INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT

FISCAL YEAR 2002 ANNUAL PERFORMANCE REPORT

Prepared for:

Commander
Twin Cities Army Ammunition Plant
4700 Highway 10, Suite A
ATTN: DAIM-BO-A-TW
Arden Hills, Minnesota 55112-3928

TECUMSEH/WENCK
INSTALLATION SUPPORT SERVICES

ALLIANT TECHSYSTEMS INC.
CONESTOGA-ROVERS & ASSOCIATES, INC.
SECOR INTERNATIONAL, INC.

AUGUST 2003
FINAL REPORT

Minnesota Pollution Control Agency

August 22, 2003

Mr. Michael R. Fix
Remedial Project Manager
Twin Cities Army Ammunition Plant
4700 Highway 10 - Suite A
Arden Hills, MN 55112 - 3928

RE: Consistency Test for the Fiscal Year 2002 Annual Performance Report
Twin Cities Army Ammunition Plant
Arden Hills, Minnesota

Dear Mr. Fix:

Staff at the Minnesota Pollution Control Agency (MPCA) and the U.S. Environmental Protection Agency (U.S. EPA) have completed review of the Fiscal Year 2002 Annual Performance Report (Report). Our review included the draft version of the Report, dated February 19, 2003; U.S. EPA comments dated April 24, 2003 and MPCA comments dated April 30, 2003; and Army's responses to our comments dated May 14, 2003. Comments resolution meetings were held on May 22, 2003 and June 3, 2003. Redline changes were submitted on June 24, 2003, with MPCA staff providing comments to the redline changes on July 22, 2003 and U.S. EPA providing comments on July 31, 2003. At the August 5, 2003 Technical Review Committee meeting, Army provided verbal concurrence with the agencies' comments to the redline changes and the regulators indicated that consistency approval for the Report would be provided.

You are hereby advised that, in accordance with Chapter XIV of the Federal Facility Agreement, with the incorporation of the aforementioned redline page changes, the Twin Cities Army Ammunition Plant Fiscal Year 2002 Annual Performance Report passes the Consistency Test.

If you have questions, please contact Dagmar Romano of MPCA at (651) 296-7776 or Tom Barounis of U.S. EPA at (312) 353-5577.

Sincerely,

Dagmar Romano

Dagmar Romano
Project Manager
Site Remediation Section
Majors and Remediation Division

Dagmar Romano for

Tom Barounis
U.S. Environmental Protection Agency

DR/TB:csa

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List of Acronyms

Alliant	-	Alliant Techsystems, Inc.
Army	-	U.S. Army
AS/SVE	-	Air Sparging/Soil Vapor Extraction
BGRS	-	Boundary Groundwater Recovery System
CRA	-	Conestoga-Rovers and Associates, Inc.
CRDL	-	Contract Required Detection Limit
DNAPL	-	Dense Non-Aqueous Phase Liquid
EE/CA	-	Engineering Evaluation/Cost Analysis
ERIS	-	Environmental Restoration Information System
FFA	-	Federal Facilities Agreement
FY	-	Fiscal Year
GAC	-	Granular Activated Carbon
gpm	-	Gallons per Minute
HRC	-	Hydrogen Release Compound
IRA	-	Interim Remedial Action
MCES	-	Metropolitan Council Environmental Services
MCLs	-	Maximum Contaminant Levels
MCLGs	-	Maximum Contaminant Level Goals
MDH	-	Minnesota Department of Health
MDL	-	Method Detection Limit
MPCA	-	Minnesota Pollution Control Agency
NBM	-	New Brighton Municipal
NPL	-	National Priorities List
O&M	-	Operation and Maintenance
OU	-	Operable Unit
PCBs	-	Polychlorinated Biphenyls
PGAC	-	Permanent Granular Activated Carbon

List of Acronyms (Cont.)

PGRS	-	Plume Groundwater Recovery System
PLC	-	Programmable Logic Controller
PM	-	Preventative Maintenance
POTW	-	Publicly-Owned Treatment Works
ROD	-	Record of Decision
scfm	-	Standard Cubic Feet per Minute
SDWA	-	Safe Drinking Water Act
SECOR	-	SECOR International, Inc.
SVE	-	Soil Vapor Extraction
TCAAP	-	Twin Cities Army Ammunition Plant
Tecumseh	-	Tecumseh Professional Associates, Inc.
TGRS	-	TCAAP Groundwater Recovery System
TSCA	-	Toxic Substances Control Act
TWISS	-	Tecumseh/Wenck Installation Support Services
μg/l	-	Micrograms per liter
USAEC	-	U.S. Army Environmental Center
USEPA	-	U.S. Environmental Protection Agency
VOCs	-	Volatile Organic Compounds
Wenck	-	Wenck Associates, Inc.

List of Chemical Abbreviations

Note: The abbreviations below are those that were required for data entry into the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS), which was replaced by the USAEC Environmental Restoration Information System (ERIS) in November 2001. These abbreviations, though not used in ERIS, are still used in some tables and appendices presented in this report.

111TCE	-	1,1,1-Trichloroethane
112TCE	-	1,1,2-Trichloroethane
11DCE	-	1,1-Dichloroethene
11DCLE	-	1,1-Dichloroethane
12DCE	-	1,2-Dichloroethenes (*cis* and *trans* isomers)
12DCLB	-	1,2-Dichlorobenzene
12DCLE	-	1,2-Dichloroethane
12DCLP	-	1,2-Dichloropropane
13DCLB	-	1,3-Dichlorobenzene
14DCLB	-	1,4-Dichlorobenzene
2CLEVE	-	2-Chloroethyl vinyl ether
AG	-	Silver
BRDCLM	-	Bromodichloromethane
C12DCE	-	cis-1,2-Dichloroethene
C13DCP	-	cis-1,3-Dichloropropene
C2H3CL	-	Vinyl chloride
C2H5CL	-	Chloroethane
C6H6	-	Benzene
CCL3F	-	Trichlorofluoromethane
CCL4	-	Carbon tetrachloride
CH2CL2	-	Methylene chloride
CH3CL	-	Chloromethane

List of Chemical Abbreviations (Cont.)

CHBR3	-	Bromoform
CHCL3	-	Chloroform
CLC6H5	-	Chlorobenzene
CU	-	Copper
CYN	-	Cyanide
DBRCLM	-	Dibromochloromethane
ETC6H5	-	Ethylbenzene
HG	-	Mercury
MEC6H5	-	Toluene
P4	-	Phosphorus
PB	-	Lead
SB	-	Antimony
T12DCE	-	trans-1,2-Dichloroethene
T13DCP	-	trans-1,3-Dichloropropene
TCLEA	-	Tetrachloroethane
TCLEE	-	Tetrachloroethene
TCLTFE	-	1,1,2-Trichloro-1,2,2-trifluoroethane
TRCLE	-	Trichloroethene
XYLEN	-	Xylenes
ZN	-	Zinc

1.0 Executive Summary

This Fiscal Year 2002 (FY 2002) Annual Performance Report:

- Summarizes the status of remedy implementation; and
- Addresses how the remedies are performing,

for each of the three operable units related to the Twin Cities Army Ammunition Plant (TCAAP). Fiscal Year 2002 is defined as the period from October 1, 2001, through September 30, 2002.

Records of Decision (RODs) have been signed for each of the three operable units (OUs):

- OU1 ROD signed September 1993
- OU2 ROD signed December 1997
- OU3 ROD signed September 1992

The RODs present the major components of the final remedies for the media of concern. This report looks at each of the major components and addresses:

1. *Are the remedies being implemented? (Compliance check with the RODs)*
2. *Are the remedies doing what they are suppose to?*

Table 1-1, at the end of this section, summarizes the status of remedial actions at the end of FY 2002. Following are highlights of the accomplishments for each operable unit.

Operable Unit 1 (OU1): Deep Groundwater

OU1 consists of the "north" plume of VOC groundwater contamination off the TCAAP installation. The final remedy for OU1 consists of pumping three primary municipal wells (New Brighton municipal wells NBM #4, #14 and #15) and treating the extracted groundwater through the Permanent Granular Activated Carbon (PGAC) system. Treated water is piped to the New Brighton water supply system for distribution as potable water. Other remedy components include providing alternate water supply and/or well abandonment to affected private wells, and drilling advisories for new well construction. Highlights for FY 2002 are:

- One private well was sampled in FY 2002 (#234352 owned by Nutter). This confirmation sampling showed that well #234352 was eligible for well abandonment. The Nutter residence is already connected to a municipal water system and, therefore, an offer for alternate water supply is not required. The Army is pursuing abandonment of well #234352.
- The Minnesota Department of Health Special Well Construction Areas remains in effect. The MDH has the regulatory responsibility to assure that wells constructed in the advisory area meet appropriate well construction and human health requirements.
- Evaluation of pumping rates and water quality trends support the interpretation that the extraction system is effectively containing contamination in the Prairie du Chien aquifer. The degree of containment remains under discussion between the Army, USEPA, MPCA, City of New Brighton, and Restoration Advisory Board.
- The Army, USEPA, MPCA, Restoration Advisory Board, and City of New Brighton continued discussions regarding modifying the OU1 ROD to remove the requirement for containment, and replacing it with a requirement to demonstrate that the plume is not spreading and that aquifer restoration is occurring. It is anticipated that the ROD modification will require demonstration of decreasing contaminant trends.
- The PGAC treated nearly 1.2 billion gallons of water and removed 767 pounds of VOCs during FY 2002. Approximately 15,980 pounds of VOCs have been removed since system startup.

- The effluent of the PGAC was in compliance with the applicable Safe Drinking Water Act criteria.
- The treated groundwater was beneficially used in the New Brighton municipal water supply system.

Operable Unit 2 (OU2)

OU2 is defined as the TCAAP property, including the groundwater beneath it. The OU2 ROD, which was signed in December 1997, documents the final remedies.

Highlights for activities within OU2 during FY 2002 are:

- Shallow Soil Sites
  - Closeout Reports for Sites A (excluding VOC-contaminated soils), E, H and 129-5 received regulatory approval, but final consistency will not be provided until concurrence on the land use control section of each report has been reached between the Army and the regulators or, alternatively, until the TCAAP LUCIP has received consistency approval from the regulators.
  - The Closeout Reports for Sites 129-3 and 129-15 were under regulatory review at the end of FY 2002.
  - Soil remediation work continued at Site C, with treatment and off-site disposal of an additional 6,234 tons of soil (resulting in a project total-to-date of 21,996 tons, including the quantities from 2000 and 2001). Work was suspended in Summer 2002 due to high water table conditions. Options for completing soil remediation at this site were under discussion at the end of FY2002.
  - Operation of the Site A soil vapor extraction (SVE) system continued until August 21, 2002, when it was permanently shut down (see additional discussion under Site A below).

- Deep Soil Sites
  - The Site D Shallow and Deep Soil SVE Investigation and Closeout Report received regulatory consistency.
  - Investigation of Site D shallow soils for non-VOC contaminants was completed and revealed that limited soil removal was required to address soils contaminated with metals and nitroglycerin. A work plan for the soil removal work was under regulatory review at the end of FY 2002.
  - The Site G cleanup levels were revised upward to account for the reduced infiltration through the Site G cover (this revision is contingent on proper cover maintenance). Since Site G shallow and deep soils are below the revised cleanup level, the Site G SVE system (which has not been operational since August 1998) can be dismantled.
  - A technical memorandum evaluating whether any additional dump characterization is needed was under Army review at the end of FY 2002.
- Site A Shallow Groundwater
  - Four extraction wells continued to provide containment and mass removal.
  - The system pumped at an average rate of 17.1 gallons per minute (gpm), exceeding the 15 gpm target rate.
  - During FY 2002, the system removed approximately 2.5 pounds of VOCs, with a cumulative mass removal of 37 pounds since system start-up on May 31, 1994.
  - The extracted water was discharged to the sanitary sewer system in compliance with all discharge criteria.
  - Overall, the groundwater extraction system has reduced contaminant concentrations in groundwater. The two areas where contaminants of concern exceed cleanup levels are: in the vicinity of extraction well 01U352 for cis-1,2-dichloroethene and benzene, and in the vicinity of monitoring well 01U108 (source area) for tetrachloroethene and trichloroethene.
  - In early FY 2001, the AS/SVE system began operation to remediate VOC-contaminated soils and source area groundwater. Operation of the AS system

was ceased in June 2001, due to concern regarding the lateral travel distance of sparged air. The AS system was being implemented voluntarily and was not a requirement of the OU2 ROD. The SVE system operated continuously until August 21, 2002, when it was permanently shut down.

  - During FY 2002, the AS/SVE system removed approximately 123 pounds of VOCs, with a cumulative mass removal of 536 pounds since system start-up in early FY 2001.
  - SVE VOC emissions were in compliance with discharge criteria.
  - Due to declining VOC levels in the SVE discharge, a direct-push soil investigation was conducted in July 2002 (and previously in August 2001). Results from both events showed minimal reduction in soil VOC concentrations. Since it appeared that many years of SVE system operation would be required before cleanup levels would be reached (if ever), the Army prepared a work plan clarification for excavation and off-site disposal of the VOC-contaminated soils in the source area. This work plan clarification was under regulatory review at the end of FY 2002.

- Site I Shallow Groundwater
  - Sampling at Site I indicated no significant changes in VOC concentrations in Unit 1 monitoring wells in FY 2001. Three of the seven wells scheduled for sampling were dry.
- Site K Shallow Groundwater
  - At Site K, the groundwater extraction trench and treatment system continued to operate as designed. The system captured and treated 6,251,440 gallons of water and maintained a continuous zone of capture downgradient of Building 103. A total of 11.4 pounds of VOCs were removed in FY 2002.
  - The extracted water was discharged to Rice Creek in compliance with all discharge criteria. There was an anomalous detection of copper and zinc above the criteria in the March 2002 effluent sample. The effluent was resampled in April and the results were within the criteria.

- Deep Groundwater
  - The TGRS operated in accordance with the OU2 ROD.
  - The TGRS likely operated at a rate sufficient to support the conclusion that the 5-μg/l trichloroethene contour is hydraulically contained. The overall pumping rate was below the 1989 baseline flow rates, primarily due to the downtime to clean and replace tower packing that had never peen performed in its 13 years of operation. This added some uncertainty as to whether complete capture was achieved. However, wells with the lowest contaminant concentrations were the wells with the greatest decrease in pumping rate. Therefore, the areas with the greatest chance of missed capture were the areas with low trichloroethene concentrations (near or below 5 μg/l).
  - In FY 2002, the TGRS extracted and treated 926,042,500 gallons of water. The mass of VOCs removed was 2,852 pounds. The total VOC mass removed by the TGRS through FY 2002 is 182,936 pounds.
  - Beginning in November 1996, wells B12 and SC4 were shut down due to reductions in the plume size, as per agreements with the MPCA and USEPA.
  - The Army and Agencies have verbally agreed on shutting down Wells B7, B10, and SC3 in FY2003 as part of an overall Operating Strategy, which will be finalized in FY2003.
  - The Army and Agencies have verbally agreed to replace well B-2 with a new well, B-13, as part of the Operating Strategy.

<u>**Operable Unit 3 (OU3): Deep Groundwater**</u>

- The PGRS extraction well (NB13) was not used for remediation purposes during FY2002. The PGRS, including NB13 well remain in "standby" condition in the event groundwater must be treated for contamination.
- Monitoring continued to show that the OU3 plume no longer extends to the extraction well.

Table 1-1

Status of Remedial Actions: FY 2002

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 1: Deep Groundwater				
#1: Alternate Water Supply/Well Abandonment	Yes	Yes	No	
#2: Drilling Advisories	Yes	Yes	No	
#3: Groundwater Containment	Yes	Yes	No	The containment requirement is under review.
#4: Removal of VOCs by GAC (Discharge Quality)	Yes	Yes	No	
#5: Discharge of Treated Water	Yes	Yes	No	
#6: Groundwater Monitoring	Yes	Yes	No	
Overall Remedy	Yes	Yes	No	
Operable Unit 2: Shallow Soil Sites				
#1-7: Soil Remediation				
Site A	Yes	Yes	Partially	Closeout Report for metals has been approved; however, see Note 1 at the end of the OU2 section of this table. See OU2 Site A Shallow Groundwater (below) for status on VOC soils.
Site C	Yes	Partially	No	Site was partially excavated FY2000 - 2002. Excavation suspended in FY2002 due to high water table. Options for completing site cleanup were under review at end of FY2002.
Site E	Yes	Yes	Partially	Closeout Report has been approved; however, see Note 1 at the end of the OU2 section of this table.

Table 1-1 (continued)

Status of Remedial Actions: FY 2002

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Shallow Soil Sites (continued)				
#1-7: Soil Remediation (continued)				
Site H	Yes	Yes	Partially	Closeout Report has been approved; however, see Note 1 at the end of the OU2 section of this table.
Site 129-3	Yes	Yes	Partially	Site excavation was completed in 2001. Closeout Report was under regulatory review.
Site 129-5	Yes	Yes	Partially	Closeout Report has been approved; however, see Note 1 at the end of the OU2 section of this table.
#8: Groundwater Monitoring	No	No	No	Monitoring will begin in FY2003, since shallow soil site remediation work is complete (with the exception of Site C).
#9: Characterization of Dumps:				
Site B	Yes	Yes	Yes	
Site 129-15	Yes	Yes	Partially	Site 129-15 was characterized in FY1999. CERCLA soil cover was completed in 2001. Closeout Report was under regulatory review.
Overall Remedy	Yes	Yes	No	

Note 1: *Closeout report has been approved, but final consistency will not be provided until concurrence on the land use control section of the report has been reached between the Army and the regulators or, alternatively, until the TCAAP LUCIP has received consistency approval from the regulators.*

Table 1-1 (continued)

Status of Remedial Actions: FY 2002

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Soil Sites				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Restrict Site Access	Yes	Yes	No	
#3: SVE Systems (Deep)	Yes	Yes	Partially	Deep SVE systems will not be required at Sites D or G. The Site D VOC Closeout Report received consistency in FY2002. The Site G VOC Closeout Report was in progress.
#4: Enhancements to SVE Systems	Yes	Yes	Yes	Neither system needs to be operated with enhancements. The Site D SVE system was dismantled in FY2001. The Site G SVE system can now be dismantled.
#5: Maintain Existing Site Caps (Site G)	Yes	Yes	No	
#6: Maintain Surface Drainage Controls (Site G)	Yes	Yes	No	
#7: Characterize Shallow Soils and Dump	Yes	Partially	No	Site D characterization for non-VOC contaminants has been completed. A work plan for removal and off-site disposal of contaminated soil was under regulatory review. For Site G, a technical memorandum evaluating whether any additional dump characterization is needed was under Army review.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2002

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site A Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Groundwater Containment/Mass Removal	Yes	Yes	No	
#3: Drilling Advisory/Alternate Water Supply/Well Abandonment	Yes	Yes	No	
#4: Discharge of Extracted Water	Yes	Yes	No	
#5: Source Characterization/Remediation	Yes	Yes	No	The SVE system ceased operating on August 21, 2002, due to minimal VOC removal rates. Since VOC concentrations in source area soils were not significantly declining, the Army submitted a work plan clarification for removal and off-site disposal of the source area soils, rather than continue SVE operation (under regulatory review).
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2002

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site I Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Groundwater Extraction	No	No	No	Pilot study determined that extraction remedies are not feasible. An amendment to the OU2 ROD is being pursued to change the remedy to a monitoring based remedy.
#3: POTW Discharge	No	No	No	See above.
#4: Additional Investigation	Yes	Yes	No	See above.
Overall Remedy	Yes	Yes	No	See above.
Operable Unit 2: Site K Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Sentinel Wells	Yes	Yes	Yes	
#3: Hydraulic Containment	Yes	Yes	No	
#4: Groundwater Treatment	Yes	Yes	No	
#5: Treated Water Discharge	Yes	Yes	No	
#6: Discharge Monitoring	Yes	Yes	No	
#7: Additional Investigation	Yes	Yes	Yes	Well 03U621 was added as a sentinel well and is listed in the annual performance monitoring plan for annual monitoring.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2002

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Groundwater					
#1:	Hydraulic Containment and Contaminant Mass Removal	Yes	Yes	No	TGRS reconfiguration analysis was under regulatory review.
#2:	Groundwater Treatment	Yes	Yes	No	
#3:	Treated Water Discharge	Yes	Yes	No	
#4:	Institutional Controls	Yes	Yes	No	
#5:	Review of New Technologies	Yes	Yes	No	
#6:	Groundwater Monitoring	Yes	Yes	No	
Overall Remedy		Yes	Yes	No	
Operable Unit 3: Deep Groundwater					
#1:	Groundwater Extraction	No	Yes	No	PGRS flowrate was reduced to 0 gpm in FY2001 as an interim operational change. A final decision regarding pumping extraction well NB13 has not yet been made.
#2:	Groundwater Treatment	No	Yes	No	
#3:	Use of Water for Municipal Supply	No	Yes	No	
#4:	Groundwater Monitoring	Yes	Yes	No	
Overall Remedy		Yes	Yes	No	

2.0 Introduction

2.1 PURPOSE

This Fiscal Year 2002 Annual Performance Report is intended to:

- Summarize the status of remedy implementation; and
- Address how the remedies are doing,

for remedial actions at the New Brighton/Arden Hills Superfund site. Fiscal Year 2002 (FY 2002) extended from October 1, 2001, through September 30, 2002.

For purposes of remediation, the areas contaminated by activities at TCAAP have been divided into three areas designated "Operable Units." Operable Unit 1 (OU1) encompasses the deep groundwater "North Plume" of off-TCAAP contaminated groundwater. Operable Unit 2 (OU2) includes all soil and groundwater contamination on TCAAP. OU2 also includes the shallow Site A plume which extends off the north end of TCAAP in the Unit 1 aquifer. Operable Unit 3 (OU3) consists of the deep groundwater "South Plume" of off-TCAAP contaminated groundwater.

The report addresses remedial actions for the following media as prescribed in the Record of Decision (ROD) for each Operable Unit:

- Operable Unit 1
  - Deep Groundwater

- Operable Unit 2
  - Shallow Soil Sites
  - Deep Soil Sites
  - Site A Shallow Groundwater
  - Site I Shallow Groundwater
  - Site K Shallow Groundwater
  - Deep Groundwater

- Operable Unit 3
  - Deep Groundwater

Monitoring activities and submittal of this report are in fulfillment of the Federal Facilities Agreement (FFA) signed August 12, 1987, between the United States Army (Army), United States Environmental Protection Agency (USEPA), and Minnesota Pollution Control Agency (MPCA). Minor modifications to the FFA were agreed to by these parties on:

- October 12, 1990
- February 5, 1992
- March 3, 1992
- November 23, 1993
- January 9, 1998
- May 12, 1998
- June 30, 1998

The requirements have been fulfilled for FFA Attachment 2 (Interim Remedial Actions), Attachment 3 (Remedial Investigation), and Attachment 4 (Feasibility Study). Activities are now geared towards fulfilling the requirements of FFA Attachment 5 (Remedial Design and Remedial Action).

Assessment of performance is really answering two questions:

1. *Are all of the remedies being implemented? (Compliance check with the RODs)*
2. *Are the remedies doing what they are supposed to?*

To address these two questions, this report is broken into the three Operable Units. Using each ROD, the report is broken down one more level to the major components of the selected remedy for each of the media described previously. Performance standards are then presented for each of the major remedy components. The performance standards are the "what they are supposed to" part of the question, "Are the remedies doing what they are supposed to?" The performance standards are the yardstick against which performance is measured, and are used to determine when a remedy component has been successfully implemented and/or completed.

For some of the remedy components, the performance standards are clearly defined in the RODs (e.g., soil or groundwater cleanup levels). For other remedy components (e.g., alternate water supply) the performance standards are less clear in the RODs, but may have been agreed to through Work Plans or design documents.

With the performance standards identified, this report then addresses the two questions described above, often through a series of sub-questions. The questions are written in the text in an attempt to make the report focused, streamlined, and user friendly. To the extent possible, answers are in the form of pictures (figures, graphs, etc.) versus words.

In addition to the performance evaluation, another objective of making the report focused is to make the monitoring program focused and efficient. With specific questions identified, it is easier to develop the monitoring needs. In addition to reporting on FY 2002, this document presents proposed monitoring for future years (Appendix A). Monitoring locations or items that are new in this year's report are shown in red color. The monitoring plan shows FY 2002 through FY 2006. The FY 2002 monitoring plan indicates the work that generated the results presented in this report. The FY 2003 monitoring plan is in progress. The monitoring plan is a moving 5-year timespan (i.e., next year FY 2002 will drop off and FY 2007 will be added).

This report represents the collaboration of work performed by the Army and Alliant Techsystems Inc. (Alliant). On behalf of the Army, Tecumseh/Wenck Installation Support Services (TWISS) prepared Sections 2.0 through 6.0, and 11.0 of this report. On behalf of Alliant, SECOR International, Inc. (SECOR) prepared Sections 7.0, 8.0 and 10.0, and Conestoga-Rovers & Associates, Inc. (CRA) prepared Section 9.0. TWISS, SECOR, and CRA all contributed to Section 1.0.

2.2 SITE DESCRIPTION

The Twin Cities Army Ammunition Plant is a government-owned facility located in Arden Hills, Minnesota, in the northern portion of the Minneapolis-St. Paul metropolitan area (Figure 2-1). For purposes of the TCAAP restoration program, the facility occupies approximately a four-square mile area immediately east of U.S. Interstate Highway 35W and north of Ramsey County Highway 96. Alliant is the prime tenant on the installation. TWISS is the contracted operator.

TCAAP was constructed in 1941 to provide small-caliber ammunition for the military needs of the United States. Production began in 1941 and then alternated between periods of activity and standby. TCAAP was last placed in "standby" status in 1976; and then in 1992, its status was changed to "modified caretaker" which meant that it will no longer be maintained for the production of ammunition. In 2002, 774 acres of TCAAP was declared excess to the needs of the Army.

During periods of activity, solvents were utilized as part of the manufacturing process. Disposal of solvents and other wastes at the TCAAP site resulted in soil contamination and also groundwater contamination, which has migrated beyond the site boundary. Groundwater contamination was first discovered in July 1981, and the site was placed on the National Priorities List (NPL) in 1983.

A number of known and potential contaminant source areas have been identified on the TCAAP property: Sites A, B, C, D, E, F, G, H, I, J, K, 129-3, 129-5 and 129-15 (see Figure 2-2 for locations). Sites F and J have previously been remediated. The remaining sites are addressed in the OU2 ROD. Surface water and sediment on TCAAP are being addressed separately from the OU2 ROD.

Five other sites, the Grenade Range, the Outdoor Firing Range, the Trap Range, and the 135 and 535 Primer/Tracer Areas are being addressed as Removal Actions separate from the OU2 ROD; therefore, they are not specifically addressed in this report.

2.3 HYDROGEOLOGIC UNITS AND WELL NOMENCLATURE

On- and off-post wells have been installed in four hydrogeologic units beneath the site: Unit 1 through Unit 4. Descriptions of these four units are presented in Appendix B, along with a description of the nomenclature system used for well designations (e.g., 03U704). A well-designation cross-reference guide (sorted two different ways) is included in Tables B-1 and B-2 in Appendix B. The well index lists wells of concern, the TCAAP designation, Minnesota unique number, and any other name(s) the wells may have. Figure B-2 (off-TCAAP) and Figure B-3 (on-TCAAP) in Appendix B show the locations of wells that are included in the TCAAP monitoring plan. With a known well name, the location of that well can be determined using the "Edit, Find" function and typing in the well name, which will highlight the desired well name on the figure. Available well logs can be viewed by selecting the well of interest in Table B-3 (on-TCAAP) and Table B-4 (off-TCAAP) in Appendix B (click on the well name with the mouse).

2.4 DATA COLLECTION, MANAGEMENT, AND PRESENTATION

Performance monitoring data was collected in accordance with the:

- FY 2002 Monitoring Plan for Groundwater Monitoring Wells
- FY 2002 Monitoring Plan for Remedial Treatment Systems
- FY 2002 Monitoring Plan for Surface Water
- New Brighton Water System Sampling and Analysis Plan

Data was collected principally by four parties: TWISS on behalf of the Army, SECOR and CRA on behalf of Alliant, and Barr Engineering on behalf of the City of New Brighton. Appendix C presents information on data collection, management, and presentation. Tables showing FY 2002 data are presented following the text at the end of each section in which it is referenced. The comprehensive groundwater level and groundwater quality databases from 1987 to present are contained in Appendix D. Groundwater quality trend graphs for the primary contaminant of concern (trichloroethene) can be viewed by selecting the well of interest on Figure B-2 (off-TCAAP) and B-3 (on-TCAAP) in Appendix B (click on the well name with the mouse). The trend graphs for Site A also include tetrachloroethene and cis-1,2-dichloroethene, in addition to trichloroethene.

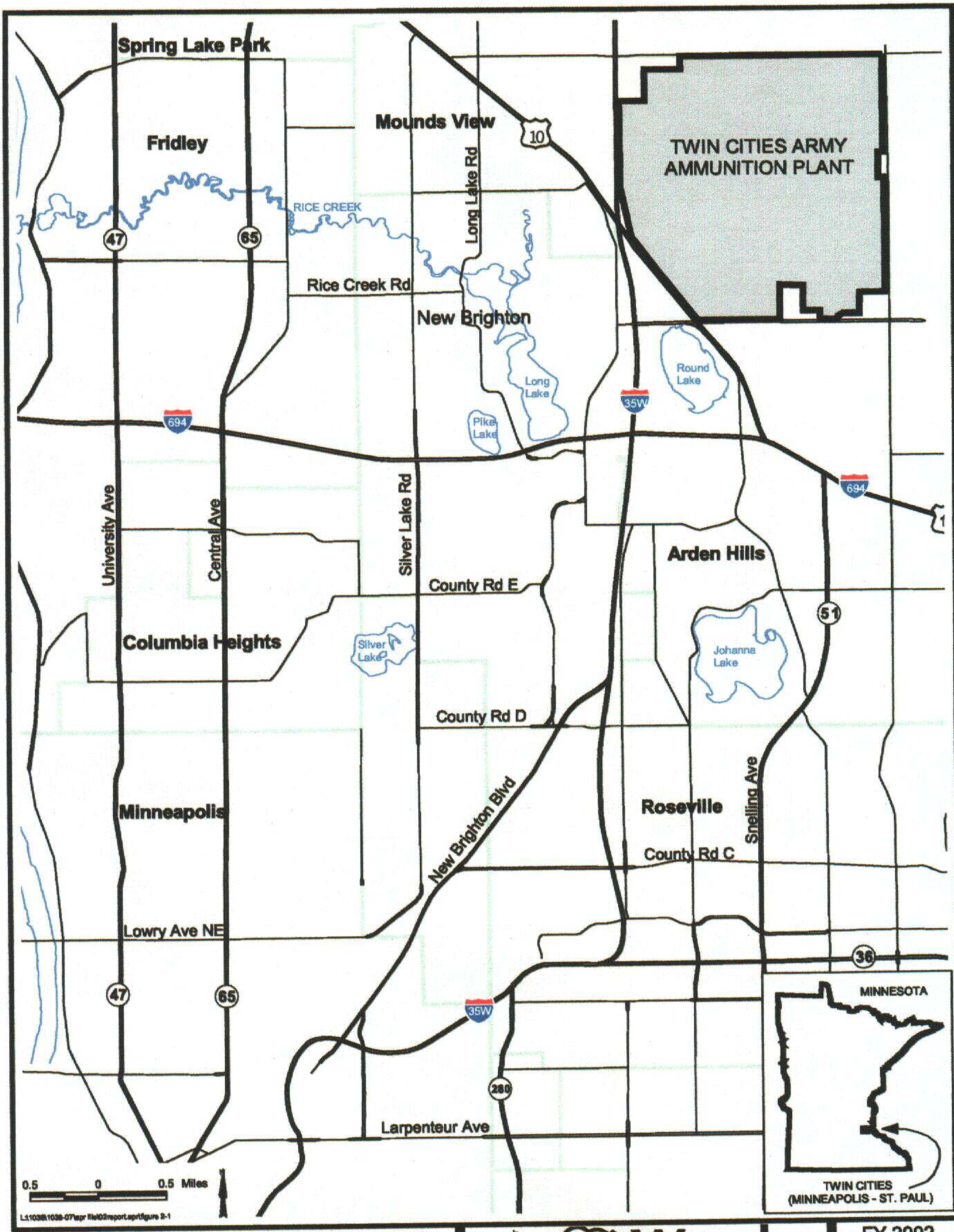
Is the data complete and representative (are we making decisions based on complete and technically-sound information)?

Yes. The data was collected, assessed, and validated in accordance with the FY 2002 Monitoring Plan and the "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996). The data tables in the various report sections and the comprehensive water quality databases (Appendix D) show the data qualifiers and flagging codes that were assigned to the data as a result of data assessment/validation. The data qualifiers and flagging codes applied to FY 2002 data are explained in footnotes on the data tables in the various report sections. Data assessments (performed on 100 percent of the data) and "full validation" (performed on at least 10 percent of the data) were provided to the MPCA and

USEPA in submittals dated March 5, June 4, October 1, and December 3, 2002. MPCA and USEPA approval letters for these submittals are included in Appendix C.3.

With regard to completeness, Appendix C.2 summarizes a few minor deviations from the FY 2002 Monitoring Plan. Field completeness for FY 2002 was 98% and laboratory completeness was 100%, meeting the QAPP completeness goal of 95%. Field duplicates, equipment rinse blanks, and matrix spike/matrix spike duplicates were collected at overall frequencies of 19%, 10% and 12%, exceeding the QAPP-specified frequencies of 10%, 10% and 5%, respectively. For the subset of metals analyses, matrix spike/matrix spike duplicates were collected at an overall frequency of 64%, also meeting the QAPP-specified frequency. Data validation was performed on 30% of the data, meeting the QAPP-specified requirement of 10%. No problems with analytical procedures/reporting were identified in the data validations.

The data for FY 2002 is deemed to be representative based on: 1) adherence to QAPP-specified sampling and laboratory analytical procedures; 2) completion of data assessments and data validation; and 3) comparability to historical results (any substantial deviations from historical/anticipated results are discussed within the site-specific sections of this report).



TWIN CITIES ARMY AMMUNITION PLANT

Site Location Map

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Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2002

Figure 2-1

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2002
TCAAP Site Boundaries		Figure 2-2

3.0 Operable Unit 1: Deep Groundwater

The reference for the OU1 ROD is:

RECORD OF DECISION
Groundwater Remediation
Operable Unit 1
At New Brighton/Arden Hills Superfund Site
September 1993

There have been no subsequent ROD Amendments or Explanations of Significant Differences.

Groundwater containment is provided by three primary municipal wells: New Brighton Municipal (NBM) #4, #14 and #15. NBM #3, which is located next to NBM #4, also contributes to containment, especially when one of the other three wells is off. The extracted water is treated in the Permanent Granular Activated Carbon (PGAC) treatment facility for removal of VOCs, and is then used as part of the municipal water supply. NBM #3 and #4 were pre-existing wells. NBM #14 and NBM #15 began pumping in December 1996 and March 1998, respectively.

The remedy also relies on institutional controls (drilling advisory, alternate water supply, and well abandonment) to manage risks, including downgradient of the containment system.

Section 1.4 of the ROD prescribes six major components of the remedy, which are described and evaluated in the following sections.

3.1 REMEDY COMPONENT #1: ALTERNATE WATER SUPPLY/WELL ABANDONMENT

Description: "Providing an alternative water supply to residents with private wells within the North Plume." (OU1 ROD, page 2)

- Clarified by the OU1 Alternate Water Supply Plan (Montgomery Watson, October 1995) to delete "residents with" since the remedy applies to other wells in addition to residential wells. This plan also identifies the criteria for determining what wells are eligible for an alternate water supply.
- Clarified by the OU1 Alternate Water Supply Plan to also include well abandonment.
- Clarified by the OU1 Alternate Water Supply Plan (page i-2) to also encompass OU3 and the OU2 Site A shallow groundwater plume.

Performance Standard (how do you know when you're done):

- For alternate water supply, when <u>all</u> well owners that meet all of the following criteria have been offered and provided with an alternate water supply (or when the well owners have rejected the offers):
  - i. The well is located within the area affected by groundwater plumes that originate at TCAAP, as shown on Figures E-2 and E-3; and
  - ii. The well is completed in an affected aquifer; and
  - iii. The well contains detectable concentrations of the TCAAP-related chemicals of concern identified on page 18 of the OU1 ROD (or page 26 of the OU3 ROD, or Table 1 of the OU2 ROD, as appropriate for the well location); and
  - iv. The well is used in a manner to cause exposure (uses are defined in the Alternate Water Supply Plan); and
  - v. The well owner does not already have an alternate water supply.

If eligible well owners refuse the offer to have an alternate water supply provided, this also satisfies the performance standard.

- For well abandonment, when all wells that meet all of the following criteria have been offered and provided abandonment (or when the well owners have rejected the offers):
  - i. The well is located within the area affected by groundwater plumes that originate at TCAAP; and
  - ii. The well is completed in an affected aquifer; and
  - iii. The well contains detectable concentrations of the TCAAP-related chemicals of concern identified on page 18 of the OU1 ROD (or page 26 of the OU3 ROD, or Table 1 of the OU2 ROD, as appropriate for the well location); and
  - iv. The well was constructed prior to the Minnesota Department of Health (MDH) Special Well Construction Area advisory; and
  - v. The well is being used by the well owner or use was discontinued due to contamination; and
  - vi. The well is used in a manner to cause exposure (uses are defined in the Alternate Water Supply Plan).

  If eligible well owners refuse the offer for abandonment, this also satisfies the performance standard. An exception to abandonment would be if the well is needed for groundwater monitoring.

Is this remedy component being implemented?

Yes. The Alternate Water Supply and Well Abandonment Program is implemented and is an ongoing program maintained by the Army. The process of identifying wells eligible for alternate water supply and/or abandonment is accomplished by maintaining a "well inventory." The well inventory is a database that was initially developed in 1992, and which has been periodically updated since then. For the purposes of the well inventory, a study area was established which encompasses the groundwater plume (the study area boundary is the same as the MDH Special Well Construction Area). The well inventory is intended to include all wells within the study area. Within the study area, areas of concern are defined by the edge of the groundwater plume, plus additional buffer area. The wells are grouped into categories based on factors such as location relative to the area of concern, type of use, active or sealed, etc. Wells in categories with the potential to be impacted are periodically sampled to see if any qualify for alternate water supply and/or abandonment.

Thus, maintenance of the well inventory consists of the following tasks:

1. Check if the area of concern needs to be adjusted based on the extent of contamination,
2. Check if there are any previously unknown wells to be added to the database,
3. Sample wells on a prescribed schedule,
4. Take the appropriate course of action depending on the results,
5. Update the well inventory database with any new information (e.g., water quality results, owner information, construction information, well re-categorizing)
6. Report findings through the Annual Performance Report.

Additional information on the well inventory is presented in Appendix E. The following questions and answers summarize developments since the last Annual Performance Report with respect to Operable Unit 1.

Did the well inventory area of concern change during FY 2002, as defined by the 1 μg/l contour line?
No. Since FY 2002 was an "off year" in the biennial sampling program, no new information was available.

Were any additional water supply wells discovered within the North Plume during FY 2002? No.

Were any water supply wells within the North Plume sampled during FY 2002 (outside of those included in the OU1 performance monitoring plan)? If yes, what were the findings? Yes, one well was sampled: Well #234352, owned by Aaron Nutter at 1206 12th Avenue NW, New Brighton. This well was resampled in FY 2002 to confirm a cleanup level exceedance in the previous sampling event (1,1-dichloroethene at 7.3 μg/l, which was above the OU1 cleanup level of 6 μg/l). This well is used for outside irrigation, and is not used for drinking water since the residence is connected to the municipal water supply.

Analytical results from the FY 2002 sampling are summarized in Table E-2 and the well location is illustrated on Figure E-5 (Appendix E). Although 1,1-dichloroethene (and all other OU1 chemicals of concern) were below the OU1 cleanup levels, an additivity calculation similar to the MDH Hazard Index yielded a result of 1.4. Since this value was greater than 1.0, the results for this confirmation sample were viewed as exceeding the OU1 cleanup levels.

Were any well owners offered an alternate water supply and/or well abandonment during FY 2002? Yes, the Army is pursuing abandonment of well #234352 (Nutter).

Within the North Plume, are there any well owners which meet the criteria, but have not yet been provided an alternate water supply? No.

Within the North Plume, are there any wells which meet the criteria, but have not yet been abandoned?
Yes, well #234352 (Nutter) as described above.

Is any sampling of water supply wells (excluding those included in the OU1 performance monitoring plan) proposed prior to the next report?
No. The next "major" sampling event will be in FY 2005.

Are there any changes or additional actions required for this remedy component?
No.

3.2 REMEDY COMPONENT #2: DRILLING ADVISORIES

Description: "Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When the Minnesota Department of Health (MDH) has issued a Special Well Construction Area Advisory.

Has the MDH issued a Special Well Construction Area Advisory?
Yes. It was issued in June 1996. In addition to covering OU1, the Special Well Construction Area also encompasses OU3 and the OU2 Site A shallow groundwater plume. In June 1999, the MPCA requested that the MDH extend the boundary of the Special Well Construction Area further to the southwest to the Mississippi River and Marshall Avenue to ensure that the southern boundary fully encompassed the plume. The MDH revised the Special Well Construction Area in December 1999. The new area is shown on Figure E-1 (Appendix E).

Are any changes or additional actions required for this remedy component? No.

3.3 REMEDY COMPONENT #3: GROUNDWATER CONTAINMENT

Description: "Extracting groundwater at the containment boundary in the North Plume near County Road E." (ROD, page 2)

- This remedy component consists of recovering deep (Unit 4) groundwater using three City of New Brighton municipal wells: NBM #4, #14 and #15. New Brighton municipal well #4 (NBM #4) was an existing well completed in both the Prairie du Chien and Jordan. NBM #14 and NBM #15 were constructed in the Prairie du Chien as part of the remedy and began pumping in December 1996 and March 1998, respectively. The locations of the three recovery wells are shown on Figure B-2 (Appendix B).

- NBM #3 has been designated as an alternate containment/production well for times when one of the three primary wells is not in operation. NBM #5 and NBM #6 are considered secondary alternates.

The extracted groundwater is used as part of the New Brighton water supply system, and as such, New Brighton took the lead on design and construction of the system, and is responsible for operation of the system. New Brighton contracted Barr Engineering to provide design and construction oversight services. The OU1 remedy is being paid for by the Army.

Performance Standard (how do you know when you're done):
When the containment boundary created by the extraction system is providing capture of groundwater with contaminant concentrations exceeding the cleanup standards specified on page 18 of the OU1 ROD.

During FY 2002, did the OU1 extraction system provide capture (at the containment boundary) of groundwater exceeding the cleanup standards specified on page 18 of the OU1 ROD?
The degree of containment remains under discussion between the Army, USEPA, MPCA, City of New Brighton, and Restoration Advisory Board. During FY 2002, the Army prepared a technical memorandum (TWISS, December 2001) regarding the feasibility of a modification to the ROD. The contemplated change would be to switch from a requirement for containment, to a requirement for demonstrating that the plume is not spreading and that aquifer restoration is occurring. The USEPA, MPCA, Restoration Advisory Board, and City of New Brighton provided comments on the technical memorandum, and there were several meetings to work out technical issues. Details regarding monitoring wells, frequency of sampling, and how to

evaluate the data are expected to be resolved in FY 2003; which will enable the ROD modification process to move forward.

In the meantime, the extraction system has continued to operate. Following is a discussion of the performance of the system with respect to containment.

Pumping Rates

Table 3-1 presents the monthly pumping volumes for each extraction well and Figure 3-1 illustrates the average monthly pumping rate targets and actual monthly volumes pumped for NBM #3/4, #15 and #14 (west to east order). The pumping targets were derived by Barr Engineering based on their Final Conceptual Design Report, Containment/Production Wells (Barr, 1995). The operating system devised by Barr includes different operational conditions (named A thru G), designed to respond to maintenance issues by altering the target rates at each extraction well. Condition A is the normal operating condition for when NBM#4, #14 and #15 are all in operation, and has pumping targets (lower limits) of 1.19, 0.99 and 0.99 million gallons per day, respectively. Conditions B through F have different pumping targets for when different wells are out of service (e.g. a pumping target for NBM#3 is added when NBM#4, #14 or #15 are out of service, and pumping targets for NBM#5 and #6 are added when both NBM#3 and #4 are out of service). Condition G is unique from the other conditions because it does not have a pumping target (i.e the targets for all wells are zero). Condition G primarily applies during carbon changeouts for the GAC treatment system. Hence, the daily pumping targets can vary depending on what operating condition the system is in. The targets depicted on Figure 3-1 represent a collective or cumulative monthly target based on the daily operating conditions.

Figure 3-1 indicates that the NBCGRS, as a whole, exceeded the monthly targets, except for March 2002. The graph shows low targets and lower pumping in December 2001 and April 2002 when most, or all of the days in these months were in Condition G for GAC changeouts. The graph also shows a low target in August 2001 when the City designated Condition G because more than one well was out of service simultaneously; however, the pumping was sustained for the month.

The graphs for the extraction wells on Figure 3-1 show that each well usually met targets throughout the year, indicating that the pumping was appropriately distributed. In addition to the times off-line for GAC changeouts, NBM #14 was out of service in May 2002 for maintenance and NBM #15 was out of service in March 2002. NBM #4 was below the target in November 2001 and March 2003, but NBM #3 was pumped to make up the difference.

The overall adherence to the pumping targets supports the interpretation that the extraction system is providing substantial containment in the Prairie du Chien.

Water Level Contour Analysis

Under the biennial monitoring frequency, water levels were not measured in FY 2002.

Extraction Well Water Quality

Trend graphs for total VOCs in NBM #3, #4, #14 and #15 are shown on Figure 3-2 and the data is presented in Table 3-1. At NBM #3, total VOCs decreased dramatically between 1994 and 1998, then stabilized between 1998 and 2000, and appear to be increasing slightly since then. The range in FY 2002 was 27 μg/l to 93 μg/l, with an average of 62 μg/l. NBM #4 also exhibits a similar decrease between 1994 and 1998, and since 1998, has been relatively stable. The range in FY 2002 was 37 μg/l to 90 μg/l, with an average of 65 μg/l. NBM #14 has shown a decreasing trend since its startup in December 1996. The range in FY 2002 was 18 μg/l to 76 μg/l, with an average of 43 μg/l. NBM #15 fluctuated between its startup in March 1998 and 2000, and since then appears to be exhibiting a decreasing trend. The range in FY 2002 was 67 μg/l to 120 μg/l, with an average of 100 μg/l.

While not conclusive in and of itself, the decreasing water quality trends at the extraction wells support the interpretation that the OU1 system is making progress towards aquifer restoration.

Monitoring Well Water Quality

Over the long-term, water quality data will be useful in evaluating containment. If containment is being achieved, decreases in contaminant concentrations should be evident in wells near and downgradient of the extraction wells. Trichloroethene versus time graphs are presented in Figure B-2 of Appendix B. The graphs can be viewed by clicking on the well of interest. Following are some comments regarding key wells near the extraction system. Note that FY 2002 was the "off" year in the biennial monitoring program, so only the following three wells were sampled. Figure 3-3 presents TCE trend graphs for these three wells.

04U877: Located near the capture line south of NBM #14 and #15. The TCE concentration decreased from 5.6 μg/l in 2001 to 2.2 μg/l in 2002, suggesting effective containment for the east edge of the plume. All parameters are now below the cleanup levels at this well.

04U871: Located downgradient of NBM #4 and NBM #15, near the center of the plume. The concentration had declined from approximately 225 μg/l in 1996 to 25 μg/l in 2001, before increasing slightly in 2002 to 41 μg/l.

04U872: Located further downgradient of 04U871, this well shows a similar decline with the concentrations decreasing from approximately 170 μg/l in 1996 to 16 μg/l in 2001, followed by essentially the same level in 2002 (17 μg/l).

Overall, the declining concentrations support the Army's belief that the OU1 extraction system is effectively containing contamination in the Prairie du Chien, although other factors are contributing to the decreases (i.e., natural attenuation). The Army, USEPA, MPCA, City of New Brighton, and Restoration Advisory Board continued discussions evaluating the performance of the OU1 remedy.

Are any changes or additional actions required for this remedy component?

Potential changes and/or additional actions will be addressed through the ROD modification process previously referenced.

3.4 REMEDY COMPONENT #4: REMOVAL OF VOCs BY GAC

Description: "Pumping the extracted groundwater to the Permanent Granular Activated Carbon (PGAC) Water Treatment Facility in New Brighton for removal of VOCs by a pressurized GAC system." (OU1 ROD, page 2)

- Treatment by the PGAC (along with iron and manganese removal and chlorination) makes the recovered groundwater suitable for municipal drinking water purposes. The PGAC is located approximately one-third mile south of Interstate 694 near Silver Lake Road. The City of New Brighton is responsible for operation and maintenance of the PGAC, with cost reimbursement from the Army for the operations related to the remedy.

Performance Standard (how do you know when you're done):
When the treated water meets the MCLs and non-zero MCLGs established by the Safe Drinking Water Act (SDWA) for the chemicals of concern, as identified on page 18 of the OU1 ROD.

Did the treated water meet the MCLs and non-zero MCLGs established by the SDWA for the OU1 chemicals of concern?
Yes. Table 3-2 shows that the PGAC effluent met the performance standard during FY 2002.

Each of the 8 pairs of GAC Contractors (labeled A and B) are normally run in series (i.e., water passes through A then B, or B then A, depending on whether the most recent carbon change-out was the A or B vessel). The sampling data is not from a combined effluent after the GAC vessels; instead, it is from sampling ports between the lead and lag GAC vessel *and/or* after the lag GAC vessel for each of the 8 GAC vessel pairs in the PGAC. The sampling between the lead and lag vessels is performed every month and determines when breakthrough of the lead GAC vessels has occurred. When there are no contaminant detections between the lead and lag vessels, there is no reason to sample after the lag vessels. When breakthrough of a lead vessel has occurred, a carbon change-out of all 8 lead vessels is scheduled. Until the change-out occurs, monthly samples are collected after each lag vessel (in addition to the monthly between-vessel samples) to ensure that water leaving the PGAC meets the treatment requirements. When the carbon change-out of the lead vessels is completed, the lead vessels are switched to the lag position and vice versa. Monthly sampling then reverts to only between the lead and lag vessels until a contaminant detection occurs, whereupon the process repeats.

Table 3-2 shows that two carbon change-outs occurred in FY 2002, one in November/December 2001 and one in April/May 2002. The sampling results that represent PGAC effluent water quality are highlighted in Table 3-2 for ease of viewing the compliance portion of the data. There were no detections of VOCs in the samples representing PGAC effluent water quality.

Is any sampling of the treated water proposed prior to the next report?
Yes. Sampling will continue to be performed by the City of New Brighton or their contractor.

Are any changes or additional actions required for this remedy component? No.

3.5 REMEDY COMPONENT #5: DISCHARGE OF TREATED WATER

Description: "Discharging all of the treated water to the New Brighton municipal distribution system." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When the connection to the New Brighton municipal supply system has been completed and water is being discharged.

Is the treated water being discharged to the New Brighton municipal distribution system?
Yes.

Are any changes or additional actions required for this remedy component? No.

3.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING

Description: "Monitoring the groundwater to verify the effectiveness of the remedy." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When a performance groundwater monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. Performance monitoring programs have been established to collect the data required to verify the effectiveness of remedy components #1 through #5. Table 3-3 summarizes the performance monitoring requirements, implementing parties, and the specific documents which contain the monitoring plans.

Were the groundwater monitoring requirements for this remedy met? Yes.

Is any groundwater sampling proposed prior to the next report? Yes.

- Groundwater sampling of water supply wells related to alternate supply and abandonment will be in accordance with recommendations in Appendix E. The next "major" event will be in FY 2005.
- Monitoring of the extraction wells and treatment system effluent will be performed by the City of New Brighton in accordance with the "New Brighton Water System Sampling and Analysis Plan," June 1997.
- Other groundwater monitoring will be in accordance with the Groundwater Monitoring Plan included as Appendix A.1.

Are any changes or additional actions required for this remedy component? No.

3.7 OVERALL REMEDY FOR OU1 DEEP GROUNDWATER

Has the OU1 remedy been completed (i.e., have the cleanup levels on page 18 of the OU1 ROD been attained throughout the areal and vertical extent of the North Plume)? No.

What impact is the groundwater extraction system having on contaminant concentrations?

Given that only three wells were sampled in FY 2002, it is not possible to draw any new conclusions regarding the overall effect. FY 2003 is the next comprehensive sampling year.

How much VOC mass has been removed (at each well and total)?
Table 3-1 shows that the PGAC removed 767 pounds of VOCs during FY 2002. The relative contribution from each extraction well was 31% from NBM #3/4, 16% from NBM #14, and 42% from NBM #15 (with a combined 11% from other extraction wells).

Besides the changes already discussed, are any other changes or additional actions required for OU1? No.

Table 3-1
OU1 Pumping/VOC Mass Removal Data

Fiscal Year 2002

		NBCGRS Wells						Total NBCGRS Wells
		Well # 3	Well # 4	Well # 5	Well # 6	Well # 14	Well # 15	
Oct-01	Pumpage (1000 gals)	2,530	37,099	176	157	42,695	43,493	126,150
	VOC Level (ug/l)	27	47	170	120	76	120	
	Total VOCs (lbs)	0.6	15	0.2	0.2	27	44	86
Nov-01	Pumpage (1000 gals)	4,102	29,415	217	309	28,928	37,105	100,076
	VOC Level (ug/l)	30	37	160	110	45	100	
	Total VOCs (lbs)	1.0	9.1	0.3	0.3	11	31	53
Dec-01	Pumpage (1000 gals)	1,245	21,568	154	150	6,575	20,168	49,860
	VOC Level (ug/l)	61	66	160	100	18	77	
	Total VOCs (lbs)	0.6	12	0.2	0.1	1.0	13	27
Jan-02	Pumpage (1000 gals)	3,850	37,933	161	149	34,005	44,383	120,481
	VOC Level (ug/l)	55	62	160	110	19	100	
	Total VOCs (lbs)	1.8	20	0.2	0.1	5.4	37	64
Feb-02	Pumpage (1000 gals)	3,916	34,071	258	115	32,348	34,907	105,615
	VOC Level (ug/l)	60	68	170	120	40	120	
	Total VOCs (lbs)	2.0	19	0.4	0.1	11	35	68
Mar-02	Pumpage (1000 gals)	22,601	39,920	180	173	50,792	0	113,666
	VOC Level (ug/l)	50	62	180	120	41	Not Sampled	
	Total VOCs (lbs)	9.4	21	0.3	0.2	17	0.0	48
Apr-02	Pumpage (1000 gals)	1,583	1,507	183	176	2,177	22	5,648
	VOC Level (ug/l)	69	79	170	110	47	Not Sampled	
	Total VOCs (lbs)	0.9	1.0	0.3	0.2	0.9	0.0	3
May-02	Pumpage (1000 gals)	14,230	24,081	15,047	6,677	0	29,131	89,166
	VOC Level (ug/l)	91	90	140	110	Not Sampled	67	
	Total VOCs (lbs)	11	18	18	6.1	0.0	16	69
Jun-02	Pumpage (1000 gals)	9,450	38,690	173	6,047	30,586	42,414	127,360
	VOC Level (ug/l)	93	68	150	97	37	98	
	Total VOCs (lbs)	7.3	22	0.2	4.9	9.4	35	79
Jul-02	Pumpage (1000 gals)	11,219	33,250	2,030	5,772	39,905	44,645	136,821
	VOC Level (ug/l)	72	73	170	110	53	110	
	Total VOCs (lbs)	6.7	20	2.9	5.3	18	41	94
Aug-02	Pumpage (1000 gals)	3,462	36,403	7,555	15,345	25,867	41,681	130,313
	VOC Level (ug/l)	72	65	140	100	53	110	
	Total VOCs (lbs)	2.1	20	8.8	13	11	38	93
Sep-02	Pumpage (1000 gals)	0	34,557	21,791	96	31,664	38,893	127,001
	VOC Level (ug/l)	Not Sampled	58	130	93	44	100	
	Total VOCs (lbs)	0.0	17	24	0.1	12	32	85
Fiscal Year 2002 Totals:								
	Pumpage (1000 gals)	78,188	368,494	47,925	35,166	325,542	376,842	1,232,157
	Total VOCs (lbs)	43	193	55	30	124	322	767

Table 3-2
OU1, PGAC Effluent Water Quality

Fiscal Year 2002

	Influent Well Monitoring						Operational Performance Monitoring															
Sampling	Well	Well	Well	Well	Well	Well	Contactor #1		Contactor #2		Contactor #3		Contactor #4		Contactor #5		Contactor #6		Contactor #7		Contactor #8	
Date	#3	#4	#5	#6	#14	#15	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
31-Oct-01	27	47	170	120	76	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Nov-01	30	37	160	110	45	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2	0
GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between November 27, 2001 and December 24, 2001. "B" Vessels become the Lead Vessels.																						
31-Dec-01	61	66	160	100	18	77	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Jan-02	55	62	160	110	19	100	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
28-Feb-02	60	68	170	120	40	120	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Mar-02	50	62	180	120	41	NS	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
30-Apr-02	69	79	170	110	47	NS	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between April 2, 2002 and May 14, 2002. "A" Vessels become the Lead Vessels.																						
30-May-02	91	90	140	110	NS	67	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
30-Jun-02	93	68	150	97	37	98	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
31-Jul-02	72	73	170	110	53	110	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
31-Aug-02	72	65	140	100	53	110	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
30-Sep-02	NS	58	130	93	44	100	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS

Notes:

1) All results shown are for Total VOCs (ug/l).

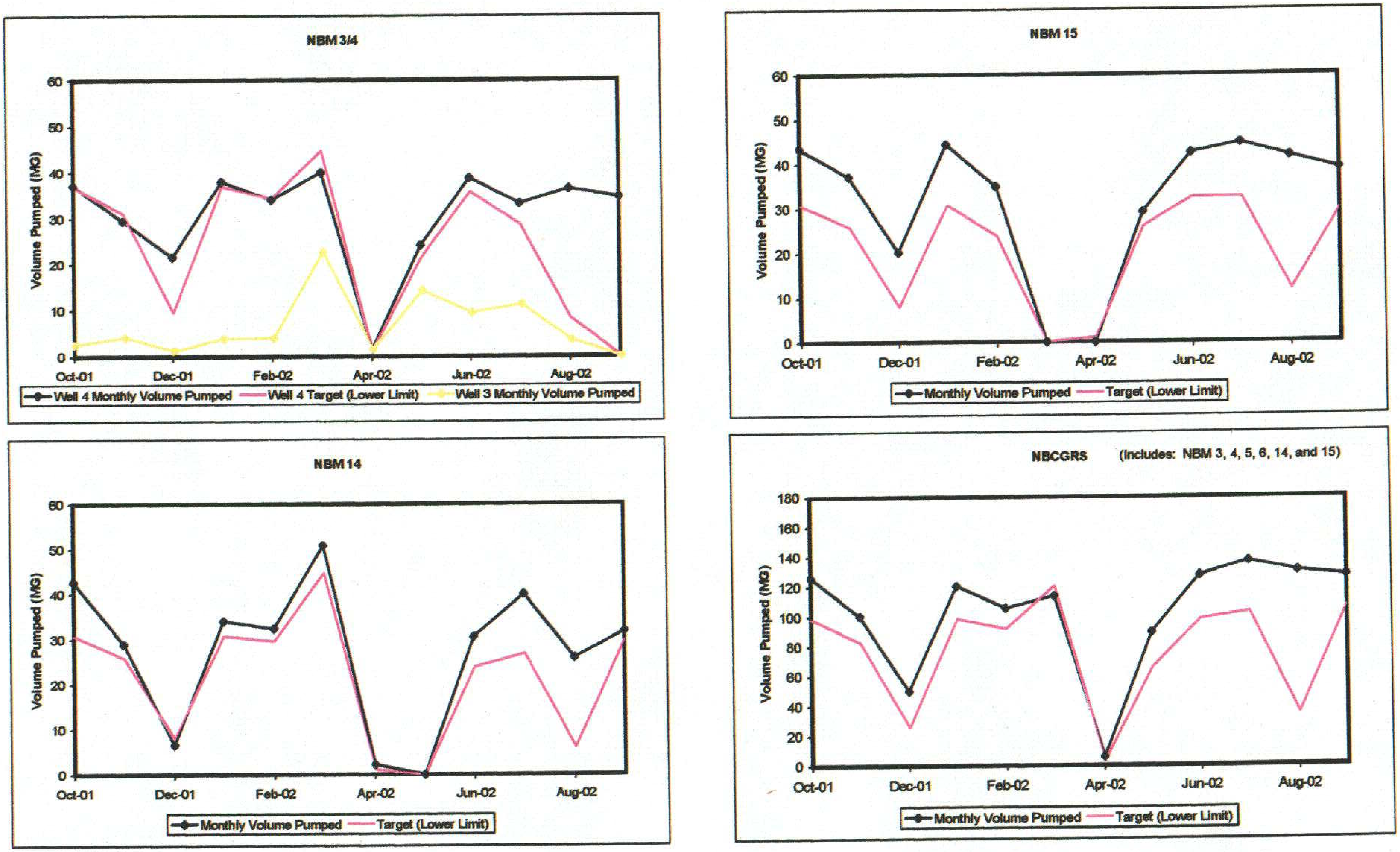
2) NS = Not Sampled (specific to influent well monitoring, this means that the well was not in service at time of sampling event).

3) The highlighted results indicate those results which are representative of effluent water quality for the given pair of contactor vessels (only the A or B vessel result is highlighted since vessels are operating in series).

Table 3-3
Summary of OU1 Monitoring Requirements

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Alternate Water Supply/Well Abandonment	a. Water quality data for the perimeter of the plume to define the area of concern	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	b. Water quality data for water supply wells to determine eligibility for alternate supply/abandonment	Army	Well Inventory Report
#2: Drilling Advisories	a. Verification that drilling advisories are in place and functioning as intended	Army/MDH	N/A
#3: Groundwater Containment	a. Pumping volume and rates for each extraction well for comparison to design flowrates for containment	New Brighton	New Brighton Water System Sampling and Analysis Plan
	b. Water levels from monitoring wells to draw contour maps showing the influences of pumping	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	c. Water quality, especially downgradient of the extraction system, to assist in evaluation of containment.	Army	OU1 Groundwater Monitoring Plan in the Annual Report
#4: Removal of VOCs	a. Effluent water quality to demonstrate compliance with the Safe Drinking Water Act	New Brighton	New Brighton Water System Sampling and Analysis Plan
#5: Discharge of Treated Water	a. Verification of discharge	New Brighton	N/A
#6: Groundwater Monitoring	Outlined above and below		
OR: Overall Remedy (Attainment of cleanup goals)	a. Water quality data throughout the North Plume to evaluate attainment	Army	OU1 Groundwater Monitoring Plan in the Annual Report

FIGURE 3-1
OU1 WELL PUMPING RATES VS. TARGETS
TWIN CITIES ARMY AMMUNITION PLANT



T:\1038\09\FY02 APR\APR Tables\Table 3-1.xls: Sheet 'Figure 3-1'

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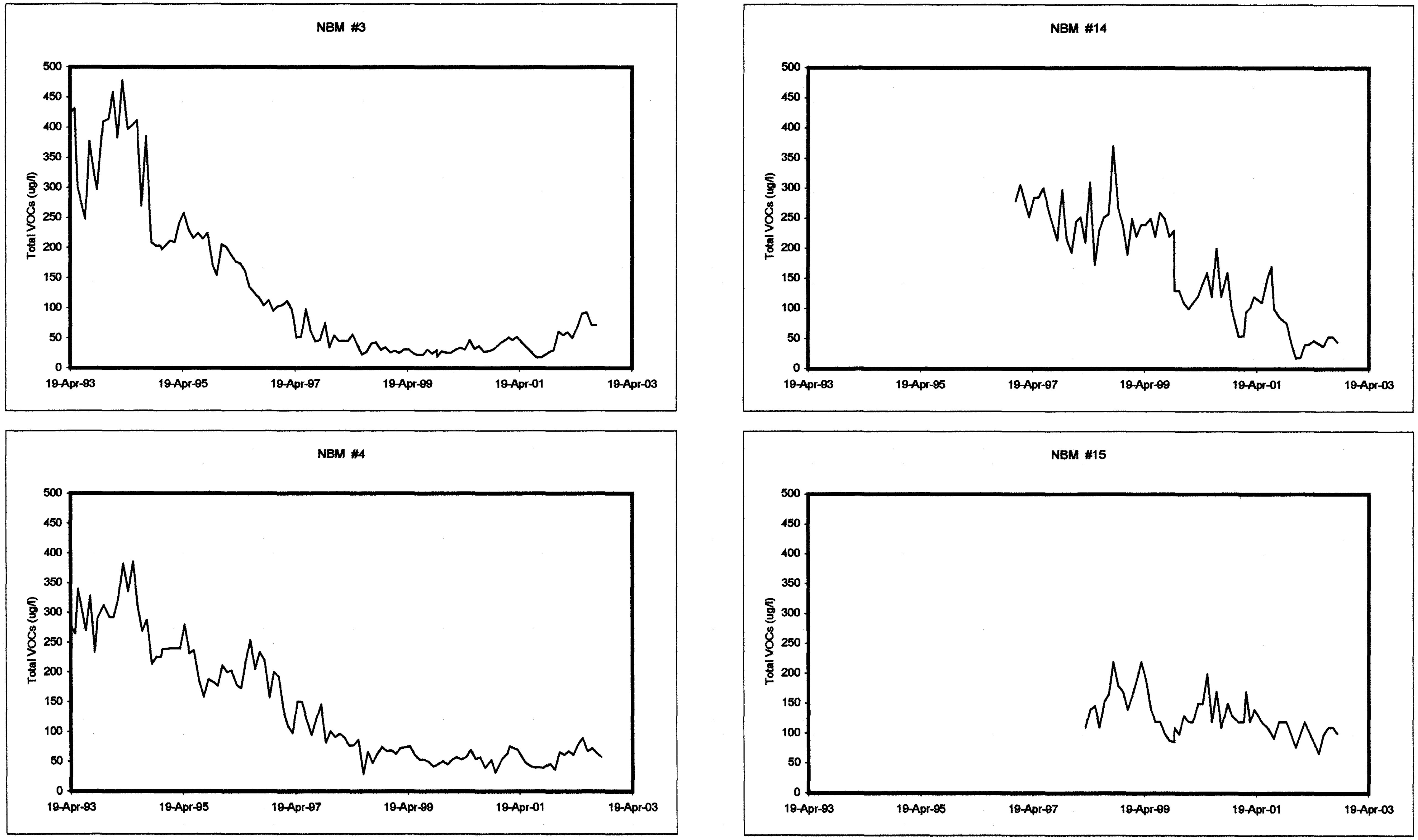
FIGURE 3-2
OU1 WELLS: TOTAL VOC WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT



T:\1038\09\FY02 APR\APR Tables\Table 3-2.xls: Sheet 'Figure 3-2'

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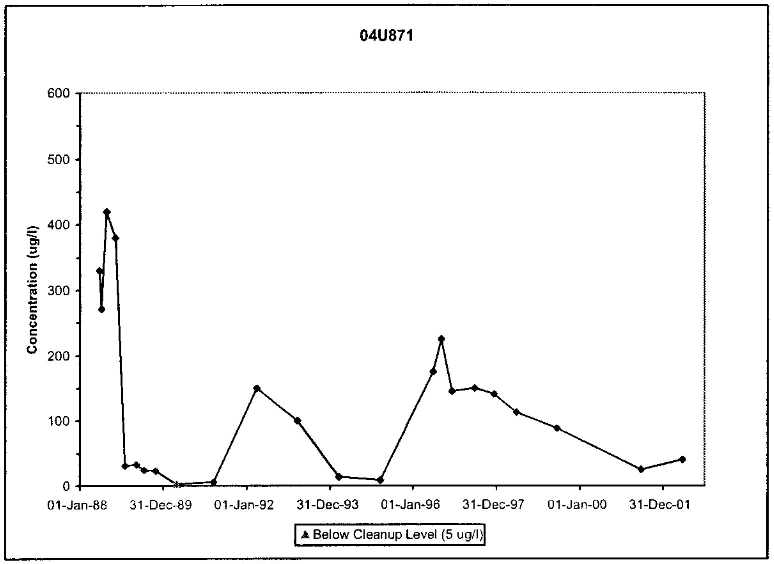
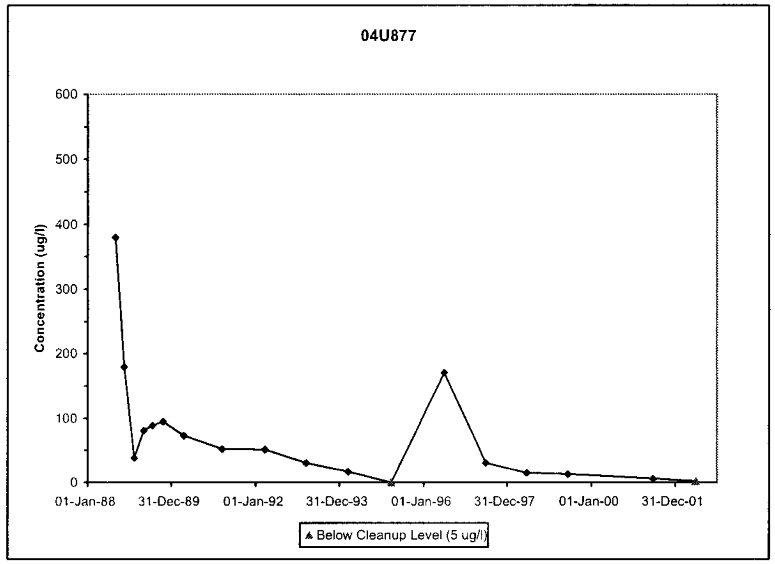
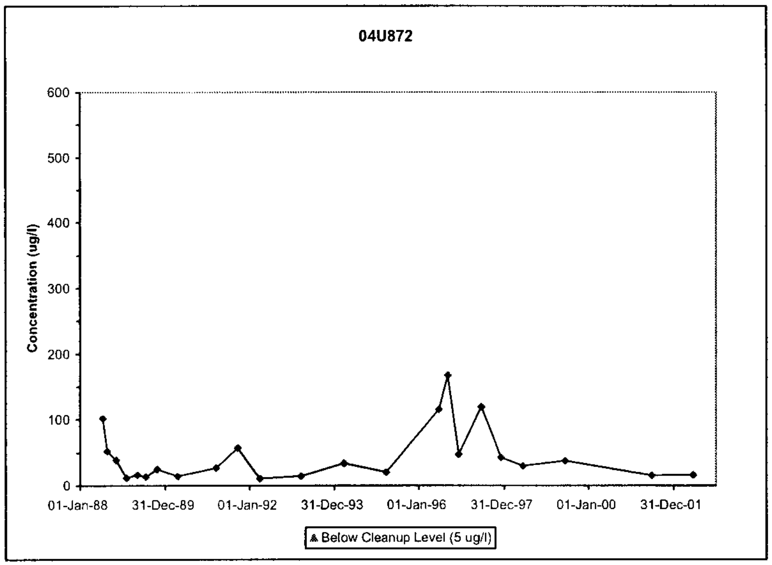
FIGURE 3-3
OU1, WELLS 04U871, 04U872, AND 04U877, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT







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4.0 Operable Unit 2: Shallow Soil Sites

The reference for the OU2 ROD is:

Twin Cities Army Ammunition Plant
New Brighton/Arden Hills Superfund Site
Operable Unit 2
RECORD OF DECISION
October 1997

There have been no subsequent ROD Amendments or Explanations of Significant Differences.

Section 1.4 of the ROD prescribes major remedy components for each of four media as described in sections 4.0 through 9.0 of this report. Section 4.0 addresses the shallow soil sites.

Through the RI/FS process, Sites A, C, E, H, 129-3 and 129-5 were found to have inorganic and/or organic contaminants above the cleanup goals specified in Table 1 of the OU2 ROD. Unpermitted landfills, or dumps, were identified within Sites A, B, E, H and 129-15. The OU2 ROD (page 2) describes nine remedy components to address the shallow soil sites.

4.1 REMEDY COMPONENTS #1 THROUGH 7: SOIL REMEDIATION

Description: These seven components collectively address the characterization, excavation, sorting, treatment, disposal, site restoration, and site access restrictions for the shallow soils and dumps at Sites A, C, E, H, 129-3 and 129-5.

Performance Standard (how do you know when you're done):

When the soils at these sites have been remediated such that the contaminant concentrations are below the cleanup levels specified in Table 1 of the OU2 ROD.

Are these remedy components being implemented?

Yes. Activities during FY 2002 were:

- Soil remediation field work was completed at Sites A (excluding VOC-contaminated soils), E, H, and 129-5 prior to FY 2002. The Closeout Reports for each of these sites (prepared by Stone & Webster) received regulatory approval in FY 2002, but final consistency will not be provided until concurrence on the land use control section of each report has been reached between the Army and the regulators or, alternatively, until the TCAAP LUCIP has received consistency approval from the regulators.
- Soil remediation field work was completed at Site 129-3 in calendar year 2001. The Site 129-3 Closeout Report (prepared by Stone & Webster) was under regulatory review at the end of FY 2002.
- At Site C, soil excavation, treatment, and disposal continued.
    - In FY 2002, 6,234 tons of soil were stabilized and transported off-site as non-hazardous waste for disposal at permitted disposal facilities. The project-to-date Site C soil quantity, including the totals from 2000 and 2001, is 21,996 tons.
    - Work was suspended in Summer 2002, due to high water table conditions. Options for completing soil remediation at this site were under discussion at the end of FY 2002. A work plan for additional characterization of Site C (to provide information for evaluating soil remediation options) was under review at the end of FY 2002.

- A work plan for removal of the on-TCAAP Corrective Action Management Unit (CAMU) received regulatory consistency at the beginning of FY 2002. Field work for removal of the CAMU was initiated in late FY 2002. Monitoring wells installed around the CAMU will be sampled a final time in September 2003 to verify that CAMU operations did not impact the groundwater beneath it.
- Operation of the Site A soil vapor extraction (SVE) system to remediate VOC-contaminated soils in the Site A shallow groundwater source area was continued until August 21, 2002, when it was permanently shut down due to low VOC levels in the SVE discharge (while soil concentrations within the source were not significantly improving). A work plan clarification was under regulatory review at the end of FY 2002 for excavation and off-site disposal of the VOC-contaminated soils.

4.2 REMEDY COMPONENT #8: GROUNDWATER MONITORING

Description: "Five-year period of groundwater monitoring to verify no adverse remedy impacts at Sites A, C, E, H, 129-3 and 129-5." (OU2 ROD, page 2)

Performance Standard (how do you know when you're done):
When five years have elapsed with groundwater monitoring results below the groundwater cleanup levels.

Is this remedy component being implemented?
No. The intent of this remedy component is to verify that soil characterization and/or remediation activities do not somehow cause impacts to groundwater. As such, the five-year monitoring period is intended to start after completion of remedy components #1 through 7 described in the previous section. Thus, specifically for this remedy component, there was no monitoring performed in FY 2001. With the exception of Site C, the shallow soil remediation has now been completed, and the groundwater monitoring will begin in FY2003 (and end in FY 2007). The monitoring plan for each of the Sites is presented below(these monitoring activities

are included in the site wide monitoring plan presented in Appendix A). In general, the well most likely to be affected from a hypothetical release from the soil was selected for each Site. Thus several wells are in the middle of the Site, since this would be the most likely location to see an impact under an assumption that impact would be due to vertical leaching from the soil. At the Sites on the kame (E,129-3, and 129-5) upper Unit 3 wells were selected since that is the first encountered aquifer. The selected parameter lists for each Site are the contaminants of concern for that Site.

There are no groundwater cleanup standards in the ROD for the contaminants of concern in soils at these Sites, with the exception of antimony at Site A. The data collected under this monitoring program will, therefore, be screened against the Minnesota Health Risk Limits (HRLs) for each Site (and the ROD standard for antimony at Site A). Since there are not any expected groundwater impacts, the screening will serve to identify possible concerns. If there are detections above the HRLs, then further evaluation will be necessary. The results of this sampling will be reported in the annual performance report.

Monitoring Plan:

Site A

Monitoring point: 01U119

Rationale for selected location: Well is located in Unit 1 near to and downgradient of the area of soil excavation at Site A.

Parameters: antimony, barium, copper, lead

Frequency: Annual

Site C

There is an on going Corrective Action for Site C shallow groundwater that is being conducted under the MPCA's supervision. This Corrective Action is not part of the ROD. The groundwater monitoring that is part of the Corrective Action satisfies the intent of the ROD requirement for groundwater monitoring at Site C.

Site E

Monitoring point: 03U089

Rationale for selected location: Well is a shallow Unit 3 well (the first encountered aquifer) located near and downgradient of the soil remediation area.

Parameters: antimony, barium, copper, lead, manganese

Frequency: Annual

Site H

Monitoring point: 01U060

Rationale for selected location: Well is on the downgradient edge of Site H and is also the only available Unit 1 monitoring well at the Site.

Parameters: antimony, arsenic, copper, lead, manganese

Frequency: Annual

129-3

Monitoring point: 03U087

Rationale for selected location: Well is a Unit 3 well (the first encountered aquifer) located in the center of the Site and below the area of soil remediation.

Parameters: antimony, lead, manganese, nitroglycerine, VOCs

Frequency: Annual

129-5

Monitoring point: 03U097

Rationale for selected location: Well is a Unit 3 well (the first encountered aquifer) located in the center of the Site and below the area of soil remediation.

Parameters: antimony, barium, lead

Frequency: Annual

4.3 REMEDY COMPONENT #9: CHARACTERIZATION OF DUMPS

Description: "Characterization of dumps at Sites B and 129-15 to determine their contents. If contents are found to be toxic, hazardous, or contaminated, then a remedy for the landfill will be utilized and documented through a post-ROD amendment. If the contents are not toxic, hazardous or contaminated, a no further action remedy would be employed." (OU2 Rod, page 2)

Performance Standard (how do you know when you're done):
When characterization has been sufficient to determine if the contents are toxic, hazardous, or contaminated.

Is this remedy component being implemented?
Yes. Field work was performed at both sites in early FY 1999. At Site B, characterization revealed that a no further action remedy was appropriate. A Closeout Report (prepared by Stone & Webster) received consistency in FY 2001 ("Site B Dump Investigation, Characterization, and Closeout Report"). At Site 129-15, characterization revealed that construction of a soil cover was necessary. The design for the Site 129-15 dump cover was finalized in FY 2001, and the cover construction was completed at the beginning of FY 2002. The Site 129-15 Closeout Report (prepared by Stone & Webster) was under regulatory review at the end of FY 2002. An amendment to the ROD documenting the remedy selection for Site 129-15 was under concurrent Army/regulatory review at the end of FY 2002.

5.0 Operable Unit 2: Deep Soil Sites

Sites D and G were impacted primarily by VOC contaminants at depths extending to between 50 and 170 feet. Some additional shallow soil contaminants were also present at Site D, and Site G also contains a dump. The OU2 ROD (pages 2–3) describes seven remedy components for these two sites. The final remedy incorporated the use of existing SVE systems and site caps, which were installed in 1986.

5.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: “Groundwater Monitoring.” (OU2 ROD, page 2)

Performance Standard (how do you know when you’re done):
When groundwater monitoring results from wells adjacent to each site are below the cleanup levels for deep groundwater specified in Table 1 of the OU2 ROD, and shown on Table 5-1 in this report.

Is this remedy component being implemented? Yes.

Were the groundwater monitoring requirements of this remedy met?
Yes. Samples were collected and analyzed from the wells that are nearest to Sites D and G in accordance with the FY 2002 Monitoring Plan.

What impact are the SVE systems having on contaminant concentrations in groundwater adjacent to Sites D and G?

Figure 5-1 shows the location of the well nearest to Site D (03U093) and Site G (03U094), along with trichloroethene concentrations. Table 5-1 presents the FY 2002 data for the deep groundwater chemicals of concern for the two wells nearest Sites D and G. The table shows that trichloroethene is the only chemical of concern in 03U093 that still exceeds the cleanup level. In well 03U094 , both trichloroethene and 1,1-dichloroethene exceed the cleanup levels.

Figures 5-2 and 5-3 present trichloroethene trend graphs for these wells. Downgradient of Site D, at well 03U093 (Figure 5-2), the concentrations over the past five years show a slight decline, though the past three years appear relatively stable. Downgradient of Site G, at well 03U094 (Figure 5-3), the concentrations over the past five years also show an overall decline.

During the years of SVE operation (1986 – 1998), trichloroethene concentrations in groundwater decreased from 10,000's to less than 800 µg/l. The most dramatic improvement has been at well 03U093 (Figure 5-2). Overall, these results indicate that the SVE systems at Sites D and G effectively minimized (or eliminated) further contamination of the deep groundwater beneath these sites. However, the contaminant concentrations are still well above the cleanup levels (about 60 times the cleanup level in 03U094). This suggests that residual contamination is acting as an ongoing source for groundwater contamination, most likely in the saturated zone. It is possible that natural attenuation will cause reductions in contaminant concentrations in the future, as suggested by the findings of the USEPA's Natural Attenuation Study (finalized in FY 2000).

Is any groundwater sampling proposed prior to the next report?

Yes. As shown in Appendix A.1, wells 03L018, 03U018, 03U093 and 03U096 (Site D) and 03L014, 03U014 and 03U094 (Site G) will be sampled in June 2003 for VOC analysis.

Are any changes or additional actions required for this remedy component? No.

5.2 REMEDY COMPONENT #2: RESTRICT SITE ACCESS

Description: "Restrict site access and use during remedy implementation." (OU2 ROD, page 2)

Performance Standard (how do you know when you're done):
When site access is adequately restricted to protect human health.

Is this remedy component being implemented?
Yes. TCAAP is fenced with locked gates.

Are any changes or additional actions required for this remedy component? No.

5.3 REMEDY COMPONENT #3: SVE SYSTEMS

Description: "Install and operate deep soil vapor extraction (SVE) systems with modified shallow SVE." (OU2 ROD, page 2)

- SVE systems were installed at Sites D and G in 1986 as Interim Remedial Actions to address soil contamination, which were then incorporated into the final remedy. The Site D system included 39 shallow vents (depths of 33–54 feet) and one deep vent (depth of 150 feet). The Site G system included 89 shallow vents (depths of 23–55 feet). The systems removed a combined total of over 220,000 pounds of VOCs from both shallow and deep soils between startup in 1986 and shutdown in 1998 (116,199 pounds for Site D and 104,418 pounds for Site G). The Site D SVE system was dismantled in FY 2001.

- The intent of this remedy component was to add additional deep vents at both sites, as needed, to address presumably contaminated soils below the existing SVE systems. Also, the existing systems were to be modified, as needed, to improve VOC mass removal.

Performance Standard (how do you know when you're done):
When the soil concentrations are below the cleanup levels specified in Table 8 of the OU2 ROD.

Is this remedy component being implemented?
Yes. A soil investigation was conducted in FY 2000 to determine VOC concentrations in shallow and deep soils at both Sites D and G. Activities during FY 2002 included:

- The FY 2000 investigation had shown that all Site D soils (shallow and deep) were below the VOC cleanup levels. The report documenting the soil investigation at Site D and documenting the Site D SVE system dismantlement received regulatory consistency in FY 2002 ("Site D Deep Soil VOC Investigation and Closeout Report," prepared by Stone & Webster).
- The FY 2000 Investigation had shown only two locations in shallow soils at Site G which were above the original VOC cleanup levels. In FY 2002, the Site G VOC cleanup levels were revised upward based on a new soil leaching evaluation that accounted for the reduction in infiltration due to the presence of the Site G cover. The revised cleanup levels were higher than the two soil concentrations which had exceeded the original VOC cleanup levels. All Site G soils (shallow and deep) are below the revised cleanup levels. Use of the higher cleanup levels is contingent on maintenance of the cover and the vegetation thereon. The development of the higher cleanup goals, and the specifics of the cover requirements, were documented in "Technical Memorandum, Soil Leaching Values, Site G," dated July 31, 2002, which received regulatory consistency.

Have the deep SVE systems been installed?

No. Deep systems will not be required at either site, as discussed above.

Have the shallow SVE systems been modified?

No. For Site D, the shallow SVE system has already been removed, as discussed above. The Site G shallow SVE system will not need to be modified, since all VOC concentrations in Site G soils are now below the revised cleanup levels. The Site G SVE system can now be dismantled.

Are any changes or additional actions required for this remedy component? No.

5.4 REMEDY COMPONENT #4: ENHANCEMENTS TO THE SVE SYSTEMS

Description: "Evaluate and potentially use enhancements to the SVE systems." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When an adequate evaluation has been completed.

Is this remedy component being implemented?

Yes. No enhancements to either SVE system were required, since soil cleanup levels were reached without the need for any such modifications.

Are any changes or additional actions required for this remedy component? No.

5.5 REMEDY COMPONENT #5: MAINTAIN EXISTING SITE CAPS

Description: "Maintain existing site caps." (OU2 ROD, page 3)

- This component originally applied to the site caps at both Sites D and G. Since VOC remediation has been completed at Site D, this component now only applies to Site G.

Performance Standard (how do you know when you're done):
When the cap is maintained in adequate condition.

Is this remedy component being implemented?
Yes. TWISS inspected the Site G cap during monthly operation and maintenance inspections.

Are there any problems with the Site G cap?
No problems were observed in FY 2002.

Were any maintenance activities performed for the Site G cap in FY 2002? No.

Are any maintenance activities planned prior to the next report?
No, except for cutting of any trees or bushes, as necessary.

Are any changes or additional actions required for this remedy component? No.

5.6 REMEDY COMPONENT #6: MAINTAIN SURFACE DRAINAGE CONTROLS

Description: "Maintain surface [drainage] controls." (OU2 ROD, page 3)

- This component originally applied to both Sites D and G. Since VOC remediation has been completed at Site D, this component now only applies to Site G.

Performance Standard (how do you know when you're done):
When surface water does not pond on the cap, and surface water flows off at a rate that does not cause erosion problems with the cap.

Is this remedy component being implemented?
Yes. TWISS inspected the Site G drainage conditions during routine operation and maintenance inspections.

Are there any problems with the Site G surface drainage controls? No.

Were any maintenance activities performed for the Site G surface drainage controls in FY 2002? No.

Are any maintenance activities planned prior to the next report? No.

Are any changes or additional actions required for this remedy component? No.

5.7 REMEDY COMPONENT #7: CHARACTERIZE SHALLOW SOILS AND DUMP

Description: "Following completion of SVE remediation of deep soils, characterize Site D shallow soils and Site G dump to determine appropriate action." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the characterizations have provided answers necessary to determine if additional remediation is required, and if remediation is required, when it has been completed.

Is this remedy component being implemented?
Yes. For Site D, a work plan for shallow soil characterization received consistency in early FY 2002, and the investigation was conducted. A documentation report for this investigation work was finalized in late FY 2002. The appropriate action for Site D was determined to be soil removal to address soils with metals and nitroglycerin contamination. A work plan for this soil removal work was under regulatory review at the end of FY 2002. An amendment to the ROD will be prepared to document the remedy selection for Site D shallow soils.

For Site G, a technical memorandum evaluating whether any additional dump characterization is needed was under Army review at the end of FY 2002. This technical memorandum also includes discussion of the appropriate action for Site G.

Are any changes or additional actions required for this remedy component? No.

5.8 OVERALL REMEDY FOR DEEP SOIL SITES

Has the SVE remediation been completed (i.e., have the soil cleanup levels in Table 8 of the OU2 ROD been attained throughout the areal and vertical extent of Sites D and G)?
Yes, subject to the revised Site G cleanup levels cited previously.

Has it been determined that remediation of shallow soils at Site D and/or the dump at Site G is not required, or if required, has the remediation been completed?
For Site D, it has been determined that additional soil removal is required to address metals and nitroglycerin contamination. Soil excavation and off-site disposal is anticipated to occur in early FY 2003.

For Site G, the determination has not been made.

Table 5-1
Deep Groundwater Data Near Sites D and G

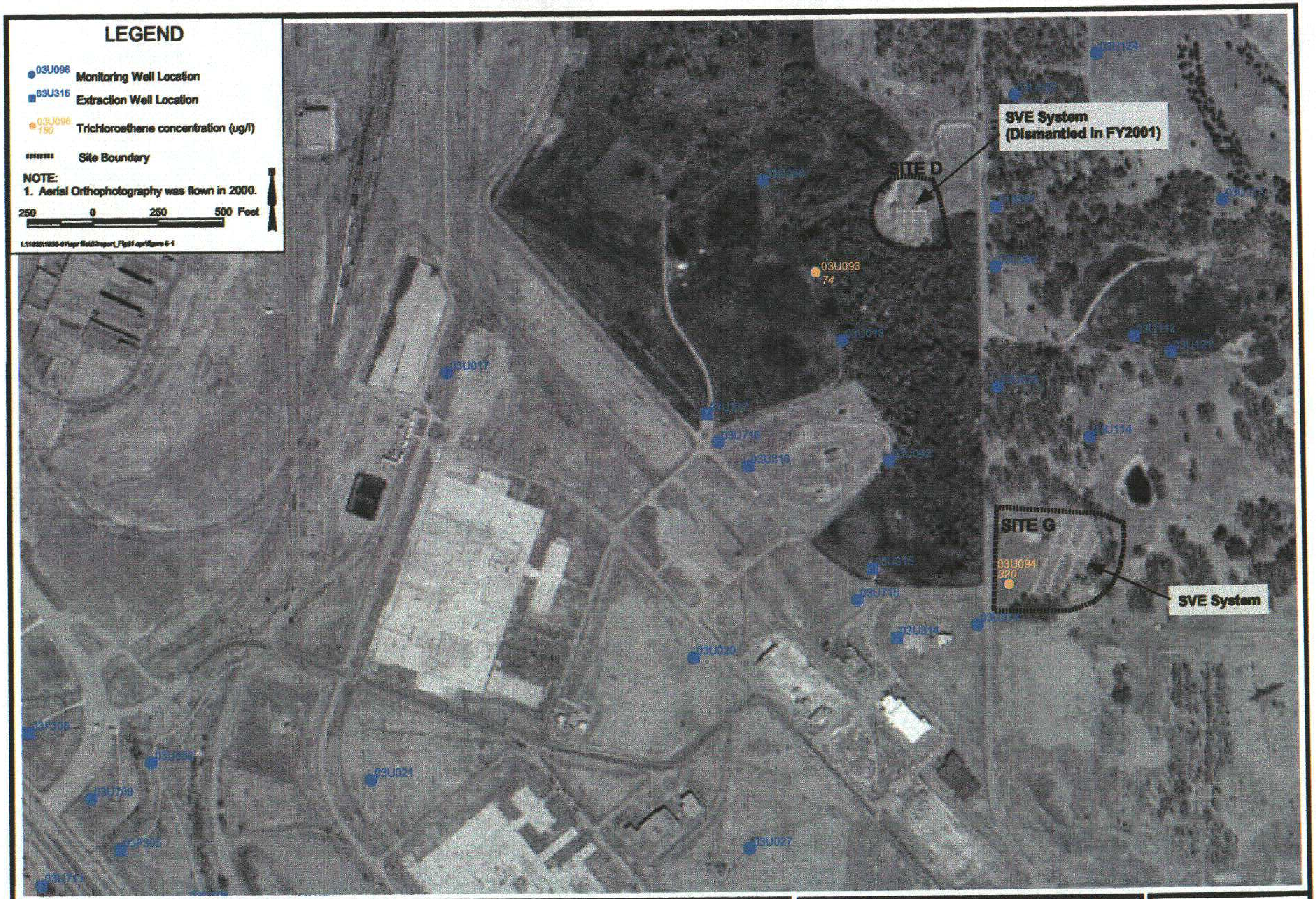
Fiscal Year 2002

		Tetrachloro-ethene (ug/l)	Trichloro-ethene (ug/l)	1,1-Dichloro-ethene (ug/l)	cis-1,2-Dichloro-ethene (ug/l)	1,1-Dichloro-ethane (ug/l)	1,1,1-Trichloro-ethane (ug/l)	1,2-Dichloro-ethane (ug/l)
OU2 Cleanup Level (1)		5	5	6	70	70	200	4
Site D								
03U093	07-Jun-02	<1.0	**74**	1.5	JP 0.65	JP 0.66	17	<1.0
Site G								
03U094	06-Jun-02	<5.0	**320**	**7.8**	JP 2.2	JP 2.2	150	**<5.0**

Notes:

(1) Cleanup levels for Deep Groundwater are from Table 1 of the OU2 ROD. Bolding indicates exceedance of the cleanup level, or reporting limits that are higher than the cleanup level.

JP = The value is below the reporting limit, but above the method detection limit.



TWIN CITIES ARMY AMMUNITION PLANT

Location of Wells Nearest to Sites D and G

Wenck

Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0429

FY 2002

Figure 5-1

FIGURE 5-2
SITE D, WELL 03U093, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITITES ARMY AMMUNITION PLANT

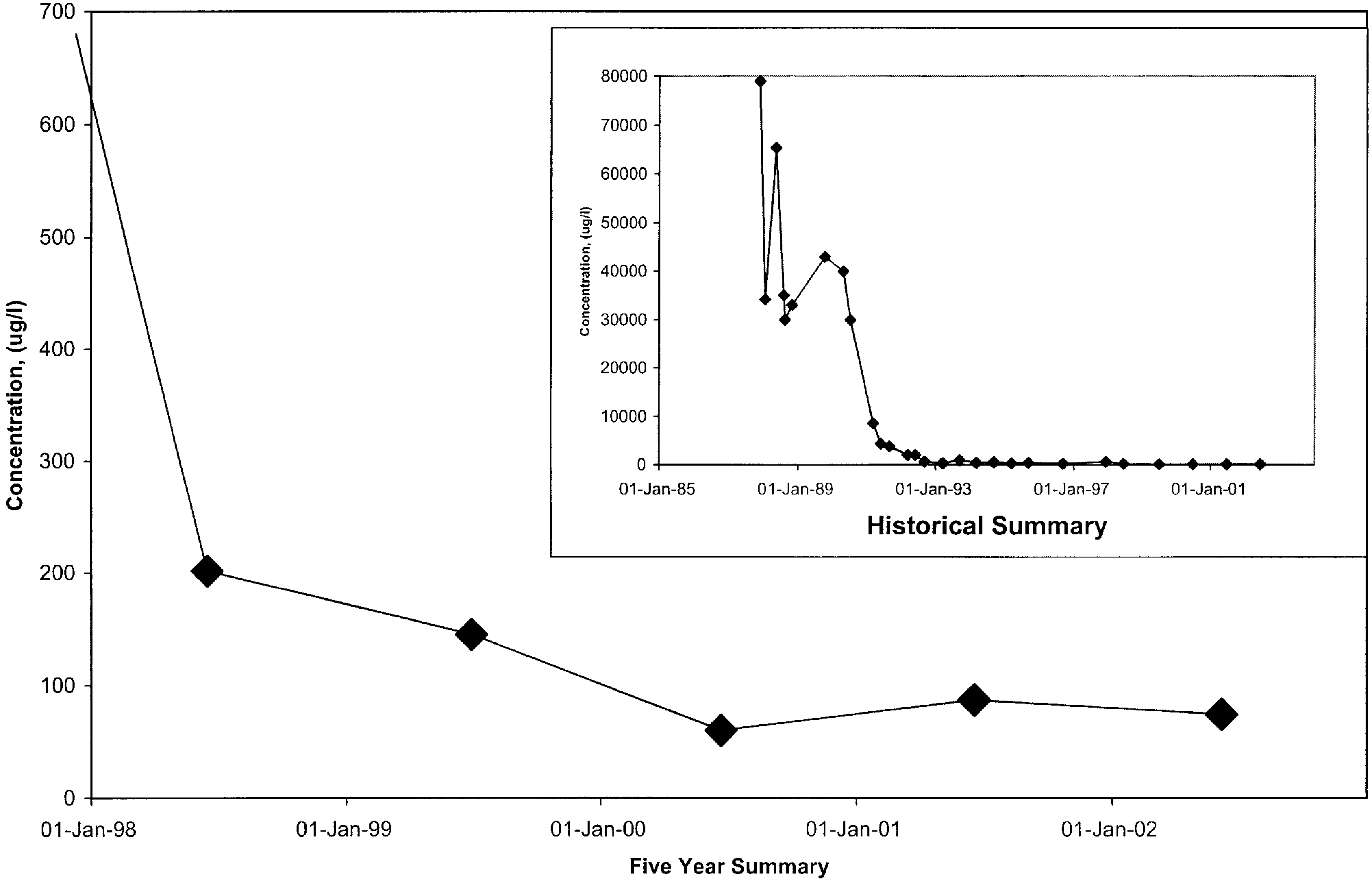


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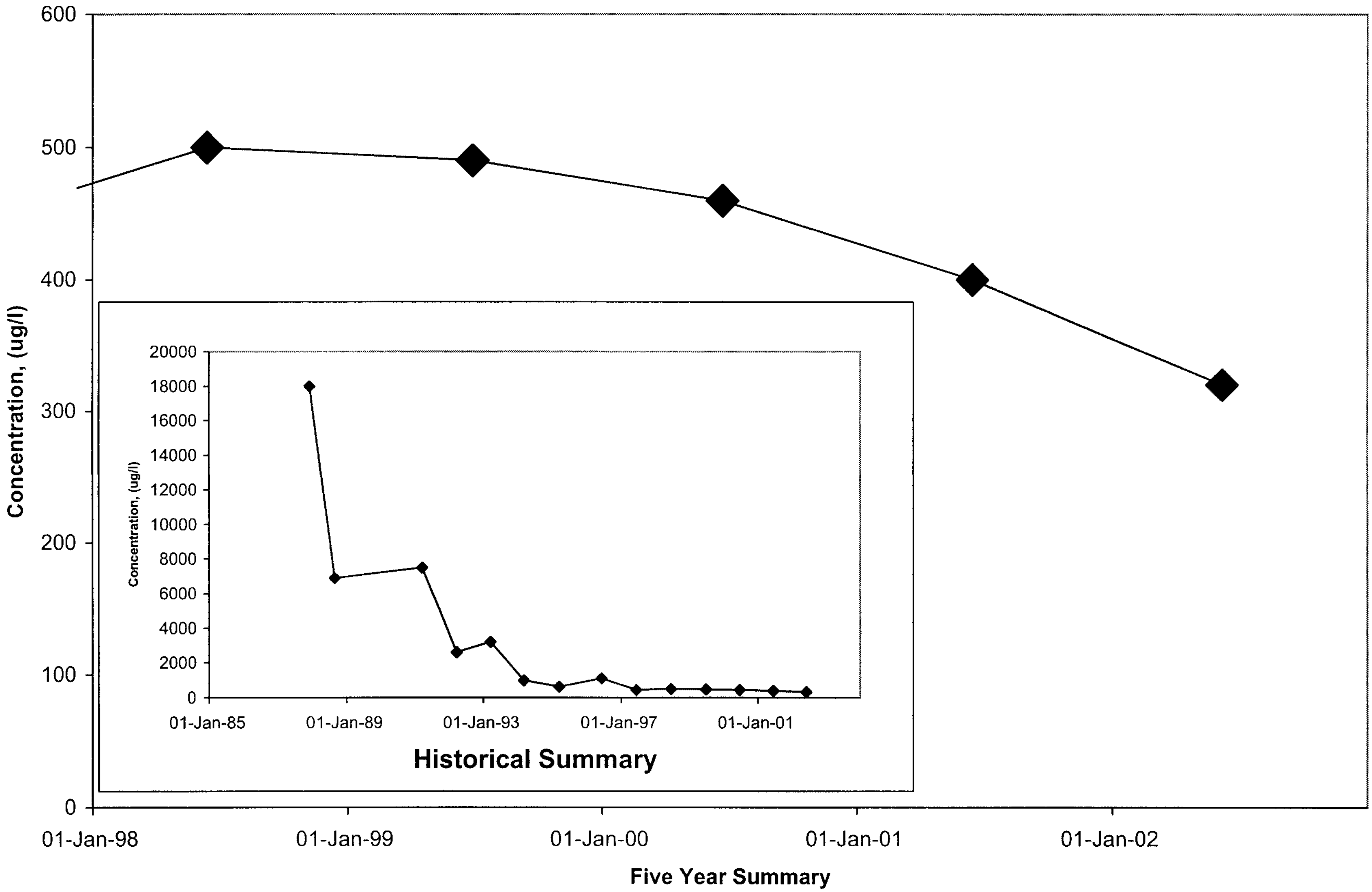
FIGURE 5-3
SITE G, WELL 03U094, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT



6.0 Operable Unit 2: Site A Shallow Groundwater

Shallow groundwater at Site A has been impacted by VOCs and antimony. The selected remedy in the OU2 ROD incorporates the use of a groundwater extraction system, which began operation May 31, 1994. The containment system originally consisted of eight extraction wells installed along two lines downgradient of the source area. Only four of the eight extraction wells currently need to be operated to provide the necessary containment. Extracted groundwater is discharged to the sanitary sewer for treatment at a Publicly-Owned Treatment Works (POTW). The ROD prescribes five major components of the remedy which are described and evaluated in the following sections.

6.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track plume migration and remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a performance groundwater monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. Performance monitoring programs have been established to collect the data required for remedy components #2 to #4 and evaluation of the overall remedy. Table 6-1 summarizes the performance monitoring requirements, implementing parties, and the documents which contain the monitoring plans. The FY 2002 Monitoring Plan is included in Appendix A. Figure 6-1

illustrates the wells and piezometers associated with Site A and highlights those sampled in FY 2002.

Were the groundwater monitoring requirements for this remedy met? Yes.

Is any groundwater sampling proposed prior to the next report? Yes.

- Groundwater sampling of water supply wells related to alternate water supply and well abandonment will be in accordance with recommendations in Appendix E. No wells are recommended for FY 2003. The next "major" event will be in FY 2005.
- Monitoring of the extraction wells (pumping volumes, water levels, and water quality) and treatment system effluent will be in accordance with Appendix A.2.
- Other groundwater monitoring will be in accordance with the Groundwater Monitoring Plan included as Appendix A.1.

Are any changes or additional actions required for this remedy component? No.

However, note that monitoring wells 01U103, 01U108, and 01U350 had been on a quarterly sampling frequency during operation of the air sparging/soil vapor extraction (AS/SVE) system. Since this system ceased operation on August 21, 2002, sampling frequencies for these wells have been reverted to their pre-AS/SVE sampling frequencies (01U103 and 01U108 to be sampled annually; 01U350 will not be sampled). This change was previously approved by the USEPA and MPCA.

6.2 REMEDY COMPONENT #2: GROUNDWATER CONTAINMENT AND MASS REMOVAL

Description: "Use of existing gradient control wells to contain the contaminant plume and remove mass." (OU2 ROD, page 3)

- Eight extraction wells (01U351–01U358) were installed in two capture lines as shown on Figure 6-1. Seven of the eight extraction wells fully penetrate the Unit 1 aquifer and range in depth from 31 to 48 feet, as shown in cross-sectional view on Figure 6-2. The one partially penetrating well, 01U353, was completed in silt to sandy clay units which were resistant to drilling and determined to be the top of Unit 2 by the field geologist. The well log does not note the presence of silt (Fuller, 1994). The partially penetrating well is illustrated on cross-section B-B' on Figure 6-2.
- Wells 01U355 through 01U358, the line of extraction wells downgradient of the "first line" of extraction wells, were shut off (with regulatory approval) on July 11, 2000, and have remained off since that time. These wells were shut off because: 1) they were below the cleanup levels, and 2) the known area of groundwater having cleanup goal exceedances was within the capture area of the first line of extraction wells.

Performance Standard (how do you know when you're done):
When the extraction system is providing complete capture of all groundwater exceeding the cleanup levels specified in Table 1 of the OU2 ROD, and shown in Table 6-2 of this report.

Is the Site A groundwater extraction system providing complete capture of all groundwater exceeding the cleanup levels specified in Table 1 of the OU2 ROD?
Yes. Table 6-3 shows the monthly average pumping rate for each extraction well along with the target pumping rates for containment. The original target pumping rate for wells 01U351 through 01U355 was 15 gpm. Even with 01U355 off, the system has been operated to maintain a target pumping rate of 15 gpm. Table 6-3 shows that the average pumping rate for FY 2002 (17.1 gpm) exceeded the target. Only one individual month was below the target (14.1 gpm for September 2002).

Table 6-4 presents water level data collected during FY 2002 at Site A. Figure 6-3 presents a water level contour map using the data from June 13, 2002. Figure 6-3 shows the influence from pumping the four extraction wells and the interpreted capture boundary, which supports the statement that the system is providing complete capture of all groundwater exceeding the Site A cleanup levels.

Table 6-2 shows that the locations where groundwater exceeds cleanup levels continue to be at and upgradient of the first line of recovery wells. The decreasing concentration of cis-1,2-dichloroethene in 01U902 (downgradient of the extraction system) is also evidence of the extraction system's capture zone (Figure 6-8). The cis-1,2-dichloroethene concentration in this well has dropped from a historical high around 100 μg/l to 8.4 μg/l in FY 2002.

Were there any significant operation and maintenance problems (greater than 24 hour shutdown)?
Yes. Table 6-5 summarizes O&M notes for FY 2002.

Are any changes or additional actions required for this remedy component? No.

6.3 REMEDY COMPONENT #3: DRILLING ADVISORY/ALTERNATE WATER SUPPLY/WELL ABANDONMENT

Description: "Institutional controls to restrict new well installations and provide alternate water supplies and well abandonment as necessary." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the MDH has issued a Special Well Construction Area Advisory and when well owners who qualify have been offered and provided with alternate water supply and/or have had their wells abandoned (or the offers have been rejected).

Is the remedy component being implemented?
Yes. The OU1 Alternate Water Supply and Well Abandonment Program is underway and was expanded to cover the area affected by the OU2 Site A Shallow Groundwater plume. See Section 3.1 of this report.

Has the MDH issued a Special Well Construction Area Advisory for the area impacted by Site A?
Yes, it was issued in June 1996 and revised in December 1999; however, this revision did not affect the boundary for the Site A vicinity.

Did the boundary of the Site A plume get any bigger during FY 2002, as defined by the 1 μg/l contour?
No. Figure 6-4 shows the 1 μg/l contour line for cis-1,2-dichloroethene (the chemical of concern at Site A with the biggest plume footprint). There were no significant changes from last year.

Were any additional water supply wells discovered within the Site A plume? No.

Were any water supply wells within the Site A plume sampled during FY 2002? If yes, what were the findings? No.

Were any well owners offered an alternate supply and/or well abandonment in FY 2002? No.

Within the Site A plume, are there any well owners which meet the criteria, but have not yet been provided an alternate water supply? No.

Within the Site A plume, are there any wells which meet the criteria, but have not yet been abandoned? No.

Is any sampling of water supply wells proposed prior to the next report? No.

Are any changes or additional actions required for this remedy component? No.

6.4 REMEDY COMPONENT #4: DISCHARGE OF EXTRACTED WATER

Description: "Discharge of extracted groundwater to a publicly-owned treatment works (POTW)." (OU2 ROD, page 3)

- The recovered groundwater is piped to a sewer discharge manhole (Shoreview sanitary sewer discharge manhole #229) located approximately 150 feet north of the TCAAP boundary as shown on Figure 6-1. The recovered groundwater is conveyed via a City of Shoreview sanitary sewer to the Metropolitan Council Environmental Services (MCES) Treatment Plant located at 2400 Childs Road in St. Paul, Minnesota. Discharge is in accordance with Industrial Discharge Permit Number 2194 from the MCES.

Performance Standard (how do you know when you're done):
When the concentrations of contaminants in the extracted groundwater and the flow rate are below the criteria in the Special Discharge Permit, as shown in Table 6-6.

During FY 2002, was the discharge water in compliance with the Industrial Discharge Permit requirements?
Yes. Table 6-6 shows that the effluent water quality was below the discharge criteria every month in FY 2002.

Is any sampling of the discharge water proposed prior to the next report?
Yes. In accordance with the permit requirements, the discharge will be sampled monthly for 1,2-dichloroethene (cis and trans); trichloroethene; 1,1,1-trichloroethane; and total mercury (see Appendix A.2).

Are any changes or additional actions required for this remedy component? No.

6.5 REMEDY COMPONENT #5: SOURCE CHARACTERIZATION/ REMEDIATION

Description: "Source characterization/remediation." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
For characterization, when the investigation has answered the questions needed to prepare remedial design documents. For remediation, when the contaminant concentrations in soil are below the cleanup levels specified in Table 1 of the OU2 ROD.

Is this remedy component being implemented?
Yes. Characterization work has been completed. Stone and Webster performed investigation work in 1997 and the final "Site A Investigation Report" was issued December 12, 1997. That report delineated the extent of both VOC-contaminated and metal-contaminated soils requiring remediation.

Remediation work has been partially completed. Stone and Webster completed removal of metal-contaminated soils in FY 1999. Construction of an air sparging/soil vapor extraction (AS/SVE) system to remediate VOC-contaminated soils was completed in FY 2000, which began operation in early FY 2001. The AS system was operated minimally in FY 2001 and was shut off permanently in June 2001 due to a lack of increase in SVE VOC levels and due to concern regarding potential plume spreading. The AS system was being implemented voluntarily and was not a requirement of the OU2 ROD. Soil samples were collected within the source area in July 2002 (and previously in August 2001). In both events, the results showed minimal reduction in soil VOC concentrations. Since it appeared that many years of SVE system operation would be required before cleanup levels would be reached (if ever), the Army ceased SVE system operation on August 21, 2002, and submitted a work plan clarification to the USEPA and MPCA for excavation of the VOC-contaminated soils in the source area, with transport to an off-site, permitted disposal facility. The work plan clarification was under regulatory review at the end of FY 2002.

Were there any significant AS/SVE system operation and maintenance problems in FY 2002 (greater than 24-hour shutdown)? Yes. Table 6-7 summarizes O&M notes for FY 2002.

Were SVE vents operating in accordance with design flowrates? Yes. The FY02 averages for all three vents exceeded the design flowrate of 75 cubic feet per minute, though some individual months were slightly below the design flowrate (Table 6-8). Vent A was shut off on February 25, 2002, since VOCs could no longer be detected in its airflow.

Did SVE emissions exceed any discharge criteria? No. SVE emissions were below the screening criteria for emissions treatment at the time of initial system start-up sampling (October 2000) and have declined considerably since that time. Results for the two discharge samples that were collected in FY 2002 are shown in Table 6-9.

Are any changes or additional actions required for this remedy component?
No, though the method of achieving this remedy component is proposed to be changed, as explained previously (soil removal and off-site disposal, rather than continued SVE system operation).

6.6 OVERALL REMEDY FOR SITE A SHALLOW GROUNDWATER

Performance Standard (how do you know when you're done):
When the cleanup levels in Table 1 of the OU2 ROD have been attained throughout the areal and vertical extent of the Site A plume within the anticipated ten-year lifespan of the remedy. If the remedy has not been completed within ten years, additional remedial measures will be addressed. (OU2 ROD, p. 54)

Has the Site A shallow groundwater remedy been completed (i.e., have the cleanup levels in Table 1 of the OU2 ROD been attained throughout the areal and vertical extent of the Site A plume)?

No. Table 6-2 shows the exceedances in wells at Site A during FY 2002. Figure 6-5 shows that the area with tetrachloroethene exceedances (greater than 7 μg/l) extends from the source area (near 01U108 and 01U350) downgradient to near 01U126. The tetrachloroethene exceedances do not extend to the first line of extraction wells. Table 6-2 shows that trichloroethene exceedances are also limited to near the source area (01U108 and 01U350). There were no cis-1,2-dichloroethene exceedances (greater than 70 μg/l) in the June 2002 event (Figure 6-4). However, Table 6-2 shows that extraction well 01U352, which was just below the cleanup level in June 2002, was over the cleanup level in September 2002 at 160 μg/l. This suggests that an area with cis-1,2-dichloroethene exceedances (greater than 70 μg/l) still persists in the vicinity of extraction well 01U352, though it does not extend back to the source area. Similarly, the benzene concentration in 01U352 was below the cleanup level of 10 μg/l in the June 2002 event, but was above the cleanup level in the September 2002 event (detected at 19 μg/l). The benzene cleanup level was not exceeded in any other wells.

What impact is the groundwater extraction system having on contaminant concentrations?

Groundwater contaminant concentrations at Site A were generally comparable to last year's data. Some minor changes in plume contours in Figures 6-4 (cis-1,2-dichloroethene) and 6-5 (tetrachloroethene) from FY 2001 plume contours are noted as follows:

- Figure 6-4:
  1) 01U102 decreased from 18 to 1.3 μg/l, moving the 10 and 1 μg/l, contours inward.
  2) 01U117 increased from 8.5 to 26 μg/l, moving the 10 μg/l contour outward.
  3) 01U139 increased from 9 to 12 μg/l, creating an isolated 10 μg/l area.
- Figure 6-5:
  1) 01U350 decreased from 130 to 88, eliminating the 100 μg/l contour.

Wells at, and downgradient, of the first line of extraction wells generally showed stable or slightly decreasing concentrations. All wells downgradient of the first line of extraction wells (01U351–354), had water quality results that remained below the cleanup levels. Wells in the source area generally showed comparable or slightly decreasing concentrations (01U108 and 01U350). Figures 6-6 through 6-8 present trend graphs of cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene for representative wells to illustrate these points:

- 01U108 (Near the source area)
- Extraction Wells 01U351 – 01U354 (the first line of extraction wells) (cis-1,2-dichloroethene only)
- 01U902 (Downgradient of the extraction system)

Note that some of the data points prior to FY 1999 may be showing total 1,2-dichloroethene (cis and trans isomers combined), since analysis of the cis isomer alone has not always been performed.

What impact is source removal having on contaminant concentrations?

At 01U108 and 01U350, the closest monitoring wells downgradient of the source area, contaminant concentrations do appear to be decreasing. Additional monitoring will be required to verify the apparent trends. The groundwater travel time from the source area to the first line of recovery wells is approximately 2 years, and therefore the potential effects of source removal will be delayed at the recovery wells.

How much VOC mass has been removed?
Based on the calculated VOC mass removal rates for the total effluent, the groundwater extraction system removed approximately 2.5 pounds of VOCs in FY 2002, with a cumulative VOC mass removal of approximately 37 pounds since system startup on May 31, 1994 (Table 6-10).

Based on monitoring of the discharge air, the SVE system removed approximately 123 pounds of VOCs in FY 2002, with a cumulative VOC mass removal of approximately 536 pounds since system startup in early FY 2001 (Table 6-11).

Has 10 years elapsed since signing of the OU2 ROD? No. The FY 2001 June sampling event marked five years of extraction system operation since the signing of the OU2 ROD. The ROD states that "should aquifer restoration not be attained within the anticipated ten year lifespan of the remedy, additional remedial measures will be addressed". Based on the water quality trends at 01U108 and 01U350, it appears that cleanup levels could potentially be reached throughout the areal extent of the plume by the tenth year. However, even if cleanup levels are not reached by the tenth year, the situation might be that exceedances will persist only in the source area vicinity and will not extend to the first line of recovery wells.

Do additional remedial measures need to be addressed? No.

Table 6-1
Summary of Site A Shallow Groundwater Monitoring Requirements

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Groundwater Monitoring	Outlined below		
#2: Containment and Mass Removal	a. Pumping volumes and rates for each extraction well for comparison to design flowrates for containment	Army	Site A Monitoring Plan in the Annual Report
	b. Water levels from monitoring wells to draw contour maps showing the influences of pumping	Army	Site A Monitoring Plan in the Annual Report
	c. Water quality data for each extraction well to determine VOC mass removal	Army	Site A Monitoring Plan in the Annual Report
#3: Drilling Advisory/Alternate Water Supply/Well Abandonment	See OU1, Remedy Component #1 which also includes the area north of Site A		
#4: Discharge of Extracted Water	a. Water quality data for total system effluent to demonstrate compliance with the Industrial Discharge Permit	Army	Site A Monitoring Plan in the Annual Report
#5: Source Characterization/ Remediation	a. AS/SVE system flowrates and air quality data to evaluate system effectiveness and emissions (this system was permanently shut down on August 21, 2001)	Army	Site A Monitoring Plan in the Annual Report
OR: Overall Remedy (Attainment of cleanup goals)	a. Water quality data throughout the Site A plume to evaluate attainment	Army	Site A Monitoring Plan in the Annual Report

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2002

		Tetrachloro-ethene (ug/l)	Trichloro-ethene (ug/l)	1,1-Dichloro-ethene (ug/l)	1,2-Dichloro-ethane (ug/l)	cis-1,2-Dichloro-ethene (ug/l)	Chloroform (ug/l)	Benzene (ug/l)	Antimony (ug/l)
Site A Cleanup Level (1)		7	30	6	4	70	60	10	6
01U039	17-Jun-02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
01U102	19-Jun-02	4.2	JP 0.50	<1.0	<1.0	1.3	<1.0	<1.0	
01U103	13-Dec-01	<1.0	<1.0	<1.0	JP 0.18 (UB0.38)	<1.0	<1.0	<1.0	
01U103	19-Mar-02	JP 0.48	JP 0.16	<1.0	<1.0	<1.0	<1.0	<1.0	
01U103	18-Jun-02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.4 B
01U103	16-Sep-02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
01U108	13-Dec-01	**180**	**37**	<1.0	JP 0.18 (UB0.38)	27	<1.0	<1.0	
01U108	18-Mar-02	**110**	20	<1.0	<1.0	8.3	<1.0	<1.0	
01U108	19-Jun-02	**7.6**	1.5	<1.0	<1.0	JP 0.32	<1.0	<1.0	
01U108 D	19-Jun-02	6.8	1.3	<1.0	<1.0	JP 0.27	<1.0	<1.0	
01U108	16-Sep-02	**36**	7.8	<1.0	<1.0	JP 0.92	<1.0	<1.0	
01U115	17-Jun-02	<1.0	JP 0.16	<1.0	<1.0	JP 0.56	<1.0	<1.0	
01U116	18-Jun-02	<1.0	JP 0.19	<1.0	<1.0	JP 0.18	<1.0	<1.0	
01U117	18-Jun-02	3.1	2.6	<1.0	<1.0	26	<1.0	<1.0	
01U126	19-Jun-02	**24**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
01U138	18-Jun-02	JP 0.078	<1.0	<1.0	<1.0	JP 0.19	<1.0	<1.0	
01U139	18-Jun-02	<1.0	JP 0.35	<1.0	<1.0	12	<1.0	JP 0.84	
01U139 D	18-Jun-02	<1.0	JP 0.37	<1.0	<1.0	12	<1.0	JP 0.82	
01U140	18-Jun-02	<1.0	JP 0.15	<1.0	<1.0	2.1	<1.0	JP 0.66	
01U157	18-Jun-02	<1.0	JP 0.54	<1.0	<1.0	1.3	<1.0	<1.0	
01U158	18-Jun-02	<1.0	JP 0.25	<1.0	<1.0	1.7	<1.0	JP 0.15	
01U350	13-Dec-01	**170**	**64**	<1.0	JP 0.18 (UB0.38)	40	JP 0.49	<1.0	
01U350	18-Mar-02	**160**	**57**	<1.0	<1.0	28	JP 0.44	<1.0	
01U350	19-Jun-02	**88**	30	<1.0	<1.0	10	JP 0.28	<1.0	
01U350	16-Sep-02	**94**	25	<1.0	<1.0	5.6	JP 0.43	<1.0	
01U350 D	16-Sep-02	**86**	25	<1.0	<1.0	5.2	JP 0.42	<1.0	

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2002

			Tetrachloro-ethene (ug/l)	Trichloro-ethene (ug/l)	1,1-Dichloro-ethene (ug/l)	1,2-Dichloro-ethane (ug/l)	cis-1,2-Dichloro-ethene (ug/l)	Chloroform (ug/l)	Benzene (ug/l)	Antimony (ug/l)
Site A Cleanup Level (1)			7	30	6	4	70	60	10	6
01U901		19-Jun-02	<1.0	<1.0	<1.0	<1.0	JP 0.29	<1.0	<1.0	
01U902		19-Jun-02	<1.0	JP 0.28	<1.0	<1.0	8.4	<1.0	JP 0.15	0.81 B (UB0.6)
01U903		19-Jun-02	<1.0	JP 0.17	<1.0	<1.0	JP 0.20	<1.0	<1.0	
01U903	D	19-Jun-02	<1.0	JP 0.13	<1.0	<1.0	JP 0.14	<1.0	<1.0	
01U904		19-Jun-02	<1.0	JP 0.12	<1.0	<1.0	3.0	<1.0	JP 0.13	0.8 B (UB0.6)
Extraction Wells:										
01U351		19-Jun-02	JP 0.29	JP 0.73	<1.0	<1.0	1.1	<1.0	<1.0	
01U352		19-Jun-02	JP 0.56	2.1	<1.0	<1.0	67	<1.0	6.4	
01U352	D	19-Jun-02	JP 0.56	2.2	<1.0	<1.0	66	<1.0	6.3	
01U352		16-Sep-02	JP 0.51	1.4	JP 0.24	JP 0.76	**160**	<1.0	**19**	
01U353		19-Jun-02	JP 0.26	JP 0.81	<1.0	<1.0	36	<1.0	1.0	
01U353	D	19-Jun-02	JP 0.25	JP 0.79	<1.0	<1.0	37	<1.0	JP 0.89	
01U353		16-Sep-02	JP 0.28	JP 0.76	<1.0	<1.0	25	<1.0	JP 0.43	
01U354		19-Jun-02	<1.0	JP 0.27	<1.0	<1.0	JP 0.92	<1.0	<1.0	

Notes:

(1) Cleanup levels for Site A Shallow Groundwater are from Table 1 of the OU2 ROD. Bolding indicates exceedance of the cleanup level.
JP The value is below the reporting level, but above the method detection limit.
D Duplicate sample.
B The value is below the reporting level, but above the method detection limit.
UB The sample result was less than 5 times the value detected in a blank (the result for the blank is listed after "UB"), and therefore the sample result can be considered non detect.

Table 6-3
Site A Removal Action Pumping Data

Fiscal Year 2002

Monthly Average Flowrate (gpm)

	01U351	01U352	01U353	01U354	Total
			Target Flowrate (gpm):		15.0
October	6.4	5.9	4.6	7.0	23.9
November	4.2	6.2	4.0	5.4	19.8
December	4.2	5.5	4.0	4.4	18.0
January	4.1	4.3	3.8	4.0	16.2
February	3.1	4.8	3.5	3.8	15.1
March	3.7	3.9	3.5	4.1	15.2
April	4.4	3.4	3.6	4.4	15.9
May	3.8	3.5	3.8	4.1	15.2
June	3.5	4.1	3.5	4.9	16.0
July	3.2	4.5	3.9	5.0	16.6
August	4.9	5.9	3.6	4.2	18.7
September	3.3	3.5	3.4	3.9	14.1
FY02 Averages:	**4.1**	**4.6**	**3.8**	**4.6**	**17.1**

Table 6-4
Site A Groundwater Level Data

Fiscal Year 2002

Well ID	TOS (ft)	Groundwater Elevation (ft)	Well ID	TOS (ft)	Groundwater Elevation (ft)
01U038	900.30	893.88	01U140	898.83	886.00
01U039	897.50	885.42	01U141	897.74	887.50
01U040	892.54	885.75	01U145	902.56	888.68
01U041	898.33	894.11	01U146	902.89	886.63
01U063	892.61	885.20	01U147	902.80	888.13
01U067	897.40	894.69	01U148	902.60	887.57
01U102	905.20	890.79	01U149	901.30	887.41
01U103	904.14	892.08	01U150	901.30	886.91
01U104	899.12	894.40	01U151	904.70	887.05
01U105	901.39	895.58	01U152	901.00	886.99
01U106	896.80	891.81	01U153	899.90	886.65
01U107	899.16	893.63	01U154	898.90	886.26
01U108	904.30	891.64	01U155	897.90	885.37
01U110	897.22	895.65	01U156	897.80	884.88
01U115	900.33	887.13	01U157	901.90	886.99
01U116	902.71	887.42	01U158	901.10	886.73
01U117	902.69	888.40	01U350	903.88	891.62
01U118	901.79	891.28	01U901	901.48	883.85
01U119	898.08	894.01	01U902	901.29	886.32
01U120	902.15	891.16	01U903	903.70	887.82
01U126	903.34	890.01	01U904	899.40	884.92
01U127	902.93	891.66			
01U133	900.73	893.42	*Extraction Wells:*		
01U135	899.94	884.56	*(Elevations measured while pumping.)*		
01U136	898.84	880.72	01U351	904.00	886.18
01U137	900.51	889.71	01U352	901.00	884.24
01U138	904.38	886.91	01U353	902.00	881.74
01U139	901.15	886.88	01U354	903.80	885.86

Notes:

TOS = Top of Surface which represents the ground surface elevation in feet above mean sea level (MSL).

Groundwater elevations were measured on June 13, 2002.

Table 6-5
Site A Removal Action Monthly Operation and Maintenance Notes

Fiscal Year 2002

October
10/30 - 11/1 System down for scheduled cleaning. Down time: 49 hours.

November
10/30 - 11/1 System down for scheduled cleaning. System down time: 49 hours.
11/29 EW-2 down on arrival. Pump replaced 11/30. EW-2 down time: 44 hours.

December
12/17 System down for scheduled cleaning. System down time: 33 hours.
12/18 EW-3 down. No down time, pump replaced during system cleaning.
12/19 Agassiz on site to clean EW-2 line. System down time: 3 hours.

January
1/28 System down for scheduled cleaning. System down time: 29 hours.

February
2/1 Pump for EW-1 down. Replaced electrical box at well and pump restarted 2/8. EW-1 down time: 7 days.

March
3/11 - 3/12 System down for scheduled cleaning. System down time: 31 hours.
3/18 System shut down to repair leaks. System down time: 4 hours.

April
No significant operational problems or changes this month.

May
5/6 - 5/8 System down for scheduled cleaning. On 5/8 some extra effort was required to clean the pipe line for EW-2. System down time: 50 hours.

June
No significant operational problems or changes this month.

July
7/8 - 7/9 & 7/22 System down for scheduled cleaning. Total system down time: 31 hours.

August
No significant operational problems or changes this month.

September
System was pumping slightly below the target rate due to an operator oversight. No operational problems.

Table 6-6
Site A Removal Action Effluent Water Quality

Fiscal Year 2002

	cis-1,2-Dichloroethene (ug/l)	trans-1,2-Dichloroethene (ug/l)	1,1,1-Trichloroethane (ug/l)	Trichloroethene (ug/l)	Mercury (ug/l)
Discharge Limits:	3000	3000	3000	3000	2
09-Oct-01	35	JP 0.61	<1.0	JP 1.1	<0.100
20-Nov-01	42	JP 0.68	<1.0	JP 0.97	<0.100
31-Dec-01	24	<1.0	<1.0	JP 0.84	<0.100
17-Jan-02	30	JP 0.81	<1.0	JP 0.95	<0.100
14-Feb-02	29	JP 0.75	<1.0	JP 0.96	<0.100
19-Mar-02	34	JP 0.82	<1.0	1.1	<0.100
24-Apr-02	17	JP 0.65	<1.0	JP 0.88	<0.100
23-May-02	24	JP 0.63	<1.0	JP 0.99	<0.100
19-Jun-02	26	JP 0.70	<1.0	JP 0.97	<0.100
25-Jul-02	37	JP 0.93	<1.0	1.2	<0.100
20-Aug-02	42 (JS65)	JP 0.94	<1.0	JP 0.80 (JL132)	<0.100
16-Sep-02	51	JP 0.83	<1.0	JP 0.80	<0.100

Notes:

JP = The value is below the reporting limit, but above the method detection limit.

JL = The percent recovery for the Laboratory Control Spike was outside QC limits (the LCS percent recovery is listed after "JL"), and therefore the result should be considered estimated.

JS = The percent recovery for the Matrix Spike was outside QC limits (the MS percent recovery is listed after "JS"), and therefore the result should be considered estimated.

Table 6-7
Site A SVE/AS System Monthly Operation and Maintenance Notes

Fiscal Year 2002

October

10/17 System down upon arrival, high temperature warning. System could not be restarted due to a transformer problem. Excel Energy repaired the transformer on 10/18. System down time: 47.5 hours.

November

No significant operational problems or changes this month.

December

No significant operational problems or changes this month.

January

No significant operational problems or changes this month.

February

2/14 System down upon arrival. No alarms present, possible power outage. System down time: 24 hours.
2/25 Vent A closed since VOCs could no longer be detected in its airflow.

March

3/1 - 3/7 System undergoing airflow reconfiguration. No down time.

April

4/15 System down, high temperature alarm. System down time: 2 hours.

May

No significant operational problems or changes this month.

June

6/24 System down upon arrival, possible power outage. System down time: 8 hours.
6/25 System down upon arrival, condensate tank full. Tank water tested for VOCs. System down time: 158 hrs.

July

7/1 System down upon arrival: high temperature alarm. System down time: 24 hours.
7/2 System down upon arrival: high temperature alarm. System down time: 24 hours.
7/12 System down upon arrival: condensate tank full. Emptied tank and restarted. System down time: 26 hrs.
7/12 Collected soil samples from soil probes for lab analysis to determine progress towards soil cleanup goals.

August

8/21 System down upon arrival: condensate tank full. Emptied tank and tried to restart the SVE blower. Blower did not start and control panel began smoking. Panel was shut down pending further assessment. System remained off through end of August. System down time: 240 hours.

September

The Site A SVE/AS System remained shut-down for the month of September. Remediation alternatives were evaluated and the site was scheduled for excavation in October 2002. The SVE/AS System shut down was deemed permanent and system dismantling was scheduled for October 2002.

Table 6-8
Site A SVE System Flowrates

Fiscal Year 2002

Monthly Average Flow Rate (cfm)

	SVE A	SVE B	SVE C	Total
Target Flow Rate:	75	75	75	225
October	72	74	80	226
November	93	93	100	286
December	92	91	98	281
January	92	92	104	288
February	84	92	100	276
March (1)	0	91	102	193
April	0	94	104	198
May	0	86	92	178
June	0	58	64	122
July	0	53	58	111
August	0	65	71	136
September (2)	0	0	0	0
FY 2002 Averages (3):	**87**	**81**	**88**	**256**

Notes:
cfm = cubic feet per minute
(1) Vent A was closed on February 25, 2002, since VOCs could no longer be detected in its airflow.
(2) The system was permanently shut down on August 21, 2002.
(3) Averages include October 2001 - February 2002 for Vent A, and October 2001 - August 2002 for Vents B and C.

Table 6-9
Site A SVE System Discharge Monitoring Results

Fiscal Year 2002

	Site A VOCs of Concern							Other Compounds Detected														
	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	1,1-Dichloroethene	1,2-Dichloroethane	Benzene	Chloroform	Ethylbenzene	Toluene	M&P-Xylene	O-Xylene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	4-Ethyl Toluene	Chloromethane	Dichlorodifluoromethane	Freon 11	Acetone	Methylene Chloride	Methyl Ethyl Ketone	Total VOCs
19-Nov-01	52	25	0.99J	<1.0	1.2	4.0	0.24J	6.3	34	26	13	26	15	7.2	0.72J	0.44J	0.48J	66	9.0	21B	287
24-Jan-02	73	18	1.7	<1.0	<1.0	<1.0	<1.0	2.5	0.73J	15	13	36	20	9.2	0.29J	0.55J	0.31J	4.5B	0.34J	4.5B	190

Notes:

1) All results are reported as parts per billion by volume (ppbv).
2) J = The value is below the reporting limit, but above the method detection limit.
3) B = The compound was also detected in the method blank.

Table 6-10
Site A Removal Action Monthly VOC Removal

Fiscal Year 2002

Month	1,2-Dichloroethene (cis and trans) (ug/l)	Trichloroethene (ug/l)	Total VOCs in System Effluent (ug/l)	Conversion Factor (l*lb)/(ug*gal)	Water Pumped (gallons)	Total VOCs Removed by Extraction System (lbs)
Total Gallons Pumped and VOCs Removed Through September 30, 2001:					112,712,835	34.5
Oct-01	35.61	1.1	36.71	8.35E-09	1,065,200	0.33
Nov-01	42.68	0.97	43.65	8.35E-09	856,170	0.31
Dec-01	24.00	0.84	24.84	8.35E-09	805,330	0.17
Jan-02	30.81	0.95	31.76	8.35E-09	724,210	0.19
Feb-02	29.75	0.96	30.71	8.35E-09	607,090	0.16
Mar-02	34.82	1.1	35.92	8.35E-09	614,800	0.18
Apr-02	17.65	0.88	18.53	8.35E-09	753,450	0.12
May-02	24.63	0.99	25.62	8.35E-09	677,860	0.14
Jun-02	26.70	0.97	27.67	8.35E-09	643,680	0.15
Jul-02	37.93	1.2	39.13	8.35E-09	741,090	0.24
Aug-02	42.94	0.80	43.74	8.35E-09	779,920	0.28
Sep-02	51.83	0.80	52.63	8.35E-09	609,808	0.27
Total Gallons Pumped and VOCs Removed for Fiscal Year 2002:					**8,878,608**	**2.54**
Total Gallons Pumped and VOCs Removed Since System Start-up:					**121,591,443**	**37.0**

Note:

1) VOC concentrations do not include estimated concentrations for compounds detected below the reporting limit.

Table 6-11
Site A SVE/AS System Monthly VOC Removal

Fiscal Year 2002

Period	Average Effluent PID Reading (PPM)	Average Effluent Flowrate (1) (SCFM)	VOC Removal Rate (2) (Lbs/day)	VOCs Removed in Period (3) (Lbs)	Down Time in Period (Hours)	VOCs Removed in Month (Lbs)
Total VOCs Removed Through September 30, 2001:						413
10/1 - 10/11	3.2	268	0.4	4.3	0	
10/12 - 10/31	3.2	295	0.4	7.8	47.5	
				October Total:		12.1
11/1 - 11/15	3.2	285	0.4	6.3	0	
11/16 - 11/31	3.2	294	0.4	6.9	0	
				November Total:		13.1
12/1 - 12/13	3.2	298	0.4	5.7	0	
12/14 - 12/31	3.2	280	0.4	7.4	0	
				December Total:		13.0
1/1 - 1/16	1.0	297	0.1	2.2	0	
1/17 - 1/31	1.0	263	0.1	1.8	0	
				January Total:		4.0
2/1 - 2/19	1.0	271	0.1	2.2	24	
2/20 - 2/24	1.0	298	0.1	0.7	0	
2/25 - 2/28 (4)	9.5	298	1.3	5.2	0	
				February Total:		8.1
3/1 - 3/13	7.5	287	1.0	12.8	0	
3/14 - 3/31	7.5	296	1.0	18.3	0	
				March Total:		31.1
4/1 - 4/30	5.3	302	0.7	22.0	2	
				April Total:		22.0
5/1 - 5/14	5.3	304	0.7	10.3	0	
5/15 - 5/31	1.0	301	0.1	2.2	0	
				May Total:		12.5
6/1 - 6/14	1.0	299	0.1	2.1	0	
6/15 - 6/30	0.0	275	0.0	0.0	164	
				June Total:		2.1
7/1 - 7/31	1.4	288	0.2	5.0	74	
				July Total:		5.0
8/1 - 8/31	0.0	292	0.0	0.0	240 (5)	
				August Total:		0.0
9/1 - 9/30	(System Shut Down (5))					
				September Total:		0.0
Total VOCs Removed for Fiscal Year 2002:						**123**
Total VOCs Removed Since System Start-up:						**536**

Notes:

(1) Effluent flowrate includes dilution air.

(2) Average VOC molecular weight of 125 assumed for VOC removal rate calculation.

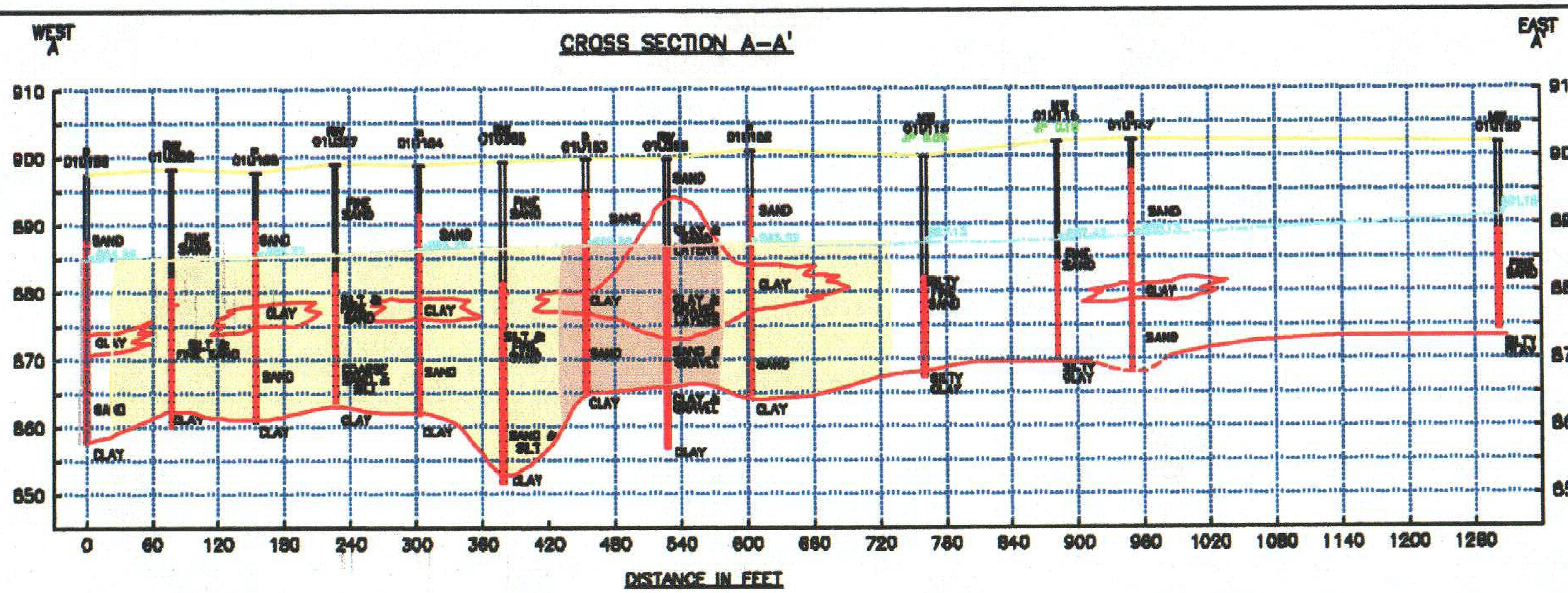
(3) VOCs removed in each period are adjusted for down time.

(4) Vent A was closed on February 25, 2002, since VOCs could no longer be detected in its airflow.

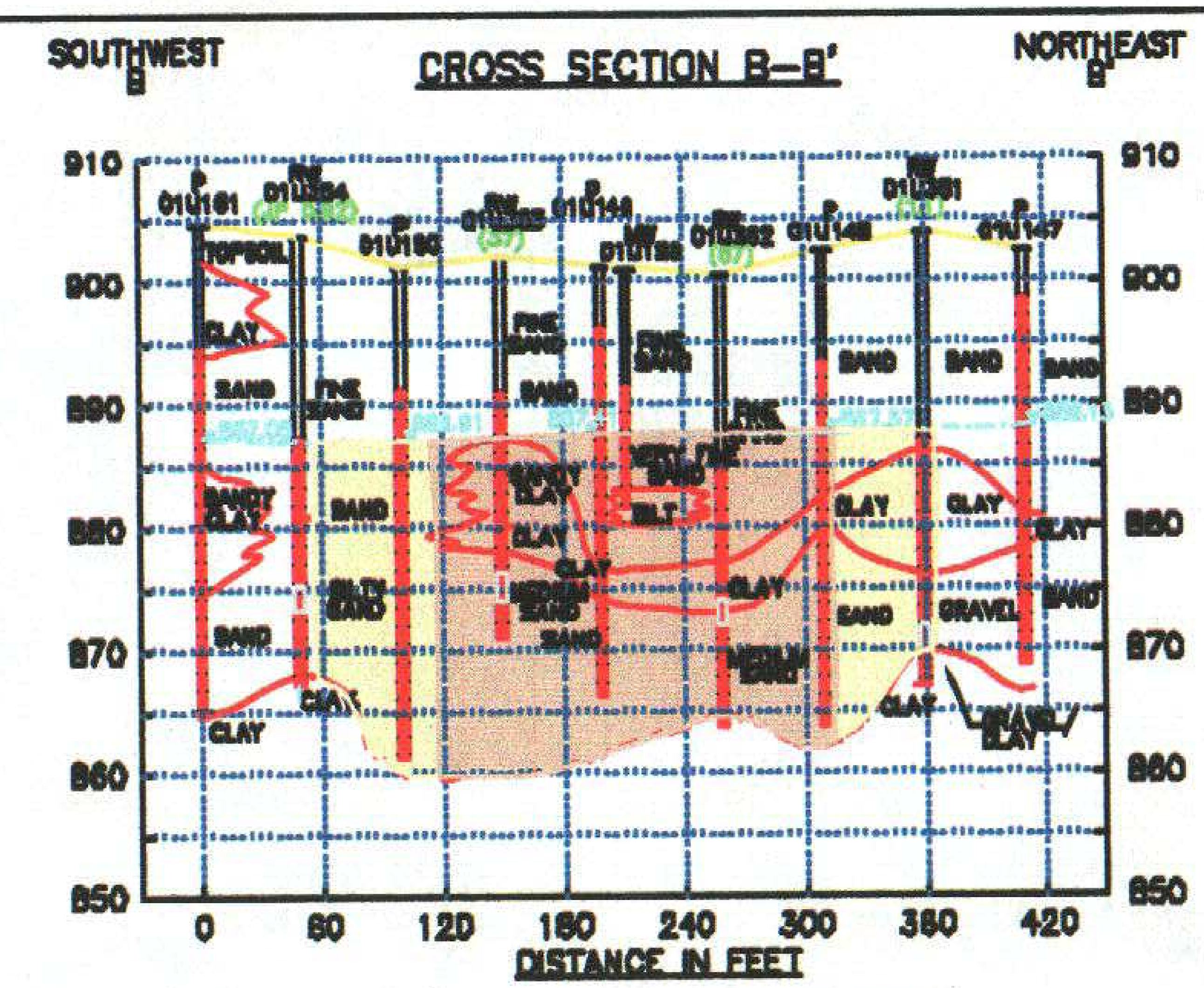
(5) The system was permanently shut down on August 21, 2002.

TWIN CITIES ARMY AMMUNITION PLANT	Wenck	FY 2002
Site A, Well Location Map	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	Figure 6-1

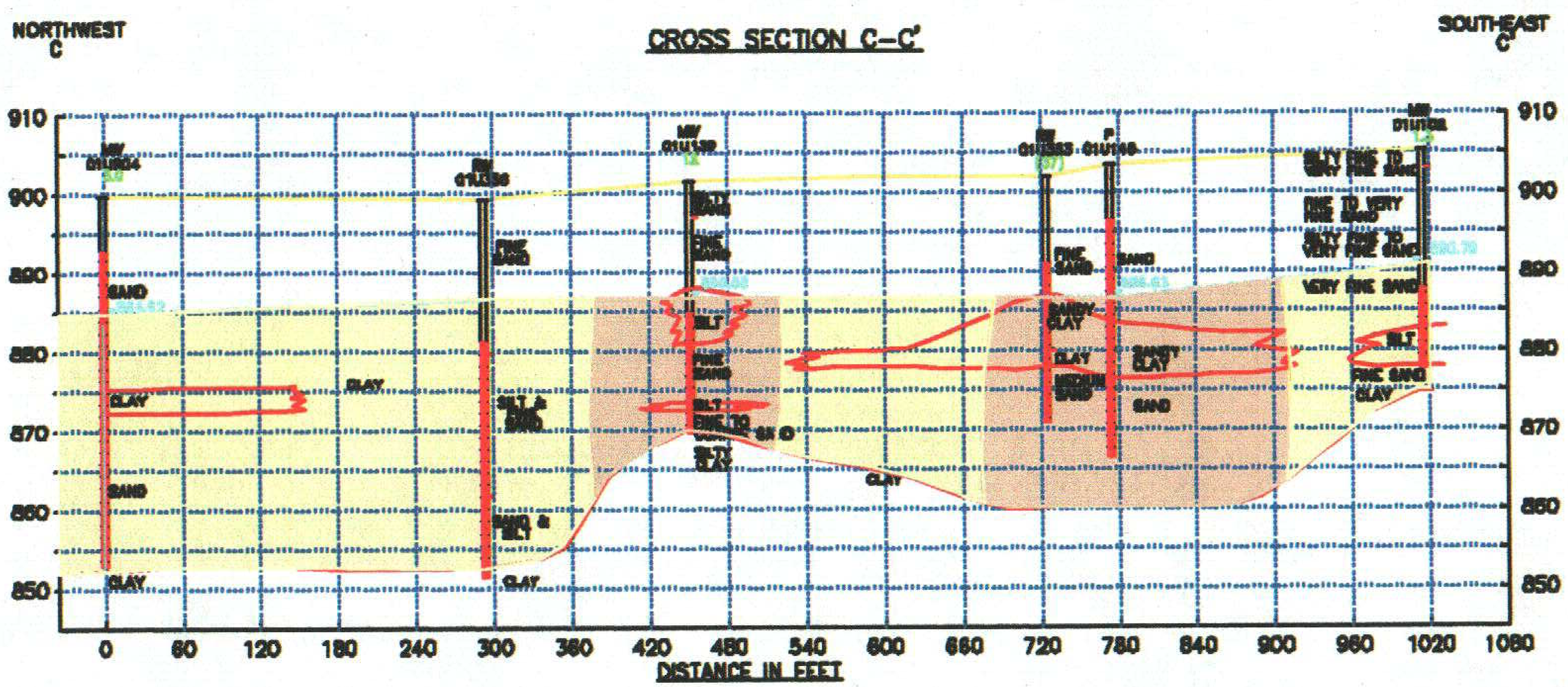
CROSS SECTION A-A'



CROSS SECTION B-B'



CROSS SECTION C-C'



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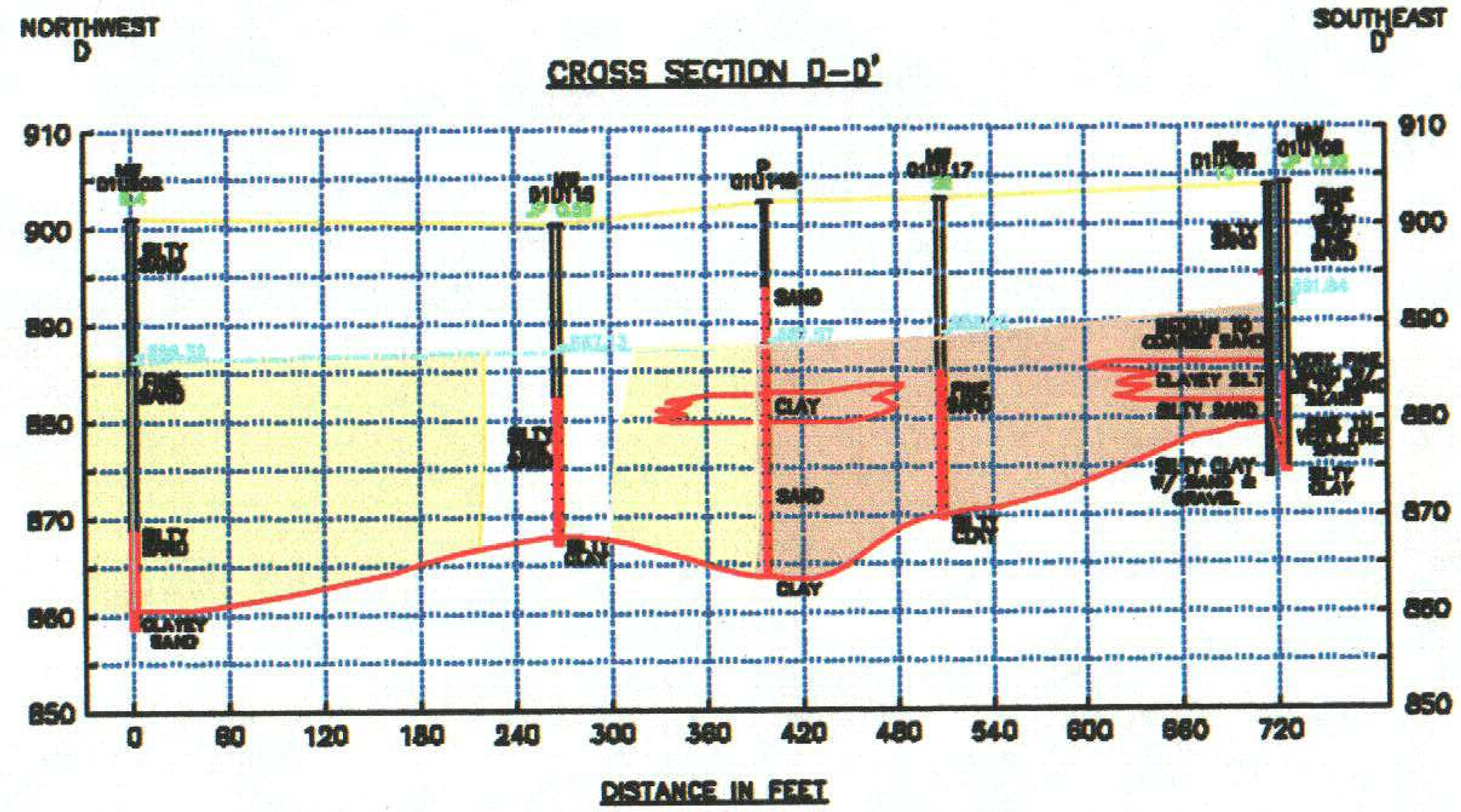


NOTES:

1. RESULTS ARE FROM GROUNDWATER SAMPLES COLLECTED BETWEEN JUNE 17-19, 2002.
2. CONSTRUCTION INFORMATION ON RECOVERY WELLS AND PIEZOMETERS WAS GENERATED BY DAHL AND ASSOCIATES, INC. AS PART OF THE SITE A REMOVAL ACTION SYSTEM CONSTRUCTION. CONSTRUCTION INFORMATION ON MONITORING WELLS WAS PROVIDED BY FEDERAL CARTRIDGE COMPANY.

LEGEND

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- SCREENED INTERVAL OF WELL
- PUMP LOCATION
- WATER LEVEL SURFACE
- SLIGHT CHANGE IN GEOLOGIC UNIT (MARK LOCATED ALONG WELL STAFF)
- MW MONITORING WELL
- RW RECOVERY WELL
- P PIEZOMETER
- cis-1,2-DICHLOROETHENE CONCENTRATION (ug/l) (VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)

cis-1,2-DICHLOROETHENE CONCENTRATIONS

- 1-10 ug/l
- 10-100 ug/l

TWIN CITIES ARMY AMMUNITION PLANT

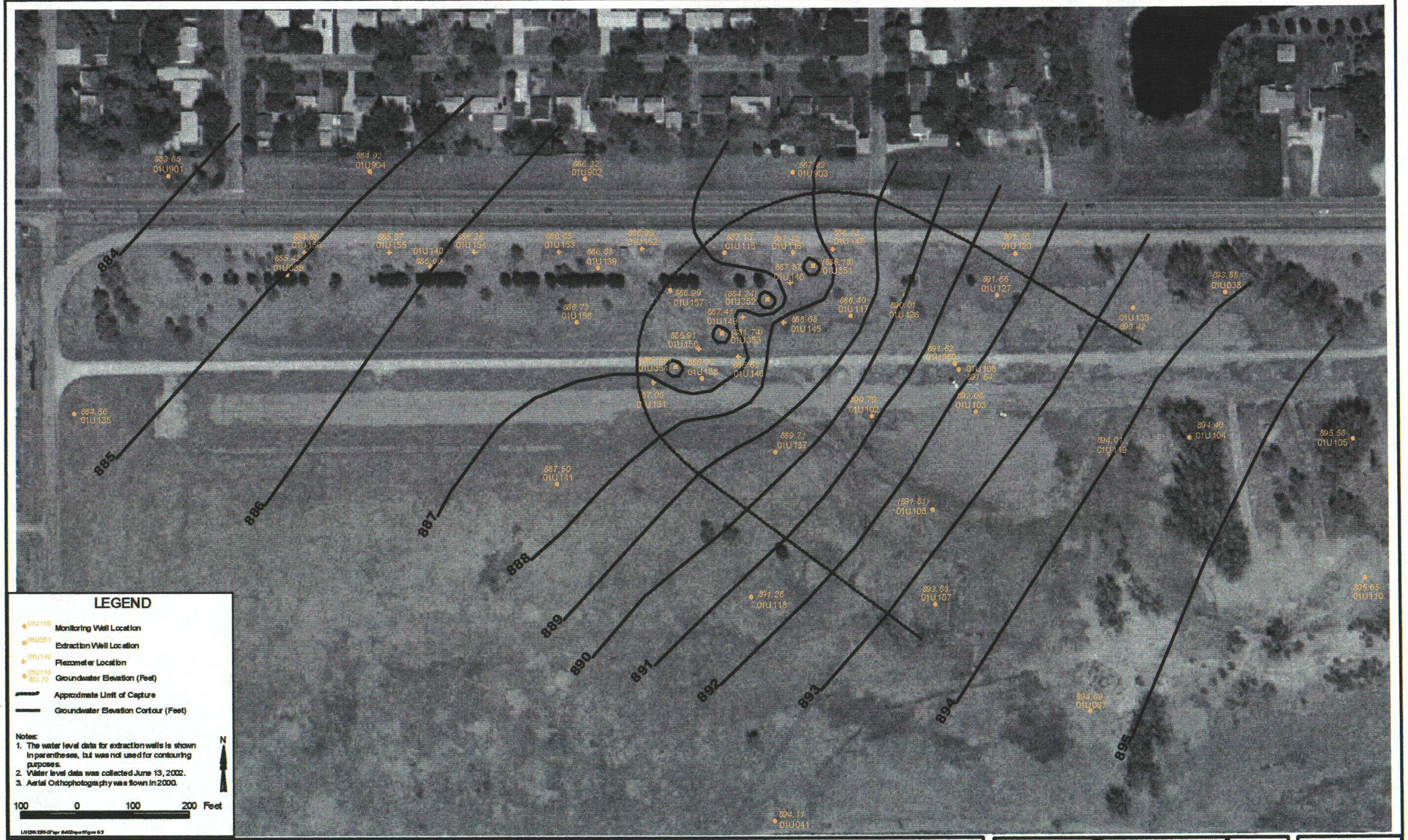
Site A, cis-1,2-Dichloroethene Cross Sections A-A', B-B', C-C' and D-D' Summer 2002

Wenck

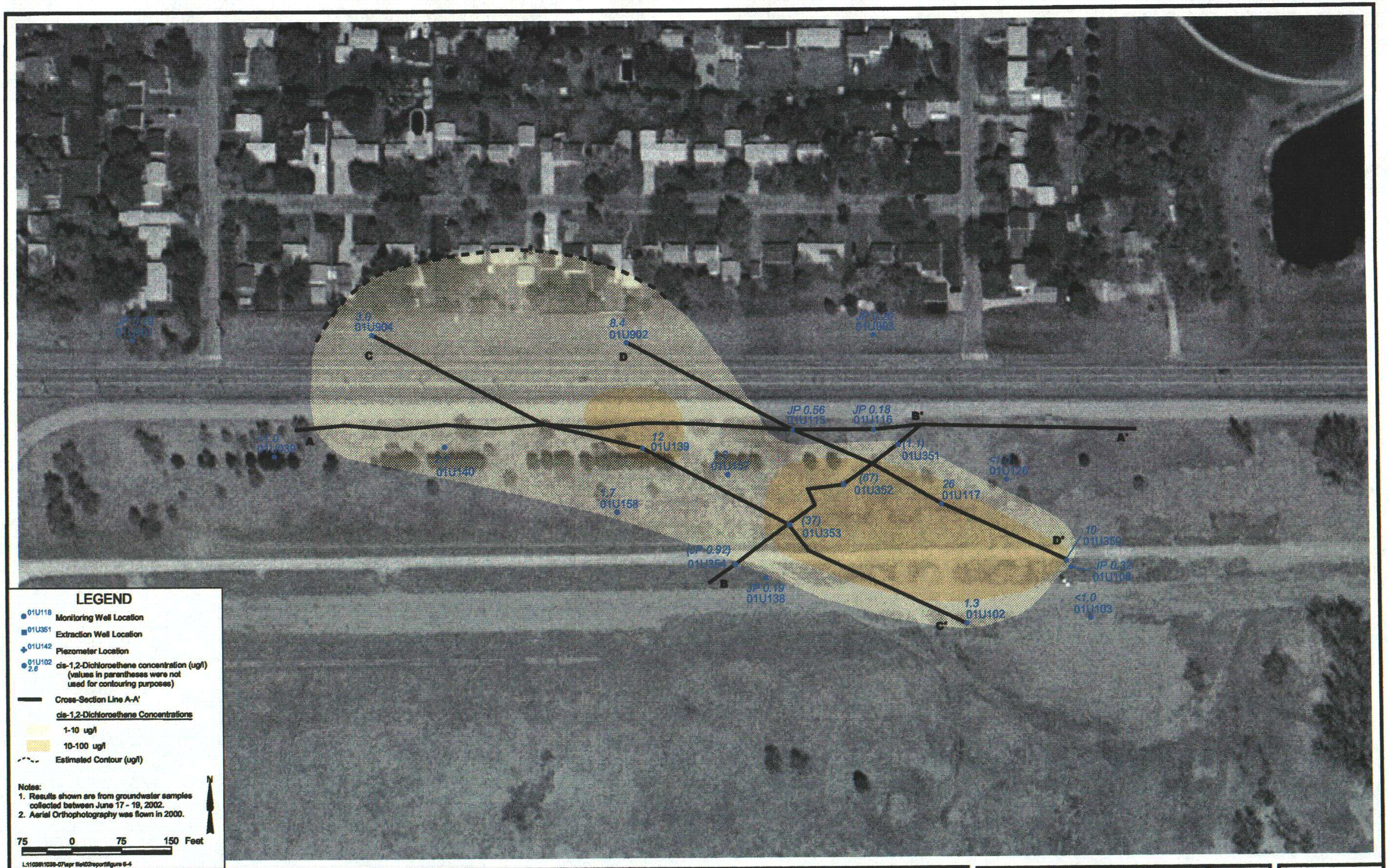
Wenck Associates, Inc. Environmental Engineers

FY 2002

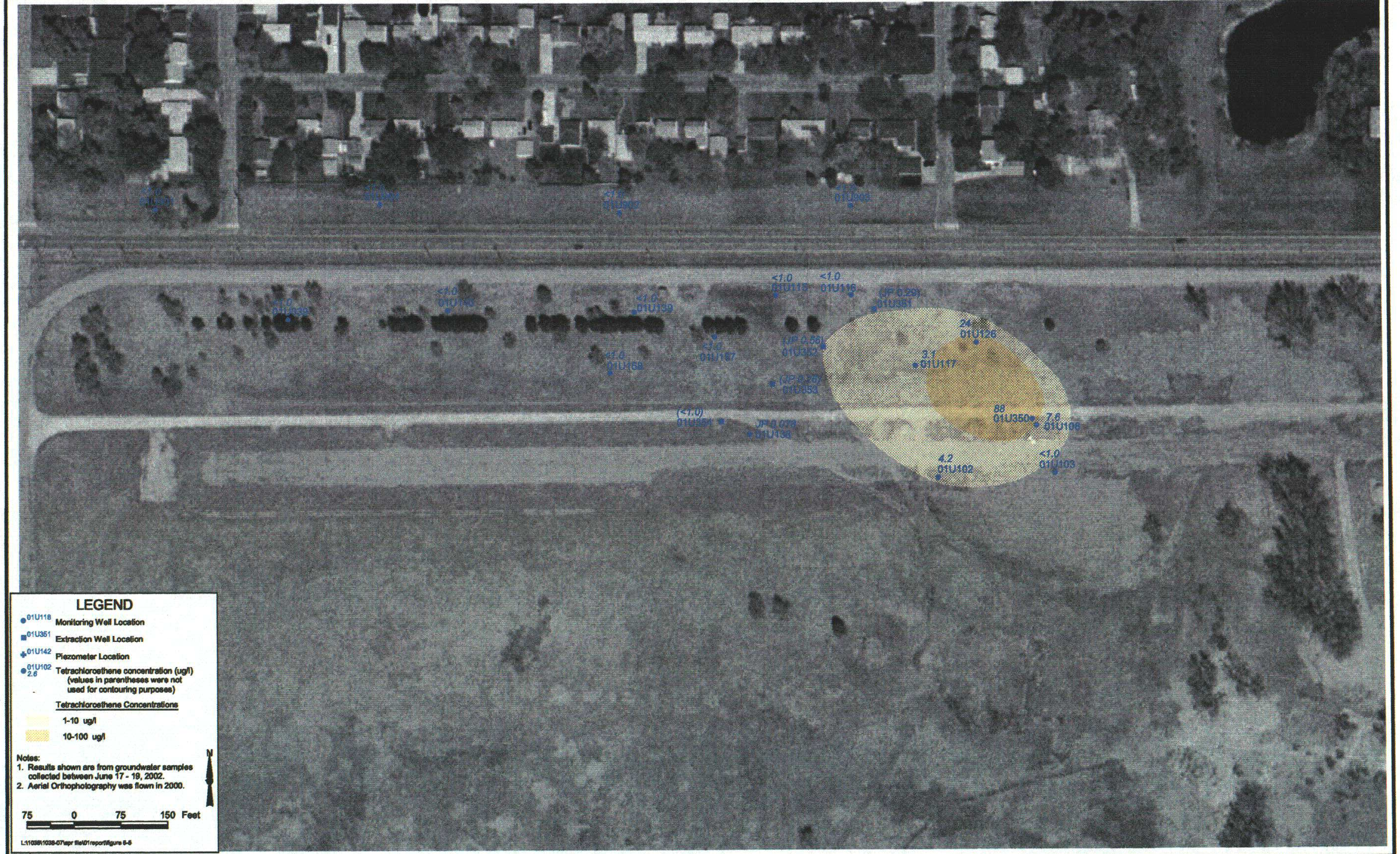
Figure 6-2



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359-0249	FY 2002
Site A, Unit 1, Potentiometric Map -- Summer 2002		Figure 6-3



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2002
Site A, Unit 1, cis-1,2-Dichloroethene Isoconcentration Map, Summer 2002		Figure 6-4



TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1 Tetrachloroethene Isoconcentration Map, Summer 2002

Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

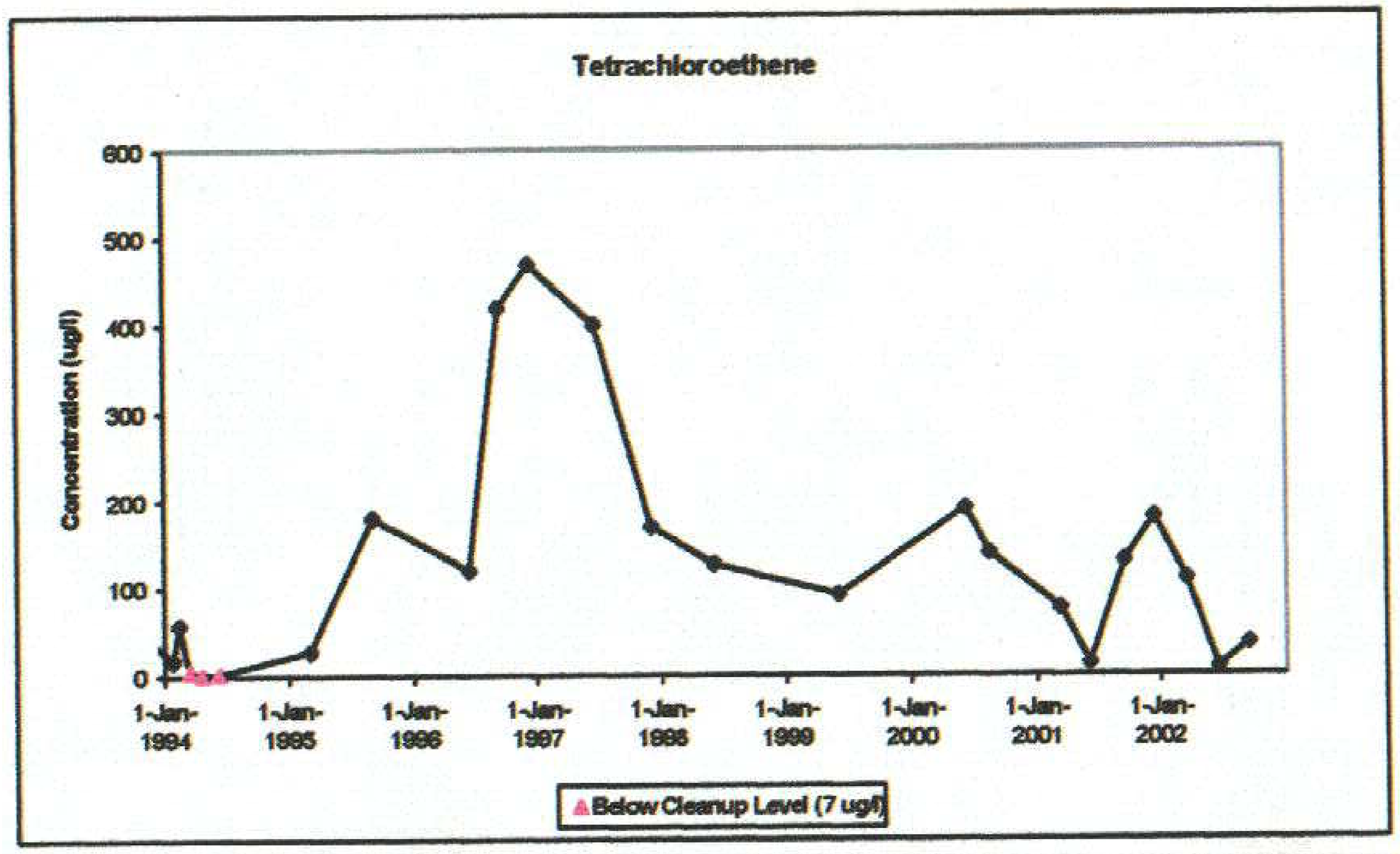
FY 2002

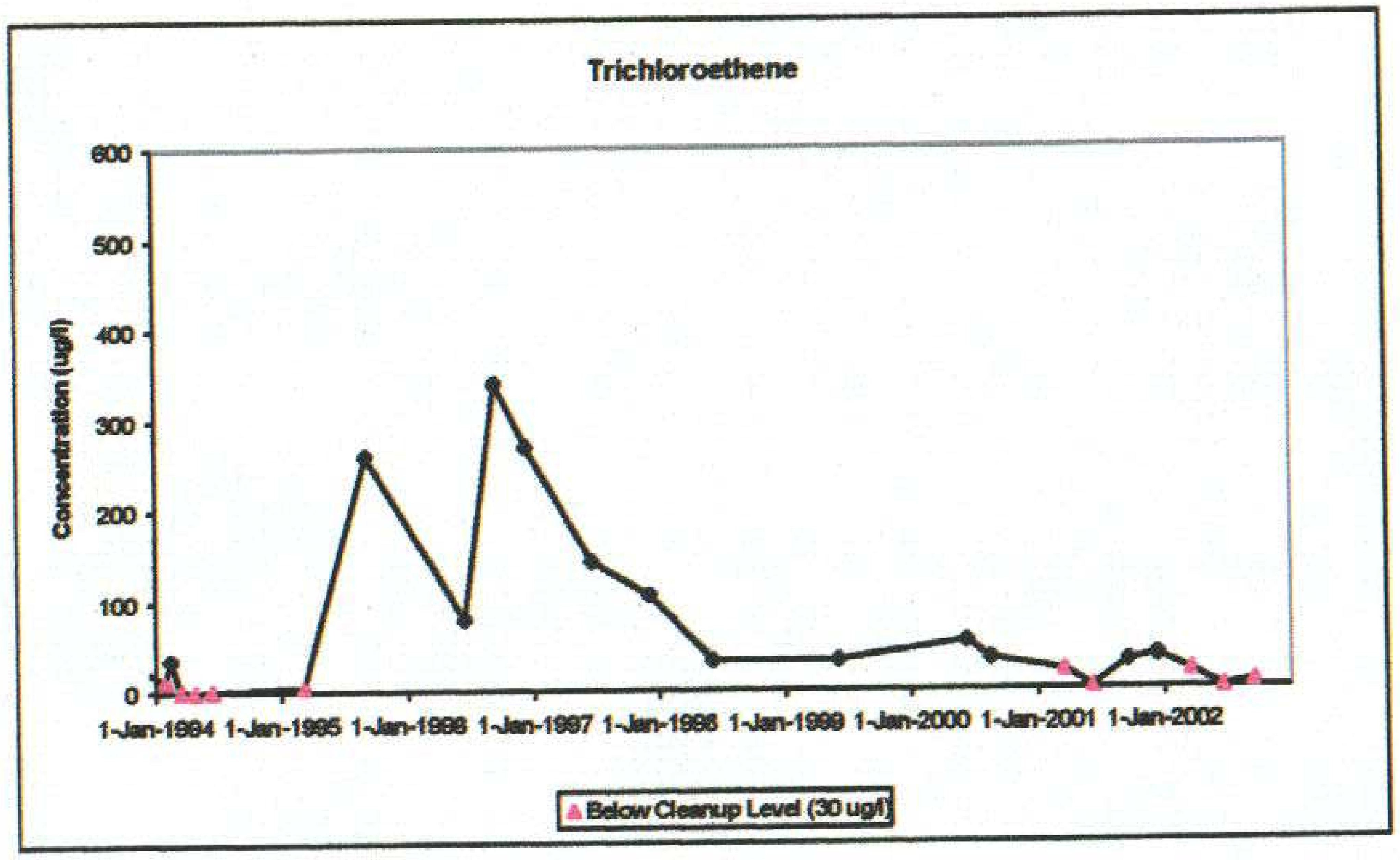
Figure 6-5

FIGURE 6-6

SITE A, WELL 01U108, TETRACHLOROETHENE, TRICHLOROETHENE, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS

TWIN CITIES ARMY AMMUNITION PLANT





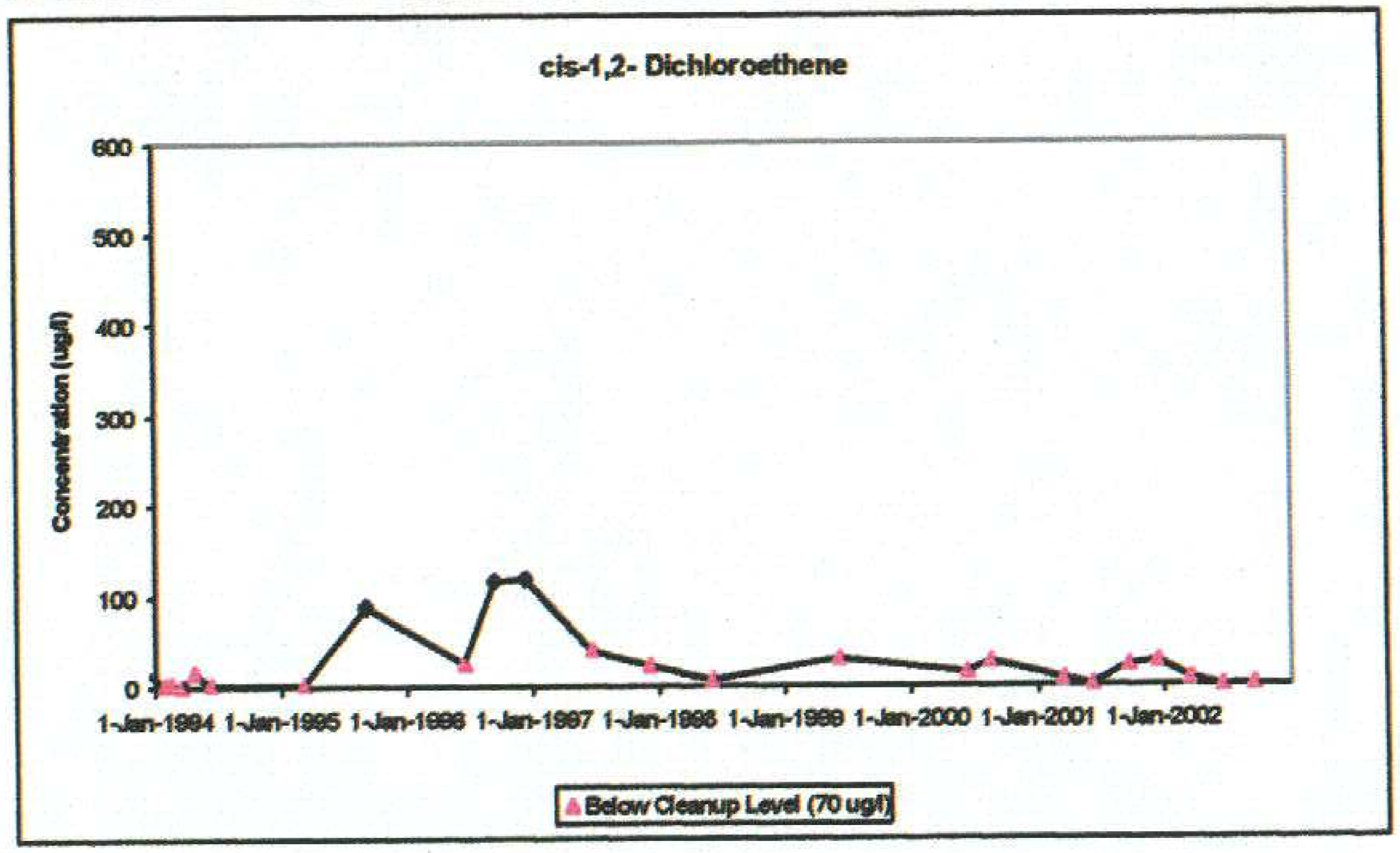


FIGURE 6-7

SITE A, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS: RECOVERY WELLS

TWIN CITIES ARMY AMMUNITION PLANT

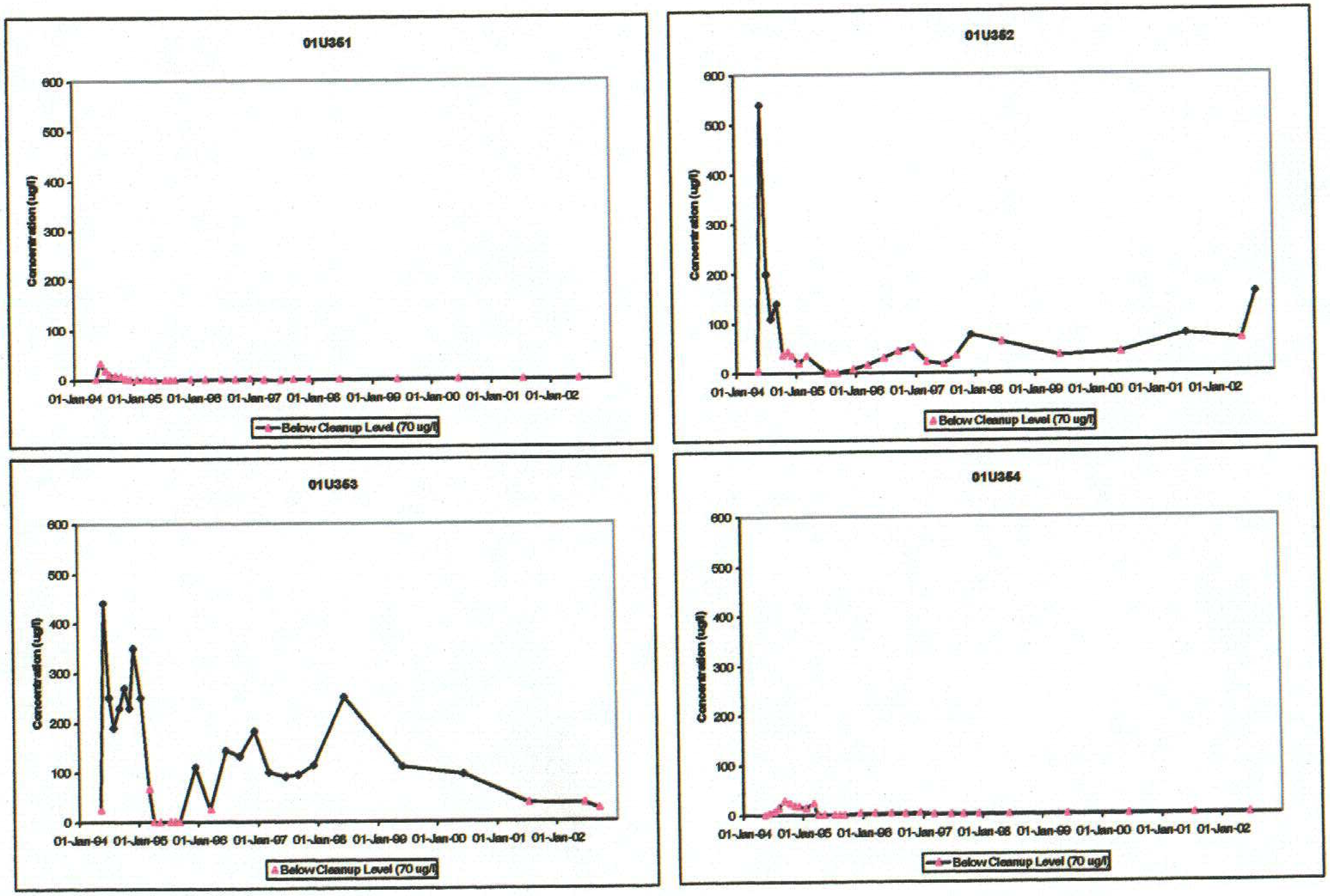
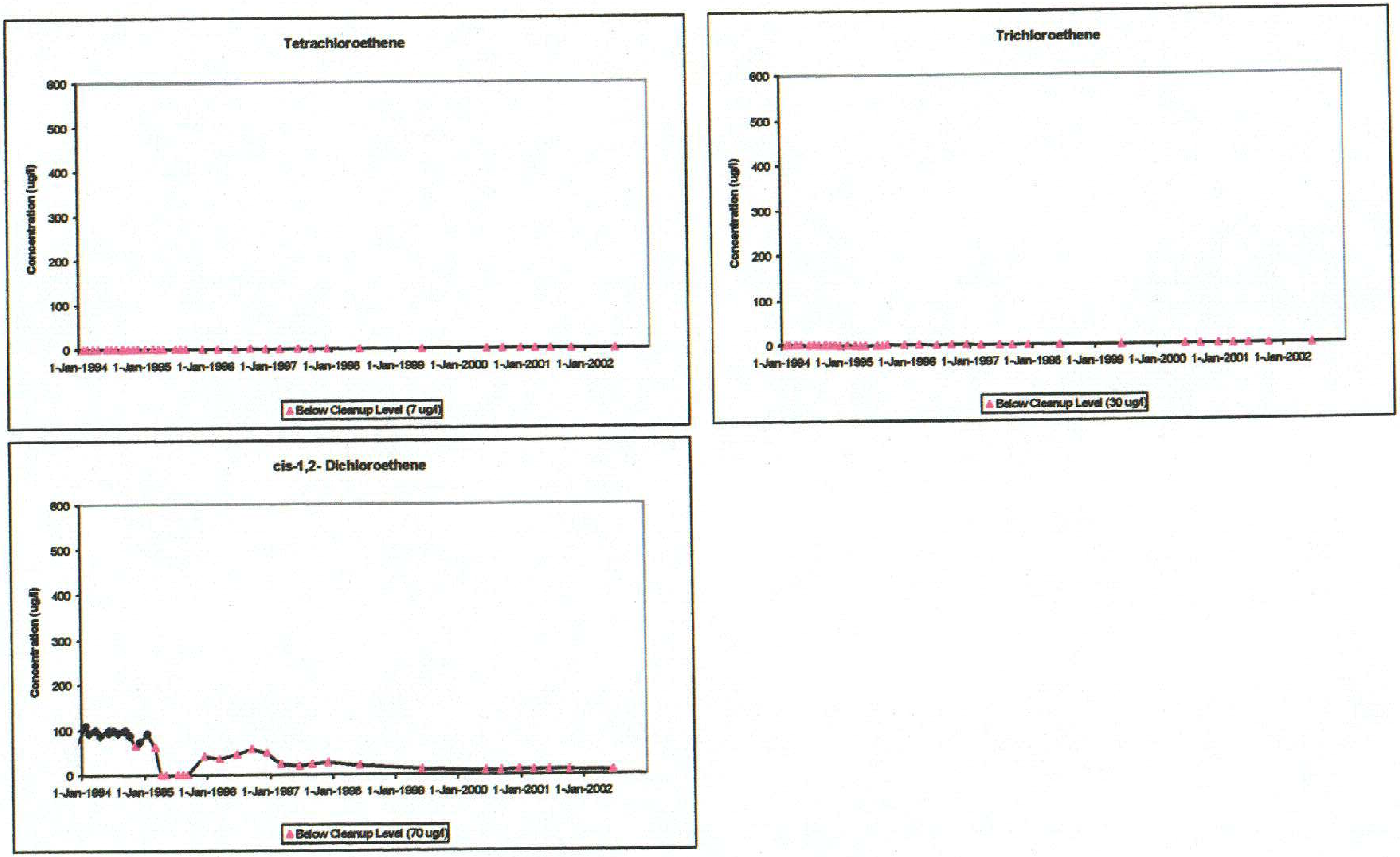


FIGURE 6-8

SITE A, WELL 01U902, TETRACHLOROETHENE, TRICHLOROETHENE, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS

TWIN CITIES ARMY AMMUNITION PLANT



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Wenck Associates, Inc.

7.0 Operable Unit 2: Site I Shallow Groundwater

VOCs were identified in the Unit 1 groundwater at Site I. PCBs were identified in soils east of Building 502.

PCB contaminated soils east of Building 502 were excavated in 1986. These soils were stored in a storage building built as part of the PCB Interim Remedial Action (IRA) at Site I. During August and September 1996, these soils were removed and disposed of at a Toxic Substances Control Act (TSCA) landfill with approval of the MPCA and USEPA. Groundwater monitoring was conducted for PCBs through FY 1997. PCBs were not detected in groundwater and the monitoring was discontinued. Information on this work is included in the OU2 Remedial Investigation (Argonne National Laboratory 1991).

Monitoring in FY 2002 addressed the VOCs identified in the Unit 1 groundwater beneath the western portion of Building 502. The selected remedy in the OU2 ROD consists of four components, which incorporate the use of an existing well for groundwater extraction and additional investigation beneath the building slab. The additional investigation and Predesign Investigation Work Plan (Work Plan) were completed in FY2000. Based on these documents the selected remedy was modified to consist of a dual phase vacuum extraction system, which combines groundwater extraction with soil vapor extraction, to be installed beneath Building 502. A pilot test of dual phase extraction subsequently determined that dual phase extraction is not feasible due to the low permeability of the Unit 1 aquifer beneath the building. An amendment to the OU2 ROD is currently being pursued to address the likely change to a monitoring based remedy.

7.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan has been established and ongoing monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Monitoring at Site I in FY 2002 was conducted according to the monitoring plan for FY 2002. Appendix A summarizes the FY 2002 monitoring plan and any deviations are explained in Appendix C.2.

Seven Unit 1 monitoring wells were planned for sampling at Site I (Building 502) during FY2002. These wells are 01U064, 01U636, 01U639, 01U640, I01-MW, I02-MW and I05-MW. Figure 7-1 shows these well locations. Wells 01U639, I02-MW, and I02-MW were dry at the time of sampling (June, 2002). The dry wells yielded water when originally installed. Samples from the remaining wells were analyzed using EPA Method 8260 for VOCs.

What were the monitoring results for FY 2002?
Table 7-1 presents the results of the FY 2002 analyses. Monitoring wells 1U064 and 1U640, have both shown overall declines in concentration of trichloroethene and 1,2 dichloroethene since the early 1990's. These wells are now below the clean up standards for Site I. Figure 7.2 presents the groundwater elevations.

7.2 REMEDY COMPONENT #2: GROUNDWATER EXTRACTION

Description: "Use of an existing well to remove impacted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the equipment has been installed and is operating according to the Remedial Design approved by the regulators.

Has the remedy component been implemented?
No. The report on the dual phase vacuum extraction pilot test was submitted to the Agencies and received a consistency determination on March 16, 2000. The report concluded that neither dual phase extraction nor groundwater extraction is feasible. The pilot test found that the soil permeability is low. As a result the test yielded only approximately 1 gallon per hour. The report recommended that no further remedial action be considered until the building is demolished.

7.3 REMEDY COMPONENT #3: POTW DISCHARGE

Description: "POTW discharge of extracted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the discharge component has been implemented.

Has the remedy component been implemented?
No. As discussed above, the report on dual phase vacuum extraction determined that extraction remedies are not currently feasible.

7.4 REMEDY COMPONENT #4: ADDITIONAL INVESTIGATION

Description: "Additional characterization of the Unit 1 and Unit 2 soil and groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the work has been completed according to an Agency approved work plan.

Has the remedy component been implemented?
Yes. The results of the additional investigation were included in the Work Plan. The additional investigation resulted in a pilot study to evaluate the applicability of dual phase vacuum extraction technology to the site.

Overall Remedy for Site I Shallow Groundwater
The remedy specified in the OU2 ROD was modified in the RD work plan. Based on the dual phase pilot test report, the remedy was modified further to include only monitoring. This is acceptable, in large part, due to the fact that groundwater in the Unit 1 aquifer does not flow off site. Contaminants from the Unit 1 leak downward into the Unit 3. The deeper Unit 3 aquifer is hydraulically contained by the TGRS.

Monitoring in FY 2002 was consistent with the FY 2002 monitoring plan. The following conclusions are made for FY 2002:

- VOCs continue to be present in the Unit 1 aquifer beneath the western portion of Building 502.

- The additional investigation work identified the sources of VOCs in the Unit 1 aquifer beneath Building 502 and allowed for an evaluation of dual phase vacuum extraction technology to be completed. The evaluation determined that extraction technologies are not feasible beneath the building.

Is additional monitoring proposed prior to the next report?

Yes. Appendix A presents the FY 2002 – FY 2006 Monitoring Plan. Table 7-2 presents the monitoring requirements for Site I. Unit 3 and Unit 4 groundwater monitoring at Site I is addressed as part of the deep groundwater portion of the monitoring plan. The monitoring plan for Site I will be subject to review based on the anticipated OU2 ROD amendment.

TABLE 7-1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2002
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	111TCE	112TCE	11DCE	11DCLE	C12DCE	C2H3CL	CCL4	CH2CL2	CHCL3	T12DCE	TCLEE	TCLTFE	TRCLE	12DCLE
01U064	6/4/02	0.14JP	<1	0.20JP	0.73JP	35	2.3	<1	0.15 1UL	<1	2.4	<1	<1	1.4	<1
01U064 dup	6/4/02	0.14JP	<1	0.19JP	0.69JP	33	2.2	<1	<1	<1	2.2	<1	<1	1.3	<1
01U636	6/4/02	<1	<1	<1	<1	<1	<1	<1	0.097 1UL	<1	<1	<1	<1	<1	<1
01U639	6/4/02	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U640	6/4/02	0.16JP	<1	<1	<1	<1	<1	<1	0.14 1UL	<1	<1	<1	<1	0.26JP	<1
I01MW	6/4/02	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I02MW	6/4/02	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I05MW	6/4/02	<1	<1	<1	<1	1.3	<1	<1	0.18 1UL	<1	<1	<1	<1	3.1	<1

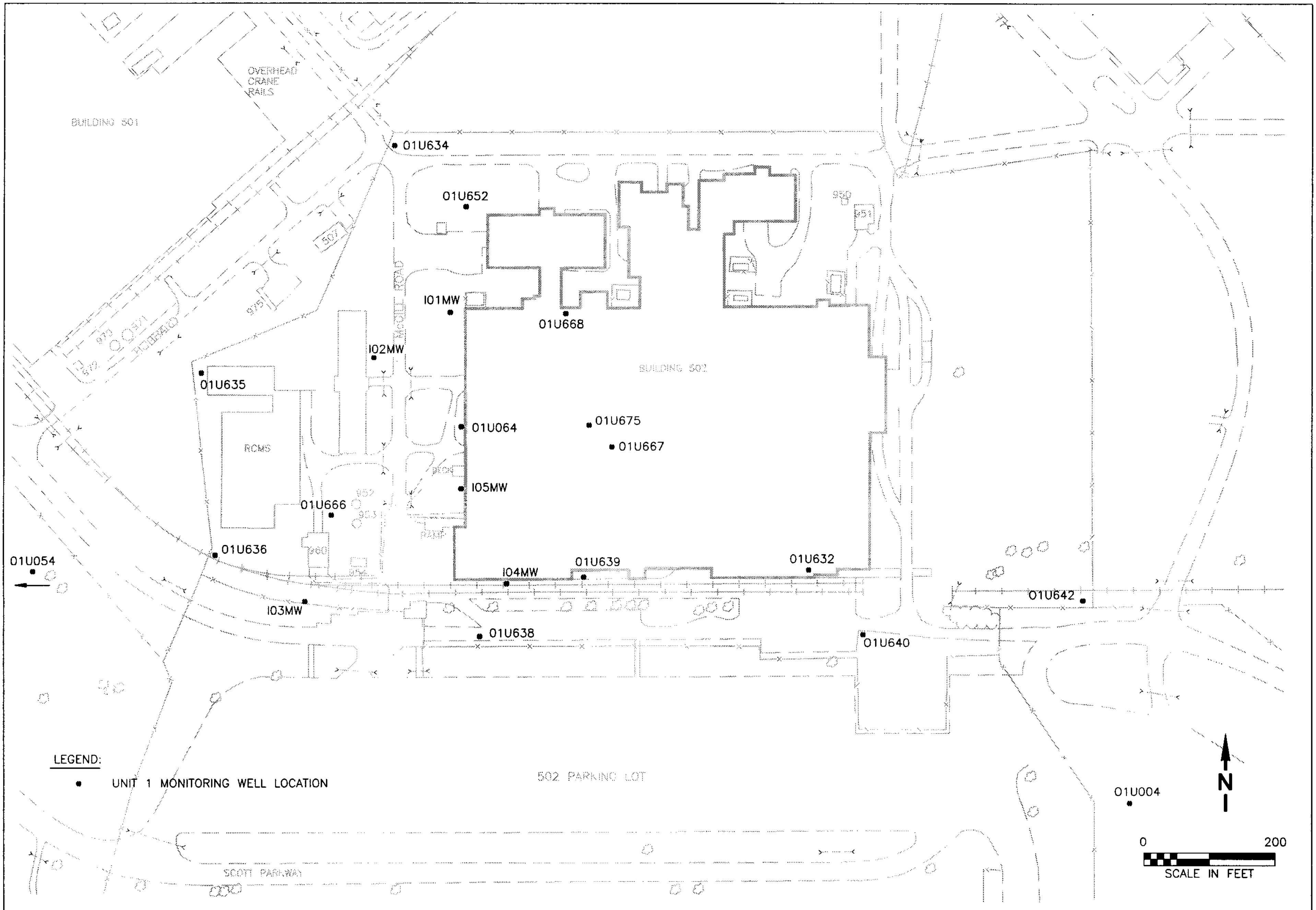
Notes:
Concentrations in ug/L.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.
1UL - Nondetect, trip blank yielded detections of compound.

TABLE 7-2

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

	Remedy Component		Monitoring Requirements	Responsible Party	Document Containing the Monitoring Plan
#1	Groundwater Monitoring	a.	Groundwater quality and water levels to track remedy progress.	Alliant	Site I Monitoring Plan in Annual Performance Report
#2	Groundwater Extraction (1)	a.	Extracted water volumes and rates.	Alliant	Not applicable (1)
#3	POTW Discharge (1)	a.	Water quality data for system effluent to demonstrate compliance with discharge requirement.	Alliant	Not applicable (1)
#4	Additional Investigation	a.	As per work plan (completed).	Alliant	Not applicable
	Overall Remedy	a.	Water quality data to evaluate attainment.	Alliant	Site I Monitoring Plan in Annual Performance Report

Note:
(1) Currently there is no pumping required based on results of additional investigation and pilot test results.



SECOR

INTERNATIONAL INCORPORATED

4463 WHITE BEAR PARKWAY, SUITE 106

WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITY ARMY AMMUNITION PLANT

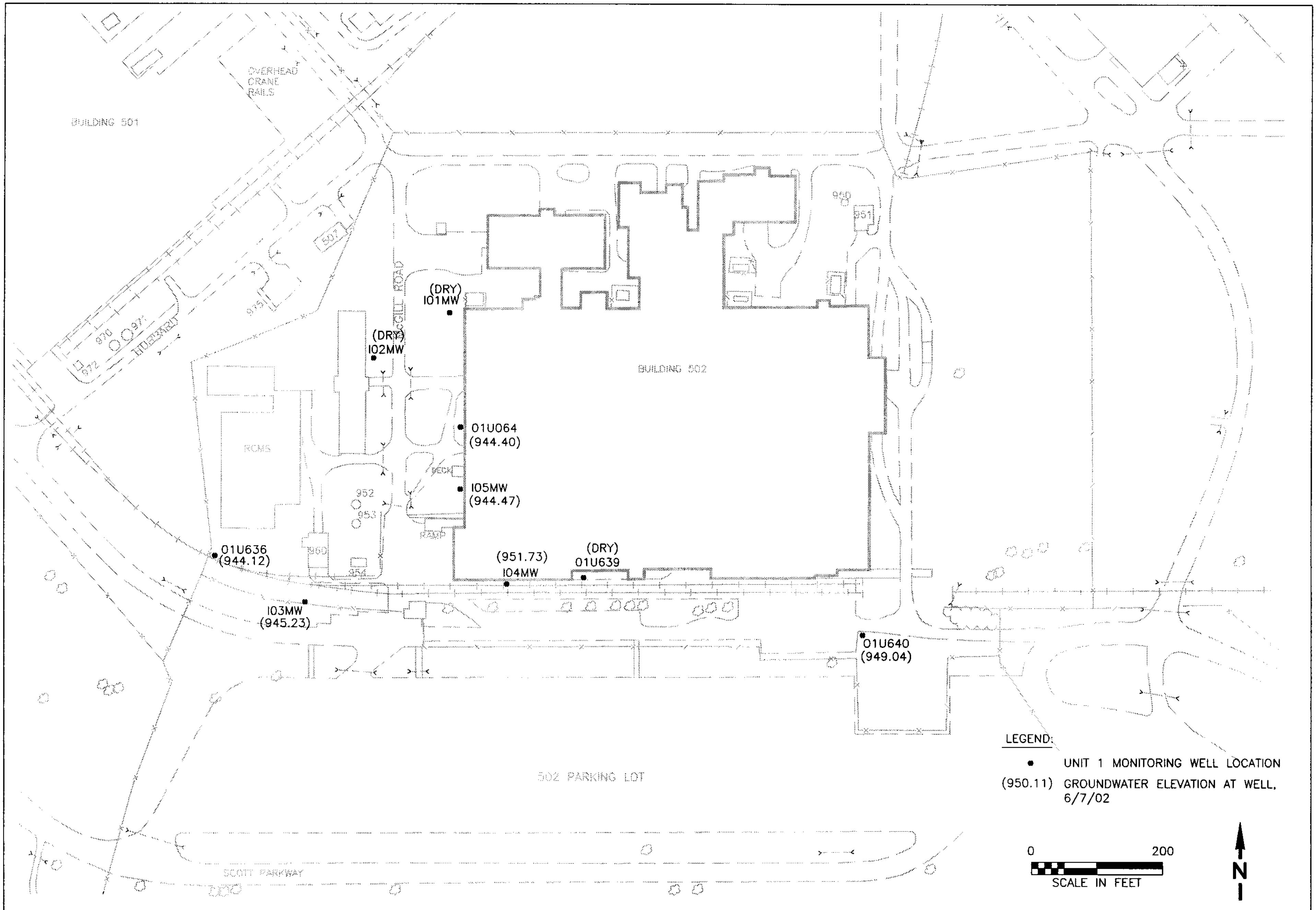
ARDEN HILLS, MINNESOTA

SITE I, UNIT 1

GROUNDWATER QUALITY MONITORING LOCATIONS

SECOR PROJECT #: 003.18508.362 | FILENAME: 18508-W1 | DATE: 06/17/03

FIGURE 7-1



SECOR

INTERNATIONAL INCORPORATED

4463 WHITE BEAR PARKWAY, SUITE 106

WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITY ARMY AMMUNITION PLANT

ARDEN HILLS, MINNESOTA

SITE I, UNIT 1

GROUNDWATER ELEVATIONS, 6/4/02

SECOR PROJECT #: 003.18508.362 | FILENAME: SITE-02-3 | DATE: 01/10/03

FIGURE 7-2

8.0 Operable Unit 2: Site K Shallow Groundwater

VOC contamination was identified in the Unit 1 (perched aquifer) at Building 103. The limits of the VOC plume in the perched groundwater have been defined to be beneath and immediately northwest of Building 103.

The remedy selected in the OU2 ROD consists of seven components that incorporate the existing groundwater extraction trench and air stripper, which began operation in August 1986. The remedy also includes additional investigation of the unsaturated soils beneath the building slab.

8.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan is established and monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2002 monitoring plan and any deviations are explained in Appendix C.2.

Water levels are collected annually from the monitoring wells and bundle piezometers in the vicinity of the groundwater collection and treatment system. FY 2002 monitoring was performed in accordance with the Monitoring Plan included as Appendix A. The comprehensive monitoring well sampling round was conducted in June 2002. Figures 8-1 and 8-2 present the sampling and water level monitoring locations. Figure 8-1 also shows the cross-section alignment.

8.2 REMEDY COMPONENT #2: SENTINEL WELLS

Description: "Installation of sentinel wells at the bottom of Unit 1 and top of Unit 3." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the wells have been installed according to a regulator approved work plan.

Is the remedy component being implemented?

Yes. The OU2 ROD was signed in December 1997 (FY 1998). The Predesign Investigation Work Plan for Site K was approved in February 1999. The upper Unit 3 sentinel well was installed in February 2000.

Existing piezometers were used to accomplish the deep Unit 1 sentry monitoring. Piezometers 01U625D, 01U626D, 01U627D and 01U628D were used since they monitor the base of the Unit 1 aquifer near the trench. The issue is the potential for DNAPLs to migrate beneath the trench along the Unit1/Unit2 interface. These four piezometers are screened at that interface.

Figure 8-2 shows the location of the upper Unit 3 sentinel well (03U621) and the piezometers. The sentinel well was installed to monitor the potential for VOCs to migrate through the Unit 2 till and into the Unit 3 aquifer.

What are the results of the Unit 1 piezometer and Unit 3 Sentinel well sampling?

The piezometers (Unit 1 sentinel wells) were sampled in March 2000 and the results were discussed in the FY 2000 APR. The results did not indicated the presence of DNAPLs at the Unit 2/Unit 3 interface. This was a one-time sampling event, as required by the MPCA/USEPA approved Predesign Investigation Work Plan, Site K, TCAAP, CRA, February 1999, and as documented in the Predesign Investigation Report, Site K, TCAAP, CRA, December 2001, for which concurrence was received.

The Unit 3 sentinel well (03U621) was sampled in March, July and September 2000, of FY 2000, and in January 2001 for the quarterly sampling required by the Work Plan. After that the well was incorporated into the regular TCAAP monitoring plan. In FY 2002 it was sampled in June 2002. The results of the sample collected during FY 2002 are presented in Table 8-1. VOCs were not detected in the Unit 3 sentinel well

8.3 REMEDY COMPONENT #3: HYDRAULIC CONTAINMENT

Description: "Use of existing interceptor/recovery trench to contain the plume and remove impacted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the trench is operating as designed and capturing all groundwater exceeding the clean up levels presented in Table 1 of the OU2 ROD, as described below.

Is the remedy component being implemented?
Yes. The groundwater collection system continues to provide capture (as described later) of the Unit 1 groundwater, upgradient of the trench and beneath Building 103, as designed.

Is the system providing hydraulic capture of the plume?
Yes. Water level data are presented in Table 8-2. Figure 8-3 presents a plan view of the groundwater contours from the June round of groundwater level measurement. At nested wells, the numerically lowest water elevation was used to create the plan view contours. Monitoring wells downgradient of the extraction trench show consistently higher water levels than those near and upgradient of the trench. This demonstrates that the horizontal hydraulic gradient has been reversed toward the extraction trench due to system operation.

Vertical capture was also effective as illustrated on Figure 8-4. As seen in the figure, groundwater both upgradient and downgradient of the trench is captured and collected. The upward gradient beneath the trench indicates that groundwater does not migrate below the trench. The monitoring coverage provided by the bundle piezometer demonstrates complete vertical and horizontal hydraulic capture.

Figure 8-5 presents the trichloroethene concentrations from the June 2002 annual sampling event. Trichloroethene concentrations range from non-detect to 13,000μg/l. The concentrations at wells 01U615 and 01U611, which monitor the core of the plume, were higher than in FY2001. Water levels were approximately 0.5 feet lower in FY2002, which may account for the higher concentrations at these wells. These wells have historically exhibit fluctuating concentrations.

Comparison of Figure 8-5 to the groundwater contour maps indicates that the VOC plume is hydraulically contained by the treatment system. Table 8-1 presents the monitoring well sampling data. The plume was originally defined based on data from all of the monitoring wells. The current monitoring well network is used to confirm the plume contours and measure the progress of remediation. Thus, the contours on Figure 8-5 were drawn with consideration of the extensive historical data.

Three wells (01U128, 01U617 and 01U621) exhibit low concentrations of 1,2-dichloroethene downgradient of the groundwater collection system's capture zone. Two of these wells (01U128 and 01U617) have exhibited reasonably consistent concentrations of 1,2-dichloroethene since 1987, indicating that it migrated prior to the establishment of the capture zone. The third well, 01U621, has exhibited 1,2-dichloroethene since September 1993. The concentrations at these wells were consistent with those measured in FY 2001 and previous years.

8.4 REMEDY COMPONENT #4: GROUNDWATER TREATMENT

Description: "Treatment of contaminated groundwater using air stripping."
(OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the air stripping facility is treating water to the clean up standards.

Is the remedy component being implemented?

Yes. See discussion below.

Were there any major operational changes during the year?

No. The original air stripping tower and controls were replaced with a new fluidized bed type air stripper system on June 21, 1999. During FY 2002, the treatment system functioned properly. The new air stripper is less prone to fouling and requires less maintenance. The treatment system was operational 95% of the time in FY 2002. During FY 2002, a regular maintenance schedule was maintained. Appendix F.1 summarizes operational data and events at the groundwater extraction and treatment system.

8.5 REMEDY COMPONENT #5: TREATED WATER DISCHARGE

Description: "Discharge of treated groundwater to Rice Creek." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the system is operating as designed with treated water discharge to the storm sewer that, in turn, discharges to Rice Creek. The water is required to meet the substantive requirements of Document No. MNU000579 (MPCA), which contains the state accepted discharge limits for surface water. Sampling and analysis are performed to monitor performance (see below).

Is the remedy component being implemented?

Yes. See discussion in Section 8.6.

8.6 REMEDY COMPONENT #6: DISCHARGE MONITORING

Description: "Monitoring to track compliance with discharge requirements." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan is established and is being implemented in accordance with the plan.

Is the remedy component being implemented?
Yes. Treatment system monitoring consisted of quarterly influent and effluent sampling. Influent and effluent analytical results are presented in Table 8-3 and Table 8-4. The discharge met all the treatment requirements. There was an anomalous detection of copper and zinc above the criteria in the March 2002 effluent sample. The effluent was resampled in April and the results were within the criteria.

Table 8-5 presents the VOC mass removal and monthly flow rates. A total of 6,251,440 gallons of water and 11.4 pounds of VOCs were removed from the aquifer in FY 2002. The cumulative mass removal is 130.5 pounds of VOCs.

8.7 REMEDY COMPONENT #7: ADDITIONAL INVESTIGATION

Description: "Additional characterization of the unsaturated Unit 1 soil." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the additional investigation has been completed according to a regulator approved work plan.

Is the remedy component being implemented?

Yes. The Work Plan was approved in FY 1999. Work began in February 2000. A report of the investigation results was submitted in November 2001 and received a consistency determination from the Agencies on December 6, 2001. The report defined the extent of VOC contaminated soils beneath Building 103 and refined the location of the source area. The report and subsequent follow up sampling resolved anomalous dissolved zinc, lead and nickel data at two monitoring wells. Zinc, lead and nickel are no longer groundwater concerns.

8.8 OVERALL REMEDY FOR SITE K

Overall, the remedy for Site K continued to operate consistent with past years and in compliance with the required performance criteria.

Is additional monitoring proposed prior to the next report?

Yes. Appendix A presents the FY 2002 – 2005 Monitoring Plan. Table 8-6 presents the Site K monitoring requirements. The monitoring plan is subject to review based on the results of the additional investigation and final design of the remedial action.

8.9 OTHER ACTIVITY

Alliant conducted pilot scale tests of two new technologies at Site K. These are Hydrogen Release Compound™ (HRC), and direct hydrogen injection with gas-permeable membranes. Both technologies are intended to enhance natural anaerobic degradation of chlorinated VOCs. These tests were completed in late FY 2000 and a report of the results was issued in FY 2001. The report determined that HRC was not effective under the specific conditions beneath the building slab at Site K. The direct hydrogen injection test yielded promising results but more research is needed for full-scale operation.

In FY 2002, no research field work was conducted; however, Alliant continued helping the University of Minnesota to continue its research into direct hydrogen injection by making the test plot available for its use. The University is continuing its research under a grant from the Department of Defense, Office of Naval Research. No research findings were published by the University in FY 2002.

In June 2002 a Remedial Action Report for Site K, TCAAP was issued to the EPA and MPCA. The purpose of the report was to document the remedial action implementation as required by the FFA. The report discussed implementation of the components required by the TCAAP OU2 ROD. A consistency letter for this report is anticipated to be received in FY 2003.

TABLE 8-1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*	*12DCLE*
01U128	6/4/02	<1	<1	<1	<1	4.4	<1	<1	0.17 1UL	<1	0.54JP	<1	<1	<1	<1
OW103 **(01U603)**	6/4/02	<1	<1	<1	<1	<1	<1	<1	0.23 1UL	<1	<1	<1	<1	<1	<1
(01U604)	6/4/02	<1	<1	<1	<1	<1	<1	<1	0.17 1UL	<1	<1	<1	<1	<1	<1
(01U604)D	6/4/02	<1	<1	<1	<1	<1	<1	<1	0.22 1UL	<1	<1	<1	<1	0.11JP	<1
OW111[1] **(01U611)**	6/4/02	<100	<100	<100	<100	860	<100	<100	7.9 1UL	<100	130	<100	<100	13,000	<100
OW115 **(01U615)**	6/4/02	<1	<1	1.3	<1	900	4.7	<1	0.12 1UL	<1	280	<1	<1	2,700	0.47JP
OW117 **(01U617)**	6/3/02	<1	<1	<1	<1	2	<1	<1	0.24 1UL	<1	0.31JP	<1	<1	0.2JP	<1
OW118 **(01U618)**	6/3/02	<1	<1	<1	0.13JP	0.51JP	<1	<1	0.21 1UL	<1	<1	<1	2.1	1.2	<1
OW119 **(01U619)**	6/4/02	<1	<1	<1	0.12JP	<1	<1	<1	0.12 1UL	<1	<1	<1	2.1	0.62JP	<1
OW121 **(01U621)**	6/3/02	<1	<1	<1	<1	5.9	<1	<1	0.22 1UL	<1	0.21JP	<1	<1	0.13JP	<1
03U621	6/6/02	<1	<1	<1	<1	<1	<1	<1	0.29 1UL	<1	<1	<1	<1	<1	<1
K04MW	6/3/02	<1	<1	<1	0.93JP	<1	<1	<1	0.22 1UL	<1	<1	<1	<1	1.2	<1

Notes:

Concentrations in ug/L.

D - Duplicate analysis.

J - Value is estimated.

P - Results less than reporting level but greater than instrumental detection limit.

[1] Sample dilution = 100.

1UL - Nondetect, trip blank yielded detections of compound.

TABLE 8-2

GROUNDWATER ELEVATIONS (FT. AMSL)
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Well ID	TOC Elevation	6/6/2002
01U047	880.31	875.15
01U048	885.32	875.10
01U052	886.51	875.62
01U065	883.90	873.61
01U128	883.69	875.44
01U601	892.68	884.49
01U602	889.35	883.53
01U603	887.31	878.26
01U604	888.98	877.32
01U605	887.76	878.31
01U607	891.01	884.91
01U608	889.30	883.83
01U609	889.33	883.67
01U611	889.29	884.00
01U612	886.91	877.55
01U613	892.07	883.91
01U615	888.66	876.90
01U616	890.37	879.46
01U617	887.72	877.60
01U618	891.52	879.93
01U619	891.75	883.65
01U620	888.65	878.87
01U621	886.57	878.54
01U622	889.43	NR
01U623	889.44	NR
01U624A	889.88	878.44
01U624B	889.88	878.42
01U624C	889.91	878.43
01U624D	889.89	878.43
01U625A	886.92	877.60
01U625B	886.91	877.56
01U625C	886.91	877.56
01U625D	886.92	877.57
01U626A	886.87	877.47
01U626B	886.88	877.20
01U626C	886.88	877.26
01U626D	886.88	877.30
01U627A	886.46	878.26
01U627B	886.47	877.52
01U627C	886.47	877.07
01U627D	886.48	877.18
01U628A	887.82	878.30
01U628B	887.83	878.07
01U628C	887.82	877.75
01U628D	887.84	877.74
K01MW	891.24	885.98
K02MW	891.35	885.15
K04MW	887.66	880.82
03U621	887.01	851.26

Notes:
NR = Not Required

TABLE 8-3

TREATMENT SYSTEM CONCENTRATIONS (ORGANICS)
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*11DCLE*		*11DCE*		*12DCLE*		*C12DCE*		*T12DCE*		*TRCLE*		*C2H3CL*	
Effluent	12/4/01	ND		ND		ND		0.12	JP	ND		0.24	JP	ND	
Effluent	12/4/01	ND	D	ND	D	ND	D	0.11	JPD	ND	D	0.20	JPD	ND	D
Effluent	3/5/02	ND		ND		ND		0.22	JP	ND		0.52	JP	ND	
Effluent	3/5/02	ND	D	ND	D	ND	D	0.22	JPD	ND	D	0.51	JPD	ND	D
Effluent	6/3/02	ND		ND		ND		0.18	JP	ND		0.59	JP	ND	
Effluent	6/3/02	ND	D	ND	D	ND	D	0.20	JPD	ND	D	0.56	JPD	ND	D
Effluent	9/5/02	ND		ND		ND		ND		ND		ND		ND	
Effluent	9/5/02	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D
Influent	12/4/01	0.11	JP	ND		ND		29		5		110		0.73	JP
Influent	3/5/02	0.077	JP	ND		ND		35		6.4		150		0.83	JP
Influent	6/3/02	0.11	JP	ND		ND		40		5.6		220		0.44	JP
Influent	9/5/02	0.11	JP	ND		ND		62		14		180		2.0	
MDL	12/01	0.0325		0.0500		0.0736		0.0649		0.0421		0.0313		0.0688	
MDL	3/02, 6/02, 9/02	0.0693		0.1640		0.0736		0.0844		0.0719		0.0909		0.0930	
CRDL		1		1		1		1		1		1		1	
REQ.		--		7.0		3.8		70		100		10		0.18	

Notes:

Results are reported in µg/L unless otherwise noted.

D - Duplicate Analysis

J - Value Estimated

P - Results less than reporting level but greater than instrument detection limit.

ND - Not Detected

MDL - Method Detection Limit

CRDL - Contract Required Detection Limit

REQ - Substantive Requirement Document Concentration Limit, Maximum Daily.

TABLE 8-4

TREATMENT SYSTEM CONCENTRATIONS (INORGANICS)
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Phosphorus Total*	*Copper*	*Cyanide*	*Lead*	*Mercury*	*Silver*	*Zinc*
Effluent	12/04/01	398	ND U	ND U	ND U	ND U	ND U	27.6
Effluent	03/05/02	528	41	ND	9.72	ND U	ND U	194
Effluent[1]	04/29/02	NA	ND	NA	NA	NA	NA	26.6
Effluent	06/03/02	223	ND U	ND J	ND U	ND U	ND U	25.5
Effluent	09/05/02	186 J	ND U	ND	ND U	ND U	ND U	20.2
Influent	04/29/02	NA	ND	NA	NA	NA	NA	8.34
MDL	12/01	11.4	8.18	3.32	0.862	0.0840	0.101	8.21
MDL	3/02, 4/02,	11.6	8.42	3.32	2.92	0.0469	0.109	6.71
MDL	6/02, 9/02	11.6	8.42	8.16	2.92	0.0469	0.109	6.71
CRDL		20	20	10	3	0.100	1.0	20
REQ.		1000	21	17	106	0.2	3.4	134

Notes:
Results are reported in ug/L unless otherwise noted.
J - Estimated Value
NA - Sample not analyzed for this parameter.
REQ. - Substantive Requirement Document Concentration Limit, Maximum Daily.
U - Not detected at or above the MDL or IDL.
[1] An additional grab sample was collected on April 2, 2002, and analyzed for Cu & Zn to provide verification that the effluent was in compliance.

TABLE 8-5

SUMMARY OF MONTHLY VOC REMOVAL
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Month	Total Monthly Flow (million gallons)	Total VOC Influent Concentration	Total VOC Effluent Concentration	Total VOCs in Treatment Center Discharge (g)	Total VOC Mass Removed (g)	Total VOC Mass Removed (lb)
Cumulative as of September 2001						119.1
October[(1)]	0.53005	144.0	0	0.00	288.52	0.64
November[(1)]	0.44499	144.0	0	0.00	242.22	0.53
December	0.51094	144.0	0	0.00	278.11	0.61
January[(1)]	0.45818	191.4	0	0.00	331.49	0.73
February[(1)]	0.38041	191.4	0	0.00	275.22	0.61
March	0.42591	191.4	0	0.00	308.14	0.68
April[(1)]	0.45662	265.6	0	0.00	458.43	1.01
May[(1)]	0.76315	265.6	0	0.00	766.18	1.69
June	0.62726	265.6	0	0.00	629.75	1.39
July[(1)]	0.63548	258.0	0	0.00	619.75	1.37
August[(1)]	0.50005	258.0	0	0.00	487.67	1.07
September	0.51840	258.0	0	0.00	505.56	1.11
Totals - FY02	6.25144			0.0	5191.0	11.4
Cumulative to Date						130.5

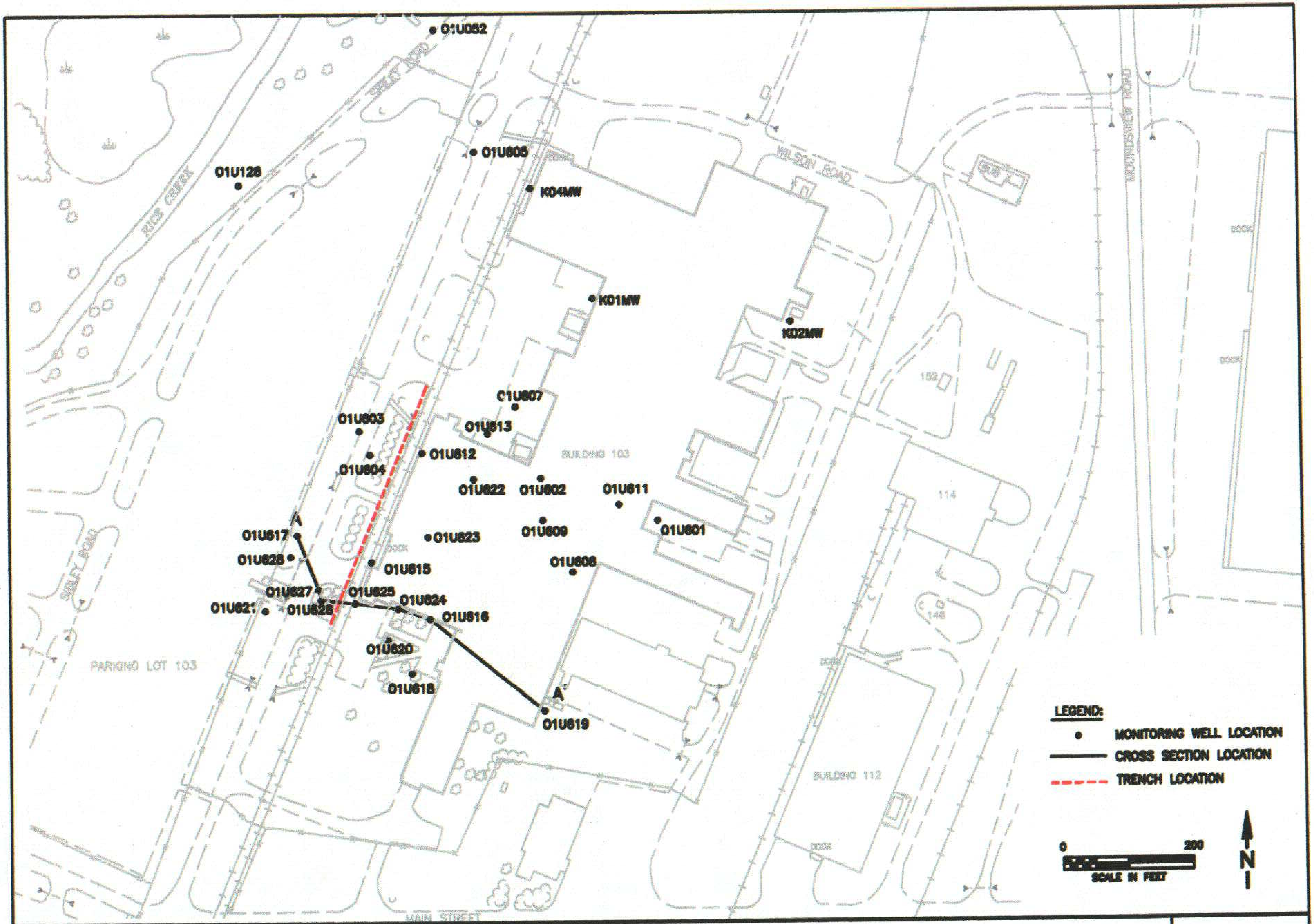
Notes:

[(1)] Influent and Effluent VOC concentrations from 12/4/01, 3/5/02, 6/7/02 and 9/5/02 quarterly samples, respectively.
Calculations based on compounds with concentrations above the CRDL only.

TABLE 8-6

SUMMARY OF MONITORING REQUIREMENTS
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

	Remedy Component	Monitoring Requirements	Responsible Party	Documents Containing the Monitoring Plan
#1	Groundwater Monitoring	Outlined below	Alliant	Site K Monitoring Plan in Annual Performance Report
#2	Sentinel Wells	a. Water quality to monitor potential migration.	Alliant	Site K Monitoring Plan in Annual Performance Report
#3	Hydraulic Containment	a. Water levels for use in drawing contour maps showing capture.	Alliant	Site K Monitoring Plan in Annual Performance Report
		b. Pumping volumes and rates for reporting and mass removal calculation.	Alliant	Site K Monitoring Plan in Annual Performance Report
#4	Groundwater Treatment	None	Alliant	Site K Monitoring Plan in Annual Performance Report
#5	Treated Water Discharge	None	Alliant	Site K Monitoring Plan in Annual Performance Report
#6	Discharge Monitoring	a. Treated effluent water quality for comparison to substantive requirements criteria for discharge maximum daily concentration.	Alliant	Site K Monitoring Plan in Annual Performance Report
#7	Additional Investigation	a. As per work plan (completed).	Alliant	Site K Monitoring Plan in Annual Performance Report



SECOR

INTERNATIONAL INCORPORATED

4463 WHITE BEAR PARKWAY, SUITE 106

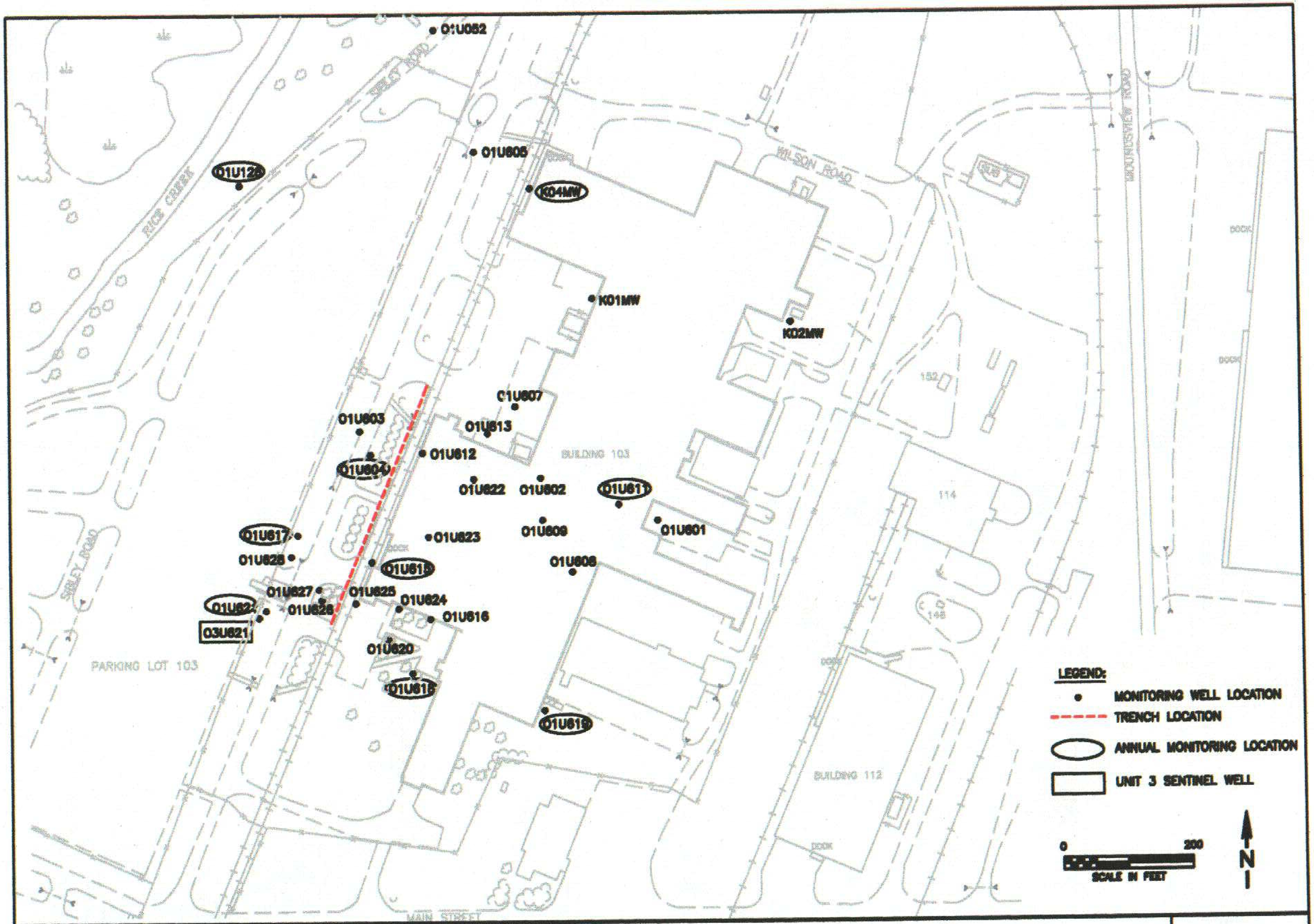
WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITY ARMY AMMUNITON PLANT
ARDEN HILLS, MINNESOTA

SITE K, UNIT 1
GROUNDWATER LEVEL MONITORING LOCATIONS

SECOR PROJECT #: 003.18508.482 | FILENAME: SITE-02-3 | DATE: 01/12/03

FIGURE
8-1



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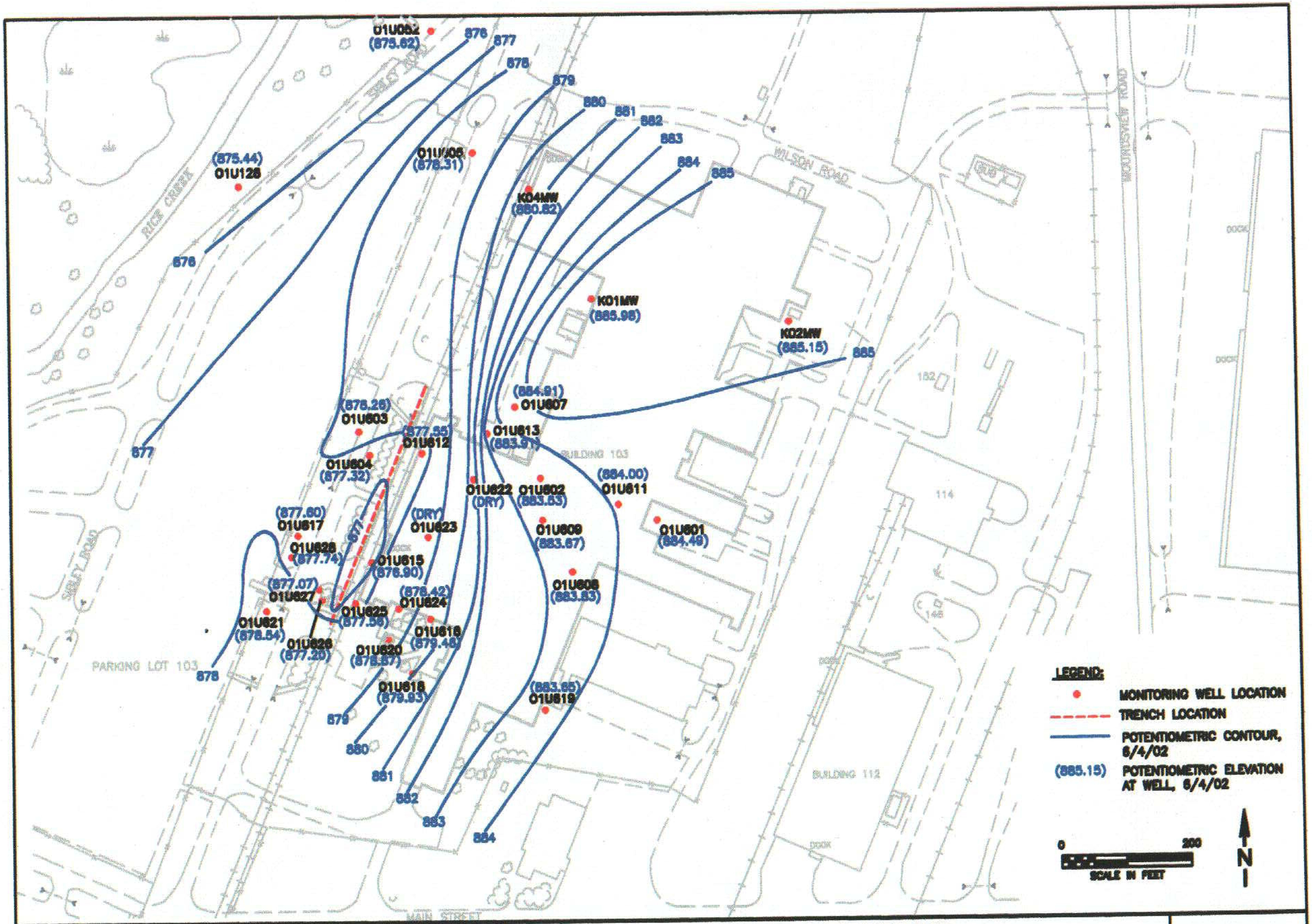
ARDEN HILLS, MINNESOTA

SITE K, UNIT 1 AND UNIT 3
GROUNDWATER QUALITY MONITORING LOCATIONS

SECOR PROJECT #: 003.18508.482 | FILENAME: SITE-02-3 | DATE: 01/12/03

FIGURE 8-2



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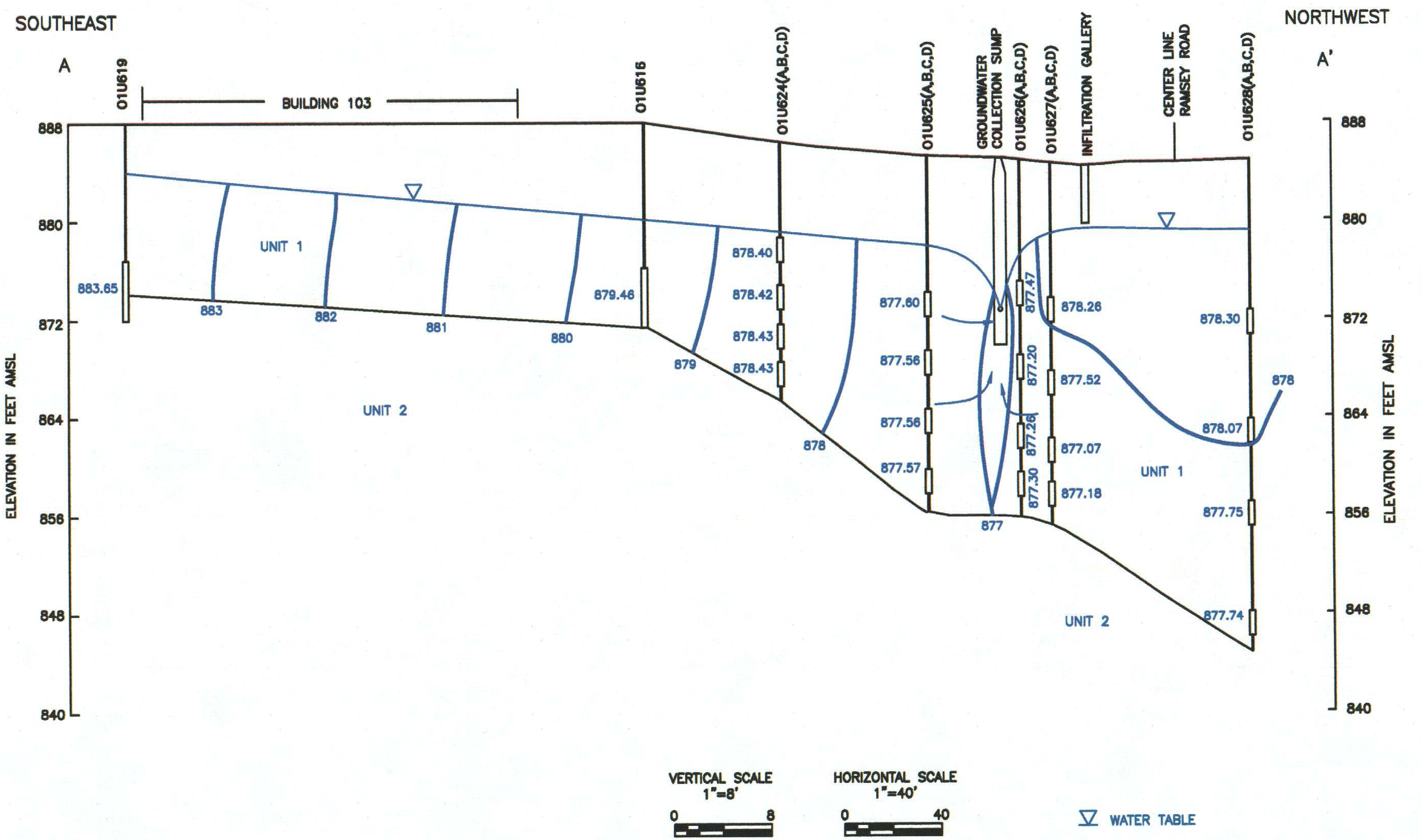
WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITY ARMY AMMUNITON PLANT
ARDEN HILLS, MINNESOTA

SITE K, UNIT 1
POTENTIOMETRIC MAP, 6/4/02 (Q75)

SECOR PROJECT #: 003.18508.462	FILENAME: SITE-10-GW	DATE: 01/12/03

FIGURE
8-3



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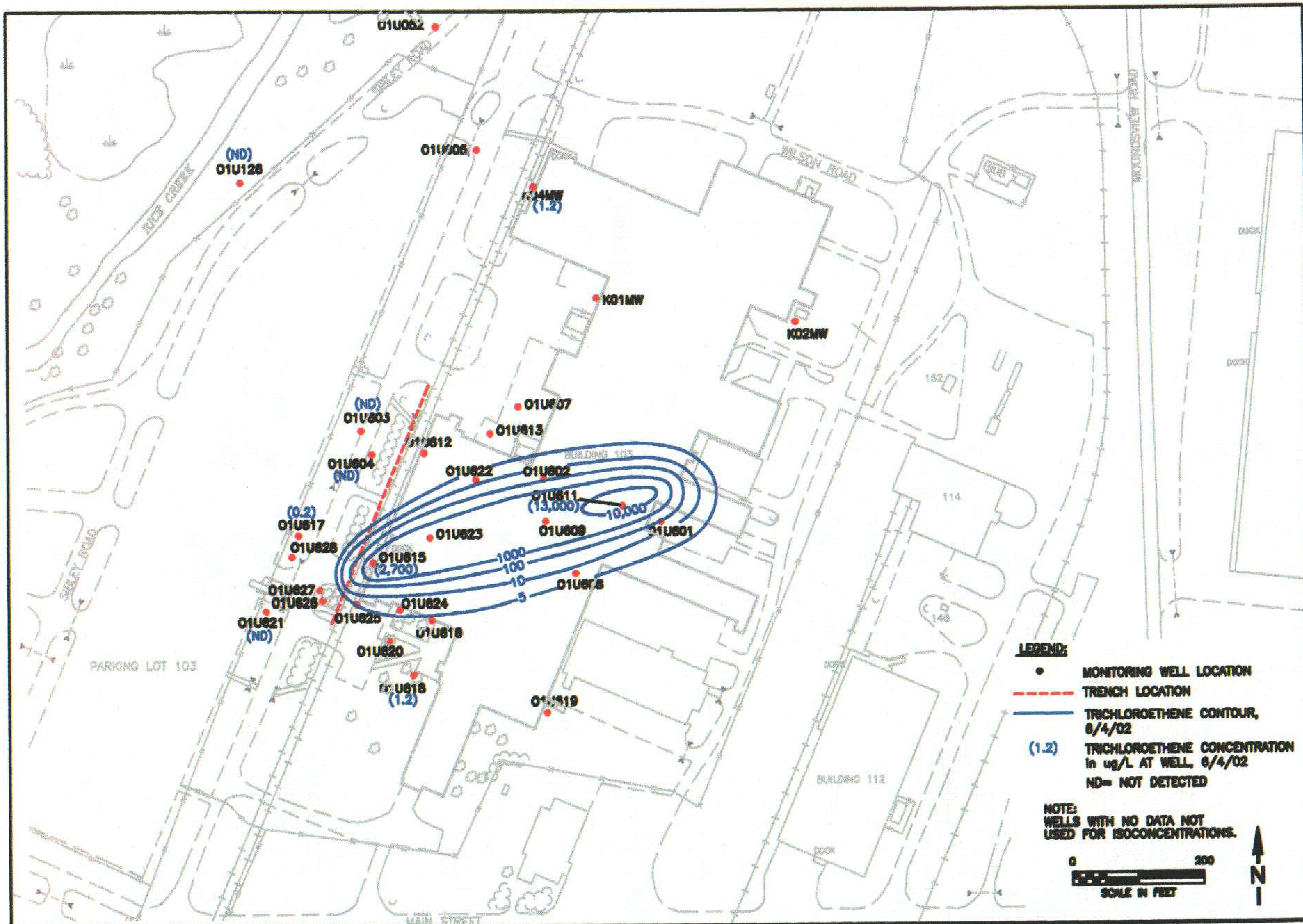
TWIN CITY ARMY AMMUNITON PLANT
ARDEN HILLS, MINNESOTA

SITE K
HYDROGEOLGIC CROSS SECTION A-A', 6/4/02 (Q75)

003.18508.462
CROSS-02-A
01/11/03

FIGURE
8-4



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TWIN CITY ARMY AMMUNITON PLANT
ARDEN HILLS, MINNESOTA
SITE K, UNIT 1
TRICHLOROETHENE CONCENTRATION MAP, 6/4/02 (Q75)

SECOR PROJECT #: 003.18508.462	FILENAME: SITE-10-TCE	DATE: 01/12/03

FIGURE 8-5

9.0 Operable Unit 2: Deep Groundwater

The selected remedy for the Deep Groundwater in the OU2 ROD consists of five remedial components that include continued use of the TGRS to hydraulically contain the source area and optimize the removal of contaminants. It also includes an annual review of new and emerging technologies potentially applicable to the Deep Groundwater. This report documents all performance and monitoring data collected from October 2001 through September 2002.

Historical Design and Evaluation of TGRS Remedial Action

In September 1987, a Record of Decision (1987 ROD) was prepared in order to implement an interim response action. The 1987 ROD provided specific criteria for the BGRS. Following extensive interagency negotiations on the FFA and the ROD, the BGRS was started on October 19, 1987.

The BGRS consisted of six Unit 3 extraction wells (B1 through B6), which were connected by forcemain to an air stripping treatment facility. The initial six BGRS extraction wells (B1 through B6) were installed and pumping tests were conducted prior to start up of the BGRS. These pumping tests were documented in the BGRS Extraction Well Pumping Test Report.

Following the initial 90-day operation of the BGRS, the IRA–BGRS Performance Assessment Report (PAR) was prepared. The PAR assessed the hydraulic and treatment performance of the BGRS. The PAR presented an extensive database collected during the initial 90-day period of BGRS operation and prior pertinent data. The PAR also included a summary of the geology, hydrogeology and remediation history for TCAAP. The MPCA and EPA subsequently approved the PAR.

A pumping test on well B9 was conducted in August 1988 and formed the basis of the final design of the TGRS. This and the previous pumping tests were utilized to determine the pumping rate required to achieve the necessary zone of capture for the TGRS, based on the plume size at that time. The PAR stated that the overall pumping rate needed for the 17 extraction wells was 2,450 gpm. During the detailed design of the TGRS, the system was designed with the capacity to operate at a maximum theoretical rate of 2,900 gpm. The additional pumpage was included to provide a safety margin for the calculations and to allow for fluctuations in system operation.

The PAR made recommendations for expansion of the BGRS into the TGRS in order to meet the Phase II remediation criteria established in the 1987 ROD. These modifications were completed and the expanded system began operation on January 31, 1989.

The 1989 Annual Monitoring Report was the first report covering the fully configured TGRS. It concluded that the TGRS develops a continuous zone of capture that was approximately 4,500 feet wide at the TCAAP boundary. The zone of capture widened to approximately 8,300 feet upgradient of the boundary. This zone of capture was demonstrated at average system pumping rates of 2,400 to 2,700 gpm.

The 1989 Annual Monitoring Report was wider in scope than this or future annual monitoring reports for the TGRS. The 1989 report was both a performance assessment report and a monitoring report. The 1989 report represented the first year of operation of the expanded TGRS. Thus, a more detailed and exhaustive performance assessment was appropriate and possible, as there were data available from non-pumping conditions for detailed comparison with pumping conditions. Hence, a minimum TGRS extraction rate of 2,400 gpm was established to assure capture of the 5-µg/l trichloroethene contour. Since 1990, the system has continued to operate at an essentially steady state condition, so, no new comparisons to ambient conditions are necessary or possible.

TGRS Modifications

Since 1990 a number of modifications have been made to the TGRS operation in response to changes in plume configuration or operational issues. A brief summary of the major changes is presented below:

1. Source control well SC4 was shut down in November 1996 in response to insignificant VOC mass removal by this well. SC4 operated at an average extraction rate of 29 gpm in 1989 and 45 gpm prior to shut down.
2. Boundary extraction well B12 was shut down in November 1996. Well B12 is the northern most extraction well and is screened across the Unit 4. The plume in the B12 area had dropped below cleanup standards for several years. Well B12 operated at an average extraction rate of 139 gpm in 1989 and 190 gpm prior to shut down.
3. Flowrates at individual wells have been modified from time to time due to plume configuration changes and operational issues.

Discussions were held with the MPCA and USEPA throughout FY2002, related to reconfiguring the TGRS. These discussions lead to the following:

1. Verbal approval to shutdown Wells B7, B10, and SC3 in FY2003 while increasing the pumping rate at well B9 to approximately 300 gpm.
2. Verbal approvals to shutdown Well B2 and replace it with new extraction Well B13 in FY2003.
3. Development of draft Global and Micro operating strategies for the TGRS. It was agreed that a total system (Global) extraction rate of 1,800 gpm would adequately meet the requirement for hydraulic containment of the source due to the 50 percent factor of safety included in the containment calculations. Specific extraction rates (micro) for well groupings were also developed.

Completion of the TGRS Operating Strategyis expected in FY 2003.

9.1 REMEDY COMPONENT #1: HYDRAULIC CONTAINMENT AND CONTAMINANT REMOVAL FROM THE SOURCE AREA

Description: "Groundwater extraction to hydraulically contain the contaminated source area to the 5-µg/l trichloroethene (TRCLE) concentration contour and optimize the removal of contaminants from the source area through pumping of select wells." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the TGRS is containing the contaminated source area to the 5-µg/l trichloroethene contour and removal of contaminants from the deep groundwater source area is optimized using the existing extraction system in addition to any new wells installed to improve the effectiveness of the system.

Is the remedy component being implemented?
Yes. The TGRS was operated in FY 2002 consistent with the requirements of the OU2 ROD. Table 9-1 presents the cleanup requirements for the TGRS from the OU2 ROD. The TGRS Operating Strategy is nearly complete with the assistance of the Agencies and RAB.

How is the system operated and what preventative maintenance measures were conducted during the year?

Summary of Operations

During FY 2002, groundwater was extracted from 11 wells along the southwest boundary of TCAAP (B1 through B11) and four wells down gradient of interior source areas on TCAAP (SC1 through SC3 and SC5). Submersible pumps in the extraction wells discharge into a common pressurized forcemain that carries the water to the treatment system. The treatment system is located adjacent to Building 116. The TGRS layout is presented on Figure 9-1.

The TGRS is designed and constructed with three options for treated water discharge: recharge at the Arsenal Sand and Gravel Pit, discharge to Rice Creek, and discharge to the TCAAP elevated water tank. Water stored in the elevated tank is "softened" and then "polished" with granular activated carbon (GAC) prior to distribution at TCAAP. Currently, the Arsenal Sand and Gravel Pit option is utilized for the majority of treated water. The TCAAP, through its distribution system, uses approximately 55,000 gallons per workday, depending on the time of year.

System Operation Specifications

In general, the influent and effluent water flow rates at the treatment plant are designed to be equal, thereby providing continuous operation of all processes and equipment. The following is a summary of the system design parameters:

- The groundwater extraction system, including the treatment center and 17 TGRS extraction wells, was designed to provide a theoretical hydraulic capacity of 2,900 gpm and a sustained daily average capacity of 2,730 gpm (by agreement with the regulators, B12 and SC4 were shut down in November 1996).
- The influent to the treatment plant is divided between Towers 1 and 2, each receiving up to a maximum of 1,450 gpm.
- Wet Well Pumps 1 and 2 (WWP#1 and WWP#2 located in Wet Wells 1 and 2) transfer water to Towers 4 and 3, respectively. Each pump and tower handles up to a maximum of 1,450 gpm.
- Wet Well Pumps 3 and 4 (WWP#3 and WWP#4 located in Wet Well 3) discharge treated water to an end use at a combined rate of up to a maximum of 2,900 gpm.
- Air blowers provide air to the towers. The blowers for Towers 1 and 2 are designed to provide 6,000 – 7,000 standard cubic feet per minute (scfm) each. The blowers for Towers 3 and 4 are designed to provide 9,000 – 14,000 scfm each.

Water level sensors within the wet wells communicate with the programmed logic controller (PLC) according to changing water levels. A complete and balanced operation should provide continuing water levels above the low-level sensors and below the high-level sensors. However, given the probability of unbalanced flows for any number of reasons (e.g., changing hydraulic heads, maintenance, repairs, temporary malfunctions), the PLC has provisions within its program to cycle-off the extraction well(s) or wet well pumps according to high water levels occurring in the wet wells; and in turn, cycle-off the wet well pumps according to low levels occurring within these wet wells.

The system operates such that the wet well pumps cycle rather than the extraction well pumps. The rationale behind this is that there are a relatively small number of motors, starters and electrically controlled valves associated with the wet wells when compared with the extraction well field. This also provides for more continuous and complete hydraulic capture within the aquifer units. However, the extraction well field will cycle if necessary, starting with the least contaminated extraction well, followed by the other extraction wells in a predetermined sequence.

In summary, the priority of operation is as follows:

- Maintain constant operation of all extraction wells and air stripping towers;
- Maintain the desired flow rates at individual wells;
- Maintain treatment center WWP#1 and WWP#2 pumping rate equal to or slightly above the combined pumping rate of the extraction well field;
- Maintain treatment center WWP#3 and WWP#4 pumping rate equal to or slightly above WWP#1 and #2; and
- Provide water to the TCAAP water supply system.

FY 2002 Maintenance and Inspection Activity

TGRS Operating Strategy: The development of a TGRS operating strategy began in FY 2002 as part of the reconfiguration process and will be completed in FY 2003. The TGRS operating strategy will have more stringent criteria for inspecting and assessing the treatment system for potential failures so that repairs can be implemented in a more timely manner. During FY 2002, the following inspection and maintenance activities occurred.

Preventive Maintenance (PM): The extensive PM program allowed the operations staff to identify and repair or replace equipment to avoid a downtime failure. When required, further repair work was scheduled rather than waiting for the failure to occur. A broad range of system-specific information was collected during this year's PM. This information is used to direct future repair work.

Electrical Inspection and Temperature Survey: A system-wide electrical inspection and infrared temperature survey was performed to identify loose connections and overheating components. Component overheating often precedes equipment failure. Electrical components that were identified as failing were replaced.

Verification of Flow Meters: As part of the annual PM, flow meters in the pumphouses were interchanged and the flow meters in the treatment center were interchanged. Flow volume measurements before and after conducting maintenance on the meters were compared to verify the consistency of measurements. Pumphouse flow meters were also compared to a factory-calibrated flow meter.

Daily Tracking of Flow Rates: Pumphouse and treatment center meter readings were recorded in the course of the daily inspections. Daily meter readings were entered into the computer and the flow rates were calculated and reviewed by the operations staff. Early detection of changes in flow rate was critical in early identification of failing equipment. By early detection of flow rate changes, equipment repair was typically scheduled before a failure occurred.

Pumphouse Flow Tests and Motor Amperage Readings: Pumphouse lift systems were tested to determine the flow capacity and motor amperage draw. The test data were compared to the original flow capacity and amperage draw. Decreases in flow capacity or changes in current draw alerted the system operations staff to inspect suspect equipment and schedule repairs before a down-time failure occurred.

Air Stripping Towers: Effluent concentrations from the treatment center gradually increased throughout FY2001 (maximum TRCLE concentration of 1.9μg/L); although they remained below the discharge limits. The cause of the increasing effluent concentrations was decreased air flow through the air stripping towers caused by plugging of the towers by iron and calcium precipitates that had accumulated over the 13 years of TGRS operation. During FY2002 a tower-cleaning program was completed. Towers 1 and 2 were cleaned in November/December 2001 and Towers 3 and 4 were cleaned in June/July 2002 (the packing inside Tower 4 was replaced). As a result, the airflow in Towers 1 and 2 increased from approximately 1,400 scfm to over 7,000 scfm and the airflow in Tower 4 increased from approximately 3,500 scfm to over 18,500 scfm. As expected, the increase in airflow rate has resulted in decreasing effluent concentrations to below detection limits (0.091 μg/L for TRCLE).

All the air stripping towers were also repainted in August 2002.

In order to clean and paint the towers, TGRS extraction wells with low TRCLE concentrations (primarily Wells B2, B3, B7, B8, B9, B10, B11, SC2, and SC3) were shut off. This reduced the total flow through the system to between 1,000 and 1,200 gpm for approximately 88 days.

Did the system operate at a rate sufficient for complete capture?

Probably, although total extraction rates were lower than in previous years due to the shutdown of the wells with lower TRCLE concentrations during the Tower cleanings and painting. The TGRS successfully captured and treated 926,042,500 gallons of contaminated water from October 2001 through September 2002. The system pumped at an average rate of 1,762 gpm, of which, the boundary wells contributed 1562 gpm and the source control wells contributed

200 gpm. The above pumphouse volumes are corrected to reflect the total from treatment center meters #1 and #2, which are the most accurate for overall flow measurement. The TGRS as a whole was operational 83 percent of the time. When the flow rate is corrected for down time, the average operational flow rate was 2,100 gpm. This compares to a pumping goal of 2231 gpm (based on the 1989 pumping rates for the wells pumping in FY2002).

The monthly and annual volume of water pumped is presented in Tables 9-2 and 9-3. Table 9-2 presents the pumphouse metered monthly flow volumes of each extraction well and historical flow data. Table 9-3 presents the combined pumphouse-metered flow volume (extraction wells) and the flow volumes metered at various stages in the treatment center along with historical data.

Review of Table 9-2 shows that even though the total system extraction rate was at a historical low, wells containing the higher TRCLE concentrations (such as B4 and SC5) operated at or near historical highs. Wells with lower TRCLE concentrations (such as B7 and B3) operated at historical low flow rates. The main reason for this is that wells with lower TRCLE concentrations (wells B3, B7, B8, B10, SC2, and SC3) were turned off during the tower cleanings and repairs. This is reflected in Table 9-4. The lower flow in the extraction system forcemain resulted in a lower pressure in the forcemain so the wells that remained in operation during tower maintenance could pump at a slightly higher flow rate.

As part of the TGRS reconfiguration process, the Army and the Agencies have been working together to develop more specific measures to confirm hydraulic capture. Although there is some disagreement on what is the absolute minimum extraction rate to achieve hydraulic capture (between 1,600 gpm and 1,200 gpm), there is general agreement that a total system extraction rate of 1,800 gpm adequately meets the hydraulic containment requirement and a total system extraction rate below 1,800 gpm requires additional corrective action.

As part of the development of the TGRS Operating Strategy, the Army and regulators verbally agreed to shut down B7, B10, and SC3 in FY 2003 because they are no longer needed to hydraulically contain the 5-μg/l plume.

By considering only the remaining wells for FY2002, the associated base rate (estimated based on 1989 pumping rates) can be calculated for those wells. The following table also includes a comparison to actual pumping and downtime-adjusted pumping rates for FY2002.

	All Wells FY2002	Pumping Wells (excludes B7, B10, SC3)	TGRS OS Pumping Goal
Goals	2231 gpm*	1692 gpm*	1800 gpm**
Actual Pumping Rates	1762 gpm	1473 gpm	–
Downtime-Adjusted Pumping Rates	2100 gpm	1681 gpm	–

* Based on 1989 pumping rates
** Goal to be implemented for FY2003 pumping

Most of the down time is due to the approved shut down of low VOC concentration extraction wells to perform needed preventive maintenance on the air stripping towers as discussed under other questions in Section 9.1. Therefore, the wells with the lowest contaminant concentrations had the greatest decrease in pumping rates. Wells in the center of the plume with higher concentrations were actually pumped at a higher rate during these down times. In summary, the areas with the greatest chance of missed capture were the areas with low trichloroethene concentrations (near or below 5 μg/l).

<u>Monthly Flow Reports</u>

Each month a Monthly Flow Report is prepared. The report includes the month's meter totalizer readings, calculated flow volumes and operational notes. Flow volumes are presented on a daily basis and are totaled to provide a monthly flow volume. A compilation of FY2002 operational notes is presented in Appendix F-2. During FY2002, treatment center flow meters #1 and #2 were used to measure total flow volumes used in monthly reports, and in this report, because they are the most accurate and representative of actual flow.

How much down time occurred during the year?

The down time for each extraction well, over the last five years, is presented in Table 9-4. A summary of average down time for the pumphouses and the treatment center by the category of failure is presented in Table 9-5. A description of each down time event, organized chronologically, is presented in Appendix F-2. The same descriptions organized by affected pumphouse, treatment center, and forcemain is presented in Appendix F-3.

Treatment center and extraction well down times resulted from failure and subsequent repair of components in the pumphouses, treatment center, and electrical service and from some major maintenance tasks. The treatment center and extraction wells were shut down for repairs extensively in FY 2002 primarily because of the air stripping tower cleaning and painting program, which caused many wells to be shut down for long periods of time. However, the treatment system operates more efficiently and effectively since the towers were cleaned.

Description of Down Time Categories

Pumphouse component failures accounted for an average of 2.2 days down time per pumphouse. Compared to FY 2001, down times due to pumphouse maintenance increased in FY 2002. The major pumphouse repairs causing down time were:

- Pumphouse B1: redeveloped the well to increase flow rate and replaced pump.
- Pumphouse B3: malfunctioning and subsequent repair of some electrical and control components within the pumphouse.
- Pumphouse B6: replaced a gasket to repair a leaking pipe.

Wells B2 and B7 had minor decreases in average pumping rates for much of FY 2002. While under performance does not contribute to down time, the lower pumping rates did slightly contribute to the overall lower pumping rate for the system in FY 2002, discussed previously under the question "Did the system operate at a rate sufficient for complete capture?" Also, B7 failed on September 10, 2002, and was not repaired because it was scheduled for shut down in FY 2003.

Treatment center component failures and repairs that caused pumphouse down time consisted of electric check valve maintenance, wet well pump repairs and maintenance malfunctions and repairs, and electrical control equipment failures and subsequent repairs. Two events that created significant down time in FY2002 were painting the air stripping towers and flooding of the sumps during the winter due to some blown fuses. Treatment center component failures, repairs, and adjustments accounted for an average of 15.0 days of down time.

Electrical service system failures accounted for an average of 2.8 days down time per pumphouse. Down time was caused by storm damage and repairs and upgrades initiated by Xcel Energy.

Preventative maintenance procedures accounted for an average of 44.1 days of down time per pumphouse. The most significant preventative maintenance task was cleaning the air stripping tower packing, which accounted for most of the 44.1 down time days. This was the first time in 13 years of operation that the towers had been cleaned. The Army expects that the towers will not need another extensive cleaning, requiring prolonged down time, for another decade. Routine preventative maintenance procedures, performed on a monthly, quarterly, and annual schedule, are described in the project Operation and Maintenance Manual.

There was no down time due to system modifications. No system modifications were made in FY2002.

No system down time was attributed to the forcemain. No repairs of the forcemain were required.

Were there any major operational changes during the year? No. Wells B7, B10, and SC3 were scheduled to be shut down in early FY 2003 as part of the TGRS Operating Strategy. Well B7 failed on September 10, 2002, and was not repaired because of the scheduled shut down. Also, replacement of B2 by a new well B13 was planned for FY 2003. The TGRS operating strategy will be implemented in FY2003, which will result in more stringent criteria for assessing when repairs are required, with the intention of repairing the system before equipment failures, thereby reducing down time.

Did the system achieve hydraulic capture?

Probably. As discussed under the question "Did the system operate at a rate sufficient for complete capture?" the TGRS overall flow rate, adjusted to not include wells B7, B10, and SC3, was less than the adjusted 1989 baseline flow rate. However, extensive downtime, primarily caused by the much needed tower cleaning and painting, and under performance of well B2 caused the lower flow rate. When the TGRS was operating normally (excluding B2), the system produced a flow rate that suggests that hydraulic capture was likely achieved.

FY 2002 was an "off year" in the biennial monitoring program; therefore, comprehensive monitoring well sampling and water level measurements were not completed. Thus, water elevation contour and plume concentration contour figures were not prepared. Confidence in the groundwater contours was gained during the detailed analysis presented in the 1989 Annual Monitoring Report. The 1989 report included pumping test analysis, drawdown analysis, and vertical gradient analysis. The reader should consult the 1989 report for a complete analysis of hydraulic capture. The Operating Strategy, due to be completed in FY2003 will have an updated discussion on hydraulic capture.

Chemical data for the few monitoring wells that were sampled is in Table 9-6. Appendix D contains the entire chemical and water level database.

How much VOC mass was removed by the system and how is it changing with time?
As discussed above, the TGRS extracted and treated 926,042,500 gallons of water from October 2001 through September 2002. Based on the monthly influent and effluent VOC concentrations and the monthly flow totals measured with meters #1 and #2, the TGRS removed a total of 2852 pounds of VOCs from October 2001 through September 2002. The VOC mass removal is 16 percent lower than the FY 2001 VOC mass removal of 3,418 pounds. The VOC mass removal rate for the TGRS has been declining since FY 1991. This reflects the overall decrease in plume concentration. Table 9-7 summarizes the individual VOC mass contribution of each extraction well and the entire system. Overall, the TGRS has removed 182,936 pounds of VOCs from the aquifers since 1987.

The total mass removed is based on the monthly TGRS influent and effluent sampling and flow through the treatment system. The monthly sampling of the treatment system provides the best estimate of overall mass removal, compared to the individual extraction well sampling, due to the larger number of samples and consistency in the month-to-month analytical results. The percent contributions for each well are based on the average flows from each well and the semi-annual VOC results from each well.

To calculate the number of pounds of VOCs for each well, the flows and concentrations were normalized to the treatment center flows and concentrations to correct for variance between flow meters in the well houses and for consistency between VOC concentrations at the wells and monthly VOC concentrations in the influent and effluent.

VOC samples were collected semi-annually from the 17 extraction wells that comprise the TGRS. Wells B12 and SC4 are shut down, but were temporarily operated for sampling. Table 9-8 presents a summary of these sampling results. Variations in detection limits from round to round are the result of varying sample dilution performed by the laboratory. Dilutions are required due to the high concentrations of some analytes. The location of the extraction wells is presented on Figure 9-1.

Appendix G-1 presents trichloroethene versus time graphs for each extraction well. Wells B1, B2, B6, B7, B8, B9, B10, B11, B12, SC2, SC3 and SC5 exhibit declining TRCLE concentrations over time. As is typical, these wells exhibit asymptotic decreases over time. Wells B2, B8, and B9 have had fairly steady TRCLE concentration over the past 2-4 years. In the past, wells B3 and B4 exhibited rising TRCLE concentrations with time, but since 1994 both have been declining. Well B5 was increasing through 1992 and has been decreasing since then. Overall, the graphs indicate a long-term decrease in VOC concentrations.

Extraction well B6 exhibited a slight concentration increase in FY 1998 and was stable or slightly declining through FY 2002. This is probably due to plume redistribution following the shutdown of B12 in FY 1996. Extraction well B7 has been stable and below the contaminant-specific requirement for trichloroethene (5 μg/l), and all other VOCs from March 1995 through FY 2002.

These trends reflect the overall decline in OU2 contaminant concentrations. In addition, as discussed below, there has been a reduction in overall TGRS influent concentrations over the previous several years.

As Table 9-7 illustrates, six wells, B1, B4, B5, B6, B9, SC1 and SC5, that are located in the centers of the plume, achieve the largest rates of VOC removal. These seven wells together accounted for 98.7 percent of the VOC mass removed. Wells B10 and B11, which pump on the south and north edges of the plume, removed only about 0.1 percent (2.9 pounds) of the total VOC mass.

The source control wells, SC1 through SC3 and SC5, together accounted for 60.2 percent of the VOC mass removed while accounting for only 11.3 percent of the water pumped by the system. SC5, in particular, removed 57.0 percent of the total VOC mass at a rate of only approximately 114 gpm (6.5 percent of the total water pumped by the system). This illustrates the efficiency of extracting groundwater from near the source areas. At the opposite extreme, B7 and SC3 have had very low VOC concentrations and combined accounted for only 0.9 pounds of VOCs removed during the year further justifying their shutdown.

What do the long-term trends in the monitoring wells show?

Appendix B presents the trichloroethene graphs over time for monitoring wells on and off TCAAP. Although a formal statistical analysis has not been conducted, the large majority of these graphs reflect downward trends in TRCLE concentration, indicating an overall improvement in water quality both up gradient and down gradient of the TGRS. Due to the complexity of the flow system, changes in flow direction over time, and the variation in chemical transport properties across the study area, the graphs are not expected to reflect a uniform or easily predictable pattern. Several wells were identified in past discussions as presenting apparently anomalous patterns compared to the overall downward TRCLE concentration trends. Two of those wells within the TGRS area are sampled annually (as opposed to every other year). Following is a summary of the TRCLE concentration trends for those two wells:

Well	Trend Observation
03U806 and 04U806	Dropped from 1,000's of ppb in mid 1990's recently stable in 100's of ppb.

9.2 REMEDY COMPONENT # 2: GROUNDWATER TREATMENT

Description: "Groundwater treatment using air stripping." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the air stripping treatment facility is treating water and meeting the clean up requirements in Table 1 of the OU2 ROD.

Is the remedy component being implemented?
Yes. The air stripping treatment facility has been operating since 1986.

Did the treatment system meet the treatment requirements in the OU2 ROD?
Yes. Influent and effluent water was sampled on a monthly basis during FY2002. The influent/effluent database for FY2002 is contained in Appendix G-2. Figure 9-2 presents a graph of influent trichloroethene versus time. This graph is cumulative and includes data from before 1989, when the system consisted of only six extraction wells. Influent concentrations continued to decline in FY2002.

The average FY2002 influent trichloroethene concentration was 292 μg/l, down slightly from 294 μg/l in FY 2001. Since the full-scale start-up of the TGRS, influent concentrations had not exhibited a clear trend until approximately 1993, when a decrease began. The decline corresponds with the decrease in VOC mass removal and shrinkage of the plume discussed earlier.

The decrease in average trichloroethene concentration in FY2002 was not significant. This can be attributed to the fact that while the system was partially down for cleaning and painting the air strippers, the wells that remained in operation were those that would remove the greatest VOC mass. They were the wells with the highest trichloroethene concentrations. This caused the treatment system influent concentration to be higher because there was less water from wells with low concentrations to dilute the influent.

Figure 9-2 also presents a graph of the effluent trichloroethene concentration versus time. As indicated, the effluent was below 5-µg/l trichloroethene for all sampling events in FY2002. A review of the FY2002 database indicates that the effluent has also remained below the treatment requirements for all other VOC compounds specified in the OU2 ROD. Comparison of influent and effluent trichloroethene concentrations indicates average removal efficiency over 99.8 percent.

What was the mass of VOCs emitted into the air?

The air stripping towers remove VOCs with an efficiency of approximately 99.8 percent. Thus, the air emissions are essentially equal to the VOC mass removal rates presented in Table 9-7. Air emissions therefore averaged 7.8 pounds/day based on the VOC mass removal rates. The total VOC emissions from October 2001 through September 2002 were 2852 pounds.

9.3 REMEDY COMPONENT #3: TREATED WATER DISCHARGE

Description: "Discharge of treated water to the on-site gravel pit." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the gravel pit is accommodating the discharge from the treatment system and allowing it to recharge to the aquifer.

Is the remedy component being implemented?

Yes. Based on visual observation during FY 2002, there were no noticeable changes in Gravel Pit performance. The Gravel Pit is accommodating the TGRS discharge as designed.

9.4 REMEDY COMPONENT #4: INSTITUTIONAL CONTROLS

Description: "Institutional controls to restrict access to contaminated aquifers and prevent exposure to contaminated groundwater." (OU2 ROD, page 4)

Performance Standard (how do you know when you're done):
When a special well construction area and alternate water supply have been established and private wells in impacted areas have been sealed.

Is the remedy component being implemented?
Yes, although, the institutional controls have not been formally adopted for OU2. There are no private users of groundwater on TCAAP and the TCAAP potable water supply is treated by the TGRS prior to distribution. TCAAP is a government reservation, is fenced, and access is restricted to authorized personnel. TCAAP will remain under Army control into the foreseeable future.

9.5 REMEDY COMPONENT #5: REVIEW OF NEW TECHNOLOGIES

Description: "Reviews of new and emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration. Reviews shall be performed by the Army and reported annually in accordance with the consistency provisions of the TCAAP FFA." (OU2 ROD, page 4)

- The intent is to consider new technologies of merit, which is not on any set schedule. To have merit, a new technology must have promise in reducing cost and the time for cleanup. There may be years where no technologies are considered. It is envisioned that at any time, any interested party (Army, USEPA, MPCA) can suggest new technologies for consideration. At a minimum, the Technical Review Committee meetings can serve as a forum for discussion of possible technologies. If a technology is agreed to have merit by the Army, USEPA, and MPCA, then the Army will evaluate the technology. The level of effort for evaluations can range from simple literature searches to extensive treatability studies. On an annual basis, the Army will report on:

- Whether or not any new technologies were identified and considered to have merit that year,
- The progress or results of any evaluations during that year,
- Any planned evaluations for the following year.

Performance Standard (how do you know when you're done):
When the Army reports on the status of any reviews of emerging technologies in the annual monitoring report.

Is the remedy component being implemented?
Yes. Beginning with the FY 1997 Annual Performance Report, the Army reports annually on the status of any reviews of emerging technologies.

- In November 2001, the Army, MPCA, and USEPA attended the "Defense Environmental Restoration Program (DERP) 2001 Workshop" in Corpus Christi, Texas.
- In May 2002, the Army and Alliant attended the "Third International Conference on Remediation of Chlorinated and Recalcitrant Compounds" in Monterey, California.
- In April 2002, the MPCA gave a presentation at the Restoration Advisory Board (RAB) meeting on the joint MPCA/USEPA study "TCAAP Natural Attenuation Microcosm Study." This study was also the basis for a presentation at the May conference noted in the previous bullet item.

- In September 2002, the MPCA and USEPA announced they will be conducting a microcosm study using carbon dating. Army will drill a boring at Site G to collect soil for the study.
- "New technologies" is an ongoing agenda item for the monthly Technical Review Committee meetings between the Army, USEPA, and MPCA. No emerging technologies were identified through the process during FY 2002.
- The MPCA is continuing to monitor the results of a vegetable oil injection pilot study at the Navy site in Fidley, Minnesota.

Were any new technologies identified and considered to have merit during FY 2002?
No. The Army's review did not identify any new or emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration.

What is the status and/or findings of any previously initiated reviews of emerging technologies?
Alliant continues to make Site K available to the University of Minnesota to continue its research into direct hydrogen injection. The University is continuing its research under a grant from the Department of Defense, Office of Naval Research.

Are any new reviews planned at this time for the coming year?
No. The Army will continue to have new technologies on the agenda for the monthly Technical Review Committee meeting, and attend conferences that highlight emerging and new technologies. However, reviews of specific technologies are not planned in FY 2003.

9.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 4)

Performance Standard (how do you know when you're done):
When a regulator approved monitoring plan is in place and monitoring is conducted according to the plan.

Is the remedy component being implemented?
Yes. Monitoring in FY 2002 was consistent with the OU2 ROD. Appendix A summarizes the FY 2002 monitoring plan and any deviations are explained in Appendix C-2. Monitoring was as follows:

<u>Groundwater</u>
Monitoring well groundwater samples were collected, and water levels measured in June 2002 in accordance with the FY 2002 monitoring plan. FY2002 was an "off year" in the biennial sample program, so only a few wells were sampled. Samples were analyzed for VOCs.

<u>Treatment System</u>
The TGRS treatment system influent and effluent was sampled monthly during FY 2002 in accordance with the FY 2002 monitoring plan. Groundwater samples from the extraction wells were collected in December 2001 and June 2002 in accordance with the FY 2002 monitoring plan.

Is additional monitoring proposed prior to the next report?
Yes. Table 9-9 presents the monitoring requirements for Deep Groundwater. Beginning in FY2000, a biennial monitoring well sampling and water level measurement schedule was implemented, with selected wells sampled annually. In FY2003, the complete set of monitoring wells will be monitored. The TGRS extraction wells (including B13, the new extraction well) will be monitored semiannually and the TGRS treatment system influent and effluent will continue to be monitored monthly for detailed system tracking.

Appendix A presents the FY 2002 to FY 2006 monitoring plan. There were a few minor changes to the monitoring plan. Two former extraction wells that are no longer pumped (B12 and SC4) have been placed on the biennial-monitoring schedule beginning in FY2004. The three wells that are scheduled for shutdown in FY2003 (B7, B10, and SC3) will be sampled annually in FY 2004 and then go on the biennial schedule in FY2005. Extraction well B2, which is being replaced by B13 has been placed on the annual monitoring schedule.

In addition, at the request of the USEPA, nine wells have been added to the FY2003 monitoring schedule as a one time monitoring event to assist the USEPA with their five-year review. Those wells are: 03U002, 03M002, 03M003, 03L003, 04U003, PJ#003, 03M806, 03L021, and PJ#802.

9.7 OVERALL REMEDY FOR DEEP GROUNDWATER

Did the TGRS meet the requirements of the OU2 ROD? Yes.

- Hydraulic capture in Unit 3 probably extends beyond the 5-µg/l trichloroethene contour. The overall pumping rate was below the adjusted baseline rate based on 1989 flow rates, primarily due to the downtime for Tower maintenance activities, adding some uncertainty as to whether complete capture was achieved. However, wells with the lowest contaminant concentrations were the wells with the greatest decrease in pumping rate. Therefore, the areas with the greatest chance of missed capture were the areas with low trichloroethene concentrations (near or below 5 µg/l). Contaminant concentrations were not measured in most monitoring wells in FY2002. Based on FY 2001 monitoring well data and the continued decrease in the treatment center contaminant concentrations, hydraulic capture was likely achieved. This meets the VOC capture criterion in the OU2 ROD.
- Hydraulic capture in Unit 4 probably extends beyond the 5-µg/l trichloroethene contour. The overall pumping rate was below the adjusted baseline rate based on 1989 flow rates, primarily due to the downtime for Tower maintenance activities, adding some uncertainty as to whether complete capture was achieved. However,

wells with the lowest contaminant concentrations were the wells with the greatest decrease in pumping rate. Therefore, the areas with the greatest chance of missed capture were the areas with low trichloroethene concentrations (near or below 5 μg/l). Contaminant concentrations were not measured in most monitoring wells in FY2002. Based on FY 2001 monitoring well data and the continued decrease in the treatment center contaminant concentrations, hydraulic capture was likely achieved. This meets the VOC capture criterion in the OU2 ROD.

- The TGRS extracted and treated 926,042,500 gallons of water and removed 2852 pounds of VOCs from October 2001 to September 2002.
- Based on the extracted water quality, the source area contamination continued to decrease in concentration. This demonstrates that the TGRS is effectively removing VOC mass from the aquifer as it also effectively contains the contamination.
- Effluent VOC concentrations were below contaminant-specific requirements for all sampling events.

Do any additional measures need to be addressed?

The TGRS Operating Strategy will be finalized in FY2003. This plan will address the optimization of the TGRS as required by the OU2 ROD.

TABLE 9-1

GROUNDWATER CLEANUP LEVELS
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Substance	*Expected Level in Discharge (ppb)*	*Operable Unit 2 Rod Requirements (ppb)*
Volatile Organic Compounds (VOCs)		
cis-1,2-Dichloroethene plus trans-1,2-Dichloroethene	<1	70
1,1-Dichloroethene	<1	6
1,1,1-Trichloroethane	<1	200
1,2-Dichloroethane	--	4
1,1,2-Trichloroethene	<5	5
1,1-Dichloroethane	--	70
Tetrachloroethene	--	5

TABLE 9-2

EXTRACTION WELL WATER PUMPED
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)																
	B1	*B2*	*B3*	*B4*	*B5*	*B6*	*B7*	*B8*	*B9*	*B10*	*B11*	*B12*	*SC1*	*SC2*	*SC3*	*SC4*	*SC5*	*TOTAL*
October 2001	8,352,800	3,085,200	8,976,900	9,459,600	8,803,300	9,965,900	5,012,000	6,553,100	7,075,300	11,484,800	4,403,500	0	1,083,900	1,298,400	2,180,600	0	4,860,800	92,596,100
November 2001	4,204,500	2,829,100	3,977,300	9,172,900	8,585,800	9,623,200	2,166,200	2,899,100	7,168,200	5,293,600	3,753,100	0	977,200	554,800	1,033,000	0	4,751,400	66,989,400
December 2001	10,000,437	3,203,300	3,457,400	9,368,800	8,901,400	10,311,100	2,197,500	2,588,400	7,888,000	4,664,946	1,730,300	0	1,064,900	746,500	816,600	0	4,740,200	71,679,783
January 2002	9,448,600	2,275,500	6,690,400	8,968,300	8,729,700	10,173,300	4,039,300	4,849,600	7,887,200	8,569,900	3,204,400	0	980,600	1,322,100	1,527,600	0	4,871,100	83,537,600
February 2002	9,494,400	2,441,400	5,391,800	7,715,000	6,661,700	8,720,000	5,355,800	5,522,400	6,687,100	9,636,100	3,609,100	0	995,900	1,501,600	2,094,100	0	4,746,000	80,572,400
March 2002	9,930,167	2,750,503	6,600,992	8,486,050	8,416,405	9,938,539	5,745,310	5,991,263	7,813,810	10,125,766	3,993,434	0	1,000,850	1,865,355	2,218,069	0	5,631,360	90,507,874
April 2002	9,165,200	2,521,800	7,849,500	8,426,900	7,943,300	9,586,180	5,474,300	6,033,600	6,550,900	8,895,500	3,967,300	0	1,022,500	2,098,600	2,263,800	0	5,286,800	87,086,180
May 2002	9,224,226	2,484,468	8,769,489	8,994,868	8,815,847	9,702,864	3,951,016	6,450,135	6,513,092	10,103,883	4,260,057	0	1,087,430	1,545,145	1,984,163	0	4,819,060	88,705,742
June 2002	10,678,400	977,800	1,209,300	8,179,200	8,333,900	8,559,100	431,300	878,200	3,294,300	1,380,300	576,900	0	316,400	221,700	264,000	0	4,537,400	49,838,200
July 2002	10,165,400	668,000	2,076,500	10,083,400	10,120,500	10,243,000	904,500	1,536,700	1,703,600	2,509,200	853,000	0	1,124,800	365,000	481,900	0	5,684,900	58,520,400
August 2002	8,938,300	1,926,600	5,746,000	8,676,200	8,623,000	8,473,500	1,822,000	4,075,100	4,579,200	6,887,200	2,856,800	0	998,700	1,073,200	1,450,900	0	5,182,400	71,309,100
September 2002	8,488,100	2,328,200	7,735,600	7,961,700	8,704,900	8,724,700	193,000	5,156,200	6,023,400	8,200,100	3,367,800	0	982,100	1,417,000	1,739,500	0	4,953,800	75,976,100
TOTAL FY 2002	108,090,530	27,491,872	68,481,181	105,492,918	102,639,752	114,021,382	37,292,226	52,533,798	73,184,102	87,751,296	36,575,692	0	11,635,280	14,009,400	18,054,231	0	60,065,219	917,318,879

FY89	67,563,900	69,364,850	72,257,490	75,237,700	76,328,500	100,611,510	138,278,100	42,329,200	60,613,300	54,516,600	93,534,437	60,210,340	13,867,660	20,078,880	36,660,309	12,593,300	39,307,600	1,033,353,676
gpm	156	161	167	174	177	233	320	98	140	126	217	139	32	46	85	29	91	2,392
FY90	70,722,300	69,450,060	73,633,450	80,511,000	71,897,000	105,220,300	117,609,400	40,747,900	59,883,400	95,227,900	40,939,800	63,867,460	11,281,750	19,278,830	35,609,300	15,260,500	37,275,400	1,008,415,750
gpm	135	132	140	153	137	200	224	78	114	181	78	122	21	37	68	29	71	1,919
FY91	99,482,900	102,399,960	98,521,050	104,674,800	105,191,900	137,181,500	153,080,700	63,386,100	77,083,200	130,044,100	54,094,000	95,329,240	17,111,600	23,724,440	46,611,600	20,228,000	54,182,500	1,382,327,590
gpm	189	195	187	199	200	261	291	121	147	247	103	181	33	45	89	38	103	2,630
FY92	103,612,700	105,175,800	104,103,100	105,741,800	106,869,400	140,681,700	155,934,000	61,053,000	78,498,200	129,041,800	52,635,900	93,170,000	17,472,600	21,165,900	50,254,500	22,045,100	53,891,100	1,401,346,600
gpm	197	200	198	201	203	267	296	116	149	245	100	177	33	40	95	42	102	2,659
FY93	104,610,228	97,362,300	102,039,200	102,785,395	105,885,800	140,275,000	153,555,300	60,334,400	78,395,400	129,093,800	49,765,700	90,094,600	16,887,368	24,623,700	51,413,200	25,104,180	55,980,600	1,388,206,172
gpm	199	185	194	196	201	267	292	115	149	246	95	171	32	47	98	48	107	2,641
FY94	99,994,100	75,083,100	98,156,900	91,607,800	93,671,400	126,439,100	140,213,900	63,403,400	71,130,200	115,719,700	48,857,400	87,868,300	17,351,750	19,244,100	45,125,400	20,715,000	46,698,300	1,261,279,850
gpm	190	143	187	174	178	241	267	121	135	220	93	167	33	37	86	39	89	2,400
FY95	117,949,700	68,908,100	115,358,700	104,187,500	102,308,300	141,348,900	147,788,900	68,183,400	75,017,600	128,802,200	53,372,700	100,424,400	16,572,496	23,173,800	47,176,100	24,037,800	51,323,400	1,385,933,996
gpm	224	131	219	198	195	269	281	130	143	245	102	191	32	44	90	46	98	2,637
FY96	125,047,900	55,550,500	129,118,200	103,113,100	106,158,000	142,485,500	100,031,500	68,182,700	80,266,000	130,823,300	50,345,100	95,047,900	7,152,620	22,803,400	50,843,300	23,411,400	51,382,800	1,341,763,220
gpm	237	105	245	196	201	270	190	129	152	248	96	180	14	43	96	44	97	2,546
FY97	103,065,700	63,195,800	116,976,600	91,590,200	103,636,700	141,103,600	133,956,600	60,633,500	77,677,200	129,353,600	47,439,800	10,526,600	15,381,400	24,099,800	48,925,600	3,166,500	51,146,000	1,213,035,110
gpm	196	120	223	174	197	268	255	115	148	246	90	20	29	46	93	6	97	2,308
FY98	115,684,000	58,471,500	119,211,700	88,388,000	104,434,700	129,709,500	137,341,100	63,132,100	69,450,500	120,372,500	51,393,600	12,100	15,379,800	21,415,000	51,647,100	200	49,964,500	1,196,007,900
gpm	220	111	227	168	199	247	261	120	132	229	98	0	29	41	98	0	95	2,276
FY99	98,763,900	49,003,200	96,200,600	109,201,100	111,041,600	125,486,690	133,823,800	66,488,100	77,138,800	127,121,800	47,648,300	35,500	15,373,580	22,786,400	46,156,600	8,600	31,946,300	1,158,224,870
gpm	188	93	183	208	211	239	255	126	147	242	91	0	29	43	88	0	61	2,204
FY00	101,335,000	49,614,400	108,593,300	98,476,400	107,988,300	106,634,800	132,057,200	73,093,500	78,949,500	126,707,800	56,705,000	9,500	17,193,900	20,904,400	33,691,100	2,850	36,491,400	1,148,448,350
gpm	192	94	206	187	205	202	251	139	150	240	108	0	33	40	64	0	69	2,179
FY01	119,183,600	40,051,700	114,852,000	93,556,600	104,756,160	108,585,000	80,152,100	73,738,600	77,474,700	127,575,700	53,743,900	58,400	14,039,400	25,913,900	24,268,000	5,200	55,208,400	1,113,163,360
gpm	227	76	219	178	199	207	152	140	147	243	102	0	27	49	46	0	105	2,118
FY02	108,090,530	27,491,872	68,481,181	105,492,918	102,639,752	114,021,382	37,292,226	52,533,798	73,184,102	87,751,296	36,575,692	0	11,635,280	14,009,400	18,054,231	0	60,065,219	917,318,879
gpm	206	52	130	201	195	217	71	100	139	167	70	0	22	27	34	0	114	1,745

TABLE 9-3

TREATMENT CENTER WATER METER TOTALS
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)									
	Extraction Wells	Meter 1	Meter 2	Total Meters 1 & 2	Meter 3	Meter 4	Total Meters 3 & 4	Meter 5	Meter 6	Total Meters 5 & 6
October 2001	92,596,100	57,048,600	37,992,000	95,040,600	23,364,000	64,577,000	87,941,000	0	0	0
November 2001	66,989,400	25,806,400	43,914,000	69,720,400	11,843,000	53,726,000	65,569,000	0	0	0
December 2001	71,679,783	34,078,800	46,665,000	80,743,800	34,673,000	33,813,000	68,486,000	0	0	0
January 2002	83,537,600	46,371,000	37,166,600	83,537,600	23,683,000	55,231,000	78,914,000	0	0	0
February 2002	80,572,400	46,642,000	33,059,100	79,701,100	21,865,000	54,014,000	75,879,000	0	0	0
March 2002	90,507,874	51,226,289	37,314,983	88,541,272	21,359,867	63,951,636	85,311,503	0	0	0
April 2002	87,086,180	48,602,711	35,609,017	84,211,728	23,390,133	57,663,364	81,053,497	0	0	0
May 2002	88,705,742	52,029,000	36,886,000	88,915,000	23,206,000	62,082,000	85,288,000	0	0	0
June 2002	49,838,200	7,141,000	43,248,000	50,389,000	6,447,000	42,417,000	48,864,000	0	0	0
July 2002	58,520,400	41,923,000	16,713,000	58,636,000	13,260,000	43,258,000	56,518,000	0	0	0
August 2002	71,309,100	40,282,000	30,584,000	70,866,000	11,657,000	56,809,000	68,466,000	0	0	0
September 2002	75,976,100	39,932,000	35,808,000	75,740,000	10,712,000	63,297,000	74,009,000	0	0	0
TOTAL FY 2002	917,318,879	491,082,800	434,959,700	926,042,500	225,460,000	650,839,000	876,299,000	0	0	0

FY89	1,033,353,676	501,826,000	560,836,000	1,062,662,000	383,736,000	587,596,000	971,332,000	493,681,000	582,955,000	1,076,636,000
FY90	1,008,415,750	493,915,000	526,417,000	1,020,332,000	371,391,000	588,642,000	960,033,000	487,946,000	543,726,000	1,031,672,000
FY91	1,382,327,590	666,166,000	708,313,000	1,374,479,000	523,702,000	789,947,000	1,313,649,000	601,307,000	649,621,000	1,250,928,000
FY92	1,401,346,600	68,289,000	724,328,000	1,407,227,000	557,169,000	772,509,000	1,329,678,000	767,707,000	677,735,000	1,445,442,000
FY93	1,388,206,172	666,814,000	725,341,000	1,392,155,000	504,027,000	651,149,000	1,155,176,000	729,078,000	762,791,000	1,491,869,000
FY94	1,245,663,275	660,700,000	659,953,000	1,320,653,000	457,210,000	715,668,000	1,172,878,000	653,913,000	550,131,000	1,204,044,000
FY95	1,369,361,500	706,114,000	683,982,000	1,390,096,000	500,275,000	739,744,000	1,240,019,000	495,616,000	274,507,000	770,123,000
FY96	1,341,763,220	734,443,000	629,327,000	1,363,770,000	503,518,000	754,399,000	1,257,917,000	4,000	600,035,000	600,039,000
FY97	1,213,035,110	688,312,000	568,804,600	1,257,116,600	538,625,000	586,515,000	1,125,140,000	13,000	578,900,000	578,913,000
FY98	1,196,007,900	624,784,000	540,353,000	1,220,604,000	511,065,000	603,871,000	1,114,936,000	58,000	178,076,000	178,134,000
FY99	1,158,224,870	623,500,000	496,773,200	1,177,206,200	398,620,000	718,384,000	1,117,004,000	26,000	17,000	43,000
FY 2000	1,148,448,350	635,724,000	489,669,000	1,183,258,000	389,709,000	663,807,000	1,053,516,000	0	0	0
FY 2001	1,113,163,360	614,341,000	443,167,000	1,113,164,000	318,517,000	718,661,000	1,037,178,000	0	0	0
FY 2002	917,318,879	491,082,800	434,959,700	926,042,500	225,460,000	650,839,000	876,299,000	0	0	0

TABLE 9-4

PUMPHOUSE DOWN TIME (DAYS)
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Well Name	*FY02 Down Time (Days)*	*FY01 Down Time (Days)*	*FY00 Down Time (Days)*	*FY99 Down Time (Days)*	*FY98 Down Time (Days)*
B1	22	3.4	7.5	12.1	19.9
B2	63	3.9	18.7	39.7	18.4
B3	118	1.8	8.8	30.6	16.1
B4	12	1.7	5.7	17.8	16.9
B5	9	3.3	6.0	9.4	29.1
B6	11	1.6	32.3	10.3	12.6
B7	109	2.9	11.8	28.4	12.3
B8	108	1.3	9.0	21.2	14.9
B9	51	1.3	4.8	9.1	27.3
B10	110	2.4	8.0	29.0	15.8
B11	91	1.5	12.0	31.9	20.6
B12	--	--	--	--	--
SC1	36	2.9	18.7	47.8	16.1
SC2	108	3.0	6.8	7.5	23.9
SC3	108	1.5	7.2	8.2	12.3
SC4	--	--	--	--	--
SC5	6	2.0	12.1	14.7	13.9

Note:
(1) Days down do not include down time resulting from automatic cycling of well field due to electric check valve failures.

TABLE 9-5

DOWN TIME (DAYS) BY CATEGORY
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Category	*Down Time (Days)*	
Pumphouse Component	2.2	
Treatment Center Component	15.0	
Electrical Service	2.8	
Miscellaneous	0.0	
Preventive Maintenance	44.1	(1)
System Modification	0.0	
Forcemain	0.0	
Total System Equivalent	61.9	(2)

Anticipated Down Time for Fiscal Year 2003

Pumphouse Component	3
Treatment Center Component	5
Electrical Service	3
Miscellaneous	0.1
Preventive Maintenance	1
System Modification	0.1
Forcemain	0.1

Notes:
(1) Preventative maintenance down time consists primarily of cleaning the air stripping towers.
(2) This value represents the adjusted down time for the entire system.

TABLE 9-6

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*	*1,1,1-Trichloroethane*	*1,1-Dichloroethane*	*1,1-Dichloroethene*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level[1]		200	70	6	4	70	5	5
03U093	6/7/02	17	0.66 JP	1.5	< 1	0.65 JP	< 1	74
03U094	6/6/02	150	2.2 JP	7.8	< 5	2.2 JP	< 5	320
03U099	6/6/02	2.1	< 1	0.17 JP	< 1	0.094 JP	0.12 JP	8.9
03U708	6/6/02	74	9.5	17	0.32 JP	6.2	2.9	270
03U801	6/6/02	0.18 JP	< 1	< 1	< 1	0.63 JP	< 1	39
03U806	6/6/02	0.8 JP	7.8	6	< 1	1.1	1.3	170
03U806	6/6/02	0.79 JPD	7.5 D	5.9 D	< 1 D	1 D	1.3 D	170 D
04J077	6/7/02	99	54	49	1 JP	29	< 5	610
04U806	6/6/02	31	53	41	< 10	8.7 JP	< 10	380
04U833	6/7/02	0.31 JP	0.18 JP	< 1	< 1	0.093 JP	< 1	17
PJ#806	6/7/02	12	14	11	0.21 JP	2.8	< 1	140

Notes:

[1] Cleanup levels for TGRS are from the OU2 ROD. Shading indicates exceedence of the cleanup level.

D - Duplicate Analysis

J - Value is estimated

P - Results less than reporting level but greater than instrument detection limit.

TABLE 9-7

VOC MASS LOADING SUMMARY
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Well	*% Contribution to VOC Mass Removal*	*FY 2002 Total Pounds VOC Mass Removed*
B1	5.5	156.7
B2	0.3	10.0
B3	0.1	2.8
B4	15.0	427.0
B5	9.8	279.7
B6	6.1	174.5
B7	0.0	0.3
B8	0.3	9.2
B9	2.5	72.4
B10	0.1	1.9
B11	0.0	1.0
B12	0.0	shut-down
SC1	2.8	80.9
SC2	0.4	10.3
SC3	0.0	0.6
SC4	0.0	shut-down
SC5	57.0	1624.9
Fiscal Year 2002 Total (lbs)		*2852*
Daily Average (lbs/day)		*7.8*

HISTORICAL TOTAL

Fiscal Year		*Pounds VOC Mass Removed*
2002		2852
2001		3,418
2000		4,499
1999		4,878
1998		6,132
1997		6,210
1996		10,655
1995		13,355
1994		15,070
1993		20,165
1992		24,527
1991		26,760
1990		18,005
1989	(First year of full scale system)	19,510
1988		4,800
1987		2,100
Total		*182,936*

TABLE 9-8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (ug/L)
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

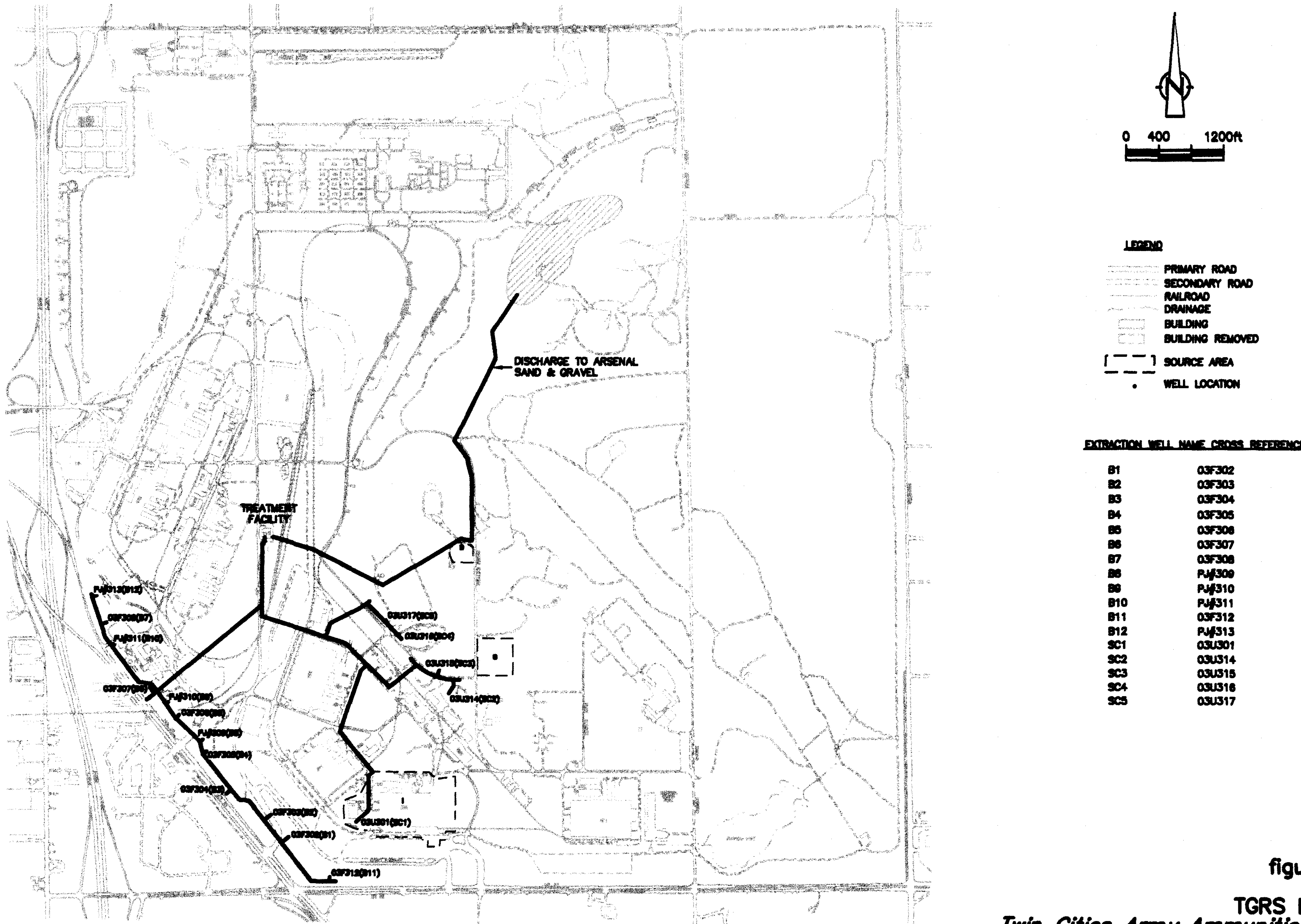
Location	*Date*	*111TCE*	*112TCE*	*11DCLE*	*11DCE*	*12DCLE*	*CCL4*	*CHCL3*	*C12DCE*	*TCLTFE*	*CH2CL2*	*TCLEE*	*T12DCE*	*TR*
03F302	12/21/01	11	0.54 JP	2.7	2.6	< 1	< 1	0.18 JP	11	< 1	< 1 U	1.6	0.094 JP	2
(B1)	12/21/01	9.8 D	0.53 JPD	2.6 D	2.6 D	< 0.04 D	< 0.089 D	0.16 JPD	10 D	< 1 D	< 1 UD	1.6 D	0.082 JPD	2
	6/4/02	8	< 1	2.2	1.9	< 1	< 1	< 1 U	8.3	< 1	< 1 U	1.5	0.082 JP	1
03F303	12/21/01	1.5	1.4	1.2	1.8	0.18 JP	< 1	0.21 JP	1.5	< 1	< 1	2.7	< 1	[illegible]
(B2)	6/4/02	1.3	1.4	1.1	1.7	0.18 JP	< 1	< 1 U	1.5	< 1	< 1 U	2.5	< 1	[illegible]
03F304	12/21/01	0.53 JP	0.27 JP	0.59 JP	0.72 JP	< 1	< 1	< 1	0.17 JP	< 1	< 1 U	< 1	< 1	1
(B3)	6/4/02	0.93 JP	< 1	1	1	< 1	< 1	< 1	0.35 JP	< 1	< 1 U	< 1	< 1	5
	6/4/02	0.96 JPD	< 1 D	1.1 D	1.1 D	< 1 D	< 1 D	< 1 D	0.35 JPD	< 1 D	< 1 UD	< 1 D	< 1 D	5
03F305	12/21/01	79	< 5	35	31	< 5	< 5	< 5	18	< 5	< 5	< 5	< 5	5
(B4)	6/4/02	67	< 10	29	26	< 10	< 10	< 10	16	< 10	< 10 U	< 10	< 10	4
03F306	12/21/01	18	< 5	14	12	< 5	< 5	< 5	2.3 JP	< 5	< 5	0.85 JP	< 5	4
(B5)	6/4/02	14	< 5	11	9.8	< 5	< 5	< 5	2 JP	< 5	< 5 U	1 JP	< 5	3
03F307	12/20/01	5.1	< 1	7.8	6.5	0.17 JP	< 1	< 1	1.4	< 1	< 1 U	0.089 JP	< 1	2
(B6)	6/4/02	5.7	< 1	7.1	6.1	< 1	< 1	< 1	1.6	< 1	< 1 U	0.083 JP	0.09 JP	1
03F308	12/20/01	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	1
(B7)	6/4/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1
PJ#309	12/21/01	2.6	< 1	1	1.1	< 1	< 1	< 1	0.45 JP	< 1	< 1 U	< 1	< 1	[illegible]
(B8)	6/4/02	3.5	< 1	1.4	1.5	< 1	< 1	< 1	0.66 JP	< 1	< 1 U	< 1	< 1	[illegible]
PJ#310	12/21/01	16	< 1	7	7.3	0.16 JP	< 1	0.06 JP	3.1	< 1	< 1 U	< 1	< 1	1
(B9)	6/4/02	15	< 1	6.7	6.8	0.2 JP	< 1	0.082 JP	3.3	< 1	< 1 U	< 1	< 1	1
PJ#311	12/20/01	0.2 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1
(B10)	6/4/02	0.5 JP	< 1	0.07 JP	0.17 JP	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	4
03F312	12/21/01	< 1	< 1	0.27 JP	0.12 JP	< 1	< 1	< 1	0.2 JP	< 1	< 1 U	< 1	< 1	
(B11)	6/4/02	< 1	< 1	0.37 JP	0.18 JP	< 1	< 1	< 1	0.3 JP	< 1	< 1 U	< 1	< 1	3
PJ#313	12/20/01	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	< [illegible]
(B12)	6/4/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.[illegible]
03U301	12/20/01	25	< 25	2.1 JP	3.2 JP	< 25	< 25	< 25	71	< 25	< 25	< 25	< 25	11
(SC1)	6/4/02	19	< 10	1.4 JP	2.3 JP	< 10	< 10	< 10	54	< 10	< 10 U	< 10	< 10	8
03U314	12/20/01	12	< 1	2.4	1.8	< 1	< 1	< 1	0.98 JP	< 1	< 1 U	< 1	< 1	[illegible]
(SC2)	12/20/01	11 D	< 1 D	2.4 D	1.6 D	< 1 D	< 1 D	< 1 D	0.97 JPD	< 1 D	< 1 UD	< 1 D	< 1 D	[illegible]
	6/4/02	24	< 1	1.4	2.1	< 1	< 1	< 1 U	0.59 JP	< 1	< 1 U	< 1	< 1	[illegible]
03U315	12/20/01	0.4 JP	< 1	0.096 JP	0.06 JP	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	3
(SC3)	6/4/02	0.56 JP	< 1	0.094 JP	< 1	< 1	< 1	< 1 U	< 1	< 1	< 1 U	< 1	< 1	4
03U316	12/20/01	0.56 JP	< 1	< 1	0.082 JP	< 1	< 1	0.44 JP	< 1	< 1	< 1 U	< 1	< 1	5
(SC4)	6/4/02	1 JP	< 1	0.14 JP	< 1	< 1	< 1	< 1 U	0.1 JP	< 1	< 1 U	< 1	< 1	8
	6/4/02	0.79 JPD	< 1 D	0.1 JPD	< 1 D	< 1 D	< 1 D	< 1 UD	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	5
03U317	12/20/01	990	< 25	22 JP	32	< 25	< 25	< 25	2.2 JP	< 25	< 1 U	7 JP	< 25	3[illegible]
(SC5)	6/4/02	770	2.1	18	24	1.8	< 1	< 1 U	2.2	12	< 1 U	5.9	< 1	2[illegible]

Notes:
D - Duplicate Analysis
J - Value is estimated
P - Results less than reporting level but greater than instrument detection limit.
U - The analyte is non-detect with the associated value being the quantitation limit.

TABLE 9-9

SUMMARY OF OU2 DEEP GROUNDWATER MONITORING REQUIREMENTS
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Implementing Party*	*Documents Containing the Monitoring Plan*
#1 Hydraulic Containment and Mass Removal	a. Water levels to draw contour maps showing hydraulic zone of capture	Alliant/Army	Deep groundwater monitoring plan in Annual Report
	b. Pumping volumes and rates for comparison to design rates	Alliant/Army	Deep groundwater monitoring plan in Annual Report
	c. Influent and extraction well water quality for overall mass removal calculations	Alliant/Army	Deep groundwater monitoring plan in Annual Report
#2 Groundwater Treatment	• Outlined below	Alliant/Army	Deep groundwater monitoring plan in Annual Report
#3 Treated Water Discharge	• Effluent monitoring to verify attainment of treatment requirements	Alliant/Army	Deep groundwater monitoring plan in Annual Report
#4 Institutional Controls	• None	Alliant/Army	Deep groundwater monitoring plan in Annual Report
#5 Review of New Technologies	• None	Alliant/Army	Deep groundwater monitoring plan in Annual Report
#6 Groundwater Monitoring	• As above	Alliant/Army	Deep groundwater monitoring plan in Annual Report
Overall Remedy	a. Groundwater quality to verify attainment of clean up goals	Alliant/Army	Deep groundwater monitoring plan in Annual Report



EXTRACTION WELL NAME CROSS REFERENCE

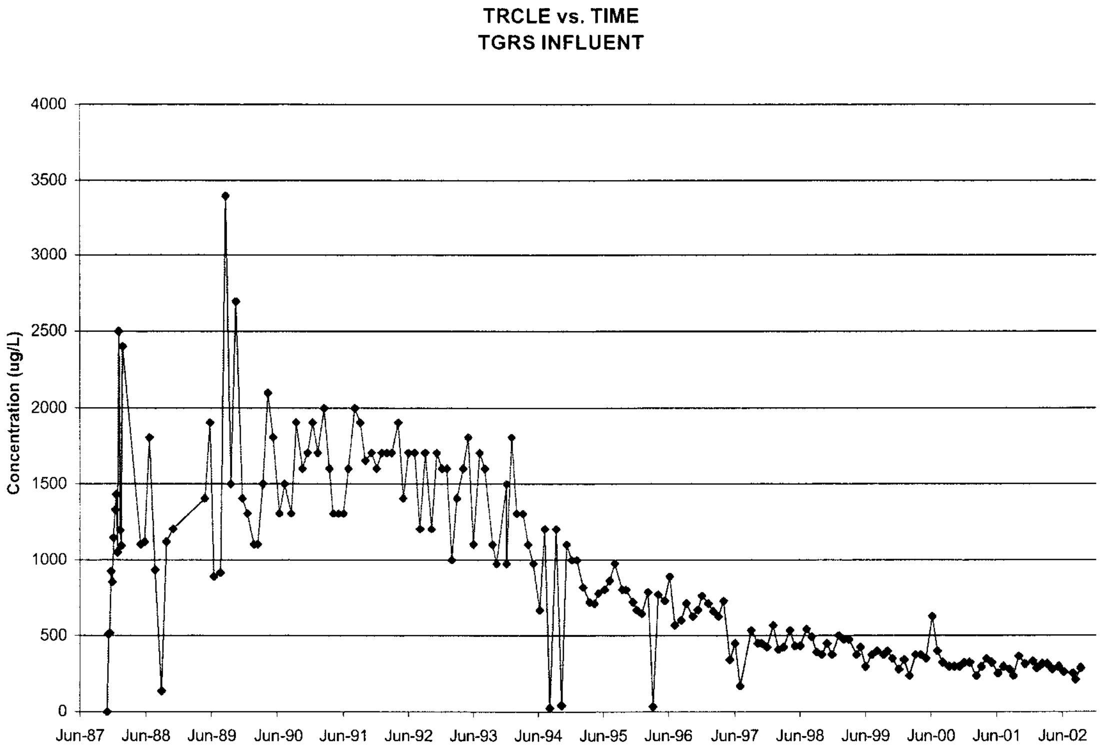
B1	03F302
B2	03F303
B3	03F304
B4	03F305
B5	03F306
B6	03F307
B7	03F308
B8	PJ#309
B9	PJ#310
B10	PJ#311
B11	03F312
B12	PJ#313
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

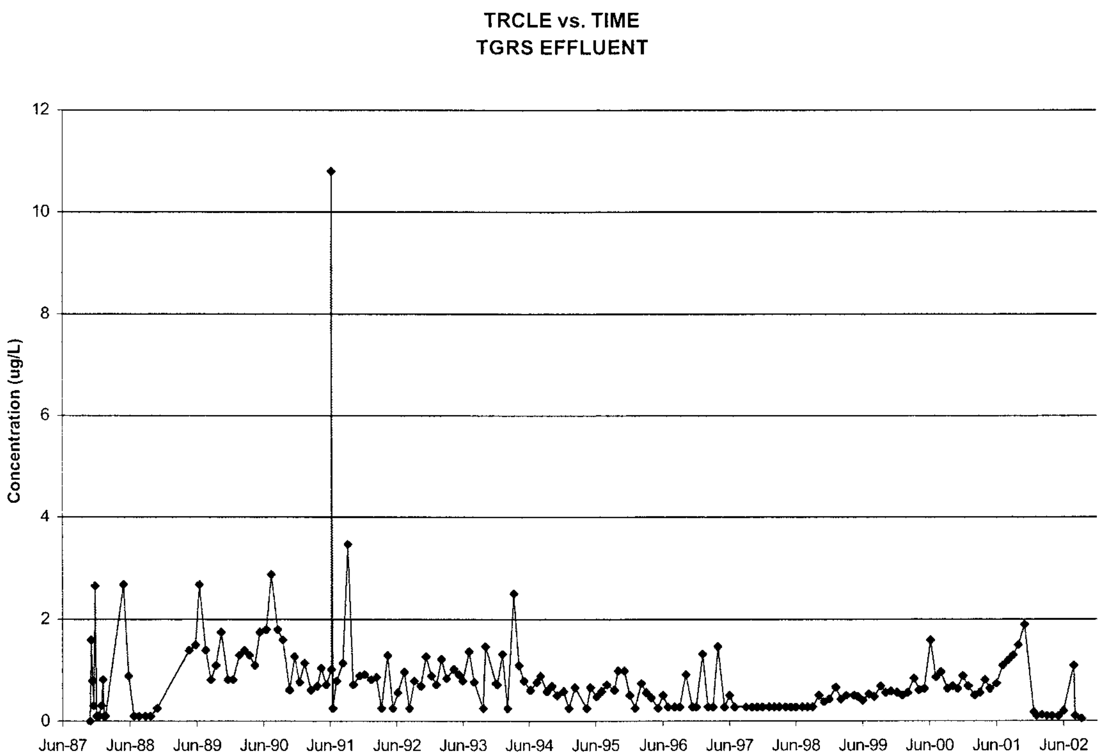
figure 9-1

TGRS LAYOUT
Twin Cities Army Ammunition Plant

CRA

19382-43(001)GN-SP001 JAN 09/2003





NOTE: SAMPLES REPORTING CONCENTRATIONS LESS THAN THE DETECTION LIMIT WERE PLOTTED AS HALF THE DETECTION LIMIT. WHEN DUPLICATE SAMPLES WERE COLLECTED, THE HIGHER CONCENTRATION WAS PLOTTED.

figure 9–2

TGRS TREATMENT SYSTEM PERFORMANCE
Twin Cities Army Ammunition Plant

CRA

19382–43(001)GN–SP002 JAN 09/2003

10.0 Operable Unit 3: Deep Groundwater

The reference for the OU3 ROD is:

RECORD OF DECISION
Groundwater Remediation
Operable Unit 3
at New Brighton/Arden Hills Superfund Site
September 1992

There have been no subsequent ROD Amendments or Explanations of Significant Differences.

The PGRS (Plume Groundwater Recovery System) of Operable Unit 3 (OU3) is an off-post groundwater extraction and treatment system and municipal potable water supply. The PGRS consists of New Brighton Municipal Well #13 (NBM#13) and a GAC treatment plant. The water is used by New Brighton for Municipal supply. The PGRS is designed to contain the south plume of VOC contamination emanating from TCAAP and to prevent further downgradient migration. Recovered groundwater is treated and used by the City of New Brighton to fulfill its municipal water supply demand. Figure 10-1 presents a site plan for OU3.

The PGRS began operations on May 3, 1994. In 1997 the PGRS influent dropped to below the ROD required limits for all VOCs. In December 1999, under an agreement with the Agencies, the PGRS pumping rate was reduced from a nominal rate of 1000 gpm to 400 gpm to help determine if the reductions in concentration were the result of actual plume decreases or the result of dilution from over pumping. In conjunction with the flow rate decrease, a quarterly monitoring program was undertaken to monitor for potential "rebound" in VOC concentrations. As of the end of FY 2000, no rebound was observed and a review of the historical database for all of OU3 and the associated source area in OU2 revealed that the entire south plume had dramatically decreased in size and concentration since the early 1990s. The concentration decreases were such that the leading edge of the south plume, at the PGRS, dropped below the ROD requirements.

The results of this evaluation were presented to the Agencies on September 6, 2000, and a report titled "Plume History Evaluation, Operable Unit 3" was submitted to the Agencies on October 10, 2000. The report documents the history of plume size and concentration reductions throughout OU3. Based on the dramatic reductions in plume size and concentration, the report recommended shutting down the PGRS. The Agencies subsequently accepted the recommendation. The City of New Brighton stopped significant pumping in August 2001. The City is conducting an evaluation of its municipal system to, in part, determine the future use of the PGRS extraction well and treatment system. The extraction well is being maintained in standby status while on going monitoring continues.

10.1 REMEDY COMPONENT #1: GROUNDWATER EXTRACTION

Description: "Extraction of groundwater at the leading edge of the South Plume." (OU3 ROD, page 2)

Performance Standard (how do you know when you're done):
When the PGRS is operating at the designed flow rates and the zone of capture is achieving containment of the leading edge of the south plume.

Is the remedy component being implemented?
Yes. The PGRS began full scale operation in May 1994. The flow rate was reduced to zero in August 2001 due to the reduction in plume size and concentration. The system is being maintained in a "standby" condition in the event groundwater must be treated for contamination.

Is the PGRS containing the south plume?

The intent of this ROD requirement is being met. The monitoring data indicates that the south plume no longer extends as far as the PGRS at concentrations above the ROD requirements. Samples collected in FY 2002 from the extraction well and monitoring wells in the vicinity of the extraction well were below 1 μg/l, indicating that the southern edge of the South Plume was north of monitoring well 04U863

10.2 REMEDY COMPONENT #2: GROUNDWATER TREATMENT

Description: "Treatment of extracted groundwater for the removal of volatile organic compounds (VOCs) by a pressurized granular activated carbon (GAC) system." (OU3 ROD, page 2)

Performance Standard (how do you know when you're done):

When the effluent from the treatment system meets the standards in the OU3 ROD.

Is the remedy component being implemented?

As discussed above, the PGRS is no longer being operated, therefore this remedy component is no longer applicable.

Is treatment meeting the requirements of the OU3 ROD?

As discussed above, the PGRS was not operated after August 2001, therefore, this remedy component is no longer applicable.

How much VOC mass did the system remove?

As discussed above, the PGRS was not operated after August 2001, therefore, this remedy component is no longer applicable. The total VOC mass removed from the PGRS from startup through FY 2001 was 132 pounds.

10.3 REMEDY COMPONENT #3: USE OF WATER FOR MUNICIPAL SUPPLY

Description: "Discharge of treated groundwater to the potable supply of the City of New Brighton." (OU3 ROD, page 2)

Performance Standard (how do you know when you're done):
When the City of New Brighton is able to accept the entire discharge from the PGRS, and is doing so on a full time basis.

Is the remedy component being implemented?

As discussed above, the PGRS was not operated after August 2001, therefore, this remedy component is no longer applicable.

10.4 REMEDY COMPONENT #4: GROUNDWATER MONITORING

Description: "Monitoring of the groundwater to verify the effectiveness of the remedy." (OU3 ROD, page 2)

Performance Standard (how do you know when you're done):
When a monitoring program is established and monitoring is in compliance with the regulator approved Annual Monitoring Plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2002 monitoring plan and any deviations are explained in Appendix C.2. Monitoring was as follows:

Groundwater

Groundwater samples were collected quarterly from seven wells, including the extraction well, in the vicinity of the PGRS (south of Interstate 694). Monitoring well 04U863 was not part of the monitoring network but was voluntarily added to the quarterly monitoring program beginning in March 2002. These wells provide a sentry monitoring network near the extraction well to monitor for any potential rebound in concentrations. All samples were analyzed for VOCs using SW846 8260. Monitoring wells used for sampling for the PGRS are shown on Figure 10-1. The specific role of each well is provided in Appendix A. Table 10.1 presents the monitoring results. Trichloroethene was detected below the contract detection limit of 1 ug/L in four wells. These concentrations are consistent with expected residual levels in this area.

Is additional monitoring proposed prior to the next report?

Yes. The existing OU3 monitoring requirements are presented in Table 10-2. For FY 2002 through FY 2006, quarterly monitoring well sampling and water level measurements are planned. Appendix A presents the FY 2002 – FY 2006 monitoring plan.

10.5 OVERALL REMEDY FOR OU3

Is the Remedy for OU3 Operating in Compliance with the OU3 ROD?

The PGRS extraction well was shut down in FY 2001. In FY2002 there were no wells exhibiting VOC concentrations above the ROD requirements in the vicinity of the PGRS. All detection limits were below the requirements of the ROD.

Are any changes or additional actions required for OU3?

No. Monitoring will continue, to confirm that the plume remains below ROD standards.

TABLE 10-1
GROUNDWATER QUALITY DATA
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Trichloroethylene* *TRCLE*	*1,1,1-Trichloroethane* *111TCE*	*1,1,2-Trichloroethane* *112TCE*	*1,1-Dichloroethylene* *11DCE*	*1,1-Dichloroethane* *11DCLE*	*cis-1,2-Dichloroethylene* *C12DCE*	*Vinyl chloride* *C2H3CL*	*Carbon tetrachloride* *CCL4*	*Methylene chloride* *CH2CL2*	*Chloroform* *CHCL3*	*trans-1,2-Dichloroethylene* *T12DCE*	*Tetrachloroethylene* *TCLEE*	*1,1,2-Trichlorotrifluoroethane* *TCLTFE*	*1,2-Dichloroethane* *12DCLE*	*1,2-Dichloroethylene* *12DCE*
PGRS Cleanup Level (1)		*5*	*200*	*3*	*6*	*70*	*70*	--	--	--	--	--	--	--	--	
04J864	Dec-01	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J864	Mar-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J864	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J864	Sept-02	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
04J866	Dec-01	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J866 D	Mar-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J866	Mar-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J866	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J866 D	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J866	Sept-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04J866 D	Sept-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U863	Mar-02	0.11 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U863	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U863	Sept-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U864	Dec-01	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U864	Mar-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U864	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U864	Sept-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U865	Dec-01	0.071 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U865	Mar-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U865	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U865	Sept-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U866	Dec-01	0.35 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U866 D	Dec-01	0.39 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U866	Mar-02	0.50 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U866	June-02	0.36 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
04U866	Sept-02	0.17 JP	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
NB13INF.	Dec-01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
NB13INF.D	Dec-01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
NB13INF.S	Dec-01	<0.1	<0.2	<0.2	<0.5	<0.2	<0.2	<0.5	<0.2	<0.5	<0.1	<0.1	<0.2	<0.2	<0.2	
NB13INF.	Mar-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
NB13INF.	June-02	<1	<1	<1	<1	<1	<1	<1	<1	<1 1UL	<1	<1	<1	<1	<1	
NB13INF.	Sept-02	0.14 JPV1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	<1 V1	

TABLE 10-1
GROUNDWATER QUALITY DATA
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

		Trichloroethylene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	1,1-Dichloroethylene	1,1-Dichloroethane	cis-1,2-Dichloroethylene	Vinyl chloride	Carbon tetrachloride	Methylene chloride	Chloroform	trans-1,2-Dichloroethylene	Tetrachloroethylene	1,1,2-Trichlorotrifluoroethane	1,2-Dichloroethane	1,2-Dichloroethylene
Location	*Sample Date*	*TRCLE*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*12DCLE*	*12DCE*
PGRS Cleanup Level (1)		5	200	3	6	70	70	--	--	--	--	--	--	--	--	

Notes:

- Indicates a detection.

D - Duplicate analysis.

J - Value Estimated.

P - Results less than reporting level but greater than instrument detection limit.

S - Split sample collected and anaylzed by Minnesota Pollution Control Agency.

V - Sample arrived at laboratory with cooler temp. of 7° C.

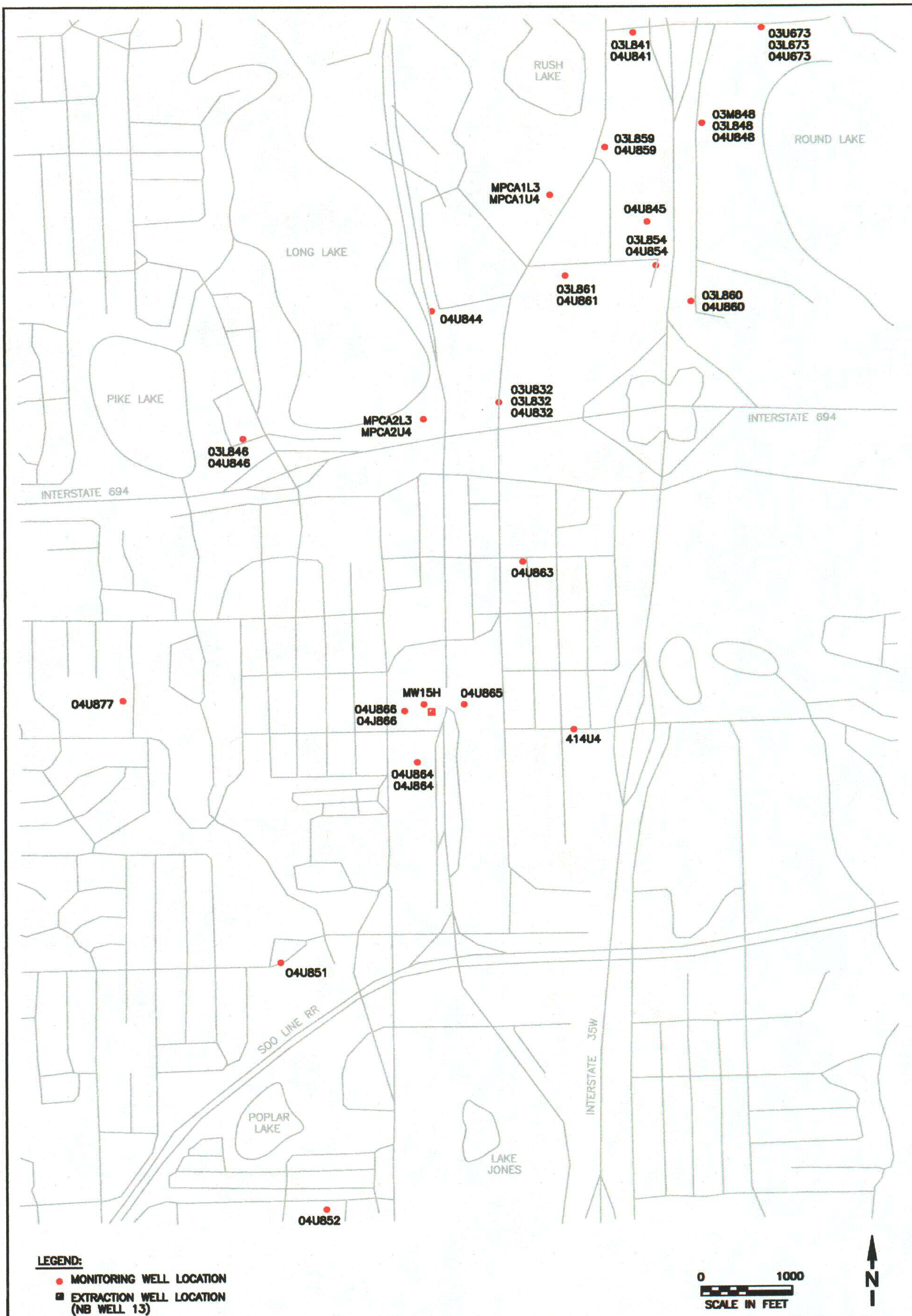
(1) Clean up from OU3 ROD.

1UL - Non-detect, trip blank yielded concentrations of compound.

TABLE 10-2

SUMMARY OF OU3 MONITORING REQUIREMENTS
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Remedy Component		Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1	Groundwater Extraction	a.	Water levels for use in drawing contour maps demonstrating capture (currently not applicable).	Alliant	OU3 Monitoring Plan in Annual Report
		b.	Pumping rates and volumes for reporting (currently not applicable).	Alliant	OU3 Monitoring Plan in Annual Report
#2	Groundwater Treatment	a.	Influent/effluent monitoring to verify compliance and calculate mass removal (currently not applicable).	Alliant	OU3 Monitoring Plan in Annual Report
#3	Use of Water for Municipal Supply	a.	Effluent monitoring for verifying compliance with public water supply requirements (currently not applicable).	New Brighton	New Brighton's Monitoring Plan
#4	Groundwater Monitoring	a.	Groundwater sampling to track progress of clean-up.	Alliant	OU3 Monitoring Plan in Annual Report
	Overall Remedy	a.	Water quality monitoring to verify attainment of clean-up goals.	Alliant	OU3 Monitoring Plan in Annual Report



SECOR

INTERNATIONAL INCORPORATED

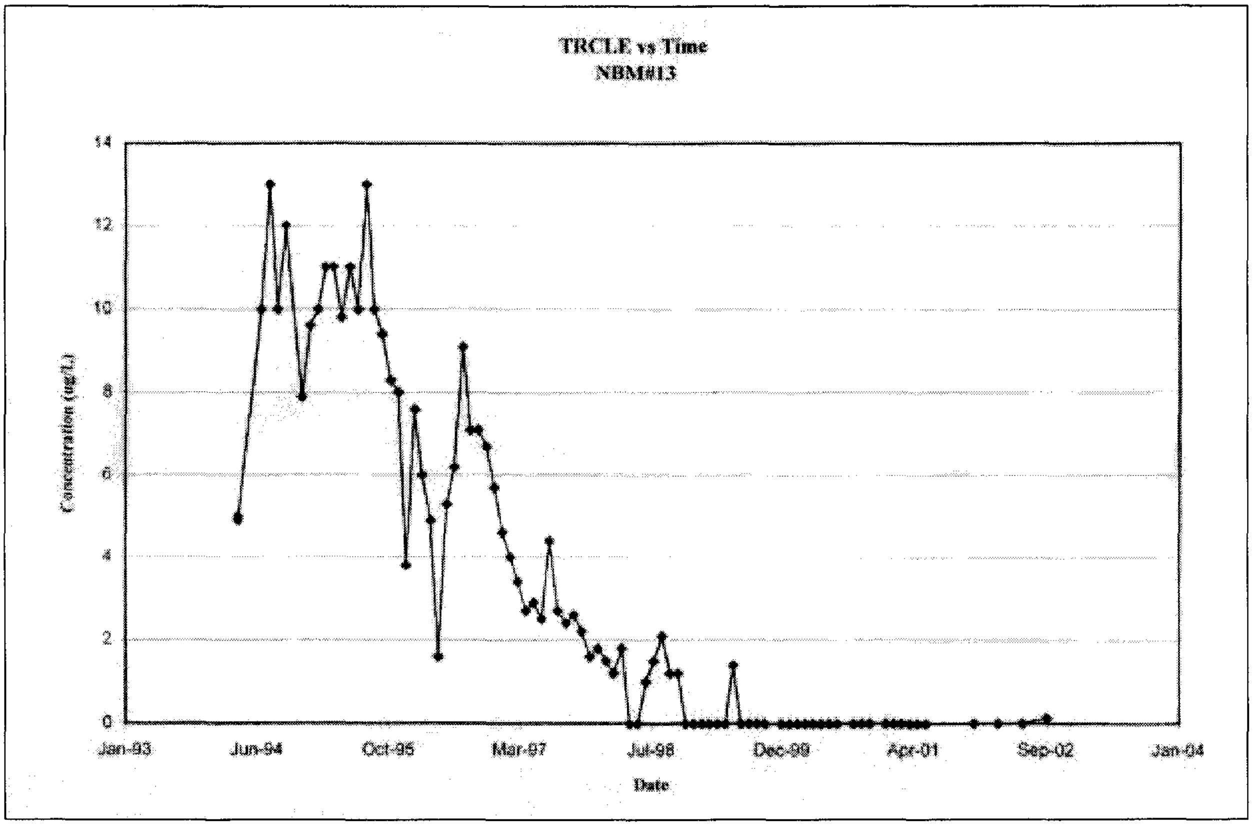
4463 WHITE BEAR PARKWAY, SUITE 106
WHITE BEAR LAKE, MINNESOTA 55110

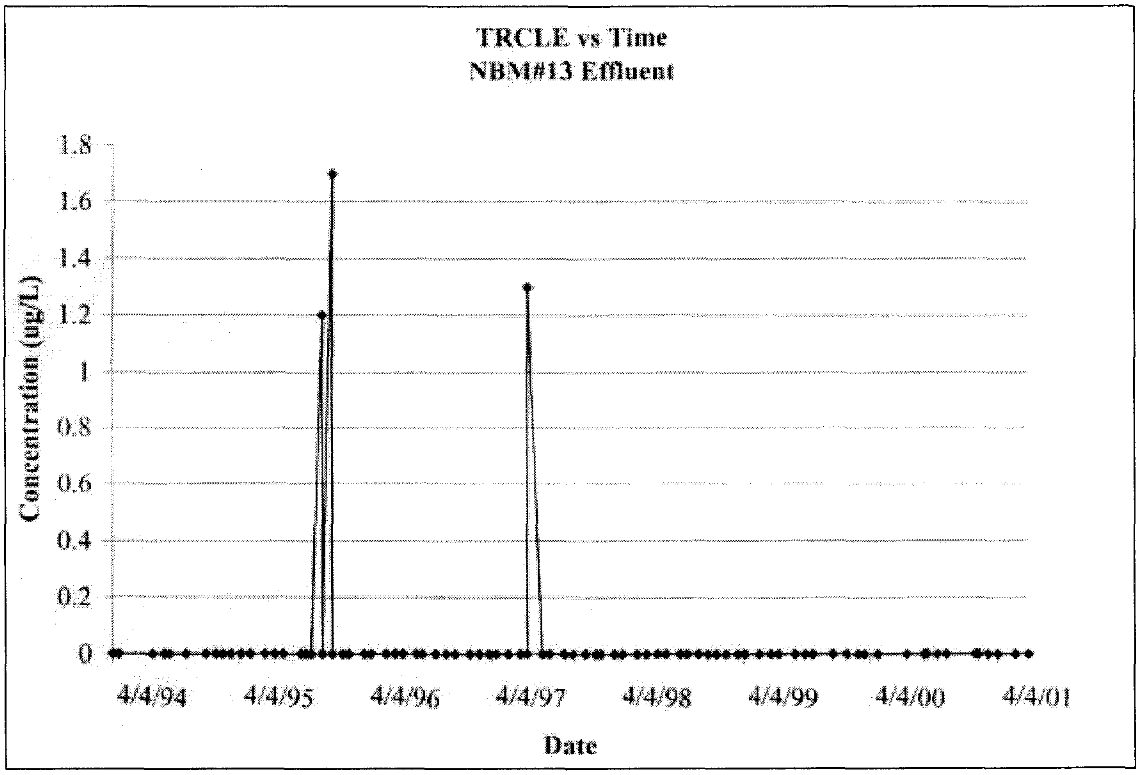
TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

OU3 (PGRS) SITE PLAN

FIGURE 10–1

SECOR PROJECT #: 003.18508.262	FILENAME: SITE-03	DATE: 01/10/03





SECOR INTERNATIONAL INCORPORATED 4463 WHITE BEAR PARKWAY, SUITE 106 WHITE BEAR LAKE, MINNESOTA 55110	TWIN CITIES ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA OU3 (PGRS) TRCLE VS. TIME SECOR PROJECT #: 003.18508.262 | FILENAME: SITE-06 | DATE: 01/09/03	FIGURE 10-2

11.0 Other Installation Restoration Activities During FY 2002

Appendix I briefly summarizes the status of other activities at TCAAP which are related to the Installation Restoration Program, but are not required in the RODs for OU1 through OU3. They are not part of the performance evaluation of the performance monitoring programs.

12.0 References

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"Record of Decision, Groundwater Remediation Operable Unit 1 at New Brighton/Arden Hills Superfund Site." September 1993.

"Twin Cities Army Ammunition Plant, New Brighton/Arden Hills Superfund Site, Operable Unit 2, Record of Decision." October 1997.

APPENDIX A.1
FY 2002 – FY 2006 MONITORING PLAN
FOR GROUNDWATER MONITORING WELLS

Unit Designations

01U	- Upper Fridley Formation	03L	- Lower Hillside Formation	SL	- St. Lawrence
01L	- Lower Fridley Formation	SP	- St. Peter	UNK	- Unknown
03U	- Upper Hillside Formation	PC	- Prairie du Chien		
03M	- Middle Hillside Formation	J	- Jordan		

Notes:

(A) Indicates that the monitoring is the responsibility of Alliant Techsystems Inc.
(B) Indicates that the monitoring is the responsibility of the Army.
(1) "L (A or B)" denotes a water level measurement by the appropriate party.
(2) "Q (A or B)" denotes a water quality sampling by the appropriate party. The required analyte list for each specific site is shown in Appendix A.4.
(3) The designations refer to the following purposes:
- ❖ Operable Unit 1 Water Quality
  - 1.a = To contour the perimeter of the plume which defines the area of concern for alternate water supply/well abandonment
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 1 Water Levels
  - 3.b = To contour water levels for evaluation of containment
- ❖ Site A Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site A Water Levels
  - 2.b = To contour water levels for evaluation of containment
- ❖ Site I Water Quality
  - 1.a = To track remedy progress
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site I Water Levels
  - 1.a = To track remedy progress
- ❖ Site K Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site K Water Levels
  - 3.a = To contour water levels for evaluation of containment
- ❖ TGRS Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ TGRS Water Levels
  - 1.a = To contour water levels for evaluation of containment
- ❖ Operable Unit 3 Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 3 Water Levels
  - 1.a = To contour water levels for evaluation of containment

(4) Sample if in production at time of sample collection.
(5) Sample quarterly during operation of Site A AS/SVE system (December, March, June, and Sept).
(6) Sample semiannually through FY 2003 as an extraction well. Beginning in FY 2004, sample biennially because it is no longer pumped.
(7) Quarterly water levels and water quality (December, March, June, and September).
(8) Sample annually for five years (FY 2003 through FY 2007) to verify that there have been no adverse impacts to groundwater due to shallow soil remediation work.

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Operable Unit 1											
03U	03U811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03U	03U815			---	---	---	---	---	---	---	
03U	03U821			---	Q,L(B)	---	---	---	OR	3.b	
03U	03U822				Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03U	03U831			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03U	409550	PCA 6U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03U	409596	BS118U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03M	03M843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03L	03L813			---	---	---	---	---	---	---	
03L	03L822			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L841			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L846			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L853			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L856			---	---	---	---	---	---	---	
03L	409546	PCA2L3		---	---	---	---	---	---	---	
03L	409556	PCA4L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409557	PCA1L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409597	BS118L3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U821			---	Q,L(B)	---	---	---	OR	3.b	
PC	04U834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U836	MW-1		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U837	MW-3		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U838	MW-5		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U839	MW-7		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U841			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U844			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U846			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U847			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U849			---	Q,L(B)	---	---	---	OR	3.b	
PC	04U850			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U855			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U871			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U872			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U875			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U877			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U879			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U880			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U881			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	04U882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U883			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
PC	191942	BS118U4		---	Q,L(B)	---	---	---	---	---	One-time event (missed '01)
PC	200154	UM Golf Course		---	Q (B)	---	Q (B)	---	1.a, OR	---	
PC	206688	Cloverpond		---	Q (B)	---	Q (B)	---	1.a, OR	---	
PC	234547	Hnywell Ridgway		---	---	---	---	---	---	---	
PC	409547	PCA1U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409548	PCA2U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409549	PCA3U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409555	PCA5U4		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	512761	Gross Golf Course #2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	554216	New Brighton #14									See Appendix A.2
PC	582628	New Brighton #15									See Appendix A.2
J	04J834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	04J835			---	---	---	---	---	---	---	
J	04J836	MW-2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J837	MW-4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J838	MW-6		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J839	MW-8		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	200524	St. Anthony #5	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
J	200803	St. Anthony #4	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
J	206796	New Brighton #5									See Appendix A.2
J	206797	New Brighton #6									See Appendix A.2
PC/J	200804	St. Anthony #3	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
PC/J	200812	Gross Golf #1		---	---	---	---	---	---	---	
PC/J	200814	American Linen		---	---	---	---	---	---	---	
PC/J	206792	New Brighton #4									See Appendix A.2
PC/J	206793	New Brighton #3									See Appendix A.2
PC/J	233221	Reuben Meats		---	---	---	---	---	---	---	
PC/J	234549	Reiner		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC/J	PJ#318			---	Q,L(B)	---	Q,L(B)	---	OR	None	
UNK	234546	Hnywell Ridgway		---	Q(B)	---	Q(B)	---	OR	---	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Operable Unit 2											
Site A Removal Action											
01U	01U038			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U039			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U040			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U041			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U063			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U067			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U102			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U103		(5)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U104			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U105			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U106			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U107			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U108		(5)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U110			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U115			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U116			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U117			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U118			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U119		(8)	L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	(Note 8)	2.b	See Page 2 of Appendix A.4
01U	01U120			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U125			---	---	---	---	---	OR	2.b	
01U	01U126			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U127			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U133			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U135			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U136			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U137			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U138			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U139			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U140			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U141			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U145	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U146	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U147	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U148	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U149	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U150	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U151	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U152	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U153	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
01U	01U154	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U155	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U156	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U157			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U158			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U350		(5)	Q,L(B)	---	---	---	---	OR	2.b	
01U	01U351	EW-1									See Appendix A.2
01U	01U352	EW-2									See Appendix A.2
01U	01U353	EW-3									See Appendix A.2
01U	01U354	EW-4									See Appendix A.2
01U	01U355	EW-5		---	---	---	---	---	---	---	
01U	01U356	EW-6		---	---	---	---	---	---	---	
01U	01U357	EW-7		---	---	---	---	---	---	---	
01U	01U358	EW-8		---	---	---	---	---	---	---	
01U	01U901			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U902			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U903			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U904			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Site I Remedial Action											
01U	01U004			---	---	---	---	---	---	---	
01U	01U054			---	---	---	---	---	---	---	
01U	01U064			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U132			---	---	---	---	---	---	---	
01U	01U631			---	---	---	---	---	---	---	
01U	01U632			---	---	---	---	---	---	---	
01U	01U634			---	---	---	---	---	---	---	
01U	01U635			---	---	---	---	---	---	---	
01U	01U636			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U638			---	---	---	---	---	---	---	
01U	01U639			Q,L(A)	L(A)	L(A)	L(A)	L(A)	1a, OR	1a, OR	
01U	01U640			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U642			---	---	---	---	---	---	---	
01U	01U652			---	---	---	---	---	---	---	
01U	01U666			---	---	---	---	---	---	---	
01U	01U667			---	---	---	---	---	---	---	
01U	01U668			---	---	---	---	---	---	---	
01U	01U675			---	---	---	---	---	---	---	
01U	482086	I01MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482087	I05MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482088	I02MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482089	I04MW		L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482090	I03MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Site K Remedial Action											
01U	01U047			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U048			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U052			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U065			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U128			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U601			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U602			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U603			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U604			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U605			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U607			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U608			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U609			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U611			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U612			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U613			L(A)	Q,L(A)	L(A)	L(A)	L(A)	OR	3.a	
01U	01U615			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U616			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U617			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U618			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U619			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U620			L(A)	Q,L(A)	L(A)	L(A)	L(A)	OR	3.a	
01U	01U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U622			---	---	---	---	---	---	---	
01U	01U623			---	---	---	---	---	---	---	
01U	01U624			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U625			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U626			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U627			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U628			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	482083	K04-MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	482084	K02-MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	482085	K01-MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
03U	03U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	

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FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
TCAAP Groundwater Recovery System											
03F	03F302	B1									See Appendix A.2
03F	03F303	B2		See App. A.2	See App. A.2	Q.I.(A)	Q.I.(A)	Q.I.(A)	OR	1.a	
03F	03F304	B3									See Appendix A.2
03F	03F305	B4									See Appendix A.2
03F	03F306	B5									See Appendix A.2
03F	03F307	B6									See Appendix A.2
03F	03F308	B7	(6)	See App. A.2	See App. A.2	Q.I.(A)	Q.I.(A)	---	OR	1.a	
03F	03F312	B11									See Appendix A.2
03F	03F319	B13									See Appendix A.2
03U	03U001			---	L(A)	---	L(A)	---	---	1.a	
03U	03U002			---	Q.L(A)	---	L(A)	---	---	1.a	
03U	03U003			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U004			---	L(A)	---	L(A)	---	---	1.a	
03U	03U005			---	L(A)	---	L(A)	---	---	1.a	
03U	03U007			---	Q.L(A)	---	Q.L(A)	---	Background	1.a	
03U	03U008			---	L(A)	---	L(A)	---	---	1.a	
03U	03U009			---	Q.L(A)	---	Q.L(A)	---	Background	1.a	
03U	03U010			---	L(A)	---	L(A)	---	---	1.a	
03U	03U011			---	L(A)	---	L(A)	---	---	1.a	
03U	03U012			---	L(A)	---	L(A)	---	---	1.a	
03U	03U013			---	L(A)	---	L(A)	---	---	1.a	
03U	03U014			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U015			---	L(A)	---	L(A)	---	---	1.a	
03U	03U016			---	L(A)	---	L(A)	---	---	1.a	
03U	03U017			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U018			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U019			---	L(A)	---	L(A)	---	---	1.a	
03U	03U020			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U021			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U022			---	L(A)	---	L(A)	---	---	1.a	
03U	03U023			---	L(A)	---	L(A)	---	---	1.a	
03U	03U024			---	L(A)	---	L(A)	---	---	1.a	
03U	03U025			---	L(A)	---	L(A)	---	---	1.a	
03U	03U026			---	L(A)	---	L(A)	---	---	1.a	
03U	03U027			---	L(A)	---	L(A)	---	---	1.a	
03U	03U028			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U029			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U030			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U031			---	L(A)	---	L(A)	---	---	1.a	
03U	03U032			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	
03U	03U075			---	Q.L(A)	---	Q.L(A)	---	OR	1.a	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
03U	03U076			---	L(A)	---	L(A)	---	---	1.a	
03U	03U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U082			---	L(A)	---	L(A)	---	---	1.a	
03U	03U083			---	L(A)	---	L(A)	---	---	1.a	
03U	03U084			---	L(A)	---	L(A)	---	---	1.a	
03U	03U087		(8)	---	Q(B),L(A)	Q(B)	Q(B),L(A)	Q(B)	(Note 8)	1.a	See Page 2 of Appendix A.4
03U	03U088			---	L(A)	---	L(A)	---	---	1.a	
03U	03U089		(8)	---	Q(B),L(A)	Q(B)	Q(B),L(A)	Q(B)	(Note 8)	1.a	See Page 2 of Appendix A.4
03U	03U090			---	L(A)	---	L(A)	---	---	1.a	
03U	03U092			---	L(A)	---	L(A)	---	---	1.a	
03U	03U093			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U094			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U096			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U097		(8)	---	Q(B)	Q(B)	Q(B)	Q(B)	(Note 8)	---	See Page 2 of Appendix A.4
03U	03U099			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U111			---	L(A)	---	L(A)	---	---	1.a	
03U	03U112			---	L(A)	---	L(A)	---	---	1.a	
03U	03U113			---	L(A)	---	L(A)	---	---	1.a	
03U	03U114			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U121			---	---	---	---	---	---	---	
03U	03U124			---	---	---	---	---	---	---	
03U	03U129			---	---	---	---	---	---	---	
03U	03U301	SC1									See Appendix A.2
03U	03U314	SC2									See Appendix A.2
03U	03U315	SC3	(6)	See App. A.2	See App. A.2	Q,L(A)	Q,L(A)	---	OR	1.a	
03U	03U316	SC4	(6)	See App. A.2	See App. A.2	---	Q,L(A)	---	OR	1.a	
03U	03U317	SC5									See Appendix A.2
03U	03U521			---	---	---	---	---	---	---	
03U	03U647			---	L(A)	---	L(A)	---	---	1.a	
03U	03U648			---	L(A)	---	L(A)	---	---	1.a	
03U	03U658			---	L(A)	---	L(A)	---	---	1.a	
03U	03U659			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U671			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U672			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U674			---	L(A)	---	L(A)	---	---	1.a	
03U	03U675			---	---	---	---	---	---	---	
03U	03U676			---	L(A)	---	L(A)	---	---	1.a	
03U	03U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U703			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U704			---	L(A)	---	L(A)	---	---	1.a	
03U	03U705			---	L(A)	---	L(A)	---	---	1.a	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
03U	03U706			---	L(A)	---	L(A)	---	---	1.a	
03U	03U707			---	L(A)	---	L(A)	---	---	1.a	
03U	03U708			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U710			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U711			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U715			---	L(A)	---	L(A)	---	---	1.a	
03U	03U716			---	L(A)	---	L(A)	---	---	1.a	
03U	03U801			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U803			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U804			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U805			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	519288	E101-MW		---	---	---	---	---	---	---	
03U	519289	E102-MW		---	---	---	---	---	---	---	
03U	519290	E103-MW		---	---	---	---	---	---	---	
03U	519291	1291501-MW		---	---	---	---	---	---	---	
03M	03M001			---	L(A)	---	L(A)	---	---	1.a	
03M	03M002			---	Q,L(A)	---	L(A)	---	---	1.a	
03M	03M003			---	Q,L(A)	---	L(A)	---	---	1.a	
03M	03M004			---	L(A)	---	L(A)	---	---	1.a	
03M	03M005			---	L(A)	---	L(A)	---	---	1.a	
03M	03M007			---	L(A)	---	L(A)	---	---	1.a	
03M	03M010			---	L(A)	---	L(A)	---	---	1.a	
03M	03M012			---	L(A)	---	L(A)	---	---	1.a	
03M	03M013			---	L(A)	---	L(A)	---	---	1.a	
03M	03M017			---	L(A)	---	L(A)	---	---	1.a	
03M	03M020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M713			---	L(A)	---	L(A)	---	---	1.a	
03M	03M802			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M806			---	Q,L(A)	---	L(A)	---	---	1.a	
03L	03L001			---	L(A)	---	L(A)	---	---	1.a	
03L	03L002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L003			---	Q,L(A)	---	L(A)	---	---	1.a	
03L	03L004			---	L(A)	---	L(A)	---	---	1.a	
03L	03L005			---	L(A)	---	L(A)	---	---	1.a	
03L	03L007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03L	03L010			---	L(A)	---	L(A)	---	---	1.a	
03L	03L012			---	L(A)	---	L(A)	---	---	1.a	
03L	03L013			---	L(A)	---	L(A)	---	---	1.a	
03L	03L014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	

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FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
03L	03L018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L021			---	Q,L(A)	---	L(A)	---	---	1.a	
03L	03L027			---	L(A)	---	L(A)	---	---	1.a	
03L	03L028			---	L(A)	---	L(A)	---	---	1.a	
03L	03L029			---	L(A)	---	L(A)	---	---	1.a	
03L	03L077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L080			---	L(A)	---	L(A)	---	---	1.a	
03L	03L081			---	L(A)	---	L(A)	---	---	1.a	
03L	03L084			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L086			---	---	---	---	---	---	---	
03L	03L091			---	---	---	---	---	---	---	
03L	03L113			---	L(A)	---	L(A)	---	---	1.a	
03L	03L137			---	---	---	---	---	---	---	
03L	03L138			---	---	---	---	---	---	---	
03L	03L802			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L806			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L809			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L833			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U001			---	L(A)	---	L(A)	---	---	1.a	
PC	04U002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U003			---	Q,L(A)	---	L(A)	---	---	1.a	
PC	04U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U012			---	L(A)	---	L(A)	---	---	1.a	
PC	04U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U027			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U510			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U711			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U714			---	L(A)	---	L(A)	---	---	1.a	
PC	04U802			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U833			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J077			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	

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FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
J	04J708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J714			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#003			---	Q,L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#027			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#074			---	---	---	---	---	---	---	
PC/J	PJ#309	B8									See Appendix A.2
PC/J	PJ#310	B9									See Appendix A.2
PC/J	PJ#311	B10		See App. A.2	See App. A.2	Q,L(A)	Q,L(A)	---	OR	1.a	
PC/J	PJ#313	B12	(6)	See App. A.2	See App. A.2	---	Q,L(A)	---	OR	1.a	
PC/J	PJ#802			---	Q,L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
SG	Staff Gauges			---	L(A)	---	L(A)	---	---	---	

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APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Unit 1 Wells											
01U	01U035			---	---	---	---	---	---	---	
01U	01U043			---	---	---	---	---	---	---	
01U	01U044			---	---	---	---	---	---	---	
01U	01U045			---	---	---	---	---	---	---	
01U	01U046			---	---	---	---	---	---	---	
01U	01U060		(8)	---	Q(B)	Q(B)	Q(B)	Q(B)	(Note 8)	---	See Page 2 of Appendix A.4
01U	01U072			---	---	---	---	---	---	---	
01U	01U085			---	---	---	---	---	---	---	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Operable Unit 3											
03U	03U673			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U832			---	---	---	---	---	---	---	
03M	03M848			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L673			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L832			---	---	---	---	---	---	---	
03L	03L848			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L854			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L859			---	L(A)	---	L(A)	---	---	1.a	
03L	03L860			---	L(A)	---	L(A)	---	---	1.a	
03L	03L861			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	476837	MW15H		---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U414	414U4		---	---	---	---	---	---	---	
PC	04U673			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U832			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U845			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U848			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U851			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U852			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U854			---	L(A)	---	L(A)	---	---	1.a	
PC	04U859			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U860			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U861			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U863	323U4	(7)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U864	324U4	(7)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U865	325U4	(7)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U866	326U4	(7)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	520931	NBM #13									See Appendix A.2
J	04J864	324 J	(7)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J866	326 J	(7)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Other Installation Restoration Activities											
TCAAP Well Inventory											
(Entries under "Notes" refer to the well inventory category)											
---	234356	Nordquist, Bob	1a	---	---	---	Q(B)	---	Well Inventory	---	1873 Old Hwy 8
---	249608	Rapit Printing, Inc	1a	---	---	---	Q(B)	---	Well Inventory	---	2520 Larpenteur Ave
---	433298	Town & Cntry Golf Crse	1a	---	---	---	Q(B)	---	Well Inventory	---	2279 Marshall Ave
---	509052	Shriners Hospital	1a	---	---	---	Q(B)	---	Well Inventory	---	2025 E River Rd
---	800311	Inglebrech, Brenda	1a	---	---	---	Q(B)	---	Well Inventory	---	1390 Silver Lake Rd
---	800444	Mnpls Parks & Rec Dept	1a	---	---	---	Q(B)	---	Well Inventory	---	Ontario & E River Rd
---	200173	KSTP Radio TV	1b	---	---	---	Q(B)	---	Well Inventory	---	3415 University Ave
---	234355	Kingdom Hall	1b	---	---	---	Q(B)	---	Well Inventory	---	1987 Mound St
---	234421	BioChem	1b	---	---	---	Q(B)	---	Well Inventory	---	2151 Mustang Dr
---	234469	Palwski, T.	1b	---	---	---	Q(B)	---	Well Inventory	---	2816 Hwy 88
---	234544	R&D Systems	1b	---	---	---	Q(B)	---	Well Inventory	---	2201 Kennedy St NE
---	249632	Montzka, Harold	1b	---	---	---	Q(B)	---	Well Inventory	---	2301 N Upland Crest NE
---	537801	Midwest Industrial	1b	---	---	---	Q(B)	---	Well Inventory	---	4759 Old Hwy 8
---	200180	Town & Cntry Golf Crse	1c	---	---	---	Q(B)	---	Well Inventory	---	2279 Marshal Ave
---	200522	Pemtom	1c	---	---	---	Q(B)	---	Well Inventory	---	Silver Lake Rd
---	200523	Pemtom	1c	---	---	---	Q(B)	---	Well Inventory	---	Silver Lake Rd & Co Rd E
---	756236	Pechiney Plastic Pckging	1c	---	---	---	Q(B)	---	Well Inventory	---	150 26th Ave SE
---	800437	Northern Star Co.	1c	---	---	---	Q(B)	---	Well Inventory	---	3171 5th St SE
---	249113	Wyttenbach, Daniel	2a	---	---	---	Q(B)	---	Well Inventory	---	990 11th Ave NW
---	200176	Waldorf Paper Products	2b	---	---	---	Q(B)	---	Well Inventory	---	2236 Myrtle Ave
---	234571	Leiser, Mark	2b	---	---	---	Q(B)	---	Well Inventory	---	1901 17th St NW
---	800002	Midland Hills Cntry Club	2b	---	---	---	Q(B)	---	Well Inventory	---	2001 N Fulham St
---	127537	Midwest Asphalt	2c	---	---	---	Q(B)	---	Well Inventory	---	1400 Old Hwy 8
---	200076	Old Dutch Foods, Inc.	2c	---	---	---	Q(B)	---	Well Inventory	---	2375 Terminal Rd
---	236029	R&D Systems, S. Well	2c	---	---	---	Q(B)	---	Well Inventory	---	2201 Kennedy St NE
---	236439	Waldorf Paper Products	2c	---	---	---	Q(B)	---	Well Inventory	---	2250 Wabash Ave
---	249118	Cameron, David	4a	---	---	---	Q(B)	---	Well Inventory	---	1003 7th St NW
---	249150	Barres, Martha	4a	---	---	---	Q(B)	---	Well Inventory	---	3511 Stinson Blvd NE
---	249185	Novotny, Mark	4a	---	---	---	Q(B)	---	Well Inventory	---	1706 Malvern St
---	249191	Wells, Henry	4a	---	---	---	Q(B)	---	Well Inventory	---	1651 Millwood Ave
---	800294	Western Remodelers	4a	---	---	---	Q(B)	---	Well Inventory	---	2520 W Larpenteur Ave
---	800295	Alfson, Loren	4a	---	---	---	Q(B)	---	Well Inventory	---	2351 Summer St
---	800409	Ohara, Rose	4a	---	---	---	Q(B)	---	Well Inventory	---	3553 Stinson Blvd NE
---	800608	Grundtner, James	4a	---	---	---	Q(B)	---	Well Inventory	---	136 Oakwood Dr
---	---	Polynesian Village	4a	---	---	---	Q(B)	---	Well Inventory	---	1417 NW 10th St

APPENDIX A.1

FY 2002 - FY 2006 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 02	June 03	June 04	June 05	June 06	Water Quality	Water Level	Comments
Grenade Range											
---	653903	GR1-1		Q(B)	Q(B)	Q(B)	---	---	OR	---	
---	653904	GR1-2		Q(B)	Q(B)	Q(B)	---	---	OR	---	
---	653905	GR2-1		Q(B)	Q(B)	Q(B)	---	---	OR	---	
---	675976	GR-DF1		Q(B)	Q(B)	Q(B)	---	---	OR	---	
CAMU Monitoring											
---	589650	CM1MW		---	Q(B)	---	---	---	OR	---	Sample in Sept 03 (not June)
---	616601	CM2MW		---	Q(B)	---	---	---	OR	---	Sample in Sept 03 (not June)
---	616602	CM3MW		---	Q(B)	---	---	---	OR	---	Sample in Sept 03 (not June)
---	624019	CM5MW		---	Q(B)	---	---	---	OR	---	Sample in Sept 03 (not June)

APPENDIX A.2
FY 2002 - FY 2006 MONITORING PLAN
FOR REMEDIAL TREATMENT SYSTEMS

OU1: DEEP GROUNDWATER(1)

Location	Sampling Frequency	Parameters
• Extraction Wells NBM#4, #14, and #15	- Monthly	- Pumping Volumes
(also NBM #3, #5, and #6)	- Monthly	- Water Quality (2)
• PGAC Effluent	- Monthly	- Water Quality (2)

OU2: SITES D & G SOIL VAPOR EXTRACTION (SVE) SYSTEMS

Location	Sampling Frequency	Parameters
• Site D	- N/A (dismantled)	
• Site G	- N/A (can be dismantled)	

OU2: SITE A SHALLOW GROUNDWATER

Location	Sampling Frequency	Parameters
• Extraction Wells 01U351-01U354	- Monthly	- Pumping Volumes
	- Monthly	- Water Levels
	- Annual	- Water Quality (2)
• Extraction/Discharge System Effluent	- Monthly	- C12DCE, T12DCE, TRCLE, 111TCE, HG (3)

OU2: SITE A AIR SPARGING/SVE SYSTEM

Location	Sampling Frequency	Parameters
• SVE Emissions	- N/A (operation has been ceased)	

OU2: SITE K REMEDIAL ACTION

Location	Sampling Frequency	Parameters
• Treatment System Effluent (Outfall 391 (010))	- See Appendix A.3	- See Appendix A.3
• Extracted Groundwater	- Monthly	- Volume

OU2: TCAAP GROUNDWATER RECOVERY SYSTEM (TGRS)

Location	Sampling Frequency	Parameters
• Treatment System Influent	- Monthly	- Water Quality (2)
	- Monthly	- Volume
• Treatment System Effluent	- Monthly	- Water Quality (2)
• Extraction Wells	- Semi-Annually	- Water Levels and Water Quality (2)

OPERABLE UNIT 3 PLUME GROUNDWATER RECOVERY SYSTEM (PGRS) [Not Operating]

Location	Sampling Frequency	Parameters
• Extraction Well (NBM#13)	- Quarterly	- Water Quality (2)

Notes:

(1) Performed by the City of New Brighton using their Sampling and Analysis Plan.

(2) The required analyte list for each specific site is presented in Appendix A.4.

(3) Site A effluent sampling frequency and parameters are as required by the MCES Special Discharge Permit (#2194).

APPENDIX A.3
FY 2002 - FY 2006 MONITORING PLAN FOR SURFACE WATER

Analysis	Analytical Method	Units	Outfall 010 Site K Effluent	20700 Rice Creek (Entering TCAAP)	20800 Rice Creek (Leaving TCAAP)
Flow Rate	- -	M gal/day	Continuous	- -	- -
Total Flow	- -	M gal	M	- -	- -
pH	(field)	(pH)	Q	A	A
Cyanide	9012A	ug/l	Q	A	A
Copper	6020	ug/l	Q	A	A
Lead	6020	ug/l	Q	A	A
Mercury	7470A	ug/l	Q	A	A
Phosphorus (Total)	365.4	mg/l	Q	A	A
Silver	7761	ug/l	Q	A	A
Zinc	6020	ug/l	Q	A	A
Trichloroethene	8260B	ug/l	Q	A	A
1,1-Dichloroethene	8260B	ug/l	Q	A	A
1,1-Dichloroethane	8260B	ug/l	Q	A	A
Cis-1,2-Dichloroethene	8260B	ug/l	Q	A	A
Trans-1,2-Dichloroethene	8260B	ug/l	Q	A	A
Vinyl Chloride	8260B	ug/l	Q	A	A
1,2-Dichloroethane	8260B	ug/l	Q	A	A

Notes:

M = Measurement required once per month

Q = Analysis required once per quarter

A = Analysis required once per year

APPENDIX A.4
SITE SPECIFIC LISTS OF REQUIRED ANALYTES

Note: Cleanup levels (in ug/l) from each Record of Decision are shown below for use in determining the required method detection limits. Also note that these lists represent the minimum list of analytes. A larger analyte list may be utilized by the monitoring organization, if so desired.

OU1 (DEEP GROUNDWATER) (1)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

SITE A (SHALLOW GROUNDWATER) (2)

Antimony*	6
1,1-Dichloroethene	6
1,2-Dichloroethane	4
Benzene	10
Chloroform	60
cis-1,2-Dichloroethene	70
Tetrachloroethene	7
Trichloroethene	30

*Antimony is only monitored at 01U103, 01U902 and 01U904 on an annual basis.

SITE I (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30
Vinyl Chloride	0.2

SITE K (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30

OU2 (DEEP GROUNDWATER) (2)

1,1,1-Trichloroethane	200
1,1-Dichloroethane	70
1,1-Dichloroethene	6
1,2-Dichloroethane	4
cis-1,2-Dichloroethene	70
Tetrachloroethene	5
Trichloroethene	5

OU3 (DEEP GROUNDWATER) (3)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

Notes:

(1) From page 18 of the OU1 Record of Decision.

(2) From Table 1 of the OU2 Record of Decision.

(3) From Page 26 of the OU3 Record of Decision.

Analytical Methods:

VOCs: SW-846 Method 8260B

Antimony: SW-846 Method 6020

APPENDIX A.4 (cont'd)
SITE SPECIFIC LISTS OF REQUIRED ANALYTES

OTHER INSTALLATION RESTORATION ACTIVITIES

WELL INVENTORY SAMPLING

VOCs (Report all target list compounds for SW-846 Method 8260B)

OU2 SHALLOW SOIL SITE 5-YEAR GROUNDWATER MONITORING

01U119 (Site A)	Metals (antimony, barium, copper, lead)
03U089 (Site E)	Metals (antimony, barium, copper, lead, manganese)
01U060 (Site H)	Metals (antimony, arsenic, copper, lead, manganese)
03U087 (Site 129-3)	Metals (antimony, lead, manganese), Explosives (nitroglycerine), VOCs
03U097 (Site 129-5)	Metals (antimony, barium, lead)

GRENADE RANGE

SVOCs (bis (2-ethylhexyl) phthalate)
VOCs (ethylene glycol**)
PCBs (PCB-1016, 1221, 1232, 1242, 1248, 1254, 1260)
Metals (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, nickel, silver, thallium, vanadium, zinc)
Radionuclides (gross alpha, gross beta, radium 226, radium 228)

** Ethylene glycol monitoring is to be discontinued after the FY 2002 sampling event.

CAMU MONITORING

Explosives (1,3,5-TNB)
VOCs (1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, cis-1,2-dichloroethene, 1,1,1-trichloroethane, benzene, chloroform, ethylbenzene, methylene chloride, trichloroethene, tetrachloroethene)
Metals (antimony, arsenic, barium, beryllium, cadmium, copper, lead, manganese, nickel, thallium, zinc)

APPENDIX B

DESCRIPTION OF HYDROGEOLOGIC UNITS/WELL NOMENCLATURE AND TRICHLOROETHENE TRENDS

On- and off-TCAAP wells have been installed in four hydrogeologic units beneath the site. These hydrogeologic units, as referred to in this report, are conceptually illustrated on Figure B-1 and are described below:

Unit 1: This unit, referred to as the Fridley Formation, consists of alluvium and lacustrine deposits above the Twin Cities Formation (Unit 2). The formation is made up of fine- to medium-grained sand and clayey silt which acts as an unconfined aquifer with an estimated hydraulic conductivity of 8.3×10^{-3} cm/sec (International Technology Corp. 1992). The Unit 1 deposits are discontinuous at TCAAP and ranges in thickness from zero to 50 feet. They are predominantly limited to the north, east, and southwest portions of the site. Groundwater in Unit 1 is also discontinuous.

Unit 2: Known as the Twin Cities Formation, (Unit 2) consists of Quaternary aged glacial till and, similar to Unit 1, is discontinuous at TCAAP. Unit 2 is generally regarded as an aquitard to vertical migration of groundwater; however, sand and gravel lenses may contain water.

Unit 3: This unit consists primarily of the Quaternary aged Hillside Sand Formation which is continuous beneath TCAAP. Near the center of TCAAP, the Hillside Sand Formation is overlain by the Arsenal Sand, which forms a kame. There is no distinct lithologic contact between the Hillside Sand and the Arsenal Sand, and both are considered included in Unit 3. Unit 3 ranges in thickness from 25 to 450 feet. For monitoring purposes, the Unit 3 aquifer thickness has been arbitrarily subdivided into thirds designated as upper, middle, and lower.

Unit 4: This unit consists collectively of bedrock from the Prairie du Chien Group and Jordan Formation (Ordovician and Cambrian periods, respectively). For monitoring purposes, the Prairie du Chien Group is referred to as Upper Unit 4, while the Jordan Formation is Lower Unit 4. The Jordan Formation varies from fine- to coarse-grained quartz sandstone. The Prairie du Chien Group in the TCAAP area consists of a finely crystalline dolomite of the Oneota Formation, as well as quartz sandstone and dolomite members of the Shakopee Formation. A more detailed description of the bedrock geology can be found in the Remedial Investigation Report (Argonne National Laboratory, 1991).

In order to identify the hydrogeologic unit in which each well is completed, the United States Army Environmental Center (USAEC), formerly the United States Army Toxic and Hazardous Materials Agency (USATHAMA), developed a standardized identification system for wells at TCAAP (referred to as the IRDMIS number). Well designations consist of six characters, such as 03U093. The first two characters represent the hydrogeologic unit in which the well is completed, as follows:

01	-	Unit 1
03	-	Unit 3
04	-	Unit 4: Prairie du Chien Group <u>or</u> Jordan Formation
PJ	-	Unit 4: Prairie du Chien Group <u>and</u> Jordan Formation

The third character represents the relative position of the well screen or open hole within the specified hydrogeologic unit, as follows:

U	-	upper portion
M	-	middle portion
L	-	lower portion
J	-	Jordan Sandstone
F	-	fully penetrating Unit 3
#	-	open hole (total or partial thickness)

The remaining three characters represent the well number, as follows:

001 thru 500	USAEC wells and additional wells installed by others adjacent to an existing well with the 001-500 designation.
501 thru 600	TCAAP wells.
601 thru 800	On-post Alliant Techsystems Inc. wells.
801 thru 999	Off-post Alliant Techsystems Inc. wells.

Off-TCAAP wells installed by parties other than USAEC, TCAAP, or Alliant Techsystems Inc. are designated by their Minnesota unique number. A well-designation cross-reference guide is included as Tables B-1 and B-2, which lists all wells of concern, the Minnesota unique number, the IRDMIS number, and any other name(s) the wells may have. Table B-1 is sorted by unique number and Table B-2 is sorted by IRDMIS number. The well type in these two tables is abbreviated as follows:

UN	-	Unknown
MUNI	-	Municipal
MON	-	Monitoring
DOM	-	Domestic
IND	-	Industrial
P.S.	-	Public Supply
COM	-	Commercial
IRR	-	Irrigation
ABAND	-	Abandoned
PIEZ.	-	Piezometer
REM	-	Remedial

Tables B-3 and B-4, which contain the same list of wells as Table B-2 (i.e., a listing that is sorted by IRDMIS number), can be used to view the boring log for a given well, if available. To view the well log, click on the desired well name in the table with the mouse. Table B-3 provides the boring logs for on-TCAAP wells and Table B-4 provides the boring logs for off-TCAAP wells.

Figures B-2 and B-3 show locations for off- and on-TCAAP wells, respectively. With a known well name, the location of that well can be determined using the "Edit, Find" function and then typing in the desired well name, which will highlight this well name on the figure. Using either of the figures, the trichloroethene trend graph for a specific well can be viewed by clicking on the desired well name with the mouse. Sealed wells and wells not routinely monitored do not have trend graphs available. Refer to the historical water quality database in Appendix D for this information.

TABLE B-1
TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
107405		ROEBKE	OFF	UN		
110485		NEW BRIGHTON #12	OFF	MUNI		
114410	03U521		OFF	MON		
122210		ST. PAUL PORT AUTH. #3	OFF	IND		
127537		MIDWEST ASPHALT	OFF	DOM		
134318		LORENZ W SEUTTER	OFF	DOM		
139035		WATERGATE MARINA	OFF	P.S.		
151568		ARDEN MANOR MOBILE HOME	OFF	P.S.		
161432		NEW BRIGHTON #10	OFF	MUN		
191942		118PDC/MODEL STONE	OFF	MON		
194701	01U620	OW120U1	ON	MON		
194702	01U621	PW121U1	ON	MON		
194703	01U622	OW122U1	ON	MON		
194704	01U623	OW123U1	ON	MON		
194716	01U634	OW504U1	ON	MON		
194717	01U638	OW508U1		MON		
194718	01U639	OW509U1	ON	MON		
194719	01U640	OW510U1	ON	MON		
194720	01U631	OW501U1	ON	MON		
194721	01U632	OW502U1		MON		
194722	01U635	OW505U1	ON	MON		
194723	01U636	OW506U1	ON	MON.		
194724	01U642	OW512U1	ON	MON		
194725	01U612	OW112U1	ON	MON		194758
194726	01U613		ON	MON		194759
194727	01U615	OW115U1	ON	MON		194760
194728	01U616	OW116U1	ON	MON		194761
194729	01U617	OW117U1	ON	MON		194770
194730	01U618	OW118U1	ON	MON		194771
194772	01U619	PW119U1	ON	MON		
200070		RUAN TRANSPORT	OFF	COM	✓	
200071		PRESTRESSED CONCRETE	OFF	IND	✓	
200072		WITTE TRANSPORTATION	OFF	IND	✓	
200073		WILSON TRANSFER & STORAGE	OFF	IND		
200074		ASBESTOS PROD	OFF	IND	✓	
200075		PHILLIPS PETROLEUM	OFF	IND	✓	
200076		OLD DUTCH FOODS INC	OFF	IND		
200077		JOHN CONLIN	OFF	DOM	✓	
200078		WILLIAM CLASS	OFF	DOM		
200079		LAWRENCE SCHOENING	OFF	DOM		
200080		CARL A OSTROM & SON	OFF	DOM		
200081		A. O. LIEBIG	OFF	DOM		
200082		2196 MARION ROAD	OFF	DOM		
200148		PAPER CALMERSON	OFF	IND	✓	
200154		U OF M GOLF COURSE	OFF	IRR		
200167		KOPPERS COKE #1	OFF	IND		
200171		PLATING INC	OFF	IND		
200197		SNOW FLAKE DAIRY	OFF	COM		
200264		1620 CENTRAL	OFF	IND		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
200384		METALLURGICAL INC. WELL #1	OFF	IND		
200524		ST. ANTHONY #5	OFF	MUNI		
200525		PLETSCHER	OFF	UN		
200531		NAZARETH	OFF	UN		
200599		CEDAR AVE. TRIANGLE	OFF	P.S.		
200602		ATKINSON MILL CO.	OFF	IND		
200629		GENERAL MILLS	OFF	IND		
200803		ST. ANTHONY #4	OFF	P.S.		
200804		ST. ANTHONY #3	OFF	MUNI		
200812		GROSS GOLF COURSE #1	OFF	COM		
200814		AMERICAN LINEN	OFF	IND		
201074		GLEASSON MORTUARY	OFF	COM		
201082		NORTHWESTERN HOSPITAL	OFF	P.S.		
206669		FRIDLEY #8	OFF	MUNI		
206672		FRIDLEY #9	OFF	MUNI		
206673		FRIDLEY #6	OFF	MUNI		
206688		CLOVERPOND WELL	OFF	DOM		
206689		JAMES K. O'NEIL	OFF	UN		
206693		FERNELIUS	OFF	UN		
206702		MINN E.S.	OFF	UN		
206720		MOUNDSVIEW	OFF	MUNI		
206722		M0UNDSVIEW #5	OFF	MUNI		
206724	PJ#504	TWIN CITIES ARSENAL	OFF	ABAND	✓	
206725	03L523	ARSENAL GRAVEL PIT	ON	ABAND	✓	
206750		SHORE #4	OFF	MUNI		
206753	PJ#506	TWIN CITIES ARSENAL NO. 6	ON		✓	
206754	PJ#501	TWIN CITIES ARSENAL NO. 1	ON	P.S.	✓	
206755	PJ#507	TWIN CITIES ARSENAL NO. 7	ON	ABAND	✓	
206756	PJ#502	TWIN CITIES ARSENAL NO. 2	ON	IND	✓	
206758	PJ#503	TWIN CITIES ARSENAL NO. 3	ON	IND	✓	
206759	PJ#508	TWIN CITIES ARSENAL NO. 8	ON	ABAND	✓	
206760	03M509		ON		✓	
206760	PJ#509	TWIN CITIES ARSENAL NO.9	ON	DOM	✓	
206787		MOUNDSVIEW H.S.	OFF	P.S.		
206789		NEW BRIGHTON #1	OFF	MUNI	✓	
206791		NEW BRIGHTON #7	OFF	MUNI		
206792		NEW BRIGHTON #4				
206793		NEW BRIGHTON #3	OFF	MUNI		
206794		NEW BRIGHTON #9	OFF	MUNI		
206795		NEW BRIGHTON #8	OFF	MUNI		
206796		NEW BRIGHTON #5	OFF	MUNI		
206797		NEW BRIGHTON #6	OFF	MUNI		
206798		NEW BRIGHTON #2	OFF	MUNI	✓	
223844		KURTH MALTING CO EAST WL	OFF	IND		
223992		BOOM ISLAND	OFF	IND		
225886		FRANKLIN STEEL SQUARE	OFF	P.S.		
225905		ST PAUL TERM. WAREHOUSE	OFF	IND		
225906		ST PAUL TERM. WAREHOUSE	OFF	IND		
231741		LABELLE	OFF	UN		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
231742	04U510	GRENADE PLANT PROOF RANGES	ON	IND		
231845		MNDOT CIVIL DEFENSE TRAIN.	ON/OFF	P.S.		
231854	03L522	ARSENAL GRAVEL PIT	ON	ABAND 8/9	✓	
231857	03M505			ABAND	✓	
231878		MENGELKOCH #2	OFF	UN		
232067		NBR 135	OFF	UN		
232069		UHIL	OFF	UN		
233221		REUBEN MEAT	OFF	DOM		
233222		LOWRY GROVE TRAILER	OFF	ABAND	✓	
233241		KOZAH'S MARKET	OFF	UN	✓	
233520		MCGILLIS	OFF	UN		
233533		ROSELAWN CEMETARY	OFF	IRR		
233763		P. L. MORGAN	OFF	DOM		
233806		2581 NORTH CLEVELAND	OFF	DOM		
234135	03U001	S1U3	ON	MON		
234136	03M001	S1M3	ON	MON		
234137	03L001	S1L3	ON	MON		
234138	04U001	S1U4	ON	MON		
234139	03U002	S2U3	ON	MON		
234140	03M002	S2M3	ON	MON		
234141	03L002	S2L3	ON	MON		
234142	03U003	S3U3	ON	MON		
234143	03M003	S3M3	ON	MON		
234144	03L003	S3L3	ON	MON		
234145	03U004	S4U3	ON	MON		
234146	03M004	S4M3	ON	MON		
234147	03L004	S4L3	ON	MON		
234148	03U005	S5U3	ON	MON		
234149	03U006	S6U3	ON	MON	✓	
234150	03U007	S7U3	ON	MON		
234151	03M007	S7M3	ON	MON		
234152	03L007	S7L3	ON	MON		
234153	03U008	S8U3	ON	MON		
234154	03U009	S9U3	ON	MON		
234155	03U010	S10U3	ON	MON		
234156	03M010	S10M3	ON	MON		
234157	03L010	S10L3	ON	MON		
234158	03U011	S11U3	ON	MON		
234159	03U012	S12U3	ON	MON		
234160	03M012	S12M3	ON	MON		
234161	03L012	S12L3	ON	MON		
234162	03U013	S13U3	ON	MON		
234163	03M013	S13M3	ON	MON		
234164	03L013	S13L3	ON	MON		
234165	03U014	S14U3	ON	MON		
234166	03U015	S15U3	ON	MON		
234167	03U016	S16U3	ON	MON		
234168	03U017	S17U3	ON	MON		
234169	03M017	S17M3	ON	MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
234170	03L017	S17L3	ON	MON		
234171	03U018	S18U3	ON	MON		
234172	03U019	S19U3	ON	MON		
234173	03U020	S20U3	ON	MON		
234174	03M020	S20M3	ON	MON		
234175	03L020	S20L3	ON	MON		
234176	03U021	S21U3	ON	MON		
234193	04U003	S3U4	ON	MON		
234194	04U002	S2U4	ON	MON		
234195	04U007	S7U4	ON	MON		
234196	04U012	S12U4	ON	MON		
234197	04U020	S20U4	ON	MON		
234198	01U004	S4U1	ON	MON		
234199	01U011	S11U1	ON	MON	✓	
234200	01U012	S12U1	ON	MON	✓	
234201	01U022	S22U1	ON	MON	✓	
234202	01U033	S33U1	ON	MON	✓	
234204	01U034	S34U1	ON	MON	✓	
234205	01U035	S35U1	ON	TEST		
234206	01U036	S36U1	ON	MON	✓	
234207	01U037	S37U1		MON	✓	
234208	01U038	S38U1		MON		
234209	01U039	S39U1	ON	MON		
234210	01U040	S40U1	ON	MON		
234211	01U041	S41U1	ON	MON		
234212	01U044	S44U1	ON	MON		
234215	01U045	S45U1	ON	MON		
234216	01U046	S46U1	ON	MON		
234217	01U047	S47U1	ON	MON		
234218	01U048	S48U1		MON		
234221	01U050	S50AU1		MON	✓	
234222	01U051	S51U1	ON	MON	✓	
234223	01U052	S52U1	ON	MON		
234225	01U053	S53AU1	ON	MON	✓	
234227	01U054	S54AU1		MON		
234235	01U060	S60U1	ON	MON		
234237	01U062	S62U1	ON	MON	✓	
234239	01U063	S63U1	ON	MON		
234240	01U064	S64U1	ON	MON		
234241	01U065	S65U1	ON	MON		
234243	01U067	S67U1	ON	MON		
234250	01U072	S72AU1	ON	MON		
234301		DEWITT	OFF	UN		
234305		GLENN BEGGIN	OFF	UN		
234319		HIDE & TALLOW #1	OFF	UN		
234327		BRESKE	OFF	UN		
234335		MENGELKOCH #1	OFF	UN		
234337		MENGELKOCH #3	OFF	UN	✓	
234350		GORDON	OFF	UN		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
234351		YEMPA	OFF	UN		
234352		1206 12TH AV NW	OFF	UN		
234353		LENTSCH'S ICE WK.	OFF	UN		
234355		KINGDOM HALL	OFF	UN		
234356		NORDQUIST P43	OFF	UN		
234357		PHILLIPS PET P46	OFF	UN		
234386		ZELL OLS.	OFF	UN		
234391		SHERER L.	OFF	UN		
234396		DEWITT	OFF	UN	✓	
234406		KLAPP	OFF	UN	✓	
234409		HIDE & TALLOW	OFF	UN		
234425		KEN GEREBI	OFF	UN	✓	
234430		CMIEL	OFF	UN	✓	
234431		HARSTAD	OFF	UN		
234463		KEN SOLIE	OFF	UN		
234546		HONEYWELL RIDGEWAY	OFF	UN		
234547		HONEYWELL RIDGEWAY	OFF	UN		
234549		REINER	OFF	IRR		
235539		OLD HOTEL	OFF	UN		
235557		HIDDEN FALLS PARK W.WELL	OFF	P.S.		
235565	PJ#074	S74PJ		MON		
235619		SHRINERS HOSPITAL	OFF	P.S.		
235735		FLOUR CITY ARCHITECTURAL	OFF	COM		
235748	03L014	S14L3	ON	MON		
235749	03L018	S18L3	ON	MON		
235750	03L021	S21L3	ON	MON		
235751	03L027	S27L3	ON	MON		
235752	03L028	S28L3		MON		
235753	03L029	S29L3		MON		236066
236066	03U094	S94U3	ON	MON		
236067	03L091	S91L3	ON	MON		
236068	03L086	S86L3	ON	MON		
236069	03U084	S84U3	ON	MON		
236070	03L081	S81L3	ON	MON		
236071	03L080	S80L3	ON	MON		
236072	03U079	S79U3	ON	MON		
236073	03U078	S78U3	ON	MON		
236074	03L078	S78L3	ON	MON		
236075	03U077	S77U3	ON	MON		
236076	03L077	S77L3	ON	MON		
236077	03U076	S76U3	ON	MON		
236078	03U075	S75U3	ON	MON		
236079	03L005	S5L3	ON	MON		
236080	03L113	WF1L3	ON	MON		
236122		NWR	OFF	ABAND		
236176	01U003	S3U1	ON	MON	✓	
236177	01U043	S43AU1		MON		
236178	03U022	S22U3		MON		
236179	03U023	S23U3		MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236180	03U024	S24U3		MON		
236181	03U025	S25U3		MON		
236182	03U026	S26U3	ON	MON		
236183	03U027	S27U3		MON		
236184	03U028	S28U3		MON		
236185	03U029	S29U3		MON		
236186	03U030	S30U3		MON		
236187	03U031	S31U3		MON		
236188	03U032	S32U3		MON		
236189	01U601	OW101U1	ON	MON		
236190	01U602	OW102U1	ON	MON		
236191	01U603	OW103U1	ON	MON		
236192	01U604	OW104U1	ON	MON		
236193	01U605	OW10571	ON	MON		
236194	01U524	FA4U1	ON	PIEZ.	✓	
236195	01U527	FV8U1	ON	PIEZ.	✓	
236196	01U525	FW5U1	ON	PIEZ.	✓	
236197	01U526	FV12U1	ON	PIEZ.	✓	
236437	PJ#802	T2PJ	OFF	MON		421437
236449	03U801	T1U3	OFF	MON		
236450	04U802	T2U4	OFF	MON		
236452	01U803	T3U1	OFF	TEST	✓	424053
236453	03U803	T3U3	OFF	MON		421434
236455	03U804	T4U3	OFF	MON		421433
236457	01U805	T5U1	OFF	MON	✓	424060
236458	03U805	T5U3	OFF	MON		421432
236460	01U806	T6U1	OFF	MON	✓	424058
236461	03U806	T6U3	OFF	MON		421431
236462	03M806	T6M3	OFF	MON		421430
236463	03L806	T6L3	OFF	MON		421429
236464	04U806	T6U4	OFF	MON		421428
236465	PJ#806	T6PJ	OFF	MON		421427
236468	PJ#003	S3PJ	ON	MON		
236469	PJ#027	S27PJ	ON	MON		
236471	01U807	T7U1	OFF	TEST	✓	424059
236476	03U082	S82U3	ON	MON		
236478	03U083	S83U3	ON	MON		
236479	01U085	S85U1	ON	MON		
236480	03U087	S87U3	ON	MON		
236482	03U088	S88U3	ON	MON		
236483	03U089	S89U3	ON	MON		
236485	03U090	S90U3	ON	MON		
236487	03U092	S92U3	ON	MON		
236489	03U093	S93U3	ON	MON		
236491	03U096	S96U3	ON	MON		
236493	03U097	S97U3	ON	MON		
236494	01U098	S98U1	ON	MON	✓	
236495	03U099	S99U3	ON	MON		
236497	01U100	S100U1	ON	MON	✓	

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236498	01U101	S101U1	ON	MON	✓	
236499	01U102	S102U1	ON	MON		
236500	01U103	S103U1	ON	MON		
236501	01U104	S104U1	ON	MON		
236502	01U105	S105U1	ON	MON		
236503	01U106	S106U1	ON	MON		
236504	01U107	S107U1	ON	MON		
236505	01U108	S108U1	ON	MON		
236506	01U109	S109U1	ON	MON	✓	
236507	01U110	S11OU1	ON	MON		
236508	03U111	S111U3	ON	MON		
236510	03U112	S112U3	ON	MON		
242124	03U113	WF1U3	ON	MON		
242125	03U114	WF2U3	ON	MON		
242127	01U607	OW107U1	ON	MON		
242128	01U608	OW108U1	ON	MON		
242129	01U609	OW109U1	ON	MON		
242130	01U610	OW110U1	ON	MON		
242131	01U611	OW111U1	ON	MON		
242132	03U647	OW517U3	ON	MON		
242133	03U648	OW518U3	ON	MON		
242134	01U652	OW522U1	ON	MON		
242135	01U666	OW536U1	ON	MON		
242136	01U667	OW537U1	ON	MON		
242137	01U668	OW538U1	ON	MON		
242138	04U027	S27U4		MON		
242153	01U813	H3U1	OFF	MON	✓	
242160	03L079	S79L3	ON	MON		
242162		301PB	OFF	UN		
242182	01U624A	BP185A	ON	PIEZ		
242183	01U624B	BP185B	ON	PIEZ		
242184	01U624C	BP185C	ON	PIEZ		
242185	01U624D	BP185D	ON	PIEZ		
242186	01U625A	BP285A	ON	PIEZ		
242187	01U625B	BP285B	ON	PIEZ		
242188	01U625C	BP285C	ON	PIEZ		
242189	01U625D	BP285D	ON	PIEZ		
242190	01U626A	BP385A	ON	PIEZ		
242191	01U626B	BP385B	ON	PIEZ		
242192	01U626C	BP385C	ON	PIEZ		
242193	01U626D	BP385D	ON	PIEZ		
242194	01U627A	BP485A	ON	PIEZ		
242195	01U627B	BP485B	ON	PIEZ		
242196	01U627C	BP485C	ON	PIEZ		
242197	01U627D	BP485D	ON	PIEZ		
242198	01U628A	BP585A	ON	PIEZ		
242199	01U628B	BP585B	ON	PIEZ		
242200	01U628C	BP585C	ON	PIEZ		
242201	01U628D	BP585D	ON	PIEZ		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
242207		SUNSET MEMORIAL CEMETARY	OFF	UN		
249152		BOYLE	OFF	DOM		
265735		FLOUR CITY ARCH	OFF	UN		
322664		ABBOTT NW HOSP	OFF	UN		
405651		METAL-MATIC INC.	OFF	IND		
406198	04U851	311U4	OFF	MON		
409546		PCA2L3	OFF	TEST		
409547		PCA1U4	OFF	TEST		
409548		PCA2U4	OFF	TEST		
409549		PCA3U4	OFF	TEST		
409550		PCA6U3	OFF	TEST		
409555		PCA5U4	OFF	TEST		
409556		PCA4L3	OFF	TEST		
409557		PCA1L3	OFF	TEST		
409595		B109U3	OFF	ABAND		
409596		B118U3	OFF	MON		
409597		B118L3	OFF	IND		
409598		B117U3	OFF	ABAND		
416051	03M848	308M3	OFF	MON		
416078	04U848	308U4	OFF	TEST		
416080	04U852	312U4	OFF	MON		
416081	03L858	318L3	OFF	MON	✓	
416082	04U849	309U4	OFF	MON		
416143			OFF	ABAND		
416198		311U4	OFF	MON		
416199	03L848	308L3	OFF	MON		
416200	04U850	310U4	OFF	MON		
420713		HERBST LANDFILL	OFF	MON		
421425	03U659	OW529U3	ON	MON		
421426	03U658	OW528U3	ON	MON		
421438	03U671	PO-1	ON	MON		
421440	03U672	PD2U3	OFF	MON		
421441	03U673	PD3U3	OFF	MON		
424052	01L822	NW2L1	OFF	TEST	✓	
424054	01L821	NW1L1	OFF	TEST	✓	
424055	01L811	H1L1; DNR Well	OFF	TEST		
424056	01L816	H6L1	OFF	ABAND	✓	
424057	01U808	T8U1	ON	MON	✓	
424061	01L823	NW3L1	OFF	TEST	✓	
424062	01L813	H3L1	OFF	TEST	✓	
426808	03U811	H1U3	OFF	TEST		
426809	03L811	H1L3	OFF	TEST		
426810	03U821	NW1U3	OFF	TEST		
426811	04U821	NW1U4	OFF	TEST		
426812	03U822	NW2U3	OFF	TEST		
426813	03L822	NW2L3	OFF	TEST		
426814	03U824	NW4U3	OFF	TEST	✓	
426815	03L673	PD3L3	OFF	TEST		
426816	03L813	H3L3	OFF	TEST		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426817	03L802	T2L3	OFF	TEST		
426818	03M802	T2M3	OFF	TEST		
426842	03F302	B1	ON	REM		
426843	03F303	B2	ON	REM		
426844	03F304	B3	ON	REM		
426845	03F305	B4	ON	REM		
426846	03F306	B5	ON	REM		
426847	03F307	B6	ON	REM		
426848	03U701	701U3	ON	MON		
426849	04U701	701U4	ON	MON		
426850	03U702	702U3	ON	MON		
426851	04U841	301U4	OFF	TEST		
426852	03M843	303M3	OFF	TEST		
426853	04U843	303U4	OFF	TEST		
426854	04U844	304U4	OFF	TEST		
426855	04U845	305U4	OFF	MON		
426856	04U846	306U4	OFF	MON		
426857	04U847	307U4	OFF	MON		
426858	03L853	313L3	OFF	MON		
426859	03L854	314L3	OFF	MON		
426860	04U855	315U4	OFF	MON		
426861	03L856	316L3	OFF	MON		
426862	03U815	H5U3	OFF	TEST		
426863	03U831	OM1U3	OFF	TEST		
426864	03U832	OM2U3	OFF	TEST		
426865	03L832	OM2L3	OFF	TEST		
426866	04U832	OM2U4	OFF	TEST		
426867	04U673	PD3U4	OFF	TEST		
426868	03L809	T9L3	OFF	MON		
426876	04U702	702U4	ON	MON		
426877	04U077	ST77U4	ON	MON		
426878	03U703	703U3		MON		
426879	03U708	708U3	ON	MON		
426880	04U708	708U4	ON	MON		
426881	03U709	709U3	ON	MON		
426882	04U709	709U4	ON	MON		
426883	03U704	704U3	ON	MON		
426884	03U705	705U3	ON	MON		
426885	03U706	706U3	ON	MON		
426886	03U707	707U3	ON	MON		
427410	01U120		ON	MON		
427411	01U115		ON	MON		
427412	01U116		ON	MON		
427413	01U117		ON	MON		
427414	01U118		ON	MON		
427415	01U119		ON	MON		
434031	04U711	711U4	OFF	MON		
434032	03U710	71OU3	ON	MON		
434033	03U711	711U3	OFF	MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
434034	04U861	321U4	OFF	MON		
434035	04U860	320U4	OFF	MON		
434036	04U859	319U4	OFF	MON		
434037	03L841	301L3	OFF	MON		
434038	03L860	320L3	OFF	MON		
434039	03L861	321L3	OFF	MON		
434040	03L859	319L3	OFF	MON		
439701	04U854	314U4	OFF	MON		
440884	03U121		ON	MON		
440885	03M005	ST-5-M3	ON	MON		
440886	03U129		ON	MON		
440887	03L084	ST84L3	ON	MON		
440888	01U122		ON	MON	✓	
440889	01U125		ON	MON		
440890	01U126		ON	MON		
440891	01U127		ON	MON		
440892	01U128		ON	MON		
440893	01U133		ON	MON		
440894	01U134		OFF	MON		
440895	01U130		ON	MON	✓	
440896	03U124		ON	MON		
447889	04U871	401U4	OFF	MON		
447890	04U882	412U4	OFF	MON		
447891	04U881	411U4	OFF	MON		
447892	04U883	413U4	OFF	MON		
447893	01U350		ON	MON		
447894	PJ#318	318U4	OFF	MON		
447895	04U880	410U4	OFF	MON		
447896	04U877	407U4	OFF	MON		
447898	04U875	405U4	OFF	MON		
447899	03L846	306L3	OFF	MON		
447900	04U879	409U4	OFF	MON		
447988	04U872	402U4	OFF	MON		
447998	01U135		ON	MON		
447999	01U136		ON	MON		
453821	03U317	SC-5	ON	REM		
453822	03U316	SC-4	ON	REM		
453823	03F308	B7	ON	REM		
453824	03F312	B11	ON	REM		
453825	PJ#309	B8	ON	REM		
453826	PJ#310	B9	ON	REM		
453827	PJ#311	B10	ON	REM		
453828	PJ#313	B12	ON	REM		
453829	04J708		ON	MON		
453830	04J713		ON	MON		
453831	03M713		ON	MON		
453832	04U714		ON	MON		
453833	03U715	SM1	ON	MON		
453834	03U716	SM2	ON	MON		

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TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
471394	04U863	323U4	OFF	MON		
476387		MW15H	OFF	MON		
482083		K04-MW	ON	MON		
482084		K02-MW	ON	MON		
482085		K01-MW	ON	MON		
482086		I01-MW	ON	MON		
482087		I05-MW	ON	MON		
482088		I02-MW	ON	MON		
482089		I04-MW	ON	MON		
482090		I03-MW	ON	MON		
482707	04J882		OFF	MON		
482708	04J835		OFF	MON		
482709	04J834		OFF	MON		
500691	04U414	414U4/EZ SELF SERVICE	OFF	MON		
500694	03L137		ON	MON		
505189	01U137		ON	MON		
505190	01U138		ON	MON		
505191	01U139		ON	MON		
505192	01U140		ON	MON		
505193	01U141		ON	MON		
505209	01U902		OFF	MON		
505210	01U901	H3U1	OFF	MON		
505618	03L138		ON	MON		
508115	04U322	322U4	OFF	MON		
508117	04J702		ON	MON		
508118	04J077		ON	MON		
508119	04U713		ON	MON		
508120	04J714		ON	MON		
508122	03U314	SC-2	ON	REM		
509083		NEW BRIGHTON #11	OFF	MUNI		
512761		GROSS GOLF #2	OFF	IRR		
519288		E101-MW	ON	MON		
519289		E102-MW	ON	MON		
519290		E103-MW	ON	MON		
519291		129-1501-MW	ON	MON		
519836	04U834		OFF	MON		
519956	03L833		OFF	MON		
519957	04U833		OFF	MON		
520931		NEW BRIGHTON #13	OFF	MUNI		
524047	04U865	325U4	OFF	MON		
524048	04J866	326J	OFF	MON		
524049	04U866	326U4	OFF	MON		
524050	04U864	324U4	OFF	MON		
524051	04J864	324J	OFF	MON		
538039	01U145		ON	PIEZ.		
538040	01U146		ON	PIEZ.		
538041	01U147		ON	PIEZ.		
538042	01U148		ON	PIEZ.		
538043	01U149		ON	PIEZ.		

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
538044	01U150		ON	PIEZ.		
538045	01U151		ON	PIEZ.		
538046	01U152		ON	PIEZ.		
538047	01U153		ON	PIEZ.		
538048	01U154		ON	PIEZ.		
538049	01U155		ON	PIEZ.		
538050	01U156		ON	PIEZ.		
538051	01U351		ON	REM		
538052	01U352		ON	REM		
538053	01U353		ON	REM		
538054	01U354		ON	REM		
538055	01U355		ON	REM		
538056	01U356		ON	REM		
538057	01U357		ON	REM		
538058	01U358		ON	REM		
538059	01U904		OFF	MON		
538060	01U903		OFF	MON		
538062	01U157		ON	MON		
538063	01U158		ON	MON		
	PJ#006		ON	MON		
	01U131				✓	
	01U132					
	01U142				✓	
	01U143				✓	
	01U144				✓	
	03U301	SC-1	ON	REM		
	03L306		ON	MON		
	03U315	SC-3		REM		
	01U653			MON		
554216		NEW BRIGHTON #14	OFF	MUNI		
	03U674	OW541U3	ON	MON		
	01U675					
	03U675					
	03U676	OW543U3	ON	MON		
	04U842			MON		
	03L843	303L3	OFF	MON		
		MW15D	OFF	MON		
		MW15S	OFF	MON		
		Staff Gauge 1				
		Staff Gauge 2				
		Staff Gauge 3				
582628		NEW BRIGHTON #15	OFF	MUNI		
596628	04U836	MW-1	OFF	MON		
596629	04J836	MW-2	OFF	MON		
596630	04U837	MW-3	OFF	MON		
596631	04J837	MW-4	OFF	MON		
596632	04U838	MW-5	OFF	MON		
596633	04J838	MW-6	OFF	MON		
596634	04U839	MW-7	OFF	MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
596635	04J839	MW-8	OFF	MON		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
424055	01L811	H1L1; MDNR Well	OFF	TEST		
424062	01L813	H3L1	OFF	TEST	✓	
424056	01L816	H6L1	OFF	ABAND	✓	
424054	01L821	NW1L1	OFF	TEST	✓	
424052	01L822	NW2L1	OFF	TEST	✓	
424061	01L823	NW3L1	OFF	TEST	✓	
236176	01U003	S3U1	ON	MON	✓	
234198	01U004	S4U1	ON	MON		
234199	01U011	S11U1	ON	MON	✓	
234200	01U012	S12U1	ON	MON	✓	
234201	01U022	S22U1	ON	MON	✓	
234202	01U033	S33U1	ON	MON	✓	
234204	01U034	S34U1	ON	MON	✓	
234205	01U035	S35U1	ON	TEST		
234206	01U036	S36U1	ON	MON	✓	
234207	01U037	S37U1		MON	✓	
234208	01U038	S38U1		MON		
234209	01U039	S39U1	ON	MON		
234210	01U040	S40U1	ON	MON		
234211	01U041	S41U1	ON	MON		
236177	01U043	S43AU1		MON		
234212	01U044	S44U1	ON	MON		
234215	01U045	S45U1	ON	MON		
234216	01U046	S46U1	ON	MON		
234217	01U047	S47U1	ON	MON		
234218	01U048	S48U1		MON		
234221	01U050	S50AU1		MON	✓	
234222	01U051	S51U1	ON	MON	✓	
234223	01U052	S52U1	ON	MON		
234225	01U053	S53AU1	ON	MON	✓	
234227	01U054	S54AU1		MON		
234235	01U060	S60U1	ON	MON		
234237	01U062	S62U1	ON	MON	✓	
234239	01U063	S63U1	ON	MON		
234240	01U064	S64U1	ON	MON		
234241	01U065	S65U1	ON	MON		
234243	01U067	S67U1	ON	MON		
234250	01U072	S72AU1	ON	MON		
236479	01U085	S85U1	ON	MON		
236494	01U098	S98U1	ON	MON	✓	
236497	01U100	S100U1	ON	MON	✓	
236498	01U101	S101U1	ON	MON	✓	
236499	01U102	S102U1	ON	MON		
236500	01U103	S103U1	ON	MON		
236501	01U104	S104U1	ON	MON		
236502	01U105	S105U1	ON	MON		
236503	01U106	S106U1	ON	MON		
236504	01U107	S107U1	ON	MON		
236505	01U108	S108U1	ON	MON		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236506	01U109	S109U1	ON	MON	✓	
236507	01U110	S11OU1	ON	MON		
427411	01U115		ON	MON		
427412	01U116		ON	MON		
427413	01U117		ON	MON		
427414	01U118		ON	MON		
427415	01U119		ON	MON		
427410	01U120		ON	MON		
440888	01U122		ON	MON	✓	
440889	01U125		ON	MON		
440890	01U126		ON	MON		
440891	01U127		ON	MON		
440892	01U128		ON	MON		
440895	01U130		ON	MON	✓	
	01U131				✓	
	01U132					
440893	01U133		ON	MON		
440894	01U134		OFF	MON		
447998	01U135		ON	MON		
447999	01U136		ON	MON		
505189	01U137		ON	MON		
505190	01U138		ON	MON		
505191	01U139		ON	MON		
505192	01U140		ON	MON		
505193	01U141		ON	MON		
	01U142				✓	
	01U143				✓	
	01U144				✓	
538039	01U145		ON	PIEZ.		
538040	01U146		ON	PIEZ.		
538041	01U147		ON	PIEZ.		
538042	01U148		ON	PIEZ.		
538043	01U149		ON	PIEZ.		
538044	01U150		ON	PIEZ.		
538045	01U151		ON	PIEZ.		
538046	01U152		ON	PIEZ.		
538047	01U153		ON	PIEZ.		
538048	01U154		ON	PIEZ.		
538049	01U155		ON	PIEZ.		
538050	01U156		ON	PIEZ.		
538062	01U157		ON	MON		
538063	01U158		ON	MON		
447893	01U350		ON	MON		
538051	01U351		ON	REM		
538052	01U352		ON	REM		
538053	01U353		ON	REM		
538054	01U354		ON	REM		
538055	01U355		ON	REM		
538056	01U356		ON	REM		

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SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
538057	01U357		ON	REM		
538058	01U358		ON	REM		
236194	01U524	FA4U1	ON	PIEZ.	✓	
236196	01U525	FW5U1	ON	PIEZ.	✓	
236197	01U526	FV12U1	ON	PIEZ.	✓	
236195	01U527	FV8U1	ON	PIEZ.	✓	
236189	01U601	OW101U1	ON	MON		
236190	01U602	OW102U1	ON	MON		
236191	01U603	OW103U1	ON	MON		
236192	01U604	OW104U1	ON	MON		
236193	01U605	OW10571	ON	MON		
242127	01U607	OW107U1	ON	MON		
242128	01U608	OW108U1	ON	MON		
242129	01U609	OW109U1	ON	MON		
242130	01U610	OW110U1	ON	MON		
242131	01U611	OW111U1	ON	MON		
194725	01U612	OW112U1	ON	MON		194758
194726	01U613		ON	MON		194759
194727	01U615	OW115U1	ON	MON		194760
194728	01U616	OW116U1	ON	MON		194761
194729	01U617	OW117U1	ON	MON		194770
194730	01U618	OW118U1	ON	MON		194771
194772	01U619	PW119U1	ON	MON		
194701	01U620	OW120U1	ON	MON		
194702	01U621	PW121U1	ON	MON		
194703	01U622	OW122U1	ON	MON		
194704	01U623	OW123U1	ON	MON		
242182	01U624A	BP185A	ON	PIEZ		
242183	01U624B	BP185B	ON	PIEZ		
242184	01U624C	BP185C	ON	PIEZ		
242185	01U624D	BP185D	ON	PIEZ		
242186	01U625A	BP285A	ON	PIEZ		
242187	01U625B	BP285B	ON	PIEZ		
242188	01U625C	BP285C	ON	PIEZ		
242189	01U625D	BP285D	ON	PIEZ		
242190	01U626A	BP385A	ON	PIEZ		
242191	01U626B	BP385B	ON	PIEZ		
242192	01U626C	BP385C	ON	PIEZ		
242193	01U626D	BP385D	ON	PIEZ		
242194	01U627A	BP485A	ON	PIEZ		
242195	01U627B	BP485B	ON	PIEZ		
242196	01U627C	BP485C	ON	PIEZ		
242197	01U627D	BP485D	ON	PIEZ		
242198	01U628A	BP585A	ON	PIEZ		
242199	01U628B	BP585B	ON	PIEZ		
242200	01U628C	BP585C	ON	PIEZ		
242201	01U628D	BP585D	ON	PIEZ		
194720	01U631	OW501U1	ON	MON		
194721	01U632	OW502U1		MON		

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SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
194716	01U634	OW504U1	ON	MON		
194722	01U635	OW505U1	ON	MON		
194723	01U636	OW506U1	ON	MON.		
194717	01U638	OW508U1		MON		
194718	01U639	OW509U1	ON	MON		
194719	01U640	OW510U1	ON	MON		
194724	01U642	OW512U1	ON	MON		
242134	01U652	OW522U1	ON	MON		
	01U653			MON		
242135	01U666	OW536U1	ON	MON		
242136	01U667	OW537U1	ON	MON		
242137	01U668	OW538U1	ON	MON		
	01U675					
236452	01U803	T3U1	OFF	TEST	✓	424053
236457	01U805	T5U1	OFF	MON	✓	424060
236460	01U806	T6U1	OFF	MON	✓	424058
236471	01U807	T7U1	OFF	TEST	✓	424059
424057	01U808	T8U1	ON	MON	✓	
242153	01U813	H3U1	OFF	MON	✓	
505210	01U901	H3U1	OFF	MON		
505209	01U902		OFF	MON		
538060	01U903		OFF	MON		
538059	01U904		OFF	MON		
426842	03F302	B1	ON	REM		
426843	03F303	B2	ON	REM		
426844	03F304	B3	ON	REM		
426845	03F305	B4	ON	REM		
426846	03F306	B5	ON	REM		
426847	03F307	B6	ON	REM		
453823	03F308	B7	ON	REM		
453824	03F312	B11	ON	REM		
234137	03L001	S1L3	ON	MON		
234141	03L002	S2L3	ON	MON		
234144	03L003	S3L3	ON	MON		
234147	03L004	S4L3	ON	MON		
236079	03L005	S5L3	ON	MON		
234152	03L007	S7L3	ON	MON		
234157	03L010	S10L3	ON	MON		
234161	03L012	S12L3	ON	MON		
234164	03L013	S13L3	ON	MON		
235748	03L014	S14L3	ON	MON		
234170	03L017	S17L3	ON	MON		
235749	03L018	S18L3	ON	MON		
234175	03L020	S20L3	ON	MON		
235750	03L021	S21L3	ON	MON		
235751	03L027	S27L3	ON	MON		
235752	03L028	S28L3		MON		
235753	03L029	S29L3		MON		236066
236076	03L077	S77L3	ON	MON		

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SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236074	03L078	S78L3	ON	MON		
242160	03L079	S79L3	ON	MON		
236071	03L080	S80L3	ON	MON		
236070	03L081	S81L3	ON	MON		
440887	03L084	ST84L3	ON	MON		
236068	03L086	S86L3	ON	MON		
236067	03L091	S91L3	ON	MON		
236080	03L113	WF1L3	ON	MON		
500694	03L137		ON	MON		
505618	03L138		ON	MON		
	03L306		ON	MON		
231854	03L522	ARSENAL GRAVEL PIT	ON	ABAND	✓	
206725	03L523	ARSENAL GRAVEL PIT	ON	ABAND	✓	
426815	03L673	PD3L3	OFF	TEST		
426817	03L802	T2L3	OFF	TEST		
236463	03L806	T6L3	OFF	MON		421429
426868	03L809	T9L3	OFF	MON		
426809	03L811	H1L3	OFF	TEST		
426816	03L813	H3L3	OFF	TEST		
426813	03L822	NW2L3	OFF	TEST		
426865	03L832	OM2L3	OFF	TEST		
519956	03L833		OFF	MON		
434037	03L841	301L3	OFF	MON		
	03L843	303L3	OFF	MON		
447899	03L846	306L3	OFF	MON		
416199	03L848	308L3	OFF	MON		
426858	03L853	313L3	OFF	MON		
426859	03L854	314L3	OFF	MON		
426861	03L856	316L3	OFF	MON		
416081	03L858	318L3	OFF	MON	✓	
434040	03L859	319L3	OFF	MON		
434038	03L860	320L3	OFF	MON		
434039	03L861	321L3	OFF	MON		
234136	03M001	S1M3	ON	MON		
234140	03M002	S2M3	ON	MON		
234143	03M003	S3M3	ON	MON		
234146	03M004	S4M3	ON	MON		
440885	03M005	ST-5-M3	ON	MON		
234151	03M007	S7M3	ON	MON		
234156	03M010	S10M3	ON	MON		
234160	03M012	S12M3	ON	MON		
234163	03M013	S13M3	ON	MON		
234169	03M017	S17M3	ON	MON		
234174	03M020	S20M3	ON	MON		
231857	03M505			ABAND	✓	
206760	03M509		ON		✓	
453831	03M713		ON	MON		
426818	03M802	T2M3	OFF	TEST		
236462	03M806	T6M3	OFF	MON		421430

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SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426852	03M843	303M3	OFF	TEST		
416051	03M848	308M3	OFF	MON		
234135	03U001	S1U3	ON	MON		
234139	03U002	S2U3	ON	MON		
234142	03U003	S3U3	ON	MON		
234145	03U004	S4U3	ON	MON		
234148	03U005	S5U3	ON	MON		
234149	03U006	S6U3	ON	MON	✓	
234150	03U007	S7U3	ON	MON		
234153	03U008	S8U3	ON	MON		
234154	03U009	S9U3	ON	MON		
234155	03U010	S10U3	ON	MON		
234158	03U011	S11U3	ON	MON		
234159	03U012	S12U3	ON	MON		
234162	03U013	S13U3	ON	MON		
234165	03U014	S14U3	ON	MON		
234166	03U015	S15U3	ON	MON		
234167	03U016	S16U3	ON	MON		
234168	03U017	S17U3	ON	MON		
234171	03U018	S18U3	ON	MON		
234172	03U019	S19U3	ON	MON		
234173	03U020	S20U3	ON	MON		
234176	03U021	S21U3	ON	MON		
236178	03U022	S22U3		MON		
236179	03U023	S23U3		MON		
236180	03U024	S24U3		MON		
236181	03U025	S25U3		MON		
236182	03U026	S26U3	ON	MON		
236183	03U027	S27U3		MON		
236184	03U028	S28U3		MON		
236185	03U029	S29U3		MON		
236186	03U030	S30U3		MON		
236187	03U031	S31U3		MON		
236188	03U032	S32U3		MON		
236078	03U075	S75U3	ON	MON		
236077	03U076	S76U3	ON	MON		
236075	03U077	S77U3	ON	MON		
236073	03U078	S78U3	ON	MON		
236072	03U079	S79U3	ON	MON		
236476	03U082	S82U3	ON	MON		
236478	03U083	S83U3	ON	MON		
236069	03U084	S84U3	ON	MON		
236480	03U087	S87U3	ON	MON		
236482	03U088	S88U3	ON	MON		
236483	03U089	S89U3	ON	MON		
236485	03U090	S90U3	ON	MON		
236487	03U092	S92U3	ON	MON		
236489	03U093	S93U3	ON	MON		
236066	03U094	S94U3	ON	MON		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236491	03U096	S96U3	ON	MON		
236493	03U097	S97U3	ON	MON		
236495	03U099	S99U3	ON	MON		
236508	03U111	S111U3	ON	MON		
236510	03U112	S112U3	ON	MON		
242124	03U113	WF1U3	ON	MON		
242125	03U114	WF2U3	ON	MON		
440884	03U121		ON	MON		
440896	03U124		ON	MON		
440886	03U129		ON	MON		
	03U301	SC-1	ON	REM		
508122	03U314	SC-2	ON	REM		
	03U315	SC-3		REM		
453822	03U316	SC-4	ON	REM		
453821	03U317	SC-5	ON	REM		
114410	03U521		OFF	MON		
242132	03U647	OW517U3	ON	MON		
242133	03U648	OW518U3	ON	MON		
421426	03U658	OW528U3	ON	MON		
421425	03U659	OW529U3	ON	MON		
421438	03U671	PO-1	ON	MON		
421440	03U672	PD2U3	OFF	MON		
421441	03U673	PD3U3	OFF	MON		
	03U674	OW541U3	ON	MON		
	03U675					
	03U676	OW543U3	ON	MON		
426848	03U701	701U3	ON	MON		
426850	03U702	702U3	ON	MON		
426878	03U703	703U3		MON		
426883	03U704	704U3	ON	MON		
426884	03U705	705U3	ON	MON		
426885	03U706	706U3	ON	MON		
426886	03U707	707U3	ON	MON		
426879	03U708	708U3	ON	MON		
426881	03U709	709U3	ON	MON		
434032	03U710	71OU3	ON	MON		
434033	03U711	711U3	OFF	MON		
453833	03U715	SM1	ON	MON		
453834	03U716	SM2	ON	MON		
236449	03U801	T1U3	OFF	MON		
236453	03U803	T3U3	OFF	MON		421434
236455	03U804	T4U3	OFF	MON		421433
236458	03U805	T5U3	OFF	MON		421432
236461	03U806	T6U3	OFF	MON		421431
426808	03U811	H1U3	OFF	TEST		
426862	03U815	H5U3	OFF	TEST		
426810	03U821	NW1U3	OFF	TEST		
426812	03U822	NW2U3	OFF	TEST		
426814	03U824	NW4U3	OFF	TEST	✓	

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426863	03U831	OM1U3	OFF	TEST		
426864	03U832	OM2U3	OFF	TEST		
508118	04J077		ON	MON		
508117	04J702		ON	MON		
453829	04J708		ON	MON		
453830	04J713		ON	MON		
508120	04J714		ON	MON		
482709	04J834		OFF	MON		
482708	04J835		OFF	MON		
596629	04J836	MW-2	OFF	MON		
596631	04J837	MW-4	OFF	MON		
596633	04J838	MW-6	OFF	MON		
596635	04J839	MW-8	OFF	MON		
524051	04J864	324J	OFF	MON		
524048	04J866	326J	OFF	MON		
482707	04J882		OFF	MON		
234138	04U001	S1U4	ON	MON		
234194	04U002	S2U4	ON	MON		
234193	04U003	S3U4	ON	MON		
234195	04U007	S7U4	ON	MON		
234196	04U012	S12U4	ON	MON		
234197	04U020	S20U4	ON	MON		
242138	04U027	S27U4		MON		
426877	04U077	ST77U4	ON	MON		
508115	04U322	322U4	OFF	MON		
500691	04U414	414U4/EZ SELF SERVICE	OFF	MON		
231742	04U510	GRENADE PLANT PROOF RANGES	ON	IND		
426867	04U673	PD3U4	OFF	TEST		
426849	04U701	701U4	ON	MON		
426876	04U702	702U4	ON	MON		
426880	04U708	708U4	ON	MON		
426882	04U709	709U4	ON	MON		
434031	04U711	711U4	OFF	MON		
508119	04U713		ON	MON		
453832	04U714		ON	MON		
236450	04U802	T2U4	OFF	MON		
236464	04U806	T6U4	OFF	MON		421428
426811	04U821	NW1U4	OFF	TEST		
426866	04U832	OM2U4	OFF	TEST		
519957	04U833		OFF	MON		
519836	04U834		OFF	MON		
596628	04U836	MW-1	OFF	MON		
596630	04U837	MW-3	OFF	MON		
596632	04U838	MW-5	OFF	MON		
596634	04U839	MW-7	OFF	MON		
426851	04U841	301U4	OFF	TEST		
	04U842			MON		
426853	04U843	303U4	OFF	TEST		
426854	04U844	304U4	OFF	TEST		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426855	04U845	305U4	OFF	MON		
426856	04U846	306U4	OFF	MON		
426857	04U847	307U4	OFF	MON		
416078	04U848	308U4	OFF	TEST		
416082	04U849	309U4	OFF	MON		
416200	04U850	310U4	OFF	MON		
406198	04U851	311U4	OFF	MON		
416080	04U852	312U4	OFF	MON		
439701	04U854	314U4	OFF	MON		
426860	04U855	315U4	OFF	MON		
434036	04U859	319U4	OFF	MON		
434035	04U860	320U4	OFF	MON		
434034	04U861	321U4	OFF	MON		
471394	04U863	323U4	OFF	MON		
524050	04U864	324U4	OFF	MON		
524047	04U865	325U4	OFF	MON		
524049	04U866	326U4	OFF	MON		
447889	04U871	401U4	OFF	MON		
447988	04U872	402U4	OFF	MON		
447898	04U875	405U4	OFF	MON		
447896	04U877	407U4	OFF	MON		
447900	04U879	409U4	OFF	MON		
447895	04U880	410U4	OFF	MON		
447891	04U881	411U4	OFF	MON		
447890	04U882	412U4	OFF	MON		
447892	04U883	413U4	OFF	MON		
236468	PJ#003	S3PJ	ON	MON		
	PJ#006		ON	MON		
236469	PJ#027	S27PJ	ON	MON		
235565	PJ#074	S74PJ		MON		
453825	PJ#309	B8	ON	REM		
453826	PJ#310	B9	ON	REM		
453827	PJ#311	B10	ON	REM		
453828	PJ#313	B12	ON	REM		
447894	PJ#318	318U4	OFF	MON		
206754	PJ#501	TWIN CITIES ARSENAL NO. 1	ON	P.S.	✓	
206756	PJ#502	TWIN CITIES ARSENAL NO. 2	ON	IND	✓	
206758	PJ#503	TWIN CITIES ARSENAL NO. 3	ON	IND	✓	
206724	PJ#504	TWIN CITIES ARSENAL	OFF	ABAND	✓	
206753	PJ#506	TWIN CITIES ARSENAL NO. 6	ON		✓	
206755	PJ#507	TWIN CITIES ARSENAL NO. 7	ON	ABAND	✓	
206759	PJ#508	TWIN CITIES ARSENAL NO. 8	ON	ABAND	✓	
206760	PJ#509	TWIN CITIES ARSENAL NO.9	ON	DOM	✓	
236437	PJ#802	T2PJ	OFF	MON		421437
236465	PJ#806	T6PJ	OFF	MON		421427
107405		ROEBKE	OFF	UN		
110485		NEW BRIGHTON #12	OFF	MUNI		
122210		ST. PAUL PORT AUTH. #3	OFF	IND		
127537		MIDWEST ASPHALT	OFF	DOM		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
134318		LORENZ W SEUTTER	OFF	DOM		
139035		WATERGATE MARINA	OFF	P.S.		
151568		ARDEN MANOR MOBILE HOME	OFF	P.S.		
161432		NEW BRIGHTON #10	OFF	MUNI		
191942		118PDC/MODEL STONE	OFF	MON		
200070		RUAN TRANSPORT	OFF	COM	✓	
200071		PRESTRESSED CONCRETE	OFF	IND	✓	
200072		WITTE TRANSPORTATION	OFF	IND	✓	
200073		WILSON TRANSFER & STORAGE	OFF	IND		
200074		ASBESTOS PROD	OFF	IND	✓	
200075		PHILLIPS PETROLEUM	OFF	IND	✓	
200076		OLD DUTCH FOODS INC	OFF	IND		
200077		JOHN CONLIN	OFF	DOM	✓	
200078		WILLIAM CLASS	OFF	DOM		
200079		LAWRENCE SCHOENING	OFF	DOM		
200080		CARL A OSTROM & SON	OFF	DOM		
200081		A. O. LIEBIG	OFF	DOM		
200082		2196 MARION ROAD	OFF	DOM		
200148		PAPER CALMERSON	OFF	IND	✓	
200154		U OF M GOLF COURSE	OFF	IRR		
200167		KOPPERS COKE #1	OFF	IND		
200171		PLATING INC	OFF	IND		
200197		SNOW FLAKE DAIRY	OFF	COM		
200264		1620 CENTRAL	OFF	IND		
200384		METALLURGICAL INC. WELL #1	OFF	IND		
200524		ST. ANTHONY #5	OFF	MUNI		
200525		PLETSCHER	OFF	UN		
200531		NAZARETH	OFF	UN		
200599		CEDAR AVE. TRIANGLE	OFF	P.S.		
200602		ATKINSON MILL CO.	OFF	IND		
200629		GENERAL MILLS	OFF	IND		
200803		ST. ANTHONY #4	OFF	P.S.		
200804		ST. ANTHONY #3	OFF	MUNI		
200812		GROSS GOLF COURSE #1	OFF	COM		
200814		AMERICAN LINEN	OFF	IND		
201074		GLEASSON MORTUARY	OFF	COM		
201082		NORTHWESTERN HOSPITAL	OFF	P.S.		
206669		FRIDLEY #8	OFF	MUNI		
206672		FRIDLEY #9	OFF	MUNI		
206673		FRIDLEY #6	OFF	MUNI		
206688		CLOVERPOND WELL	OFF	DOM		
206689		JAMES K. O'NEIL	OFF	UN		
206693		FERNELIUS	OFF	UN		
206702		MINN E.S.	OFF	UN		
206720		MOUNDSVIEW	OFF	MUNI		
206722		M0UNDSVIEW #5	OFF	MUNI		
206750		SHORE #4	OFF	MUNI		
206787		MOUNDSVIEW H.S.	OFF	P.S.		
206789		NEW BRIGHTON #1	OFF	MUNI	✓	

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

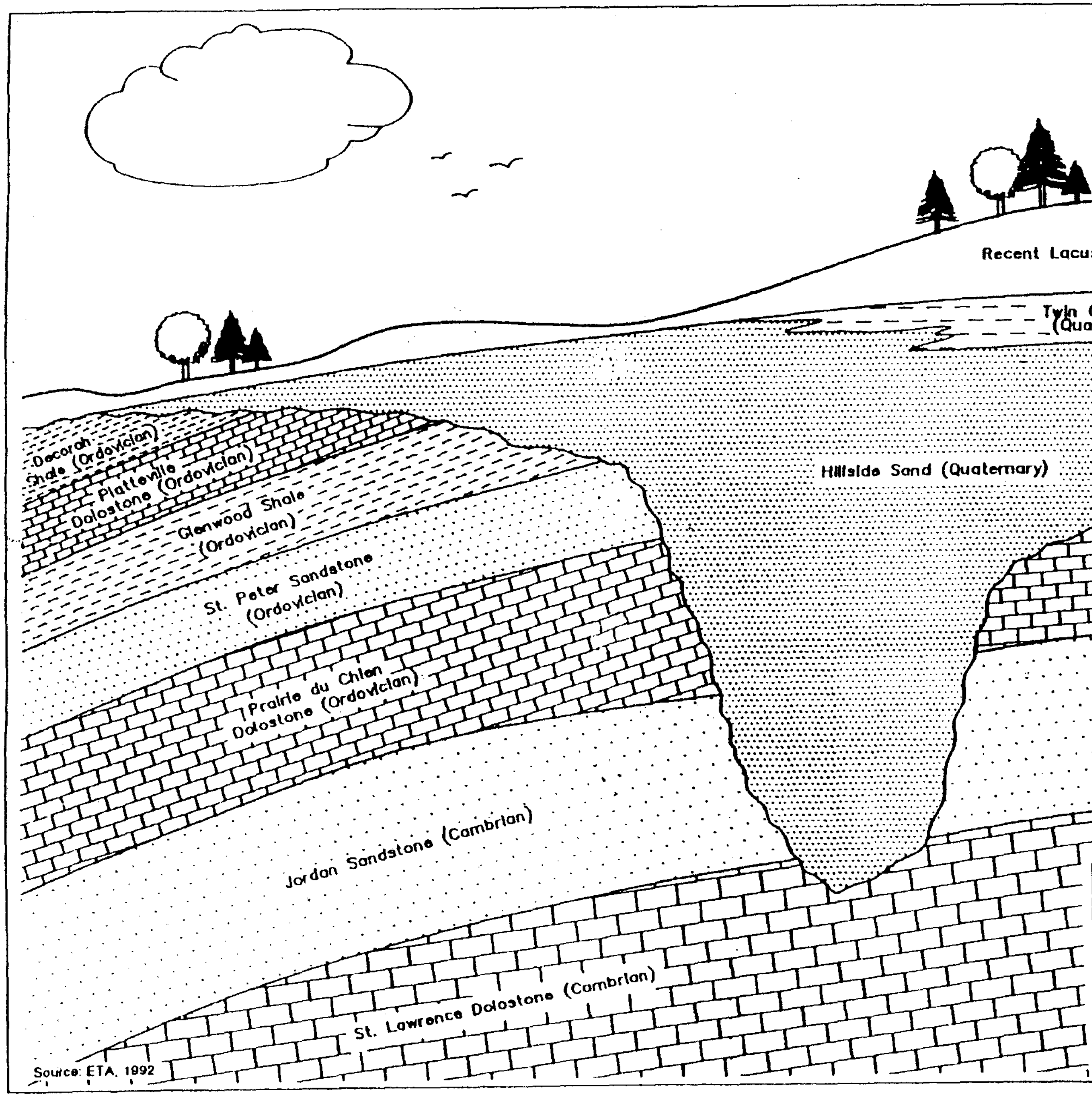
Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
206791		NEW BRIGHTON #7	OFF	MUNI		
206792		NEW BRIGHTON #4				
206793		NEW BRIGHTON #3	OFF	MUNI		
206794		NEW BRIGHTON #9	OFF	MUNI		
206795		NEW BRIGHTON #8	OFF	MUNI		
206796		NEW BRIGHTON #5	OFF	MUNI		
206797		NEW BRIGHTON #6	OFF	MUNI		
206798		NEW BRIGHTON #2	OFF	MUNI	✓	
223844		KURTH MALTING CO EAST WL	OFF	IND		
223992		BOOM ISLAND	OFF	IND		
225886		FRANKLIN STEEL SQUARE	OFF	P.S.		
225905		ST PAUL TERM. WAREHOUSE	OFF	IND		
225906		ST PAUL TERM. WAREHOUSE	OFF	IND		
231741		LABELLE	OFF	UN		
231845		MNDOT CIVIL DEFENSE TRAIN.	ON/OFF	P.S.		
231878		MENGELKOCH #2	OFF	UN		
232067		NBR 135	OFF	UN		
232069		UHIL	OFF	UN		
233221		REUBEN MEAT	OFF	DOM		
233222		LOWRY GROVE TRAILER	OFF	ABAND	✓	
233241		KOZAH'S MARKET	OFF	UN	✓	
233520		MCGILLIS	OFF	UN		
233533		ROSELAWN CEMETARY	OFF	IRR		
233763		P. L. MORGAN	OFF	DOM		
233806		2581 NORTH CLEVELAND	OFF	DOM		
234301		DEWITT	OFF	UN		
234305		GLENN BEGGIN	OFF	UN		
234319		HIDE & TALLOW #1	OFF	UN		
234327		BRESKE	OFF	UN		
234335		MENGELKOCH #1	OFF	UN		
234337		MENGELKOCH #3	OFF	UN	✓	
234350		GORDON	OFF	UN		
234351		YEMPA	OFF	UN		
234352		1206 12TH AV NW	OFF	UN		
234353		LENTSCH'S ICE WK.	OFF	UN		
234355		KINGDOM HALL	OFF	UN		
234356		NORDQUIST P43	OFF	UN		
234357		PHILLIPS PET P46	OFF	UN		
234386		ZELL OLS.	OFF	UN		
234391		SHERER L.	OFF	UN		
234396		DEWITT	OFF	UN	✓	
234406		KLAPP	OFF	UN	✓	
234409		HIDE & TALLOW	OFF	UN		
234425		KEN GEREBI	OFF	UN	✓	
234430		CMIEL	OFF	UN	✓	
234431		HARSTAD	OFF	UN		
234463		KEN SOLIE	OFF	UN		
234546		HONEYWELL RIDGEWAY	OFF	UN		
234547		HONEYWELL RIDGEWAY	OFF	UN		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
234549		REINER	OFF	IRR		
235539		OLD HOTEL	OFF	UN		
235557		HIDDEN FALLS PARK W.WELL	OFF	P.S.		
235619		SHRINERS HOSPITAL	OFF	P.S.		
235735		FLOUR CITY ARCHITECTURAL	OFF	COM		
236122		NWR	OFF	ABAND		
242162		301PB	OFF	UN		
242207		SUNSET MEMORIAL CEMETARY	OFF	UN		
249152		BOYLE	OFF	DOM		
265735		FLOUR CITY ARCH	OFF	UN		
322664		ABBOTT NW HOSP	OFF	UN		
405651		METAL-MATIC INC.	OFF	IND		
409546		PCA2L3	OFF	TEST		
409547		PCA1U4	OFF	TEST		
409548		PCA2U4	OFF	TEST		
409549		PCA3U4	OFF	TEST		
409550		PCA6U3	OFF	TEST		
409555		PCA5U4	OFF	TEST		
409556		PCA4L3	OFF	TEST		
409557		PCA1L3	OFF	TEST		
409595		B109U3	OFF	ABAND		
409596		B118U3	OFF	MON		
409597		B118L3	OFF	IND		
409598		B117U3	OFF	ABAND		
416143			OFF	ABAND		
416198		311U4	OFF	MON		
420713		HERBST LANDFILL	OFF	MON		
476387		MW15H	OFF	MON		
482083		K04-MW	ON	MON		
482084		K02-MW	ON	MON		
482085		K01-MW	ON	MON		
482086		I01-MW	ON	MON		
482087		I05-MW	ON	MON		
482088		I02-MW	ON	MON		
482089		I04-MW	ON	MON		
482090		I03-MW	ON	MON		
509083		NEW BRIGHTON #11	OFF	MUNI		
512761		GROSS GOLF #2	OFF	IRR		
519288		E101-MW	ON	MON		
519289		E102-MW	ON	MON		
519290		E103-MW	ON	MON		
519291		129-1501-MW	ON	MON		
520931		NEW BRIGHTON #13	OFF	MUNI		
554216		NEW BRIGHTON #14	OFF	MUNI		
582628		NEW BRIGHTON #15	OFF	MUNI		
		MW15D	OFF	MON		
		MW15S	OFF	MON		
		Staff Gauge 1				
		Staff Gauge 2				

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

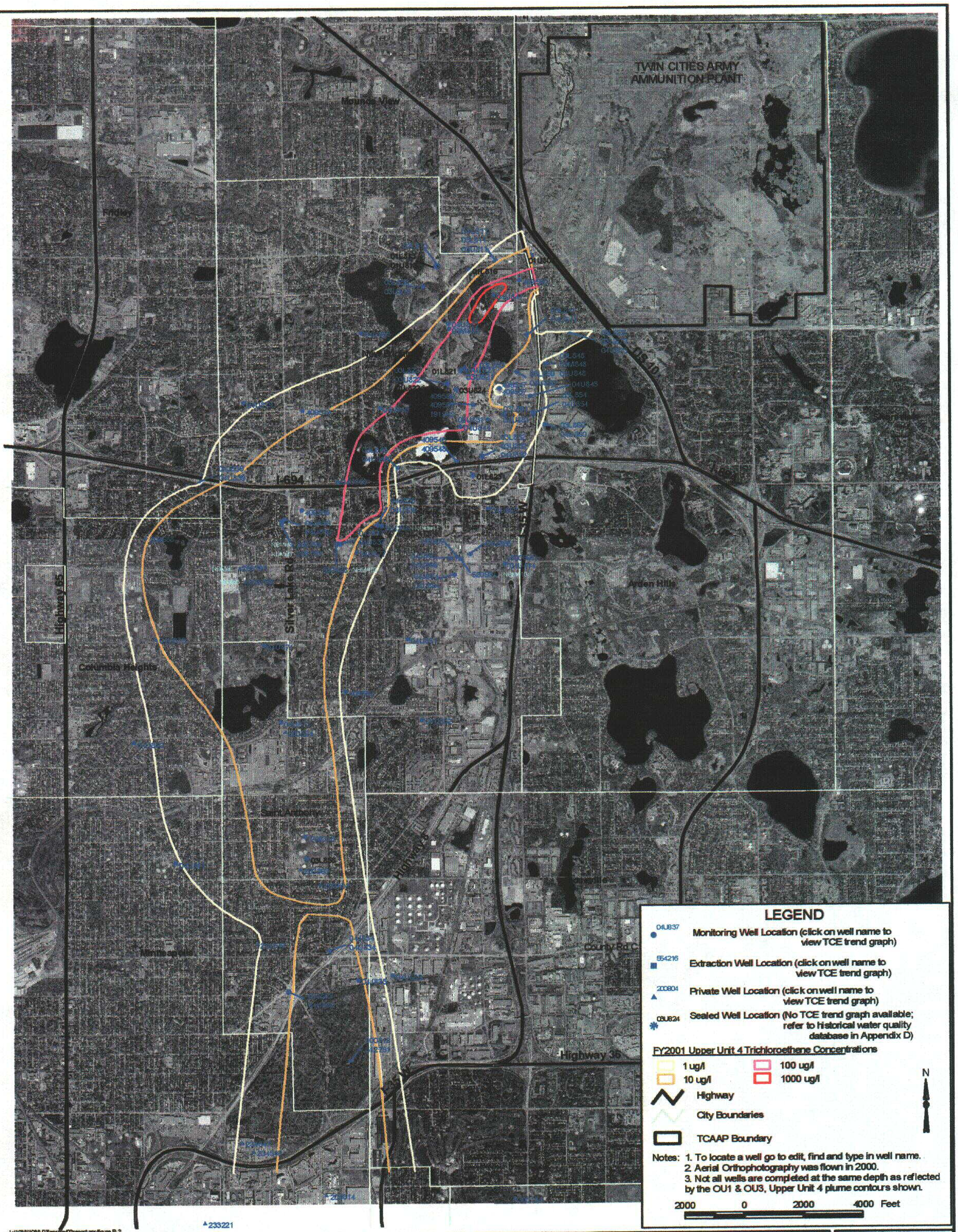
Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
		Staff Gauge 3				



Twin Cities Army Ammunition Plant

Figure B-1

Conceptual Illustration of
TCAAP Site Geology



TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3, Well Location and TCE History Map

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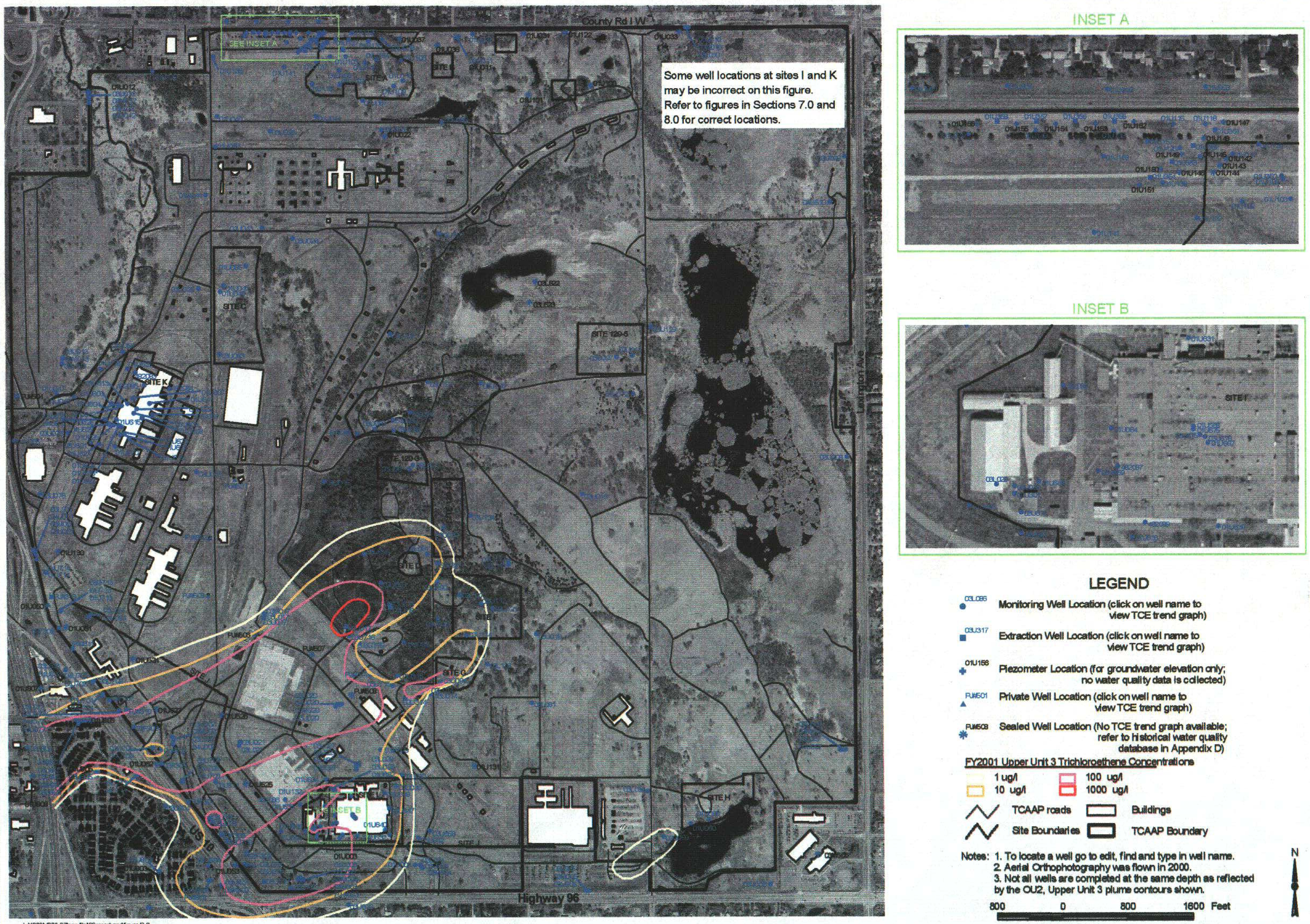
Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2002

Figure B-2



L:\1036\1036-07\apr file\02report.apr\figure B-3

TWIN CITIES ARMY AMMUNITION PLANT

OU2 Well Location and TCE History Map

Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

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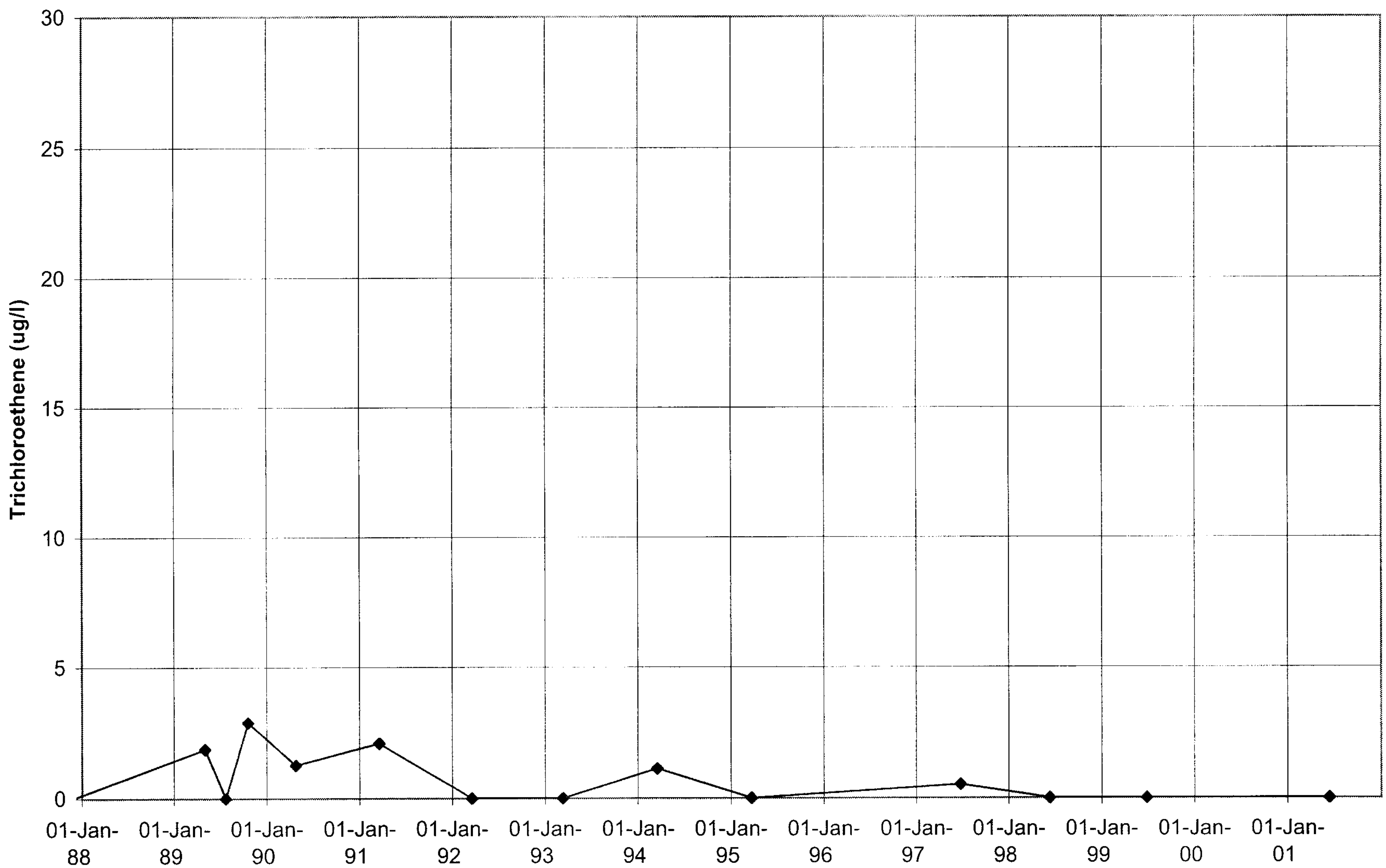
Figure B-3

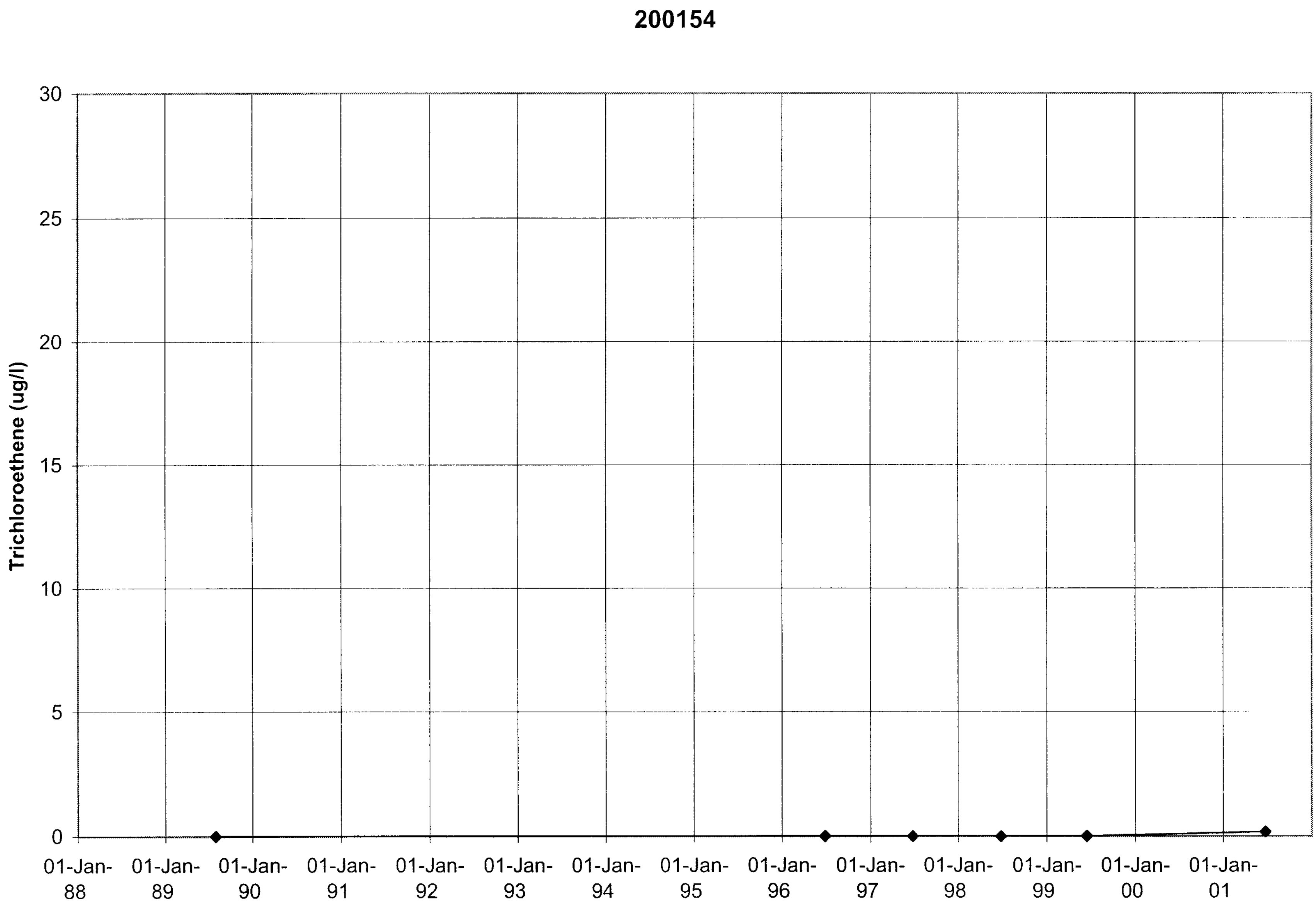
Trend Graph Not Available,
Well No Longer Routinely Sampled

TO RETURN TO MAP: Click on "Go to Previous View" Button in the Tool Bar

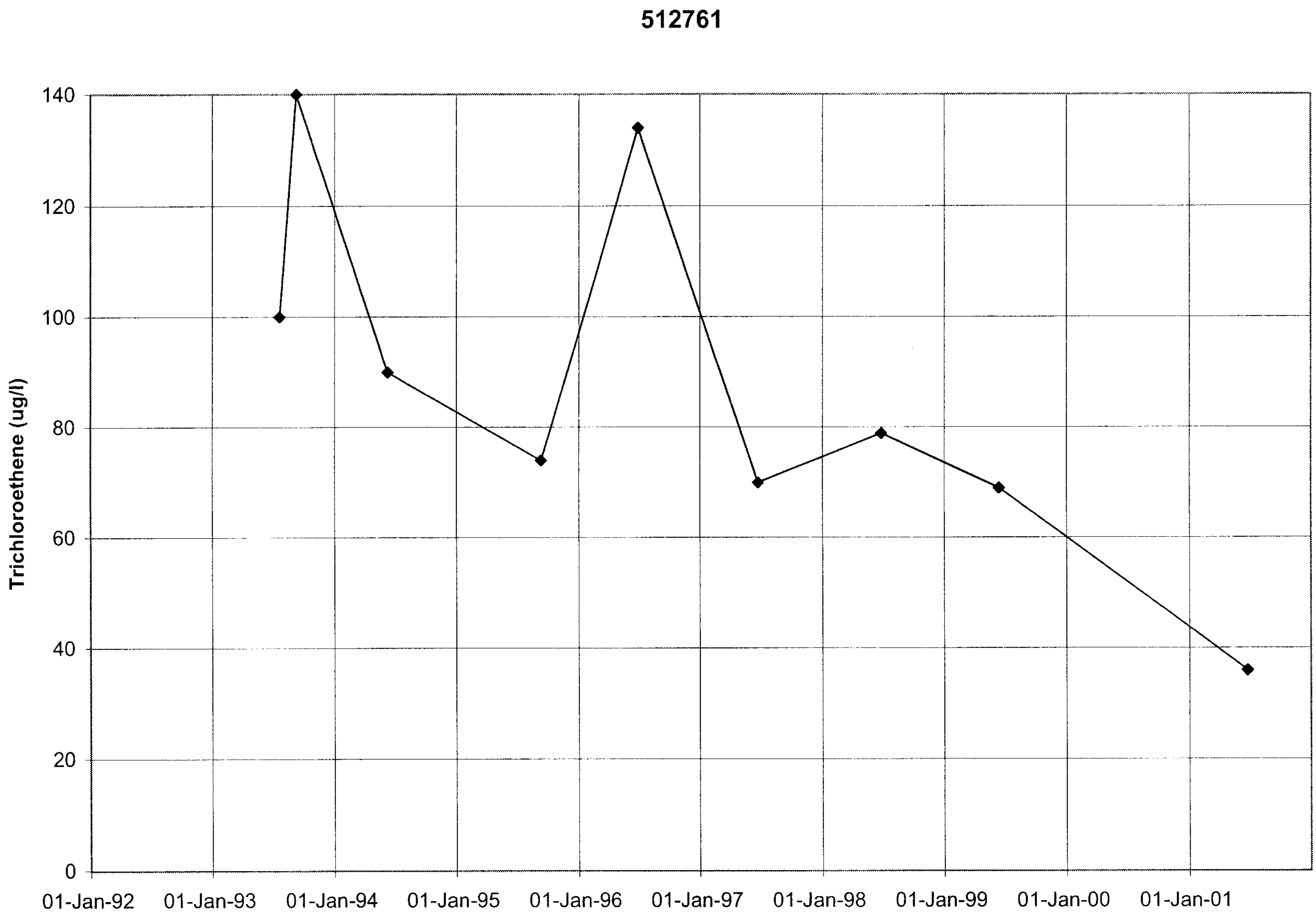
03L811



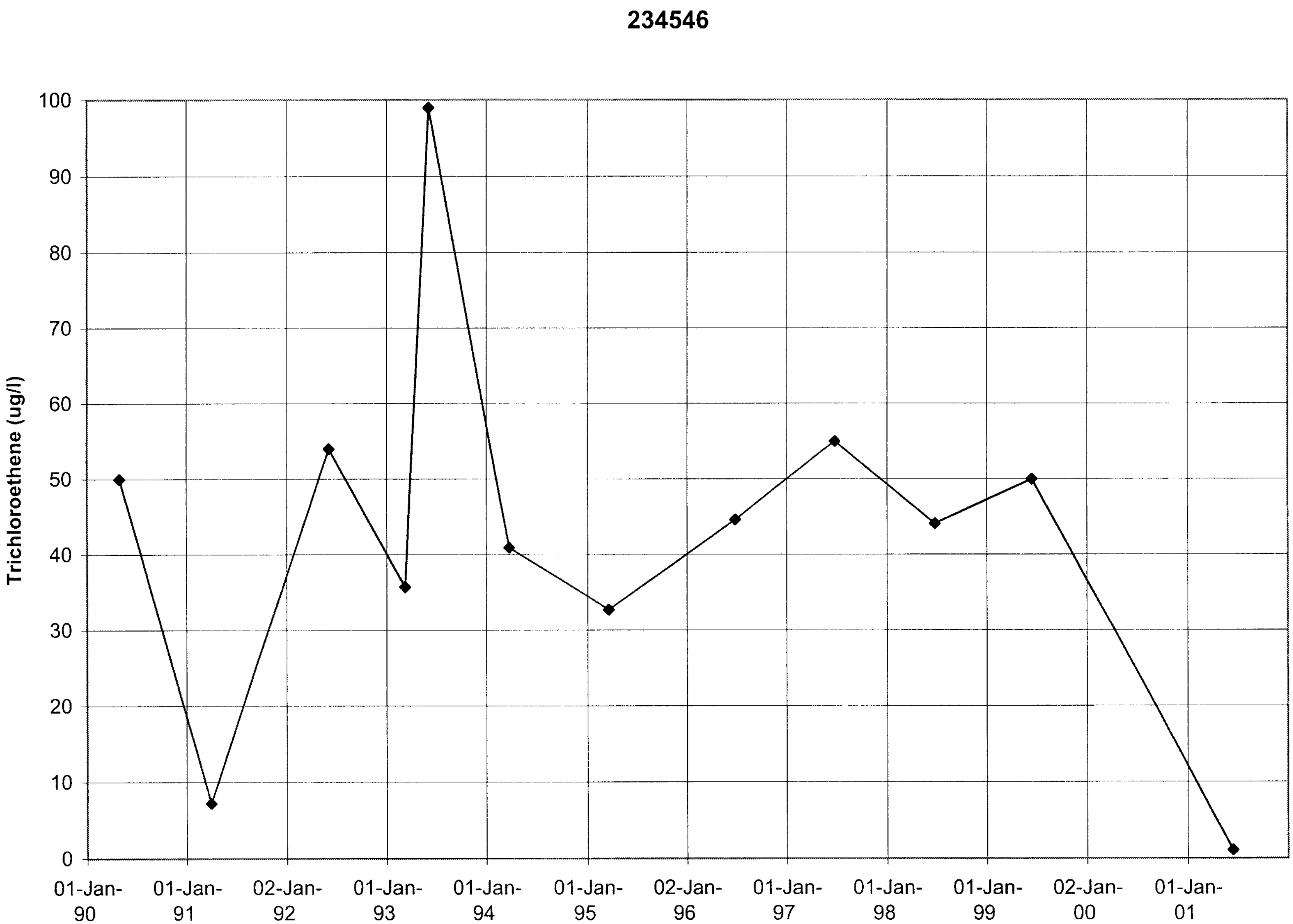
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

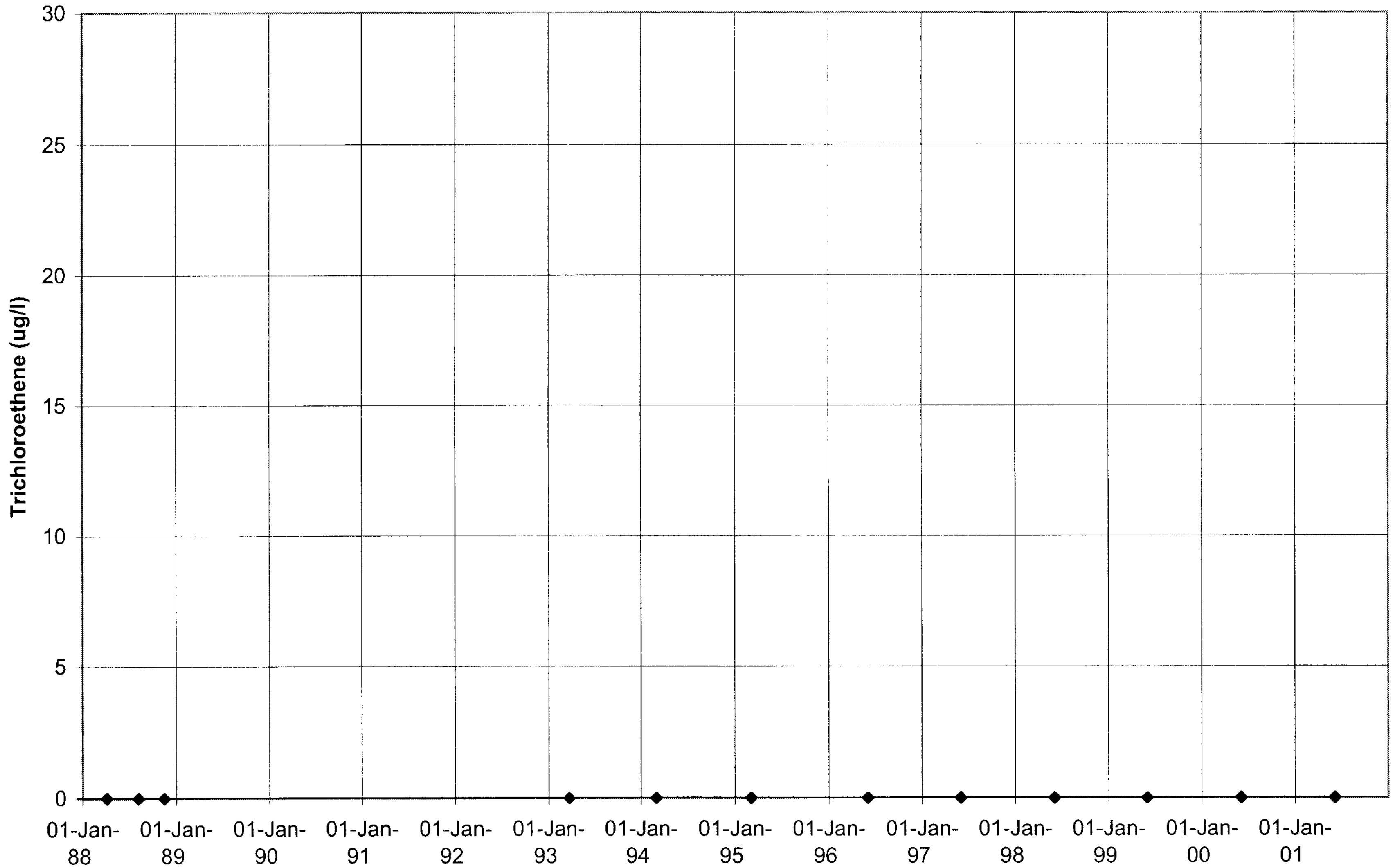


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

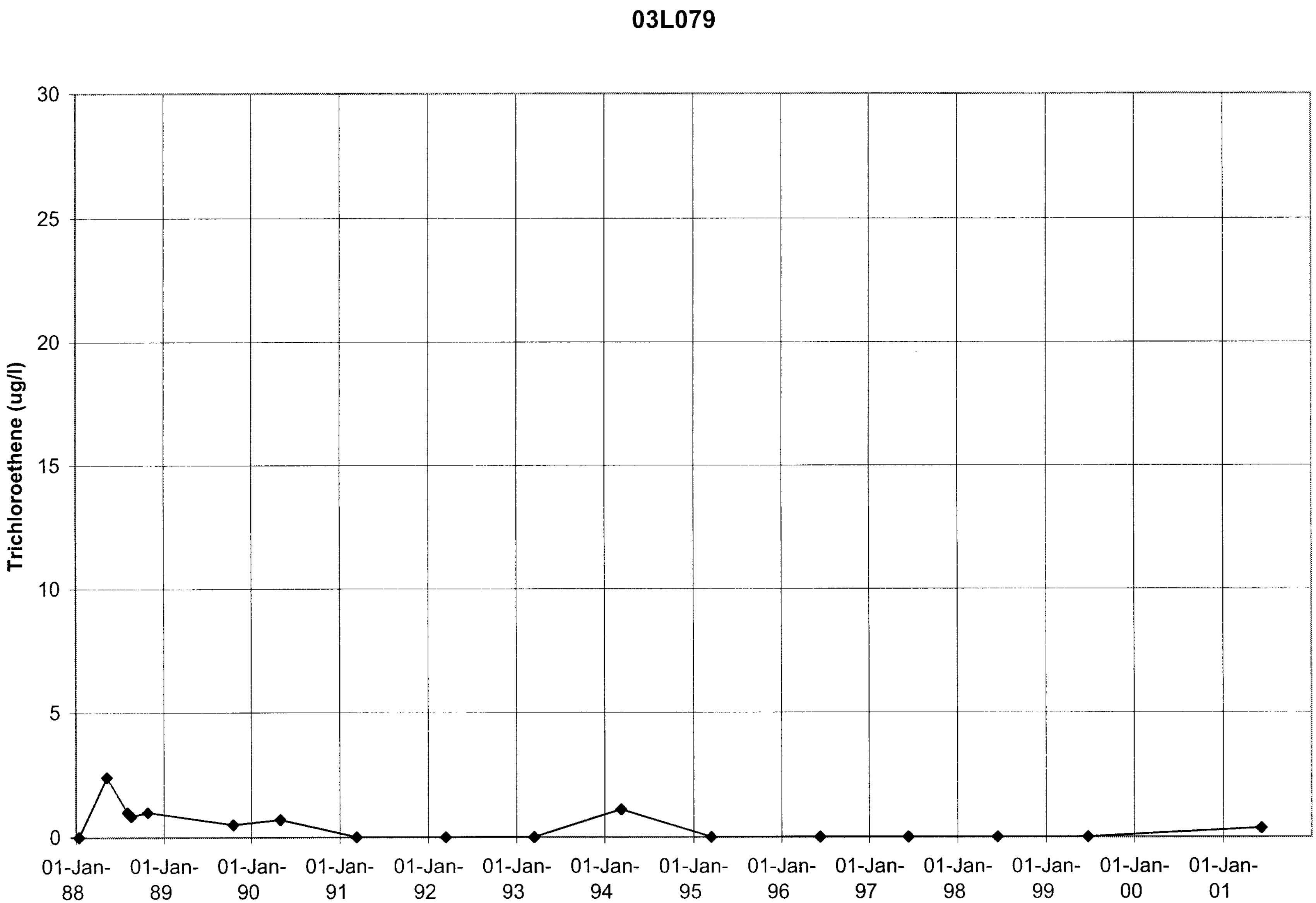


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U128

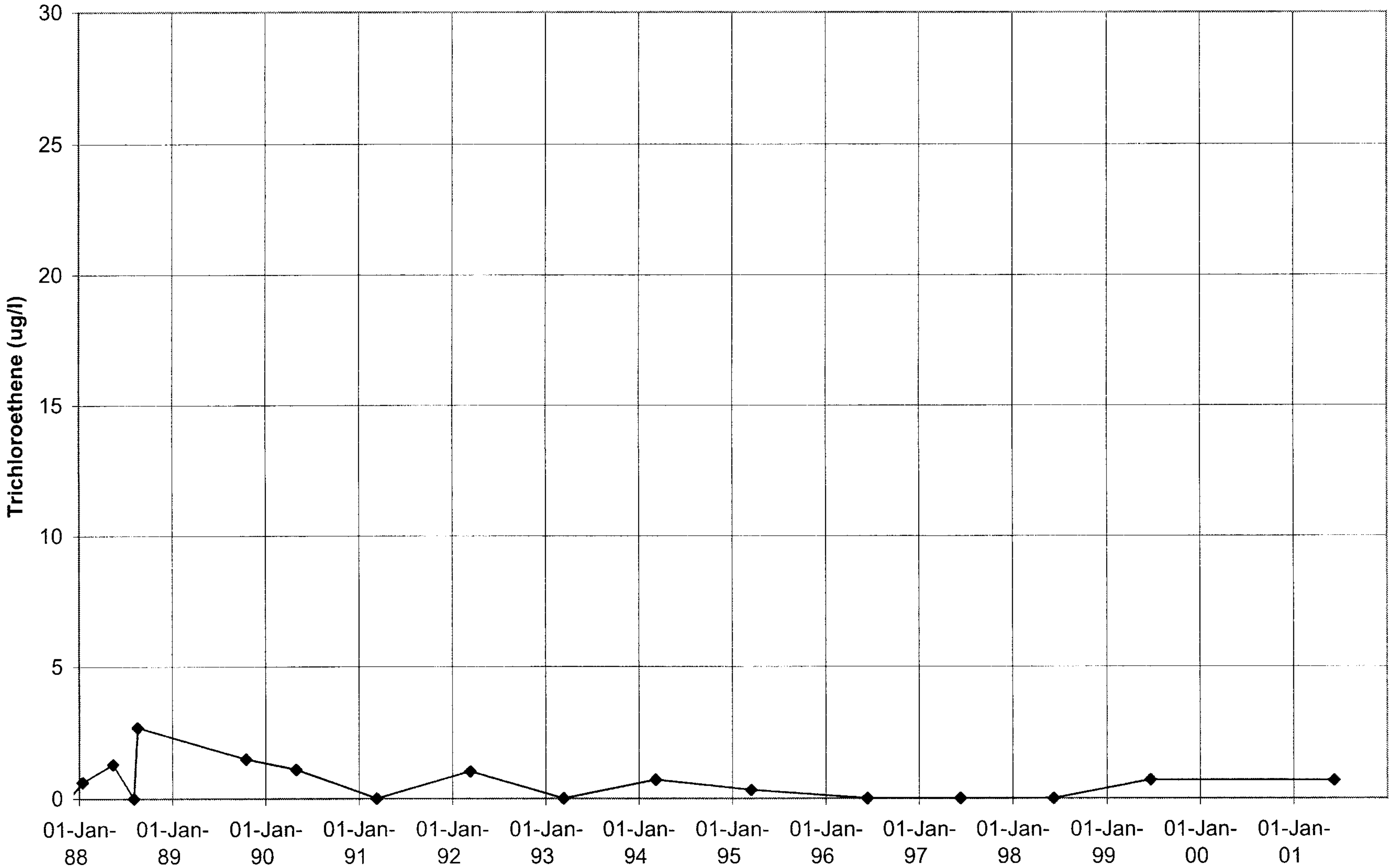


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

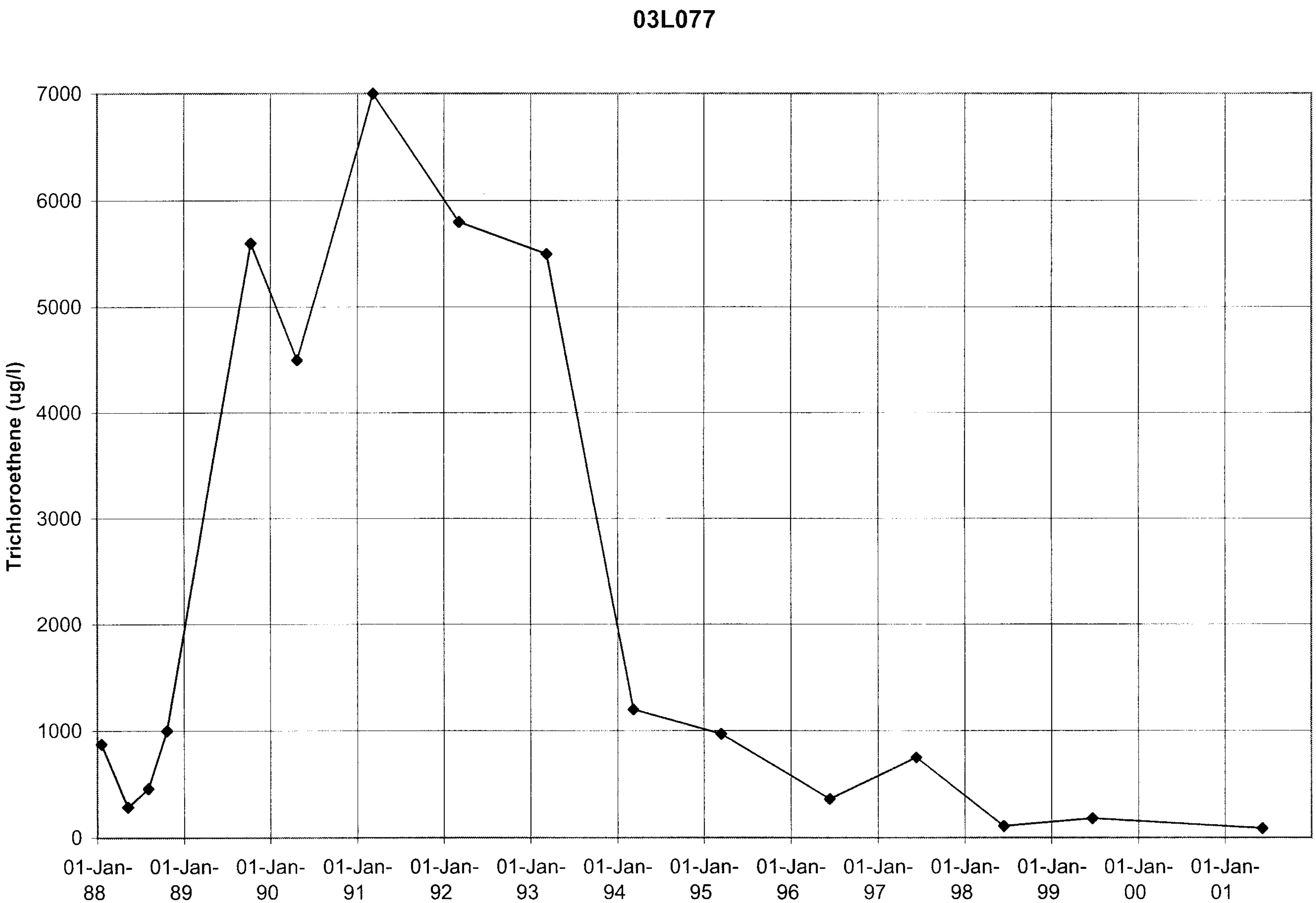


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

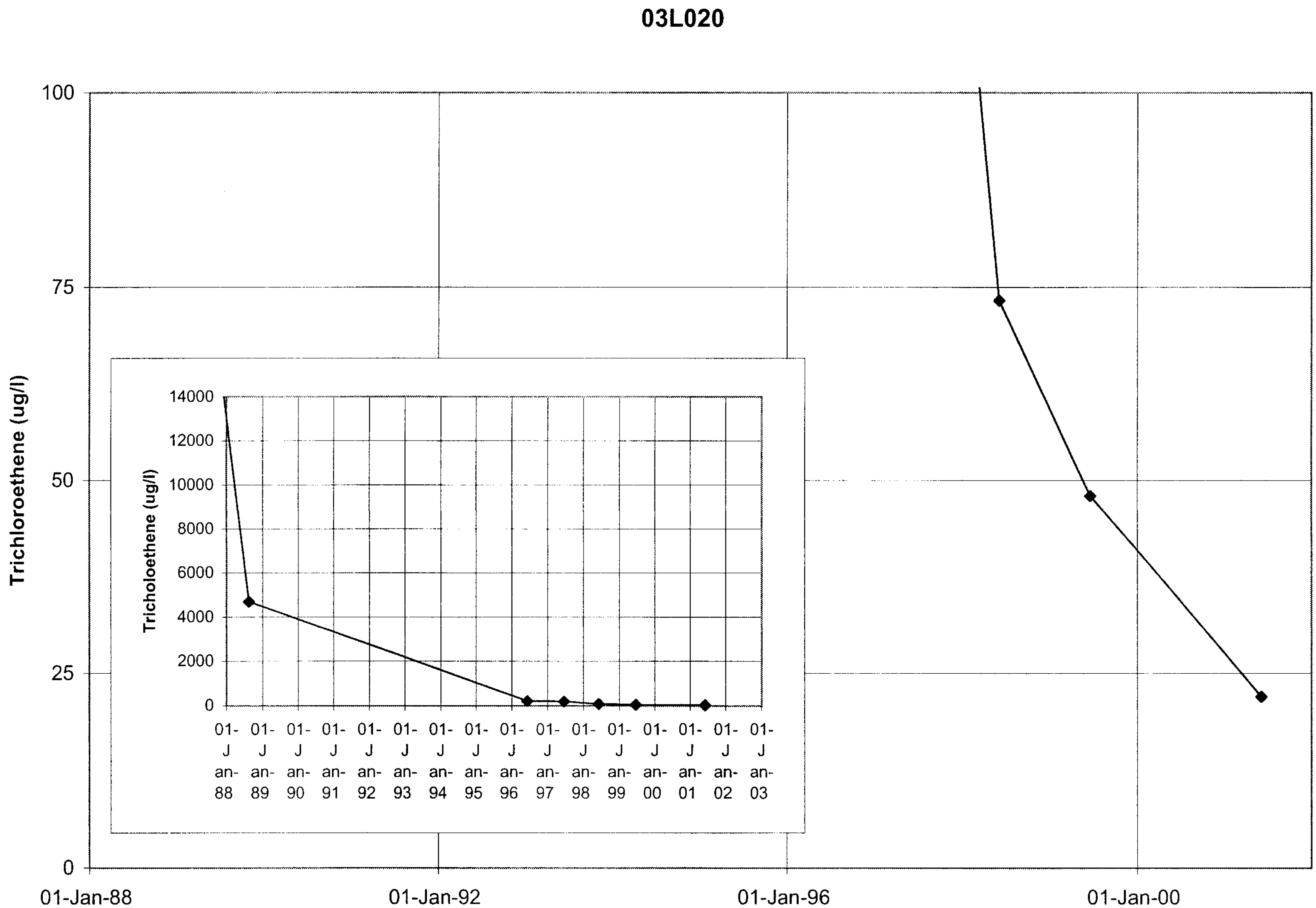
03L078



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

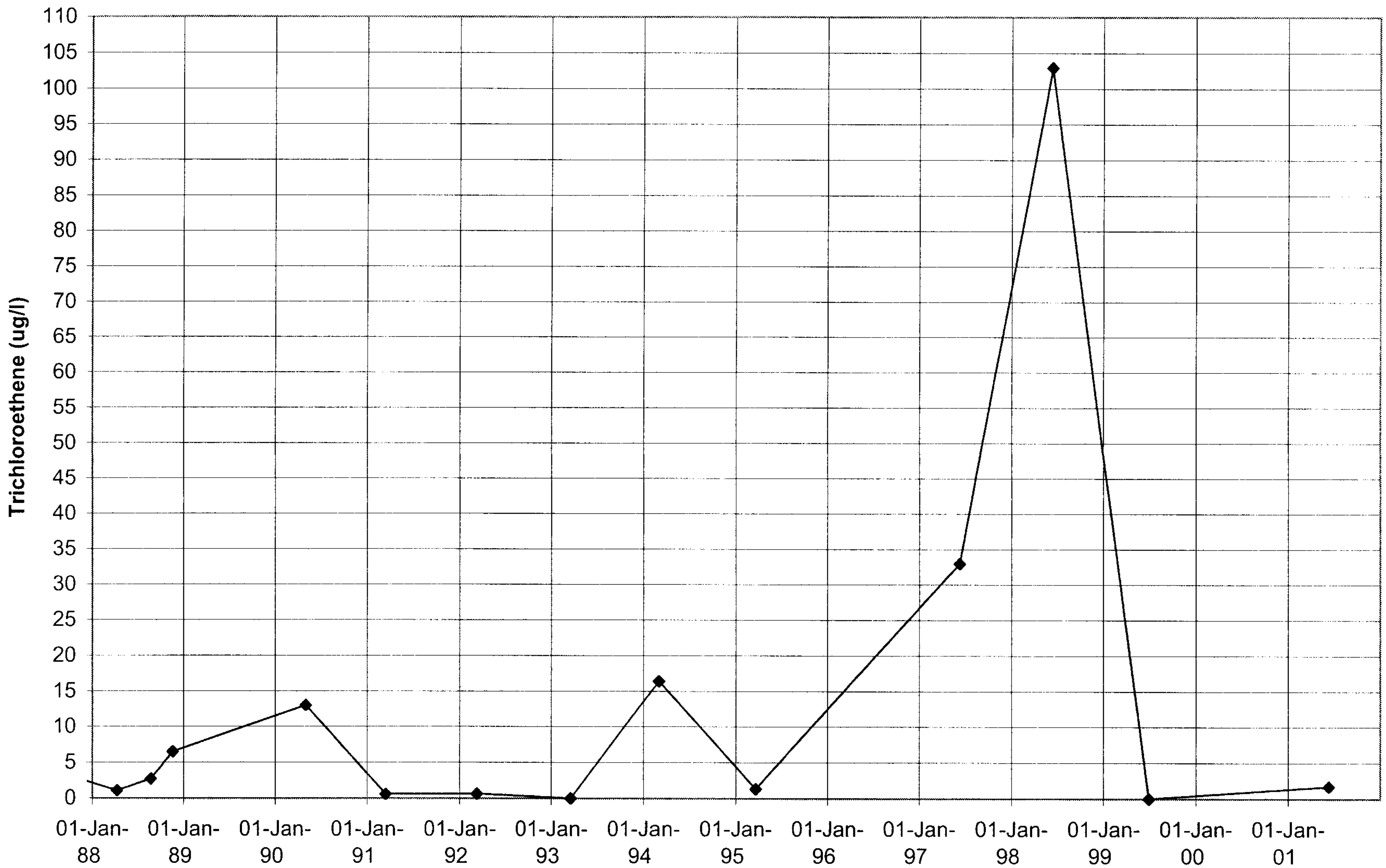


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

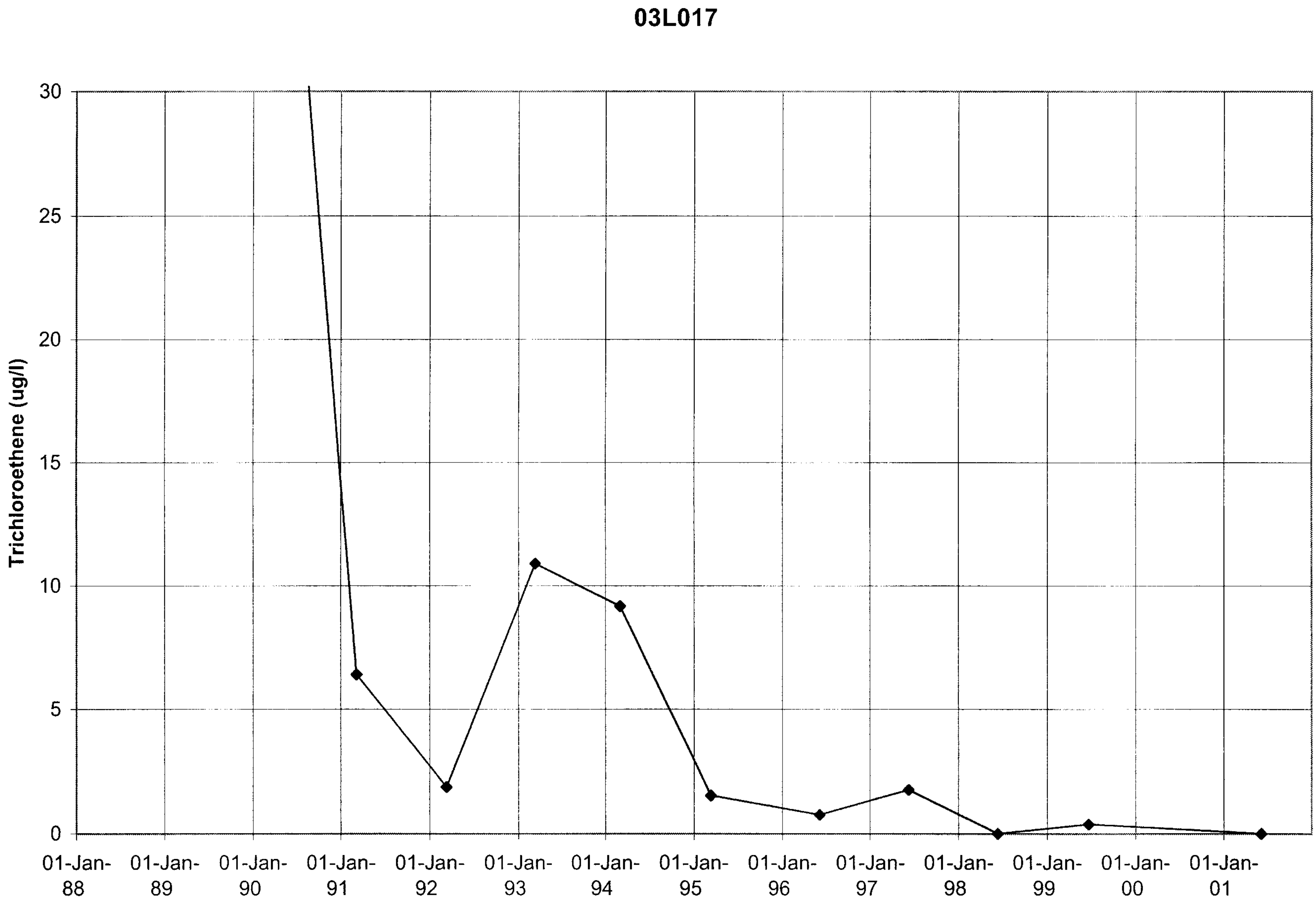


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L018

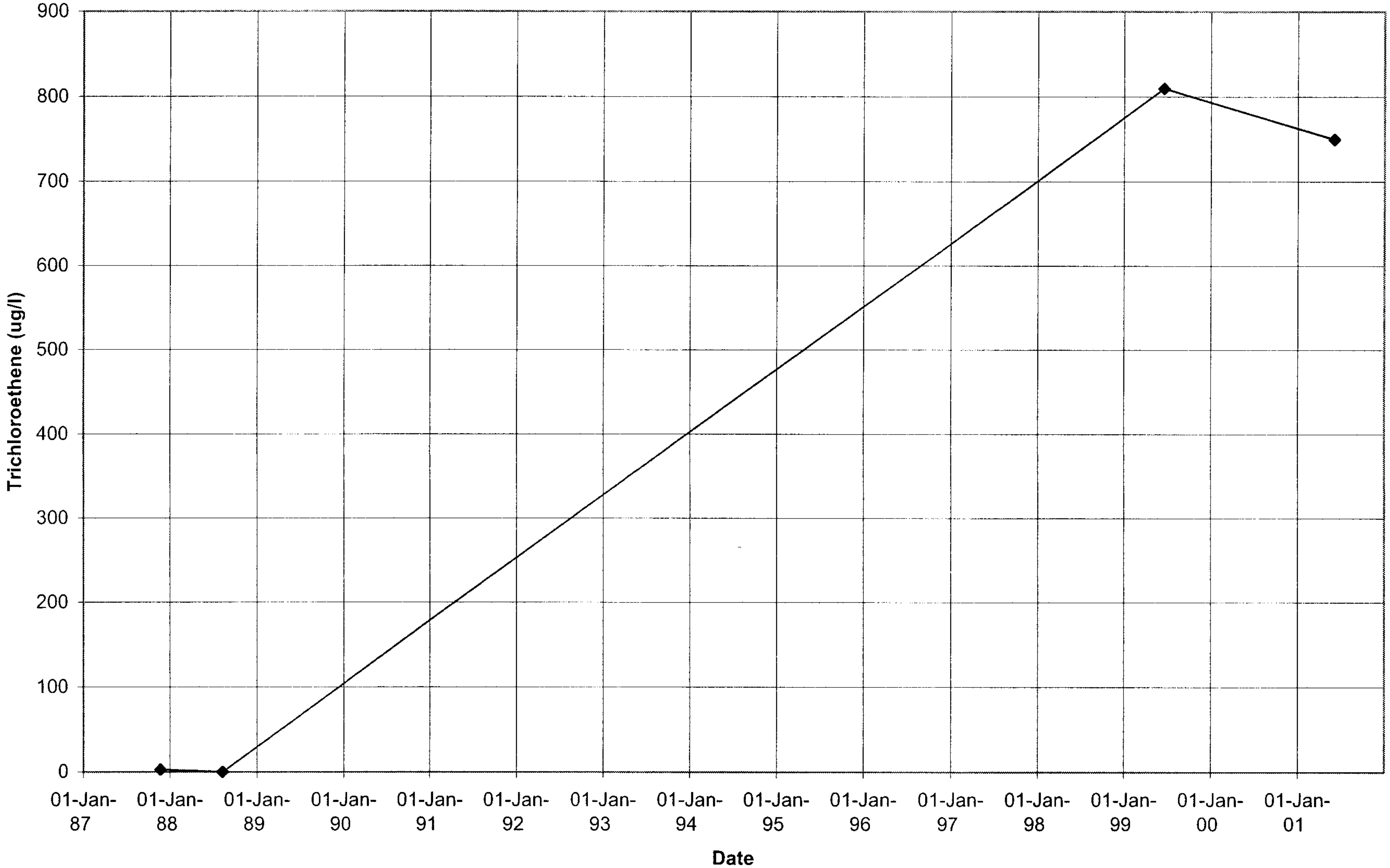


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

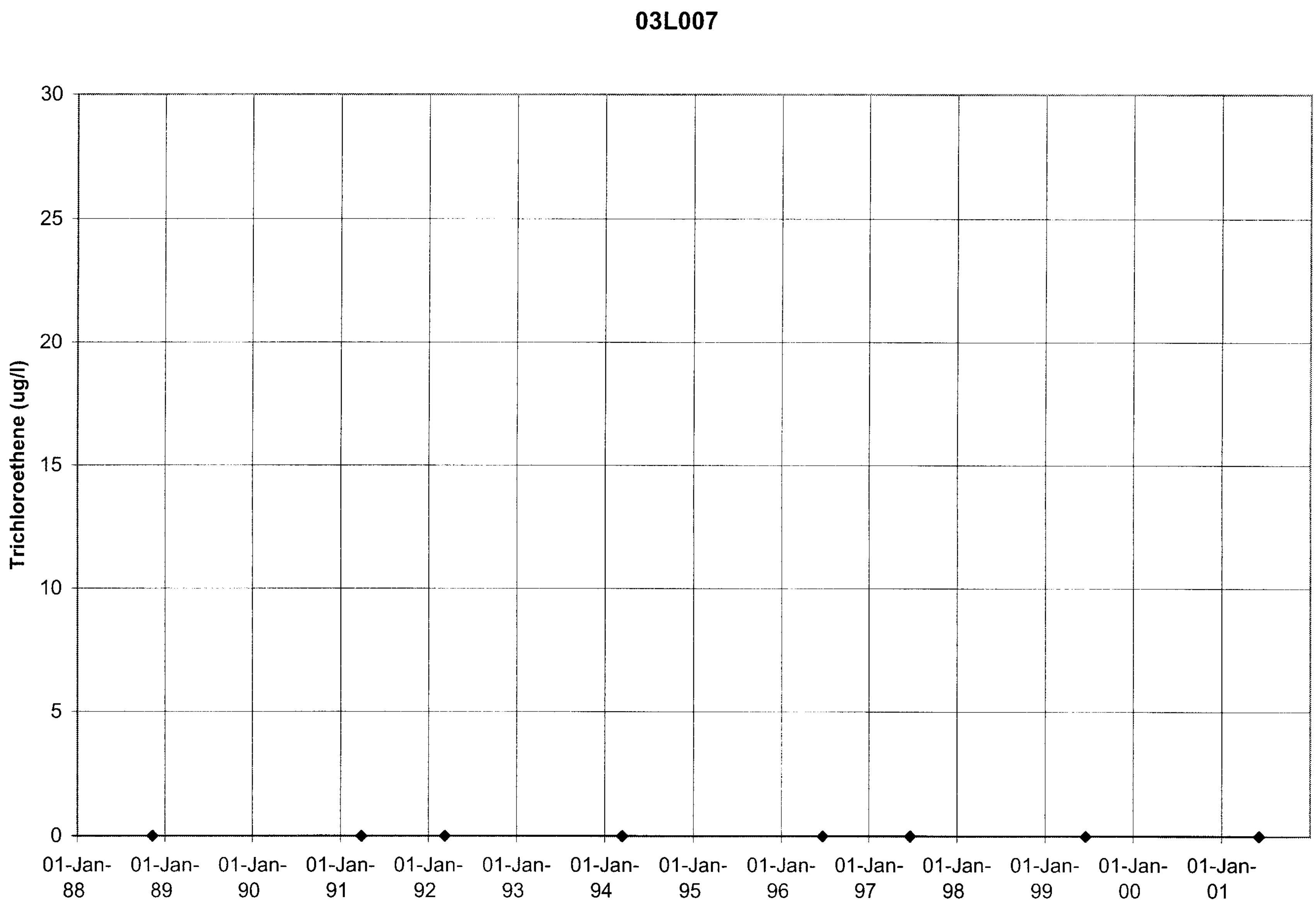


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L014



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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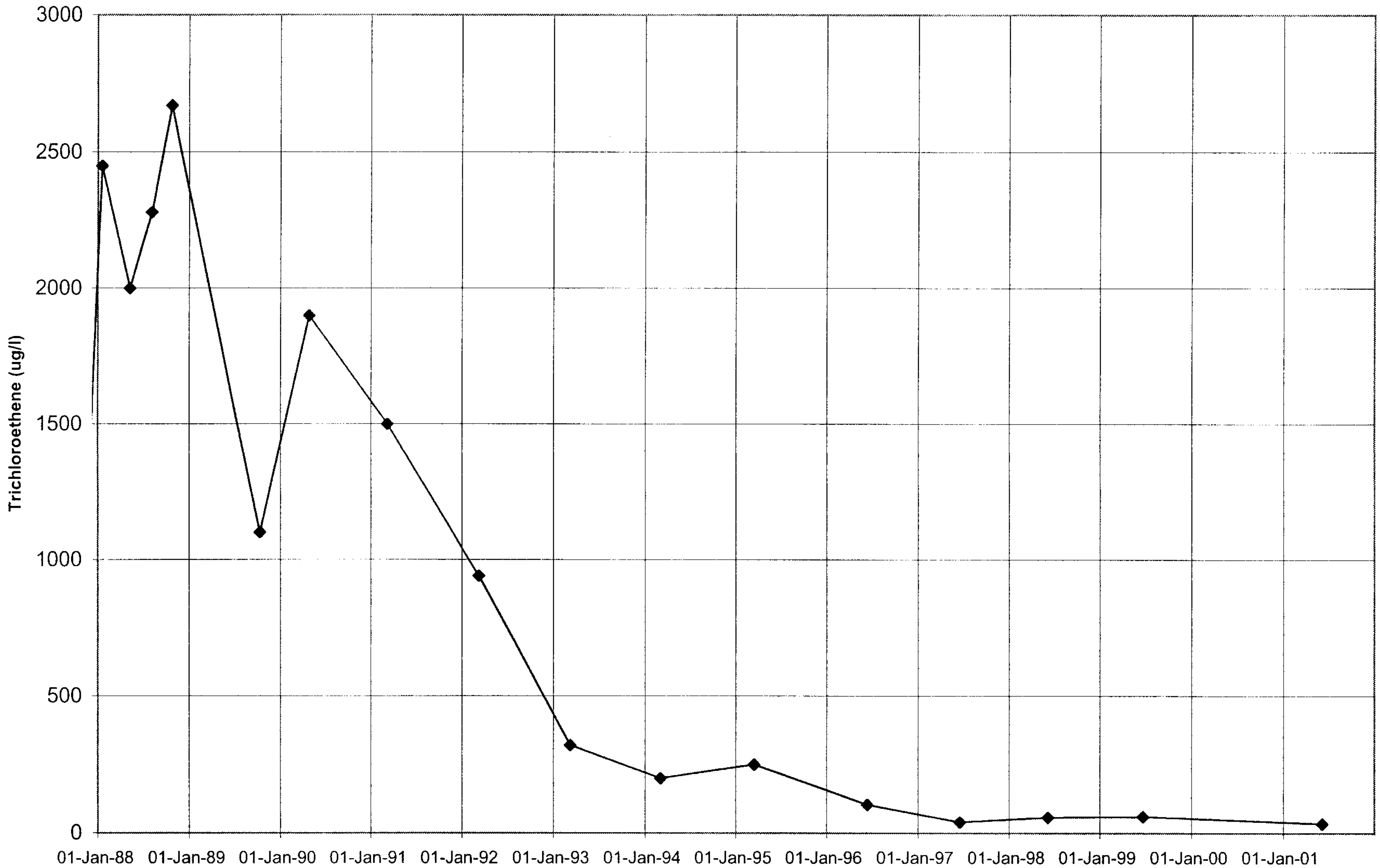
03L002



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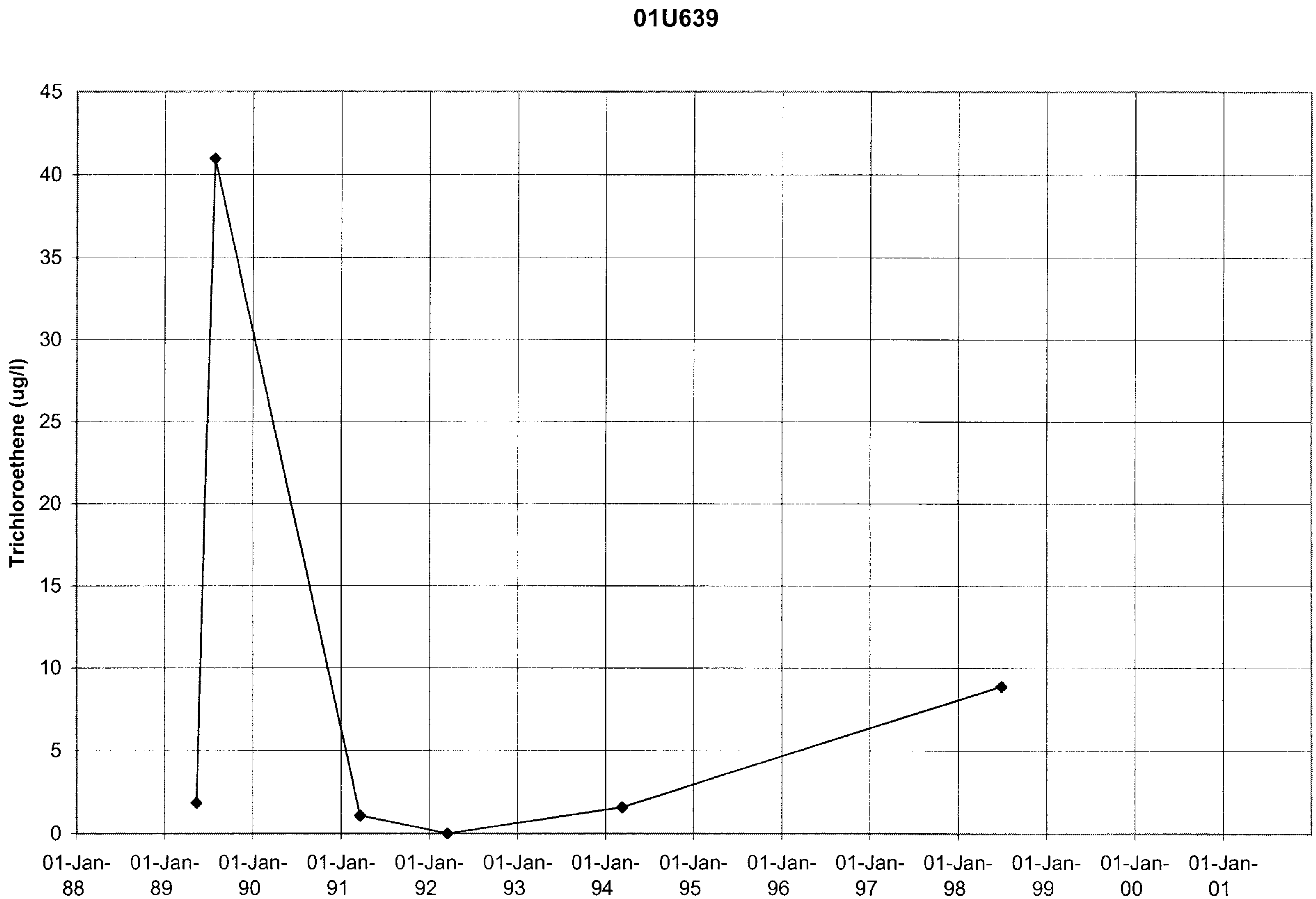

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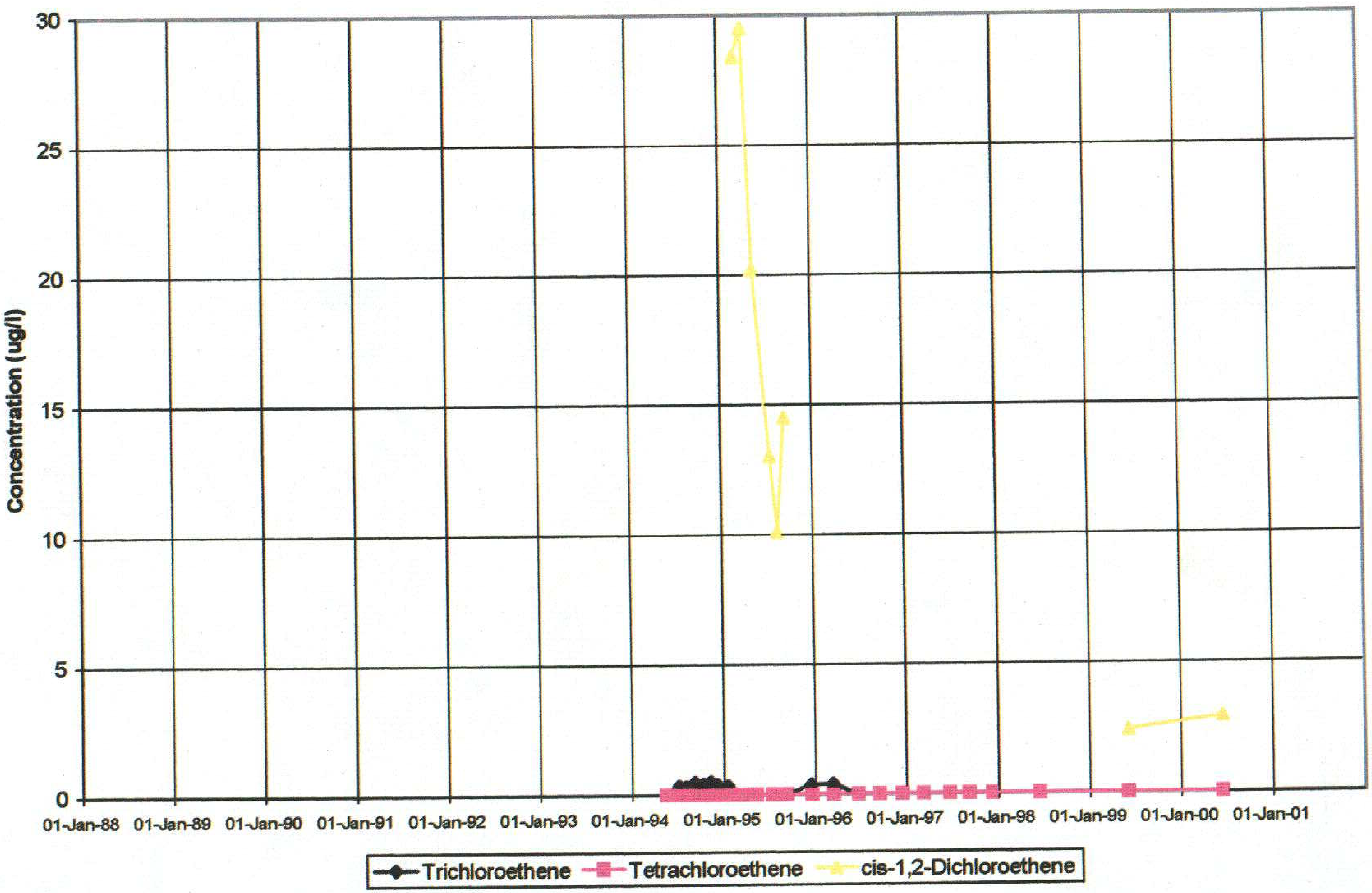

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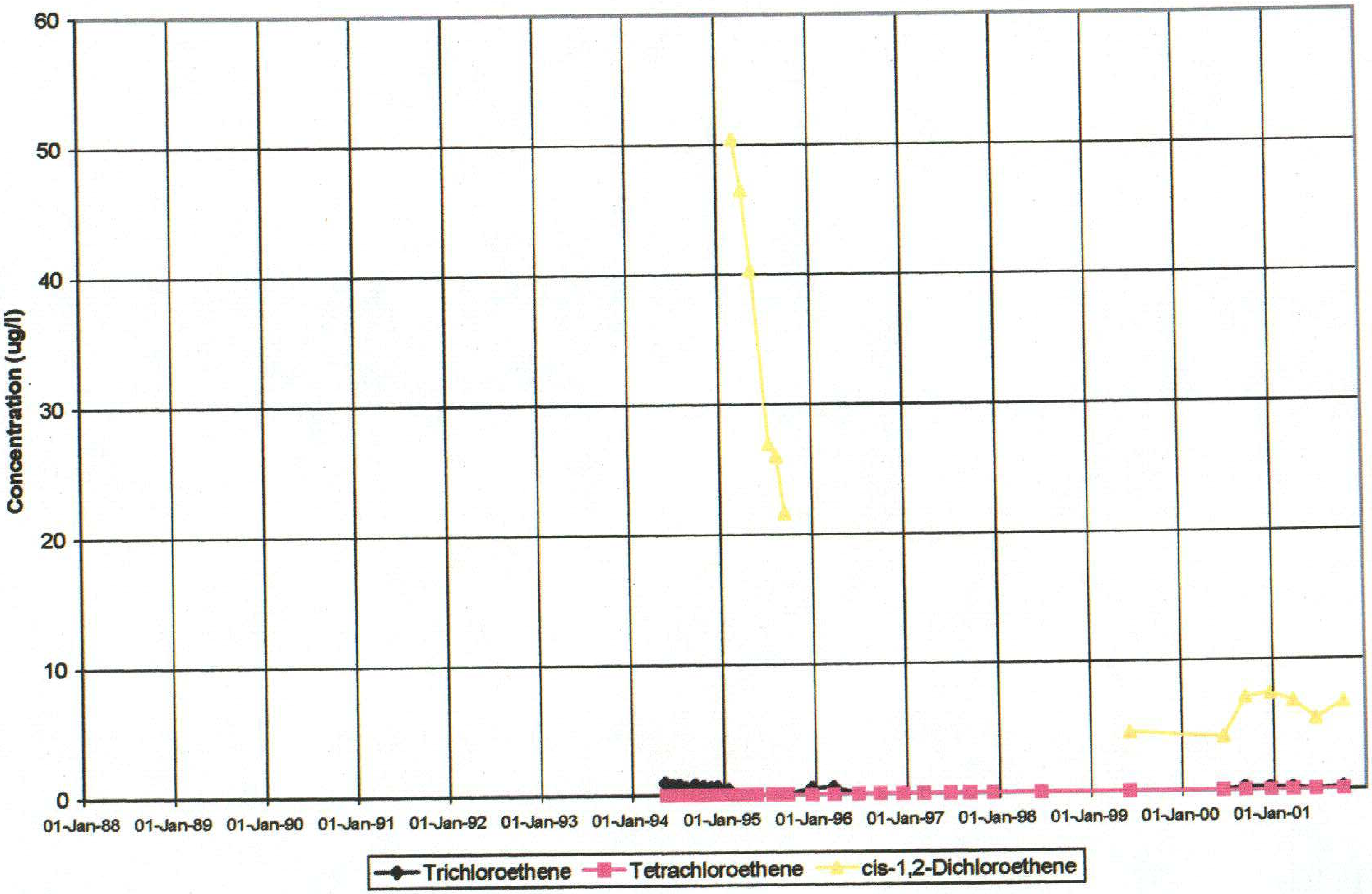

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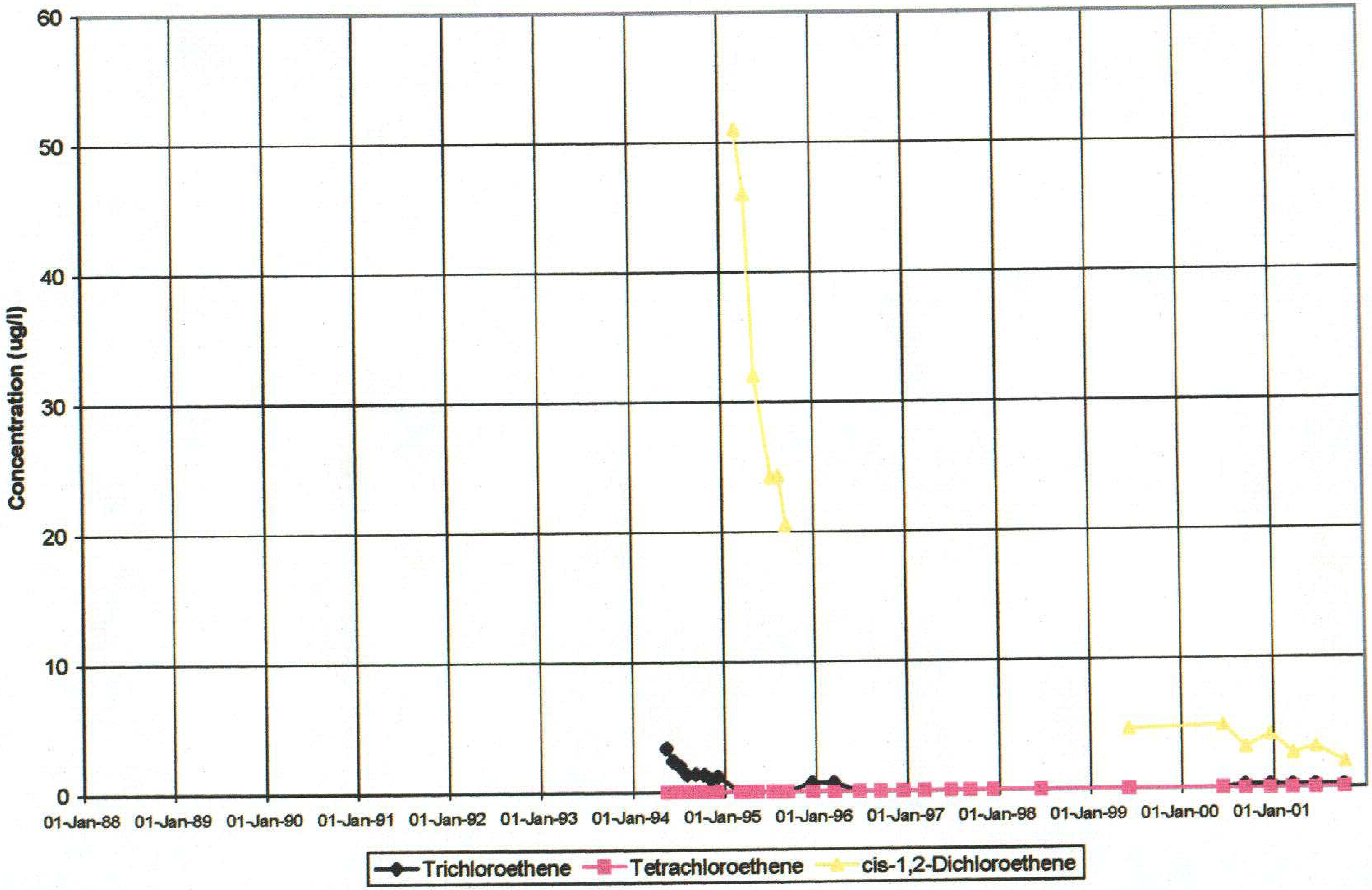

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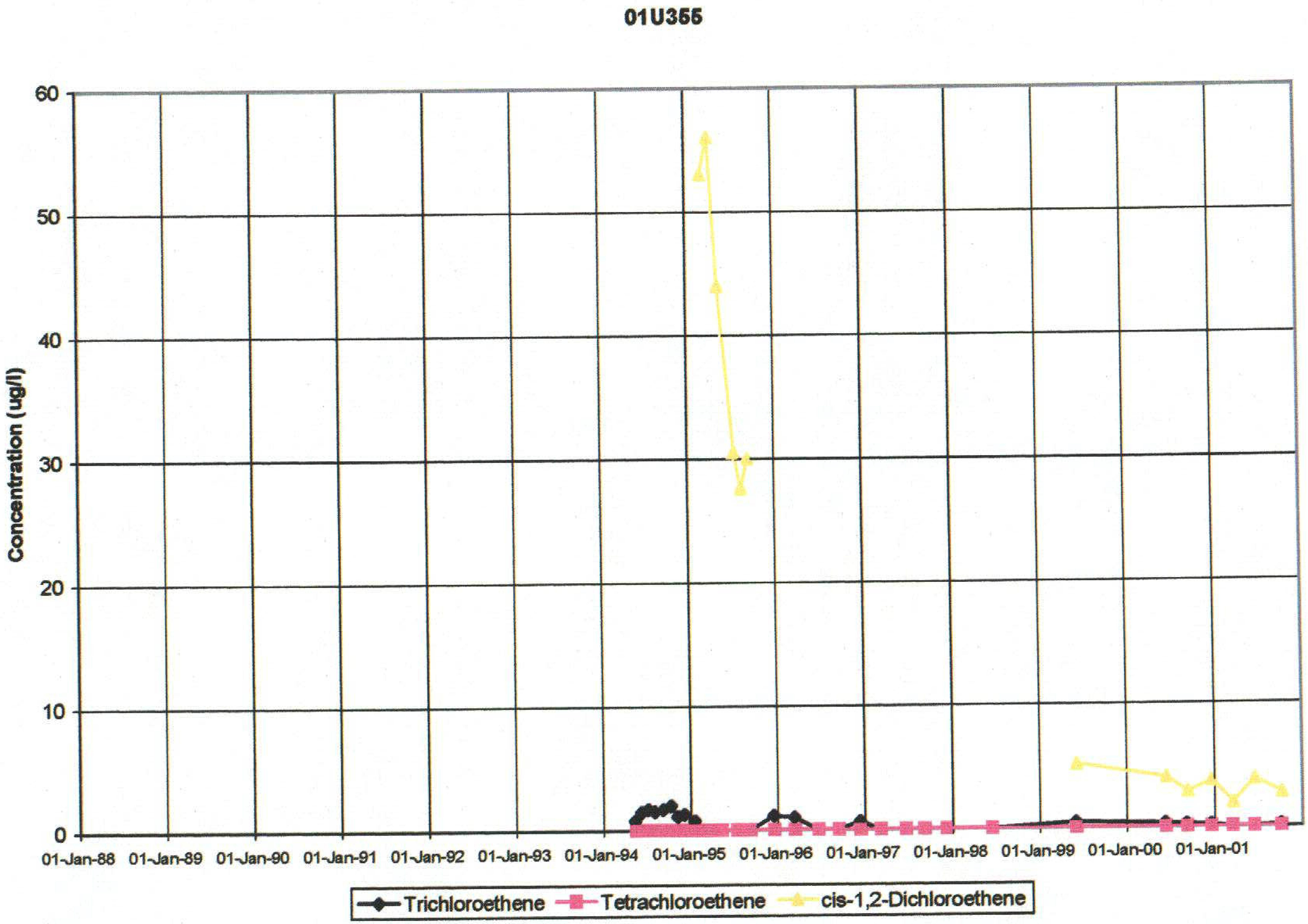

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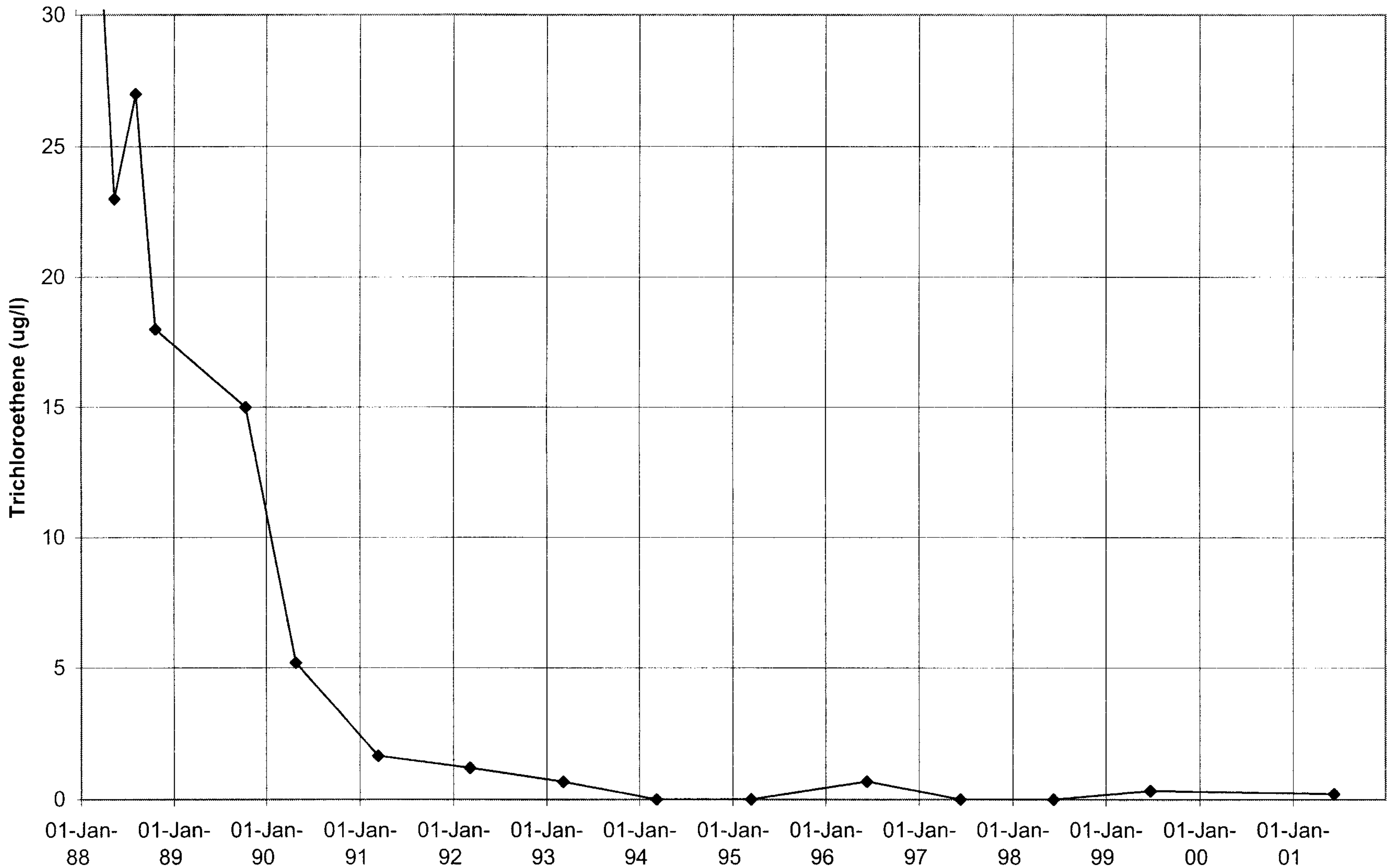

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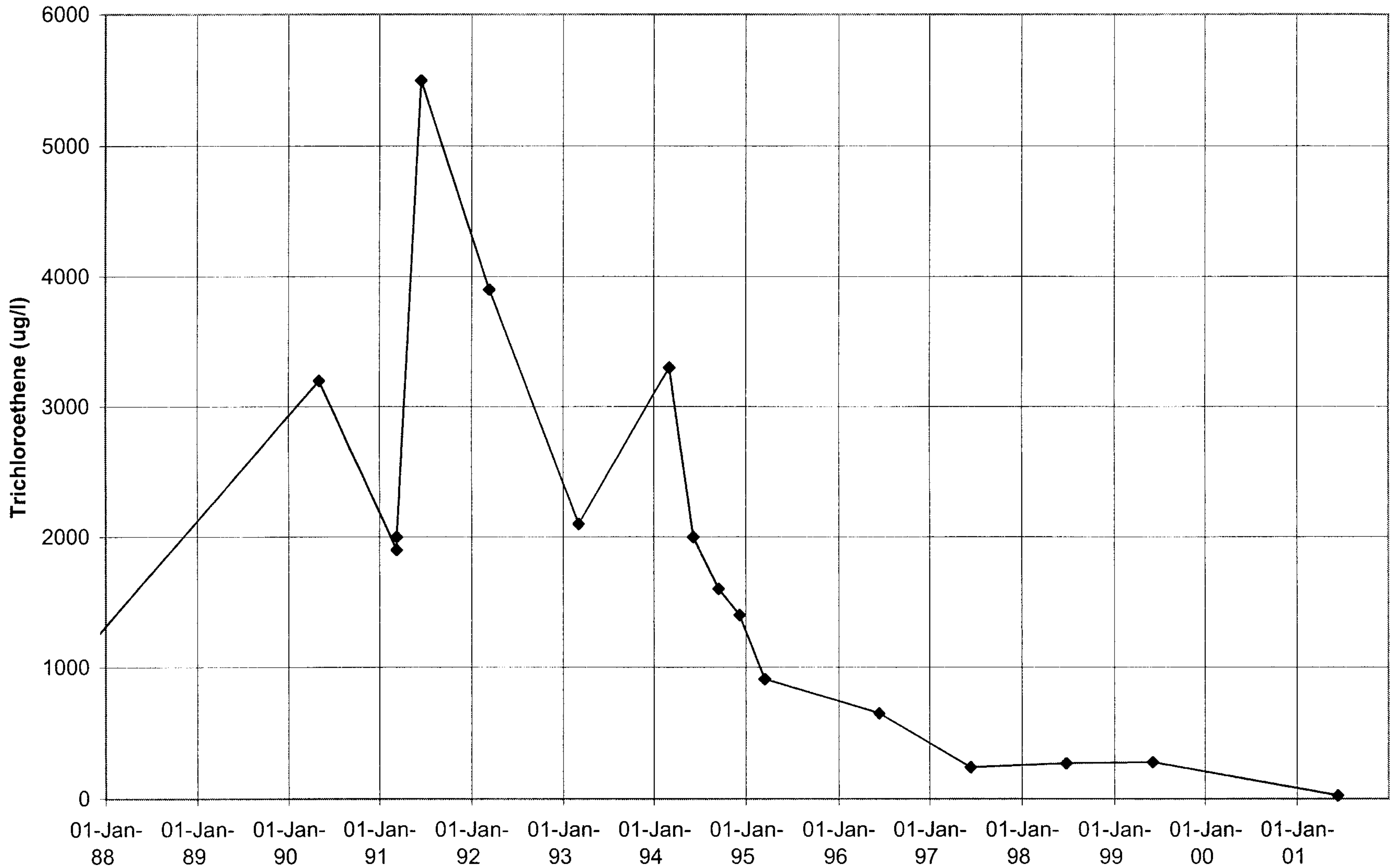

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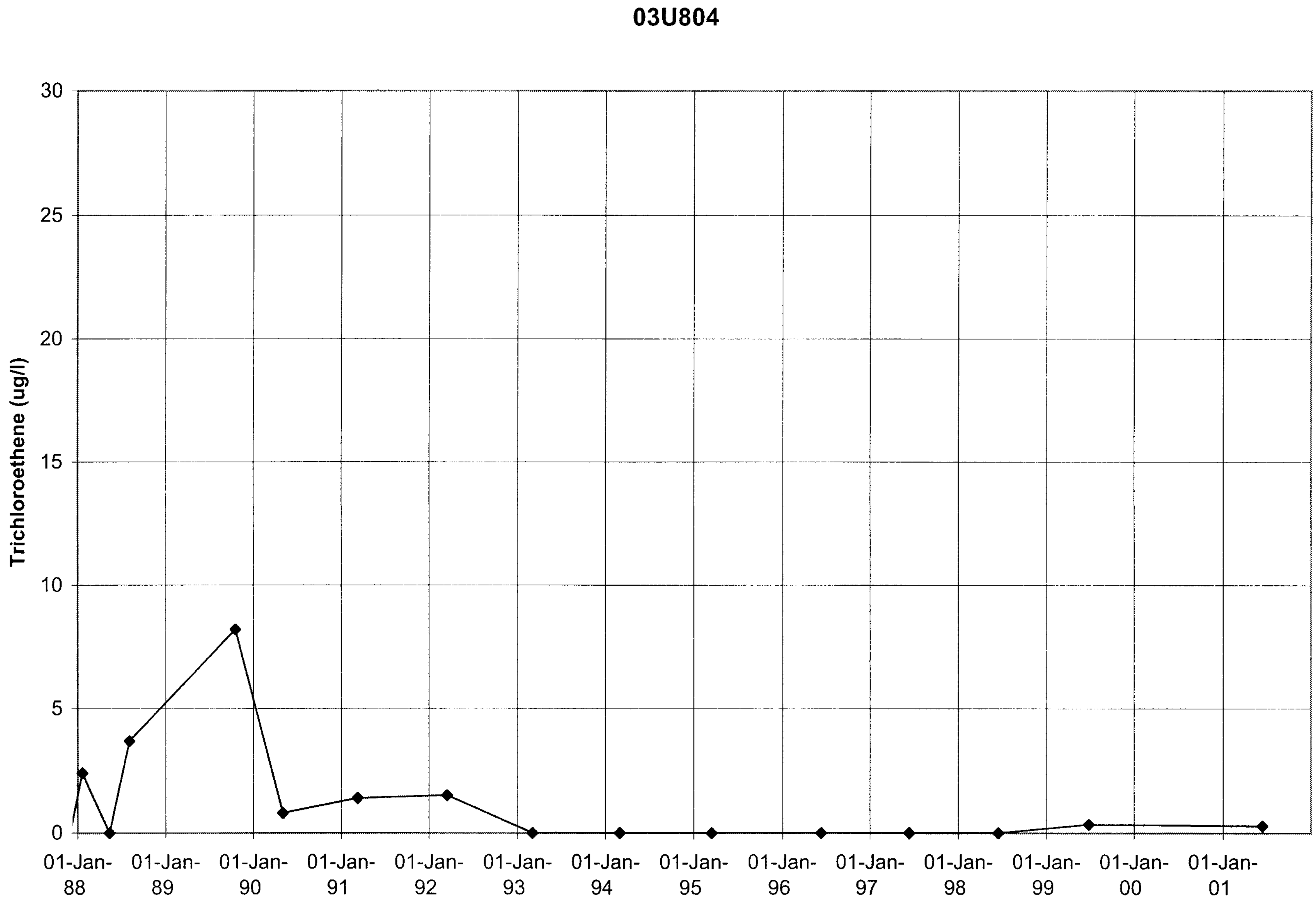

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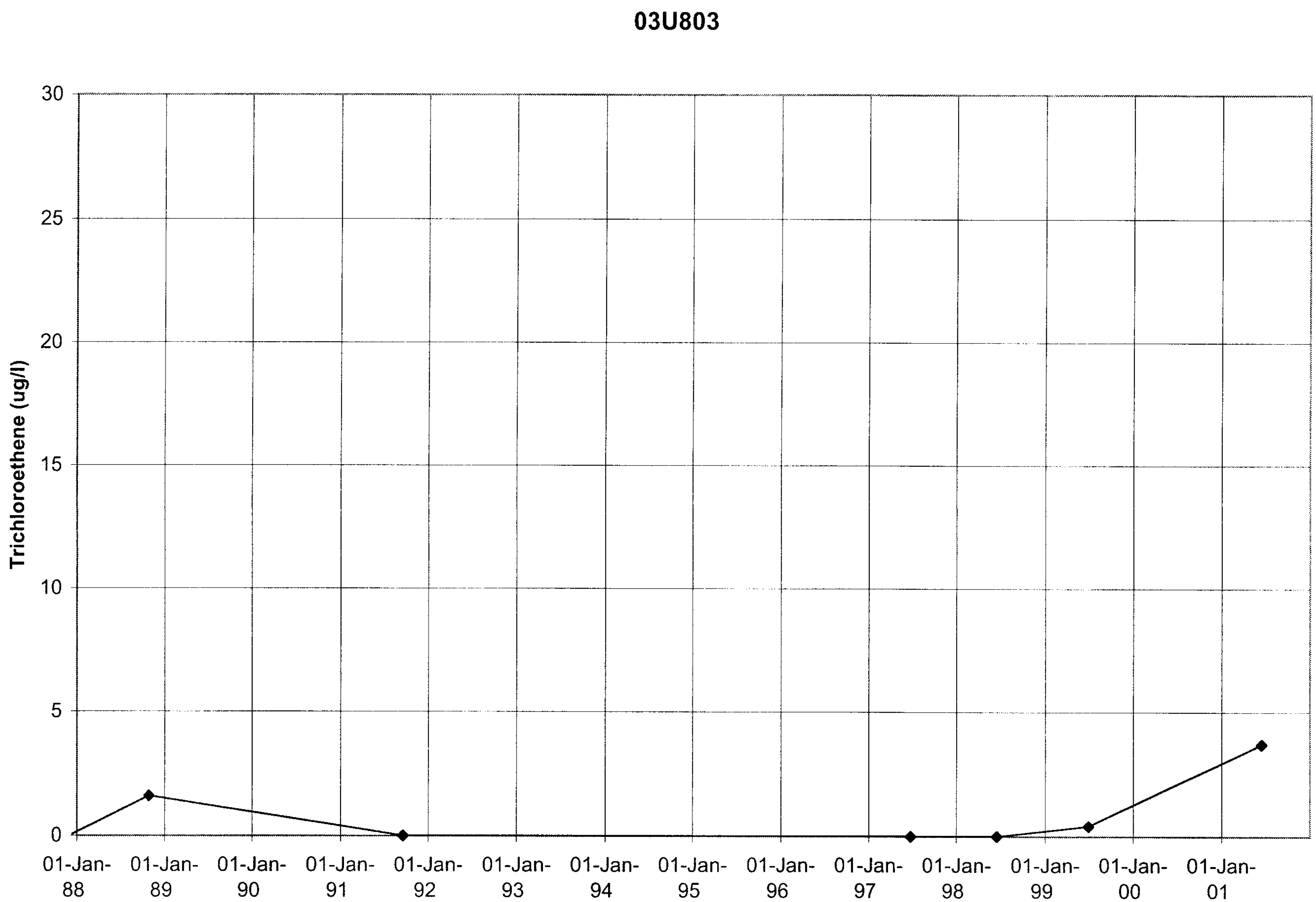

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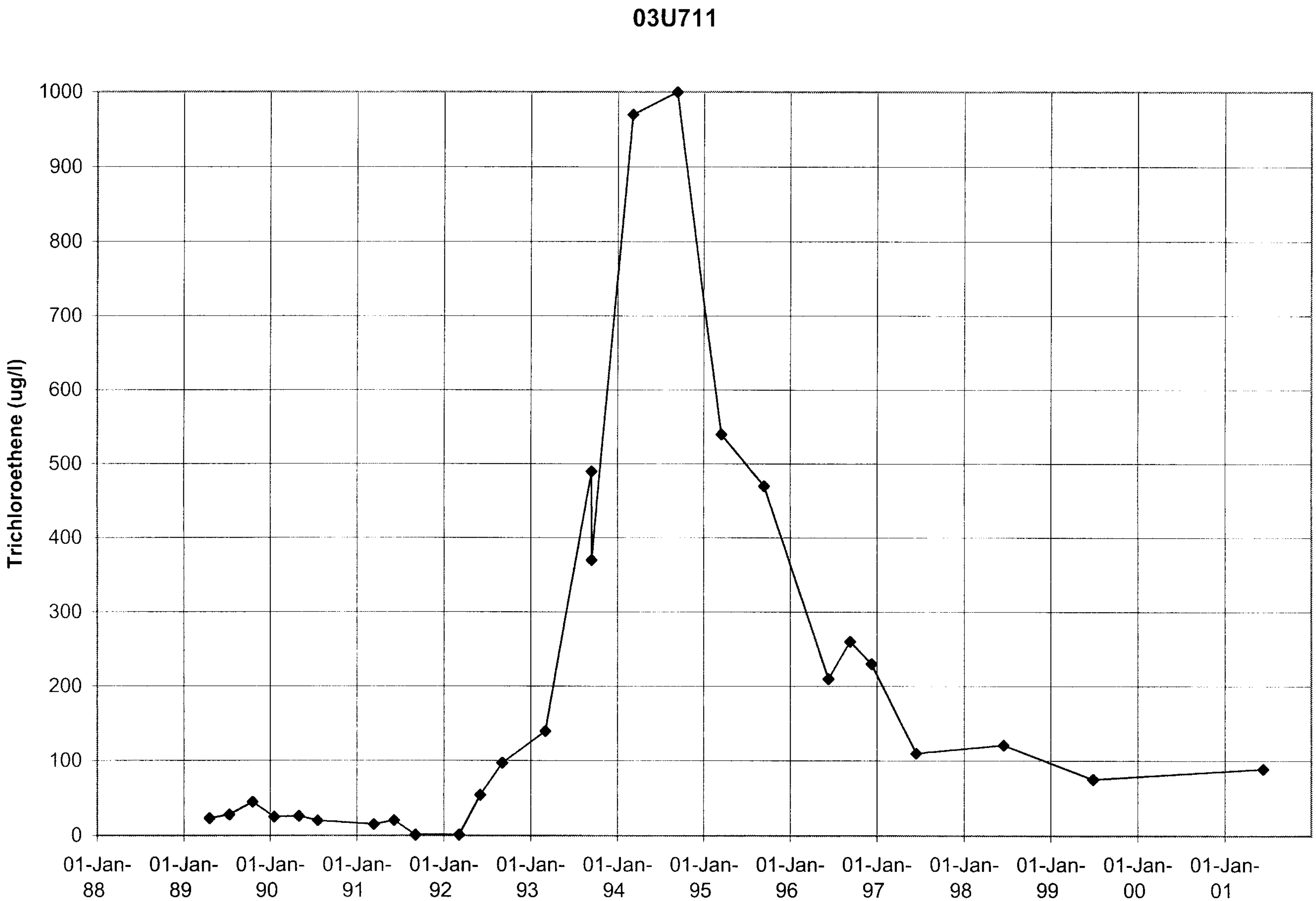

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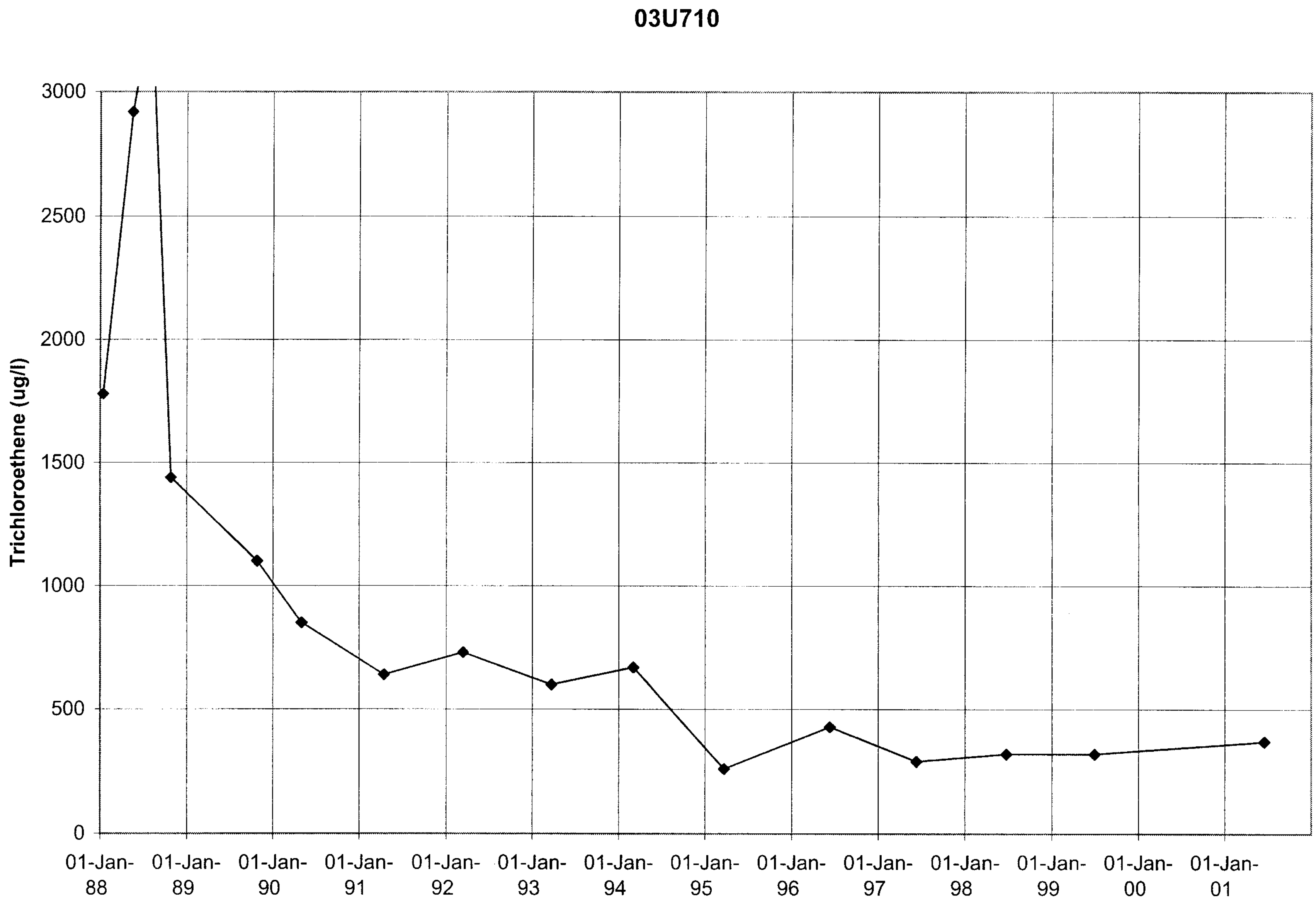

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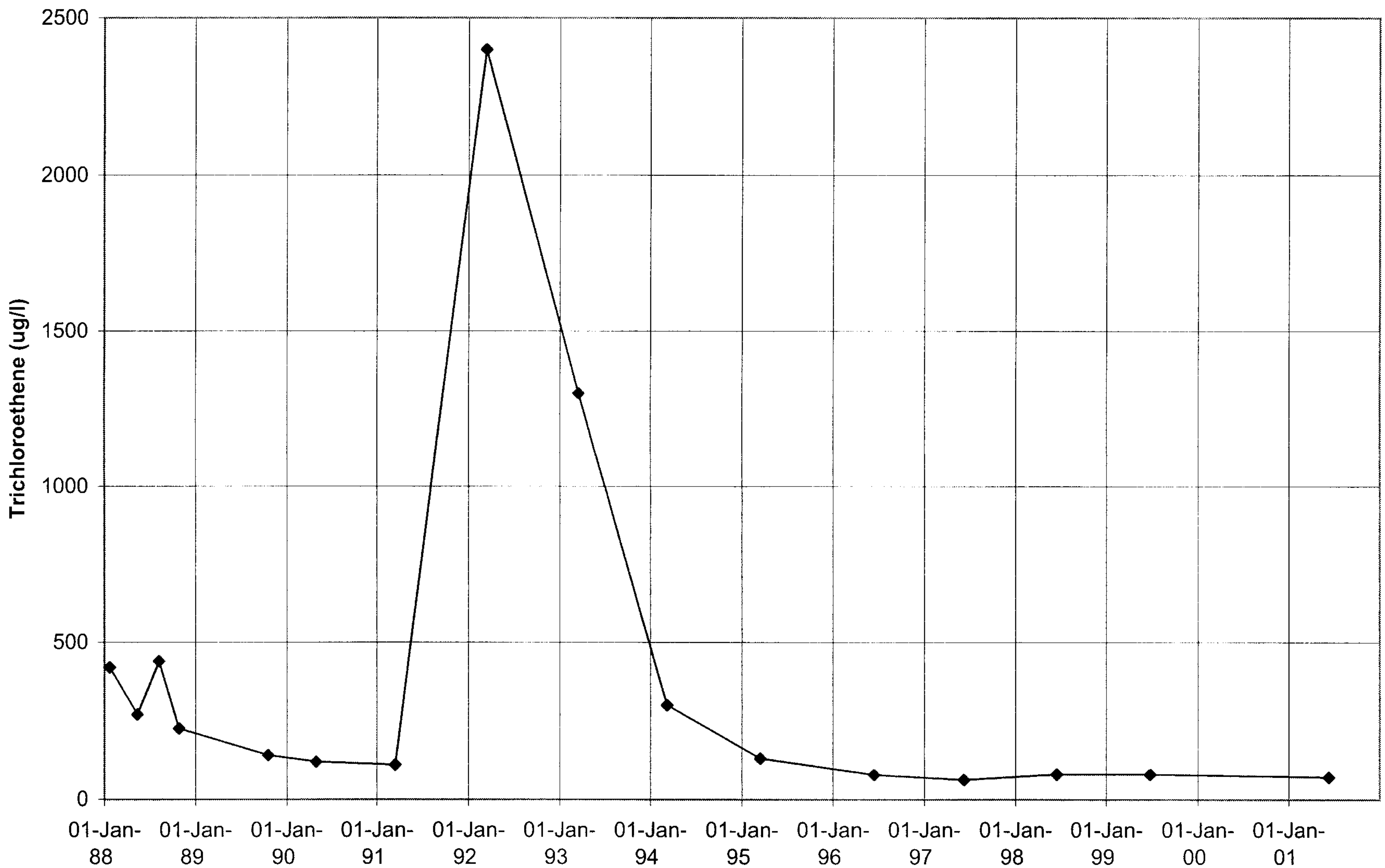

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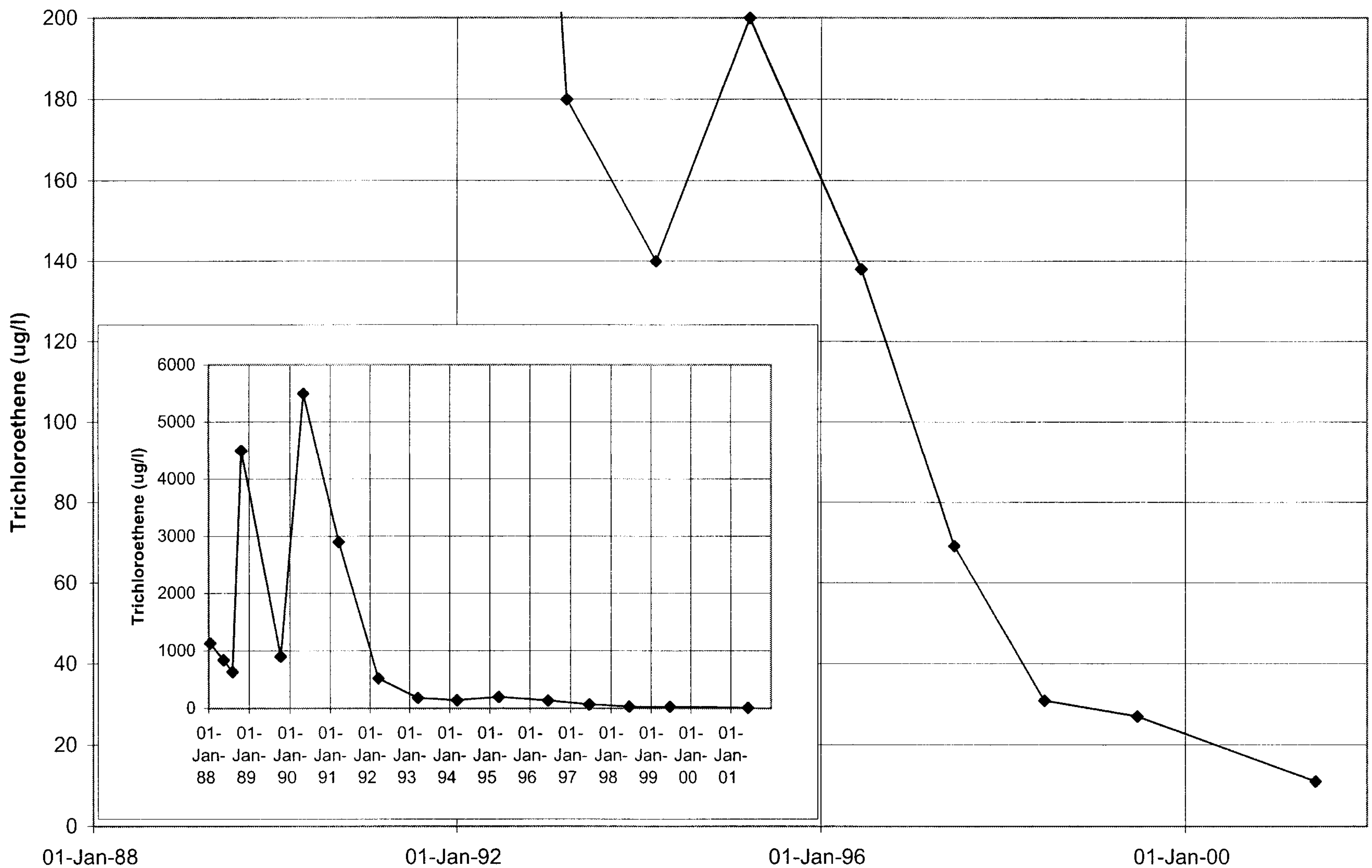

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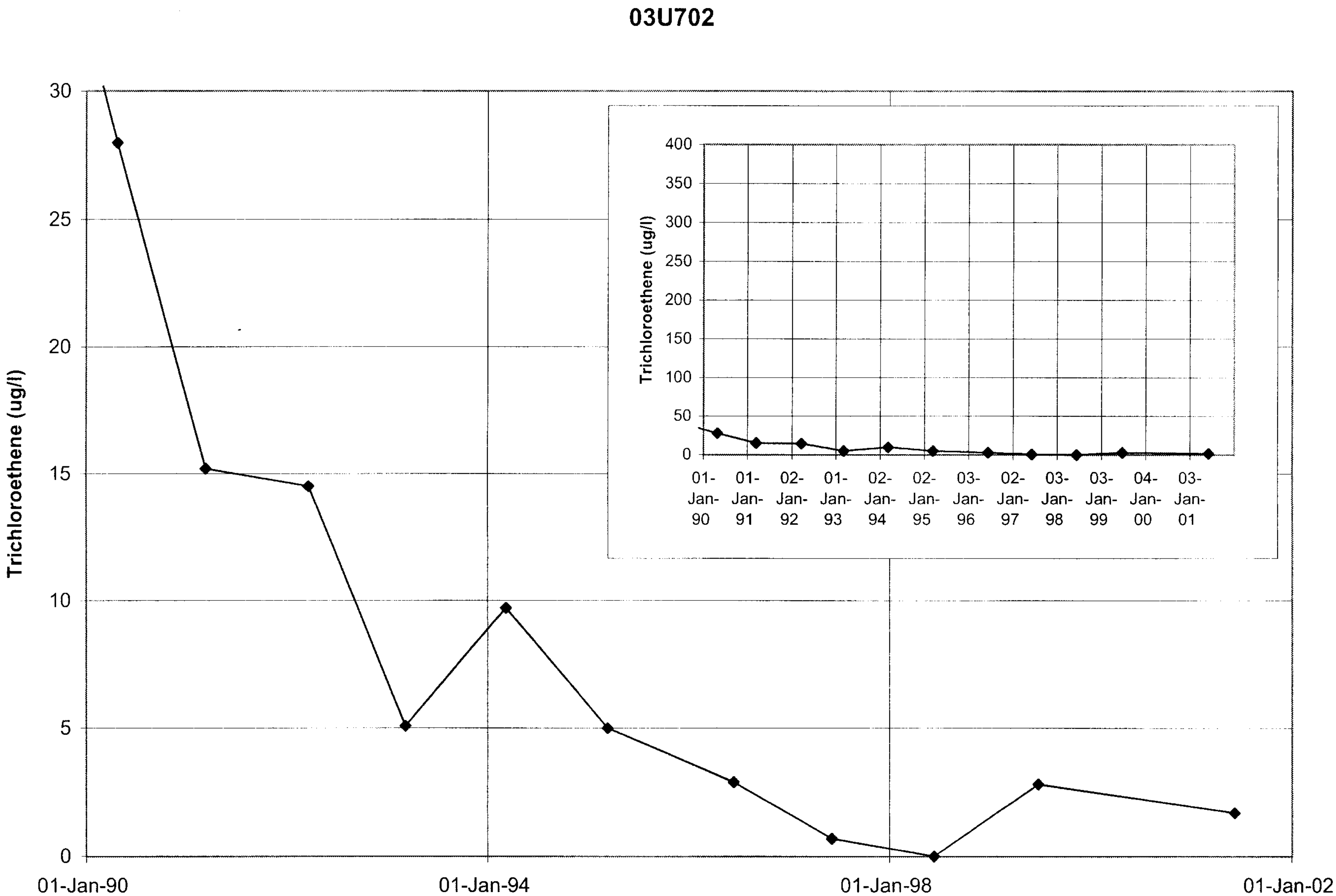

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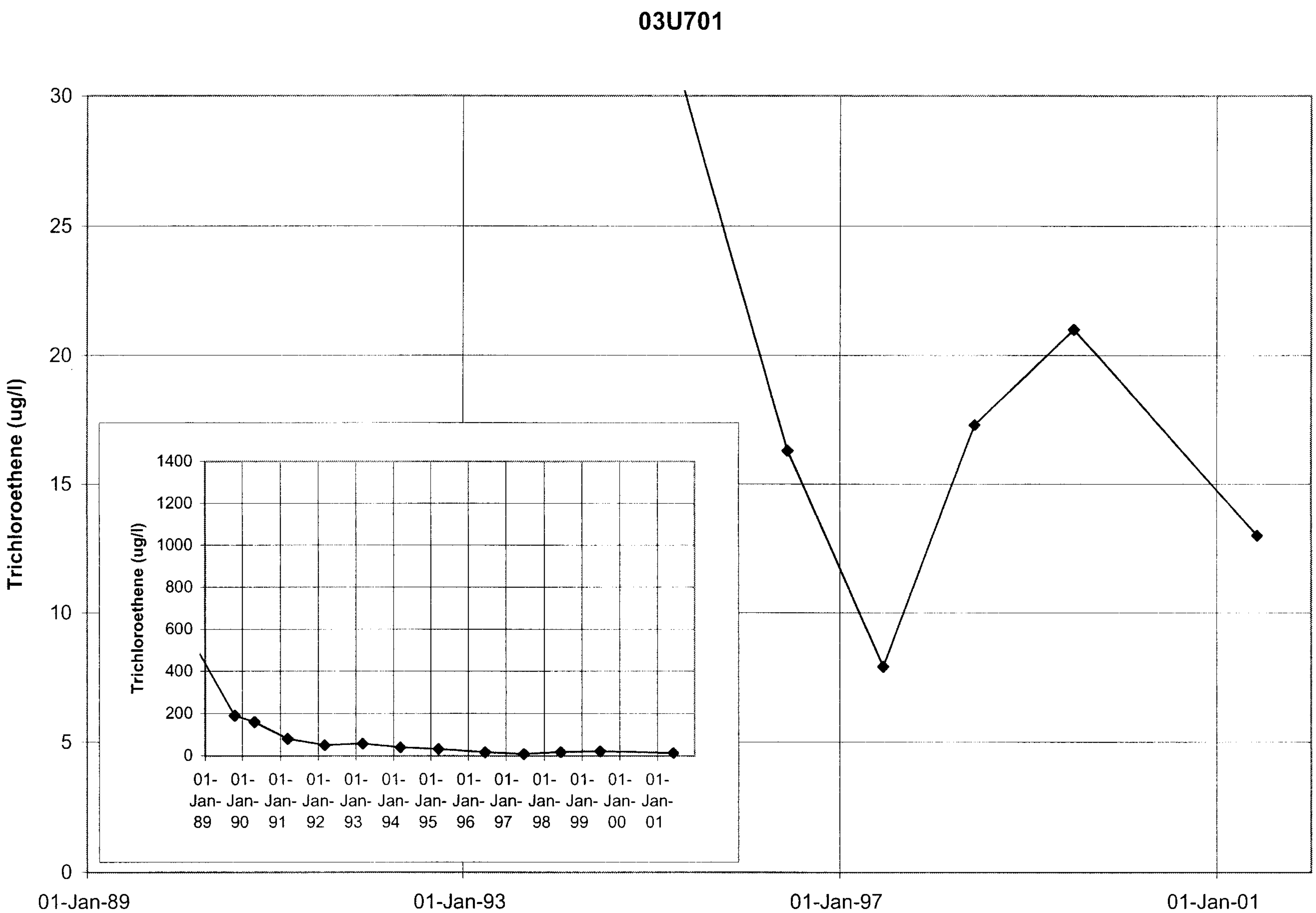

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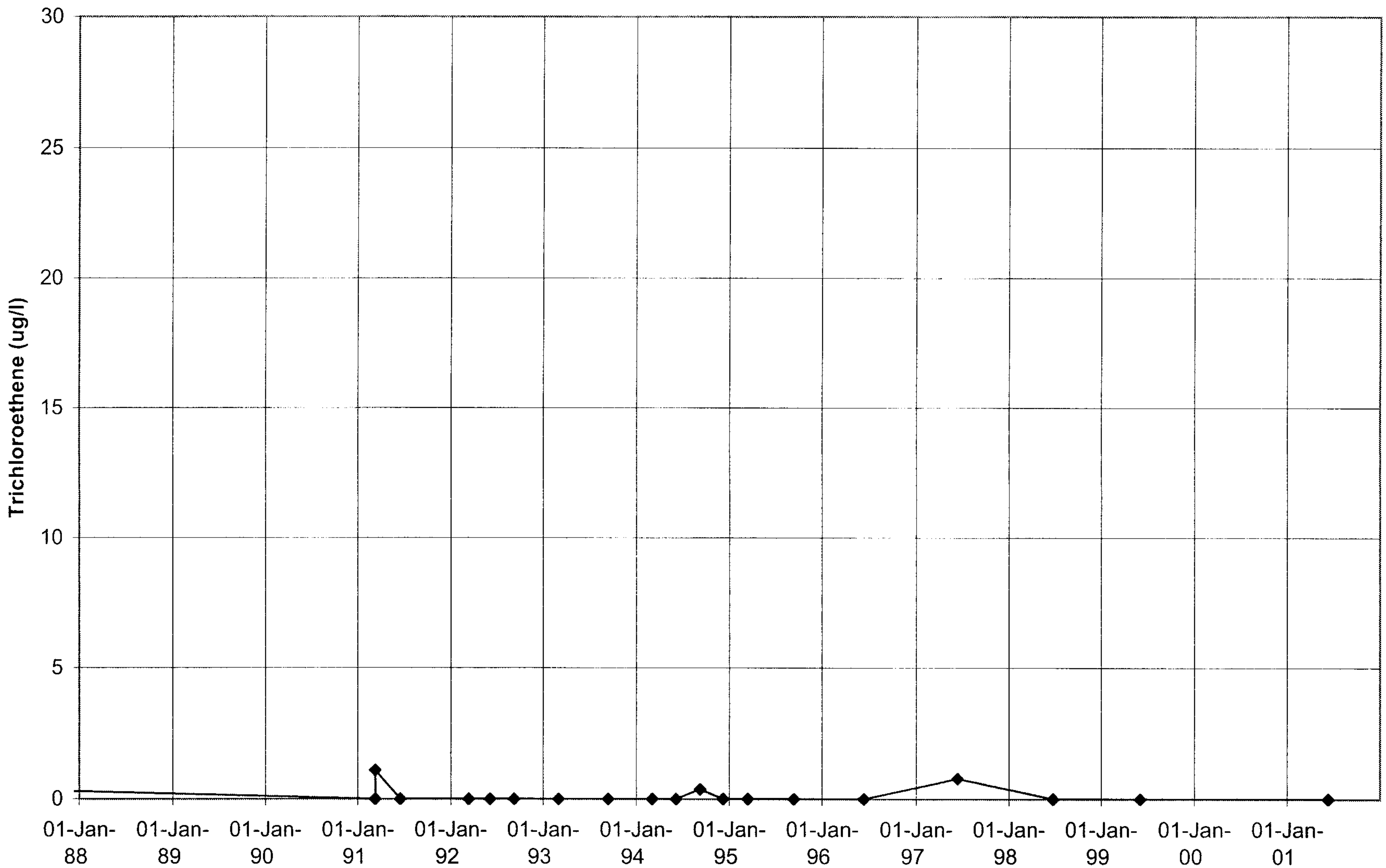

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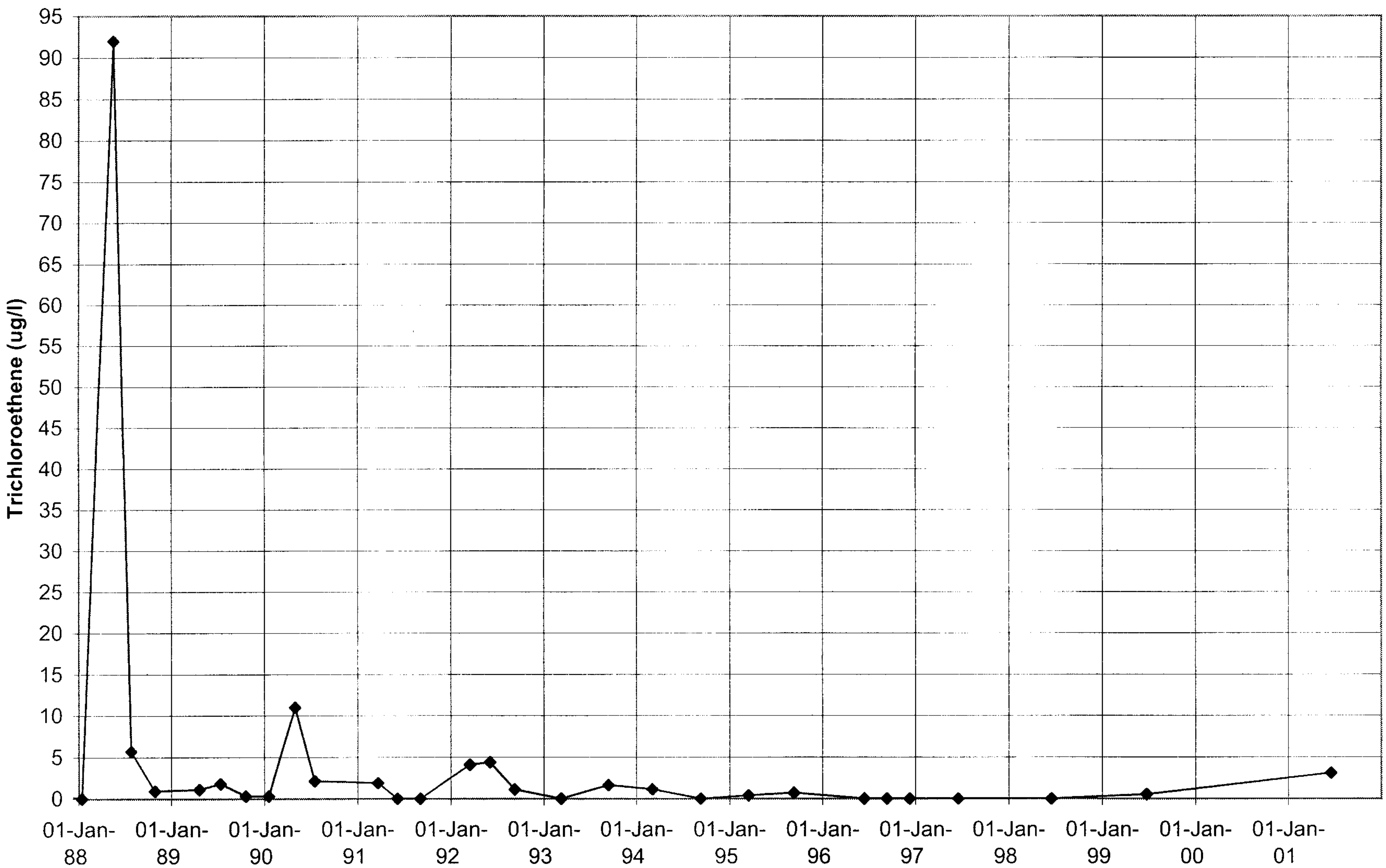

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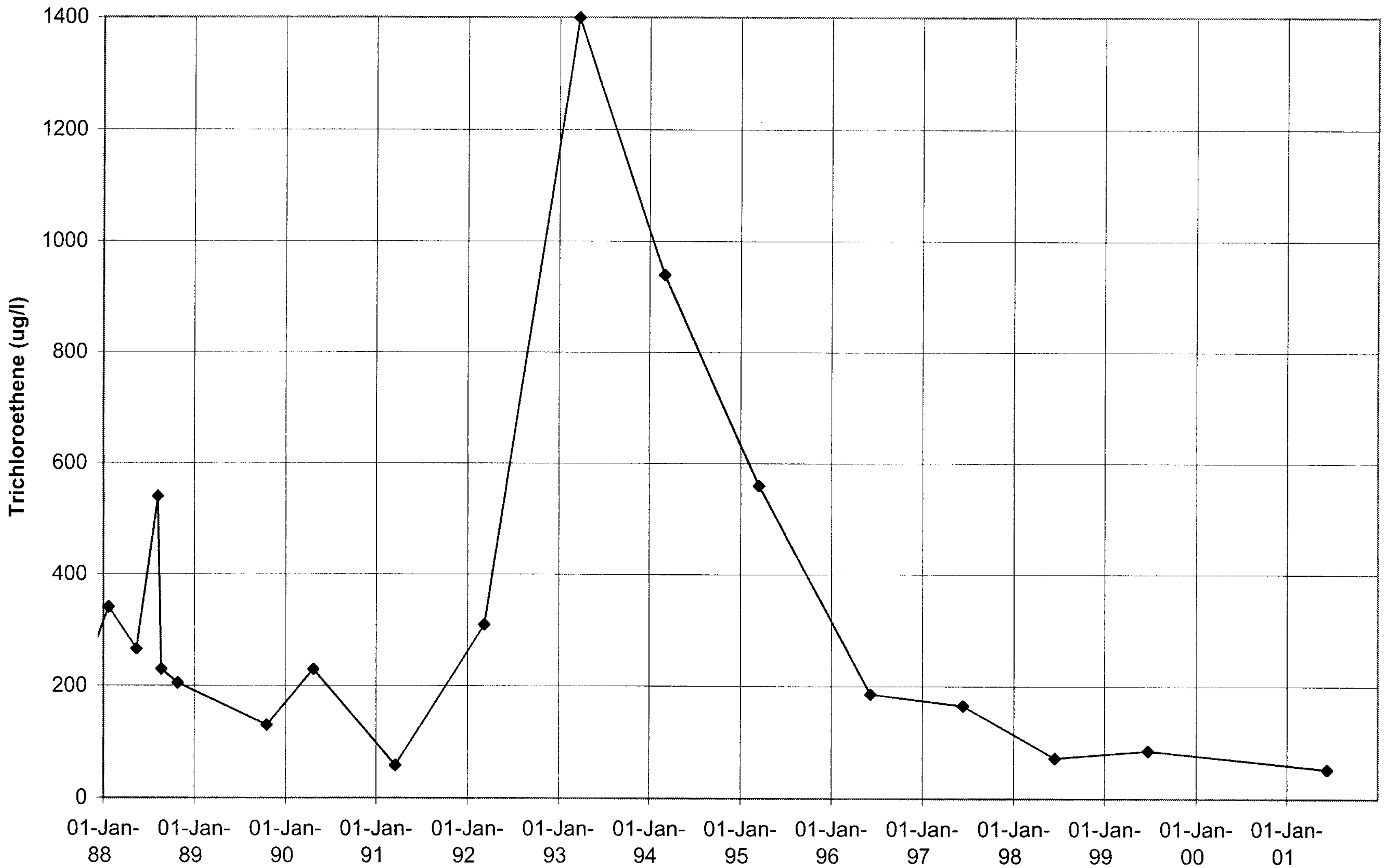

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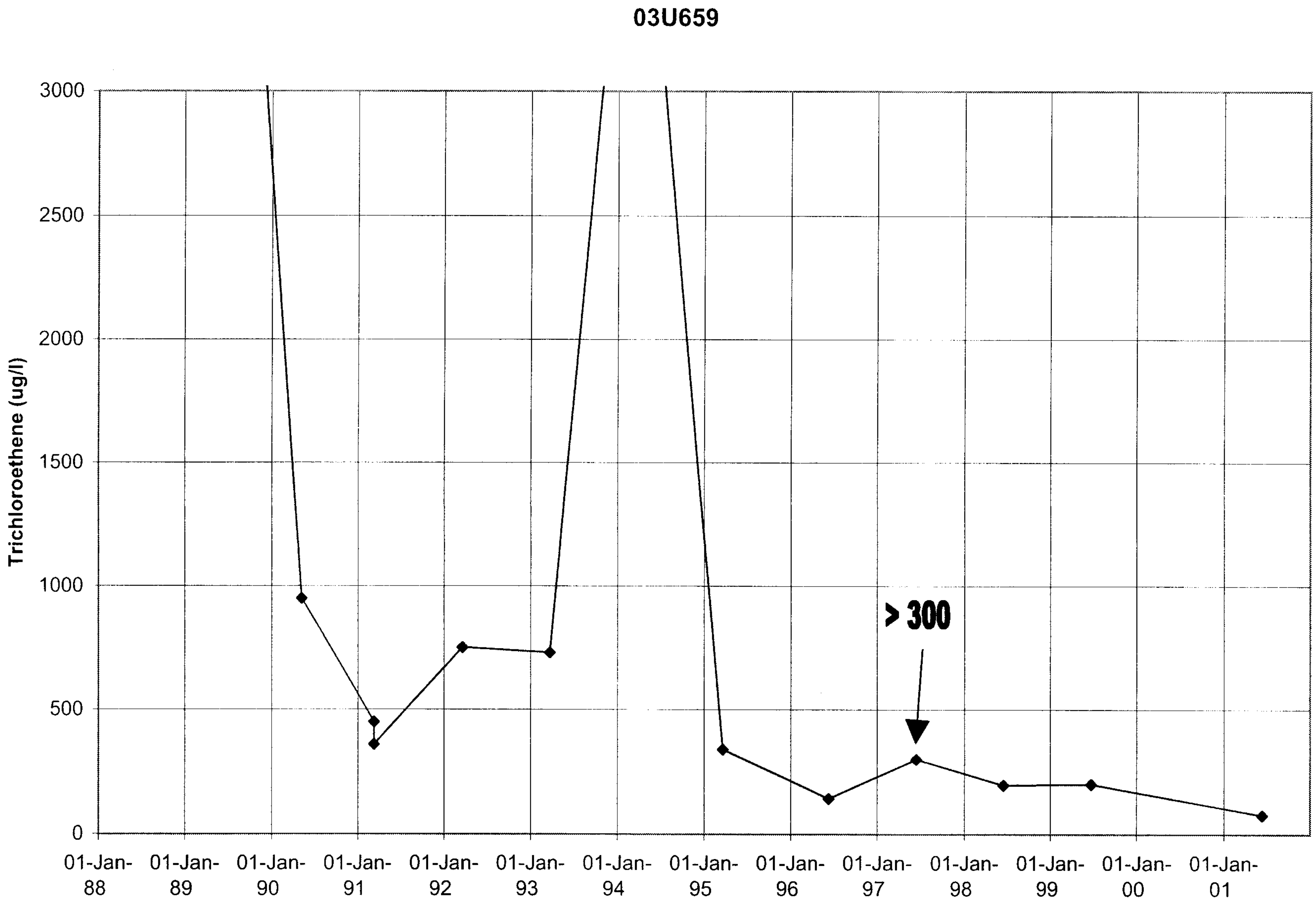

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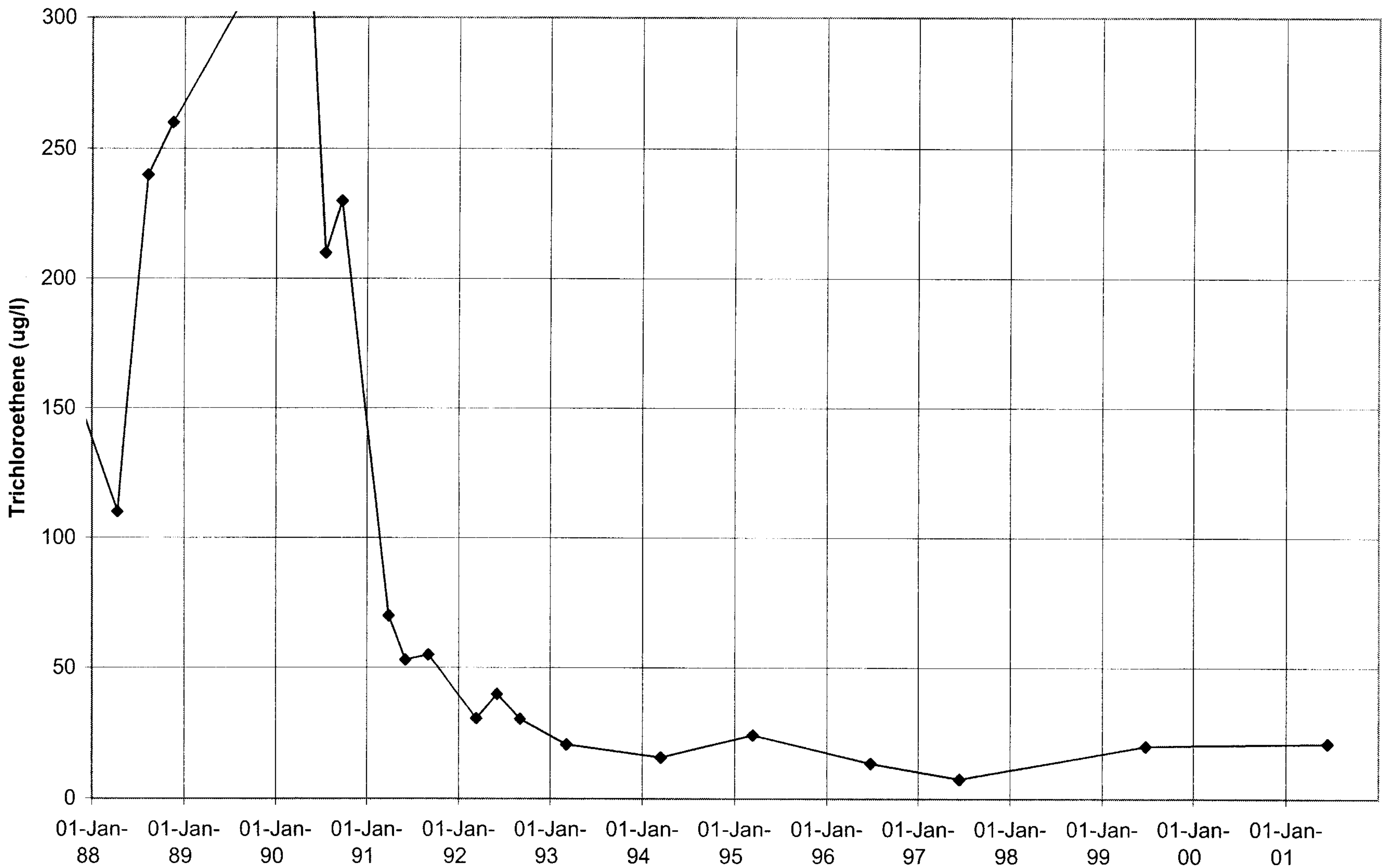

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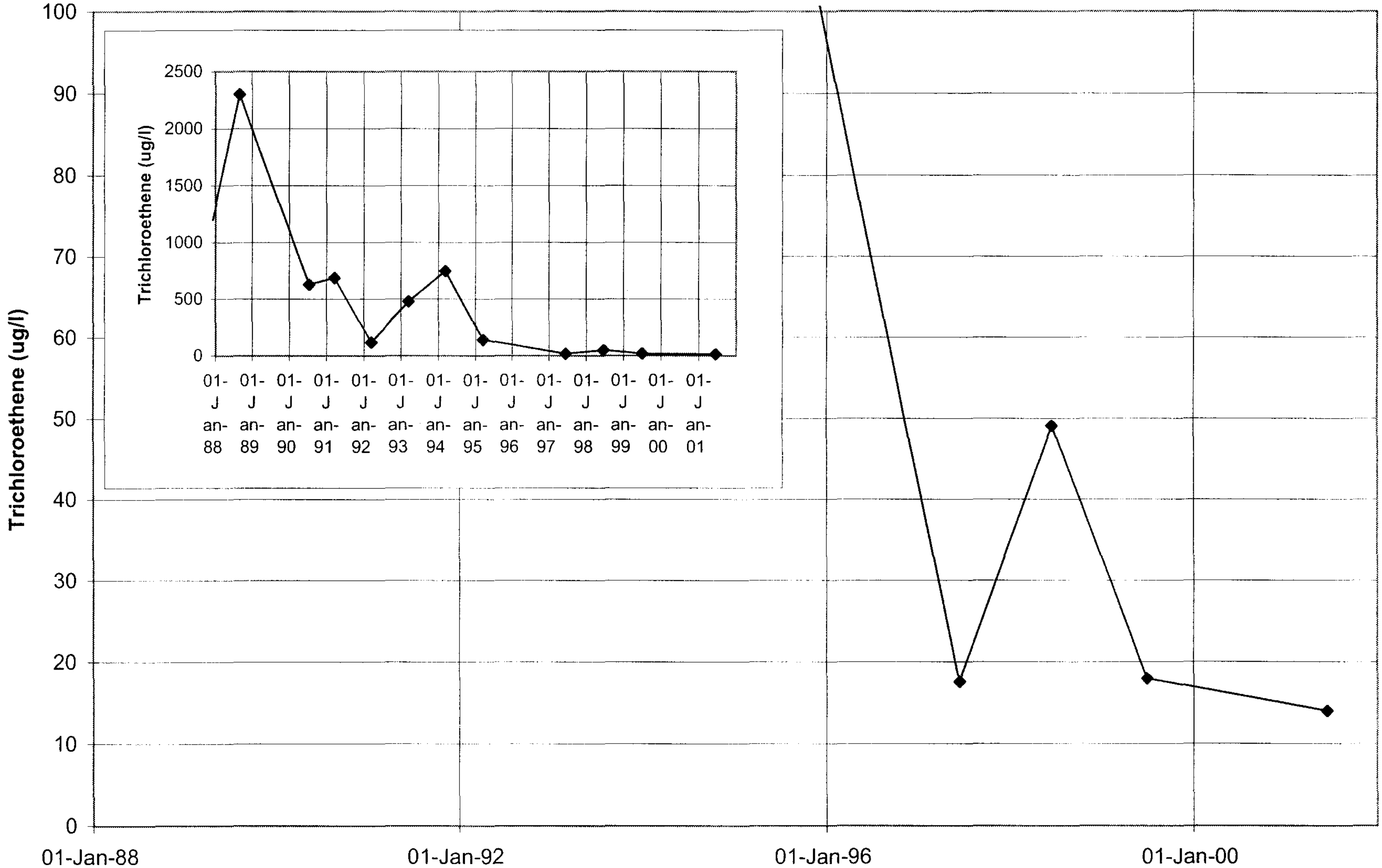

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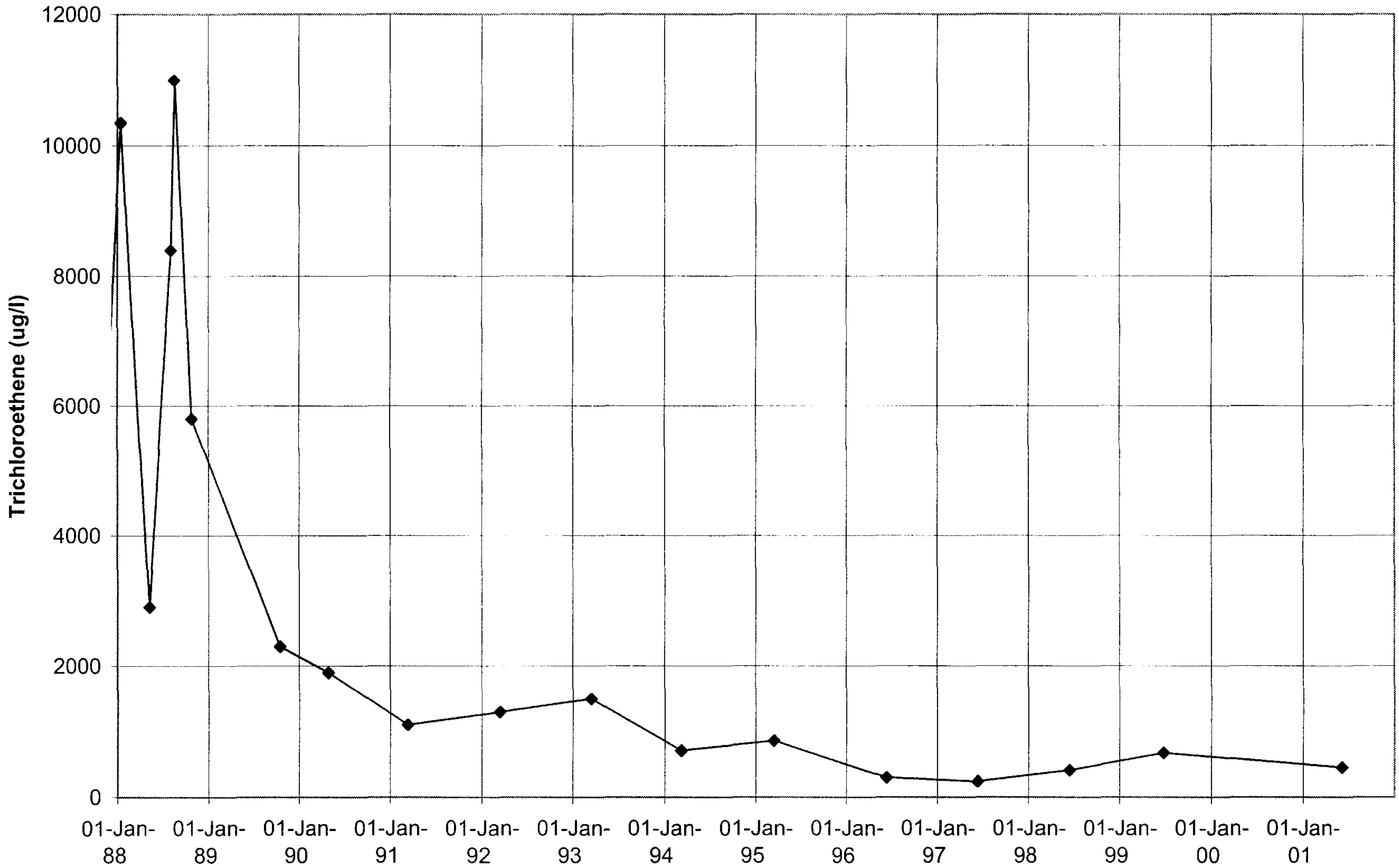

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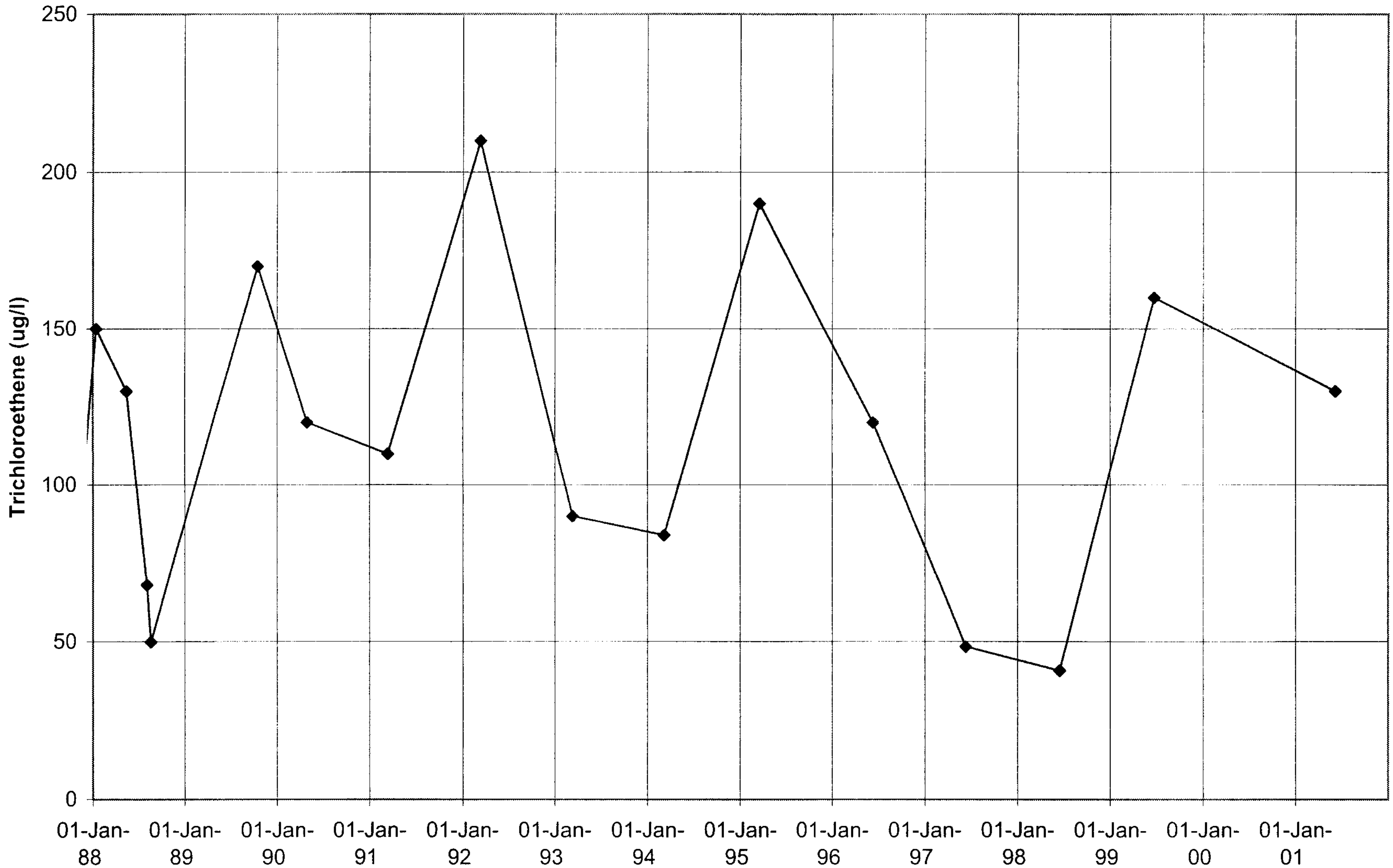

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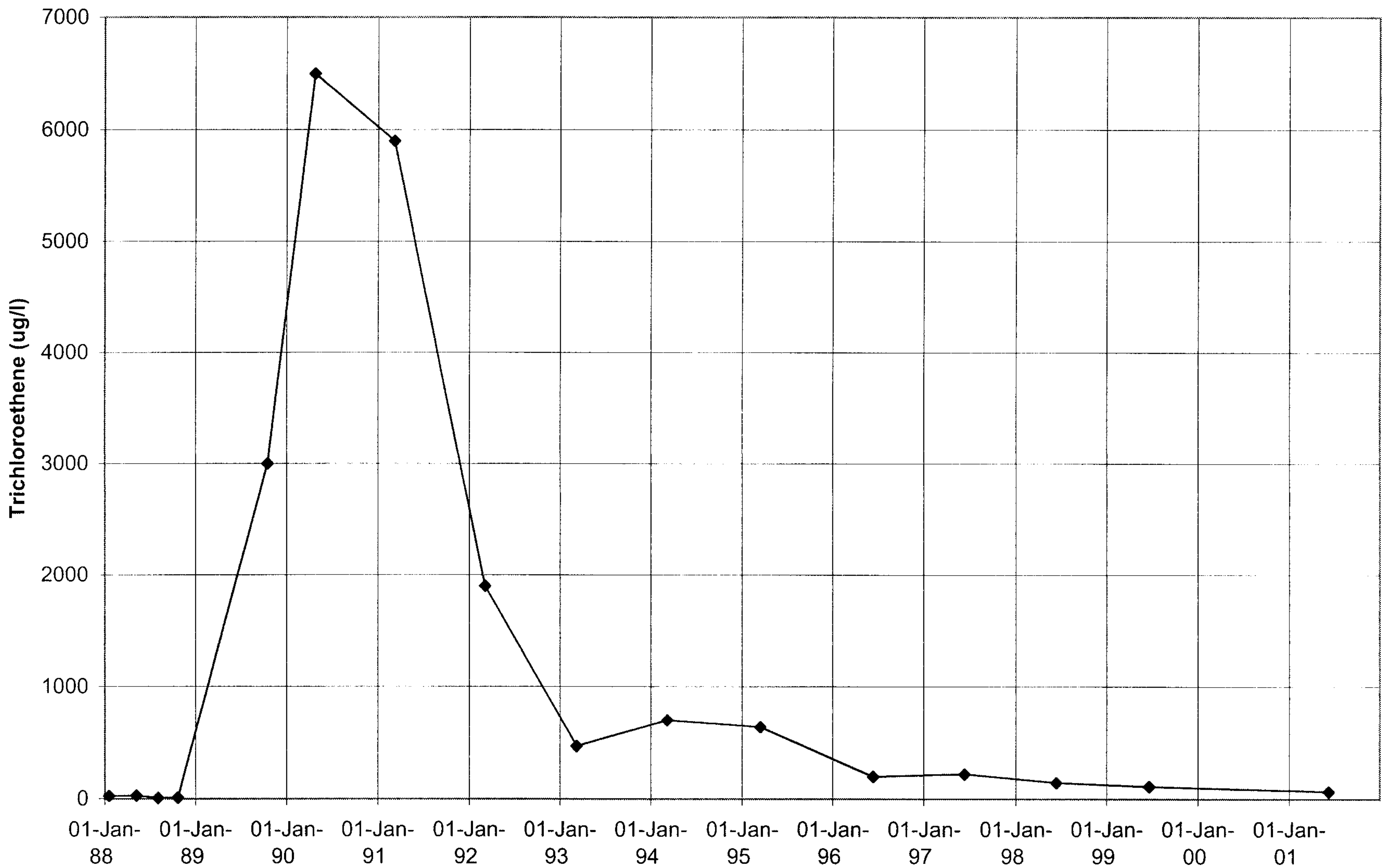

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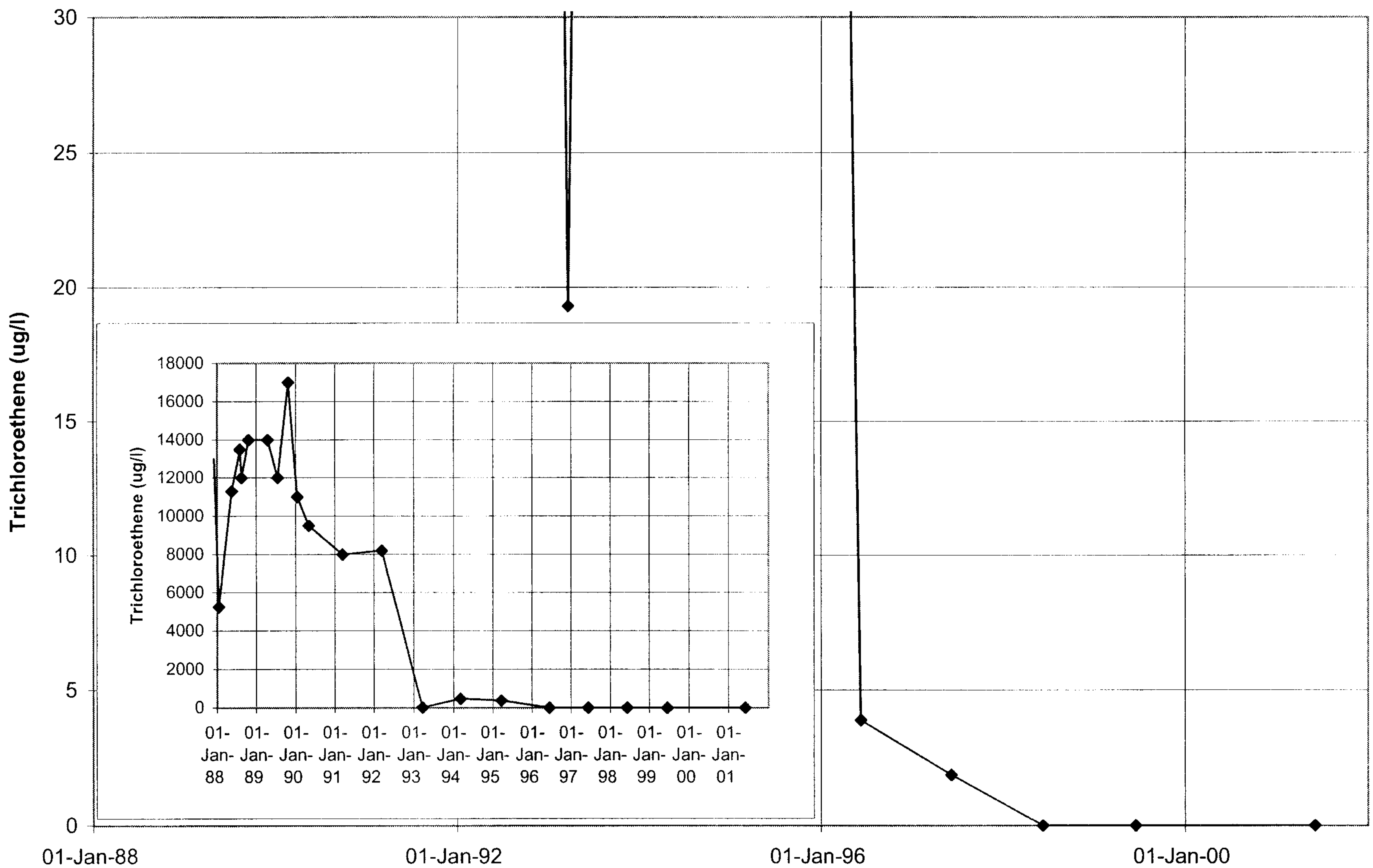

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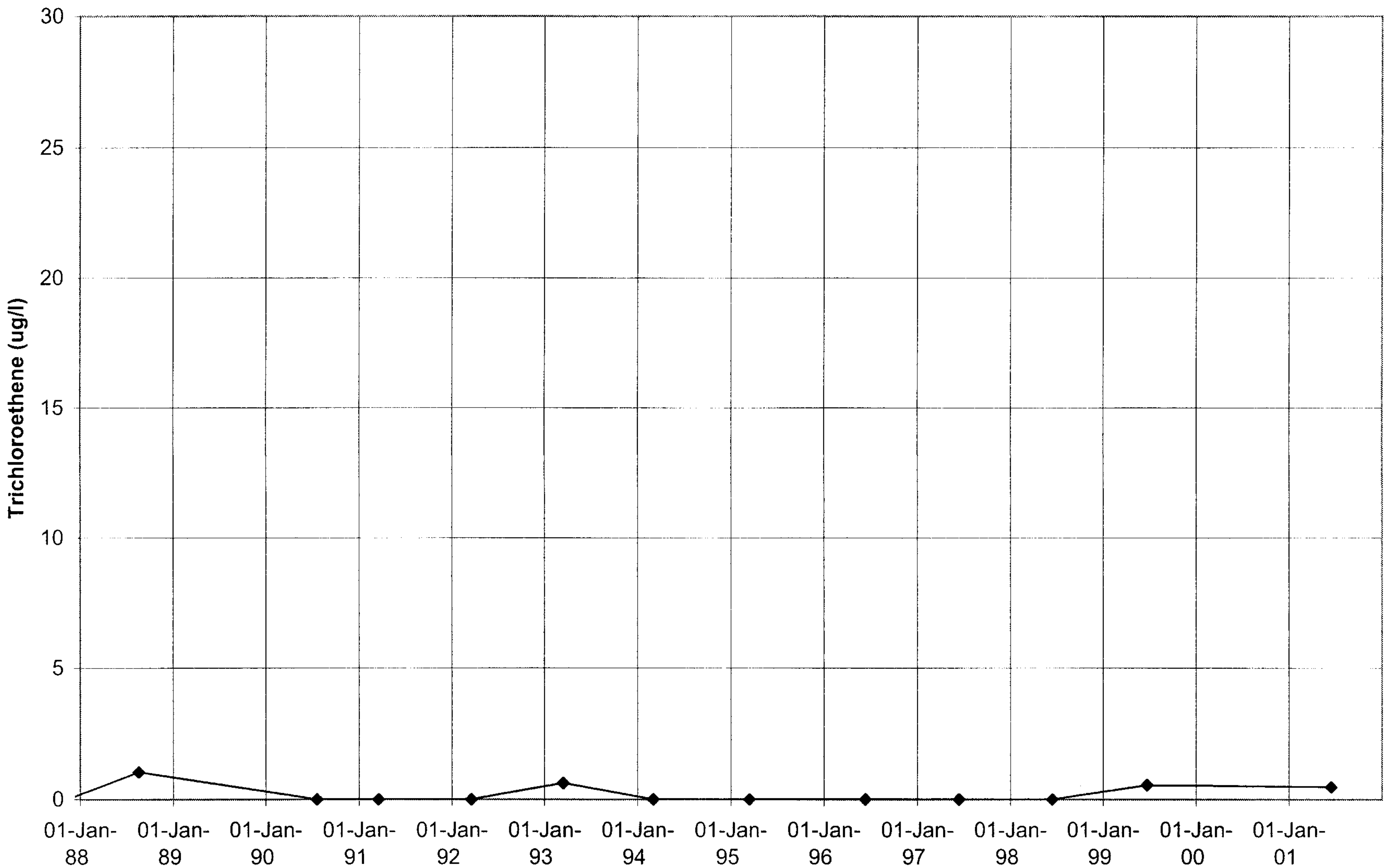

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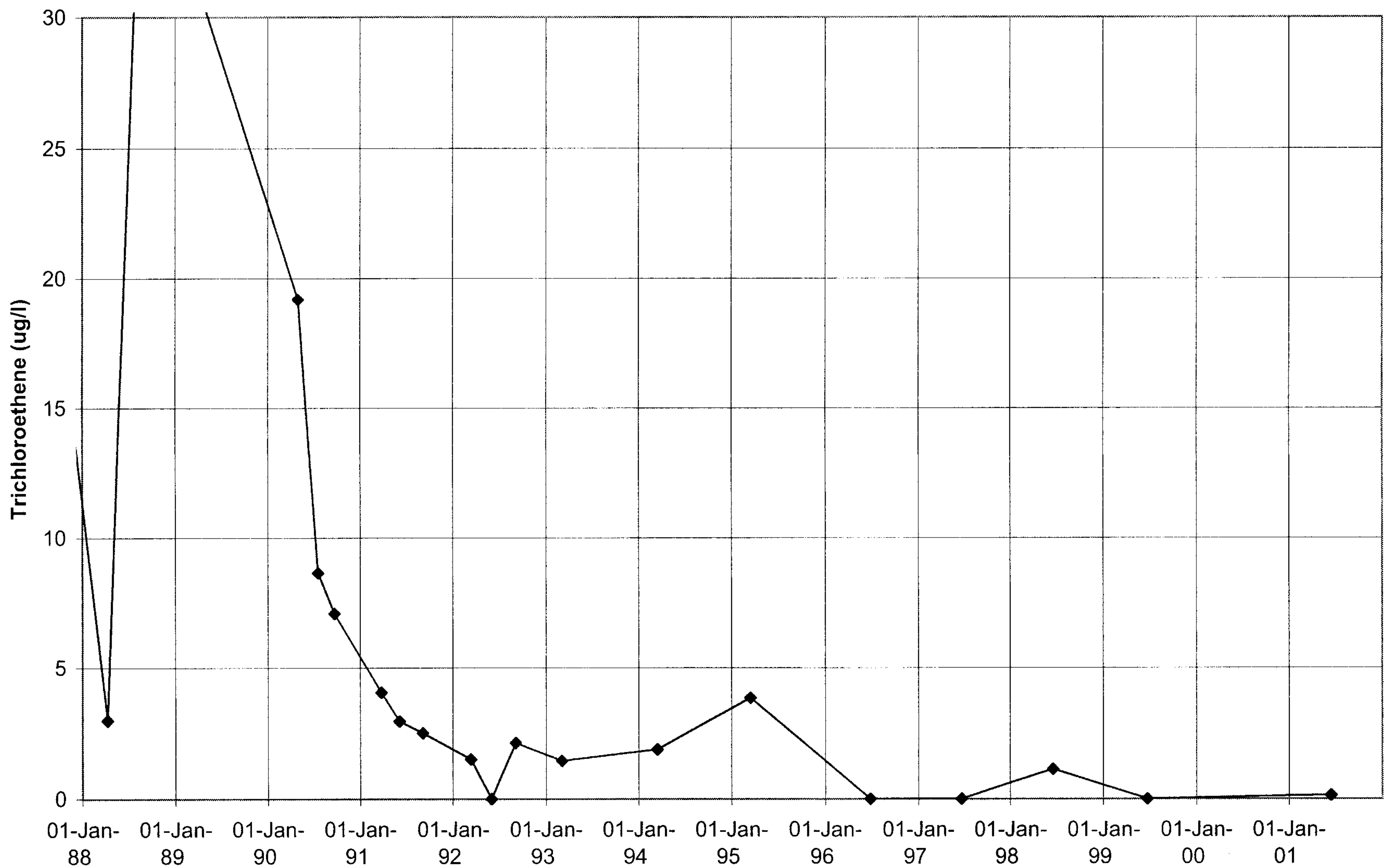

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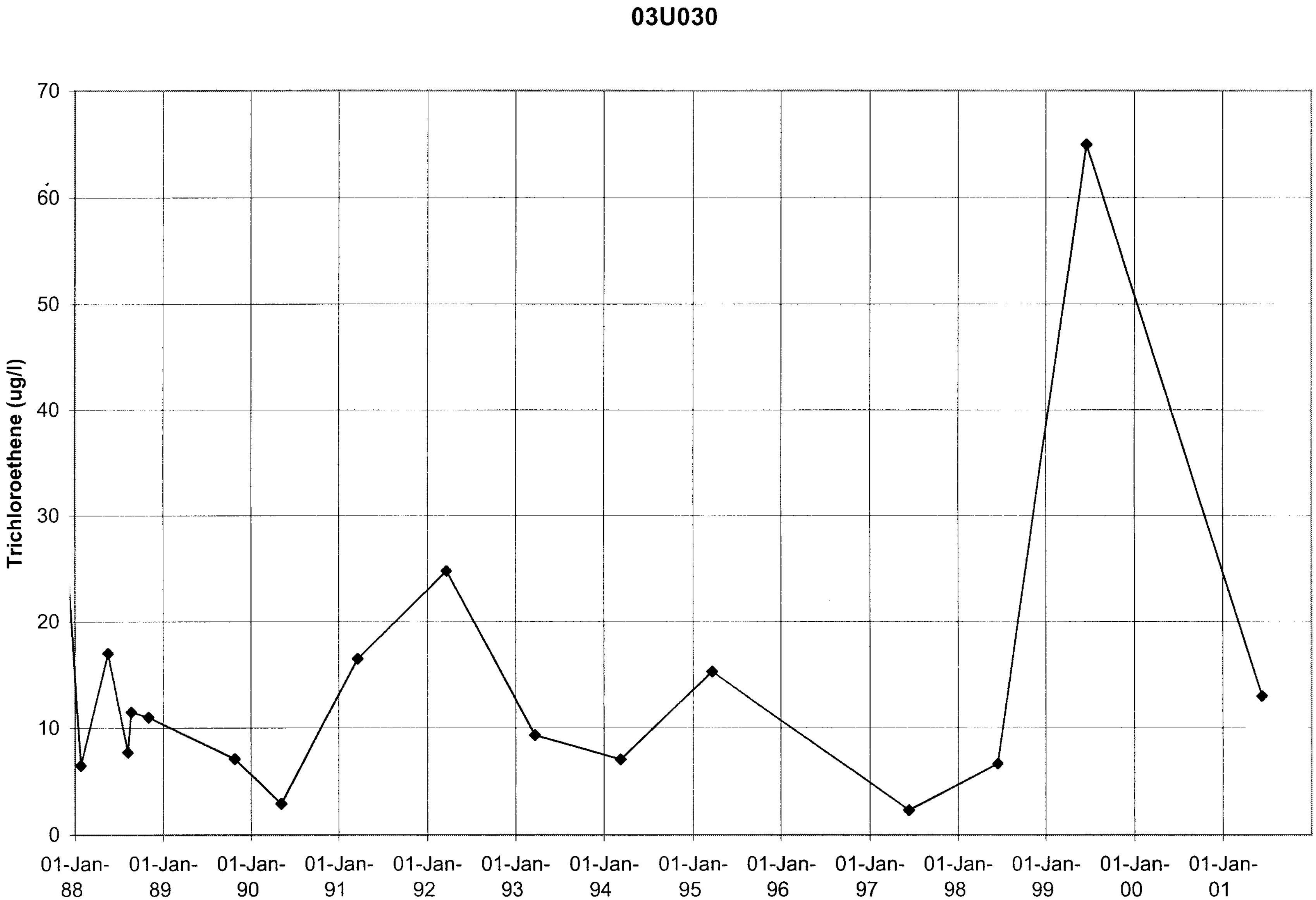

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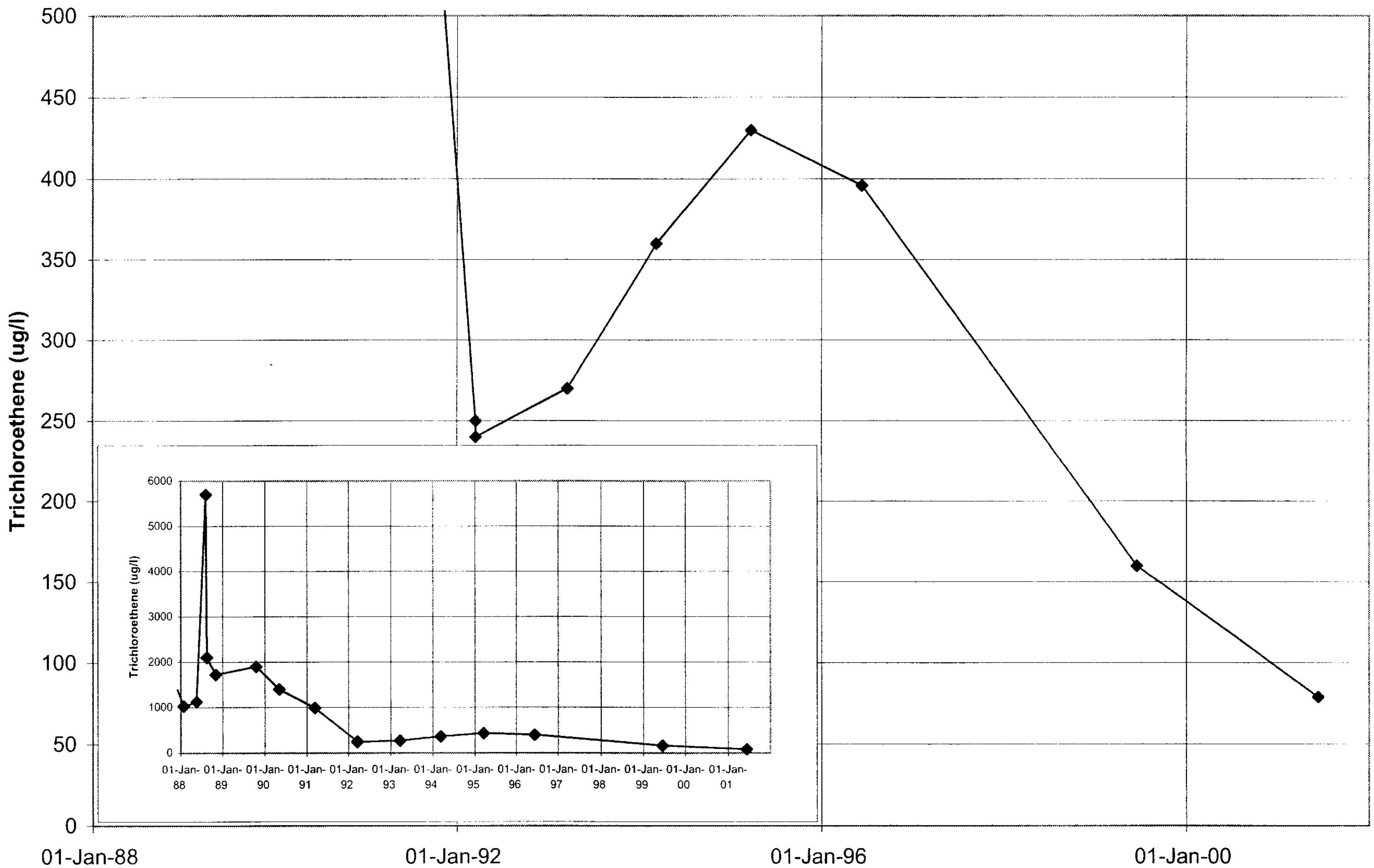

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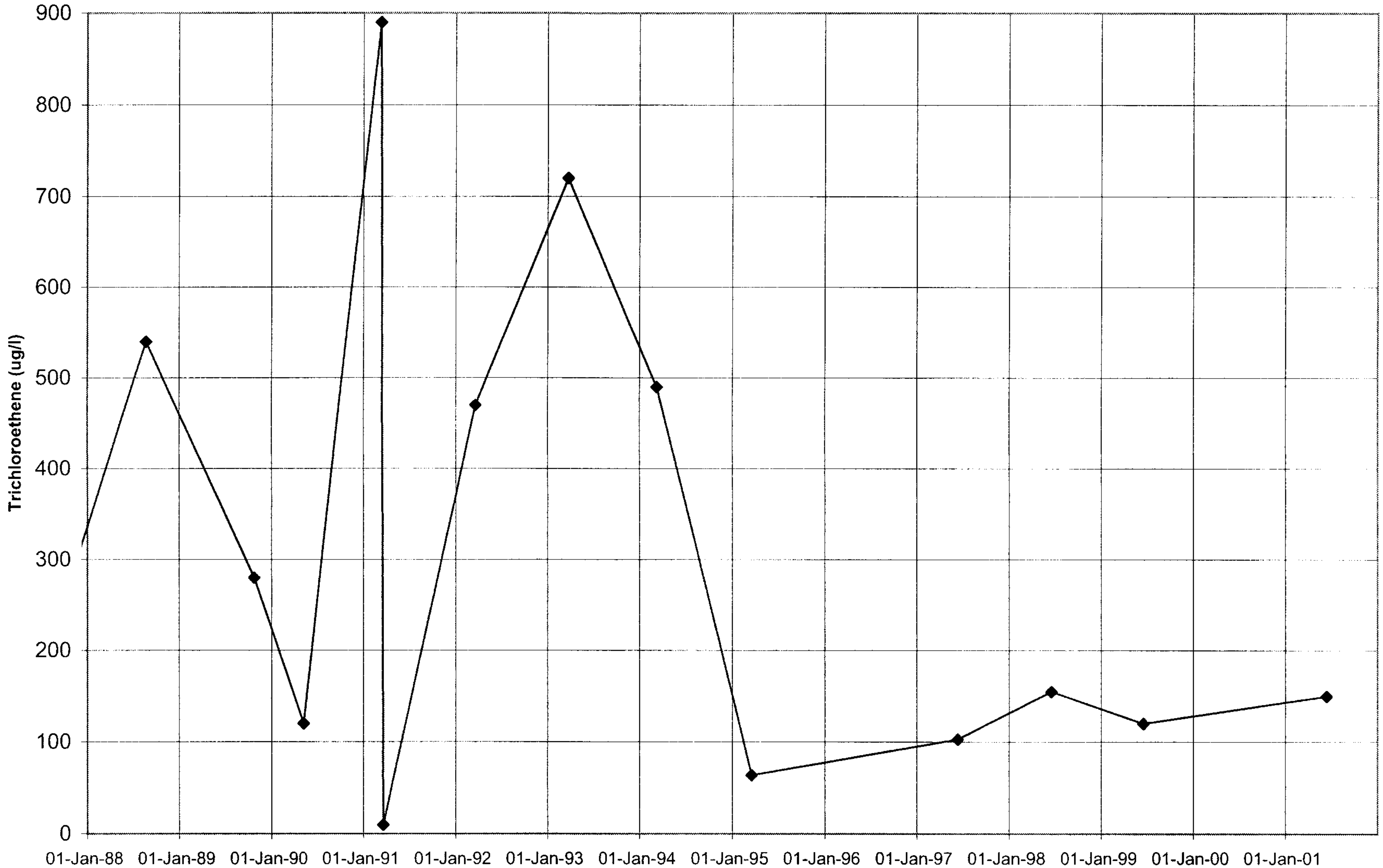

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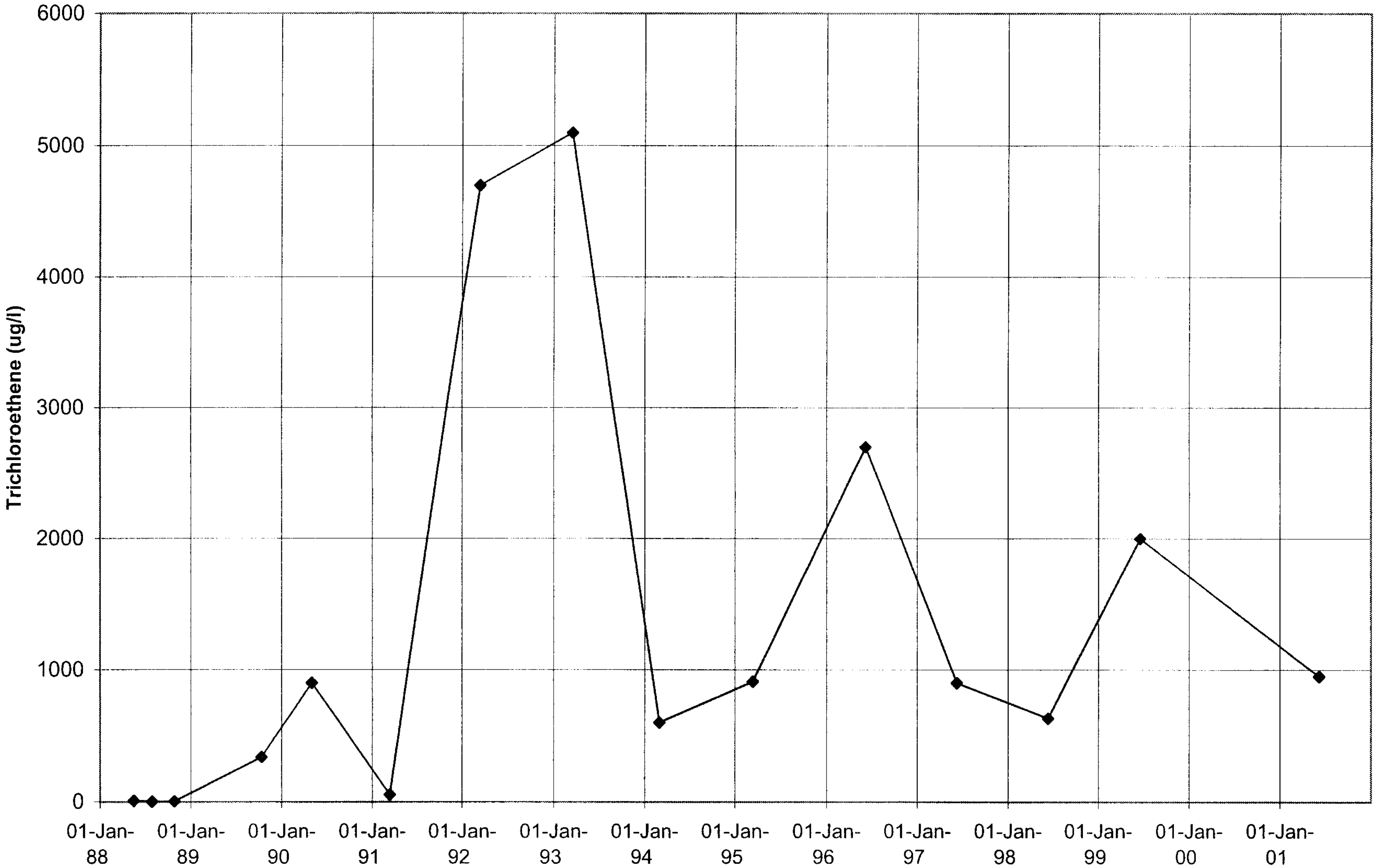

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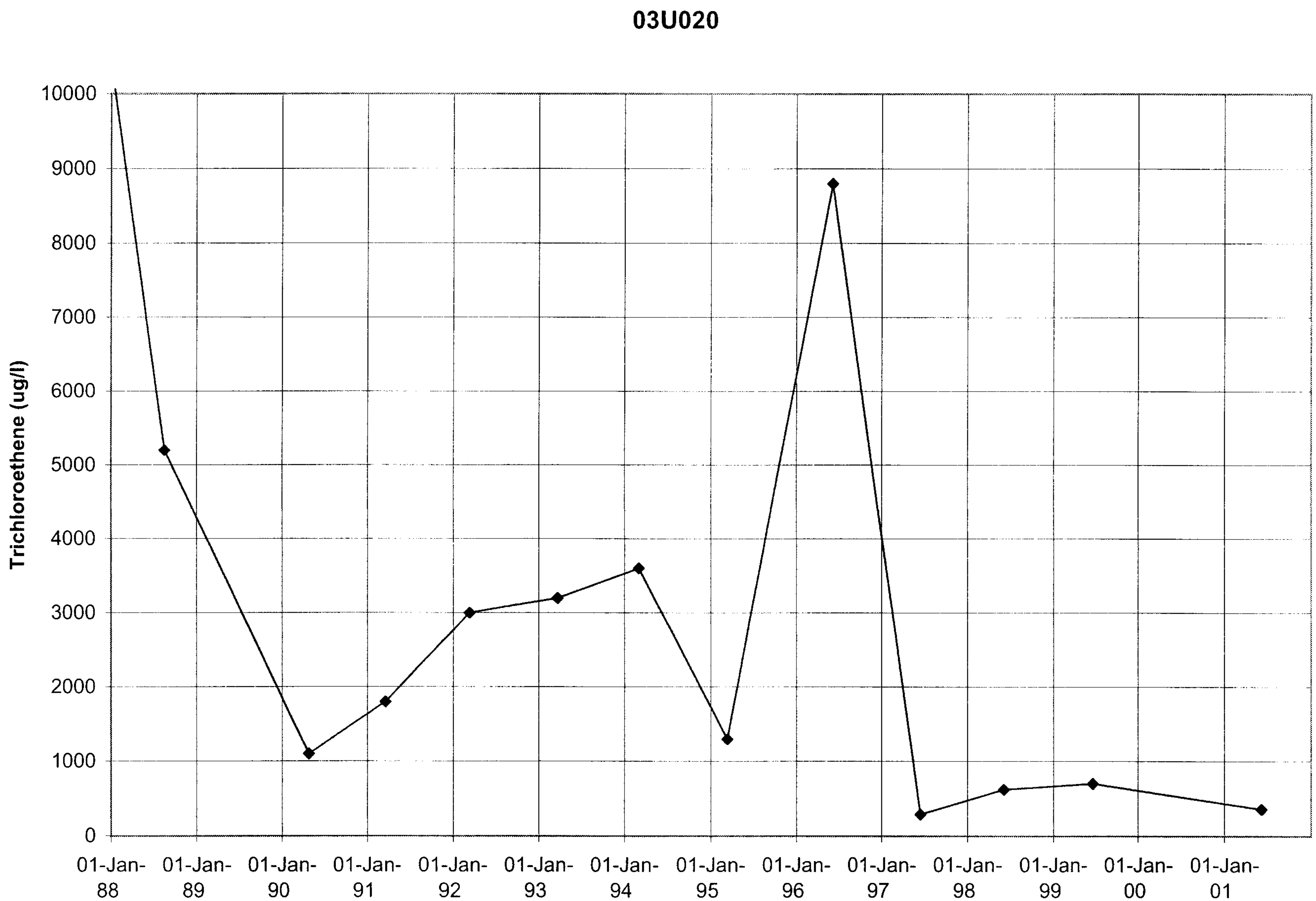

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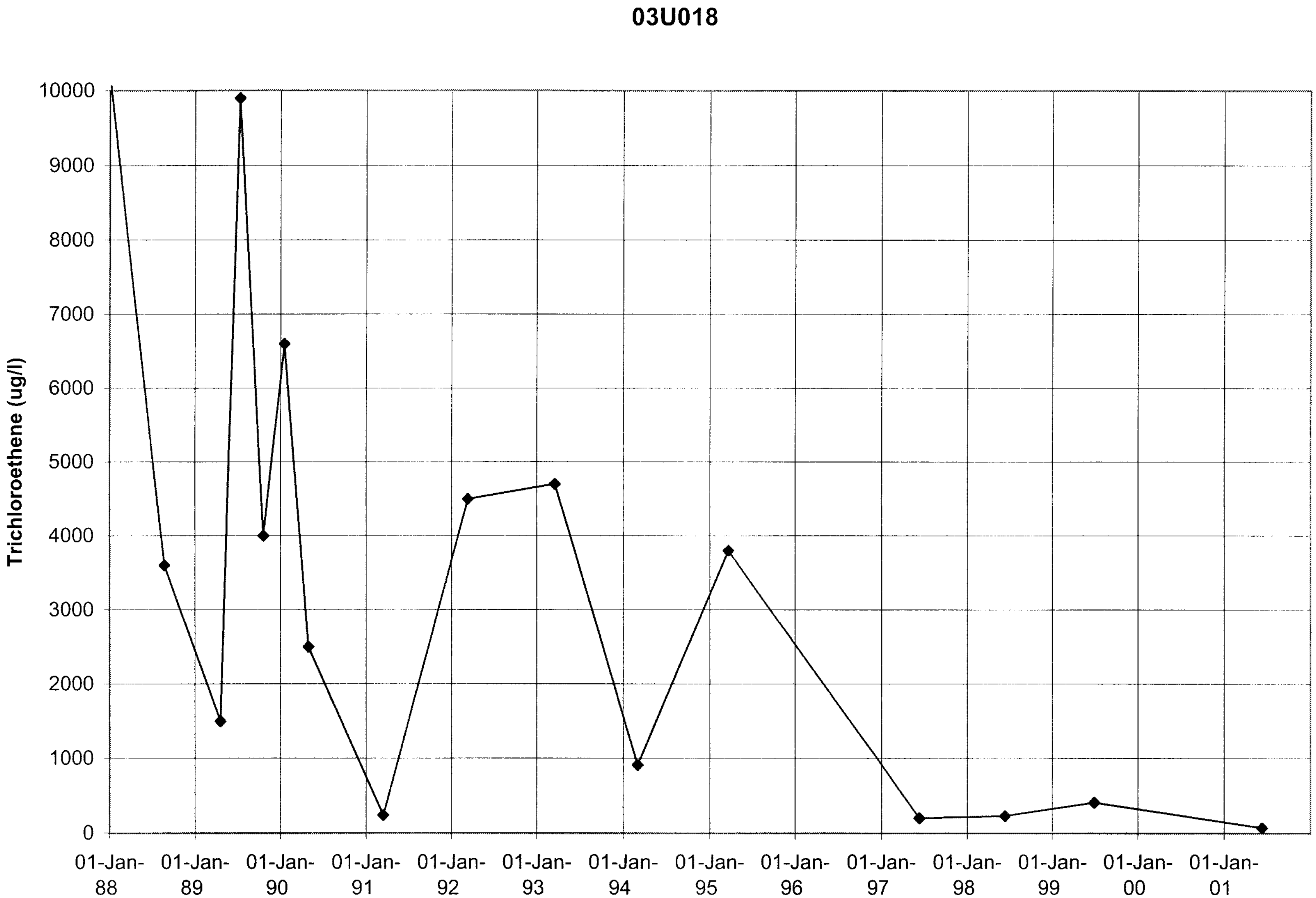

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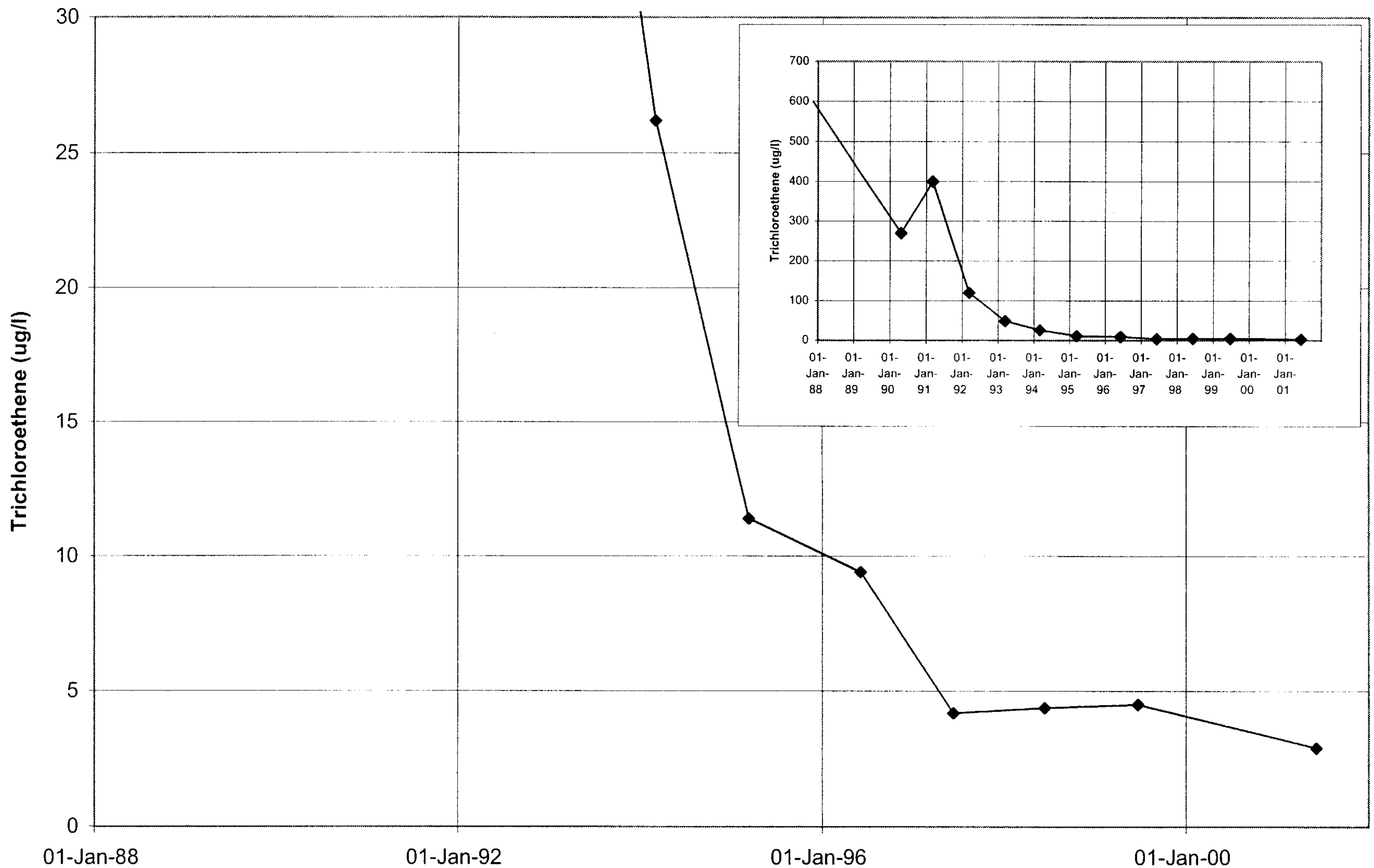

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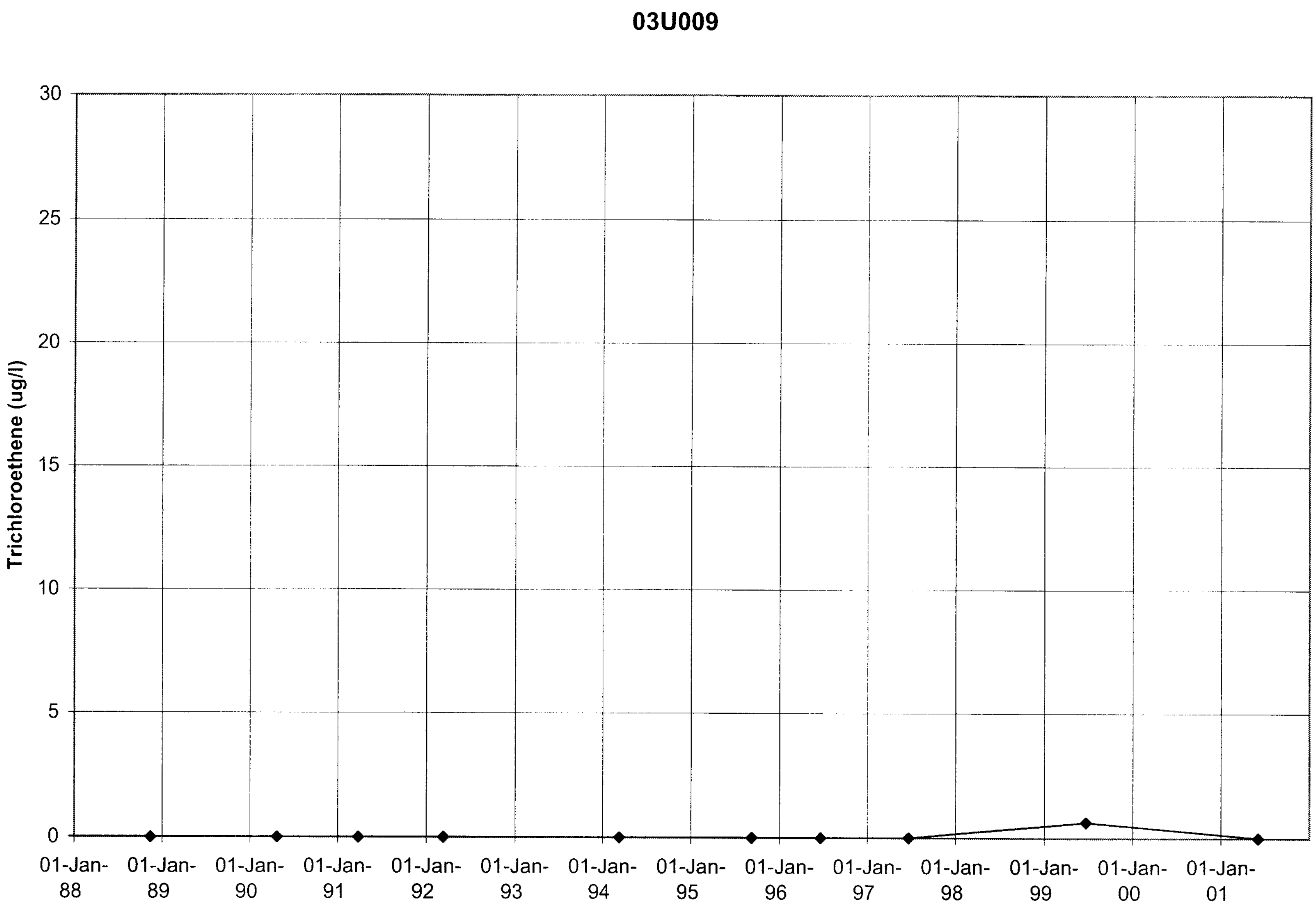

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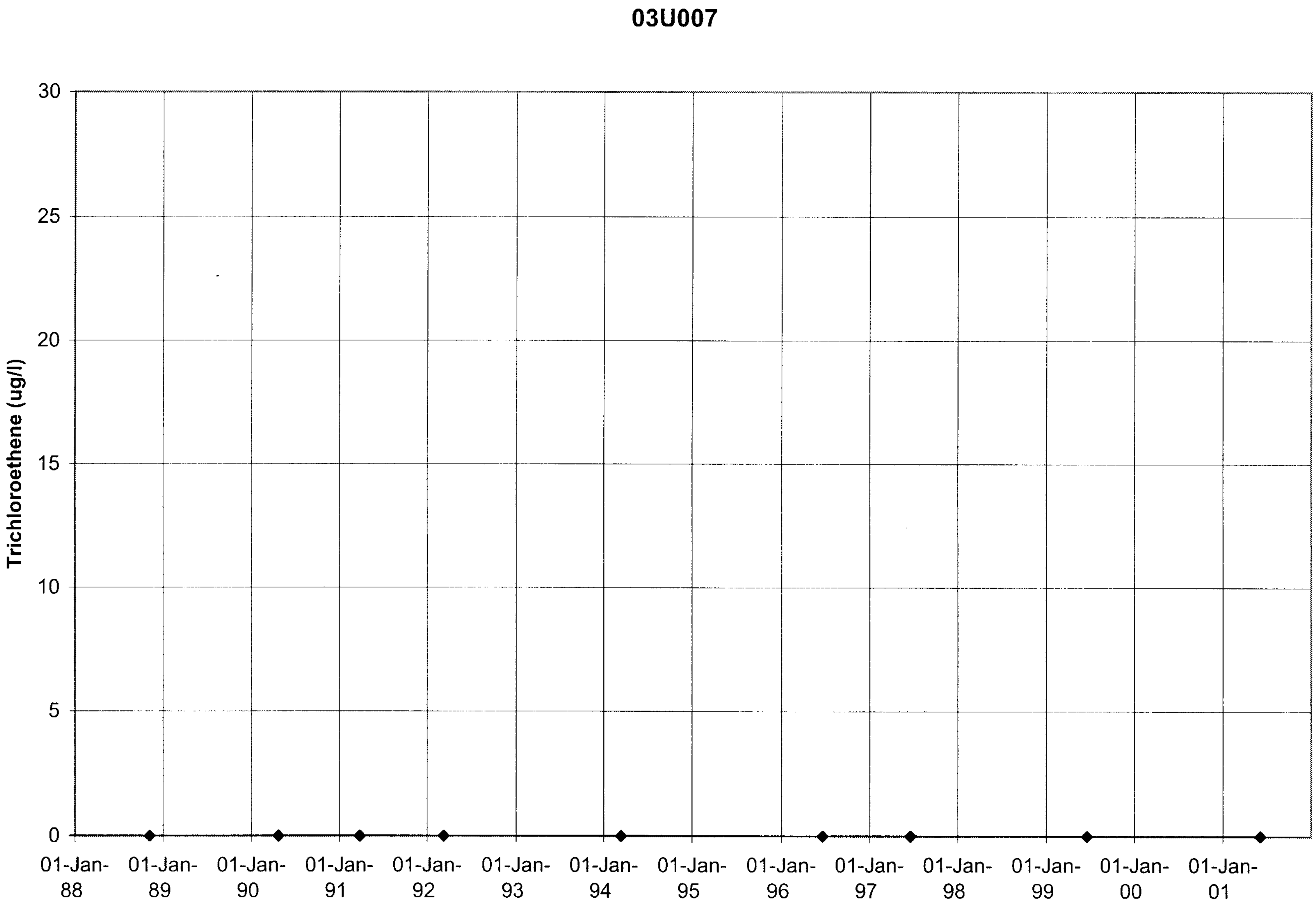

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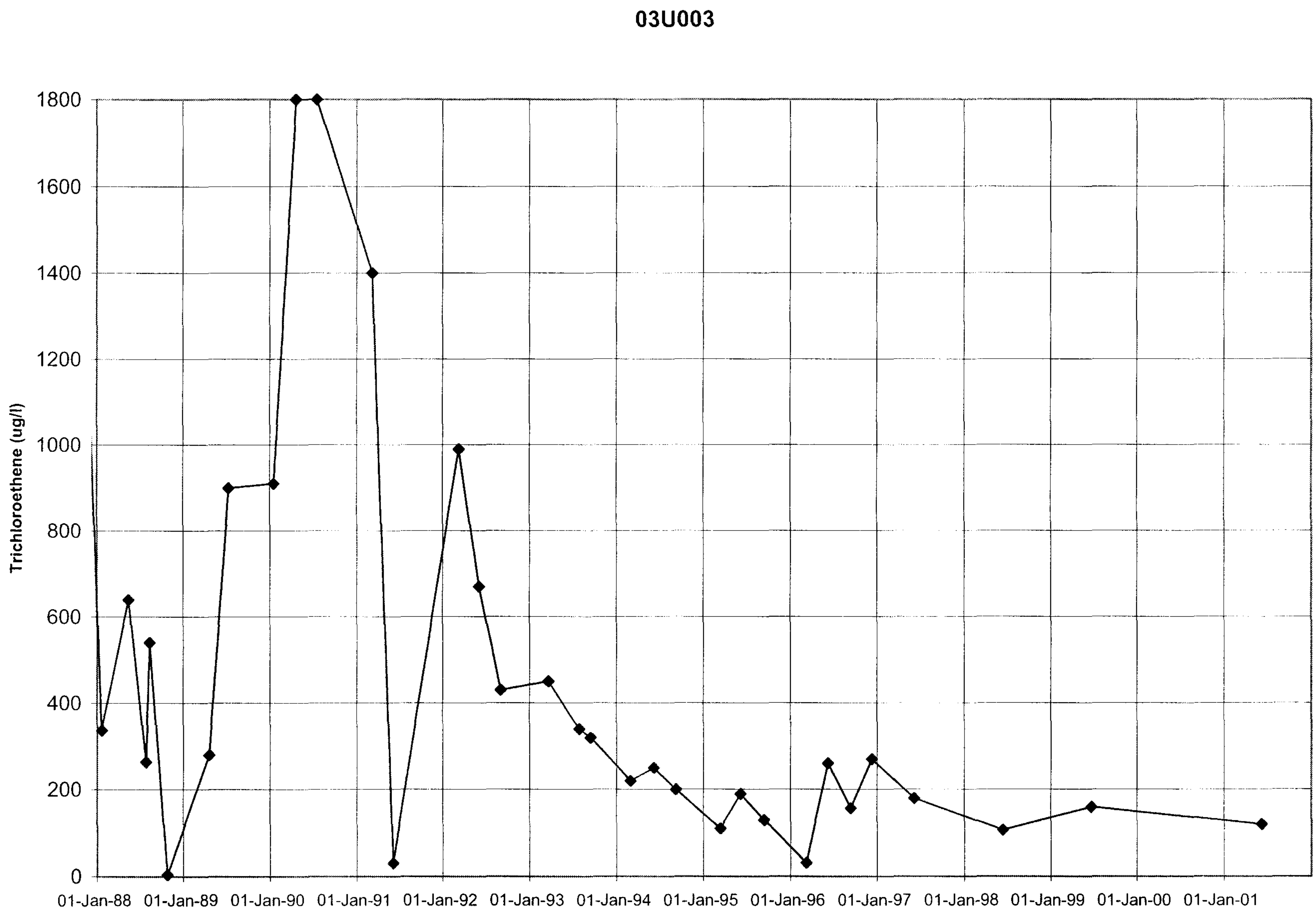

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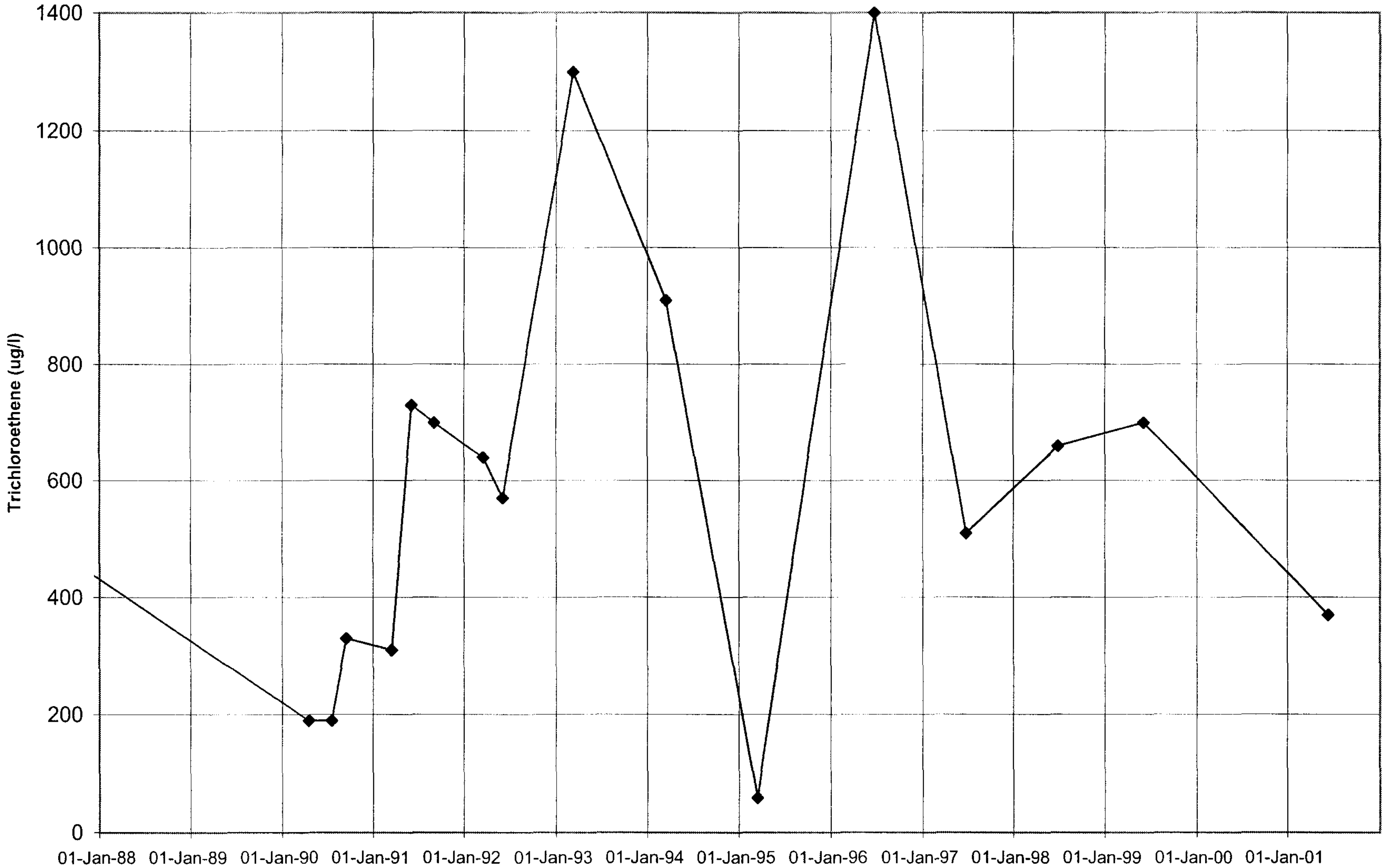

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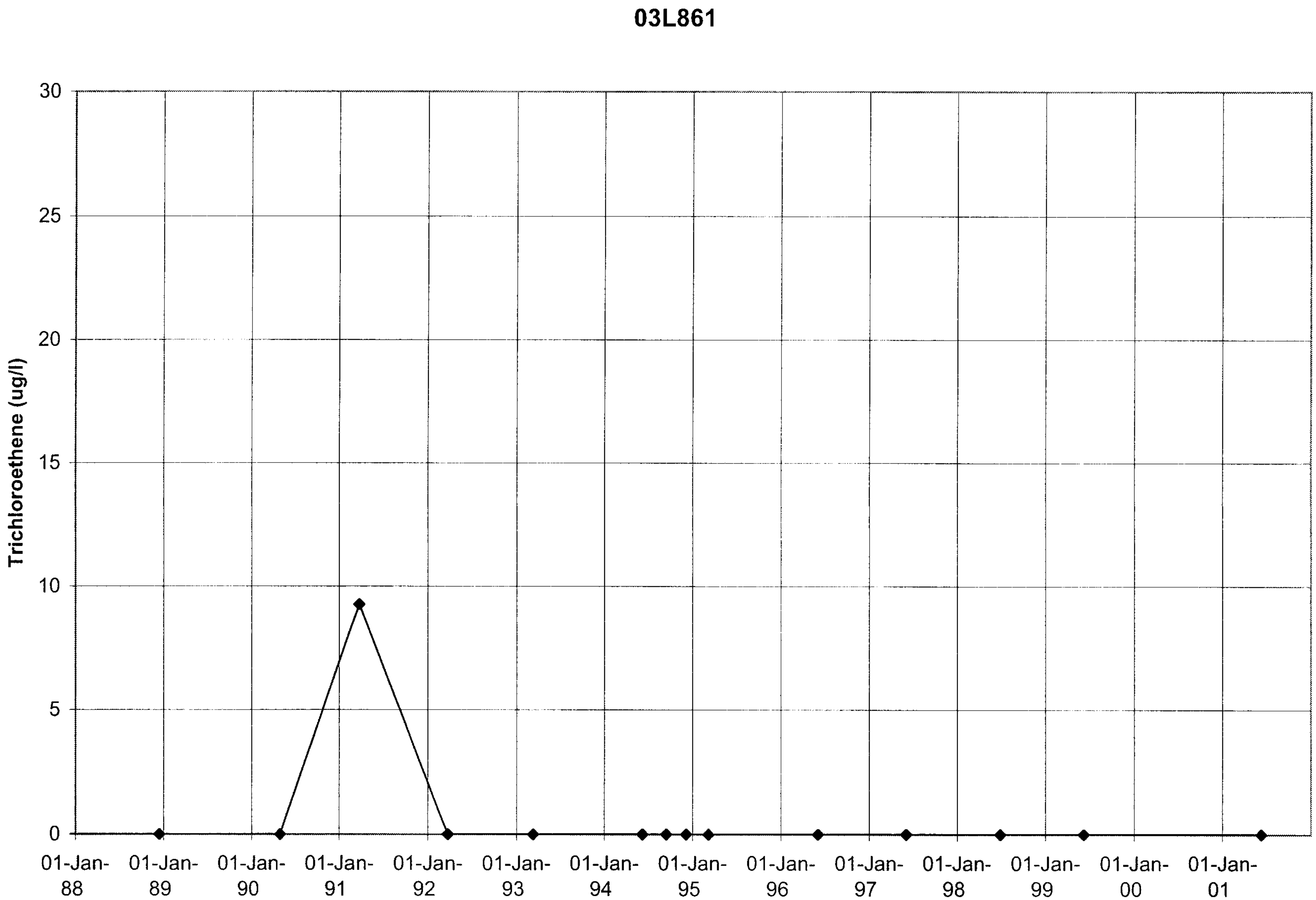

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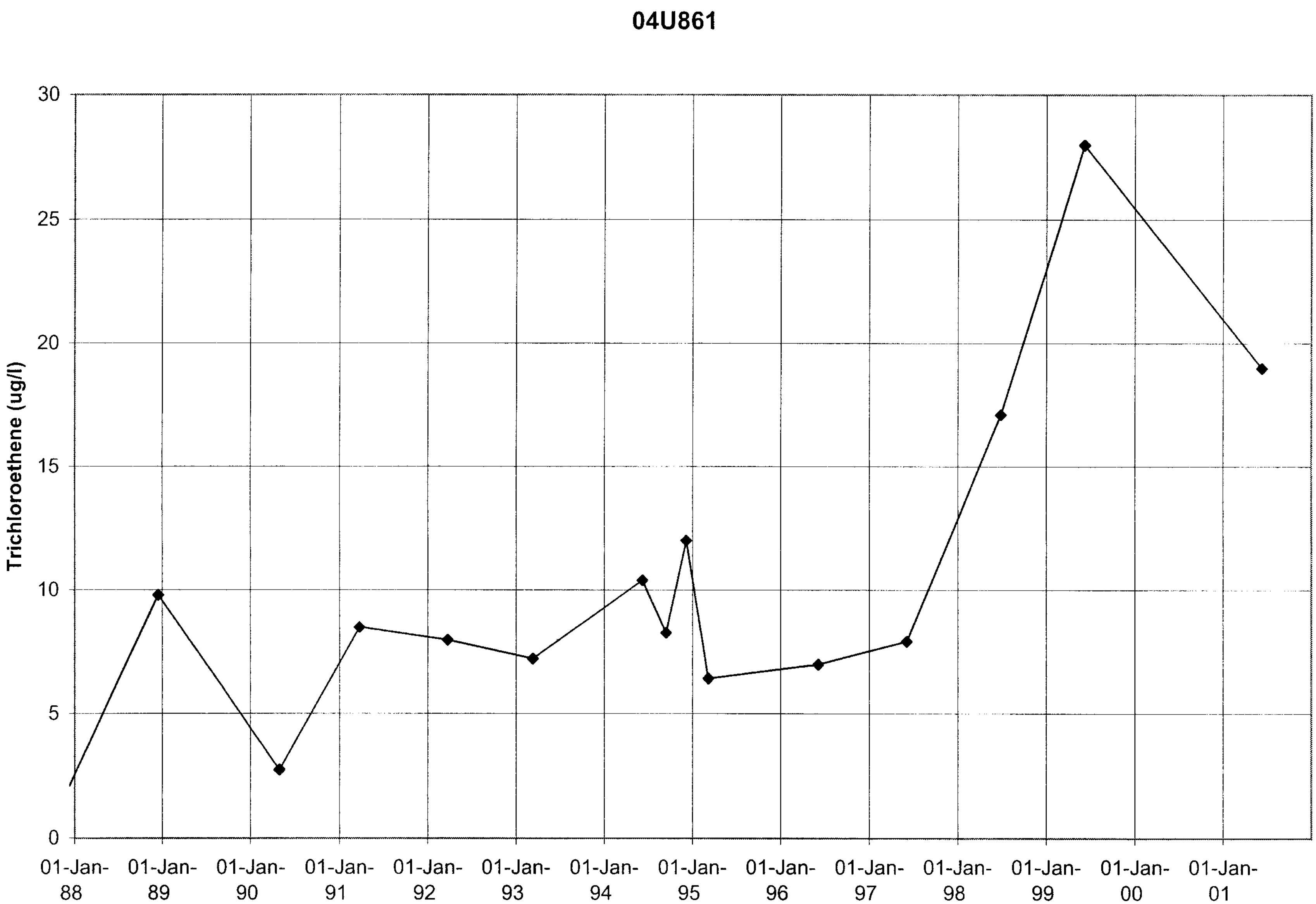

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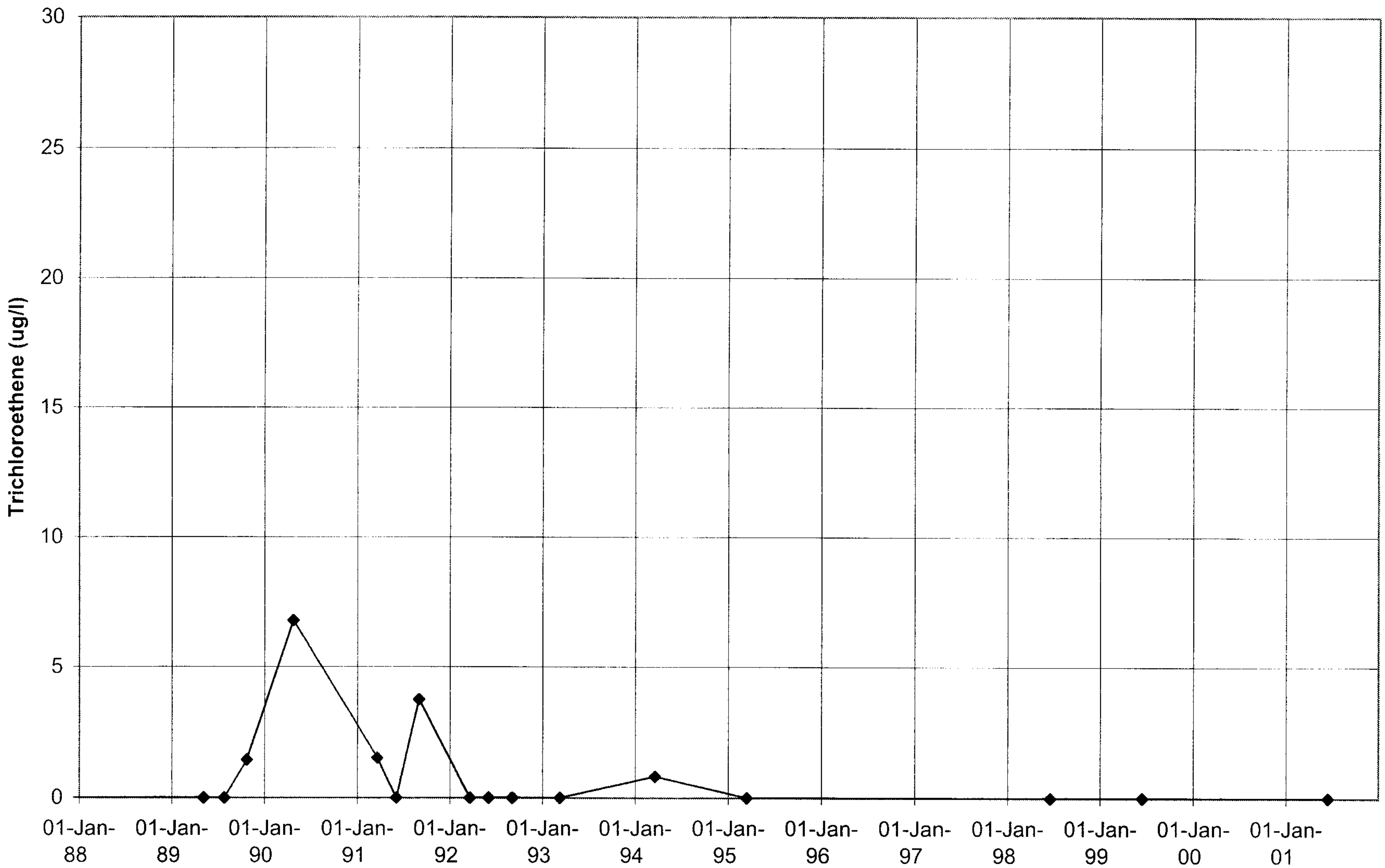

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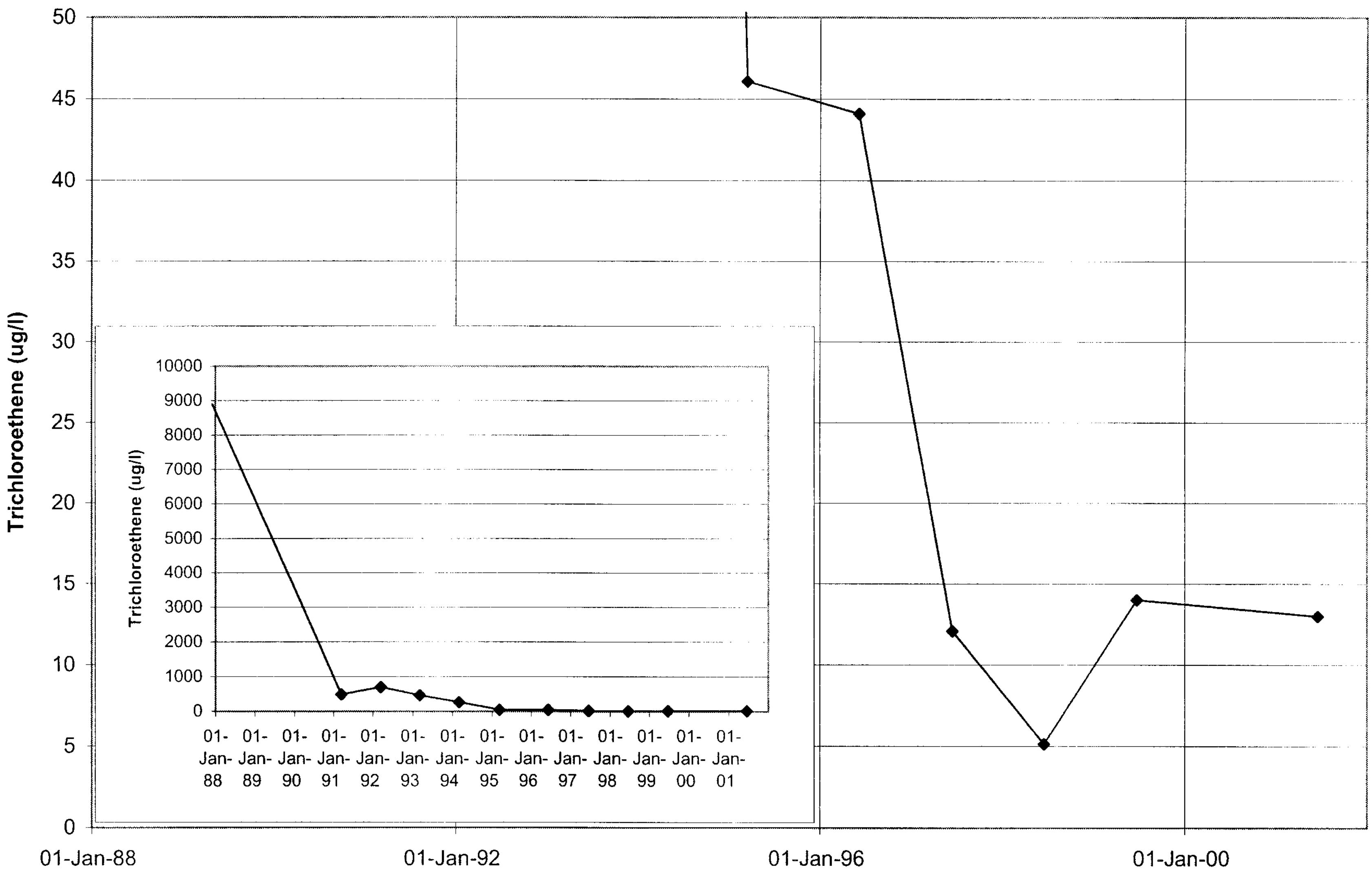

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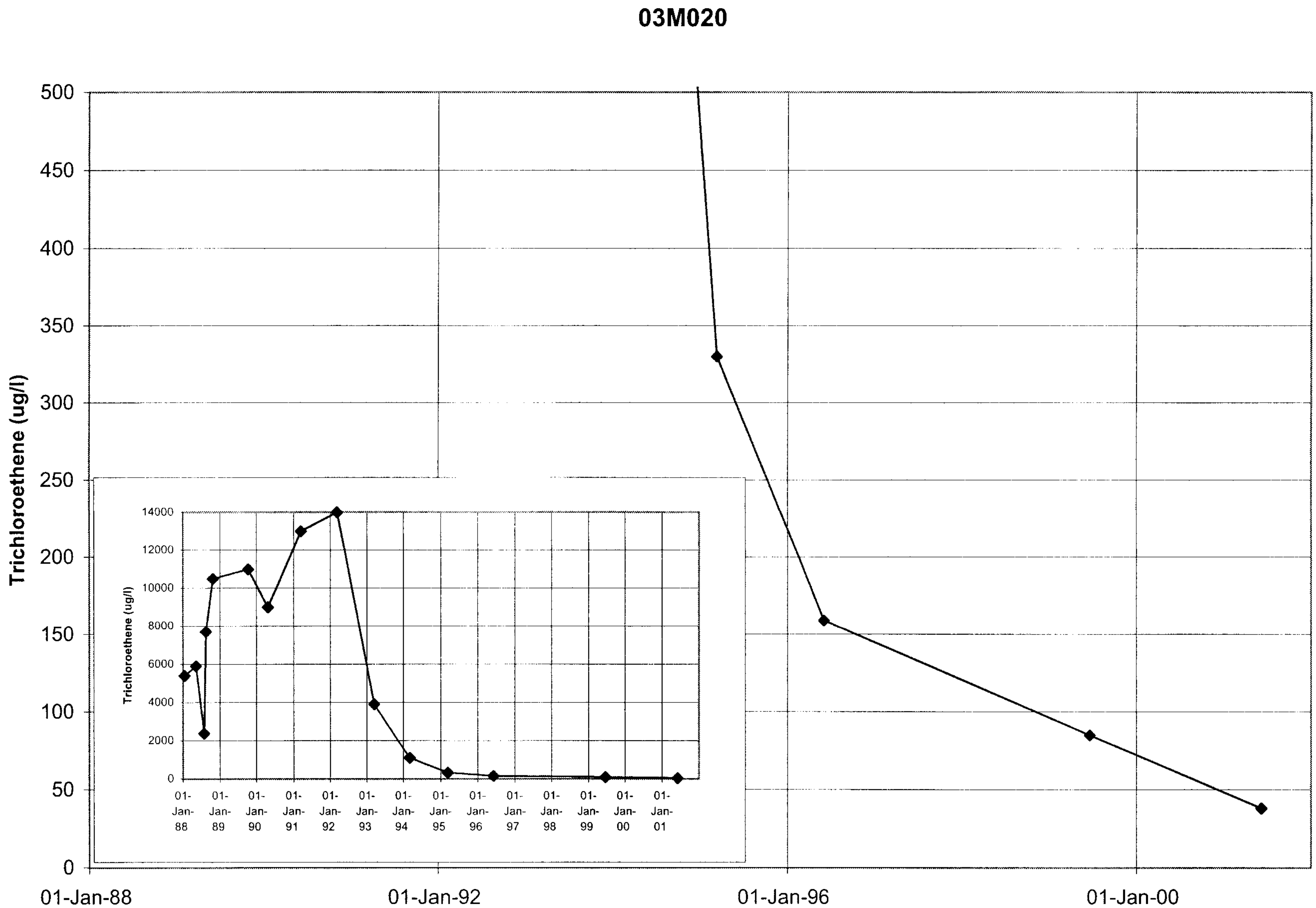

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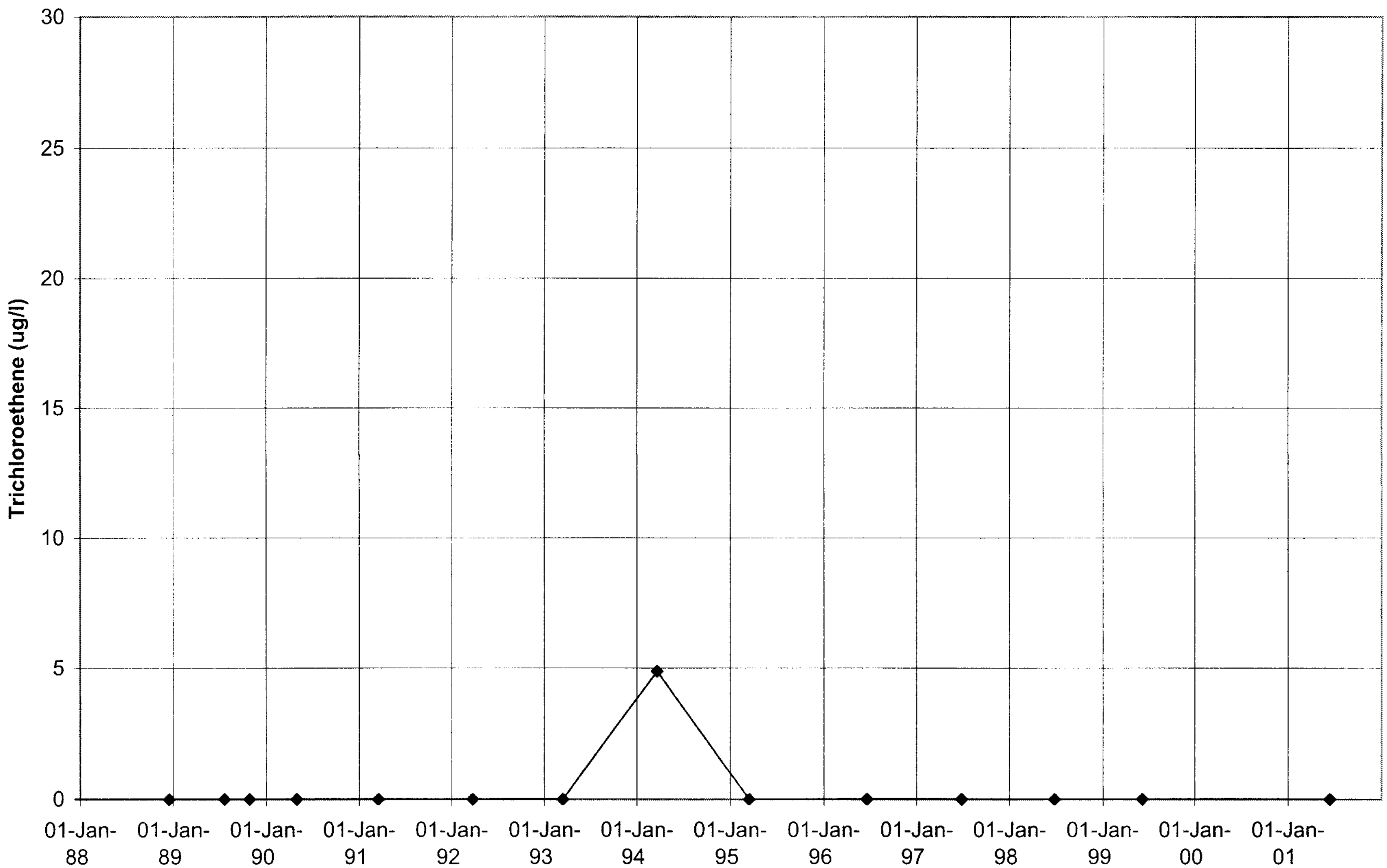

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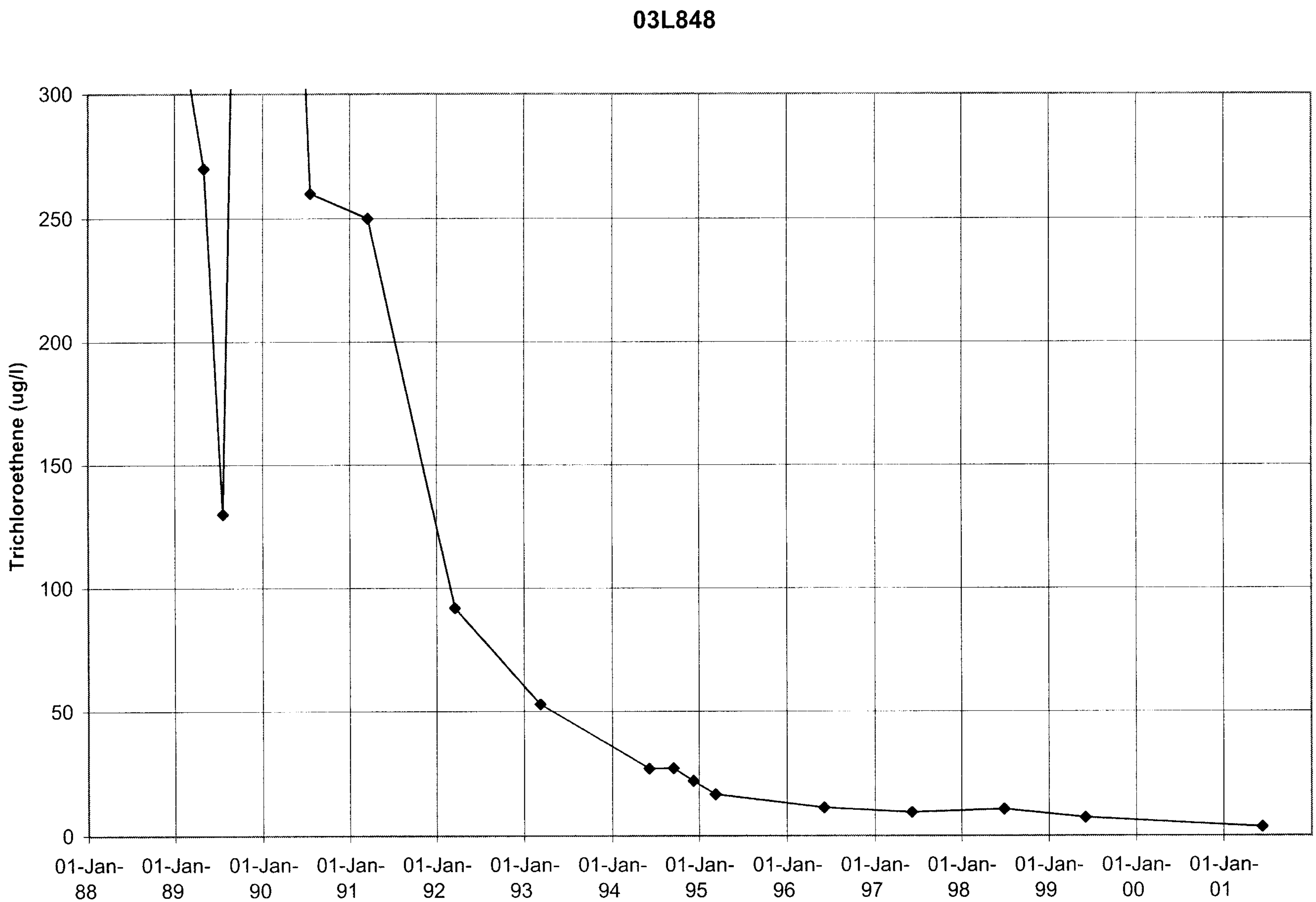

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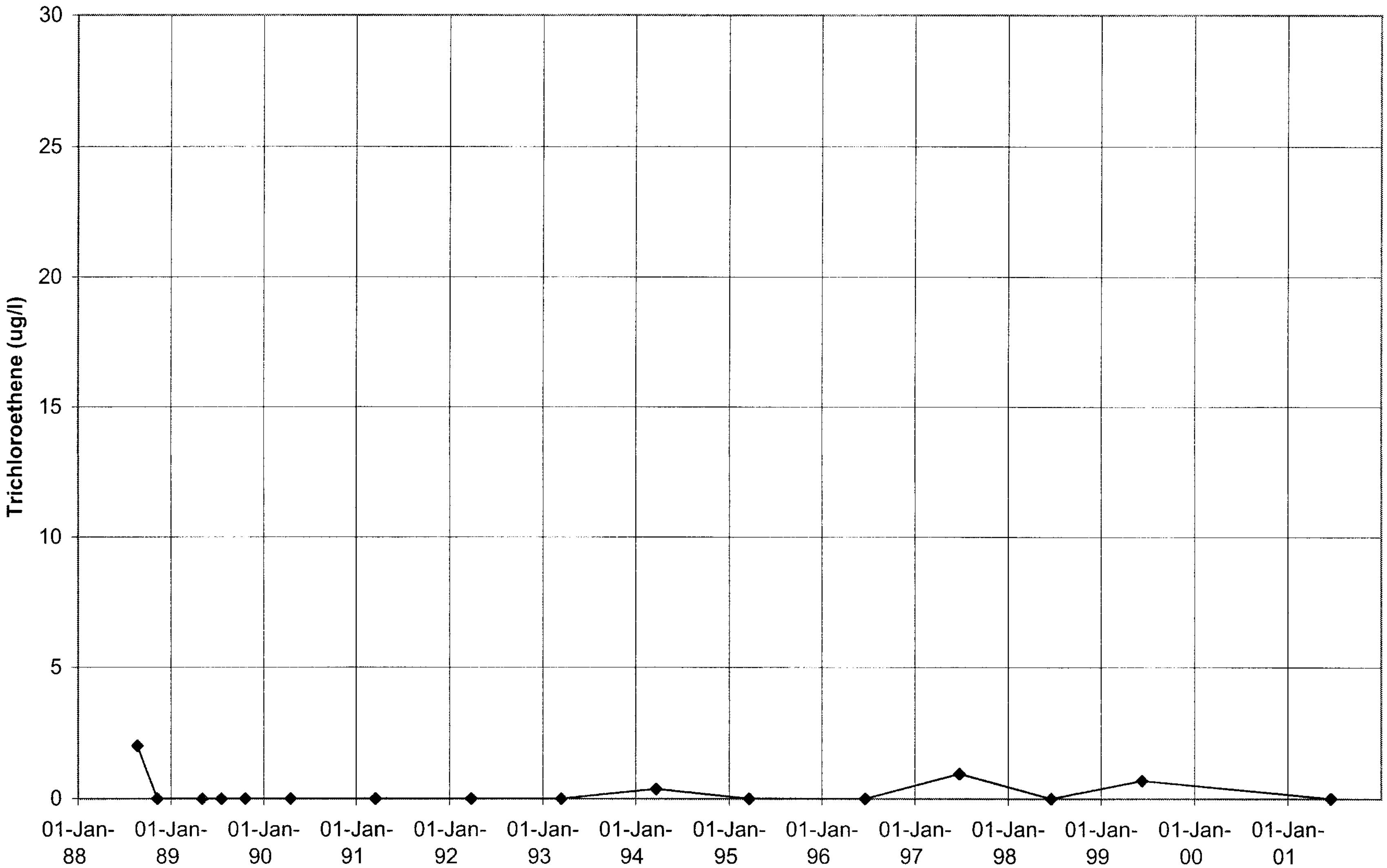

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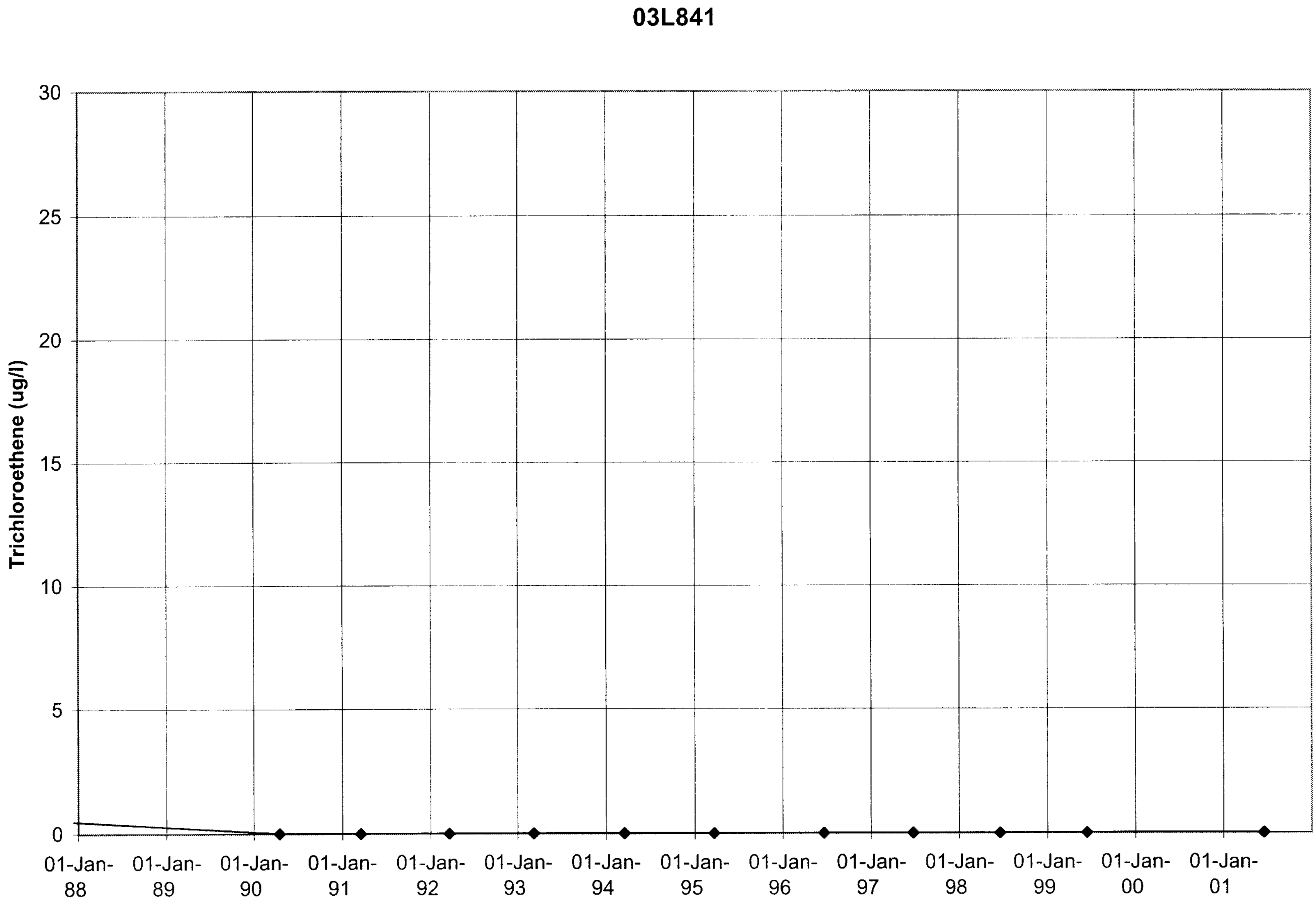

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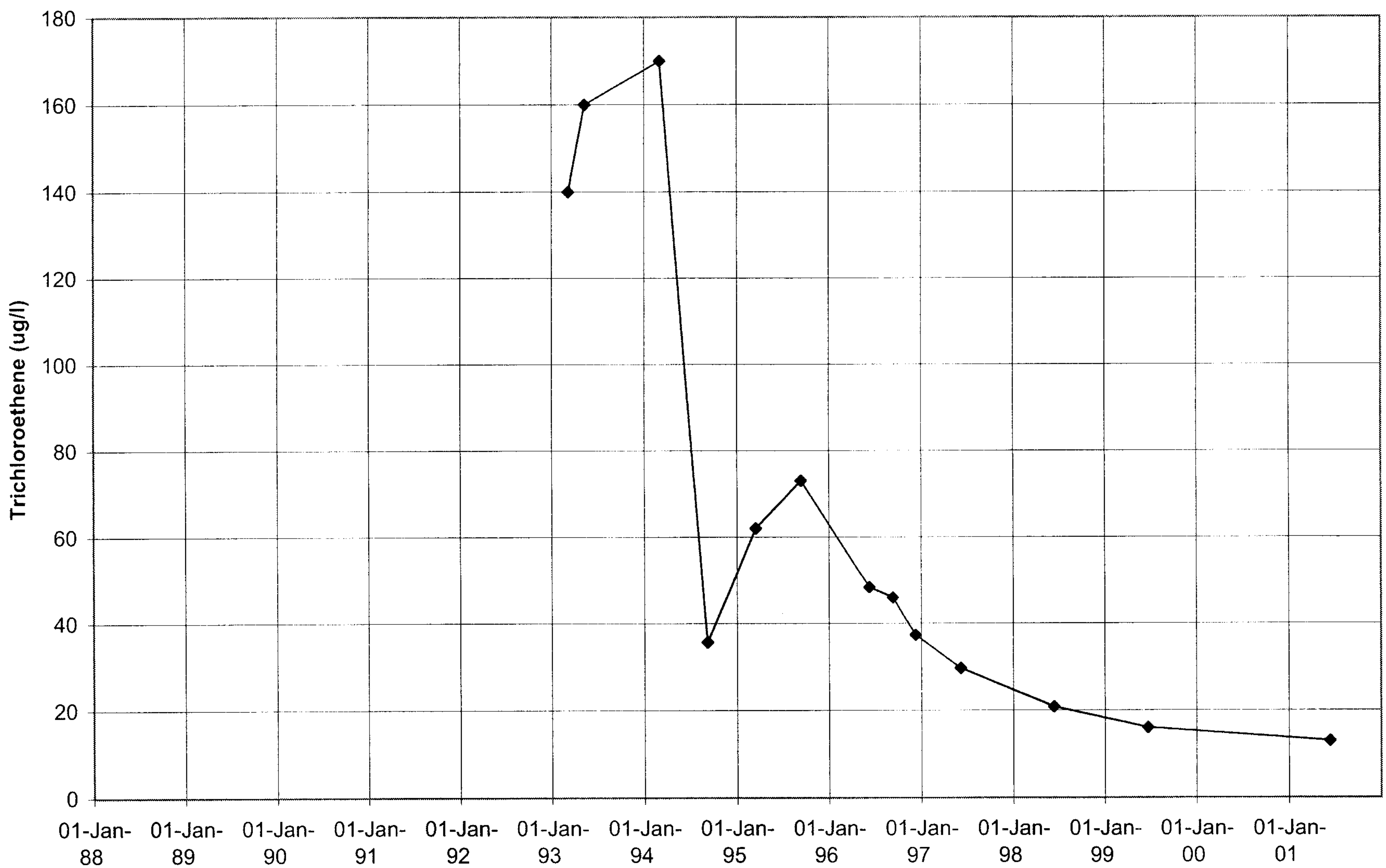

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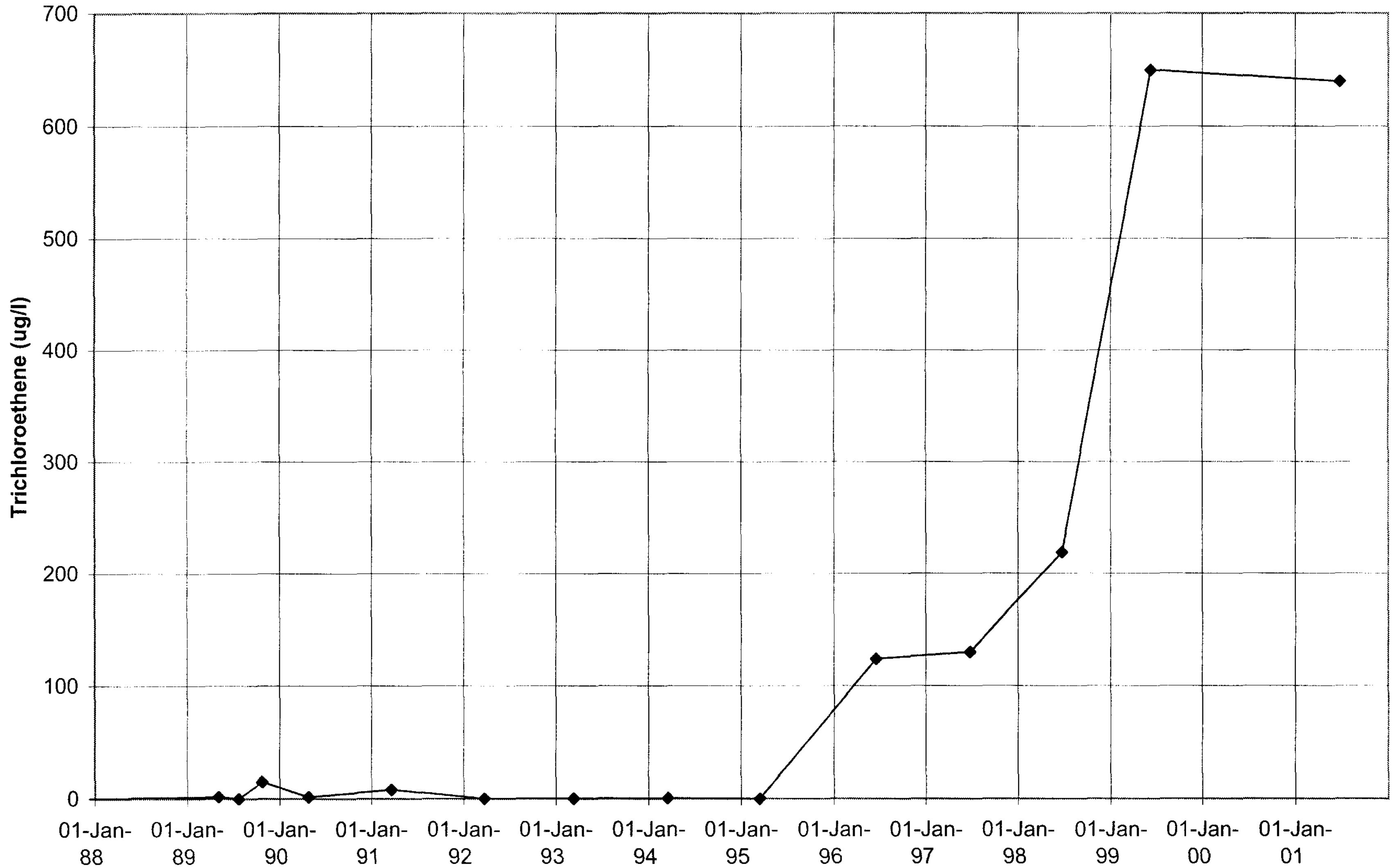

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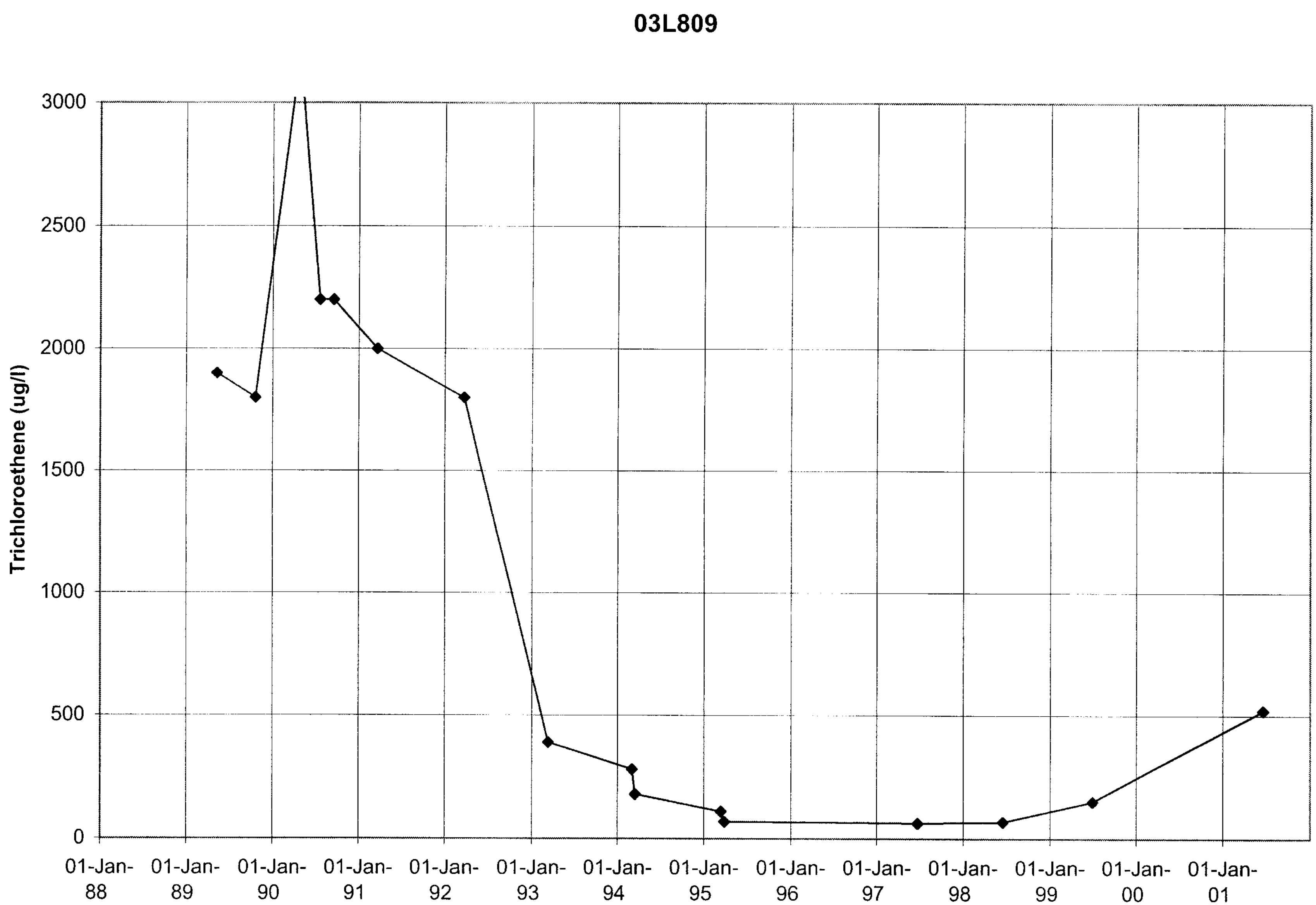

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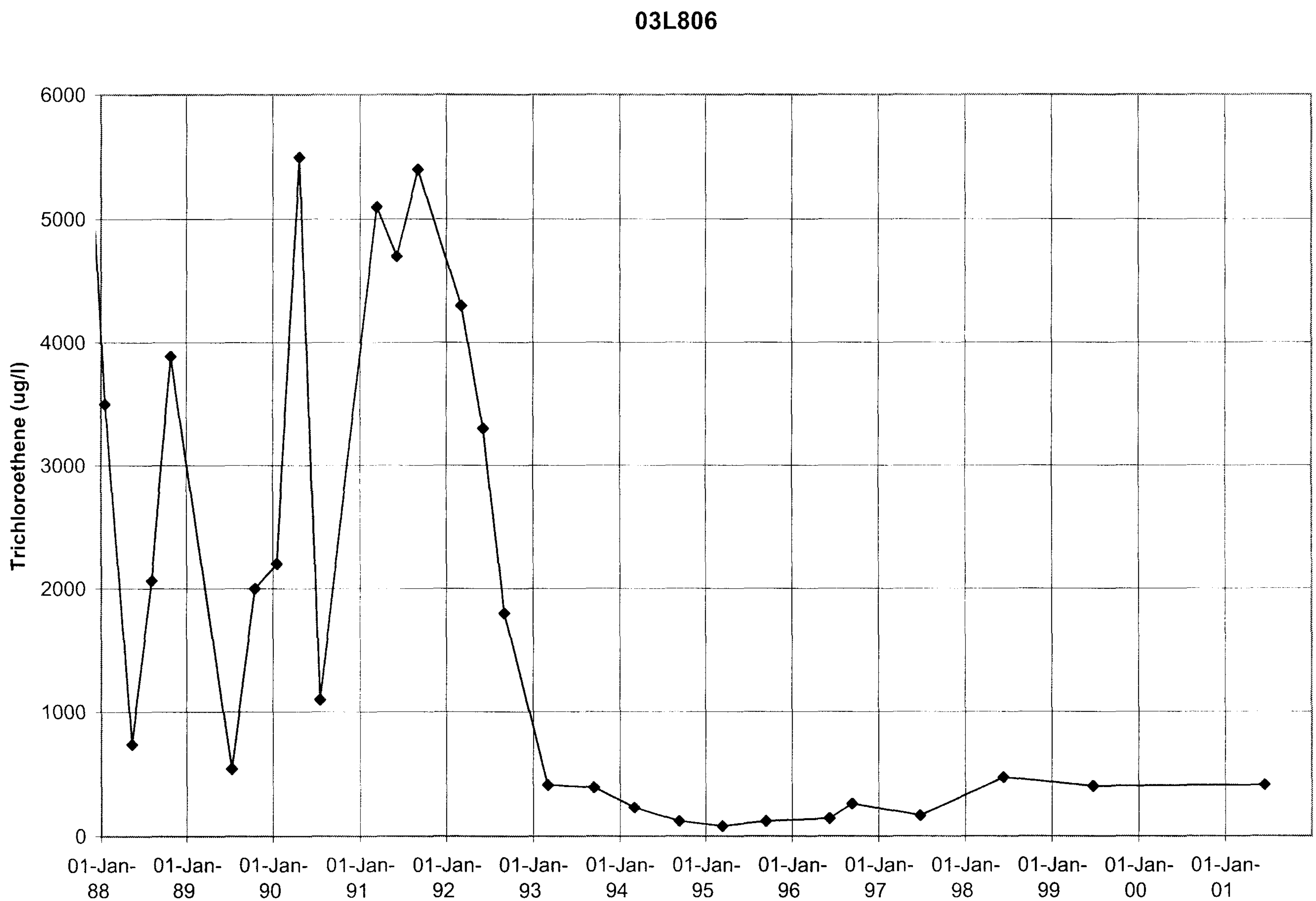

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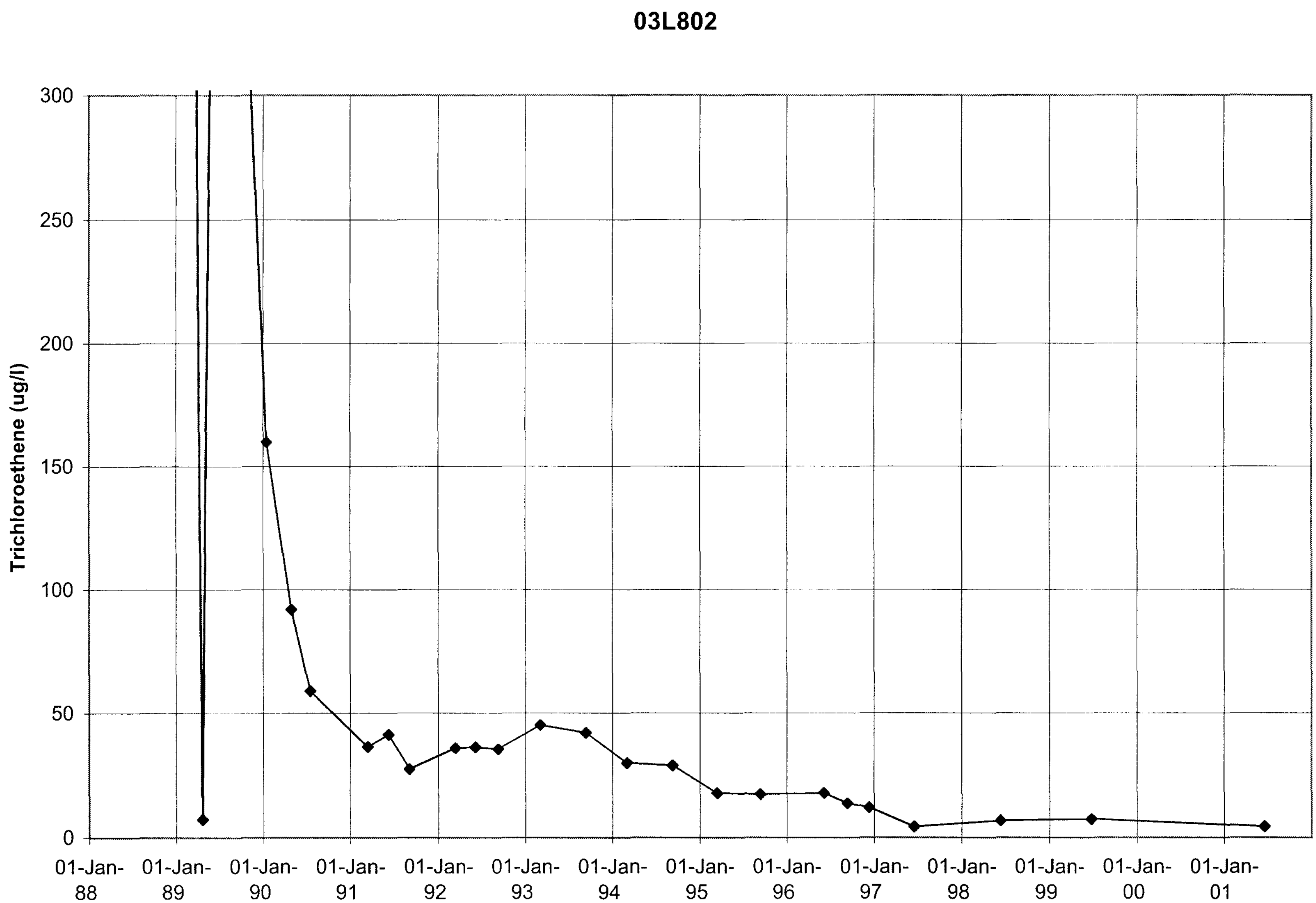

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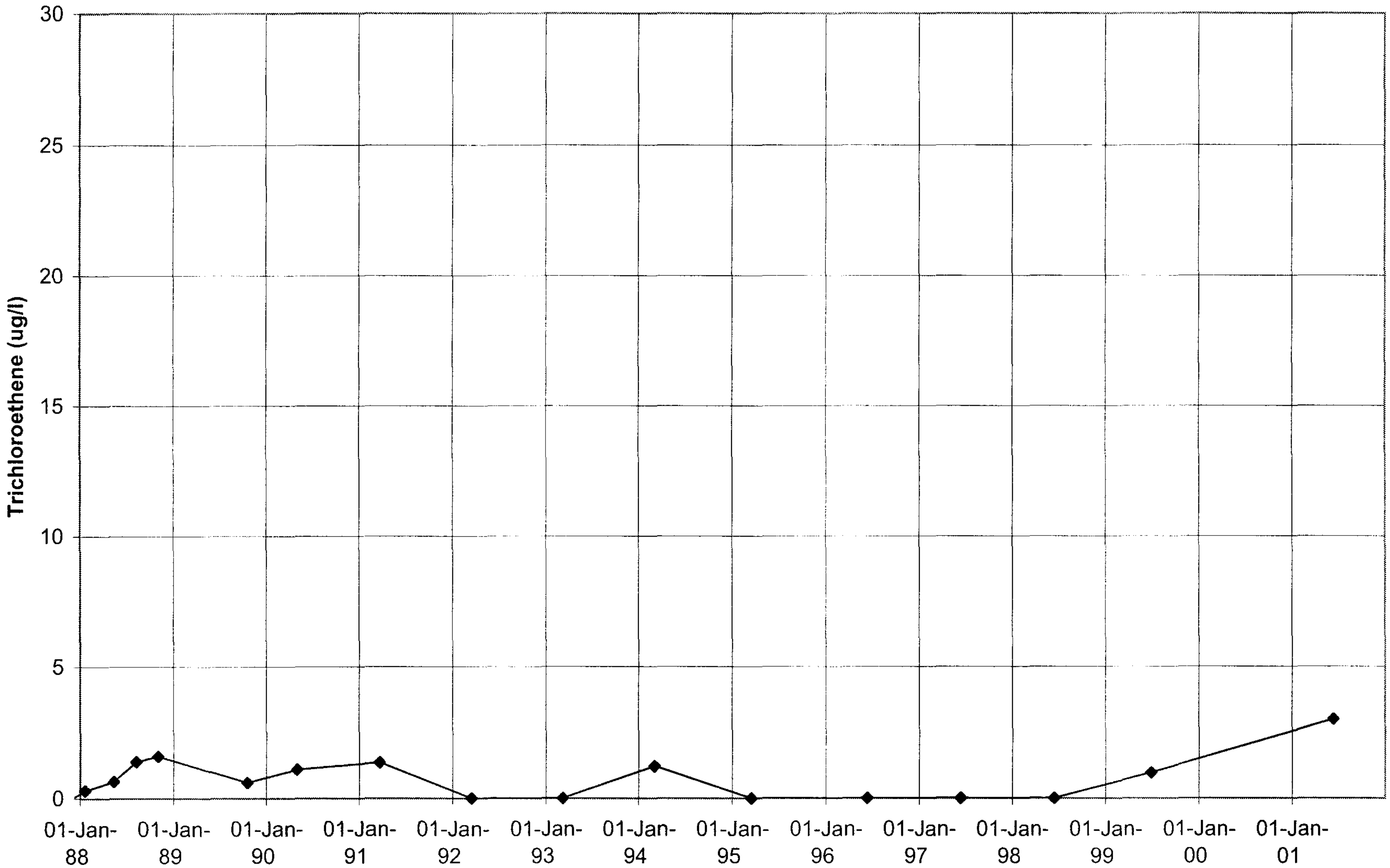

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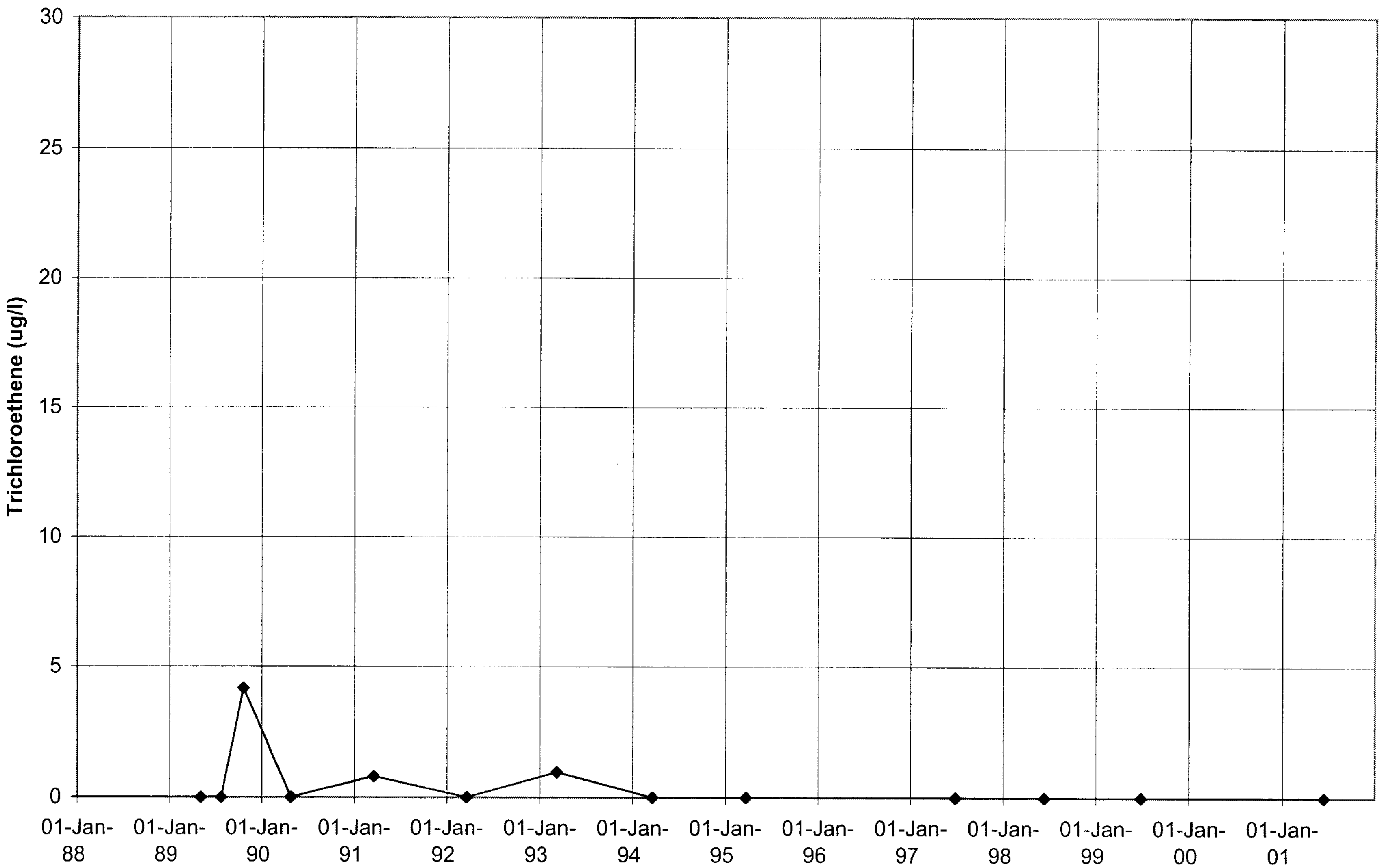

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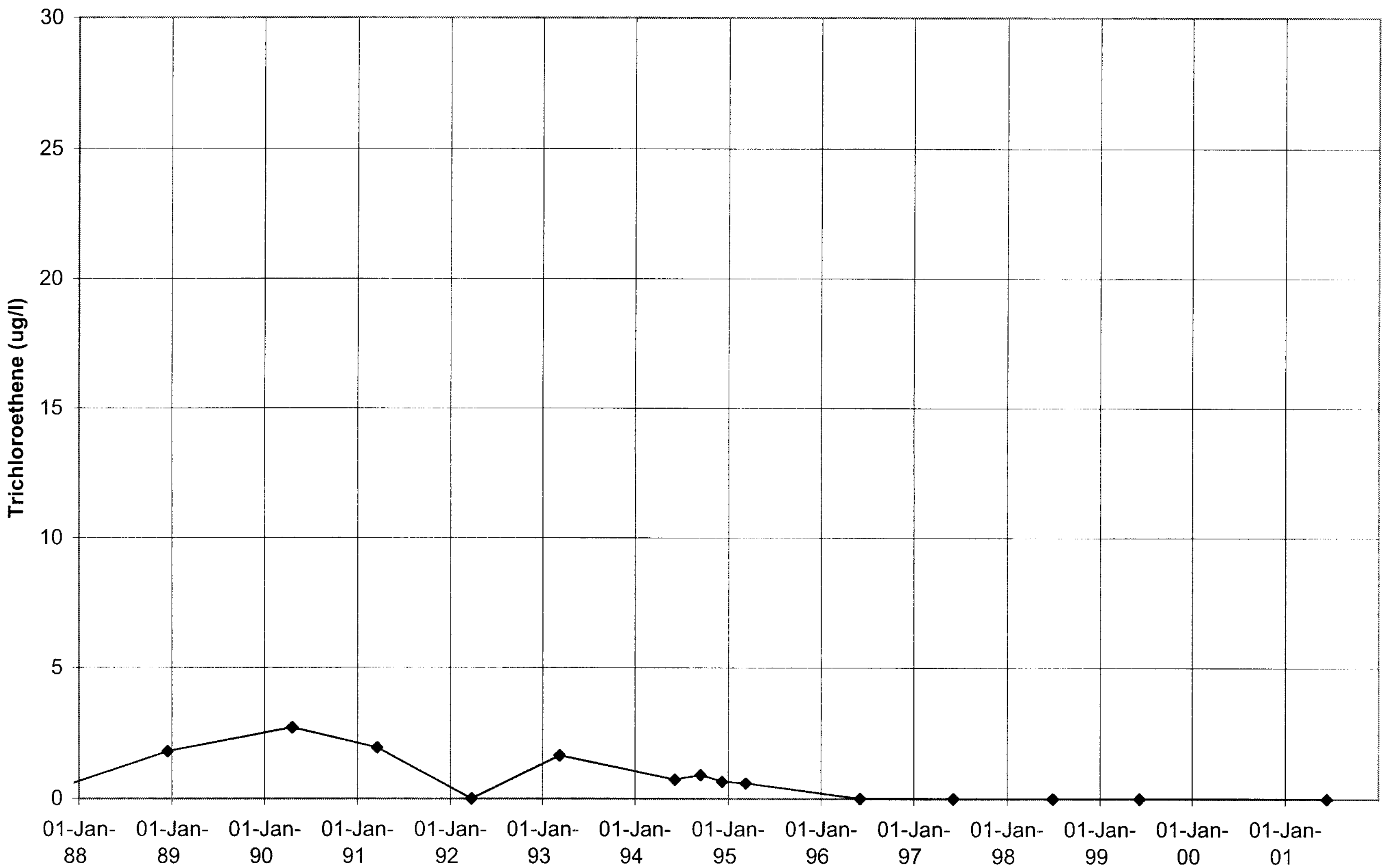

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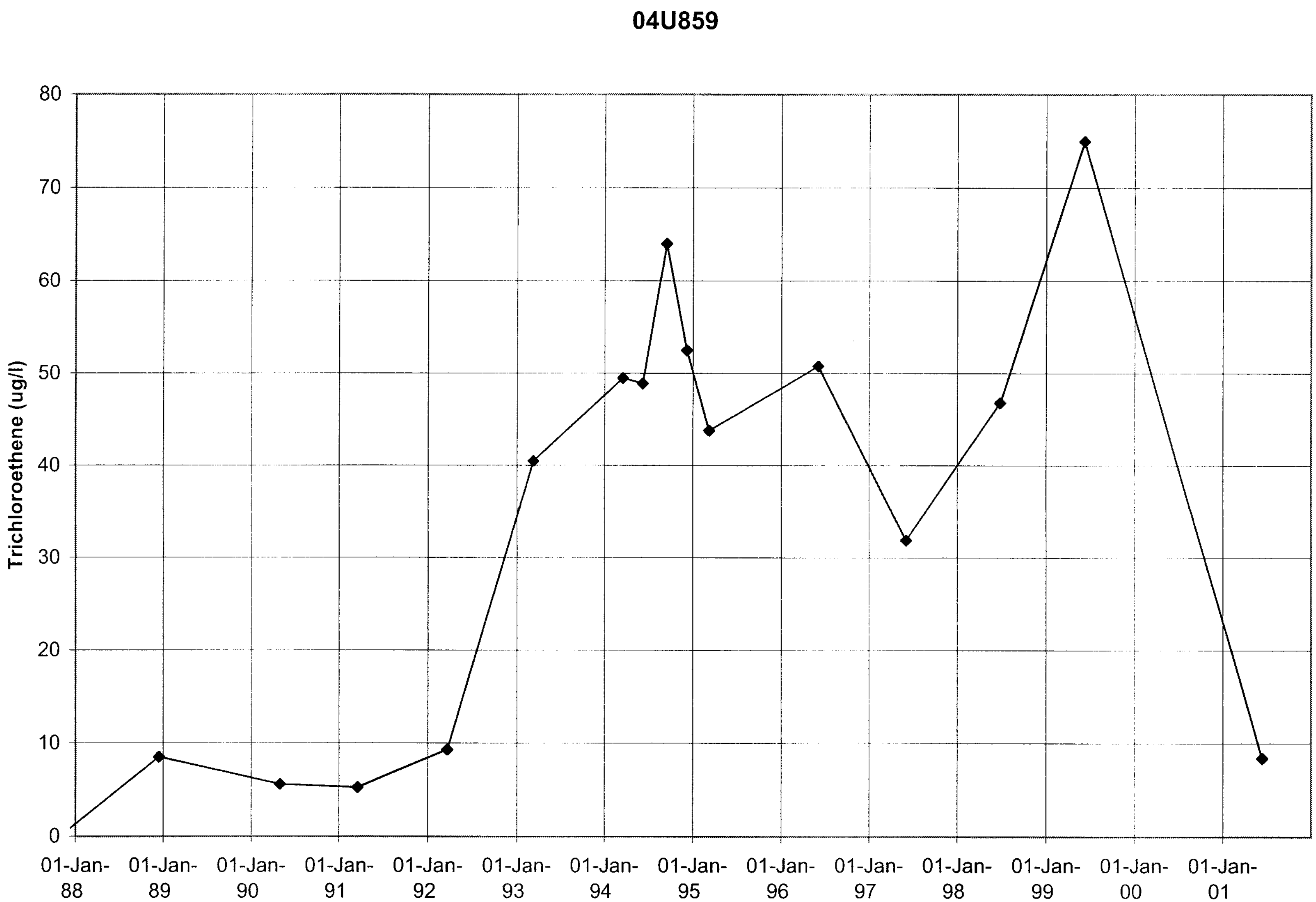

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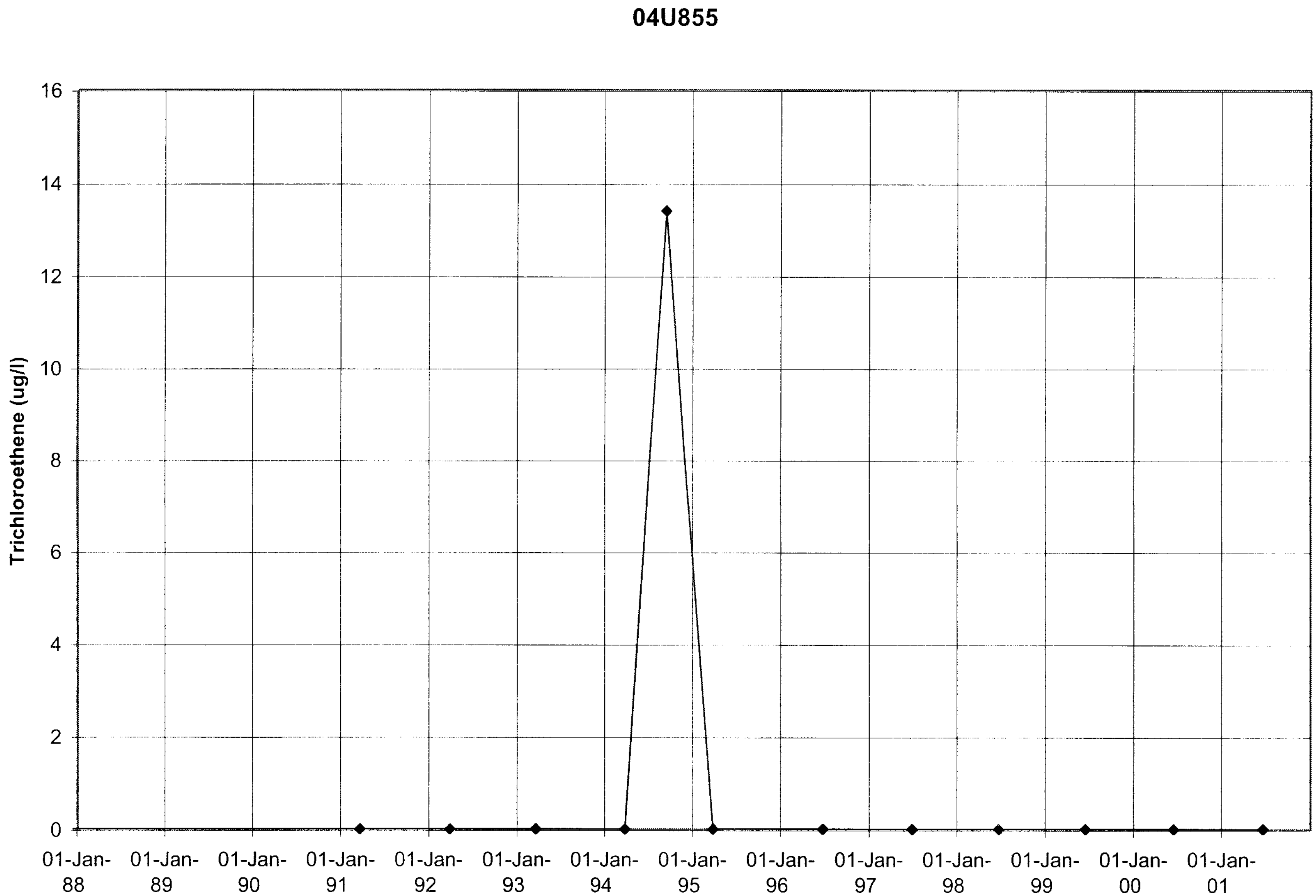

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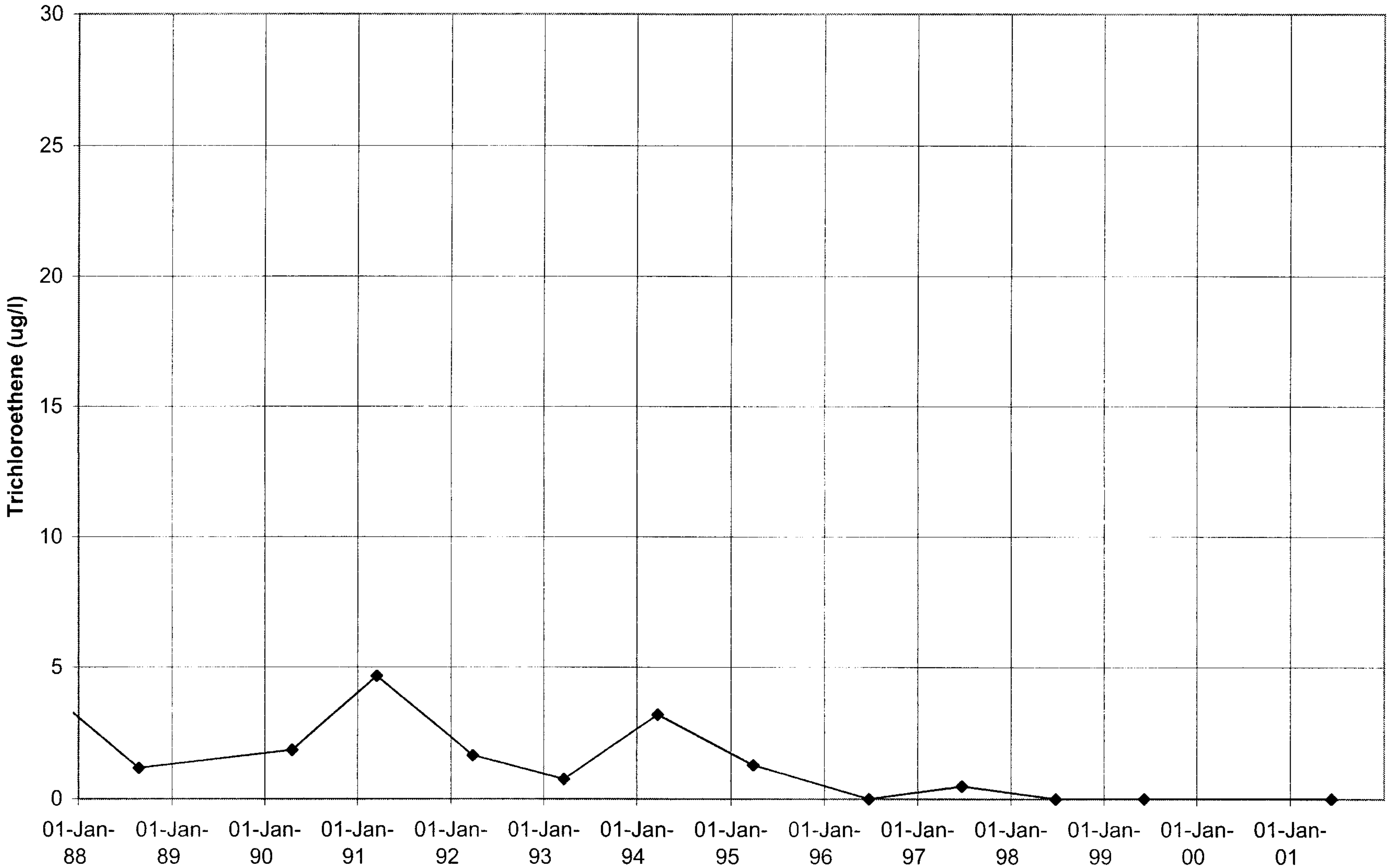

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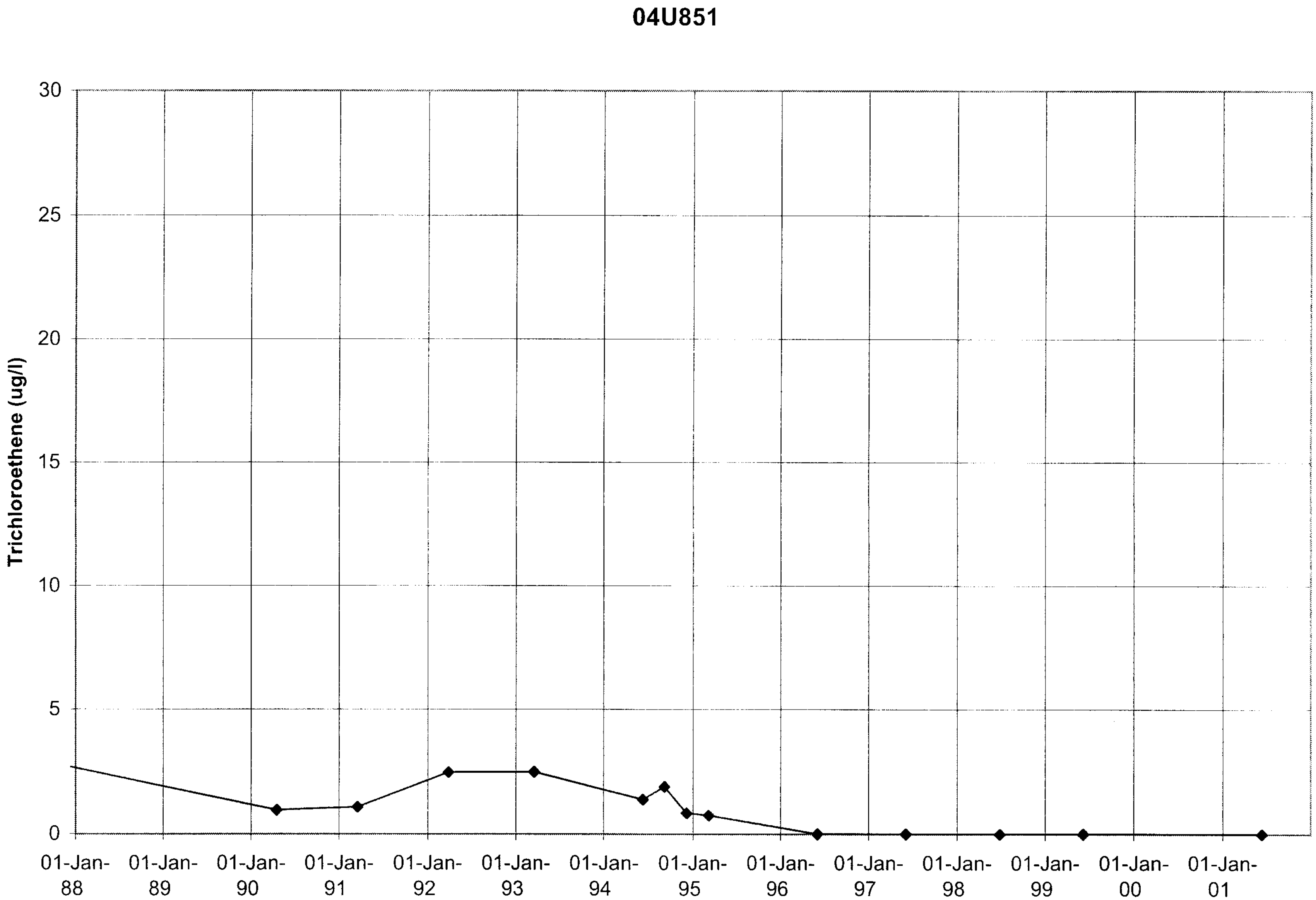

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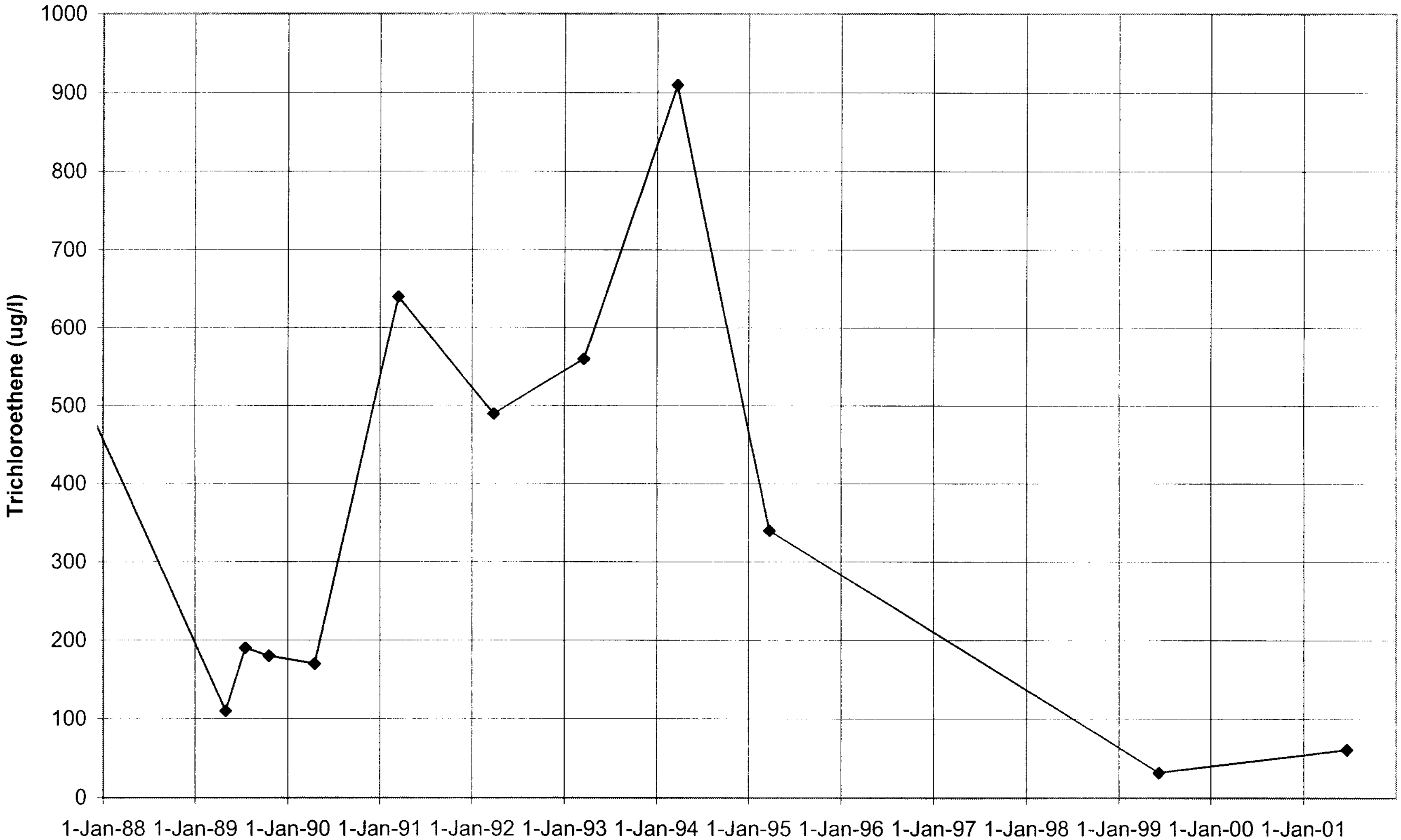

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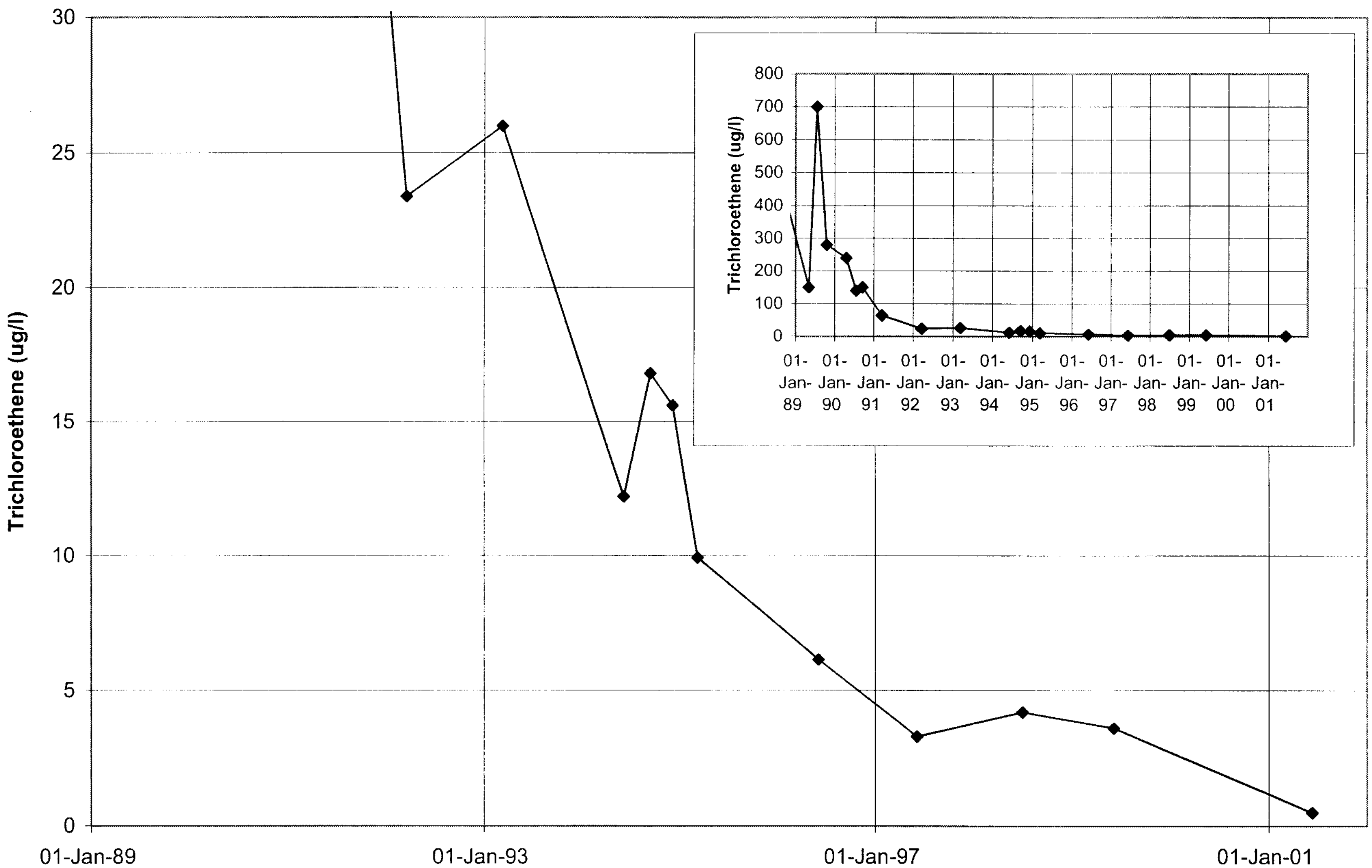

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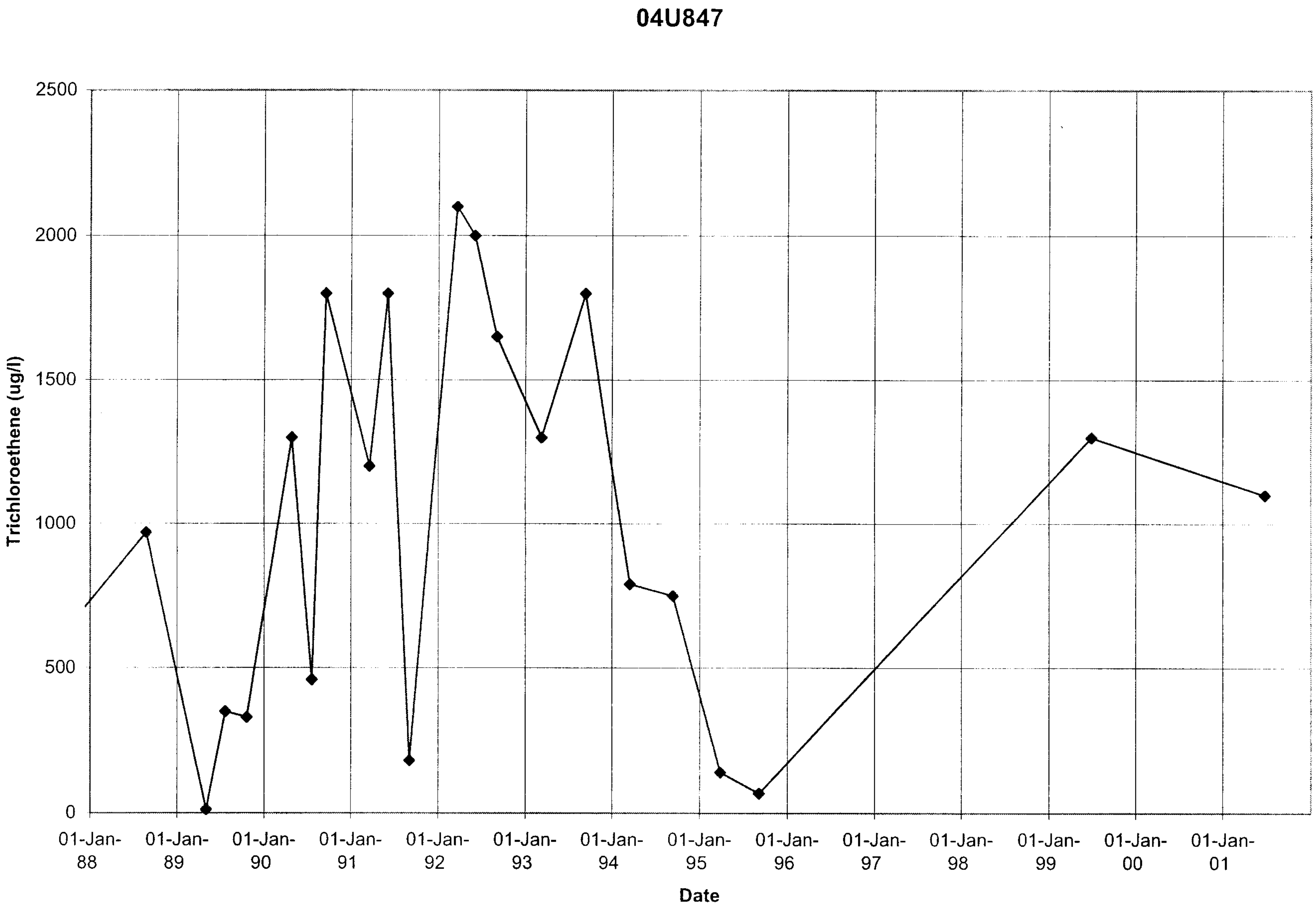

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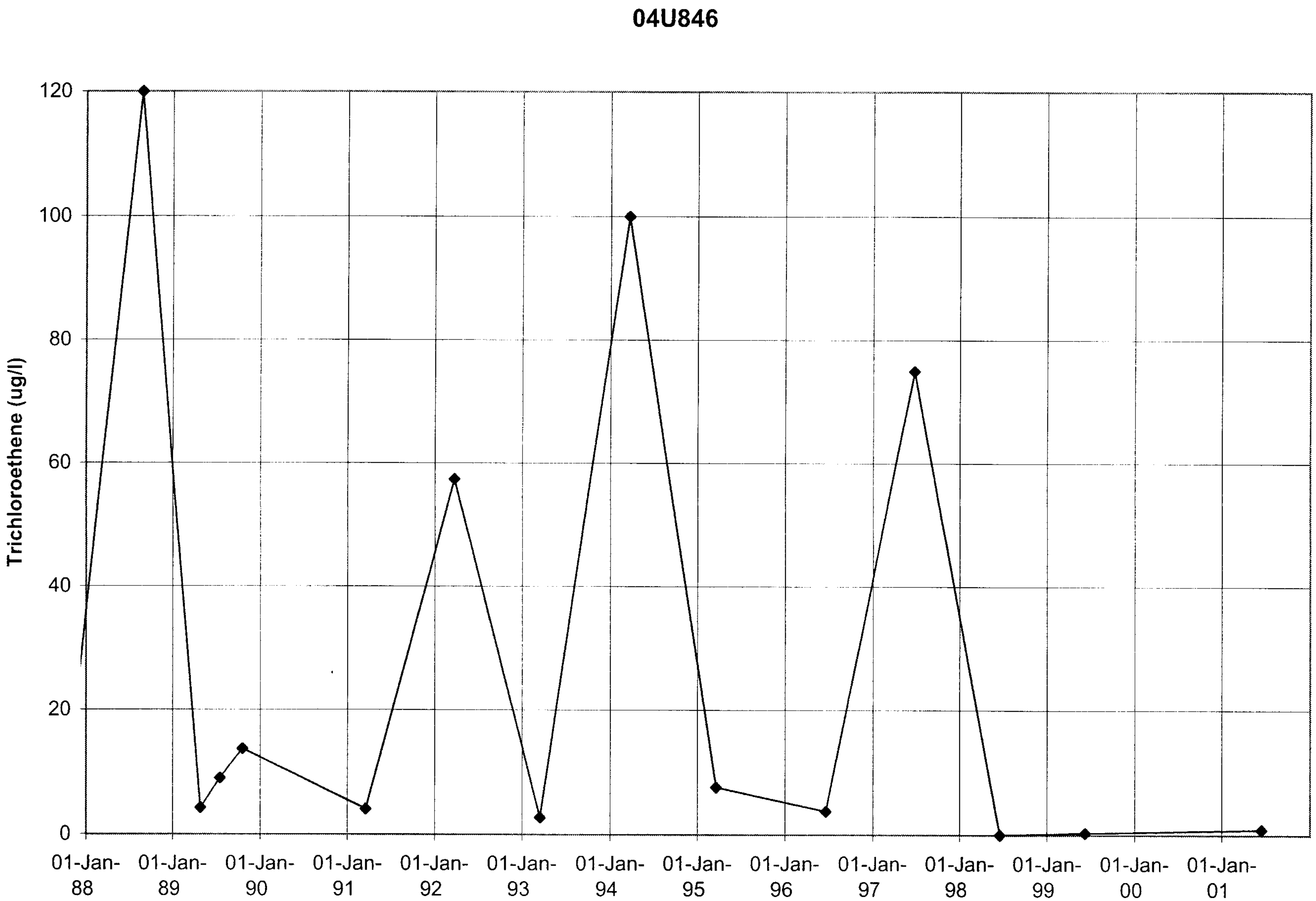

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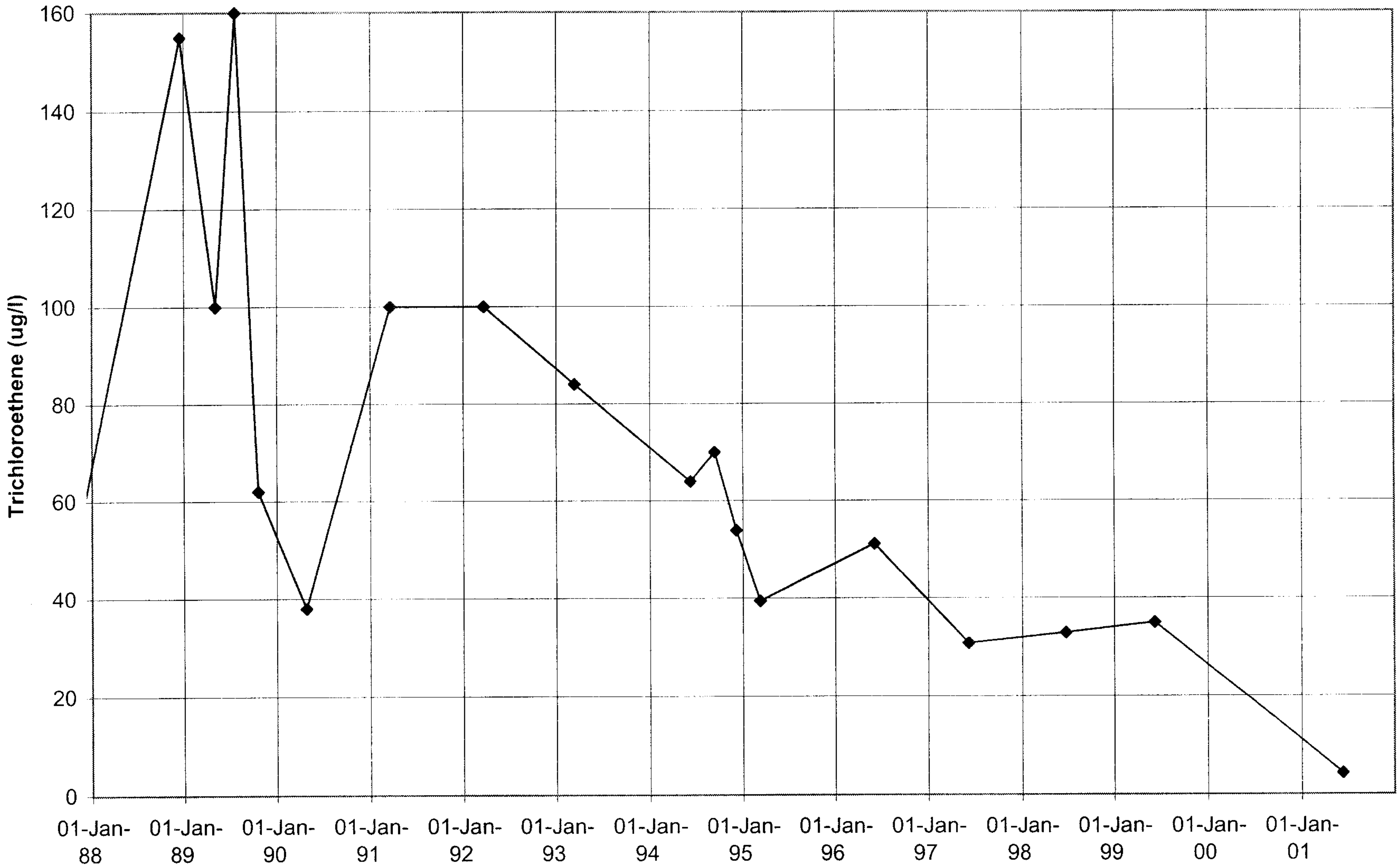

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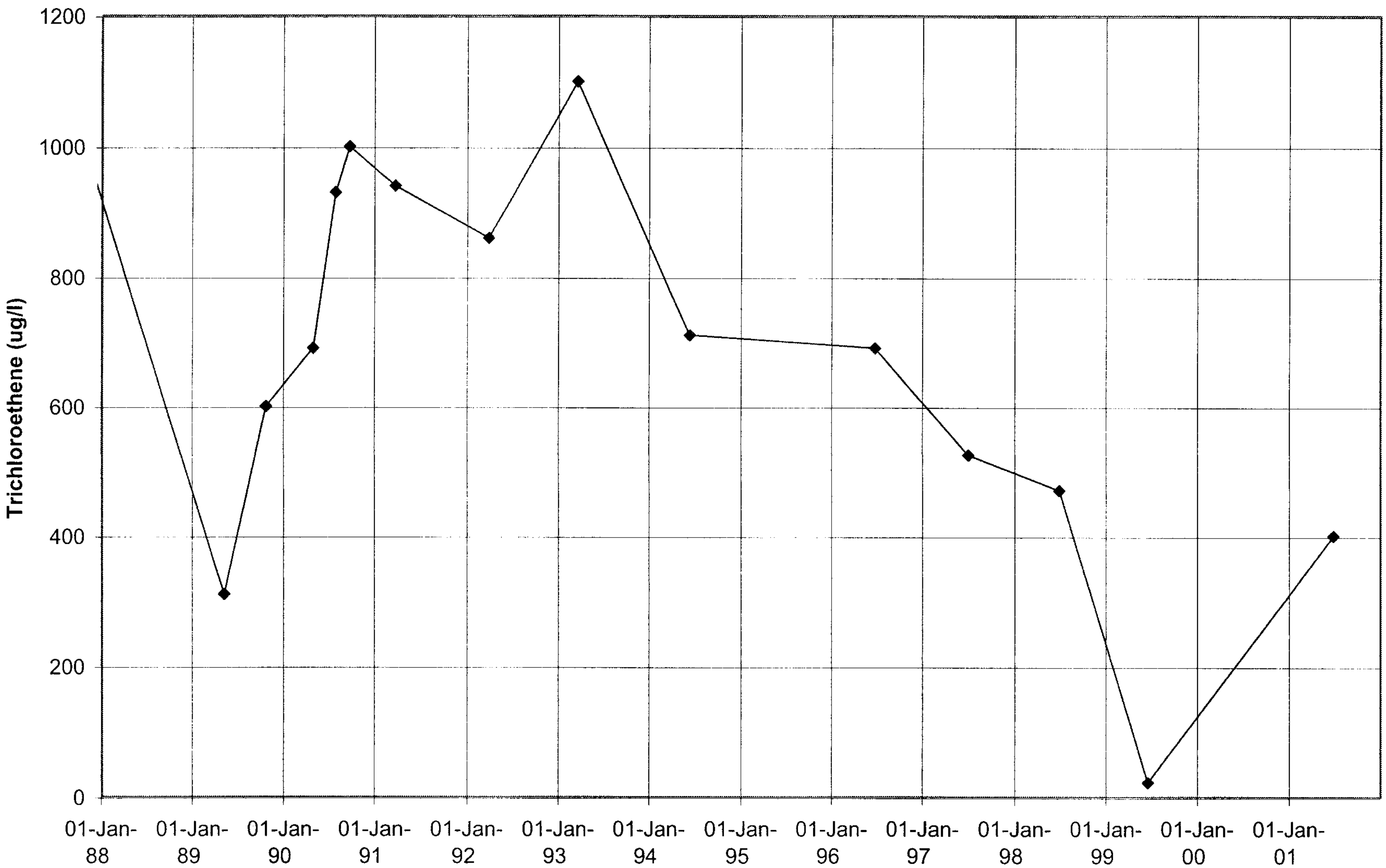

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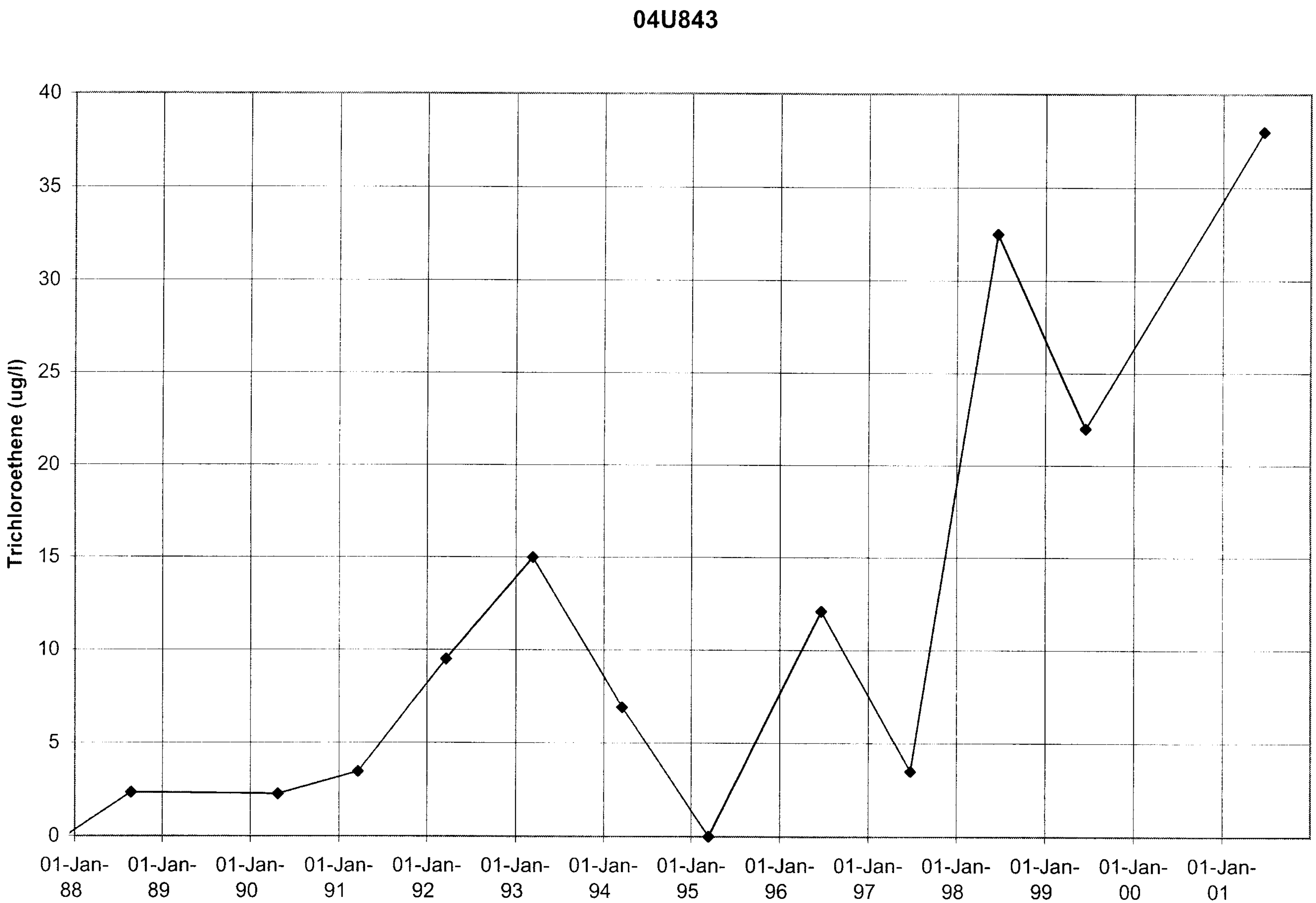

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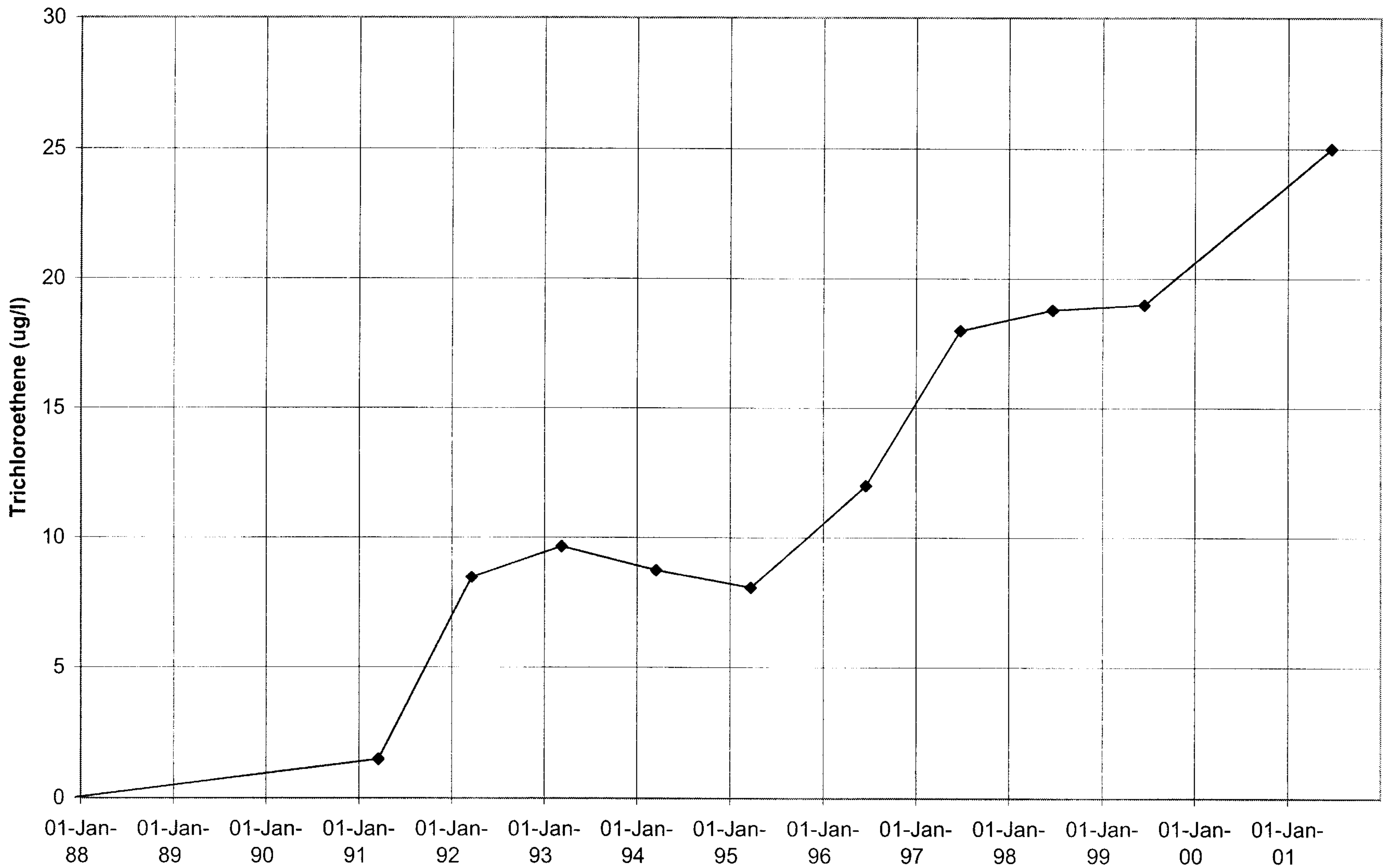

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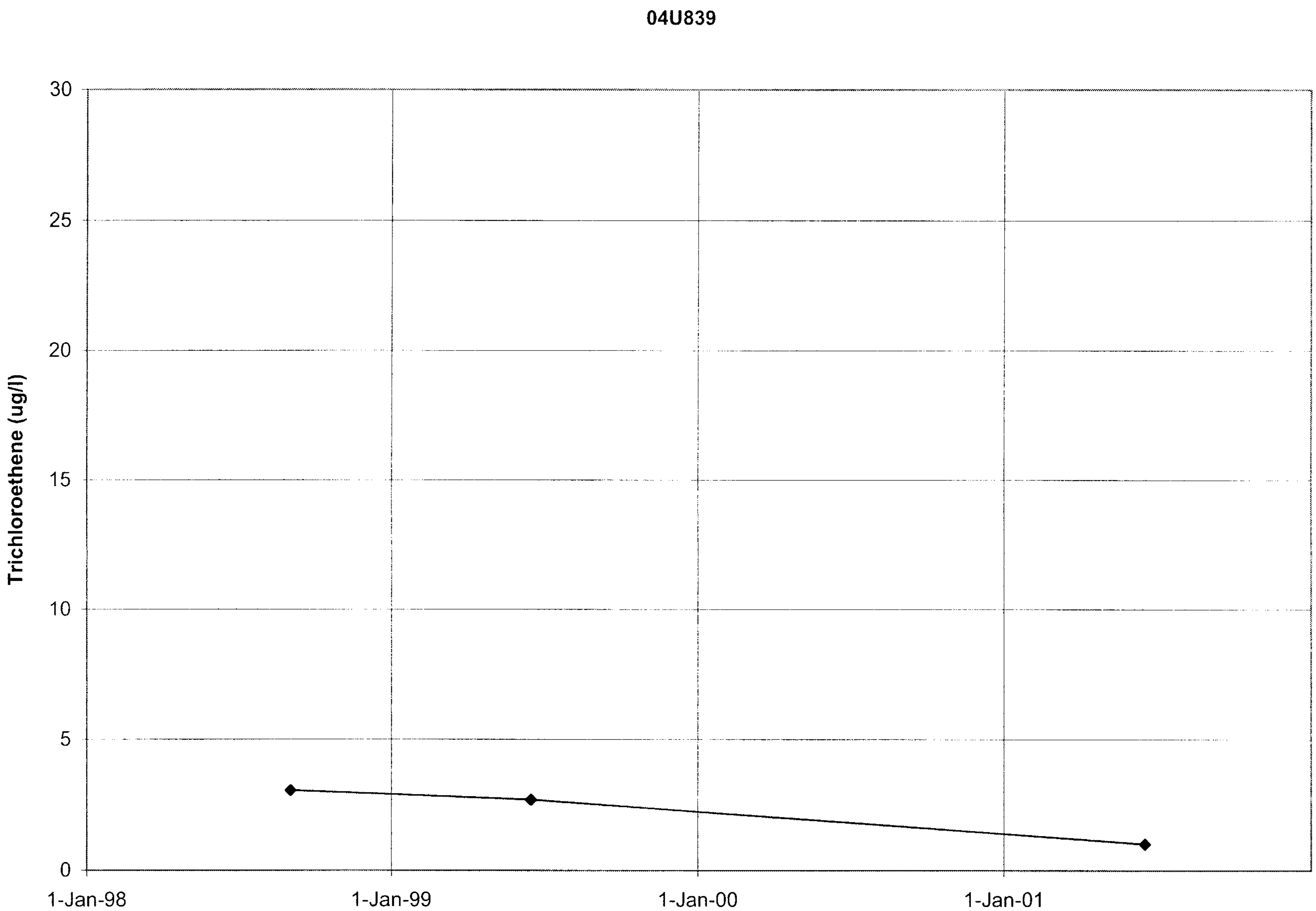

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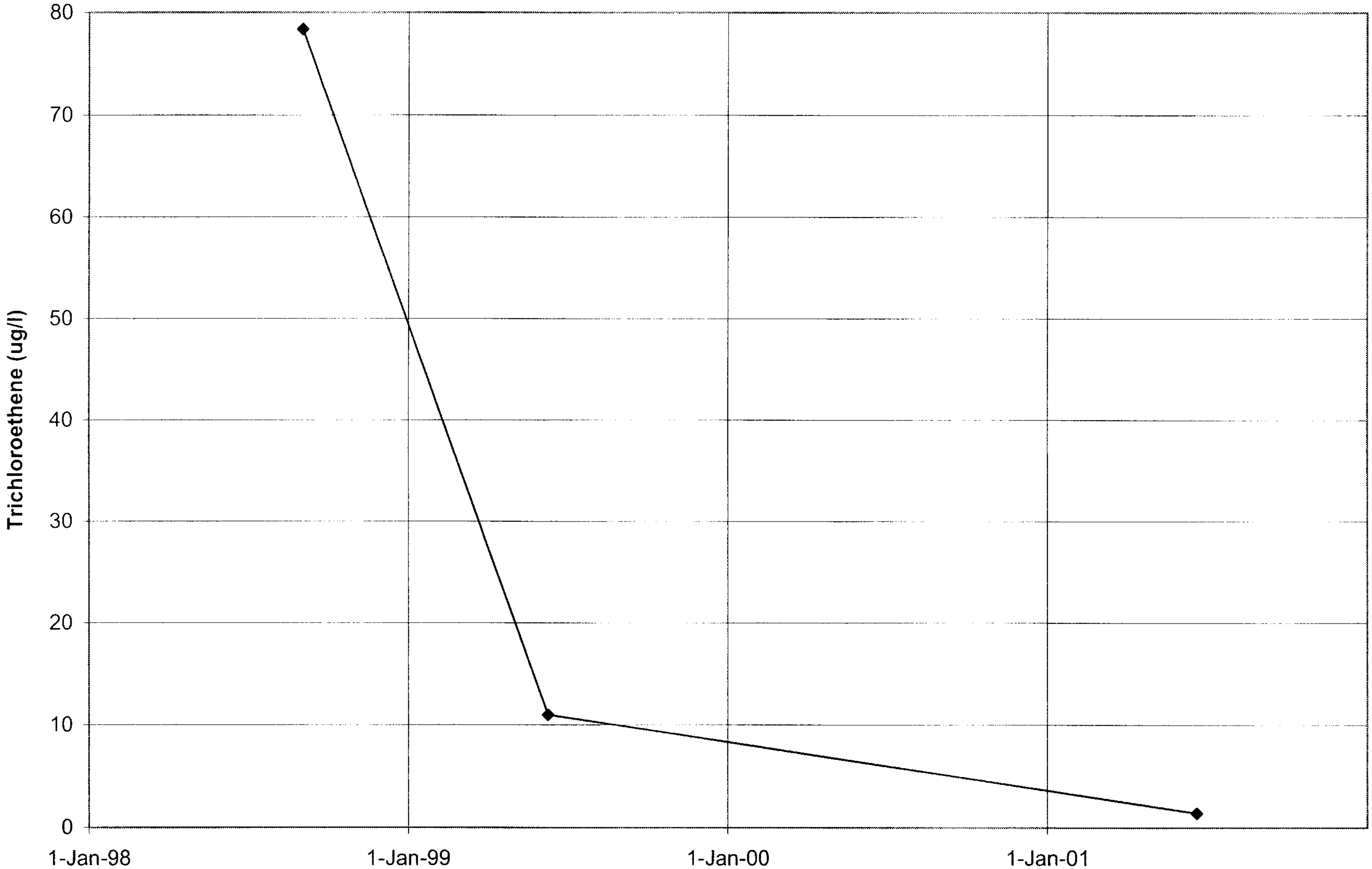

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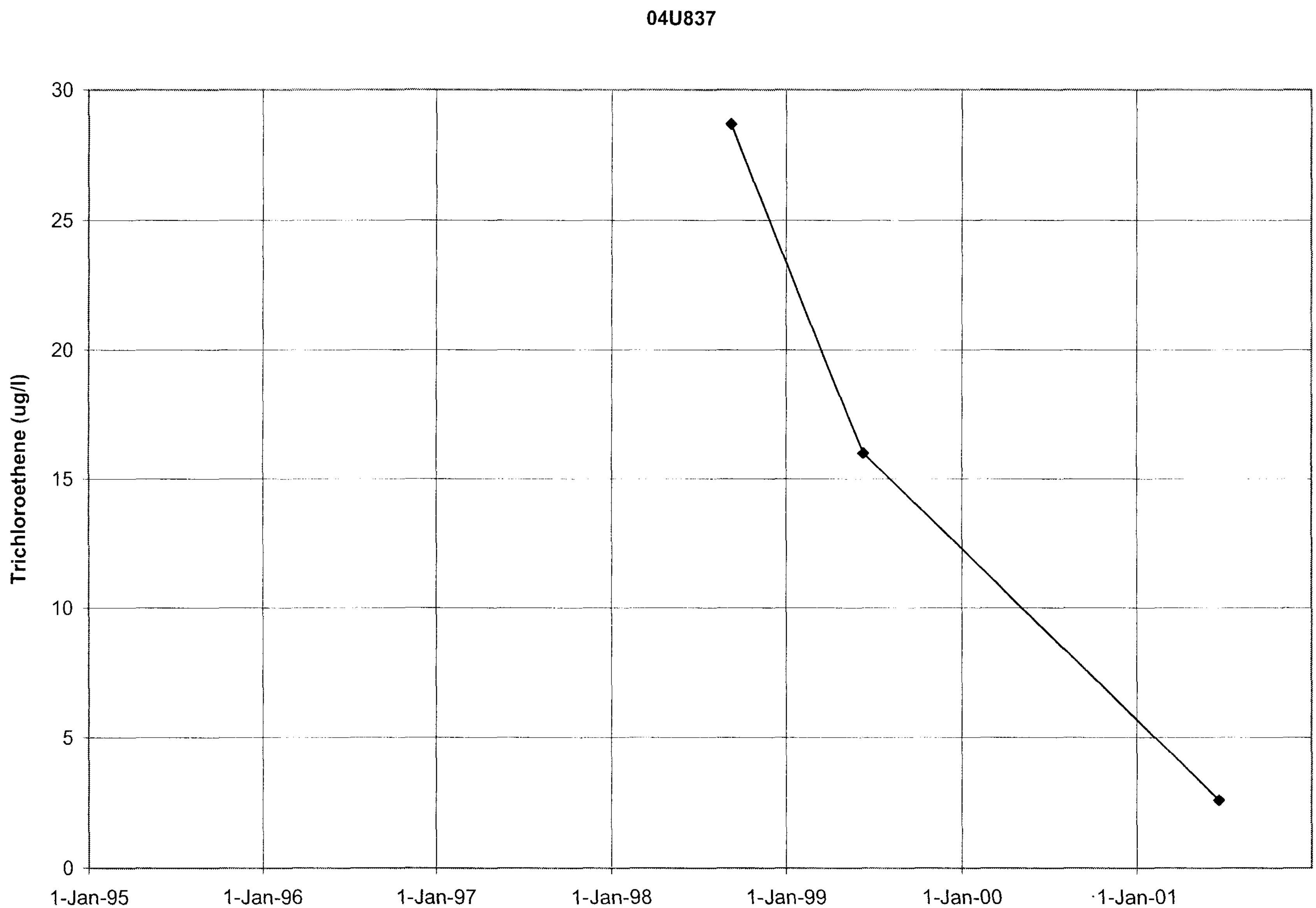

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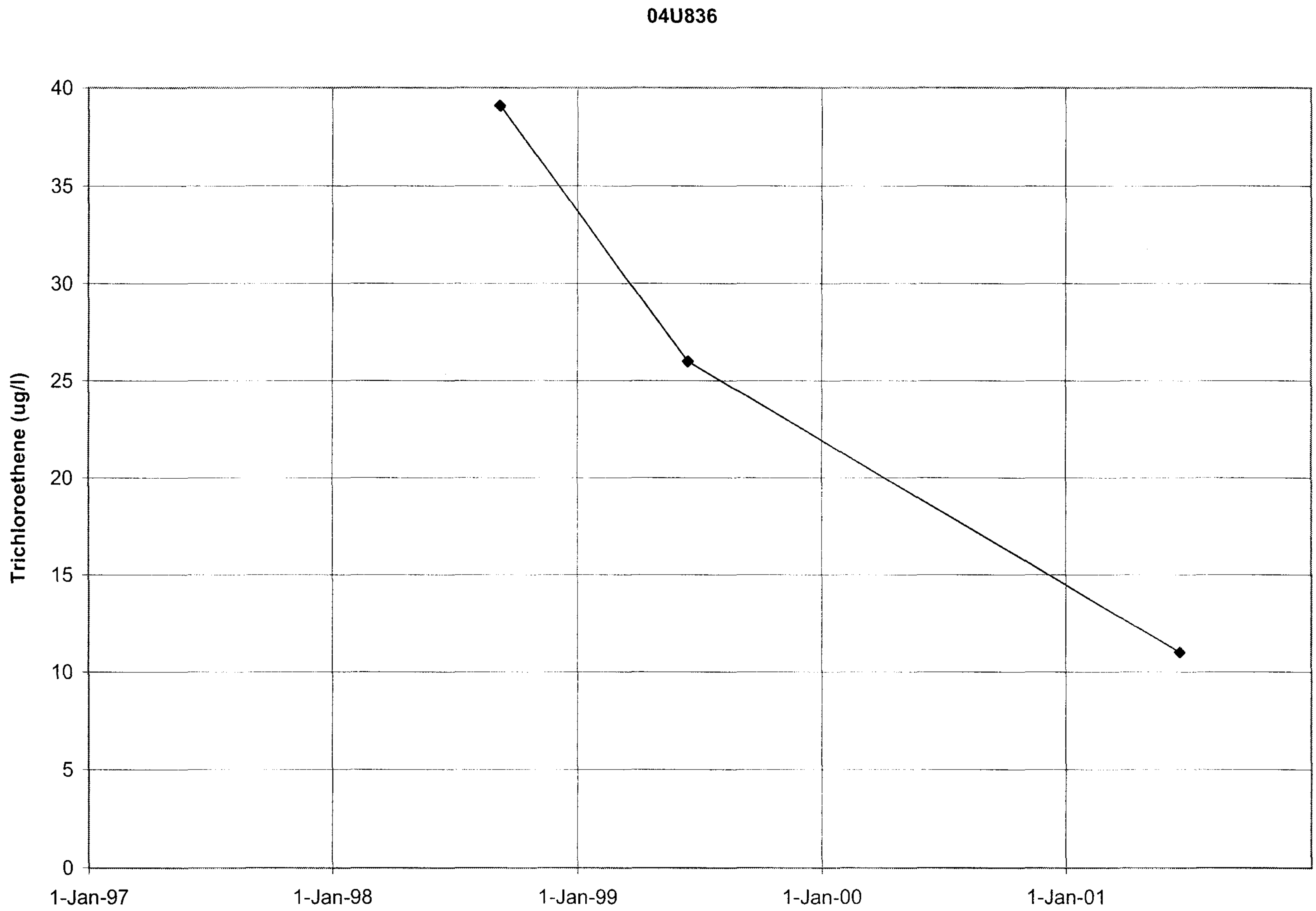

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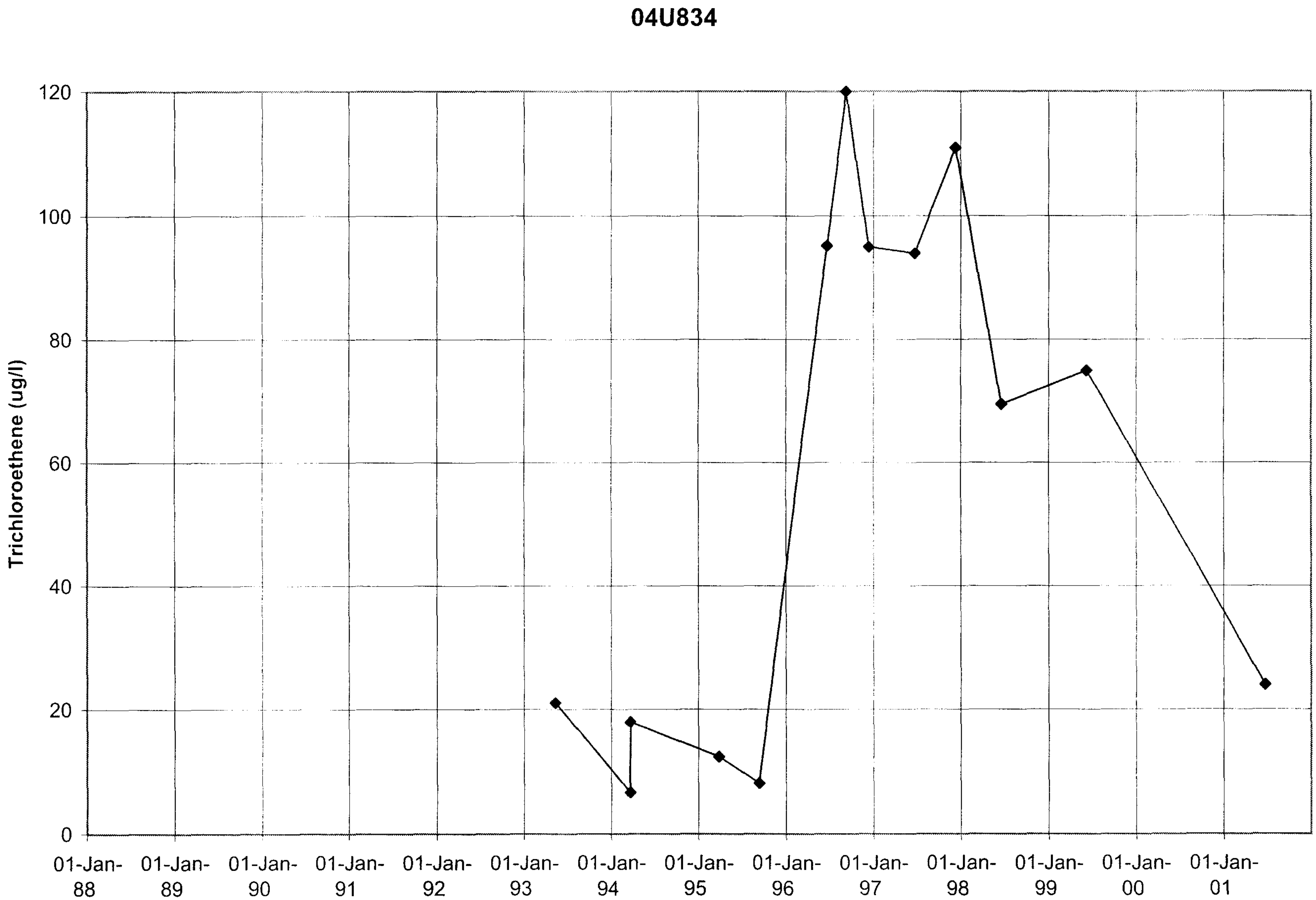

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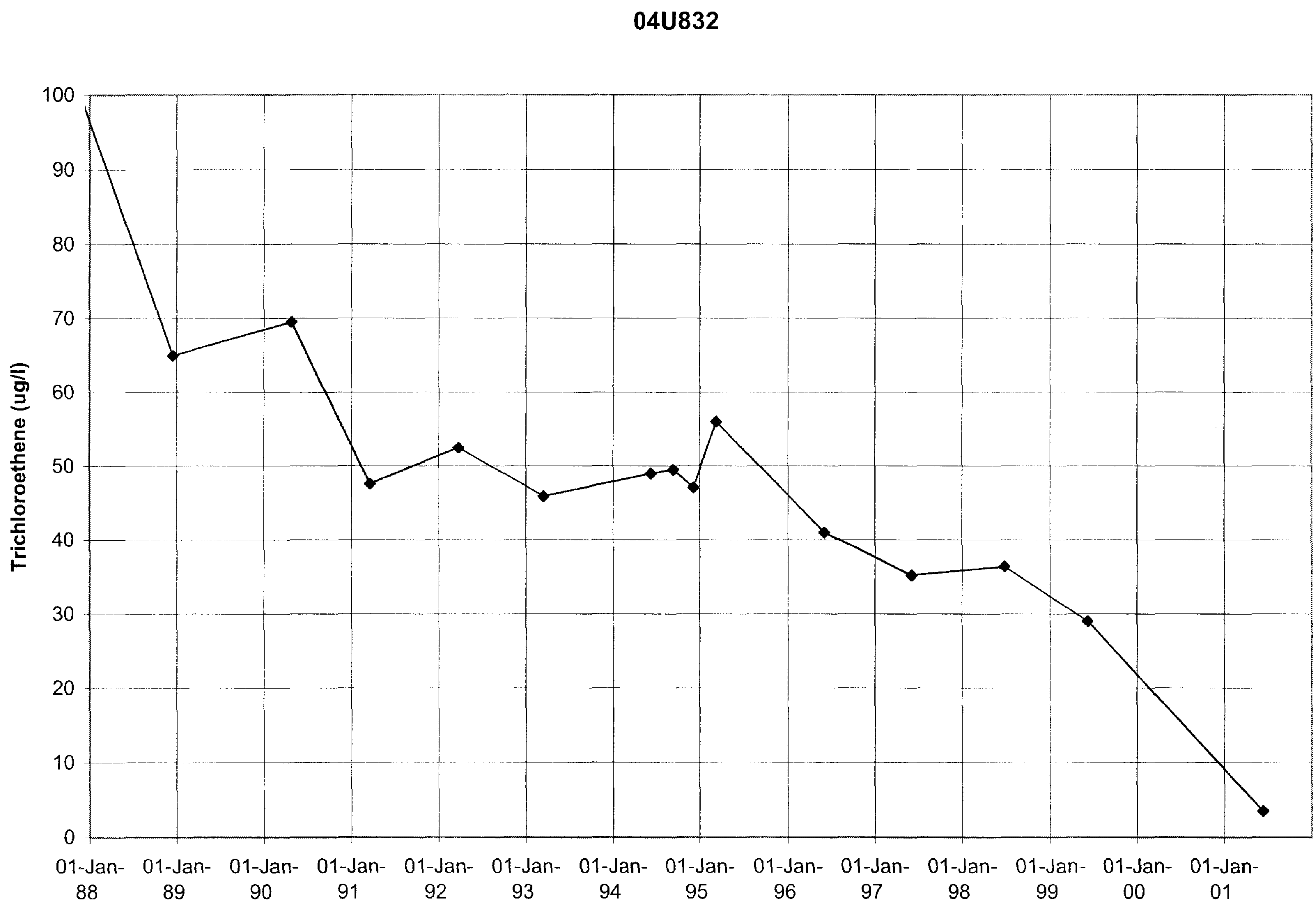

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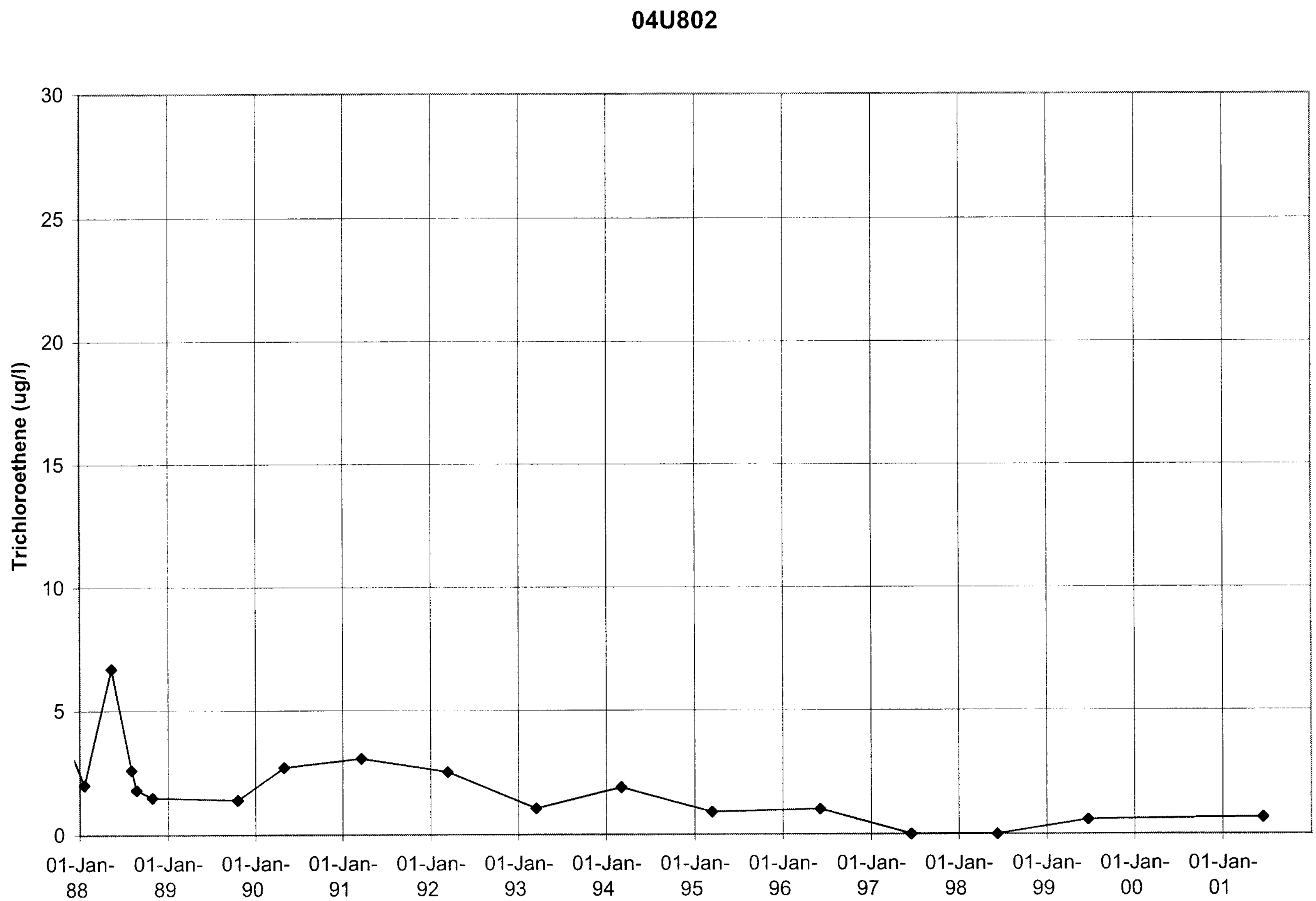

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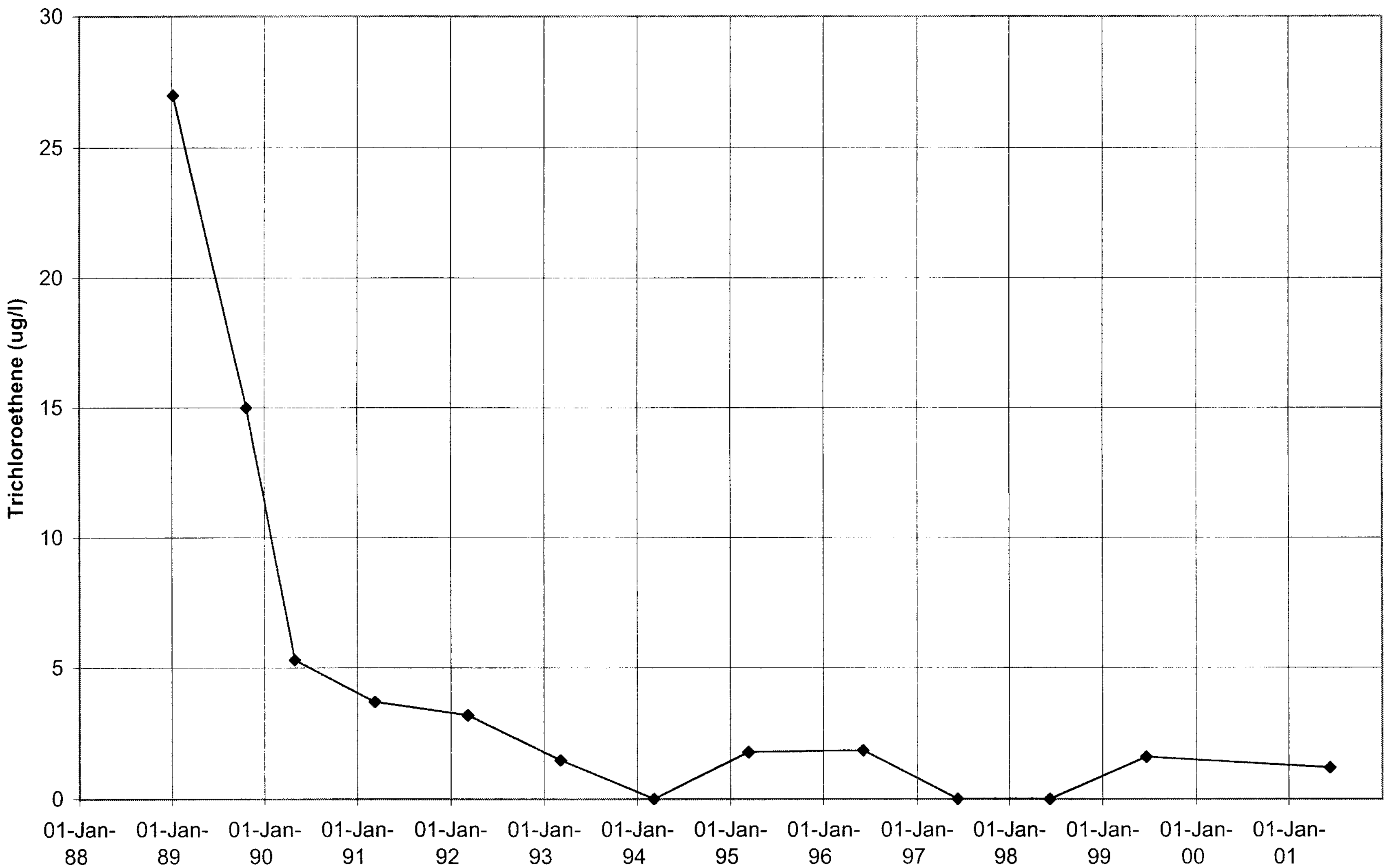

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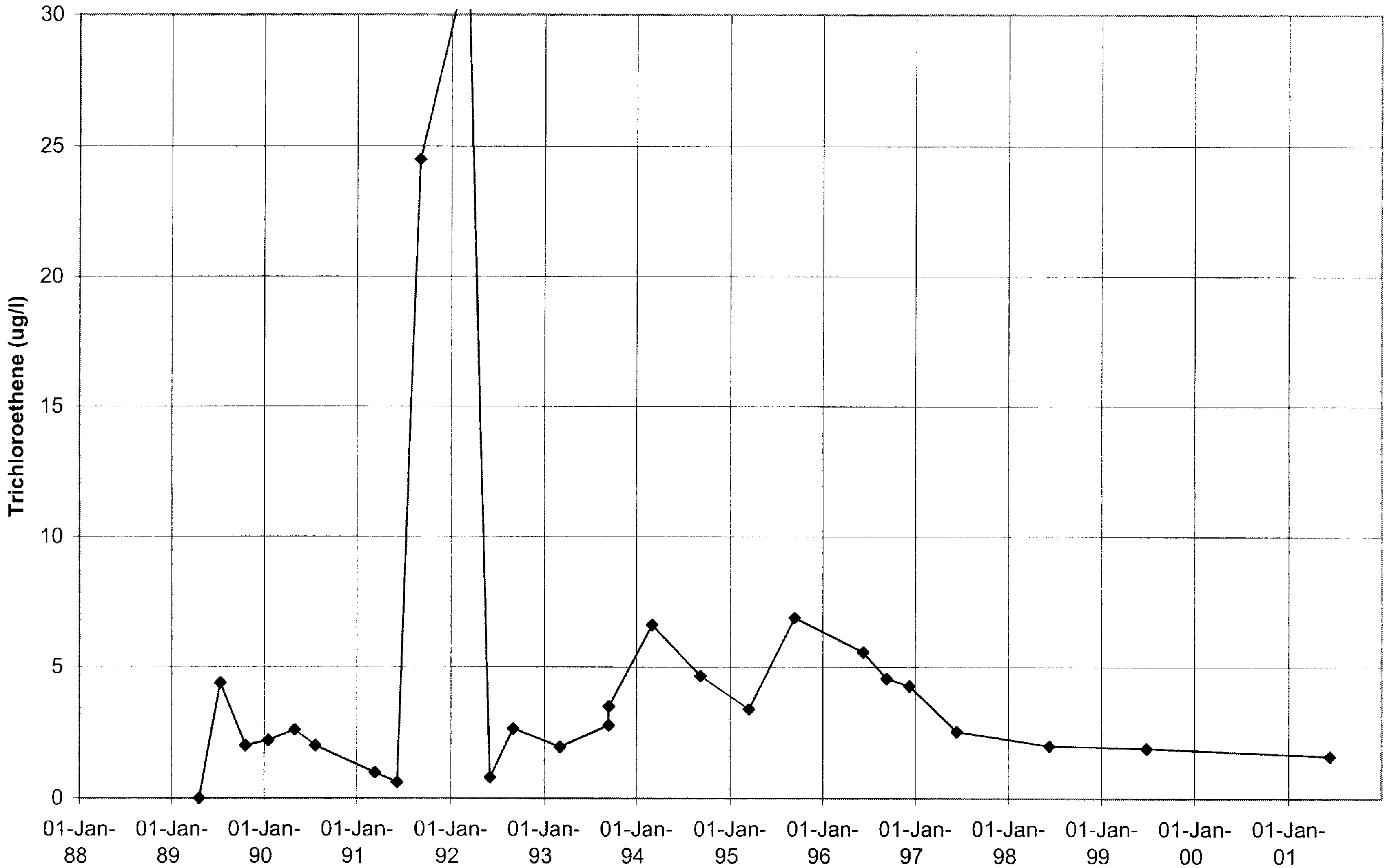

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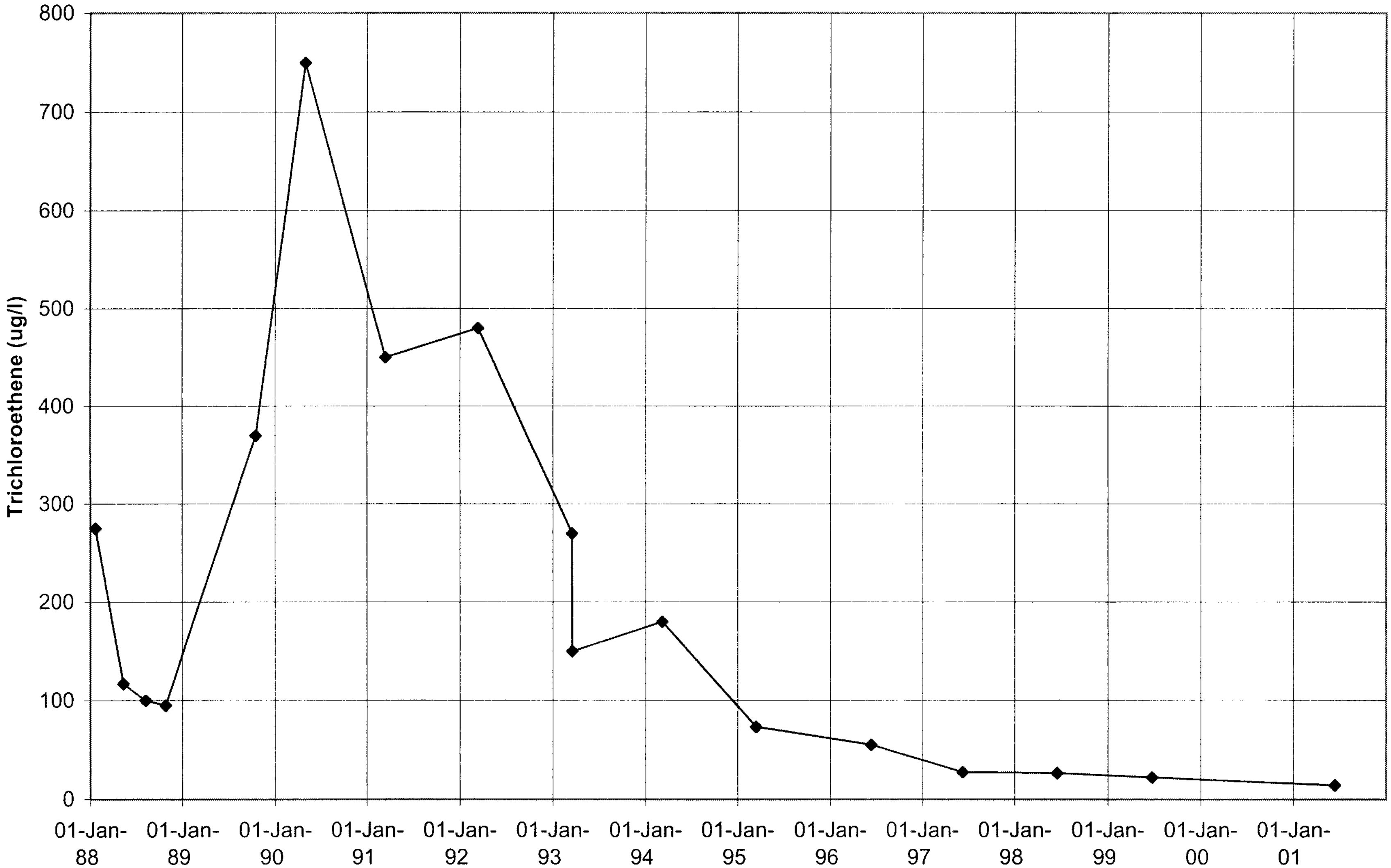

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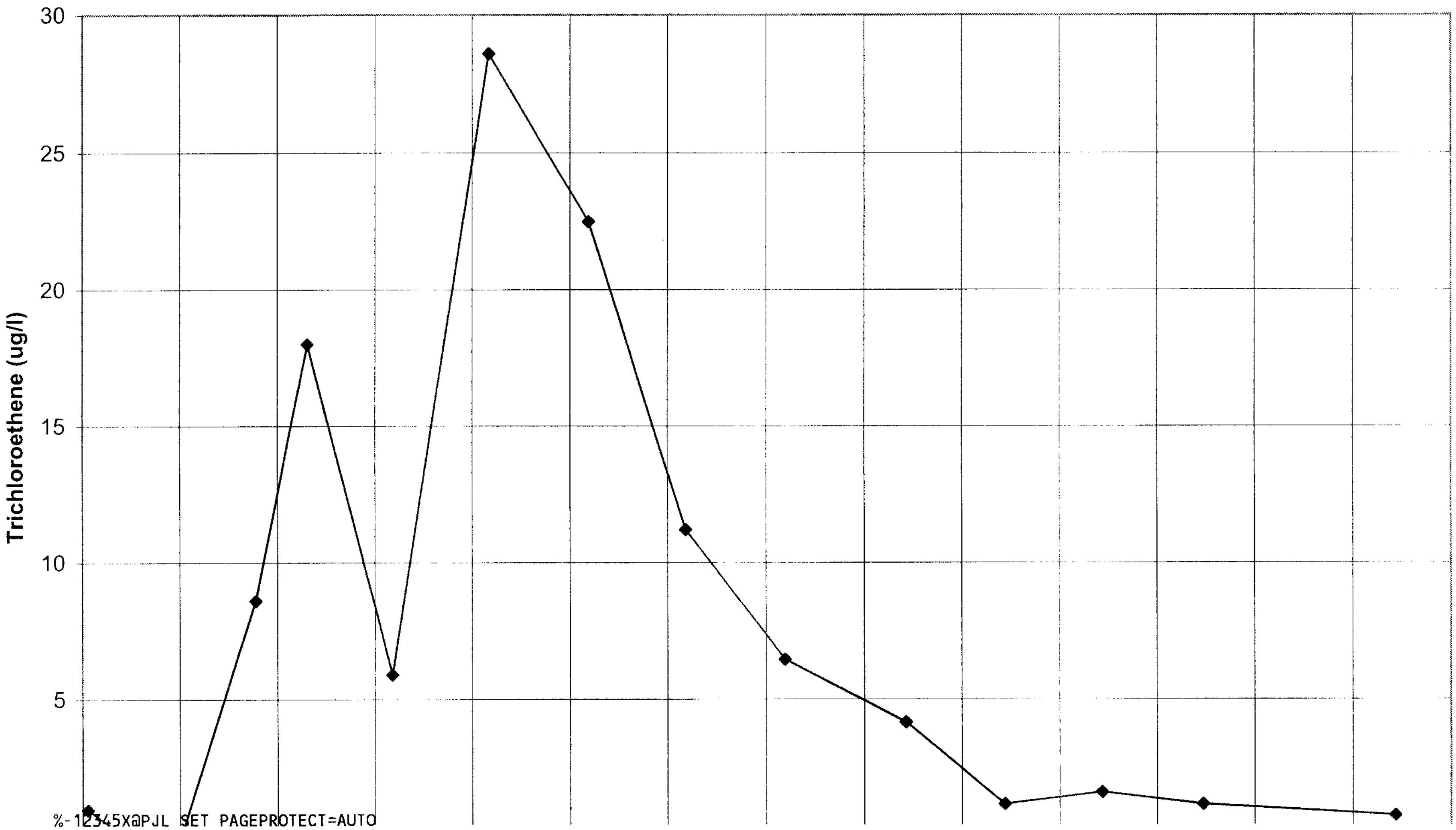

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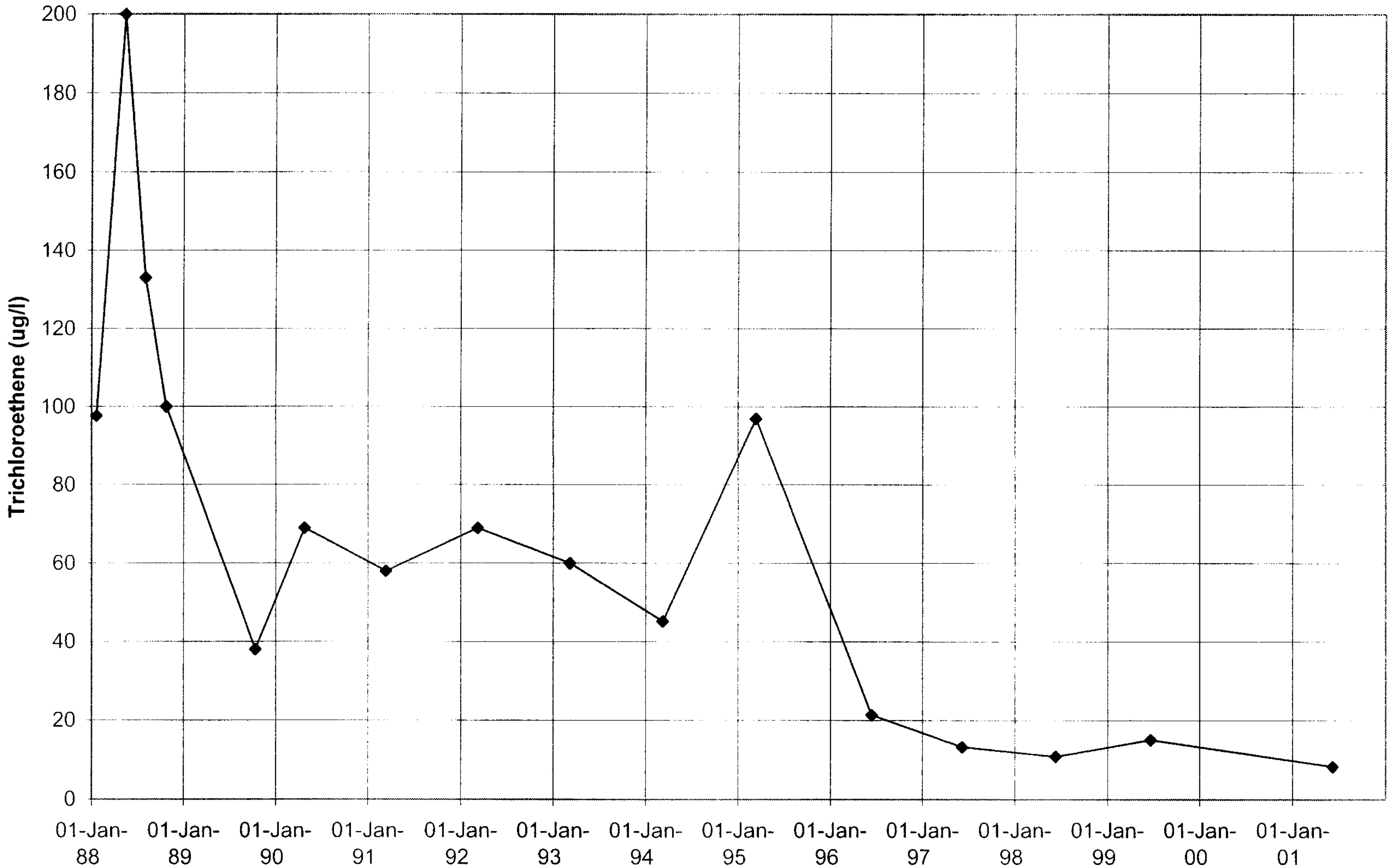

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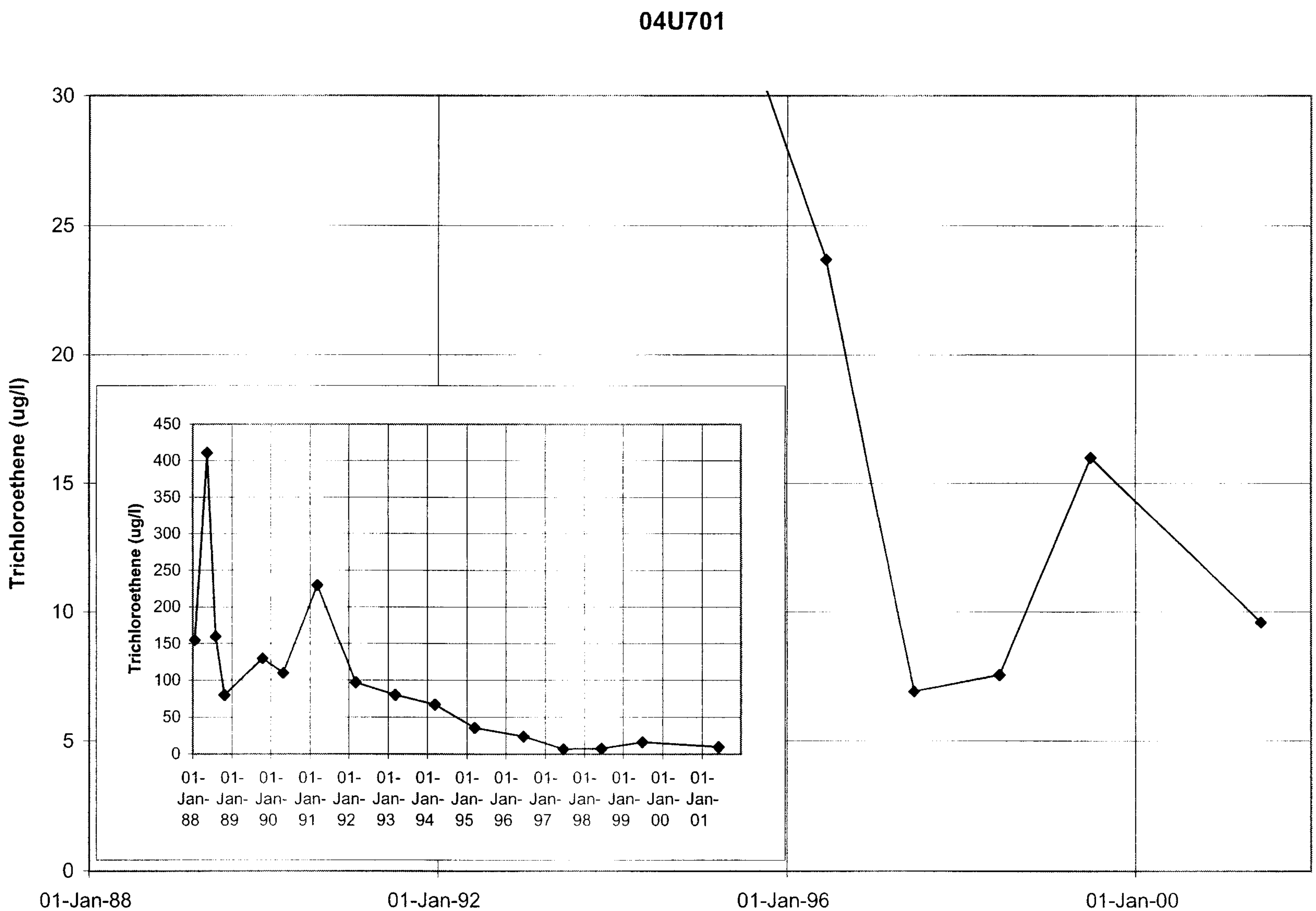

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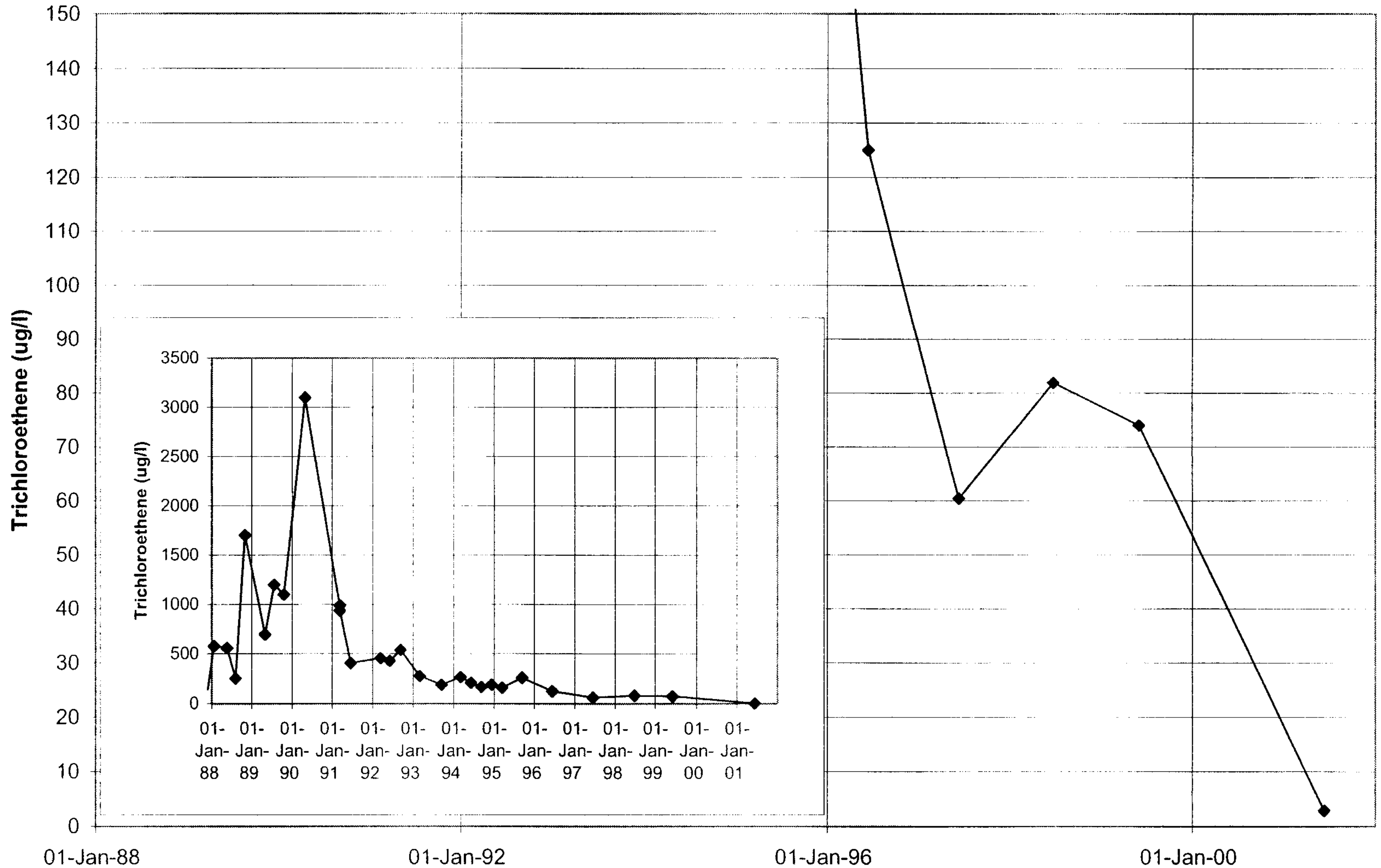

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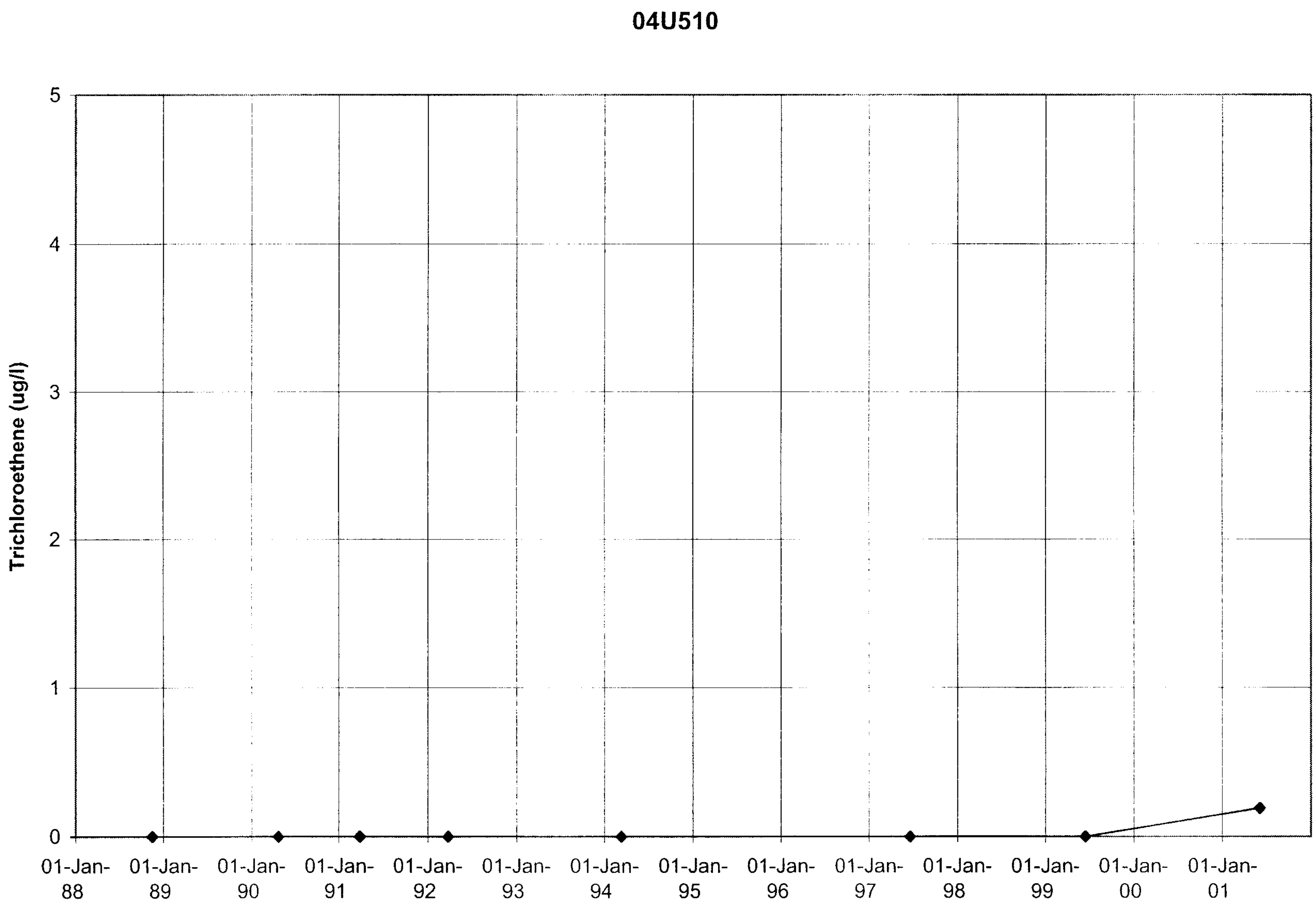

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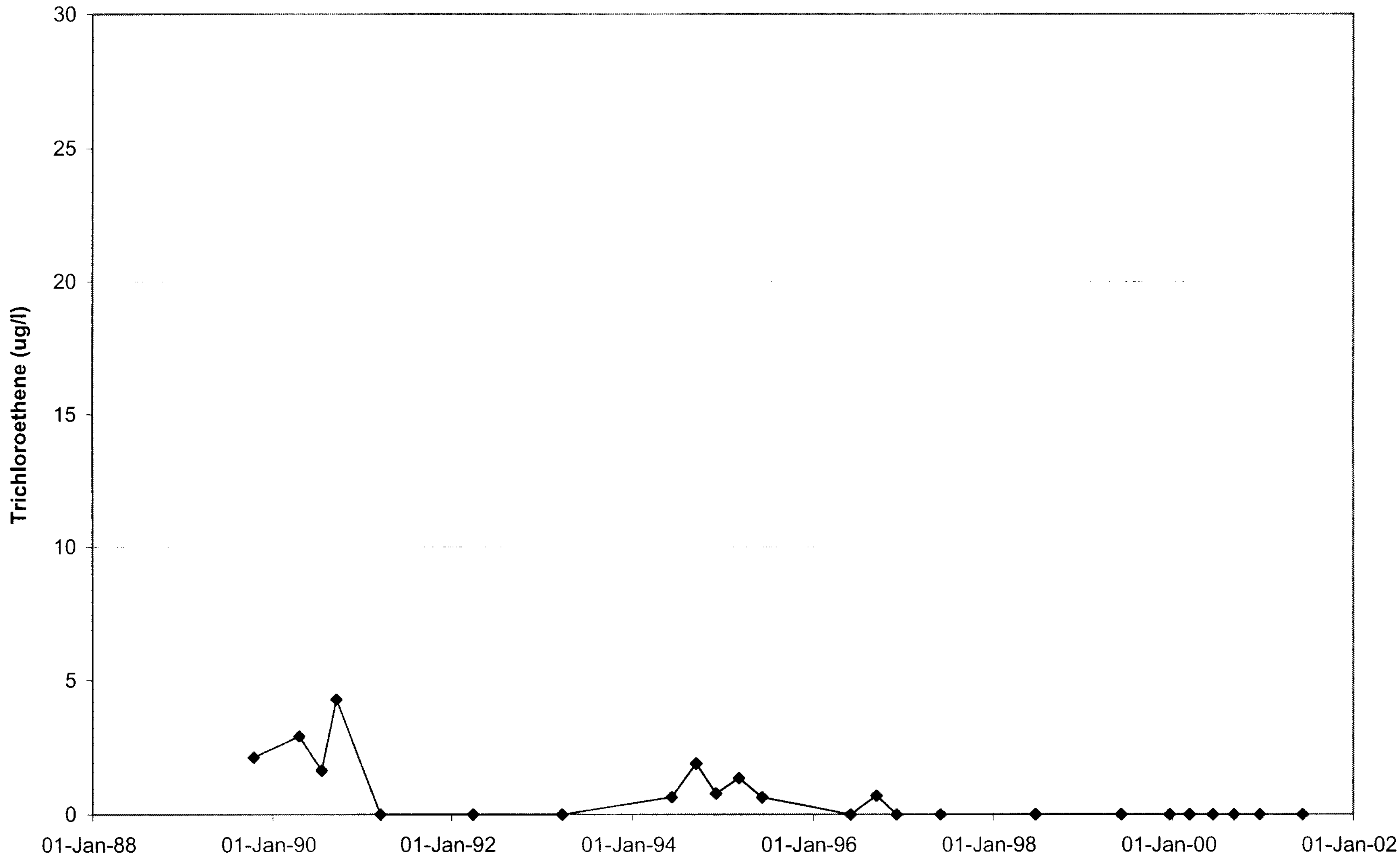
04U414 (414U4)



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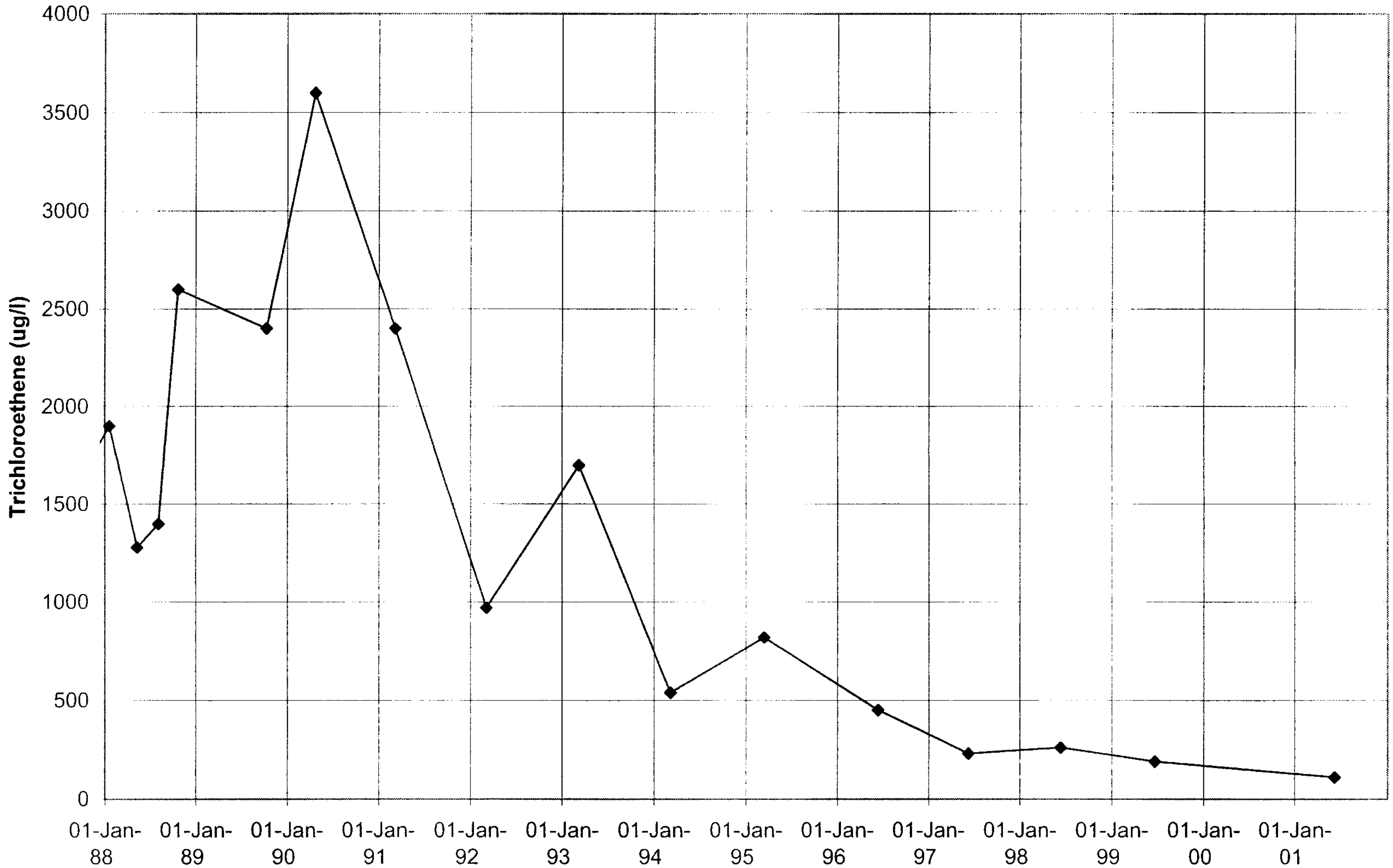

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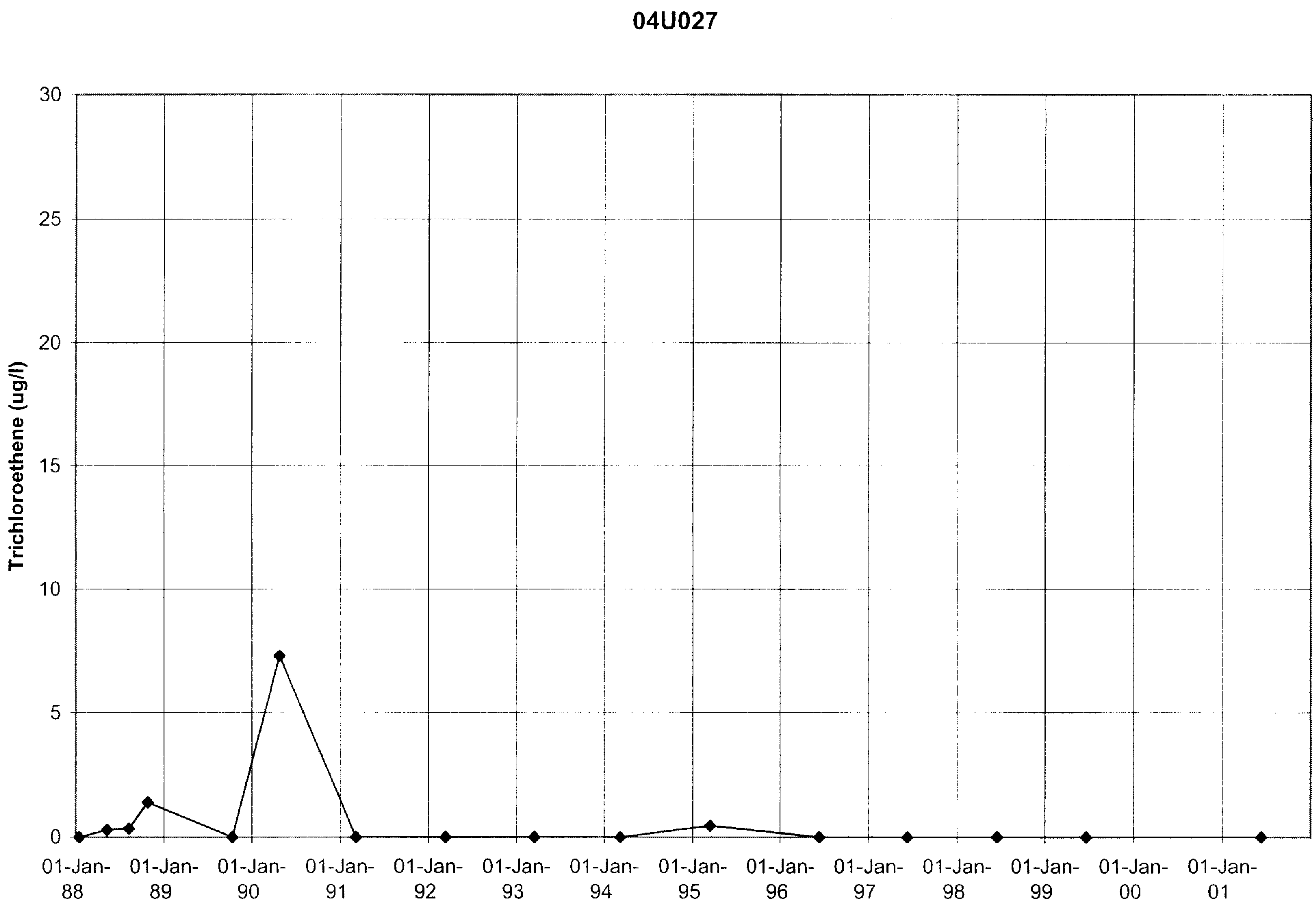

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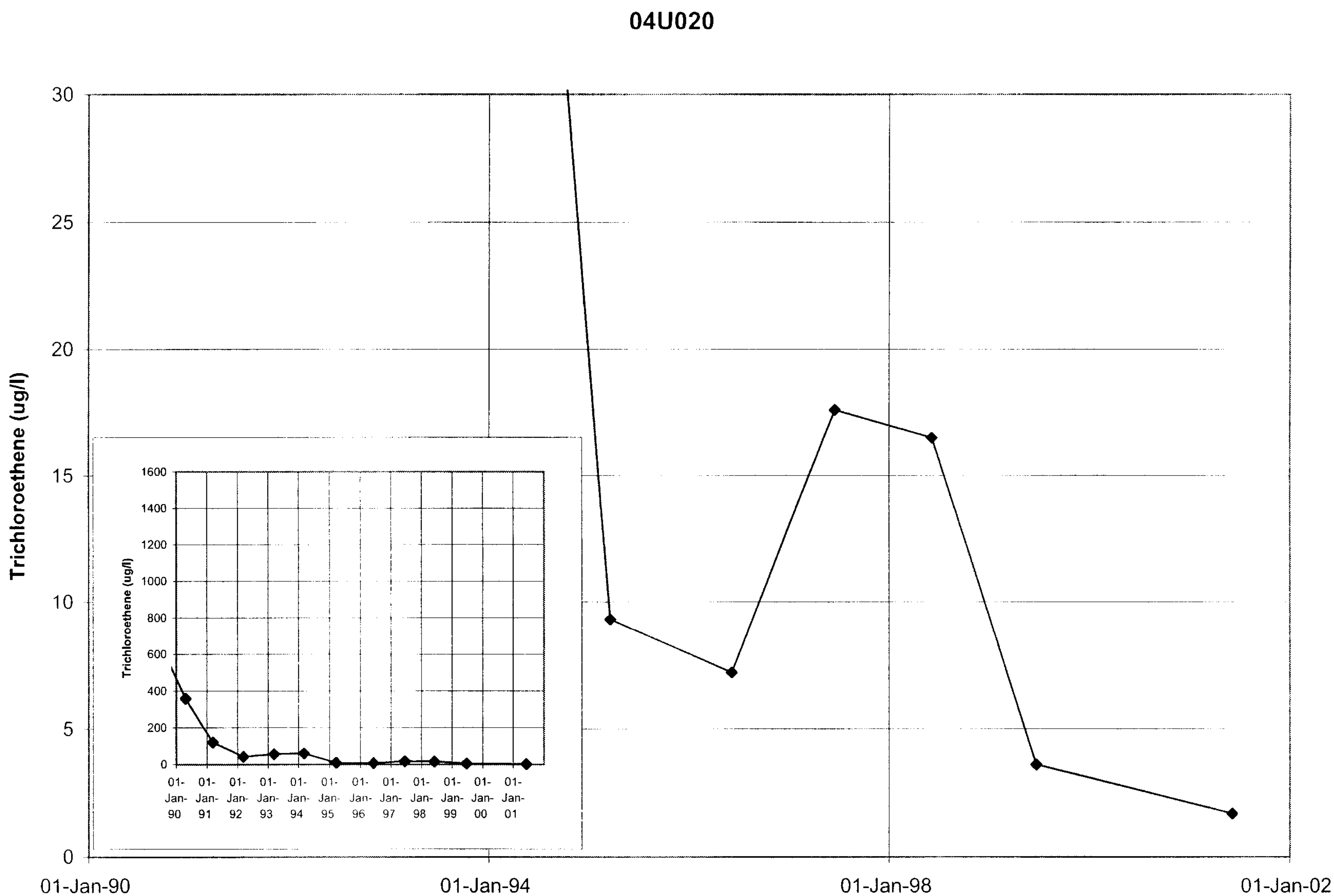

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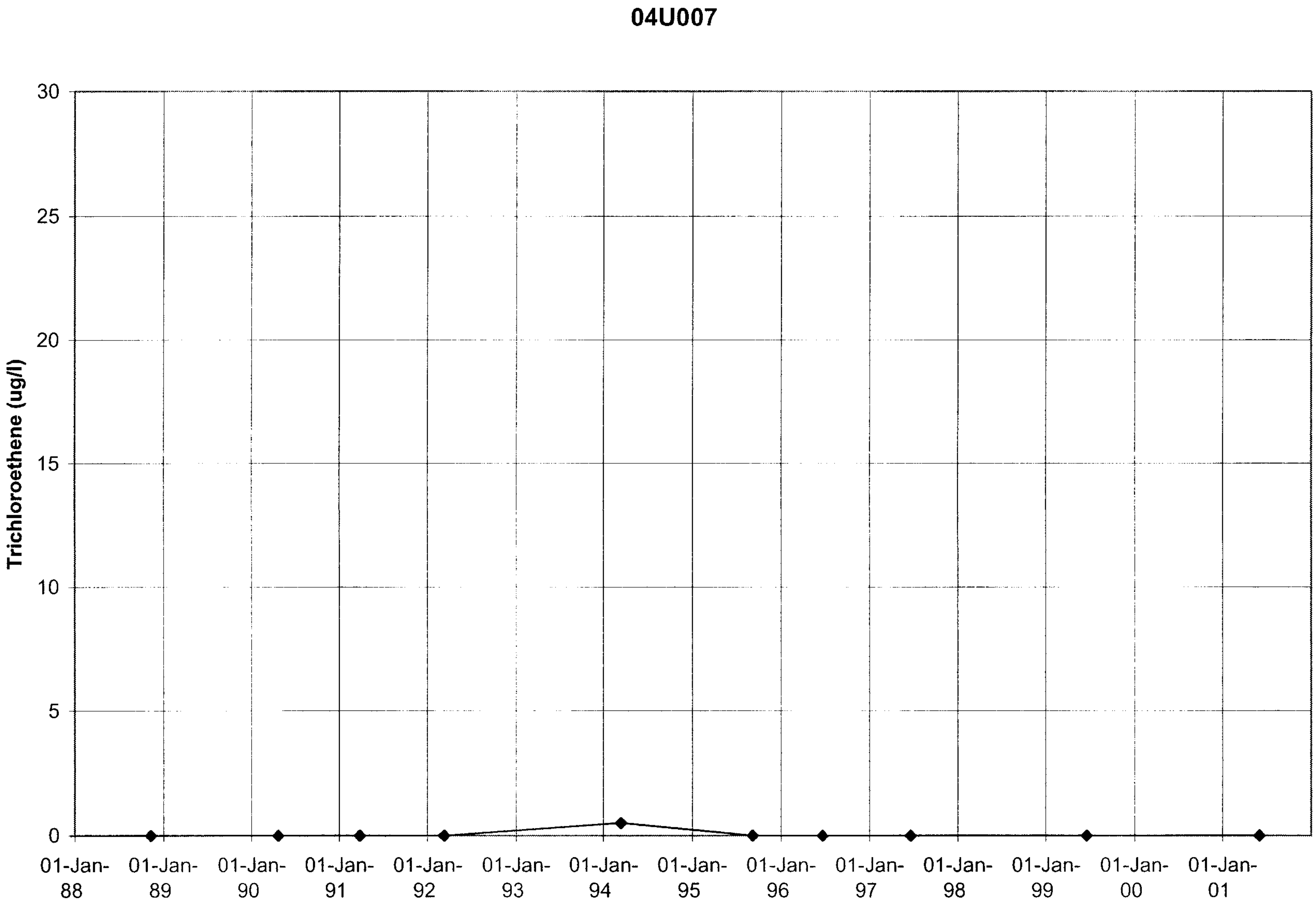

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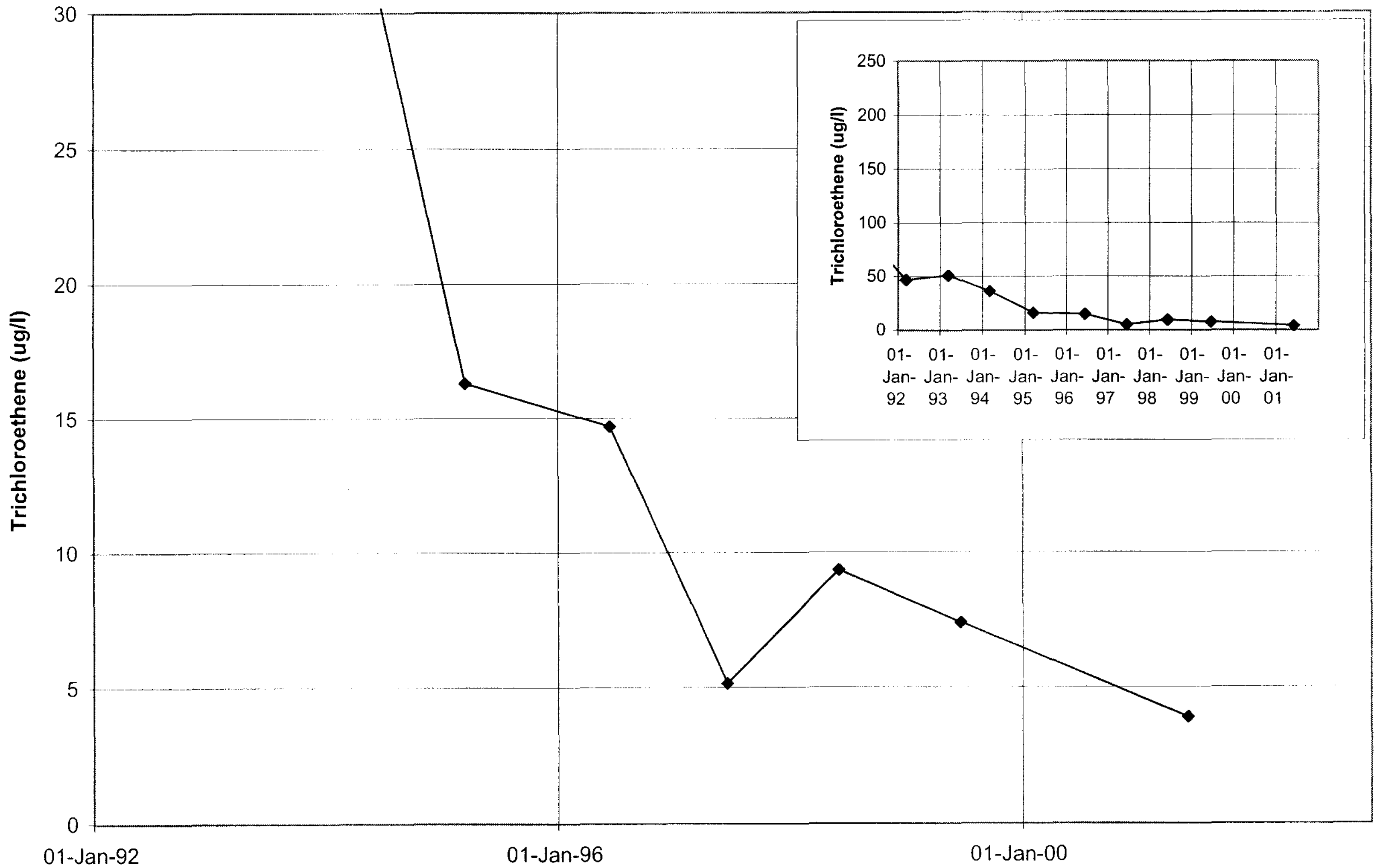

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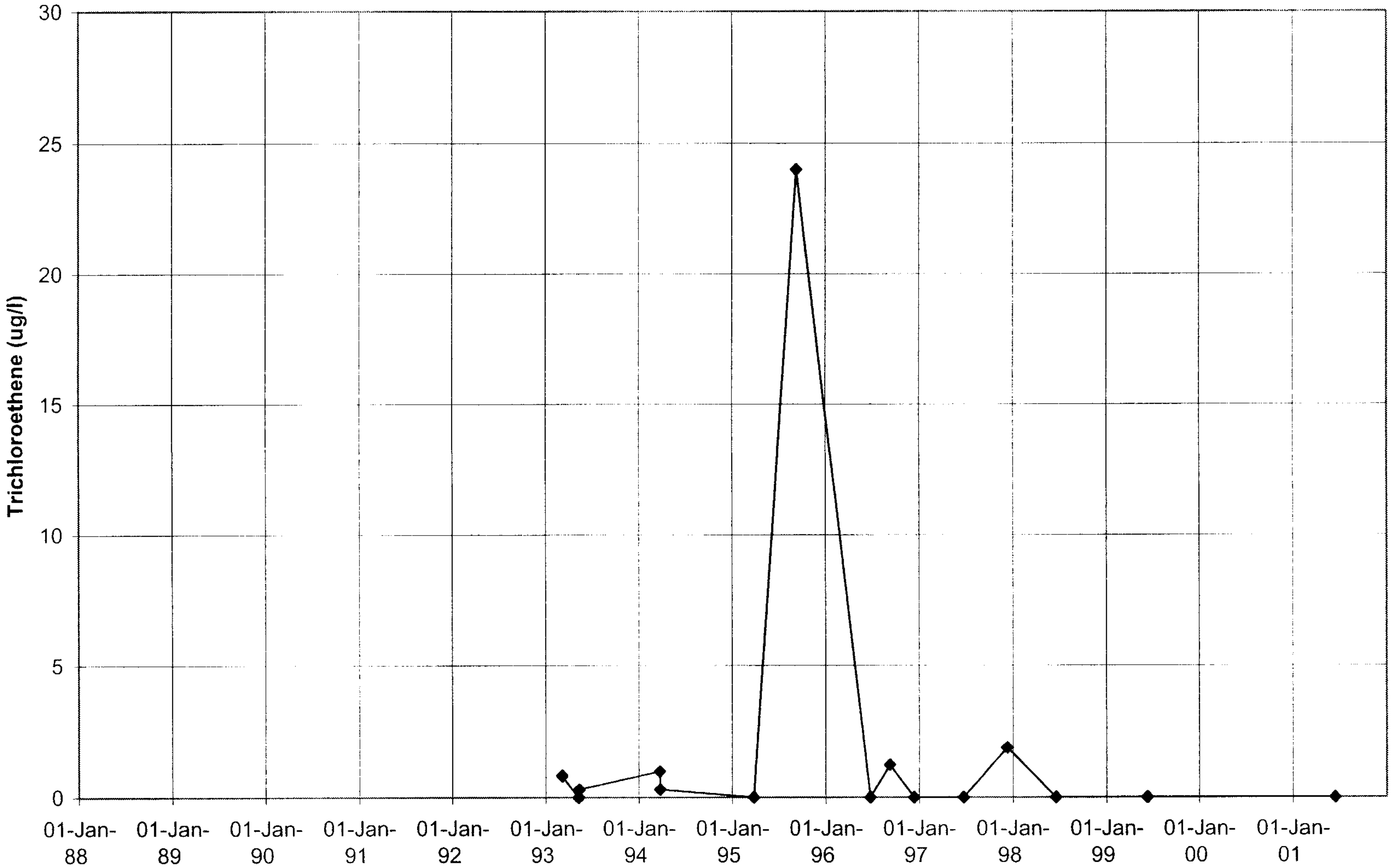

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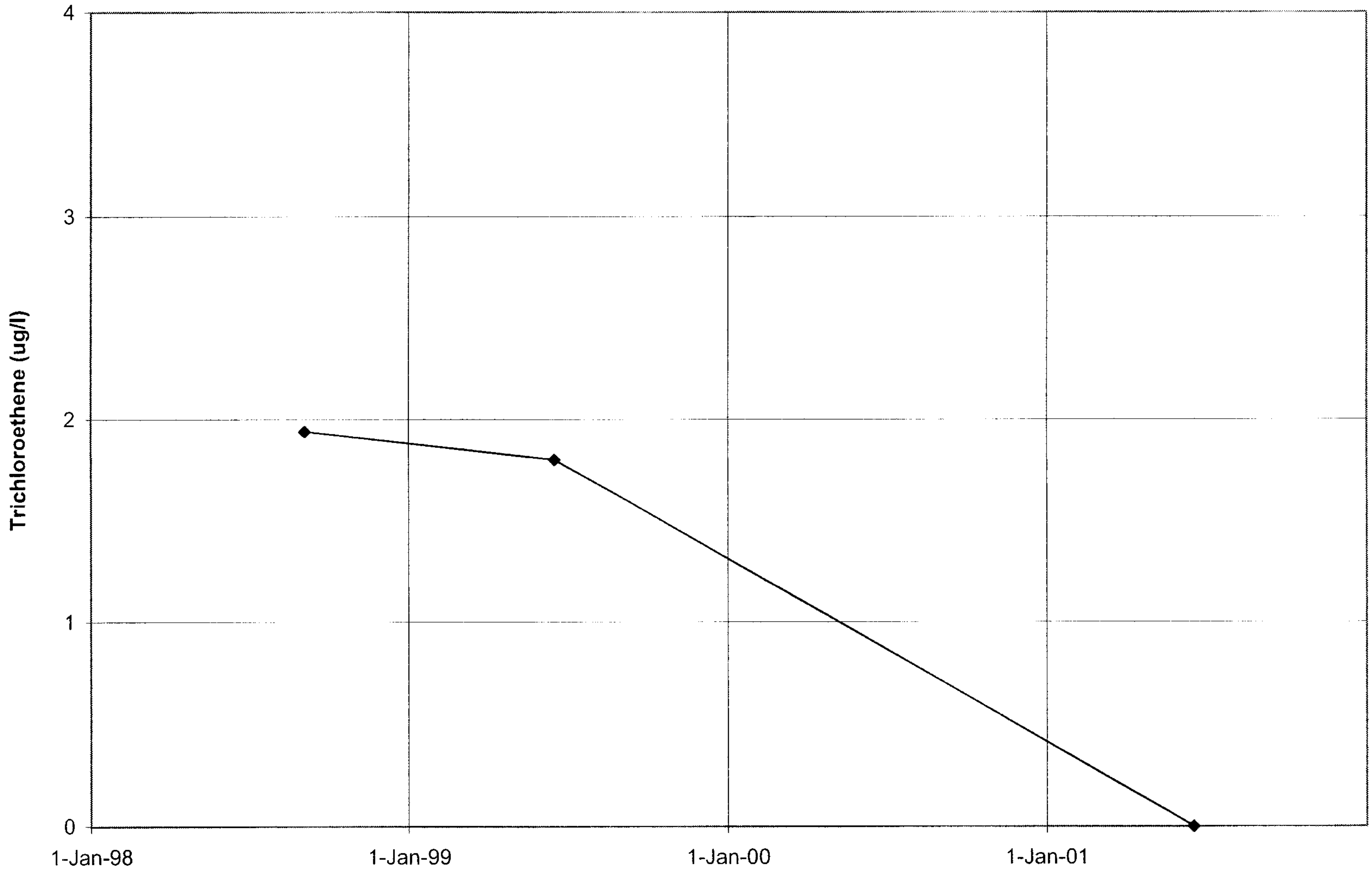

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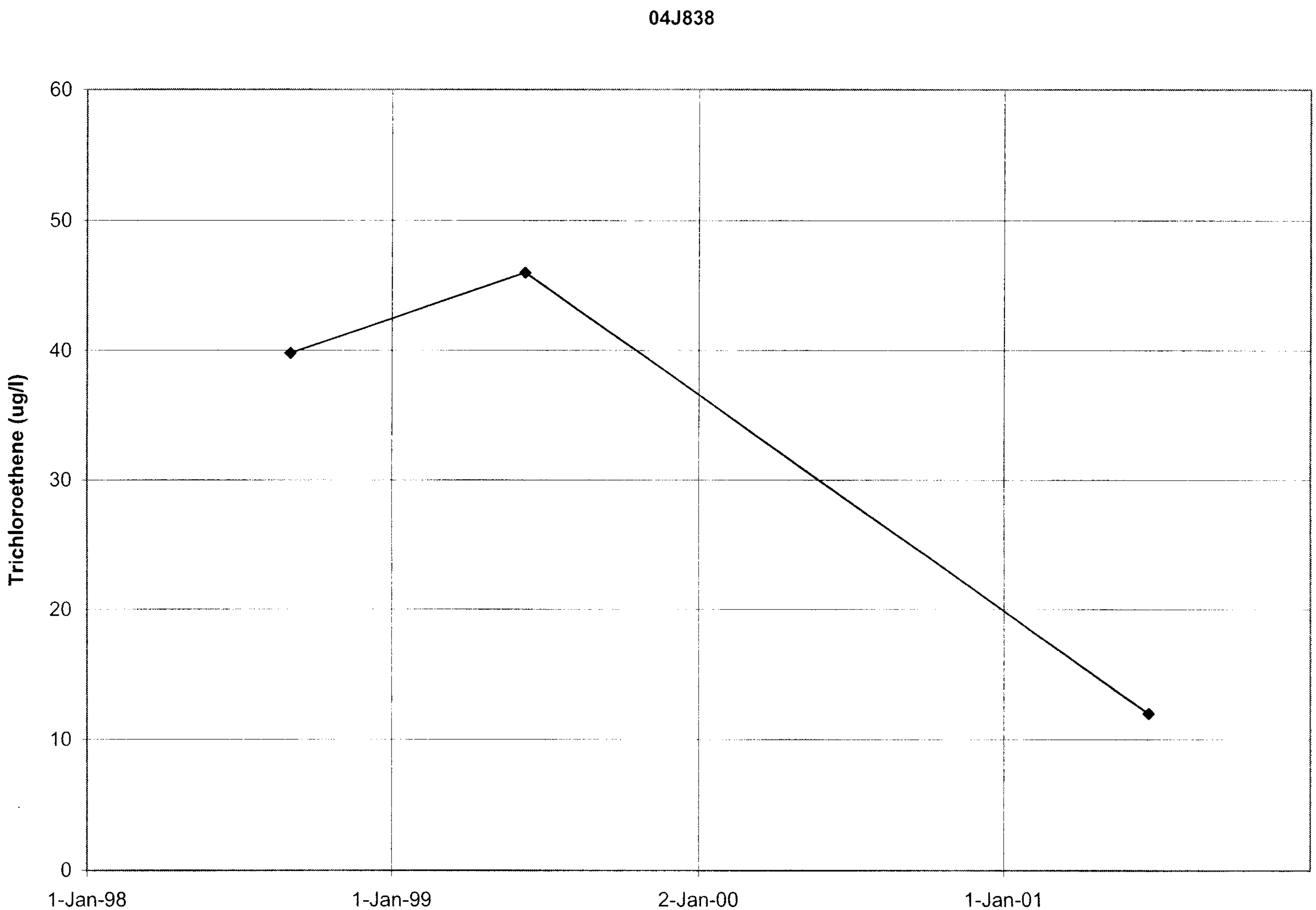

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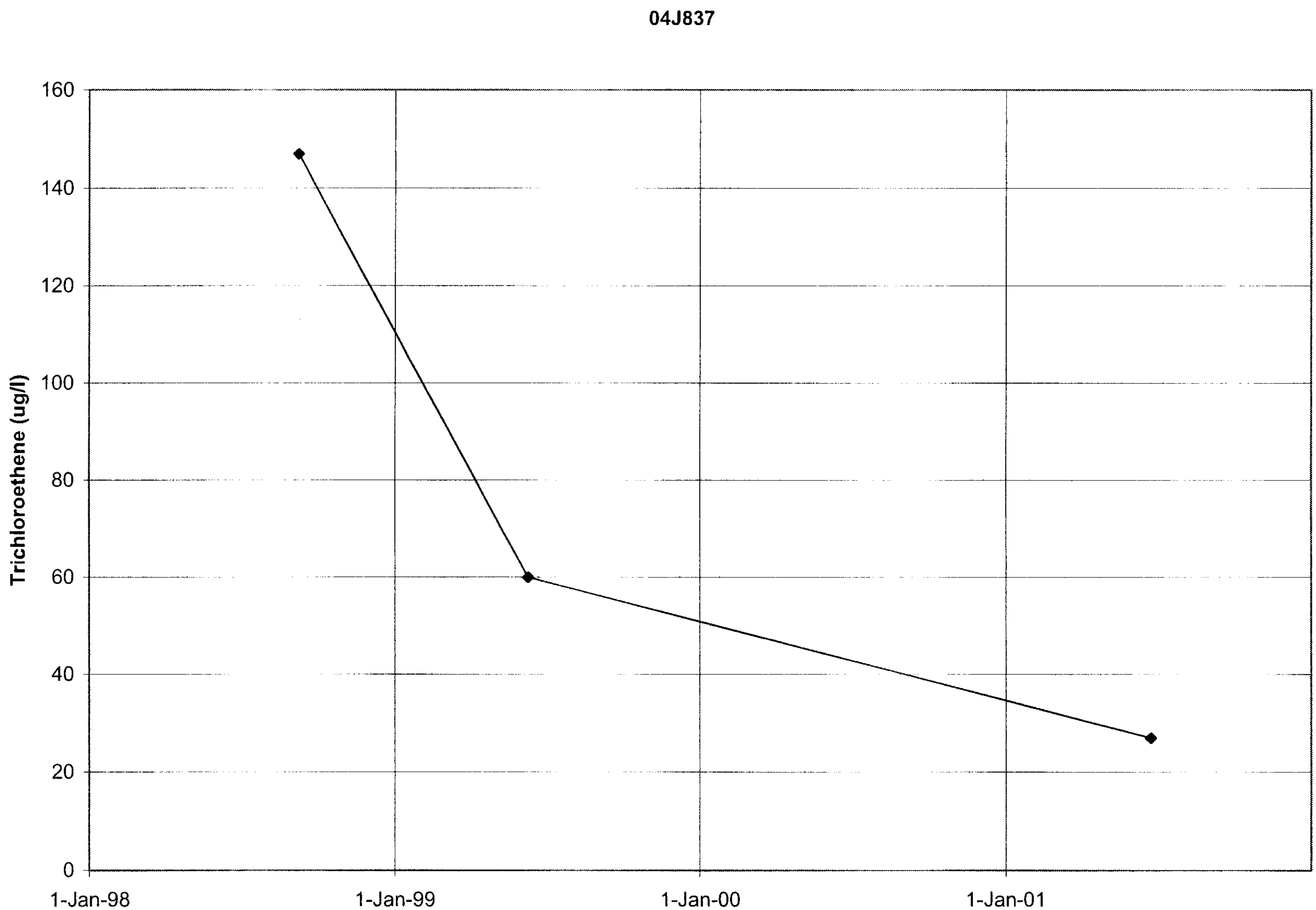

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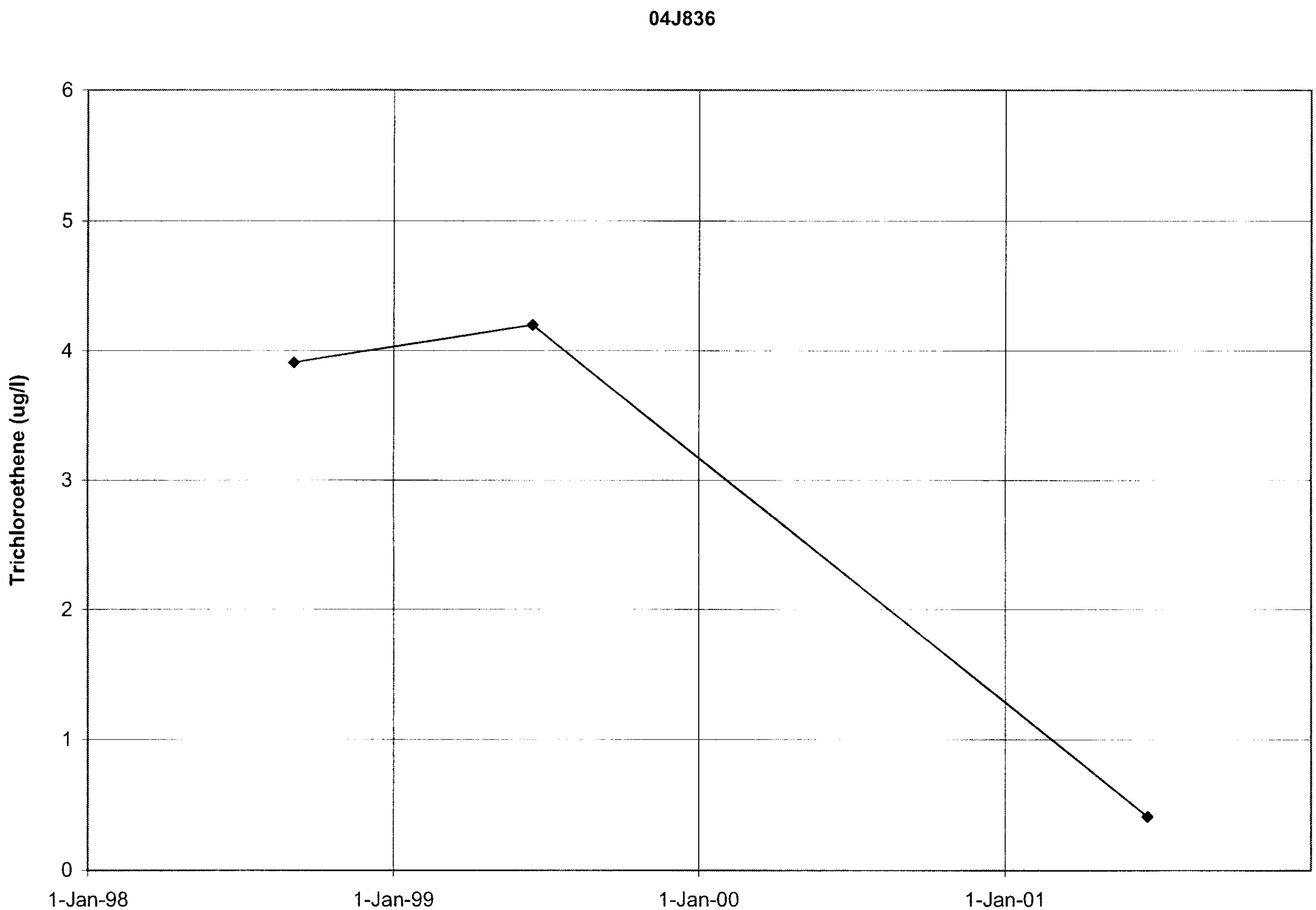

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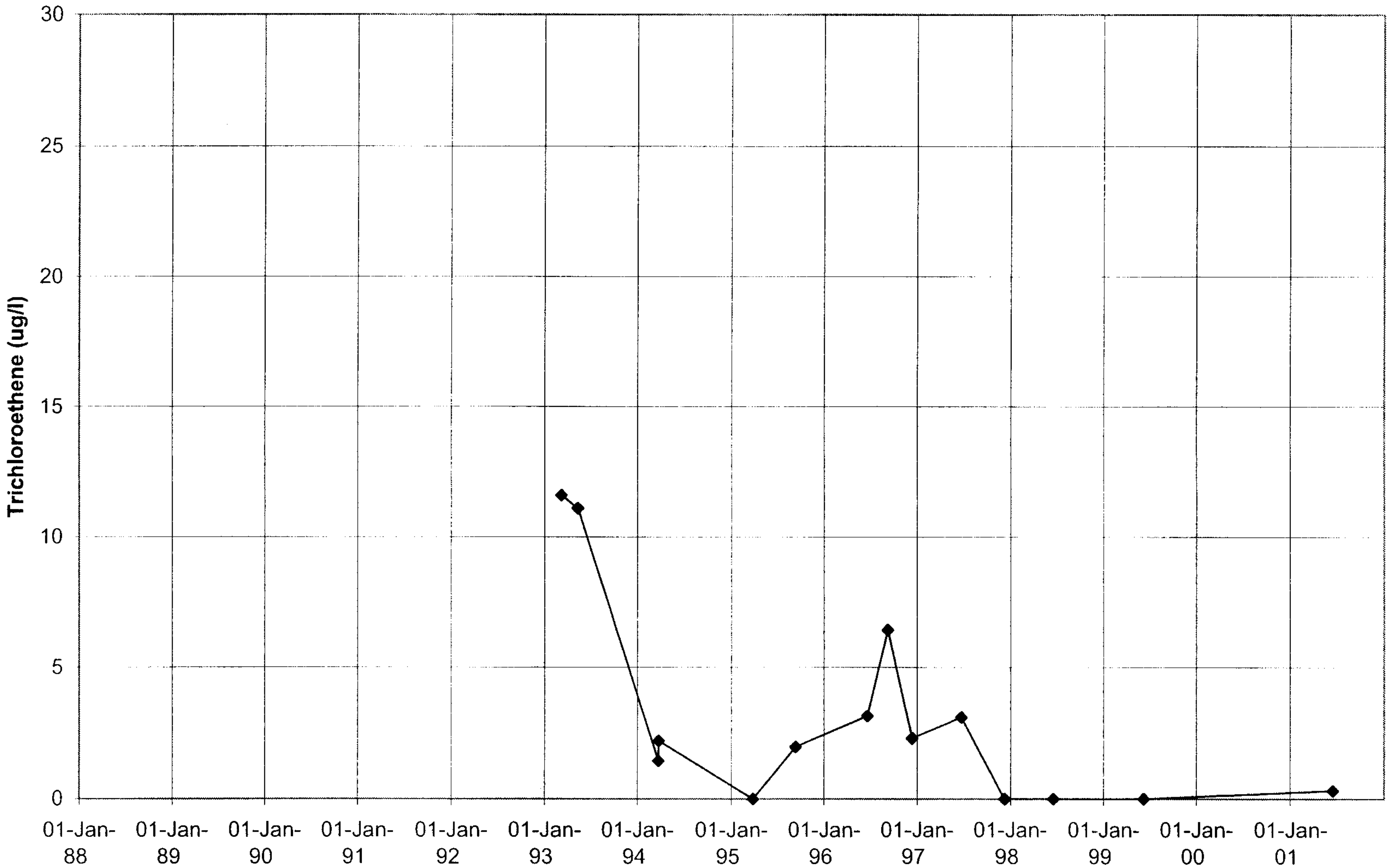

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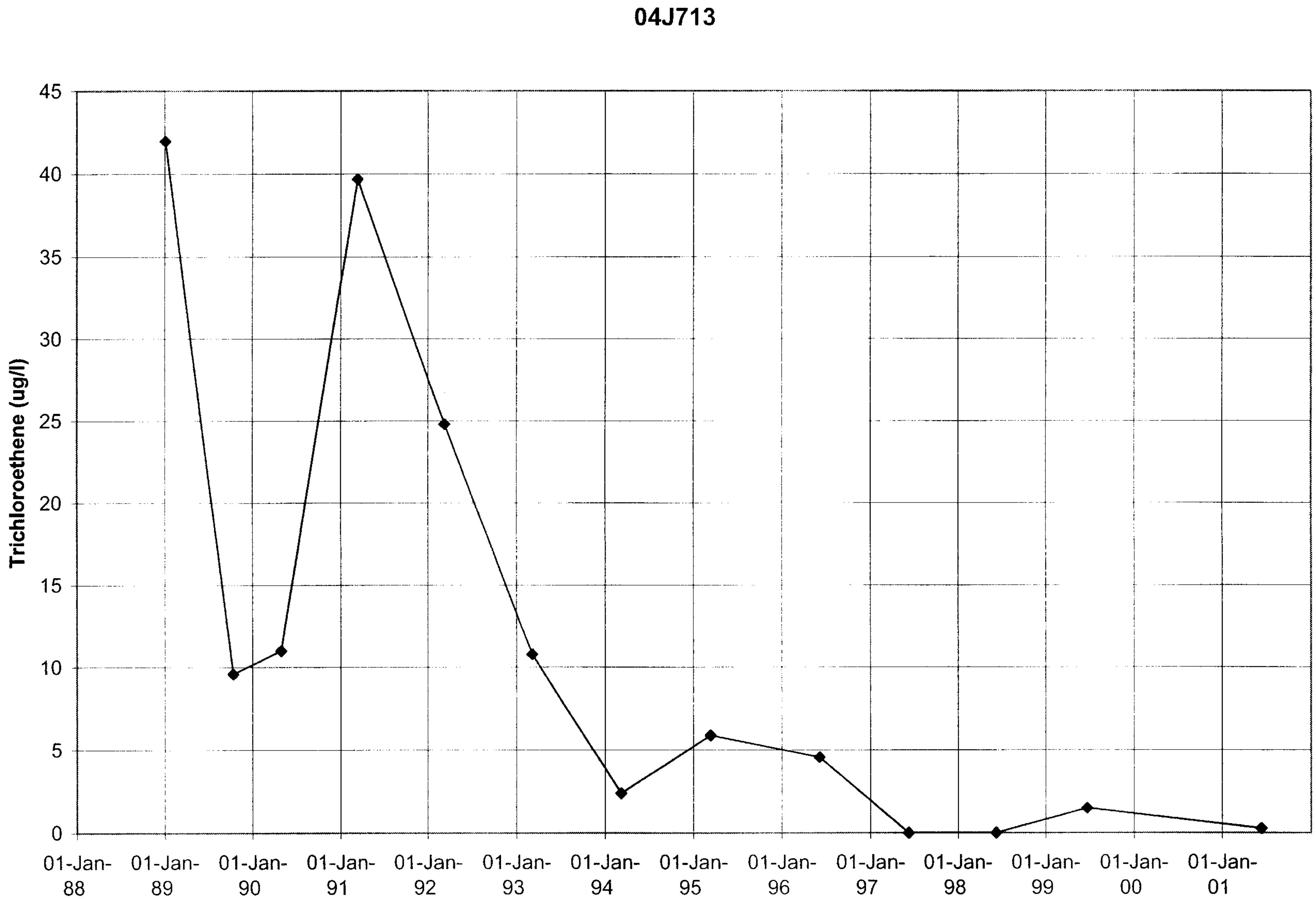

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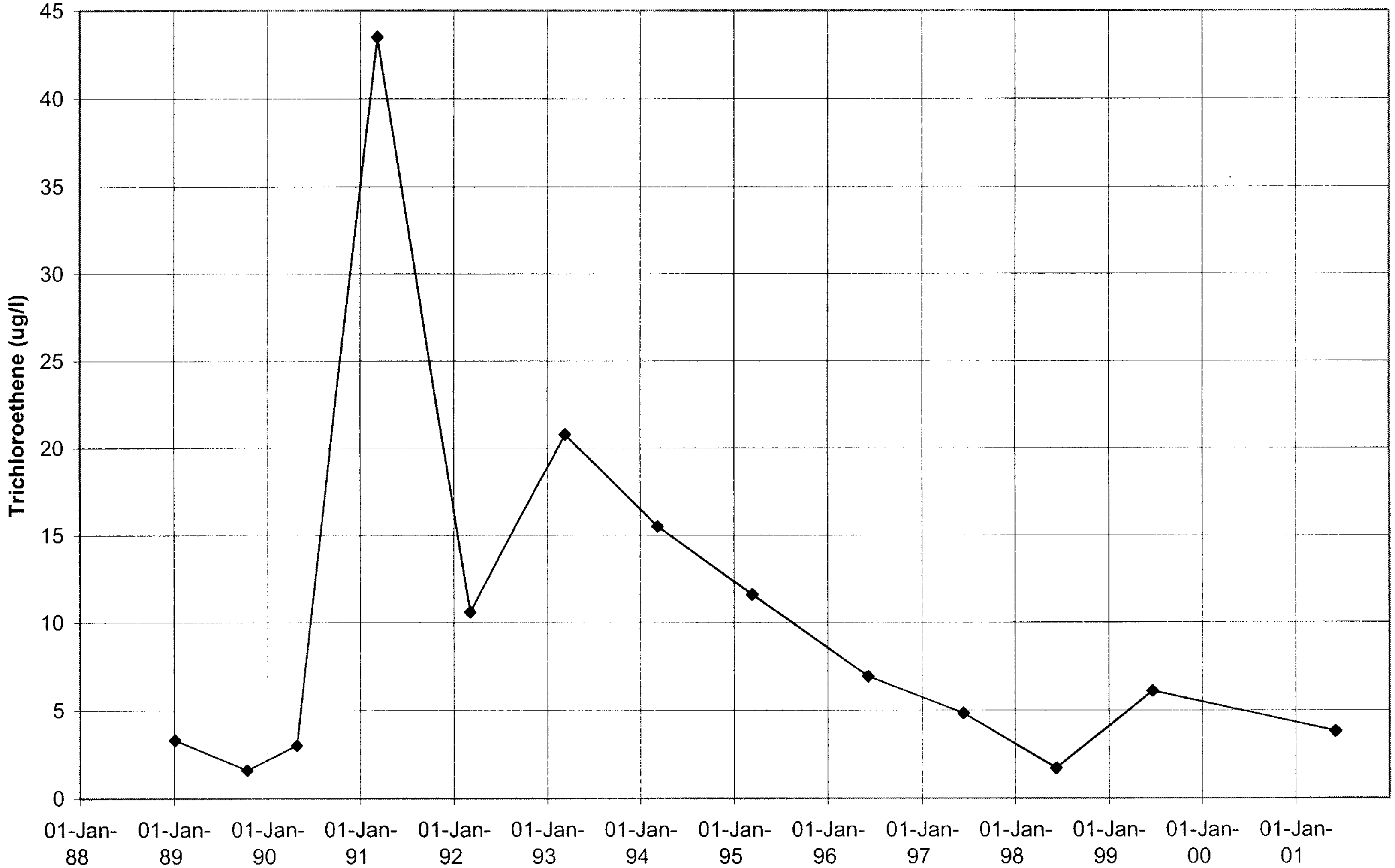

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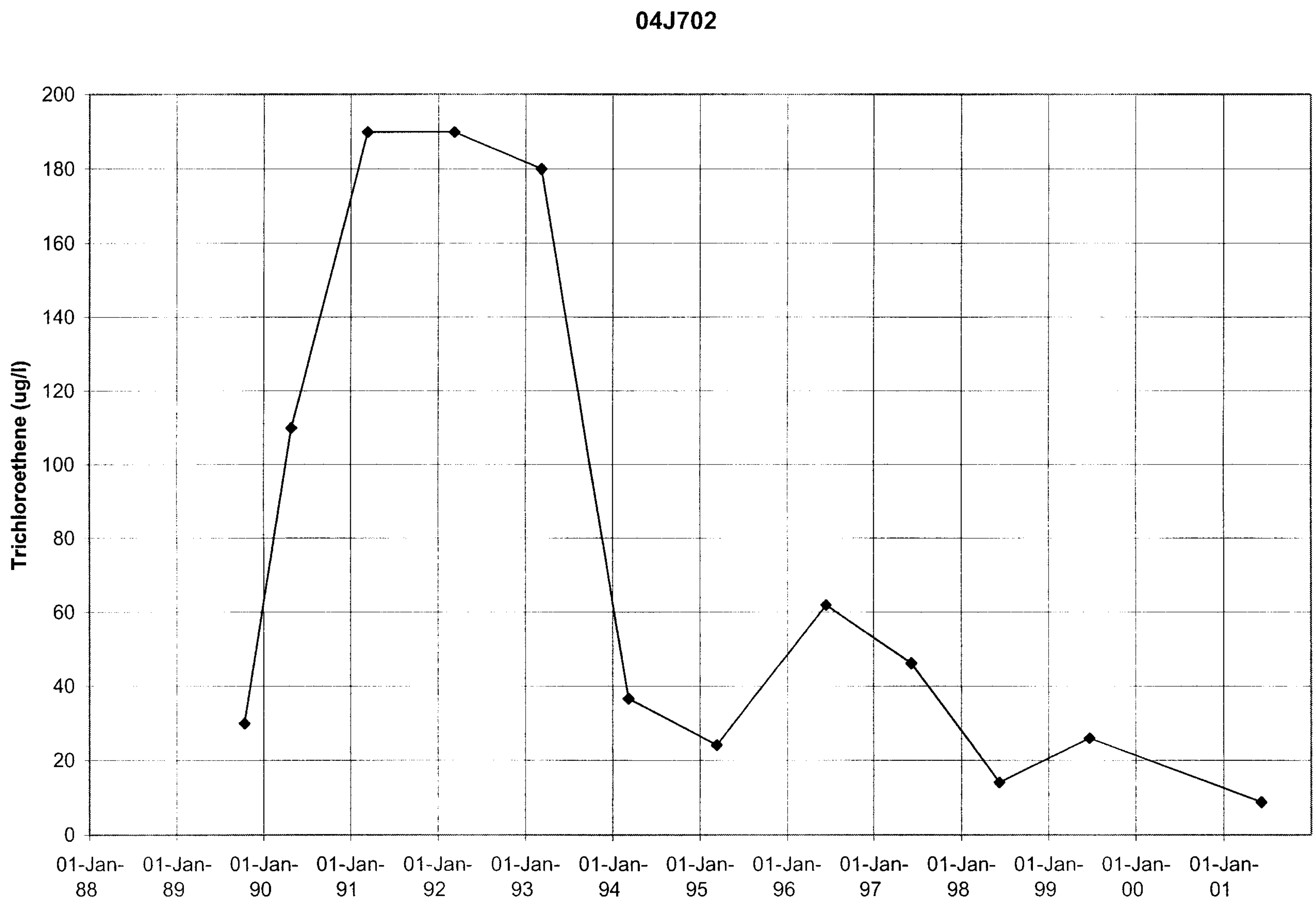

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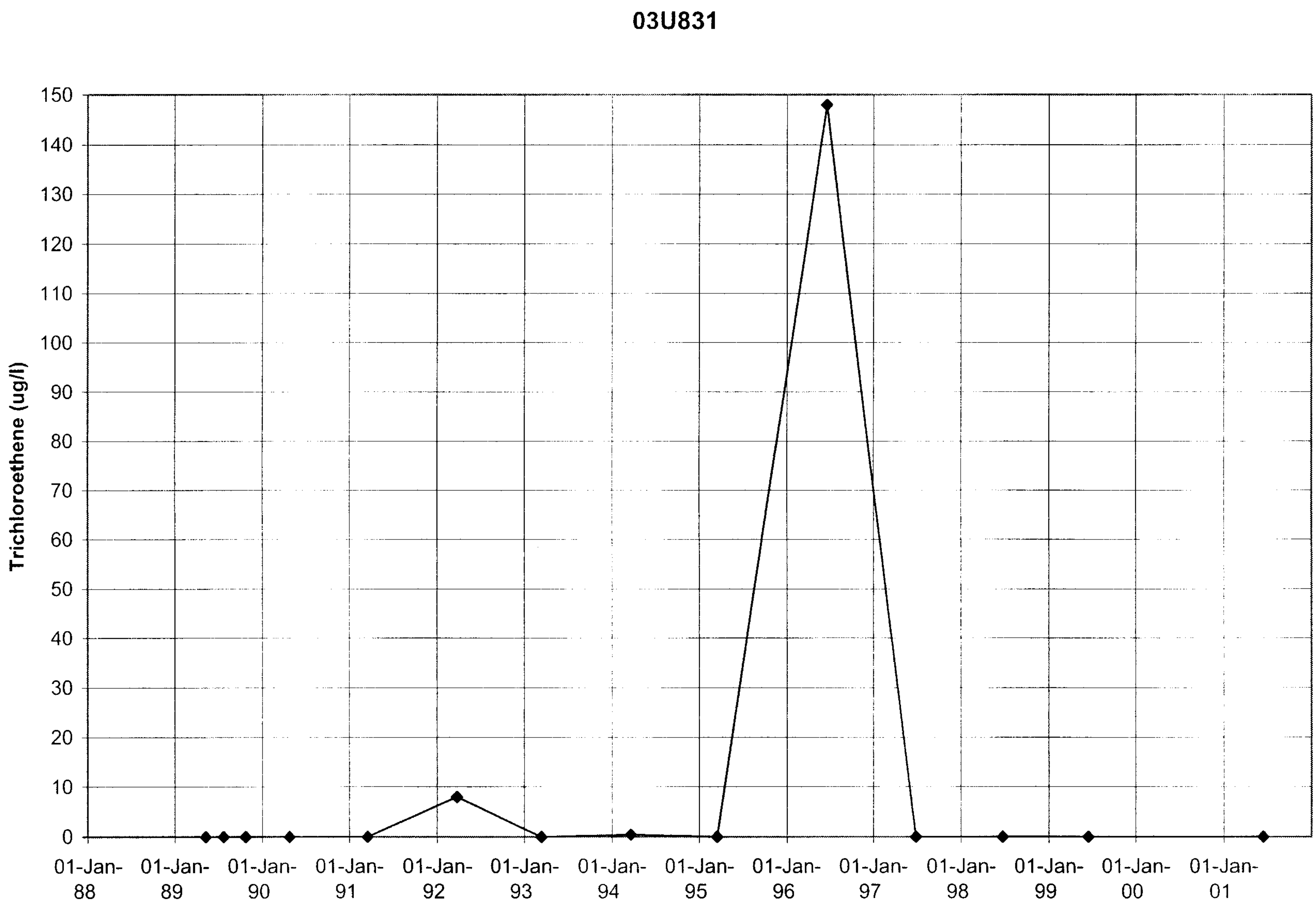

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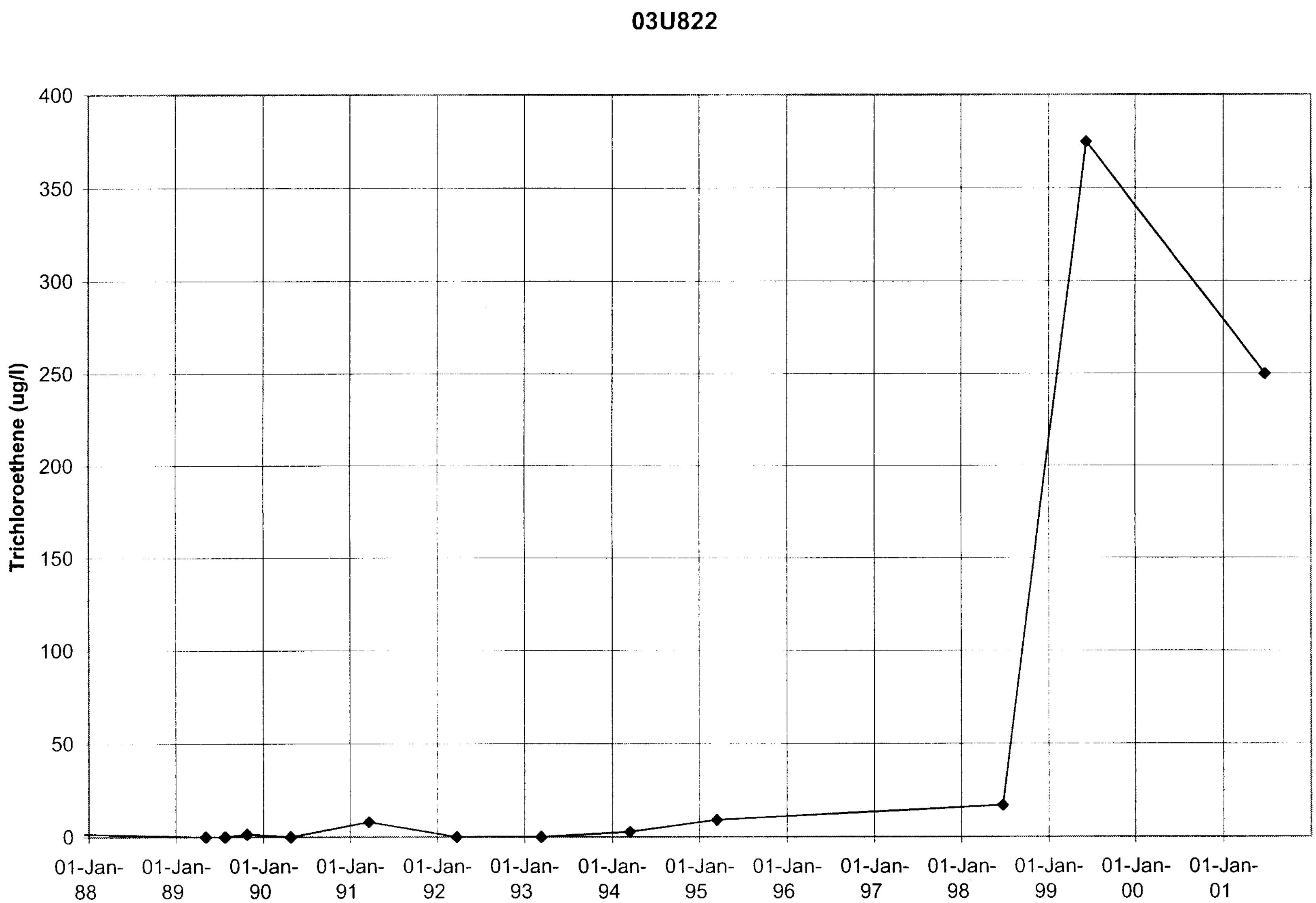

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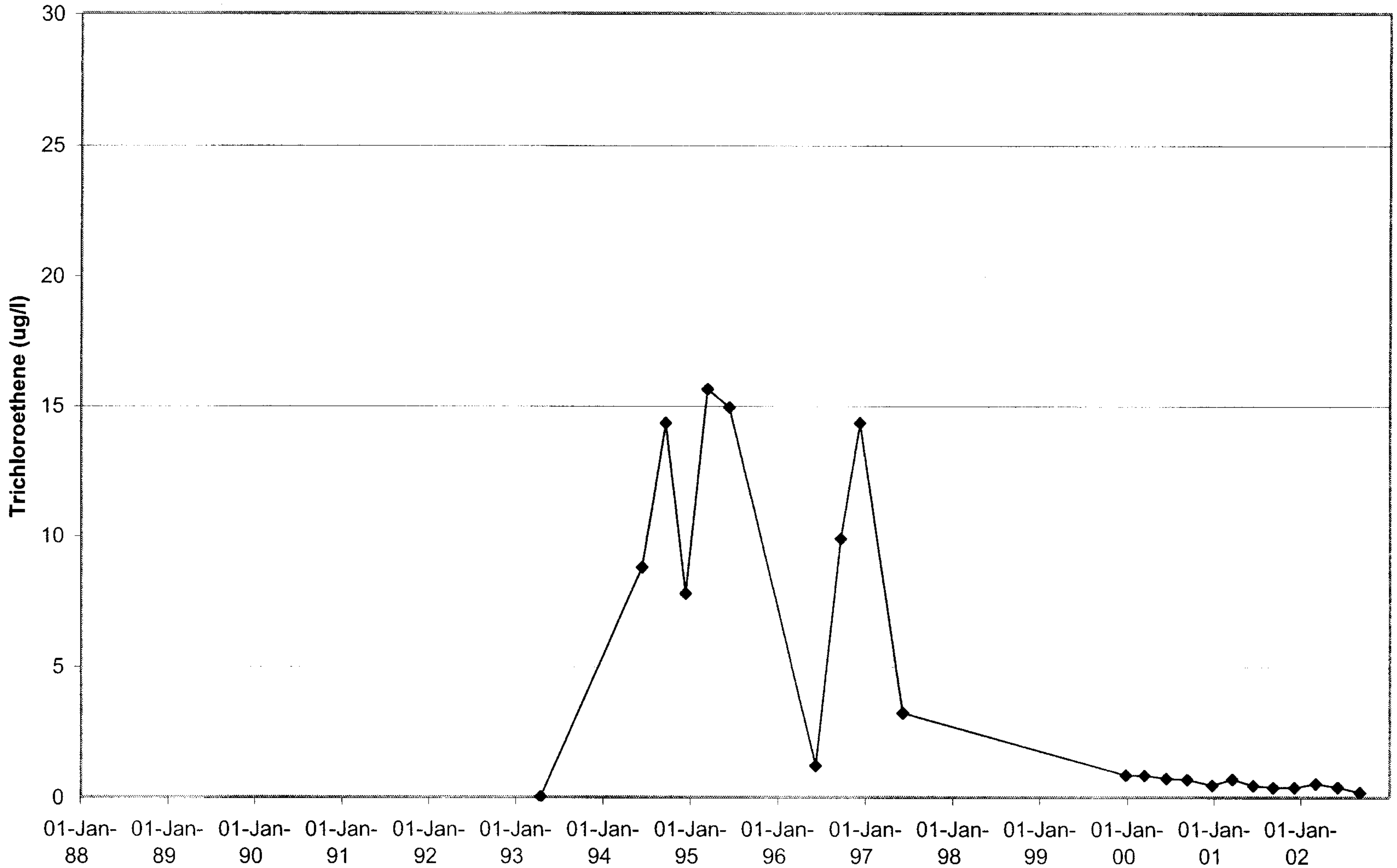

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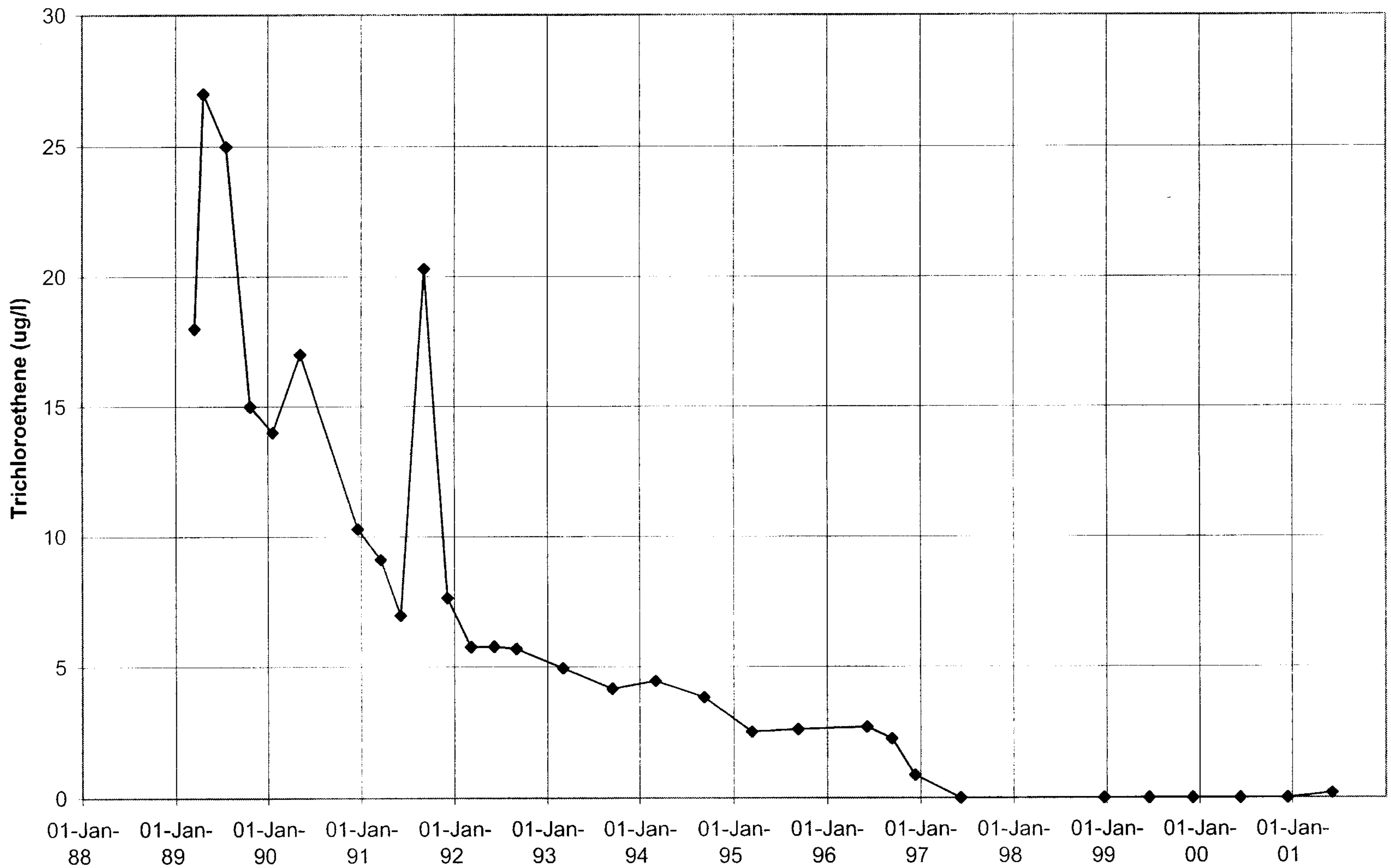

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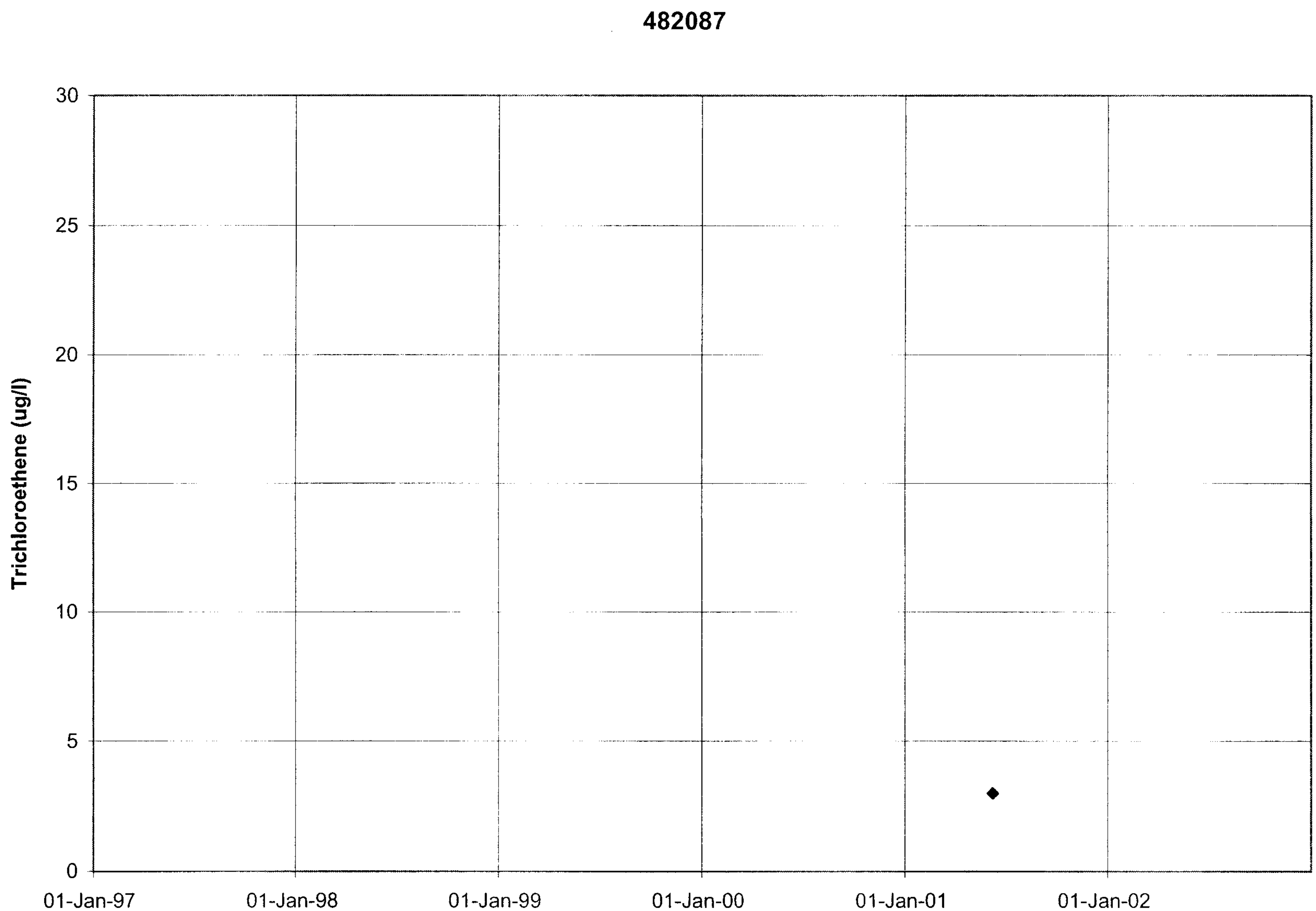

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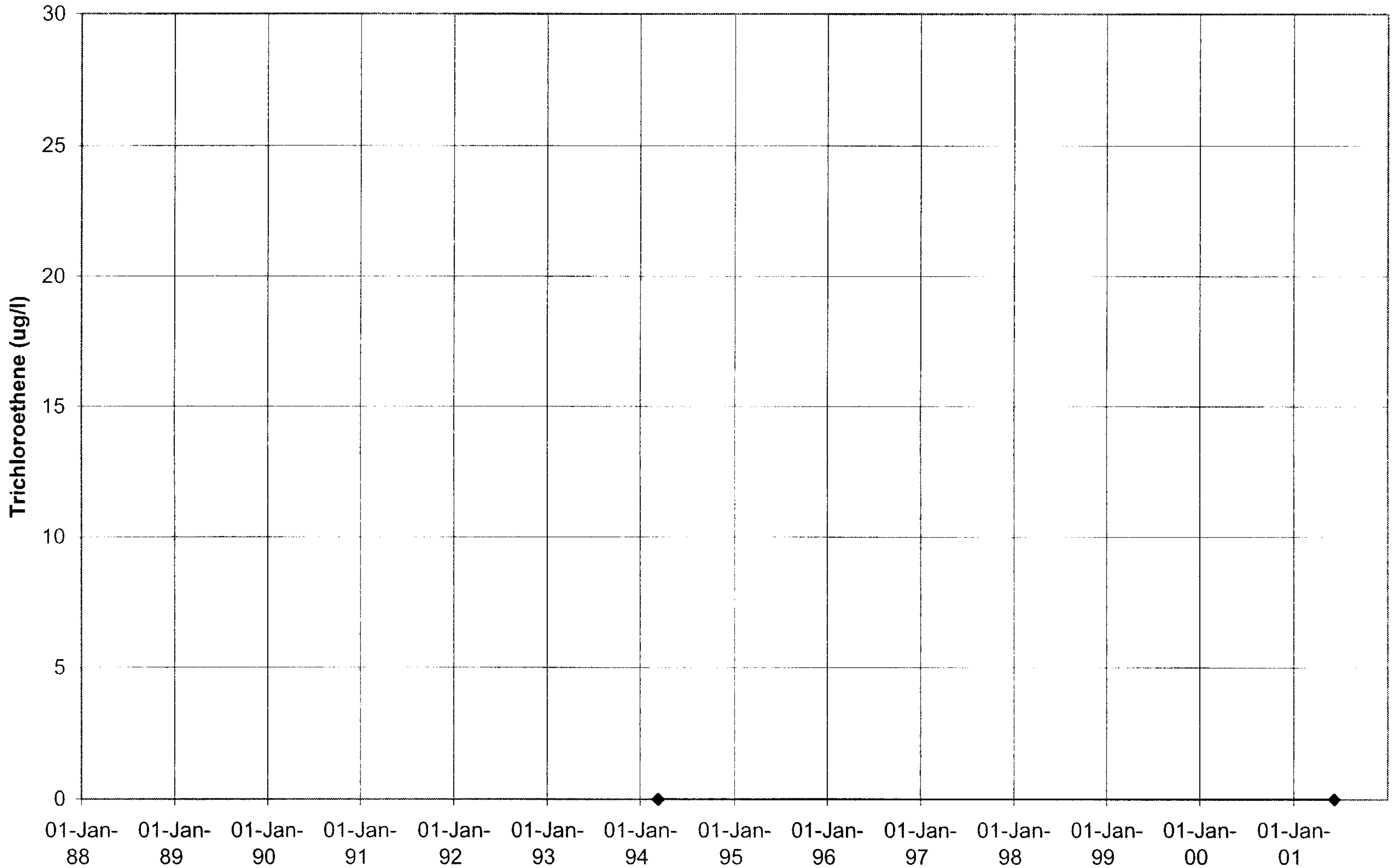

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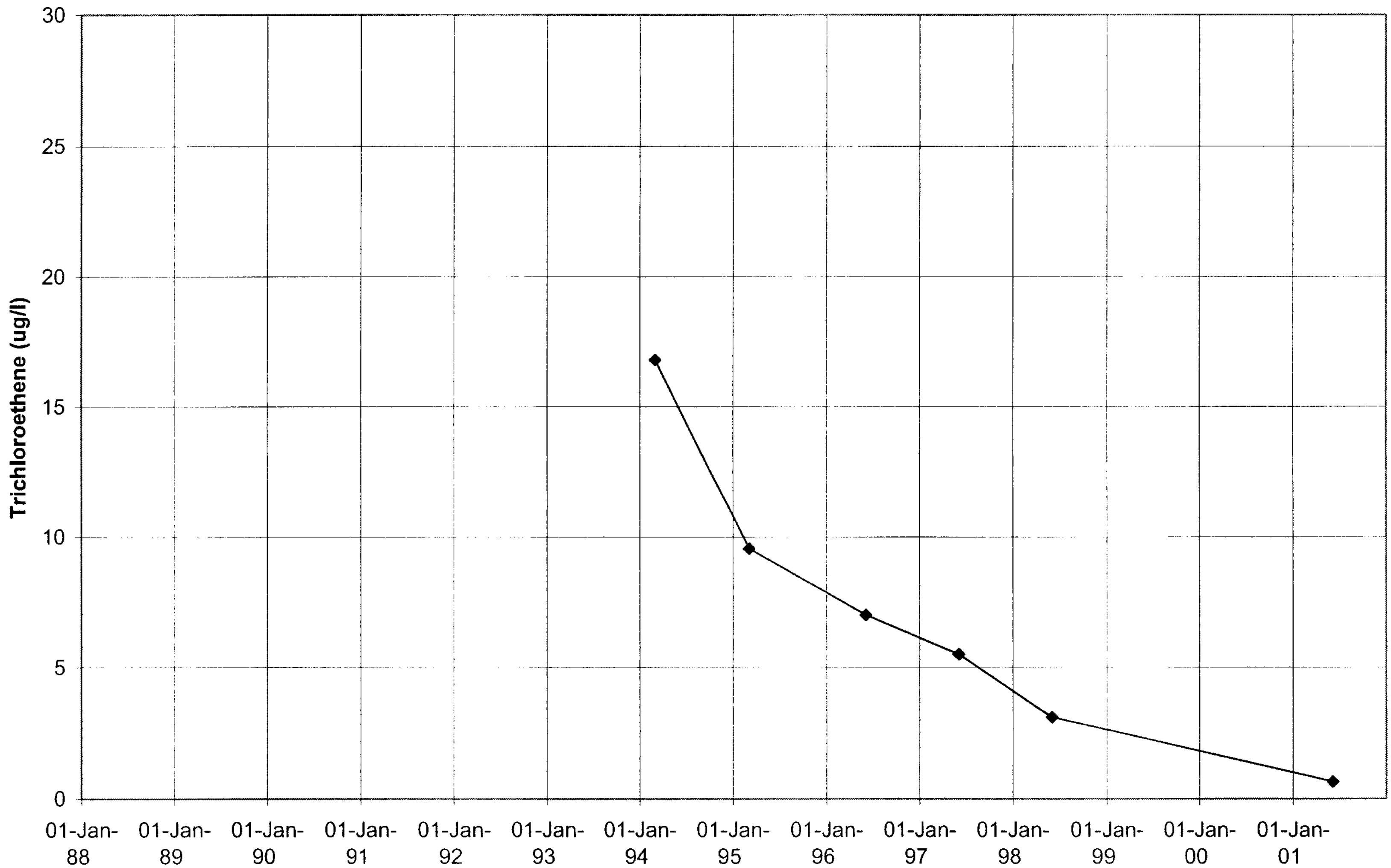

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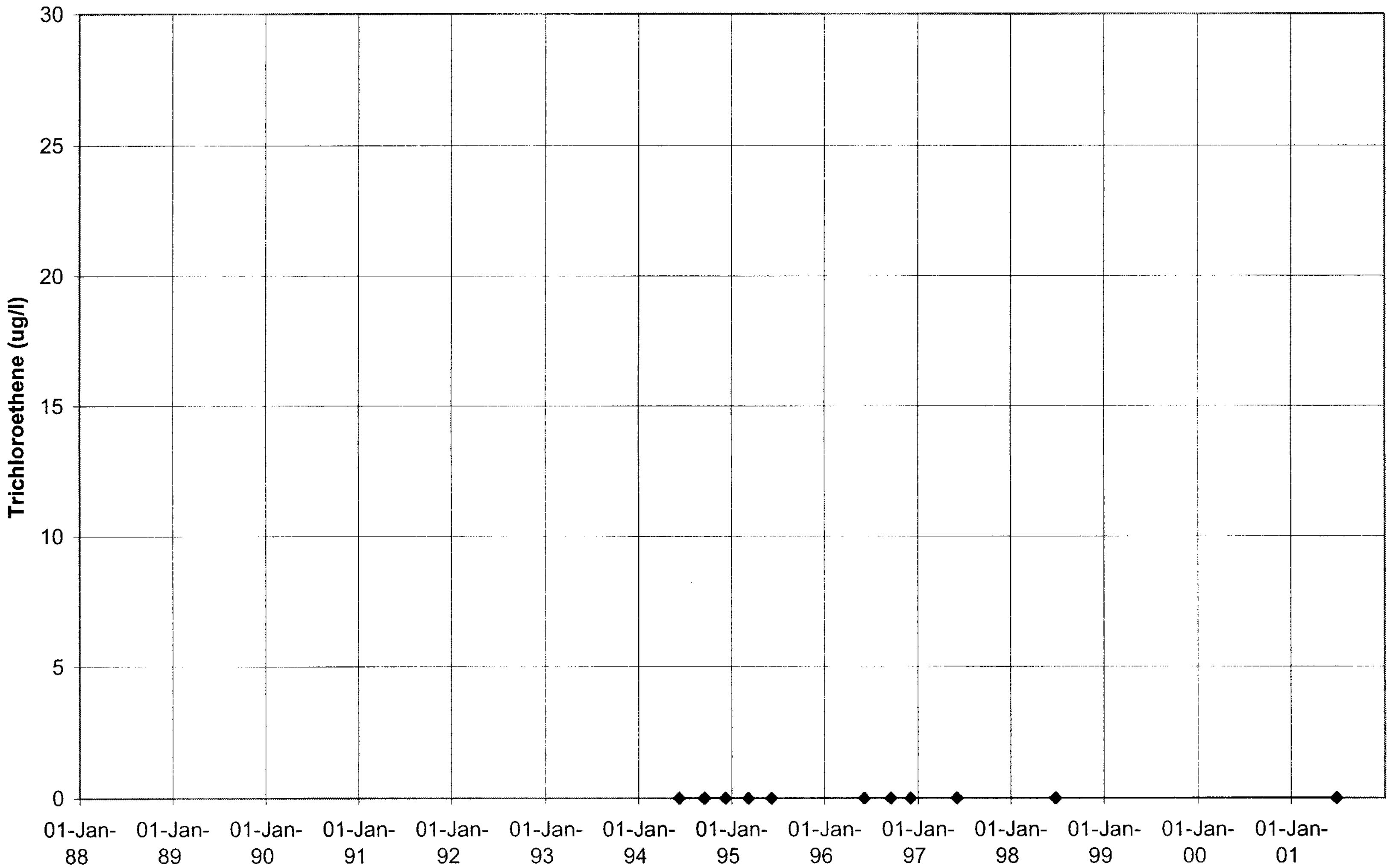

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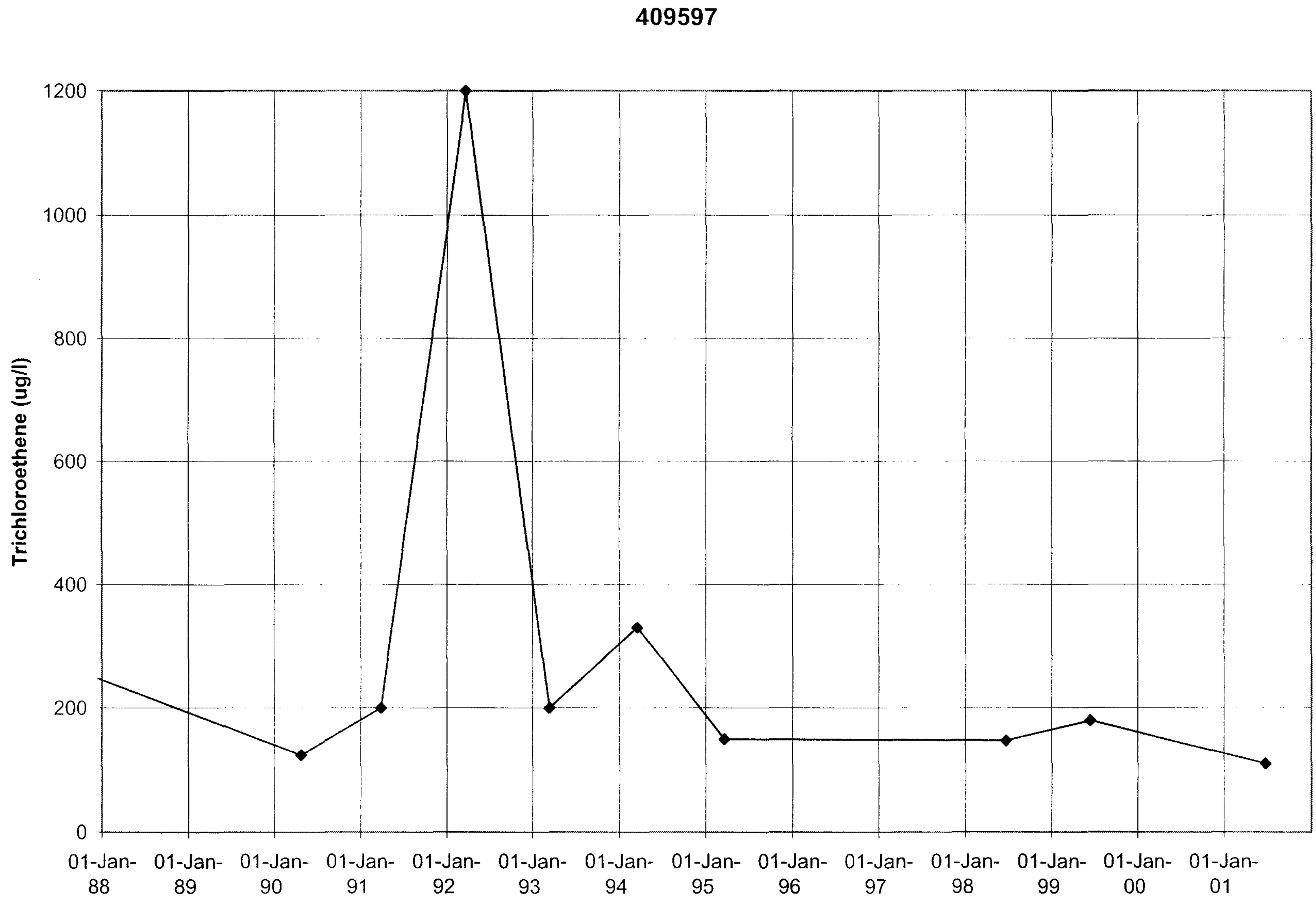

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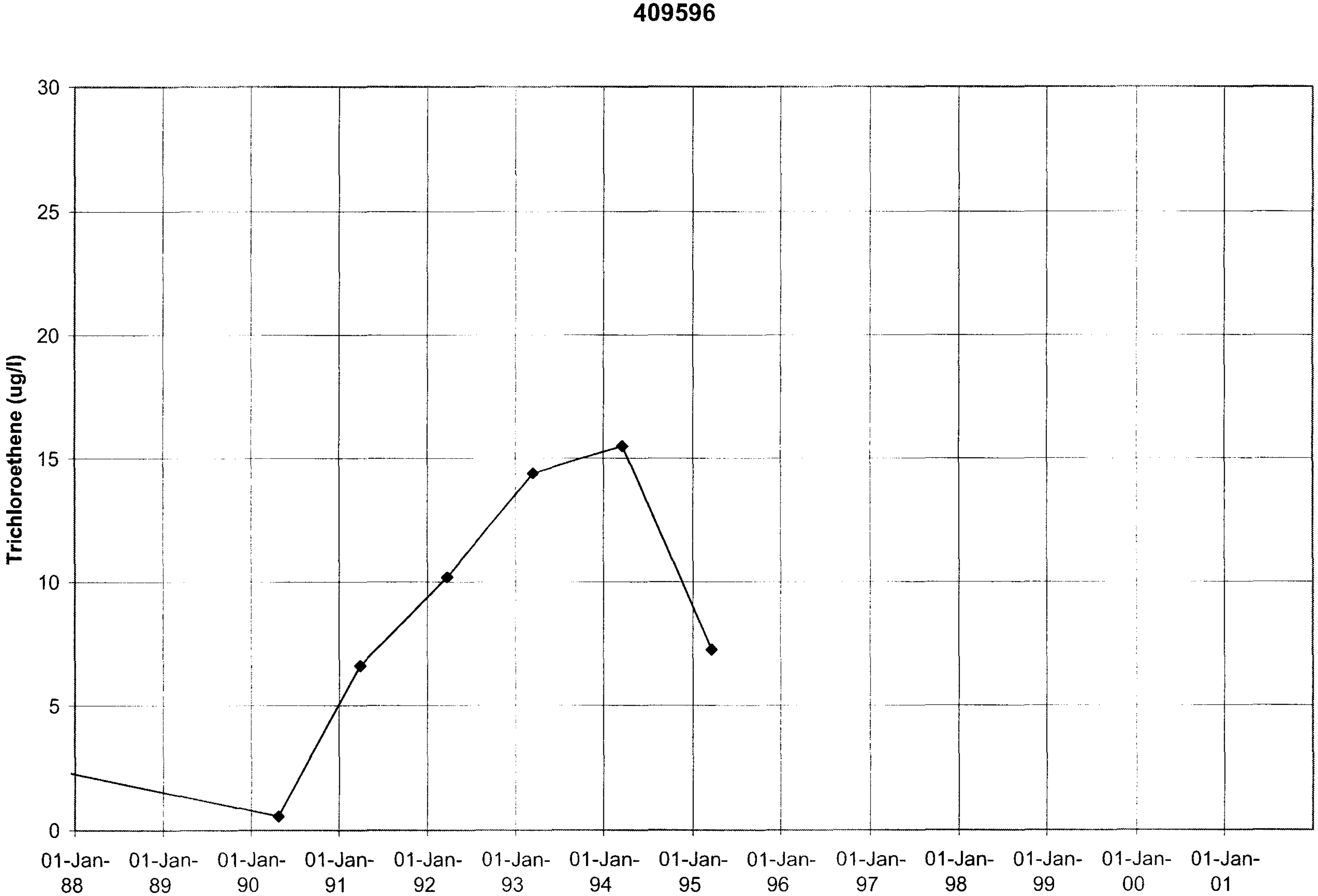

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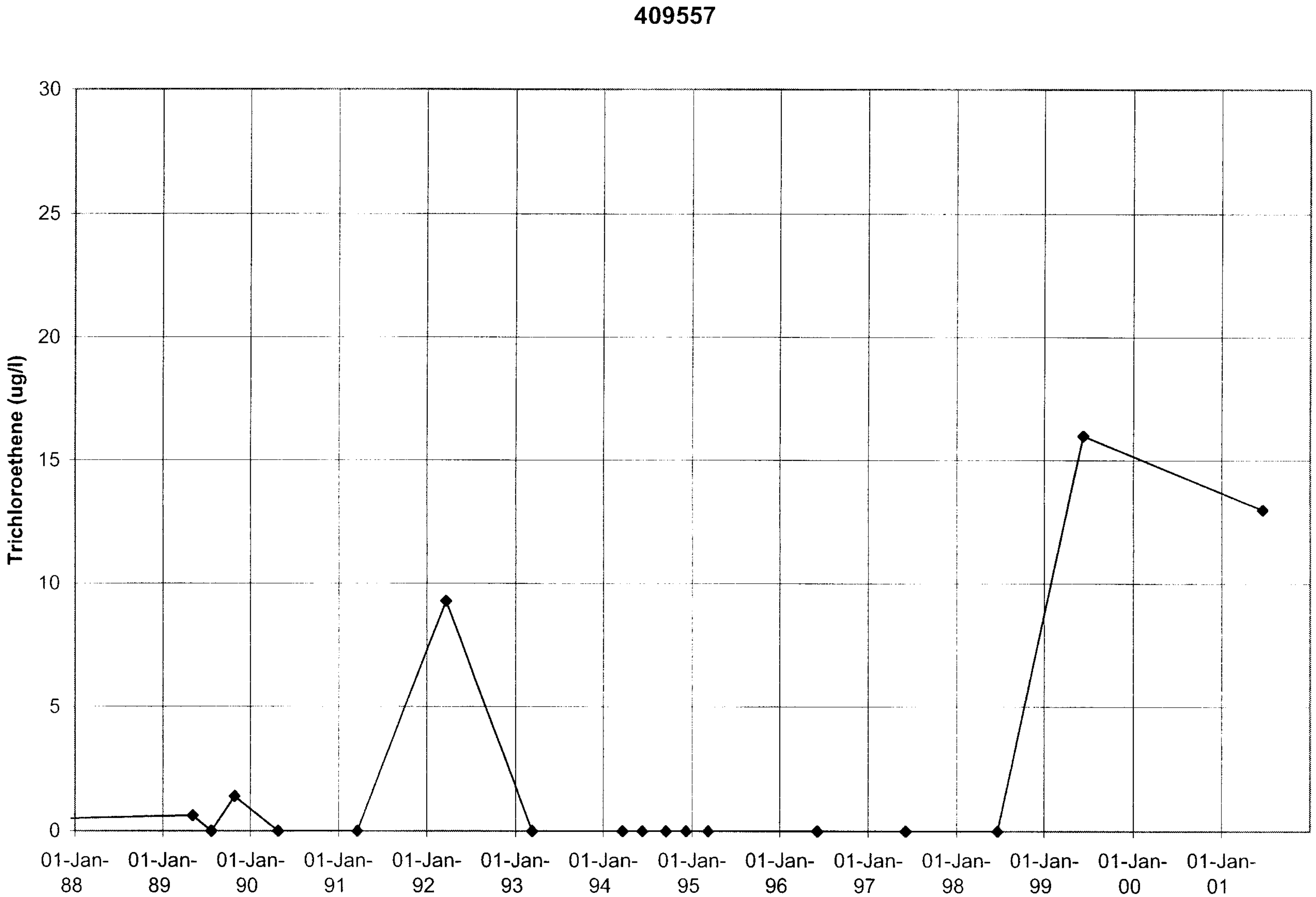

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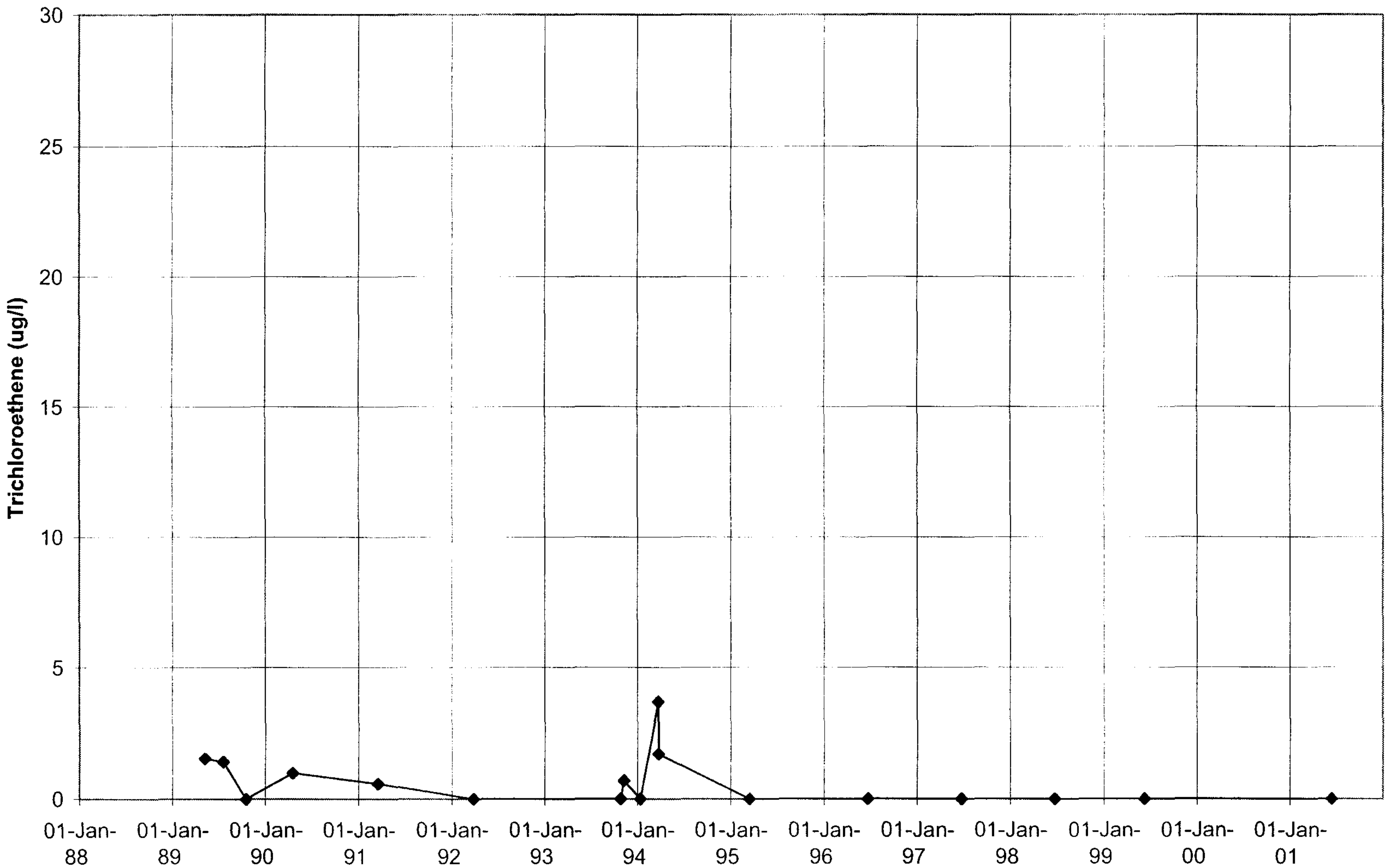

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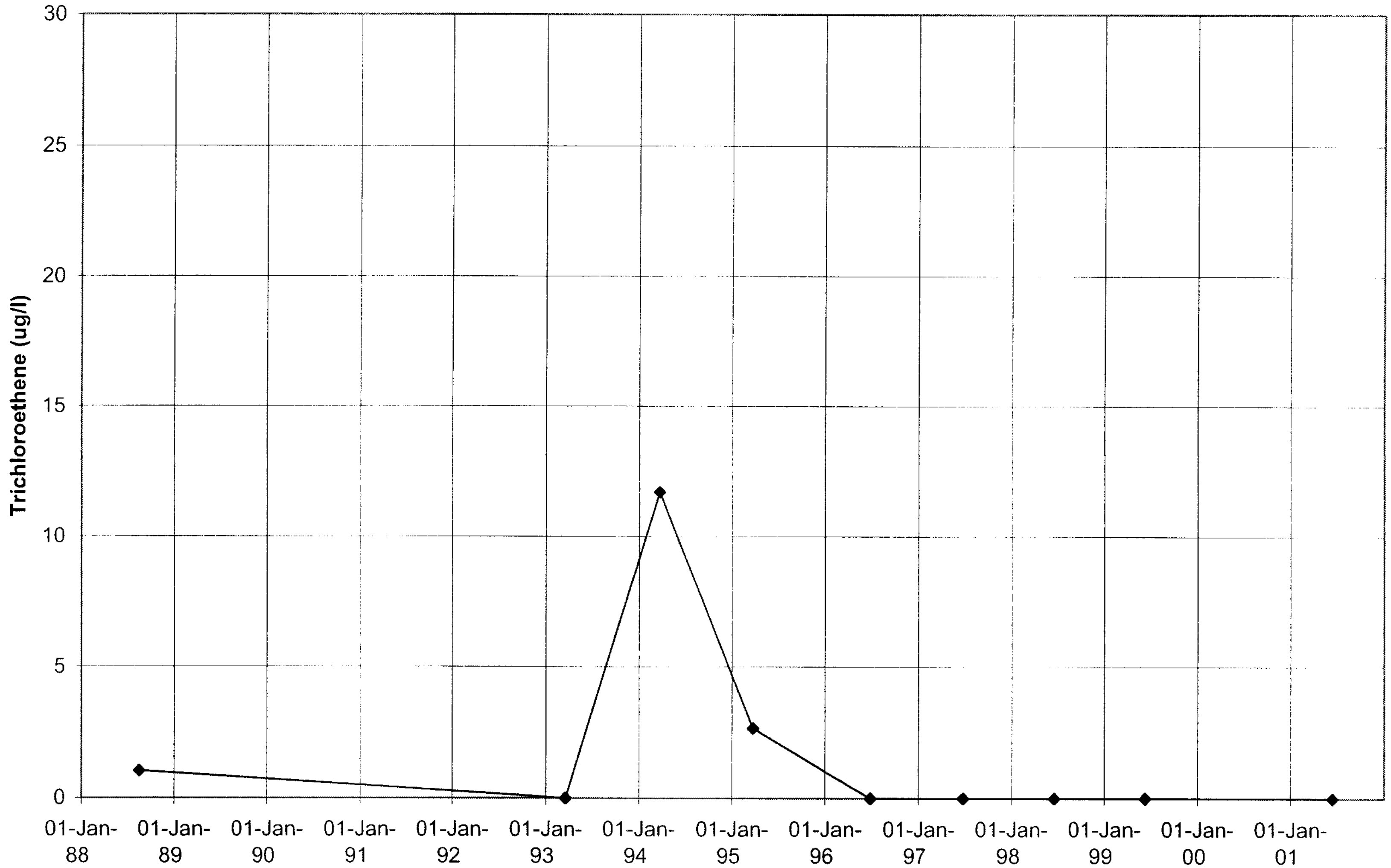

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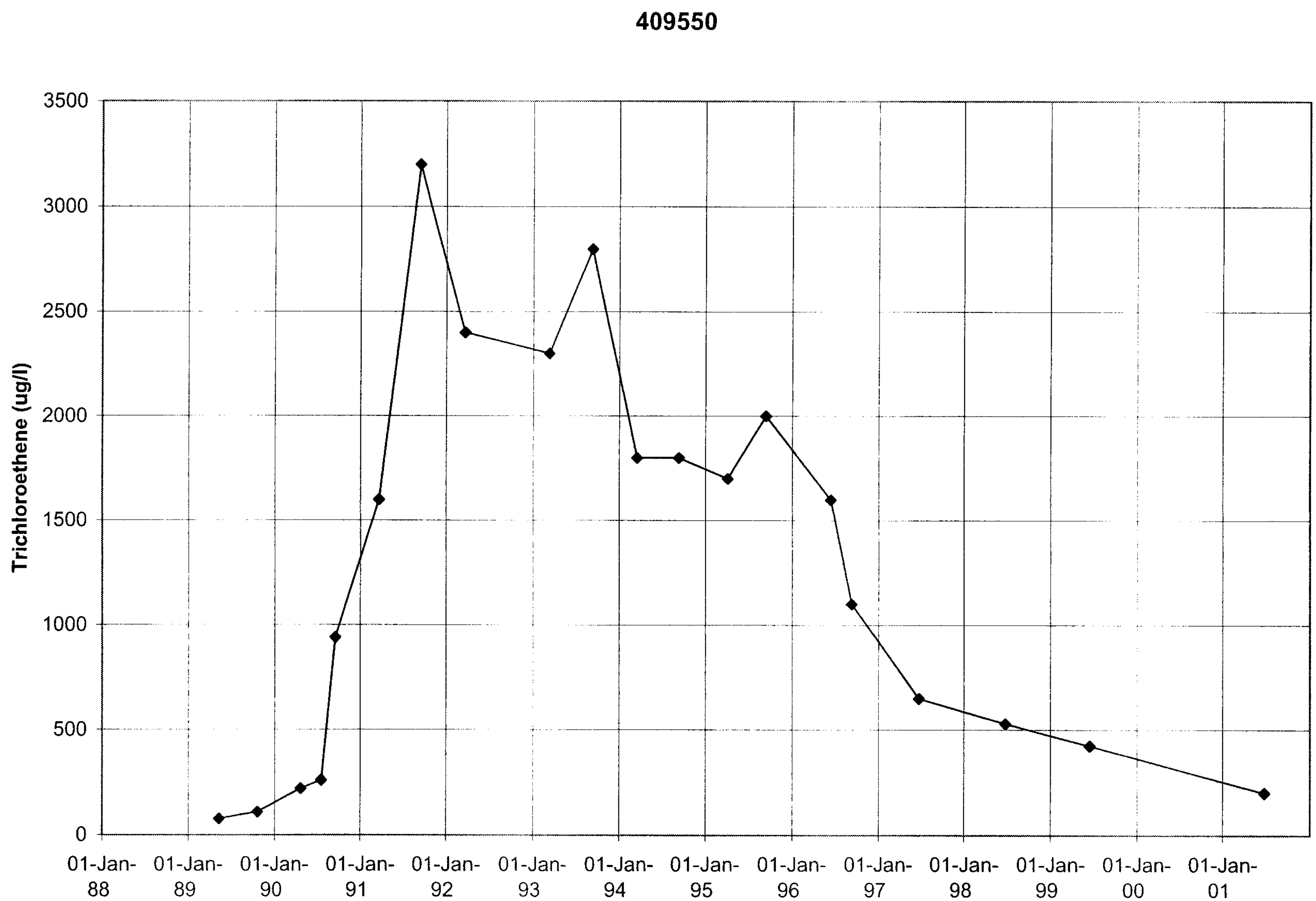

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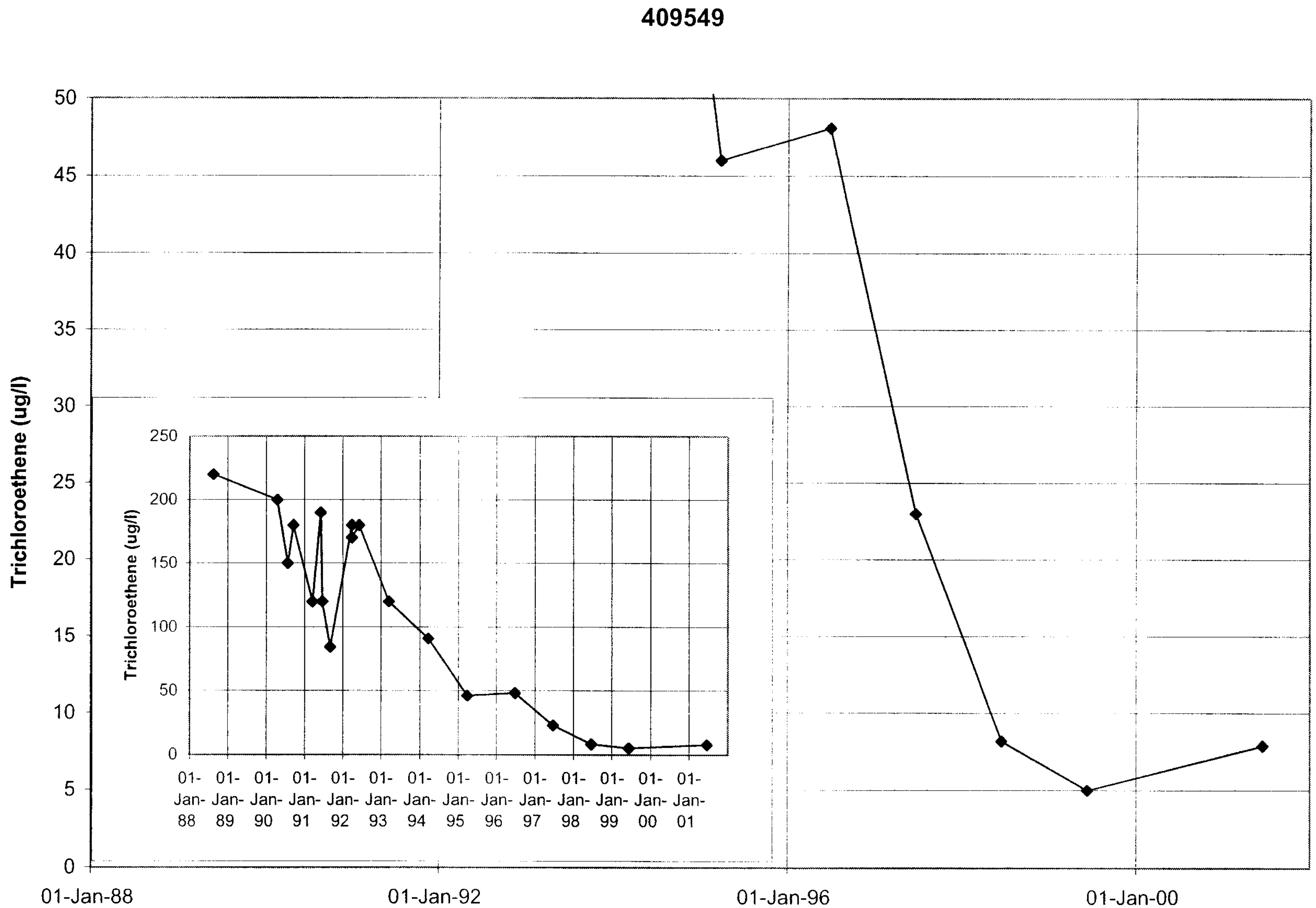

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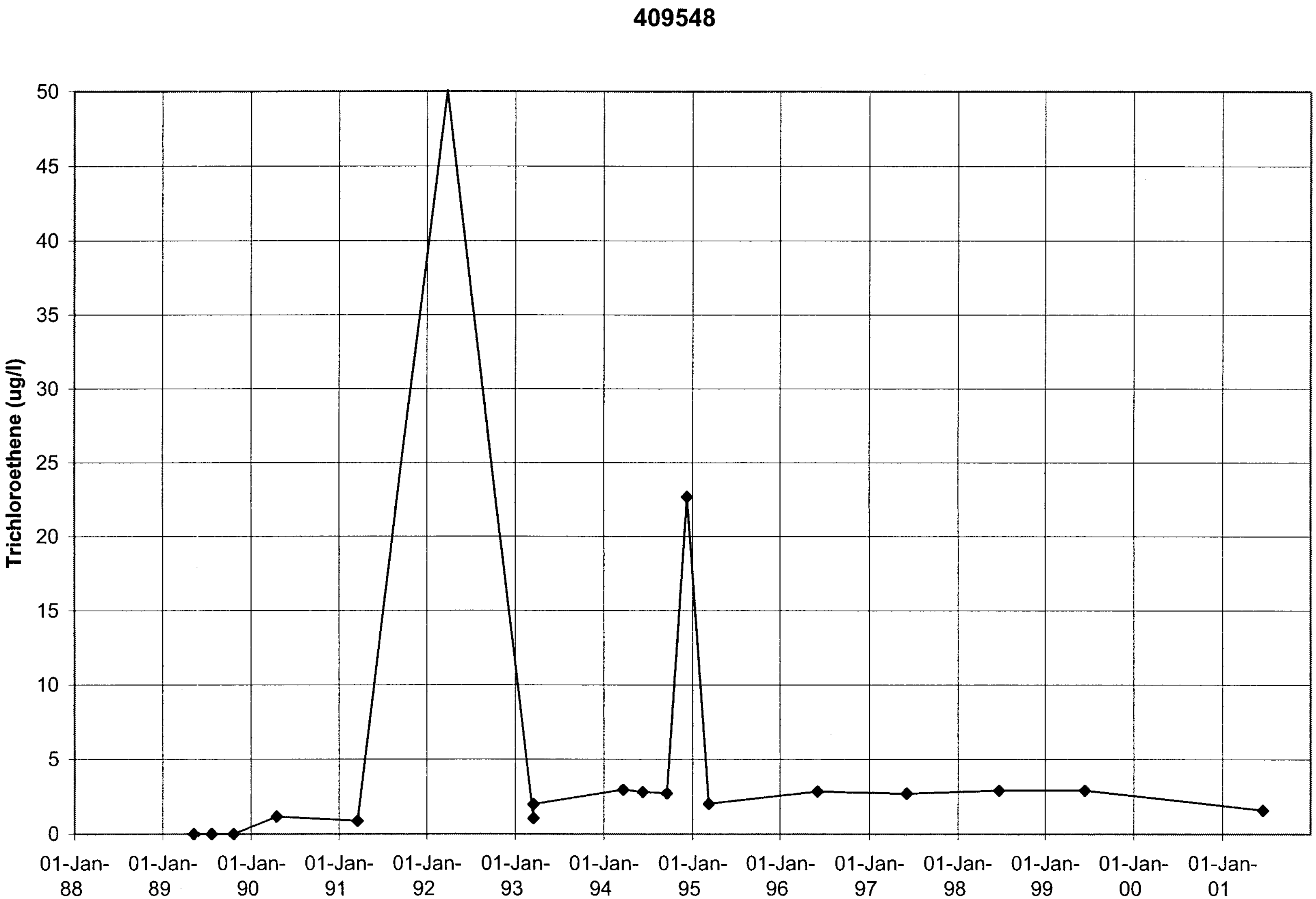

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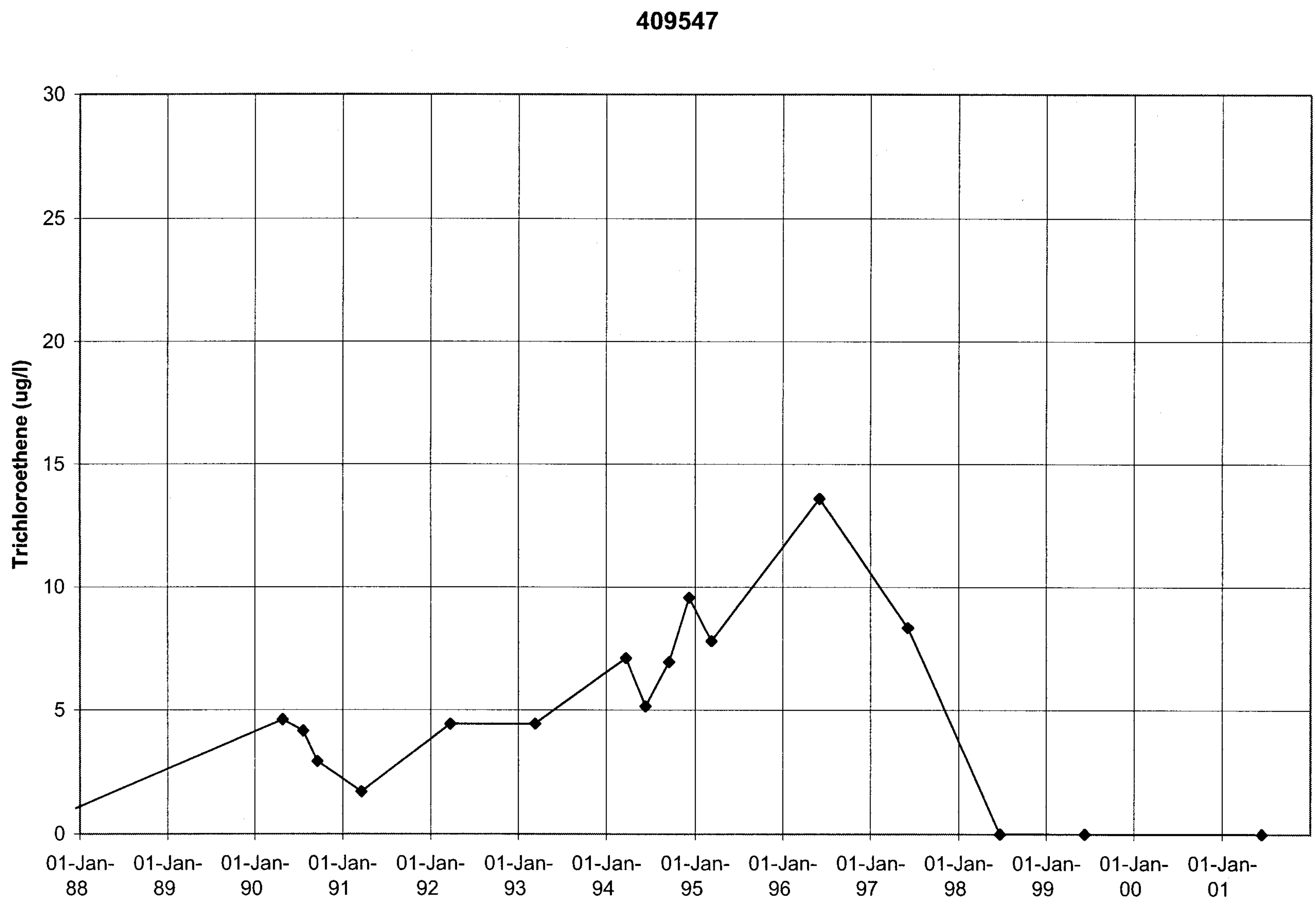

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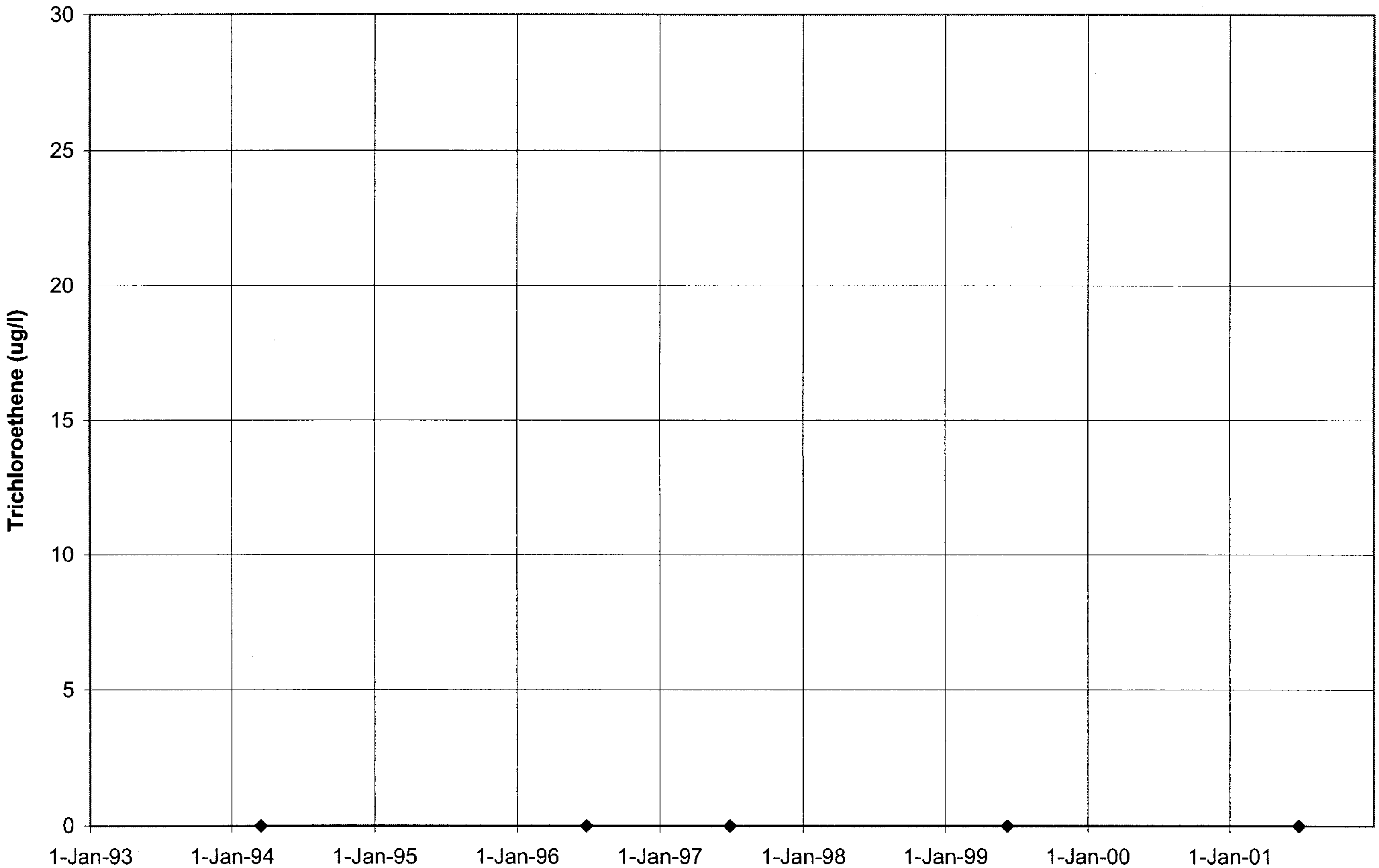

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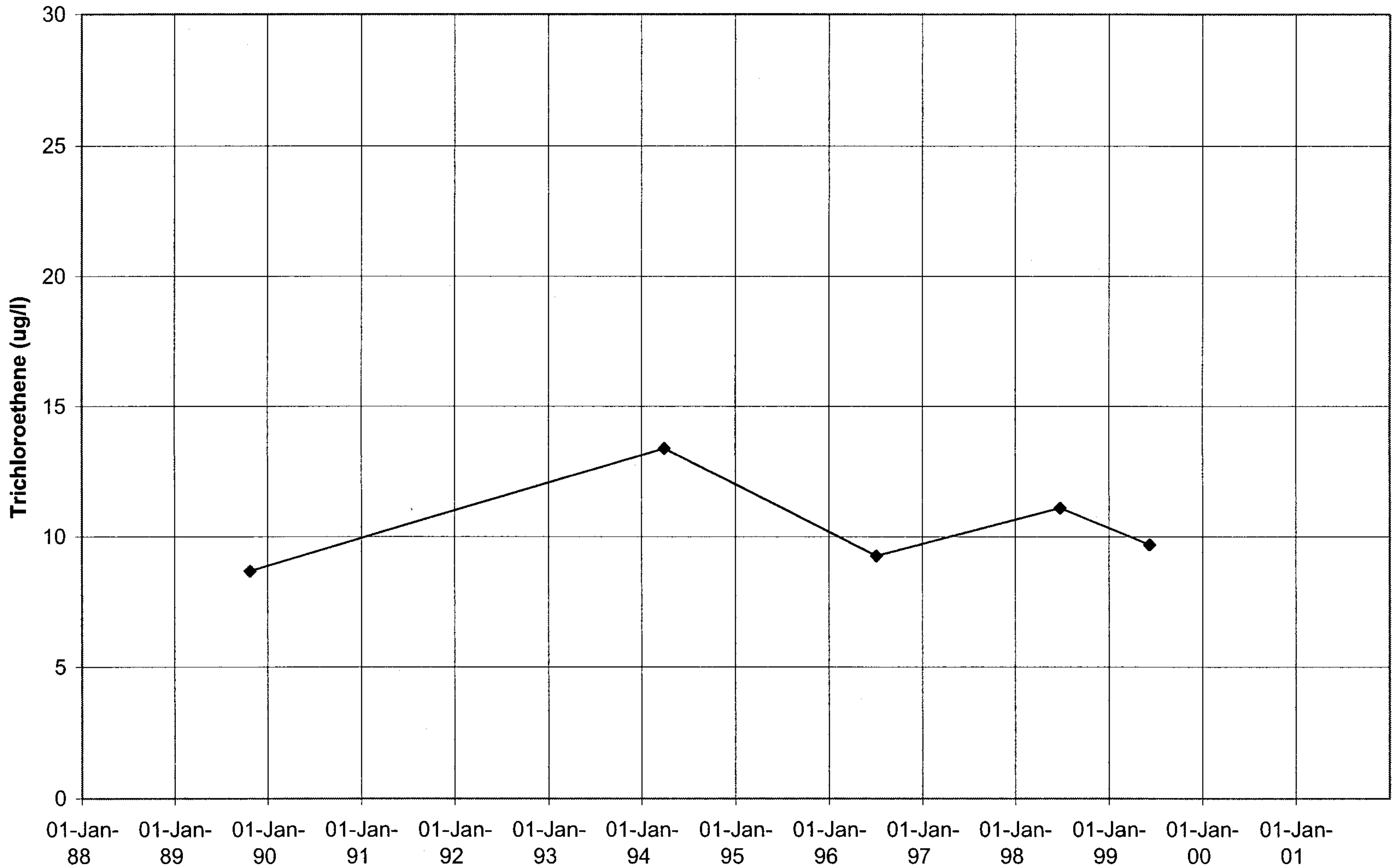

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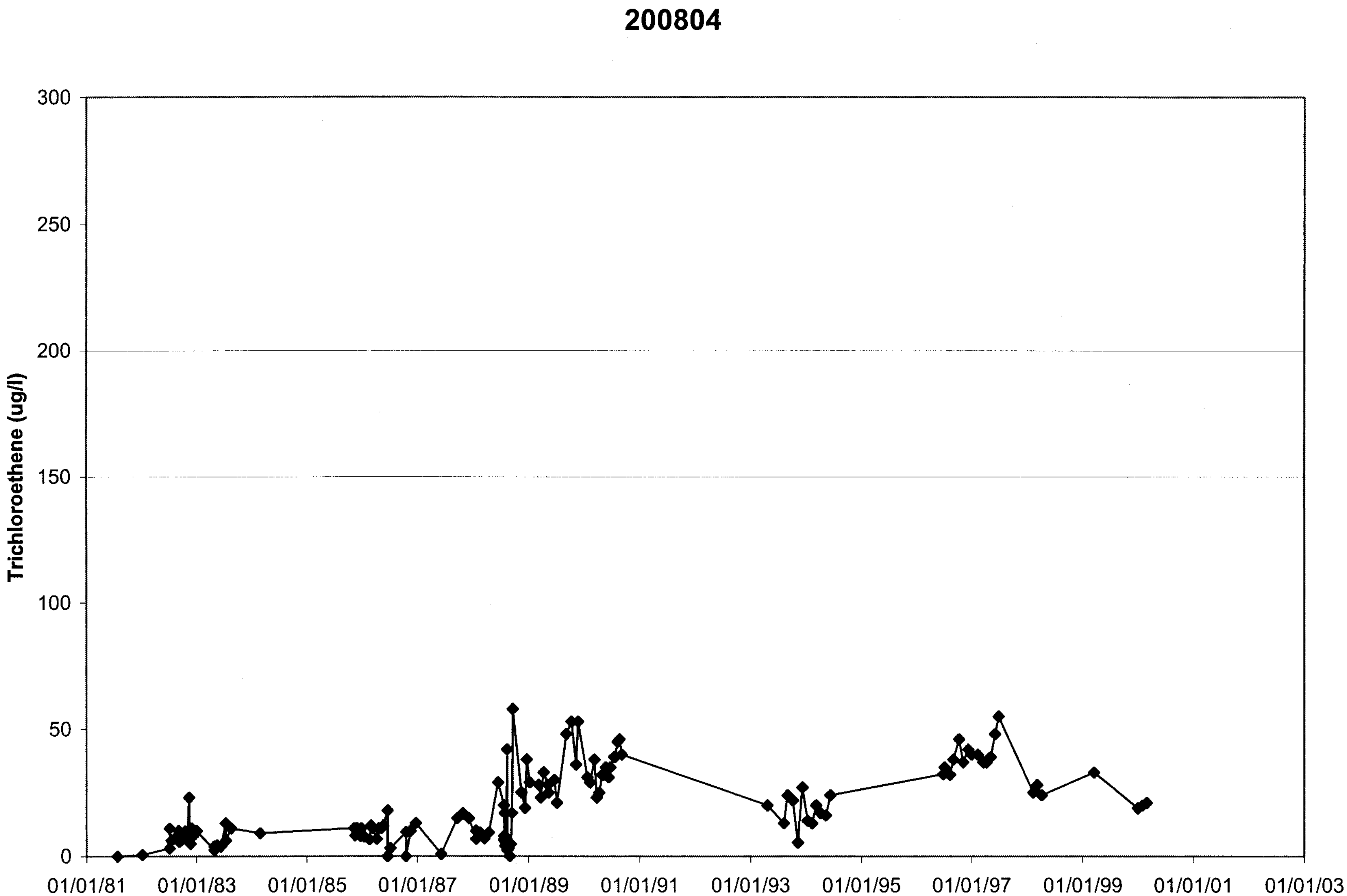

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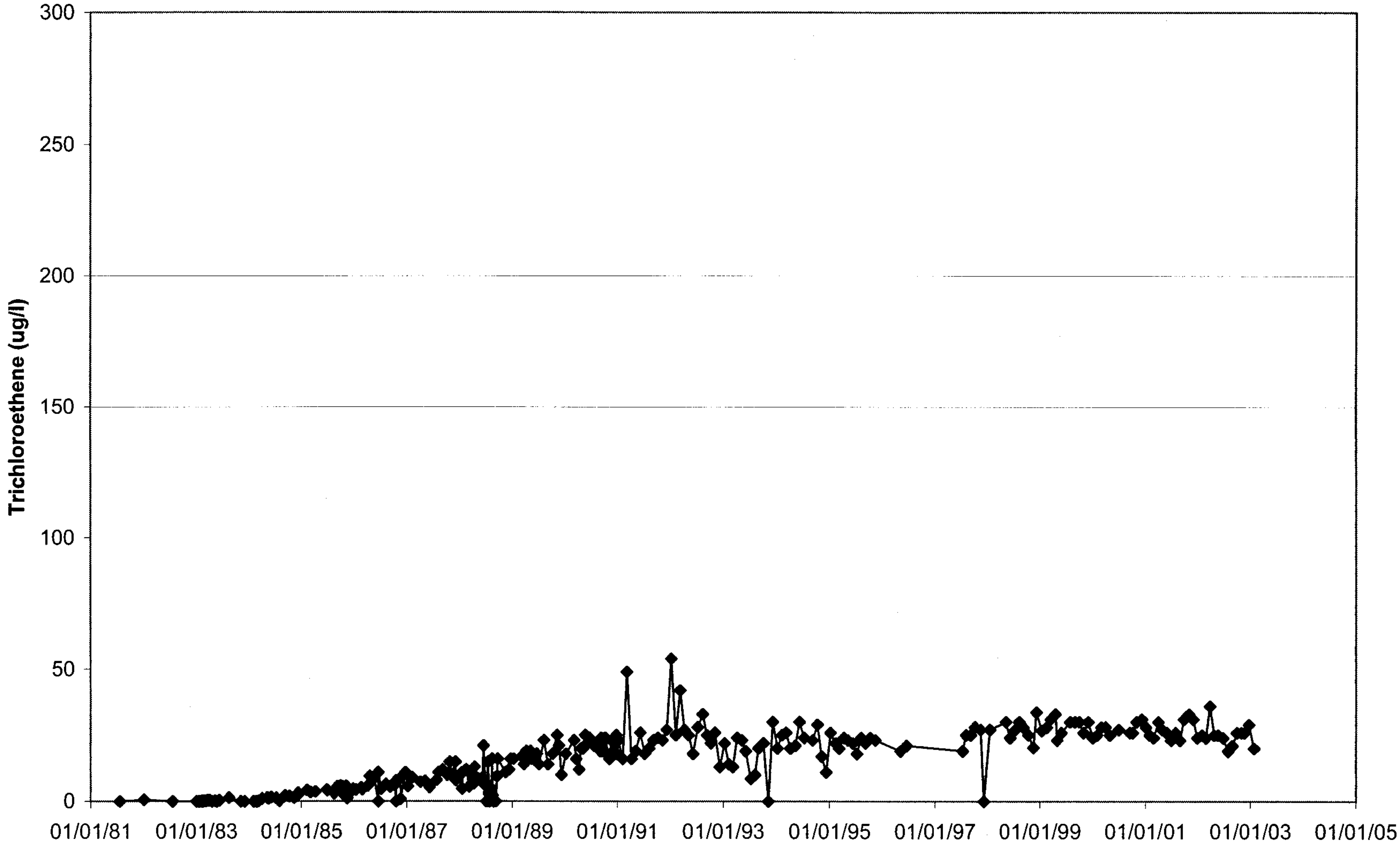

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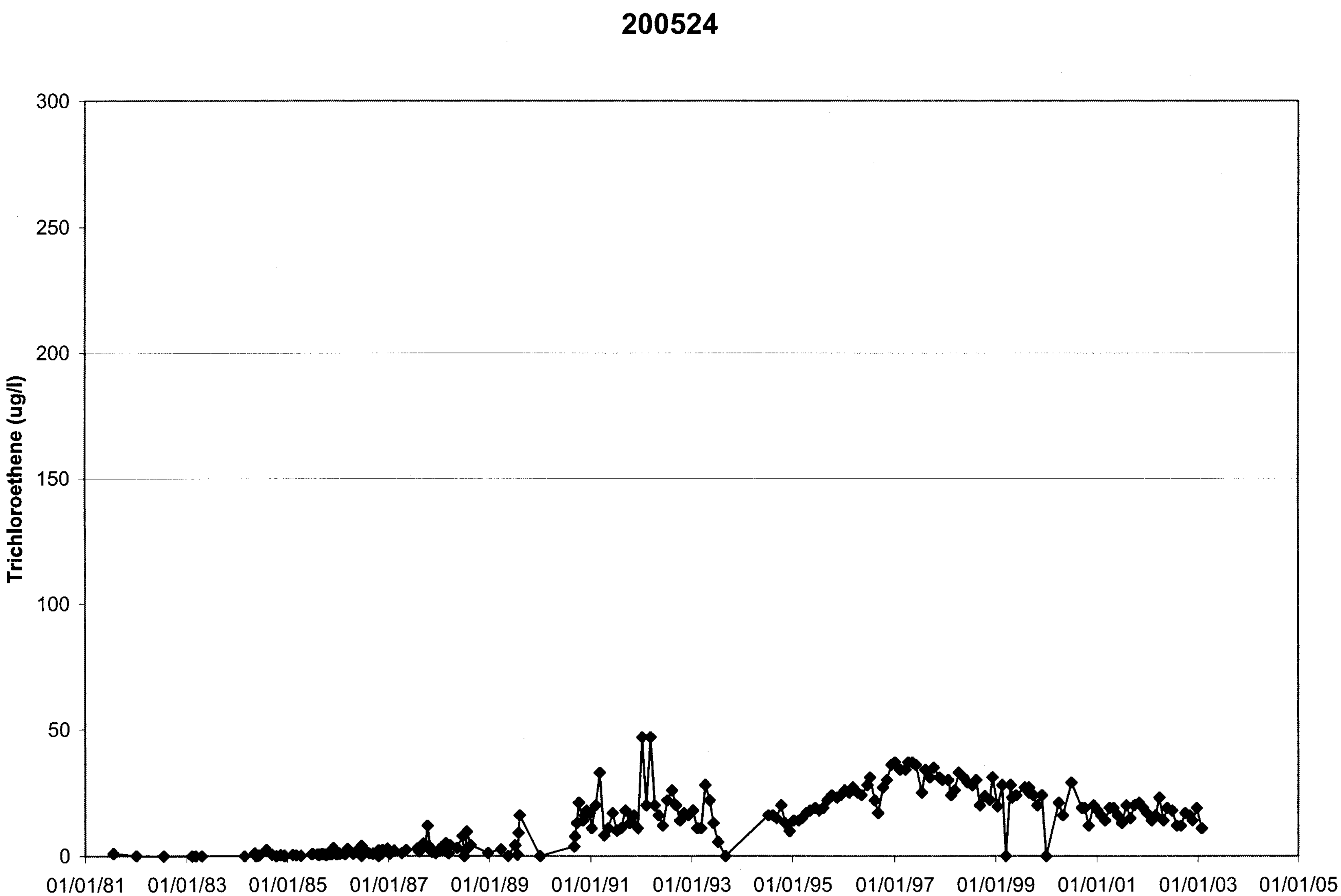

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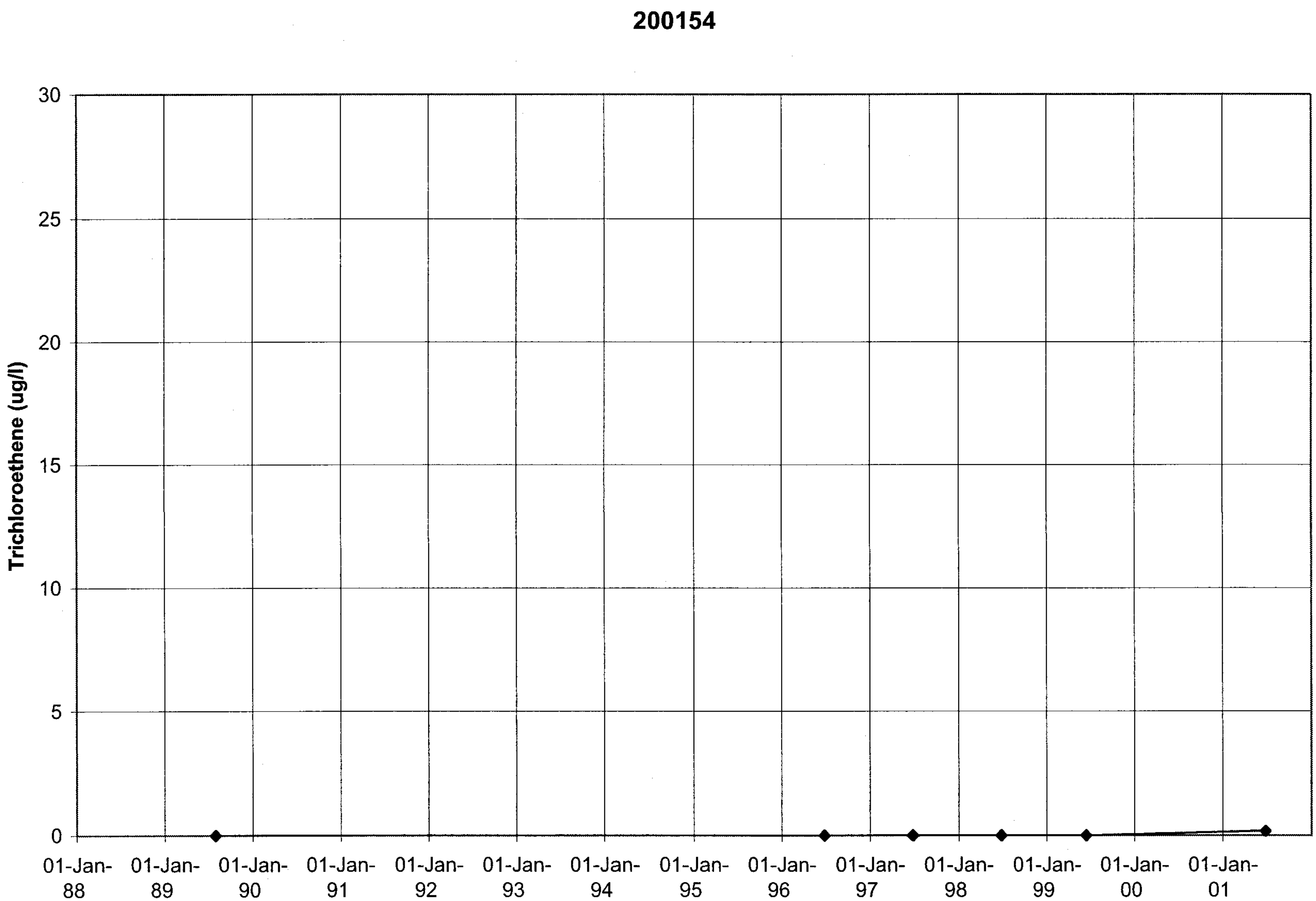

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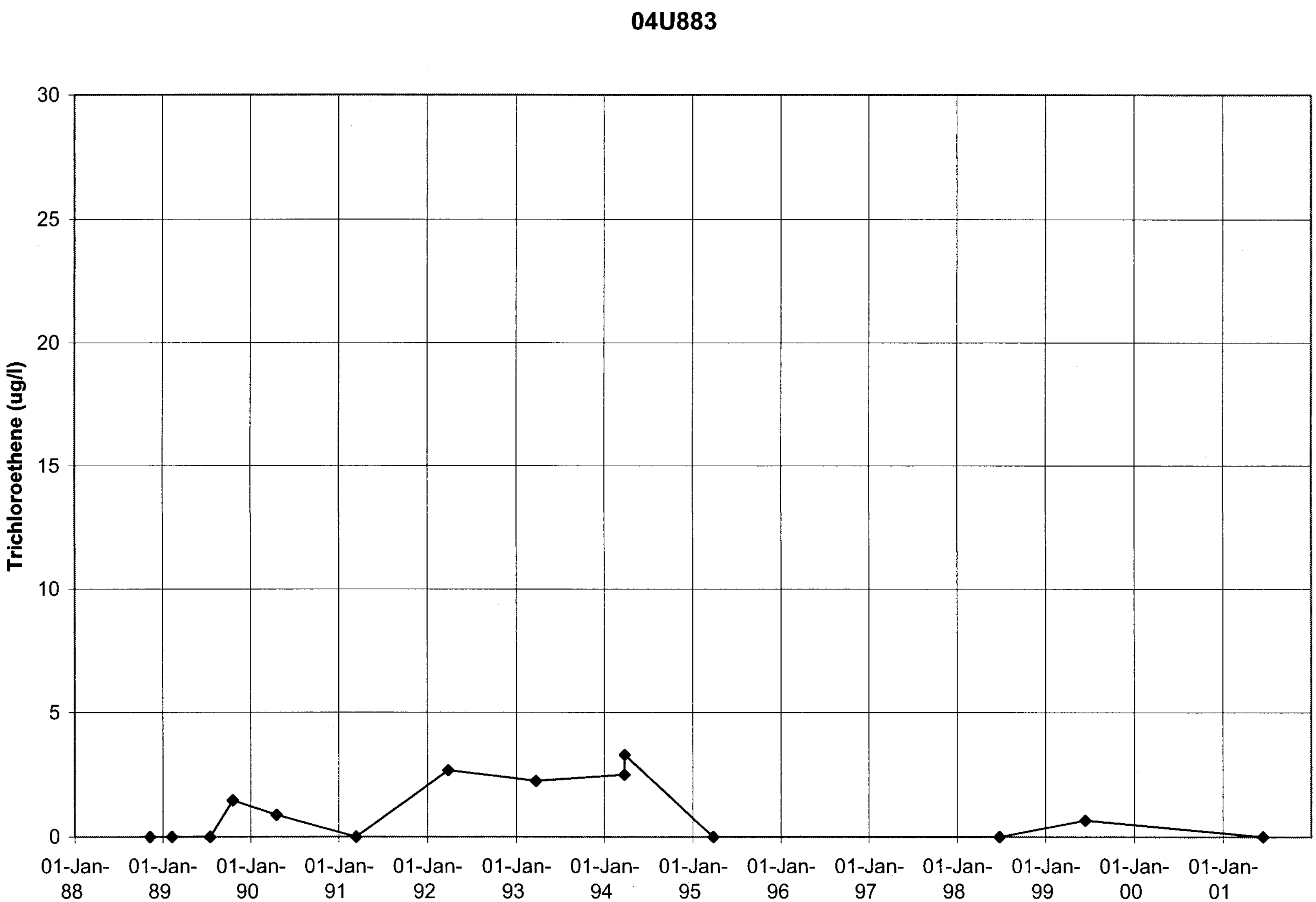

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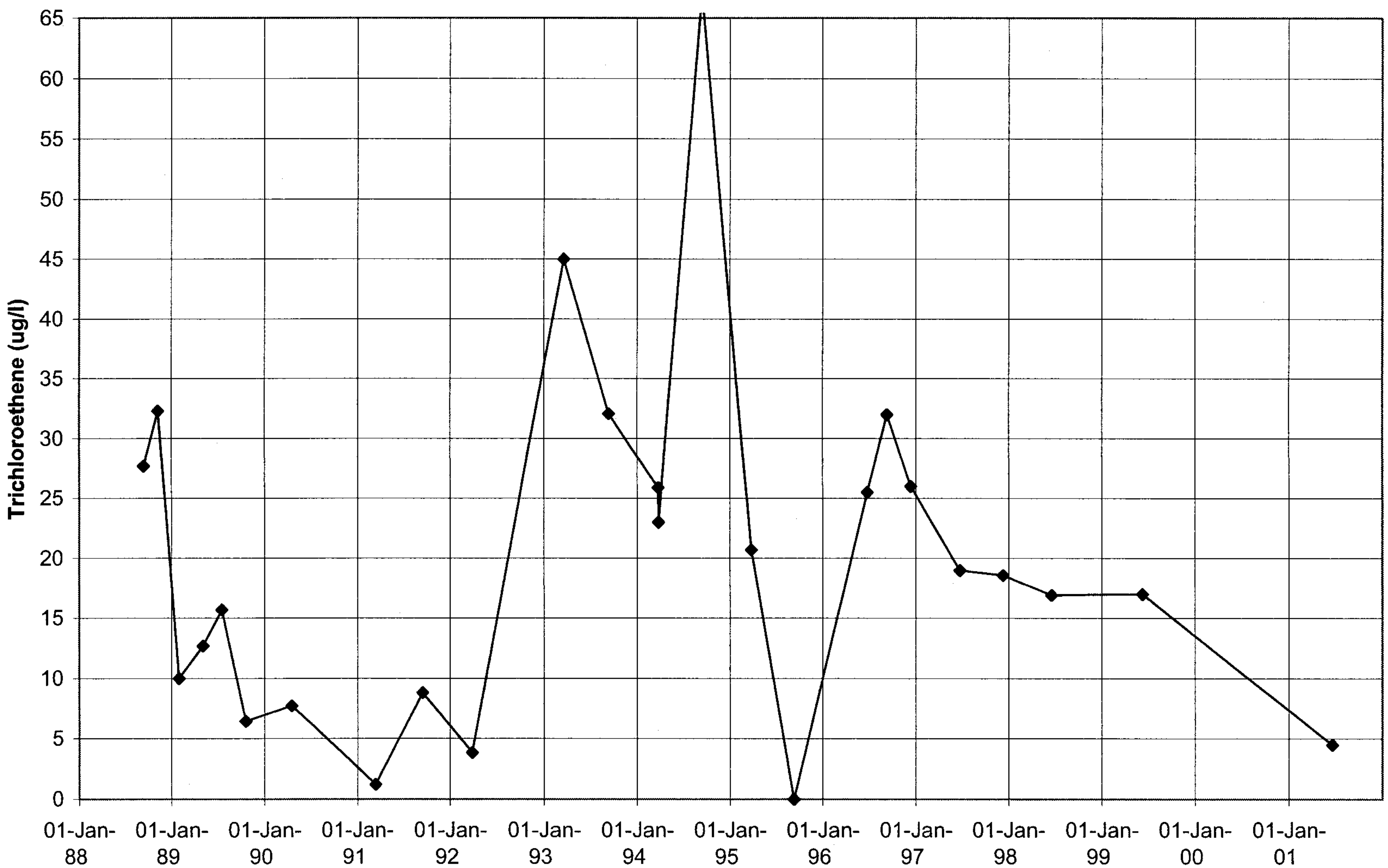

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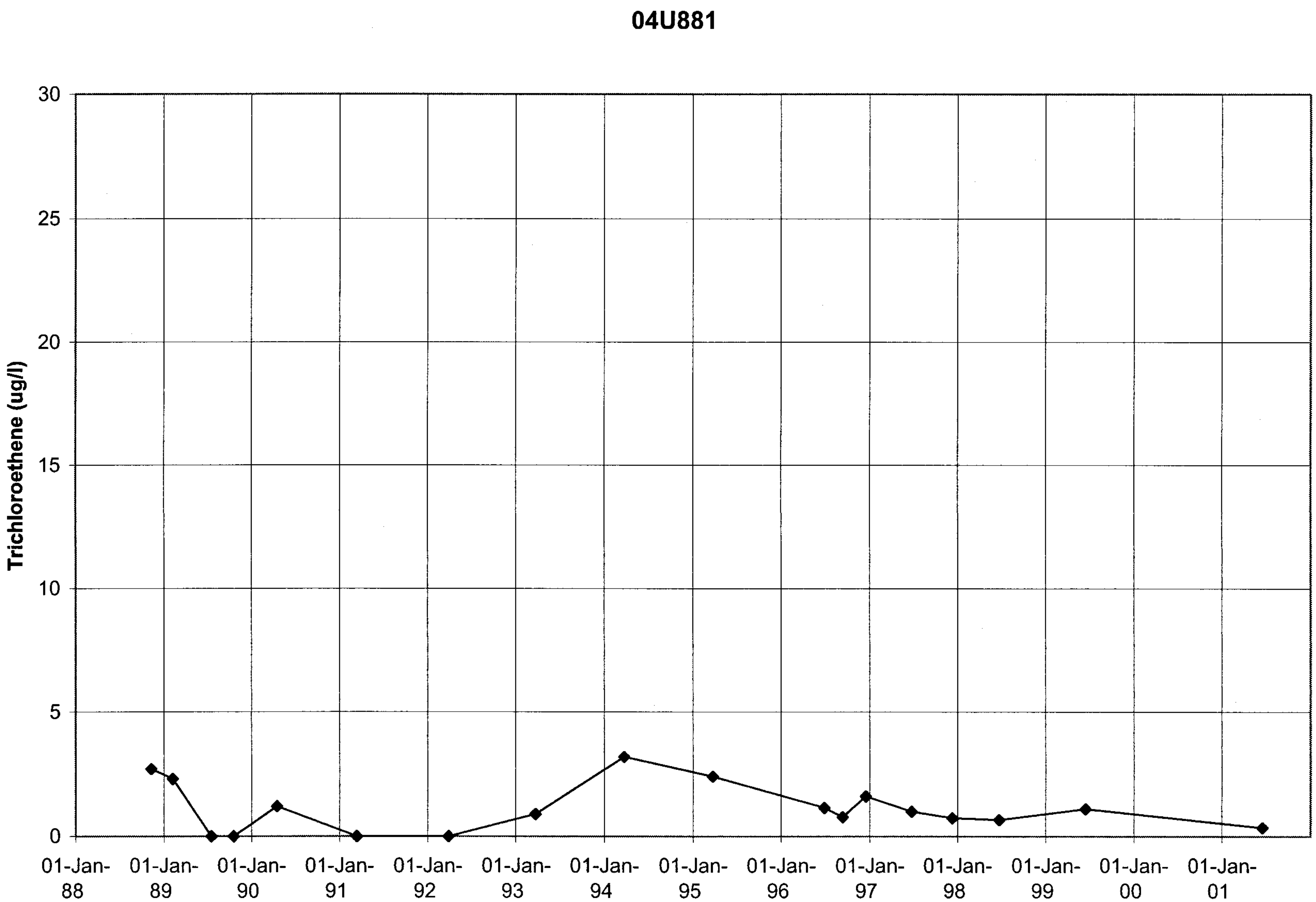

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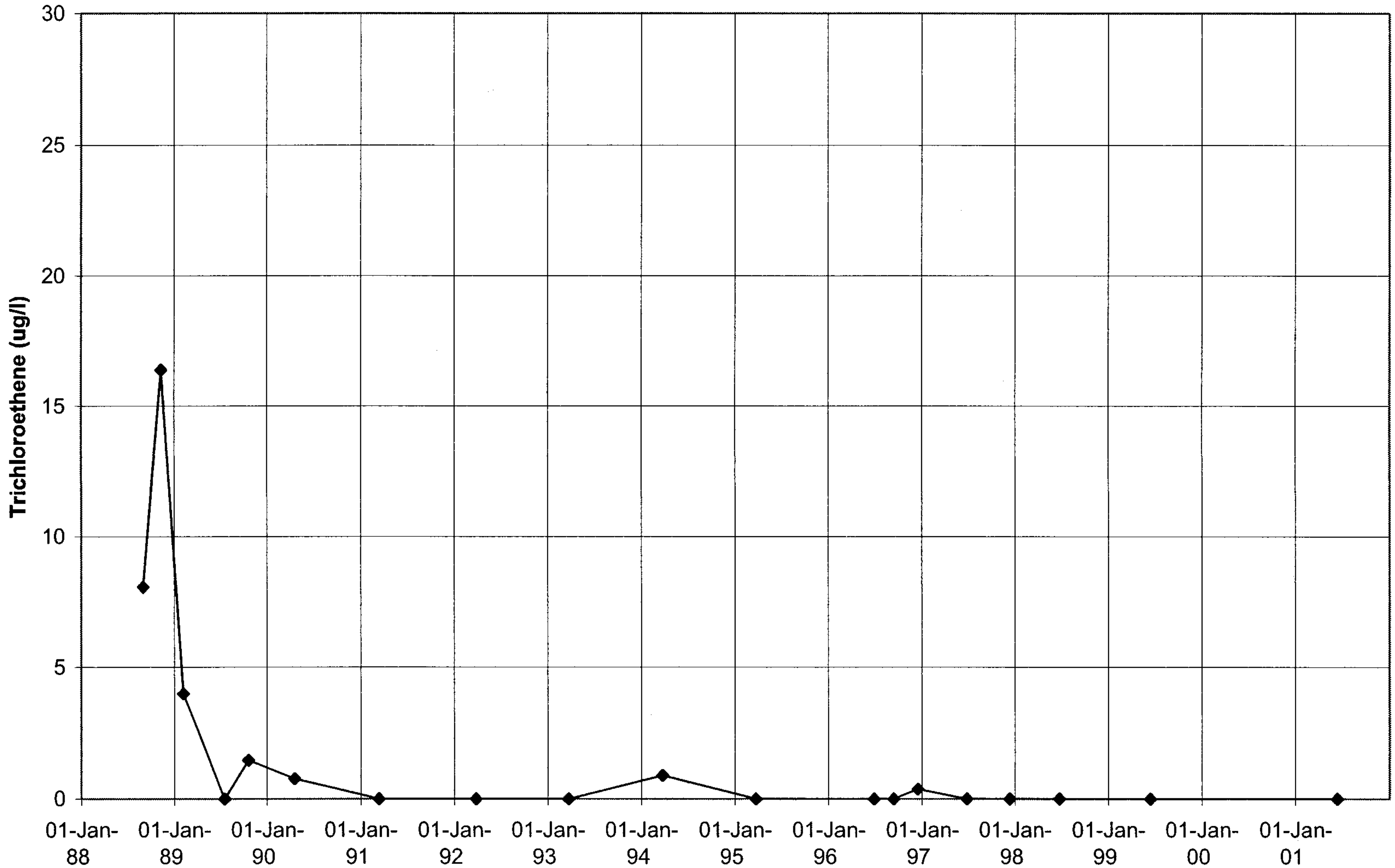

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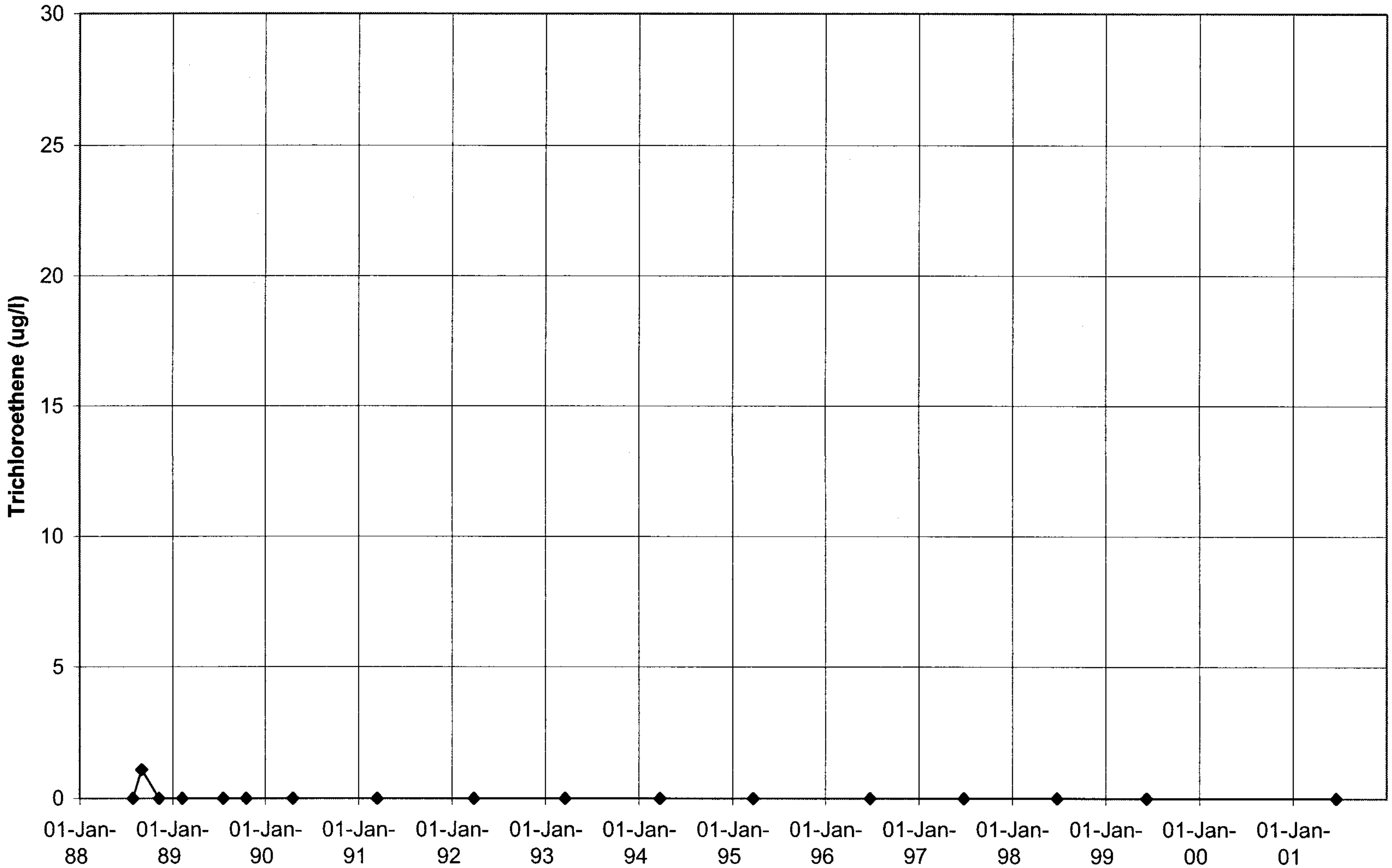
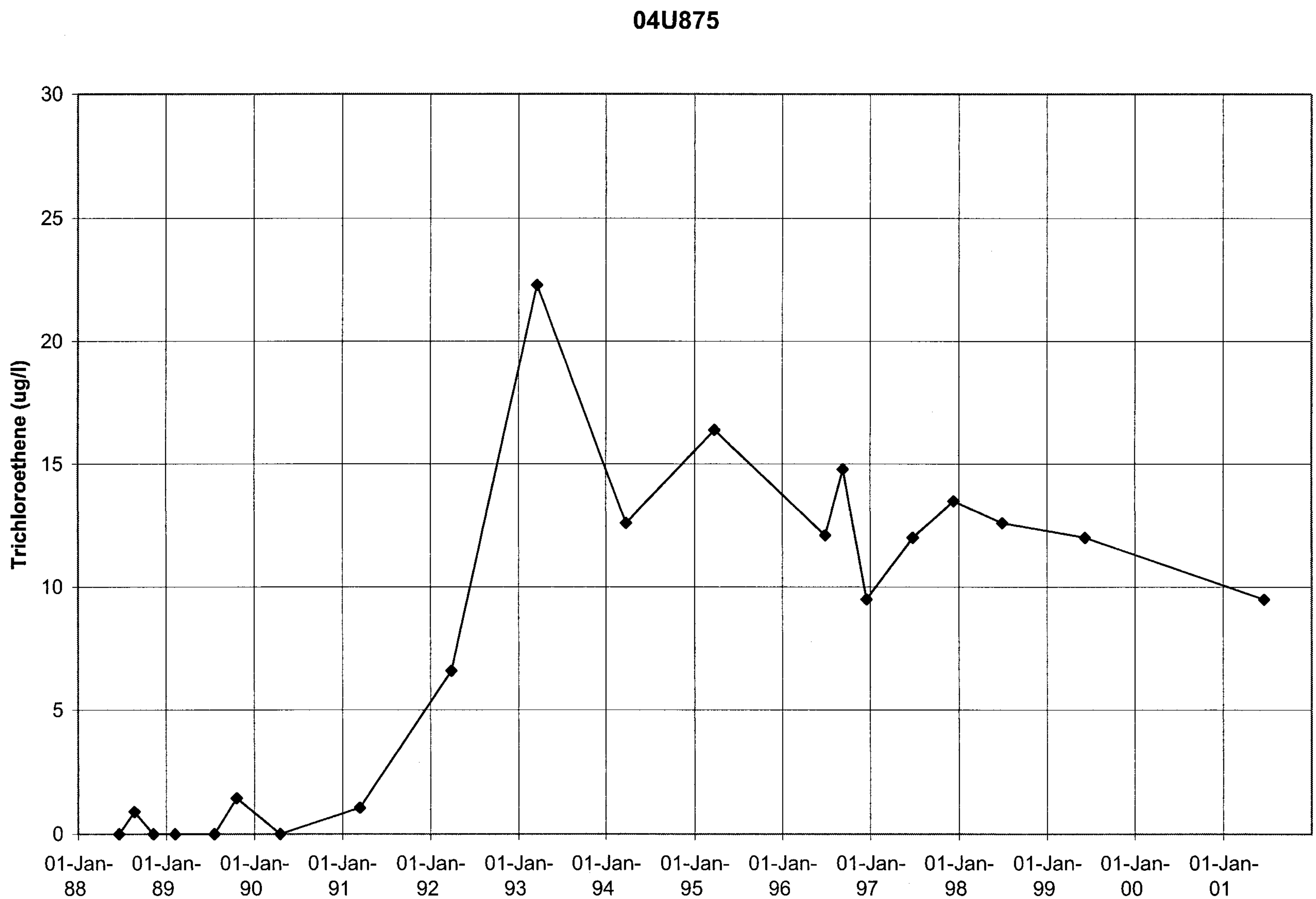
04U879

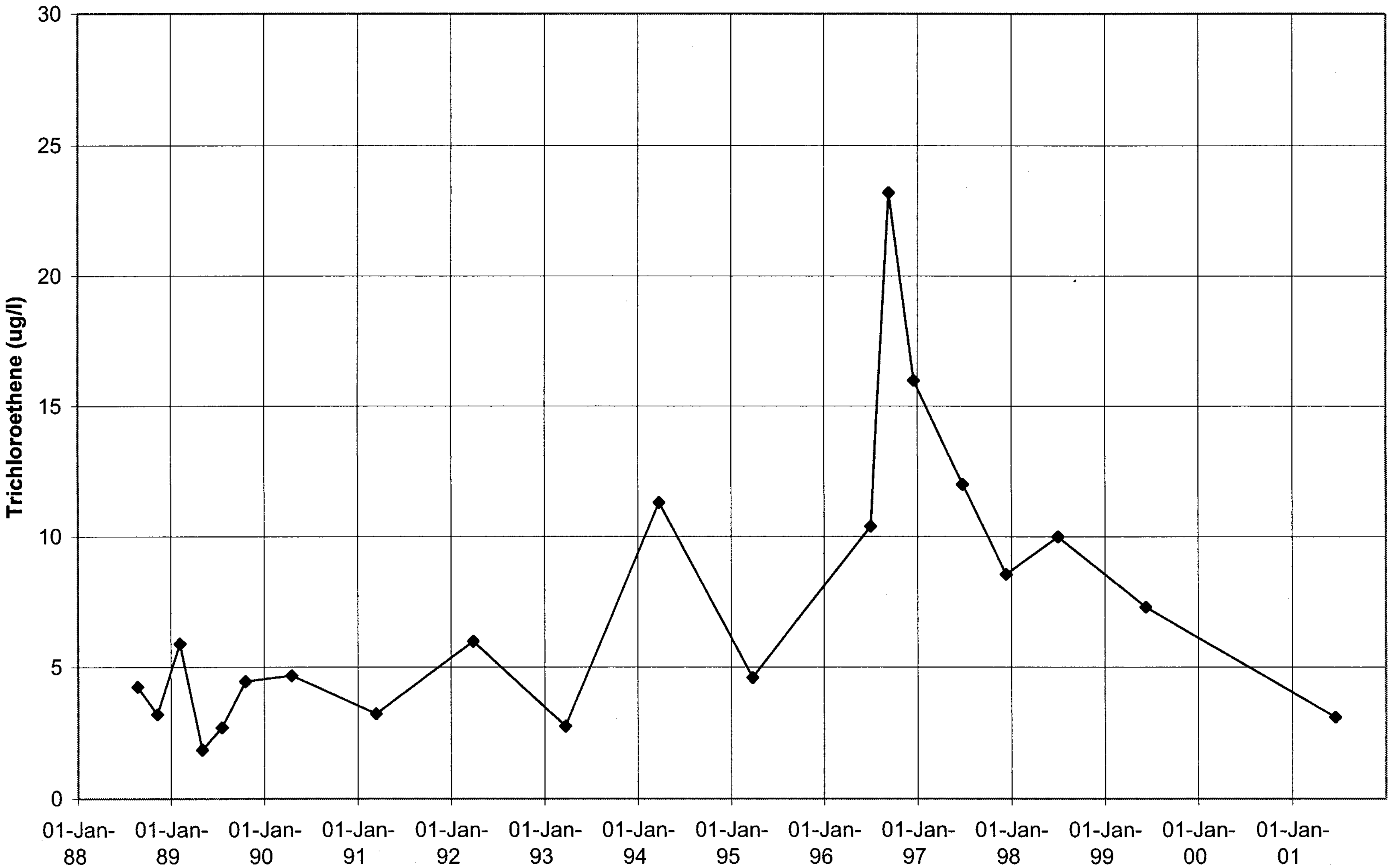


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



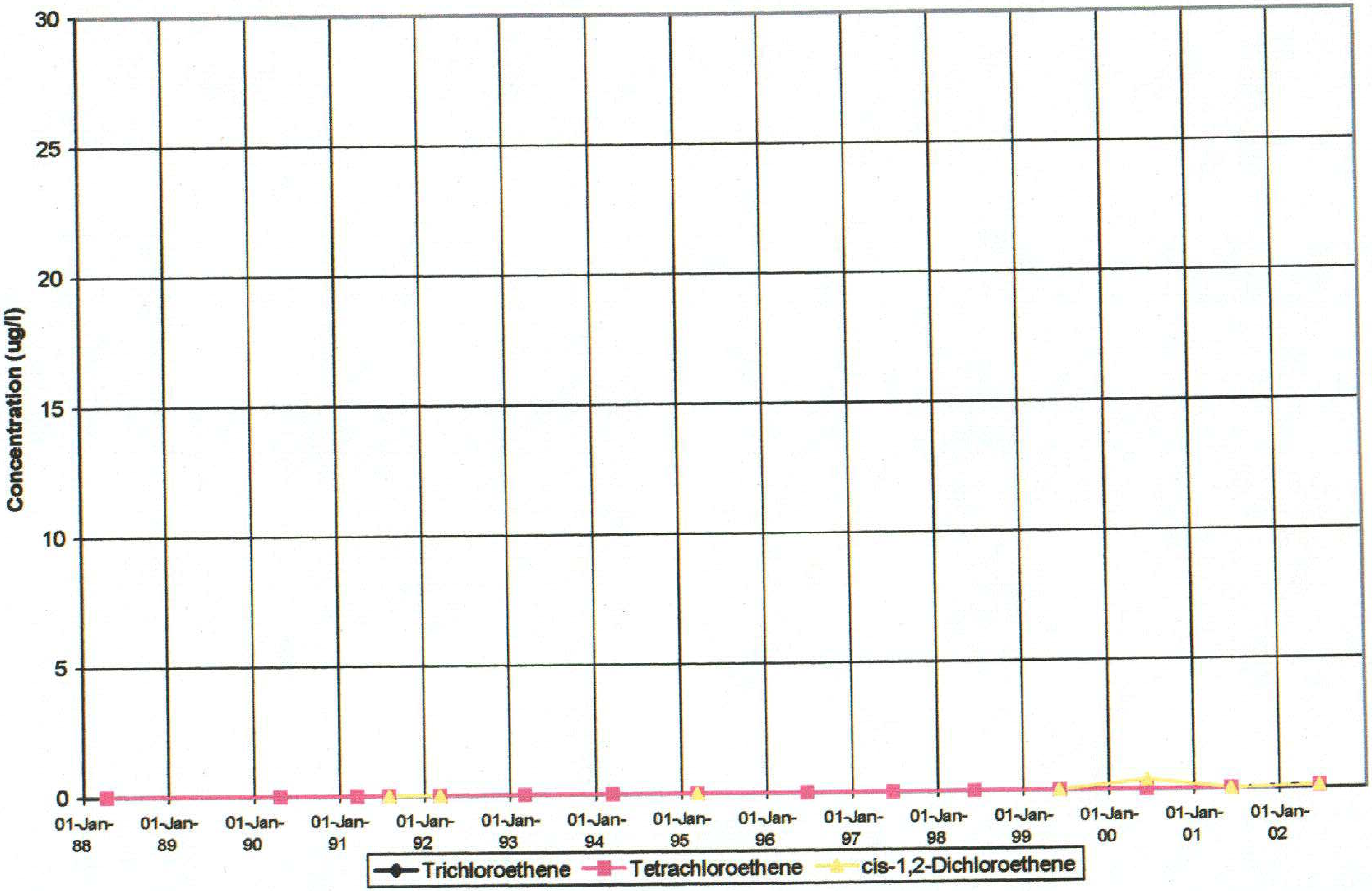
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

PJ#318



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U039



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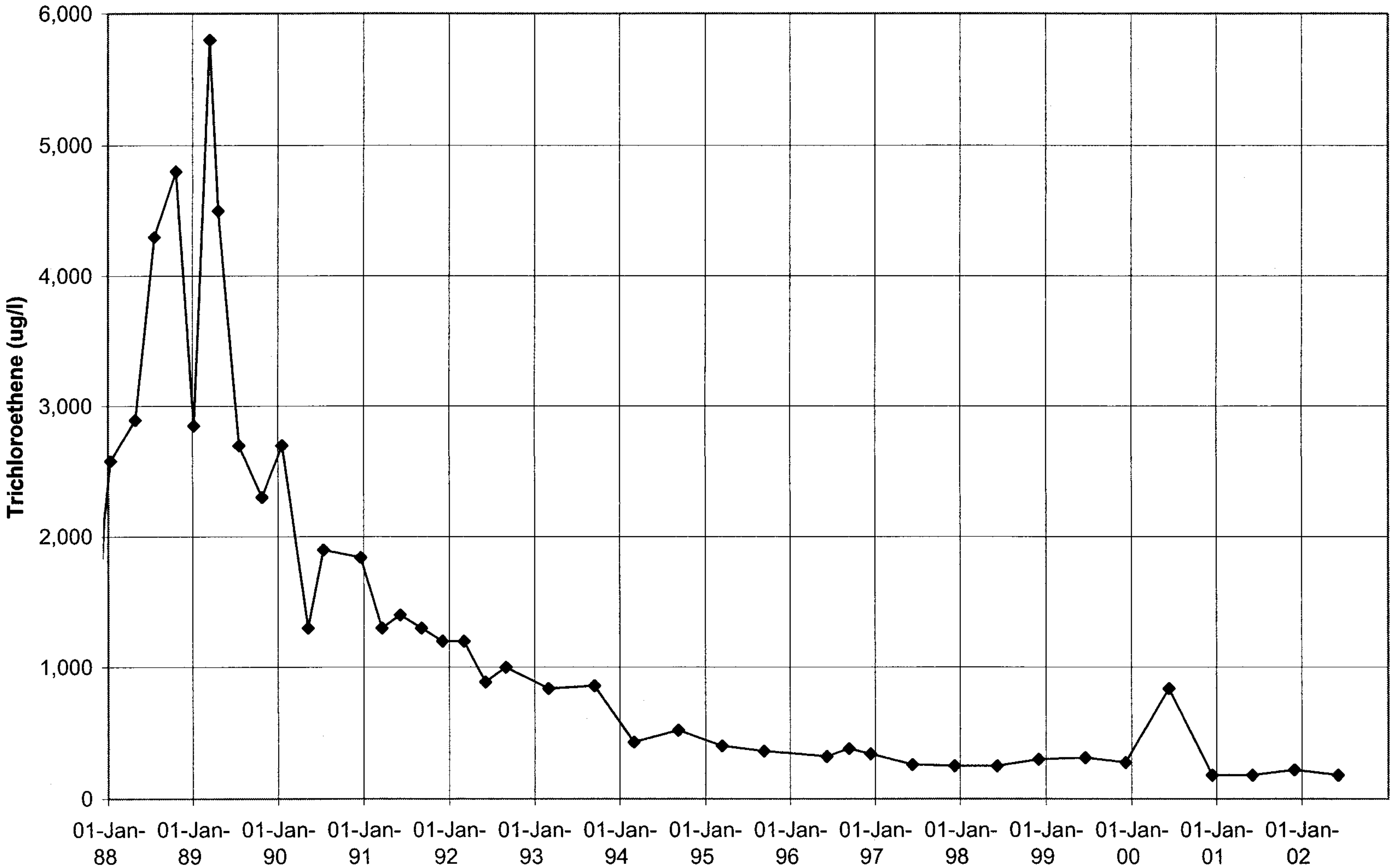
03F302



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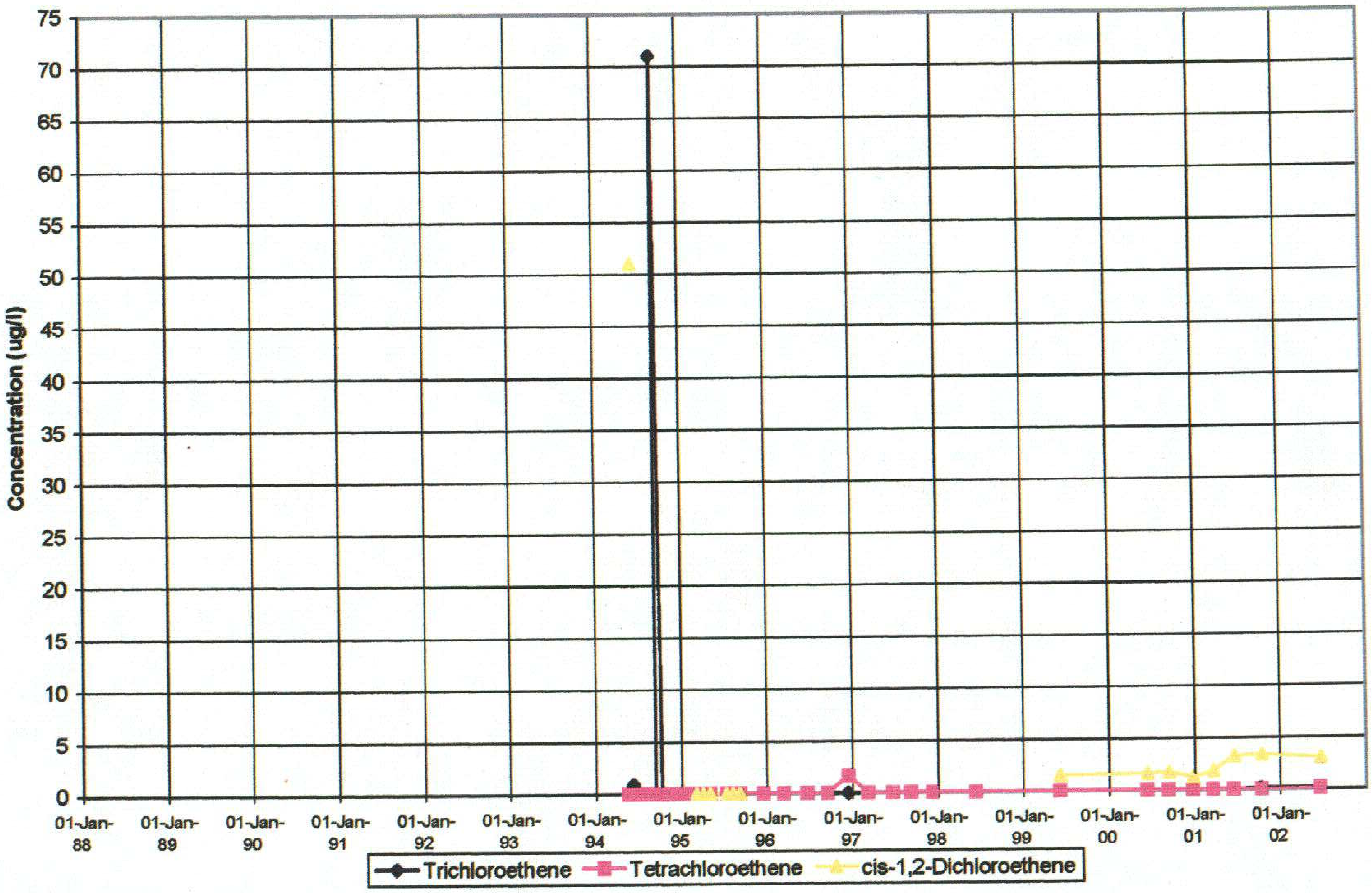
01U904



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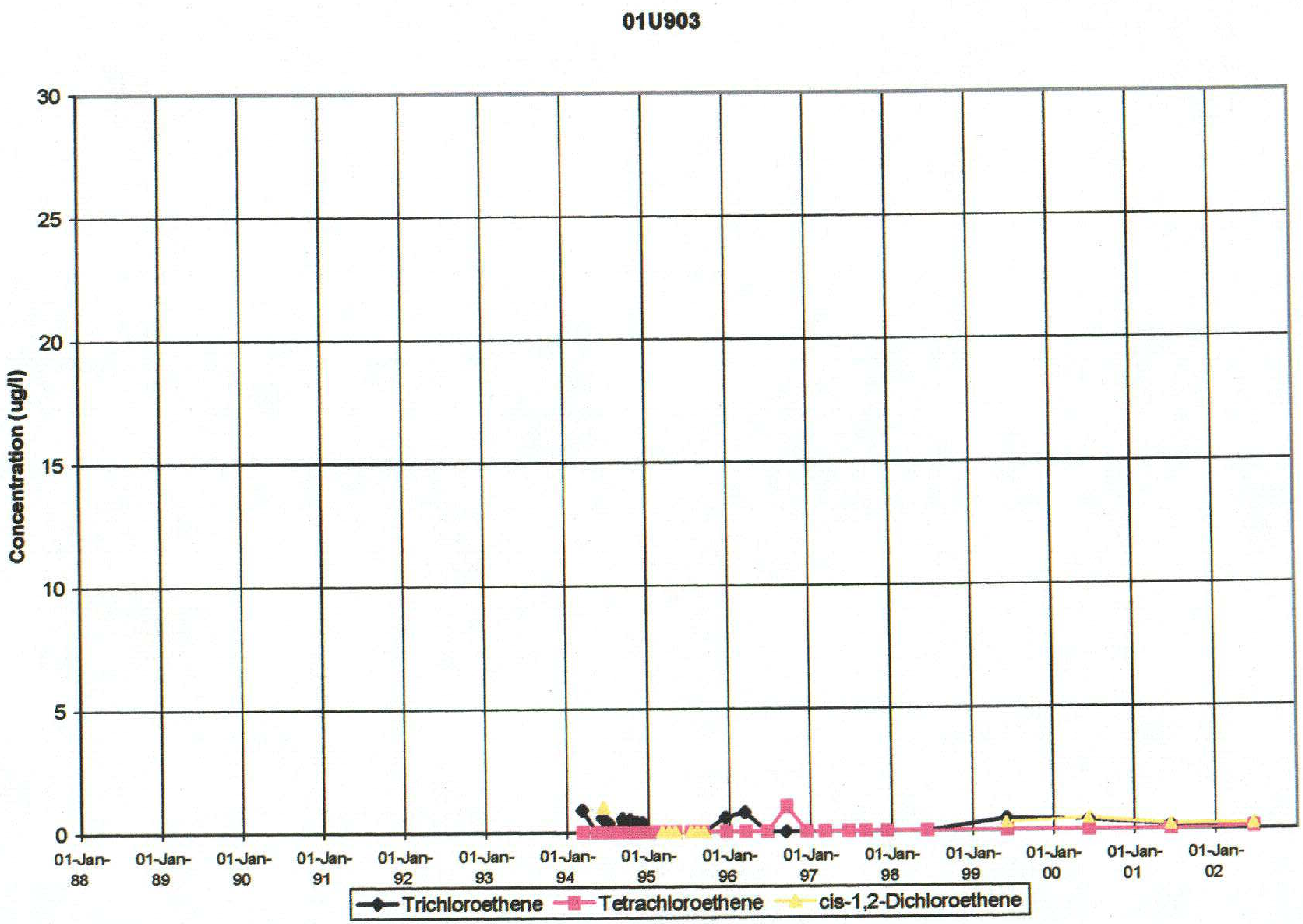

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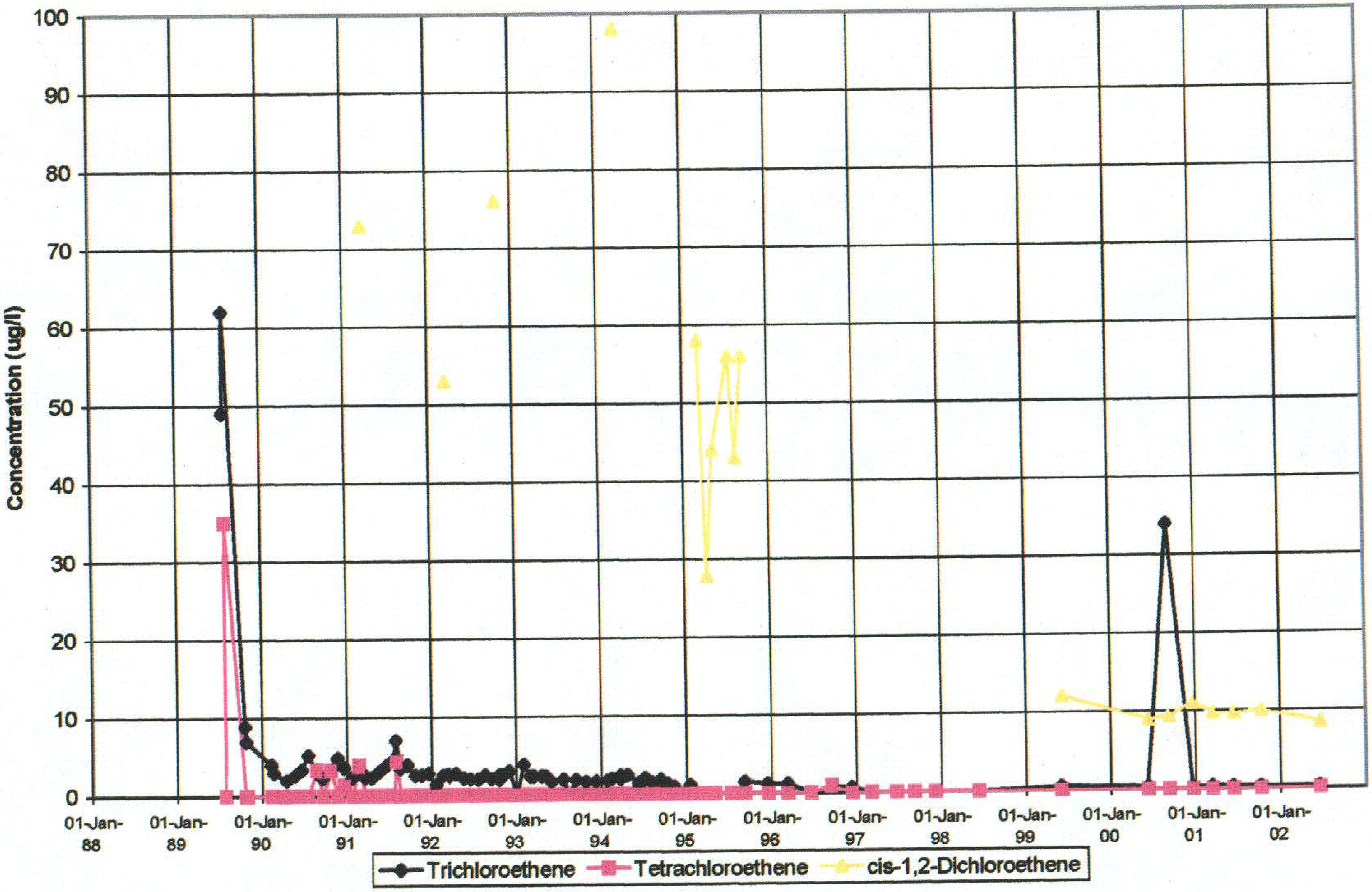
01U902



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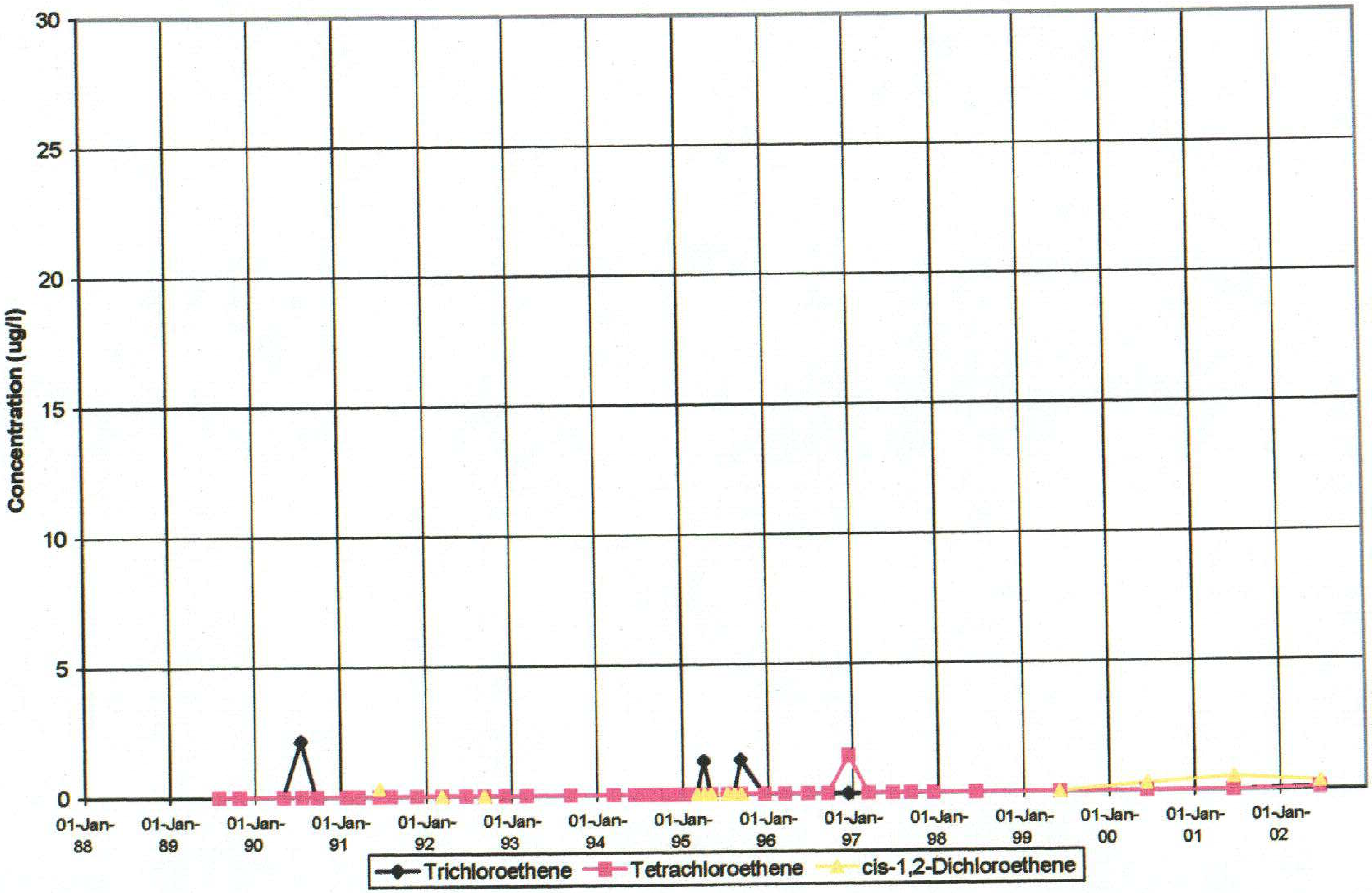
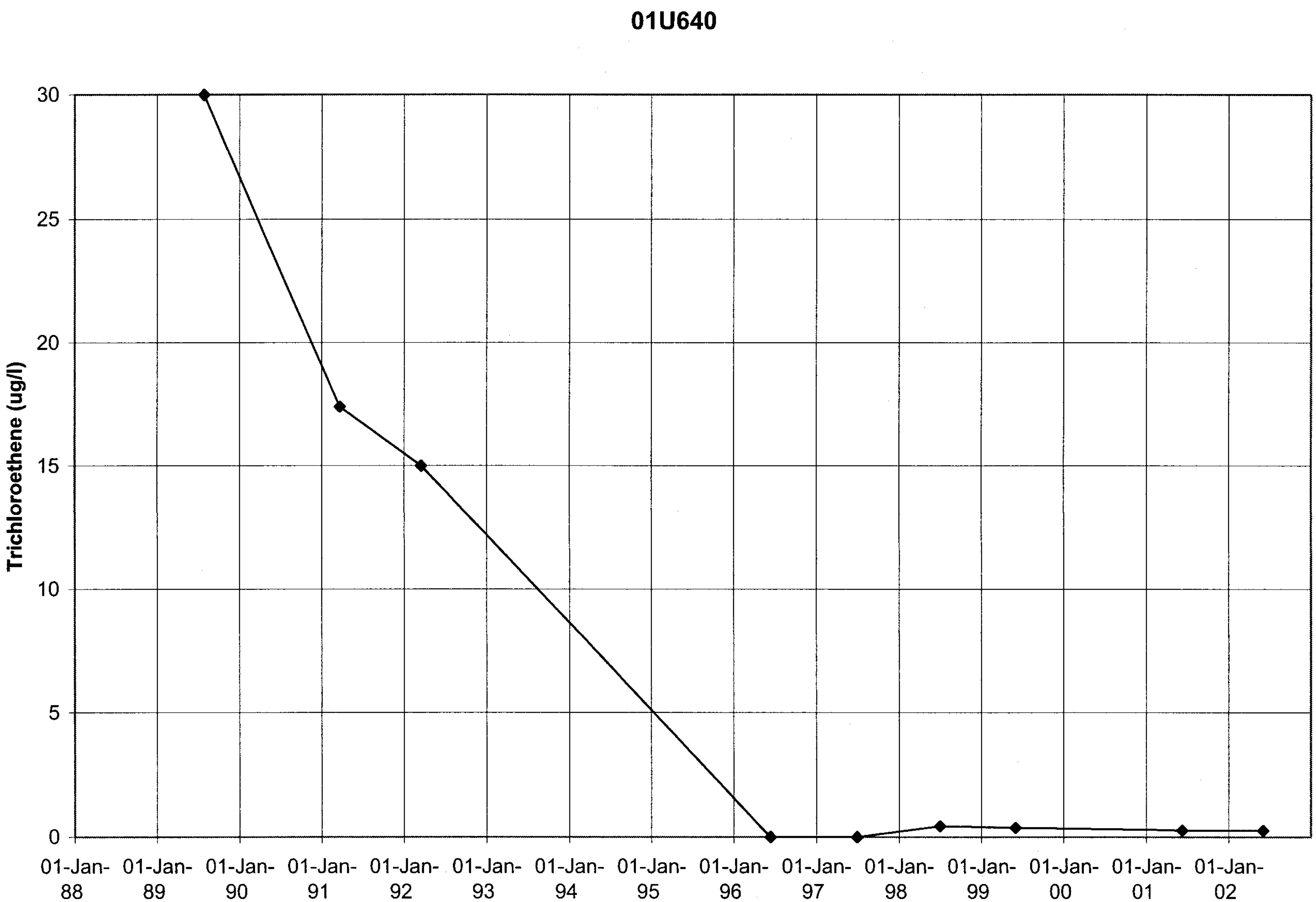
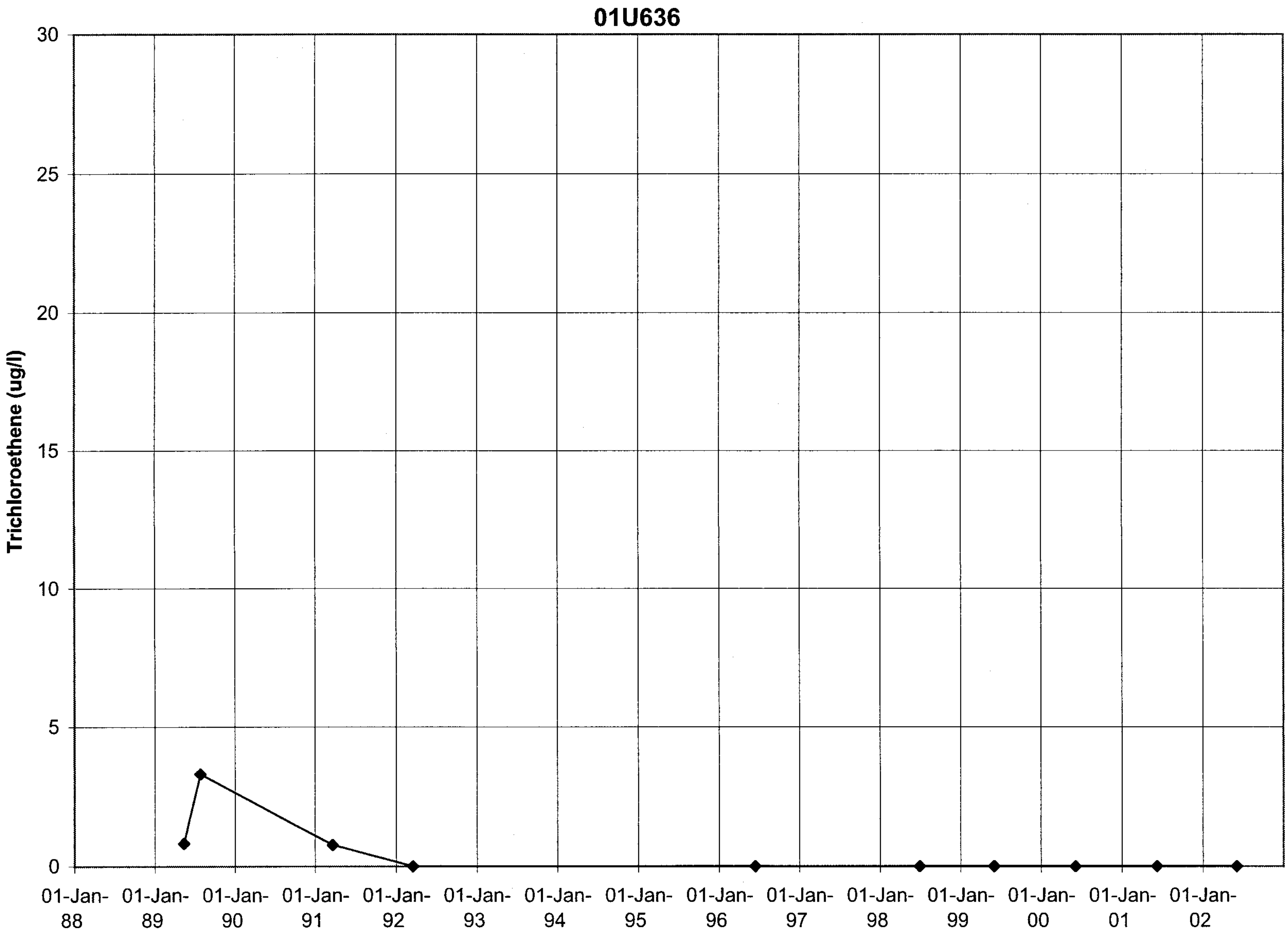
01U901



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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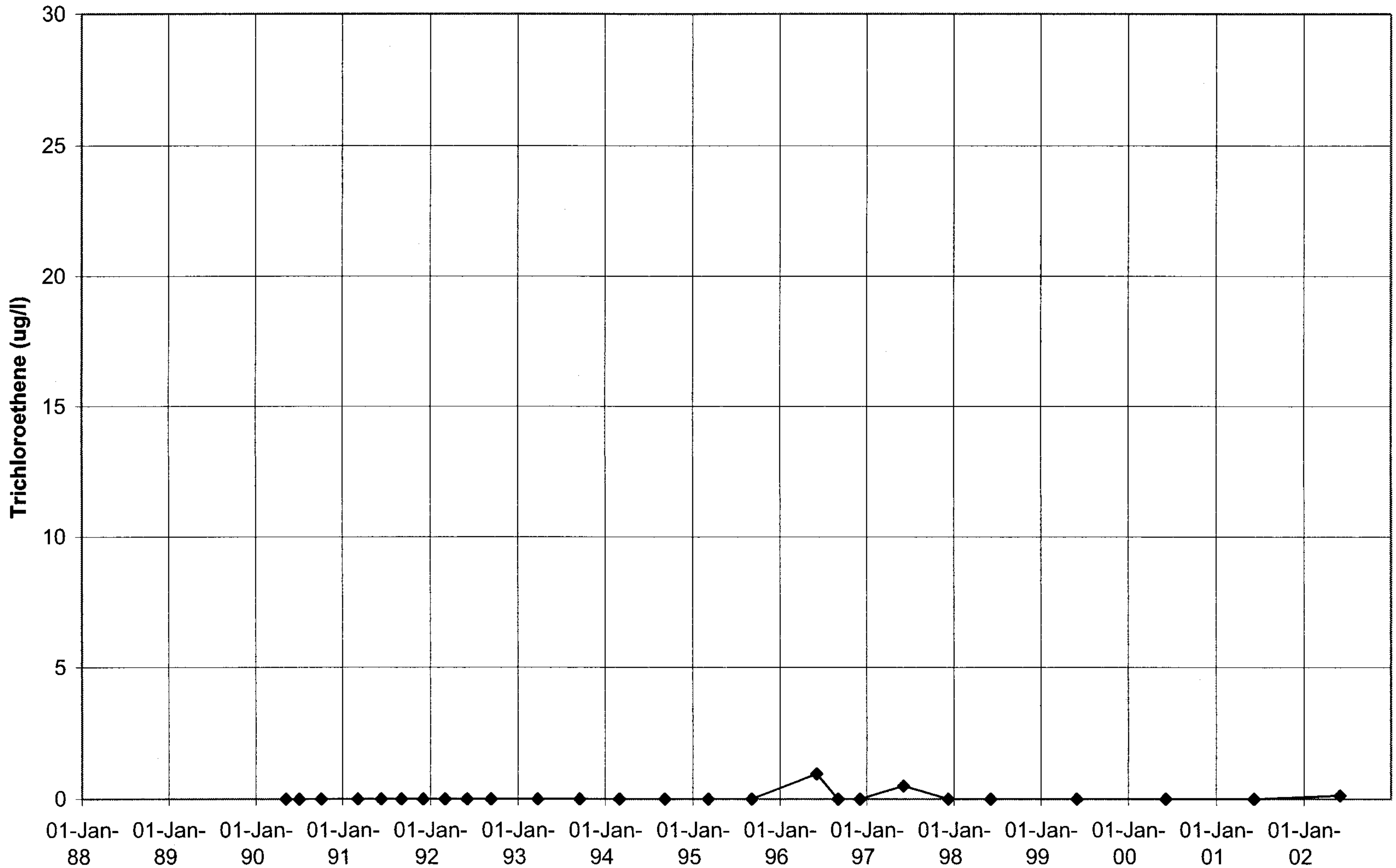
01U621



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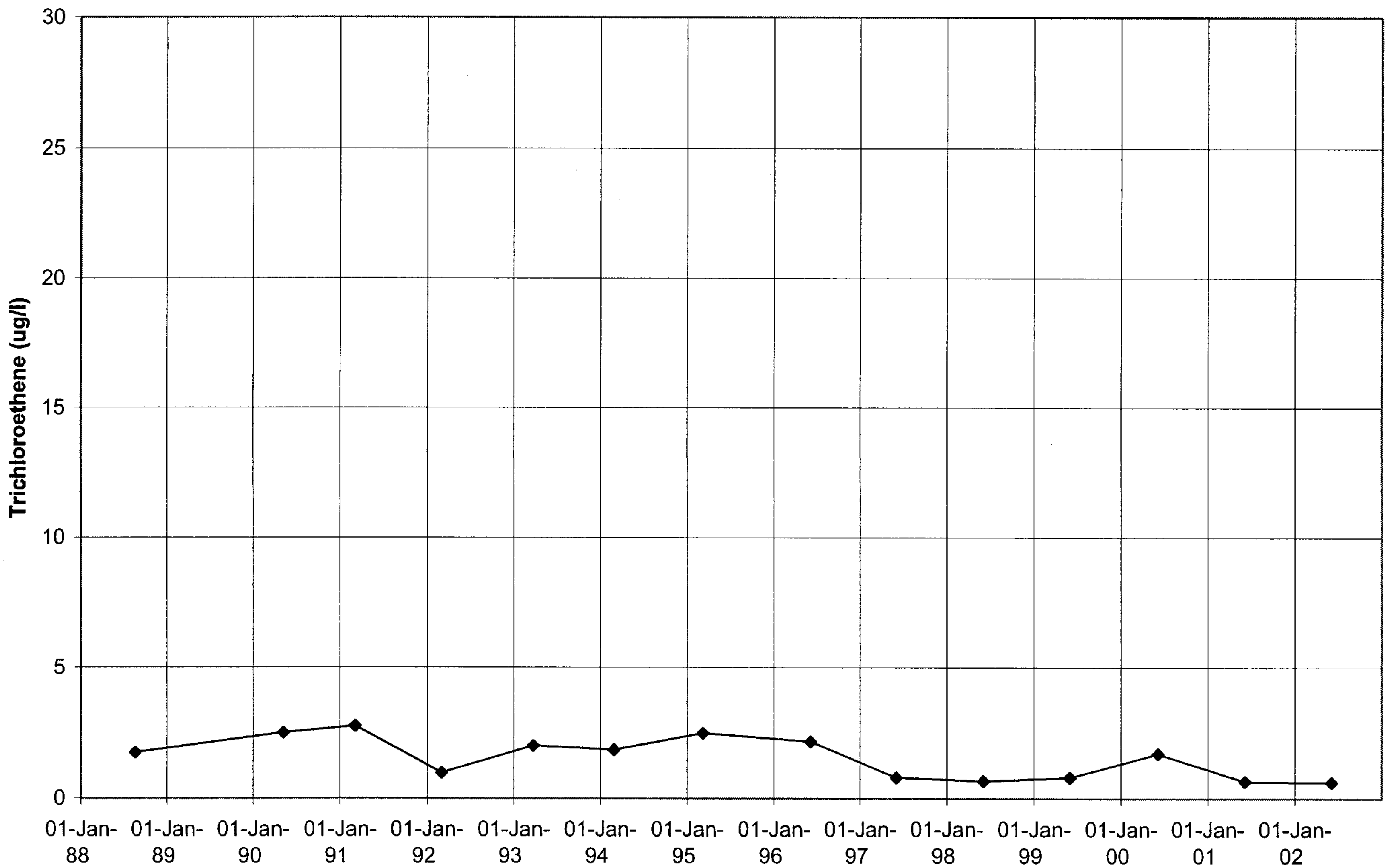
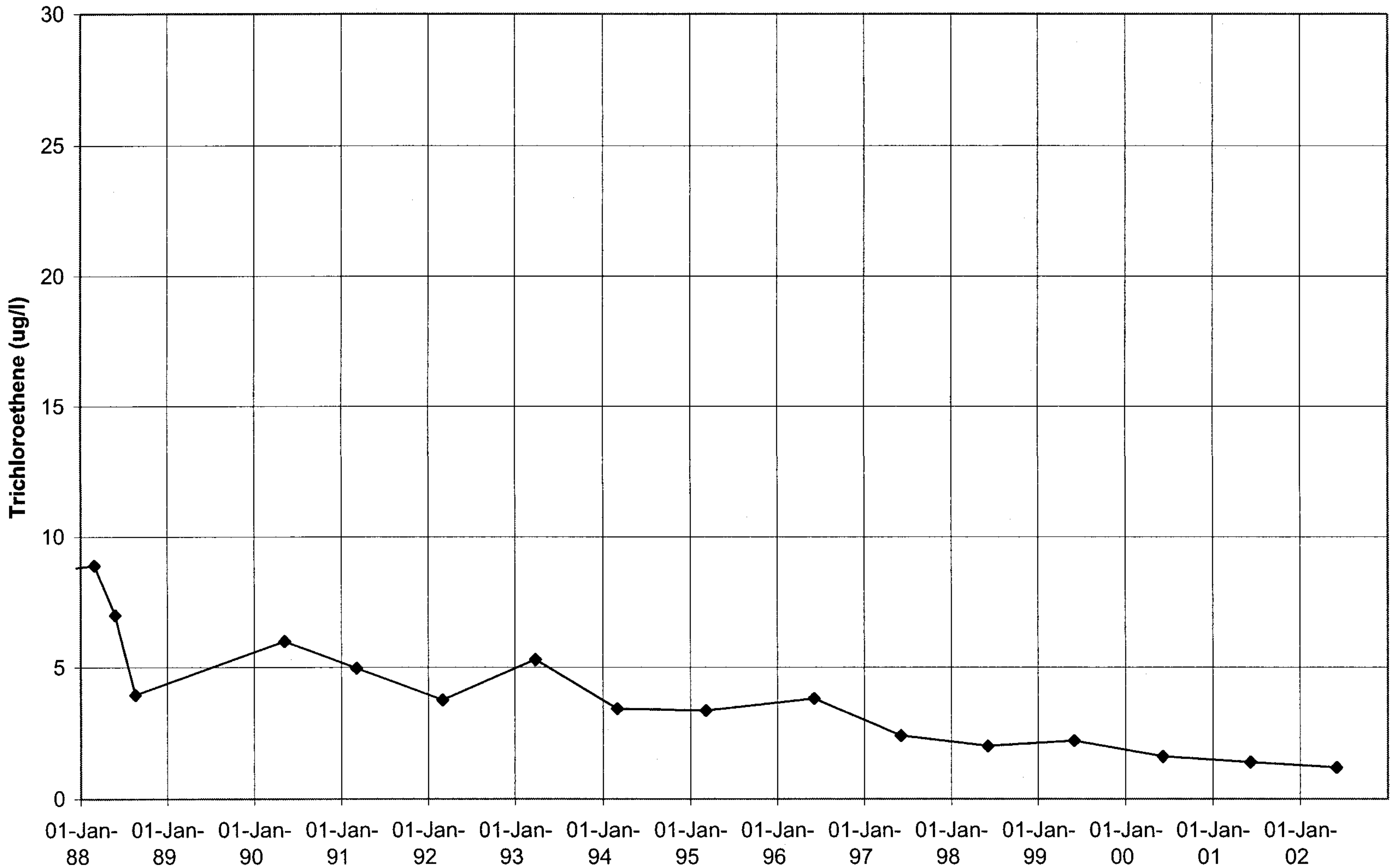
01U619



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U618



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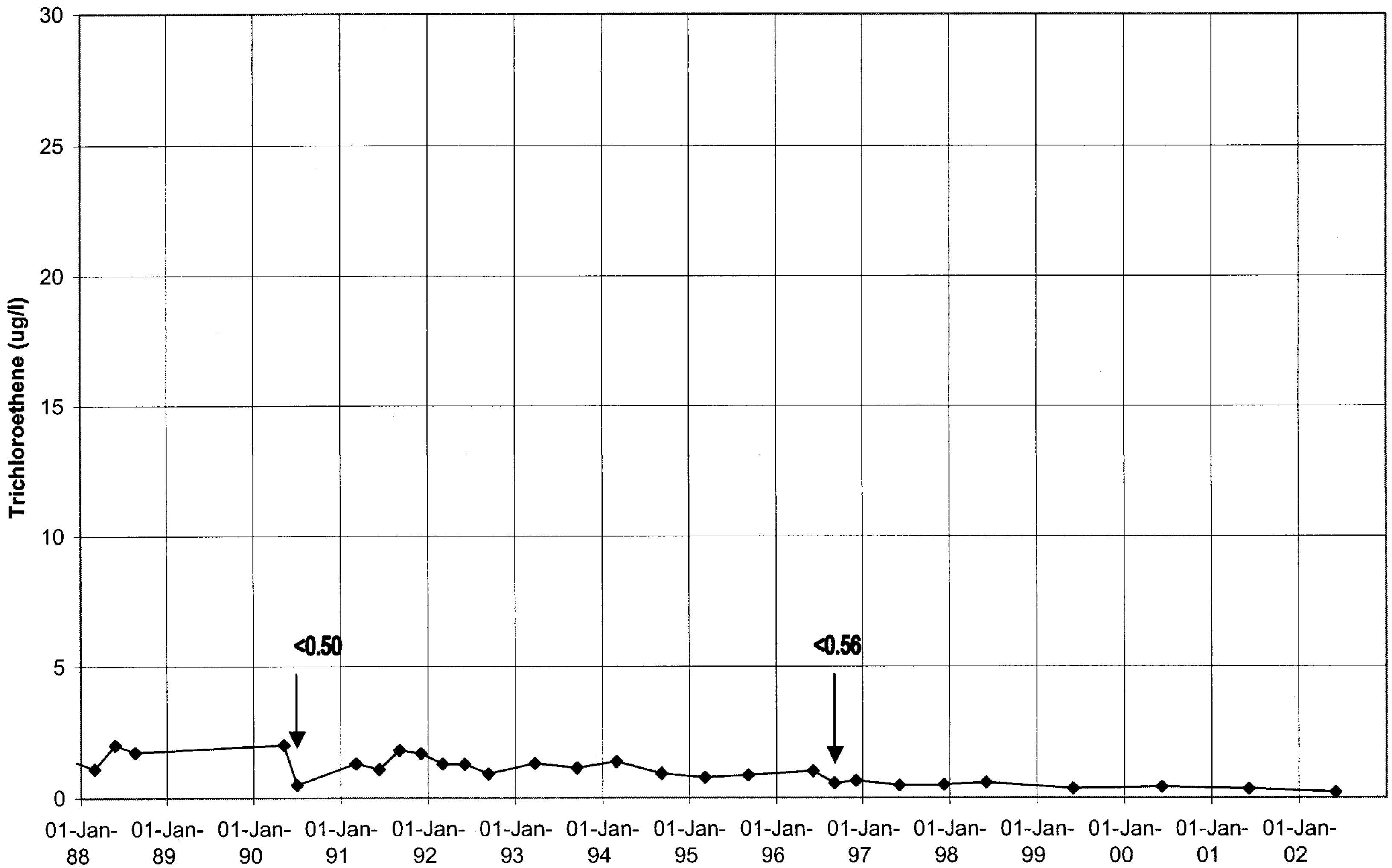
01U617



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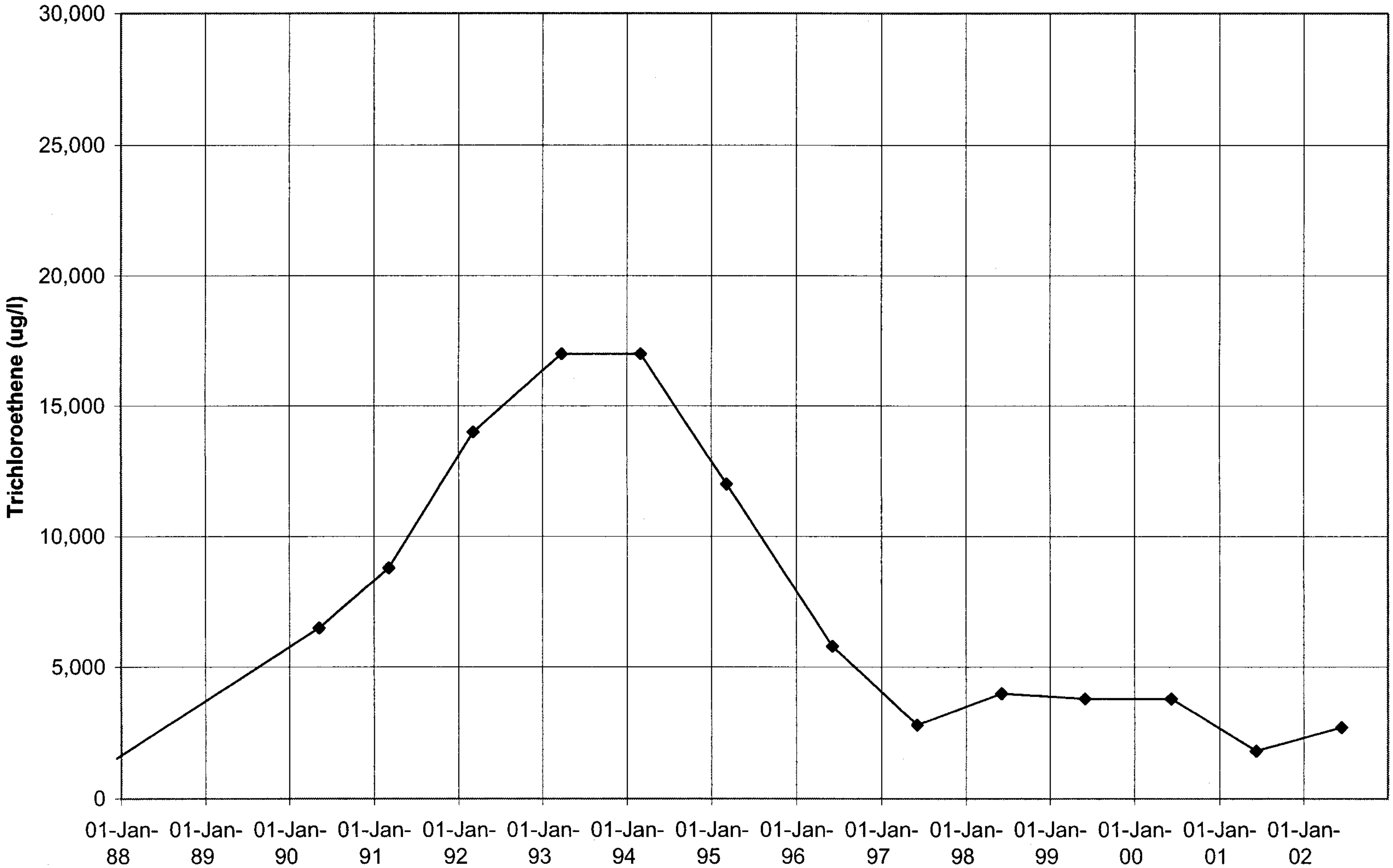
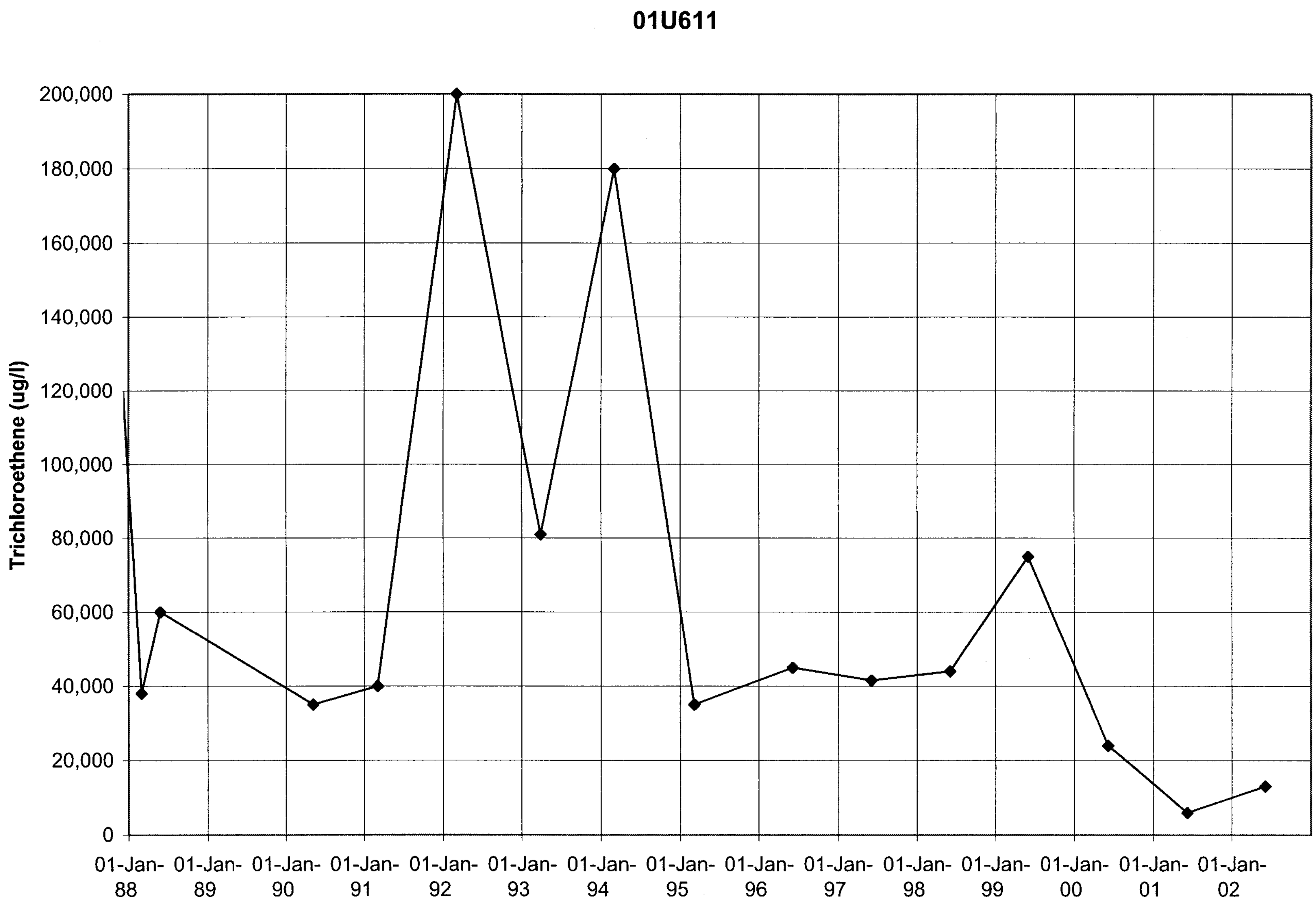
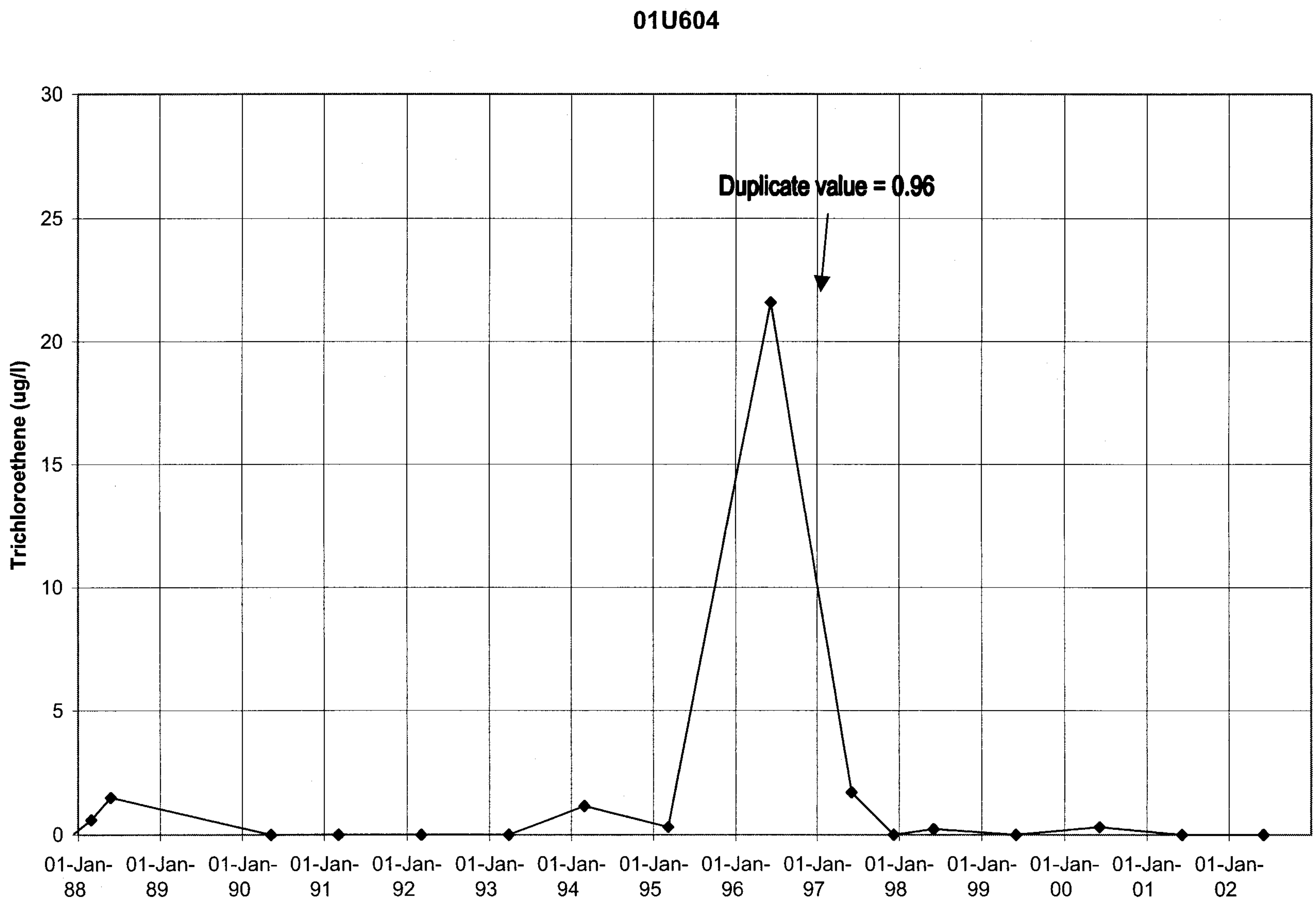
01U615



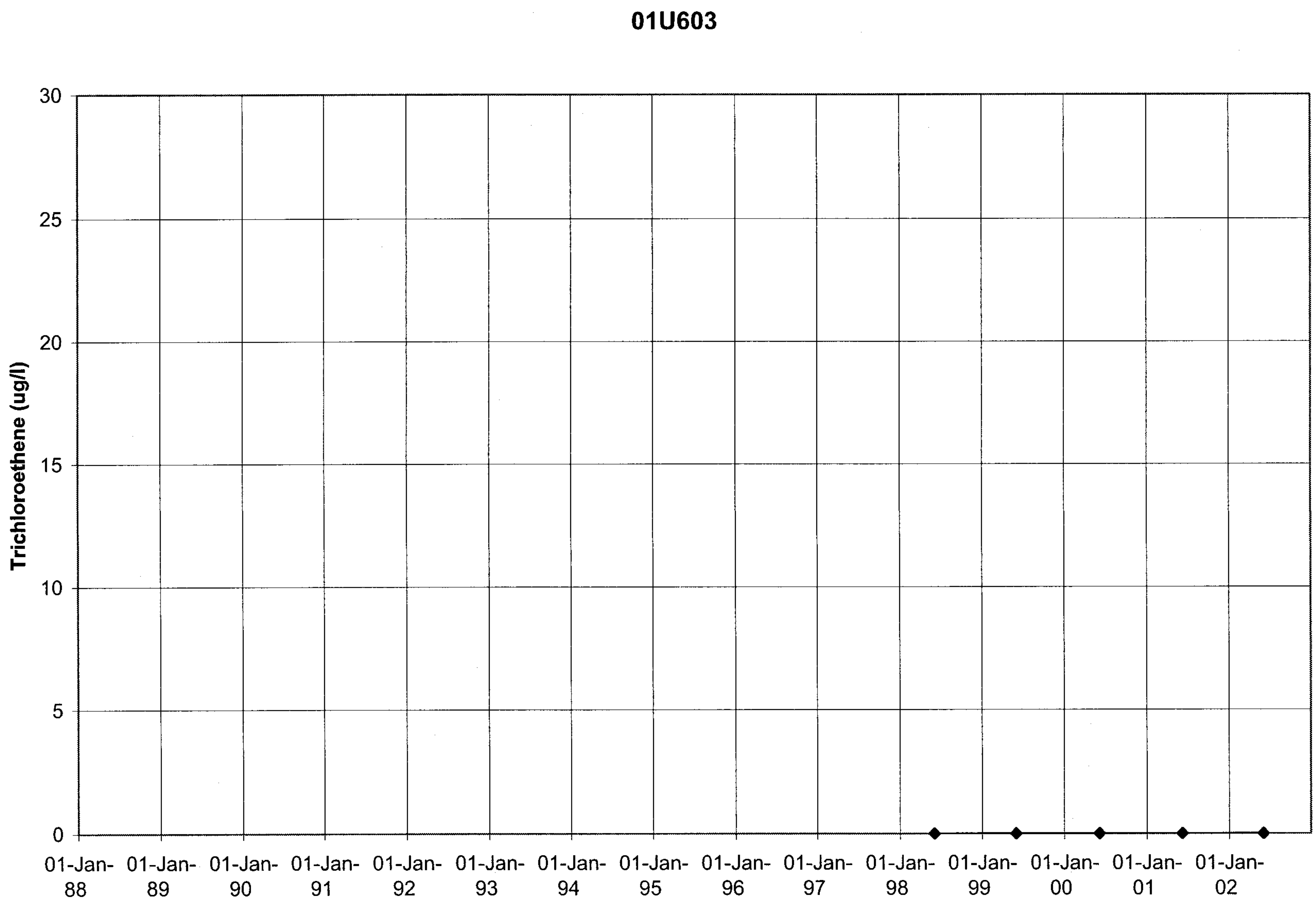
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



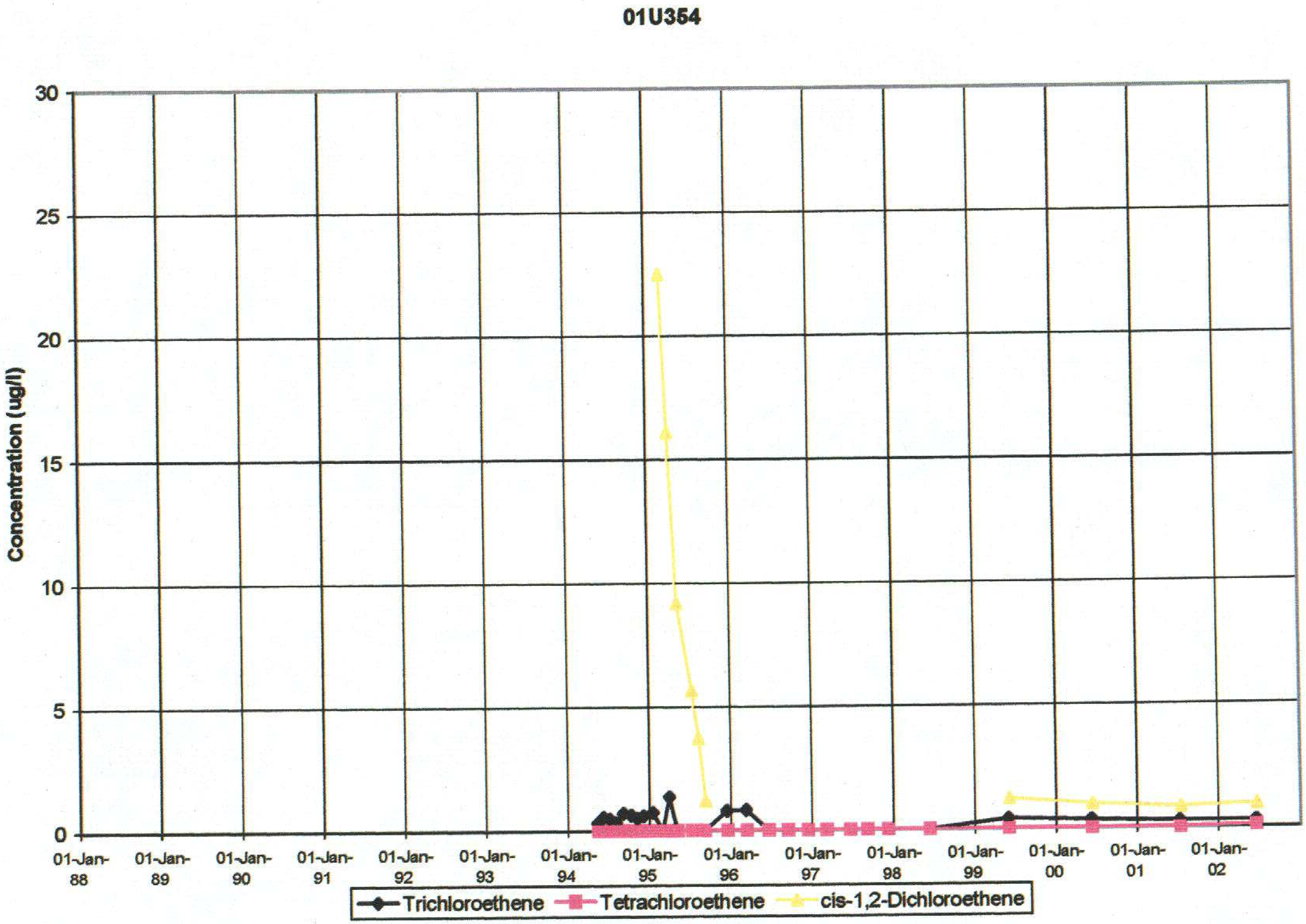
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



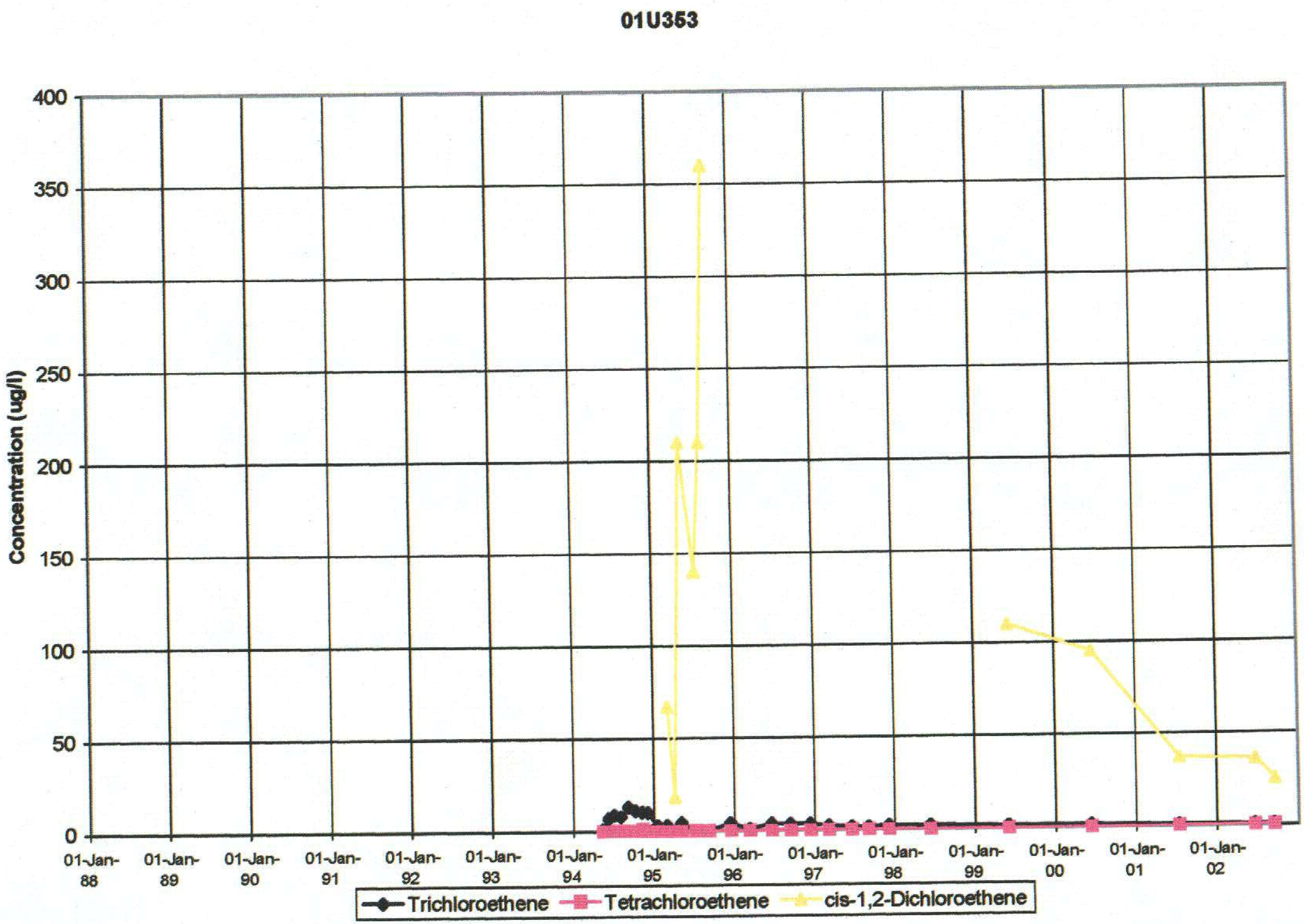
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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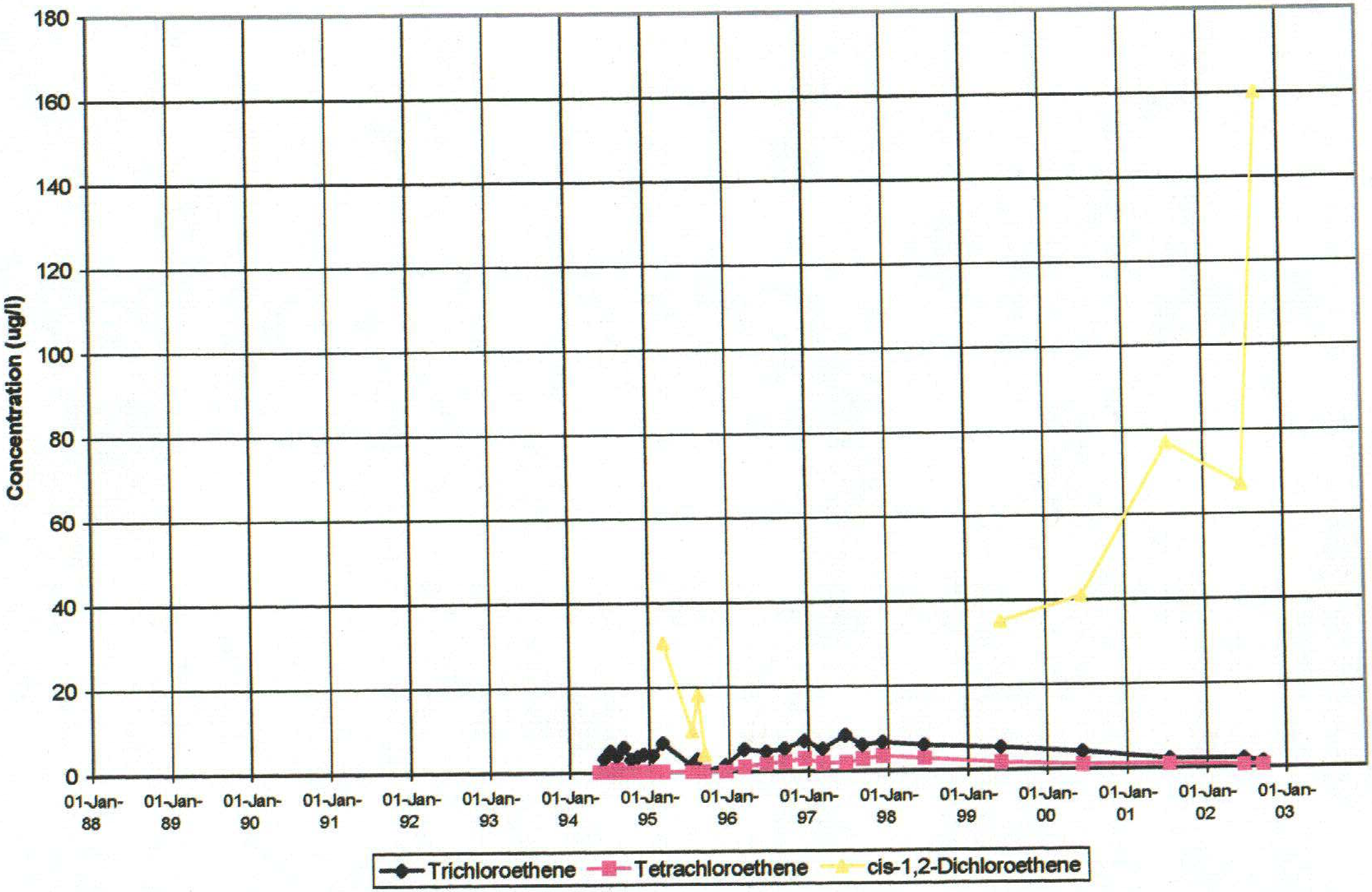
01U352



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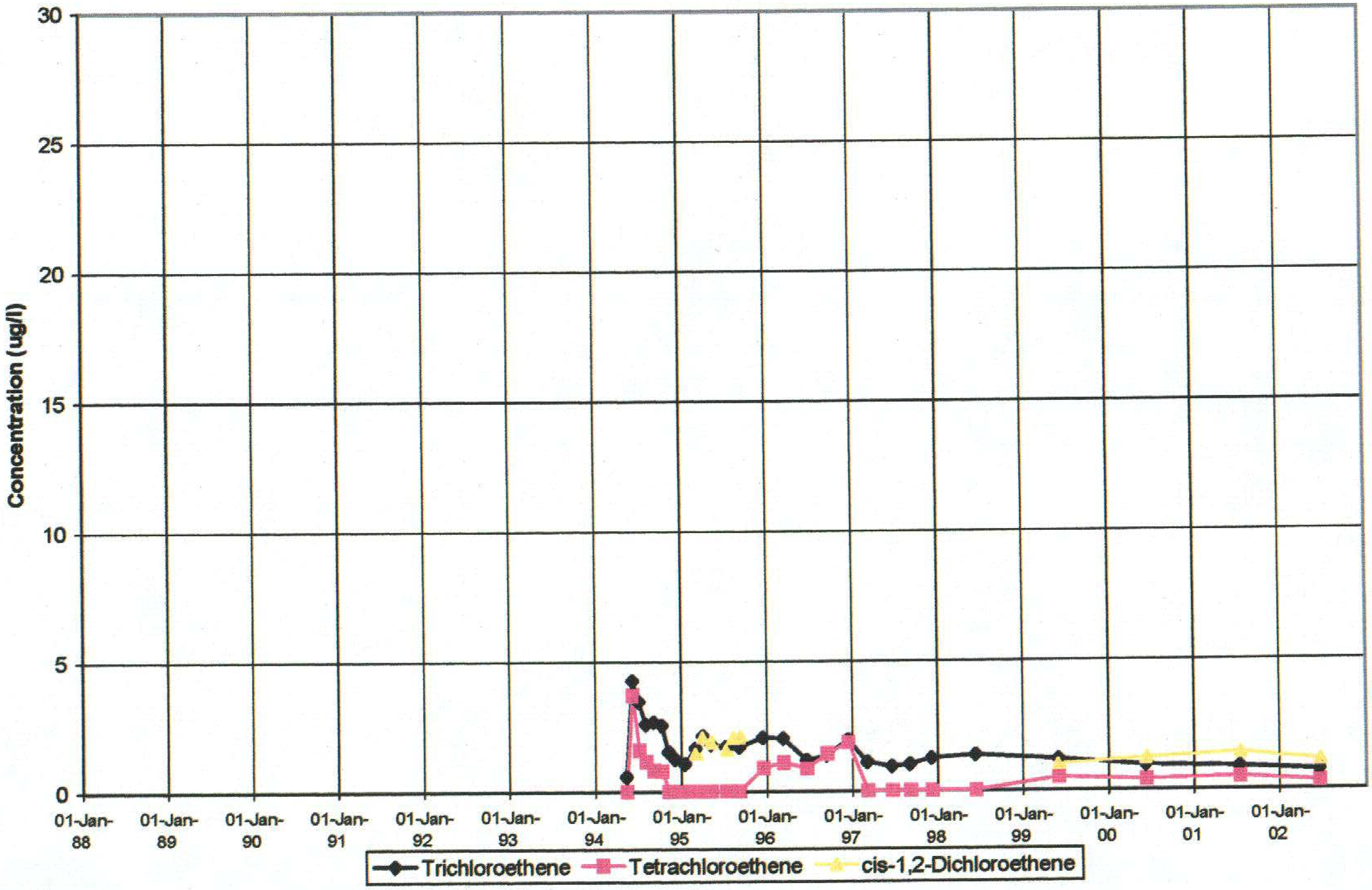
01U351



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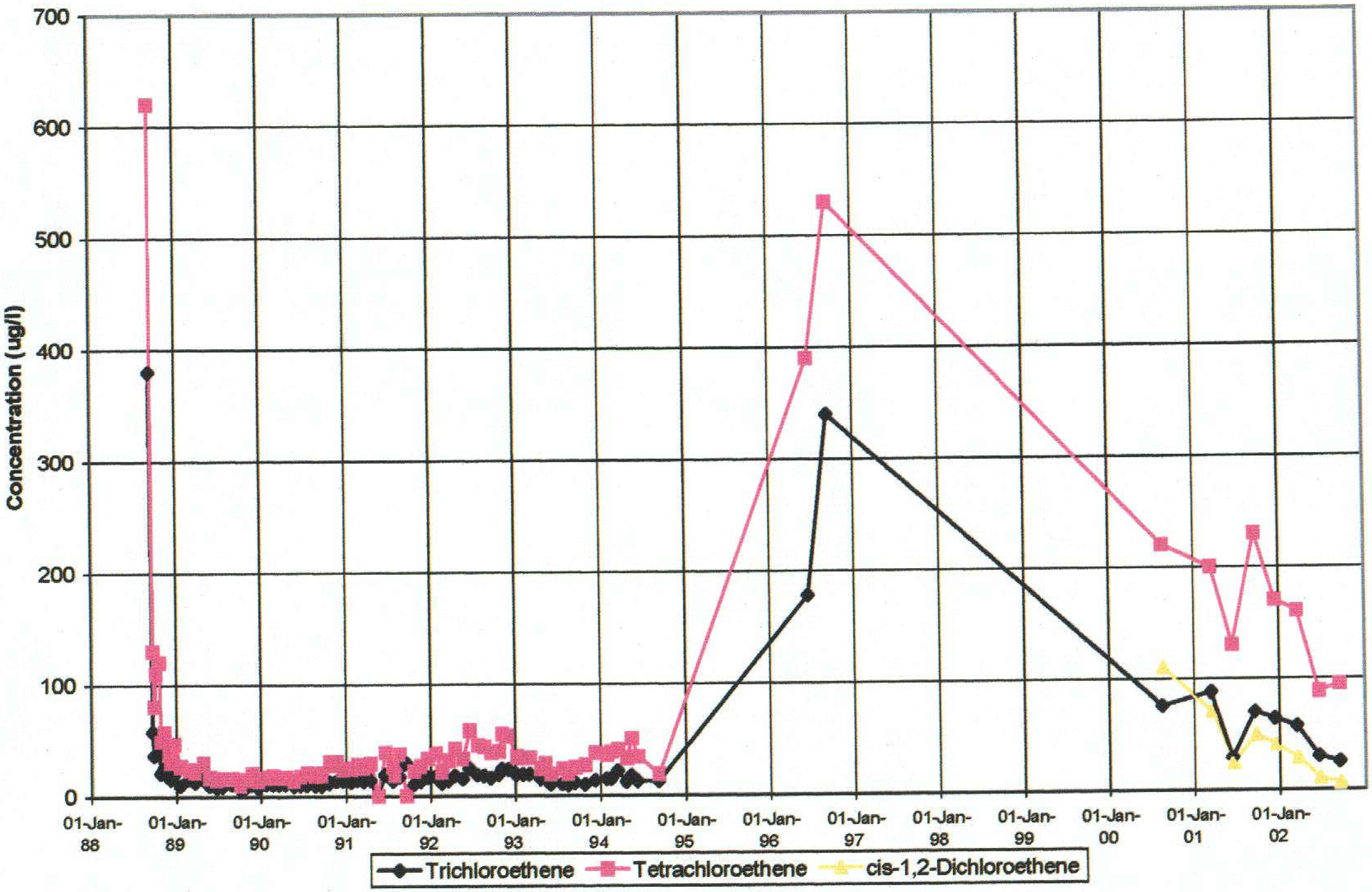
01U350



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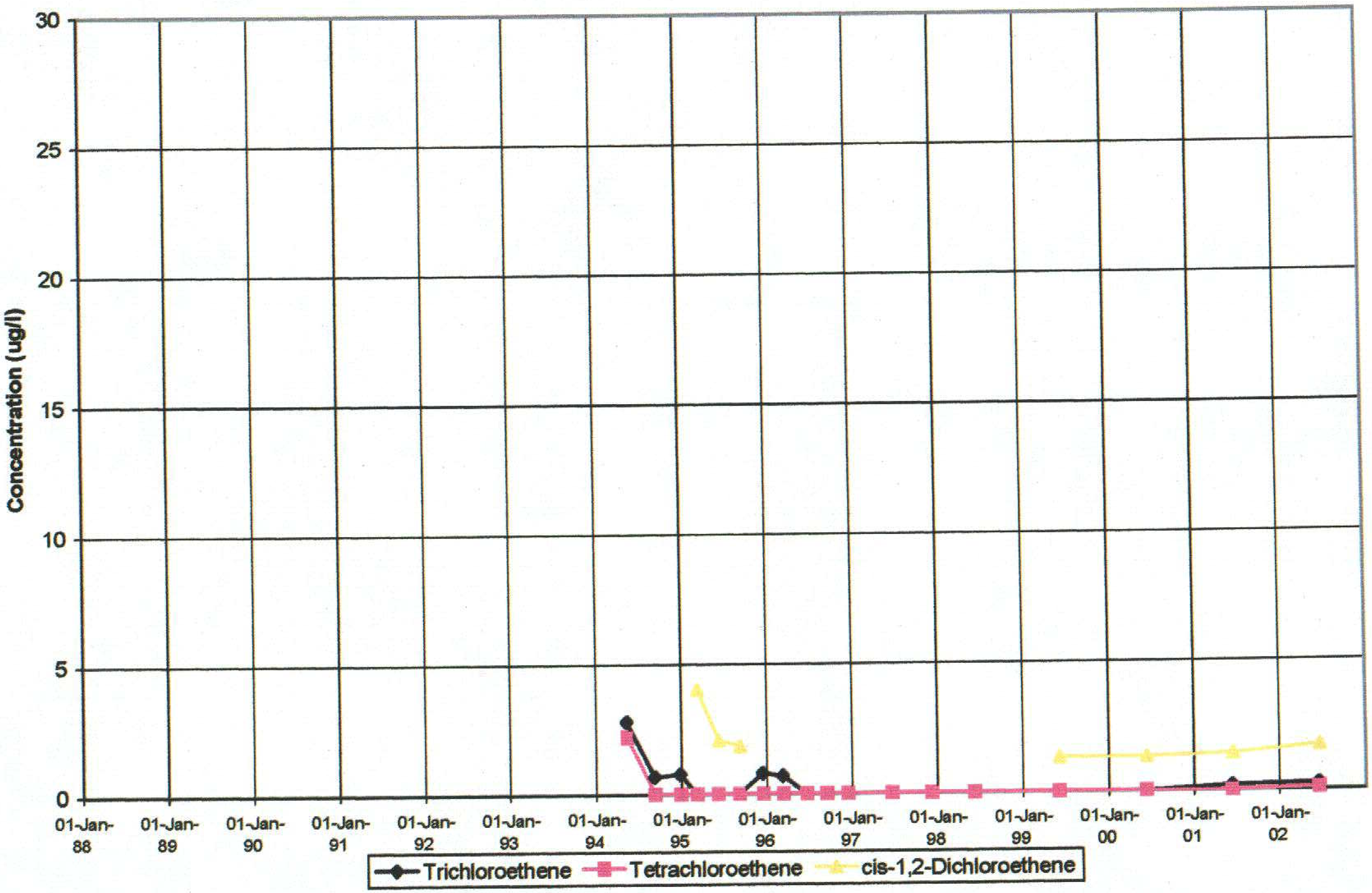
01U158



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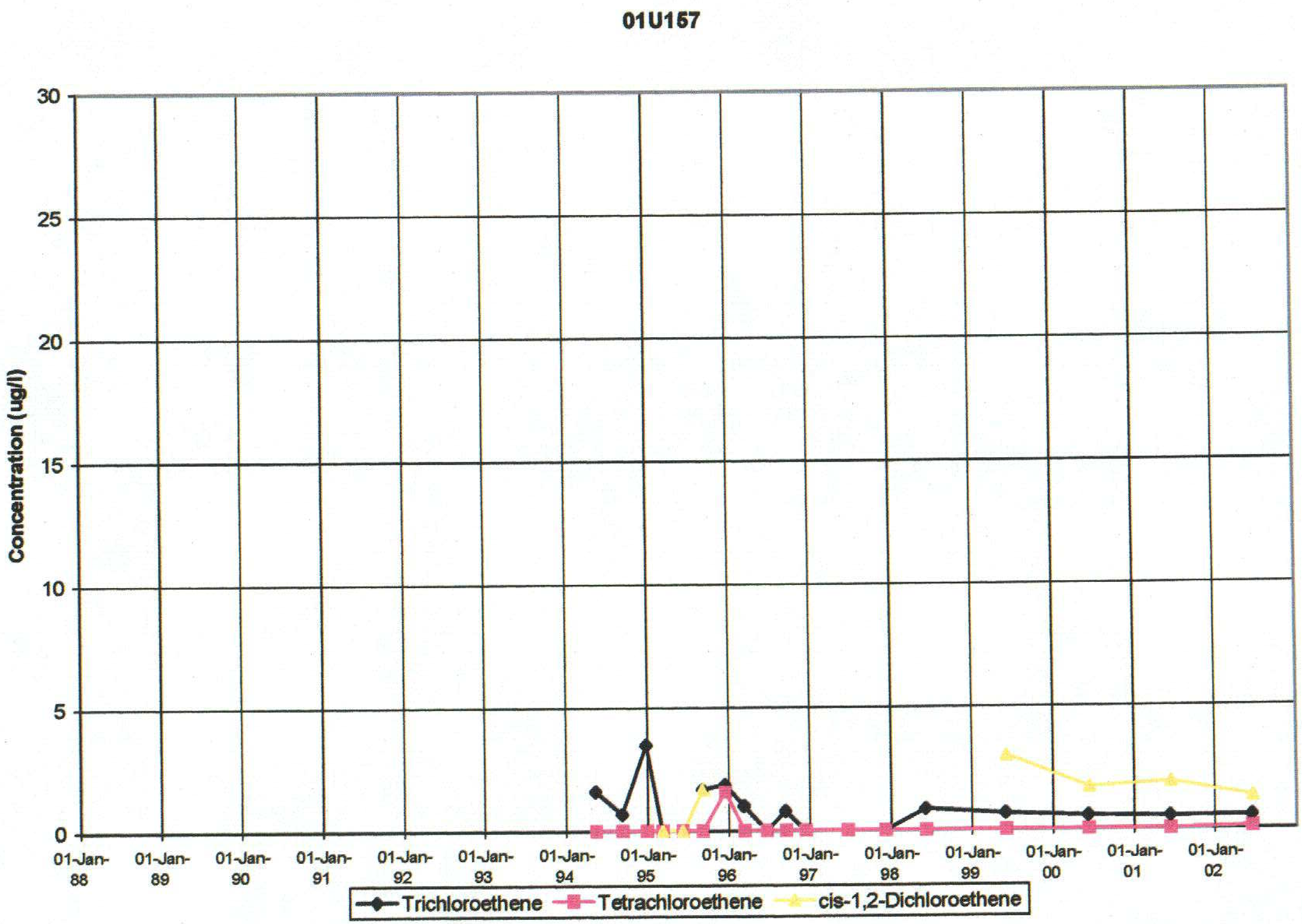

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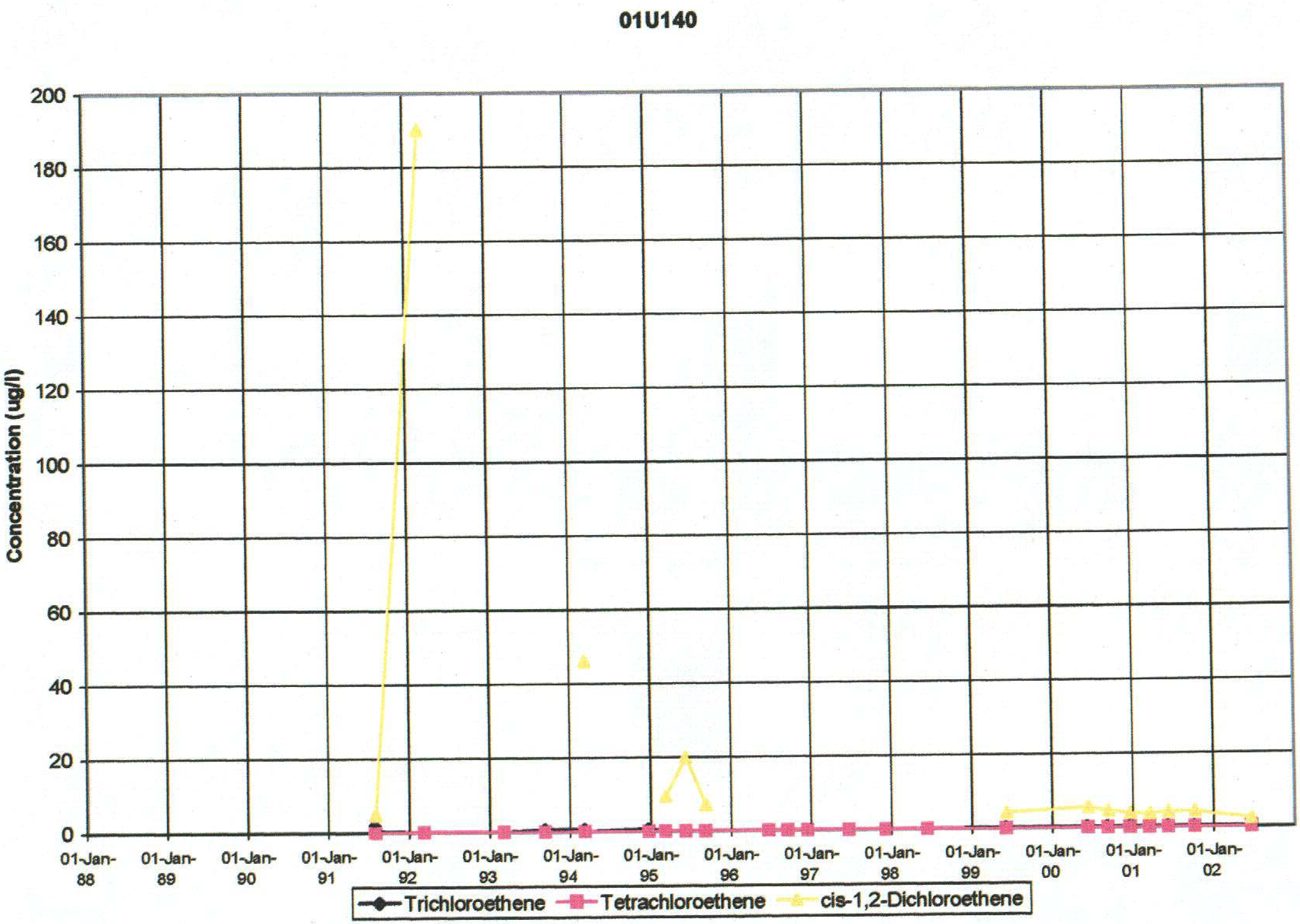

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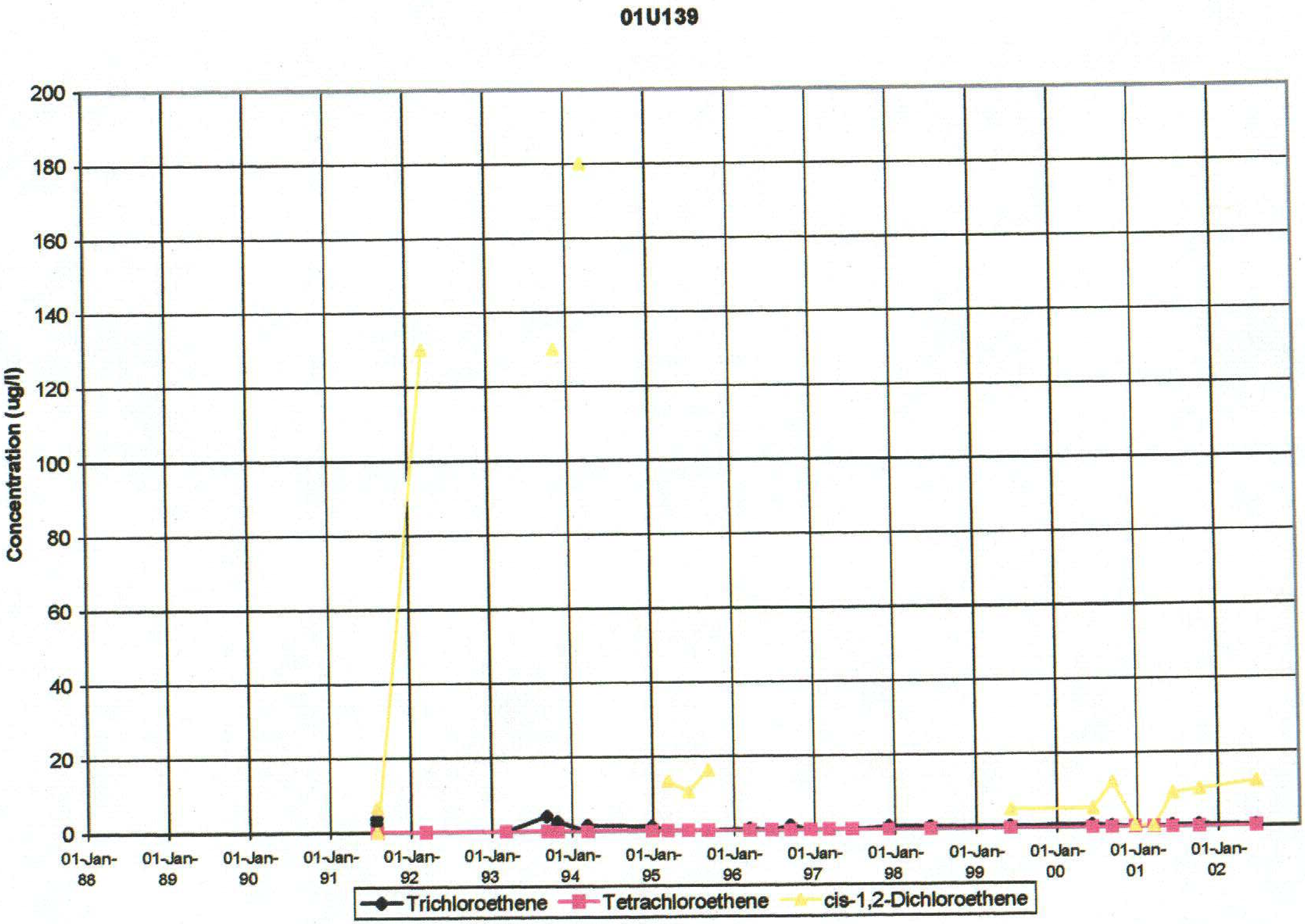

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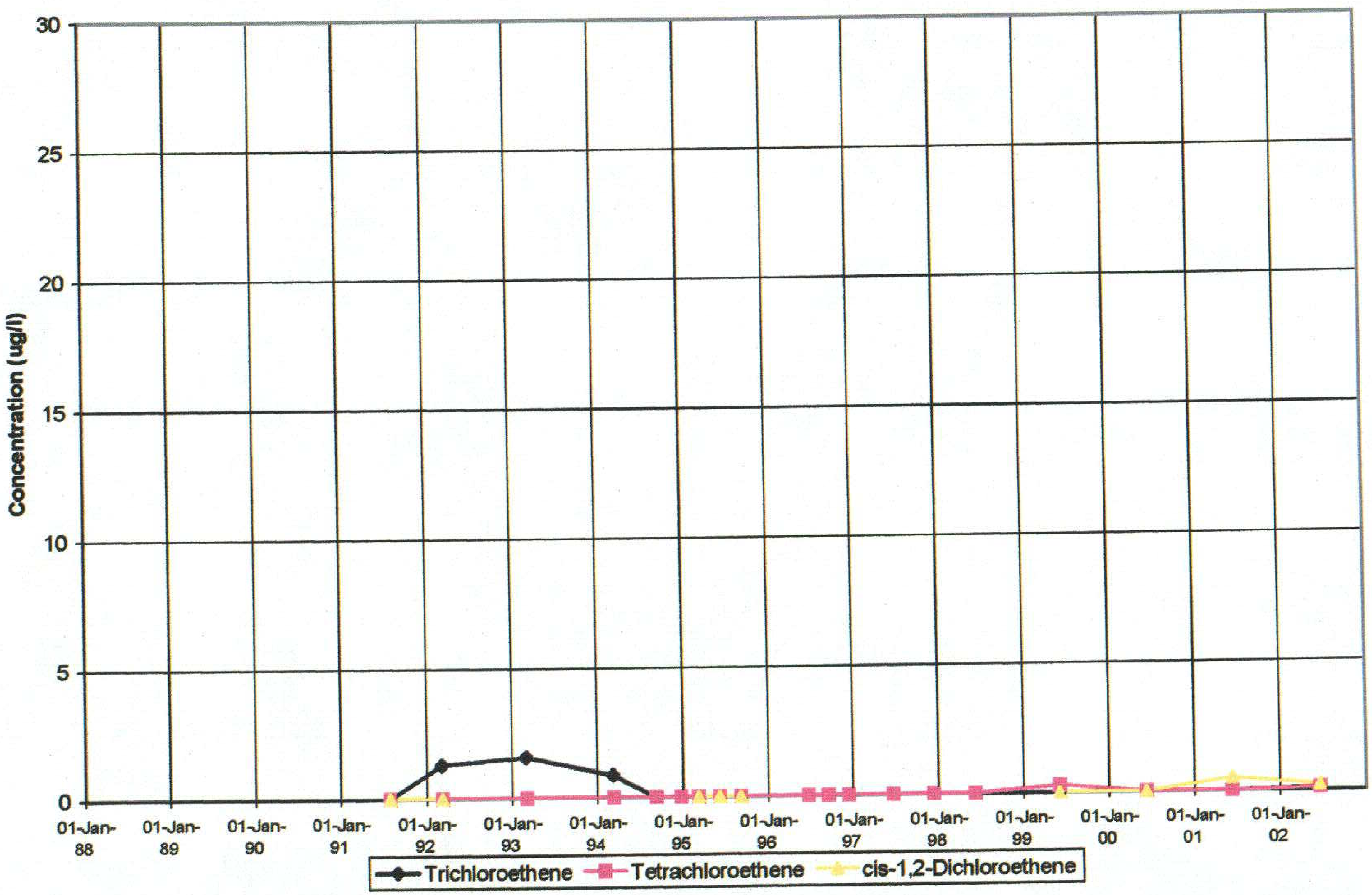
01U138



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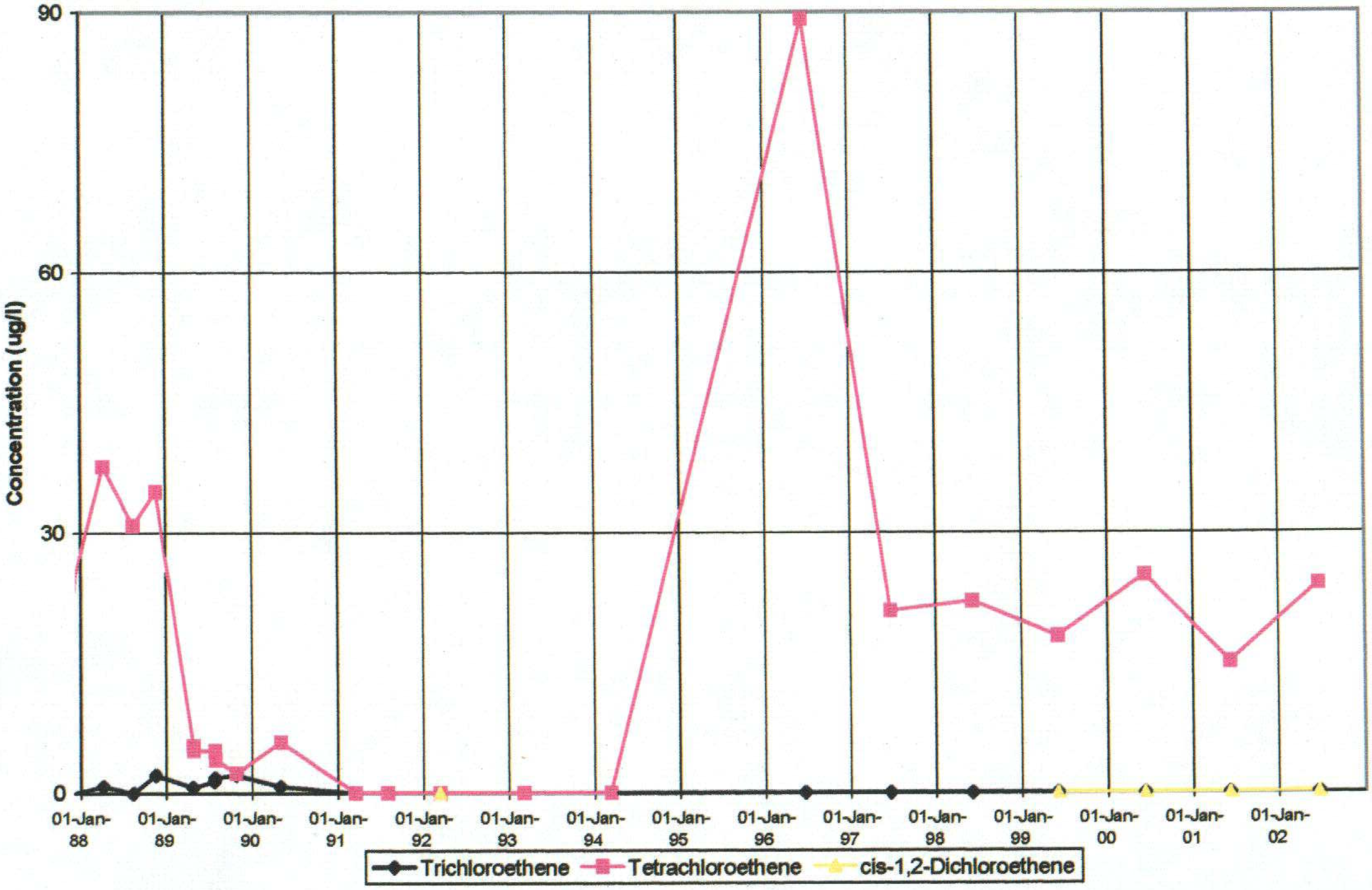
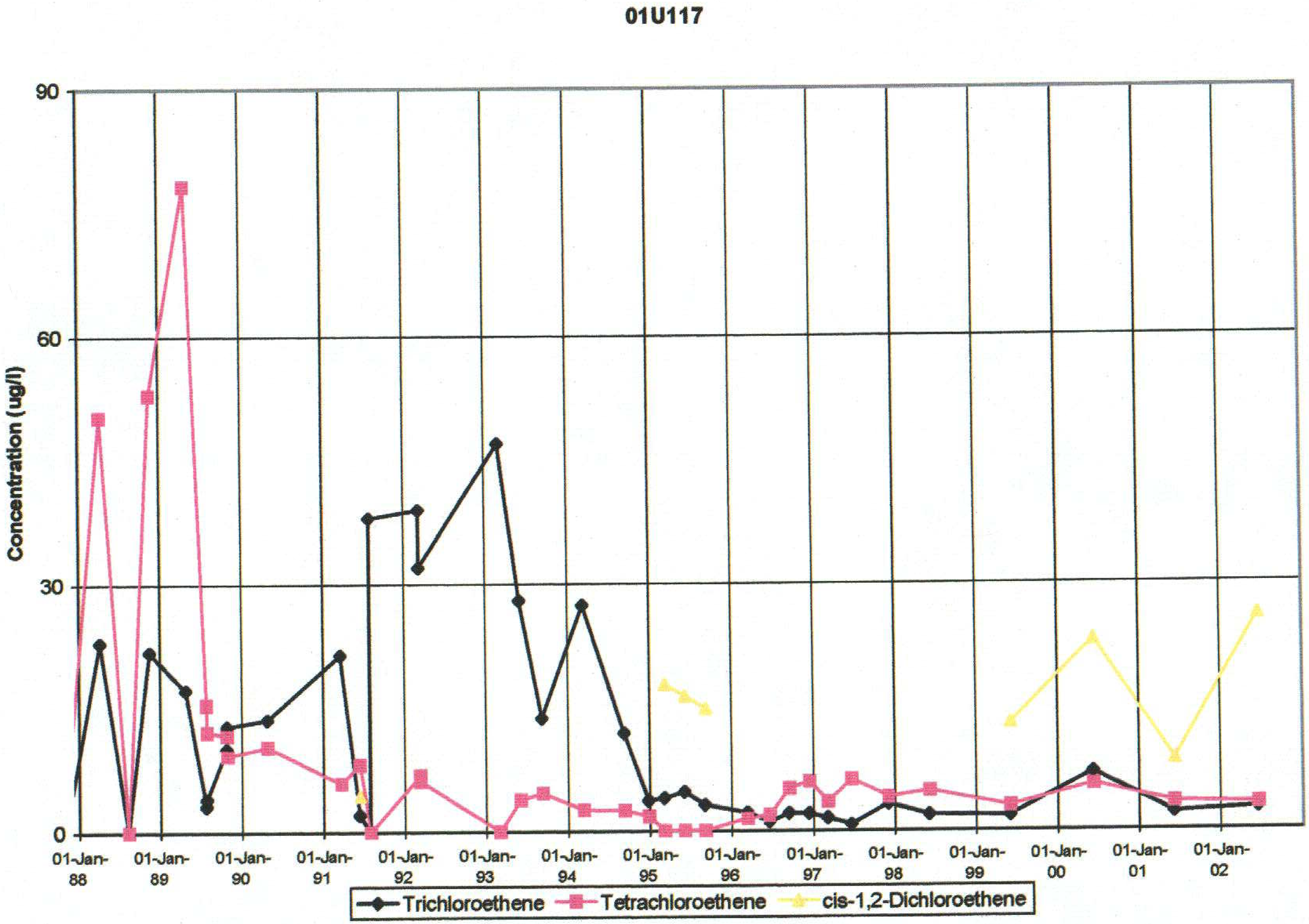
01U126

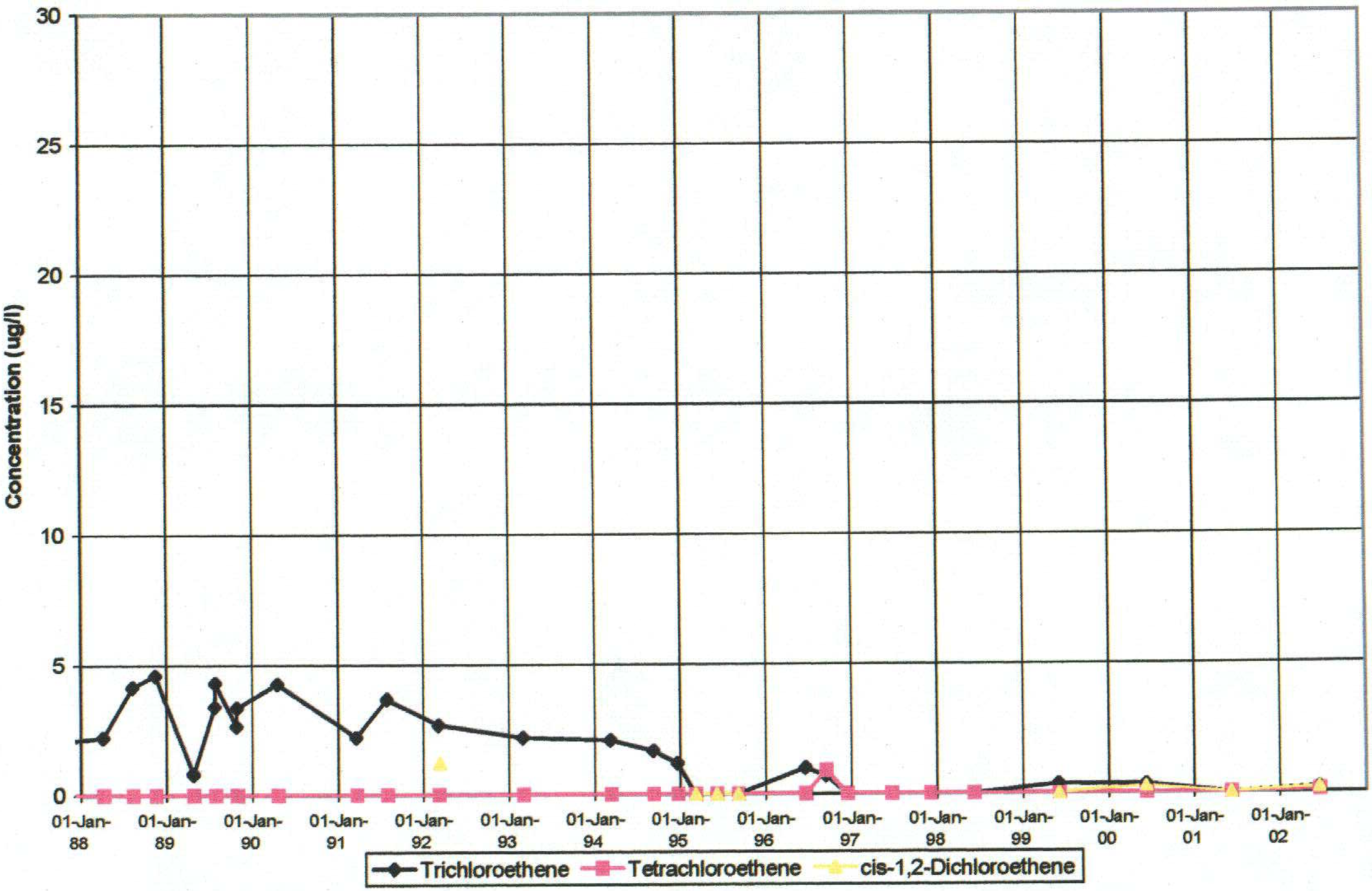


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



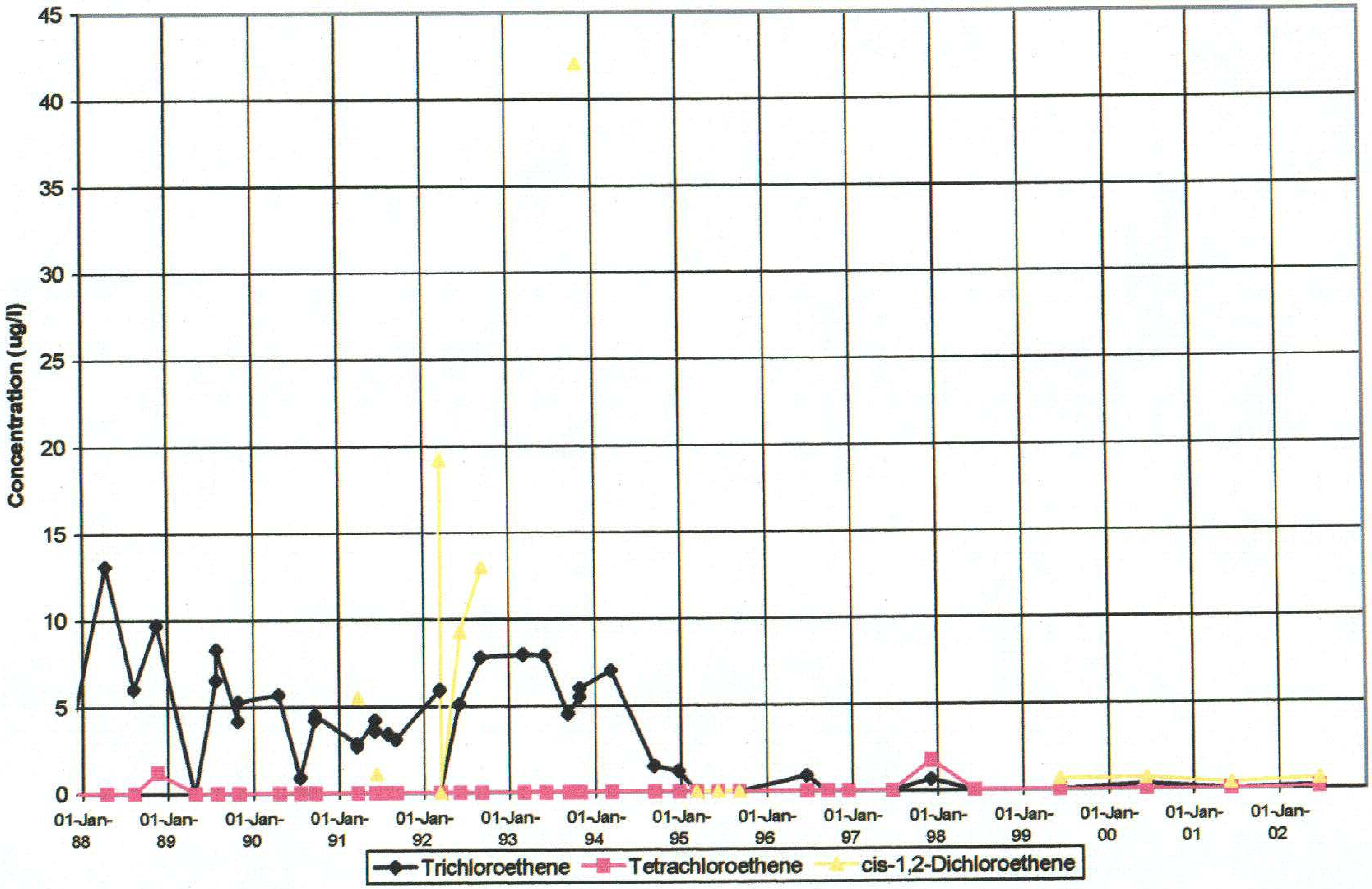
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U116



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U115



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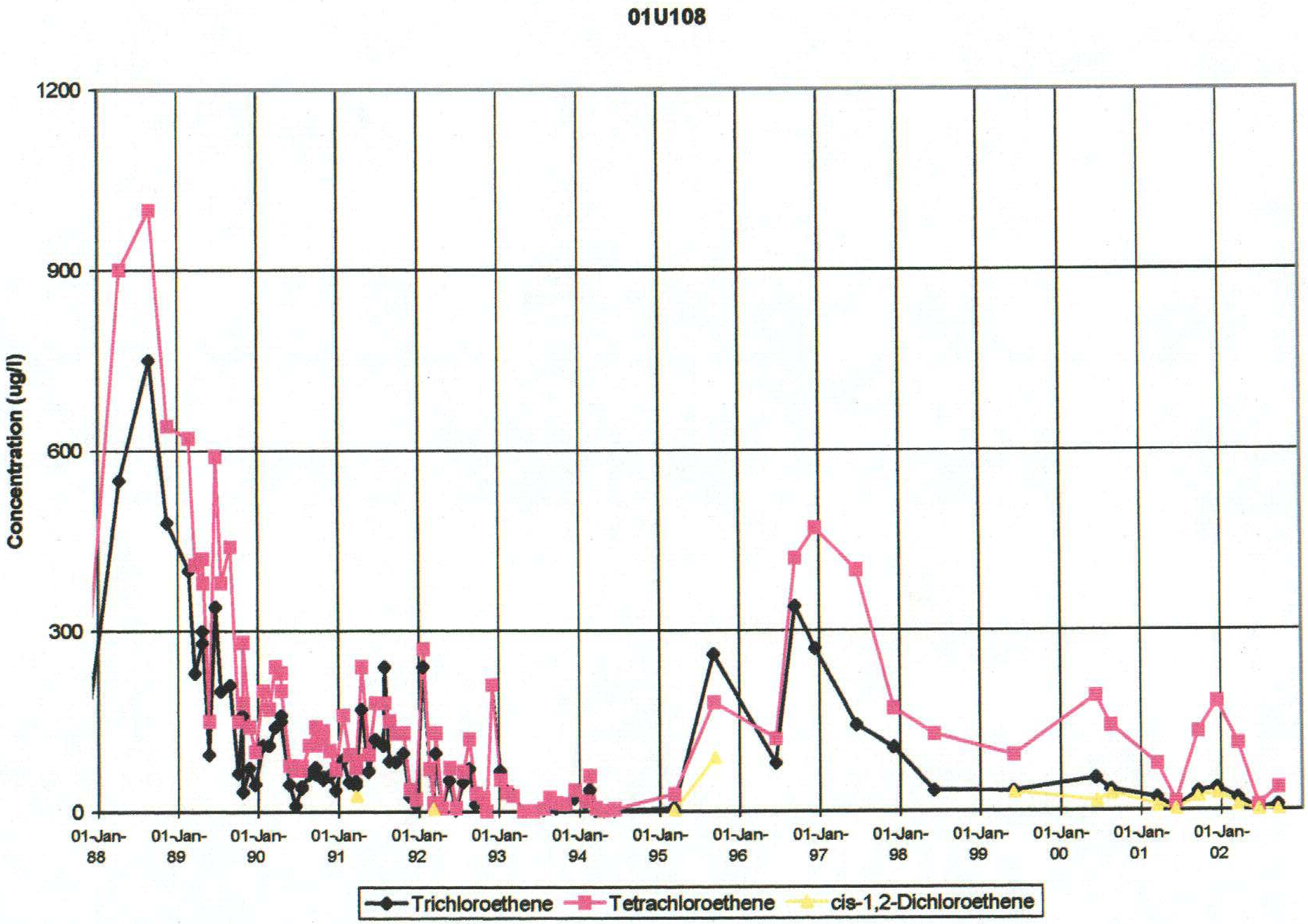
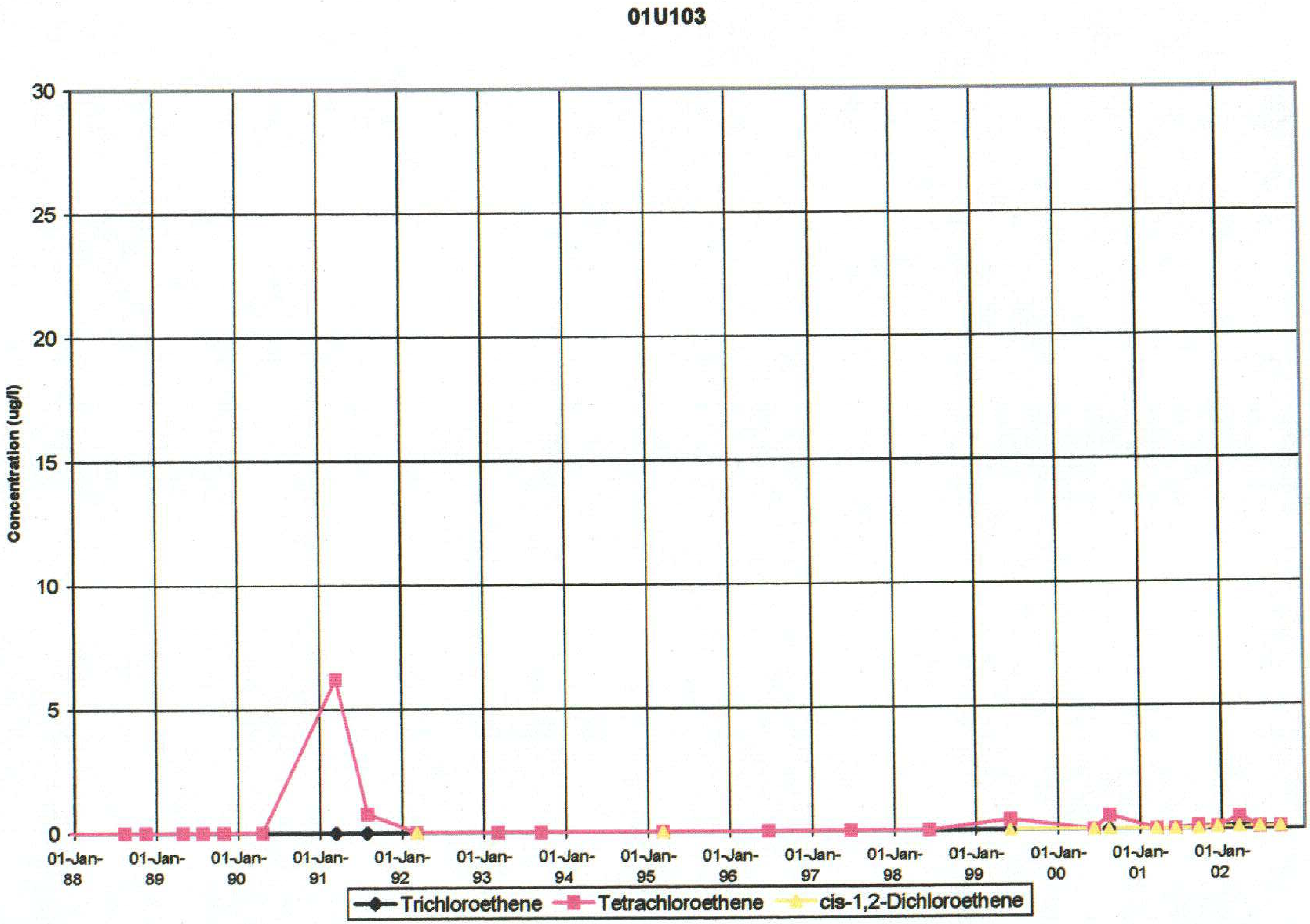
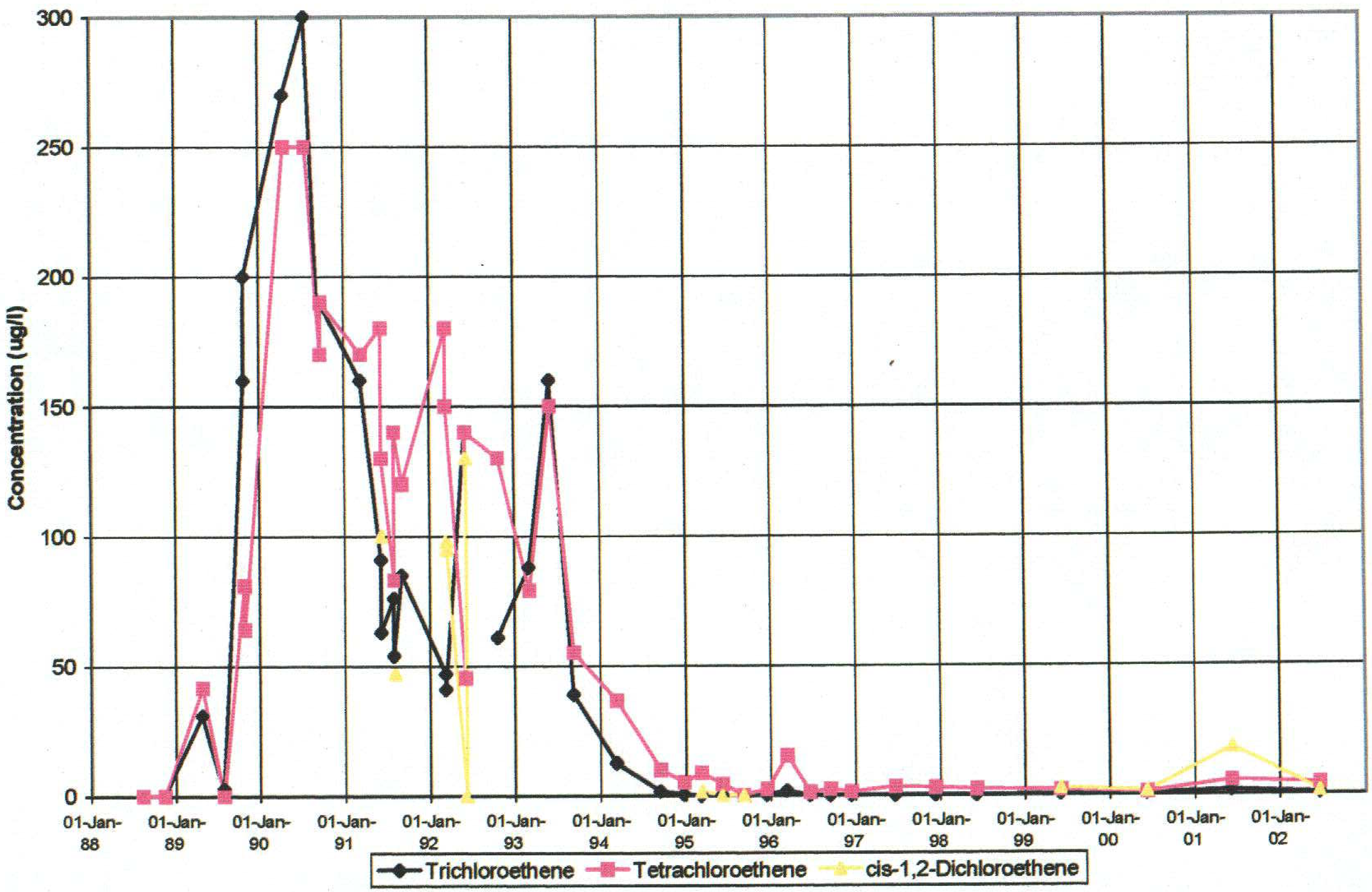


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



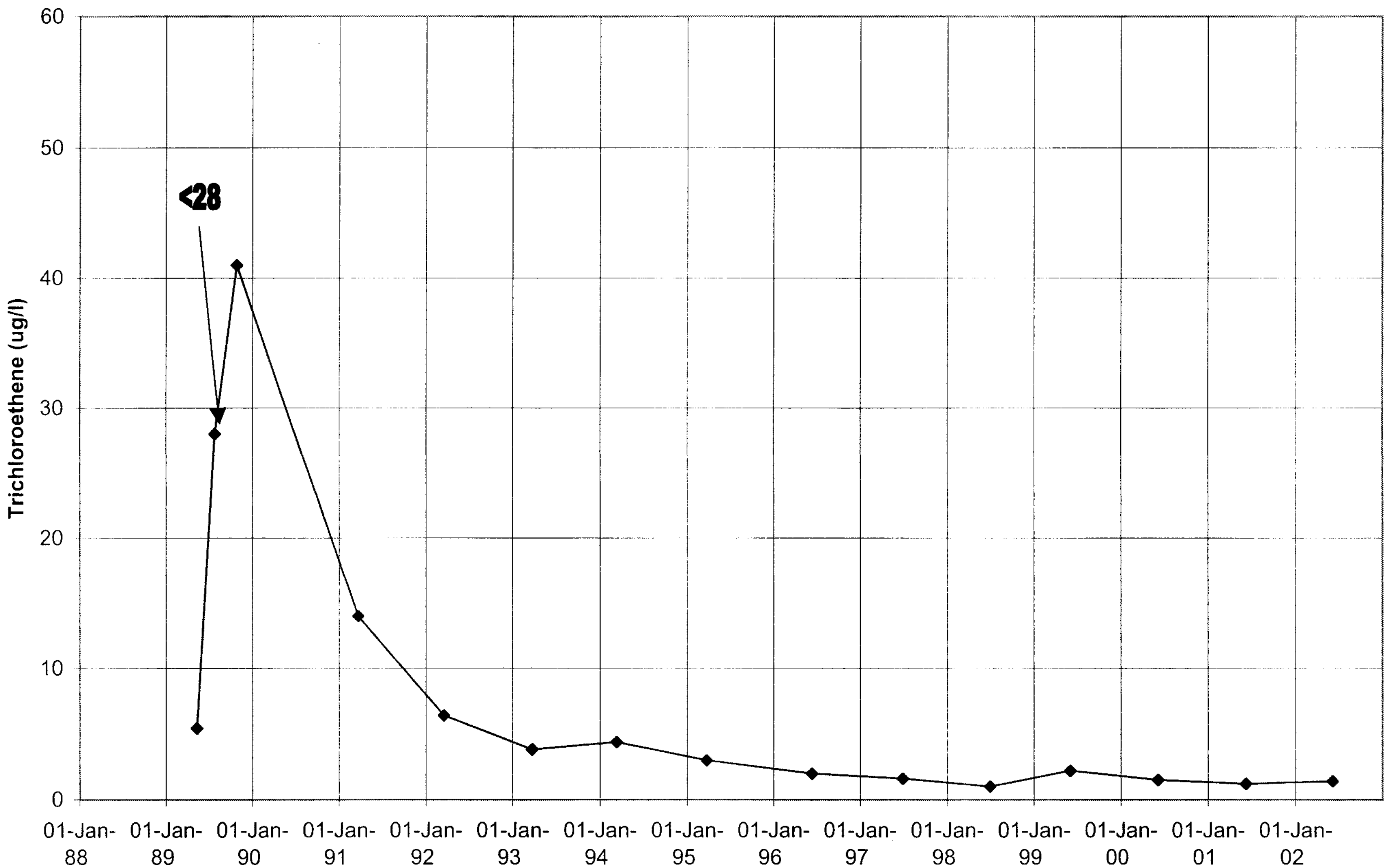
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U102



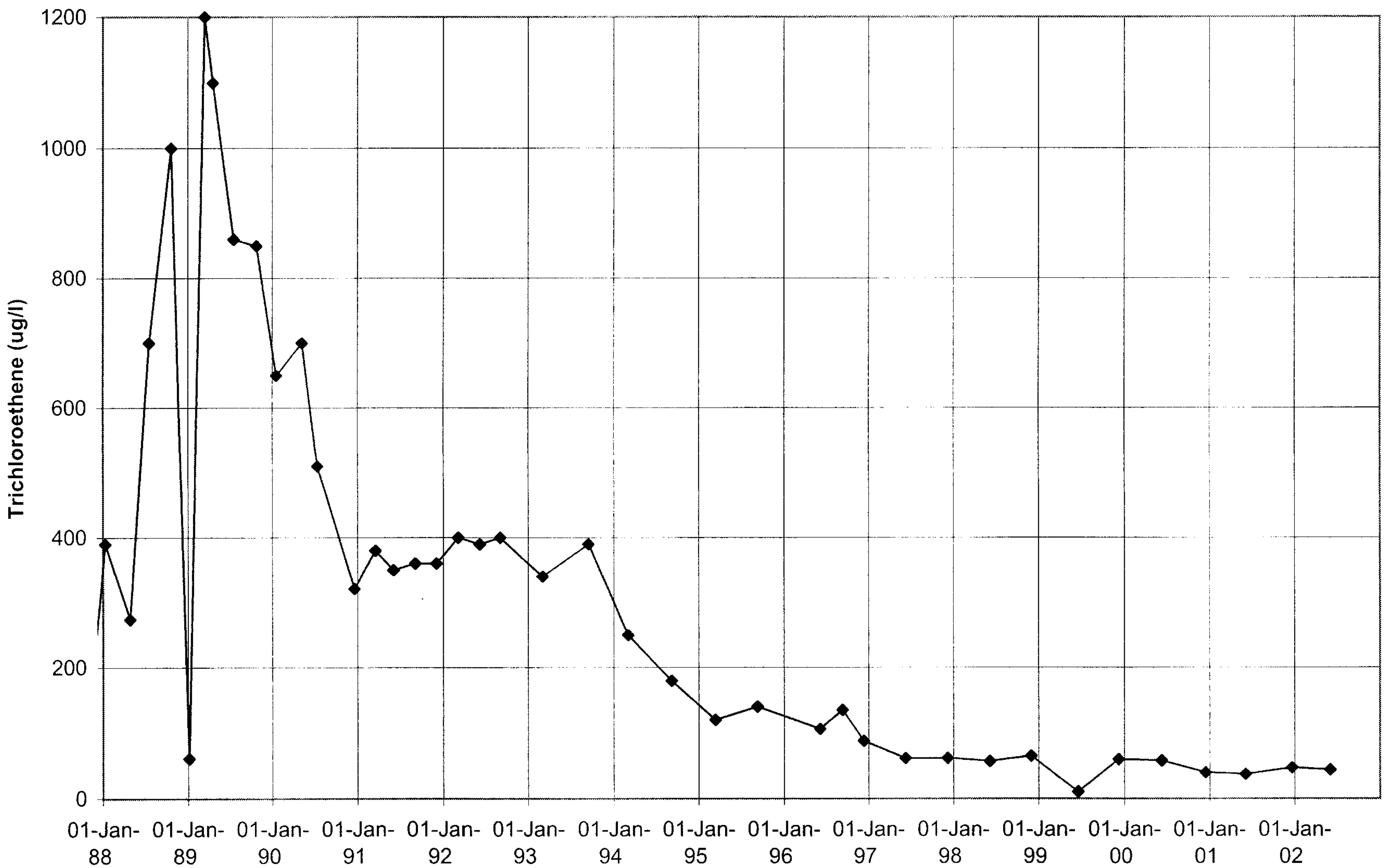
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U064



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03F303



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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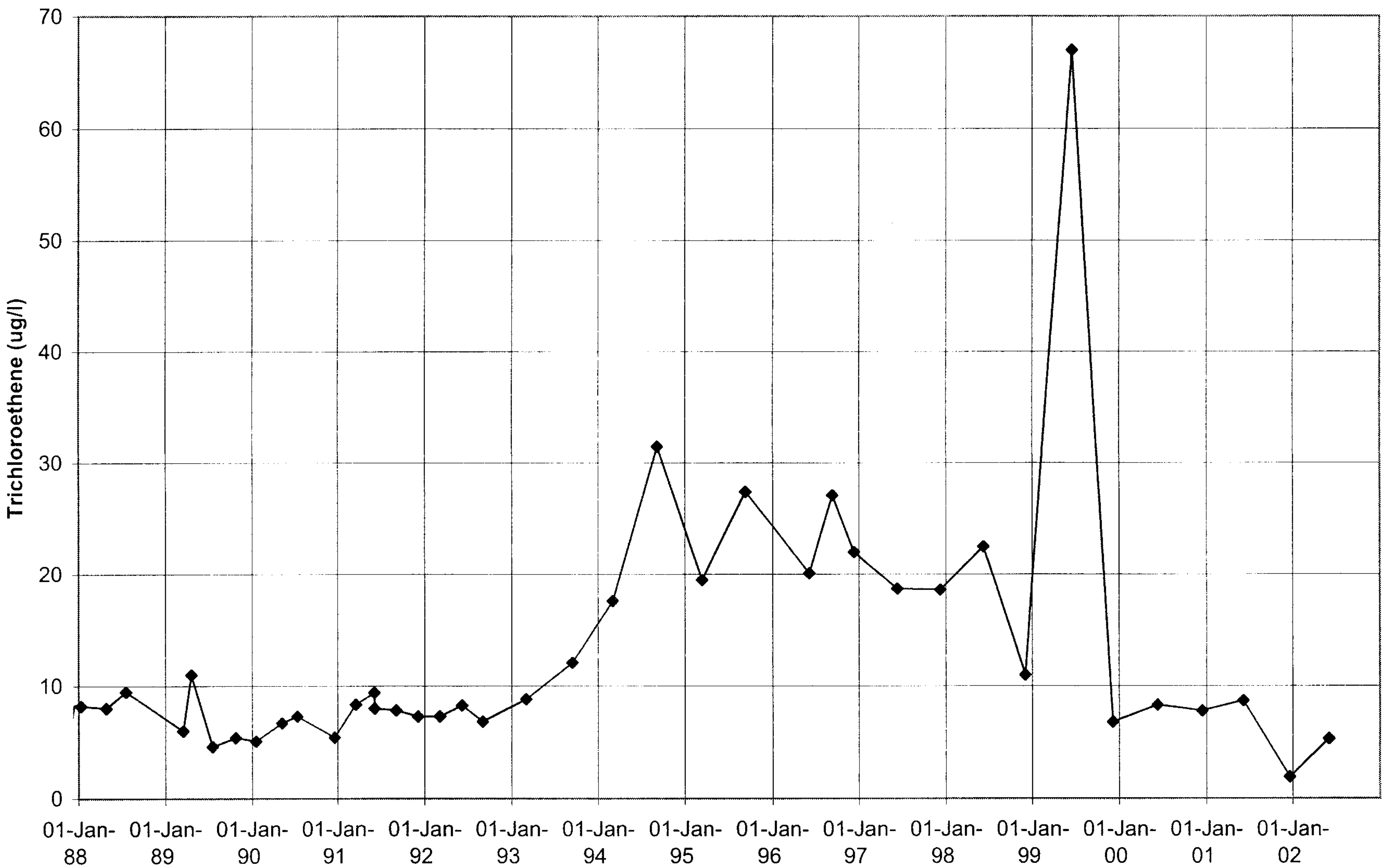
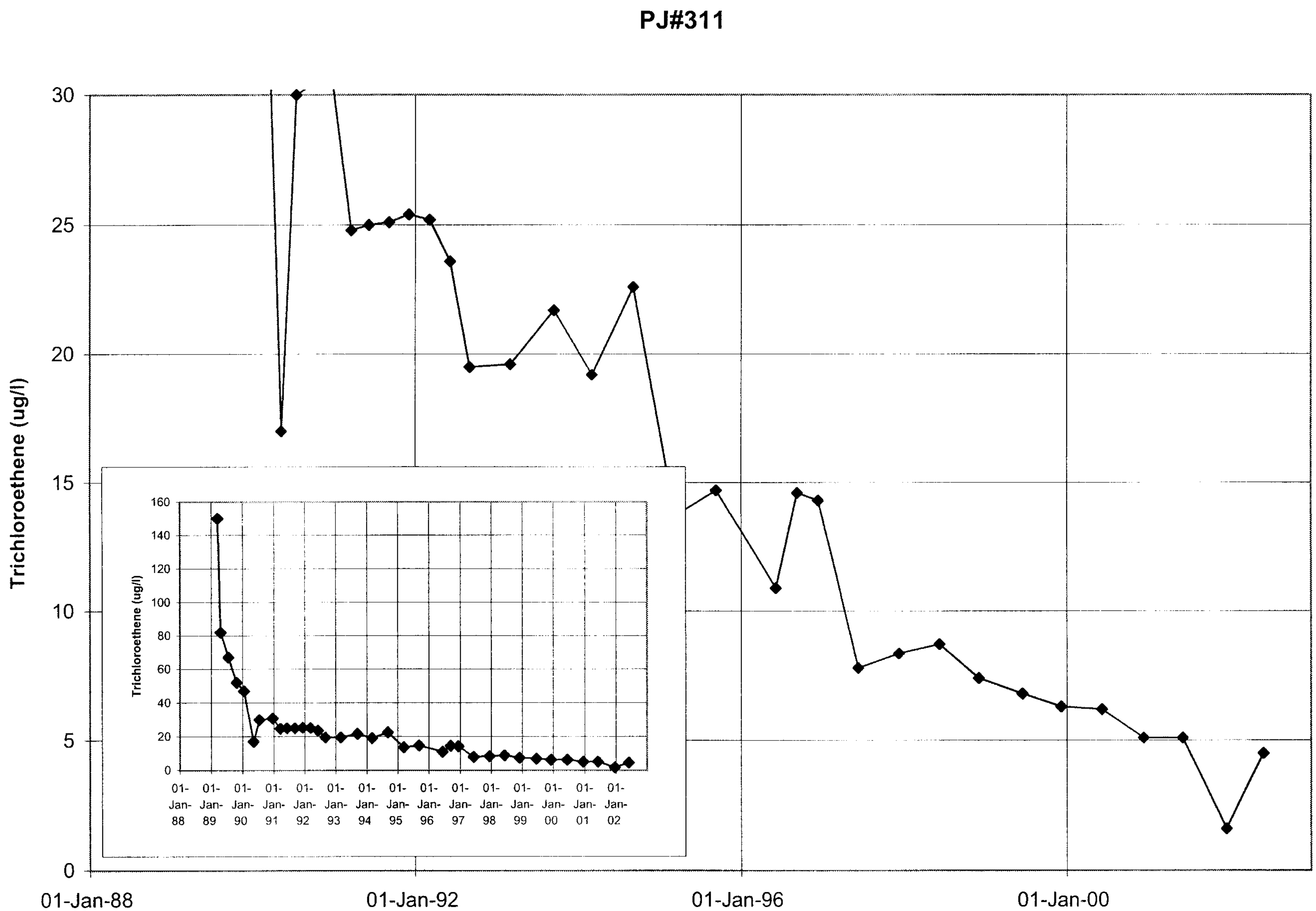
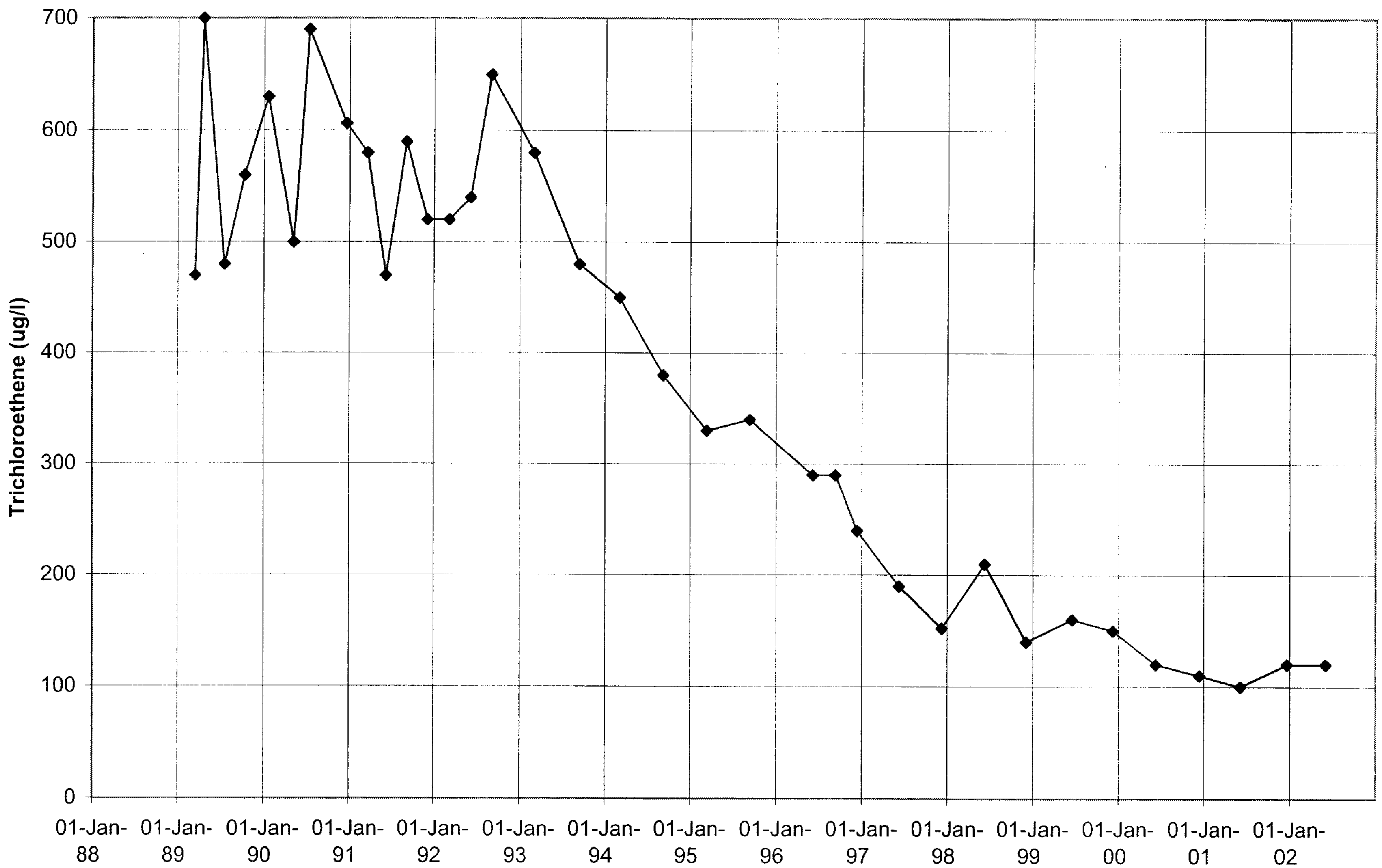


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

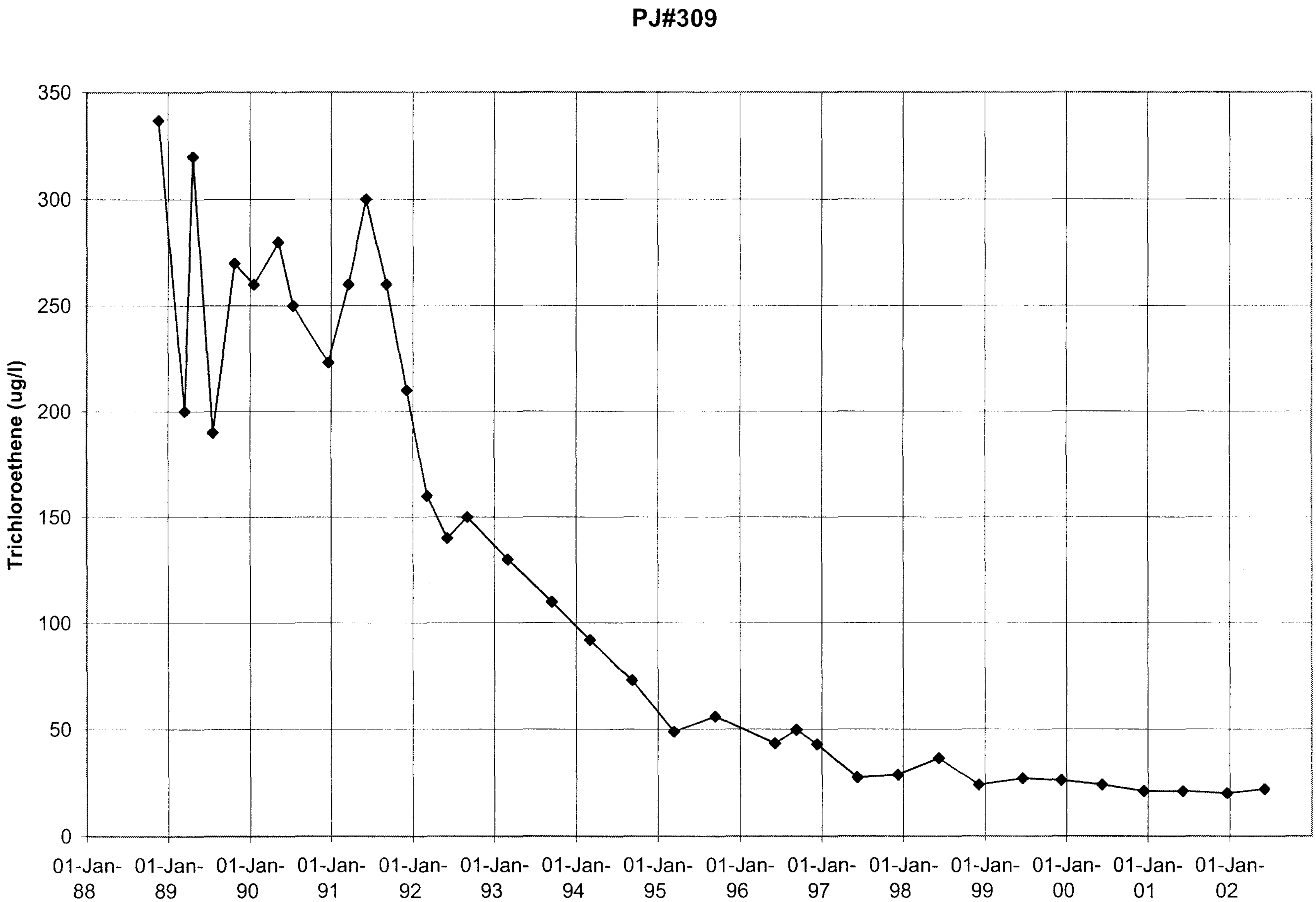


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

PJ#310



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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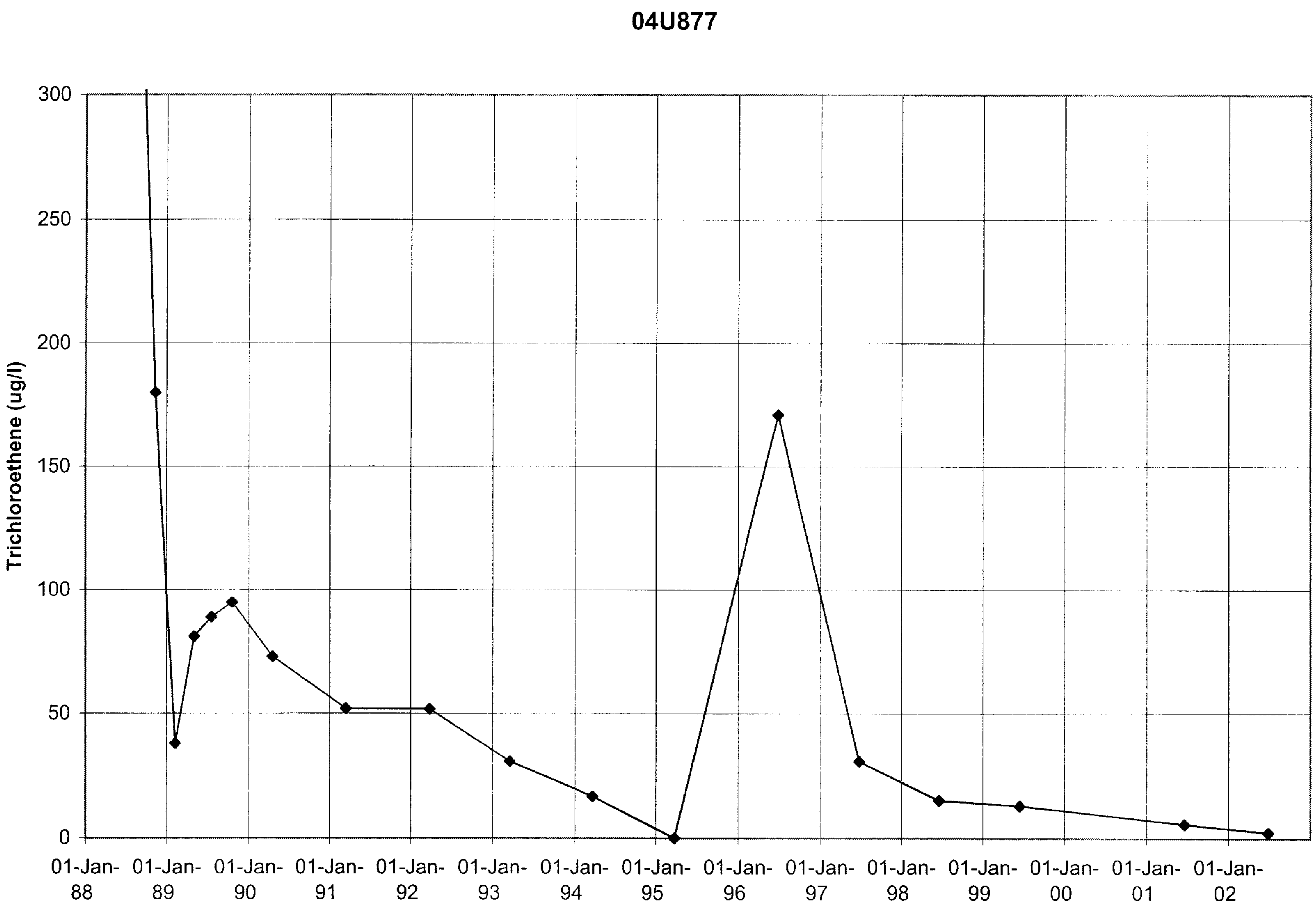

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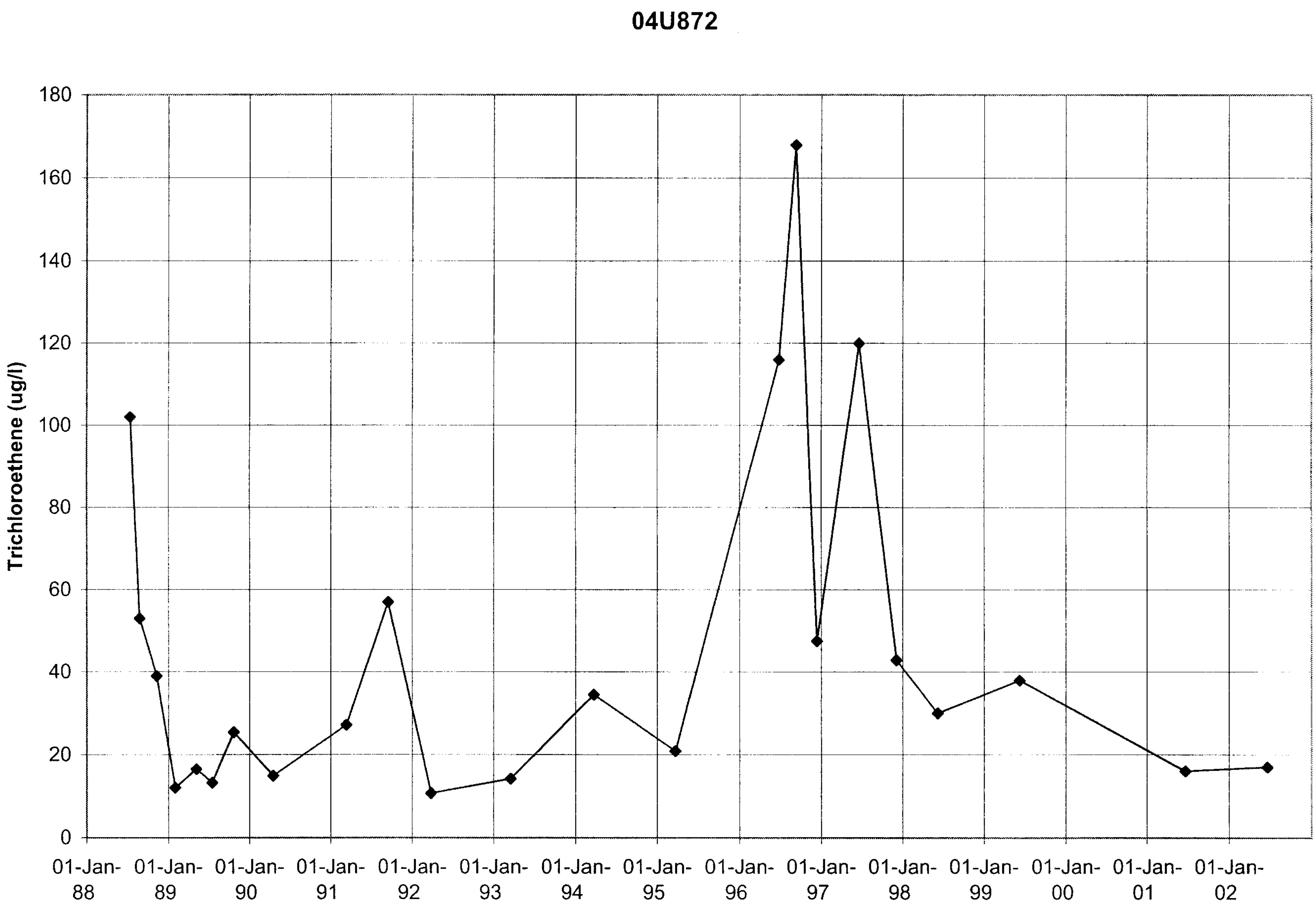

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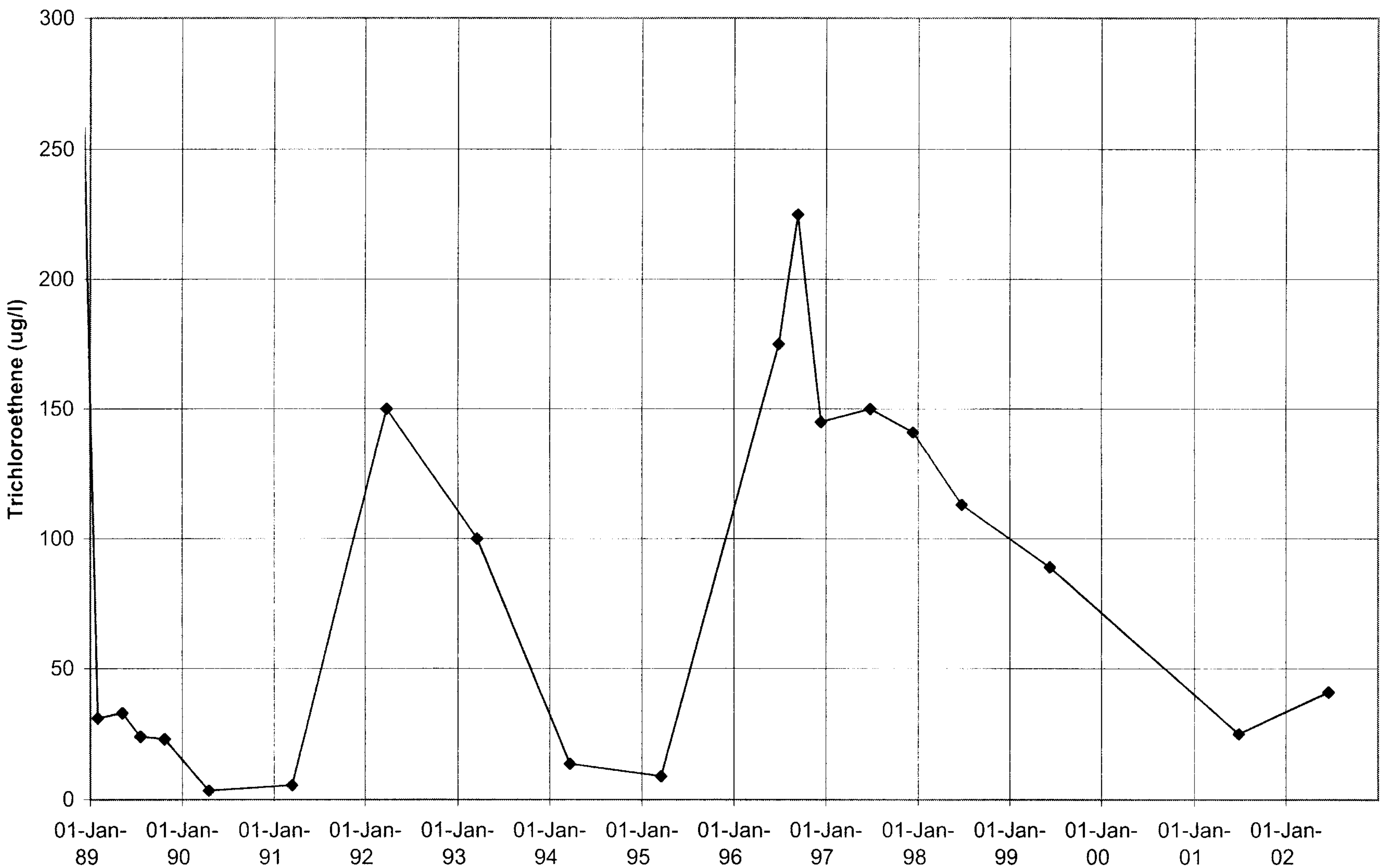
04U871



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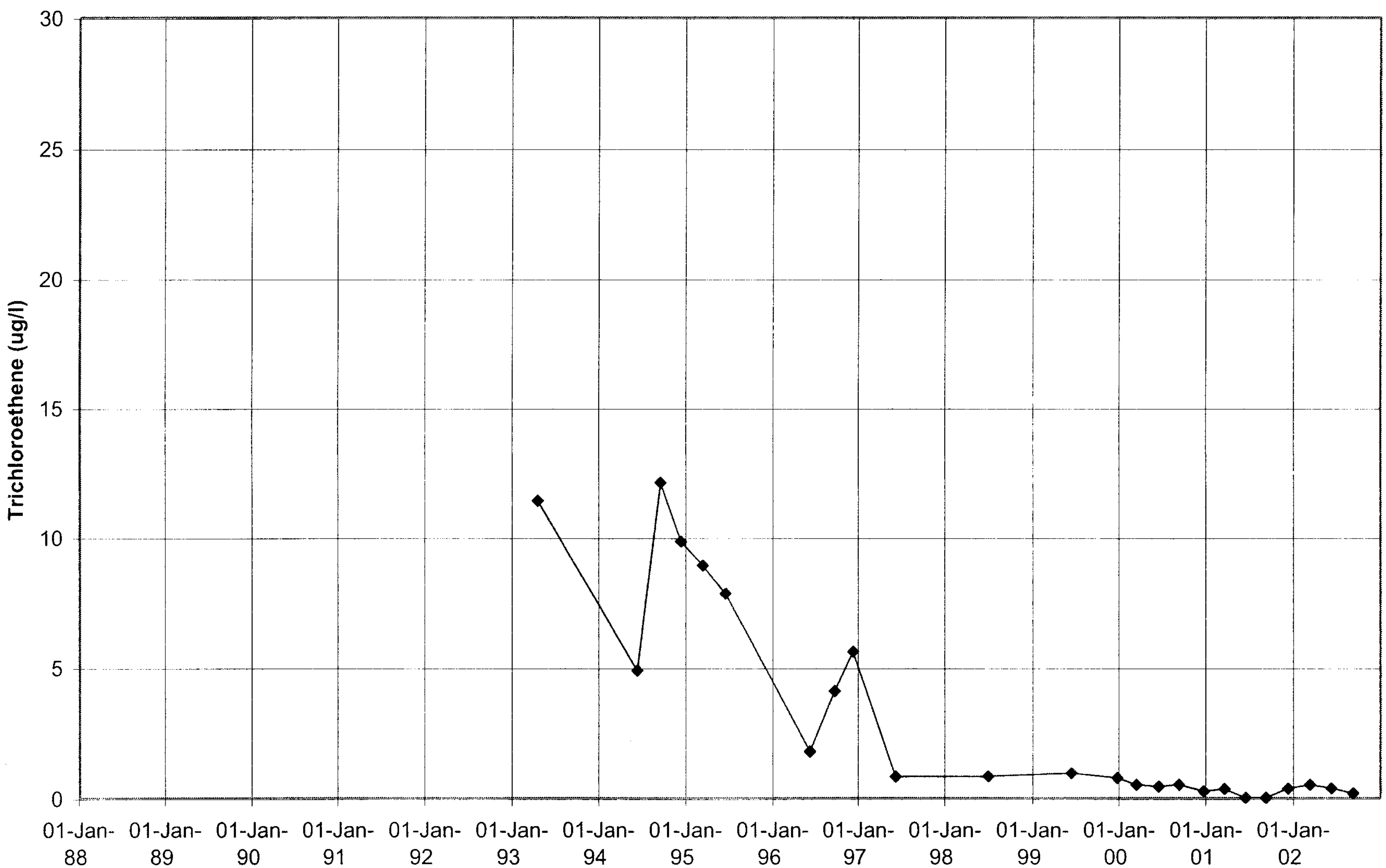
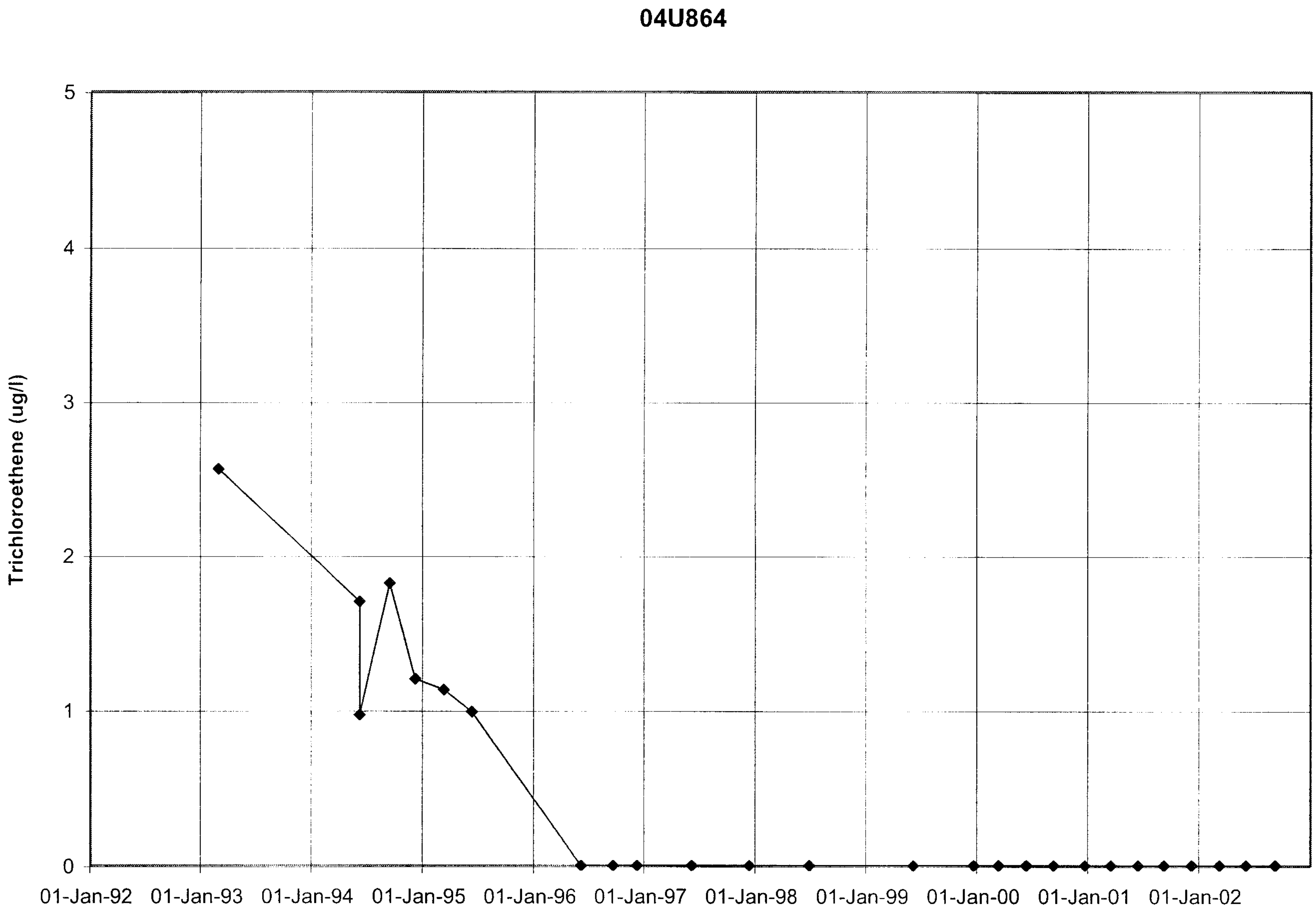
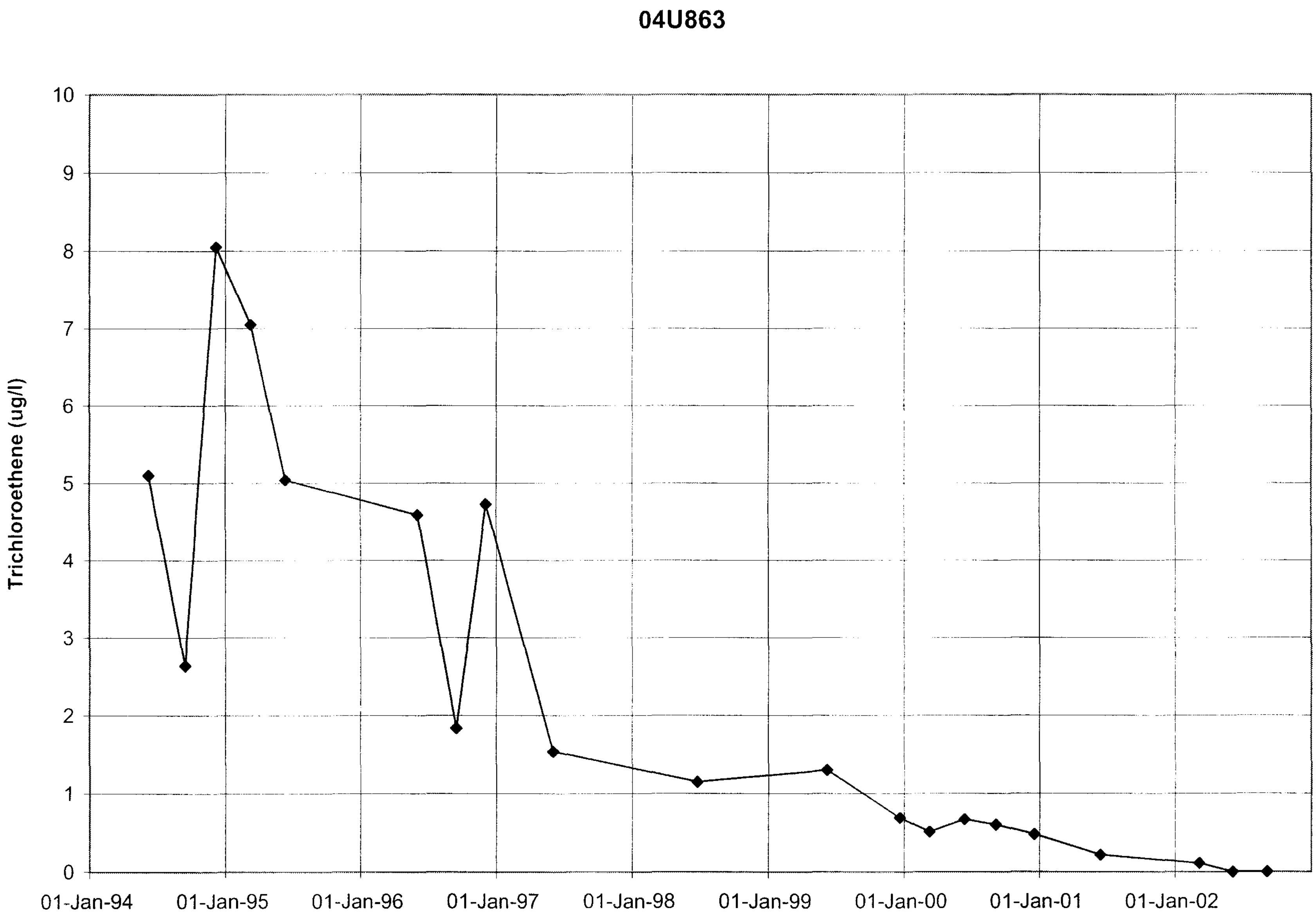
04U865



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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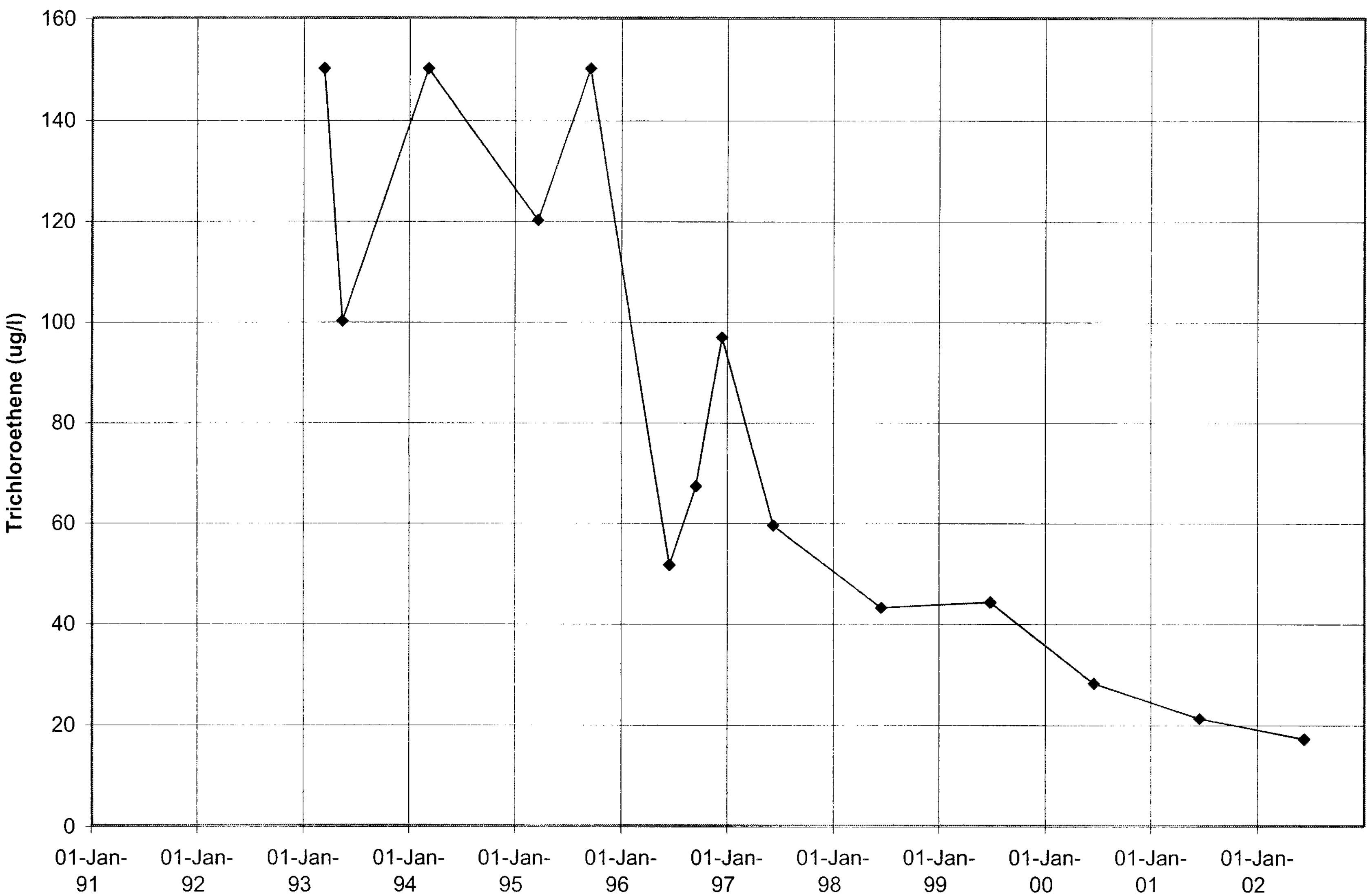
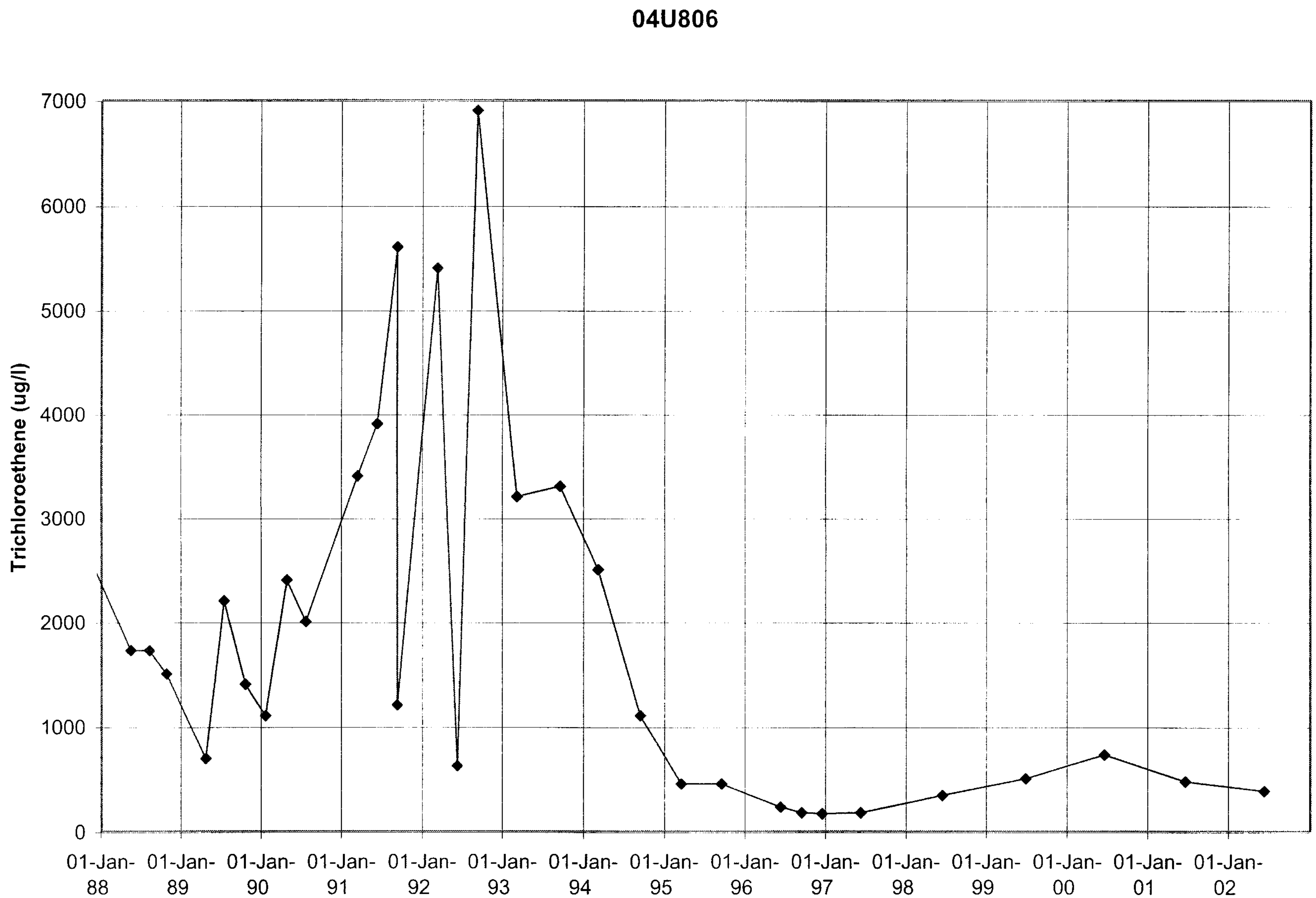
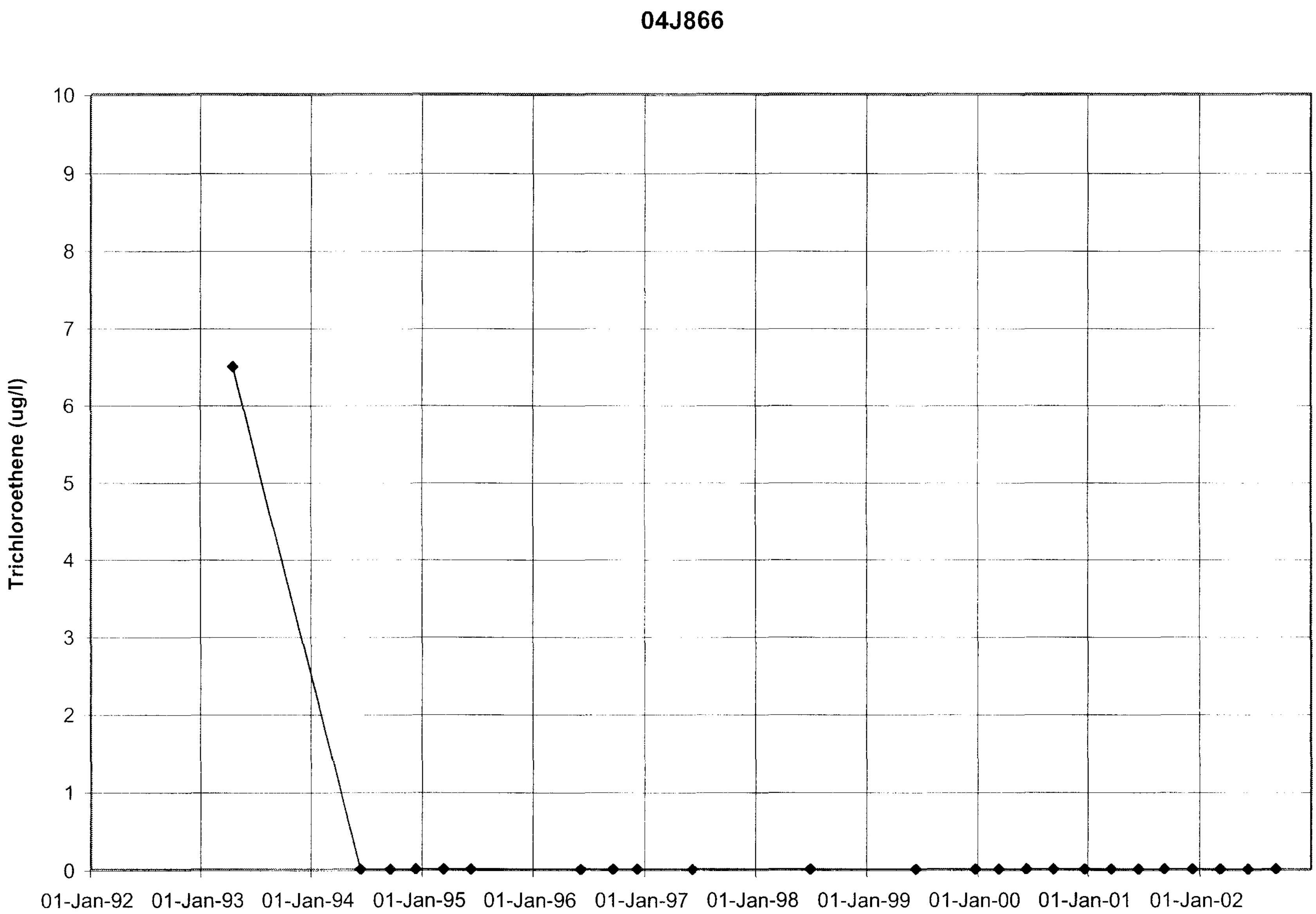


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

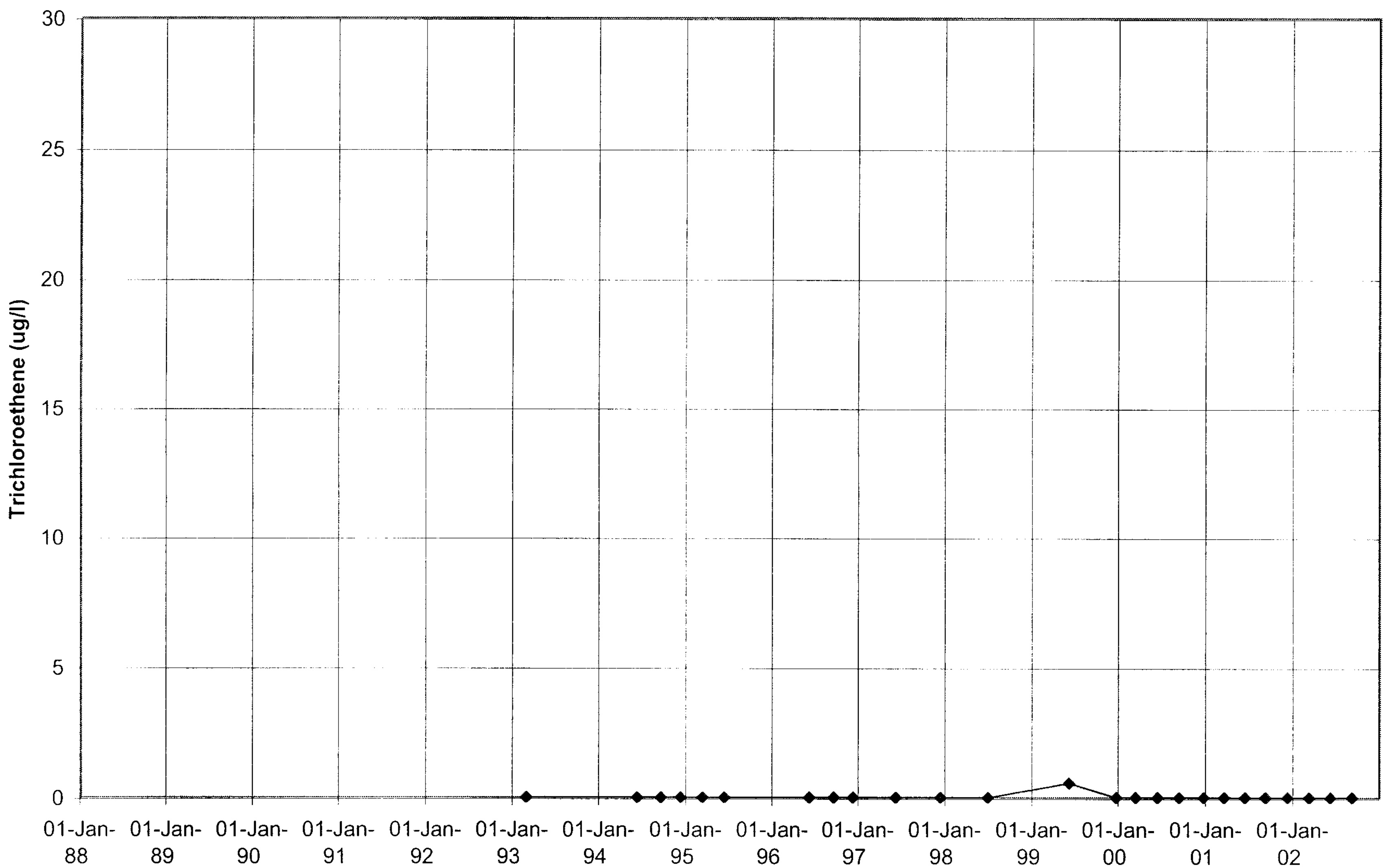


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

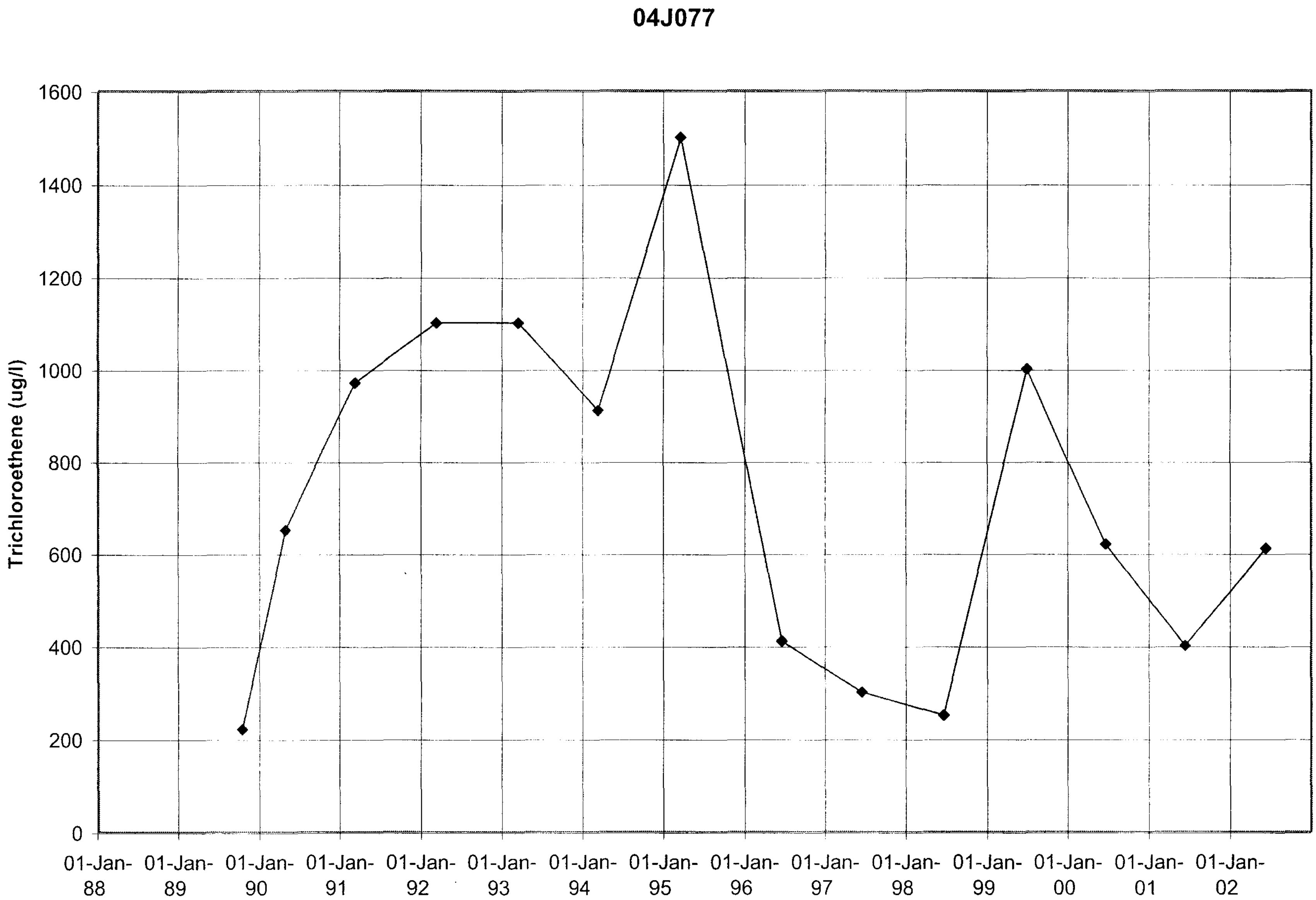


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

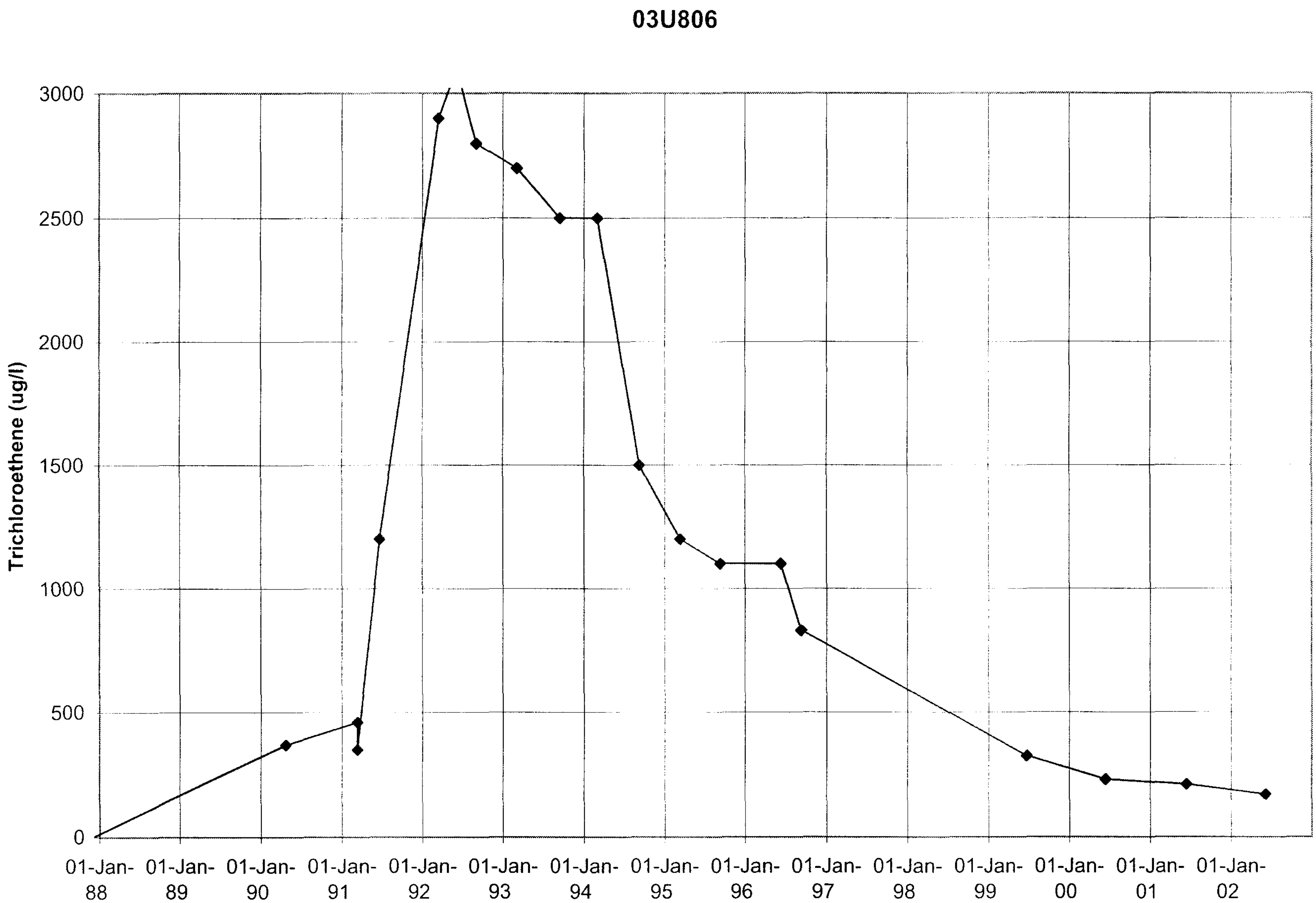
04J864



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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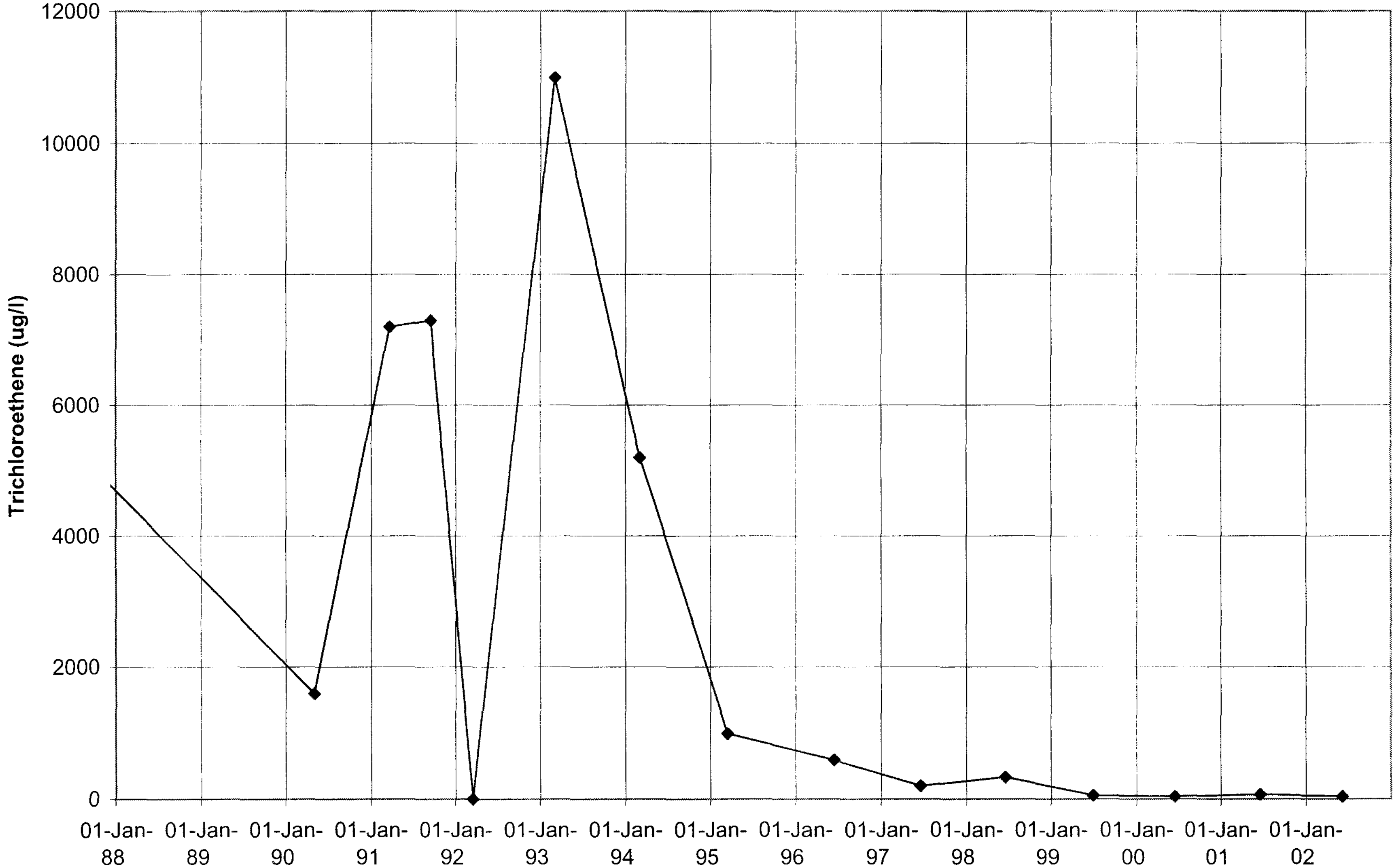
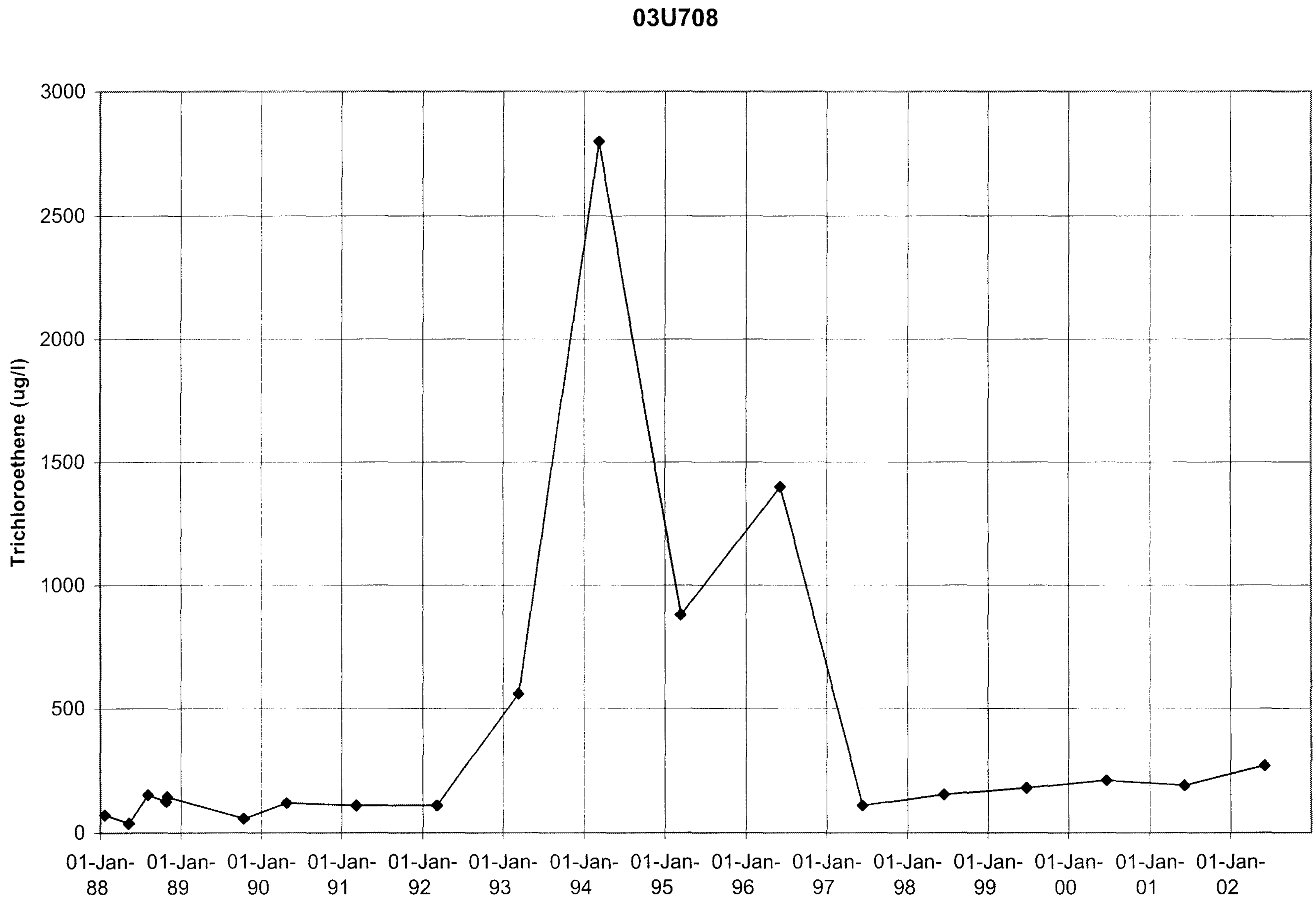
03U801

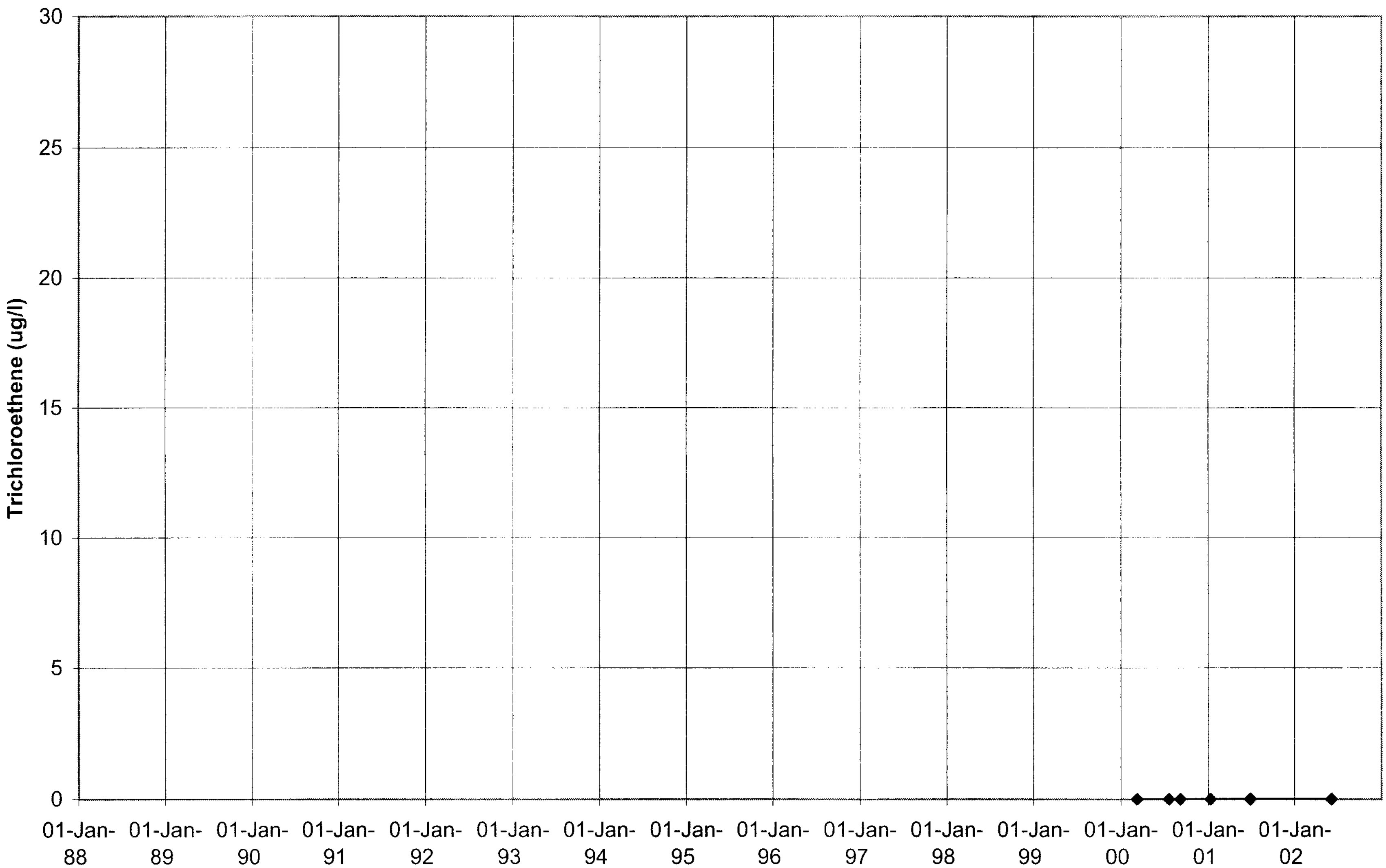


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



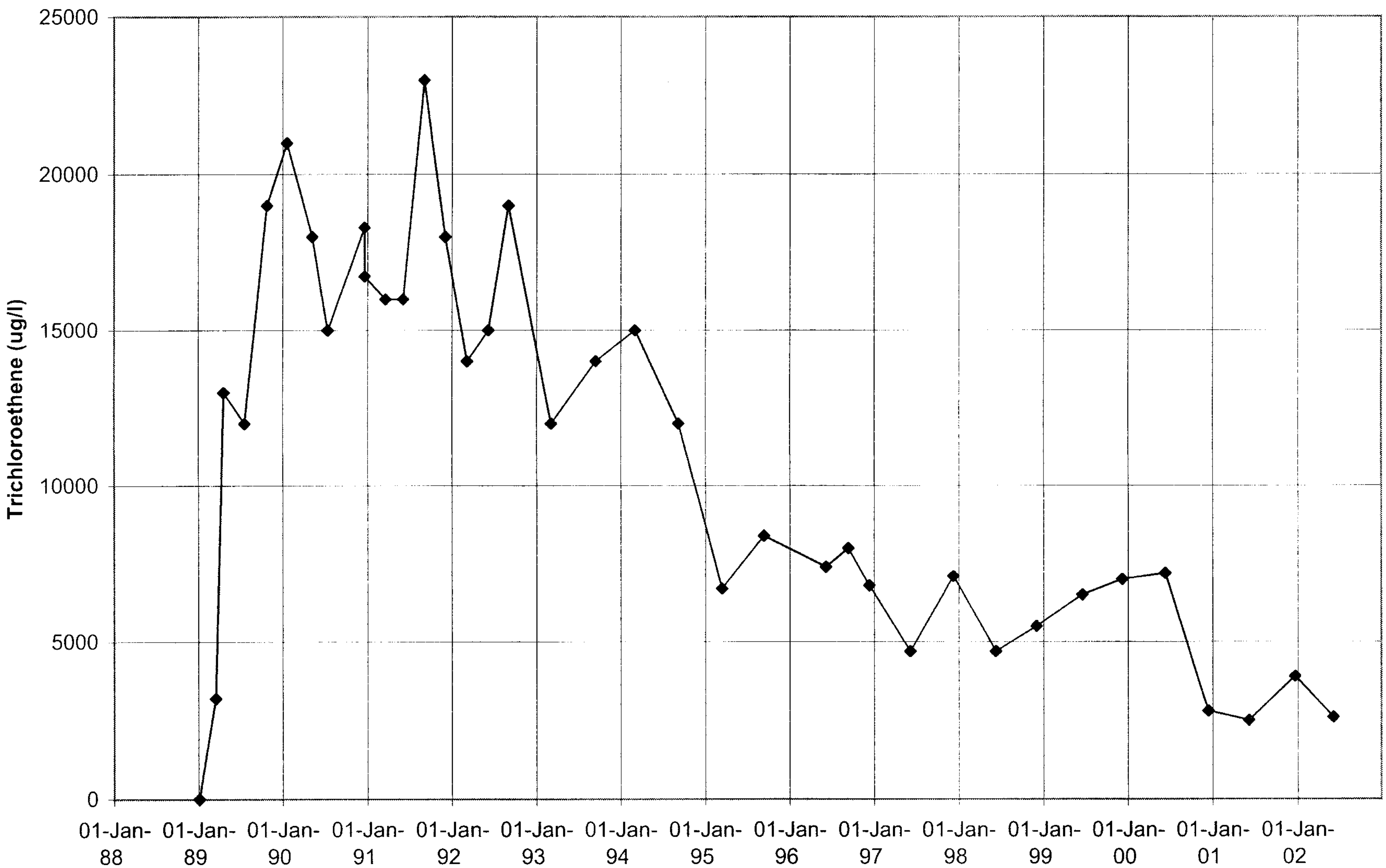
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03U621



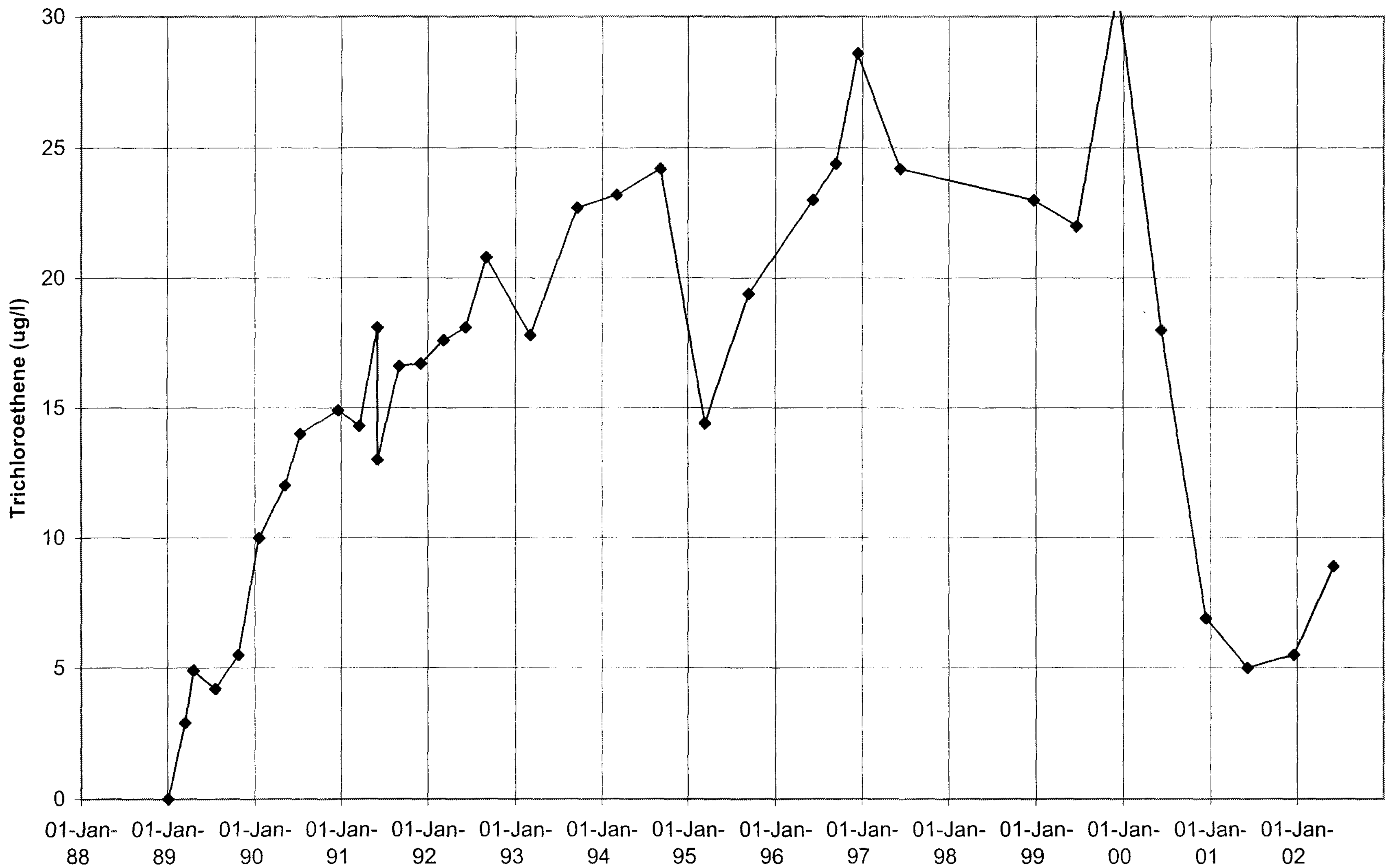
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03U317



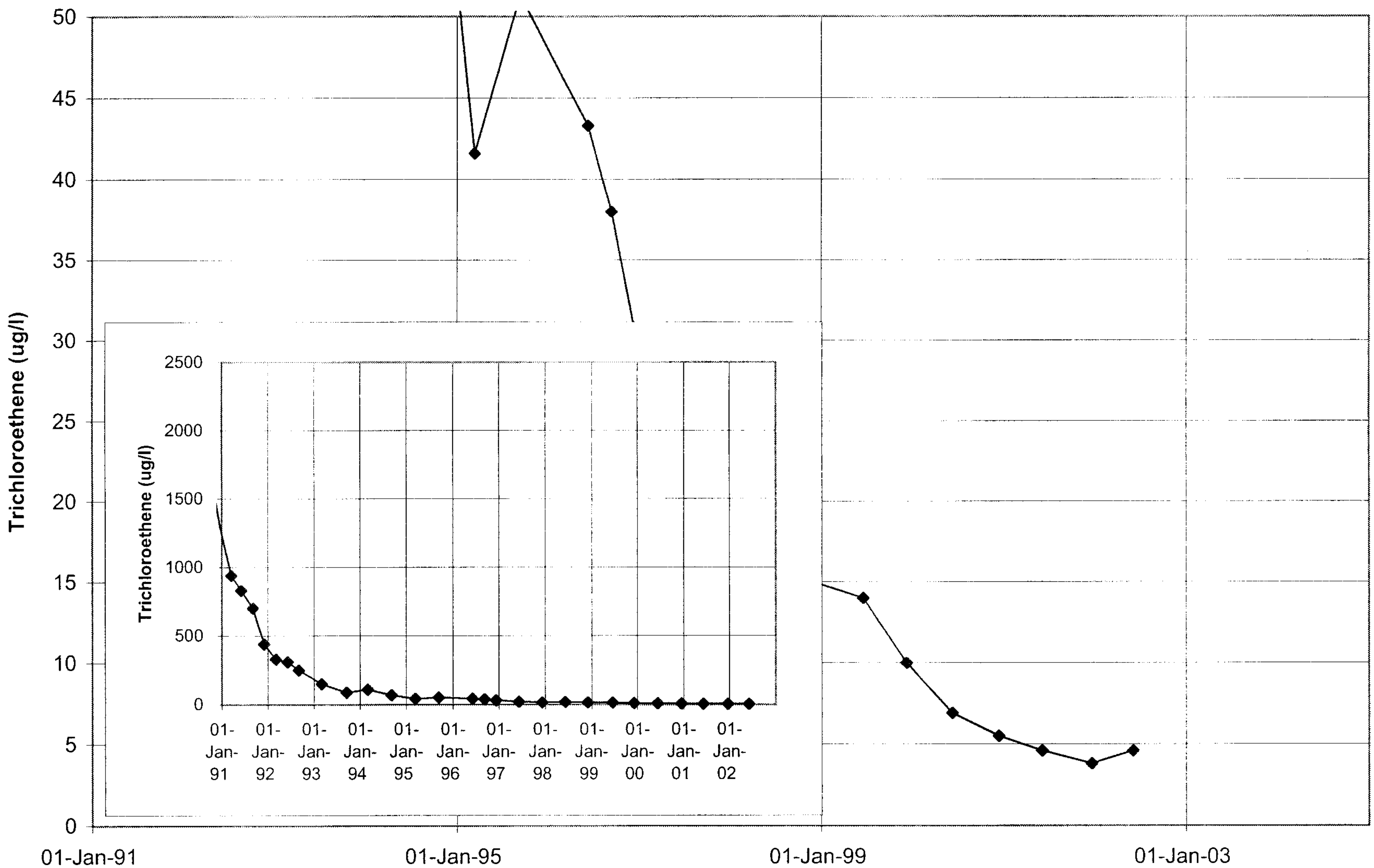
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03U316

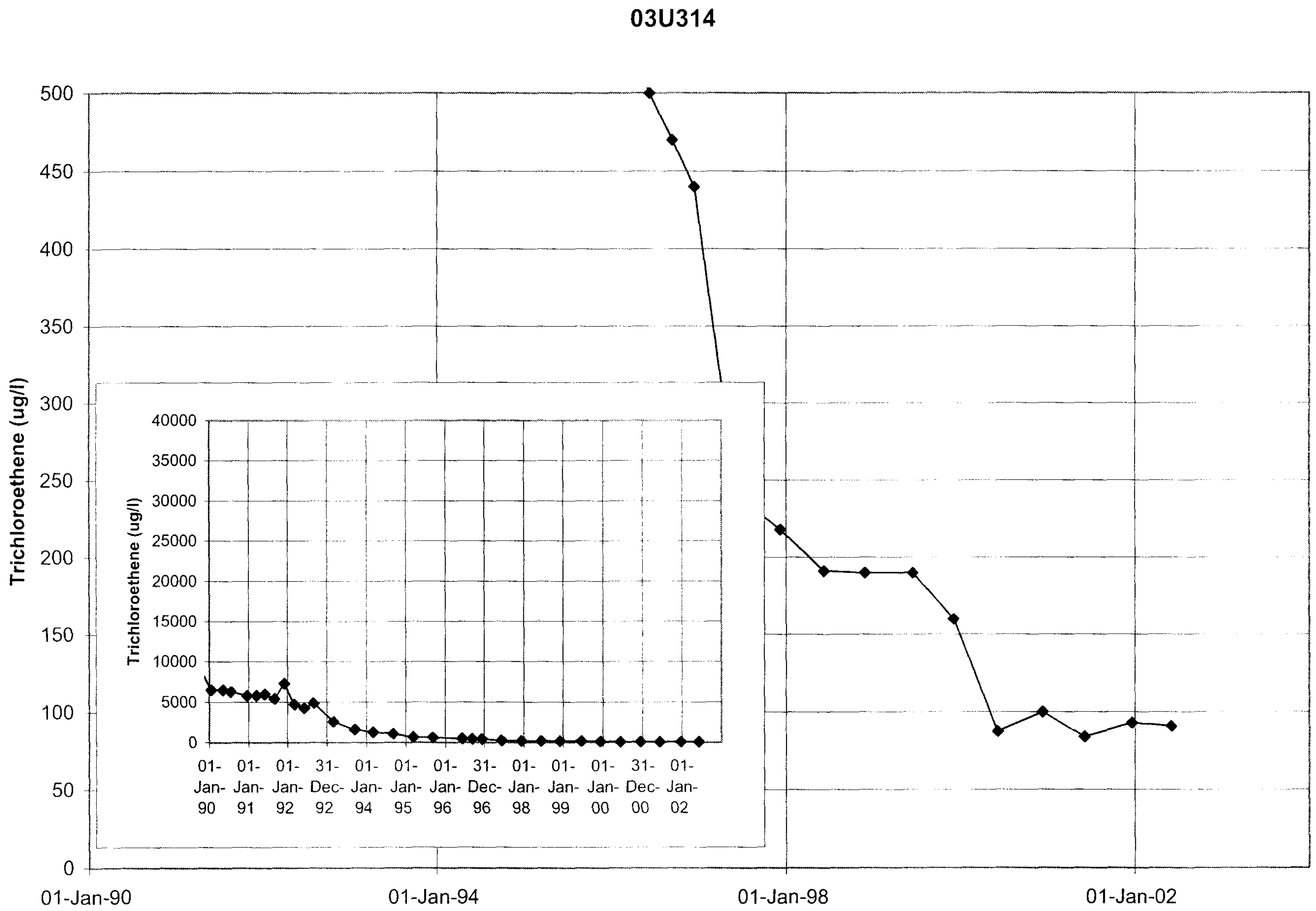


TO RETURN TO MAP: *Click on "Go To Previous View" Button in the Tool Bar*

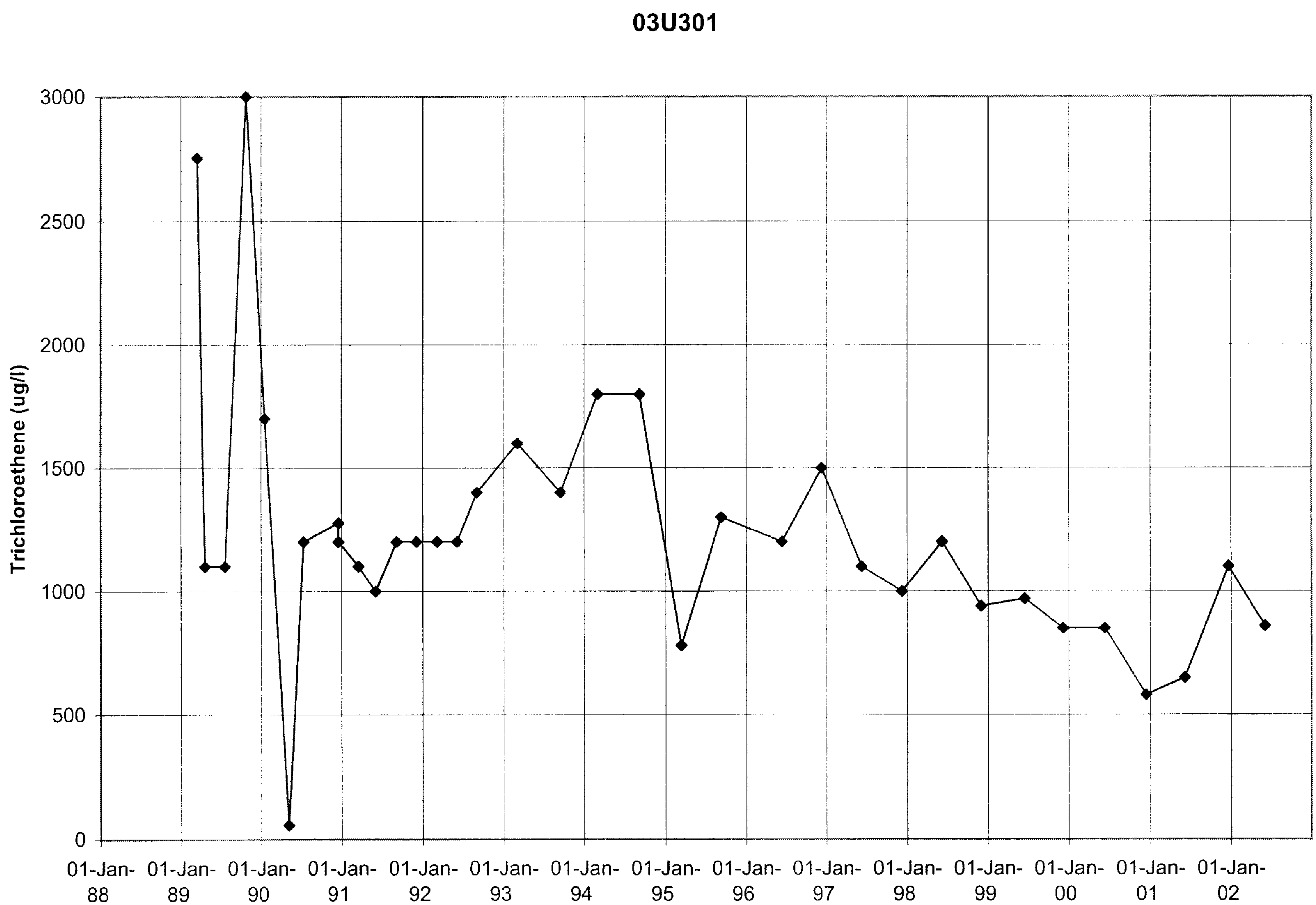
03U315



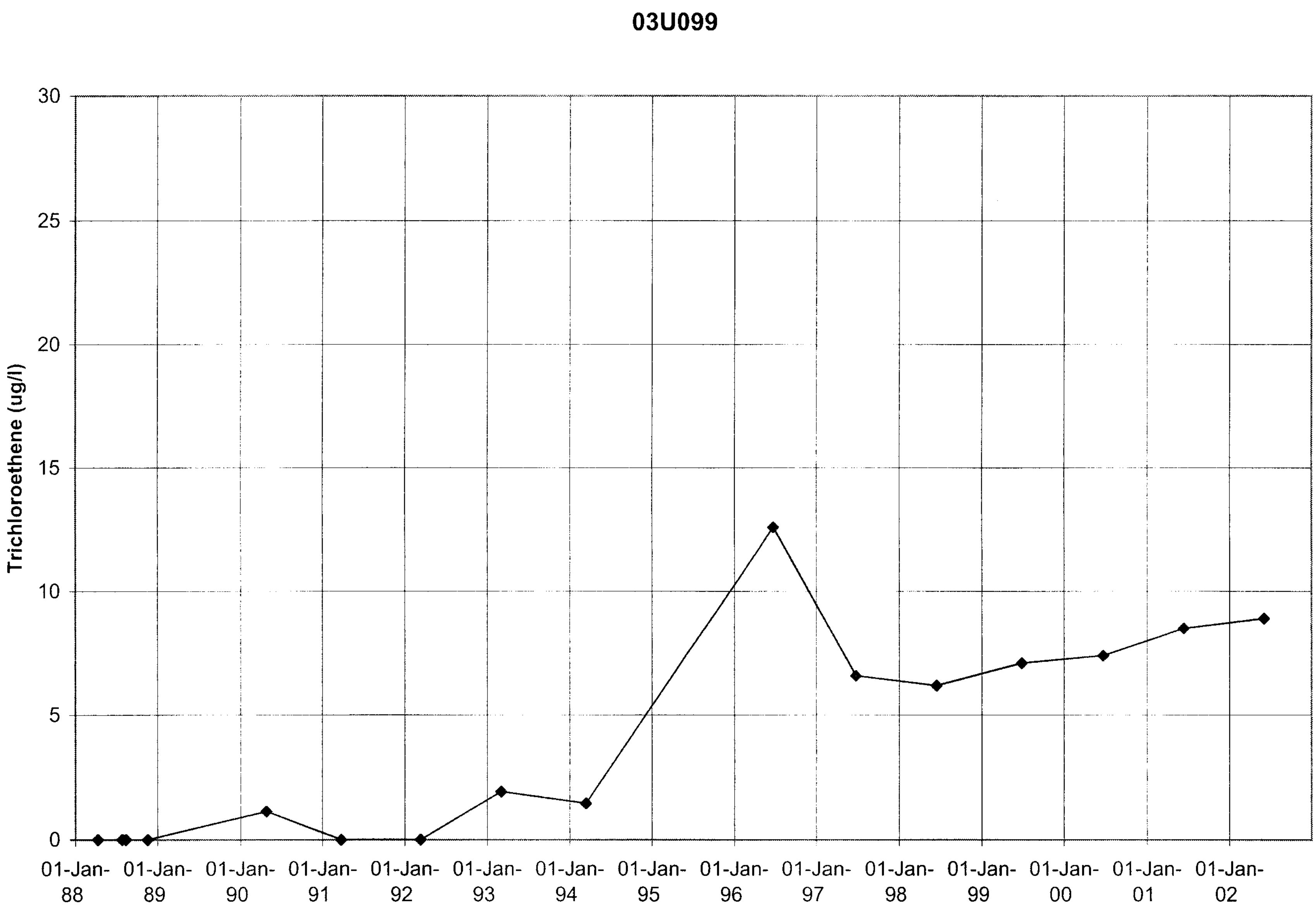
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



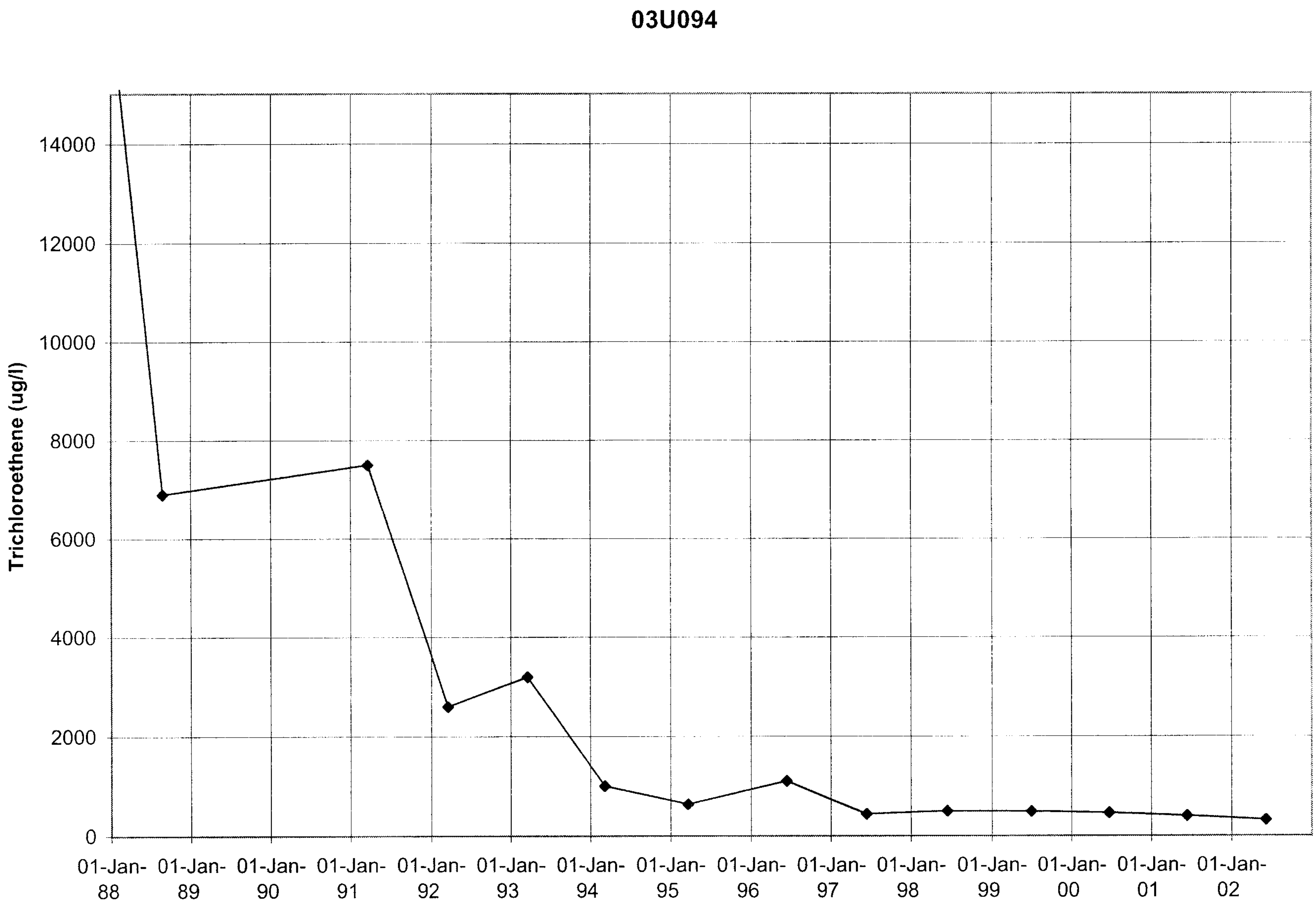
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

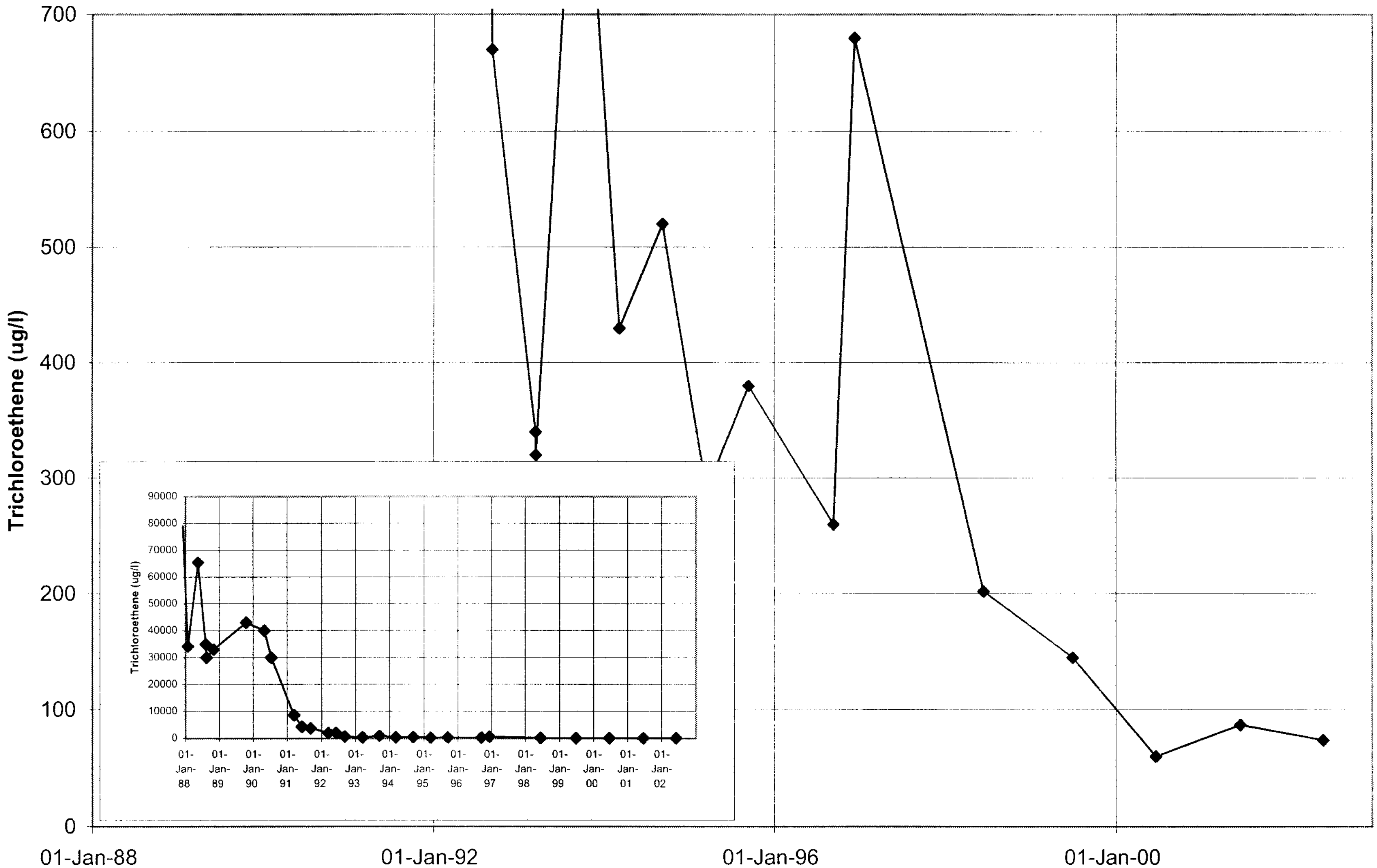


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03U093



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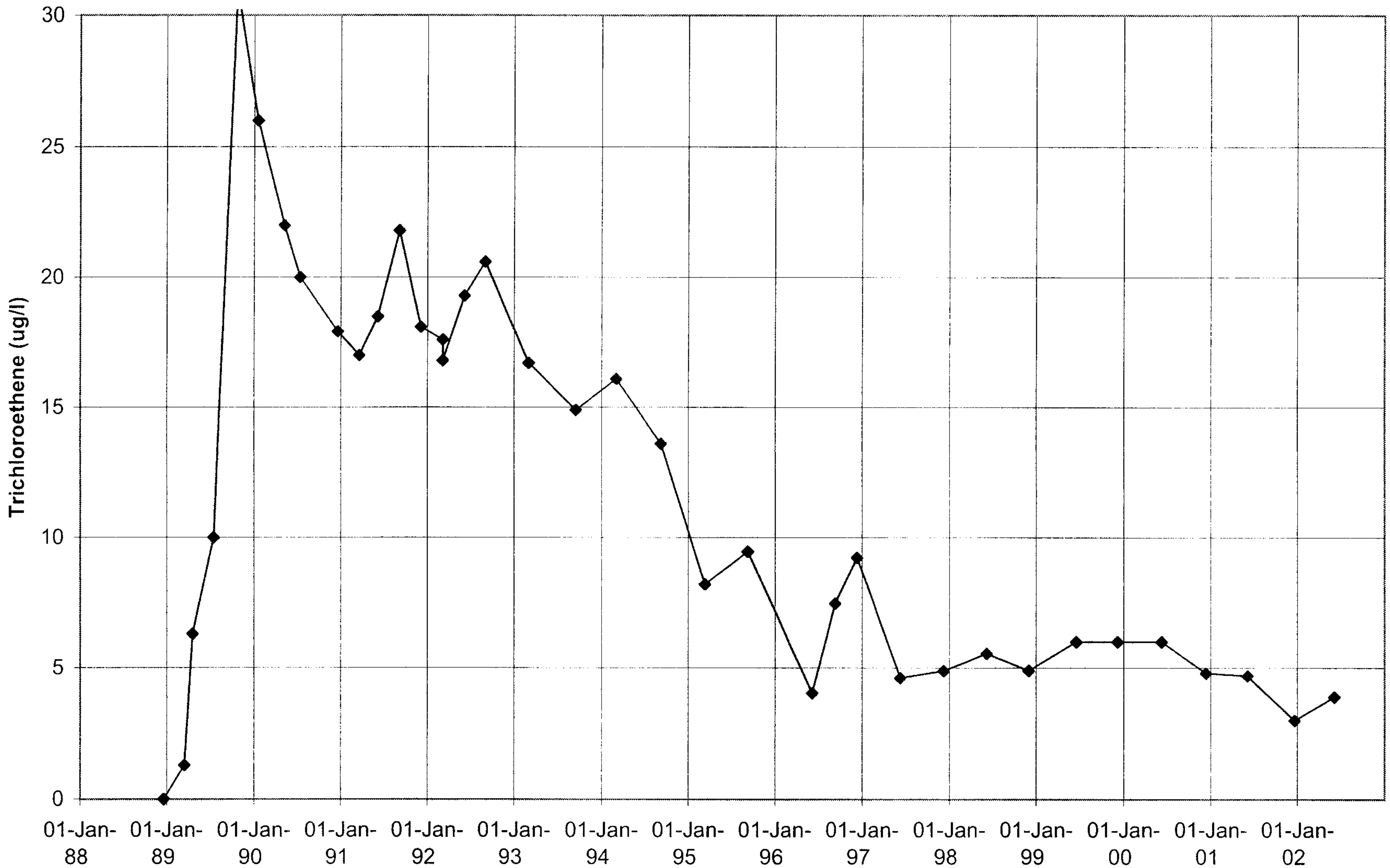
03F312



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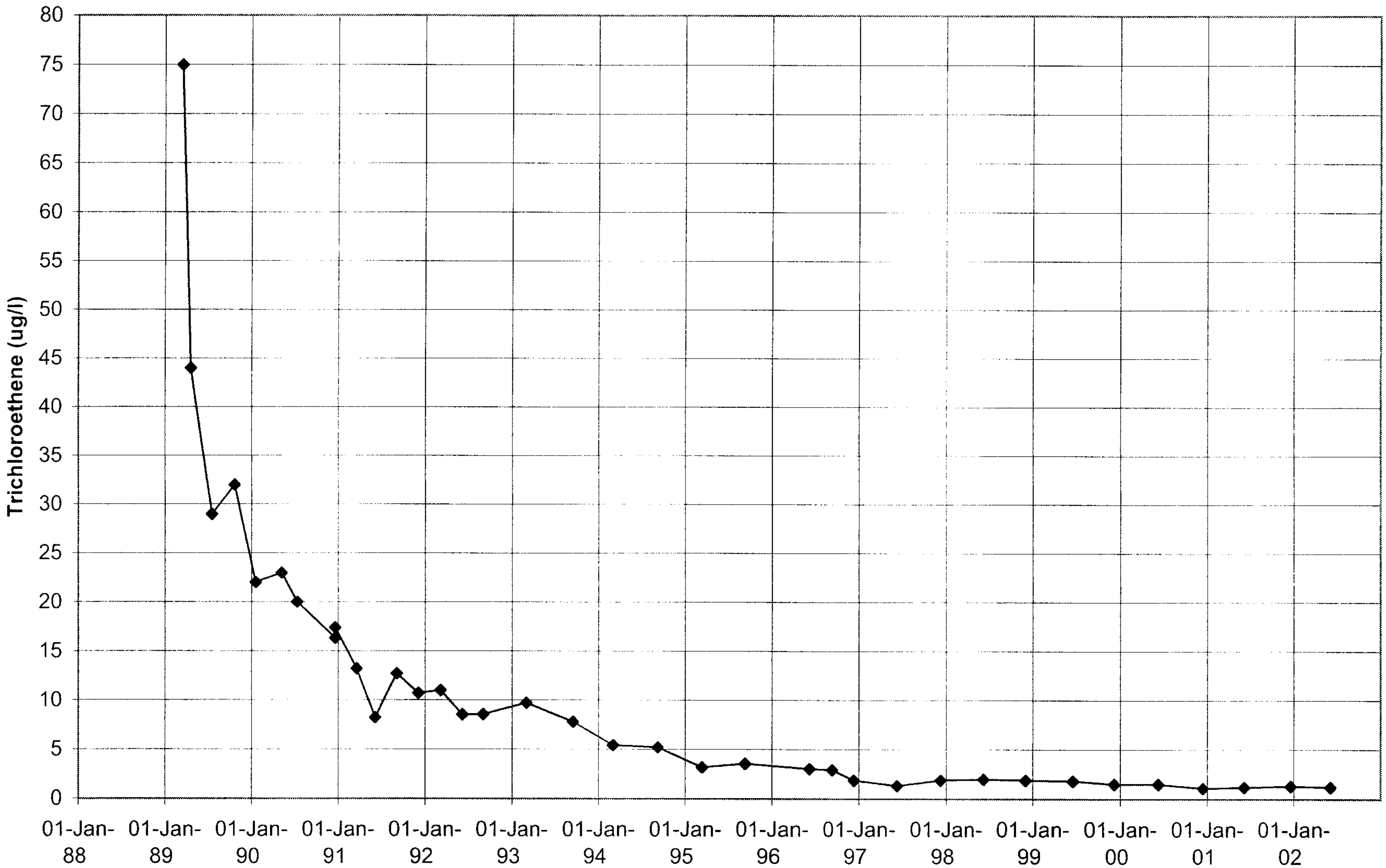

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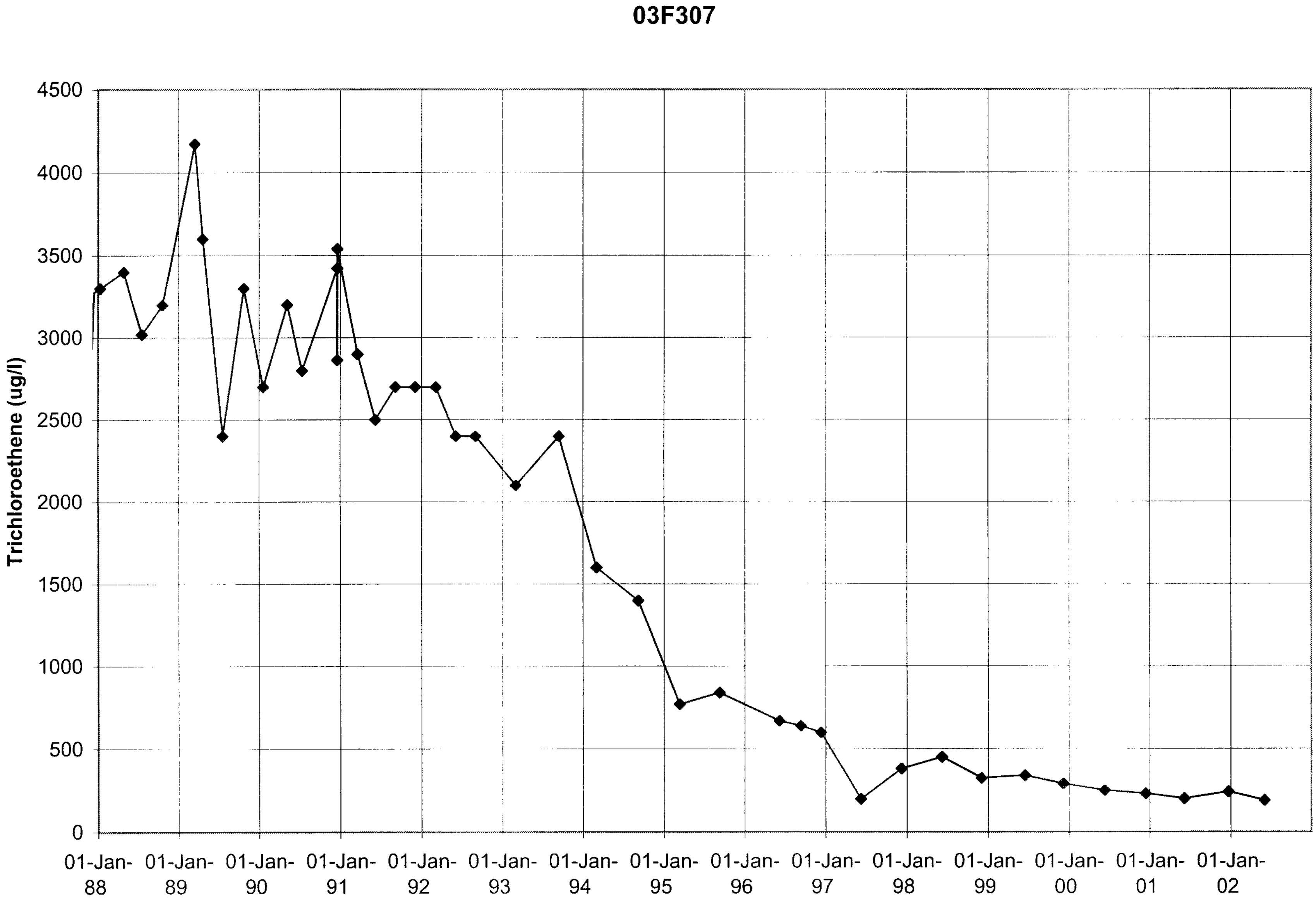

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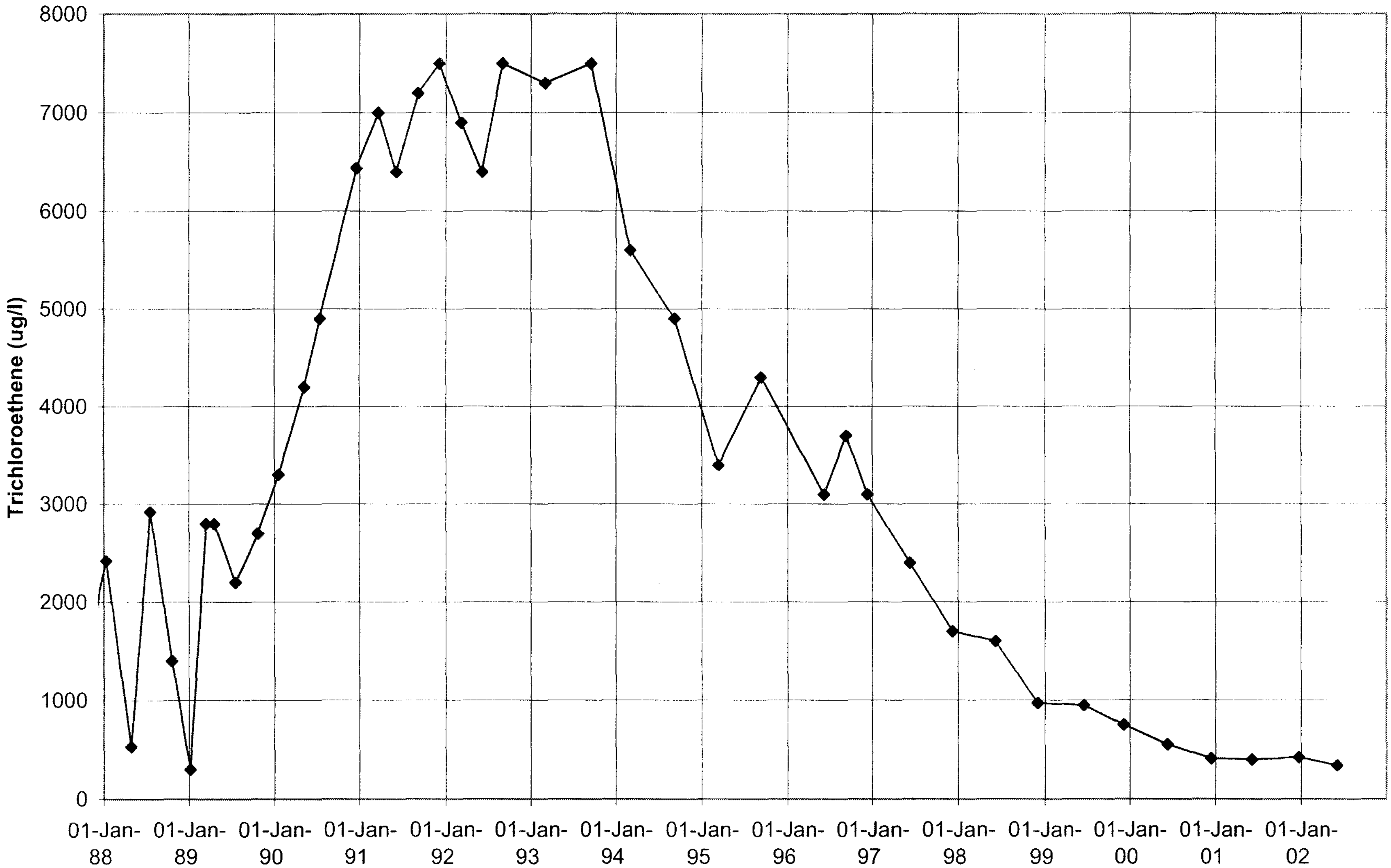

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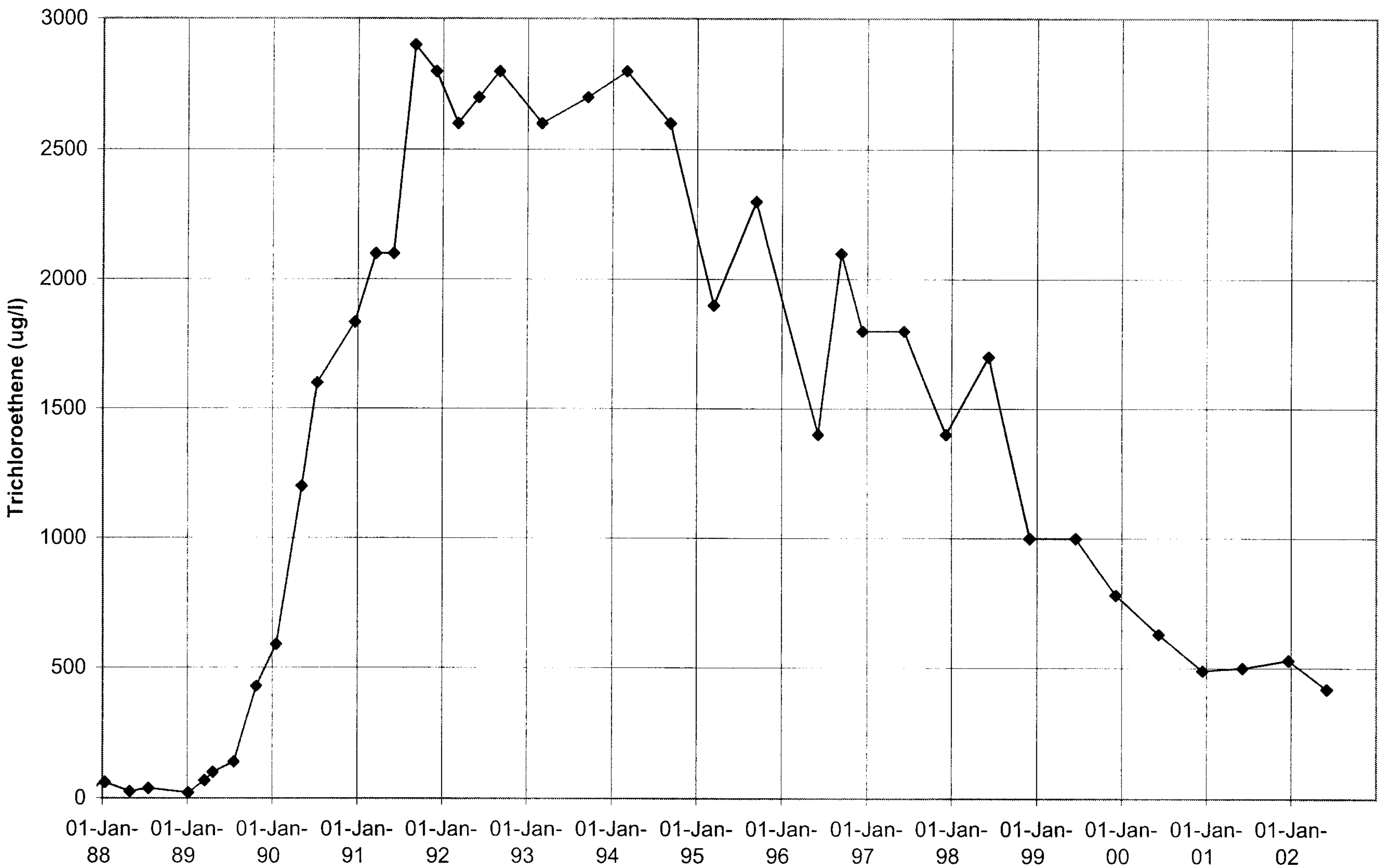

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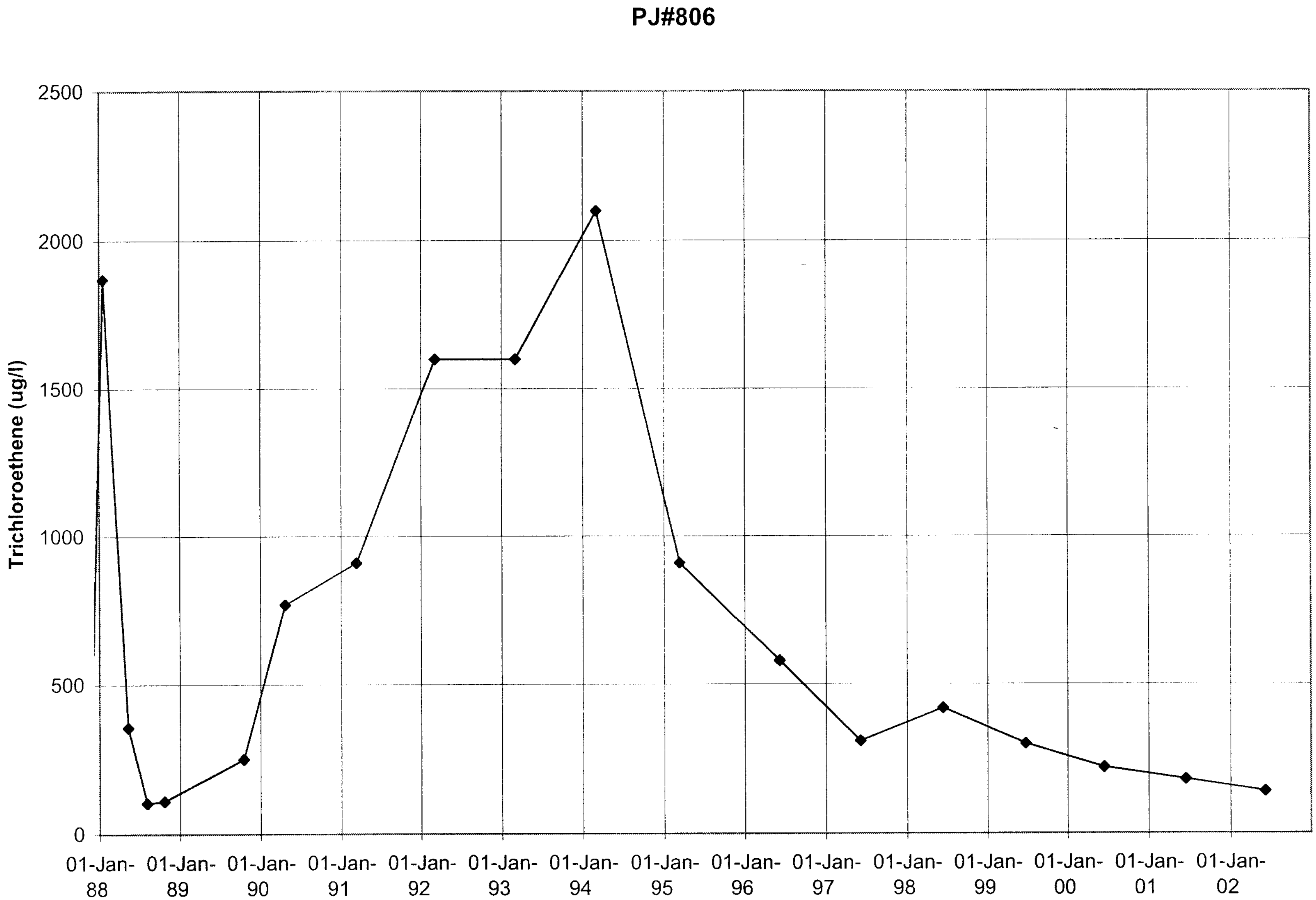

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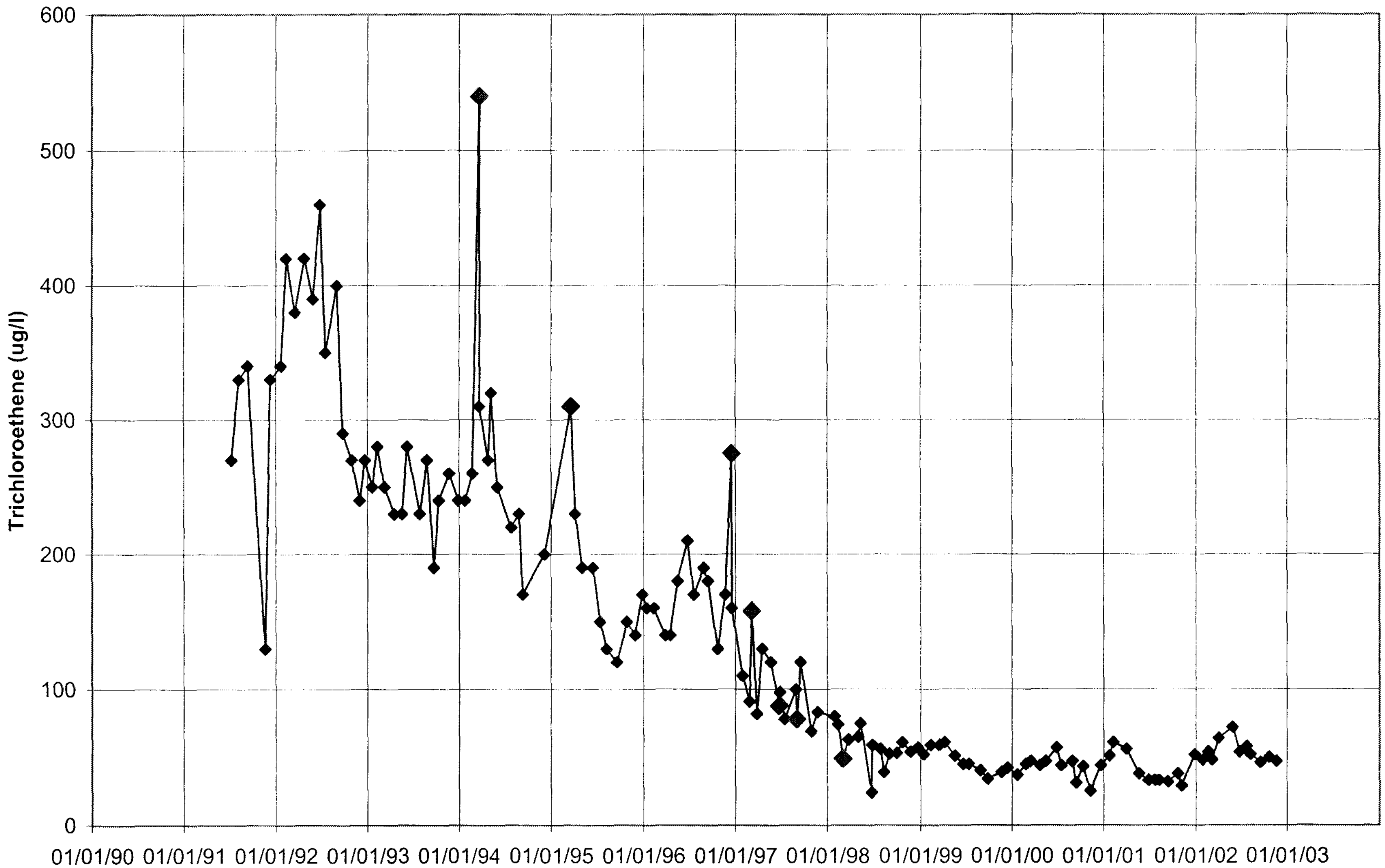

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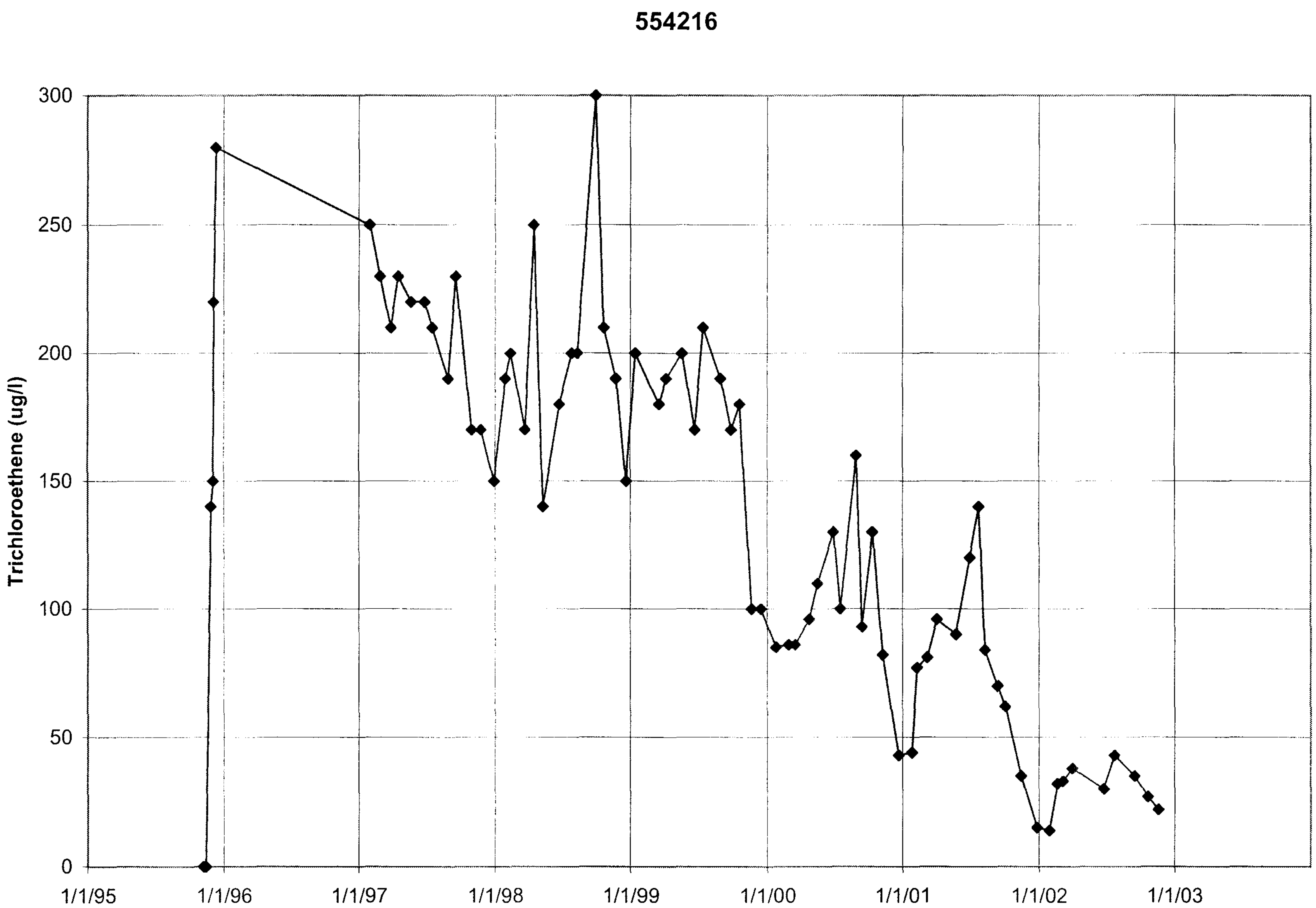

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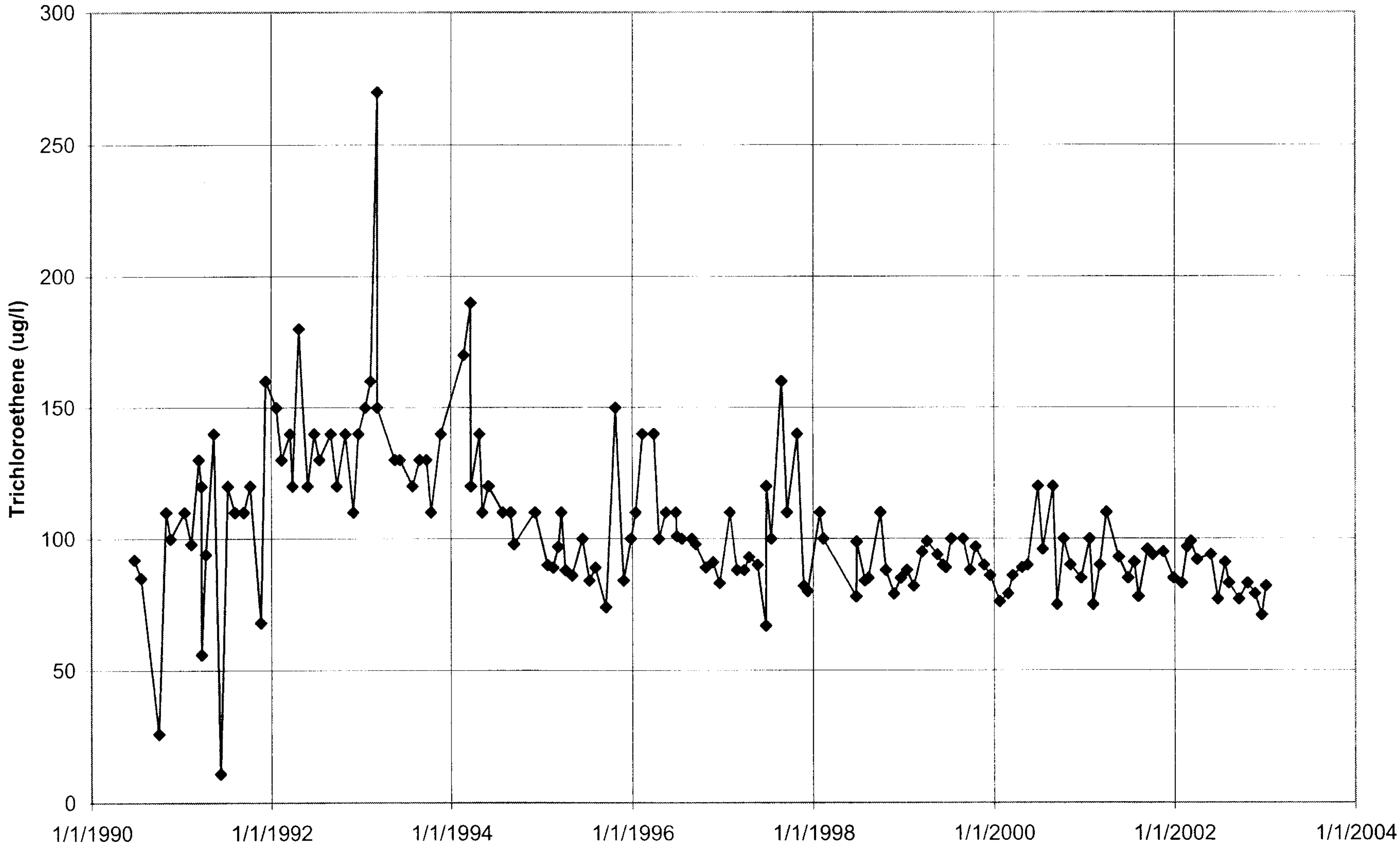

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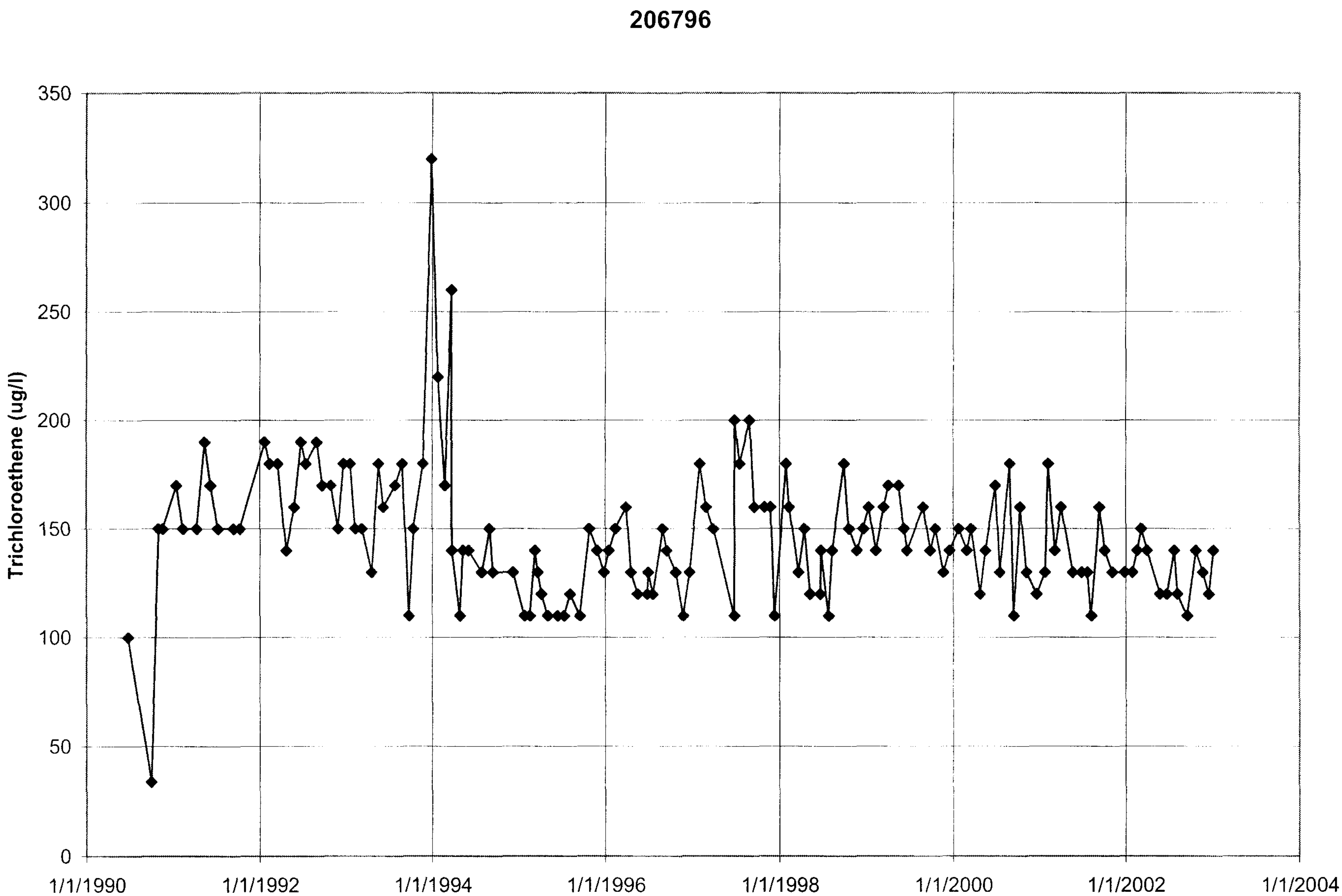

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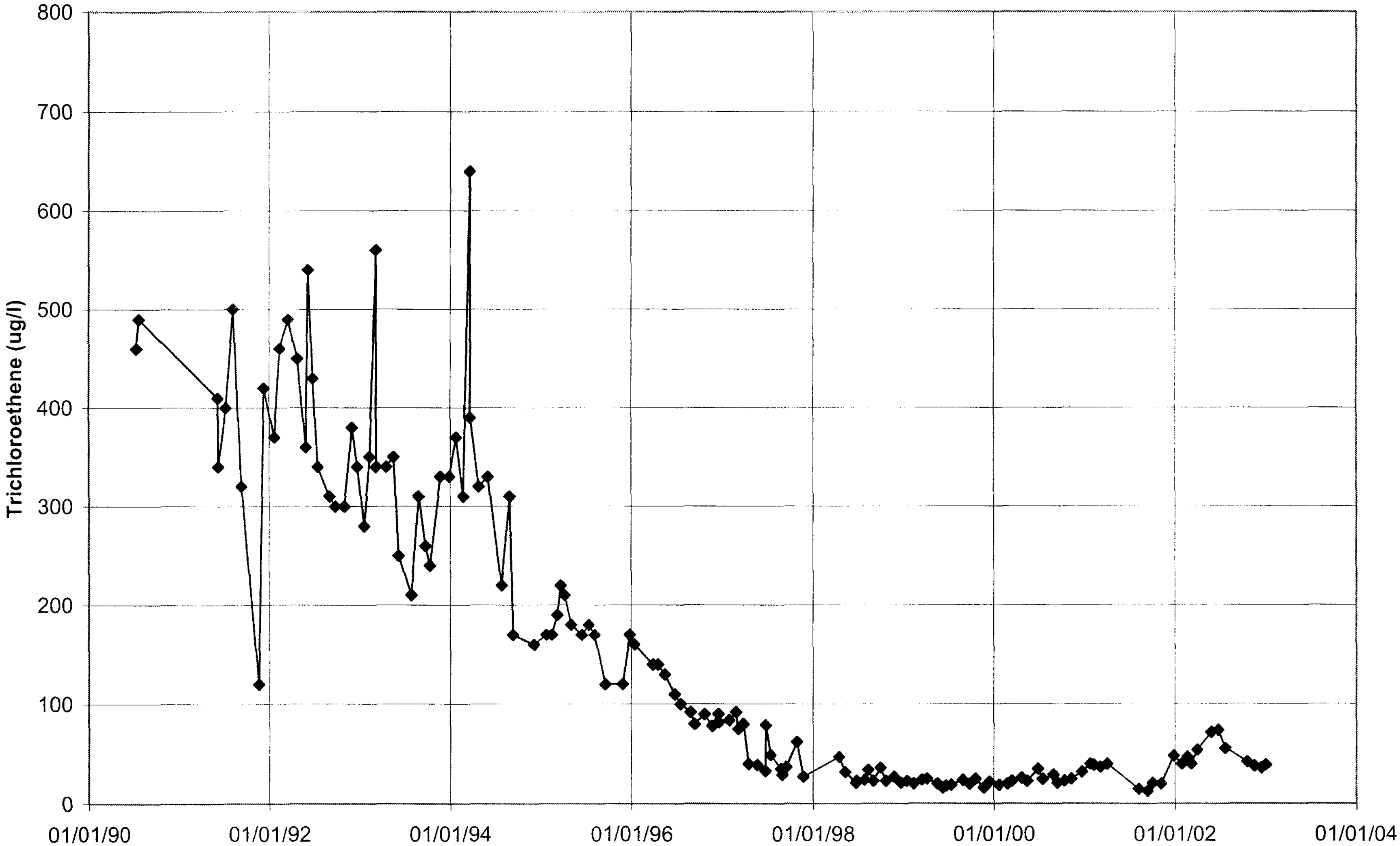

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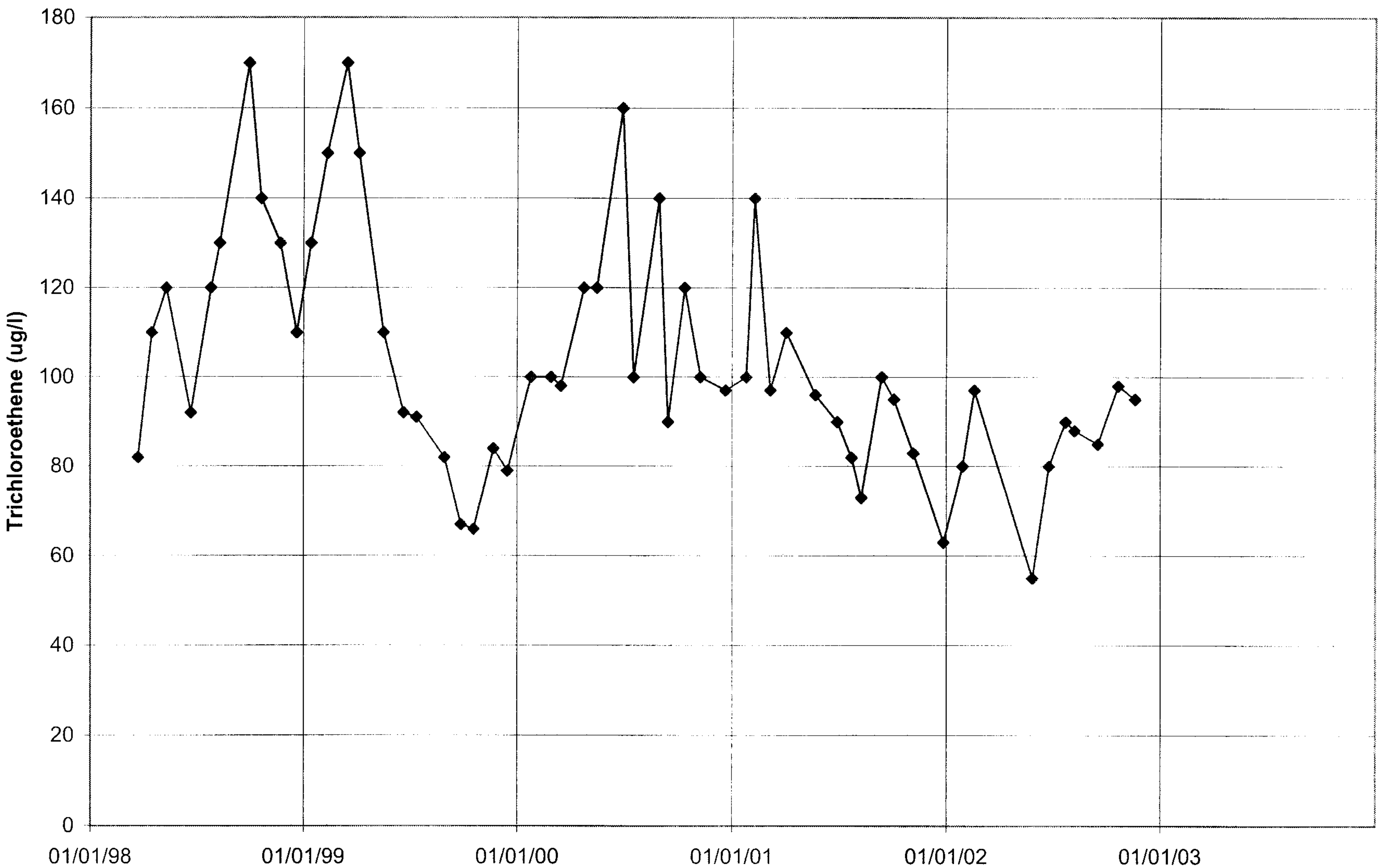

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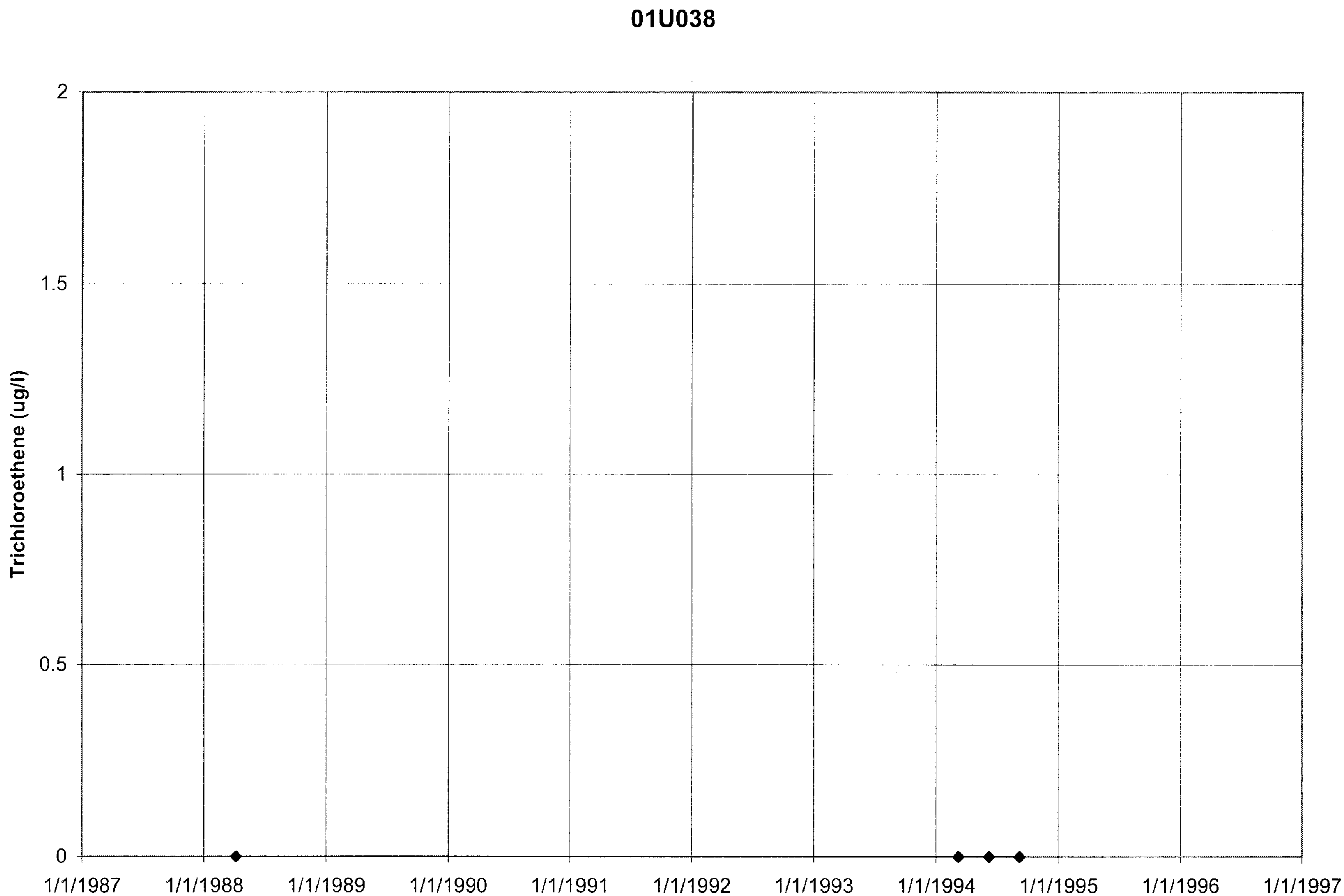

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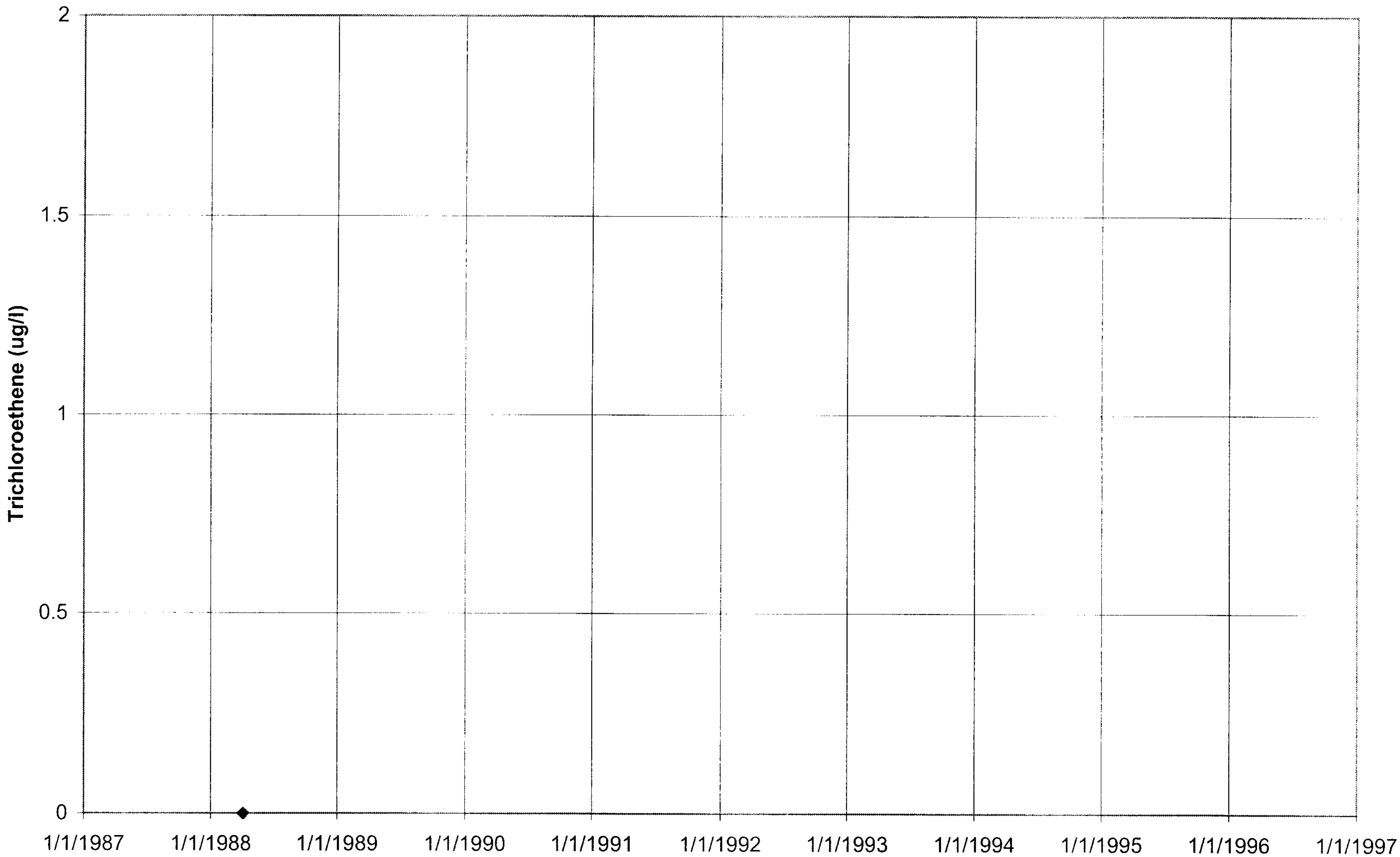
01U040



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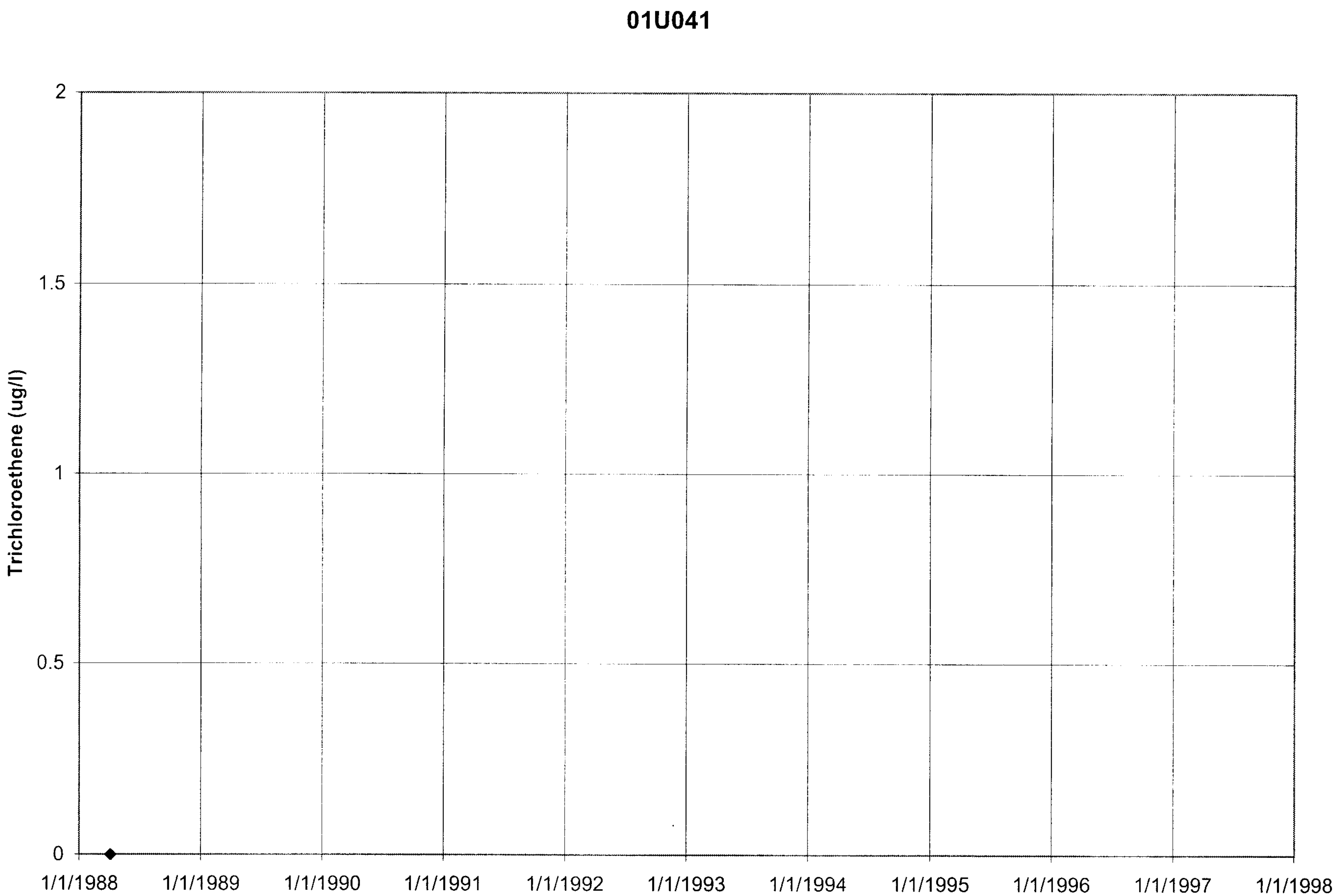

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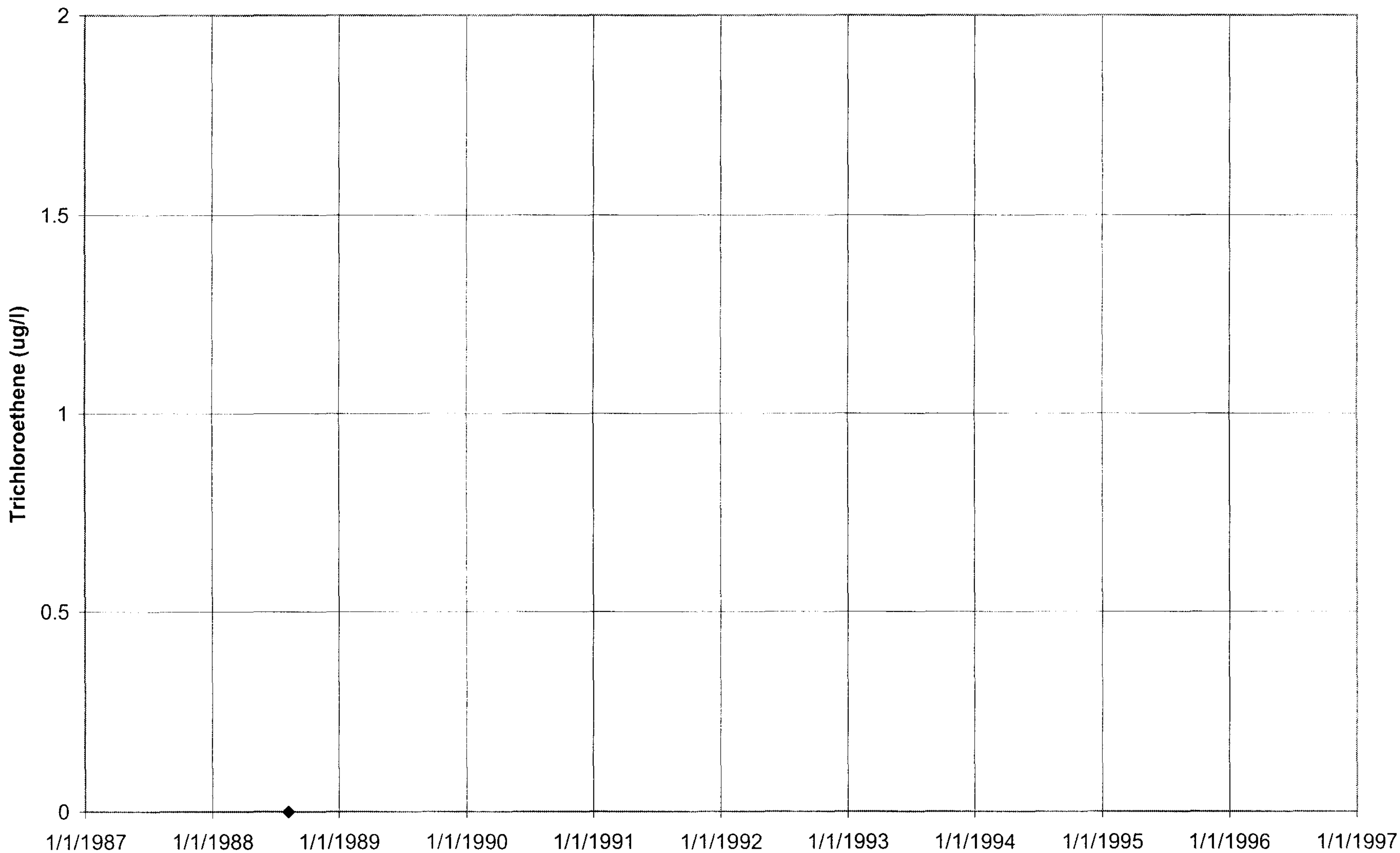

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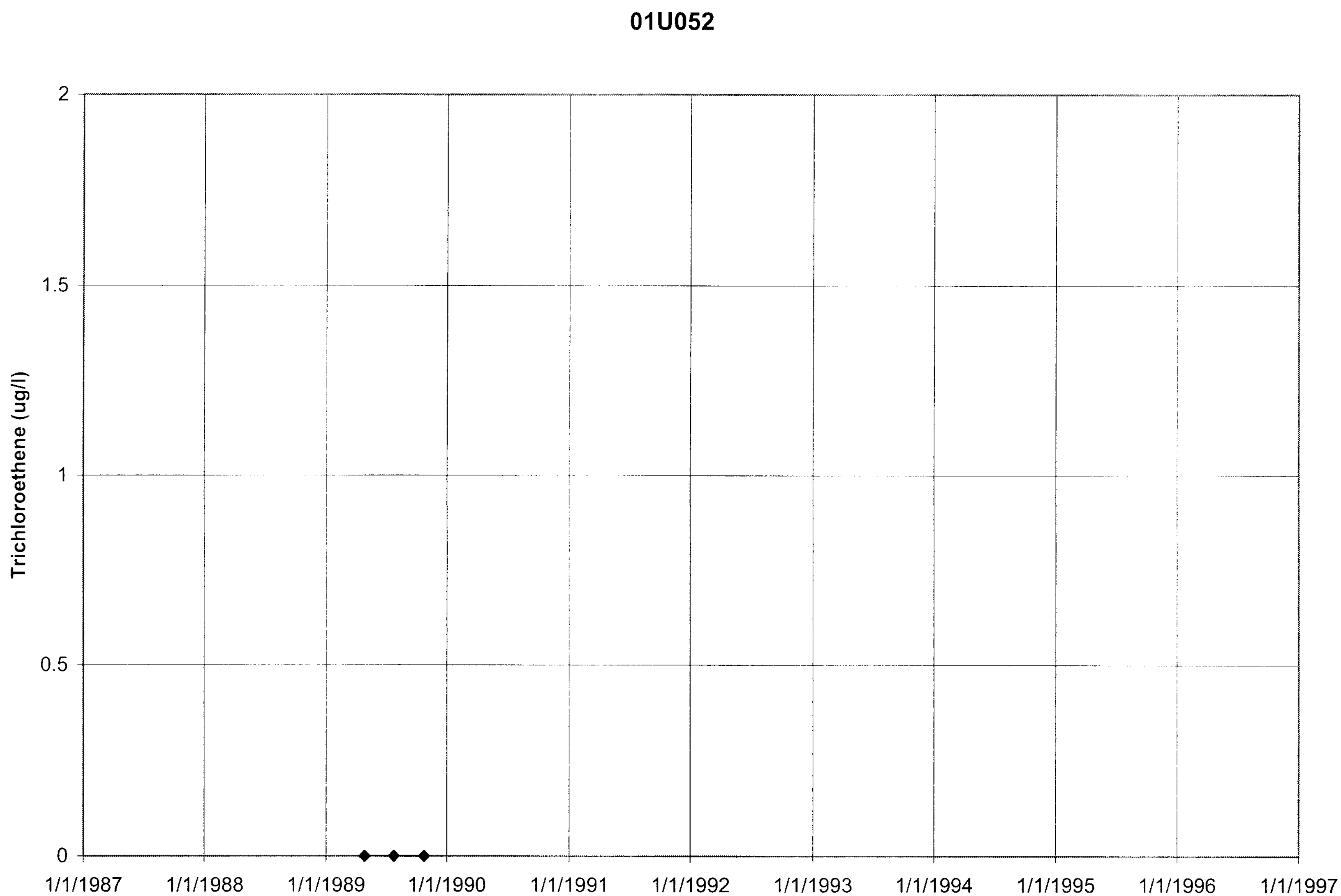

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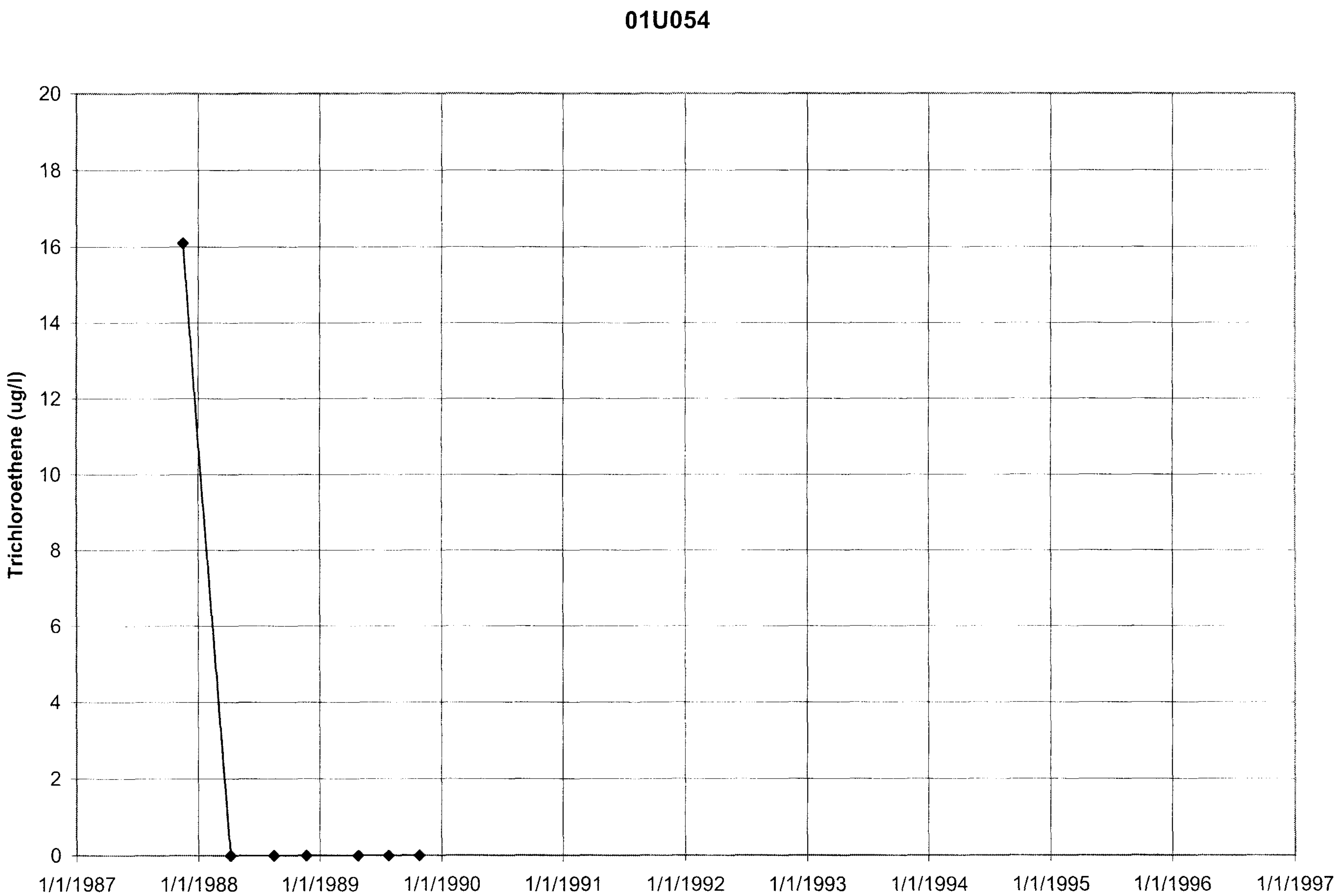

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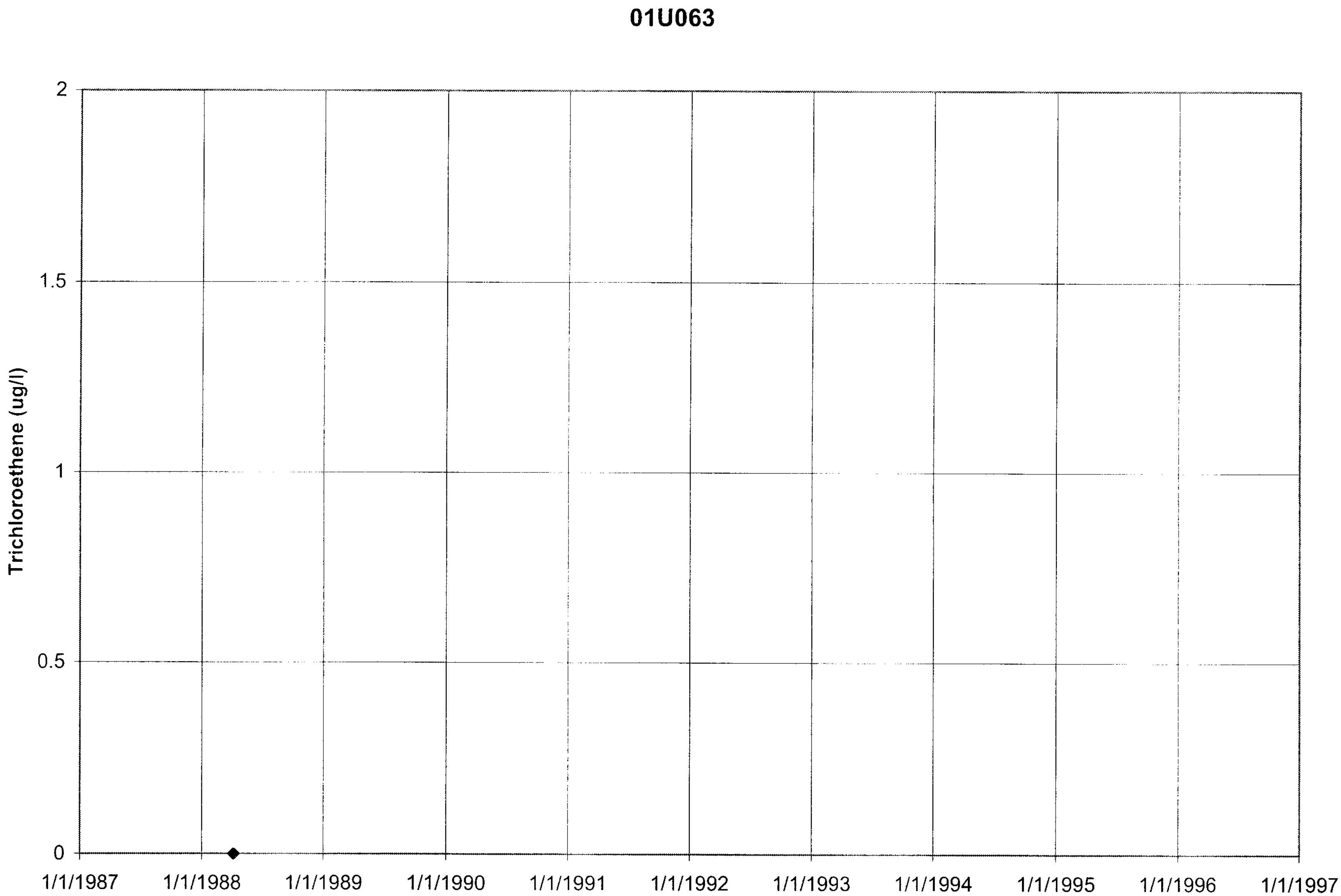

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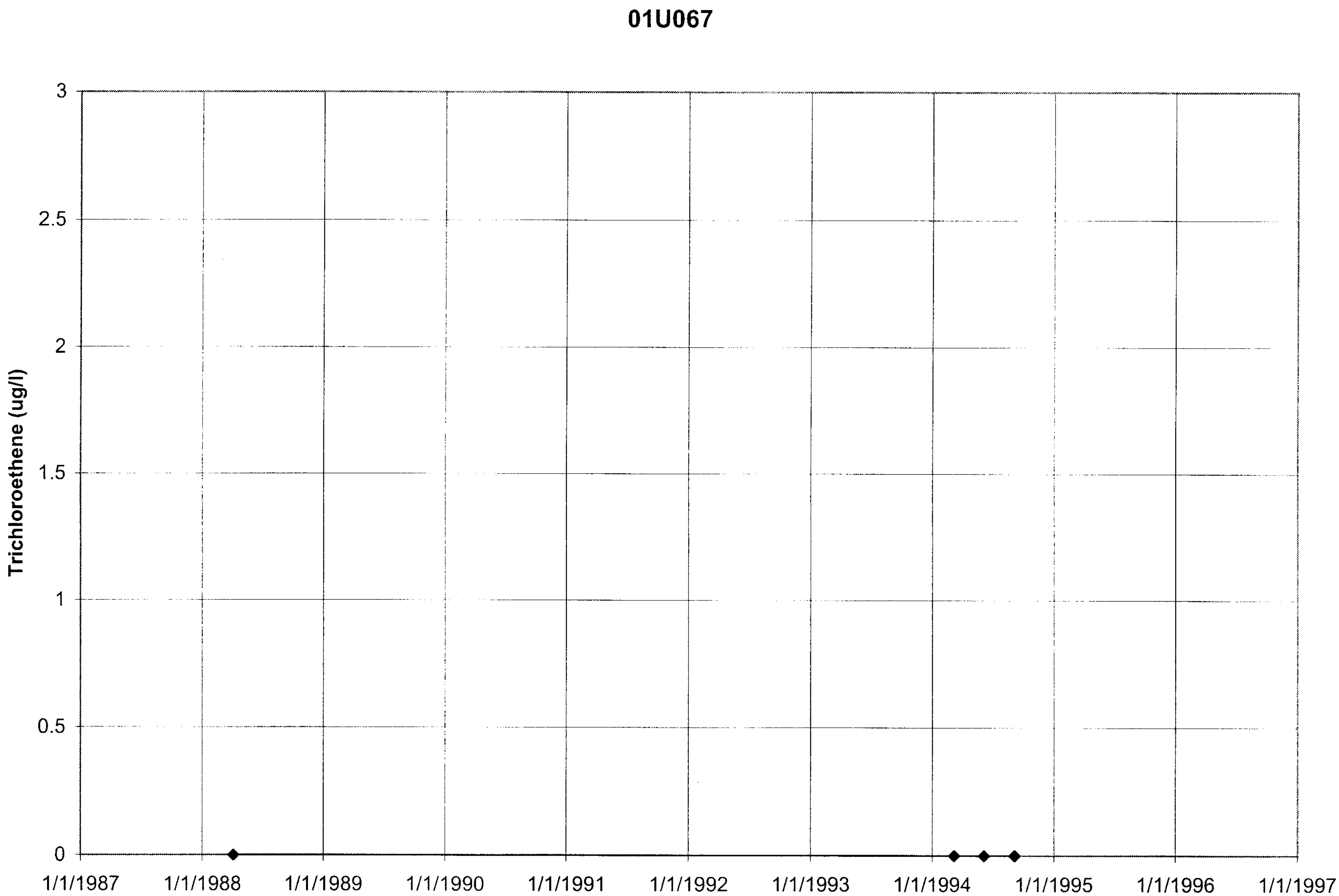

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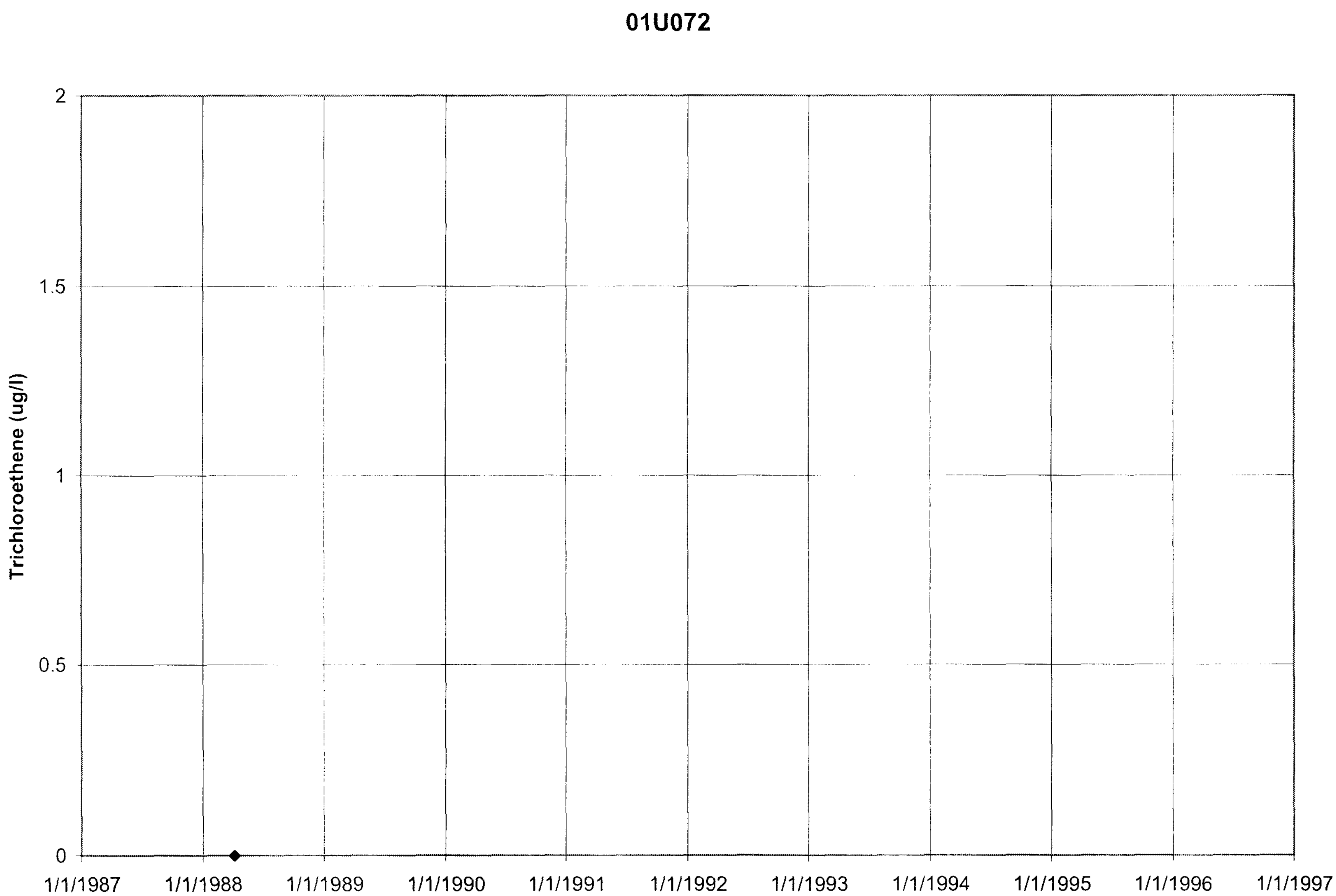

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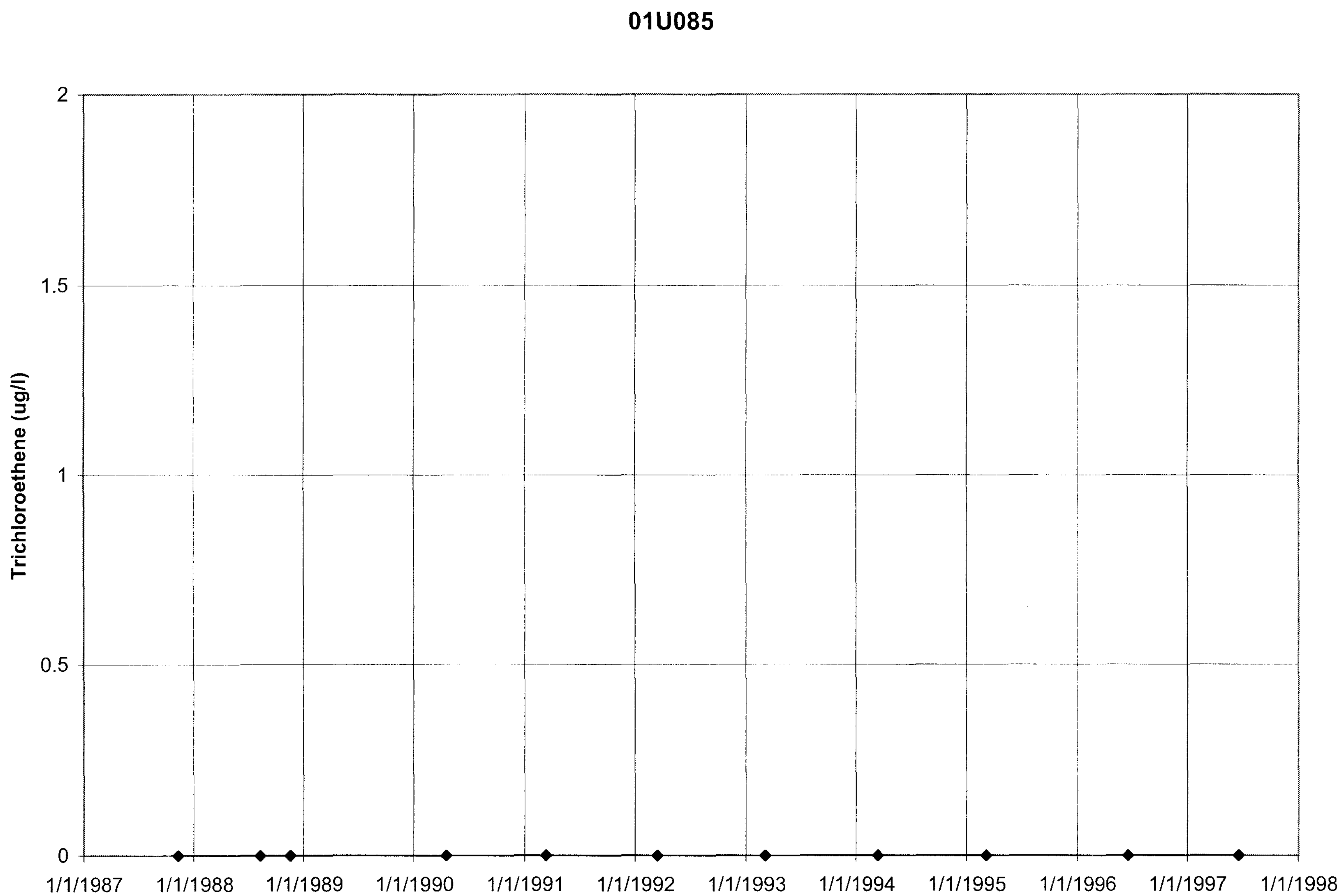

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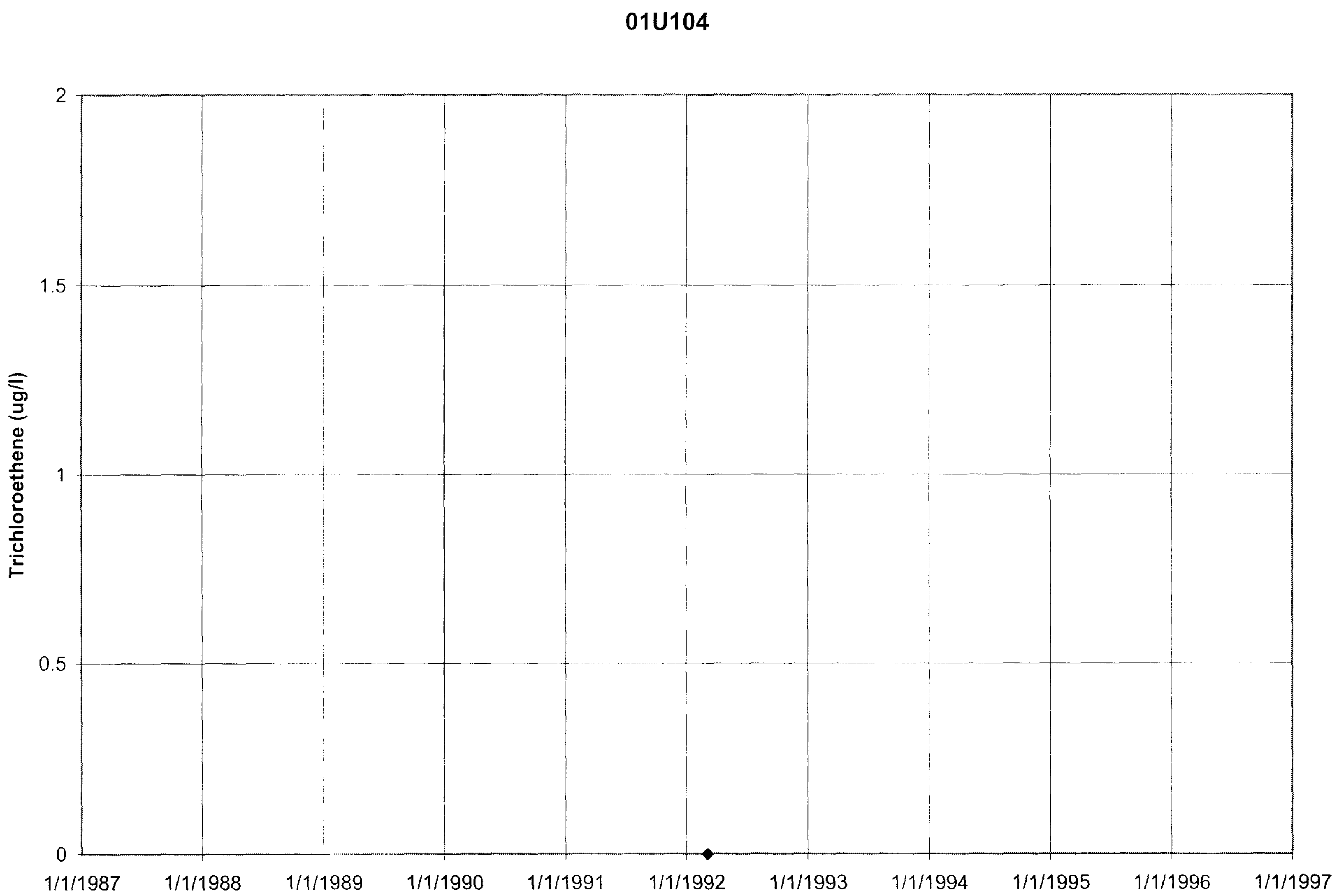

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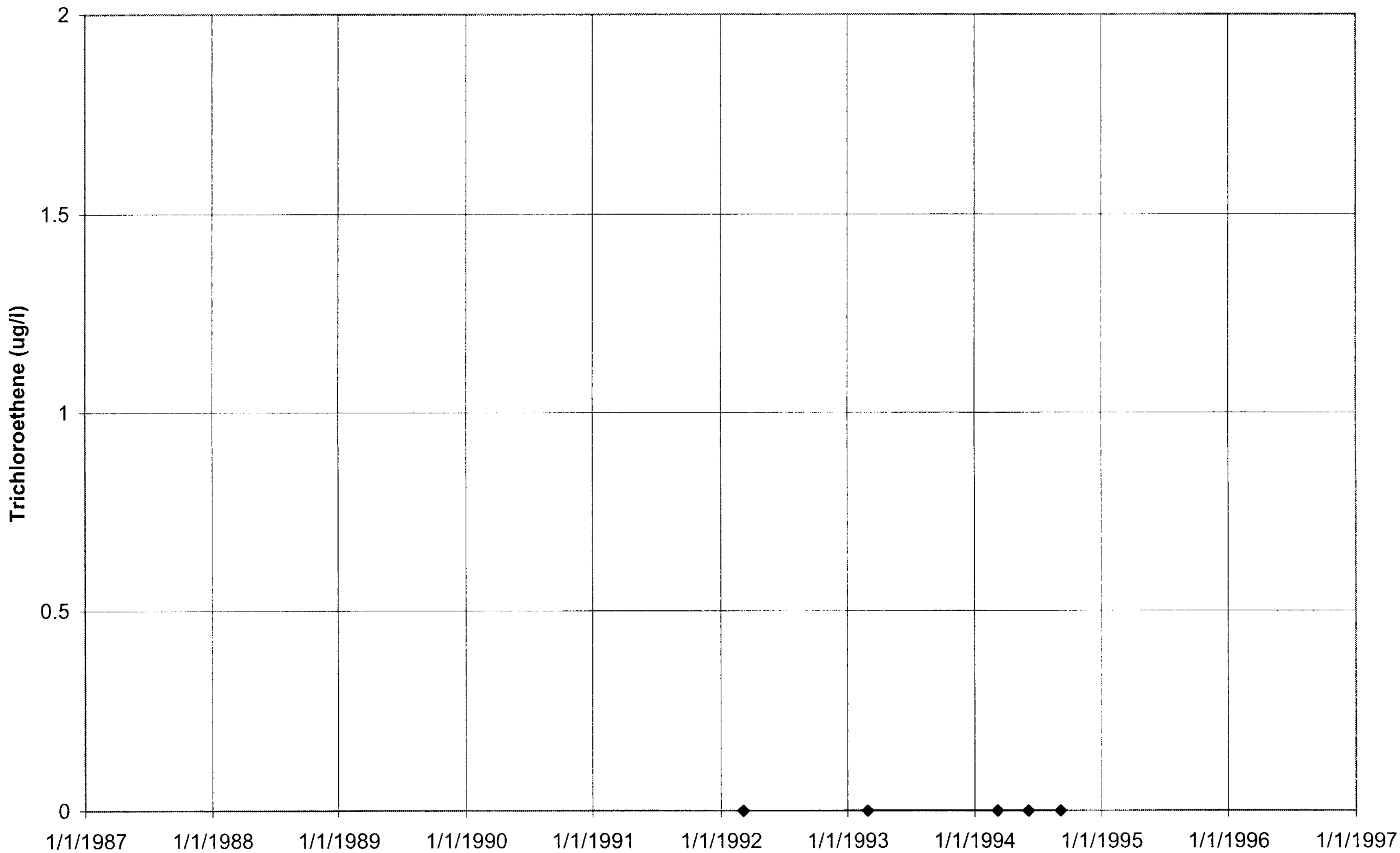
01U105



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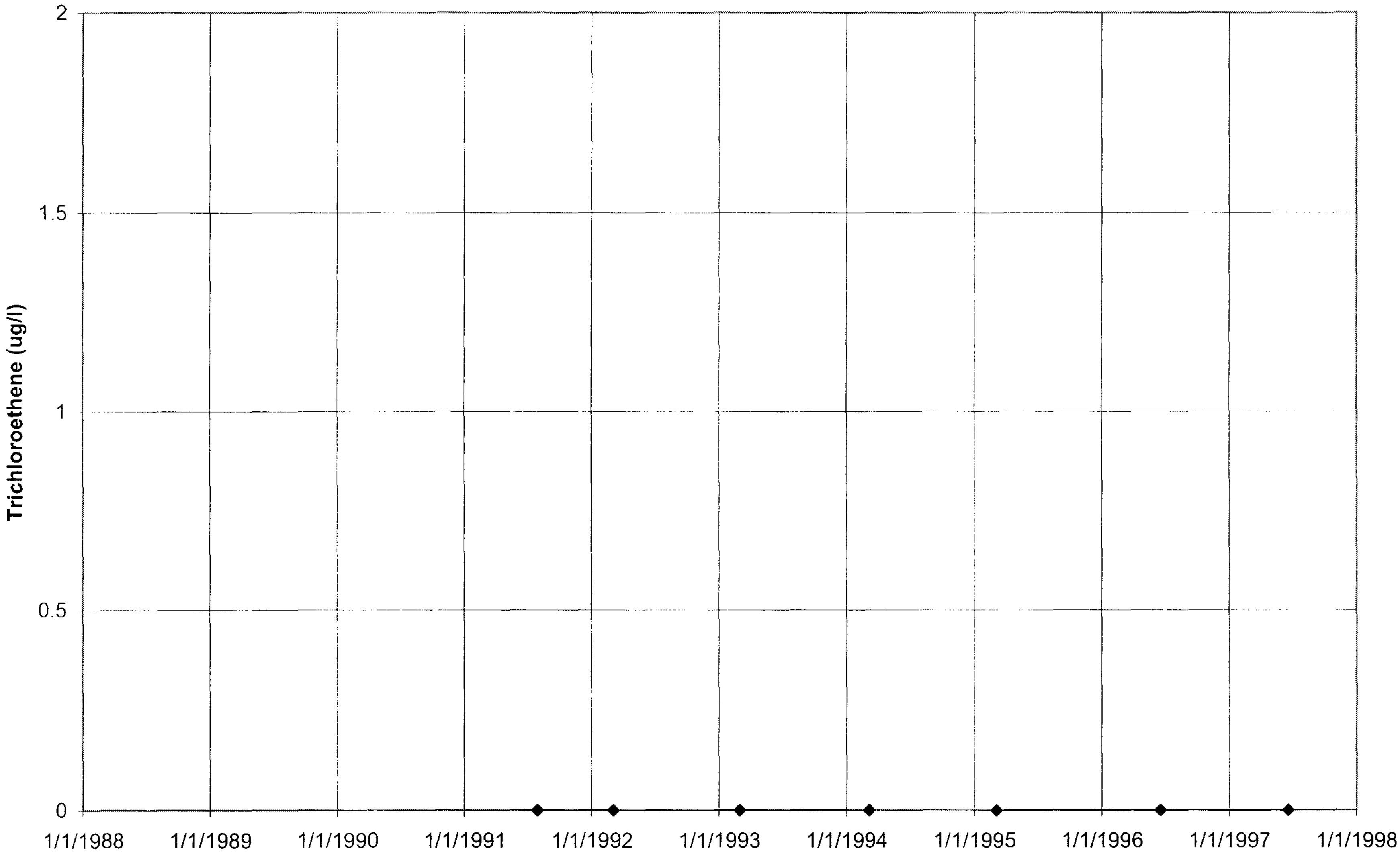
01U106



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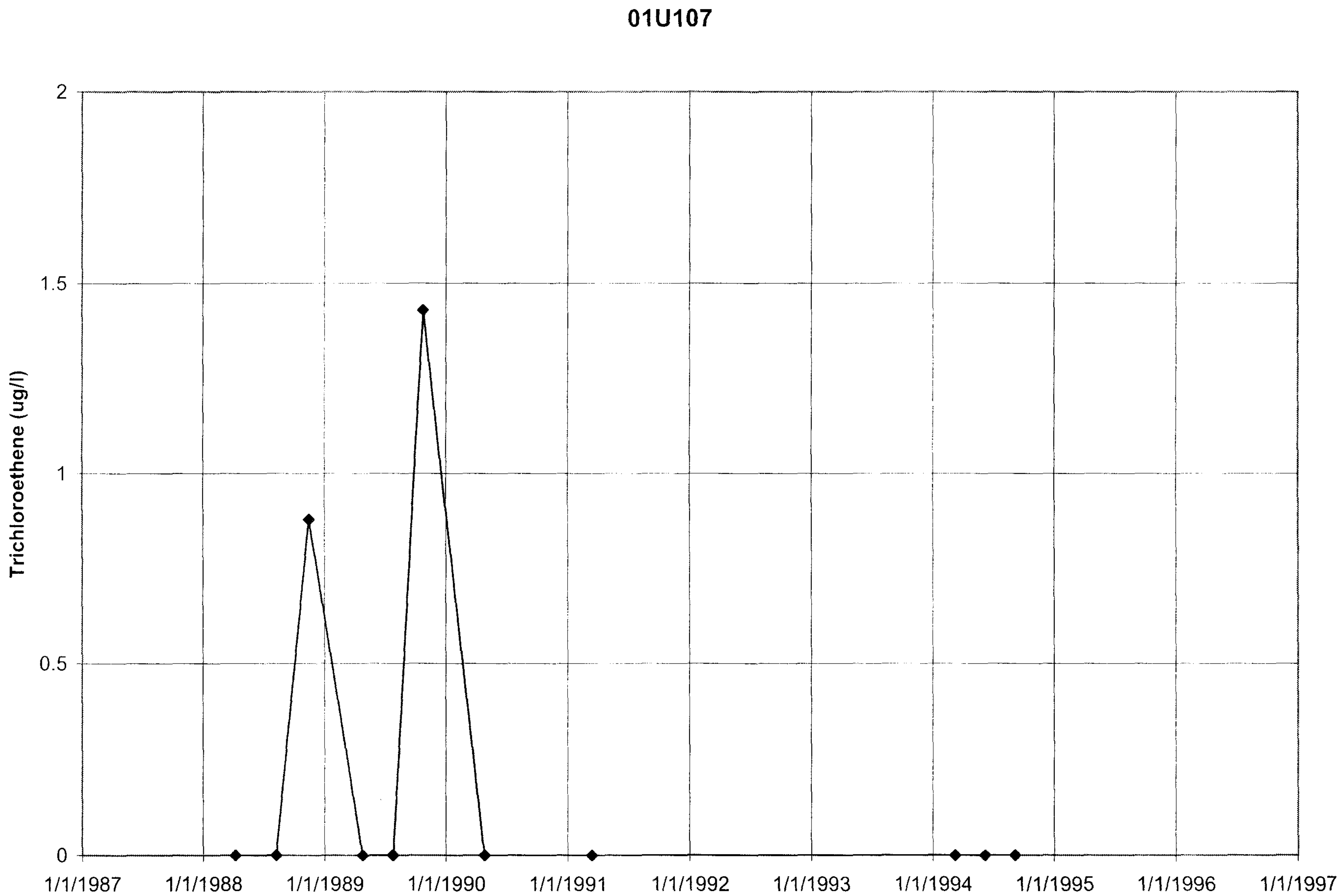

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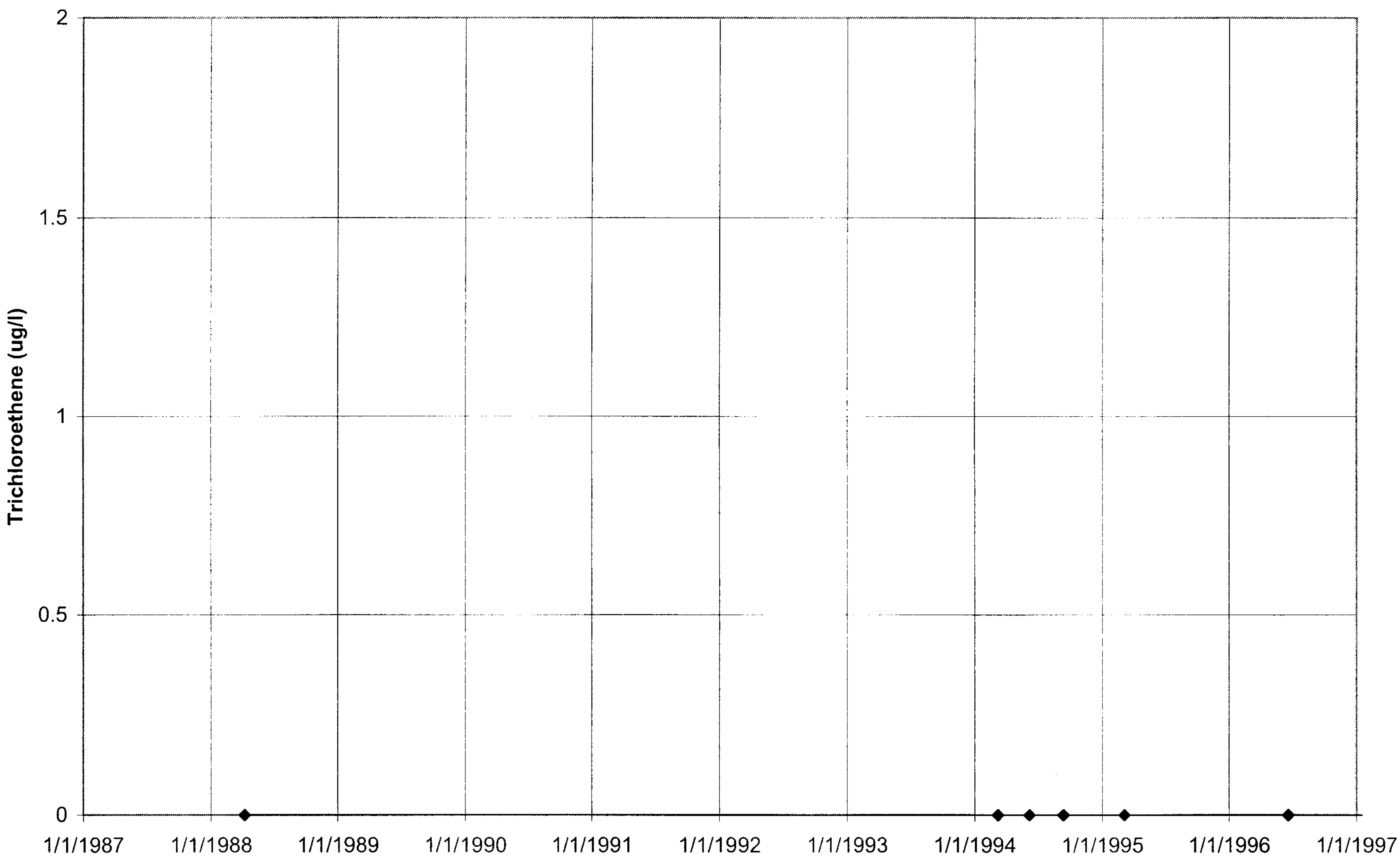

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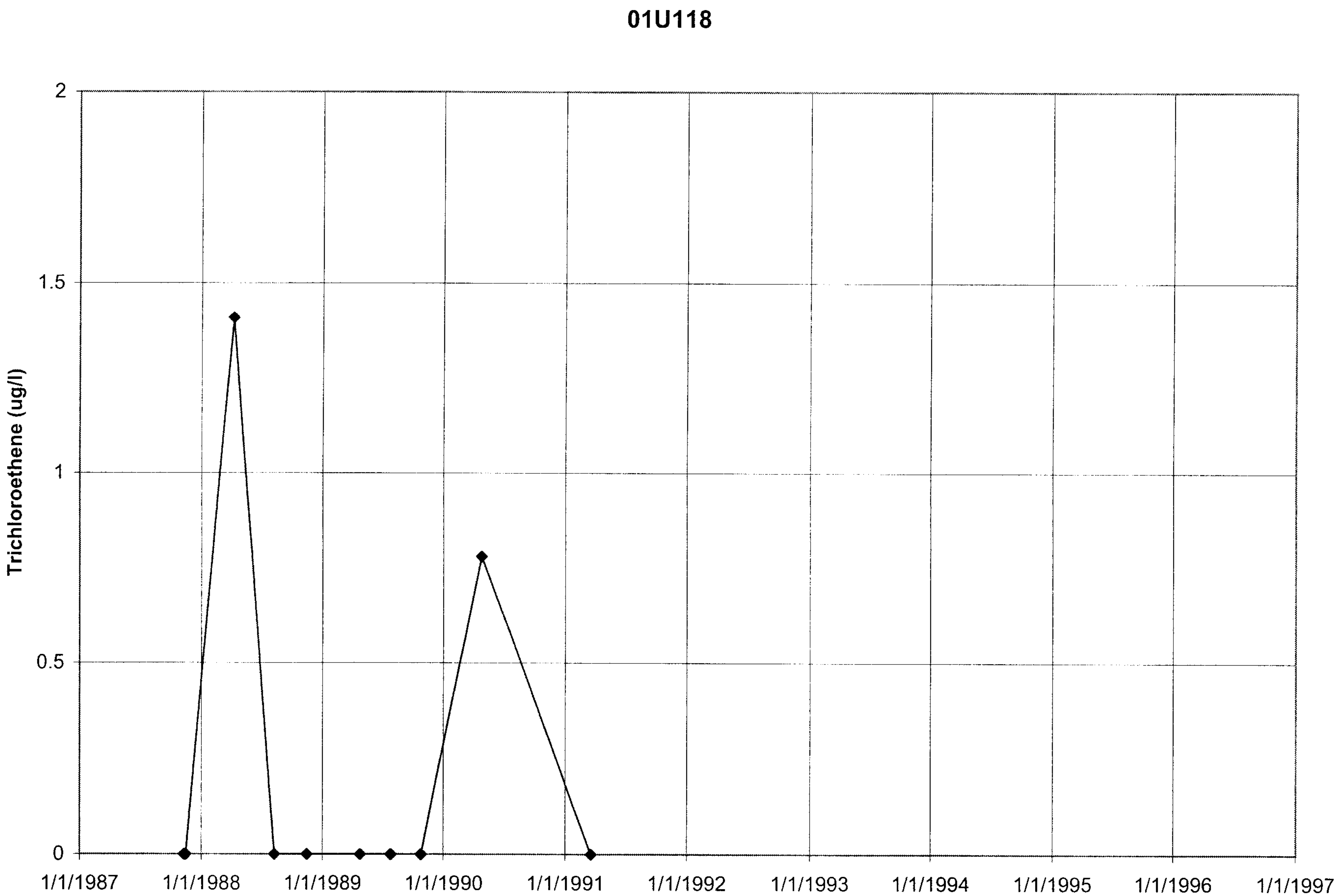

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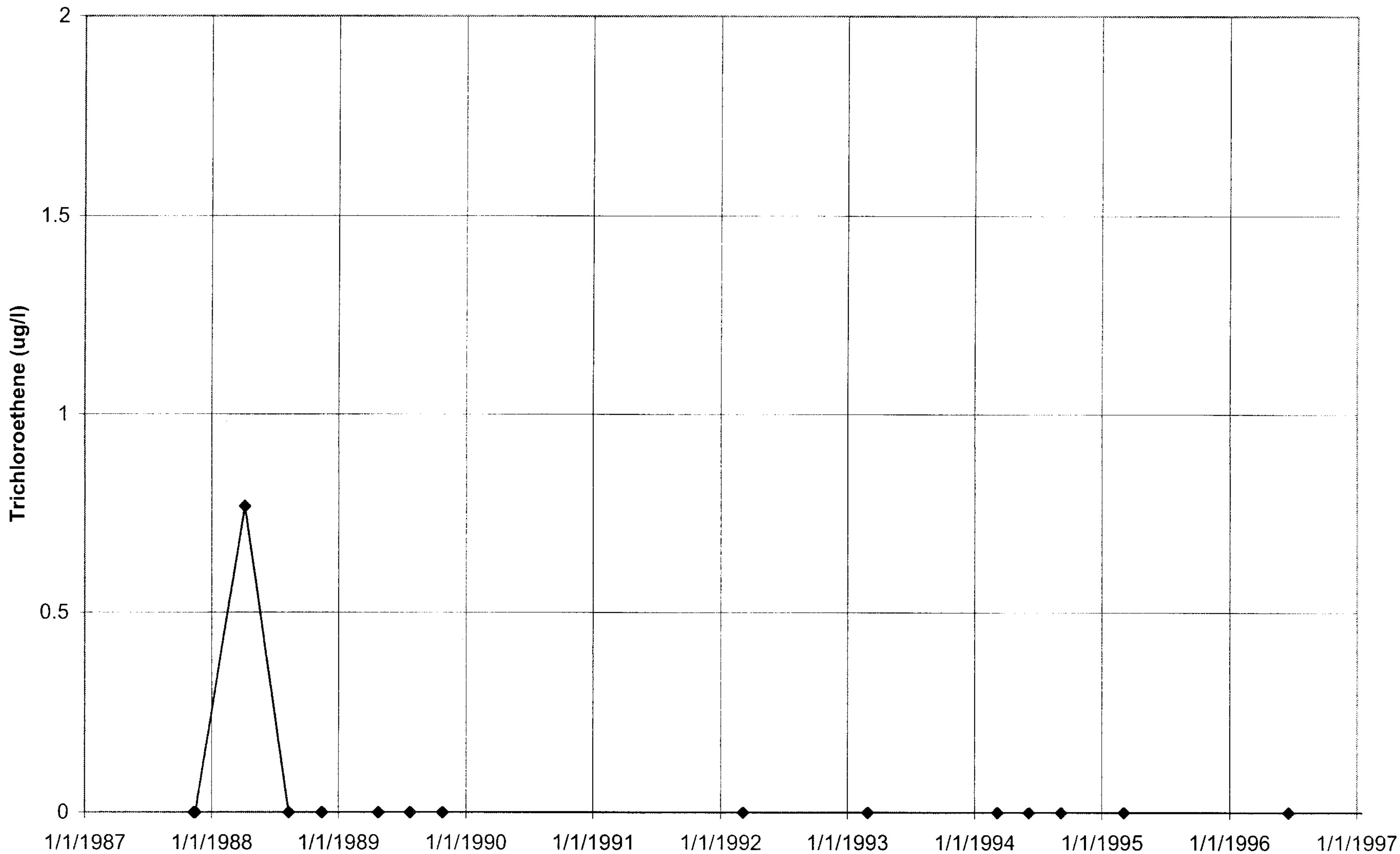

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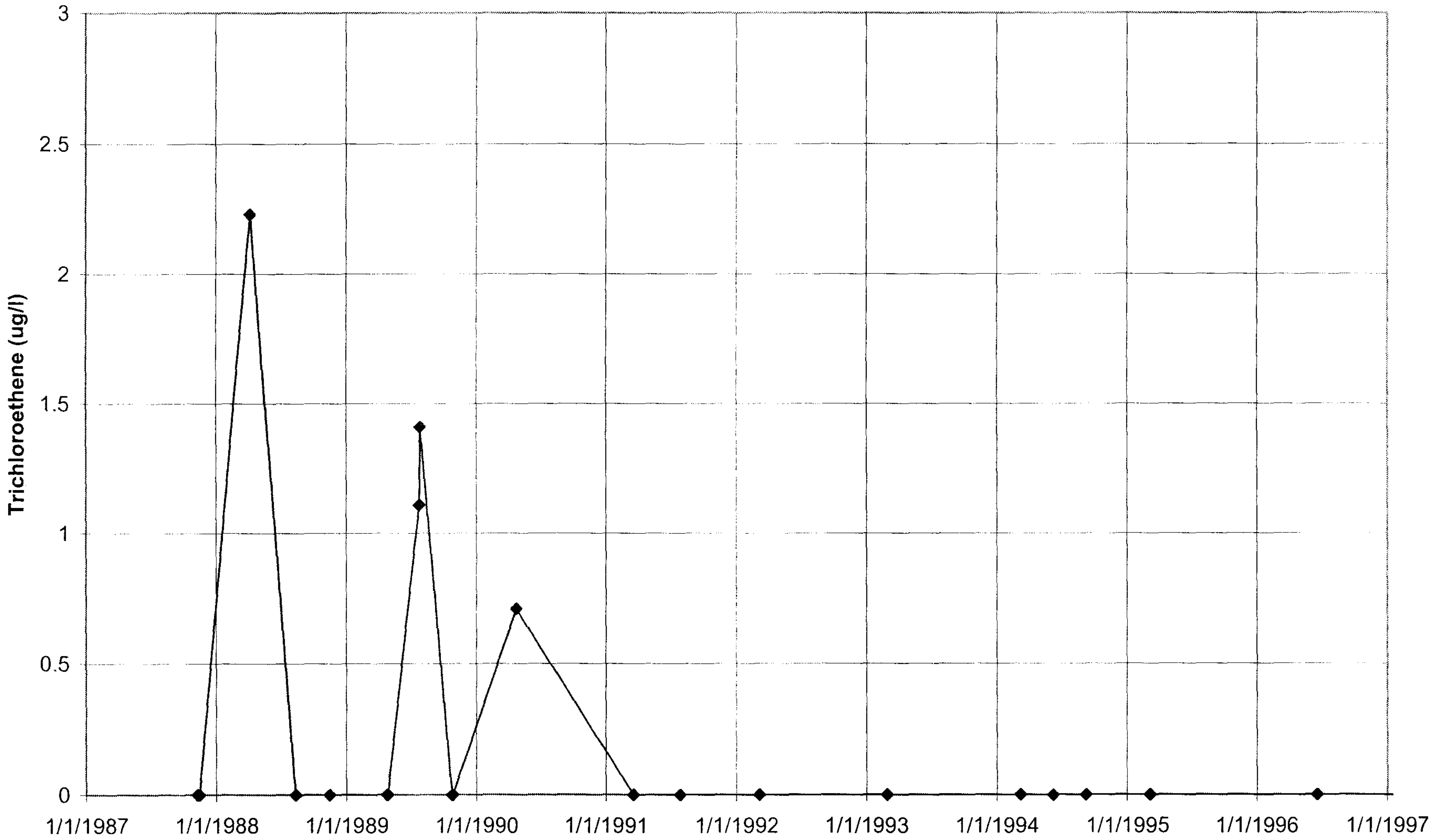

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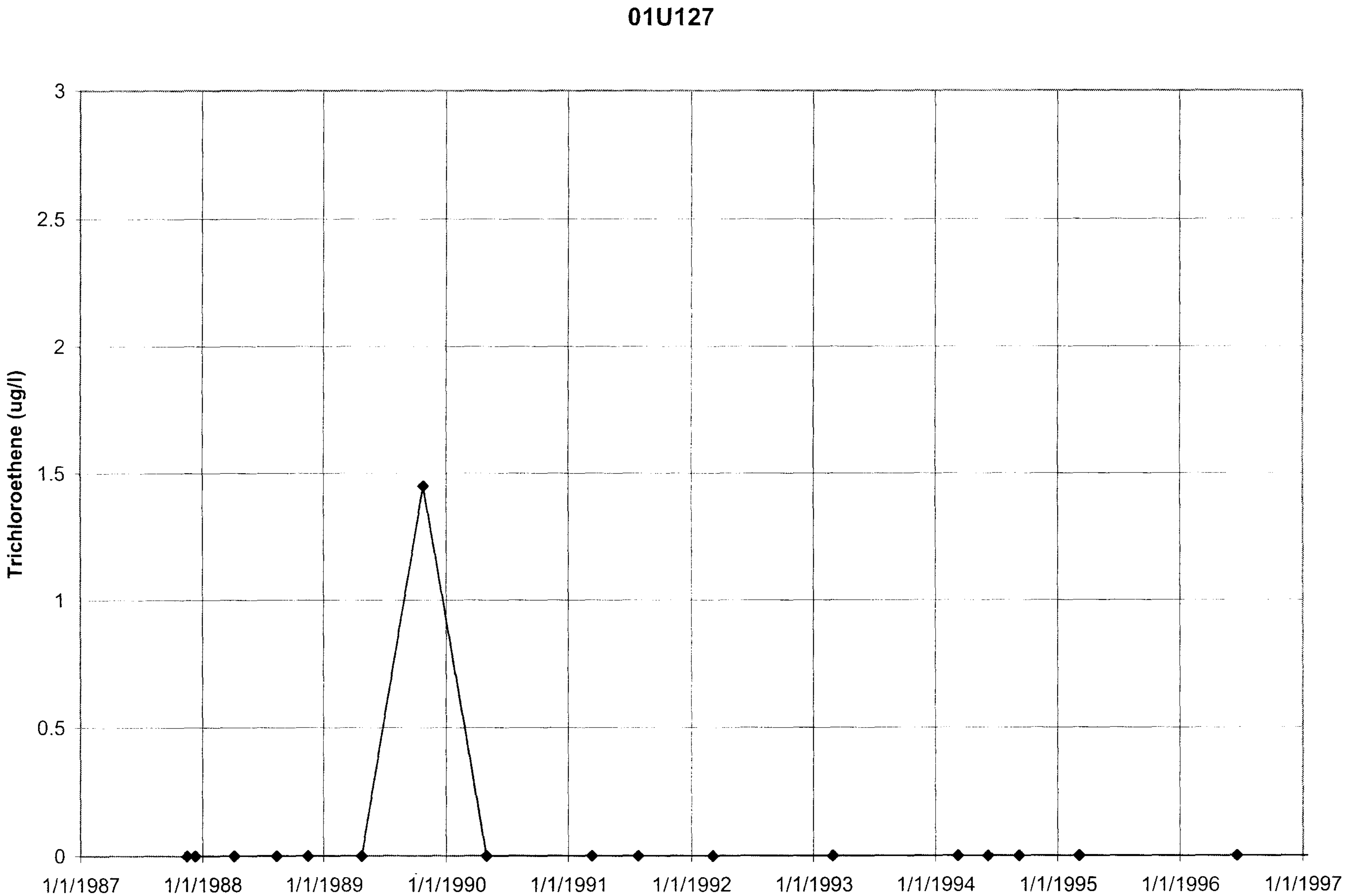

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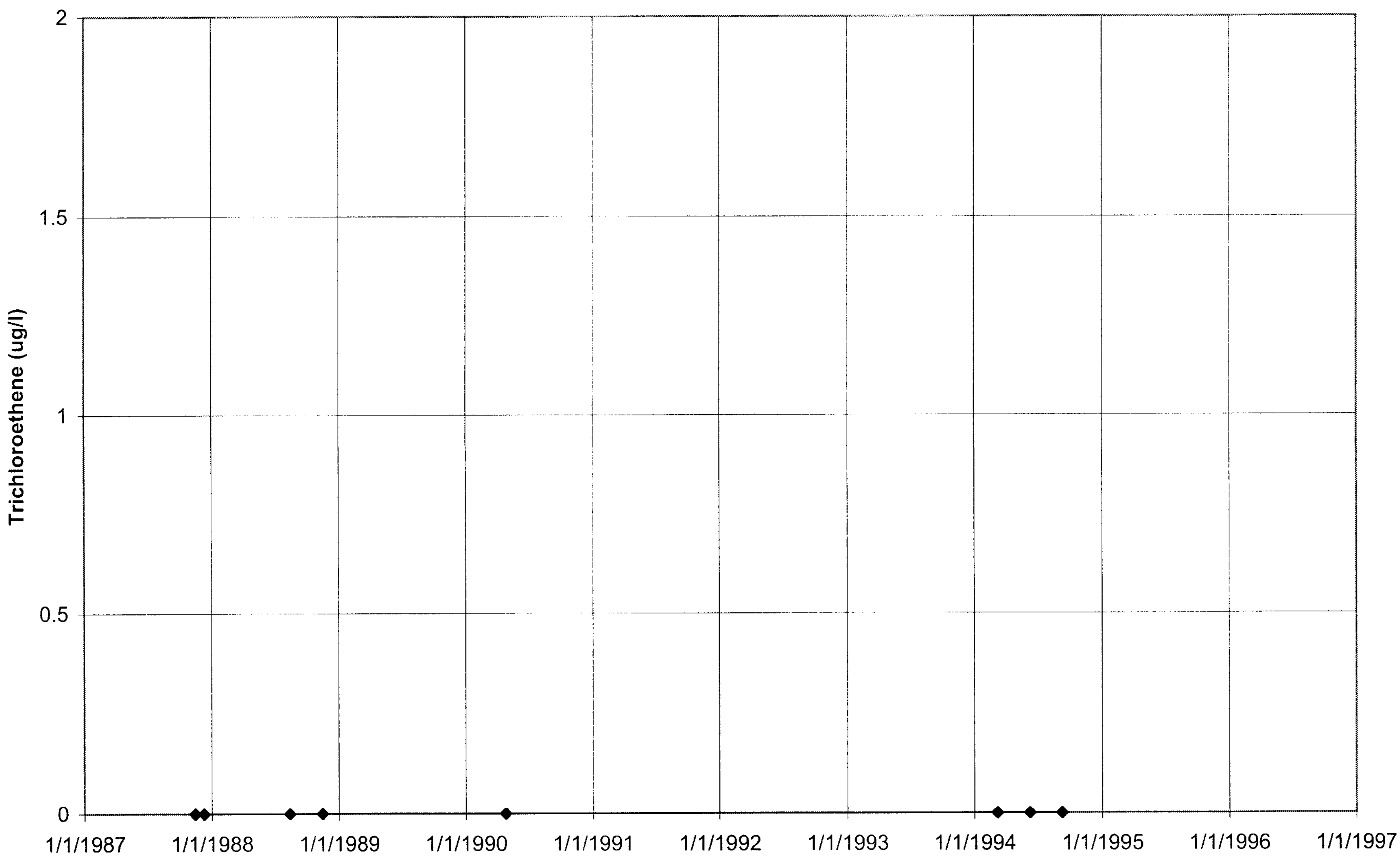

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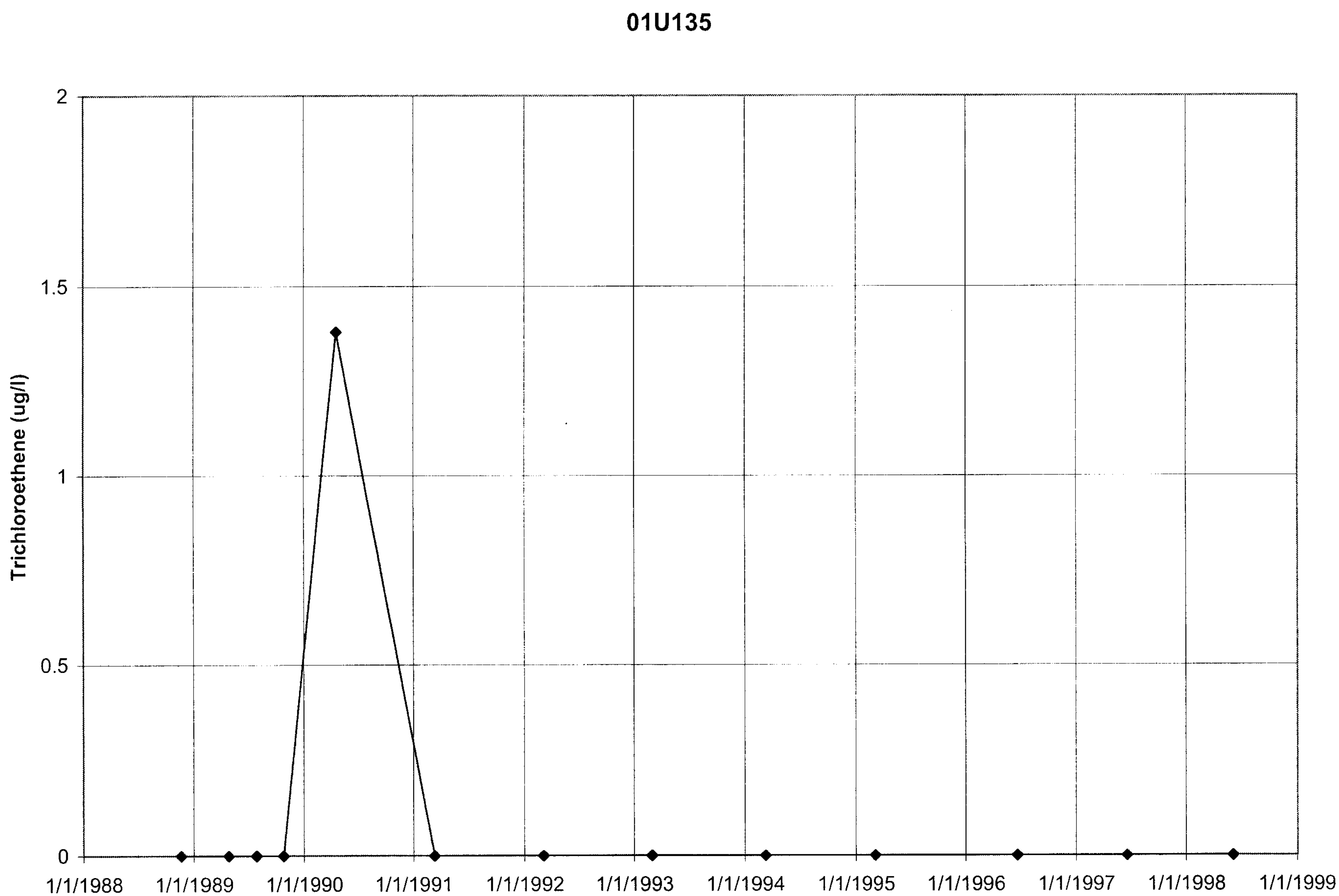

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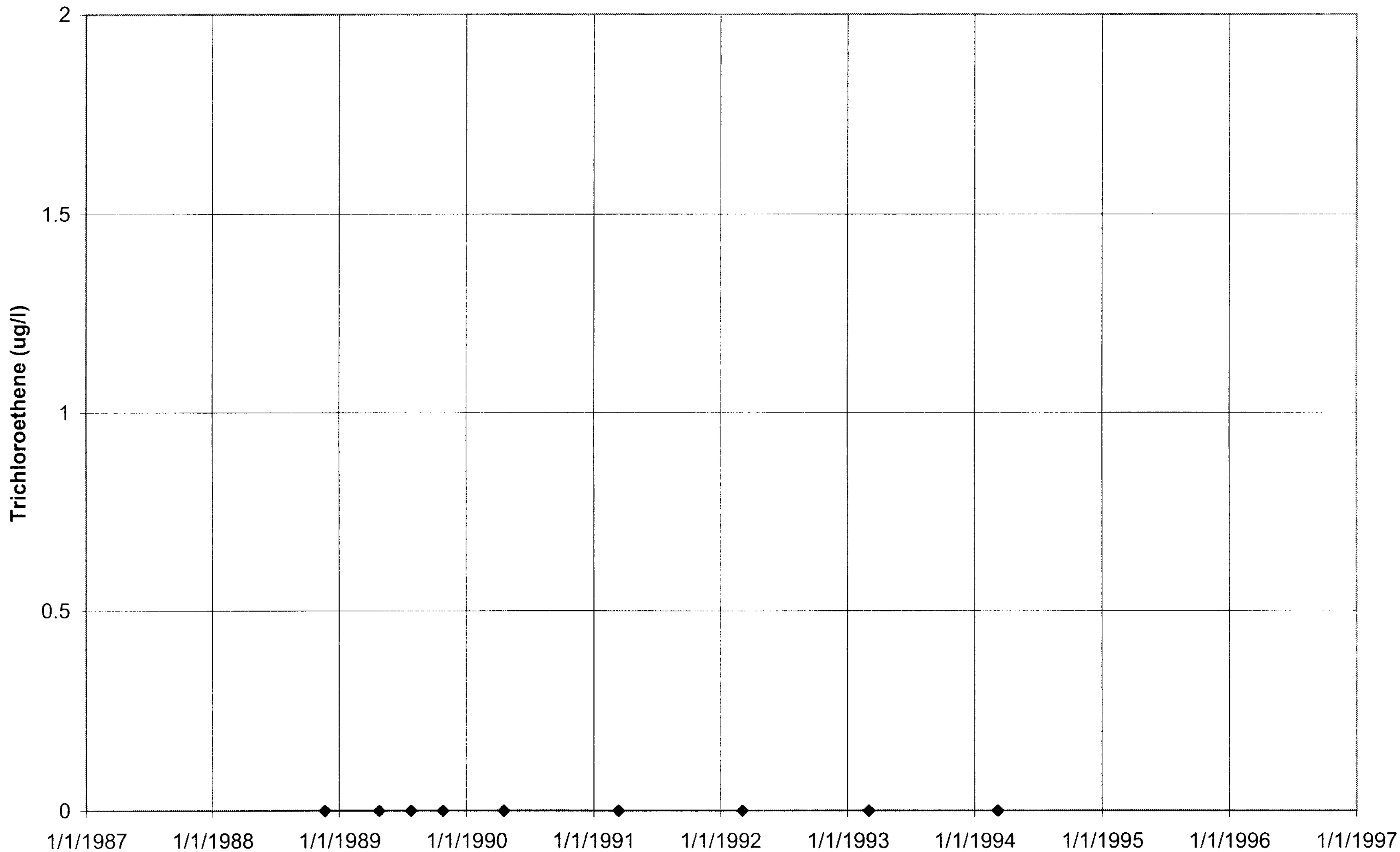

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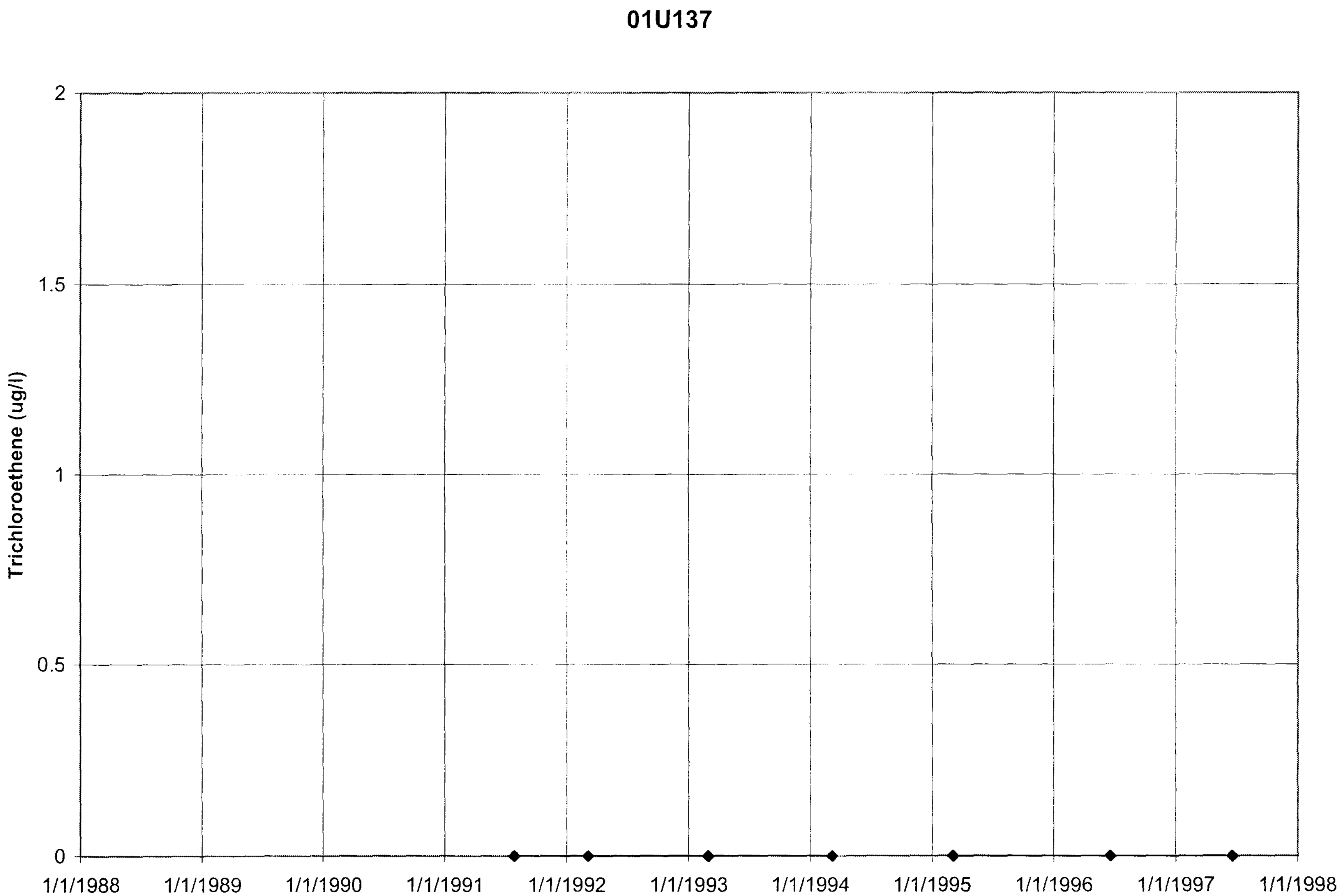

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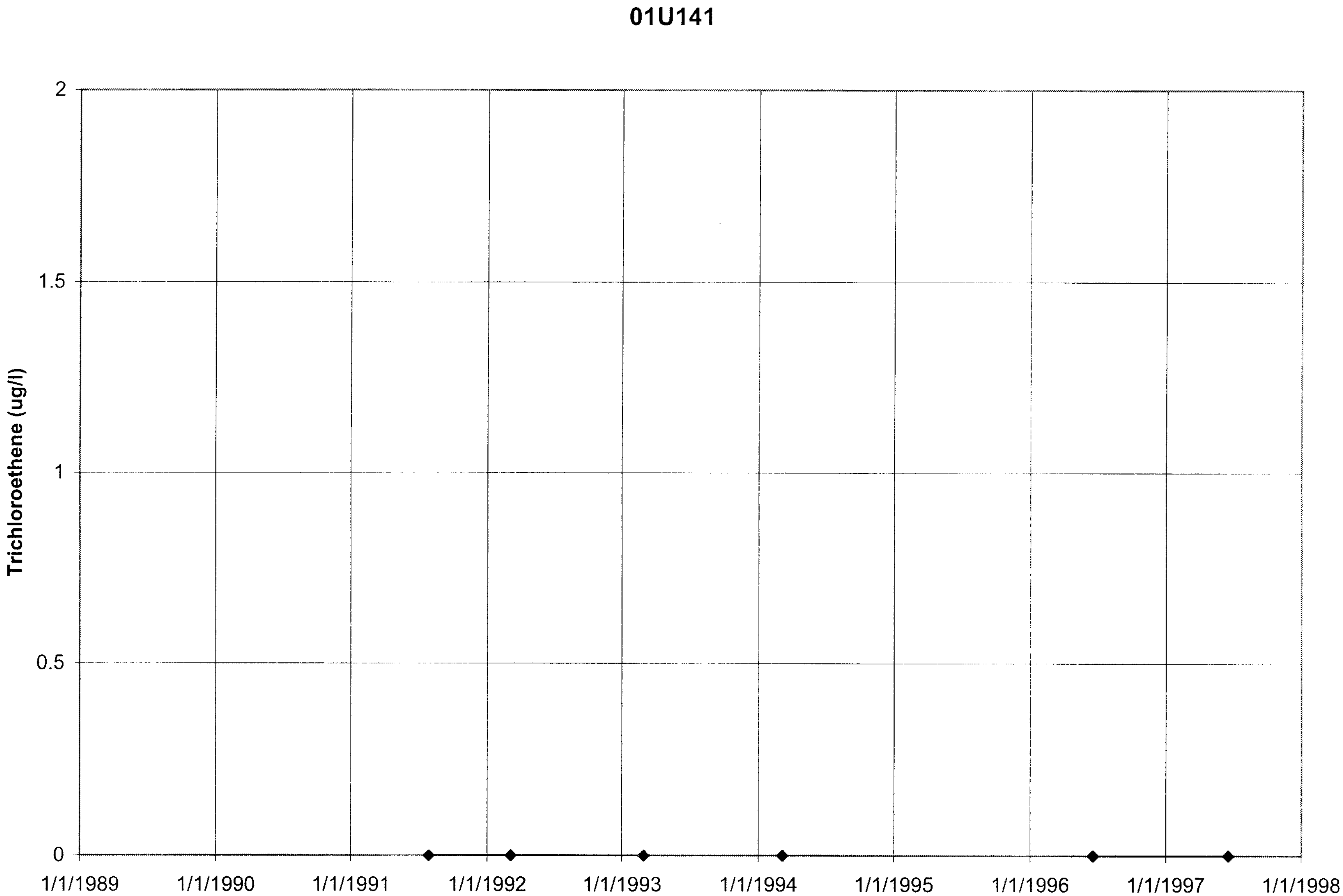

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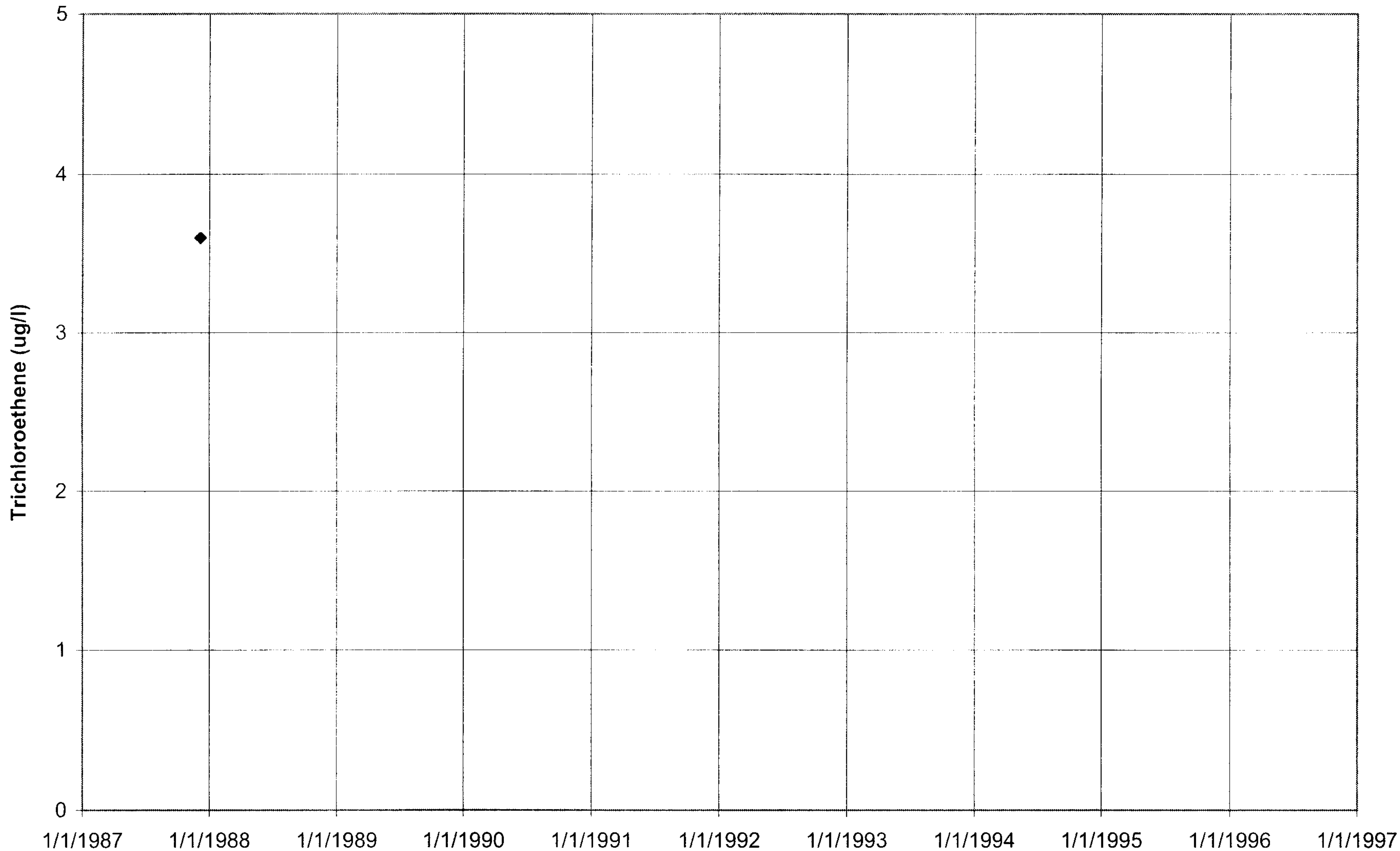

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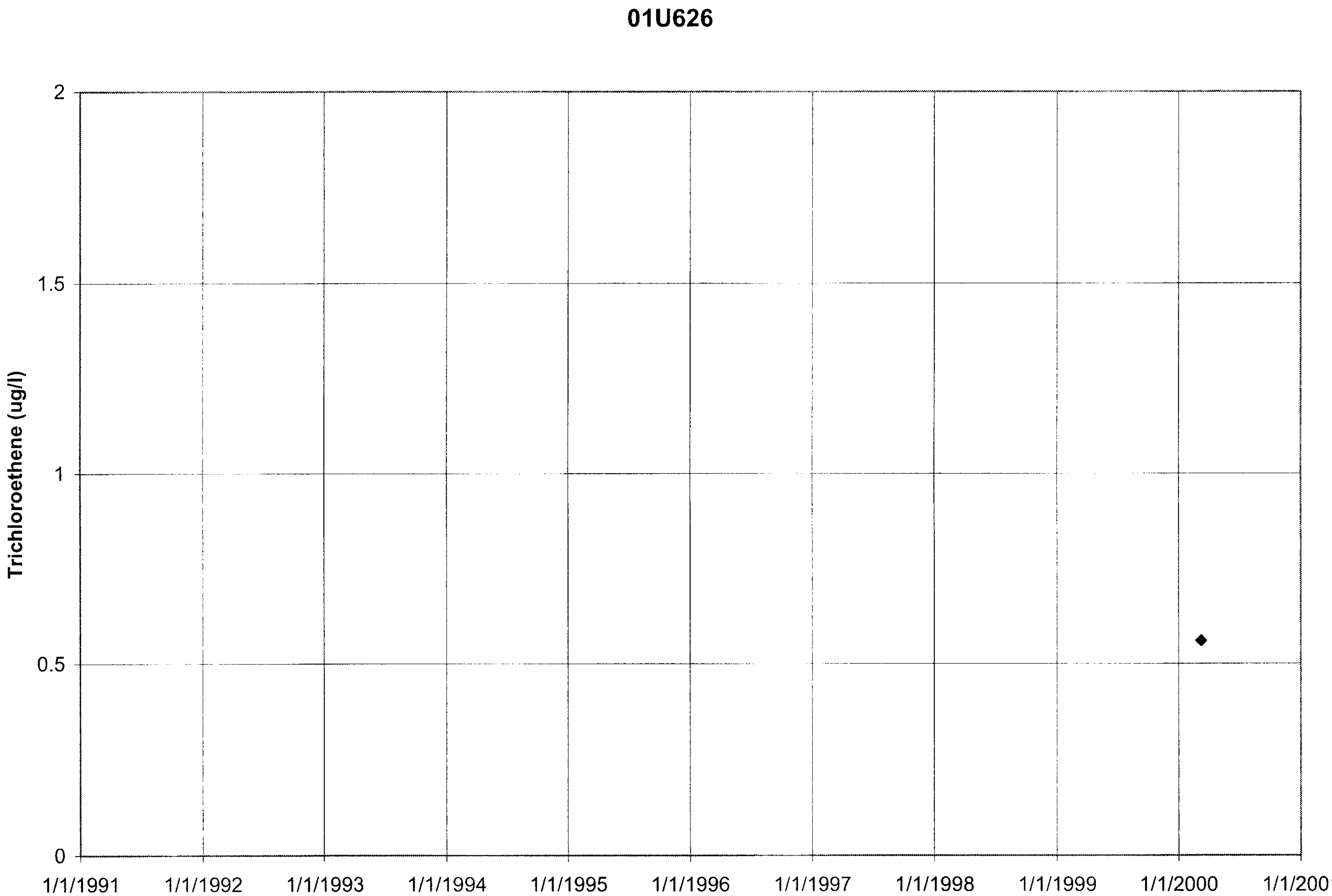

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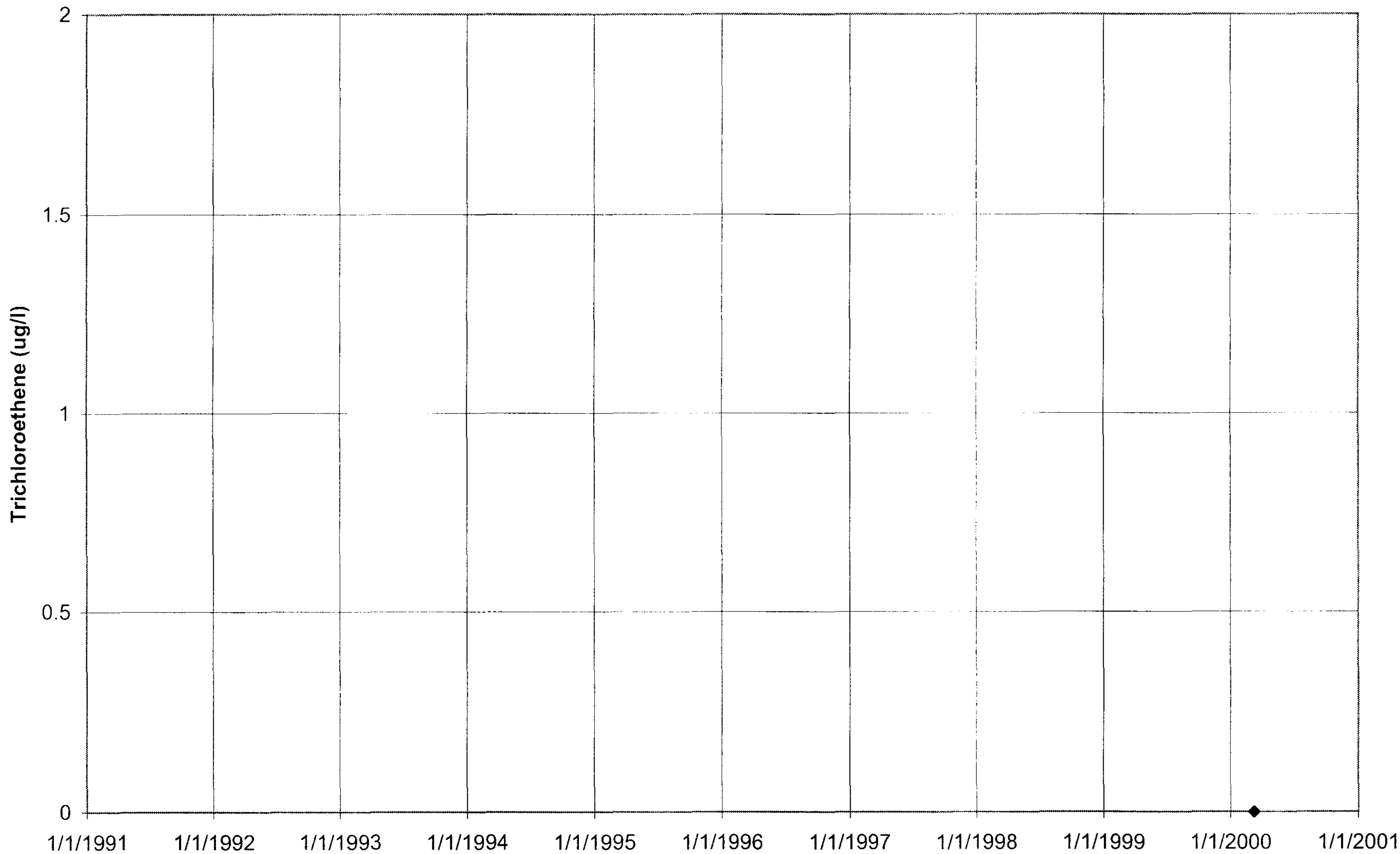

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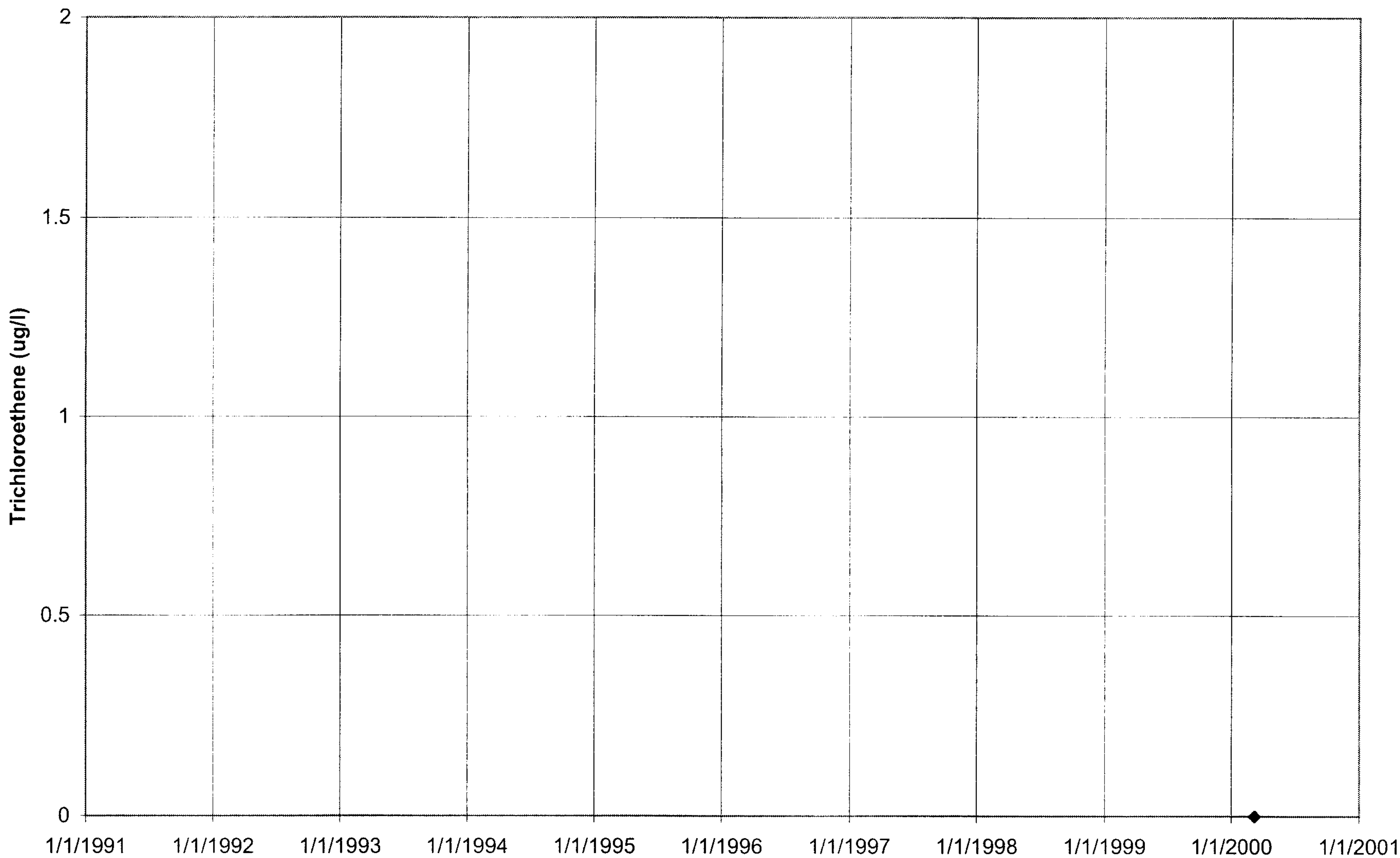

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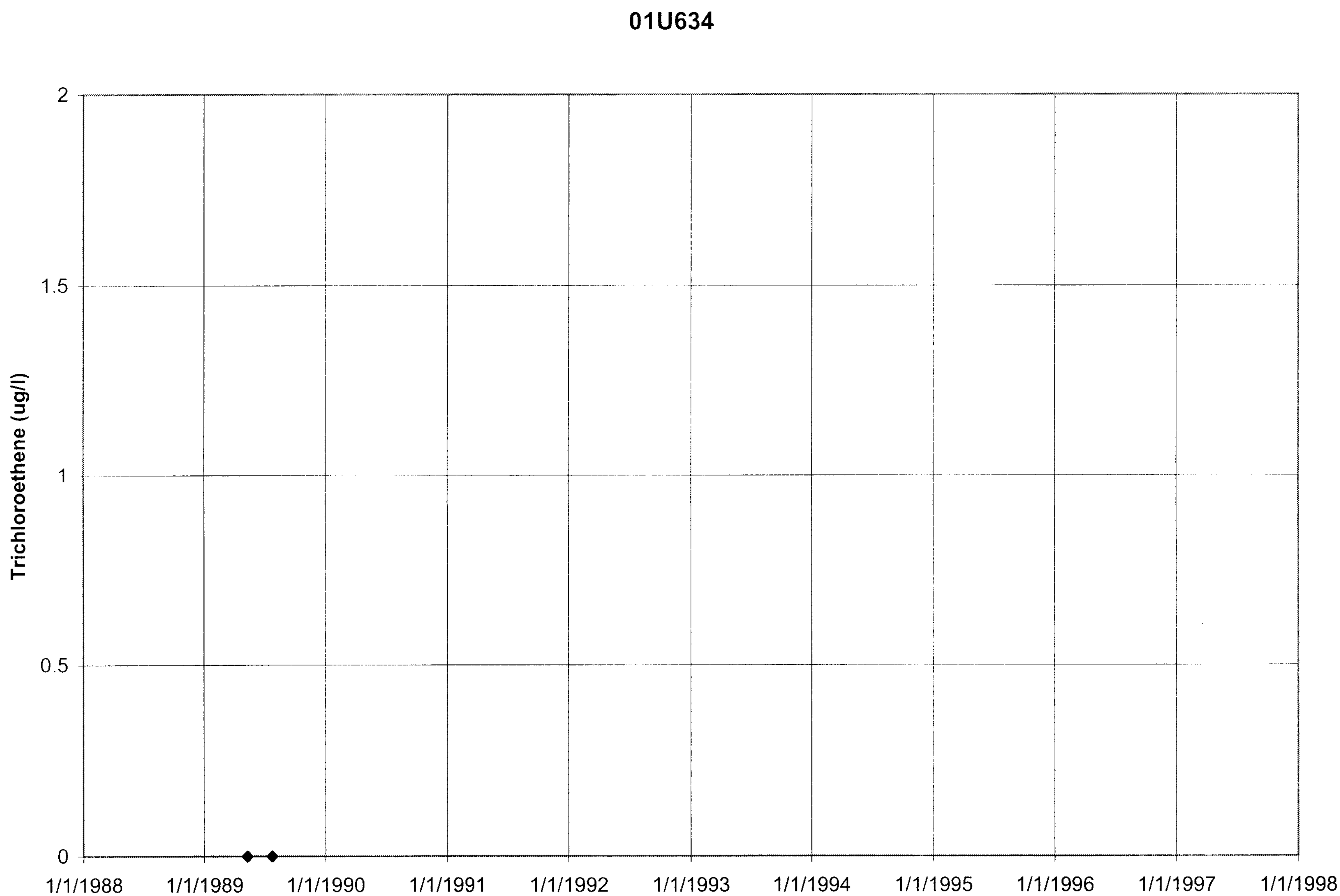

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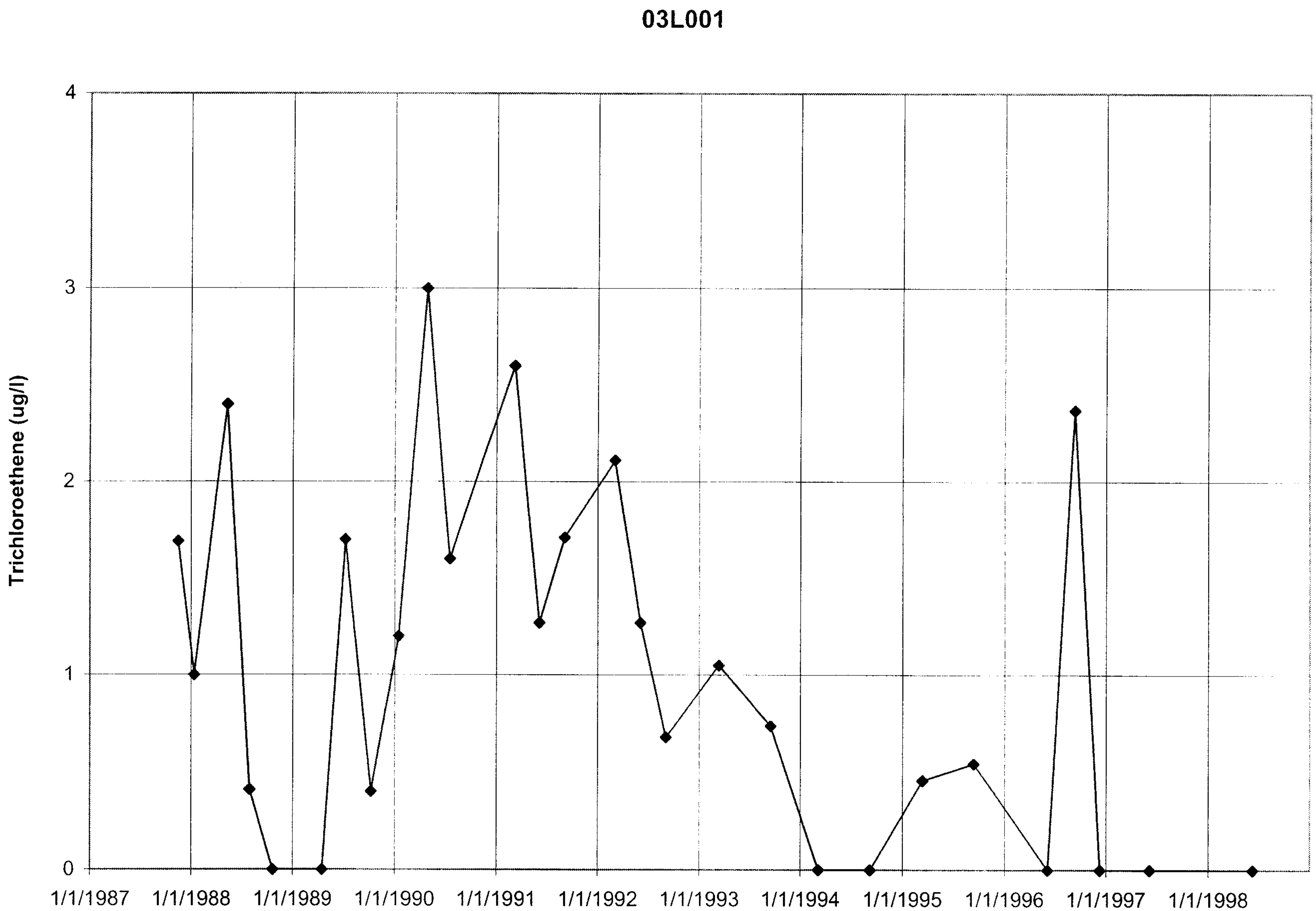

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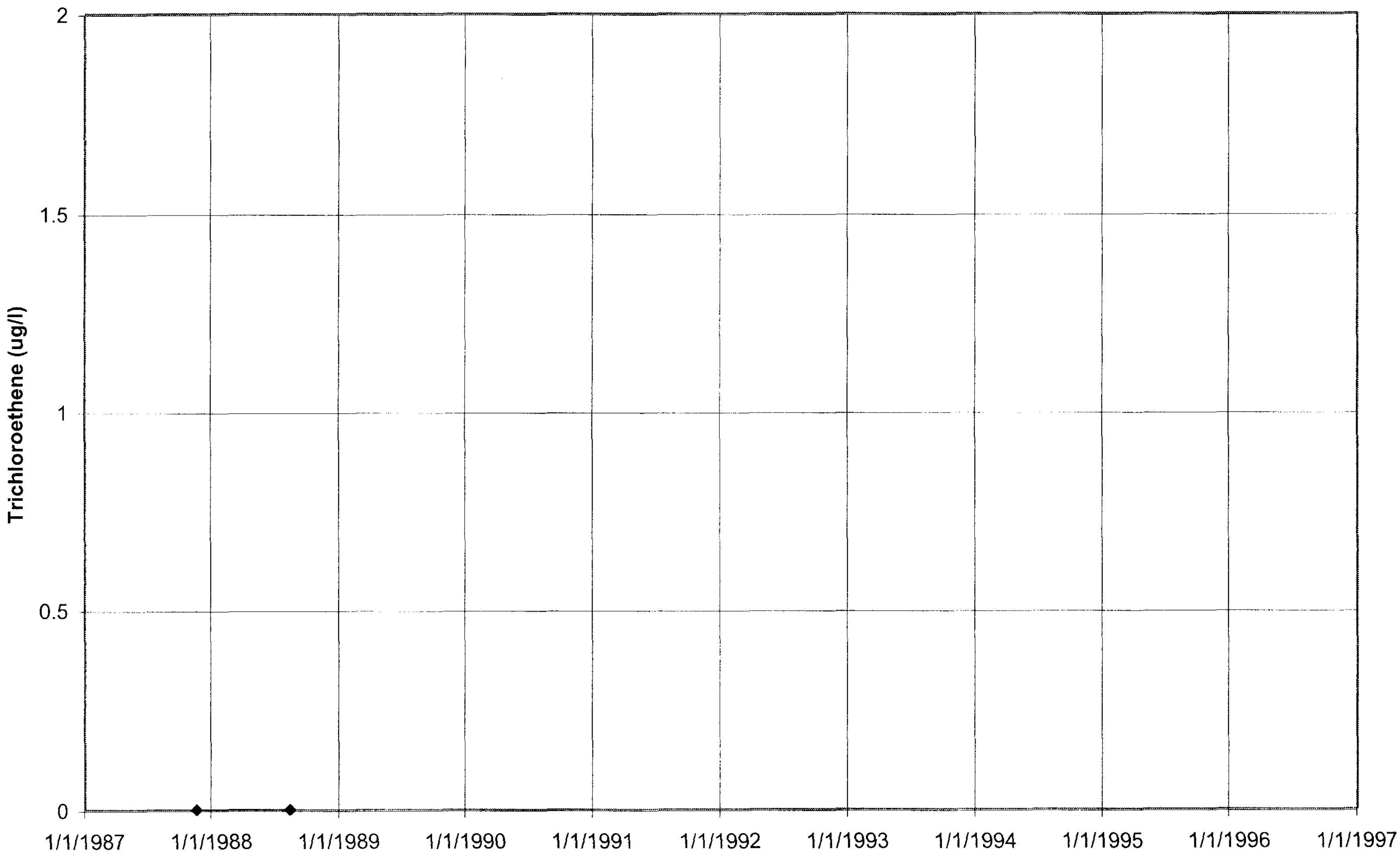
03L003



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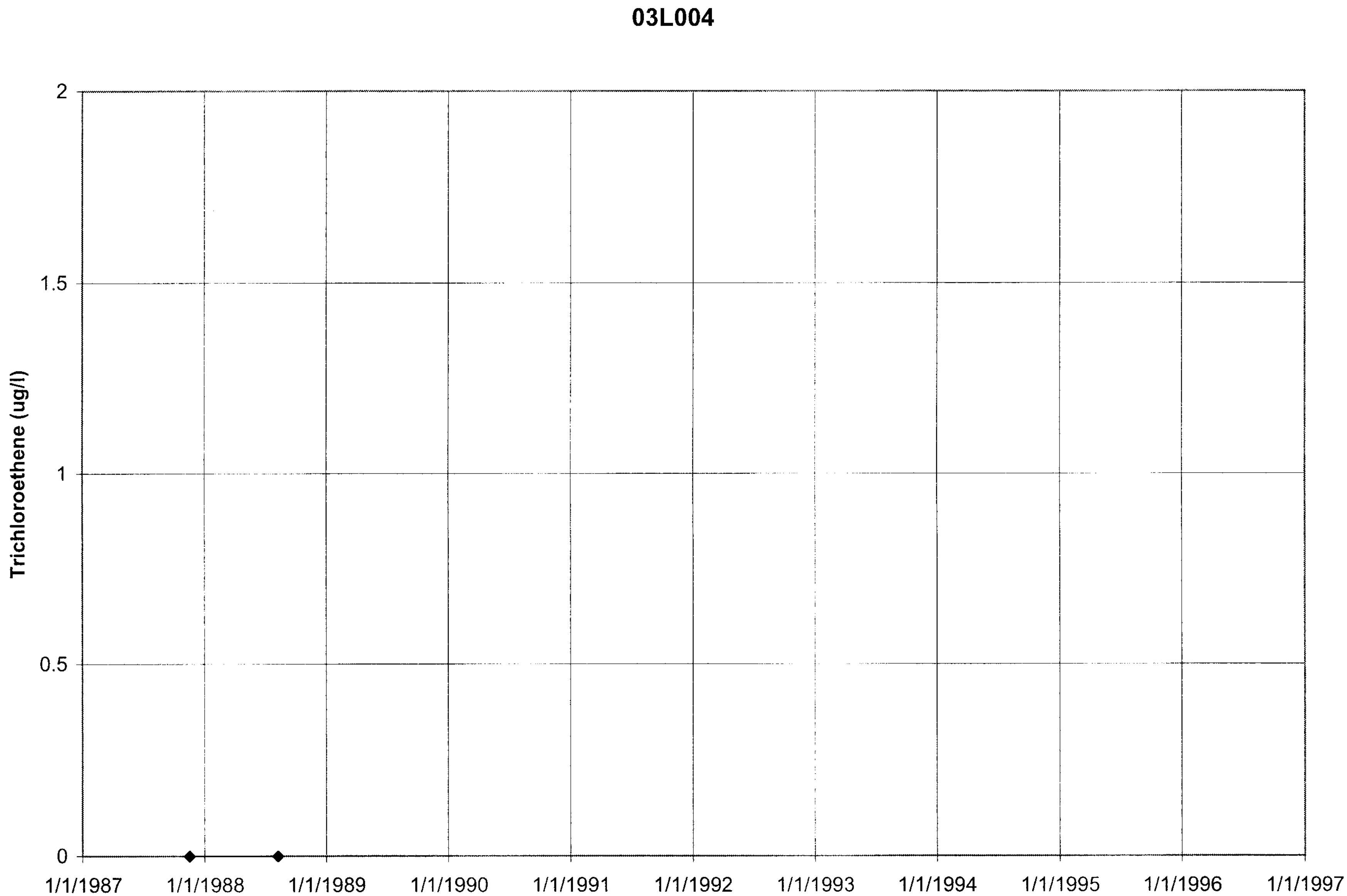

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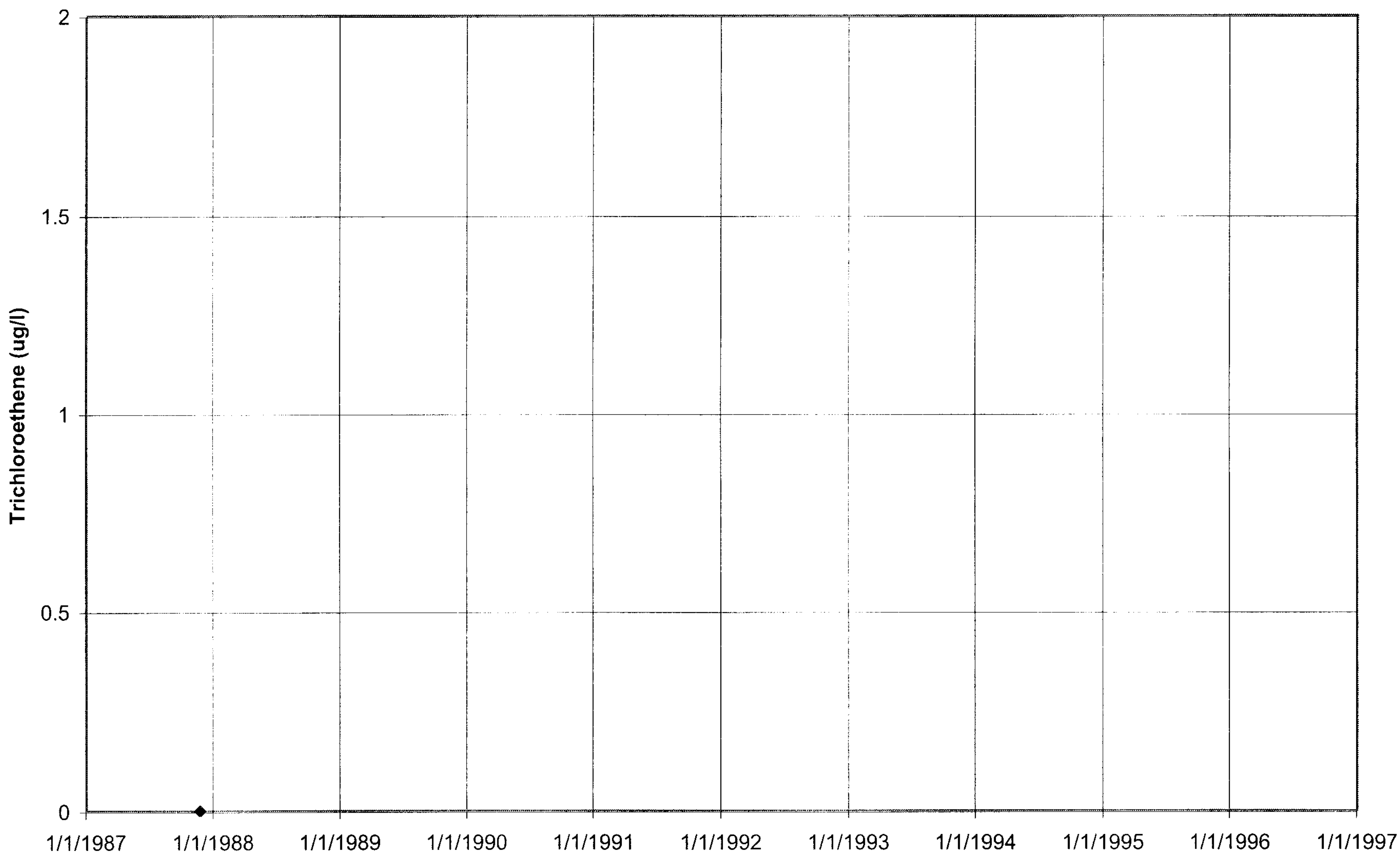

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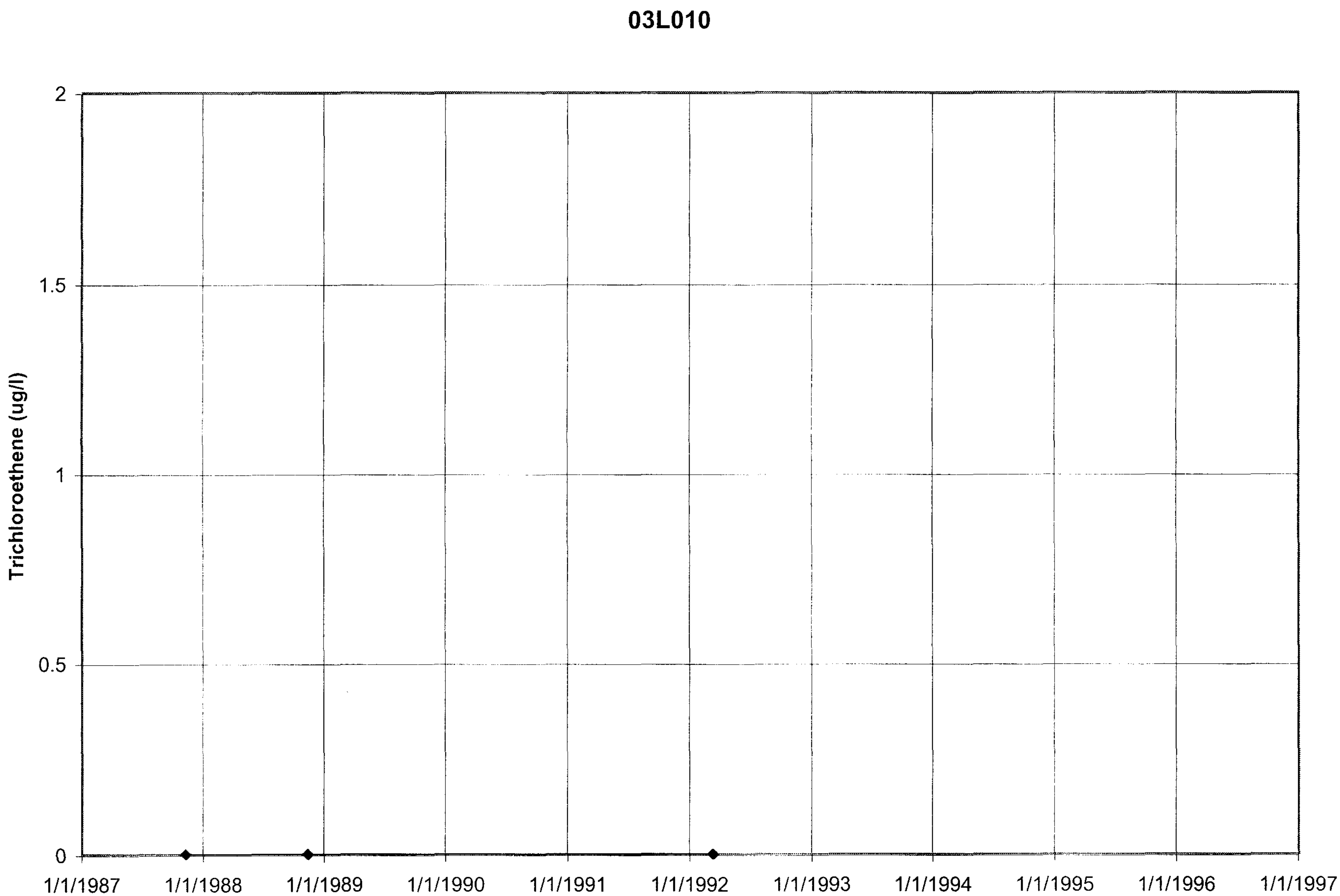

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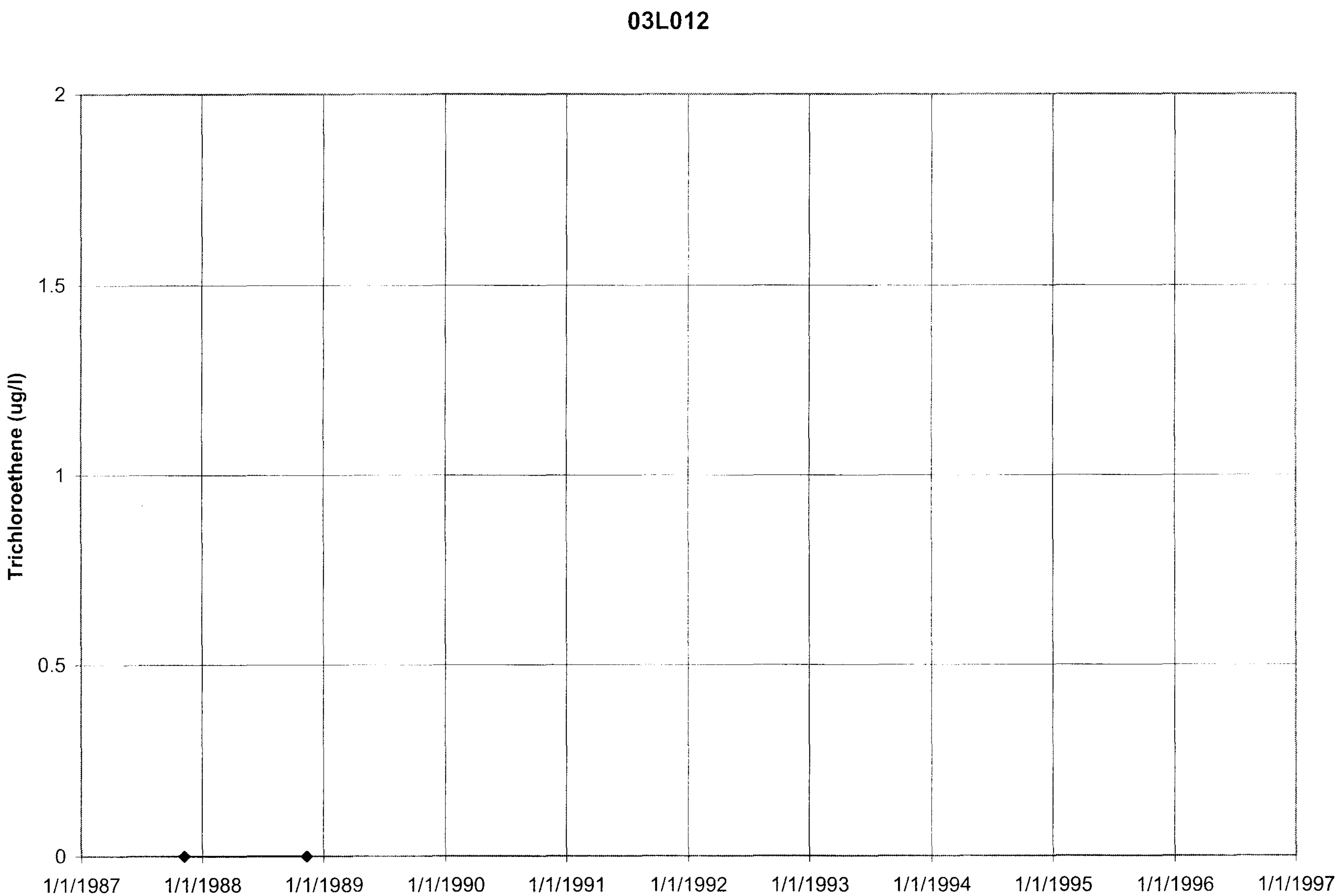

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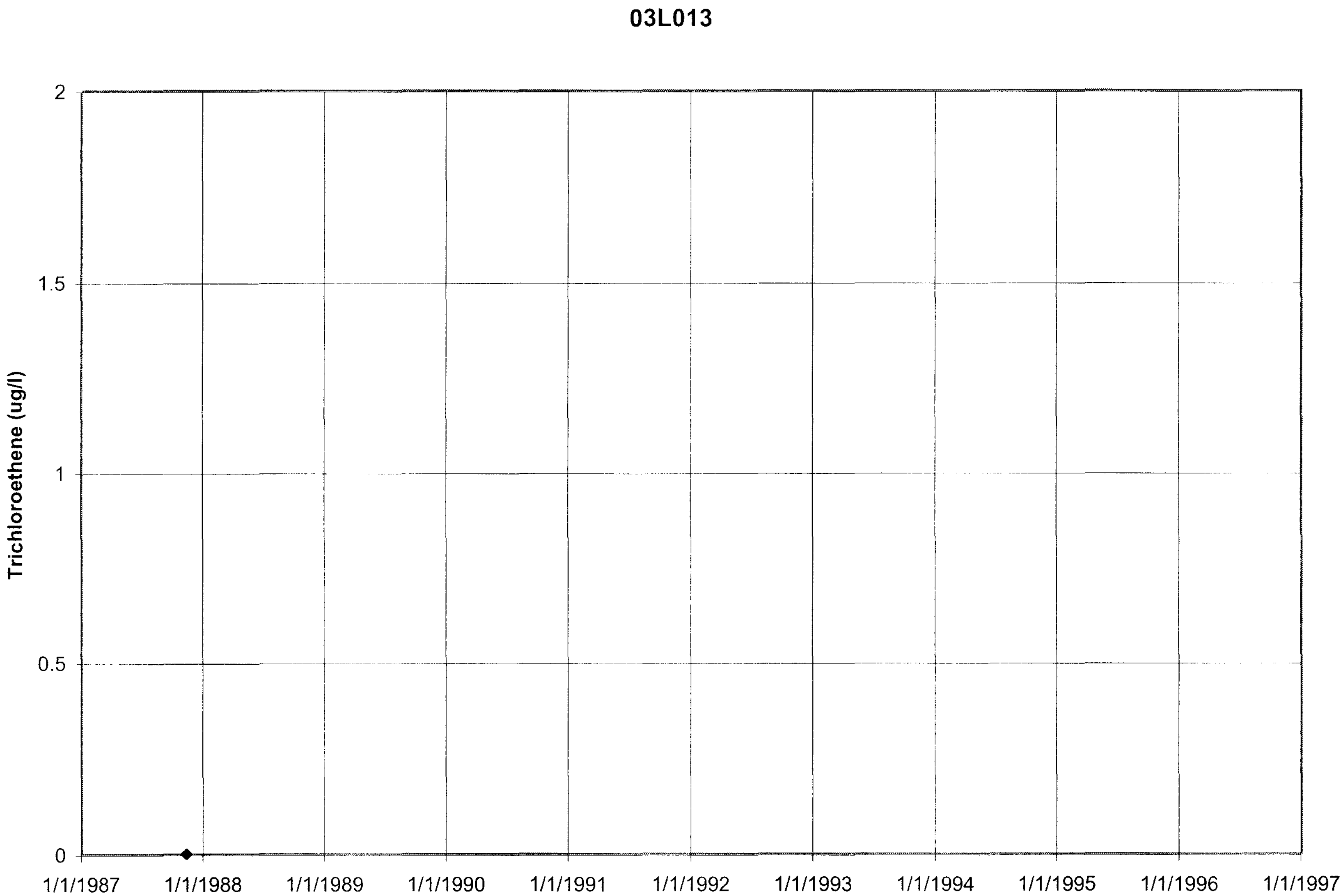

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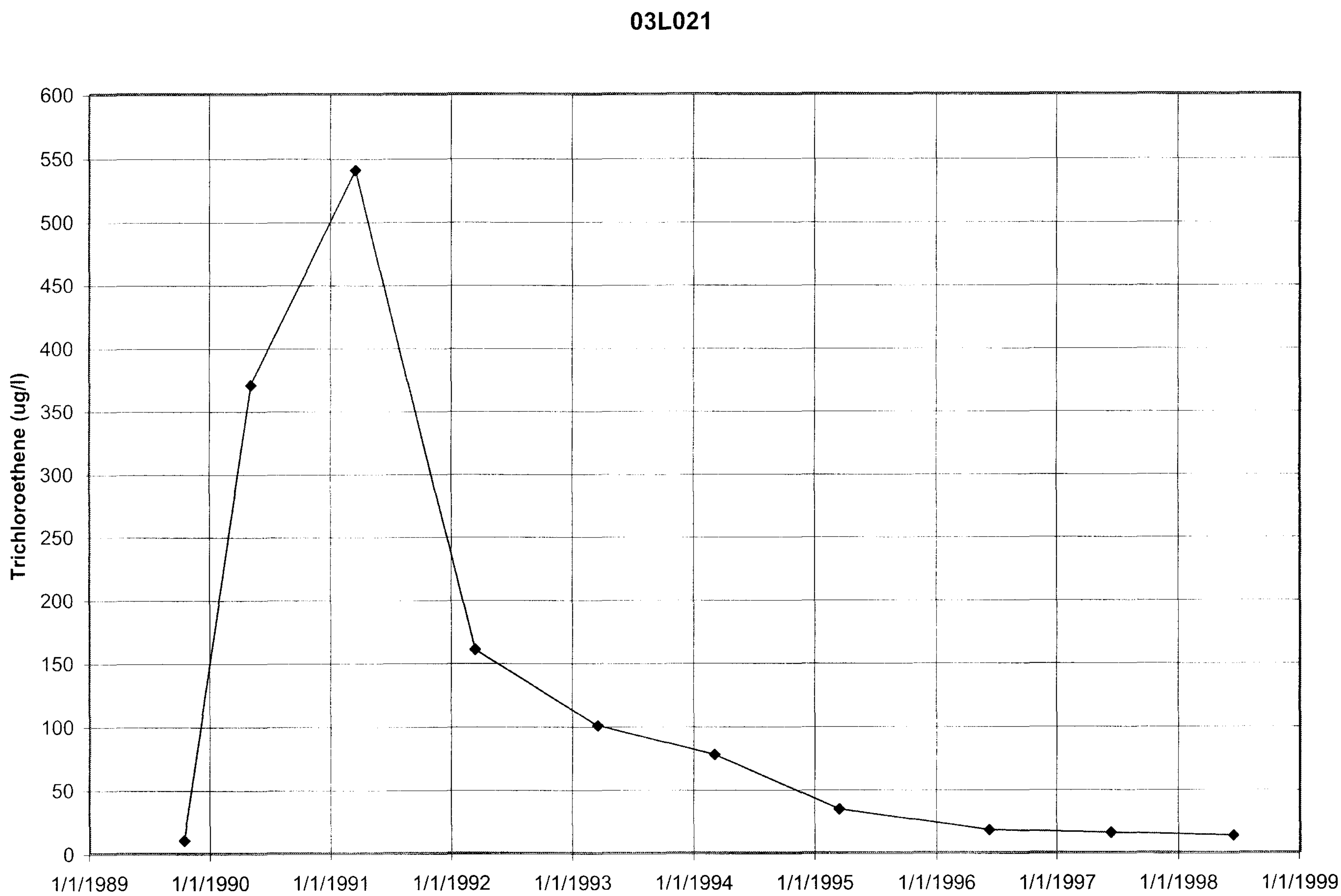

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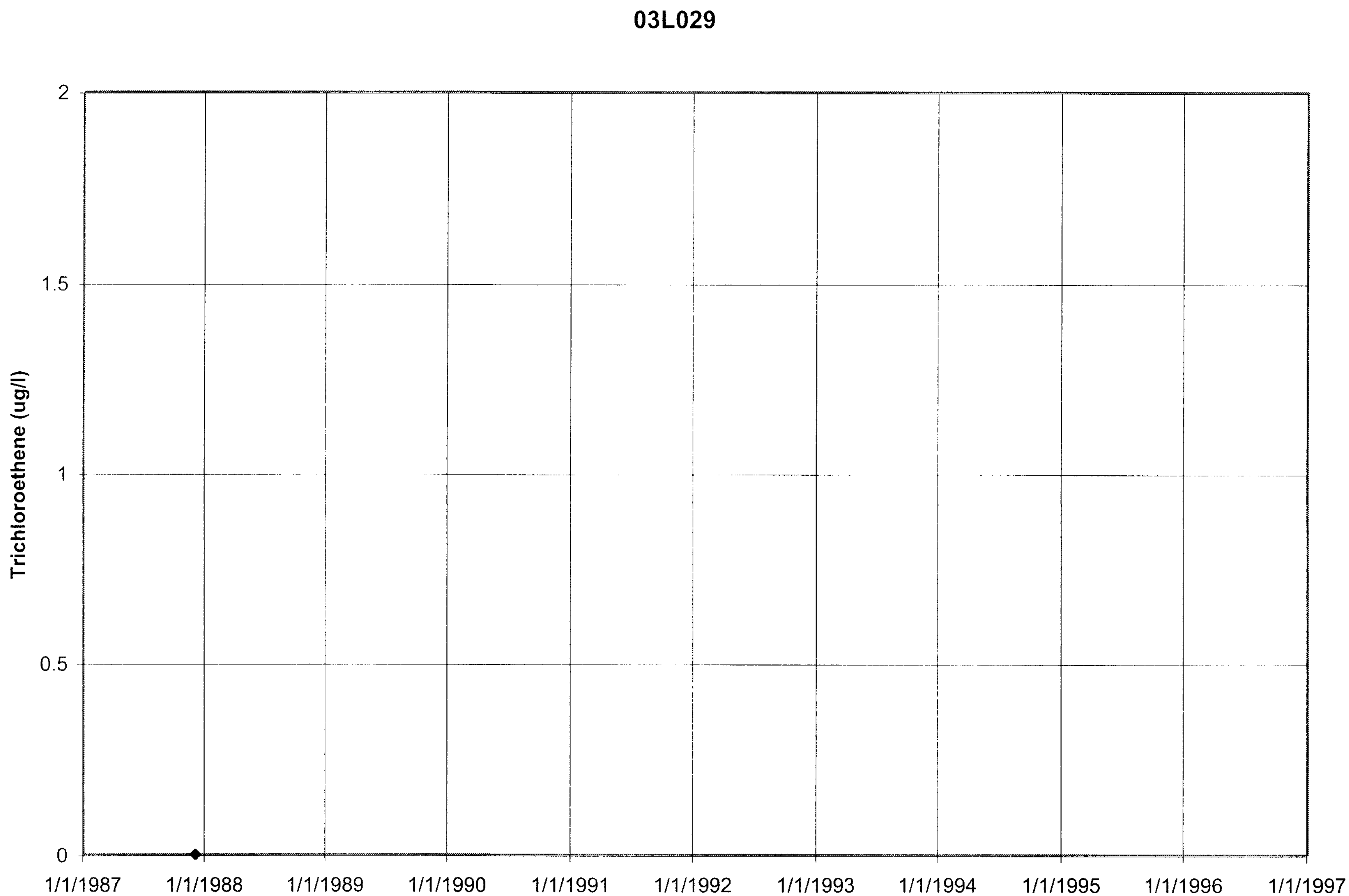

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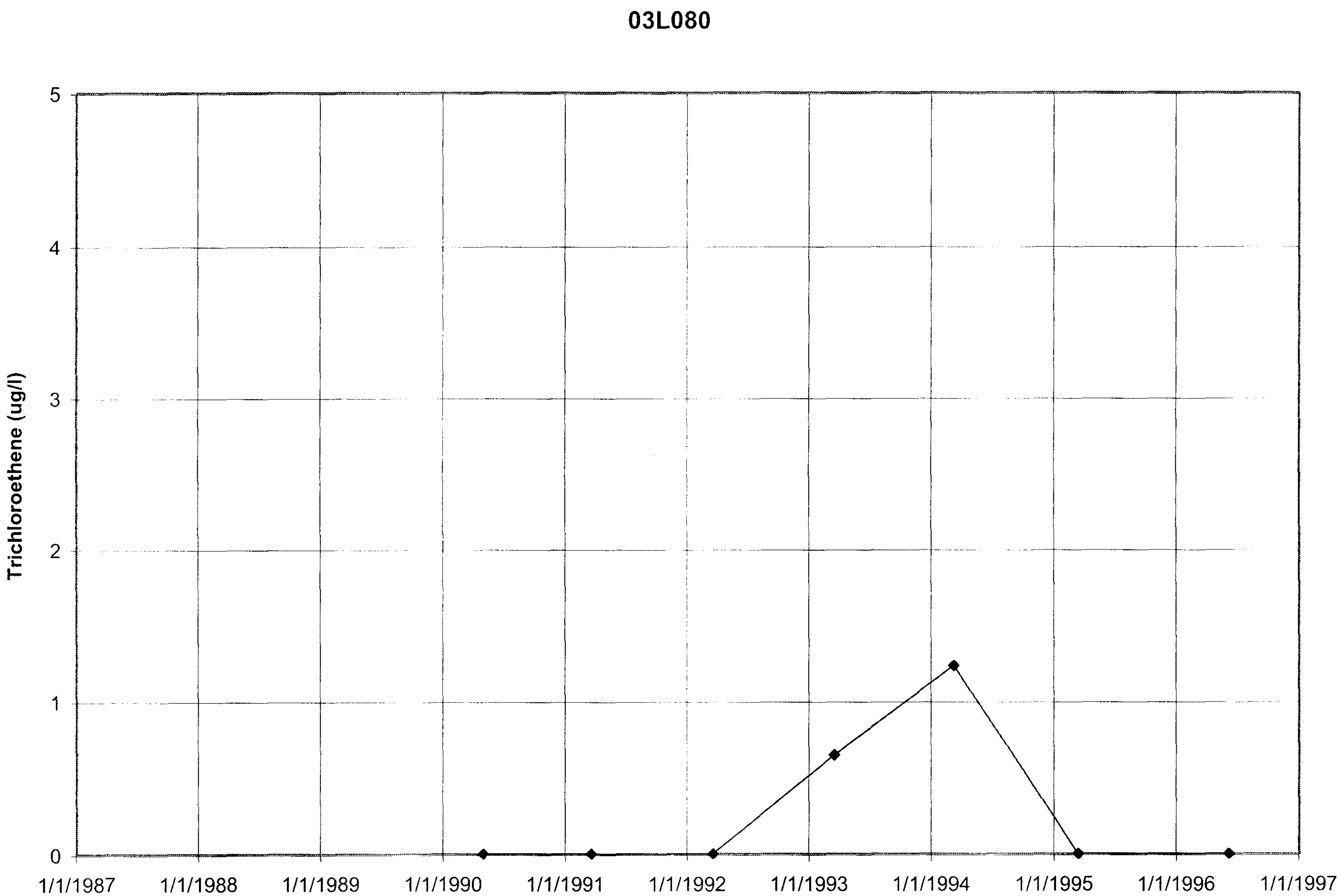

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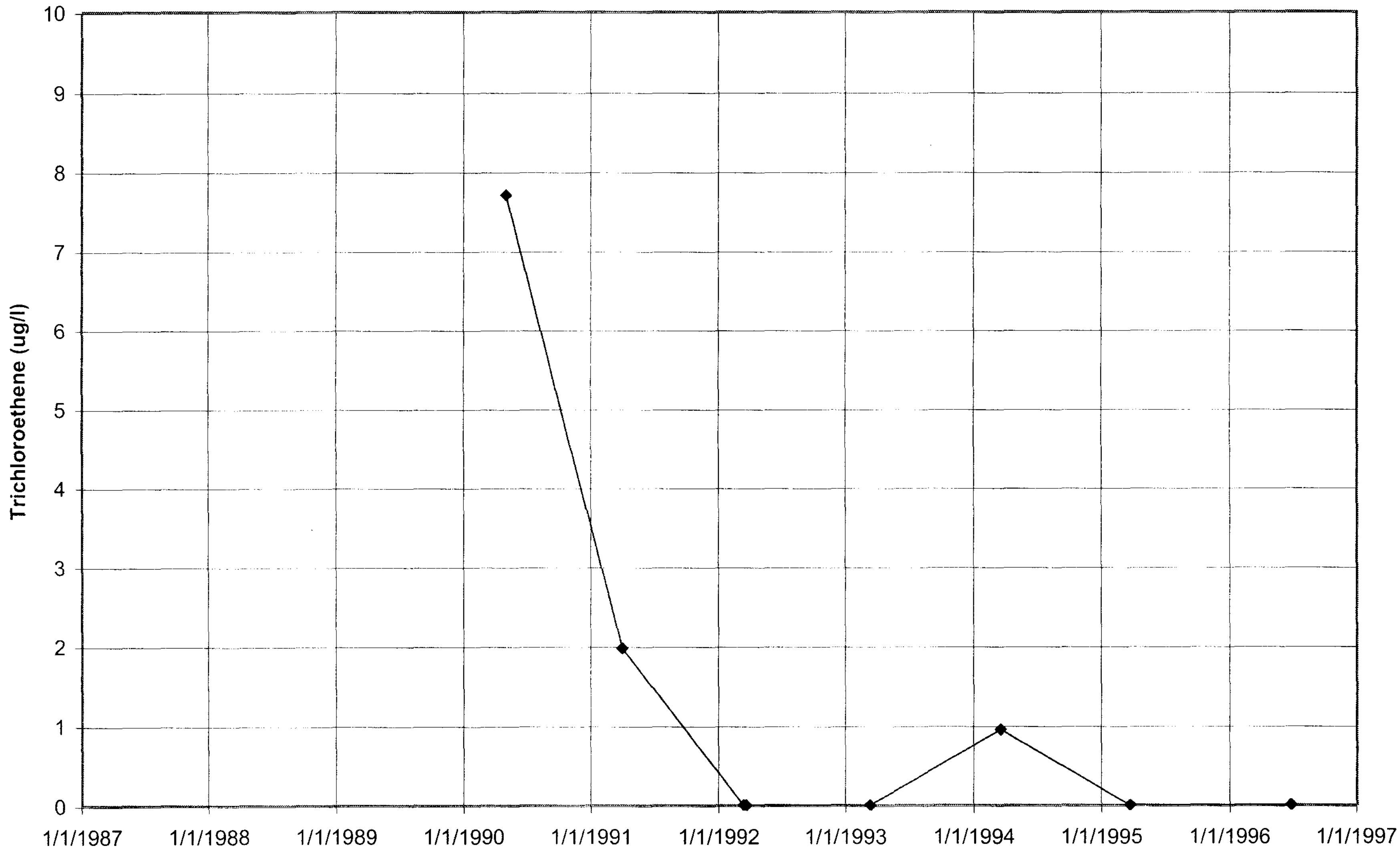

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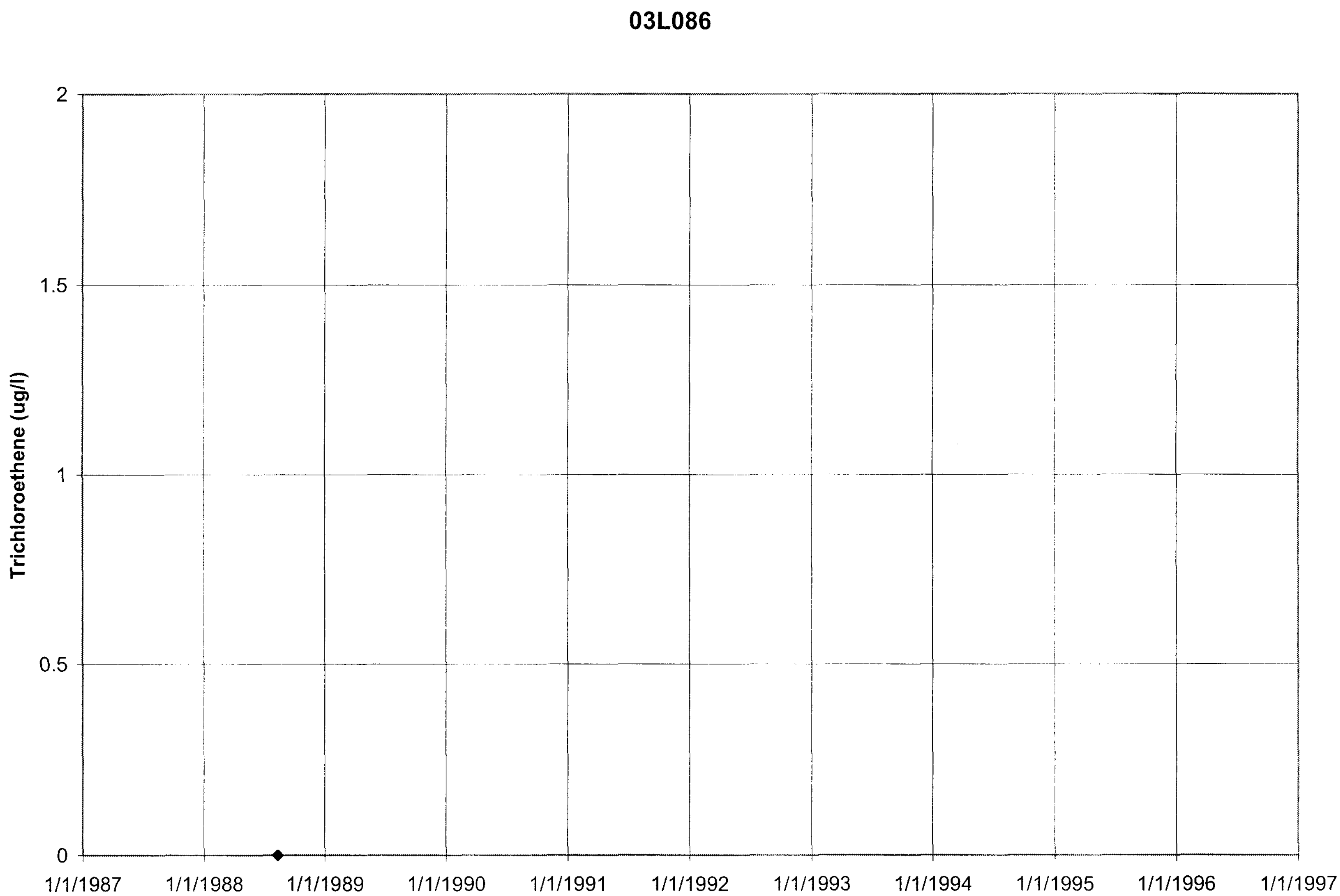

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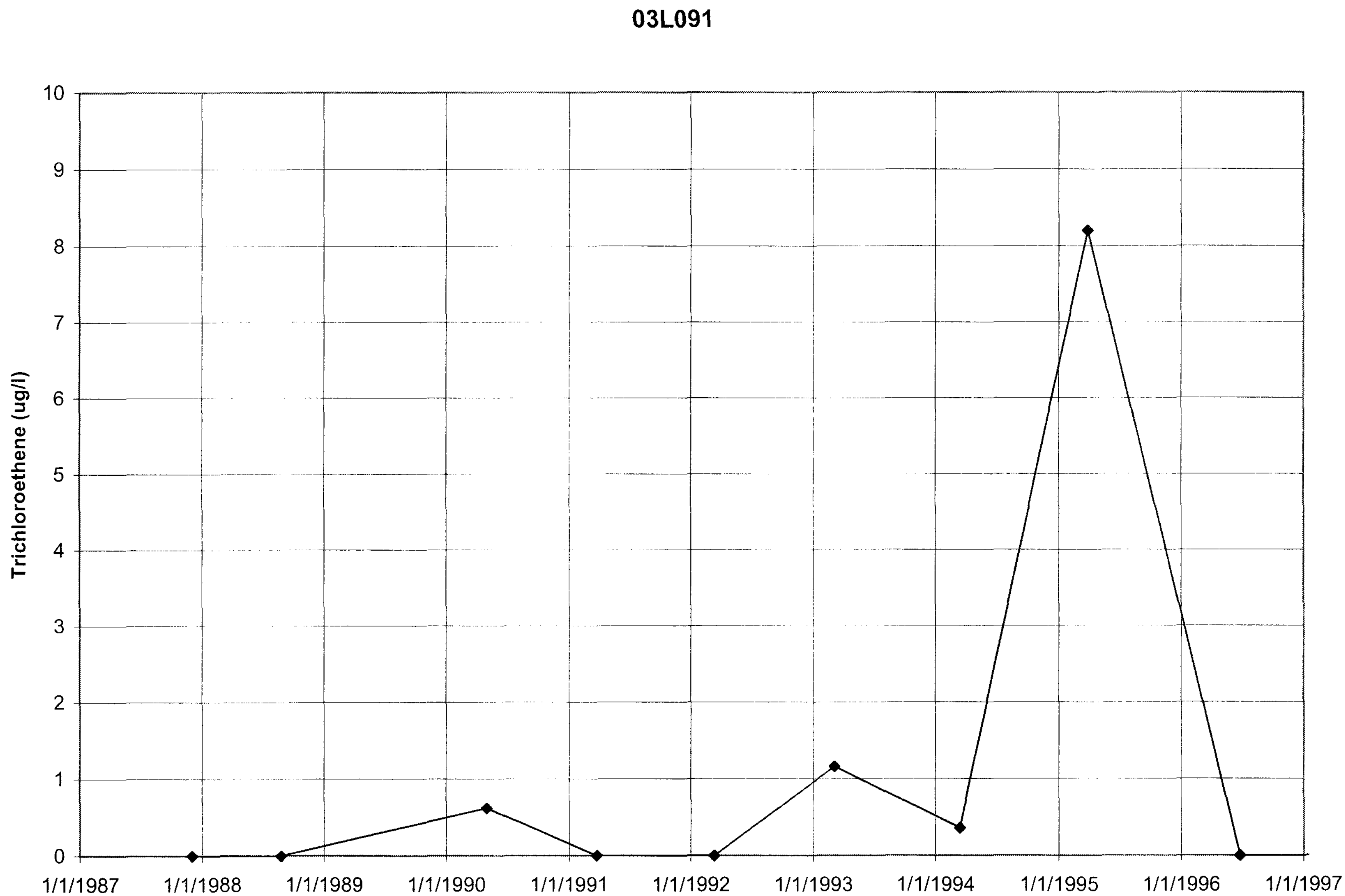

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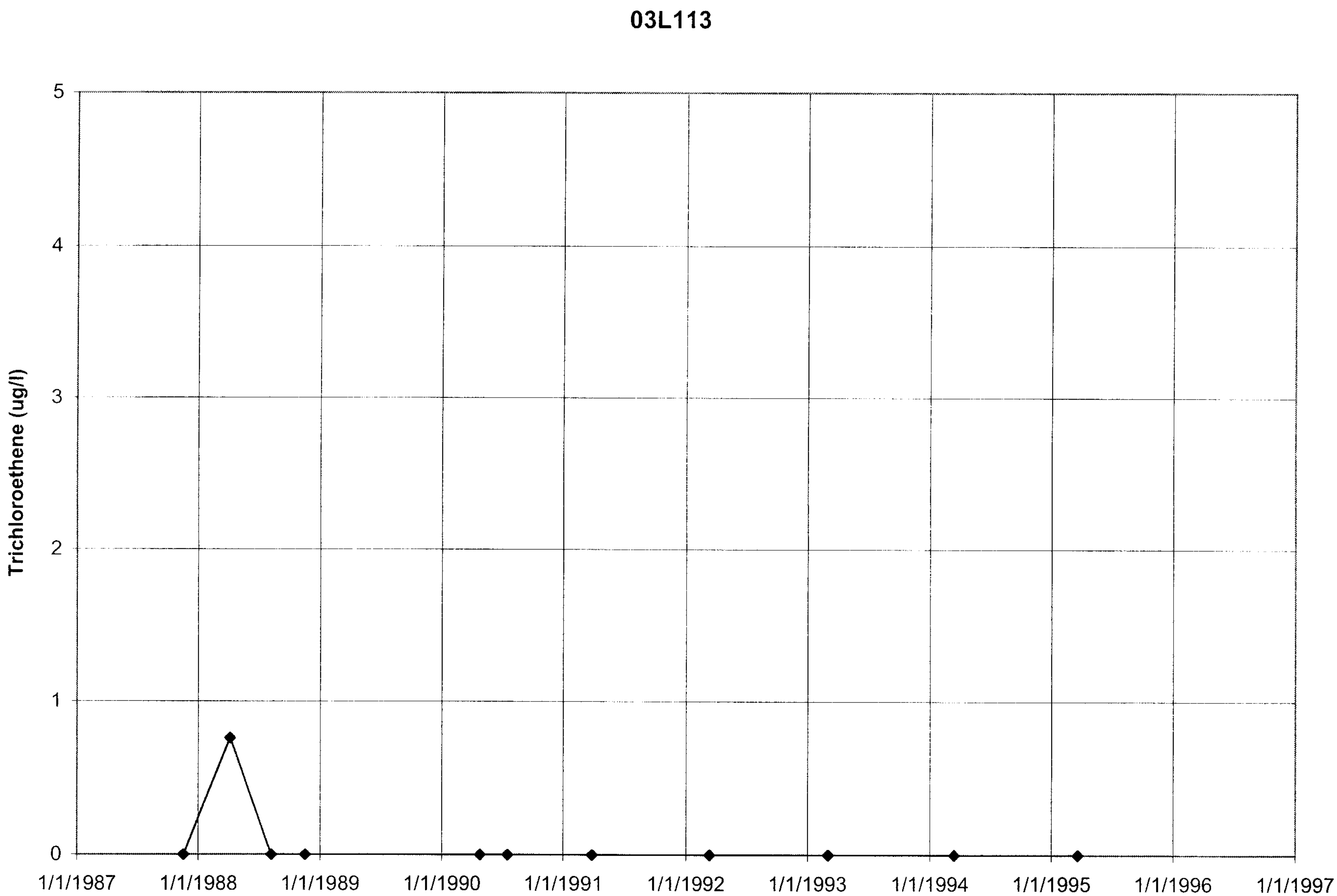

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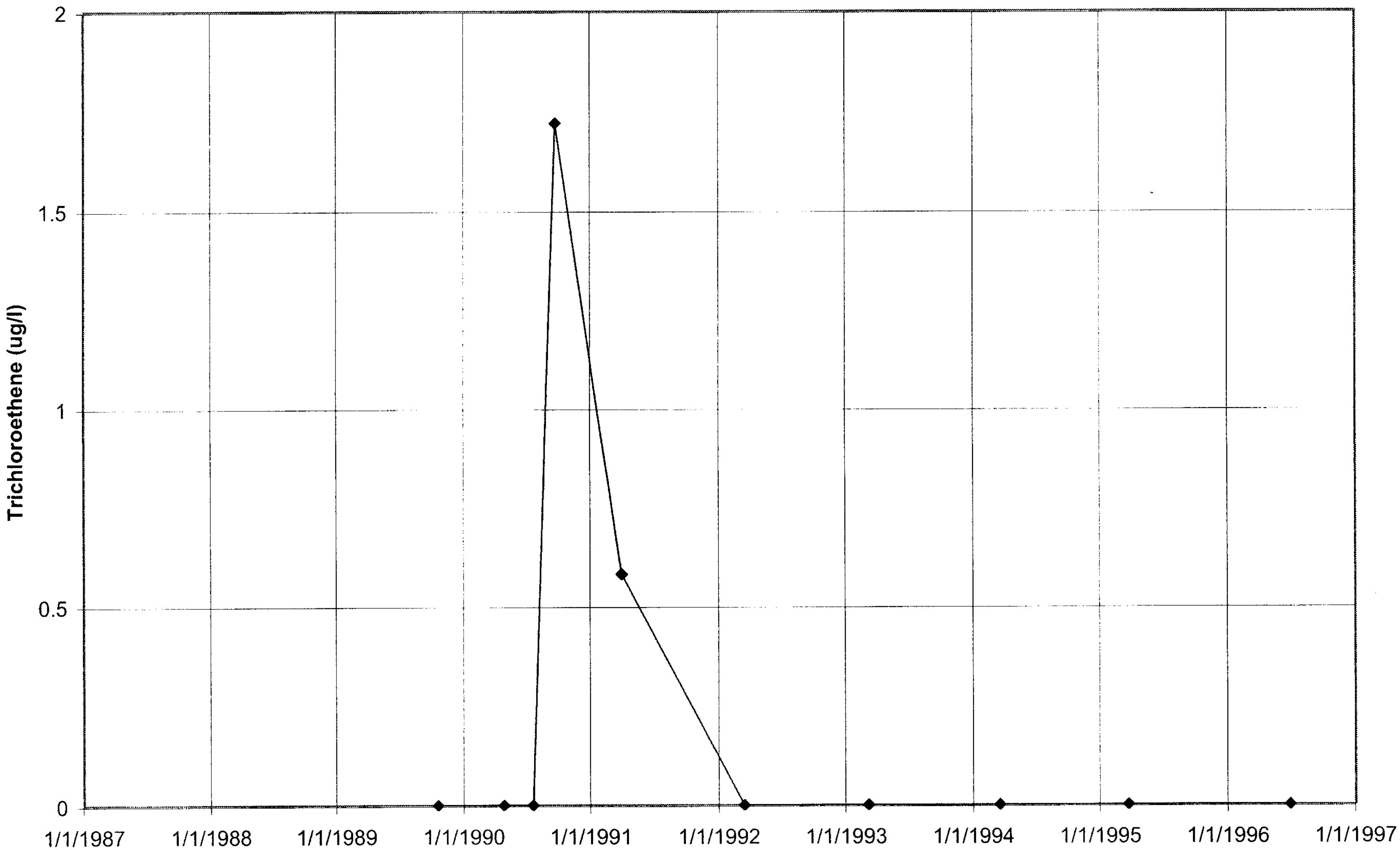
03L138



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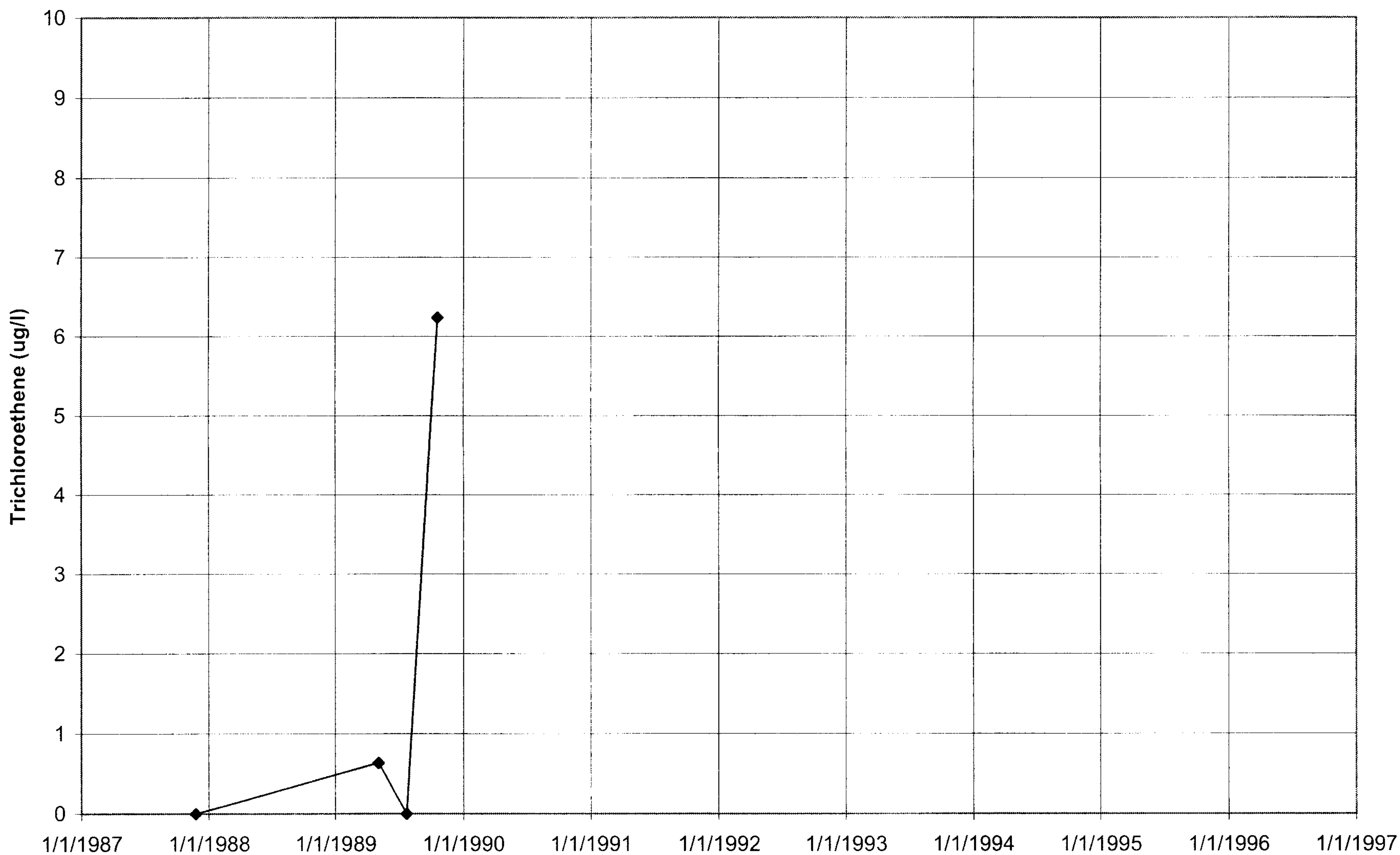

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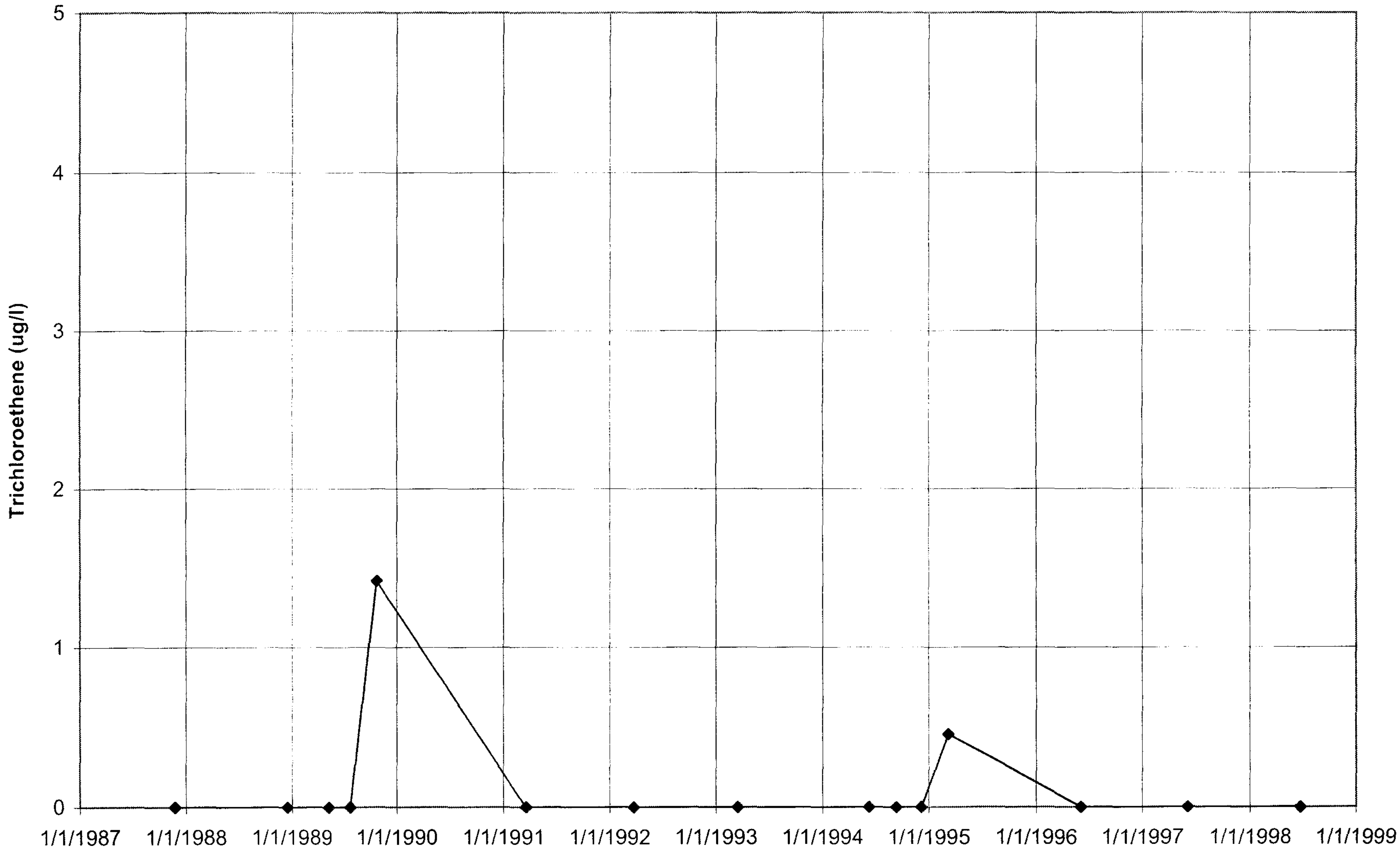

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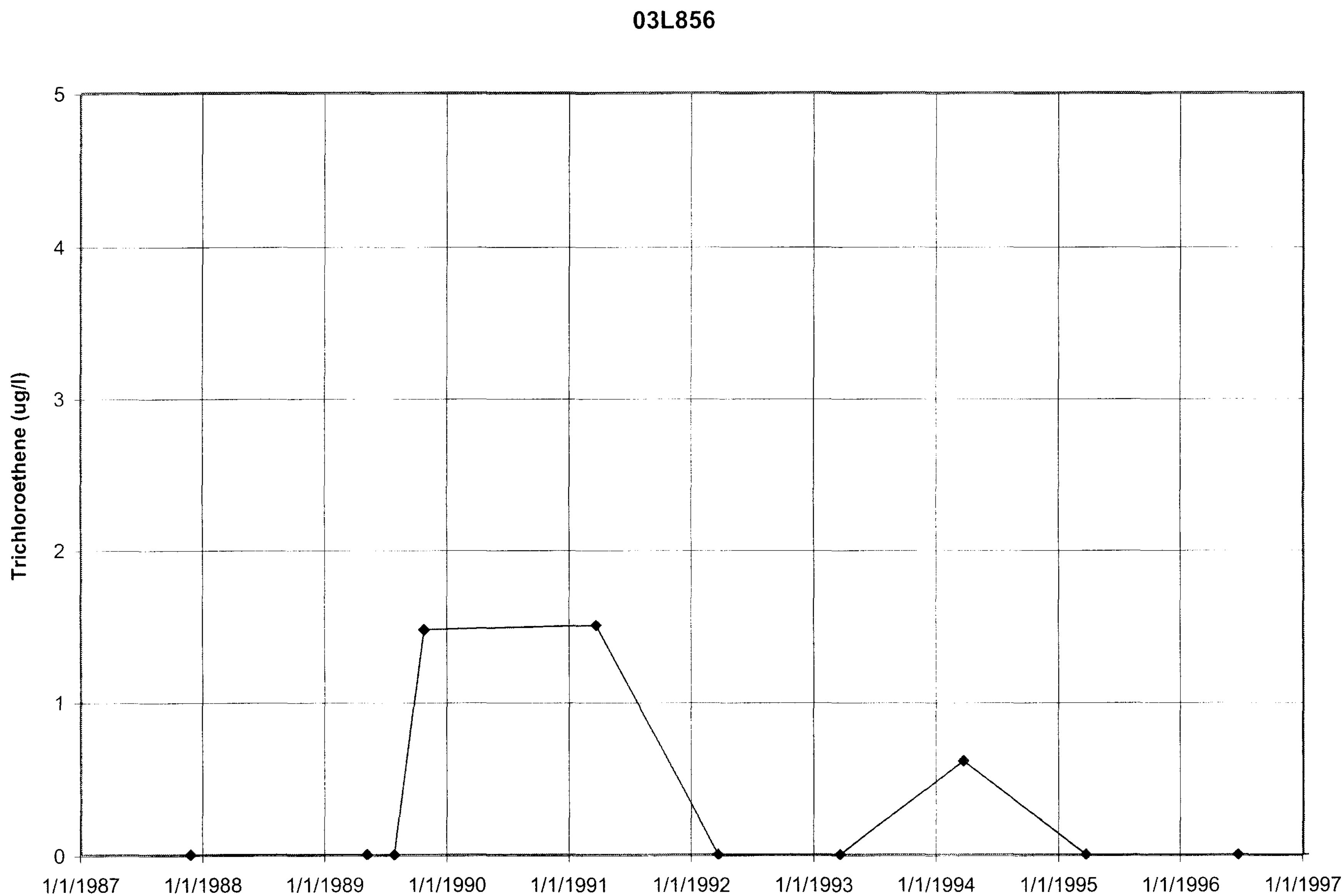

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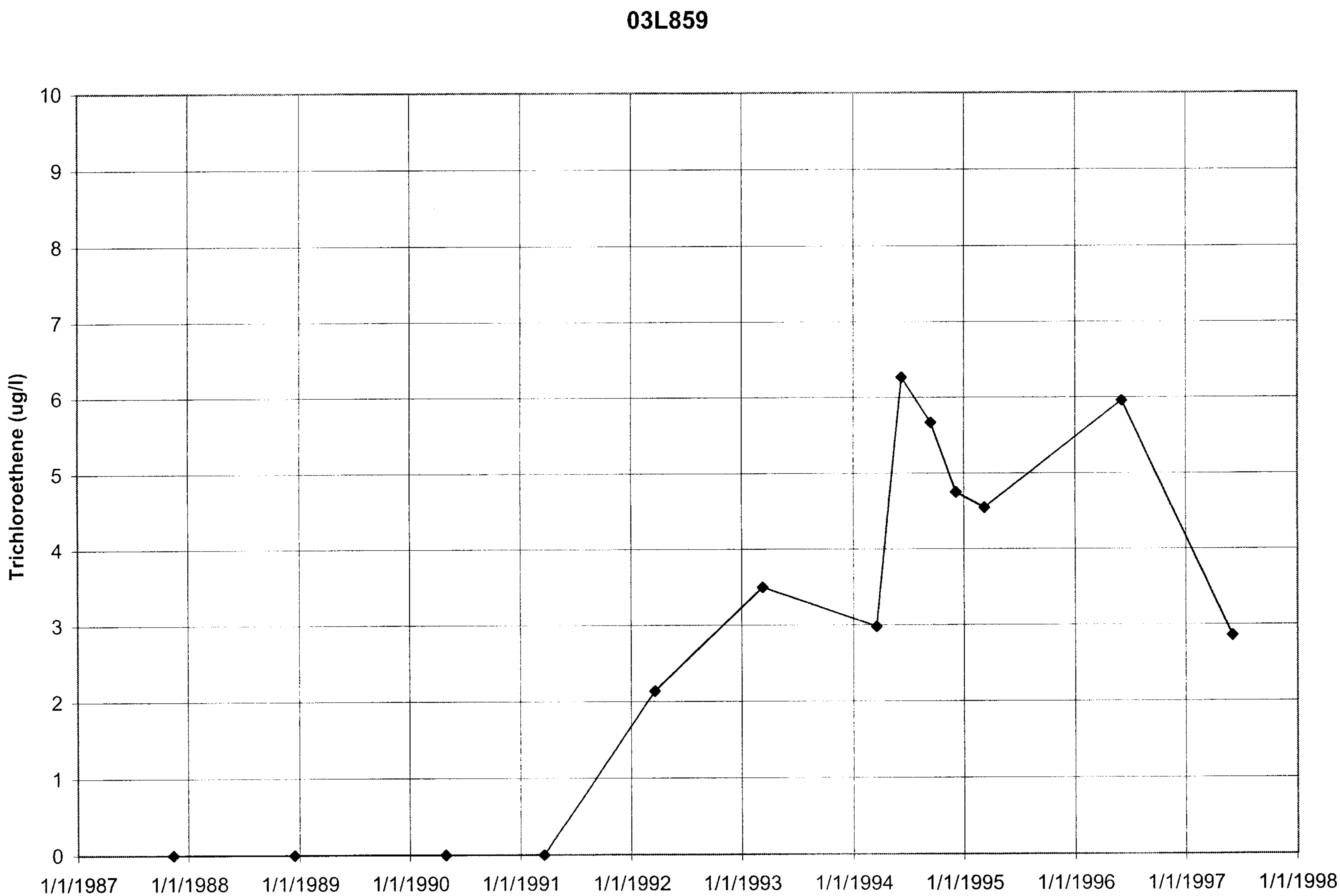

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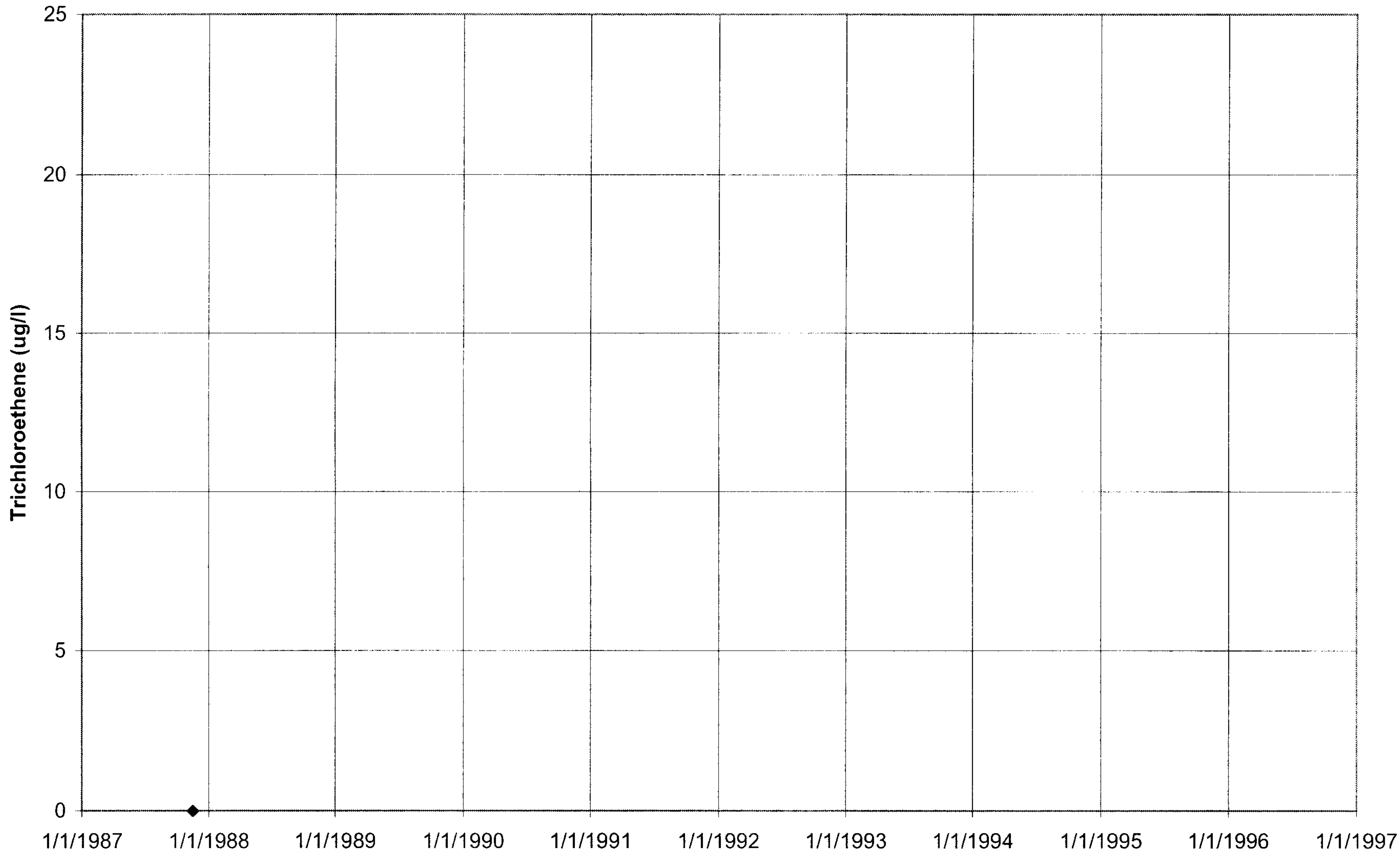
03M001



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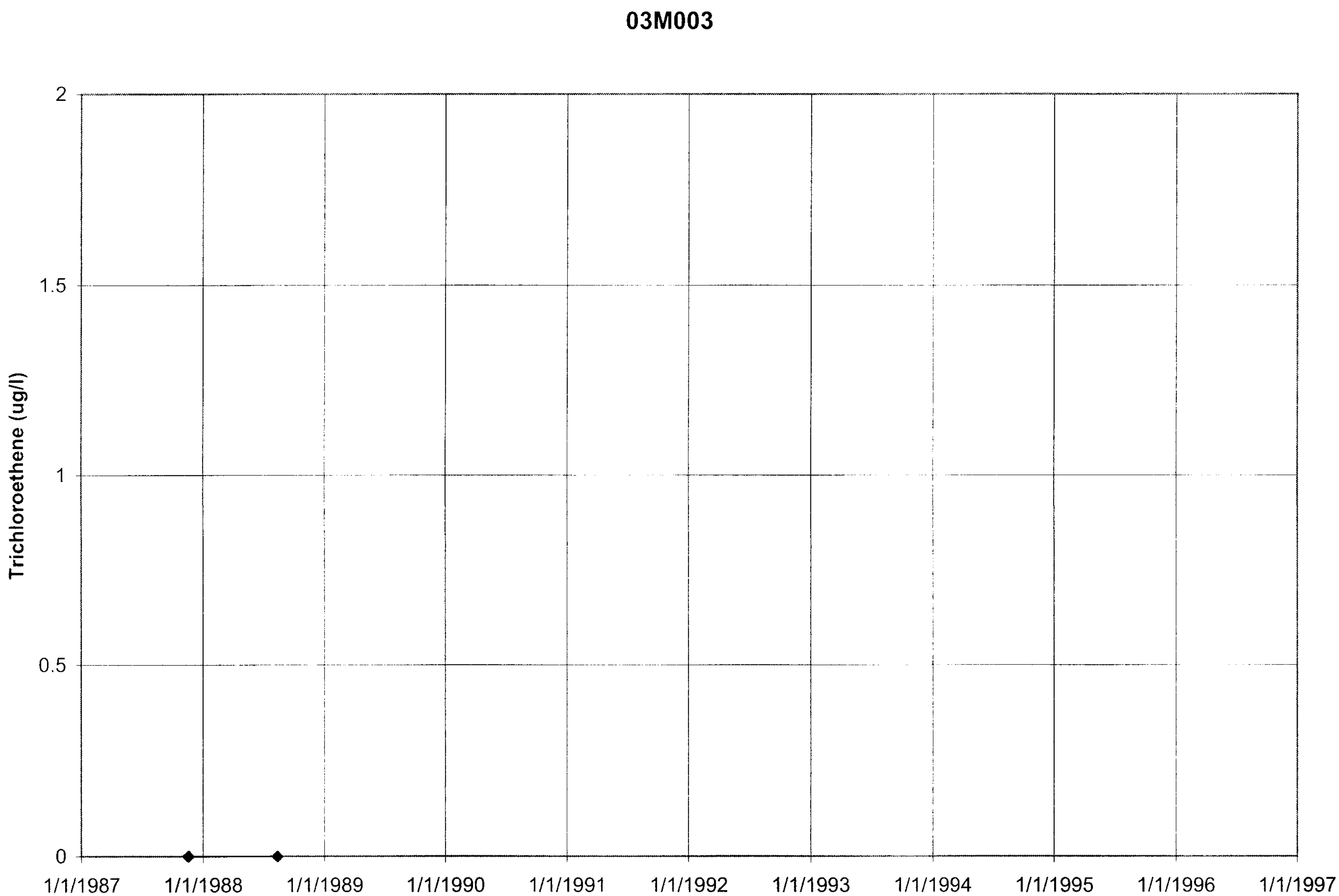
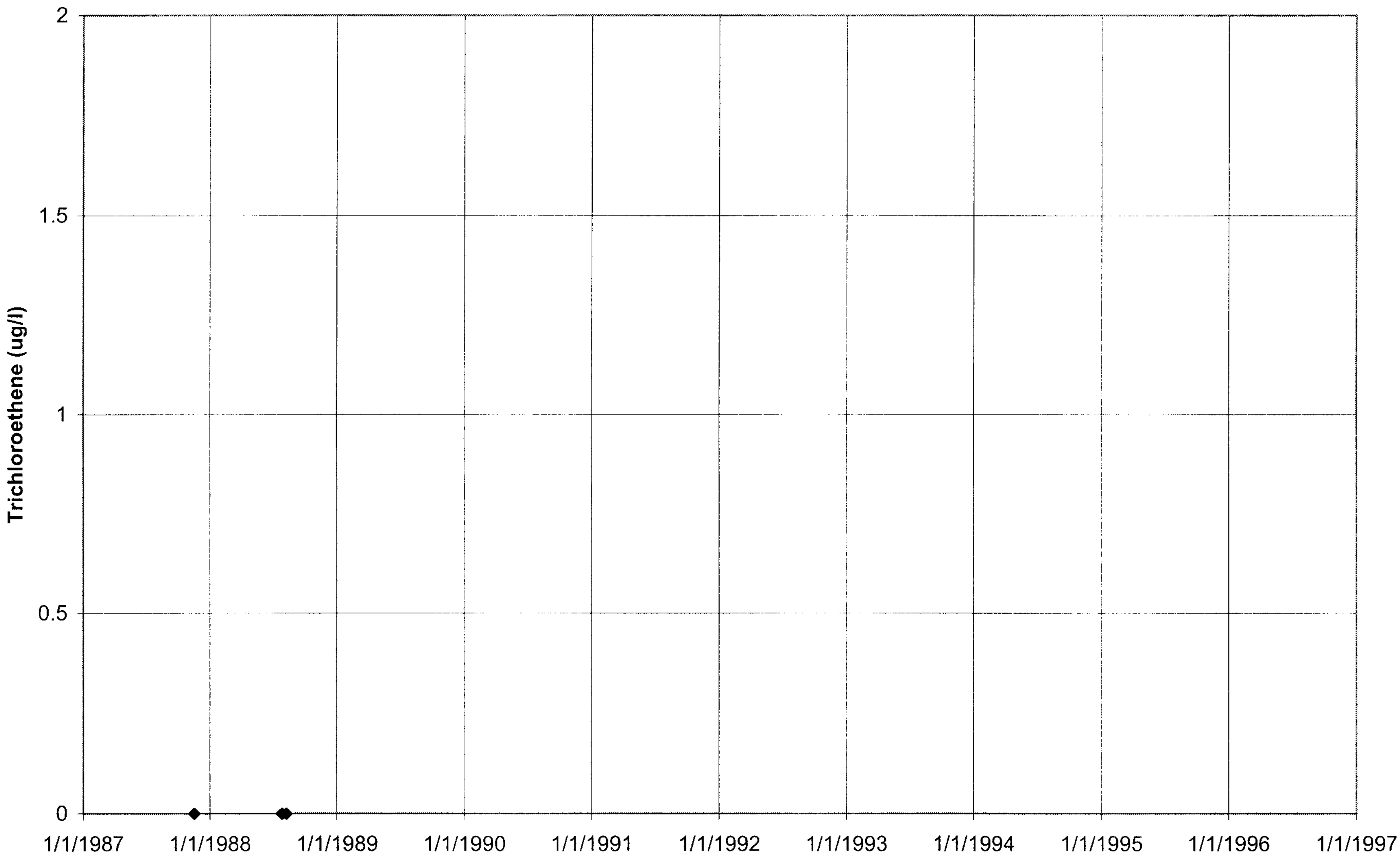


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03M004



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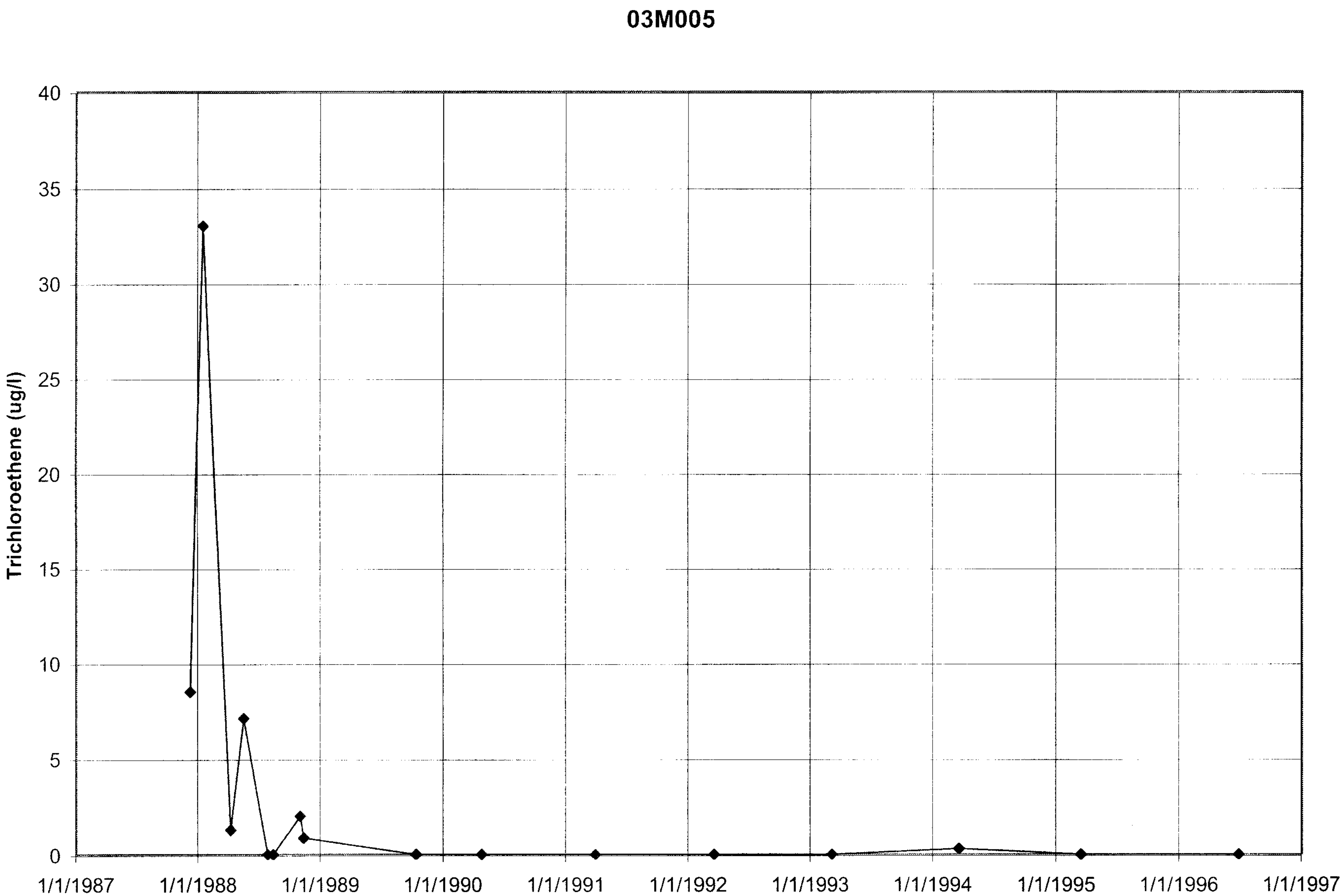
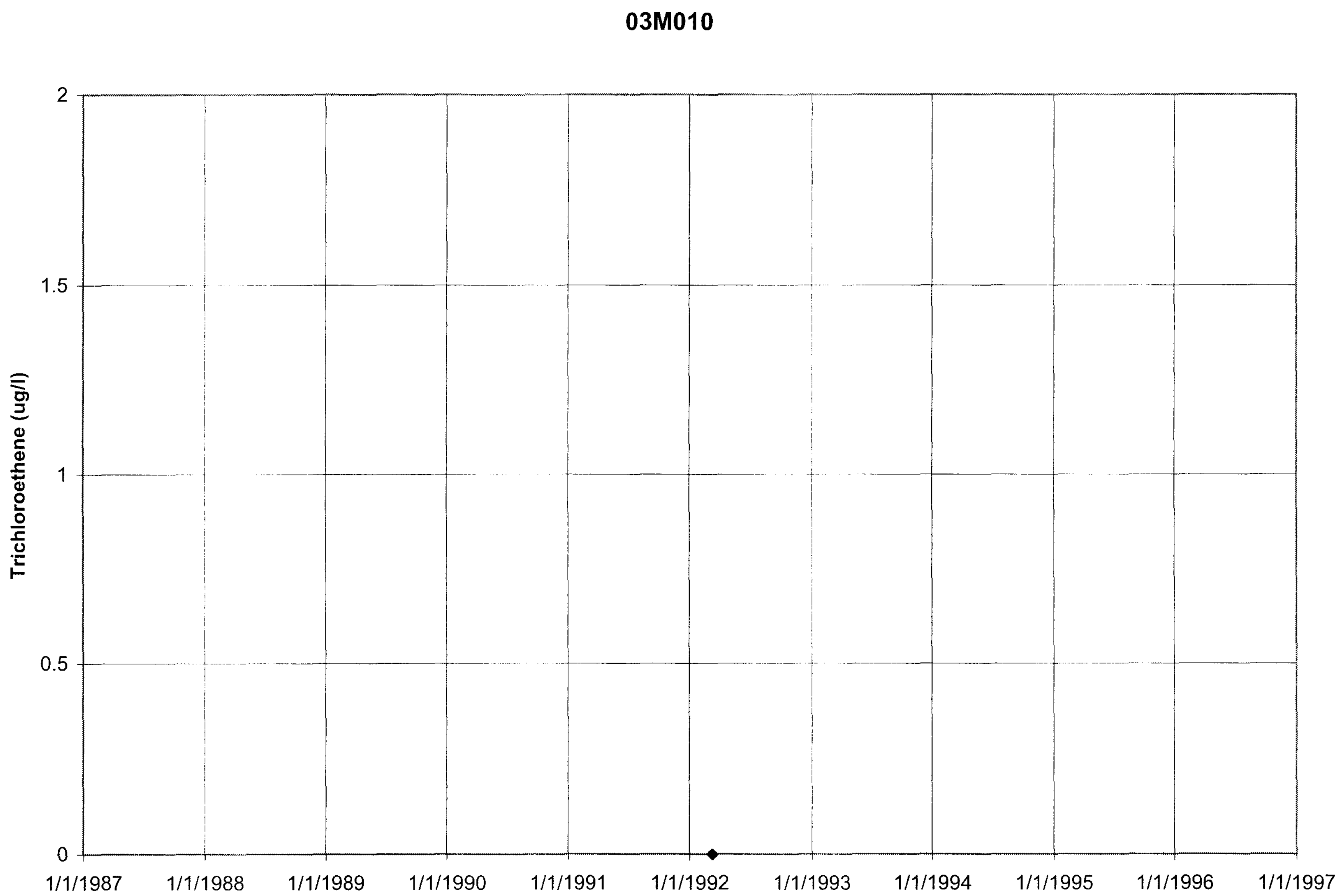


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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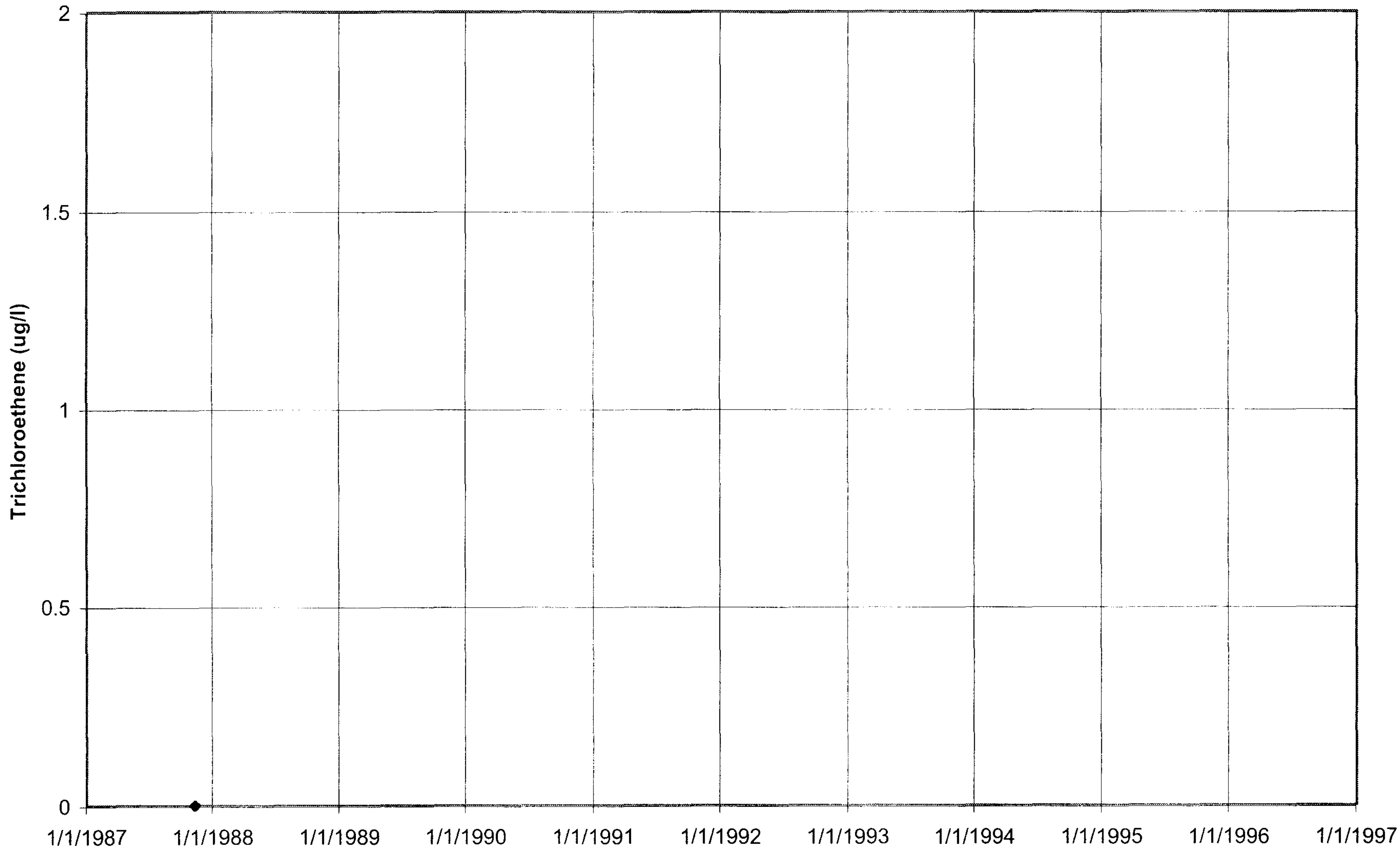

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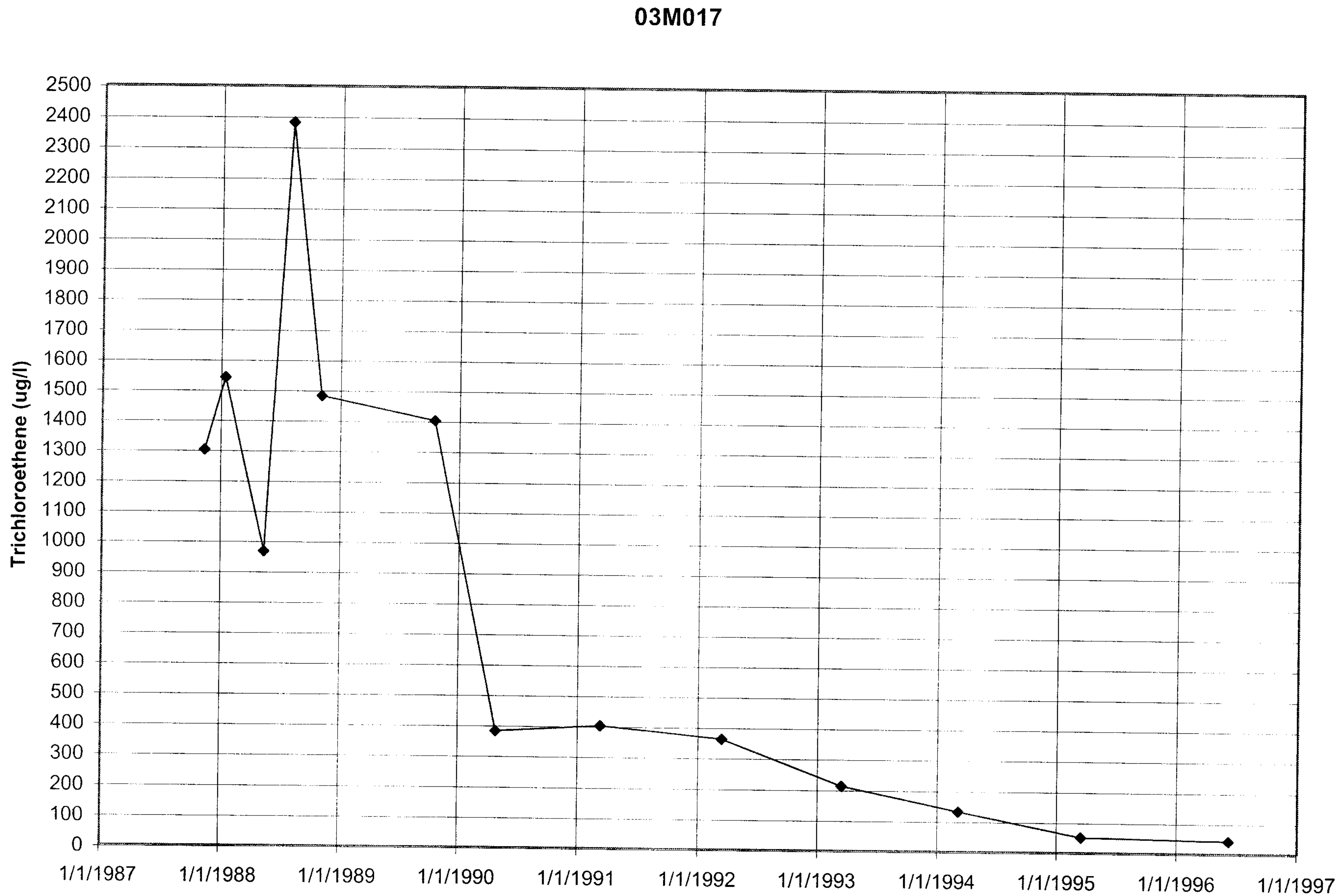

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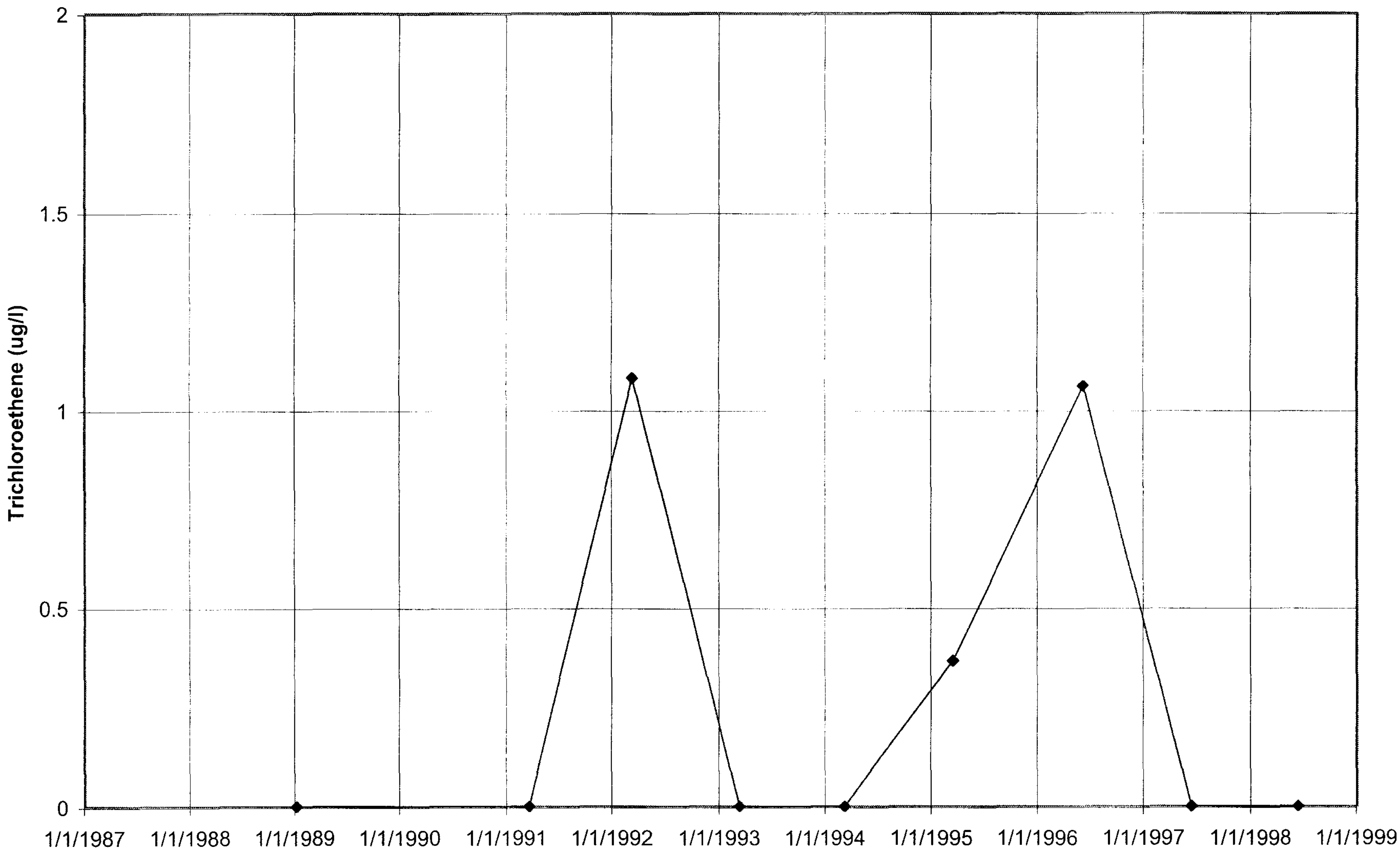

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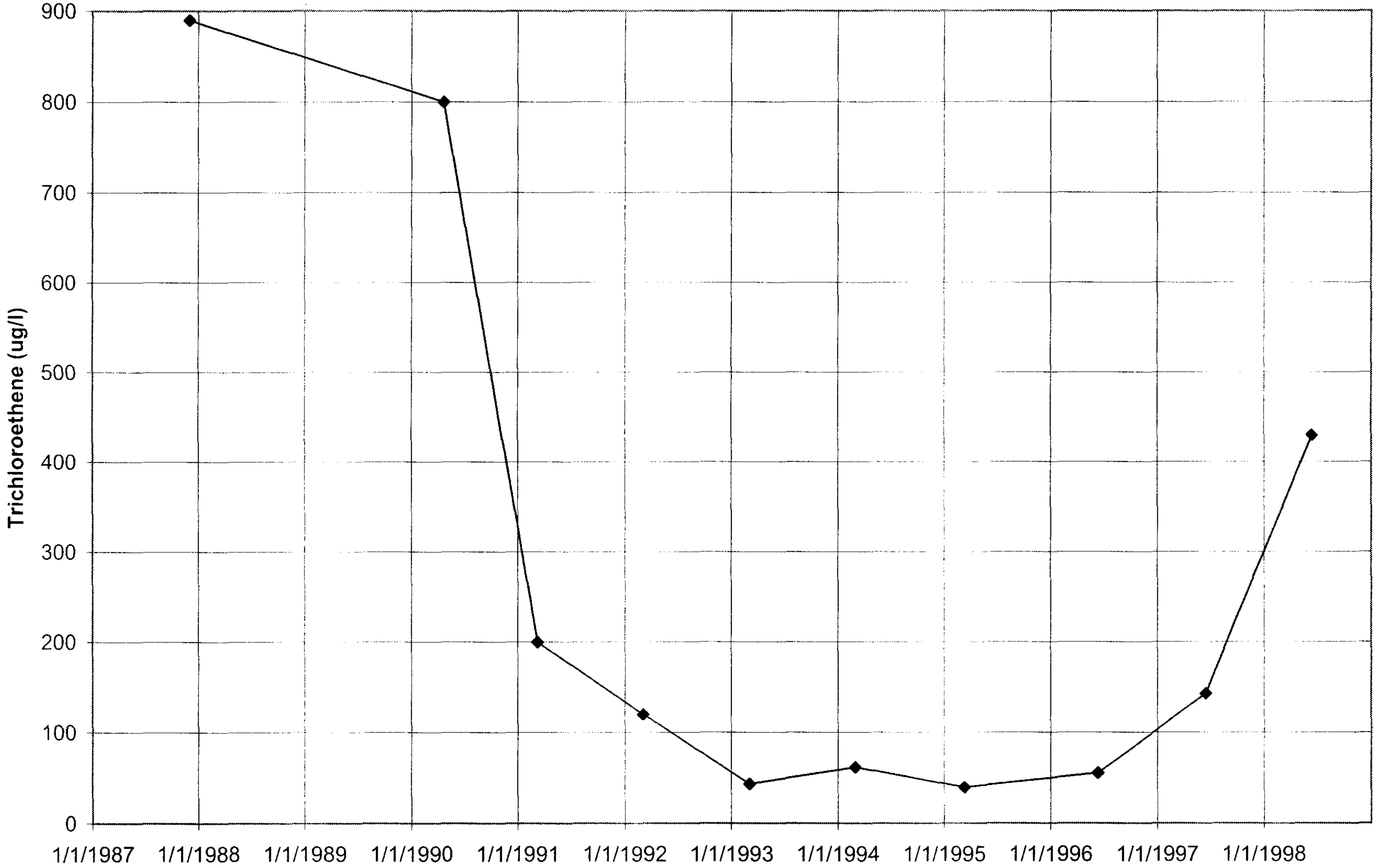

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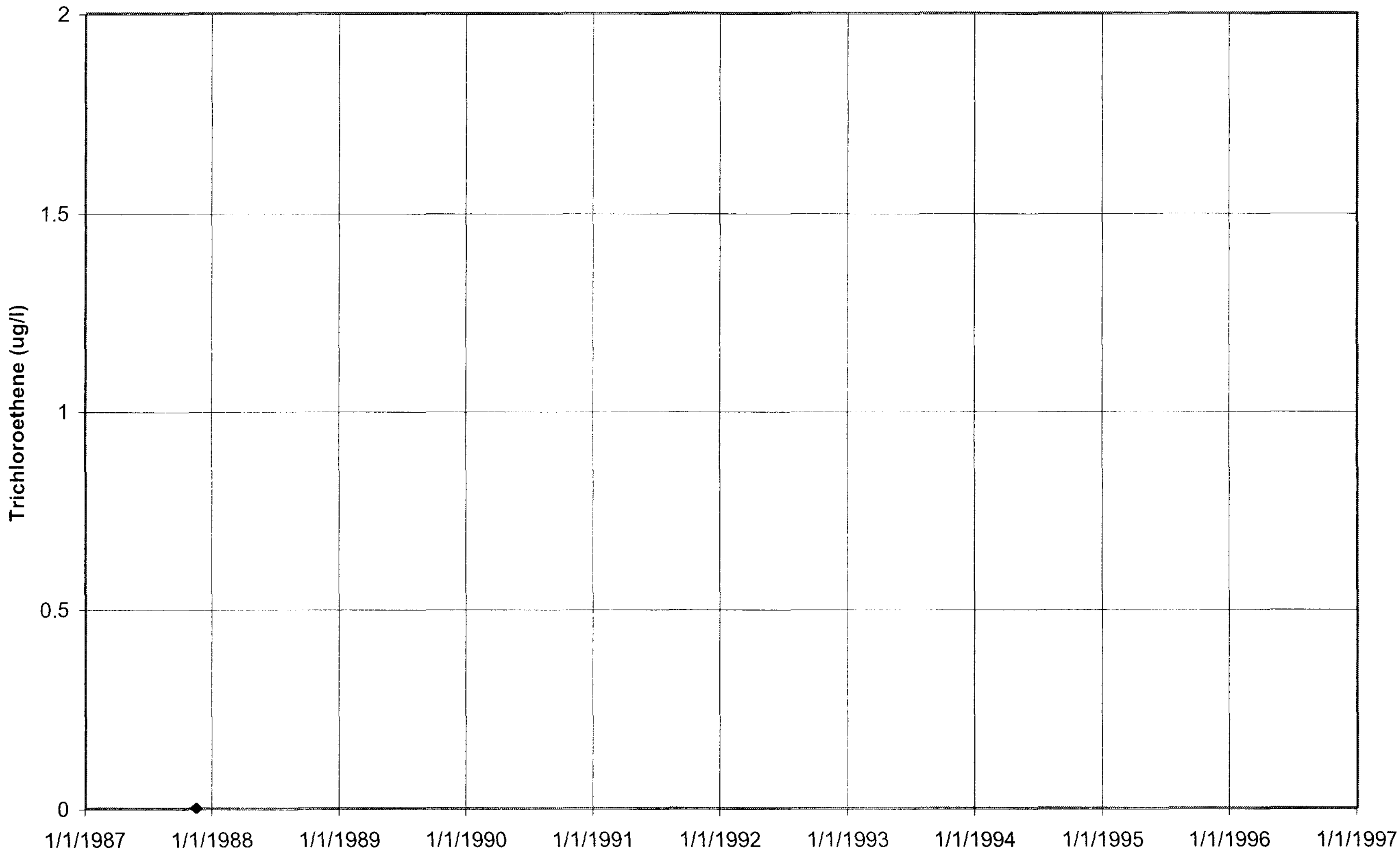
03U001



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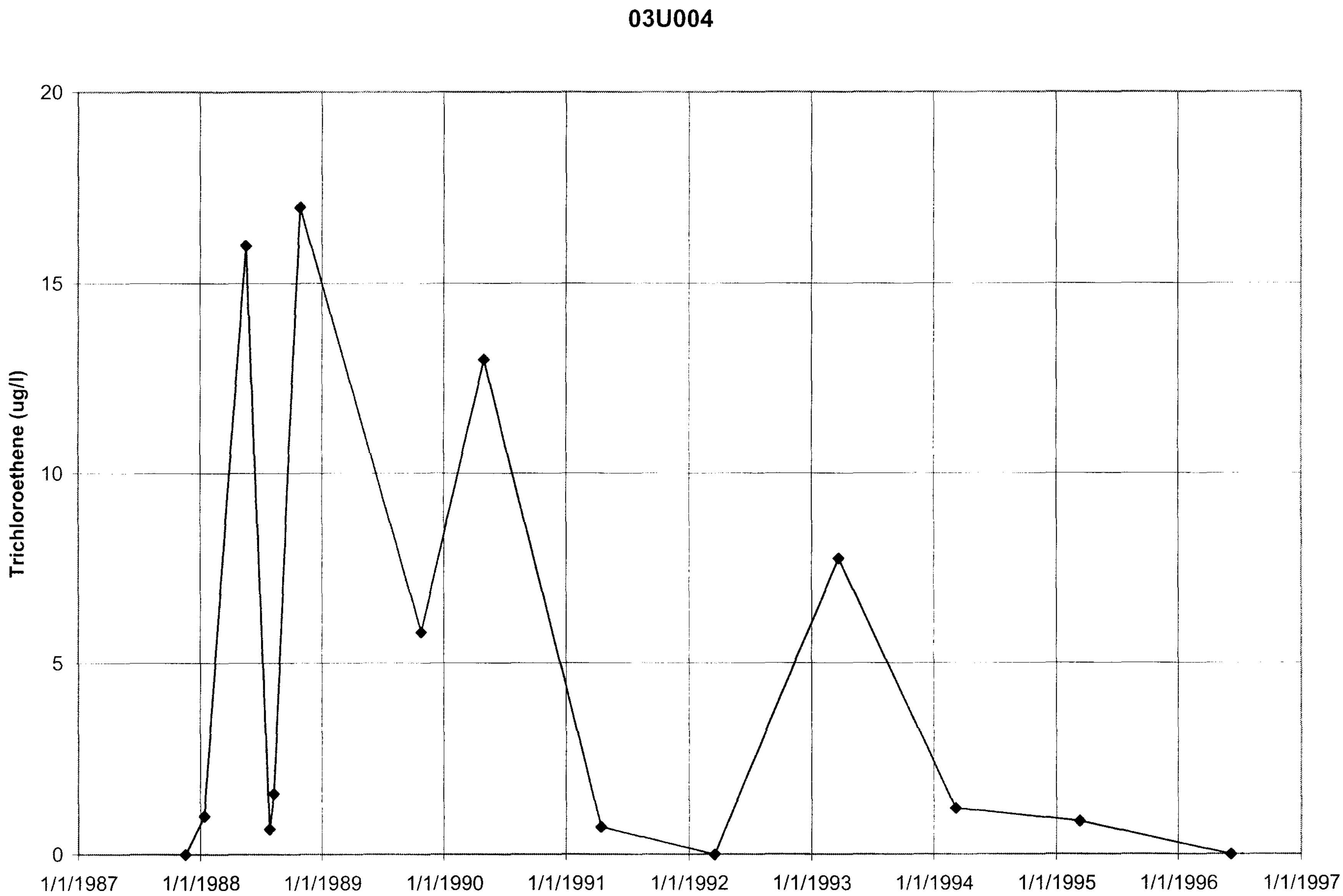

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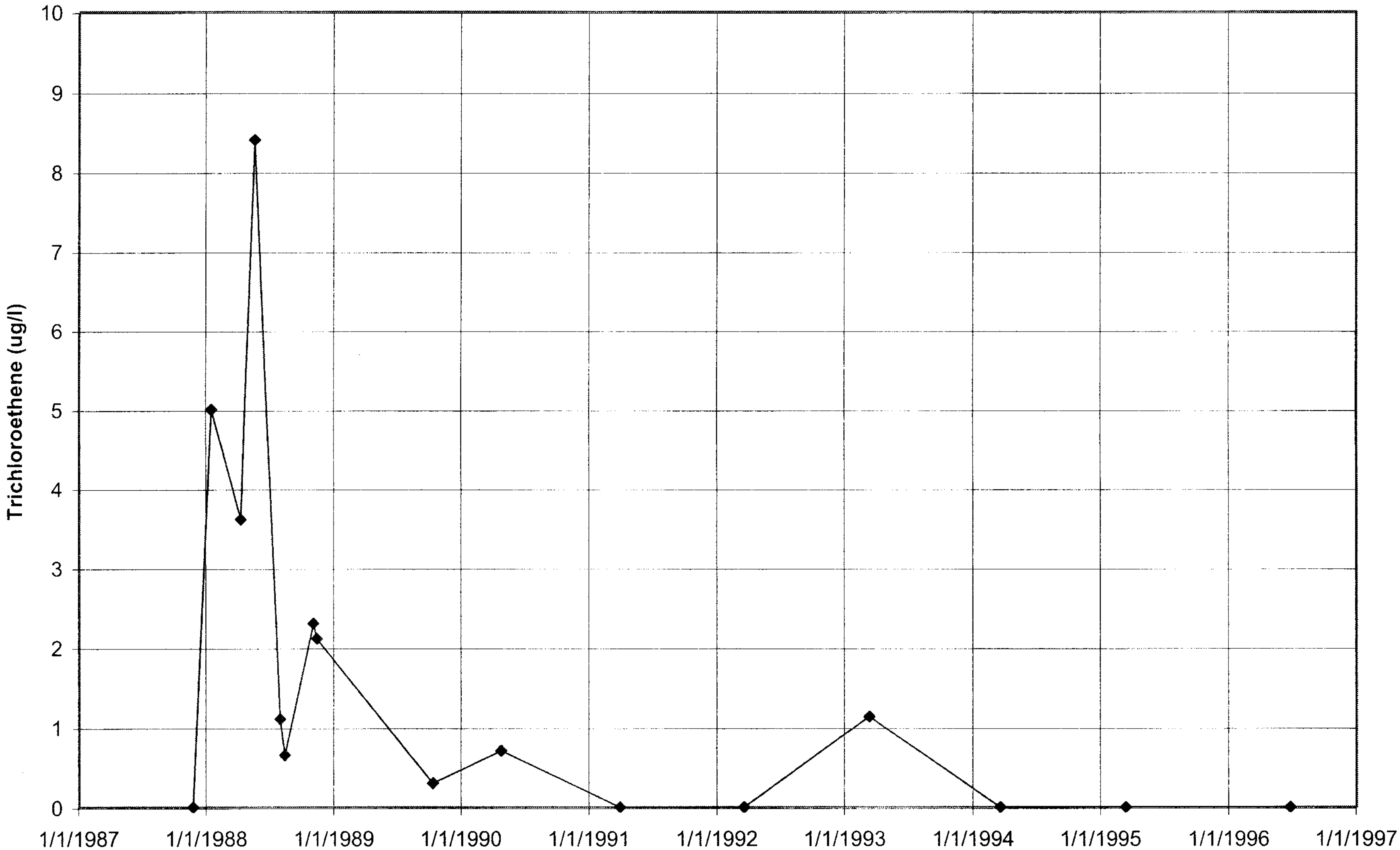

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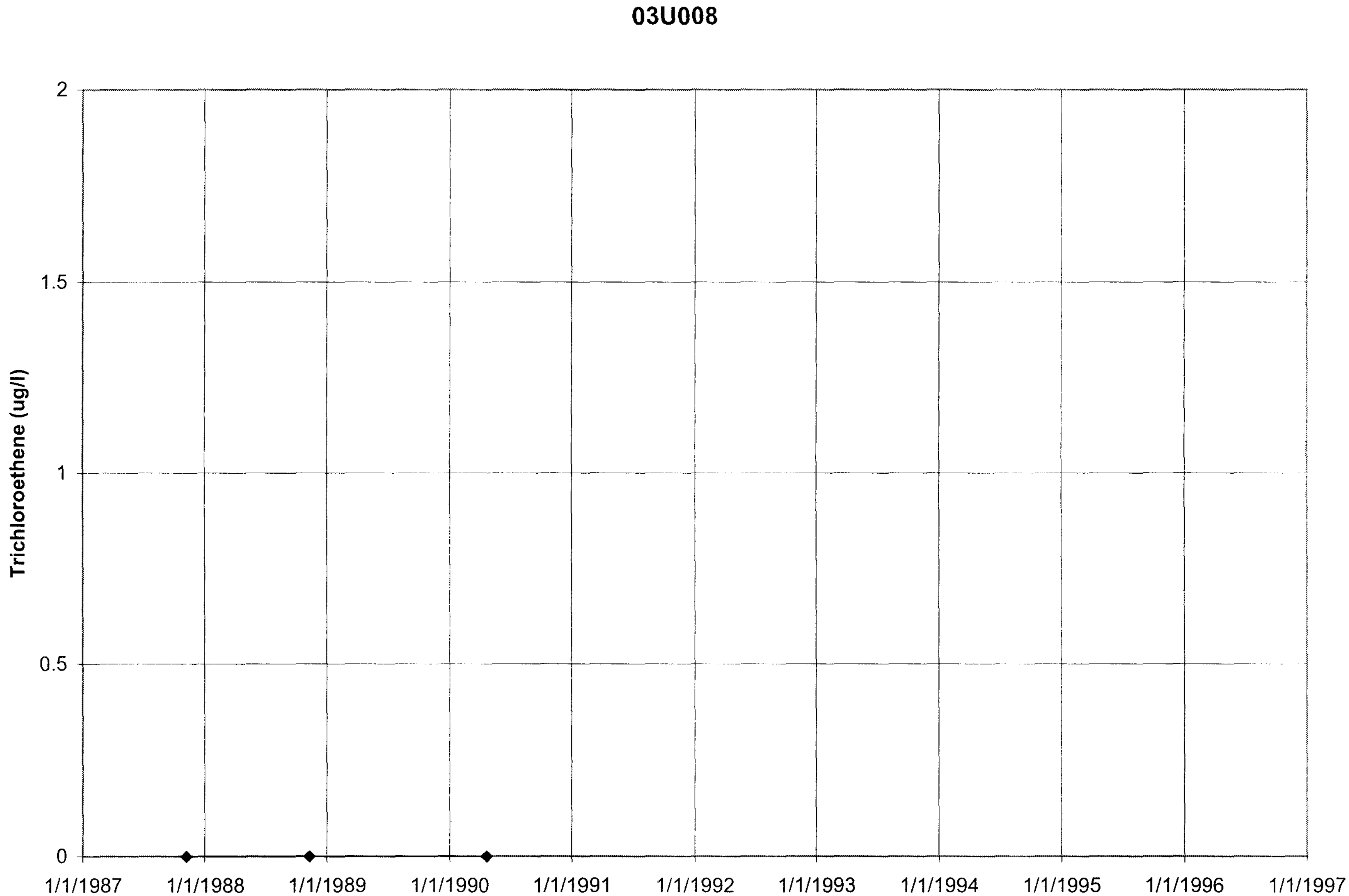

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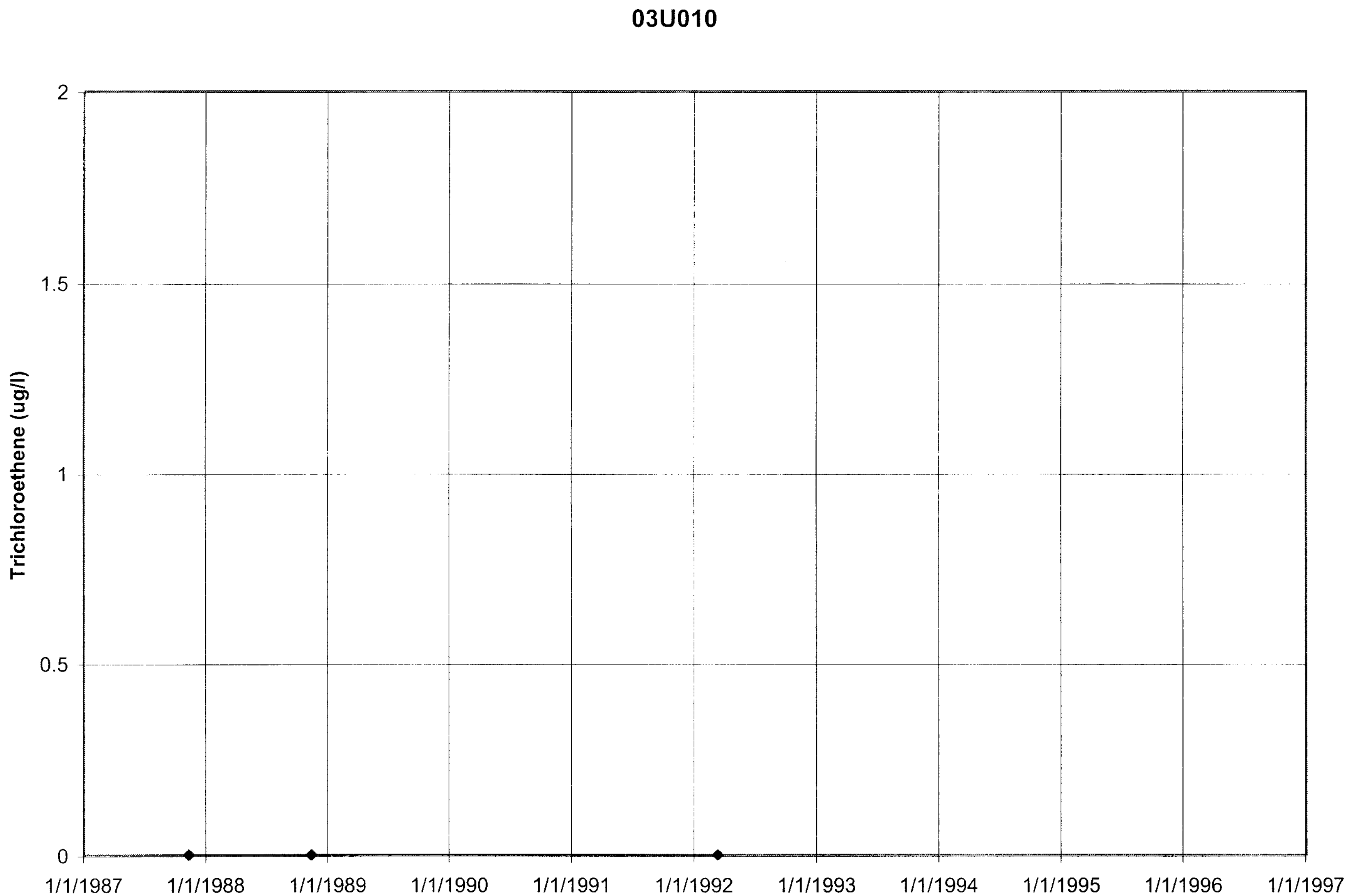

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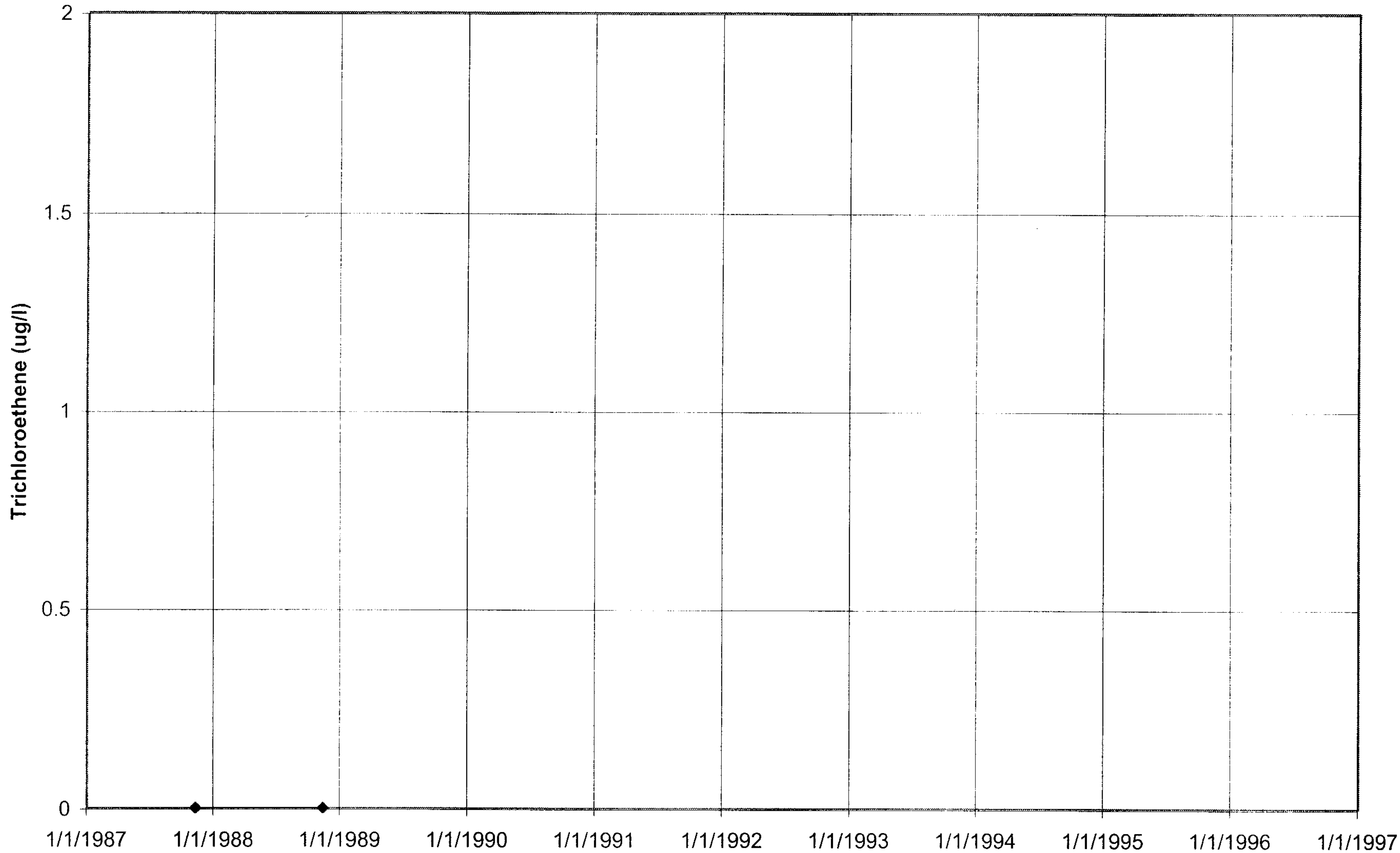

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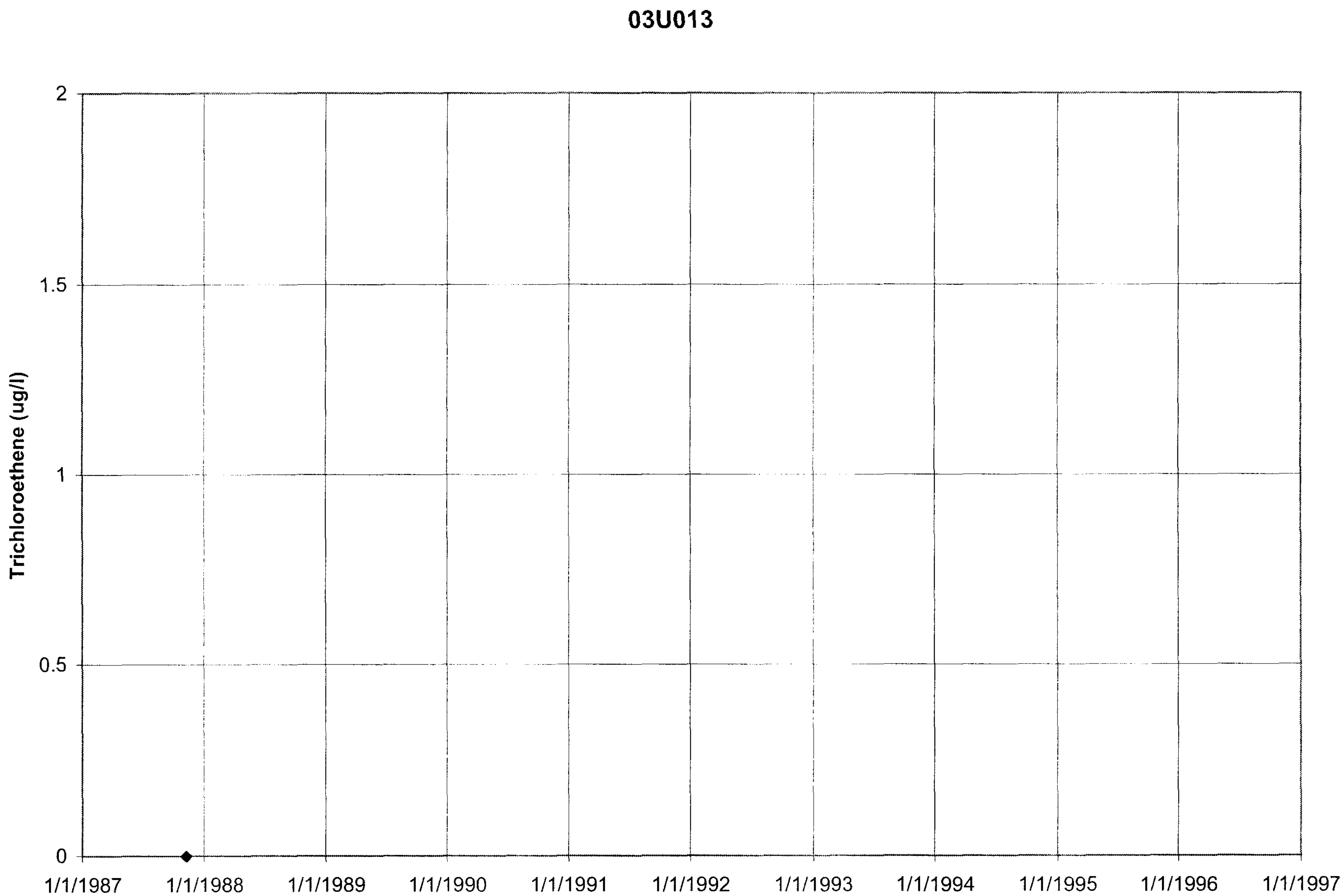

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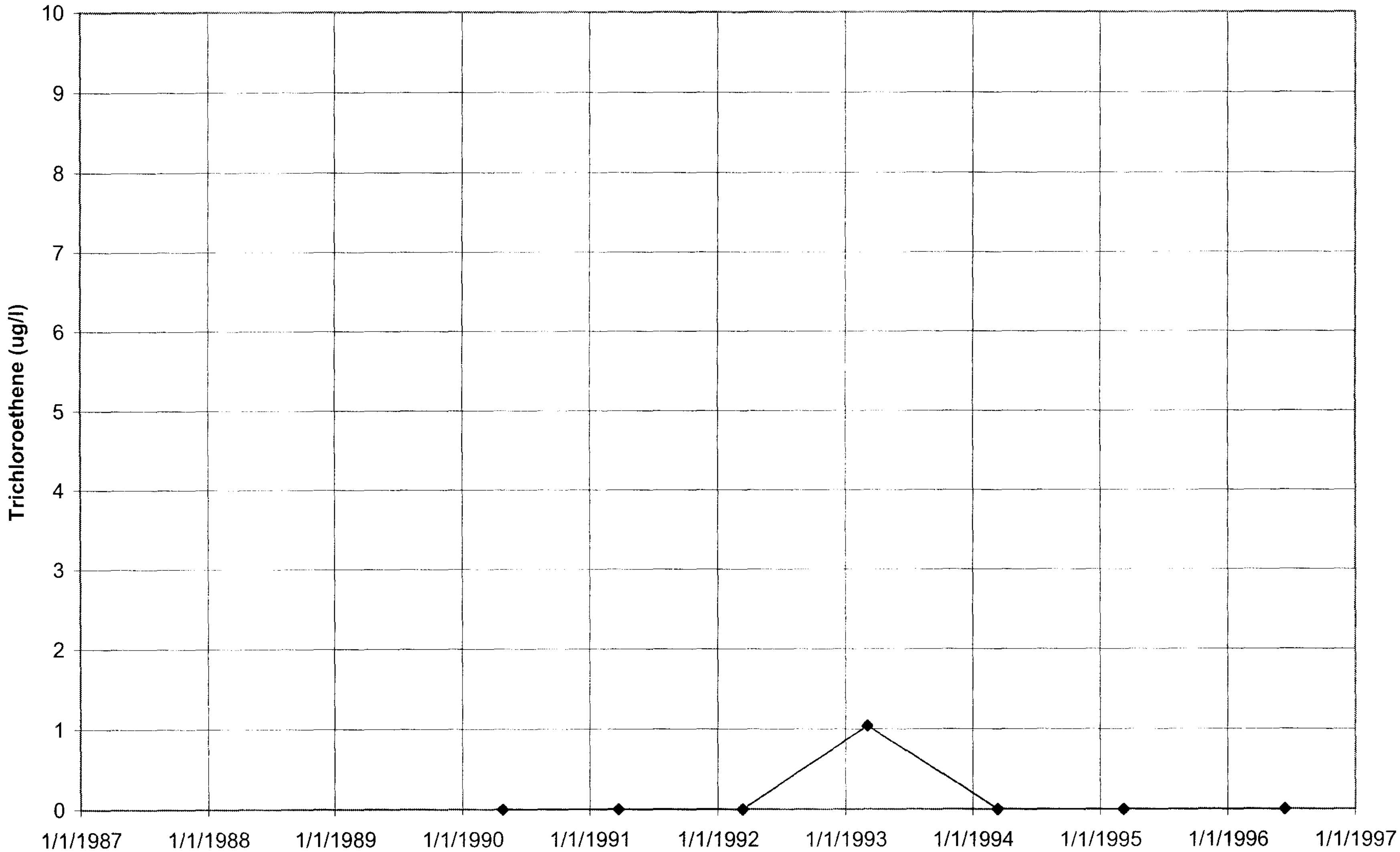

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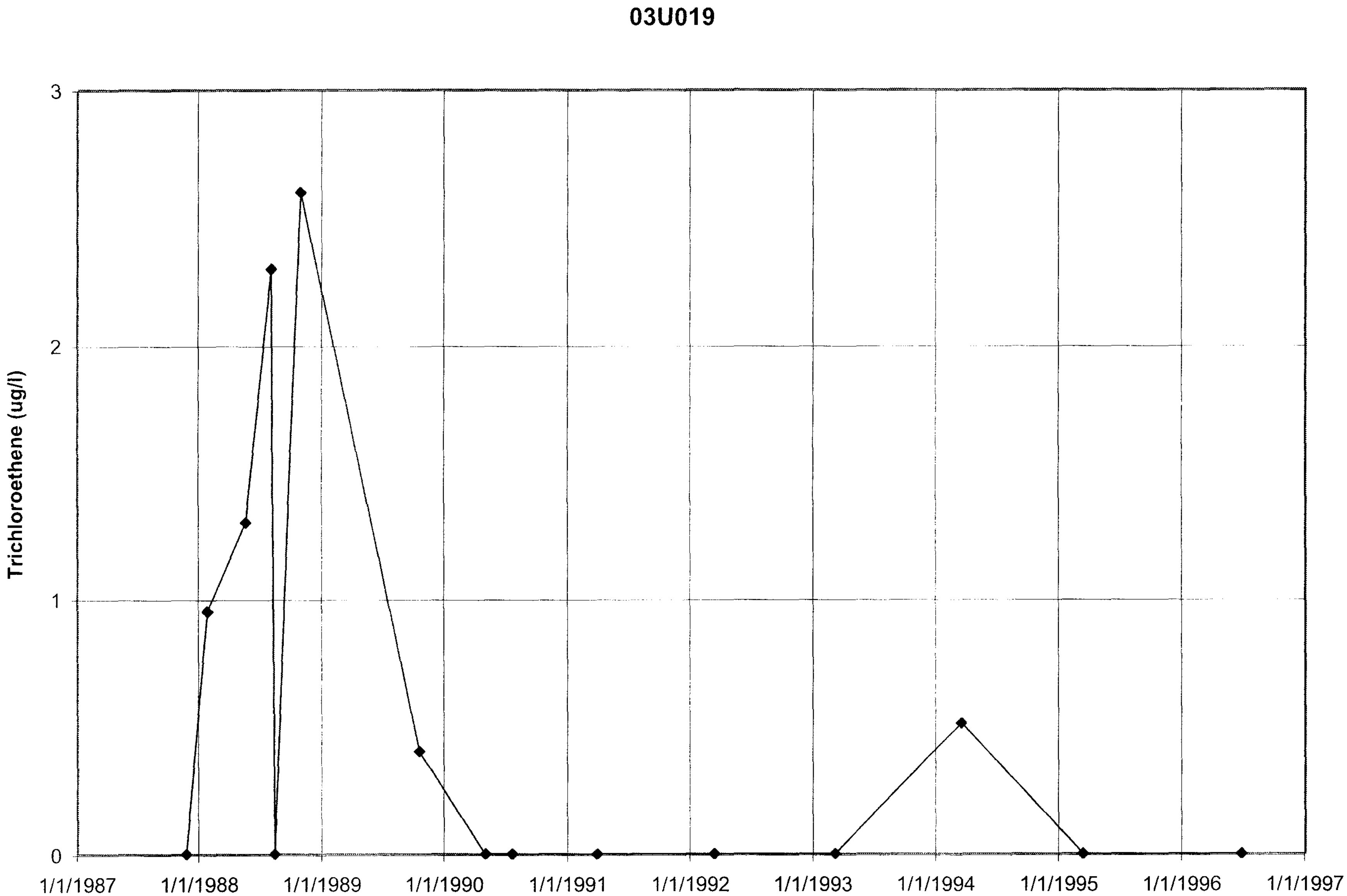

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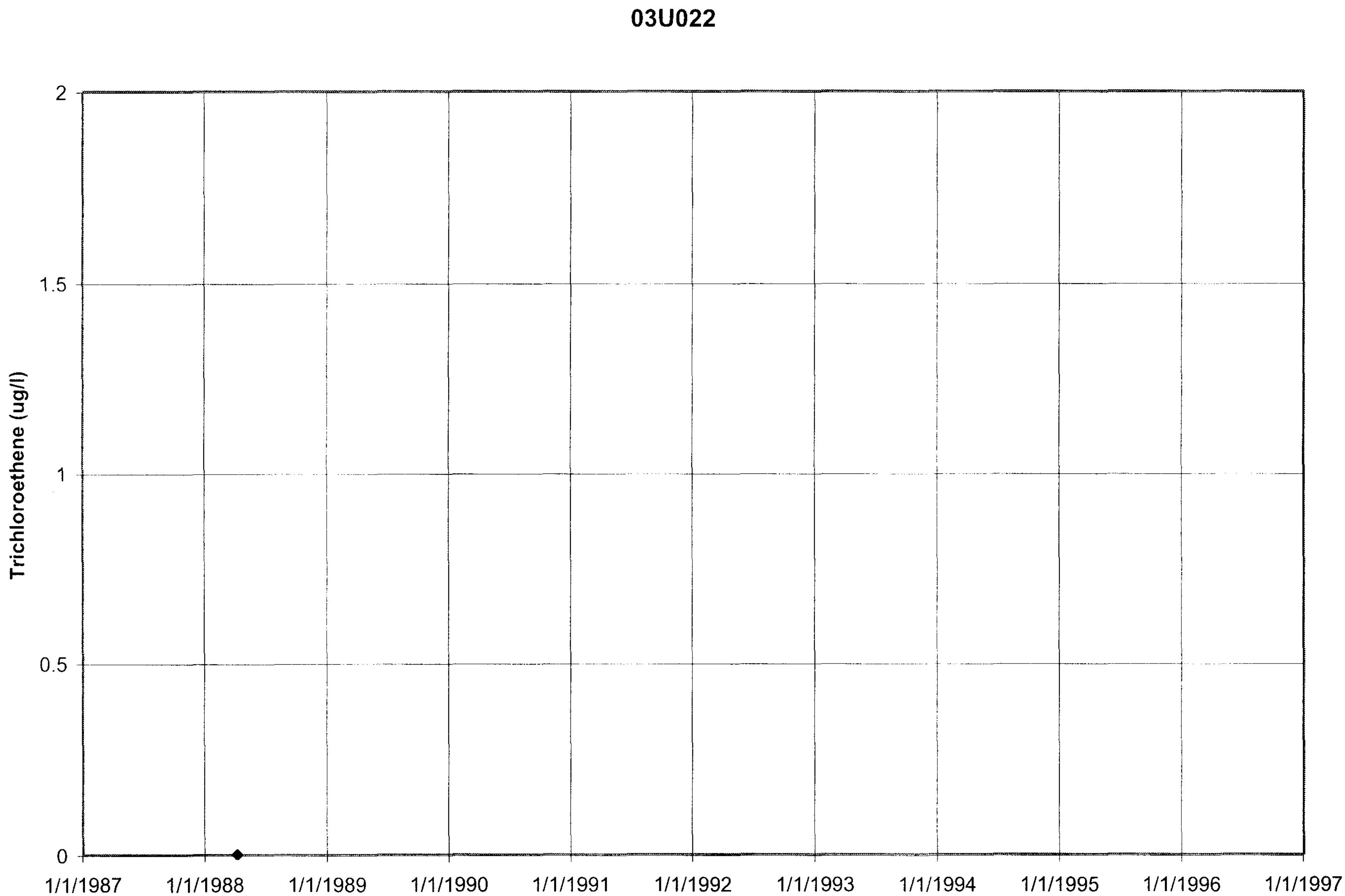

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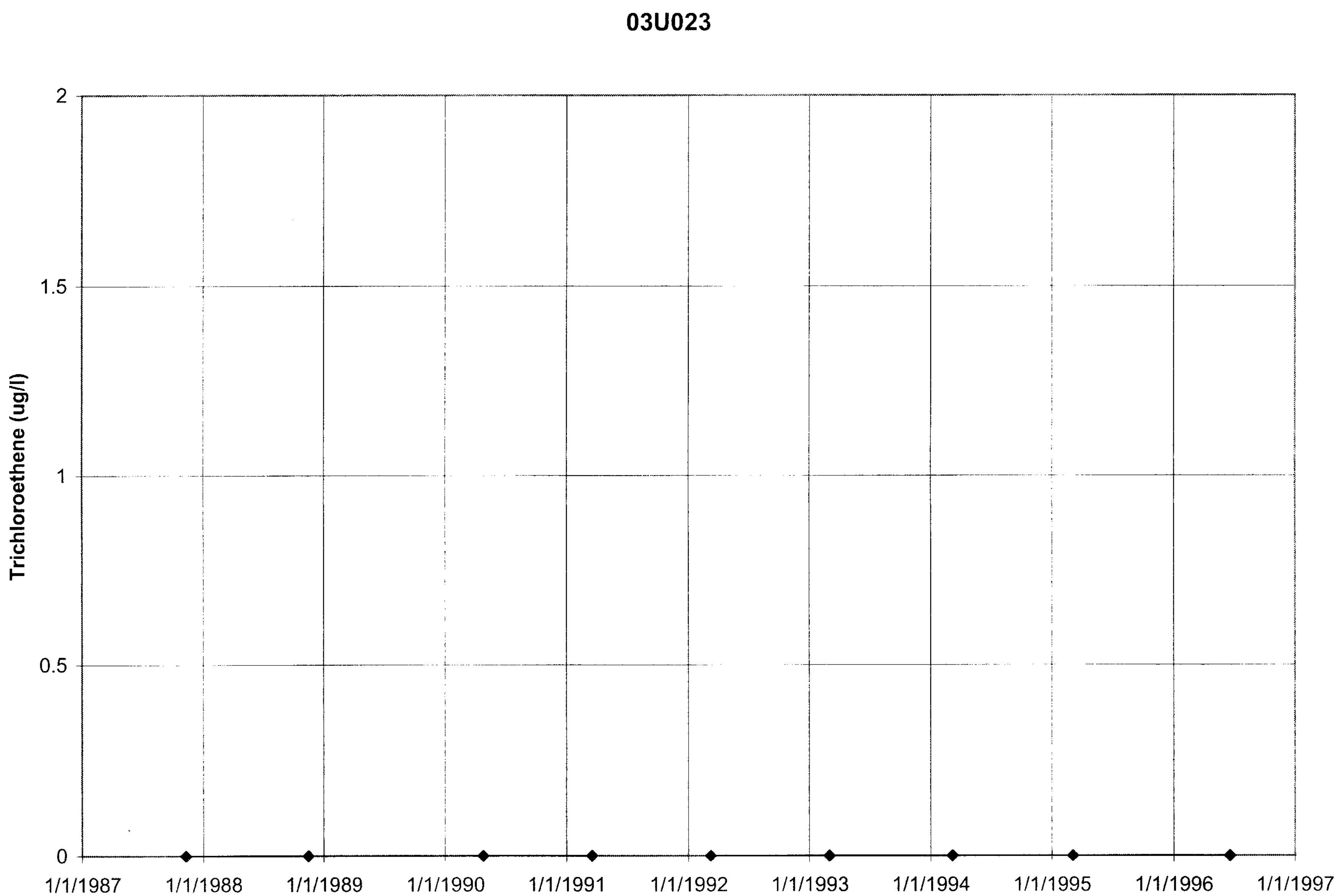

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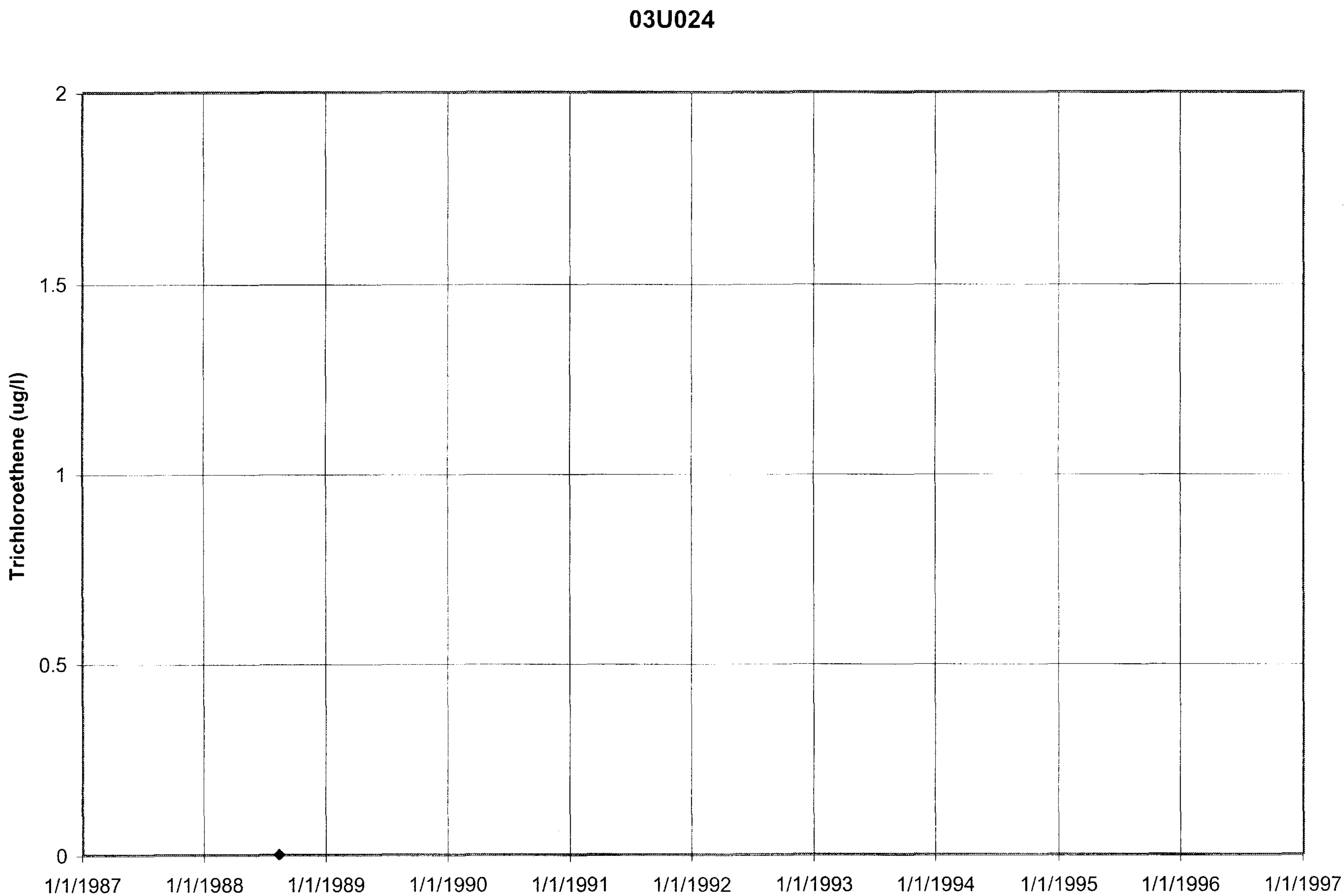

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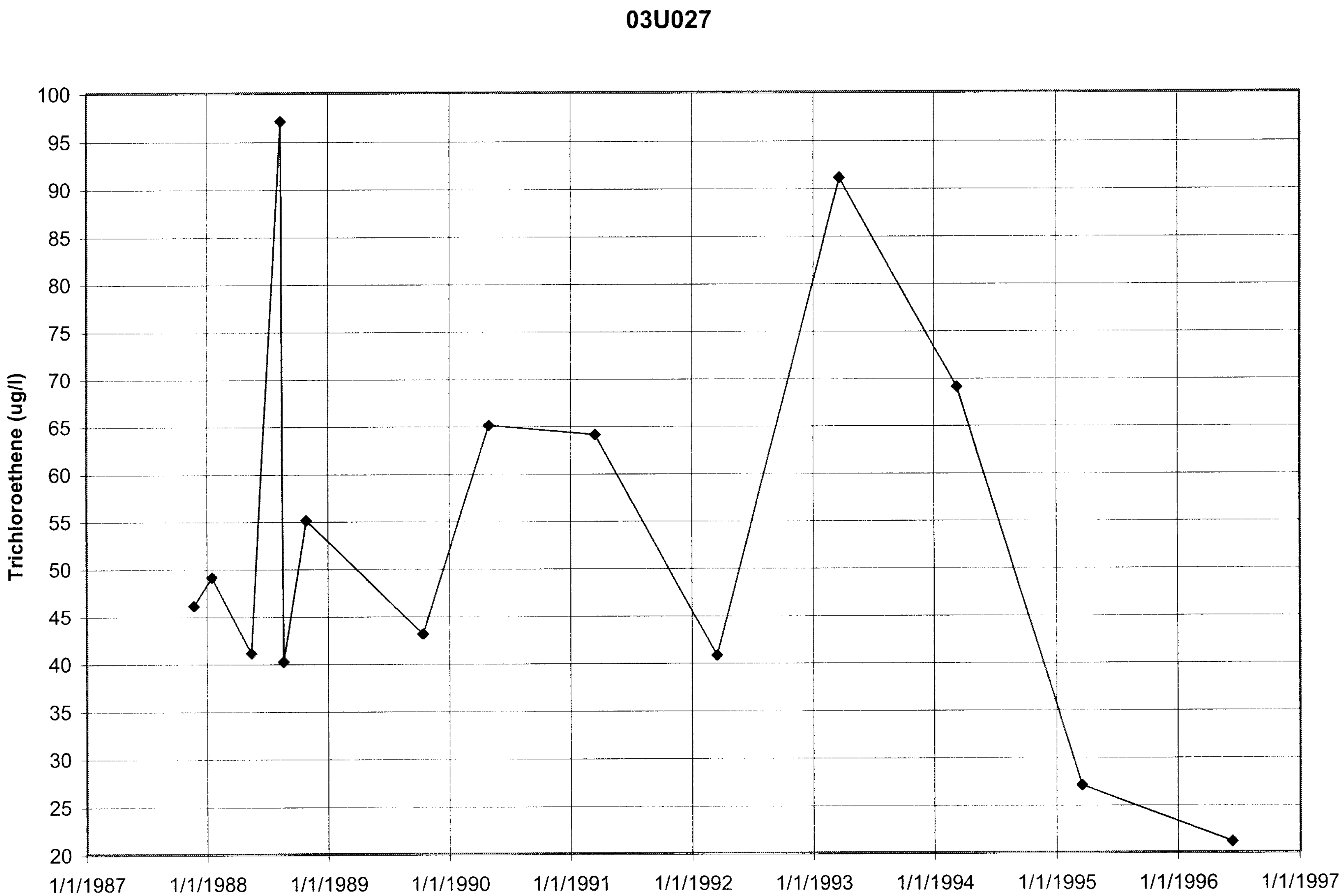

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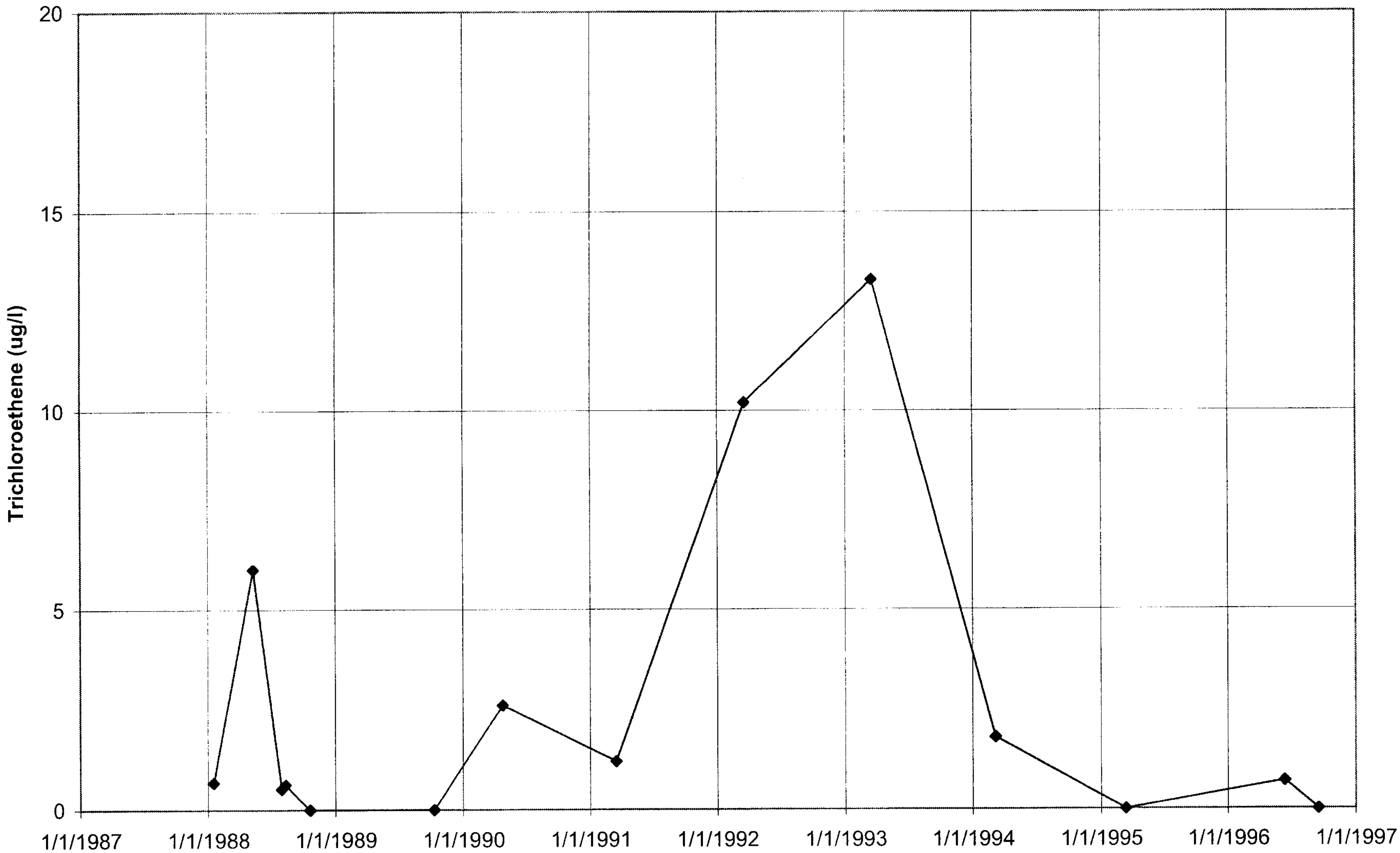

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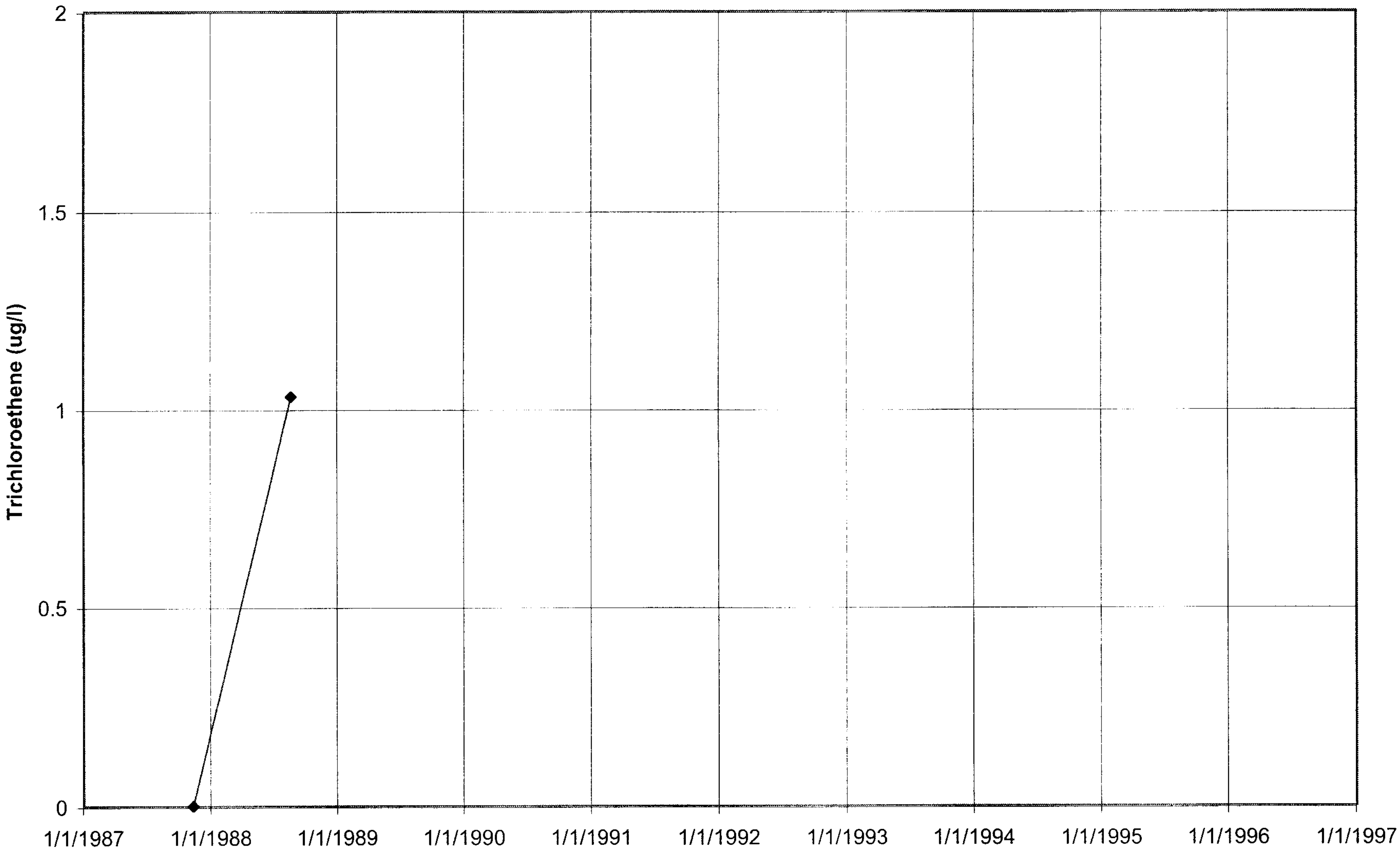

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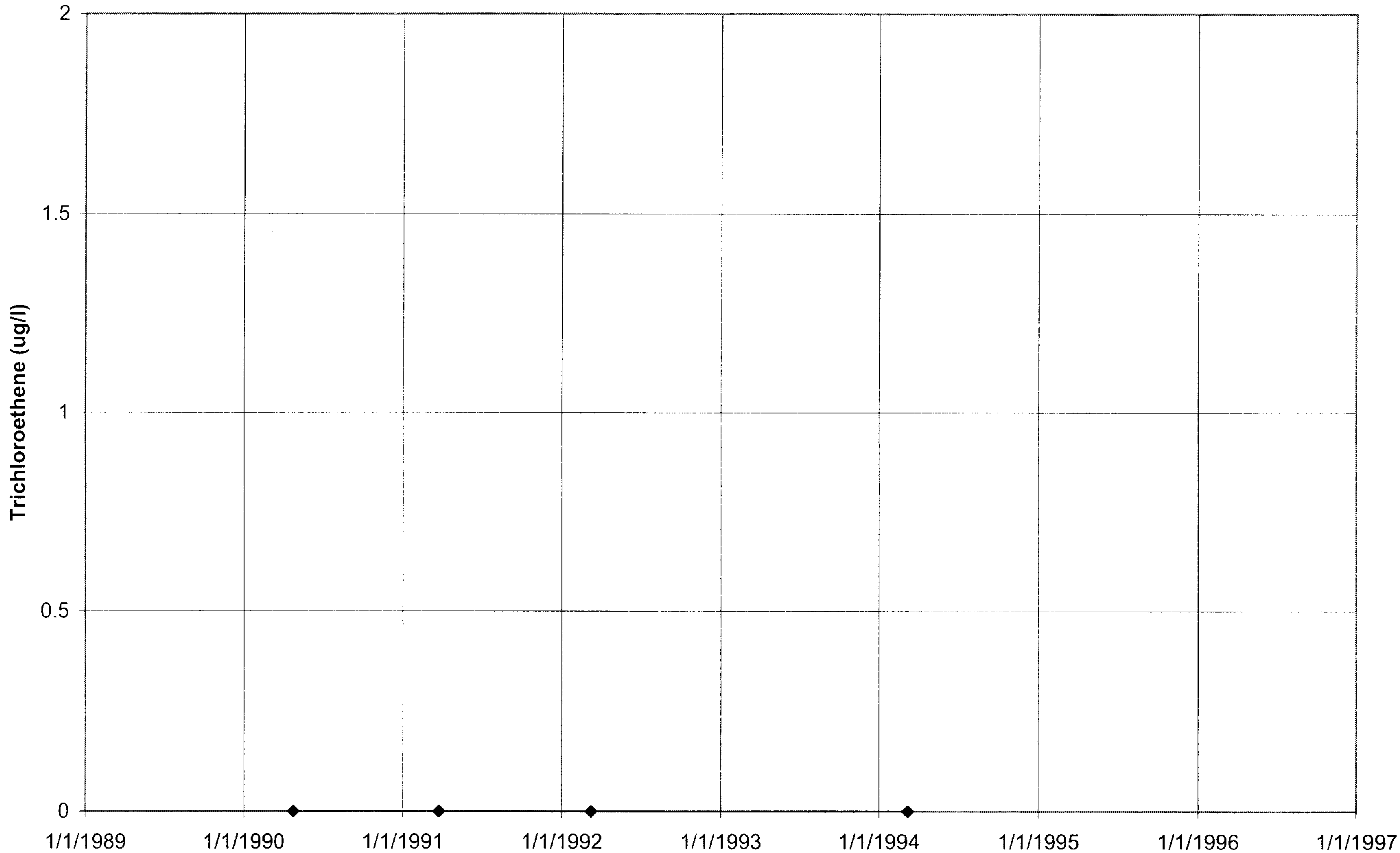

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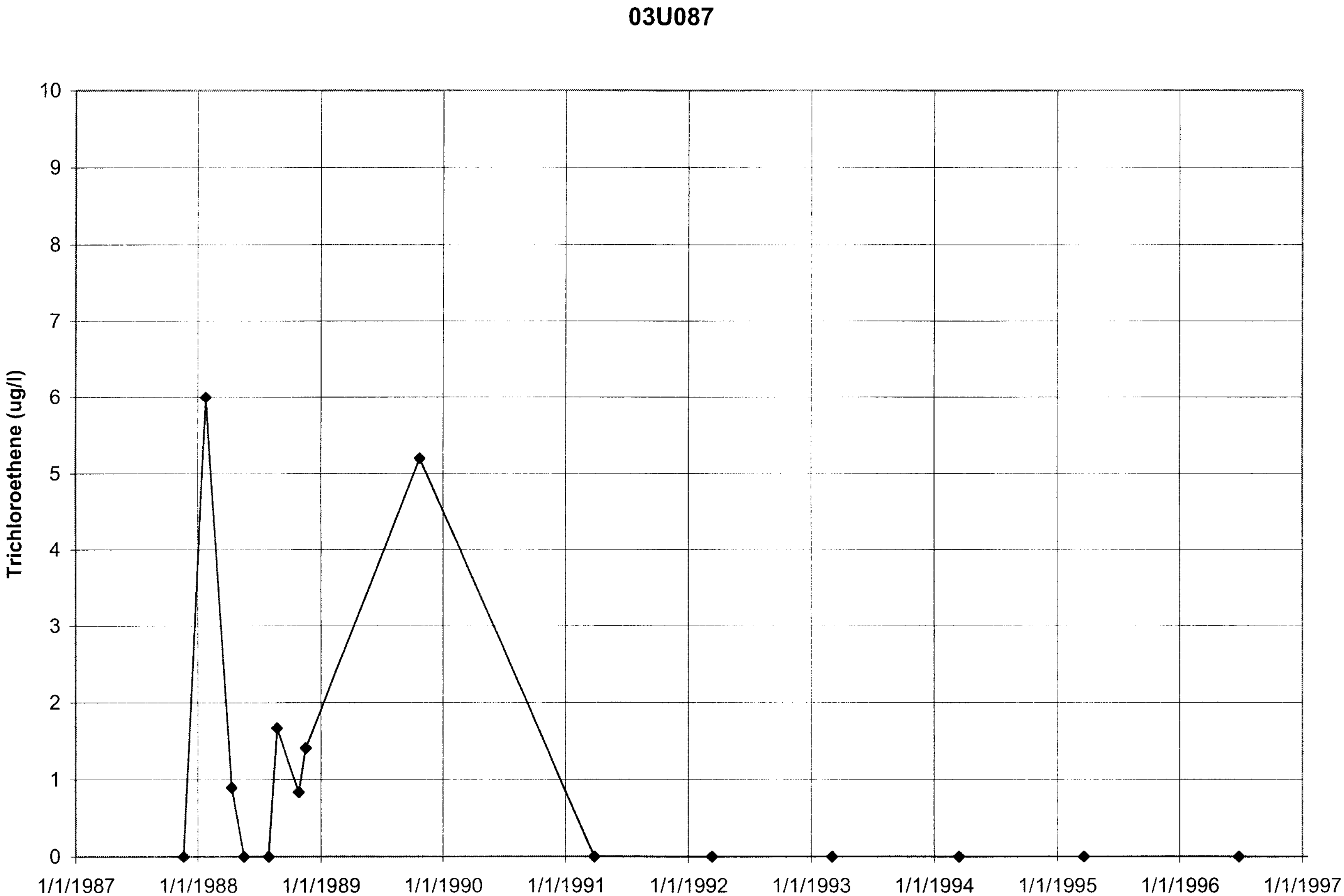

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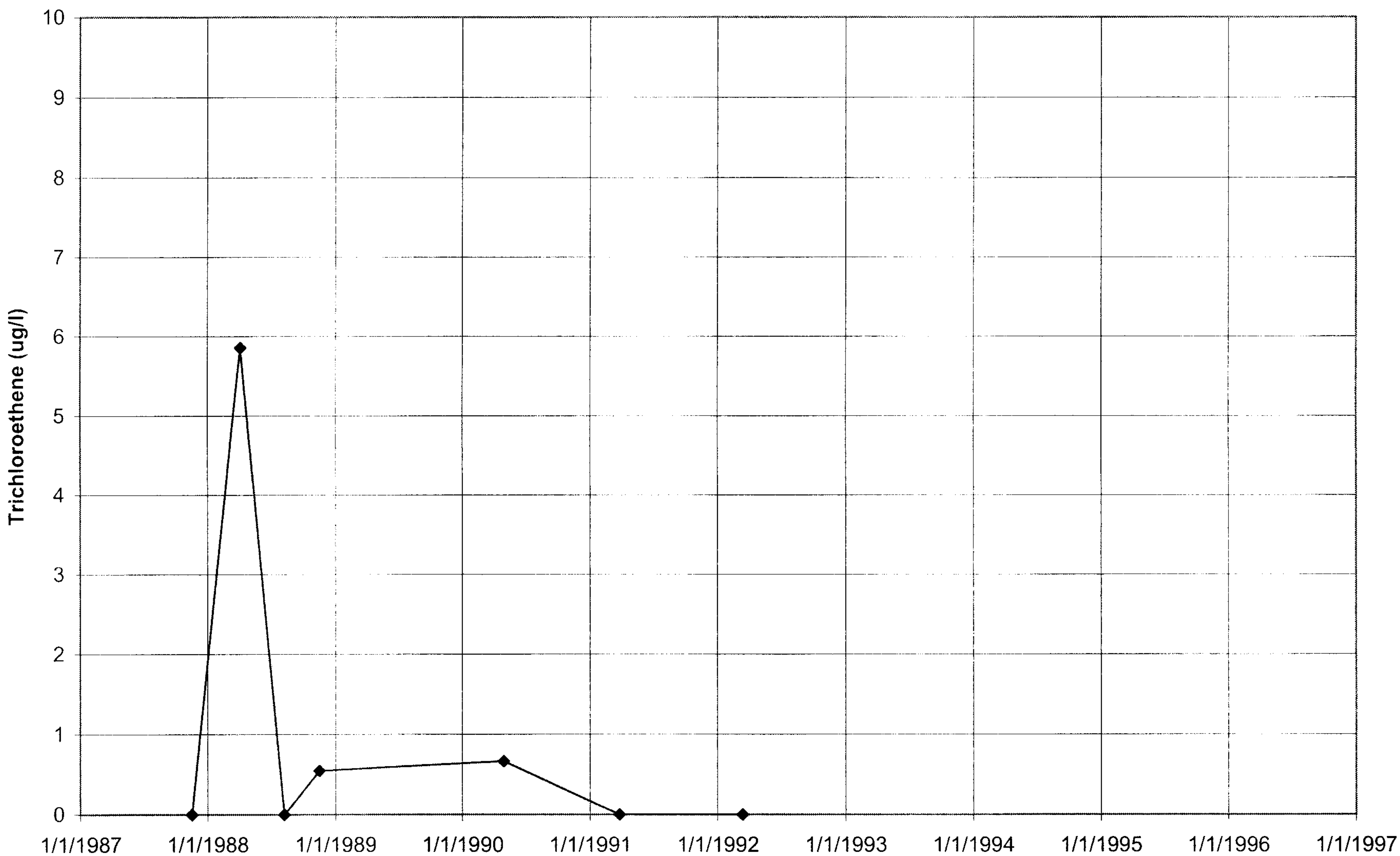

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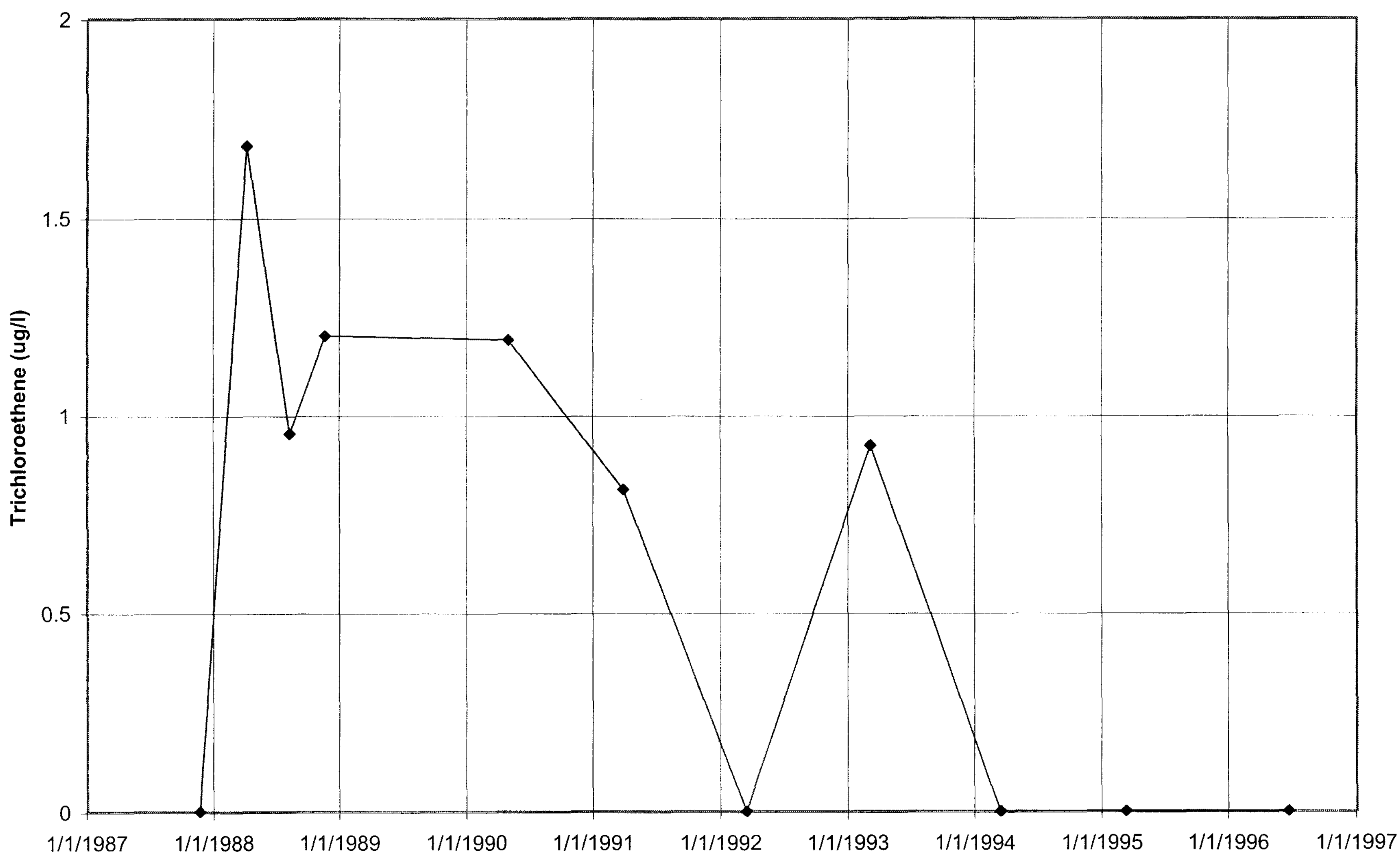

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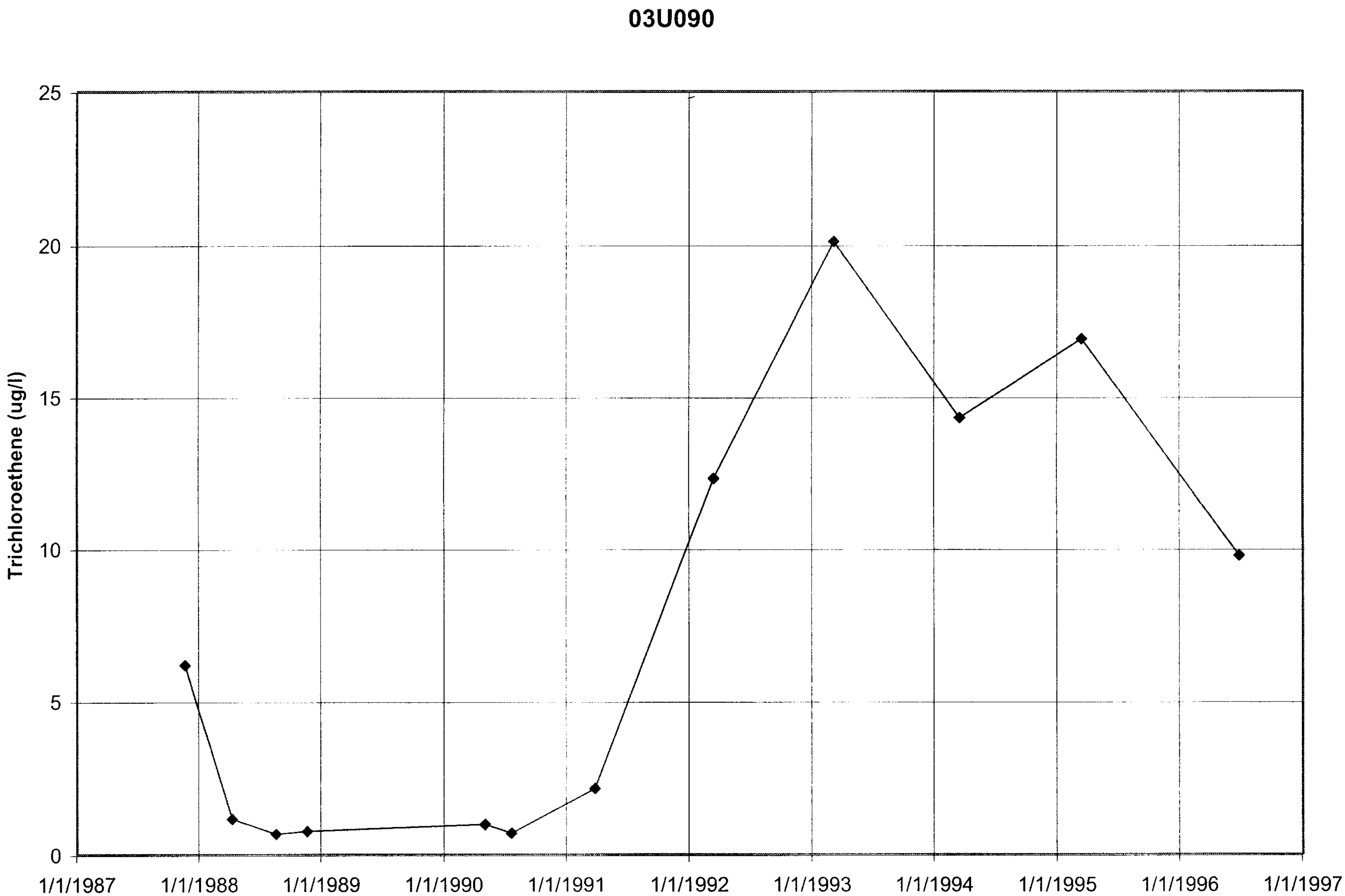

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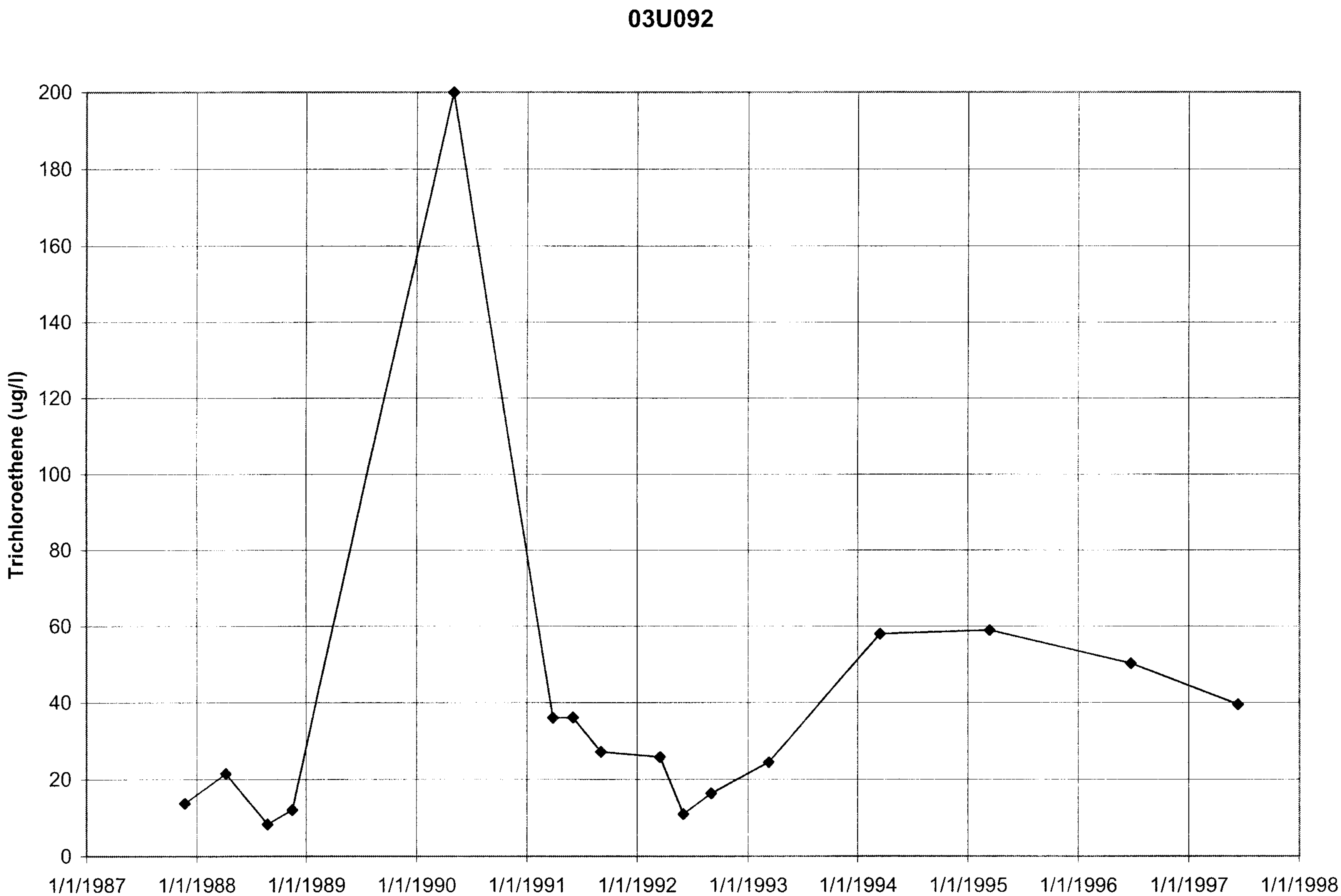

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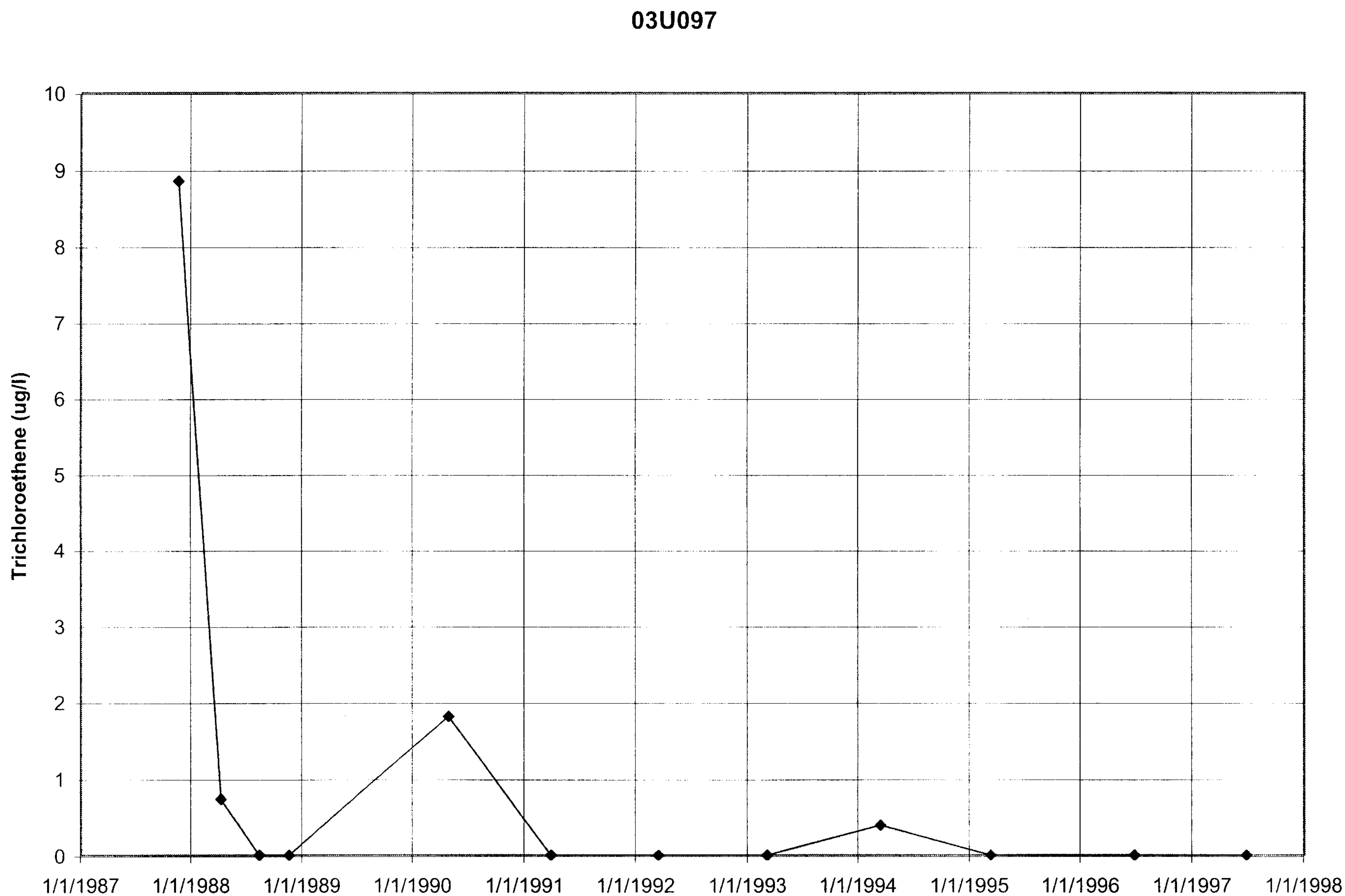

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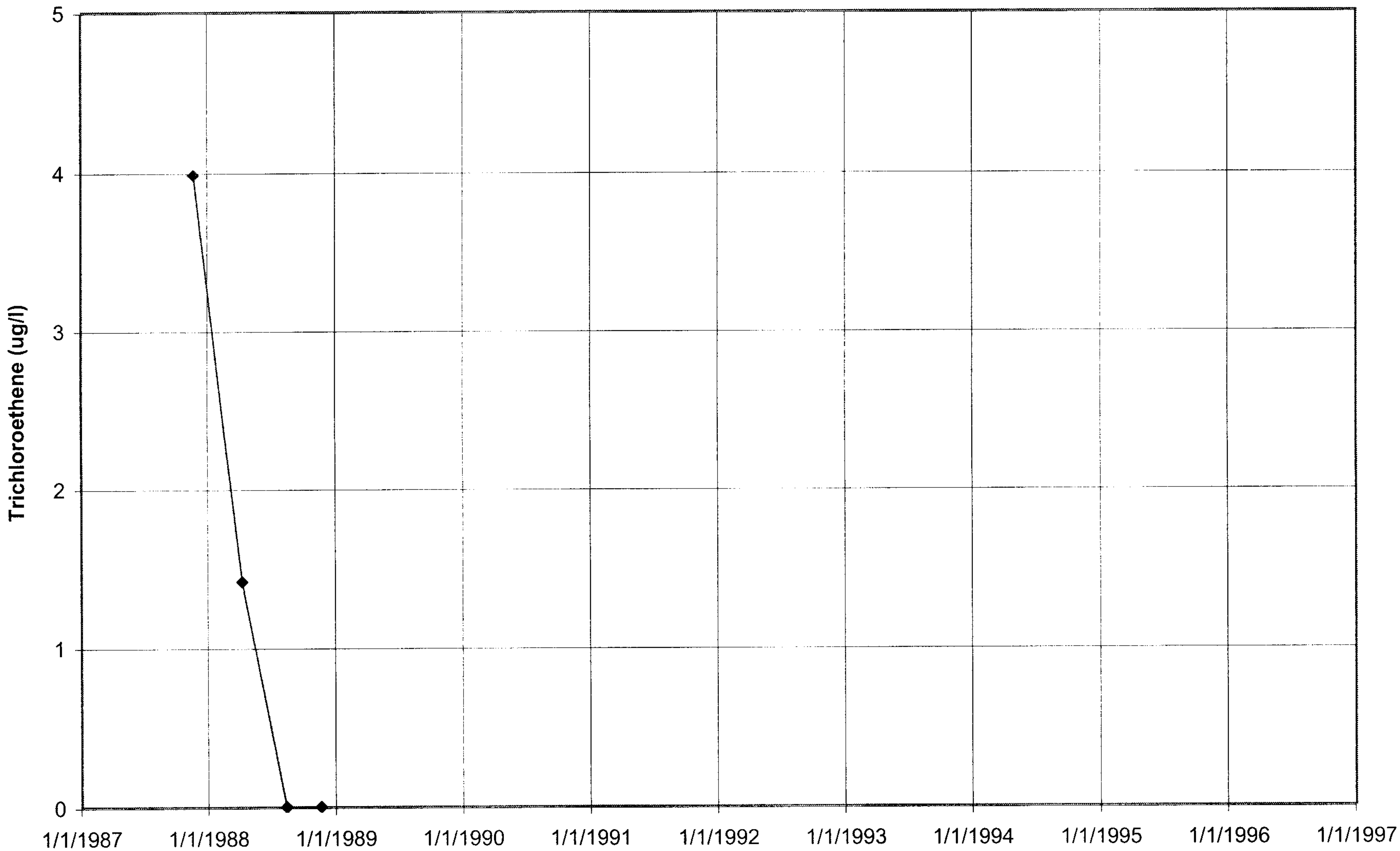

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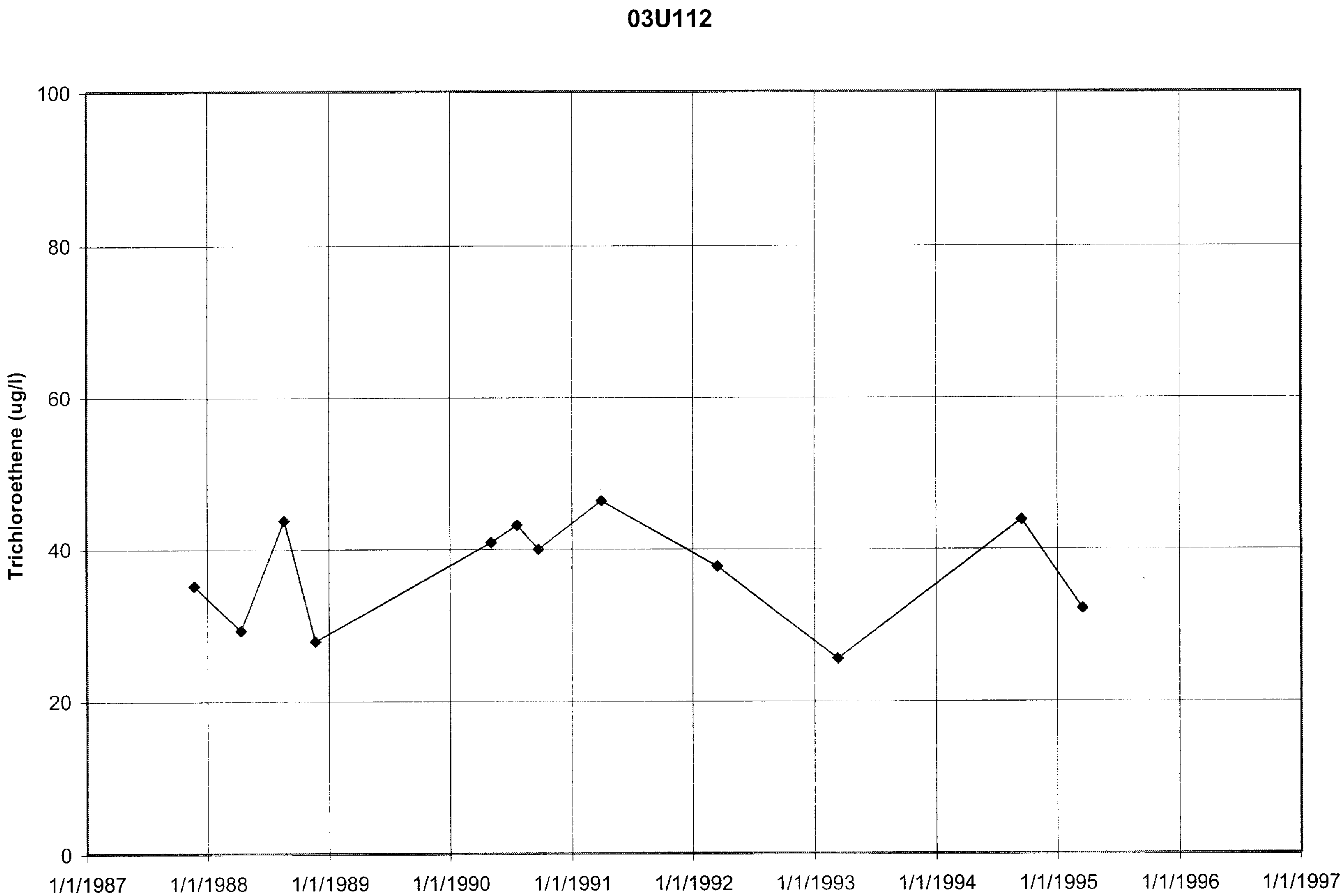

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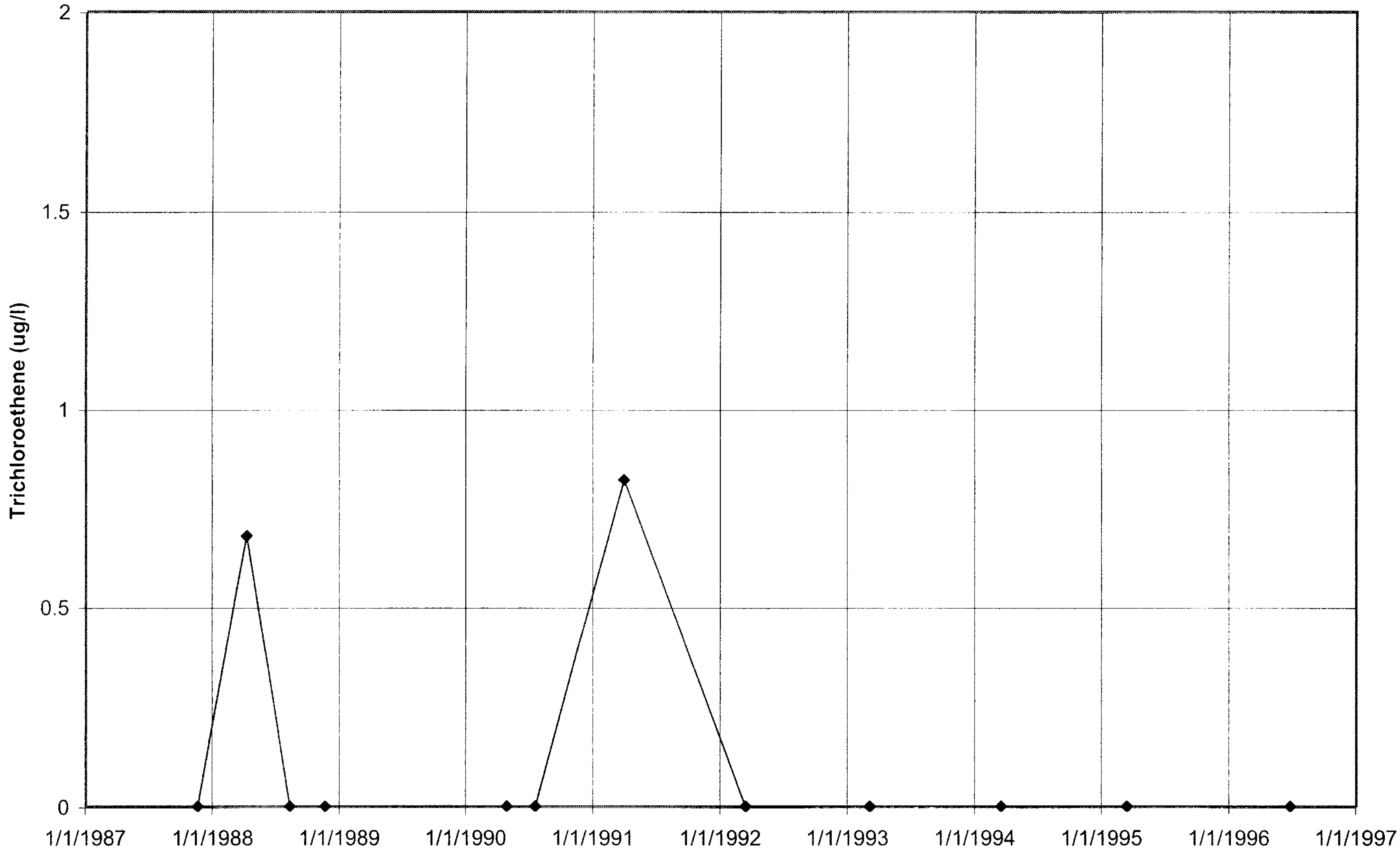

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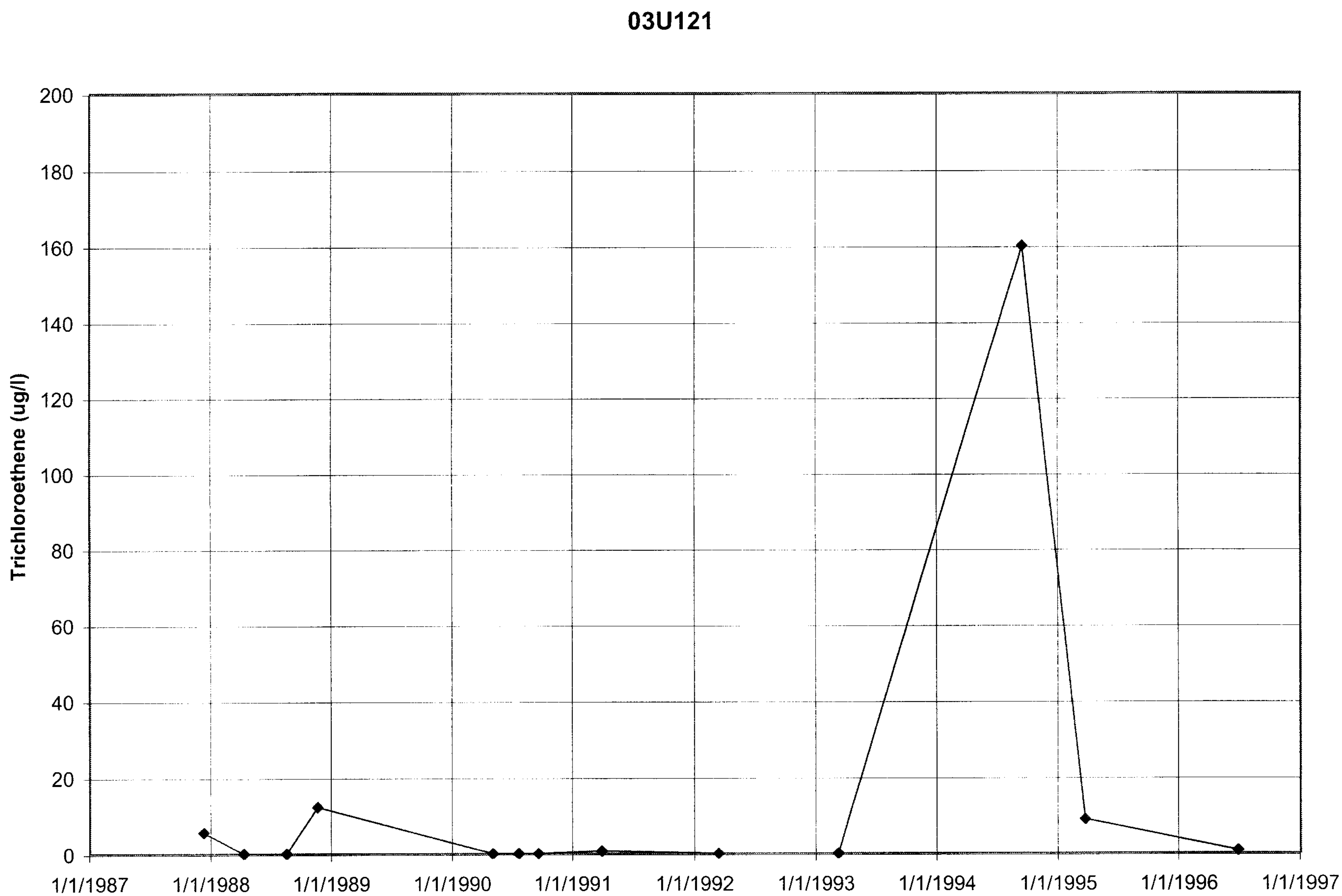

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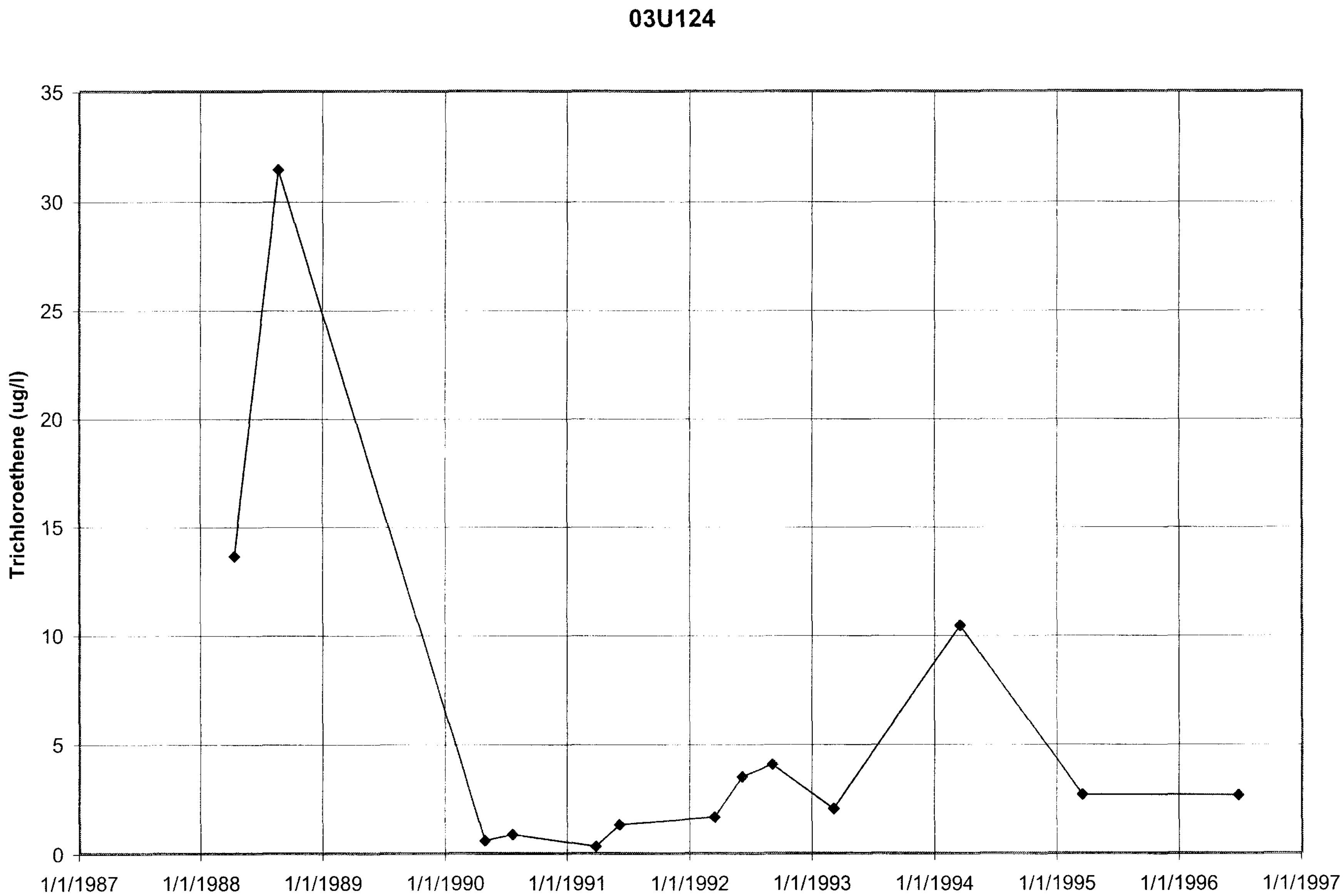

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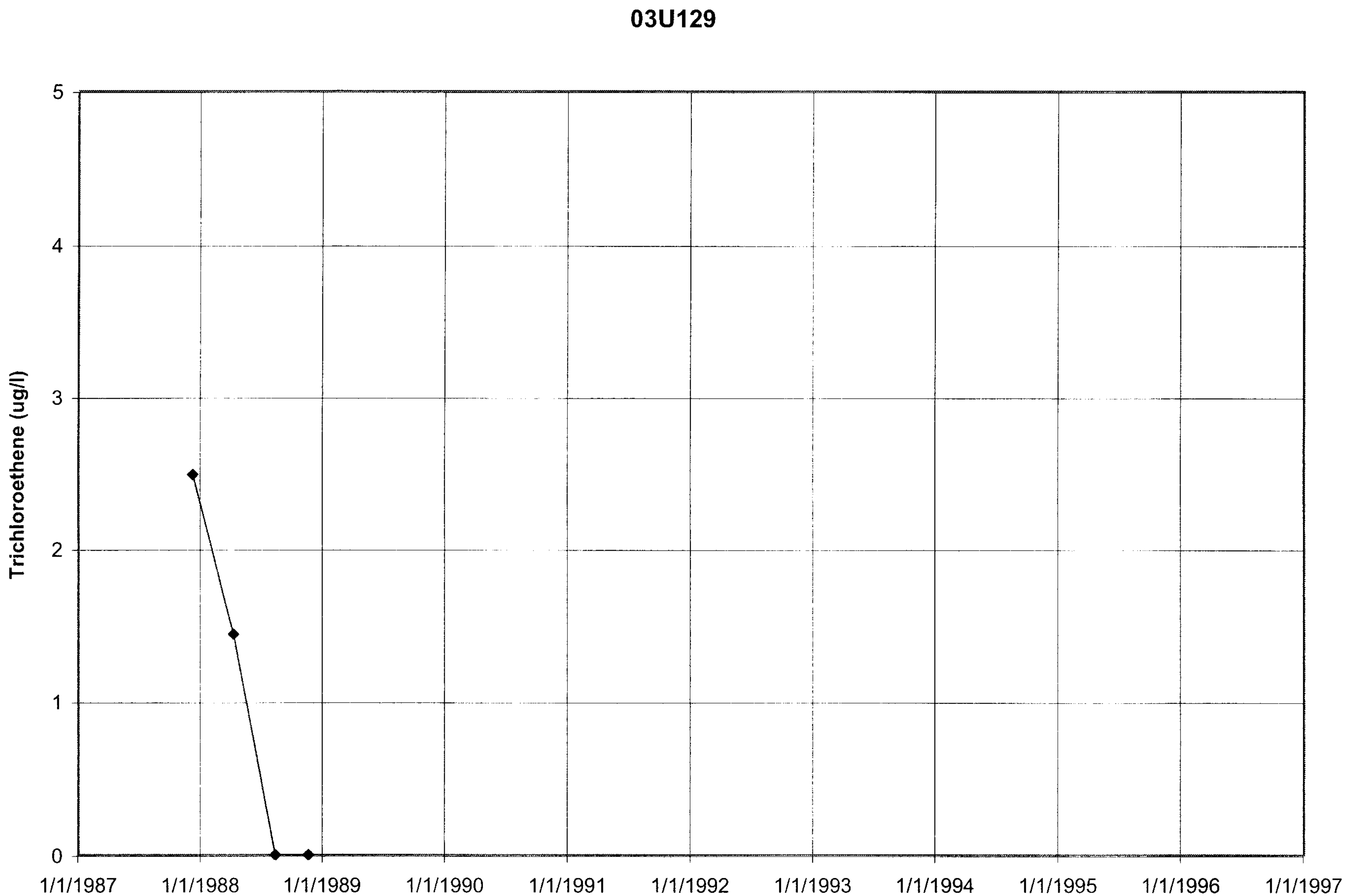

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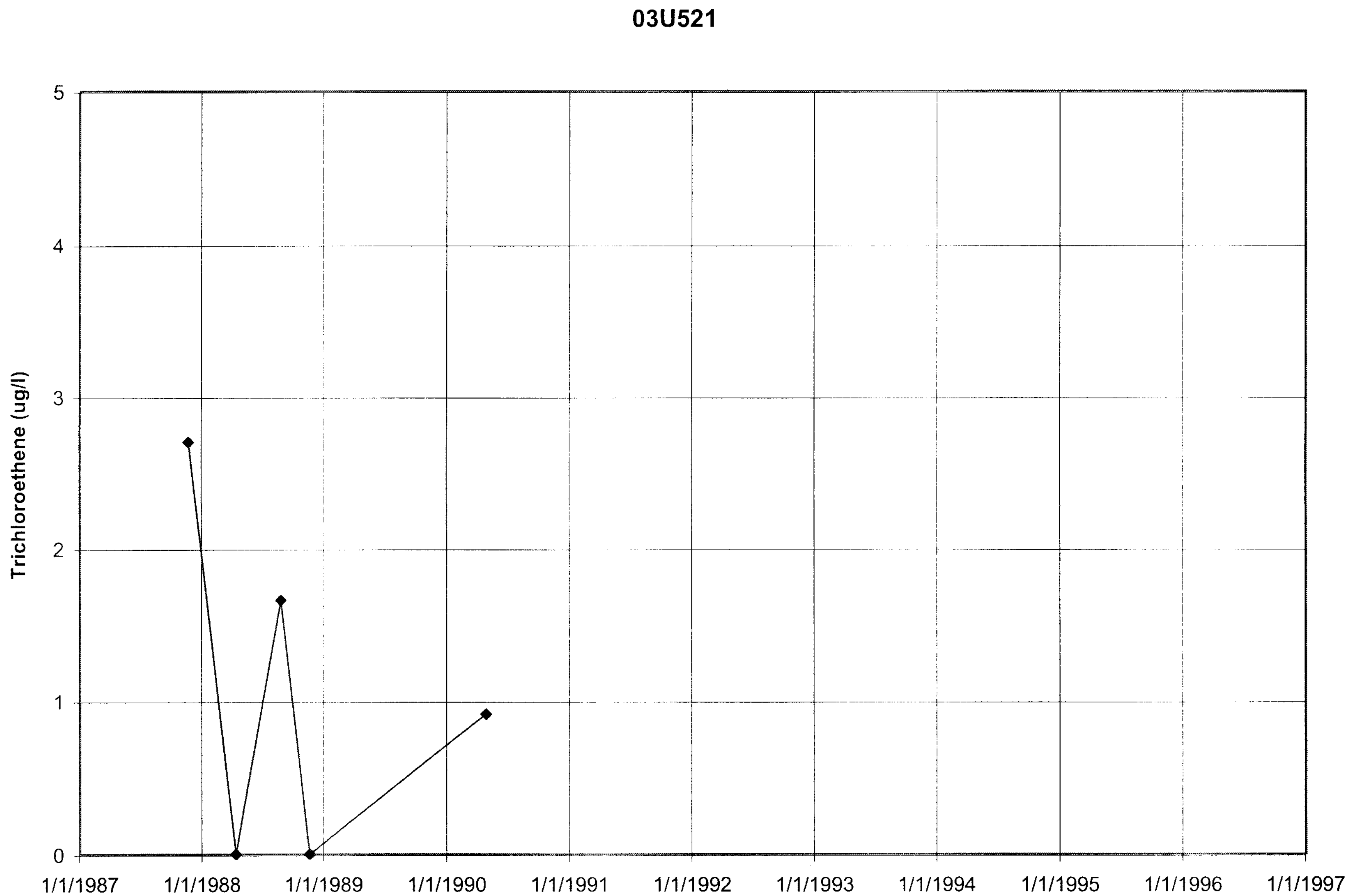

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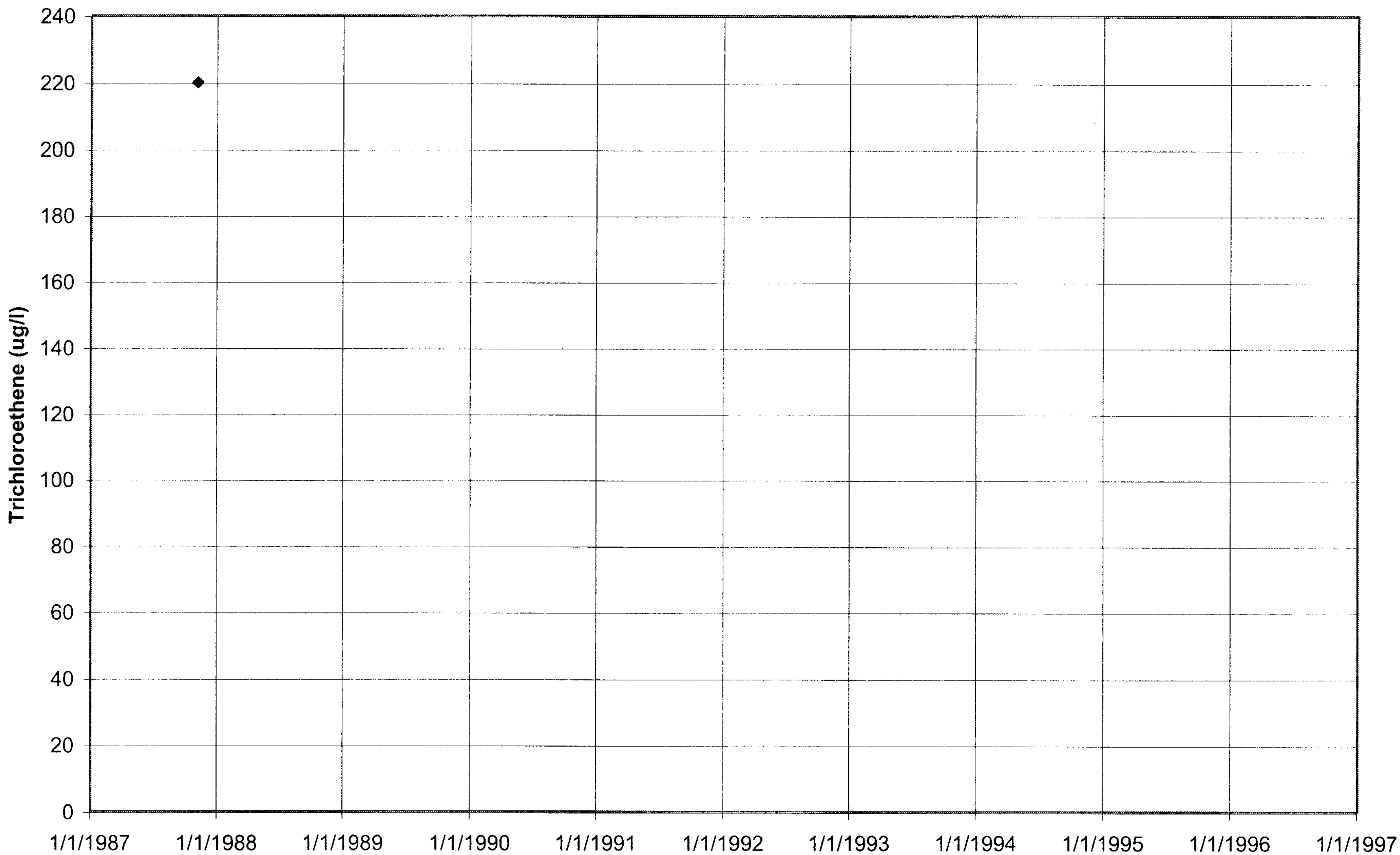

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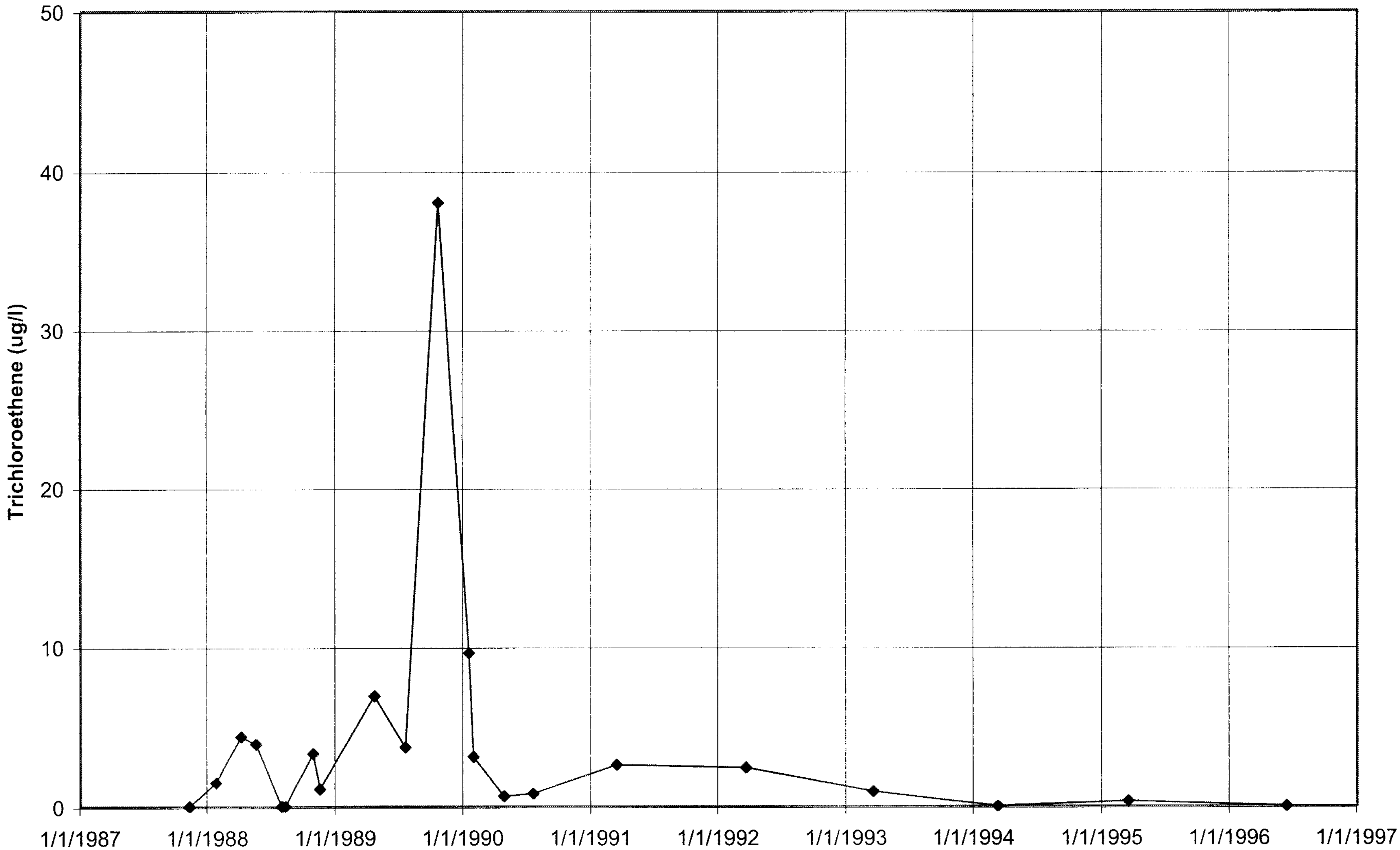

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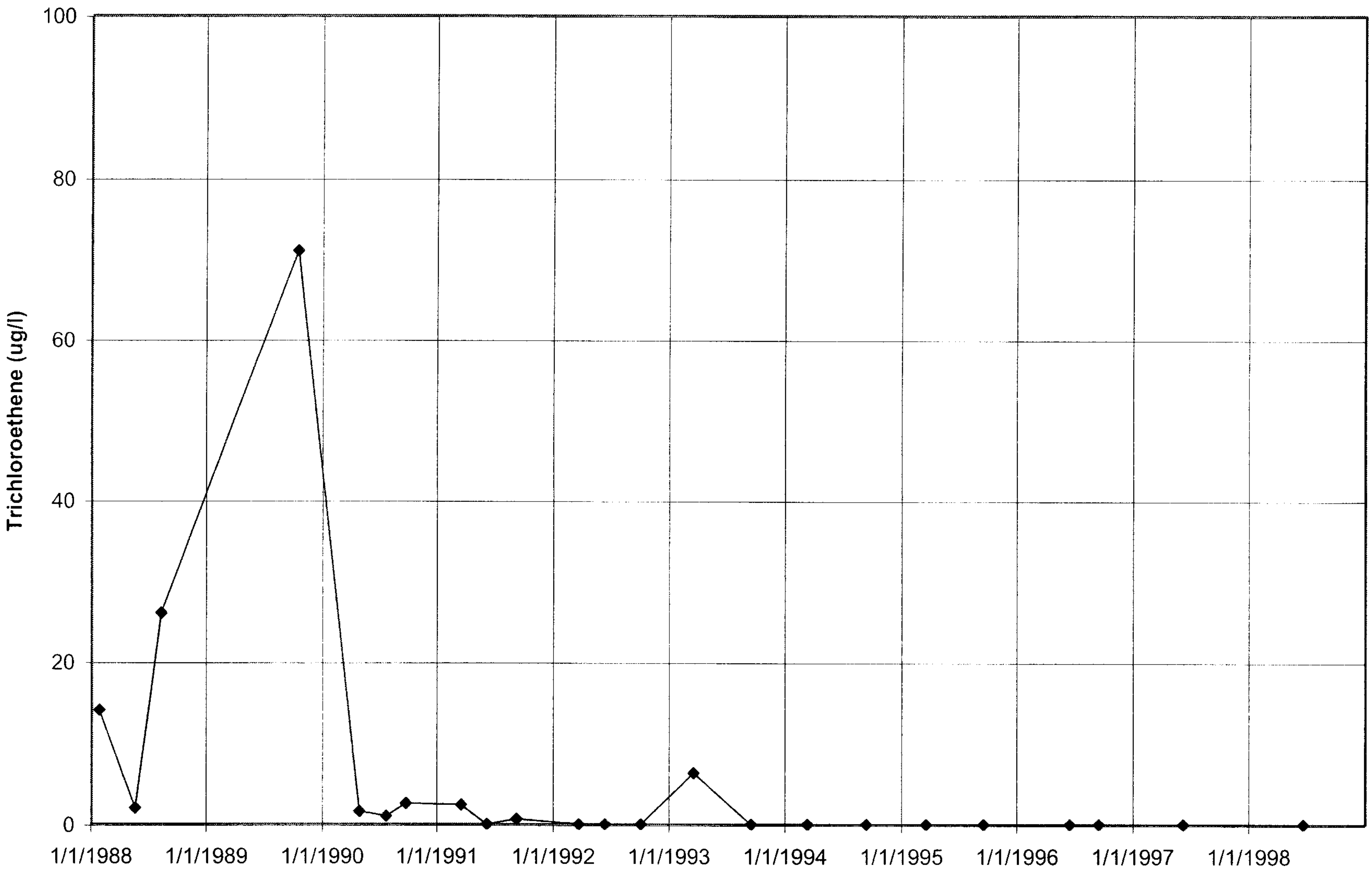

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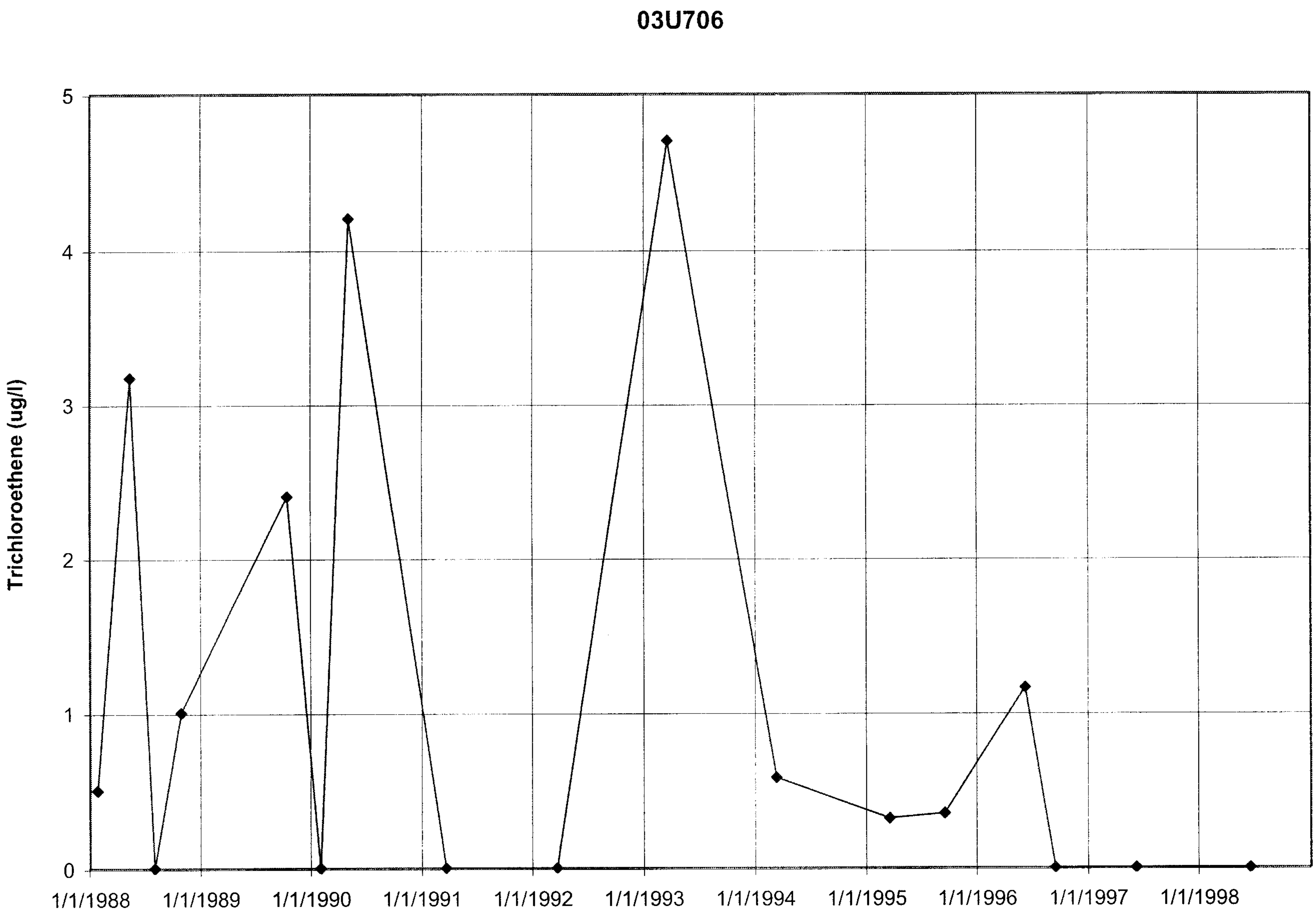

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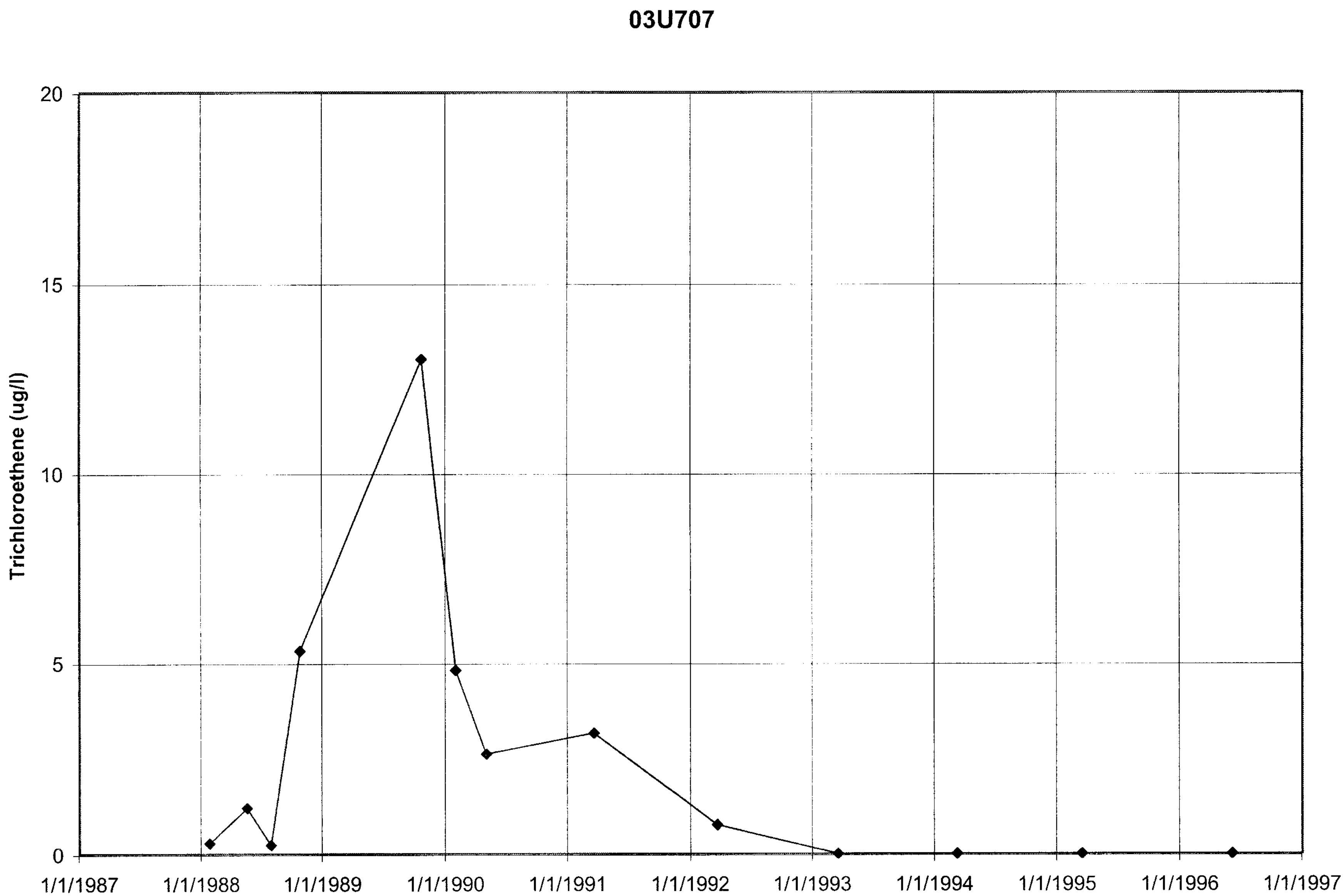

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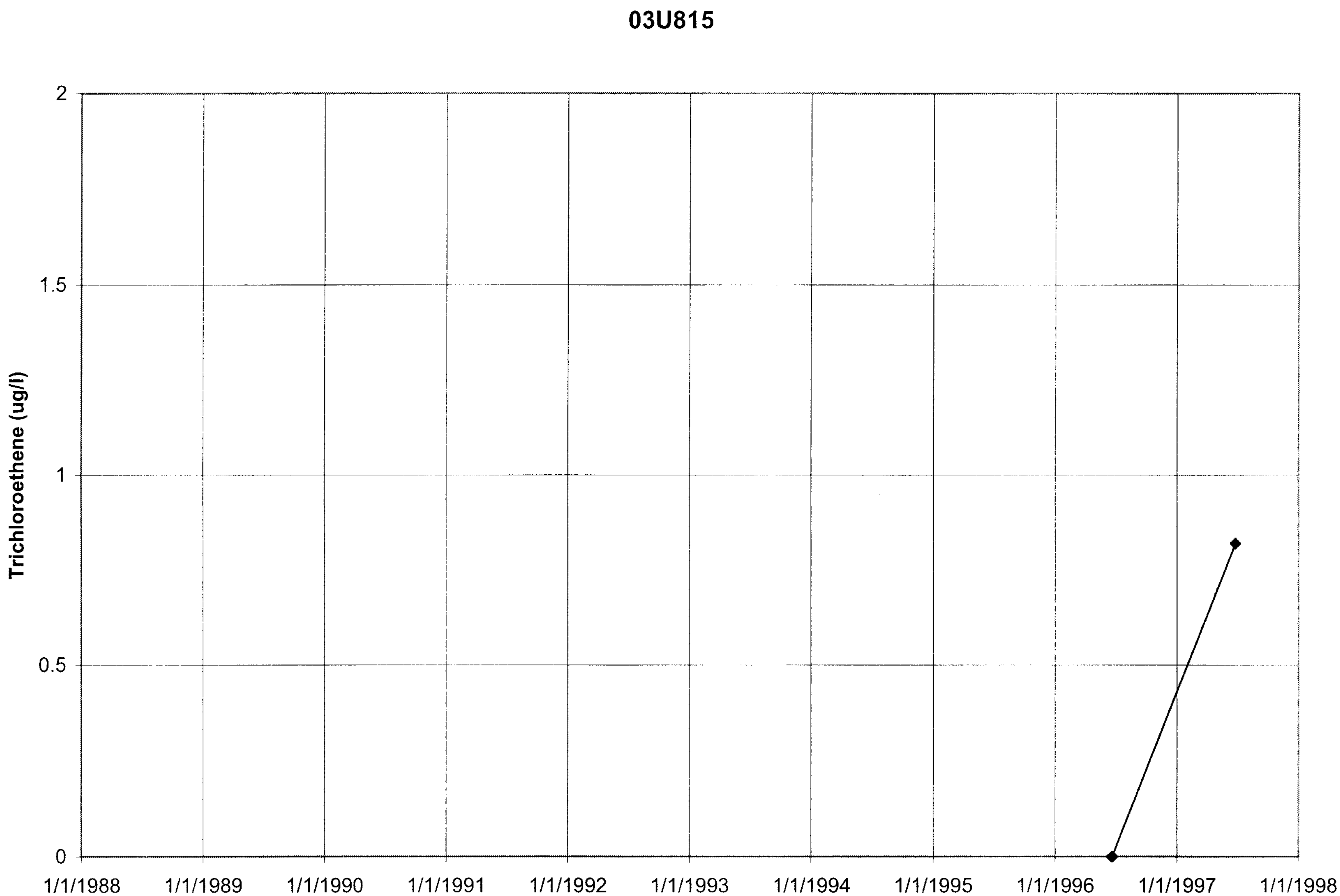

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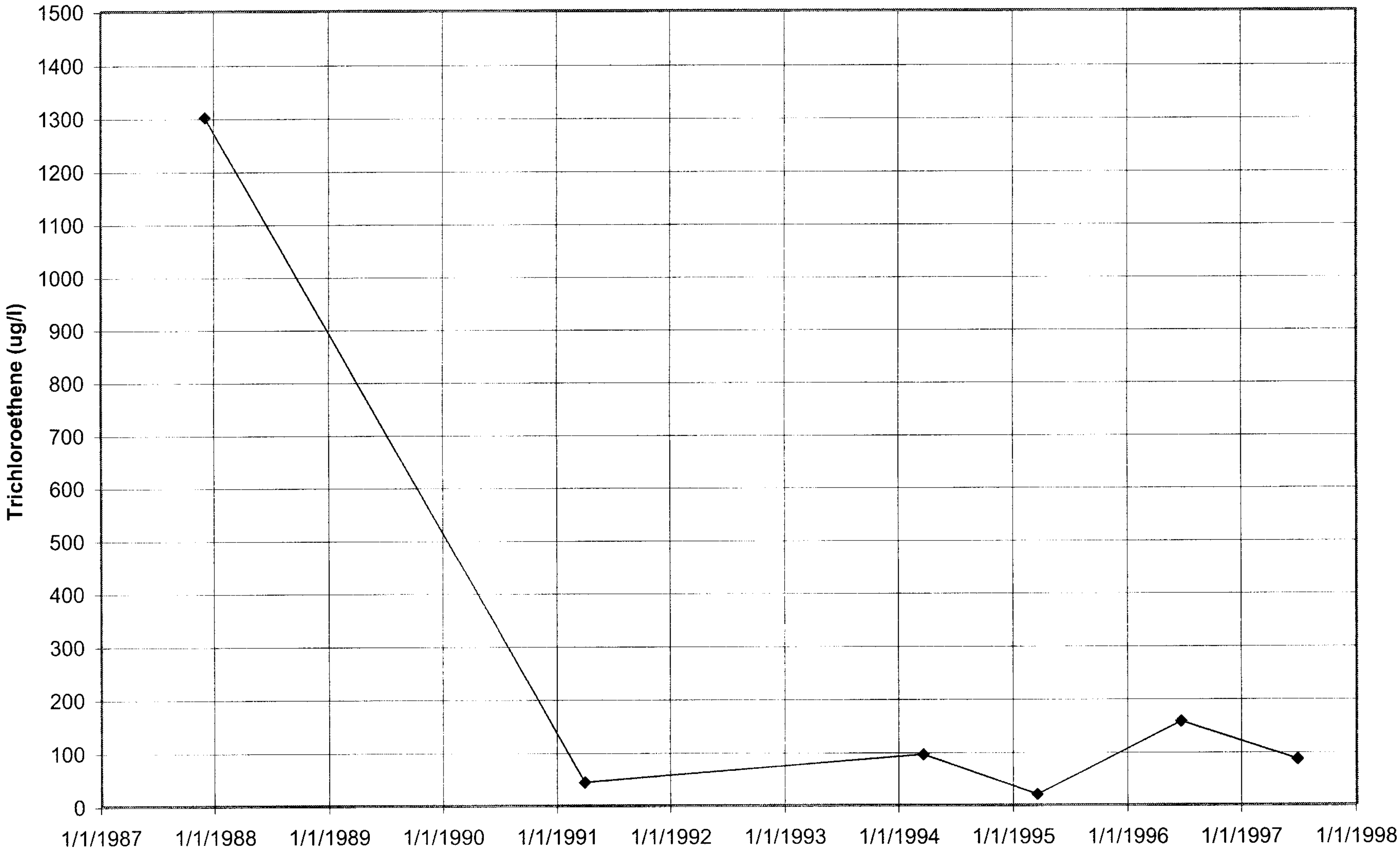

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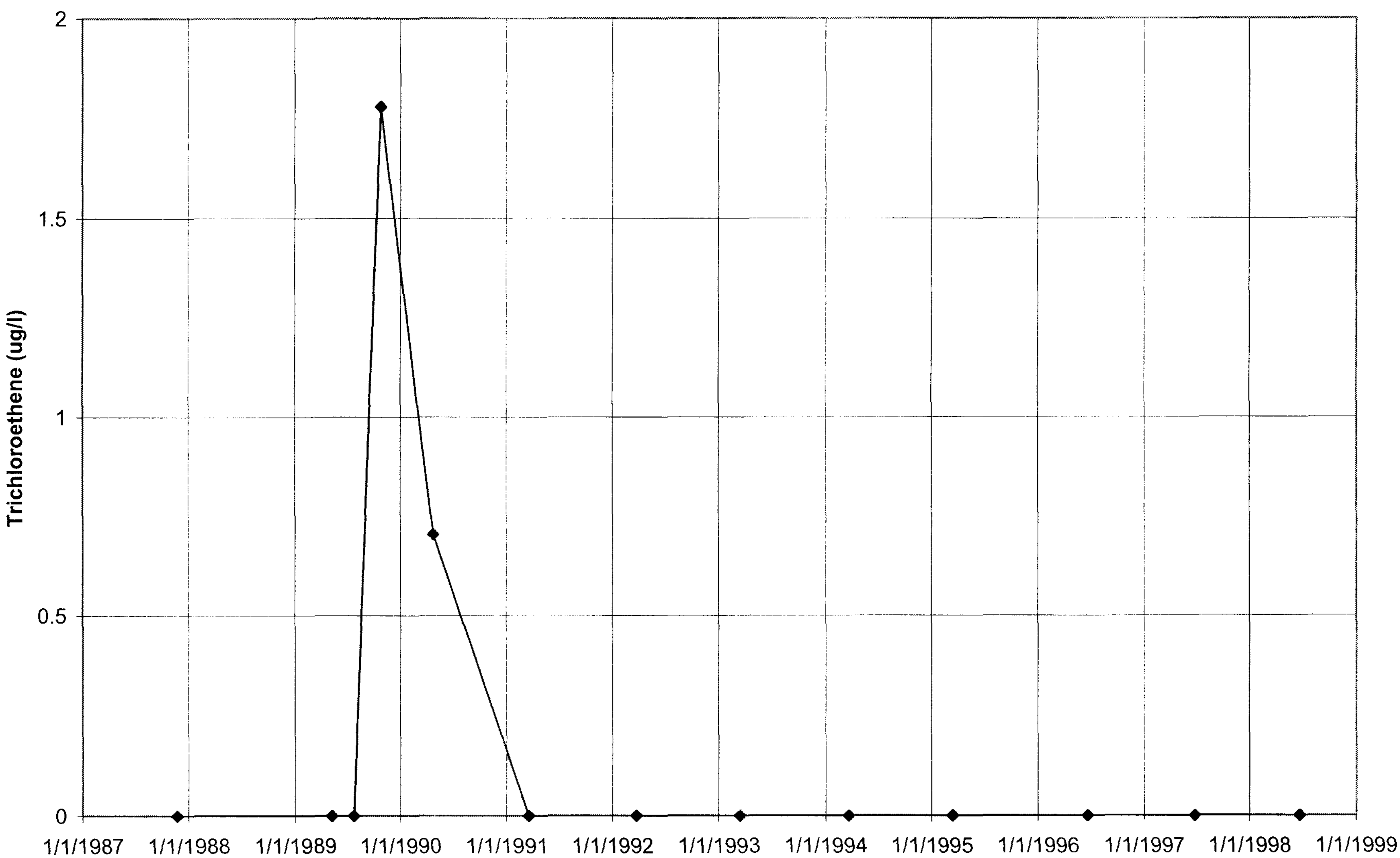

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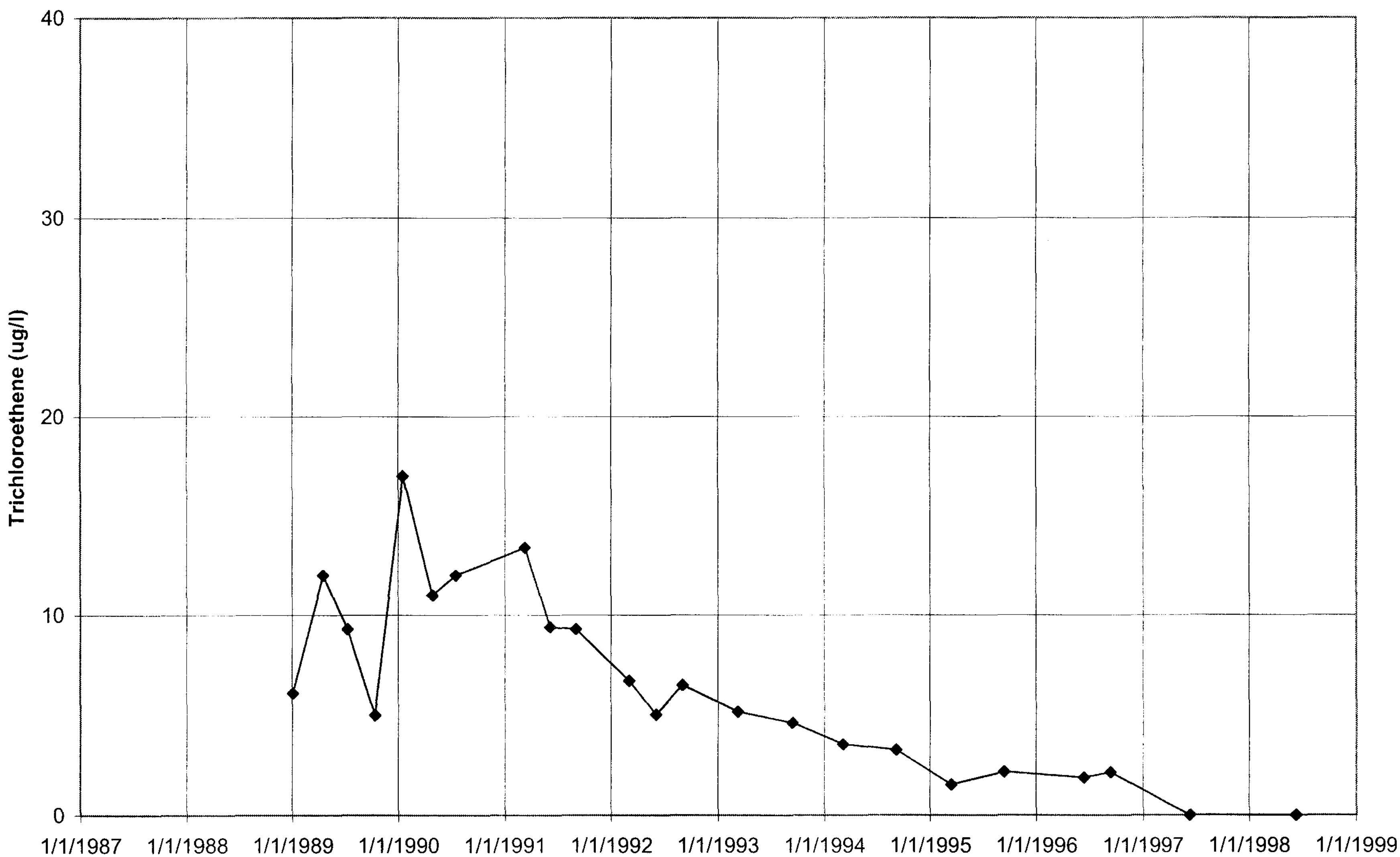

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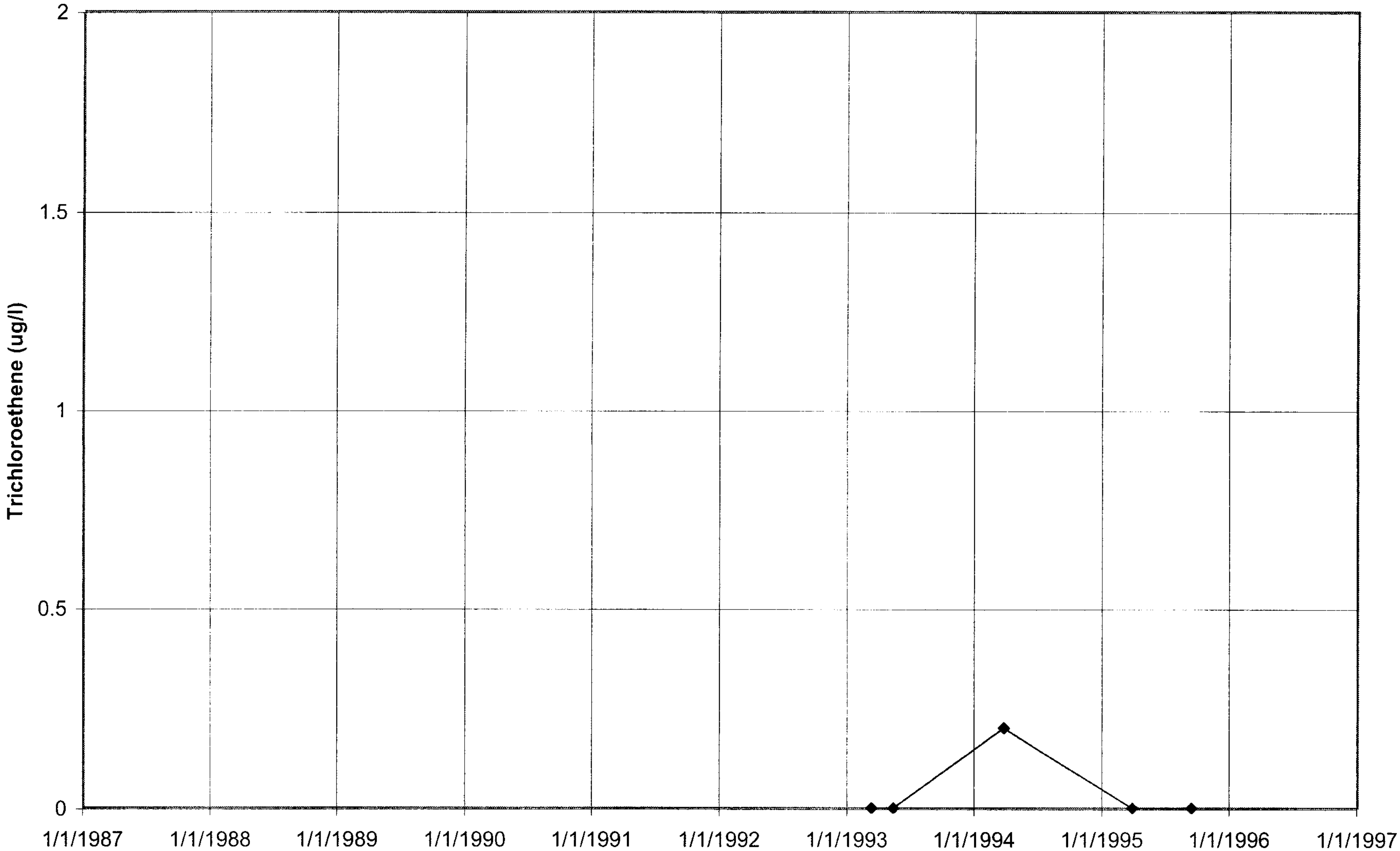

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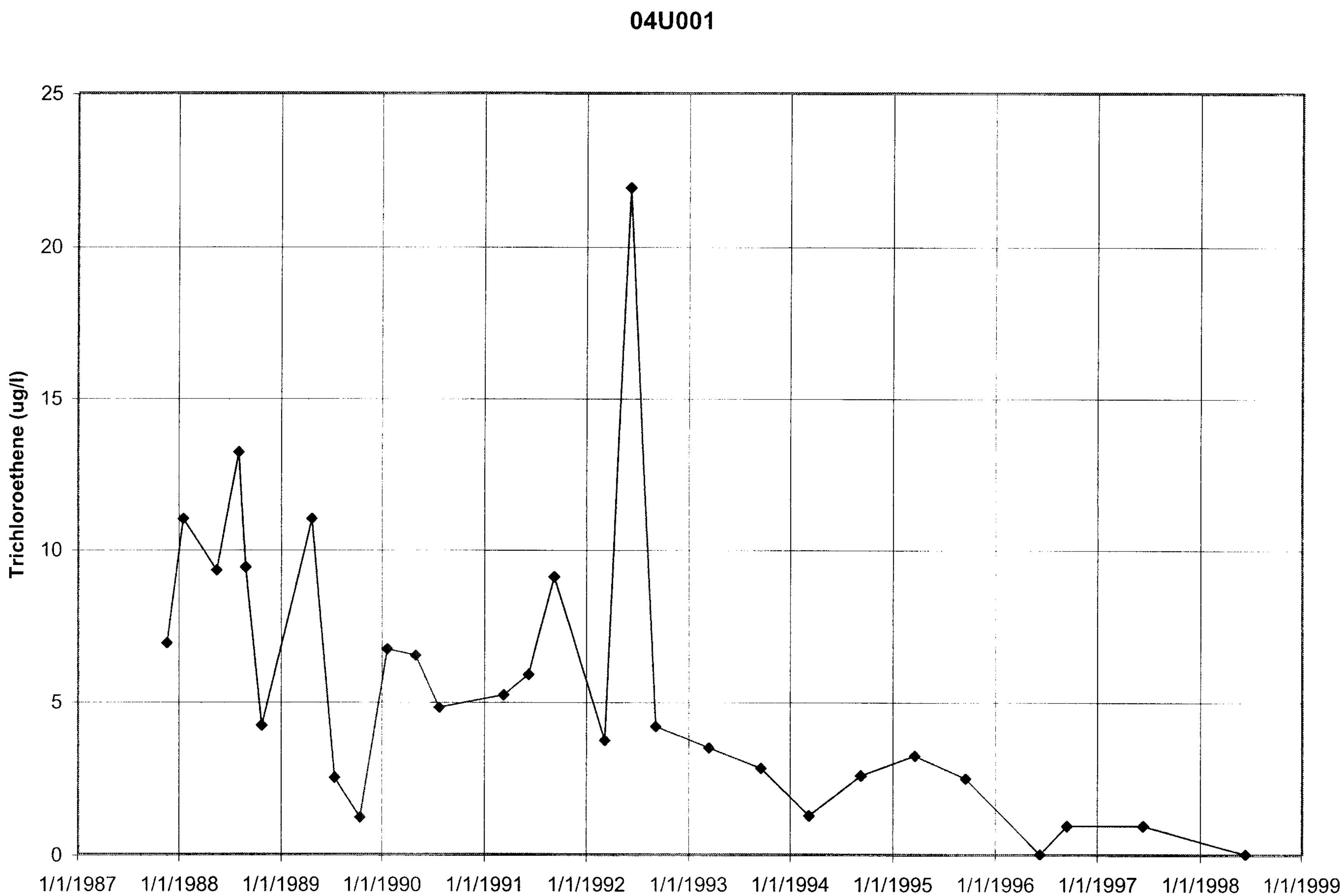

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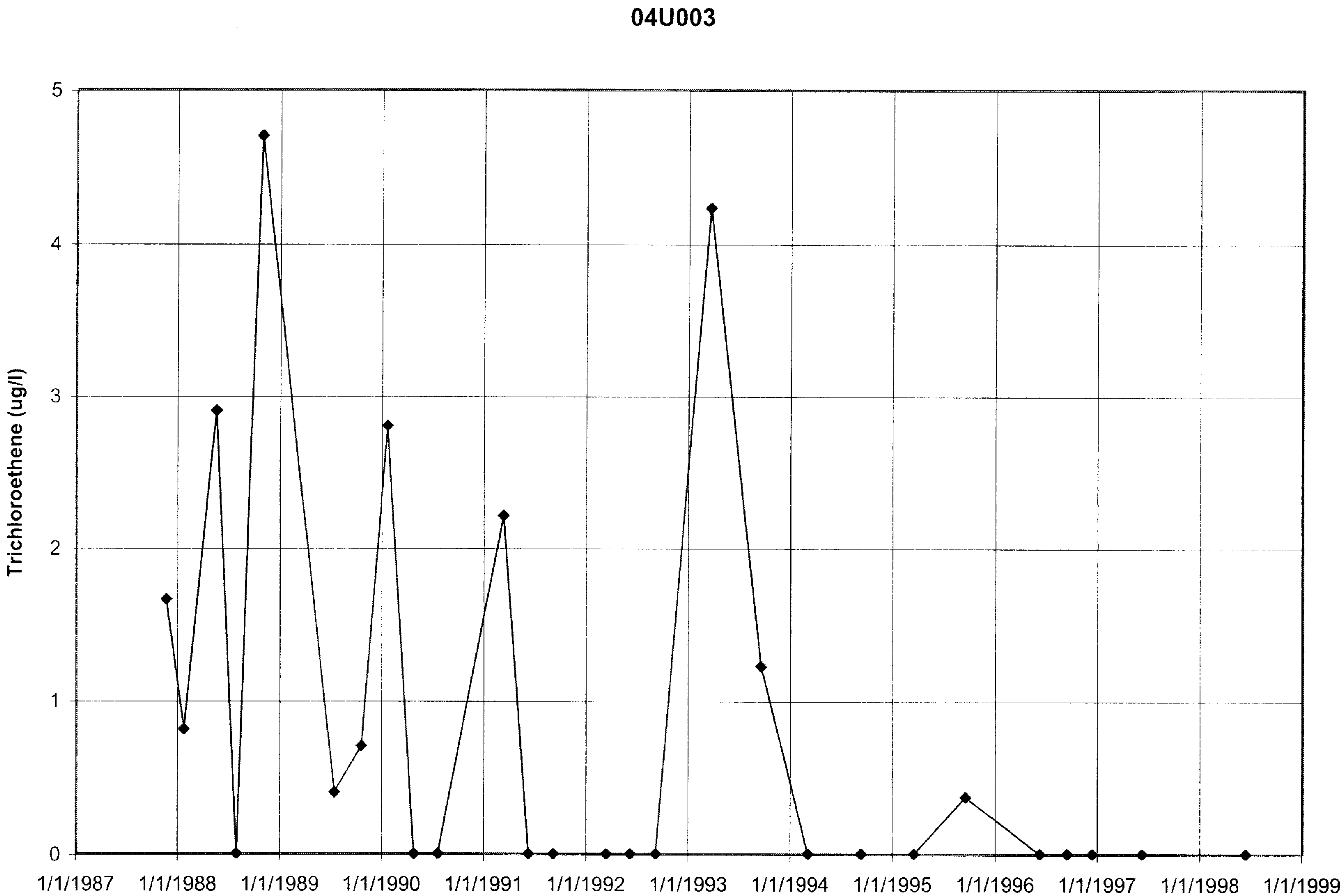

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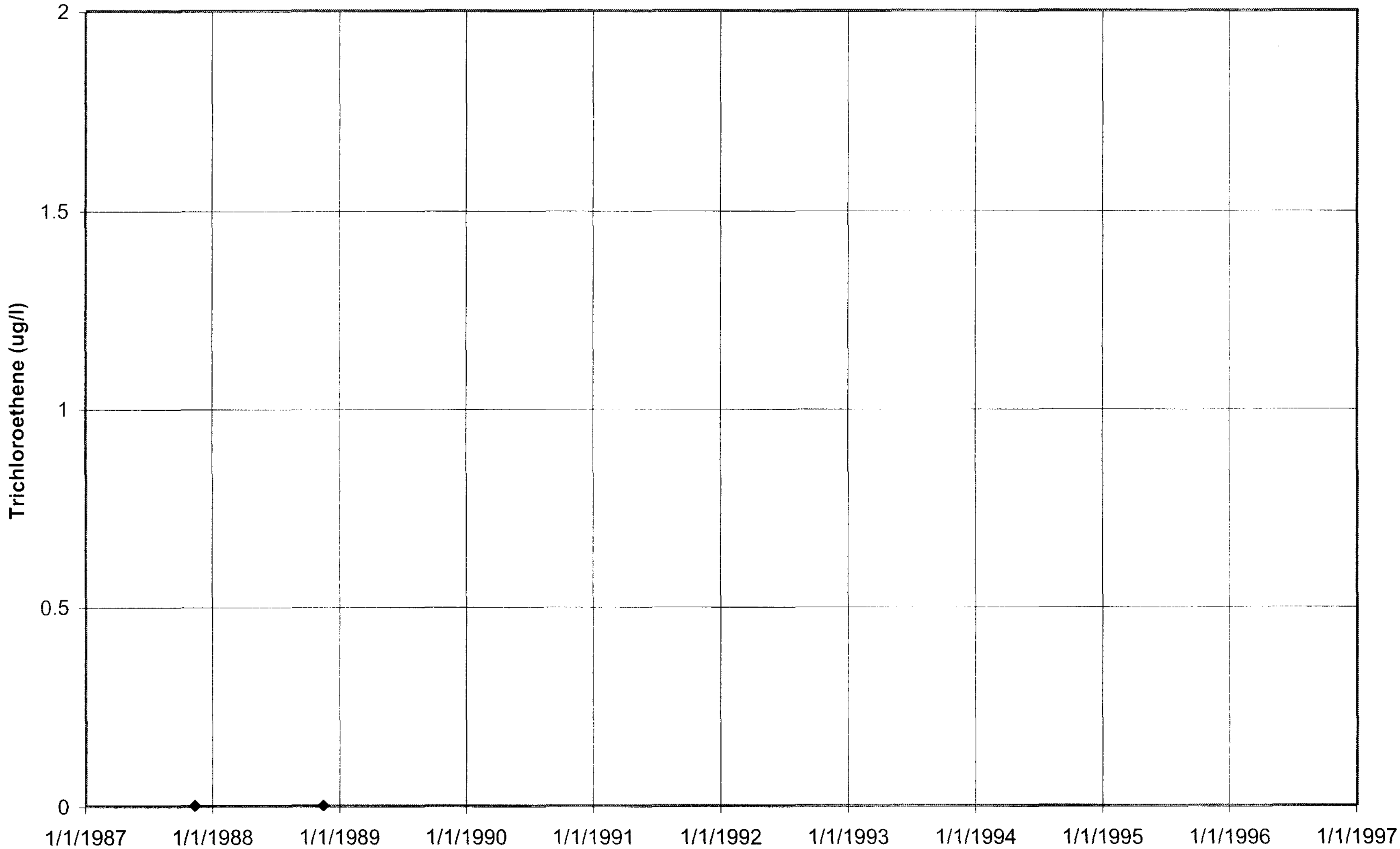

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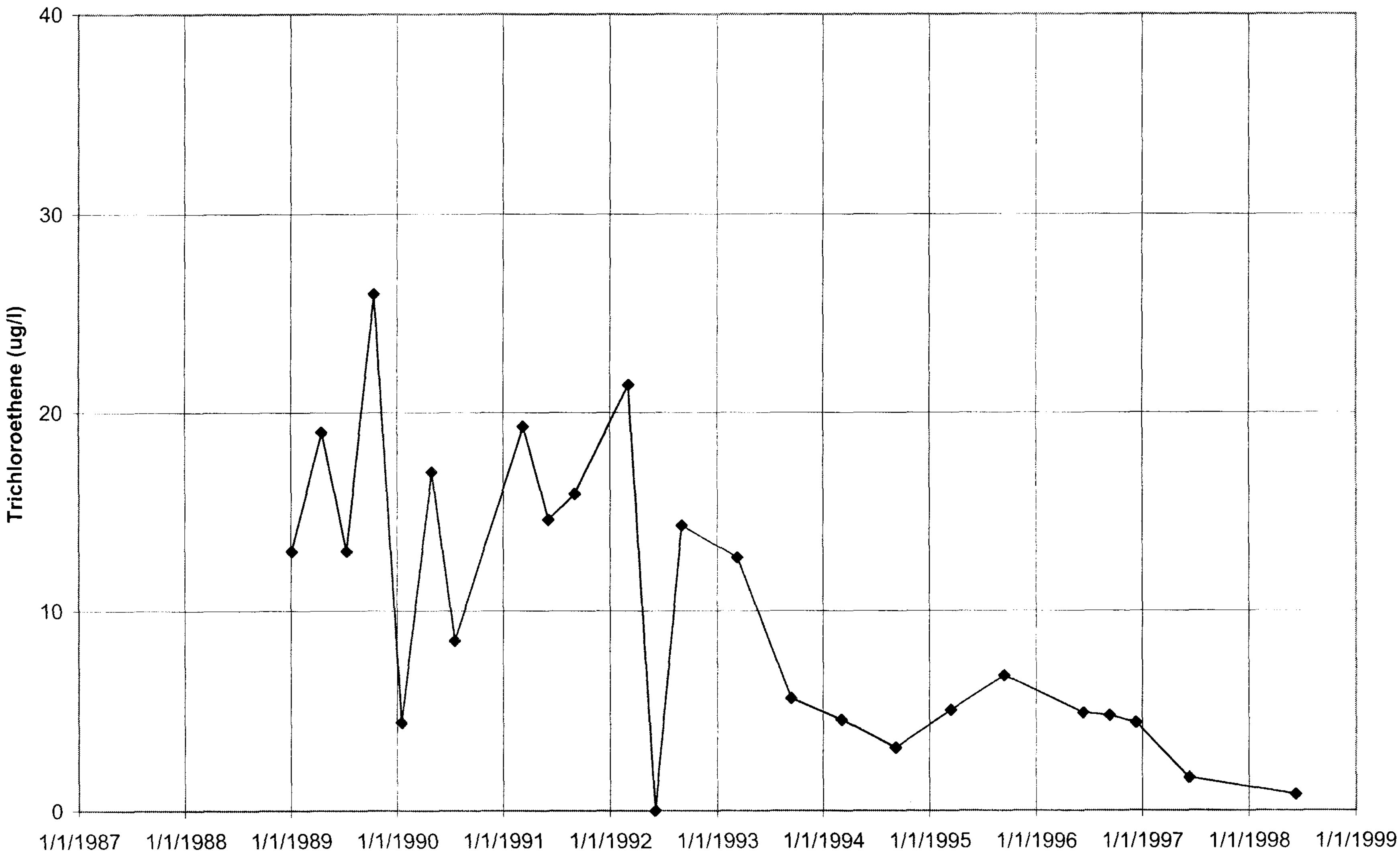

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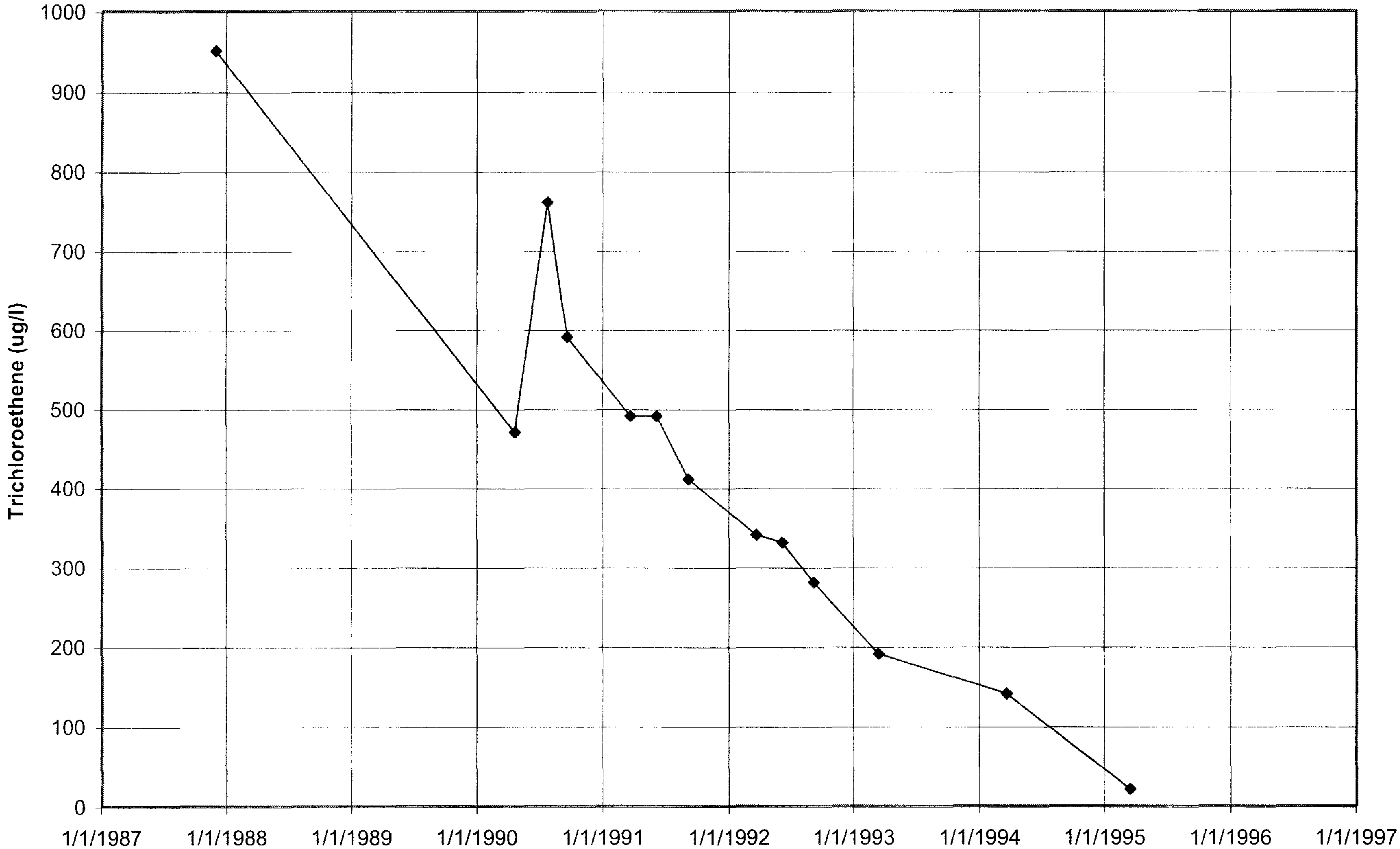

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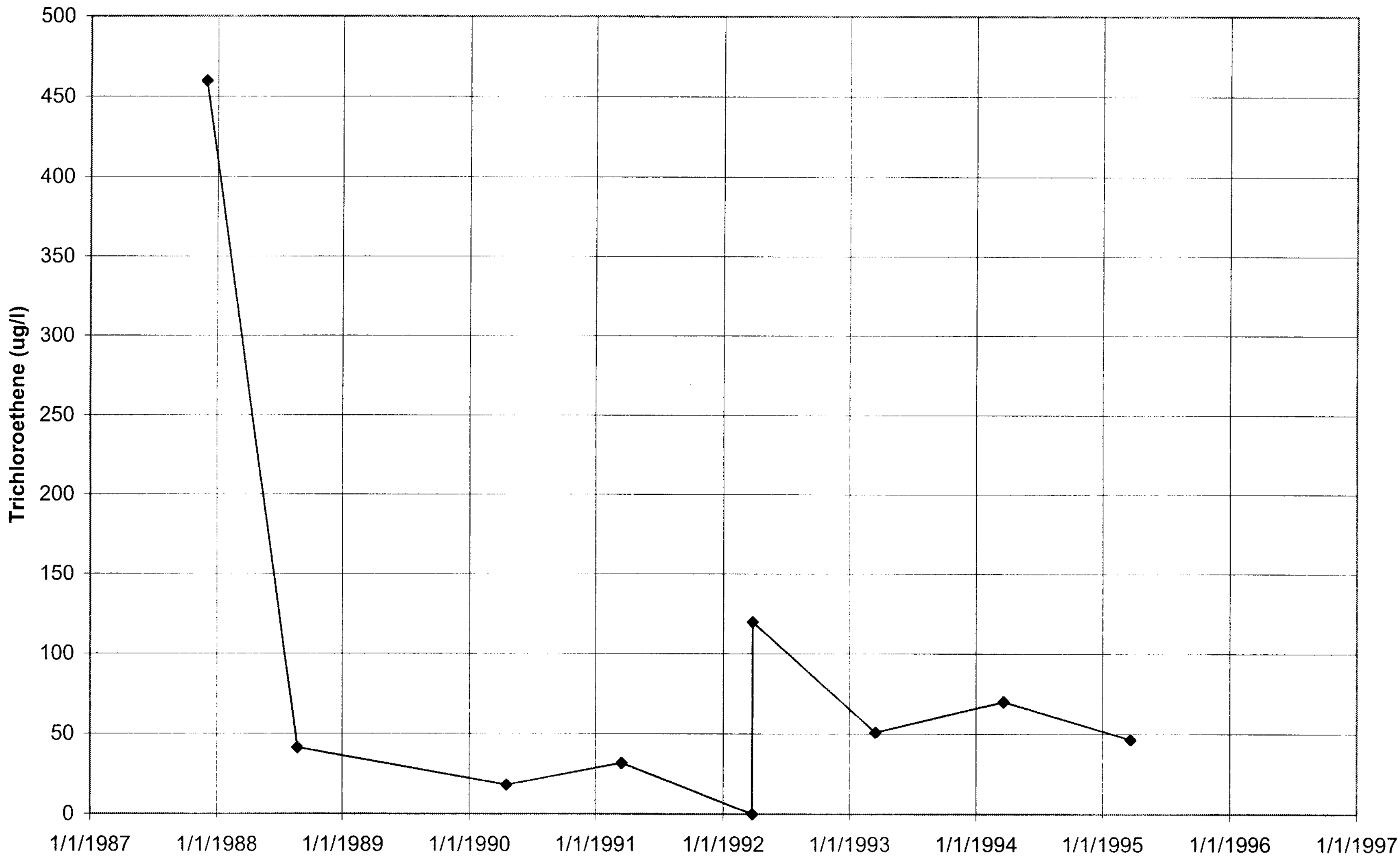

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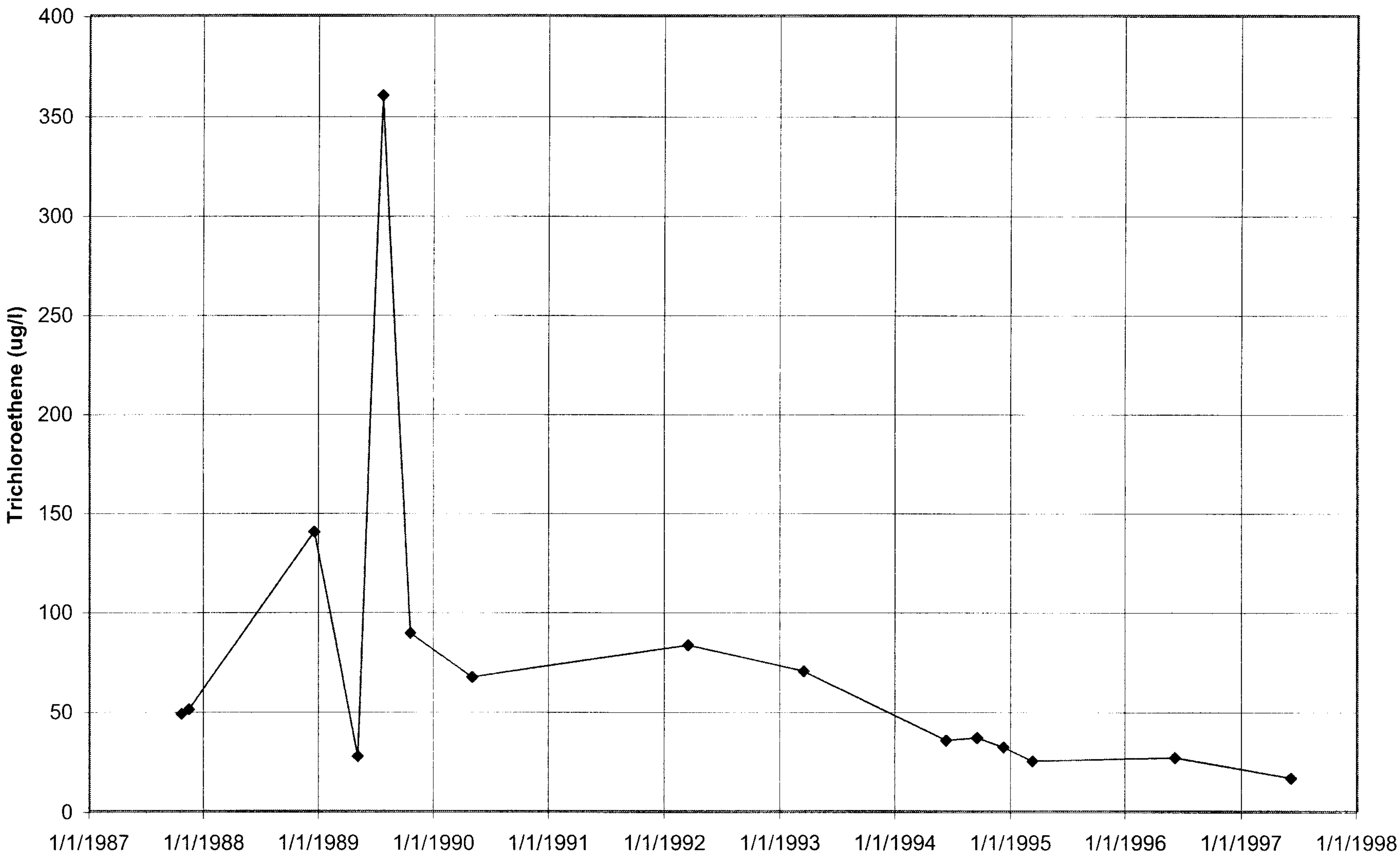

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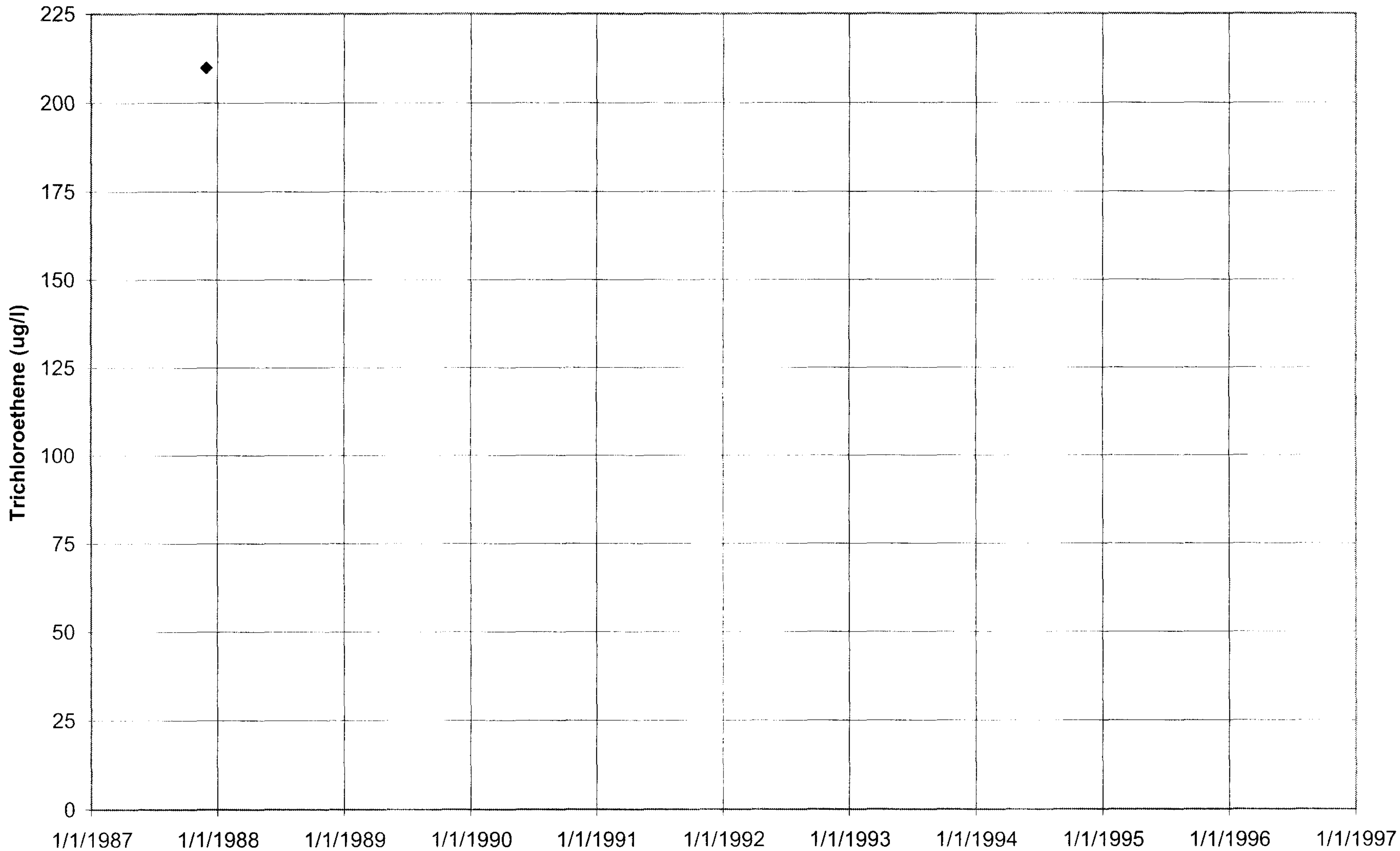

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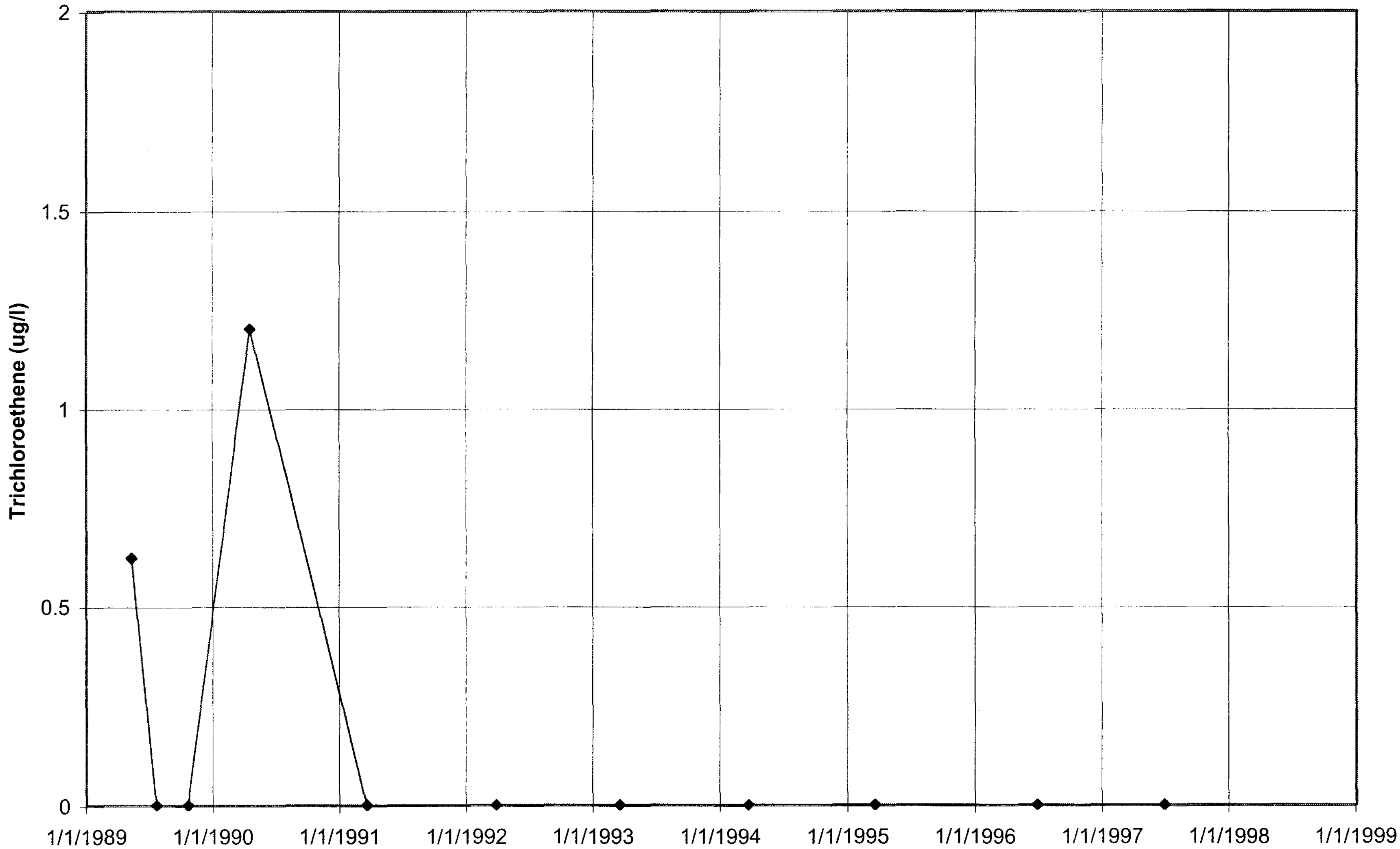

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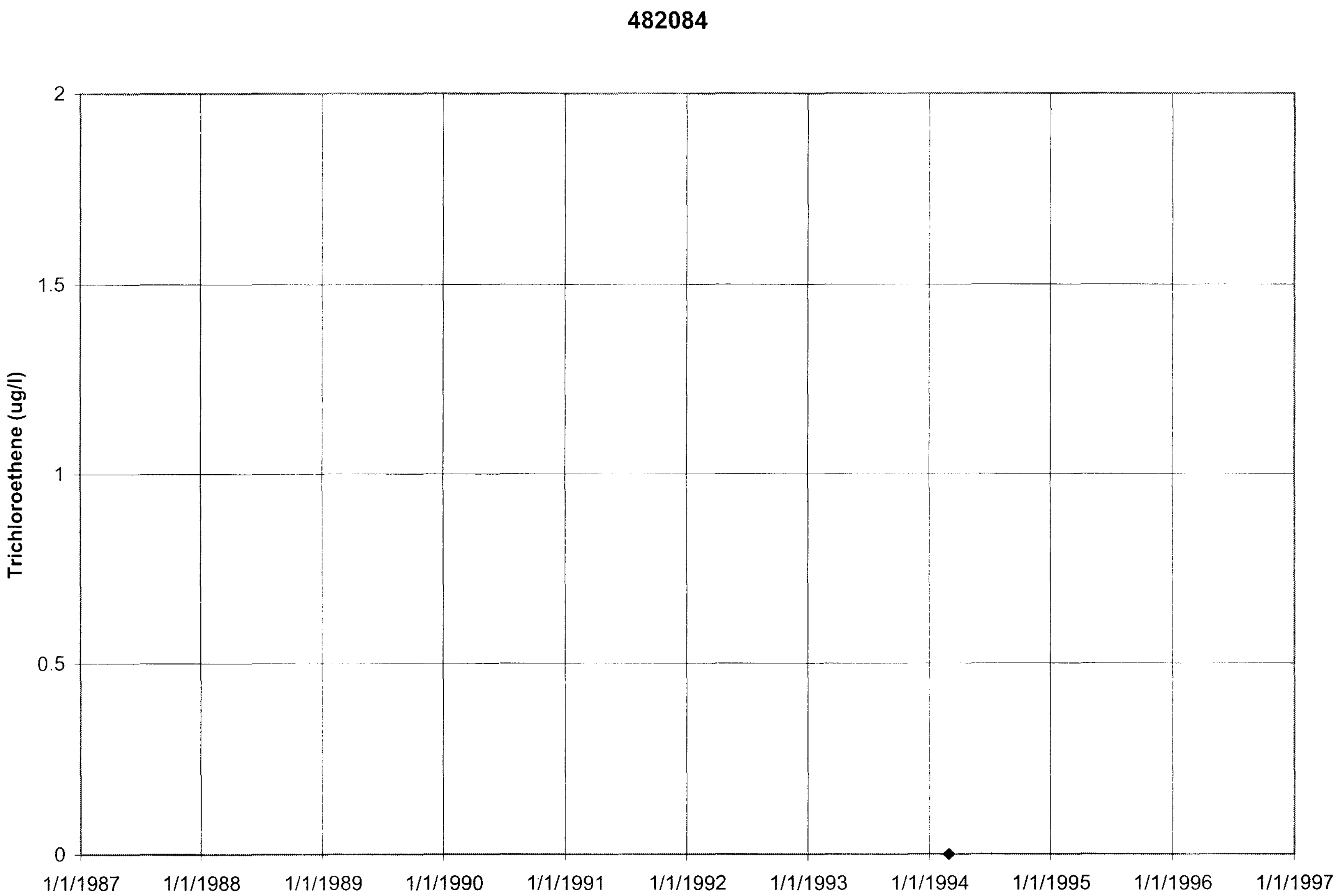

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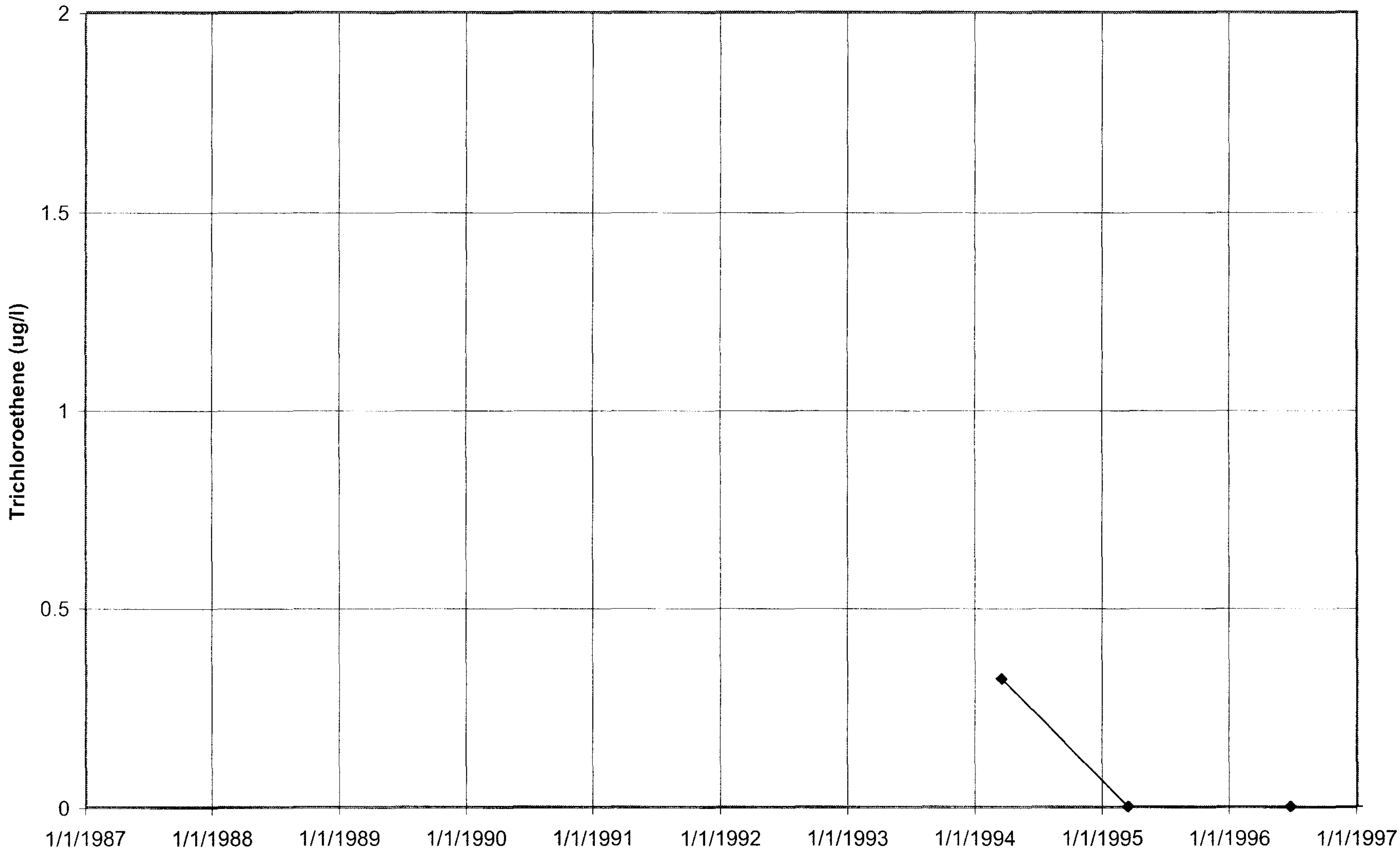

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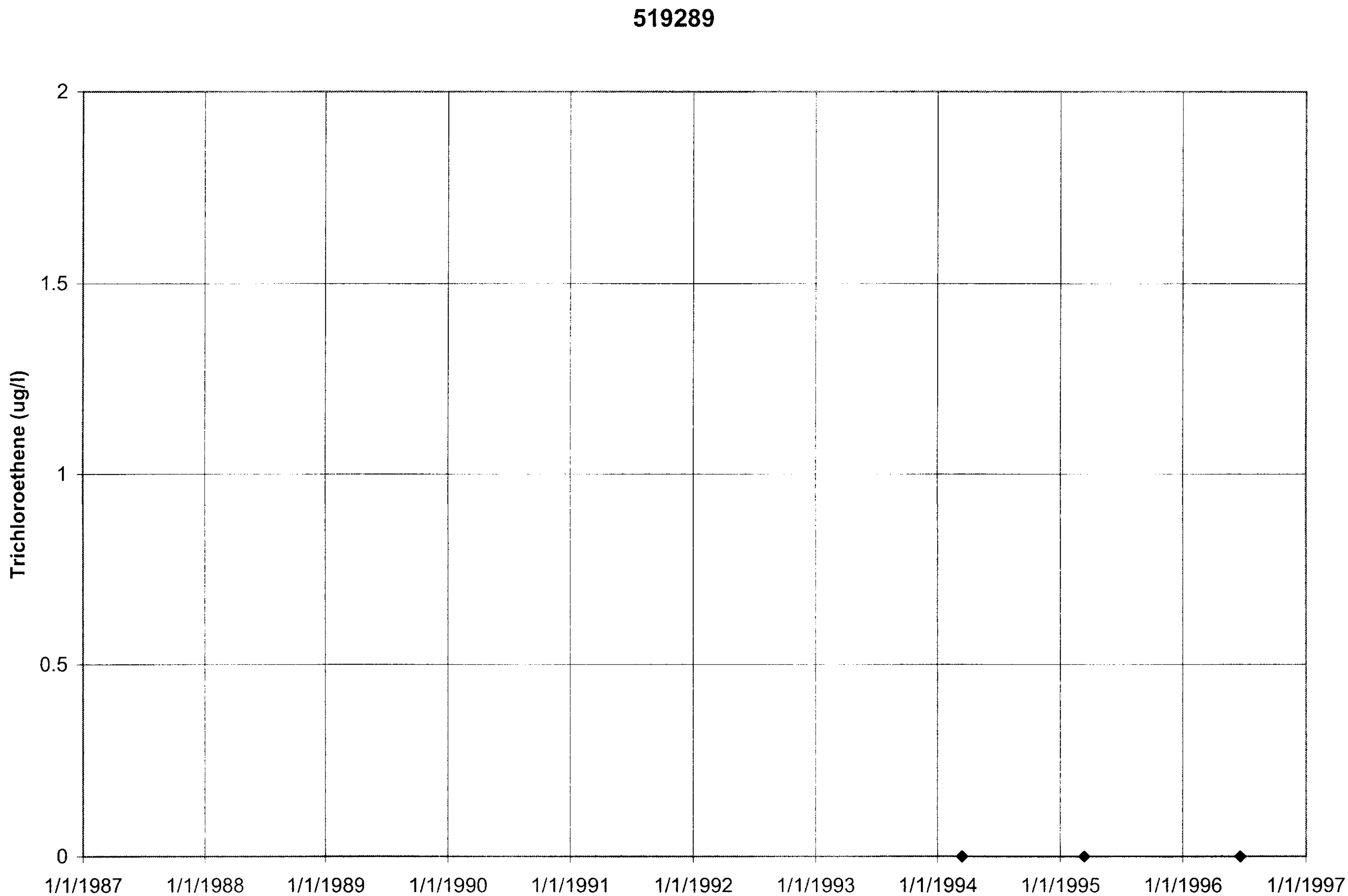

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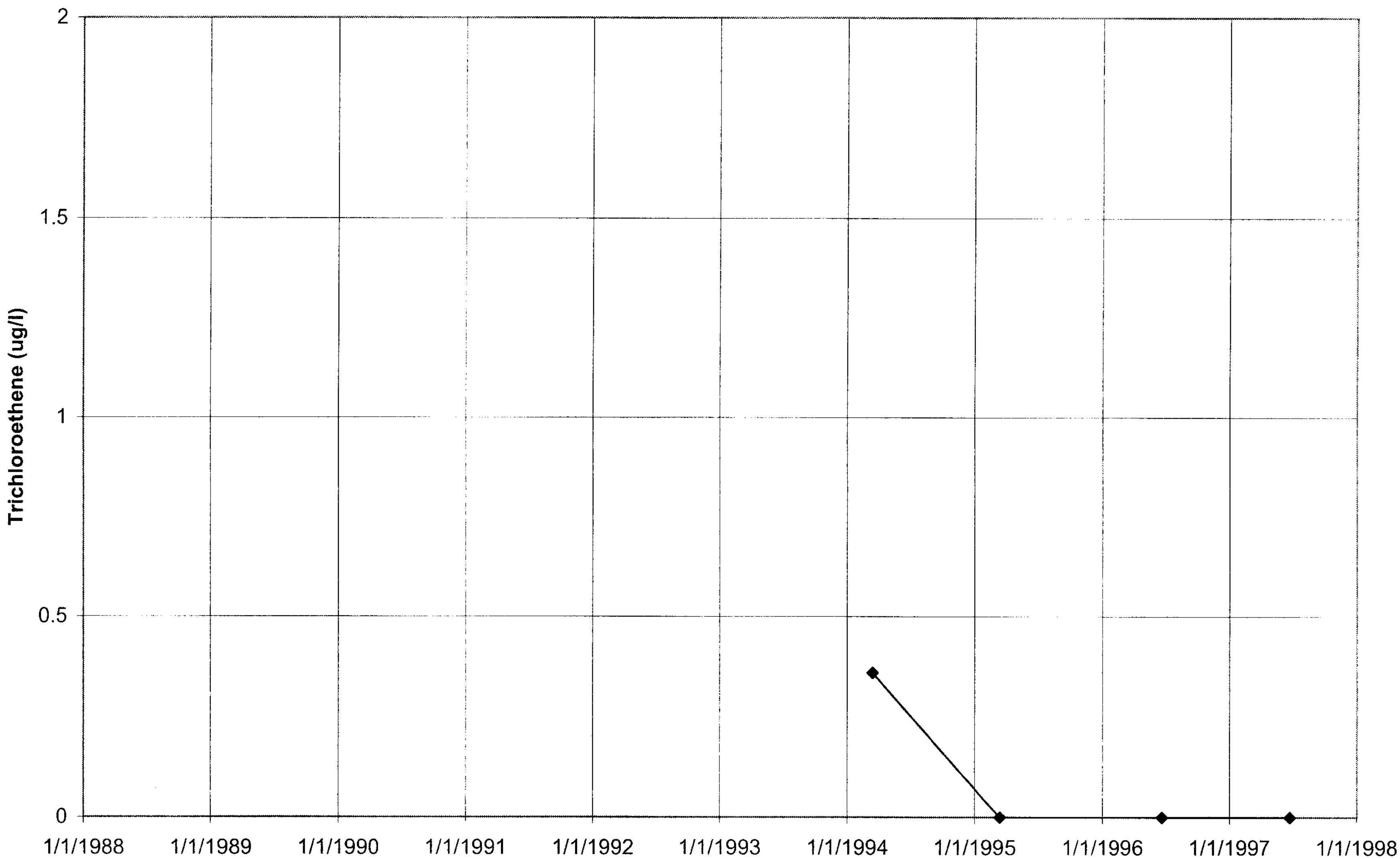

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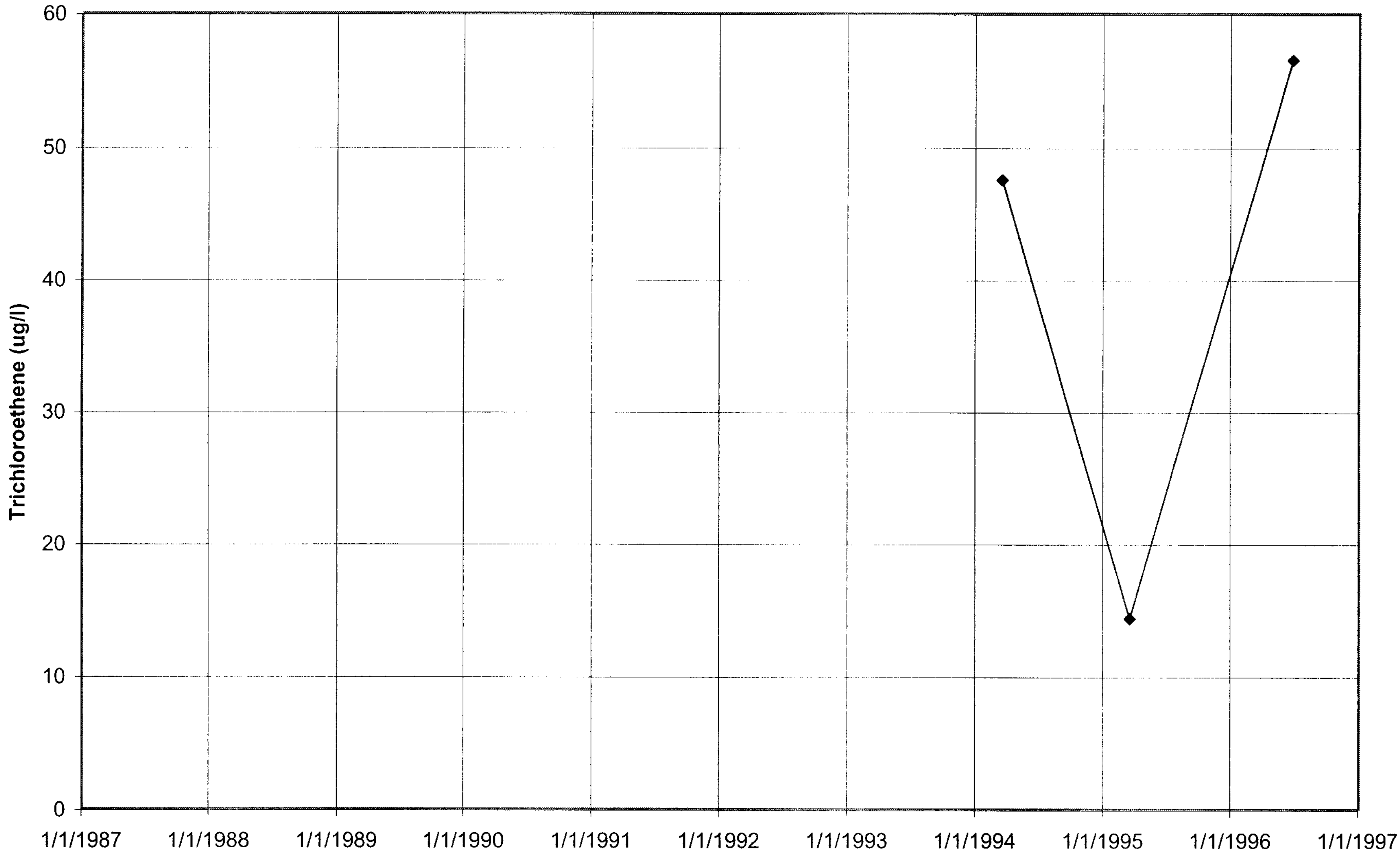

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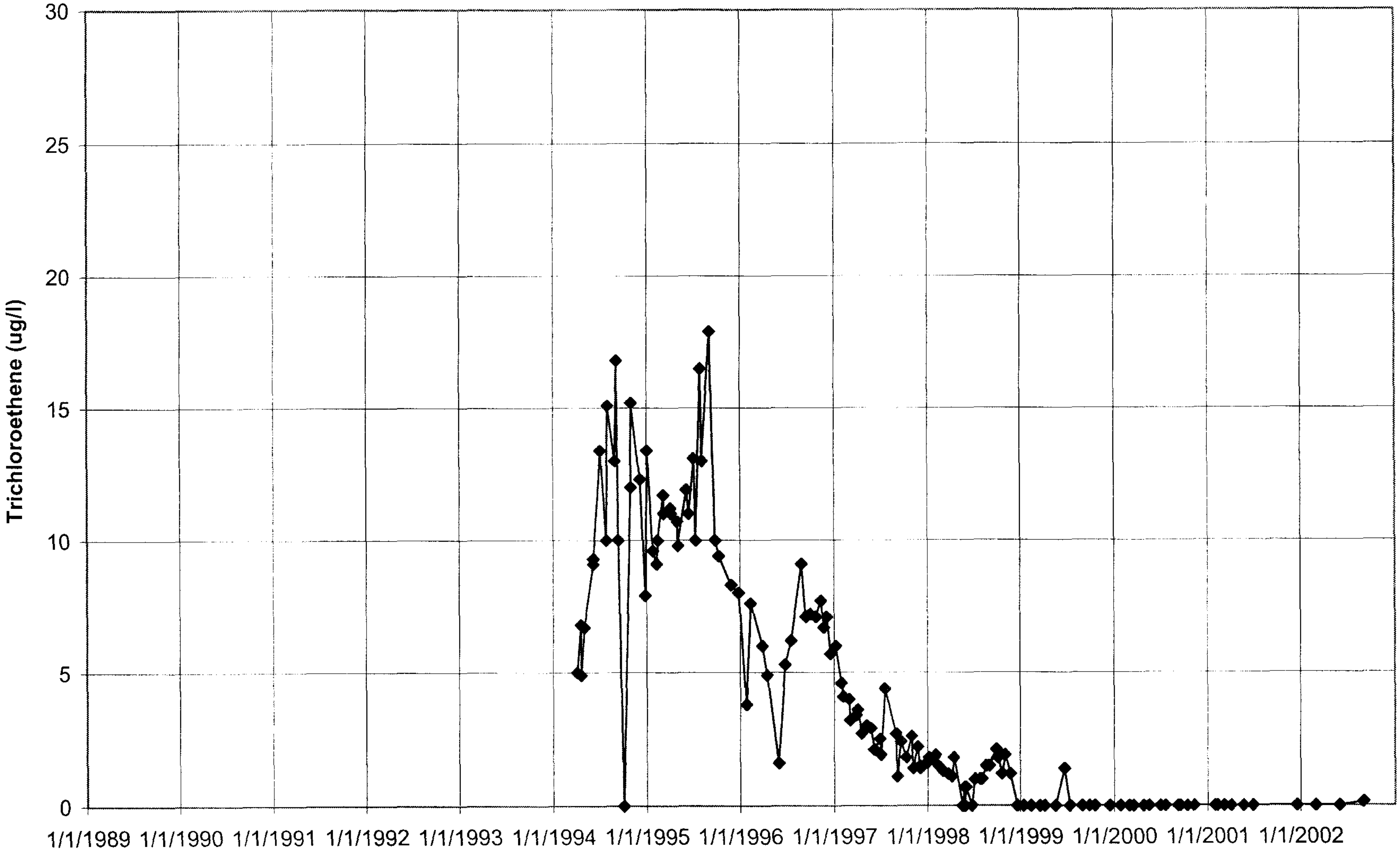

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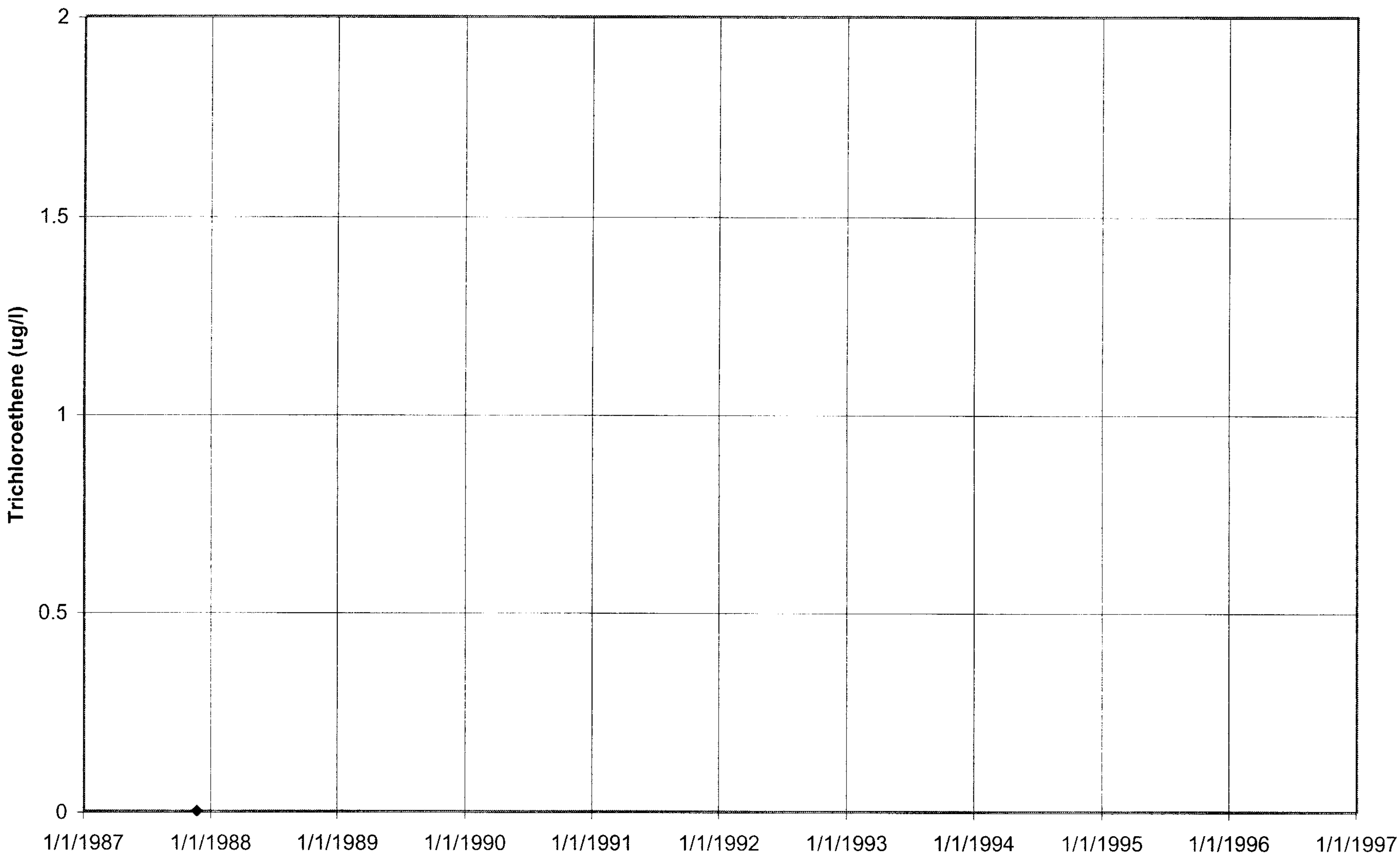

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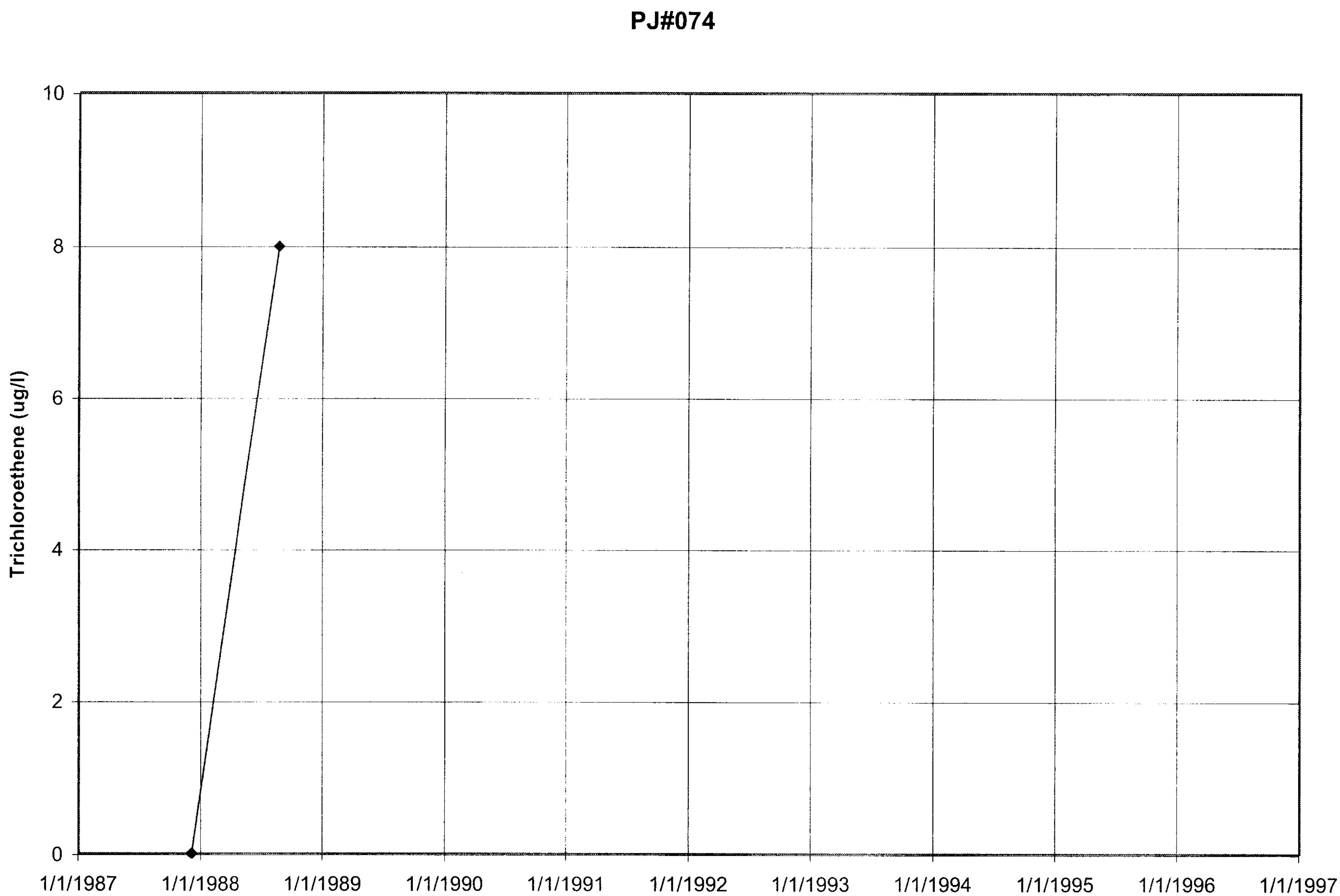

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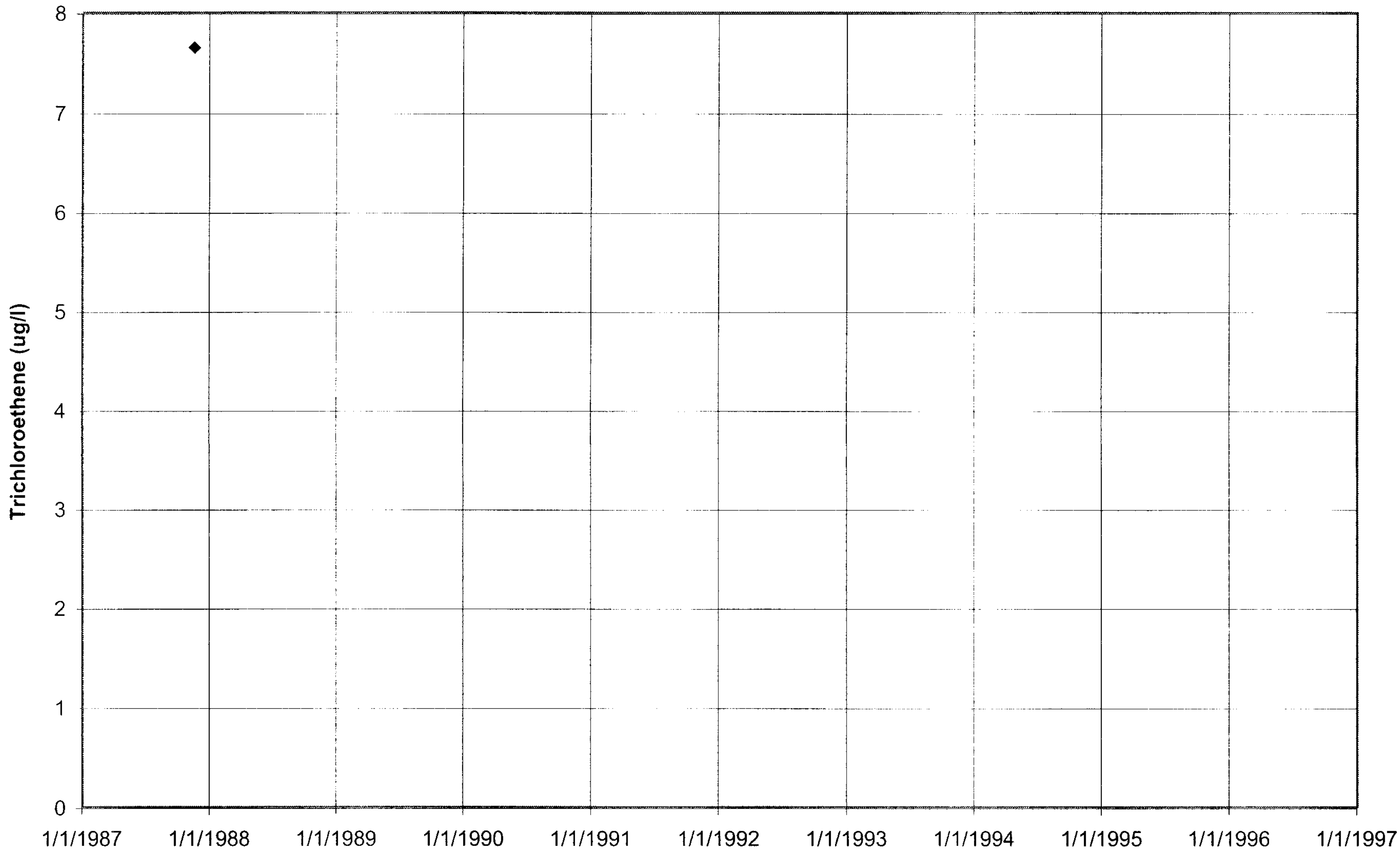
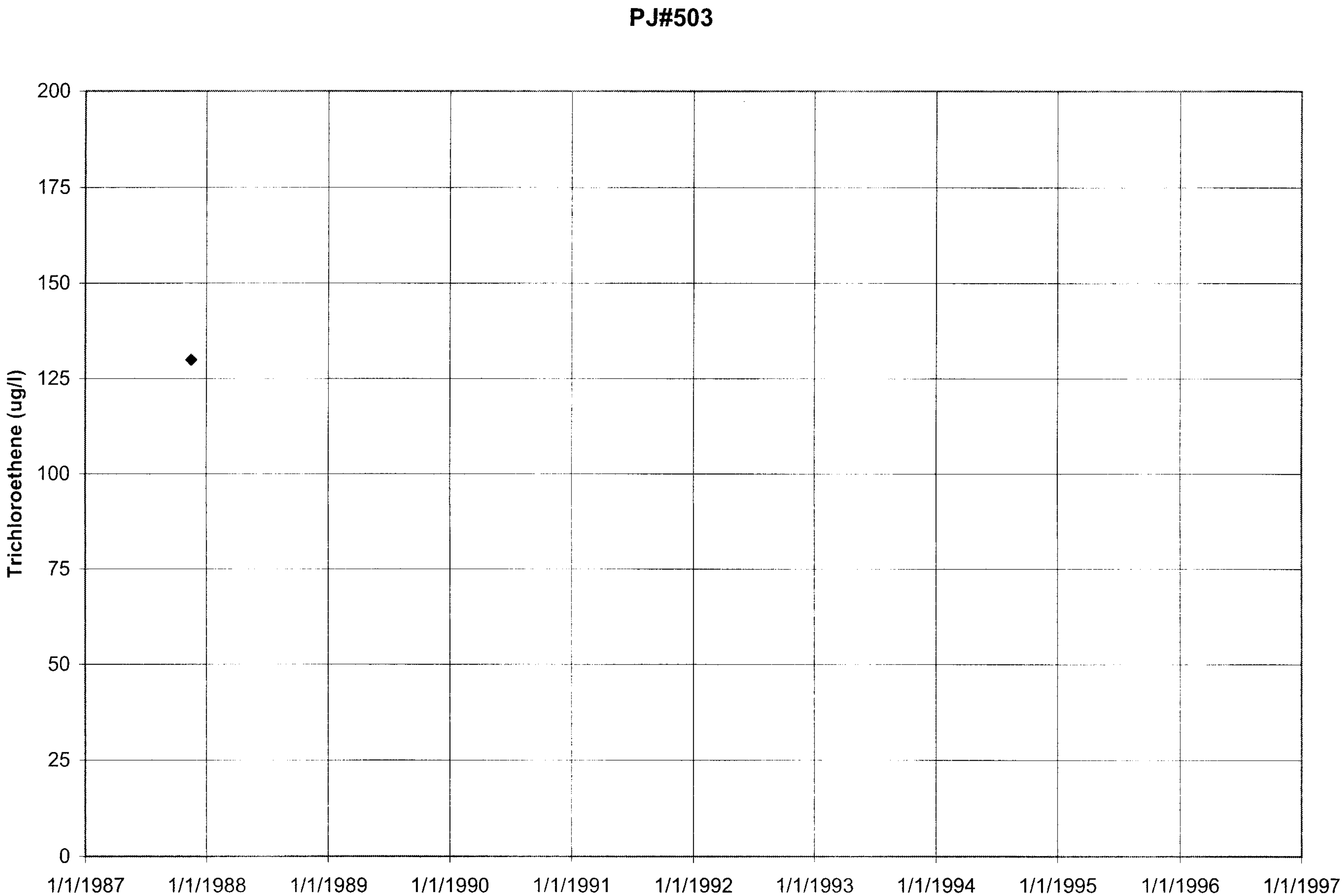
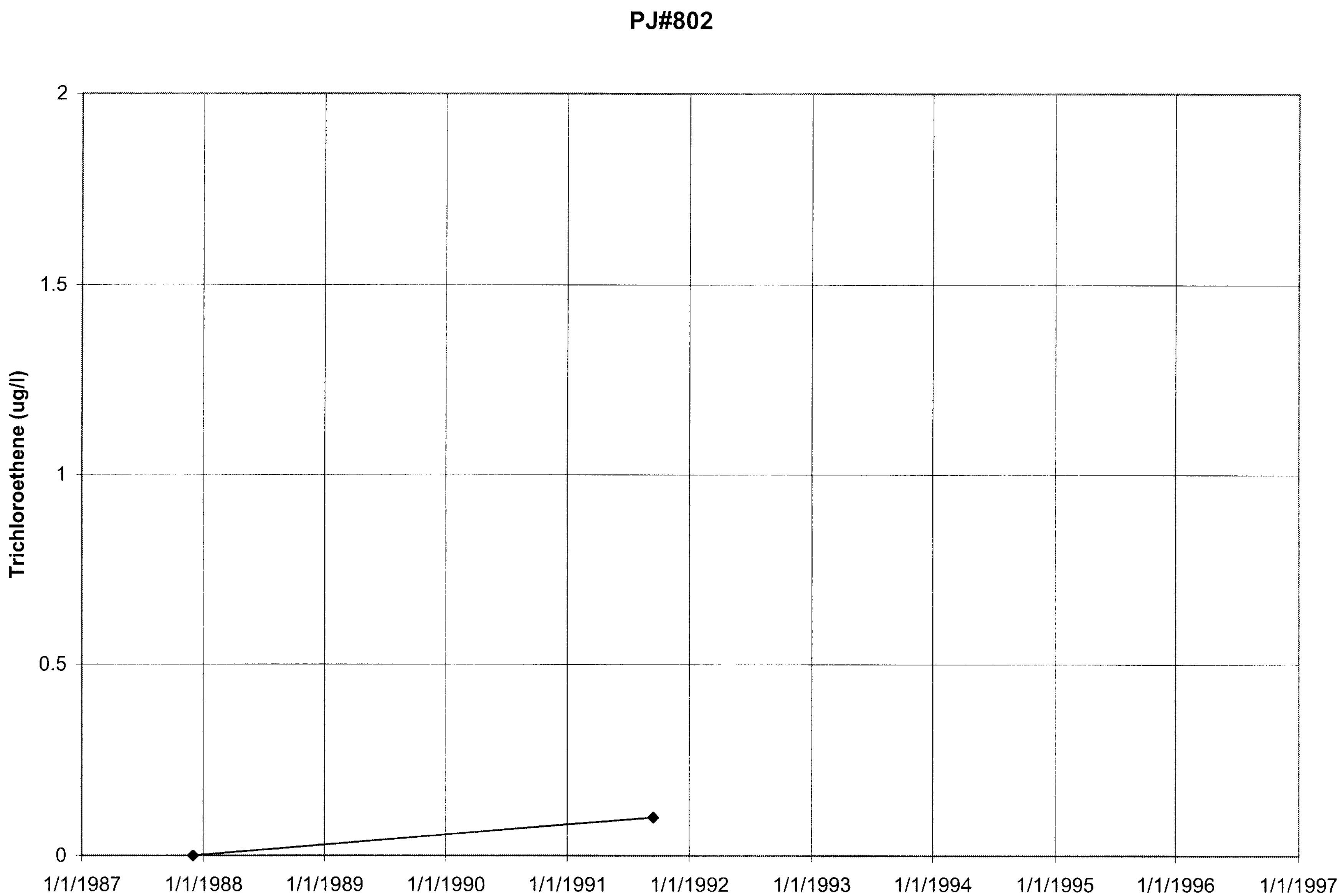
PJ#502



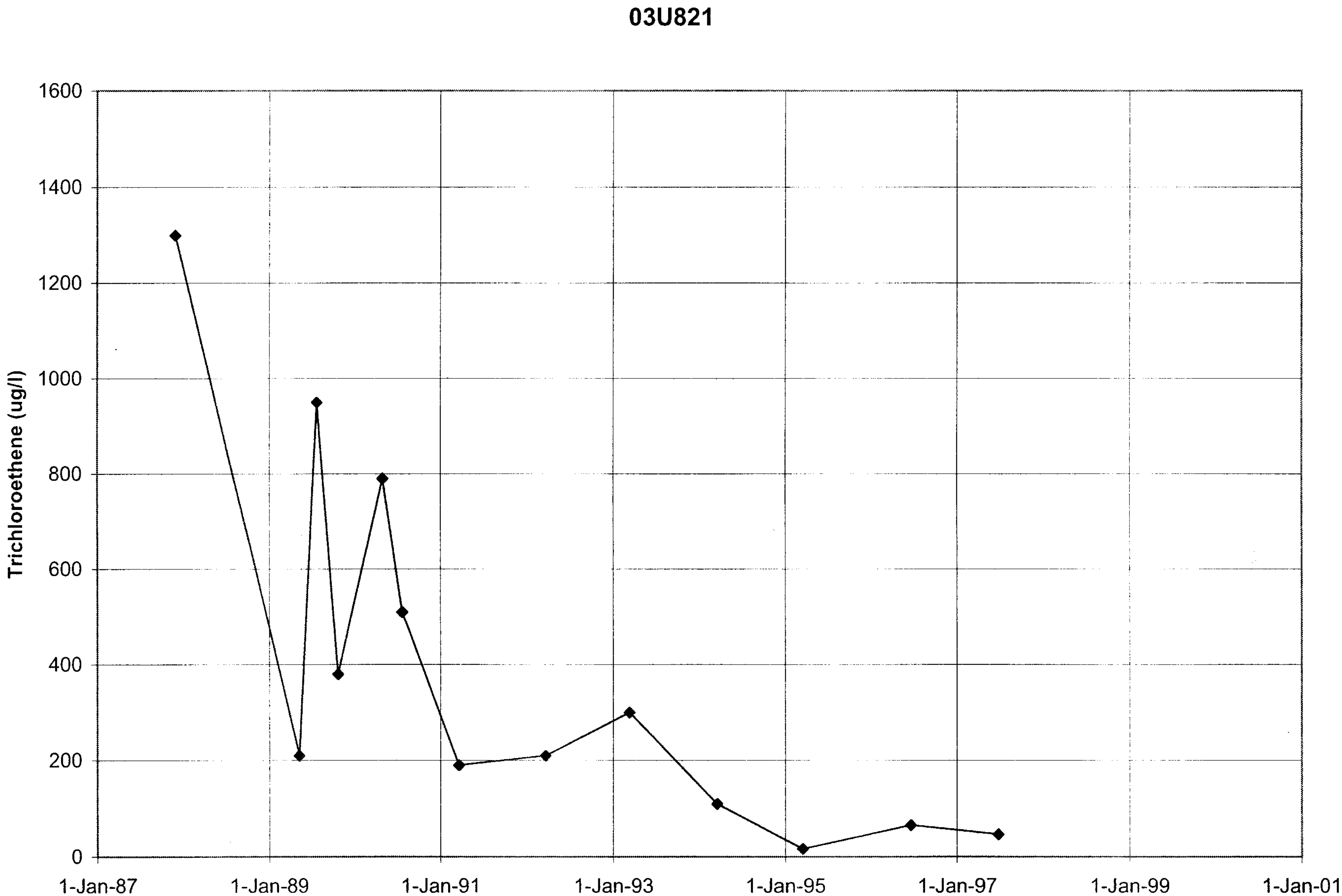
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

Well 01U098 is Sealed

Well 01U109 is Sealed

Well 03U006 is Sealed

APPENDIX C-1

DATA COLLECTION, MANAGEMENT, AND PRESENTATION

1.0 INTRODUCTION

A groundwater monitoring program was initiated in January 1984 to obtain water level and water quality data at TCAAP. Each year has been divided into quarters with each quarter assigned a number. Accordingly, FY 2002 was comprised of Quarter 73 (October through December), Quarter 74 (January through March), Quarter 75 (April through June), and Quarter 76 (July through September). Water sampling and water level measurements were conducted in accordance with the TCAAP "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996).

Prior to November 1, 2001, data collected at TCAAP was stored in the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS). The IRDMIS was managed by Potomac Research, Inc. (PRI) on behalf of the USAEC. The IRDMIS System was then replaced by the Environmental Restoration Information System (ERIS).

2.0 GROUNDWATER LEVELS AND GROUNDWATER QUALITY

2.1 Data Collection and Management

Groundwater level and groundwater quality data were collected in accordance with the FY 2002 Annual Monitoring Plan (Appendix A), which established the monitoring responsibilities for both:

- The Army
- Alliant Techsystems Inc. (tenant and responsible party)

Water level monitoring and groundwater sampling were conducted by TWISS for the Army and by SECOR and CRA for Alliant. Laboratory analysis was performed by DataChem Laboratories for all samples.

Appendix A.4 contains analyte lists that are referenced by the monitoring plans in Appendix A. The lists are site-specific, based on the chemicals of concern. Halogenated volatile organic compounds were the parameters of primary interest, while select wells were sampled for aromatic volatile organic compounds and antimony. Appendix C.2 presents clarifications and deviations from the FY 2002 Annual Monitoring Plan.

Data assessment and validation was conducted in accordance with procedures and requirements outlined in the TCAAP QAPP. Flagging codes and data qualifiers assigned to data through data assessment/validation appear in the data tables within each report section (see table footnotes for definitions) and also in the historical databases. Data assessment and validation information was submitted to the MCPA and USEPA for review. Regulatory approvals for these submittals are included in Appendix C.3.

For water level measurements, the depth to water from the surveyed top of the well casing was measured. Groundwater elevations were calculated and maintained in Installation databases. The water level database capability of ERIS was under review at the time of this report.

2.2 Groundwater Elevation Contour Maps

Using June 2002 data (Quarter 75), groundwater elevation contour maps were prepared for Sites A and K shallow groundwater. These maps are presented as figures that follow the text for these sections. No OU1/OU3 or OU2 deep groundwater data was mapped since FY 2002 was an "off year" in the biennial monitoring program.

2.3 Groundwater Quality Contour Maps and Cross-Sections

The most extensive sampling event performed during FY 2002 was in June (Quarter 75). This data was used to prepare groundwater quality contour maps and/or cross-sections for Sites A and K shallow groundwater. Contour maps were generated by hand, based on the observed contaminant concentrations and the extent of past site contamination. Again, no OU1/OU3 or OU2 deep groundwater data was mapped since FY 2002 was an "off year" in the biennial monitoring program.

For Site A, isoconcentration contour maps were developed for cis-1,2-dichloroethene (as this is the most widespread contaminant at Site A) and tetrachloroethene (which illustrates the source area). Site A cross-sections were also prepared which illustrate cis-1,2-dichloroethene. Contour maps for Site A were prepared only for Unit 1, since this is the only contaminated aquifer.

For Site K, isoconcentration contour maps were developed for trichloroethene (the primary contaminant). Contour maps for Site K were prepared only for Unit 1, since this is the only contaminated aquifer.

Contaminant concentrations at recovery wells are shown in parentheses on the maps. These values were considered, but were not used alone to prepare the isoconcentration contours. Concentrations of recovery wells generally represent an average contaminant value for all groundwater being drawn to the well; hence, the concentrations do not necessarily represent a discrete location or depth.

APPENDIX C.2

DEVIATIONS FROM MONITORING PROGRAM

Fiscal Year 2002

OU1 Site I

June 2002

Monitoring wells I01MW, I02MW and 01U639 were dry and samples were not collected.

Monitoring wells 01U640 bailed dry after removing one well volume and one set of field parameters was collected.

OU1 Site K

April 2002

The treatment system influent and effluent sample collected. This sample is in addition to the required quarterly sampling.

June 2002

Wells 01U603, 01U604, 01U617, 01U618, and 03U621 bailed or pumped dry during purging so incomplete field parameters were collected.

Well K04MW bailed dry during purging. Three sets of field parameters were collected.

OU3 PGRS

March 2002, June 2002 and September 2002

Additional location, 04U863 was sampled.

Surface Water

June 2002

Phosphorus data for both sampling locations (20700 and 20800) were rejected due to low matrix spike recovery. The Army elected not to resample for phosphorus (surface water monitoring was conducted voluntarily by the Army). The MPCA and USEPA were notified of the decision not to resample.

APPENDIX C.3

Regulatory Approvals for Data Assessments and Validation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

January 13, 2003

REPLY TO THE ATTENTION OF:
SRF-5J

Mr. Michael R. Fix
Commander's Representative
Twin Cities Army Ammunition Plant
4700 Highway 10 - Suite A
Arden Hills MN 55112-3928

Subject: **Approval of Data Usability Report Numbers 15 and 18**

Ref.: **Data Usability Report, Report Number 15, TCAAP FY 2002 Performance Monitoring Program Data Usability Reports for October - December 2001, Tecumseh/Wenck Installation Support Services, March 5, 2002;**

EPA comments for Data Usability Report Number 15 dated April 15, 2002;

MPCA comments for Data Usability Report Number 15 dated April 24, 2002;

Verbal discussion but written responses to comments (RTCs) not required.

EPA approval of DUR as is on September 25, 2002 and by MPCA on October 30, 2002.

Data Usability Report, Report Number 18, TCAAP FY 2002 Performance Monitoring Program Data Usability Reports for January - March 2002, Tecumseh/Wenck Installation Support Services, June 4, 2002;

EPA comments for Data Usability Report Number 18 dated October 2, 2002;

MPCA comments for Data Usability Report Number 18 dated July 1, 2002;

Response to USEPA Comments on Data Usability Report #18, TCAAP, dated June 4, 2002 (October 24, 2002);

RTCs approved by EPA on December 6, 2002 and DUR approved as is by MPCA on July 22, 2002;

TCAAP DUR #18, Final Report, Tecumseh/Wenck Installation Support Services, December 27, 2002.

Dear Mr. Fix:

The U.S. Environmental Protection Agency (U.S. EPA) and the Minnesota Pollution Control Agency (MPCA) have completed their review of Data Usability Report (DUR) Numbers 15 and 18. Based upon the information provided in the referenced documents, and upon technical conversations held among EPA, MPCA and Army contractor staff, the U.S. EPA and the MPCA agree that the subject DURs are acceptable.

You are hereby advised that the U.S. EPA and the MPCA approve Data Usability Report Numbers 15 and 18.

If you have any questions, please contact Tom Barounis of the EPA at (312) 353-5577 or Dagmar Romano of the MPCA at (651) 296-7776.

Sincerely,

Tom Barounis

Tom Barounis
Remedial Project Manager
U.S. Environmental Protection Agency
Region 5

Tom Barounis for

Dagmar Romano
Project Manager
Superfund/RCRA
Majors and Remediation Division
Minnesota Pollution Control Agency

Minnesota Pollution Control Agency

May 5, 2003

Mr. Michael R. Fix
Remedial Project Manager
Twin Cities Army Ammunition Plant
4700 Highway 10 - Suite A
Arden Hills, MN 55112 - 3928

Subject: Approval of Data Usability Report Number 22 and 25

Ref: **Data Usability Report, Report Number 22, Twin Cities Army Ammunition Plant, Tecumseh/Wenck Installation Support Services, April 15, 2003**

MPCA comments for Data Usability Report Number 22 dated November 7, 2002;

EPA comments for Data Usability Report Number 22 dated November 13, 2002;

Response to comments on Data Usability Report Number 22 dated February 7, 2003;

MPCA comment on responses to comments for Data Usability Report Number 22 dated February 11, 2003;

Army responses to response dated February 12, 2003;

MPCA responses dated February 12, 2003;

Data Usability Report, Report Number 25, TCAAP FY 2002 Performance Monitoring Program, 4th Quarter Monitoring (July – September 2002)

MPCA comments for Data Usability Report Number 25 dated December 18, 2002;

EPA comments for Data Usability Report Number 25 dated January 30, 2003;

Response to comments on Data Usability Report 25, TCAAP dated February 21, 2003;

Dear Mr. Fix:

The Minnesota Pollution Control Agency (MPCA) staff and the U.S. Environmental Protection Agency (U.S. EPA) have completed their review of Data Usability Report (DUR) Numbers 22 and 25. Based upon the information provided in the referenced documents, and upon technical conversations conducted among U.S. EPA, MPCA and the Army contractor staff, MPCA staff and the U.S. EPA agree that the subject DURs are acceptable.

You are hereby advised that MPCA staff and the U.S. EPA approve Data Usability Report Numbers 22 and 25.

If you have any questions, please feel free to contact Dagmar Romano at (651) 296-7776 or Tom Barounis at (312) 353-5577.

Sincerely,

Dagmar Romano

Dagmar Romano
Superfund Unit 2
Superfund Section
Majors and Remediation Division

Dagmar Romano
for Tom Barounis
U.S. EPA

DR/TB:csa

APPENDIX D

Comprehensive Groundwater Quality and Groundwater Level Databases

The historical groundwater tables are located on this CD in a directory named Appendix D. This directory contains three Microsoft Excel files: Compelev.xls, Comporwq.xls, and Compinwq.xls. These contain historic groundwater elevations, historic groundwater organic water quality, and historic groundwater inorganic water quality, respectively.

APPENDIX E

TCAAP WELL INVENTORY UPDATE

FISCAL YEAR 2002

Purpose

The purpose of well inventory is to identify wells that have been impacted by contaminants from TCAAP or that could potentially be impacted by TCAAP contaminants.

Background

Developing and maintaining the well inventory is a process that was initiated in 1991, with the work efforts documented in several update reports since that time. Beginning in FY 1999, the update reporting was incorporated into the Annual Performance Reports.

The well inventory "study area," as defined by the Minnesota Pollution Control Agency, is shown on Figure E-1, and coincides with the Minnesota Department of Health (MDH) Special Well Construction Area.

The aquifers of concern are defined by the 1 µg/l trichloroethene contour for the Unit 3 and Unit 4 aquifers, and the 1 µg/l cis-1,2-dichloroethene contour for the Unit 1 aquifer north of TCAAP.

The "area of concern" for the Unit 3 and Unit 4 aquifers is created by adding a quarter mile buffer area outside the 1 µg/l trichloroethene contour. The area of concern for the Unit 3 and Unit 4 aquifers is shown on Figure E-2.

The area of concern for the Unit 1 aquifer north of TCAAP is delineated by city streets. Figure E-3 presents the area of concern for the Unit 1 aquifer.

Wells within the study area are categorized based on location, depth, and use. Well categories for the well inventory are described in Table E-1.

Program Requirements

The well inventory program requirements have evolved over time, with changes documented through the update reports. A flowchart which describes the annual requirements for maintaining the TCAAP well inventory database is shown on Figure E-4. Requirements are summarized below.

At the beginning of each federal fiscal year, an updated version of the MDH database of wells in the study area is acquired. The MDH database consists of three lists:

1. Wells constructed since 1990 (generated through drillers submitting Water Well Records);
2. Sealed wells (generated through drillers submitting Well Sealing Records); and
3. Wells disclosed through property transfer.

Since the MDH database is comprehensive for all time, the database is screened to extract the new information that was added since the previous update.

With the new MDH information, the TCAAP well inventory database is updated by recategorizing wells, as necessary, and by adding any new wells that are within the study area. Any new wells found in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a are targeted for sampling in that fiscal year; however, an attempt to reclassify any new category 4a wells will be made prior to sampling. Wells that are not sampled due to non-responsive well owners are targeted for sampling in the next major sampling event.

Category 4 wells are those with an unknown depth or unknown location, or both. Ideally, there should be no wells in Category 4. Each year, an attempt is made to reclassify Category 4 wells into one of the other categories. This is accomplished through phone calls, letters, and/or site visits in an attempt to obtain additional information. Any wells which are re-classified as Category 1a, 1b, 1c, 2a, 2b, or 2c are targeted for sampling in that fiscal year.

"Major" well inventory sampling events occur every four years and are shown in Appendix A.1. The major sampling events are scheduled to coincide with the biennial sampling events for performance purposes as delineated in the APR (FY 2005 will be the next major well inventory sampling event). For each major event, all wells in Categories 1a, 1b, 1c, 2a, 2b, 2c, and 4a are targeted for sampling. After every sampling event, each well owner is mailed a copy of their testing results. Wells that are not sampled due to non-responsive well owners are targeted for sampling in the next major sampling event.

For each sampling event, if any well has a detection which exceeds the applicable TCAAP groundwater cleanup level for that contaminant (or an additivity of 1.0, similar to the MDH Hazard Index calculation), the well is evaluated using the flow chart presented in Figure E-4 to determine the timing of additional sampling. Wells that are used for drinking water are sampled again within one month of data validation. Wells that are not used for drinking water, but have possible contact exposure risks, are sampled the next fiscal year. If a cleanup level exceedance is confirmed (two consecutive events), and the contaminant concentrations in the well are proportional to contaminant concentrations of the TCAAP OU1 plume, the Army offers to abandon the well and/or provide an alternate water supply.

The annual reporting requirements for the TCAAP well inventory will include:

- A list of any wells found or reclassified.
- Analytical results and a summary of sampling efforts from that fiscal year.
- Recommendations for participation in the Well Abandonment/Alternate Water Supply Program.
- An updated well inventory database that lists wells by well category.
- An updated database listing water quality of wells.

FY 2002 Update

No new wells were found and no wells were reclassified. Since there were no changes to this database, an updated interactive well inventory database was not provided with the FY 2002 Annual Performance Report (refer to Appendix E2 of the FY 2001 Annual Performance Report for this information).

Only one well required sampling: Well #234352. This well, owned by Mr. Aaron Nutter, was sampled on July 25, 2002. The analytical results are summarized in Table E-2 and the well location is shown on Figure E-5. Well #234352 was previously sampled on September 27, 2000, and had a detection of 1,1-dichloroethene at 7.3 μg/l, exceeding the OU1 cleanup level of 6 μg/l. This well was being used for outside irrigation, and was not being used for drinking water since the residency is connected to the municipal water supply (Category 1b). The FY 2002 sampling provided the "next fiscal year" confirmation of results. Results for FY 2002 showed that all OU1 chemicals of concern were below their respective OU1 groundwater cleanup levels, including 1,1-dichloroethene, which was 5.4 ug/l (versus the cleanup level of 6 ug/l). However, an additivitity calculation similar to the MDH Hazard Index yielded a result of 1.4. Since this value was greater than 1.0, the results for this well were viewed as exceeding the OU1 cleanup levels. The FY 2002 result therefore confirmed the need for the Army to offer well abandonment to the well owner. The Army is pursuing abandonment of Well #234352. An offer for alternate water supply is not required since this residence is connected to the municipal water supply.

Recommendations

- The Army should implement well abandonment for Well #234352.
- Wells to be sampled in FY 2003 are:
  - Any previously undiscovered wells determined to be in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a based on the FY 2003 review of the MDH database.
  - Any Category 4 wells that are determined, from further investigation, to be in Category 1a, 1b, 1c, 2a, 2b, or 2c.
- The next "major" sampling event will be in FY 2005.

Table E-1
Well Inventory Category Descriptions

Category	*Subcategory*	*Explanation*
1		Water supply wells screened in an aquifer of concern, inside the 1 ug/l contour. Wells are divided into the following subcategories:
	1a	• Drinking water well
	1b	• Nondrinking but possible contact water
	1c	• Nondrinking, noncontact water
	1d	• Well is inoperable or has not been used for several years
	1e	• Well for which the owner has refused (or has been unresponsive to) an Army offer for abandonment, or for which the water use has been deemed acceptable
2		Water supply wells in an area of concern, inside the buffer lines, but outside the 1 ug/L contour, screened in an aquifer of concern. Wells are divided into the following subcategories:
	2a	• Drinking water well
	2b	• Nondrinking but possible contact water
	2c	• Nondrinking, noncontact water
	2d	• Well is inoperable or has not been used for several years
3		Water supply wells within the Study Area that are either outside the area of concern, or are within the area of concern but are not screened in an aquifer of concern.
4		Water supply wells in the Study Area, but insufficient information is available, leaving the following information gap:
	4a	• Unknown depth or aquifer
	4b	• Unknown location. Wells with both an unknown depth and an unknown location are included in 4b
5		Wells that are in the study area, but that have been field checked and not located. No further action is recommended for these wells.
6		Nonsupply wells (primarily monitoring wells).
7		Sealed or abandoned wells. Wells are divided into the following subcategories:
	7a	• Documented as sealed/abandoned
	7b	• Undocumented as sealed, or improperly abandoned

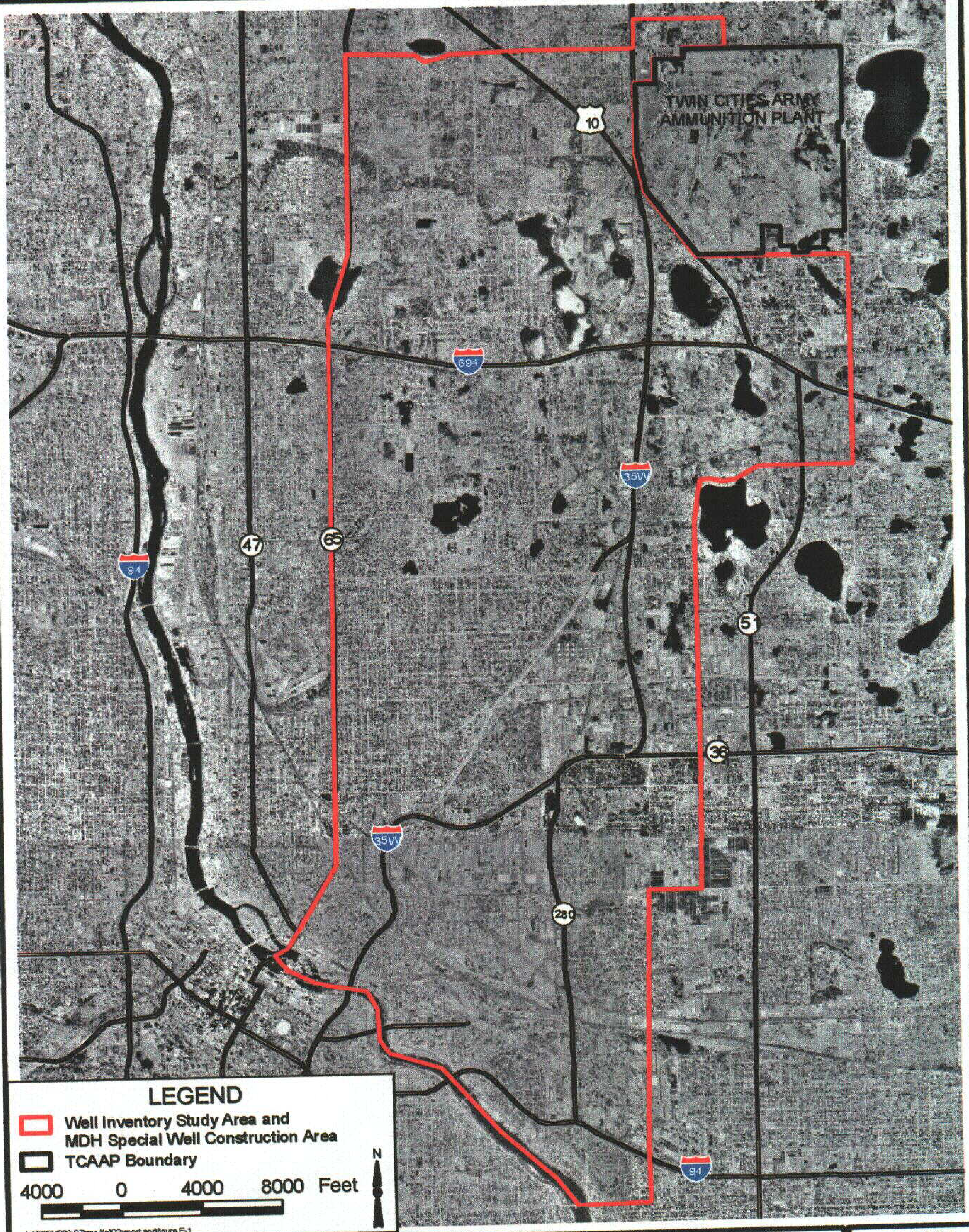
Table E-2
Well Inventory Sampling Results

Fiscal Year 2002

Well	Address	Owner	Sampled	Trichloro-ethene	1,1-Dichloro-ethene	cis-1,2-Dichloro-ethene	1,1,1-Trichloro-ethane	1,1,2-Trichloro-ethane	1,1-Dichloro-ethane
			OU1 Cleanup level (1):	5	6	70	200	3	70
234352	1206 12th Ave NW	Nutter, Aaron	25-Jul-02	1.6	5.4	1.7	JP 0.12	<1.0	8.2

Notes:

(1) Cleanup levels for OU1 deep groundwater are from page 18 of the OU1 ROD.
JP = The value is below the reporting limit, but above the method detection limit.



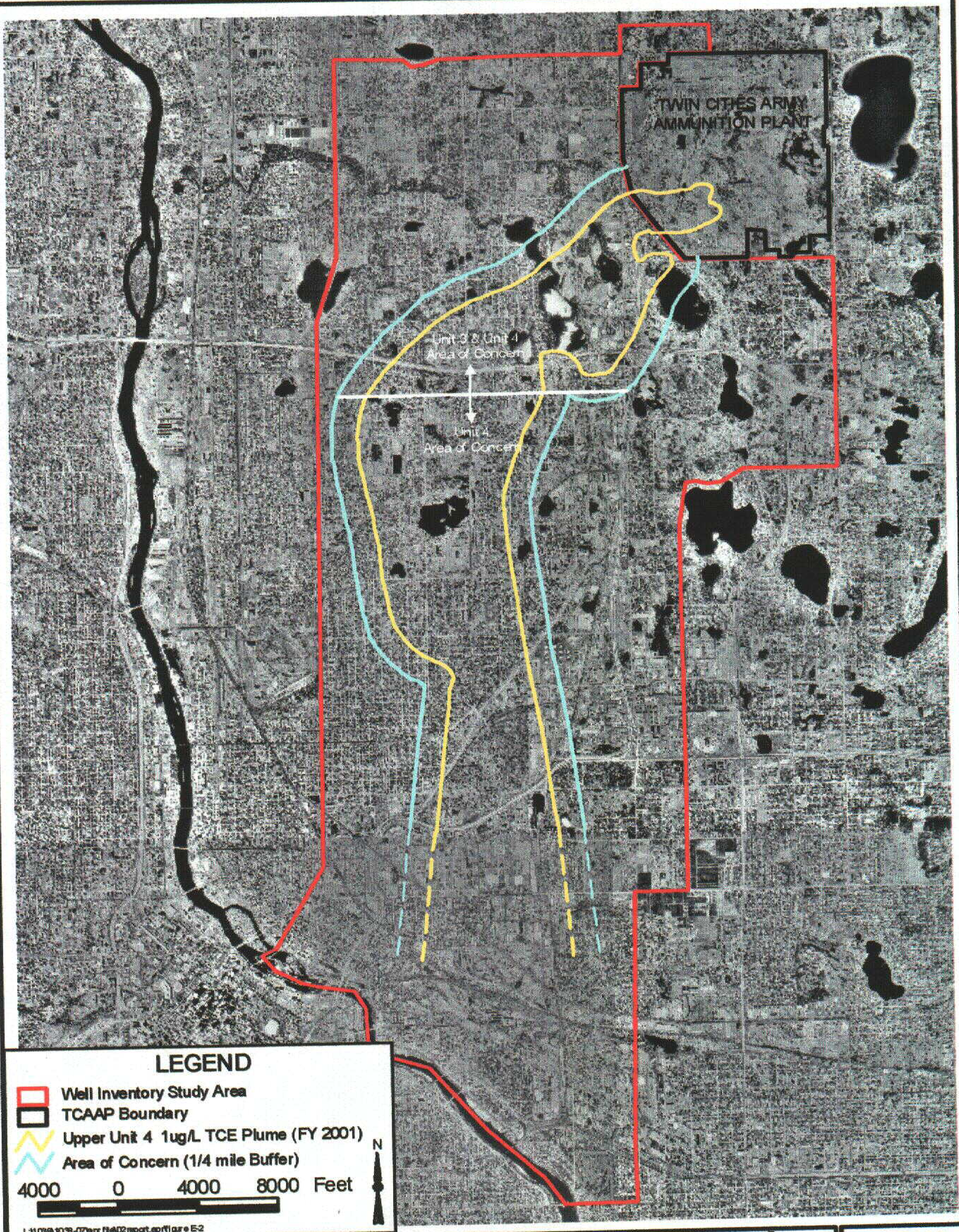
TWIN CITIES ARMY AMMUNITION PLANT

Well Inventory Study Area

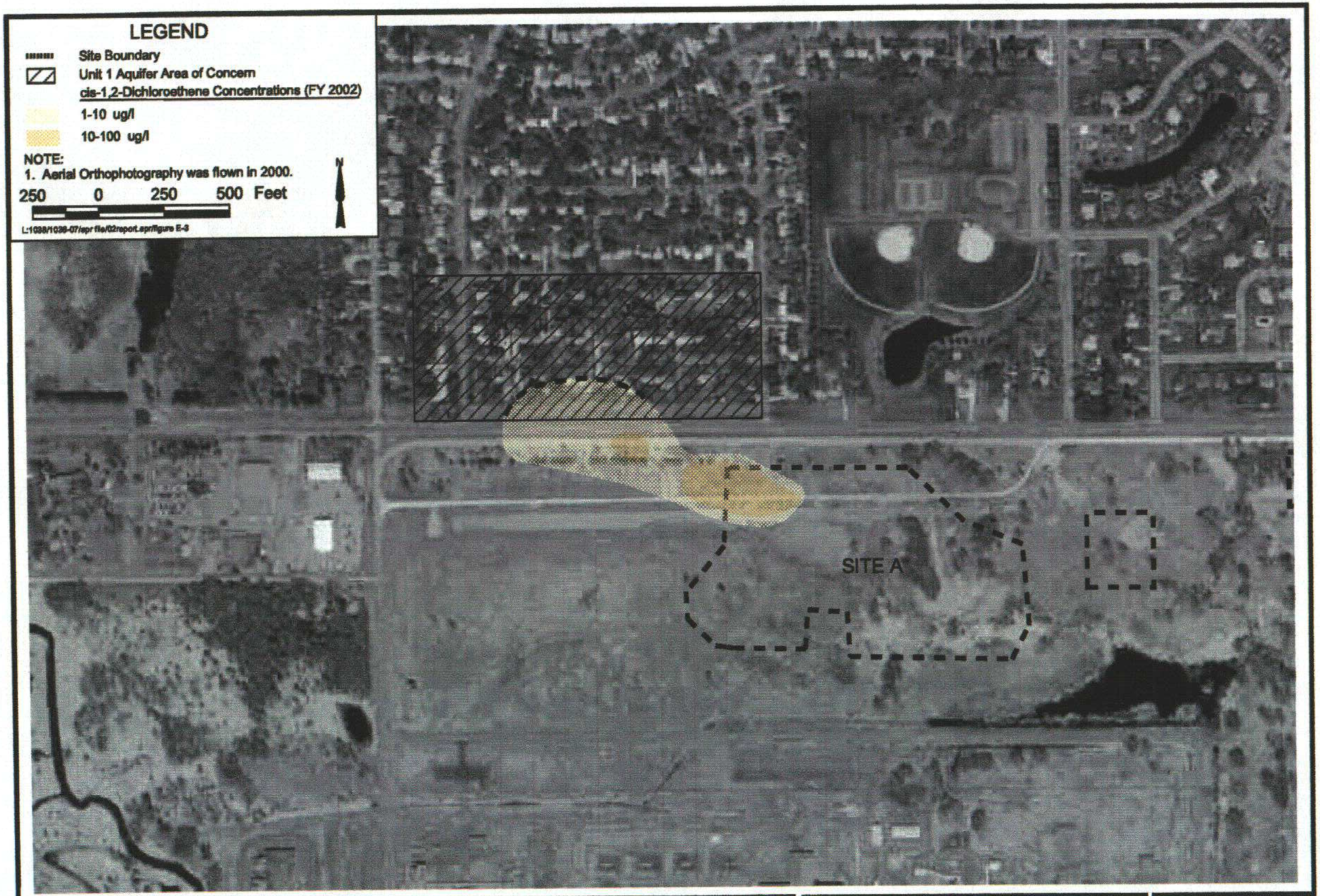
Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2002

Figure E-1



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2002
Areas of Concern (Unit 3 and Unit 4)		Figure E-2



TWIN CITIES ARMY AMMUNITION PLANT

Area of Concern (Unit 1)

Wenck

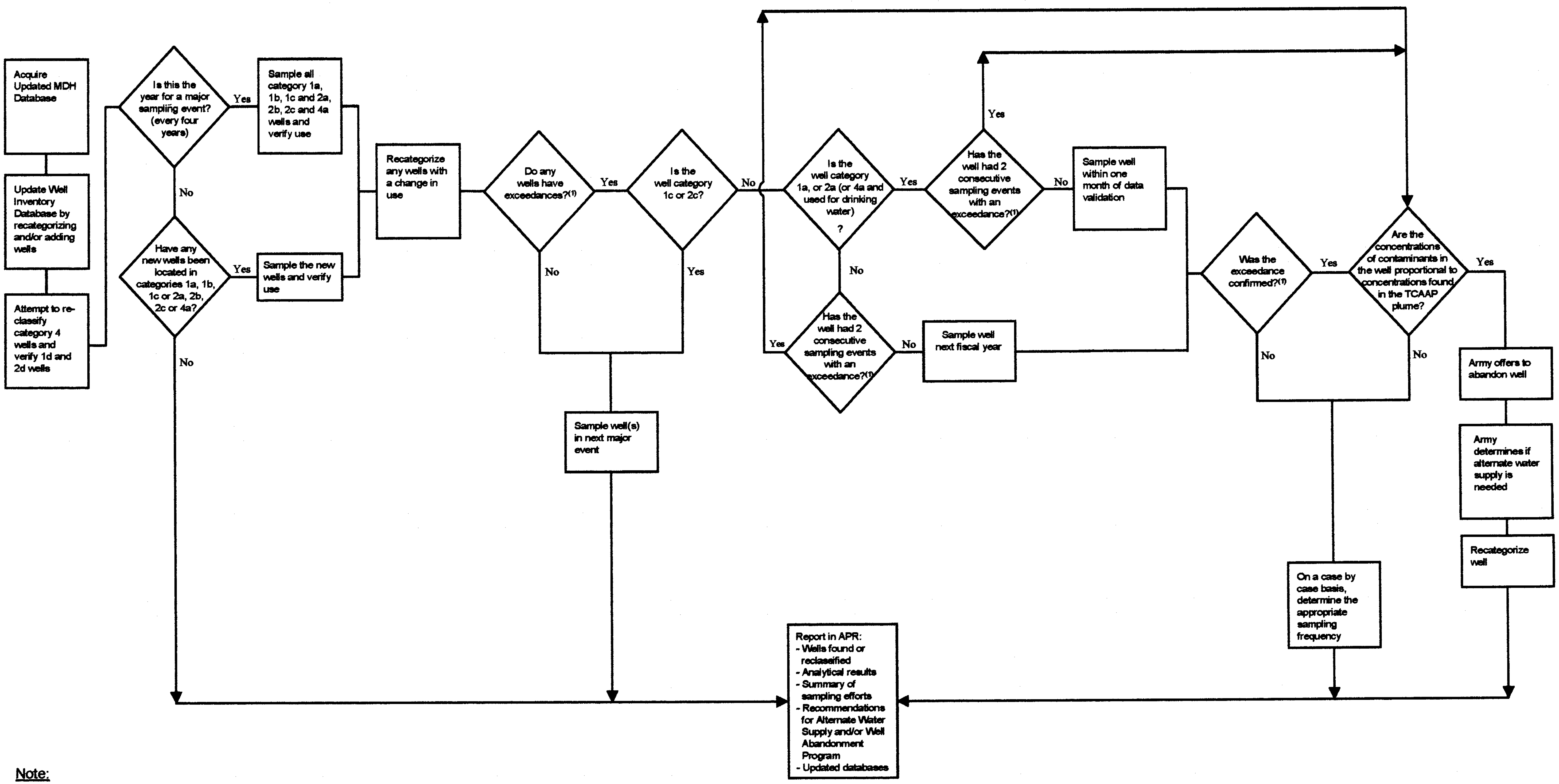
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0249

FY 2002

Figure E-3

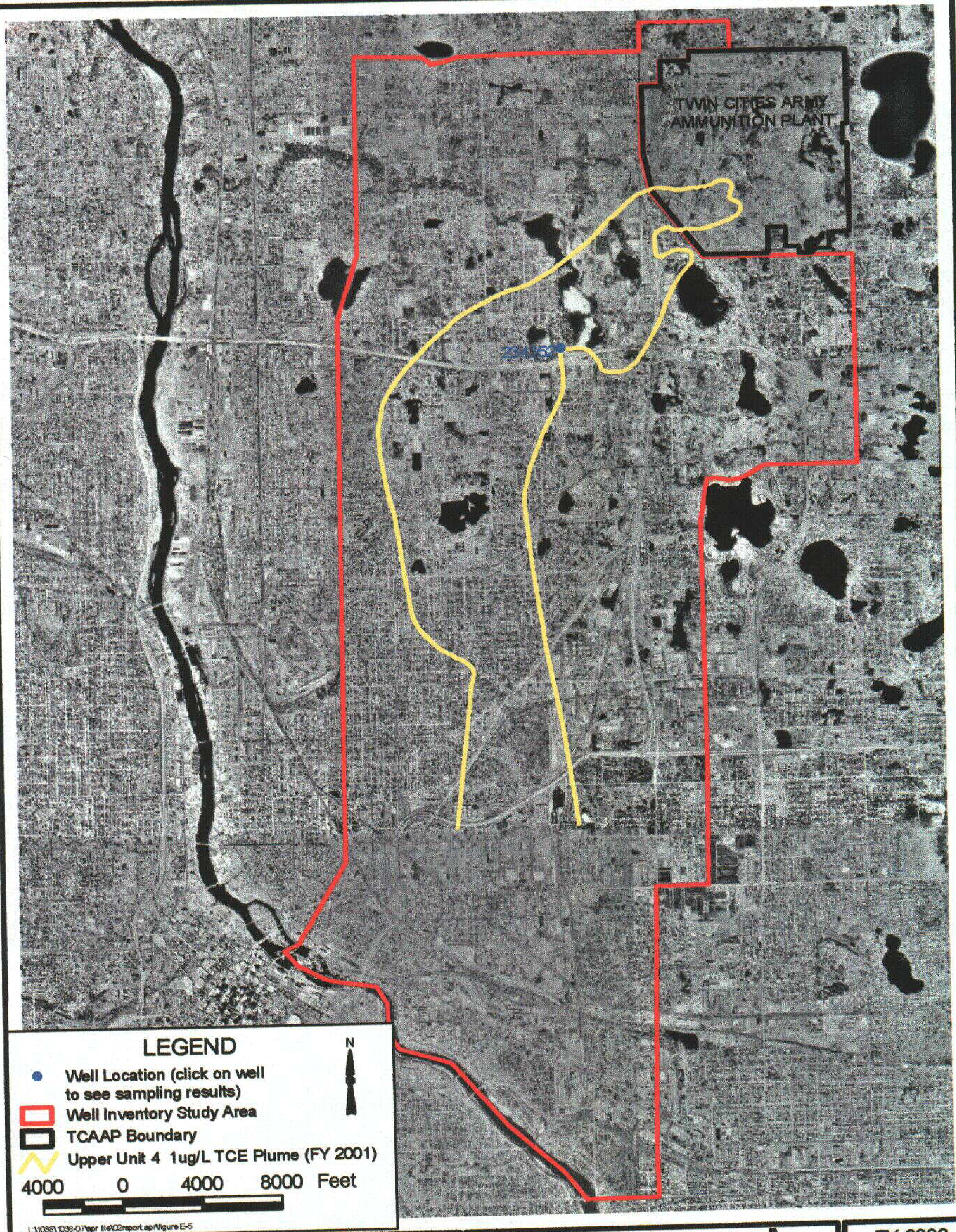
Figure E-4

Annual Requirements for Maintaining TCAAP Well Inventory Database



Note:

(1) = Exceedance of a TCAAP Groundwater Cleanup Level



TWIN CITIES ARMY AMMUNITION PLANT

FY2002 Well Inventory Sampling Location

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2002

Figure E-5

Well #234352
Nutter, Aaron
1206 12th Ave NW
New Brighton

Sampled 7/25/02

Analyte	Concentration (ug/L)
Trichloroethene	1.6
1,1 - Dichloroethene	5.4
cis -1,2 - Dichloroethene	1.7
1,1,1 - Trichloroethane	JP 0.12
1,1,2 - Trichloroethane	<1.0
1,1 - Dichloroethane	8.2

Notes:
JP = The value is below the reporting limit, but above the method detection limit.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

October 2001

10-05-01: Replaced High/Low Air Flow Switch Gauge (Photohelic gauge) and pitot tube sensor with new switch gauge and use static pressure in place of pitot tube.

10-09-01: With system in "automatic" mode, photohelic was manually placed into fail condition, after 30 second delay period, system failed. Reset and treatment system restarted automatically.

10-16-01: System cycled off during inspection, in "automatic" mode. Tested building heater; functioned properly.

10-17-01: Ice observed on service platform, reduced air flow to approximately 15" H_20.

10-22-01: Treatment system shut down on "Low Air Flow" alarm. Alarm reset and treatment system restarted automatically. Down time: 24 hours.

10-24-01: Adjusted low static pressure set point from 8" to 6". Drained sump water level to 12"

November 2001

11-5-01 through 11-8-01: System O.K., in suspense.

11-12-01: System O.K., in suspense.

11-13-01: System O.K., in suspense.

11-15-01: System O.K., in suspense, started during ispection. No water was observed out top of tower during startup and system is balanced.

11-19-01: System O.K., in suspense.

11-25-01: 1730 hours- TCAAP power grid failure due to snow storm. All power down, drained tower, building temperature 45 F and dropping.

11-27-01: 0900 hours- Power back on, building temperature 60 F, heater on. System alarm- low building temperature, reset system, system operational - O.K. Down time: 56 hours.

December 2001

12-5-01: Cleaned sight glass.

12-17-01: Performed monthly inspection- System in good working order.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

12-19-01: System O.K., in suspense.

12-20-01: System O.K., in suspense.

12-28-01: System O.K., in suspense.

January 2002

1-02-02: Some minor ice buildup on tower, reduced flow to ~ 15.3 gpm. System then entered recharge cycle, will return later in day to evaluate during daylight hours.

1-04-02: System O.K., in suspense. Cleaned sight glass. Returned at 1415 hrs and reduced air flow to ~15" and cut flow rate to ~15.5 gpm. No water or vapor observed exiting stack.

1-14-02: System O.K., in suspense. Cleaned sight glass.

1-18-02: System O.K., in suspense.

1-24-02: Performed monthly inspection.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

February 2002

2-01-02: System O.K., in suspense.

2-11-02: System O.K., in suspense. Cleaned sight glass.

2-13-02: Performed monthly inspection.

2-15-02: System O.K., in suspense.

2-19-02: System O.K., in suspense.

2-20-02: System O.K., in suspense.

2-21-02: System O.K., in suspense.

2-22-02: System O.K., in suspense.

2-27-02: System O.K., in suspense.

March 2002

3-05-02: System operating normally, cycled off prior to taking reading.

3-08-02: System O.K., in suspense.

3-12-02: System O.K., in suspense

3-13-02: System O.K., in suspense. Performed monthly inspection.

3-15-02: System cycled off shortly before inspection.

3-19-02: System O.K., in suspense.

3-25-02: System O.K., in suspense. Cleaned sight glass.

3-27-02: System O.K., in suspense.

April 2002

4-02-02: System O.K., in suspense. Snow melt on roof causing dripping inside-several spots. Cleaned sight glass.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

4-05-02: System O.K., in suspense.

4-09-02: System O.K., in suspense, performed monthly inspection.

4-10-02: System O.K., in suspense.

4-12-02: System O.K., in suspense.

4-15-02: Increased static pressure, to ~19" H_2O and increased flow rated to ~20 gpm.

4-16-02: Reduced flow rate to 17-18 gpm.

4-17-02: System O.K., in suspense. Roof leakage occurred overnight.

4-18-02: Turned vent fan on to dry the inside of the building.

4-23-02: System had not run since 4-19 meter reading. The system had been turned off. The cause for turning off the system is unknown. The system was restarted at 1300 hrs. The MPCA (D. Romano) and EPA (T. Barounis) were notified of the system down-time. D. Romano will place a note to the file regarding this shut down. Down time: 101 hours.

4-23-02: Adjust air flow through tower from 14" H_2O to 18" H_2O.

May 2002

5-01-02: System O.K., in suspense.

5-14-02: Performed monthly inspection.

5-17-02: Daily inspection not performed.

5-27-02: Memorial Day Holiday, daily inspection not performed.

June 2002

6-06-02: Performed monthly inspection.

6-07-02: Repaired cap on sight glass, system down until Monday morning while glue on cap set. Down time: 63 hours.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

July 2002

7-08-02: Air Stripper high water level sensor tripped, reset system- O.K. Estimate system down time of 21 hours.

7-19-02: Performed monthly inspection.

August 2002

8-01-02: Performed annual inspection and cleaning. System did not operate following cleaning. System down from 8-01-02 to 8-08-02 because the flow meter would not function.

8-08-02: Diversified Remediation Controls technician inspects system and identifies a lose plug inside flow meter. The plug was connected and the meter functioned. Down time: 144 hours.

8-12-12: Flow meter not functioning properly. Flow readings varying from 0.0 gpm to 30.0 gpm.

8-13-02 to 8-15-02: No system monitoring.

8-27-02: Performed monthly inspection.

8-28-02: Control & Meters technician on-site to troubleshoot flow meter. Flow meter testing not conclusive due to a failed ground in system controls. Schedule an electrician to locate and repair

8-29-02: An electrician is on-site and he corrects faulty ground on control panel transformer. The flow meter continues to function improperly.

8-30-02: System down on Low Flow Alarm. Changed Low Flow Rate Alarm set point to 0.0 gpm and restarted system. System functions. Down time: 48 hours.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

September 2002

9-1-02 through 9-30-02: Flow meter not functioning properly. Flow readings floating typically from 0.0 gpm to 30.0 gpm with spikes of up to 70 GPM. Flow rate is estimated at 12 GPM for the month of September 2002.

9-10-02: Performed monthly inspection.

9-11-02: Control & Meters technician on-site to repair flow meter. A new circuit board is installed in the flow meter. Flow rate readings continue to float from 0 GPM to 30 GPM. A new flow meter

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

October 2001

10/8/2001	Treatment Center; TUSCO on-Site to repack wet well pump shafts for wet well pumps 1 and 4. Down time: B2, B3, B7, B8, B10, B11 and SC3 for 3.5 hours each.
10/9/2001	Treatment Center; CRA repacks wet well pump shaft 3. Down time: 2 hours.
10/9/2001	Treatment Center; Pilot for ECV #3 leaking; replaced pilot with new. Down time: None.
10/10/2001	Treatment Center; Shutdown treatment center and well field to inspect and collect samples of packing material in treatment towers. Down time: 1 hour.
10/17/2001	Pumphouse B3; Light on control panel in Building 116 was not lit, reset control panel in Building 116. Down time: 5 hours.
10/23/2001	Treatment Center; Shutdown treatment center and well field to inspect and collect samples of packing material in treatment tower 1. Down time: 1 hour.

November 2001

11/6/2001	Pumphouse B9; Hissing sound from inside well; All Enviro removed and replaced first 2 sections of riser pipe and reinstalled lift system. Down time: 3 hours.
11/6/2001 and 11/11/2001	Pumphouse B7; Lift system cycled 14 times on 11/6/01 and 12 times on 11/11/01. Down time: 17 hours on 11/6/01 and 8 hours on 11/11/01.
11/12/2001	Treatment Center; Auto dialer indicated a system failure. Upon inspection, system found to be operating normally, probable brownout condition. Down time: None.
11/14/2001	Treatment Center; Air Stripper Tower 1 shut down for cleaning. Down time: 401 hours each for B3, B7, B8, B10, SC2 and SC3.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

11/15/2001	Pumphouse B1; Extraction well flow rate has decreased requiring redevelopment. All Enviro redeveloped the well. Down time: 295 hours.
11/21/2001	Pumphouse B10; Replace fuse and restarted pumphouse. Down time: 3 hours.
11/27/2001	Pumphouses B1, B2, B4, B5, B6, B9, and SC1; Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.

December 2001

12/3/2001	Treatment Center; Air Stripper Tower 2 shut down for cleaning. Restarted on 12/18/2001. Down time: 432 hours each for B3, B7, B8, B10, B11, SC2 and SC3.
12/5/2001	Pumphouse B1; Wet end of submersible pump failing, All Enviro replaced. Down time: 6 hours.
12/6/2001	Treatment Center; Flow meter from ECV No. 2 inoperable. Replaced old flow meter with new from inventory. Down time: None.
12/10/2001	Pumphouse B1; Low flow rate indicated at well. Replaced flow meter. Subsequently, flow rates are estimated for 12/5-11/01. Down time: 1 hour.
12/19/2001	Pumphouse B10; Flow meter inoperable. Replaced with spare rebuilt from inventory. Down time: 1 hour.
12/20/2001	Treatment Center; Valve seals blown in ECV No. 3; TUSCO on site and replaced seals. Down time: 7.5 hours each at B2, B4, B5, B6, B9, B11, SC1 and SC5 and 6 hours each at B1, B3, B7, B8, B10, SC2 and SC3.
12/20/2001	Pumphouse B5; Replaced piping and saddle tap for ARV. Down time: 0.25 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/29/2001 Treatment Center; Blower for tower No. 3 inoperable; Laughlin Electric on site and repaired starter relay.
Down time: 2 hours each at B7 and B10.

January 2002

1/17/2002 Treatment Center; ECV #3 will not remain open on start up, PDU not recognizing valve is open. Micro switch on ECV #3 valve cover is full of water and 1 wire off of terminal. Cleaned, dried, rewired, and applied silicon to switch.
Down time: 0.5 hours.

1/18-27/2002 Treatment Center; Tower #4 flooding; Turned off half of the extraction wells. Blower #4 not working. Rewired starter and ordered new micro switch. Installed new micro switch and restarted Tower #4 and extraction wells.
Down time: B1-69 hours, B2 and SC1-110 hours, B3, B8 and B11-140 hours and B7, B10, SC2 and SC3-190 hours.

February 2002

2/1/2002 Treatment Center; Fuse blown on PDU #4 mother board. Replaced fuse.
Down time: 8 hours.

2/3, 8-20/2002 Pumphouse B3; Intermittent shutdowns; B3 light flashing on Building 116 control panel. Low level light on in B3 pumphouse. Reset H-O-A switch and adjusted ECV valves daily.
Down time: 156 hours.

2/5/2002 Pumphouse B5; Low level light on in B5 pumphouse. Reset H-O-A switch and shut off upstream valve to ECV.
Down time: 30 hours.

2/10/2002 Treatment Center; Power outage at Building 116; Xcel Energy contacted and on Site. Repaired a transformer in the Wilson substation.
Down time: 19 hours.

2/11/2002 Treatment Center; Wet Well #2 flow meter failing. Replaced flow meter and associated piping.
Down time: 3 hours.

2/12/2002 Treatment Center; Wet Well #1 flow meter failing. Replaced flow meter and associated piping.
Down time: 2.5 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

March 2002

3/3-4/2002	Treatment Center; Blown fuse at PDU#2 causing Tower #3 to flood. Water in the base of Tower #3 froze. Replaced blown fuse, thawed frozen water, cleared ice from sump and restarted system. Down time: 19 hours.
3/5-7/2002	Pumphouse B3; Electrical failure between the pumphouse control panel and the ECV. Laughlin Electric replaced the LCS 10 circuit board. Down Time: 63 hours.
3/15/2002	Treatment Center; Well field cycling; ECV #1 stuck in the open position; Opened and closed the speed control valves and flushed piping. Down time: 5 hours.
3/15-17/2002	Pumphouse B3; Reset H-O-A switch in pumphouse and observed normal operation during both inspections. B3 normal during 3/18/02 inspection. Down time: 13 hours on 3/15, 26.7 hours on 3-16, and 11.4 hours on 3/17/02.
3/19/2002	Pumphouse B3; Replaced Allen-Bradley input card in pumphouse control panel. Down time: 5.5 hours.

April 2002

4/9/2002	Treatment Center; Well field cycling at PLC in Building 116. Reset well field and PDU #1 and #3. Down time: B3 - 8 hours.
4/20/2002	Treatment Center; Well field and PDU #3 cycling at PLC in Building 116. Reset well field and PDU #3. Down time: None.
4/28/2002	Treatment Center; Motor starter for PDU #3 was tripped. Reset motor starter. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/29/2002 Pumphouses B1-B11 and SC1; Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells.
Down time: 10 hours each for B1-B11 and SC1.

4/30/2002 Pumphouse B3; Replaced power supply card.
Down time: 24 hours.

May 2002 None.

June 2002

6/5-30/2002 Treatment Center; Air Stripping Tower #4 shut down for cleaning.
Down time: 618 hours each for B3, B7, B8, B10, B11, SC2, and SC3.

6/12-30/2002 Treatment Center; Shut down extraction wells B2 and SC1 to minimize well field cycling due to tower cleaning.
Down time: 447 hours each for B2 and SC1.

6/13/2002 Pumphouses B1, B4, B5, B6, B9, and SC5 (other extraction wells were already down for tower cleaning work); Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers.
Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.

6/20/2002 Pumphouse B4; Following testing of the control system, the H-O-A switch on the control panel was inadvertently left in the off position.
Down time: 28 hours.

6/21-30/02 Treatment Center; Shut down extraction well B9 to minimize well field cycling due to tower cleaning.
Down time: 240 hours at B9.

July 2002

7/1/2002 Treatment Center; Finished cleaning Air Stripping Tower #4. Began cleaning Tower #3. Restarted system on 7/23/02.
Down time: 9 hours on 7/1 for SC1; 546 hours each for B2, B3, B7, B8, B9, B10, B11, SC2, and SC3.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/3/2002 Elevated Tank; Altitude valve not closing. Control piping plugged with manganese. Removed and replaced control piping upstream of filter cartridge.
Down time: None.

7/11/2002 Pumphouses B1, B4, B5, and B6; Power outage at boundary pumphouses (other boundary pumphouses already down for tower cleaning work). Xcel Energy restored blown fuse at power pole near Gate 4.
Down time: 15 hours each at B1, B4, B5 and B6.

7/18/2002 Treatment Center; Blown seal on ECV 4. Turn off wet well pump 4 and turn on wet well pump 3. 7/26/02-Tusco on Site to replace seal. Replaced 3-way solenoid valve.
Down time: None.

7/25/2002 Pumphouses B11 and SC1; Power outage; A Red-tailed hawk tripped the transformer at the power pole near B11. Xcel Energy on-Site to repair.
Down time: 24 hours each at B11 and SC1.

7/27/2002 Treatment Center; Valve closed without command at wet well 4, reset PDU 4.
Down time: 1 hour.

7/28/2002 Treatment Center; Power outage due to thunder storm; Xcel Energy on-Site and replaces a 125 amp blown fuse at the Pillsbury Substation near Building 105.
Down time: 5.5 hours.

August 2002

8/4/2002 Pumphouse B6; Replaced a gasket between the check valve and the flow meter.
Down time: 39 hours.

8/9/2002 Pumphouses B3 and B4; Electrician (during annual electrical inspection) inadvertently left the pump director in the "Off" position.
Down time: 23 hours each.

8/14/2002 Treatment Center; Pumphouses B2, B3, B7, B8, B9, B10, B11, SC2, and SC3 were shut down for the painting of Air Stripping Towers 1 through 4.
Down time: 215 hours each for B2, B3, B7, B8, B9, B10, B11, SC2, and SC3.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

8/20/2002 Treatment Center; Overhead wire off pole near Bldg. 116. Xcel Energy repaired problem and restored power. Most wells already down for tower painting.
Down time: 10.5 hours each for B1, B4, B5, B6, SC1, and SC5.

8/29/2002 Treatment Center; Water entered wet well motor No. 2 causing it to short circuit. All Enviro replaced the motor from stock.
Down time: 27 hours each for B5, B6, B7, B8, B9, B10, and SC1.

8/31/2002 Pumphouse B4; Water leaking from pressure gage inlet; Repositioned gasket and restarted pump.
Down time: 31 hours.

September 2002

9/1-4/2002 Treatment Center; Malfunction of wet well pump 2 pump controller.
Down time: B2, B3 and B6 for 24 hours each; B4 and B9 for 33 hours each; B7, B8, B10, B11, SC1, SC2 and SC3 for 78 hours each and SC5 for 46 hours.

9/5/2002 Treatment Center; Power failure at ECV 2, valve did not open at start up. Replaced electrical solenoid which was off of harness and reset auto dialer. Auto dialer tripped again 4 hours later. The PLC did not reset during the first site visit.
Down time: 5.5 hours each at B2, B7, B8, B10, B11, SC1, and SC3.

9/10/2002 Pumphouse B7; Pump failure, unable to purge groundwater; A temporary shutdown has been authorized. Remained off for remainder for FY2002.

9/25/2002 Treatment Center; Shutdown the TGRS to install leak containment shrouds around all 4 wet well pump shafts.
Down time: 2 hours each at B1, B2, B3, B4, B5, B6, B8, B9, B10, B11, SC1, SC2, SC3, and SC5.

9/29/2002 Treatment Center; Valve for wet well pump 1 closed without command. Cycled valve 3 times and observed normal operation.
Down time: B1, B4, B5, B6 and SC5 for 5 hours each. SC1 for 16 hours and B2, B3, B8, B9, B10, B11, SC2, and SC3 for 30 hours each.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Pumphouse B1

11/15/2001	Extraction well flow rate has decreased requiring redevelopment. All Enviro redeveloped the well. Down time: 295 hours.
11/27/2001	Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.
12/5/2001	Wet end of submersible pump failing, All Enviro replaced. Down time: 6 hours.
12/10/2001	Low flow rate indicated at well. Replaced flow meter. Subsequently, flow rates are estimated for 12/5-11/01. Down time: 1 hour.
4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
6/13/2002	Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers. Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.
7/11/2002	Power outage at boundary pumphouses (other boundary pumphouses already down for tower cleaning work). Xcel Energy restored blown fuse at power pole near Gate 4. Down time: 15 hours each at B1, B4, B5 and B6.

Pumphouse B2

11/27/2001	Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.
4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Pumphouse B3

10/17/2001	Light on control panel in Building 116 was not lit, reset control panel in Building 116. Down time: 5 hours.
2/3, 8-20/2002	Intermittent shutdowns; B3 light flashing on Building 116 control panel. Low level light on in B3 pumphouse. Reset H-O-A switch and adjusted ECV valves daily. Down time: 156 hours.
3/5-7/2002	Electrical failure between the pumphouse control panel and the ECV. Laughlin Electric replaced the LCS 10 circuit board. Down Time: 63 hours.
3/15-17/2002	Reset H-O-A switch in pumphouse and observed normal operation during both inspections. B3 normal during 3/18/02 inspection. Down time: 13 hours on 3/15, 26.7 hours on 3-16, and 11.4 hours on 3/17/02.
3/19/2002	Replaced Allen-Bradley input card in pumphouse control panel. Down time: 5.5 hours.
4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
4/30/2002	Replaced power supply card. Down time: 24 hours.
8/9/2002	Electrician (during annual electrical inspection) inadvertently left the pump director in the "Off" position. Down time: 23 hours each.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Pumphouse B4

11/27/2001	Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.
4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
6/13/2002	Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers. Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.
6/20/2002	Following testing of the control system, the H-O-A switch on the control panel was inadvertently left in the off position. Down time: 28 hours.
7/11/2002	Power outage at boundary pumphouses (other boundary pumphouses already down for tower cleaning work). Xcel Energy restored blown fuse at power pole near Gate 4. Down time: 15 hours each at B1, B4, B5 and B6.
8/9/2002	Electrician (during annual electrical inspection) inadvertently left the pump director in the "Off" position. Down time: 23 hours each.
8/31/2002	Water leaking from pressure gage inlet; Repositioned gasket and restarted pump. Down time: 31 hours.

Pumphouse B5

11/27/2001	Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.
12/20/2001	Replaced piping and saddle tap for ARV. Down time: 0.25 hours.
2/5/2002	Low level light on in B5 pumphouse. Reset H-O-A switch and shut off upstream valve to ECV Down time: 30 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
6/13/2002	Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers. Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.
7/11/2002	Power outage at boundary pumphouses (other boundary pumphouses already down for tower cleaning work). Xcel Energy restored blown fuse at power pole near Gate 4. Down time: 15 hours each at B1, B4, B5 and B6.

Pumphouse B6

11/27/2001	Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.
4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
6/13/2002	Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers. Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.
7/11/2002	Power outage at boundary pumphouses (other boundary pumphouses already down for tower cleaning work). Xcel Energy restored blown fuse at power pole near Gate 4. Down time: 15 hours each at B1, B4, B5 and B6.
8/4/2002	Replaced a gasket between the check valve and the flow meter. Down time: 39 hours.

Pumphouse B7

11/6/2001 and 11/11/2001	Lift system cycled 14 times on 11/6/01 and 12 times on 11/11/01. Down time: 17 hours on 11/6/01 and 8 hours on 11/11/01.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
9/10/2002	Pump failure, unable to purge groundwater; A temporary shutdown has been authorized. Remained off for remainder for FY2002.

Pumphouse B8

4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.

Pumphouse B9

11/6/2001	Hissing sound from inside well; All Enviro removed and replaced first 2 sections of riser pipe and reinstalled lift system. Down time: 3 hours.
11/27/2001	Snow storm caused a power outage to the boundary wells. Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.
4/29/2002	Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells. Down time: 10 hours each for B1-B11 and SC1.
6/13/2002	Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers. Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.

Pumphouse B10

11/21/2001	Replace fuse and restarted pumphouse. Down time: 3 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/19/2001 Flow meter inoperable. Replaced with spare rebuilt from inventory.
Down time: 1 hour.

4/29/2002 Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells.
Down time: 10 hours each for B1-B11 and SC1.

Pumphouse B11

4/29/2002 Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells.
Down time: 10 hours each for B1-B11 and SC1.

7/25/2002 Power outage; A Red-tailed hawk tripped the transformer at the power pole near B11. Exel Energy on-Site to repair.
Down time: 24 hours each at B11 and SC1.

Pumphouse SC1

11/27/2001 Snow storm caused a power outage to the boundary wells.
Down time: 48 hours each for B1, B2, B4, B5, B6, B9 and SC1.

4/29/2002 Several extraction wells were not pumping during the daily inspection. Xcel Energy already on-Site. They had shut down an electrical substation near Building 105 to perform electrical repairs which shut down several of the TGRS extraction wells.
Down time: 10 hours each for B1-B11 and SC1.

7/25/2002 Power outage; A Red-tailed hawk tripped the transformer at the power pole near B11. Exel Energy on-Site to repair.
Down time: 24 hours each at B11 and SC1.

Pumphouse SC5

6/13/2002 Shut down Extraction wells to upgrade electrical use efficiency at TGRS transformers.
Down time: 3 hours each for B1, B4, B5, B6, B9, and SC5.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

TREATMENT CENTER

10/8/2001	TUSCO on-Site to repack wet well pump shafts for wet well pumps 1 and 4. Down time: B2, B3, B7, B8, B10, B11 and SC3 for 3.5 hours each.
10/9/2001	CRA repacks wet well pump shaft 3. Down time: 2 hours.
10/9/2001	Pilot for ECV #3 leaking; replaced pilot with new. Down time: None.
10/10/2001	Shutdown treatment center and well field to inspect and collect samples of packing material in treatment towers. Down time: 1 hour.
10/23/2001	Shutdown treatment center and well field to inspect and collect samples of packing material in treatment tower 1. Down time: 1 hour.
11/12/2001	Auto dialer indicated a system failure. Upon inspection, system found to be operating normally, probable brownout condition. Down time: None.
11/14/2001	Air Stripper Tower 1 shut down for cleaning. Down time: 401 hours each for B3, B7, B8, B10, SC2 and SC3.
12/3/2001	Air Stripper Tower 2 shut down for cleaning. Restarted on 12/18/2001. Down time: 432 hours each for B3, B7, B8, B10, B11, SC2 and SC3.
12/6/2001	Flow meter from ECV No. 2 inoperable. Replaced old flow meter with new from inventory. Down time: None.
12/20/2001	Valve seals blown in ECV No. 3; TUSCO on site and replaced seals. Down time: 7.5 hours each at B2, B4, B5, B6, B9, B11, SC1 and SC5 and 6 hours each at B1, B3, B7, B8, B10, SC2 and SC3.
12/29/2001	Blower for tower No. 3 inoperable; Laughlin Electric on site and repaired starter relay. Down time: 2 hours each at B7 and B10.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

1/17/2002	ECV #3 will not remain open on start up, PDU not recognizing valve is open. Micro switch on ECV #3 valve cover is full of water and 1 wire off of terminal. Cleaned, dried, rewired, and applied silicon to switch. Down time: 0.5 hours.
1/18-27/2002	Tower #4 flooding; Turned off half of the extraction wells. Blower #4 not working. Rewired starter and ordered new micro switch. Installed new micro switch and restarted Tower #4 and extraction wells. Down time: B1-69 hours, B2 and SC1-110 hours, B3, B8 and B11-140 hours and B7, B10, SC2 and SC3-190 hours.
2/1/2002	Fuse blown on PDU #4 mother board. Replaced fuse. Down time: 8 hours.
2/10/2002	Power outage at Building 116; Xcel Energy contacted and on Site. Repaired a transformer in the Wilson substation. Down time: 19 hours.
2/11/2002	Wet Well #2 flow meter failing. Replaced flow meter and associated piping. Down time: 3 hours.
2/12/2002	Wet Well #1 flow meter failing. Replaced flow meter and associated piping. Down time: 2.5 hours.
3/3-4/2002	Blown fuse at PDU#2 causing Tower #3 to flood. Water in the base of Tower #3 froze. Replaced blown fuse, thawed frozen water, cleared ice from sump and restarted system. Down time: 19 hours.
3/15/2002	Well field cycling; ECV #1 stuck in the open position; Opened and closed the speed control valves and flushed piping. Down time: 5 hours.
4/9/2002	Well field cycling at PLC in Building 116. Reset well field and PDU #1 and #3. Down time: B3 - 8 hours.
4/20/2002	Well field and PDU #3 cycling at PLC in Building 116. Reset well field and PDU #3. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/28/2002	Motor starter for PDU #3 was tripped. Reset motor starter. Down time: None.
6/5-30/2002	Air Stripping Tower #4 shut down for cleaning. Down time: 618 hours each for B3, B7, B8, B10, B11, SC2, and SC3.
6/12-30/2002	Shut down extraction wells B2 and SC1 to minimize well field cycling due to tower cleaning. Down time: 447 hours each for B2 and SC1.
6/21-30/02	Shut down extraction well B9 to minimize well field cycling due to tower cleaning. Down time: 240 hours at B9.
7/1/2002	Finished cleaning Air Stripping Tower #4. Began cleaning Tower #3. Restarted system on 7/23/02. Down time: 9 hours on 7/1 for SC1; 546 hours each for B2, B3, B7, B8, B9, B10, B11, SC2, and SC3.
7/18/2002	Blown seal on ECV 4. Turn off wet well pump 4 and turn on wet well pump 3. 7/26/02-Tusco on Site to replace seal. Replaced 3-way solenoid valve. Down time: None.
7/27/2002	Treatment Center; Valve closed without command at wet well 4, reset PDU 4. Down time: 1 hour.
7/28/2002	Power outage due to thunder storm; Xcel Energy on-Site and replaces a 125 amp blown fuse at the Pillsbury Substation near Building 105. Down time: 5.5 hours.
8/14/2002	Pumphouses B2, B3, B7, B8, B9, B10, B11, SC2, and SC3 were shut down for the painting of Air Stripping Towers 1 through 4. Down time: 215 hours each for B2, B3, B7, B8, B9, B10, B11, SC2, and SC3.
8/20/2002	Overhead wire off pole near Bldg. 116. Xcel Energy repaired problem and restored power. Most wells already down for tower painting. Down time: 10.5 hours each for B1, B4, B5, B6, SC1, and SC5.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

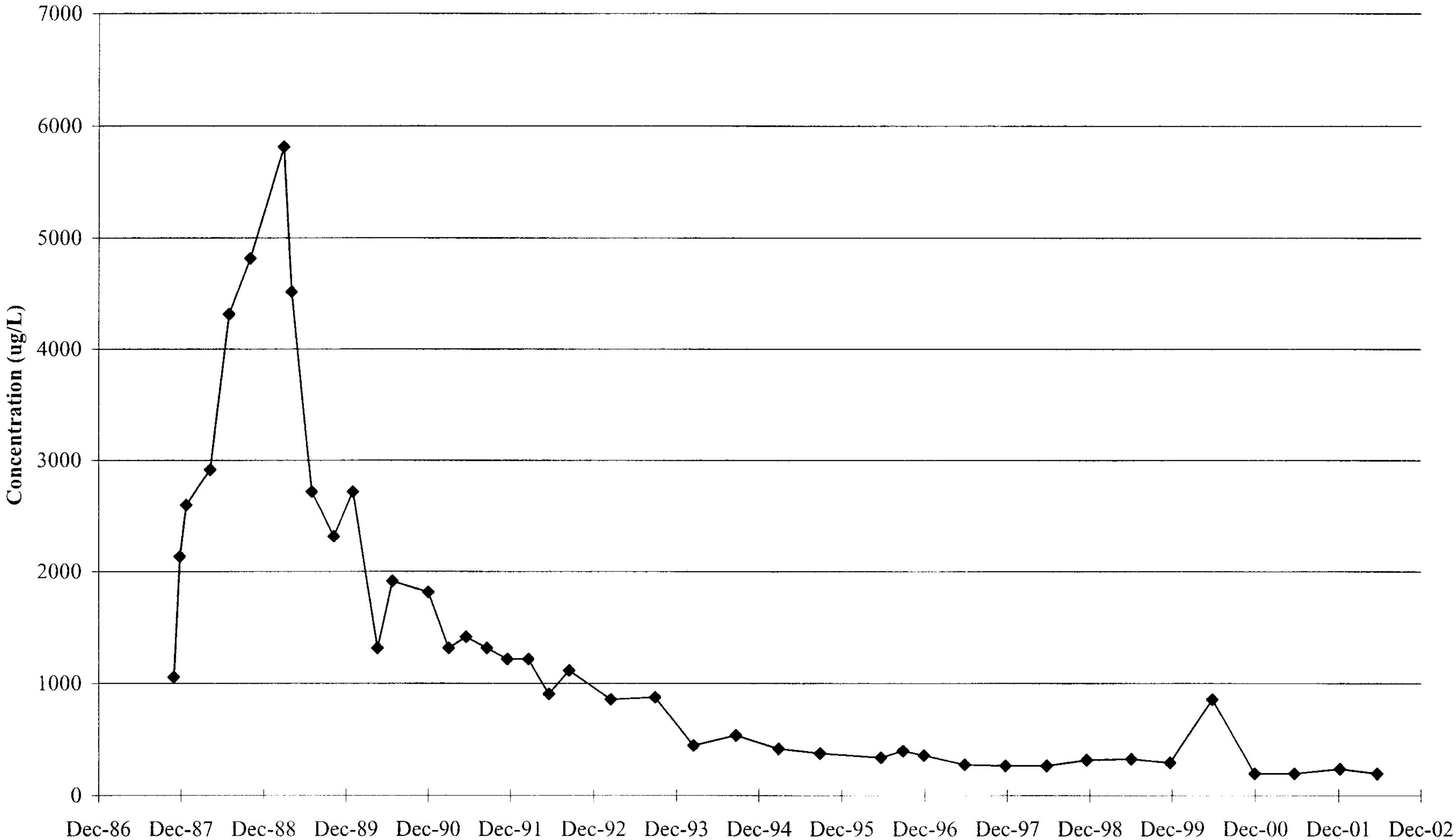
8/29/2002	Water entered wet well motor No. 2 causing it to short circuit. All Enviro replaced the motor from stock. Down time: 27 hours each for B5, B6, B7, B8, B9, B10, and SC1.
9/1-4/2002	Malfunction of wet well pump 2 pump controller. Down time: B2, B3 and B6 for 24 hours each; B4 and B9 for 33 hours each; B7, B8, B10, B11, SC1, SC2 and SC3 for 78 hours each and SC5 for 46 hours.
9/5/2002	Power failure at ECV 2, valve did not open at start up. Replaced electrical solenoid which was off of harness and reset auto dialer. Auto dialer tripped again 4 hours later. The PLC did not reset during the first site visit. Down time: 5.5 hours each at B2, B7, B8, B10, B11, SC1, and SC3.
9/25/2002	Shutdown the TGRS to install leak containment shrouds around all 4 wet well pump shafts. Down time: 2 hours each at B1, B2, B3, B4, B5, B6, B8, B9, B10, B11, SC1, SC2, SC3, and SC5.
9/29/2002	Valve for wet well pump 1 closed without command. Cycled valve 3 times and observed normal operation. Down time: B1, B4, B5, B6 and SC5 for 5 hours each. SC1 for 16 hours and B2, B3, B8, B9, B10, B11, SC2, and SC3 for 30 hours each.

ELEVATED TANK

7/3/2002	Altitude valve not closing. Control piping plugged with manganese. Removed and replaced control piping upstream of filter cartridge. Down time: None.

APPENDIX G-1

EXTRACTION WELL B1 - TRCLE VS.TIME

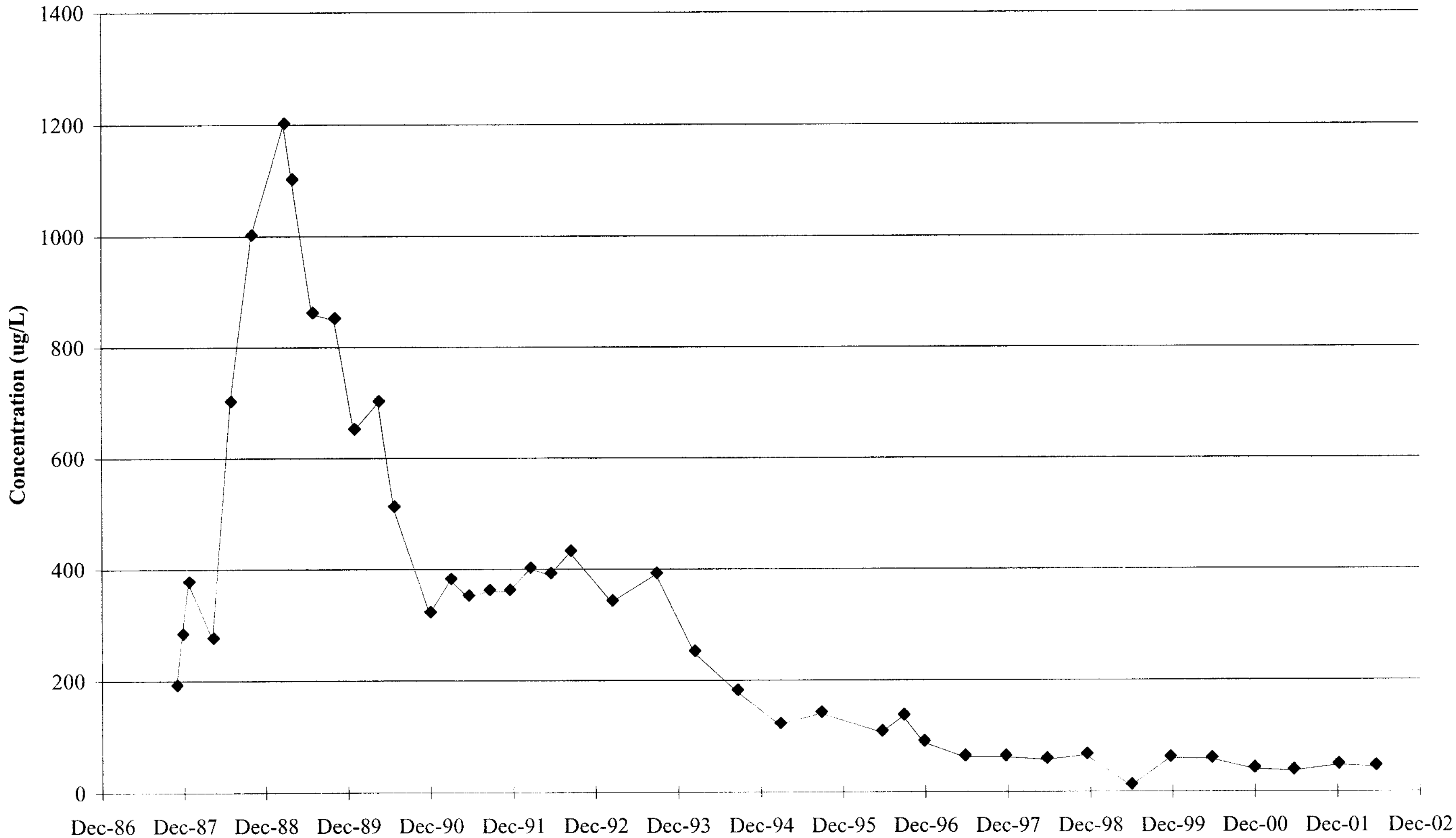


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B2 - TRCLE VS. TIME

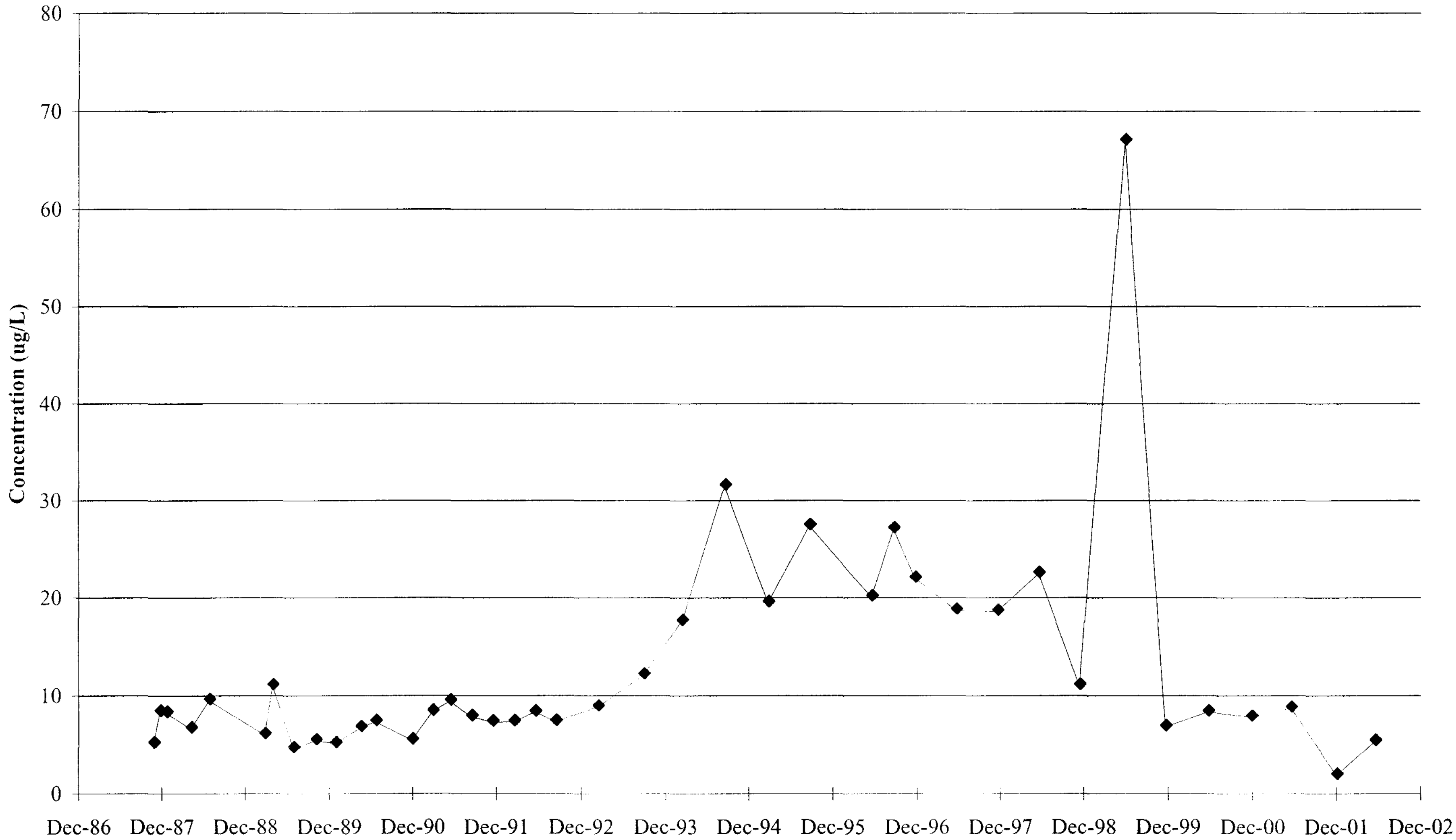


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

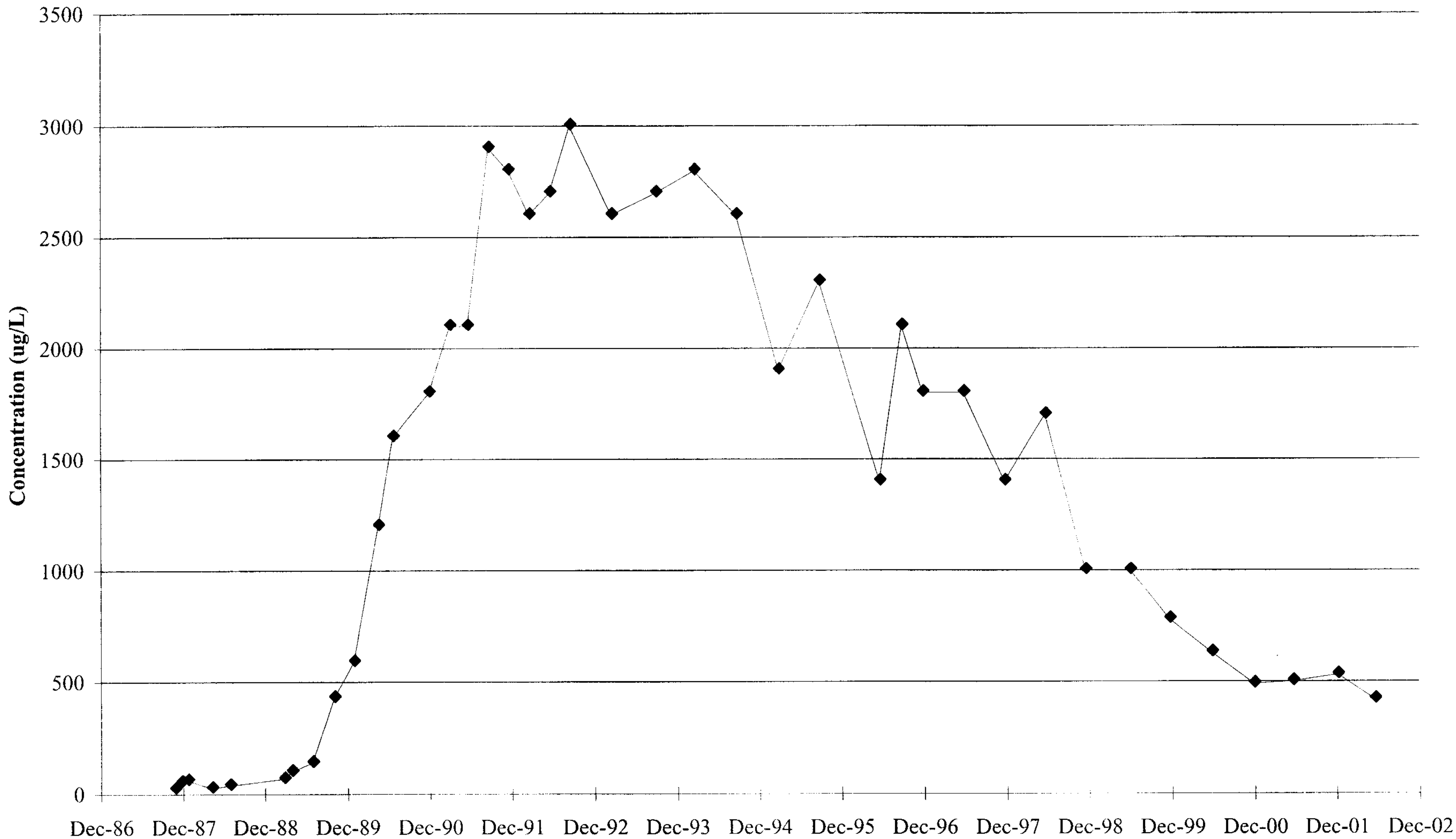
EXTRACTION WELL B3 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G-1

EXTRACTION WELL B4 - TRCLE VS. TIME

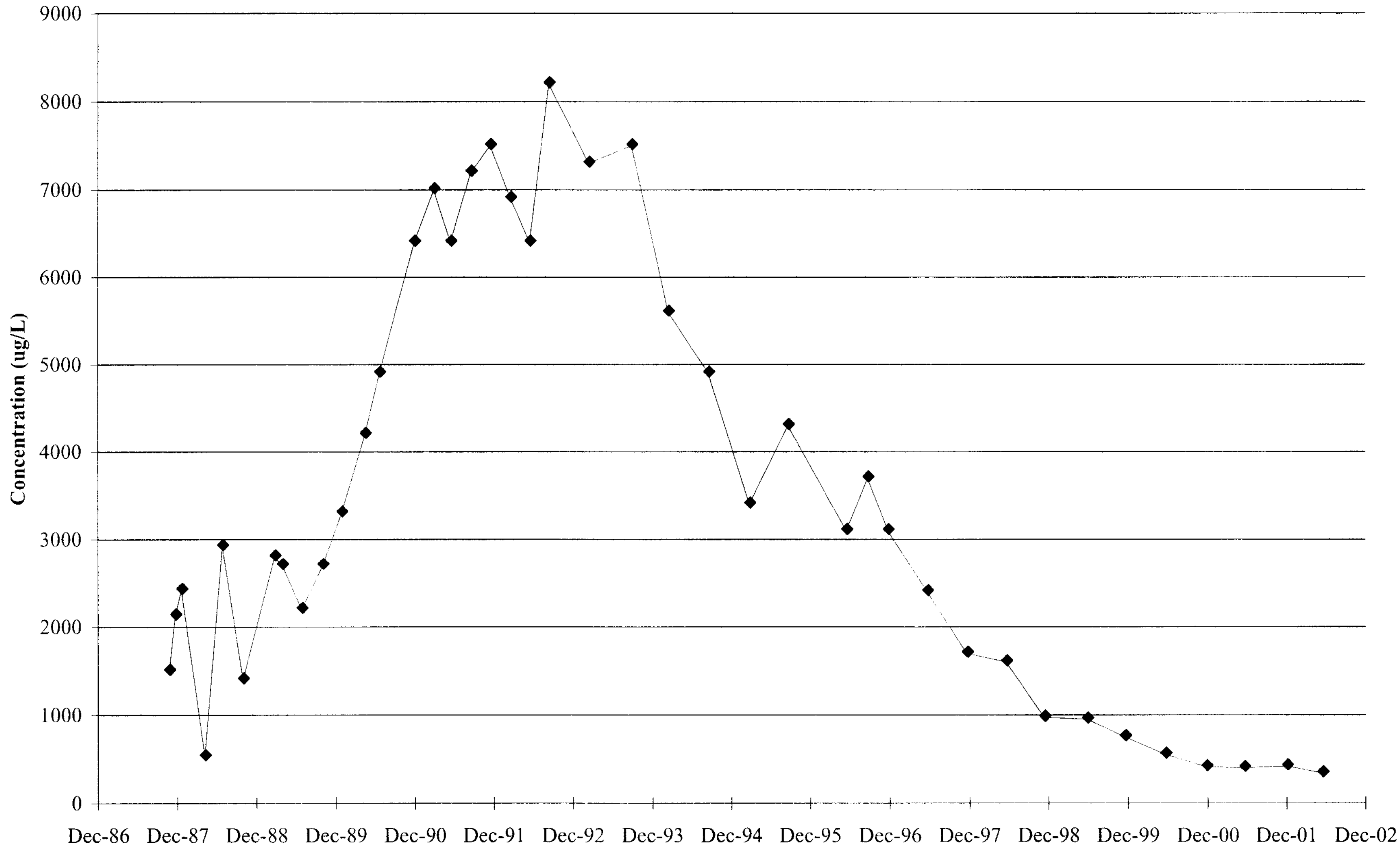


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

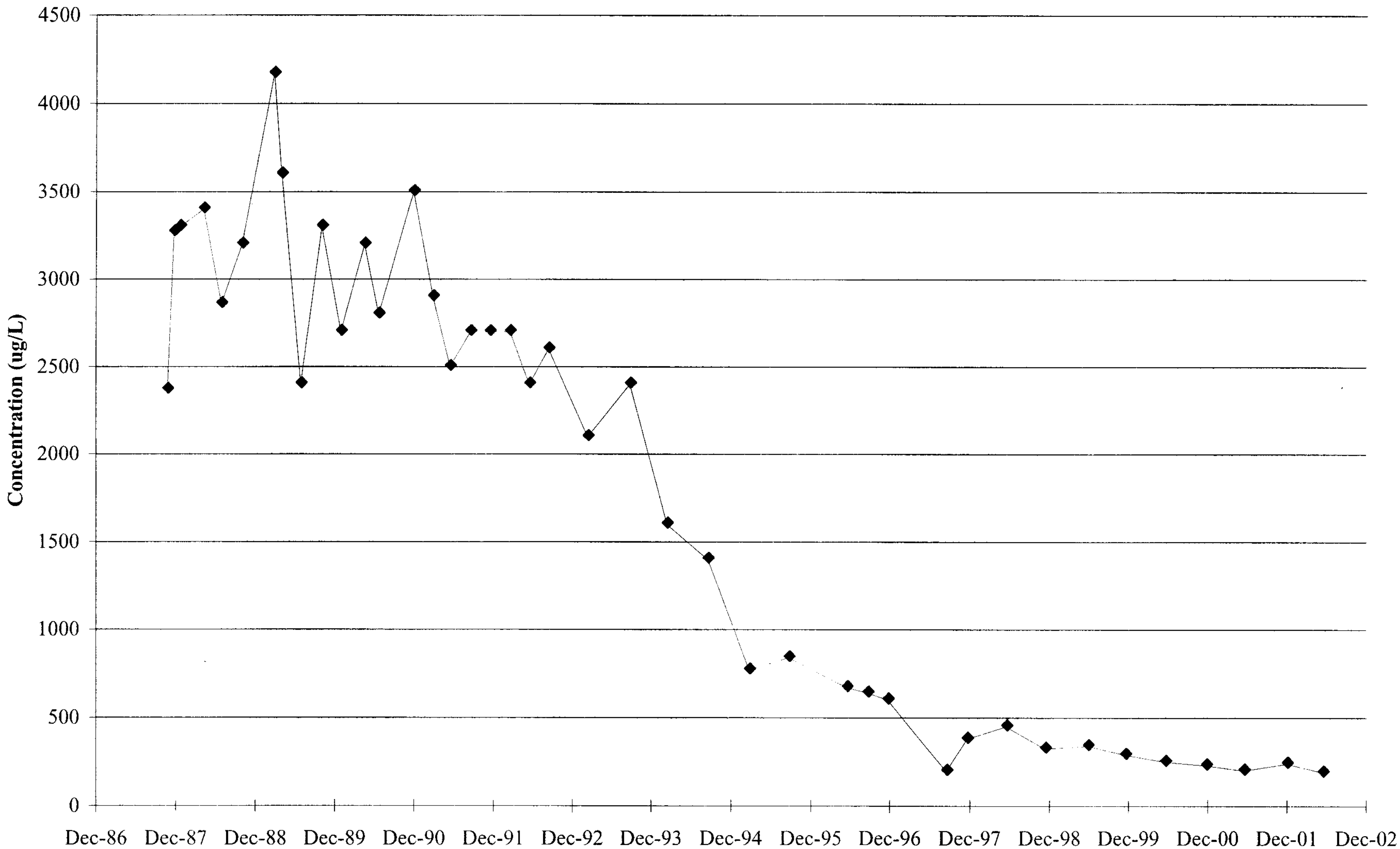
EXTRACTION WELL B5 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G-1

EXTRACTION WELL B6 - TRCLE VS. TIME

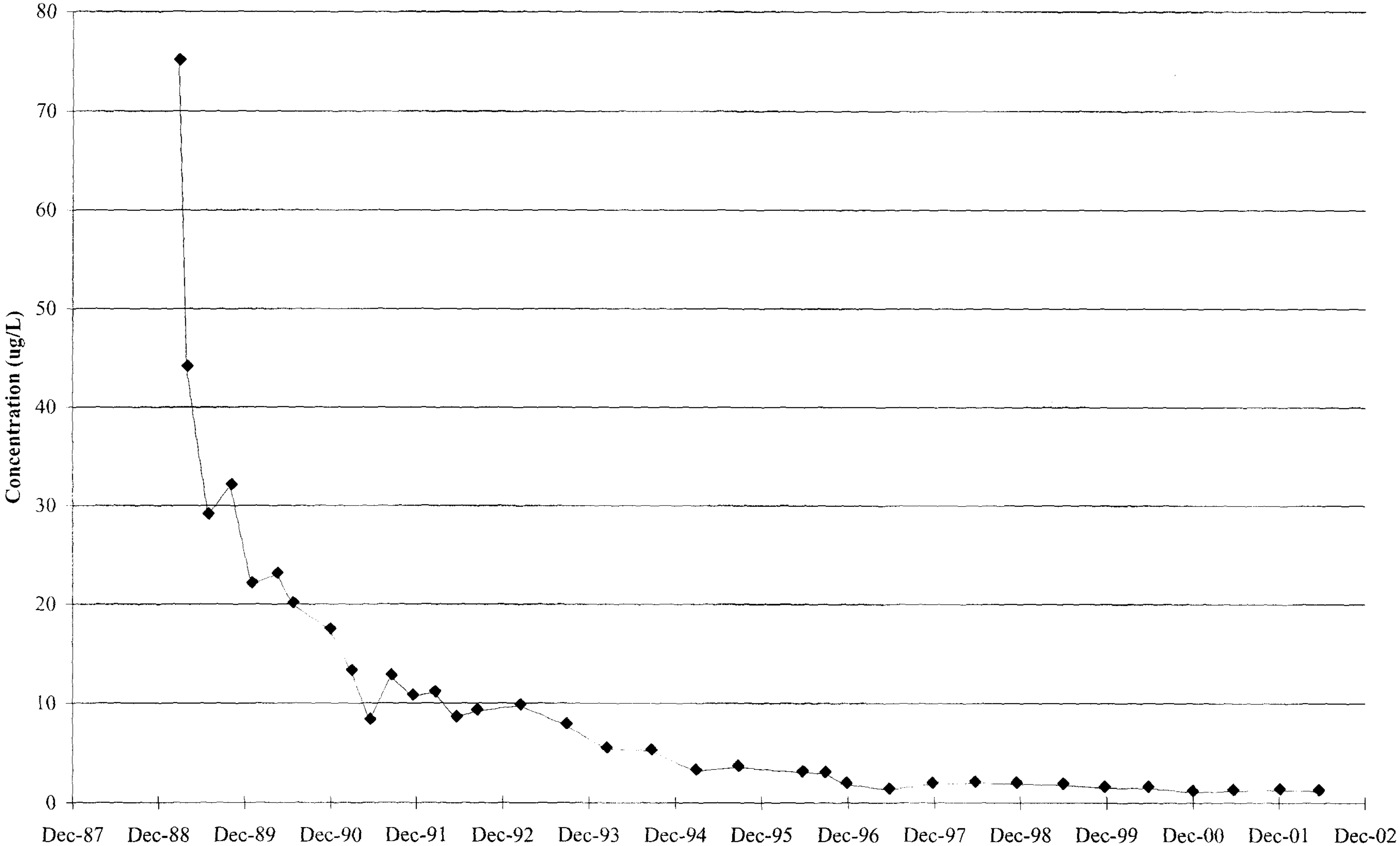


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B7 - TRCLE VS. TIME

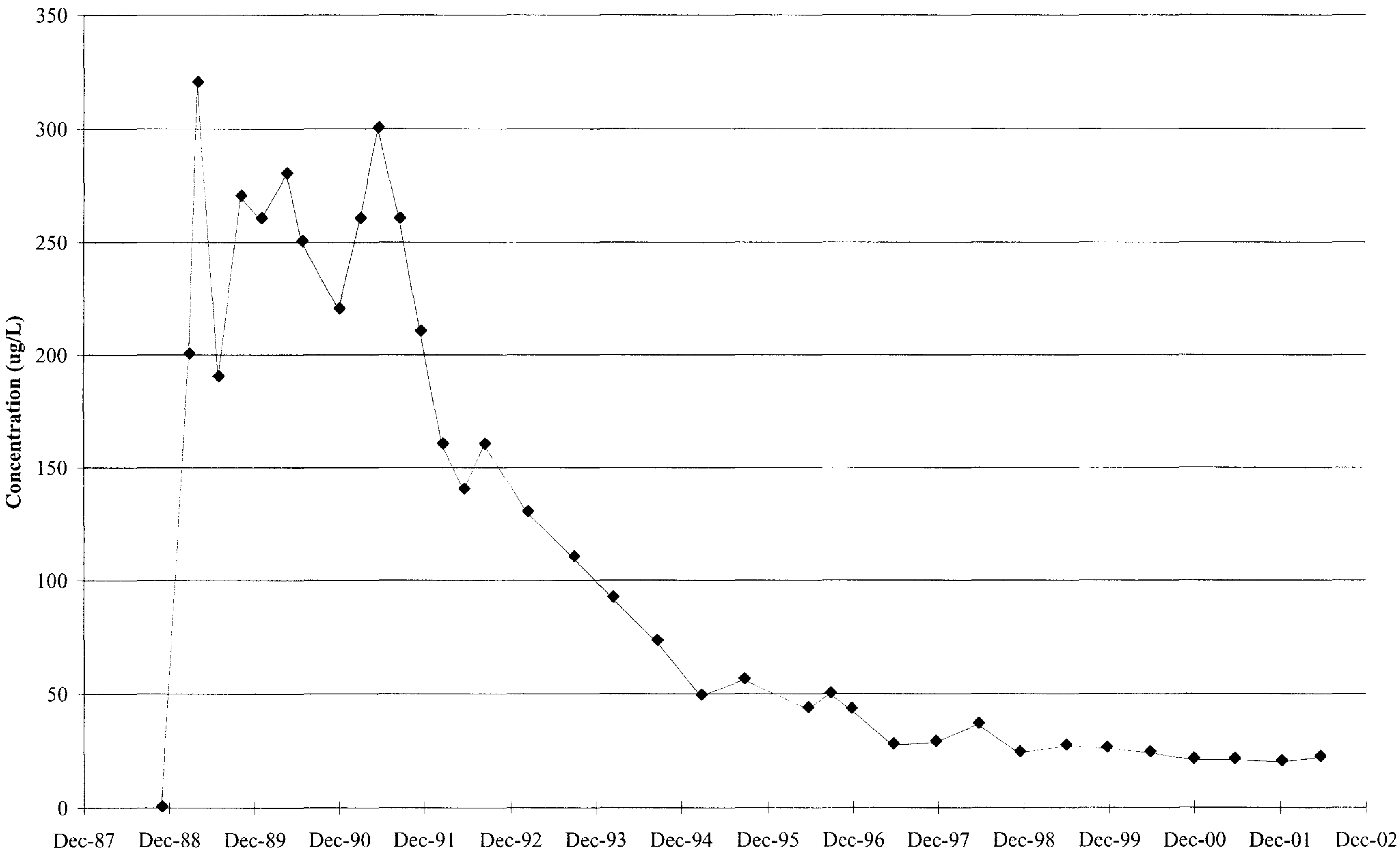


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B8 - TRCLE VS. TIME

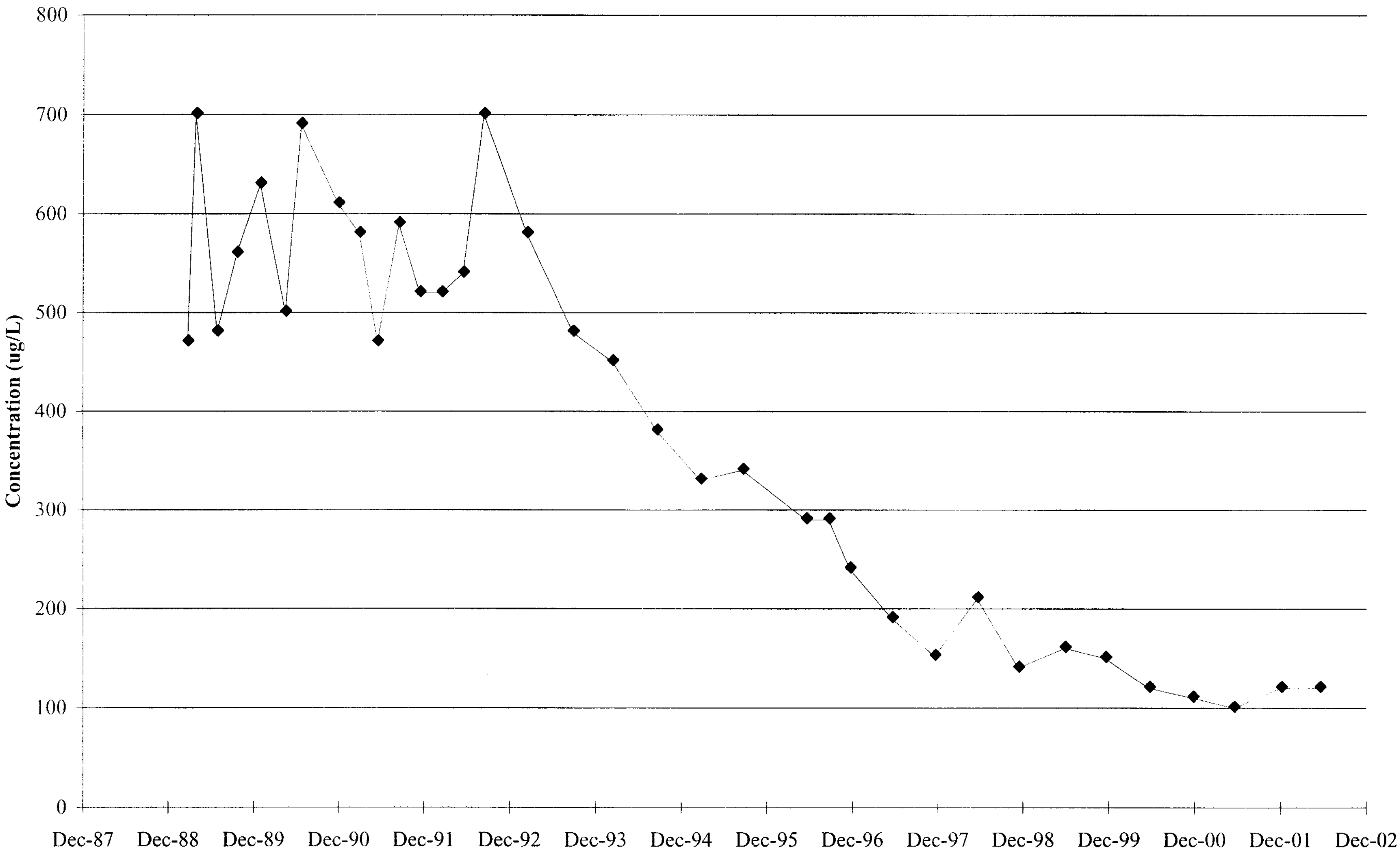


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B9 - TRCLE VS. TIME

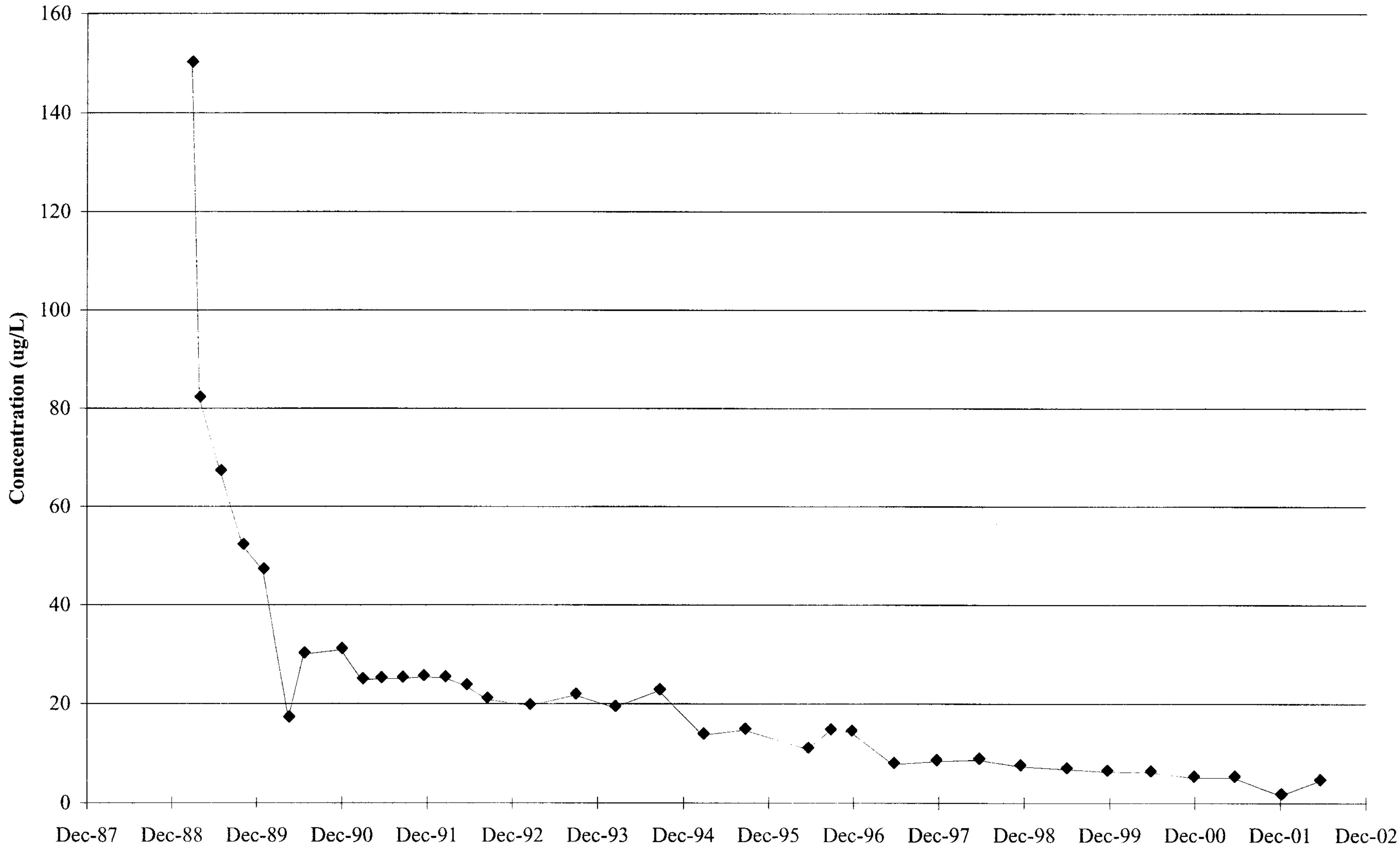


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B10 - TRCLE VS. TIME

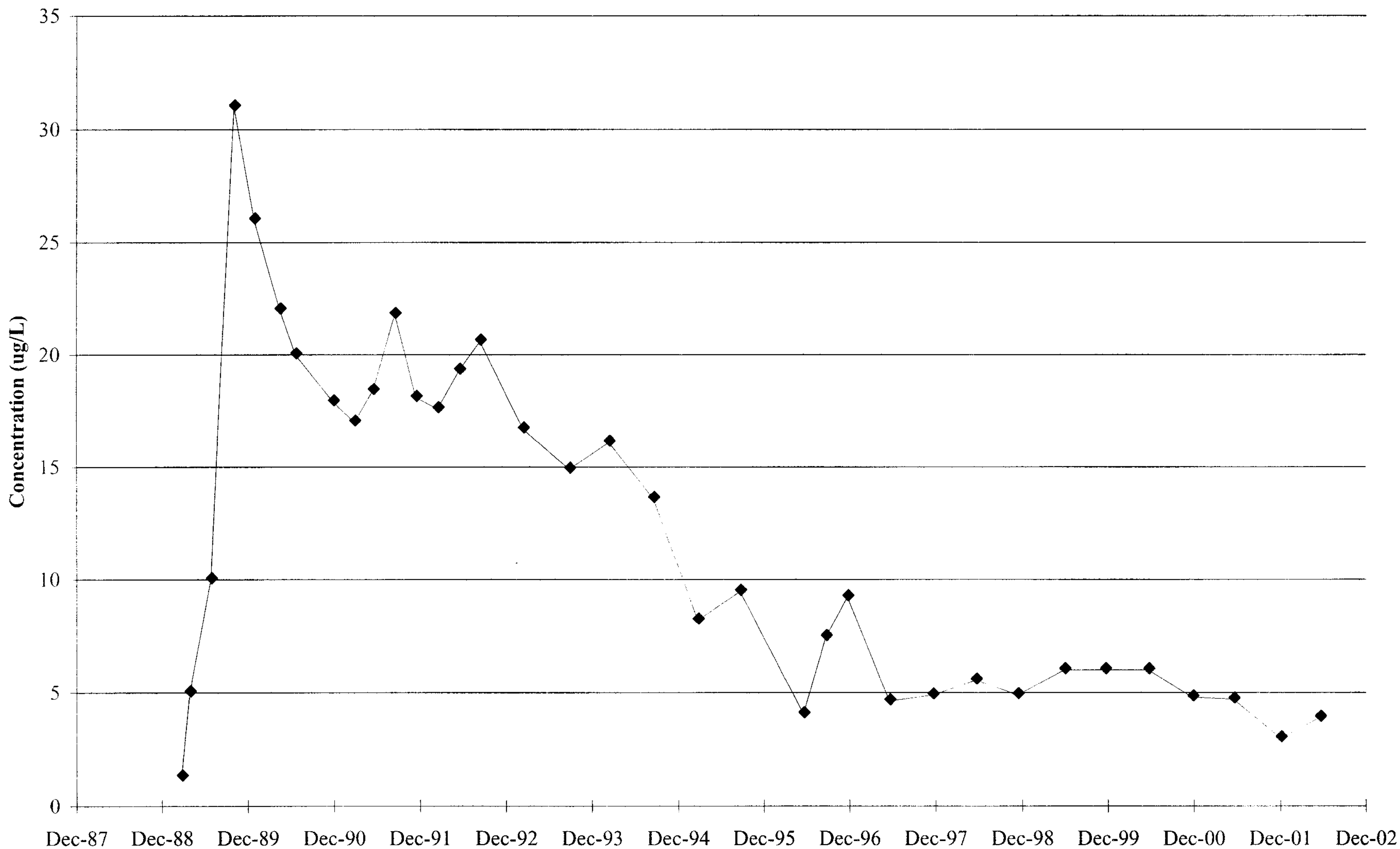


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B11 - TRCLE VS. TIME

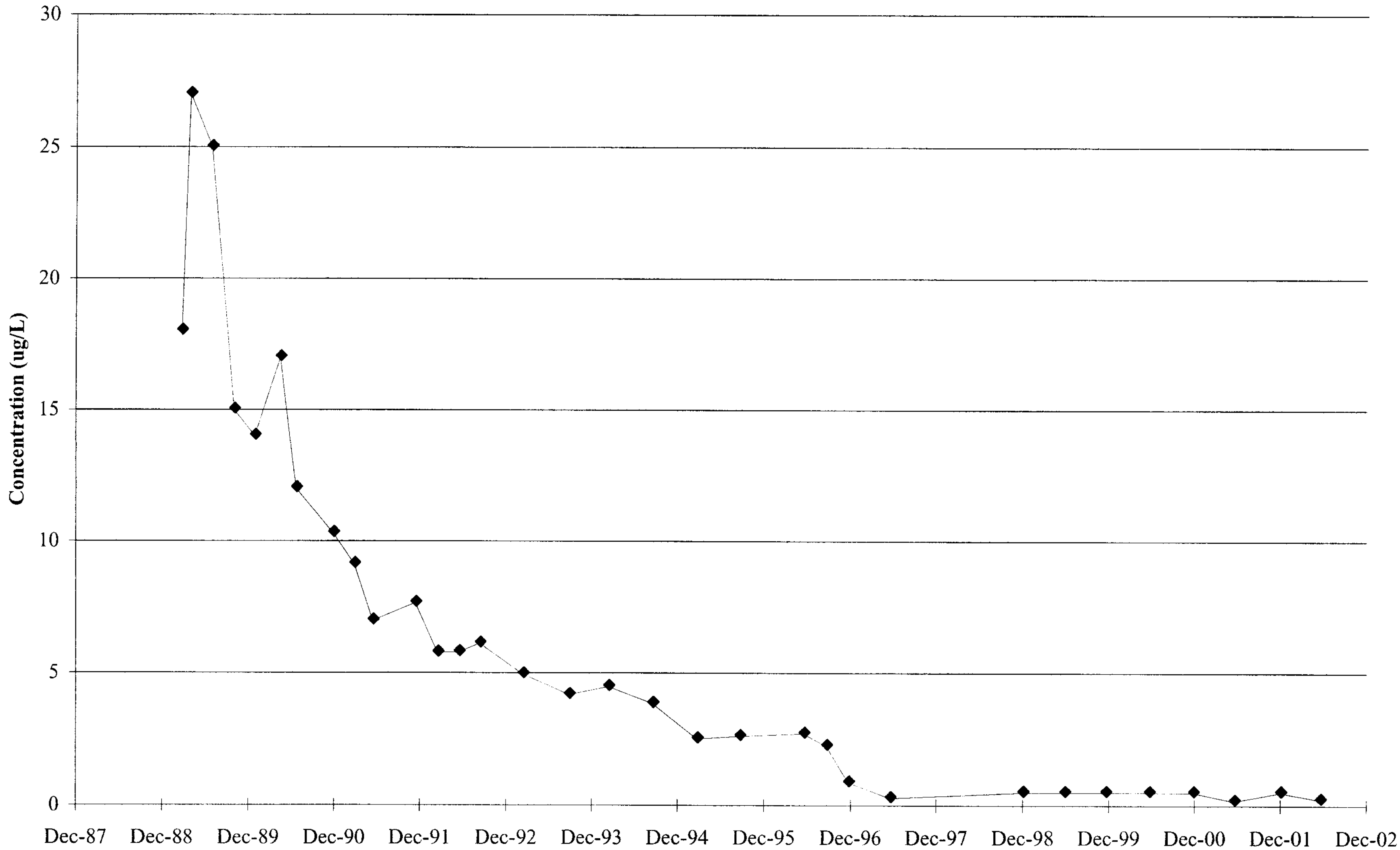


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL B12 - TRCLE VS. TIME

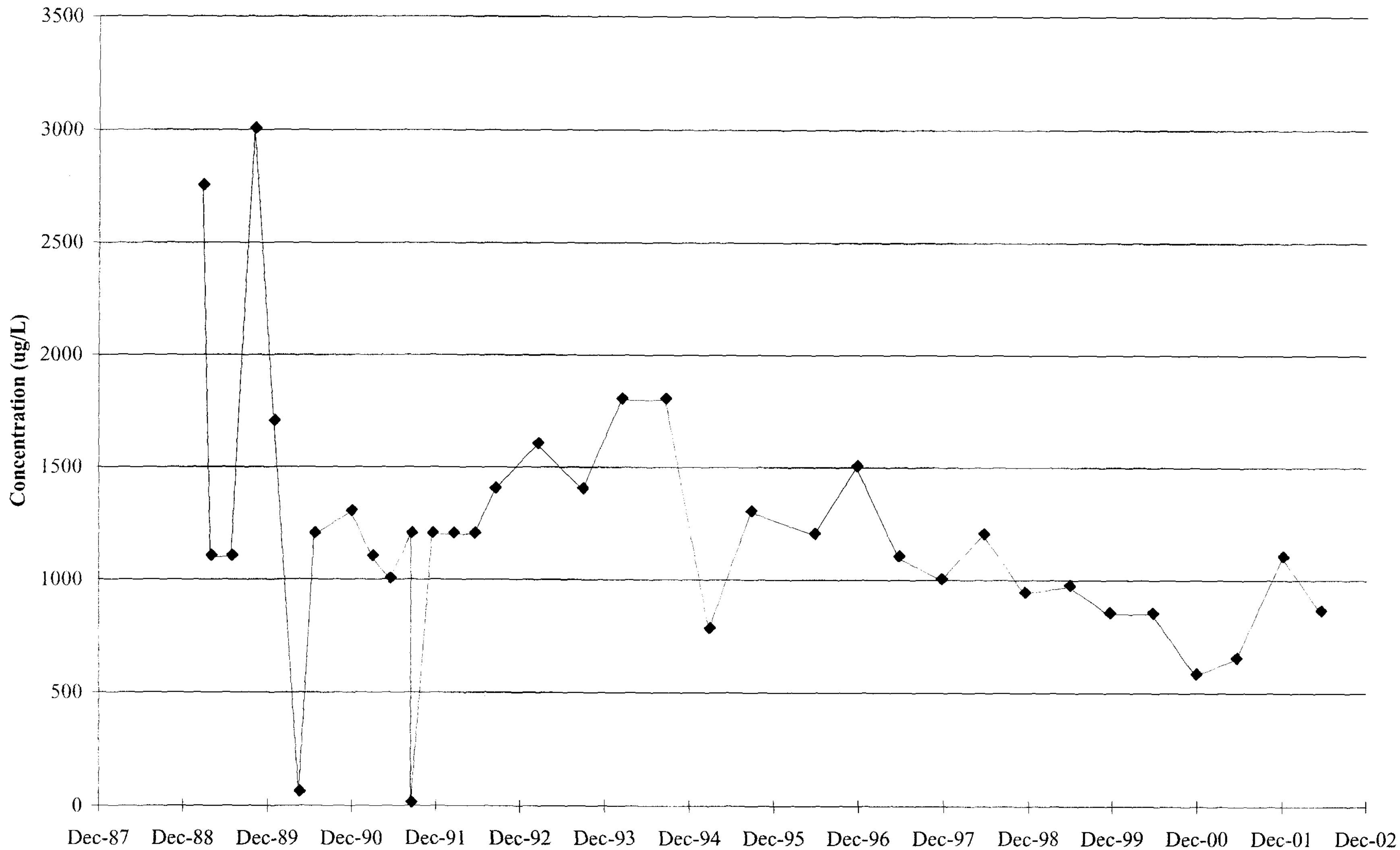


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL SC1 - TRCLE VS. TIME

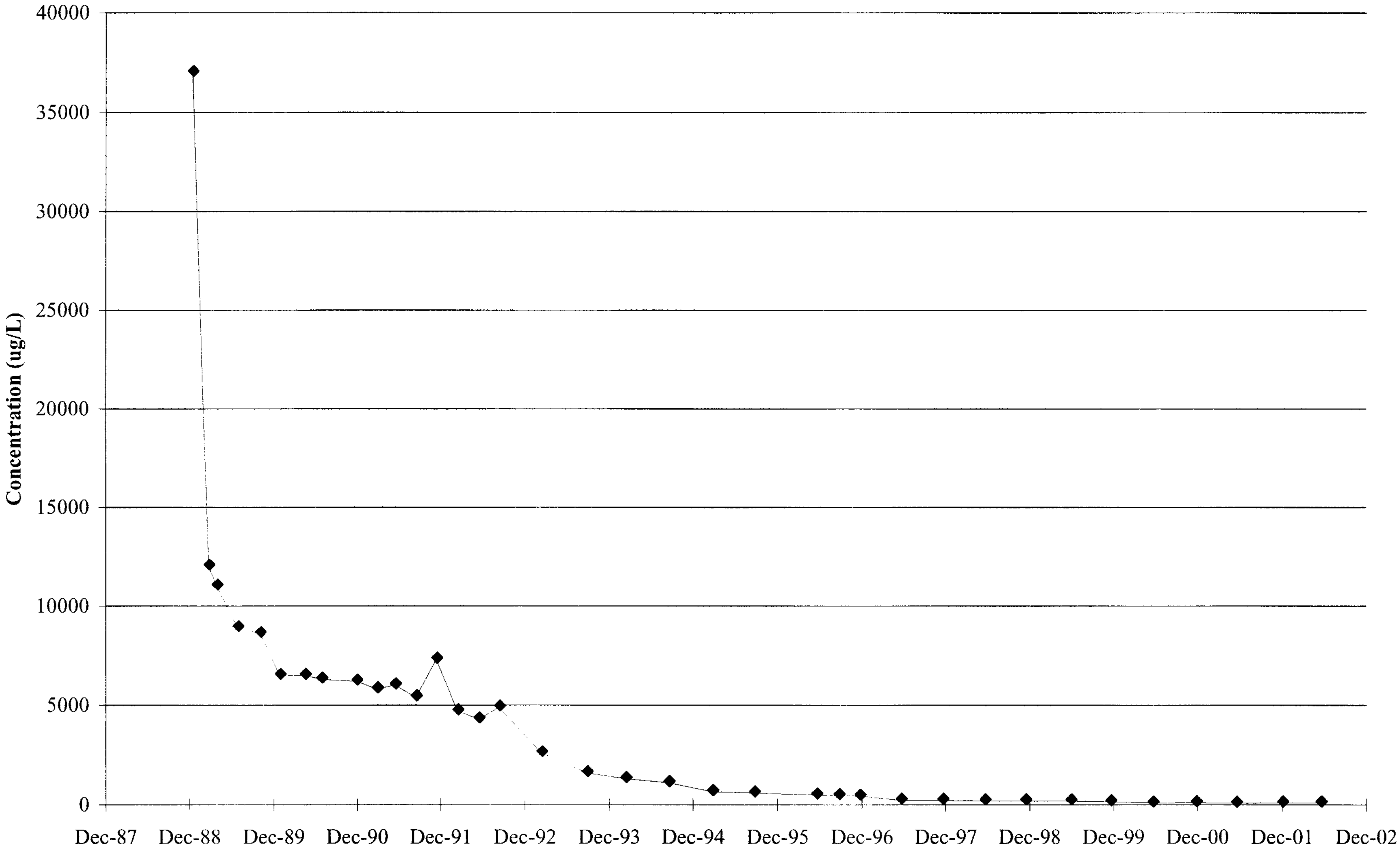


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELLSC2 - TRCLE VS. TIME

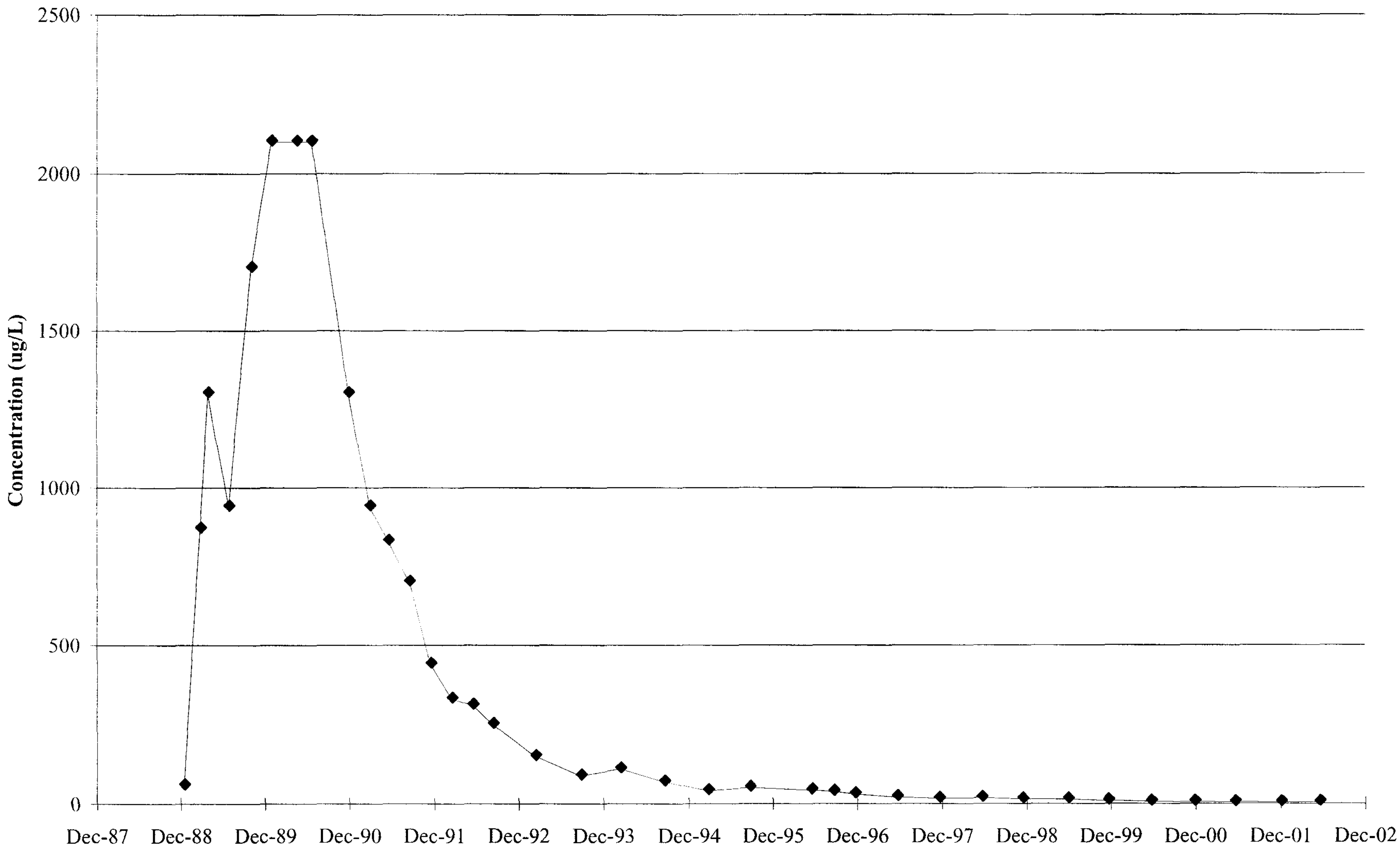


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL SC3 - TRCLE VS. TIME

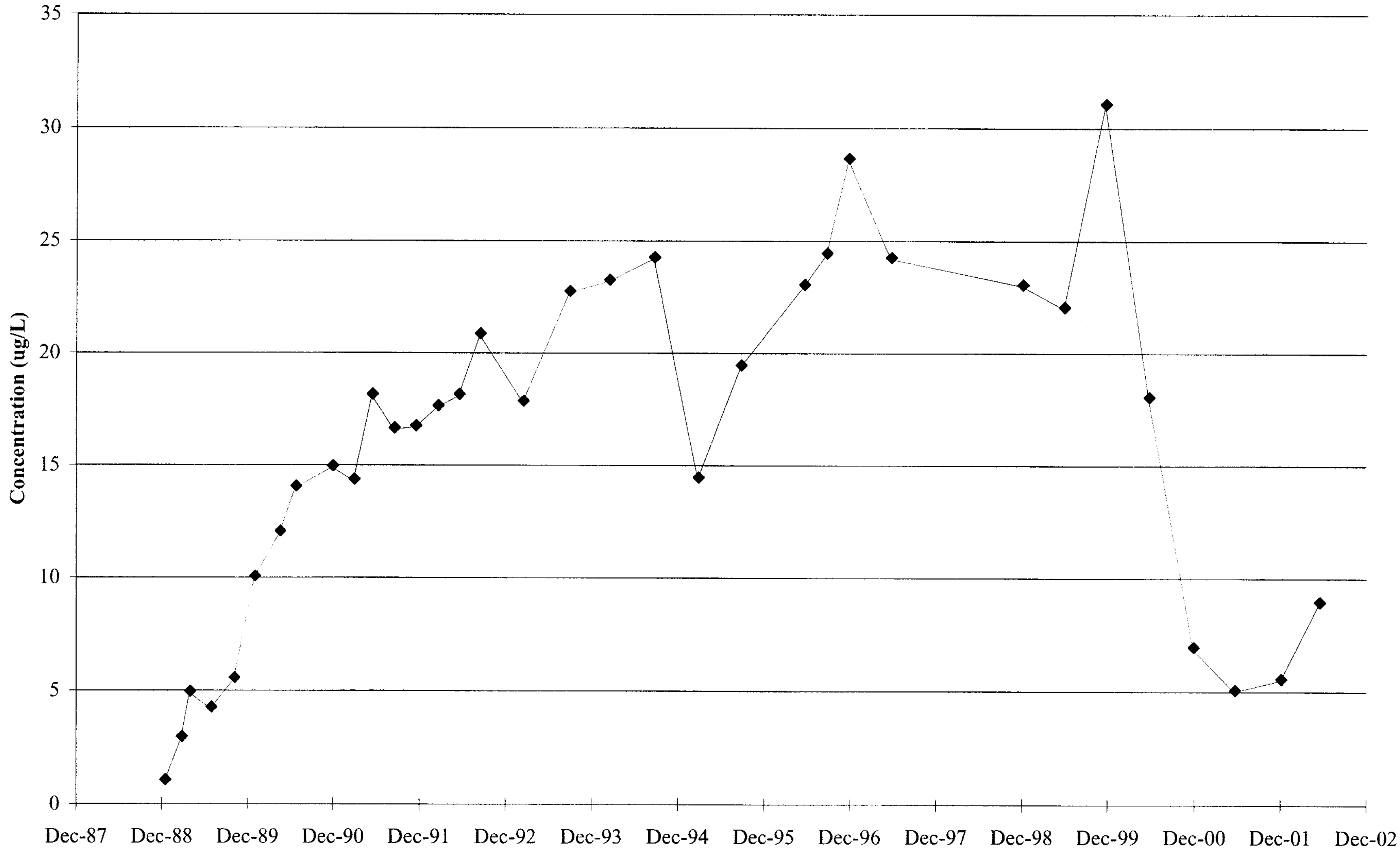


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL SC4 - TRCLE VS. TIME

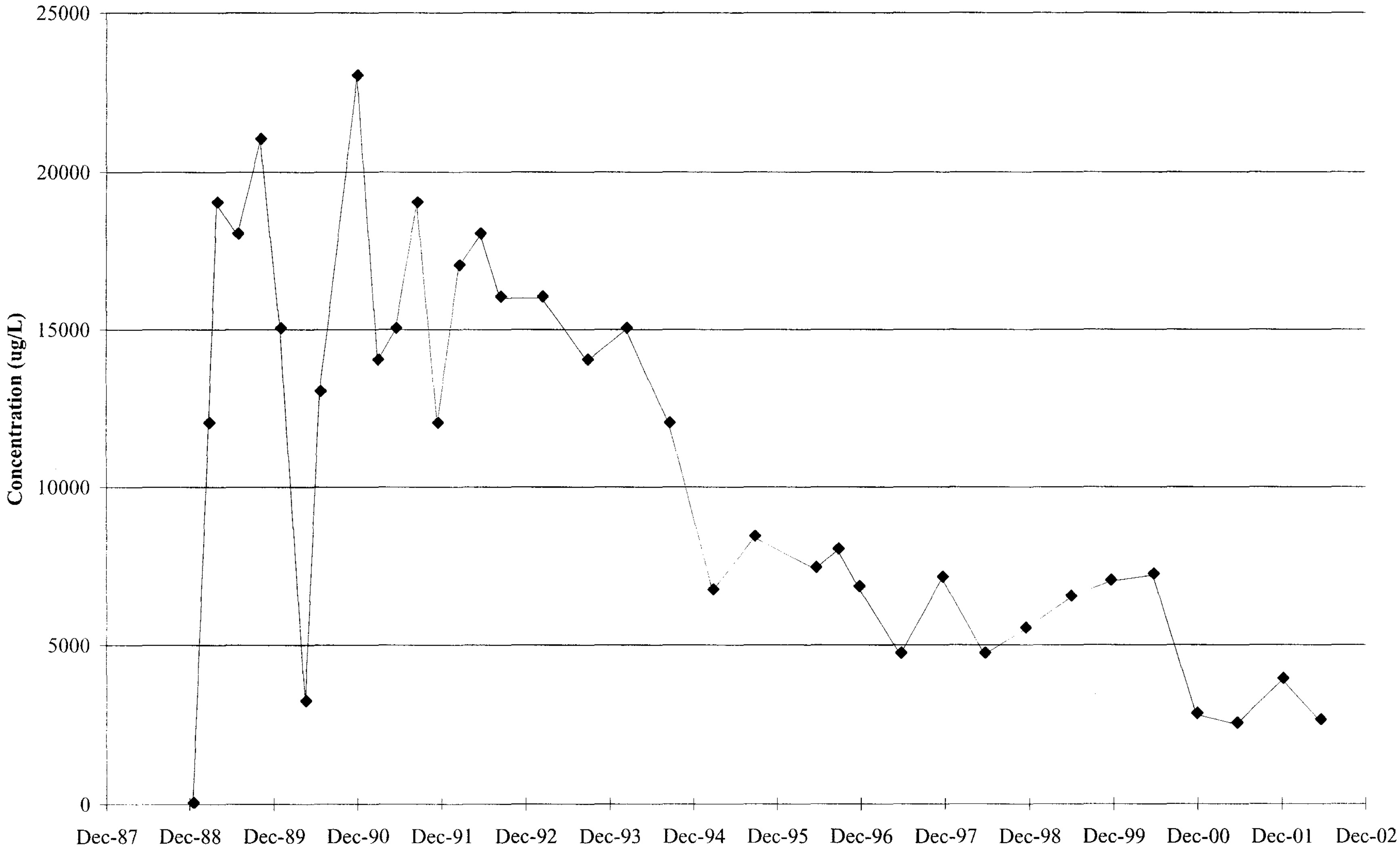


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-1

EXTRACTION WELL SC5 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 17520 (2)

APPENDIX G-2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	111TCE	112TCE	11DCLE	11DCE	12DCLE	CCL4	CHCL3	C12DCE	TCLTFE	CH2CL2	TCLEE	T12DCE	TRCLE	C2H3CL
Effluent	10/2/01	< 1	< 1	0.13 JP	< 1	< 1	< 1	< 1	0.14 JP	< 1	< 1 U	< 1	< 1	1.5	< 1
Effluent	10/2/01	< 1 D	< 1 D	0.13 JPD	< 1 D	< 1 D	< 1 D	< 1 D	0.15 JPD	< 1 D	< 1 UD	< 1 D	< 1 D	1.5 D	< 1 D
Effluent	11/6/01	< 1	< 1	0.13 JP	< 1	< 1	< 1	< 1	0.15 JP	< 1	< 1 U	< 1	< 1	1.9	< 1
Effluent	11/6/01	< 1 D	< 1 D	0.13 JPD	< 1 D	< 1 D	< 1 D	< 1 D	0.16 JPD	< 1 D	< 1 UD	< 1 D	< 1 D	1.9 D	< 1 D
Effluent	12/20/01	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	< 1 U	< 1
Effluent	12/20/01	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 UD	< 1 D	< 1 D	< 1 UD	< 1 D
Effluent	1/8/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	< 1 U	< 1
Effluent	1/8/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 UD	< 1 D	< 1 D	< 1 UD	< 1 D
Effluent	2/6/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	0.12 JP	< 1
Effluent	2/6/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 UD	< 1 D	< 1 D	0.12 JPD	< 1 D
Effluent	3/5/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.09 JP	< 1
Effluent	3/5/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 UD	< 1 D	< 1 D	0.1 JPD	< 1 D
Effluent	4/2/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.11 JP	< 1
Effluent	4/2/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	0.11 JPD	< 1 D
Effluent	5/7/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Effluent	5/7/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	0.1 JPD	< 1 D
Effluent	6/4/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 U	< 1	< 1	0.2 JP	< 1
Effluent	6/4/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 UD	< 1 D	< 1 D	0.15 JPD	< 1 D
Effluent	7/25/02	0.11 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.1	< 1
Effluent	7/25/02	0.11 JPD	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	0.97 JPD	< 1 D
Effluent	8/7/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Effluent	8/7/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D
Effluent	9/6/02	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Effluent	9/6/02	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D
Influent	10/2/01	70	0.37 JP	8.8	7.2	0.23 JP	< 1	< 1	4.4	< 1	< 1 U	0.64 JP	< 1	360	< 1
Influent	11/6/01	58	0.22 JP	6.2	5.8	0.26 JP	< 1	0.09 JP	3.6	< 1	< 1 U	0.55 JP	< 1	310	< 1
Influent	12/20/01	61	0.36 JP	7.2	6.9	0.21 JP	< 1	0.12 JP	4.3	< 1	< 1 U	0.7 JP	< 1	330	< 1
Influent	1/8/02	50	0.34 JP	7.2	6.7	0.22 JP	< 1	0.1 JP	3.9	< 1	< 1 U	0.55 JP	< 1	290	< 1
Influent	2/6/02	66	0.53 JP	6.7	6.3	0.27 JP	< 1	0.11 JP	3.8	< 1	< 1 U	0.64 JP	< 1	310	< 1
Influent	3/5/02	61	< 1	6.7	6.5	0.21 JP	< 1	0.12 JP	3.9	< 1	< 1 U	0.65 JP	< 1	310	< 1
Influent	4/2/02	51	0.48 JP	6.3	5.6	0.21 JP	< 1	0.1 JP	4	< 1	< 1	0.54 JP	< 1	280	< 1
Influent	5/7/02	47	0.31 JP	6.4	6	0.21 JP	< 1	0.1 JP	4	< 1	< 1	0.58 JP	< 1	300	< 1
Influent	6/4/02	50	0.41 JP	5.7	5.3	0.21 JP	< 1	< 1 U	3.6	< 1	< 1 U	0.54 JP	< 1	260	< 1
Influent	7/25/02	50	0.36 JP	6.2	6.1	0.18 JP	< 1	0.11 JP	3	< 1	< 1	0.68 JP	< 1	250	< 1
Influent	8/7/02	43	0.28 JP	5.4	5.2	0.15 JP	< 1	0.1 JP	3.6	< 1	< 1 U	0.53 JP	< 1	210	< 1
Influent	9/6/02	69	< 1	7.2	6.8	< 1	< 1	0.16 JP	4.2	< 1	< 1	0.75 JP	< 1	290	< 1

Notes:

D - Duplicate Analysis

J - Value is estimated

P - Results less than reporting level but greater than instrument detection limit.

U - The analyte is non-detect with the associated value being the quantitation limit.

APPENDIX H-1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	3/30/94	3/31/94	4/10/94	4/17/94	4/18/94 (AM)	4/18/94 (noon)	4/18/94 (PM)	4/19/94
03U673	897.84	843.91	844.33	844.11	843.94	844.70	844.74	844.74	844.10
03L673	898.44	843.01	843.37	843.15	842.99	843.94	843.95	843.86	843.12
04U673	898.34	843.16	843.54	843.32	843.16	844.13	844.13	844.04	843.29
03U832	886.82	834.71	835.06	834.98	835.03	835.52	835.54	835.43	834.87
03L832	886.85	834.58	834.90	834.89	834.95	835.40	835.42	835.27	834.71
04U832	885.31	834.45	834.74	834.79	835.29	835.29	835.29	835.11	834.59
03L841	911.91	842.37	842.76	842.53	842.26	843.29	843.31	843.21	842.42
04U841	912.47	842.56	842.91	842.70	842.45	843.50	843.52	843.42	842.59
04U844	886.74	834.39	834.72	834.69	834.76	835.23	835.24	835.08	834.47
04U845	894.91	- -	836.46	836.43	836.43	836.99	836.98	836.84	836.26
03L846	888.54	- -	- -	- -	832.63	832.95	832.89	832.81	832.48
04U846	889.46	831.87	831.96	832.13	832.31	832.56	832.06	831.91	831.51
03M848	904.12	840.95	841.39	841.15	841.02	841.77	841.80	841.79	841.15
03L848	903.91	841.44	841.84	841.61	841.47	842.28	842.30	842.27	841.58
04U848	903.92	842.18	842.57	842.37	842.18	843.11	843.15	843.07	842.32
04U851	914.51	831.29	831.38	831.63	831.81	832.05	831.69	831.44	830.98
04U852	905.66	829.18	829.28	829.61	829.76	830.03	829.71	829.40	828.94
03L854	892.41	838.39	838.88	838.58	838.55	839.16	839.19	839.21	838.66
04U854	891.95	834.73	835.14	835.20	835.27	835.66	835.71	835.50	834.97
03L859	903.55	838.96	839.48	839.16	839.08	839.77	839.79	839.79	839.21
04U859	903.73	841.83	842.22	841.98	841.81	842.75	842.78	842.68	841.93
03L860	896.79	838.65	839.10	838.83	838.81	839.43	839.45	839.45	838.92
04U860	896.61	834.70	835.04	835.11	835.18	835.61	835.61	835.46	834.89
03L861	891.35	836.95	837.47	837.18	837.15	837.77	837.80	837.80	837.24
04U861	890.91	834.90	835.25	835.28	835.31	835.77	835.76	835.61	835.06
04U863	895.33	834.31	834.59	834.67	834.79	835.13	835.13	834.93	834.44
04U864	908.67	832.60	832.70	832.91	833.07	833.25	832.07	831.80	831.30
04J864	908.79	827.76	828.03	828.45	829.15	829.53	829.42	829.15	828.31
04U865	915.60	833.15	833.30	833.45	833.63	833.83	832.46	832.16	831.66
04U866	910.60	831.97	832.05	832.27	832.44	832.60	831.25	830.96	830.51
04J866	910.69	828.46	828.73	829.14	829.87	830.19	830.07	829.79	828.94
04U877	923.08	831.31	831.30	831.57	831.77	831.95	831.53	831.34	830.95
MPCA1L3	898.25	- -	838.03	837.71	837.65	838.30	838.35	838.34	837.76
MPCA1U4	898.60	- -	836.33	836.18	836.13	836.74	836.75	836.68	836.08
MPCA2L3	872.05	- -	833.60	833.59	833.68	834.10	833.95	833.83	833.33
MPCA2U4	872.19	- -	832.71	832.78	832.93	833.29	832.99	832.85	832.39
414U4	893.95	834.05	834.33	834.45	834.61	834.94	834.85	834.61	834.10
MW15H	911.52	- -	834.81	834.67	834.77	835.28	835.27	835.23	834.61
NB WELL 13	914.66	- -	- -	- -	- -	- -	820.66	- -	824.16

APPENDIX H-1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	4/20/94	4/21/94	4/22/94	4/25/94	4/26/94	4/28/94	4/29/94	5/2/94	5/9/94
03U673	897.84	844.00	844.04	844.13	844.67	844.90	843.92	843.92	844.20	844.37
03L673	898.44	843.09	843.09	843.17	843.58	843.76	842.98	842.94	843.21	843.27
04U673	898.34	843.27	843.26	843.34	843.73	843.91	843.15	843.11	843.38	843.43
03U832	886.82	834.98	835.08	835.17	835.37	835.44	834.81	834.82	835.25	835.04
03L832	886.85	834.85	834.99	835.07	835.24	835.28	834.64	834.70	835.13	834.91
04U832	885.31	834.74	834.89	834.98	835.12	835.15	834.50	834.61	835.02	834.81
03L841	911.91	842.39	842.39	842.50	842.90	843.10	842.28	842.26	842.52	842.56
04U841	912.47	842.59	842.56	842.67	843.03	843.22	842.45	842.44	842.69	842.72
04U844	886.74	834.64	834.76	834.83	835.01	835.00	834.39	834.45	834.86	834.65
04U845	894.91	836.38	836.47	836.53	836.80	836.84	836.20	836.30	836.69	836.51
03L846	888.54	832.63	832.71	832.72	832.83	832.87	832.39	832.44	832.69	832.45
04U846	889.46	832.16	832.27	832.22	832.31	832.01	831.32	831.91	832.15	831.68
03M848	904.12	841.11	841.15	841.25	841.69	841.90	841.04	841.02	841.30	841.41
03L848	903.91	841.55	841.59	841.70	842.11	842.31	841.46	841.45	841.72	841.81
04U848	903.92	842.29	842.28	842.42	842.80	842.96	842.20	842.17	842.42	842.46
04U851	914.51	831.45	831.70	831.65	831.76	831.66	830.84	830.88	831.60	831.26
04U852	905.66	829.32	829.49	829.41	829.59	829.48	828.93	828.86	829.51	829.29
03L854	892.41	838.62	838.70	838.93	839.27	839.51	838.57	838.58	838.88	839.03
04U854	891.95	835.11	835.22	835.40	835.49	835.52	834.87	835.10	835.49	835.23
03L859	903.55	839.16	838.72	839.47	839.77	840.02	839.09	839.08	839.40	839.50
04U859	903.73	841.92	841.92	842.12	842.39	842.59	841.78	841.79	842.05	842.08
03L860	896.79	838.89	838.94	839.06	839.52	839.72	838.84	838.81	839.12	839.28
04U860	896.61	835.08	835.21	835.23	835.46	835.39	834.84	835.00	835.35	835.11
03L861	891.35	837.21	837.29	837.54	837.83	838.04	837.14	837.15	837.47	837.54
04U861	890.91	835.22	835.36	835.49	835.60	835.62	835.00	835.13	835.53	835.30
04U863	895.33	834.63	834.70	834.88	835.06	834.94	834.38	834.40	834.95	834.73
04U864	908.67	832.26	833.04	833.04	833.16	832.61	831.25	831.28	832.89	832.27
04J864	908.79	828.54	828.52	828.28	828.45	828.25	828.26	827.87	828.51	828.76
04U865	915.60	832.80	833.64	833.69	833.79	832.15	831.59	831.62	833.75	832.68
04U866	910.60	831.60	832.40	832.39	832.46	830.94	830.35	830.44	832.08	831.65
04J866	910.69	829.23	829.21	829.22	829.13	828.84	828.98	828.54	829.17	829.48
04U877	923.08	831.54	831.71	831.64	831.76	831.58	830.62	830.83	831.45	831.11
MPCA1L3	898.25	837.73	837.81	838.02	838.33	838.54	837.63	837.64	837.97	838.01
MPCA1U4	898.60	836.14	836.20	836.36	836.57	836.67	835.95	836.02	836.38	836.19
MPCA2L3	872.05	833.60	833.74	833.74	833.88	833.91	833.25	833.32	833.77	833.45
MPCA2U4	872.19	832.83	832.93	832.93	832.98	832.94	832.24	832.41	832.89	832.52
414U4	893.95	834.37	834.59	834.65	834.82	834.60	834.02	834.04	834.72	834.45
MW15H	911.52	834.72	834.83	834.92	835.14	835.24	834.60	834.62	835.04	834.76
NB WELL 13	914.66	829.86	- -	832.78	- -	822.66	822.16	822.21	822.66	830.87

APPENDIX H-1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	5/16/94	5/23/94	6/20/94	7/19/94	10/10/94	1/27/95	3/6/95	6/21/95 8:00 A.M.	9/5/95
03U673	897.84	843.97	844.35	844.01	845.00	843.06	843.42	843.31	843.59	842.55
03L673	898.44	842.91	843.20	842.81	844.33	842.23	842.24	842.12	842.76	841.34
04U673	898.34	843.08	843.34	842.95	843.93	842.43	842.39	842.24	842.96	841.49
03U832	886.82	834.44	834.31	833.55	833.48	832.65	833.36	833.24	833.02	832.57
03L832	886.85	834.31	834.14	833.33	833.25	832.49	833.20	833.48	832.82	832.40
04U832	885.31	834.19	833.99	833.19	833.09	832.39	833.07	833.14	832.63	832.27
03L841	911.91	842.26	842.50	842.10	843.37	841.48	841.55	841.42	842.03	840.53
04U841	912.47	842.39	842.60	842.20	843.55	841.71	841.65	841.53	842.23	840.69
04U844	886.74	834.05	833.90	833.18	833.20	832.29	833.09	833.16	832.59	832.22
04U845	894.91	835.93	835.83	835.16	835.29	834.23	834.94	834.94	834.64	834.06
03L846	888.54	832.07	831.96	831.16	830.78	830.16	830.74	830.92	830.62	830.20
04U846	889.46	831.18	830.91	830.06	829.74	829.44	830.11	830.23	829.35	829.25
03M848	904.12	841.01	841.31	840.84	841.46	839.75	840.21	840.14	840.39	839.38
03L848	903.91	841.40	841.69	841.18	841.95	840.28	840.62	frozen	840.91	840.48
04U848	903.92	842.10	842.36	841.94	843.02	841.27	841.40	841.27	841.82	840.49
04U851	914.51	830.60	830.23	829.20	829.01	828.85	829.72	829.87	828.58	828.55
04U852	905.66	828.53	827.90	plugged	826.62	826.83	827.91	828.13	826.08	826.04
03L854	892.41	838.55	838.81	838.26	838.30	836.93	837.56	837.59	837.56	836.87
04U854	891.95	834.58	834.44	833.63	833.60	832.83	833.52	833.54	833.00	832.68
03L859	903.55	839.04	839.30	838.79	839.07	837.48	838.14	838.15	838.12	837.33
04U859	903.73	841.71	841.92	841.51	842.57	840.83	840.96	840.88	841.42	840.09
03L860	896.79	838.78	839.09	838.51	838.54	837.22	837.86	837.84	837.83	837.11
04U860	896.61	834.47	834.31	833.57	833.41	832.75	833.38	833.43	832.98	832.57
03L861	891.35	836.99	837.17	836.55	836.54	835.25	835.99	836.03	835.86	835.23
04U861	890.91	834.71	834.53	833.78	833.76	832.97	833.63	833.66	833.20	832.80
04U863	895.33	834.02	833.82	832.92	832.79	832.18	832.85	832.95	832.42	832.09
04U864	908.67	830.77	830.76	829.72	829.55	829.07	829.71	829.88	829.10	829.01
04J864	908.79	827.29	826.49	825.46	825.93	825.04	826.81	826.92	824.22	824.77
04U865	915.60	831.35	831.14	830.22	830.04	829.54	830.14	830.24	829.50	829.33
04U866	910.60	830.15	829.96	828.90	828.72	828.28	828.97	829.22	828.24	828.14
04J866	910.69	827.90	827.25	826.26	826.71	825.71	827.46	827.57	825.13	825.55
04U877	923.08	830.61	830.30	829.34	828.98	828.84	829.50	829.76	828.63	828.71
MPCA1L3	898.25	837.51	837.70	837.13	837.27	835.82	836.58	836.59	836.45	835.79
MPCA1U4	898.60	835.69	835.64	835.03	835.22	834.05	834.74	834.80	834.49	833.89
MPCA2L3	872.05	832.93	832.75	831.94	831.81	831.12	831.89	831.93	831.43	831.08
MPCA2U4	872.19	831.96	831.78	830.93	830.71	830.14	830.91	830.99	830.31	830.07
414U4	893.95	833.68	833.44	832.55	832.43	831.91	832.59	832.67	832.03	830.77
MW15H	911.52	834.14	834.12	833.30	833.12	832.36	833.11	833.19	832.85	832.41
NB WELL 13	914.66	821.81	- -	820.58	820.26	819.41	819.66	819.66	819.66	819.66

APPENDIX H-1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	12/14/95	3/5/96	5/28/96	9/16/96	12/3/96	5/30/97	9/2/97	12/6/97	6/1/98
03U673	897.84	843.33	843.28	843.84	842.44	842.16	842.39	- -	842.03	843.33
03L673	898.44	842.14	842.23	842.84	840.97	840.99	841.06	- -	840.99	842.11
04U673	898.34	842.29	842.38	843.00	841.08	841.13	841.21	- -	841.19	842.30
03U832	886.82	833.26	833.55	834.26	831.27	832.31	831.36	- -	- -	- -
03L832	886.85	833.11	833.40	834.55	831.09	832.16	831.22	- -	- -	- -
04U832	885.31	832.97	833.27	833.89	830.93	832.04	831.11	- -	831.76	832.38
03L841	911.91	841.48	841.47	842.13	840.18	840.31	840.34	- -	- -	- -
04U841	912.47	841.59	841.63	842.30	840.27	840.48	840.42	- -	- -	- -
04U844	886.74	833.00	833.26	833.75	830.99	832.02	831.23	- -	- -	- -
04U845	894.91	834.87	835.07	835.70	832.94	833.93	833.23	- -	833.74	834.46
03L846	888.54	830.51	830.94	831.51	828.83	829.46	828.41	- -	- -	- -
04U846	889.46	829.69	830.08	830.17	827.71	828.49	827.60	- -	- -	- -
03M848	904.12	840.18	frozen	840.85	838.97	839.01	838.99	- -	838.80	839.95
03L848	903.91	840.61	frozen	841.28	839.39	frozen	839.40	- -	839.27	840.41
04U848	903.92	841.33	frozen	841.99	840.08	840.22	840.18	- -	840.17	841.20
04U851	914.51	829.49	829.91	829.86	827.25	828.46	827.97	- -	827.93	828.61
04U852	905.66	827.66	828.16	827.76	obstructed	obstructed	- -	- -	826.57	826.74
03L854	892.41	837.63	837.65	838.41	836.06	836.38	836.20	- -	836.10	837.29
04U854	891.95	833.46	833.71	834.36	831.41	832.56	831.68	- -	832.44	832.98
03L859	903.55	838.14	838.13	838.95	836.53	836.68	836.77	- -	836.62	837.81
04U859	903.73	840.95	841.00	841.63	839.47	839.84	839.82	- -	839.83	840.97
03L860	896.79	837.90	837.92	838.66	836.58	836.68	836.49	- -	836.39	837.46
04U860	896.61	833.40	833.59	834.30	831.38	832.53	831.41	- -	832.33	832.81
03L861	891.35	836.03	836.09	836.89	834.22	834.79	834.41	- -	834.47	835.53
04U861	890.91	833.59	833.75	834.45	831.56	832.65	831.79	- -	832.43	833.09
04U863	895.33	832.76	833.14	833.75	830.86	831.88	830.92	- -	831.80	832.33
04U864	908.67	829.50	829.97	830.23	827.63	828.59	828.68	- -	828.02	828.87
04J864	908.79	827.23	827.49	826.50	823.55	825.99	825.07	- -	826.32	826.40
04U865	915.60	829.67	830.41	830.63	827.84	829.01	829.05	- -	828.57	829.30
04U866	910.60	828.40	829.06	829.14	826.74	827.43	826.23	- -	826.30	827.42
04J866	910.69	827.80	828.07	827.17	824.83	826.54	825.76	- -	826.80	827.02
04U877	923.08	829.14	829.53	829.48	827.06	827.85	827.45	- -	- -	- -
MPCA1L3	898.25	836.58	836.63	837.35	834.80	835.34	835.04	- -	- -	- -
MPCA1U4	898.60	834.68	834.85	835.45	832.73	833.66	832.99	- -	- -	- -
MPCA2L3	872.05	831.63	832.03	832.55	829.74	830.62	829.66	- -	- -	- -
MPCA2U4	872.19	830.62	830.99	831.36	828.69	829.54	828.58	- -	- -	- -
414U4	893.95	832.48	832.90	833.36	830.57	831.64	830.72	830.40	831.64	832.12
MW15H	911.52	833.02	833.34	834.10	831.10	832.11	831.08	- -	831.66	832.36
NB WELL 13	914.66	816.10	820.01	819.66	819.66	818.33	827.94	- -	816.59	816.21

APPENDIX H-1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	5/27/99	12/20/99	3/9/00	6/5/00	9/5/00	12/18/00	3/13/01	6/1/01	9/4/01
03U673	897.84	843.14	--	--	--	--			842.22	--
03L673	898.44	841.91	--	--	--	--			841.11	--
04U673	898.34	842.06	--	--	--	--			841.25	--
03U832	886.82	--	--	--	--	--			832.62	--
03L832	886.85	832.03	--	--	--	--			832.46	--
04U832	885.31	832.02	--	--	--	--			832.40	--
03L841	911.91	--	--	--	--	--			--	--
04U841	912.47	--	--	--	--	--			--	--
04U844	886.74	--	--	--	--	--			--	--
04U845	894.91	834.19	--	--	--	--			834.54	--
03L846	888.54	--	--	--	--	--			--	--
04U846	889.46	--	--	--	--	--			--	--
03M848	904.12	839.71	--	--	--	--			839.86	--
03L848	903.91	840.20	--	--	--	--			840.35	--
04U848	903.92	841.02	--	--	--	--			841.14	--
04U851	914.51	828.12	--	--	--	--			828.23	--
04U852	905.66	826.63	--	--	--	--			827.45	--
03L854	892.41	836.92	--	--	--	--			837.19	--
04U854	891.95	832.77	--	--	--	--			833.06	--
03L859	903.55	837.40	--	--	--	--			837.68	--
04U859	903.73	840.61	--	--	--	--			837.86	--
03L860	896.79	837.24	--	--	--	--			837.49	--
04U860	896.61	832.72	--	--	--	--			831.33	--
03L861	891.35	835.14	--	--	--	--			835.53	--
04U861	890.91	832.76	--	--	--	--			833.13	--
04U863	895.33	832.11	832.36	832.80	817.42	831.59	831.98		832.46	--
04U864	908.67	827.92	829.19	829.50	827.35	828.22	829.45	828.93	829.13	828.04
04J864	908.79	825.77	826.99	827.49	827.95	825.62	826.49	826.84	826.75	824.91
04U865	915.60	828.63	830.11	830.30	833.09	829.19	830.29	829.77	831.02	830.44
04U866	910.60	825.89	827.53	827.82	848.44	826.59	827.90	827.23	827.39	826.70
04J866	910.69	826.31	827.50	827.98	826.34	826.24	827.21	827.35	827.30	825.59
04U877	923.08	--	--	--	--	--			--	--
MPCA1L3	898.25	--	--	--	--	--			--	--
MPCA1U4	898.60	--	--	--	--	--			--	--
MPCA2L3	872.05	--	--	--	--	--			--	--
MPCA2U4	872.19	--	--	--	--	--			--	--
414U4	893.95	831.86	832.10	832.77	833.05	831.31	831.88		832.43	--
MW15H	911.52	832.02	--	--	--	--			832.47	--
NB WELL 13	914.66	815.46	--	--	--	--			--	--

APPENDIX H-1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	12/4/01	3/6/02	6/5/02	9/5/02
03U673	897.84				
03L673	898.44				
04U673	898.34				
03U832	886.82				
03L832	886.85				
04U832	885.31				
03L841	911.91				
04U841	912.47				
04U844	886.74				
04U845	894.91				
03L846	888.54				
04U846	889.46				
03M848	904.12				
03L848	903.91				
04U848	903.92				
04U851	914.51				
04U852	905.66				
03L854	892.41				
04U854	891.95				
03L859	903.55				
04U859	903.73				
03L860	896.79				
04U860	896.61				
03L861	891.35				
04U861	890.91				
04U863	895.33		833.67	834.40	833.92
04U864	908.67	832.37	831.14	831.92	831.25
04J864	908.79	829.20	828.04	827.59	827.23
04U865	915.60	834.41	833.52	834.26	833.62
04U866	910.60	831.44	829.78	830.89	829.87
04J866	910.69	828.89	828.81	828.50	827.93
04U877	923.08				
MPCA1L3	898.25				
MPCA1U4	898.60				
MPCA2L3	872.05				
MPCA2U4	872.19				
414U4	893.95				
MW15H	911.52				
NB WELL 13	914.66				

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	**IRDMIS**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**
Sample Date	**Abbreviation**	**4/5/1994**	**4/21/1994**	**7/28/1994**	**8/30/1994**	**9/13/1994**	**10/31/1994**	**12/27/1994**	**1/25/1995**	**2/14/1995**	**3/9/1995**	**4/7/1995**	**5/4/1995**	**6/15/1995**	**7/13/1995**
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**5.0**	**4.9**	**10**	**13**	**10**	**12**	**7.9**	**9.6**	**10**	**11**	**11**	**9.8**	**11**	**10**
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1 b**	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	**7.8**	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.
Sample Date	Abbreviation	8/7/1995	9/28/1995	10/11/1995	11/28/1995	12/27/1995	1/26/1996	2/12/1996	3/28/1996	4/17/1996	5/31/1996	6/25/1996	7/18/1996	8/27/1996	9/12/1996
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**13**	**10**	**9.4**	**8.3**	**8.0**	**3.8**	**7.6**	**6.0**	**4.9**	**1.6**	**5.3**	**6.2**	**9.1**	**7.1**
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**4.3 b**	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	**IRDMIS**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**
Sample Date	**Abbreviation**	**10/22/1996**	**11/21/1996**	**12/17/1996**	**1/30/1997**	**2/26/1997**	**3/27/1997**	**4/17/1997**	**5/22/1997**	**6/26/1997**	**7/16/1997**	**8/28/1997**	**9/17/1997**	**10/30/1997**	**11/24/1997**
Dup														**RMS**	**RMS**
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**7.1**	**6.7**	5.7	**4.6**	**4.0**	3.4	**2.7**	**2.9**	**2.5**	4.4	**2.7**	**2.4**	**2.6**	2.2
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	**IRDMIS**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**	**NB13INF.**
Sample Date	**Abbreviation**	**12/30/1997**	**1/29/1998**	**2/12/1998**	**3/23/1998**	**4/16/1998**	**5/20/1998**	**5/29/1998**	**6/25/1998**	**7/27/1998**	**8/20/1998**	**9/30/1998**	**10/21/1998**	**11/23/1998**	**12/21/1998**
Dup		RMS	RMS	RMS	RMS	RMS	RMS	RMS	RMS						
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**1.6**	**1.8**	**1.5**	**1.2**	**1.8**	<1.0	<1.0	<1.0	**1.0**	**1.5**	**2.1**	**1.2**	**1.2**	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.4**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	**2.2 b**	<1.0	<5.0	<5.0	<5.0	<5.0	<5.0	**12 b**	**8.6 b**	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13INF. 1/14/1999	NB13INF. 2/11/1999	NB13INF. 3/17/1999	NB13INF. 4/6/1999	NB13INF. 5/18/1999	NB13INF. 6/21/1999	NB13INF. 7/13/1999	NB13INF. 8/30/1999	NB13INF. 9/27/1999	NB13INF. 10/19/1999	NB13INF. 12/16/1999	NB13INF. 1/25/2000	NB13INF. 2/28/2000	NB13INF. 3/16/2000
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	**1.4**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.
Sample Date	Abbreviation	4/24/2000	5/16/2000	6/28/2000	7/17/2000	9/5/2000	9/14/2000	10/12/2000	11/8/2000	1/29/2001	2/8/2001	3/7/2001	4/3/2001	5/23/2001	6/29/2001
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	4/4/1994	4/21/1994	7/28/1994	8/30/1994	9/13/1994	9/13/1994	10/31/1994	12/27/1994	12/27/1994	1/25/1995	1/25/1995	2/14/1995	3/9/1995	4/7/1995
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.3**	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 4/7/1995	NB13EFF. 5/4/1995	NB13EFF. 6/15/1995	NB13EFF. 6/15/1995	NB13EFF. 7/13/1995	NB13EFF. 7/13/1995	NB13EFF. 8/7/1995	NB13EFF. 9/28/1995	NB13EFF. 10/11/1995	NB13EFF. 10/11/1995	NB13EFF. 11/28/1995	NB13EFF. 12/27/1995	NB13EFF. 10/22/1996	NB13EFF. 11/21/1996
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.7**	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.2**	**1.3**	**1.3**	**1.3**	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	**Abbreviation**	**12/17/1996**	**1/30/1997**	**2/26/1997**	**3/27/1997**	**4/17/1997**	**5/22/1997**	**6/26/1997**	**7/16/1997**	**8/28/1997**	**8/28/1997**	**9/17/1997**	**10/30/1997**	**11/24/1997**	**11/24/1997**
Dup													**RMS**	**RMS**	**DUP**
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.1**	**1.0**	**1.2**	**1.2**	**1.8**	**2.4**	**2.2**	**1.2**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	**IRDMIS**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**
Sample Date	**Abbreviation**	**12/30/1997**	**1/29/1998**	**2/12/1998**	**2/12/1998**	**3/23/1998**	**4/16/1998**	**4/16/1998**	**5/29/1998**	**6/25/1998**	**7/27/1998**	**8/20/1998**	**8/20/1998**	**9/30/1998**	**10/21/1998**
Dup		RMS	RMS	RMS	RMS	RMS	RMS	DUP	RMS	RMS					
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**3.0**	**2.8**	**2.8**	**2.9**	**3.8**	**2.6**	**2.9**	**2.5**	**2.7**	**2.2**	**2.6**	**2.8**	**1.9**	**1.8**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<5.0	<5.0	<5.0	**12 b**	**8.7 b**
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 11/23/1998	NB13EFF. 11/23/1998	NB13EFF. 12/21/1998	NB13EFF. 1/14/1999	NB13EFF. 2/11/1999	NB13EFF. 3/17/1999	NB13EFF. 4/6/1999	NB13EFF. 5/18/1999	NB13EFF. 5/18/1999 DUP	NB13EFF. 6/21/1999	NB13EFF. 7/13/1999	NB13EFF. 8/30/1999	NB13EFF. 8/30/1999 DUP	NB13EFF. 9/27/1999
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.4**	**1.5**	**1.5**	**1.3**	<1.0	<1.0	**1.2**	**1.2**	**1.2**	**1.1**	**1.2**	<1.0	<1.0	**1.1**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	10/19/1999	4/4/1994	10/27/1995	11/28/1995	12/27/1995	1/26/1996	1/26/1996	2/12/1996	3/28/1996	4/17/1996	4/17/1996	5/31/1996	6/25/1996	7/18/1996
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.0**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.0 b**	**1.4**	**1.7**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	7.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	**IRDMIS**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**
Sample Date	**Abbreviation**	**7/18/1996**	**8/27/1996**	**9/12/1996**	**10/22/1996**	**10/22/1996**	**11/21/1996**	**12/17/1996**	**1/30/1997**	**1/30/1997**	**2/26/1997**	**3/27/1997**	**4/17/1997**	**4/17/1997**	**5/22/1997**
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.7**	**2.0**	**2.1**	**1.6**	**1.6**	**3.1**	**1.6**	**1.5**	**1.6**	**1.4**	**1.4**	**1.9**	**1.9**	**2.5**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	6/26/1997	7/16/1997	8/28/1997	9/17/1997	10/30/1997	11/24/1997	12/30/1997	1/29/1998	2/12/1998	3/23/1998	4/16/1998	5/29/1998	6/25/1998	7/27/1998
Dup						RMS	RMS	RMS	RMS	RMS	RMS	RMS	RMS	RMS	
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	1.6	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 8/20/1998	NB13EFF. 9/30/1998	NB13EFF. 10/21/1998	NB13EFF. 11/23/1998	NB13EFF. 12/21/1998	NB13EFF. 1/14/1999	NB13EFF. 2/11/1999	NB13EFF. 3/17/1999	NB13EFF. 4/6/1999	NB13EFF. 5/18/1999	NB13EFF. 6/21/1999	NB13EFF. 7/13/1999	NB13EFF. 8/30/1999	NB13EFF. 9/27/1999
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	**1.1**	**1.5**	**1.3**	<1.0	**1.3**	**1.4**	**1.6**	**1.4**	**1.5**	**1.3**	**1.6**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	**12 b**	**8.8 b**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	**IRDMIS**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**	**NB13EFF.**
Sample Date	**Abbreviation**	**10/19/1999**	**12/16/1999**	**12/16/1999**	**1/25/2000**	**1/25/2000**	**2/28/2000**	**3/16/2000**	**3/16/2000**	**4/24/2000**	**7/17/2000**	**7/17/2000**	**9/5/2000**	**9/14/2000**	**9/14/2000**
Dup				**DUP**		**DUP**			**DUP**			**DUP**			**DUP**
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.5**	**1.5**	<1.0	**3.2**	**2.8**	**2.8**	**3.0**	**2.9**	**2.8**	**2.8**	**2.3**	**2.5**	**2.3**	**2.2**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	10/12/2000	11/8/2000	11/8/2000	1/29/2001	2/8/2001	2/8/2001	3/7/2001	4/3/2001	4/3/2001	5/23/2001	5/23/2001	6/29/2001
Dup				DUP			DUP			DUP		DUP	
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	**1.1**	**1.2**	**1.0**	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**2.1**	**2.2**	**2.3**	**4.3**	**4.2**	**3.8**	**3.6**	**3.1**	**2.9**	**2.3**	**2.3**	**1.4**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1.3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2002
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Notes:

--	Not analyzed.
b	Potential false positive based on blank data validation procedure.
*	Estimated value, QA/QC criteria not met.
ND	None detected.
Dup	Duplicate sample
RMS	Routine monitoring sample

Concentrations in ug/L

Samples were collected and analyzed by Barr Ingineering for City of New Brighton.

Final sampling date 6-29-01. System shut down per agreement with Agencies.

APPENDIX I

OTHER INSTALLATION RESTORATION ACTIVITIES DURING FY 2002

This appendix is intended to give the reader a brief overview of other activities at TCAAP that are related to the Installation Restoration Program, but are not required by the RODs for OU1 through OU3. These activities are not part of the performance evaluation or the performance monitoring programs.

A. BACKGROUND MONITORING

1. Deep Groundwater

No data is available since FY 2002 was the "off year" in the biennial monitoring program.

2. Surface Water

The FY 2002 – FY 2006 Surface Water Monitoring Plan is presented in Appendix A.3. Although an NPDES permit is no longer in effect, monitoring for the Building 103 (Site K) treatment system effluent (Outfall 010) is being done to meet the Final Modified Substantive Requirements Document (MN U000579) dated November 19, 1997. The data for Outfall 010 is presented in Tables 8.3 and 8.4, where it is listed as "effluent."

In addition, the Army has chosen to monitor Rice Creek as it enters and exits TCAAP (monitoring points 20700 and 20800, respectively, as shown on Figure I-1). This voluntary monitoring (not regulatory required) is simply intended to establish baseline characteristics for Rice Creek. Monitoring has been conducted annually beginning with FY 2001 (previous years had been quarterly). The FY 2002 data is presented in Table I-1. VOCs, mercury, silver, and cyanide were all non-detectable in the water entering and leaving TCAAP. There were low detections reported for copper, lead and zinc (both entering and leaving TCAAP); however, all detections were qualified as non-detect due to detections in a corresponding blank. Phosphorus was detected at both locations; however, this data was rejected due to unacceptably low matrix spike recoveries. The Army did not elect to resample for phosphorus (MPCA and USEPA were notified of this).

B. AQUATIC STUDIES

The Tier II Ecological Risk Assessment Report for aquatic sites, prepared by the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM), was under regulatory review at the end of FY 2002.

C. GRENADE RANGE

The removal action to address contaminated soils was completed in early FY 2000. The Grenade Range Closeout Report (prepared by Alliant Techsystems) received regulatory approval in FY 2002. The Groundwater Investigation Report (prepared by Alliant Techsystems) also received regulatory approval in FY 2002.

The four monitoring wells at this site were sampled in FY 2002. Locations of the wells are shown on Figure I-2. Sampling results are shown on Table I-2. Detected analytes were below or near background (or were qualified as non-detect), as summarized below:

- Bis (2-ethylhexyl) phthalate was detected in GR-DF1; however, the result was qualified as non-detect based on its detection in the corresponding method blank.
- Aluminum was detected in GR1-2 at 50 ug/l, which is below the background level.
- Barium was detected in all four wells between 36 and 105 ug/l, which are below the background level.
- The gross beta result for GR2-1 was 37 pCi/L, just slightly above the background level.

Although there were very few detections of metals, the analytical detection limits were higher than the background level for many of the analytes. The same analytical method was used in this event as was used in the previous event (Method 6010); however, a different laboratory was used and the detection limits were higher. Future sampling events will utilize laboratory method(s) that have detection limits that are at (or near) the background concentration levels. Two more sampling events are required for these four wells (June 2003 and June 2004).

D. OUTDOOR FIRING RANGE

The removal action to address metals-contaminated soils was completed in early FY 2000. The Outdoor Firing Range Closeout Report (prepared by Alliant Techsystems) received regulatory approval in FY 2002. Alliant Techsystems also prepared a work plan for a soil cover to be installed over a portion of the 1900-yard range that was contaminated with polynuclear aromatic hydrocarbons (PAHs). This work plan was under Army review at the end of FY 2002. Construction of the soil cover will be documented in an addendum to the Outdoor Firing Range Closeout Report.

E. #150 RESERVOIR AREA

A small area of contamination was found near the water storage reservoir in FY 1999. Alliant Techsystems sampled the area and prepared a characterization report. This area was cleaned up as part of the removal action at the Outdoor Firing Range in early FY 2000. Documentation was included with the Outdoor Firing Range Closeout Report, which received regulatory approval in FY 2002.

F. 135 AND 535 PRIMER/TRACER AREAS

Preliminary assessment reports for both of these sites were prepared by Alliant Techsystems. Both reports received regulatory approval in FY 2002. Alliant Techsystems also prepared site investigation work plans for both of these sites in FY 2002. The 135 Primer/Tracer Area work plan received regulatory approval in FY 2002 and site investigation field work was completed in late FY 2002. The 535 Primer/Tracer Area work plan was under regulatory review at the end of FY 2002

G. MONITORING WELL ABANDONMENT

In FY2001, MPCA and USEPA approved the Final Sitewide Groundwater Monitoring Well Abandonment Work Plan for monitoring wells that no longer serve a purpose. Phase I of the well sealing was completed in FY 2002. A total of 31 wells were sealed as documented in "Phase I Sitewide Groundwater Monitoring Well Abandonment Completion Report, TCAAP", prepared by Stone & Webster. Three wells that were scheduled to be sealed could not be located in the field and were presumed to have been previously sealed, though the MDH did not have any sealing records for those three wells. Tables and figures in Appendix B were updated to indicate that these wells were sealed. Sealed wells were also deleted from the monitoring plan (Appendix A.1). The Phase II list of wells to be sealed received regulatory approval in FY 2002, though well sealing field work was not initiated.

Table I-1
Water Quality Data for Surface Water

Fiscal Year 2002

	20700	20800
	20-Jun-02	20-Jun-02
VOCs (ug/l)		
1,1-Dichloroethane	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
cis-1,2-Dichloroethene	<1.0	<1.0
trans-1,2-Dichloroethene	<1.0	<1.0
Trichloroethene	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0
Metals (ug/l)		
Copper	**3.9** B (UB3.1)	**4.0** B (UB3.1)
Lead	**1.6** B (UB0.6)	**1.7** B (UB0.6)
Mercury	<0.100	<0.100
Silver	<1.0	<1.0
Zinc	**5.20** (UB3.0)	**6.36** (UB3.0)
Inorganics (ug/l)		
Cyanide	<10 (JC70, JL72)	<10 (JC70, JL72)
Total Phosphorus	**148** (R)	**126** (R)

Notes:

Bold numbers indicate detection of the analyte.

B = The value is below the reporting level, but above the method detection limit.

UB = The sample result was less than 5 times the value detected in a blank (the result for the blank is listed after "UB"), and therefore the sample result can be considered non detect.

JC = The percent recovery for the Initial Calibration Verification was outside QC limits (the ICV percent recovery is listed after "JC"), and therefore the result should be considered estimated.

JL = The percent recovery for the Laboratory Control Spike was outside QC limits (the LCS percent recovery is listed after "JL"), and therefore the result should be considered estimated.

R = Data is rejected. Matrix spike recoveries were below the minimum QC limit of 30%.

Table I-2
Grenade Range Groundwater Quality Data

Fiscal Year 2002

	GR 1 - 1	GR 1 - 2	GR 2 - 1	GR - DF1	Background [1]
	25-Jun-02	25-Jun-02	25-Jun-02	25-Jun-02	
SVOCs (ug/l)					
Bis (2-ethylhexyl) phthalate	<5	<5	<5	**JP 2.0 B**	
VOCs (mg/l)					
Ethylene Glycol	<260	<260	<260	<260	
PCBs (ug/L)					
PCB-1016	<0.100	<0.100	<0.100	<0.100	
PCB-1221	<0.200	<0.200	<0.200	<0.200	
PCB-1232	<0.100	<0.100	<0.100	<0.100	
PCB-1242	<0.100	<0.100	<0.100	<0.100	
PCB-1248	<0.100	<0.100	<0.100	<0.100	
PCB-1254	<0.100	<0.100	<0.100	<0.100	
PCB-1260	<0.100	<0.100	<0.100	<0.100	
Metals (ug/l)					
Aluminum	<200	**50 B**	<200	<200	500
Arsenic	<300	<300	<300	<300	4
Barium	**64.8**	**105**	**105**	**36.1**	372
Beryllium	<5.00	<5.00	<5.00	<5.00	1
Cadmium	<5.00	<5.00	<5.00	<5.00	4
Chromium	<10.0	<10.0	<10.0	<10.0	5
Cobalt	<50.0	<50.0	<50.0	<50.0	1
Lead	<100	<100	<100	<100	7
Nickel	<40.0	<40.0	<40.0	<40.0	4
Silver	<10.0	<10.0	<10.0	<10.0	4
Thallium	<300	<300	<300	<300	2
Vanadium	<50.0	<50.0	<50.0	<50.0	17
Zinc	<20.0	<20.0	<20.0	<20.0	19
Radionuclides (pCi/L)					
Gross alpha	<4.0	<4.0	<4.0	<4.0	20
Gross beta	<6.0	<6.0	**37**	<6.0	29.5
Radium 226	<1.0	<1.0	<1.0	<1.2	(Not Listed)
Radium 228	<1.6	<1.3	<1.3	<1.3	(Not Listed)

Notes:

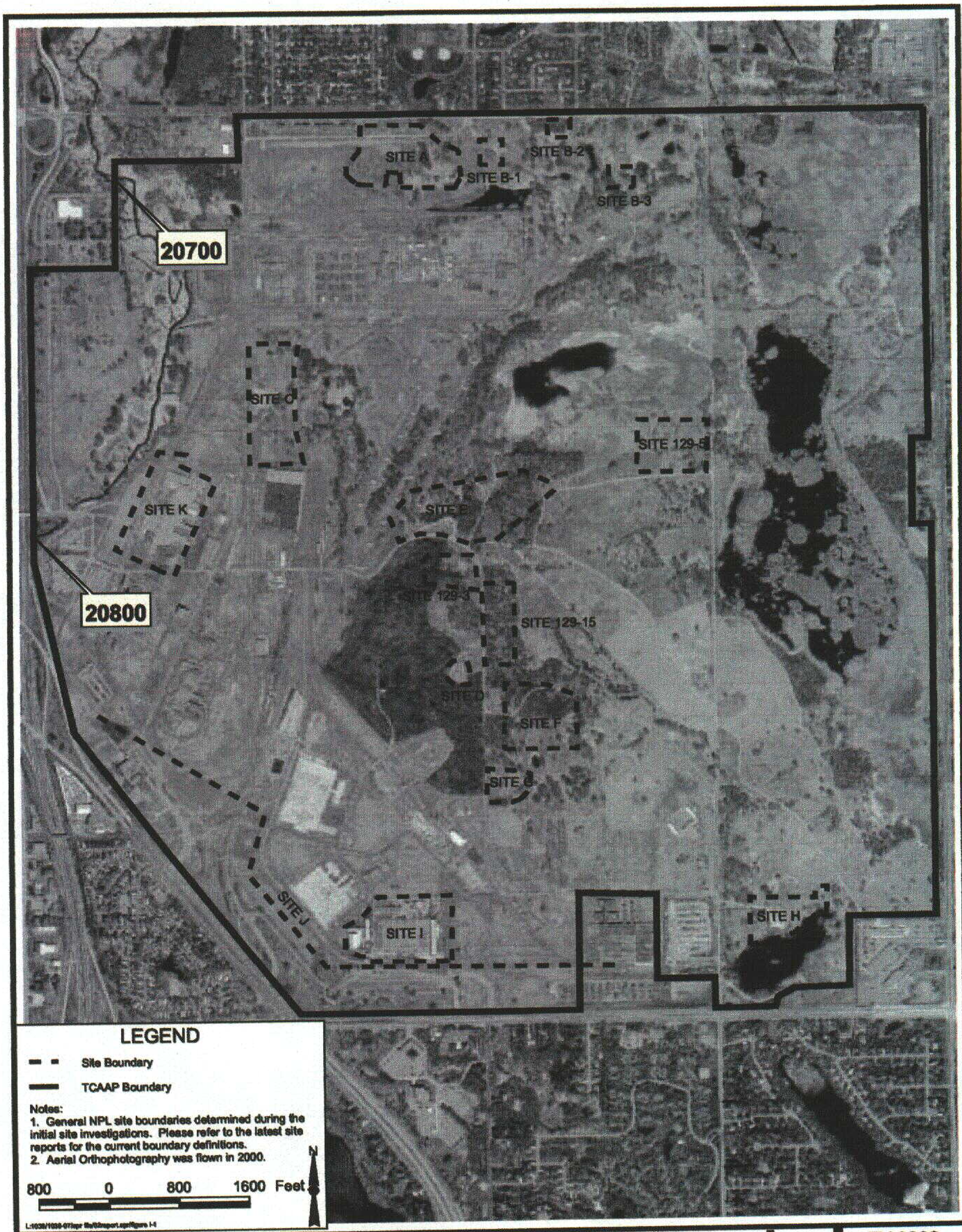
(1) The background values were cited in Table 3 of the Grenade Range Engineering Evaluation / Cost Analysis Report.

Bold numbers indicate detection of the analyte.

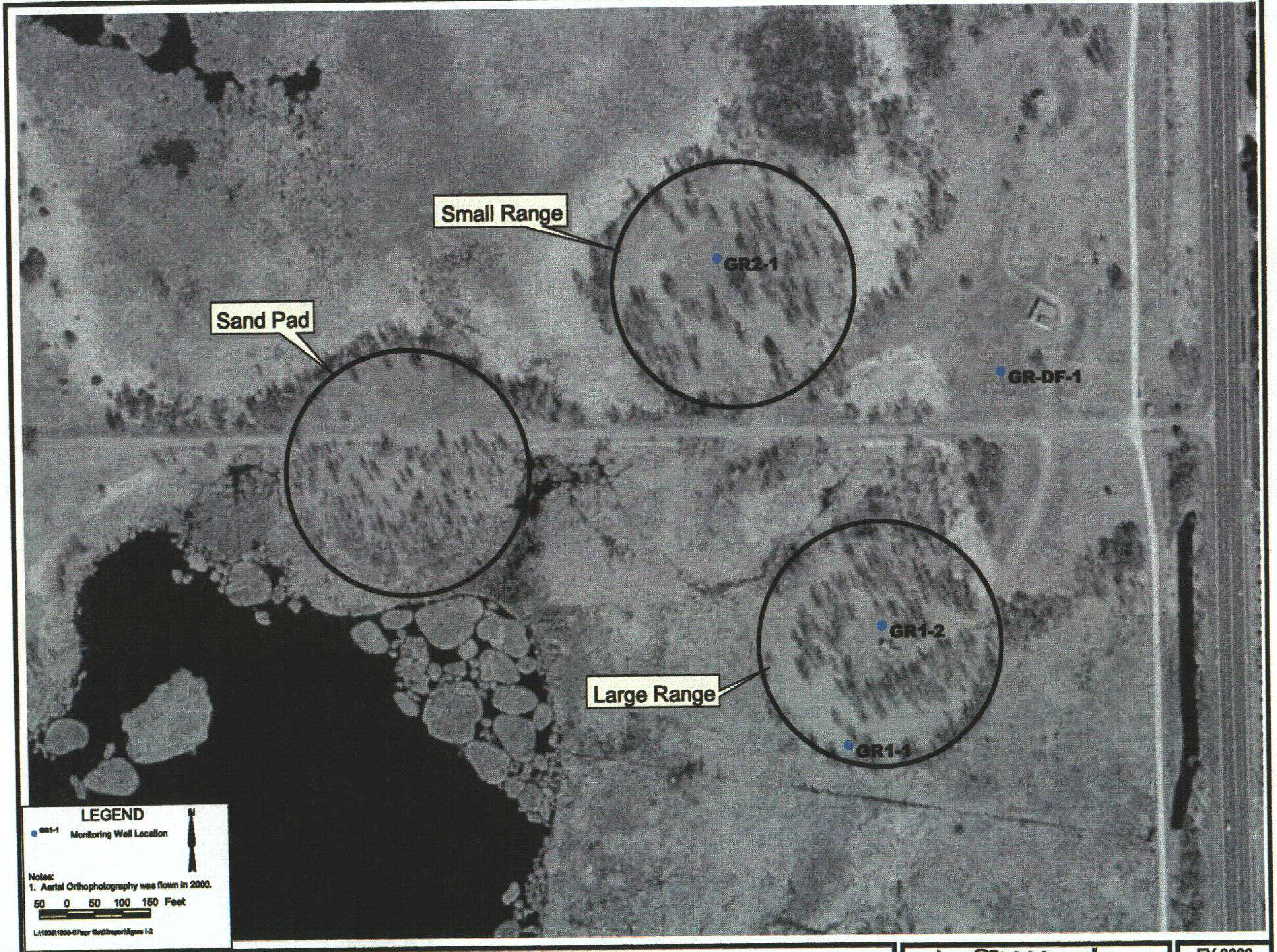
JP = The value is below the reporting level, but above the method detection limit.

B = The analyte was also detected in the method blank (when used with organic data).

B = The value is below the reporting level, but above the method detection limit (when used with inorganic data).



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2002
Surface Water Monitoring Locations		Figure I-1



TWIN CITIES ARMY AMMUNITION PLANT

Grenade Range Monitoring Well Locations

Wenck

Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2002

Figure I-2