December 17, 1997

MEMORANDUM

TO: Nick Vizzone, EPA

THROUGH: Mary Wolfe, SAIC

CC: Anita Cummings and Elaine Eby, EPA

FROM: Howard Finkel, ICF

SUBJECT: Calculation of Universal Treatment Standard (UTS) for HTMR Residues Using Data
Submitted by Horsehead Research Development (HRD) Co., Inc. and INMETCO

I followed the methodology presented in "Final Best Demonstrated Available Technology (BDAT) Background
Document For Quality Assurance/Quality Control Procedures and Methodology," dated October 23, 1991 to
evaluate the data submitted by both Horsehead Research Development (HRD) Co., Inc., and INMETCO. As
requested, I performed three sets of UTS calculations using: (1) HRD's data, (2) INMETCO's data, and (3) the
combination of HRD's data and INMETCO's data. I describe these three sets of analyses below.

EVALUATION OF HRD'S DATA

I entered all of HRD's data into an electronic spreadsheet for analysis. Attachment 1 presents a summary of all
the data submitted by HRD without any data manipulation.

In then used the Z-score test, as described in Attachment A-1 of the background document, to remove all the
data points that fell outside of the -2.0 to +2.0 range.[1] Based on the Z-score outlier test, I removed seven
arsenic data points, seven barium data points, nine beryllium data points, two chromium data points, ten lead
data points, seven nickel data points, one selenium data point, seven silver data points, and seven zinc data
points. Attachment 2 presents a summary of the Z-score analysis.

I then used the BDAT methodology to calculate variability factors and treatment standards. Specifically, I
followed Appendix D - Variability Factor to estimate the daily maximum

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[1]HRD did not provide influent concentrations; therefore, I was unable to determine if the effluent
concentrations were equal to, or greater than the influent concentrations.

variability factor using HRD's data. Following this procedure, I used equation [1], on page D-1 to calculate VF:

$$VF = \frac{C_{99}}{Mean}$$

Where:

$$C_{99} = EXP\ (y\ +\ 2.33 * Sy)$$

y   =   the mean of the logtransformed (natural log) data
Sy   =   the standard deviation of the logtransformed (natural log) data
Mean   =   the average of the individual performance values.

As noted on page D-2 of the background document, "For residuals with concentrations that are not all below the detection limit, the 99th percentile and the mean can be estimated using equation 1".

The treatment standard for each constituent was then calculated by taking the product of the variability factor and mean constituent concentration. Attachment 3 presents both the variability factors and treatment standards calculated using HRD's data - minus the statistical outliers.

EVALUATION OF INMETCO'S DATA

I entered all of INMETCO's data into an electronic spreadsheet for analysis. Attachment 4 presents a summary of all the data submitted by INMETCO without any data manipulation.

In then used the Z-score test, as described in Attachment A-1 of the background document, to remove all the data points that fell outside of the -2.0 to +2.0 range.[2] Based on the Z-score outlier test, I removed three antimony data points, four arsenic data points, two barium data points, five beryllium data points, two cadmium data points, two chromium data points, one lead data point, five nickel data points, three silver data points, and one vanadium data point. Attachment 5 presents a summary of the Z-score analysis.

I then used the BDAT methodology to calculate variability factors and treatment standards. Specifically, I followed Appendix D - Variability Factor to estimate the daily maximum variability factor using INMETCO's data. As described above, I used equation [1], on page D-1 to calculate the variability factor. The treatment standard for each constituent was then calculated by taking the product of the variability factor and mean constituent concentration. Attachment 6 presents both the variability factors and treatment standards calculated using INMETCO's data - minus the statistical outliers.

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[2]INMETCO did not provide influent concentrations; therefore, I was unable to determine if the effluent concentrations were equal to, or greater than the influent concentrations.

EVALUATION OF HRD'S AND INMETCO'S DATA

I combined HRD's and INMETCO's data into a single electronic spreadsheet for analysis. Attachment 7 presents a summary of all the data submitted by both HRD and INMETCO without any data manipulation.

In then used the Z-score test, as described in Attachment A-1 of the background document, to remove all the data points that fell outside of the -2.0 to +2.0 range.[3] Based on the Z-score outlier test, I removed six arsenic data points, seven barium data points, five beryllium data points, nine cadmium data points, thirteen chromium data points, ten lead data points, twelve selenium data points, one vanadium data point, and seven zinc data points. Attachment 8 presents a summary of the Z-score analysis.

I then used the BDAT methodology to calculate variability factors and treatment standards. Specifically, I followed <u>Appendix D - Variability Factor</u> to estimate the daily maximum variability factor using both HRD's and INMETCO's data. Again, I followed equation [1], on page D-1 to calculate the variability factor. The treatment standard for each constituent was then calculated by taking the product of the variability factor and mean constituent concentration. Attachment 9 presents both the variability factors and treatment standards calculated using both HRD's and INMETCO's data - minus the statistical outliers.

I present the results of the three sets of new UTS level calculations for HTMR residues using (1) Horsehead's data, (2) INMETCO's data, and (3) the combination of Horsehead's and INMETCO's data in Exhibit 1. For comparison, Exhibit 1 also presents the UTS levels calculated by Versar using data submitted by INMETCO.[4]

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[3]Neither HRD nor INMETCO provided influent concentrations; therefore, I was unable to determine if the effluent concentrations were equal to, or greater than the influent concentrations.

[4]Versar apparently did not conduct the Z-score test analysis to identify and remove statistical outliers from the variability factor and UTS level calculations.

EXHIBIT 1

SUMMARY OF REVISED UTS LEVELS FOR HTMR RESIDUES
(ALL VALUES HAVE BEEN ROUNDED TO TWO SIGNIFICANT FIGURES BY EXCEL)

	HRD	**INMETCO-New**	**INMETCO-Versar**	**HRD & INMETCO**
Antimony	0.61	0.025	0.043	0.45
Arsenic	0.022	0.028	0.026	0.035
Barium	5.9	2.4	3.3	6.3
Beryllium	0.0028	0.028	0.018	0.013
Cadmium	0.056	0.11	0.20	0.033
Chromium	0.28	0.60	0.85	0.15
Lead	0.19	0.10	0.12	0.18
Mercury	0.028	--	--	0.028
Nickel	0.089	11	13.6	26
Selenium	0.022	0.29	0.29	0.095
Silver*	0.020	0.14	0.11	0.063
Thallium	0.084	--	--	0.084
Vanadium	--	0.028	0.015	0.028
Zinc	2.3	3.8	3.8	2.7

*   Includes the 74 additional grab samples collected between January and May 1997 that were submitted
     by INMETCO in their comments on the 2nd Supplemental.

If you have any questions regarding the attached analyses, please call me at (703) 934-3656.

attachments

ATTACHMENT 1

ATTACHMENT 2

ATTACHMENT 3

ATTACHMENT 4

ATTACHMENT 5

ATTACHMENT 6

ATTACHMENT 7

ATTACHMENT 8

ATTACHMENT 9