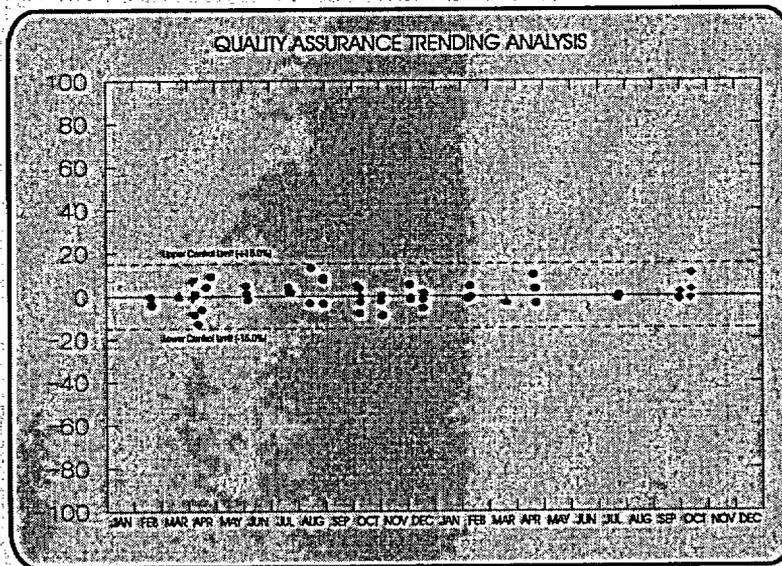




ANALYTICAL SERVICES

# SEMI-ANNUAL QUALITY ASSURANCE STATUS REPORT

January - June 2004



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**FRAMATOME ANP  
ENVIRONMENTAL LABORATORY**

**ANALYTICAL SERVICES  
SEMI-ANNUAL QUALITY ASSURANCE STATUS REPORT  
JANUARY-JUNE 2004**

**EL 116/04**

Prepared By:  Date: 8/5/2004

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## I. INTRODUCTION

This report covers the Quality Assurance (QA) Program for the Analytical Services function of the Framatome ANP Environmental Laboratory (E-LAB) for the first half (January-June) of 2004. Due to the broad scope of QC inter-comparison programs in which the E-LAB participates, the report consolidates wherever possible, text and results into three service categories: Radiological Environmental Monitoring, Part 50/61, and Bioassay.

This report includes:

- intralaboratory QC results analyzed during the reporting period, .
- interlaboratory QC results, analyzed prior to the reporting period, for which "known values" were not previously available, and
- interlaboratory QC results, analyzed during the reporting period, for which "known values" were available.

Any other inter-laboratory QC results will be included in the next semi-annual report.

Manual 100, Revision 7 (Reference 1) became effective on June 18, 2004. The text of this report reflects the latest revision of this manual, as do the trending graphs and any data evaluations performed after the June 18, 2004 date. Any data evaluations performed prior to June 18<sup>th</sup>, however, were conducted in accordance with Manual 100, Revision 6.

### A. Quality Control Program Scope

#### 1. Inter-laboratory and Third Party

The Framatome ANP Environmental Laboratory QC Program is designed to monitor the quality of analytical processing associated with environmental, bioassay, effluent (10CFR Part 50), and waste (10CFR Part 61) sample analysis.

Inter-laboratory and third party quality control programs for environmental radioanalyses include: the Environmental Crosscheck Program, administered by Analytics, Inc., the National Institute of Standards and Technology (NIST) Measurement Assurance Program (MAP), the Environmental Resource Associates (ERA) Proficiency Test (PT) Program, the Department of Energy (DOE) Quality Assessment Program (QAP), and the Mixed Analyte performance Evaluation Program (MAPEP).

The QAP program is administered by the (DOE) Environmental Measurements Laboratory (EML) and consists of four media; (e.g., water, vegetation, soil, and air filters) submitted twice per year. The DOEQAP was suspended by the Department of Homeland Security following the results of QAP 60 (contained in this report). The MAPEP program is administered by the Radiological and Environmental Sciences Laboratory (RESL) and consists of one soil and one water sample submitted each

year. The MAPEP samples are designed to evaluate the ability and quality of analytical facilities performing sample measurements that contain hazardous and radioactive (mixed) analytes. The EML has determined that some of the cancelled DOEQAP will be included in future sample distributions. The ERA PT program consists of radionuclides in water submitted twice per year. This program is used to maintain certification with the National Environmental Laboratory Accreditation Program (NELAP). The certification is necessary to perform analysis for projects that must meet EPA regulations for the Clean Water Act (CWA), Resource Conservation & Recovery Act (RCRA), or the Safe Drinking Water Act (SDWA).

Inter-laboratory and third party quality control for Part 50/61 radioanalyses, is provided by the Radiochemistry Crosscheck Program, administered by Analytix, Inc. and the NIST MAP.

## 2. Intra-laboratory

The internal Quality Control program is designed to include QC functions such as instrumentation checks (to insure proper instrument response), blank samples (to which no analyte radioactivity has been added), instrumentation backgrounds, duplicates, as well as overall staff qualification analyses and process controls. Both process control and qualification analyses samples seek to mimic the media type of those samples submitted for analysis by the various laboratory clients. These process controls (or process checks) are either actual samples submitted in duplicate in order to evaluate the precision of laboratory measurements, or blank samples which have been "spiked" with a known quantity of a radioisotope that is of interest to Laboratory clients. These QC samples, which represent either "single" or "double blind" unknowns, are intended to evaluate the entire radiochemical and radiometric process.

To provide a sense of direction and consistency in administering the quality control program, E-LAB has developed and follows an annual quality control and audit assessment schedule (Reference 2). The plan, which is approved on or before January 15<sup>th</sup> of each year and reviewed for adequacy at monthly LQARC meetings, describes the scheduled frequency and scope of Quality Assurance and Control actions considered necessary for an adequate program. The magnitude of the process control program combines both internal and external sources targeted at 5% of the routine sample analysis load.

## B. Quality Assurance Program (Internal and External Audits)

During each semi-annual reporting period at least one internal assessment is conducted in accordance with the pre-established E-LAB Quality Control and Audit Assessment Schedule. In addition, the Laboratory may be audited by prospective customers during a pre-contract audit, and/or by existing clients who wish to conduct periodic audits in accordance with their contractual arrangements. A National Environmental Laboratory Accreditation Program

(NELAP) audit is performed every two years as part of maintaining certification to perform EPA-related analyses.

## II. PERFORMANCE EVALUATION CRITERIA

### A. Acceptance Criteria

E-LAB has adopted a QC acceptance protocol based upon two performance models:

- For those inter-laboratory programs that already have established performance criteria (i.e., DOE QAP, MAPEP, ERA, and TRIP), the Laboratory will utilize the criteria for the specific program.
- For inter-laboratory or third party QC programs that have no preset acceptance criteria (e.g. the Analytics Crosscheck Programs, NIST MAP), results will be evaluated in accordance with E-LAB internal acceptance criteria.

#### 1. Internal Process Control Samples

Internal Process Control (PC) results are evaluated in accordance with two separate E-LAB acceptance criteria. A full discussion of the analytical services acceptance criteria can be found in Reference 1. The first criterion concerns bias, which is defined as the deviation of any one result from the known value. The second criterion concerns precision, which deals with the ability of the measurement to be faithfully replicated by comparison of an individual result with the mean of all results for a given sample set. Quality control deviations falling outside the Laboratory acceptance criteria are discussed in the appendices.

##### (a) Bias

For each analytical measurement tested, the bias is the percent deviation of the reported result relative to the expected value (value of the spike known by comparison with or derivation from a standard reference material). The percent deviation relative to the known is calculated as follows:

$$\frac{(H'_i - H_i)}{H_i} 100$$

where:

$H'_i$  = the value of the  $i^{\text{th}}$  measurement in a category being tested

$H_i$  = the actual quantity in the test sample as defined by the spike

The Laboratory internal criterion for bias is that an analysis is considered in agreement if the value is within  $\pm 15\%$  of the known value. If this condition is not met, the two-sigma range about the analyzed value is established. If the known value falls within the specified range, the analysis is considered in agreement.

Deviations from this general criterion, for specific radionuclides, are given in Tables 1 and 13 and Reference 1.

E-LAB acceptance criteria are applied when the sample concentration is 10 or more times the method MDC. Otherwise, the "known value" and associated uncertainty are compared to the measured result and uncertainty using a two-tailed standard statistical test at the 95% confidence level.

(b) Precision

For a group of test measurements containing a given spiked level, the precision is the percent deviation of individual results relative to the mean reported measurement. At least two values are required for the determination of precision. The percent deviation relative to the mean reported measurement is calculated as follows:

$$\left( \frac{H_i' - \bar{H}}{\bar{H}} \right) 100$$

where:

$H_i'$  = the reported measurement for the *i*th analytical measurement

$\bar{H}$  = the mean analytical measurement

$$\bar{H} = \sum H_i' \left( \frac{1}{n} \right)$$

$n$  = the number of samples in the test group

The Laboratory criterion for precision is that an analysis is considered in agreement if the individual value is within  $\pm 15\%$  of the mean value. If this condition is not met, the two-sigma range about the analyzed value is established. If the mean value falls within the specified range, the analysis is considered in agreement. In the case of duplicate or replicate analyses where there is no "known" value, the two-sigma range is established for each duplicate analysis (three-sigma range for replicates) for each analysis. If the ranges overlap, the analyses are considered in agreement for precision.

Deviations from this general criterion, for specific radionuclides, are given in Tables 1 and 13 and Reference 1.

(c) Mean Bias

For each group of analytical measurements tested, the mean bias is the percent deviation of the mean reported result relative to the expected value. The mean percent deviation relative to the expected value is calculated as follows:

$$\left( \left( \frac{(\bar{H} - H_i)}{H_i} \right) 100 \right)$$

where:

$\bar{H}$  = the mean analytical measurement

$H_i$  = the actual quantity in the test sample as defined by the spike

2. Backgrounds

As discussed in Reference 1, backgrounds represent the ambient signal response, recorded by measuring instruments, which is independent of radioactivity contributed by the radionuclides being measured in the sample. Backgrounds will not normally contain any three-sigma statistically positive activity of the target parameters. The background signal is subtracted from the sample's signal.

3. Blanks

Wherever possible equivalent media for preparing laboratory processing blanks will be used. Synthetic matrices may be used for bioassay if equivalency is proven.

4. NRC Resolution Criteria

Some Laboratory clients use the NRC Resolution Criteria to evaluate double blind Part 50 performance. NRC Resolution Criteria are based on an empirical relationship that combines prior experience and the accuracy needs of the program. As "Resolution" increases, the acceptability of one's measurement becomes more selective. Conversely, as "Resolution" decreases, agreement levels are widened to account for the increase in uncertainty.

5. DOE Evaluation Criteria

(a) The Environmental Measurements Laboratory (EML) has implemented an evaluation system where control limits are established based upon percentiles of historic data distributions. The criteria are described as follows: "Participants' analytical performance is evaluated based on the historical analytical capabilities for individual analyte/matrix pairs. The criteria for acceptable performance, 'A' has been chosen to be between the

15th and 85th percentile. The acceptable with warning criteria, "W", is between the 5th and 15th percentile and between the 85th and 95 percentile. In other words, the middle 90% of all reported values are acceptable, while the outer 5th-15th (10%) and 85-95th (10%) are in the warning area. The not acceptable criteria, "N" is established at less than the 5th percentile and greater than the 95th percentile, that is, the outer 10% of the historical data." (Reference 3)

- (b) The Radiological & Environmental Sciences Laboratory (RESL) inter-comparison program, MAPEP defines three levels of performance: Acceptable (flag = "A"), Acceptable with Warning (flag = "W"), and Not Acceptable (flag = "N"). Performance is considered acceptable for a mean with a bias  $\leq 20\%$  of the reference value for the analyte. Performance is acceptable with warning for a mean result bias of  $>20\%$  but  $\leq 30\%$  of the reference value. If the bias is greater than 30% the results are deemed not acceptable.

6. ANSI 13.30 Relative Bias Criteria for Bioassay

The relative bias statistic is defined for the  $i$ th measurement in a category with respect to the expected value (value of the spike known by comparison with or derivation from a standard reference material) is defined as:

$$B_{ri} = \frac{(A_i - A_{ai})}{A_{ai}}$$

Where:

$A_i$  = the value of the  $i^{\text{th}}$  measurement in a category being tested

$A_{ai}$  = the actual quantity in the test sample, as defined by the spike

In order to avoid the expense of a large number of replicates at each radioactivity level in each category, the relative bias  $B_r$  is calculated from the individual relative biases  $B_{ri}$  and defined as

$$B_r = \sum_{i=1}^N \left( \frac{B_{ri}}{N} \right)$$

Where: N is the number of test samples measured by an individual service laboratory in a given test category.

For testing purposes  $B_r$  shall be within -0.25 to +0.50

## B. QC Investigation Criteria and Result Reporting

### 1. QC Investigation Criteria

Summarized below are the investigation criteria applied to QC analyses that failed E-LAB bias criteria. The Condition Report process tracks investigation results.

- (a) No investigation is necessary when an individual QC result falls outside the QC performance criteria for bias.
- (b) Investigations shall be initiated when the mean of a QC process batch or the mean of three consecutive individual QC processes is outside the performance criterion for bias.
- (c) An investigation shall be initiated when the trending of at least 12 consecutive results for a given process indicates that the mean bias from the known is greater than 60% of the bias performance criterion.

### 2. Reporting of Analytical Results to Laboratory Customers

A similar set of guidelines was developed, applicable to reporting of results. The guidelines are as follows:

If an investigation is required for a process (normally after consecutive QC process check failures), and if the QC results requiring the investigation have a mean bias from the known of greater than  $\pm$  (applicable E-LAB bias criterion +5%) for environmental and bioassay processing and  $\pm$  (applicable E-LAB bias criterion +10%) for Part 50/61 processing, then the LQARC shall meet to determine the disposition of client results.

### 3. Self-Assessment Program

In accordance with Reference 1, E-LAB has established a Self-Assessment policy where all Laboratory staff members are strongly encouraged to continually evaluate laboratory activities for quality enhancements, cost savings, and time savings.

## III. ANALYTICAL SERVICES QUALITY CONTROL SYNOPSIS

### A. Result Summary

Two-year (2003-2004) trending graphs are provided in Appendices A-C of this report to give temporal perspective regarding possible trends or bias. In the event an analysis does not meet E-LAB performance criteria, the individual analysis sheet(s), in addition to a brief explanation, are included to augment the graph. It should be noted that DOE and ERA samples are evaluated against criteria specific to the DOE samples. Therefore, only sample results which fell in the "Warning" or Non-Agreement" categories will be addressed in the Appendices. If any questions arise regarding previous analyses, please refer to

the semi-annual status report corresponding to the sample analysis date. In all cases an analysis sheet is available for each individual analysis to back-up the data presented on the graph.

1. Radiological Environmental Services Quality Control

During this semi-annual reporting period, twenty-seven nuclides associated with media types were analyzed by means of the Laboratory's internal process control, DOE, NIST, ERA and Analytics quality control programs. Media types representative of client company analyses performed during this reporting period were selected. Presented below is a synopsis of the media types evaluated.

Air Filter	Sediment/soil
Charcoal (Air Iodine)	Water
Milk	

(a) Analytics Environmental Cross Check Program

During this semi-annual period the Analytics Cross Check Program provided 173 individual environmental analyses for bias and 171 for precision evaluation (Table 1). Of the 173 analyses evaluated for bias, 98.3% (170/173) of all results fell within E-LAB acceptance criteria. Of the 171 analyses evaluated for precision, 100% (171/171) came within E-LAB tolerance limits. Appendix A graphically summarizes the results by two-year trending graphs.

Table 2 provides a report of the Laboratory's participation in the Analytics' cross check program for the fourth quarter of 2003 and first quarter of 2004. Using the Laboratory's internal acceptance criteria as the basis of evaluation, all 58 of mean results came within agreement criteria.

(b) National Institute of Standards and Technology (NIST) Measurement Assurance Program (MAP)

The E-LAB has been a participant in the Nuclear Energy Institute (NEI)/National Institute of Standards and Technology (NIST) Measurements Assurance Program since June of 1987. Continued participation is documented by dated Reports of Traceability issued for particular radionuclides, which indicate the deviation of the participant's reported value for a given measurement technique from that measured and certified by the NIST.

During this reporting period there were three NIST MAP samples consisting of a total of 5 radionuclides and 36 measurements performed. Detailed information on Environmental NIST MAP data is provided in Tables 3 and 4. All of the 36 measurements met the E-LAB acceptance criteria and 10 of 12 mean results met the administrative limit of  $\pm 5\%$  for traceability.

(c) Summary of Participation in the Department of Energy (DOE) Monitoring Programs

During this semi-annual reporting period, a combination of three different media types and six different nuclides were analyzed by means of the DOE Quality Assessment Program (DOE QAP 0403, Table 5). All of the ten mean analyses evaluated were in "Agreement."

The E-LAB participated in the semi-annual Mixed Analyte Performance Evaluation Program (MAPEP) for water analysis (MAPEP-03-W11, Table 6). All of the nine analytes were evaluated as "Acceptable."

(d) Environmental Resource Associates (ERA) Proficiency Test (PT) Program

During this semi-annual period, a total of 9 mean results (n=3) were evaluated by ERA. Using the evaluation criteria set by NELAP, 100% (9/9) of the radionuclides were in "Agreement." Appendix A graphically summarized the results by two-year trending graphs. Table 7 provides a report of the Laboratory's participation in the PT program.

The Framatome ANP Environmental Laboratory (Lab ID# 11823) maintained NELAP accreditation from the New York State Department of Health through the Environmental Laboratory Approval Program for the following methods for both potable and non-potable waters:

Gross Alpha, Method EPA 900.0  
Gross Beta, Method EPA 900.0  
Iodine-131, Method ASTM D4785-88  
Photon Emitters, Method EPA 901.1  
Radioactive Cesium, Method EPA 901.1  
Tritium, Method EPA 906.0

(e) Intra-Laboratory Process Control Program

The Environmental Laboratory internal process control program evaluated 423 individual analyses for bias and 217 analyses for precision. Trending graphs associated with the performance results for this program are given in Appendix A, and the results are summarized in Table 8.

Of the 423 internal process control analyses evaluated for bias, 99.3% met Laboratory acceptance criteria. Also, 99.1% of the 217 results for precision were found to be acceptable.

Table 9 lists QC samples used to qualitatively screen calibrated geometry air charcoals for activity above the Minimum Detectable

Concentration (MDC). All 54 QC charcoals evaluated during this semi-annual period reported positive activity as expected. The bias data for each individual measurement is presented in Table 9.

(f) Analytical Blanks

During this semi-annual reporting period, none of the 167 environmental analytical blanks analyzed reported positive activity, greater than three (3) times the standard deviation.

(g) Instrumentation Backgrounds

None of the instrumentation backgrounds processed between January-June 2004 reported activity that was above the three standard deviation investigation level.

(h) Blind Duplicate Results

Blind duplicate results for 2004 are presented in Attachment 1. Based upon the summary evaluation, 100% of all paired measurements met the acceptance criteria. This data is not included in the summary tables (Tables 10-12).

(i) Overall Data Summary for the Reporting Period January-June 2004

The compilation of intra- and inter-laboratory comparison data by analyzed matrix for this reporting period is summarized in Table 10. Table 11 presents the same data grouped according to analysis type. In either case, the cumulative bias for the three programs evaluated to internal E-LAB performance criteria shows 99.1% of the 632 individual results were observed to fall within the E-LAB bias acceptance criteria, while 99.5% of the 424 analyses passed the acceptance criteria for precision.

(j) Summary of Environmental Quality Control Results by Year

The historical summary of the E-LAB process control program performance for the environmental monitoring function is provided in Table 12. For the first half of 2004, 99.1% of the analyses fell within the E-LAB acceptance criteria for bias as compared to a historical percentage of 96.6. Similarly, 99.5% of the analyses evaluated for precision met the E-LAB acceptance criteria as compared to 99.4% of analyses for the 27-year operating history.

2. Part 50/61 Quality Control

During this semi-annual reporting period, twenty-one nuclides were analyzed by means of the Laboratory's internal process control, National Institute for Standards and Technology Measurement Assurance Program

(NIST MAP) measurements of Part 50/61 radionuclides, and the Analytics Radiochemistry Crosscheck Program.

(a) Analytics Radiochemistry Cross Check Program

During this semi-annual period the Analytics Cross Check Program provided 18 individual analyses to be evaluated for bias and precision (Table 13). Of the 18 analyses, 100% fell within the E-LAB acceptance criteria for bias and 100% for precision. Appendix B graphically summarizes the results by two-year trending graphs.

Table 14 provides a report of the Laboratory's participation in the Analytics' cross check program for the first half of 2004. Using the Laboratory's internal acceptance criteria as the basis of evaluation, all 6 results passed the agreement criteria.

(b) NIST Measurement Assurance Program (MAP)

There were 36 NIST MAP process control analyses evaluated for both bias and precision during the first half of 2004 in the Part 50/61 area. Of these, 100% (36/36) met the E-LAB acceptance criteria for bias and for precision (Table 15).

Table 16 summarizes the percent deviation of the E-LAB's mean measurements from the NIST reported known values for each source standard. Of the 12 mean results evaluated, all 12 were within E-LAB performance criteria for bias and precision. Traceability certificates from NIST were received for the twelve radionuclides in water. Ten of the twelve mean measurements met the target traceability criteria of  $\pm 5\%$ .

(c) Intra-Laboratory Process Check Program

There were 109 internal Laboratory QC process control analyses evaluated for bias and 97 for precision during the first half of 2004 in the Part 50/61 area. Of these, 91.7% (100/109) met the E-LAB acceptance criteria for bias. A total of 100% (97/97) Part 50/61 process control samples met E-LAB acceptance criteria for precision (Table 17).

(d) Analytical Blanks

During this semi-annual reporting period, none of the 219 Part 50/61 analytical blanks analyzed reported positive activity greater than three (3) times the standard deviation.

(e) Instrumentation Backgrounds

One hundred percent (100%) of the instrumentation backgrounds processed between January-June 2004 reported activity that was below the three standard deviation investigation level.

(f) Overall Data Summary for the Reporting Period January-June 2004

The compilation of intra- and inter-laboratory comparison data by analyzed matrix for this reporting period is summarized in Table 18. The cumulative bias shows 94.5% (154/163) of the individual results fell within E-LAB acceptance criteria for bias. A total of 100% (151/151) of the results met Laboratory precision criteria.

(g) Summary of Part 50/61 Quality Control Results by Year

The historical E-LAB summary of process control performance for the Part 50/61 monitoring program is provided in Table 19. For the calendar year 2003, 94.5% of the QC analyses fell within E-LAB acceptance criteria for bias as compared to the sixteen year historical percentage of 94.0. For precision, 100% of the results met the precision acceptance criteria as compared to 99.2% historically.

3. Bioassay Quality Control

There were no bioassay QC analyses performed during this semi-annual period as indicated in Table 20.

For the past several years, the E-LAB has participated in the Lawrence Livermore National Laboratory (LLNL) Thyroid Radioiodine Intercomparison Project (TRIP). This program allows laboratories and facilities to self-assess their performance for *in-vivo* measurements of radioiodine isotopes in the thyroid. The LLNL established the intercomparison project to provide participating facilities with an independent means of evaluating their thyroid radio-iodine measurement using the IAEA/ANSI thyroid calibration neck phantom and well characterized NIST-traceable isotopes for I-125 and I-131. As shown in Table 21, there were no TRIP tests this semi-annual period.

B. Status of Condition Reports (CR)

Table 22 provides a synopsis of CR activity for sample processing during the first half of 2004. Twelve items were closed while eight were opened during this reporting period. As of June 30, 2004, a total of three CRs remain open, none of which are older than 6 months.

C. Status of Audits/Assessments

1. Internal

Supplier Audit CW-01-04

The E-LAB audited vendor Caley & Whitmore Corporation on April 6, 2004 as a part of the QA Manual required control of suppliers of primary calibration services. Caley & Whitmore Corporation provides calibration and maintenance of the laboratory balances. The audit identified three (3) findings: 1) a procedure was not signed by management prior to implementation, 2) a technicians training file was missing required educational information, 3) a balance calibration traceability certificate referenced an incorrect certified weight set. Caley & Whitmore corrected these items and the findings were closed by April 30, 2004. There was no affect on the actual calibrations of any of the laboratory balances.

Supplier Audit AL-02-04

The E-LAB audited supplier Analytics, Inc., from April 19-20, 2004 as part of the QA Manual required control of suppliers of primary calibration services. Analytics, Inc., provides radioactive materials with NIST-traceability that are used for instrument calibrations, process checks, third-party interlab test samples, and creating radioactive sources.

Overall, the Analytics' quality process was found adequate and properly implemented. Personnel are highly qualified and trained to perform their activities. A total of four (4) issues were identified during the audit. Analytics personnel adequately addressed each of the items prior to the issuance of the final audit report.

2. External

State of New York, Department of Health, Environmental Laboratory Approval Program (ELAP) Audit Finding Report, dated April 13, 2004.

The State of New York Department of Health performed an audit of the Framatome ANP Environmental Laboratory on March 30, 2004 as part of the ELAP accreditation program. The auditor noted six areas that were not in full compliance with the State of New York ELAP regulations. The items noted were: 1) no equipment master list is on file, 2) 5 instances of failing to document ELAP qualifications on special forms, 3) receipt surveys for contamination are not documented, 4) the uranium test method differs from the EPA method, 5) e-mails do not contain required confidentiality statements, and 6) reports are missing page numbers.

IV. UPDATED PROCEDURES ISSUED DURING JANUARY-JUNE 2004

A list of Analytical Services Section procedures, which were updated during this semi-annual period, is included in Table 23.

V. REFERENCES

1. Framatome ANP Environmental Laboratory Manual 100 "Laboratory Quality Assurance Plan", Revision 7, June 18, 2004.
2. Framatome ANP Environmental Laboratory 2004 Quality Control and Audit Assessment Schedule.
3. State of New York, Department of Health, Environmental Laboratory Approval Program (ELAP) Audit Finding Report, dated April 13, 2004.

**TABLE 1**

**ANALYTICS ENVIRONMENTAL CROSSCHECK PROGRAM RESULTS BY  
FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ACCEPTANCE CRITERIA, MEDIA, AND MEASUREMENT CATEGORIES  
JANUARY-JUNE 2004**

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
<b>I. Air Particulate</b>								
Alpha	2	1	0	3	6	0	0	0
Beta	0	6	0	0	6	0	0	0
Gamma	7	15	5	0	27	0	0	0
Sr-89	0	1	0	0	0	0	0	0
Sr-90	1	0	0	0	0	0	0	0
<b>II. Milk</b>								
Gamma	47	9	4	0	56	4	0	0
Iodine (LL)	5	0	4	0	3	2	4	0
Sr-89	0	0	3	0	2	1	0	0
Sr-90	1	2	0	0	3	0	0	0
<b>III. Water</b>								
Alpha	3	0	0	0	3	0	0	0
Beta	2	0	1	0	1	2	0	0
Gamma	23	7	0	0	29	1	0	0
H-3	2	1	0	0	2	1	0	0
Iodine (LL)	1	2	0	0	1	2	0	0
Sr-89	3	2	4	0	8	1	0	0
Sr-90	2	3	1	0	5	1	0	0
<b>Total Number in Range:</b>	<b>99</b>	<b>49</b>	<b>22</b>	<b>3</b>	<b>152</b>	<b>15</b>	<b>4</b>	<b>0</b>
<b>Percentage of Total Processed:</b>	<b>57.2</b>	<b>28.3</b>	<b>12.7</b>	<b>1.7</b>	<b>88.9</b>	<b>8.8</b>	<b>2.3</b>	<b>0.0</b>
<b>Sum of Analyses:</b>	<b>173</b>				<b>171</b>			

(1) Percent Bias by Deviation Category as noted in Table 1, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 1, Footnote (2)

\* Total may not equal 100 due to rounding

TABLE 1

ENVIRONMENTAL PROCESS CONTROL ANALYSIS RESULTS BY  
FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ACCEPTANCE CRITERIA, MEDIA AND MEASUREMENT CATEGORIES  
JANUARY-JUNE 2004  
(Continued)

(1) Percent Bias by Deviation Category

1 =  $>0$  and  $\leq 5$

2 =  $>5$  and  $\leq 10$

3 =  $>10$  and  $\leq 15$  (or within 2 sigma of known, see Reference 1)

For Gross Alpha and Beta  
In water

3 =  $>10$  and  $\leq 25$  (or within 2 sigma of known)

For Sr-89/90 mixtures

3 =  $>10$  and  $\leq 25$  (or within 2 sigma of known)

For Alpha Spectrometry\*,

3 =  $>10$  and  $\leq 20$  (or within 2 sigma of known)

For Uranium-Total, Pu-241,  
Zn-65 on an air filter

3 =  $>10$  and  $\leq 20$  (or within 2 sigma of known)

4 = Outside criteria

(2) Percent Precision by Deviation Category

1 =  $>0$  and  $\leq 5$

2 =  $>5$  and  $\leq 10$

3 =  $>10$  and  $\leq 15$  (or within 2 sigma of mean, see Reference 1). Exceptions as above.

4 = Outside criteria

\* Isotopic Uranium (U-234, 235, 238)  
Isotopic Thorium (Th-230, 232)  
Np-237  
Am-241/Cm-242, 243/244  
Pu-alpha (Pu-238, 239, 240)  
Ra-226

\*\* Total may not equal 100 due to rounding.

TABLE 2

**FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM  
PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E3937-162	4th/03	Water	H-3	pCi/L	2307	2290	1.01	Acceptable
E3938-162	4th/03	Water	Sr-89	pCi	99	100	0.99	Acceptable
E3938-162	4th/03	Water	Sr-90	pCi	11	10	1.10	Acceptable
E3939-162	4th/03	Filter	Gross Alpha	pCi	15	16	0.94	Acceptable
E3939-162	4th/03	Filter	Gross Beta	pCi	50	47	1.06	Acceptable
E3940-162	4th/03	Filter	Ce-141	pCi	110	100	1.10	Acceptable
E3940-162	4th/03	Filter	Cr-51	pCi	171	153	1.12	Acceptable
E3940-162	4th/03	Filter	Cs-134	pCi	75	74	1.01	Acceptable
E3940-162	4th/03	Filter	Cs-137	pCi	75	71	1.06	Acceptable
E3940-162	4th/03	Filter	Co-58	pCi	64	61	1.05	Acceptable
E3940-162	4th/03	Filter	Mn-54	pCi	103	95	1.08	Acceptable
E3940-162	4th/03	Filter	Fe-59	pCi	64	56	1.14	Acceptable
E3940-162	4th/03	Filter	Zn-65	pCi	117	108	1.08	Acceptable
E3940-162	4th/03	Filter	Co-60	pCi	82	85	0.96	Acceptable
E3941-162	4th/03	Filter	Sr-89	pCi	103	109	0.94	Acceptable
E3941-162	4th/03	Filter	Sr-90	pCi	11	11	1.00	Acceptable
E3942-162	4th/03	Milk	I-131	pCi/L	84	90	0.93	Acceptable
E3942-162	4th/03	Milk	I-131LL(1)	pCi/L	91	90	1.01	Acceptable
E3942-162	4th/03	Milk	I-131LL(2)	pCi/L	89	90	0.99	Acceptable
E3942-162	4th/03	Milk	Ce-141	pCi/L	191	202	0.95	Acceptable
E3942-162	4th/03	Milk	Cr-51	pCi/L	275	280	0.98	Acceptable
E3942-162	4th/03	Milk	Cs-134	pCi/L	135	135	1.00	Acceptable
E3942-162	4th/03	Milk	Cs-137	pCi/L	126	129	0.98	Acceptable
E3942-162	4th/03	Milk	Co-58	pCi/L	107	111	0.96	Acceptable
E3942-162	4th/03	Milk	Mn-54	pCi/L	173	173	1.00	Acceptable
E3942-162	4th/03	Milk	Fe-59	pCi/L	106	102	1.04	Acceptable
E3942-162	4th/03	Milk	Zn-65	pCi/L	203	197	1.03	Acceptable
E3942-162	4th/03	Milk	Co-60	pCi/L	148	155	0.95	Acceptable

(1) - I-131 sample measurement by beta-gamma coincidence counter

(2) - I-131 sample measurement by proportional counter

**TABLE 2**  
**(Continued)**  
**FRAMATOME ANP ENVIRONMENTAL LABORATORY**  
**ANALYTICS RADIOLOGICAL ENVIRONMENTAL CROSS-CHECK**  
**PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Value	Known Value	Ratio E-LAB/ Analytics	Evaluation
E4057-162	1st/04	Water	Gross Alpha	pCi/L	72.3	74.5	0.97	Acceptable
E4057-162	1st/04	Water	Gross Beta	pCi/L	285.7	301	0.95	Acceptable
E4058-162	1st/04	Water	I-131	pCi/L	94	90.2	1.04	Acceptable
E4058-162	1st/04	Water	I-131LL	pCi/L	88.7	90.2	0.98	Acceptable
E4058-162	1st/04	Water	Ce-141	pCi/L	87.5	85	1.03	Acceptable
E4058-162	1st/04	Water	Cr-51	pCi/L	335	326	1.03	Acceptable
E4058-162	1st/04	Water	Cs-134	pCi/L	86	89.7	0.96	Acceptable
E4058-162	1st/04	Water	Cs-137	pCi/L	185.6	185	1.00	Acceptable
E4058-162	1st/04	Water	Co-58	pCi/L	113.2	112	1.01	Acceptable
E4058-162	1st/04	Water	Mn-54	pCi/L	112.3	114	0.99	Acceptable
E4058-162	1st/04	Water	Fe-59	pCi/L	60.8	56.7	1.07	Acceptable
E4058-162	1st/04	Water	Zn-65	pCi/L	149.1	143	1.04	Acceptable
E4058-162	1st/04	Water	Co-60	pCi/L	151.4	153	0.99	Acceptable
E4059-162	1st/04	Water	Sr-89	pCi	107.7	123	0.88	Acceptable
E4059-162	1st/04	Water	Sr-90	pCi	14.85	14.5	1.02	Acceptable
E4060-162	1st/04	Filter	Gross Alpha	pCi/L	48.09	58.9	0.82	Acceptable
E4060-162	1st/04	Filter	Gross Beta	pCi/L	231.1	218	1.06	Acceptable
E4061-162	1st/04	Milk	I-131	pCi/L	77.73	77.7	1.00	Acceptable
E4061-162	1st/04	Milk	I-131LL	pCi/L	83.6	77.7	1.08	Acceptable
E4061-162	1st/04	Milk	Ce-141	pCi/L	92	85.2	1.08	Acceptable
E4061-162	1st/04	Milk	Cr-51	pCi/L	314	327	0.96	Acceptable
E4061-162	1st/04	Milk	Cs-134	pCi/L	88.7	90	0.99	Acceptable
E4061-162	1st/04	Milk	Cs-137	pCi/L	188.6	185	1.02	Acceptable
E4061-162	1st/04	Milk	Co-58	pCi/L	115	112	1.03	Acceptable
E4061-162	1st/04	Milk	Mn-54	pCi/L	114.7	114	1.01	Acceptable
E4061-162	1st/04	Milk	Fe-59	pCi/L	59.7	56.8	1.05	Acceptable
E4061-162	1st/04	Milk	Zn-65	pCi/L	145.5	143	1.02	Acceptable
E4061-162	1st/04	Milk	Co-60	pCi/L	154.8	153	1.01	Acceptable
E4062-162	1st/04	Milk	Sr-89	pCi	86.2	103	0.84	Acceptable
E4062-162	1st/04	Milk	Sr-90	pCi	12.7	12.1	1.05	Acceptable

**TABLE 3**

**NIST MAP ANALYSIS RESULTS BY  
FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ACCEPTANCE CRITERIA, MEDIA, AND MEASUREMENT CATEGORIES  
JANUARY-JUNE 2004**

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
<b>I. Water</b>								
<b>Gamma</b>	31	5	0	0	36	0	0	0
<b>Total Number In Range:</b>	<b>31</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>36</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Percentage of Total Processed:</b>	<b>86.1</b>	<b>13.9</b>	<b>0.0</b>	<b>0.0</b>	<b>100.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>Sum of Analyses:</b>	<b>36</b>				<b>36</b>			

(1) Percent Bias by Deviation Category as noted in Table 1, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 1, Footnote (2)

\* Total may not equal 100 due to rounding

TABLE 4

**SUMMARY OF FRAMATOME ANP ENVIRONMENTAL LABORATORY  
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)  
TRACEABILITY RESULTS  
JANUARY-JUNE, 2004**

NIST Standard Number	Reference Date of Standard	Radionuclide	Matrix	E-LAB Measurement Technique	Mean Percent Deviation From NIST
1623-17	27-Aug-03	Ba-133	Liquid	Gamma Spectroscopy #2	-0.69
1623-17	27-Aug-03	Ba-133	Liquid	Gamma Spectroscopy #5	3.25
1623-17	27-Aug-03	Cs-134	Liquid	Gamma Spectroscopy #2	-4.08
1623-17	27-Aug-03	Cs-134	Liquid	Gamma Spectroscopy #5	0.96
1623-17	27-Aug-03	Eu-152	Liquid	Gamma Spectroscopy #2	-1.22
1623-17	27-Aug-03	Eu-152	Liquid	Gamma Spectroscopy #5	1.85
1649-4	29-Dec-03	Co-60	Liquid	Gamma Spectroscopy #2	0.10
1649-4	29-Dec-03	Co-60	Liquid	Gamma Spectroscopy #2	-0.55
1649-4	29-Dec-03	Co-60	Liquid	Gamma Spectroscopy #2	0.44
1657-12	28-Jan-04	I-131	Liquid	Gamma Spectroscopy #2	-6.97
1657-12	28-Jan-04	I-131	Liquid	Gamma Spectroscopy #2	-4.94
1657-12	28-Jan-04	I-131	Liquid	Gamma Spectroscopy #2	-5.01

Data on NIST MAP program is repeated in Table 16 for Part 50/61 QC data.

TABLE 5

ENVIRONMENTAL MEASUREMENTS LABORATORY  
QUALITY ASSESSMENT PROGRAM QAP 60 (0403)

MATRIX/ UNITS	RADIO- NUCLIDE	REPORTED MEAN VALUE Bq/Units	REPORTED ERROR	EML VALUE Bq/Units	EML ERROR	REPORTED TO KNOWN RATIO	EVALUATION
Soil (Bq/kg)	K-40	596.000	19.000	539.000	29.110	1.106	Agreement
Soil (Bq/kg)	Sr-90	47.000	2.400	51.000	5.900	0.922	Agreement
Soil (Bq/kg)	Cs-137	1515.300	44.000	1323.000	66.170	1.145	Agreement
Soil (Bq/kg)	Ac-Th-228	50.700	2.100	49.000	1.960	1.035	Agreement
Vegetation (Bq/kg)	K-40	751.700	23.000	720.000	37.920	1.044	Agreement
Vegetation (Bq/kg)	Co-60	14.920	0.310	14.470	0.640	1.031	Agreement
Vegetation (Bq/kg)	Cs-137	593.1	17.3	584.67	229.23	1.014	Agreement
Water (Bq/L)	H-3	218.700	7.900	186.600	3.300	1.172	Agreement
Water (Bq/L)	Co-60	153.700	4.500	163.200	5.900	0.942	Agreement
Water (Bq/L)	Cs-137	48.400	1.500	51.950	2.700	0.932	Agreement

EML has notified the industry that QAP 60 is the final set of samples to be issued. Further information may be found site, URL <http://www.eml.doe.gov/qap/>

TABLE 6.

DEPARTMENT OF ENERGY MIXED ANALYTE PERFORMANCE EVALUATION  
PROGRAM (MAPEP-03-W11)

MATRIX	RADIO-NUCLIDE	E-LAB MEAN VALUE Bq/Kg	MAPEP VALUE Bq/Kg	BIAS %	Evaluation
Water	Cs-134	305.9	322	-4.99	Agreement
Water	Cs-137	114.1	124	-7.96	Agreement
Water	Co-57	158.2	173	-8.56	Agreement
Water	Co-60	117.6	121.8	-3.49	Agreement
Water	H-3	361	379	-4.75	Agreement
Water	Mn-54	145.2	155	-6.32	Agreement
Water	Sr-90	15.6	17.7	-11.86	Agreement
Water	Tc-99	26	28.8	-9.72	Agreement
Water	Zn-65	317.8	320	-0.70	Agreement

TABLE 7

**ENVIRONMENTAL RESOURCE ASSOCIATES PROFICIENCY TEST RESULTS  
FRAMATOME ANP ENVIRONMENTAL LABORATORY**

ERA LOT #/ REF. DATE	MATRIX/ UNITS	RADIO- NUCLIDE	REPORTED MEAN VALUE pCi/L	ERA VALUE pCi/L	ERA CONTROL LIMITS	ERA WARNING LIMITS	EVALUATION
RAD-57 May 2004	Water pCi/L	Gross Alpha	34	38.8	22.0-55.6	27.6-50.0	Acceptable
RAD-57 May 2004	Water pCi/L	Gross Beta	57.8	559.6	42.3-76.9	48.1-71.1	Acceptable
RAD-57 May 2004	Water pCi/L	Tritium	31200	30900	25600-36200	27300-34500	Acceptable
RAD-57 May 2004	Water pCi/L	Ba-133	98.6	101	83.5-118	89.3-113	Acceptable
RAD-57 May 2004	Water pCi/L	Cs-134	49.8	50.5	41.8-59.2	44.7-56.3	Acceptable
RAD-57 May 2004	Water pCi/L	Cs-137	82.4	82.5	73.8-91.2	76.7-88.3	Acceptable
RAD-57 May 2004	Water pCi/L	Co-60	40.5	41.6	32.9-50.3	35.8-47.4	Acceptable
RAD-57 May 2004	Water pCi/L	Zn-65	75.6	75.2	62.2-88.2	66.5-83.9	Acceptable
RAD-57 May 2004	Water pCi/L	I-131	26.4	25.1	19.9-30.3	21.6-28.6	Acceptable

TABLE 8

**INTRA-LABORATORY ENVIRONMENTAL PROCESS CONTROL RESULTS BY  
FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ACCEPTANCE CRITERIA, MEDIA, AND MEASUREMENT CATEGORIES  
JANUARY-JUNE 2004**

	Bias Criteria (1)				Precision Criteria (2), (3)			
	1	2	3	4	1	2	3	4
<b>I. Air Particulate</b>								
Beta	131	7	0	0	0	0	0	0
Gamma								
<b>II. Air Charcoal</b>								
Gamma-Quantitative	2	2	0	0	0	0	0	0
Gamma - Screening	25	17	12	0	0	0	0	0
<b>III. Milk</b>								
Gamma								
Iodine (LL)								
Sr-89								
Sr-90								
<b>IV. Soil/Sed.</b>								
Am-241	1	0	0	0	0	0	0	0
Gamma								
Pu-239								
<b>V. Water</b>								
Am-241	0	8	6	0	2	0	14	0
C-14	8	3	7	2	2	0	18	0
Fe-55	4	4	8	0	0	2	16	0
Gross Alpha	7	3	15	0	2	0	12	0
Gross Beta	15	6	7	0	6	2	6	0
Gamma	30	2	0	0	0	2	28	2
Iodine (LL)								
Ni-63	9	2	3	0	0	0	16	0
Pu-238	8	5	1	0	0	0	16	0
Pu-241	6	7	1	0	0	2	15	0
Sr-90	5	5	5	0	0	0	18	0
Tritium	12	2	1	0	4	4	8	0
Tc-99	12	3	3	1	0	0	20	0
Total Number in Range:	275	76	69	3	16	12	187	2
Percentage of Total Processed:	65.0	18.0	16.3	0.7	7.4	5.5	86.2	0.9
Sum of Analyses:	423				217			

(1) Percent Bias by Deviation Category as noted in Table 1, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 1, Footnote (2)

(3) Most Precision data generated from non-positive client samples for specific contractual evaluation

\* Total may not equal 100 due to rounding

TABLE 9

## QC CHARCOAL ACTIVITY SCREENING RESULTS

SPIKE NUMBER	LSN	FILTER TYPE	ANALYSIS DATE	ACT. REPORTED	% BIAS
67296162-D	6794-01	SAIC-1	17-Jan-04	YES	10.15
	6804-01	SAIC-1	20-Jan-04	YES	9.70
	6805-01	SAIC-1	22-Jan-04	YES	7.87
	6846-01	SAIC-1	30-Jan-04	YES	10.50
	6917-01	SAIC-1	12-Feb-04	YES	7.95
	6939-01	SAIC-1	17-Feb-04	YES	10.62
67296162-F	6794-03	SAIC-2	17-Jan-04	YES	8.75
	6804-03	SAIC-2	20-Jan-04	YES	10.47
	6805-03	SAIC-2	20-Jan-04	YES	9.87
	6846-03	SAIC-2	30-Jan-04	YES	13.12
	6917-03	SAIC-2	13-Feb-04	YES	10.21
	6939-03	SAIC-2	21-Feb-04	YES	8.05
67296162-E	6794-02	SA2C	17-Jan-04	YES	-4.89
	6804-02	SA2C	20-Jan-04	YES	-4.87
	6804-02	SA2C	20-Jan-04	YES	-1.52
	6846-02	SA2C	30-Jan-04	YES	-5.05
	6917-02	SA2C	12-Feb-04	YES	-4.55
	6939-02	SA2C	18-Feb-04	YES	-4.07
67795162-C	6975-01	SAIC-1	26-Feb-04	YES	11.07
	7005-01	SAIC-1	4-Mar-04	YES	13.07
	7028-01	SAIC-1	11-Mar-04	YES	15.20
	7059-01	SAIC-1	15-Mar-04	YES	17.82
	7098-01	SAIC-1	30-Mar-04	YES	14.24
	7132-01	SAIC-1	2-Apr-04	YES	10.84
67795162-D	6975-02	SA2C	26-Feb-04	YES	0.62
	7005-02	SA2C	4-Mar-04	YES	1.82
	7028-02	SA2C	10-Mar-04	YES	-2.63
	7059-02	SA2C	15-Mar-04	YES	0.47
	7098-02	SA2C	26-Mar-04	YES	-1.59
	7132-02	SA2C	31-Mar-04	YES	-0.66
67795162-E	6975-03	SAIC-2	27-Feb-04	YES	2.76
	7005-03	SAIC-2	4-Mar-04	YES	1.60
	7028-03	SAIC-2	11-Mar-04	YES	3.49
	7059-03	SAIC-2	15-Mar-04	YES	3.34
	7098-03	SAIC-2	29-Mar-04	YES	3.44
	7132-03	SAIC-2	2-Apr-04	YES	0.93

**TABLE 9**  
(continued)  
**QC CHARCOAL ACTIVITY SCREENING RESULTS**

SPIKE NUMBER	LSN	FILTER TYPE	ANALYSIS DATE	ACT. REPORTED	% BIAS
67795162-J	7176-01	SAIC-1	7-Apr-04	YES	8.82
	7211-01	SAIC-1	13-Apr-04	YES	8.32
	7239-01	SAIC-1	19-Apr-04	YES	8.11
	7270-01	SAIC-1	26-Apr-04	YES	5.72
	7351-01	SAIC-1	6-May-04	YES	9.20
	7380-01	SAIC-1	10-May-04	YES	6.69
67795162-L	7176-02	SA2C	8-Apr-04	YES	3.63
	7211-03	SA2C	13-Apr-04	YES	2.26
	7239-02	SA2C	19-Apr-04	YES	1.49
	7270-02	SA2C	26-Apr-04	YES	2.89
	7351-02	SA2C	5-May-04	YES	3.68
	7380-02	SA2C	11-May-04	YES	3.88
67795162-K	7176-03	SAIC-2	7-Apr-04	YES	4.36
	7211-02	SAIC-2	13-Apr-04	YES	5.68
	7239-03	SAIC-2	20-Apr-04	YES	8.62
	7270-03	SAIC-2	26-Apr-04	YES	4.80
	7351-03	SAIC-2	6-May-04	YES	7.45
	7380-03	SAIC-2	11-May-04	YES	7.74

I-131 source was unavailable from the supplier during the month of June.

TABLE 10

**FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ENVIRONMENTAL INTRA-LABORATORY AND INTER-LABORATORY  
DATA SUMMARY BIAS AND PRECISION BY MEDIA  
JANUARY-JUNE 2004**

	Bias Criteria (1)				Precision Criteria (2), (3)			
	1	2	3	4	1	2	3	4
<b>I. Air Filter</b>								
Gross Alpha	2	1	0	3	6	0	0	0
Gross Beta	131	13	0	0	6	0	0	0
Gamma	7	15	5	0	27	0	0	0
Sr-89	0	1	0	0	0	0	0	0
Sr-90	1	0	0	0	0	0	0	0
<b>II. Charcoal</b>								
Gamma-Quantitative	2	2	0	0	0	0	0	0
Gamma-Screening	25	17	12	0	0	0	0	0
<b>III. Milk</b>								
Gamma	47	9	4	0	56	4	0	0
Iodine (LL)	5	0	4	0	3	2	4	0
Sr-89	0	0	3	0	2	1	0	0
Sr-90	1	2	0	0	3	0	0	0
<b>IV. Soil/Sediment</b>								
Am-241	1	0	0	0	0	0	0	0
Gamma								
<b>V. Water</b>								
Am-241	0	8	6	0	2	0	14	0
C-14	8	3	7	2	2	0	18	0
Fe-55	4	4	8	0	0	2	16	0
Gross Alpha	10	3	15	0	5	0	12	0
Gross Beta	17	6	8	0	7	4	6	0
Gamma	84	14	0	0	65	3	28	2
Iodine (LL)	1	2	0	0	1	2	0	0
Ni-63	9	2	3	0	0	0	16	0
Pu-238	8	5	1	0	0	0	16	0
Pu-241	6	7	1	0	0	2	15	0
Sr-89	3	2	4	0	8	1	0	0
Sr-90	7	8	6	0	5	1	18	0
Tritium	14	3	1	0	6	5	8	0
Tc-99	12	3	3	1	0	0	20	0
Total Number in Range:	405	130	91	6	204	27	191	2
Percentage of Total Processed:	64.1	20.6	14.4	0.9	48.1	6.4	45.0	0.5
Sum of Analyses:	632				424			

(1) Percent Bias by Deviation Category as noted in Table 1, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 1, Footnote (2)

(3) Most Precision data generated from non-positive client samples for specific contractual evaluation

\* Total may not equal 100 due to rounding.

\*\* Totals summarize Internal PCs, NIST MAP, and Analytics Cross Check programs

TABLE 11

**FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ENVIRONMENTAL INTRA-LABORATORY AND INTER-LABORATORY  
DATA SUMMARY BIAS AND PRECISION BY ANALYSIS TYPE  
JANUARY-JUNE 2004**

	Bias Criteria (1)				Precision Criteria (2), (3)			
	1	2	3	4	1	2	3	4
<b>I. Gross Alpha</b>								
Air Filter	2	1	0	3	6	0	0	0
Water	10	3	15	0	5	0	12	0
<b>II. Am-241</b>								
Soil	1	0	0	0	0	0	0	0
Water	0	8	6	0	2	0	14	0
<b>III. C-14</b>								
Water	8	3	7	2	2	0	18	0
<b>IV. Fe-55</b>								
Water	4	4	8	0	0	2	16	0
<b>V. Gross Beta</b>								
Air Filter	131	13	0	0	6	0	0	0
Water	17	6	8	0	7	4	6	0
<b>VI. Gamma</b>								
Air Filter	7	15	5	0	27	0	0	0
Charcoal-Quantitative	2	2	0	0	0	0	0	0
Charcoal-Screening	25	17	12	0	0	0	0	0
Milk	47	9	4	0	56	4	0	0
Soil								
Water	84	14	0	0	65	3	28	2
<b>VII. Iodine (LL)</b>								
Milk	5	0	4	0	3	2	4	0
Water	1	2	0	0	1	2	0	0
<b>VIII. Ni-63</b>								
Water	9	2	3	0	0	0	16	0
<b>IX. Pu-238</b>								
Water	8	5	1	0	0	0	16	0
<b>X. Pu-241</b>								
Water	6	7	1	0	0	2	15	0
<b>XI. Sr-89</b>								
Air Filter	0	1	0	0	0	0	0	0
Milk	0	0	3	0	2	1	0	0
Water	3	2	4	0	8	1	0	0
<b>XII. Sr-90</b>								
Air Filter	1	0	0	0	0	0	0	0
Milk	1	2	0	0	3	0	0	0
Water	7	8	6	0	5	1	18	0
<b>XIII. Tritium</b>								
Water	14	3	1	0	6	5	8	0
<b>XIV. Tc-99</b>								
Water	12	3	3	1	0	0	20	0
Total Number In Range:	405	130	91	6	204	27	191	2
Percentage of Total Processed:	64.1	20.6	14.4	0.9	48.1	6.4	45.0	0.5
Sum of Analyses:	632				424			

(1) Percent Bias by Deviation Category as noted in Table 1, Footnote (1)

TABLE 12

## ENVIRONMENTAL BIAS AND PRECISION BY YEAR

Year	Percent Bias Deviation from Known					Percent Precision Deviation from Mean				
	Bias Criteria* (1)					Precision Criteria* (2)				
	1	2	3	Outside Criteria	% Within Criteria	1	2	3	Outside Criteria	% Within Criteria
2004	405	130	91	6	99.1	204	27	191	2	99.5
2003	572	182	74	13	98.5	354	55	106	1	99.8
2002	619	170	74	7	99.2	411	44	16	3	99.4
2001	383	115	80	22	96.3	330	45	19	2	99.5
2000	368	143	63	18	97.0	342	70	36	1	99.8
1999	323	100	44	13	97.3	301	46	10	2	99.4
1998	375	100	21	7	98.6	355	56	21	4	99.1
1997	351	118	46	11	97.9	306	46	11	0	100.0
1996	616	187	104	24	97.4	696	71	33	3	99.6
1995	291	75	37	12	97.1	200	43	24	0	100.0
1994	359	116	54	14	97.4	265	61	10	1	99.7
1993	262	121	60	29	93.9	227	59	26	1	99.7
1992	438	206	84	21	97.2	656	112	29	1	99.9
1991	504	174	92	19	97.6	710	82	30	4	99.5
1990	519	153	56	34	95.5	644	97	20	2	99.7
1989	448	171	70	28	96.1	599	76	35	4	99.4
1988	425	141	66	22	96.6	536	76	20	1	99.8
1987	450	187	65	27	96.3	623	80	15	3	99.6
1986	558	185	70	27	96.8	700	82	33	0	100.0
1985	449	177	92	25	96.6	561	93	28	0	100.0
1984	479	254	104	31	96.4	699	127	24	0	100.0
1983	475	211	108	36	95.7	639	113	46	4	99.5
1982	341	109	135	30	95.1	496	112	135	12	98.4
1981	175	116	152	29	93.9	286	72	46	1	99.8
1980	160	115	167	37	92.3	335	96	59	1	99.8
1979	80	51	68	20	90.9	230	73	51	16	95.7
1978	112	90	40	20	92.4	259	73	29	14	96.3
1977	28	18	12	8	87.9	75	39	5	7	94.4
Total # in Range:	10,565	3,915	2,129	590	96.6	12,039	2,026	1,108	90	99.4
% of all Analyses in Range*	61.4	22.8	12.4	3.4		78.9	13.3	7.3	0.6	
Total Number	17,199					15,263				

\* Total may not equal 100 due to rounding.

(1) Deviation Categories 1-3 as noted in Table 1, Footnote (1)

(2) Deviation Categories 1-3 as noted in Table 1, Footnote (2)

TABLE 13

ANALYTICS RADIOCHEMISTRY CROSSCHECK PROGRAM RESULTS BY  
 FRAMATOME ANP ENVIRONMENTAL LABORATORY  
 ACCEPTANCE CRITERIA, MEDIA, AND MEASUREMENT CATEGORIES  
 JANUARY-JUNE 2004

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
<b>I. Water</b>								
Fe-55	0	2	4	0	5	1	0	0
Sr-89	2	1	3	0	6	0	0	0
Sr-90	0	2	4	0	5	1	0	0
Total Number In Range:	2	5	11	0	16	2	0	0
Percentage of Total Processed:	11.1	27.8	61.1	0.0	88.9	11.1	0.0	0.0
Sum of Analyses:	18				18			

(1) Percent Bias by Deviation Category as noted in Table 12, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 12, Footnote (2)

\* Total may not equal 100 due to rounding

TABLE 13

PART 50/61 PROCESS CONTROL ANALYSIS RESULTS BY  
FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ACCEPTANCE CRITERIA, MEDIA AND MEASUREMENT CATEGORIES  
JANUARY – JUNE 2004  
(Continued)

(1) Percent Bias by Deviation Category

1 =  $>0$  and  $\leq 5$

2 =  $>5$  and  $\leq 10$

3 =  $>10$  and  $\leq 15$  (or within 2 sigma of known, see Reference 1)

For Gross Alpha and Beta  
In water,

3 =  $>10$  and  $\leq 25$  (or within 2 sigma of known)

For Alpha Spectrometry\*,

3 =  $>10$  and  $\leq 20$  (or within 2 sigma of known)

For Uranium-Total, Pu-241,  
Zn-65 on an air filter, C-14,

3 =  $>10$  and  $\leq 20$  (or within 2 sigma of known)

4 = Outside criteria

(2) Percent Precision by Deviation Category

1 =  $>0$  and  $\leq 5$

2 =  $>5$  and  $\leq 10$

3 =  $>10$  and  $\leq 15$  (or within 2 sigma of mean, see Reference 1)

4 = Outside criteria

\* Isotopic Uranium (U-234, 235, 238)  
Isotopic Thorium (Th-230, 232)  
Np-237  
Am-241/Cm-242, 243/244  
Pu-alpha (Pu-238, 239, 240)  
Ra-226

\*\* Total may not equal 100 due to rounding.

TABLE 14

**FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ANALYTICS RADIOCHEMISTRY CROSS-CHECK  
PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Mean		Ratio	Evaluation
					Reported Value	Known Value	E-LAB/ Analytics	
A17776-162	1st/2004	Liquid	Fe-55	uCi/cc	1.39E-04	1.58E-04	0.88	Agreement
A17777-162	1st/2004	Liquid	Sr-89	uCi/cc	1.35E-03	1.54E-03	0.88	Agreement
A17777-162	1st/2004	Liquid	Sr-90	uCi/cc	1.10E-04	1.24E-04	0.89	Agreement
A18125-162	2nd/2004	Liquid	Fe-55	uCi/cc	9.99E-05	1.12E-04	0.89	Agreement
A18126-162	2nd/2004	Liquid	Sr-89	uCi/cc	3.76E-03	3.96E-03	0.95	Agreement
A18126-162	2nd/2004	Liquid	Sr-90	uCi/cc	3.27E-04	3.60E-04	0.91	Agreement

TABLE 15

NIST MAP ANALYSIS RESULTS BREAKDOWN BY  
 FRAMATOME ANP ENVIRONMENTAL LABORATORY  
 ACCEPTANCE CRITERIA, MEDIA AND MEASUREMENT CATEGORIES  
 JANUARY-JUNE 2004

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
I. Liquid								
Gamma	31	5	0	0	36	0	0	0
Total Number in Range:	31	5	0	0	36	0	0	0
Percentage of Total Processed:	86.1	13.9	0.0	0.0	100.0	0.0	0.0	0.0
Sum of Analyses:	36				36			

(1) Percent Bias by Deviation Category as noted in Table 13, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 13, Footnote (2)

\* Total may not equal 100 due to rounding

TABLE 16

SUMMARY OF FRAMATOME ANP ENVIRONMENTAL LABORATORY  
 NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)  
 TRACEABILITY RESULTS  
 JANUARY-JUNE 2004

NIST Standard Number	Reference Date of Standard	Radionuclide	Matrix	E-LAB Measurement Technique	Mean Percent Deviation From NIST
1623-17	27-Aug-03	Ba-133	Liquid	Gamma Spectroscopy #2	-0.69
1623-17	27-Aug-03	Ba-133	Liquid	Gamma Spectroscopy #5	3.25
1623-17	27-Aug-03	Cs-134	Liquid	Gamma Spectroscopy #2	-4.08
1623-17	27-Aug-03	Cs-134	Liquid	Gamma Spectroscopy #5	0.96
1623-17	27-Aug-03	Eu-152	Liquid	Gamma Spectroscopy #2	-1.22
1623-17	27-Aug-03	Eu-152	Liquid	Gamma Spectroscopy #5	1.85
1649-4	29-Dec-03	Co-60	Liquid	Gamma Spectroscopy #2	0.10
1649-4	29-Dec-03	Co-60	Liquid	Gamma Spectroscopy #2	-0.55
1649-4	29-Dec-03	Co-60	Liquid	Gamma Spectroscopy #2	0.44
1657-12	28-Jan-04	I-131	Liquid	Gamma Spectroscopy #2	-6.97
1657-12	28-Jan-04	I-131	Liquid	Gamma Spectroscopy #2	-4.94
1657-12	28-Jan-04	I-131	Liquid	Gamma Spectroscopy #2	-5.01

Data on NIST MAP program is repeated in Table 4 for Environmental QC data.

TABLE 17

INTRA-LABORATORY PART 50/61 PROCESS CONTROL RESULTS BREAKDOWN BY  
 FRAMATOME ANP ENVIRONMENTAL LABORATORY  
 ACCEPTANCE CRITERIA, MEDIA AND MEASUREMENT CATEGORIES  
 JANUARY-JUNE 2004

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
<b>I. Filter</b>								
Alpha								
Am-241								
Fe-55								
Gamma								
Sr-89								
Sr-90								
<b>II. Liquid</b>								
Alpha	5	1	6	1	3	2	0	0
Am-241	0	6	0	0	6	0	0	0
Beta	2	2	2	0	4	1	0	0
C-14	2	2	2	0	5	1	0	0
Cm-243/4	3	0	3	0	6	0	0	0
Fe-55	3	0	1	2	6	0	0	0
Gamma	1	4	1	0	3	0	0	0
H-3	10	1	2	0	13	0	0	0
I-129	0	7	1	0	6	2	0	0
Ni-63	3	1	2	0	6	0	0	0
Np-237	3	3	0	0	6	0	0	0
Pu-238	6	0	0	0	6	0	0	0
Pu-241	2	1	3	0	3	2	1	0
Sr-89	0	1	2	3	6	0	0	0
Sr-90	0	3	0	3	6	0	0	0
Tc-99	0	3	0	0	3	0	0	0
Total Number in Range:	40	35	25	9	88	8	1	0
Percentage of Total Processed:	36.7	32.1	22.9	8.3	90.7	8.2	1.0	0.0
Sum of Analyses:	109				97			

(1) Percent Bias by Deviation Category as noted in Table 13, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 13, Footnote (2)

\* Total may not equal 100 due to rounding.

TABLE 18

**PART 50/61 ANALYSIS RESULTS BREAKDOWN BY  
FRAMATOME ANP ENVIRONMENTAL LABORATORY  
ACCEPTANCE CRITERIA, MEDIA AND MEASUREMENT CATEGORIES  
JANUARY-JUNE 2004**

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
<b>I. Filter</b>								
Alpha								
Am-241								
Fe-55								
Gamma								
Sr-89								
Sr-90								
<b>II. Liquid</b>								
Alpha	5	1	6	1	3	2	0	0
Am-241	0	6	0	0	6	0	0	0
Beta	2	2	2	0	4	1	0	0
C-14	2	2	2	0	5	1	0	0
Cm-243/4	3	0	3	0	6	0	0	0
Fe-55	3	2	5	2	11	1	0	0
Gamma	32	9	1	0	39	0	0	0
H-3	10	1	2	0	13	0	0	0
I-129	0	7	1	0	6	2	0	0
Ni-63	3	1	2	0	6	0	0	0
Np-237	3	3	0	0	6	0	0	0
Pu-238	6	0	0	0	6	0	0	0
Pu-241	2	1	3	0	3	2	1	0
Sr-89	2	2	5	3	12	0	0	0
Sr-90	0	5	4	3	11	1	0	0
Tc-99	0	3	0	0	3	0	0	0
<b>Total Number in Range:</b>	<b>73</b>	<b>45</b>	<b>36</b>	<b>9</b>	<b>140</b>	<b>10</b>	<b>1</b>	<b>0</b>
<b>Percentage of Total Processed:</b>	<b>44.8</b>	<b>27.6</b>	<b>22.1</b>	<b>5.5</b>	<b>92.7</b>	<b>6.6</b>	<b>0.7</b>	<b>0.0</b>
<b>Sum of Analyses:</b>	<b>163</b>				<b>151</b>			

(1) Percent Bias by Deviation Category as noted in Table 13, Footnote (1)

(2) Percent Precision by Deviation Category as noted in Table 13, Footnote (2)

\* Total may not equal 100 due to rounding.

\*\* Totals summarize Internal PCs, NIST MAP, and Analytics Cross Check programs

TABLE 19

PART 50/61 BIAS AND PRECISION BY YEAR (1)

Year	Percent Bias Deviation from Known					Percent Precision Deviation from Mean				
	Bias Criteria (2)					Precision Criteria (2)				
	1	2	3	Outside Criteria 4	% Within Criteria	1	2	3	Outside Criteria 4	% Within Criteria
2004	73	45	36	9	94.5	140	10	1	0	100.0
2003	144	91	51	9	96.9	249	18	2	0	100.0
2002	215	94	49	8	97.8	300	24	5	2	99.4
2001	159	90	46	24	92.5	238	46	6	0	100.0
2000	151	72	28	23	91.6	220	38	16	4	98.6
1999	111	59	14	7	96.3	168	13	5	2	98.9
1998	90	68	24	7	96.3	160	22	7	0	100.0
1997	99	43	33	8	95.6	168	13	2	0	100.0
1996	194	80	33	17	94.8	285	31	8	0	100.0
1995	112	47	35	7	96.5	173	15	4	0	100.0
1994	125	39	25	5	97.4	158	22	5	1	99.5
1993	154	51	32	17	93.3	208	34	7	0	100.0
1992	116	86	38	7	97.2	207	27	5	0	100.0
1991	126	77	53	35	88.0	223	28	10	5	98.1
1990	116	65	31	21	91.0	199	35	6	0	100.0
1989	73	71	51	26	88.2	152	40	24	8	96.4
1988	30	19	13	13	82.7	43	13	6	9	87.3
Total # in Range:	2,088	1,097	592	243	94.0	3,291	429	119	31	99.2
% of all Analyses in Range*	51.9	27.3	14.7	6.0		85.0	11.1	3.1	0.8	
Sum of Analyses	4,020					3,870				

\* Total may not equal 100 due to rounding.

(1) This breakdown excludes the 71 verification analyses associated with the startup of this area of the Laboratory during 1988-89.

(2) Deviation Categories 1-4 as noted in Table 13, Footnote (1)

TABLE 20

BIOASSAY ANALYSIS RESULTS BREAKDOWN BY  
 FRAMATOME ANP ENVIRONMENTAL LABORATORY  
 ACCEPTANCE CRITERIA, MEDIA AND MEASUREMENT CATEGORIES  
 JANUARY-JUNE 2004

	Bias Criteria (1)				Precision Criteria (2)			
	1	2	3	4	1	2	3	4
<b>I. Urine (3)</b>								
Gamma								
H-3								
<b>Total Number in Range:</b>	0	0	0	0	0	0	0	0
<b>Percentage of Total Processed*:</b>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Sum of Analyses:</b>	0				0			

- (1) Percent Bias by Deviation Category as noted in Table 13, Footnote (1)
- (2) Percent Precision by Deviation Category as noted in Table 13, Footnote (2)
- (3) There were no internal or external bioassay QC samples analyzed during this period.
- \* Total may not equal 100 due to rounding

TABLE 21

LAWRENCE LIVERMORE NATIONAL LABORATORY (LLNL)  
 BIOASSAY THYROID RADIOIODINE INTERCOMPARISON PROJECT (TRIP)

TRIP ID	RADIO- NUCLIDE	REPORTED VALUE (dpm)	REPORTED UNCERTAINTY (dpm)	LLNL CERTIFIED VALUE (dpm)	LLNL CERTIFIED UNCERTAINTY (dpm)	BIAS %	ANSI 13.30 BIAS CRITERIA
*	I-125						
*	I-131						

\* - No testing was performed during this period.

TABLE 22

**CONDITION REPORT (CR) STATUS  
(JANUARY-JUNE 2004)**

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 06/30/04
CR 03-14	8-May-03	11-May-04	MAPEP water sample for Pu-239/240 was evaluated as "False Positive."	Sample count data was reviewed and no contaminants were identified. A detailed evaluation of the uncertainty evaluation for the MAPEP samples was performed.
CR 03-16	26-Jun-03	25-Jun-04	NIST sample for Fe-55 had negative bias greater than Laboratory acceptance criteria.	No dilution errors were identified in sample preparation. Sample dilution techniques were enhanced by requiring the addition of chemical carriers to the diluted sample aliquot as is normally done for source preparation. The sample was reanalyzed successfully using the new dilution technique. An ~10% error was identified in the vendor iron carrier used in the recovery determination. NIST Iron standards are now being used to determine chemical recovery. The Liquid Scintillator calibration curve was verified to be free of statistically significant bias.
CR 03-18	30-Jun-03	25-Jun-04	An internal process check for Fe-55 (Part 50/61) fell just outside the Laboratory acceptance criteria for bias.	An ~10% error was identified in the vendor iron carrier used in the recovery determination. NIST Iron standards are now being used to determine chemical recovery. The Liquid Scintillator calibration curve was verified to be free of statistically significant bias.
CR 03-19	7-Jul-03	25-Jun-04	Analytics 2nd quarter 2003 Fe-55 Part 50 sample had negative bias greater than Laboratory acceptance criteria.	An ~10% error was identified in the vendor iron carrier used in the recovery determination. NIST Iron standards are now being used to determine chemical recovery. The Liquid Scintillator calibration curve was verified to be free of statistically significant bias.
CR 03-27	15-Oct-03	28-May-04	The procedure for standardization and verification of carriers does not completely address all the activities required to perform the verifications.	Procedure 730 was revised to include detailed steps for the verification of radiotracers. A new form was added to improve the clarity of the verification data.
CR 03-29	14-Nov-03	3-Feb-04	Corporate QA Audit - Procedure 200 was not revised to account for activities controlled by the new Procedure 201.	Procedure 200 and QA Manual 100 were revised to clarify the sample receipt process.
NUPIC/PPL 2003-061- 002	4-Dec-03	15-Apr-04	MDC values for three contracts are not being controlled as specified in QA Manual 100.	The MDC values for two clients have been entered into LIMS. The third contract MDC values, for Part 50/61 analysis, has been entered into the contract file and the staff has been notified of these values.

\* - Gaps in the CR numbering sequence are due to either closed CRs from previous report or CRs dealing with issues that are not applicable.

TABLE 22  
 CONDITION REPORT (CR) STATUS  
 (JANUARY-JUNE 2004)  
 (continued)

CR #	(OPEN) INITIATION DATE	(CLOSED) CLOSE-OUT DATE	DESCRIPTION	STATUS AS OF 06/30/04
CR 04-01	14-Jan-04	2-Mar-04	3 Analytics filters were not processed expeditiously.	Training was provided to the Sample Receipt tech concerning the appropriate LIMS template for these samples. A controlled holding area was created for samples requiring resolution of processing questions.
CR 04-03	11-Feb-04	6-May-04	DOEQAP gross beta air particulate sample fell in "Warning" range.	Sample was recounted in triplicate, verifying the original result. Three previous DOEQAP analyses using the same instrument/calibration were all within 10% of the known. EML has suspended the DOEQAP program. CR closed since this calibration is specific to the DOEQAP matrix.
CR 04-04	24-Feb-04	9-Mar-04	A sample of pecans was unable to be analyzed to the required MDC.	The QA manual was revised to include specific requirement for management to oversee daily sample processing. A processing procedure was also revised to address the potential hazard of ashing 'oily' samples, such as nuts.
CR 04-06	16-Apr-04		Client requested investigation into concerns over timeliness of sample processing and explanation of several sample results.	Required MDCs for these samples were all met, several though did not meet the specific time frames. Management is monitoring the processing of these special samples during routine sample status meetings. Each 'unusual' sample result was investigated and explanation provided.
CR 04-07	18-May-04	25-May-04	A C-14 analysis on well water failed the matrix spike but passed the laboratory control spike.	Debris from construction near the well was determined to be the root cause of the failure. The sample was filtered (client requested previously not to filter this sample) and re-analyzed successfully.
CR 04-08	25-May-04		Process check for Fe-55 failed with negative bias.	A detailed investigation into the Fe-55 analysis is ongoing.
CR 04-09	10-Jun-04		Four water samples were entered into LIMS with the incorrect requested analysis, causing the required MDC to be missed.	The Sample Receipt tech was counseled concerning self-checking. Another individual is cross-checking the LIMS data entry for all samples.

\* - Gaps in the CR numbering sequence are due to either closed CRs from previous report or CRs dealing with issues that are not applicable.

TABLE 23

UPDATED INSTRUMENTATION GROUP/ANALYTICAL SERVICES  
SECTION PROCEDURES ISSUED DURING JANUARY-JUNE 2004

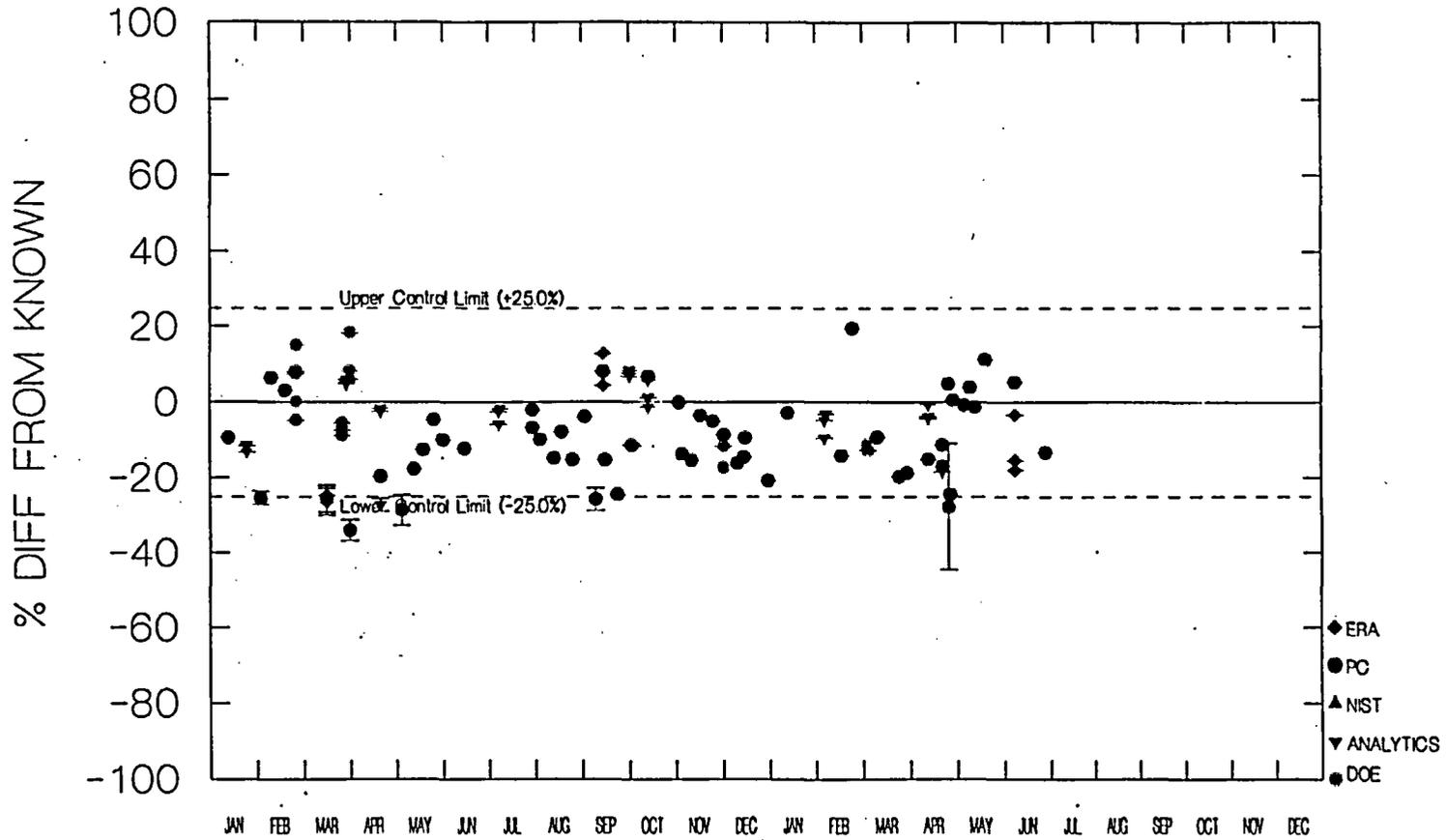
PROCEDURE NUMBER	TITLE	REVISION NUMBER	APPROVAL DATE	EFFECTIVE DATE
010	Control of Framatome ANP Environmental Laboratory Manuals and Procedures	19	06/01/04	06/01/04
200	Sample Receipt And General Chain-Of-Custody using Foxpro	19 20	01/15/04 02/03/04	01/15/04 02/10/04
201	Sample Receipt And Chain Of Custody Using LIMS	7 8	02/12/04 05/11/04	02/24/04 05/31/04
320	Preparation and Analysis of Environmental Water and Soil/Sediment/Sludge Samples for Gross Alpha and/or Gross Beta	21	05/11/04	05/11/04
340	The Determination of Iodine-131 in Environmental Media Using Anion Exchange Chromatography	25	03/08/04	03/10/04
730	Standardization and Verification of Carriers	15	05/25/04	05/25/04
765	Guidelines for Maintaining the Milli-Q Deionized Water Systems	3	05/18/04	05/18/04
780	Purchasing Controls	0 1	02/24/04 05/28/04	02/29/04 05/28/04
1123	The Sequential Determination of Iron-55 and Nickel-59,63 in 10 CFR 50/61 Media	8	01/16/04	01/16/04

**APPENDIX A**

**INTER/INTRA-LABORATORY,  
ENVIRONMENTAL MONITORING  
ANALYTICS, DOE, ERA AND NIST  
QUALITY CONTROL PROGRAM RESULTS**

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

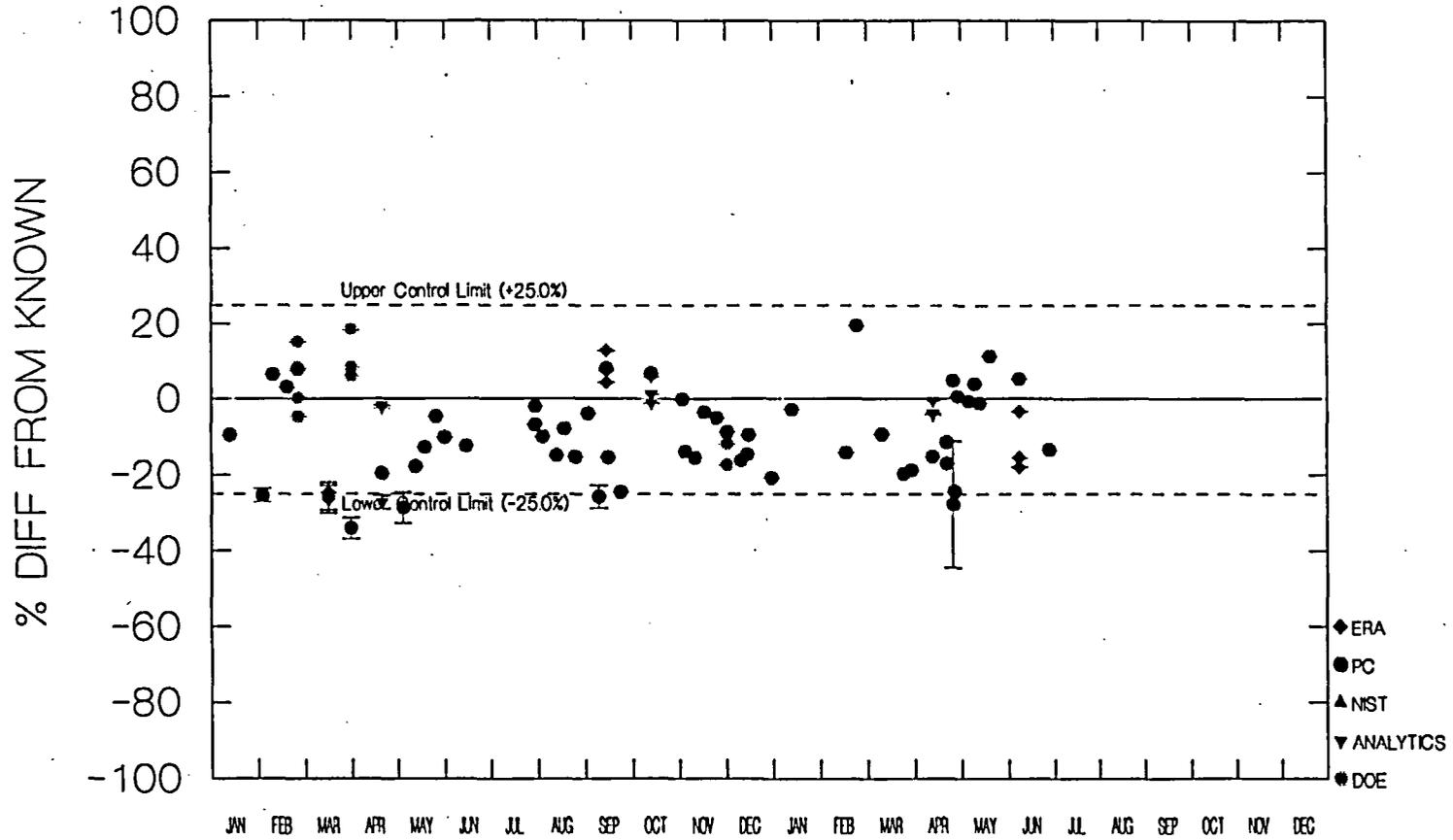
## REMP GROSS ALPHA RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP GROSS ALPHA WATER RESULT BIAS



ANALYSIS PERIOD 2003-2004

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/24/2004

REF. DATE: 03/19/2004

LAB SAMPLE NO: 709919 ANAL DATE: 04/26/2004

UNITS: pCi/L

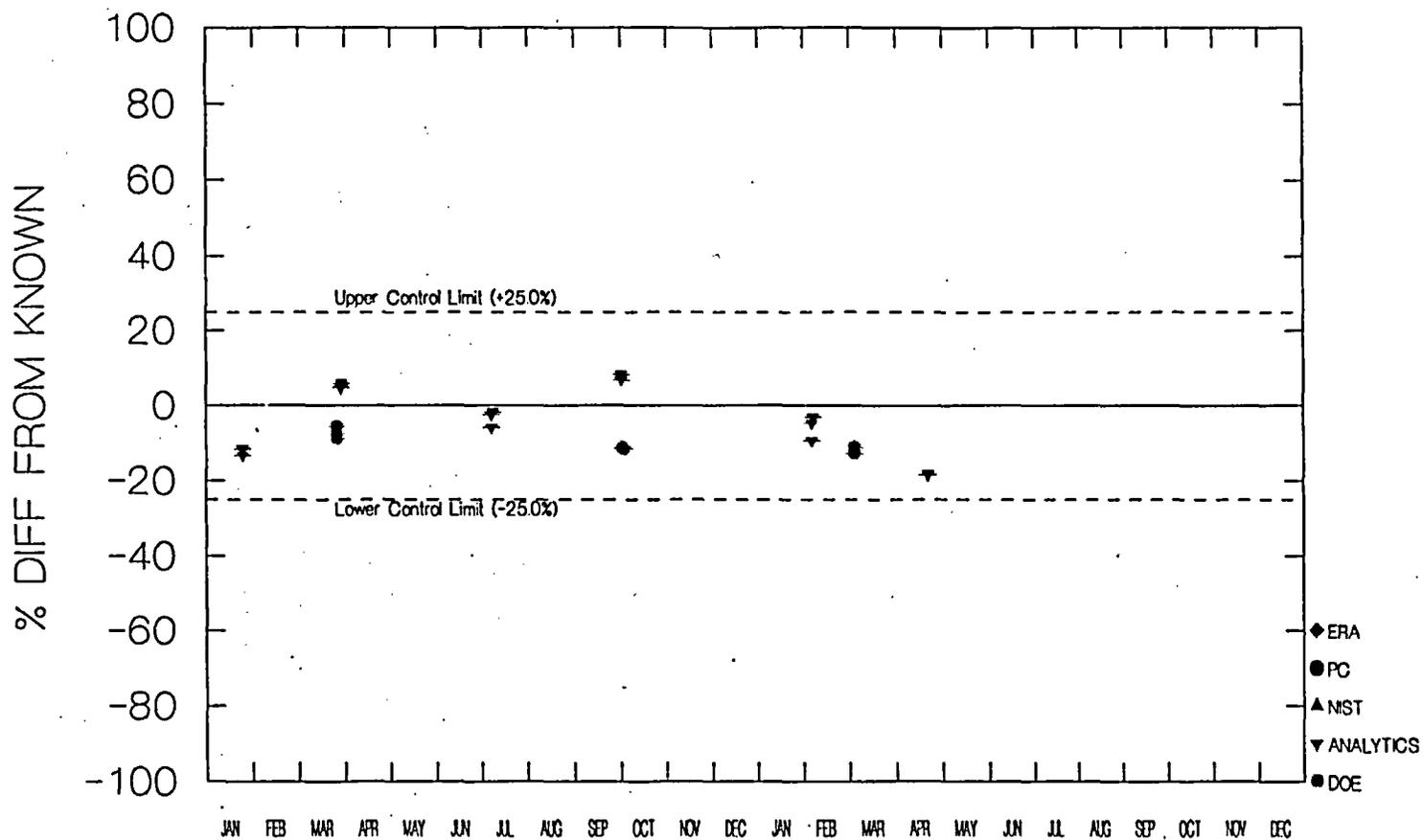
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Alpha	( 450 ± 52)E-01				62.20E 00	-27.70		
Beta	( 491 ± 42)E-01				47.10E 00	4.20		

Internal spike for Gross Alpha in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

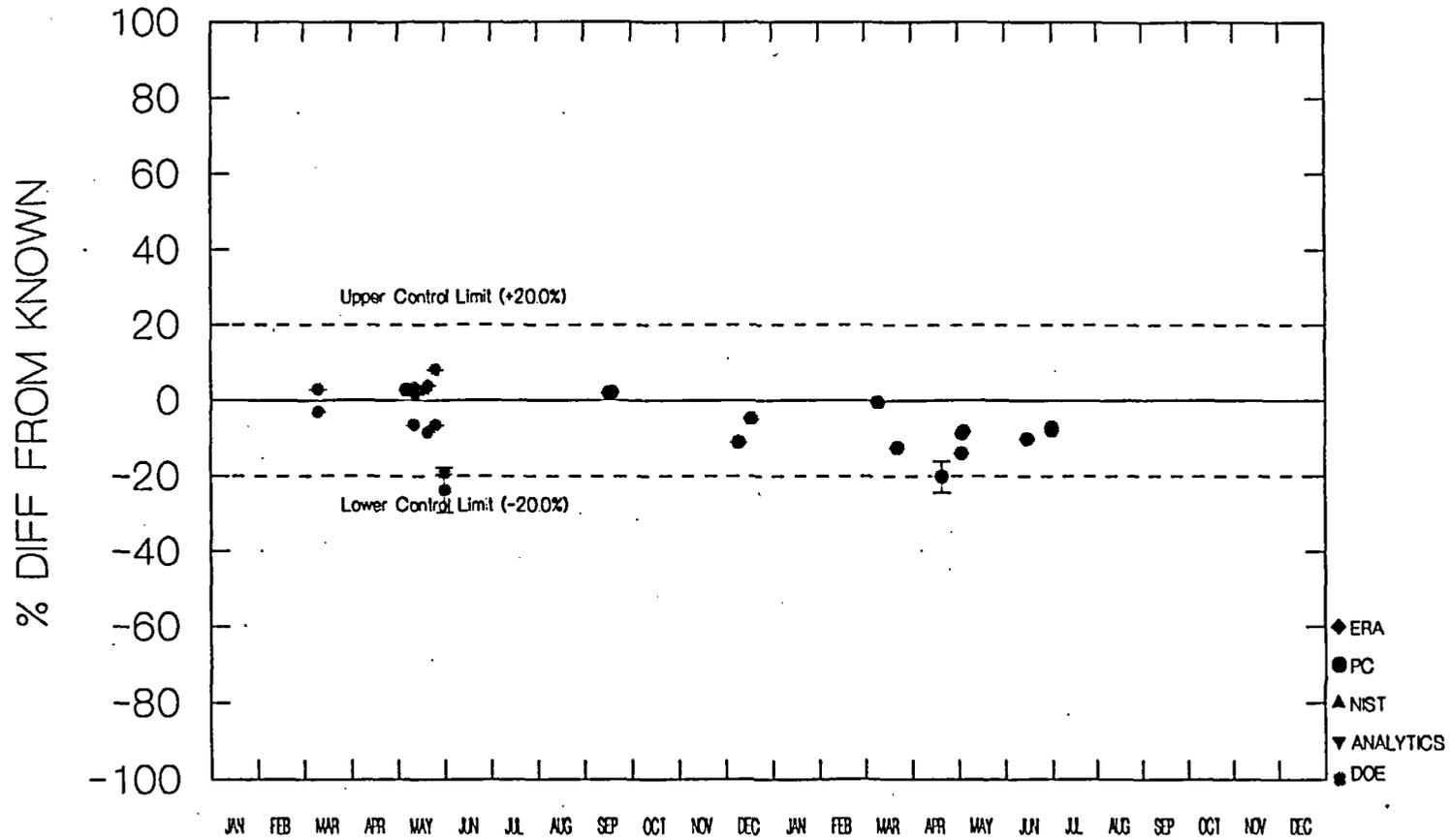
## REMP GROSS ALPHA AIR PARTICULATE RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

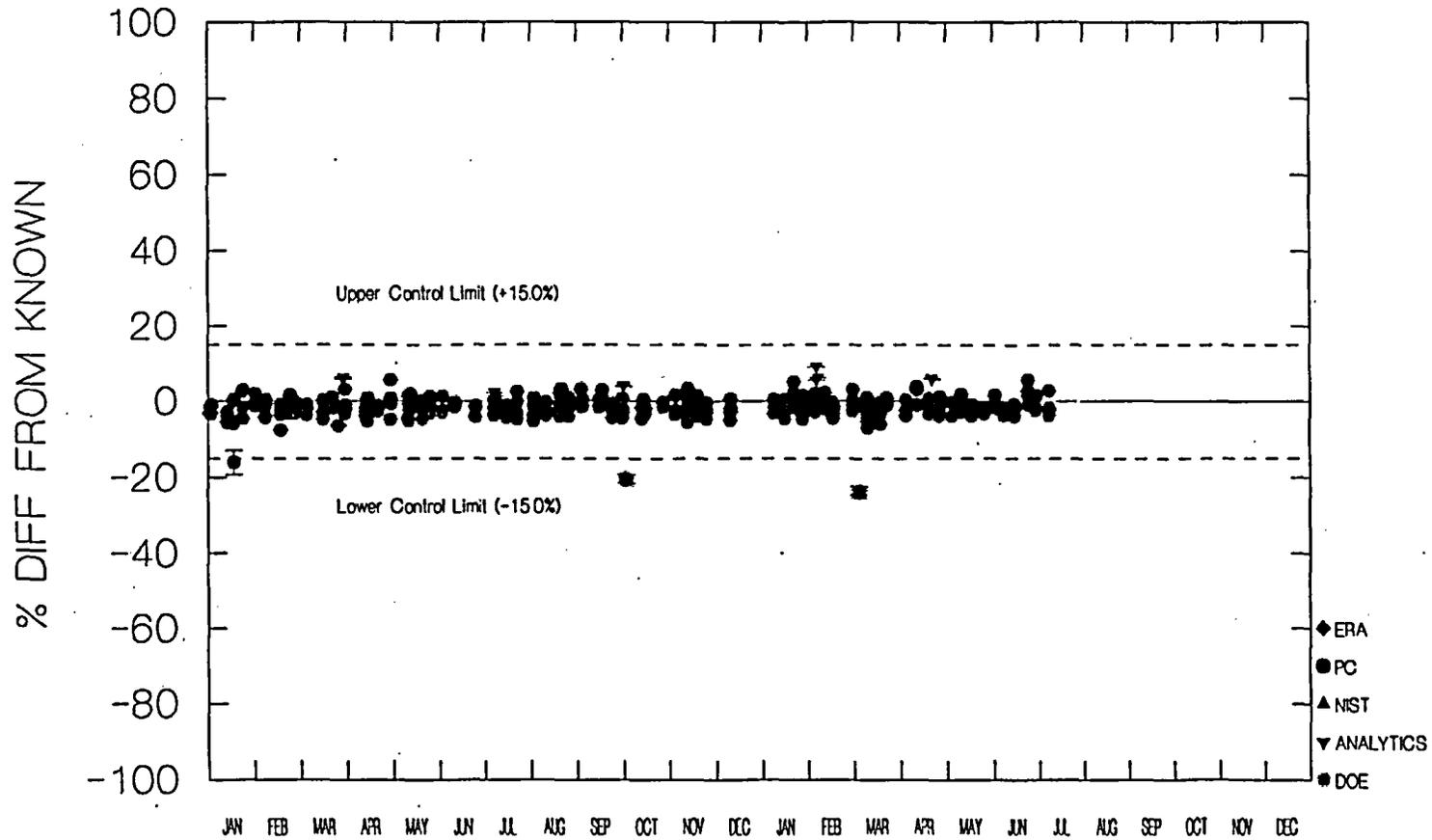
## REMP Am-241 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

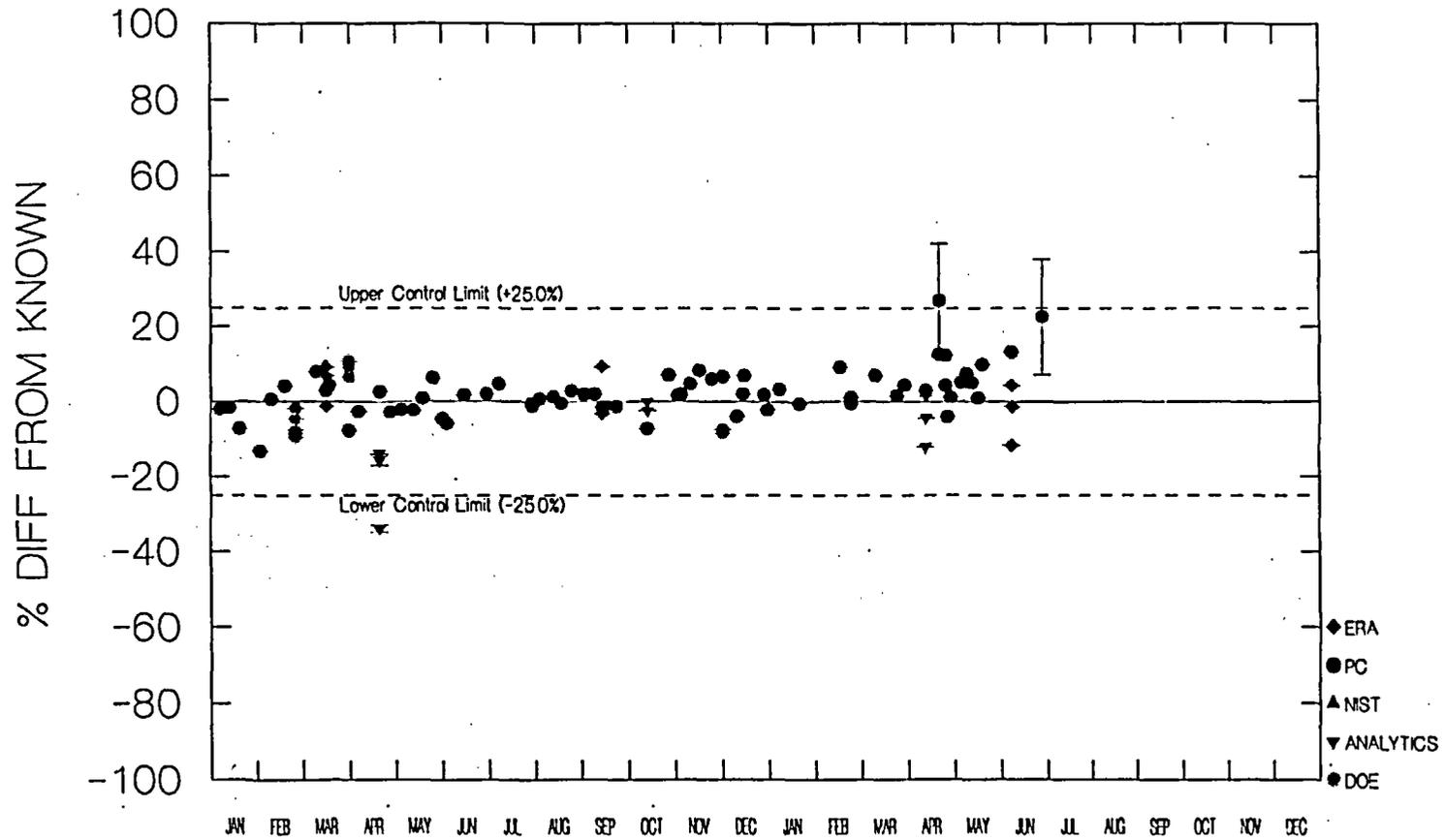
## REMP AIR PARTICULATE GROSS BETA RESULT BIAS



ANALYSIS PERIOD 2002-2003

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP BETA (NON-AP) RESULT BIAS



ANALYSIS PERIOD 2003-2004

QC . CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/03/2004

REF. DATE: 03/08/2004

LAB SAMPLE NO: 702516

ANAL DATE: 04/22/2004

UNITS: pCi/L

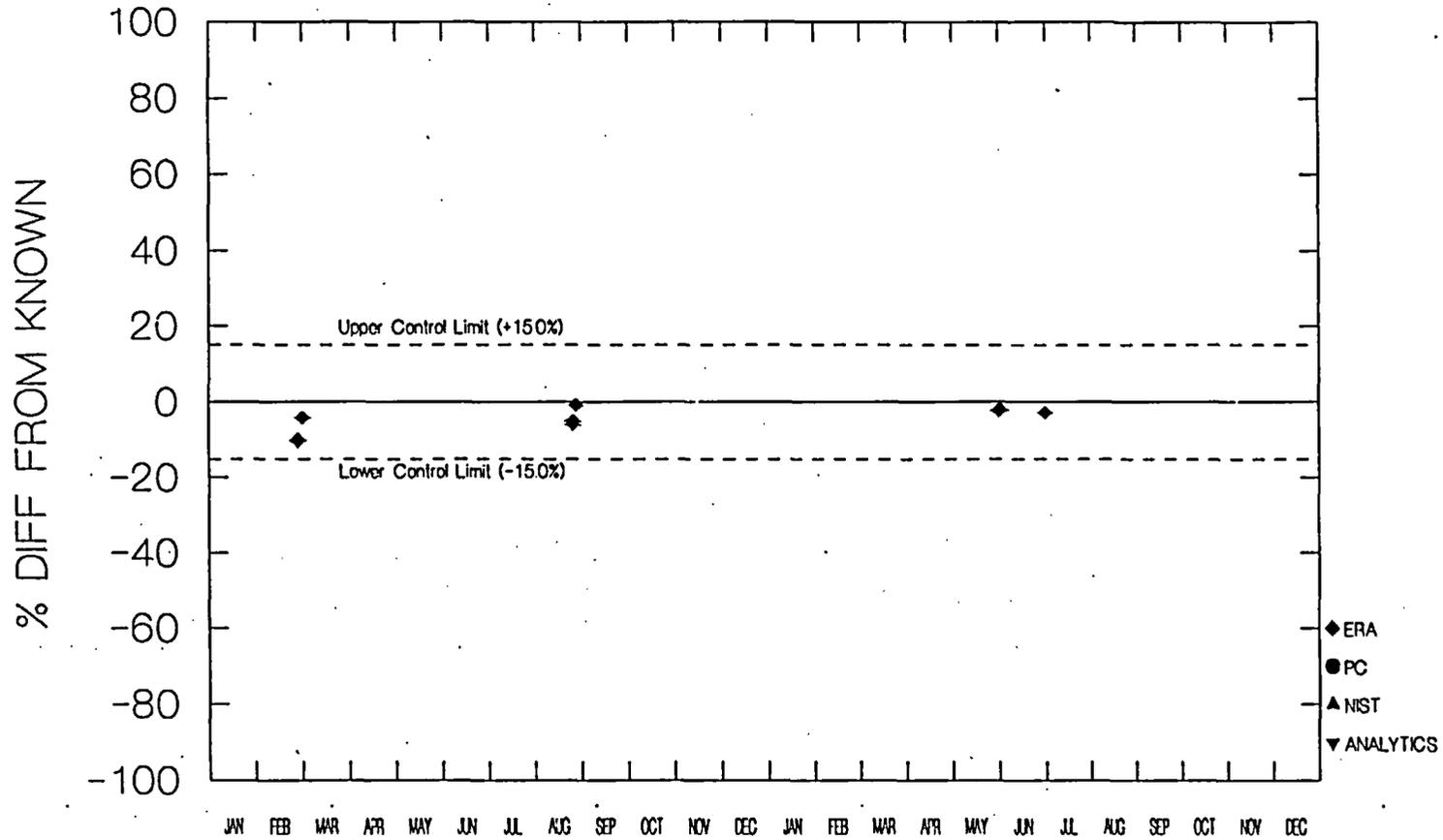
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Alpha	( 491 ± 52)E-01				55.40E 00	-11.40		
Beta	( 757 ± 45)E-01				59.60E 00	27.00		

Internal spike for Gross Beta in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

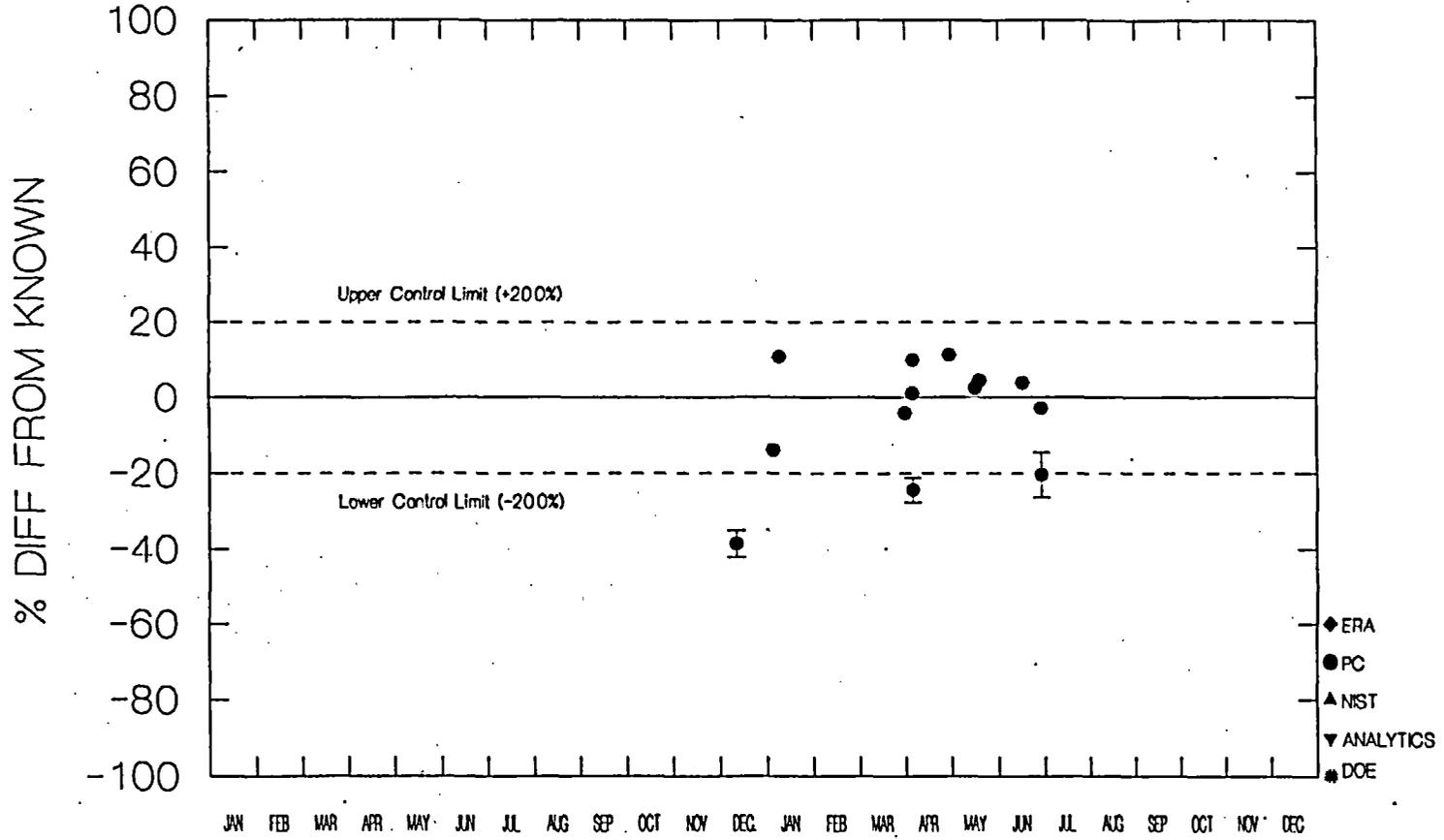
## REMP Ba-133 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP C-14 RESULT BIAS



ANALYSIS PERIOD 2003-2004

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/24/2004

REF. DATE: 03/19/2004

LAB SAMPLE NO: 709919 ANAL DATE: 04/06/2004

UNITS: pCi/L

NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
C-14	( 1460 ± 32)E 00				19.31E 02	-24.40		

Internal spike for C-14 in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/24/2004

REF. DATE: 03/24/2004

LAB SAMPLE NO: 713909 ANAL DATE: 04/30/2004

UNITS: pCi/L

NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
C-14	( 1250 ± 41)E 00				19.80E 02	-36.90*		

REF. DATE: 03/24/2004

LAB SAMPLE NO: 713909 ANAL DATE: 05/17/2004

UNITS: pCi/L

NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
C-14	( 1160 ± 55)E 00				19.80E 02	-41.40*		

REF. DATE: 03/24/2004

LAB SAMPLE NO: 713912 ANAL DATE: 05/20/2004

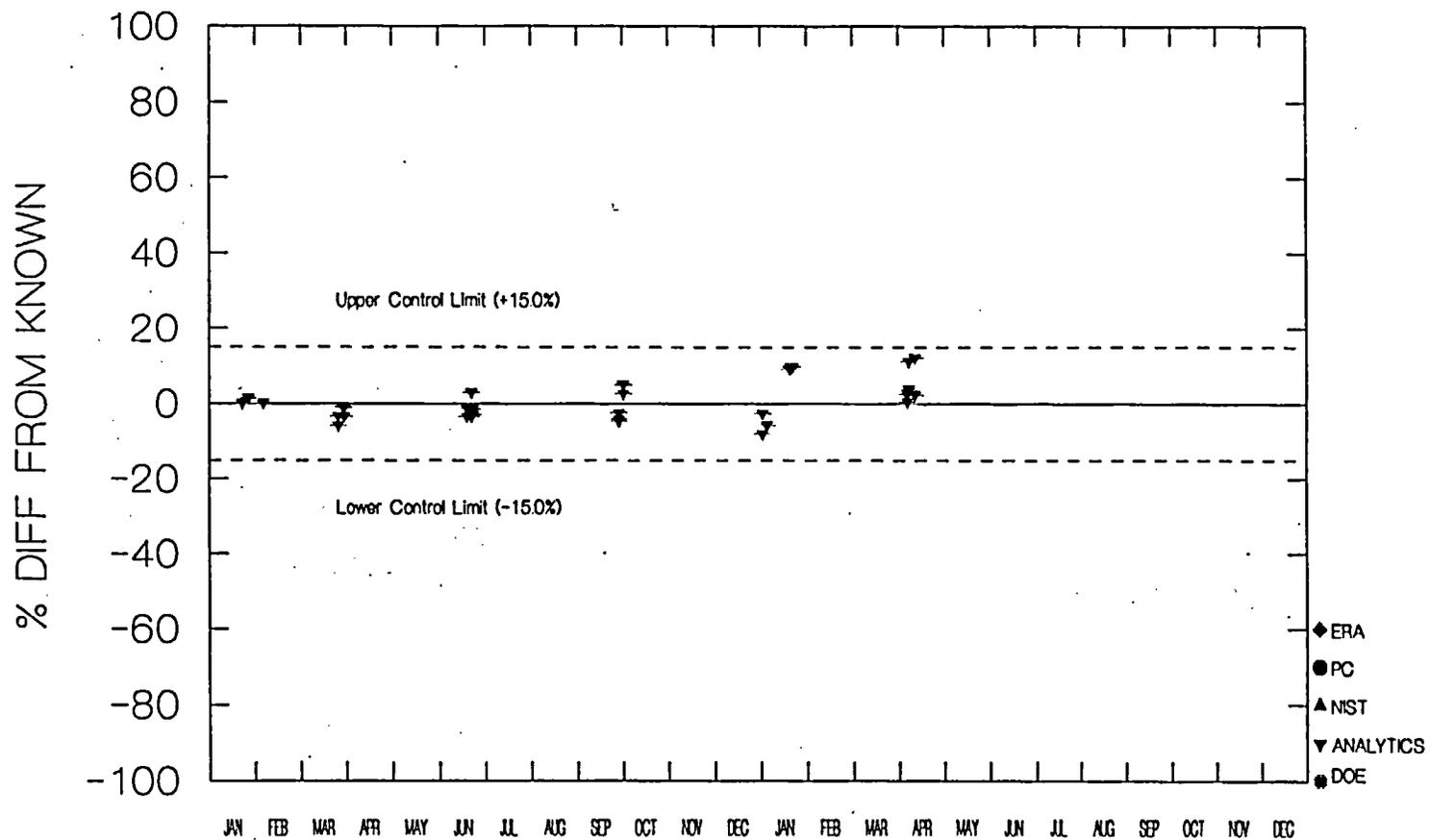
UNITS: pCi/L

NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
C-14	( 1860 ± 57)E 00				19.80E 02	-6.10		

Internal spike for C-14 in water was analyzed according to specific client protocol. The analysis and reprocess results were outside the client's acceptable limits. Debris and color in sample were filtered from sample with client's approval and the spike was analyzed successfully.

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

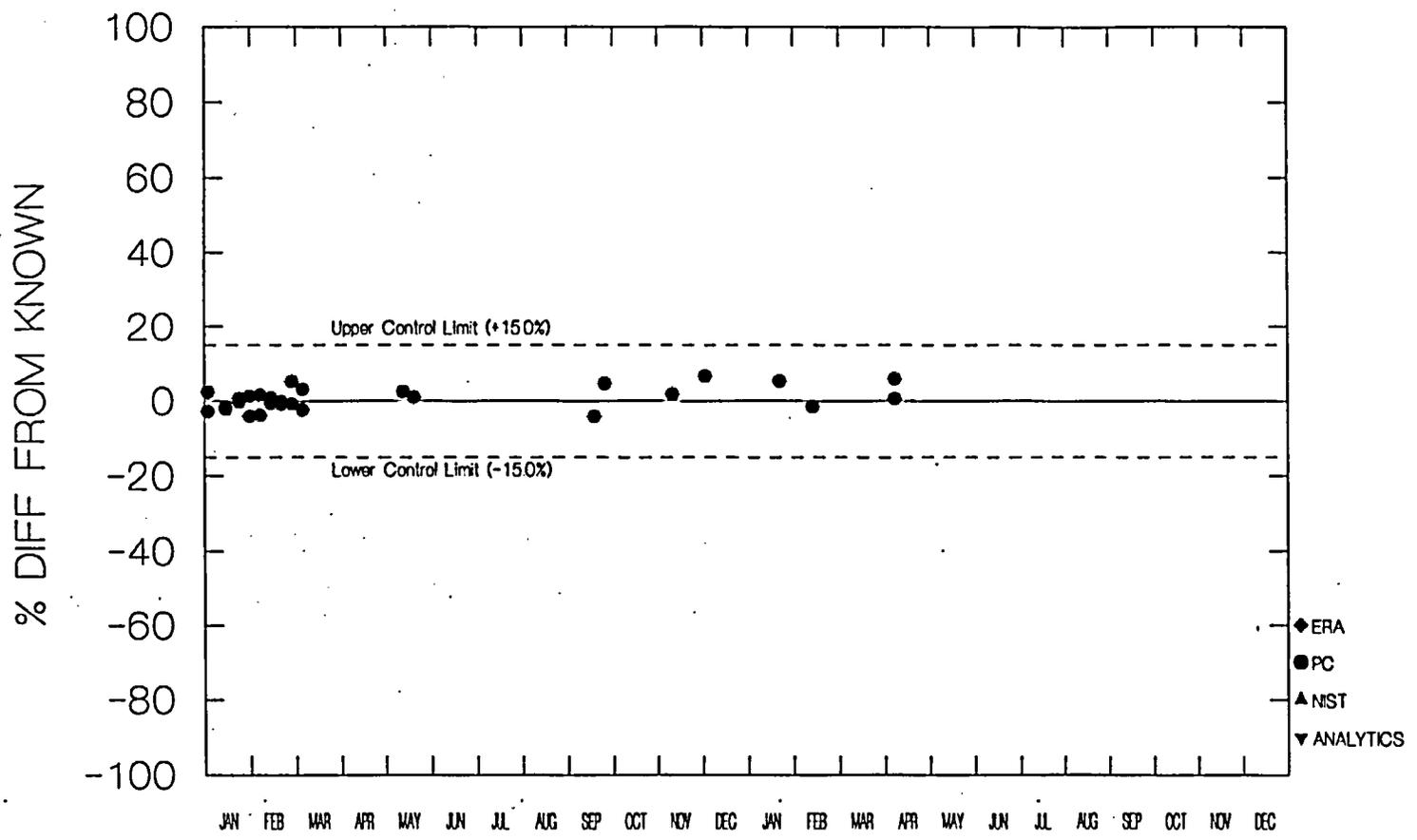
## REMP Ce-141 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

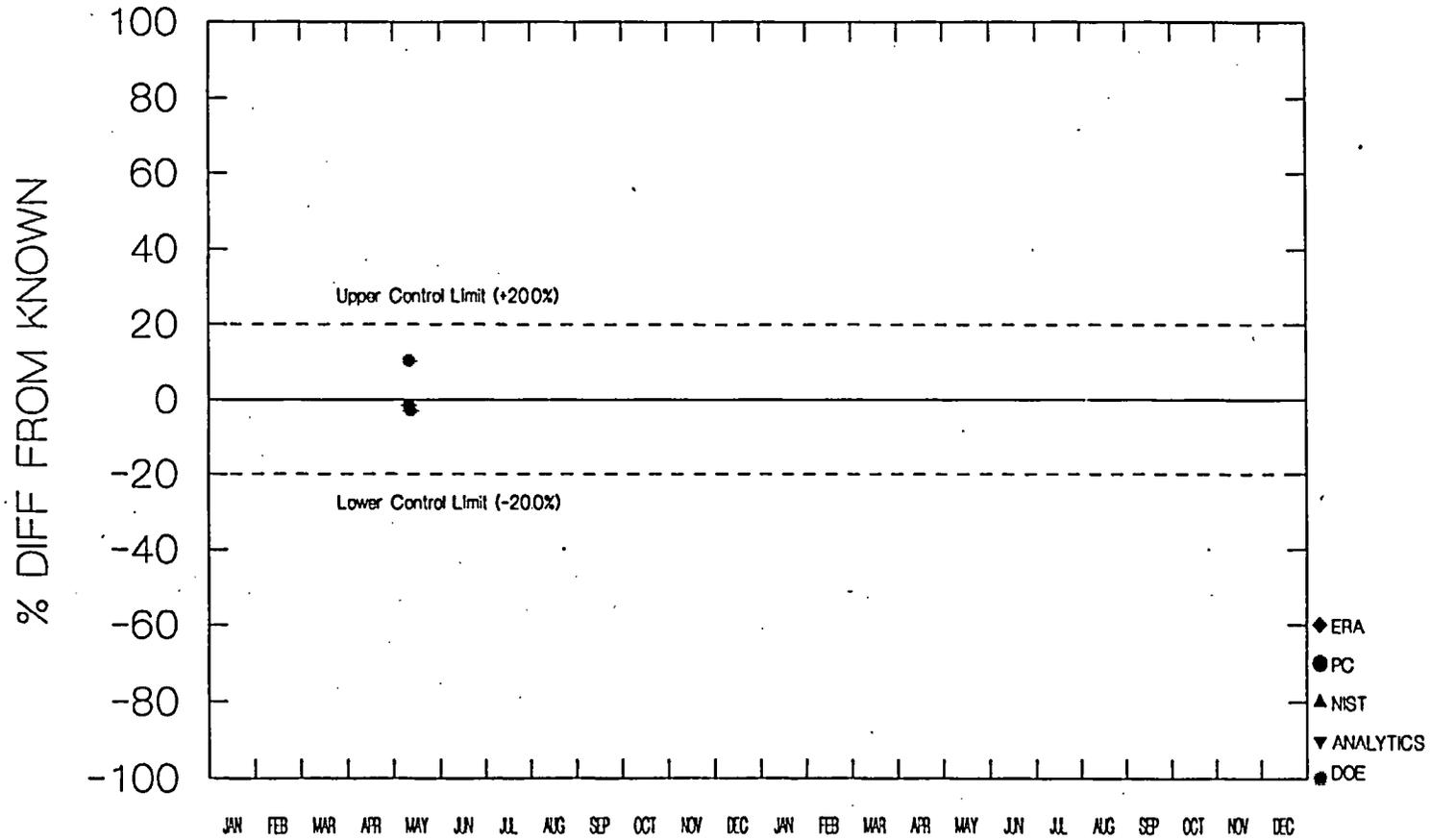
## REMP CHARCOAL RESULT BIAS



ANALYSIS PERIOD 2002-2003

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

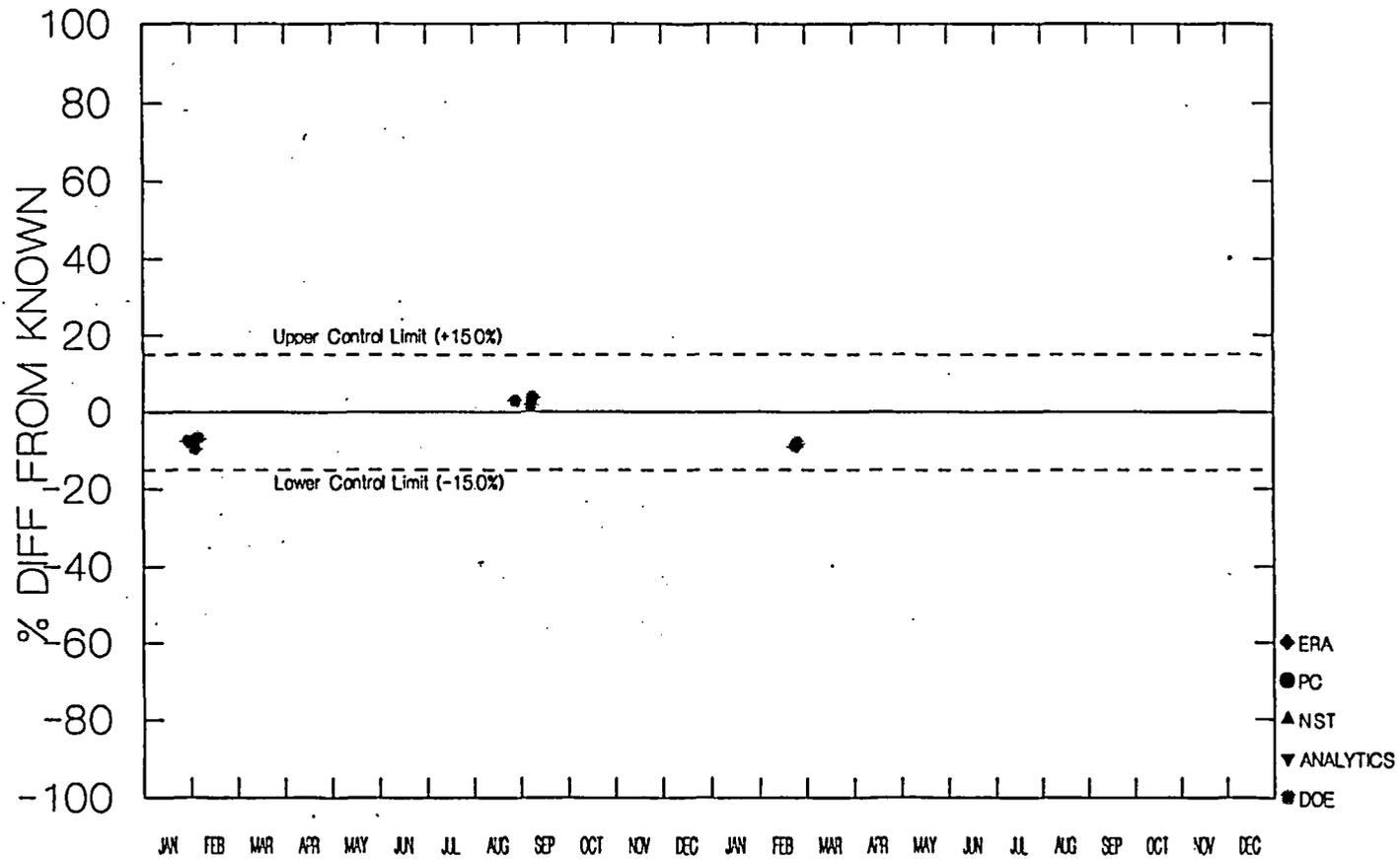
## REMP Cm-244 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

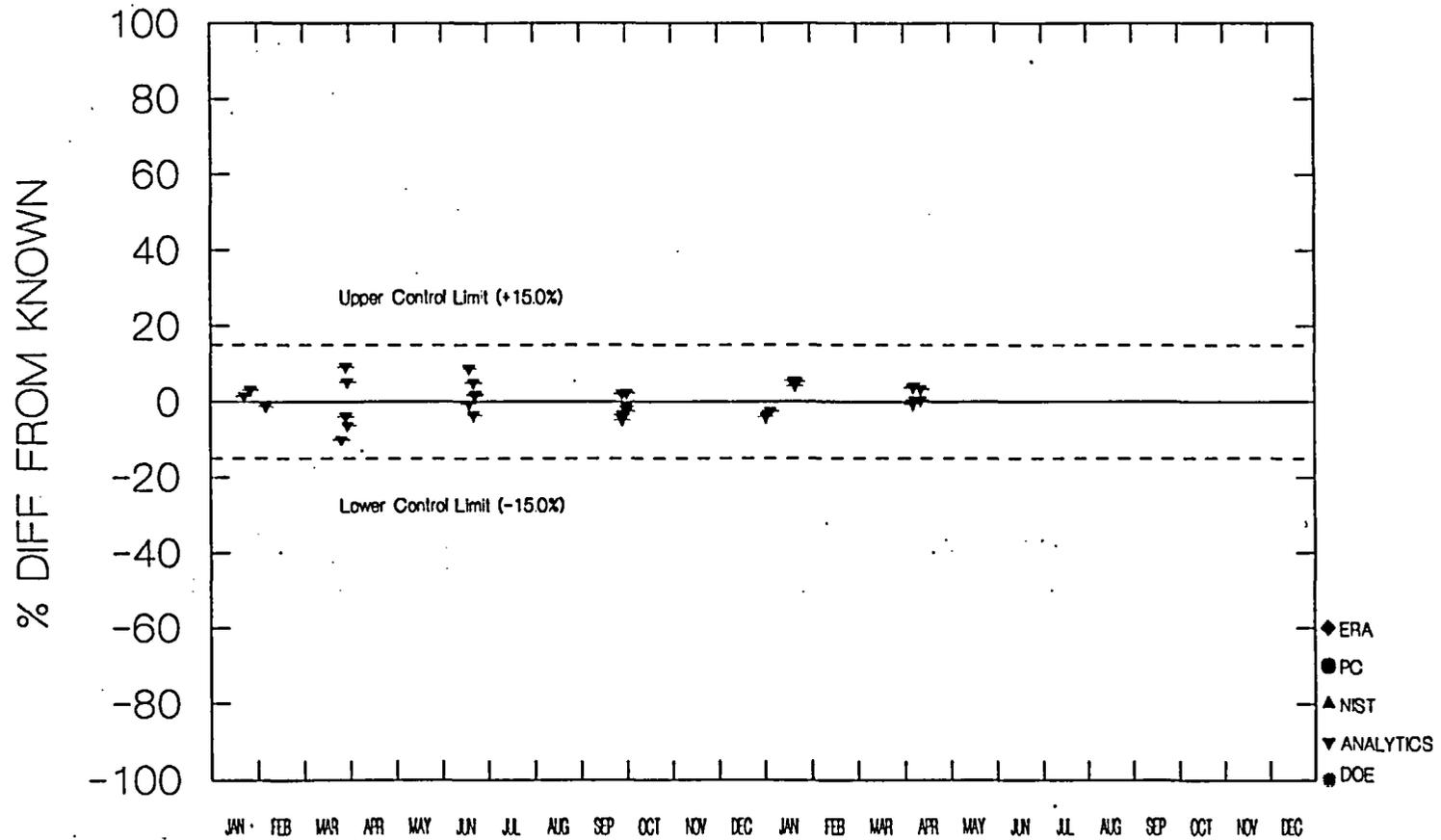
## REMP Co-57 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

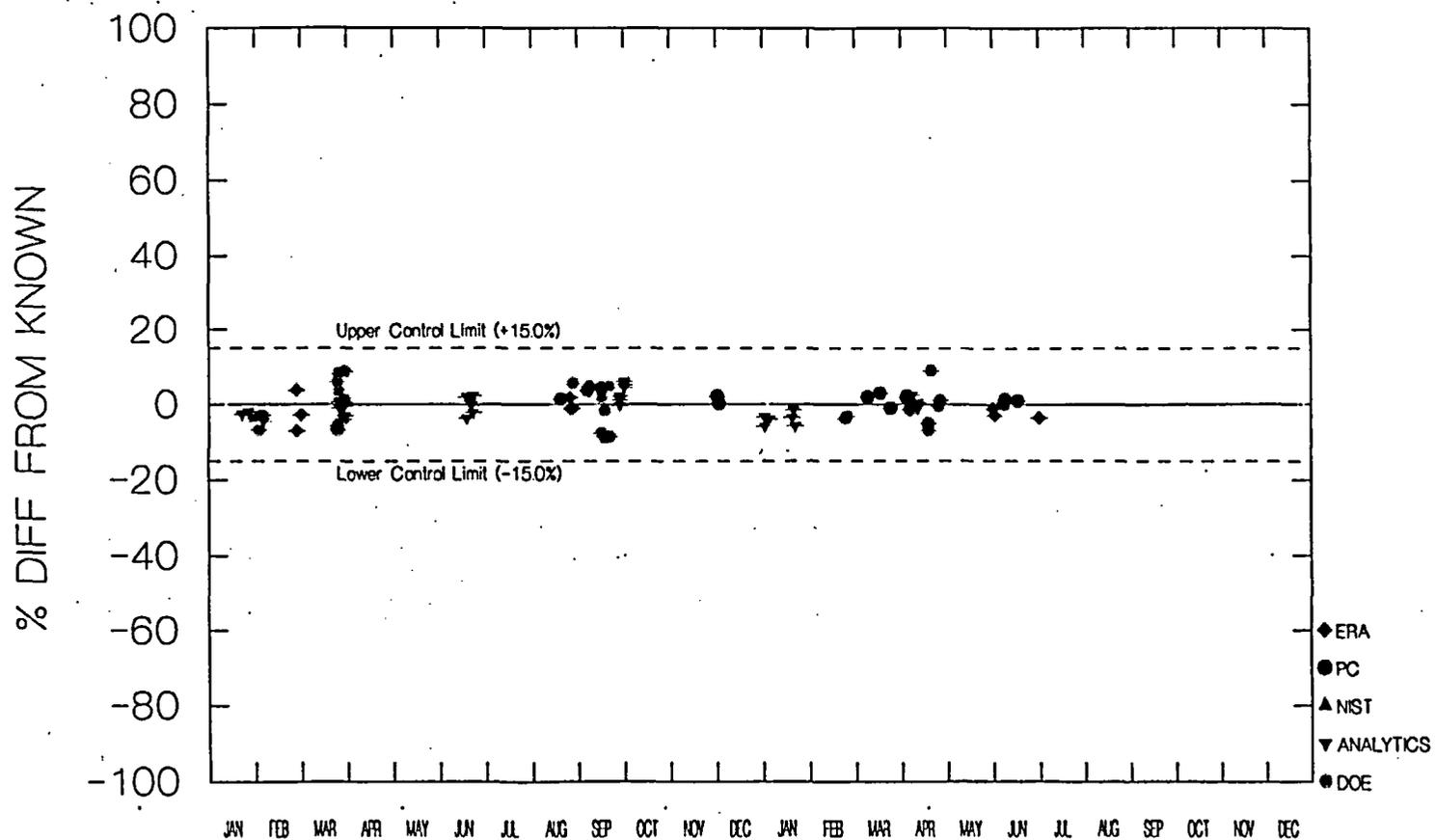
## REMP Co-58 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

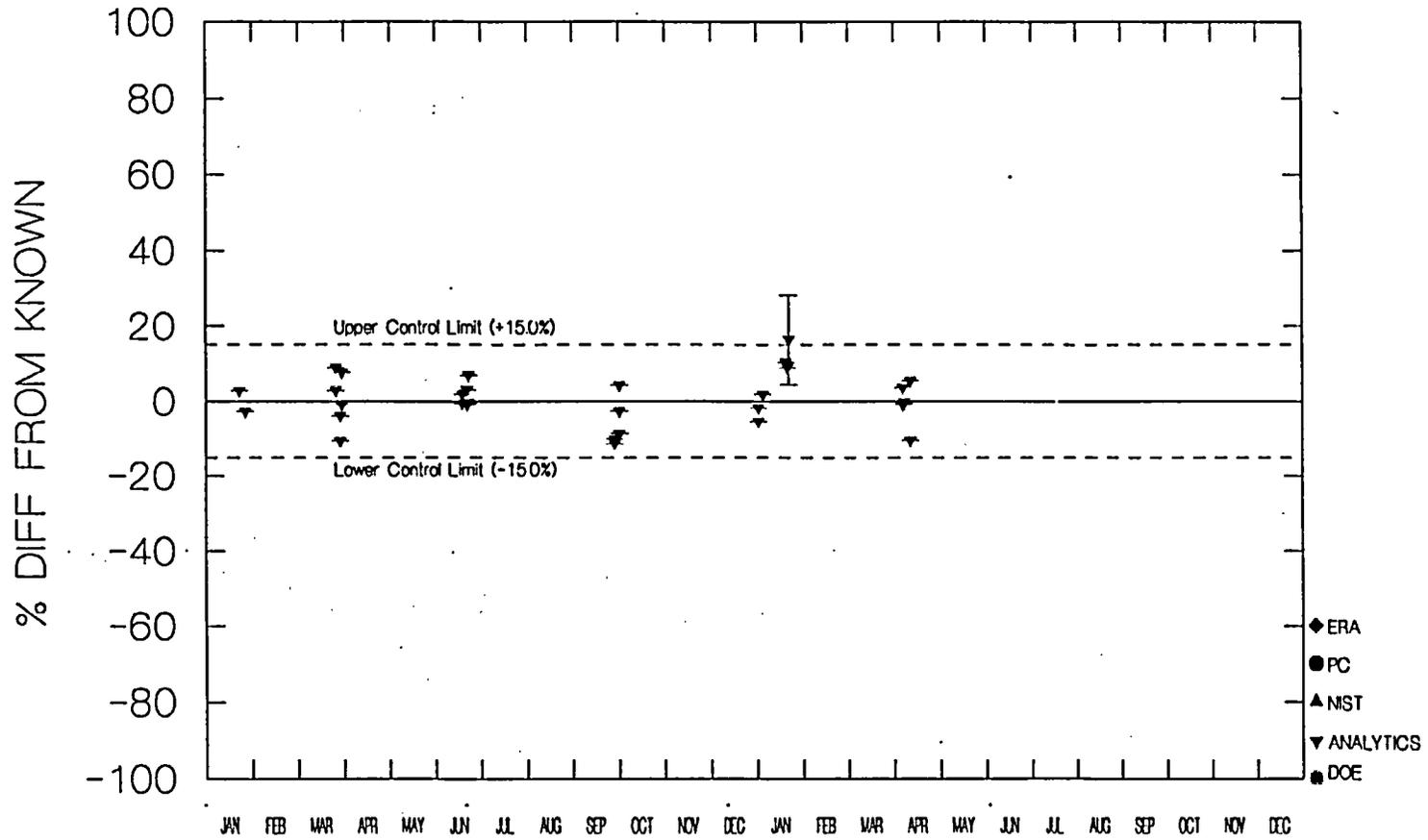
## REMP Co-60 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

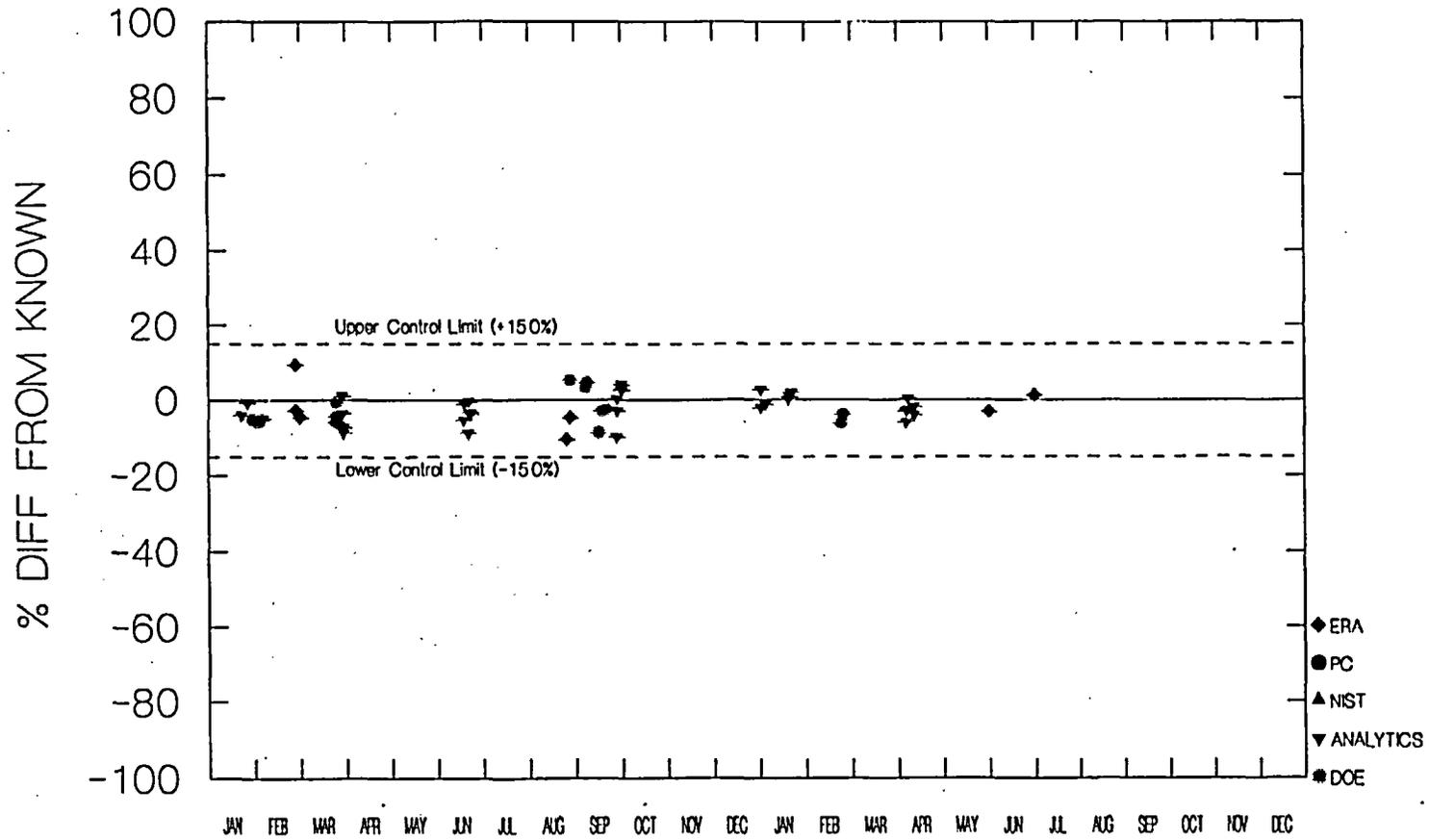
## REMP Cr-51 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

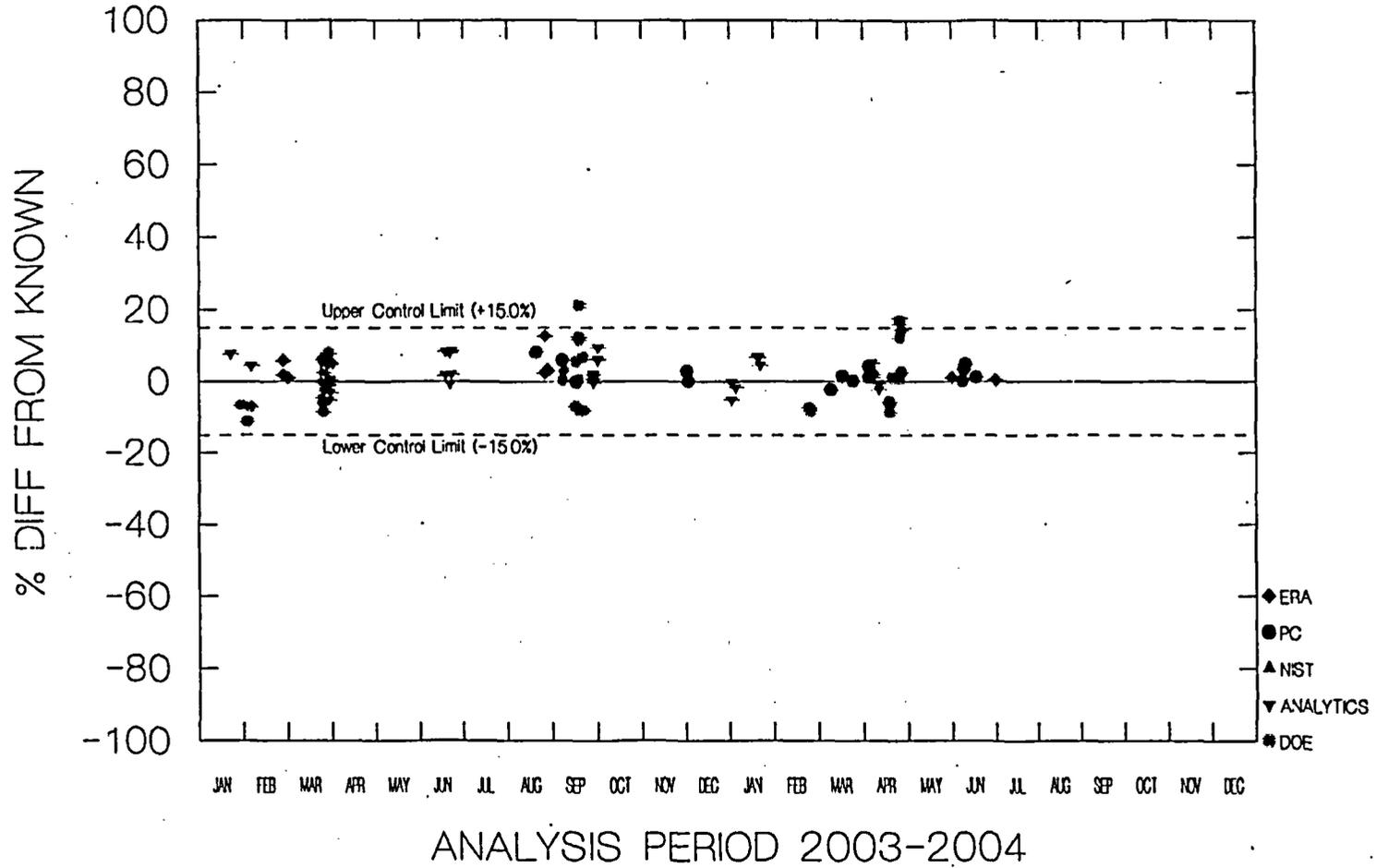
## REMP Cs-134 RESULT BIAS



ANALYSIS PERIOD 2003-2004

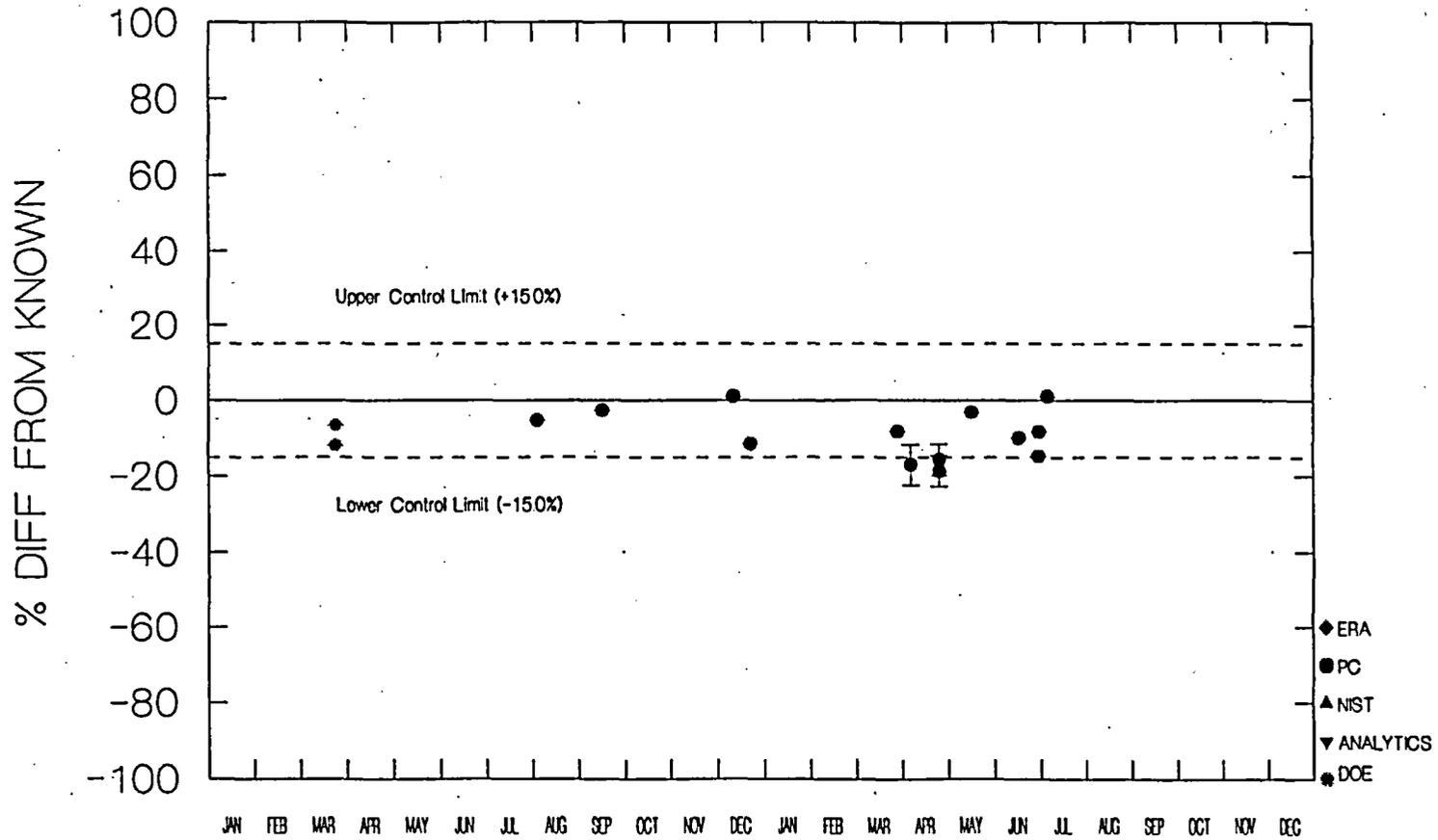
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Cs-137 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Fe-55 RESULT BIAS



ANALYSIS PERIOD 2003-2004

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/12/2004

REF. DATE: 03/09/2004

LAB SAMPLE NO: 707019

ANAL DATE: 04/07/2004

UNITS: pCi/L

NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Fe-55	( 1241 ± 39)E 00				16.26E 02	-23.70		

Internal spike for Fe-55 in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/24/2004

REF. DATE: 03/08/2004

LAB SAMPLE NO: 709902

ANAL DATE: 04/26/2004

UNITS: pCi/L

NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Fe-55	( 1255 ± 31)E 00				15.43E 02	-18.70		

Internal spike for Fe-55 in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/24/2004

REF. DATE: 03/24/2004

LAB SAMPLE NO: 713909 ANAL DATE: 05/17/2004

UNITS: pCi/L

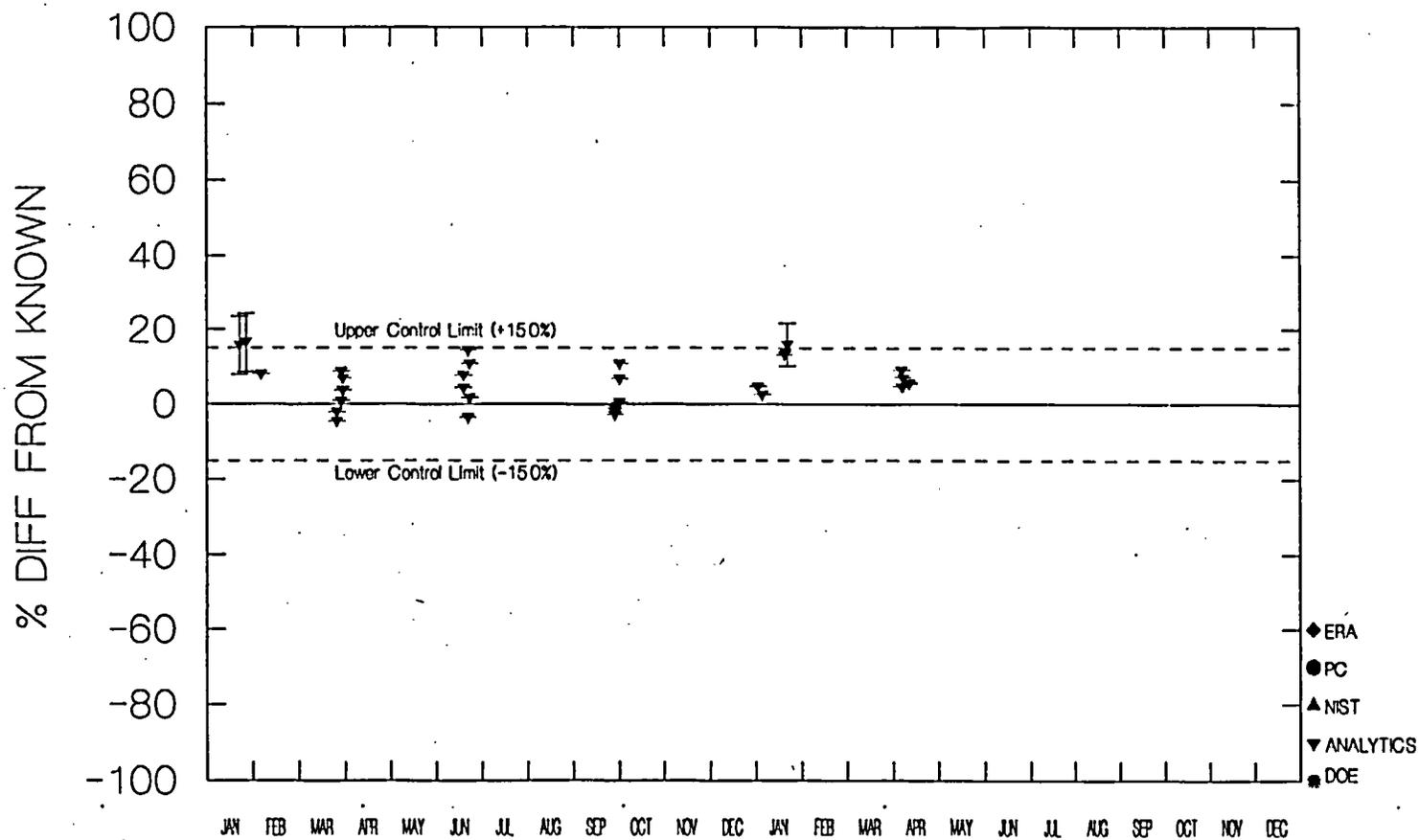
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Fe-55	( 1439 ± 42)E 00				19.53E 02	-26.30		

Internal spike for Fe-55 in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

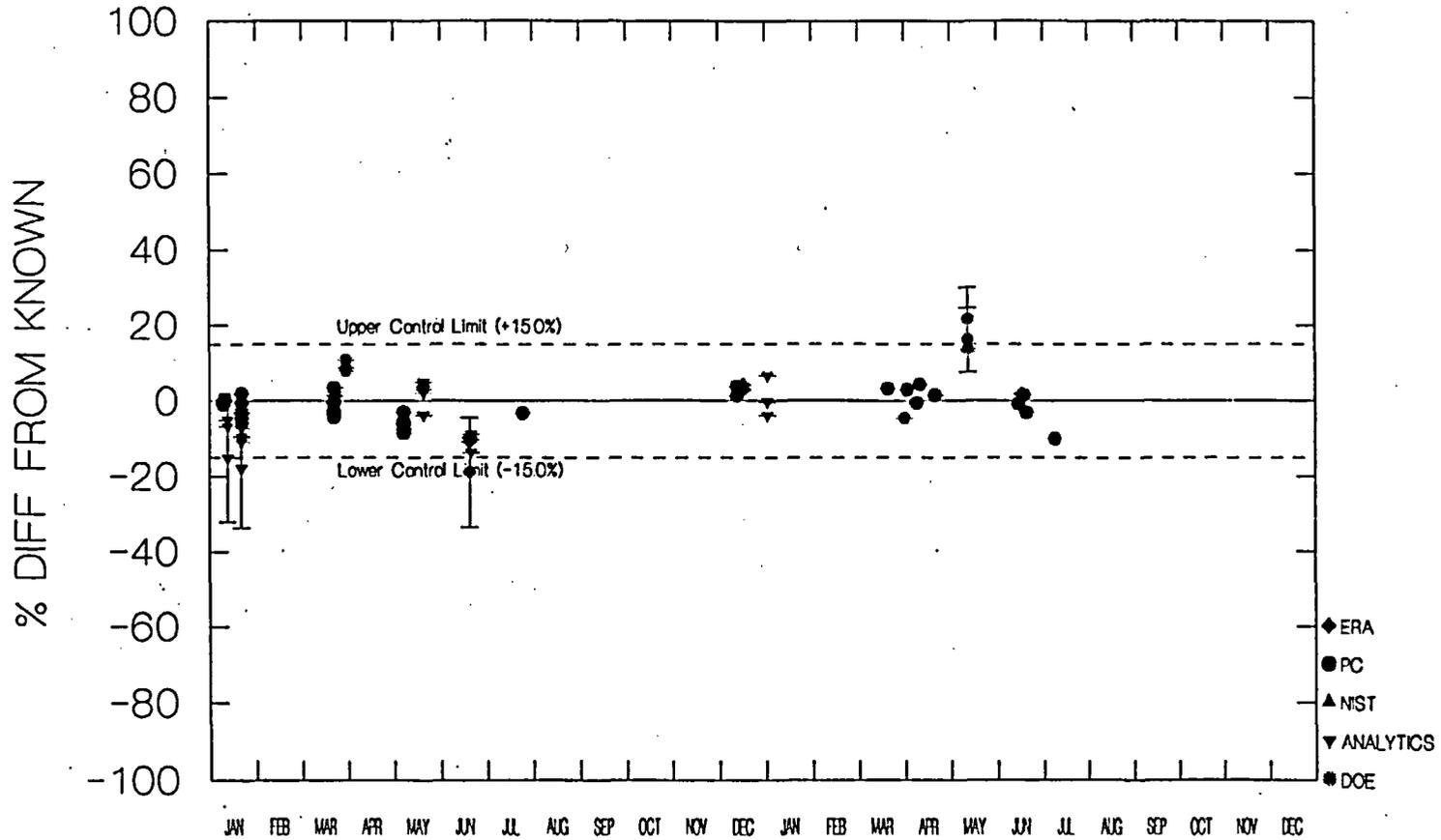
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Fe-59 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

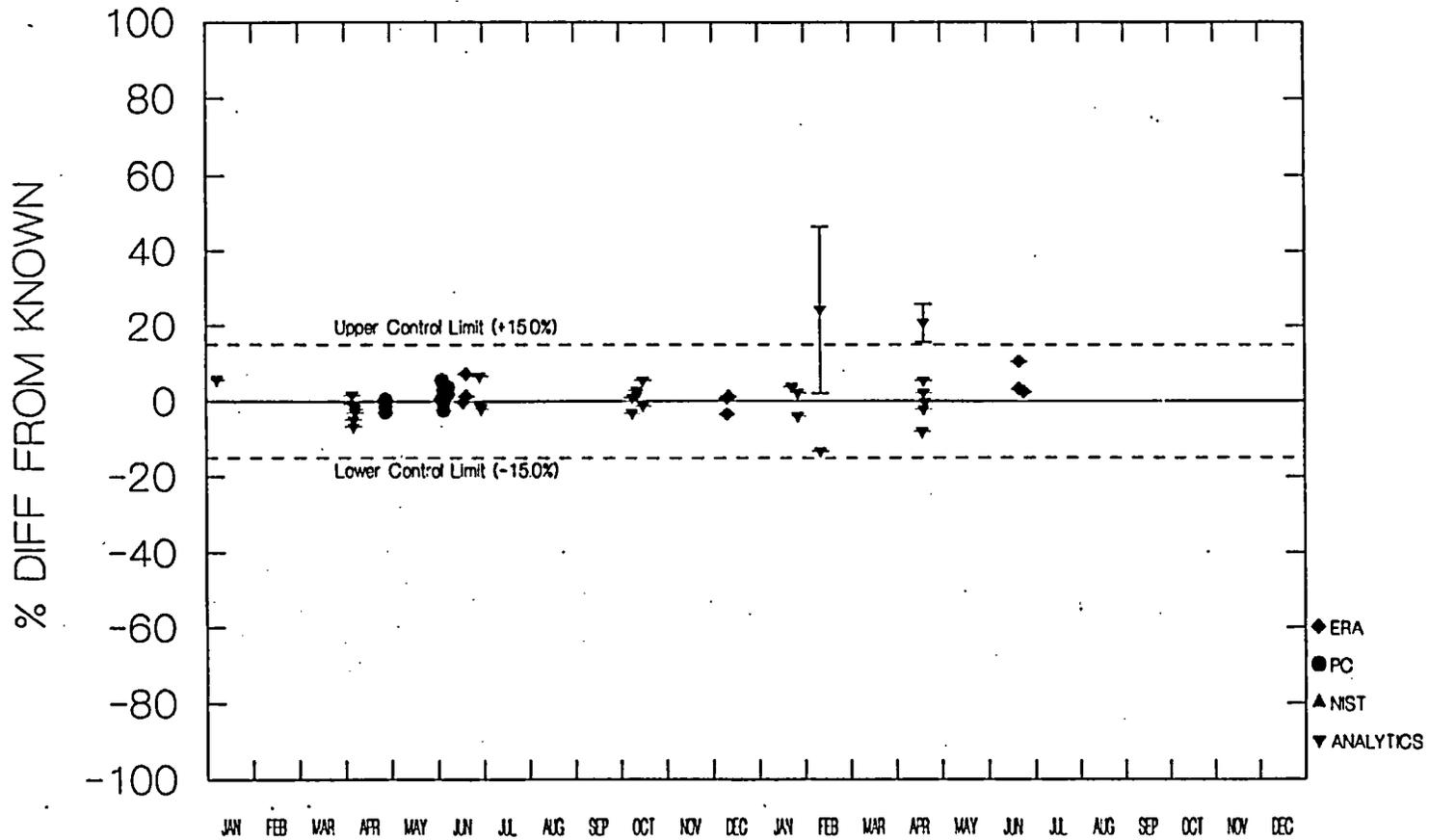
## REMP H-3 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

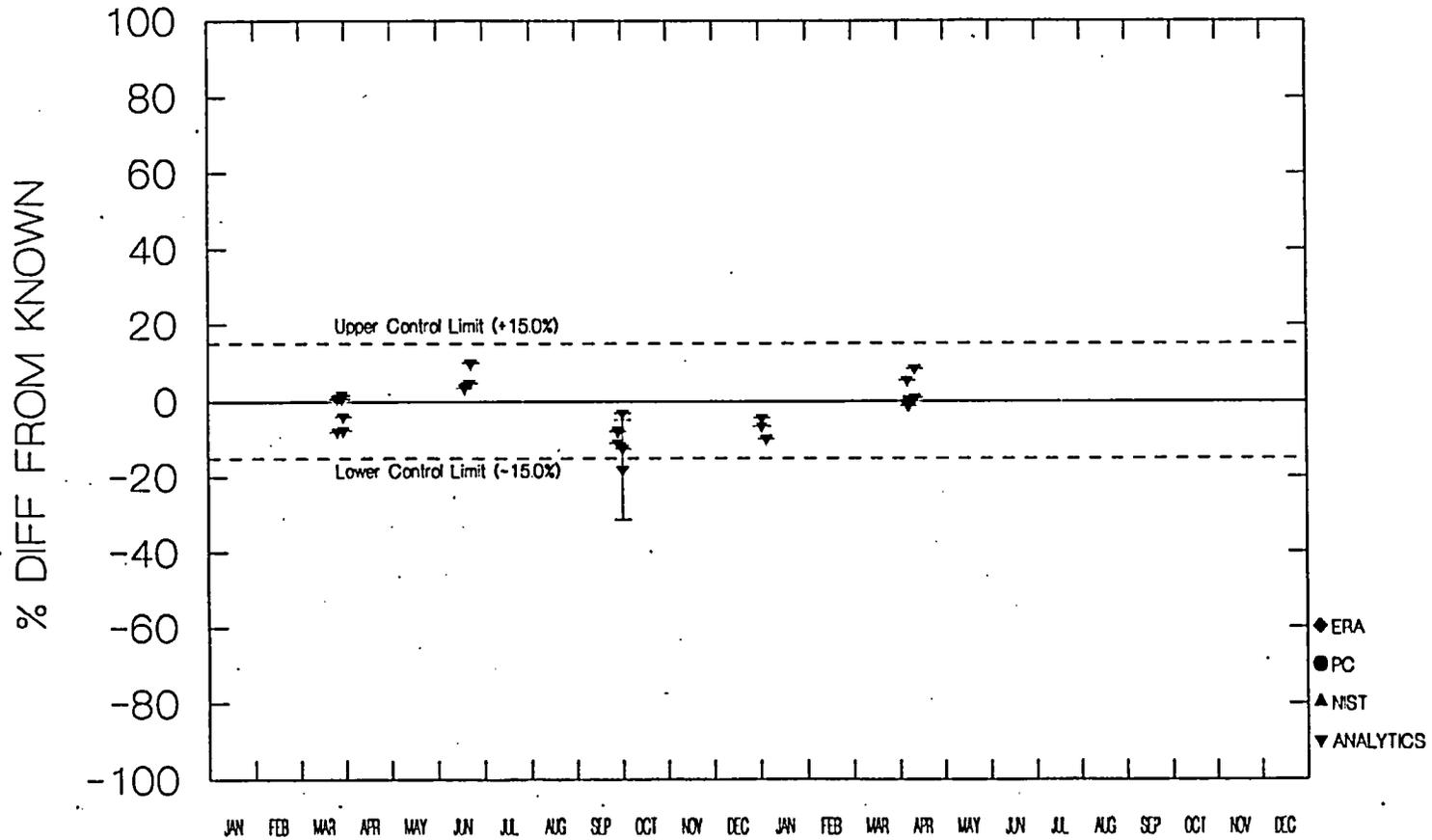
## REMP I-131 LOW LEVEL RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

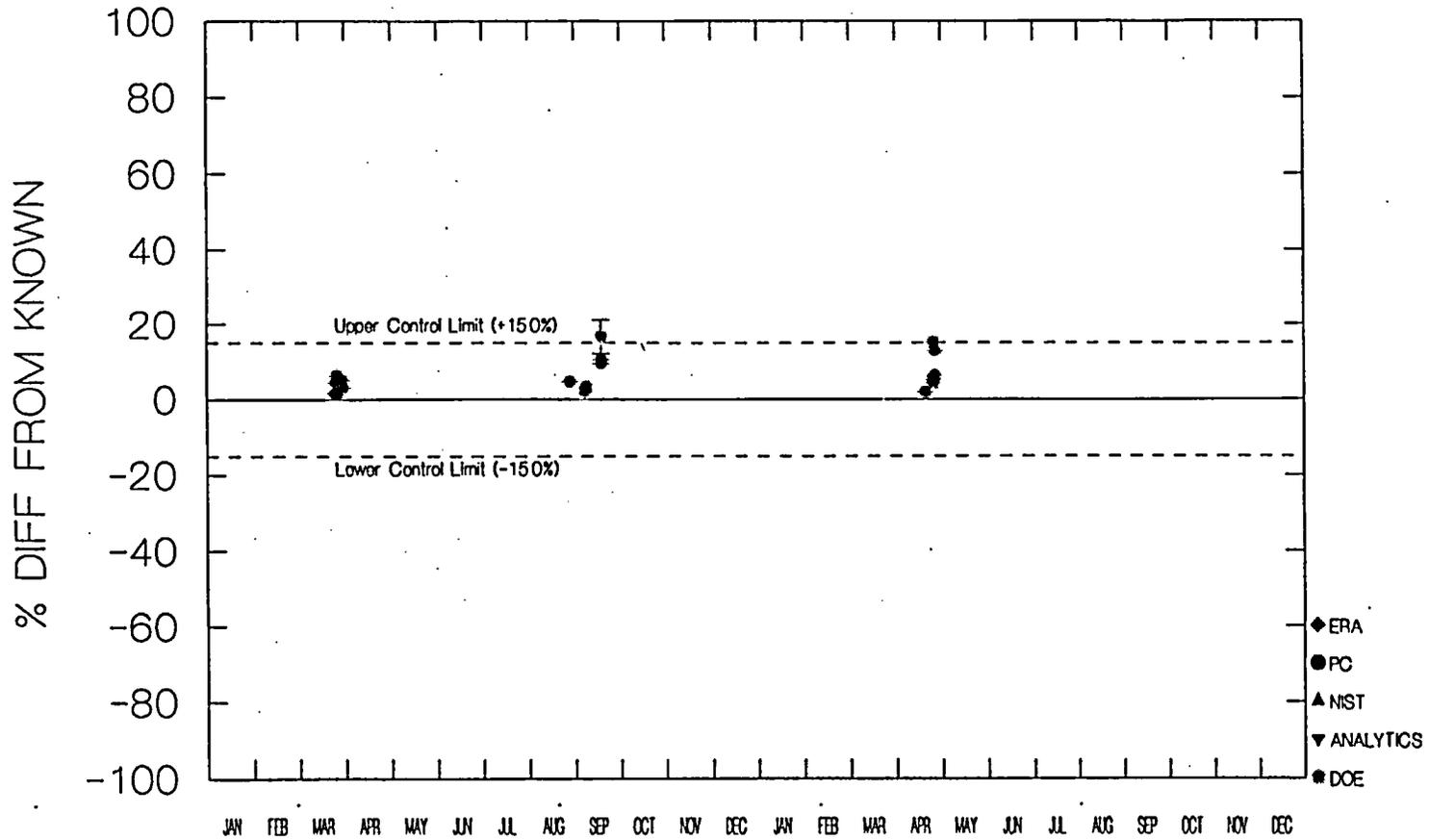
## REMP I-131 (Gamma) RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

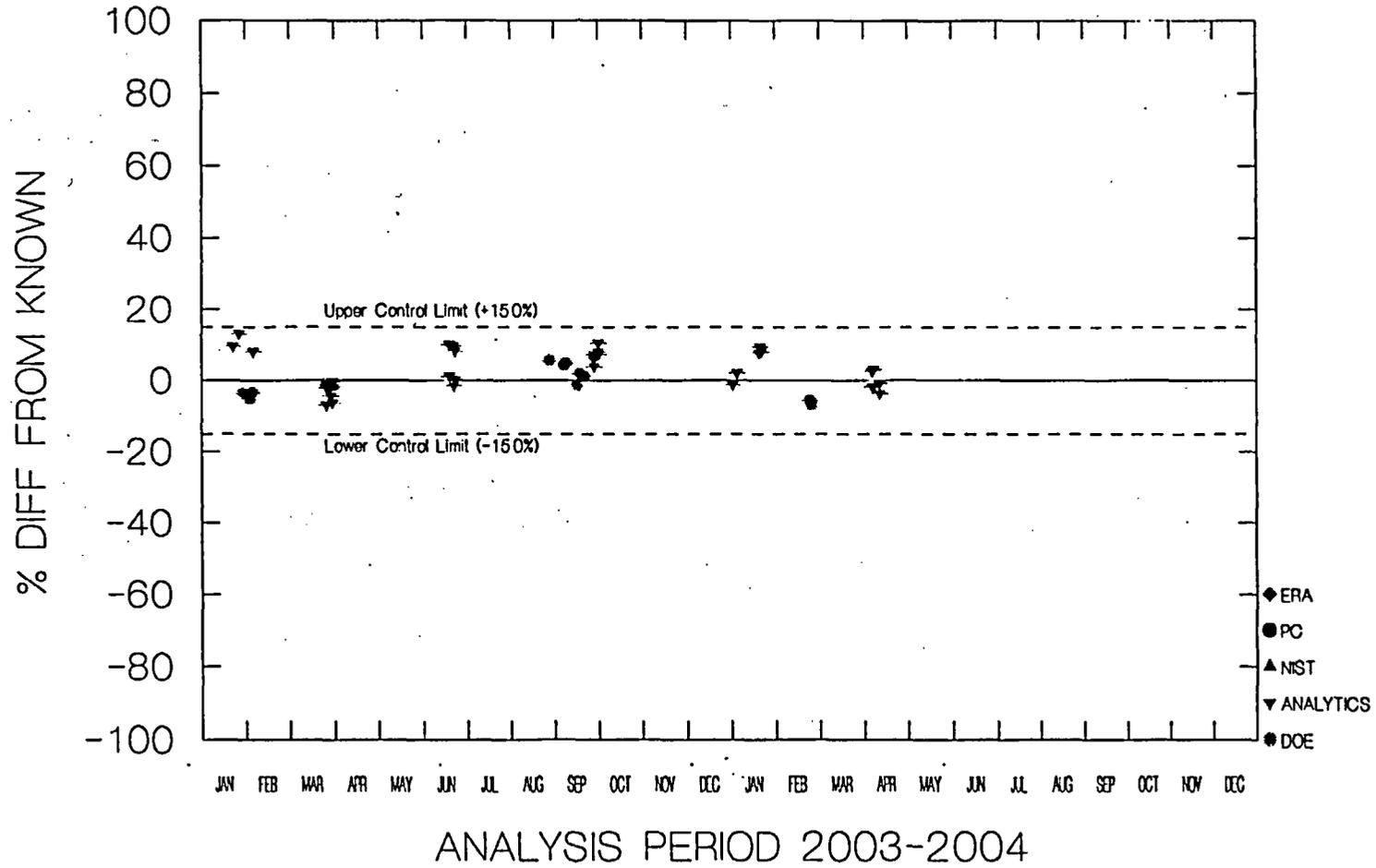
## REMP K-40 RESULT BIAS



ANALYSIS PERIOD 2003-2004

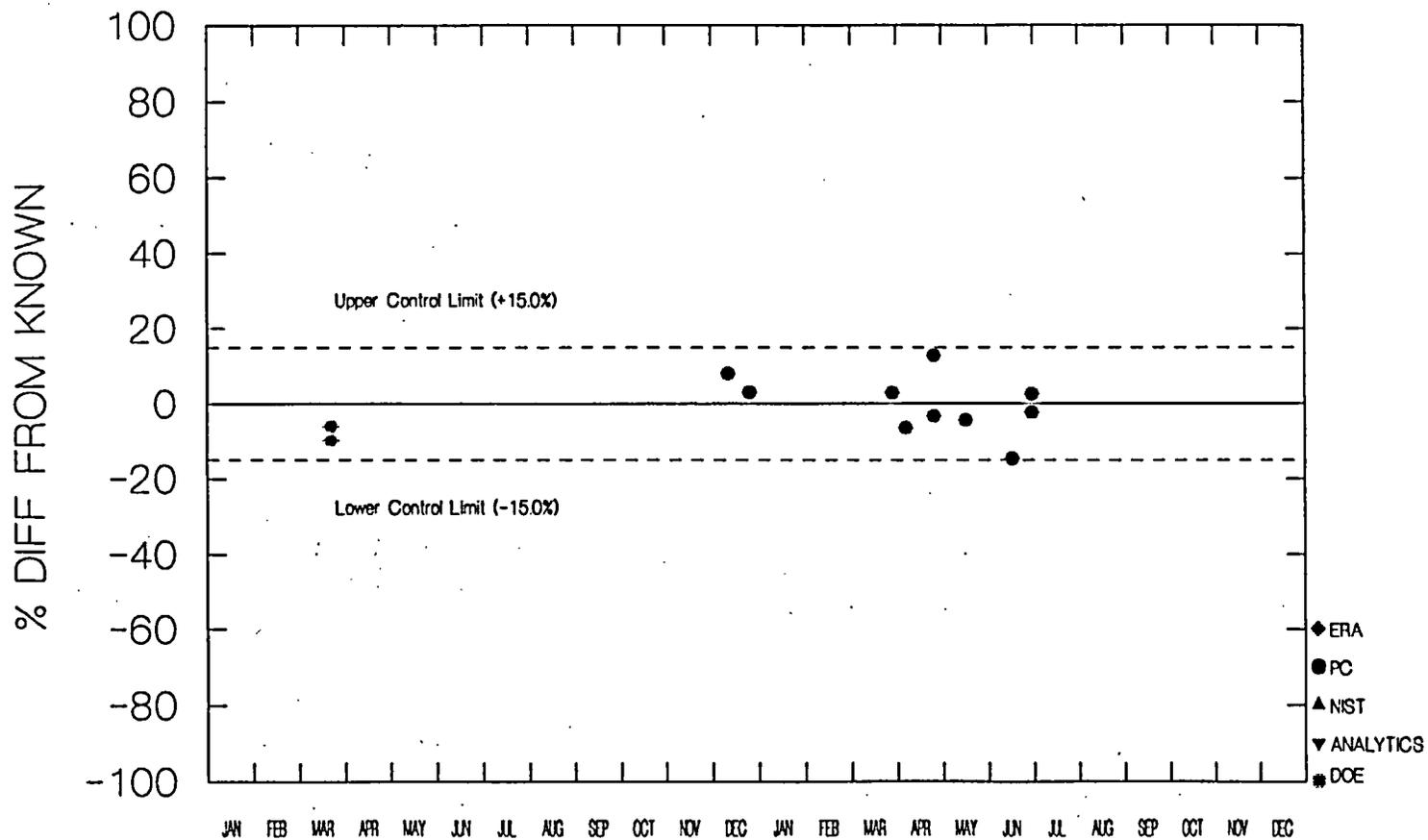
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Mn-54 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

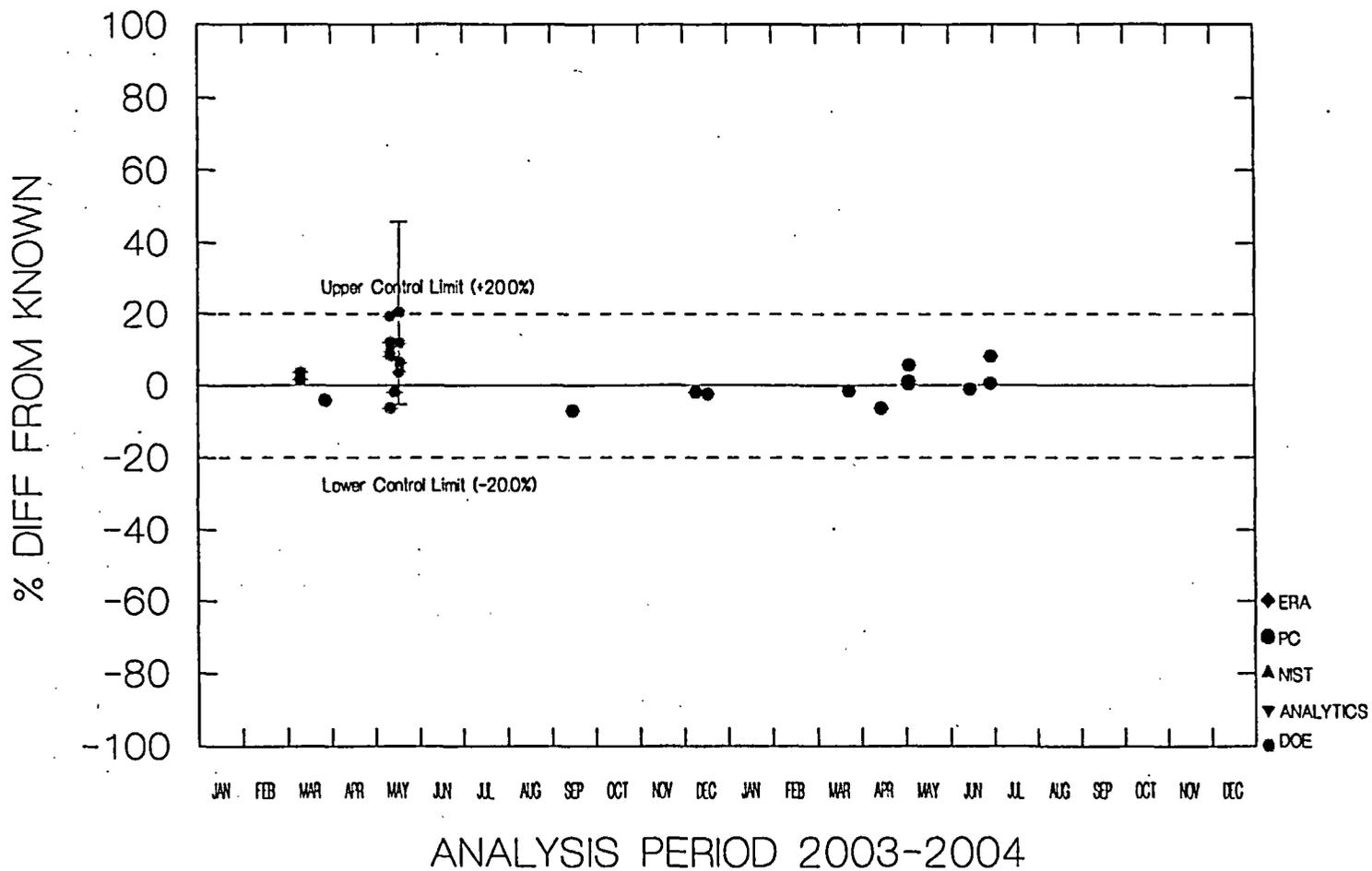
## REMP Ni-63 RESULT BIAS



ANALYSIS PERIOD 2003-2004

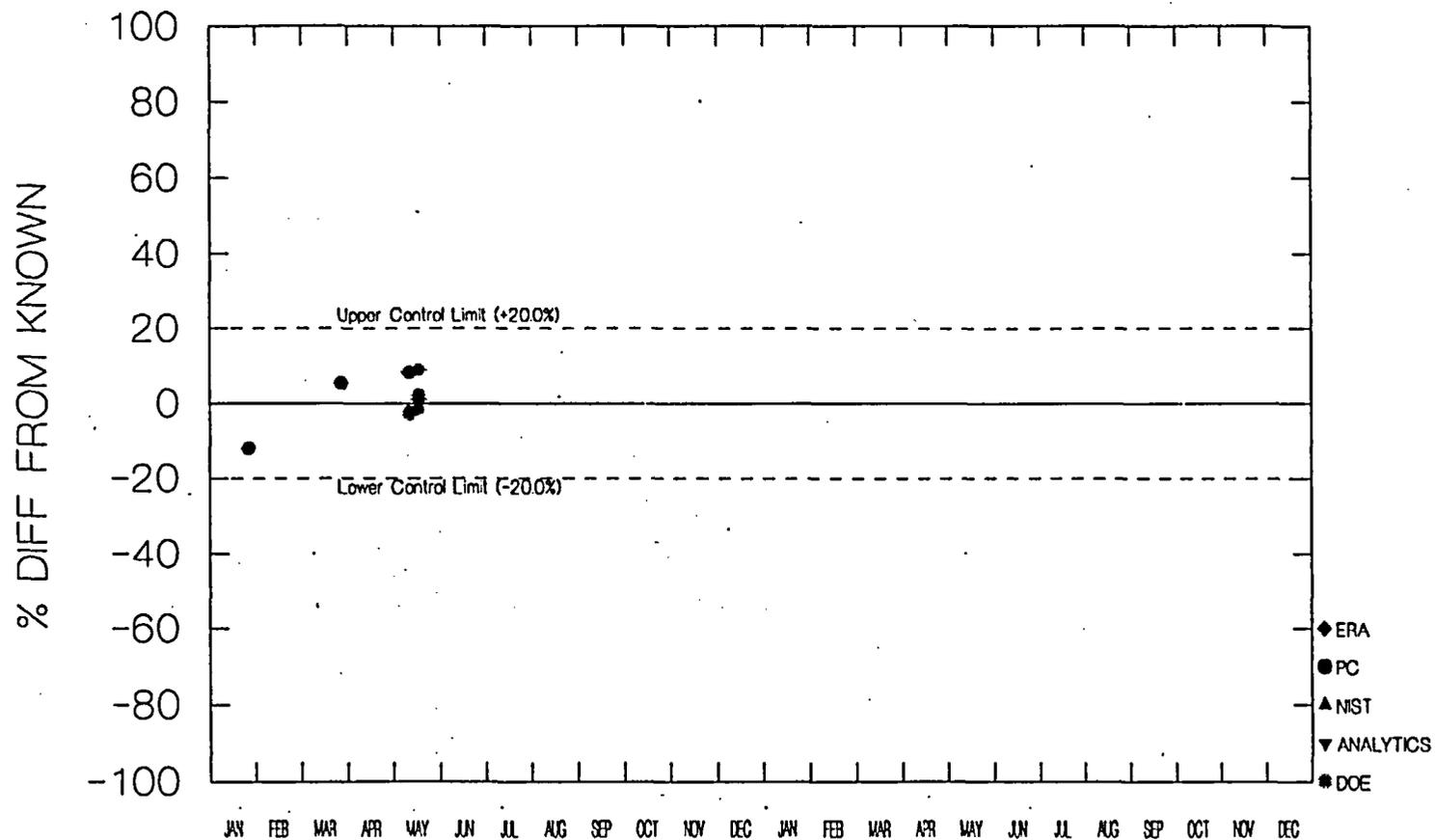
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Pu-238 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

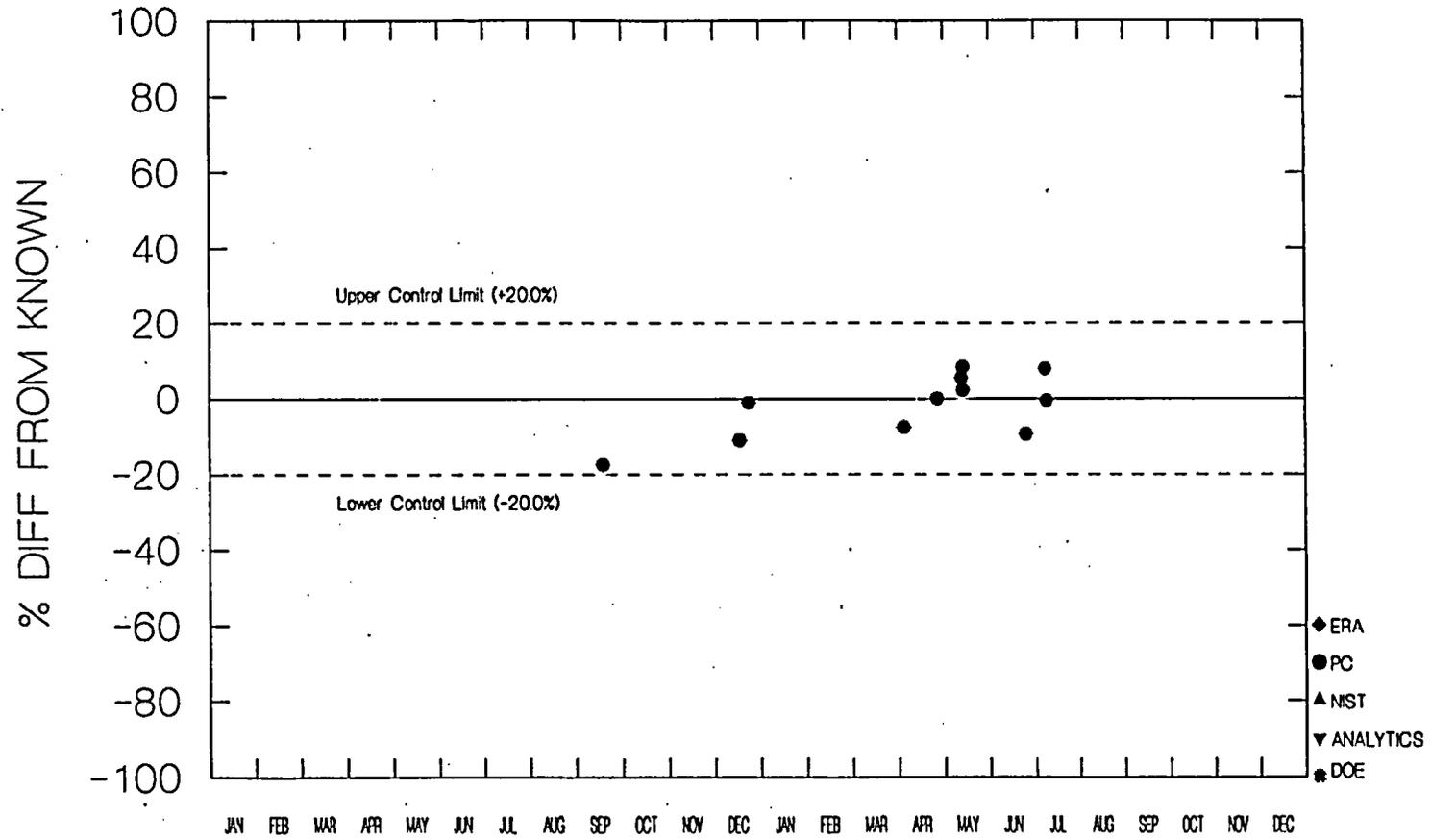
## REMP Pu-239 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

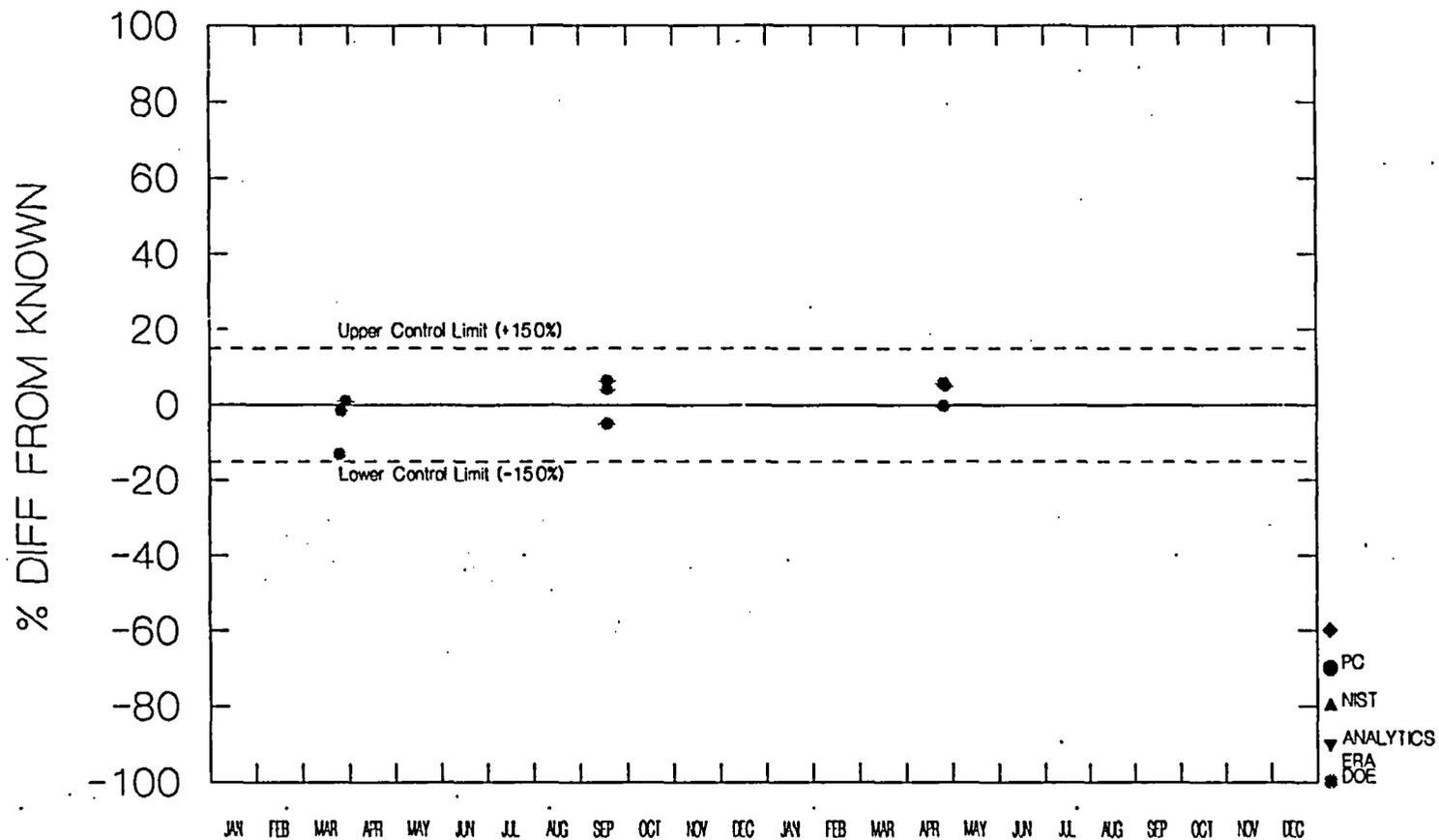
## REMP Pu-241 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

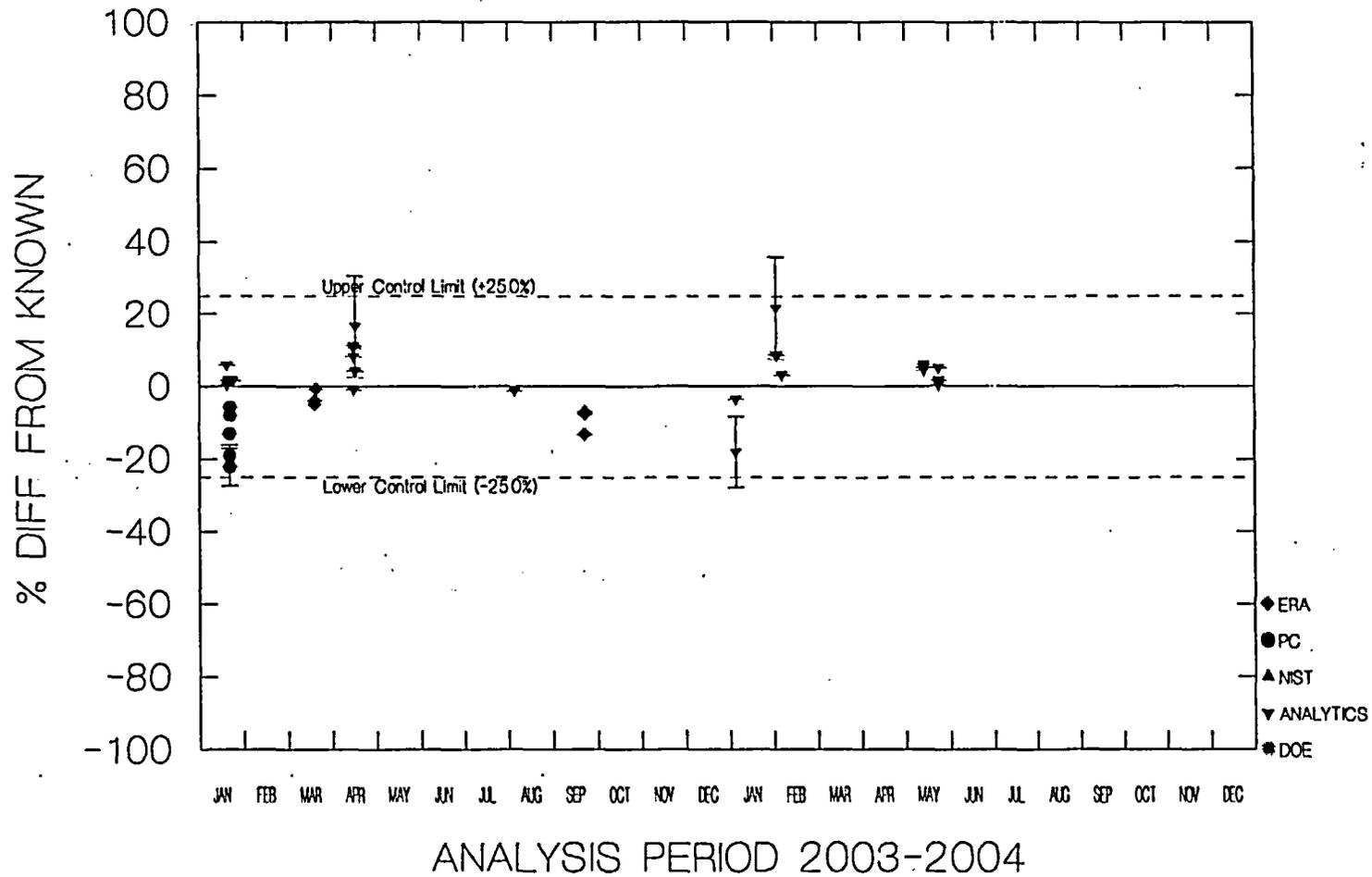
## REMP Ra-228 BY GAMMA RESULT BIAS



ANALYSIS PERIOD 2003-2004

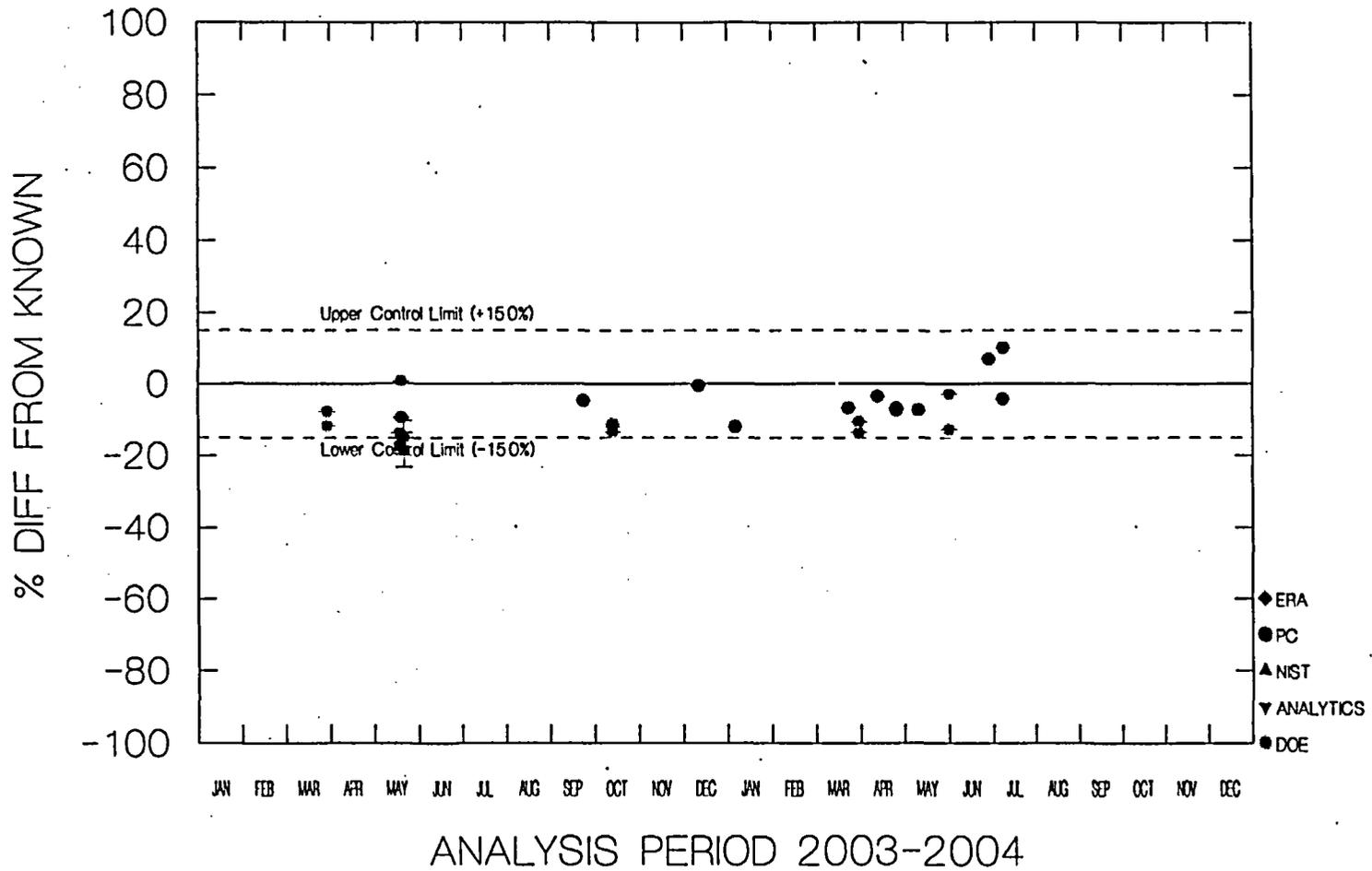


2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS  
REMP Sr-90 (COMBINED WITH Sr-89) RESULT BIAS



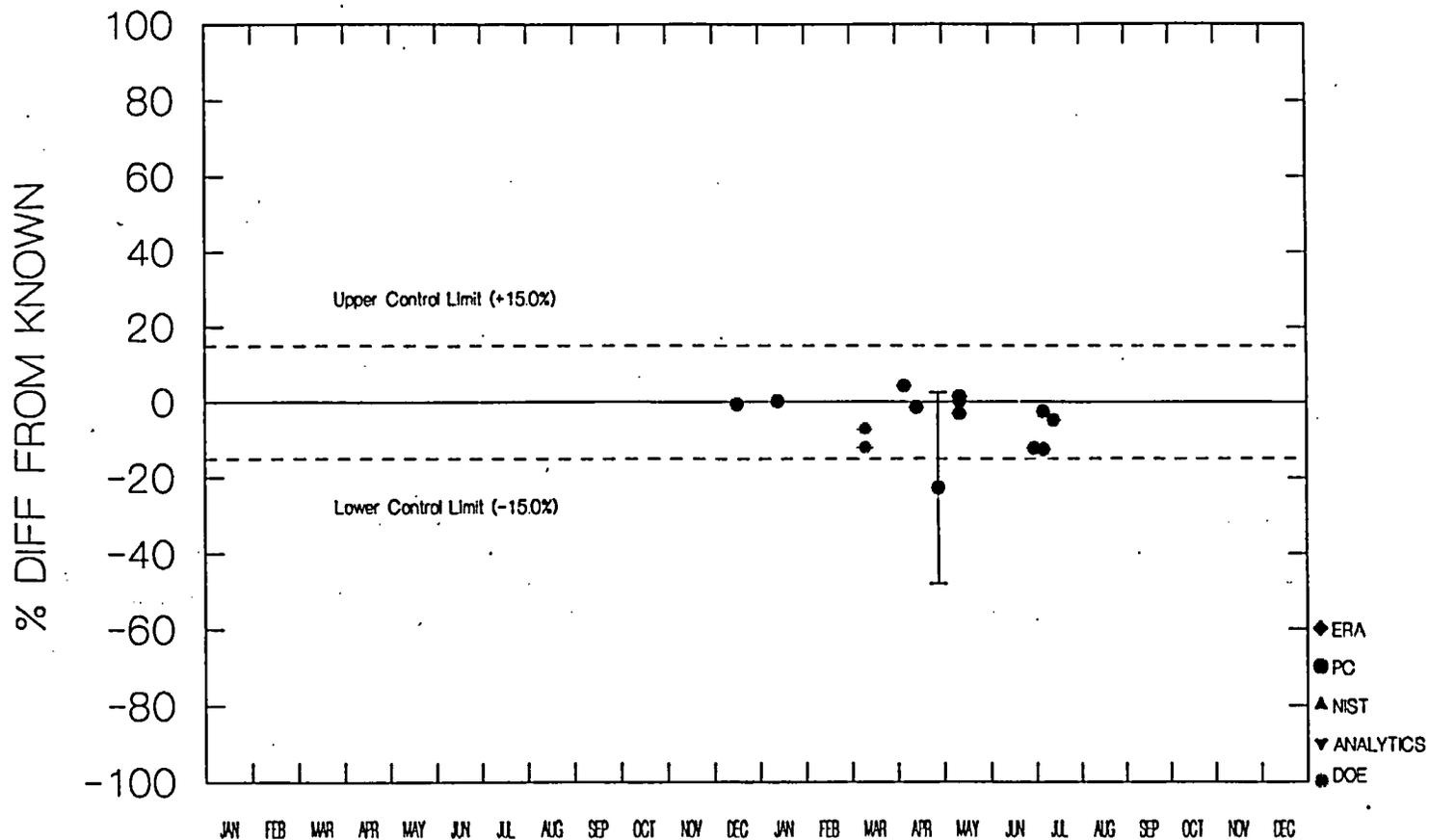
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Sr-90 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Tc-99 RESULT BIAS



ANALYSIS PERIOD 2003-2004

QC CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: WATER

ISSUANCE DATE: 05/12/2004

REF. DATE: 03/08/2004

LAB SAMPLE NO: 707002 ANAL DATE: 04/28/2004

UNITS: pCi/L

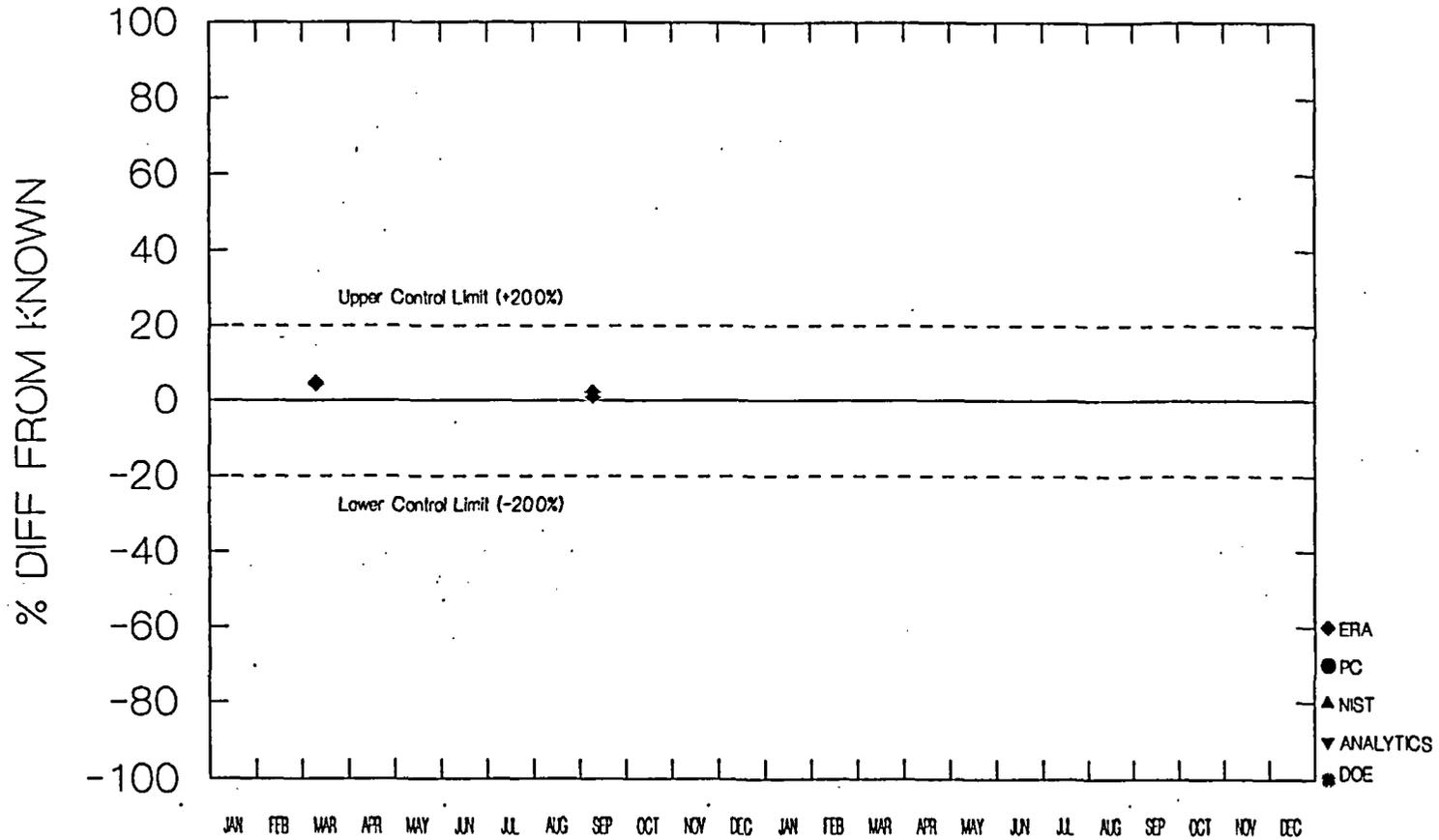
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Tc-99	( 135 ± 22)E 00				17.46E 01	-22.70		

Internal spike for Tc-99 in water was analyzed according to specific client protocol. The result met the client's QC criteria.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

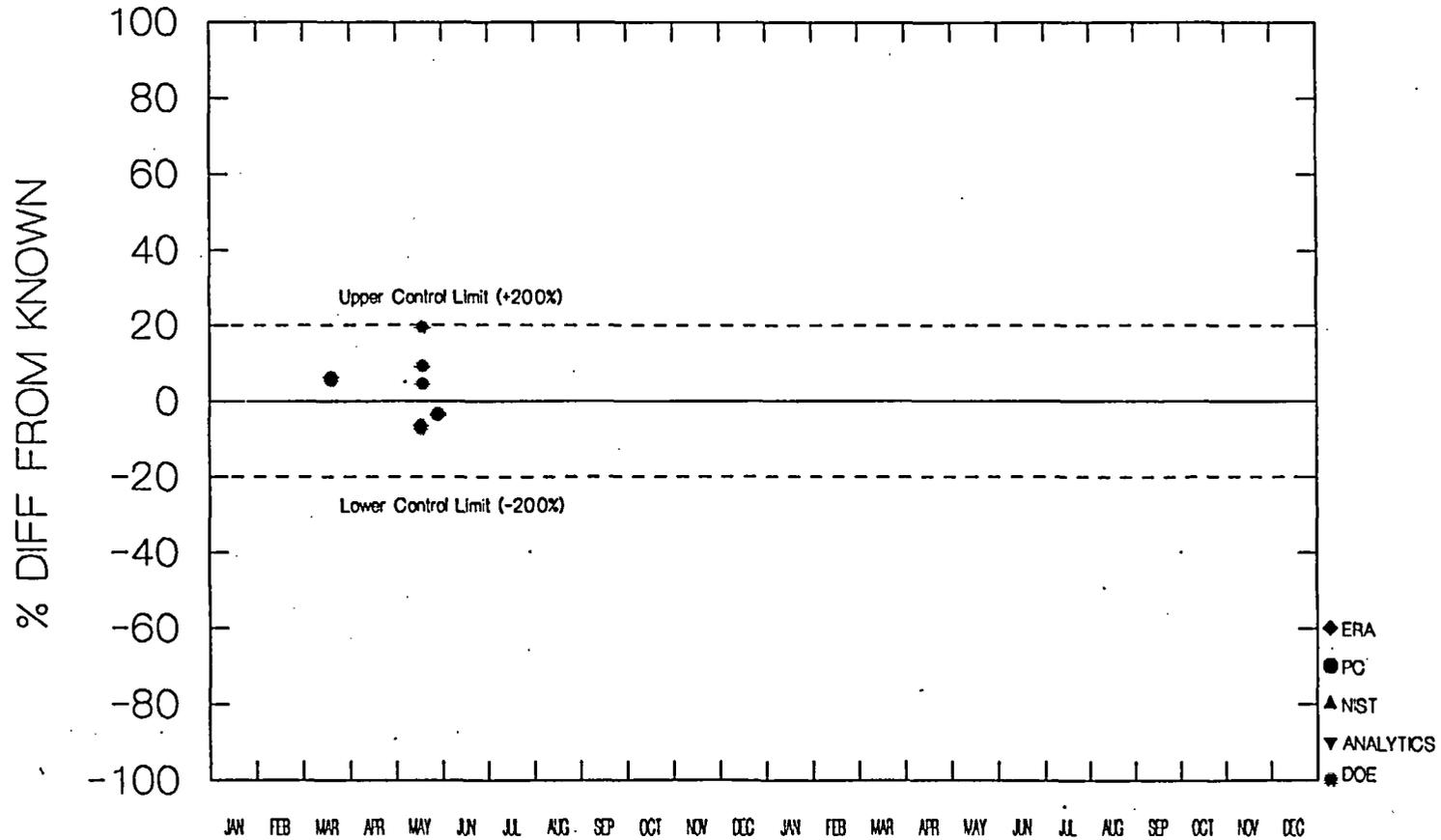
## REMP URANIUM-ISOTOPIC RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

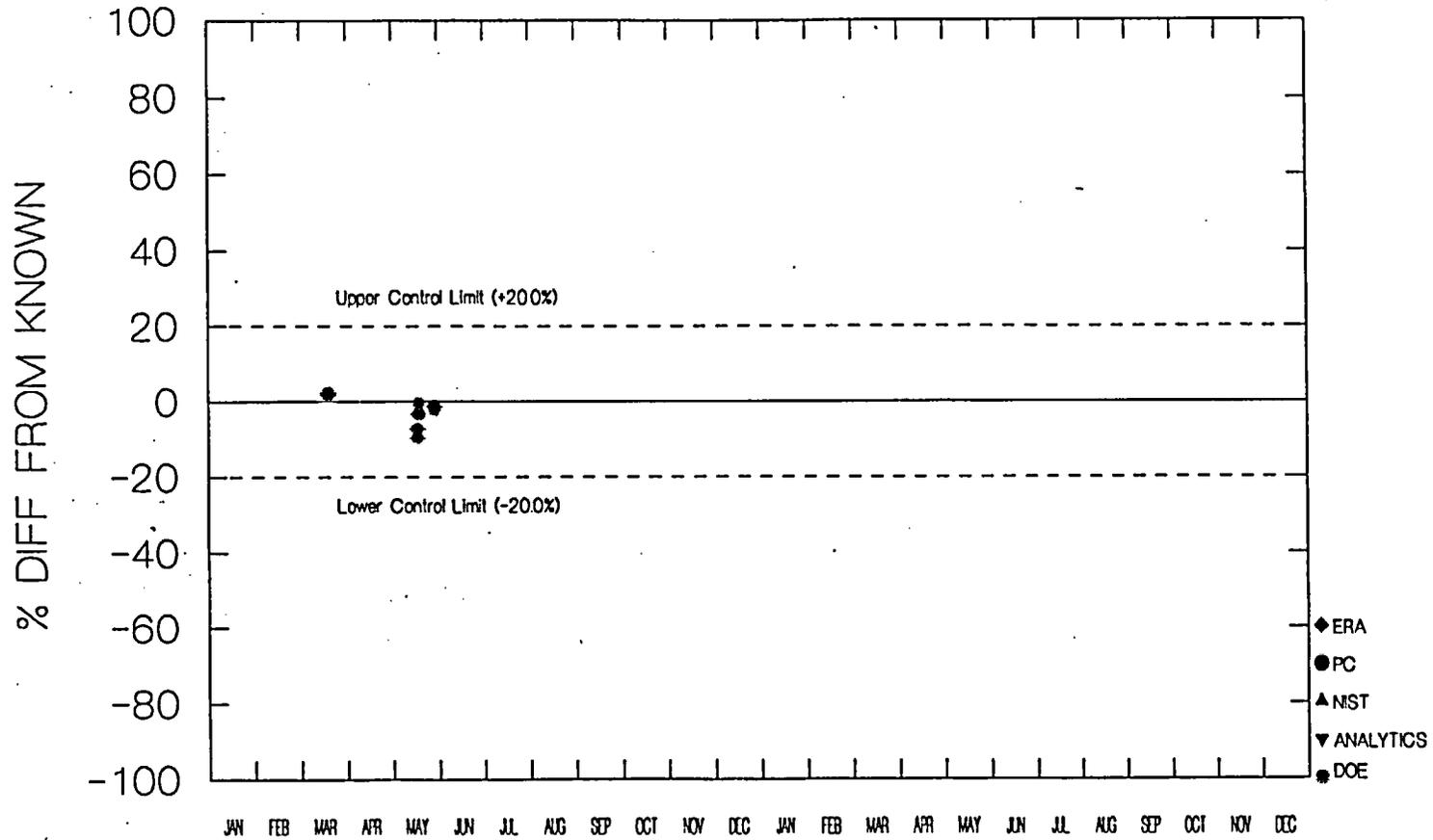
## REMP U-234 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

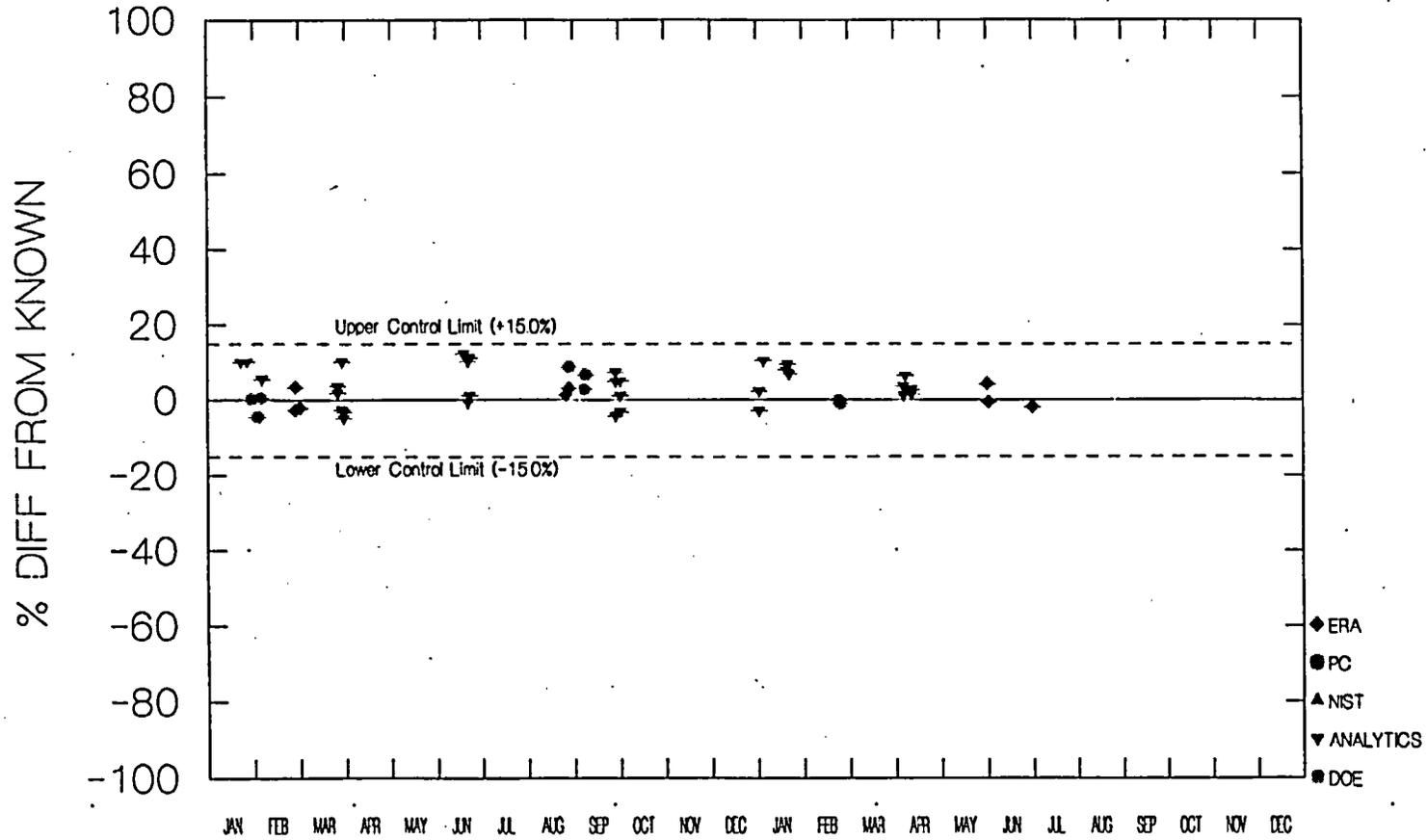
## REMP U-238 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## REMP Zn-65 RESULT BIAS



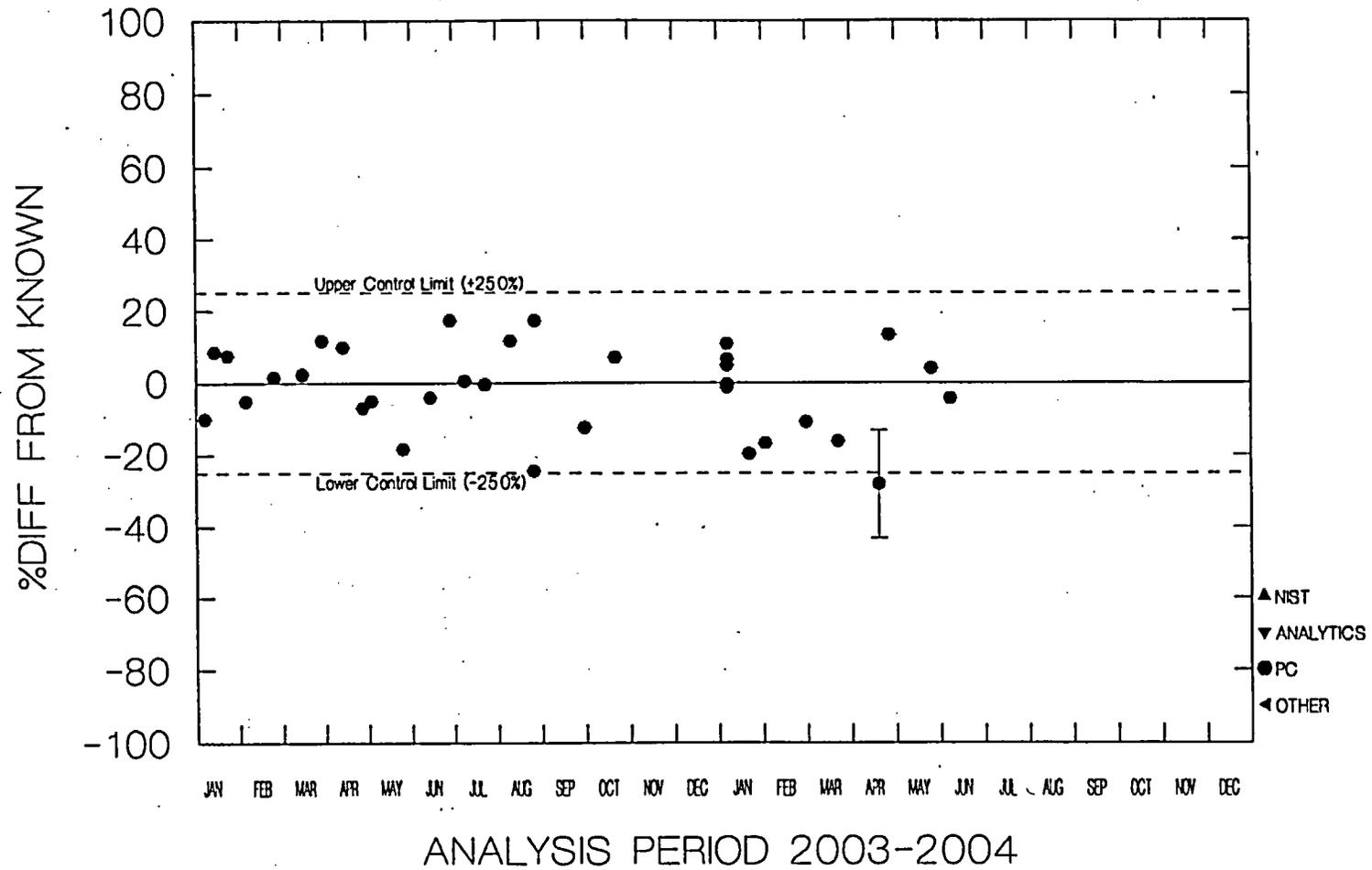
ANALYSIS PERIOD 2003-2004

**APPENDIX B**

**EFFLUENT MONITORING AND WASTE CHARACTERIZATION  
QUALITY CONTROL RESULTS  
(10CFR PART 50/61)**

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Gross Alpha RESULT BIAS



PART 50/61 CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: LIQUID

ISSUANCE DATE: 06/11/2004

REF. DATE: 11/19/2003

LAB SAMPLE NO: X21565 ANAL DATE: 04/20/2004

UNITS: uCi/g

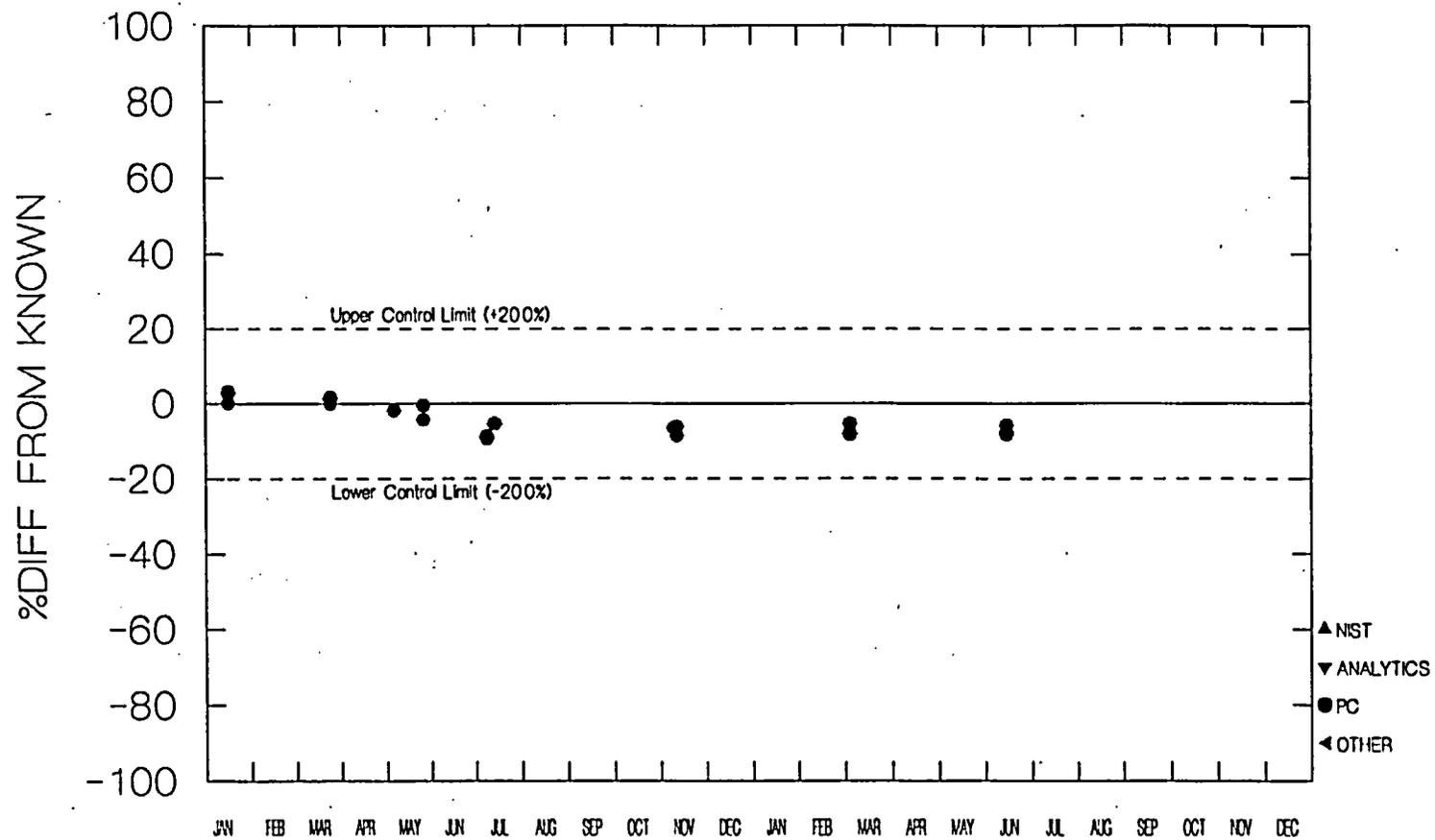
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Alpha	( 774 ± 81)E-09				10.77E-07	-28.10*		
Beta	( 671 ± 37)E-09				82.00E-08	-18.20		

Internal Spike for Gross Alpha in water exceeded the 25% bias limit. No CR was initiated since the mean of 3 consecutive spikes (-18.3%) and the mean of 12 consecutive spikes (-6.4%) were well within the bias limit (IAW QA Manual). All client samples analyzed with this spike were reprocessed with a new spike sample.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

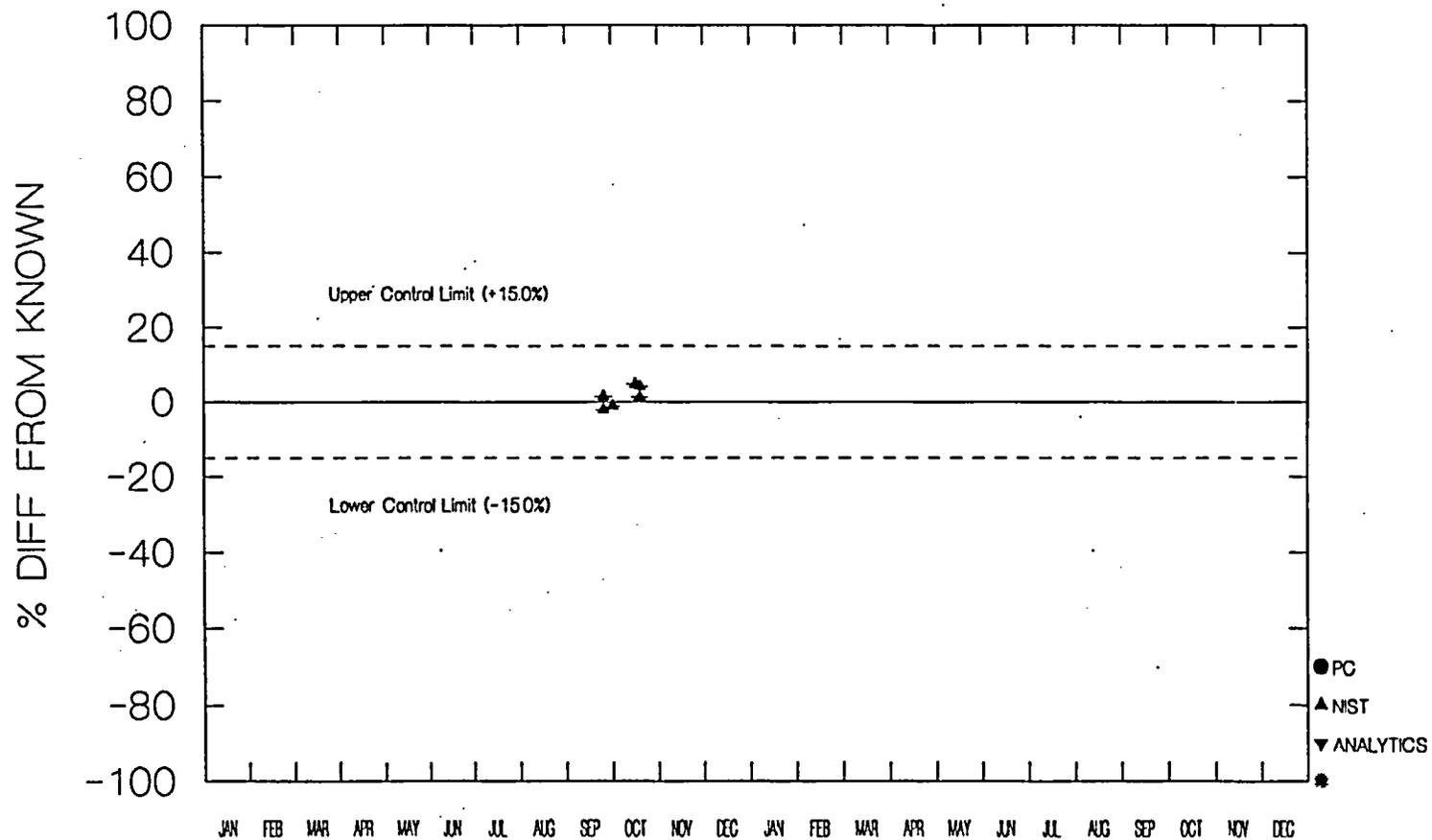
## PART 50/61 Am-241 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

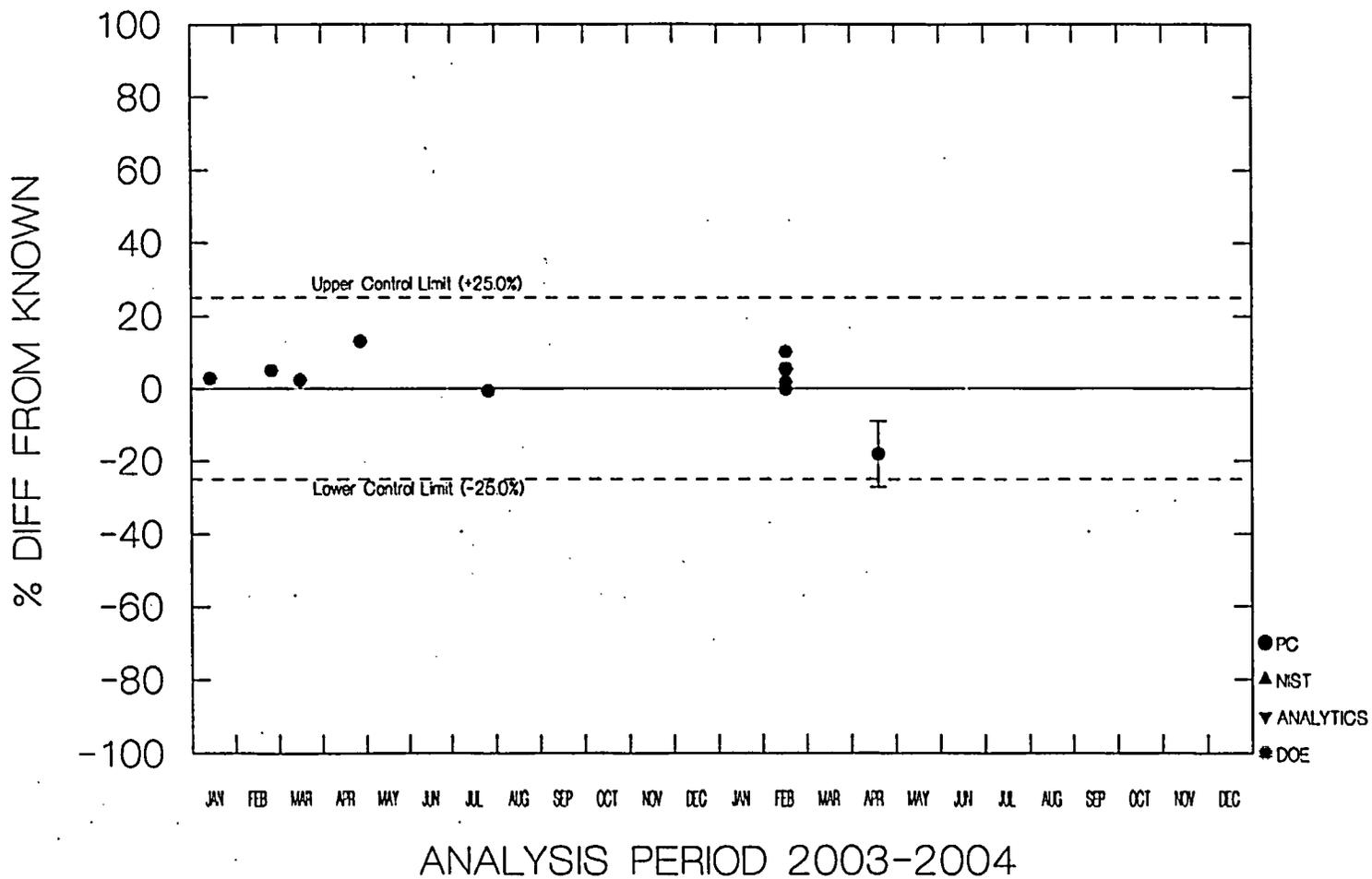
## PART 50/61 Ba-133 RESULT BIAS



ANALYSIS PERIOD 2003-2004

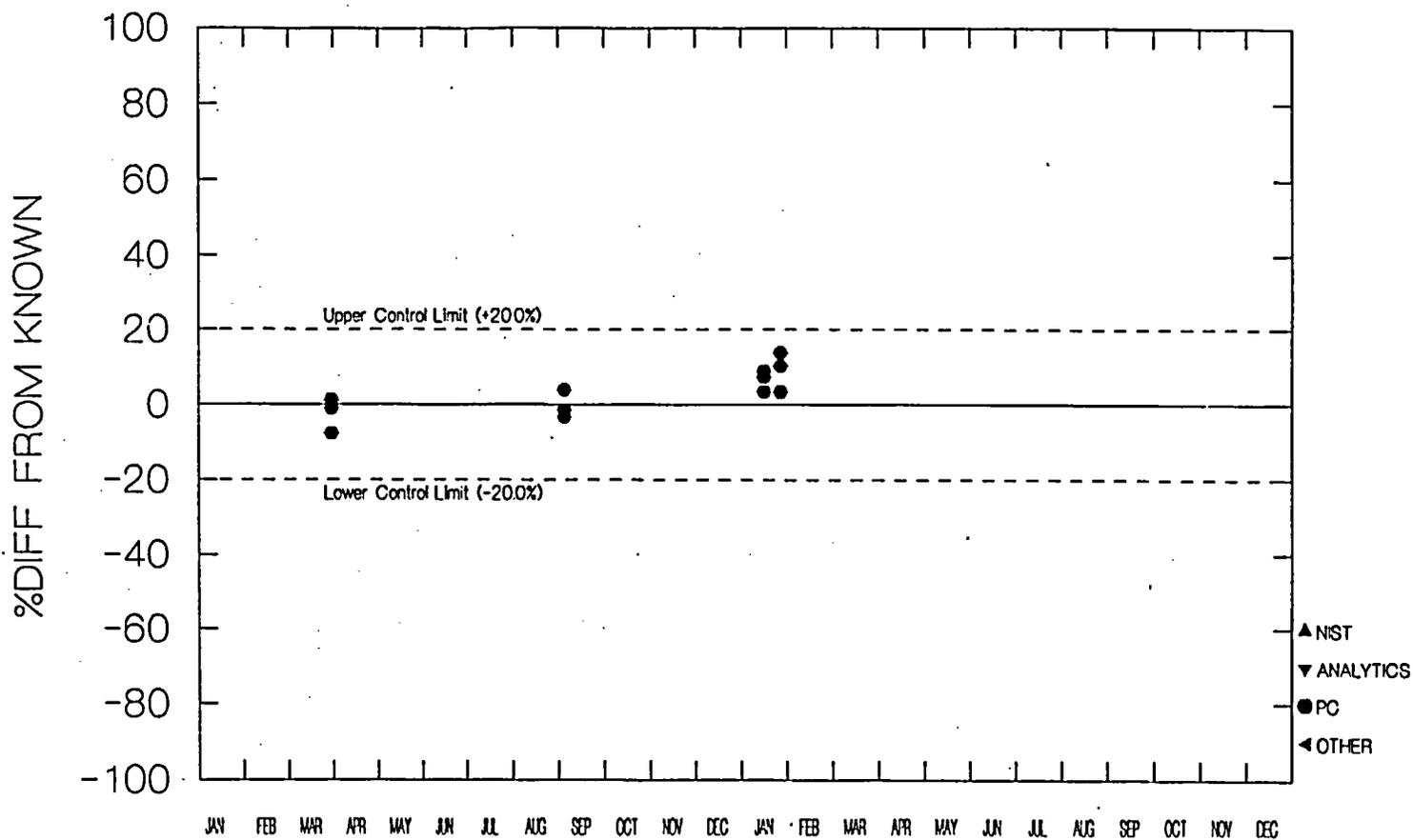
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Beta RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

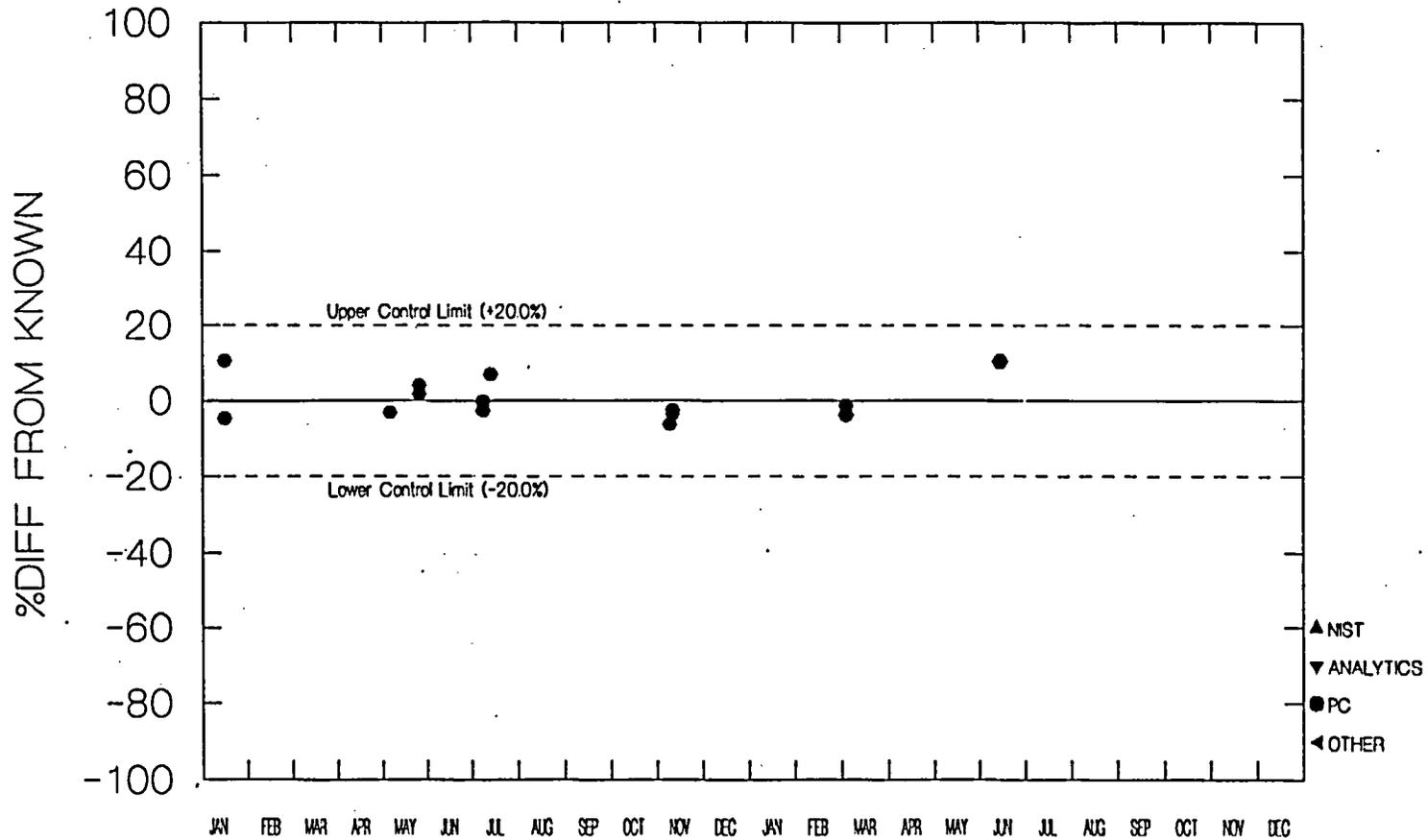
## PART 50/61 C-14 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

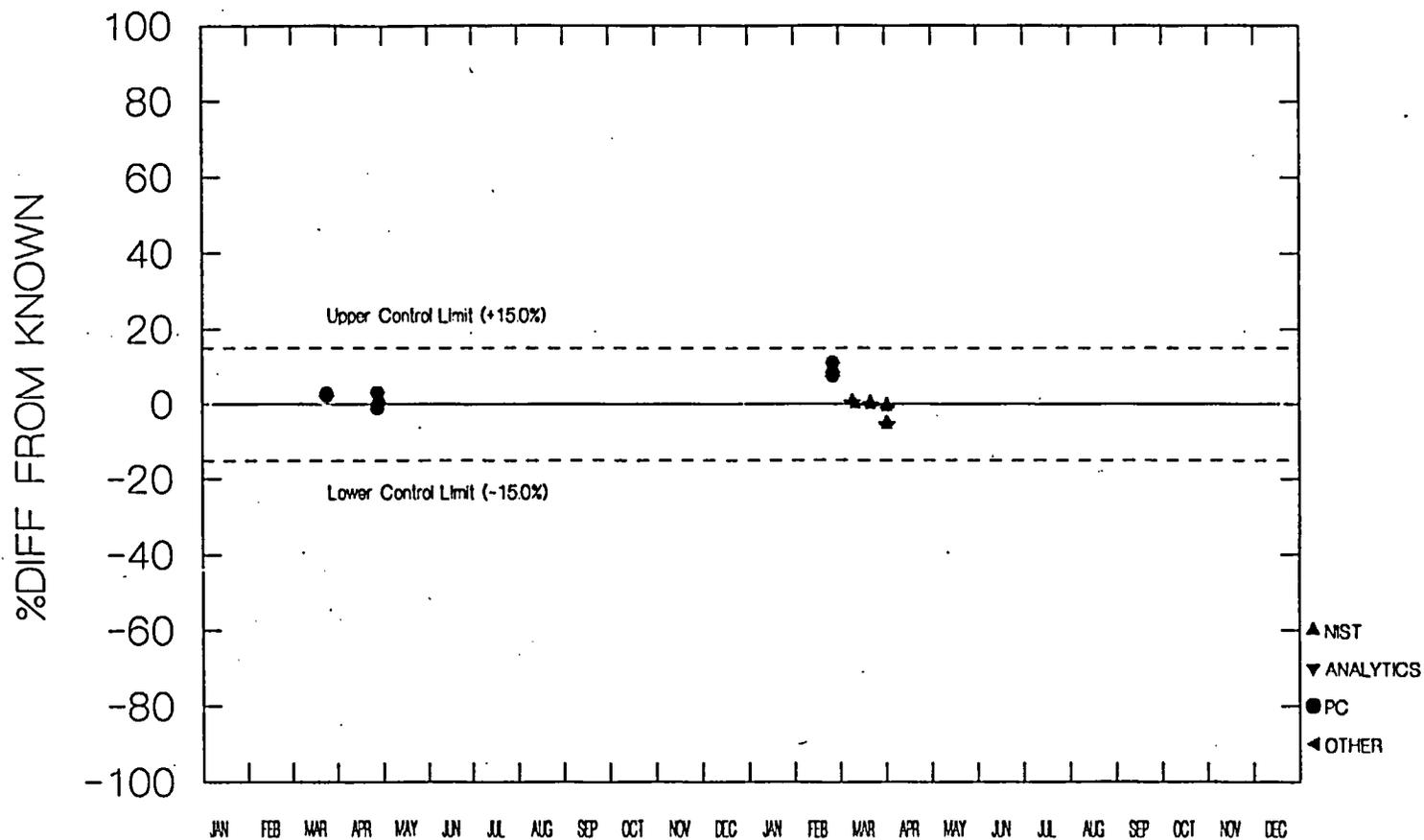
## PART 50/61 Cm-243/244 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

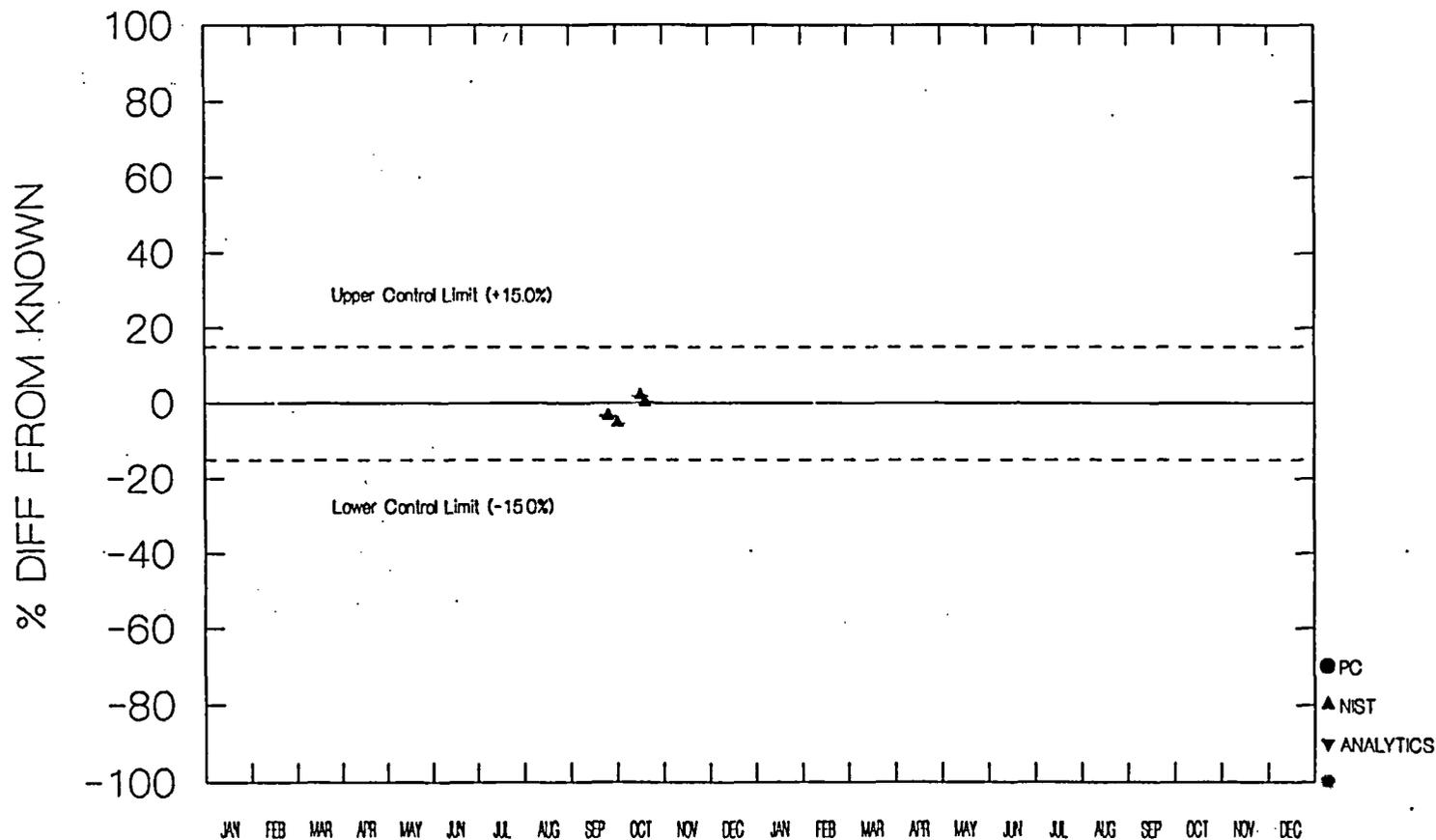
## PART 50/61 Co-60 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

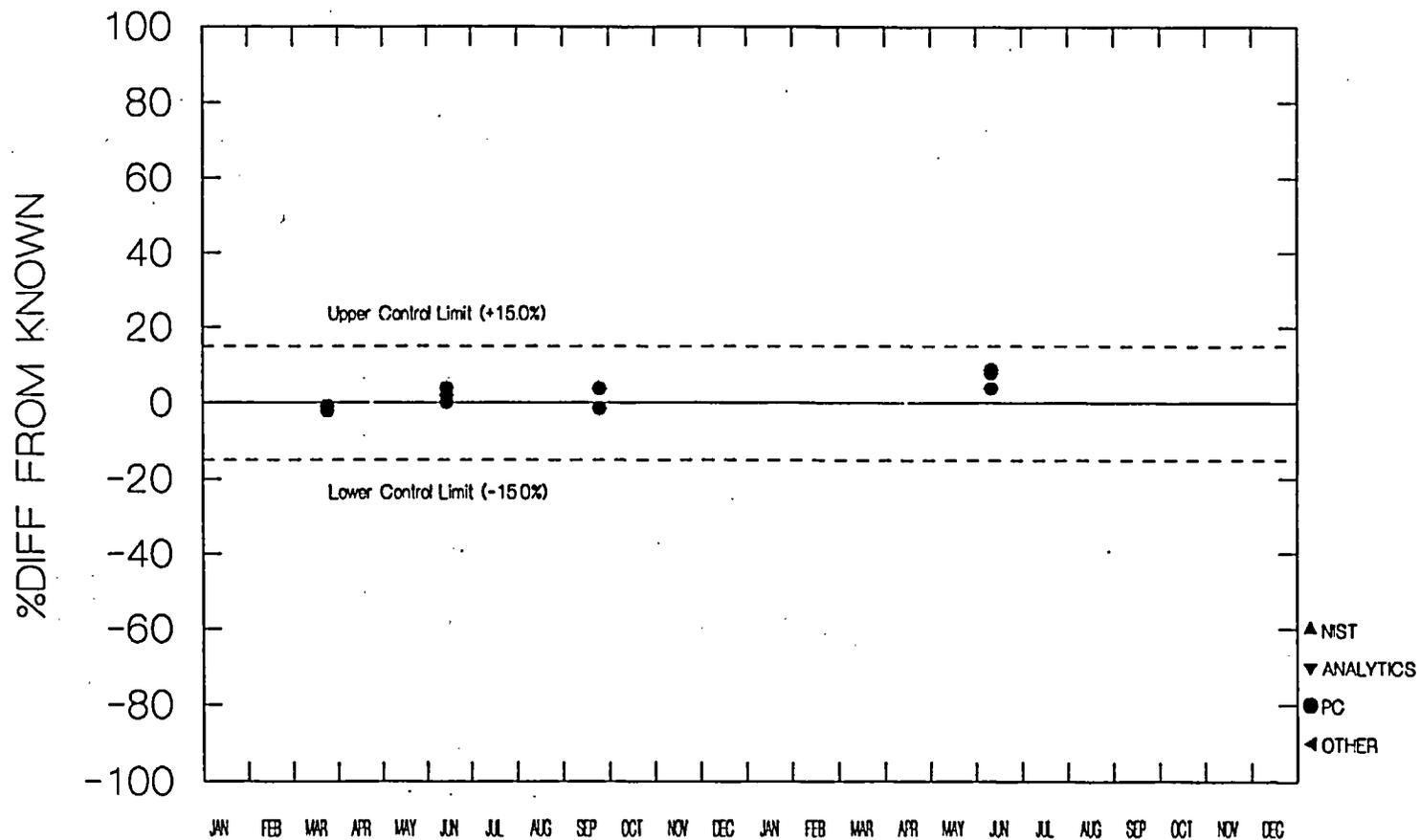
## PART 50/61 Cs-134 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

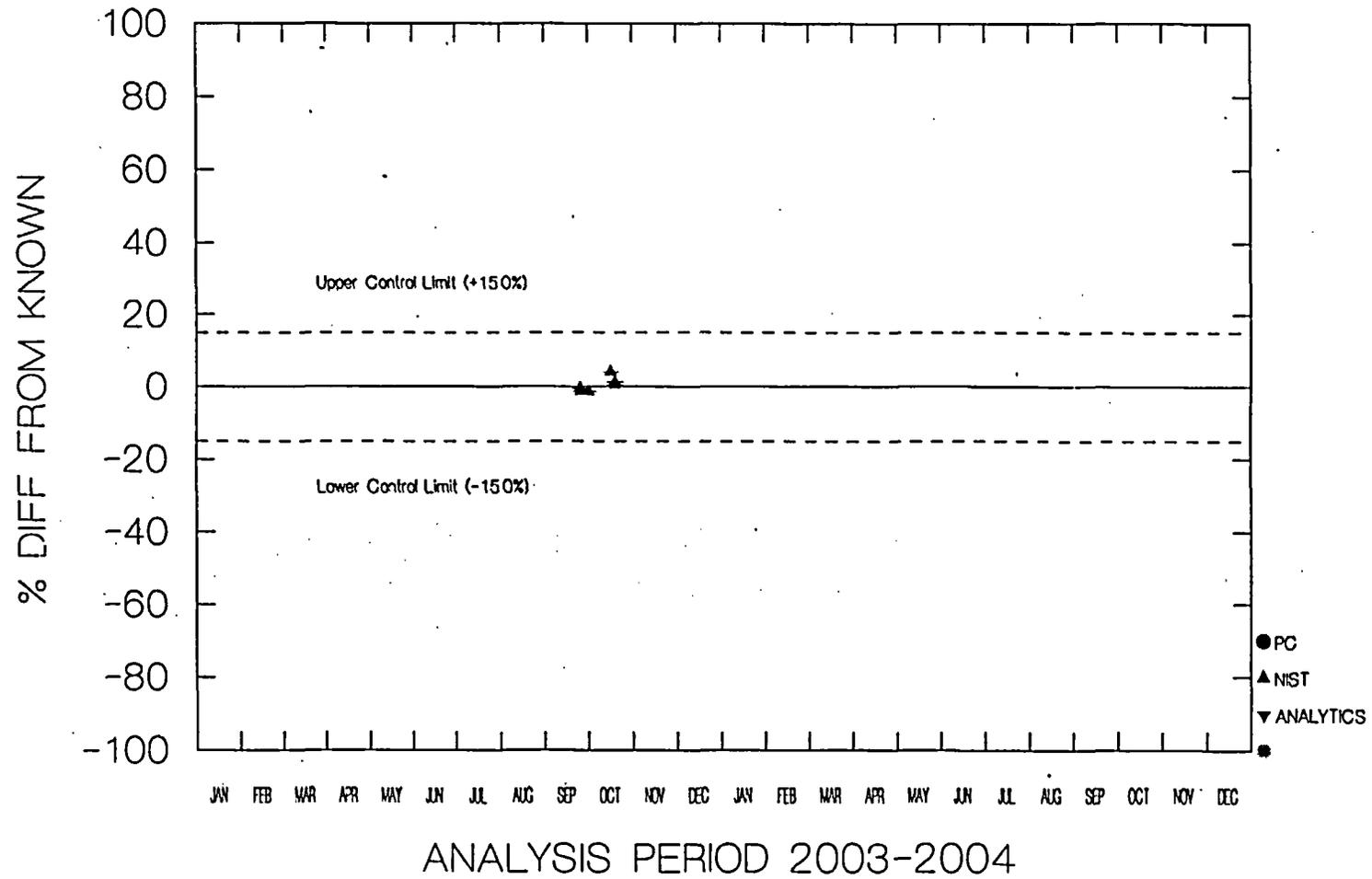
## PART 50/61 Cs-137 RESULT BIAS



ANALYSIS PERIOD 2003-2004

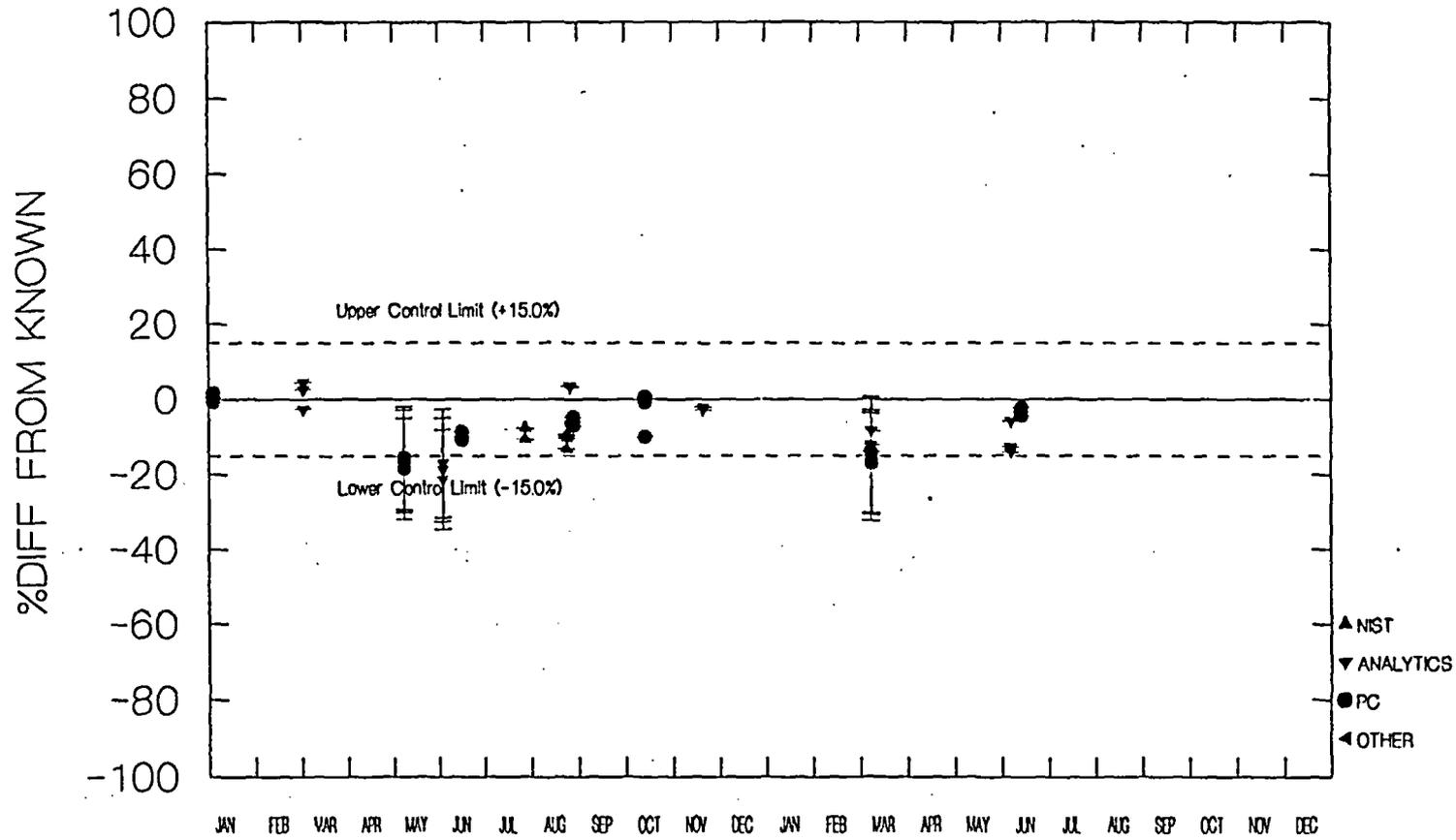
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Eu-152 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Fe-55 RESULT BIAS



ANALYSIS PERIOD 2003-2004

## PART 50/61 CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: LIQUID

ISSUANCE DATE: 05/11/2004

REF. DATE: 12/31/2003

LAB SAMPLE NO: Z21005      ANAL DATE: 03/09/2004

LAB SAMPLE NO: Z21006      ANAL DATE: 03/09/2004

LAB SAMPLE NO: Z21007      ANAL DATE: 03/09/2004

UNITS: uCi/g

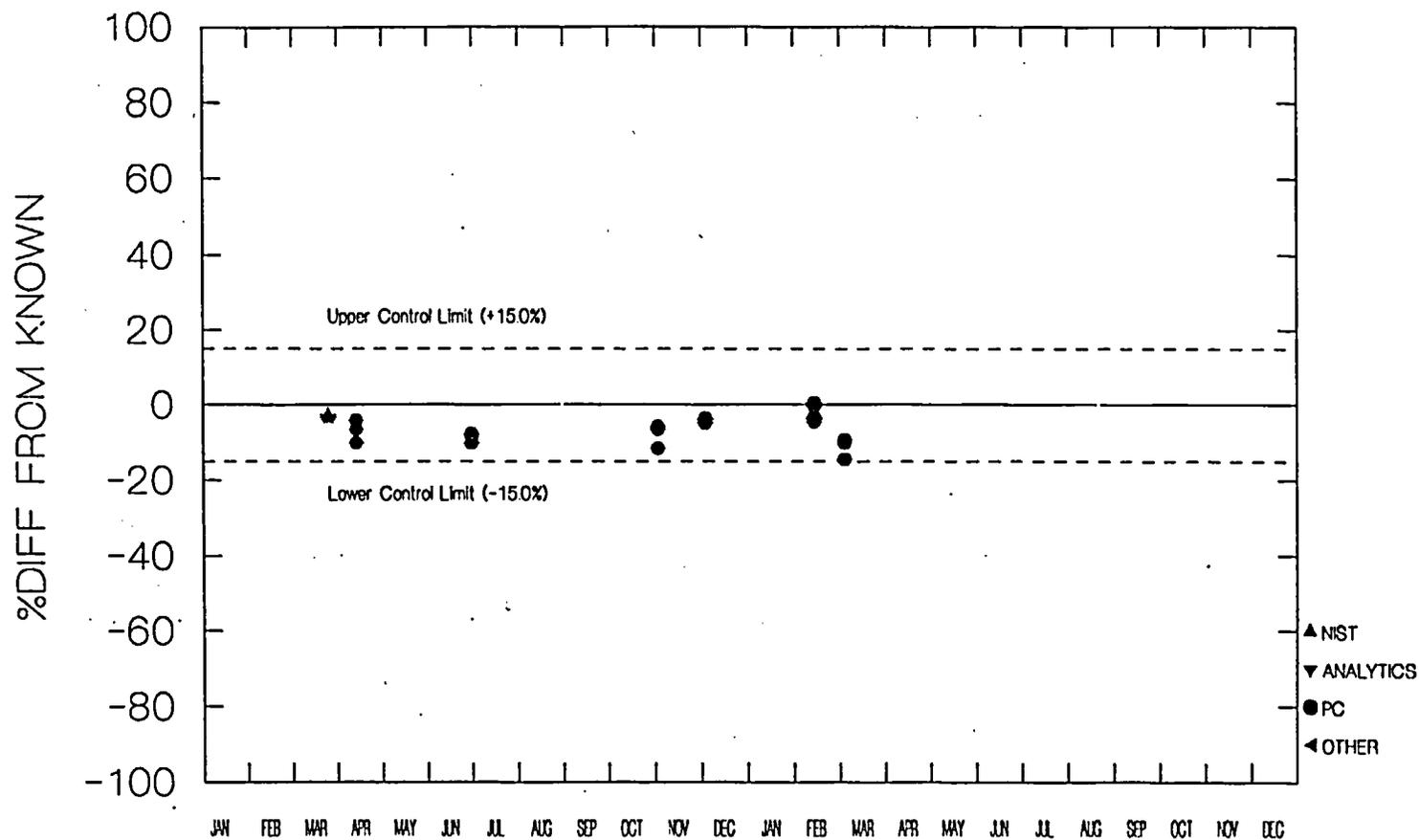
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Fe-55	( 808 ± 66)E-05	( 783 ± 64)E-05	( 778 ± 63)E-05		93.70E-04	-13.80	-16.40*	-17.00*
			% DIFF FROM MEAN:	78.97E-04		2.30	-0.80	-1.50
Ni-63	( 1018 ± 80)E-05	( 1007 ± 79)E-05	( 985 ± 78)E-05		10.07E-03	1.10	0.00	-2.20
			% DIFF FROM MEAN:	10.03E-03		1.50	0.40	-1.80
Sr-89	( 753 ± 26)E-05	( 748 ± 26)E-05	( 758 ± 26)E-05		84.10E-04	-10.50	-11.10	-9.90
			% DIFF FROM MEAN:	75.30E-04		0.00	-0.70	0.70
Sr-90	( 1222 ± 59)E-06	( 1257 ± 61)E-06	( 1225 ± 59)E-06		13.44E-04	-9.10	-6.50	-8.90
			% DIFF FROM MEAN:	12.35E-04		-1.00	1.80	-0.80
Co-60	( 865 ± 44)E-05	( 846 ± 43)E-05	( 838 ± 42)E-05		77.90E-04	11.00	8.60	7.60
			% DIFF FROM MEAN:	84.97E-04		1.80	-0.40	-1.40

Mean of three spikes for Fe-55 (bias = -15.7%) in water exceeded the 15% bias limit. CR 04-08 was initiated to investigate the failure.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

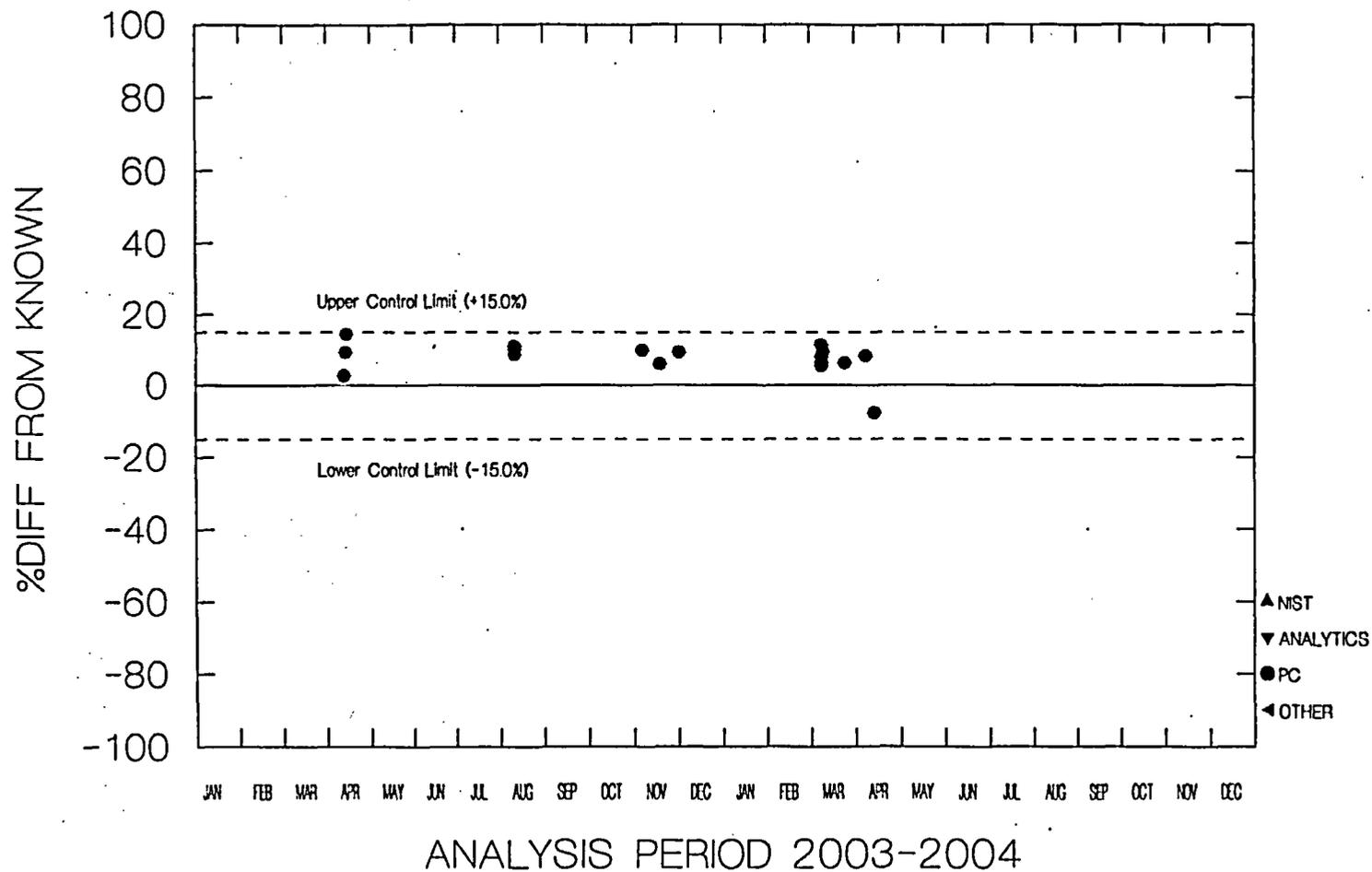
## PART 50/61 H-3 RESULT BIAS



ANALYSIS PERIOD 2003-2004

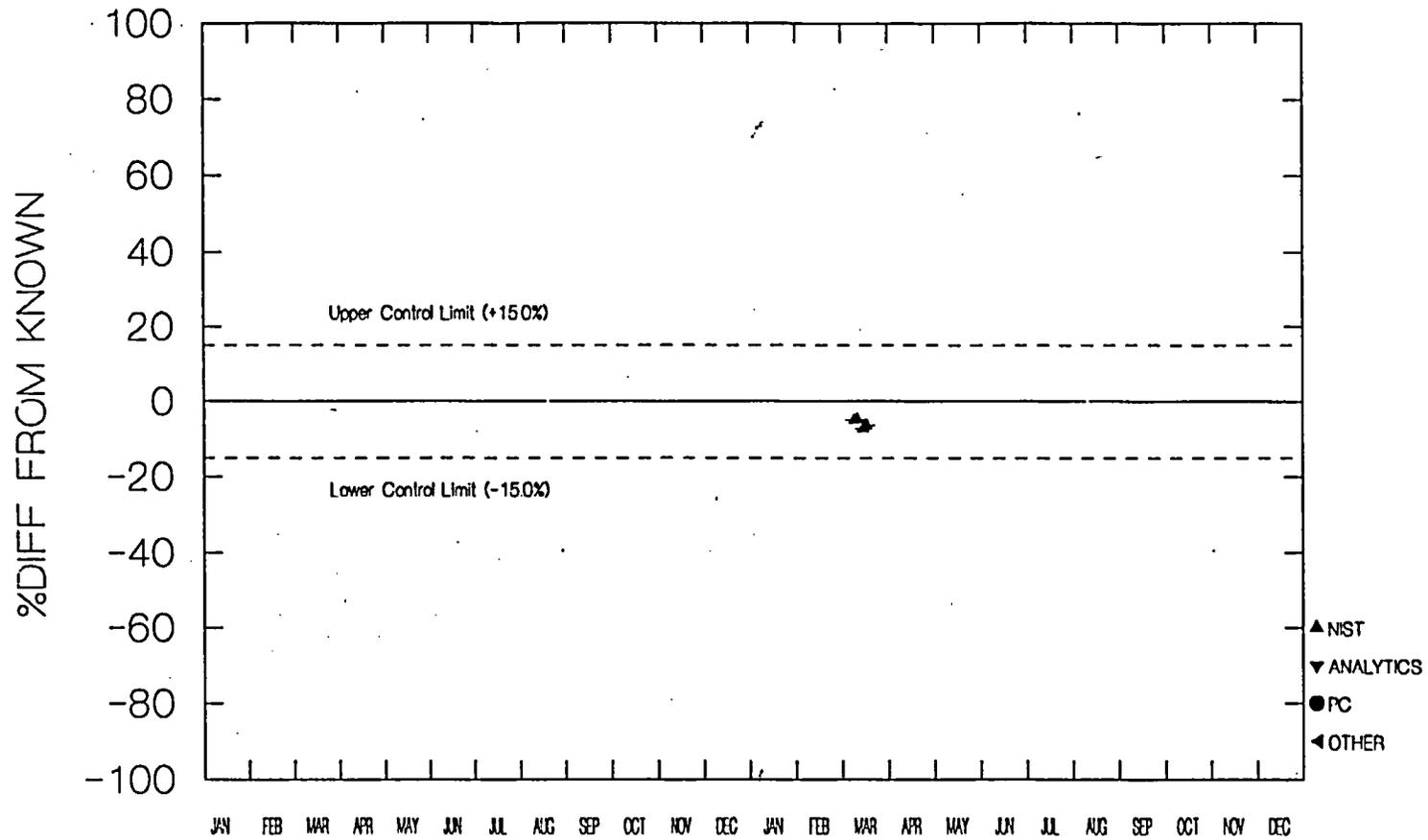
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 I-129 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

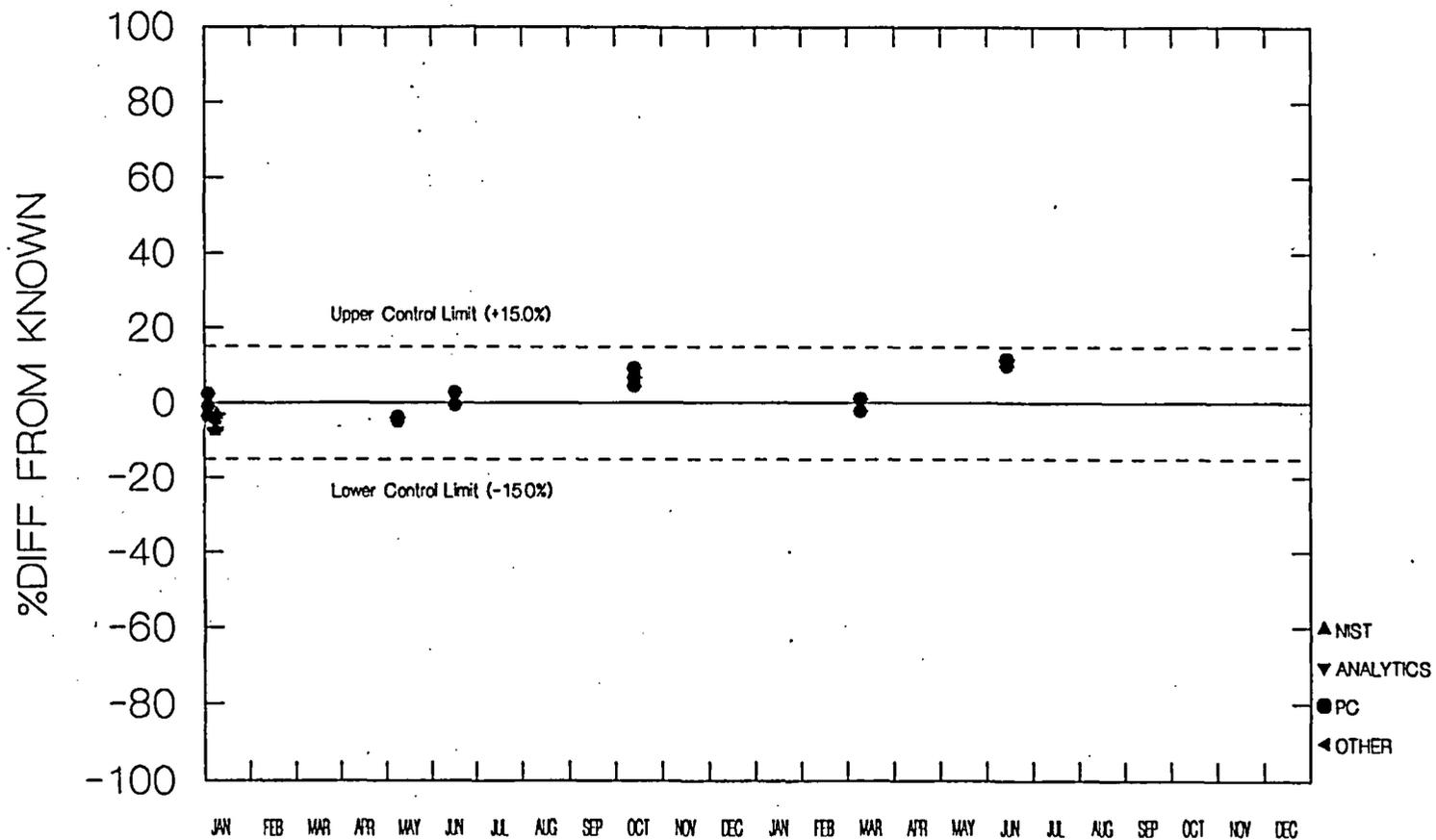
## PART 50/61 I-131 (Gamma) RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

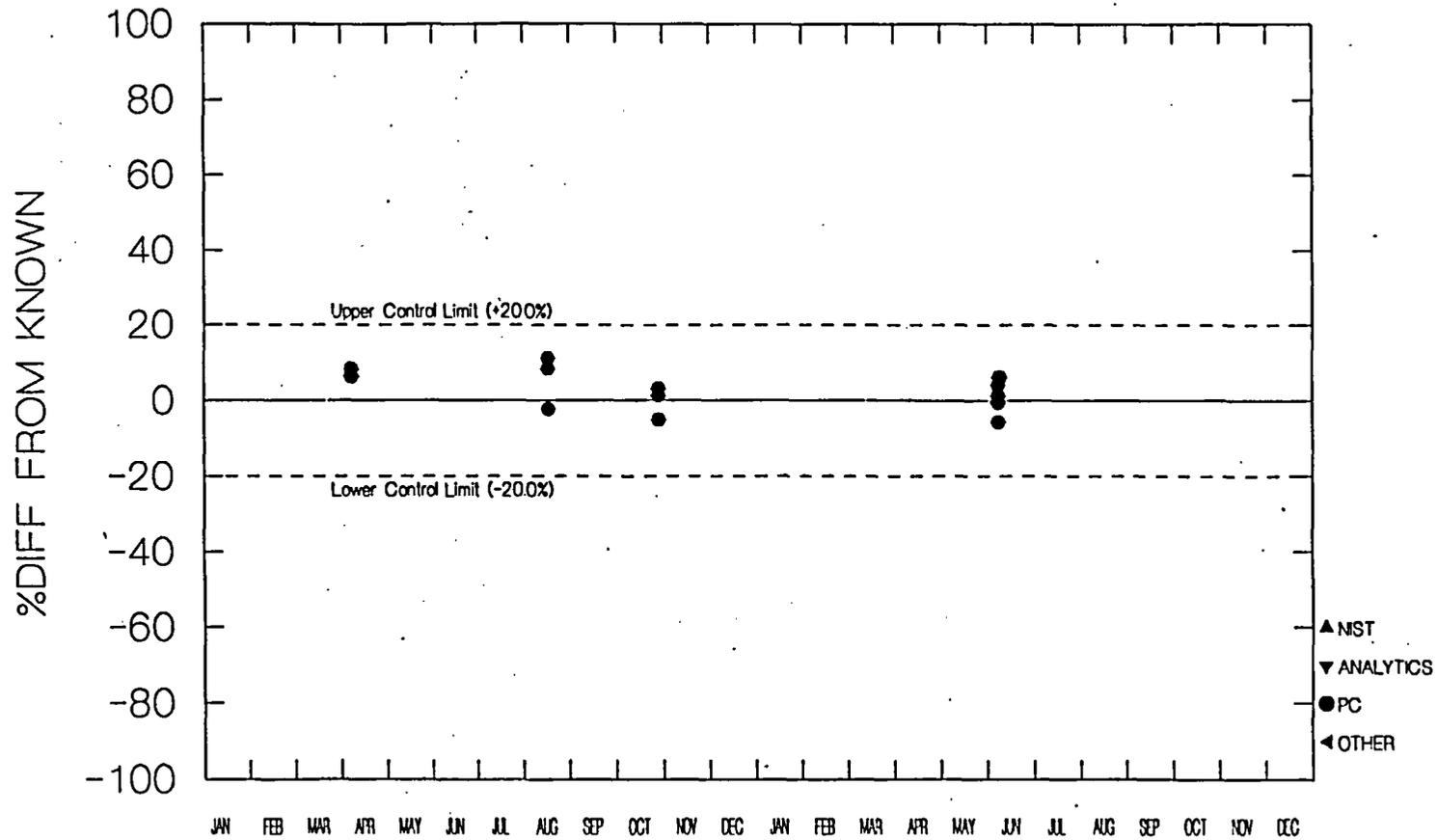
## PART 50/61 Ni-63 RESULT BIAS



ANALYSIS PERIOD 2003-2004

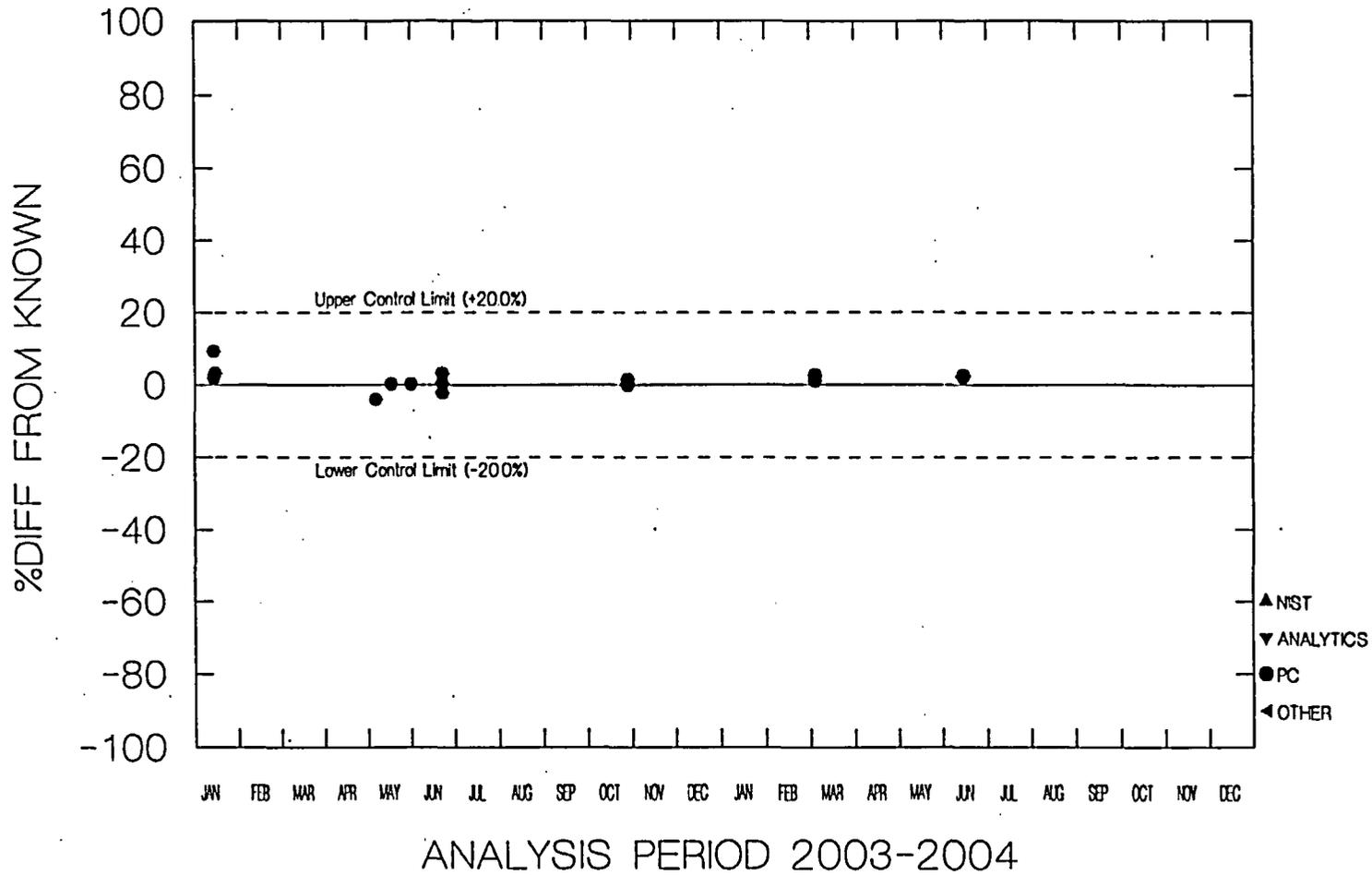
# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Np-237 RESULT BIAS



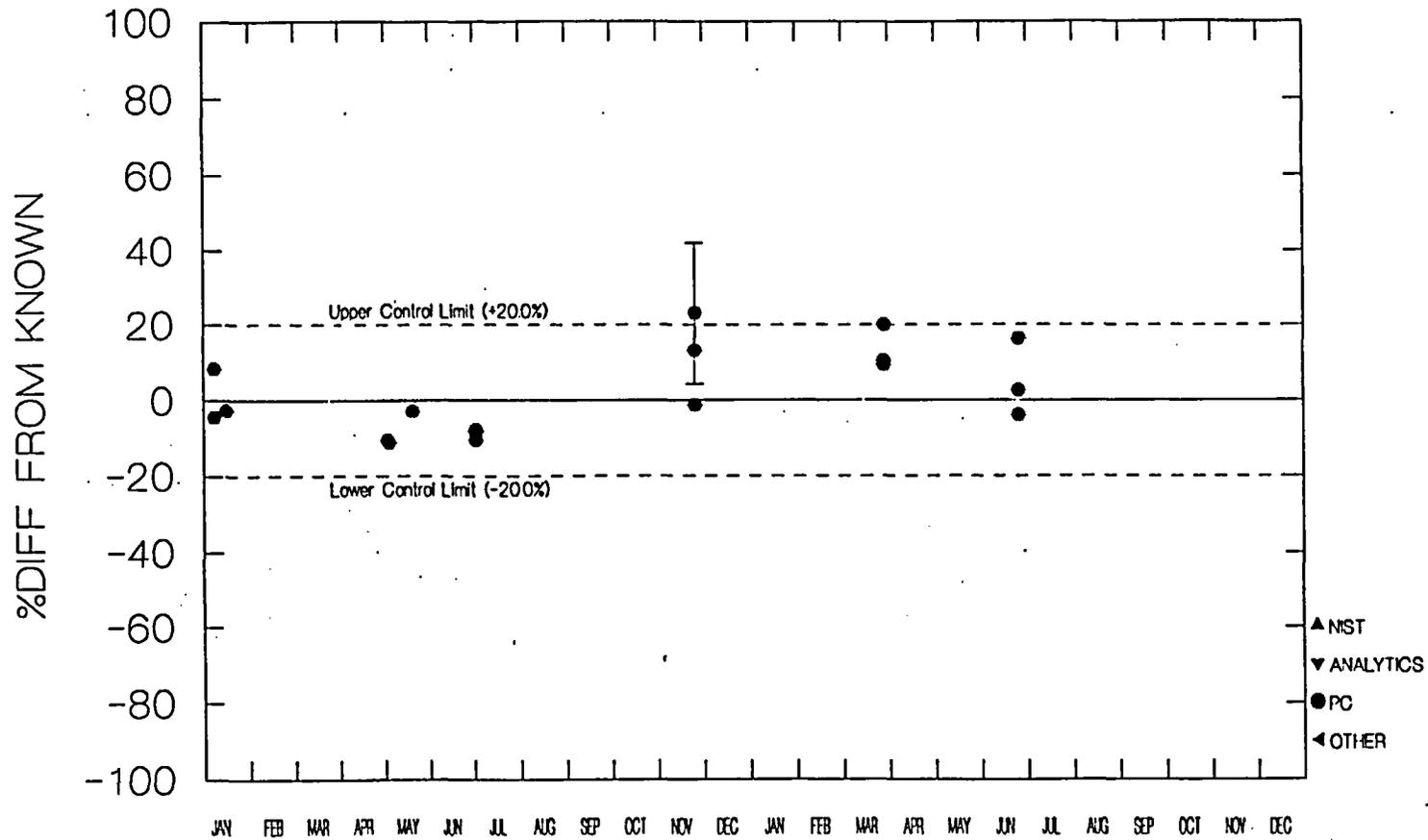
ANALYSIS PERIOD 2003-2004

2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS  
PART 50/61 Pu-238 RESULT BIAS



# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

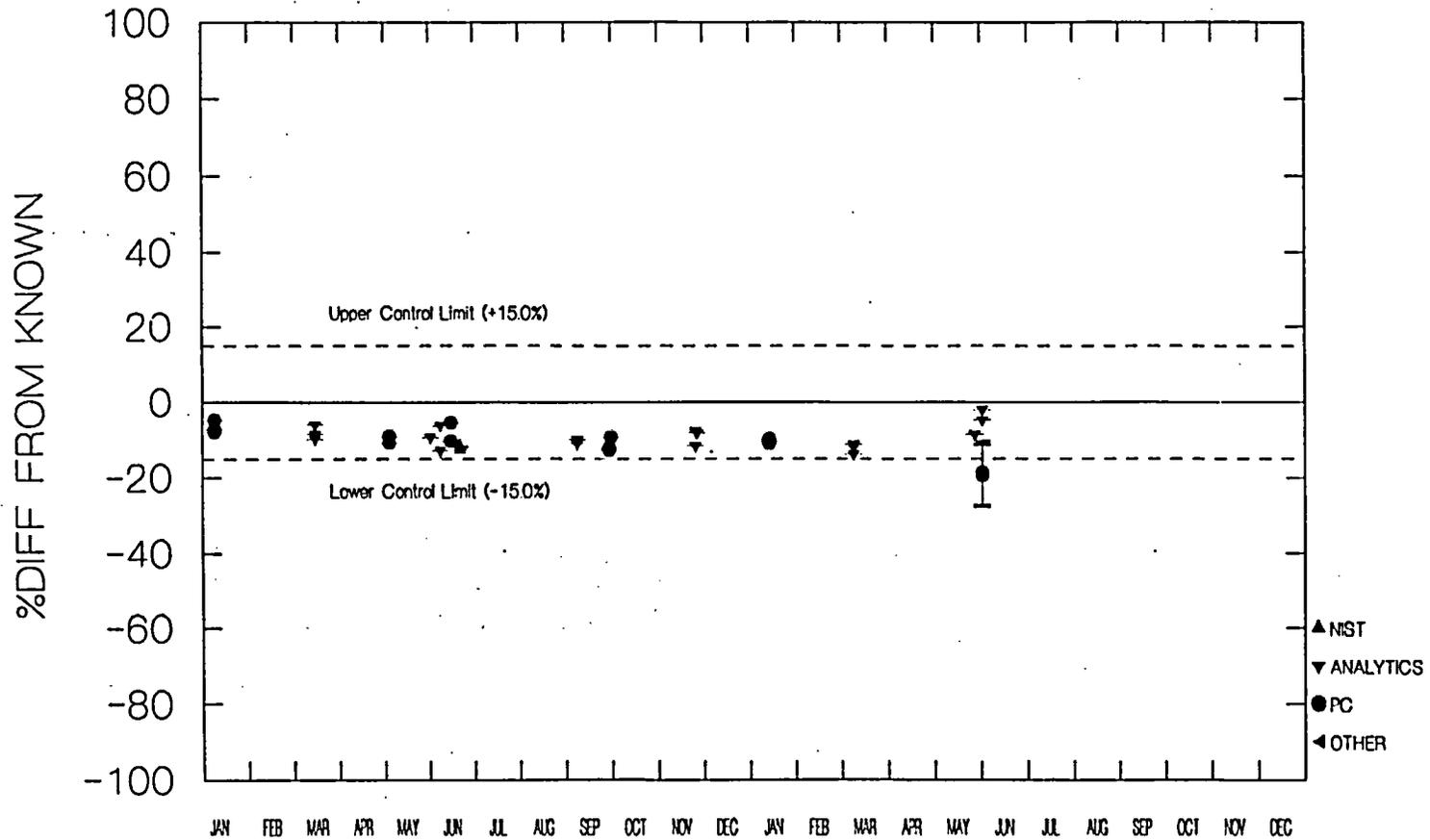
## PART 50/61 Pu-241 RESULT BIAS



ANALYSIS PERIOD 2003-2004

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Sr-89 RESULT BIAS



ANALYSIS PERIOD 2003-2004

## PART 50/61 CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: LIQUID

ISSUANCE DATE: 07/15/2004

REF. DATE: 04/01/2004

LAB SAMPLE NO: Z21488    ANAL DATE: 06/14/2004  
 LAB SAMPLE NO: Z21489    ANAL DATE: 06/14/2004  
 LAB SAMPLE NO: Z21490    ANAL DATE: 06/14/2004

UNITS:  $\mu\text{Ci/g}$ 

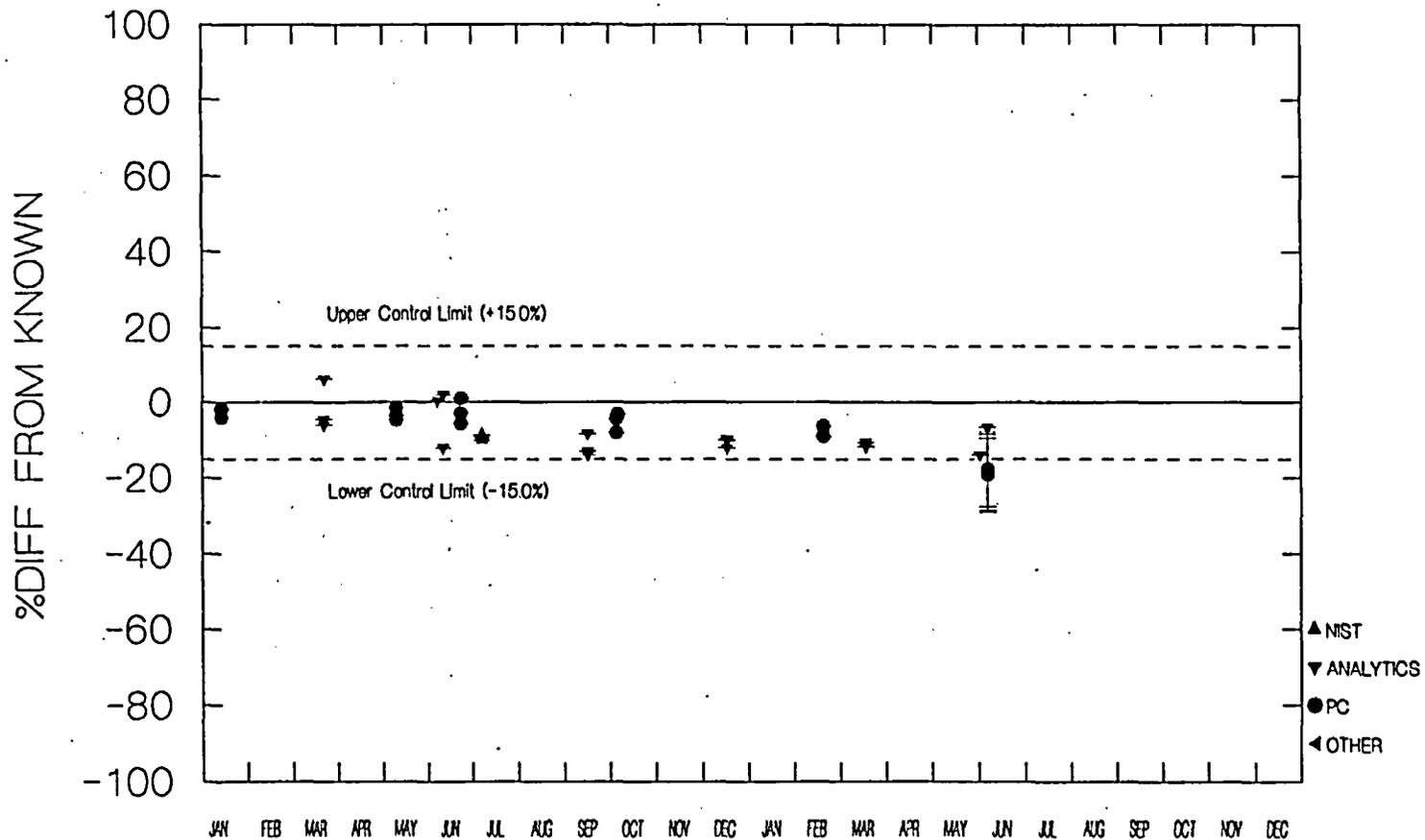
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Fe-55	( 1168 $\pm$ 95)E-05	( 1183 $\pm$ 96)E-05	( 1195 $\pm$ 97)E-05		12.22E-03	-4.40	-3.20	-2.20
			% DIFF FROM MEAN:	11.82E-03		-1.20	0.10	1.10
Ni-63	( 868 $\pm$ 68)E-05	( 883 $\pm$ 70)E-05	( 879 $\pm$ 69)E-05		78.90E-04	10.00	11.90	11.40
			% DIFF FROM MEAN:	87.67E-04		-1.00	0.70	0.30
Sr-89	( 803 $\pm$ 40)E-05	( 811 $\pm$ 42)E-05	( 804 $\pm$ 42)E-05		99.80E-04	-19.50*	-18.70*	-19.40*
			% DIFF FROM MEAN:	80.60E-04		-0.40	0.60	-0.20
Sr-90	( 798 $\pm$ 48)E-06	( 813 $\pm$ 49)E-06	( 805 $\pm$ 50)E-06		98.80E-05	-19.20*	-17.70*	-18.50*
			% DIFF FROM MEAN:	80.53E-05		-0.90	1.00	0.00
Cs-137	( 1130 $\pm$ 57)E-05	( 1185 $\pm$ 60)E-05	( 1174 $\pm$ 59)E-05		10.89E-03	3.80	8.80	7.80
			% DIFF FROM MEAN:	11.63E-03		-2.80	1.90	0.90

Mean of three spikes for Sr-89 (bias = -19.2%) in water exceeded the 15% bias limit. CR 04-11 was initiated to investigate the failure.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Sr-90 RESULT BIAS



ANALYSIS PERIOD 2003-2004

## PART 50/61 CROSS CHECK ANALYSIS SHEET

SAMPLE TYPE: LIQUID

ISSUANCE DATE: 07/15/2004

REF. DATE: 04/01/2004

LAB SAMPLE NO: Z21488    ANAL DATE: 06/14/2004  
 LAB SAMPLE NO: Z21489    ANAL DATE: 06/14/2004  
 LAB SAMPLE NO: Z21490    ANAL DATE: 06/14/2004

UNITS: uci/g

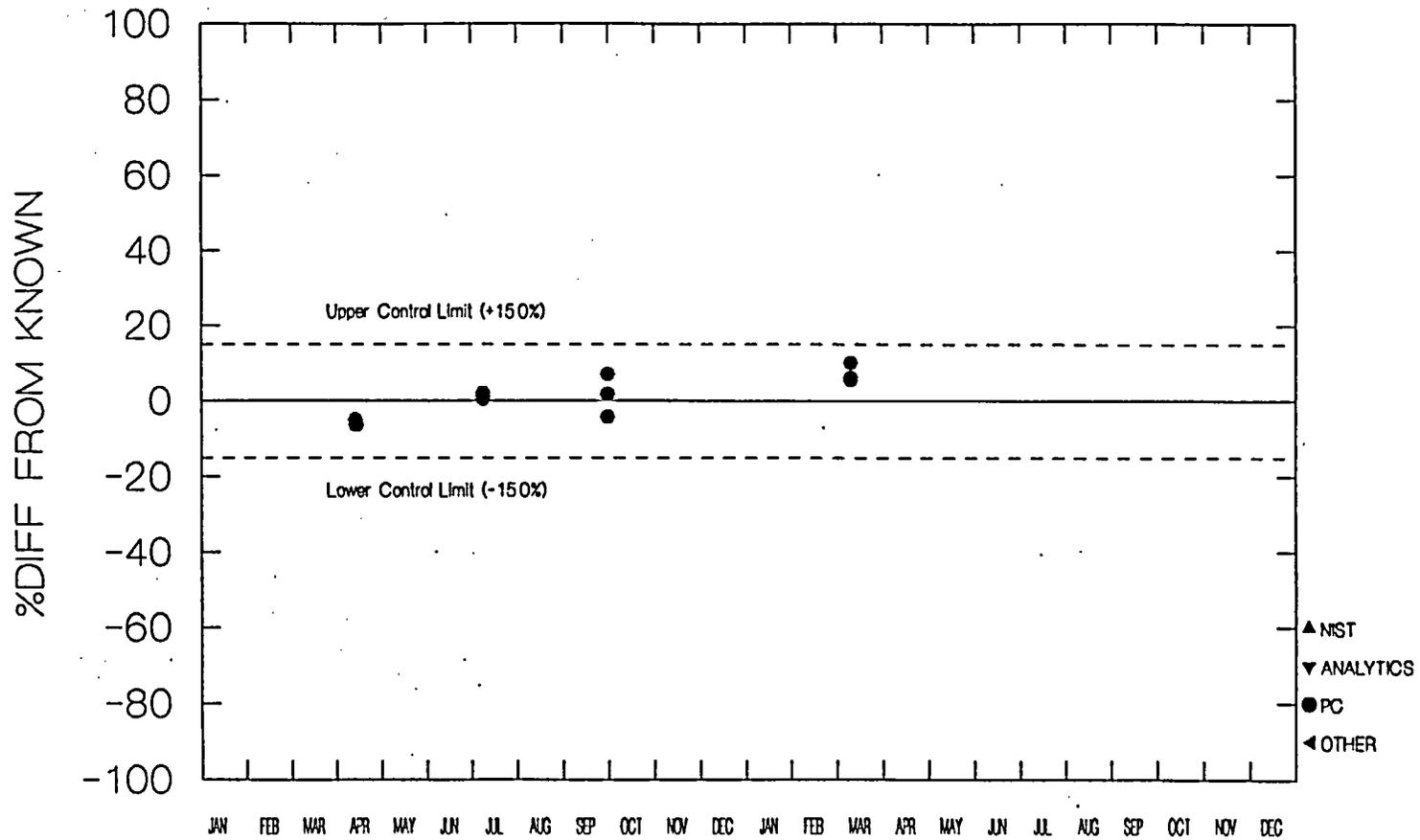
NUCLIDE	RESULT 1	RESULT 2	RESULT 3	MEAN	KNOWN VALUE	% DIFF.1	% DIFF.2	% DIFF.3
Fe-55	( 1168 ± 95)E-05	( 1183 ± 96)E-05	( 1195 ± 97)E-05		12.22E-03	-4.40	-3.20	-2.20
			% DIFF FROM MEAN:	11.82E-03		-1.20	0.10	1.10
Ni-63	( 868 ± 68)E-05	( 883 ± 70)E-05	( 879 ± 69)E-05		78.90E-04	10.00	11.90	11.40
			% DIFF FROM MEAN:	87.67E-04		-1.00	0.70	0.30
Sr-89	( 803 ± 40)E-05	( 811 ± 42)E-05	( 804 ± 42)E-05		99.80E-04	-19.50*	-18.70*	-19.40*
			% DIFF FROM MEAN:	80.60E-04		-0.40	0.60	-0.20
Sr-90	( 798 ± 48)E-06	( 813 ± 49)E-06	( 805 ± 50)E-06		98.80E-05	-19.20*	-17.70*	-18.50*
			% DIFF FROM MEAN:	80.53E-05		-0.90	1.00	0.00
Cs-137	( 1130 ± 57)E-05	( 1185 ± 60)E-05	( 1174 ± 59)E-05		10.89E-03	3.80	8.80	7.80
			% DIFF FROM MEAN:	11.63E-03		-2.80	1.90	0.90

Mean of three spikes for Sr-90 (bias = -19.2%) in water exceeded the 15% bias limit. CR 04-11 was initiated to investigate the failure.

ALL RESULTS PASSED QA PERFORMANCE CRITERIA EXCEPT THOSE NOTED WITH AN ASTERISK

# 2003-2004 QUALITY ASSURANCE TRENDING ANALYSIS

## PART 50/61 Tc-99 RESULT BIAS



ANALYSIS PERIOD 2003-2004

## **APPENDIX C**

# **BIOASSAY QUALITY CONTROL PROGRAM RESULTS**

There are no charts for the bioassay quality control program for this semi-annual report period.

**ATTACHMENT 1**

**RESULTS OF THE LABORATORY  
BLIND DUPLICATE PROGRAM**



August 2, 2004  
EL 115/04

Distribution

Subject: First Half of 2004, Blind Duplicate Program Results

The Framatome ANP Environmental Laboratory (E-LAB) participates in a Blind Duplicate Program administered by the participating utility companies. For the first half of calendar year 2004, 100% of the paired sample measurement results were within the program's criteria for acceptance.

The Blind Duplicate Program began in 1979 as a cooperative effort among the participating companies. Samples are collected and split in the field and submitted to the E-LAB for analysis. The E-LAB Quality Assurance Officer verifies and reports the program results to the participants. The results are evaluated against the E-LAB acceptance criterion established in Reference 1, which states that a paired measurement is in agreement if the individual values are within  $\pm 15\%$  of the mean value. If this condition is not met, a two-sigma range is established for each of the results, which are in agreement if the two ranges overlap.

Table 1 summarized the types of media submitted as part of the Blind Duplicate Program by each participant for a total of 11 paired samples.

Table 2 presents the results of the Blind Duplicate Program by analysis type for each participating company. For the first half of 2004 program, 100% of the paired measurements met the acceptance criteria as specified in Reference 1. The number of paired measurements falling outside the acceptance criteria is listed before the dash ( / ) in each company column. For example, the number 1/2 should be interpreted as 1 paired measurements out of 2 falling outside the acceptance criteria. Totals are presented for each participating company as well as for the entire program.

#### REFERENCES

1. Framatome ANP Environmental Laboratory Manual 100, "Laboratory Quality Assurance Plan," Revision 7, June 18, 2004.

Christopher Shelton  
Quality Assurance Officer  
Framatome ANP Environmental Laboratory

CAS/cas

Attachment

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FRAMATOME ANP  
ENVIRONMENTAL LABORATORY: 29 Research Drive, Westborough, MA 01581-3913  
Phone: 508 898-9970 Fax: 508 836-9815 www.us.framatome-anp.com

EL 115/04  
August 2, 2004

Table 1

Summary of Paired Samples Submitted January through June 2004

Sample Media	Yankee Atomic	Maine Yankee	Seabrook Station	Total
Ground Water	1	0	0	1
Surface Water	2	2	4	8
Algae	0	0	1	1
Mussel	0	0	1	1
Total	3	2	6	11

Table 2

Summary of Paired Measurements Analyzed January through June 2004<sup>(1)</sup>

Analysis Type	Yankee Atomic	Maine Yankee	Seabrook Station	Total
Gamma <sup>(2)</sup>	0/78	0/52	0/104	0/234
Gross Beta	0/3	0/0	0/0	0/3
Tritium	0/3	0/0	0/2	0/5
Total	0/84	0/52	0/106	0/242

(1) The number of measurements that fail to meet the acceptance criteria is shown before the slash.

(2) The gamma numbers represent the total radionuclide measurements in a gamma isotopic analysis.



March 2, 2004  
EL 027/05

**TO:** Distribution  
**FROM:** J. M. Raimondi  
**SUBJECT:** Framatome ANP Environmental Laboratory  
Analytical Service Semi-Annual Quality Assurance Status Report  
(July - December 2004)

---

Attached is the Semi-Annual Status Report covering the Framatome ANP Environmental Laboratory's (E-LAB) Quality Assurance Programs comprising radiological environmental, Part 50/61, and bioassay analytical services for the second half of 2004.

For the Radiological Environmental Monitoring Program (REMP), 99.4% of 672 individual QC analyses evaluated during this semi-annual period met E-LAB acceptance criteria for bias, while 100% of 439 QC analyses met the Laboratory QC acceptance criteria for precision. To provide a perspective of the overall environmental quality program since its inception in 1977, 96.7% of the 17,871 environmental QC analyses processed in the past 27 years met acceptance criteria for bias, whereas, 99.4% of 15,702 QC samples evaluated for precision met Laboratory criteria for this performance category. DOE program participation (MAPEP) resulted in 22 of 23 mean results evaluated as in "Agreement" with the acceptance criteria. DOE data is not included in the above summary values.

The Framatome ANP Environmental Laboratory (ID# 11823) received full certification for six radiological analytes in the Potable water and Non-Potable water categories from the State of New York Department of Health under the National Environmental Laboratory Accreditation Program (NELAP). A total of 9 Proficiency Test (PT) results, 8 of which were rated "Acceptable," were received during this period. The single failure was the result of an incorrectly entered value in the PT website.

During the second half of 2004, 95.4% of the 175 Part 50/61 individual analyses evaluated for bias and 100% of the 162 analyses evaluated for precision met E-LAB acceptance criteria. During the past sixteen years of processing Part 50/61 samples, 4195 QC analyses have been evaluated for bias along with 4032 samples for precision. Overall performance statistics indicate an acceptance rate of 94.0% for bias and 99.2% for precision.

A handwritten signature in black ink, appearing to read 'J. M. Raimondi', is written over a horizontal line.

J. M. Raimondi  
Manager, Environmental Laboratory

CAS/cas  
ATTACHMENTS

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Page 2  
EL 027/05  
March 2, 2005

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