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MAY 3 2004

Mr. James A. Saric, Remedial Project Manager
United States Environmental Protection Agency
Region V, SR-6J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

DOE-0234-04

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

APRIL 6, 2004 CONFERENCE CALL ON THE ON-SITE DISPOSAL FACILITY DATA EVALUATION AND REPORTING PATH FORWARD

The purpose of this letter is to document the April 6, 2004, conference call with the United States Environmental Protection Agency (USEPA) and the Ohio Environmental Protection Agency (OEPA) regarding the On-Site Disposal Facility (OSDF) data evaluation and reporting process. A write-up proposing modifications to the process was included as part of the March 23, 2004, weekly conference call information. This proposal was discussed on April 6 and, overall, the USEPA and OEPA agreed to the proposed modifications. The following summarizes the four modifications and associated USEPA/OEPA Concerns and Paths forward. Enclosed for reference purposes is the March 23, 2004 documentation along with modified figures for the below paths forward:

(Item 1) Prepare control charts for all OSDF locations where baseline has been established, regardless of serial correlation and trend.

> **USEPA/OEPA Concern:** Presenting data that exceeds the statistical control limits on the control charts could possibly lead a reviewer to believe that there may be an issue regarding the integrity of the OSDF.
> **Path forward:** The scale on control charts will be adjusted to Final Remediation Levels (FRL), where possible, so concentrations will be put into proper perspective. Note that concentrations in all horizons except the Leachate Collection System (LCS), are significantly lower than FRLs. Qualifying statements will be added for

clarification purposes. For example, Figure 4 (enclosed) will include the following text, "Note: Not a Leak Detection Concern. Refer to Figure 1 for overall cell concentrations." Additionally, data that exceeds the statistical control limits will be discussed textually in Attachment A.5 of the site environmental reports to ensure issues are thoroughly and clearly resolved.

USEPA/OEPA Concern: Environmental specific references should be evaluated to support statistical methodology modifications.
Path forward: Additional environmental statistical methodologies will be reviewed to determine if additional insights can be gained.

(Item 2) Consolidate table information previously presented in site environmental reports in a graphical format.

USEPA/OEPA Concern: Information pertaining to the statistical tests used to justify data set combining, which was on 2002 Site Environmental Report tables, is not included on the graphical format.
Path forward: Statistical test information for combining data sets (i.e., F-Test and t-Test for normal distributions) will be included on each control chart, where possible (e.g., no baseline data for LCS and LCS locations). Baseline will be updated, where appropriate (based on statistical information – for example, Figure 5 in enclosure).

USEPA/OEPA Concern: There is a lot of information on the graph (Figure 1) and every attempt should be made to ensure clarity.
Path forward: Every attempt will be made to ensure that information is clearly conveyed.

(Item 3) Eliminate statistical evaluations determining correlations between water levels and uranium concentrations for both OSDF and Integrated Environmental Monitoring Plan (IEMP) Great Miami Aquifer wells.

USEPA/OEPA Concern: No issues.
Path forward: These evaluations will not be included in the 2003 Site Environmental Report.

(Item 4) Initiate filtering protocol in OSDF samples as described in the IEMP.

USEPA/OEPA Concern: Filtering protocol should only be instituted on Great Miami Aquifer well samples.
Path forward: Filtering will be initiated in May 2004 on Great Miami Aquifer samples collected for the OSDF, as necessary.

These modifications will be implemented in the 2003 Site Environmental Report, unless otherwise noted.

If you have any questions concerning the enclosed documents, please contact Dave Lojek at (513) 648-3127.

Sincerely,

FCP:Lojek

William J. Taylor
Director

Enclosure: As Stated

cc w/enclosure:
D. Lojek, OH/FCP
J. Reising, OH/FCP
G. Jablonowski, USEPA-V, SR-6J
M. Murphy, USEPA-V, 5HRE-8J
T. Schneider, OEPA-Dayton (total of 3 copies of encs.)
F. Bell, ATSDR
M. Cullerton, TetraTech
M. Shupe, HSI GeoTrans
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AR Coordinator, Fluor Fernald, Inc/MS78

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K. Johnson, OH/FCP
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W. Hertel, Fluor Fernald, Inc., MS52-5
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ENCLOSURE

OSDF GROUNDWATER DATA EVALUATION AND REPORTING

OSDF Data Evaluation and Reporting

As identified in the 2002 Site Environmental Report (Section A.5.1.6), while statistical analyses of the groundwater data are being performed to comply with OEPA solid waste landfill monitoring regulations, these analyses appear to be of very limited value to the leak detection program at this time. DOE additionally identified that given the limited value of the statistical analyses of the groundwater data, further refinement of the post-baseline leak detection data evaluation process is recommended. DOE has reviewed literature and data and at this time would like to recommend the following modifications to data evaluations and reporting processes (justification for each items follows):

(Item 1) Prepare control charts for all OSDF locations where baseline has been established, regardless of serial correlation and trend.

(Item 2) Consolidate table information previously presented in site environmental reports in a graphical format.

(Item 3) Eliminate statistical evaluations determining correlations between water levels and uranium concentrations for both OSDF and IEMP Great Miami Aquifer wells.

(Item 4) Initiate filtering protocol in OSDF samples as described in IEMP.

(Justification – Item 1)
Although DOE has identified several factors, such as serial correlation, data trends, and pre-existing contamination, which complicate the statistical evaluation and control charting of OSDF data, DOE also recognizes the need to establish an evaluation protocol for leak detection monitoring data. For this reason, DOE investigated various resources in order to establish a reasonable path forward for evaluating OSDF data. Resources included (but were not limited to):

- *Shewhart's Control Charts: Foundation and Myths,* Donald J. Wheeler: 1989
- *Understanding Statistical Process Control,* Donald J. Wheeler: 1990
- *Statistical Process Control for Serially Correlated Data,* Jakob Edo Wieringa: 1999
- *The Influence of Parameter Estimation on the ARL of Shewhart Type Charts for Time Series,* H. Kramer and W. Schmid: 1996

a) Serial Correlation
In previous OSDF evaluations, serial correlation has been used to determine sample independence. Through the literature review, it has been concluded that autocorrelation appears to be more frequently used in industry practices for assessing independence of consecutively sampled measurements. Autocorrelation is calculated on a 1 to –1 scale, much like R-square values, where 1 is a perfect positive correlation between consecutive measurements and –1 is a perfect negative correlation. Specifically from the literature review, studies have shown that autocorrelation less than 0.60 (and greater than –0.60) in datasets does not differ much from those derived from in-control independent observations. One study claims that "... control limits will be contaminated..." only when autocorrelation exceeds 0.80. In re-evaluating the OSDF data where serial correlation was detected, it appears that there are no cases where autocorrelation exceeds +/- 0.60. Therefore, sample independence should not be an issue regarding control charting the OSDF data.

b) Trend and Pre-existing Contamination
Pre-existing contamination at the Fernald site can cause data trends and complications with respect to control charting of the OSDF data. However, regardless of trends and pre-existing contamination, DOE believes that control charting the data allows for the possible identification of "system changes." Trend analysis will continue to be performed and outcomes will be provided on control charts and graphs to further assist data evaluations. It is important to note that in review of control charts, the overall vertical system (LCS, LDS, HTW, Great Miami Aquifer locations) from each cell must be simultaneously evaluated. For example, total uranium concentrations from the LCS, LDS, HTW, and Great Miami Aquifer wells for Cell 1 should be evaluated together to identify such things as the lower horizon (e.g., Great Miami Aquifer) having higher concentrations than upper horizons (e.g., LCS, LDS or HTWs).

c) Non-transformed Data versus Log-transformed Data
An additional factor that was reviewed pertaining to control charts was presenting the data in non-transformed versus log-transformed format. According to Donald J. Wheeler, data do not have to be normally distributed to be placed on a control chart. "While the control chart constants were created under the assumption of normally distributed data, the control chart technique is essentially insensitive to this assumption. This insensitivity is what makes the control chart robust enough to work in the real world as a procedure for inductive inference." In addition, "The computations are essentially unaffected by the degree of normality of the data." And finally, "The normality of the data is neither a prerequisite nor a consequence of statistical control." The benefit of presenting the data in a non-transformed format is that the actual concentrations and control chart limits can be easily compared to other criteria such as FRLs and the overall vertical concentration profile for each cell.

(Justification – Item 2)
DOE will continue to ensure that all OSDF reporting commitments are achieved; however, DOE would like to revise the format in which data are presented for OSDF locations where post baseline data are being collected. Specifically, DOE would like to present information, previously presented in Tables A.5-1 through A.5-4 (2002 Site Environmental Report), in graphical format (see Figure 1). These graphs would also meet the commitment identified in the Technical Memorandum for OSDF Cells 1 through 3:

- **Constituent concentration comparisons:** These graphical comparisons will be completed cell by cell for the HTW versus the LCS and LDS. The data used to generate these graphs (as well as the Great Miami Aquifer data) will be provided on the IEMP Data Information Site as it becomes available.

These graphs will not only provide LCS, LDS, and HTW concentrations but will also include Great Miami Aquifer concentrations to allow for overall vertical profile comparisons and holistic system evaluations for each cell by constituent. Graphs will also identify outliers (from control charting process), minimum, maximum, and average concentrations along with trends and FRLs (if available) for each location of interest. Note that average concentrations and trends will be based on the data that are control charted (i.e., standardized frequency data, etc.) so that weighting of the data will be appropriate such that those samples collected more frequently early on will not be given more weight. These graphs, along with the control charts for each individual location/constituent (see Figures 2 through 6), will allow for the overall evaluation of the data with respect to the system, the vertical profile, trends, and associated limits and regulatory levels (FRLs).

(Justification – Item 3)
Statistical evaluations determining the relationship between water level and uranium concentrations were introduced in the 2002 Site Environmental Report (Appendix A, Attachments A.2 and A.5). However, as indicated by DOE and OEPA through discussions and comment responses (2002 Site Environmental Report Comment Responses #26 and #31), these statistical evaluations are more than likely not meaningful and must be tempered because other factors (e.g., advective/dispersive mass transport) may impact/effect the observed trends. For this reason, DOE recommends elimination of these statistically evaluations. However, DOE agrees that it is important to continue to review the relationship between water levels and uranium and will continue to do so through the concentration/water level versus time plots provided in both Appendix A, Attachments A.2 and A.5.

(Justification – Item 4)
The approved IEMP, Revision 2, which was implemented in 2001, instituted the filtering protocol in Great Miami Aquifer samples (metals and radiological) where turbidity is greater than 5 NTU. However, this protocol has not been implemented for samples collected for OSDF, although several locations are sampled for cross purposes (i.e., Property/Plume Boundary and OSDF). DOE recommends that the filtering protocol be implemented in Great Miami Aquifer samples collected for OSDF. Additionally, DOE recommends that all data collected from OSDF locations, including filtered results (although it's a minimal number of samples at this time), be used in data evaluations in order to be consistent with sitewide data evaluation processes and in order to better depict OSDF conditions. DOE would like to implement the filtering protocol as soon as approval is granted and to use the filtered results, as appropriate, in the 2003 Site Environmental Report.

Conclusions:
DOE would like to implement the modifications above associated with OSDF data evaluation and reporting processes in the 2003 Site Environmental Report. Additionally upon approval, DOE would like to implement the filtering protocol used in the IEMP for those Great Miami Aquifer samples collected for OSDF purposes. Due to the complexities associated with the OSDF system and the factors identified above, DOE would like to continue to make further refinements regarding the post-baseline leak detection data evaluation process. These refinements would be presented to the OEPA and EPA for approval prior to implementation.

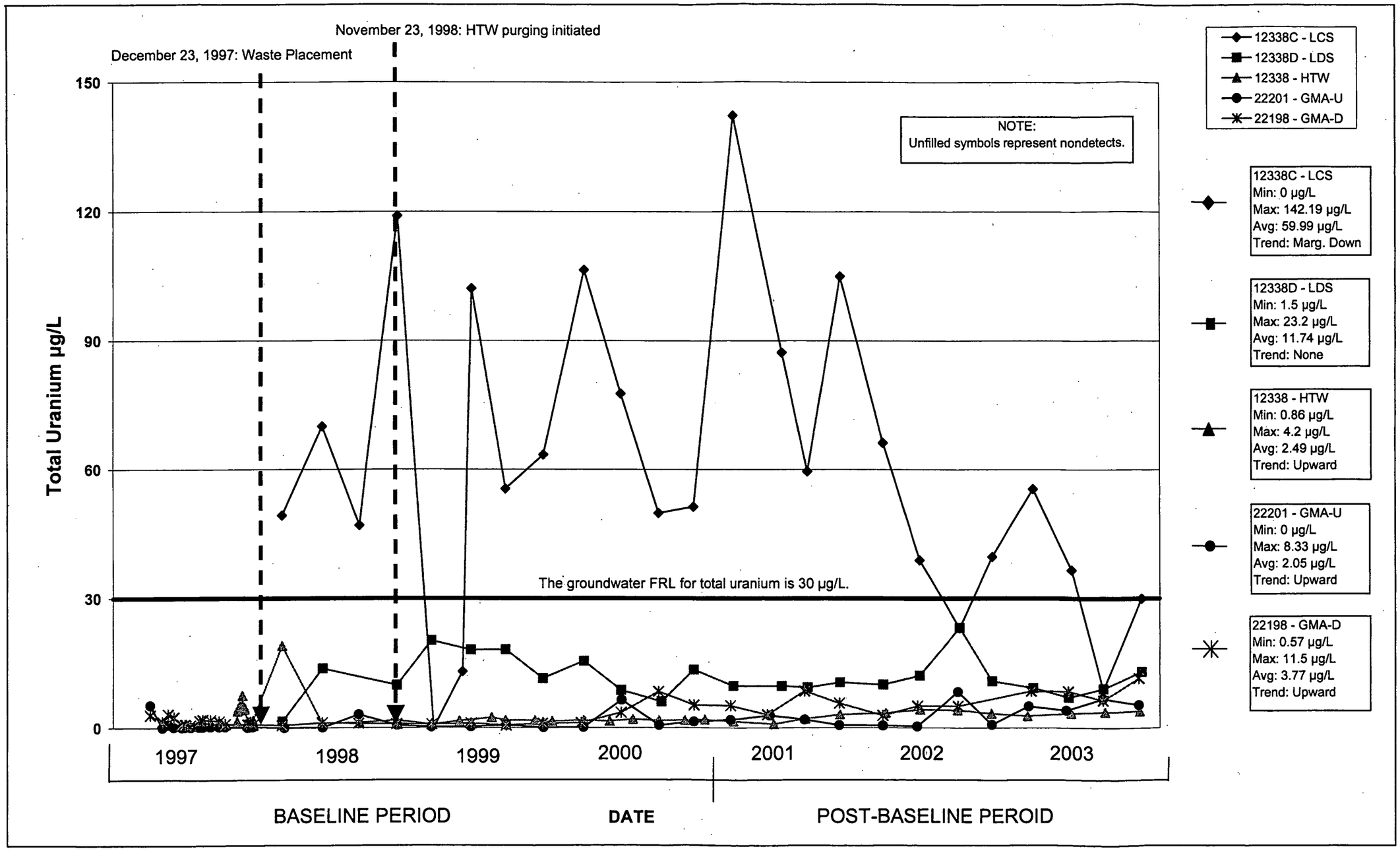

FIGURE 1. Cell 1 Total Uranium Concentrations versus Time Plot

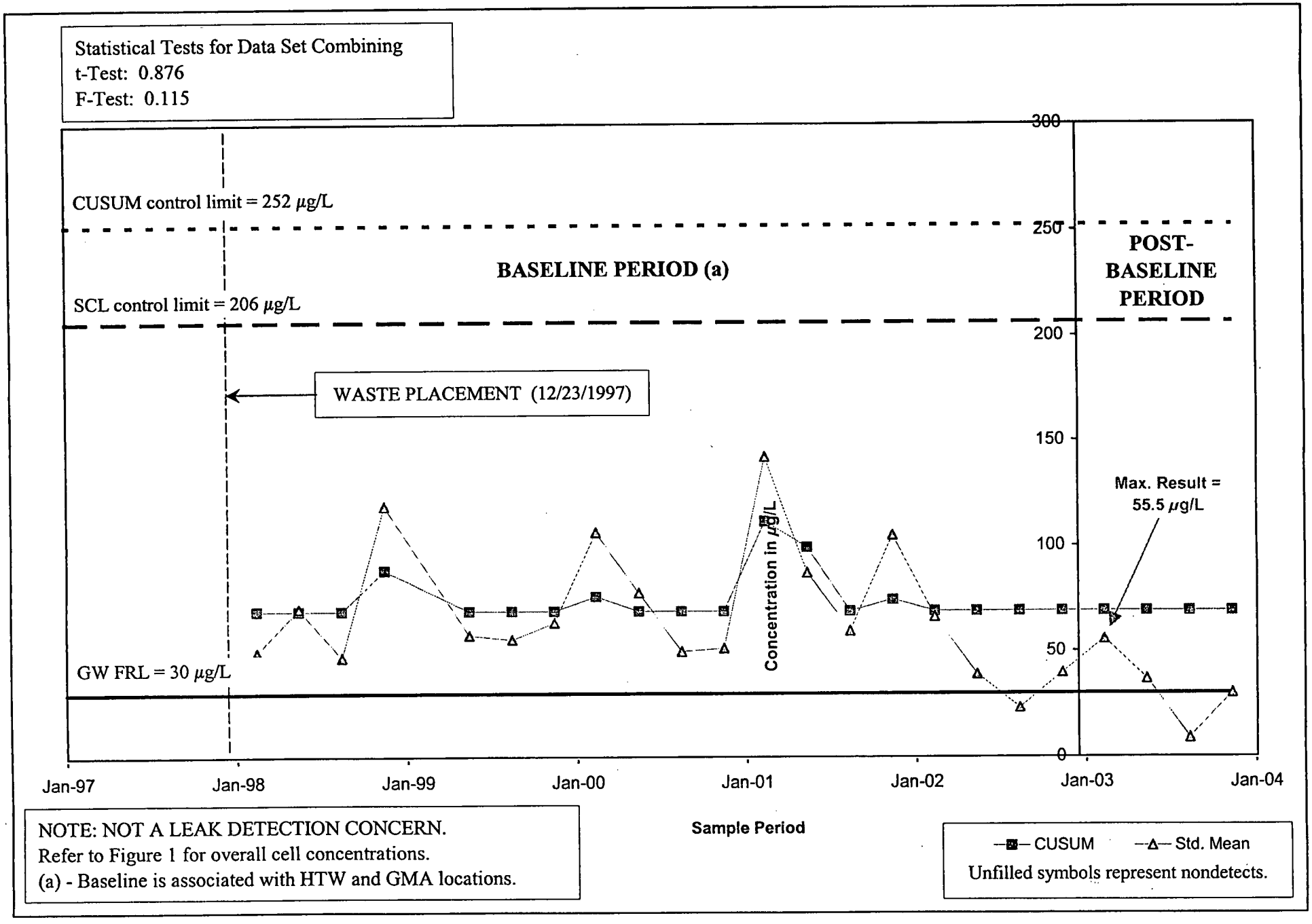

FIGURE 2. TOTAL URANIUM
CONCENTRATIONS AT CELL 1 LCS (Well 12338C) - MONITORING CONTROL CHART

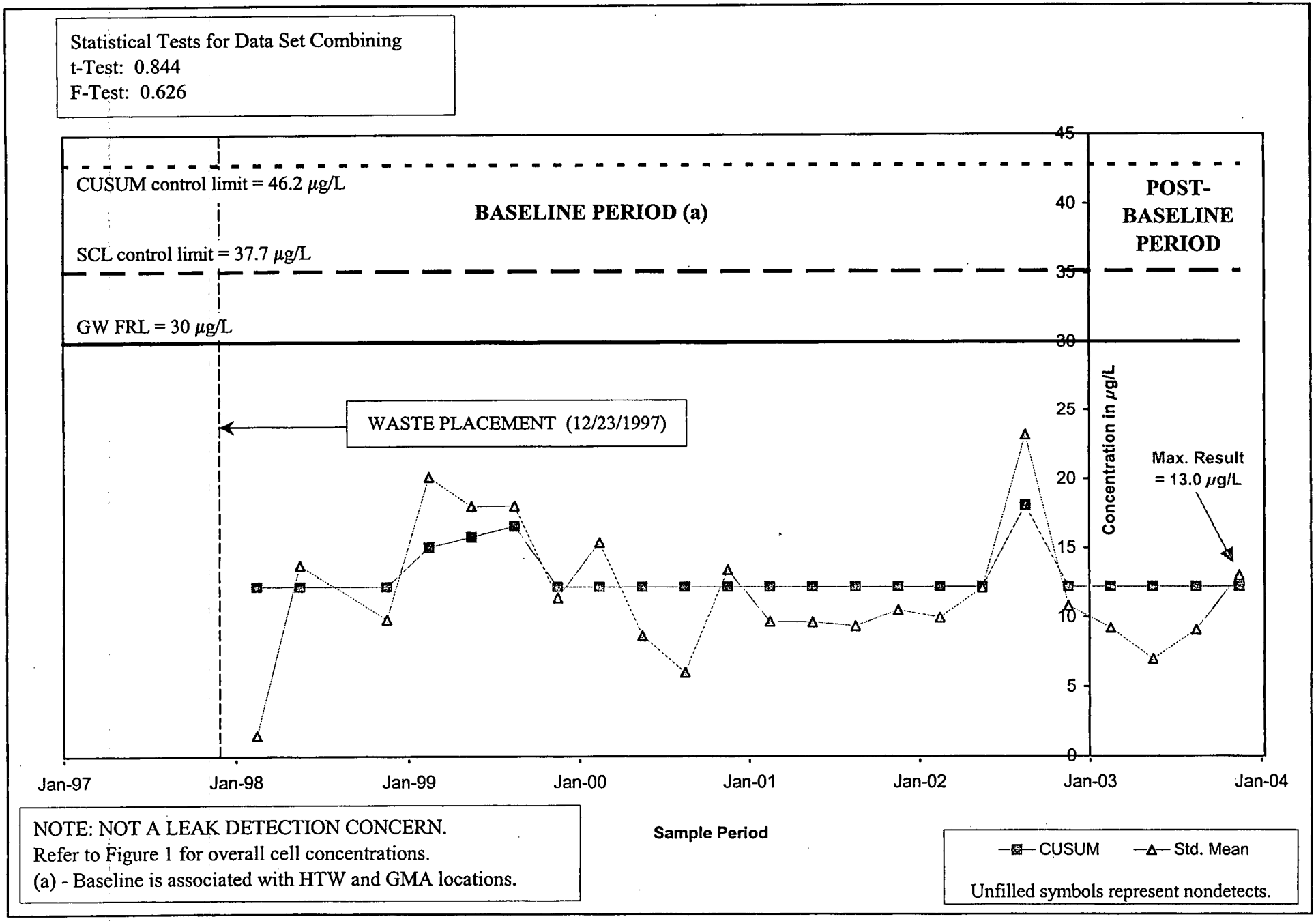

FIGURE 3. TOTAL URANIUM
CONCENTRATIONS AT CELL 1 LDS (Well 12338D) - MONITORING CONTROL CHART

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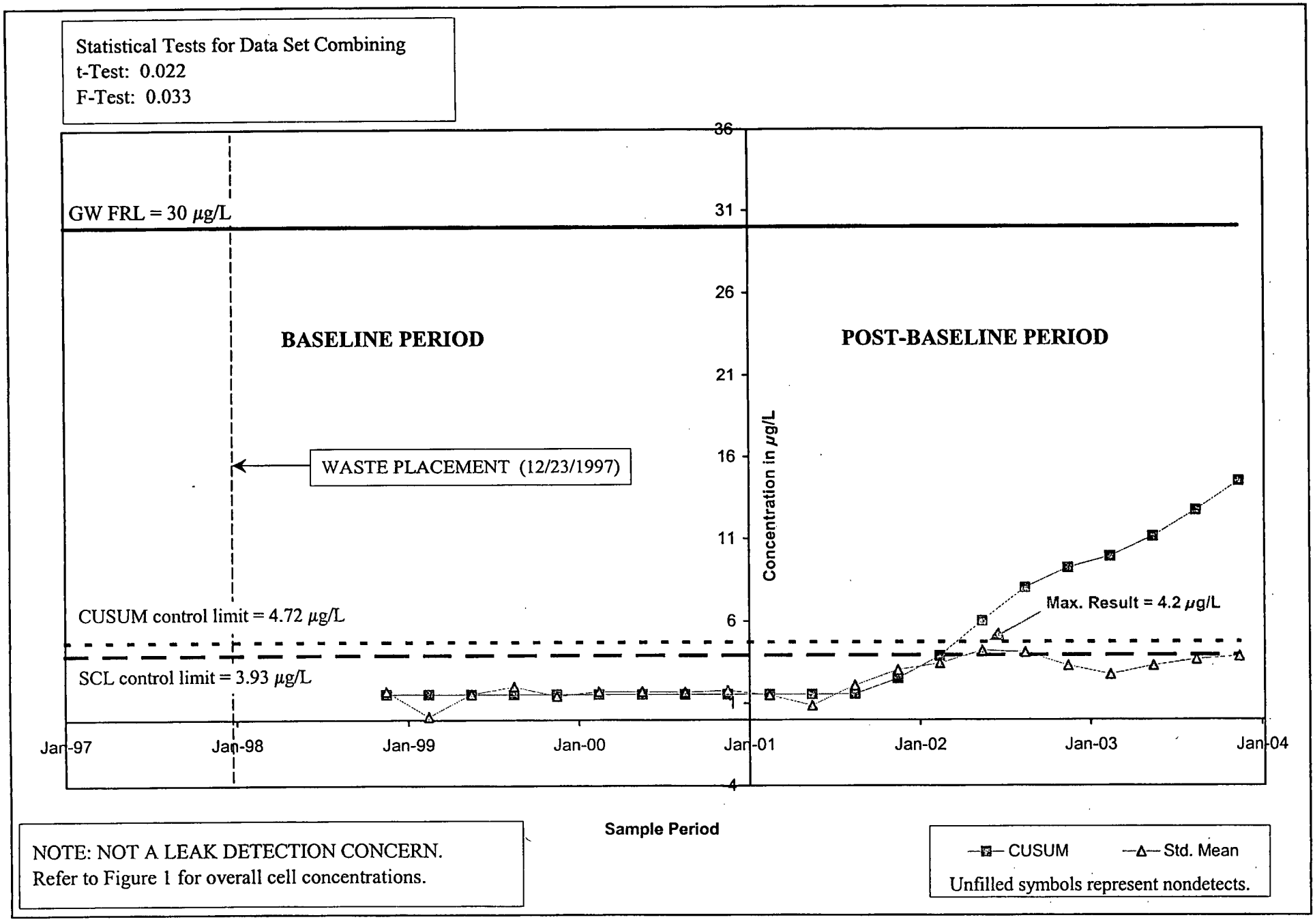

FIGURE 4. TOTAL URANIUM
CONCENTRATIONS AT CELL 1 HTW (Well 12338) - MONITORING CONTROL CHART

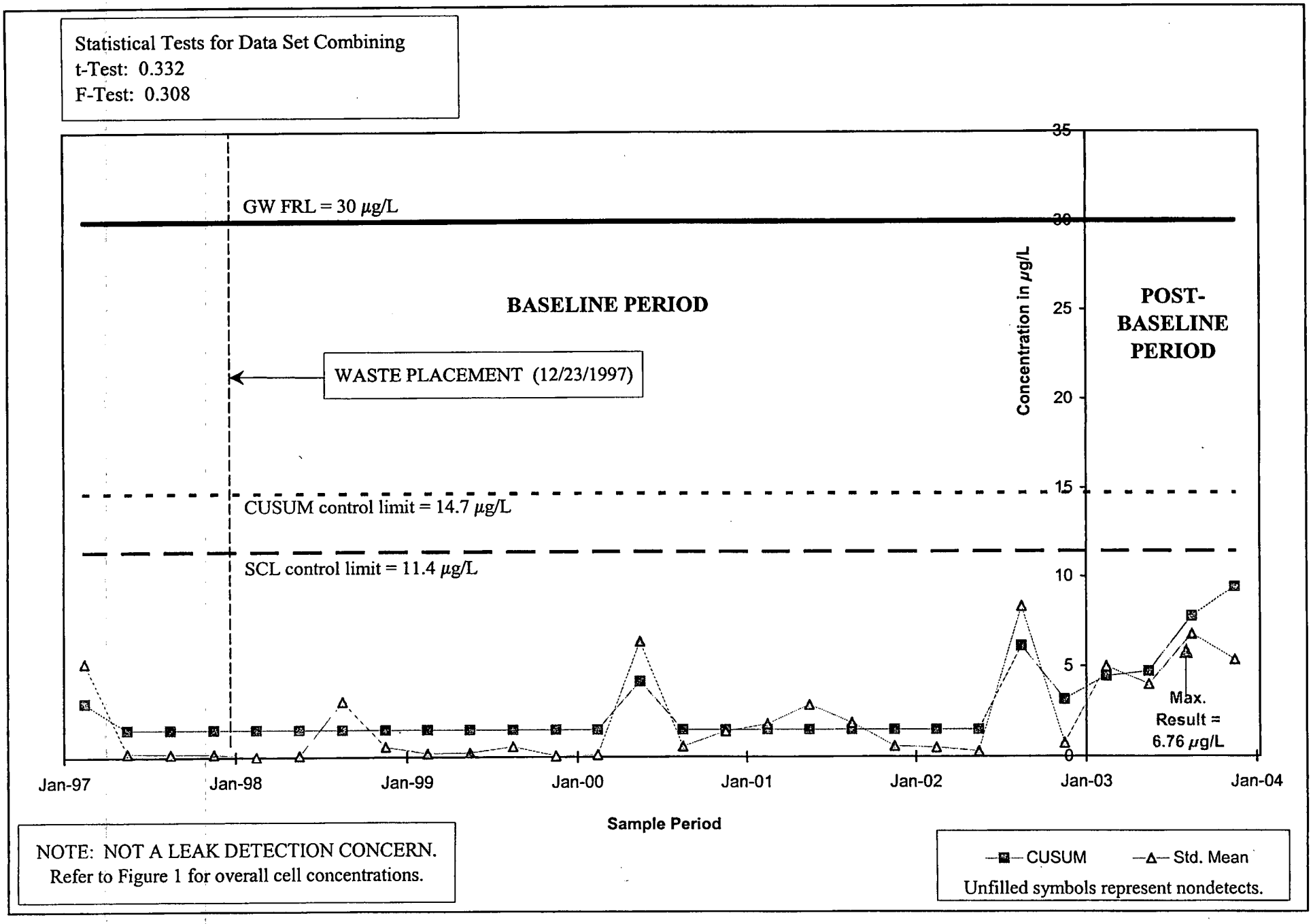

FIGURE 5. TOTAL URANIUM
CONCENTRATIONS AT CELL 1 GMA - UPGRADIENT (Well 22201) - MONITORING CONTROL CHART

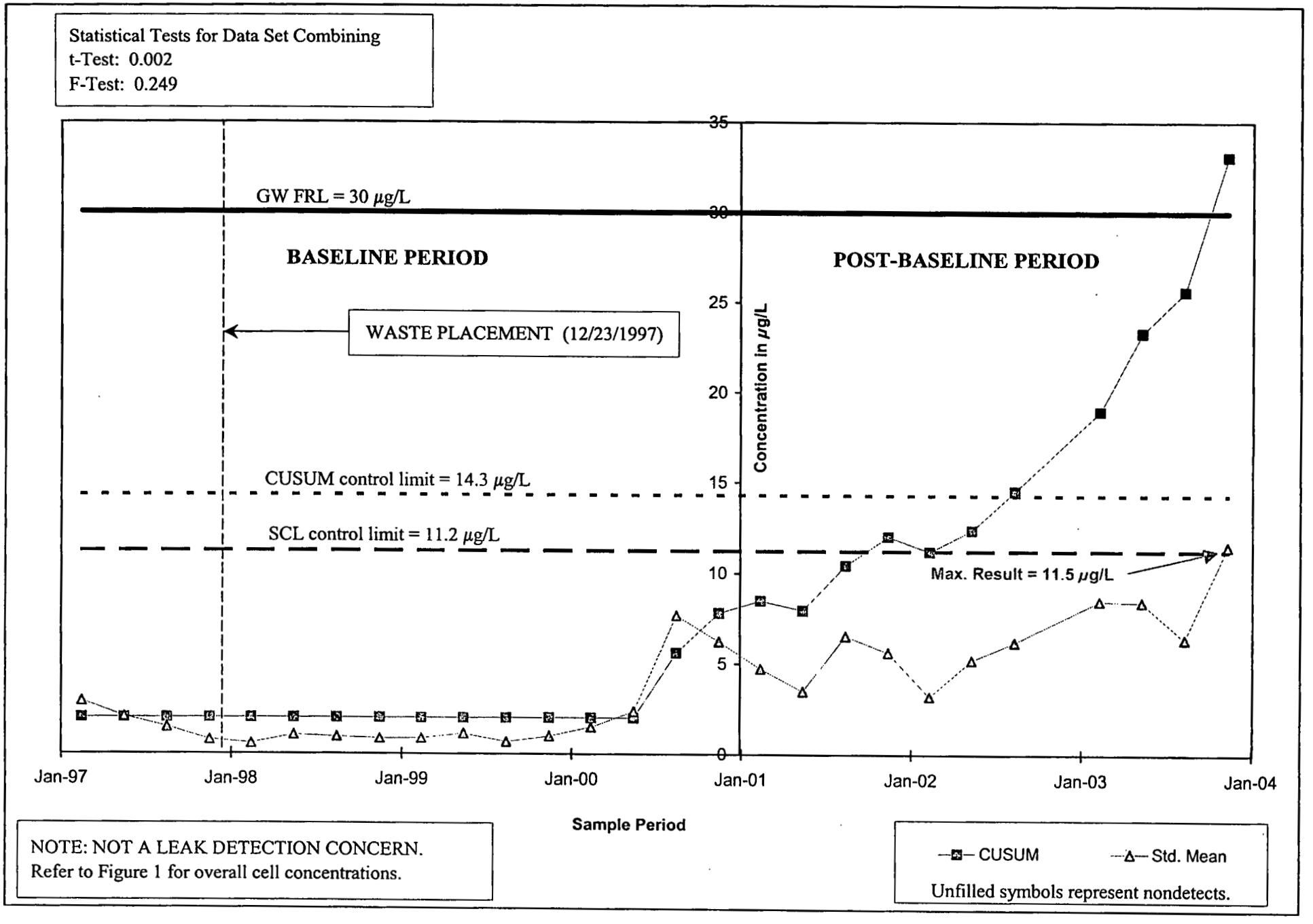

FIGURE 6. TOTAL URANIUM
CONCENTRATIONS AT CELL 1 GMA - DOWNGRADIENT (Well 22198) - MONITORING CONTROL CHART

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