RADIOLOGICAL ENVIRONMENTAL MONITORING SPECIAL REPORT

JULY 1992

STATEMENT OF THE PROBLEM:

Water samples taken on April 29, May 13 and May 18, 1992, from the outfall to the storm drain effluent pond on the Plant 2 site contained elevated levels of iodine-131, cerium-141, and tritium. These samples also contained detectable levels of manganese-54, zinc-65, antimony-125, cesium-137 and cobalt-60. The concentrations of iodine-131 found in these three samples were 12.6, 21.1 and 1.2 pCi/liter. The tritium concentrations were 270,000 and 120,000 pCi/liter for the May 13 and May 18 samples, respectively.[1] The estimated second quarter 1992 average concentrations determined for iodine-131 and tritium were 2.4 pCi/liter and 46,000 pCi/liter, respectively.[2] These estimated average concentrations exceed the Nuclear Regulatory Commission's (NRC's) reporting levels for iodine-131 and for tritium, as given in Table 6.3.1.1-2 of the Offsite Dose Calculation Manual (ODCM). In addition, the individual results exceeded the investigation levels set by the Washington State Department of Health (DOH) and the Supply System for Radiological Environmental Monitoring Program (REMP) samples.[3]

DISCUSSION

The Plant 2 storm drain system receives water from several sources, including building roof drains, the Service Building floor drain sump, Diesel Generator Building floor drains, air-handling unit drains, backwash effluent from gravity and carbon filters in the Service Building, Turbine Building nonradioactive floor drains, and the dike around the condensate storage tanks. Water released through this system flows to a small pond area, about 400 feet

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[1] No tritium data is available for the April 29 sample.

[2] Based on time-weighted averages of all sample results. Averages of only the biweekly samples taken during the quarter were 4.0 and 91,000 pCi/liter for iodine-131 and tritium, respectively.

[3] Letter from R.A. Chitwood, Supply System, to Bob Mooney, DOH, "Establishing Reporting Levels for Supply System REMP Results," dated March 26, 1986; letter from John L. Erickson, DOH, to Joe Bell, Supply System, dated January 17, 1991.

in length, which is situated approximately 1500 feet northeast of the plant. The estimated water flow to the storm drain is approximately 30,000 gallons per day.

Floor drains in the Diesel Generator, Service, and Turbine Buildings, as well as the storm water drainage, are normally considered nonradioactive. However, the potential for radioactivity to enter these systems has been recognized. The drainage from the nonradioactive floor drain sumps in the Turbine Building is monitored before and during release to the storm drain by detectors which have alarm setpoints at 80% of the 10 CFR 20 Appendix B Table II value for cesium-137. The other floor and equipment drain systems connected to the storm drain system are not monitored. Drainage from the dike around the condensate storage tanks is analyzed before being routed to the storm drain or to radwaste.

Sediment samples and occasional water and vegetation samples have been collected from the storm drain since 1985. Low levels of cesium-137, cesium-134, cobalt-60 and zinc-65 have been routinely detected in the storm drain sediments, but no detectable radioactivity has been found in the vegetation and water prior to this year. The REMP began in February 1992 to take biweekly water (grab) samples and quarterly soil and vegetation samples, in addition to the monthly sediment samples from the storm drain outfall. Summaries and graphs of the sediment, water and vegetation results prior to 1992 and during the first four months of 1992 are presented in Attachments 1 and 2. The soil sample results are not included, since they are not directly related to the issues presented here.

On April 29 and May 13, 1992, the biweekly water samples and the monthly sediment samples were collected from the storm drain outfall. On May 15, Teledyne Isotopes, the analytical contractor for the REMP, reported that the gamma isotopic analysis results for the April 29 water sample indicated that it contained 12.6 pCi/liter of iodine-131. Recounts of the sample supported that analysis. On May 21, gamma isotopic analysis results for the May 13 water sample indicated not only detectable iodine-131, but detectable levels of several other radionuclides. A later tritium analysis indicated significant levels of that radionuclide, as well. The May 13 water sample results are presented in the following table. Also included in that table are the NRC reporting levels, the DOH investigation levels and

80% of the 10 CFR 20 Appendix B Table II maximum permissible concentrations (MPCs) for comparison.

MAY 13, 1992, WATER SAMPLE RESULTS COMPARED TO REGULATORY LEVELS (pCi/liter)

Nuclide[4]	Sample Result ± 2σ	NRC Reporting Level *	DOH Investigation Level	80% Table II Value
iodine-131	21.1 ± 5.0	2	1	240
manganese-54	5.8 ± 3.6	1000	100	80,000
cobalt-60	124.7 ± 7.7	300	100	40,000
zinc-65	52.9 ± 10.2	300	100	80,000
antimony-125	20.8 ± 9.6	Not given	100	80,000
cesium-137	5.7 ± 3.3	50	100	16,000
cerium-141	707.0 ± 11.6	Not given	100	72,000
tritium	270,000 ± 10,000	30,000	1000	2,400,000

* quarterly average concentration

On May 22, PER # 292-0531, describing the storm drain water radioactivity, was completed. The State of Washington DOH was notified that the investigation levels for iodine-131, cerium-141 and cobalt-60 had been exceeded. The Region V office of the Nuclear Regulatory Commission was also notified of the results. Later, when the tritium result for the May 13 sample was received, DOH was again notified that an investigation level had been exceeded.

Tritium analyses were also performed on later samples, but none were as high as the May 13 sample. The second highest concentration was in the May 18 sample, which contained 120,000 pCi/liter. The quarterly average concentrations for iodine-131 and tritium estimated for the Second Quarter 1992 were, therefore, 2.4 and 46,000 pCi/liter, respectively.

[4] Analyses for strontium were also performed on this sample. The strontium-90 and strontium-89 results were below detection limits.

Summaries of the water sample results and percentages of the MPCs from 10 CFR 20 Appendix B Table II for water samples collected during the Second Quarter 1992 are presented in Attachment 3. The highest percent of an MPC during the quarter was the May 13 tritium result, which was 9% of the MPC value. Water samples collected after May 29 have not contained detectable levels of gamma-emitters or tritium.

The results of gamma and tritium analyses performed on other water samples taken before and during the second quarter indicate that the ratios of tritium concentrations to the concentrations of gamma-emitters, such as cesium-137, vary greatly. In storm drain water collected March 18, for example, the tritium concentration was elevated, 15,000 pCi/liter, while the only principal gamma-emitter detected was cobalt-60, which was present at a low concentration. The sump monitors, which can detect only gamma radiation, are therefore, not effective in preventing the release of water containing significant levels of tritium via the storm drain.

Some sediment samples taken at the storm drain outfall and pond during May also contained the same radionuclides observed in the May 13 water sample. A sediment sample taken on May 18 contained detectable levels of manganese-54, cerium-141 and cesium-134, in addition to the cobalt-60, zinc-65 and cesium-137 previously observed in the sediment. These radionuclides continued to be detected in sediment samples in June and July. A summary and graphs of these recent sediment sample results are presented in Attachment 4.

A special set of water, vegetation, and sediment samples was taken on May 22 at the pipe outfall and at five other locations around the pond, in order to characterize the spread of radionuclides to various parts of the pond. The concentrations of gamma-emitters in the water were below detection levels at all locations. The tritium results, however, were above detection levels at all locations. One water sample taken from the point furthest from the drain outfall, Location E, had a tritium result that exceeded the 1,000 pCi/liter DOH investigation level. The cobalt-60, zinc-65, cesium-137 and cerium-141 concentrations found in the sediment at some locations, especially at the point where the narrow stream bed widens into the main pond area, were above DOH investigation levels. Cattails collected at

two locations in the pond had no detectable radioactivity, aside from potassium-40, which is naturally-occurring. As shown in Attachment 2, vegetation samples taken since then, however, have contained detectable levels of cesium-137, zinc-65, and cobalt-60. A summary and graphs of the water, vegetation, and sediment results for each sampling location used in this special study are presented in Attachment 5.

DOSE CALCULATIONS

The ODCM Requirement for Operability 6.3.1.1, applies to cases when, as result of plant effluents, levels of radioactivity in an environmental medium exceed NRC reporting levels. It requires that, in response to those levels, corrective actions be taken to reduce radioactive liquid effluents so that the potential annual dose to a member of the public is: (1) $\leq$ 1.5 mrem to the total body and $\leq$ 5 mrem to any organ during any calendar quarter, and (2) $\leq$ 3 mrem to the total body and $\leq$ 10 mrem to any organ for any calendar year. The storm drain has no direct pathway to members of the public, so it is highly unlikely that the measured radioactivity in the pond water would impact the dose to members of the public. Even if an individual drank this water every day, the annual dose to total body and to the maximum organ would still be below the above limits.[5]

CAUSES OF THE RELEASES TO THE STORM DRAIN:

The most probable sources of the radioactivity observed in the storm drain pond were releases of liquids associated with the turbine replacement and other nonroutine outage work in the Turbine Building. Other contributing factors include the use of 10 CFR 20 Appendix B Table II levels as the criteria for releases, sump monitor setpoints, the assumption that sufficient levels of gamma-emitters would accompany the beta-emitters and the limited ability of the radwaste processing system to handle water with high organic and silica content.

[5] The estimated total body and maximum organ doses for the second quarter are 0.4 and 1.5 mrem, respectively. The estimated annual doses to the total body and to the maximum organ are 1.6 and 5.9 mrem, respectively. These estimated doses were calculated using the quarterly averages and ODCM Equation 5.

The specific factors that have been considered in order to resolve the problem are:

a) Some water has been released to the storm drain if the radioactivity it contained was below 80% of 10 CFR 20 Appendix B, Table II levels. Since the sump monitoring systems are designed to detect 80% of the 10 CFR 20 Appendix B Table II levels of radioactivity, levels below the Table II values could be released to the environment. These levels are up to 1000 times greater than the NRC reporting levels for environmental samples;

b) The sensitivity of the sump monitors and the residual radioactivity in the Turbine Building nonradioactive sumps makes the monitoring equipment appropriate only for detecting gamma radioactivity in the sump. The monitors are not designed to detect beta-emitters;

c) Supply System policies and procedures do not clearly specify the criteria for the release or the transfer of water from potentially contaminated sumps to clean drain systems.

CORRECTIVE ACTIONS:

The ODCM Requirement for Operability 6.3.1.1 requires that corrective actions be taken to reduce radioactive effluents so that the potential annual dose to a member of the public would be within the limits discussed in the Dose Calculation section of this report. Based on the conservative evaluation performed, no corrective actions are needed to reduce the dose to the public.

The Supply System's response to PER 292-0531 (elevated levels of radioactivity detected in the storm drain pond) included the following actions:

a) Administrative controls were tightened on release of liquids to the storm drain system to preclude further releases of radioactivity;

b) A formal root cause analysis was instituted to identify the causes of the elevated readings and further corrective actions to prevent recurrence of the problem;

c) Efforts underway prior to the event were accelerated to ensure that all floor drains were properly and clearly labeled to distinguish between radioactive and nonradioactive drains, and established policy prohibiting discharge of liquids to plant drains was reinforced.

Proposed corrective actions from the root cause analysis include strengthening and clarifying the policies and procedures, investigating the monitoring system capabilities and sensitivities to determine the feasibility of improving the sensitivity to low levels of activity, and investigating other leak paths into the system to ensure that all sources of radioactive water are isolated. These actions are judged to be sufficient to prevent recurrence of the spikes of activity observed in the storm drain pond.

ATTACHMENT 1

ST101 SEDIMENT - 1987 TO APRIL 1992

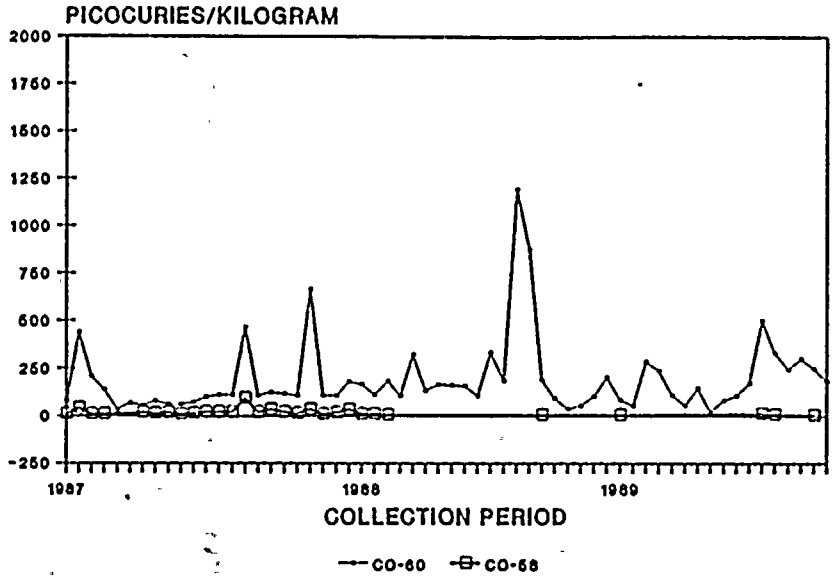
1987-92 ST101 SEDIMENT RESULTS - PICOCURIES/KILOGRAM

DATE	CS-137	CS-134	CO-60	CO-58	ZN-65	I-131
01/09/87	3.80E+01	4.50E+00	7.80E+01	7.90E+00	8.40E+02	
01/27/87	4.81E+01		4.35E+02	3.93E+01	1.84E+03	
02/05/87	3.57E+01		2.08E+02	9.20E+00	1.09E+03	
02/19/87	4.70E+01		1.37E+02	7.78E+00	9.28E+02	
03/20/87	3.63E+01		3.44E+01		5.07E+02	
04/02/87	4.32E+01		6.93E+01		6.89E+02	
04/23/87	3.15E+01		5.33E+01	1.55E+01	6.66E+02	
05/01/87	4.93E+01	4.90E+00	7.85E+01	1.29E+01	8.76E+02	
05/21/87	4.99E+01		6.16E+01	1.62E+01	7.81E+02	
05/29/87	4.70E+01	8.82E+00	6.11E+01	7.62E+00	6.97E+02	
06/11/87	4.39E+01	7.75E+00	7.17E+01	1.41E+01	8.10E+02	
06/28/87	4.66E+01	8.90E+00	1.00E+02	2.07E+01	8.87E+02	
07/10/87	4.09E+01		1.09E+02	2.03E+01	1.00E+03	
07/13/87	4.80E+01	1.27E+01	1.10E+02	1.86E+01	9.75E+02	
07/23/87	5.35E+01	1.48E+01	4.66E+02	9.36E+01	1.78E+03	
08/10/87	4.21E+01		1.07E+02	2.01E+01	9.42E+02	
08/20/87	4.69E+01		1.25E+02	3.35E+01	9.14E+02	
09/03/87	3.83E+01	9.79E+00	1.18E+02	2.02E+01	8.52E+02	
10/09/87	4.44E+01		1.07E+02	1.21E+01	6.94E+02	
10/28/87	1.50E+02	5.42E+01	6.64E+02	3.49E+01	1.81E+03	
11/12/87	4.34E+01		1.08E+02	1.03E+01	7.29E+02	
11/24/87	4.89E+01	2.35E+01	1.07E+02	1.46E+01	6.82E+02	
12/10/87	5.29E+01	2.82E+01	1.81E+02	3.28E+01	6.85E+02	6.06E+00
01/07/88	5.62E+01	2.54E+01	1.66E+02	9.49E+00	6.46E+02	
01/21/88	5.49E+01	2.39E+01	1.09E+02	1.04E+01	5.43E+02	
02/12/88	7.29E+01	2.71E+01	1.84E+02	6.36E+00	7.57E+02	
03/23/88	3.65E+01	1.78E+01	1.08E+02		3.60E+02	
04/18/88	4.87E+01	2.16E+01	3.20E+02		5.62E+02	1.79E+01
05/11/88	5.67E+01	2.76E+01	1.36E+02		4.27E+02	2.86E+01
06/09/88	3.75E+01	2.94E+01	1.64E+02		3.73E+02	1.54E+01
06/28/88	6.88E+01	3.14E+01	1.63E+02		3.93E+02	
07/08/88	6.94E+01	4.83E+01	1.57E+02		3.93E+02	
07/21/88	6.85E+01	3.37E+01	1.06E+02		3.15E+02	
08/04/88	7.78E+01	4.65E+01	3.31E+02		4.77E+02	
08/19/88	6.64E+01	4.38E+01	1.87E+02		3.55E+02	
09/01/88	9.54E+01	4.89E+01	1.19E+03		1.01E+03	
09/19/88	8.76E+01	3.71E+01	8.74E+02		7.82E+02	
10/10/88	6.88E+01	4.25E+01	1.91E+02	6.23E+00	3.81E+02	
10/25/88	6.02E+01	3.75E+01	9.39E+01		2.33E+02	
11/17/88	2.77E+01		3.86E+01		5.55E+01	
11/29/88	3.06E+01	2.41E+01	5.39E+01		4.15E+01	
12/09/88	4.92E+01	4.60E+01	1.02E+02		1.48E+02	
12/22/88	4.54E+01	3.70E+01	2.05E+02		1.50E+02	
01/17/89	5.76E+01	4.53E+01	8.44E+01	4.85E+00	1.74E+02	
01/31/89	5.03E+01	3.26E+01	5.41E+01		8.48E+01	
02/17/89	7.16E+01	6.40E+01	2.82E+02		2.69E+02	
02/28/89	8.68E+01	6.35E+01	2.40E+02		1.97E+02	
03/23/89	5.02E+01	4.84E+01	1.11E+02		1.43E+02	
04/14/89	4.95E+01	6.60E+01	5.73E+01		8.08E+01	
04/28/89	8.00E+01	7.04E+01	1.46E+02		1.04E+02	
05/18/89	2.99E+01	4.08E+01	2.34E+01		4.72E+01	
05/31/89	5.49E+01	4.09E+01	8.28E+01		1.00E+02	
06/15/89	6.53E+01	3.58E+01	1.07E+02		1.19E+02	
07/05/89	6.36E+01	3.91E+01	1.72E+02		6.74E+02	
08/28/89	1.14E+02	1.27E+02	5.00E+02	1.29E+01	1.08E+03	

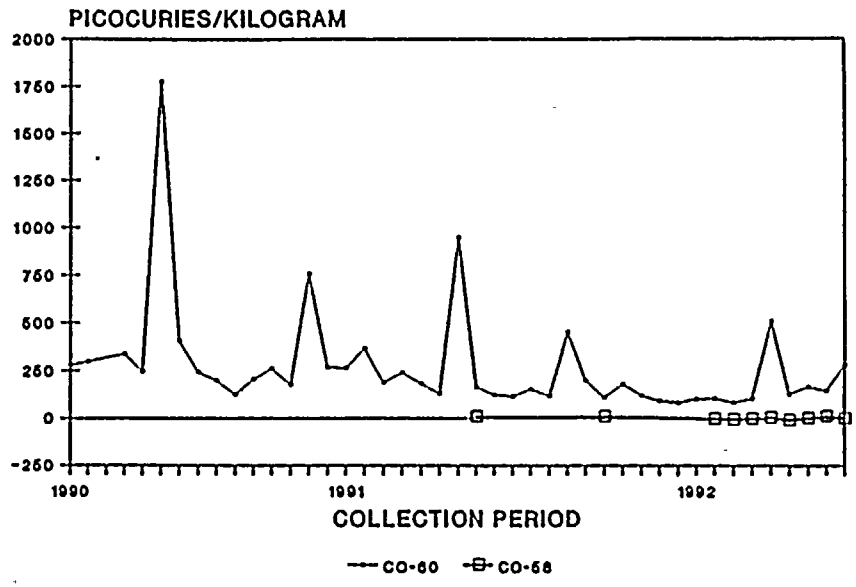
1987-92 ST101 SEDIMENT RESULTS - PICOCURIES/KILOGRAM

	DATE	CS-137	CS-134	CO-60	CO-58	ZN-65	I-131
	09/13/89	5.81E+01	6.28E+01	3.33E+02	1.04E+01	6.33E+02	
	09/26/89	1.09E+02	7.22E+01	2.46E+02		6.94E+02	
	10/13/89	6.20E+01	5.73E+01	3.03E+02		5.08E+02	
	10/30/89	7.67E+01	5.84E+01	2.48E+02	4.68E+00	5.44E+02	7.61E+00
	11/21/89	6.38E+01	4.19E+01	1.82E+02		3.25E+02	
	12/07/89	9.31E+01	6.63E+01	3.98E+02		5.81E+02	
	12/20/89	9.95E+01	6.62E+01	3.50E+02		6.00E+02	6.67E+00
	01/08/90	8.70E+01	6.11E+01	2.76E+02		4.18E+02	
	02/05/90	8.37E+01	6.17E+01	2.99E+02		4.25E+02	4.50E+00
	03/23/90						
	06/07/90	1.08E+02	6.43E+01	3.36E+02		1.92E+02	
	06/29/90	1.12E+02	7.44E+01	2.46E+02		1.42E+02	
	07/13/90	8.23E+01	5.88E+01	1.78E+03		2.32E+02	
	07/19/90	1.49E+02	9.41E+01	4.06E+02		2.23E+02	
	08/08/90	1.07E+02	6.87E+01	2.42E+02		1.70E+02	
	08/31/90	1.04E+02	4.50E+01	1.97E+02		6.70E+01	
	09/05/90	7.89E+01	4.98E+01	1.24E+02		1.41E+02	
	10/05/90	1.47E+02	9.67E+01	2.06E+02		1.49E+02	
	10/30/90	1.53E+02	9.24E+01	2.60E+02		1.12E+02	
	11/08/90	1.79E+02	1.13E+02	1.75E+02		1.13E+02	
	11/28/90	1.56E+02	8.66E+01	7.55E+02		2.57E+02	
	12/28/90	1.55E+02	9.13E+01	2.68E+02		1.00E+02	
	01/18/91	1.45E+02	7.97E+01	2.63E+02		1.02E+02	
	02/15/91	1.45E+02	8.21E+01	3.62E+02		1.18E+02	
	03/15/91	1.51E+02	9.05E+01	1.87E+02		7.09E+01	8.96E+00
	03/29/91	1.68E+02	8.64E+01	2.37E+02		8.14E+01	
	04/17/91	1.58E+02	8.90E+01	1.80E+02		7.02E+01	
	05/15/91	1.66E+02	1.04E+02	1.28E+02		1.70E+02	
	06/19/91	1.44E+02	1.04E+02	9.48E+02		1.47E+02	
	06/28/91	8.57E+01	5.93E+01	1.63E+02	6.00E+00	7.30E+01	
	07/11/91	5.59E+01	4.67E+01	1.19E+02		5.87E+01	
	07/25/91	6.68E+01	4.65E+01	1.13E+02		6.14E+01	
	08/20/91	7.50E+01	4.98E+01	1.53E+02		4.49E+01	
	08/30/91	8.03E+01	4.90E+01	1.17E+02		4.05E+01	
	09/13/91	1.01E+02	6.35E+01	4.49E+02		8.75E+01	
	10/01/91	8.20E+01	5.73E+01	1.96E+02		7.67E+01	
	10/18/91	8.25E+01	5.10E+01	1.06E+02	4.95E+00	5.64E+01	
	10/31/91	9.47E+01	5.25E+01	1.77E+02			
	11/21/91	4.83E+01	3.62E+01	1.16E+02		4.04E+01	
	12/12/91	6.28E+01	4.17E+01	9.04E+01		3.07E+01	
	12/31/91	8.69E+01	4.30E+01	7.71E+01		5.96E+01	
(S/S)	01/23/92	7.79E+01	5.57E+01	1.01E+02		5.80E+01	
(TELE	01/23/92	1.15E+02	4.90E+01	1.03E+02	-2.80E+00	6.60E+01	-3.50E+01
	02/05/92	9.95E+01	5.37E+01	8.22E+01	-9.20E+00	5.51E+01	1.90E+01
	02/19/92	8.30E+01	1.50E+01	1.04E+02	-3.40E+00	9.08E+01	-4.20E-01
	03/04/92	1.43E+02	7.09E+01	5.11E+02	3.40E+00	9.30E+01	-8.80E+00
	03/18/92	1.43E+02	7.86E+01	1.27E+02	-1.30E+01	9.40E+01	-1.80E+01
	04/02/92	1.40E+02	6.16E+01	1.64E+02	-1.80E+00	1.22E+02	1.20E+01
	04/15/92	1.08E+02	2.70E+01	1.46E+02	9.20E+00	1.31E+02	-5.50E+00
	04/29/92	1.47E+02	8.90E+01	2.79E+02	-9.70E-01	1.43E+02	6.10E+00
	Average	8.07E+01	5.18E+01	2.28E+02	1.33E+01	4.08E+02	4.07E+00
	High	1.79E+02	1.27E+02	1.78E+03	9.36E+01	1.84E+03	2.86E+01
	Low	2.77E+01	4.50E+00	2.34E+01	-1.30E+01	3.07E+01	-3.50E+01
	# of Sample	104	91	104	39	103	16

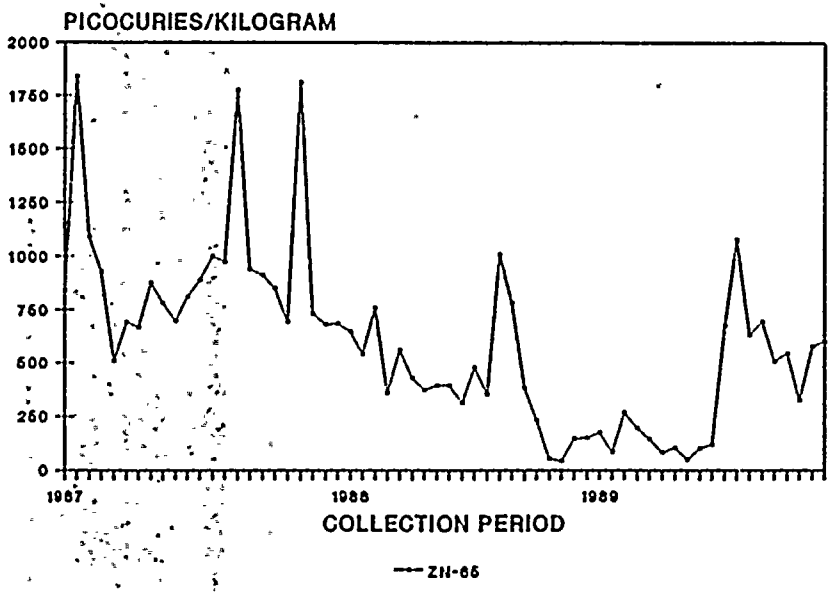
1987-89 ST101 RESULTS
Co-60 and Co-58 Thru 12/20/89



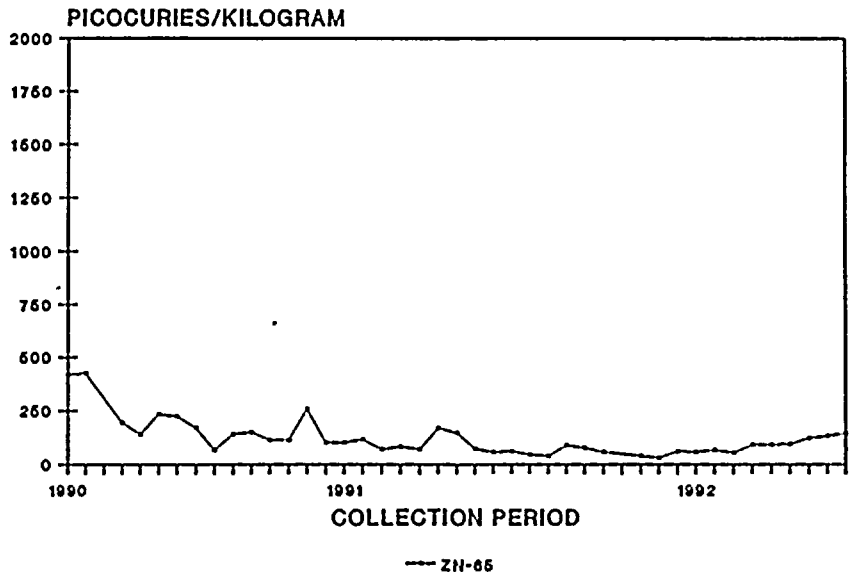
1990-92 ST101 RESULTS
Co-60 and Co-58 thru 04/29/92



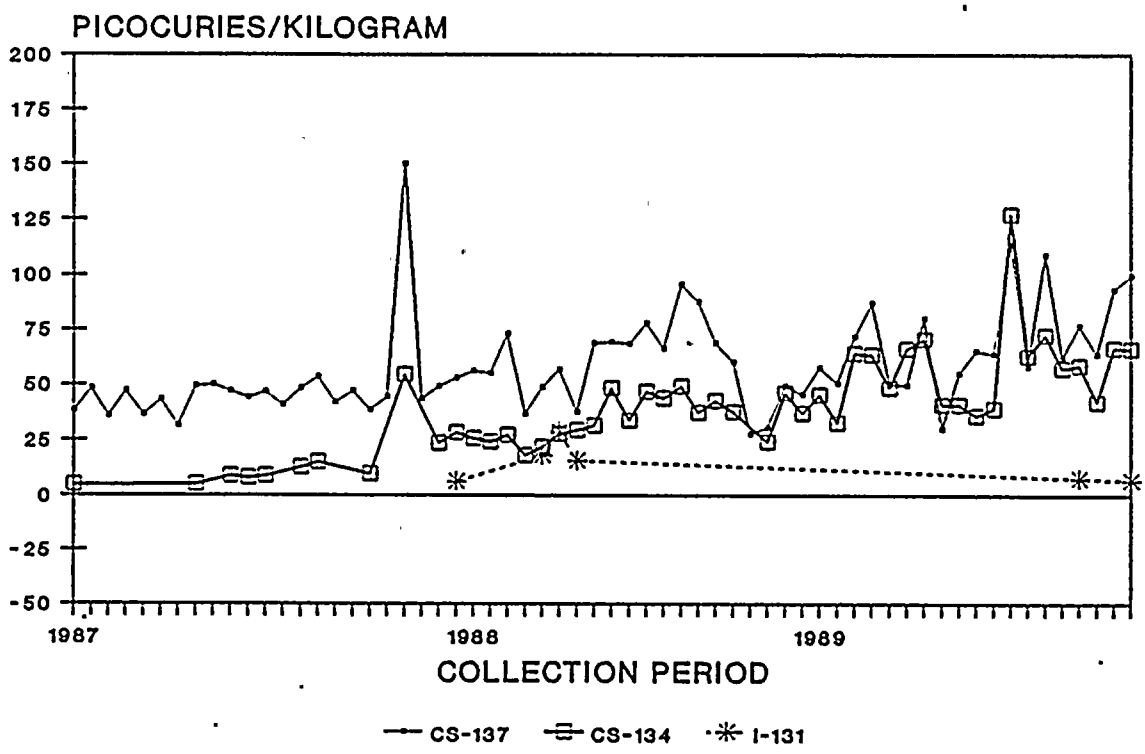
1987-89 ST101 RESULTS
Zn-65 thru 12/20/89



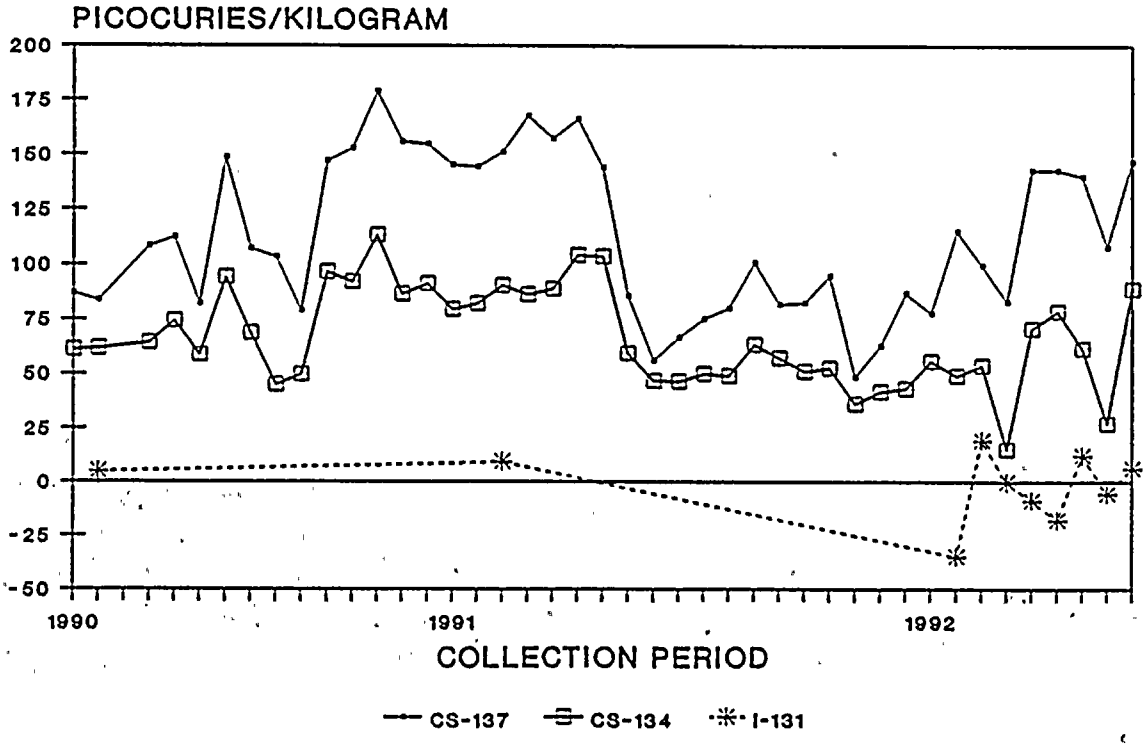
1990-92 ST101 RESULTS
Zn-65 thru 04/29/92



1987-89 ST101 RESULTS
Cs-137, Cs-134 and I-131 thru 12/20/89



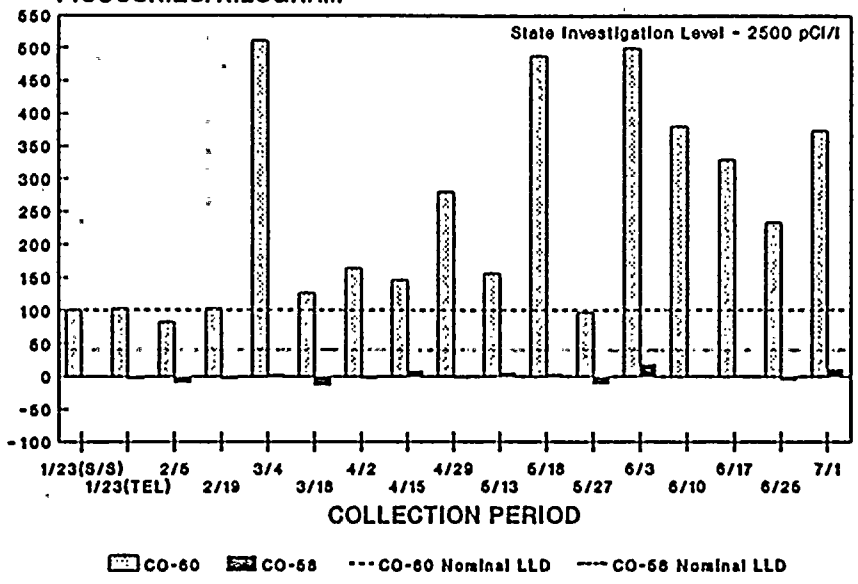
1990-92 ST101 RESULTS
Cs-137, Cs-134 and I-131 thru 04/29/92



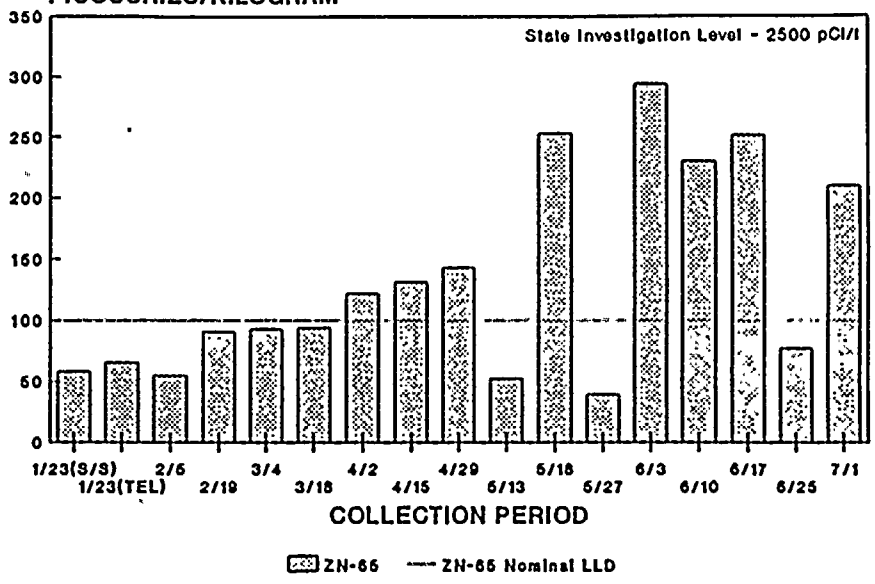
ATTACHMENT 2

1992 ST101 SEDIMENT, WATER AND VEGETATION RESULTS

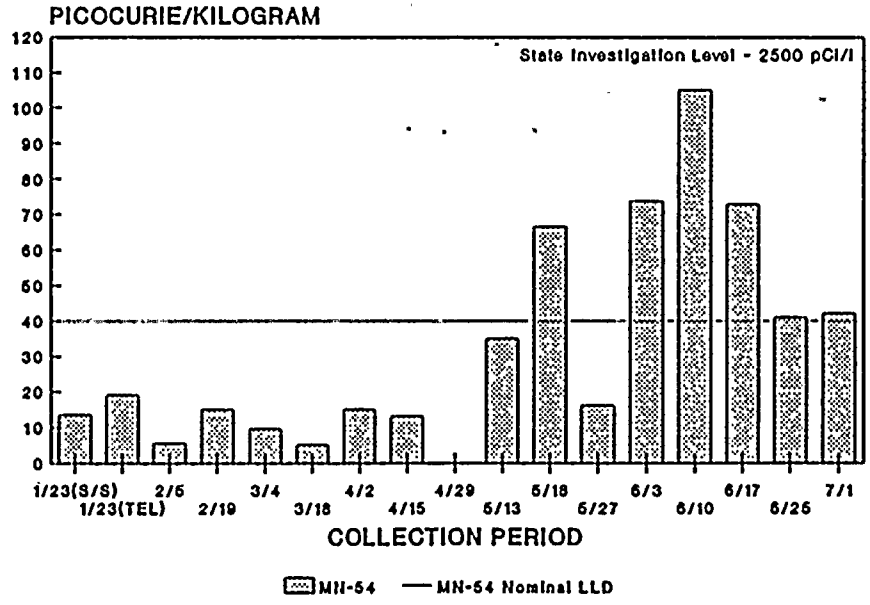
1992 ST101 SEDIMENT RESULTS
ACTIVATION PRODUCTS



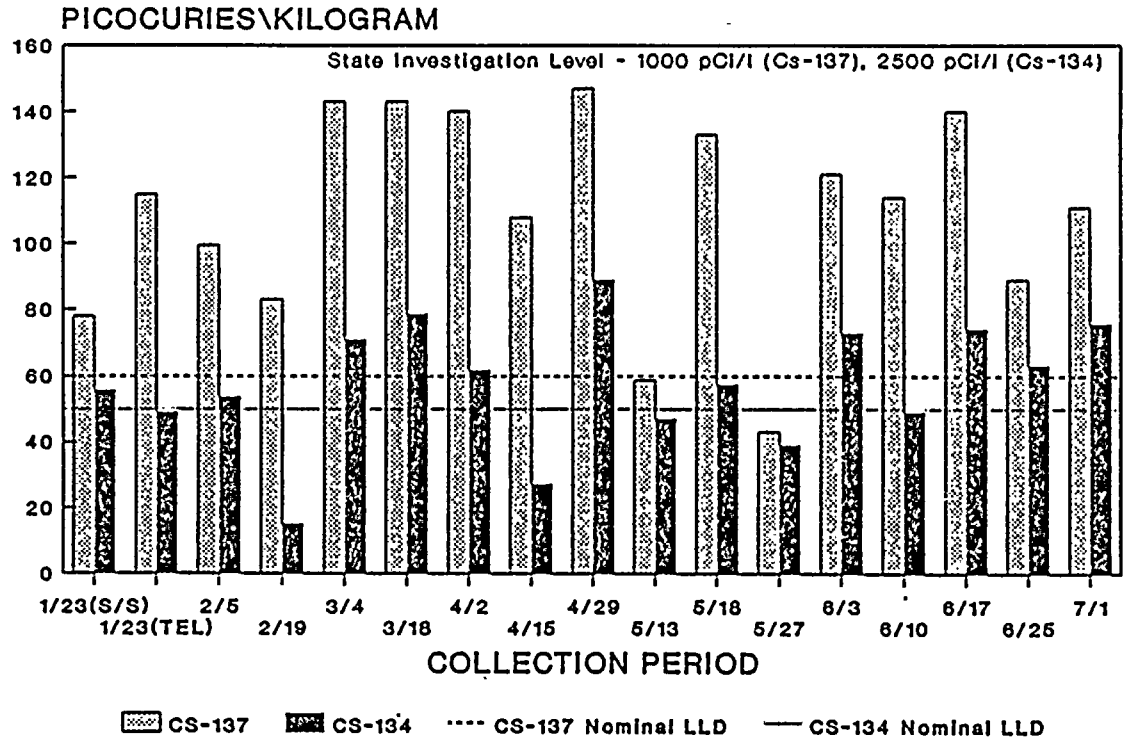
1992 ST101 SEDIMENT RESULTS
ACTIVATION PRODUCTS



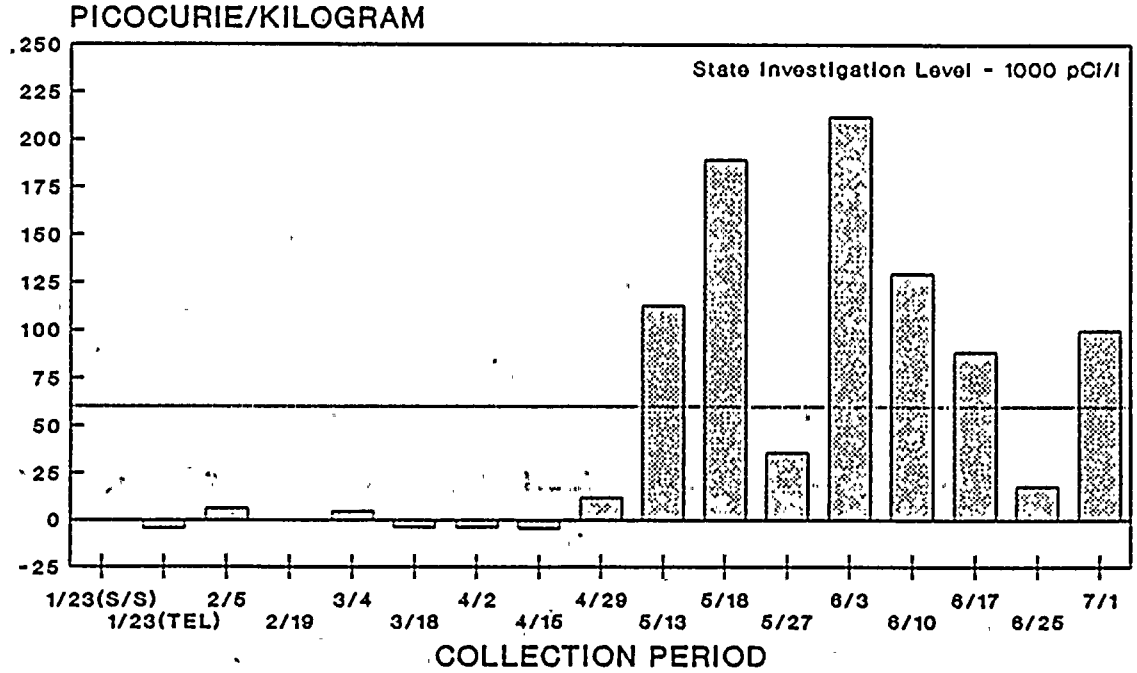
1992 ST101 SEDIMENT RESULTS
ACTIVATION PRODUCTS



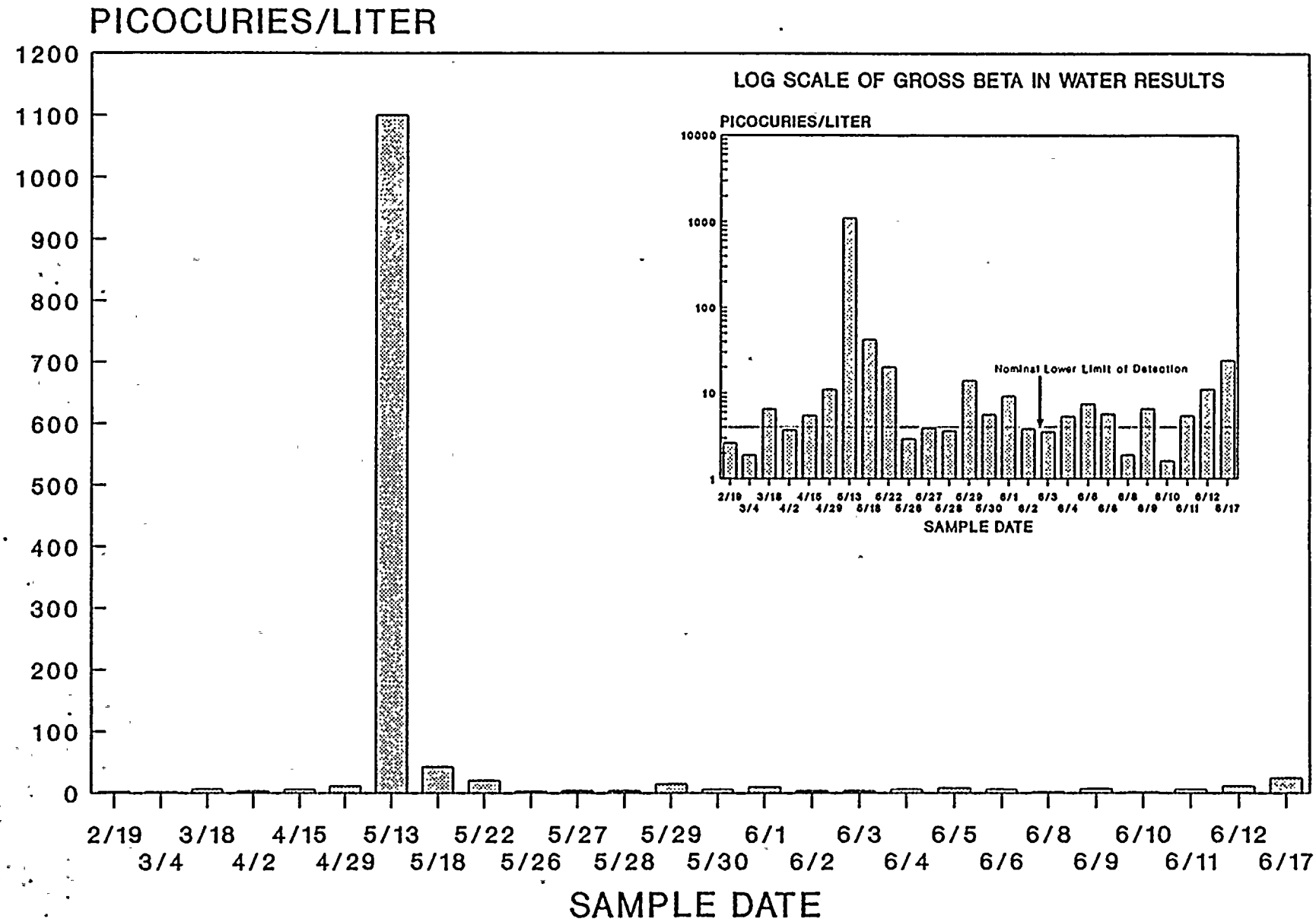
1992 ST101 SEDIMENT RESULTS
FISSION PRODUCTS



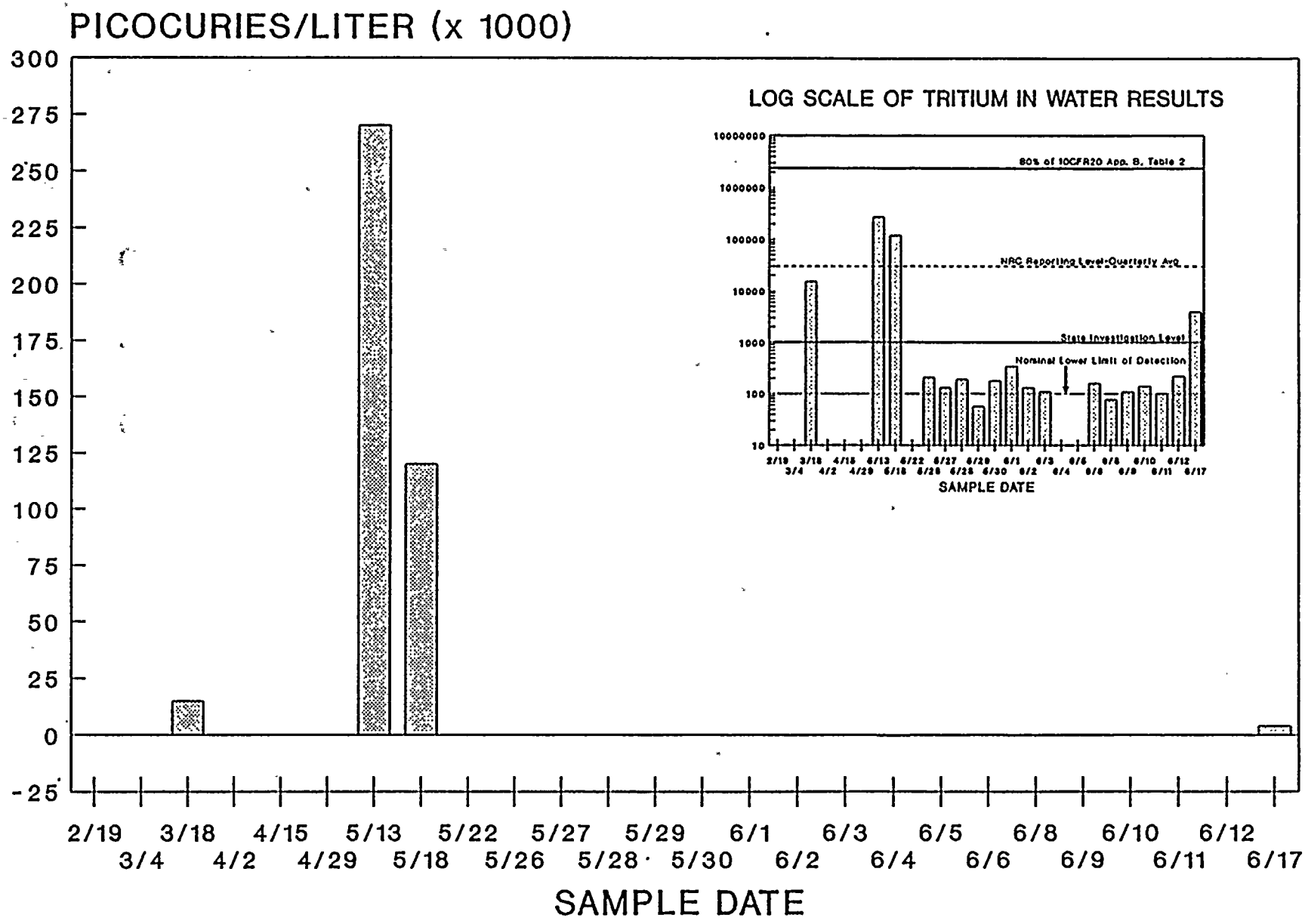
1992 ST101 SEDIMENT RESULTS
FISSION PRODUCTS



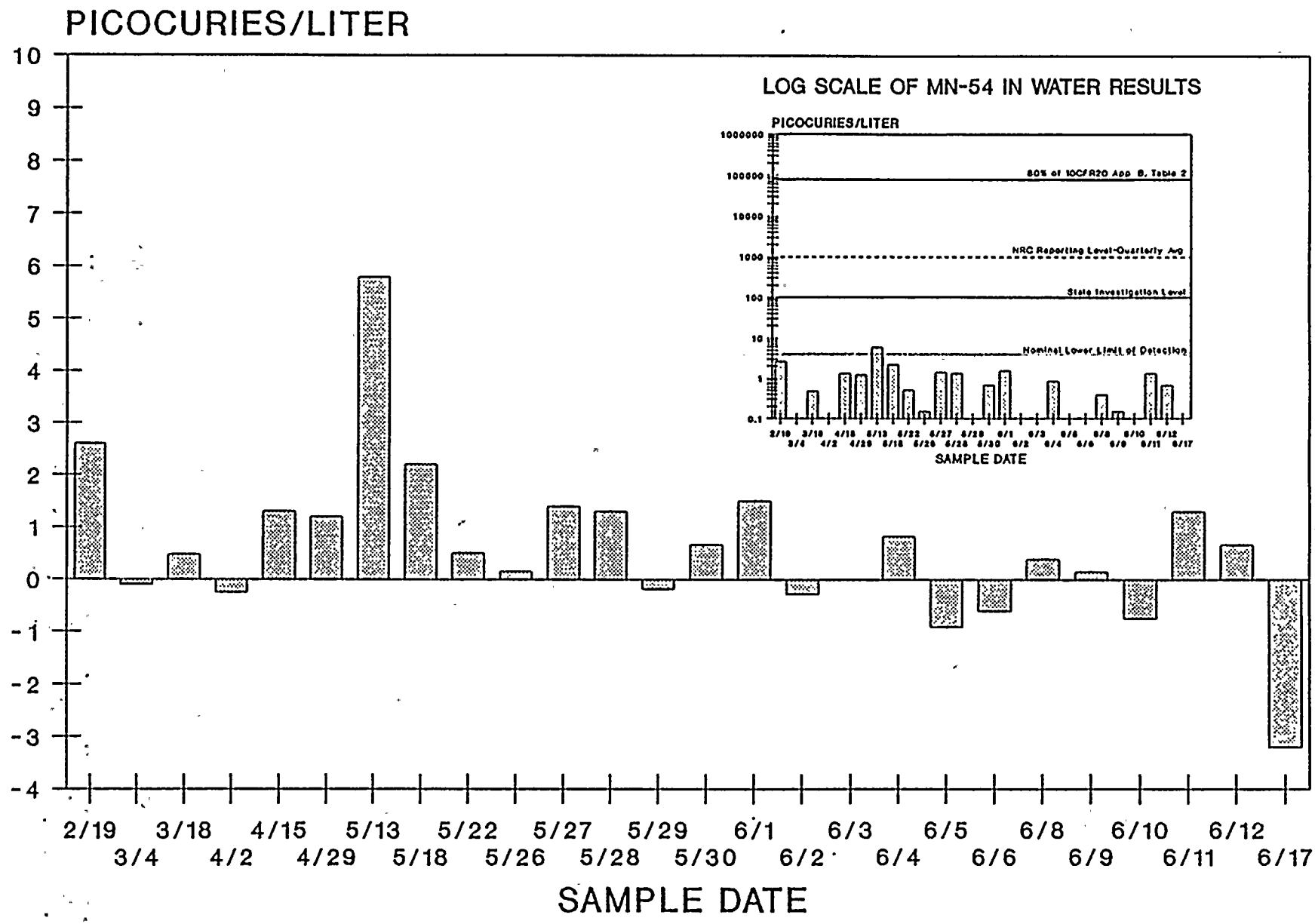
1992 GROSS BETA IN WATER RESULTS
FOR ST101 DRAINAGE LAGOON



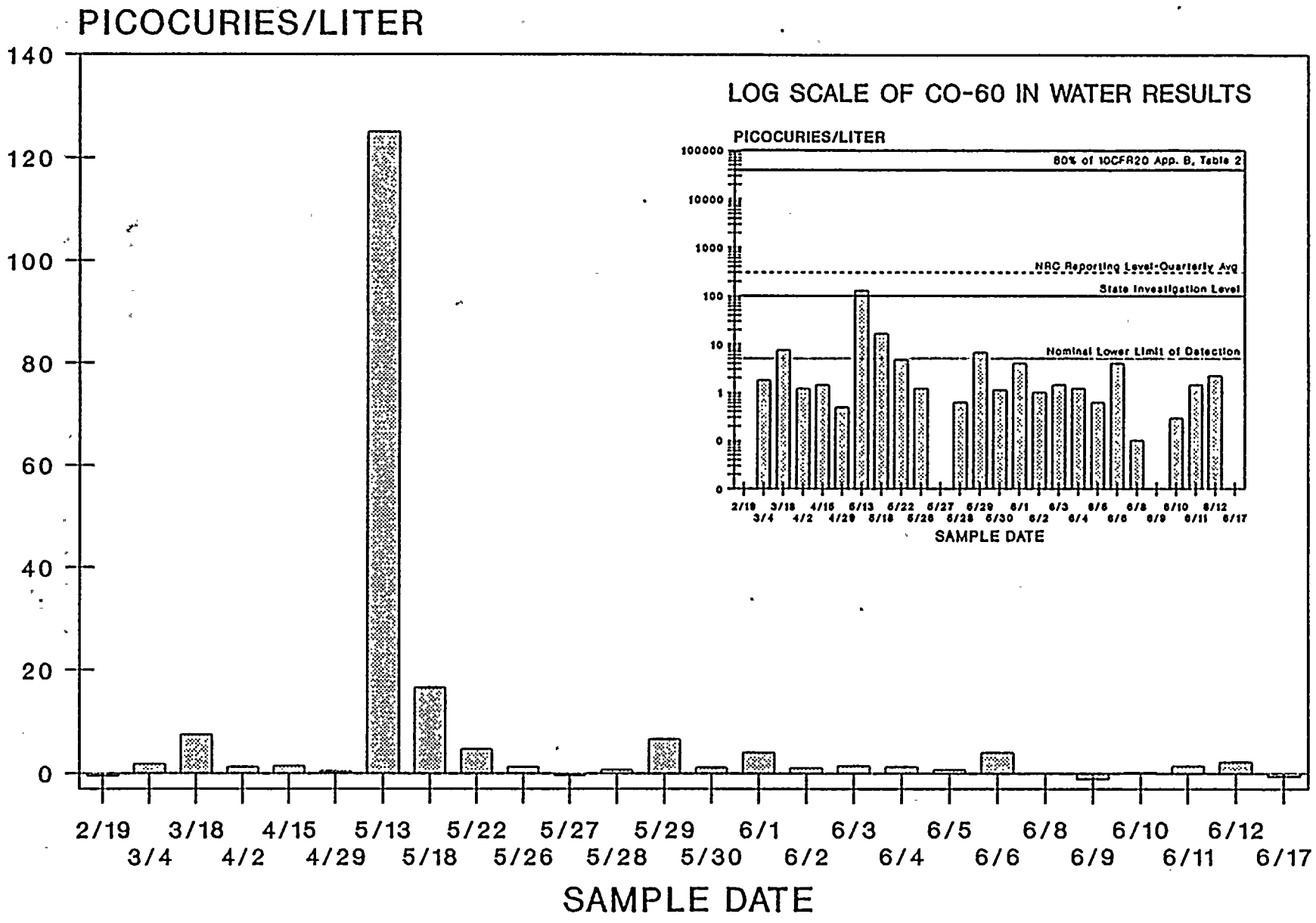
1992 TRITIUM IN WATER RESULTS
FOR ST101 DRAINAGE LAGOON



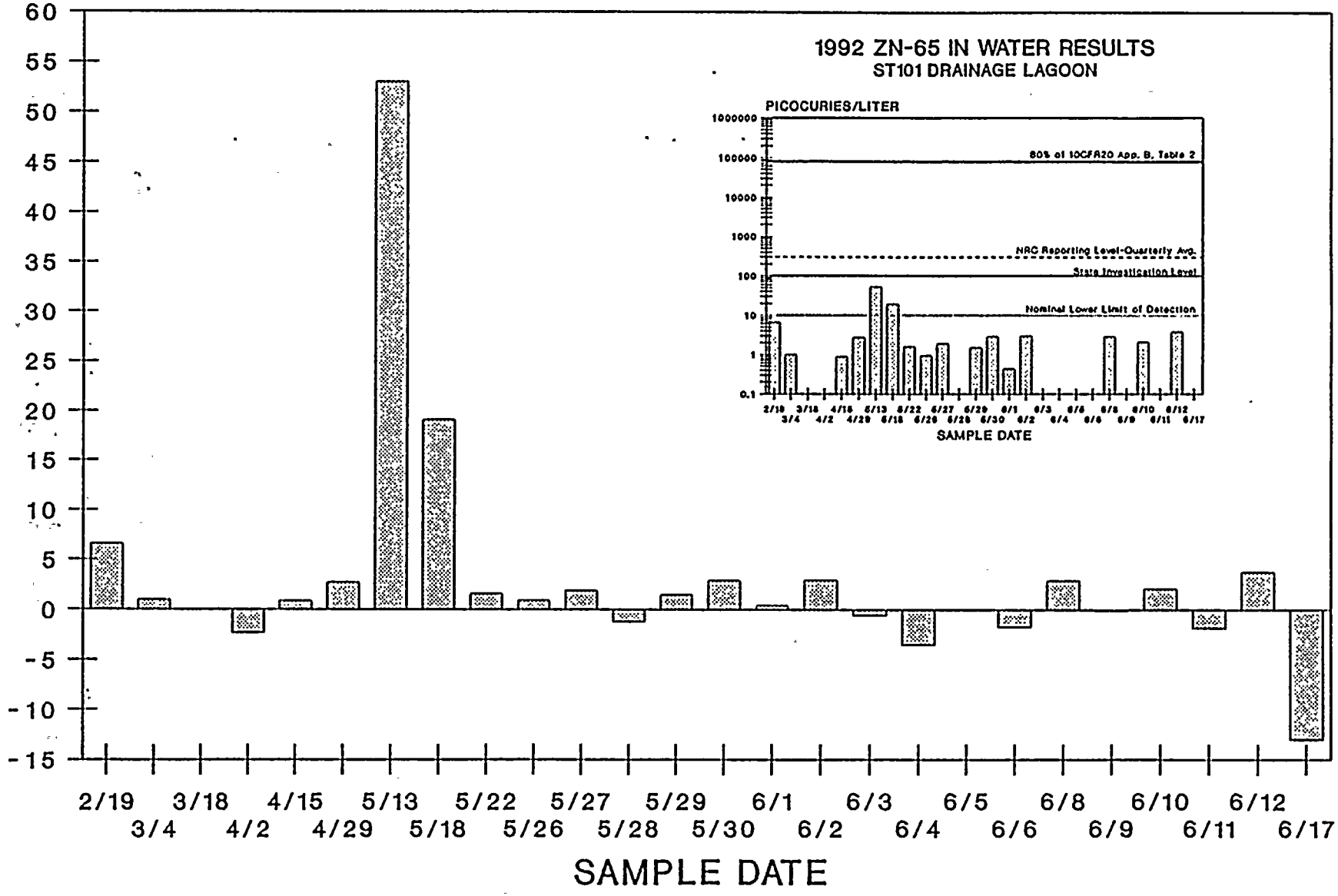
1992 MN-54 IN WATER RESULTS
ST101 DRAINAGE LAGOON



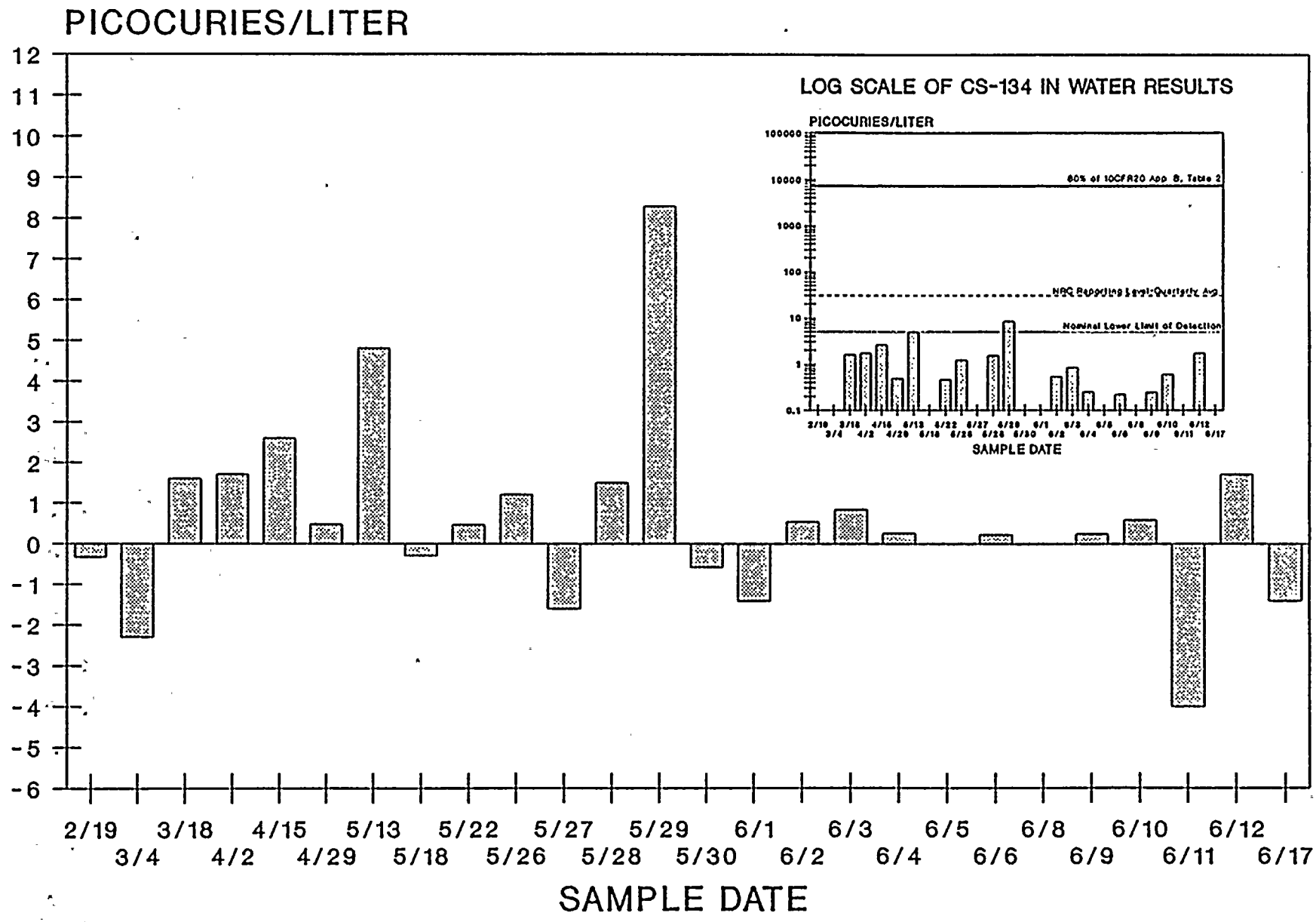
1992 CO-60 IN WATER RESULTS
ST101 DRAINAGE LAGOON



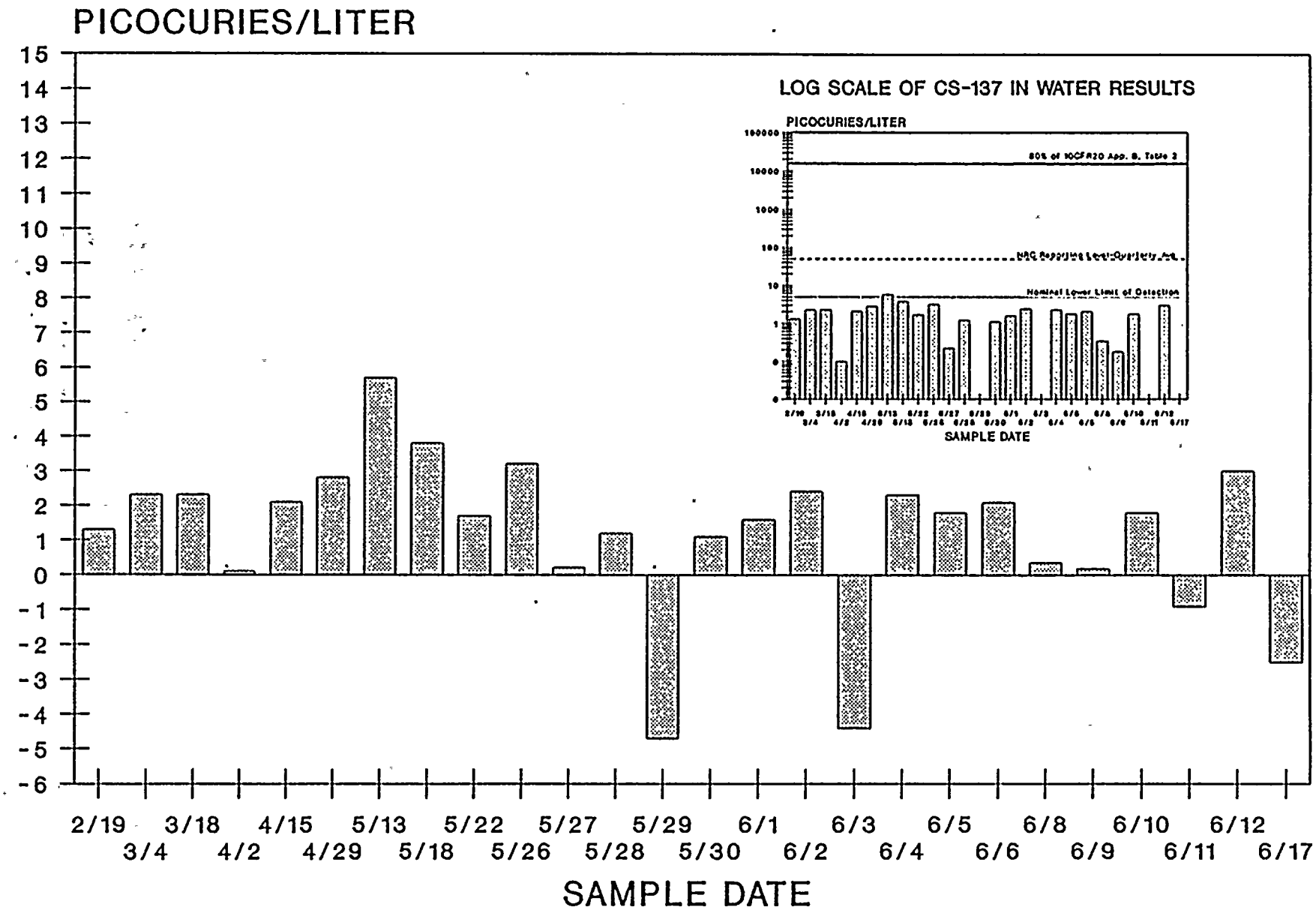
1992 ZN-65 IN WATER RESULTS
ST101 DRAINAGE LAGOON



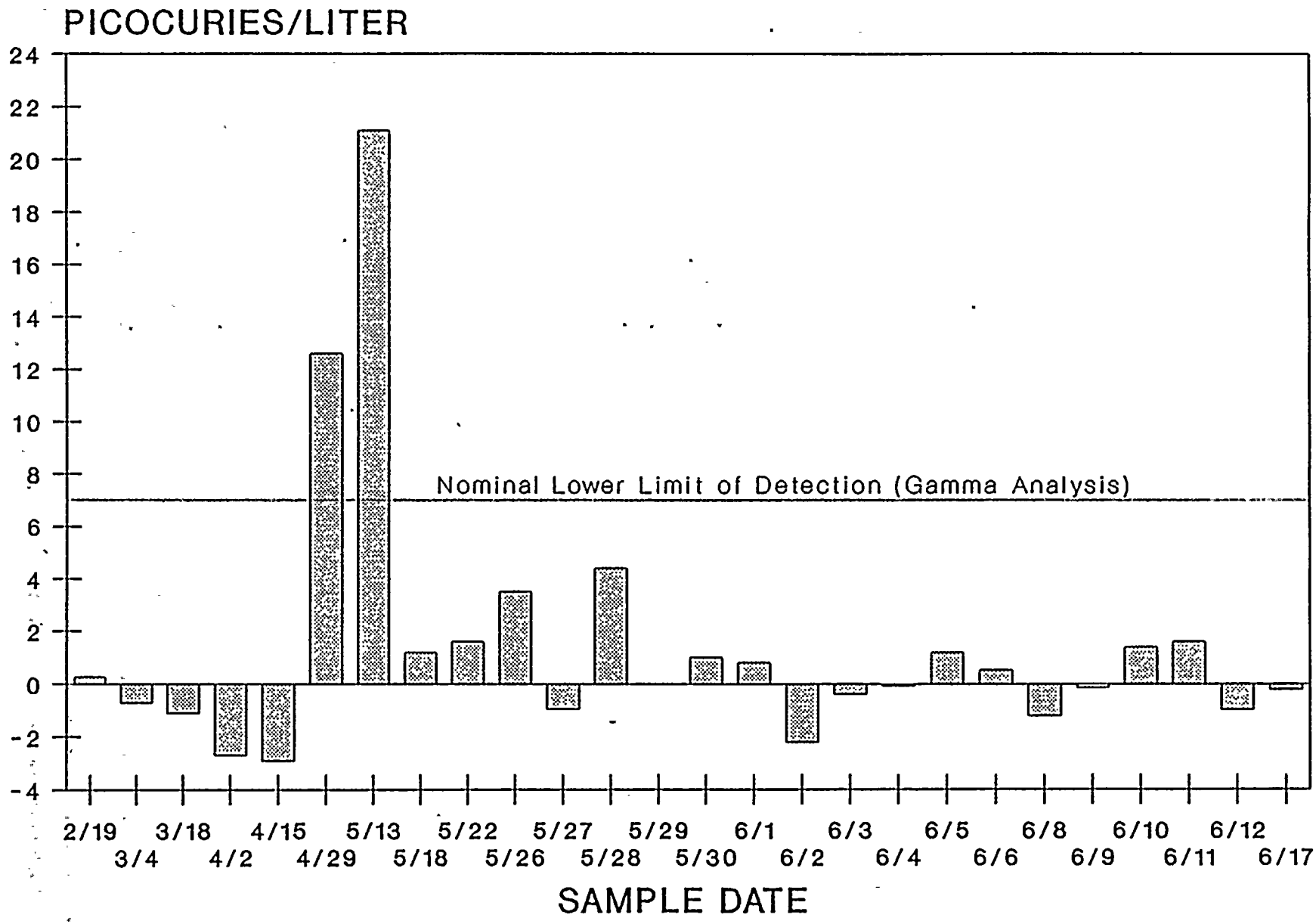
1992 CS-134 IN WATER RESULTS
ST101 DRAINAGE LAGOON



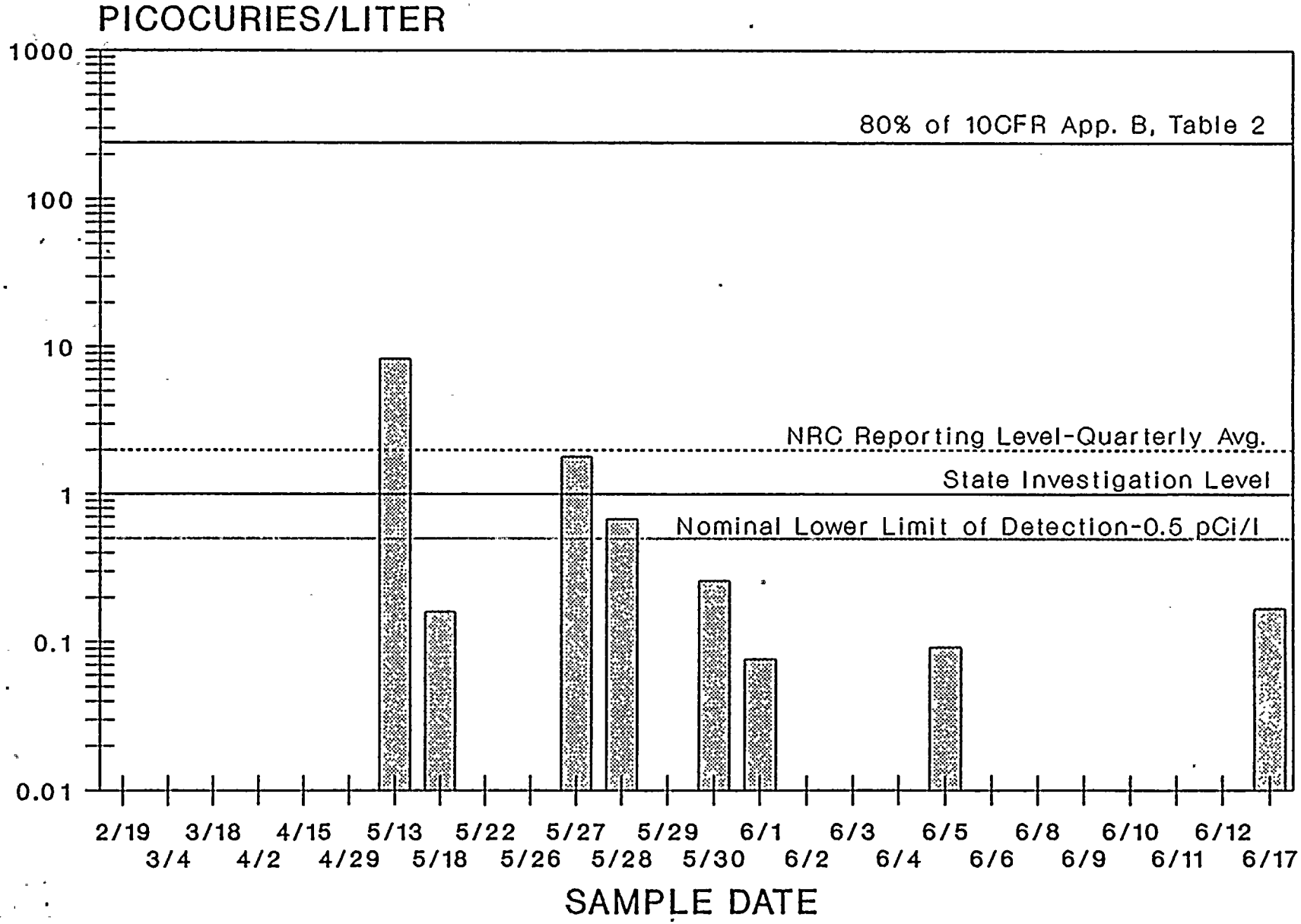
1992 CS-137 IN WATER RESULTS
ST101 DRAINAGE LAGOON



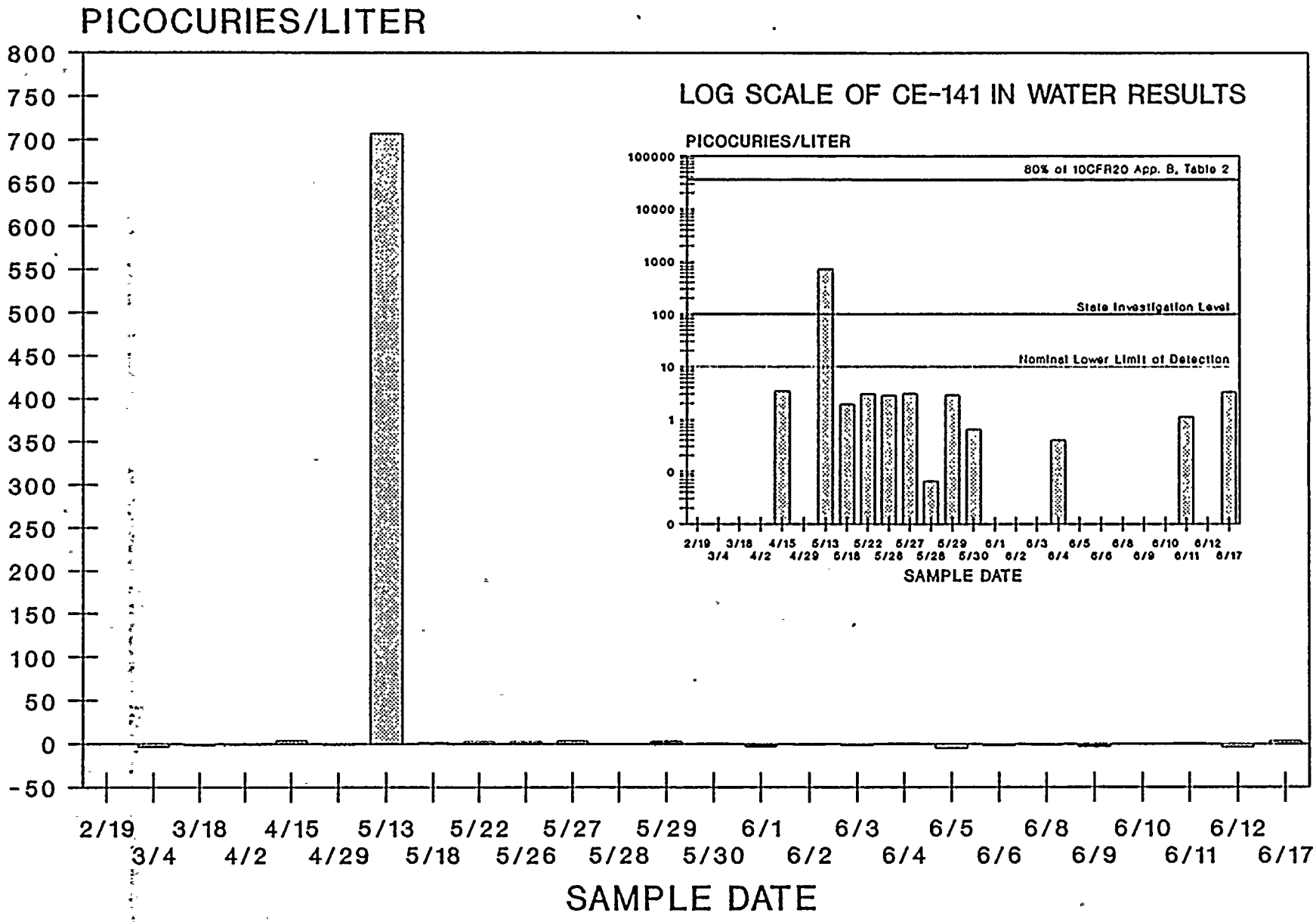
1992 I-131 IN WATER RESULTS
FOR ST101 DRAINAGE LAGOON (GAMMA)



1992 I-131 IN WATER RESULTS
FOR ST101 DRAINAGE LAGOON (RESIN)



1992 CE-141 IN WATER RESULTS
ST101 DRAINAGE LAGOON

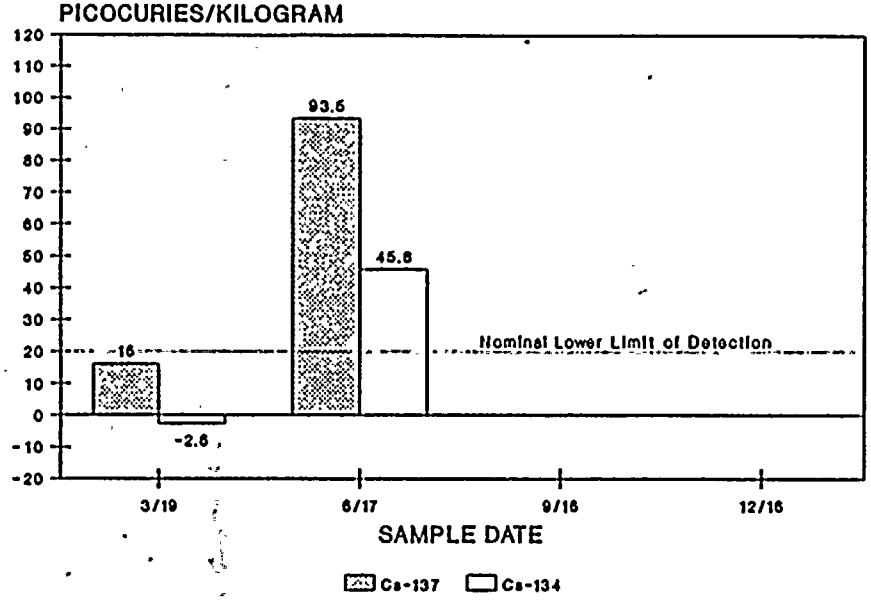


1992 ST101 QUARTERLY GAMMA IN VEGETATION RESULTS – pCi/kg

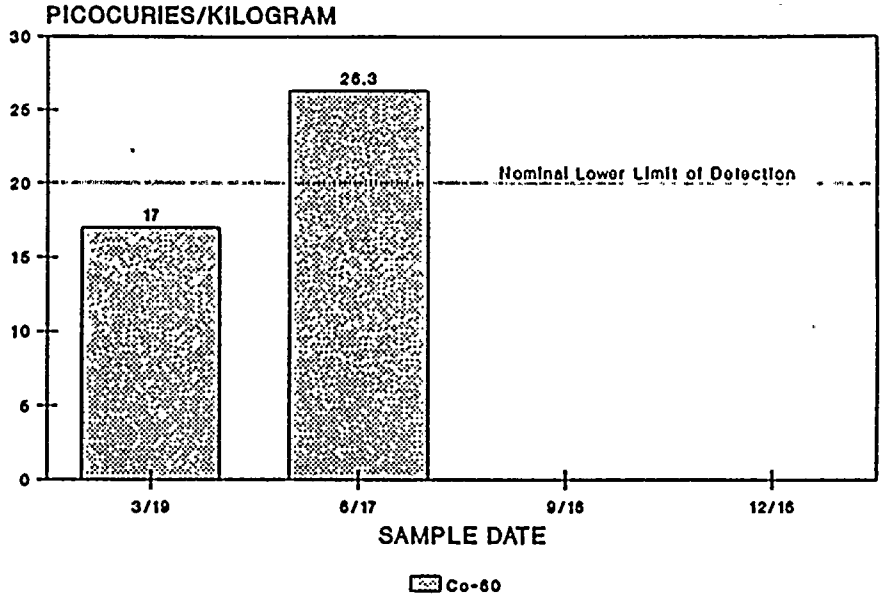
DATE	CS-137	CS-134	CO-60	CO-58	ZN-65	MN-54	I-131	CE-141	CE-144
03/19/92	1.6E+01	-2.6E+00	1.7E+01	-7.2E+00	4.3E+01	1.7E+01	5.9E-01	-1.3E+01	-3.1E+01
06/17/92	*9.4E+01*	*4.6E+01*	*2.6E+01*	-1.1E-01	*5.7E+01*	*3.2E+01*	2.8E+00	6.1E+00	-5.1E+00
AVERAGE	5.5E+01	2.2E+01	2.2E+01	-3.7E+00	5.0E+01	2.5E+01	1.7E+00	-3.5E+00	-1.8E+01
HIGH	9.4E+01	4.6E+01	2.6E+01	-1.1E-01	5.7E+01	3.2E+01	2.8E+00	6.1E+00	-5.1E+00
LOW	1.6E+01	-2.6E+00	1.7E+01	-7.2E+00	4.3E+01	1.7E+01	5.9E-01	-1.3E+01	-3.1E+01
# OF SAMPLES	2	2	2	2	2	2	2	2	2

NOTE: Larger, darker print indicates result above detection level.

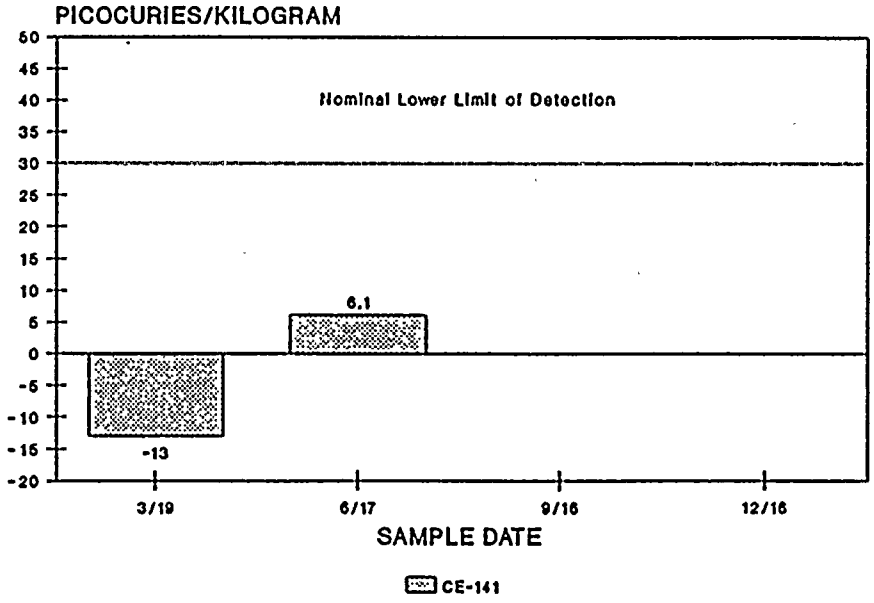
ST101 QUARTERLY VEGETATION SAMPLE
1992 RESULTS



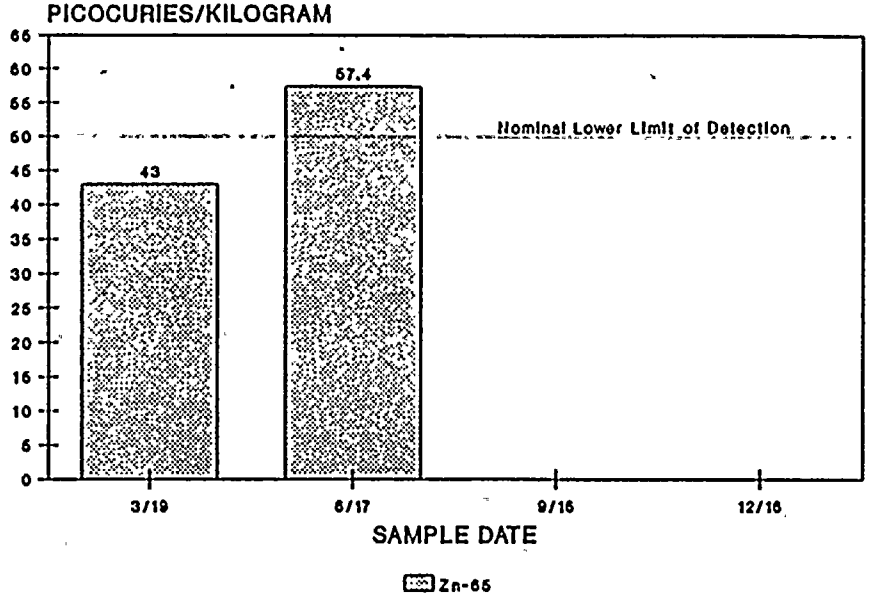
ST101 QUARTERLY VEGETATION SAMPLE
1992 RESULTS



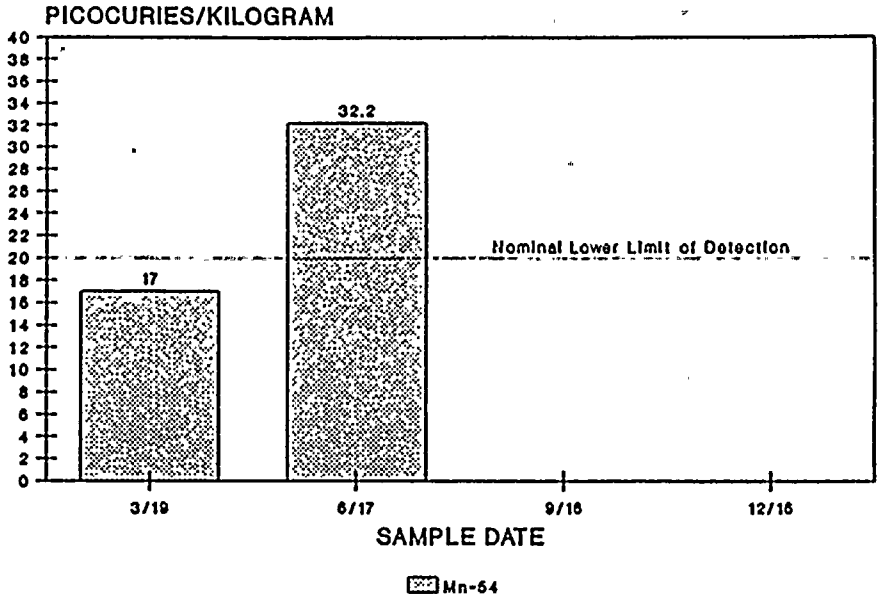
ST101 QUARTERLY VEGETATION SAMPLE
1992 RESULTS



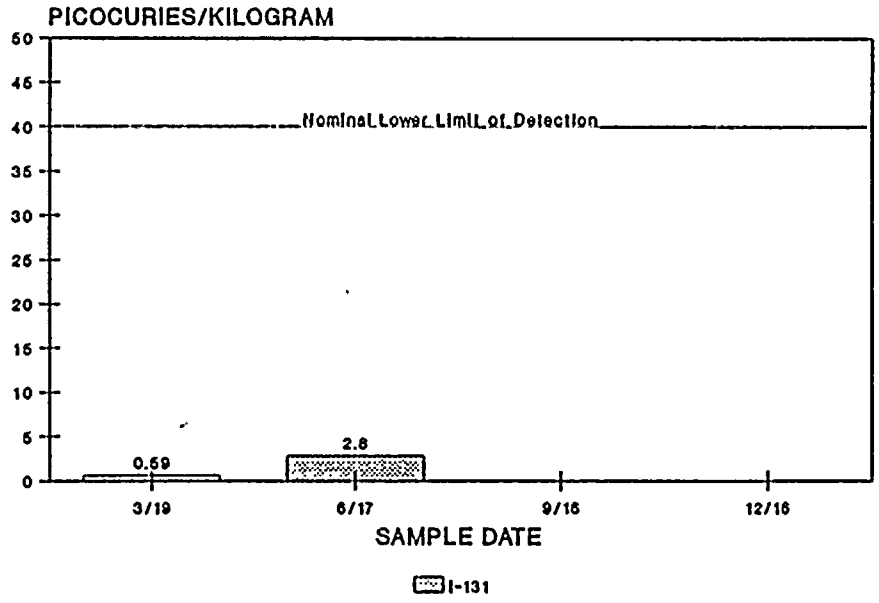
ST101 QUARTERLY VEGETATION SAMPLE
1992 RESULTS



ST101 QUARTERLY VEGETATION SAMPLE
1992 RESULTS



ST101 QUARTERLY VEGETATION SAMPLE
1992 RESULTS



ATTACHMENT 3

SECOND QUARTER 1992 ST101 WATER SAMPLE RESULTS AND % MPC LISTING

				1992 ST101 IN WATER RESULTS (pCi/l)									
DATE	Cs-137	Cs-134	Co-60	Co-58	Zn-65	Mn-54	I-131	Ce-141	Ce-144	Sb-124	Sb-125	I-131R	H-3
04/02/92	9.7E-02	1.7E+00	1.2E+00	-1.6E+00	-2.3E+00	-2.5E-01	-2.7E+00	-5.6E-01	-2.8E+00				
04/15/92	2.1E+00	2.6E+00	1.4E+00	-1.3E+00	8.9E-01	1.3E+00	-2.9E+00	3.4E+00	1.7E+00				
04/29/92	2.8E+00	4.8E-01	4.9E-01	-1.7E-01	2.7E+00	1.2E+00	1.26E+01	-7.6E-01	-3.5E+00				
05/13/92	5.69E+00	4.8E+00	1.25E+02	3.4E+00	5.30E+01	5.79E+00	2.11E+01	7.07E+02	1.1E+01	1.15E+01	2.08E+01	8.3E+00	2.7E+05
05/18/92	3.8E+00	-3.0E-01	1.66E+01	-4.2E-01	1.91E+01	2.2E+00	1.2E+00	1.9E+00	-1.5E+01			1.6E-01	1.2E+05
05/22/92	1.7E+00	4.6E-01	4.7E+00	-7.3E-02	1.6E+00	5.0E-01	1.6E+00	3.0E+00	8.0E+00			-1.0E-01	
05/26/92	3.2E+00	1.2E+00	1.2E+00	8.9E-01	9.3E-01	1.5E-01	3.5E+00	2.8E+00	-3.3E+00			-1.8E-02	2.1E+02
05/27/92	2.2E-01	-1.6E+00	-4.50E-01	4.7E-01	1.9E+00	1.4E+00	-9.5E-01	3.1E+00	-5.1E+00			1.8E+00	1.3E+02
05/28/92	1.2E+00	1.5E+00	6.2E-01	-5.4E-02	-1.2E+00	1.3E+00	4.4E+00	6.5E-02	-8.8E+00			6.8E-01	1.9E+02
05/29/92	-4.7E+00	8.3E+00	6.65E+00	4.8E-01	1.5E+00	-1.8E-01	0.0E+00	2.9E+00	-6.4E+00			-4.4E-02	5.7E+01
05/30/92	1.1E+00	-5.8E-01	1.1E+00	-3.4E-01	2.9E+00	6.7E-01	1.0E+00	6.4E-01	-3.4E+00			2.6E-01	1.8E+02
06/01/92	1.6E+00	-1.4E+00	4.0E+00	1.1E+00	4.4E-01	1.5E+00	8.1E-01	-2.8E+00	-6.2E+00			7.7E-02	3.4E+02
06/02/92	2.4E+00	5.4E-01	1.0E+00	-1.3E-01	3.0E+00	-2.7E-01	-2.2E+00	-6.5E-01	-5.4E+00			-2.2E-02	1.3E+02
06/03/92	-4.4E+00	8.4E-01	1.4E+00	-1.4E+00	-5.2E-01	0.0E+00	-3.9E-01	-1.9E+00	-1.1E+01			-5.9E-02	1.1E+02
06/04/92	2.3E+00	2.5E-01	1.2E+00	5.2E-01	-3.5E+00	8.3E-01	-8.0E-02	4.0E-01	-1.1E+01			-2.6E-02	-9.3E+01
06/05/92	1.8E+00	0.0E+00	6.2E-01	-1.8E+00	0.0E+00	-9.0E-01	1.2E+00	-4.5E+00	-8.2E+00			9.3E-02	-1.8E+01
06/06/92	2.1E+00	2.2E-01	4.0E+00	0.0E+00	-1.7E+00	-6.0E-01	5.3E-01	-1.9E+00	-3.4E+00				1.6E+02
06/08/92	3.5E-01	0.0E+00	1.0E-01	-1.4E-01	2.9E+00	3.9E-01	-1.2E+00	-1.2E+00	-2.2E+01				7.7E+01
06/09/92	1.8E-01	2.4E-01	-1.1E+00	-9.8E-01	-9.2E-02	1.5E-01	-1.4E-01	-3.0E+00	-7.7E+00			-2.0E-01	1.1E+02
06/10/92	1.3E+00	5.9E-01	2.9E-01	-1.0E-01	2.1E+00	-7.4E-01	1.4E+00	-1.3E-01	3.0E+00			-1.6E-01	1.4E+02
06/11/92	-8.9E-01	-4.0E+00	1.4E+00	-1.1E+00	-1.8E+00	1.3E+00	1.6E+00	1.1E+00	-9.7E+00			-1.4E-01	1.0E+02
06/12/92	3.0E+00	1.7E+00	2.2E+00	-1.4E+00	3.8E+00	6.7E-01	-9.7E-01	-3.5E+00	-1.0E+00			-9.6E-02	2.2E+02
06/17/92	-2.5E+00	-1.4E+00	-6.6E-01	-2.3E-01	-1.3E+01	-3.2E+00	-2.2E-01	3.3E+00	4.5E+00			1.7E-01	3.9E+03
* AVERAGE	1.08E+00	7.02E-01	7.52E+00	-1.92E-01	3.16E+00	5.74E-01	1.70E+00	3.08E+01	-4.60E+00	1.15E+01	2.08E+01	5.93E-01	2.08E+04
HIGH	5.69E+00	8.30E+00	1.25E+02	3.40E+00	5.30E+01	5.79E+00	2.11E+01	7.07E+02	1.10E+01	1.15E+01	2.08E+01	8.30E+00	2.70E+05
LOW	-4.70E+00	-4.00E+00	-1.10E+00	-1.80E+00	-1.30E+01	-3.20E+00	-2.90E+00	-4.50E+00	-2.20E+01	1.15E+01	2.08E+01	-2.00E-01	-9.30E+01
# SAMPLES	23	23	23	23	23	23	23	23	23	1	1	18	19

				% MPC									
DATE	Cs-137	Cs-134	Co-60	Co-58	Zn-65	Mn-54	I-131	Ce-141	Ce-144	Sb-124	Sb-125	I-131R	H-3
04/02/92	0.0005%	0.0189%	0.0024%										
04/15/92	0.0105%	0.0289%	0.0028%		0.0009%	0.0013%		0.0038%	0.0170%				
04/29/92	0.0140%	0.0053%	0.0010%		0.0027%	0.0012%	4.2000%						
05/13/92	0.0285%	0.0533%	0.2500%	0.0034%	0.0530%	0.0058%	7.0333%	0.7856%	0.1100%	0.0575%	0.0208%	2.7667%	9.0000%
05/18/92	0.0190%		0.0332%		0.0191%	0.0022%	0.4000%	0.0021%				0.0533%	4.0000%
05/22/92	0.0085%	0.0051%	0.0094%		0.0016%	0.0005%	0.5333%	0.0033%	0.0800%				
05/26/92	0.0160%	0.0133%	0.0024%	0.0009%	0.0009%	0.0002%	1.1667%	0.0031%					0.0070%
05/27/92	0.0011%			0.0005%	0.0019%	0.0014%		0.0034%				0.6000%	0.0043%
05/28/92	0.0060%	0.0167%	0.0012%			0.0013%	1.4667%	0.0001%				0.2267%	0.0063%
05/29/92		0.0922%	0.0133%	0.0005%	0.0015%			0.0032%					0.0019%
05/30/92	0.0055%		0.0022%		0.0029%	0.0007%	0.3333%	0.0007%				0.0867%	0.0060%
06/01/92	0.0080%		0.0080%	0.0011%	0.0004%	0.0015%	0.2700%					0.0257%	0.0113%
06/02/92	0.0120%	0.0060%	0.0020%		0.0030%								0.0043%
06/03/92		0.0093%	0.0028%										0.0037%
06/04/92	0.0115%	0.0028%	0.0024%	0.0005%		0.0008%		0.0004%					
06/05/92	0.0090%		0.0012%				0.4000%					0.0310%	
06/06/92	0.0105%	0.0024%	0.0080%				0.1767%						0.0053%
06/08/92	0.0017%		0.0002%		0.0029%	0.0004%							0.0026%
06/09/92	0.0009%	0.0027%				0.0002%							0.0037%
06/10/92	0.0090%	0.0066%	0.0006%		0.0021%		0.4667%		0.0300%				0.0047%
06/11/92			0.0028%			0.0013%	0.5333%	0.0012%					0.0033%
06/12/92	0.0150%	0.0189%	0.0044%		0.0038%	0.0007%							0.0073%
06/17/92								0.0037%	0.0450%			0.0567%	0.1300%

* Arithmetic average, not time-weighted.

ATTACHMENT 4

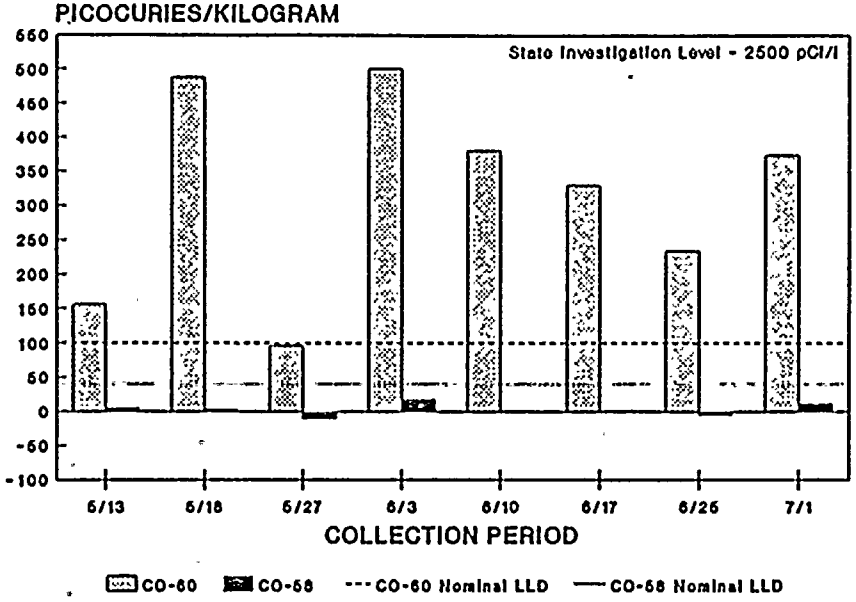
MAY - JULY 1992 ST101 SEDIMENT RESULTS

1992 ST101 GAMMA IN SEDIMENT RESULTS - pCi/kg

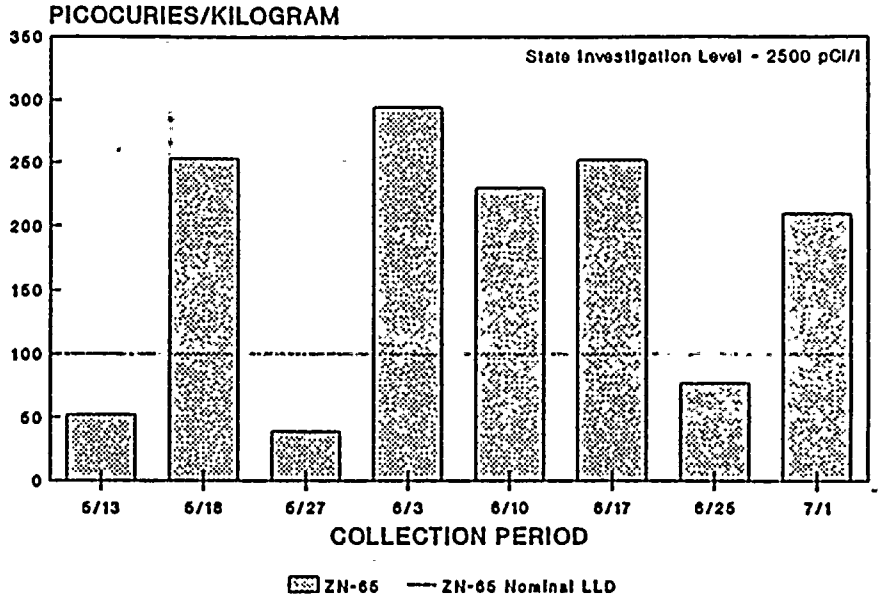
DATE	CS-137	CS-134	CO-60	CO-58	ZN-65	MN-54	I-131	CE-141	CE-144	EU-152
05/13/92	*5.9E+01*	4.7E+01	*1.6E+02*	5.6E+00	5.2E+01	3.5E+01	0.0E+00	*1.1E+02*	2.5E+00	
05/18/92	*1.3E+02*	*5.7E+01*	*4.9E+02*	3.8E+00	*2.5E+02*	*6.7E+01*	9.4E+00	*1.9E+02*	-4.2E+01	
05/27/92	4.3E+01	3.9E+01	*9.6E+01*	-1.1E+01	3.9E+01	1.6E+01	1.8E+01	3.6E+01	1.3E+01	
06/03/92	*1.2E+02*	*7.3E+01*	*5.0E+02*	1.9E+01	*2.9E+02*	*7.4E+01*	1.9E+01	*2.1E+02*	-1.5E+01	
06/10/92	*1.1E+02*	4.9E+01	*3.8E+02*	5.5E-01	2.3E+02	*1.1E+02*	-1.2E+01	*1.3E+02*	-1.1E+02	
06/17/92	*1.4E+02*	7.4E+01	*3.3E+02*	1.4E+00	*2.5E+02*	*7.3E+01*	8.9E-01	*8.9E+01*	-8.3E+01	1.3E+01
06/25/92	*8.9E+01*	6.3E+01	*2.3E+02*	-5.2E+00	7.7E+01	4.1E+01	3.1E+01	1.8E+01	-1.3E+02	
07/01/92	*1.1E+02*	*7.6E+01*	*3.7E+02*	1.2E+01	2.1E+02	4.2E+01	5.2E+00	*1.0E+02*	4.3E+00	
AVERAGE	1.0E+02	6.0E+01	3.2E+02	3.3E+00	1.8E+02	5.7E+01	8.9E+00	1.1E+02	-4.5E+01	1.3E+01
HIGH	1.4E+02	7.6E+01	5.0E+02	1.9E+01	2.9E+02	1.1E+02	3.1E+01	2.1E+02	1.3E+01	1.3E+01
LOW	4.3E+01	3.9E+01	9.6E+01	-1.1E+01	3.9E+01	1.6E+01	-1.2E+01	1.8E+01	-1.3E+02	1.3E+01
# SAMPLES	8.0E+00	8.0E+00	8.0E+00	8.0E+00	8.0E+00	8.0E+00	8.0E+00	8.0E+00	8.0E+00	1.0E+00

NOTE: Larger, darker print indicates result above detection level.

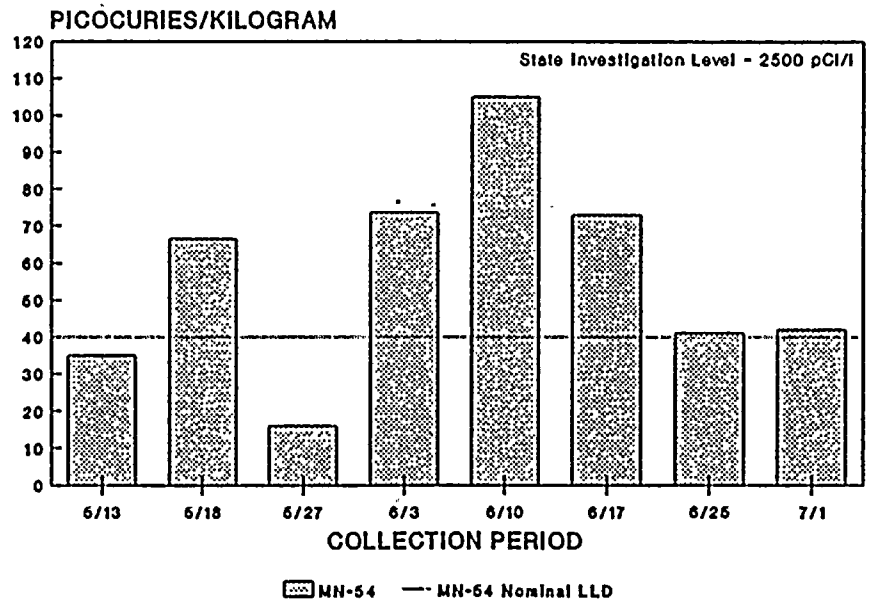
1992 ST101 SEDIMENT RESULTS
ACTIVATION PRODUCTS



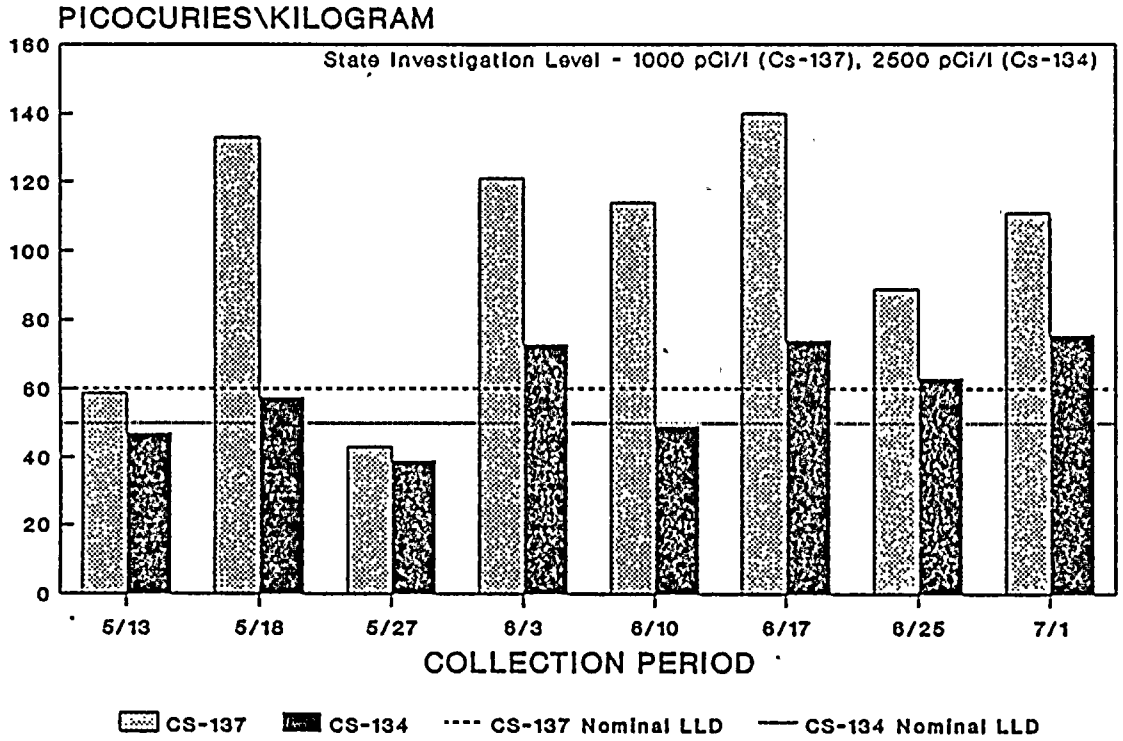
1992 ST101 SEDIMENT RESULTS
ACTIVATION PRODUCTS



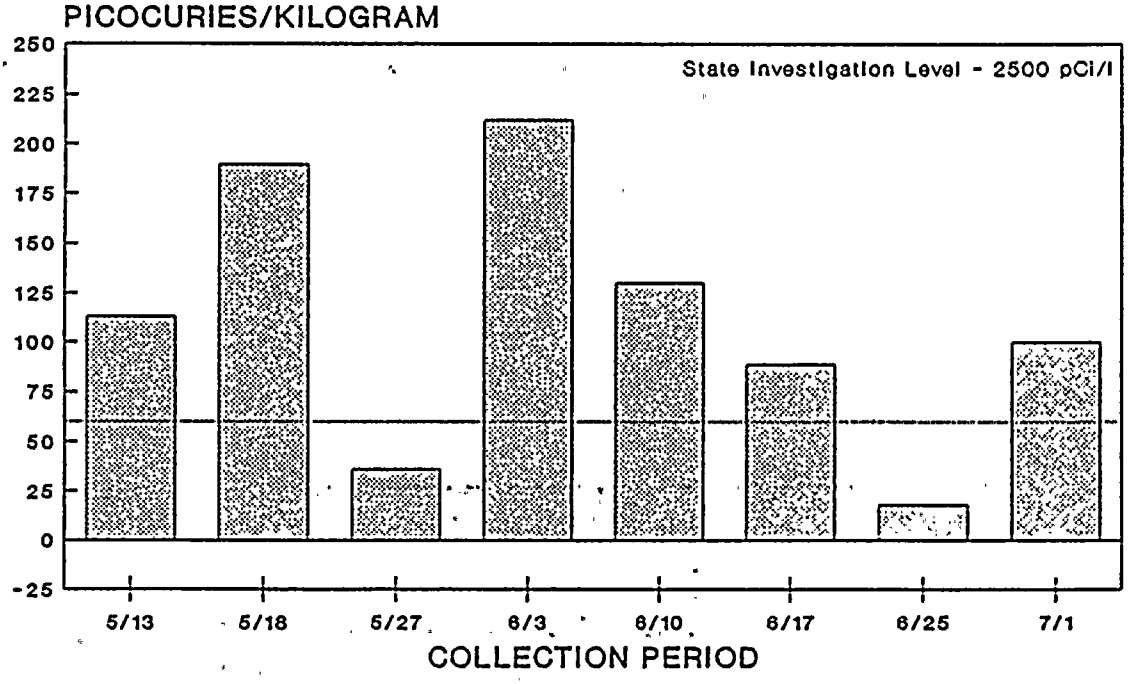
1992 ST101 SEDIMENT RESULTS
ACTIVATION PRODUCTS



1992 ST101 SEDIMENT RESULTS
FISSION PRODUCTS



1992 ST101 SEDIMENT RESULTS
FISSION PRODUCTS



ATTACHMENT 5

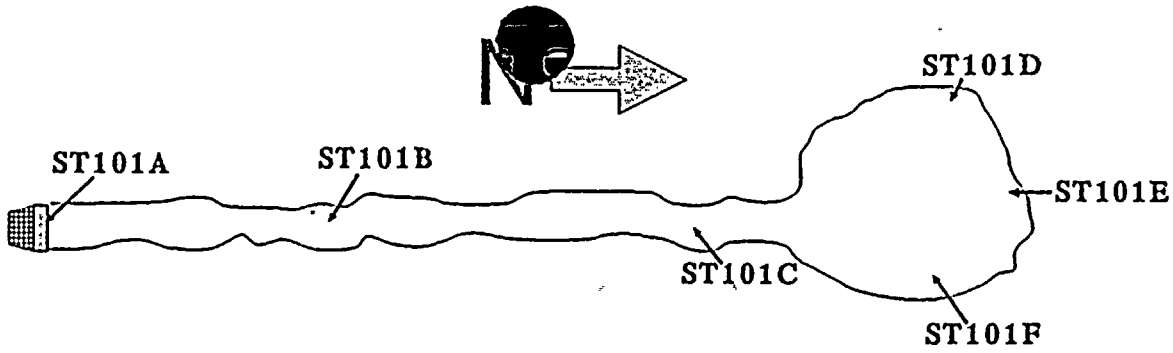
ST101 MAY 22 SPECIAL STUDY RESULTS

MAY 22 STORM DRAIN POND SEDIMENT SAMPLE RESULTS (pCi/kg)

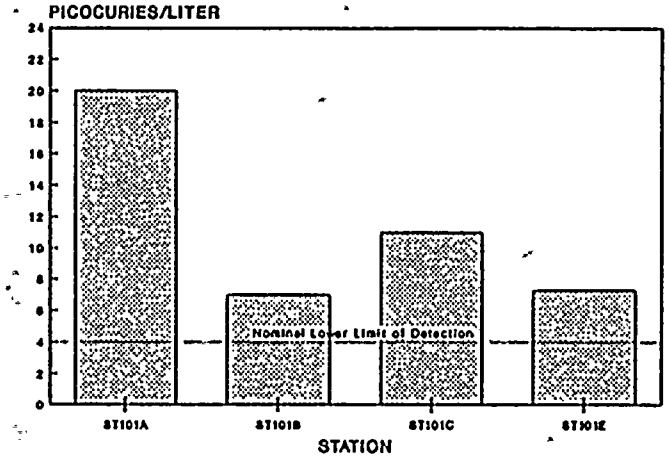
Radionuclide Concentrations	Sample Location[1]
cobalt-60	
200	Location A (near pipe)
18,000[2]	" B (mid channel)
25,400[2]	" C (mouth of channel)
483	" D (west side of pond)
935	" E (north side of pond)
1920	" F (east side of pond)
zinc-65	
184	Location A (near pipe)
4650[2]	" B (mid channel)
2870[2]	" C (mouth of channel)
150	" D (west side of pond)
130	" E (north side of pond)
300	" F (east side of pond)
cesium-134	
64	Location A (near pipe)
1140	" B (mid channel)
737	" C (mouth of channel)
81	" D (west side of pond)
98	" E (north side of pond)
202	" F (east side of pond)
cesium-137	
94	Location A (near pipe)
2900[2]	" B (mid channel)
2500[2]	" C (mouth of channel)
270	" D (west side of pond)
275	" E (north side of pond)
500	" F (east side of pond)
cerium-141	
144	Location A (near pipe)
3474[2]	" B (mid channel)
1390	" C (mouth of channel)
67	" D (west side of pond)
manganese-54	
670	Location B (mid channel)
448	" C (mouth of channel)

(1) Sketch of sample locations on the following page of this attachment.

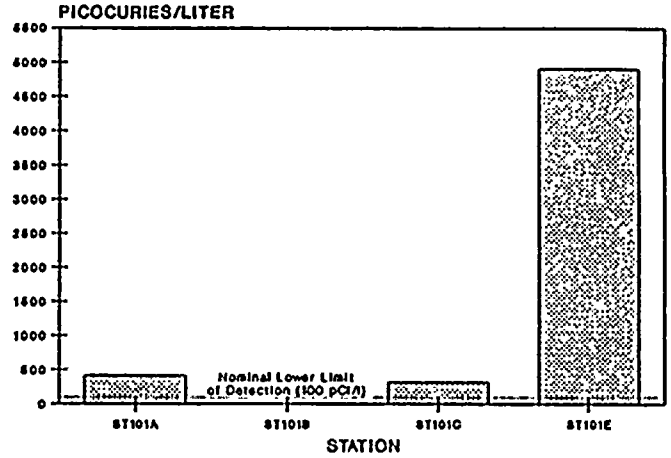
(2) Exceed the DOH investigation levels of 1000 pCi/kg for cesium-137 and 2500 pCi/kg for other radionuclides.



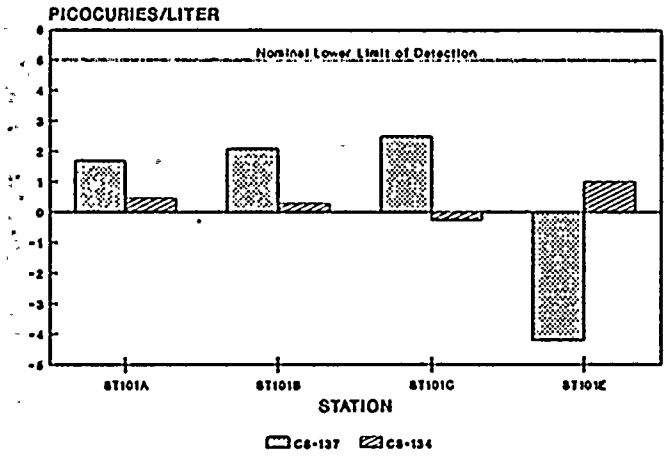
ST101 GROSS BETA IN WATER RESULTS
SPECIAL SAMPLE 5/22/92



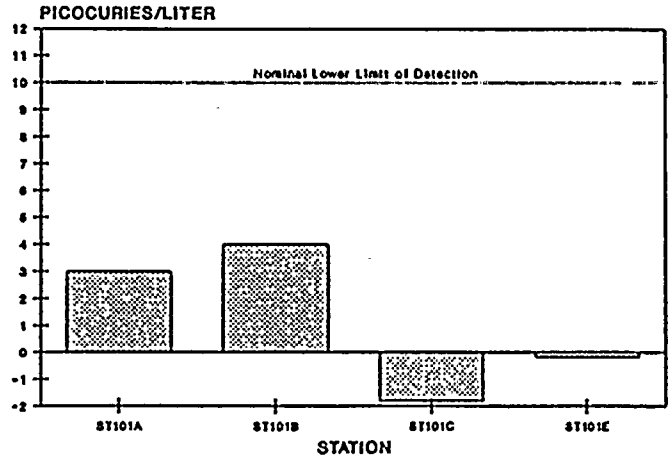
ST101 TRITIUM IN WATER RESULTS
SPECIAL SAMPLE 5/22/92

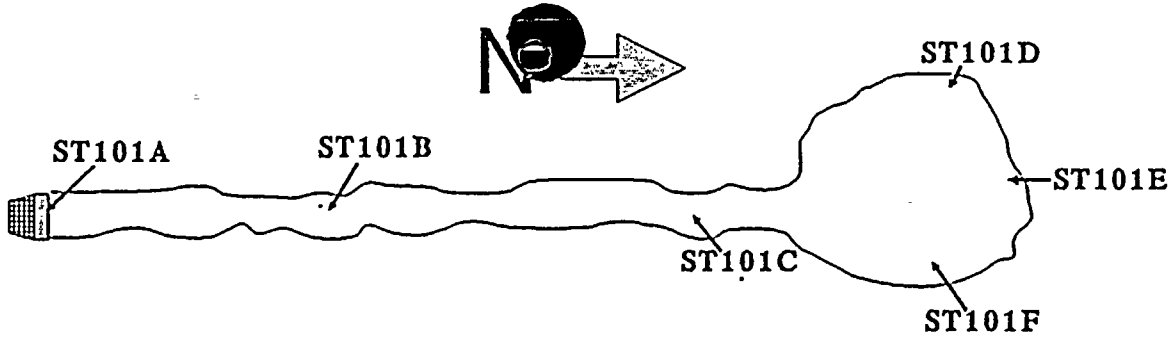


ST101 CS-137 & CS-134 IN WATER RESULTS
SPECIAL SAMPLE 5/22/92

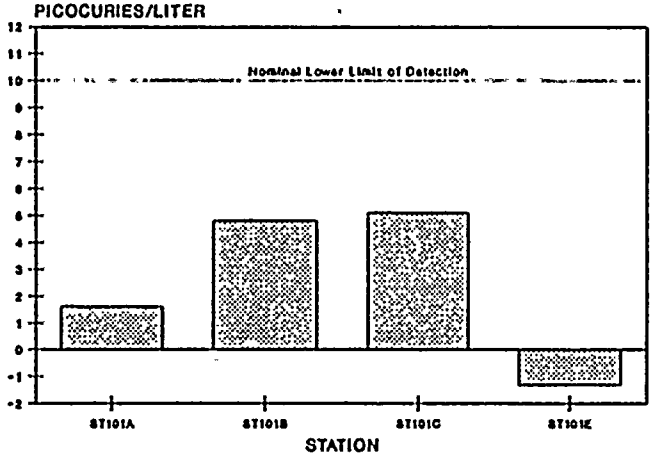


ST101 CE-141 IN WATER RESULTS
SPECIAL SAMPLE 5/22/92

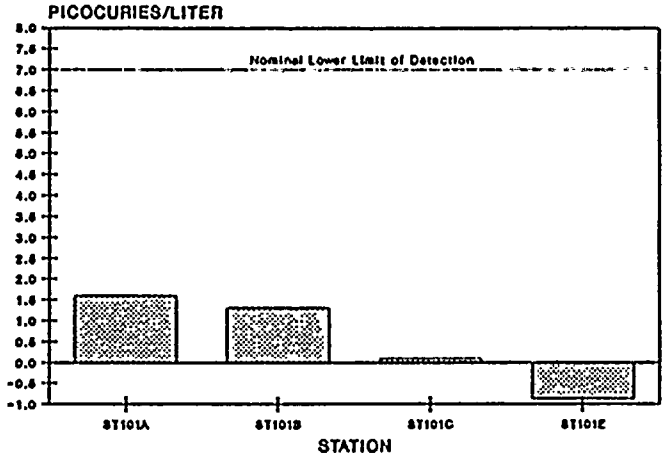




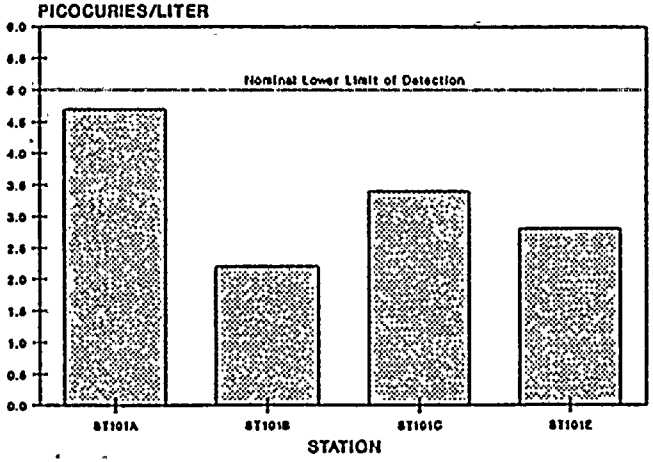
ST101 ZN-65 IN WATER RESULTS
SPECIAL SAMPLE 5/22/92



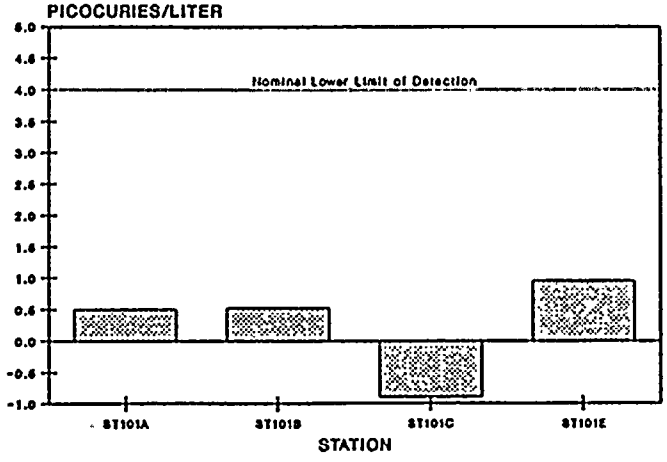
ST101 I-131 IN WATER RESULTS
SPECIAL SAMPLE 5/22/92



ST101 CO-60 IN WATER RESULTS
SPECIAL SAMPLE 5/22/92



ST101 MN-54 IN WATER RESULTS
SPECIAL SAMPLE 5/22/92

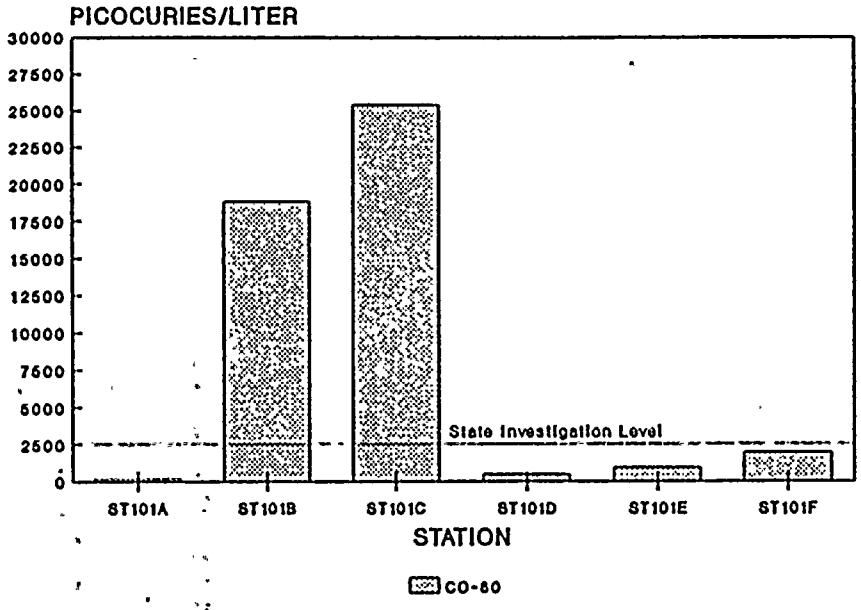


1992 ST101 GAMMA IN SPECIAL SEDIMENT SAMPLE RESULTS – pCi/kg

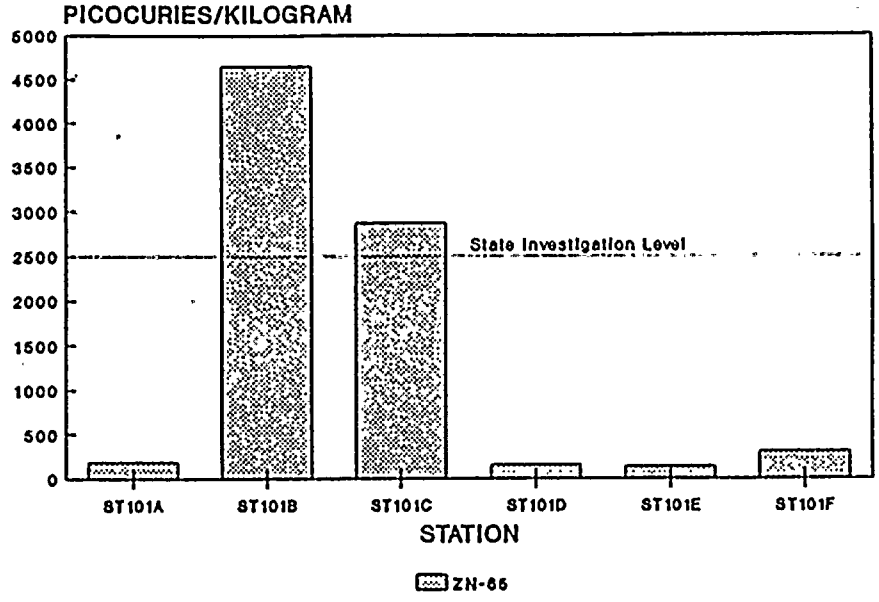
DATE	LOCATION	CS-137	CS-134	CO-60	CO-58	ZN-65	MN-54	I-131	CE-141	CE-144	EU-152
05/22/92	ST101A	*9.4E+01*	*6.4E+01*	*2.0E+02*	*1.5E+01*	*1.8E+02*	2.3E+01	5.4E+00	*1.4E+02*	-5.4E+01	-9.2E+00
05/22/92	ST101B	*2.9E+03*	*1.1E+03*	*1.9E+04*	5.8E+01	*4.7E+03*	*6.7E+02*	7.2E+02	*3.7E+03*	6.6E+01	1.5E+02
05/22/92	ST101C	*2.5E+03*	*7.4E+02*	*2.5E+04*	2.1E+00	*2.9E+03*	*4.5E+02*	1.3E+02	*1.4E+03*	1.5E+02	-3.2E+02
05/22/92	ST101D	*2.7E+02*	*8.1E+01*	*4.8E+02*	-6.8E+00	*1.5E+02*	4.2E+00	-7.2E+00	*6.7E+01*	-5.0E+01	-1.6E+01
05/22/92	ST101E	*2.8E+02*	*9.8E+01*	*9.4E+02*	6.3E+00	*1.3E+02*	1.6E+01	-9.2E+00	3.1E+01	-3.4E+01	3.1E+01
05/22/92	ST101F	*5.0E+02*	*2.0E+02*	*1.9E+03*	-2.0E+00	3.0E+02	5.1E+01	4.2E+00	*9.9E+01*	-5.6E+01	2.4E+01
05/28/92	MID-POND	*4.0E+01*	3.3E+01	*1.6E+02*	-1.0E+01	2.4E+01	6.8E+00	7.5E+00	2.2E+01	-1.4E+02	[illegible]
	AVERAGE	9.4E+02	3.4E+02	6.8E+03	8.9E+00	1.2E+03	1.7E+02	1.2E+02	7.8E+02	-1.7E+01	-2.3E+01
	HIGH	2.9E+03	1.1E+03	2.5E+04	5.8E+01	4.7E+03	6.7E+02	7.2E+02	3.7E+03	1.5E+02	1.5E+02
	LOW	4.0E+01	3.3E+01	1.6E+02	-1.0E+01	2.4E+01	4.2E+00	-9.2E+00	2.2E+01	-1.4E+02	-3.2E+02
	# SAMPLES	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	7.0E+00	6.0E+00

NOTE: Larger, darker print indicates result above detection level.

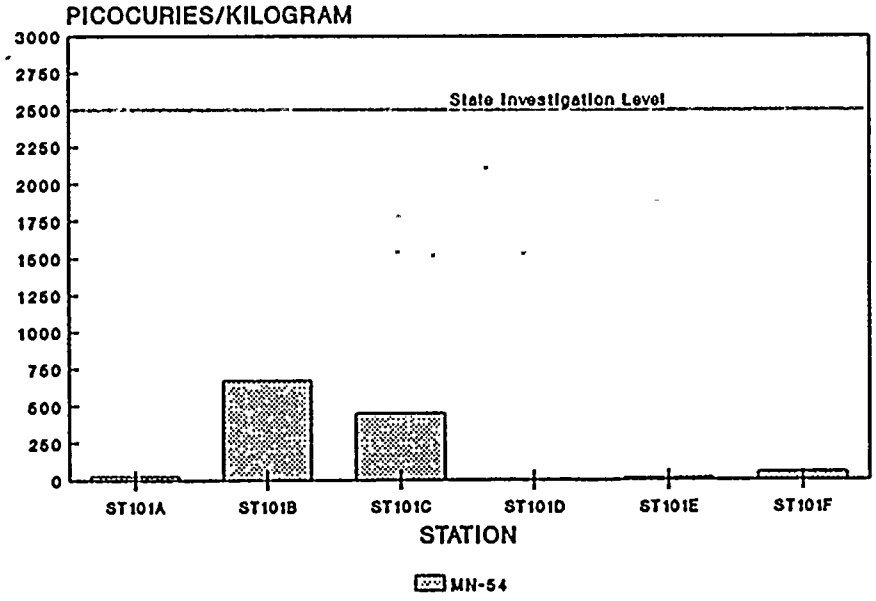
1992 ST101 SPECIAL SEDIMENT RESULTS
SAMPLES TAKEN 5/22/92



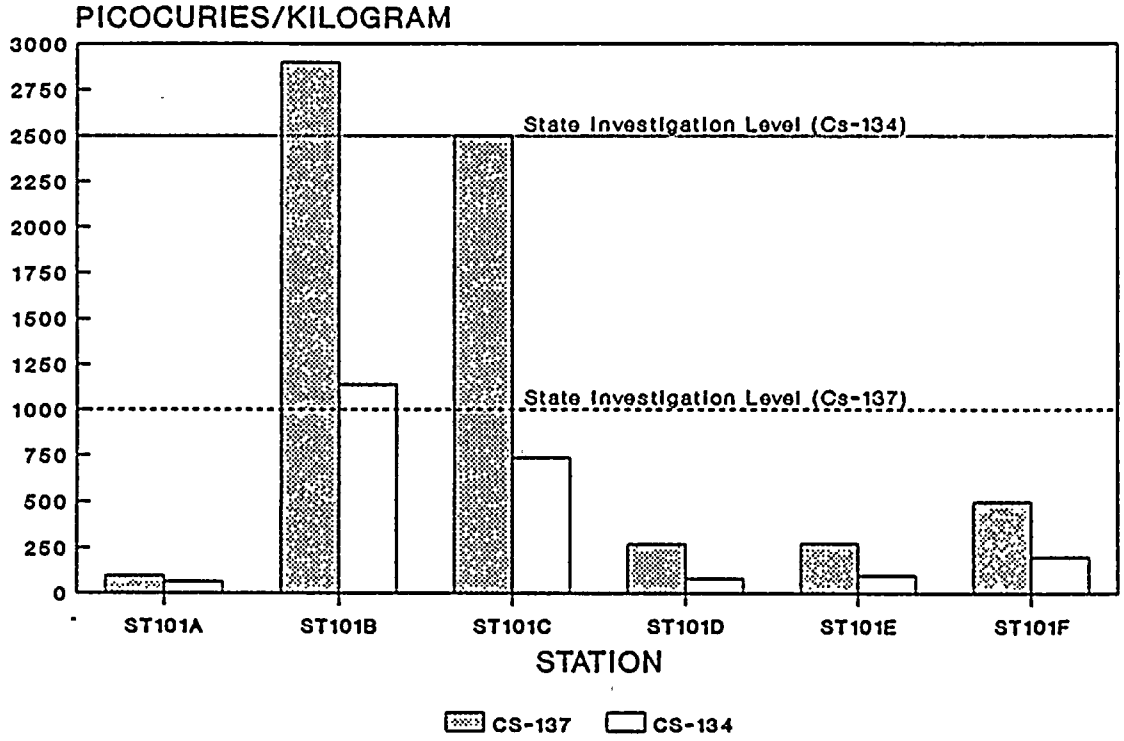
1992 ST101 SPECIAL SEDIMENT RESULTS
SAMPLES TAKEN 5/22/92



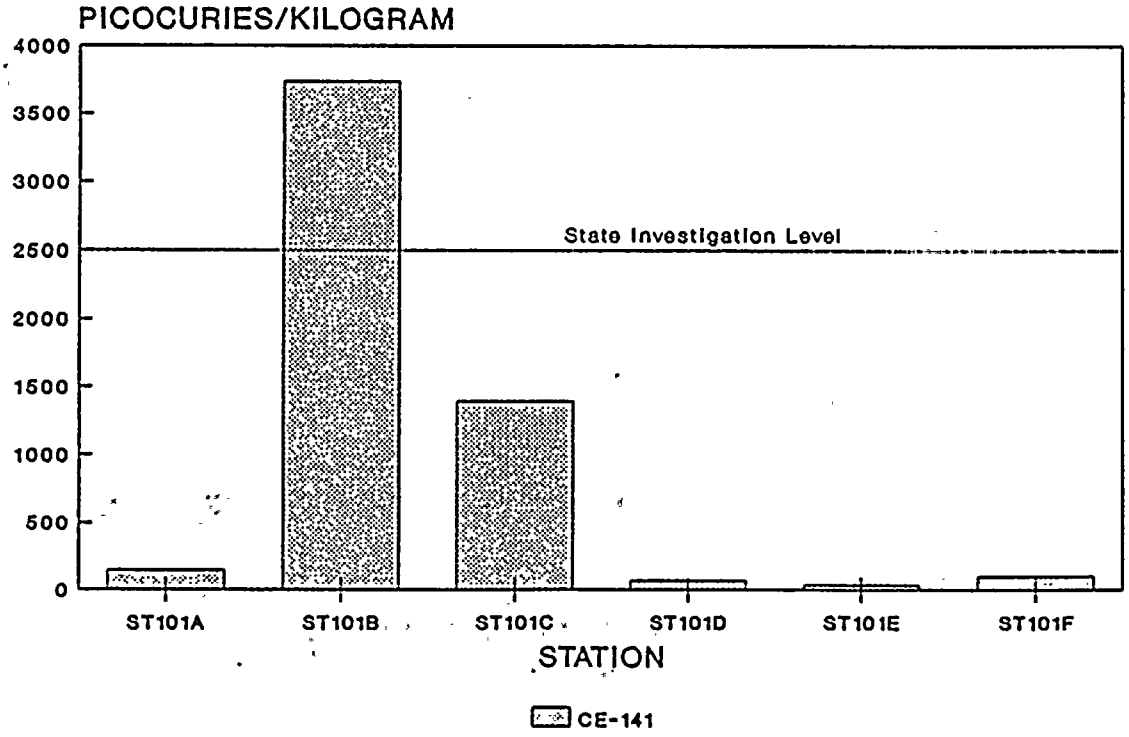
1992 ST101 SPECIAL SEDIMENT RESULTS
SAMPLES TAKEN 5/22/92



1992 ST101 SPECIAL SEDIMENT RESULTS
SAMPLES TAKEN 5/22/92



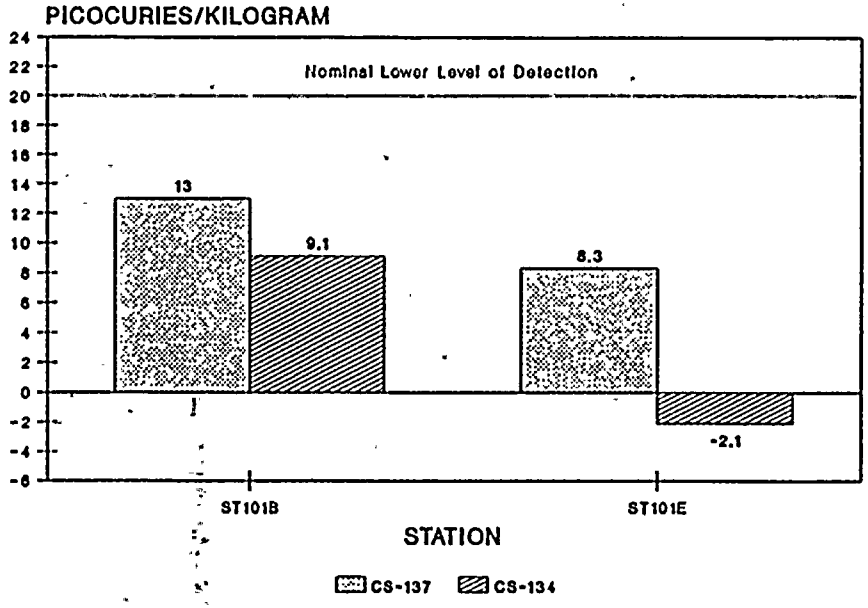
1992 ST101 SPECIAL SEDIMENT RESULTS
SAMPLES TAKEN 5/22/92



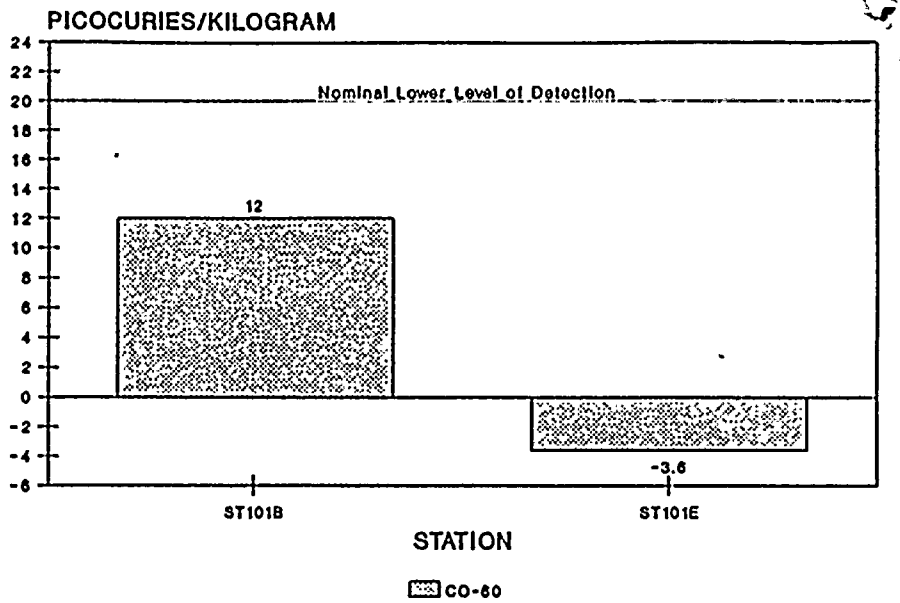
GAMMA IN SPECIAL 05/22/92 VEGETATION SAMPLE RESULTS - pCi/kg

LOCATION	CS-137	CO-58	CO-60	MN-54	CS-134	CE-141	I-131	ZN-65	CE-144
ST101B	1.3E+01	3.4E+00	1.2E+01	9.6E+00	9.1E+00	1.2E+01	-1.2E+00	4.1E+00	-2.1E+01
ST101E	8.3E+00	1.5E+00	-3.6E+00	1.7E+01	-2.1E+00	-6.5E-01	2.4E+00	2.8E+01	-5.4E+01
AVERAGE	1.1E+01	2.5E+00	4.2E+00	1.3E+01	3.5E+00	5.7E+00	6.0E-01	1.6E+01	-3.8E+01
HIGH	1.3E+01	3.4E+00	1.2E+01	1.7E+01	9.1E+00	1.2E+01	2.4E+00	2.8E+01	-2.1E+01
LOW	8.3E+00	1.5E+00	-3.6E+00	9.6E+00	-2.1E+00	-6.5E-01	-1.2E+00	4.1E+00	-5.4E+01
# OF SAMPLES	2	2	2	2	2	2	2	2	2

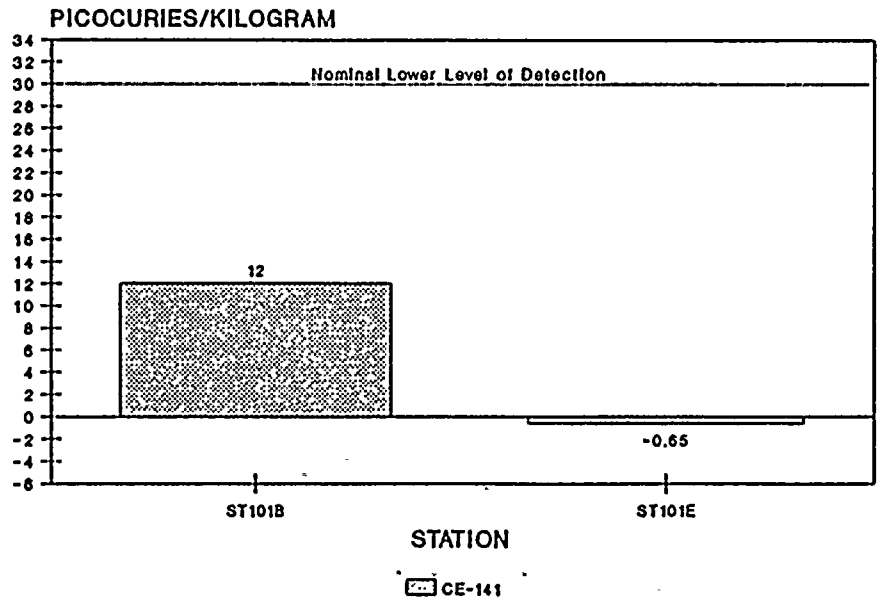
ST101 SPECIAL VEGETATION SAMPLES
SAMPLES TAKEN 5/22/92



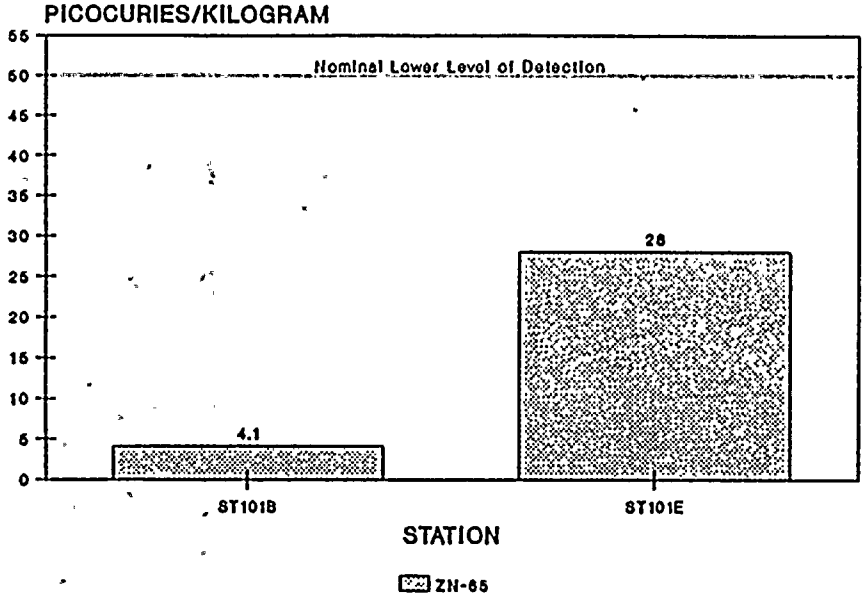
ST101 SPECIAL VEGETATION SAMPLES
SAMPLES TAKEN 5/22/92



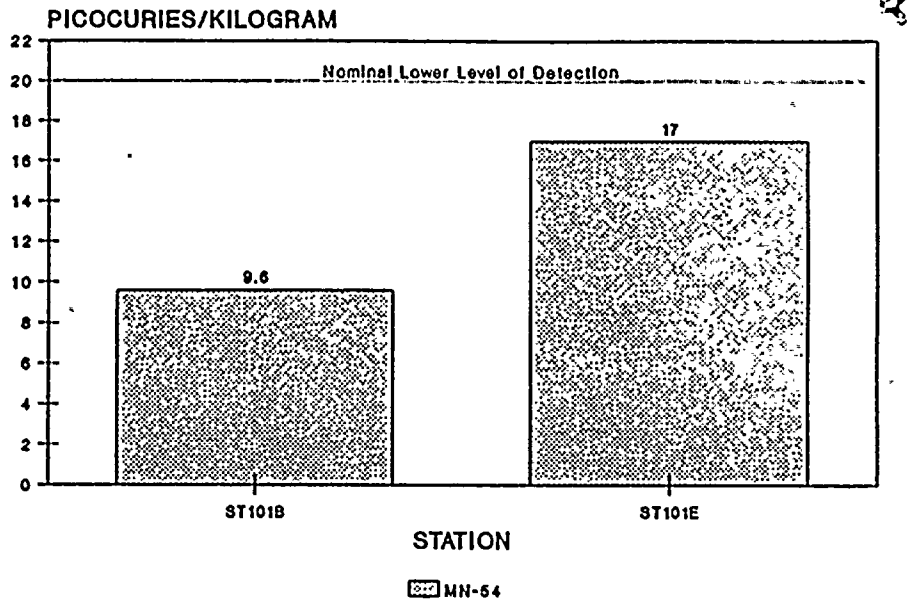
ST101 SPECIAL VEGETATION SAMPLES
SAMPLES TAKEN 5/22/92



ST101 SPECIAL VEGETATION SAMPLES
SAMPLES TAKEN 5/22/92



ST101 SPECIAL VEGETATION SAMPLES
SAMPLES TAKEN 5/22/92



ST101 SPECIAL VEGETATION SAMPLES
SAMPLES TAKEN 5/22/92