

INEL SITE ENVIRONMENTAL SURVEILLANCE DATA FOR THE FIRST QUARTER 1992

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# CONTENTS

	page
INEL SITE ENVIRONMENTAL SURVEILLANCE DATA.....	1
General Information.....	1
ATMOSPHERIC SAMPLING.....	3
Low-Volume Samplers.....	3
Gross Alpha.....	5
Gross Beta.....	5
Weekly Comparisons.....	5
Monthly Comparisons.....	6
Quarterly Comparisons.....	13
Specific Nuclides.....	13
Gamma-Emitting Nuclides.....	13
Strontium-90.....	14
Transuranic Nuclides.....	14
High-Volume Samplers.....	14
Atmospheric Tritium Samplers.....	15
Precipitation Samplers.....	15
Nitrogen Oxides Samplers.....	16
Sulfur Dioxide Sampler.....	16
WATER SAMPLING.....	18
Production Wells.....	18
CFA.....	18
ICPP.....	21
Rifle Range.....	23
RWMC.....	23
Observation Wells.....	23
ICPP.....	24
TRA.....	28
RWMC.....	35

## FIGURES

No.		page
A-1	Low Volume Air Sampling Locations.....	4
A-2	ANL-W vs. Distant Community Mean Gross Beta Concentration....	7
A-3	ARA vs. Distant Community Mean Gross Beta Concentration.....	7
A-4	CFA vs. Distant Community Mean Gross Beta Concentration.....	8
A-5	EBR-I vs. Distant Community Mean Gross Beta Concentration....	8
A-6	EFS vs. Distant Community Mean Gross Beta Concentration.....	9
A-7	ICPP vs. Distant Community Mean Gross Beta Concentration.....	9
A-8	NRF vs. Distant Community Mean Gross Beta Concentration.....	10
A-9	PBF vs. Distant Community Mean Gross Beta Concentration.....	10
A-10	RWMC vs. Distant Community Mean Gross Beta Concentration.....	11
A-11	TAN vs. Distant Community Mean Gross Beta Concentration.....	11
A-12	TRA vs. Distant Community Mean Gross Beta Concentration.....	12
A-13	VANB vs. Distant Community Mean Gross Beta Concentration.....	12
B-1	USGS Well Locations.....	19
B-2	Tritium Concentrations in CFA Production Wells.....	20
B-3	Tritium Concentrations in ICPP Production Wells.....	22
B-4	Strontium-90 Concentrations in ICPP Production Wells.....	22
C-1	Tritium in ICPP Area Ground Water.....	26
C-2	Strontium-90 in ICPP Area Ground Water.....	26
C-3	Hydrograph of USGS Well #40 (Aquifer Ground Water).....	27
C-4	Hydrograph of USGS Well #50 (Deep Perched).....	27
D-1	Tritium in TRA Area Ground Water.....	30
D-2	Tritium Concentration in Discharges to TRA Radioactive Waste Infiltration Pond.....	30
D-3	Specific Conductance in TRA Area Ground Water.....	32
D-4	Total Chromium in TRA Area Ground Water.....	32
D-5	Hydrograph of USGS Well #58 (Regional Ground Water).....	33
D-6	Hydrograph of Auger Hole TRA #A-77 (Shallow Perched).....	33
D-7	Hydrograph of Auger Hole TRA #A-13 (Shallow Perched).....	34
D-8	Hydrograph of USGS Well #54 (Deep Perched).....	34
E-1	Tritium Concentrations in RWMC Wells.....	36
E-2	Hydrographs of RWMC Wells #87 and #90.....	37
E-3	Hydrographs of RWMC Wells #88 and #89.....	37

TABLE

No.		page
I	INEL Routine Radiological Environmental Surveillance Programs.....	2

## INEL SITE ENVIRONMENTAL SURVEILLANCE DATA - FIRST QUARTER 1992

### General Information

This report summarizes data from analyses of samples collected at INEL Site locations by the Environmental Sciences Branch (ESB) of the Radiological and Environmental Sciences Laboratory (RESL), U.S. Department of Energy Idaho Field Office during the first quarter of calendar year 1992. Data from analyses of some water samples collected by the INEL Project Office of the U.S. Geological Survey (USGS) are also included. Data were obtained from analyses of air and well and surface water samples. Table I summarizes the radiological sampling programs. The approximate minimum detectable concentrations (-MDC) shown in Table I and the results of the air and water radiological surveillance program are compared to the derived concentration guides (DCG) listed in DOE Order 5400.5 dated February 8, 1990. Nonradiological pollutants are compared to appropriate EPA standards.

The RESL Analytical Chemistry Branch (ACB) and Laboratory Quality Branch (LQB) report analytical results with the estimated analytical uncertainty "1s" where all analytical uncertainties have been propagated. RESL has adopted the following interpretation of results near the minimum detectable concentration (MDC). If the result is less than or equal to twice the estimated analytical uncertainty, the material is not considered to be detected by the analysis. If the result lies in the range of two to three times its estimated analytical uncertainty, detection of the material by the analysis may be questionable because of statistical fluctuations. Due to the questionable nature of results between "2s" and "3s", they will usually be reported but not discussed. If the result exceeds three times its estimated analytical uncertainty, there is confidence that the material was detected by the analysis, and the data will be discussed.

TABLE I  
ONSITE RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE PROGRAM SUMMARY

**AIR**

Type of Analysis	Frequency of Analysis	Number of Samples	Sample Size	Count Time	-MDC <sup>a</sup>	% DCG
<b>Low-Volume Samplers</b>						
Gross Beta	Weekly	12	330 m <sup>3</sup>	20 min.	8 E-15 $\mu$ Ci/mL	0.3 <sup>b</sup>
Am	Quarterly	6	4000	1000	8 E-18	0.04
Pu	Quarterly	6	4000	1000	6 E-18	$\leq$ 0.03
Specific gamma	Quarterly	12	4000	60	1-10 E-15	$\leq$ 0.01
Sr-90	Quarterly	2	4000	50	1 E-16	0.001
<b>High-Volume Samplers</b>						
Gross Gamma	Daily	2	2000	10	N/A <sup>c</sup>	N/A
Specific gamma	Monthly	2	56000	60	1-10 E-16	$\leq$ 0.001 <sup>d</sup>
<b>Other Samplers</b>						
H-3 as HTO	3 to 7 weeks	2	10-20	20	1 E-11	0.01
Kr-85	Biweekly	1	0.6-1	100	2 E-12	0.00007

**WATER**

<b>Production Wells</b>						
Gross Beta	Monthly	26	250 mL	20	5 E-9 $\mu$ Ci/mL	5 <sup>b</sup>
Gross Alpha	Monthly	26	100	60	3 E-9	10 <sup>e</sup>
Sr-90	Monthly	2	4000	20	0.5 E-9	0.05
H-3 as HTO	Monthly	26	10	20	0.4 E-6	0.02
<b>Observation Wells</b>						
Gamma Scans:	Quarterly	6	400	60	10-100 E-9	$\leq$ 6 <sup>d</sup>
	Semiannually	12	400	60	10-100 E-9	$\leq$ 6 <sup>d</sup>
	Annually	18	400	60	10-100 E-9	$\leq$ 6 <sup>d</sup>
Sr-90	Quarterly	14	400	20	5 E-9	0.5
	Semiannually	39	400	20	5 E-9	0.5
	Annually	6	500	1000	0.05 E-9	0.2
Am	Semiannually	7	500	1000	0.04 E-9	0.1
	Annually	3	500	1000	0.04 E-9	0.1
Pu	Quarterly	28	10	20	0.4 E-6	0.02
	Semiannually	82	10	20	0.4 E-6	0.02

**SOIL**

Specific gamma	Annually	Varies	400 g	1000	4 E-8 $\mu$ Ci/g	N/A <sup>f</sup>
Pu	Annually	Varies	10	1000	2 E-9	N/A
Am	Annually	Varies	10	1000	3 E-7	N/A
Sr-90	Annually	Varies	10	50	9 E-8	N/A

**ENVIRONMENTAL RADIATION**

Thermoluminescent Dosimeters	Semiannually	135	5 TLDs per dosimeter	N/A	5 mR	N/A
Gamma Radiation Surveys	Annually <sup>g</sup>	N/A	N/A	N/A	N/A	N/A

- Approximate minimum detectable concentration.
- DCG based on the most restrictive beta emitter (Ra-228).
- Not applicable.
- For principle gamma-emitting radionuclides.
- DCG based on Am-241, Pu-239 and Pu-240.
- Onsite soil sampling is performed each year at a different facility. Facilities are sampled on a rotating seven-year schedule.
- Surveys performed each year at different facilities on a rotating 3-year schedule.

## ATMOSPHERIC SAMPLING

### Low-Volume Samplers

Atmospheric low-volume samplers are in operation at 12 onsite locations just outside facility security fences, seven INEL perimeter (boundary) locations, and four distant (background) locations (Figure A-1). Each low-volume air sampler contains two filters: a membrane prefilter for measurement of airborne particulates and a charcoal cartridge for collection of iodine. ESB personnel change the filters weekly and submit them to the ACB for analysis.

The gross alpha activity is determined weekly for particulate filters from eight selected locations--four offsite and four onsite--as a nonspecific screening technique for alpha-emitting radionuclides. Results are tabulated and inspected each week for anomalies.

Gross gamma activity is determined weekly for the charcoal cartridges to screen for Iodine-131. If activity is detected, the cartridges may be analyzed by gamma spectrometry specifically for I-131.

The gross beta activity is determined weekly for the particulate filters from each location as a screening technique to give timely information in the event of Site releases, worldwide fallout, etc. This information may be difficult to interpret due to local variations in gross beta levels at any given time or location. Any of several factors may be responsible for the variations observed, including: loading of dust or soot on certain individual filters and varying concentrations of natural or fallout radioactivity as a result of diverse local meteorological conditions. If unusually high gross beta activity is detected on the filters, they may be submitted for gamma spectrometry for more information.

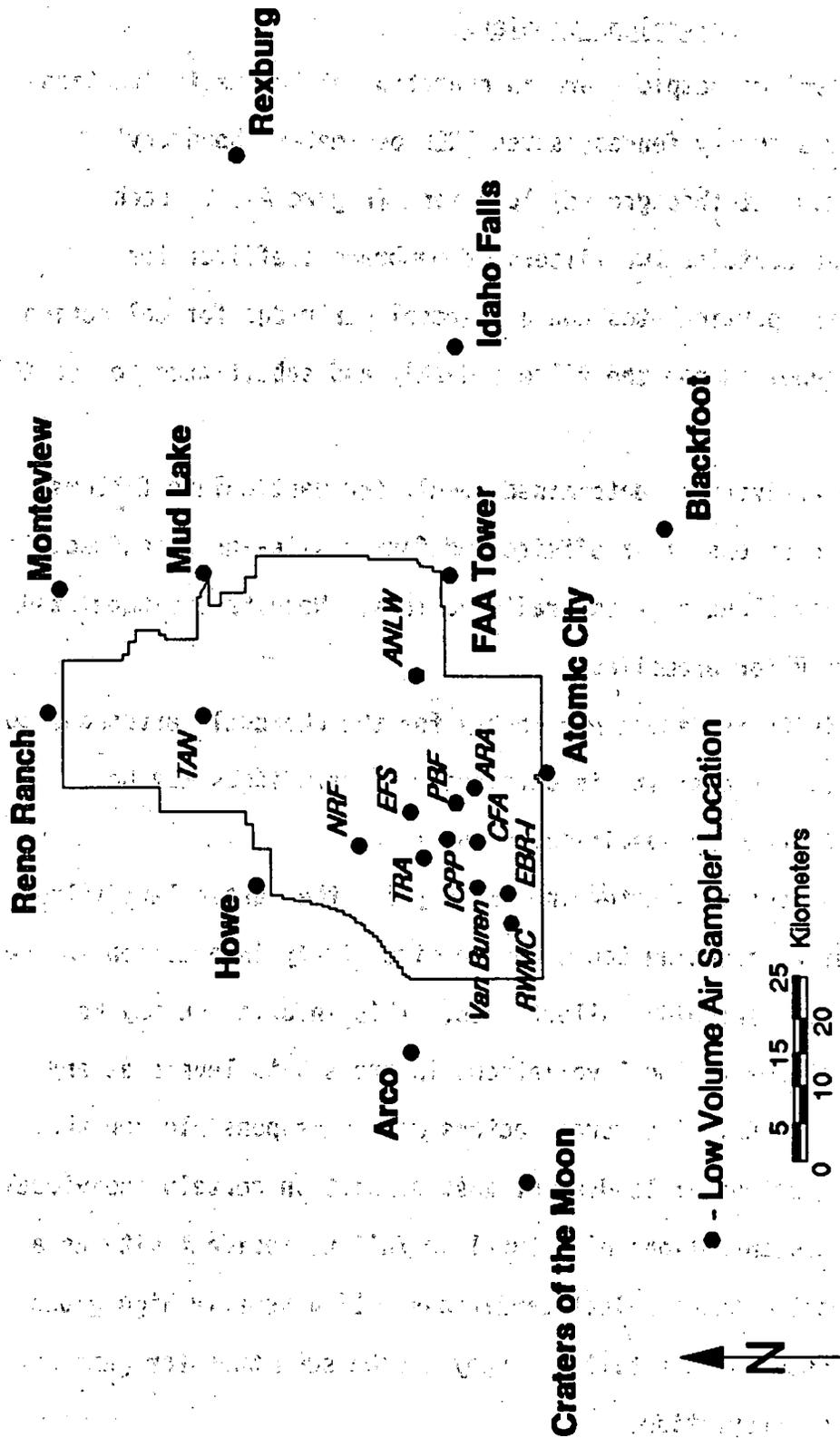


Figure A-1. Low-volume Air Sampling Locations

At the end of each quarter, composites of the particulate filters for each location are submitted to ACB and to the Laboratory Quality Branch (LQB) for specific nuclide analyses. When interpreting air sampling data to assess possible INEL impact, more reliance is placed upon results from analyses for specific man-made radionuclides than upon gross alpha or gross beta concentrations. Gross alpha and gross beta analyses are used primarily as screening techniques to detect sudden increases over natural background radioactivity.

#### Gross Alpha

Gross alpha concentrations were, in general, typical of those normally measured. An exception was at Mud Lake, where the gross alpha activity was statistically greater than the gross alpha concentration at the distant locations for the month of January and for the quarter. Gross alpha activity is generally higher at Blackfoot than at boundary or onsite locations due to contributions from non-INEL sources. During the first quarter, the average gross alpha concentration at Blackfoot was  $1.7 \text{ E-}15 \text{ } \mu\text{Ci/mL}$  (9% DCG), compared to an average of  $1.8 \text{ E-}15 \text{ } \mu\text{Ci/mL}$  (9% DCG) at Mud Lake. The onsite location average was  $1.4 \text{ E-}15 \text{ } \mu\text{Ci/mL}$  (7% DCG).

#### Gross Beta

Results from analyses of particulate filters for all locations are interpreted with the help of statistical comparisons as described in the following sections.

Weekly Comparisons. The gross beta activities for all sampling locations are analyzed each week using an analysis-of-variance test, a lognormal plot,

and comparisons between individual locations and the distant community group mean.

Weekly gross beta concentrations ranged from  $8.1 \pm 1.1 \text{ E-15}$  to  $6.2 \pm 0.4 \text{ E-14 } \mu\text{Ci/mL}$ . Comparison between the background group mean gross beta concentration and individual location gross beta concentrations indicated there was only one week during which weekly gross beta concentrations were statistically greater than the distant group mean concentration. This was the week of March 20 to March 27, when gross beta concentrations at Arco, FAA Tower, Howe, Mud Lake, Reno Ranch, ARA, CFA, ICPP, NRF, TRA, and VANB were above background. The highest gross beta concentration for the week, at ARA, was  $3.2 \text{ E-14 } \mu\text{Ci/mL}$ .

Monthly Comparisons. Figures A-2 through A-13 graphically illustrate monthly gross beta mean concentrations of onsite and distant groups.

Each month, the weekly data for each onsite location are grouped and statistically compared to the corresponding set of data from the distant community locations using an unpaired t-test ( $\alpha=0.05$ ).

In January of 1992, the mean gross beta concentration at the following locations was statistically greater than the distant group mean gross beta concentration: Howe, Mud Lake, CFA, ICPP, TAN, and TRA. Mud Lake was also statistically greater than background for the month of March. In addition, the onsite and boundary group mean gross beta concentrations were also statistically above the background group mean gross beta concentration in January. After analysis of INEL facility radioactive release information and the results of the specific nuclides analyses reported in a later section, no likely INEL origin could be found for the statistical differences.

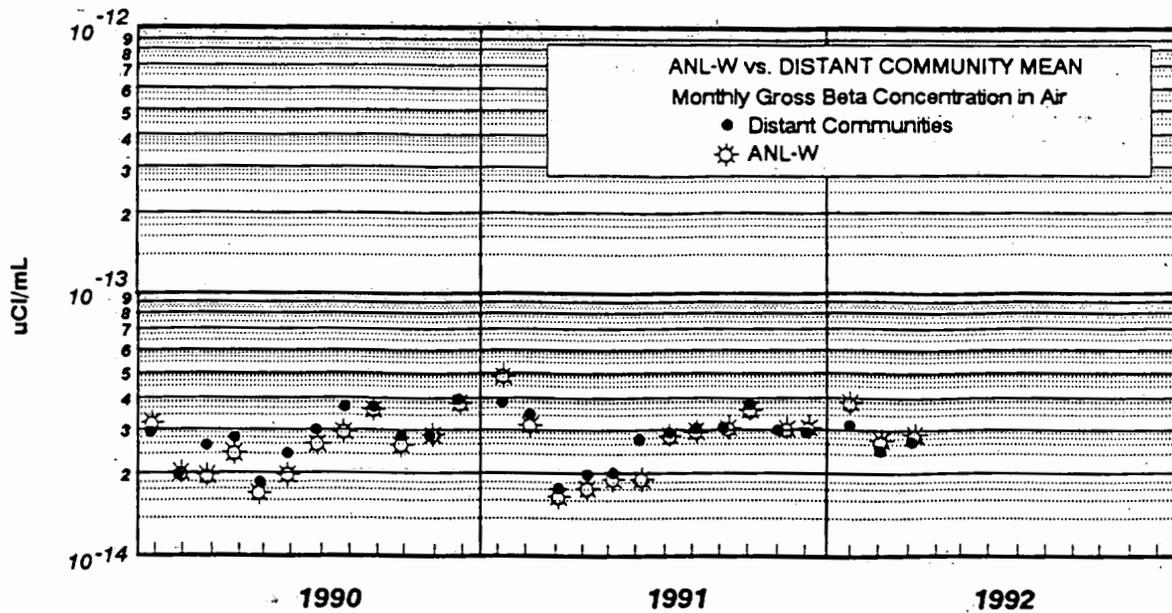


Figure A-2. ANL-W vs. Distant Community Mean Gross Beta Concentration

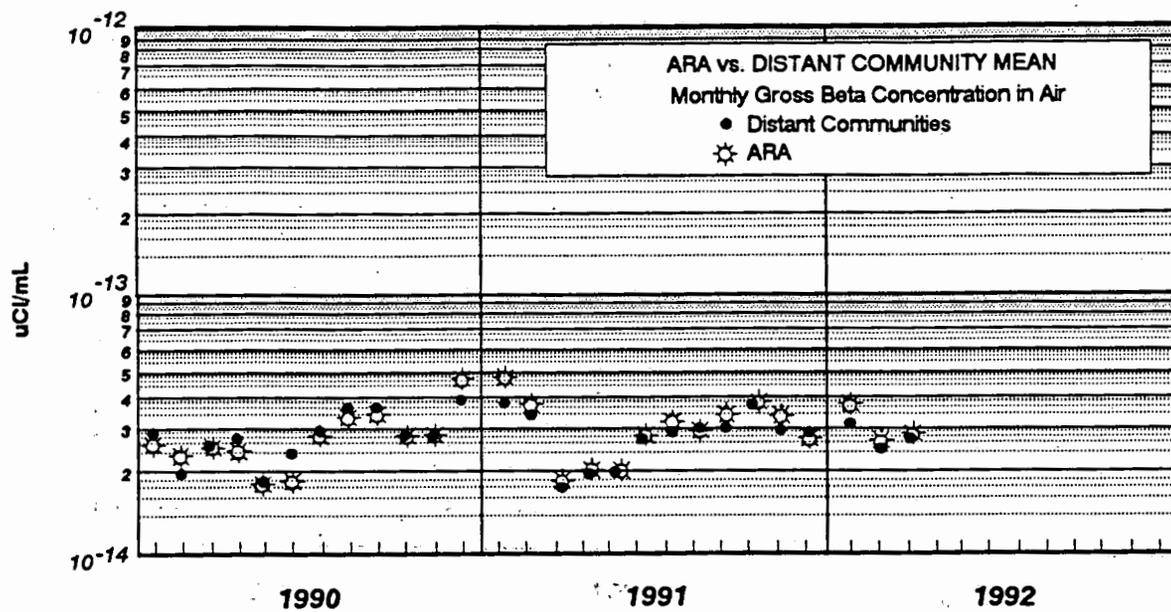


Figure A-3. ARA vs. Distant Community Mean Gross Beta Concentration

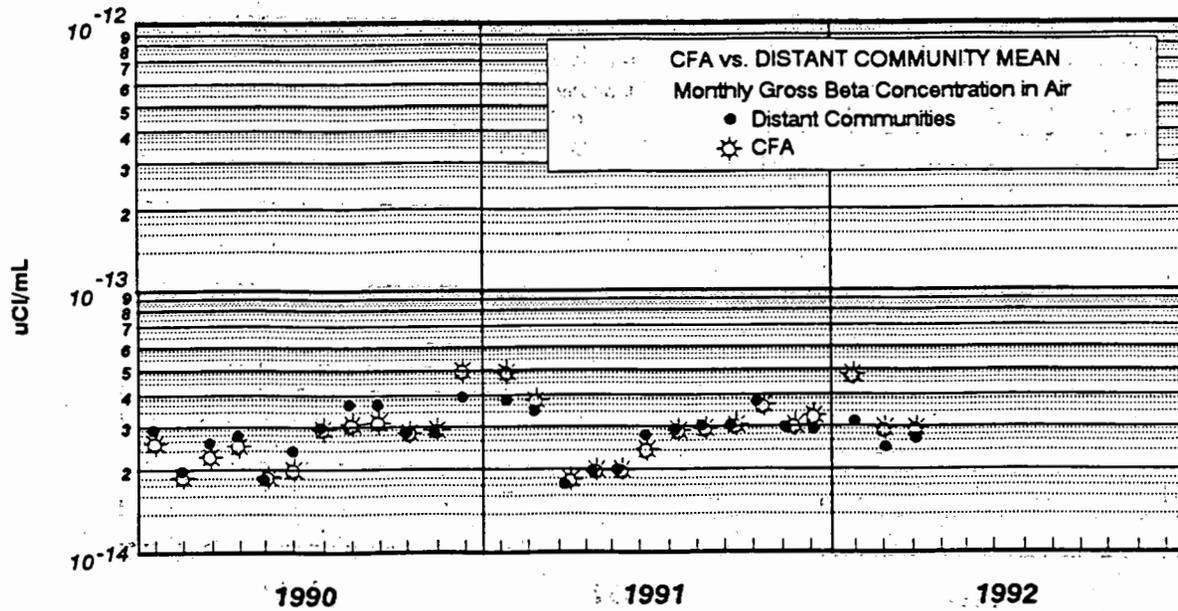


Figure A-4. CFA vs. Distant Community Mean Gross Beta Concentration

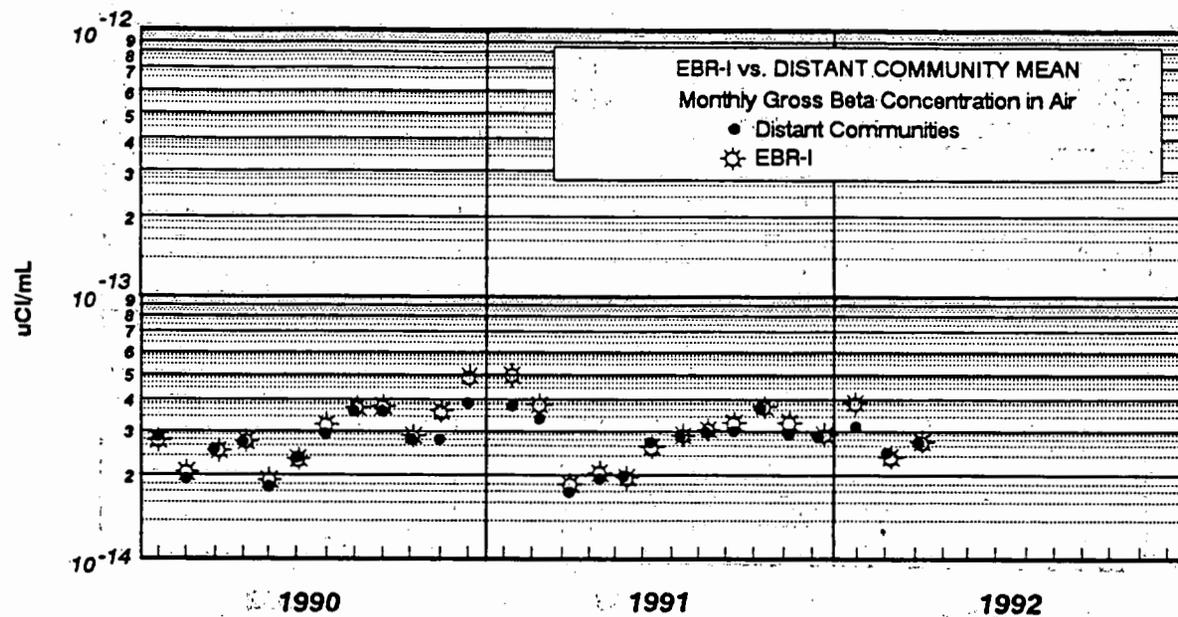
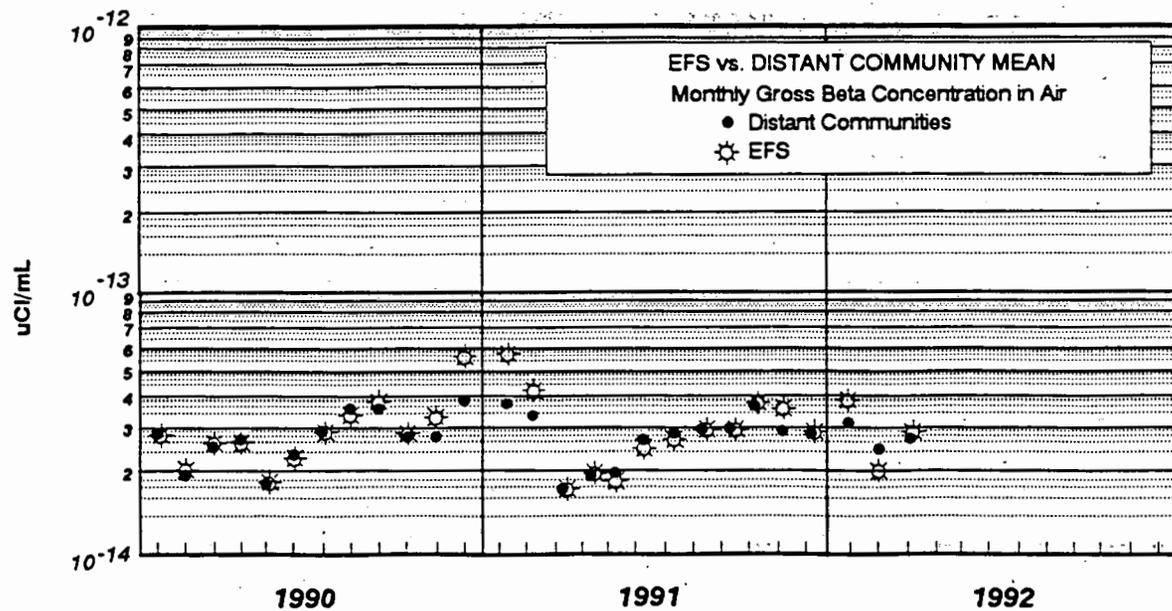
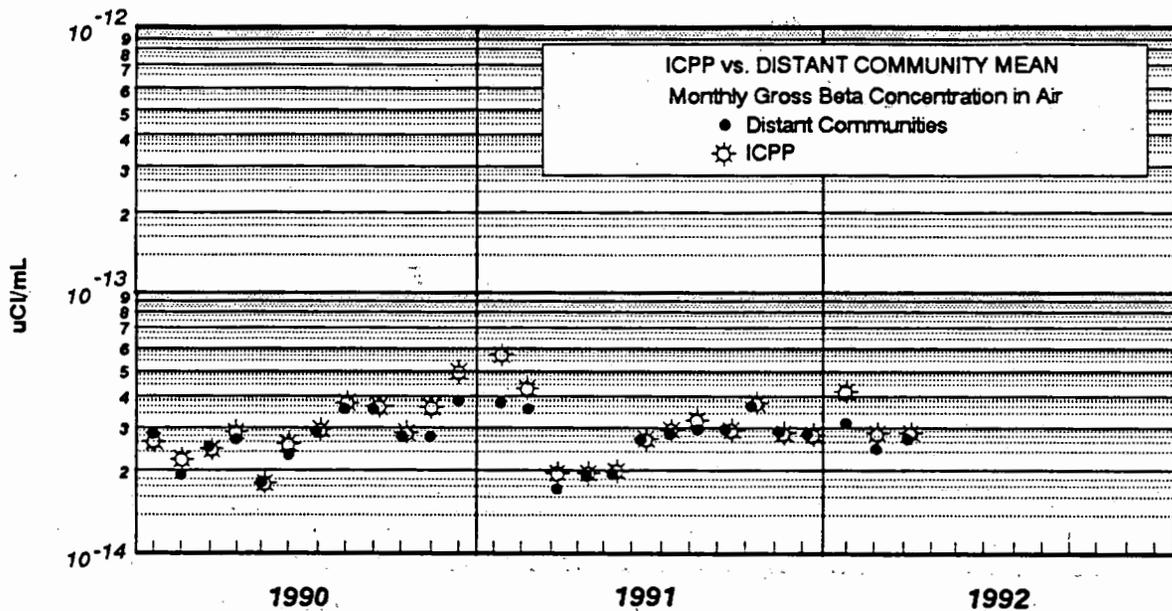


Figure A-5. EBR-I vs. Distant Community Mean Gross Beta Concentration



**Figure A-6. EFS vs. Distant Community Mean Gross Beta Concentration**



**Figure A-7. ICPP vs. Distant Community Mean Gross Beta Concentration**

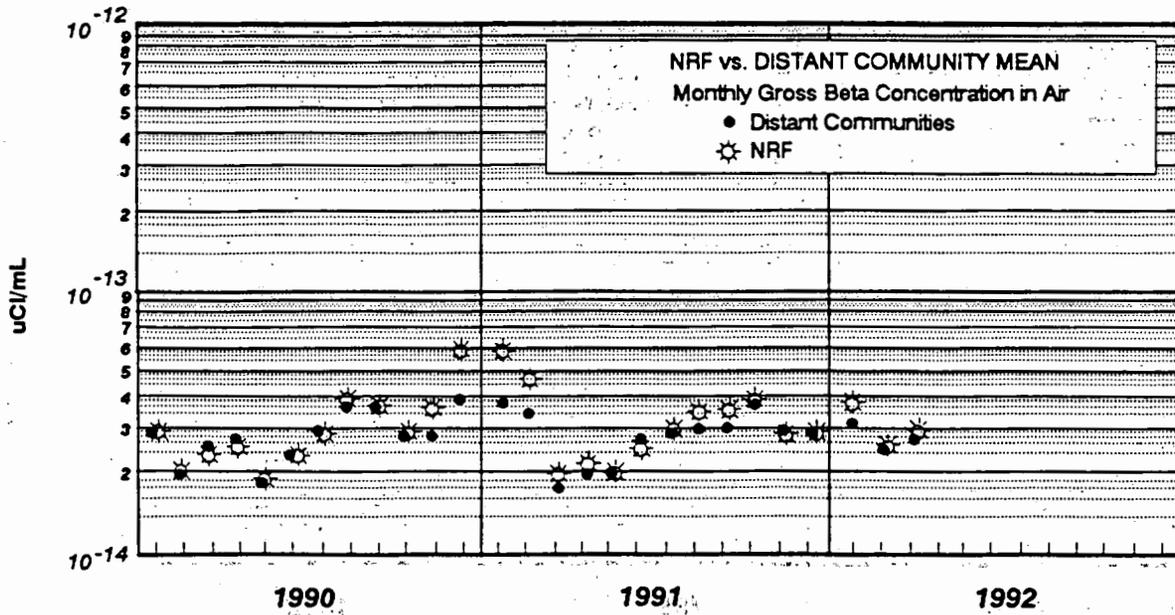


Figure A-8. NRF vs. Distant Community Mean Gross Beta Concentration

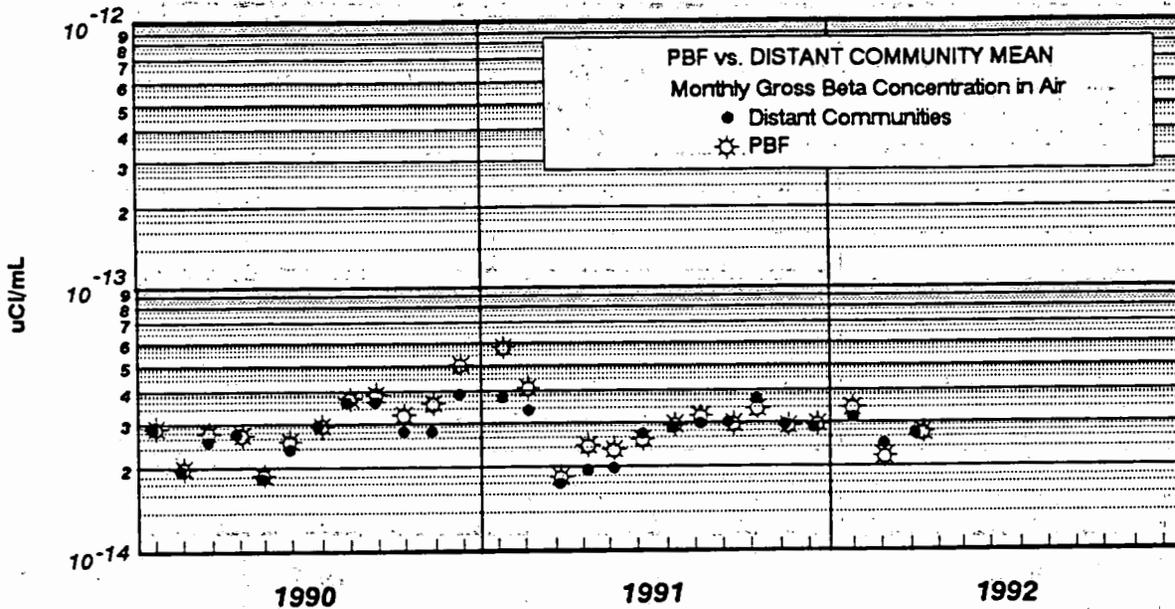
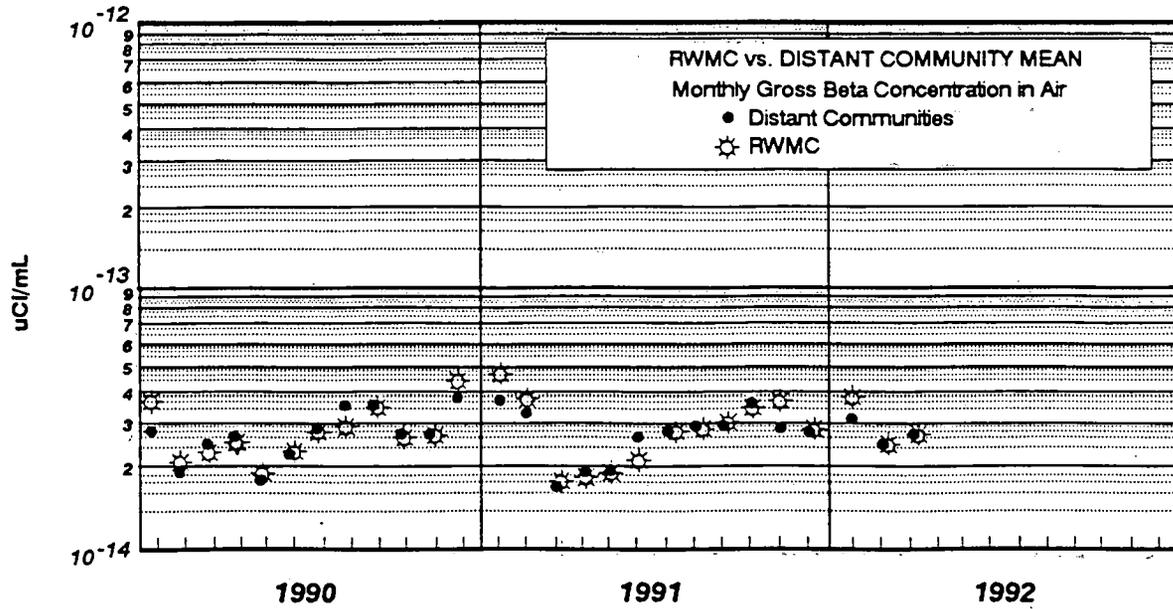
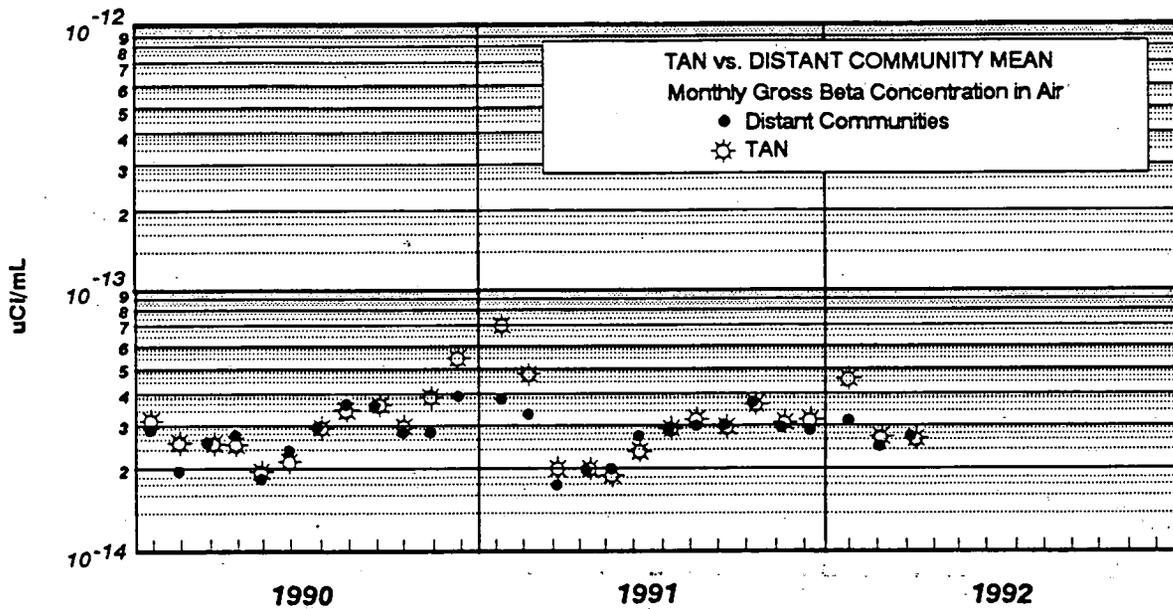


Figure A-9. PBF vs. Distant Community Mean Gross Beta Concentration



**Figure A-10. RWMC vs. Distant Community Mean Gross Beta Concentration**



**Figure A-11. TAN vs. Distant Community Mean Gross Beta Concentration**

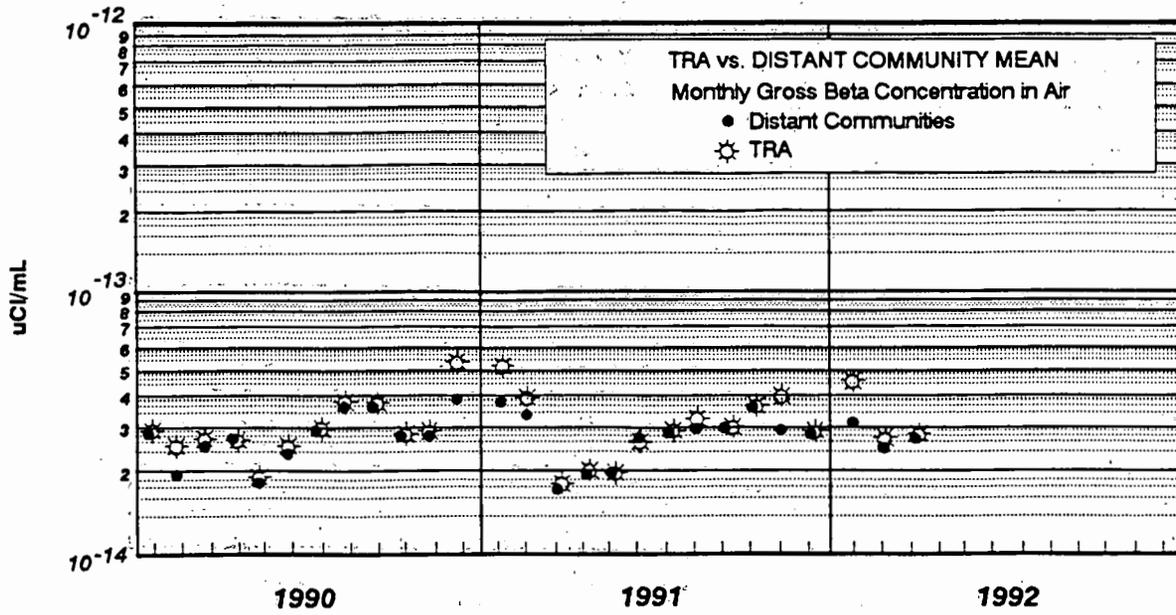


Figure A-12. TRA vs. Distant Community Mean Gross Beta Concentration

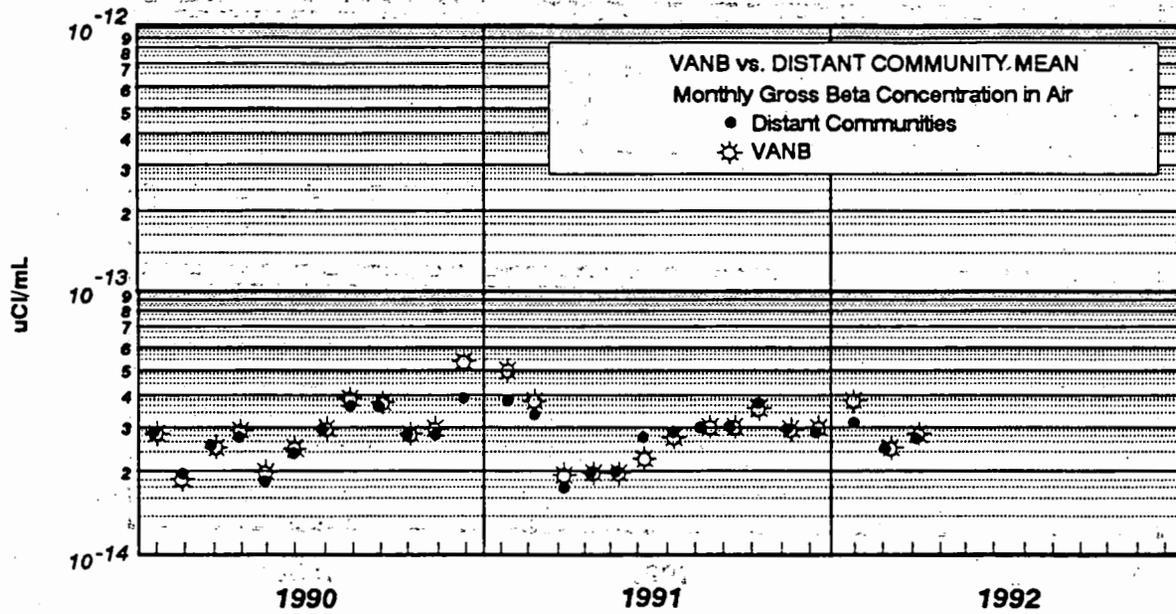


Figure A-13. VANB vs. Distant Community Mean Gross Beta Concentration

Quarterly Comparisons. Each quarter, the weekly gross beta concentration data for each onsite location are grouped and compared to the corresponding data from the distant community group using an unpaired t-test ( $\alpha=0.05$ ).

During the first quarter of 1992, the mean gross beta concentration at Howe, Mud Lake, CFA, ICPP, and TRA was statistically greater than the background mean gross beta concentration. The onsite and boundary group mean gross beta concentrations were also statistically above the background group mean gross beta concentration. Not enough evidence could be found in radioactive release information reported by INEL contractors or in the results of the specific nuclides results to link these statistical differences with a specific INEL source. The highest quarterly gross beta concentration, at Mud Lake, was  $3.7 \text{ E-14 } \mu\text{Ci/mL}$  or 1.2% of the annual DCG.

#### Specific Nuclides

After gross beta analyses are completed each week, the particulate filters are retained to make up a quarterly composite of filters from each sampling location. At the end of the quarter, ACB and LQB analyze these composites for specific radionuclides.

Gamma-Emitting Nuclides. Each quarter the composited particulate filters for each location are submitted to LQB and analyzed by gamma spectrometry. Spectra are specifically examined for 11 gamma-emitting radionuclides (Be-7, Ce-141, Ce-144, Co-60, Cs-134, Cs-137, Mn-54, Ru-103, Ru-106, Sb-125, and Zr-95). Any other nuclides detected are also reported. The data for radionuclides detected at any location are then statistically examined using an analysis-of-variance test and unpaired t-test comparisons ( $\alpha=0.05$ ) between

the distant community and the onsite group means and between individual onsite location results and the distant group mean.

No gamma-emitting nuclides other than Be-7, a naturally-occurring radionuclide, were detected on any of the first quarter particulate filter composites.

Strontium-90. Selected composites of the first quarter filters were analyzed for Sr-90. This nuclide was indicated at one of the seven locations submitted for analysis (EFS) at a concentration of  $1.8 \pm 0.8 \text{ E-16 } \mu\text{Ci/mL}$  (0.002% DCG).

Transuranic Nuclides. Selected composites of the first quarter filters were analyzed by alpha spectrometry for Pu-238, Pu-239/240, and Am-241. Americium-241 fractions were lost in the analytical process and no results were available. Pu-238 was not detected on any of the composites. Pu-239/240 was indicated on the filters from Craters of the Moon at a concentration of  $3.3 \pm 1.2 \text{ E-18 } \mu\text{Ci/mL}$  (0.017% DCG).

#### High-Volume Samplers

Two onsite high-volume air samplers (CFA and EFS) continuously sample air for particulate airborne radioactivity from any source: natural radioactivity, INEL Site releases, weapons testing, domestic or foreign reactor accidents, etc. Filters from these samplers are analyzed each workday for gross gamma activity and decay curves are plotted. When indicated by unusual decay curves (different from naturally-occurring radon daughters) or suspected nuclear incidents, individual filters may be submitted for gamma

spectrometry. No unusual curves were noted and no individual filters were submitted for analysis during the first quarter.

At the end of each month, the filters at each location are composited and submitted for gamma spectrometry. No manmade gamma-emitting radionuclides were found on any of the first quarter composites.

#### Atmospheric Tritium Samplers

Samplers for tritium in water vapor are located offsite in Idaho Falls and onsite at EFS and Van Buren. In these samplers, air is passed through a column of silica gel at a rate of 0.3 L/min. Columns are changed when the silica gel becomes saturated. Tritium concentrations are determined by liquid scintillation counting of water extracted from the columns.

Two samples covering a part of the first quarter were collected from each location. Tritium was detected in a sample taken at EFS from January 3 to February 28 at a concentration of  $1.5 \pm 0.2 \text{ E-6 } \mu\text{Ci/mL}$ . This concentration is similar to those reported both onsite and offsite during the last four years. No tritium was detected in any of the three samples collected from February 28 to May 15.

#### Precipitation Samplers

Monthly precipitation samples are collected at Idaho Falls and CFA. These samples are analyzed for tritium and pH. Weekly samples from EFS are also collected and analyzed for tritium.

A total of eleven precipitation samples were collected during the first quarter. Tritium was not detected in any of the samples.

### Nitrogen Oxides Samplers

Two stations, one located at the intersection of Van Buren Boulevard and Highway 20/26 and another at EFS, continuously monitor the air for nitrogen dioxide (NO<sub>2</sub>). Both analyzers are designated as equivalent methods by EPA.

The average NO<sub>2</sub> concentration measured during the first quarter of 1992 was 9.5 ppb (17.9 µg/m<sup>3</sup>) at EFS and 1.6 ppb (3.0 µg/m<sup>3</sup>) at Van Buren. These respective concentrations are 18% and 3% of the annual primary and secondary ambient air quality standards for NO<sub>2</sub>. Data recovery for the quarter was reduced to 82% at EFS due to power outages and to 76% at Van Buren because of analyzer malfunctions.

Performance checks were made at least biweekly on both samplers by testing the response of both the NO and NO<sub>x</sub> channels of the analyzers to purified air and to air with a known concentration of nitric oxide (NO). Details of the performance checks have been sent to the State of Idaho.

### Sulfur Dioxide Sampler

A sulfur dioxide monitoring station was in service at the intersection of Van Buren Boulevard and U.S. Highway 20/26 during the first quarter. The analyzer is designated as an equivalent method by EPA.

The average SO<sub>2</sub> concentration measured during the quarter was 0.23 ppb (0.6 µg/m<sup>3</sup>). This concentration is 0.8% of the annual primary air quality standard. The maximum daily average SO<sub>2</sub> concentration during first quarter was 3.2 ppb (8.4 µg/m<sup>3</sup>), or 2% of the 24-hour primary ambient air quality standard, on January 10. The maximum 3-hour average SO<sub>2</sub> concentration of 8.7 ppb (23.1 µg/m<sup>3</sup>), on January 20, was 1.8% of the secondary air quality standard.

Weekly performance checks were made by testing the SO<sub>2</sub> analyzer response to purified air and to air with a known concentration of SO<sub>2</sub>. Valid data were collected during 97% of the hours in the quarter.

## WATER SAMPLING

### Production Wells

NOTE: DOE Order 5400.1 recommends the use of units of  $\mu\text{Ci/mL}$  for concentrations of radionuclides in water. However, 40 CFR 141 states standards in units of  $\text{pCi/L}$ . For the convenience of readers of this report, concentrations in the Water Sampling section are given with exponents which allow easy conversion to the EPA units:

$$1 \text{ E-9 } \mu\text{Ci/mL} = 1 \text{ pCi/L}$$

$$1 \text{ E-6 } \mu\text{Ci/mL} = 1000 \text{ pCi/L.}$$

Each month, contractor personnel collect water samples from production wells that are in use. These samples are then analyzed by ACB. Figure B-1 shows most well locations. Gross alpha activity was detected in 14 of the 76 production well samples collected during the first quarter--4 during January and 10 during February. Detectable concentrations were all near the minimum detectable concentration shown in Table 1, ranging from  $2.1 \pm 1.0 \text{ E-9 } \mu\text{Ci/mL}$  (7% DCG) to  $3.1 \pm 1.2 \text{ E-9 } \mu\text{Ci/mL}$  (10% DCG). Gross beta activity was reported in 8 of the 76 samples. All detectable gross beta concentrations were  $6 \pm 2 \text{ E-9 } \mu\text{Ci/mL}$  (6% DCG) or less. Examination of the data for trends with time or geographic location revealed no clear patterns. It is probable that the detectable gross alpha and gross beta activities in the water samples were due to statistical variations in analyses and/or to natural radionuclides derived from rocks that make up the aquifer.

### CFA

The tritium concentrations for CFA production wells (CFA-1 and CFA-2 in Figure B-1) are plotted in Figure B-2. As described in the Second Quarter 1991 report, samples from December 1989 through May 1991 came not from CFA #1 but from the distribution system (consisting mostly of water from CFA #2). EG&G resumed sampling CFA #1 in June 1991.



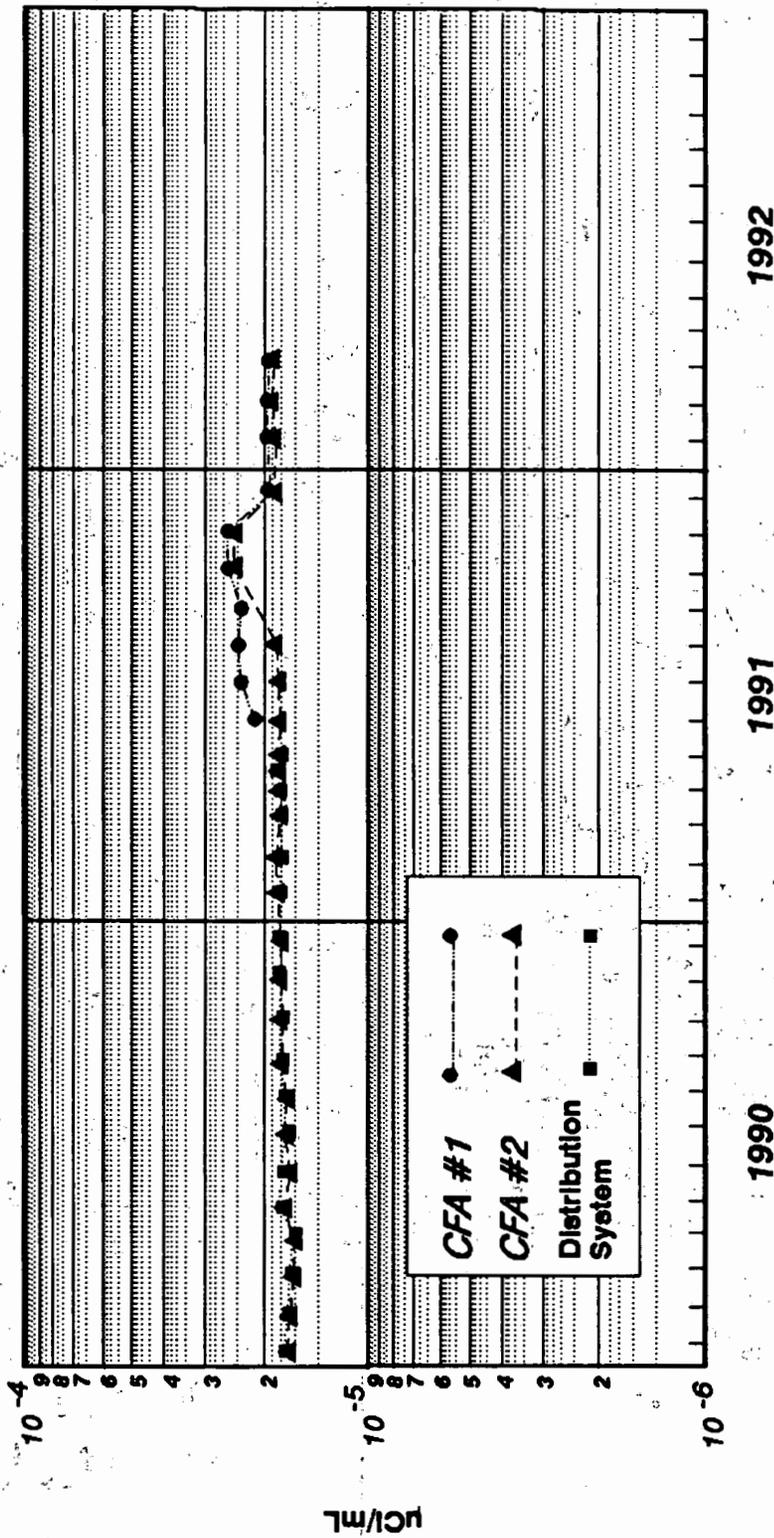


Figure B-2. Tritium Concentrations in CFA Production Wells

In the first quarter, the mean tritium concentration in water from well CFA #1 was  $19.0 \text{ E-6 } \mu\text{Ci/mL}$  (1.0% DCG), lower than previous measurements. USGS also reported a reduced concentration of  $18.5 \pm 0.6 \text{ E-6 } \mu\text{Ci/mL}$  (0.9% DCG) in the first quarter sample. First quarter samples from CFA #2 had a mean tritium concentration of  $17.4 \text{ E-6 } \mu\text{Ci/mL}$  (0.9% DCG), lower than in the fourth quarter of 1991 but similar to concentrations reported in the previous three years. An investigation is currently underway into the variations in concentrations reported over the past year for water from CFA wells. In addition, EG&G has begun taking an additional sample from the CFA Distribution System each month.

#### ICPP

The monitoring results for ICPP production wells (CPP-1 and CPP-2 in Figure B-1) are summarized in Figures B-3 and B-4. Well ICPP #2 was sampled in January and February, and well #1 was sampled in March. The tritium concentration in all three samples was below the minimum detectable concentration. The fraction of the January well #2 sample for Sr-90 analysis was lost prior to completion of the analysis. Sr-90 was detected in the well #1 sample at a concentration of  $0.75 \pm 0.13 \text{ E-9 } \mu\text{Ci/mL}$  (0.08% DCG).

The drinking water well, ICPP #4, is sampled each month, and has never shown detectable concentrations of tritium. Strontium-90 was not detected in any of the first quarter samples. The only previously detected Sr-90 concentrations in samples from this well were in April 1985 and February 1991, both at concentrations of  $0.8 \pm 0.2 \text{ E-9 } \mu\text{Ci/mL}$  (0.08% DCG).

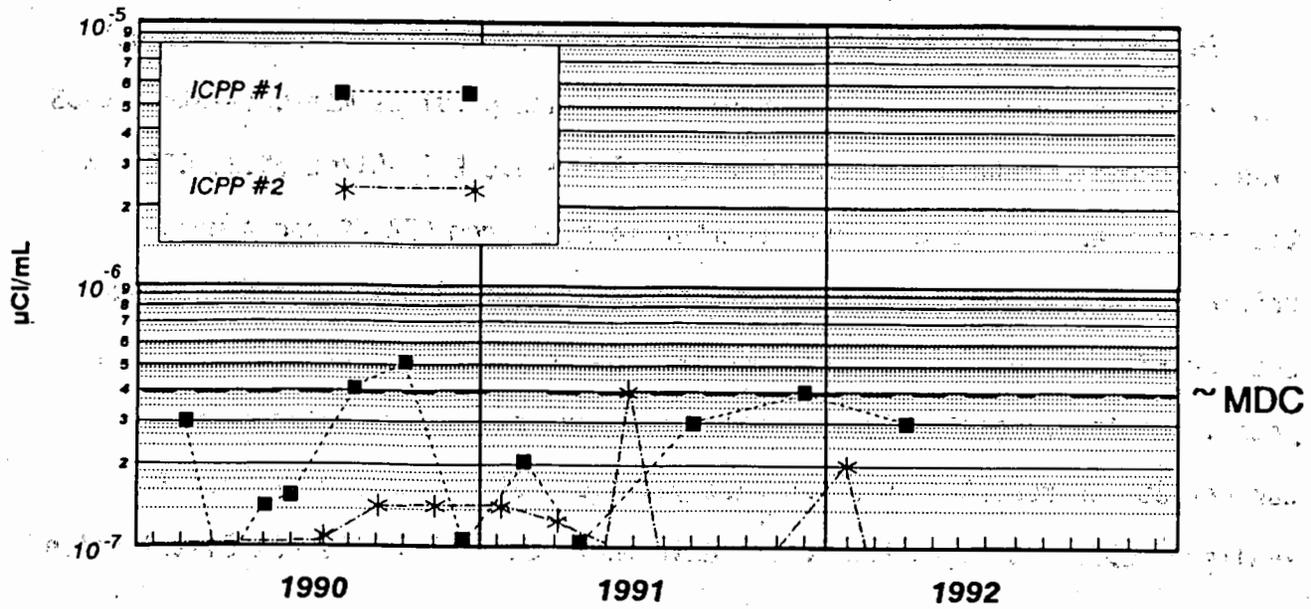


Figure B-3. Tritium Concentrations in ICPP Production Wells

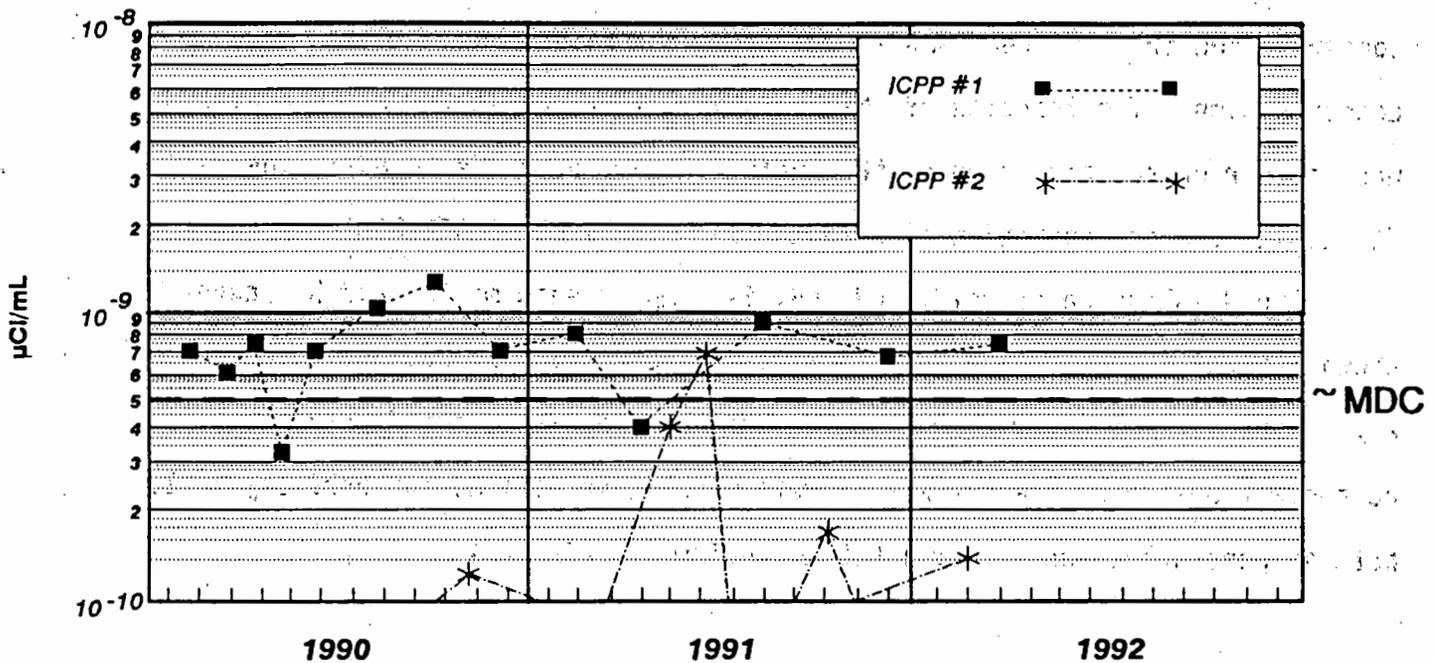


Figure B-4. Strontium-90 Concentrations in ICPP Production Wells

### Rifle Range

The PTI Rifle Range is located northwest of CFA about halfway between well #85 and well Highway 3. First quarter samples had an average tritium concentration of  $4.5 \text{ E-6 } \mu\text{Ci/mL}$  (0.2% DCG). This concentration is consistent with those reported previously, with the exception of the sample from April 1990 in which the tritium concentration was below the minimum detectable concentration.

### RWMC

During the first quarter, the mean tritium concentration in water samples from the RWMC production well was  $1.5 \text{ E-6 } \mu\text{Ci/mL}$  (0.08% DCG), about the same as that measured in previous quarters.

### Observation Wells

The U.S. Geological Survey (USGS) has access to about 300 observation wells and auger holes on or near the INEL Site. About 160 of these are sampled on varied schedules depending on USGS hydrologic studies in progress and on the needs of the environmental surveillance program. USGS personnel measure water levels periodically for an indication of the amount of recharge to the ground-water system and the amount of water in storage in the Snake River Plain aquifer and perched-water bodies. The specific conductance of each sample is measured in the field to provide an indication of dissolved electrolytes at a given location. Other analyses performed are determined by the needs of the USGS in following the movement of specific waste material plumes.

Analyses of samples from several observation wells located between CFA and the southern INEL boundary show detectable concentrations of tritium.

Well #106, about 6 km (3.5 mi) north of the southern INEL boundary (Figure B-1); was not sampled during the first quarter and has been placed on a semiannual sampling schedule. In the fourth quarter of 1991, water from this well had a tritium concentration of  $2.3 \pm 0.2 \text{ E-6 } \mu\text{Ci/mL}$  (0.12% DCG). Only one of the wells just inside the southern INEL boundary (well #103) was sampled during the first quarter, and this sample did not contain a detectable concentration of tritium. Low concentrations of tritium have been detected in some samples from three of the boundary wells in the past, most recently in third quarter 1986, but tritium from INEL operations has not been detected in water from the nearest offsite wells south of the INEL boundary. For more information on levels and movement of tritium in the aquifer, see the USGS report, Tritium in Ground Water at the Idaho National Engineering Laboratory, Idaho: USGS Water-Resources Investigations Report 90-4090, DOE/ID-22090, June 1990.

Results of sample analyses from a few wells around ICPP, TRA, and RWMC are discussed below. Hydrographs are provided for selected wells as an indication of recharge to the aquifer and the amount of water in storage. ICPP:

Since February 1984, ICPP service wastes have been discharged to the ICPP infiltration ponds south of the facility. Well #57, located southwest of the ICPP infiltration ponds, and wells #111 through #116, south of the ponds, are used to monitor the aquifer downgradient from the ponds. Well #40 is used to sample the aquifer about 215 m southwest of the old ICPP disposal well which was not used for routine discharges after 1984. The disposal well was formally capped in November 1989.

The tritium concentration of  $7.4 \pm 0.4 \text{ E-6 } \mu\text{Ci/mL}$  (0.4% DCG) in the sample from well #40 (Figure C-1) was lower than in the previous quarter. A general upward trend in the year prior to January 1992 is indicated in Figure C-1. Water from well #57 contained tritium at a concentration of  $25.1 \pm 0.7 \text{ E-6 } \mu\text{Ci/mL}$  (1.3% DCG), similar to the concentration in fourth quarter 1991. The strontium-90 concentration in well #57 samples has remained about the same in the previous few years, except for sharply lower concentrations reported in the second quarters of 1989 and 1991 (Figure C-2). Strontium-90 in water from well #40 has, overall, stayed about the same over the last two years (Figure C-2). The first quarter value was  $27 \pm 3 \text{ E-9 } \mu\text{Ci/mL}$  (3% DCG). The water level measurements in well #40 are shown in Figure C-3. Gamma spectrometric analysis was performed on first quarter samples from both wells #40 and #50. No manmade gamma-emitting nuclides were detected in the well #40 sample, but Cs-137 was indicated in water from well #50 at a concentration of  $50 \pm 20 \text{ E-9 } \mu\text{Ci/mL}$  (1.7% DCG).

The tritium concentration decreased slightly in the well #50 sample (deep perched water), and Figure C-1 indicates that tritium concentrations decreased from 1988 through mid-1989, leveled off during late 1989 and 1990, and may be slowly decreasing again. The Sr-90 concentration in water from this well decreased throughout 1988 and 1989, remained fairly constant during 1990 and 1991, and dropped during the fourth quarter 1991 (Figure C-2). The Sr-90 concentration in the first quarter sample increased. The water level of well #50 is shown in Figure C-4.

Results from an October 1991 sample of well #59, located in a northeasterly direction from the ICPP Infiltration Ponds, showed a tritium concentration of  $19.3 \pm 0.6 \text{ E-6 } \mu\text{Ci/mL}$  (1.0% DCG). Similar values were reported for replicate samples. The preceding sample, from April 1991, showed

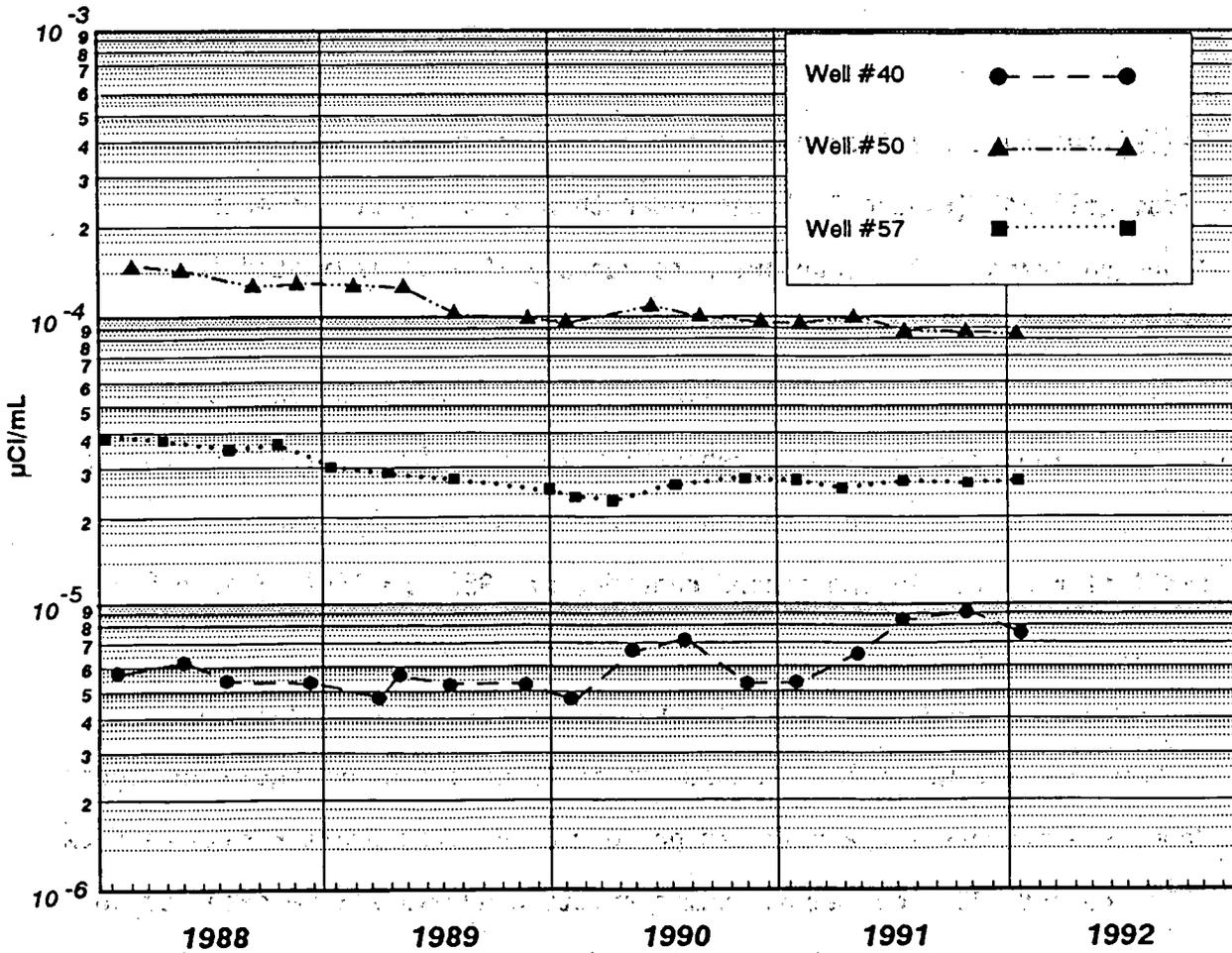


Figure C-1. Tritium in ICPP Area Ground Water

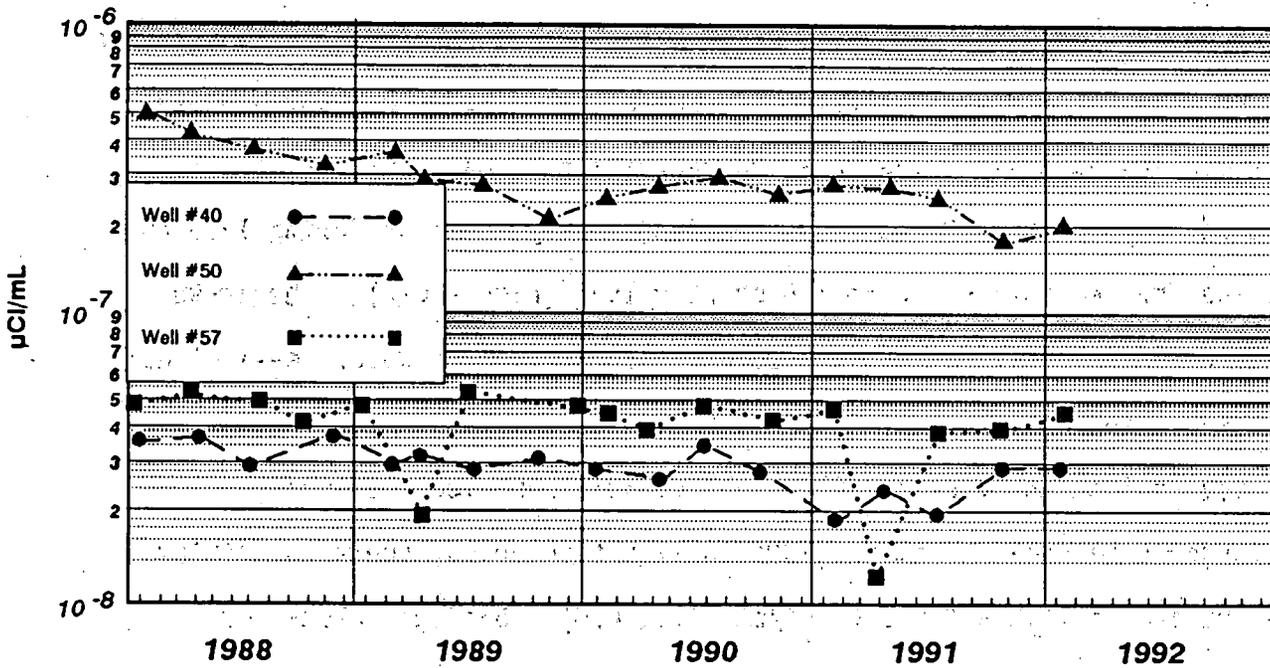


Figure C-2. Strontium-90 in ICPP Area Ground Water

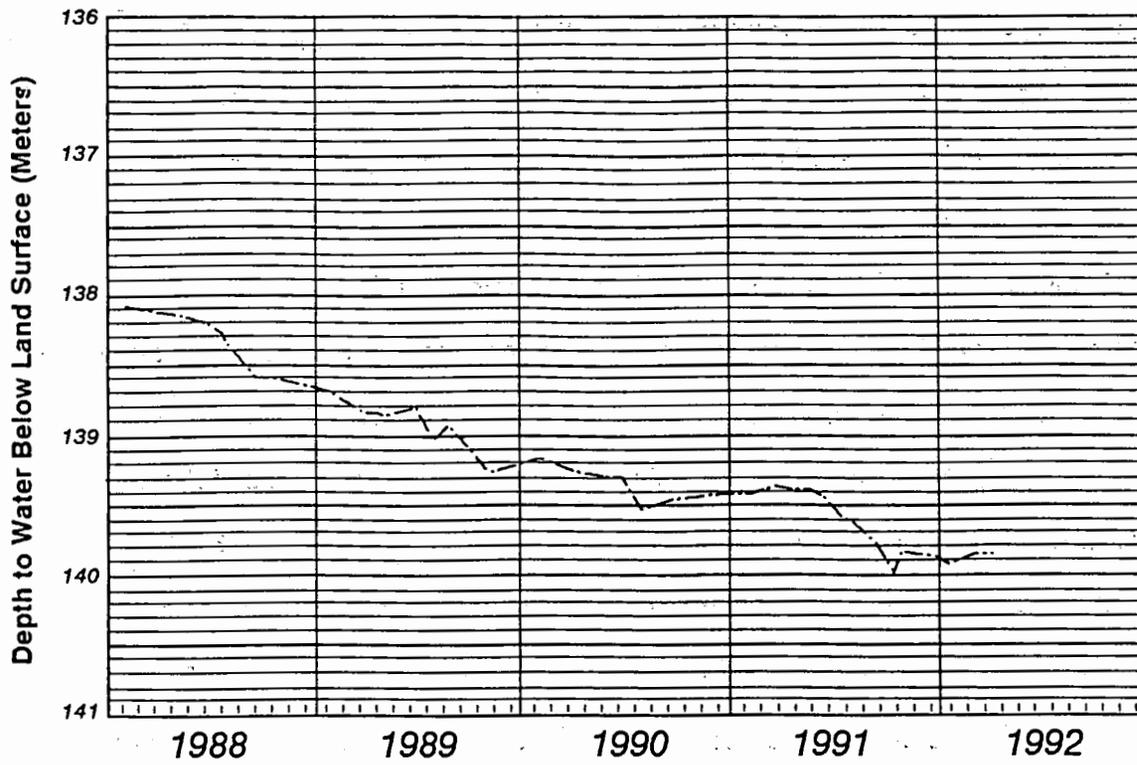


Figure C-3. Hydrograph of USGS Well #40 (Aquifer Ground Water)

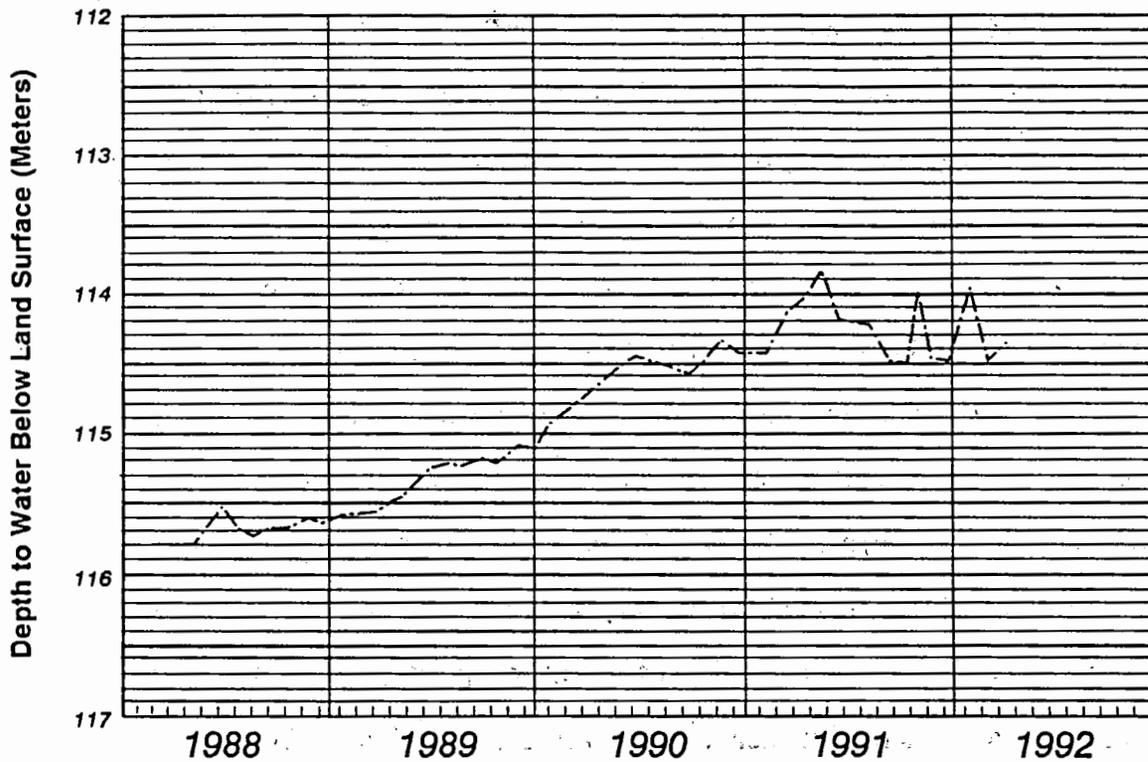


Figure C-4. Hydrograph of USGS Well #50 (Deep Perched)

a concentration of  $4.9 \pm 0.3 \text{ E-6 } \mu\text{Ci/mL}$  (0.2% DCG), which is typical of previously measured values. The tritium concentration in a sample taken in April 1992 was once again at earlier levels, measuring  $5.2 \pm 0.2 \text{ E-6 } \mu\text{Ci/mL}$  (0.3% DCG).

Well #111 was not sampled during the first quarter and is now on a semiannual sampling schedule. First quarter samples from wells #112 through #116 all contained tritium at concentrations ranging from  $8.5 \pm 0.4 \text{ E-6 } \mu\text{Ci/mL}$  to  $28.7 \pm 0.7 \text{ E-6 } \mu\text{Ci/mL}$  (0.4% to 1.4% DCG). Strontium-90 was also detected in water from wells #112 and #113 at  $34 \pm 3 \text{ E-9 } \mu\text{Ci/mL}$  (3% DCG) and  $23 \pm 3 \text{ E-9 } \mu\text{Ci/mL}$  (2% DCG), respectively. For more information on waste material plumes, their extent and direction of movement, see the USGS report, Hydrologic Conditions at the Idaho National Engineering Laboratory, 1986 to 1988: USGS Water-Resources Investigations Report 91-4047, DOE/ID-22096, June 1991.

#### TRA

Tritium, specific conductance, and total chromium levels were measured in water from wells #54, #65, and #A-77. Well #A-13 was dry during the first quarter and therefore was not sampled. Well #65 is used to sample Snake River Plain aquifer water and well #54 is used to sample a deep perched-water zone. Auger-holes #A-77 and #A-13 penetrate a shallow perched-water zone near the TRA 1964 radioactive infiltration pond and the 1982 nonradioactive infiltration pond. Well #65 and auger-hole #A-77 are used to monitor the downward movement of tritium from the retention basin and the radioactive infiltration pond. Auger-hole #A-77, which is used to sample a shallow perched-water zone below the retention basin, is located near the basin and about 100 m west of the TRA radioactive infiltration pond. The retention basin consists of two rectangular concrete tanks separated by a 30-cm thick

concrete wall. The west side of the basin apparently leaks more rapidly than the east side and soon affects the water levels in perched-water bodies. When the side of the retention basin receiving waste fills to a certain level, its pumps are activated and the contents of the basin are discharged to the TRA radioactive waste infiltration pond.

The tritium concentration in water from well #65 appears to have decreased gradually over the last five years (Figure D-1). The concentration measured in the first quarter sample was  $37.7 \pm 0.8 \text{ E-6 } \mu\text{Ci/mL}$  (1.9% DCG), little change from the previous quarter. Gamma spectrometric analysis was performed on a sample from well #65 and no manmade nuclides were detected. Strontium-90 was also not detected in this sample. The tritium concentration in auger-hole #A-77 increased during the first quarter as shown in Figure D-1. Tritium concentrations in samples from #A-77 generally follow the trend of tritium concentrations in discharges from the retention basin to the TRA radioactive waste infiltration pond (Figure D-2). Gamma spectrometric analysis was not performed on a sample from auger-hole #A-77, but the USGS has begun performing Sr-90 analyses on water from this well. This nuclide has been detected at concentrations ranging from  $1.87 \text{ to } 4.95 \text{ E-6 } \mu\text{Ci/mL}$  (187% to 495% DCG) in samples analyzed since the beginning of 1991. The concentration measured in the first quarter of 1992 was  $1.96 \pm 0.05 \text{ E-6 } \mu\text{Ci/mL}$  (196% DCG).

Since March of 1983, samples from auger-hole #A-13 and well #54 have generally shown specific conductance at higher levels than in other wells in the area. This is probably due to recharge containing dissolved ions from the nonradioactive infiltration pond reaching the perched water bodies penetrated by these two wells. Over the past few years, specific conductance has been fluctuating in samples from wells #54 and #A-13 (Figure D-3); water from well #65 showed a gradual increase until 1989 but has leveled off. Specific

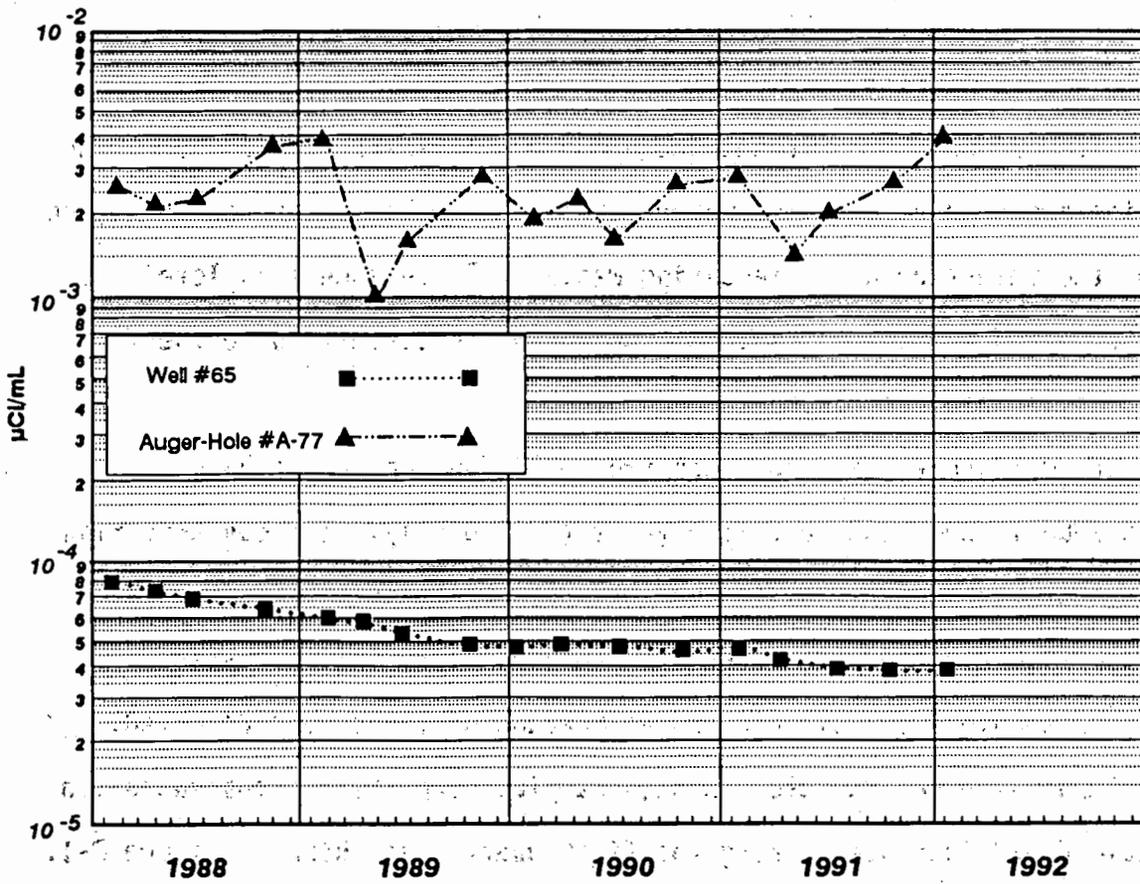


Figure D-1. Tritium in TRA Area Ground Water

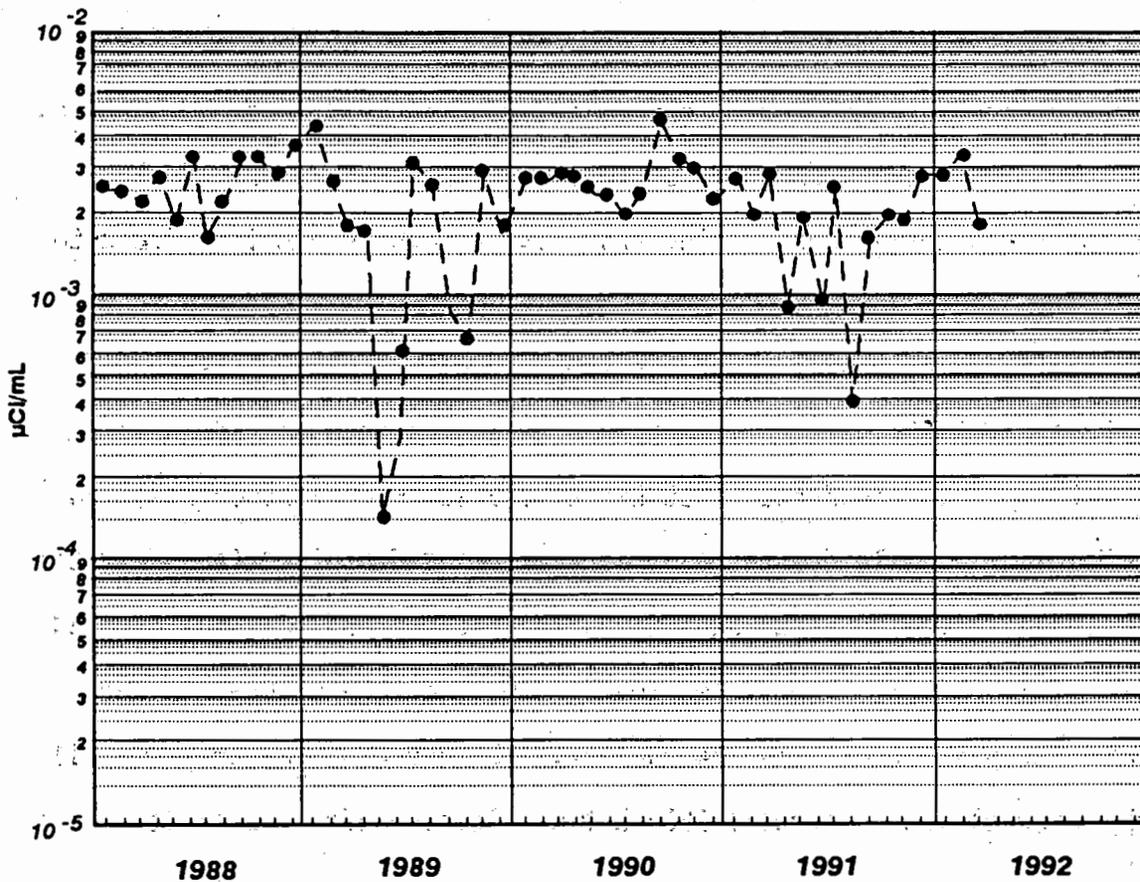


Figure D-2. Tritium Concentration in Discharges to TRA Radioactive Infiltration Pond

conductance in samples from auger-hole #A-77 has generally stayed at about the same level.

Figure D-4 shows the chromium concentration of water from wells #65, #A-77, #A-13, and #54, none of which provide water for a drinking water system. (For comparison, the EPA Drinking Water Standard for chromium is  $1 \text{ E-6 mol/L}$  or  $0.05 \text{ mg/L}$ ). Data shown in Figure D-4 prior to fourth quarter 1989 were measurements of dissolved chromium made by the RESL Analytical Chemistry Branch, whose minimum detectable concentration was  $0.05 \text{ mg/L}$ . Starting in October 1989, measurements have been made at the USGS Laboratory in Arvada, Colorado. This lab has a reporting level of  $0.001 \text{ mg/L}$ . Data from October 1989 through April 1990 are of both dissolved and suspended chromium, while measurements after April 1990 are of dissolved chromium only.

Chromium concentrations were below the minimum detectable concentration in well #A-13 from 1985 until the change in analytical laboratories, and have stayed at levels less than  $0.05 \text{ mg/L}$  since. Well #54 was similarly less than  $0.05 \text{ mg/L}$  until the first quarter of 1992 when a concentration of  $0.06 \text{ mg/L}$  was reported. The higher concentration coincides with a lower water level in the well. Well #A-77 was only occasionally above detectable levels, generally at  $0.06\text{-}0.08 \text{ mg/L}$ , until October 1989. The increase during October 1989 and January 1990 possibly reflects the inclusion of suspended chromium in the samples, as discussed in previous quarterly reports. Measurements of water from well #65 have remained about the same over the last three years, and a chromium concentration of  $0.19 \text{ mg/L}$  was reported for the first quarter. Figures D-5 through D-8 present water levels in these wells plus those of well #58, a regional aquifer well.

Changes in water levels in #A-77 were probably due to operational shifts in liquid waste disposal back and forth between the east side of the retention

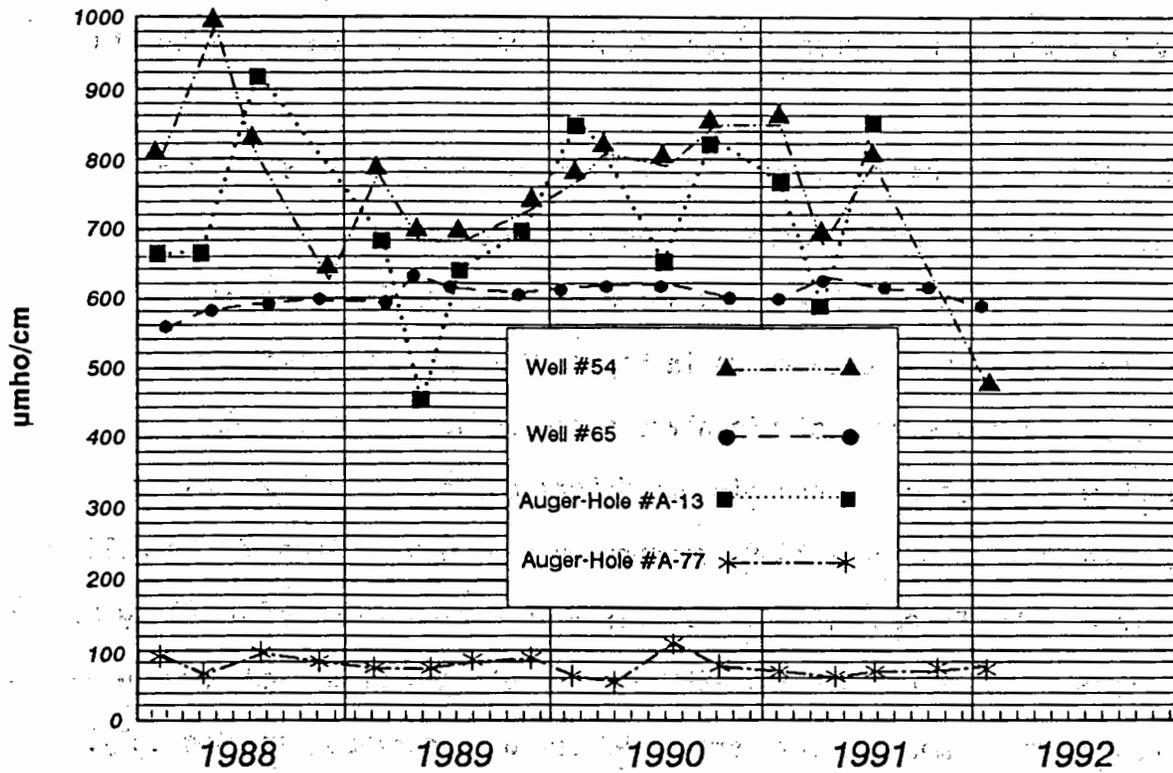


Figure D-3. Specific Conductance in TRA Area Ground Water

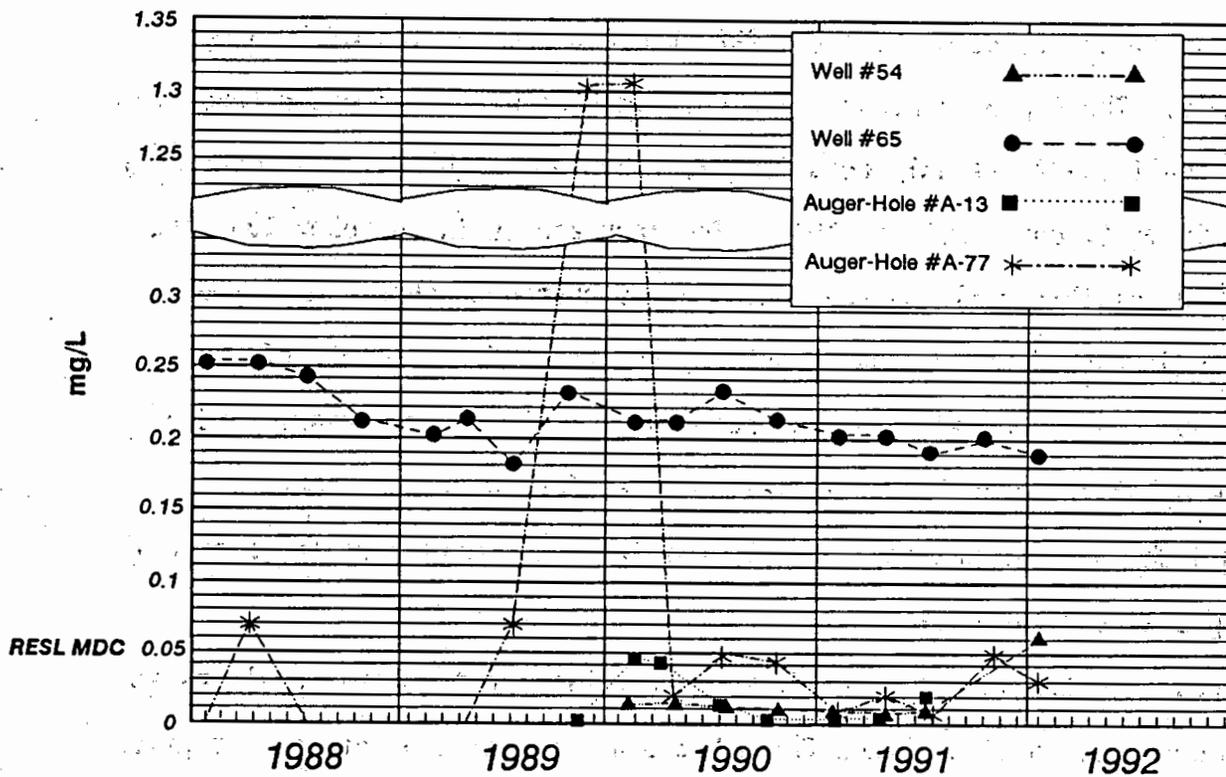


Figure D-4. Total Chromium in TRA Area Ground Water

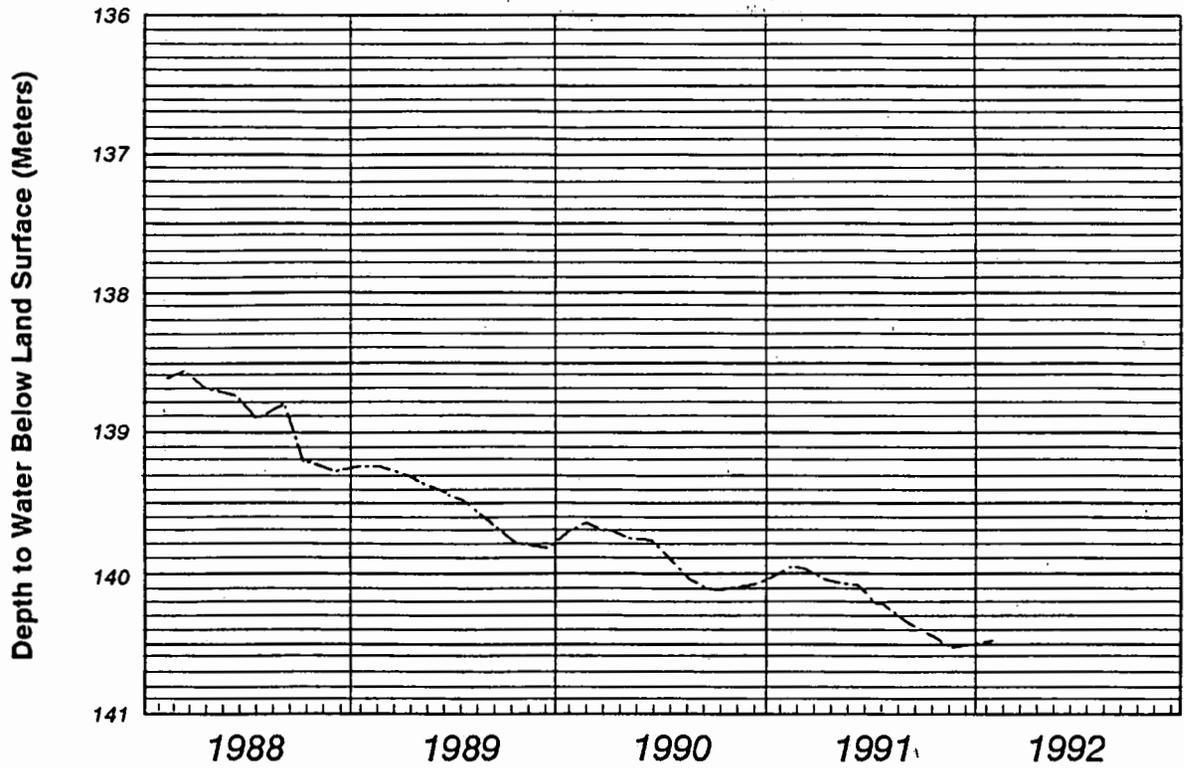


Figure D-5. Hydrograph of USGS Well #58 (Regional Ground Water)

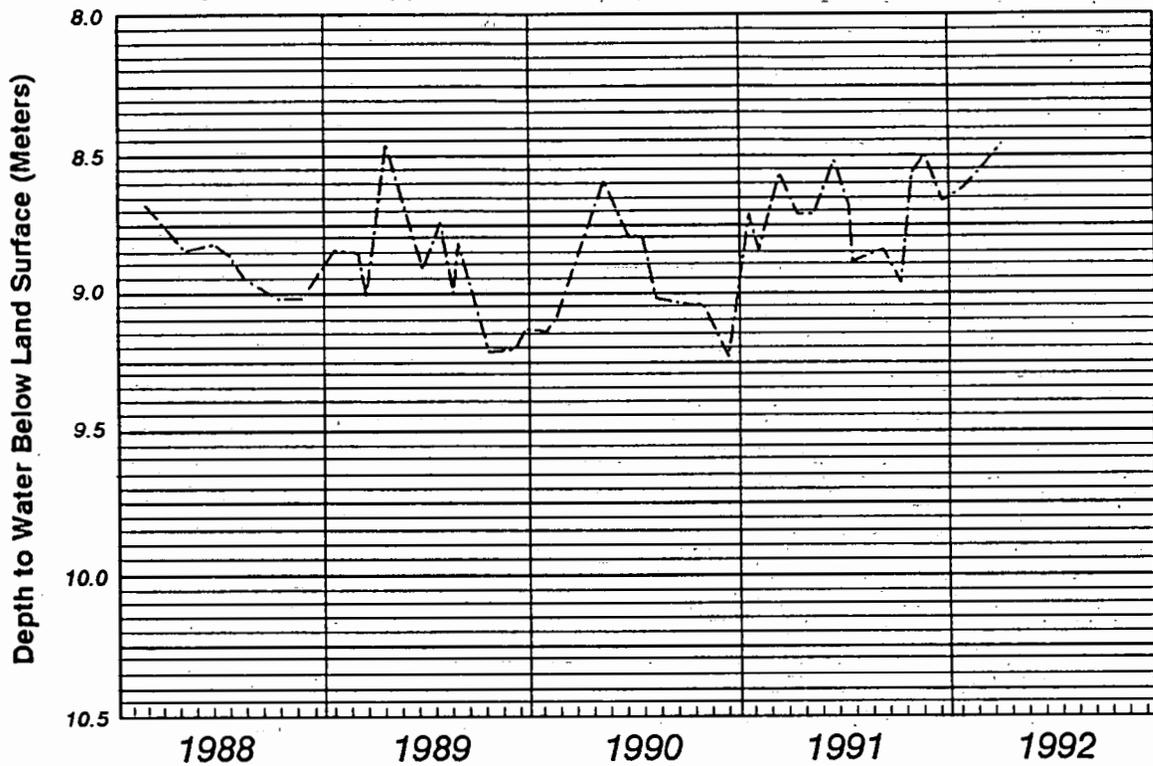


Figure D-6. Hydrograph of Auger Hole TRA #A-77 (Shallow Perched)

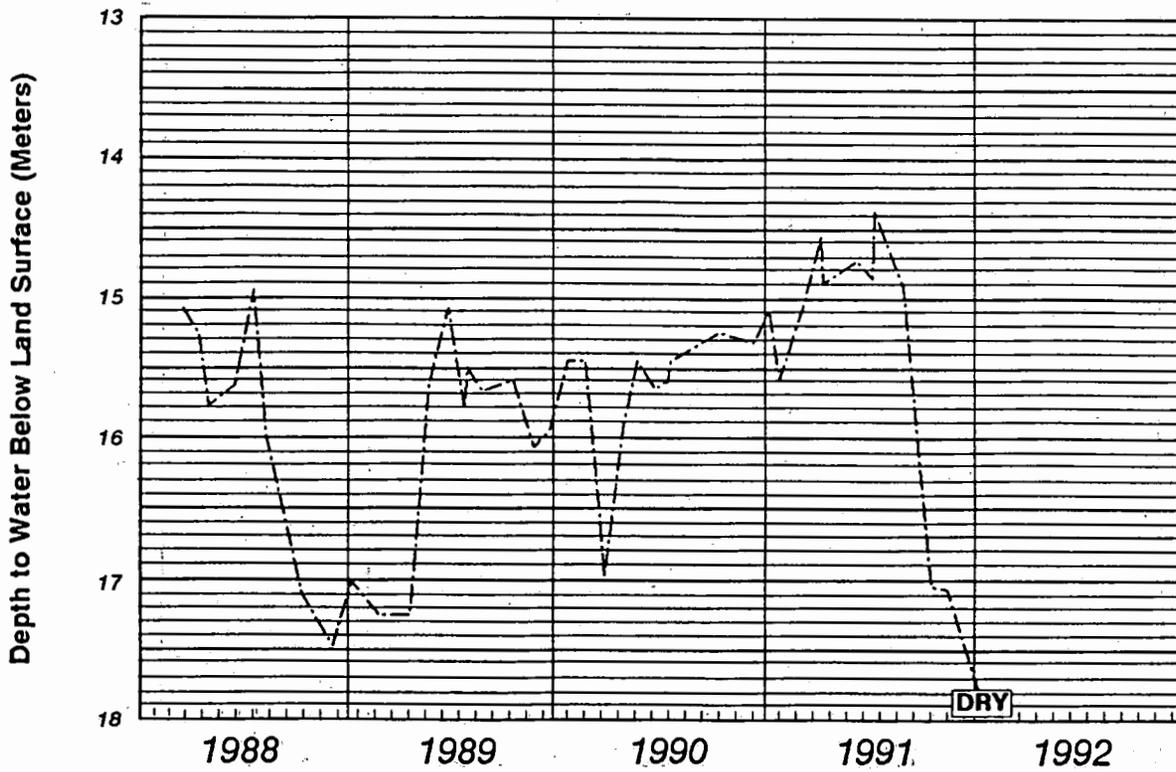


Figure D-7. Hydrograph of Auger Hole TRA #A-13 (Shallow Perched)

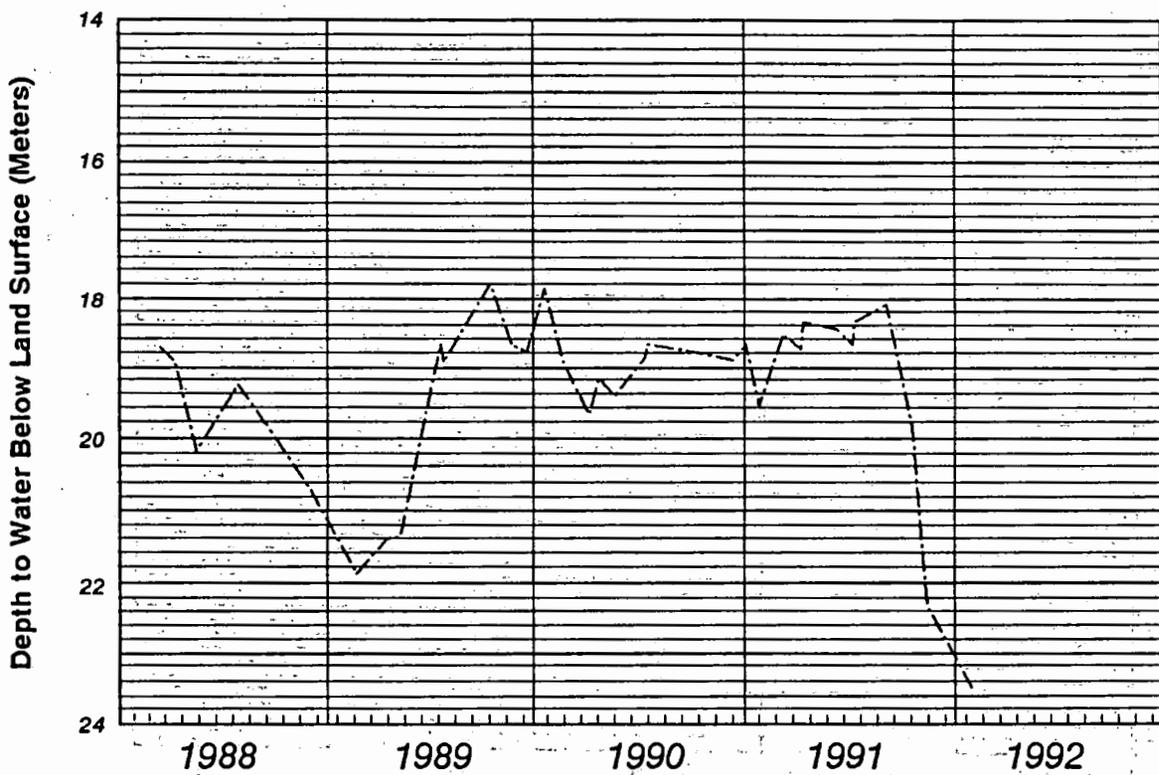


Figure D-8. Hydrograph of USGS Well #54 (Deep Perched)

basin and the faster-leaking west side mentioned earlier. The changes in water levels of #A-13 and #54 are related to discharges made to the nonradioactive infiltration ponds. When the north pond is being used, water levels in #A-13 and #54 rise several meters.

### RWMC

The tritium concentrations in water from aquifer wells #87 and #90 and in USGS samples of the RWMC production well are plotted in Figure E-1. Since tritium is rarely detected in wells #88 and #89, data from these wells are not included in Figure E-1. Water levels for wells #87 and #90 are plotted in Figure E-2, and for #88 and #89 in Figure E-3.

Selected first quarter samples from the RWMC wells were analyzed for gamma-emitting radionuclides, Sr-90, and transuranic elements. None of these radionuclides were reported in any of the samples measured.

USGS has continued sampling wells at the RWMC for purgeable organic compounds during 1991. Results are consistent with those reported previously by USGS. For example, the mean concentration of carbon tetrachloride in three first quarter RWMC production well samples was 2.2  $\mu\text{g/L}$ .

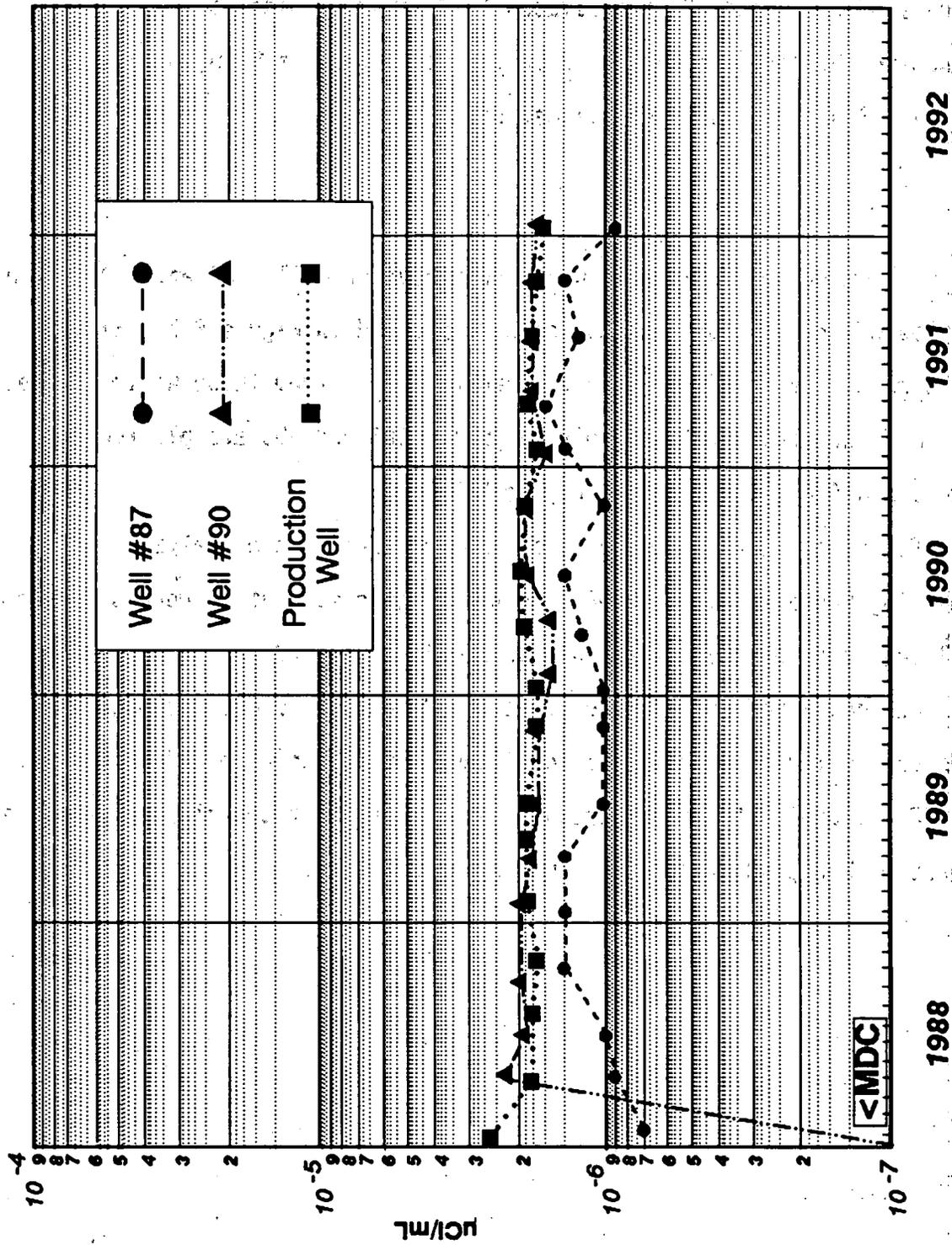


Figure E-1. Tritium Concentrations in RWMC Wells

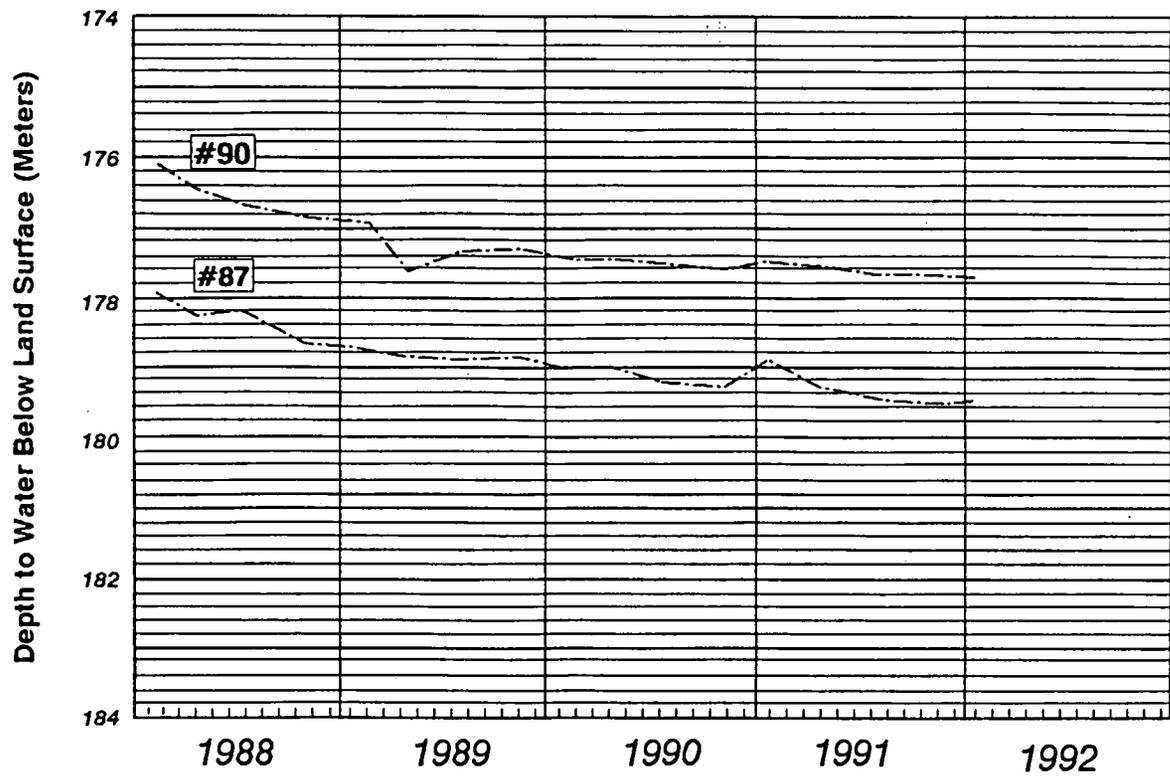


Figure E-2. Hydrographs of RWMC Wells #87 and #90

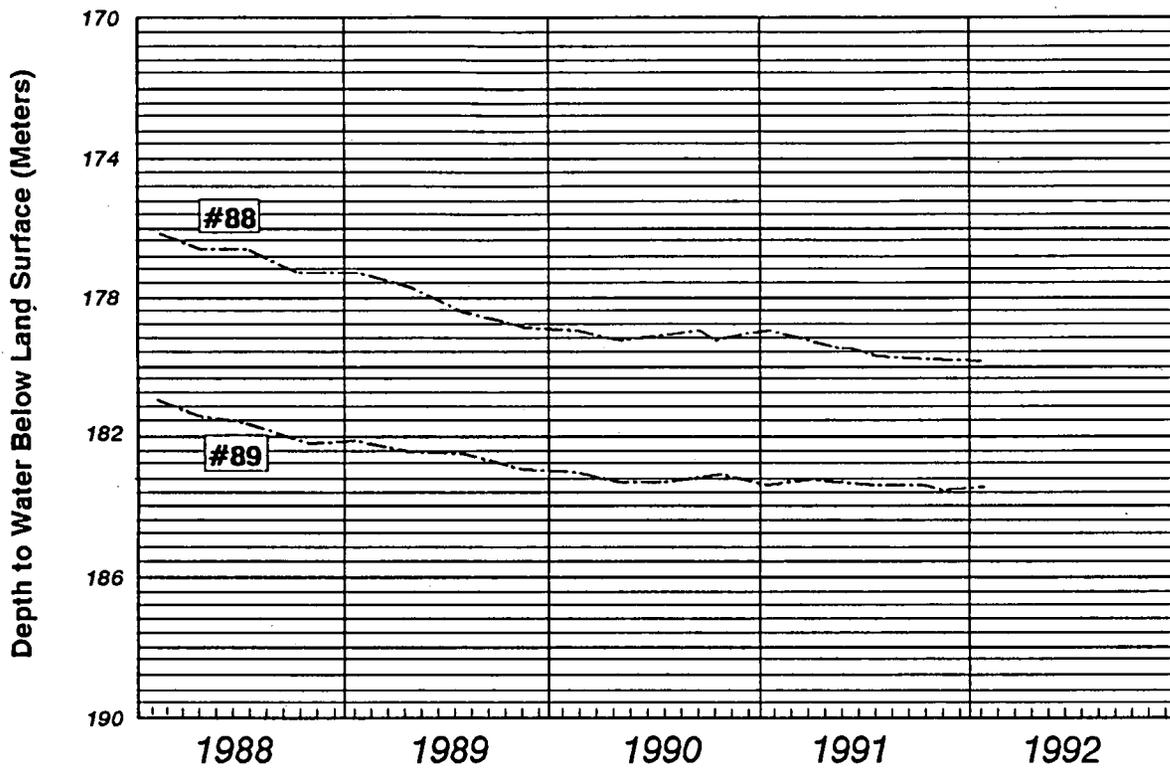


Figure E-3. Hydrograph of RWMC Wells #88 and #89

PRR



## Department of Energy

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September 10, 1992

See Addressee List

SUBJECT: INEL Site Environmental Surveillance Report for the First Quarter  
1992 - AM/EP-RESL-92-304

Enclosed is the INEL Site Environmental Surveillance Report for the First Quarter of 1992. If you have any changes to suggest, we will try to incorporate them in the next report. Please direct any questions of comments to Eddie Chew at the Radiological and Environmental Sciences Laboratory, 526-2335.

Sincerely,

**Public Reading Room  
U. S. Department of Energy  
Idaho Operations Office**

A handwritten signature in cursive script that reads "T. E. Williams for".

Thomas E. Williams, Director  
Radiological and Environmental  
Sciences Laboratory

1 Enclosure  
INEL Site Environmental Surveillance Report  
First Quarter of 1992

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