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Environmental Restoration Program

OPERABLE UNIT 9, SITE SCOPING REPORT VOLUME 8 - ENVIRONMENTAL MONITORING DATA: 1976 - 1989

MOUND PLANT
MIAMISBURG, OHIO

February 1992

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

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This report is Volume 8 of a multiple-volume Site Scoping Report providing the background information pertinent to the remedial investigation/feasibility study (RI/FS) of the Mound Plant. Under the terms of the Federal Facility Agreement between DOE and US EPA, this report is submitted to US EPA for approval.

This report is approved by US EPA only for the purposes of scoping the RI/FS, and approval does not imply concurrence with the interpretations presented herein. It is recognized that additional information will be collected during the RI/FS and may supersede information contained in this report.

APPROVED: Diana Mally
Remedial Project Manager
U.S. Environmental Protection Agency
Region V

Diana Mally

ENVIRONMENTAL RESTORATION PROGRAM

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DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
TECHNICAL SUPPORT OFFICE
LOS ALAMOS NATIONAL LABORATORY

FINAL

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APPROVAL

This document was prepared under University of California, Los Alamos National Laboratory, Subcontract 9-XS8-0146R-1, by Roy F. Weston, Inc.

APPROVED -- ROY F. WESTON, INC.

John B. Price			
NAME (type)	(DATE)	MICHAEL P. MAUZY, P.E.	(DATE)
INSTALLATION MANAGER		PROGRAM MANAGER	

APPROVED -- LOS ALAMOS NATIONAL LABORATORY ER TSO

Tom Farmer			
NAME (type)	(DATE)	KENNETH H. REA, PH.D.	(DATE)
INSTALLATION COORDINATOR		GROUP LEADER	

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
EL	environmental level
EPA	U.S. Environmental Protection Agency
FFA	Federal Facilities Agreement
NPDES	National Pollution Elimination System
NPL	National Priorities List

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1. INTRODUCTION

The U.S. Department of Energy (DOE) Mound Plant, Miamisburg Ohio, was placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA - also known as Superfund) National Priorities List (NPL) on November 21, 1989 (54 Federal Register 48184). Pursuant to its NPL status, DOE signed a CERCLA Section 120 Federal Facilities Agreement (FFA) with the U.S. Environmental Protection Agency (EPA) that became effective October 11, 1990 (administrative Docket No. VW-'90-C-075). The DOE and Ohio EPA have discussed amending the agreement to include Ohio as a participant. The terms of the FFA require that DOE develop and implement remedial investigations and feasibility studies and conduct interim remedial actions in order to ensure that environmental impacts associated with past and present activities at the site are thoroughly investigated and appropriate action is taken to protect the public health and welfare and the environment.

The Albuquerque Operations Office of the DOE established the Environmental Restoration Program in 1984 to collect and assess environmental data in order to develop a conceptual site model to assess both the nature and extent of contamination and to identify potential exposure pathways and potential human and environmental receptors. These activities have been conducted under DOE policy for all facilities to comply with applicable environmental regulations. In order to provide EPA with sufficient information and data gathered during these previous investigations, a multi-volume scoping report providing background information has been prepared. The Site Scoping Report will provide descriptions and summaries of the current conditions and characteristics of Mound Plant and will consist of at least the following volumes:

1. Groundwater Data: February 1987 - July 1990
2. Geologic Log and Well Information Report
3. Radiologic Survey Report
4. Engineering Map Series
5. Topographic Map Series
6. Photo History Report
7. Waste Management Report
8. Environmental Monitoring Report
9. Bibliography

2. SCOPE OF THIS REPORT

This report presents analytical data from environmental sampling conducted by Mound Plant as part of the ongoing environmental surveillance program, the Potable Water Standards Project (Dames and Moore 1976a,b) and the Plutonium Soil Inventory Project (MRC 1977). The analyses include the radionuclides tritium, plutonium-238, uranium-233, uranium-234 and uranium-238 from water and silt samples collected at sites along the Great Miami River and other surface water bodies from 1974 to 1989. Also analyzed were tritium levels in the Buried Valley aquifer from 1975 to 1990 and concentrations of plutonium measured in regional soils in 1977. This report is intended to transmit the data to the regulatory agencies and should not be construed as an interpretive report. The data are provided to constrain the nature and extent of known radiological contamination adjacent to Mound Plant.

Not included in this report are other data pertinent to radiological analyses within the Miami Erie Canal and Mound Plant property, and nonradiologic analyses. Data on radiological contamination within the plant boundaries have been collected as part of the Mound Plant Site Survey Project and are reported in Volume 3 of the Site Scoping Report (DOE 1991). The extent of contamination of the Miami-Erie Canal is reported by Rogers (1975).

3. OVERVIEW OF MOUND PLANT ENVIRONMENTAL MONITORING PROGRAM

The Mound Plant environmental monitoring program has been in existence since the plant opened in 1948. The objectives of the environmental monitoring program have been, first, control of all discharges to levels well within existing or proposed standards, and second, the collection and measurement of air, water, vegetation, foodstuff, and sediment samples collected from the environment at distances up to 48 kilometers (30 miles) from the plant. The samples are analyzed for radionuclides handled at the plant, including tritium, plutonium and uranium. Annual reports of the environmental monitoring program have been generated since 1975 (MRC 1975-1988). These reports are published through the National Technical Information Service, U.S. Department of Commerce. The annual reports include data summaries, averages, minimum, maximum, and background levels measured over the course of the year. The 1988 report is included in Appendix A for reference purposes (EG&G 1989).

3.1. REDUCTION OF EFFLUENTS

As a result of controls the amounts of tritium and plutonium released to the environment were significantly reduced in the 1970's through changes in operational practices (Table III.1). Before 1967, liquid waste discharges from tritium operations at the plant were collected in sumps, analyzed for tritium, and diluted if necessary to a guideline concentration of 1000 nCi/L (FRC 1959). Once diluted, the sump water was discharged through either the plant drainage ditch and a remnant of the Miami-Erie canal to the Great Miami River or the plant sanitary sewer directly to the river (Styron and Meyer 1981). A waste disposal facility was constructed in 1967 providing a centralized system for processing tritiated liquid waste from several onsite sources. The combined waste stream was collected in holding tanks for assay and then discharged in batches with dilution water. The amount of tritium released was recorded by waste disposal operators, and in 1970 an automated monitoring system was installed. In 1971 a similar monitoring system was installed in the sanitary sewer pipeline National Pollution Elimination System (NPDES) Outfall 001.

In 1970, the decision was made to discontinue the discharge of all tritium process waste liquids in favor of collection, solidification, packaging and shipment to an offsite burial ground approved by the Atomic Energy Commission (now DOE). The plant was able to reduce its tritium liquid releases from 2,330 curies (Ci) in 1969 to 58 Ci in 1975 and 4.1 Ci in 1988 (Table III.1). Concurrent with tritium reduction in liquid effluents, releases of tritium to the atmosphere were also greatly reduced. Through many waste management actions, the stack emissions were reduced from 315 kilocuries (kCi) in 1969 to less than 9 kCi in 1975, although the tritium inventory at Mound Plant remained relatively constant during this period.

Emission of plutonium in the surface waters and stack emissions was also reduced through waste management actions during the early 1970's. Particulate radionuclides are removed from stack emissions

Table III.1. Summary of Mound Plant Effluents 1959-1989

Year	Pu-238 Air (μCi)	Pu-238 Water (μCi)	H-3 Air (Ci)	H-3 Water (Ci)
1959			31,527	
1960	250,125		102,427	
1961	160		240,644	
1962	140		244,455	
1963	108		313,932	
1964	252		262,638	
1965	5,803		206,750	
1966	30,442		199,561	
1967	54,347	24,900	364,685	169
1968	5,720	243,800	275,856	202
1969	10,544	109,700	315,252	2,332
1970	4,342	7,420	179,468	250
1971	401	15,234	73,503	399
1972	74	60,586	30,483	244
1973	84	16,043	15,331	149
1974	28	19,755	10,031	105
1975	23	17,862	8,859	58
1976	15	2,973	6,206	46
1977	12	3,584	4,896	57
1978	14	4,947	7,346	32
1979	12	3,157	3,831	34
1980	15	773	3,795	26
1981	8	1,110	4,285	22
1982	21	1,207	4,283	14
1983	4	1,003	4,293	8
1984	7	1,342	3,430	8
1985	5	991	4,795	6
1986	6	691	3,555	6
1987	5	472	3,863	6
1988	5	997	3,204	4
1989	4	1,419	41,534	6

by high efficiency particle air filters at both the point of origin and in the release stacks. Water-borne releases of plutonium were recognized to have been due to erosion of surficially contaminated soils. The soils at Mound Plant had experienced widespread low-level plutonium contamination from airborne deposition (discussed below) and higher levels of contamination locally from spills and radioactive waste line breaks (see the Site-Wide RI/FS Work Plan, DOE 1991).

Reduction of water-borne plutonium contamination was accomplished through the construction of the system of surface water retention and discharge basins along the plant drainage ditch. The asphalt-lined pond, completed in 1980, collects surface runoff and allows for controlled resedimentation on the upper reach of the drainage ditch. The low-flow retention basins and the overflow pond were constructed in 1976 and 1977, respectively, on the lower reach of the plant drainage ditch to control surface water discharge from the plant (through the NPDES Permitted Outfall 002) and to provide settling for suspended sediment in the plant runoff water. Runoff water and suspended sediment containing low-level plutonium contamination is retained in the ponds to reduce peak runoff volume and velocity. The system was designed to retain 95% of the silt and sand particles, thereby reducing the amount of suspended solids and plutonium released offsite. Retention basin effluent is discharged through a standpipe to the south section of the abandoned Miami-Erie Canal and the Great Miami River. During periods of high flow, water is diverted through a channel to the overflow pond, which is designed to retain all facility effluents for five days in the event of a spill. Additional information concerning the construction and utility of the basins and ponds are included in the Site-Wide RI/FS Work Plan (DOE 1991).

3.2. BACKGROUND MEASUREMENT

The methods of determining background concentrations of radionuclides has changed over time. From 1972 through 1978 Mound Plant personnel reported published values of background concentration of tritium and plutonium in the environment. In 1979, Mound Plant began measuring background or environmental levels (ELs) of tritium and plutonium at distances beyond the influence of Mound Plant activities. Armed with measured regional ELs, Mound Plant was able to calculate the incremental concentration of radionuclides contributed to the environment from Mound Plant activities. Annual environmental monitoring reports (e.g., EG&G 1989) have included the ELs (i.e., regional background) and the incremental concentrations. This report includes actual concentrations and ELs. The latter must be subtracted from the former to obtain the incremental concentrations.

3.3. QUALITY CONTROL FOR SAMPLING AND ANALYSIS

An essential part of Mound Plant's quality assurance program is the analysis of reference samples from reliable outside laboratories. Mound Plant currently analyzes reference samples from the following

sources: DOE's Environmental Measurements Laboratory; the EPA; and a private laboratory, Analytical Products Group, Inc.. The Environmental Measurements Laboratory samples contain trace radionuclides in air filters, water, soil, and vegetation. The EPA and Analytical Products Group, Inc. samples contain nonradioactive contaminants in water.

Another essential part of Mound Plant's quality assurance program is the determination of "blank values." A "blank value" is a measurement result for a contaminant determined by carrying out the chemical analysis procedure without a true sample, but rather using deionized water, a clean filter paper, or only the reagents used in the analysis. Analysis of "blanks" is essential because many of the samples analyzed show contaminant concentration at or below the lower detection limit at the analytical method being used. Analyzing "blanks" is essential in verifying the absence of excessive laboratory contamination or detector background. Also, the standard deviation of the "blank values" are used to calculate lower detection limits, which are given with each set of environmental data.

Additionally, internal standards and duplicate samples are included with sets of environmental samples through the analysis procedure. Approximately 20% of all samples analyzed are quality control related. Other aspects of Mound Plant's environmental section quality control program have been documented in a quality control manual published in 1981 (MRC 1981a).

4. RIVER, SURFACE WATER, AND SILT MONITORING PROGRAM

As part of the Mound Environmental Program, river water, surface water, and silt samples are collected from the environment and analyzed for the specific radionuclides utilized in operations at the Mound Plant. The river water monitoring program consists of the collection of samples at five locations along the Great Miami River. The river water samples refer only to samples that are collected from the river and are comprised of two types of samples: river water and river silt.

The surface water monitoring program consists of the collection of samples at eight pond locations in all quadrants surrounding the Mound Plant. The surface water samples refer only to samples collected from the ponds and are comprised of two types of samples: pond water and pond silt. The river water and surface water sampling locations are shown on Plate 1.

The five river water sampling locations along the banks of the Great Miami River were selected according to guidelines recommended by the EPA (e.g. MRC 1979). The locations provide samples that are representative of river water after considerable mixing of the effluent from the Mound Plant has occurred in addition to background and upriver samples. The river water samples are subjected to laboratory analyses at Mound Plant for plutonium-238, uranium-233 and -234, uranium-238, and tritium. River silt samples, collected at the same five locations, are subjected to laboratory analysis at Mound Plant for plutonium-238.

The surface water samples are collected at eight pond locations and are subjected to laboratory analyses at Mound Plant for plutonium-238 and tritium. Pond silt samples, collected at the same eight locations, are subjected to laboratory analysis at Mound Plant for plutonium-238. These pond locations do not include the north and south ponds along the abandoned stretch of the Miami-Erie Canal directly west of the plant.

4.1. SAMPLE COLLECTION

The same sample collection procedures have been used to obtain river water, surface water, and silt samples; however, the procedures followed during sample preparation have changed several times. Prior to 1975, only samples of unfiltered river water and pond water were analyzed for each location. No separate analyses were performed on river or pond silt during these early years. The laboratory analyses for these samples included plutonium-238 and tritium.

In 1976, the procedures for sample preparation were changed, whereby samples of river water and pond water were filtered prior to laboratory analysis. After filtration, the river water and pond water samples from each location were analyzed for plutonium-238 and tritium, and the filtrate (the suspended particulate matter or "silt" removed during filtration) was analyzed for plutonium-238. In 1979, the sample preparation

procedures were changed again whereby the river water and pond water samples were still filtered, but the remaining filtrate was discarded and a sediment sample from each location along the river and from each pond location were collected. Although the sample preparation procedure changed in 1979 from analyzing the filtrate (silt) to analyzing sediment, the sediment is still referred to as "silt".

Also, beginning in 1978, additional analyses were performed for uranium-233, -234, and -238 on the filtered river water only.

A description of the following data sets collected as part of the river water and surface water monitoring program are presented in the sections that follow:

- Tritium in the Great Miami River,
- Tritium in pond water,
- Plutonium-238 in the Great Miami River,
- Plutonium-238 in the Great Miami River silt,
- Plutonium-238 in pond water,
- Plutonium-238 in pond silt,
- Uranium-233 and -234 in the Great Miami River, and
- Uranium-238 in the Great Miami River.

4.2. TRITIUM IN THE GREAT MIAMI RIVER

4.2.1. Available Data

Tritium concentrations measured in the Great Miami River have been summarized in the annual reports since 1974. The tritium analyses are performed weekly on a composite of daily samples. The available data (Appendix B) consist of handwritten data compilation sheets from 1974 through 1984, and computer-generated data compilation sheets from 1985 through 1989.

The data set was used to compute the average annual tritium concentrations for each of the five sampling locations along the Great Miami River (Plate 1), for the years 1974 through 1989 (Table IV.1).

4.2.2. Data Description

The average annual tritium concentrations at each sampling location were plotted versus time. These plots are shown in Figures 4.1. and 4.2. These data indicate a decreasing trend in the average tritium

Table IV.1. Tritium Concentrations (nCi/L) in the Great Miami River (1974–1989)

	Sample Location R-1			Sample Location R-2			Sample Location R-3		
Year	x	s	n	x	s	n	x	s	n
1974	<1.0	NA	249	<2.8	NA	249	<2.9	NA	249
1975	<1.5	NA	210	<2.1	NA	210	<1.9	NA	210
1976	<0.89	NA	210	<1.3	NA	210	<0.93	NA	210
1977	<1.0	NA	210	<1.5	NA	210	<1.9	NA	210
1978	0.7	0.6	41	1.4	2.2	40	1	1.3	41
1979	0.54	0.52	42	0.9	0.8	43	0.7	0.5	43
1980	0.6	0.5	47	0.65	0.5	47	0.67	0.54	47
1981	0.31	0.29	42	0.29	0.15	41	0.3	0.18	42
1982	0.54	0.28	30	0.59	0.29	30	0.61	0.29	30
1983	0.13	0.09	11	0.16	0.18	11	0.15	0.12	11
1984	0.23	0.19	33	0.24	0.2	35	0.28	0.23	34
1985	0.13	0.1	29	0.14	0.1	29	0.14	0.11	29
1986	0.11	0.13	36	0.14	0.17	37	0.13	0.14	37
1987	0.08	0.18	50	0.11	0.35	50	0.06	0.13	50
1988	-0.01	0.07	48	0.03	0.09	48	0.02	0.1	48
1989	-0.01	0.09	49	-0.01	0.12	49	-0.02	0.09	49

x = average concentration (nCi/L)
s = standard deviation
n = number of samples
NS = not sampled
NA = not available or not applicable
EL = environmental level

Table IV.1. (page 2 of 2)

	Sample Location R-4			Sample Location R-5			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1974	<2.0	NA	249	1.4	NA	249	NS		
1975	<2.1	NA	210	<1.7	NA	210	0.5	NA	NA
1976	<0.9	NA	210	<0.9	NA	210	0.5	NA	NA
1977	<1.6	NA	210	<1.0	NA	210	0.9	NA	NA
1978	0.8	0.6	41	0.7	0.5	41	0.9	NA	NA
1979	0.79	0.49	43	0.76	0.61	43	1.1	NA	NA
1980	0.8	0.54	47	0.77	0.51	47	0.82	0.43	17
1981	0.38	0.17	42	0.43	0.21	42	0.21	0.24	16
1982	0.65	0.3	30	0.61	0.32	29	0.48	0.36	16
1983	0.18	0.14	11	0.16	0.11	11	0.15	0.16	16
1984	0.31	0.21	35	0.3	0.36	34	0.23	0.18	17
1985	0.15	0.1	29	0.16	0.12	29	0.13	0.07	16
1986	0.14	0.15	36	0.16	0.16	36	0.05	0.07	12
1987	0.1	0.23	50	0.06	0.15	50	0.01	0.02	14
1988	0.02	0.09	48	0.01	0.1	48	-0.02	0.09	13
1989	0.01	0.07	49	0	0.09	49	0.11	0.16	9

x = average concentration (nCi/L)
s = standard deviation
n = number of samples
NS = not sampled
NA = not available or not applicable
EL = environmental level

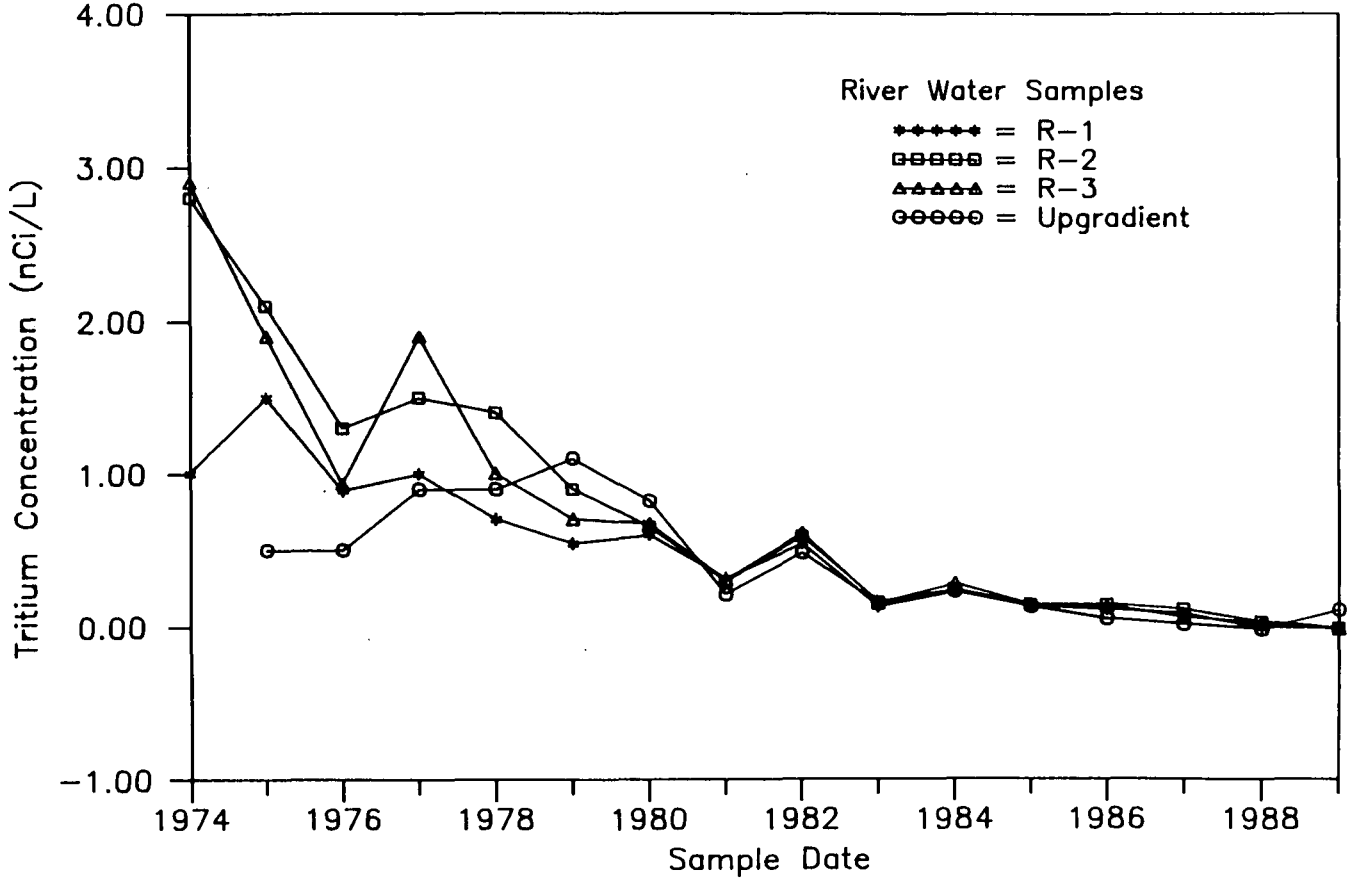


Figure 4.1. Tritium concentrations in river water samples from sampling locations R-1, R-2, R-3, and upgradient for the years 1974 through 1989.

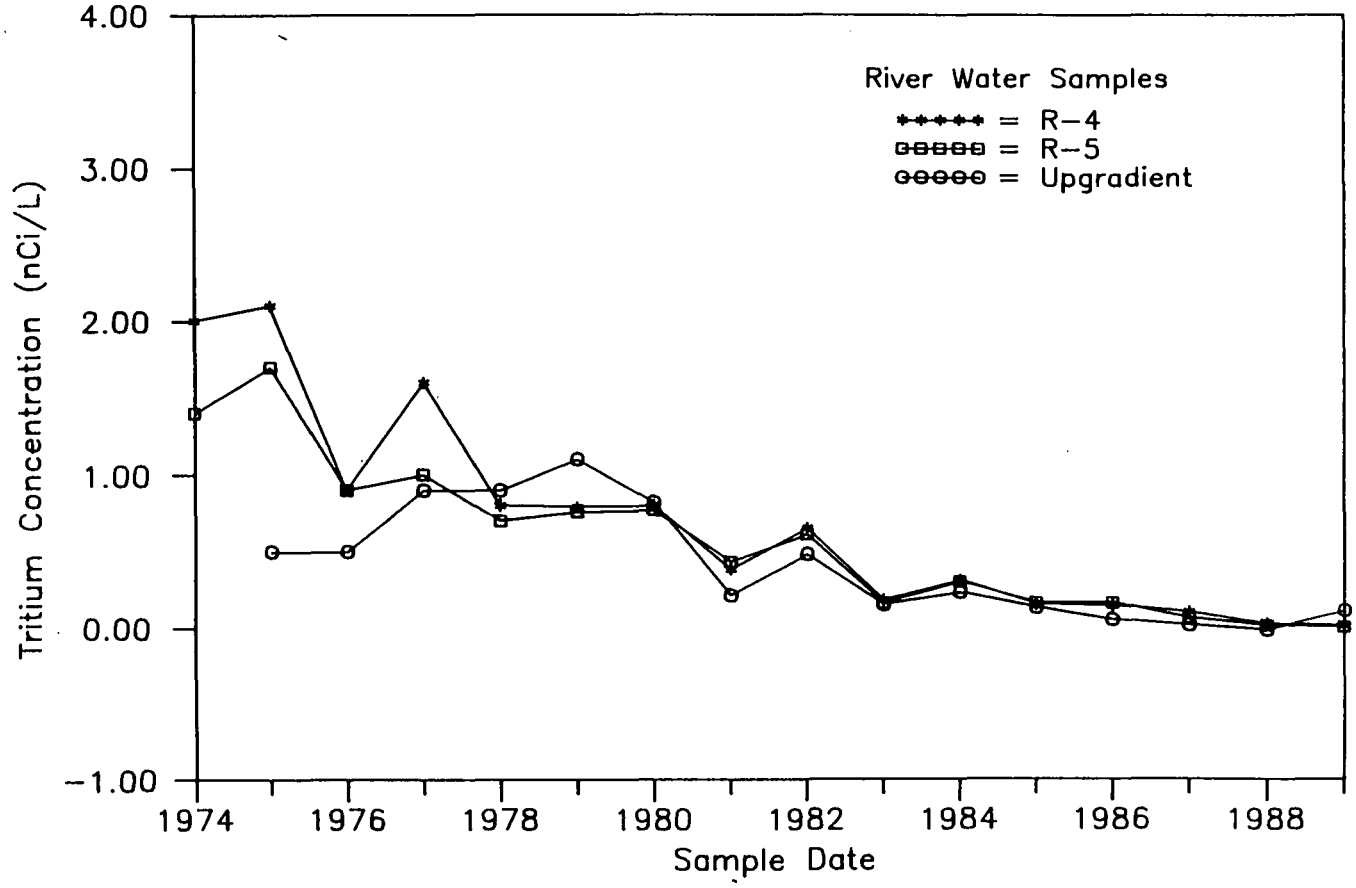


Figure 4.2. Tritium concentrations in river water samples from sampling locations R-4, R-5, and upgradient for the years 1974 through 1989.

concentrations at the five sampling locations along the Great Miami River for the years 1974 through 1989. The average background (upgradient) concentration of tritium ranged from a low of 0.5 nCi/L to a high of 1.1 nCi/L for the years 1974 through 1980. The five sampling points along the river ranged from a low of 0.54 nCi/L to a high of 2.9 nCi/L for the same period of time. From 1980 to present, the average tritium concentrations in the Great Miami River have reflected the average background concentrations, with only minor fluctuations.

4.3. TRITIUM IN POND WATER

4.3.1. Available Data

Tritium concentrations measured in ponded surface waters at each of the eight sampling locations have been summarized in the annual reports since 1974. The tritium analyses are currently performed quarterly; however, the frequency has varied from annually to semi-annually in previous years. The available data consist of copies of handwritten data sheets (1976 to 1984), copies of computer-generated data sheets (1985 to 1989), and summary tables contained in the Mound Facility Annual Environmental Monitoring Report for the calender years 1974 through 1988 (MRC 1975 through 1988; EG&G 1989). The copies of the data sheets for 1976 through 1989 are presented in Appendix C.

Mound Plant personnel analyzed the data by computing the annual average tritium concentration at each of the eight pond sampling locations. For the years 1974 to 1977, actual concentrations were reported (Table IV.2). Since 1978, incremental concentrations were reported and calculated by subtracting the EL from the measured concentrations. Table IV.2 reports both measured concentrations and EL. The average value included all samples taken in a given year regardless of sampling data. Results of duplicate samples were apparently given the same weight as other results. The computer average values for Location 11 (1980) and Location 12 (1980) did not include one result at each location, perhaps due to an oversight. It was also noted that several values of "zero" were included in the computed annual average concentrations.

Other values that were computed include "standard deviation", which is more commonly referenced to as "sample deviation" for sample groups less than 50 in number; "combined error" for certain years only; and "standard error." During efforts to duplicate computed results, several minor mathematical errors were detected that were possibly due to transcribing values by hand.

4.3.2. Data Description

To identify long-term trends, the average annual tritium concentrations at each of the eight pond sampling locations were plotted versus time. The results are shown in Figures 4.3, 4.4, and 4.5.

Table IV.2. Tritium Concentrations (nCi/L)
in Pond Water (1974–1988)

	Sample Location #10			Sample Location #11			Sample Location #12		
Year	x	s	n	x	s	n	x	s	n
1974	<1.4	NA	4	<0.8	NA	4	<0.9	NA	4
1975	0.9	NA	1	3.1	NA	1	<0.3	NA	1
1976	0.59	0.33	1	0.34	0.31	1	0.34	0.32	1
1977	0.8	NA	3	0.6	NA	4	0.5	NA	4
1978	1.4	0.6	4	0.98	0.33	4	1.4	0.7	4
1979	0.96	0.59	4	0.84	0.51	4	0.51	0.26	4
1980	0.48	0.58	12	0.60	0.48	13	0.62	0.46	13
1981	0.31	NA	16	0.37	NA	20	0.23	NA	19
1982	0.53	0.3	18	0.59	0.32	18	0.75	0.69	17
1983	0.18	0.14	14	0.14	0.11	21	0.14	0.1	22
1984	0.23	0.02	4	0.19	0.18	19	0.16	0.14	20
1985	0.19	0.13	8	0.17	0.07	10	0.15	0.14	10
1986	0.15	0.06	8	0.05	0.07	15	0.03	0.04	16
1987	NS			0.15	0.32	7	0.09	0.23	7
1988	NS			0.33	0.38	4	0.07	0.08	4
1989	NS			0.02	0.11	4	0.04	0.07	4

x= average concentration (nCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

Table IV.2. (page 2 of 3)

	Sample Location #13			Sample Location #14			Sample Location #15		
Year	x	s	n	x	s	n	x	s	n
1974	<1.4	NA	4	<2.1	NA	4	<2.8	NA	4
1975	0.8	NA	1	1.5	NA	1	0.6	NA	1
1976	0.38	0.32	1	0.48	0.33	1	0.63	0.33	1
1977	1.1	NA	4	1.1	NA	4	1.3	NA	4
1978	1.7	0.5	3	1.4	0.9	4	1.6	0.7	4
1979	0.95	NA	4	1.20	0.39	4	0.59	0.80	4
1980	1.01	0.53	12	0.93	0.58	12	0.84	0.55	13
1981	0.29	NA	19	0.45	NA	21	0.37	NA	21
1982	0.55	NA	0.28	0.79	0.43	19	0.67	0.4	18
1983	0.22	0.12	23	0.39	0.14	21	0.34	0.17	20
1984	0.21	0.14	20	0.64	0.27	19	0.42	0.38	19
1985	0.16	0.10	10	0.33	0.11	10	0.24	0.12	10
1986	0.17	0.06	16	0.24	0.17	12	0.14	0.11	16
1987	0.02	0.03	7	0.13	0.17	7	0.19	0.27	6
1988	0.09	0.10	4	0.15	0.11	4	0.10	0.13	4
1989	0.06	0.10	4	0.16	0.10	4	−0.01	0.18	4

x= average concentration (nCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

Table IV.2. (page 3 of 3)

	Sample Location #16			Sample Location #17			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1974	<0.9	NA	4	<3.5	NA	4	NS		
1975	0.4	NA	1	2.1	NA	1	0.5	NA	NA
1976	0.34	0.32	1	1.9	0.35	1	0.5	NA	NA
1977	0.8	NA	4	1.9	NA	3	0.9	NA	NA
1978	1.5	1.1	4	2.0	1.6	4	0.9	NA	NA
1979	0.78	0.35	4	1.15	NA	4	0.85	NA	NA
1980	0.76	0.58	13	1.1	0.61	12	0.61	0.50	17
1981	0.35	NA	19	0.62	NA	19	0.28	NA	16
1982	0.66	0.56	19	0.77	0.32	18	0.57	0.29	16
1983	0.14	0.09	23	0.51	0.16	23	0.11	0.1	16
1984	0.17	0.08	14	0.44	0.17	19	0.21	0.14	18
1985	0.09	0.08	10	0.31	0.09	10	0.1	0.10	12
1986	0.07	0.08	16	0.34	0.07	16	0.06	0.07	12
1987	0.01	0.03	7	0.25	0.16	7	0.10	0.27	10
1988	0.02	0.11	4	0.16	0.12	4	0.02	0.06	4
1989	-0.06	0.17	4	0.14	0.13	4	-0.01	0.05	4

x= average concentration (nCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

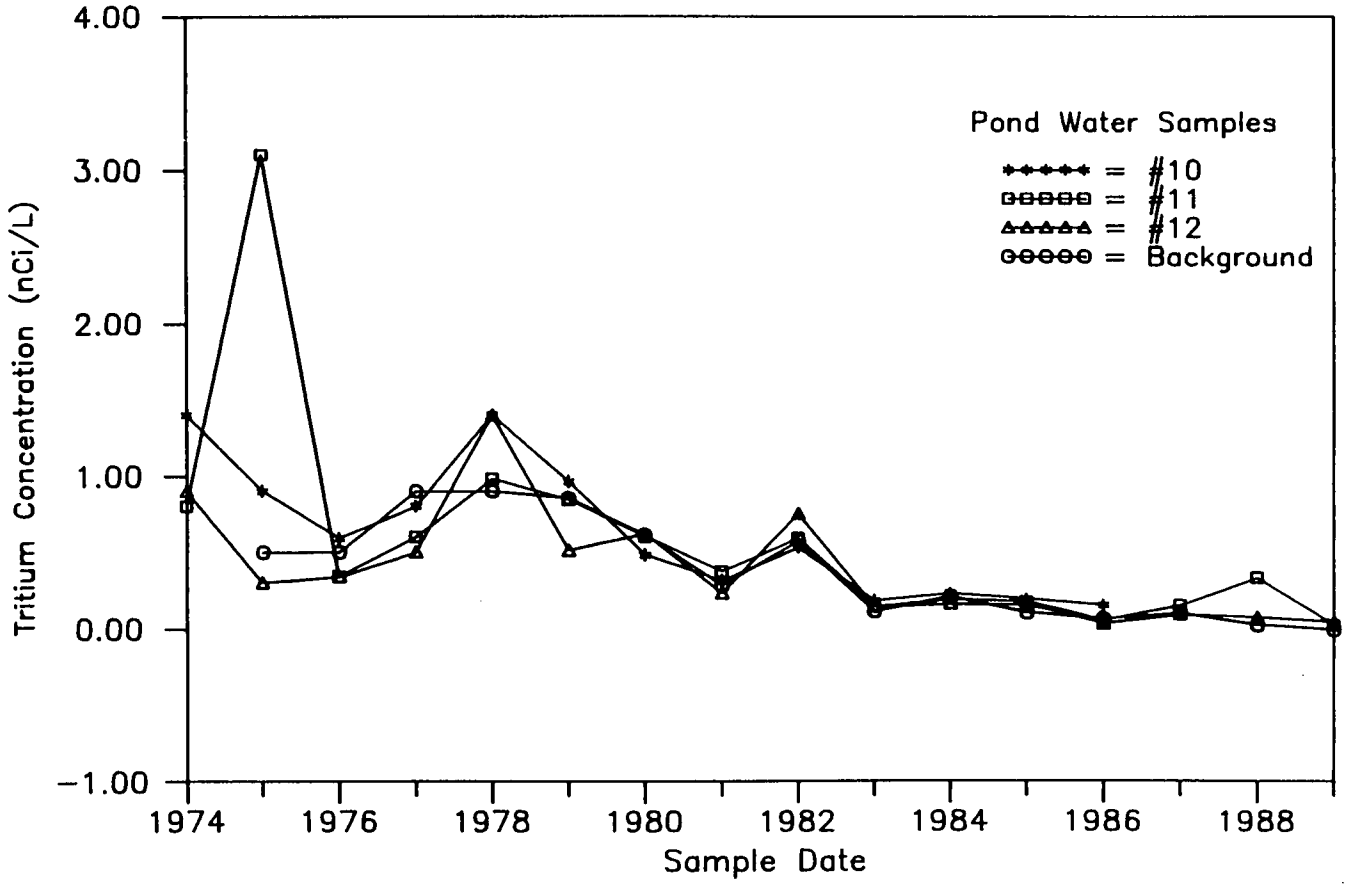


Figure 4.3. Tritium concentrations in pond water samples from sampling locations 10, 11, 12, and background for the years 1974 through 1989.

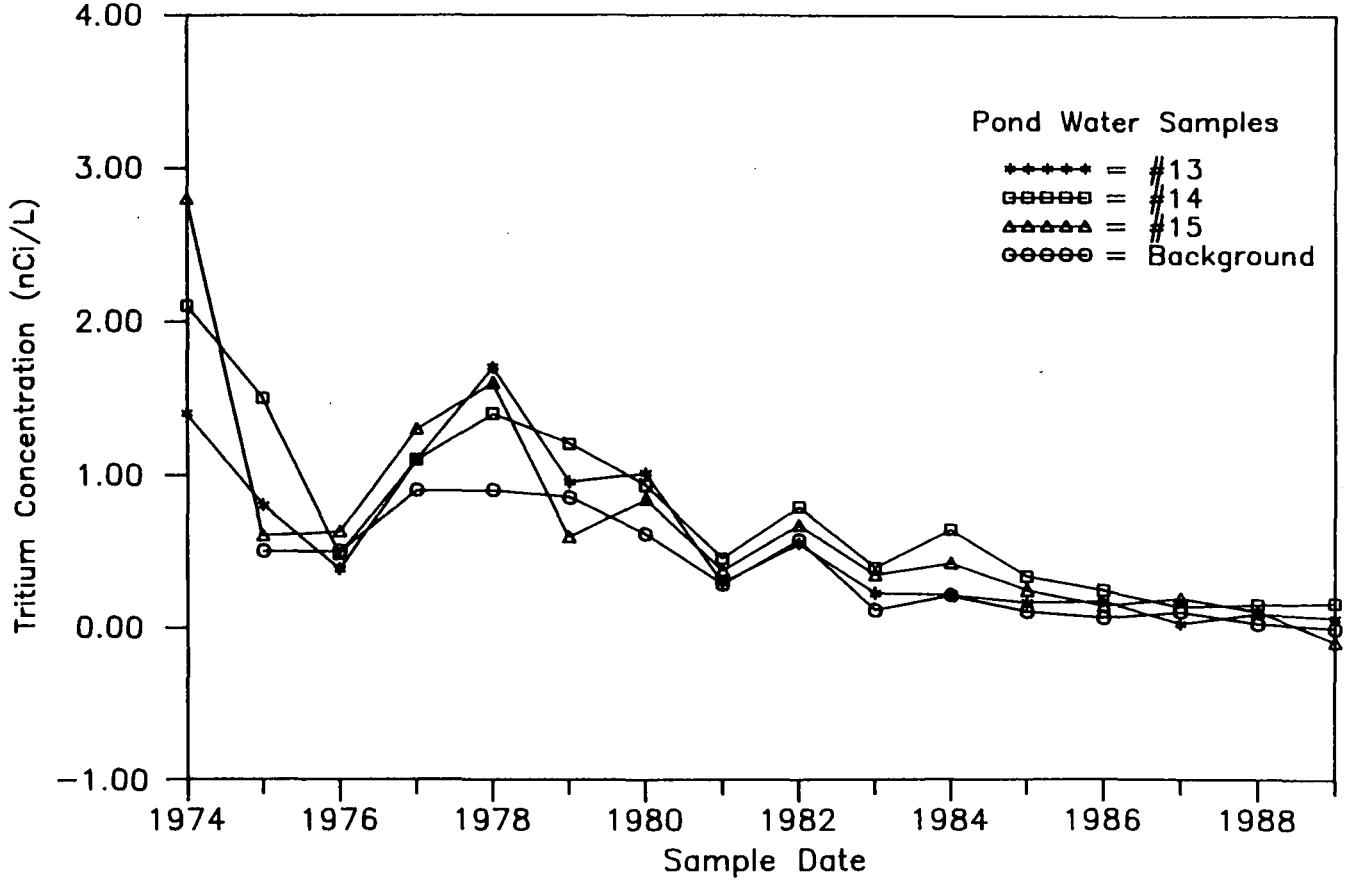


Figure 4.4. Tritium concentrations in pond water samples from sampling locations 13, 14, 15, and background for the years 1974 through 1989.

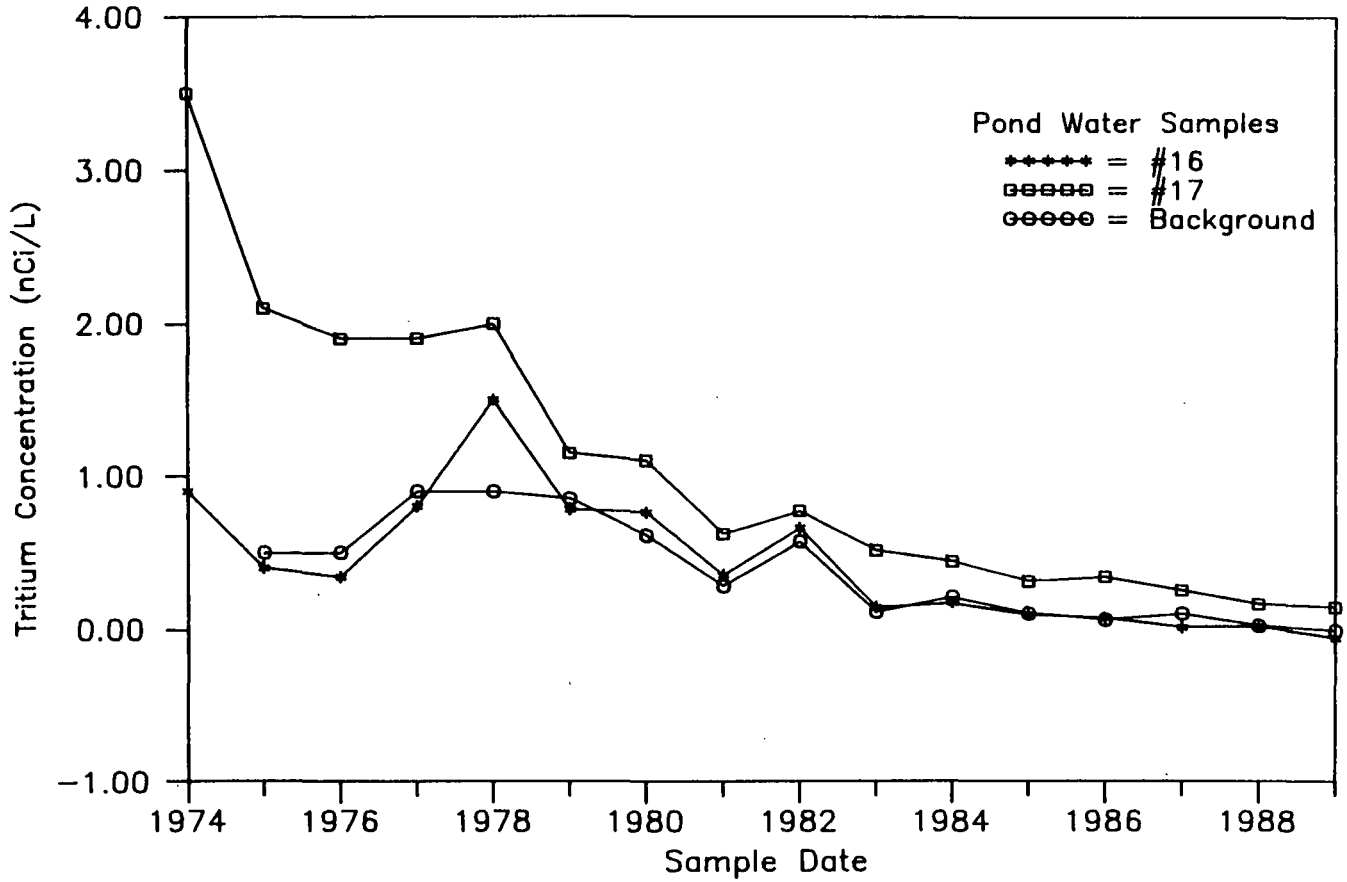


Figure 4.5. Tritium concentrations in pond water samples from sampling locations 16, 17, and background for the years 1974 through 1989.

These data indicate a decreasing trend in the annual tritium concentrations at the eight sampling locations through time. The data show that the average background concentration of tritium in pond water ranged from a high of 0.85 nCi/L in 1979 to a low of 0.06 nCi/L in 1989. The pond water sampling locations show an overall decrease in tritium concentration from a high in 1974 to a low in 1986 for sample locations 10, 11, and 12; and a low in 1988 for sample locations 13, 14, 15, 16, and 17. Pond location 10 was not sampled in 1987, 1988, or 1989. The high recorded for sample location 11 in 1975 appears to be analytically related when compared in light of the other concentrations recorded for the same year at other locations. The tritium concentrations in pond water samples fluctuate more from background than do the river water samples discussed above.

Although other factors may be involved, such as atmospheric fallout reduction from weapons testing, the reduction in annual average tritium concentrations through time in the pond water may be largely attributed to the reduction of tritium stack emissions, as discussed in Section 3.

4.4. PLUTONIUM-238 IN THE GREAT MIAMI RIVER

4.4.1. Available Data

Plutonium-238 concentrations measured in the Great Miami River have been summarized in the annual reports since 1974. The plutonium-238 analyses are currently performed monthly; however, the frequency has varied from semi-annually to quarterly in previous years. The available data (Appendix D) consist of handwritten data compilation sheets from 1976 through 1984, and computer-generated data compilation sheets from 1985 through 1989.

The data set was used to compute the average annual plutonium-238 concentrations at each of the five Great Miami River sampling locations (Plate 1) for the years 1974 through 1989. A summary of the computed average plutonium-238 concentrations in river water is presented in Table IV.3.

4.4.2. Data Evaluation

To identify long-term trends, the average plutonium-238 concentrations at each of the five sampling locations were plotted versus time. The generated plots are shown in Figures 4.6 and 4.7.

These data indicate a sudden decrease in the average annual plutonium-238 concentrations at the five river sampling locations from 1974 to 1975. The concentrations of plutonium at the five sampling locations in 1974 ranged from a high of 14 pCi/L to a low of 5.0 pCi/L. By 1975, the range of concentrations of plutonium at the sampling locations had dropped drastically to a high of 0.52 pCi/L and a low of

Table IV.3. Plutonium-238 Concentrations (pCi/L) in the Great Miami River (1974-1989)

	Sample Location R-1			Sample Location R-2			Sample Location R-3		
Year	x	s	n	x	s	n	x	s	n
1974	<.60	NA	249	<1.4	NA	249	<.80	NA	249
1975	0.019	NA	210	<.034	NA	210	0.023	NA	210
1976	0.006	NA	105	0.019	NA	105	0.004	NA	105
1977	<.01	NA	210	<.016	NA	210	<.020	NA	210
1978	<.036	0.032	2	<.016	0.003	2	<.016	0.003	2
1979	0.005	0.003	4	0.004	0.002	4	0.007	0.002	4
1980	0.008	0.005	4	0.003	0.002	4	0.004	0.002	4
1981	0.006	0.009	4	0.005	0.005	4	0.003	0.002	4
1982	0.002	0.0001	4	0.002	0.001	4	0.006	0.007	3
1983	0.001	0.001	4	0.002	0.001	4	0.002	0.001	4
1984	0.002	0.003	4	0.002	0.001	4	0.001	0.001	4
1985	0.003	0.004	4	0.001	0.002	4	0.003	0.004	4
1986	0.003	0.002	3	0.002	0.002	3	0.003	0.001	3
1987	0.001	0.004	10	0.001	0.003	10	-0.002	0.002	10
1988	-0.0001	0.005	12	0.0002	0.005	12	0.001	0.004	12
1989	0.001	0.003	12	0.003	0.003	12	0.002	0.002	12

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

Table IV.3. (page 2 of 2)

	Sample Location R-4			Sample Location R-5			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1974	<.50	NA	249	<.80	NA	249	NS		
1975	0.052	NA	210	0.024	NA	210	0.001	NA	NA
1976	0.01	NA	105	0.005	NA	105	0.001	NA	NA
1977	0.08	NA	210	<.01	NA	210	0.001	NA	NA
1978	<.028	0.021	2	<.01	NA	2	0.001	NA	NA
1979	0.01	0.006	4	0.01	0.007	4	0.003	0.001	3
1980	0.011	0.002	4	0.003	0.001	4	0.002	0.001	4
1981	0.005	0.002	4	0.002	0.001	4	0.003	0.002	4
1982	0.004	0.002	4	0.003	0.001	4	0.002	0.001	4
1983	0.002	0.0003	4	0.001	0.001	4	0.002	0.0001	3
1984	0.002	0.002	4	0.001	0.001	4	0.001	0.001	2
1985	0.002	0.001	4	0.002	0.002	4	0.0003	0.001	4
1986	0.002	0.002	3	0.004	0.004	3	0.001	0.003	3
1987	0.003	0.005	10	0.0002	0.002	10	-0.0004	0.002	10
1988	0.001	0.007	12	0.0004	0.003	12	-0.0009	0.005	12
1989	0.003	0.003	12	0.002	0.004	12	0.0002	0.006	12

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

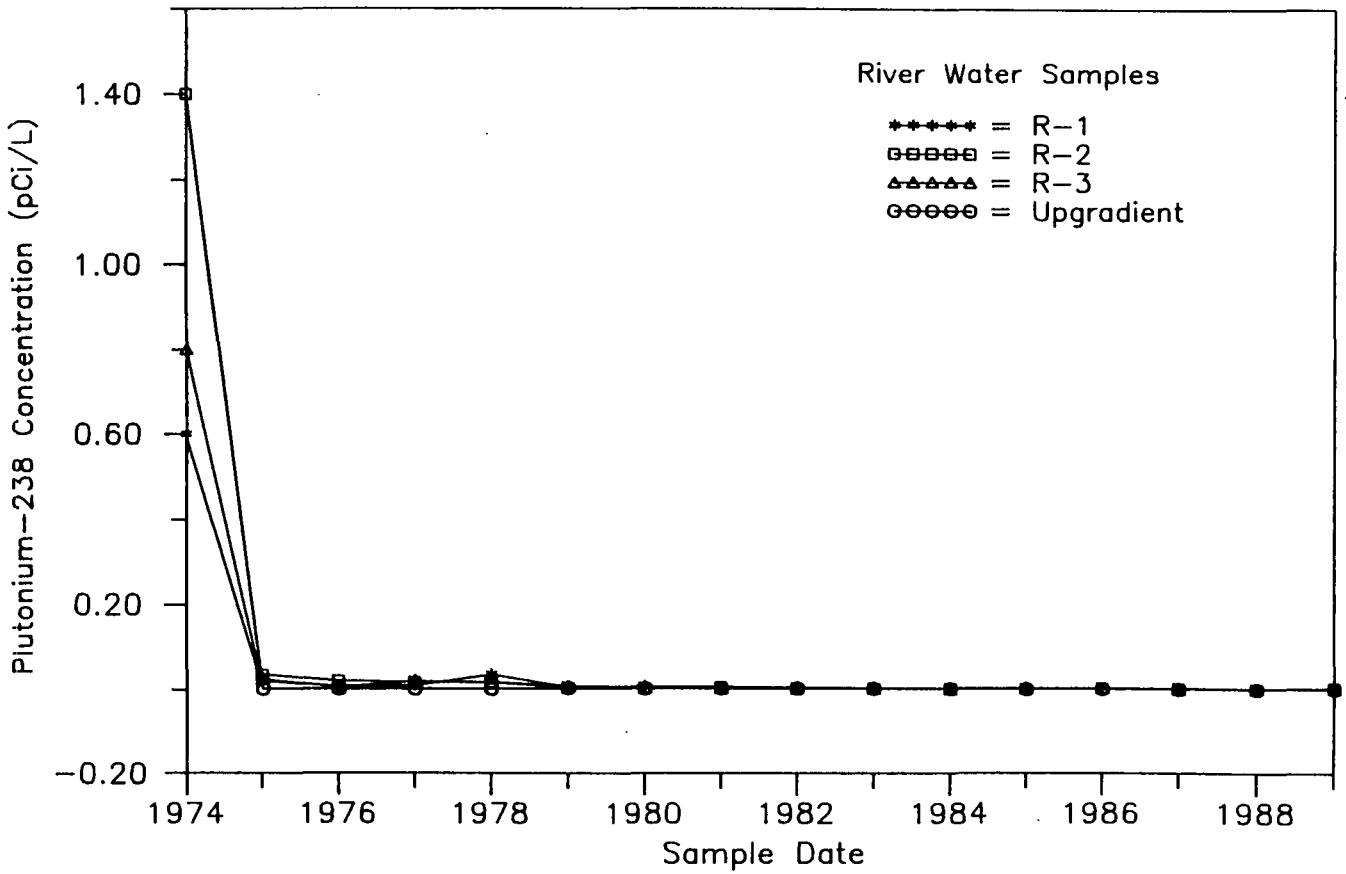


Figure 4.6. Plutonium-238 concentrations in river water samples from sampling locations R-1, R-2, R-3, and upgradient for the years 1974 through 1989.

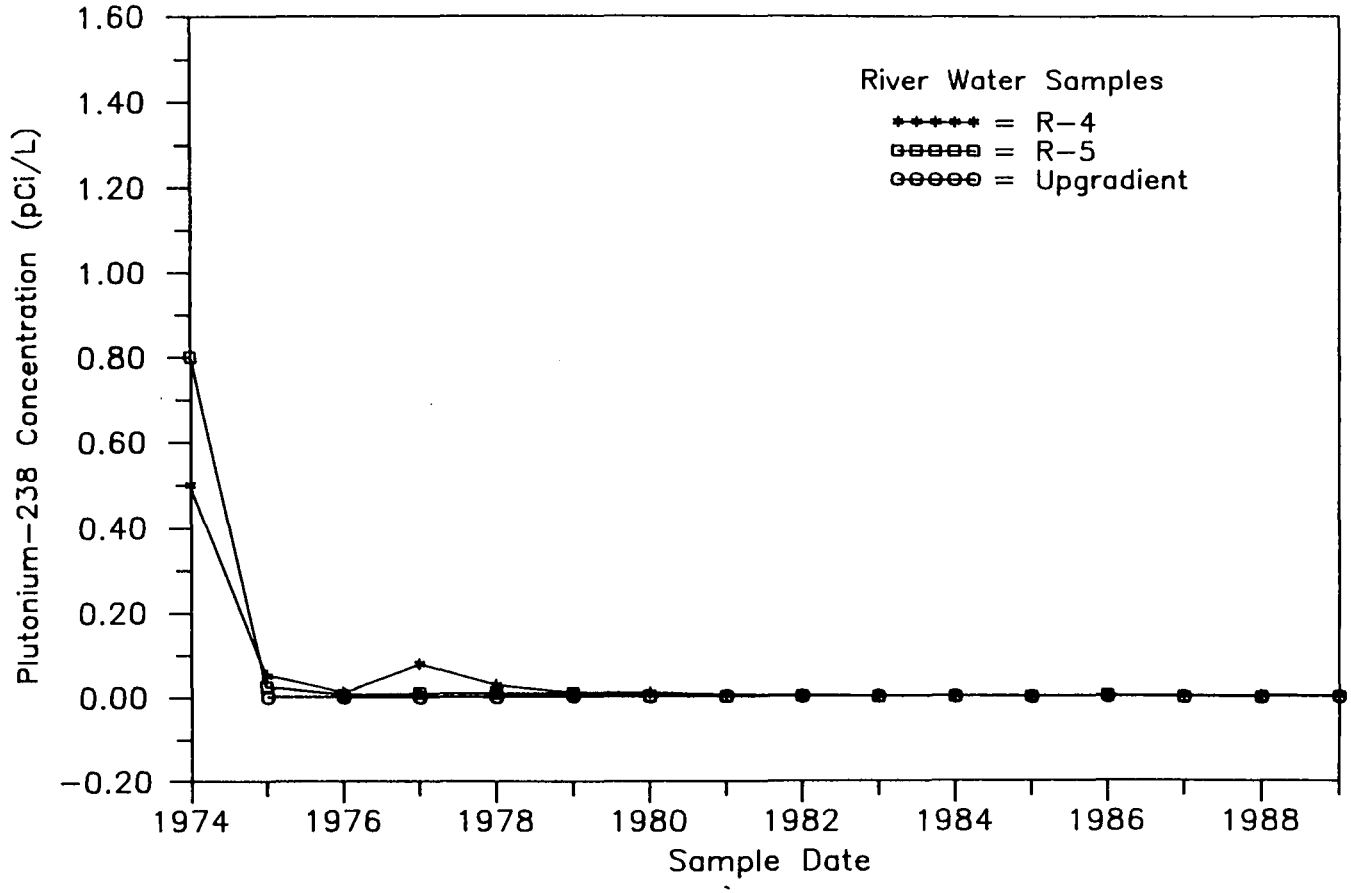


Figure 4.7. Plutonium-238 concentrations in river water samples from sampling locations R-4, R-5, and upgradient for the years 1974 through 1989.

0.19 pCi/L. From 1975 to 1979, a minor amount of fluctuation is noted between background and the plutonium concentrations in samples from the five river locations; from 1979 to present, the concentrations of plutonium in river samples have essentially been equal to the average background concentrations. These levels of plutonium-238 in the Great Miami River are comparable to those measured by other researchers. Wayman et al. (1976) reported values of .00035 to .005 pCi/L in river samples upstream and downstream of Mound Plant, respectively.

Although other factors may be involved, the decrease in the annual average plutonium-238 concentrations in 1975 is probably due to the change in water sample preparation. Whereas unfiltered water samples were analyzed in 1974, filtered water samples were analyzed in 1975 and years thereafter.

4.5. PLUTONIUM-238 IN THE GREAT MIAMI RIVER SILT

4.5.1. Available Data

Plutonium concentrations measured in the Great Miami River silt have been summarized in the annual reports since 1976. The plutonium-238 analyses are currently performed quarterly; however, the analyses have been performed semi-annually in previous years. The available data (Appendix E) consists of handwritten data compilation sheets from 1976 through 1984, and computer-generated data compilation sheets from 1985 through 1989. No original laboratory reports are known to exist.

The data set was used to compute the average annual plutonium-238 concentrations in the Great Miami River silt at each of the five sampling locations (Plate 1) for the years 1976 through 1989. A summary of the computed values is presented in Table IV.4.

4.5.2. Data Description

To identify long-term trends, the average annual concentrations at each of the five sampling locations along the Great Miami River were plotted versus time. The generated plots are presented in Figures 4.8 and 4.9.

These data show highly variable plutonium-238 concentrations at river silt sampling locations from 1976 through 1978. Since 1979, the average plutonium concentrations measured in samples remain very close to the background (upgradient) concentrations with only minor fluctuations occurring from 1983 to 1989 in samples from location R-4.

The high variability in the samples from 1976 to 1978 may be the result of sample collection, preparation, or analysis errors. Although other factors may be involved, the reduction in the annual average plutonium-238

Table IV.4. Plutonium-238 Concentrations (pCi/g) in the Great Miami River Silt (1976-1989)

Year	Sample Location R-1			Sample Location R-2			Sample Location R-3		
	x	s	n	x	s	n	x	s	n
1976	1.19	NA	1	15.22	NA	1	NS		
1977	0.795	0.4031	2	7.44	9.84	2	2.68	0.1556	2
1978	32.05	43.36	2	20.47	21.5	2	9.2	2.21	2
1979	0.0011	NA	1	0.0131	NA	1	0.8066	NA	1
1980	0.0013	0.0008	4	0.0189	0.0081	4	0.1026	0.0307	4
1981	0.004	0.0057	4	0.0528	0.0644	4	0.075	0.0291	4
1982	0.0023	0.0016	4	0.0354	0.0402	4	0.0534	0.0163	4
1983	0.0015	0.0007	2	0.0133	0.0037	2	0.243	0.3013	2
1984	0.0017	0.0013	3	0.0309	0.0134	3	0.0224	0.0212	3
1985	0.0016	0.0019	4	0.0136	0.0048	4	0.0362	0.0067	4
1986	0.0019	0.0028	3	0.0223	0.0093	3	0.0432	0.0262	2
1987	0.0078	0.0145	4	0.0222	0.0187	4	0.0374	0.0182	4
1988	0.0044	0.0075	4	0.0669	0.0286	4	0.2146	0.1084	4
1989	0.0015	0.0006	4	0.0369	0.0239	4	0.0725	0.0262	4

x= average concentration (pCi/Kg)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

Table IV.4. (page 2 of 2)

	Sample Location R–4			Sample Location R–5			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1976	5.12	NA	1	0.47	NA	1	NS		
1977	4.72	0.495	2	0.94	0.9051	2	NS		
1978	20.44	23.47	2	1.91	1.25	2	NS		
1979	0.4232	NA	1	0.0693	NA	1	0.0005	0.0001	3
1980	0.2472	0.0868	4	0.0119	0.0054	4	0.0031	0.0043	4
1981	0.2998	0.1939	4	0.0239	0.0163	4	0.0053	0.0084	4
1982	0.0999	0.1316	4	0.064	0.1047	4	0.0011	0.0006	4
1983	0.0547	0.0053	2	0.0094	0.0006	2	0.0021	0.0005	2
1984	0.9379	1.0376	3	0.0403	0.0236	3	0.0005	0.0001	2
1985	0.1239	0.0617	4	0.0113	0.008	4	0.0007	0.0008	4
1986	0.3028	0.2222	3	0.0136	0.0044	3	0.0006	0.0006	3
1987	0.6671	1.0604	4	0.025	0.0215	4	0.0004	0.0006	4
1988	0.9749	0.4356	4	0.0077	0.0027	3	0.0022	0.0045	3
1989	0.1076	0.0924	4	0.0124	0.0082	4	–0.0027	0.0039	3

x= average concentration (pCi/Kg)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
EL = environmental level

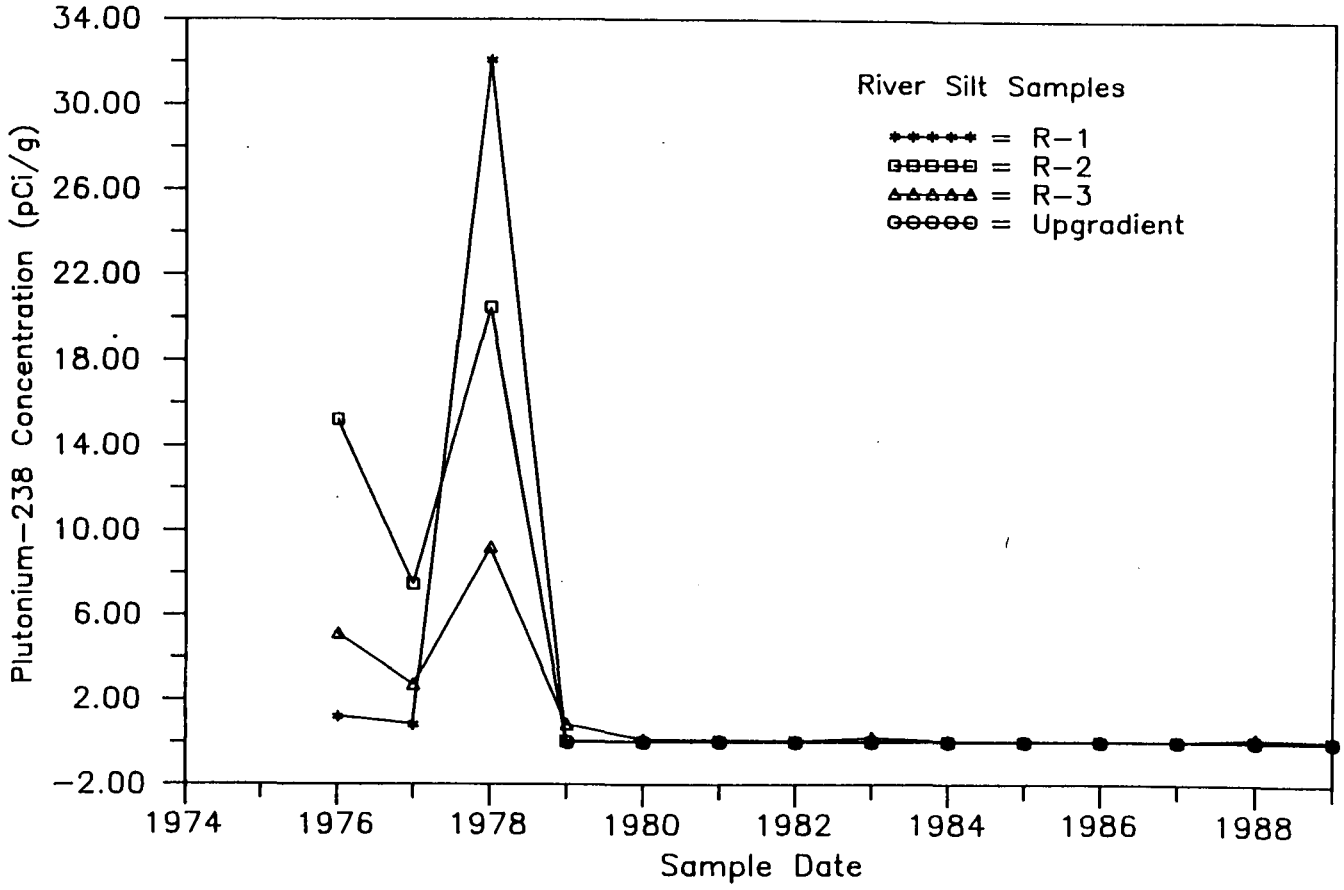


Figure 4.8. Plutonium-238 concentrations in river silt samples from sampling locations R-1, R-2, R-3, and upgradient for the years 1976 through 1989.

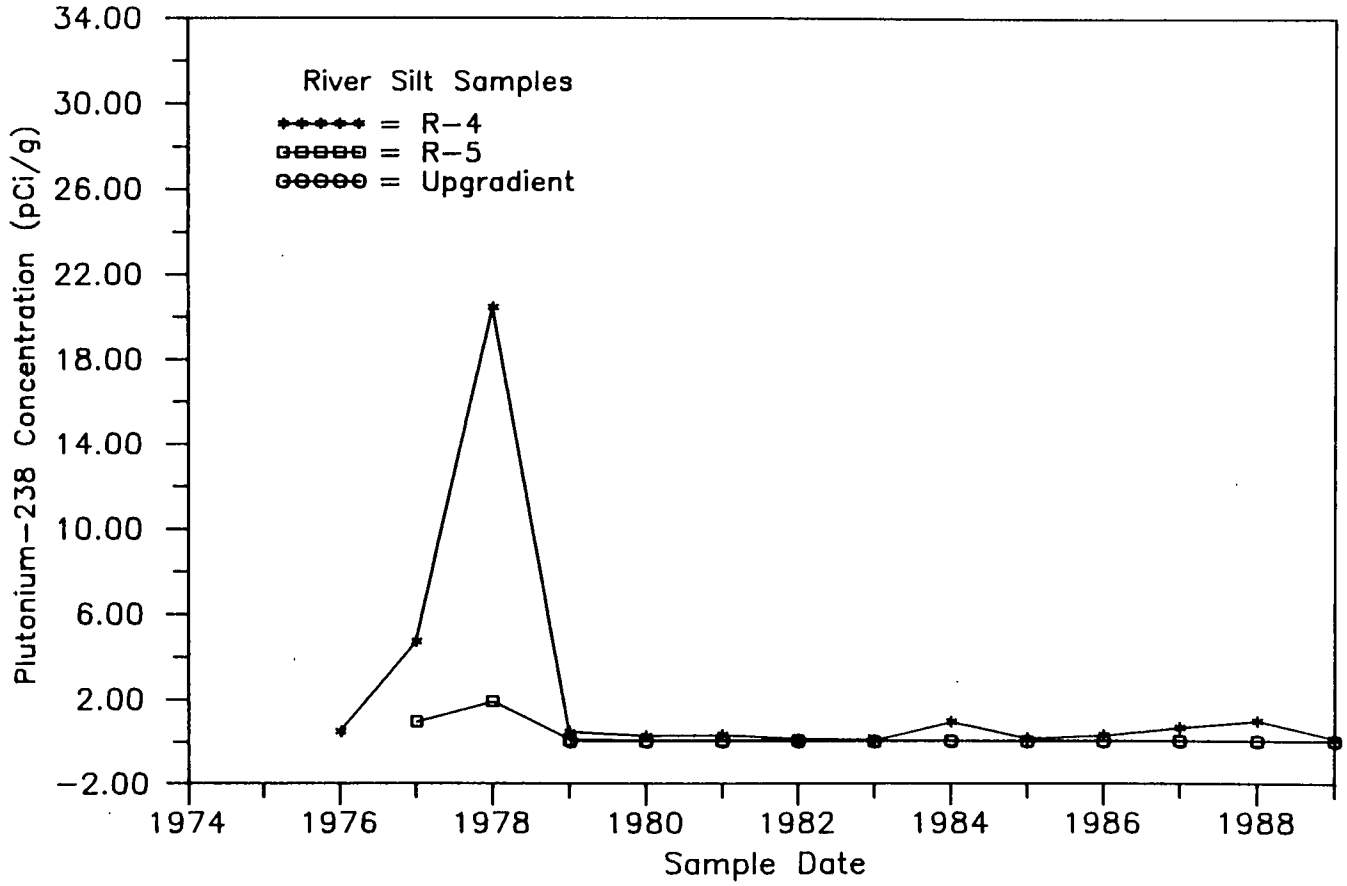


Figure 4.9. Plutonium-238 concentrations in river silt samples from sampling locations R-4, R-5, and upgradient for the years 1976 through 1989.

concentrations through time in the Great Miami River may be attributed to the reduction in the amounts of plutonium contaminated sediment released offsite. In 1977, construction of an overflow pond and retention basin system was completed that controlled discharge of plutonium-contaminated sediment. The change in sample collection and preparation procedures of suspended versus deposited silts in 1978 make before and after comparisons difficult. No samples of suspended silt are known to have been collected since 1978.

4.6. PLUTONIUM-238 IN POND WATER

4.6.1. Available Data

Plutonium-238 concentrations have been measured at the eight pond sampling locations since 1974. The plutonium-238 analyses are currently performed quarterly; however, the frequency has varied from annually to semi-annually in previous years. The available data consist of copies of handwritten data sheets (1976 to 1984), copies of computer-generated data sheets (1985 to 1989), and summary tables contained in the Mound Facility Annual Environmental Monitoring Report for the calender years 1974 through 1988 (MRC 1975 through 1988; EG&G 1989). The ponds included in the surveillance do not include the ponds along the abandoned stretch of the Miami-Erie Canal.

For the years 1974 to 1977, actual concentrations were reported (Table IV.5). Since 1978, incremental concentrations were reported and were calculated by subtracting the EL from the measured concentrations. Table IV.5 reports both measured concentrations and ELs. The copies of the data sheets for 1976 through 1989 are presented in Appendix F.

Mound Plant personnel analyzed the data by computing the annual average plutonium-238 concentration at each of the eight pond sampling locations. The average value included all samples taken in a given year regardless of sampling data. Results of duplicate samples were apparently given the same weight as other results. It was also noted that several values of "zero" were included in the computed annual average concentrations. Beginning in 1980 when ELs could not be detected, "reagent blank levels" were subtracted from "gross concentrations." All calculations from 1980 on were performed using values which "represent actual measurements above reagent blank levels."

Other values that were computed include: "standard deviation", which is more commonly referred to as "sample deviation" for sample groups less than 50 in number; "combined error" for certain years only; and "standard error." During efforts to duplicate computed results, several minor mathematical errors were detected that were possibly due to transcribing values by hand.

Table IV.5. Plutonium-238 Concentrations (pCi/L) in Pond Water (1974–1988)

	Sample Location #10			Sample Location #11			Sample Location #12		
Year	x	s	n	x	s	n	x	s	n
1974	<.45	NA	4	<.38	NA	4	<.31	NA	4
1975	0.14	NA	1	0.15	NA	1	0.067	NA	1
1976	0.010	NA	2	0.012	NA	2	0.007	NA	2
1977	<.015	NA	210	<.010	NA	210	<.010	NA	210
1978	0.005	NA	2	0.002	NA	2	0.001	NA	2
1979	0.004	0.0019	4	0.003	0.0008	4	0.004	0.0003	4
1980	0.0001	0.0001	4	0.0002	0.0002	4	-0.003	0.0009	4
1981	0.001	NA	4	0.0003	NA	4	0.0026	NA	4
1982	0.0039	.0029	3	0.0028	0.0021	4	0.0011	.0014	4
1983	NS			0.005	0.0078	4	0.0005	0.0004	4
1984	NS			0.0022	0.0038	4	0.0007	0.0003	4
1985	0.0004	0.0009	3	0.0017	0.0012	4	0.0014	0.0010	4
1986	0.00	NA	1	0.0022	0.0005	3	0.0019	0.0012	3
1987	NS			0.0015	0.0018	4	0.0015	0.0009	4
1988	NS			0.0023	0.0029	4	-0.0015	0.0013	4
1989	NS			0.0020	-0.0015	4	0.0010	0.0012	4

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
ND= not detected
EL = environmental level

Table IV.5. (page 2 of 3)

	Sample Location #13			Sample Location #14			Sample Location #15		
Year	x	s	n	x	s	n	x	s	n
1974	<.31	NA	4	<.30	NA	4	<.61	NA	4
1975	0.034	NA	1	0.041	NA	1	0.066	NA	1
1976	0.006	NA	2	0.011	NA	2	0.005	NA	2
1977	<.010	NA	210	<.01	NA	210	<.010	NA	210
1978	0.002	NA	1	0.001	NA	2	0.002	NA	2
1979	0.003	0.0026	4	0.004	0.0011	3	0.003	0.0009	4
1980	0.001	0.0021	4	0.001	0.0004	4	0.0004	0.0005	4
1981	0.00003	NA	4	.0006	NA	4	0.001	NA	4
1982	0.0015	.0018	4	0.0009	0.0016	4	0.0005	0.0007	4
1983	0.0014	0.0016	4	0.0013	0.0007	4	0.0011	0.0006	4
1984	0.0009	0.0015	4	0.0008	0.0004	4	0.0029	0.0044	4
1985	0.0015	0.0010	4	0.0013	0.0009	4	0.0009	0.0005	4
1986	0.0050	0.0066	3	0.0005	0.0012	3	0.0002	0.0009	3
1987	0.0584	0.0081	4	0.0000	0.0005	4	0.0017	0.0031	4
1988	0.0020	0.0059	4	-0.014	0.0022	4	-0.0022	0.0022	4
1989	0.0006	0.0010	4	0.0008	0.0045	4	-0.0009	0.0024	4

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
ND= not detected
EL = environmental level

Table IV.5. (page 3 of 3)

	Sample Location #16			Sample Location #17			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1974	<.94	NA	4	<.33	NA	4	NS		
1975	0.009	NA	1	0.014	NA	1	NS		
1976	0.008	NA	2	0.004	NA	2	NS		
1977	<.010	NA	210	<.010	NA	210	NS		
1978	0.004	NA	1	0.002	NA	2	NS		
1979	0.002	0.0003	3	0.006	0.0012	4	0.001	0.0003	3
1980	0.001	0.0007	3	0.007	0.005	4	-0.0003	0.0006	
1981	0.0019	NA	4	0.011	NA	4	0.0025	NA	4
1982	0.0011	0.0018	4	0.0018	0.0007	4	0.0001	0.0004	4
1983	0.0004	0.0003	4	0.0007	0.0008	4	0.0005	0.0004	4
1984	0.0006	0.0005	4	0.0014	0.0012	4	0.0014	0.0011	4
1985	0.0008	0.0002	4	0.029	0.0637	4	0.0062	0.0105	4
1986	0.0012	0.0014	3	0.0007	0.0015	3	0.0034	0.0007	3
1987	0.0013	0.0013	4	0.0004	0.0020	4	0.0023	0.0040	4
1988	-0.0034	0.0018	4	0.0060	0.0121	4	-0.0018	0.0029	4
1989	0.0001	0.0059	4	0.0061	0.0043	4	0.0034	0.0071	4

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
NA= not available or not applicable
ND= not detected
EL = environmental level

4.6.2. Data Description

To identify long-term trends, the average annual plutonium-238 concentrations at each of the eight pond sampling locations were plotted versus time. The results are shown in Figures 4.10, 4.11, and 4.12.

These data show a sharp decrease in plutonium concentrations at the eight pond sampling locations for the years 1974 through 1976. The plutonium concentrations recorded in 1974 ranged from a high of 9.4 pCi/L to a low of 3.0 pCi/L. Since 1976, the plutonium concentrations at each of the pond sampling locations remain near background with only a minor fluctuation occurring in sample 17 in 1985.

The sharp decrease in plutonium concentration from 1974 to 1976 is likely due to the change in sample preparation from unfiltered to filtered water samples.

4.7. PLUTONIUM-238 IN POND SILT

4.7.1. Available Data

Plutonium-238 concentrations measured in silt at the eight pond sampling locations have been summarized in the annual reports since 1976. The plutonium-238 analyses are currently performed quarterly; however, the analyses have been performed semi-annually in previous years. The available data (Appendix G) consist of handwritten data compilation sheets from 1976 through 1984, and computer-generated data compilation sheets from 1985 through 1989.

The data set was used to compute the average annual plutonium-238 concentrations in pond silt for each of the eight pond sampling locations (Plate 1) for the years 1976 through 1989. A summary of the computed average plutonium-238 concentrations in pond silt is presented in Table IV.6.

4.7.2. Data Evaluation

The plutonium-238 concentrations at each of the eight pond sampling locations were plotted versus time. The results are shown in Figures 4.13, 4.14, and 4.15.

These data show a sudden decrease in plutonium concentration in pond silt samples from 1976 to 1977. The average plutonium concentrations recorded in 1976 ranged from a high of 113.0 pCi/g to a low of 0.02 pCi/g. By 1977, the concentrations of plutonium dropped to a high of 0.3 pCi/g and a low of 0.0002 pCi/g. The background concentration of plutonium ranged from a high of 0.07 pCi/g to a low of 0.00002 pCi/g. These concentrations are comparable to those measured by other researchers (.0006 to 0.76 pCi/g) (Wayman et al. 1976).

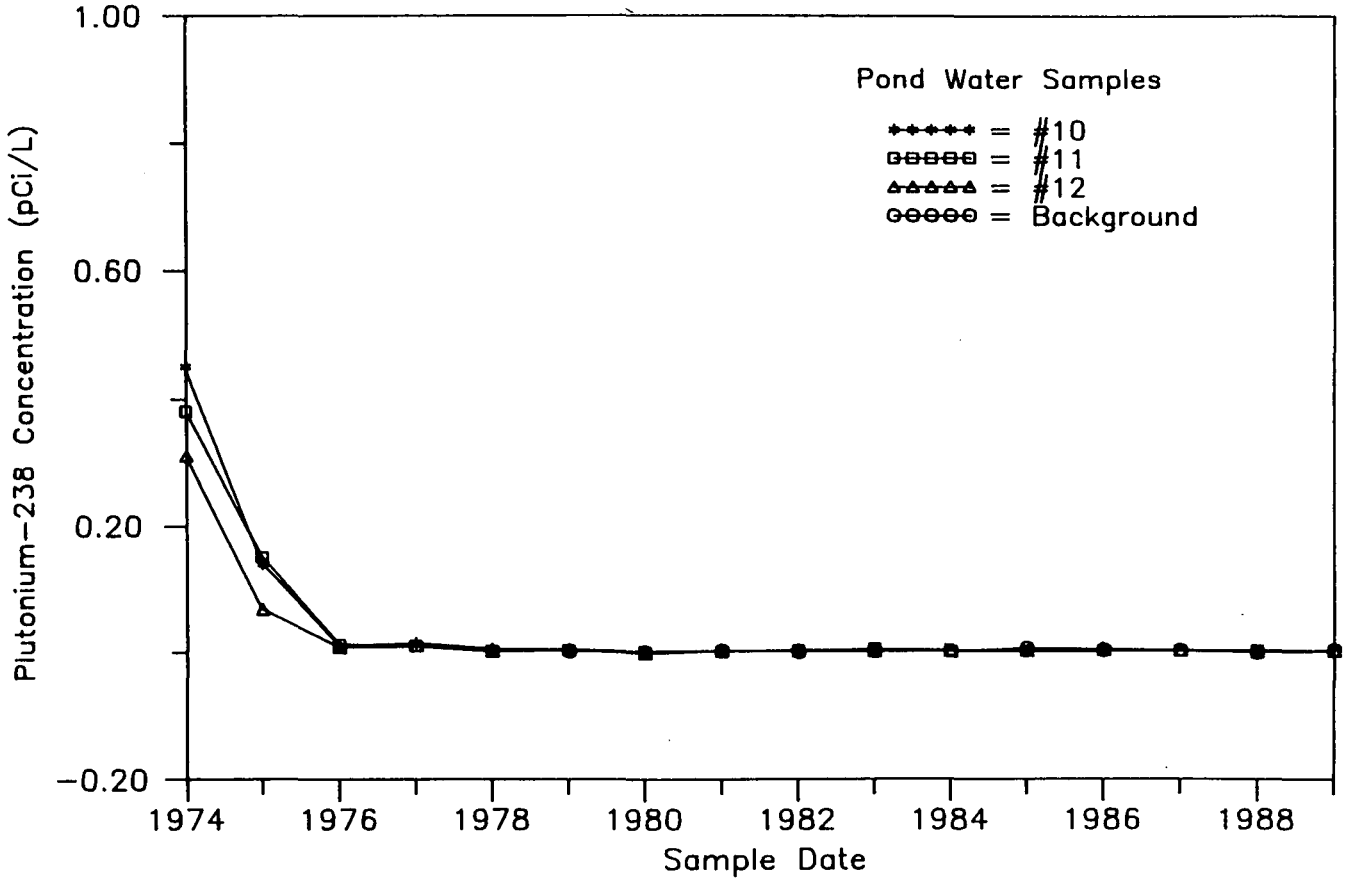


Figure 4.10. Plutonium-238 concentrations in pond water samples from sampling locations 10, 11, 12, and background for the years 1974 through 1989.

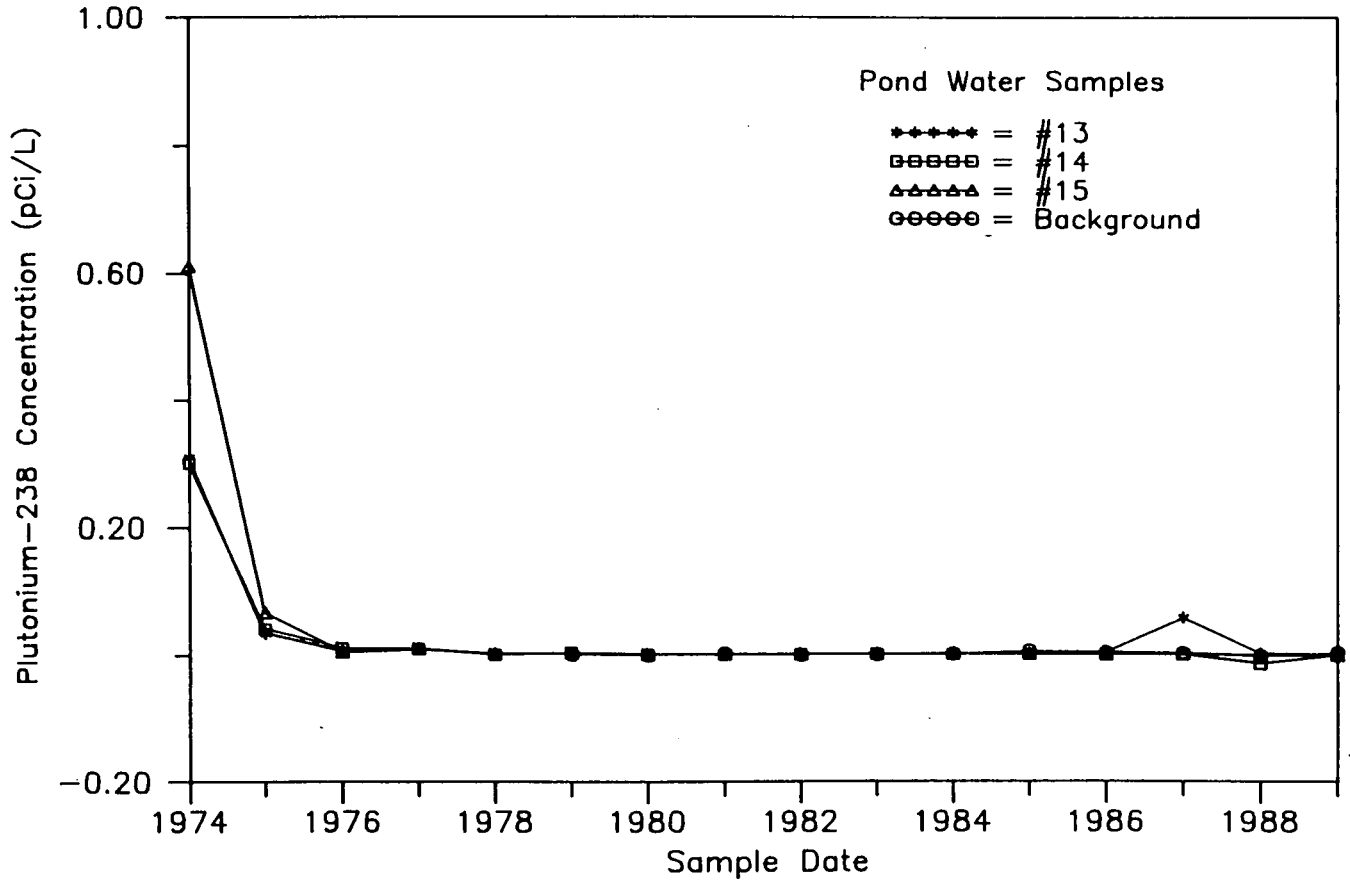


Figure 4.11. Plutonium-238 concentrations in pond water samples from sampling locations 13, 14, 15, and background for the years 1974 through 1989.

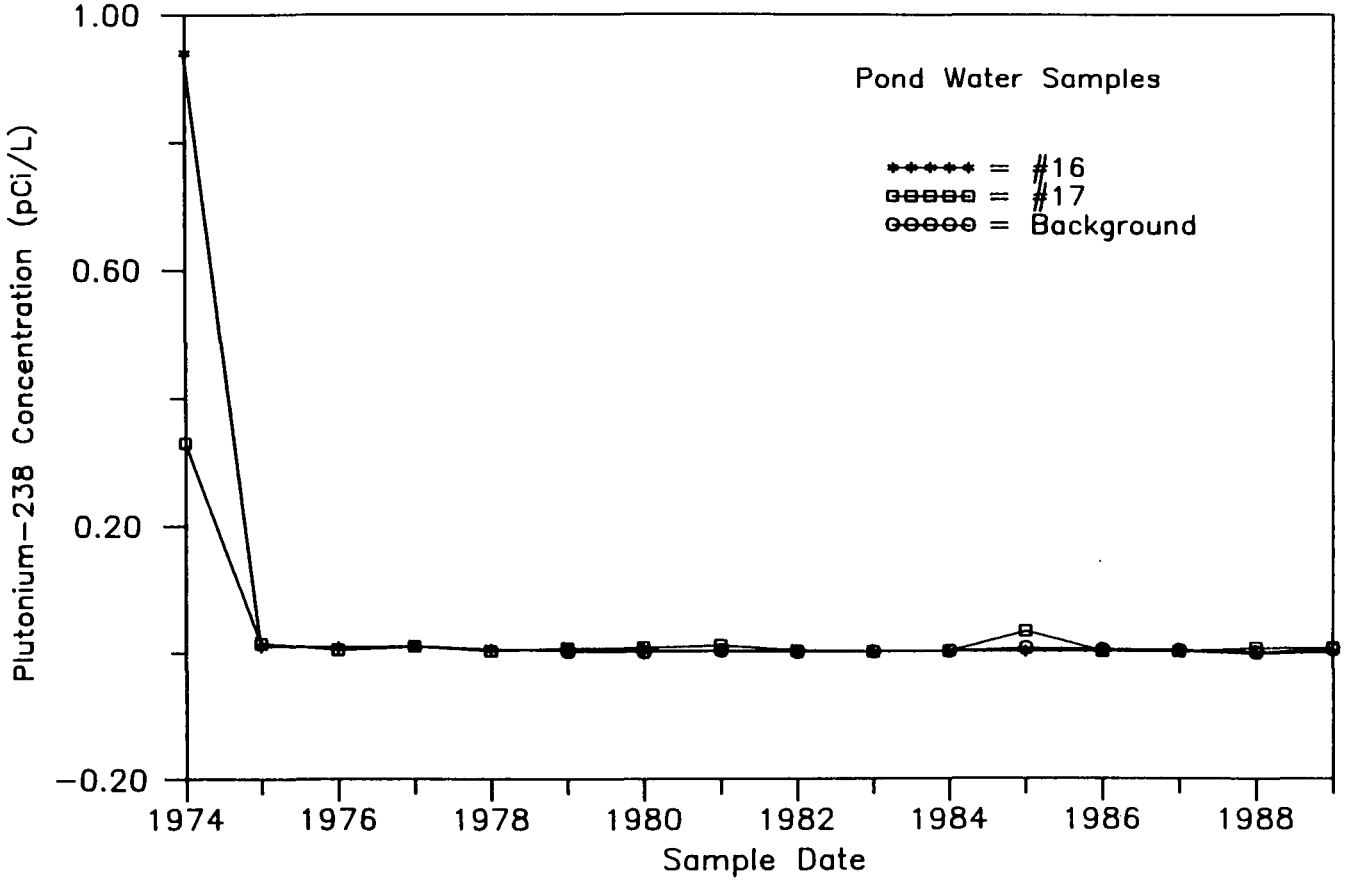


Figure 4.12. Plutonium-238 concentrations in pond water samples from sampling locations 16, 17, and background for the years 1974 through 1989.

Table IV.6. Plutonium-238 Concentrations (pCi/g) in Pond Silt (1976-1989)

	Sample Location #10			Sample Location #11			Sample Location #12		
Year	x	s	n	x	s	n	x	s	n
1976	0.04	0.02	2	5.05	7	2	0.23	0.23	2
1977	0.3	0	2	0.3	0	2	0.36	0	2
1978	0.27	NA	1	0.4214	0.3986	2	0.2894	0.223	2
1979	0.001	0.0004	4	0.0019	0.0023	3	0.0022	0.0014	4
1980	0.01	0.0071	4	0.0013	0.0005	4	0.0023	0.0009	4
1981	0.001	0.0003	4	0.0016	0.0003	4	0.002	0.0007	4
1982	0.003	0.001	4	0.0013	0.0002	4	0.0015	0.0006	4
1983	NS			0.0013	0.0002	4	0.0013	0.0003	4
1984	NS			0.0008	0.0004	3	0.0034	0.0036	3
1985	0.001	0.0001	3	0.0114	0.0201	4	0.0017	0.0009	4
1986	0.001	NA	1	0.0002	0.0003	3	0.0009	0.0011	3
1987	NS			0.0004	0.0001	4	0.0009	0.0006	4
1988	NS			0.002	0.0018	4	0.0006	0.0008	4
1989	NS			0.0359	0.0135	4	0.0398	0.0431	4

x = average concentration (pCi/Kg)
s = standard deviation
n = number of samples
NS = not sampled
NA = not available or not applicable
EL = environmental level

Table IV.6. (page 2 of 3)

	Sample Location #13			Sample Location #14			Sample Location #15		
Year	x	s	n	x	s	n	x	s	n
1976	25.12	31.5	2	3.6	4.9	2	0.12	0.16	2
1977	0.3	0	2	0.3	0	2	0.3	0	2
1978	0.564	0.4714	2	0.1371	0.045	2	0.0459	0.0276	2
1979	0.0024	NA	1	0.0009	0.0003	3	0.003	0.0014	3
1980	0.0012	0.0007	4	0.0029	0.0015	4	0.002	0.0014	4
1981	0.0018	0.002	4	0.001	0.0004	4	0.0043	0.0024	4
1982	0.0015	0.0007	4	0.0028	0.0019	4	0.0183	0.0337	4
1983	0.0017	0.0012	3	0.0016	0.0004	4	0.0027	0.0016	4
1984	0.0004	0.0003	3	0.0011	0.0007	3	0.0017	0.0007	3
1985	0.0037	0.0054	4	0.0037	0.0047	4	0.0014	0.001	4
1986	0.001	0.0007	3	0.002	0.0027	3	0.0015	0.0013	3
1987	0.001	0.0005	4	0.0004	0.0004	4	0.0022	0.0013	4
1988	0.001	0.0005	4	0.001	0.0019	4	0.0004	0.002	4
1989	0.0169	0.0126	4	0.0222	0.0183	4	0.0286	0.0317	4

x = average concentration (pCi/Kg)
s = standard deviation
n = number of samples
NS = not sampled
NA = not available or not applicable
EL = environmental level

Table IV.6. (page 3 of 3)

	Sample Location #16			Sample Location #17			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1976	113	156.6	2	1.4	1.4	2	NS		
1977	0.3	0	2	0.43	0.18	2	NS		
1978	0.6445	0.0764	2	0.9063	0.5709	2	NS		
1979	0.0019	0.0017	4	0.0623	NA	1	0.0011	0.0001	2
1980	0.0034	0.002	4	0.0551	0.0463	3	0.0014	0.006	4
1981	0.0017	0.0009	4	NS			0.0011	0.0005	4
1982	0.0033	0.0026	4	NS			0.0025	0.0017	4
1983	0.0021	0.0008	4	NS			0.0012	0.0007	3
1984	0.0017	0.0012	3	NS			0.0004	0.0001	4
1985	0.0007	0.0002	4	NS			0.0003	0.0004	4
1986	0.001	0.0011	3	NS			0.00002	0.0002	2
1987	0.0005	0.0006	4	NS			0.0003	0.0004	4
1988	0.0011	0.0005	4	NS			0.0006	0.0009	3
1989	0.0167	0.012	3	NS			0.0668	0.0628	4

x = average concentration (pCi/Kg)
s = standard deviation
n = number of samples
NS = not sampled
NA = not available or not applicable
EL = environmental level

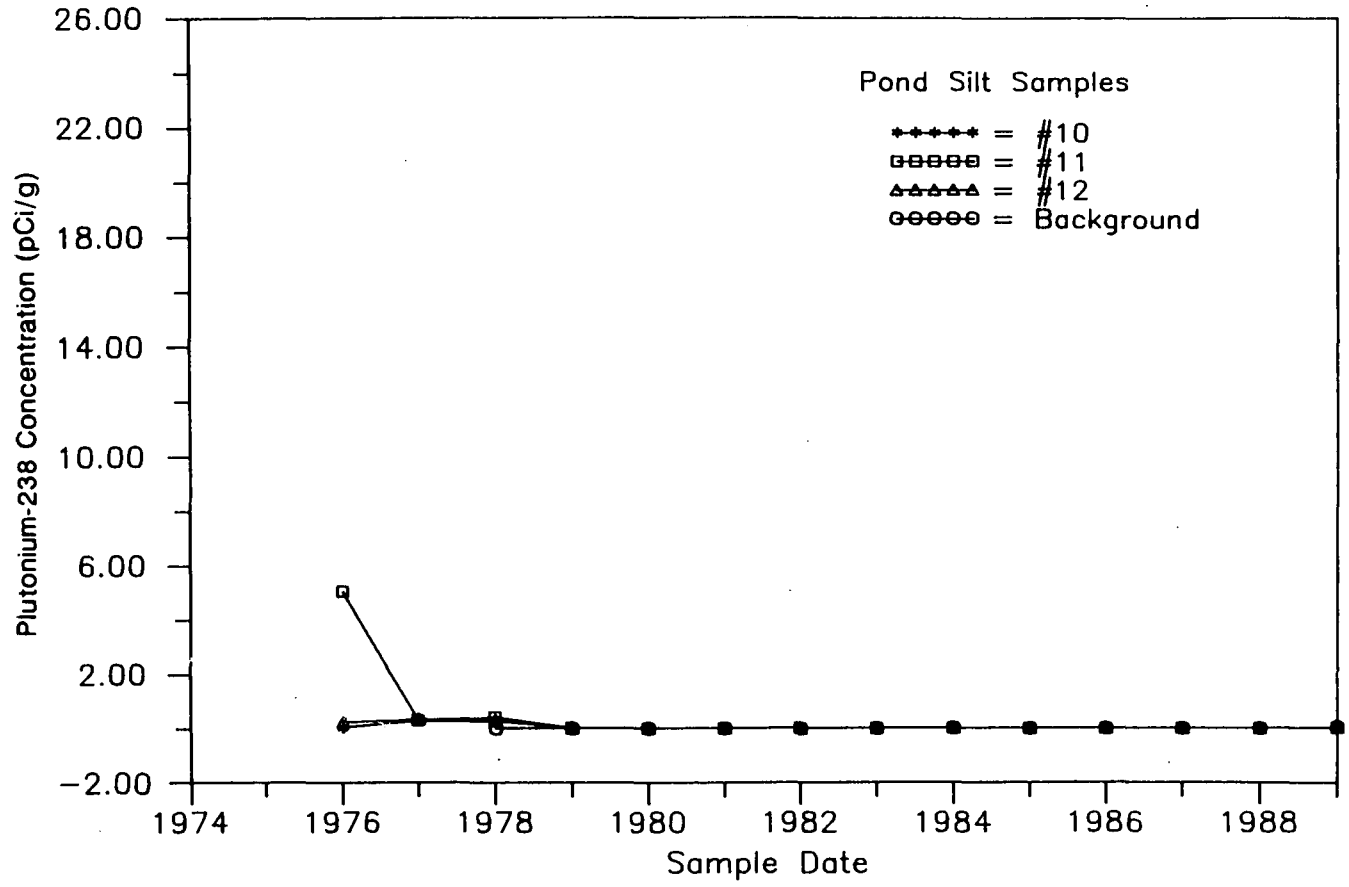


Figure 4.13. Plutonium-238 concentrations in pond silt samples from sampling locations 10, 11, 12, and background for the years 1976 through 1989.

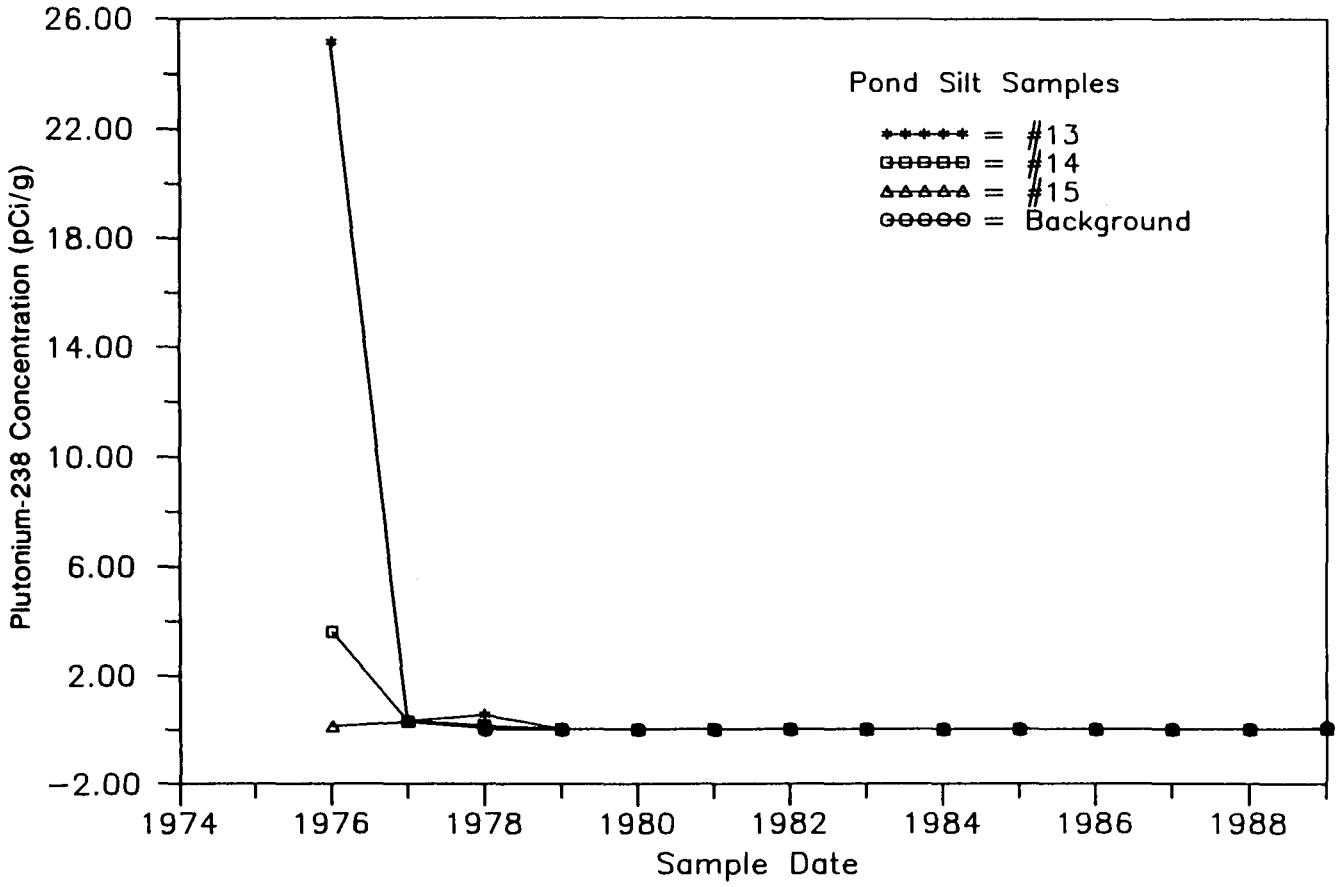


Figure 4.14. Plutonium-238 concentrations in pond silt samples from sampling locations 13, 14, 15, and background for the years 1976 through 1989.

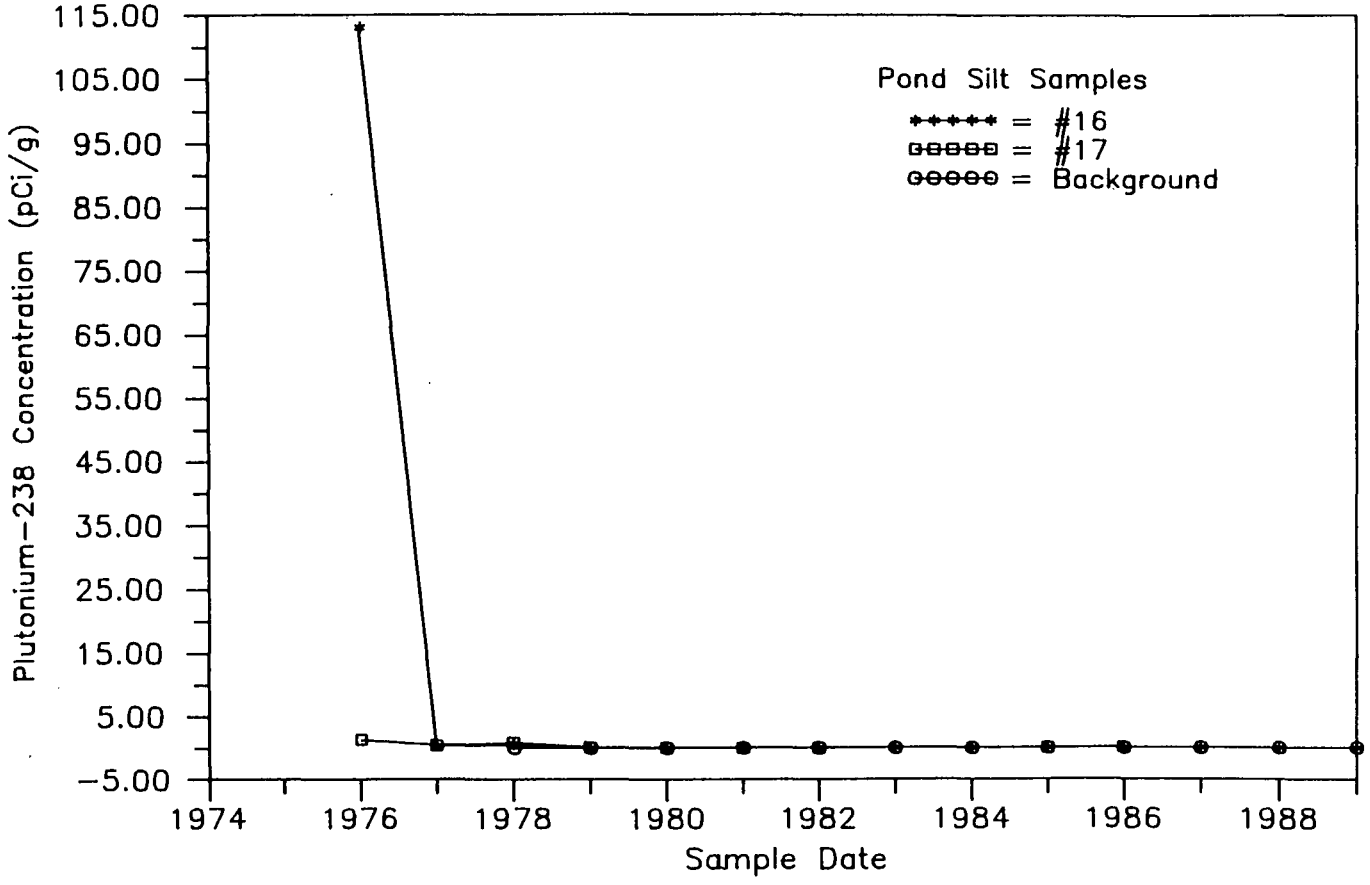


Figure 4.15. Plutonium-238 concentrations in pond silt samples from sampling locations 16, 17, and background for the years 1976 through 1989.

The change in plutonium-238 concentrations from 1977 to 1978 are probably due to the change in sample collection and preparation, from analyzing suspended silt to analyzing separate sediment samples.

4.8. URANIUM-233 AND -234 IN THE GREAT MIAMI RIVER

4.8.1. Available Data

Uranium-233 and -234 concentrations measured in the Great Miami River have been summarized in the annual reports since 1978. The uranium-233 and -234 analyses are currently performed monthly; however, the frequency has varied from semi-annually to quarterly in previous years. The available data (Appendix H) consist of handwritten data compilation sheets from 1978 through 1984, and computer-generated data compilation sheets from 1985 through 1989.

The data set was used to compute the average annual uranium-233 and -234 concentrations for each of the five Great Miami River sampling locations (Plate 1) for the years 1978 through 1989. A summary of the computed average uranium-233 and -234 concentrations in river water is presented in Table IV.7.

4.8.2. Data Evaluation

To identify long-term trends, the average uranium-233 and -234 concentrations at each of the five Great Miami River sampling locations were plotted versus time. The generated plots are shown in Figures 4.16 and 4.17.

These data indicate that the concentrations of uranium-233 and -234 in the Great Miami River have remained constant with only a minor amount of fluctuation recorded through the years. The average background concentration ranged from a low of 0.7 pCi/L to a high of 0.84 pCi/L for the years 1978 through 1989. The average concentrations at the five river sampling locations ranged from a low of 0.74 pCi/L to a high of 0.87 pCi/L for the same time period. These values indicate that the concentrations of uranium-233 and -234 at the five sampling locations were background levels.

4.9. URANIUM-238 IN THE GREAT MIAMI RIVER

4.9.1. Available Data

Uranium-238 concentrations have also been measured in the Great Miami River since 1978. The uranium-238 analyses are currently performed monthly; however, the frequency has varied from semi-annually to

Table IV.7. Uranium-233 and -234 Concentrations (pCi/L) in the Great Miami River (1978-1989)

Year	Sample Location R-1			Sample Location R-2			Sample Location R-3		
	x	s	n	x	s	n	x	s	n
1978	0.6058	0.0271	2	0.6501	0.0285	2	0.619	0.0213	2
1979	0.8658	0.1104	4	0.7384	0.1205	4	0.7533	0.1138	4
1980	0.8659	0.0051	4	0.748	0.0038	4	0.7682	0.0029	4
1981	0.7134	0.0699	4	0.6951	0.0983	4	0.7474	0.0632	4
1982	0.7473	0.1354	4	0.7218	0.0724	4	0.6139	0.1314	4
1983	0.7734	0.1458	4	0.6733	0.069	4	0.6809	0.0667	4
1984	0.8013	0.0658	4	0.639	0.0943	4	0.5368	0.2679	3
1985	0.7875	0.1672	4	0.68	0.1657	4	0.7175	0.1933	4
1986	0.73	0.07	3	0.69	0.13	3	0.72	0.11	3
1987	0.83	0.1	10	0.7	0.07	10	0.75	0.12	10
1988	0.79	0.16	12	0.65	0.18	12	0.63	0.13	12
1989	0.74	0.21	12	0.74	0.1	12	0.75	0.07	12

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
EL = environmental level

Table IV.7. (page 2 of 2)

	Sample Location R-4			Sample Location R-5			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1978	0.6281	0.012	2	0.6363	0.0018	2	NS		
1979	0.7811	0.1186	4	0.7501	0.1246	4	0.7725	0.1694	3
1980	0.7901	0.0078	4	0.7411	0.0107	4	0.7353	0.0182	4
1981	0.7532	0.0333	4	0.6768	0.0803	4	0.8437	0.0671	4
1982	0.7431	0.054	4	0.6788	0.0055	4	0.7254	0.1555	4
1983	0.6864	0.0538	4	0.6892	0.0825	4	0.732	0.1102	4
1984	0.693	0.0477	4	0.7322	0.0818	4	0.6273	0.0484	2
1985	0.7475	0.2053	4	0.7833	0.0577	3	0.7133	0.1762	3
1986	0.66	0.06	3	0.68	0.06	3	0.75	0.05	3
1987	0.69	0.09	10	0.75	0.1	10	0.71	0.11	10
1988	0.65	0.12	12	0.65	0.15	12	0.7	0.18	12
1989	0.76	0.08	12	0.75	0.06	12	0.73	0.12	12

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
EL = environmental level

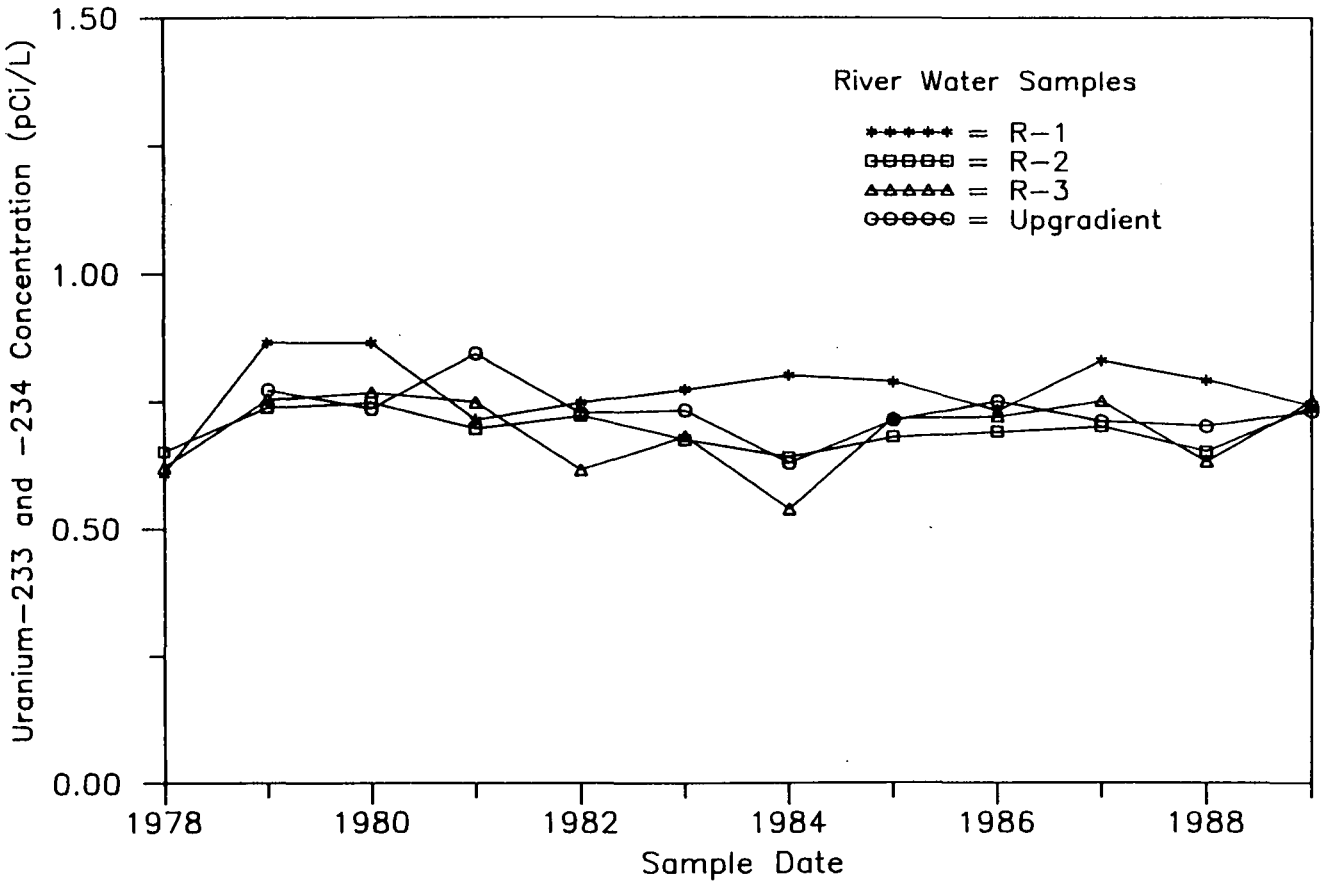


Figure 4.16. Uranium-233 and -234 concentrations in river water samples from sampling locations R-1, R-2, R-3, and upgradient for the years 1978 through 1989.

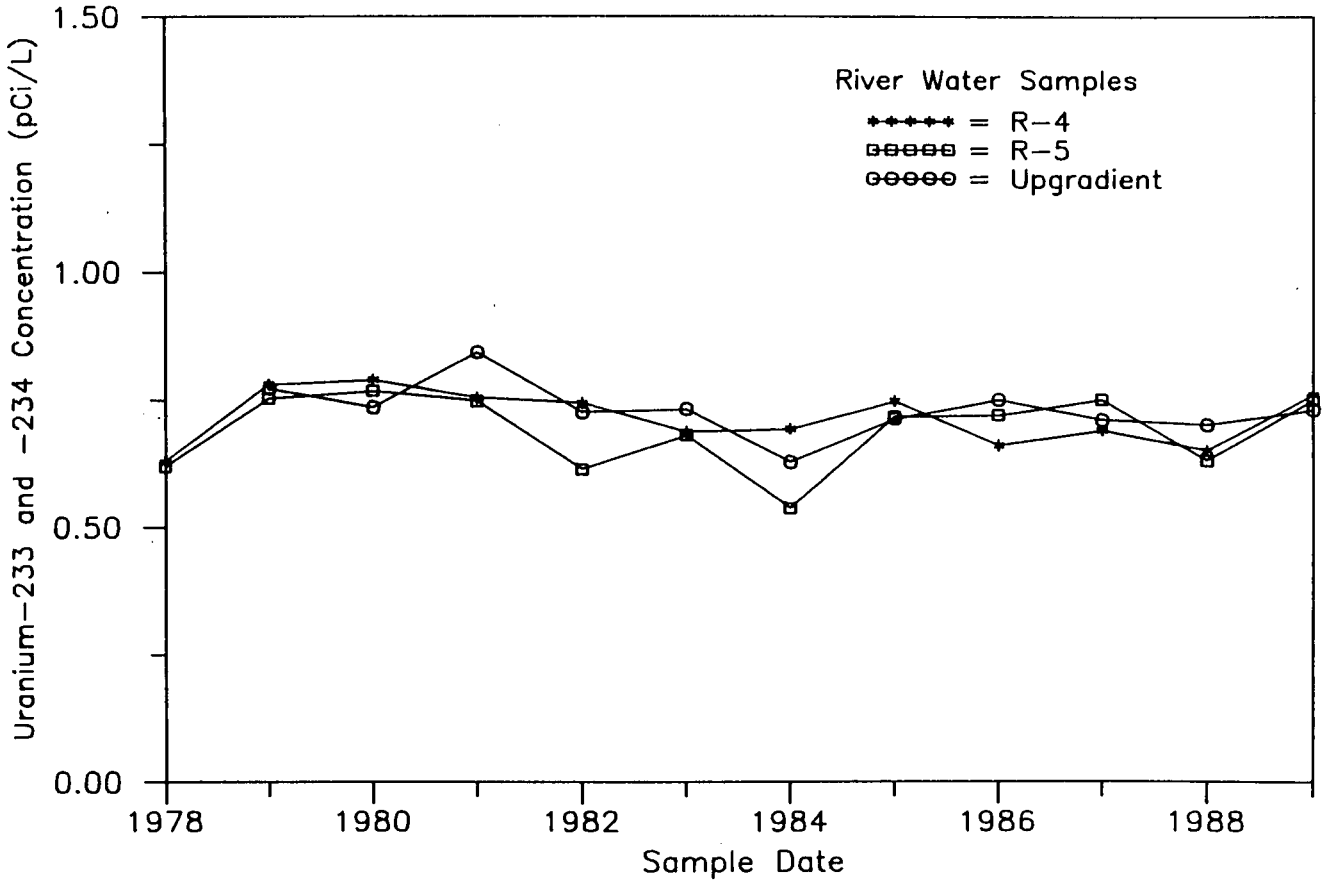


Figure 4.17. Uranium-233 and -234 concentrations in river water samples from sampling locations R-4, R-5, and upgradient for the years 1978 through 1989.

quarterly in previous years. The available data (Appendix I) consist of handwritten data compilation sheets from 1978 through 1984, and computer-generated data compilation sheets from 1985 through 1989.

The data set was used to compute the average annual uranium-238 concentrations for each of the five Great Miami River sampling locations for the years 1978 through 1989. A summary of the computed average uranium-238 concentrations in river water is presented in Table IV.8.

4.9.2. Data Evaluation

The average annual uranium-238 concentrations at each of the five river sampling locations (Plate 1) were plotted versus time. The results are shown in Figures 4.18 and 4.19.

These data indicate that the concentrations of uranium-238 have remained constant with only minor fluctuations recorded through the years. The average background concentration ranged from a low of 0.60 pCi/L to a high of 0.76 pCi/L for the years 1978 through 1989. The average concentrations at the five river sampling locations ranged from a low of 0.45 pCi/L to a high of 0.79 pCi/L for the same time period. As with the uranium-233 and -234 concentrations discussed above, the uranium-238 concentrations were background levels.

Table IV.8. Uranium-238 Concentrations (pCi/L) in the Great Miami River (1978-1989)

Year	Sample Location R-1			Sample Location R-2			Sample Location R-3		
	x	s	n	x	s	n	x	s	n
1978	0.5851	0.0001	2	0.4495	0.1759	2	0.5791	0.0117	2
1979	0.7924	0.1254	4	0.6772	0.1061	4	0.6854	0.1022	4
1980	0.794	0.0511	4	0.6382	0.0285	4	0.6958	0.0365	4
1981	NS			NS			NS		
1982	0.6629	0.0539	4	0.6575	0.0797	4	0.6678	0.1397	4
1983	0.6812	0.1282	4	0.6273	0.0443	4	0.589	0.0607	4
1984	0.6612	0.0411	4	0.5478	0.0362	4	0.509	0.231	3
1985	0.72	0.2048	4	0.605	0.1799	4	0.6075	0.1846	4
1986	0.67	0.01	3	0.63	0.14	3	0.64	0.13	3
1987	0.73	0.11	10	0.64	0.09	10	0.66	0.11	10
1988	0.7	0.15	12	0.54	0.16	12	0.56	0.14	12
1989	0.67	0.19	12	0.65	0.09	12	0.66	0.08	12

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
EL = environmental level

Table IV.8. (page 2 of 2)

	Sample Location R–4			Sample Location R–5			Background (EL)		
Year	x	s	n	x	s	n	x	s	n
1978	0.5691	0.0105	2	0.5658	0.0242	2	NS		
1979	0.6858	0.1114	4	0.6984	0.1025	4	0.7627	0.1102	3
1980	0.7464	0.1486	4	0.6914	0.1171	4	0.7007	0.1274	4
1981	NS			NS			NS		
1982	0.6559	0.0557	4	0.6161	0.0313	4	0.7053	0.1482	4
1983	0.632	0.0583	4	0.6185	0.0858	4	0.7311	0.178	4
1984	0.6272	0.0486	4	0.6224	0.0511	4	0.6014	0.035	2
1985	0.6475	0.1522	4	0.69	0.05	3	0.7633	0.0252	3
1986	0.61	0.05	3	0.59	0.03	3	0.7	0.01	3
1987	0.64	0.8	10	0.65	0.07	10	0.67	0.08	10
1988	0.57	0.13	12	0.55	0.12	12	0.65	0.18	12
1989	0.67	0.06	12	0.7	0.06	12	0.69	0.1	12

x= average concentration (pCi/L)
s= standard deviation
n= number of samples
NS= not sampled
EL = environmental level

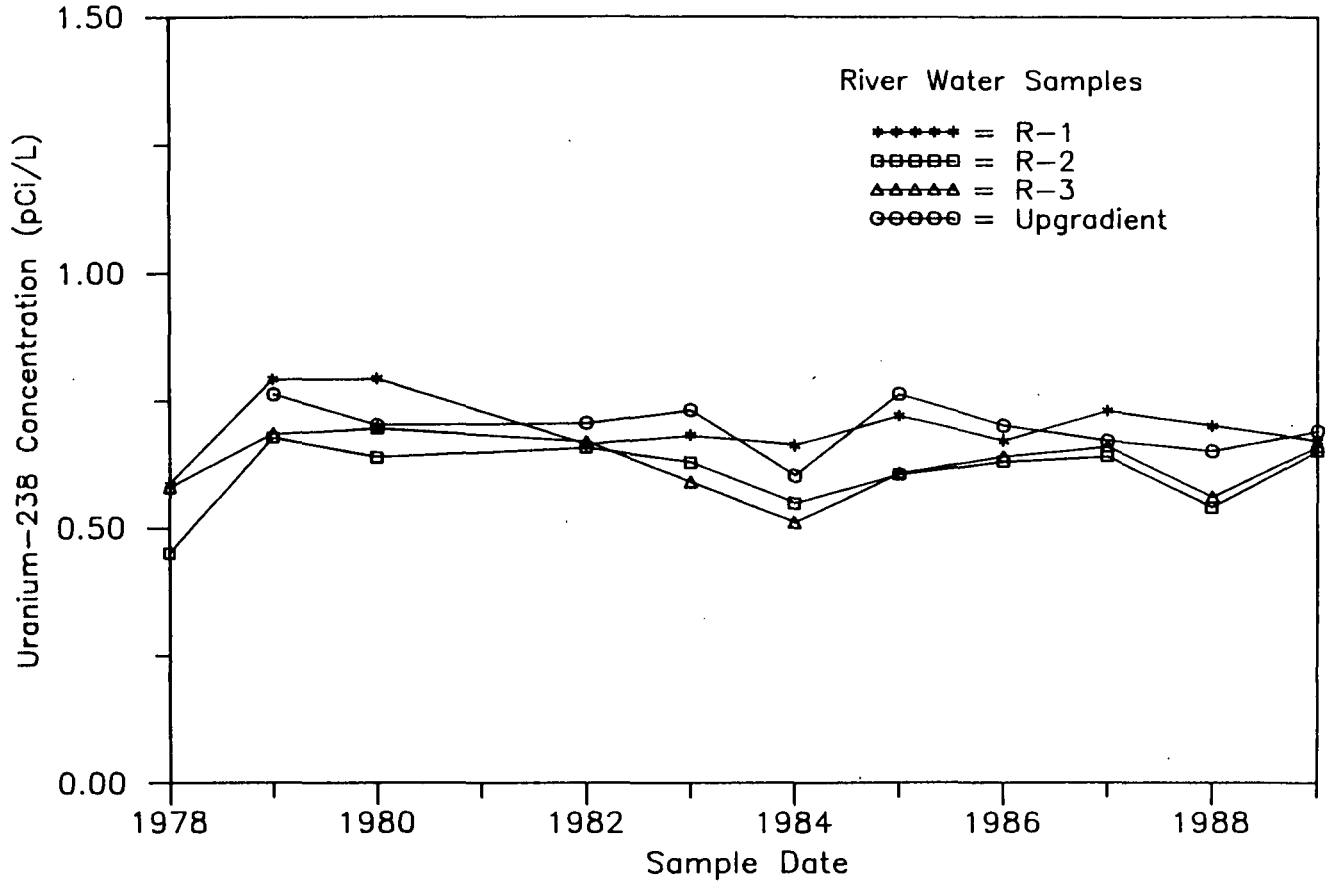


Figure 4.18. Uranium-238 concentrations in river water samples from sampling locations R-1, R-2, R-3, and upgradient for the years 1978 through 1989.

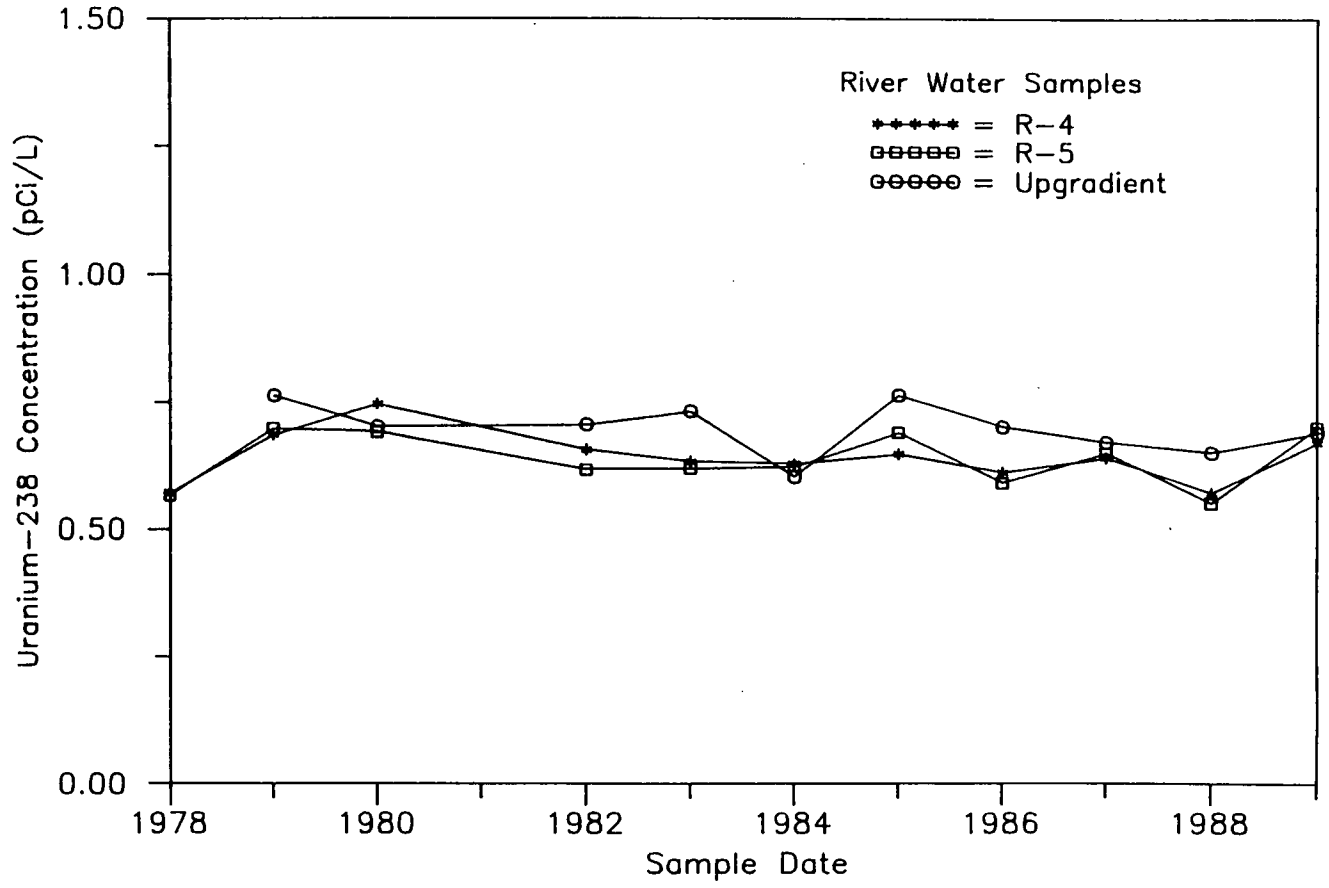


Figure 4.19. Uranium-238 concentrations in river water samples from sampling locations R-4, R-5, and upgradient for the years 1978 through 1989.

5. POTABLE WATER STANDARDS PROJECT

The Potable Water Standards Project (Dames and Moore 1976a; Styron and Meyer 1981) was conducted by Mound Plant to ascertain the extent and concentration of tritium in groundwater at the plant in order to comply with the Safe Drinking Water Act National Interim Primary Drinking Water Regulations (40 CFR part 141, July 9, 1976). The offsite study of tritium in the groundwater was complemented by the Buried Valley Aquifer Evaluation Project (Dames and Moore 1976b). These projects included a review of the plant hydrogeology and tritium sources from the plant. Historical emissions and monitoring data were reviewed and supplemented by an onsite sampling program that included test borings, monitoring well installation, and soil and water sampling and analysis. Monitoring wells were installed in 1975 and 1976 (Figure 5.1); some of these onsite wells were destroyed during the construction of the overflow pond and site sanitary landfill, but at present a few remain. Well construction information is contained the project report (Dames and Moore 1976a) and the Site Scoping Report: Volume 2 - Geologic Log and Well Information Report (DOE 1990).

A long-term effort for ensuring compliance with the regulated standards incorporated the routine environmental surveillance of the facility and periodic, high-volume pumping of the abandoned Miamisburg municipal well #2 (0912), initiated in 1981 (Styron and Meyer 1981).

In 1976, Mound Plant initiated a plan to use Miamisburg Well #2 (0912) to conduct a test to determine if tritiated water could be removed from the aquifer by high-volume pumping. Ten observation wells (Figure 5.1) were constructed in the Buried Valley aquifer between July 1976 and November 1976 as part of the Buried Valley Aquifer Evaluation Project (Dames and Moore 1976b) to monitor water levels and tritium concentrations prior to and during the pumping test of 0912. These wells continued to be monitored for tritium levels until at least 1989. Tritium concentrations greater than 100 nCi/L (EPA standard = 20 nCi/L) were found in the observation wells and 0912, and appeared to be the result of groundwater flow from onsite sources. The estimated total tritium activity in the Buried Valley aquifer was 80 Ci (Dames and Moore 1976a).

During the pumping test of 0912 (October 11, 1976 through January 20, 1977), tritium levels in the observation wells (0002) decreased from 103 to 76 nCi/L (Dames and Moore 1976a). The study concluded that

- Pumping 0912 appeared to be effective in lowering tritium concentrations in groundwater, but it was not possible to accurately estimate the probability of lowering tritium concentrations below the EPA standard of 20 nCi/L by this method.

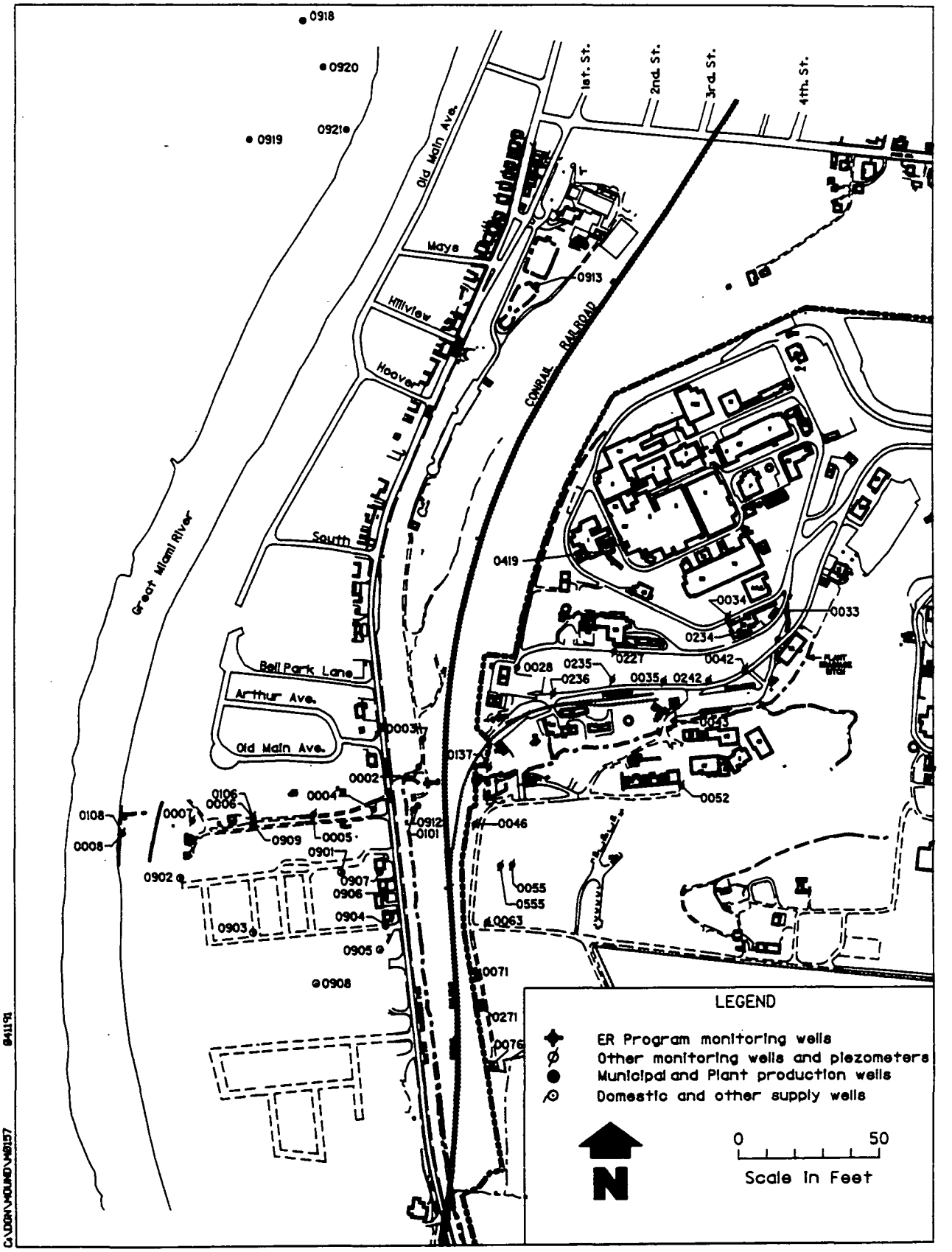


Figure 5.1. Wells sampled under the Potable Water Standards Projects, 1975-1990.

- Tritiated water flowing off the site within the tongue of the Buried Valley aquifer was being intercepted during pumping of 0912; hence, it could not spread through the Buried Valley aquifer.

- Pumping 0912 appeared to create a cone of depression that intercepted tritiated water that would otherwise migrate to Mound Plant well 0071 (Figure 5.1) and be recirculated.

- Tritium concentrations in the lower zone of the Buried Valley aquifer were below EPA standards. Well installation in this zone, however, appeared to be not economical.

Pumping of 0912 resumed April 18, 1977, with simultaneous pumping of Mound Plant supply well 0071 being initiated on May 16, 1977. Over a period of nine months, approximately 1.5×10^9 liters (400 million gallons) of water and 50 Ci of tritium were removed from the aquifer. The data collected showed that during the pumping of 0912 and Mound Plant well 0076, the tritium concentrations, as measured in the majority of observation wells, decreased (Dames and Moore 1976a).

High-volume pumping was chosen as the long-term method to reduce the tritium in the aquifer and ultimately in the drinking water to the EPA standard of 20 nCi/L. High-volume pumping of well 0912 was initiated in April 1977, and continued until January 26, 1978, when it was halted by a blizzard. Mound Plant well 0071 (Figure 5.1) was also shut off on February 6, 1978, and a study of tritium concentration rebound in the Buried Valley aquifer began. Tritium concentrations in area wells continued to decrease when the pumping was stopped, but concentrations in well 0912 increased rapidly from 17 to 67 nCi/L after two months (Styron and Meyer 1981). Tritium concentrations in well 0912 decreased rapidly when pumping was resumed (June 28, 1978), but concentrations gradually increased in wells that had previously been brought into compliance. As pumping continued, these wells showed a decline in concentrations of tritium.

Tritium levels in the groundwater in the vicinity of Mound Plant are currently monitored by Mound Plant on a weekly basis. Former Miamisburg production well 0912 is sampled at least monthly. When the concentration of tritium exceeds 20 nCi/L, the well is pumped until concentrations fall below an arbitrary level of 10 nCi/L. Discharge is routed through NPDES Outfall 001 to the Great Miami River. Successive pumping periods have required progressively shorter durations to achieve the 10 nCi/L target. In the last four years, it was necessary to pump the Miamisburg No. 2 well four times: from May 1 to May 27, 1986; from November 3 to November 5, 1987; from July 25 to August 2, 1989; and from July 20 to July 24, 1990.

5.1. TRITIUM IN GROUNDWATER

5.1.1. Available Data

Tritium concentrations have been measured in groundwater samples taken from 63 different wells located both onsite and offsite of the Mound Plant property (Figure 5.1). These data are separated into five groups and are designated by well type and/or the name of the project under which the wells were installed. The five groups of wells include the Buried Valley Aquifer Evaluation Project wells, the Potable Water Standards Project wells, the Mound Plant production wells, the offsite water supply wells, and the Miamisburg production wells.

The available data was compiled in electronic format (Lotus 1-2-3®) and was received on a diskette. These data are presented in Appendices J through T. A graph of tritium concentration versus the sampling date was created for each of the 63 sampling locations included in the five groups. The graphs are presented in Appendix U. The sampling frequency and duration varies from group to group. The first groundwater sample was taken on January 2, 1975, and the most recent data include a groundwater sample taken on August 24, 1990.

5.1.2. Data Description

Representative wells from each of the five groups were selected to illustrate the tritium concentrations from 1975 to 1990. These data (Figures 5.2 through 5.8) indicate a decreasing tritium concentration through time interpreted to represent the response to the pumping program discussed above.

There are 12 wells in the Buried Valley Aquifer Evaluation Project group comprised primarily of wells located outside the Mound Plant property. Many of the wells have been sampled on a relatively continuous basis from about 1975 to present (Appendices J and K). The highest concentration of tritium in this group of wells was for well 0003 with a value of 178 nCi/L on December 10, 1976 (Figure 5.2). These data reflect a strong decreasing trend in the tritium concentrations from 1975 to about 1980, which was typical of the entire group (Appendices G and H). Since 1980, tritium concentrations have generally stayed below a level of 20 nCi/L, with some fluctuation.

There are 24 wells in the Potable Water Standards Project group that are all located within the Mound Plant property. The majority of the data are from samples collected between 1975 and about 1980 (Appendices L through O). The highest concentration of tritium recorded for all wells in the five groups was in well 0419 with a value of 2442 nCi/L on June 11, 1976 (Figure 5.3). These data also indicate a sharp decline in tritium

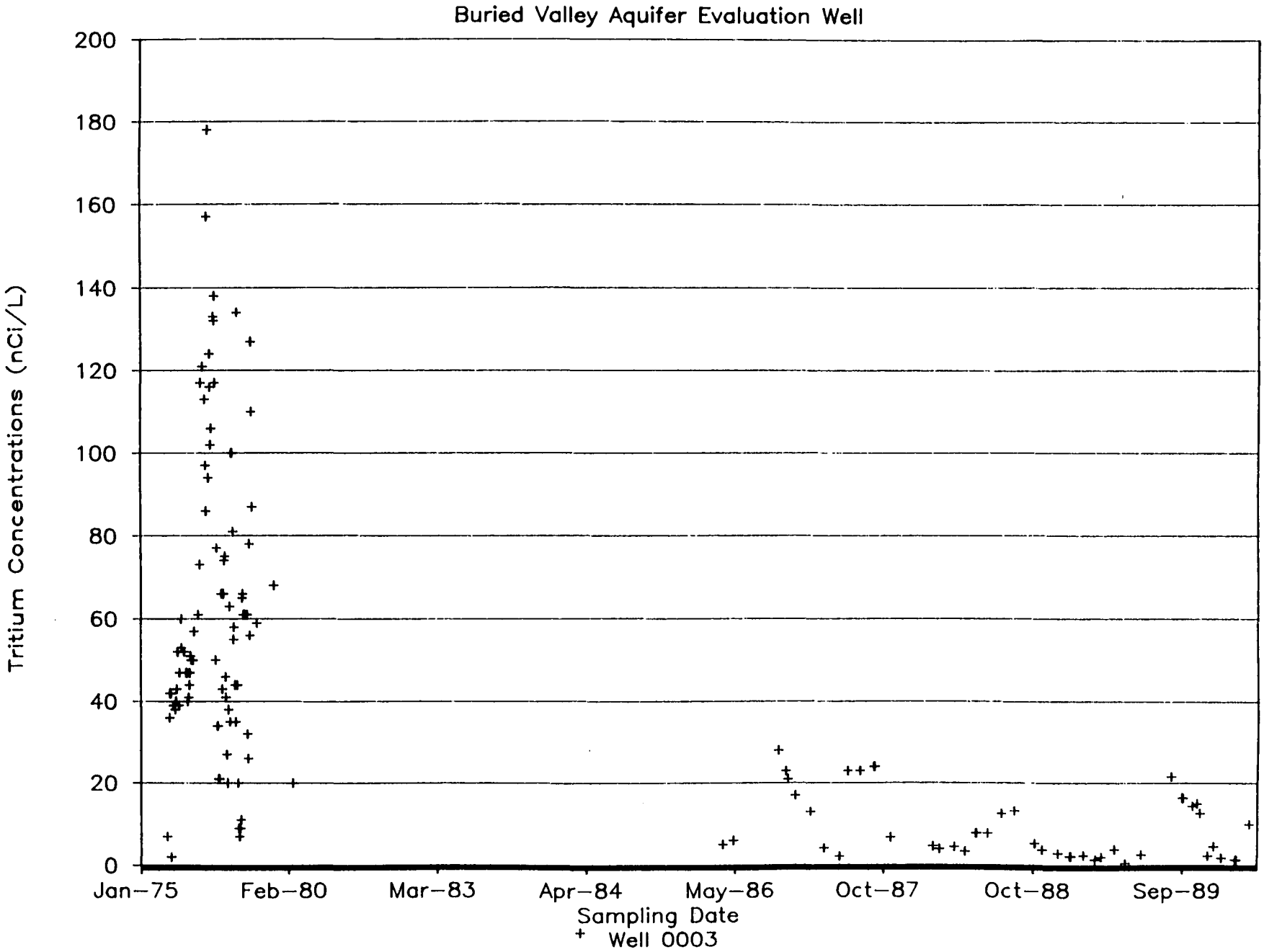


Figure 5.2. Tritium concentrations in well 0003 for the years 1975 through 1989.

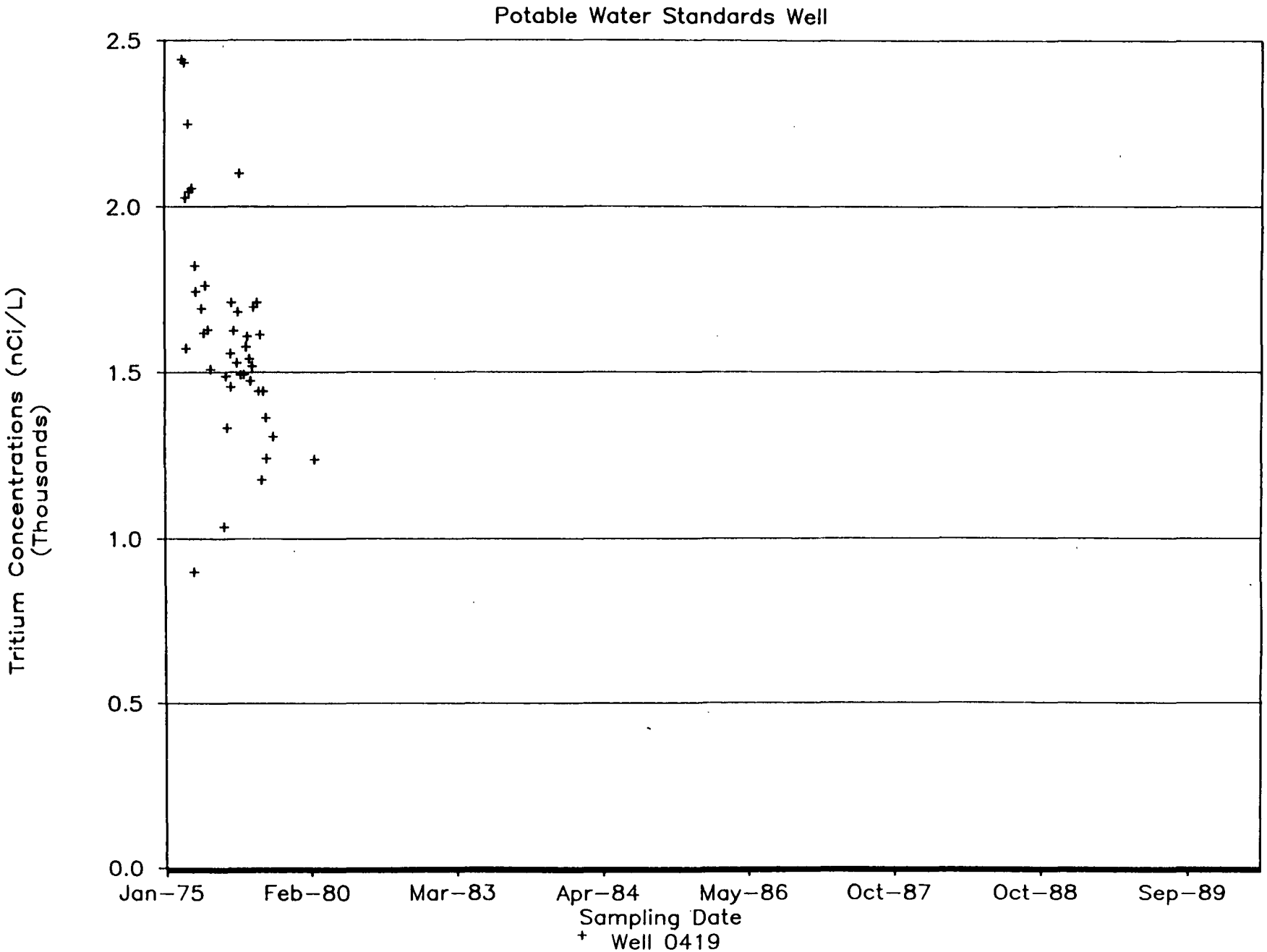


Figure 5.3. Tritium concentrations in well 0419 for the years 1975 through 1980.

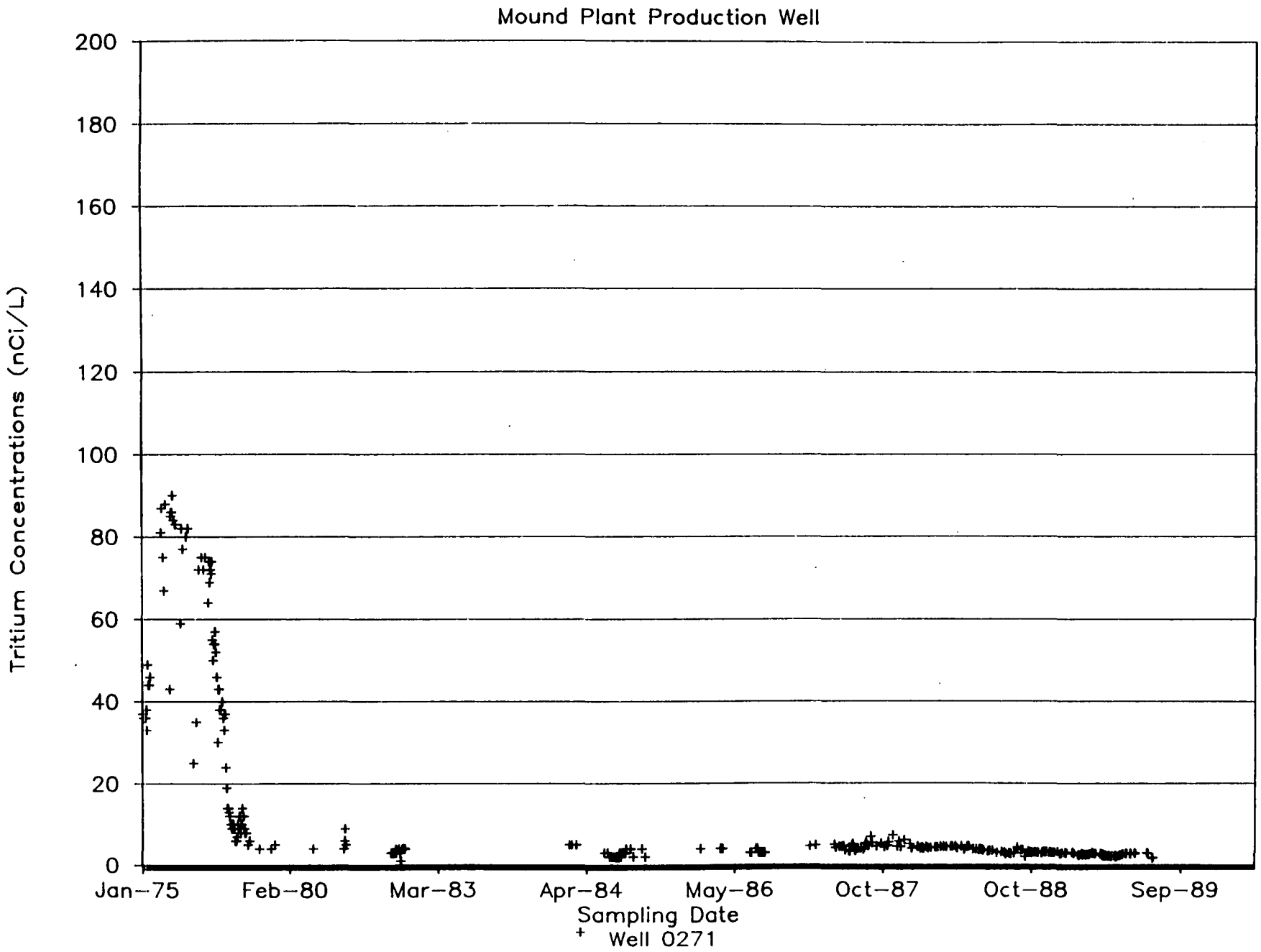


Figure 5.4. Tritium concentrations in well 0271 for the years 1975 through 1989.

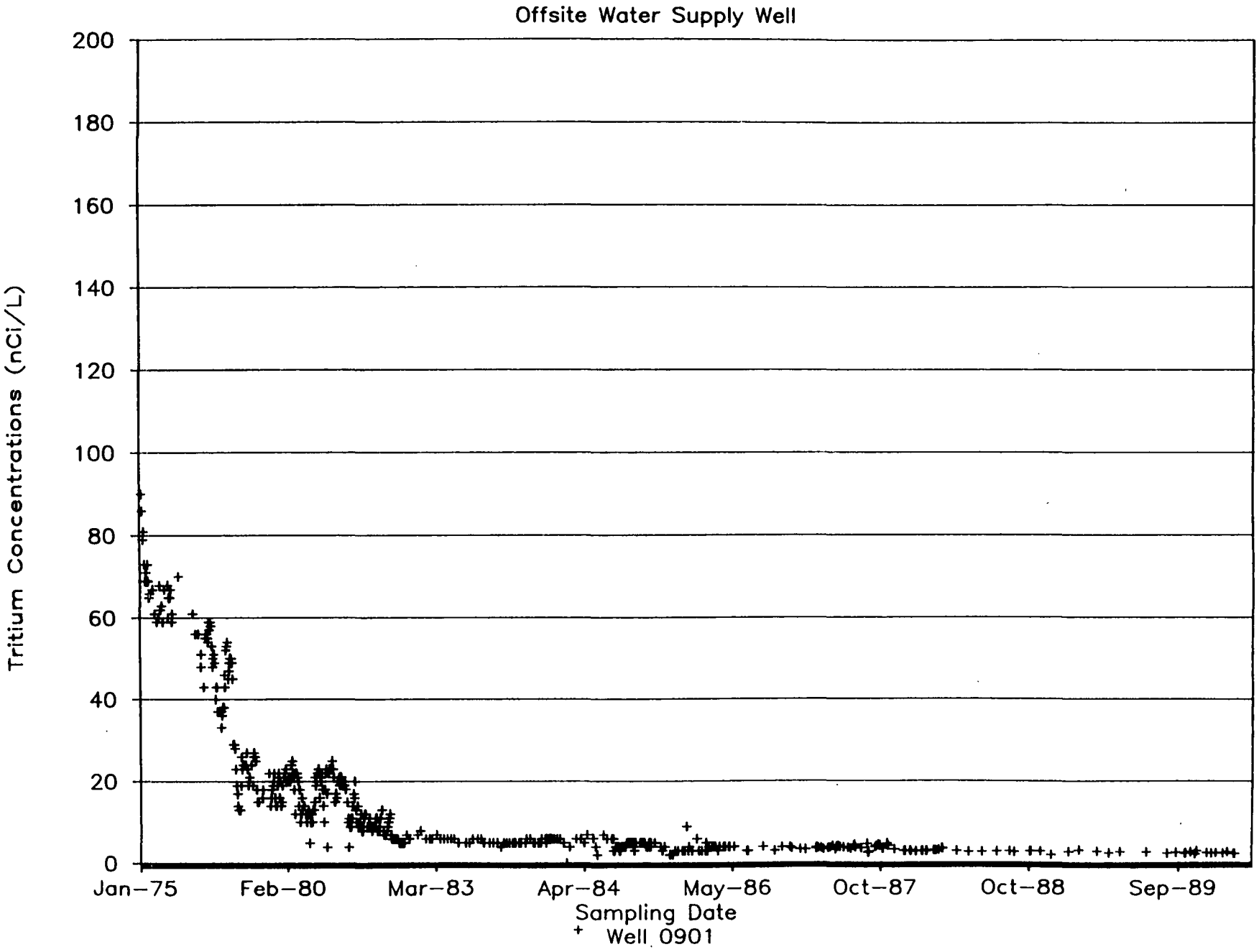


Figure 5.5. Tritium concentrations in well 0901 for the years 1975 through 1989.

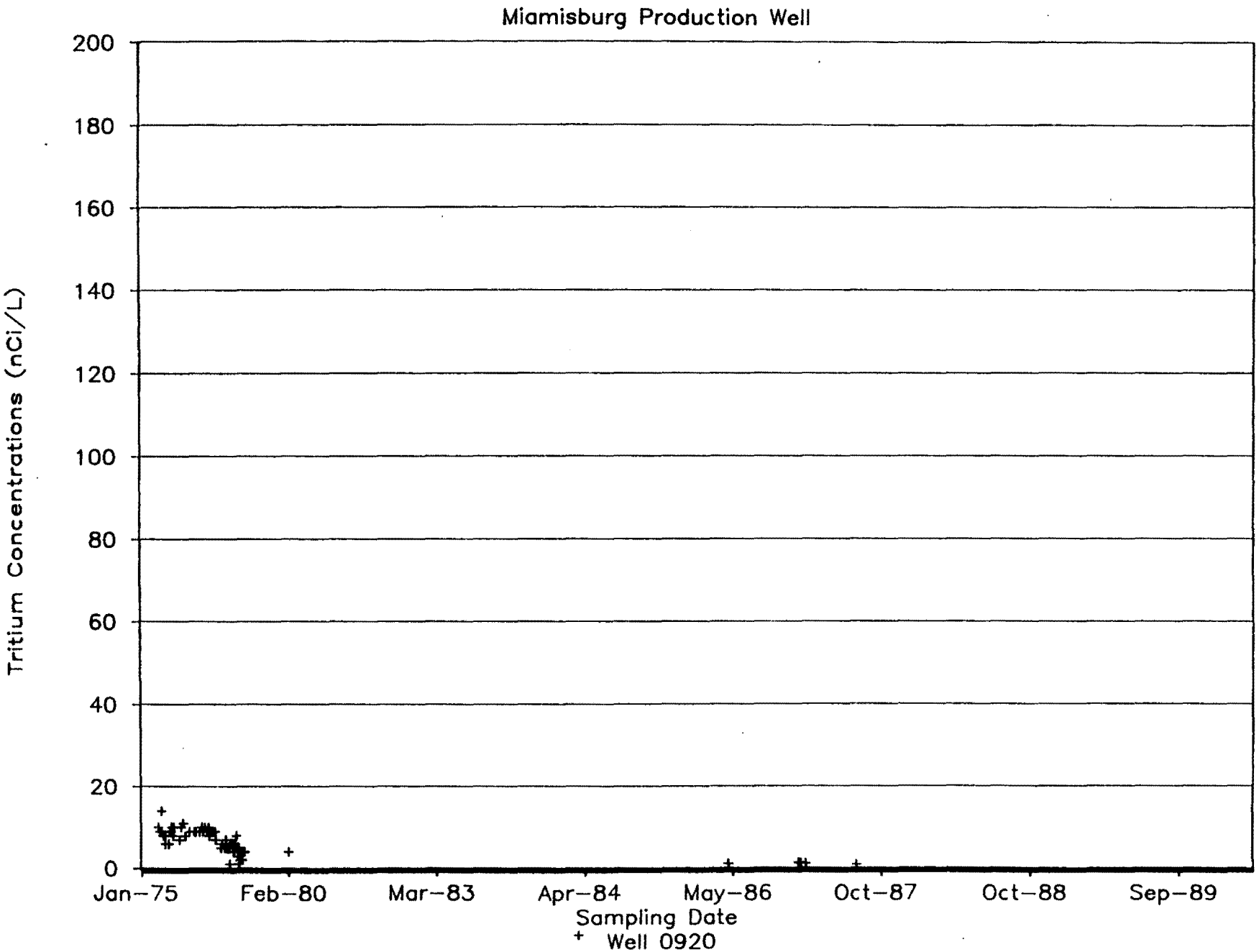


Figure 5.6. Tritium concentrations in well 0920 for the years 1975 through 1980.

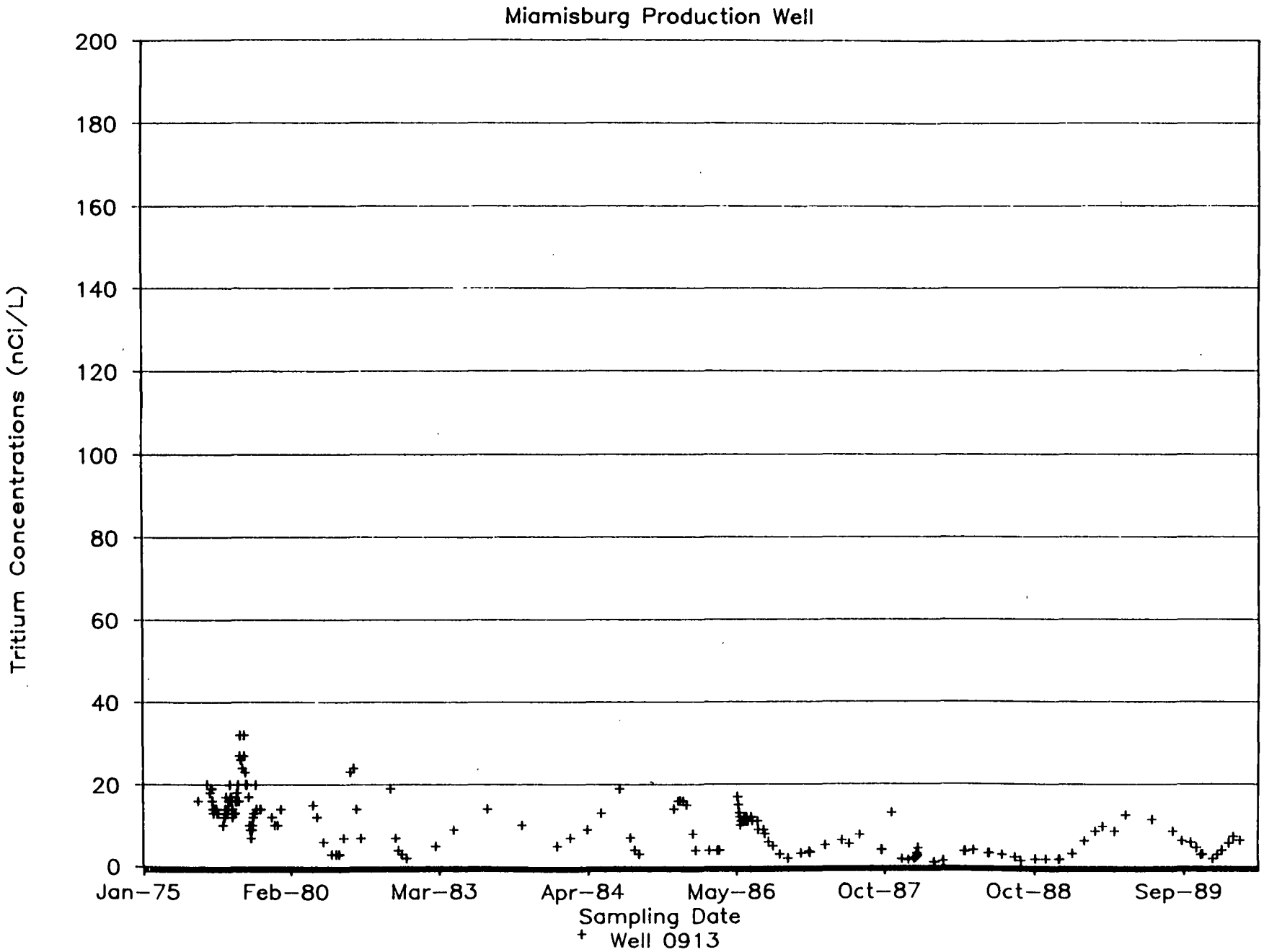


Figure 5.7. Tritium concentrations in well 0913 for the years 1975 through 1989.

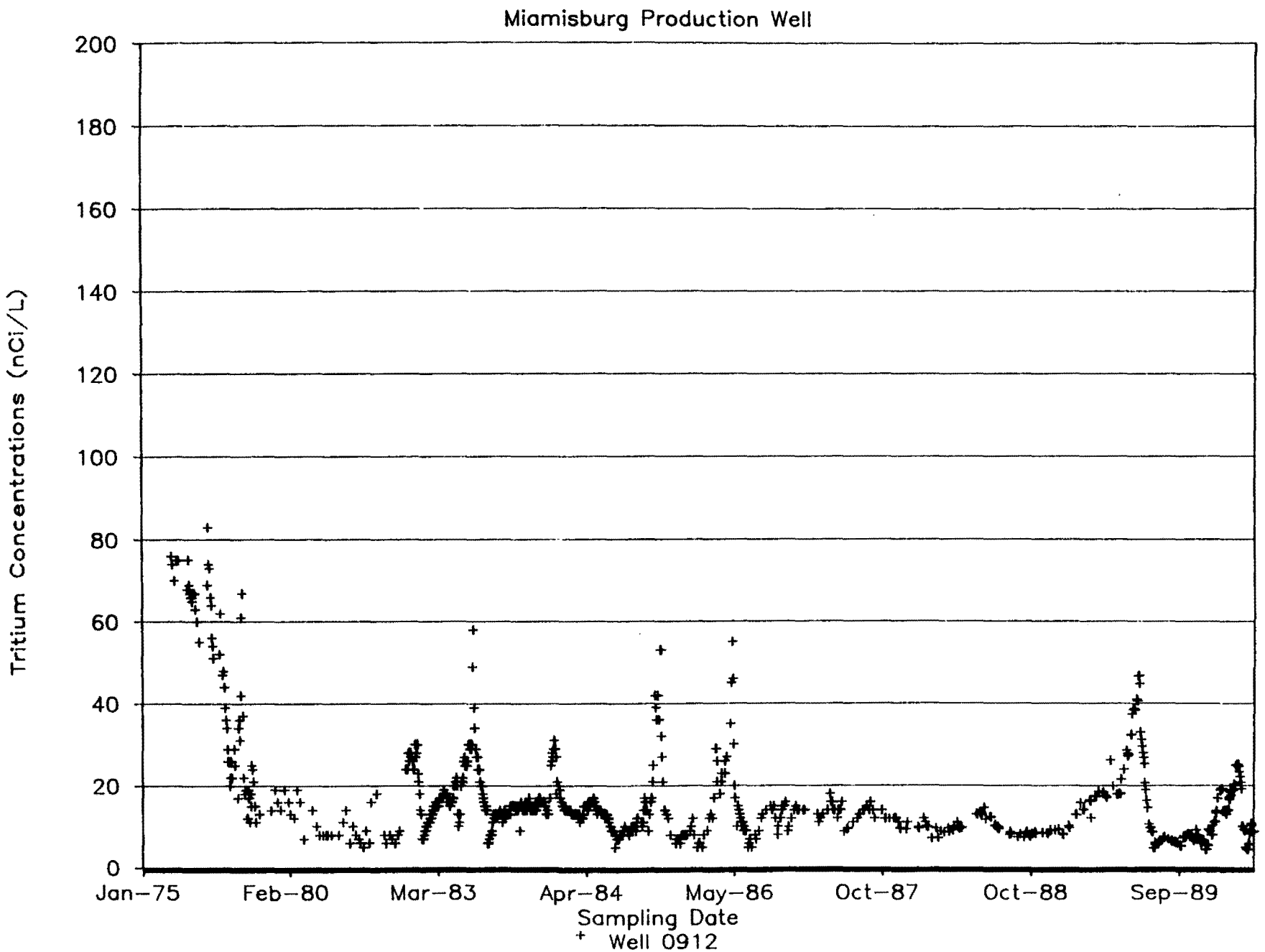


Figure 5.8. Tritium concentrations in well 0912 for the years 1975 through 1989.

concentrations from 1975 to 1980. After 1980, efforts focused on the effects of pumping in the Buried Valley aquifer and sampling of wells such as 0419 were discontinued.

There are three wells in the Mound Plant production wells group that supply potable water for use within the plant. These wells have been continuously sampled from 1975 to present even though the frequency has been slightly irregular (Appendix P). The highest concentration of tritium recorded is for well 0271 with a value of 90 nCi/L on August 27, 1976 (Figure 5.4). These data indicate a strong decreasing trend from 1975 to about 1980. Since 1980, concentrations have generally stayed below a level of about 10 nCi/L. These trends are typical of this group of wells (Appendix P).

There are 12 wells in the Offsite Water Supply group. Most of these wells have been sampled on a relatively continuous basis from about 1975 to present (Appendices Q and R). The highest concentration of tritium recorded is for well 0901 (a domestic supply well) with a value of 90 nCi/L on February 1, 1975 (Figure 5.5). These data indicate a sharp decreasing trend from 1975 to about 1982. Since 1982, the tritium concentrations have generally stayed below a level of 10 nCi/L. The initial sharp decline in tritium concentrations from 1975 to 1982 reflect the effects of pumping of well 0912 on the entire group of wells located in the Buried Valley aquifer. Since January of 1988, well 0901 has not been maintained for potable supply but continues to be sampled by Mound Plant.

There are 12 wells in the Miamisburg Production group (Appendices S and T). Wells 0918, 0919, 0920, and 0921 are Miamisburg Municipal supply wells that were sampled regularly from 1976 to about 1978, and intermittently through 1987 (Appendix T). These wells, represented by 0920 (Figure 5.6), have always been below 20 nCi/L. Well 0913 is a Miamisburg Municipal well (Figure 5.7) of only limited use (it supplies water to the City of Miamisburg water park) that has relatively low tritium concentrations, generally less than 20 nCi/L, but variations that may correlate with variations in well 0912 (Figure 5.8). Well 0912 is a former municipal well currently being used for high-volume pumping of the Buried Valley aquifer. The data from 0912 (Appendix T and Figure 5.8) reflect the effects of pumping and tritium rebound in the Buried Valley Aquifer as discussed above.

6. PLUTONIUM IN SOIL INVENTORY PROGRAM

The soil sampling by Mound Plant originally included two aspects. First was the evaluation of the resuspendable amounts of plutonium-238 in the upper one-eighth inch of soil. For this program, surface scrapping of undisturbed soil was collected and analyzed in 1971. Review of the data indicated that the evaluation of resuspendable plutonium in soil could best be accomplished by high-volume air samplers, so surface soil sampling was suspended in 1972. The second aspect was the documentation of the total accumulation and distribution of plutonium-238. An inventory of plutonium-238 in soils was begun in 1974 and completed in 1977. The purpose of the program was to establish the quantity and distribution of airborne plutonium-238 from Mound Plant stack emissions that had been deposited in the environment offsite.

In 1974, eight soil samples were taken at two locations in each quadrant around the plant. Soil samples consisted of cores 3.5 inches in diameter and approximately 12 inches deep. Ten core samples were taken from a square area 30 feet on a side and composited to obtain a single sample from each location. Sample locations were shown on a large-scale map in the Annual Environmental Monitoring Report : Calendar Year 1974 (MRC 1975). These samples were analyzed at Mound Plant by being digested in a an acid mixture, passed over an ion exchange column, electrodeposited, and analyzed by alpha spectrometry.

To complete the soil inventory, in 1977, 31 additional locations were sampled in 16 compass directions at various distances from the Mound Plant. A total of 79 locations were sampled in the inventory. Background levels were determined by collecting four additional samples at 0, 90, 180 and 270 degrees at distances ranging from 21 to 32 miles from the Plant.

At each location, soil samples collected in 1977 were from cores with depths that were generally 30 cm (about 12 inches) deep with a diameter of 8 cm (about 3 inches). Ten cores were collected at each sampling location and then composited, dried, crushed, and passed through a quarter-inch mesh screen. The sample was then riffled down to approximately 3 kg and pulverized to pass through a 60-mesh sieve. Aliquots of 500 g or 1000 g, depending on soil location, were then taken from this homogenized sample for analysis. The analytical scheme used for these analyses was essentially the HASL (now EML) Procedure No. E.Pu-06 using plutonium-242 as the internal tracer. All of the plutonium-238 measured in the core volume was assumed to lie within the top few millimeters of soil in order to calculate the maximum resuspendable particulates and doses (MRC 1977).

The results of the soil sampling program were fit to power functions by a least-squares program along each of the sixteen radial compass directions. Smoothed isopleth lines were drawn between radials and points of equal concentrations. Background levels measured at distances ≥30 km were extrapolated back to the

plant. The points where the background curves intersected the power functions extending from the plant were assumed to be the lateral extent of Mound Plant influences. The isopleth map produced was reported in the Annual Environmental Monitoring Report: Calendar Year 1977 (MRC 1978), and reproduced as Figure 6.1. The 0.1 mCi/km^2 isopleth was interpreted to be the background concentration.

6.1. AVAILABLE DATA

Results of soil analyses for plutonium by the Mound Plant environmental surveillance program are only available for 1974 and 1977. Results of the 1974 analyses were published in the Annual Environmental Monitoring Report: Calendar Year 1974 (MRC 1975) and reproduced as Table VI.1. The locations of the samples taken in 1974 were shown by a small-scale map in the report cited (MRC 1975). The sample collection and results records for the 1974 samples are no longer available.

Results of the 1977 analyses are available only on handwritten data compilation sheets (Appendix V) for 48 samples. No original laboratory data sheets are available. The results were recorded in disintegrations per minute per sample (d/m) and have been recalculated to picocuries per gram for this report (Table VI.2), using a correction factor of (0.4505 pCi/d/m). Results of the 1974 sampling could not be performed since sample weights are required to perform the recalculations.

6.2. DATA DESCRIPTION

To identify the concentrations of plutonium-238 in the region adjacent to Mound Plant, the concentrations of the available 48 sample values were plotted concentration over distance (Figure 6.2). Only the far-field data is available for this evaluation, as the near-field data (largely collected in 1974) does not contain sufficient information to recalculate concentration per mass and the original calculations are not sufficiently documented.

The data available indicate that much of the plutonium-238 deposition offsite is consistent with the prevailing wind direction from the southwest (Figure 6.2). The concentration levels toward the southeast, however, are considerably higher than can be explained by simply annual averaged prevailing winds and may reflect differences in diurnal wind patterns. At the distances (3-4 miles) encompassed in the available data set, the highest plutonium-238 concentrations (0.0016 pCi/g) appear to have been measured at a distance of 4 miles west-southwest of the plant.

There are several peaks in the Pu-238 concentration in the vicinity of the Mound site and to the northeast that suggest locally higher Pu-238 contamination. With the available data, however, it is difficult to

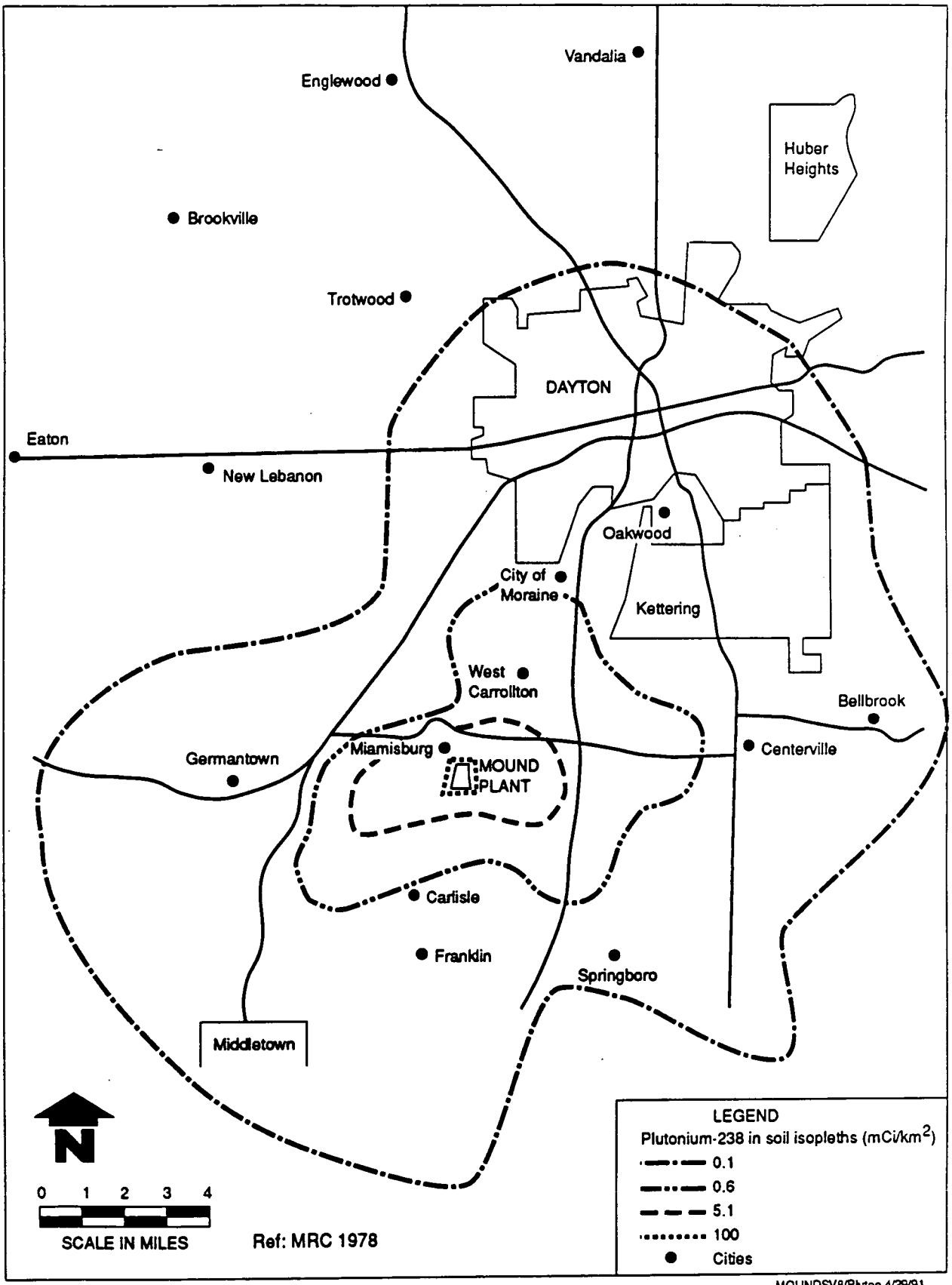


Figure 6.1. Plutonium-238 in soil isopleths (mCi/km^2).

Table VI.1. Summary of Soil Core Analysis for Plutonium-238 - 1974

Location (Direction & Distance)			Pu (10EE-03 µCi/m2)
15 degrees	760m	(2500 ft.)	5.0 +/- 0.6
105 degrees	760m	(2500 ft.)	40 +/- 1
115 degrees	60m	(200 ft.)	79 +/- 2
180 degrees	1900m	(6300 ft.)	5.6 +/- 0.5
205 degrees	1500m	(5000 ft.)	4.4 +/- 0.7
270 degrees	150m	(500 ft.)	230 +/- 3
270 degrees	460m	(1500 ft.)	0.40 +/- 0.20
320 degrees	120m	(400 ft.)	42 +/- 2

Notes:

Directions from approximate center of plant and distances measured from site boundary.
Minimum detection limit for Pu-238 in soil is 5.4 µCi/m2.

determine if these peaks are local concentrations or if the sample spacing was simply too large for true Pu-238 distribution to emerge.

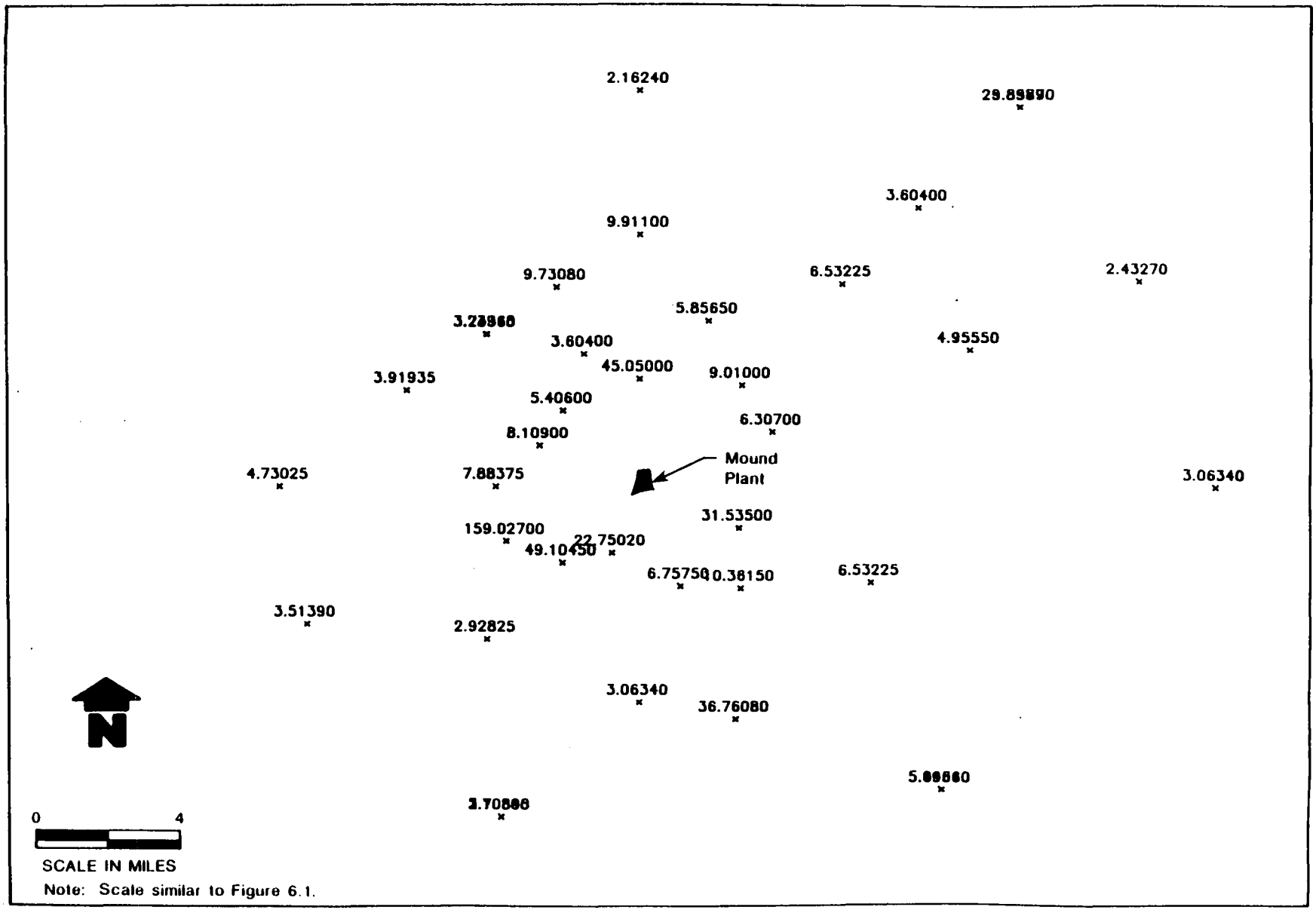
Table VI.2. 1977 Soil Inventory Data
Plutonium-238 and Plutonium-239 Concentrations In Soil Samples [dpm/g] and [pCi/g]

Sample Number	Angle From Plant (degrees) (0 = North)	Distance From Plant (miles)	Pu-238 Conc. (dpm/g)	Pu-239 Conc. (dpm/g)	Ratio 239/238	Sample Weight (grams)	Pu-238 Conc. (pCi/g)
14897	270.0	4	0.00175	0.01300	7.4	19445	7.88E-04
14895	225.0	3	0.01090	0.01880	1.7	13960	4.91E-03
14899	315.0	3	0.00120	0.01125	9.2	19916	5.41E-04
14898	292.5	3	0.00180	0.01450	8	19505	8.11E-04
148921	157.5	3	0.00150	0.01280	8.4	18905	6.76E-04
14891	135.0	4	0.00230	0.01315	5.7	17238	1.04E-03
14893	180.0	31	0.00280	0.01540	5.5	15874	1.26E-03
14894	202.5	2	0.00505	0.02160	4.3	11501	2.28E-03
14890	112.5	3	0.00700	0.02290	3.3	10513	3.15E-03
14896	247.5	4	0.03530	0.01910	0.5	13898	1.59E-02
14900	337.5	4	0.00080	0.00420	5.1	19073	3.60E-04
14883	0.0	3	0.01000	0.01440	1.4	19750	4.51E-03
14884	22.5	5	0.00130	0.01350	10.5	20643	5.86E-04
14889	67.5	4	0.00140	0.01220	8.7	21318	6.31E-04
14888	67.5	10	0.00110	0.01610	14.8	17390	4.96E-04
14885	45.0	11	0.00080	0.01020	12.8	19522	3.60E-04
14887	45.0	4	0.00200	0.00940	4.7	24985	9.01E-04
14886	45.0	8	0.00145	0.01730	11.8	14374	6.53E-04
14882	0.0	7	0.00220	0.02400	10.8	15003	9.91E-04
14726	270.0	27	0.00080	0.01890		16420	3.60E-04
14725	180.0	21	0.00070	0.01680	24.3	15880	3.15E-04
14724	90.0	32	0.00050	0.01280	27.2	18670	2.25E-04
14723	0.0	30	0.00060	0.01630	28	17010	2.70E-04
14557	0.0	11	0.00048	0.00562	11.4	18050	2.16E-04
14558	22.5	15	0.00122	0.01750	14.2	18920	5.50E-04

Table VI.2. (page 2 of 2)

Sample Number	Angle From Plant (degrees) (0 = North)	Distance From Plant (miles)	Pu-238 Conc. (dpm/g)	Pu-239 Conc. (dpm/g)	Ratio 239/238	Sample Weight (grams)	Pu-238 Conc. (pCi/g)
14559	45	15	0.00657	0.01390	2.1	23500	2.96E-03
14560	67.5	15	0.00054	0.01210	21.9	17920	2.43E-04
14561	90.0	16	0.00068	0.01050	15.9	23470	3.06E-04
14562	112.5	7	0.00145	0.02480	16.9	13470	6.53E-04
14563	135.0	12	0.00122	0.02920	23.4	14200	5.50E-04
14564	157.5	7	0.00816	0.02320	2.8	13150	3.68E-03
14565	180.0	6	0.00068	0.01250	18.5	21140	3.06E-04
14566	202.5	10	0.00069	0.01360	20.3	18180	3.11E-04
14567	225.0	6	0.00065	0.01260	19.5	18960	2.93E-04
14568	247.5	10	0.00078	0.01640	21.2	19870	3.51E-04
14569	270.0	10	0.00105	0.01490	14.1	18640	4.73E-04
14570	292.5	7	0.00087	0.01520	17.5	16420	3.92E-04
14571	315.0	6	0.00083	0.01290	15.4	17010	3.74E-04
14572	337.5	6	0.00216	0.01440	6.6	16740	9.73E-04
14723	0.0	30	0.00063	0.01700	26.3	17010	2.84E-04
14724	90.0	32	0.00058	0.01300	22.1	18760	2.61E-04
14725	180.0	21	0.00073	0.01610	21.2	15880	3.29E-04
14726	270.0	27	0.00079	0.01340	16.5	16420	3.56E-04
14559	45.0	15	0.00574	0.01420	2.5	23500	2.59E-03
14563	135.0	12	0.00112	0.02770	25.6	14200	5.05E-04
14566	202.5	10	0.00060	0.01450	24	18180	2.70E-04
14571	315.0	6	0.00072	0.01340	18.8	17010	3.24E-04
KY-14524	KY	KY	0.00153	0.01690	11	10020	6.89E-04

KY = Kentucky



Note: Scale similar to Figure 6.1.

Figure 6.2. Sample locations and posted values for plutonium-238 in soil inventory-1977.

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APPENDIX A

ENVIRONMENTAL MONITORING AT MOUND

1988 REPORT

MLM-3589
UC-41

Environmental Monitoring at Mound: 1988 Report

Daniel G. Carfagno and Billy M. Farmer

Issued: May 1989

MOUND

operated by
EG&G MOUND APPLIED TECHNOLOGIES
P.O. Box 3000, Miamisburg, Ohio 45343-3000

for the
U. S. DEPARTMENT OF ENERGY
Contract No. DE-AC04-88DP43495

Foreword

This report was prepared by the Environmental Section of the Administration Department at EG&G Mound Applied Technologies pursuant to DOE Order 5400.1 for the calendar year 1988. Sample analyses and data reduction were performed by the Environmental Assessment Group. Particulate samples offsite were collected by the Air Pollution Control Section of the Montgomery County Combined General Health District, which acts as the Regional Air Pollution Control Agency in this area for the Ohio Environmental Protection Agency. All other sampling was performed by personnel in the Environmental Section.

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Introduction

Mound is a government-owned facility operated by EG&G Mound Applied Technologies, Inc., for the U.S. Department of Energy (DOE). Occupying 1.24 km^2 (306 acres) of land in Miamisburg, Ohio, the Mound facility is approximately 16 km (10 mi) southwest of Dayton, Ohio. The predominant geographical feature in the five-county region surrounding Mound is the Great Miami River, which flows from northeast to southwest through the city of Miamisburg. The river valley is highly industrialized. The remainder of the region is predominantly farmland, dotted with light industry and small communities. The locations and populations of these communities are shown in Figure 1. The population distribution surrounding Mound is shown in Figure 2. Drinking water for the area is obtained from a buried valley aquifer that generally follows the Great Miami River. This aquifer was designated a sole source aquifer by the U.S. Environmental Protection Agency (EPA) during 1988. The primary agricultural activity in the area is raising field crops such as corn and soybeans. Approximately 10% of the land in agricultural use is devoted to pasturing livestock [1].

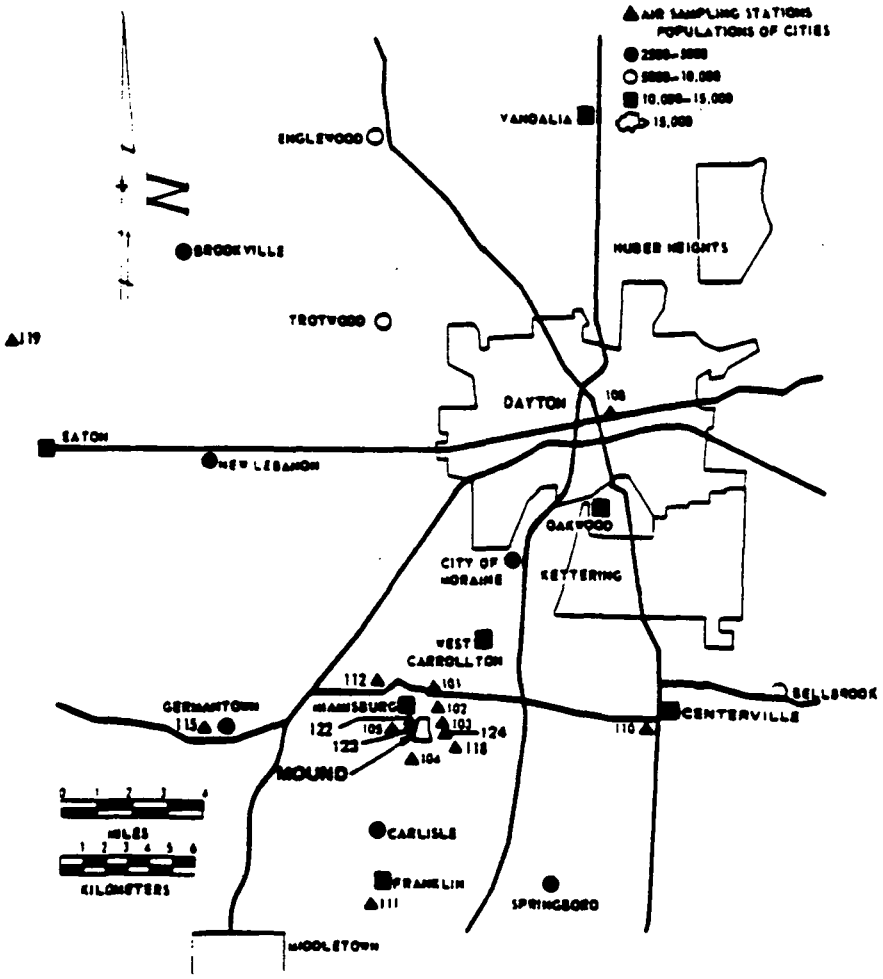
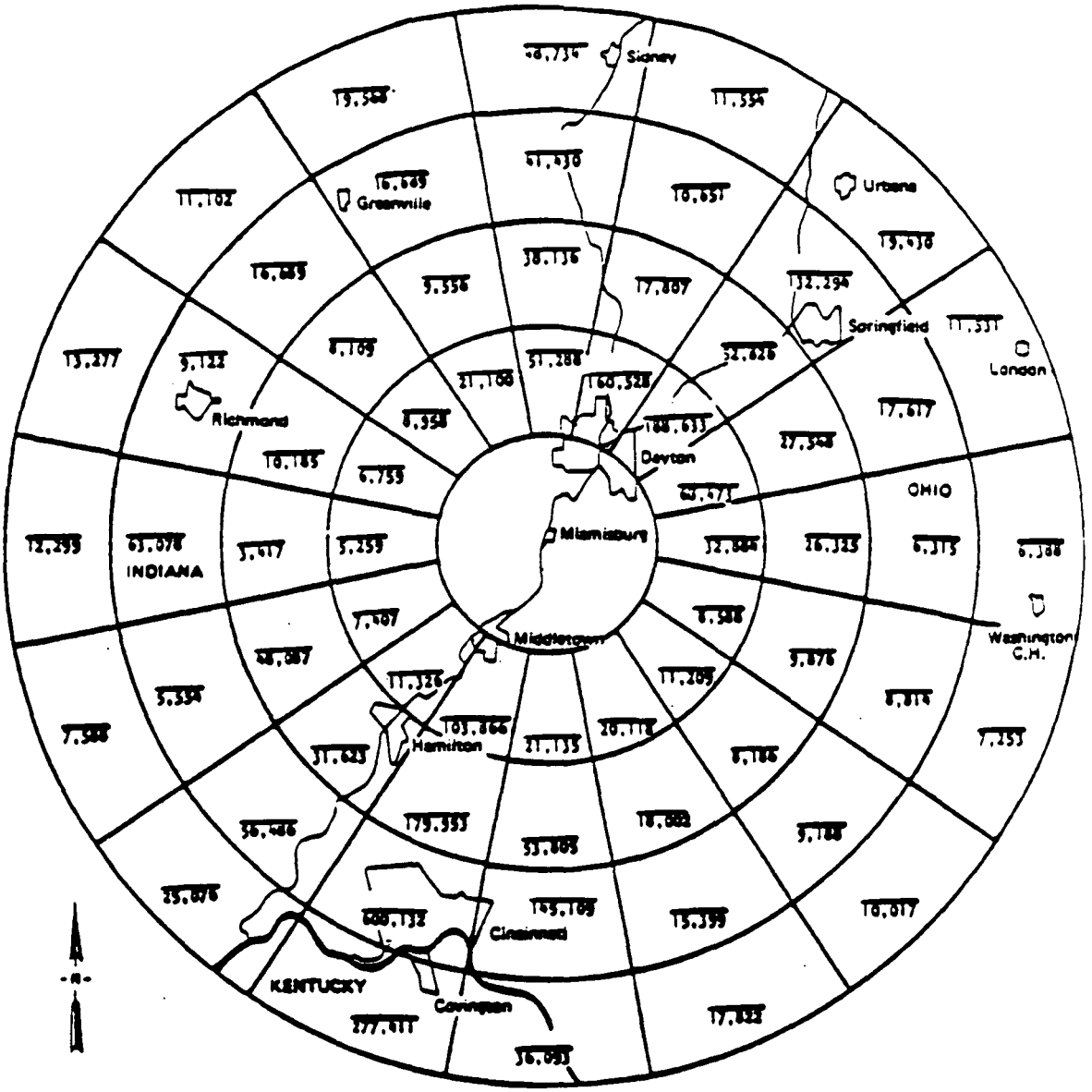


FIGURE 1 - Offsite air sampling locations.



Cumulative Population Totals
1980 Population 0 - 50 Miles

0-10	398,259
0-20	1,125,790
0-30	1,669,231
0-40	2,823,798
0-50	3,358,941

FIGURE 2 - Projected 1980 population within 50 miles of Mound.

The climate in the area is considered moderate. Average annual precipitation is 91 cm (36 in.) and is evenly distributed throughout the year. Precipitation measured at Mound in 1988 was 84 cm (33 in.). Winds are predominantly from the south or west, except during the summer, when they are recorded more frequently from out of the southwest [2]. The annual average wind speed measured by the National Weather Service at Dayton, Ohio, for 1988 was 4.0 m/s (8.9 mi/hr). Figure 3 shows the wind rose for 1988 compiled by the National Weather Service at Dayton, and Table 1 shows average wind speed and percent frequency for each of 16 wind directions.

In 1949, Mound began operations for the production of nuclear weapon components. Currently, its mission includes (1) research, development, engineering, production, and surveillance of components for DOE weapons programs; (2) separation, purification, and sale of stable isotopes; and (3) DOE programs in nuclear safeguards and waste management, heat source testing, and fusion fuel systems. The radionuclides of primary concern that result from Mound's current or past operations are plutonium-238 (Pu-238) and tritium (HT, HTO).

Radionuclides in particulate form are removed from process air effluents by

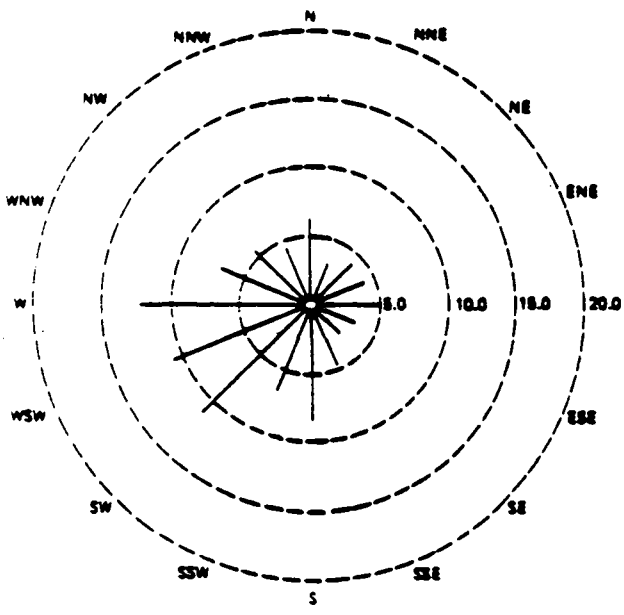


FIGURE 3 - The relative frequency of winds from different directions from the National Weather Service, Dayton, Ohio, for 1988.

Table 1 - PERCENT FREQUENCY OF WIND DIRECTION AND WIND SPEED FROM THE NATIONAL WEATHER SERVICE, DAYTON, OHIO, FOR 1988

Direction	Percent	Average Speed (m/s)
N	6.2	3.8
NNE	3.2	4.0
NE	4.2	4.2
ENE	4.2	3.8
E	5.0	3.1
ESE	3.4	3.3
SE	3.0	3.3
SSE	4.7	3.4
S	8.5	4.0
SSW	6.7	5.1
SW	11.1	4.8
WSW	10.7	4.4
W	12.3	4.8
WNW	7.0	4.8
NW	5.5	4.5
NNW	4.3	3.9
	Average	4.0

Total relative frequency of calms distributed above is 5.5%.

high efficiency particulate air (HEPA) filters. Air effluents are filtered first at their points of origin (i.e., gloveboxes) and then just before reaching the release point (i.e., the stack). The filtering system at the stack comprises two banks of HEPA filters in series, each bank having a collection efficiency of 99.95%. Tritium is removed from waste gas streams by chemical processing. Solid radioactive wastes are packaged and shipped offsite for burial at approved burial sites. Wastes generated in the processing of explosive materials are collected and disposed of according to the Defense Armament and Research Command (DARCOM) Regulation 385-100 and DOE/EV/06194-1.

An onsite, sanitary waste treatment plant provides secondary treatment, in accordance with U.S. EPA requirements [3], using an activated sludge process operating in the extended aeration mode. The waste treatment plant was upgraded in 1986 to essentially tertiary treatment by the installation of a continuous backwash sand filter. All domestic sewage generated onsite is treated in this facility. The influent and effluent at the sewage treatment plant are monitored for radioactivity to ensure no undetected discharge can occur to the environment via the sanitary sewage plant. All wastewater, after appropriate treatment, is discharged from the site to the Great Miami River. Digested sludge from the sewage plant is shipped offsite as low specific activity (LSA) radioactive waste for burial at an approved burial site. Nonradioactive solid wastes are disposed of according to a recycling and reclamation program whenever possible. White paper, scrap metal, and wood are sold for reclamation. General refuse was transported to a sanitary landfill site approved by both the state and county during 1988. Hazardous wastes are containerized, manifested, and moved offsite by a commercial-industrial waste disposal firm for treatment or disposal using EPA-approved procedures.

Mound's compliance with regulations prescribed by DOE for the safety of its employees and the public has been demonstrated throughout the history of the facility. The fundamental objective of the Mound Environmental Control Program, an ongoing program since Mound began operations, is the containment of radioactive discharges to levels well within the existing standards. Waste streams are monitored and controlled at each operating step, resulting in no more than low-level releases of airborne or liquid wastes to the environment. Control techniques can be implemented because of early detection, thus ensuring that concentrations are well within existing standards and follow the "as-low-as-reasonably-achievable" (ALARA) DOE guideline.

The same objective -- control to levels well within applicable standards -- applies to nonradioactive discharges. This is achieved primarily by directing waste streams to the appropriate waste treatment system; e.g., sewage treatment plant, solvent collection system, or filtration. ALARA guidelines are also maintained for nonradioactive discharges.

As part of the Mound Environmental Program monitoring functions, air, water, vegetation, foodstuffs, and sediment samples are collected from the environment at distances up to 64 km (40 mi) from Mound's boundaries. These samples are then analyzed for the specific radionuclides handled at Mound. A summary of the monitoring program is shown in Table 2.

Table 2 - MONITORING PROGRAM

Air Surveillance	Sampling Frequency	Parameter Measured[a]
Offsite: 14 locations	Weekly	HTO, Pu, particulate
Onsite: 5 locations	Weekly	HTO, Pu, particulate
Stack Emission: 10 locations	Daily	HT, HTO, Pu, U
Water Surveillance - Offsite		
River: 5 locations	Weekly	HTO
5 locations	Monthly	Pu, U
Pond: 7 locations	Quarterly	HTO, Pu, U
Municipal Drinking Water:		
12 locations	Monthly	HTO
1 location	Monthly	Pu
Well Water: 7 locations	Monthly	HTO
4 locations	Quarterly	Pu, U
Water Surveillance - Onsite		
Effluent Water: 3 locations	Daily	Flow, suspended solids, BOD_5, fecal coliform, pH, oil and grease, COD, residual chlorine, dissolved solids, HTO, Pu, U
1 location	Semimonthly	Cyanide, chromium, cadmium, nickel, copper
	Quarterly	Total toxic organics
Well Water: 3 locations	Weekly	HTO
3 locations	Monthly	Pu, U
Silt Surveillance - Offsite		
River: 5 locations	Quarterly	Pu
Pond: 6 locations	Quarterly	Pu
Vegetation and Foodstuff Surveillance		
Vegetation: 6 locations	Annually	HTO, Pu
Foodstuffs: 6 locations	Annually	HTO, Pu
Environmental Level Surveillance		
Five Mediums		
6 locations	Monthly, Quarterly, or Annually	HTO, Pu, U

[a]HTO,HT - Tritium
Pu - Plutonium
U - Uranium
BOD_5 - Five-day biochemical oxygen demand
COD - Chemical oxygen demand

The results of the environmental analyses for 1988 are provided in this report. The primary purpose of the report is to detail what impact, if any, Mound's operations have had on the environment in 1988. Several terms that are used throughout this report are described below. The concentrations of various radionuclides reported here that result from Mound's operations are termed "incremental." The term "incremental" denotes a concentration value that exceeds normal environmental levels of the same radionuclide. The "environmental level" is the background concentration found in the environment at a distance from the plant where Mound operations would have no impact. These environmental levels are subtracted from all onsite and offsite data except where noted. Some individual values may be negative and are included as such in averages. These values, if negative, are reported as the average environmental level (e.l.). Environmental levels of radionuclides in various media as measured during 1988 by Mound are shown in Table 3.

The concentrations of radionuclides found in the environment are determined by subtracting the instrument background and reagent blanks from the sample count. This value was then used in averages. The incremental concentration was obtained by subtracting the environmental level (background concentration) from the concentration measured in the various environmental media.

The lower detection limit (LDL) is shown for each set of data in this report for comparative purposes and for single sample evaluation. The LDL is the estimated standard deviation of the blanks at the 95% confidence level.

The error estimates shown with each set of data are estimates of the standard error of the estimated mean at the 95% confidence level. These values include all sources of variability including sampling, analyses, counting statistics, and the propagated error involved when the environmental levels are subtracted from the actual data.

Summary

The local environment around Mound was monitored primarily for tritium and plutonium-238. The results are reported for 1988. Environmental media analyzed included air, water, vegetation, foodstuffs, and sediment.

The average concentrations of plutonium-238 and tritium were within the DOE interim air and water Derived Concentration Guides (DCG) for these radionuclides [4,5].

The average incremental concentrations of plutonium-238 and tritium oxide in air measured at all offsite locations during 1988 were 3.6×10^{-18} uCi/mL and 9.6×10^{-12} uCi/mL, respectively. These correspond to 0.01% and 0.01%, respectively, of the DOE DCGs for uncontrolled areas [5]. Details of the applicable standards are given in the Appendix.

The average incremental concentration of plutonium-238 measured at all locations in the Great Miami River during 1988 was 1.5×10^{-12} uCi/mL which is 0.004% of the DOE DCG. The average incremental concentration of tritium measured at all locations in the Great Miami River during 1988 was 0.03×10^{-6} uCi/mL which is 0.002% of the DOE DCG.

Radionuclide effluent data for 1988 are summarized in Table 4.

Table 3 - ENVIRONMENTAL CONCENTRATIONS OF RADIONUCLIDES IN VARIOUS MEDIUMS IN 1988

Plutonium-238 in air[a]	= 0.2 ± 0.6 x 10^{-18}	uCi/mL
Tritium oxide in air[a,f]	= 2.0 ± 1.5 x 10^{-12}	uCi/mL
Plutonium-238 in river water[b,f]	= n.d.	
Tritium in river water[b]	= n.d.	
Plutonium-238 in surface water[c]	= n.d.	
Tritium in surface water[c]	= 0.02 ± 0.09 x 10^{-6}	uCi/mL
Plutonium-238 in well water[d,g]	= 0.1 ± 1.4 x 10^{-12}	uCi/mL
Tritium in well water[d]	= 0.06 ± 0.05 x 10^{-6}	uCi/mL
Uranium-233,234 in well water[d,g]	= 0.2 ± 0.1 x 10^{-9}	uCi/mL
Uranium-233,234 in river water[b]	= 0.7 ± 0.1 x 10^{-9}	uCi/mL
Uranium-238 in well water[d,g]	= 0.2 ± 0.1 x 10^{-9}	uCi/mL
Uranium-238 in river water[b]	= 0.7 ± 0.1 x 10^{-9}	uCi/mL
Plutonium-238 in river silt[b]	= 2.2 ± 8.4 x 10^{-9}	uCi/g
Plutonium-238 in surface water silt[b]	= 0.6 ± 1.7 x 10^{-9}	uCi/g
Tritium in grass[c,f]	= 0.2 ± 0.1 x 10^{-6}	uCi/g
Tritium in tomatoes[e]	= 0.1 ± 0.1 x 10^{-6}	uCi/g
Plutonium-238 in grass[c]	= 0.1 ± 0.3 x 10^{-9}	uCi/g
Plutonium-238 in potatoes[e]	= n.d.	
Plutonium-238 in fish[e]	= n.d	

[a]Measured at offsite sampler 119.

[b]Measured 32 km (20 mi) upstream on Great Miami River.

[c]Measured 61 km (38 mi) southeast of Mound. pond

[d]Measured 58 km (36 mi) southeast of Mound. well

[e]Measured 64 km (40 mi) west of Mound.

[f](n.d.) environmental level cannot be detected above reagent blanks.

[g]Average of monthly and quarterly values.

Table 4 - EFFLUENT DATA FOR 1988

Radionuclide	Medium	Quantity
Tritium[a,b,c]	air[a,b,c]	3204 Ci[a,b,c]
Tritium	water	4.1 Ci
Plutonium-238	air	4.9×10^{-6} Ci
Plutonium-238	water	1.0×10^{-3} Ci
Plutonium-239	air	3.8×10^{-7} Ci
Plutonium-239	water	4.1×10^{-6} Ci
Uranium-233,234	air	2.2×10^{-8} Ci
Uranium-233,234	water	3.4×10^{-4} Ci
Uranium-238	air	3.7×10^{-8} Ci

[a]Tritium oxide in air	1549 Ci
[b]Elemental tritium in air	1655 Ci
[c]Total tritium in air	3204 Ci

The average incremental concentrations of plutonium-238 found during 1988 in surface water was 0.006% of the DOE DCG. The average incremental concentration of tritium in surface water was less than 0.005% of the DOE DCG.

All tritium in drinking water data is compared to the U. S. EPA Drinking Water Standard. When these comparisons are made, no environmental level is subtracted from the data. The average concentrations in local private and municipal drinking water systems were less than 16% and 1%, respectively, of the U. S. EPA standard.

The concentrations found in foodstuffs were extremely low. Although no DOE DCG is available for foodstuffs, the average concentrations are a small fraction of the water DCG (0.04%). Sediment samples were obtained at offsite surface water sampling locations. The concentrations of these samples were very low and therefore represent no adverse impact to the environment.

The dose equivalent estimates for the average air, water, and foodstuff concentrations indicate that the levels are 0.6% of the DOE standard of 100 mrem [4]. The air emission dose as calculated with the EPA AIRDOS model is 0.9% of the EPA air emission standard of 25 mrem. The person-rem calculated to 80 km for the total population as a result of Mound operations during 1988 was 10 person-rem. Background radiation would result in approximately 300 mrem per person or 1,000,000 person-rem for the area.

Data for the emission of nonradioactive species into the atmosphere are also presented. All of these emissions were 28% or less of the applicable air emissions standard.

A National Pollutant Discharge Elimination System (NPDES) permit regulates nonradioactive pollutants in Mound's effluent water. The NPDES permit requires this effluent to be characterized by analyzing samples collected at four onsite locations. Mound effluents were analyzed by 722 NPDES measurements in 1988. All measurements were in compliance with daily NPDES limits. Mound effluents, however, did exceed average NPDES limits twice during 1988. The sewage treatment plant effluent averaged 21 mg/L BOD during the first week of April, which represents 140% of the weekly limit. The other exception occurred at outfall 002 during September. The monthly average discharge of suspended solids was 32 mg/L, which represents 107% of the limit. Both exceptions were minor and did not affect the water quality of the Great Miami River or its compliance with Ohio Stream Standards which are referenced in the Appendix.

Environmental Surveillance

Quality Assurance

An essential part of Mound's Quality Assurance Program is the analysis of reference samples from reliable outside laboratories. Mound analyzed reference samples during 1988 from DOE's Environmental Measurements Laboratory (EML); from the U.S. Environmental Protection Agency (EPA); and from a private laboratory, Analytical Products Group, Inc. (APG). The EML samples contained trace radionuclides in air filters, water, soil, and vegetation. The EPA and APG samples contained nonradioactive contaminants in water.

Tables 5 and 6 [6,7] summarize the Mound results of the DOE Quality Assessment Program for 1988. Two-thirds of Mound's results agree with the reference EML results to within 20%. Two of Mound's measured results on vegetation and two on soil were biased high or low by more than 30%. Such biases pose no major problem, however, because of the low levels of uranium and plutonium being measured. The Mound measured tritium in water for the March 1988 sample was 36% high. However, the sample had not been distilled before liquid scintillation counting and it is believed that this accounts for the high Mound value.

Table 5 - MOUND DOE QUALITY ASSESSMENT PROGRAM RESULTS
RADIONUCLIDES IN ENVIRONMENTAL SAMPLES
(MARCH 1988 SAMPLES)

Sample Type[a]	Isotope	Mound Concentration (pCi/(g or mL))[b,c]	EML Reference Concentration (pCi/(g or mL))[d]	Ratio Mound Concentration to EML Concentration
Air	Pu-239	2.42 ± 6%	2.52 ± 3%	0.96 ± 0.06
	U-234	2.15 ± 5%	2.52 ± 1%	0.85 ± 0.04
	U-238	2.17 ± 5%	2.53 ± 7%	0.86 ± 0.07
Soil	Cs-137	0.24 ± 4%	0.4 ± 4%	0.60 ± 0.03
	U-234	0.31 ± 3%	0.67 ± 4%	0.46 ± 0.02
	U-238	0.31 ± 9%	0.69 ± 4%	0.45 ± 0.04
Vegetation	Pu-238	0.23 ± 4%	0.218 ± 2%	1.06 ± 0.05
	Pu-239	0.062 ± 6%	0.045 ± 2%	1.38 ± 0.09
	U-234	0.026 ± 7%	0.036 ± 25%	0.72 ± 0.19
	U-238	0.029 ± 17%	0.036 ± 25%	0.81 ± 0.24
Water	H-3	28.1 ± 3%	20.7 ± 3%	1.36 ± 0.06
	Pu-239	0.021 ± 4%	0.0243 ± 9%	0.86 ± 0.09
	U-234	0.0039 ± 5%	0.00425 ± 7%	0.92 ± 0.08
	U-238	0.0038 ± 5%	0.00425 ± 9%	0.89 ± 0.09

[a]All samples were labeled 8803.

[b]Units are pCi/sample for air filters, pCi/mL for water, and pCi/g for soil and vegetation.

[c]The Mound error is the two sigma error based on counting statistics or replicate analysis.

[d]The EML error is the standard error of the mean.

Table 6 - MOUND DOE QUALITY ASSESSMENT PROGRAM RESULTS
RADIONUCLIDES IN ENVIRONMENTAL SAMPLES
(SEPTEMBER 1988 SAMPLES)

Sample Type[a]	Isotope	Mound Concentration (pCi/(g or mL))[b,c]	EML Reference Concentration (pCi/(g or mL))[d]	Ratio Mound Concentration to EML Concentration
Air	Pu-239	0.96 ± 7%	1.09 ± 6%	0.88 ± 0.08
	U-234	1.94 ± 7%	2.4 ± 3%	0.81 ± 0.06
	U-238	1.82 ± 8%	2.39 ± 3%	0.76 ± 0.07
Soil	Cs-137	1 ± 10%	0.91 ± 5%	1.10 ± 0.12
	Pu-239	0.403 ± 7%	0.38 ± 2%	1.06 ± 0.08
Vegetation	Pu-239	0.038 ± 15%	0.021 ± 9%	1.81 ± 0.32
	U-234	0.023 ± 43%	0.023 ± 8%	1.00 ± 0.44
	U-238	0.019 ± 42%	0.018 ± 5%	1.06 ± 0.45
Water	H-3	10.1 ± 1%	10.6 ± 4%	0.95 ± 0.04
	Pu-239	0.0049 ± 4%	0.0054 ± 8%	0.91 ± 0.08
	U-234	0.0038 ± 2%	0.0041 ± 4%	0.93 ± 0.04
	U-238	0.0038 ± 2%	0.0042 ± 4%	0.90 ± 0.04

[a]All samples were labeled 8809.

[b]Units are pCi/sample for air filters, pCi/mL for water, and pCi/g for soil and vegetation.

[c]The Mound error is the two sigma error based on counting statistics or replicate analysis.

[d]The EML error is the standard error of the mean.

Mound results of the 1988 EPA Quality Assurance Program for the determination of nonradioactive parameters in water are compared to the EPA "true values" in Table 7. All eleven of the measured parameters were within the acceptance limits and the warning limits set by the EPA. This indicates excellent agreement between Mound's measured concentrations and the EPA reference values.

Another part of Mound's Quality Assurance Program in the measurement of nonradioactive parameters in water involves the analysis of reference samples prepared by Analytical Products Group, Inc. (APG). Analysis of these APG samples is part of a Monsanto Company quality control program. EG&G Mound Applied Technologies will continue with the APG program at Mound in 1989. Mound analyzed four sets of APG samples in 1988, and these results are summarized in Table 7. The difference between the Mound value and the APG reference value is expressed in the APG reports as the number of standard deviations of the Mound value from the average determined for all participating laboratories.

As seen in Table 8, the greatest observed number of standard deviations from the average was only 2.3. The "EPA Warning Limits" are 1.96 standard deviations from the average and "EPA Acceptance Limits" are 2.58 standard deviations from the average. Thus, all 88 of Mound's 1988 APG results are acceptable.

Another essential part of Mound's Quality Assurance Program is the determination of

Table 7 - 1988 MOUND EPA-NPDES QUALITY ASSURANCE PROGRAM RESULTS FOR THE DETERMINATION OF NONRADIOACTIVE PARAMETERS IN WATER

Parameters	Mound Value[a]	EPA Value	Acceptance Limits	Warning Limits	Performance Evaluation
			Trace Metals (mg/L)		
Cadmium	178	180	158-208	164-202	Acceptable
Chromium	790	832	673-967	709-930	Acceptable
Copper	283	291	263-319	270-312	Acceptable
Nickel	551	571	492-646	511-627	Acceptable
			Miscellaneous Parameters		
pH	7.53	7.5	7.28-7.66	7.33-7.61	Acceptable
Total Suspended Solids (mg/L)	62.8	56.3	44.9-67.7	47.7-64.9	Acceptable
Oil and Grease (mg/L)	13.9	14.0	6.52-18.7	8.04-17.2	Acceptable
Total Cyanide (mg/L)	0.456	0.46	0.308-0.587	0.343-0.552	Acceptable
Total Residual Chlorine (mg/L)	3.5	4.14	2.97-4.88	3.22-4.63	Acceptable
			Demands (mg/L)		
COD	24	25	13.7-34.4	16.3-31.8	Acceptable
5-day BOD	15.4	16	7.54-24.4	9.63-22.3	Acceptable

[a]Standard deviations (precision) of Mound's values are generally ±10% or less; for BOD, the standard deviation is closer to ±30%.

Table 8 - SUMMARY OF MOUND'S PERFORMANCE IN THE ANALYTICAL PRODUCTS GROUP PROFICIENCY ENVIRONMENTAL TESTING PROGRAM FOR 1988

Parameter Measured in Water	Parameter Range Measured	Range of Observed Number of Standard Deviations from the Average
Biochemical Oxygen Demand	24.4-239 mg/L	0.1-1.0
Chemical Oxygen Demand	39.3-385 mg/L	0.1-2.3
Total Suspended Solids	52.4-313 mg/L	0.1-0.9
Oil and Grease	5.13-33.9 mg/L	0.1-0.4
pH	3.80-8.54	0.2-0.9
Cyanide	0.14-4.09 mg/L	0.1-1.2
Residual Chlorine	0.21-6.12 mg/L	0.1-0.9
Cadmium	18.6-208 µg/L	0.1-1.6
Chromium	37.2-222 µg/L	0.2-2.3
Copper	36.0-218 µg/L	0.1-1.7
Nickel	66.6-254 µg/L	0.3-1.4

"blank values." A "blank value" is a measurement result for a contaminant determined by carrying out the chemical analysis procedure without a true sample, but rather using deionized water, a clean filter paper, or only the reagents used in the analysis. Analysis of "blanks" is essential because many of the samples analyzed show contaminant concentrations at or below the lower detection limit of the analytical method being used. Analyzing "blanks" is essential in verifying the absence of excessive laboratory contamination or detector background. Also, the standard deviation of the "blank values" is used to calculate lower detection limits, which are given with each set of environmental data in this report.

Additionally, internal standards and duplicate samples are included with sets of environmental samples through the analysis procedure. Approximately 20% of all samples analyzed are QC related.

Other aspects of Mound's Environmental Section quality control program have been documented in a quality control manual [8]. Summarizing, along with a formal quality control program, the agreement between Mound measured concentrations and reference values of EML, the EPA, or APG, indicates good reliability of the data generated in the routine environmental monitoring program.

Air - Radioactive

The offsite air-sampling network consisted of 15 continuously operating air-sampling stations used for sampling both tritium oxide and plutonium. Ten sampling stations are located within a 1.6 km (one mile) radius of Mound, and four samplers are located in or near population centers. The remaining sampler (#119) is approximately 44.8 km (28 mi) from Mound in the least prevailing wind direction. This sampler receives no measurable contribution from Mound operations and serves as a baseline sample for computing background environmental levels.

The radionuclide concentrations from sampler #119 are subtracted from concentrations detected at other locations. The samplers currently in operation are located at critical distances and directions, based on a diffusion model developed for Mound [9]. The locations of the sampling stations are shown in Figure 1.

Two types of samples are collected at each sampling station. One is a particulate air sample for plutonium-238 analysis, and the other, from a bubbler-type sampler, is for tritium oxide analysis. The particulate sample is collected on a 200-mm diameter Microdon disk by a continuously operating (24 hr/day, 7 days/week) high-volume air sampler. The air is sampled at an average rate of 1.3×10^6 cm³/min (~45 ft³/min). The disk is changed weekly and represents a sample of approximately 13,000 m³ of air. Individual sample flow rates are used to calculate concentrations at each location. Plutonium-238 analyses were performed on a monthly composite for three sampling locations, #122, #123, and #124, and on quarterly composites for the other offsite locations.

The analytical scheme for plutonium-238 incorporates the following basic steps: use of an internal tracer, chemical treatment, separation of plutonium with anion exchange resin, and alpha spectrometry.

The average incremental offsite plutonium-238 air concentration for all locations was 3.6×10^{-18} uCi/mL, which is 0.01% of the DOE DCG. The analytical results are summarized in Table 9.

Table 10 shows concentrations of plutonium-239,240 and plutonium-238, including environmental levels for the sake of completeness.

The gas bubbler sample is also collected on a continuous basis by bubbling air at approximately 3×10^3 cm³/min through 200 mL of ethylene glycol. Ethylene glycol is used because this material eliminates evaporation and freezing problems associated with sample collection [10]. Tritium (oxide) in the air is collected in the solution. Tritium oxide rather than elemental tritium is sampled and analyzed because about half of the tritium emission is in the oxide form, and the Derived Air Concentration is much more restrictive (25,000 times) than it is for elemental tritium [11]. A sample representing ~30 m³ of air is collected, and an aliquot representing 0.15 m³ is counted in a liquid scintillation spectrometer. The average incremental concentration of tritium oxide measured during 1988 for all offsite locations, not including the environmental level found at sampler #119, was 9.6×10^{-12} uCi/mL. This concentration is

Table 9 - INCREMENTAL CONCENTRATIONS OF PLUTONIUM-238 IN AIR AT OFFSITE SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Plutonium-238 (10^{-18} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
101	4	0.1	2.4	1.4 ± 1.7	0.005
102	4	1.7	20.4	8.2 ± 13.3	0.03
103	4	1.6	31.1	13.3 ± 20.0	0.04
104	4	0.2	4.7	2.4 ± 3.7	0.008
105	4	e.l.	0.6	0.3 ± 0.9	0.001
108	4	e.l.	0.2	0.002 ± 0.7	0.000007
110	4	e.l.	e.l.	e.l.	
111	4	e.l.	0.7	0.3 ± 1.0	0.001
112	4	e.l.	0.3	0.1 ± 0.7	0.0003
115	4	e.l.	0.4	e.l.	
118	4	0.4	1.9	1.1 ± 1.3	0.004
122	12	0.5	20.2	7.5 ± 5.0	0.03
123	11	0.5	20.5	8.0 ± 4.7	0.03
124	12	2.4	16.3	7.1 ± 3.2	0.02

[a]Average environmental level (e.l.) found in Table 3 is subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for monthly values of plutonium-238 in air is 0.3 x 10^{-18} µCi/mL; for quarterly values, 0.1 x 10^{-18} µCi/mL.

[d]DOE DCG for plutonium-238 in air is 30,000 x 10^{-18} µCi/mL.

0.01% of the DOE DCG. The results are summarized in Table 11. Environmental levels for plutonium-238 and tritium in air as measured at sampler #119 are shown in Table 3. These environmental levels of plutonium-238 and tritium in air are subtracted from the sample data.

An onsite perimeter network consisting of five continuous, high-volume air samplers is used to further assess the effectiveness of stack emission control systems. The onsite sampling locations are shown in Figure 4. Particulate samples and tritium samples are collected by the onsite samplers at approximately the same flow rate as the offsite samplers and are analyzed in the same manner.

The average incremental plutonium-238 concentration measured for all locations onsite is 44 x 10^{-18} µCi/mL, which is 0.1% of the DOE DCG. The results are summarized in Table 12. Table 13 presents onsite concentrations of plutonium-239,240, and plutonium-238, including environmental levels, for the sake of completeness. The quantity of plutonium-238 discharged to the atmosphere during 1988 was 4.9 x 10^{-6} Ci.

The average incremental onsite tritium oxide concentration for all locations was 26 x 10^{-12} µCi/mL, which is 0.03% of the DOE DCG. The results are summarized in Table 14. The quantity of tritium discharged to the atmosphere during 1988 was 3204 Ci.

Table 10 - CONCENTRATIONS OF PLUTONIUM INCLUDING ENVIRONMENTAL LEVELS IN AIR AT OFFSITE SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Plutonium-239,240 (10^{-18} uCi/mL) Minimum[a]	Maximum	Average[b,c]	Plutonium-238 (10^{-18} uCi/mL) Average[b,c]
101	4	0.2	0.8	0.4 ± 0.5	1.6 ± 1.6
102	4	0.2	0.3	0.2 ± 0.08	8.3 ± 13.3
103	4	0.2	0.6	0.4 ± 0.3	13.4 ± 20.0
104	4	0.03	0.4	0.2 ± 0.3	2.5 ± 3.6
105	4	0.1	0.9	0.4 ± 0.5	0.4 ± 0.6
108	4	0.1	0.2	0.2 ± 0.1	0.2 ± 0.3
110	4	0.1	0.2	0.1 ± 0.1	n.d.
111	4	0.2	0.3	0.2 ± 0.1	0.4 ± 0.7
112	4	0.1	0.2	0.1 ± 0.1	0.2 ± 0.4
115	4	0.2	0.4	0.3 ± 0.2	0.1 ± 0.5
118	4	0.1	0.3	0.2 ± 0.1	1.2 ± 1.1
119	4	0.03	0.4	0.2 ± 0.2	0.2 ± 0.6
122	12	n.d.	0.6	0.2 ± 0.2	7.7 ± 5.0
123	11	n.d.	0.4	0.1 ± 0.2	8.1 ± 4.6
124	12	n.d.	0.5	0.2 ± 0.1	7.3 ± 3.1

[a]The (n.d.) indicates that the values cannot be detected above the reagent blanks.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for monthly values of plutonium-238 in air is 0.3 x 10^{-18} uCi/mL; for quarterly values, 0.1 x 10^{-18} uCi/mL. Lower detection limit (LDL) for monthly values of plutonium-239,240 in air is 0.2 x 10^{-18} uCi/mL; for quarterly values, 0.02 x 10^{-18} uCi/mL.

Table 11 - INCREMENTAL CONCENTRATIONS OF TRITIUM OXIDE IN AIR AT OFFSITE SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Tritium Oxide (10^{-12} uCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
101	52	e.l.	109	13.3 ± 4.8	0.01
102	52	e.l.	42.1	14.5 ± 3.1	0.01
103	51	e.l.	163	16.2 ± 6.9	0.02
104	52	e.l.	60.5	10.7 ± 3.8	0.01
105	52	e.l.	25.4	5.7 ± 2.4	0.006
108	50	e.l.	33.1	4.9 ± 2.5	0.005
110	51	e.l.	12.6	1.5 ± 2.0	0.002
111	51	e.l.	17.8	1.2 ± 2.1	0.001
112	52	e.l.	53.9	5.1 ± 2.8	0.005
115	52	e.l.	13.2	1.1 ± 2.1	0.001
118	51	e.l.	34.2	5.5 ± 2.6	0.006
122	50	e.l.	107	15.8 ± 6.6	0.02
123	52	e.l.	241	21.4 ± 10.5	0.02
124	50	e.l.	100	17.0 ± 5.4	0.02

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium oxide in air is 13 x 10^{-12} uCi/mL.

[d]DOE DCG for tritium oxide in air is 100,000 x 10^{-12} uCi/mL. This value has been adjusted to include the fraction of tritium oxide that is absorbed through the skin as part of the inhalation pathway.

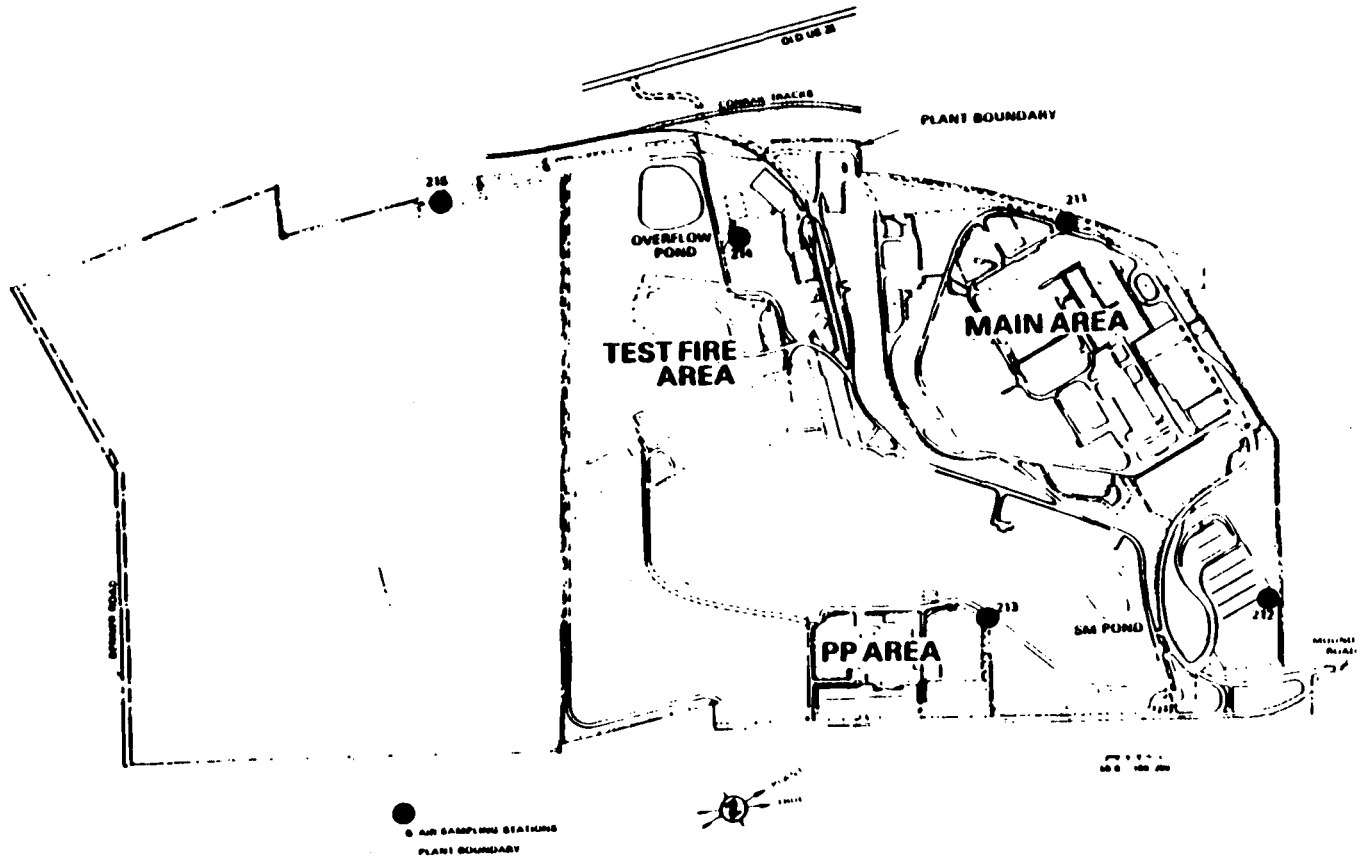


FIGURE 4 - Onsite air sampling locations.

Table 12 - INCREMENTAL CONCENTRATIONS OF PLUTONIUM-238 IN AIR AT ONSITE SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Plutonium-238 (10^{-18} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
211	12	9	313	80 ± 64	0.3
212	12	2	85	13 ± 15	0.04
213	12	21	146	61 ± 22	0.2
214	11	5	354	58 ± 63	0.2
215	12	1	19	6 ± 3	0.02

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) plutonium-238 in air is 0.3 x 10^{-18} µCi/mL.

[d]DOE DCG for plutonium-238 in air is 30,000 x 10^{-18} µCi/mL.

Table 13 - CONCENTRATIONS OF PLUTONIUM INCLUDING ENVIRONMENTAL LEVELS IN AIR AT ONSITE SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Plutonium-239,240 (10^{-18} µCi/mL) Minimum[a]	Maximum	Average[b,c]	Plutonium-238 (10^{-18} µCi/mL) Average[b,c]
211	12	n.d.	2.9	0.8 ± 0.6	80 ± 64
212	12	n.d.	0.8	0.2 ± 0.2	13 ± 15
213	12	n.d.	1.3	0.6 ± 0.2	61 ± 22
214	11	n.d.	1.1	0.4 ± 0.2	58 ± 63
215	12	n.d.	0.7	0.3 ± 0.2	6 ± 3

[a]The (n.d.) indicates that the values cannot be detected above the reagent blanks.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for monthly values of plutonium-238 in air is 0.3 x 10^{-18} µCi/mL. Lower detection limit (LDL) for monthly values of plutonium-239,240 in air is 0.2 x 10^{-18} µCi/mL.

Table 14 - INCREMENTAL CONCENTRATIONS OF TRITIUM OXIDE IN AIR AT ONSITE SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Tritium Oxide (10^{-12} uCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
211	50	e.l.	147	20.8 ± 7.8	0.02
212	51	1.4	81.1	24.1 ± 6.1	0.02
213	51	2.3	502	40.6 ± 19.5	0.04
214	51	e.l.	165	24.5 ± 10.0	0.02
215	52	e.l.	189	22.2 ± 9.6	0.02

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium oxide in air is 13 x 10^{-12} uCi/mL.

[d]DOE DCG for tritium oxide in air is 100,000 x 10^{-12} uCi/mL. This value has been adjusted to include the fraction of tritium oxide which is absorbed through the skin as part of the inhalation pathway.

Air – Nonradioactive

The primary source of nonradioactive airborne emissions is the Mound steam power plant. This plant is normally fueled with natural gas, but can burn fuel oil. Fuel oil with <1% sulfur content is burned during unusually cold weather if the natural gas supply to Mound is interrupted. Approximately 495,000 liters (131,000 gal) of fuel oil were burned during 1988.

Additional sources of airborne emissions are as follows. A waterwash, paint spray booth is operated intermittently in the Mound paint shop. Wastes from operations involving explosives are disposed of by open burning under a permit issued by the Regional Air Pollution Control Agency (RAPCA). Fire-fighter training exercises are held at an open outdoor facility under a burning permit issued by RAPCA. No exercises were held during 1988 because of other work being performed in the training area.

Emissions from sources and the applicable emission standards are summarized in Table 15. The emissions were estimated from emission factors established by the U.S. EPA [12]. Emission factors allow calculation of emissions based on quantity of material used or consumed. Nonradioactive airborne emissions at Mound were all within applicable standards and had minimal impact on ambient air quality. This is further demonstrated by the particulate concentration data summarized in Tables 16 and 17.

The data presented are weekly particulate concentrations measured at Mound's offsite and onsite air-sampling sites (Figures 1 and 4). The particulate concentration at onsite locations is generally within the range of the offsite locations. The particulate concentration also appears to be independent of distance from Mound. This would suggest no influence from Mound operations. The State of Ohio - Ambient Quality Standard for airborne particulates is also given in Table 16 for comparison.

Table 15 - NONRADIOACTIVE AIRBORNE EMISSIONS - 1988

Emission Source	Pollutant	Emission	Emission Standard[a]	% of Standard
Powerhouse	Particulates	0.006 lb/10^6 Btu Input	0.02 lb/10^6 Btu	28
Powerhouse	Sulfur Oxides	0.009 lb/10^6 Btu Input	1.6 lb/10^6 Btu	0.6
Paint Shop	Organics	6.1 lb/day	40 lb/day	15
Explosives Burning	Particulates	10 lb	NA	NA
Fire Fighter Training	Particulates	None	NA	NA

[a]Ohio EPA Air Pollution Regulations 3745-17-10, 3745-18-06, and 3745-21-07.

NA - Not applicable.

Table 16 - 1988 PARTICULATE CONCENTRATIONS OFFSITE

Location	Number of Samples	Particulates[a] (ug/m³) Minimum	Maximum	Annual[a,b] Arithmetic Average (ug/m³)
101	52	33	159	64 ± 7
102	52	16	71	35 ± 3
103	52	18	59	32 ± 3
104	52	15	127	45 ± 7
105	52	15	61	33 ± 3
108	52	28	350	58 ± 13
110	52	9	57	30 ± 3
111	51	9	148	61 ± 9
112	52	3	58	28 ± 3
115	50	7	142	47 ± 8
118	52	7	79	35 ± 4
119	52	7	91	34 ± 5
122	51	13	88	36 ± 4
123	48	23	77	41 ± 4
124	50	7	82	36 ± 5

[a]Ohio Ambient Air Quality Standard = 60 ug/m³ (annual geometric mean).

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

These data are obtained by the Mound air monitoring program and are indicative only of the particulate air loading of the Dayton metropolitan area. Mound particulate discharges presented in Table 14 make a negligible contribution to the surrounding area. Table 16 presents onsite particulate data.

Additionally, since the Ohio Ambient Air Quality Standard is not based on continuous sampling, a direct comparison to the standard is not appropriate. The arithmetic average is used for Mound's data, which will give a higher value than the geometric mean technique.

Table 17 - 1988 PARTICULATE CONCENTRATIONS ONSITE

Location	Number of Samples	Particulates (ug/m³) Minimum	Maximum	Annual[a] Arithmetic Average (ug/m³)
211	50	5	73	41 ± 4
212	50	5	62	31 ± 4
213	51	2	126	57 ± 6
214	50	7	59	34 ± 3
215	48	2	51	28 ± 3

[a]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

Water - Radioactive

Water sampling locations along the banks of the Great Miami River were selected according to guidelines recommended by the U. S. EPA [13]. The locations, shown in Figure 5, provide samples that are representative of river water after considerable mixing of the effluent from Mound has occurred. Water samples are collected at these locations monthly and weekly and are subjected to specific analyses for plutonium-238 and tritium, respectively.

Water samples are collected and analyzed for plutonium-238 on a monthly basis. The average incremental concentration of plutonium-238 measured for all locations in the Great Miami River was 1.5 x 10^{-12} µCi/mL, which is 0.004% of the DOE DCG. These results are summarized in Table 18.

Weekly samples are analyzed for tritium. The average incremental concentration of tritium measured at all locations in the Great Miami River was 0.03 x 10^{-6} µCi/mL, which is 0.002% of the DOE DCG. These results are summarized in Table 19.

Uranium-233, 234, and 238 were also monitored at the river water sampling locations during 1988. The average incremental concentration of uranium-233,234 was 0.02 x 10^{-9} µCi/mL, which is 0.004% of the DOE DCG. The average incremental concentration for uranium-238 was 0.01 x 10^{-9} µCi/mL, which is 0.002% of the DOE DCG. Additionally, as shown in Table 20, the ratio of uranium-233,234 to uranium-238 is slightly greater than unity, which is in range of background ratios reported [14]. This is expected as a result of secular equilibrium and indicates that the uranium is naturally occurring.

The total discharges to the Great Miami River during 1988 consisted of 1.0 x 10^{-3} Ci of plutonium-238, 4.1 Ci of tritium, 3.4 x 10^{-4} Ci of uranium-233, 234, and 4.1 x 10^{-6} Ci of plutonium-239. The average concentrations of these materials in the discharge system were: plutonium-238, 0.44 x 10^{-9} µCi/mL; tritium, 5.7 x 10^{-6} µCi/mL; uranium-233,234 0.29 x 10^{-9} µCi/mL; and plutonium-239, 0.003 x 10^{-9} µCi/mL. The percentages of DOE DCG for these concentrations were: plutonium-238, 1.1%; tritium, 0.3%; uranium-233,234, 0.06%; and plutonium-239, 0.01%.

Seven additional surface water locations, such as ponds, in all quadrants surrounding Mound as shown in Figure 5 are sampled quarterly for plutonium and tritium analyses. The average concentrations of plutonium-238 and tritium for all locations were 2.3 x 10^{-12} µCi/mL and 0.1 x 10^{-6} µCi/mL, respectively, which are 0.006% and 0.005%, respectively, of the DOE DCG. The results of the surface water samples are summarized in Tables 21 and 22. Environmental levels (Table 3) have been subtracted from the concentration of plutonium and tritium in water.

Drinking water from communities in the surrounding area is sampled and analyzed monthly for tritium. These communities and their relative locations are shown in Figure 5. The average concentration of tritium for all locations was 0.1 nCi/L which is 0.5% of the standard adopted by the U.S. EPA in 1977 for community drinking water systems. Data from the analyses of community drinking water samples are summarized in Table 23. The environmental level in Table 3 for tritium in water is not subtracted from these data because the EPA standard

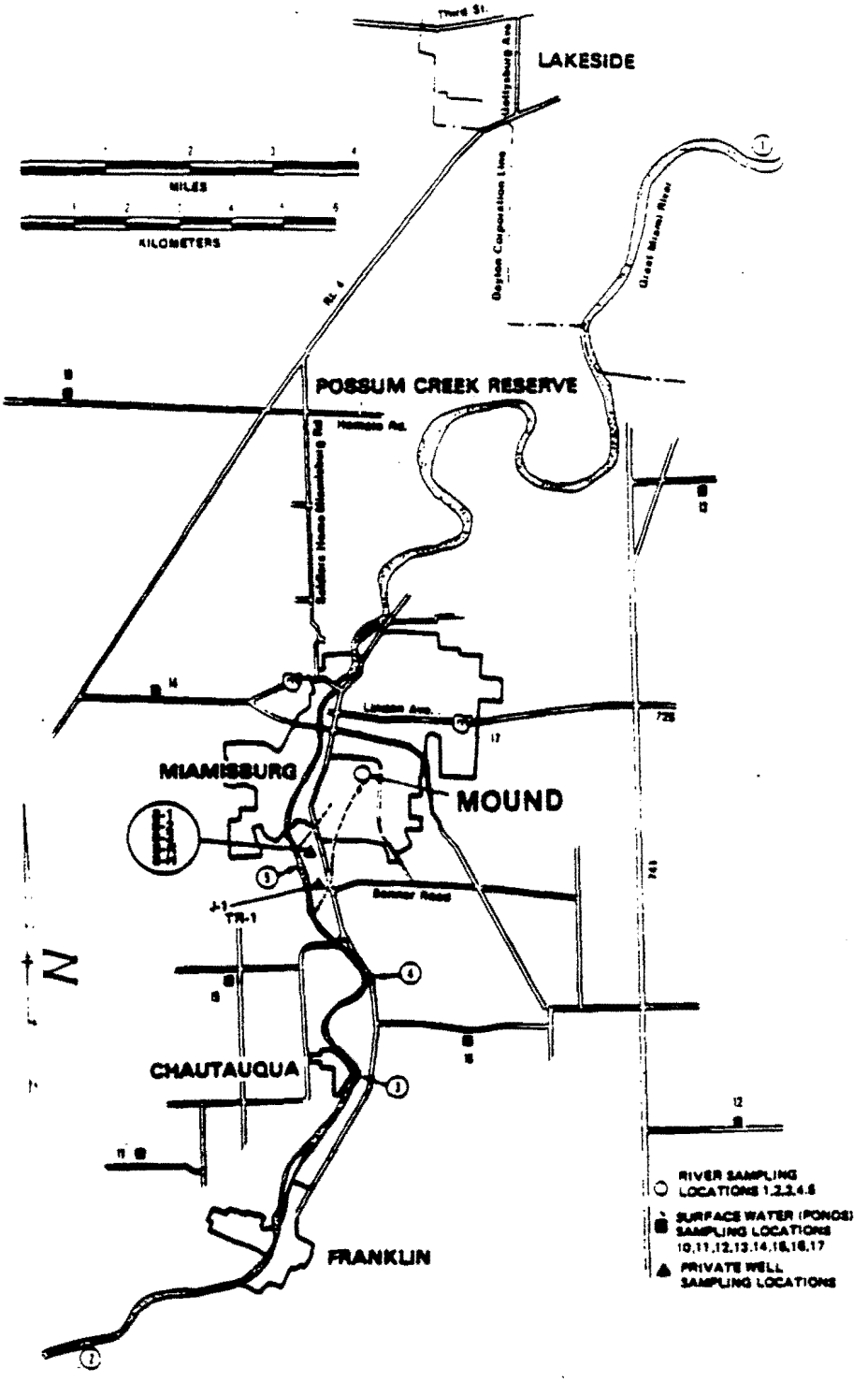


FIGURE 5 - Offsite water sampling locations.

Table 18 - INCREMENTAL CONCENTRATION OF PLUTONIUM-238 IN THE GREAT MIAMI RIVER IN 1988

Location	Number of Samples	Plutonium-238 (10^{-12} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
1	12	e.l.	11.3	0.8 ± 4.5	0.002
2	12	e.l.	9.3	1.1 ± 4.3	0.003
3	12	e.l.	9.5	2.2 ± 3.9	0.006
4	12	e.l.	12.7	2.1 ± 5.7	0.005
5	12	e.l.	7.8	1.3 ± 3.6	0.003

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) plutonium-238 in water is 9.2 x 10^{-12} µCi/mL.

[d]DOE DCG for plutonium-238 in water is 40,000 x 10^{-12} µCi/mL.

Table 19 - INCREMENTAL CONCENTRATIONS OF TRITIUM IN THE GREAT MIAMI RIVER IN 1988

Location	Number of Samples	Tritium (10^{-6} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
1	48	e.l.	0.2	0.01 ± 0.06	0.0005
2	48	e.l.	0.4	0.04 ± 0.06	0.002
3	48	e.l.	0.4	0.04 ± 0.06	0.002
4	48	e.l.	0.3	0.04 ± 0.06	0.002
5	48	e.l.	0.3	0.03 ± 0.06	0.002

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium in water is 0.1 x 10^{-6} µCi/mL.

[d]DOE DCG for tritium oxide in water is 2,000 x 10^{-6} µCi/mL.

Table 20 - INCREMENTAL CONCENTRATION OF URANIUM-233,234 AND URANIUM-238 IN THE GREAT MIAMI RIVER IN 1988

Location	Number of Samples	Uranium-233,234 (10^{-9} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG	Uranium-238 (10^{-9} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Ratio[e] Uranium-233,234 / Uranium-238
1	12	e.l.	0.4	0.1 ± 0.2	0.02	e.l.	0.3	0.1 ± 0.2	1.1
2	12	e.l.	0.3	e.l.	--	e.l.	0.2	e.l.	1.2
3	12	e.l.	0.1	e.l.	--	e.l.	0.2	e.l.	1.1
4	12	e.l.	0.2	e.l.	--	e.l.	0.2	e.l.	1.1
5	12	e.l.	0.2	e.l.	--	e.l.	0.1	e.l.	1.2

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for uranium-233,234 is 0.01 x 10^{-9} µCi/mL. The LDL for Uranium-238 is 0.01 x 10^{-9} µCi/mL.

[d]DOE DCG for uranium-233,234 in water is 500 x 10^{-9} µCi/mL. The DOE DCG for uranium-238 is 600 x 10^{-9} µCi/mL.

[e]Environmental level not subtracted from these data.

Table 21 - INCREMENTAL CONCENTRATION OF PLUTONIUM-238 IN SURFACE WATER IN 1988

Location	Number of Samples	Plutonium-238 (10^{-12} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
11	4	e.l.	6.7	4.1 ± 6.6	0.01
12	4	e.l.	2.0	0.3 ± 5.1	0.0008
13	4	0.6	12.5	3.7 ± 10.4	0.009
14	4	e.l.	3.6	0.4 ± 5.9	0.001
15	4	e.l.	1.1	e.l.	-
16	4	e.l.	0.1	e.l.	-
17	4	e.l.	25.4	7.8 ± 19.8	0.02

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) plutonium-238 in surface water is 2.3 x 10^{-12} µCi/mL.

[d]DOE DCG for plutonium-238 in water is 40,000 x 10^{-12} µCi/mL.

Table 22 - INCREMENTAL CONCENTRATION OF TRITIUM IN SURFACE WATER IN 1988

Location	Number of Samples	Tritium (10^{-6} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
11	4	0.1	0.9	0.3 ± 0.6	0.02
12	4	e.l.	0.2	0.1 ± 0.2	0.005
13	4	e.l.	0.2	0.1 ± 0.2	0.005
14	4	e.l.	0.2	0.1 ± 0.2	0.005
15	4	e.l.	0.2	0.1 ± 0.2	0.005
16	4	e.l.	0.1	0.001 ± 0.2	0.00005
17	4	e.l.	0.3	0.1 ± 0.2	0.005

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium in surface water is 0.2 x 10^{-6} µCi/mL.

[d]DOE DCG for tritium in water is 2,000 x 10^{-6} µCi/mL.

Table 23 - TRITIUM LEVELS IN COMMUNITY DRINKING WATER IN 1988

Location	Number of Samples	Tritium (nCi/L) Minimum[a,d]	Maximum[a]	Average[a,b,c]	Percent of EPA Standard
Bellbrook	12	n.d.	0.2	0.04 ± 0.1	0.2
Centerville	12	n.d.	0.2	0.1 ± 0.1	0.5
Dayton	12	n.d.	0.2	0.03 ± 0.1	0.2
Franklin	12	0.1	0.4	0.2 ± 0.1	1.0
Germantown	12	n.d.	0.1	0.1 ± 0.04	0.5
Kettering	12	n.d.	0.2	0.1 ± 0.1	0.5
Miamisburg	12	0.3	0.7	0.5 ± 0.1	2.5
Middletown	12	n.d.	0.2	0.1 ± 0.1	0.5
Moraine	12	n.d.	0.2	0.04 ± 0.04	0.2
Springboro	12	0.1	0.5	0.2 ± 0.1	1.0
Waynesville	12	n.d.	0.2	0.01 ± 0.1	0.1
West Carrollton	12	n.d.	0.1	0.1 ± 0.03	0.5

[a]Average environmental level (e.l.) not subtracted from the data. The EPA standard of 20 nCi/L assesses total concentration including background.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium in community drinking water is 0.1 nCi/L.

[d](n.d.) Analytical result cannot be detected above reagent blanks.

assesses total concentration including background.

Drinking water from private wells is also analyzed for tritium. The average concentration of tritium for all private well locations was 3.1 nCi/L, which is less than 16% of the U.S. EPA Standard. These data are shown in Table 24. Most of the tritium in these wells has decreased consistently over the last few years and, during 1988, all of the "B" wells were discontinued as drinking water sources. Drinking water from these discontinued wells was supplanted by municipal sources. Additionally, the average concentration of tritium in Mound's onsite wells was 3.1 nCi/L, which is less than 16% of the U.S. EPA standard. These data are shown in Table 25.

Four private wells and Miamisburg city water were sampled and analyzed for plutonium-238. The average incremental plutonium-238 concentration for these locations was 1.9×10^{-12} uCi/mL, which is 0.005% of the DOE DCG. These results are shown in Table 26. Additionally, the average incremental concentration of plutonium-238 in Mound's onsite wells was 1.5×10^{-12} uCi/L, which is 0.004% of the DOE DCG. These results are shown in Table 27.

Private wells and Miamisburg drinking water were analyzed for uranium-233,234 and uranium-238 during 1988. The average

Table 24 - TRITIUM IN PRIVATE WELLS IN 1988

Location	Number of Samples	Tritium (nCi/L) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of EPA Standard
B-1	15	2.0	3.5	2.9 ± 0.2	15
B-2	7	2.7	5.1	4.0 ± 0.7	20
B-3	12	0.6	3.1	2.2 ± 0.6	11
J-1	9	1.9	3.0	2.3 ± 0.3	12
B-H	11	2.9	4.7	3.8 ± 0.3	19
B-R	11	4.2	6.6	5.7 ± 0.5	29
TR-1	10	0.5	0.8	0.6 ± 0.1	3

[a]Average environmental level (e.l.) not subtracted from the data. The EPA standard of 20 nCi/L assesses total concentration including background.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium in well water is 0.2 nCi/L.

Table 25 - TRITIUM IN ONSITE WELLS IN 1988

Location	Number of Samples	Tritium (nCi/L) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of EPA Standard
71-1	41	1.5	5.6	3.5 ± 0.3	18
71-2	47	2.6	4.6	3.7 ± 0.2	19
76-1	40	1.3	3.2	2.1 ± 0.1	11

[a]Average environmental level (e.l.) not subtracted from the data. The EPA standard of 20 nCi/L assesses total concentration including background.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium in well water is 0.2 nCi/L.

Table 26 - INCREMENTAL CONCENTRATION OF PLUTONIUM-238 IN PRIVATE WELLS AND MIAMISBURG MUNICIPAL DRINKING WATER IN 1988

Location	Number of Samples	Plutonium-238 (10^{-12} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG
Miamisburg	12	e.l.	3.3	0.1 ± 2.5	0.0002
B-1	4	e.l.	3.0	1.0 ± 3.7	0.003
B-2	2	e.l.	2.8	0.7 ± 26.7	0.002
B-3	4	e.l.	2.4	0.9 ± 3.9	0.002
J-1	4	e.l.	21.8	6.9 ± 16.6	0.02

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for monthly plutonium-238 in drinking water is 4.5 x 10^{-12} µCi/mL. The LDL for quarterly plutonium-238 is 2.1 x 10^{-12} µCi/mL.

[d]DOE DCG for plutonium-238 in water is 40,000 x 10^{-12} µCi/mL.

Table 27 - INCREMENTAL CONCENTRATION OF PLUTONIUM-238 IN ONSITE WELL WATER IN 1988

Location	Number of Samples	Plutonium-238 (10^{-12} µCi/mL) Minimum[a]	Maximum[b]	Average[a,b,c]	Percent of[d] DOE DCG
71-1	11	e.l.	7.0	1.5 ± 2.9	0.004
71-2	12	e.l.	6.4	1.4 ± 2.6	0.004
76-1	10	e.l.	6.5	1.7 ± 2.7	0.004

[a]Average environmental level (e.l.) found in Table 3 subtracted from the data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for plutonium-238 in drinking water is 4.5 x 10^{-12} µCi/mL.

[d]DOE DCG for plutonium-238 in water is 40,000 x 10^{-12} µCi/mL.

incremental uranium-233,234 concentration was 0.04 x 10^{-9} uCi/mL, which is 0.008% of the DOE DCG. The average incremental uranium-238 concentration was 0.04 x 10^{-9} uCi/mL, which is 0.007% of the DOE DCG. Additionally, the average incremental concentrations of uranium-233,234 in Mound's onsite wells were at the environmental level. The average incremental concentration of uranium-238 was 0.007 x 10^{-9} uCi/mL, which is 0.001% of the DOE DCG. These results are shown in Tables 28 and 29.

These concentrations are in the range found in ground water, and the ratio of uranium-234 to uranium-238 (1.0 to 1.3) is also in the expected range [15].

Table 28 - INCREMENTAL CONCENTRATION OF URANIUM-233,234 AND URANIUM-238 IN PRIVATE WELLS AND MIAMISBURG MUNICIPAL DRINKING WATER IN 1988

Location	Number of Samples	Uranium-233,234 (10^{-9} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG	Uranium-238 (10^{-9} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Ratio[e] Uranium-233,234 / Uranium-238
Miamisburg	12	0.1	0.3	0.2 ± 0.1	0.04	0.1	0.3	0.2 ± 0.1	1.1
B-1	4	e.l.	0.1	e.l.	--	e.l.	0.03	e.l.	1.1
B-2	3	e.l.	e.l.	e.l.	--	e.l.	e.l.	e.l.	1.0
B-3	4	e.l.	0.04	e.l.	--	e.l.	0.02	e.l.	1.2
J-1	4	e.l.	e.l.	e.l.	--	e.l.	e.l.	e.l.	1.3

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for uranium-233,234 is 0.01 x 10^{-9} µCi/mL. The LDL for Uranium-238 is 0.01 x 10^{-9} µCi/mL.

[d]DOE DCG for uranium-233,234 in water is 500 x 10^{-9} µCi/mL. The DOE DCG for uranium-238 is 600 x 10^{-9} µCi/mL.

[e]Environmental level not subtracted from these data.

Table 29 - INCREMENTAL CONCENTRATION OF URANIUM-233,234 AND URANIUM-238 IN ONSITE WELL WATER IN 1988

Location	Number of Samples	Uranium-233,234 (10^{-9} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Percent of[d] DOE DCG	Uranium-238 (10^{-9} µCi/mL) Minimum[a]	Maximum[a]	Average[a,b,c]	Ratio[e] Uranium-233,234 / Uranium-238
71-1	11	e.l.	0.02	e.l.	--	e.l.	0.04	e.l.	1.2
71-2	12	e.l.	0.05	e.l.	--	e.l.	0.02	e.l.	1.1
76-1	10	e.l.	0.03	e.l.	--	e.l.	0.05	0.02 ± 0.1	1.1

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for uranium-233,234 is 0.01 x 10^{-9} µCi/mL. The LDL for Uranium-238 is 0.01 x 10^{-9} µCi/mL.

[d]DOE DCG for uranium-233,234 in water is 500 x 10^{-9} µCi/mL. The DOE DCG for uranium-238 is 600 x 10^{-9} µCi/mL.

[e]Environmental level not subtracted from these data.

Water - Nonradioactive

Mound discharged an average of 3.0 million liters (0.79 million gallons) of water per day in 1988 to the Great Miami River. Nonradioactive pollutants in this effluent water are regulated by a National Pollutant Discharge Elimination System (NPDES) permit. This permit, issued by the Ohio EPA, requires Mound to characterize its effluent water by analyzing samples collected at four onsite locations.

A 24-hr composite, flow proportional sample and a grab sample are collected from discharges 001-A, 001-B, and 002. Discharge 001-A contains the effluent from the sanitary sewage treatment plant. Discharge 001-B includes storm water runoff, single-pass cooling water, cooling tower blowdown, zeolite softener backwash, boiler plant blowdown, and discharge from the radioactive waste disposal facility. Discharge 002 consists of single-pass cooling water, cooling tower blowdown, zeolite softener backwash, and most of the plant storm water runoff. A time proportional sample (8-hr composite) and a grab sample are collected from the electroplating facility at discharge 001-C.

Mound's NPDES permit was renewed in October 1985 for a five-year period. The permit limits are found in Table 30 and in the Appendix. Results of effluent analyses for 1988 are summarized in Table 30. These water samples were analyzed for water quality parameters according to methods found in Standard Methods Edition 16 [16].

Water was not discharged from outfall 003 during 1988. Well water has been discharged in previous years from this outfall in conjunction with the Potable Water Standards Project.

There were 722 samples analyzed for NPDES parameters during 1988. Mound effluents did not exceed any daily maximum limits in the NPDES monitoring during this year. Two average exceptions, however, did occur in 1988. The effluent BOD from outfall 001A, the sanitary treatment plant, was 21 mg/L on April 7, which exceeded the weekly limit of 15 mg/L. This exception resulted after the malfunction of a clarifier involving a sludge return pump failure. The treatment plant operations repaired the pump and added chemical coagulant to minimize the washout of solids. This action elevated the BOD of the effluent because the coagulant is biodegradable. The average suspended solids measured at outfall 002 during September was 32 mg/L. This value was 107% of the 30 mg/L limit. No unusual circumstances were attributable for this exception. The increase in suspended solids was caused by soil erosion in storm runoff.

Summarizing, Mound's 1988 effluents were in compliance with daily NPDES limits. The weekly average (BOD) exception and the monthly average (suspended solids) exception had no significant impact on the water quality of the Great Miami River. Data from the U.S. Geological Survey show that flow in the Great Miami River at Miamisburg in 1988 averaged 744 million gallons per day (MGD), with a minimum and maximum of 135 MGD and 7,687 MGD, respectively. The magnitude of this river flow is significantly greater than Mound effluents, such that Mound effluents did not affect the Great Miami River and its compliance with Ohio Stream Standards as shown in the Appendix.

Table 30 - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM DATA FOR 1988

Parameter	No. of Samples	Minimum	Maximum	Annual Average	Maximum Monthly Average	NPDES Permit Limits Maximum[b]	NPDES Permit Limits Monthly Average
Discharge 001-A							
Flow Rate, MDG[a]	Cont.	0.04	0.23	0.11	0.13	c	c
pH, s.u.	51	7.2	8.8	7.7	8.0	9.0	c
Biochemical Oxygen, Demand, mg/L	51	0.5	21	4.8	10.0	15	10
Suspended Solids, mg/L	51	1.0	15.3	4.7	9.8	30	15
Fecal Coliform, MPN/100 mL	28	<2	1096	46	131	2000	1000
Residual Chlorine, mg/L	126	0.16	0.41	0.26	0.30	0.5	c
Discharge 001-B							
Flow Rate, MGD	Cont.	0.00	0.29	0.07	0.10	c	c
Chemical Oxygen Demand, mg/L	51	4	1456	256	598	c	c
Suspended Solids, mg/L	51	1.8	48.3[d]	18.3	27.5	45	30
Grease and Oil, mg/L	12	<0.5	2.2	<0.8	2.2	10	c
pH, s.u.	51	7.2	9.3	8.4	8.9	9.5	c
Discharge 001-C							
Cyanide, mg/L	24	<0.1	0.17	<0.1	<0.13	1.0	0.65
Chromium, µg/L	24	<50	<50	<50	<50	500	c
Cadmium, µg/L	24	<10	27	<11	<19	100	c
Nickel, µg/L	24	<50	100	<50	<75	500	c
Copper, µg/L	24	<50	267	<99	183	500	c
pH, s.u.	24	7.0	9.0	7.6	8.2	9.0	c
Total Toxic Organics, mg/L	4	<1.1	<1.1	<1.1	<1.1	2.13	c
Discharge 002							
Flow Rate, MGD	Cont.	0.00	2.50	0.61	0.93	c	c
Suspended Solids, mg/L	51	3.3	44.3	19.5	32.1	45	30
pH, s.u.	51	7.3	8.5	8.2	8.3	9.0	c

[a]Includes flow from 001-C. The maximum flow from 001-C is approximately 2000 gal/day.

[b]pH also has a minimum limit of 6.5, and discharge 001-A has a seven-day average limit rather than a maximum limit.

[c]No limit applicable.

[d]Rain exclusion. Suspended solids limit shall not apply during a normal work week in which rain equal to or greater than 1/4 in. per day occurs for three or more days.

Foodstuffs and Vegetation - Radioactive

Various locally grown foodstuffs and vegetation samples are collected from the surrounding area. The intent of this portion of the Environmental Monitoring Program is to determine whether there is significant uptake and concentration of radionuclides by plant or animal life. Samples were collected in Miamisburg, Centerville, Bellbrook, Trotwood, Franklin, and Germantown. Centerville and Bellbrook are in the prevailing wind direction from Mound at a distance of eight km (five mi) and 16 km (10 mi), respectively. Both communities are shown in Figure 1. Fish were collected in the Great Miami River. Mound's outfalls are shown as dotted lines in Figure 5. The plutonium-238 content of the foodstuff and vegetation samples is determined by ashing the samples, then proceeding with the same techniques used for plutonium-238 analyses of air samples (see section on Air - Radioactive). The tritium content of the foodstuff and vegetation samples is determined by distilling the water from the sample, then analyzing the distillate for tritium. The results of the foodstuff, vegetation, and fish analyses are summarized in Tables 31 and 32. The concentration is given in terms of the sample weight (wet weight) before ashing or distilling. The samples of aquatic life analyzed included only the edible, fleshy portions of fish. These analyses indicate no evidence of any significant uptake or concentration by plant or animal life of the radionuclides handled at Mound, and they are consistent with data obtained in previous years (1980-1987). Environmental levels for foodstuffs and vegetation have been subtracted from the data (Table 3).

Table 31 - INCREMENTAL PLUTONIUM-238 IN FOODSTUFFS AND VEGETATION IN 1988

Location	Type of Sample	Number of Samples	Plutonium-238 (10^{-9} uCi/g) Minimum[a]	Maximum[a]	Average[a,b,c]
Miamisburg	Grass	4	e.l.	0.1	e.l.
	Potatoes	4	e.l.	0.2	e.l.
Centerville	Grass	4	e.l.	0.1	e.l.
	Potatoes	4	0.03	0.2	0.1 ± 0.2
Bellbrook	Grass	4	e.l.	0.4	0.01 ± 0.6
	Potatoes	4	e.l.	0.1	e.l.
Trotwood	Grass	4	e.l.	0.1	e.l.
	Potatoes	4	e.l.	0.1	0.03 ± 0.3
Franklin	Grass	4	e.l.	0.4	0.1 ± 0.5
	Potatoes	4	e.l.	0.2	0.1 ± 0.4
Germantown	Grass	4	e.l.	0.5	0.1 ± 0.6
	Potatoes	4	0.02	0.1	0.03 ± 0.2
Mound (outfall to river)	Fish	4	e.l.	0.1	0.01 ± 0.1

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for plutonium-238 in grass is 0.2 x 10^{-9} uCi/g. For plutonium-238 in potatoes, the LDL is 0.4 x 10^{-9} uCi/g. For plutonium-238 in fish, the LDL is 0.07 x 10^{-9} uCi/g.

Table 32 - INCREMENTAL CONCENTRATION OF TRITIUM IN VEGETATION IN 1988

Location	Type of Sample	Number of Samples	Tritium (10^{-6} uCi/g) Minimum[a]	Maximum[a]	Average[a,b,c]
Miamisburg	Grass	4	0.1	0.2	0.1 ± 0.1
	Tomatoes	4	0.2	0.4	0.3 ± 0.1
Centerville	Grass	4	e.l.	0.4	0.01 ± 0.4
	Tomatoes	4	e.l.	0.03	e.l.
Bellbrook	Grass	4	0.1	0.6	0.2 ± 0.4
	Tomatoes	4	e.l.	e.l.	e.l.
Trotwood	Grass	4	0.02	0.4	0.2 ± 0.3
	Tomatoes	4	e.l.	e.l.	e.l.
Franklin	Grass	4	e.l.	0.4	0.1 ± 0.3
	Tomatoes	4	e.l.	e.l.	e.l.
Germantown	Grass	4	e.l.	0.1	0.03 ± 0.2
	Tomatoes	4	e.l.	0.1	e.l.

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for tritium in grass is 0.1 x 10^{-6} uCi/g. For tritium in tomatoes, the LDL is 0.07 x 10^{-6} uCi/g.

Silt - Radioactive

Silt samples were collected from the river and surface water sample locations shown in Figure 5.

The results of the silt sample analyses are found in Tables 33 and 34. No adverse impact to the environment could be determined from the radionuclide levels found in these sediments.

Table 33 - INCREMENTAL CONCENTRATION OF PLUTONIUM-238 IN SILT FROM RIVER SAMPLING LOCATIONS IN 1988

Location	Number of Samples	Plutonium-238 (10^{-9} µCi/g) Minimum[a]	Maximum[a]	Average[a,b,c]
1	4	e.l.	13	2 ± 15
2	4	29	98	65 ± 46
3	4	99	360	212 ± 173
4	4	536	1463	973 ± 693
5	3	3	8	6 ± 10

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for plutonium-238 in silt is 0.5 x 10^{-9} µCi/g.

Table 34 - INCREMENTAL CONCENTRATION OF PLUTONIUM-238 IN SILT FROM SURFACE WATER LOCATIONS IN 1988

Location	Number of Samples	Plutonium-238 (10^{-9} µCi/g) Minimum[a]	Maximum[a]	Average[a,b,c]
11	4	e.l.	4.0	1.4 ± 3.4
12	4	e.l.	0.6	e.l.
13	4	e.l.	1.0	0.3 ± 1.9
14	4	e.l.	3.1	0.3 ± 3.4
15	4	e.l.	2.0	e.l.
16	4	0.01	1.0	0.5 ± 1.8

[a]Average environmental level (e.l.) found in Table 3 subtracted from data.

[b]Error limits are estimates of the standard error of the estimated means at the 95% confidence level.

[c]Lower detection limit (LDL) for plutonium-238 in surface water silt is 0.5 x 10^{-9} µCi/g.

Evaluation of Effective Dose Equivalent to the Public

The dose assessment techniques have been revised according to the Department of Energy guidelines. The "effective dose equivalent" is used in the dose assessment evaluation in this report [4].

The effective dose equivalent values for the plutonium-238 and tritium exposures from the air, water, and vegetation pathways are calculated and summed to estimate the maximum dose at the site boundary and to the individual. The general assumptions used in these determinations follow.

The solubility of ingested or inhaled plutonium-238 in the receptor is unknown. However, it is highly probable that most of the plutonium-238 is in the oxide form, which is very insoluble. In order to provide a realistic but conservative effective dose equivalent estimate, it is assumed that 50% of the plutonium-238 which is inhaled is soluble (class W) and 50% is insoluble (class Y). It is also assumed that the plutonium-238 that is ingested is also 50% soluble and 50% insoluble.

The term "effective dose equivalent," as used in this report, is that cumulative effective dose equivalent for a period of 50 yr from 1 yr of exposure to a given radionuclide. This effective dose equivalent is composed of the sum of the effective dose equivalents from the air, water, and foodstuffs pathways.

Dose Assessment Assumptions and Methodology

The effective dose equivalent estimates for plutonium-238 and tritium were based on environmental monitoring data for 1988. The estimates for maximum effective dose equivalent in air at the site boundary and maximum effective dose equivalent to individuals were based on the maximum onsite incremental average concentration of plutonium-238 and tritium (oxide) in air from onsite samplers (sampler 211, Table 12, and sampler 213, Table 14, respectively). These samplers are in proximity to the site boundary.

The estimates for water for maximum effective dose equivalent at the site boundary and in individuals were based on the maximum average incremental concentration of plutonium-238 and tritium in wells. The maximum offsite average concentration of plutonium-238 was the J-1 location and for tritium it was the average at location B-R.

The terms "maximum effective dose equivalent at the site boundary" and "maximum effective dose equivalent to individuals" refer to the maximum dose equivalent for individuals to receive, assuming they remain at the site boundary 24 hr/day, 365 days/yr. During this continuous occupancy, it is assumed that the individual continually breathes air with maximum concentrations of radionuclides found at the onsite samplers. It is also assumed that the same individual consumes all his drinking water at the maximum radionuclide concentrations found in offsite wells. In addition, the same individual is assumed to consume a portion of foodstuffs with the maximum radionuclide concentrations found offsite. All of these contributions, air, water, and foodstuffs, are added to obtain an estimate of the total maximum effective dose equivalent. The estimated contributions from each pathway and the estimated total maximum effective dose equivalent are shown in Table 35.

Table 35 - EFFECTIVE DOSE ESTIMATES

MAXIMUM EFFECTIVE DOSE COMMITMENT AT THE SITE BOUNDARY AND TO INDIVIDUALS IN THE POPULATION

Pathway	Plutonium (mrem)	Tritium (mrem)	Total (mrem)	Total (mSv)	Percent of DOE Standard
Air	0.26	0.03	0.29	(0.0029)	0.29
Water	0.01	0.26	0.27	(0.0027)	0.27
Foodstuffs	0.0004	0.003	0.003	(0.00003)	0.003
TOTAL	0.27	0.29	0.56	(0.0056)	0.56

The maximum dose to an individual from Mound's operations is an estimated 0.56 mrem which is 0.6% of the DOE standard of 100 mrem. To put this 0.56 mrem into perspective, one jet flight over the Atlantic would expose an individual to 2.6 mrem [17]. In addition, if an individual from Ohio would move to Colorado for one year, he would receive an additional 75 mrem as compared to living in Ohio for that one year [18,19].

The person-rem dose equivalent estimate calculation was based on tritium (oxide) and plutonium-238 data from environmental air sampling stations in two ranges: 0-8 km (0-5 mi) and 8-32 km (5-20 mi). The 0-8 km range includes 10 samplers within 1.6 km (1 mi) of Mound.

The average concentration of tritium (oxide) and plutonium in air was obtained by averaging concentrations found at 10 offsite tritium air samplers and then subtracting the concentration found at sampler #119. From this average concentration, a dose equivalent was determined and multiplied by the number of people from 0 to 8 km.

The average tritium (oxide) concentration from the four other offsite samplers (less the concentration at sampler 119) was used to obtain the person-rem from 8 to 32 km. Eight area segments from 8 to 32 km were obtained by letting each sampler represent one segment concentration and the average of two adjacent samplers represent another segment. These segment concentrations were then multiplied by their respective population. Using the concentrations from the four samplers and this averaging technique gives a more realistic population dose value.

The person-rem from tritium (oxide) and plutonium-238 in community drinking water was based on average concentrations of tritium (oxide) and plutonium-238 in various community water supplies, less appropriate environmental levels, and weighting these concentrations with respective populations.

The person-rem from foodstuffs was based on average incremental concentrations of tritium (oxide) and plutonium-238 found in foodstuffs weighted with assumed consumption quantities and population. The total person-rem was obtained by adding the effect from the air, water, and foodstuffs pathways.

It is estimated that the total population from 0 to 32 km is receiving 10 person-rem from Mound's emissions. The remaining population from 32 km to 80 km (20 to 50 mi) is expected to receive negligible dose commitment from tritium (oxide) and plutonium-238 emissions. Thus, the effective dose equivalent from Mound's emission is estimated to be 10 person-rem for the 0-80 km range.

The population effective dose values from natural radiation for comparison, including cosmic rays, terrestrial, and internal radiation, would be approximately 300 mrem per person or 1,000,000 person-rem for the 0 to 80 km (50 mi) range [20].

AIRDOS-EPA Calculations

A copy of the AIRDOS-EPA computer code was obtained from Oak Ridge National Laboratory (ORNL). Appropriate meteorological data for 1988 from the National Weather Service facility at Dayton were used. The computer code was executed for compliance with 40 CFR 61. These data are reported to the U.S. EPA.

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Appendix

Applicable Standards

RADIOACTIVE STANDARDS

In conformance with the U. S. Department of Energy memoranda "Radiation Standard for Protection of the Public in the Vicinity of DOE Facilities" (8/5/85) and "Preparation of Annual Site Environmental Reports for Calendar Year 1985" (2/28/86), environmental sample results were used to estimate doses to compare with the DOE and EPA standards listed below.

RADIATION STANDARDS FOR PROTECTION OF THE PUBLIC IN THE VICINITY OF DOE FACILITIES

Dose Limits

1. ALL PATHWAYS

The effective dose equivalent for any member of the public from all routine DOE operations[1] (natural background and medical exposures excluded) shall not exceed the values given below:

	Effective Dose Equivalent[2]	
	mrem/yr	(mSv/yr)
Occasional annual exposures[3]	500	(5)
Prolonged period of exposure[3]	100	(1)

No individual organ shall receive a committed effective dose equivalent of 5 rem/yr (50 mSv/yr) or greater.

[1] Routine DOE operations means normal planned operations and does not include actual or potential, accidental or unplanned releases.

[2] Effective dose equivalent will be expressed in rem (or millirem) with the corresponding value in Sievert (or milliSievert) in parenthesis.

[3] For the purposes of these standards, a prolonged exposure will be one that lasts, or is predicted to last, longer than 5 years.

2. AIR PATHWAY ONLY

(Limits of 40 CFR 61, Subpart H)

	Dose Equivalent	
	mrem/yr	(mSv/yr)
Whole body dose	25	(0.25)
Any organ	75	(0.75)

Drinking Water

As of June 24, 1977, community drinking water quality is regulated by the EPA National Interim Primary Drinking Water Regulations for Radionuclides. The new standard for tritium = 20 x 10^{-6} uCi/mL (20,000 pCi/L).

Soil

There are no guidelines established for radioactive species in soil. (The U.S. EPA has guidelines under consideration.)

NONRADIOACTIVE STANDARDS

Water

The Ohio EPA has issued a discharge permit under NPDES regulations governing Mound's liquid effluent streams. This permit is for the period from October 1, 1985, to September 27, 1990. The discharge limitations for each effluent stream are as follows:

Discharge 001-A EPA #601	7-day Average	Monthly Average
Residual Chlorine* (mg/L)	0.5	--
BOD_5 (mg/L)	15.	10.
Suspended Solids (mg/L)	30.	15.
Fecal Coliform* (n/100 mL)	2000.	1000.
pH (s.u.)	6.5 - 9.0 (daily limit)	

*May 1 through October 31

Discharge 001-B EPA #602	Daily Limit	Monthly Limit
COD (mg/L)	(Monitor only)	
Suspended Solids (mg/L)	45.	30.
Oil/Grease (mg/L)	10.	--
pH (S.U.)	6.5-9.5	--

Discharge 001-C EPA #603	Daily Limit	Monthly Limit
Cyanide (mg/L)	1.0	0.65
Chromium (ug/L)	500.	--
Cadmium (ug/L)	100.	--
Nickel (ug/L)	500.	--
Copper (ug/L)	500.	--
Total Toxic Organics (1/quarter) (ug/L)	2130.	--

Discharge 002 EPA #002	Daily Limit	Monthly Limit
Suspended Solids	45.	30.
pH (S.U.)	6.5-9.0	--

The Ohio EPA has established Water Quality Standards (3745-1-01-3745-1-09). The standards listed below are excerpted from these regulations. These standards are stream standards and apply to a stream beyond a suitable mixing zone permitted for discharges. They should not be compared with effluent concentrations.

Constituent	Average Concentration (mg/L)
Dissolved Oxygen	5.0
pH (pH units)	6-9
Fecal Coliform (N/100 mL)	200 per 100 mL
Dissolved Solids	1500
Ammonia	1.5
Arsenic	0.05
Barium	0.8
Cadmium	0.005
Chloride	250
Chromium (hexavalent)	0.05
Cyanide (free)	0.005
Fluoride	1.3
Foaming Agents (MBAS)	0.5
Iron	1
Lead	0.04
Manganese	1
Mercury	0.0005
Oil and Grease	5
Phenols	0.01
Selenium	0.005
Silver	0.001
Copper	0.005 - 0.075*
Zinc	0.075 - 0.5*

*Dependent on $CaCO_3$ hardness.

Effective Dose Equivalent Calculations

The effective doses from both plutonium-238 and tritium oxide are calculated in a similar manner then summed for the significant pathways. The result is one value which represents a weighted result which is compared to the DOE standard shown above.

The technique in detail involves determining the concentration of the radionuclide through environmental monitoring then calculating the total effective dose equivalent by:

$$DE = \sum_{1}^{N} R \sum_{1}^{P} C_R I_a D_F C_F$$

where

DE = total Effective Dose Equivalent (Dose integrated through 50 years from 1 year of exposure) (mrem/50 year).

$\sum_{1}^{N} R$ = Sum of the different radionuclides

$\sum_{1}^{P} I$ = Sum of the different pathways - air, water, and foodstuff

C_R = Average concentration of the radionuclide

I_a = Annual intake of the environmental media [1,2]

D_F = Dose factors for the particular radionuclide and type of intake [3]

C_F = Conversion factor to convert various units into units which can be used with DOE effective dose conversion factors

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APPENDIX B

DATA COMPILATION SHEETS

FROM 1974 THROUGH 1989 FOR TRITIUM IN THE

GREAT MIAMI RIVER

1989 TRITIUM IN RIVER WATER (nCi/L)

DATE	R-1	R-2	R-3	R-4	R-5	E.L.
1/6/89	0.02	0.02	0.08	0.14	0.16	0.18
1/13/89	0.01	-0.002	0.04	0.04	0.06	
1/20/89	-0.08	-0.04	0.1	-0.04	0.19	
2/2/89	0.14	0.12	0.1	0.15	0.06	
2/8/89	0.06	0.06	0.05	0.08	0.21	
2/16/89	0.14	0.13	0.05	0.14	0.05	
2/28/89	-0.06	-0.12	-0.1	0.02	-0.08	
3/3/89	0.03	0.06	0.07	0.11	0.06	0.06
3/13/89	0.03	0.02	-0.02	0.11	0.005	
3/17/89	0.07	0.05	0.12	0.1	0.18	
3/24/89	-0.05	-0.11	-0.09	-0.02	-0.02	
3/31/89	-0.02	0.55	0.08	0.03	0.08	0.45
4/7/89	-0.02	-0.14	-0.14	-0.02	-0.14	
4/14/89	-0.04	-0.05	0.06	0.06	0.06	
4/19/89	0.05	0.07	-0.01	0.01	-0.11	0.04
4/25/89	0.11	0.08	0.04	0.12	0.03	
5/3/89	-0.06	0.01	0.02	0.03	-0.05	
5/12/89	-0.04	-0.02	-0.06	-0.04	-0.09	
5/17/89	0.08	0.14	0.01	0.06	0.09	
5/23/89	0.01	-0.04	-0.12	0.01	0.02	0.02
6/2/89	-0.04	-0.02	-0.04	-0.08	-0.06	
6/8/89	0.13	-0.07	-0.02	0.02	0.01	
6/16/89	-0.02	-0.08	-0.14	0.02	-0.03	
6/23/89	-0.02	-0.18	-0.17	-0.08	0.005	
6/29/89	-0.04	-0.05	-0.05	0.01	-0.03	
7/7/78	-0.06	-0.12	-0.01	0.02	-0.05	
7/14/89	-0.19	-0.15	-0.18	-0.17	-0.15	
7/18/89	-0.03	-0.05	0.01	0.05	0.02	
7/28/89	0.01	-0.02	0.04	0.04	0.08	
8/4/89	-0.02	-0.01	0.11	0.01	0.08	
8/10/89	0.07	0.04	0.01	0.04	-0.03	0.04
8/18/89	0.05	0.08	-0.01	-0.01	0.01	
8/22/89	0.06	0.04	0.07	0.04	0.05	
8/30/89	-0.05	-0.1	-0.14	-0.03	-0.05	
9/6/89	-0.05	-0.1	-0.03	-0.03	-0.01	
9/15/89	-0.05	-0.05	-0.12	-0.03	0.002	-0.05
9/21/89	-0.03	0.02	-0.02	0.02	-0.07	
9/28/89	-0.07	-0.08	-0.06	-0.05	-0.02	
10/3/89	0.03	0.00	0.03	-0.04	0.01	
10/10/89	0.01	-0.05	-0.06	-0.01	0.02	
10/17/89	-0.07	-0.08	-0.2	-0.05	-0.02	
10/27/89	0.09	0.02	-0.04	-0.08	0.00	
11/3/89	0.05	0.02	-0.02	0.04	0.04	

11/8/89	-0.18	-0.03	-0.15	-0.16	-0.17	
11/15/89	0.01	-0.02	0.05	-0.01	0.005	-0.04
11/22/89	-0.03	-0.09	-0.07	-0.02	-0.05	
11/30/89	0.01	0.06	0.002	0.01	-0.05	
12/5/89	0.11	0.07	0.02	-0.05	-0.12	0.27
12/14/89	-0.35	-0.25	-0.28	-0.18	-0.26	

N	49	49	49	49	49	9
AVERAGE	-0.01	-0.01	-0.02	0.01	-0.00	0.11
STD DEV	0.09	0.12	0.09	0.07	0.09	0.16
MINIMUM	-0.35	-0.25	-0.28	-0.175	-0.26	-0.05
MAXIMUM	0.14	0.55	0.12	0.15	0.21	0.45
STD ERROR	0.02	0.03	0.03	0.02	0.03	0.13

INCREMENTAL CONCENTRATION					
AVERAGE	-0.11	-0.12	-0.13	-0.10	-0.11
MINIMUM	-0.46	-0.36	-0.39	-0.28	-0.37
MAXIMUM	0.03	0.44	0.01	0.04	0.10
STD ERROR	0.13	0.13	0.13	0.13	0.13

1988 TRITIUM IN RIVER WATER (nCi/L)

DATE	R-1	R-2	R-3	R-4	R-5	E.L.
1/4/88	-0.11	-0.1	0.05	-0.07	-0.01	-0.1
1/19/88	-0.04	-0.02	-0.07	0.04	-0.07	
1/25/88	-0.08	0.007	-0.09	0.08	0.05	
2/12/88	-0.03	-0.03	-0.03	0.09	-0.05	-0.07
2/19/88	-0.08	-0.04	-0.11	-0.04	-0.1	
2/26/88	-0.05	-0.008	-0.01	-0.001	-0.01	
3/4/88	0.04	-0.03	0.04	0.03	0.07	-0.006
3/10/88	-0.06	0.008	0.004	0.02	0.02	
3/18/88	0.08	0.37	0.23	0.26	0.31	
3/25/88	-0.05	0.12	0.04	0.03	0.06	
3/30/88	-0.03	-0.06	0.06	0.05	0.09	
4/7/88	-0.05	-0.04	0.12	0.08	0.06	
4/15/88	0.06	0.15	-0.004	0.12	0.11	
4/20/88	0.13	0.02	-0.02	-0.12	-0.04	
4/27/88	0.07	0.08	0.11	0.1	0.09	0.04
5/4/88	0.1	0.07	0.02	0.04	-0.06	
5/13/88	0.06	0.11	-0.06	0.07	0.13	0.007
5/27/88	-0.04	0.08	0.15	0.13	0.18	0.04
6/3/88	-0.04	0.03	0.11	0.11	0.06	
6/10/88	-0.12	-0.14	-0.06	-0.08	-0.06	
6/16/88	-0.009	0.02	0.03	-0.02	-0.05	
6/24/88	-0.14	0.04	-0.1	-0.15	-0.06	-0.14
6/28/88	-0.09	-0.07	-0.15	-0.15	-0.12	
7/6/88	-0.04	0.06	-0.05	-0.006	-0.03	
7/15/88	-0.11	0.05	-0.14	-0.23	-0.23	-0.1
7/21/88	0.03	0.009	0.03	0.07	-0.02	
7/29/88	-0.03	0.06	0.01	-0.11	-0.05	
8/4/88	-0.04	0.02	0.07	-0.01	-0.08	
8/11/88	-0.008	-0.06	0.03	-0.06	-0.15	
8/19/88	-0.12	-0.11	-0.04	-0.08	-0.04	
8/26/88	0.03	0.06	-0.03	-0.006	0.07	
9/1/88	-0.02	0.16	0.1	0.15	0.08	0.03
9/8/88	-0.01	0.05	-0.01	0.17	-0.12	
9/16/88	0.01	-0.01	-0.04	0.02	0.07	
9/20/88	-0.15	-0.1	-0.17	-0.05	-0.12	-0.17
9/29/88	0.18	0.13	0.23	0.07	0.1	
10/7/88	0.08	-0.05	0.17	0.09	0.11	0.1
10/14/88	0.12	0.04	0.03	0.1	0.13	
10/21/88	0.03	0.08	-0.002	0.04	-0.002	
10/26/88	0.01	0.02	0.08	0.04	-0.03	
10/31/88	0.02	0.2	0.37	0.05	0.13	0.03
11/10/88	0.01	0.07	0.07	0.03	0.11	
11/16/88	-0.10	-0.1	-0.07	0.03	0.04	

11/22/88	-0.08	-0.08	-0.02	-0.11	-0.04	
12/2/88	0.002	-0.01	0.02	-0.01	0.02	
12/9/88	0.07	0.13	0.07	0.08	-0.01	0.13
12/16/88	0.02	0.03	-0.05	0.1	0.09	
12/22/88	0.05	0.1	0.09	0.05	0.03	

N	48	48	48	48	48	13
AVERAGE	-0.01	0.03	0.02	0.02	0.01	-0.02
STD DEV	0.07	0.09	0.10	0.09	0.10	0.09
MINIMUM	-0.15	-0.14	-0.17	-0.23	-0.23	-0.17
MAXIMUM	0.18	0.37	0.37	0.26	0.31	0.13
STD ERROR	0.02	0.03	0.03	0.03	0.03	0.06

INCREMENTAL CONCENTRATION					
AVERAGE	0.01	0.04	0.04	0.04	0.03
MINIMUM	-0.13	-0.12	-0.15	-0.21	-0.21
MAXIMUM	0.20	0.38	0.39	0.28	0.33
STD ERROR	0.06	0.06	0.06	0.06	0.06

1987 TRITIUM IN RIVER WATER (nCi/L)

DATE	R-1	R-2	R-3	R-4	R-5	E.L.
1/7/87	0.06	0.009	0.08	0.07	0.03	
1/16/87	0.05	0	0	0.05	0	
1/20/87	0	0.08	0	0.19	0	
2/2/87	0.34	0.33	0.32	0.3	0.19	
2/3/87						0
2/3/87						0
2/3/87						0.04
2/3/87						0
2/12/87	0.1	0	0.009	0.04	0.06	
2/18/87	0.19	0.18	0.16	0.25	0.24	
2/24/87	0.08	0.05	0	0.03	0.009	
3/3/87	0	0	0	0	0	
3/10/87	0	0	0	0.03	0	
3/18/87	0.13	0.08	0.04	0.16	0.09	
3/27/87	0	0	0	0.01	0	
4/1/87	0.01	0	0	0	0	
4/9/87	0	0	0	0	0	
4/17/87	0	0	0	0	0	
4/22/87						0
4/22/87						0
4/24/87						0
4/24/87	0	0	0	0	0	0
4/28/87	0	0	0	0.13	0	
5/11/87	0	0	0	0	0	
5/15/87	0	0	0	0	0	
5/22/87	0	0	0	0	0	
5/30/87	0	0	0	0	0	
6/4/87	0	0	0	0.14	0.18	
6/10/87	0	0	0	0	0	
6/17/87	0	0	0	0	0	
6/23/87	0	0	0	0	0	
6/30/87	0.04	0.01	0.2	0	0.11	
7/10/87	0	0	0	0	0	
7/15/87	0.03	0	0.08	0.01	0.03	
7/23/87	0	0	0	0	0	0
7/31/87	0	0.07	0.04	0.11	0.08	
8/4/87	0.34	0.16	0.04	0	0	0.06
8/14/87	0	0	0	0	0	0
8/20/87	0	0.003	0	0.005	0	
8/28/87	0	0.35	0	0.33	0	
9/3/87	0.62	0.53	0.39	0.09	0.65	
9/9/87	0.01	0	0	0	0	0
9/18/87	0.66	2.31	0.23	1.46	0.38	

9/22/87	0.57	0.59	0.58	0.59	0.65	
10/1/87	0.08	0.25	0.2	0.25	0.05	
10/8/87	0.05	0.1	0.2	0.2	0.15	0.03
10/14/87	0	0.16	0.1	0.08	0	
10/23/87	0	0	0.29	0.16	0.25	
11/2/87	0.59	0.25	0.28	0.23	0.12	
11/6/87	0.11	0.04	0.09	0.06	0.07	
11/19/87	0.02	0.10	-0.003	0.14	0.1	
11/25/87	-0.04	-0.1	-0.10	-0.07	-0.15	
12/4/87	0.007	0.05	0.03	0.11	0	0.04
12/11/87	0.01	0.02	-0.05	0.14	0.02	
12/18/87	-0.09	-0.03	-0.06	0.06	0.06	
12/23/87	-0.03	-0.05	0.03	-0.08	-0.05	
12/30/87	0.01	0.03	-0.07	-0.04	-0.08	
N	50	50	50	50	50	14
AVERAGE	0.08	0.11	0.06	0.10	0.06	0.012
STD DEV	0.18	0.35	0.13	0.23	0.15	0.021
MINIMUM	-0.085	-0.1	-0.095	-0.08	-0.15	0
MAXIMUM	0.664	2.31	0.58	1.46	0.65	0.06
STD ERROR	0.05	0.10	0.04	0.07	0.04	0.01

INCREMENTAL CONCENTRATION					
AVERAGE	0.07	0.10	0.05	0.09	0.05
MINIMUM	-0.10	-0.11	-0.11	-0.09	-0.16
MAXIMUM	0.65	2.30	0.57	1.45	0.64
STD ERROR	0.05	0.10	0.04	0.07	0.04

1986 TRITIUM IN RIVER WATER (nCi/L)

DATE	R-1	R-2	R-3	R-4	R-5	E.L.
1/3/86	0	0.11	0.08	0.23	0.22	
1/11/86	0.08	0.2	0.27	0.19	0.22	
1/18/86	0.12	0.23	0.18	0.3	0.31	
1/24/86	0.14	0.14	0	0.08	0.12	
2/17/86	0.1	0.06	0.26	0.22	0.25	
3/10/86	0.13	0.65	0.19	0.16	0.18	0.18
						0.14
						0
						0.15
3/20/86	0	0.3	0			
3/28/86	0.11	0.2	0.18	0.09	0.23	
4/4/86	0.36	0.22	0.31	0.2	0.32	
4/18/86	0.23	0.28	0.14	0.29	0.24	
5/8/86	0	0	0	0	0	
5/23/86	0.09	0.05	0.05	0.14	0.14	
5/31/86	0.19	0.13	0	0.07	0.2	
6/6/86	0.05	0.19	0.13	0.25	0.21	
6/12/86	0	0.05	0	0.11	0.1	
6/27/86	0	0	0	0	0	
7/11/86	0.17	0.05	0.08	0.02	0.04	
7/18/86	0	0.1	0.01	0.04	0.01	
7/25/86	0.04	0.03	0.12	0	0.009	
8/1/86	0.07	0.27	0.15	0.24	0.1	
8/18/86		0.14	0.14	0.18	0.2	
8/21/86						0
						0.02
						0
						0.05
8/28/86	0.14	0.27	0.15	0.16	0.2	
9/5/86	0	0	0	0	0	
9/11/86						0.02
						0
						0
						0
9/12/86	0	0	0	0	0	
9/19/86	0	0.1	0.12	0.22	0.25	
9/26/86	0.08	0	0	0	0	
10/3/86	0.66	0.76	0.7	0.8	0.88	
10/10/86	0.21	0.31	0.35	0.18	0.24	
10/14/86	0.03	0.05	0.17	0.08	0.13	
10/31/86	0	0	0	0.003	0	
11/7/86	0.22	0.18	0.17	0.16	0.23	
11/14/86	0.19	0.02	0.15	0.12	0.12	

11/20/86	0.15	0.1	0.24	0.23	0.31	
11/26/86	0.05	0	0.07	0.09	0	
12/12/86	0	0	0	0	0	
12/19/86	0.12	0	0.19	0.16	0.05	
12/23/86	0.11	0.07	0.16	0.12	0.17	
N	36	37	37	36	36	12
AVERAGE	0.11	0.14	0.13	0.14	0.16	0.05
STD DEV	0.13	0.17	0.14	0.15	0.16	0.07
MINIMUM	0	0	0	0	0	0
MAXIMUM	0.66	0.76	0.7	0.8	0.88	0.18
STD ERROR	0.04	0.06	0.05	0.05	0.06	0.04
INCREMENTAL CONCENTRATION						
AVERAGE	0.06	0.10	0.08	0.10	0.11	
MINIMUM	-0.05	-0.05	-0.05	-0.05	-0.05	
MAXIMUM	0.61	0.71	0.65	0.75	0.83	
STD ERROR	0.06	0.07	0.06	0.07	0.07	

1985 TRITIUM IN RIVER WATER (nCi/L)

DATE	R-1	R-2	R-3	R-4	R-5	E.L.
2/20/85	0.09	0.15	0.13	0.06	0	
3/08/85	0.15	0.21	0.1	0.15	0.15	
3/20/85	0.19	0.18	0.07	0.06	0	
3/21/85						0.18
3/21/85						0.14
3/21/85						0.11
3/21/85						0.21
3/28/85						
4/11/85	0.11	0	0.13	0.16	0.21	
4/19/85						
4/24/85	0.02	0.04	0.07	0.09	0.04	
4/27/85						0.003
4/27/85						0.04
4/27/85						0.05
4/27/85						0.03
5/02/85	0.18	0.14	0.08	0.12	0.22	
5/24/85	0.11	0.11	0.08	0.06	0.09	
5/31/85	0.24	0.15	0.22	0.22	0.21	
6/05/85	0.14	0.24	0.3	0.32	0.38	
7/09/85						0.12
7/09/85						0.17
7/09/85						0.08
7/09/85						0.13
7/12/85	0.23	0.23	0.18	0.21	0.12	
7/19/85	0.26	0.07	0.13	0.15	0.28	
7/26/85	0.27	0.14	0.15	0.18	0.35	
8/02/85	0.2	0.15	0.22	0.22	0.22	
8/12/85	0.15	0.2	0.13	0.09	0.06	
8/23/85	0.08	0.17	0.38	0.21	0.2	
8/27/85	0.1	0.2	0.03	0.13	0.04	
9/06/85	0.01	0.19	0.1	0.06	0.06	
9/12/85	0.09	0.04	0.22	0.16	0.18	
9/17/85	0.02	0.03	0.006	0.13	0.11	
9/23/85	0.16	0.2	0.24	0.16	0.18	
9/26/85	0.3	0.15	0.29	0.26	0.3	
10/15/85	0.19	0.25	0.4	0.26	0.34	
10/19/85						0.2
10/19/85						0.16
10/19/85						0.23
10/19/85						0.15
10/25/85	0.21	0.16	0.14	0.35	0.28	
11/08/85	0	0.12	0	0.06	0.22	
11/15/85	0.09	0	0	0	0.02	

11/22/85	0	0.14	0.16	0.15	0.14	
12/06/85	0	0.24	0.17	0.15	0.03	
12/11/85	0.15	0	0	0.18	0.33	
12/18/85	0	0.05	0	0	0	
N	29	29	29	29	29	16
AVERAGE	0.128965	0.136206	0.142275	0.15	0.164137	0.125187
STD DEV	0.089815	0.077109	0.109284	0.085898	0.117032	0.068341
MINIMUM	0	0	0	0	0	0.003
MAXIMUM	0.3	0.25	0.4	0.35	0.38	0.23
STD ERROR	0.034157	0.029324	0.041561	0.032667	0.044507	0.036408
INCREMENTAL CONCENTRATION						
AVERAGE	0.003778	0.011019	0.017088	0.024813	0.038950	0
MINIMUM	-0.12518	-0.12518	-0.12518	-0.12518	-0.12518	
MAXIMUM	0.174813	0.124813	0.274813	0.224813	0.254813	
STD ERROR	0.049922	0.046749	0.055252	0.048915	0.057502	

= 1984 HTO IN RIVER WATER - nCi/L OR 10⁻⁶ µCi/ml

Date	#1	#2	#3	#4	#5	E.L.*	Bkg (c/m)	EST EFF.
1/6/84	—	0.028	0.004	0.052	—		8.2	0.25
1/17	—	0.207	0.31	0.231	0.294		7.1	0.24
1/27	0.062	0.226	0.191	0.32	0.2		7.4	0.23
2/17	0.3	0.139	0	0.338	0.323		8.6	0.2
2/22	0.206	0.205	0.177	0.214	0.373		9.1	0.2
2/29	0.093	0.036	0.104	0.164	0.039		—	0.2
3/6	0.88	0.97	0.92	1.02	2.07		8.2	—
3/13	0.75	0.76	0.85	0.79	0.81		9.1	—
4/3	0.259	0.24	0.273	0.367	0.415		9.2	0.2
4/27	0.225	0.113	0.188	0.318	0.144		8.9	0.2
5/4	0.159	0.2	0.169	0.225	0.261*		8.9	0.2
5/11	0.414	0.358	0.403	0.466	0.417		8.1	0.2
5/14	0.341	0.218	0.181	0.328	0.261		9.1	0.2
5/21	0.107	0.28	0.155	0.329	0.256		9.1	0.2
6/1	0.315	0.481	0.344	0.53	0.46		8.7	0.2
6/27	0	0	0	0.15	0.075		—	-
7/6	0.167	0.332	0.27	0.192	0.168		9.5	0.2
7/13	0.457	0.374	0.476	0.642	0.494		8.6	0.2
7/20	0.213	0.165	0.419	0.251	0.283		8.6	0.2
8/1	0.368	0.307	0.267	0.182	0.081		9.0	0.2
8/10	0.16	0.156	0	0.096	0.14		9.0	0.2
8/23	0.083	0.319	0.507	0.415	0.186		8.2	0.2
8/29	0.318	0.362	0.471	0.443	0.507		9.3	0.2
9/7	0.259	0.329	0.312	0.474	0.232		8.9	0.2
9/12	0	0.004	0	0	0		10.0	0.2
9/21	0.253	0.189	—	0.235	0.253		7.7	0.2
9/28	0.249	0.198	0.729	0.191	0.324		7.8	0.2
10/5	0	0.057	0.241	0.235	0.139		8.1	0.2
10/12	0.182	0.19	0.296	0.307	0		7.6	0.2
10/19	0.139	0.205	0.202	0.193	0.118		—	0.2

nCi/L OR 10^{-6} µci/ml NET

Date	#1	#2	#3	#4	#5	EL #	BKG (c/m)	EST EFF.
11/9	0.115	0.049	0.069	0.193	0.097			
11/16	0.119	0.126	0.17	0.365	0.138			
11/21	0.184	0.388	0.467	0.322	0.462			
12/7	0.181	0.218	0.159	0.153	0.239			
12/20	0.021	0.029	0.055	0.004	0.076			
n =	33	35	34	35	34	17	27	27
$\bar{X}$ =	0.23	0.24	0.28	0.31	0.3	0.23	8.6	0.23
S =	0.19	0.2	0.23	0.21	0.36	0.18	0.7	0.02
$TS_{\bar{X}}$ =	0.07	0.07	0.08	0.07	0.13	0.09		

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1984 Environmental Level River Water *

3rd QTR - @ 9/5/84

pCi/L	Bkg c/m	EOT EFF
0.142	8.2	0.3
0.083		
0.172		
0.306		
0.268		
0.233		
0.532		
0.639		
0.449		
0.276		
0.172		
0.291		

4th QTR - @ 11/2/84

0.116
0.087
0.043
0.005
0.079

$n = 17$
$\bar{x} = 0.23$
$s = 0.18$
$s_{\bar{x}} = 0.09$

HTO in River water 1983 ~~net~~ Gross pCi/L or 10^{-6} µCi/ml

2/10/84

Date	#1	#2	#3	#4	#5	E.L.	BKG (C/L)	ST. ERR
1/7	0.13	0.09	0.16	0.23	0.21		8.0	0.25
1/14	0.29	0.19	0.2	0.34	0.3	0.46	7.6	0.25
						0.47		
						0.33		
						0.34		
2/8	0.18	0.06	0	0.04	0.1		7.6	0.22
2/18	0.17	0.63	0.3	0.34	0.41		6.3	0.25
2/28	0.12	0.09	0.17	0.1	0.09		7.2	0.23
6/10						0.07	7.1	0.20
						0.15		
						0.14		
						0		
9/21						0.19	7.7	0.26
						0.09		
						0.08		
						0.15		
10/7	0.21	0.32	0.36	0.35	0.14		7.4	0.22
10/21	0	0.04	0.02	0.07	0.13		8.1	0.23
10/28	0.06	0	0.18	0.04	0.13		7.4	0.23
11/7	0.14	0.14	0.02	0.3	0.02		6.9	0.24
11/14	0	0.004	0.03	0.09	0.06		7.6	0.24
11/18	0.09	0.15	0.26	0.04	0.2		7.0	0.23
12/8						0		
$\bar{x}$	.13	.16	.15	.18	.16	0		
						0		
						0		
						0		

1982 TRITIUM IN RIVER WATER - pCi/L or 10^{-6} µci/ml

1/4/83

date	River #1	River #2	River #3	River #4	River #5	BKg C/M	$\bar{x}$ Estimated Instrument EFF.	Date	E.L.
1/8/82	0.8	0.8	0.9	0.8	0.8	8.9	0.21	3/29	0.74
2/1/82	1.1	1.1	1.0	0.9	0.8	8.9	0.19		0.66
2/17/82	0.71	0.75	0.67	0.83	0.73	9.5 Cab	0.25		0.88
3/2/82	0	0.71	0.82	1.04	1.14	9.8	0.24		0.45
3/24/82	0.75	0.77	0.67	0.75	0.75	9.3	0.23	4/29	0.93
3/29/82	0.53	0.58	0.57	0.56	0.78	9.6	0.25		1.09
4/20/82	0.36	0.66	0.96	0.77	0.71	9.5	0.24	5/4	0.62
4/28/82	0.69	0.79	0.65	0.96	0.96	9.0	0.23		0.9
5/11/82	0.83	0.96	0.94	0.92	0.94	10.6	0.22	7/13	0
5/18/82	0.99	1.01	1.01	1.13	0.77	10.3	0.23		0
5/24/82	0.9	0.88	0.87	0.95	1.08	10.3	0.23		0.09
6/23/82	0.89	0.93	0.96	1.1	1.15	8.8	0.22		0.02
7/2/82	0.98	0.78	0.97	0.93	0.88	8.5	0.23	11/5	0.26
7/9/82	0.64	0.86	0.87	0.92	0.72	9.7	0.22		0.24
7/13/82	0.53	0.51	0.73	0.79	1.02	8.9	0.21		0.45
7/29/82	0.78	0.8	0.78	0.85	N.S.	9.3	0.23		0.32
8/3/82	0.3	0.5	0.6	0.6	0.4	8.2	0.4584		
8/17/82	0.34	0.3	0.35	0.27	0.37	$\bar{x}_w$: 9.1	0.23		
8/31/82	0.3	0.39	0.31	0.46	0.26	8.6	0.23		
9/3/82	0.39	0.39	0.41	0.48	0.41	8.3	0.23		
9/21/82	0.54 9/21	0.6 9/21	0.59 9/22	0.62 9/22	0.36 9/22	$\bar{x}_w$: 8.4	0.23		
9/30/82	0.29	0.43	0.49	0.34	0.32	9.3	0.23		
10/8/82	0.29	0.49	0.62	0.54	0.4	8.4	0.24		
10/15/82	0.34	0.48	0.39	0.24	0.33	8.6	0.23		
10/29/82	0.4	0.35	0.27	0.35	0.6	8.7	0.23		
11/18/82	0.34	0.44	0.32	0.46	0.47	8.2	0.23		
12/6/82	0.17	0.004	0.08	0.22	0.13	8.9	0.24		

date	River #1	River #2	River #3	River #4	River #5	Bkg c/m	$\bar{x}$ Estimated Instrument Efficiency	Date	E.L.
12/10	0.31	0.33	0.3	0.08	0.08	x_w = 8.8	0.22		
12/15	0.35 12/15	0 12/16	0.07 12/16	0.25 12/17	0.24 12/17	$\bar{x}_w$ = 8.2	0.23		
12/20	0.31	0.14	0.21	0.34	0.21	8.2	0.23		
n =	30	30	30	30	29	30	29		16
$\bar{x}$ =	0.54	0.59	0.61	0.65	0.61	9.03	0.23		0.48
S =	0.28	0.29	0.29	0.3	0.32	0.66	0.01		0.36
$S_{\bar{x}}$ =	0.05	0.05	0.05	0.05	0.06	0.12	0.002		0.09

5

1981 H_3O in water Data

River (μci/L) or (10^{-3} μci/cc)

1/22/82

date	#1	#2	#3	#4	#5		ENVIRONMENTAL	BLANK C/M	BLANK EFF	μci/L
~~4/9/81~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~ NS(*)	3/13/81	0.0003	~~15.5~~ NS(*)		
1/14/81	0.0002	0.0003	0.0003	0.0004	0.0007		0.0001	8.9		
1/23/81	0.0004	0.0004	0.0004	0.0004	0.0007		0.0002	6.7		
1/28/81	0.0004	0.0004	0.0005	0.0005	0.0007		0.0003	6.7		
2/3/81	0.0002	0.0002	0.0003	0.0003	0.0004			8.9		
2/13/81	0.0004	0.0002	0.0002	0.0004	0.0004			6.7		
2/19/81	0	0.0004	0.0003	0.0004	0.0003	7/10/81	0	8.9		
2/27/81	0.0002	0.0003	0.0003	0.0004	0.0004		0.0001	8.9		
3/5/81	0.0002	0.0004	0.0002	0.0002	0.0003		0	8.9		
3/11/81	0	0.0001	0	0.0003	0.0004		0	8.9		
3/17/81	0.0003	0.0004	0.0003	0.0005	0.0005			8.9		
3/23/81	0.0002	0.0002	0.0003	0.0003	0.0001			8.9		
4/1/81	0	0.0003	0.0002	0.0003	0.0004	7/13/81	0.0001	8.9		
4/7/81	0.0002	0.0003	0.0003	0.0005	0.0005		0	8.9		
4/16/81	0.0002	0.0003	0.0003	0.0003	0		0	8.9		
4/22/81	0.0003	0.0002	0.0002	0.0003	0.0003		0	8.9		
4/25/81	0.0002	0.0002	0.0003	0.0005	0.0004			8.9		
5/4/81	0.0007	0.0008	0.0009	0.0004	0.0012			8.9		
5/7/81	0.0002	0.0003	0.0003	0.0003	0.0004	4/6/81	0.0005	8.9		
5/21/81	0.0002	0.0002	0.0002	0.0004	0.0004		0.0006	8.9		
5/22/81	0.0002	0.0002	0.0002	0.0004	0.0005		0.0006	8.9		
6/1/81	0.0002	0.0004	0.0004	0.0005	0.0004		0.0006	8.9		
6/23/81	0.0002	0.0003	0.0002	0.0004	0.0005			6.7		
6/30/81	0.0001	0.0003	0.0002	0.0004	0.0003			8.9		
7/7/81	0.0001	0.0001	0.0002	0.0003	0.0006			8.9		
7/15/81	0.0004	0.0003	0.0002	0.0003 9.4	0.0004			8.9		
7/28/81	0	0.0001 7.6	0.0001	0.0002	0.0002 11.4			8.9		
8/3/81	0.0003	0.0003	0.0003 7.6	0.0005	0.0005			6.7		
8/10/81	0.0003	0.0002	0.0004	0.0004	0.0004			6.7		

8/25/81	0.0003	0.0004	0.0005	0.0004	0.0006		
9/1/81	0.0011	0.0006	0.0006	0.0004	0.0004		8.9
9/10/81	0.0004	0.0003	0.0003	0.0008	0.0006		
9/22/81	0.0007	0.0001	0.0003	0.0003	0.0003		8.9
~~9/28/81~~	~~0~~	~~0.0008~~	~~0~~	~~0~~	~~0~~	~~N.S. (*)~~	~~35.4~~
10/7/81	0.0007	N.S.	0.0007	0.001	0.0008		5.3
10/19/81	0.0001	0.0001	0.0003	0.0001	0.0002		8.9
10/26/81	0	0	0	0.0002	0		11.1
11/4/81	0.0001	0.0001	0.0002	0.0001	0.0003		8.9
~~11/10/81~~	~~0~~	~~0~~	~~0~~	~~0.0003~~	~~0.0005~~	~~N.S. (*)~~	~~28.9~~
11/19/81	0.0002	0.0003	0.0002	0.0002	0.0003		8.9
11/24/81	0.0012	0.0006	0.0002	0.0003	0.0004		8.9
12/2/81	0.001	0.0004	0.0004	0.0004	0.0004		
12/8/81	0.0002	0.0003	0.0003	0.0003	0.0005		8.9
12/15/81	0.0001	0.0002	0.0001	0.0004	0.0005		
12/23/81	0.0006	0.0005	0.0007	0.0007	0.0006		
	13	12	12.8	16.1	10.2		

~~1980~~ ^3H in River Data - pCi/L 7/27/81

Date	#1	#2	#3	#4	#5	E.L.
1/4/80	0.0005	0.0004	0.0003	0.0006	0.0007	2/1/80 - 0.0011
1/10/80	0.0004	0.0004	0.0003	0.0005	0.0005	0.0009
1/17	0.0004	0.0004	0.0003	0.0006	0.0005	0.0012
1/24	0.001	0.0008	0.001	0.0014	0.0014	0.0012
1/31	0.0003	0.0009	0.0003	0.0006	0.0007	2/14/80 - 0.0008
2/8	0.0005	0.0005	0.0003	0.0006	0.0008	0.0007
2/14	0.0010	0.0010	0.0013	0.0015	0.0014	0.0007
2/28	0.0001	0.0001	0.0002	0.0004	0.0004	0.0006
3/6	0.0006	0.0005	0.0007	0.0006	0.0008	4/30/80 - 0.0013
3/14	0.0004	0.0004	0.0003	0.0005	0.0006	0.0015
3/19	0.0004	0.0004	0.0003	0.0004	0.0004	0.0014
3/26	0.0005	0.0004	0.0003	0.0006	0.0005	0.0011
4/2	0.0003	0.0003	0.0003	0.0005	0.0004	9/2/80 - 0.0003
4/10	0.0016	0.0012	0.0013	0.0015	0.0018	0
4/17	0.0012	0.0013	0.0015	0.0014	0.0012	0.0001
4/25	0.0011	0.0013	0.0014	0.0014	0.0012	0.0002
4/30	0.0015	0.0015	0.0014	0.0016	0.0017	10/31/80 - 0.0001
5/7	0.0013	0.0014	0.0012	0.0014	0.0016	
5/14	0.0011	0.0011	0.0012	0.0009	0.0013	
5/22	0.0010	0.0013	0.0012	0.0014	0.0011	
5/29	0.0015	0.0015	0.0018	0.0017	0.0015	
6/18	0.0009	0.0015 18.6	0.0016	0.0012	0.0014 21.9	
6/24	0.001	0.0008	0.0011 19.6	0.0013 22.6	0.0012	
7/11	0.0012	0.0009	0.0012	0.0016	0.0012	
7/16	0.0011 - 20.9	0.0013	0.0012	0.0014	0.0011	
7/25	0.0009	0.0013	0.0014	0.0014	0.0011	
7/29	0.0013	0.0011	0.0012	0.0016	0	
8/6	0.0015	0.0017	0.0015	0.0021	0.0016	
	.0246	.0257	.0261	.0307	.0281	

Date	#1	#2	#3	#4	#5	E.L.
8/14/80	0.0003	0.0003	0.0002	0.0003	0.0005	
8/21	0.0003	0.0003	0.0004	0.0006	0.0006	
8/28	0.0004	0.0004	0.0005	0.0006	0.0006	
9/4	0	0.0001	0	0.0002	0.0001	
9/9	0.0001	0.0002	0.0003	0.0003	0.0003	
9/25	0.0004	0.0005	0.0005	0.0009	0.0015	
10/2	0.0004	0.0005	0.0006	0.0006	0.0006	
10/10	0.0002	0.0002	0.0003	0.0003	0.0003	
10/15	0.0001	0.0002	0.0003	0.0002	0.0004	
10/22	0.0001	0.0002	0.0003	0.0004	0.0003	
10/29	0.0002	0.0004	0.0004	0.0005	0.0005	
11/6	0.0004	0.0003	0.0004	0.0005	0.0003	
11/14	0	0.0002	0.0001	0.0001	0.0001	
11/18	0.0002	0.0003	0.0002	0.0002	0.0005	
11/24	0.0002	0.0002	0.0003	0.0004	0.0005	
12/3	0	0	0	0	0	
12/11	0	0	0	0	0	
12/18	0.0003	0.0004	0.0004	0.0005	0.0006	
12/22	0.0001	0	0.0001	0.0004	0.0004	
	.0283	.0304	.0314	.0377	.0362	

Concentration of tritium in the Great Miami River (1979) 1/29/80

Sample #1 (10 ml samples) 24

date	BKG	Net C/M	EFF	μci/L
1/3	19.2	0.1	.1767	.000026
1/8				
1/19	19.1	2.5	.1485	.000758
1/25	19.7	1.9	.1452	.000589
2/9	17.8	1.5	.1511	.000447
3/16	15.8	3.0	.1473	.000917
3/23	18.4	1.7	.1473	.000520
3/30	17.1	0.9	.1456	.000278
4/6	17.7	2.3	.1561	.000664
4/12	17.5	2.8	.1561	.000808
4/20	16.2	2.8	.1557	.000810
4/27	18.0	0	.1603	0
5/4	17.1	2.4	.1565	.000691
5/11	17.5	2.5	.1574	.000715
5/18	17.1	2.4	.1570	.000689
5/25	18.2	1.7	.1565	.000489
6/1	18.5	0.3	.1523	.000089
6/8	8.1	1.5	.2160	.000313
6/15	17.6	0.3	.1574	.000086
6/22	18.3	1.1	.1586	.000329
6/29	7.7	1.9	.2235	.000383
7/6	16.9	1.9	.1579	.000563
7/13	16.7	-1.7	.1575	⊖ .000505
7/20	15.7	3.3	.1528	.000973
7/27	16.5	-0.9	.1532	⊖ .000265
8/3	15.2	0.1	.1579	.000030
8/10	16.6	-0.4	.1620	⊖ .000111
8/24	8.5	1.4	.2187	.000288
8/30	19.1	2.4	.1456	.000743
9/11	18.0	1.5	.1575	.000446
9/18	16.7	1.2	.1490	.000363
9/25	16.7	1.1	.1582	.000313
10/1	18.2	-3.0	.1532	⊖ .000882
10/12	15	1.8	.1473	.000550
10/19	15.3	3.1	.1511	.000924
10/26	17.5	5.0	.1342	.001678
11/1	18.8	4.4	.1363	.001454
11/8	18.7	5.9	.1317	.002034

date	BKG	Net C/M	EFF	μci/L
11/15	18.8	3.0	.1316	.00098
11/20	18.4	2.1	.1418	.00066
11/29	17.7	2.9	.1367	.00095
12/4	13.8	3.6	.1935	.00113
12/17	14.0	2.4	.1524	.00076
$\bar{x}$	16.7		.1555	.00054
S	2.8		.0197	.00052
$S_{\bar{x}}$	0.43		.0030	.00008
$+S_{\bar{x}}$ (t.02)	0.87			.00016
$n = 42$			42	42
$\Sigma x = 699.4$			6.5292	.02
$\Sigma x^2 = 11{,}959.2$			1.0319	.00002

$$LDL = \frac{0.9}{(10)(.1555)(2.22 \times 10^6)} = 0.000261 \ \mu ci/L$$

$\therefore$ LDL = 0.00026 μci/L

Concentration of tritium in the Great Miami River (1979) 1/30/80

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Sample #2 - (10 ml Sample)

date	gKg	Net c/m	eff	μci/L	date	gKg	Net c/m	EFF	μci/L
1/3	19.2	11.1	.1787	.002798	11/8	18.7	5.4	.1367	.001[illegible]
1/8	19.1	1.2	.1254	.000931	11/15	18.8	2.6	.1363	.000[illegible]
1/19	19.1	3.7	.1490	.001119	11/20	18.4	5.1	.1414	.0016
1/25	19.7	3.8	.1460	.001172	11/29	17.7	3.5	.1367	.0011
2/9	17.8	4.8	.1536	.001408	12/4	23.8	3.5	.1422	.0011
3/16	15.8	3.0	.1497	.000934	12/17	14.0	3.0	.1540	.000[illegible]
3/23	18.4	1.8	.1506	.000538					
3/30	17.1	1.1	.1469	.000337	$\bar{x}$	16.9		0.1529	0.000
4/6	17.7	4.1	.1511	.001222	S	2.9		0.0181	0.000
4/12	17.5	3.1	.1561	.000895	$S_{\bar{x}}$	0.44		0.0028	0.0000
4/20	16.2	3.4	.1515	.001011	$\pm S_{\bar{x}}$	0.89			0.0001
4/27	18.0	1.3	.1578	.000371					
5/4	17.1	2.1	.1536	.000616					
5/11	17.5	2.4	.1553	.000696	n =	43		43	43
5/18	17.1	2.3	.1591	.000651	Σx =	729		6.5744	0.03[illegible]
5/25	18.2	2.2	.1544	.000642	Σx^2 =	12700		1.0189	0.0000
6/1	18.5	0.9	.1515	.000268					
6/8	8.1	1.5	.1950	.000347					
6/15	17.6	0.3	.1498	.000090					
6/22	18.3	1.5	.1498	.000451	LOL =	$\frac{0.9}{(10)(.1529)(2.22\times10^3)}$		= 0.000265 μci/L	
6/29	7.7	2.3	.2174	.000477					
7/6	16.9	2.5	.1544	.000729					
7/13	16.7	-0.1	.1506	-.000030					
7/20	15.7	2.0	.1557	.000579					
7/27	16.5	1.6	.1574	.000458					
8/3	15.2	0.6	.1494	.000181					
8/10	16.6	0.4	.1591	.000113					
8/24	8.5	1.1	.2126	.000233					
8/30	19.1	1.9	.1431	.000598					
9/11	18.0	1.3	.1464	.000400					
9/18	16.7	2.7	.1469	.000828					
9/25	16.7	1.3	.1296	.000452					
10/5	18.2	-2.1	.1596	-.000593					
10/12	15.0	2.1	.1477	.000640					
10/19	15.3	3.5	.1497	.001090					
10/26	17.5	5.6	.1369	.001845					
11/1	16.8	4.2	.1359	.001392					

Computation of tritium in the Great Miami River

Sample #3 - (10 ml Sample) (1979)

Date	BKG	μcpm	EFF	μCi/L
1/3	19.2	1.0	.1791	.000252
1/8	19.1	1.9	.1258	.000680
1/19	19.1	3.5	.1490	.001058
1/25	19.7	3.0	.1418	.000953
2/9	17.8	3.3	.1579	.000979
3/16	15.8	1.5	.1443	.000468
3/23	15.4	1.8	.1473	.000550
3/30	17.1	1.4	.1506	.000419
4/6	17.7	3.2	.1578	.000913
4/12	17.5	1.9	.1553	.000551
4/20	16.2	3.0	.1571	.000894
4/27	18.0	0.5	.1617	.000140
5/4	17.1	2.8	.1523	.000828
5/11	17.5	1.8	.1565	.000518
5/18	17.1	2.5	.1565	.000720
5/25	18.2	1.5	.1553	.000435
6/1	18.5	0.4	.1544	.000117
6/8	8.1	2.1	.2099	.000451
6/15	17.6	2.5	.1498	.000752
6/22	18.3	1.2	.1469	.000368
6/29	7.7	2.3	.2160	.000480
7/6	16.9	0.4	.1557	.000116
7/13	16.7	-0.2	.1494	⊖.000060
7/20	15.7	2.2	.1579	.000631
7/27	16.5	0.8	.1540	.000234
8/3	15.2	0.2	.1591	.000057
8/10	16.6	0.8	.1574	.000229
8/24	8.5	0.8	.2494	.000164
8/30	19.1	2.1	.1443	.000656
9/11	18.0	1.8	.1447	.000560
9/18	16.7	0.6	.1553	.000174
9/25	16.7	2.1	.1557	.000608
10/5	18.2	-2.0	.1590	⊖.000567
10/12	15.0	2.4	.1460	.000740
10/19	15.3	4.9	.1511	.001461
10/26	18.5	5.6	.1359	.001856
11/1	18.8	6.2	.1304	.002142
11/8	18.7	6.4	.1380	.002[illegible]
11/15	18.8	3.1	.1386	.001
11/20	18.4	4.3	.1389	.001
11/29	17.7	4.4	.1342	.001
12/4	238	3.3	.1464	.001
12/17	14.0	2.5	.1602	.000
$\bar{X}$	16.9		0.1545	0.000
S	2.9		0.0193	0.000
$S_{\bar{x}}$	–			
[illegible]	–			0.000
[illegible]	–			
n =	43		43	4
Σx =	729		6.6425	0.02
Σx^2 =	12700		1.0417	0.000

LDC = $\frac{0.9}{(10)(.1545)(2.22\times10^3)}$ = 0.000262 μCi

Concentration of tritium in the Great Miami River (1979)

11/30/80

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Sample #4 - (10 ml Sample)

date	BKg	net cpm	CPM	pci/L
1/3		-0.1	.1713	0.000026
1/8		1.7	.1806	.000424
1/19		2.5	.1296	.000869
1/25		1.6	.1571	.000477
2/9		2.1	.1426	.000663
3/16		2.9	.1528	.000855
3/23		2.2	.1469	.000675
3/30		2.6	.1480	.000786
4/6		4.0	.1473	.001223
4/12		3.2	.1540	.000936
4/20		3.6	.1523	.001065
4/27		2.4	.1519	.000712
5/4		3.6	.1595	.001017
5/11		2.5	.1549	.000727
5/18		3.5	.1574	.001002
5/27		1.2	.1608	.000336
6/1		0.6	.1553	.000174
6/8		1.8	.1515	.000535
6/15		4.1	.2133	.000866
6/22		1.4	.1485	.000425
6/29		3.0	.1498	.000902
7/6		1.5	.2160	.000313
7/13		1.1	.1540	.000322
7/20		3.1	.1532	.000911
7/27		3.2	.1520	.000918
8/3		1.0	.1494	.000302
8/10		0.4	.1574	.000011
8/24		1.3	.1565	.000374
8/30		2.9	.1544	.000590
9/11		2.8	.1418	.000889
9/18		2.9	.1439	.000908
9/25		4.4	.1511	.001312
10/5		-1.0	.1494	0.000302
10/12		1.9	.1586	.000540
10/19		3.7	.1532	.001088
10/26		5.0	.1308	.001722
11/1		5.1	.1267	.001681

Same as above

date	BKg	net cpm	CPM	pci/L
11/8		5.6	.1346	.001871
11/15		3.2	.1384	.00104
11/20		4.3	.1369	.00142
11/29		4.8	.1431	.00151
12/4		2.8	.1275	.00098
12/17		4.4	.1414	.00140
$\bar{x}$	16.9		0.1542	0.000793
s	2.9		0.0201	0.000489
$5\bar{x}$				
$t_{95\%}$				0.000150
95% CL.				
n =	43		43	43
Σx =	729		6.6317	0.034115
Σx^2 =	12700		1.0398	0.000370

$$LOC = \frac{0.9}{(10)(.1542)(2.2210)} = 0.000263 \text{ pci/L}$$

"Concentration" of tritium in the Great Miami River 1/30/80 25

Sample #5 (10 ml Sample) (1979)

Date	BKG	Net C/M	CPM	μμi/L
1/3		0.8	.1791	.000201
1/8		1.6	.1052	.000685
1/9		3.4	.1511	.001014
1/25		1.4	.1439	.000438
1/9		1.0	.1549	.000291
1/6		2.2	.1485	.000667
1/23		2.4	.1469	.000736
1/30		2.7	.1406	.001100
1/6		3.1	.1574	.000904
1/12		4.0	.1523	.001183
4/20		2.7	.1481	.000821
1/10		2.1	.1553	.000609
7/4		3.3	.1575	.000981
7/11		3.0	.1523	.000887
7/18		3.8	.1661	.001097
7/25		0.3	.1557	.000087
1/1		0.9	.1553	.000261
1/8		2.3	.2149	.000484
5		3.8	.1557	.001099
12		0.5	.1443	.000156
29		2.2	.2201	.000450
16		1.5	.1582	.000427
13		2.3	.1523	.000680
10		0.9	.1519	.000267
17		3.1	.1532	.000911
3		1.9	.1575	.000565
0		-0.6	.1586	⊖ .000170
4		1.9	.2058	.000416
10		2.3	.1447	.000716
1		2.7	.1481	.000821
8		3.1	.1485	.000940
5		2.8	.1308	.000964
5		-3.4	.1499	⊖ .001452
12		2.6	.1494	.000784
19		3.3	.1498	.000992
26		8.0	.1359	.002652
1		4.4	.1414	.001402

Same as Above

Date	BKG	Net C/M	CPM	μμi/L
11/8		6.0	.1401	.001929
11/15		4.7	.1313	.001612
11/20		3.0	.1414	.000956
11/29		2.9	.1396	.000949
12/4		4.2	.1435	.001318
12/17		3.1	.1610	.000867
$\bar{x}$	16.9		0.1524	.000760
S	2.9		0.0209	.000608
$S_{\bar{x}}$				
$t S_{\bar{x}}$				
95% C.L.				0.000187
$n =$	43		43	43
$\Sigma x =$	729		6.5512	.032697
$\Sigma x^2 =$	12700		1.0164	.0000404

$$LLC = \frac{0.9}{(10)(.1543)(2.22 \times 10^3)} = 0.000263 \ \mu\mu i/L$$

Environmental Level tritium Concentration for 2/4/80
water -(10 cc Samples)

Run	Gross cpm	Bkg	Net cpm	cpm	μci/L
	13.5	10.8	2.7	.1106	.001100
	13.1	10.8	2.3	.1124	.000922
	13.6	10.8	2.8	.1085	.001162
	13.6	10.8	2.8	.1092	.001155
				.1102	.001085
				.0017	.000112
					.000178

1978 River Water (Tritium Results)

#1 → No. 2				#2 → No. 3				#3 → No. 4				#4 → No. 5				#5 → No. 1			
date	Bkg c/m	EPP	Net 10^{-3}/min	date	Bkg c/m	EPP	Net 10^{-3}/min	date	Bkg c/m	EPP	Net 10^{-3}	date	Bkg c/m	EPP	Net 10^{-3}	date	Bkg c/m	EPP	Net 10^{-3}
1/9	15.6	.1494	.0007	1/9	15.6	.1494	.0011	1/9			.0010				.0005				.0005
3/3	15.2	.1286	.0015	3/17	16.8	.1210	.0003 ~~.0002~~	3/17			.0003				.0005				.0003 ~~.0004~~
3/31	15.2	.1219	.0016	3/23	15.2	.1234	.0026	3/23			.0019				.0017				.0018
4/7	19.1	.1634	.0017	3/31	15.2	.1224	.0017	3/31			.0013				.0010				.0011
4/14	19.1	.1649	.0013	4/7	19.1	.1565	.0018	4/7			.0013				.0013				.0014
4/21	18.2	.1651	.0002	4/14	19.1	.1536	.0012	4/14			.0022				.0014				.0007
4/28	18.2	.1599	.0009	4/21	18.2	.1708	.0006	4/21			.0010				.0005				.0003
5/5	18.6	.1673	.0008	4/28	18.2	.1570	.0007	4/28			.0006				.0004				.0004
5/12	18.6	.1639	.0009	5/5	18.6	.1678	.0009	5/5			.0005				.0005				.0005
6/19	17.6	.1678	.0009	5/12	18.6	.1663	.0003	5/12			.0006				.0003				.0004 ~~.0004~~ .0003
5/26	18.2	.1563	.0003	5/19	17.6	.1668	.0006	5/19			.0004				.0003				
6/5	20.6	.1674	.0055	5/26	18.2	.1629	.0003 ~~.0009~~	5/26			.0003				.0003				.0005
6/9	20.5	.1641	.0034	6/5	20.6	.1639	.0084	6/5			.0024				.0011				.0017
6/19	20.5	.1355	.0014	6/9	20.5	.1924	.0014	6/9			.0020				.0015				.0018
6/23	20.5	.1548	.0010	6/19	20.5	.1742	.0014	6/19			.0005				.0012				.0007
6/30	20.5	.1621	.0006	6/23	20.5	.1595	.0006	6/23			.0006				.0005				.0004
7/7	12.9	.1000	.0135	6/30	20.5	.1590	.0006	6/30			.0003				.0003				.0005
7/14	12.9	.1063	.0010	7/7	12.9	.1196	.0008	7/7			.0015				.0016				.0016
7/21	12.9	.1150	.0013	7/14	12.9	.1060	.0012	7/14			.0009				.0010				.0008
7/28	20.7	.1516	.0024	7/21	12.9	.1160	.0019	7/21			.0011				.0013				.0012
8/4	20.7	.1575	.0005	7/28	20.7	.1614	.0006	7/28			.0005				.0007				.0028
8/11	18.3	.1604	.0016	8/4	20.7	.1699	.0003 ~~.0002~~	8/4			.0004				.0003				.0003
8/18	18.2	.1609	.0010	8/11	18.3	.1644	.0012	8/11			.0008				.0009				.0008
8/25	20.9	.1683	.0006	8/18	18.2	.1609	.0009	8/18			.0007				.0007				.0015
9/1	18.4	.1683	.0005	8/25	20.9	.1703	.0008	8/25			.0015				.0005				.0006
9/8	21.1	.1619	.0005	9/1	18.4	.1668	.0007	9/1			.0003 ~~.0003~~				.0004				.0003
9/15	18.6	.1698	.0003 ~~.0001~~	9/8	21.1	.1639	.0003	9/8			.0005				.0006				.0006
9/22	18.5	.1683	.0004	9/15	18.6	.1708	.0004	9/15			.0007				.0003				.0003
9/21	18.2	.1649	.0005	9/22	18.5	.1698	.0003	9/22			.0003				.0008				.0004
10/6	21.9	.1703	.0003 ~~.0004~~	9/29	18.2	.1654	.0005	9/29			.0008 ~~.0003~~				.0005 ~~.0003~~				.0007 ~~.0003~~

10/6	21.4	.1703	~~<BKG~~
10/13	19.1	.1703	.0006
			.0003
10/20	20.4	.1718	~~<BKG~~
10/27	20.9	.1624	.0004
11/3	13.1	.1143	.0005
11/10	13.1	.1186	.0028
11/17	19.0	.1609	.0007
11/22	17.6	.1654	.0005
			.0003
12/1	20.9	.1727	~~.0004~~
			.0003
12/8	20.1	.1565	~~<BKG~~
			.0003
12/15	21.3	.1693	~~<BKG~~
$\bar{x}$ =	18.6	.1540	.0014
S =	3.0	.0200	.0022
n =	40	40	40
$S_{\bar{x}}$ =	.47		.0003
$tS_{\bar{x}}$ =	.94		.0006
@95%			

LDL = 0.94 c/m / 10cc x .1540 x 2.22x10^6

= .27 x 10^-6 µci/cc

LDL = .00027 x 10^-3 µci/cc

9/29	18.2	.1654	.0005
			.0003
10/6	21.9	.1742	~~<BKG~~
10/13	19.1	.1708	.0006
10/20	20.4	.1604	.0004
10/27	20.9	.1156	.0013
11/3	13.1	.1240	.0012
11/10	13.1	.1678	.0011
11/17	19.0	.1619	.0011
11/22	17.7	.1698	.0011
12/1	20.9	.1570	.0004
12/8	19.7	.1698	.0003
			.0003
12/15	21.3		~~.0004~~
$\bar{x}$ =	18.5	.1559	.0010
S =	2.9	.0202	.0013
n =	41	40	41
$S_{\bar{x}}$ =	.45		.0002
$tS_{\bar{x}}$ =	.90		.0004
@95%			

LDL = 0.90 c/m / 10cc x .1559 x 2.22 x 10^6

= .26 x 10^-6 µci/cc

LDL = .00026 x 10^-3 µci/cc

9/29	.0008
	.0003
10/6	~~<BKG~~
10/13	.0003
	~~.0002~~
10/20	.0006
10/27	.0004
11/3	.0008
11/10	.0024
11/17	.0008
11/22	.0009
12/1	.0004
12/8	.0005
	.0003
12/15	~~<BKG~~
$\bar{x}$ =	.0008
S =	.0006
n =	41
$S_{\bar{x}}$ =	.0001
$tS_{\bar{x}}$ =	.0002
@95%	

LDL = .0003 x 10^-3 µci/cc

Assume Same Avg BKG / efficiency

	.0006
	.0003
	~~<BKG~~
	.0003
	~~.0001~~
	.0003
	.0006
	.0006
	.0020
	.0005
	.0008
	.0004
	.0003
	~~<BKG~~
	.0003
	~~<BKG~~
$\bar{x}$ =	.0007
S =	.0005
n =	41
$S_{\bar{x}}$ =	.00008
$tS_{\bar{x}}$ =	.0002
@95%	

LDL = .0003 x 10^-3 µci/cc

Assume Same Avg BKG/efficiency

.9 x 10^-6

	.0007
	.0003
	~~<BKG~~
	.0003
	~~<BKG~~
	.0003
	~~.0001~~
	.0003
	~~.0002~~
	.0006
	.0011
	.0010
	.0008
	.0003
	.0003
	~~<BKG~~
	.0003
	~~<BKG~~
$\bar{x}$ =	.1007
S =	.0006
n =	41
$S_{\bar{x}}$ =	.0001
$tS_{\bar{x}}$ =	.0002
@95%	

LDL = .0003 x 10^-3 µci/cc

Assume Same Avg BKG/ EFFICIENCY

1977 HTO in River Data (10^{-6} pCi/ml)

29.

R-1	R-2	R-3	R-4	R-5
4.3	4.1	5.3	23.4	4.5
3.6	3.4	4.6	3.9	3.2
1.1	0.5	2.4	1.1	0.9
0.6	0.5	1.4	1.0	0.7
0.6	0.9	1.7	1.1	0.9
1.1	1.2	2.4	1.5	0.9
0.9	0.7	1.8	0.8	0.8
0.5	0.2	1.2	0.6	0.2
0.4	0.2	0.2	0.2	0.2
0.2	0.2	1.7	0.6	0.2
0.2	0.4	3.9	0.5	0.4
1.2	1.1	2.5	1.7	1.1
0.7	0.9	1.7	1.3	0.7
0.8	0.6	2.2	1.2	1.0
1.0	0.9	1.3	1.3	1.1
1.0	0.6	0.8	0.8	0.8
1.2	1.1	1.5	1.3	1.0
1.2	1.1	1.7	1.4	1.2
1.0	0.7	0.6	0.7	0.8
1.0	1.0	1.0	0.9	1.0
0.8	0.6	0.6	0.7	0.6
2.0	1.3	8.3	1.5	1.3
0.9	1.6	2.8	3.4	1.8
1.4	1.1	1.4	1.3	1.3
2.0	0.6	1.0	1.1	1.3
1.0	0.6	0.7	0.8	0.8
0.7	0.8	1.0	1.0	0.8
0.8	0.4	0.6	0.6	0.4
1.3	1.1	1.4	1.1	1.5
1.3	2.4	0.9	1.2	1.1
1.0	0.7	1.1	1.2	1.2
1.2	5.0	1.5	1.2	1.2
1.1	1.3	1.4	1.3	1.1
1.0	0.6	1.0	1.1	0.9
1.0	16.8	1.8	0.9	0.7
0.6	0.4	1.7	0.2	0.5
1.4	1.4	1.4	1.5	1.5

(10^-6 curie/ml)

30

R-1	R-2	R-3	R-4	R-5
1.0	0.8	6.9	1.3	1.4
1.5	0.6	5.2	1.2	1.0
0.8	1.8	0.6	1.0	2.6
0.9	7.7	1.4	1.0	0.6
0.2	0.3	0.3	0.6	0.2
0.3	0.3	0.4	0.2	0.2
0.2	0.4	3.6	0.2	0.5
0.3	0.5	0.5	0.4	0.2

1976 H-3 in River Water

Samples 1, 2, 3, 4, 5 Volume 10 cc ^3H 3/5/77

date	Counting time	#1 NET c/m	#1 EFF	#2 NET c/m	#2 EFF	#3 NET c/m	#3 EFF	#4 NET c/m	#4 EFF	#5 NET c/m	#5 EFF	BKg c/m	EFF BKg
1/9/76	50 min	0	1.72 .1268	0	1.72 .1243	0	1.72 .1186	0	1.72 .1293	0	1.72 .1237	19.0	
2/6/76	"	5.1	22.9 .1410	1.6	1.72 .1373	0.1	1.72 .1365	0.7	1.72 .1382	1.7	1.72 .1331	17.8	
2/11/76	"	1.3	1.72 .1118	0	1.72 .1269	0.7	1.72 .1149	0.1	1.72 .1189	0.4	1.72 .1182	18.5	
2/23/76	"	2.8	19 .1080	2.3	18.5 .1083	2.1	18.3 .1201	4.0	20.2 .1064	2.7	18.9 .1121	16.2	
2/27/76	"	0.8	1.72 .1094	0.7	1.72 .1264	2.2	19.9 .1242	1.2	1.72 .0977	0.5	1.72 .0975	17.7	
3/5/76	"		< 1.72 MDA		< 1.72 MDA		< 1.72 MDA		< 1.72 MDA		< 1.72 MDA	18.3	
3/12/76	"		< 1.72 MDA		< 1.72 MDA		< 1.72 MDA		< 1.72 MDA		< 1.72 MDA	17.9	
3/19/76	"	5.3	23.1 .1132	6.3	24.1 .1167	4.7	22.5 .1188	4.2	22 .1176	6.7	24.5 .1216	17.8	
4/2/76	"	1.1	1.72 .1294	0.4	1.72 .1316	0.6	1.72 .1368	0.3	1.72 .1328	1.4	1.72 .1356	17.4	
4/9/76	"	0.3	1.72 .1313	0.2	1.72 .1296	0.5	1.72 .1305	0	1.72 .1321	0	1.72 .1231	19.2	
4/19/76	"	7.0	18 .2009	7.7	18.7 .1933	6.8	17.8 .2052	6.1	17.1 .1994	4.8	15.8 .1929	11.0	
4/23/76	"	3.7	14.7 .2045	5.7	16.7 .2045	3.4	14.4 .2060	4.3	15.3 .2067	3.4	14.4 .2052	11.0	
5/3/76	"	4.1	22.5 .1228	5.9	24.3 .1201	5.1	23.5 .1205	4.3	22.7 .1227	4.2	22.6 .1230	18.4	
5/7/76	"	3.1	22.2 .1325	4.1	22.5 .1272	4.2	22.6 .1278	2.7	21.1 .1274	4.2	22.6 .1275	18.4	
5/14/76	"	4.2	23.3 .1150	3.8	22.9 .1164	4.9	24 .1116	3.6	22.7 .1155	2.7	21.8 .1178	19.1	
5/21/76	"	1.7	1.72 .1186	3.7	23.2 .1248	3.2	22.7 .1227	2.3	21.8 .1188	3.9	23.4 .1233	19.5	
5/28/76	"	2.6	14.2 .2096	6.3	17.9 .2118	4.7	16.3 .2132	4.3	15.9 .2129	4.8	16.4 .2158	11.6	
6/4/76	"	2.2	17.2 .1530	3.9	18.9 .1587	9.5	19.5 .1975	2.6	17.6 .1546	2.3	17.3 .1596	15.0	
6/11/76	"	3.7	18.7 .1500	4.9	19.9 .1591	3.7	18.7 .1541	2.7	17.7 .1510	4.0	19 .1459	15.0	
6/18/76	"	5.2	18.6 .1623	5.2	18.6 .1592	4.7	18.1 .1607	4.7	18.1 .1556	4.9	18.3 .1556	13.4	
6/28/76	"	3.5	17.8 .1591	6.1	20.4 .1536	3.7	18 .1602	1.8	16.1 .1623	0.9	1.72 .1470	14.3	

.54 half

BKg 1 MDA = 18.22

Samples 1, 2, 3, 4, 5 Volume 10 cc H 12/5/77

date	counting time	#1 Net c/m	#1 EFF	#2 Net c/m	#2 EFF	#3 Net c/m	#3 EFF	#4 Net c/m	#4 EFF	#5 Net c/m	#5 EFF	BKg c/m	BKg EFF
7/1/76	100 min	1.1	8.14 .1561	2.8	16.6 .1561	1.3	15.1 .1643	1.8	15.6 .1592	0.0	1.14 .1572	13.8	
7/9/76	"	2.2	12.4 .1347	4.3	19.5 .1311	2.3	12.5 .1480	1.4	16.6 .1459	1.5	16.7 .1593	15.2	
7/12-7/16	"	2.1	18.1 .1424	5.3	21.3 .1398	0.7	1.14 .1408	0.0	1.14 .1459	1.0	1.14 .1306	16.0	
7/19-7/23	"	4.8	19.7 .1541	5.1	19.8 .1613	3.7	18.6 .1388	5.2	23.1 .1526	5.0	22.9 .1413	14.9	
7/30/76	"	0.2	1.14 .1684	2.5	17.2 .1623	0.8	1.14 .1607	0.0	1.14 .1633	0.0	1.14 .1618	14.7	
8/9/76	"	1.6	16.7 .1613	2.4	17.5 .1664	0.4	1.14 .1638	1.3	16.4 .1638	0.6	1.14 .1607	15.1	

date	counting time	gross c/m ①	Net	EFF	gross c/m ②	Net	EFF	gross c/m ③	Net	EFF	gross c/m ④	Net	EFF	gross c/m ⑤	Net	EFF	BKg c/m	BKg EFF
8/16/76	100 min	15.0	1.14	.1464	16.5	1.80	.1567	15.5	1.14	.1674	17.1	2.3	.1536	17.1	2.3	.1653	14.8	.3104
8/20/76	"	16.5	1.8	.1464	18.9	4.2	.1597	16.3	1.6	.1424	17.1	2.4	.1551	15.9	1.2	.1572	14.7	.3048
8/31/76	"	19.0	4.6	.1515	26.7	12.3	.1495	19.8	5.4	.1567	19.4	5.0	.1485	19.1	4.7	.1475	14.4	.3150
9/3/76	"	17.1	2.7	.1617	19.0	4.6	.1669	17.7	3.3	.1602	17.8	3.4	.1577	17.8	3.4	.1679	14.4	.3156
9/10/76	"	15.2	2.2	.1531	16.4	3.4	.1444	15.8	2.8	.1556	15.2	2.2	.1546	15.7	2.7	.1378	13.0	.3042
9/20/76	"	15.4	1.4	.1591	16.5	1.4	.1591	17.2	2.1	.1515	15.7	1.4	.1534	16.0	1.4	.1513	15.1	.3156
9/24/76	"	18.0	2.9	.1628	20.4	5.3	.1664	18.2	3.1	.1643	18.0	2.9	.1643	17.2	2.1	.1561	15.1	.3158
10/1/76	"	18.6	5.2	.1643	20.5	7.1	.1618	18.9	5.5	.1638	19.1	5.7	.1653	18.4	5.0	.1643	13.4	.3125
10/8/76	"	17.5	3.4	.1648	17.7	3.6	.1643	17.4	3.3	.1602	16.0	1.9	.1648	15.5	1.4	.1689	14.1	.3176
10/15/76	"	17.5	2.8	.1648	19.3	4.6	.1587	18.6	3.9	.1602	18.9	4.2	.1587	18.4	3.7	.1572	14.7	.3176
10/22/76	"	15.6	1.14	.1694	16.8	1.8	.1572	15.3	1.14	.1572	16.2	1.2	.1607	17.5	2.5	.1572	15.0	.312
10/29/76	"	16.6	2.3	.1689	20.9	6.6	.1628	15.5	1.2	.1694	15.7	1.4	.1648	15.7	1.4	.1623	14.3	.317
11/5/76	"	18.9	4.4	.1597	21.9	7.4	.1551	20.6	6.1	.1613	19.4	4.9	.1587	20.7	6.2	.1643	14.5	.319
11/12/76	"	16.3	2.8	.1689	17.7	4.2	.1720	16.5	3.0	.1659	17.2	3.7	.1653	17.0	3.5	.1638	13.5	.31
11/19/76	"	16.4	2.9	.1684	17.9	4.4	.1643	17.4	3.9	.1638	18.0	4.5	.1679	16.9	3.4	.1633	13.5	.31
11/24/76	"	18.0	3.1	.1628	18.8	3.9	.1561	18.7	3.8	.1577	18.6	3.7	.1582	18.2	3.3	.1607	14.9	.30
12/10/76	"	20.3	6.2	.1582	21.0	6.9	.1633	17.9	3.8	.1592	18.2	4.1	.1607	17.5	3.4	.1587	14.1	.30
12/17/76	"	16.4	2.9	.1689	22.8	9.3	.1659	18.6	5.1	.1607	17.6	4.1	.1577	17.1	3.6	.1643	13.5	.30
12/22/76	"	18.9	4.3	.1659	21.7	7.1	.1698	17.8	3.2	.1638	16.9	3.4	.1643	18.4	3.8	.1592	14.6	.31

MDL + BKg 2nd half = 1506

1975 HTO in River Water
(10^{-6} pci/ml)

R-1		R-2		R-3		R-4		R-5	
0.5	0.5	0.7	0.5	1.1	0.5	0.9	0.5	0.5	0.5
0.6	1.8	0.5	1.6	0.5	2.0	0.6	2.1	0.7	1.6
0.8	0.5	0.7	0.5	0.7	0.5	0.5	0.5	0.9	0.5
0.5	0.5	0.5	0.5	0.7	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	0.5	0.5
0.6		0.5		0.7		1.2		0.9	
5.6		9.6		8.6		7.8		7.4	
0.8		1.9		1.1		1.2		0.7	
7.4		8.6		0.8		7.8		0.5	
7.4		9.2		13.9		19.8		7.6	
0.6		3.4		3.4		3.4		3.4	
7.7		17.5		4.1		13.6		14.5	
1.1		1.6		1.4		1.4		1.2	
0.5		1.5		1.2		0.9		1.0	
0.5		3.1		9.6		0.5		0.5	
3.1		3.0		5.3		3.8		4.5	
1.4		1.4		1.2		1.6		1.2	
0.7		1.3		1.1		1.1		0.5	
1.4		1.5		1.2		1.4		0.8	
0.5		0.5		0.5		0.8		0.5	
0.5		1.0		1.7		1.1		0.5	
0.5		0.5		0.5		0.5		4.0	
0.5		0.8		0.8		0.8		0.5	
0.5		0.5		0.5		0.5		0.5	
2.5		2.7		3.1		2.6		2.3	
2.0		2.7		1.5		2.1		2.2	
3.2		3.3		3.3		3.7		3.1	
2.0		3.0		3.0		2.0		2.0	
0.5		0.5		0.5		0.5		0.5	
0.5		1.0		0.5		0.5		0.7	
0.5		0.5		0.5		0.5		0.5	
0.5		0.5		0.5		0.5		1.5	
0.5		0.5		0.8		0.6		0.8	
0.5		0.5		0.5		0.5		0.5	
0.5		1.0		1.0		0.6		0.5	
0.5		0.5		2.1		0.5		0.5	
0.5		0.5		0.5		0.5		0.5	
0.5		0.5		0.5		0.5		0.5	

APPENDIX C

TRITIUM IN SURFACE WATER (PONDS)

DATA COMPILATION SHEETS 1976 - 1989

Florida 2nd Half 1976 ^3H 3/10/7

Location	Volume	Counting time	Sample efficiency	Gross c/m	corrected values $\times 10^{-6}$ µci/ml	^3H µci/L
10	10CL	100 minutes	.1528	16.5	.590	.0025
11	"	"	.1563	14.7	.336	.0018
12	"	"	.1531	14.5	.336	.0019
13	"	"	.1531	15.8	.382	.0022
14	"	"	.1503	16.1	.480	.0024
15	"	"	.1512	16.6	.626	.0075
16	"	"	.1531	15.1	.336	.0020
17	"	"	.1531	20.9	1.883	.1037

MDA calculations

Avg background = 14.5 c/m 100 minute count
(based on Drinking water Samples 1976) (estimated)

Avg sample efficiency = .1529

$$\% \text{ MDA} = 3\sqrt{\frac{14.5}{100}} = 1.14 \text{ c/m} \quad \text{above BKg} = \text{MDA}$$

$$\frac{1.14 \text{ c/m}}{(.1529)(10)(2.22\times10^6)} = .336 \times 10^{-6} \text{ µci/ml} = \text{MDA}$$

Standard Deviation calculations

$$\#10 = 2\sqrt{\frac{16.5}{100} + \frac{14.5}{100}} = \frac{1.11 \text{ c/m}}{(.1529)(10)(2.22\times10^6)} = .33 \times 10^{-6} \text{ µci/ml}$$

$$\#11 = 2\sqrt{\frac{14.7}{100} + \frac{14.5}{100}} = \frac{1.08 \text{ c/m}}{(.1563)(10)(2.22\times10^6)} = .31 \times 10^{-6} \text{ µci/ml}$$

$$\#12 = 2\sqrt{\frac{14.5}{100} + \frac{14.5}{100}} = \frac{1.08 \text{ c/m}}{(.1531)(10)(2.22\times10^6)} = .32 \times 10^{-6} \text{ µci/ml}$$

$$\#13 = 2\sqrt{\frac{15.8}{100} + \frac{14.5}{100}} = \frac{1.10 \text{ c/m}}{(.1531)(10)(2.22\times10^6)} = .32 \times 10^{-6} \text{ µci/ml}$$

$$\#14 = 2\sqrt{\frac{16.1}{100} + \frac{14.5}{100}} = \frac{1.11 \text{ c/m}}{(.1503)(10)(2.22\times10^6)} = .33 \times 10^{-6} \text{ µci/ml}$$

$$\#15 = 2\sqrt{\frac{16.6}{100} + \frac{14.5}{100}} = \frac{1.12 \text{ c/m}}{(.1512)(10)(2.22\times10^6)} = .33 \times 10^{-6} \text{ µci/ml}$$

$$\#16 = 2\sqrt{\frac{15.1}{100} + \frac{14.5}{100}} = \frac{1.09 \text{ c/m}}{(.1531)(10)(2.22\times10^6)} = .32 \times 10^{-6} \text{ µci/ml}$$

$$\#17 = 2\sqrt{\frac{20.9}{100} + \frac{14.5}{100}} = \frac{1.19 \text{ c/m}}{(.1531)(10)(2.22\times10^6)} = .35 \times 10^{-6} \text{ µci/ml}$$

1977 monitoring report Data ^3H ponds 2/22/78

$\times 10^{-3}$ µci/cc

1977	10		11		12		13		14		15		16		17	
1st QTR	Result	EFF	Res	EFF	Res	EFF	Res	EFF	Res	EFF	Res	EFF	Res	EFF	Res	EFF
(NOMIN - 10CC)	.0014	-	.0009	-	.0007	-	.0012	-	.0012	-	.0015	-	.0008	-	.0023	-
Bkg																
2nd QTR	.0004*	.1403	.0004*	.1422	.0004*	.1409	.001	.1393	.0004*	.1216	.0008	.1253	.0006	.1296	.0015	.1313
(NOMIN-10CC)																
Bkg		14.1		14.1		14.4		14.1		14.1		14.1		14.1		14.1
3rd QTR	.0006	.1269	.0006	.1379	.0006	.1416	.0013	.1429	.0014	.1210	.0015	.1286	.0006	.1263	.0018	.1243
(NOMIN-10CC)																
Bkg		11.8		11.8		13.8		11.8		11.8		11.8		11.8		11.8
4th QTR			.0004*	.1180	.0004*	.1186	.0010	.1276	.0013	.1278	.0012	.1256	.0010	.1289		
(NOMIN-10CC)																
Bkg				12.5		13.1		12.5		12.5		12.5		12.5		
$\bar{X}$	.0008		.0006		.0005		.0011		.0011		.0013		.0008		.0019	
CE	± .0006		± .0006		± .0006		± .0006		± .0006		± .0006		± .0006		± .0006	

Avg Bkg = 13.0

Avg Efficiency = .1303

LDL Calculations

$$LDL = 2\sqrt{\frac{13}{40}} = \frac{1.14\ c/m}{10 \times .1303 \times 2.22 \times 10^6} = .4 \times 10^{-6}\ \mu ci/ml \text{ or } .0004 \times 10^{-3}\ \mu ci/cc$$

1977 monitoring report Data ^3H ponds 2/22/78

$\times 10^{-3}$ μci/cc

1977	10		11		12		13		14		15		16		17	
1st QTR	Raw	EFF	Raw	EFF	Raw	EFF	Raw	EFF	Raw	EFF	Raw	EFF	Raw	EFF	Raw	EFF
(40mid-10ec)	.0014	-	.0009	-	.0007	-	.0012	-	.0012	-	.0015	-	.0008	-	.0023	-
Bkg																
2nd QTR	.0004	.1403	.0004	.1422	.0004	.1409	.601	.1393	.0004	.1216	.0008	.1253	.0006	.1296	.0015	.1313
(40mid-10ec)																
Bkg		14.1		14.1		14.4		14.1		14.1		14.1		14.1		14.1
3rd QTR	.0006	.1269	.0006	.1379	.0006	.1416	.0013	.1429	.0014	.1210	.0015	.1286	.0006	.1263	.0018	.1243
(40mid-10ec)																
Bkg		11.8		11.8		13.8		11.8		11.8		11.8		11.8		11.8
4th QTR			.0004	.1180	.0004	.1186	.0010	.1276	.0013	.1278	.0012	.1256	.0010	.1289		
(40mid-10ec)																
Bkg				12.5		13.1		12.5		12.5		12.5		12.5		
$\bar{X}$	.0008		.0006		.0005		.0011		.0011		.0013		.0008		.0019	
CE	± .0006		± .0006		± .0006		± .0006		± .0006		± .0006		± .0006		± .0006	

Avg Bkg = 13.0

Avg Efficiency = .1303

LDL Calculations

$$LDL = 2\sqrt{\frac{13}{40}} = \frac{1.14\,c/m}{10 \times .1303 \times 2.22 \times 10^6} = .4 \times 10^{-6}\ \mu ci/ml \text{ or } .0004 \times 10^{-3}\ \mu ci/cc$$

1978 SURFACE WATER LEVELS (pCi/L) for TRITIUM ($\times 10^{-3}$ µCi/cc)

2/26/79

E.L. = $.9 \times 10^{-6}$ *

#10			#11			#12			#13			#14			#15			#16			#17			
BKG C/m	EFF	NET Result	BKG C/m	EFF	NET Result	BKG	EFF	NET	BKG	EFF	NET	BKG	EFF	NET	BKG	EFF	NET	BKG	EFF	NET	BKG	EFF	NET	
13.3	.1238	.0017	13.3	.1079	.0006		.1260	.0021		—	—	—		.1266	.0023		.1283	.0012		.1213	.0031		.1233	.0043	
11.7	.1303	.0021	11.7	.1269	.0014		.1230	.0019			.1316	.0016		.1183	.0006		.1279	.0016		.1303	.0010		.1203	.0010	
11.5	.1316	.0009	11.5	.1343	.0009		.1309	.0012			.1369	.0023		.1329	.0020		.1276	.0026		.1343	.0012		.1343	.0020	
12.9	.1223	.0010	12.9	.1263	.0010		.1266	<.0005 ~~.0004~~			.1298	.0013		.1233	.0008		.1273	.0010		.1266	.0007		.1206	.0007	
12.4	.1270	.0014	12.4	.1286	.0098	12.4	.1266	.0014	12.4	.1326	.0017	12.4		.0014	12.4		.0016	12.4		.0015	12.4		.0020	$\bar{x}$
.9	.005	.0006	.9	.004	.0033	.9	.003	.0007	.9	.004	.0005	.9		.0009	.9		.0007	.9		.0011	.9		.0016	S
4	4	4	4	4	4	4	4	4	4	3	3	4		4	4		4	4		4	4		4	n
.45		.0003			.0017			.00035			.0003			.00045			.00035			.00055			.0008	$S_{\bar{x}}$
1.4		.0010			.0005			.0011			.0012			.0014			.0011			.0018			.0025	$TS_{\bar{x}}$ @ 95%

LDL = $\frac{1.4}{(10)(.1270)(1.1 \times 10^{-6})}$

LDL = $.5 \times 10^{-6}$ µCi/cc

#11	#12	#13	#14	#15	#16	#17
LDL = $.5 \times 10^{-6}$	LDL = $.5 \times 10^{-6}$	LDL = $.5 \times 10^{-6}$	LDL = $.5 \times 10^{-6}$	LDL = $.5 \times 10^{-6}$	LDL = $.5 \times 10^{-6}$	LDL = $.5 \times 10^{-6}$

* Results less environmental levels

$.5 \times 10^{-6}$	0.08×10^{-6}	0.5×10^{-6}	0.8×10^{-6}	0.5×10^{-6}	0.7×10^{-6}	0.6×10^{-6}	1.1×10^{-6}
$\pm 1.0 \times 10^{-6}$	$\pm .5 \times 10^{-6}$	$\pm 1.1 \times 10^{-6}$	$\pm 1.2 \times 10^{-6}$	$\pm 1.4 \times 10^{-6}$	$\pm 1.1 \times 10^{-6}$	$\pm 1.8 \times 10^{-6}$	$\pm 2.5 \times 10^{-6}$

1/31/80

Tritium Concentrations in Surface Water (Ponds) 1979
(10 ml samples)

10					11					12					13				
date	BKG	NET	EFF	pci/ml	date	BKG	NET	EFF	pci/ml	date	BKG	NET	EFF	pci/ml	date	BKG	NET	EFF	pci/ml
3/20	18.0	1.4	.1473	.000428	3/26	17.2	1.4	.1477	.000427	3/29	17.9	2.1	.1460	.000648	4/2	17.1	2.7	.1536	.
3/26	17.6	1.8	.1464	.000554	6/27	17.6	1.7	.1473	.000510	6/25	17.6	0.6	.1389	.000195	6/19	16.3	4.7	.1515	.
9/12	16.7	3.5	.1422	.001109	9/13	16.7	2.7	.1443	.000843	9/26	16.4	1.3	.1410	.000445	9/11	18	2.6	.1481	.
12/5	22.2	5.5	.1426	.001737	12/7	23.4	4.7	.1359	.001358	12/13	14.1	2.3	.1347	.000769	10/24	15.3	3.0	.1506	
$\bar{X}$	18.6		.1446	.000957		18.7		.1438	.000839		16.5		.1402	.000507		16.7		.1510	.0
S	2.4		.0026	.000598		3.1		.0055	.000513		1.7		.0047	.000255		1.2		.0023	.0
$S_{\bar{X}}$	1.2		.0013	.000299		1.6		.0028	.000257		0.9		.0024	.000128		0.6		.0012	.0
$t S_{\bar{X}}$	3.8		.0041	.000951		4.9		.0088	.000816		2.7		.0075	.000406		1.9		.0037	.0

LDL * use LVL for River Water

14					15					16					17				
date	BKG	NET	EFF	pci/ml	date	BKG	NET	EFF	pci/ml	date	BKG	NET	EFF	pci/ml	date	BKG	NET	EFF	pci/ml
3/20	17.3	4.3	.1452	.001334	3/27	17.9	2.8	.1506	.000837	3/28	17.0	3.5	.1469	.001073	3/22	17.9	4.5	.1519	.00
6/20	16.4	4.1	.1439	.001283	6/22	17.0	1.7	.1460	.000524	6/28	17.6	2.0	.1536	.000587	6/21	16.8	2.8	.1464	.0
9/25	16.7	2.1	.1469	.000644	9/27	17.3	2.3	.1481	.000700	9/24	17.4	1.1	.1375	.000389	9/21	18	1.1	.1570	.0
12/3	23	4.6	.1334	.001553	12/17	14	4.8	.1586	.001363	12/12	13.8	3.6	.1495	.001078	11/27	17.8	5.9	.1367	.0
$\bar{X}$	18.4		.1424	.001204		16.6		.1508	.000594		16.5		.1444	.000784		17.6		.1480	.0
S	3.1		.0061	.000391		1.7		.0055	.000798		1.8		.0116	.000351		0.6		.0087	.00
$S_{\bar{X}}$	1.6		.0031	.000196		0.9		.0028	.000399		0.9		.0058	.000176		0.3		.0044	.00
$t S_{\bar{X}}$	4.9		.0097	.000622		2.7		.0088	.001270		2.9		.0185	.000558		1.0		.0138	.00

LVL * use LDL FOR River water

1980 ^{3}H in (Pond) Surface Water pick 7/27/81

Date	10	11	12	13	14	15	16	17	E.L.
3/11/80	0.0001	3/12 0.0003	3/11 0.0004	3/27 0.0015	3/19 0.0006	3/26 0.0009	3/25 0.0003	3/18 0.0005	3/1 0.0011
"	0.00002	" 0.0003	" 0.0004	0.0011	0.0009	0.0008	0.0002	0.0006	" 0.0008
"	0.0001	" 0.0003	" 0.0003	0.0014	0.0007	0.0009	0.0002	0.0005	" 0.0008
"	0.00002	" 0.0006	" 0.0004	0.0013	0.0007	0.0008	0.0003	0.0008	" 0.0007
4/18	0.0015	4/28 0.0012	4/21 0.0013	4/17 0.0014	4/28 0.0016	4/29 0.0017	4/30 0.0015	4/25 0.0019	3/20 0.0004
5/7	0.0014	5/8 0.0015	5/28 0.0011	5/15 0.0013	5/28 0.0013	5/29 0.0014	5/21 0.0016	5/12 0.0019	" 0.0004
7/1	0.0009	6/23 0.0011	6/26 0.0012	6/4 0.0015	7/1 0.0012	6/23 0.0016	7/1 0.0009	6/20 0.0019	" 0.0002
7/25	0.0011	7/30 0.0010	7/28 0.0013	7/21 0.0013	7/22 0.0023	7/31 0.0013	7/23 0.0018	7/24 0.0019	" 0.0005
8/27	0	8/6 0.0017	8/7 0.0013	8/18 0.0004	8/28 0.0005	8/27 0	8/7 0.0012	8/28 0.0008	5/7 0.0014
9/8	0.0002	9/9 0	9/10 0.0003	9/15 0.0005	9/8 0.0005	9/9 0.0002	9/15 0.0007	9/15 0.0006	" 0.0013
10/7	0.0003	10/7 0.0001	10/10 0	10/14 0	10/7 0.0003	10/10 0.0001	10/7 0.0003	10/13 0.001	" 0.0012
11/10	0.0001	11/12 0.0003	11/12 0.0003	11/11 0.0004	11/10 0.0005	11/12 0.0006	11/12 0.0004	11/11 0.0008	" 0.0012
		12/10 0.0005	12/10 0.0004			12/11 0.0006	12/11 0.0005		9/5 0.0001
									" 0
									" 0
									" 0
									10/28 0.0002

1980 ^3H in water in ponds ($\times 10^{-3}$ µci/ml)

	Pond 10	Pond 11	Pond 12	Pond 13	Pond 14
$\bar{X}$ =	0.00048	0.00060	0.00062	0.00101	0.00093
S =	0.00058	0.00048	0.00046	0.00053	0.00058
n =	12	12	12	12	12
$S_{\bar{X}}$ =	0.00037	0.00030	0.00029	0.00034	0.00037
MIN =	0	0	0	0	0
MAX =	0.0015	0.0015	0.0013	0.0015	0.0023
$\bar{X}$ less EL =	EL.	EL.	0.00001	0.0004	0.00032
MAX less EL =	0.00089	0.00089	0.00069	0.00089	0.00169

	Pond 15	Pond 16	Pond 17	Background (E.L.)
$\bar{X}$ =	0.00084	0.00076	0.0011	0.00061
S =	0.00055	0.00058	0.00061	0.00050
n =	13	13	12	17
$S_{\bar{X}}$ =	0.00033	0.00035	0.00039	0.00026
MIN =	0	0	0	
MAX =	0.0017	0.0018	0.0019	
$\bar{X}$ less E.L. =	0.00023	0.00015	0.00049	
MAX less E.L. =	0.00109	0.00119	0.00129	

1981 H_3O IN SURFACE WATER CALCULATIONS 1/25/82

#	(10^{-6} pci/ml) CONCENTRATION	(10^{-6} pci/ml) ENVIRONMENTAL LEVEL	(10^{-6} pci/ml) MOUND IMPACT
10	0.31 ± 0.09	0.28 ± 0.15	0.03 ± 0.17
11	0.37 ± 0.13	0.28 ± 0.15	0.09 ± 0.2
12	0.23 ± 0.07	0.28 ± 0.15	E.L.
13	0.29 ± 0.04	0.28 ± 0.15	0.01 ± 0.16
14	0.45 ± 0.06	0.28 ± 0.15	0.17 ± 0.16
15	0.37 ± 0.08	0.28 ± 0.15	0.09 ± 0.17
16	0.35 ± 0.07	0.28 ± 0.15	0.07 ± 0.17
17	0.62 ± 0.09	0.28 ± 0.15	0.34 ± 0.17

Combined error (propagation) calculations

#10 : $\sqrt{(0.09)^2 + (0.15)^2} = \sqrt{0.0081 + 0.0225} = 0.17$

#11 : $\sqrt{(0.13)^2 + (0.15)^2} = \sqrt{0.0169 + 0.0225} = 0.2$

#12 : $\sqrt{(0.07)^2 + (0.15)^2} = \sqrt{0.0049 + 0.0225} = 0.17$

#13 : $\sqrt{(0.04)^2 + (0.15)^2} = \sqrt{0.0016 + 0.0225} = 0.16$

#14 : $\sqrt{(0.06)^2 + (0.15)^2} = \sqrt{0.0036 + 0.0225} = 0.16$

#15 : $\sqrt{(0.08)^2 + (0.15)^2} = \sqrt{0.0064 + 0.0225} = 0.17$

#16 : $\sqrt{(0.07)^2 + (0.15)^2} = \sqrt{0.0049 + 0.0225} = 0.17$

#17 : $\sqrt{(0.09)^2 + (0.15)^2} = \sqrt{0.0081 + 0.0225} = 0.17$

LDL Calculations

Std Deviation of background (River Samples) = 1.07 c/m $\bar{x} = 8.51$

$$\frac{1.07 \text{ c/m/10 ml}}{(0.225)(10 \text{ ml})(2.22 \times 10^6)} = 2.14 \times 10^{-7} \text{ pci/ml} \quad \& \quad 1.645 = 3.52 \times 10^{-7} \text{ pci/ml}$$

↑ est $\bar{x}$ eff

1981 H_3O in water Data 1/22/82

Ponds (μCi/L) or (10^{-3} μCi/cc)

date	Pond 10	Pond 11	Pond 12	Pond 13	Pond 14	Pond 15	Pond 16	Pond 17	ENV LEVEL	BKg c/m
2/25/81		0.0003			0.0005	0.0007				6.7
		0.0003			0.0005	0.0005				
		0.0004			0.0005	0.0007				
		0.0003			0.0007	0.0005				
2/26/81			0.0002	0.0002				0.0006		6.7
			0.0002	0.0004				0.0008		
2/27/81	0.0004						0.0005			6.7
	0.0004						0.0005			
3/4/81	0.0005		0		0.0007		0.			8.9
	0.0007		0		0.0006		0.0001			
4/20/81				0.0004						6.7
				0.0004						
3/10/81		0.0001				0.0005				8.9
		0.0002				0.0004				
3/17/81				0.0002				0.0004	3/19/81 0.0001	8.9
				0.0002				0.0006	0	
4/27/81			0.0004						0	8.9
			0.0002						0	
4/28/81								0.0006		8.9
								0.0007		
4/30/81		0.0002								8.9
		0.0003								
5/4/81							0.0003			8.9
							0.0004			
5/5/81					0.0005	0.0002				8.9
					0.0002	0.0002				
5/22/81				0.0004				0.0007		8.9
				0.0002				0.0007		

5/27/81		0.0002			0.0004					6.1
		0.0002			0.0003					
6/9/81			0			0	0.0002			8.9
			0			0	0.0002			
6/12/81				0.0003				0.0007	~~5/24/81~~	8.9
				0.0003				0.0006	0.0004	
6/15/81		0.0003	0.0005						0.0102	6.7
		0.0003	0.0004						0.0003	
6/16/81	0.0002				0.0004		0.0004		0.0003	8.9
	0.0001				0.0004		0.0003			
	0.0003									
6/17/81						0.0003				8.9
						0.0004				
7/14/81				0.0002				0.0007	3rd qtr	8.9
				0.0003				0.0007	0.0001	
7/24/81		0.0002	0.0002				0.0004		0.0001	8.9
		0.0002	0.0002				0.0005		0	
7/27/81	0.0002								0.0001	6.7
	0.0002									
7/28/81					0.0005	0.0004				6.7
					0.0005	0.0004				
8/4/81		0.0007				0.0003	0.0004			8.9
		0.0006				0.0003	0.0005			
8/7/81								0.0004		8.9
								0.0004		
8/18/81	0.0004			0.0003						8.9
	0.0003			0.0003						
8/20/81					0.0005					6.7
					0.0006				4th qtr	
8/28/81			0.0003						0.0008	6.7
			0.0003						0.0005	
9/1/81	0.0003	0.0004							0.0007	6.7

	0.0004	0.0004							0.0008	
9/3/81			0.0004	0.0002	0.0004		0.0004	0.0004		6.7
			0.0003	0.0004	0.0004		0.0004	0.0004		
9/8/81						0.0004				8.9
						0.0002				
~~10/5/81~~	~~0.0047~~	~~0.0012~~		~~0.0009~~	~~0~~				~~NS*~~	~~12.3~~
	~~0.0043~~	~~0.0008~~							~~NS*~~	
~~10/6/81~~			~~0.0033~~			~~0.0101~~	~~0.0091~~	~~0.0001~~	~~NS*~~	~~8.9~~
			~~0.0135~~			~~0.011~~	~~0.0121~~	~~0~~	~~NS*~~	~~11.1~~
11/25/81			0.0002	0.0003			0.0004	0.0007		
			0.0003	0.0002			0.0004	0.0012		
11/30/81	0.0002	0.0014			0.0003	0.0005				
	0.0004	0.0004			0.0004					
12/3/81			0.0002		0.0002	0.0004	0.0003			
						0.0004				
12/4/81								0.0005		
12/8/81				0.0004						8.9
12/9/81	0									8.9

* INSTRUMENT PROBLEM N.S.

1982 TRITIUM IN SURFACE WATER (PONDS) - nCi/L or 10^{-7} µci/ml

date	10	11	12	13	14	15	16	17	E.L.	BKG (c/m)	cst EFF.
2/23/82	0.41 3/2	0.54 3/2	0.99 2/23	0.97 2/23	0.82 2/24	0.83 2/24	1.98 2/23	1.08 2/26	0.76 3/9	9.5	0.24
	0.41 3/2	0.75 3/5	2.3 2/23	0.75	0.95	0.92	1.86	1.02	0.76	9.3	
	0.41 3/7	0.94 3/5	2.41 2/23	0.93	0.82	1.07	0.56	1.34	0.83	9.2	
3/9/82	0.99 3/5	1.07 3/5	1.05 3/5	0.73 3/9	1.23 3/5	1.17 3/9	0.98 3/5	0.32 3/9	0.72	9.2	
4/14/82	0.68 4/14	0.85 4/14	0.78 4/14	0.83 4/14	1.76 4/14	0.72 4/16	0.73 4/26	1.29 4/14	0.44 4/26	9.3	
	0.77 5/4	0.76	0.59	0.75	1.64	0.93	0.91	1.18 4/15c	0.57	9.4	
	0.99	0.93 5/4	0.8 5/11	0.65 5/5	0.93 5/4	1.38 5/6	1.16 5/6		0.54	9.3	
5/11/82	0.91	1.07	1.09	0.79 5/5	1.09 5/4	1.41	1.1		0.53	9.3	
7/1/82	0.93 7/1	0.89 7/1	0.84 7/2	0.86 7/2	1.11 7/1	0.5 8/6	0.35 8/6	1.03 7/1	7/22 0.85	8.5	
	0.59 8/6	0.41 8/6	0.28 8/6	0.4 8/6	0.64 8/6	0.5 8/6	0.29 8/6	0.65 8/6	0.69	8.3	
8/6/82	0.43 8/6	0.5 8/6	0.46 8/6	0.46 8/6	0.47 8/6			0.64 8/6	0.88	8.3	
									0.84		
9/3/82	0.48 9/21	0.26 9/3	0.25 9/3	0.32 9/3	0.44 9/3	0.31 9/3	0.18 9/3	0.43 9/3		8.9	
	0.51 9/21	0.28 9/3	0.24 9/3	0.31 9/3	0.39 9/3	0.23 9/3	0.29 9/3	0.61 9/3		8.9	
	0.46 9/21	0.49 9/21		0.68 9/16	0.51 9/30	0.21 9/30	0.8 9/16	0.98 9/16		8.6	
10/29/82	0.35 11/1	0.16 11/1	0.3 10/29	0.27 10/29	0.37 11/1	0.32 11/1	0.47 10/29	0.47 10/29		8.7	
	0 11/1	0.39 11/1	0.31 10/29	0.37 10/29	0.41 11/1	0.52 11/1	0.21 10/29	0.59 10/29		8.7	
12/6/82	0.04 12/6	0.12 12/6	0 12/6	0.18 12/6	0.32 12/6	0.3 12/6	0.16 12/6	0.68 12/6		8.9	
	0.21 12/6	0.23 12/6	0.1 12/6	0.26 12/6	0.43 12/6	0.26 12/6	0.2 12/6	0.56 12/6		8.9	
12/9/82						0.48 12/9			0.02 12/9	9.1	
12/10/82							0.18 12/10	0.46 12/10	0.26 12/10	8.9	
12/14/82				0.01 12/14	0.62 12/15		0.13 12/16	0.51 12/16	0.14 12/10	8.8	
									0.1 12/10	8.9	
n	18	18	17	19	19	18	19	18	16	22	
$\bar{x}$	0.53	0.59	0.75	0.55	0.79	0.67	0.66	0.77	0.57	9.0	
S	0.3	0.32	0.69	0.28	0.43	0.4	0.56	0.32	0.29	0.34	
$S_{\bar{x}}$	0.07	0.08	0.17	0.07	0.1	0.09	0.13	0.08	0.07	0.07	

9/13/84

HTO IN SURFACE WATER - (10^{-6} µci/ml) Summary 1983

	#10	#11	#12	#13	#14	#15	#16	#17	E.L.
$\bar{Y}$	0.18	0.14	0.14	0.22	0.39	0.34	0.14	0.51	0.11
S	0.14	0.11	0.1	0.12	0.14	0.17	0.09	0.16	0.1
n	14	21	22	23	21	20	23	23	16
TSY	0.08	0.05	0.04	0.05	0.06	0.08	0.07	0.07	0.05

HTO IN SURFACE WATER (INCREMENTAL) (10^{-6} µci/ml)

	Net conc		E.L. (10^{-6} µci/ml)		Incremental conc $\pm \sqrt{(e_N)^2 + (e_{EL})^2}$
#10	= 0.18 ± 0.08	−	0.11 ± 0.05	=	0.07 ± 0.09
#11	= 0.14 ± 0.05	−		=	0.03 ± 0.07
#12	= 0.14 ± 0.04	−		=	0.03 ± 0.06
#13	= 0.22 ± 0.05	−		=	0.11 ± 0.07
#14	= 0.39 ± 0.06	−		=	0.28 ± 0.08
#15	= 0.34 ± 0.08	−		=	0.23 ± 0.09
#16	= 0.14 ± 0.07	−		=	0.03 ± 0.09
#17	= 0.51 ± 0.07	−		=	0.4 ± 0.09

Blank (C/M)	EFF
$\bar{X}$ = 7.5	$\bar{X}$ = 0.22
S = 0.46	S = 0.01
n = 29	n = 27

$$LDL = \frac{1.645 \cdot 0.46\ C/M}{(0.22)(2.22 \times 10^{6})} = 0.15 \times 10^{-6}\ \mu ci/ml \text{ @ } 95\%\ C.L.$$

3/10/84

1983 Tritium in Surface Water (Ponds) - nCi/l or (10^{-6} µci/ml)

date	#10	#11	#12	#13	#14	#15	#16	#17	E.L.	Bkg (c/m)	PST cpm
1/14	0.25	0.3	0.29	0.4	0.63	0.52	0.26	0.76		7.2	0.24
	0.27	0.2	0.32	0.38	0.47	0.59	0.35	0.68			
2/24		0.07	0.1			0.37	0.21			6.5	0.23
		0.09				0.55	0.03				
2/28	0.44			0.36	0.42			0.84		7.0	0.22
	0.4			0.39	0.69			0.71			
3/8	0.17	0.05								7.1	0.2
	0.18	0.01									
3/9			0.33	0.28				0.64		6.8	0.21
			0.17	0.28				0.71			
3/15									0.112	7.1	0.21
									0.067		
									0.006		
									0.04		
3/17							0			7.8	
							0				
3/25						0.43				6.9	0.2
						0.4					
4/20				0				0.47		7.6	0.2
				0.04				0.42			
4/26	0.02				0.53					7.6	0.21
	0.26				0.43						
4/27			0.22							7.6	0.21
			0.12								
4/28		0.32				0.46	0.1			7.6	0.19
		0.03				0.6	0.06				
5/23		0.04				0.33				7.6	0.24
		0.11				0.33					

date	#10	#11	#12	#13	#14	#15	#16	#17	EL	PEG (CA)	ST EFF.
5/25	0				0.31					7.6	0.24
	0.13				0.36						
5/27			0.06	0.09			0.16	0.4		7.6	0.23
			0.1	0.29			0.2	0.52			
6/10	0.23		0.18		0.45		0.21			7.1	0.21
	0.22		0.31		0.41		0.28				
6/14				0.32				0.54		7.3	0.22
				0.25				0.59			
7/25									0.19	7.1	0.23
									0.11		
									0.12		
									0.26		
7/27	0	0	0.07	0.21	0.32	0.2	0.16			8.2	0.22
	0	0.07	0.16	0.16	0.43	0.08	0.1				
8/5								0.51		8.3	0.2
								0.42			
8/20				0.28						8.3	0.2
				0.1							
9/15		0.1	0.09		0.23	0	0.09	0.39		7.4	0.22
		0.12	0.04		0.16	0	0.07	0.44			
		0.16	0.14	0.16	0.39		0.22	0.45			
9/21									0.1	7.7	0.23
									0.12		
									0.34		
									0.22		
10/7		0.36		0.27						6.9	0.23
		0.22		0.3							

date	#10	#11	#12	#13	#14	#15	#16	#17	E.L.	BKG g/m	EST EFF.
10/20									0	8.1	
									0		
									0		
									0		
11/7			0.02		0.38	0.35	0.07	0.24		7.8	0.21
			0		0.34	0.36	0.1	0.26			
11/10			0.07	0.06	0.1	0.3	0.08	0.32		7.8	0.21
			0	0.02	0.31	0.29	0.1	0.39			
11/21		0.22								7.9	0.24
		0.27									
11/30		0.07	0.1	0.16	0.44	0.25	0.24	0.49		7.3	0.23
		0.12	0.11	0.17	0.35	0.29	0.24	0.52			

1984 HTO in Surface Water (Ponds) nCi/L or (10^{-6} μCi/ml)

Date	#10	#11	#12	#13	#14	#15	#16	#17	E.L.	BKG (c/m)	SCT. EFF.
3/22–		3/21 0.006	3/22 0	3/22 0.201	3/23 0.853	3/23 0.153	3/29 0.152	3/26 0.263	3/30 0.443	8.7	0.29
3/30		0.022	0.13	0.162	0.844	0.201	0.155	0.344	0.404	8.5	0.28
		0	0	0.168	0.983	0.132	0.243	0.344	0.23	8.5	0.29
		0	0.131	0.061	0.963	0.154	0.212	0.267	0.376	9.1	0.29
										9.6	0.33
										9.3	0.29
										8.3	0.28
										9.3	0.21
4/3 –		4/3 0.4	4/3 0.298	4/9 0.329	4/13 0.975	4/11 0.549		4/10 0.67	4/13 0.374	8.7	0.22
4/13		0.354	0.514	0.246	0.844	0.502		0.7	0.288	8.8	0.23
		0.508	0.265	0.331	0874	0.46		0.72	0.3	9.0	0.23
		0.54	0.075	0.364	0.723	0.57		0.69	0.306	8.9	0.22
										9.1	0.21
										9.1	0.21
5/4 –	5/4 0.226									8.1	0.3
	0.259										
	0.217										
	0.247										
7/17		7/21 0.165	7/17 0.326	7/17 0.339	7/20 0.835	7/20 0.813	7/25 0.181	7/20 0.606		9.4	0.23
		0.078	0.324	0.43	0.626	0.621	0.171	0.495		8.6	0.22
		0.07	0.259	0.376	0.818	1.751	0.182	0.524		8.6	0.24
				0.307							
9/7		9/7 0	9/7 0.002	9/7 0	9/10 0.286	9/10 0.11	9/7 0	9/10 0.306		9.6	0.28
		0.018	0.12	0	0.245	0.119	0	0.272		8.7	0.28
		0.03	0	0	0.242	0.224		0.248			
			0								

1984 HTO in Surface Water (pondd) nCi/l or (10^{-6} µci/ml)

date	#10	#11	#12	#13	#14	#15	#16	#17	E.L.	Bkg c/m	est eff
11/1		0.34	0.22	0.32	0.47	0.39	0.24	0.42			
11/2									0		
									0.03		
									0		
									0.1		
									0.09		
12/1		0.33	0.08	0.17	0.42	0.28	0.28	0.28			
		0.25	0.14	0.22	0.34	0.35	0.24	0.35			
12/5		0.19	0.2	0.09	0.36	0.34	0.16	0.39			
		0.28	0.18	0.06	0.41	0.35	0.22	0.41			
12/14									0.11		
									0.19		
									0.07		
									0.27		
									0.23		
n =	4	19	20	20	19	19	14	19	18	20	20
$\bar{x}$ =	0.23	0.19	0.16	0.21	0.64	0.42	0.17	0.44	0.21	8.9	0.26
S =	0.02	0.18	0.14	0.14	0.27	0.38	0.08	0.17	0.14	0.42	
$TS_{\bar{x}}$ =	0.04	0.09	0.07	0.07	0.13	0.18	0.05	0.08	0.07		

$$LDL = \frac{0.42 \times 1.645}{10 \times 0.26 \times 2.22 \times 10^{6}} = 0.12 \times 10^{-6}\ \mu ci/ml \text{ @ 95\% C.C.}$$

1985

HTO IN SURFACE WATER
(nCi/L)

DATE	10	11	12	13	14	15
3/01/85		0.13	0.11	0.09	0.24	0.14
3/22/85		0.21	0.3	0.27	0.51	0.43
4/15/85						
5/24/85	0.03	0.07	0.13	0.06	0.33	0.26
6/28/85	0	0.08	0.06	0	0.19	0.15
8/12/85	0.39	0.18	0.39	0.2	0.3	0.15
8/12/85	0.24	0.3	0.32	0.13	0.25	0.1
8/12/85	0.3	0.21	0.14	0.1	0.22	0.12
10/23/85	0.17	0.15	0.09	0.2	0.42	0.4
10/23/85	0.24	0.17	0	0.22	0.47	0.37
10/23/85	0.11	0.16	0	0.3	0.38	0.23
N	8	10	10	10	10	10
AVERAGE	0.185	0.166	0.154	0.157	0.331	0.235
STD DEV	0.133844	0.066866	0.136479	0.096269	0.110398	0.124298
MINIMUM	0	0.07	0	0	0.19	0.1
MAXIMUM	0.39	0.3	0.39	0.3	0.51	0.43
STD ERROR	0.111914	0.047829	0.097624	0.068862	0.078968	0.088911

DATE	16	17	E.L.
3/01/85	0.11	0.3	
3/22/85	0.25	0.5	
3/27/85			
3/27/85			
3/27/85			
3/27/85			
4/15/85			
4/23/85			
4/23/85			
4/23/85			
4/23/85			
5/24/85	0.03	0.37	
6/27/85			0
6/27/85			0
6/27/85			0
6/27/85			0
6/28/85	0	0.14	
7/10/85			0.07
7/10/85			0.11
7/10/85			0.11
7/10/85			0.04
8/12/85	0.08	0.31	
8/12/85	0.12	0.24	
8/12/85	0.17	0.29	
10/16/85			0.27
10/16/85			0.15
10/16/85			0.2
10/16/85			0.25
10/23/85	0.03	0.33	
10/23/85	0.04	0.38	
10/23/85	0.03	0.28	
N	10	10	12
AVERAGE	0.086	0.314	0.1
STD DEV	0.077917	0.094304	0.099361
MINIMUM	0	0.14	0
MAXIMUM	0.25	0.5	0.27
STD ERROR	0.055734	0.067456	0.063131

1986 HTO IN SURFACE WATER
(nCi/L)

DATE	10	11	12	13	14	15	16	17	E.L.
3/20/86	0.2		0	0.15					
3/20/86	0.13		0	0.19					
3/20/86	0.13		0.08	0.29					
3/20/86	0.27		0	0.2					
3/24/86							0.1	0.4	
3/24/86							0.22	0.29	
3/24/86							0.12	0.31	
3/24/86							0.16	0.42	
3/26/86									0.14
3/26/86									0.02
3/26/86									0
3/26/86									0.17
3/28/86						0.23			
3/28/86						0.26			
3/28/86						0.32			
3/28/86						0.33			
3/31/86		0.08			0.45				
3/31/86		0.17			0.34				
3/31/86		0.06			0.45				
3/31/86					0.29				
6/10/86	0.13								
6/10/86	0.11								
6/10/86	0.15								
6/10/86	0.1								
6/16/86							0.14		
6/16/86							0.22		
6/16/86							0.14		
6/16/86							0.06		
6/18/86				0.16					
6/18/86				0.12					
6/18/86				0.11					
6/18/86				0.12					
6/19/86								0.39	
6/19/86								0.29	
6/19/86								0.37	
6/19/86								0.43	
6/25/86									0.01
6/25/86									0
6/25/86									0
6/25/86									0
6/26/86			0						
6/26/86			0.12						
6/26/86			0						
6/26/86			0						
6/27/86		0.19							
6/27/86		0.18							
6/27/86		0.05							
6/27/86		0.03							
8/1/86					0.28				
8/1/86					0.32				
8/1/86					0.31				
8/1/86					0.34				
8/21/86						0.12			
8/21/86						0.15			
8/21/86						0.22			
8/21/86						0.2			
9/4/86		0.04							
9/4/86		0.02							

9/4/86		0							
9/4/86		0							
9/8/86					0.06	0			
9/8/86					0	0			
9/8/86					0.02	0			
9/8/86					0	0			
9/11/86			0.04	0.08					
9/11/86			0.03	0.22					
9/11/86			0.05	0.25					
9/11/86			0.13	0.1					
9/12/86							0		
9/12/86							0		
9/12/86							0		
9/12/86							0		
9/17/86								0.41	
9/17/86								0.31	
9/17/86								0.32	
9/17/86								0.37	
11/19/86		0							
11/19/86		0							
11/19/86		0							
11/19/86		0							
11/25/86								0.32	
11/25/86								0.26	
11/25/86								0.25	
11/25/86								0.22	
12/1/86						0.08			
12/1/86						0.1			
12/1/86						0.12			
12/1/86						0.1			
12/8/86			0	0.14			0		
12/8/86			0	0.2			0		
12/8/86			0	0.14			0		
12/8/86			0	0.18			0		
12/18/86									0.06
12/18/86									0.01
12/18/86									0.06
12/18/86									0.21
	10	11	12	13	14	15	16	17	E
N	8	15	16	16	12	16	16	16	12
AVERAGE	0.15	0.05	0.03	0.17	0.24	0.14	0.07	0.34	0.06
STD DEV	0.06	0.07	0.04	0.06	0.17	0.11	0.08	0.07	0.07
MINIMUM	0.10	0.00	0.00	0.08	0.00	0.00	0.00	0.22	0.00
MAXIMUM	0.27	0.19	0.13	0.29	0.45	0.33	0.22	0.43	0.21
STD ERROR	0.05	0.04	0.02	0.03	0.11	0.06	0.04	0.03	0.05

1987 HTO IN SURFACE WATER
(nCi/L)

DATE	10	11	12	13	14	15	16	17	E.L.
1/15/87									0
1/15/87									0
1/15/87									0
1/15/87									0
2/23/87								0.34	
2/23/87								0.31	
2/23/87								0.43	
2/23/87								0.24	
3/18/87		0	0	0	0.11	0.04			
3/18/87		0.06	0.01	0	0.11	0.19			
3/18/87		0.02	0	0.009	0.05	0.16			
3/18/87		0.07	0	0.03	0.12	0.02			
3/31/87							0		
3/31/87							0		
3/31/87							0.09		
3/31/87							0		
4/24/87									0
4/24/87									0
4/24/87									0.1
4/24/87									0
5/22/87		0.05	0.02	0.08	0.03		0	0.06	
7/20/87		0	0	0	0	0	0	0	0
10/22/87		0.87	0.62	0	0.51	0.71	0	0.36	0.87
N		7	7	7	7	6	7	7	10
AVERAGE		0.15	0.09	0.02	0.13	0.19	0.01	0.25	0.10
STD DEV		0.32	0.23	0.03	0.17	0.27	0.03	0.16	0.27
MINIMUM		0	0	0	0	0	0	0	0
MAXIMUM		0.87	0.62	0.08	0.51	0.71	0.09	0.43	0.87
STD ERROR		0.29	0.21	0.03	0.16	0.28	0.03	0.15	0.19

1988 HTO IN SURFACE WATER
(nCi/L)

DATE	11	12	13	14	15	16	17	E.L.
1ST QTR	0.17	0.06	0.15	0.2	0.2	0.13	0.31	0
2ND QTR	0.14	0.03	0.03	0.2	0.23	0.06	0.14	0.06
3RD QTR	0.1	-0.003	-0.01	-0.02	-0.005	-0.13	0.01	-0.05
4TH QTR	0.89	0.18	0.19	0.2	-0.02	0.02	0.19	0.07
N	4	4	4	4	4	4	4	4
AVERAGE	0.33	0.07	0.09	0.15	0.10	0.02	0.16	0.02
STD DEV	0.38	0.08	0.10	0.11	0.13	0.11	0.12	0.06
MINIMUM	0.1	-0.003	-0.01	-0.02	-0.02	-0.13	0.01	-0.05
MAXIMUM	0.89	0.18	0.19	0.2	0.23	0.13	0.31	0.07
STD ERROR	0.60	0.13	0.15	0.18	0.21	0.17	0.20	0.09

1989 HTO IN SURFACE WATER
(nCi/L)

DATE	11	12	13	14	15	16	17	E.L.
1ST QTR (2/2/89)	0.11	0.11	0.2	0.26	0.19	0.08	0.26	0.02
2ND QTR (6/30/89)	0.05	0.02	-0.005	0.02	0.08	-0.25	0.18	-0.08
3RD QTR (9/13/89)	-0.15	-0.05	-0.03	0.16	-0.11	-0.14	-0.04	-0.03
4TH QTR (10/30/89)	0.05	0.07	0.08	0.2	-0.21	0.08	0.17	0.04
N	4	4	4	4	4	4	4	4
AVERAGE	0.02	0.04	0.06	0.16	-0.01	-0.06	0.14	-0.01
STD DEV	0.11	0.07	0.10	0.10	0.18	0.17	0.13	0.05
MINIMUM	-0.15	-0.05	-0.03	0.02	-0.21	-0.25	-0.04	-0.075
MAXIMUM	0.11	0.11	0.2	0.26	0.19	0.08	0.255	0.04
STD ERROR	0.18	0.11	0.17	0.16	0.29	0.26	0.20	0.08

APPENDIX D

DATA COMPILATION SHEETS

FROM 1975 THROUGH 1989 FOR PLUTONIUM-238 IN THE

GREAT MIAMI RIVER

1989 PLUTONIUM-238 IN RIVER WATER (fCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
JAN	0.55	0.98	0.70	4.20	1.08	3.61
FEB	-0.76	0.18	-0.53	-0.22	-3.05	-2.58
MAR	0.90	1.71	1.33	2.48	0.18	1.00
APR	5.23	5.03	2.90	4.98	4.58	3.80
MAY	-0.13	1.05	0.73	-0.24	0.45	0.37
JUN	-3.25	11.30	7.93	6.80	6.11	5.10
JUL	0.29	1.53	2.78	0.70	0.30	-1.83
AUG	1.72	1.10	-0.05	4.15	2.45	1.78
SEP	1.38	5.05	-1.35	5.88	8.75	3.10
OCT	-7.13	0.77	-0.70	-5.30	-4.63	-14.93
NOV	3.85	1.88	3.10	4.77	1.40	0.53
DEC	4.83	2.60	1.53	4.50	0.40	2.20
N	12	12	12	12	12	12
AVERAGE	0.62	2.76	1.53	2.72	1.50	0.18
STD DEV	3.42	3.11	2.49	3.43	3.67	5.26
MINIMUM	-7.13	0.18	-1.35	-5.30	-4.63	-14.93
MAXIMUM	5.23	11.30	7.93	6.80	8.75	5.10
STD ERROR	2.17	1.97	1.58	2.18	2.33	3.34
INCREMENTAL CONCENTRATION						
AVERAGE	0.44	2.58	1.35	2.54	1.32	
MINIMUM	-7.31	-0.01	-1.53	-5.48	-4.81	
MAXIMUM	5.04	11.12	7.74	6.62	8.57	
STD ERROR	3.99	3.88	3.70	3.99	4.08	

1988 PLUTONIUM-238 IN RIVER WATER (fCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
JAN	-2.68	5.48	4.08	8.45	1.28	1.78
FEB	1.15	-3.03	-0.20	0.37	-0.80	0.95
MAR	-4.85	-3.32	-1.05	-2.35	-3.85	-4.43
APR	10.38	8.38	8.65	11.80	6.90	8.38
MAY	-5.75	-5.65	-7.23	-6.38	-0.38	-5.55
JUN	-2.55	1.47	3.49	7.48	-0.60	-2.47
JUL	3.50	-0.01	2.85	-2.73	-0.58	-2.73
AUG	4.18	-0.83	0.11	3.00	2.33	3.80
SEP	5.15	-0.22	0.07	6.15	3.48	-1.65
OCT	0.53	6.90	1.38	5.00	0.85	4.30
NOV	-3.14	-0.85	-0.12	-0.20	-2.13	-3.73
DEC	-6.58	-6.01	3.23	-15.45	-1.22	-9.23
N	12	12	12	12	12	12
AVERAGE	-0.06	0.19	1.27	1.26	0.44	-0.88
STD DEV	5.12	4.66	3.79	7.46	2.82	4.89
MINIMUM	-6.58	-6.01	-7.23	-15.45	-3.85	-9.23
MAXIMUM	10.38	8.38	8.65	11.80	6.90	8.38
STD ERROR	3.26	2.96	2.41	4.74	1.79	3.11
INCREMENTAL CONCENTRATION						
AVERAGE	0.83	1.07	2.15	2.14	1.32	
MINIMUM	-5.69	-5.13	-6.34	-14.57	-2.97	
MAXIMUM	11.26	9.26	9.53	12.68	7.78	
STD ERROR	4.50	4.29	3.93	5.67	3.59	

1987 PLUTONIUM-238 IN RIVER WATER (fCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
1ST QTR	3.09	4.15	-1.05	2.6	0.43	0.07
APR	8.6	3.13	-2.18	9.78	0.48	3.95
MAY	3.6	6.63	2.63	-0.90	-0.73	-0.45
JUN	1.2	0.67	-0.55	0.41	2.08	0.75
JUL	0.95	0.20	2.98	1.70	0.03	-0.33
AUG	-1.78	0.55	0.18	-0.93	0.93	-1.28
SEP	-0.48	-2.74	0.02	-0.63	-0.75	-1.70
OCT	-0.62	-2.35	1.03	-0.27	2.61	-1.10
NOV	-6.81	-2.90	-4.60	11.73	-3.82	-5.55
DEC	2.68	-1.79	1.00	3.30	-0.15	0.80
N	10	10	10	10	10	10
AVERAGE	1.38	1.15	-0.22	2.67	0.16	-0.39
STD DEV	4.02	3.22	2.24	4.52	1.76	2.39
MINIMUM	-6.81	-2.90	-4.60	-0.93	-3.82	-5.55
MAXIMUM	8.60	6.63	2.98	11.73	2.61	3.95
STD ERROR	2.87	2.30	1.60	3.24	1.26	1.71
INCREMENTAL CONCENTRATION						
AVERAGE	1.77	1.54	0.17	3.06	0.55	
MINIMUM	-6.42	-2.51	-4.21	-0.54	-3.44	
MAXIMUM	8.99	7.01	3.36	12.11	3.00	
STD ERROR	3.34	2.87	2.34	3.66	2.12	

1986 PLUTONIUM-238 IN RIVER WATER (fCi/L)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1						
2	1.98	4.23	4.38	3.68	8.58	2.68
3	2.40	-0.62	3.15	0.43	2.10	-2.98
4	5.55	2.60	1.80	2.50	2.70	3.00
N	3	3	3	3	3	3
AVERAGE	3.31	2.07	3.11	2.20	4.46	0.90
STD DEV	1.95	2.47	1.29	1.65	3.58	3.36
MINIMUM	1.98	-0.62	1.80	0.43	2.10	-2.98
MAXIMUM	5.55	4.23	4.38	3.68	8.58	3.00
STD ERROR	4.85	6.13	3.20	4.09	8.89	8.35
INCREMENTAL CONCENTRATION						
AVERAGE	2.41	1.17	2.21	1.30	3.56	
MINIMUM	1.08	-1.53	0.90	-0.47	1.20	
MAXIMUM	4.65	3.32	3.48	2.78	7.68	
STD ERROR	9.65	10.36	8.94	9.29	12.19	

1985 PLUTONIUM-238 IN RIVER WATER (fCi/L)

QTR	R-1	R-2	R-3	R-4	R-5	E.L.
1	0.5	0.6	0.5	1.3	0.4	0.7
2	2.1	2.4	3.9	2.9	1.8	0.6
3	8.5	1.6	8.9	3.2	4.2	0.4
4	0.6	-1.6	0.4	0.7	2	-0.7

N	4	4	4	4	4	4
AVERAGE	2.925	0.75	3.425	2.025	2.1	0.25
STD DEV	3.788029	1.731088	3.996143	1.214838	1.570562	0.645497
MINIMUM	0.5	-1.6	0.4	0.7	0.4	-0.7
MAXIMUM	8.5	2.4	8.9	3.2	4.2	0.7
STD ERROR	6.026754	2.754161	6.357865	1.932808	2.498764	1.026986

INCREMENTAL CONCENTRATION						
AVERAGE	2.675	0.5	3.175	1.775	1.85	0
MINIMUM	0.25	-1.85	0.15	0.45	0.15	
MAXIMUM	8.25	2.15	8.65	2.95	3.95	
STD ERROR	6.113630	2.939405	6.440275	2.188709	2.701578	

1984 Pu-238 in River Water 1/22/85

Gross (pCi/L)

Qtr	#1	#2	#3	#4	#5	E.L.	Blank
1	0.0016	0.0017	0.0018	0.0042	0.0021	N.S.	0.0003
2	0.0062	0.0034	0.0024	0.0019	0.0024	N.S.	0.0001
3	0.0007	0.0013	0.0008	0.0007	0.0005	0.0003	0.0003
4	0.0007	0.0007	0.0006	0.0008	0.0007	0.001	0.0003
$\bar{X}$	.0023	.0018	.0014	.0019	.0014		$\bar{X}$ = 0.0003
							S = 0.0001

Net (pCi/L) Blank Subtracted

Qtr	#1	#2	#3	#4	#5	E.L.
1	0.0013	0.0014	0.0015	0.0039	0.0018	N.S
2	0.0059	0.0031	0.0021	0.0016	0.0021	N.S
3	0.0004	0.0010	0.0005	0.0004	0.0002	0
4	0.0004	0.0004	0.0003	0.0005	0.0004	0.0007
$\bar{X}$ =	0.002	0.0015	0.0011	0.0016	0.0011	0.0004
S =	0.0026	0.0012	0.0008	0.0016	0.001	0.0005
n =	4	4	4	4	4	2
tS_F =	0.0041	0.0019	0.0013	0.0025	0.0016	0.0045

LDL = 1.645 · 0.0001 = 0.00016 pCi/L

1983 Pu-238 — River water 2/2/84

Gross (pCi/L)

QTR	#1	#2	#3	#4	#5	E.L.	BLANK
1	0.0004	0.0011	0.0026	0.0016	0.0013	0.0017	0.0001
2	0.0018	0.0026	0.0031	0.002	0.0006	0.0016	0.0001
3	0.0021	0.0023	0.0016	0.0014	0.0024	0.0018	0
4	0.001	0.0012	0.0017	0.0021	0.0015	N.S.	0.0001
	.0013	.0018	.0023	.0018	.0015		

$\bar{x}$ = 0.00008 (0.0001)
S = 0.0001

NET (pCi/L) Blank Subtracted

QTR	#1	#2	#3	#4	#5	E.L.
1	0.0003	0.001	0.0025	0.0015	0.0012	0.0016
2	0.0017	0.0025	0.003	0.0019	0.0005	0.0015
3	0.002	0.0022	0.0015	0.0013	0.0023	0.0017
4	0.0009	0.0011	0.0016	0.002	0.0014	N.S.
$\bar{x}$ =	0.0012	0.0017	0.0022	0.0017	0.0014	0.0016
S =	0.0008	0.0008	0.0007	0.0003	0.0007	0.0001
n =	4	4	4	4	4	
$TS_{\bar{x}}$ =	0.0013	0.0013	0.0011	0.0005	0.0011	0.0002

LDL = 1.645 · 0.0001 = 0.0002 pCi/L

1982 Plutonium-238 IN River water - pCi/L 1/13/83 8

(10^{-9} µci/ml)

(gross value)

date	#1	#2	#3	#4	#5	E.L.	BLANK
1st QTR	0.0017	0.0014	0.0019	0.0038	0.0022	0.001	0.001
2nd QTR	0.0019	0.0015	0.0016	0.0031	0.0014	0.001	0.0005
3rd QTR	0.0018	0.0040	0.2206*	0.0044	0.0038	0.001	0.001
4th QTR	0.0015	0.0018	0.0143	0.0034	0.0026	0.003	0.0007
$\bar{X}$ =	.0017	.0022	.0059	.0042	.0025		

(NET value) (10^{-9} µci/ml) Blank Subtracted

date	#1	#2	#3	#4	#5	E.L.
1st QTR	0.0007	0.0004	0.0009	0.0028	0.0012	0
2nd QTR	0.0014	0.001	0.0010	0.0026	0.0009	0.0005
3rd QTR	0.0008	0.003	N.S.	0.0054	0.0028	0
4th QTR	0.0008	0.0011	0.0136	0.0027	0.0019	0.0023

(10^{-12} µci/ml)

	#1	#2	#3	#4	#5	E.L.	BLANK
n	4	4	3	4	4	4	4
$\bar{X}$	0.93	1.38	5.2	3.38	1.7	0.7	0.8
S	0.32	1.13	7.28	1.35	0.84	1.09	0.24
$S_{\bar{X}}$	0.16	0.56	4.2	0.68	0.42	0.55	0.12
$tS_{\bar{X}}$	0.51	1.78	18.1	2.16	1.34	1.75	

Pu-238 River Summary

Sample	Conc. (10^{-12} µci/ml ± $tS_{\bar{X}}$ @ 95% CL)		E.L. (10^{-12} µci/ml ± $tS_{\bar{X}}$ @ 95% CL)	Net Ingrowth (10^{-12} µci/ml) ± $\sqrt{(tS_{\bar{X}})^2 + (tS_{\bar{X}})^2}$
#1	0.93 ± 0.51	-	0.7 ± 1.75	0.23 ± 1.8
#2	1.38 ± 1.78	-	0.7 ± 1.75	0.68 ± 1.9
#3	5.2 ± 18.1	-	0.7 ± 1.75	4.5 ± 18
#4	3.38 ± 2.16	-	0.7 ± 1.75	2.7 ± 2.3
#5	1.7 ± 1.34	-	0.7 ± 1.75	1.0 ± 1.5

LDL Pu-238 River = 0.24×10^{-12} µci/ml × 1.645 = 0.4×10^{-12} µci/ml

* Apparently due to silt contained in water. (LCH) — Disregard as outlier

1981 Plutonium in River Water - pCi/L 1/26/82 9

Gross Value (10^{-9} µci/ml)

date	#1	#2	#3	#4	#5	E.L.	BLANK
1st QTR	0.0017	0.0013	0.0005	0.0044	0.0015	0.0011	0.0014
2nd QTR	0.0193	0.0127	0.0038	0.0078	0.0021	0.0052	0.0011
3rd QTR	0.0034	0.0041	0.0046	0.0056	0.0026	0.0041	0.0014
4th QTR	0.0013	0.0034	0.002	0.0024	0.0014	0.0018	0.0009
	$\bar{X}$ = .0064	.0054	.0027	.0051	.0019		0.0003
							$\bar{X}$ = 0.0006

Con 4th Qtr

NET Values (10^{-9} µci/ml) Blank Subtracted

Date	#1	#2	#3	#4	#5	E.L.
1st QTR	0.0003	-0.0001	-0.0009	0.003	0.0001	-0.0003
2nd QTR	0.0182	0.0116	0.0027	0.0067	0.001	0.0041
3rd QTR	0.002	0.0027	0.0032	0.0042	0.0012	0.0027
4th QTR	0.0007	0.0028	0.0014	0.0018	0.0008	0.0012

Pu-238 in River Summary

Sample	conc (10^{-12} µci/ml)	E.L. (10^{-12} µci/ml)	Month Impact (10^{-12} µci)
#1	5.3 ± 13.7	1.9 ± 3.0	3.4 ± 14
#2	4.3 ± 8.0	1.9 ± 3.0	2.4 ± 8.4
#3	1.6 ± 2.9	1.9 ± 3.0	E.L.
#4	3.9 ± 3.3	1.9 ± 3.0	2.0 ± 4.5
#5	0.8 ± 0.8	1.9 ± 3.0	E.L.

Error Propagation For River Samples

#1 : $\sqrt{(13.7)^2 + (3)^2} = \sqrt{188 + 9} = 14$

#2 : $\sqrt{(8)^2 + (3)^2} = \sqrt{64 + 9} = 8.4$

#3 : $\sqrt{(3.3)^2 + (3)^2} = \sqrt{11 + 9} = 4.5$

LDL = $0.5 \times 10^{-12} \cdot 1.645 = 0.8 \times 10^{-12}$ µci/ml

Pu-238 in River Water 1980 -2- ($\times 10^{-10}$ pci/ml)

	Gross Sample	Blank	Net Concentration	Environmental Level	Increment Result
1st qtr	0.090	0.006	0.084		
2nd qtr	0.142	0.010	0.132		
3rd qtr	0.125	0.014	0.111		
4th qtr	0.101	0.017	0.084		
$\bar{X}$			0.103	0.013	0.090
S			0.023		
n			4		
$S_{\bar{X}}$			0.037	0.022	0.043
MIN					0.071
MAX					0.119
± 5					
1st qtr	0.027	0.006	0.021		
2nd qtr	0.041	0.010	0.031		
3rd qtr	0.034	0.014	0.020		
4th qtr	0.017	0.017	0		
$\bar{X}$			0.018	0.013	0.005
S			0.013		
n			4		
$S_{\bar{X}}$			0.021	0.022	0.031
MIN					E.L.
MAX					0.018
INTERMEDIATE CUBE					
1st qtr	0.040	0.006	0.034		
2nd qtr	0.021	0.010	0.011		
3rd qtr	0.017	0.014	0.003		
4th qtr	0.022	0.017	0.005		
$\bar{X}$			0.013		
S			0.014		
n			4		
$S_{\bar{X}}$			0.022		

Pu-238 in River Water ($\times 10^{-10}$ µci/ml) 1980 7/23/5

	#1 (Gross Sample)	Blank	Net Concentration	Environmental Level	Incremental Result
1st qtr	0.147	0.006	0.141		
2nd qtr	0.051	0.010	0.041		
3rd qtr	0.086	0.014	0.072		
4th qtr	0.036	0.017	0.019		
$\bar{X}$			0.068	0.013	0.055
S			0.053		
n			4		
$S_{\bar{X}}$			0.084	0.022	0.087
MIN					0.006
MAX					0.128
#2					
1st qtr	0.057	0.006	0.051		
2nd qtr	0.046	0.010	0.036		
3rd qtr	0.006	0.014	-0.008		
4th qtr	0.029	0.017	0.012		
$\bar{X}$			0.023	0.013	0.010
S			0.026		
n			4		
$S_{\bar{X}}$			0.041	0.022	0.047
MIN					E.L.
MAX					0.038
#3					
1st qtr	0.028	0.006	0.022		
2nd qtr	0.073	0.010	0.063		
3rd qtr	0.027	0.014	0.013		
4th qtr	0.022	0.017	0.005		
$\bar{X}$			0.026	0.013	0.013
S			0.026		
n			4		
$S_{\bar{X}}$			0.041	0.022	0.047
MIN					E.L.
MAX					0.05

Pu-238 Results in River Samples (Water) 1979 2/4/80

Date	#1		#2		#3		#4		#5	
Quarter	Conc $\times 10^{-9}$ µci/cc	Volume Liters	Conc $\times 10^{-9}$ µci/cc	Volume Liters	Conc $\times 10^{-9}$ µci/cc	Volume Liters	Conc $\times 10^{-9}$ µci/cc	Volume Liters	Conc $\times 10^{-9}$ µci/cc	Volume Liters
1st	0.0037	32	0.0021	32	0.0083	32	0.0101	32	0.0177	32
2nd	0.0090	30	0.0058	30	0.0075	30	0.0179	30	0.0125	30
3rd	0.0040	30	0.0045	30	0.0045	30	0.0094	30	0.0045	30
4th	0.0041	30	0.0020	27	0.0090	30	0.0132	27	0.0045	26
$\bar{X}$	0.0052	30.5	0.0036	29.8	0.0072	30.5	0.0102	29.8	0.0098	29.5
S	0.0025		0.0019		0.0022		0.0060		0.0065	
$S_{\bar{X}}$	0.00125		0.00095		0.0011		0.0030		0.0033	
$\pm S_{\bar{X}}$	0.0040		0.0030		0.0035		0.0095		0.0103	

Environmental Level for

Date	Conc $\times 10^{-9}$ µci/cc	Volume Liters
1st	—	—
2nd	0.0024	30
3rd	0.0031	30
4th	0.0045	30
$\bar{X}$	0.0033	30
S	0.0011	
$S_{\bar{X}}$	0.00064	
$\pm S_{\bar{X}}$	0.0027	

LDL: Pu-238 = $\frac{0.0279 \times 10^{-6}\ \mu ci}{30 \times 10^{3}\ cc} = 0.00093 \times 10^{-9}\ \mu ci/cc$

LDL = 0.0091×10^{-10} µci/cc

.03

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1918

* use counting statistics for table only 2 samples

Pu-238 in River Water - pCi/L (E.L. = 7×10^{-13} μCi/ml) 2/28/79

~~#1~~ → No. 2	~~#2~~ → No. 3	~~#3~~ → No. 4	~~#4~~ → No. 5	~~#5~~ → No. 1
.0184 ± .0071	.0173 ± .0015	.0431 ± .0021	< .0137 ± .0001	.0591 ± .0026
< .0137 ± .0011	< .0137 ± .0009	< .0137 ± .0070	< .0137 ± .0007	< .0137 ± .0005
$\bar{X}$ = < .0161 ± .0097	< .0155 ± .0012	< .0284 ± .0048	< .0137 ± .0004	< .0364 ± .0016
S = .0033	.0025	.0208		.0321
N = 2	2	2		2
$S_{\bar{Y}}$ = .0023	.0018	.0147		.0227
$tS_{\bar{Y}}$ = .0292	.0229	.1867		.2853
= < .161 $\times 10^{-10}$ μci/ml ± .0041	= < .155 $\times 10^{-10}$ μci/ml ± .0012	= .284 $\times 10^{-10}$ μci/ml ± .0046	= < LDL	= .364 $\times 10^{-10}$ μci/ml ± .0016

pCi/L $\times 10^{-6}$ μci/μl = 1×10^{-6} μci/L $\times 10^{-3}$ L/ml = 1×10^{-9} μci/ml

1977 Pu-238 in River Data (μCi/cc)

	R-1	R-2	R-3	R-4	R-5
1st half	$<1.0 \times 10^{-11}$	$<1.0 \times 10^{-11}$	1.6×10^{-11}	15.0×10^{-11}	$<1.0 \times 10^{-11}$
2nd half	$<1.0 \times 10^{-11}$	2.14×10^{-11}	2.33×10^{-11}	$<1.0 \times 10^{-11}$	$<1.0 \times 10^{-11}$

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Plutonium-238 in River Water (Silt filtered and excluded) 2nd half 1976 — 3/11/77

Location	Result	Result	Total Result	Volume	Volume	Total Volume	Actual Average Concentration
#1	.1221 pci	.1056	.2277 pci	19,025 ml	16,797 ml	35,822 ml	
#2	.4850 pci	.2999	.7849 pci	21,468	20,544	42,012 ml	
#3	.1194 pci	<.0219	<.1413 pci	19,493	19,563	39,056 ml	
#4	.2336 pci	.2086	.4422 pci	22,180	21,152	43,332 ml	
#5	.0942 pci	.1459	.2401 pci	21,891	22,181	44,072 ml	

#1 $\frac{.2277 \times 10^{-6}\ \mu ci}{3.5822 \times 10^{4}\ ml} = .0636 \times 10^{-10}\ \mu ci/ml$

#2 $\frac{.7849 \times 10^{-6}\ \mu ci}{4.2012 \times 10^{4}\ ml} = .1868 \times 10^{-10}\ \mu ci/ml$

#3 $\frac{<.1413 \times 10^{-6}\ \mu ci}{3.9056 \times 10^{4}\ ml} = <.0362 \times 10^{-10}\ \mu ci/ml$

#4 $\frac{.4422 \times 10^{-6}\ \mu ci}{4.3332 \times 10^{4}\ ml} = .1020 \times 10^{-10}\ \mu ci/ml$

#5 $\frac{.2401 \times 10^{-6}\ \mu ci}{4.4072 \times 10^{4}\ ml} = .0545 \times 10^{-10}\ \mu ci/ml$

1975 Pu-238 in River Water (pCi/L)

	R-1	R-2	R-3	R-4	R-5
1ST HALF	0.0225	0.0321	0.0234	0.0794	0.042
2ND HALF	0.0147	0.0352	—	0.0252	0.005

APPENDIX E

DATA COMPILATION SHEETS

FROM 1976 THROUGH 1989 FOR PLUTONIUM-238 IN THE

GREAT MIAMI RIVER SILT

1989 PLUTONIUM-238 IN RIVER WATER SILT (fCi/G)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1	1.44	65.44	76.15	228.14	11.75	
2	1.22	47.78	97.17	4.84	4.23	-1.26
3	2.42	19.51	35.61	112.15	23.61	0.28
4	0.96	14.93	80.95	85.38	9.90	-7.03
N	4	4	4	4	4	3
AVERAGE	1.51	36.91	72.47	107.63	12.37	-2.67
STD DEV	0.64	23.93	26.17	92.39	8.15	3.86
MINIMUM	0.96	14.93	35.61	4.84	4.23	-7.03
MAXIMUM	2.42	65.44	97.17	228.14	23.61	0.28
STD ERROR	1.02	38.07	41.63	146.98	12.96	9.58
INCREMENTAL CONCENTRATION						
AVERAGE	4.18	39.58	75.14	110.30	15.04	
MINIMUM	3.63	17.60	38.28	7.51	6.90	
MAXIMUM	5.09	68.11	99.84	230.81	26.28	
STD ERROR	9.64	39.26	42.72	147.30	16.12	

1988 PLUTONIUM-238 IN RIVER WATER SILT (fCi/G)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1	1.49	63.19	100.98	1209.65		
2	15.46	30.95	202.12	1465.04	7.47	7.43
3	-1.27	73.20	193.32	537.80	10.57	-0.72
4	1.79	100.17	361.95	686.91	5.18	-0.13
N	4	4	4	4	3	3
AVERAGE	4.37	66.88	214.59	974.85	7.74	2.19
STD DEV	7.52	28.59	108.37	435.64	2.71	4.54
MINIMUM	-1.27	30.95	100.98	537.80	5.18	-0.72
MAXIMUM	15.46	100.17	361.95	1465.04	10.57	7.43
STD ERROR	11.97	45.49	172.41	693.10	4.97	8.35
INCREMENTAL CONCENTRATION						
AVERAGE	2.18	64.68	212.40	972.66	5.55	
MINIMUM	-3.46	28.75	98.78	535.61	2.99	
MAXIMUM	13.27	97.98	359.75	1462.85	8.38	
STD ERROR	14.60	46.25	172.61	693.15	9.72	

1987 PLUTONIUM-238 IN RIVER WATER SILT (fCi/G)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1	0.72	21.35	59.73	135.29	7.81	1.15
2	0.46	21.54	34.10	2257.68	13.22	-0.16
3	29.42	0.10	15.49	142.30	55.77	0.51
4	0.42	45.94	40.32	132.96	23.09	-0.01
N	4	4	4	4	4	4
AVERAGE	7.75	22.23	37.41	667.06	24.98	0.37
STD DEV	14.45	18.74	18.24	1060.43	21.48	0.59
MINIMUM	0.42	0.10	15.49	132.96	7.81	-0.16
MAXIMUM	29.42	45.94	59.73	2257.68	55.77	1.15
STD ERROR	22.98	29.81	29.02	1687.14	34.18	0.94
INCREMENTAL CONCENTRATION						
AVERAGE	7.38	21.86	37.04	666.68	24.60	
MINIMUM	0.04	-0.27	15.12	132.58	7.44	
MAXIMUM	29.05	45.57	59.36	2257.31	55.40	
STD ERROR	23.00	29.82	29.04	1687.14	34.19	

1986 PLUTONIUM-238 IN RIVER WATER SILT (fCi/L)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1						
2	5.16	26.91		280.39	9.24	1.20
3	0.40	28.33	61.70	535.31	13.49	0.29
4	0.20	11.53	24.69	92.70	18.03	0.16
N	3	3	2	3	3	3
AVERAGE	1.92	22.26	43.20	302.80	13.58	0.55
STD DEV	2.81	9.32	26.17	222.16	4.40	0.56
MINIMUM	0.20	11.53	24.69	92.70	9.24	0.16
MAXIMUM	5.16	28.33	61.70	535.31	18.03	1.20
STD ERROR	6.97	23.15	235.10	551.91	10.93	1.40
INCREMENTAL CONCENTRATION						
AVERAGE	1.37	21.71	42.65	302.25	13.04	
MINIMUM	-0.35	10.98	24.15	92.15	8.69	
MAXIMUM	4.61	27.78	61.15	534.76	17.48	
STD ERROR	7.11	23.20	235.10	551.91	11.02	

1985 PLUTONIUM-238 IN RIVER WATER SILT (fCi/L)

QTR	R-1	R-2	R-3	R-4	R-5	E.L.
1	4.3	18.1	31.6	135.5	13.2	0.4
2	0.3	14.4	29.6	173.2	5.1	1.6
3	1.5	15.1	39.8	152.6	21.9	0.8
4	0.1	6.8	43.8	34.2	5	-0.2
N	4	4	4	4	4	4
AVERAGE	1.55	13.6	36.2	123.875	11.3	0.65
STD DEV	1.934769	4.809019	6.719126	61.73823	8.043631	0.754983
MINIMUM	0.1	6.8	29.6	34.2	5	-0.2
MAXIMUM	4.3	18.1	43.8	173.2	21.9	1.6
STD ERROR	3.078218	7.651149	10.69013	98.22552	12.79741	1.201178
INCREMENTAL CONCENTRATION						
AVERAGE	0.9	12.95	35.55	123.225	10.65	0
MINIMUM	-0.55	6.15	28.95	33.55	4.35	
MAXIMUM	3.65	17.45	43.15	172.55	21.25	
STD ERROR	3.304278	7.744864	10.75740	98.23286	12.85366	

1984 River Silt

1/22/85

Gross plutonium-238 in silt (pCi/g)

QTR	#1	#2	#3	#4	#5	E.L.	BLANKS
1	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.0001
2	0.0007	0.0463	0.043	2.136	0.0182	N.S.	0.0001
3	0.0032	0.0242	0.0236	0.3317	0.0375	0.0006	0.0005
4	0.0012	0.0222	0.0007	0.346	0.0651	0.0004	0.0007

$\bar{X}$ = 0.0004
S = 0.0003

NET Pu-238 IN SILT (pCi/g)

QTR	#1	#2	#3	#4	#5	E.L.
1	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
2	0.0003	0.0459	0.0426	2.1356	0.0178	N.S.
3	0.0028	0.0238	0.0232	0.3313	0.0371	0.0002
4	0.0008	0.0218	0.0003	0.3456	0.0647	0

$\bar{X}$ =	0.0013	0.0305	0.022	0.9375	0.0399	0.0001
S =	0.0013	0.0134	0.0212	1.0376	0.0236	0.0001
n =	3	3	3	3	3	2
$tS_{\bar{X}}$ =	0.0032	0.0333	0.0527	2.5778	0.0586	0.0009

LDL = 0.0003 x 1.645 = 0.0005 pCi/g

1983 Raw Silt 2/2/84

Gross Pu-238 in Silt (pCi/g)

QTR	#1	#2	#3	#4	#5	E.L.	Blanks
1	0.002	0.0159	0.0299	0.0584	0.009	0.0024	0.0006
2	0.001	0.0106	0.456	0.0509	0.0098	N.S.	0
3	N.S.	N.S.	N.S.	N.S.	N.S.	0.0017	0
4	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.0005
							$\bar{X}$ = 0.0003
							S = 0.0003

NET Pu-238 in Silt (pCi/g)

QTR	#1	#2	#3	#4	#5	E.L
1	0.0017	0.0156	0.0296	0.0581	0.0087	0.0021
2	0.0007	0.0103	0.4557	0.0506	0.0095	N.S.
3	NS	NS	NS	NS	NS	0.0014
4	NS	NS	NS	NS	NS	N.S.
$\bar{X}$ =	0.0012	0.013	0.2427	0.0544	0.0091	0.0018
S =	0.0007	0.0037	0.3013	0.0053	0.0006	0.0005
N =	2	2	2	2	2	2
$TS_{\bar{Y}}$ =	0.0063	0.0332	0.707	0.0476	0.0054	0.0045

LDL = 1.645 X 0.0003 = 0.0005 pCi/g

1982 Plutonium-238 in River Silt 1/18/83 8

(10^{-6} µci/g) or (pCi/g)

(Gross values)

Qtr	#1	#2	#3	#4	#5	E.L.	Blank
1	0.0037	0.0136	0.0685	0.0377	0.0085	0.0007	0.0008
2	0.0008	0.0127	0.0665	0.0503	0.0125	0.0012	0.0016
3	0.001	0.0955	0.0394	0.0153	0.2210	0.0007	0.0027
4	0.0036	0.0196	0.0393	0.2961	0.0139	0.0019	0.0017
							$\bar{X}$ = 0.0017
							S = 0.0008

(NET values)

Qtr	#1	#2	#3	#4	#5	E.L.
1	0.0029	0.0128	0.0677	0.0369	0.0077	-0.0001
2	-0.0008	0.0111	0.0649	0.0487	0.0109	-0.0004
3	-0.0017	0.0928	0.0367	0.0126	0.2183	-0.002
4	0.0019	0.0179	0.0374	0.2944	0.0122	0.0002
n	4	4	4	4	4	4
$\bar{X}$	0.0006	0.0337	0.0517	0.0982	0.0623	-0.0006
S	0.0022	0.0395	0.0169	0.1317	0.104	0.001
$S_{\bar{X}}$	0.0011	0.02	0.01	0.07	0.05	0.0005
$TS_{\bar{X}}$	0.0035	0.0636	0.0318	0.223	0.159	0.0016

Pu-238 River Silt Summary

Sample	Core (10^{-6} µci/g ± $TS_{\bar{X}}$)	(Non Detectable) E.L.	=	Round Injected (10^{-6} µci/g)
#1			=	0.0006 ± 0.0035
#2				0.0337 ± 0.0636
#3				0.0517 ± 0.0318
#4				0.0982 ± 0.223
#5				0.0623 ± 0.159

LDL = 0.0008×10^{-6} µci/g · 1.645 = 0.0013×10^{-6} µci/g

1981 Pu-238 in River Silt 1/27/82

pci/g or (10^{-6} µci/g) - 25 gram Sample

Qtr	#1	#2	#3	#4	#5	E.L.	Blank
1	0.0009	0.149	0.0376	0.1413	0.0116	0.0005	0.032
2	0.0125	0.0287	0.0862	0.1298	0.0421	0.0179	0.036
3	0.0014	0.0185	0.0824	0.1448	0.0332	0.0017	0.024
4	0.0012	0.0149	0.0986	0.5131	0.0087	0.0009	0.019

Net Values (10^{-9} µci/g) Blank Subtracted

((Conc x 25) - Blank)/25

Qtr	#1	#2	#3	#4	#5	E.L.
1	-0.38	147.72	31.32	140.02	10.32	-19.5
2	11.06	27.26	84.76	128.36	40.66	16.46
3	0.44	17.54	81.44	413.84	32.24	0.74
4	0.44	14.14	97.84	512.34	7.94	0.14

Pu-238 in River Silt Water Summary

Sample	Conc (10^{-9} µci/g)	E.L. (10^{-9} µci/g)	Mound Impact (10^{-9} µci/g
1	2.9 ± 8.6	N.D.	2.9 ± 8.6
2	51.7 ± 102	N.D.	52 ± 102
3	73.8 ± 46.2	N.D.	74 ± 46
4	299 ± 307	N.D.	299 ± 307
5	22.8 ± 25.6	N.D.	23 ± 26
EL	-0.54 ± 23.3		

$$L.D.L = \frac{0.019}{25g} \times 10^{-6}\ \mu ci/g \cdot 1.645 = \cancel{0.031} \times 10^{-6}\ \mu ci/g$$

0.001

N.D. can't detect E.L. above Reagent Blanks

Pu 238 in River Water (Silt) 1980 3/12/81

pCi/g

#1 (Grand Sagle)		Blank	NET Concentration	Environmental Level	Incremental Result
1st qtr	0.0005	0.0002	0.0003		
2nd "	0.0021	0.0012	0.0009		
3rd "	0.0007	0.0019	-0.0012		
4th "	0.0019	0.0015	0.0004		
$\bar{X}$			0.0001	0.0019	E.L.
S			0.0009		
$S_{\bar{X}}$			0.0014	0.0065	
MIN					E.L.
MAX					E.L.
#2					
1st qtr	0.0204	0.0002	0.0202		
2nd "	0.0132	0.0012	0.0120		
3rd "	0.0297	0.0019	0.0278		
4th "	0.0122	0.0015	0.0107		
$\bar{X}$			0.0177	0.0019	0.0158
S			0.0080		
$S_{\bar{X}}$			0.0127	0.0065	0.0142
MIN					0.0088
MAX					0.0259
#3					
1st qtr	0.1449	0.0002	0.1417		
2nd "	0.1020	0.0012	0.1008		
3rd "	0.0670	0.0019	0.0651		
4th "	0.0993	0.0015	0.0978		
$\bar{X}$			0.1014	0.0019	0.0995
S			0.0314		
$S_{\bar{X}}$			0.0500	0.0065	0.0504
MIN					0.0632
MAX					0.1398

7.900 Pu-238 in Rum Field #2 pCi/g

	#4 (Cross Sample)	Blank	Net Concentration	Environmental Level	Incremental Result
1st gpm	0.2077	0.0002	0.2075		
2nd "	0.1439	0.0012	0.1427		
3rd "	0.3089	0.0019	0.3070		
4th "	0.3281	0.0015	0.3266		
X			0.2460	0.0019	0.2441
S			0.0864		
S/X			0.1375	0.0065	0.1376
MIN					0.1408
MAX					0.3247

	#5				
1st gpm	0.0182	0.0002	0.0180		
2nd "	0.0145	0.0012	0.0133		
3rd "	0.0069	0.0019	0.0050		
4th "	0.0080	0.0015	0.0065		
X			0.0107	0.0019	0.0088
S			0.0061		
S/X			0.0097	0.0065	0.0116
MIN					0.0031
MAX					0.0161

	Environmental Level	Blank	
1st gpm	0.0006	0.0002	0.0004
2nd "	0.0013	0.0012	0.0001
3rd "	0.0009	0.0019	-0.0010
4th "	0.0095	0.0015	0.0080
X			0.0019
S			0.0041
S/X			0.0065
MIN			
MAX			

Plutonium Results in River Silt Samples (1979) 2/4/80

Pu-238 - (10^{-6} µci/g)

date	#1	#2	#3	#4	#5	Environmental Level
1st Qtr	0.0011	0.0131	0.8066	0.4232	0.0693	—
2nd Qtr	–	–	–	–	–	0.0005
3rd Qtr	–	–	–	–	–	0.0004
4th Qtr	–	–	–	–	–	0.0005

$\bar{X} = 0.00047$

$S = 0.00006$

$S_{\bar{X}} = 0.00003$

$TS_{\bar{X}} = 0.00015$

$$LDL = \frac{0.0279 \times 10^{-6}\ \mu Ci}{30\ g} = 0.0009 \times 10^{-6}\ \mu Ci/g$$

estimate 30 grams Silt/Kjeldahl

3/1/79

Pu-238 in Silt from River Locations, pCi/g 1978

1st half
2nd half

#1 → NO. 2		#2 → NO. 3		#3 → NO. 4		#4 → NO. 5		#8 → NO 1	
Conc	grams	Conc	grams	Conc	grams	Conc	grams	Conc	grams
5.2666 ± .1098	2.5685	7.6364 ± .1468	1.6423	37.0338 ± .3857	1.3935	2.8004 ± .1872	1.2112	62.7008 ± .7326	.7499
35.6727 ± .4040	.6505	10.7618 ± .2188	.7088	3.8374 ± .1112	1.0776	1.0291 ± .1173	.6744	1.4015 ± .1396	.3868
$\bar{X}$ = 20.47 ± .2569	1.6096	9.20 ± .1878	1.1756	20.44 ± .2475	1.2356	1.91 ± .1523	.9428	32.05 ± .4361	.5683
S = 21.50		2.21		23.47		1.25		43.35	
$S_{\bar{X}}$ = 15.20		1.56		16.60		.88		30.65	
$1S_{\bar{X}}$ = 193		19.8		211		11.23		389.26	
LDL = .1149 / 1.6096		LDL = .1149 / 1.1756		LDL = .1149 / 1.2356		LDL = .1149 / .9428		LDL = .1149 / .5683	
LDL = .0714 pCi/g		LDL = .0977 pCi/g		LDL = .0930 pCi/g		LDL = .1219 pCi/g		LDL = .2022 pCi/g	

1977 Pu-238 in River Silt (μCi/g)

	R-1	R-2	R-3	R-4	R-5
1st half	0.51×10^{-6}	0.48×10^{-6}	2.57×10^{-6}	5.07×10^{-6}	$<0.3 \times 10^{-6}$
2nd half	1.08×10^{-6}	14.4×10^{-6}	2.79×10^{-6}	4.37×10^{-6}	1.58×10^{-6}

Pu-238 in River Silt

1976

River — 2nd half

location	activity	weight
5	1.0529 ± .0963	2.22 g
4	2.4069 ± .2065	.47 g
3		
2	16.5931 ± .3906	1.09 g
1	1.1798 ± .1063	.99 g

1 = 6.19 fci/g ± .11
2 = 15.22 fci/g ± .36
3 —
4 = 5.12 fci/g ± .44
5 = .47 fci/g ± .04

Avg weight = 1.19 gram

$$\frac{.0218 \text{ fci}}{1.19 \text{ gram}} = .018 \text{ fci/g} = .018 \times 10^{-6}$$

APPENDIX F

PLUTONIUM-238 IN SURFACE WATER (PONDS)

DATA COMPLIATION SHEETS 1976 - 1989

Plutonium - 238 in Surface Water
(Silt filtered and excluded)

3/12/77

1st half 1976				2nd half 1976			
Location	Result	Volume	Conc	Location	Result	Volume	Conc
#10	.1883 pci	28,997 ml	$.0649 \times 10^{-10}$ pci/ml	#10	.2936 pci	19,100 ml	$.1537 \times 10^{-10}$ pci/ml
#11	.2239 pci	32,502 ml	.0689 "	#11	.3958 pci	20,177 ml	.1962 "
#12	.0873 pci	31,685 ml	.0276 "	#12	.2774 pci	19,120 ml	.1451 "
#13	.0966 pci	33,134 ml	.0292 "	#13	.1789 pci	17,170 ml	.1042 "
#14	.1635 pci	20,832 ml	.0785 "	#14	.2719 pci	19,522 ml	.1393 "
#15	.1267 pci	31,109 ml	.0407 "	#15	.1402 pci	18,520 ml	.0757 "
#16	.2802 pci	31,047 ml	.0903 "	#16	.1115 pci	19,381 ml	.0575 "
#17	.0930 pci	31,581 ml	.0294 "	#17	.1115 pci	19,483 ml	.0572 "

Location	Total Result	Total Volume	Avg Result
#10	.4819 pci	48,097 ml	$.100 \times 10^{-10}$ pci/ml
#11	.6197 pci	52,679 ml	$.118 \times 10^{-10}$ pci/ml
#12	.3647 pci	50,805 ml	$.072 \times 10^{-10}$ pci/ml
#13	.2755 pci	50,304 ml	$.055 \times 10^{-10}$ pci/ml
#14	.4354 pci	40,354 ml	$.108 \times 10^{-10}$ pci/ml
#15	.2669 pci	49,629 ml	$.054 \times 10^{-10}$ pci/ml
#16	.3917 pci	50,428 ml	$.078 \times 10^{-10}$ pci/ml
#17	.2045 pci	51,064 ml	$.040 \times 10^{-10}$ pci/ml

1977 Environmental Monitoring Report Data 2/23/78

^{238}Pu in pond Data (water)

Pond	1st half conc (μci/cc)	(ml) Volume	2nd half conc (μci/cc)	(ml) Volume	year conc (μci/cc)
10	$<1.0 \pm .04 \times 10^{-11}$	41,580	$1.29 \pm .33 \times 10^{-11}$	40,856	$<1.15 \pm 0.19 \times 10^{-11}$
11	$<1.0 \pm .14 \times 10^{-11}$	42,229	$<1.0 \pm .12 \times 10^{-11}$	40,456	$<1.0 \pm 0.13 \times 10^{-11}$
12	$<1.0 \pm .05 \times 10^{-11}$	42,376	$<1.0 \pm .16 \times 10^{-11}$	38,875	$<1.0 \pm 0.11 \times 10^{-11}$
13	$<1.0 \pm .08 \times 10^{-11}$	42,241	$<1.0 \pm .04 \times 10^{-11}$	39,278	$<1.0 \pm 0.06 \times 10^{-11}$
14	$<1.0 \pm .04 \times 10^{-11}$	43,360	$<1.0 \pm .06 \times 10^{-11}$	39,772	$<1.0 \pm 0.05 \times 10^{-11}$
15	$<1.0 \pm .06 \times 10^{-11}$	41,541	$<1.0 \pm .05 \times 10^{-11}$	41,098	$<1.0 \pm 0.06 \times 10^{-11}$
16	$<1.0 \pm .12 \times 10^{-11}$	43,237	$<1.0 \pm .03 \times 10^{-11}$	41,865	$<1.0 \pm 0.08 \times 10^{-11}$
17	$<1.0 \pm .05 \times 10^{-11}$	40,930	No Sample	41,320	$<1.0 \pm 0.05 \times 10^{-11}$

LDL: Blank = $.92 \times 10^{-11}$ μci/ml + $.10 \times 10^{-11}$ - 1* blank sample only - counting stat.

LDL = 1.0×10^{-11} μci/ml

Pu-238 in Surface Water (ponds) 1978 - (pCi/L) 2/28/79

#10	#11	#12	#13	#14	#15	#16	#17
.0049	.0024	.0008	.0023	.0012	.0014	-	.0009
.0052	.0016	.0018	—	.0017	.0016	.0035	.0027

LDL: .0137 pCi/L

* pCi less than lower detection limit.

Plutonium - 238 Results in Surface water - 1979 (ponds) 2/11/80

date	Pond 10 conc $\times 10^{-9}$	Pond 10 volume, L	Pond 11 conc $\times 10^{-9}$	Pond 11 volume, L	Pond 12 conc $\times 10^{-9}$	Pond 12 volume, L	Pond 13 conc $\times 10^{-9}$	Pond 13 volume, L	Pond 14 conc $\times 10^{-9}$	Pond 14 volume, L
1st QTR	0.0012	30	0.0038	30	0.0036	30	0.0023	30	0.0027	30
2nd QTR	0.0045	30	0.0023	30	0.0035	30	0.0015	30	0.0031	30
3rd QTR	0.0027	30	0.0029	30	0.0035	30	0.0069	30	—	—
4th QTR	0.0055	30	0.0039	30	0.0042	30	0.0015	30	0.0047	30
$\bar{x}$	0.0035	30	0.0032	30	0.0037	30	0.0031	30	0.0035	30
S	0.0019		0.0008		0.0003		0.0026		0.0011	
$S_{\bar{x}}$										
$tS_{\bar{x}}$	0.0030		0.0013		0.0005		0.0041		0.0027	

$$LDL = \frac{0.0279 \times 10^{-6}\ \mu ci}{30 \times 10^{3}\ cc} = 0.0009 \times 10^{-9}\ \mu ci/cc = 0.009 \times 10^{-10}\ \mu ci/ml$$

date	Pond 15 conc $\times 10^{-9}$	Pond 15 volume, L	Pond 16 conc $\times 10^{-9}$	Pond 16 volume, L	Pond 17 conc $\times 10^{-9}$	Pond 17 volume, L	Env. Level conc $\times 10^{-9}$	Env. Level volume, L
1st QTR	0.0017	30	0.0025	30	0.0059	30	—	—
2nd QTR	0.0032	30	0.0019	30	0.0070	30	0.0015	30
3rd QTR	0.0020	30	0.0021	30	0.0041	30	0.0010	30
4th QTR	0.0036	30	0.5561 *	30	0.0052	30	0.0014	30
$\bar{x}$	0.0026	30	0.0022	30	0.0056	30	0.0013	30
S	0.0009		0.0003		0.0012		0.0003	
$S_{\bar{x}}$								
$tS_{\bar{x}}$	0.0014		0.0007		0.0019		0.0007	

* contaminated - cannot use

1980 - Pu-238 in Surface Water (10^{-10} pci/cc) 2/23/81

Pond 10 "Q+R's"	Gross conc	(Same as River) Blank conc	Net conc	E.L. level	Incremental concentration
1	0.008	0.006	0.002	*	
2	0.022	0.010	0.012	Can't detect	
3	0	0.014	-0.014	E.L. (∴)	
4	0.013	0.017	-0.004	use net	
$\bar{X}$			0.001	conc.	
S			0.011		
N			4		
$S_{\bar{X}}$			0.018		
MIN			N.D.		
MAX			0.014		
Pond 11					
1	0.010	0.006	0.004		
2	0.033	0.010	0.023		
3	0.005	0.014	-0.009		
4	0.005	0.017	-0.012		
$\bar{X}$			0.002		
S			0.016		
N			4		
$S_{\bar{X}}$			0.025		
MIN			N.D.		
MAX			0.023		
Pond 12					
1	0.007	0.006	0.001		
2	0.018	0.010	0.008		
3	0.002	0.014	-0.012		
4	0.009	0.017	-0.008		
$\bar{X}$			-0.003		
S			0.009		
N			4		
$S_{\bar{X}}$			0.014		
MIN			N.D.		
MAX			0.008		

7/23/89

($\times 10^{-10}$ µCi/cc)

Pond 13 Gr+x's	Gross Conc.	Blank Conc.	Net Conc.	E.L. Level	Incremental concentration
1	0.012	0.006	0.006		
2	0.049	0.010	0.039		
3	0.014	0.014	0		
4	0.008	0.017	-0.009		
$\bar{X}$			0.009		
S			0.021		
N			4		
$S_{\bar{X}}$			0.033		
MIN			N.D.		
MAX			0.039		
Pond 14					
1	0.017	0.006	0.011		
2	0.015	0.010	0.005		
3	0.017	0.014	0.003		
4	0.019	0.017	0.002		
$\bar{X}$			0.005		
S			0.004		
N			4		
$S_{\bar{X}}$			0.006		
MIN			0.002		
MAX			0.011		
Pond 15					
1	0.013	0.006	0.007		
2	0.008	0.010	-0.002		
3	0.022	0.014	0.008		
4	0.019	0.017	0.002		
$\bar{X}$			0.004		
S			0.005		
N			4		
$S_{\bar{X}}$			0.008		
MIN			N.D.		
MAX			0.008		

7/23/87

($\times 10^{10}$ pci/cc)

Pond 16

Qty's	Gross conc.	Blank conc.	Net conc.	EL. Level	Increment Concentrtn
1	0.017	0.006	0.011		
2	0.023	0.010	0.013		
3	0.022	0.014	0.008		
4	0.014	0.017	-0.003		
$\bar{X}$			0.007		
S			0.007		
N			4		
$S_{\bar{X}}$			0.011		
MIN			N.D.		
MAX			0.013		

Pond 17

1	0.056	0.006	0.050		
2	0.105	0.010	0.095		
3	0.146	0.014	0.132		
4	0.031	0.017	0.014		
$\bar{X}$			0.073		
S			0.052		
N			4		
$S_{\bar{X}}$			0.083		
MIN			0.014		
MAX			0.132		

Environmental Level * "Can't" detect Environmental level

1	0.010	0.006	0.004
2	0	0.010	-0.01
3	0.015	0.014	0.001
4	0.011	0.017	-0.006
$\bar{X}$			-0.003
S			0.006
N			4
$S_{\bar{X}}$			

1/26/82

1981 Pu-238 in Surface Water - Reported in pCi/L or 10^{-9} µci/ml
(10^{-12} µci/ml)

QTR	10	11	12	13	14	15	16	17	EL.	BLANK
1	2.2	0.8	7.2	0.7	2.4	2.6	2.3	40.5	2.3	1.4
2	2.8	1.3	5.0	1.6	1.8	2.0	6.7	5.7	1.9	1.1
3	1.5	1.0	1.0	0.7	1.0	2.8	1.8	2.7	8.8	1.4
4	1.9	2.4	1.9	1.6	1.6	1.0	1.2	1.2	1.6	0.6 $\bar{X}_2$

NET Values (10^{-12} µci/ml) BLANK Subtracted

QTR	10	11	12	13	14	15	16	17	E.L.
1	0.8	-0.6	5.7	-0.7	1.0	1.2	0.9	39	0.9
2	1.7	0.2	3.9	0.5	0.7	0.9	5.6	4.6	0.8
3	0.1	-0.4	-0.4	-0.7	-0.4	1.4	0.4	1.3	7.4
4	1.3	1.8	1.3	1.0	1.0	0.4	0.6	0.6	1.0

Pu-238 in Surface Water Summary

Sample	Conc (10^{-12} µci/ml)	E.L (10^{-12} µci/ml)	Mound Impact (10^{-12} µci/ml)
10	1.0 ± 1.1	2.5 ± 5.2	E.L.
11	0.3 ± 1.7	2.5 ± 5.2	E.L.
12	2.6 ± 4.3	2.5 ± 5.2	0.1 ± 6.7
13	0.03 ± 1.4	2.5 ± 5.2	E.L.
14	0.6 ± 1.0	2.5 ± 5.2	E.L.
15	1.0 ± 0.7	2.5 ± 5.2	E.L.
16	1.9 ± 4.0	2.5 ± 5.2	E.L.
17	11 ± 29	2.5 ± 5.2	8.5 ± 29

Error propagation for surface water samples

$$\#12 = \sqrt{(4.3)^2 + (5.2)^2} = \sqrt{18 + 27} = 6.7$$
$$\#17 = \sqrt{(29)^2 + (5.2)^2} = \sqrt{841 + 27} = 29$$

$$LDL = 0.5 \times 10^{-12} \cdot 1.645 = 0.8 \times 10^{-12} \text{ µci/ml}$$

1982 Plutonium-238 in Surface Water (1/13/83)
(10^{-12} µci/ml)

QTR	#10	#11	#12	#13	#14	#15	#16	#17	E.L.	BLANK
1	1.9	2.8	1.0	1.0	0.4	0.5	0.9	2.1	1.6	1.0
2	7.2	5.4	1.0	4.6	0.9	1.1	1.0	2.3	0.6	0.5
3	33.9*	5.1	4.1	1.7	1.7	2.1	4.8	2.6	0.7	1.0
4	4.8	1.1	1.5	2.1	3.8	1.4	0.9	3.4	0.7	0.7

(NET VALUE) (10^{-12} µci/ml) BLANK Subtracted

QTR	#10	#11	#12	#13	#14	#15	#16	#17	E.L.
1	0.9	1.8	0	0	-0.6	-0.5	-0.1	1.1	0.6
2	6.7	4.9	0.5	4.1	0.4	0.6	0.5	1.8	0.1
3	N.S.	4.1	3.1	0.7	0.7	1.1	3.8	1.6	-0.3
4	4.1	0.4	0.8	1.4	3.1	0.7	0.2	2.7	0
n	3	4	4	4	4	4	4	4	4
$\bar{X}$	3.9	2.8	1.1	1.55	0.9	0.48	1.1	1.8	0.1
S	2.91	2.07	1.37	1.79	1.57	0.69	1.82	0.67	0.37
$S_{\bar{X}}$	1.68	1.04	0.69	0.9	0.78	0.34	0.91	0.33	0.19
$TS_{\bar{X}}$	7.23	3.31	2.2	2.86	2.48	1.08	2.9	1.05	0.6

Pu-238 Surface Water Summary

Sample	Conc (10^{-12} µci/ml ± TS; @95% C.L.)		E.L. (10^{-12} µci/ml ± TS x @95% C.L.)		Net Impact (10^{-12} µci/ml) ± $\sqrt{(TS_{\bar{X}}C)^2 + (TS_{\bar{X}}EL)^2}$
#10	3.9 ± 7.2	-	0.1 ± 0.6	=	2.9 ± 7.2
#11	2.8 ± 3.3	-	0.1 ± 0.6	=	2.7 ± 3.4
#12	1.1 ± 2.2	-	0.1 ± 0.6	=	1.0 ± 2.3
#13	1.6 ± 2.9	-	0.1 ± 0.6	=	1.5 ± 3.0
#14	0.9 ± 2.5	-	0.1 ± 0.6	=	0.8 ± 2.6
#15	0.5 ± 1.1	-	0.1 ± 0.6	=	0.4 ± 1.3
#16	1.1 ± 2.9	-	0.1 ± 0.6	=	1.0 ± 3.0
#17	1.8 ± 1.1	-	0.1 ± 0.6	=	1.7 ± 1.3

LDL Pu-238 Surface water (Snake River) = 0.24×10^{-12} µci/ml $\times 1.645 = 0.4 \times 10^{-12}$ µci/ml

* Apparently due to silt contained in water (LCM) - Disregard as outlier

1983 Pu-238 in Surface water (ponds) 2/2/84

Gross Pu-238 (pCi/L)

QTR	#11	#12	#13	#14	#15	#16	#17	E.L.	BLANKS
1	0.0168	0.0007	0.0038	0.0024	0.0017	0.0003	0.0006	0.0006	0.0001
2	0.0012	0.0004	0.0004	0.0012	0.0013	0.0003	0	0.0001	0.0001
3	0.0006	0.0002	0.0006	0.0008	0.0003	0.0006	0.0006	0.001	0
4	0.0016	0.0012	0.0011	0.0010	0.0016	0.0009	0.0017	0.001	0.0001

$\bar{X}$ = 0.00008 (0.0001)
S = 0.0001

NET Pu-238 (pCi/L)

QTR	#11	#12	#13	#14	#15	#16	#17	E.L.
1	0.0167	0.0006	0.0037	0.0023	0.0016	0.0002	0.0005	0.0005
2	0.0011	0.0003	0.0003	0.0011	0.0012	0.0002	-0.0001	0
3	0.0005	0.0001	0.0005	0.0007	0.0002	0.0005	0.0005	0.0009
4	0.0015	0.0011	0.001	0.0009	0.0015	0.0008	0.0017	0.0009
$\bar{X}$ =	0.005	0.0005	0.0014	0.0013	0.0011	0.0004	0.0007	0.0006
S =	0.0078	0.0004	0.0016	0.0007	0.0006	0.0003	0.0008	0.0004
n =	4	4	4	4	4	4	4	4
$tS_{\bar{X}}$ =	0.0124	0.0006	0.0025	0.0011	0.0010	0.0005	0.0013	0.0006

CDL = 1.645 x 0.0001 = 0.0002 pCi/L

/1984 Pu-238 in Surface Water (ponds) 1/22/85

Gross Pu-238 (pCi/L)

QTR	#11	#12	#13	#14	#15	#16	#17	E.L	Blanks
1	0.0082	0.0009	0.0003	0.0017	0.0098	0.0013	0.0018	0.0019	0.0003
2	0.0007	0.0013	0.0005	0.0009	0.0007	0.0004	0.0008	0.0032	0.0001
3	0.0006	0.0007	0.0006	0.0009	0.0014	0.0013	0.0034	0.001	0.0003
4	0.0004	0.0009	0.0034	0.0009	0.0007	0.0006	0.0009	0.0007	0.0003

$\bar{x}$ = 0.0003
S = 0.0001

Net Pu-238 (pCi/L)

QTR	#11	#12	#13	#14	#15	#16	#17	E.L.
1	0.0079	0.0006	0	0.0014	0.0095	0.001	0.0015	0.0016
2	0.0004	0.001	0.0002	0.0006	0.0004	0.0001	0.0005	0.0029
3	0.0003	0.0004	0.0003	0.0006	0.0011	0.001	0.0031	0.0007
4	0.0001	0.0006	0.0031	0.0006	0.0004	0.0003	0.0006	0.0004
$\bar{x}$ =	0.0022	0.0007	0.0009	0.0008	0.0029	0.0006	0.0014	0.0014
S =	0.0038	0.0003	0.0015	0.0004	0.0044	0.0005	0.0012	0.0011
n =	4	4	4	4	4	4	4	4
$t S_{\bar{x}}$ =	0.006	0.0005	0.0024	0.0006	0.007	0.0008	0.0019	0.0018

LDL = 1.645 · 0.0001 = 0.00016 pCi/L

1985 PLUTONIUM-238 IN SURFACE WATER
fCi/L

QTR	10	11	12	13	14	15
1		3	1.5	2.9	1.3	1.3
2	0.7	2.2	0.5	0.9	0.7	1.2
3	1.1	1.2	0.8	0.8	0.6	0.9
4	-0.7	0.3	2.8	1.2	2.6	0.1

N	3	4	4	4	4	4
AVERAGE	0.366666	1.675	1.4	1.45	1.3	0.875
STD DEV	0.945163	1.175797		0.981495	0.920144	0.543905
MINIMUM	-0.7	0.3	0.5	0.8	0.6	0.1
MAXIMUM	1.1	3	2.8	2.9	2.6	1.3
STD ERROR	2.348104	1.870693		1.561559	1.979691	1.170212

INCREMENTAL CONCENTRATION						
AVERAGE	-5.85833	-4.55	-4.825	-4.775	-4.925	-5.35
MINIMUM	-6.925	-5.925	-5.725	-5.425	-5.625	-6.125
MAXIMUM	-5.125	-3.225	-3.425	-3.325	-3.625	-4.925
STD ERROR	16.79445	16.73438	16.6295	16.70265	16.74692	16.67062

QTR	16	17	E.L.
1	0.9	128.4	0.7
2	0.6	1.1	21.9
3	0.6	1	1.1
4	1	1	1.2

N	4	4	4
AVERAGE	0.775	32.875	6.225
STD DEV	0.206155	63.68335	10.45223
MINIMUM	0.6	1	0.7
MAXIMUM	1	128.4	21.9
STD ERROR	0.327993	101.3202	16.62950

INCREMENTAL
CONCENTRATION

1986 PLUTONIUM-238 IN PONDS (fCi/L)

QUARTER	10	11	12	13	14	15	16	17	E.L.
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1									
2	0.00	1.68	2.83	12.58	-0.78	1.20	0.00	-0.20	2.75
3		2.18	0.58	0.15	0.68	-0.02	2.75	-0.28	3.28
4		2.63	2.20	2.33	1.65	-0.58	0.83	2.43	4.05
N	1	3	3	3	3	3	3	3	3
AVERAGE	0.00	2.16	1.87	5.03	0.52	0.20	1.19	0.65	3.36
STD DEV	ERR	0.48	1.16	6.63	1.22	0.91	1.41	1.54	0.65
MINIMUM	0.00	1.68	0.58	0.15	-0.78	-0.58	0.00	-0.28	2.75
MAXIMUM	0.00	2.63	2.83	12.58	1.65	1.20	2.75	2.43	4.05
STD ERROR	ERR	1.18	2.89	16.47	3.03	2.26	3.51	3.82	1.62

1987 PLUTONIUM-238 IN PONDS (fCi/L)

QUARTER	11	12	13	14	15	16	17	E.L.
1	2.83	0.80	-0.25	-0.05	4.28	1.62	-1.90	-1.95
2	-1.03	2.28	17.63	-0.55	-2.55	-0.58	0.37	-0.22
3	1.88	2.13	4.76	0.03	3.53	2.15	0.28	6.25
4	2.48	0.68	1.22	0.60	1.45	2.18	2.88	5.25
N	4	4	4	4	4	4	4	4
AVERAGE	1.54	1.47	5.84	0.01	1.68	1.34	0.41	2.33
STD DEV	1.75	0.85	8.13	0.47	3.06	1.30	1.95	4.03
MINIMUM	-1.03	0.68	-0.25	-0.55	-2.55	-0.58	-1.90	-1.95
MAXIMUM	2.83	2.28	17.63	0.60	4.28	2.18	2.88	6.25
STD ERROR	3.77	1.82	17.50	1.01	6.58	2.81	4.20	8.67

1988 PLUTONIUM-238 IN PONDS (fCi/L)

QUARTER	11	12	13	14	15	16	17	E.L.
1	2.65	-1.20	10.73	-2.20	-0.98	-1.72	-2.78	-0.10
2	4.93	0.22	-0.80	-2.33	-5.33	-5.13	23.63	-6.03
3	-1.83	-2.15	-0.91	-3.03	-1.65	-4.65	-0.68	-1.45
4	3.45	-2.70	-1.20	1.85	-0.65	-1.95	3.68	0.43
N	4	4	4	4	4	4	4	4
AVERAGE	2.30	-1.46	1.95	-1.43	-2.15	-3.36	5.96	-1.79
STD DEV	2.91	1.28	5.85	2.21	2.16	1.77	12.08	2.93
MINIMUM	-1.83	-2.70	-1.20	-3.03	-5.33	-5.13	-2.78	-6.03
MAXIMUM	4.93	0.22	10.73	1.85	-0.65	-1.72	23.63	0.43
STD ERROR	4.62	2.04	9.31	3.52	3.43	2.82	19.22	4.67

1989 PLUTONIUM-238 IN PONDS (fCi/L)

QUARTER	11	12	13	14	15	16	17	E.L.
---	---	---	---	---	---	---	---	---
1	1.95	0.95	0.63	0.83	-0.88	0.10	2.43	-0.35
2	-1.53	1.21	0.98	4.48	2.35	-6.60	2.88	1.43
3	10.08	14.08	13.18	11.90	4.18	7.65	11.58	13.95
4	-0.78	-0.73	-3.78	-0.59	-1.88	-0.90	7.58	-1.35
N	4	4	4	4	4	4	4	4
AVERAGE	2.43	3.88	2.75	4.15	0.94	0.06	6.11	3.42
STD DEV	5.31	6.85	7.28	5.59	2.81	5.86	4.32	7.11
MINIMUM	-1.53	-0.73	-3.78	-0.59	-1.88	-6.60	2.43	-1.35
MAXIMUM	10.08	14.08	13.18	11.90	4.18	7.65	11.58	13.95
STD ERROR	8.45	10.90	11.58	8.89	4.47	9.32	6.88	11.32

APPENDIX G

DATA COMPILATION SHEETS

FROM 1978 THROUGH 1989 FOR PLUTONIUM-238 IN

POND SILT

1989 PLUTONIUM-238 IN SURFACE WATER SILT (fCi/G)

SAMPLE	QTR	RESULT (pCi)	BLANK * (pCi)	NET (pCi)	CONC. (fCi/G)
11	1	0.0227	-0.0016	0.0243	1.22
11	2	0.0415	-0.0027	0.0442	2.21
11	3	0.0273	-0.0306	0.0579	2.90
11	4	0.0522	0.0054	0.0468	2.34

SAMPLE	QTR	RESULT (pCi)	BLANK (pCi)	NET (pCi)	CONC. (fCi/G)
12	1	0.0178	-0.0016	0.0194	0.97
12	2	0.0246	-0.0027	0.0273	1.37
12	3	0.0129	-0.0306	0.0435	2.18
12	4	0.104	0.0054	0.0986	4.93

SAMPLE	QTR	RESULT (pCi)	BLANK (pCi)	NET (pCi)	CONC. (fCi/G)
13	1	0.0275	-0.0016	0.0291	1.46
13	2	0.0101	-0.0027	0.01275	0.64
13	3	0.0025	-0.0306	0.03305	1.65
13	4	0.0274	0.0054	0.022	1.10

SAMPLE	QTR	RESULT (pCi)	BLANK (pCi)	NET (pCi)	CONC. (fCi/G)
14	1	0.0078	-0.0016	0.0094	0.47
14	2	0.0269	-0.0027	0.0296	1.48
14	3	0.0081	-0.0306	0.03865	1.93
14	4	0.0461	0.0054	0.0407	2.04

SAMPLE	QTR	RESULT (pCi)	BLANK (pCi)	NET (pCi)	CONC. (fCi/G)
15	1	0.0298	-0.0016	0.0314	1.57
15	2	0.0091	-0.0027	0.0118	0.59
15	3	0.0025	-0.0306	0.0331	1.65
15	4	0.0728	0.0054	0.0674	3.37

SAMPLE	QTR	RESULT (pCi)	BLANK (pCi)	NET (pCi)	CONC. (fCi/G)
16	1				
16	2	0.0110	-0.0027	0.01365	0.68
16	3	0.0086	-0.0306	0.0392	1.96
16	4	0.0304	0.0054	0.025	1.25

SAMPLE	QTR	RESULT (pCi)	BLANK (pCi)	NET (pCi)	CONC. (fCi/G)
E.L.	1	0.0418	-0.0016	0.04335	2.17
E.L.	2	0.013	-0.0027	0.0157	0.78
E.L.	3	0.0550	-0.0306	0.08555	4.28
E.L.	4	0.1573	0.0054	0.1519	7.60

1988 PLUTONIUM-238 IN SURFACE WATER SILT (fCi/G)

QUARTER	11	12	13	14	15	16	E.L.
1	1.61	1.13	0.67	0.33	2.67	1.32	0.12
2	0.42	-0.45	0.42	-0.49	-0.34	0.64	
3	4.65	1.26	1.64	3.70	1.23	1.60	1.70
4	1.41	0.52	1.12	0.37	-1.93	0.80	0.09
N	4	4	4	4	4	4	3
AVERAGE	2.02	0.61	0.96	0.98	0.41	1.09	0.64
STD DEV	1.83	0.78	0.53	1.86	1.99	0.45	0.92
MINIMUM	0.42	-0.45	0.42	-0.49	-1.93	0.64	0.09
MAXIMUM	4.65	1.26	1.64	3.70	2.67	1.60	1.70
STD ERROR	2.91	1.23	0.85	2.96	3.16	0.71	1.69
INCREMENTAL CONCENTRATION							
AVERAGE	1.39	-0.02	0.32	0.34	-0.23	0.45	
MINIMUM	-0.22	-1.08	-0.22	-1.12	-2.57	0.01	
MAXIMUM	4.01	0.62	1.00	3.07	2.03	0.96	
STD ERROR	3.36	2.09	1.89	3.40	3.58	1.83	

1987 PLUTONIUM-238 IN SURFACE WATER SILT (fCi/G)

QUARTER	11	12	13	14	15	16	E.L.
1	0.32	1.11	1.08	0.63	3.47	0.62	0.70
2	0.52	1.62	1.00	0.67	2.70	0.58	-0.12
3	0.47	0.44	0.35	-0.17	0.47	-0.31	0.66
4	0.26	0.42	1.51	0.36	2.22	1.06	0.12
N	4	4	4	4	4	4	4
AVERAGE	0.39	0.90	0.99	0.37	2.21	0.49	0.34
STD DEV	0.12	0.58	0.48	0.39	1.27	0.58	0.40
MINIMUM	0.26	0.42	0.35	-0.17	0.47	-0.31	-0.12
MAXIMUM	0.52	1.62	1.51	0.67	3.47	1.06	0.70
STD ERROR	0.19	0.92	0.77	0.62	2.03	0.92	0.64
INCREMENTAL CONCENTRATION							
AVERAGE	0.05	0.56	0.64	0.03	1.87	0.15	
MINIMUM	-0.08	0.08	0.01	-0.51	0.13	-0.65	
MAXIMUM	0.17	1.28	1.17	0.33	3.13	0.72	
STD ERROR	0.67	1.12	1.00	0.89	2.13	1.12	

1986 PLUTONIUM-238 IN SURFACE WATER SILT (fCi/G)

QUARTER	10	11	12	13	14	15	16	E.L.
1								
2	0.88	0.53	0.86	1.66	5.10	2.86	2.10	
3		0.28	2.00	1.09	0.94	1.49	0.91	0.14
4		-0.10	-0.17	0.25	0.07	0.25	-0.13	-0.11
N	1	3	3	3	3	3	3	2
AVERAGE	0.88	0.24	0.90	1.00	2.03	1.53	0.96	0.02
STD DEV	ERR	0.32	1.09	0.71	2.69	1.30	1.12	0.18
MINIMUM	0.88	-0.10	-0.17	0.25	0.07	0.25	-0.13	-0.11
MAXIMUM	0.88	0.53	2.00	1.66	5.10	2.86	2.10	0.14
STD ERROR	ERR	0.79	2.70	1.76	6.68	3.24	2.77	1.58
INCREMENTAL CONCENTRATION								
AVERAGE	0.86	0.22	0.88	0.98	2.02	1.52	0.95	
MINIMUM	0.86	-0.12	-0.19	0.23	0.05	0.24	-0.14	
MAXIMUM	0.86	0.52	1.99	1.64	5.08	2.84	2.09	
STD ERROR	ERR	1.76	3.13	2.36	6.87	3.60	3.19	

1985 PLUTONIUM-238 IN SURFACE WATER SILT (fCi/G)

QTR	10	11	12	13	14	15
1		1.7	0.4	11.7	1	2.2
2	1.1	41.5	1.9	0.7	10.6	2.2
3	0.9	1.1	1.8	1	1	1
4	1	1.1	2.6	1.3	2	0.2
N	3	4	4	4	4	4
AVERAGE	1	11.35	1.675	3.675	3.65	1.4
STD DEV	0.1	20.10198		5.355604	4.657252	0.979795
MINIMUM	0.9	1.1	0.4	0.7	1	0.2
MAXIMUM	1.1	41.5	2.6	11.7	10.6	2.2
STD ERROR	0.248433	31.98226		8.520766	10.02007	2.108030
INCREMENTAL CONCENTRATION						
AVERAGE	0.675	11.025	1.35	3.35	3.325	1.075
MINIMUM	0.575	0.775	0.075	0.375	0.675	-0.125
MAXIMUM	0.775	41.175	2.275	11.375	10.275	1.875
STD ERROR	0.662798	31.98816	0.614477	8.542894	10.03890	2.195763

QTR	16	17	E.L.
1	0.4		0.5
2	0.9		0.7
3	0.9		0.3
4	0.6		-0.2
N	4		4
AVERAGE	0.7		0.325
STD DEV	0.244948		0.386221
MINIMUM	0.4		-0.2
MAXIMUM	0.9		0.7
STD ERROR	0.389713		0.614477
INCREMENTAL CONCENTRATION			
AVERAGE	0.375		0
MINIMUM	0.075		
MAXIMUM	0.575		
STD ERROR	0.727639		

1984 Surface Water Silt (ponds) 1/22/85

Gross Pu-238 in pond silt (pci/g)

QTR	#11	#12	#13	#14	#15	#16	E.L.	BLANKS
1	N.S.	N.S.	N.S.	N.S.	N.S.	N.S	0.0003	0.0001
2	0.0006	0.0006	0.0005	0.0007	0.0025	0.0005	0.0003	0.0001
3	0.0005	0.0074	0.0001	0.0019	0.0015	0.0029	0.0005	0.0005
4	0.0012	0.0022	0.0007	0.0008	0.0011	0.0016	0.0005	0.0007
								$\bar{x}$ = 0.0004
								S = 0.0003

NET Pu-238 in pond silt (pci/g)

QTR	#11	#12	#13	#14	#15	#16	E.L.
1	N.S.	N.S	N.S.	N.S.	N.S.	N.S.	-0.0001
2	0.0002	0.0002	0.0001	0.0003	0.0021	0.0001	-0.0001
3	0.0001	0.007	-0.0003	0.0015	0.0011	0.0025	0.0001
4	0.0008	0.0018	0.0003	0.0004	0.0007	0.0012	0.0001
$\bar{x}$ =	0.0004	0.003	0.00003	0.0007	0.0013	0.0013	0
S =	0.0004	0.0036	0.0003	0.0007	0.0007	0.0012	0.0001
n =	3	3	3	3	3	3	4
$TS_{\bar{x}}$ =	0.001	0.0089	0.0007	0.0017	0.0017	0.003	0.0002

LDL = 1.645 x 0.0003 = 0.0005 pci/g

8

2/9/84

1983 Surface Water Silt (pond)

Gross Pu-238 in pond Silt (pCi/g)

QTR	#11	#12	#13	#14	#15	#16	E.L.	BLANKS
1	0.0015	0.0015	0	0.0014	0.0051	0.0028	0.0018	0.0006
2	0.0014	0.001	0.0031	0.0019	0.002	0.002	N.S.	0
3	0.0014	0.0015	0.0011	0.0019	0.0018	0.0025	0.0014	0
4	0.001	0.0011	0.001	0.001	0.002	0.001	0.0004	0.0005

$\bar{X} = 0.0003$
$S = 0.0003$

Net Pu-238 in pond SILT (pCi/g)

QTR	#11	#12	#13	#14	#15	#16	E.L.
1	0.0012	0.0012	-0.0003	0.0011	0.0048	0.0025	0.0015
2	0.0011	0.0007	0.0028	0.0016	0.0017	0.0017	N.S.
3	0.0011	0.0012	0.0008	0.0016	0.0015	0.0022	0.0011
4	0.0007	0.0008	0.0007	0.0007	0.0017	0.0007	0.0001
$\bar{X}$ =	0.001	0.001	0.001	0.0013	0.0024	0.0018	0.0009
S =	0.0002	0.0003	0.0013	0.0004	0.0016	0.0008	0.0007
n =	4	4	4	4	4	4	3
$S_{\bar{X}}$ =	0.0003	0.0005	0.0021	0.0006	0.0025	0.0013	0.0017

LDL = 1.645 x 0.0003 = 0.0005 pCi/g

1982 plutonium-238 in Surface Sediment (ponds) 1/18/83

(10^{-6} pci/g) or (pCi/g)

(Gross Value)

QTR	#10	#11	#12	#13	#14	#15	#16	#17	E.L.	Blank
1	0.003	0.0015	0.001	0.001	0.0045	0.0013	0.0029	N.S.	0.0049	0.000
2	0.0018	0.001	0.0017	0.001	0.0012	0.0019	0.0019	N.S.	0.001	0.00
3	0.0014	0.0015	0.001	0.0025	0.001	0.0088	0.0012	N.S.	0.0019	0.00
4	0.0036	0.0012	0.0022	0.0013	0.0043	0.001	0.007	N.S.	0.0021	0.00
									$\bar{X}$ =	0.00
									S =	0.00

(Net Value)

QTR	#10	#11	#12	#13	#14	#15	#16	#17*	EL
1	0.0022	0.0007	0.0002	0.0002	0.0037	0.0005	0.0021	N.S.	0.0041
2	0.0002	-0.0006	0.0001	-0.0006	-0.0004	0.0003	0.0003	N.S.	-0.0006
3	-0.0013	-0.0012	-0.0017	-0.0002	-0.0017	0.0661	-0.0015	N.S.	-0.0008
4	0.0019	-0.0005	0.0005	-0.0004	0.0026	-0.0007	0.0053	N.S.	0.0004
n	4	4	4	4	4	4	4	—	4
$\bar{X}$	0.0008	-0.0004	-0.0002	-0.0003	0.0011	0.0166	0.0016		0.0008
S	0.0016	0.0008	0.001	0.0003	0.0025	0.033	0.0029		0.0023
$S_{\bar{X}}$	0.0008	0.0004	0.0005	0.0002	0.0013	0.017	0.0015		0.0012
$t_{.05}\,S_{\bar{X}}$	0.0025	0.0013	0.0016	0.0006	0.0041	0.054	0.0048		0.0038

Pu-238 in Surface Water Summary

Mound IMPACT - E.L.

Sample	Conc (10^{-6} pci/g $\pm t S_{\bar{X}}$)		EL $\pm t S_{\bar{X}}$	=	Mound IMPACT $\sqrt{(tS_{\bar{X}})^2 + (tS_{\bar{X}})}$
#10	0.0008 ± 0.0025	-	0.0008 ± 0.0038	=	E.L.
#11	-0.0004 ± 0.0013	-		=	E.L.
#12	-0.0002 ± 0.0016	-		=	E.L.
#13	-0.0003 ± 0.0006	-		=	E.L.
#14	0.0011 ± 0.0041	-		=	0.0003 ± 0.005
#15	0.0166 ± 0.054	-		=	0.0158 ± 0.054
#16	0.0016 ± 0.0048	-		=	0.0008 ± 0.006
#17	N.S.			=	N.S.

LDL = 0.0008 $\times 10^{-6}$ pci/g · 1.645 = 0.0013 $\times 10^{-6}$ pci/g

Was some more difficult to get sediment sample - Rock Bottom

1981 Pu-238 in Surface Water Silt 1/27/82 10

pCi/g or (10^{-6} µci/g) - 25 gram Sample

Qtr	10	11	12	13	14	15	16	17	EL	Blank
1	0.0016	0.0019	0.0027	0.0003	0.0004	0.0039	0.0029	N.S.	0.0008	0.0[illegible]
2	0.0019	0.0019	0.0023	0.0011	0.0009	0.0032	0.0014	N.S.	0.0018	0.0[illegible]
3	0.0012	0.0012	0.0018	0.0047	0.0014	0.0078	0.001	N.S.	0.0007	0.0[illegible]
4	0.0014	0.0015	0.0011	0.001	0.0011	0.0023	0.0013	N.S.	0.0011	0.0[illegible]

NET Values (10^{-9} µci/g) Blank Subtracted ((Conc x 25) - Blank)/25

Qtr	10	11	12	13	14	15	16	17	E.L.
1	0.32	0.62	1.62	-0.98	-0.88	2.62	1.62	N.S.	-0.48
2	0.46	0.46	0.86	-0.34	-0.54	1.76	-0.04	N.S.	0.36
3	0.24	0.24	0.84	3.74	0.44	6.84	0.04	N.S.	-0.26
4	0.64	0.74	0.34	0.24	0.34	1.54	0.54	N.S.	0.34

Pu-238 in Surface Water Silt Water Summary

Sample	Conc (10^{-9} µci/g)	E.L. (10^{-9} µci/g)	Mound Impact (10^{-9} µci
10	0.42 ± 0.28	N.D.	0.4 ± 0.3
11	0.52 ± 0.35	N.D.	0.5 ± 0.4
12	0.92 ± 0.82	N.D.	0.9 ± 0.8
13	0.67 ± 3.32	N.D.	0.7 ± 3.3
14	-0.16 ± 1.04	N.D.	E.L.
15	3.19 ± 3.92	N.D.	3.2 ± 3.9
16	0.54 ± 1.2	N.D.	0.5 ± 1.2
17	N.S.	N.D.	N.S.
E.L.	-0.01 ± 0.66		

LDL = $\frac{0.019}{259} \times 10^{-6} \cdot 1.645 = \frac{0.031}{25/g} \times 10^{-6}$ µci/g = 0.001×10^{-6} µci/g

N.D. can't detect above magnet blanks

1980 Pu-238 in pond (sediment) (pCi/g) 3/12/81

11

Pond 10	Gross conc	Blank conc.	Net conc	E.L	Incremental conc
1	0.0158	0.0002	0.0156		
2	0.0009	0.0012	-0.0003		
3	0.0034	0.0019	0.0015		
4	0.0011	0.0015	-0.0004		
$\bar{X}$			0.0041	0.0002	0.0039
S			0.0077		
$S_{\bar{X}}$			0.0123	0.0005	0.0123
MIN					E.L.
MAX					0.0154
Pond 11					
1	0.0012	0.0002	0.0010		
2	0.0006	0.0012	-0.0006		
3	0.0019	0.0019	0		
4	0.0015	0.0015	0		
$\bar{X}$			0.0001	0.0002	E.L.
S			0.0007		
$S_{\bar{X}}$				0.0005	
MIN					E.L.
MAX					0.0008
Pond 12					
1	0.0009	0.0002	0.0007		
2	0.0025	0.0012	0.0013		
3	0.0027	0.0019	0.0008		
4	0.0029	0.0015	0.0014		
$\bar{X}$			0.0011	0.0002	0.0009
S			0.0004		
$S_{\bar{X}}$			0.0006	0.0005	0.0008
MIN					0.0005
MAX					0.0012

Pu-239 — Pond Sint

3/12/81

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Pond 13	Gross Conc	Blank Conc	pCi/g Net Conc	E.L.	Incremental Conc.
1	0.0010	0.0002	0.0008		
2	0.0004	0.0012	-0.0008		
3	0.0019	0.0019	0		
4	0.0016	0.0015	0.0001		
$\bar{X}$			0.00003	0.0002	E.L.
S			0.0007		
$S_{\bar{X}}$				0.0005	
MIN					E.L.
MAX					0.0006
Pond 14					
1	0.0027	0.0002	0.0025		
2	0.0050	0.0012	0.0038		
3	0.0019	0.0019	0		
4	0.0019	0.0015	0.0004		
$\bar{X}$			0.0017	0.0002	0.0015
S			0.0018		
$S_{\bar{X}}$			0.0029	0.0005	0.0029
MIN					E.L.
MAX					0.0036
Pond 15					
1	0.0031	0.0002	0.0029		
2	0.0004	0.0012	-0.0008		
3	0.0033	0.0019	0.0014		
4	0.0013	0.0015	-0.0002		
$\bar{X}$			0.0008	0.0002	0.0006
S			0.0017		
$S_{\bar{X}}$			0.0027	0.0005	0.0027
MIN					E.L.
MAX					0.0027

3/12/81

1980 pu-239 in pond silt

pCi/g

	Gross Conc	Blank Conc	Net Conc	E.L.	Incremental Conc
Pond 16					
pK 1	0.0033	0.0002	0.0031		
2	0.0014	0.0012	0.0002		
3	0.0027	0.0019	0.0008		
4	0.0062	0.0015	0.0047		
$\bar{X}$			0.0022	0.0002	0.0020
S			0.0021		
$S_{\bar{X}}$			0.0033	0.0005	0.0033
MIN					E.L.
MAX					0.0045
Pond 17					
pK 1	0.0017	0.0002	0.0015		
2	0.0795	0.0012	0.0783		
3	0.0840	0.0019	0.0821		
4	N.S.	—	—		
$\bar{X}$			0.054	0.0002	0.0538
S			0.045		
$S_{\bar{X}}$			0.112	0.0005	0.112
MIN					0.0013
MAX					0.0819
Environmental Level					
pK 1	0.0008	0.0002	0.0006		
2	0.0011	0.0012	-0.0001		
3	0.0021	0.0019	0.0002		
4	0.0014	0.0015	-0.0001		
$\bar{X}$			0.0002		
S			0.0003		
$S_{\bar{X}}$			0.0005		
MIN					
MAX					

Pu-238 Results in Silt in ponds - Surface water - 1979 2/11/80

Date	Pond 10 conc $\times 10^{-6}$ µci/g	Pond 11 conc $\times 10^{-6}$ µci/g	Pond 12 conc $\times 10^{-6}$ µci/g	Pond 13 conc $\times 10^{-6}$ µci/g	Pond 14 conc $\times 10^{-6}$ µci/g
1st	0.0016	0.0045	0.0017	0.0024	0.0012
2nd	0.0007	0.0006	0.0043	—	0.0008
3rd	0.0012	0.0005	0.0014	—	0.0007
4th	0.0016	—	0.0015	—	—
$\bar{x}$	0.0013	0.0019	0.0022	0.0024	0.0009
S	0.0004	0.0023	0.0014	—	0.0003
$S_{\bar{x}}$					
$tS_{\bar{x}}$	0.0006	0.0057	0.0022	—	0.0007

Date	Pond 15 conc $\times 10^{-6}$ µci/g	Pond 16 conc $\times 10^{-6}$ µci/g	Pond 17 conc $\times 10^{-6}$ µci/g	ENV. LEVEL conc $\times 10^{-6}$ µci/g
1st	0.0024	0.0044	0.0623	—
2nd	0.0046	0.0010	—	0.0010
3rd	0.0021	0.0010	—	0.0011
4th	—	0.0013	—	—
$\bar{x}$	0.0030	0.0019	0.0623	0.0011
S	0.0014	0.0017	—	0.00007
$S_{\bar{x}}$				
$tS_{\bar{x}}$	0.0035	0.0027	—	0.0006

LDL = 0.0009 $\times 10^{-6}$ µci/g

(pCi/g) Pu-238 in Silt in Surface water monitoring locations 1978 3/1/79

#10		#11		#12		#13		#14		#15		#16		#17	
conc	gran	conc	gran	conc	gran	conc	gran	conc	gran	conc	gran	conc	gran	conc	gran
.2704	1.1938	.1395	1.9443	.4470	1.4827	.8973	.1510	.1659	2.1512	.0264	4.1012	.5904	1.2580	1.3700	2.4924
–	–	.7032	.7632	.1317	.0227	.2307	.1829	.1053	1.4464	.0654	2.8108	.6985	.2548	.0026	1.3744
$\bar{x}$		.4214	1.3538	.2894	.7527	.5640	.1680	.1371	1.6488	.0459	3.456	.6445	.7569	.9063	1.9334
S		.3986		.2230		.4714		.0450		.0276		.0764		.5709	
$S_{\bar{x}}$		.2819		.1577		.3333		.0318		.0195		.0540		.4037	
$TS_{\bar{x}}$		3.58		2.00		4.23		.404		.248		.686		5.13	
.2704 ± .0438		.4214 ± .0531		.2894 ± .0272		.5640 ± .0910		.1371 ± .0212		.0459 ± .0091		.6445 ± .0822		.9063 ± .0421	
LDL = .0149 / 1.1938		LDL = .08		LDL = .15		LDL = .68		LDL = .07		LDL = .03		LDL = .15		LDL = .06	

= .10 pCi/g

Avg = .17 ~ .2 pCi/g (LDL)

1977 Environmental Monitoring Report Data 2/24/78

^{238}Pu in pond data (SILT)

Pond	1st half conc (μci/g)	grams	2nd half conc (μci/g)	grams	year conc. (μci/g)
10	~~0.06 ± 0.01 x10^-6~~	1.79	~~0.015 ± .02 x10^-6~~	1.07	<0.3 ± .02 x10^-6
	<.3 ± .01 x10^-6		<.3 ± .02 x10^-6		
11	~~0.10 ± .01 x10^-6~~	2.26	~~0.08 ± .01 x10^-6~~	2.33	<0.3 ± .01 x10^-6
	<.3 ± .01 x10^-6		<.3 ± .01 x10^-6		
12	~~0.17 ± .02 x10^-6~~	1.04	~~<0.04 ± .006 x10^-6~~	6.10	<0.3 ± .01 x10^-6
	<.3 ± .02 x10^-6		<.3 ± .005 x10^-6		
13	~~0.29 ± .03 x10^-6~~	.87	~~0.13 ± .03 x10^-6~~	.30	<0.3 ± .03 x10^-6
	<.3 ± .03 x10^-6		<.3 ± .03 x10^-6		
14	~~0.09 ± .01 x10^-6~~	1.85	~~0.06 ± .01 x10^-6~~	1.41	<0.3 ± .02 x10^-6
	<.3 ± .01 x10^-6		<.3 ± .03 x10^-6		
15	~~<0.04 ± .001 x10^-6~~	* 48.98	~~<0.04 ± .001 x10^-6~~	* 111.0	<0.3 ± .001 x10^-6
	<.3 ± .001 x10^-6		<.3 ± .001 x10^-6		
16	~~0.20 ± .06 x10^-6~~	.15	~~0.22 ± .04 x10^-6~~	.58	<0.3 ± .05 x10^-6
	<.3 ± .06 x10^-6		<.3 ± .04 x10^-6		
17	~~0.28 ± .03 x10^-6~~	1.35	~~0.55 ± .06 x10^-6~~	.5	<0.4 ± .05 x10^-6
	<.3 ± .03 x10^-6		0.55 ± .06 x10^-6		

* lean out of weight average *

*Avg weight = 1.54 g

LDL = 0.3684 pci/sample ± .04 = $\frac{0.4 \text{ pci/sample}}{1.54 \text{ g}}$ = Avg of = .3 x10^-6 μci/g

1st half 1976

		activity	weight	Result
food	#14	-238	.0257 pci ± .0589 → .056/g	1.049 gram	.0977 pci
	#13		8.5504 pci ± 5.3683 → 298/g	.18 gram	47.39
	#12		.2774 ± .0741 → .10	.71 gram	.3907
	#10		.5723 ± .1328 → .006	22.17 gram	.0267
	#15		.3291 ± .0258 → .019	1.39 gram	.2303
	#11		.1865 ± .0227 → .012	1.86 gram	.1003
	#16		1.627 ± .139 → .19	.73 gram	2.23
	#17		.675 ± .0901 → .059	1.53 gram	.441

Averages

#10 = 0.04 ± .009
#11 = 5.05 ± .281
#12 = 0.23 ± .06
#13 = 25.12 ± 15.1
#14 = 3.59 ± .33
#15 = -.118 ± .011
#16 = 112.98 ± 7.6
#17 = 1.4 ± .23

$\frac{.0218 \text{ pci}}{6.6 \text{ grams}} = .0033 \text{ pci/g}$

Avg weight = 6.6 grams

$= .0033 \times 10^{-6}$ pci/g

MDA →

2nd Half 1976

Location	activity	height	weight	
#10	.039 μci ± .0097 → .012/g	.05	.78	g
#11	4.5936 μci ± .2526 → .55/g	9.99	.46	g
#12	3.7904 μci ± 1.1177 → .02/g	.0718	52.77	g
#13	.5692 μci ± .0787 → .39/g	2.846	.20	g
#14	1.4170 μci ± .1199 → .6/g	7.085	.20	g
#15	.1402 μci ± .0544 → .0026/g	.0066	21.25	g
#16	2.2373 ± .1493 → .1493/g	223.73	.01	g
#17	.4234 ± .0722 → .4/g	2.352	.18	g

APPENDIX H

DATA COMPILATION SHEETS

FROM 1978 THROUGH 1989 FOR URANIUM-233 AND -234 IN THE

GREAT MIAMI RIVER

1989 URANIUM-233,234 IN RIVER WATER (pCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
JAN	0.88	0.68	0.78	0.86	0.72	0.78
FEB	0.76	0.76	0.84	0.76	0.72	0.76
MAR	0.79	0.63	0.66	0.71	0.80	0.69
APR	0.69	0.92	0.76	0.72	0.75	0.76
MAY	0.74	0.65	0.74	0.81	0.69	0.76
JUN	0.82	0.72	0.74	0.74	0.76	0.76
JUL	0.78	0.57	0.70	0.74	0.76	0.70
AUG	0.74	0.86	0.73	0.72	0.74	0.75
SEP	0.11	0.73	0.71	0.66	0.68	0.38
OCT	0.79	0.71	0.72	0.73	0.68	0.72
NOV	0.84	0.78	0.70	0.75	0.85	0.71
DEC	0.88	0.85	0.93	0.97	0.88	0.94
N	12	12	12	12	12	12
AVERAGE	0.74	0.74	0.75	0.76	0.75	0.73
STD DEV	0.21	0.10	0.07	0.08	0.06	0.12
MINIMUM	0.11	0.57	0.66	0.66	0.68	0.38
MAXIMUM	0.88	0.92	0.93	0.97	0.88	0.94
STD ERROR	0.13	0.07	0.05	0.05	0.04	0.08
INCREMENTAL CONCENTRATION						
AVERAGE	0.01	0.01	0.02	0.04	0.03	
MINIMUM	-0.62	-0.15	-0.06	-0.07	-0.05	
MAXIMUM	0.16	0.20	0.20	0.24	0.15	
STD ERROR	0.15	0.10	0.09	0.09	0.09	

1988 URANIUM-233,234 IN RIVER WATER (pCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
JAN	1.01	0.90	0.84	0.86	0.87	0.93
FEB	1.09	0.97	0.73	0.76	0.83	0.96
MAR	0.86	0.73	0.67	0.66	0.75	0.83
APR	0.79	0.71	0.77	0.71	0.73	0.89
MAY	0.85	0.67	0.62	0.71	0.71	0.78
JUN	0.69	0.60	0.53	0.58	0.58	0.58
JUL	0.77	0.48	0.59	0.54	0.55	0.53
AUG	0.59	0.54	0.55	0.60	0.45	0.47
SEP	0.69	0.35	0.40	0.41	0.43	0.55
OCT	0.70	0.49	0.51	0.69	0.51	0.48
NOV	0.58	0.72	0.62	0.59	0.64	0.64
DEC	0.85	0.65	0.74	0.73	0.76	0.77
N	12	12	12	12	12	12
AVERAGE	0.79	0.65	0.63	0.65	0.65	0.70
STD DEV	0.16	0.18	0.13	0.12	0.15	0.18
MINIMUM	0.58	0.35	0.40	0.41	0.43	0.47
MAXIMUM	1.09	0.97	0.84	0.86	0.87	0.96
STD ERROR	0.10	0.11	0.08	0.07	0.09	0.11
INCREMENTAL CONCENTRATION						
AVERAGE	0.09	-0.05	-0.07	-0.05	-0.05	
MINIMUM	-0.12	-0.35	-0.30	-0.29	-0.27	
MAXIMUM	0.39	0.27	0.13	0.16	0.17	
STD ERROR	0.15	0.16	0.14	0.14	0.15	

1987 URANIUM-233,234 IN RIVER WATER (pCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
1ST QTR	1.02	0.75	1.02	0.78	0.91	0.76
APR	0.88	0.67	0.73	0.65	0.71	0.77
MAY	0.76	0.60	0.66	0.72	0.77	0.80
JUN	0.76	0.79	0.71	0.75	0.65	0.86
JUL	0.79	0.80	0.65	0.79	0.67	0.60
AUG	0.79	0.62	0.68	0.58	0.75	0.73
SEP	0.81	0.68	0.59	0.67	0.67	0.73
OCT	0.64	0.70	0.69	0.59	0.85	0.52
NOV	0.73	0.63	0.58	0.61	0.59	0.68
DEC	0.76	0.62	0.61	0.55	0.60	0.57
N	10	10	10	10	10	10
AVERAGE	0.83	0.70	0.75	0.69	0.75	0.71
STD DEV	0.10	0.07	0.12	0.09	0.10	0.11
MINIMUM	0.64	0.60	0.58	0.55	0.59	0.52
MAXIMUM	1.02	0.80	1.02	0.79	0.91	0.86
STD ERROR	0.07	0.05	0.09	0.06	0.07	0.08
INCREMENTAL CONCENTRATION						
AVERAGE	0.12	-0.01	0.03	-0.03	0.04	
MINIMUM	-0.07	-0.12	-0.13	-0.16	-0.12	
MAXIMUM	0.31	0.09	0.30	0.08	0.20	
STD ERROR	0.11	0.09	0.12	0.10	0.11	

1986 URANIUM-233,234 IN RIVER WATER (pCi/L)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1						
2	0.80	0.58	0.67	0.60	0.66	0.81
3	0.67	0.64	0.65	0.67	0.62	0.75
4	0.72	0.83	0.84	0.72	0.75	0.70
N	3	3	3	3	3	3
AVERAGE	0.73	0.69	0.72	0.66	0.68	0.75
STD DEV	0.07	0.13	0.11	0.06	0.06	0.05
MINIMUM	0.67	0.58	0.65	0.60	0.62	0.70
MAXIMUM	0.80	0.83	0.84	0.72	0.75	0.81
STD ERROR	0.16	0.32	0.26	0.15	0.16	0.13
INCREMENTAL CONCENTRATION						
AVERAGE	-0.03	-0.07	-0.04	-0.09	-0.08	
MINIMUM	-0.09	-0.17	-0.10	-0.15	-0.13	
MAXIMUM	0.04	0.08	0.09	-0.04	-0.01	
STD ERROR	0.21	0.34	0.29	0.20	0.21	

1985 URANIUM-233,234 IN RIVER WATER (pCi/L)

QTR	R-1	R-2	R-3	R-4	R-5	E.L.
1	0.97	0.8	0.82	0.93	0.85	0.55
2	0.86	0.84	0.84	0.85	0.75	0.9
3	0.74	0.58	0.78	0.75	0.75	0.69
4	0.58	0.5	0.43	0.46		

N	4	4	4	4	3	3
AVERAGE	0.7875	0.68	0.7175	0.7475	0.783333	0.713333
STD DEV	0.167207	0.165730	0.193283	0.205324	0.057735	0.176162
MINIMUM	0.58	0.5	0.43	0.46	0.75	0.55
MAXIMUM	0.97	0.84	0.84	0.93	0.85	0.9
STD ERROR	0.266027	0.263677	0.307513	0.326671	0.143433	0.437647

INCREMENTAL CONCENTRATION						
AVERAGE	0.074167	-0.03333	0.004167	0.034167	0.070000	0
MINIMUM	-0.13333	-0.21333	-0.28333	-0.25333	0.036667	
MAXIMUM	0.256667	0.126667	0.126667	0.216667	0.136667	
STD ERROR	0.713033	0.712160	0.729528	0.737808	0.676919	

= 1984 U-233,234 [redacted] in Rain Water 1/22/85

Gross U-233,234 (pCi/L)

Qtr	#1	#2	#3	#4	#5	E.L.	Blank
1	0.8884	0.6812	0.6223	0.7037	0.7357	N.S.	0.0108
2	0.816	0.6475	0.7516	0.7334	0.8298	N.S.	0.0123
3	0.7520	0.5052	0.2366	0.624	0.6296	0.6615	0.001
4	0.7489	0.7222	N.S.	0.711	0.7338	0.593	0.0012
							$\bar{x}$ = 0.0063
							S = 0.0061

NET U-233,234 (fCi/L)

Qtr	#1	#2	#3	#4	#5	E.L.
1	0.8821	0.6749	0.616	0.6974	0.7294	N.S.
2	0.8097	0.6412	0.7453	0.7271	0.8235	N.S.
3	0.7457	0.4989	0.2303	0.6177	0.6233	0.6552
4	0.7426	0.7159	N.S.	0.7047	0.7275	0.5867
$\bar{x}$	0.795	0.6327	0.5305	0.6867	0.7259	0.621
S	0.066	0.0943	0.2679	0.0477	0.0818	0.0484
n	4	4	3	4	4	2
$t S_{\bar{x}}$	0.105	0.15	0.6656	0.0759	0.1301	0.4349

LDL = 1.645 · 0.0061 = 0.01 fCi/L

Ratios	#1	#2	#3	#4	#5
U-233,234/U-238 →	1.2	1.2	1.1	1.1	1.2

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1983 U-233,234 & U-238 in River Water 2/2/84

Gross U-233,234 (pCi/L)

Qtr	#1	#2	#3	#4	#5	E.L.
1	0.9914	0.7649	0.7634	0.7434	0.8101	0.8662
2	0.7	0.6679	0.7066	0.6412	0.6738	0.7574
3	0.7141	0.663	0.6251	0.7212	0.6336	0.6019
4	0.6879	0.5975	0.6284	0.6396	0.6394	0.7026

$\bar{X}$ = 0.0081
S = 0.0049

~~Gross U-238 (pCi/L)~~

~~Qtr~~	~~Blank~~	~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~	~~E.L.~~
~~1~~	~~0.0143~~	~~0.869~~	~~0.0934~~	~~0.6037~~	~~0.6789~~	~~0.7917~~	~~0.5301~~
~~2~~	~~0.0063~~	~~0.6529~~	~~0.6636~~	~~0.6009~~	~~0.496~~	~~0.5799~~	~~0.7105~~
~~3~~	~~0.0093~~	~~0.6006~~	~~0.6272~~	~~0.5039~~	~~0.5968~~	~~0.5685~~	~~0.6075~~
~~4~~	~~0.0075~~	~~0.6544~~	~~0.568~~	~~0.5534~~	~~0.5186~~	~~0.5706~~	~~0.6769~~

~~$\bar{X}$ = 0.0101~~
~~S = 0.0031~~

NET U-233,234 (pCi/L)

Qtr	#1	#2	#3	#4	#5	E.L.
1	0.9833	0.7568	0.7553	0.7353	0.802	0.8581
2	0.6919	0.6598	0.6985	0.6331	0.6657	0.7493
3	0.706	0.6549	0.617	0.7131	0.6255	0.5938
4	0.6798	0.5894	0.6203	0.6315	0.6313	0.6945

	#1	#2	#3	#4	#5	E.L.
$\bar{X}$ =	0.7653	0.6652	0.6728	0.6783	0.6811	0.7239
S =	0.1458	0.069	0.0667	0.0538	0.0825	0.1102
n =	4	4	4	4	4	4
$TS_{\bar{X}}$ =	0.2332	0.1098	0.1061	0.0856	0.1313	0.1753

~~NET U-238 (pCi/L)~~

~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~	~~E.L.~~
~~0.8586~~	~~0.635~~	~~0.645~~	~~0.7763~~	~~0.7766~~	~~0.82~~
~~0.8934~~	~~0.6539~~	~~0.6125~~	~~0.6626~~	~~0.7615~~	~~0.7001~~
~~0.8008~~	~~0.6249~~	~~0.6136~~	~~0.5964~~	~~0.5971~~	~~0.4991~~
~~0.641~~	~~0.5576~~	~~0.5032~~	~~0.5501~~	~~0.7582~~	~~0.6655~~
~~0.6708~~	~~0.6169~~	~~0.5906~~	~~0.6916~~	~~0.6084~~	~~0.7207~~
~~0.1882~~	~~0.0443~~	~~0.0607~~	~~0.0503~~	~~0.0856~~	~~0.178~~
~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~
~~0.204~~	~~0.0705~~	~~0.0966~~	0.0928	0.1362	0.2832

U-233,234
LDL = 1.645 • 0.0049 = 0.0081 pCi/L

~~U-238~~
~~LDL = 1.645 • 0.0037 = 0.0061 pCi/L~~

1982 Uranium -233+234 IN River Water 1/13/83 13

(10^{-9} µci/ml) or pCi/L

(Gross Values)

QTR	#1	#2	#3	#4	#5	E.L.	Counting Blank
1	0.6933	0.8138	0.4565	0.6933	0.6729	0.7327	0.007
2	0.8147	0.7314	0.7775	0.7799	0.7726	0.9287	0.004
3	0.5865	0.6393	0.6214	0.7987	0.6439	0.6874	0.006
4	0.8945	0.7028	0.6	0.7006	0.6256	0.6529	0.007

(NET Values)

QTR	#1	#2	#3	#4	#5	EL
1	0.6855	0.806	0.4487	0.6855	0.6651	0.7249
2	0.8101	0.7268	0.7729	0.7753	0.768	0.9241
3	0.5802	0.633	0.6151	0.7924	0.6376	0.6811
4	0.8868	0.6951	0.5923	0.6929	0.6179	0.5452
n	4	4	4	4	4	4
$\bar{x}$	0.7407	0.7152	0.6073	0.7365	0.6722	0.7188
S	0.1354	0.072	0.1327	0.0552	0.0668	0.1568
$S_{\bar{x}}$	0.07	0.04	0.07	0.03	0.03	0.08
$TS_{\bar{x}}$	0.22	0.13	0.22	0.1	0.1	0.25

Mound Impact - E.L. Subtracted

(10^{-9} µci/ml)

Location	NET. CONC ± TS$\bar{x}$		EL CONC ± TS$\bar{x}$		Mound Impact ± $\sqrt{(TS_{\bar{x}})^2 + (TS_{EL})^2}$
#1	0.7407 ± 0.22	−	0.7188 ± 0.25	=	0.02 ± 0.33
#2	0.7152 ± 0.13	−	0.7188 ± 0.25	=	EL
#3	0.6073 ± 0.22	−	0.7188 ± 0.25	=	EL
#4	0.7365 ± 0.1	−	0.7188 ± 0.25	=	0.02 ± 0.27
#5	0.6722 ± 0.1	−	0.7188 ± 0.25	=	EL

$LDL = 0.0015 \times 10^{-9} \times 1.645 = 0.002 \times 10^{-9}$ µci/ml

1981 Uranium - 233+234 in River Water 8/26/82
pCi/L or (10^{-9} µci/ml)

QTR	#1	#2	#3	#4	#5	E.L.	BLANK
1	0.6842	0.7513	0.8409	0.803	0.5762	0.9163	0.016
2	0.7402	0.6992	0.7061	0.7331	0.7008	0.8381	0.024
3	0.6338	0.5554	0.7122	0.7363	0.6614	0.8647	0.018
4	0.7955	0.7743	0.7303	0.7403	0.7686	0.7556	0.026

NET VALUES (10^{-9} µci/ml) BLANK Subtracted

QTR	#1	#2	#3	#4	#5	E.L.
1	0.668	0.735	0.825	0.787	0.56	0.90
2	0.716	0.645	0.682	0.709	0.677	0.814
3	0.616	0.537	0.694	0.718	0.643	0.847
4	0.77	0.748	0.704	0.714	0.743	0.73

Uranium - 233, 234 in River Water Summary

SAMPLE	CONC (10^{-10} µci/ml)	E.L. (10^{-10} µci/ml)	Hound Impact (10^{-10} µci/ml)
1	6.93 ± 1.04	8.23 ± 1.14	E.L.
2	6.66 ± 1.55	8.23 ± 1.14	E.L.
3	7.26 ± 1.04	8.23 ± 1.14	E.L.
4	7.32 ± 0.57	8.23 ± 1.14	E.L.
5	6.56 ± 1.2	8.23 ± 1.14	E.L.
E.L.	8.23 ± 1.14	8.23 ± 1.14	

LDL = 0.19×10^{-10} µci/ml × 1.645 = 0.31×10^{-10} µci/ml

1981 uranium-233+234 in River Water 8/26/82
Pci/L or (10^{-9} µci/ml)

Ctr	#1	#2	#3	#4	#5	E.L.	Blank
1	0.6542	0.7513	0.8409	0.803	0.5762	0.9163	0.016
2	0.7402	0.6992	0.7061	0.7331	0.7008	0.8381	0.024
3	0.6338	0.5554	0.7122	0.7363	0.6614	0.8647	0.018
4	0.7955	0.7743	0.7303	0.7403	0.7686	0.7556	0.026

net Values (10^{-9} µci/ml) Blank Subtracted

Ctr	#1	#2	#3	#4	#5	E.L.
1	0.668	0.735	0.825	0.787	0.56	0.90
2	0.716	0.645	0.682	0.709	0.677	0.814
3	0.616	0.537	0.694	0.718	0.643	0.847
4	0.77	0.748	0.704	0.714	0.743	0.73

uranium-233,234 in River Water Summary

Sample	Conc (10^{-10} µci/ml)	E.L. (10^{-10} µci/ml)	Hound Impact (10^{-10} µci/ml)
1	6.93 ± 1.04	8.23 ± 1.14	E.L.
2	6.66 ± 1.55	8.23 ± 1.14	E.L.
3	7.26 ± 1.04	8.23 ± 1.14	E.L.
4	7.32 ± 0.57	8.23 ± 1.14	E.L.
5	6.56 ± 1.2	8.23 ± 1.14	E.L.
E.L.	8.23 ± 1.14	8.23 ± 1.14	

LDL = 0.19×10^{-10} µci/ml × 1.645 = 0.31×10^{-10} µci/ml

U-233,234 in River Water ($\times 10^{-10}$ µci/ml) 1980 2/24/81

#1 (QHUS)	Gross conc	Blank conc	NET Concentration	Environmental Level	Increment Concentration
1	9.021	0.280	8.741		
2	8.606	0.146	8.460		
3	7.952	0.238	7.714		
4	9.057	0.197	8.860		
$\bar{X}$			8.444	7.137	1.307
S			0.515		
n			4		
$S_{\bar{X}}$			0.819	2.899	3.012
MIN					0.577
MAX					1.723
#2					
1	7.991	0.280	7.711		
2	7.534	0.146	7.388		
3	7.143	0.238	6.905		
4	7.253	0.197	7.056		
$\bar{X}$			7.265	7.137	0.128
S			0.359		
n			4		
$S_{\bar{X}}$			0.571	2.899	2.955
MIN					E.L.
MAX					0.574
#3					
1	7.508	0.280	7.228		
2	8.089	0.146	7.943		
3	7.7	0.238	7.462		
4	7.43	0.197	7.233		
$\bar{X}$			7.467	7.137	0.33
S			0.356		
n			4		
$S_{\bar{X}}$			0.566	2.899	2.954
MIN					0.096
MAX					0.806

Isotope 233, 234 (1980) in 2-liter water ($\times 10^{-10}$ pCi/ml) 2/24/81

#4	Gross Concentration	Blank Conc.	NET Concentration	Environmental Level	Increment Concentration
1	8.861	0.280	8.58		
2	8.159	0.146	8.013		
3	7.057	0.238	6.819		
4	7.526	0.197	7.329		
$\bar{x}$			7.685	7.137	0.548
S			0.771		
n			4		
$S_{\bar{x}}$			1.227	2.899	3.148
MIN					E.L.
MAX					1.443
#5					
1	8.903	0.280	8.623		
2	7.366	0.146	7.220		
3	6.962	0.238	6.724		
4	6.411	0.197	6.214		
$\bar{x}$			7.195	7.137	0.058
S			1.037		
n			4		
$S_{\bar{x}}$			1.650	2.899	3.336
MIN					E.L.
MAX					1.486
Environmental Level					
1	8.552	0.280	8.272		
2	9.055	0.146	8.909		
3	6.732	0.238	6.494		
4	5.071	0.197	4.874		
$\bar{x}$			7.137		
S			1.822		
n			4		
$S_{\bar{x}}$			2.899		
MIN					
MAX					

Uranium Results in River Samples (water) 1979 4/7/80

(U-233 + U-234)

Date	#1		#2		#3		#4		#5		Environmental Level	
Quarter	conc $\times 10^{-9}$ pci/cc	volume liters	conc $\times 10^{-9}$ pci/cc	volume liters	conc $\times 10^{-9}$ pci/cc	volume liters	conc $\times 10^{-9}$ pci/cc	volume liters	conc $\times 10^{-9}$ pci/cc	volume liters	conc $\times 10^{-9}$ pci/cc	volume liters
1st	0.9863	3	0.8940	4	0.8460	4	0.9534	4	0.8975	4	–	–
2nd	0.8016	3	0.7243	3	0.7277	3	0.7610	3	0.7093	3	0.6160	1
3rd	0.7472	1	0.6001	1	0.6027	1	0.6884	1	0.6032	1	0.7490	1
4th	0.9281	1	0.7350	1	0.8366	1	0.7217	1	0.7905	1	0.9524	1
$\bar{x}$	0.8658	2	0.7384	2.3	0.7533	2.3	0.7811	2.3	0.7501	2.3	0.7725	1
S	0.1104		0.1205		0.1138		0.1186		0.1246		0.1694	
$S_{\bar{x}}$	0.0552		0.0603		0.0569		0.0593		0.0623		0.0978	
$tS_{\bar{x}}$	0.1756		0.1917		0.1811		0.1887		0.1982		0.4208	

$$LDL = U\text{-}233+234 = \frac{0.0272 \times 10^{-6}\ \mu ci}{2 \times 10^{3}\ cc} = 0.0136 \times 10^{-9}\ pci/cc \qquad LDL = 0.14 \times 10^{-10}\ pci/ml$$

~~(U-238)~~

~~Date~~	~~#1~~		~~#2~~		~~#3~~		~~#4~~		~~#5~~		~~Environmental Level~~	
~~1st~~	~~0.9345~~	~~3~~	~~0.7918~~	~~4~~	~~0.7033~~	~~4~~	~~0.8[illegible]~~	~~4~~	~~0.8[illegible]~~	~~4~~		
~~2nd~~	~~0.6007~~	~~3~~	~~0.6[illegible]~~	~~3~~	~~0.6669~~	~~3~~	~~0.6688~~	~~3~~	~~0.6520~~	~~3~~	~~0.6[illegible]~~	~~1~~
~~3rd~~	~~0.6[illegible]~~	~~1~~	~~0.5409~~	~~1~~	~~0.5705~~	~~1~~	~~0.5770~~	~~1~~	~~0.5[illegible]~~	~~1~~	~~0.7496~~	~~1~~
~~4th~~	~~0.8639~~	~~1~~	~~0.7186~~	~~1~~	~~0.7477~~	~~1~~	~~0.6504~~	~~1~~	~~0.7991~~	~~1~~	~~0.8079~~	~~1~~
~~$\bar{x}$~~	~~0.7924~~	~~2~~	~~0.6998~~	~~2.3~~	~~0.6954~~	~~2.3~~	~~0.6838~~	~~2.3~~	~~0.6886~~	~~2.3~~	~~0.7629~~	~~1~~
~~S~~	~~0.1064~~		~~0.1061~~		~~0.1088~~		~~0.1144~~		~~0.1037~~		~~0.1403~~	
~~$S_{\bar{x}}$~~	~~0.0[illegible]~~		~~0.0531~~		~~0.0511~~		~~0.0559~~		~~0.0518~~		~~0.0836~~	
~~$tS_{\bar{x}}$~~	~~0.1995~~		~~0.1698~~		~~0.1626~~		~~0.1792~~		~~0.1634~~		~~0.2938~~	

~~$LDL = U\text{-}238 = \frac{0.0102 \times 10^{-6}\ \mu ci}{2 \times 10^{3}\ cc} = 0.0051 \times 10^{-9}\ pci/cc$ LDL = 0.09 × 10 pci/ml~~

Uranium - 233,234 Results - 1978 (Pci/L) in Water 3/1/79

River	#1 → No. 2	#2 → No. 3	#3 → No. 4	#4 → No. 5	#5 → No. 1
	.6299 ± .0231	.6340 ± .0408	.6365 ± .0209	.6376 ± .0377	.5866 ± .0281
	.6702 ± .0272	.6039 ± .0370	.6196 ± .0202	.6350 ± .0275	.6249 ± .0370
	.6501 ± .0252	.6180 ± .0389	.6281 ± .0206	.6363 ± .0326	.6058 ± .0326

Uranium - 233,234 Results - 1978 (Pci/L) in Water 3/1/79

River	#1 → No. 2	#2 → No. 3	#3 → No. 4	#4 → No. 5	#5 → No. 1
	.6299 ± .0231	.6340 ± .0408	.6365 ± .0209	.6376 ± .0377	.5866 ± .0281
	.6702 ± .0272	.6039 ± .0370	.6196 ± .0202	.6350 ± .0275	.6249 ± .0370
	.6501 ± .0252	.6190 ± .0389	.6281 ± .0206	.6363 ± .0326	.6058 ± .0326

APPENDIX I

DATA COMPILATION SHEETS

FROM 1978 THROUGH 1989 FOR URANIUM-238 IN THE

GREAT MIAMI RIVER

1989 URANIUM-238 IN RIVER WATER (pCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
JAN	0.77	0.64	0.64	0.74	0.63	0.71
FEB	0.67	0.63	0.70	0.65	0.64	0.71
MAR	0.67	0.58	0.62	0.69	0.79	0.70
APR	0.64	0.74	0.68	0.63	0.70	0.68
MAY	0.73	0.54	0.62	0.72	0.66	0.72
JUN	0.70	0.59	0.68	0.63	0.75	0.74
JUL	0.80	0.55	0.60	0.59	0.68	0.66
AUG	0.67	0.80	0.61	0.66	0.70	0.71
SEP	0.11	0.66	0.65	0.65	0.66	0.40
OCT	0.74	0.63	0.60	0.67	0.62	0.67
NOV	0.77	0.70	0.60	0.63	0.72	0.76
DEC	0.82	0.79	0.90	0.83	0.80	0.85
N	12	12	12	12	12	12
AVERAGE	0.67	0.65	0.66	0.67	0.70	0.69
STD DEV	0.19	0.09	0.08	0.06	0.06	0.10
MINIMUM	0.11	0.54	0.60	0.59	0.62	0.40
MAXIMUM	0.82	0.80	0.90	0.83	0.80	0.85
STD ERROR	0.12	0.06	0.05	0.04	0.04	0.07
INCREMENTAL CONCENTRATION						
AVERAGE	-0.02	-0.04	-0.031	-0.02	0.004	
NINIMUM	-0.58	-0.16	-0.09	-0.10	-0.07	
MAXIMUM	0.13	0.11	0.21	0.14	0.11	
STD ERROR	0.14	0.09	0.08	0.08	0.08	

1988 URANIUM-238 IN RIVER WATER (pCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
JAN	0.96	0.69	0.79	0.78	0.73	0.87
FEB	0.98	0.85	0.69	0.79	0.71	0.93
MAR	0.80	0.70	0.66	0.56	0.66	0.81
APR	0.76	0.65	0.73	0.63	0.58	0.75
MAY	0.70	0.56	0.56	0.64	0.64	0.74
JUN	0.63	0.50	0.47	0.48	0.48	0.50
JUL	0.61	0.38	0.52	0.53	0.48	0.52
AUG	0.52	0.41	0.44	0.51	0.39	0.40
SEP	0.60	0.30	0.33	0.37	0.38	0.52
OCT	0.64	0.43	0.44	0.47	0.47	0.40
NOV	0.50	0.52	0.51	0.48	0.49	0.54
DEC	0.69	0.55	0.61	0.64	0.65	0.76
N	12	12	12	12	12	12
AVERAGE	0.70	0.54	0.56	0.57	0.55	0.65
STD DEV	0.15	0.16	0.14	0.13	0.12	0.18
MINIMUM	0.50	0.30	0.33	0.37	0.38	0.40
MAXIMUM	0.98	0.85	0.79	0.79	0.73	0.93
STD ERROR	0.10	0.10	0.09	0.08	0.08	0.12
INCREMENTAL CONCENTRATION						
AVERAGE	0.05	-0.10	-0.084	-0.07	-0.09	
NINIMUM	-0.15	-0.35	-0.32	-0.28	-0.26	
MAXIMUM	0.34	0.20	0.15	0.15	0.08	
STD ERROR	0.15	0.15	0.15	0.14	0.14	

1987 URANIUM-238 IN RIVER WATER (pCi/L)

MONTH	R-1	R-2	R-3	R-4	R-5	E.L.
1ST QTR	0.87	0.78	0.87	0.76	0.72	0.74
APR	0.86	0.63	0.64	0.61	0.69	0.74
MAY	0.71	0.56	0.63	0.63	0.71	0.71
JUN	0.71	0.73	0.67	0.68	0.54	0.76
JUL	0.71	0.67	0.58	0.68	0.64	0.64
AUG	0.64	0.53	0.68	0.51	0.62	0.64
SEP	0.70	0.57	0.53	0.58	0.60	0.59
OCT	0.50	0.57	0.59	0.50	0.65	0.56
NOV	0.60	0.50	0.51	0.59	0.52	0.61
DEC	0.74	0.56	0.52	0.59	0.65	0.52
N	10	10	10	10	10	10
AVERAGE	0.73	0.64	0.66	0.64	0.65	0.67
STD DEV	0.11	0.09	0.11	0.08	0.07	0.08
MINIMUM	0.50	0.50	0.51	0.50	0.52	0.52
MAXIMUM	0.87	0.78	0.87	0.76	0.72	0.76
STD ERROR	0.08	0.06	0.08	0.06	0.05	0.06
INCREMENTAL CONCENTRATION						
AVERAGE	0.06	-0.03	-0.003	-0.03	-0.02	
NINIMUM	-0.17	-0.17	-0.16	-0.17	-0.15	
MAXIMUM	0.20	0.11	0.20	0.09	0.06	
STD ERROR	0.10	0.09	0.10	0.08	0.08	

1986 URANIUM-238 IN RIVER WATER (pCi/L)

QUARTER	R-1	R-2	R-3	R-4	R-5	E.L.
1						
2	0.6698	0.5604	0.5682	0.6129	0.5888	0.699
3	0.6747	0.5308	0.56	0.5623	0.5682	0.6855
4	0.6547	0.7937	0.7948	0.6659	0.6256	0.7016
N	3	3	3	3	3	3
AVERAGE	0.67	0.63	0.64	0.61	0.59	0.70
STD DEV	0.01	0.14	0.13	0.05	0.03	0.01
MINIMUM	0.65	0.53	0.56	0.56	0.57	0.69
MAXIMUM	0.67	0.79	0.79	0.67	0.63	0.70
STD ERROR	0.03	0.36	0.33	0.13	0.07	0.02
INCREMENTAL CONCENTRATION						
AVERAGE	-0.03	-0.07	-0.05	-0.08	-0.10	
NINIMUM	-0.04	-0.16	-0.14	-0.13	-0.13	
MAXIMUM	-0.02	0.10	0.10	-0.03	-0.07	
STD ERROR	0.03	0.36	0.33	0.13	0.08	

1985 URANIUM-238 IN RIVER WATER (pCi/L)

QTR	R-1	R-2	R-3	R-4	R-5	E.L.
1	0.97	0.76	0.74	0.78	0.74	0.79
2	0.79	0.74	0.72	0.74	0.69	0.76
3	0.62	0.54	0.63	0.63	0.64	0.74
4	0.5	0.38	0.34	0.44		

N	4	4	4	4	3	3
AVERAGE	0.72	0.605	0.6075	0.6475	0.69	0.763333
STD DEV	0.204776	0.179907	0.184639	0.152178	0.05	0.025166
MINIMUM	0.5	0.38	0.34	0.44	0.64	0.74
MAXIMUM	0.97	0.76	0.74	0.78	0.74	0.79
STD ERROR	0.325799	0.286232	0.293761	0.242116	0.124216	0.062521

INCREMENTAL CONCENTRATION						
AVERAGE	-0.04333	-0.15833	-0.15583	-0.11583	-0.07333	0
MINIMUM	-0.26333	-0.38333	-0.42333	-0.32333	-0.12333	
MAXIMUM	0.206667	-0.00333	-0.02333	0.016667	-0.02333	
STD ERROR	0.331743	0.292981	0.300340	0.250058	0.139063	

= 1984 ~~[illegible]~~ + U-238 in Rain Water 1/22/85

~~Gross U-233,234 (pCi/L)~~

Gross U-238 (pCi/L)

~~Qtr~~	~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~	~~E.L~~	~~Blank~~	#1	#2	#3	#4	#5	E.L	Blank
~~1~~	~~0.8884~~	~~0.6[illegible]~~	~~0.6[illegible]~~	~~0.7037~~	~~0.7[illegible]~~	~~N.S.~~	~~0.0[illegible]~~	0.6738	0.5784	0.5839	0.5827	0.6129	N.S.	0.00[illegible]
~~2~~	~~0.816~~	~~0.6475~~	~~0.7516~~	~~0.7234~~	~~0.8298~~	~~N.S.~~	~~0.0123~~	0.7136	0.5666	0.6933	0.6747	0.673	N.S.	0.012
~~3~~	~~0.7520~~	~~0.5052~~	~~0.2366~~	~~0.624~~	~~0.6296~~	~~0.0015~~	~~0.001~~	0.6234	0.4964	0.2499	0.5879	0.5553	0.6261	0.000
~~4~~	~~0.7489~~	~~0.7222~~	~~N.S.~~	~~0.711~~	~~0.7338~~	~~0.573~~	~~0.007~~	0.6339	0.5497	N.S.	0.6634	0.6485	0.5766	0.000
							~~$\bar{x}$=0.0063~~							$\bar{x}$=0.004
							~~S=0.0061~~							S=0.005

~~Net U-233,234 (pCi/L)~~

Net U-238 (pCi/L)

~~Qtr~~	~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~	~~E.L~~	#1	#2	#3	#4	#5	E.L
~~1~~	~~0.8121~~	~~0.6747~~	~~0.616~~	~~0.8994~~	~~0.7994~~	~~N.S.~~	0.6694	0.574	0.5795	0.5783	0.6085	N.S.
~~2~~	~~0.8097~~	~~0.6112~~	~~0.7453~~	~~0.7271~~	~~0.8235~~	~~N.S.~~	0.7092	0.5622	0.6889	0.6703	0.6686	N.S.
~~3~~	~~0.7157~~	~~0.4989~~	~~0.2463~~	~~0.6177~~	~~0.6331~~	~~0.0352~~	0.619	0.492	0.2455	0.5835	0.5509	0.6217
~~4~~	~~0.7426~~	~~0.7159~~	~~N.S.~~	~~0.7047~~	~~0.7915~~	~~0.5767~~	0.6295	0.5453	N.S.	0.659	0.6441	0.5722
~~$\bar{x}$~~	~~0.795~~	~~0.6227~~	~~0.5205~~	~~0.6867~~	~~0.7259~~	~~0.621~~	0.6568	0.5434	0.5046	0.6228	0.618	0.597
~~S~~	~~0.066~~	~~0.0943~~	~~0.2679~~	~~0.0477~~	~~0.0818~~	~~0.0484~~	0.0411	0.0362	0.231	0.0486	0.0511	0.035
~~N~~	~~4~~	~~4~~	~~3~~	~~4~~	~~4~~	~~2~~	4	4	3	4	4	2
~~SE~~	~~0.105~~	~~0.15~~	~~0.6656~~	~~0.0759~~	~~0.1301~~	~~0.4349~~	0.0654	0.0576	0.5739	0.0773	0.0813	0.3145

~~LDL = 1.645 · 0.0061 = 0.01 pCi/L~~

LDL = 1.645 · 0.0056 = 0.0092 pCi/L

~~Ratios~~	~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~
~~U-233,234/U-238 →~~	~~1.0~~	~~1.2~~	~~1.1~~	~~1.1~~	~~1.2~~

1983 ~~233,234~~ x U-238 in River Water 2/21/84

~~Gross U-233,234 (pCi/L)~~

Gross U-238 (pCi/L)

~~Date~~	~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~	~~EL~~	~~Blank~~	#1	#2	#3	#4	#5	EL
~~1~~	~~0.9914~~	~~0.7049~~	~~0.9634~~	~~0.7434~~	~~0.8101~~	~~0.8660~~	~~0.0043~~	0.869	0.6454	0.6654	0.6867	0.747	0.8304
~~2~~	~~0.7~~	~~0.6679~~	~~0.7066~~	~~0.6412~~	~~0.6738~~	~~0.7574~~	~~0.0063~~	0.5838	0.6636	0.6229	0.676	0.5799	0.9105
~~3~~	~~0.7141~~	~~0.663~~	~~0.6951~~	~~0.7212~~	~~0.6336~~	~~0.6019~~	~~0.0023~~	0.6206	0.6373	0.5239	0.5968	0.5685	0.5075
~~4~~	~~0.6879~~	~~0.5975~~	~~0.6294~~	~~0.6396~~	~~0.6394~~	~~0.7026~~	~~0.0015~~	0.6514	0.563	0.5536	0.5685	0.5786	0.6759
							~~$\bar{x}$ = 0.0087~~						$\bar{X}$ = 0.0
							~~S = 0.0049~~						S = 0.0

~~Net U-233,234 (pCi/L)~~

Net U-238 (pCi/L)

~~Date~~	~~#1~~	~~#2~~	~~#3~~	~~#4~~	~~#5~~	~~EL~~	#1	#2	#3	#4	#5	EL
~~1~~	~~0.9823~~	~~0.7568~~	~~0.7553~~	~~0.7353~~	~~0.802~~	~~0.8281~~	0.8586	0.635	0.645	0.6763	0.7366	0.82
~~2~~	~~0.6919~~	~~0.6598~~	~~0.6985~~	~~0.6331~~	~~0.6657~~	~~0.7483~~	0.5734	0.6532	0.6125	0.6656	0.5695	0.9001
~~3~~	~~0.7006~~	~~0.6549~~	~~0.617~~	~~0.7131~~	~~0.6255~~	~~0.5938~~	0.6102	0.6269	0.5135	0.5964	0.5581	0.4971
~~4~~	~~0.6798~~	~~0.5894~~	~~0.6203~~	~~0.6315~~	~~0.6313~~	~~0.6945~~	0.641	0.5526	0.5432	0.5581	0.5682	0.6655
~~$\bar{x}$ =~~	~~0.7663~~	~~0.6652~~	~~0.6728~~	~~0.6783~~	~~0.6811~~	~~0.7239~~	0.6708	0.6169	0.5786	0.6216	0.6084	0.7207
~~S =~~	~~0.1458~~	~~0.069~~	~~0.0667~~	~~0.0538~~	~~0.0825~~	~~0.1102~~	0.1282	0.0443	0.0607	0.0583	0.0856	0.178
~~n =~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	~~4~~	4	4	4	4	4	4
~~$t_{5,\gamma}$ =~~	~~0.232~~	~~0.1098~~	~~0.1061~~	~~0.0856~~	~~0.1313~~	~~0.1758~~	0.204	0.0705	0.0966	0.0928	0.1362	0.2832

~~U-233,234~~

~~LDL = 1.645 · 0.0049 = 0.0081 pCi/L~~

U-238

LDL = 1.645 · 0.0037 = 0.0061 pCi/L

1982 Uranium-238 IN River Water 1/18/83

(10^{-9} µci/ml or pCi/L)

(Gross Values)

QTR	#1	#2	#3	#4	#5	E.L.	Calculated Blank
1	0.6041	0.7525	0.8475	0.6041	0.5912	0.7738	0.0125
2	0.7341	0.6894	0.708	0.6964	0.6613	0.8759	0.0074
3	0.649	0.5725	0.5719	0.7111	0.6003	0.6272	0.0042
4	0.6642	0.6154	0.5436	0.6119	0.6115	0.5441	0.0051

(NET Values)

QTR	#1	#2	#3	#4	#5	E.L.
1	0.5916	0.74	0.835	0.5916	0.5787	0.7613
2	0.7267	0.682	0.7006	0.6893	0.6539	0.8685
3	0.6448	0.5683	0.5677	0.7069	0.5961	0.623
4	0.6591	0.6103	0.5385	0.6068	0.6064	0.539
n	4	4	4	4	4	4
$\bar{X}$	0.6556	0.6502	0.6605	0.6487	0.6088	0.698
S	0.0556	0.0761	0.1361	0.0579	0.0322	0.146
$S_{\bar{X}}$	0.03	0.04	0.07	0.03	0.02	0.07
$TS_{\bar{X}}$	0.1	0.13	0.22	0.1	0.06	0.22

Mound Impact - E.L. Subtracted

(10^{-9} µci/ml)

Location	NET Conc ± $TS_{\bar{X}}$		E.L. Conc ± $TS_{\bar{X}}$	Mound Impact ± $\sqrt{(TS_{\bar{X}(N)})^2 + (TS_{\bar{X}(E)})^2}$
#1	0.6556 ± 0.1	−	0.698 ± 0.22	E.L.
#2	0.6502 ± 0.13	−	0.698 ± 0.22	E.L.
#3	0.6605 ± 0.22	−	0.698 ± 0.22	E.L.
#4	0.6487 ± 0.1	−	0.698 ± 0.22	E.L.
#5	0.6088 ± 0.06	−	0.698 ± 0.22	E.L.

LDL = 0.0037 $\times 10^{-9}$ µci/ml · 1.645 = 0.006 $\times 10^{-9}$ µci/ml

No Uranium-238 Data
for 1981

U-238 (1.980) in River water ($\times 10^{-10}$ μci/ml) 2/24/8

#1 (Qtr #)	Gross Conc.	Blank Conc.	NET Conc.	Environmental Level	Incremental Concentration
1	8.593	0.280	8.313		
2	7.955	0.109	7.846		
3	7.347	0.180	7.167		
4	7.865	0.161	7.704		
$\bar{X}$			7.758	6.825	0.933
S			0.472		
N			4		
$S_{\bar{X}}$			0.751	2.038	2.172
MIN					0.342
MAX					1.488
#2					
1	6.464	0.280	6.184		
2	6.607	0.109	6.493		
3	6.499	0.180	6.319		
4	5.963	0.161	5.802		
$\bar{X}$			6.2	6.825	E.L.
S			0.294		
N			4		
$S_{\bar{X}}$			0.468	2.038	
MIN					E.L.
MAX					E.L.
#3					
1	6.766	0.280	6.486		
2	7.484	0.109	7.375		
3	6.913	0.180	6.733		
4	6.669	0.161	6.508		
$\bar{X}$			6.776	6.825	E.L.
S			0.415		
N			4		
$S_{\bar{X}}$			0.660	2.038	
MIN					E.L.
MAX					0.55

U-238 (1.280)

-2-

#4	Gross conc.	Blank conc.	Net conc.	Environmental Level	Incremental concentration
1	9.392	0.280	9.112		
2	7.860	0.109	7.751		
3	6.471	0.180	6.291		
4	6.134	0.161	5.973		
$\bar{X}$			7.282	6.825	0.457
S			1.445		
n			4		
$S_{\bar{X}}$			2.299	2.038	3.072
MIN					E.L.
MAX					2.287

#5					
1	8.296	0.280	8.016		
2	7.423	0.109	7.314		
3	6.256	0.180	6.076		
4	5.683	0.161	5.522		
$\bar{X}$			6.732	6.825	E.L.
S			1.138		
n			4		
$S_{\bar{X}}$			1.811	2.038	
MIN					E.L.
MAX					1.191

Environmental Level					
1	7.613	0.280	7.333		
2	8.471	0.109	8.362		
3	6.301	0.180	6.121		
4	5.643	0.161	5.482		
$\bar{X}$			6.825		
S			1.281		
n			4		
$S_{\bar{X}}$			2.038		
MIN					
MAX					

Uranium Results in river samples (warm) 1979

Quarter	#1 conc $\times 10^{-9}$ µci/ml	#1 volume liters	#2 conc $\times 10^{-9}$ µci/ml	#2 volume liters	#3 conc $\times 10^{-9}$ µci/ml	#3 volume liters	#4 conc $\times 10^{-9}$ µci/ml	#4 volume liters	#5 conc $\times 10^{-9}$ µci/ml	#5 volume liters	Environmental Level conc $\times 10^{-9}$ µci/ml	Environmental Level volume liters
~~1st~~	~~0.9863~~	~~3~~	~~0.8940~~	~~4~~	~~0.8460~~	~~4~~	~~0.9534~~	~~4~~	~~0.8975~~	~~4~~	—	—
~~2nd~~	~~0.8046~~	~~3~~	~~0.7243~~	~~3~~	~~0.7227~~	~~3~~	~~0.7610~~	~~3~~	~~0.7093~~	~~3~~	~~0.6160~~	~~1~~
~~3rd~~	~~0.7472~~	~~1~~	~~0.6001~~	~~1~~	~~0.6027~~	~~1~~	~~0.6884~~	~~1~~	~~0.6032~~	~~1~~	~~0.7490~~	~~1~~
~~4th~~	~~0.9281~~	~~1~~	~~0.9360~~	~~1~~	~~0.8966~~	~~1~~	~~0.9217~~	~~1~~	~~0.9905~~	~~1~~	~~0.9624~~	~~1~~
~~$\bar{x}$~~	~~0.8658~~	~~2~~	~~0.7384~~	~~2.3~~	~~0.7533~~	~~2.3~~	~~0.7811~~	~~2.3~~	~~0.7501~~	~~2.3~~	~~0.7725~~	~~1~~
~~S~~	~~0.1104~~		~~0.1205~~		~~0.1138~~		~~0.1186~~		~~0.1246~~		~~0.1694~~	
~~$S_{\bar{x}}$~~	~~0.0552~~		~~0.0603~~		~~0.0569~~		~~0.0593~~		~~0.0623~~		~~0.0978~~	
~~$ts_{\bar{x}}$~~	~~0.1756~~		~~0.1917~~		~~0.1844~~		~~0.1887~~		~~0.1982~~		~~0.2208~~	

~~LDL = 0.0298 µci/ml / 2 × 10^3 ml = 0.015 × 10^-9 µci/ml~~ ~~LDL = 0.14 × 10^-10 µci/ml~~

(U-238) - Same units

date	#1		#2		#3		#4		#5		Environmental Level	
1st	0.9395	3	0.7918	4	0.7833	4	0.8490	4	0.8702	4	—	—
2nd	0.6887	3	0.6577	3	0.6659	3	0.6688	3	0.6522	3	0.6806	1
3rd	0.6825	1	0.5409	1	0.5505	1	0.5970	1	0.5842	1	0.7196	1
4th	0.8539	1	0.7185	1	0.7417	1	0.6304	1	0.7371	1	0.8879	1
$\bar{x}$	0.7924	2	0.6772	2.3	0.6854	2.3	0.6858	2.3	0.6986	2.3	0.7627	1
S	0.1254		0.1061		0.1022		0.1114		0.1027		0.1102	
$S_{\bar{x}}$	0.0627		0.0531		0.0511		0.0559		0.0514		0.0636	
$ts_{\bar{x}}$	0.1995		0.1688		0.1626		0.1772		0.1634		0.2738	

$$LDL = U\text{-}238 = \frac{0.0182 \times 10^{-6}\ \mu Ci}{2 \times 10^{3}\ ml} = 0.0091 \times 10^{-9}\ \mu ci/ml \qquad LDL = 0.09 \times 10^{-10}\ \mu ci/ml$$

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Uranium - 238 results in water (1978 fiji) 3/2/79

Run	#1 → No. 2	#2 → No 3	#3 → No. 4	#4 → No. 5	#5 → No. 1
	.5830 ± .0222	.5739 ± .0394	.5774 ± .0201	.5617 ± .0354	.5487 ± .0272
	.5851 ± .0254	.3251 ± .0272	.5708 ± .0194	.5765 ± .0262	.5829 ± .0358
	.5851 ± .0238	.4495 ± .0333	.5791 ± .0198	.5691 ± .0308	.5658 ± .0315

APPENDIX J

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM BURIED VALLEY AQUIFER EVALUATION PROJECT WELLS

(WELL NO. 0002, 0003, 0004, 0005, 0006, AND 0007)

Appendix J. Tritium Concentrations In Groundwater Samples (nCi/L)
From the Buried Valley Aquifer Evaluation Project Wells
(Well Nos. 0002, 0003, 0004, 0005, 0006, and 0007)

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Jan-75						
Jan-75						
Feb-75						
Mar-75						
Apr-75						
May-75						
Jun-75						
Jul-75						
Aug-75						
Sep-75						
Oct-75						
Nov-75						
Dec-75						
Jan-76						
Jan-76						
Jan-76						
Feb-76						
Feb-76						
Feb-76						
Mar-76						
Mar-76						
Mar-76						
Mar-76						
Jun-76						
Jun-76						
Jun-76						
Jun-76						
Jun-76						
Jul-76						
Jul-76						
Jul-76						
Jul-76						
Jul-76						
Jul-76						
Jul-76						
Jul-76		7				
Jul-76	111					

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Jul-76						
Aug-76	108	36	79	57		37
Aug-76	110	42	57	60		38
Aug-76	110	42	57	60		38
Aug-76	108	2	56	62		39
Sep-76						
Sep-76	103	39	52	53		36
Sep-76						
Sep-76						
Sep-76	90	38	50	50		
Sep-76	94	40	52	50		
Sep-76	95	43	52	53		
Sep-76	102	52	56	57		
Sep-76	101	52	55	57		
Sep-76	81	39	46	54		
Sep-76	89	47	38	47		
Sep-76						
Sep-76	100	60	52	53		
Sep-76	93	53	49	51		
Oct-76						
Oct-76						
Oct-76	95	52	48	51		
Oct-76						
Oct-76						
Oct-76	102	47	48	53		
Oct-76	108	47	54	58		
Oct-76	104	40	51	56		
Oct-76	104	41	51	56		
Oct-76	99	44	47	55		
Oct-76	98	47	47	53		
Oct-76	100	51	48	52		
Oct-76	99	50	48	52		
Oct-76						
Oct-76	99	50	47	53		
Oct-76						
Oct-76	100	57	52	53		
Oct-76						
Oct-76	92		47	52		
Oct-76						

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Nov-76						
Nov-76	76	61	41	50		
Nov-76						
Nov-76	73	73	41	53		
Nov-76	69	117	48	50		
Nov-76						
Nov-76						
Nov-76	65	121	41	48		
Nov-76						
Nov-76						
Nov-76	62	113	49	44		
Nov-76	76	97	42	53		
Nov-76	81	86	55	52		
Dec-76	80	157	52	55		4
Dec-76	60	178	53	62		5
Dec-76	61	94	50	58		4
Dec-76	58	124	50	57		
Dec-76	58	116	51	61		
Jan-77	47	102	46	56		6
Jan-77	49	106	50	57		
Jan-77	45		51	55		
Jan-77	43	133	47	54		
Feb-77	47	132	51	45		6
Feb-77	48	138	48	46		
Mar-77	60	117	44	45		5
Mar-77	64	50	41	44		
Apr-77	55	77	38	40		4
Apr-77	58	34	35	37		3
Apr-77	58	34	35	37		3
Apr-77	38	21	34	36		
Apr-77	38	21	34	36		
Apr-77						
May-77	50	66	34	44		4
May-77						
May-77	55	43	36	48		
Jun-77	49	66	37	53		6
Jun-77	42	74	36	57		
Jul-77	34	75	43	50		5
Jul-77	34	46	31	49		

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Aug-77	29	41	40	52		5
Aug-77	28	27	40	54		
Sep-77	28	20	39	48		7
Sep-77	24	38	27	47		
Oct-77	24	63	37	39		6
Oct-77	23	35	36	33		
Nov-77	25		35	51		6
Dec-77	21	100	24	33		
Dec-77	21	100	24	33		
Jan-78	22	81	33	26		7
Jan-78	23	55	33	22		
Feb-78	21	58	34	20		5
Feb-78	22	44	18	18		
Mar-78	23	35	13	14		5
Mar-78	20	134	16	15		
Apr-78	22	44	15	12		6
Apr-78	32	20	14	8		
May-78	39	9	21	13		22
May-78	40	7	24	14		
Jun-78	22	9	24	16		6
Jun-78	31	11	23	15		
Jul-78	39	65	24	21		
Aug-78	20	66	25	17		
Sep-78	14	61	37	22		10
Sep-78	14	61	37	22		10
Sep-78	14	61	37	22		10
Oct-78						
Oct-78						
Oct-78	20	61	29	10		
Nov-78	15	32	69	17		
Dec-78	14	26	60	10		
Jan-79	13	78	67	7		
Feb-79	13	56	74	9		
Mar-79		127	35	8		
Mar-79	12	110				
Apr-79	11	87	24	8		
Apr-79						
May-79	10		25	7		
Jun-79	9		24	8		

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Jun-79						
Jun-79						
Jun-79		59				
Jul-79						
Jul-79	9		16	7		
Jul-79						
Jul-79						
Jul-79			9			
Jul-79			13			
Jul-79				5		
Jul-79				6		
Jul-79						
Aug-79						
Aug-79			54			
Aug-79			66			
Aug-79			11			
Aug-79			52	9		
Aug-79			52	6		
Aug-79			52	5		
Aug-79			52	9		
Aug-79	10		23	6		
Aug-79						
Aug-79						
Sep-79						
Sep-79						
Sep-79	10	68	36	6		
Sep-79						
Oct-79						
Oct-79						
Oct-79	7		21	4		
Oct-79						
Oct-79						
Nov-79						
Nov-79	11		32	8		
Nov-79						
Nov-79						
Dec-79						
Dec-79						
Dec-79	11		58	8		

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Dec-79						
Dec-79						
Jan-80						
Jan-80						
Jan-80						
Jan-80	10		46	8		
Feb-80						
Feb-80	10		32	8		
Feb-80						
Feb-80						
Mar-80						
Mar-80						
Mar-80	8	20	50	8		
Mar-80						
Mar-80						
Apr-80						16
Apr-80	8		25	9		
Apr-80						
Apr-80						
May-80						
May-80	9		26	9		
May-80						
May-80						
Jun-80						
Jun-80						
Jun-80	9		45	10		
Jun-80						
Jul-80						
Jul-80						
Jul-80						
Jul-80						
Jul-80						
Jul-80	10		21	9		
Jul-80						
Jul-80						
Aug-80						
Aug-80						
Aug-80	9		20	7		
Aug-80						

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Sep-80						
Sep-80						
Sep-80						
Sep-80	8		17	8		
Sep-80						
Oct-80						
Oct-80						
Oct-80	7		52	7		
Oct-80						
Oct-80						
Nov-80						
Nov-80						
Nov-80	7		16	7		
Nov-80						
Dec-80						
Dec-80						
Dec-80	6		5	6		
Jan-81						
Jan-81	6		6	6		
Jan-81						
Jan-81						
Feb-81						
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DATE	Well Number					
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DATE	Well Number					
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DATE	Well Number					
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DATE	Well Number					
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Jun-89	12.08	3.84	4.6	2.91	6.75	
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Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89	14.38	2.62	4.7	3.29	6.65	
Jul-89						
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Aug-89						
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DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Aug-89						
Aug-89						
Aug-89						
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Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89	11.23	21.57	3.92	1.96	5.84	
Aug-89	11.19					
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89						
Sep-89	9.32	16.42	3.91	2.24	5.4	
Sep-89		16.42				
Oct-89						

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Nov-89	9.49	14.38	3.84	2.35	6.05	
Nov-89			3.89			
Nov-89						
Nov-89						
Nov-89						
Nov-89						
Nov-89	10.2	15.03	3.77	2.51	5.66	
Nov-89				2.48		
Dec-89						
Dec-89						
Dec-89	9.9	12.67	3.73	2.1	5.86	
Dec-89					6.01	
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Feb-90	9.42	2.26	3.93	2.37	5.73	
Feb-90						
Feb-90						
Feb-90						
Feb-90						
Feb-90						
Feb-90						
Feb-90						

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Mar-90	9.09	4.56	3.36	2.04	5.78	
Mar-90						
Mar-90						
Mar-90						
Mar-90						
Mar-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90	11.11	1.82	2.92	2.26	6.14	
Apr-90	10.74					
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jul-90	12.96	1.42	3.07	2.19		
Jul-90		1.28				
Jul-90					6.05	
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						

DATE	Well Number					
	0002	0003	0004	0005	0006	0007
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90	14.19	9.95	8.86	2.11	6.11	
Jul-90			8.7			
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Aug-90						
Aug-90						
Aug-90						
Aug-90						
Aug-90						
Aug-90						

APPENDIX K

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM BURIED VALLEY AQUIFER EVALUATION PROJECT WELLS

(WELL NO. 0020, 0028, 0101, 0106, 0108, AND 0555)

Appendix K. Tritium Concentrations In Groundwater Samples (nCi/L)
From the Buried Valley Aquifer Evaluation Project Wells
(Well Nos. 0020, 0028, 0101, 0106, 0108, and 0555)

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jan-75						
Jan-75						
Feb-75						
Mar-75						
Apr-75						
May-75						
Jun-75						
Jul-75						
Aug-75						
Sep-75						
Oct-75						
Nov-75						
Dec-75						
Jan-76						
Jan-76	72	44				
Jan-76	61	42				
Feb-76	65	32				
Feb-76						
Feb-76						
Mar-76						
Mar-76	63	37				
Mar-76						
Mar-76						
Jun-76						21
Jun-76						
Jun-76						21
Jun-76						22
Jun-76						
Jul-76						21
Jul-76						14
Jul-76						
Jul-76						25
Jul-76						
Jul-76						24
Jul-76						
Jul-76						
Jul-76						
Jul-76						24

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Aug-76						20
Aug-76						23
Aug-76						23
Aug-76						25
Sep-76						23
Sep-76						
Sep-76						
Sep-76						23
Sep-76			9	22		
Sep-76			11	23		
Sep-76			14	21		
Sep-76			22	22		
Sep-76			34	22		
Sep-76			39	15		
Sep-76		26	37	16		
Sep-76	133	41				24
Sep-76			64	20		
Sep-76	121	38	54	18		22
Oct-76						
Oct-76						
Oct-76			49	19		
Oct-76	110	34				22
Oct-76						
Oct-76			60	18		
Oct-76	116	30	61	20		26
Oct-76			65	20		
Oct-76			56	20		
Oct-76			59	19		
Oct-76			54	19		
Oct-76			55	17		
Oct-76			54	16		
Oct-76	100	37				25
Oct-76			56	16		
Oct-76						
Oct-76			51	13		
Oct-76	99	23				26
Oct-76			52	11		
Oct-76						
Nov-76		26				24
Nov-76			56	11		

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Nov-76						
Nov-76			53	10		
Nov-76		23	90	12		27
Nov-76						
Nov-76						
Nov-76		27	84	11		28
Nov-76						
Nov-76		24				31
Nov-76			49	38	4	
Nov-76			74	42		
Nov-76			81	40	4	
Dec-76		26	65	30	6	31
Dec-76		29	102	22	7	37
Dec-76		24	89	28	10	
Dec-76			91	27		
Dec-76			85	7		
Jan-77		30	75	23	12	42
Jan-77			83	19		
Jan-77			72	5		
Jan-77			69	25		
Feb-77		25	71	25	17	46
Feb-77			70	23		
Mar-77		38	67	20	17	47
Mar-77			61	21		
Apr-77		31	57	20	12	45
Apr-77		32	55	18	8	39
Apr-77			55	18	8	39
Apr-77			53	17		
Apr-77			53	17		
Apr-77						
May-77		33	56	22	9	39
May-77						
May-77			64			
Jun-77		33	61	3	13	51
Jun-77			59			
Jul-77		34	55	5	14	
Jul-77			50	6		
Aug-77		38	41	11	11	49
Aug-77			38	11		
Sep-77		34	38	14	10	56

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Sep-77			36	15		
Oct-77		34	42	12	9	46
Oct-77			38	2		43
Nov-77		33	41	10	10	
Dec-77			41	12		
Dec-77			41	12		
Jan-78		29	42	2	8	43
Jan-78			41			
Feb-78		48	39	9	7	38
Feb-78			39			37
Mar-78		29	40	8	6	34
Mar-78			36	7		
Apr-78		30	38	6	1	34
Apr-78			33	2		
May-78		27	32	7	0	29
May-78			32	4		
Jun-78		28	37	5	1	31
Jun-78			37	7		
Jul-78			38	3		
Aug-78			35	2		
Sep-78		6	34	3	2	33
Sep-78		7	34	3	2	42
Sep-78		9	34	3	2	42
Oct-78						
Oct-78						
Oct-78			36	2		
Nov-78			31	6		
Dec-78			26	4		
Jan-79			22	4		
Feb-79			21	4		
Mar-79		26		4		70
Mar-79			18			
Apr-79			18	1		
Apr-79						
May-79			16	1		
Jun-79			17	1		
Jun-79						
Jun-79						
Jun-79						
Jul-79						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jul-79			16	2		
Jul-79						
Jul-79						
Jul-79						
Jul-79						
Jul-79						
Jul-79						
Jul-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79			17	3		
Aug-79						
Aug-79						
Sep-79						
Sep-79						
Sep-79			16	3		
Sep-79						
Oct-79						
Oct-79						
Oct-79			12	11		
Oct-79						
Oct-79						
Nov-79						
Nov-79			17	4		
Nov-79						
Nov-79						
Dec-79						
Dec-79						
Dec-79			17	3		
Dec-79						
Dec-79						
Jan-80						
Jan-80						
Jan-80						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jan-80			17	3		
Feb-80						
Feb-80			16	3		
Feb-80						
Feb-80						
Mar-80						
Mar-80						
Mar-80		18	17	3	1	37
Mar-80						
Mar-80						
Apr-80						
Apr-80			14	3		
Apr-80						
Apr-80						
May-80						
May-80			15	4		
May-80						
May-80						
Jun-80						
Jun-80						
Jun-80			15	4		
Jun-80						
Jul-80						
Jul-80						
Jul-80						
Jul-80						
Jul-80						
Jul-80			15	5		
Jul-80						
Jul-80						
Aug-80						
Aug-80						
Aug-80			14	3		
Aug-80						
Sep-80						
Sep-80						
Sep-80						
Sep-80		10	14	2		22
Sep-80						
Oct-80						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Oct-80						
Oct-80			14	2		
Oct-80						
Oct-80						
Nov-80						
Nov-80						
Nov-80			13	2		
Nov-80						
Dec-80						
Dec-80						
Dec-80			11	1		
Jan-81						
Jan-81			11			
Jan-81						
Jan-81						
Feb-81						
Feb-81						
Feb-81			11	1		
Feb-81						
Feb-81						
Mar-81						
Mar-81						
Mar-81						
Mar-81			9	2		
Mar-81						
Apr-81						
Apr-81						
Apr-81			8	2		
Apr-81						
Apr-81						
Apr-81						
May-81						
May-81						
May-81			9	1		
May-81						
Jun-81						
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Jun-81			8	1		
Jun-81						
Jul-81						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jul-81						
Jul-81						
Jul-81			8	2		
Jul-81						
Aug-81						
Aug-81						
Aug-81			9	2		
Aug-81						
Sep-81						
Sep-81						
Sep-81			8	3		
Sep-81						
Oct-81						
Oct-81						
Oct-81						
Oct-81						
Oct-81			7	2		
Nov-81						
Nov-81						
Nov-81						
Nov-81			9	2		
Nov-81						
Dec-81						
Dec-81						
Dec-81			9	3		
Dec-81						
Jan-82						
Jan-82						
Jan-82			8	2		
Feb-82						
Feb-82						
Feb-82			9	2		
Feb-82						
Feb-82						
Feb-82						
Mar-82						
Mar-82						
Mar-82						
Mar-82			10	2		
Mar-82						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Mar-82						
Apr-82						
Apr-82			9	1		
Apr-82						
Apr-82						
May-82						
May-82						
May-82						
May-82			9	2		
May-82						
Jun-82						
Jun-82			9	4		
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Jul-82						
Jul-82						
Jul-82			9	1		
Jul-82						
Aug-82						
Aug-82			9	1		
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Sep-82			8	2		
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Oct-82						
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Oct-82			8	2		
Oct-82						
Nov-82						
Nov-82						
Nov-82			8	1		
Nov-82						
Dec-82						
Dec-82						
Dec-82						
Dec-82			6	2		
Jan-83						
Jan-83			7	1		
Jan-83						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jan-83			7			
Jan-83			10			
Jan-83			10			
Jan-83						
Feb-83			10			
Feb-83			10			
Feb-83			10			
Feb-83			9			
Feb-83			9			
Feb-83			9			
Feb-83			10			
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Feb-83			10			
Feb-83			10			
Feb-83			9			
Feb-83			9	2		
Feb-83			9			
Feb-83			9			
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Mar-83						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
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Jun-83						
Jun-83			10	2		
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Jul-83			4			
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
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Nov-83						
Nov-83						
Nov-83			9	2		
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Dec-83			9	3		
Jan-84						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Mar-84						
Mar-84			9	1		
Apr-84						
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Apr-84						
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May-84			9	2		
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jun-84						
Jun-84						
Jun-84						
Jun-84			10	1		
Jul-84						
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Sep-84			9	2		
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Sep-84						
Oct-84						
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Oct-84						
Nov-84						
Nov-84			9	1		
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Nov-84						
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Dec-84						
Dec-84						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Feb-85						
Feb-85						
Feb-85						
Feb-85						
Feb-85						
Mar-85			8	1		
Mar-85						
Mar-85						
Mar-85						
Mar-85						
Mar-85			7	1		
Apr-85						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jun-85						
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Sep-85			7	1		
Oct-85						
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Nov-85						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Dec-85						
Dec-85						
Dec-85						
Dec-85						
Dec-85						
Dec-85			7	1		
Dec-85						
Jan-86						
Jan-86						
Jan-86						
Jan-86						
Jan-86						
Jan-86						
Jan-86						
Jan-86						
Jan-86						
Jan-86			8	1		
Jan-86						
Jan-86						
Feb-86						
Feb-86						
Feb-86						
Feb-86						
Feb-86						
Feb-86			7			
Mar-86				1	0.5	
Mar-86						
Mar-86						
Mar-86						
Mar-86						
Mar-86						
Apr-86						
Apr-86						
Apr-86				2		
Apr-86				8		
Apr-86				6		
Apr-86				8		
Apr-86						
Apr-86						
Apr-86			8			

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
May-86						
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May-86						
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May-86			7			
May-86						
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Jun-86						
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Aug-86						
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Aug-86						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Aug-86						
Aug-86						
Aug-86						
Aug-86						
Sep-86						
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Oct-86			8	1		
Oct-86						
Oct-86						
Oct-86						
Oct-86						
Nov-86						
Nov-86						
Nov-86						
Nov-86						
Nov-86						
Nov-86			8	1		
Nov-86						
Dec-86						
Dec-86			8	1		
Dec-86						
Dec-86					0	
Dec-86						
Dec-86						
Dec-86						
Dec-86						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Dec-86						
Jan-87						
Jan-87						
Jan-87			9.2	1.6		
Jan-87						
Jan-87						
Jan-87						
Jan-87						
Jan-87						
Jan-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87			9.2			
Feb-87						
Mar-87						
Mar-87		7		1.2	0.03	
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87			9.9			
Mar-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Apr-87						
Apr-87			11	1.5		
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
May-87						
Jun-87						
Jun-87						
Jun-87						
Jun-87						
Jun-87						
Jun-87						
Jun-87						
Jun-87			11	1.4		
Jun-87						
Jun-87						
Jun-87						
Jun-87						
Jun-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87			12	1.4		
Jul-87			11			
Jul-87						
Jul-87						
Jul-87						
Jul-87						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jul-87						
Jul-87						
Jul-87						
Jul-87						
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Jul-87						
Jul-87						
Jul-87						
Aug-87						
Aug-87						
Aug-87			10	1		
Aug-87						
Aug-87						
Aug-87						
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Aug-87						
Aug-87						
Aug-87						
Aug-87						
Aug-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87			12	1.4		
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Sep-87						
Oct-87						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Oct-87						
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Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87			2.8	1.3		
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87			11	0.5		
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87			11	0.7		
Dec-87						
Dec-87						
Dec-87						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Dec-87						
Dec-87						
Dec-87						
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Jan-88						
Jan-88						
Jan-88						
Jan-88						
Jan-88						
Jan-88						
Feb-88						
Feb-88						
Feb-88			9.1	0.8		
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88			9.7	1.1		
Feb-88				0.95		
Mar-88						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Mar-88						
Mar-88						
Mar-88						
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Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88			9.6	1.4		
Mar-88			9.9			
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88			9.7			
Apr-88						
Apr-88						
Apr-88						
May-88						
May-88						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
May-88						
May-88						
May-88						
May-88						
May-88						
May-88			9.2	0.74		
May-88						
Jun-88						
Jun-88						
Jun-88						
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Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88			9.2	0.79		
Jun-88						
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Jul-88						
Jul-88						
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Jul-88						
Jul-88						
Aug-88			9.19	0.78		

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Aug-88						
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Aug-88						
Aug-88						
Aug-88						
Sep-88			9.58	0.91		
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88				0.67		
Sep-88				0.75		
Oct-88						
Oct-88						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Oct-88						
Oct-88						
Oct-88						
Oct-88			9.49	1.22		
Oct-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88			9.36	0.96		
Nov-88			9.47			
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Dec-88						
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Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88			8.91	0.82		
Dec-88						
Dec-88						
Dec-88						
Jan-89						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jan-89						
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Jan-89						
Jan-89						
Jan-89						
Jan-89			10.21			
Jan-89						
Jan-89				1.12		
Jan-89						
Jan-89						
Jan-89						
Feb-89						
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Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Mar-89			11.98	1.13		
Mar-89						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Mar-89						
Mar-89						
Mar-89						
Mar-89						
Apr-89			9.17	1.05		
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89			9.5	0.99		
Apr-89						
Apr-89						
Apr-89						
May-89						
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May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
Jun-89			9.39	0.74		
Jun-89				0.72		
Jun-89						
Jun-89						
Jun-89						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jun-89						
Jun-89						
Jun-89						
Jun-89						
Jun-89						
Jul-89			9.27	0.87		
Jul-89				0.77		
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
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Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89						
Jul-89			9.45	0.93		
Jul-89			9.63			
Jul-89						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jul-89						
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Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89			8.92	0.38		
Aug-89						
Sep-89						
Sep-89						
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Sep-89						
Sep-89						
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DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Sep-89						
Sep-89			7.68	0.21		
Sep-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Oct-89						
Nov-89			9.11	0.42		
Nov-89						
Nov-89						
Nov-89						
Nov-89						
Nov-89						
Nov-89			8.35	0.5		
Nov-89						
Dec-89						
Dec-89						
Dec-89			8.81	0.45		
Dec-89						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Jan-90						
Feb-90			9.07	0.56		
Feb-90				0.67		
Feb-90						
Feb-90						
Feb-90						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Feb-90						
Feb-90						
Feb-90						
Mar-90			8.57	0.44		
Mar-90			8.57			
Mar-90						
Mar-90						
Mar-90						
Mar-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90			8.15	0.57		
Apr-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jul-90			7.77			
Jul-90						
Jul-90				0.4		
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						

DATE	Well Number					
	0020	0028	0101	0106	0108	0555
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90			7.95	0.18		
Jul-90						
Jul-90						
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Jul-90						
Aug-90						
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Aug-90						
Aug-90						
Aug-90						
Aug-90						

APPENDIX L

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM POTABLE WATER STANDARDS PROJECT WELLS

(WELL NO. 0033, 0034, 0035, 0036, 0037, AND 0042)

Appendix L. Tritium Concentrations In Groundwater Samples (nCi/L)
From the Potable Water Standards Project Wells
(Well Nos. 0033, 0034, 0035, 0036, 0037, and 0042)

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Jan-75						
Jan-75						
Feb-75						
Mar-75						
Apr-75						
May-75						
Jun-75						
Jul-75						
Aug-75						
Sep-75						
Oct-75						
Nov-75						
Dec-75						
Jan-76						
Jan-76				175		133
Jan-76				161		
Feb-76				177		121
Feb-76						
Feb-76				190		119
Mar-76				187		118
Mar-76				192		121
Mar-76				199		120
Mar-76				198		118
Jun-76	94	58	1	167	40	95
Jun-76						
Jun-76	75	61	1	181	42	120
Jun-76	88	67	1	186		124
Jun-76						
Jul-76	92	60	0	179	41	99
Jul-76	84	62	0	143	41	87
Jul-76						
Jul-76	114	85	1	198	48	129
Jul-76						
Jul-76	110	71	1	203	49	127
Jul-76						
Jul-76						
Jul-76						

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Jul-76	118	81	3	192		126
Aug-76	95	71	2	170	48	108
Aug-76	66	51	0	123	28	80
Aug-76						
Aug-76	120	82	3	189		127
Sep-76	96	76	3		48	108
Sep-76						
Sep-76						
Sep-76	120	81		177		
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76	92	57		113	30	
Sep-76	127	81		181		124
Sep-76						
Sep-76	121	79		162	43	110
Oct-76						
Oct-76						
Oct-76						
Oct-76	110	77		163	41	102
Oct-76						
Oct-76						
Oct-76	115	75		168		101
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76	40	77		156		89
Oct-76						
Oct-76						
Oct-76						
Oct-76	106	77		156		86
Oct-76						
Oct-76						
Nov-76	101	16		156		82

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Nov-76						
Nov-76						
Nov-76						
Nov-76	99	75		153		72
Nov-76						
Nov-76						
Nov-76	100	75		152		72
Nov-76						
Nov-76	109	92		169		83
Nov-76						
Nov-76						
Nov-76						
Dec-76	111	91		175		94
Dec-76	103	85		168		107
Dec-76	106	87		168		112
Dec-76						
Dec-76						
Jan-77	108	82		164		121
Jan-77						
Jan-77						
Jan-77						
Feb-77	107	75		166		118
Feb-77						
Mar-77	113	69		170		88
Mar-77						
Apr-77	111	57		162		78
Apr-77	102					80
Apr-77						
Apr-77						
Apr-77						
Apr-77						
May-77	95			155		77
May-77						
May-77						
Jun-77	105			175		96
Jun-77						
Jul-77	97			176		94
Jul-77						
Aug-77	90			177		95
Aug-77						

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Sep-77	97			164		74
Sep-77						
Oct-77	96			166		71
Oct-77						
Nov-77	91			149		72
Dec-77						
Dec-77						
Jan-78	85			142		83
Jan-78						
Feb-78	100			151		
Feb-78						
Mar-78	104			138		
Mar-78						
Apr-78	100			147		50
Apr-78						
May-78	84			155		
May-78						
Jun-78	94			168		
Jun-78						
Jul-78						
Aug-78						
Sep-78	88			146		
Sep-78	85			158		
Sep-78						
Oct-78						
Oct-78						
Oct-78						
Nov-78						
Dec-78						
Jan-79						
Feb-79						
Mar-79	74			95		
Mar-79						
Apr-79						
Apr-79						
May-79						
Jun-79						
Jun-79						
Jun-79						
Jun-79						

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Jul-79						
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Dec-79						
Jan-80						
Jan-80						

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Jan-80						
Jan-80						
Feb-80						
Feb-80						
Feb-80						
Feb-80						
Mar-80						
Mar-80						
Mar-80	71			85		
Mar-80						
Mar-80						
Apr-80						
Apr-80						
Apr-80						
Apr-80						
May-80						
May-80						
May-80						
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Jun-80						
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Aug-80						
Aug-80						
Aug-80						
Aug-80						
Sep-80						
Sep-80						
Sep-80						
Sep-80	52			17		
Sep-80						

DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Oct-80						
Oct-80						
Oct-80						
Oct-80						
Oct-80						
Nov-80						
Nov-80						
Nov-80						
Nov-80						
Dec-80						
Dec-80						
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Jan-81						
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DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Jul-81						
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DATE	Well Number					
	0033	0034	0035	0036	0037	0042
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DATE	Well Number					
	0033	0034	0035	0036	0037	0042
Jan-83						
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DATE	Well Number					
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APPENDIX M

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM POTABLE WATER STANDARDS PROJECT WELLS

(WELL NO. 0043, 0046, 0052, 0055, 0063, AND 0137)

Appendix M. Tritium Concentrations In Groundwater Samples (nCi/L) From the Potable Water Standards Project Wells (Well Nos. 0043, 0046, 0052, 0055, 0063, and 0137)

DATE	Well Number					
	0043	0046	0052	0055	0063	0137
Jan-75						
Jan-75						
Feb-75						
Mar-75						
Apr-75						
May-75						
Jun-75						
Jul-75						
Aug-75						
Sep-75						
Oct-75						
Nov-75						
Dec-75						
Jan-76						
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Jan-76	140					
Feb-76						
Feb-76						
Feb-76						
Mar-76				54		
Mar-76		52		63	32	
Mar-76				63		
Mar-76				70		
Jun-76	12	54	13		38	
Jun-76						
Jun-76	12	57	13		38	
Jun-76	12	58	13		44	25
Jun-76						
Jul-76	12	50	12		37	
Jul-76	11	46	9		32	
Jul-76						
Jul-76	12	59	14		37	
Jul-76						
Jul-76	5	60	13		37	
Jul-76						
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Jul-76	5	62	14		37	44

DATE	Well Number					
	0043	0046	0052	0055	0063	0137
Aug-76	14	61	14		35	
Aug-76	3	55	13		37	
Aug-76						
Aug-76	8	65	15		42	52
Sep-76	8	61	14		39	
Sep-76						
Sep-76						
Sep-76			14			44
Sep-76						44
Sep-76						52
Sep-76						60
Sep-76						54
Sep-76						52
Sep-76						45
Sep-76		45				34
Sep-76		61				50
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Sep-76		51				
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DATE	Well Number					
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APPENDIX N

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM POTABLE WATER STANDARDS PROJECT WELLS

(WELL NO. 0227, 0234, 0235, 0236, 0242, AND 0243)

Appendix N. Tritium Concentrations in Groundwater Samples (nCi/L) From the Potable Water Standards Project Wells

(Well Nos. 0227, 0234, 0235, 0236, 0242, and 0243)

DATE	Well Number					
	0227	0234	0235	0236	0242	0243
Jan-75						
Jan-75						
Feb-75						
Mar-75						
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Dec-75						
Jan-76						
Jan-76				54		
Jan-76				54		
Feb-76				55		
Feb-76						
Feb-76						
Mar-76						
Mar-76				31		
Mar-76						
Mar-76						
Jun-76	71	12	13		45	6
Jun-76						
Jun-76	73	28	13		45	7
Jun-76	77	40	14		46	7
Jun-76						
Jul-76	68	64	14		41	7
Jul-76	58	58	11		32	5
Jul-76						
Jul-76	81	80	16		50	8
Jul-76						
Jul-76	78	46	17		49	8
Jul-76						
Jul-76						
Jul-76						

Appendix N. (page 2 of 36)

DATE	Well Number					
	0227	0234	0235	0236	0242	0243
Jul-76	79	11	16		49	9
Aug-76	71	49	18		47	8
Aug-76	55	52	10		30	6
Aug-76						
Aug-76	82	29	18		49	9
Sep-76	76	46	16		44	9
Sep-76						
Sep-76						
Sep-76	76	15				
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76	60	58			32	
Sep-76	81	92			48	
Sep-76						
Sep-76	76	24			44	
Oct-76						
Oct-76						
Oct-76						
Oct-76	74	8			43	
Oct-76						
Oct-76						
Oct-76	76	17			46	
Oct-76						
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Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76	106	60			55	
Oct-76						
Oct-76						
Oct-76						
Oct-76	74	3			42	
Oct-76						
Oct-76						
Nov-76	73	4			43	
Nov-76						
Nov-76						

Appendix N. (page 3 of 36)

DATE	Well Number					
	0227	0234	0235	0236	0242	0243
Nov-76						
Nov-76	74	9			42	
Nov-76						
Nov-76						
Nov-76	74	25			42	
Nov-76						
Nov-76	82	36			46	
Nov-76						
Nov-76						
Nov-76						
Dec-76		82			44	
Dec-76	82	18			44	
Dec-76	78	91			44	
Dec-76						
Dec-76						
Jan-77	83	73				
Jan-77						
Jan-77						
Jan-77						
Feb-77	83	75				
Feb-77						
Mar-77	80	17				
Mar-77						
Apr-77	80	10				
Apr-77	73	35				
Apr-77						
Apr-77						
Apr-77						
Apr-77						
May-77		1				
May-77						
May-77						
Jun-77	82	34				
Jun-77						
Jul-77	86	14				
Jul-77						
Aug-77	81	12				
Aug-77						
Sep-77	75	18				
Sep-77						

Appendix N. (page 4 of 36)

DATE	Well Number					
	0227	0234	0235	0236	0242	0243
Oct-77	88	11				
Oct-77						
Nov-77	80	10				
Dec-77						
Dec-77						
Jan-78	78	13				
Jan-78						
Feb-78	86	31				
Feb-78						
Mar-78	83	37				
Mar-78						
Apr-78	72	13				
Apr-78						
May-78	63	13				
May-78						
Jun-78	83	8				
Jun-78						
Jul-78						
Aug-78						
Sep-78	83	7				
Sep-78						
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Oct-78						
Oct-78						
Oct-78						
Nov-78						
Dec-78						
Jan-79						
Feb-79						
Mar-79	68	28				
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APPENDIX O

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM POTABLE WATER STANDARDS PROJECT WELLS

(WELL NO. 0246, 0255, 0345, 0355, 0419, AND 0455)

Appendix O. Tritium Concentrations In Groundwater Samples (nCi/L) From the Potable Water Standards Project Wells (Well Nos. 0246, 0255, 0345, 0355, 0419, and 0455)

DATE	Well Number					
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Feb-76						
Mar-76	8	32	31	32		127
Mar-76	7	28	31	31		136
Mar-76	7	30	28	28		138
Mar-76	8	42	30	28		138
Jun-76					2442	
Jun-76						
Jun-76						
Jun-76					2431	
Jun-76						
Jul-76					2026	
Jul-76					1572	
Jul-76						
Jul-76					2247	
Jul-76						
Jul-76					2045	
Jul-76						
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DATE	Well Number					
	0246	0255	0345	0355	0419	0455
Aug-76						
Aug-76					1822	
Sep-76					1744	
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Sep-76					1693	
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Sep-76					1618	
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Oct-76					1628	
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Oct-76					1509	
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Nov-76					1487	
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Nov-76					1332	
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Dec-76					1557	
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Dec-76					1711	
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Feb-77					1529	
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Mar-77					1683	
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Apr-77					2099	
Apr-77					1492	
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May-77					1494	
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Jun-77					1577	
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Jul-77					1608	
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Aug-77					1541	
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Sep-77					1474	
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Oct-77					1519	
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Nov-77					1698	

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Feb-78					1711	
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Mar-78					1443	
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Apr-78					1613	
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May-78					1177	
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Jun-78					1443	
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Sep-78					1362	
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APPENDIX P

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM MOUND PLANT PRODUCTION WELLS

(WELL NO. 0071, 0076, AND 0271)

Appendix P. Tritium Concentrations In Groundwater Samples (nCi/L)
From Mound Plant Production Wells
(Well Nos. 0071, 0076, and 0271)

DATE	Well Number				
	0071	0076	0271		
Jan-75	36		37		
Jan-75	35		36		
Feb-75					
Mar-75					
Apr-75	33	34	36		
May-75	39	39	38		
Jun-75	33	35	33		
Jul-75	49	44	49		
Aug-75			44		
Sep-75			44		
Oct-75	46	71	46		
Nov-75					
Dec-75					
Jan-76					
Jan-76		32			
Jan-76	34				
Feb-76		34			
Feb-76					
Feb-76					
Mar-76					
Mar-76		36			
Mar-76					
Mar-76					
Jun-76					
Jun-76					
Jun-76	80	52	81		
Jun-76	75	50	87		
Jun-76					
Jul-76		35	75		
Jul-76	58	42	67		
Jul-76					
Jul-76	40	88	88		
Jul-76					
Jul-76		43			
Jul-76					
Jul-76					
Jul-76					

DATE	Well Number				
	0071	0076	0271		
Jul-76	66		43		
Aug-76	70	77	85		
Aug-76	68	52	86		
Aug-76	68	52	86		
Aug-76	10	79	90		
Sep-76	54	51	84		
Sep-76					
Sep-76	56				
Sep-76		76	83		
Sep-76					
Sep-76					
Sep-76					
Sep-76					
Sep-76					
Sep-76					
Sep-76	41	55	59		
Sep-76	43	42	82		
Sep-76					
Sep-76	40	40	77		
Oct-76					
Oct-76					
Oct-76	39				
Oct-76		41	80		
Oct-76					
Oct-76					
Oct-76	41	44	82		
Oct-76					
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Oct-76					
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Oct-76					
Oct-76	74	38	25		
Oct-76					
Oct-76					
Oct-76	75				
Oct-76		36	35		
Oct-76					
Oct-76					
Nov-76	35	34	72		

DATE	Well Number				
	0071	0076	0271		
Nov-76					
Nov-76					
Nov-76					
Nov-76	36	35	75		
Nov-76					
Nov-76					
Nov-76	35	36	72		
Nov-76					
Nov-76	38	39	75		
Nov-76					
Nov-76					
Nov-76					
Dec-76	35	37	64		
Dec-76	37	37	74		
Dec-76	52	53	69		
Dec-76	37	34	72		
Dec-76	36	34	71		
Jan-77	35	34	74		
Jan-77			55		
Jan-77			50		
Jan-77	32	30	54		
Feb-77	30	29	54		
Feb-77	32	31	57		
Mar-77	32	31	52		
Mar-77	27	27	46		
Apr-77	30	30	30		
Apr-77	26	25	43		
Apr-77	26	25	43		
Apr-77		24	38		
Apr-77		24	38		
Apr-77					
May-77		25	40		
May-77					
May-77	44	23	36		
Jun-77	29	19	33		
Jun-77	35	17	37		
Jul-77	32	15	24		
Jul-77	29	15	19		
Aug-77	30	12	14		
Aug-77	24	12	14		

DATE	Well Number				
	0071	0076	0271		
Sep-77	22	12	13		
Sep-77	18	11	12		
Oct-77	21	10	10		
Oct-77	17	11	10		
Nov-77	15	10	9		
Dec-77	14	11	10		
Dec-77	14	10	10		
Jan-78	12	9	9		
Jan-78					
Feb-78	12		6		
Feb-78	17	7	6		
Mar-78	20	8	7		
Mar-78	20	10	10		
Apr-78	23	11	9		
Apr-78	20	8	12		
May-78	19		12		
May-78	17	8	8		
Jun-78		9	10		
Jun-78	21	11	14		
Jul-78	20	14			
Aug-78	20		12		
Sep-78	17	5	9		
Sep-78	16	5	8		
Sep-78	16	5	8		
Oct-78					
Oct-78					
Oct-78	12	6	5		
Nov-78	10	7			
Dec-78	10		6		
Jan-79	8	5			
Feb-79	7	5			
Mar-79	7	4			
Mar-79					
Apr-79	6	4			
Apr-79					
May-79	5	4			
Jun-79	4	4			
Jun-79					
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DATE	Well Number				
	0071	0076	0271		
Jul-79					
Jul-79	7		4		
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Aug-79	5	4	4		
Aug-79					
Aug-79					
Sep-79					
Sep-79					
Sep-79			5		
Sep-79					
Oct-79					
Oct-79					
Oct-79	4	2			
Oct-79					
Oct-79					
Nov-79					
Nov-79	7	5			
Nov-79					
Nov-79					
Dec-79					
Dec-79					
Dec-79	4	4			
Dec-79					
Dec-79					
Jan-80					
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DATE	Well Number				
	0071	0076	0271		
Jan-80					
Jan-80	4	4			
Feb-80					
Feb-80	5	4			
Feb-80					
Feb-80					
Mar-80					
Mar-80					
Mar-80	4	4			
Mar-80					
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Apr-80					
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Jul-80	6				
Aug-80	7				
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Sep-80	6				
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Sep-80					

DATE	Well Number				
	0071	0076	0271		
Oct-80					
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Dec-80	5				
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Mar-81		4			
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Apr-81		4			
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May-81		4			
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Jun-81		4			

DATE	Well Number				
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Jul-81	6				
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Aug-81	5				
Sep-81	4				
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Nov-81					
Nov-81	4				
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DATE	Well Number				
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Nov-82			4		
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Jan-83	6				
Jan-83	5				

DATE	Well Number				
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DATE	Well Number				
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DATE	Well Number				
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DATE	Well Number				
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Oct-83					

DATE	Well Number				
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Dec-83					
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Jan-84		0.4			
Jan-84		3			
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Jan-84					

DATE	Well Number				
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Feb-84			5		
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Feb-84			5		
Mar-84					
Mar-84					
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Mar-84	6				
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Mar-84					
Mar-84	4				
Mar-84					
Mar-84					

DATE	Well Number				
	0071	0076	0271		
Mar-84					
Mar-84					
Mar-84	3				
Apr-84					
Apr-84					
Apr-84	4				
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Apr-84					
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May-84					
Jun-84					

DATE	Well Number				
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Jun-84			2		
Jun-84					
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Sep-84			4		
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Oct-84	3				
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Dec-84					
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Dec-84					
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Jan-85	3				
Jan-85	4				

DATE	Well Number				
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Jan-85	4				
Feb-85					
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Feb-85	4				
Feb-85	4				
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Mar-85					
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Apr-85	4				
Apr-85	4				
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May-85	5				
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May-85					
Jun-85		2			
Jun-85					
Jun-85		2			
Jun-85		1			
Jun-85					
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Jun-85					

DATE	Well Number				
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Jun-85					
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Jul-85					
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Nov-85					
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Nov-85					
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Nov-85					
Nov-85		2			
Nov-85					

DATE	Well Number				
	0071	0076	0271		
Dec-85		3			
Dec-85					
Dec-85		3			
Dec-85					
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Jan-86		3			
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Feb-86					
Feb-86		2			
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Feb-86			4		
Feb-86			4		
Feb-86					
Mar-86			4		
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Mar-86					
Apr-86		2			
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Apr-86					
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Apr-86					
Apr-86					
Apr-86		2			

DATE	Well Number				
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Apr-86					
May-86					
May-86					
May-86					
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May-86					
May-86					
May-86					
May-86					
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May-86					
May-86					
May-86					
May-86					
May-86		1			
May-86					
May-86					
May-86					
May-86		1			
May-86					
Jun-86					
Jun-86					
Jun-86			3		
Jun-86					
Jun-86			3		
Jun-86					
Jun-86					
Jun-86					
Jun-86					
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Jul-86			4		
Jul-86					
Jul-86			4		
Jul-86					
Jul-86			3		
Jul-86					
Jul-86			3		
Aug-86			3		
Aug-86					

DATE	Well Number				
	0071	0076	0271		
Aug-86			3		
Aug-86					
Aug-86			3		
Aug-86			3		
Aug-86					
Sep-86		2			
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Nov-86					
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Dec-86		2			
Dec-86		2			
Dec-86					
Dec-86					
Dec-86		3			
Dec-86					
Dec-86		3			

DATE	Well Number				
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Dec-86					
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Jan-87	6.6	2.2			
Jan-87					
Jan-87					
Jan-87		2.9			
Jan-87					
Jan-87		3			
Jan-87					
Jan-87		2.7			
Jan-87					
Feb-87					
Feb-87					
Feb-87					
Feb-87					
Feb-87		2.9			
Feb-87					
Feb-87		2.8			
Feb-87					
Feb-87		2.9			
Feb-87					
Feb-87		2.8			
Feb-87					
Mar-87		2.2			
Mar-87	5.8	1.9	4.6		
Mar-87					
Mar-87					
Mar-87					
Mar-87					
Mar-87		2.4			
Mar-87					
Mar-87		2.5			
Apr-87	5	2.4	4.8		
Apr-87					
Apr-87	3.7	1.8			
Apr-87					
Apr-87					
Apr-87					
Apr-87	2.9	2.6			
Apr-87					

DATE	Well Number				
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Apr-87					
Apr-87	4.3	2.6			
Apr-87					
May-87					
May-87					
May-87	2.9	2.9			
May-87					
May-87	6.6	6.7			
May-87	6.2	2.4			
May-87					
May-87					
May-87	3.2	2.4			
May-87					
May-87					
May-87	3.7	2.4			
May-87					
Jun-87					
Jun-87	2.9	4.6	5		
Jun-87					
Jun-87	4.6	4.3	4.2		
Jun-87					
Jun-87					
Jun-87					
Jun-87					
Jun-87	6	3.7	4.5		
Jun-87					
Jun-87					
Jun-87	5.6	4.1	4.5		
Jun-87					
Jul-87	6.4	1.2	4.6		
Jul-87	6.3				
Jul-87					
Jul-87	4.9		3.6		
Jul-87					
Jul-87					
Jul-87					
Jul-87					
Jul-87	5.4		3.5		
Jul-87			3.3		
Jul-87					

DATE	Well Number				
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Jul-87					
Jul-87	0		4.9		
Jul-87			5.2		
Jul-87					
Jul-87					
Jul-87	5.9		3.6		
Jul-87			3.5		
Jul-87					
Jul-87					
Aug-87	4.3	1.3	4		
Aug-87		1.4			
Aug-87					
Aug-87					
Aug-87	4.9	1.4	4.1		
Aug-87		1.6			
Aug-87					
Aug-87					
Aug-87	5.1	1.7	3.8		
Aug-87		1.6			
Aug-87	5.5	1.7	5.4		
Aug-87		1.7	5.3		
Aug-87					
Aug-87					
Sep-87	5.4	2.4	4.7		
Sep-87		3			
Sep-87					
Sep-87	8.7		7		
Sep-87					
Sep-87	6.2	3.7	5.4		
Sep-87		2.8			
Sep-87					
Sep-87					
Sep-87					
Sep-87					
Sep-87	2.4	2.5	4.6		
Sep-87		2.4			
Sep-87					
Sep-87					
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Sep-87					

DATE	Well Number				
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Oct-87	6.1	2.85	5.3		
Oct-87		3			
Oct-87					
Oct-87					
Oct-87	5.3	2	4.4		
Oct-87		2.2			
Oct-87					
Oct-87					
Oct-87	2.5	2.4	4.7		
Oct-87		2.3			
Oct-87	6.2	2.9	5.6		
Oct-87		2.8			
Oct-87					
Oct-87					
Oct-87					
Oct-87					
Oct-87	6.2	4.1	7.3		
Oct-87	5.8				
Nov-87					
Nov-87					
Nov-87					
Nov-87					
Nov-87	4.8	2.1	4.5		
Nov-87		2.1			
Nov-87	6.5	3.8	5.8		
Nov-87		4.3			
Nov-87	5.1	2.4	4.4		
Nov-87		2.2			
Nov-87					
Dec-87					
Dec-87					
Dec-87	4.4	2.3	6.1		
Dec-87		2.8			
Dec-87					
Dec-87					
Dec-87					
Dec-87					
Dec-87					
Dec-87					
Dec-87	5.7	2.3	5.1		

DATE	Well Number				
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Dec-87		2.3			
Dec-87	4.4	1.5	4		
Dec-87		1.4			
Dec-87					
Dec-87					
Dec-87					
Dec-87					
Dec-87					
Dec-87					
Dec-87	5.3	4.2	4.5		
Dec-87			4.4		
Dec-87					
Dec-87					
Dec-87	2.1	2	4		
Dec-87		1.9			
Jan-88	3.1	3.1	4.3		
Jan-88		3.3			
Jan-88	4.6	2.1	4		
Jan-88		2.2			
Jan-88					
Jan-88					
Jan-88	4.3	2.3	4.4		
Jan-88		2.2			
Jan-88	4.4	2	4.1		
Jan-88		2.1			
Jan-88					
Jan-88					
Feb-88	4.3	2.1	4.2		
Feb-88		2			
Feb-88					
Feb-88					
Feb-88					
Feb-88					
Feb-88	3.9	2.1	4.3		
Feb-88		2.1			
Feb-88					
Feb-88	4.6	*2.3*	*4.3*		
Feb-88		2.3			
Feb-88					
Feb-88					

DATE	Well Number				
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Mar-88	2.8	2.3	4.5		
Mar-88		2.1			
Mar-88					
Mar-88					
Mar-88	5.1	2.5	4.5		
Mar-88		2.4			
Mar-88					
Mar-88					
Mar-88	4.4	2.3	4.4		
Mar-88		2.3			
Mar-88					
Mar-88					
Mar-88					
Mar-88					
Mar-88	2.2	2.3	4.5		
Mar-88		2.2			
Mar-88	4.5	2.1	4.5		
Mar-88		2.1			
Mar-88					
Mar-88					
Apr-88	3.8	2.1	4.6		
Apr-88		2.2			
Apr-88	4.3	2	4.1		
Apr-88		2.2			
Apr-88					
Apr-88					
Apr-88					
Apr-88					
Apr-88	3.5	2.2	4.6		
Apr-88		2.2			
Apr-88					
Apr-88					
Apr-88	5.6	2.2	3.8		
Apr-88		2			
Apr-88					
Apr-88					
May-88	4.5	2.3	4.5		
May-88		2.1			
May-88	4.4	2.2	4.6		
May-88		2.3			

DATE	Well Number				
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May-88					
May-88					
May-88					
May-88					
May-88		2	3.9		
May-88		2.1			
May-88					
May-88					
Jun-88		1.9	3.9		
Jun-88		1.9			
Jun-88					
Jun-88					
Jun-88		1.7	3.7		
Jun-88		*1.6*	*3.9*		
Jun-88					
Jun-88					
Jun-88		1.8	3.7		
Jun-88		1.7			
Jun-88		1.8	3.6		
Jun-88		1.7			
Jun-88					
Jun-88					
Jun-88					
Jun-88					
Jun-88		1.7	3.4		
Jun-88		1.7			
Jul-88	2.9	1.9	3.5		
Jul-88		2			
Jul-88					
Jul-88					
Jul-88	1.8	2	3.5		
Jul-88		2			
Jul-88					
Jul-88					
Jul-88					
Jul-88					
Jul-88	3.5	1.9	3		
Jul-88		2			
Jul-88					
Jul-88					

DATE	Well Number				
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Aug-88					
Aug-88					
Aug-88	2.6	1.4	3.2		
Aug-88		1.2			
Aug-88					
Aug-88					
Aug-88	3.5	1.6	3.1		
Aug-88	3.7				
Aug-88	4.1	1.7	2.6		
Aug-88		1.7			
Aug-88					
Aug-88					
Aug-88	3.6	3	2.9		
Aug-88			2.9		
Aug-88					
Aug-88	2.7	1.5	2.7		
Aug-88		1.5			
Sep-88					
Sep-88					
Sep-88	1.5	1.5	2.9		
Sep-88		1.5			
Sep-88					
Sep-88					
Sep-88	4.6	3	4.3		
Sep-88		2.8			
Sep-88					
Sep-88					
Sep-88					
Sep-88	2	2.5	3.7		
Sep-88	1.7				
Oct-88		1.9	3.7		
Oct-88		2			
Oct-88		1.9			
Oct-88					
Oct-88	3.3	2	2		
Oct-88		1.8			
Oct-88					
Oct-88					
Oct-88	2.3		3.3		
Oct-88			3.2		

DATE	Well Number				
	0071	0076	0271		
Oct-88					
Oct-88					
Oct-88	3.7		3.1		
Oct-88			3		
Oct-88					
Oct-88					
Nov-88	3.04		3.07		
Nov-88			3.06		
Nov-88					
Nov-88					
Nov-88	3.24		3.06		
Nov-88			3.01		
Nov-88					
Nov-88					
Nov-88					
Nov-88					
Nov-88	2.98		2.87		
Nov-88			3.16		
Nov-88					
Nov-88					
Nov-88	3.2		3.32		
Nov-88			3.1		
Nov-88	2.6	3.09	3.32		
Nov-88		3.03			
Dec-88					
Dec-88					
Dec-88	3.27		3.13		
Dec-88			3.18		
Dec-88					
Dec-88					
Dec-88	3.05	2.93	3.02		
Dec-88			3.01		
Dec-88					
Dec-88	3.08	3.04	3.06		
Dec-88		2.98			
Dec-88					
Dec-88					
Dec-88	2.85	2.93	3.28		
Dec-88		2.91			
Jan-89					

DATE	Well Number				
	0071	0076	0271		
Jan-89					
Jan-89	2.82	3	2.7		
Jan-89		3.1			
Jan-89	3.33	2.82	2.91		
Jan-89		2.83			
Jan-89					
Jan-89					
Jan-89	2.6	2.74	2.95		
Jan-89		2.77			
Jan-89	2.38	2.94	2.86		
Jan-89		2.84			
Jan-89					
Jan-89					
Jan-89					
Jan-89					
Jan-89					
Jan-89					
Feb-89	2.63	2.81	3.04		
Feb-89		2.7			
Feb-89	2.65	0.91	2.76		
Feb-89		1.06			
Feb-89					
Feb-89					
Feb-89					
Feb-89					
Feb-89	2.52	2.4	2.51		
Feb-89			2.38		
Feb-89					
Feb-89					
Mar-89	3.3	2.43	2.75		
Mar-89			2.57		
Mar-89	2.63	2.51	2.53		
Mar-89			2.63		
Mar-89					
Mar-89					
Mar-89	2.29		2.49		
Mar-89			2.55		
Mar-89					
Mar-89					
Mar-89	3.08		2.55		

DATE	Well Number 0071	0076	0271		
Mar-89			2.54		
Mar-89					
Mar-89					
Mar-89	3.29		3.08		
Mar-89			2.88		
Apr-89					
Apr-89					
Apr-89	3.19		2.81		
Apr-89			2.75		
Apr-89					
Apr-89					
Apr-89					
Apr-89					
Apr-89					
Apr-89					
Apr-89	3.74		2.79		
Apr-89			2.66		
May-89	2.65	0.79	2.41		
May-89			2.62		
May-89	2.2	1.48	2.18		
May-89			2.25		
May-89	2.26	0.98	2.43		
May-89			2.22		
May-89					
May-89					
May-89	2.51	0.66	2.29		
May-89			2.19		
May-89					
May-89					
May-89	3.34	0.62	2.05		
May-89			2.17		
Jun-89					
Jun-89					
Jun-89					
Jun-89	2.06	0.88	2.24		
Jun-89			2.19		
Jun-89	4.13	0.68	1.99		
Jun-89			1.97		
Jun-89					
Jun-89					

DATE	Well Number 0071	0076	0271		
Jun-89	4.09	0.8	2.26		
Jun-89			2.35		
Jun-89					
Jun-89					
Jun-89	2.5	1.06	2.62		
Jun-89			2.61		
Jul-89					
Jul-89					
Jul-89					
Jul-89	1.51	0.85	2.8		
Jul-89			2.8		
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89	3.84	0.9	2.85		
Jul-89			2.64		
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89	4.45	0.81	2.95		
Jul-89			2.75		
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89					
Jul-89	4.49	0.76	2.94		
Jul-89			2.8		

DATE	Well Number				
	0071	0076	0271		
Jul-89					
Jul-89					
Jul-89					
Aug-89					
Aug-89					
Aug-89	0.94	1.09	1.63		
Aug-89			1.78		
Aug-89					
Aug-89					
Aug-89					
Aug-89					
Aug-89					
Aug-89	3.43	1.19			
Aug-89		1.19			
Aug-89					
Aug-89					
Aug-89					
Aug-89					
Aug-89	3.9	1.25			
Aug-89		1.15			
Aug-89					
Aug-89					
Aug-89					
Aug-89					
Aug-89	3.53	1.32			
Aug-89		1.29			
Aug-89	3.54	1.23			
Aug-89		1.34			
Aug-89					
Aug-89					
Sep-89	4.17	1.82			
Sep-89		1.93			
Sep-89					
Sep-89					
Sep-89	2.43	2.33			
Sep-89		2.37			
Sep-89	2.16	1.43			
Sep-89		1.38			
Sep-89					
Sep-89					

DATE	Well Number				
	0071	0076	0271		
Sep-89	3.69	1.64			
Sep-89		1.69			
Sep-89					
Sep-89					
Oct-89					
Oct-89					
Oct-89	4.54	2.36			
Oct-89		2.54			
Oct-89					
Oct-89					
Oct-89					
Oct-89					
Oct-89					
Oct-89					
Oct-89					
Oct-89					
Nov-89					
Nov-89					
Nov-89					
Nov-89					
Nov-89					
Nov-89					
Nov-89					
Nov-89					
Dec-89					
Dec-89					
Dec-89					
Dec-89					
Jan-90					
Jan-90					
Jan-90					
Jan-90					
Jan-90					
Jan-90					
Jan-90					
Jan-90					
Feb-90					
Feb-90					
Feb-90					
Feb-90					

DATE	Well Number				
	0071	0076	0271		
Feb-90					
Feb-90					
Feb-90					
Feb-90					
Mar-90					
Mar-90					
Mar-90					
Mar-90					
Mar-90					
Mar-90					
Apr-90					
Apr-90					
Apr-90					
Apr-90					
Apr-90					
Apr-90					
Apr-90					
May-90					
May-90					
May-90					
May-90					
May-90					
May-90					
May-90					
May-90					
Jun-90					
Jun-90					
Jun-90					
Jun-90					
Jun-90					
Jun-90					
Jun-90					
Jun-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					

DATE	Well Number				
	0071	0076	0271		
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Jul-90					
Aug-90					
Aug-90					
Aug-90					
Aug-90					
Aug-90					
Aug-90					

APPENDIX Q

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCI/L)

FROM OFFSITE WATER SUPPLY WELLS

(WELL NO. 0925, 0926, 0933, 0901, 0902, AND 0903)

Appendix Q. Tritium Concentrations In Groundwater Samples (nCi/L From Offsite Water Supply Wells (Well Nos. 0925, 0926, 0933, 0901, 0902, and 0903)

DATE	Well Number					
	0925	0926	0933	0901	0902	0903
Jan-75						
Jan-75						
Feb-75	9			90	40	41
Mar-75	6			86	34	36
Apr-75	8			79	35	36
May-75	7			81	38	38
Jun-75	8			73	35	35
Jul-75	8			69	34	37
Aug-75	6			71	34	35
Sep-75	7			69	35	40
Oct-75	7			73	33	35
Nov-75	6			69	35	38
Dec-75	7			65	40	43
Jan-76				66	32	
Jan-76						
Jan-76						
Feb-76						
Feb-76	4			67	31	38
Feb-76						
Mar-76						
Mar-76	4			61	33	32
Mar-76						
Mar-76						
Jun-76			18	59	34	43
Jun-76			2			
Jun-76				60	34	44
Jun-76			2	68	37	46
Jun-76						
Jul-76			2	62	33	44
Jul-76			2	63	34	43
Jul-76						
Jul-76			1	59	32	41
Jul-76						
Jul-76				67	37	50
Jul-76			1			
Jul-76						
Jul-76			0			
Jul-76				68	38	49

DATE	Well Number					
	0925	0926	0933	0901	0902	0903
Aug-76	6			60	29	41
Aug-76			3	65	36	47
Aug-76			3	65	36	47
Aug-76			4	67	36	49
Sep-76						
Sep-76			4	59	30	48
Sep-76			4	61	32	46
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76			4	70	36	48
Sep-76						
Sep-76			4			
Sep-76						
Oct-76						
Oct-76			5			
Oct-76						
Oct-76			4			
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76			4			
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76			3			
Oct-76				61	26	41
Oct-76						
Oct-76			2			
Oct-76				56	25	40
Nov-76						
Nov-76						
Nov-76			4			

DATE	Well Number					
	0925	0926	0933	0901	0902	0903
Nov-76				56	24	38
Nov-76						
Nov-76			4			
Nov-76				48	23	38
Nov-76				51	24	40
Nov-76			5			
Nov-76						
Nov-76			6	43	20	32
Nov-76						
Nov-76						
Dec-76			3	55	28	42
Dec-76				56	27	40
Dec-76			2	55	28	40
Dec-76				54	32	38
Dec-76				59	38	
Jan-77				57	36	37
Jan-77				59	35	35
Jan-77				58	33	35
Jan-77				53	34	36
Feb-77				48	35	37
Feb-77				50	36	36
Mar-77				51	33	35
Mar-77				49	32	35
Apr-77				40	32	35
Apr-77		42		43	26	33
Apr-77		42		43	26	33
Apr-77		36		37	26	30
Apr-77		36		37	26	30
Apr-77		37				
May-77		38				
May-77				37	32	32
May-77		36		33	29	30
Jun-77		44		36	34	32
Jun-77		48		38	32	30
Jul-77		48		38	28	31
Jul-77		49		46	30	30
Aug-77		35		43	27	28
Aug-77	6	39		52	27	26
Sep-77		36	1	53	26	26
Sep-77		31		54	24	25
Oct-77		37	1	45	25	26

Appendix Q. (page 4 of 4)

DATE	Well Number					
	0925	0926	0933	0901	0902	0903
Oct-77	3	31		47	26	27
Nov-77	2	28	1	49	24	23
Dec-77		30		50	25	22
Dec-77		30		50	25	22
Jan-78		30	0	49	32	24
Jan-78		32		45	26	22
Feb-78		24		29	22	19
Feb-78	5	26		29	24	22
Mar-78				28	27	21
Mar-78	6	27		23	22	21
Apr-78		28	2	19	20	22
Apr-78		28		17	18	17
May-78		26	0	14	16	17
May-78		25		13	17	17
Jun-78		28	2	13	18	18
Jun-78		26		13	21	19
Jul-78		18		19	21	25
Aug-78		20		26	20	22
Sep-78		22				

APPENDIX R

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM OFFSITE WATER SUPPLY WELLS

(WELL NO. 0904, 0905, 0906, 0907, 0908, AND 0909)

Appendix R. Tritium Concentrations In Groundwater Samples (nCi/L)
From Offsite Water Supply Wells
(Well Nos. 0904, 0905, 0906, 0907, 0908, and 0909)

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jan-75						
Jan-75						
Feb-75	63					
Mar-75	64					
Apr-75	54					
May-75	59					
Jun-75	47					
Jul-75	48					
Aug-75	49					
Sep-75	49					
Oct-75	45					
Nov-75	46					
Dec-75	44					
Jan-76	46					
Jan-76						
Jan-76						
Feb-76						
Feb-76	44					
Feb-76						
Mar-76						
Mar-76	43					
Mar-76						
Mar-76						
Jun-76						
Jun-76						
Jun-76						
Jun-76						
Jun-76						
Jul-76	42					
Jul-76	42					
Jul-76						
Jul-76	40					
Jul-76						
Jul-76	46		48	43		
Jul-76						
Jul-76						
Jul-76						
Jul-76	48					

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Aug-76	43					
Aug-76	47					
Aug-76	47					
Aug-76	47					
Sep-76						
Sep-76	44					
Sep-76	45					
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76	47					
Sep-76						
Sep-76						
Sep-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76	43					
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76	37					
Oct-76						
Oct-76						
Oct-76						
Oct-76	36					
Oct-76						
Nov-76						
Nov-76	35					

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Nov-76						
Nov-76	36					
Nov-76	38					
Nov-76						
Nov-76						
Nov-76	37					
Nov-76						
Nov-76						
Nov-76	33					
Nov-76						
Nov-76	40					
Dec-76	37					
Dec-76	34					
Dec-76	32					
Dec-76						
Dec-76						
Jan-77	30					
Jan-77						
Jan-77						
Jan-77	27					
Feb-77	27					
Feb-77	24					
Mar-77	23					
Mar-77	23					
Apr-77	19					
Apr-77	21					
Apr-77	19					
Apr-77						
Apr-77						
Apr-77						
May-77	20					
May-77						
May-77						
Jun-77						
Jun-77						
Jul-77						
Jul-77						
Aug-77						
Aug-77						
Sep-77				38		

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Sep-77						
Oct-77						
Oct-77						
Nov-77						
Dec-77						
Dec-77						
Jan-78						
Jan-78		11				
Feb-78						
Feb-78		17				
Mar-78				40		
Mar-78						
Apr-78						
Apr-78						
May-78						
May-78		14				
Jun-78				22	30	
Jun-78						
Jul-78		17		24	25	
Aug-78		18		26	20	
Sep-78		16		26	15	
Sep-78		16		27	15	
Sep-78		16		27	15	
Oct-78						
Oct-78						
Oct-78		15		23		
Nov-78		13		24		
Dec-78		13		24		
Jan-79		11		25		
Feb-79						
Mar-79		12		23		
Mar-79						
Apr-79		6		23	6	
Apr-79			21			
May-79		8	22	23		
Jun-79		6	24	22	5	
Jun-79				23		
Jun-79			21	23		
Jun-79			22	22		
Jul-79			20	14		

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jul-79		7	22	13	6	
Jul-79						
Jul-79			19	13		
Jul-79						
Jul-79						
Jul-79						
Jul-79						
Jul-79			19	14		
Aug-79			22	15		
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79						
Aug-79		8	22	21		
Aug-79			23	22		
Aug-79			23	22		
Sep-79			23	21		
Sep-79			22	14		
Sep-79		7	20	14		
Sep-79			23	13		
Oct-79			20	15		
Oct-79			19	11		
Oct-79		6	18	10		
Oct-79			20	13		
Oct-79			20	15		
Nov-79			20	20		
Nov-79		8	20	19		
Nov-79			23	19		
Nov-79			21	18		
Dec-79			21	14		
Dec-79			23	17		
Dec-79						
Dec-79		9	21	14		
Dec-79			20	11		
Jan-80			19	12		
Jan-80			19	12		
Jan-80			17	12		

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jan-80		5	17	12		
Feb-80			17	18		
Feb-80			16	21		
Feb-80			15	20		
Feb-80			15	19		
Mar-80			14			
Mar-80			15	17		
Mar-80		5	14	14		
Mar-80			15	13		
Mar-80			14	12		
Apr-80			16	12		
Apr-80		5	15	12	7	
Apr-80			16	12		
Apr-80			17	16		
May-80			16	18		
May-80		5	18	18		
May-80			19	19		
May-80			19	18		
Jun-80			18	14		
Jun-80			17	13		
Jun-80		6	17	12		
Jun-80			17	11		
Jul-80						
Jul-80			16	12		
Jul-80						
Jul-80			15	13		
Jul-80						
Jul-80		8	16	13		
Jul-80			15	12		
Jul-80			15	12		
Aug-80			15	11		
Aug-80			12	12		
Aug-80		7	13	11		
Aug-80			13	14		
Sep-80			13	13		
Sep-80			15	13		
Sep-80			15	13		
Sep-80		7	14	14		
Sep-80			15	13		
Oct-80			15	13		

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Oct-80			15	14		
Oct-80		6	15	15		
Oct-80			16	15		
Oct-80			16	15		
Nov-80			15	14		
Nov-80			15	13		
Nov-80		6	15			
Nov-80			14	15		
Dec-80			14	15		
Dec-80			18	14		
Dec-80		5	17	14		
Jan-81				16		
Jan-81			17	17		
Jan-81			16	16		
Jan-81				17		
Feb-81				16		
Feb-81				16		
Feb-81		5	15	16		
Feb-81			14	16		
Feb-81						
Mar-81			14	16		
Mar-81						
Mar-81			13	17		
Mar-81		6	14	16		
Mar-81			15	16		
Apr-81			15	16		
Apr-81			15	16		
Apr-81		8	14	15		
Apr-81			15	17		
Apr-81						
Apr-81			13	16		
May-81			11	16		
May-81			12	15		
May-81		6	12	16		
May-81				15		
Jun-81			10	14		
Jun-81			10	14		
Jun-81		5	12	14		
Jun-81			12	14		
Jul-81				14		

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jul-81			13	14		
Jul-81			13	13		
Jul-81		6	15	14		
Jul-81				15		
Aug-81				15		
Aug-81			15	15		
Aug-81		7	13	15		
Aug-81			13	15		
Sep-81			13	14		
Sep-81			14	14		
Sep-81		7	15	14		
Sep-81				12		
Oct-81			15	14		
Oct-81			16	13		
Oct-81			16	14		
Oct-81				12		
Oct-81		5	14	12		
Nov-81						
Nov-81			14	12		
Nov-81				9		
Nov-81		6	13	13		
Nov-81			17	16		
Dec-81			13	13		
Dec-81			12			
Dec-81		6		13		
Dec-81			13	13		
Jan-82			12	12		
Jan-82				11		
Jan-82				12		
Feb-82			13	12		
Feb-82				12		
Feb-82		6	13			
Feb-82				12		
Feb-82						
Feb-82			13	12		
Mar-82			14	12		
Mar-82			14	12		
Mar-82						
Mar-82		7	13	13		
Mar-82			13	12		

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Mar-82			12	12		
Apr-82				13		
Apr-82			12	12		
Apr-82			14	12		
Apr-82			14	12		
May-82			13	11		
May-82			12	12		
May-82			12	12		
May-82			13	13		
May-82						
Jun-82			13	12		
Jun-82			13	10		
Jun-82			14	11		
Jun-82			12	12		
Jul-82						
Jul-82			11	13		
Jul-82		5	12	12		
Jul-82			12	12		
Aug-82			12	11		
Aug-82			12	12		
Aug-82			13	10		
Sep-82			13	10		
Sep-82			13	10		
Sep-82		2	13	9		
Sep-82			10	10		
Oct-82				9		
Oct-82			11	8		
Oct-82			11	7		
Oct-82			7	6		
Nov-82			10	6		
Nov-82						
Nov-82		2	10	5		
Nov-82			10	5		
Dec-82			10	5		
Dec-82			10	5		
Dec-82			10			
Dec-82			9	5		
Jan-83						
Jan-83				5		
Jan-83						

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jan-83						
Jan-83			7	11		
Jan-83						
Jan-83						
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Mar-83						
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Mar-83				7		
Mar-83			9			
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DATE	Well Number					
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Apr-83			9			
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Apr-83			13	8		
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Apr-83			9	8		
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May-83			8	7		
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May-83			8	7		
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DATE	Well Number					
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Jul-83			6	7		
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Jul-83			7	8		
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Jul-83			8	9		
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DATE	Well Number					
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Jul-83						
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Jul-83			8	8		
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Sep-83			8	7		
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DATE	Well Number					
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Oct-83						
Oct-83			8	7		
Oct-83						
Oct-83			8	6		
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Oct-83			8	6		
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Nov-83			7	6		
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Dec-83				6		
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Dec-83						
Dec-83				7		
Jan-84				5		
Jan-84						
Jan-84				8		
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Jan-84				8		
Jan-84						
Jan-84						

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jan-84				8		
Jan-84						
Jan-84						
Feb-84						
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DATE	Well Number					
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Mar-84				7		
Apr-84						
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May-84				7		
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Jun-84				6		
Jun-84						

DATE	Well Number					
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Jun-84				7		
Jun-84				8		
Jun-84						
Jul-84				7		
Jul-84				6		
Jul-84				5		
Jul-84				4		
Jul-84				4		
Aug-84				4		
Aug-84				4		
Aug-84				4		
Aug-84				4		
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Sep-84				4		
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Sep-84				5		
Oct-84				4		
Oct-84						
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Nov-84				5		
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Dec-84				5		
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Dec-84						
Jan-85				5		
Jan-85				5		
Jan-85				5		

DATE	Well Number					
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Feb-85						
Feb-85				5		
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Feb-85				5		
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Apr-85				6		
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May-85				5		
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May-85				6		
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May-85				7		
Jun-85						
Jun-85				8		
Jun-85						
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Jun-85				6		
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DATE	Well Number 0904	0905	0906	0907	0908	0909
Jun-85						
Jul-85				6		
Jul-85						
Jul-85						
Jul-85				7		
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Jul-85				7		
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Aug-85				5		
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Aug-85				5		
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Sep-85				4		
Sep-85				5		
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Oct-85				5		
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Nov-85				3		
Nov-85						
Nov-85						
Nov-85				6		
Nov-85						
Nov-85				7		
Dec-85						

DATE	Well Number					
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Dec-85			5	5		
Dec-85						
Dec-85						
Dec-85						
Dec-85						
Dec-85			6	7		
Dec-85				7		
Jan-86						
Jan-86			5	5		
Jan-86						
Jan-86			5	5		
Jan-86						
Jan-86				5		
Jan-86						
Jan-86				5		
Jan-86						
Jan-86			6	5		
Jan-86						
Jan-86						
Feb-86		1	6	6		
Feb-86						
Feb-86						
Feb-86			5			
Feb-86						
Feb-86	2					
Mar-86		1	6	6		
Mar-86						
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Mar-86						
Mar-86						
Mar-86			6	5		
Apr-86						
Apr-86			5	5		
Apr-86						
Apr-86						
Apr-86						
Apr-86						
Apr-86				5		
Apr-86				5		
Apr-86						

DATE	Well Number 0904	0905	0906	0907	0908	0909
May-86						
May-86						
May-86						
May-86						
May-86			4	4		
May-86						
May-86						
May-86						
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May-86						
May-86						
May-86						
May-86						
May-86						
May-86						
May-86				5		
Jun-86				6		
Jun-86				6		
Jun-86			6	5		
Jun-86						
Jun-86						
Jun-86				7		
Jun-86						
Jun-86						
Jun-86						
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Jul-86				5		
Jul-86				5		
Jul-86						
Jul-86				5		
Jul-86						
Jul-86				5		
Jul-86						
Aug-86						
Aug-86				5		
Aug-86						

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Aug-86				4		
Aug-86						
Aug-86						
Aug-86			7	5		
Sep-86						
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Sep-86						
Sep-86						
Sep-86						
Sep-86						
Sep-86				5		
Sep-86						
Sep-86				4		
Sep-86						
Sep-86				5		
Oct-86						
Oct-86				5		
Oct-86			6			
Oct-86				4		
Oct-86						
Oct-86				6		
Oct-86						
Oct-86						
Oct-86				5		
Nov-86						
Nov-86				5		
Nov-86				5		
Nov-86						
Nov-86						
Nov-86						
Nov-86				5		
Dec-86						
Dec-86						
Dec-86				5		
Dec-86			6			
Dec-86						
Dec-86						
Dec-86						
Dec-86						

DATE	Well Number 0904	0905	0906	0907	0908	0909
Dec-86						
Jan-87						
Jan-87			6.4	4.9		
Jan-87						
Jan-87						
Jan-87				5.2		
Jan-87						
Jan-87				5.5		
Jan-87						
Jan-87				5.9		
Feb-87						
Feb-87						
Feb-87						
Feb-87						
Feb-87			6.2			
Feb-87				5.3		
Feb-87						
Feb-87						
Feb-87						
Feb-87				5.2		
Feb-87						
Feb-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87						
Mar-87				4.7		
Apr-87						
Apr-87				5.2		
Apr-87						
Apr-87						
Apr-87				4.9		
Apr-87				5.2		
Apr-87						
Apr-87				5.4		
Apr-87						

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Apr-87						
Apr-87						
May-87			6.6	5		1.2
May-87			6.8			1.2
May-87						
May-87				5		
May-87						
May-87						
May-87				4.5		
May-87						
May-87						
May-87				5.8		
May-87						
May-87						
May-87				5.7		
Jun-87						
Jun-87						
Jun-87				5.8		
Jun-87						
Jun-87						
Jun-87						
Jun-87				4.9		
Jun-87						
Jun-87				5.9		
Jun-87			7.4			
Jun-87				5.7		
Jun-87						
Jun-87				5.8		
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87				6		1.3
Jul-87				5.7		1.2
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87				6.5		
Jul-87						

DATE	Well Number 0904	0905	0906	0907	0908	0909
Jul-87						
Jul-87						
Jul-87				5.8		
Jul-87				5.4		
Jul-87						
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Jul-87			8	6.1		
Jul-87			7.9	5.8		
Aug-87			7.1	5.3		
Aug-87			7.2	5.3		
Aug-87						0.9
Aug-87						
Aug-87						
Aug-87						
Aug-87						
Aug-87						
Aug-87				5.4		
Aug-87						
Aug-87						
Aug-87						
Aug-87				6		
Aug-87						
Sep-87						
Sep-87						
Sep-87				7.1		
Sep-87				7.1		
Sep-87				8.4		
Sep-87						
Sep-87						
Sep-87				6.3		
Sep-87						
Sep-87						1.7
Sep-87						
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Sep-87						
Sep-87				5.5		
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Sep-87			7.3			
Sep-87						
Oct-87				6.3		

DATE	Well Number					
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Oct-87						
Oct-87			8.3	5.8		1.1
Oct-87			8.2	5.7		
Oct-87						
Oct-87						
Oct-87			7.2			
Oct-87						
Oct-87						
Oct-87						
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Oct-87						
Oct-87						
Oct-87						
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Oct-87						
Oct-87						
Oct-87						
Nov-87				5.3		
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87						
Nov-87			6.7	4.9		
Nov-87			5.5			
Nov-87						
Nov-87						
Nov-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87			7.6			1.2
Dec-87						
Dec-87						
Dec-87						

DATE	Well Number					
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Dec-87						
Dec-87						
Dec-87		0.7		4.6		
Dec-87						
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Dec-87						
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Jan-88						
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Jan-88						
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Jan-88						0.64
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Jan-88						
Jan-88						
Jan-88						
Jan-88						
Jan-88						
Jan-88						
Jan-88						
Feb-88						
Feb-88						
Feb-88						0.69
Feb-88						
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Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88			6.3	4.4		
Feb-88			6.5			
Mar-88						

DATE	Well Number					
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Mar-88						
Mar-88		0.84	6.6	4.7		
Mar-88				4.7		
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
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Mar-88						
Mar-88						
Mar-88						1.1
Mar-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88						
Apr-88		0.73	5.7	3.8		0.95
Apr-88						
Apr-88						
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Apr-88						
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Apr-88						
May-88						
May-88						
May-88						
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May-88						

DATE	Well Number					
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May-88						
May-88		0.66	5.8	3.7		
May-88		0.65				
May-88						
May-88						
May-88						0.69
May-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
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Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88						
Jun-88		0.5	4.2	2.9		
Jun-88						
Jun-88						
Jun-88						
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Jul-88						
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Jul-88						
Jul-88						
Jul-88						
Jul-88						
Aug-88		0.56	5.49	3.56		

DATE	Well Number					
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Aug-88		0.58				
Aug-88						
Aug-88						
Aug-88						0.47
Aug-88						0.55
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Sep-88		0.47	5.37	3.83		
Sep-88						
Sep-88						0.85
Sep-88						0.69
Sep-88						
Sep-88						
Sep-88		0.46	5.76	3.46		
Sep-88						
Sep-88						
Sep-88						0.67
Sep-88						0.75
Sep-88						
Sep-88						
Oct-88						
Oct-88						
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Oct-88						0.19
Oct-88						
Oct-88						
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Oct-88						
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DATE	Well Number 0904	0905	0906	0907	0908	0909
Oct-88						
Oct-88						
Oct-88						
Oct-88		0.74	6.36	4.07		
Oct-88						
Nov-88						
Nov-88						
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Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88		0.73	6.28	3.85		0.82
Nov-88			6.26			
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Dec-88						
Dec-88						
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Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88		0.47	5.04	3.48		0.67
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Jan-89						
Jan-89						

DATE	Well Number					
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Jan-89						
Jan-89						
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Jan-89						
Jan-89						
Jan-89						
Jan-89						
Jan-89						1.03
Jan-89						
Jan-89		0.7	6.07			
Jan-89		0.57				
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89				3.62		
Feb-89				3.68		
Mar-89		0.85	6.08	4.03		
Mar-89						
Mar-89						
Mar-89						
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Mar-89						
Mar-89						
Mar-89						0.72
Mar-89						0.76
Mar-89						
Mar-89						

DATE	Well Number					
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Mar-89						
Mar-89						
Mar-89		0.7	6.1	4.28		0.92
Mar-89				4.16		
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89			5.91	3.96		3.76
Apr-89			5.93			
Apr-89						
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May-89						
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May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89						
May-89		0.38	4.14	3.65		0.62
May-89		0.39				
Jun-89						
Jun-89						
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DATE	Well Number					
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Jun-89						
Jun-89						
Jun-89						
Jun-89		0.51	4.27	3.97		0.75
Jun-89		0.39				
Jul-89						
Jul-89						
Jul-89						
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Jul-89						
Jul-89						
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Jul-89						
Jul-89						
Jul-89		0.46	5.45	4.22		0.87

DATE	Well Number					
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Jul-89			5.22			
Jul-89						
Aug-89						
Aug-89						
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Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89		0.31	5.03	4.13		0.25
Aug-89				4.11		
Sep-89						
Sep-89						
Sep-89						
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Sep-89						
Sep-89						
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Sep-89						
Sep-89						
Sep-89		0.19	4.49	3.46		0.17

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Sep-89						
Sep-89						
Sep-89						
Oct-89						
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Oct-89						
Oct-89		0.46	4.3	3.71		0.46
Oct-89						
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Nov-89						
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Nov-89						
Nov-89						
Nov-89		0.41	5.25	4.24		
Nov-89						
Nov-89						0.31
Nov-89						
Dec-89						
Dec-89						
Dec-89						
Dec-89						
Jan-90		0.66				0.81
Jan-90		0.71				
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DATE	Well Number 0904	0905	0906	0907	0908	0909
Feb-90						
Feb-90		0.29				0.48
Feb-90		0.33				
Mar-90						
Mar-90						
Mar-90						
Mar-90						
Mar-90		0.22	5.19	3.13		0.4
Mar-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90						
Apr-90		0.42	5.13	3.04		0.45
Apr-90						
Apr-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90						
May-90			3.85	2.62		0.35
May-90						0.28
Jun-90						
Jun-90						
Jun-90						
Jun-90						
Jun-90		0.53	3.79	3.02		0.53
Jun-90		0.5				
Jun-90						
Jun-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90						
Jul-90		0.25	3.74	3.19		
Jul-90						
Jul-90						

DATE	Well Number					
	0904	0905	0906	0907	0908	0909
Jul-90						
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APPENDIX S

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM MIAMISBURG PRODUCTION WELLS

(WELL NO. 0927, 0928, 0929, 0930, 0931, AND 0932)

Appendix S. Tritium Concentrations In Groundwater Samples (nCi/L)
From Miamisburg Production Wells
(Well Nos. 0927, 0928, 0929, 0930, 0931, and 0932)

DATE	Well Number					
	0927	0928	0929	0930	0931	0932
Jan-75						
Jan-75						
Feb-75						
Mar-75						
Apr-75						
May-75						
Jun-75						
Jul-75						
Aug-75						
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Oct-75						
Nov-75						
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Jan-76						
Jan-76						
Jan-76						
Feb-76						
Feb-76						
Feb-76						
Mar-76						
Mar-76						
Mar-76						
Mar-76						
Jun-76	4	9	16	4	3	2
Jun-76		11	16	4	3	2
Jun-76						
Jun-76	4	10	16	4	3	2
Jun-76						
Jul-76	4	8	8	4	2	1
Jul-76	3	9	11	4	2	1
Jul-76						
Jul-76	4	8	12	3	1	0
Jul-76						
Jul-76						
Jul-76	3	8	6	2	2	
Jul-76						
Jul-76		5		0	0	0
Jul-76						

DATE	Well Number					
	0927	0928	0929	0930	0931	0932
Aug-76						
Aug-76	3	8	13	5	2	2
Aug-76	3	8	13	5	2	2
Aug-76	4	10	15	7	4	
Sep-76						
Sep-76	5	10			4	4
Sep-76	5	11	15	6	4	3
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76						
Sep-76	8	14	12	4	8	3
Sep-76						
Sep-76						
Sep-76	4	12	11	6	5	6
Sep-76						
Oct-76	4	13	10	6	9	4
Oct-76						
Oct-76						
Oct-76	6	9	8	5	3	3
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76	5	9	13	6	4	4
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76						
Oct-76	5	8		5	4	3
Oct-76						
Oct-76						
Oct-76	5	9	5	6	3	5
Oct-76						
Nov-76						
Nov-76						

DATE	Well Number					
	0927	0928	0929	0930	0931	0932
Nov-76	5	13	11	7	4	3
Nov-76						
Nov-76						
Nov-76	10	12	12	7	4	4
Nov-76						
Nov-76						
Nov-76	11	11	8	8	5	4
Nov-76						
Nov-76	4	8	7	6	4	3
Nov-76						
Nov-76						
Dec-76	8	9	13	6	3	3
Dec-76	4	9	13	5	4	3
Dec-76	5	9	14	5	4	2
Dec-76						
Dec-76						
Jan-77		9	5			
Jan-77						
Jan-77						
Jan-77						
Feb-77						
Feb-77						
Mar-77						
Mar-77						
Apr-77						
Apr-77		2	7			
Apr-77		2	7			
Apr-77						
Apr-77						
Apr-77						
May-77		6	8			
May-77						
May-77						
Jun-77						
Jun-77						
Jul-77		6	11			
Jul-77						
Aug-77		7	7			
Aug-77						
Sep-77		6	12			

DATE	Well Number					
	0927	0928	0929	0930	0931	0932
Sep-77						
Oct-77		11	7			
Oct-77						
Nov-77		8	2			
Dec-77						
Dec-77						
Jan-78		5	11			
Jan-78						
Feb-78		4	10			
Feb-78						
Mar-78		4	11			
Mar-78						
Apr-78		5	10			
Apr-78						
May-78		3	11			
May-78						
Jun-78		5	10			
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APPENDIX T

TRITIUM CONCENTRATIONS IN GROUNDWATER SAMPLES (nCi/L)

FROM MIAMISBURG PRODUCTION WELLS

(WELL NO. 0912, 0913, 0918, 0919, 0920, AND 0921)

Appendix T. Tritium Concentrations In Groundwater Samples (nCi/L)
From Miamisburg Production Wells
(Well Nos. 0912, 0913, 0918, 0919, 0920, and 0921)

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Jan-75						
Jan-75						
Feb-75						
Mar-75						
Apr-75						
May-75						
Jun-75						
Jul-75						
Aug-75						
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Nov-75						
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Jan-76						
Jan-76						
Jan-76						
Feb-76						
Feb-76						
Feb-76						
Mar-76						
Mar-76						
Mar-76						
Mar-76						
Jun-76			4	19	10	
Jun-76						
Jun-76			4	22	9	
Jun-76						
Jun-76			4	23	9	
Jul-76			4	22	14	
Jul-76						
Jul-76			3	21	8	
Jul-76						
Jul-76			2	20	8	
Jul-76				16	6	
Jul-76						
Jul-76						
Jul-76						
Jul-76			0	16	6	

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Aug-76						
Aug-76	76		3	24	9	
Aug-76	74		3	24	9	
Aug-76			5	5	10	
Sep-76						
Sep-76	70		4		8	
Sep-76			4	23	10	
Sep-76						
Sep-76	75					
Sep-76	75					
Sep-76	75					
Sep-76						
Sep-76						
Sep-76						
Sep-76			4	21	7	
Sep-76						
Sep-76			5	26	10	
Sep-76						
Oct-76						
Oct-76			5		11	
Oct-76						
Oct-76						
Oct-76			5		8	
Oct-76	68					
Oct-76	75					
Oct-76	69					
Oct-76	67					
Oct-76	66		4		9	
Oct-76	66					
Oct-76	65					
Oct-76	67					
Oct-76						
Oct-76	67					
Oct-76						
Oct-76	63		4	18	9	
Oct-76						
Oct-76	60	16	6	24	9	
Oct-76						
Nov-76						
Nov-76	55					

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Nov-76						
Nov-76			4	22	9	
Nov-76						
Nov-76						
Nov-76			10		10	
Nov-76						
Nov-76			4		9	
Nov-76						
Nov-76		20	4		10	
Nov-76						
Nov-76	69					
Dec-76	83		4		9	
Dec-76	74	18	4		9	
Dec-76	73	19	5		10	
Dec-76	66	19	4		8	
Dec-76	64	16	4		9	
Jan-77	56	14	4		9	
Jan-77	54	13				
Jan-77	51	14				
Jan-77			4		9	
Feb-77		14	4			
Feb-77		14	3			
Mar-77		13	4		9	
Mar-77		13	3		7	
Apr-77						
Apr-77						
Apr-77						
Apr-77	52					
Apr-77	62					
Apr-77						
May-77	47	10	1		5	
May-77						
May-77	48	12	1		6	
Jun-77	44	14				
Jun-77	39	17				
Jul-77	36	13	1		5	
Jul-77	34	14				
Aug-77	29	14	1		7	
Aug-77	26	16	1		5	
Sep-77	26	20	2		5	

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Sep-77	20	17	6		5	
Oct-77	22	16	2		5	
Oct-77	26	14	5		1	
Nov-77	22	12	1		6	
Dec-77		13	2		6	
Dec-77		13	2		6	
Jan-78	29	13	2		5	
Jan-78	25	16	2		6	
Feb-78		16	1		4	
Feb-78		18	2		6	
Mar-78		20	1		5	
Mar-78	17	16	6		8	
Apr-78	34	27	2		5	
Apr-78	36	32			3	
May-78	31	26		8	5	
May-78	42			6	1	
Jun-78	61	24			2	
Jun-78	67			7	4	
Jul-78	37	27				
Aug-78	22	32	5		2	
Sep-78	18	23	1		4	
Sep-78	19	20	1		4	
Sep-78	19	20	1		4	
Oct-78	12					
Oct-78	12					
Oct-78	19	17	3			
Nov-78	17	10				
Dec-78	11	9				
Jan-79	18	7				
Feb-79	15	9	2	4		
Mar-79	25	10				
Mar-79	24	12				
Apr-79	21	13	1			
Apr-79						
May-79	15	20	1			
Jun-79	11	14				
Jun-79						
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Jul-79						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Jul-79	13	14				
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Aug-79	14	12				
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Sep-79		10				
Sep-79	19					
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Oct-79						
Oct-79		10				
Oct-79	16					
Oct-79						
Oct-79						
Nov-79		14				
Nov-79	14		3			
Nov-79						
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Dec-79	19					
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DATE	Well Number					
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Jan-80	16					
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Feb-80	13		2		4	
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Mar-80	12					
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Apr-80						
Apr-80	19					
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May-80						
May-80	16					
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Jun-80						
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Jun-80	7					
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Aug-80	14	15				
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Sep-80	10	12	1			
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DATE	Well Number					
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Oct-80						
Oct-80	8					
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Nov-80	8	6				
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Dec-80	8					
Jan-81						
Jan-81	8					
Jan-81						
Jan-81						
Feb-81						
Feb-81						
Feb-81	8	3				
Feb-81						
Feb-81						
Mar-81						
Mar-81						
Mar-81						
Mar-81		3				
Mar-81						
Apr-81						
Apr-81						
Apr-81	8	3				
Apr-81						
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May-81	11	7				
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DATE	Well Number					
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Aug-81	10	24				
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Sep-81	8	14				
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Oct-81	6	7				
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Dec-81	9					
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Jan-82						
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Jan-82	6					
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DATE	Well Number					
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Oct-82	8	4				
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Nov-82	9					
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Jan-83						
Jan-83	24	2				
Jan-83	24					

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Jan-83	24					
Jan-83	28					
Jan-83	26					
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Mar-83	16					
Mar-83	15					

DATE	Well Number					
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Mar-83	16					
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Apr-83	17	9				
Apr-83	20					
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DATE	Well Number					
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May-83	25					
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May-83	29					
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Jun-83	49					
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DATE	Well Number					
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Oct-83	16					

DATE	Well Number					
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Oct-83	14					
Nov-83	16					
Nov-83	14					
Nov-83	15					
Nov-83	16					
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Nov-83	17					
Nov-83	16					
Nov-83	16					
Nov-83	16					
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Nov-83	16					
Nov-83	15					
Nov-83	13					
Dec-83	13					
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Dec-83	13					
Dec-83						
Dec-83	17					
Jan-84	25					
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Jan-84	28					
Jan-84	27					
Jan-84	29					
Jan-84	31					
Jan-84	29					

DATE	Well Number					
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Jan-84	27	5				
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Jan-84	21					
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Feb-84	20					
Feb-84	19					
Feb-84	17					
Feb-84						
Feb-84	16					
Feb-84	15					
Feb-84	15					
Feb-84	15					
Feb-84	14					
Feb-84	15					
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Feb-84	14					
Feb-84	14					
Feb-84	14	7				
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Feb-84	14					
Feb-84	13					
Mar-84	13					
Mar-84	13					
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Mar-84	13					
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Mar-84	12					
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Mar-84	11					
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Mar-84	12					
Mar-84	13					
Mar-84	15					
Mar-84	15					

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Mar-84	15					
Mar-84	15	9				
Apr-84	15					
Apr-84	14					
Apr-84	16					
Apr-84	16					
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Apr-84	16					
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Apr-84	15					
Apr-84	15					
Apr-84	14					
Apr-84	13					
Apr-84	14					
Apr-84	14					
May-84	14	13				
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May-84	14					
May-84	13					
May-84	13					
May-84	13					
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May-84	12					
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May-84	12					
May-84	11					
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May-84	10					
May-84	9					
May-84	9					
May-84	9					
Jun-84	9					
Jun-84						

DATE	Well Number					
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Jun-84	5					
Jun-84	8					
Jun-84	7					
Jun-84						
Jul-84	7	19				
Jul-84	7					
Jul-84						
Jul-84	8					
Jul-84	8					
Aug-84	8					
Aug-84	8					
Aug-84	9					
Aug-84	9					
Aug-84	10					
Aug-84						
Sep-84						
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Sep-84	9					
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Sep-84	8	7				
Sep-84						
Sep-84	9					
Oct-84	10					
Oct-84						
Oct-84	9					
Nov-84	10	4				
Nov-84						
Nov-84	10					
Nov-84	9					
Nov-84	10					
Dec-84	12					
Dec-84	12	3				
Dec-84						
Dec-84						
Dec-84						
Dec-84						
Dec-84	11					
Jan-85	10					
Jan-85	11					
Jan-85	14					

DATE	Well Number					
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Feb-85	17					
Feb-85	16					
Feb-85	16					
Feb-85	14					
Feb-85						
Mar-85	9					
Mar-85						
Mar-85	13					
Mar-85						
Mar-85	16					
Mar-85	17					
Apr-85	21					
Apr-85	25					
Apr-85						
Apr-85	42					
Apr-85	39					
Apr-85						
Apr-85	36					
Apr-85	42					
May-85						
May-85	36					
May-85	53					
May-85	53					
May-85	32					
May-85	27					
May-85	21					
May-85						
May-85	14					
May-85	14					
May-85						
May-85	13					
Jun-85						
Jun-85	12					
Jun-85						
Jun-85						
Jun-85	8					
Jun-85						
Jun-85		14				
Jun-85						
Jun-85						

DATE	Well Number					
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Jun-85						
Jul-85						
Jul-85	6					
Jul-85	7	16				
Jul-85						
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Jul-85	6					
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Aug-85	8	16				
Aug-85						
Aug-85	8					
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Aug-85	8	15				
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Aug-85	8					
Aug-85	8					
Sep-85						
Sep-85						
Sep-85						
Sep-85						
Sep-85	9					
Sep-85	10	8				
Oct-85						
Oct-85	12					
Oct-85						
Oct-85	8	4				
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Oct-85						
Oct-85						
Nov-85	5					
Nov-85						
Nov-85	6					
Nov-85	6					
Nov-85						
Nov-85						
Nov-85						
Nov-85	5					
Dec-85						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Dec-85	8					
Dec-85						
Dec-85						
Dec-85						
Dec-85						
Dec-85	9	4				
Dec-85						
Jan-86						
Jan-86	12					
Jan-86						
Jan-86	13					
Jan-86						
Jan-86	12					
Jan-86						
Jan-86	17					
Jan-86						
Jan-86	29	4				
Jan-86	29					
Jan-86	21					
Feb-86	26	4				
Feb-86						
Feb-86						
Feb-86	18					
Feb-86						
Feb-86	21					
Mar-86	23					
Mar-86						
Mar-86						
Mar-86						
Mar-86	23					
Mar-86	26					
Apr-86						
Apr-86	27					
Apr-86						
Apr-86						
Apr-86			0.4	0.9	1	0.8
Apr-86			0.4	0.9	1	0.9
Apr-86	35					
Apr-86	45					
Apr-86	55					

DATE	Well Number					
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May-86	46					
May-86	30					
May-86	20					
May-86	17	17				
May-86		15				
May-86	10	13				
May-86		12				
May-86	15	10				
May-86	14	11				
May-86	13	11				
May-86	12	11				
May-86	11	11				
May-86	10	11				
May-86	11	12				
May-86	9	11				
May-86	10	12				
May-86	9	11				
May-86	9	11				
May-86						
May-86						
Jun-86	5					
Jun-86	6	12				
Jun-86	7					
Jun-86		11				
Jun-86						
Jun-86	5					
Jun-86						
Jun-86						
Jun-86						
Jun-86						
Jul-86	8	11				
Jul-86	7	9				
Jul-86						
Jul-86						
Jul-86						
Jul-86	9					
Jul-86						
Aug-86						
Aug-86	12	9				
Aug-86						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Aug-86	13	8				
Aug-86						
Aug-86						
Aug-86						
Sep-86						
Sep-86	14	6				
Sep-86						
Sep-86						
Sep-86						
Sep-86						
Sep-86						
Sep-86	15	5				
Sep-86						
Sep-86	14					
Sep-86						
Sep-86	15					
Oct-86						
Oct-86	12					
Oct-86						
Oct-86						
Oct-86	8	3				
Oct-86	10					
Oct-86						
Oct-86						
Oct-86	12					
Nov-86						
Nov-86	14					
Nov-86	15					
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Nov-86	15					
Nov-86						
Nov-86	16	2				
Dec-86						
Dec-86						
Dec-86	9					
Dec-86	10					
Dec-86						
Dec-86						
Dec-86						
Dec-86	12					

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Dec-86						
Jan-87						
Jan-87						
Jan-87	14					
Jan-87						
Jan-87	15					
Jan-87						
Jan-87	14					
Jan-87						
Jan-87	14	3.2				
Feb-87			0.6	1	1.3	2
Feb-87			0.5	0.9	1.2	2
Feb-87			0.4	1.1	1.1	2.3
Feb-87			0.5	0.9	1.2	2
Feb-87						
Feb-87	14					
Feb-87						
Feb-87	14					
Feb-87						
Feb-87						
Feb-87		3.7	0.6	0.9	1.1	1.3
Feb-87		3.4	0.2			
Mar-87						
Mar-87						
Mar-87						
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Mar-87						
Mar-87						
Mar-87						
Mar-87						
Apr-87						
Apr-87						
Apr-87						
Apr-87	13					
Apr-87						
Apr-87	11					
Apr-87						
Apr-87	12					
Apr-87						

DATE	Well Number					
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Apr-87						
Apr-87	13	5.2				
May-87						
May-87						
May-87						
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May-87	14					
May-87						
May-87						
May-87	18					
May-87	16					
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May-87	16					
Jun-87	14					
Jun-87						
Jun-87	14					
Jun-87						
Jun-87						
Jun-87						
Jun-87	12					
Jun-87	14					
Jun-87						
Jun-87		6.4				
Jun-87	14					
Jun-87						
Jun-87	16					
Jul-87						
Jul-87						
Jul-87	8.8					
Jul-87						
Jul-87						
Jul-87						
Jul-87	9.5	5.5				
Jul-87	9.6					
Jul-87						
Jul-87						
Jul-87						
Jul-87						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Jul-87						
Jul-87						
Jul-87	11					
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Jul-87						
Aug-87	12	7.7	0.2	0.9	0.8	
Aug-87						
Aug-87	13					
Aug-87	13					
Aug-87						
Aug-87						
Aug-87						
Aug-87						
Aug-87	14					
Aug-87	14					
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Aug-87						
Aug-87	15					
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Sep-87						
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Sep-87	16					
Sep-87						
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Sep-87						
Sep-87	12					
Sep-87						
Sep-87						
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Sep-87						
Sep-87						
Sep-87		4.1				
Sep-87		4				
Oct-87						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Oct-87						
Oct-87	14					
Oct-87						
Oct-87						
Oct-87						
Oct-87	12					
Oct-87	12					
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87	12	13				
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Oct-87						
Nov-87	12					
Nov-87						
Nov-87	12					
Nov-87	12					
Nov-87						
Nov-87						
Nov-87	11					
Nov-87						
Nov-87	9.7	1.8				
Nov-87	9.5					
Nov-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87						
Dec-87	9.4	1.6				
Dec-87						
Dec-87	11					
Dec-87						
Dec-87						
Dec-87						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Dec-87						
Dec-87						
Dec-87		1.9				
Dec-87						
Dec-87		2.2				
Dec-87		3.2				
Dec-87		2.6				
Dec-87		4.4				
Dec-87						
Dec-87						
Dec-87	9.9					
Dec-87	9.6					
Dec-87						
Dec-87						
Jan-88						
Jan-88						
Jan-88						
Jan-88						
Jan-88	12					
Jan-88						
Jan-88	11					
Jan-88	10					
Jan-88						
Jan-88						
Jan-88	9.9					
Jan-88						
Feb-88						
Feb-88						
Feb-88	7.2	0.88				
Feb-88		0.95				
Feb-88						
Feb-88						
Feb-88						
Feb-88						
Feb-88	9.6					
Feb-88						
Feb-88						
Feb-88	7.3					
Feb-88						
Mar-88						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Mar-88						
Mar-88	8.9	1.4				
Mar-88						
Mar-88						
Mar-88						
Mar-88	8.7					
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88	9.7					
Mar-88	8.8					
Mar-88						
Mar-88						
Mar-88						
Mar-88						
Mar-88	9.2					
Mar-88						
Apr-88	10					
Apr-88						
Apr-88						
Apr-88						
Apr-88	11					
Apr-88	10					
Apr-88	9.9					
Apr-88	9.6					
Apr-88						
Apr-88						
Apr-88	9.8	3.7				
Apr-88		3.7				
Apr-88						
Apr-88						
Apr-88						
Apr-88						
May-88						
May-88						
May-88						
May-88						
May-88						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
May-88						
May-88		4				
May-88						
May-88						
May-88						
May-88						
May-88						
Jun-88						
Jun-88						
Jun-88	13.1					
Jun-88	12.9					
Jun-88						
Jun-88						
Jun-88	13.4					
Jun-88	13.5					
Jun-88	12.9					
Jun-88	12.9					
Jun-88						
Jun-88						
Jun-88	14.5					
Jun-88						
Jun-88	11.6	3.2				
Jun-88		3.3				
Jun-88						
Jun-88						
Jul-88						
Jul-88						
Jul-88	12.3					
Jul-88	12.1					
Jul-88						
Jul-88						
Jul-88						
Jul-88						
Jul-88	10.1					
Jul-88	10.3					
Jul-88						
Jul-88						
Jul-88	9.8					
Jul-88	9.97					
Aug-88	9.42	2.84				

DATE	Well Number					
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Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
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Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88						
Aug-88	8.1					
Aug-88	8.72					
Aug-88	8.34					
Sep-88		2.26				
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88						
Sep-88	7.42	1.42				
Sep-88						
Sep-88						
Sep-88	8.29					
Sep-88						
Oct-88						
Oct-88						
Oct-88						
Oct-88	7.48					
Oct-88						
Oct-88						
Oct-88	8.36					
Oct-88	8.73					
Oct-88						
Oct-88						
Oct-88	7.99					

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Oct-88	7.58					
Oct-88						
Oct-88						
Oct-88	8.32	1.82				
Oct-88						
Nov-88						
Nov-88						
Nov-88	8.78					
Nov-88	8.33					
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88	8.58	1.82				
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Nov-88						
Dec-88	8.47					
Dec-88	8.39					
Dec-88						
Dec-88						
Dec-88	9.02					
Dec-88	9.3					
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88						
Dec-88	9.3	1.67				
Dec-88		1.8				
Dec-88						
Dec-88						
Jan-89	9.39					
Jan-89	9.37					

DATE	Well Number					
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Jan-89						
Jan-89						
Jan-89						
Jan-89						
Jan-89	8.27					
Jan-89	8.07					
Jan-89						
Jan-89						
Jan-89						
Jan-89						
Jan-89						
Jan-89						
Jan-89	10.2	3.19				
Jan-89	9.71					
Jan-89						
Jan-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Feb-89	13.04					
Feb-89	12.93					
Feb-89						
Feb-89						
Feb-89						
Feb-89						
Mar-89	15.79	6.25				
Mar-89						
Mar-89						
Mar-89						
Mar-89	14.2					
Mar-89	14.16					
Mar-89						
Mar-89						
Mar-89						
Mar-89						
Mar-89						
Mar-89						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Mar-89	16.51					
Mar-89	16.17					
Mar-89	12.14	8.51				
Mar-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89						
Apr-89	17.49					
Apr-89	17.32					
Apr-89						
Apr-89						
Apr-89	18.65	9.77				
Apr-89						
Apr-89						
Apr-89						
May-89						
May-89						
May-89	18.22					
May-89	18.33					
May-89						
May-89						
May-89	17.66					
May-89	17.09					
May-89						
May-89						
May-89						
May-89						
May-89	26.2	8.59				
May-89						
Jun-89						
Jun-89						
Jun-89	19.88					
Jun-89						
Jun-89						
Jun-89						
Jun-89						
Jun-89	17.92					
Jun-89	17.92					
Jun-89						

DATE	Well Number					
	0912	0913	0918	0919	0920	0921
Jun-89						
Jun-89	18.06					
Jun-89	18.05					
Jun-89	21.57	12.58				
Jun-89						
Jul-89						
Jul-89						
Jul-89	23.97					
Jul-89						
Jul-89						
Jul-89	28.65					
Jul-89	27.87					
Jul-89	27.17					
Jul-89	27.55					
Jul-89						
Jul-89						
Jul-89	32.34					
Jul-89	32.45					
Jul-89	37.46					
Jul-89	38.42					
Jul-89	38.71					
Jul-89	38.42					
Jul-89						
Jul-89						
Jul-89	41.03					
Jul-89	40.62					
Jul-89	46.63					
Jul-89	46.75					
Jul-89	44.74					
Jul-89	32.99					
Jul-89	31.26					
Jul-89	29.53					
Jul-89	27.98					
Jul-89	26.79					
Jul-89	25.39					
Jul-89	20.72					
Jul-89	19.04					
Jul-89	16.45					
Jul-89						
Jul-89	14.64	11.44				

DATE	Well Number					
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Jul-89						
Jul-89	10.51					
Aug-89	9.61					
Aug-89	9.73					
Aug-89	8.76					
Aug-89	8.75					
Aug-89	8.64					
Aug-89	4.78					
Aug-89	4.77					
Aug-89	6.06					
Aug-89	5.54					
Aug-89						
Aug-89						
Aug-89	5.65					
Aug-89	6.19					
Aug-89	6.5					
Aug-89	6.52					
Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89	7.43					
Aug-89	7.39					
Aug-89						
Aug-89						
Aug-89						
Aug-89						
Aug-89	6.93	8.58				
Aug-89						
Sep-89						
Sep-89						
Sep-89	6.57					
Sep-89	6.41					
Sep-89						
Sep-89						
Sep-89	6.17					
Sep-89	6.27					
Sep-89						
Sep-89						
Sep-89	6.02	6.25				

DATE	Well Number					
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Sep-89						
Sep-89						
Sep-89						
Oct-89	5.31					
Oct-89	5.23					
Oct-89						
Oct-89						
Oct-89	7.22					
Oct-89	7.69					
Oct-89	7.69					
Oct-89	7.49					
Oct-89	7.54	5.85				
Oct-89						
Oct-89	8.2					
Oct-89	8.16					
Nov-89						
Nov-89						
Nov-89	8.02					
Nov-89	8.06					
Nov-89	7.41	4.56				
Nov-89						
Nov-89	6.56					
Nov-89						
Dec-89	7.06					
Dec-89	7.27					
Dec-89	9.11	2.87				
Dec-89						
Jan-90	7.86	3.07				
Jan-90						
Jan-90	6.77					
Jan-90	6.9					
Jan-90	6.01					
Jan-90	6.12					
Jan-90	6.55					
Jan-90	6.66					
Feb-90						
Feb-90						
Feb-90	4.34					
Feb-90	4.4					
Feb-90	5.57					

DATE	Well Number					
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Feb-90	5.38					
Feb-90	9.3	1.94				
Feb-90						
Mar-90	8.82					
Mar-90						
Mar-90	7.83					
Mar-90	7.95					
Mar-90	10.29	2.96				
Mar-90						
Apr-90	11.02					
Apr-90	11.2					
Apr-90	13.87					
Apr-90	13.32					
Apr-90	16.96	3.98				
Apr-90						
Apr-90						
May-90	18.82					
May-90	19.03					
May-90	19.23					
May-90	19.23					
May-90	13.79					
May-90	13.88					
May-90	13.94	5.68				
May-90						
Jun-90	13.62					
Jun-90	13.08					
Jun-90	14.07					
Jun-90	14					
Jun-90	17.11	7.31				
Jun-90	16.64					
Jun-90	18.42					
Jun-90	17.62					
Jul-90	18.8					
Jul-90	18.86					
Jul-90						
Jul-90	20.44					
Jul-90	20.18					
Jul-90	25.04	6.32				
Jul-90						
Jul-90	24.89					

DATE	Well Number					
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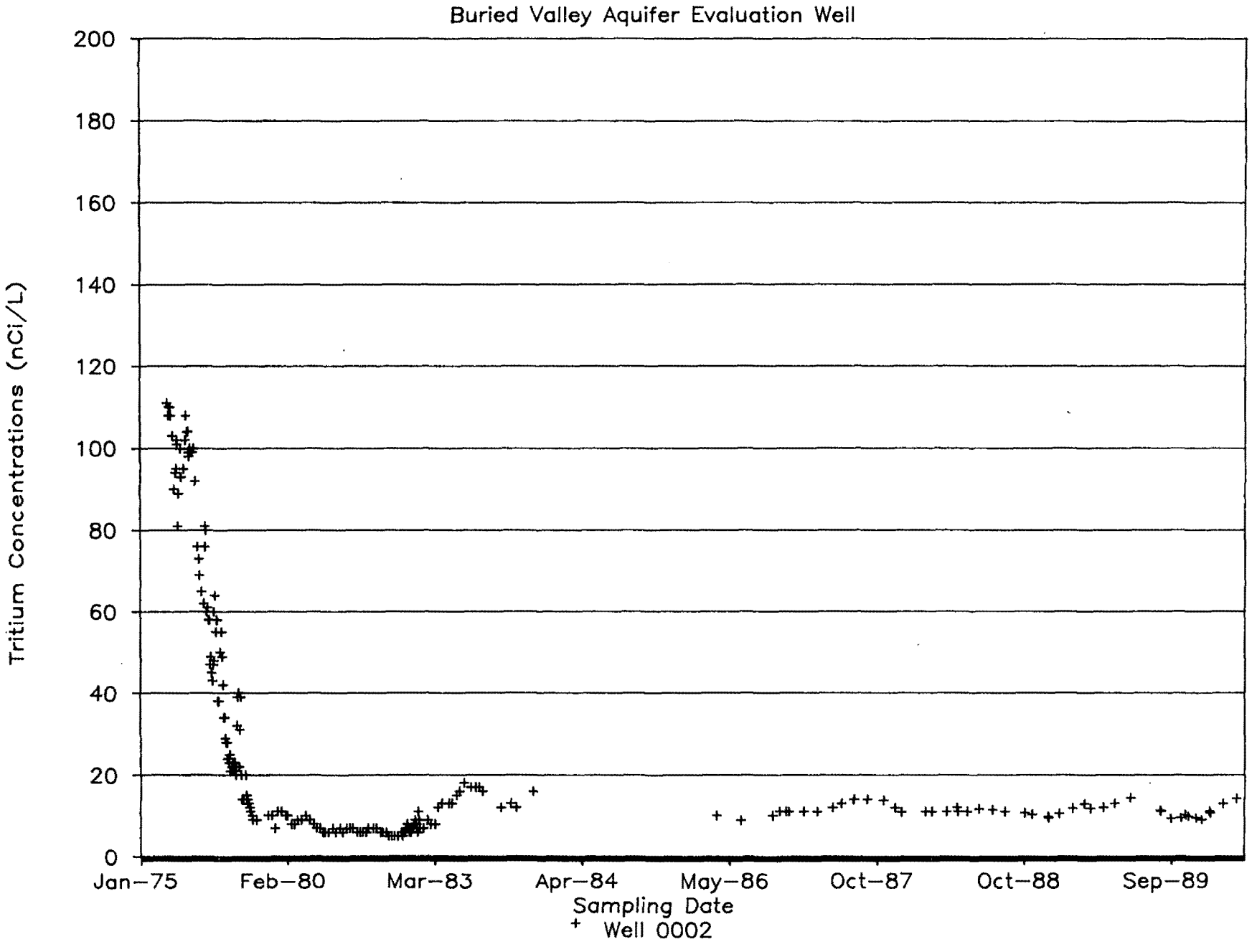
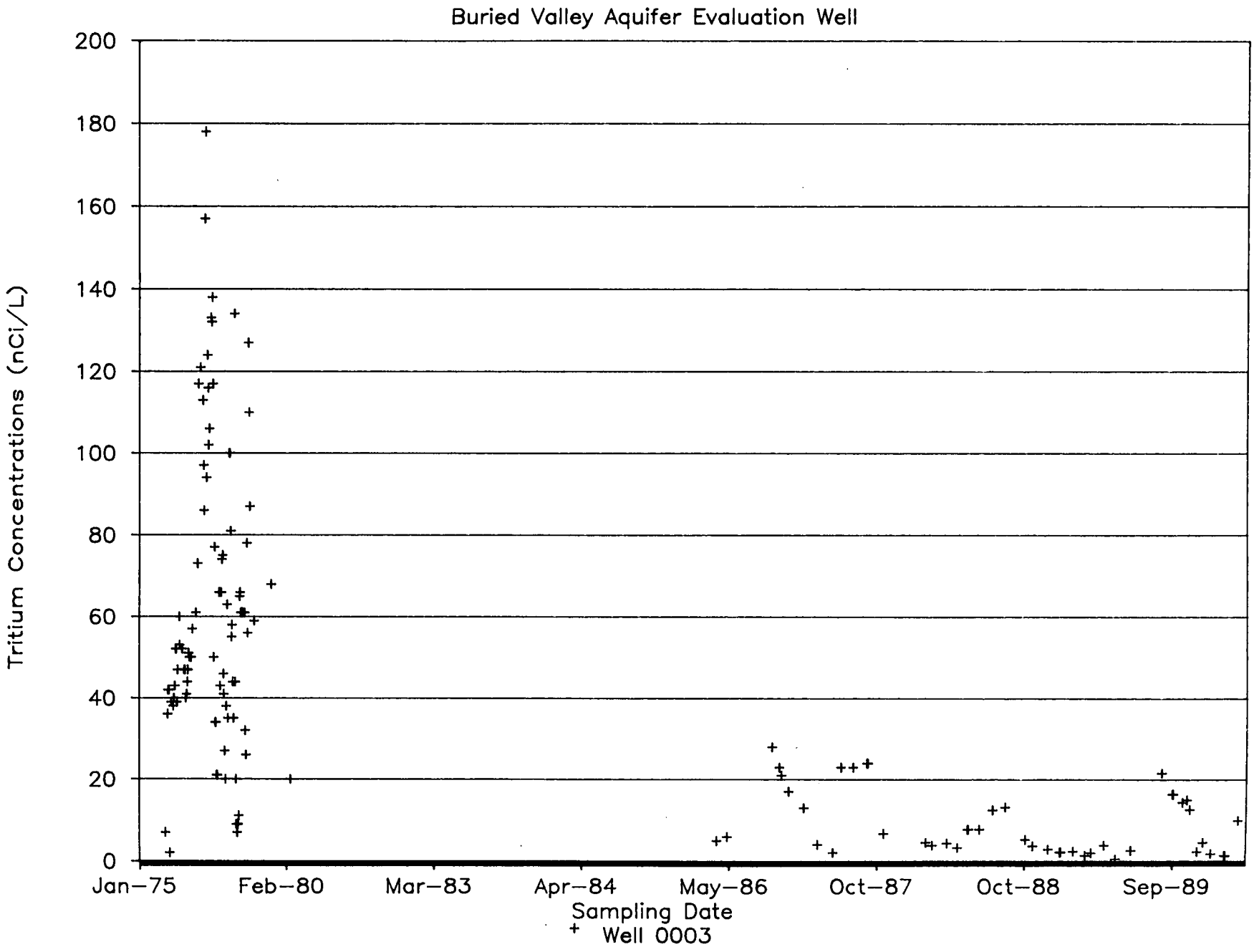
Jul-90	25.22					
Jul-90	24.66					
Jul-90	23.36					
Jul-90	22.2					
Jul-90	20.81					
Jul-90	19.22					
Jul-90	10.11					
Jul-90	9.96					
Jul-90	9.24					
Jul-90	9.03					
Jul-90	4.98					
Jul-90						
Jul-90	4.47					
Jul-90	4.37					
Jul-90	5.74					
Jul-90	5.69					
Aug-90	8.36					
Aug-90	8.69					
Aug-90	10.7					
Aug-90	10.24					
Aug-90	8.7					
Aug-90	8.86					

APPENDIX U

TRITIUM CONCENTRATIONS VERSUS

SAMPLING DATE FOR THE 63 SAMPLING LOCATIONS 1976 - 1990


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan–75
Feb–80
Mar–83
Apr–84
May–86
Oct–87
Oct–88
Sep–89
Sampling Date
+ Well 0002


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
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Jan-75
Feb-80
Mar-83
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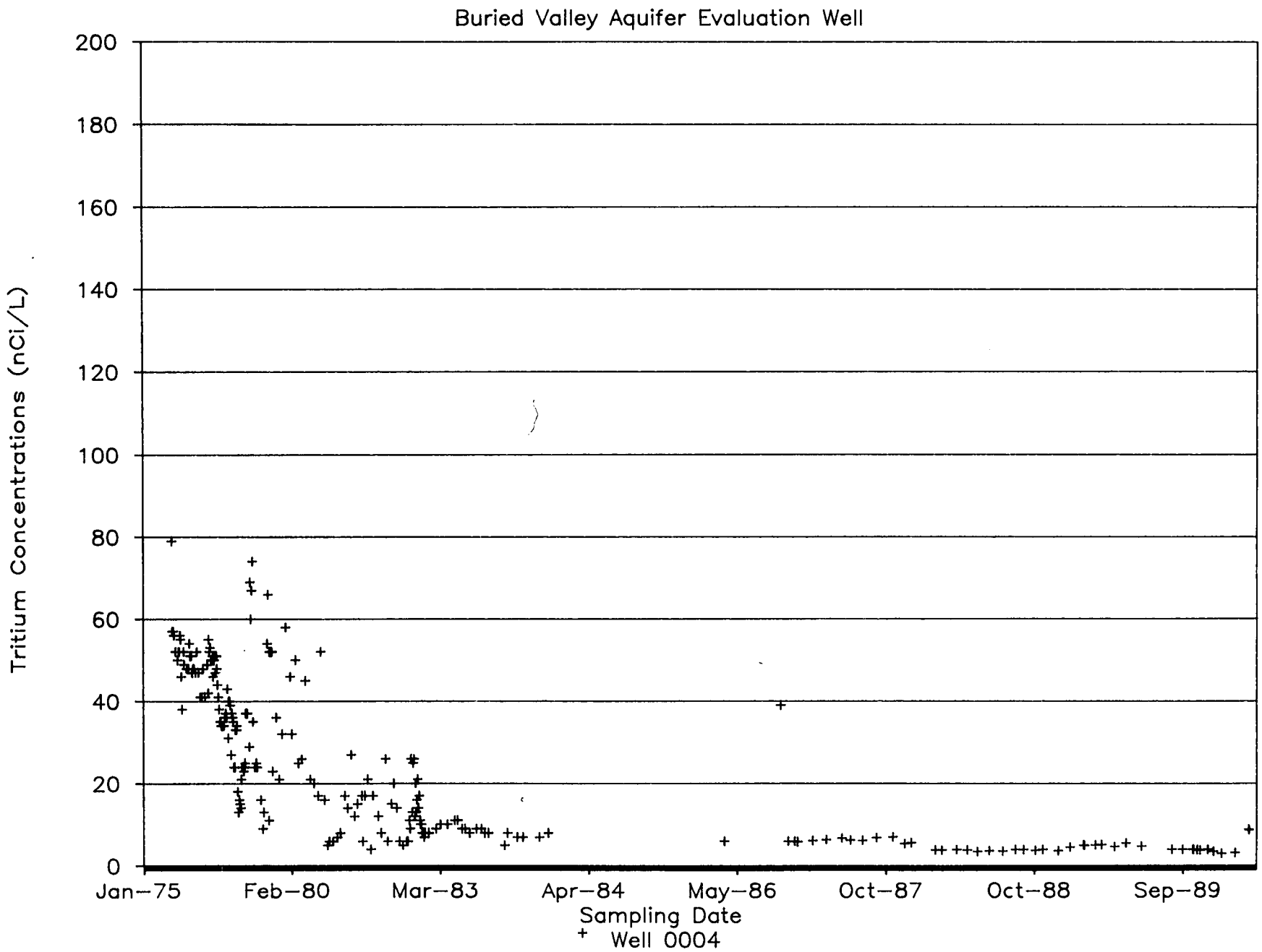
Oct-88
Sep-89
Sampling Date
+ Well 0003


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
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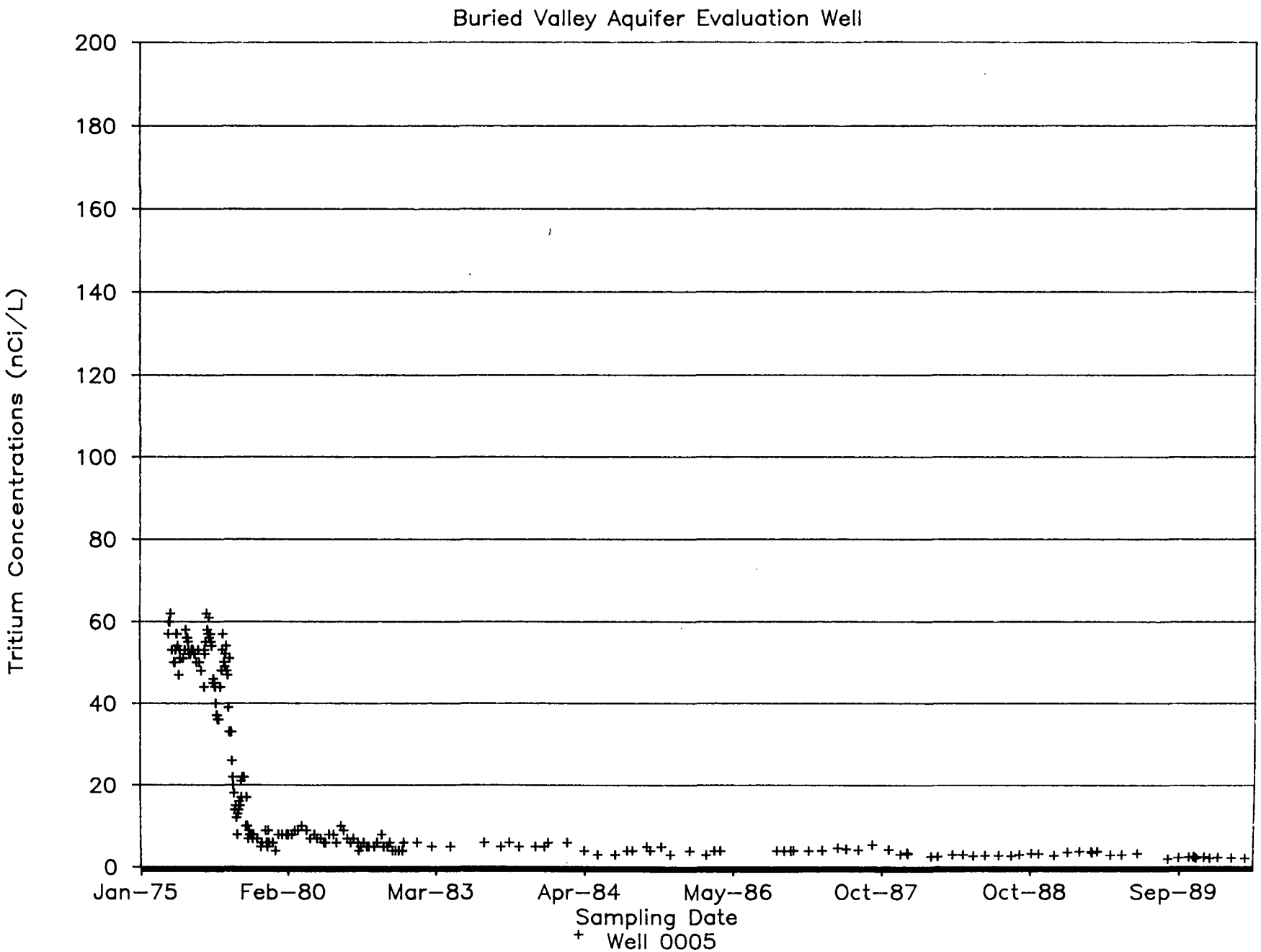
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0004


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
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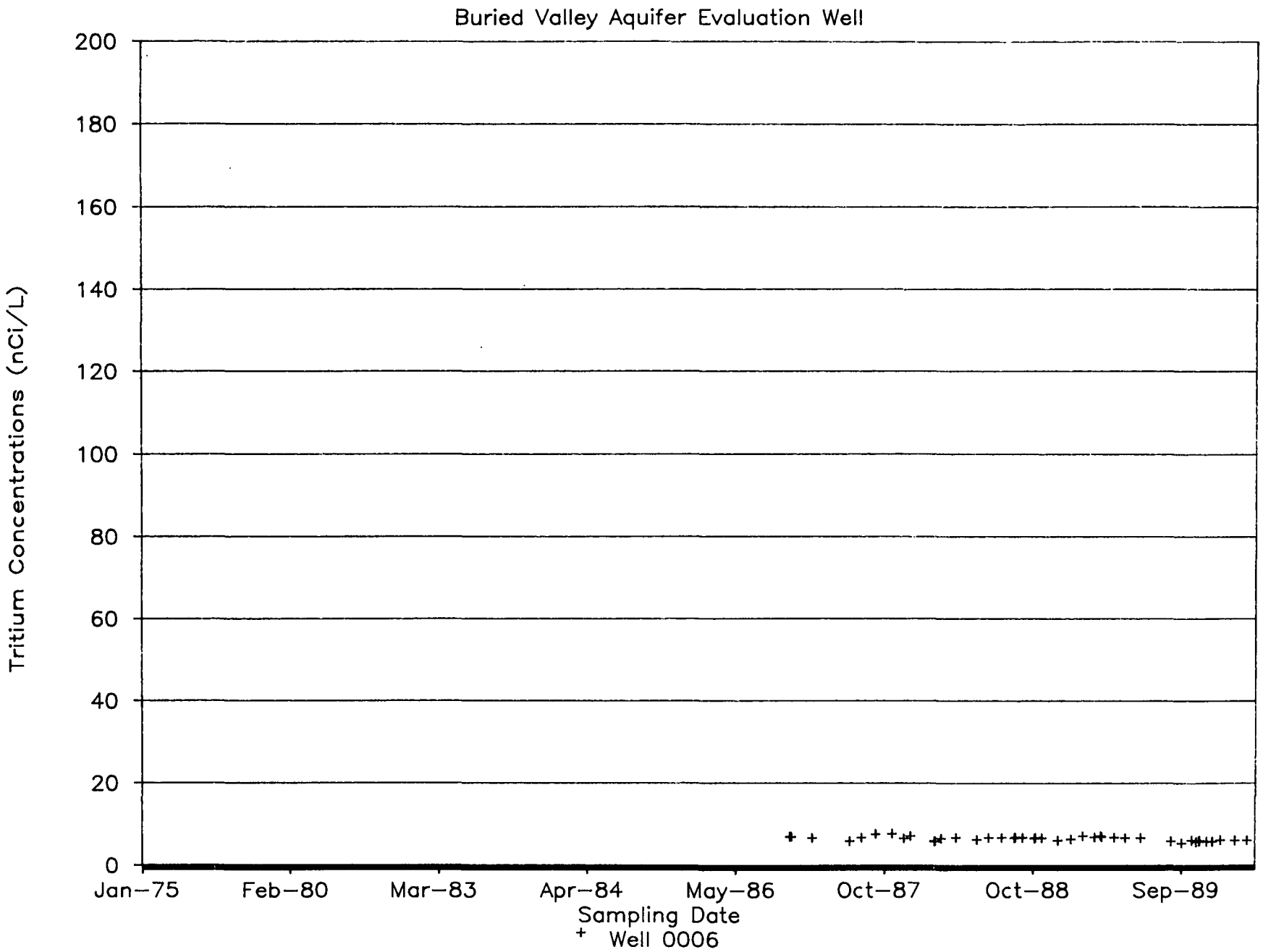
Feb–80
Mar–83
Apr–84
May–86
Oct–87
Oct–88
Sep–89
Sampling Date
+ Well 0005


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
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180
160
140
120
100
80
60
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Feb–80
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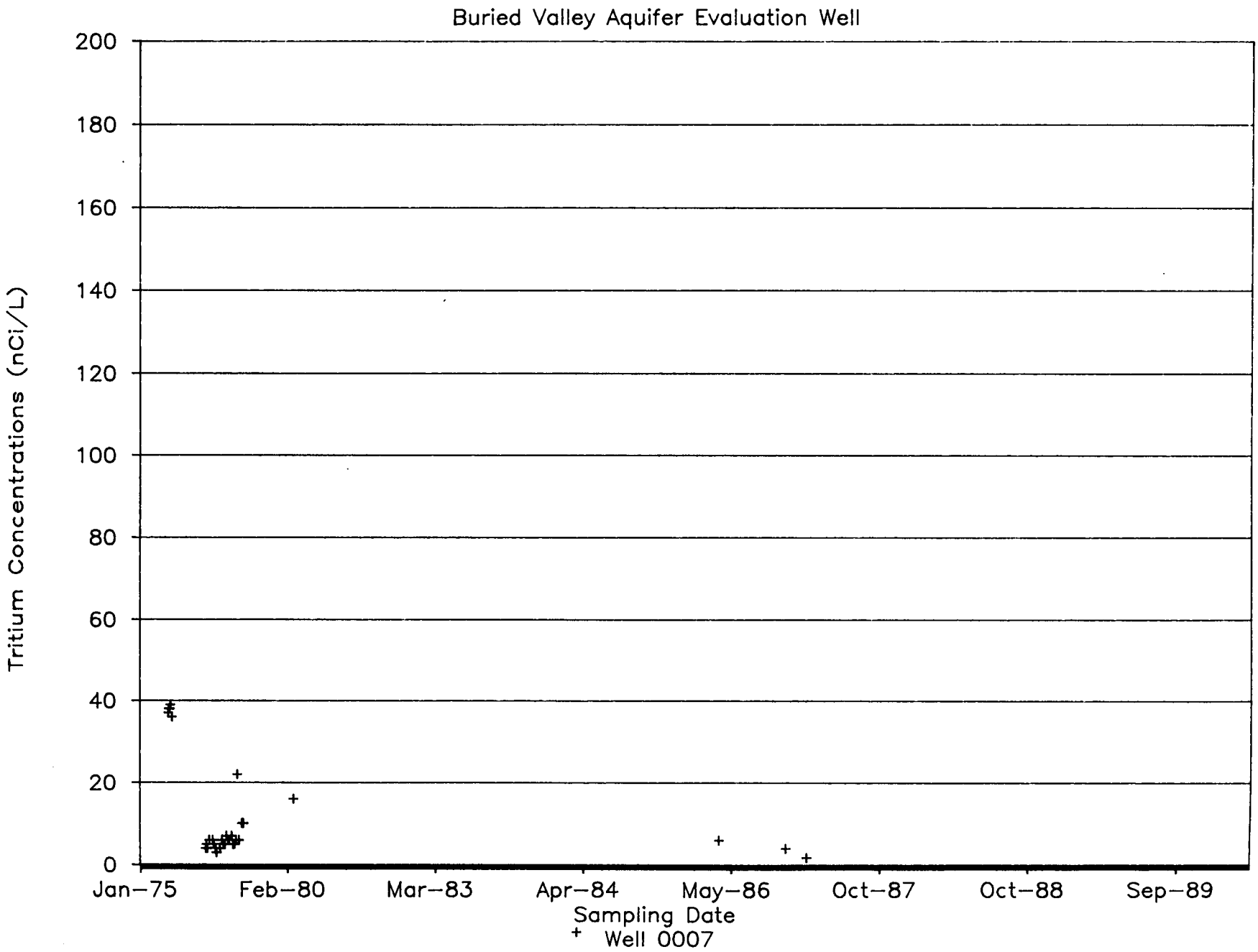
Apr–84
May–86
Oct–87
Oct–88
Sep–89
Sampling Date
+ Well 0006


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
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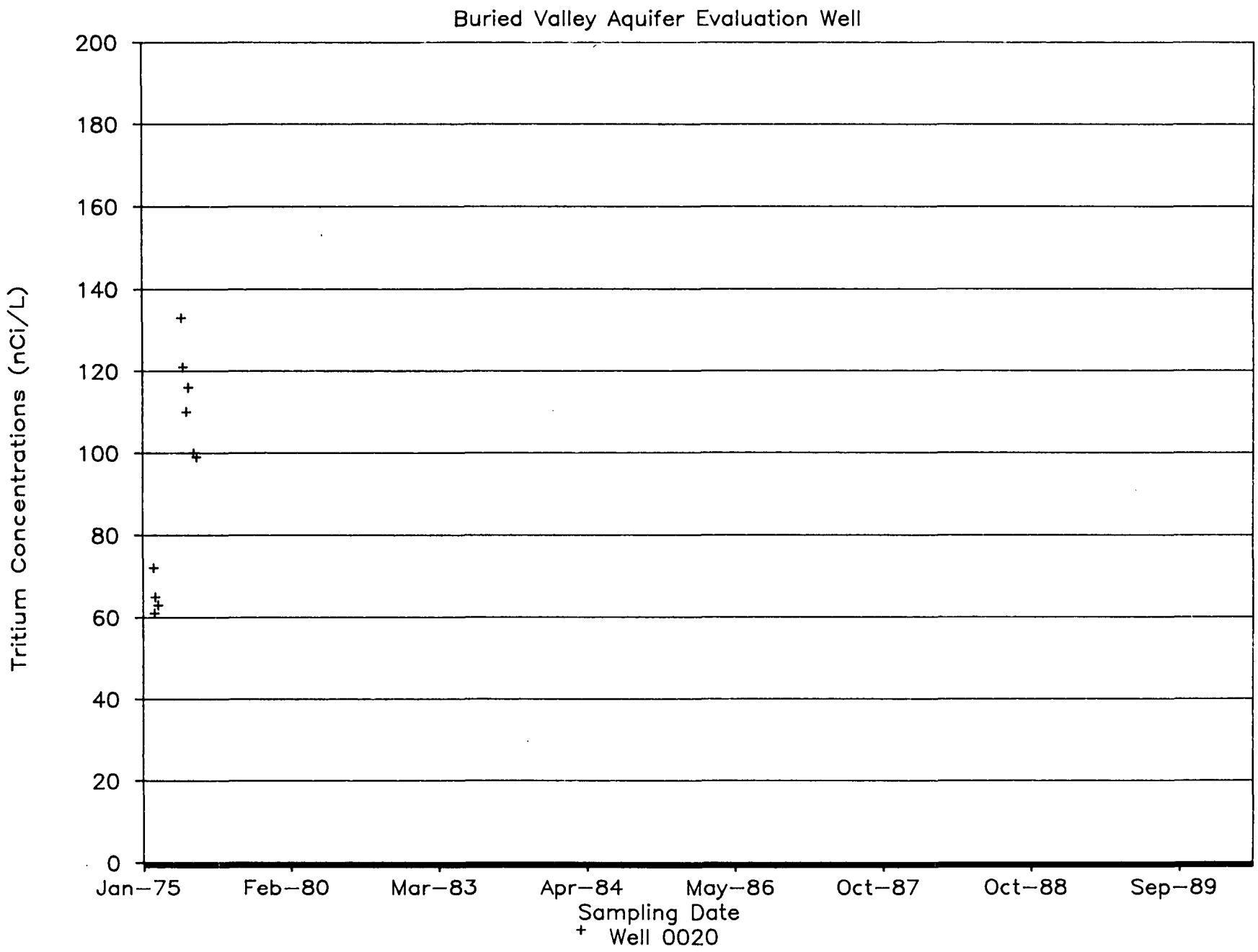
Oct-88
Sep-89
Sampling Date
+ Well 0007


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
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Feb-80
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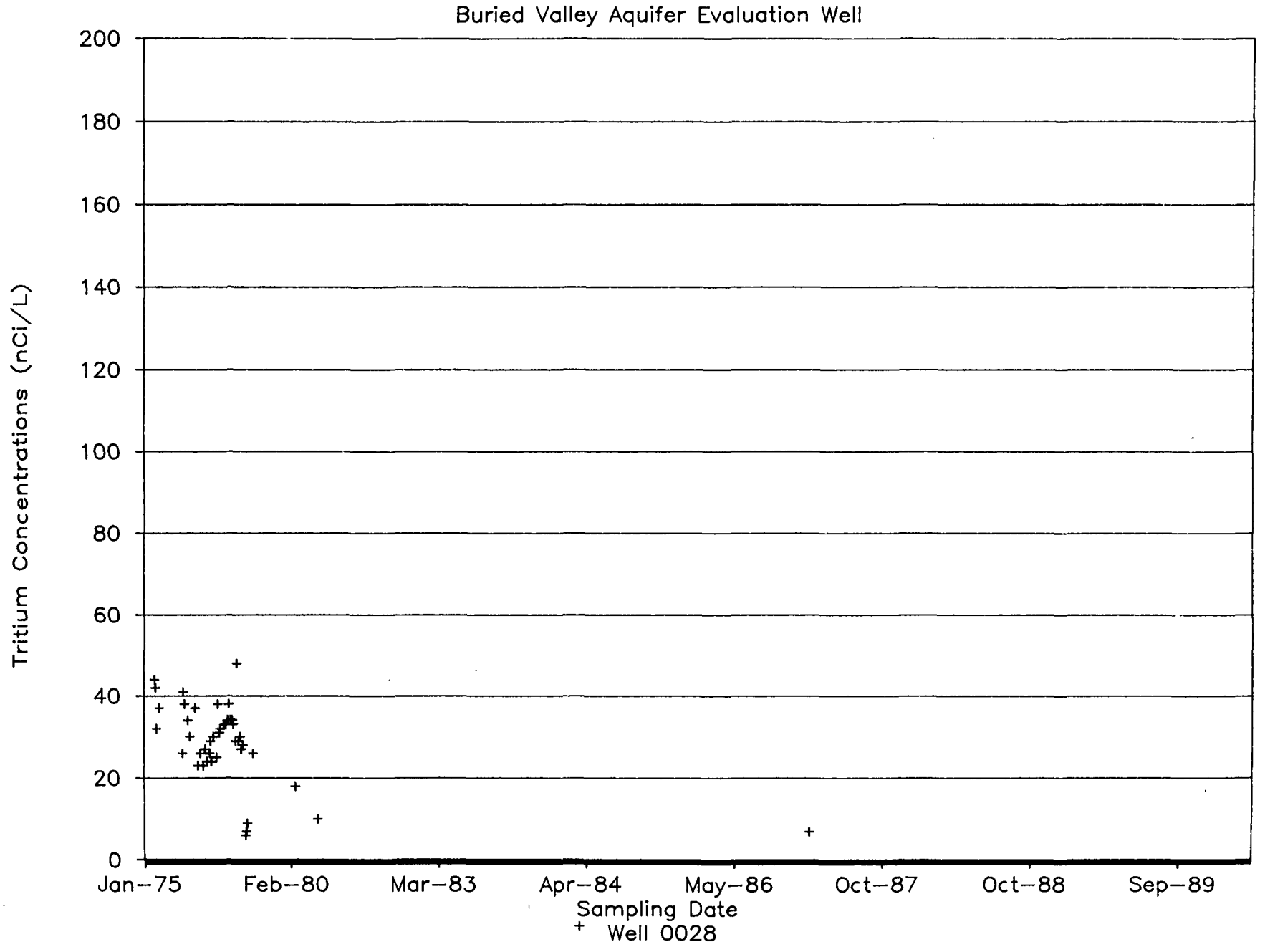
Oct-88
Sep-89
Sampling Date
+ Well 0020


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
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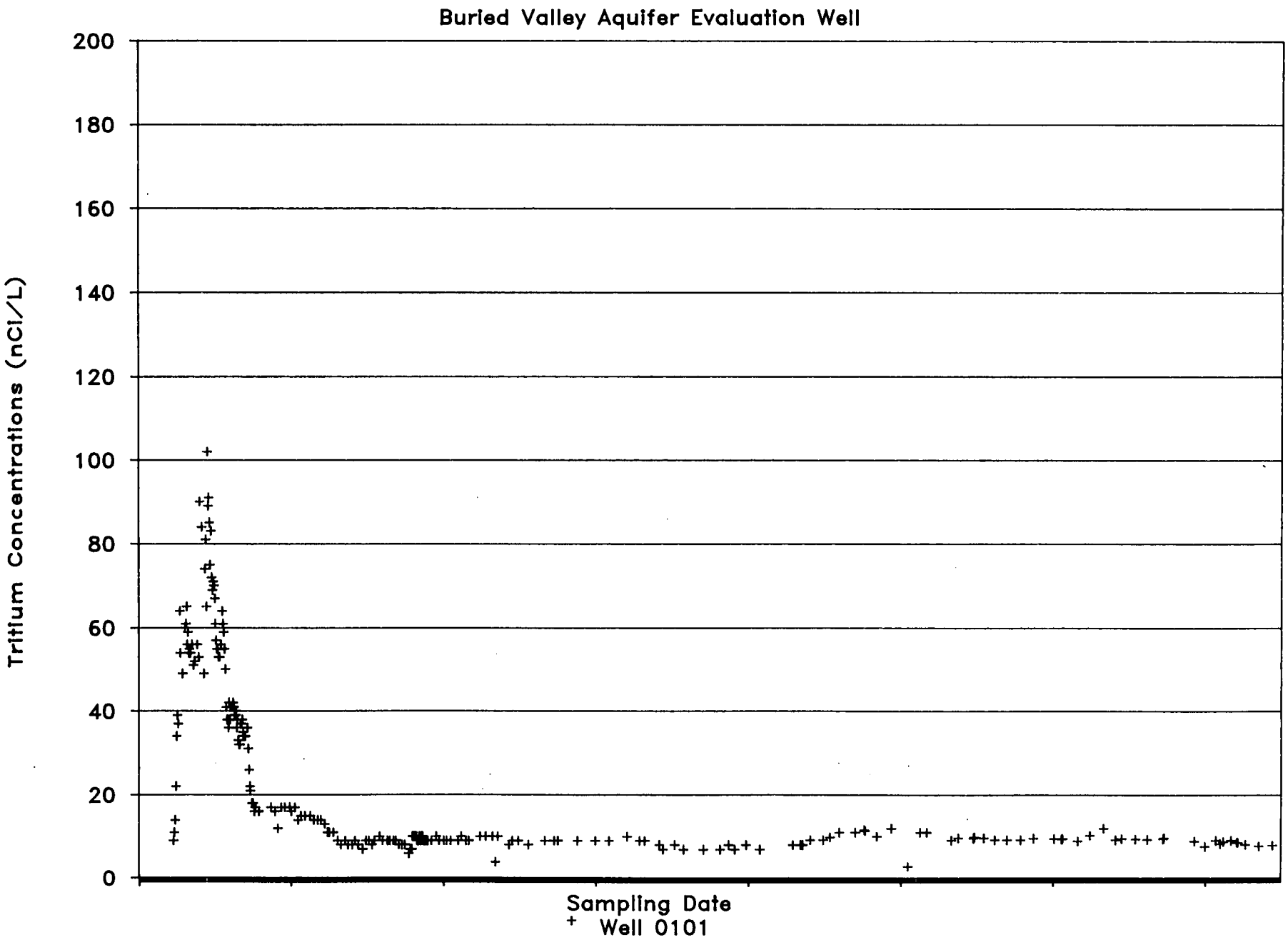
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0028


Buried Valley Aquifer Evaluation Well
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120
100
80
60
40
20
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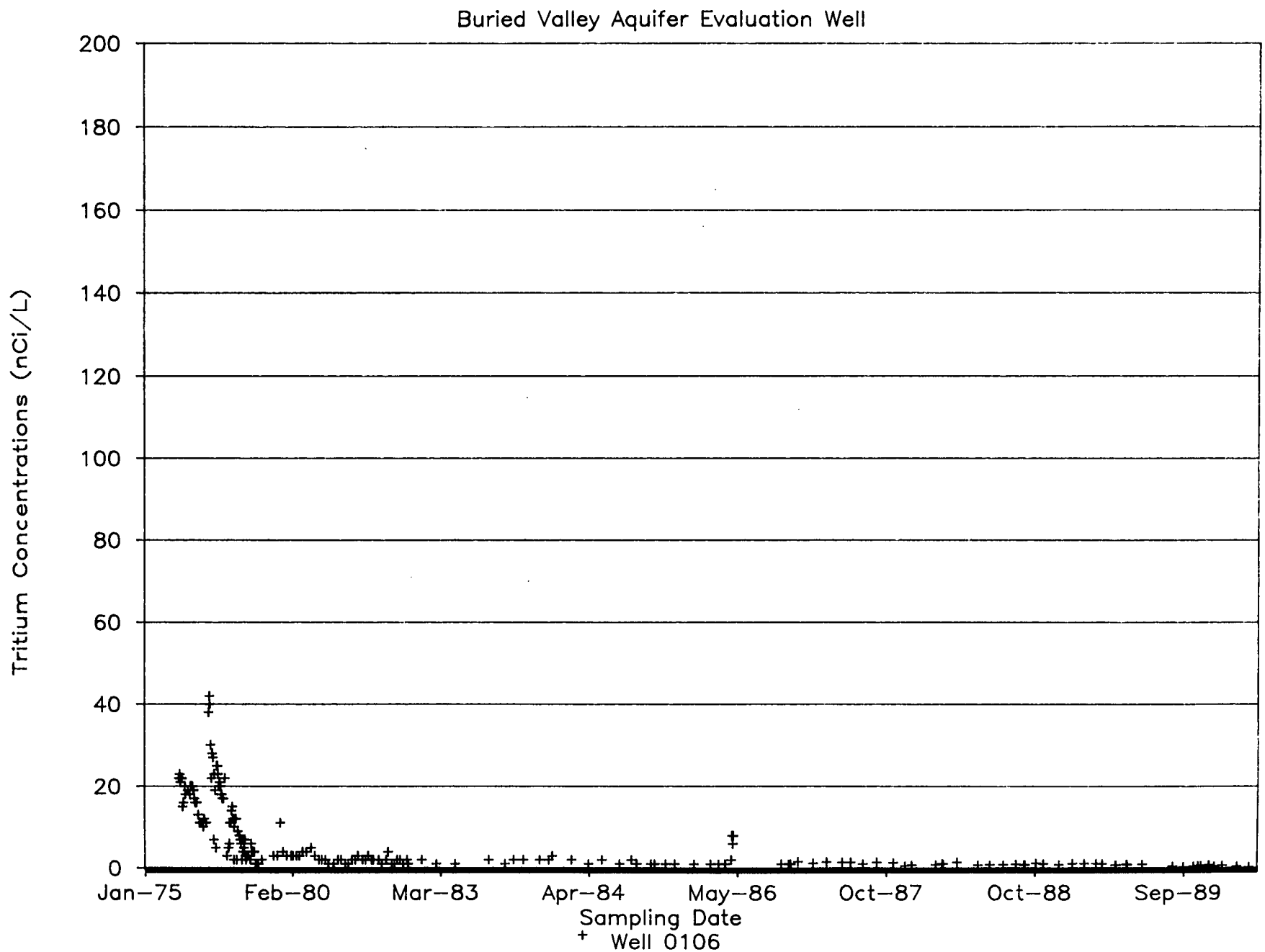
Sampling Date
+ Well 0101


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
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Feb-80
Mar-83
Apr-84
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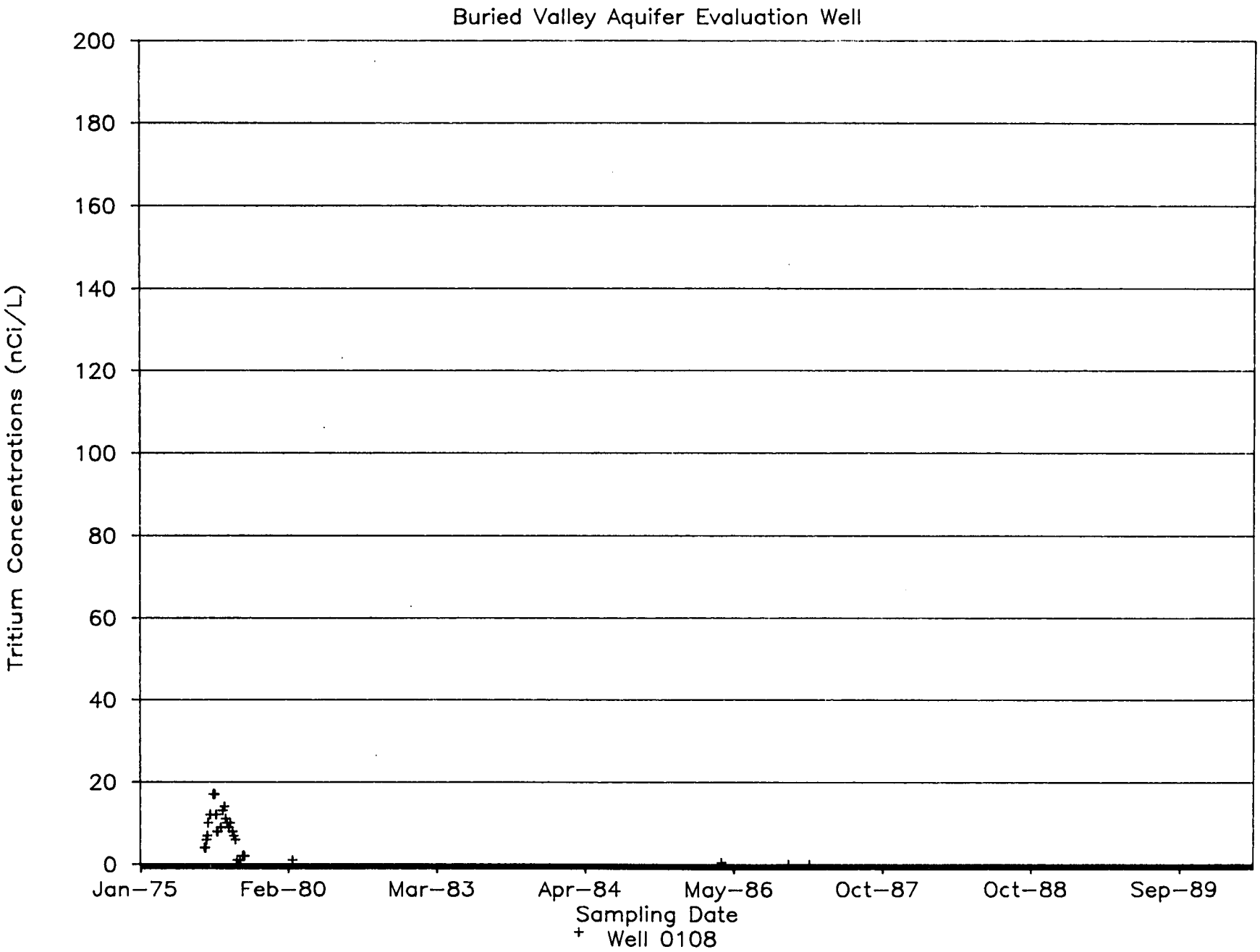
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0106


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
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20
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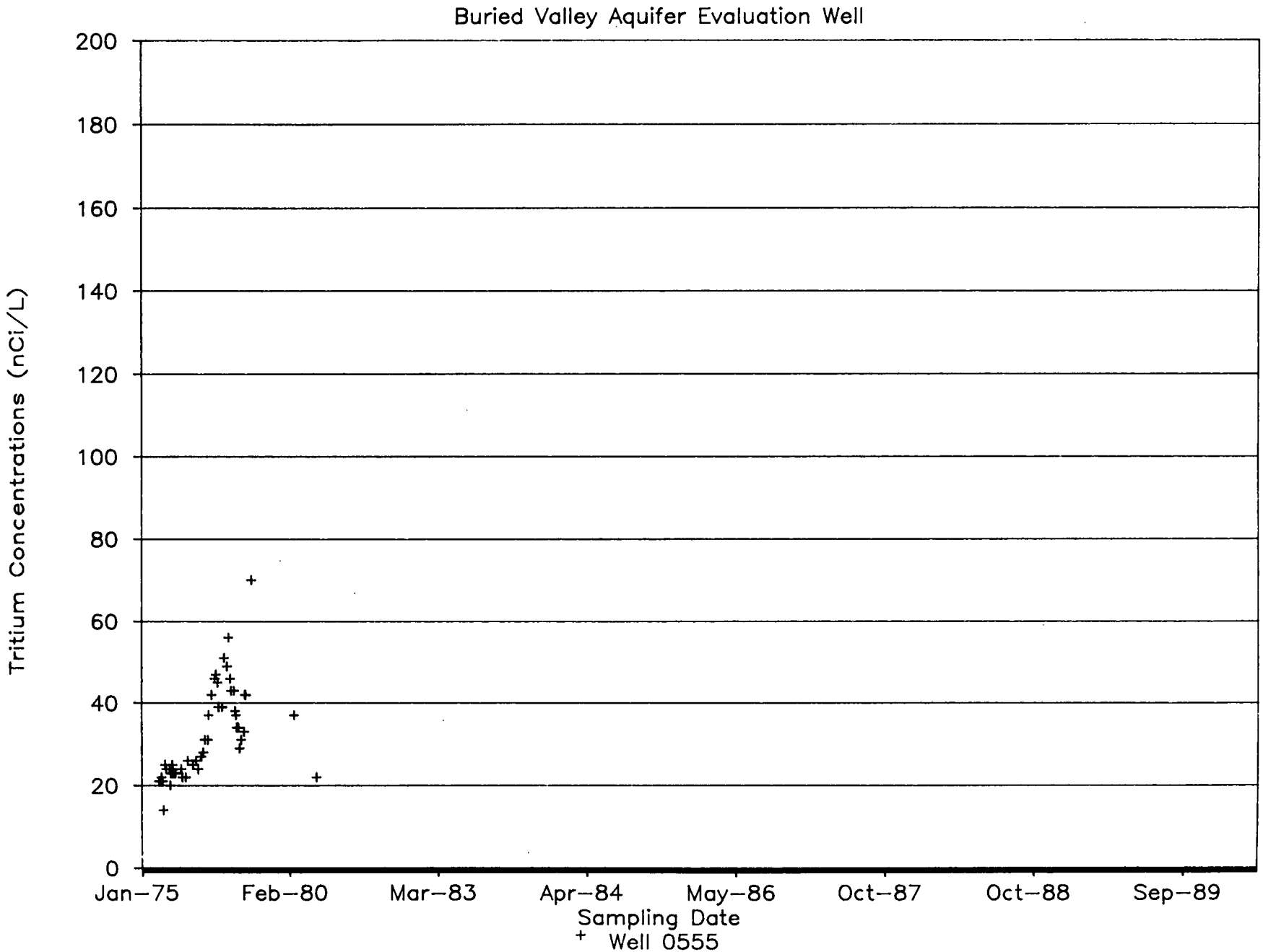
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0108


Buried Valley Aquifer Evaluation Well
Tritium Concentrations (nCi/L)
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180
160
140
120
100
80
60
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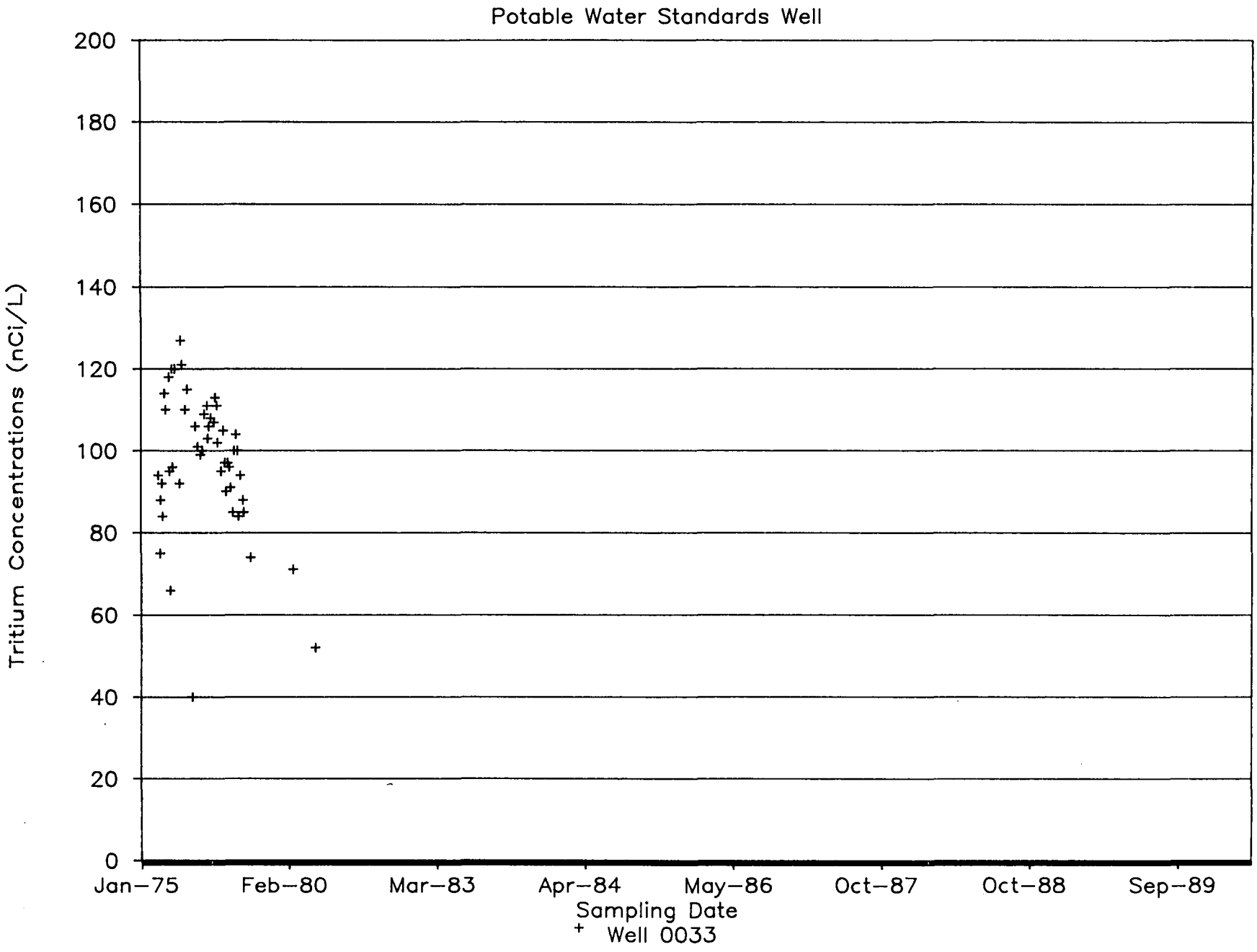
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0555


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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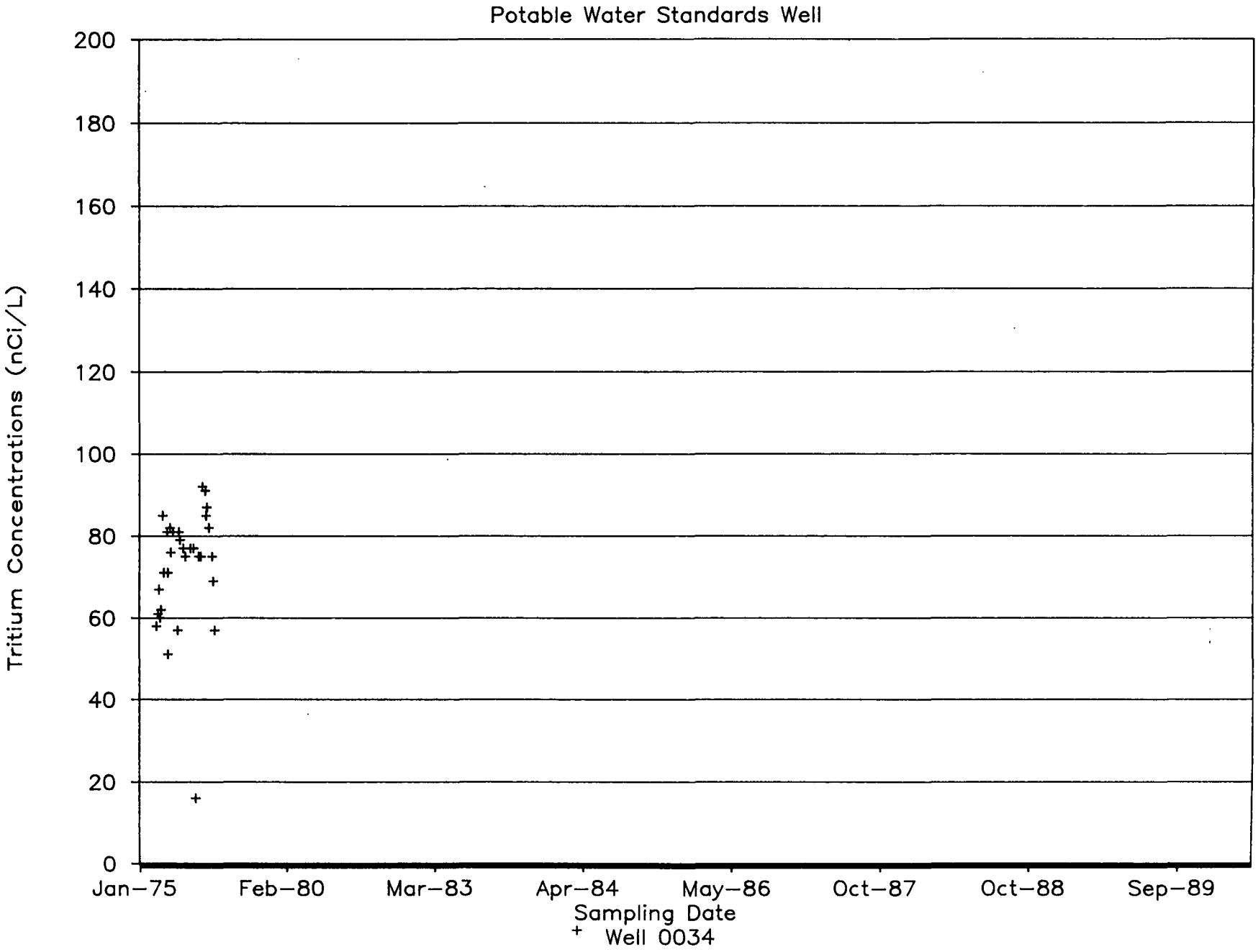
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0033


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
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20
0
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Feb-80
Mar-83
Apr-84
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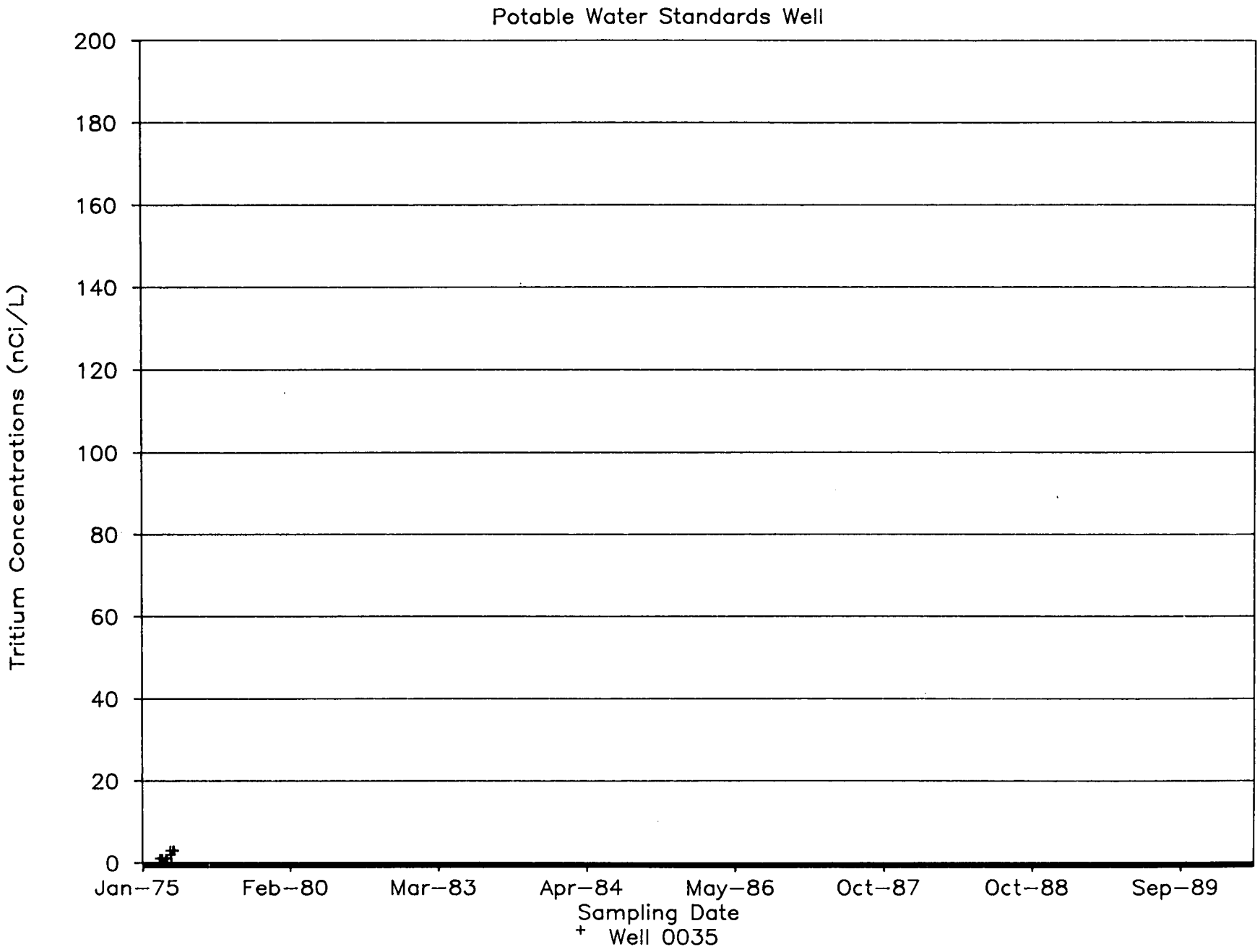
Sep-89
Sampling Date
+ Well 0034


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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180
160
140
120
100
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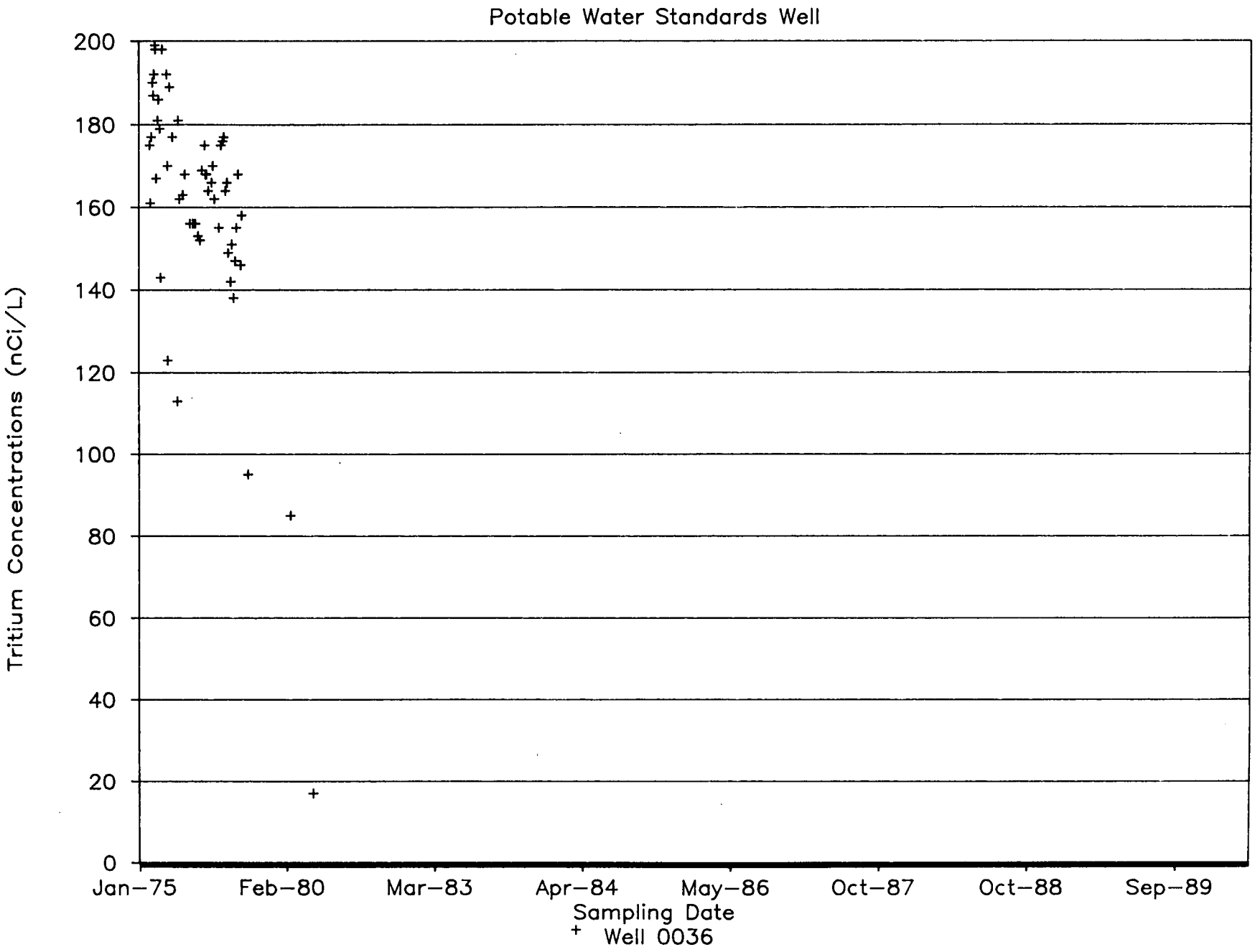
Sep-89
Sampling Date
+ Well 0035


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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140
120
100
80
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Apr-84
May-86
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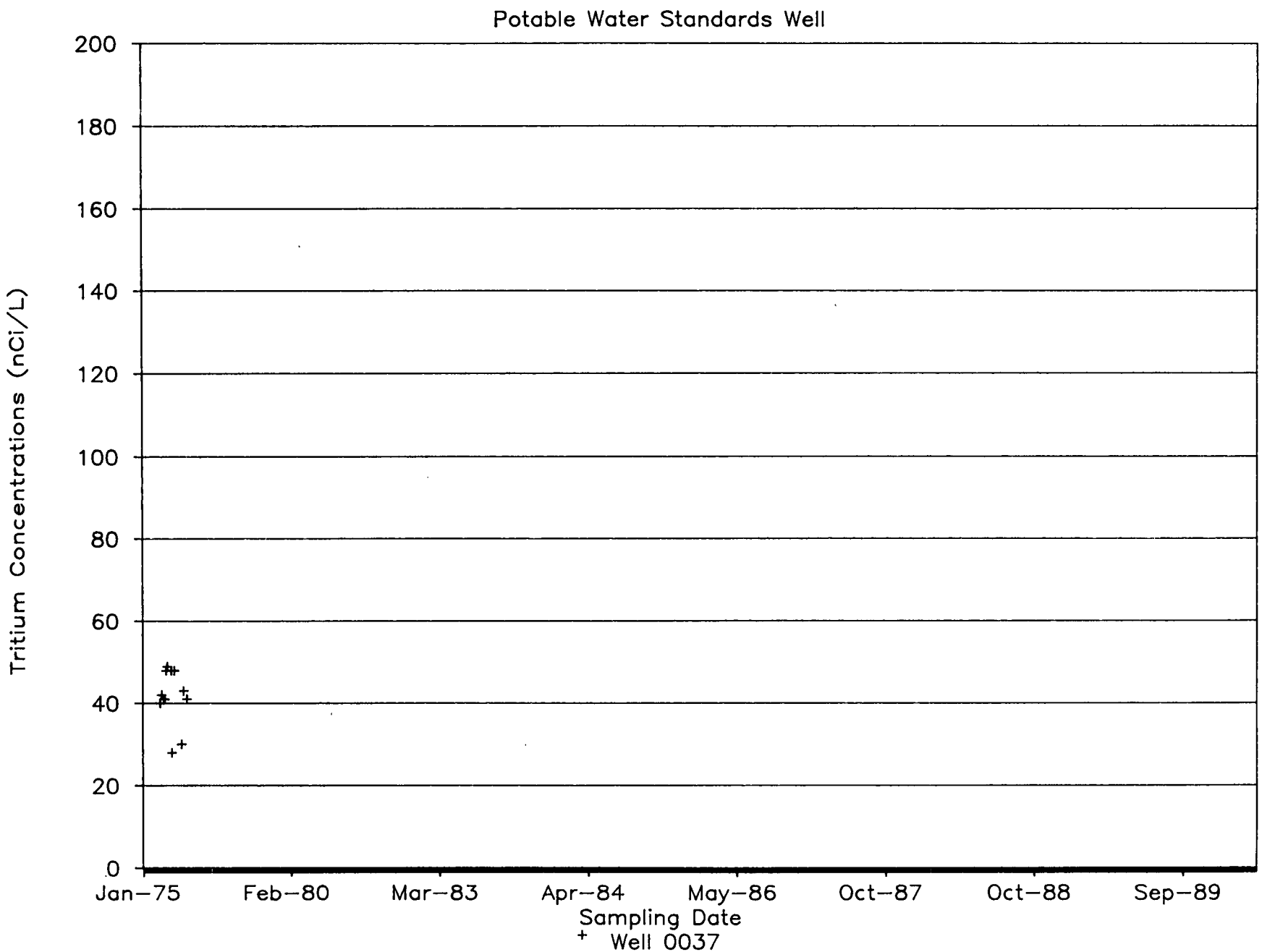
Oct-88
Sep-89
Sampling Date
+ Well 0036


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
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20
0
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Feb-80
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Apr-84
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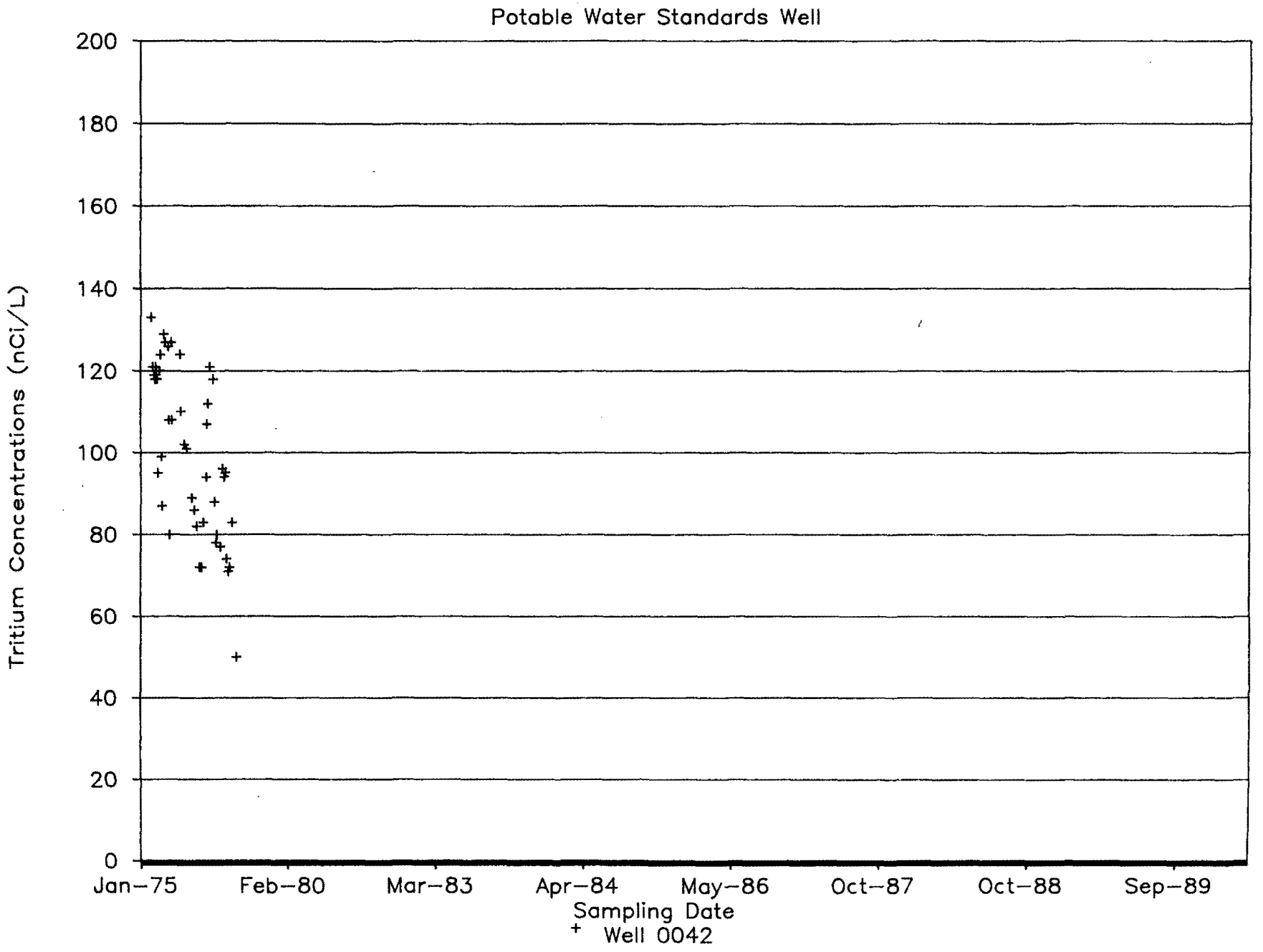
Sep-89
Sampling Date
+ Well 0037


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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180
160
140
120
100
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Feb-80
Mar-83
Apr-84
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Sep-89
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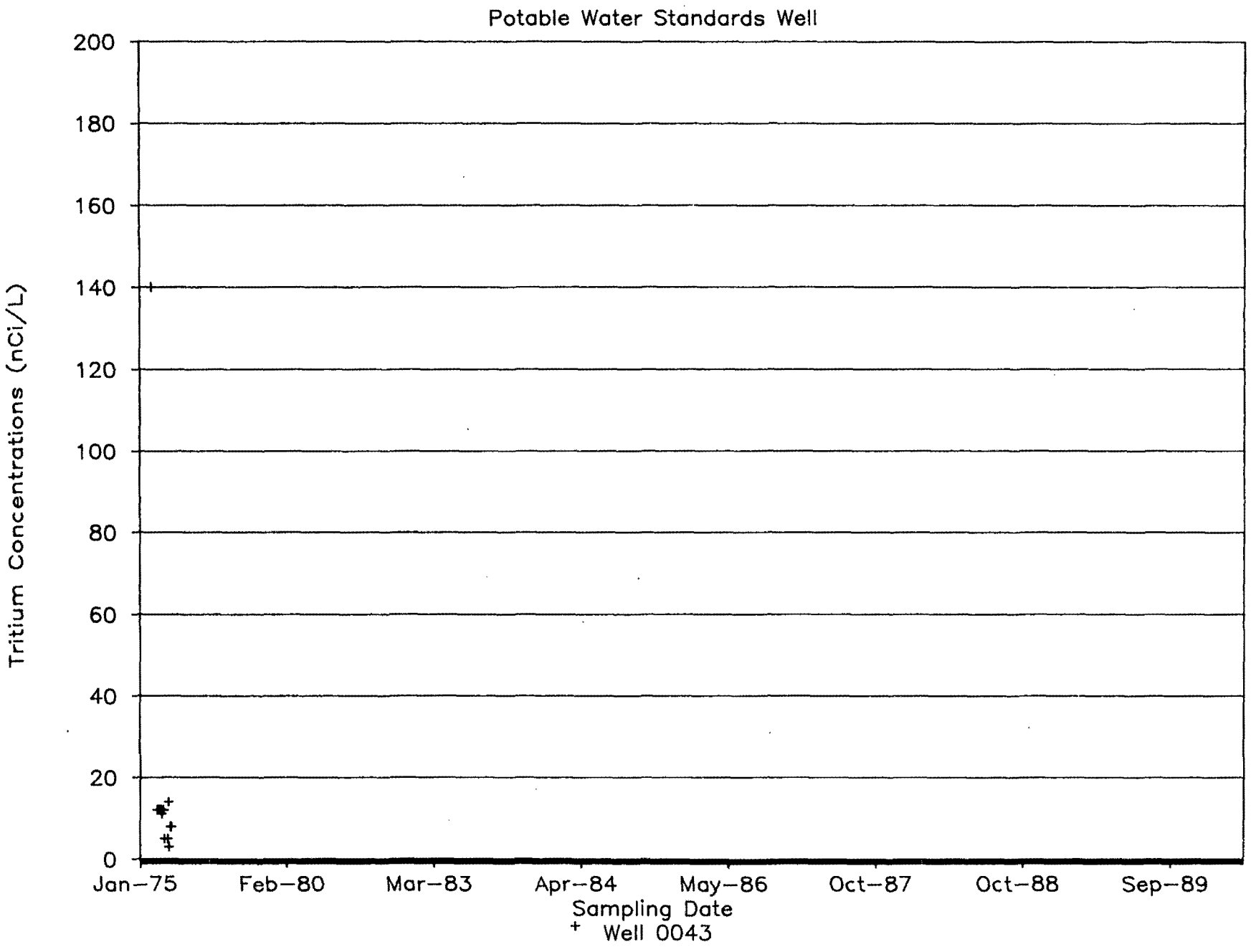
Potable Water Standards Well
Tritium Concentrations (nCi/L)
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180
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140
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Feb-80
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Apr-84
May-86
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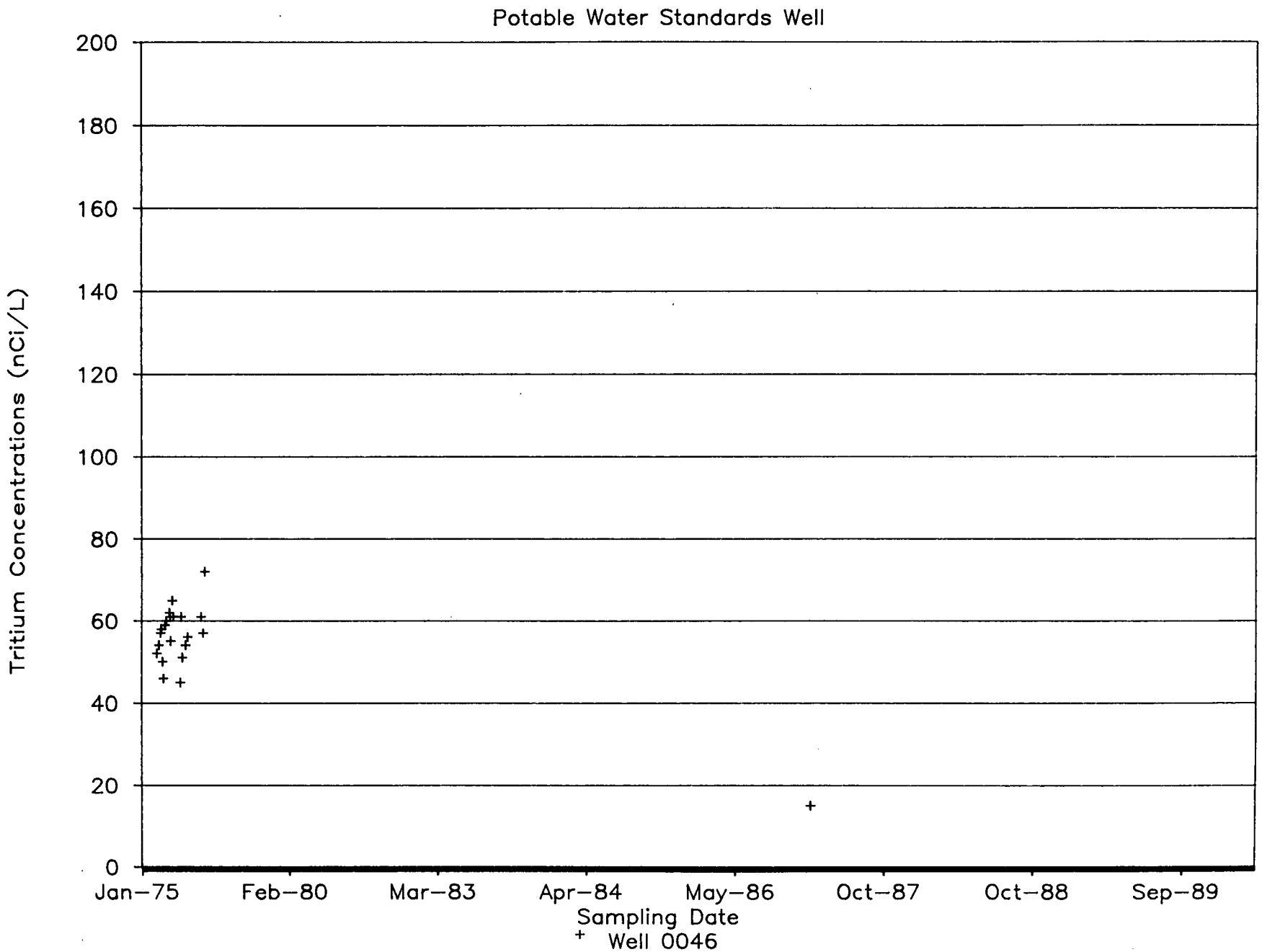
Sep-89
Sampling Date
+ Well 0043


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
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160
140
120
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Mar-83
Apr-84
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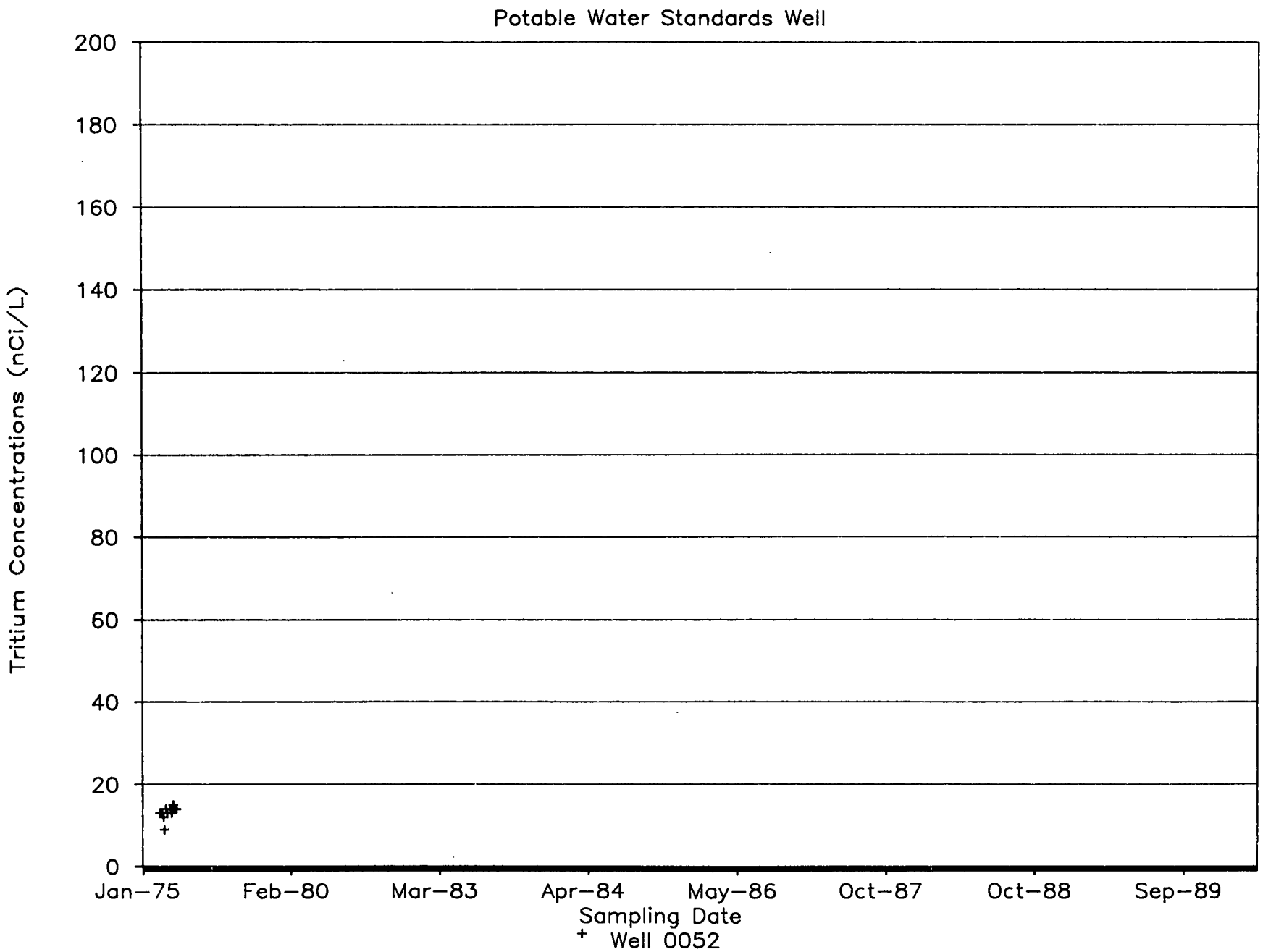
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0046


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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160
140
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100
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Feb-80
Mar-83
Apr-84
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Oct-87
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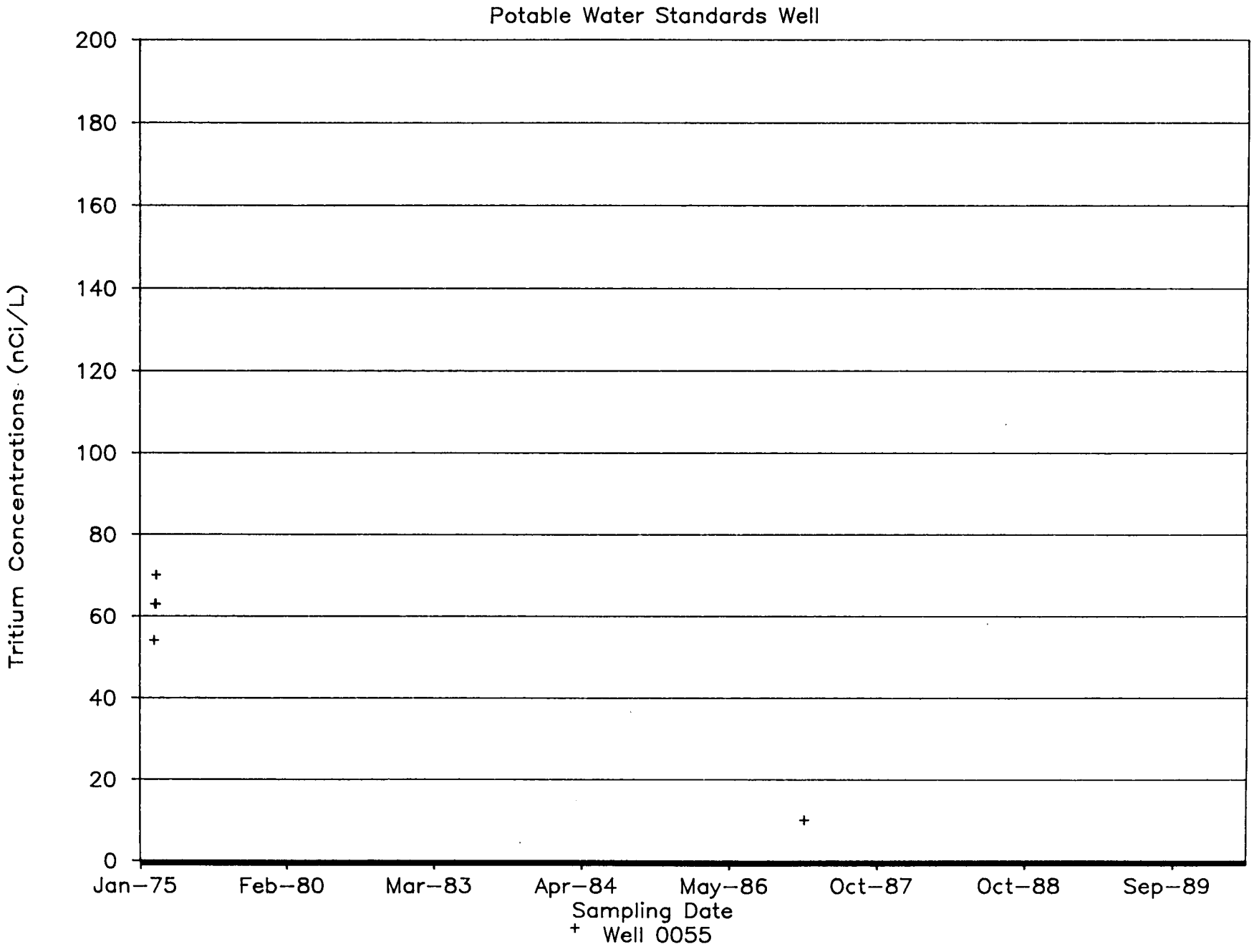
Sep-89
Sampling Date
+ Well 0052


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
160
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100
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Sampling Date
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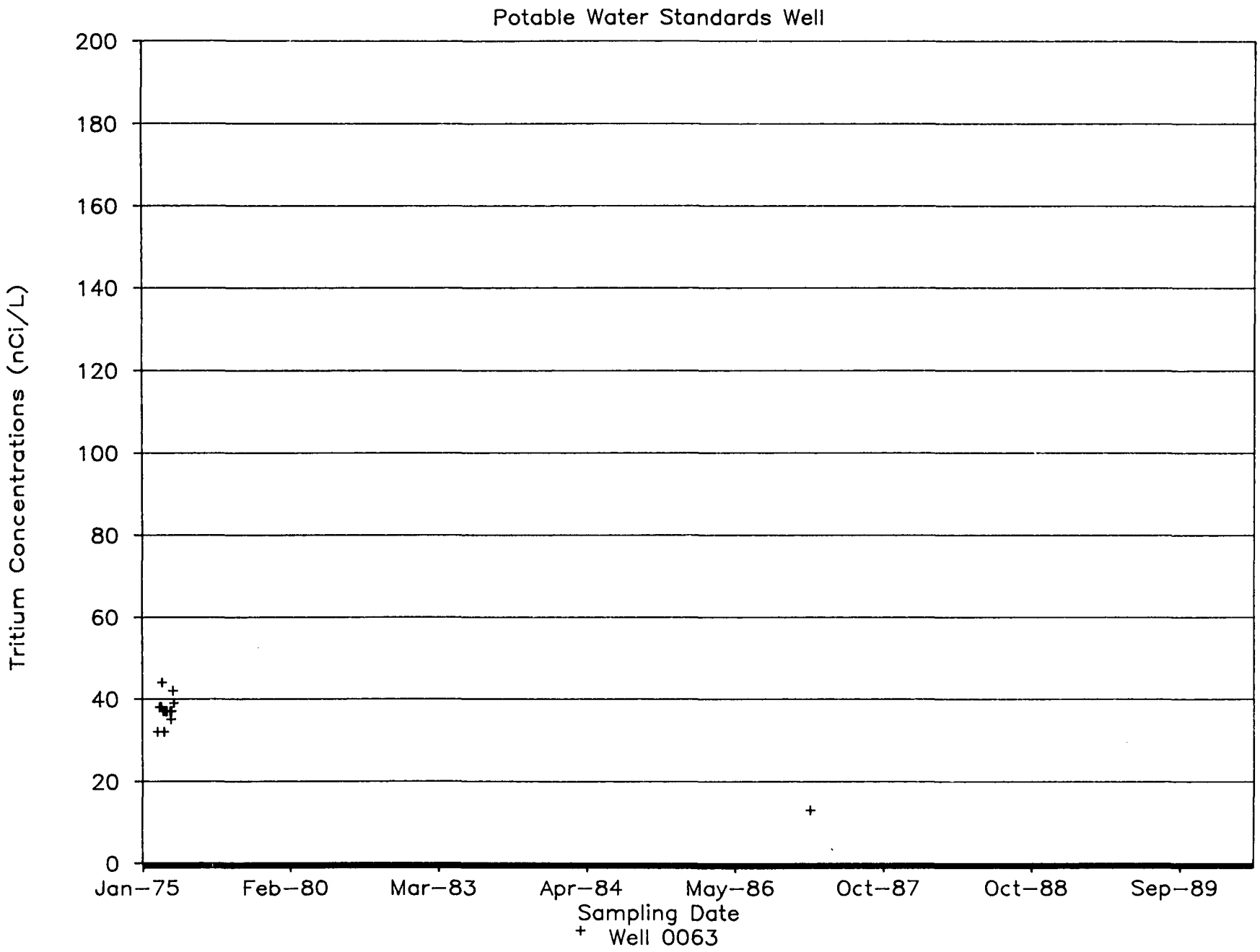
Potable Water Standards Well
Tritium Concentrations (nCi/L)
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Apr-84
May-86
Oct-87
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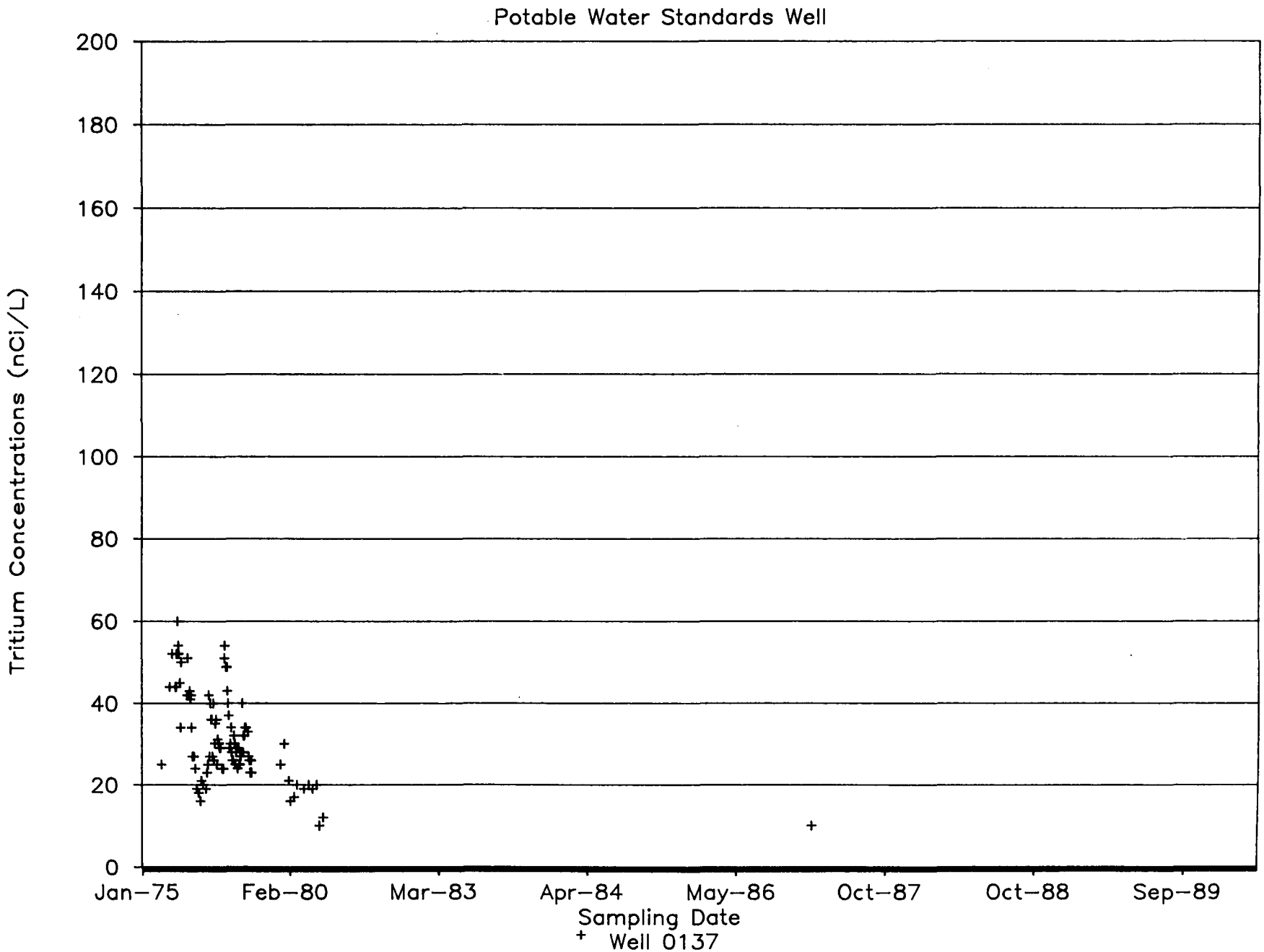
Sep-89
Sampling Date
+ Well 0063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Tritium Concentrations (nCi/L)
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Apr-84
May-86
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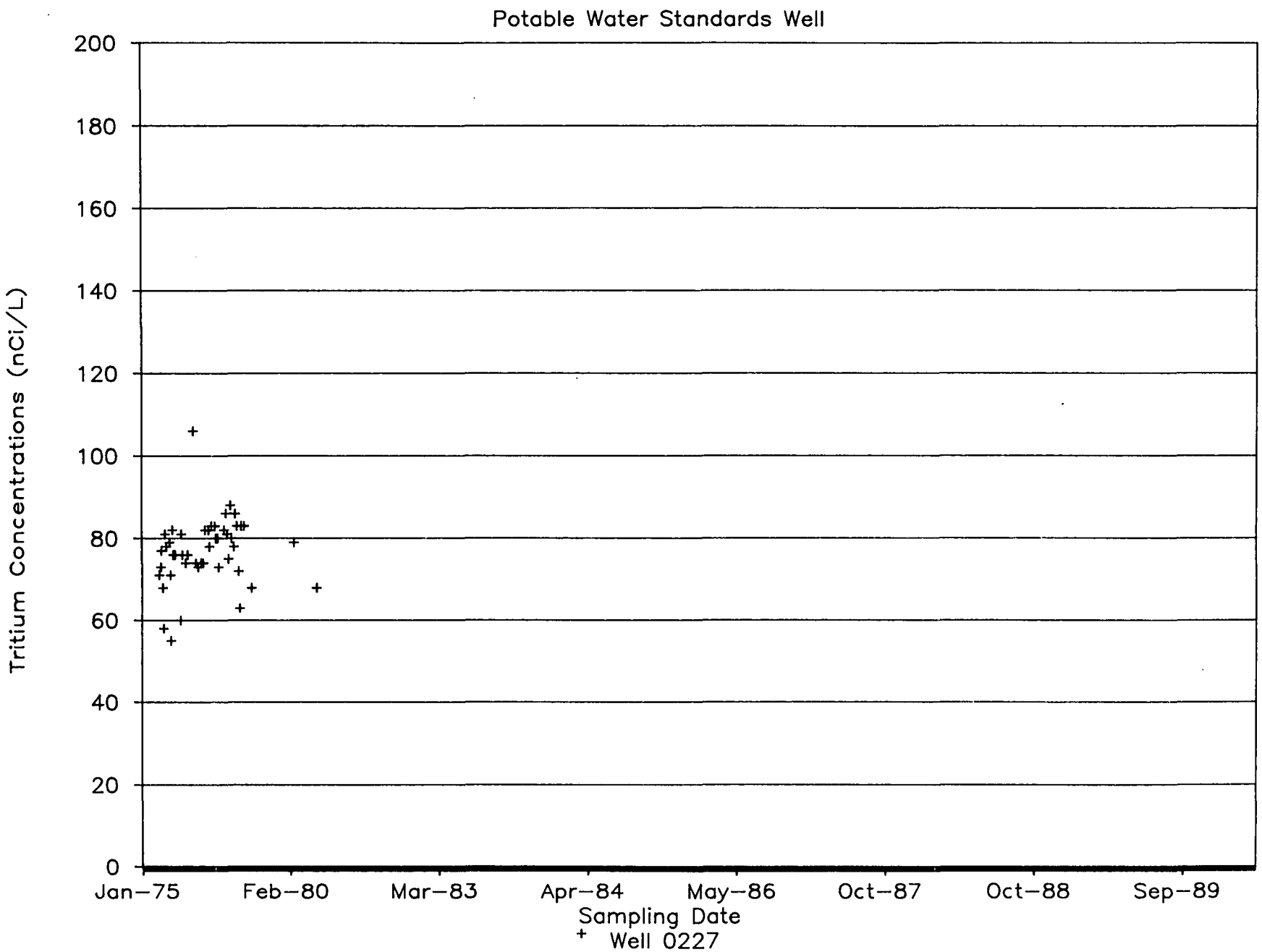
Sep-89
Sampling Date
+ Well 0137


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
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Apr-84
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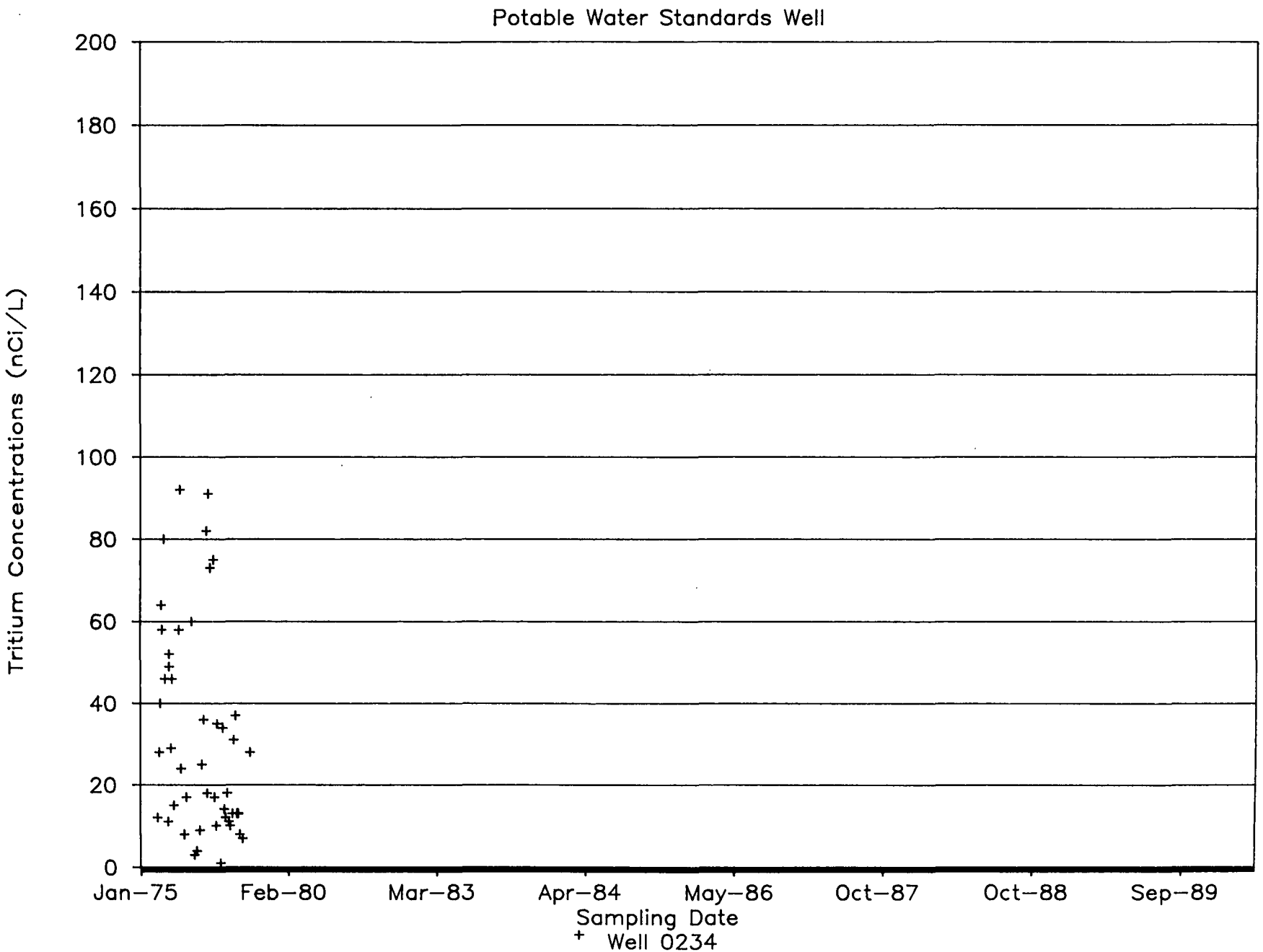
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0227


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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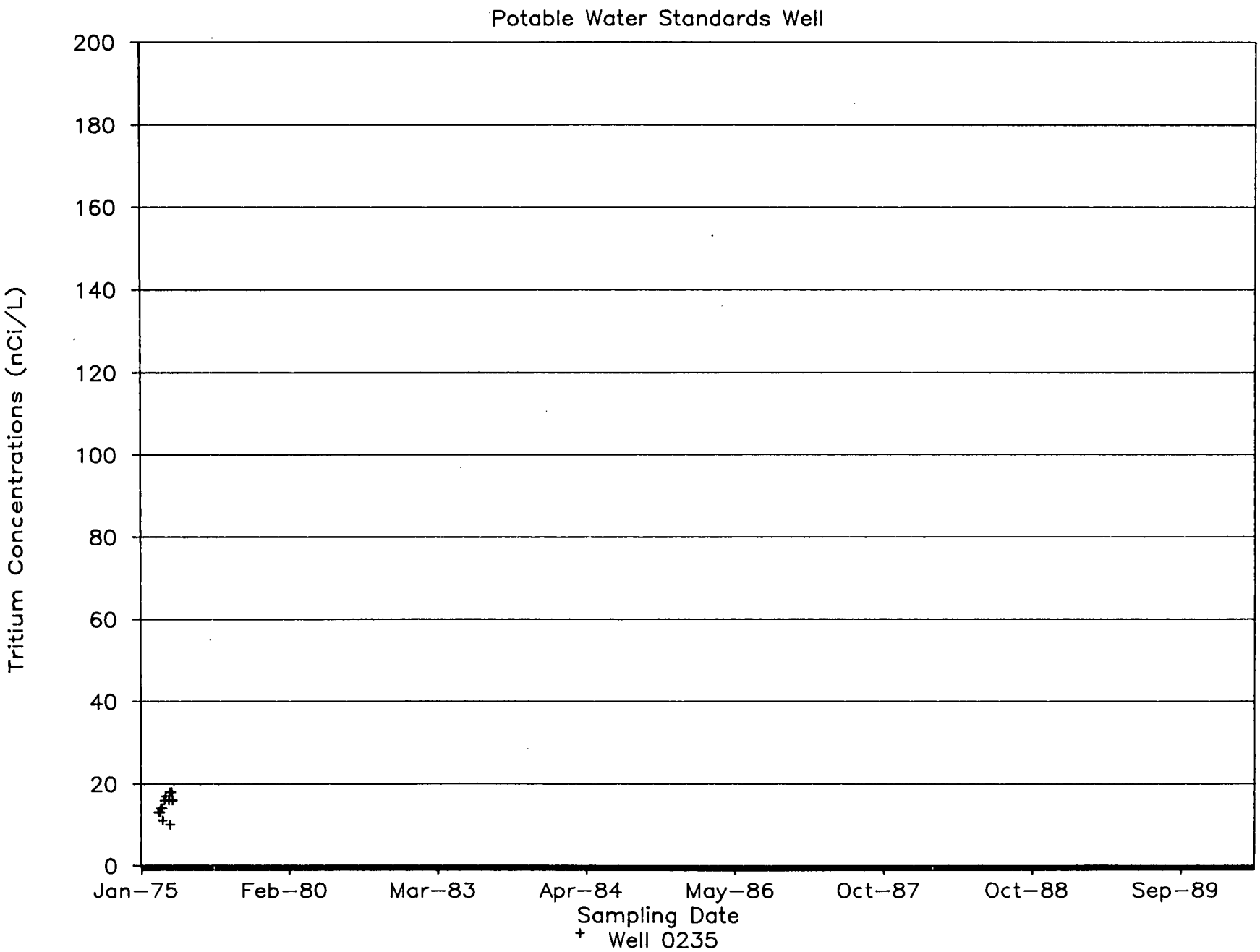
Sep-89
Sampling Date
+ Well 0234


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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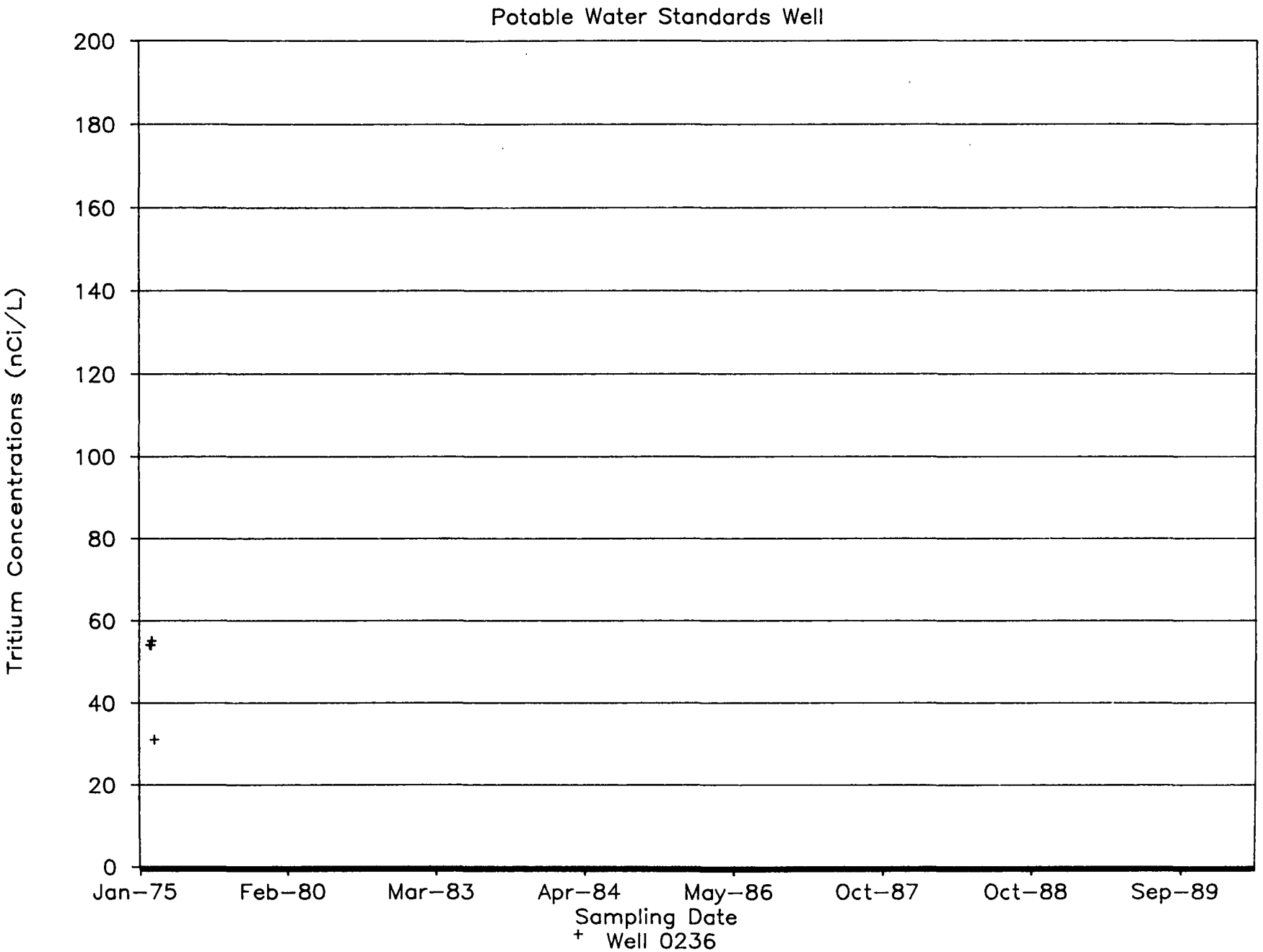
Oct-88
Sep-89
Sampling Date
+ Well 0235


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
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140
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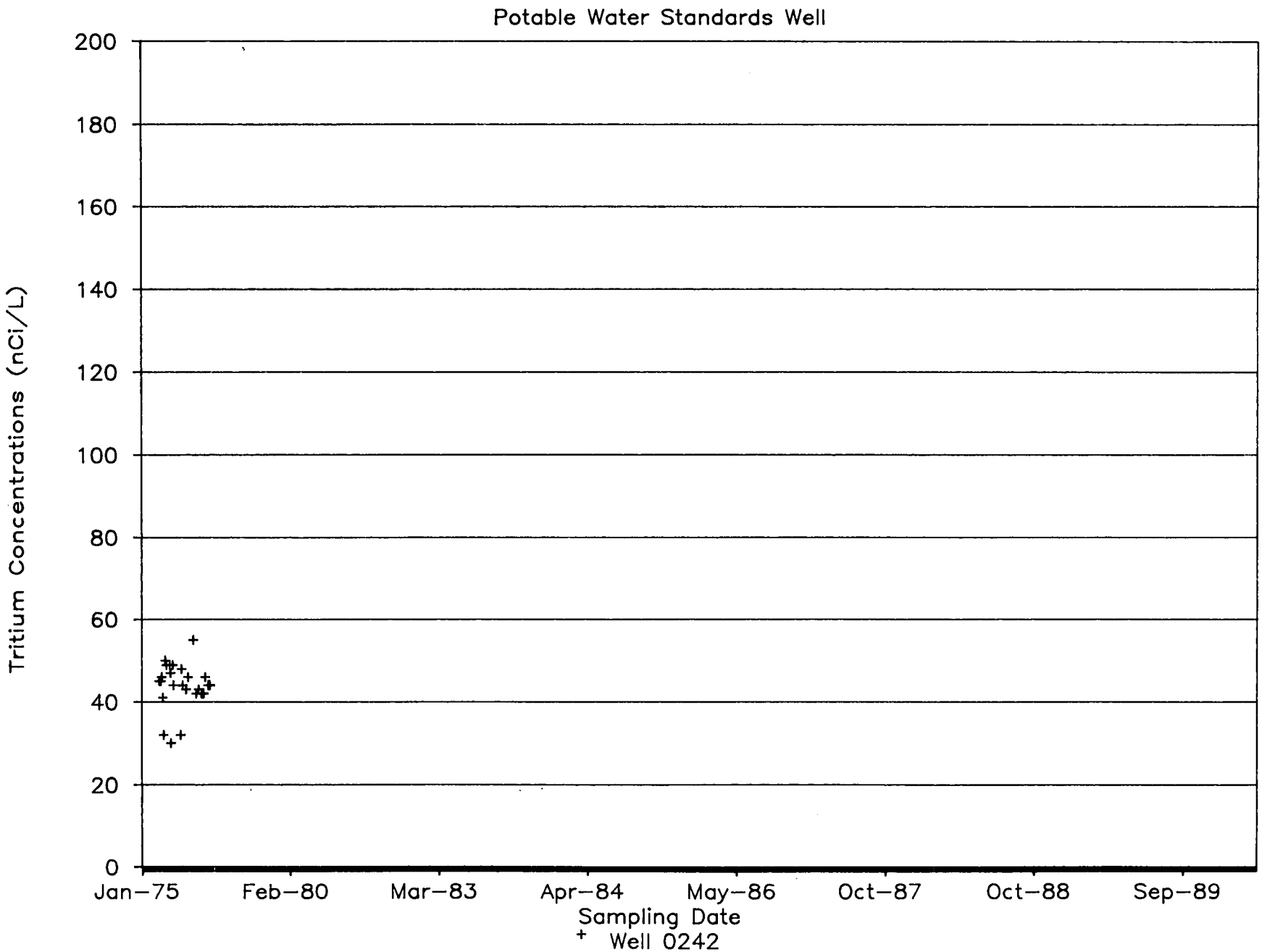
Sep-89
Sampling Date
+ Well 0236


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
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Feb-80
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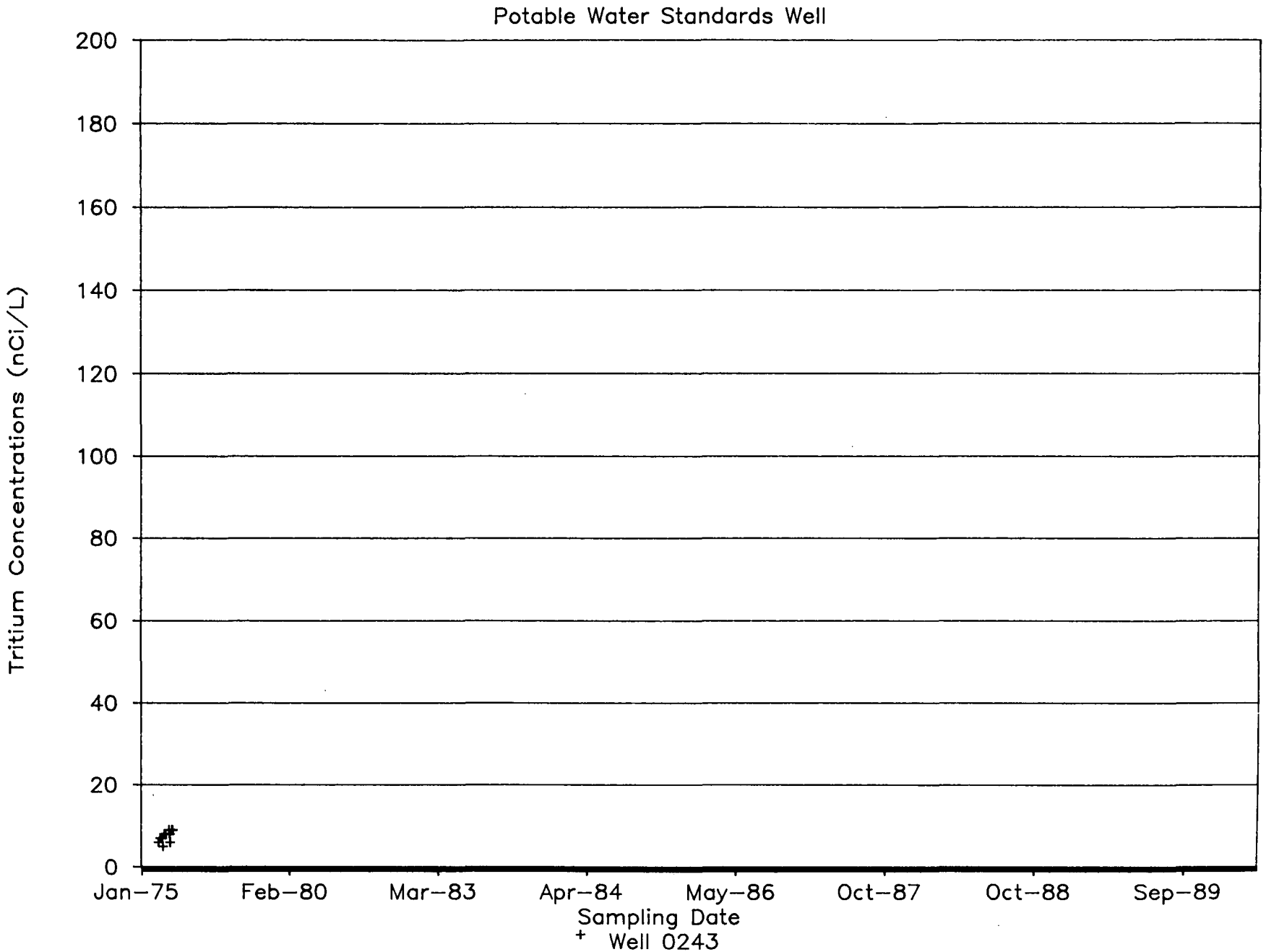
Oct-88
Sep-89
Sampling Date
+ Well 0242


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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140
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Sep-89
Sampling Date
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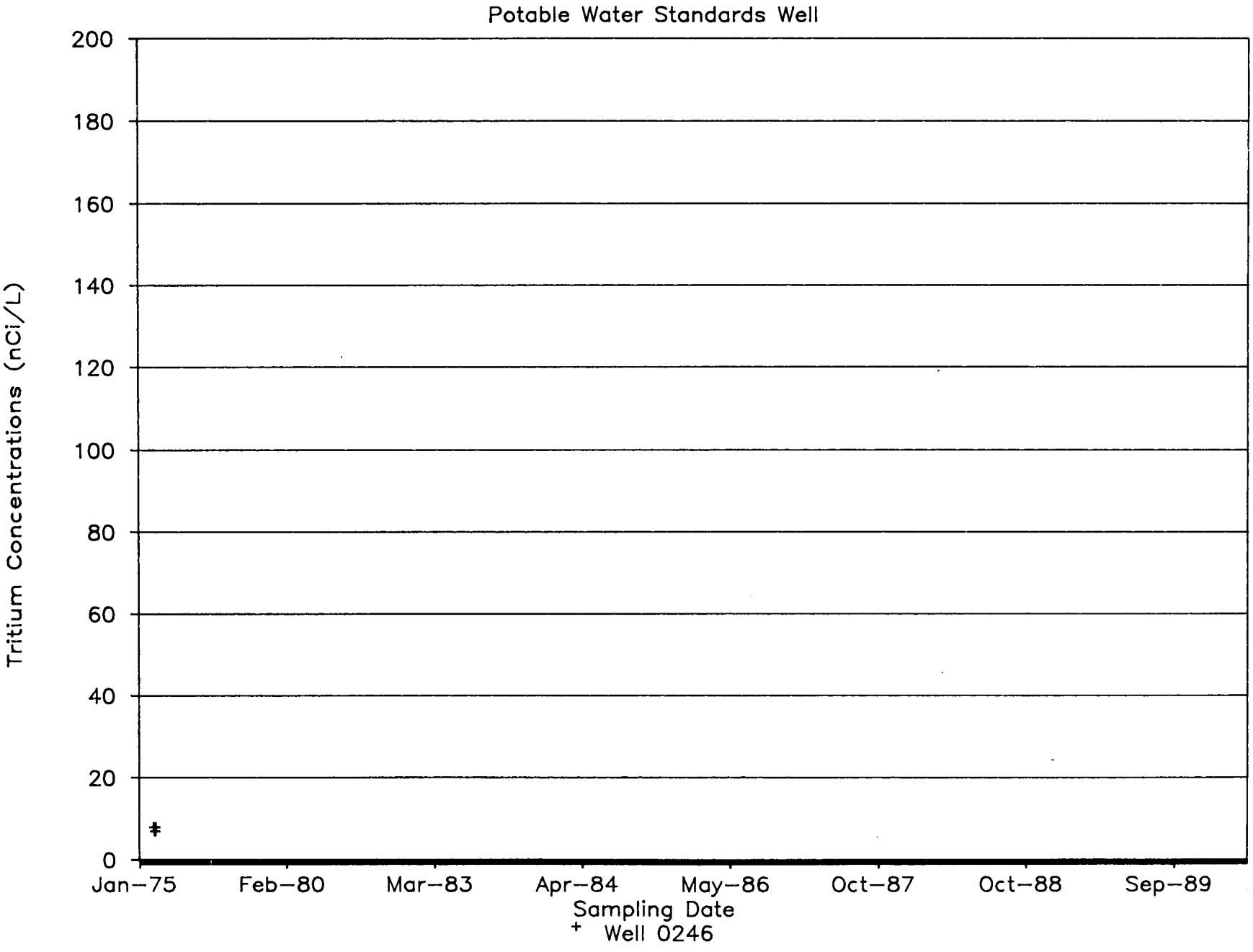
Potable Water Standards Well
Tritium Concentrations (nCi/L)
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180
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120
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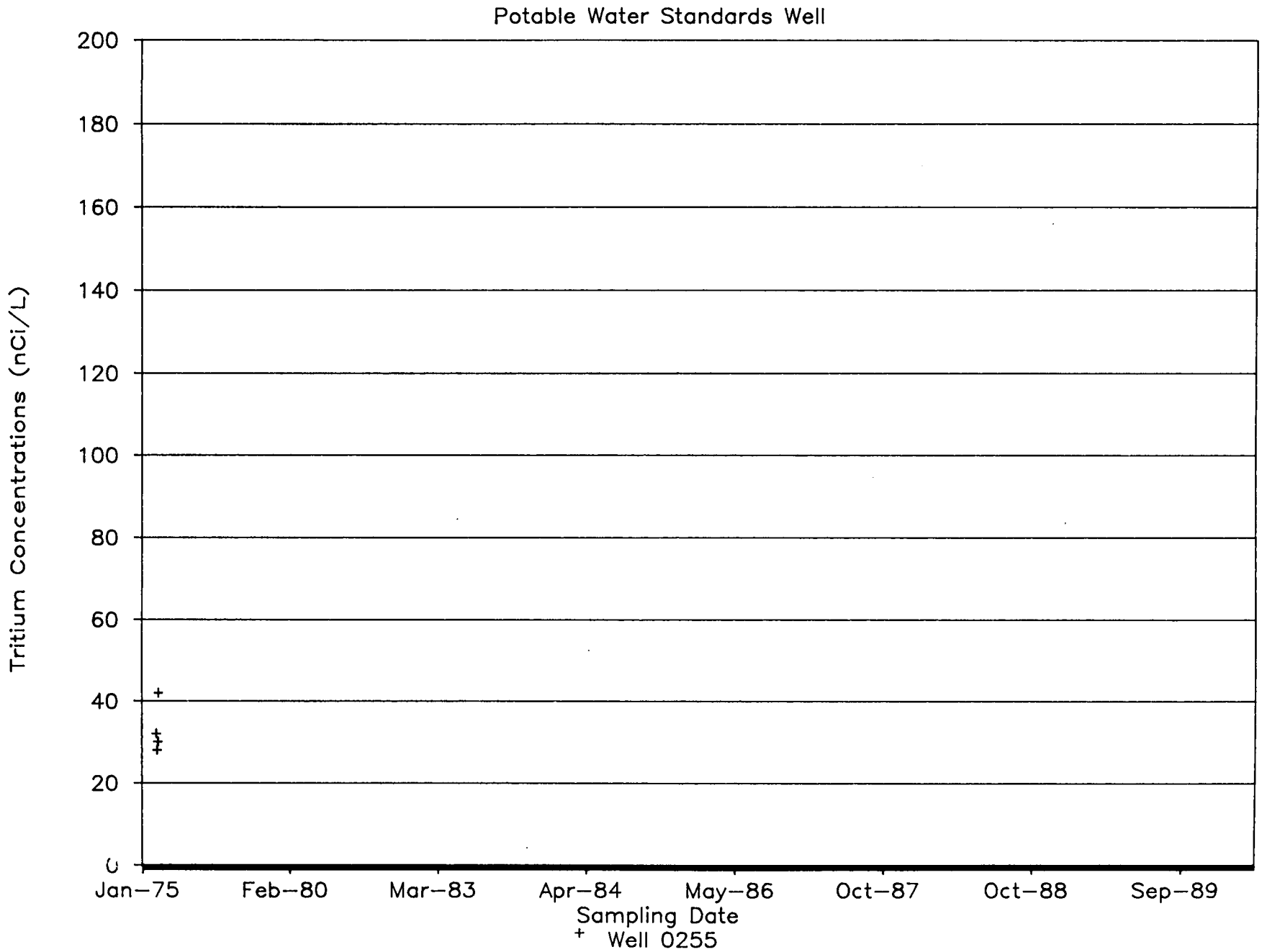
Sep-89
Sampling Date
+ Well 0246


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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Apr-84
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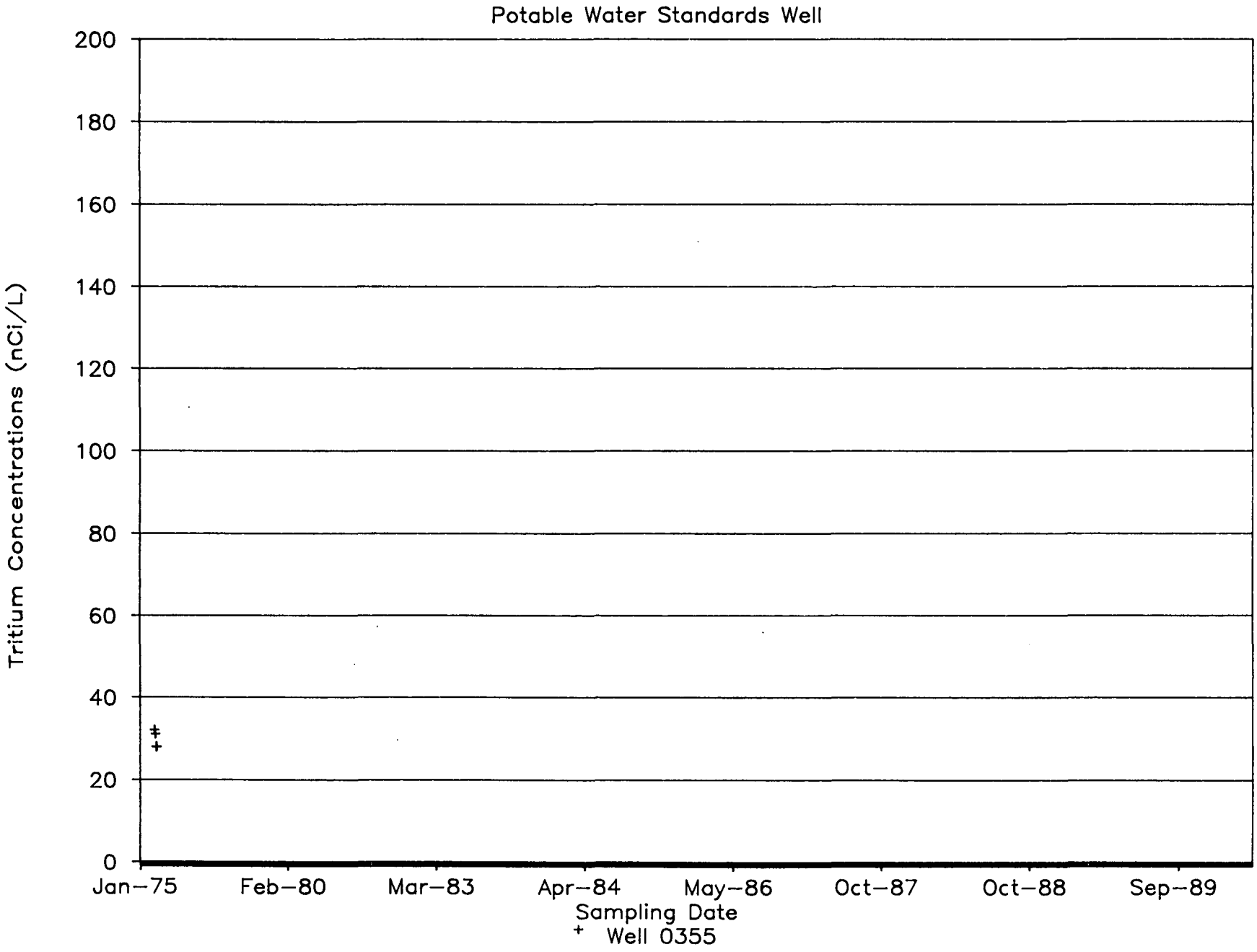
Oct-88
Sep-89
Sampling Date
+ Well 0255


Potable Water Standards Well
Tritium Concentrations (nCi/L)
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Apr-84
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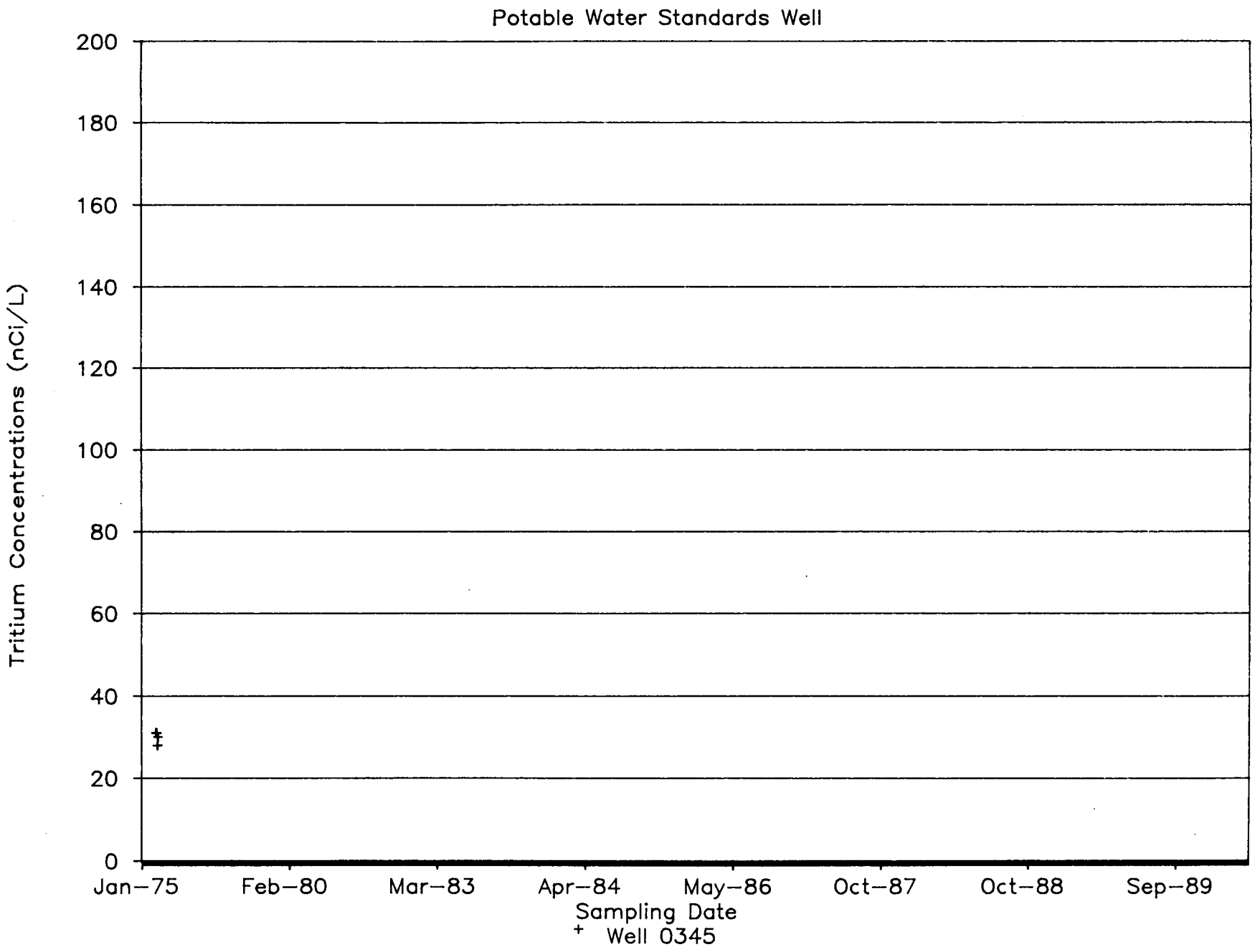
Oct-88
Sep-89
Sampling Date
+ Well 0355


Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
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140
120
100
80
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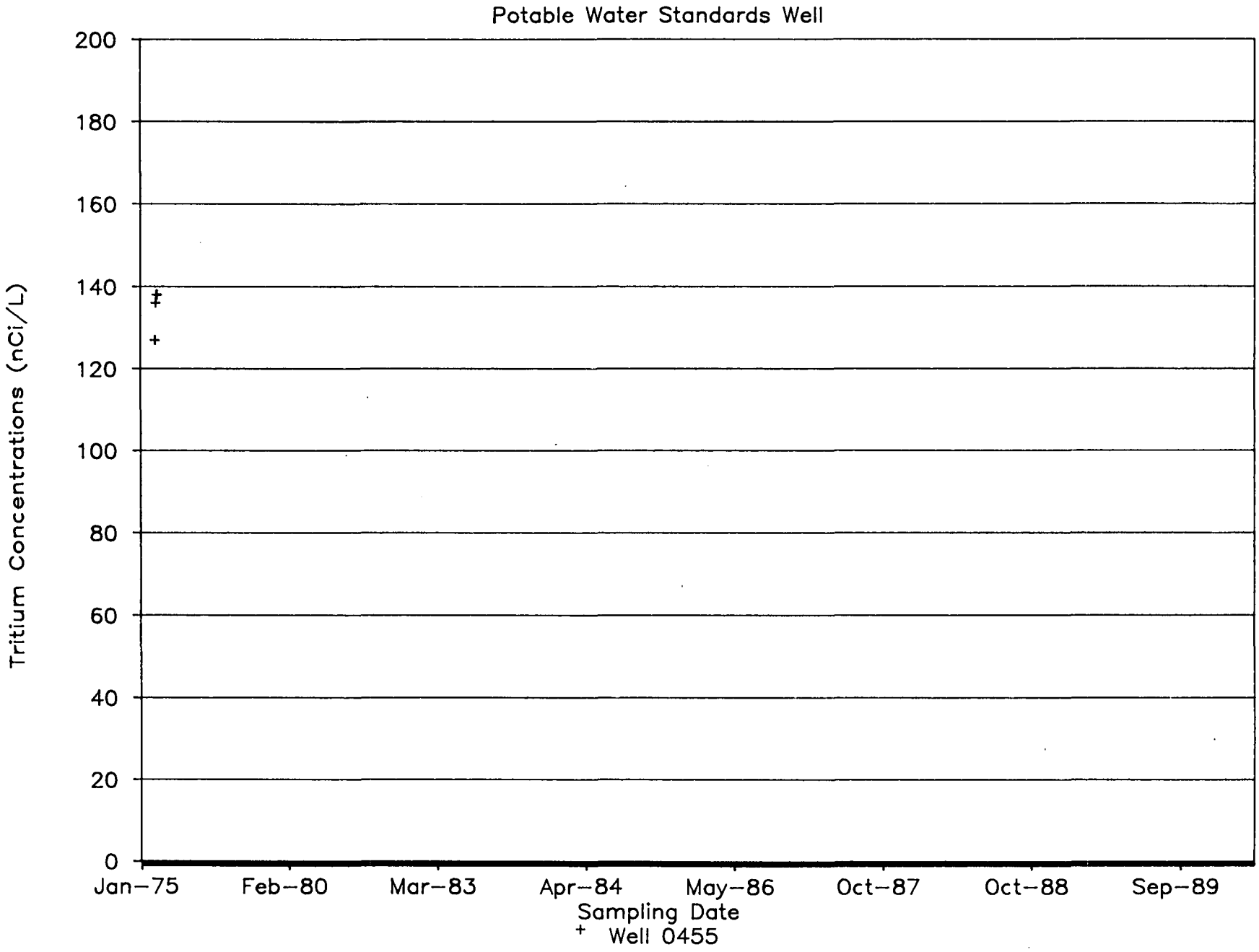
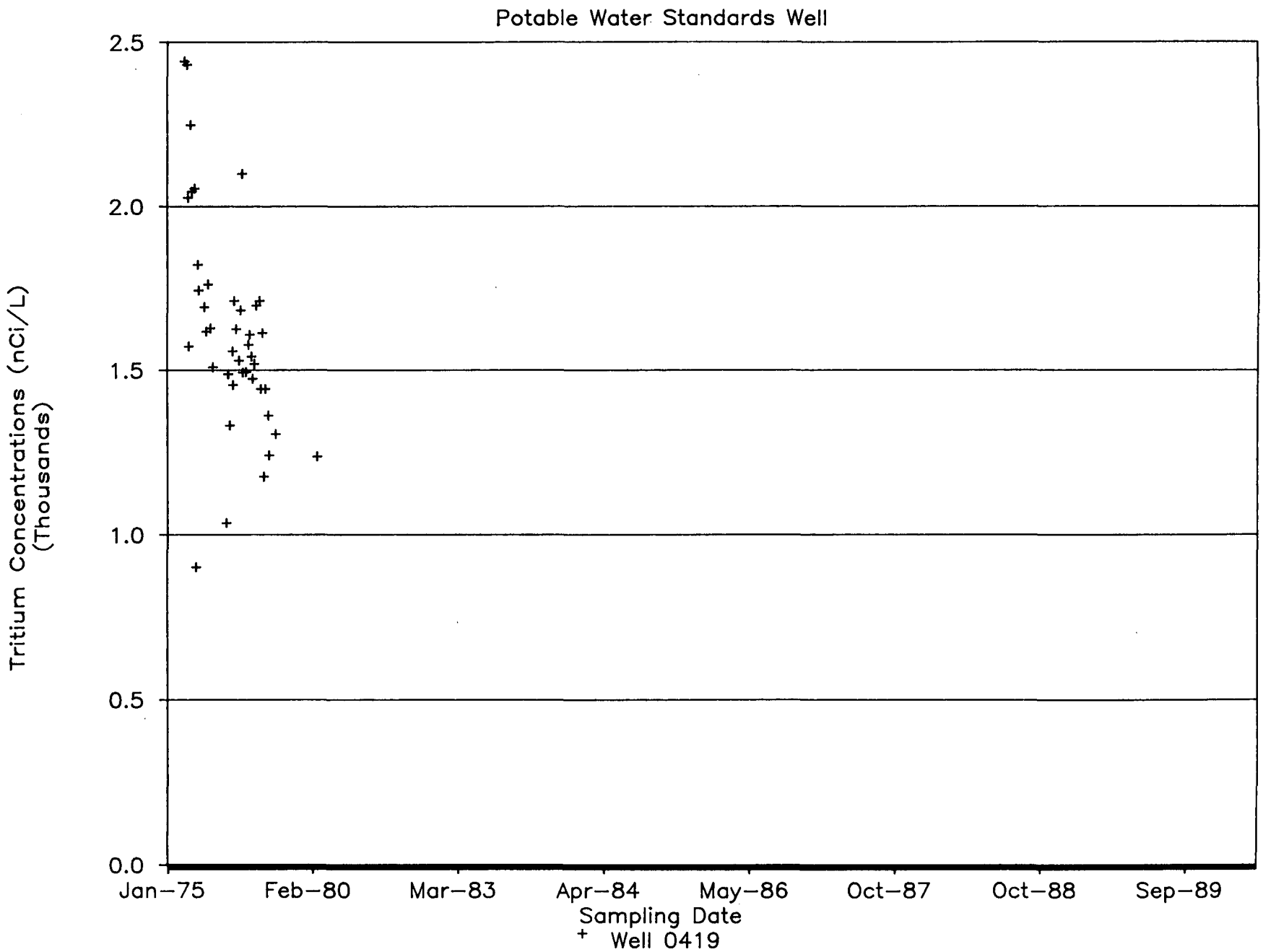
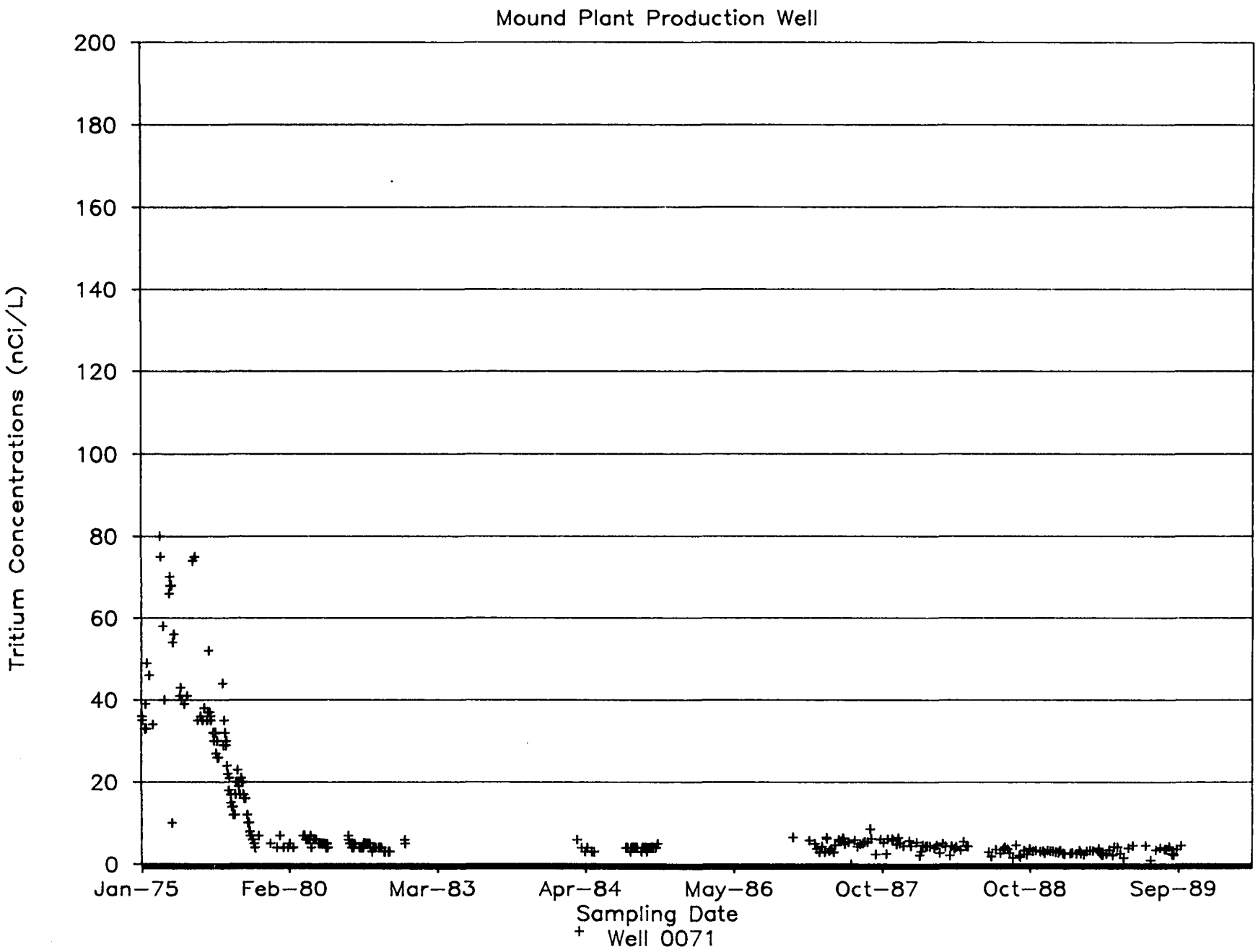
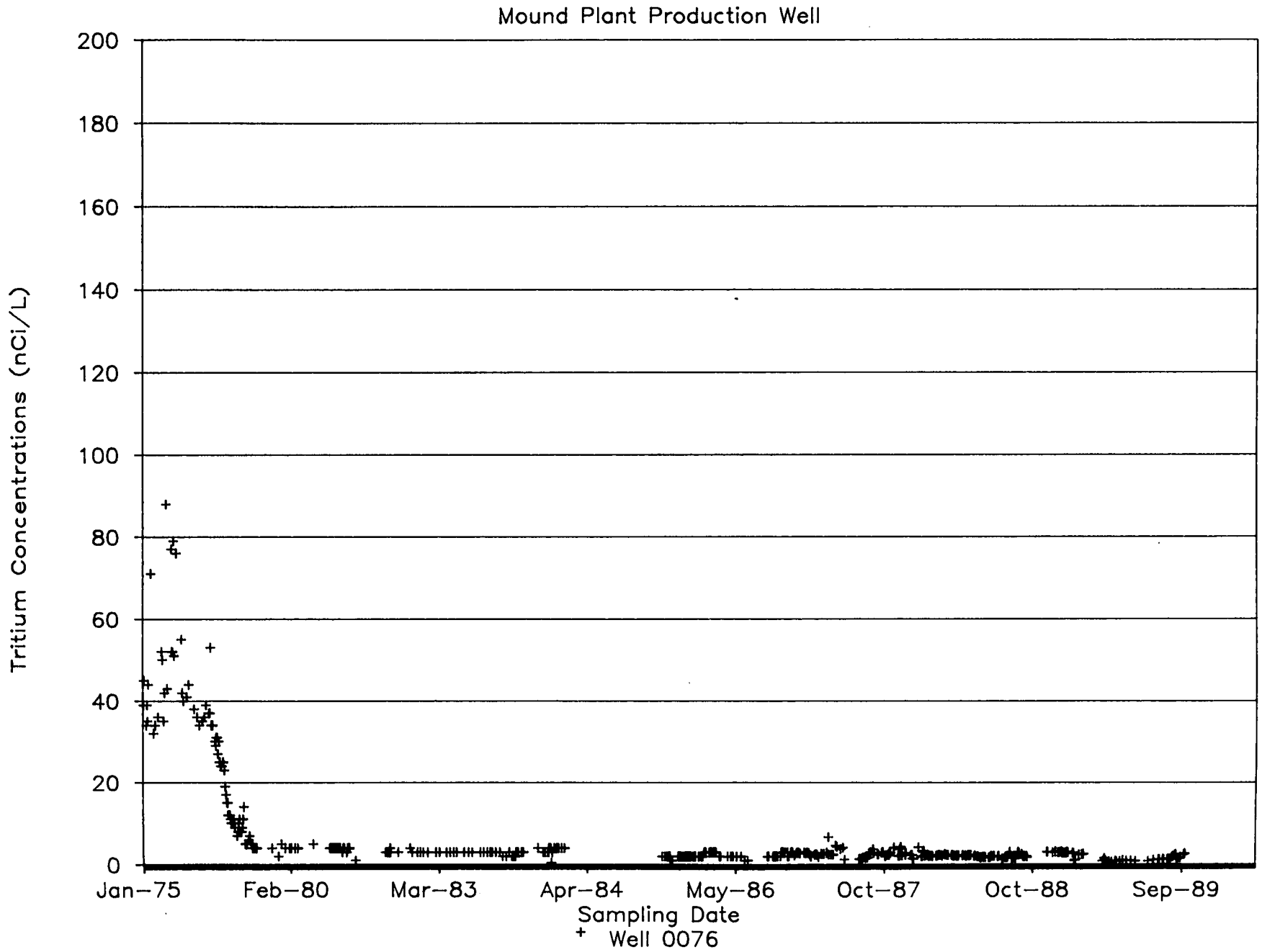
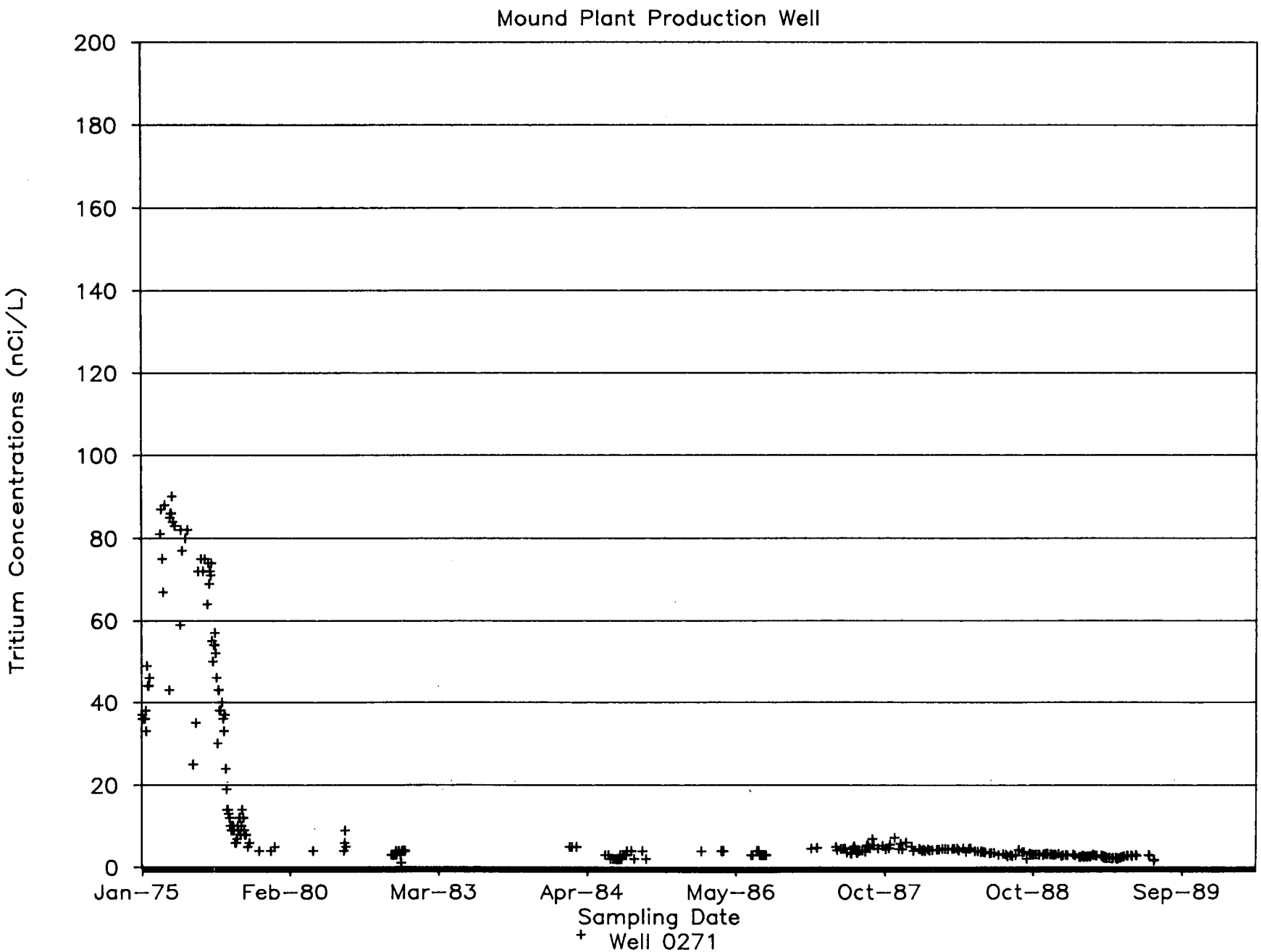
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0345

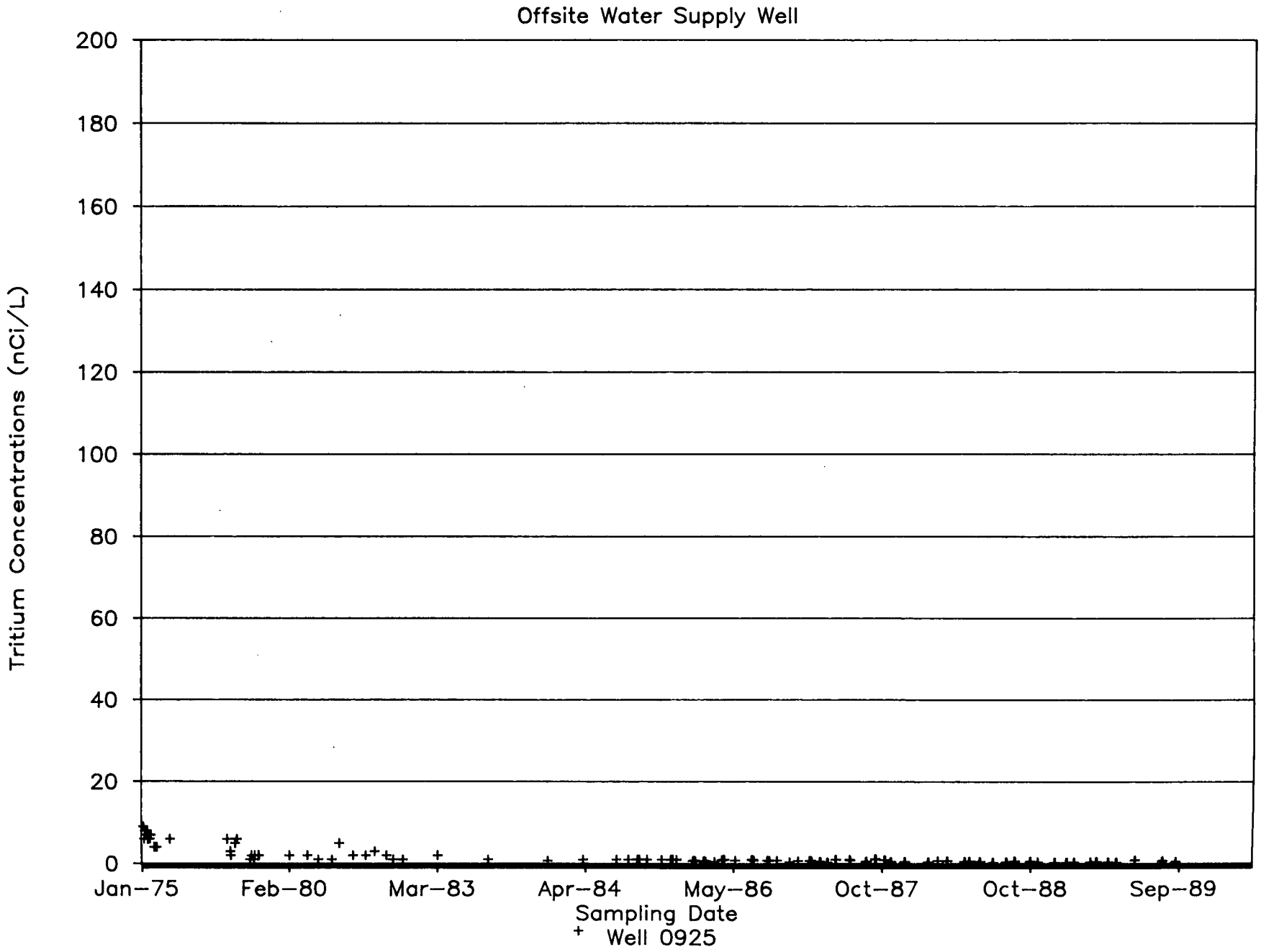

Potable Water Standards Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0455

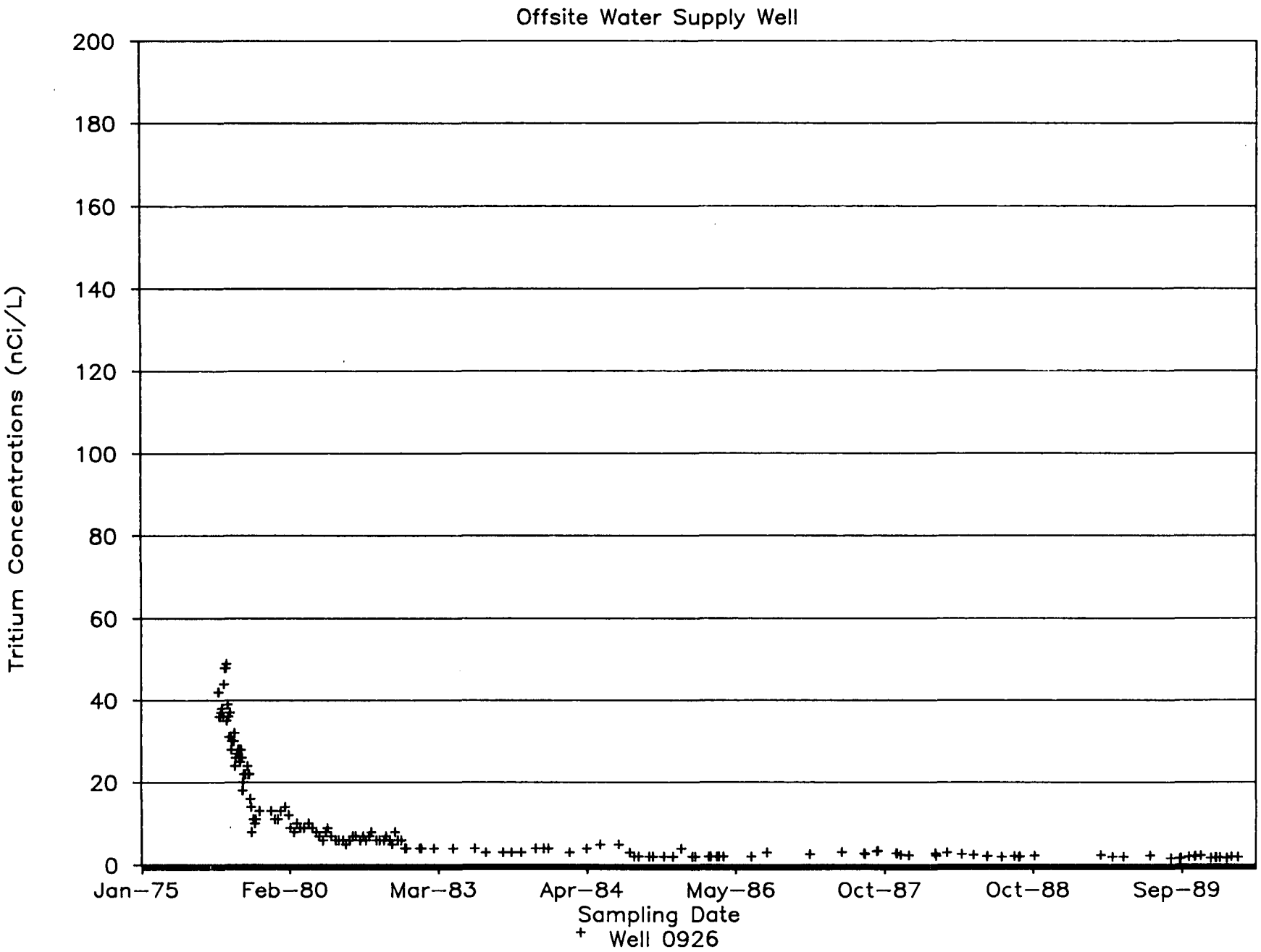

Potable Water Standards Well
Tritium Concentrations (nCi/L)
(Thousands)
2.5
2.0
1.5
1.0
0.5
0.0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0419

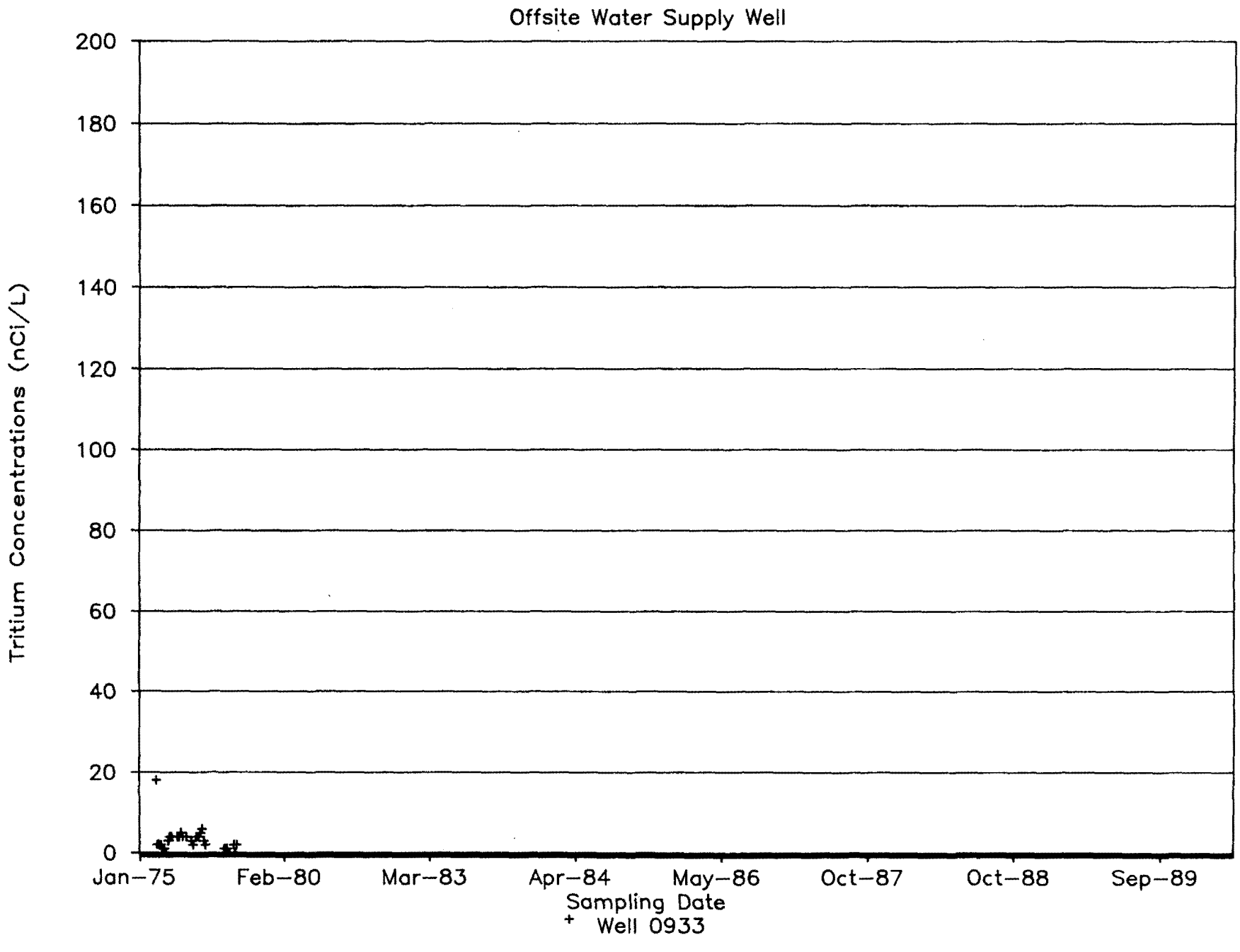

Mound Plant Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0071

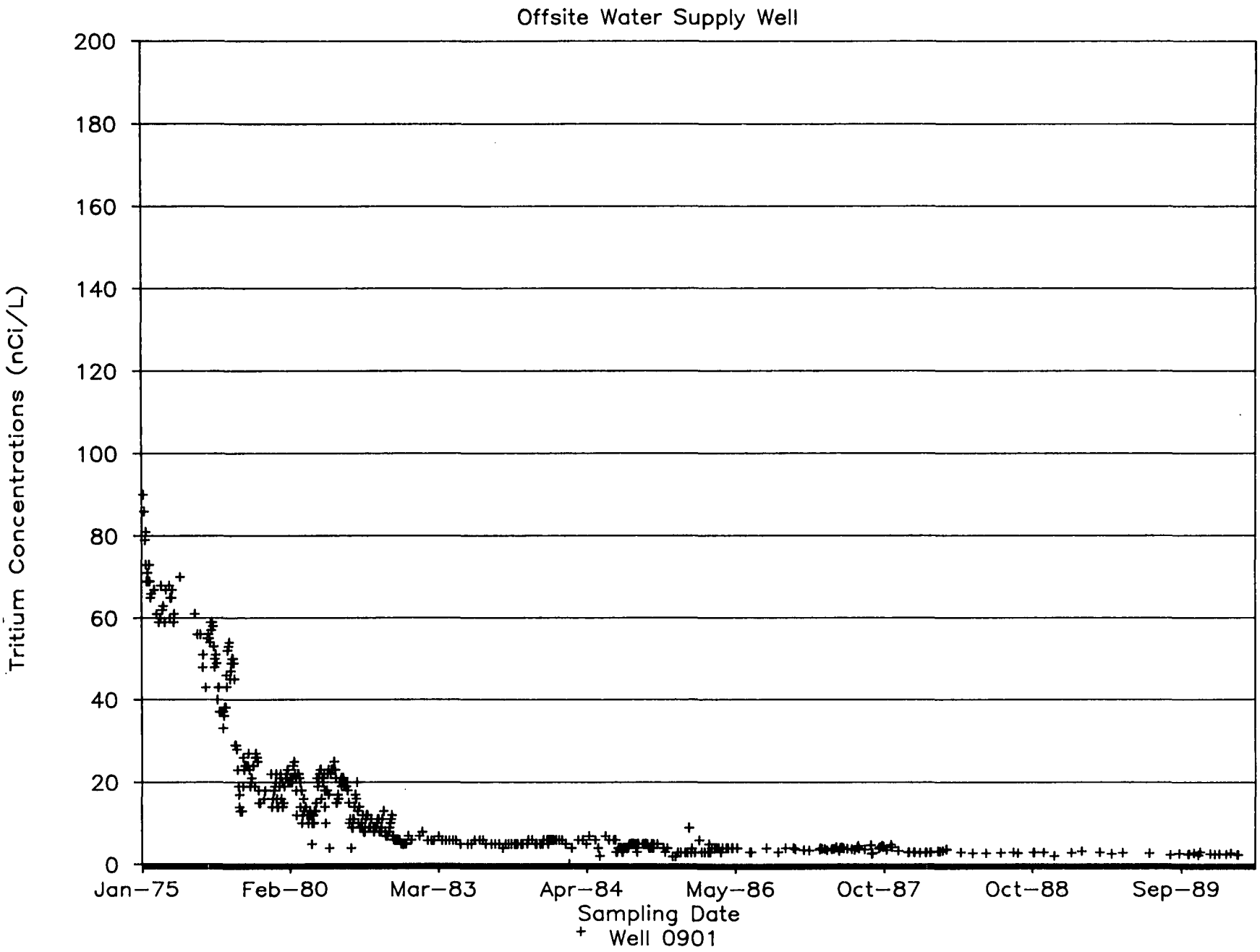

Mound Plant Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0076

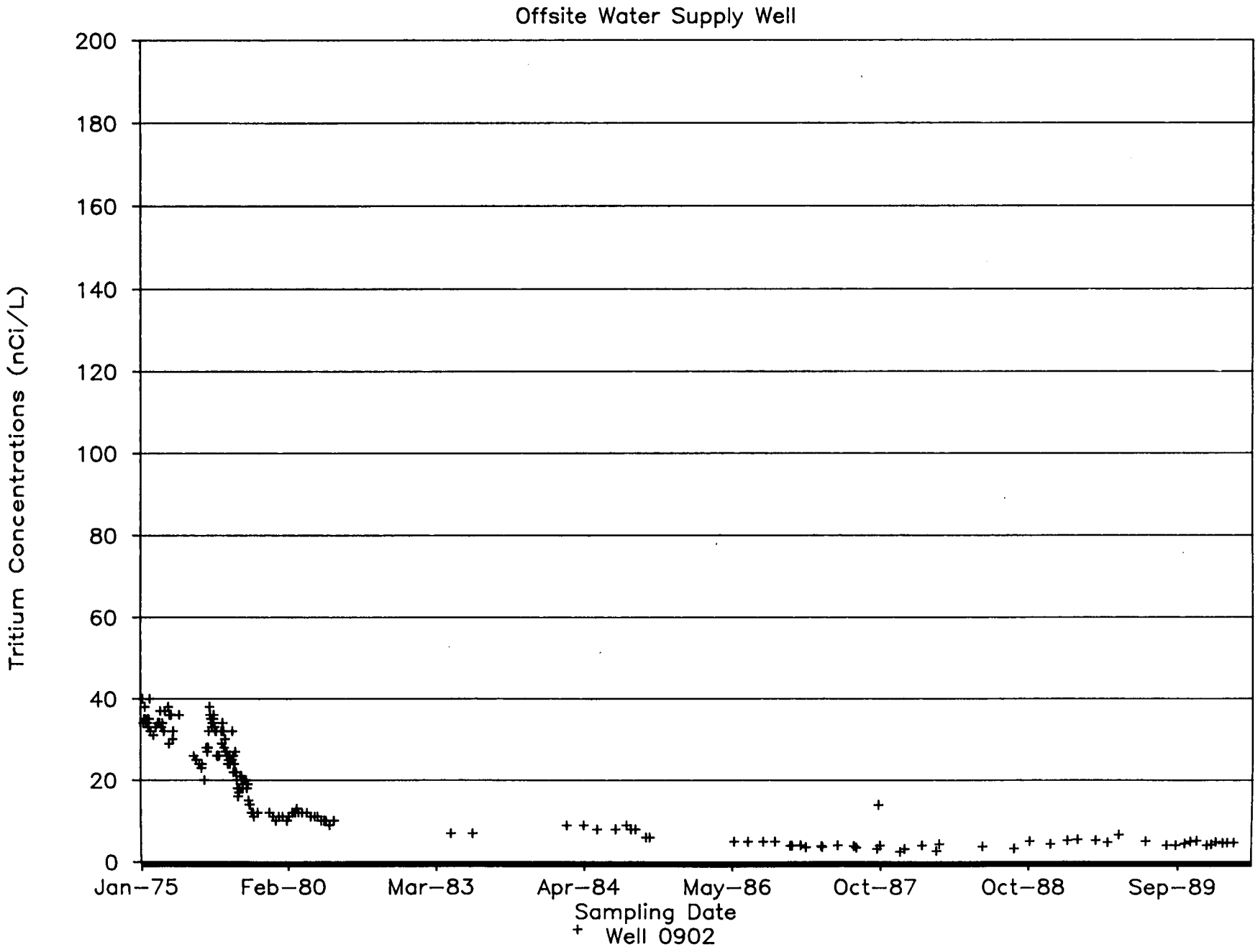

Mound Plant Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0271

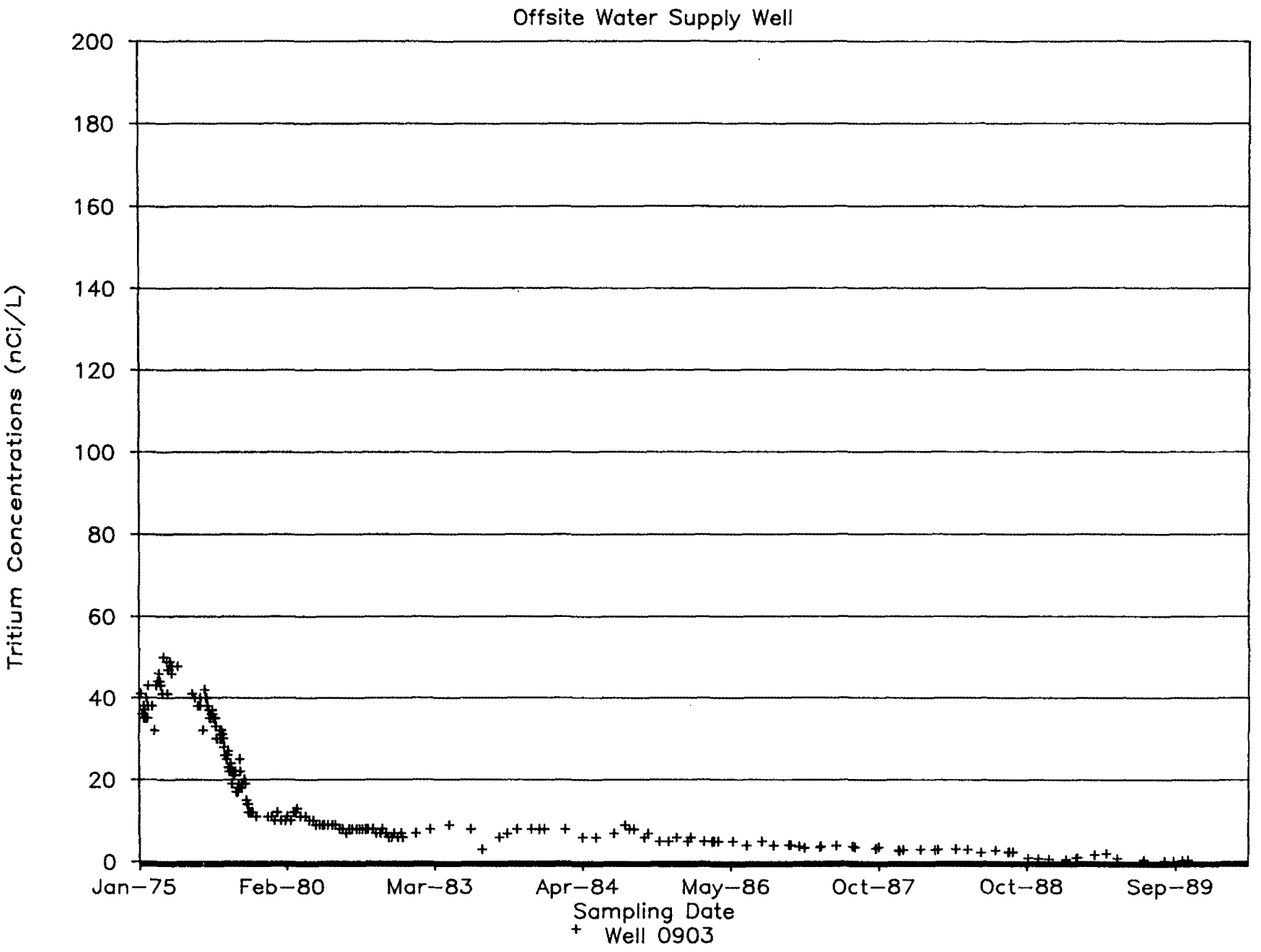

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0925

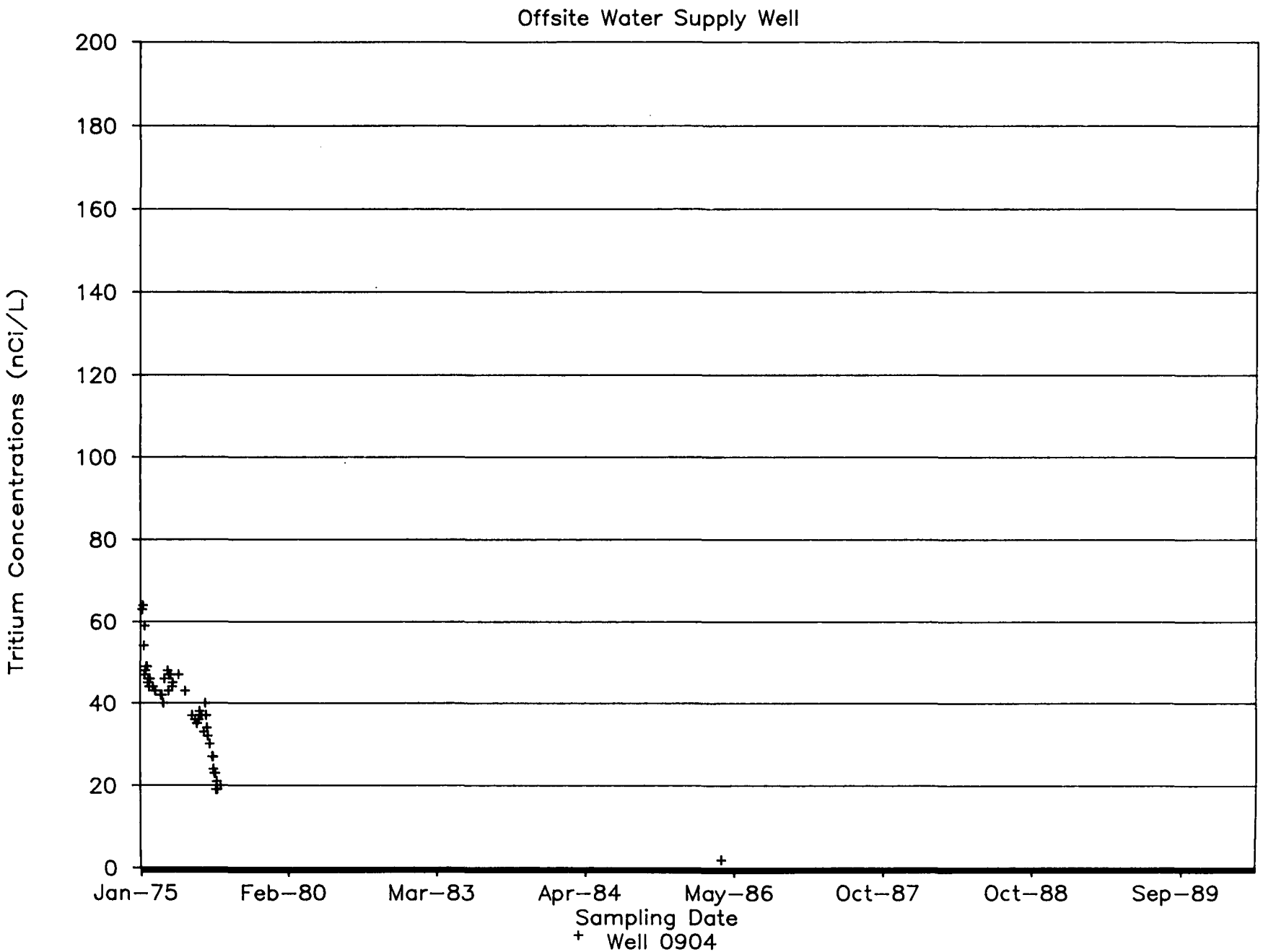

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0926

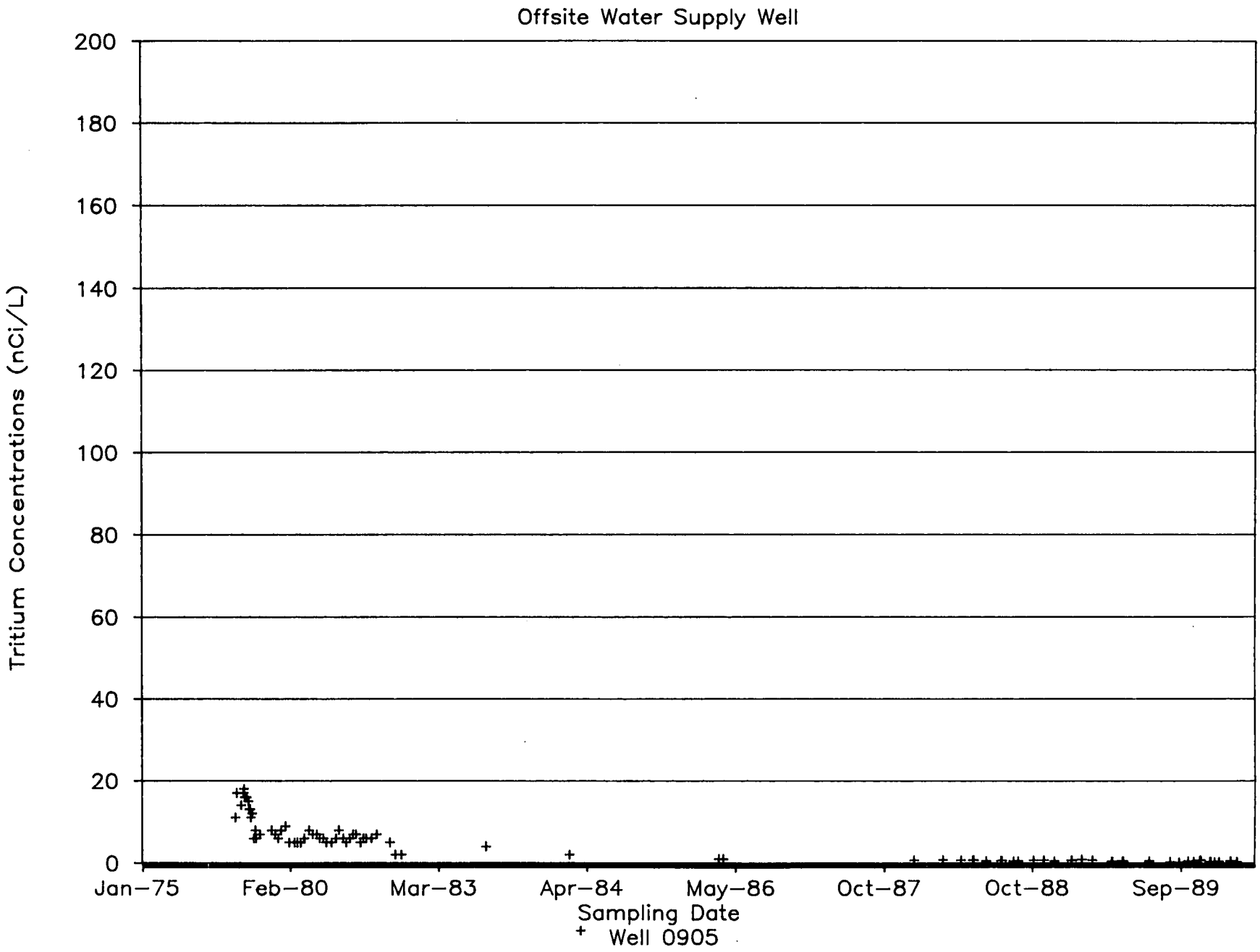

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0933

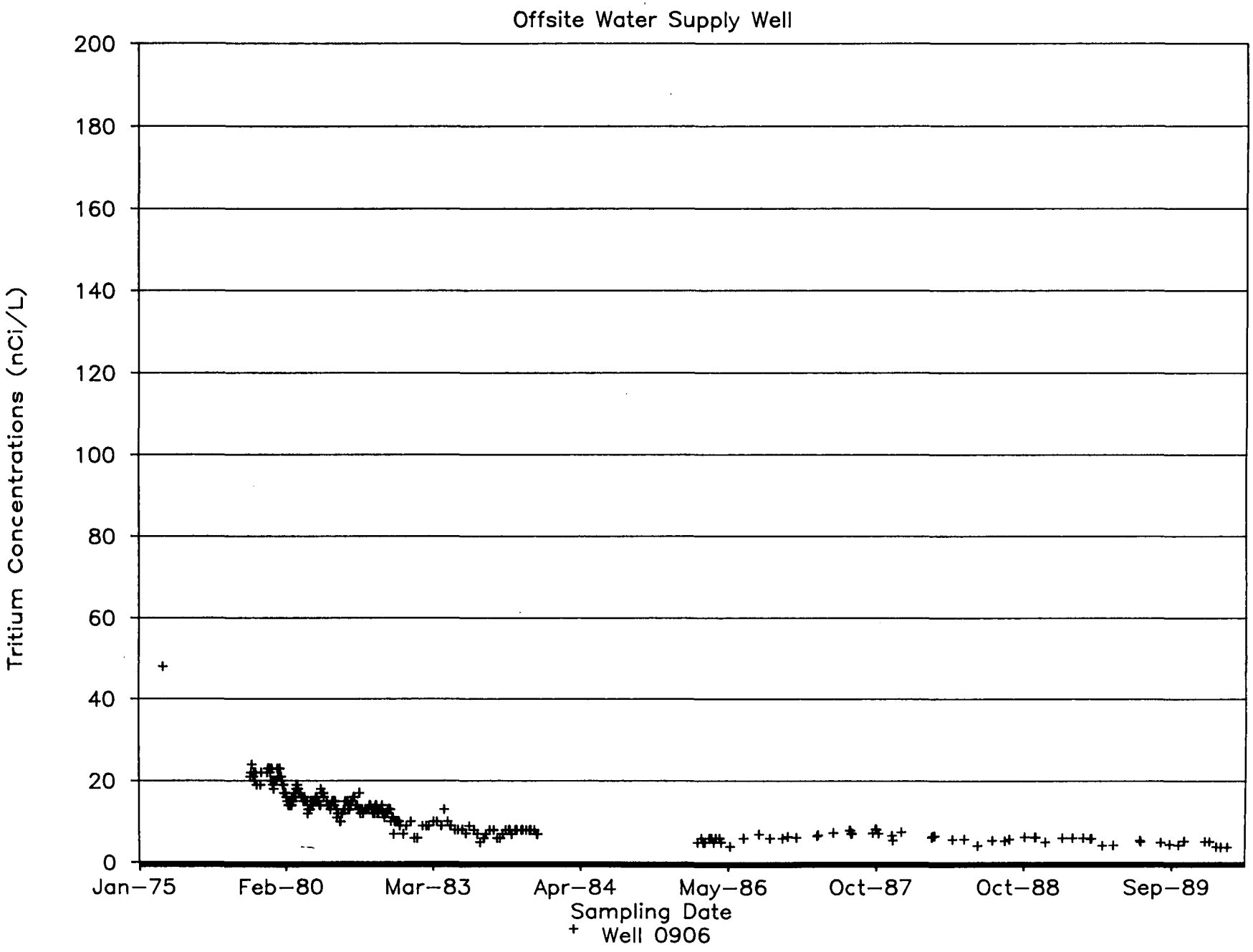

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0901

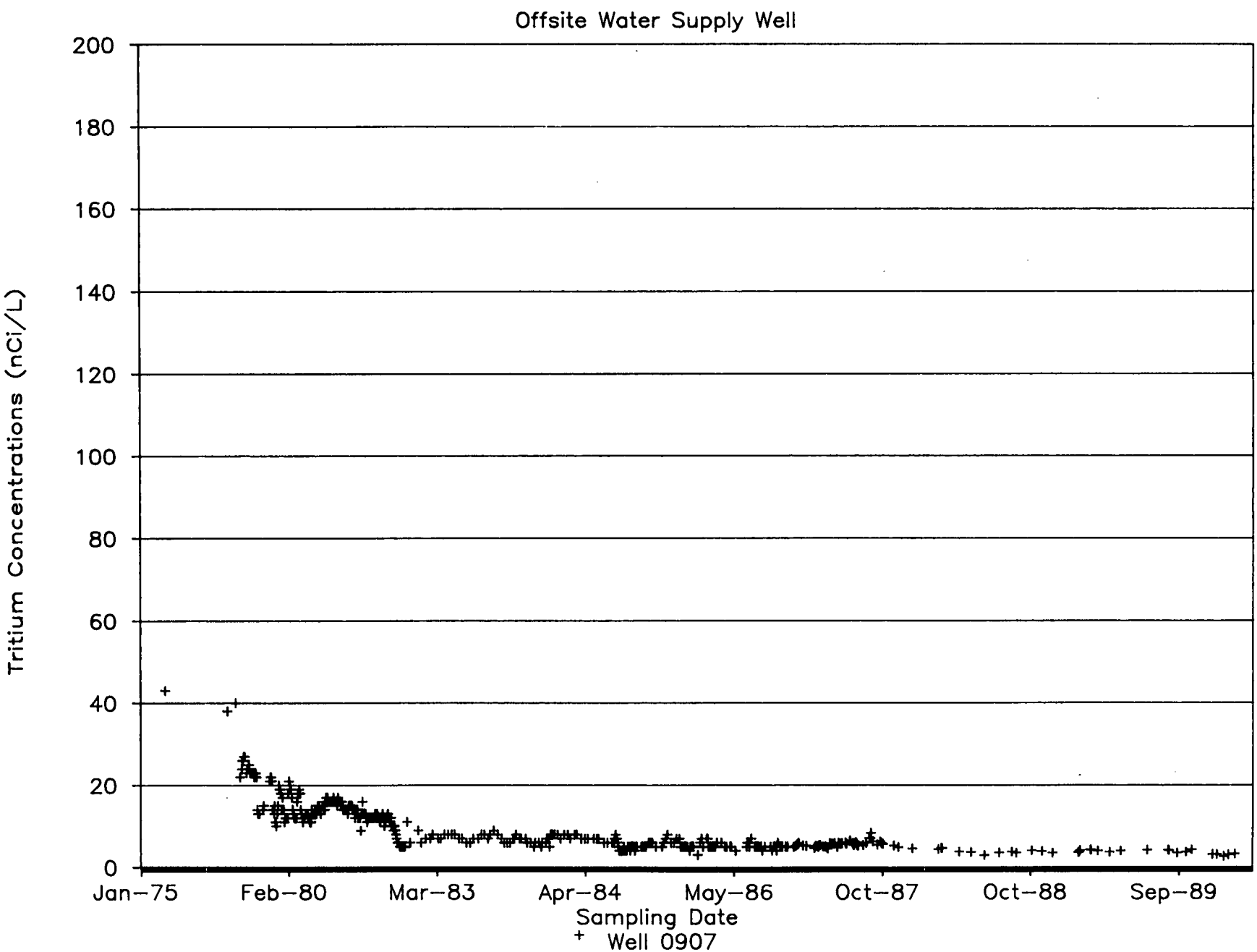

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0902

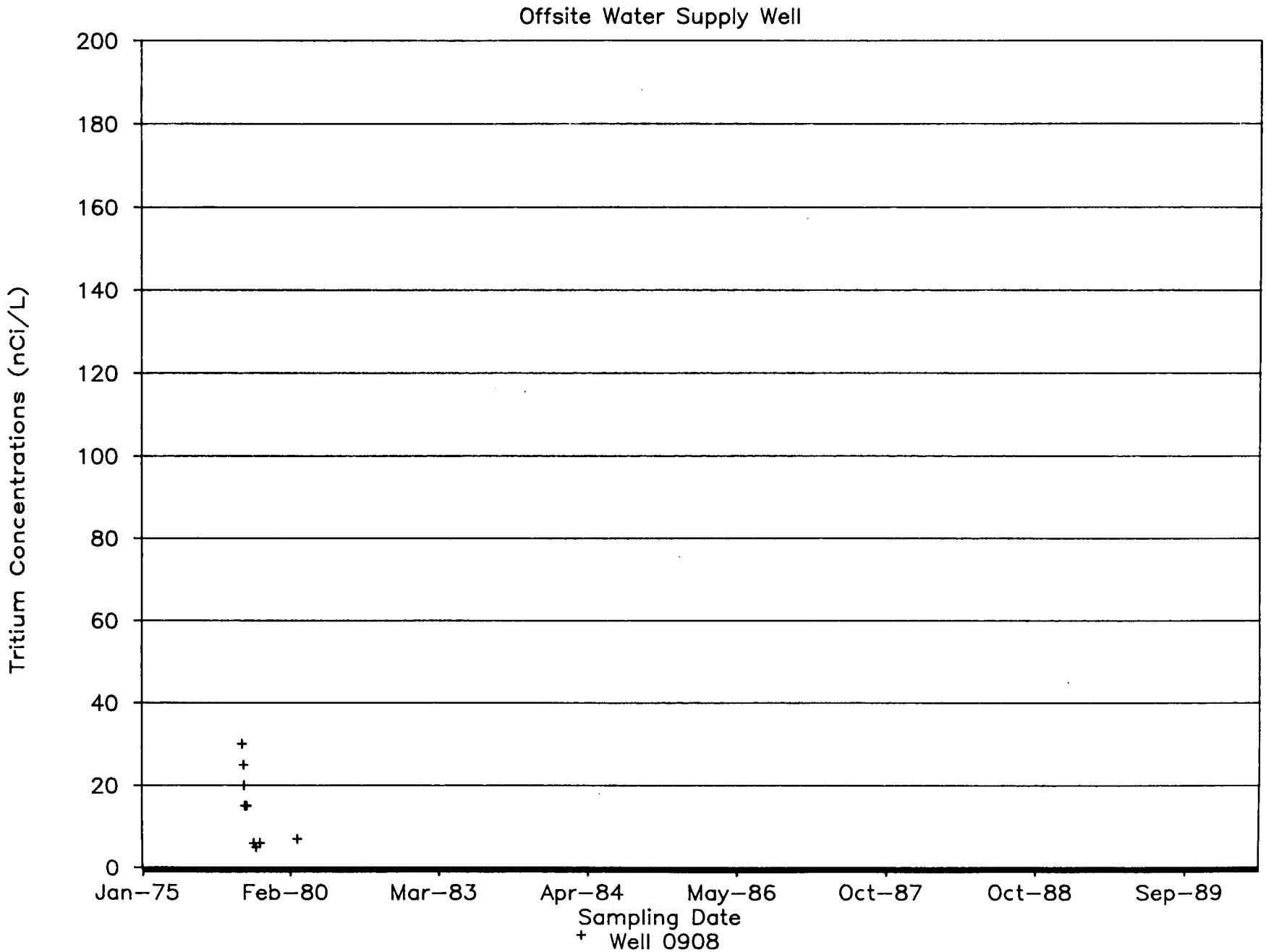

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0903

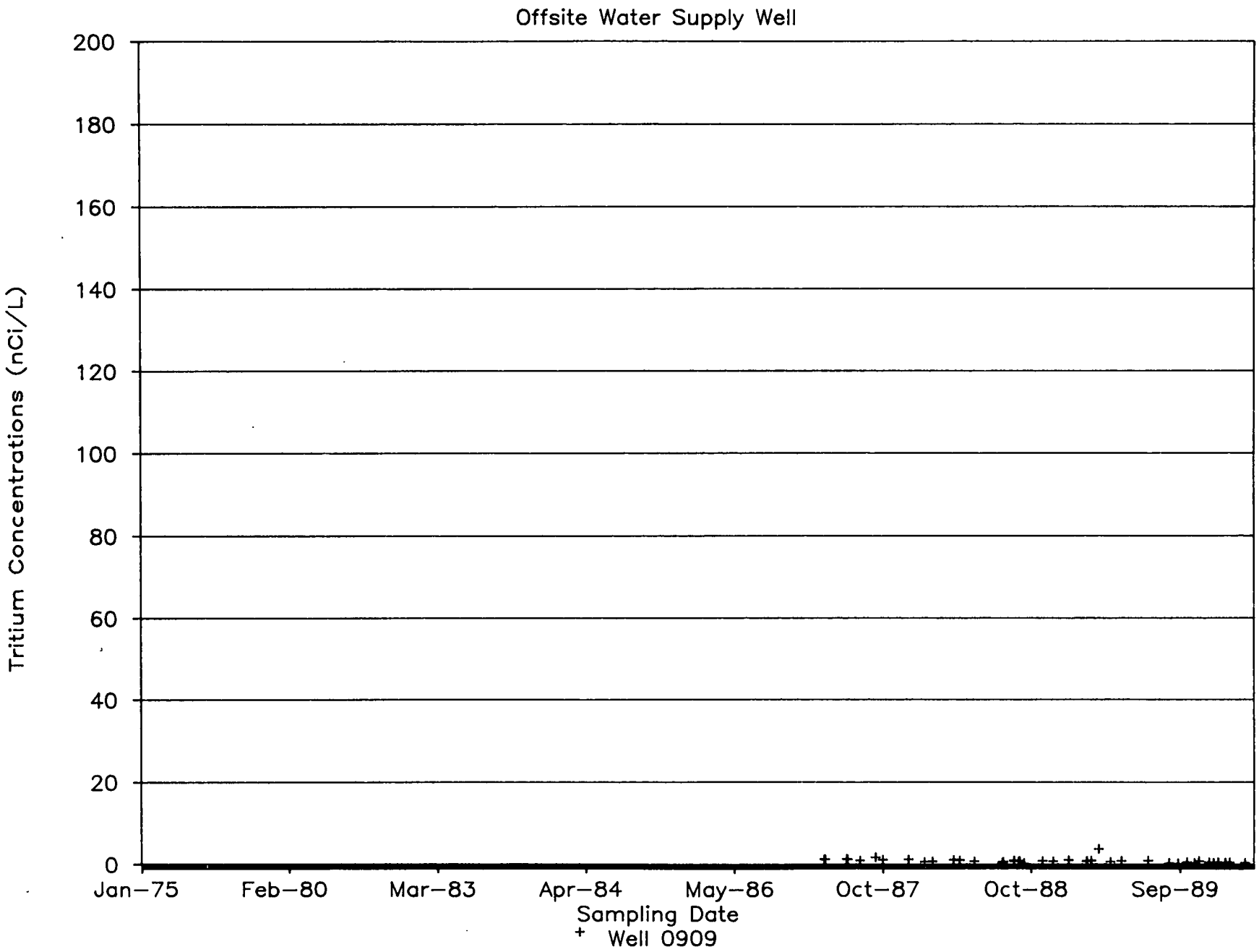

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0904

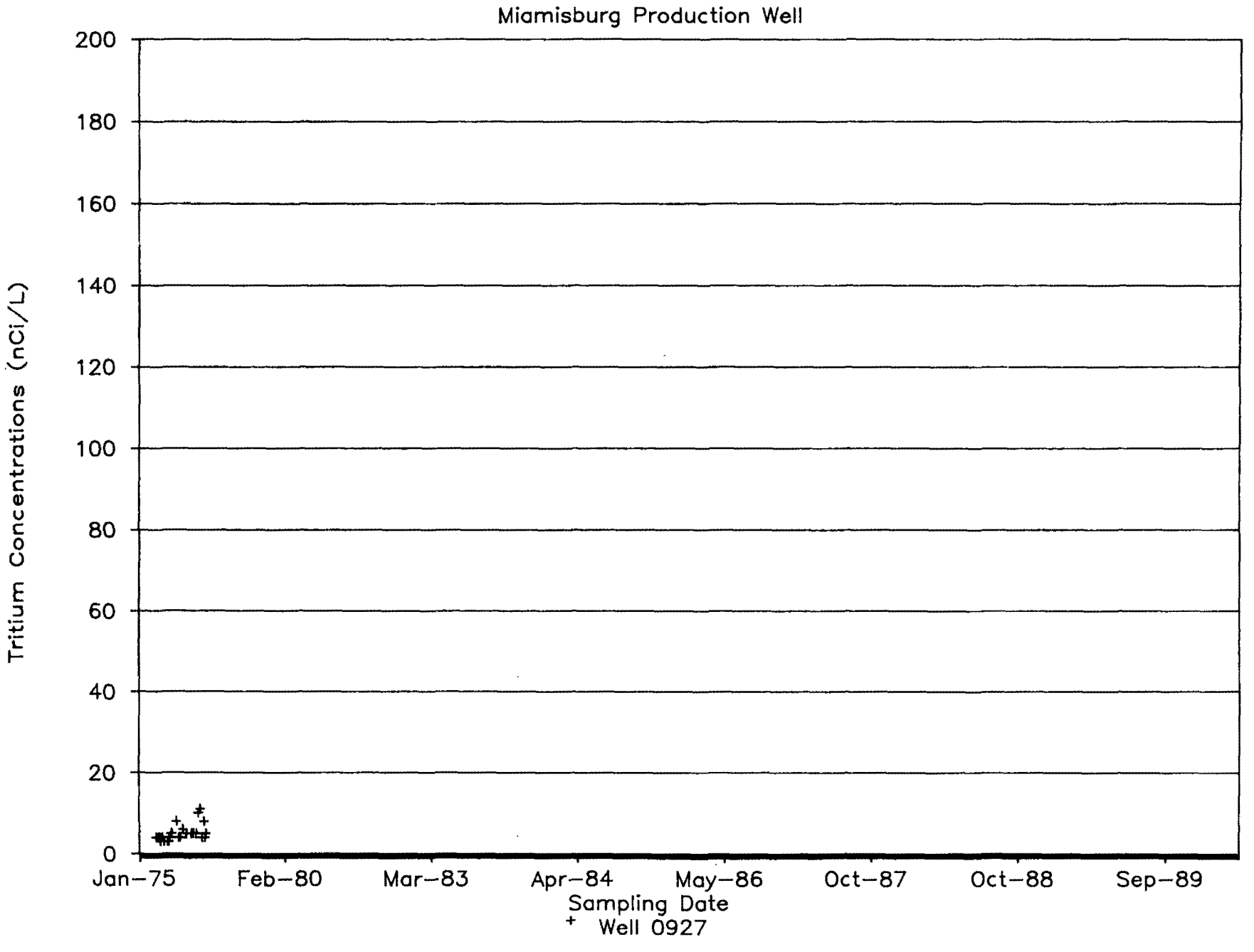

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0905

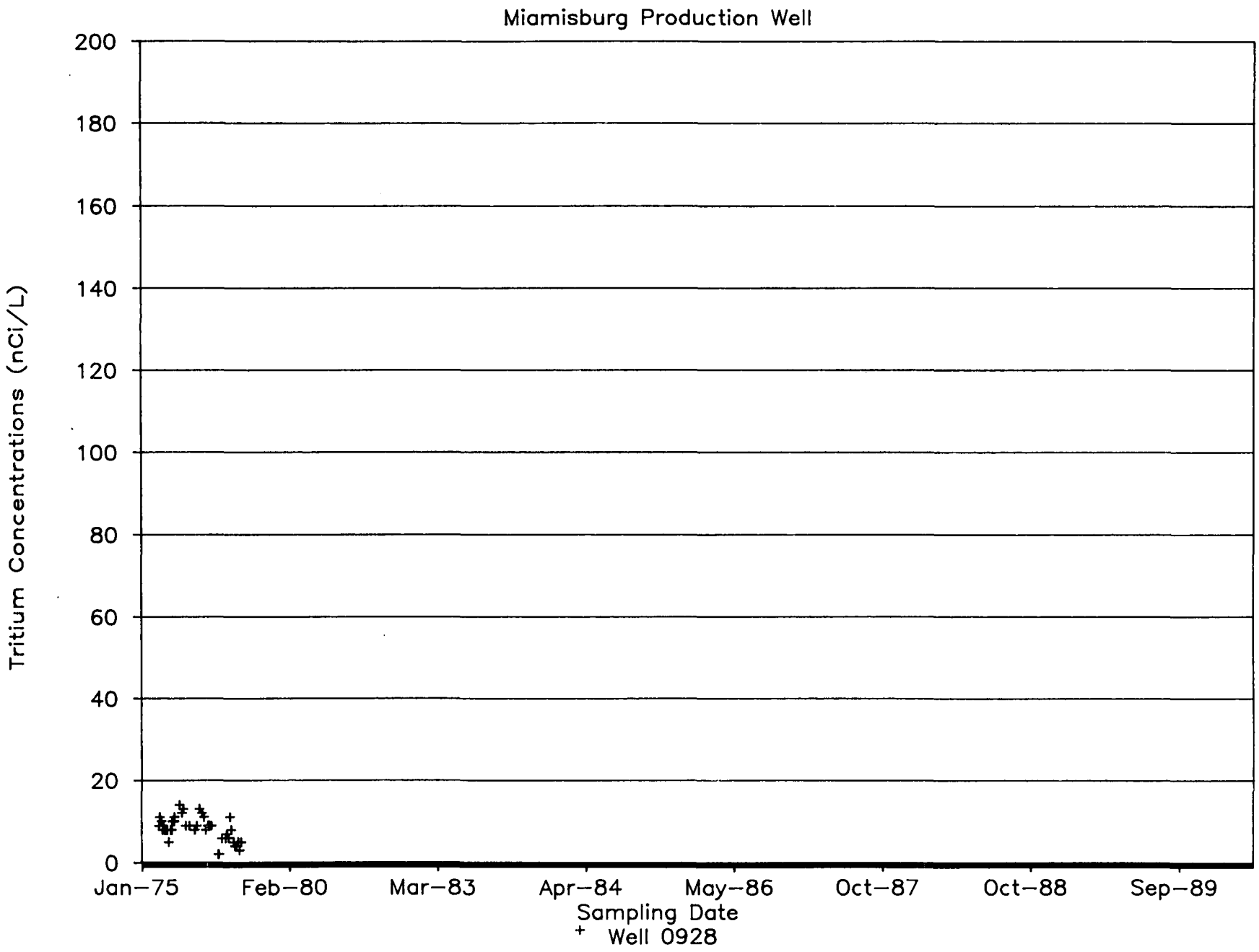

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan–75
Feb–80
Mar–83
Apr–84
May–86
Oct–87
Oct–88
Sep–89
Sampling Date
+ Well 0906

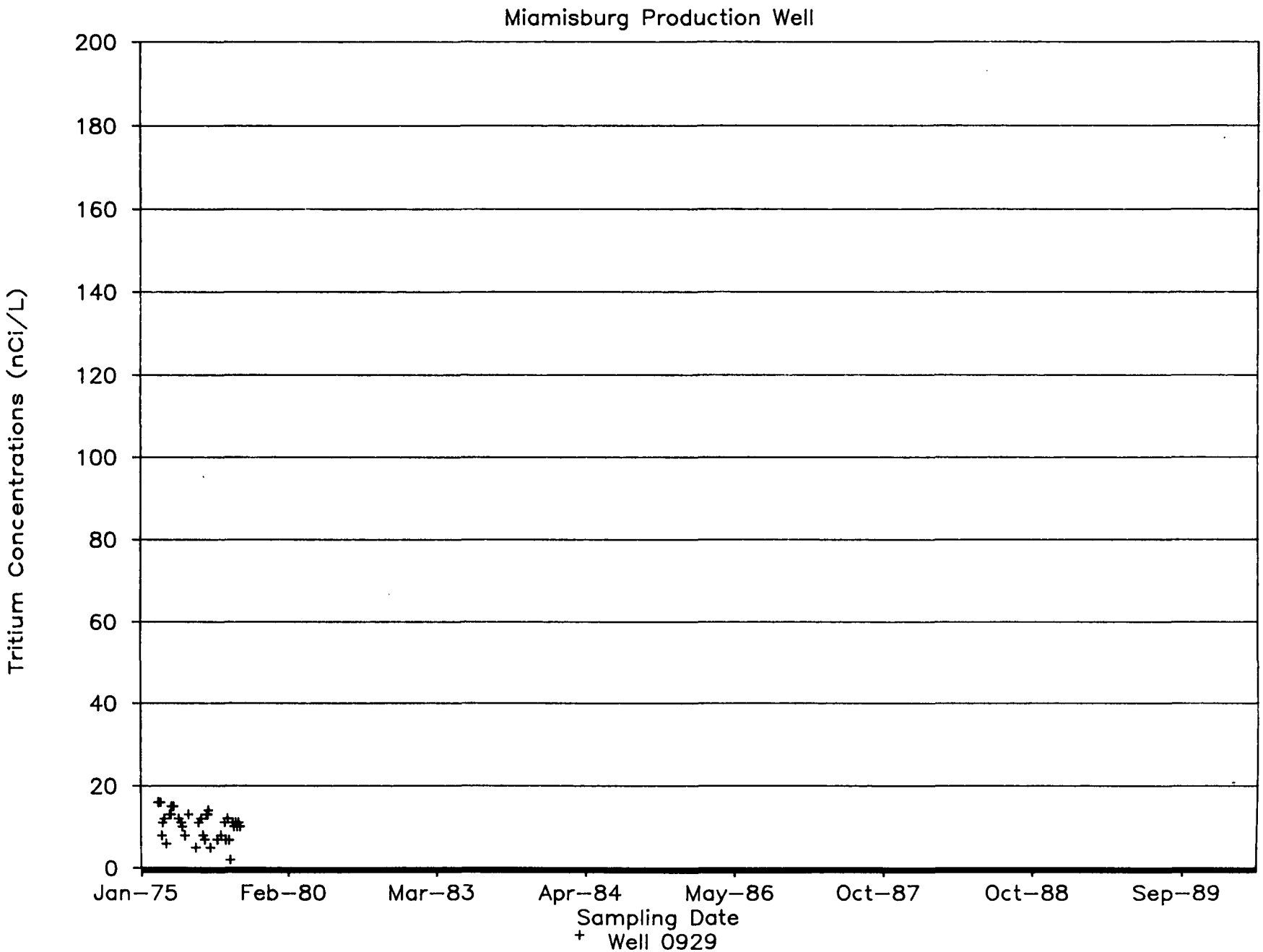

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0907

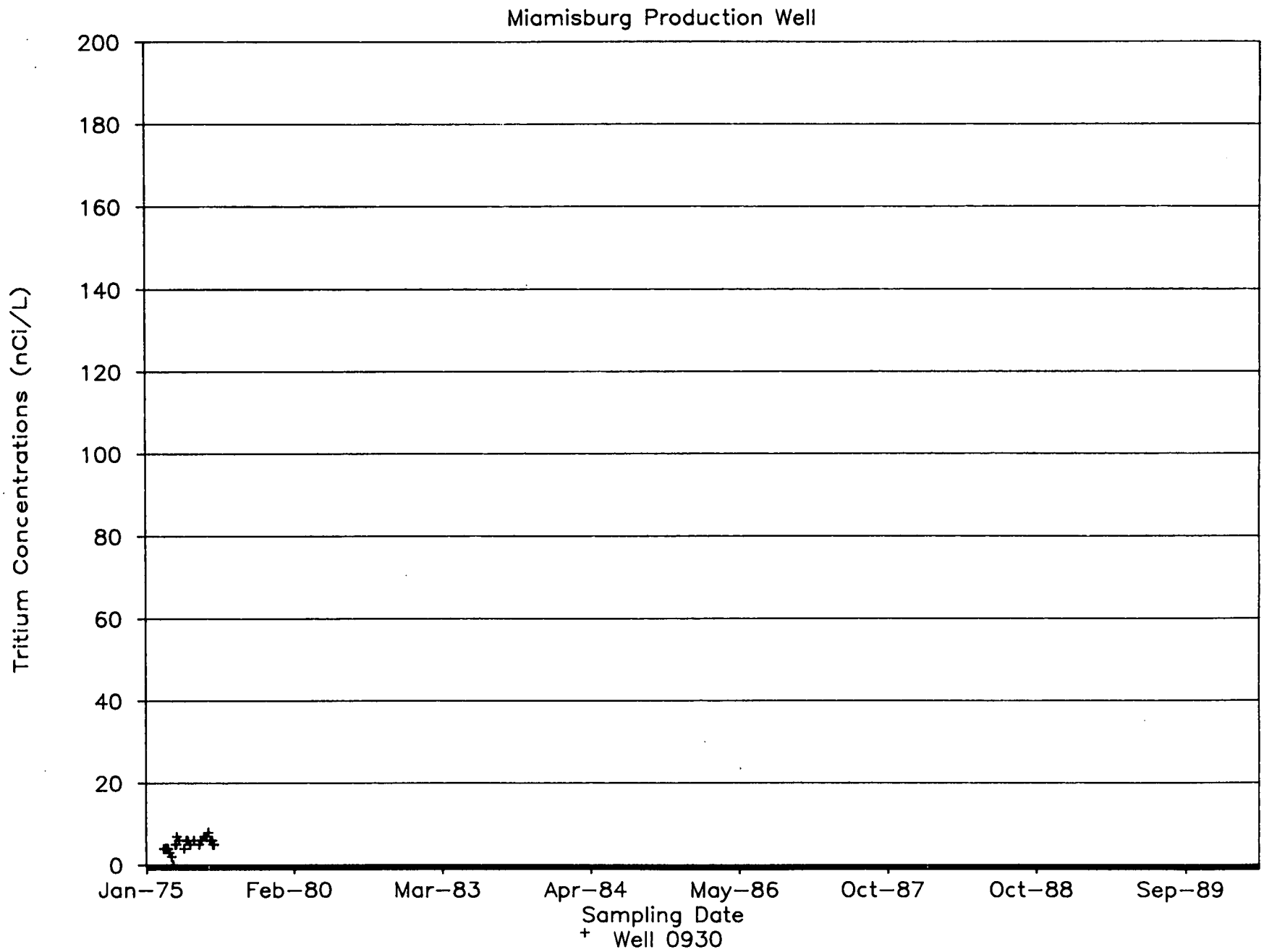

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0908

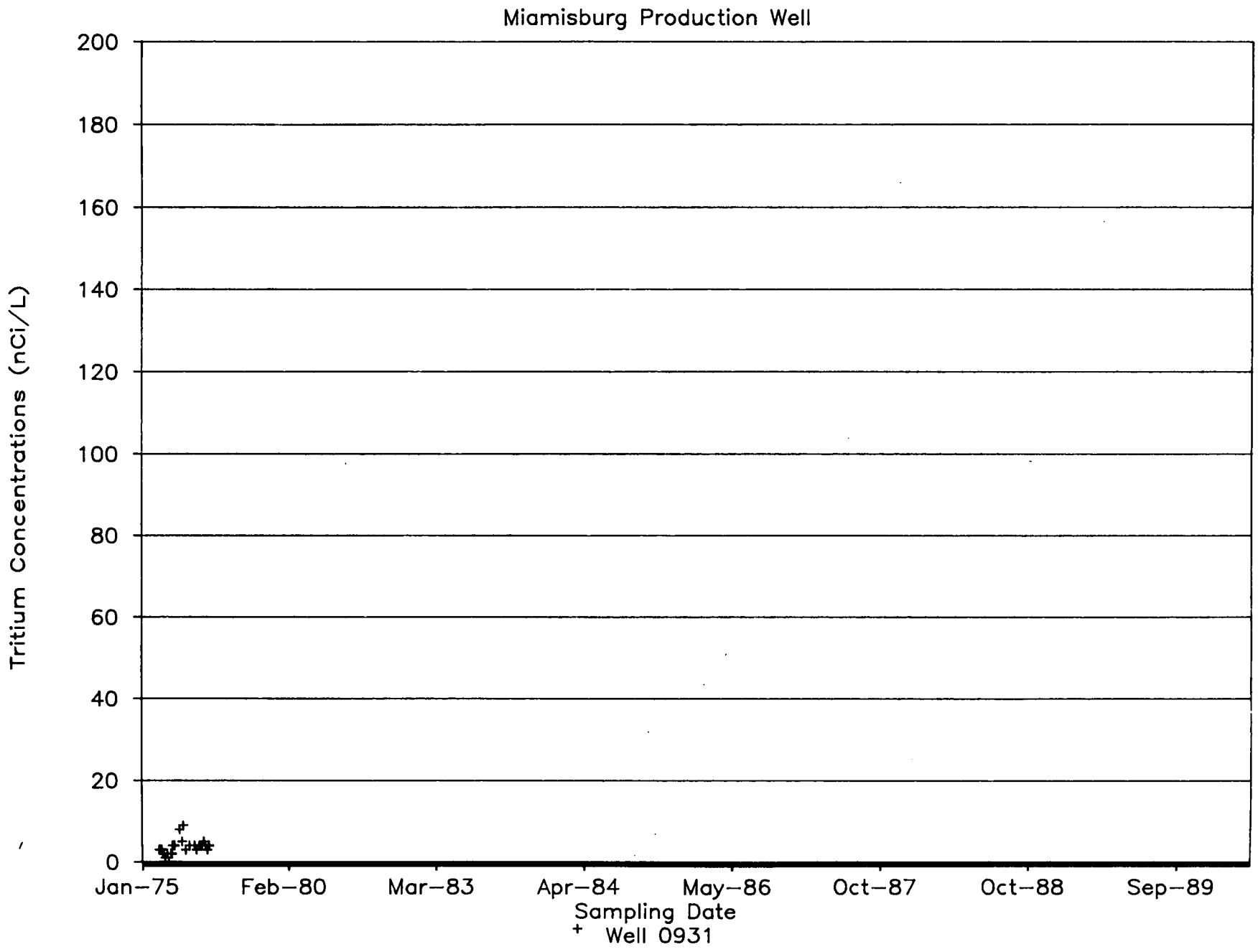

Offsite Water Supply Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0909

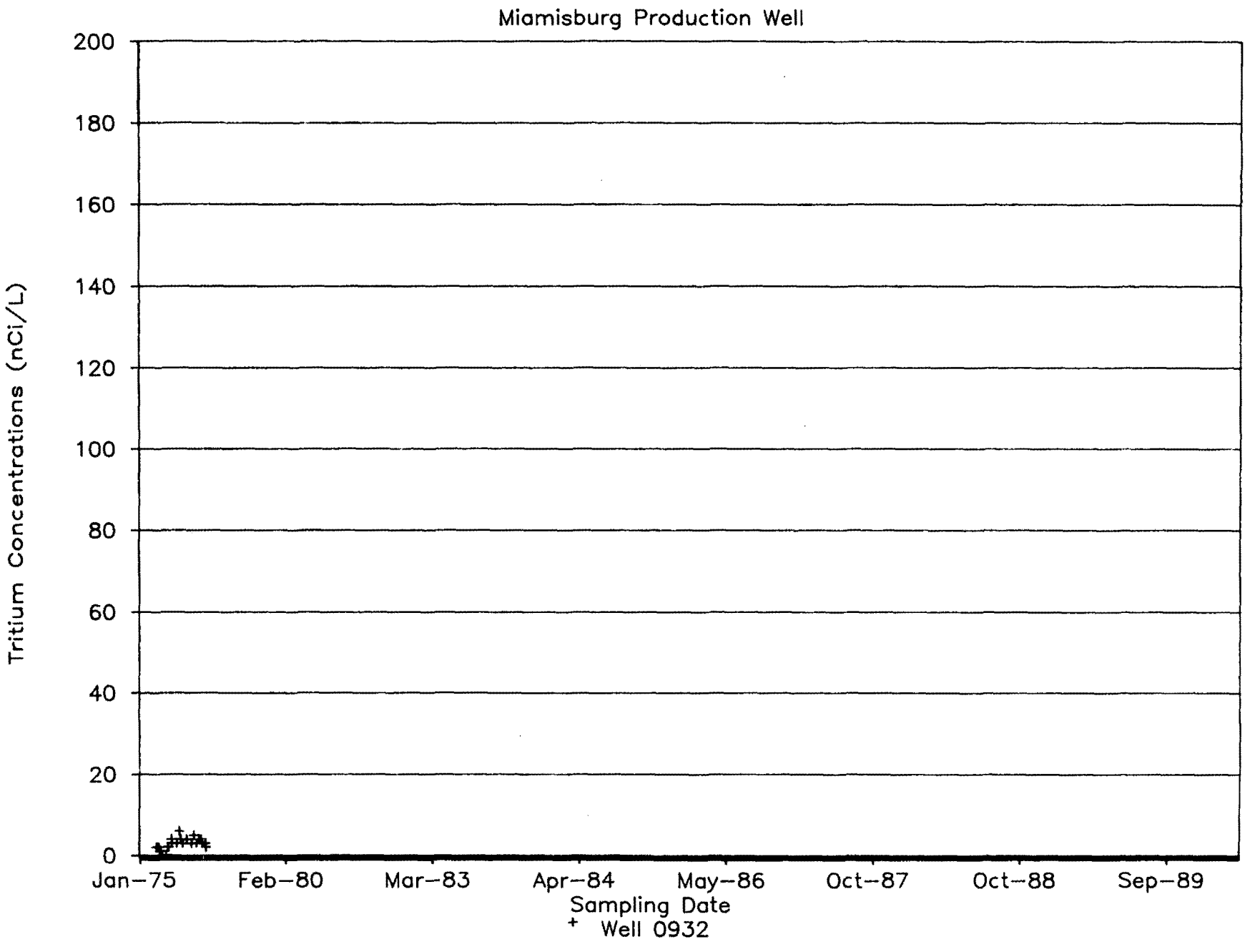

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0927

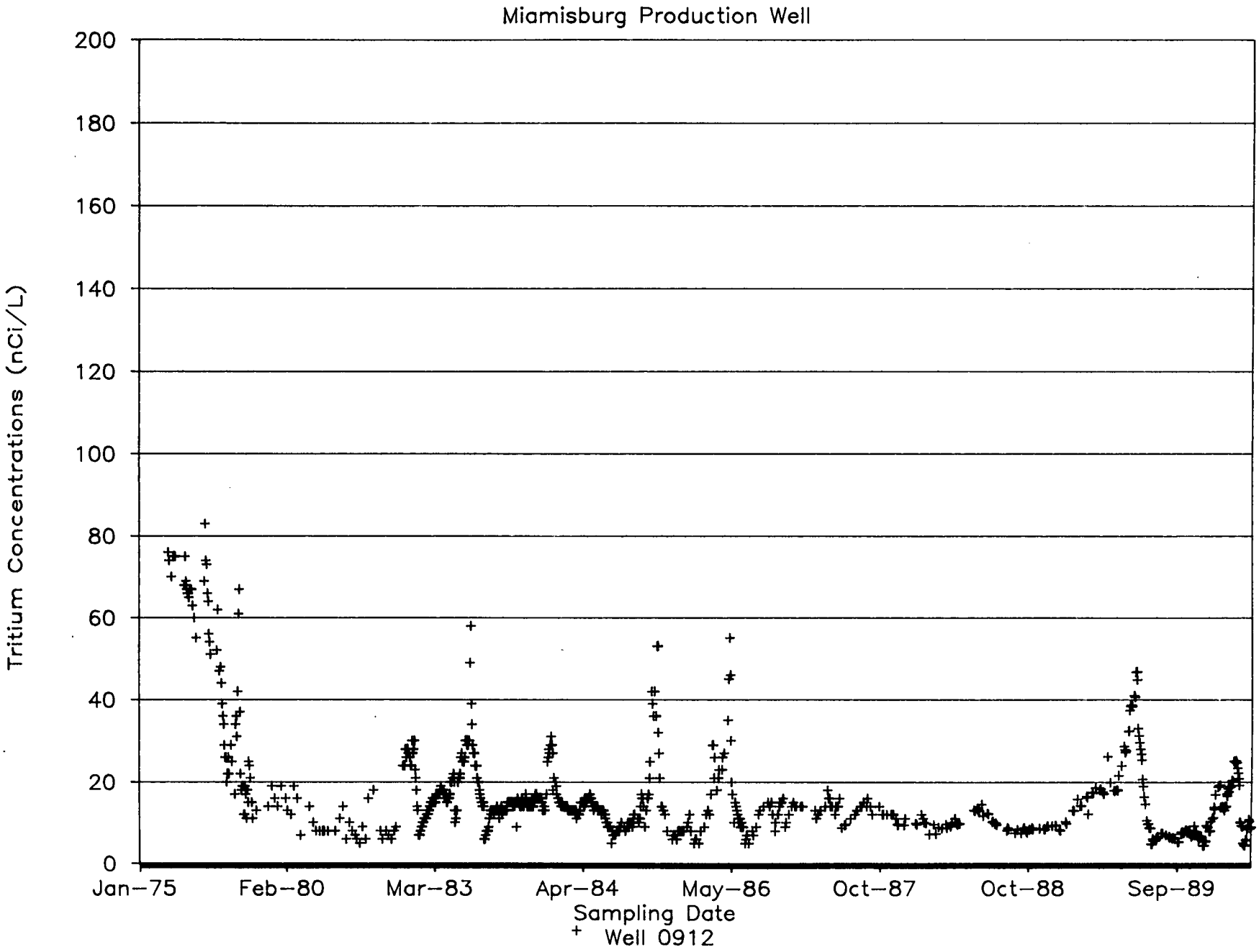

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0928

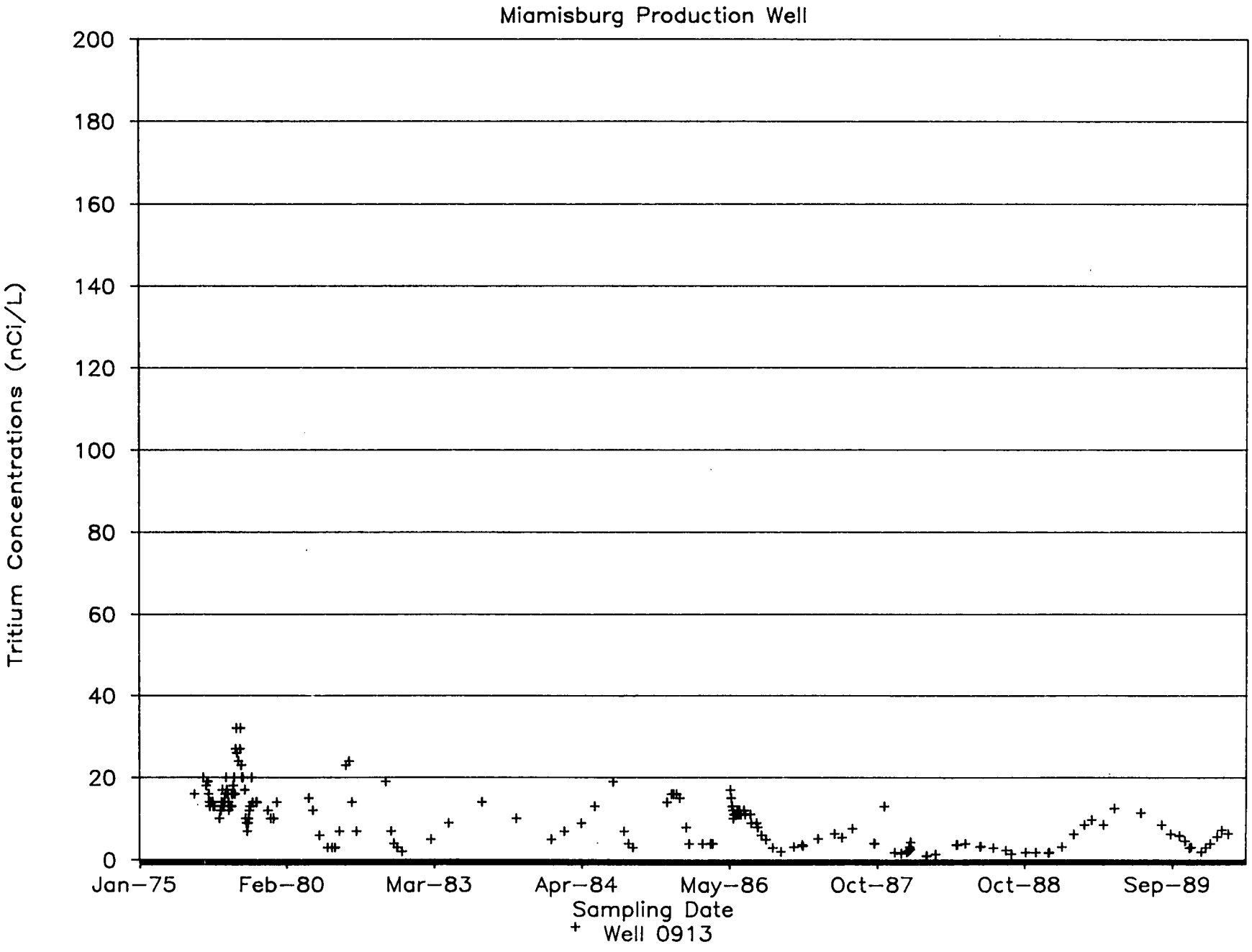

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0929

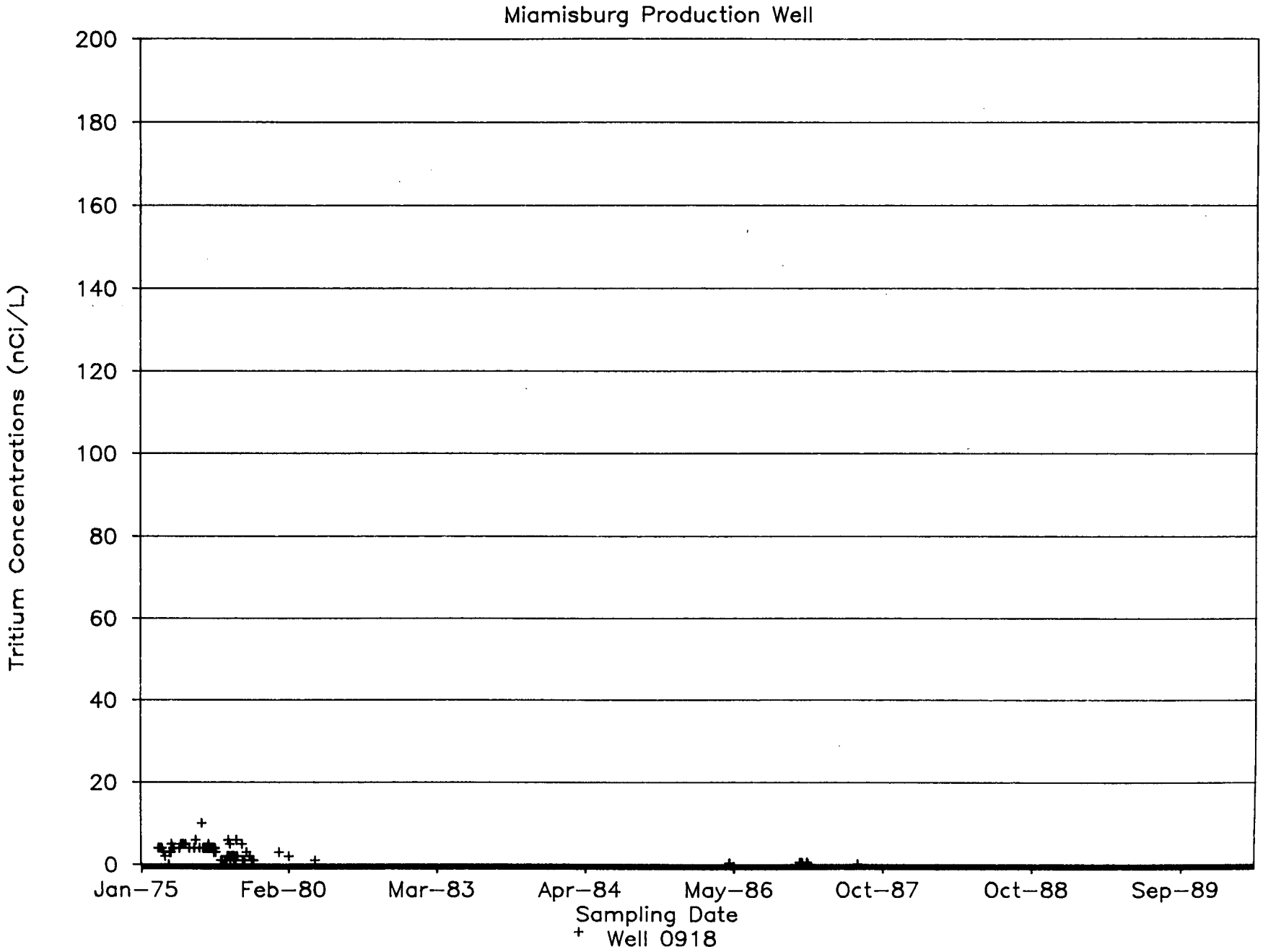

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0930

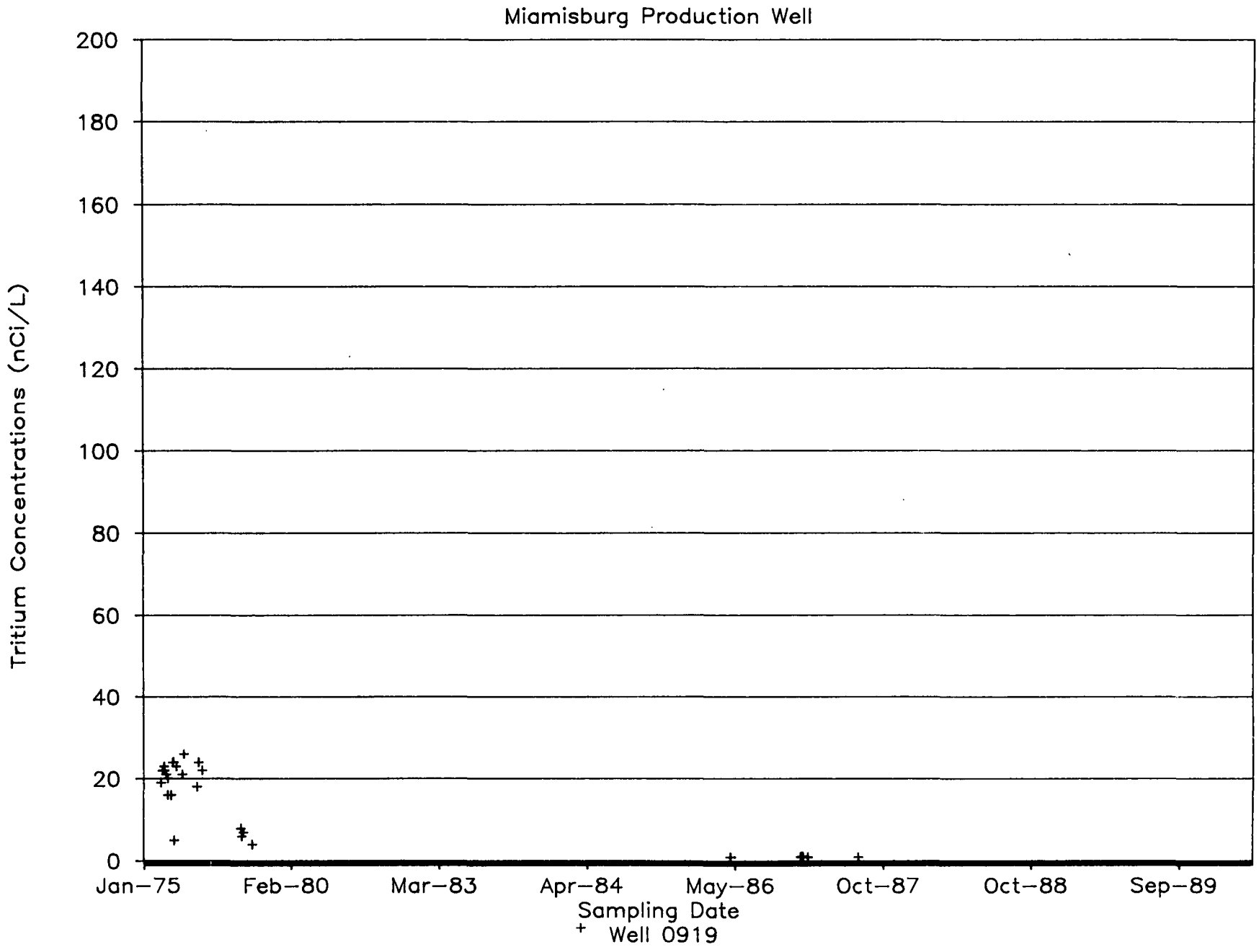

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0931

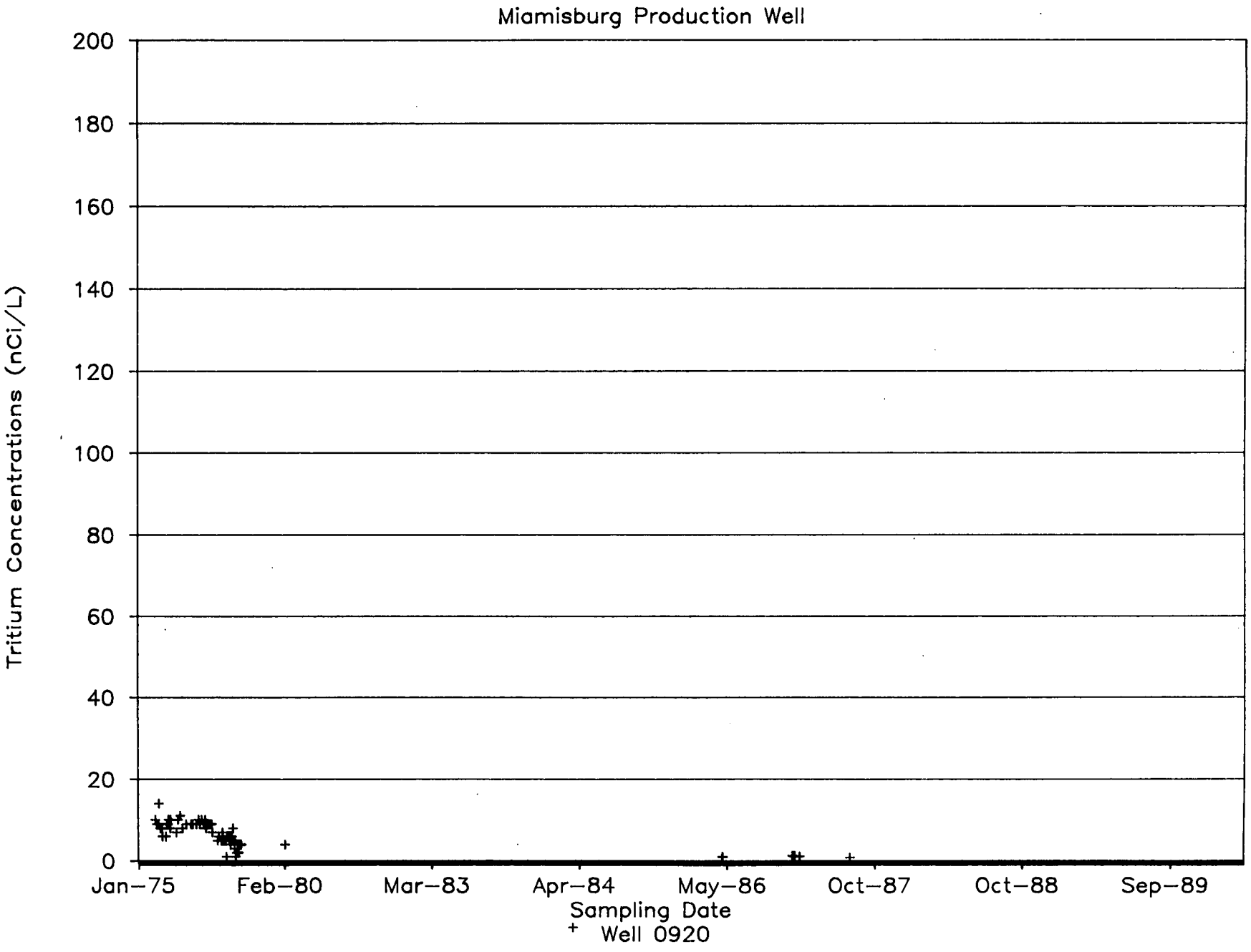

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0932

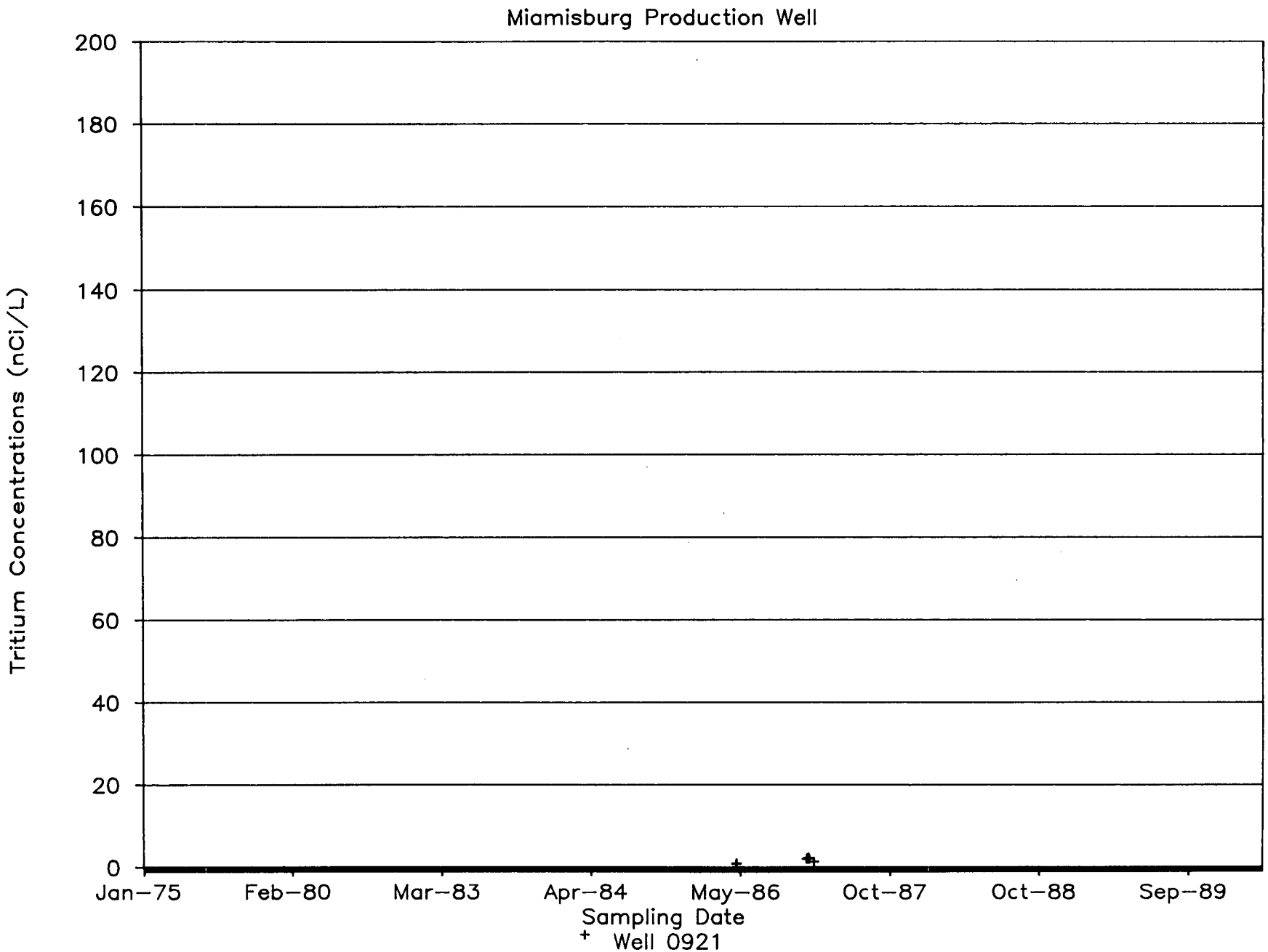

Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0912


Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0913


Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan–75
Feb–80
Mar–83
Apr–84
May–86
Oct–87
Oct–88
Sep–89
Sampling Date
+ Well 0918


Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0919


Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan–75
Feb–80
Mar–83
Apr–84
May–86
Oct–87
Oct–88
Sep–89
Sampling Date
+ Well 0920


Miamisburg Production Well
Tritium Concentrations (nCi/L)
200
180
160
140
120
100
80
60
40
20
0
Jan-75
Feb-80
Mar-83
Apr-84
May-86
Oct-87
Oct-88
Sep-89
Sampling Date
+ Well 0921

APPENDIX V

DATA COMPILATION SHEETS FOR

PLUTONIUM-238 AND -239 IN SURFACE SOILS

COLLECTED IN 1977

New Soil Inventory Data

Soil Sample	direction + distance	Pu-238 dm/g	Pu-239 dm/g	total weight sample, dry	Aliquot weight sample (ma)
14897	270° 4 miles	.00175	.0130	19,445 g	561 g
14895	225° 3 "	.0109	.0188	13,960 g	679 g
14899	315° 3 "	.0012	.01125	19,916 g	514 g
14898	292.5° 3 "	.0018	.0145	19,505 g	604 g
148921	157.5° 3 "	.0015	.0128	18,905 g	548 g
14891	135° 4 "	.0023	.01315	17,238 g	640 g
14893	180° 31 "	.0028	.0154	15,874 g	470 g
14894	202.5° 2 "	.00505	.0216	11,501 g	504 g
14890	112.5° 3 "	.0070	.0229	10,513 g	549 g
14896	247.5° 4 "	.0353	.0191	13,898 g	532.5 g
14900	337.5° 4 "	.0008	.0042	19,073 g	596 g
14883	0° 3 "	.0100	.0144	19,750 g	573 g
14884	22.5° 5 "	.0013	.0135	20,643 g	593 g
14889	67.5° 4 "	.0014	.0122	21,318 g	591 g
14888	67.5° 10 "	.0011	.0161	17,390 g	465 g
14885	45° 11 "	.0008	.0102	19,522 g	585 g
14887	45° 4 "	.002	.0094	24,985 g	525 g
14886	45° 8 "	.00145	.0173	14,374 g	540 g
14882	0° 7 "	.0022	.0240	15,003 g	462 g
14726	270° 27 "	.0008	.0189	16,420 g	1000 g
14725	180° 21 "	.0007	.0168	15,880 g	1001 g
14724	90° 32 "	.0005	.0128	18,670 g	1000 g
14723	0° 30 "	.0006	.0163	17,010 g	999 g

Total d/m Sample Pu-238	Total d/m Sample Pu-239	mci - Pu-238 Sample	mci - Pu-239 Sample	Pu-238 mci/Km²	Pu-239 mci/Km²	Ratio $^{239}Pu / ^{238}Pu$
34.029	252.785	15.83×10^{-9}	113.87×10^{-9}	3.1×10^{-1}	22.8×10^{-1}	7.4
152.164	262.448	68.54×10^{-9}	118.22×10^{-9}	13.7×10^{-1}	23.6×10^{-1}	1.7
23.899	224.055	10.77×10^{-9}	100.93×10^{-9}	2.2×10^{-1}	20.2×10^{-1}	9.2
35.109	282.823	15.81×10^{-9}	127.40×10^{-9}	3.2×10^{-1}	25.5×10^{-1}	8.0
28.398	241.984	12.77×10^{-9}	109.00×10^{-9}	2.6×10^{-1}	21.8×10^{-1}	8.4
39.647	226.680	17.86×10^{-9}	102.11×10^{-9}	3.6×10^{-1}	20.4×10^{-1}	5.7
44.447	244.460	20.02×10^{-9}	110.12×10^{-9}	4.0×10^{-1}	22.0×10^{-1}	5.5
58.080	248.422	26.16×10^{-9}	111.90×10^{-9}	5.2×10^{-1}	22.4×10^{-1}	4.3
73.591	240.748	33.15×10^{-9}	108.45×10^{-9}	6.6×10^{-1}	21.7×10^{-1}	3.3
490.599	265.452	220.75×10^{-9}	119.57×10^{-9}	44.2×10^{-1}	23.9×10^{-1}	0.5
15.258	80.107	6.87×10^{-9}	36.08×10^{-9}	1.4×10^{-1}	7.2×10^{-1}	5.1
197.500	284.400	88.96×10^{-9}	128.11×10^{-9}	17.8×10^{-1}	25.6×10^{-1}	1.4
26.836	278.681	12.09×10^{-9}	125.53×10^{-9}	2.4×10^{-1}	25.1×10^{-1}	10.5
29.845	260.080	13.44×10^{-9}	117.15×10^{-9}	2.7×10^{-1}	23.4×10^{-1}	8.7
19.129	279.979	8.62×10^{-9}	126.12×10^{-9}	1.7×10^{-1}	25.2×10^{-1}	14.8
15.618	199.124	7.04×10^{-9}	89.70×10^{-9}	1.4×10^{-1}	17.9×10^{-1}	12.8
49.970	234.859	22.51×10^{-9}	105.79×10^{-9}	4.5×10^{-1}	21.2×10^{-1}	4.7
20.842	248.670	9.39×10^{-9}	112.01×10^{-9}	1.9×10^{-1}	22.4×10^{-1}	11.8
33.007	360.072	14.87×10^{-9}	162.19×10^{-9}	3.0×10^{-1}	32.4×10^{-1}	10.8
13.136	310.338	5.92×10^{-9}	139.79×10^{-9}	1.2×10^{-1}	28.25×10^{-1}	23.5
11.116	266.784	5.01×10^{-9}	120.17×10^{-9}	1.0×10^{-1}	24.29×10^{-1}	24.3
9.335	238.976	4.20×10^{-9}	107.65×10^{-9}	$.8 \times 10^{-1}$	21.76×10^{-1}	27.2
10.206	277.263	4.60×10^{-9}	124.89×10^{-9}	$.9 \times 10^{-1}$	25.24×10^{-1}	28.0

— LFE —

14557 *	0°	11 miles	.00048	.00562	18,050 g	1000 g
14558 *	22.5°	15 "	.00122	.0175	18,920 g	908 g
14559 a	45°	15 "	.00657	.0139	23,500 g	1000 g
14560	67.5°	15 "	.00054	.0121	17,920 g	1000 g
14561 *	90°	16 "	.00068	.0105	23,470 g	1003 g
14562	112.5°	7 "	.00145	.0248	13,470 g	1000 g
14563 a *	135°	12 "	.00122	.0292	14,200 g	1000 g
14564	157.5°	7 "	.00816	.0232	13,150 g	1000 g
14565	180°	6 "	.00068	.0125	21,140 g	1000 g
14566 a *	202.5°	10 "	.00069	.0136	18,180 g	1000 g
14567 *	225°	6 "	.00065	.0126	18,960 g	1005 g
14568	247.5°	10 "	.00078	.0164	19,870 g	1000 g
14569	270°	10 "	.00105	.0149	18,640 g	1000 g
14570	292.5°	7 "	.00087	.0152	16,420 g	1000 g
14571 a	315°	6 "	.00083	.0129	17,010 g	1000 g
14572	337.5°	6 "	.00216	.0144	16,740 g	1000 g
14723	0°	30 "	.00063	.0170	17,010 g	1000 g
14724 *	90°	32 "	.00058	.0130	18,670 g	1008 g
14725	180°	21 "	.00073	.0161	15,880 g	1000 g
14726 *	270°	27 "	.00079	.0134	16,420 g	1002 g
14559 b ?	45°	15 "	.00574	.0142	23,500 g	1000 g
14563 b	135°	12 "	.00112	.0277	14,200 g	1000 g
14566 b	202.5°	10 "	.00060	.0145	18,180 g	1000 g
14571 b	315°	6 "	.00072	.0134	17,010 g	1000 g
KY - 14524	Ky.		.00153	.0169	* 19020 g	1000 g

LFC

8.664	101.441	3.90×10^{-9}	45.69×10^{-9}	$.8 \times 10^{-1}$	9.1×10^{-1}	11.4
23.082	331.100	10.40×10^{-9}	149.14×10^{-9}	2.1×10^{-1}	29.8×10^{-1}	14.2
154.395	326.650	69.55×10^{-9}	147.14×10^{-9}	14.1×10^{-1}	29.7×10^{-1}	2.1
9.677	216.832	4.36×10^{-9}	97.67×10^{-9}	$.9 \times 10^{-1}$	19.7×10^{-1}	21.9
15.960	246.435	7.19×10^{-9}	111.01×10^{-9}	1.4×10^{-1}	22.2×10^{-1}	15.9
19.532	334.056	8.80×10^{-9}	150.48×10^{-9}	1.8×10^{-1}	30.4×10^{-1}	16.9
173.241	414.640	7.80×10^{-9}	186.77×10^{-9}	1.6×10^{-1}	37.4×10^{-1}	23.4
107.304	305.080	48.34×10^{-9}	137.42×10^{-9}	9.8×10^{-1}	27.8×10^{-1}	2.8
14.375	264.250	6.48×10^{-9}	119.03×10^{-9}	1.3×10^{-1}	24.06×10^{-1}	18.5
12.544	247.248	5.65×10^{-9}	111.37×10^{-9}	1.1×10^{-1}	22.3×10^{-1}	20.3
12.324	238.896	5.55×10^{-9}	107.61×10^{-9}	1.1×10^{-1}	21.5×10^{-1}	19.5
15.499	325.868	6.98×10^{-9}	146.79×10^{-9}	1.4×10^{-1}	29.7×10^{-1}	21.2
19.572	277.736	8.82×10^{-9}	125.11×10^{-9}	1.8×10^{-1}	25.3×10^{-1}	14.1
14.285	249.584	6.43×10^{-9}	112.43×10^{-9}	1.3×10^{-1}	22.7×10^{-1}	17.5
14.118	219.429	6.36×10^{-9}	98.84×10^{-9}	1.3×10^{-1}	20.0×10^{-1}	15.4
36.158	241.056	16.29×10^{-9}	108.58×10^{-9}	3.3×10^{-1}	21.9×10^{-1}	6.6
10.716	289.170	4.83×10^{-9}	130.26×10^{-9}	1.0×10^{-1}	26.3×10^{-1}	26.3
10.829	242.710	4.88×10^{-9}	109.33×10^{-9}	1.0×10^{-1}	22.1×10^{-1}	22.1
11.592	255.668	5.22×10^{-9}	115.17×10^{-9}	1.1×10^{-1}	23.3×10^{-1}	21.2
12.972	220.028	5.84×10^{-9}	99.11×10^{-9}	1.2×10^{-1}	19.82×10^{-1}	16.5
134.890	333.700	60.76×10^{-9}	150.32×10^{-9}	12.3×10^{-1}	30.4×10^{-1}	2.5
15.904	393.340	7.16×10^{-9}	177.18×10^{-9}	1.4×10^{-1}	35.8×10^{-1}	25.6
10.908	263.610	4.91×10^{-9}	118.74×10^{-9}	1.0×10^{-1}	24.0×10^{-1}	24.0
12.247	227.934	5.52×10^{-9}	102.67×10^{-9}	1.1×10^{-1}	20.7×10^{-1}	18.8
15.331	169.338	6.91×10^{-9}	76.28×10^{-9}	2.8×10^{-1}	30.8×10^{-1}	11.0

WESTON
MANAGERS DESIGNERS/CONSULTANTS
6501 Americas Parkway N.E.
SUITE 800
ALBUQUERQUE, NM 87110
PHONE: (505) 884-5050

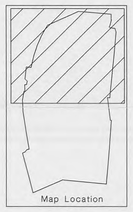
ER PROGRAM
MOUND PLANT

Miamisburg, Ohio

PLATE 1
(1 of 2)

Site Survey Project Sampling Locations

Prepared for
Site Scoping Report: Volume 3,
Radiological Site Survey



Legend

- Structure
- Paved road
- Dirt road
- Water
- Mound Plant Boundary
- 0015 Surface Location
- 0002 Core Location
- Potential Release Site
- Elevated Activity
- 19-17 Sampling Location for Verification Survey of Former WTS Pipeline

0 50 100 150 200
Scale in Feet
1 inch = 100 feet

NOTE: Accuracy of surface locations is +/- 25 feet.

TN
GN
MN

1981 MAGNETIC NORTH DECLINATION AT CENTER OF PLANT. MAGNETIC NORTH IS 3 DEGREES WEST OF TRUE NORTH. DECLINATION BETWEEN STATE PLANE (GRID) NORTH IS 1. 13 DEGREES WEST OF TRUE NORTH.

Grid system is based on the Ohio State Plane Coordinate System

J:\DGN\MOUND\M0768.DGN 122292