ENVIRON

93 FEB -3 PM 7:14

To Regional Water Quality Control Board Date 2-5-93

2101 Webster Street, 4th Floor

Oakland, CA 94612

Attention: Mr. Richard Hiett

Project Title: Statistical Analysis of Curoco Metals Data

Environ Contract Number: 03-1332E

Enclosed are: 1 Copies of

- X Technical Reports
- ___ Data Reports
- ___ Proposals
- ___ Other

Title or Description of Enclosure: Background Concentrations of Total Chromium, Lead and Zinc at the Curoco Steel Systems Facility; Completeness of Site Remediation

536 Cleveland Avenue, Albany, California

For your:

- ___ Use
- ___ Information
- X Approval
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Sent at the request of Mr. Ron Mayo.

Copies to: [redacted]
R. Mayo

By Robert A. Ellgas
Robert A. Ellgas, Ph.D.
Manager

White — Original
Yellow — File
Pink — Originator

ENVIRON · Counsel in Health and Environmental Science Corporation
Marketplace Tower, 5820 Shellmound Street, Suite 700, Emeryville, CA 94608 · (510) 655-7400 · FAX (510) 655-9517

26 JANUARY 1993

MR. R. HIETT
REGIONAL WATER QUALITY CONTROL BOARD
2101 WEBSTER STREET
4TH FLOOR
OAKLAND, CALIF. 94612

RE: ENVIRONMENTAL CLEAN-UP AT CUROCO CO. 536 CLEVELAND AVE. ALBANY. CALIF.

DEAR MR. HIETT:

AS YOU MAY RECALL. ON AUGUST 14, 1992 YOU MET WITH LARRY SETO (ALAMEDA CO HEALTH CARE SVC). DREW SEUTTER (CERTIFIED GEOLOGIST OF ENVIRON CORP), AND ME REGARDING THE APPROVAL BY THE WATER QUALITY CONTROL BOARD FOR THE CLEAN-UP PERFORMED AT CUROCO'S ALBANY SITE.

PURSUANT TO YOUR REQUEST AT THE MEETING. CUROCO HAS CONTRACTED WITH ENVIRON CORP TO "RE-DO" THE STATISTICAL ANALYSIS USED IN THE REMEDIATION REPORT DATED 14 APRIL 1992. (REFERENCE THE ESTABLISHMENT OF BACKGROUND SOIL METALS CONCENTRATIONS AT THE SITE.)

ENVIRON CORP HAS RECENTLY COMPLETED THIS ANALYSIS AND THEIR PERSONNEL FEEL CONFIDENT YOU WILL FIND THE RESULTS ACCEPTABLE.

THROUGH ENVIRON'S GUIDANCE. CUROCO HAS REPLACED ALL CONTAMINATED SOILS FROM THE SITE WITH CERTIFIED CLEAN SOIL.

CONSIDERING THE FACT THAT MANY HUNDREDS OF ACRES IN THAT AREA WERE CREATED BY IMPORTED "FILL" SOILS OF DUBIOUS ORIGIN EARLY IN THIS CENTURY. I KNOW THAT CUROCO STEEL SYSTEMS HAS PERFORMED THE BEST CLEAN-UP POSSIBLE RELATING TO THE SOILS WITH METAL CONTAMINATION AND THE REMOVAL OF THE TANK AND AFFECTED SOILS.

SINCERELY,

RON MAYO
PRES. CUROCO MGMT CORP
c/o 225 SCOFIELD DR
MORAGA. CALIF. 94556

1 ATCH- ENVIRON ADDENDUM TO CUROCO REPORT OF 14 APR 92.

cc- MR. LARRY SETO ALAMEDA CO HEALTH CARE SVC

ENVIRON

January 25, 1993

Mr. Ron Mayo, President
Curoco Management Corporation
225 Scofield Drive
Moraga, CA 94556

Re: Background Concentrations of Total Chromium, Lead and Zinc at the Curoco Steel Systems Facility; Completeness of Site Remediation
536 Cleveland Avenue, Albany, California
ENVIRON Contract No. 03-1332E

Dear Ron:

ENVIRON is providing this Addendum to our April 14, 1992 report *Phase I and Phase II Environmental Audits and Soil Remediation, Curoco Steel Systems, 536 Cleveland Avenue, Albany, California*, based on comments received from the California Regional Water Quality Control Board (RWQCB) in a meeting on August 14, 1992. In that meeting, the RWQCB stated that statistical analysis would need to be conducted on the existing metals concentration data to establish background soil metals concentrations for the site. If the soil remediation previously conducted at the site restored the site to background conditions with respect to total chromium, lead, and zinc concentrations, then the RWQCB would be able to reach closure on the metals issue.

ENVIRON recently completed this statistical analysis. Based on this analysis, we conclude that remediation at the site brought concentrations of the metals of concern within site-specific background ranges, and we recommend that the RWQCB close on this issue.

The statistical analysis method used was the same as that approved by the RWQCB for another site[1]. The objective of this method is summarized as follows: Chromium, lead, and zinc, the three inorganic constituents of concern at the Curoco site, occur naturally in soils. Because of their natural occurrence, the background distributions of soil concentrations of these metals must be statistically differentiated from the concentrations in the soil that would potentially be attributed to chemical releases. Based on the fairly large number of concentration data available from ENVIRON's Phase II Audit program

[1]ENVIRON December 24, 1991. *Remedial Design Sampling Report, 640 Page Mill Road Facility, Hewlett-Packard Company, Palo Alto, California*, RWQCB File No. 2189.8063A (JKB)

(over 50 measurements), it is theoretically possible to obtain valid and reliable statistics on the background distributions of these three metals, and hence to reliably differentiate the "signal" of a potential chemical release from the "noise" of background variation.

Calculation of Background Concentrations of Chromium, Lead, and Zinc

Table 1A provides numerical sortings of the Phase II Audit soil sample analytical results for chromium, lead, and zinc. Frequency histograms for these measurements are presented in Figures 1A, 3A, and 5A. Table 1A also provides the natural log (ln)-transformed concentration data for these metals, and Figures 2A, 4A, and 6A present the corresponding log-transformed frequency histograms. Visual inspection of the log-transformed frequency histograms indicates that, in general, the lower (background) concentrations on the histograms approximate normal distribution models. Normal sample statistics (the mean and the standard deviation) can therefore be easily calculated for these log-transformed data and then applied in establishing the background concentrations of chromium, lead and zinc.

To calculate sample means and standard deviations for background concentrations, each sorted metal data base was initially screened for high concentrations that did not likely represent background. In addition, some values that were at the high end of the background distribution, and therefore conceivably might not have represented background concentrations, were conservatively screened out. "Cutoff values," below which the measurements were assumed to represent background concentrations, were chosen and then tested. The "test" background population data were log-transformed, and means and standard deviations were calculated on the log-transformed test data. Normal deviates (means plus varying numbers of standard deviations) were then calculated, and the deviates were then reconverted into non-transformed statistics and compared to the original cutoff values. This test was performed iteratively until the mean plus two standard deviations (or approximately 95 percent of the background sample data) matched as closely as possible to the background cutoff value. This deviate could then be used to represent the limit of background concentrations of chromium, lead, and zinc. However, because the cutoff values were all lower than their corresponding deviates, it is conservatively assumed that the cutoff values actually represent the limits on background concentrations of these three metals. Statistically, more than five percent of the concentrations beyond these cutoff values will still be background concentrations.

As indicated by the heavy bars in Table 1, the limits on concentrations that could conservatively be expected to represent background concentrations are: 110 mg/kg for chromium, 140 mg/kg for lead, and 450 mg/kg for zinc. However, it is once again emphasized that concentrations higher than these values have, on the average, more than a five percent probability of representing background concentrations.

Comparison of Background Concentrations to Remediation Verification Data

Table 2A summarizes remediation verification sample results for soils left in place after several phases of excavation were completed at the site[2]. When these data are compared to the background concentration limits calculated from Table 1, it can be seen that there is only one concentration (chromium at 200 mg/kg in Sample #20) that potentially could be considered above the conservatively-calculated background concentration limit.

To decide whether this single result might realistically be considered to be above the background concentration for chromium (and hence whether remediation was completed in this particular location), it is necessary to compare the incidence of above-background concentrations of chromium based on its calculated cutoff value with the corresponding incidence of above-background concentrations of lead and/or zinc based on their calculated cutoff values. Due to the nature of past operations at the site, it is reasonable to assume that a high incidence of above-background concentrations of chromium in the soil would result in a correspondingly high incidence of above-background concentrations of lead and/or zinc in the soil. Conversely, the same would be true for corresponding incidences of background concentrations for the three metals. Table 3A, a numerical sorting of chromium concentrations and the corresponding lead and zinc concentrations from the Phase II Audit Program, clearly indicates that these assumptions are valid[3].

Table 2A indicates that the soil sample containing the chromium concentration at 200 mg/kg (above the conservatively-calculated background concentration limit) contained lead at 23 mg/kg and zinc at 120 mg/kg. Both of these results are considerably below the conservatively-calculated background concentration limits for lead and zinc. It is therefore concluded that it is very likely that the 200 mg/kg concentration for chromium is a background concentration. In other words, this concentration is very likely one of the more than five percent of concentration values that are assumed to derive from the background concentration distribution of chromium, but that are beyond the conservatively-calculated background limit.

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[2]Taken from Table 3 of the *Phase I and II Environmental Audits and Soil Remediation* report (ENVIRON April 14, 1992).

[3]The primary conclusions inferred from the data in Table 3A are: 1) there are only two instances in 40 measurements where background concentrations of chromium are not found with background concentrations of lead and zinc; and 2) there is only one instance in 14 measurements where an above-background concentration of chromium is not found with above-background concentrations of lead and zinc.

Summary, Conclusion and Recommendation

By using a statistical method approved by the RWQCB at another site, and based on the Phase II audit data collected at the Curoco Steel Systems facility, the conservatively-calculated background concentration limits for chromium, lead and zinc are, respectively, 110 mg/kg, 140 mg/kg, and 450 mg/kg. Based on the remediation verification sampling data collected at the facility, only one sample had a concentration of one metal above the conservatively-calculated background limit (chromium at 200 mg/kg). However, this sample contained lead and zinc at concentrations considerably below the background cutoff values. By comparing the incidence of above-background concentrations of chromium with corresponding above-background concentrations of lead and/or zinc, it is very likely that this chromium concentration represents a background value beyond the conservatively-calculated background limit. Thus, ENVIRON concludes that remediation at the site brought concentrations of the metals of concern within site-specific background ranges, and that no further action is warranted. We recommend that the RWQCB close on the metals issue at the facility.

If you have any questions on this Addendum to our April 14, 1992 report, please call.

Very truly yours,

Robert A. Ellgas

Robert A. Ellgas, Ph.D.
Manager

Andrew E. Seutter

Andrew E. Seutter
Certified Engineering Geologist
EG 1485 (exp. 6/30/94)

Phillip L. Fitzwater
Principal

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Attachments

TABLE 1A
Numerical Sorting of Soil Concentrations of
Total Chromium, Lead, and Zinc in Phase II Audit Samples
Curoco Steel Systems
Albany, California

	Chromium	ln(chrome)	Lead	ln(lead)	Zinc	ln(zinc)
	20	3.00	6	1.79	32	3.47
	22	3.09	6	1.79	32	3.47
	23	3.14	9	2.20	38	3.64
	28	3.33	12	2.48	44	3.78
	28	3.33	14	2.64	48	3.87
	28	3.33	14	2.64	50	3.91
	31	3.43	14	2.64	57	4.04
	35	3.56	14	2.64	58	4.06
	35	3.56	16	2.77	58	4.06
	35	3.56	20	3.00	62	4.13
	37	3.61	22	3.09	68	4.22
	37	3.61	25	3.22	68	4.22
	38	3.64	33	3.50	72	4.28
	39	3.66	34	3.53	76	4.33
	40	3.69	37	3.61	80	4.38
	40	3.69	39	45.2 3.66	89	4.49
	42	3.74	51	3.93	93	4.53
	43	3.76	51	3.93	94	4.54
	44	3.78	53	3.97	120	4.79
	45	3.81	55	4.01	140	4.94
	45	3.81	55	4.01	140	4.94
	47	3.85	56	4.03	140	4.94
	49	3.89	59	4.08	145	4.98
	52	3.95	59	4.08	170	5.14
	54	3.99	65	4.17	180	5.19
	54	3.99	65	4.17	185	5.22
	54	3.99	68	4.22	195	5.27
	55	4.01	69	4.23	215	5.37
	56	4.03	70	4.25	220	5.39
	61	4.11	71	4.26	225	5.42
	63	4.14	74	4.30	240	5.48
	64	4.16	78	4.36	245	5.50
	68	4.22	81	4.39	260	5.56
	69	4.23	83	4.42	270	5.60
	81	4.39	85	4.44	335	5.81
	85	4.44	107	4.67	360	5.89
	99	4.60	110	4.70	385	5.95
	100	4.61	119	4.78	450	6.11
	110	4.70	140	94.34 4.94	475	6.16
	110	4.70	149	5.00	550	6.31
	140	4.94	160	5.08	690	6.54
	140	4.94	183	5.21	800	6.68
	150	5.01	190	5.25	880	6.78
	175	5.16	238	5.47	910	6.81
	188	5.24	265	5.58	1050	6.96
	190	5.25	360	5.89	1120	7.02
	210	5.35	410	6.02	1440	7.27
	380	5.94	540	6.29	1800	7.50
	710	6.57	565	6.34	2150	7.67
	920	6.82	675	6.51	2520	7.83
	928	6.83	750	6.62	3000	8.01
	1100	7.00	760	6.63	6000	8.70
	2850	7.96	810	89.46 6.70	13000	9.47
	6700	8.81	960	6.87	18600	9.83
COUNT:	**54**	**54**	**54**	**54**	**54**	**54**
MEAN:	**51.65**	**3.85**	**52.28**	**3.68**	**151.03**	**4.76**
STDEV:	**--**	**0.43**	**--**	**0.84**	**--**	**0.74**
M+2SD:	**111.34**	**4.71**	**213.66**	**5.36**	**517.33**	**6.25**

TABLE 2A

Remediation Verification Soil Sample Analytical Results
Curoco Steel Systems
Albany, California

Sample Number	Date	Total Metal Concentration (mg/kg)		
		Chromium	Lead	Zinc
#1 @ 6"	1/14/91	12	3.9	44
#2 @ 6"	1/14/91	41	57	120
#3 @ 6"	1/14/91	12	31	67
#4 @ 6"	1/14/91	17	51	96
#5 @ 6"	1/14/91	13	41	76
#6 @ 6"	1/16/91	26	32	77
#7	1/18/91	49	44	200
#13	1/18/91	12	49	42
#14	1/18/91	8	82	150
#15	1/18/91	40	71	200
#16	1/18/91	32	82	180
#17	1/18/91	12	62	110
#18	1/18/91	22	86	340
#19	1/18/91	11	68	180
#20	1/18/91	200	23	120
#1B	2/1/91	24	62	67
#2B	2/1/91	38	10	70
#3B	2/1/91	57	85	200
#4B	2/27/91	47	29	110
#5B	2/27/91	37	43	98

n:\wp\c\curoco\tbl.2a

TABLE 3A
Numerical Sorting of Phase II Audit Soil Sample Concentrations of Chromium and Corresponding Soil Concentrations of Lead and Zinc
Curoco Steel Systems
Albany, California

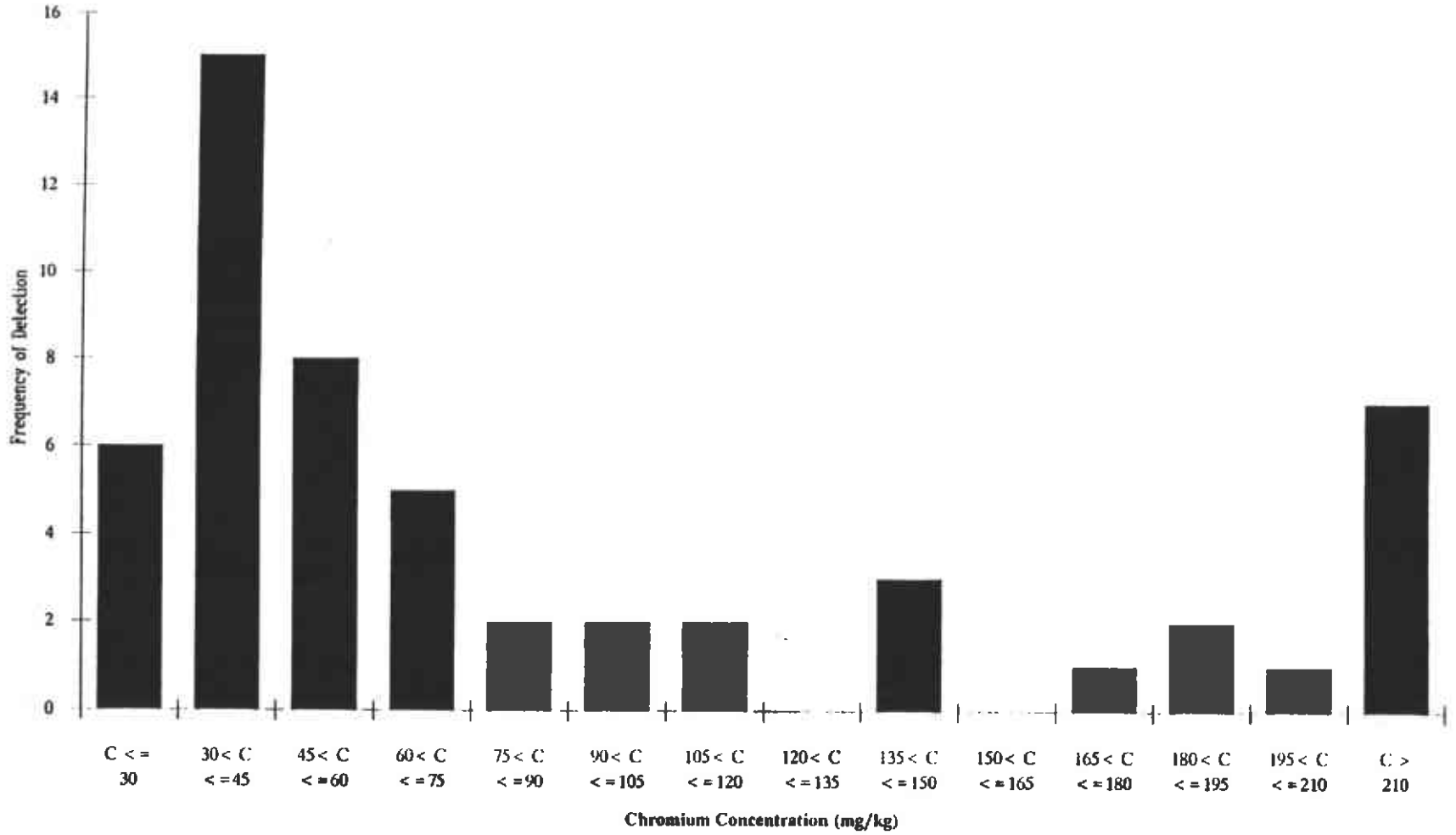
	Background Concentrations of Chromium	Corresponding Concentrations of Lead	Corresponding Concentrations of Zinc
	20	53	335
	22	70	58
	23	65	215
	28	81	185
	28	59	195
	28	39	145
	31	55	245
	35	69	475
	35	51	385
	35	14	32
	37	55	68
	37	65	89
	38	59	240
	39	78	94
	40	71	93
	40	265	270
	42	6	32
x	43	183	690
	44	33	140
	45	14	44
	45	56	360
	47	83	225
	49	14	57
	52	74	220
	54	25	80
	54	6	38
	54	37	72
	55	14	120
x	56	149	2150
	61	20	68
	63	12	48
	64	68	550
	68	16	50
	69	9	58
	81	22	62
	85	107	1050
	99	160	140
	100	85	140
	110	140	180
	110	51	76

	Above-background Concentrations of Chromium	Corresponding Concentrations of Lead	Corresponding Concentrations of Zinc
	140	540	1440
	140	119	450
xx	150	110	170
	175	360	800
	188	410	1120
	190	190	260
	210	238	910
	380	34	880
	710	565	1800
	920	760	18600
	928	675	3000
	1100	750	2520
	2850	960	6000
	6700	810	13000

x: instances where background concentrations of chromium have corresponding above-background concentrations of lead and zinc.

xx: instance where above-background concentration of chromium has corresponding background concentrations of lead and zinc.

FIGURE 1A



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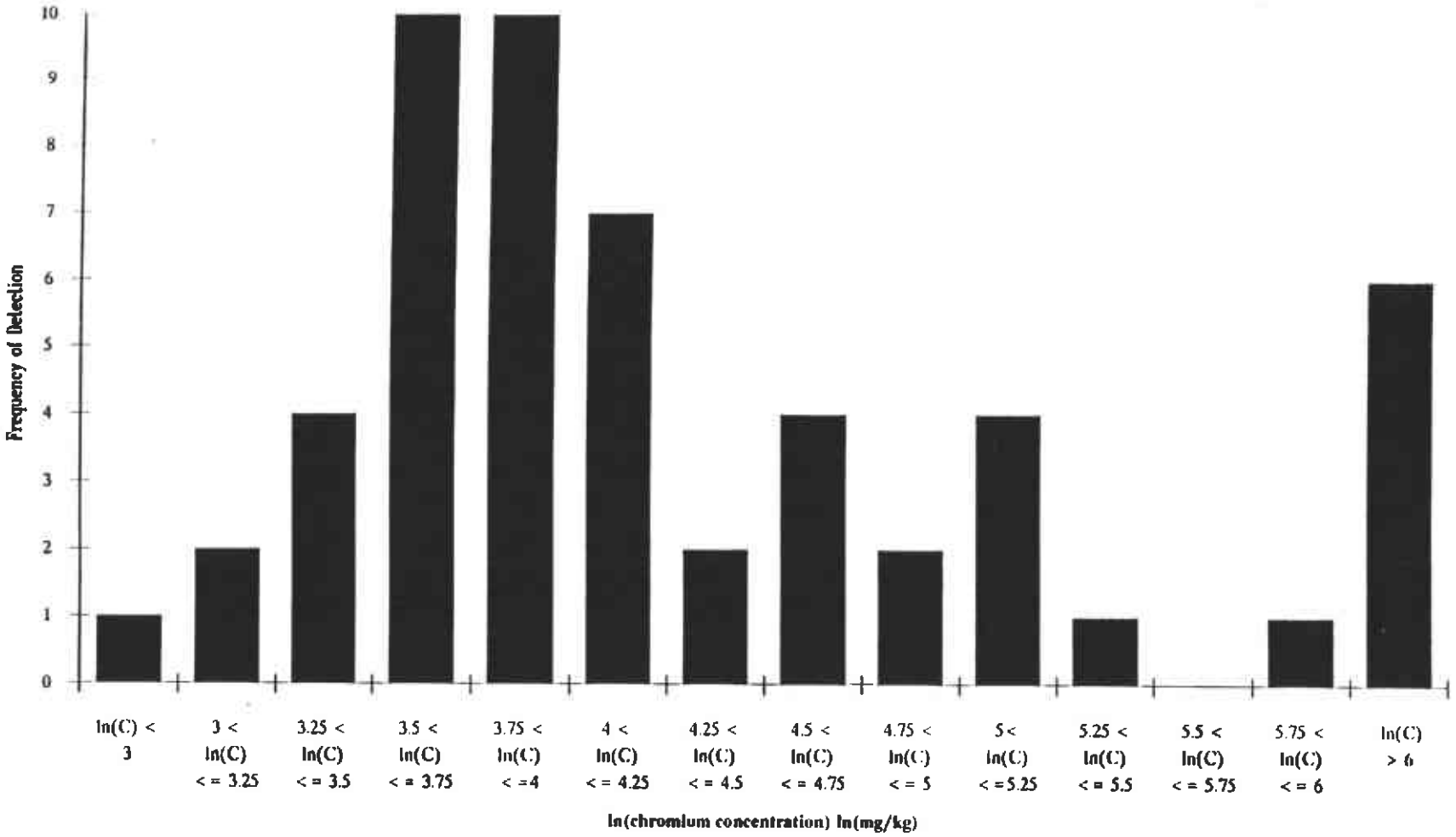
Counsel in Health and Environmental Science

Histogram - Chromium Concentrations in Phase II Audit Samples
Curoco Steel Systems
Albany, California

Figure **1A**

Drafter: RS Date: 12/92 Contract Number: 03-1332E Approved: R. Ellgas Revised:

FIGURE 2A



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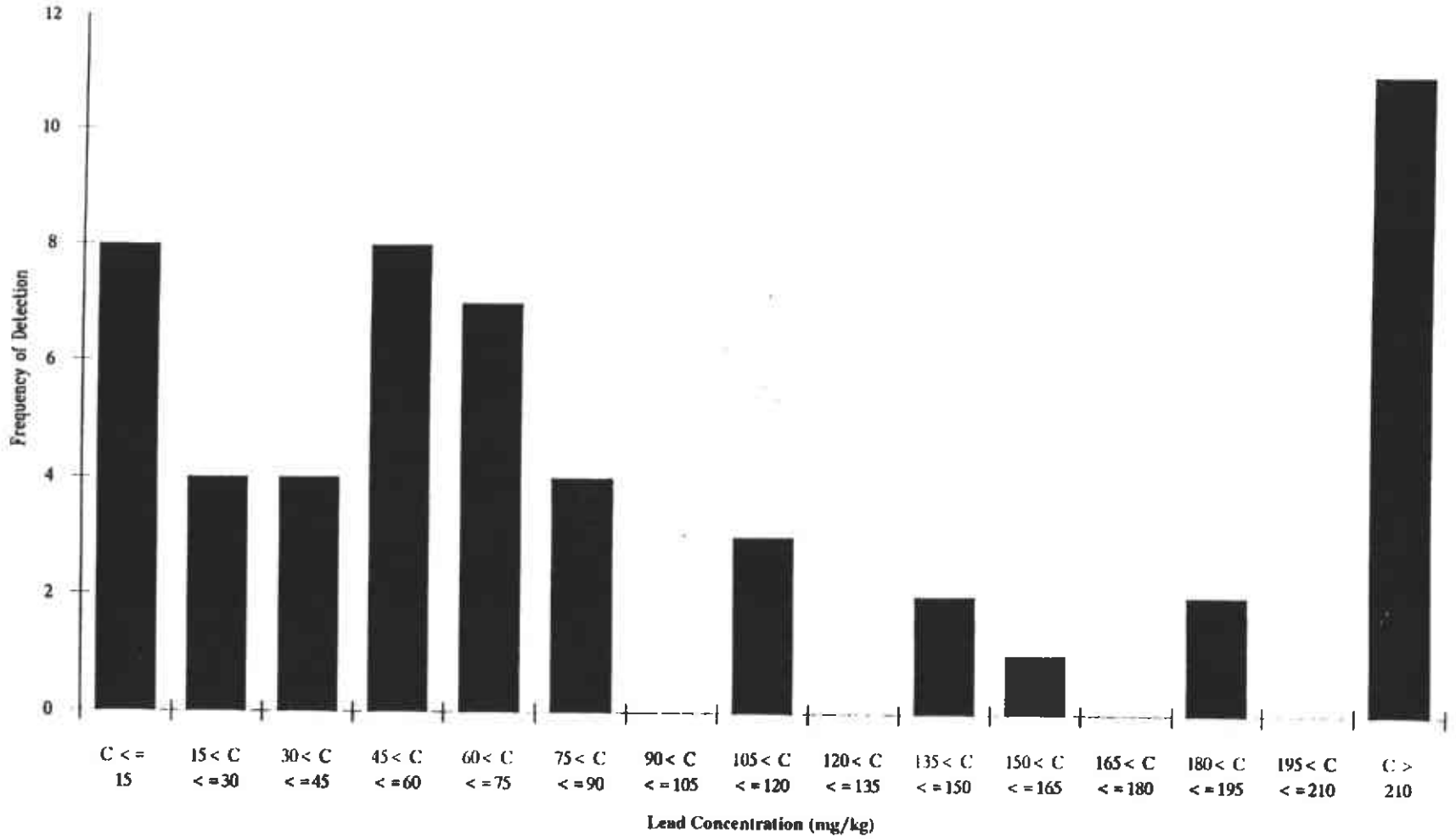
Histogram - Natural Log (ln) of Chromium Concentrations in Phase II Audit Samples
Curoco Steel Systems
Albany, California

Figure **2A**

Drafter: RS Date: 12/92 Contract Number: 03-1332E Approved: R. Ellgas Revised:

FIGURE 3A



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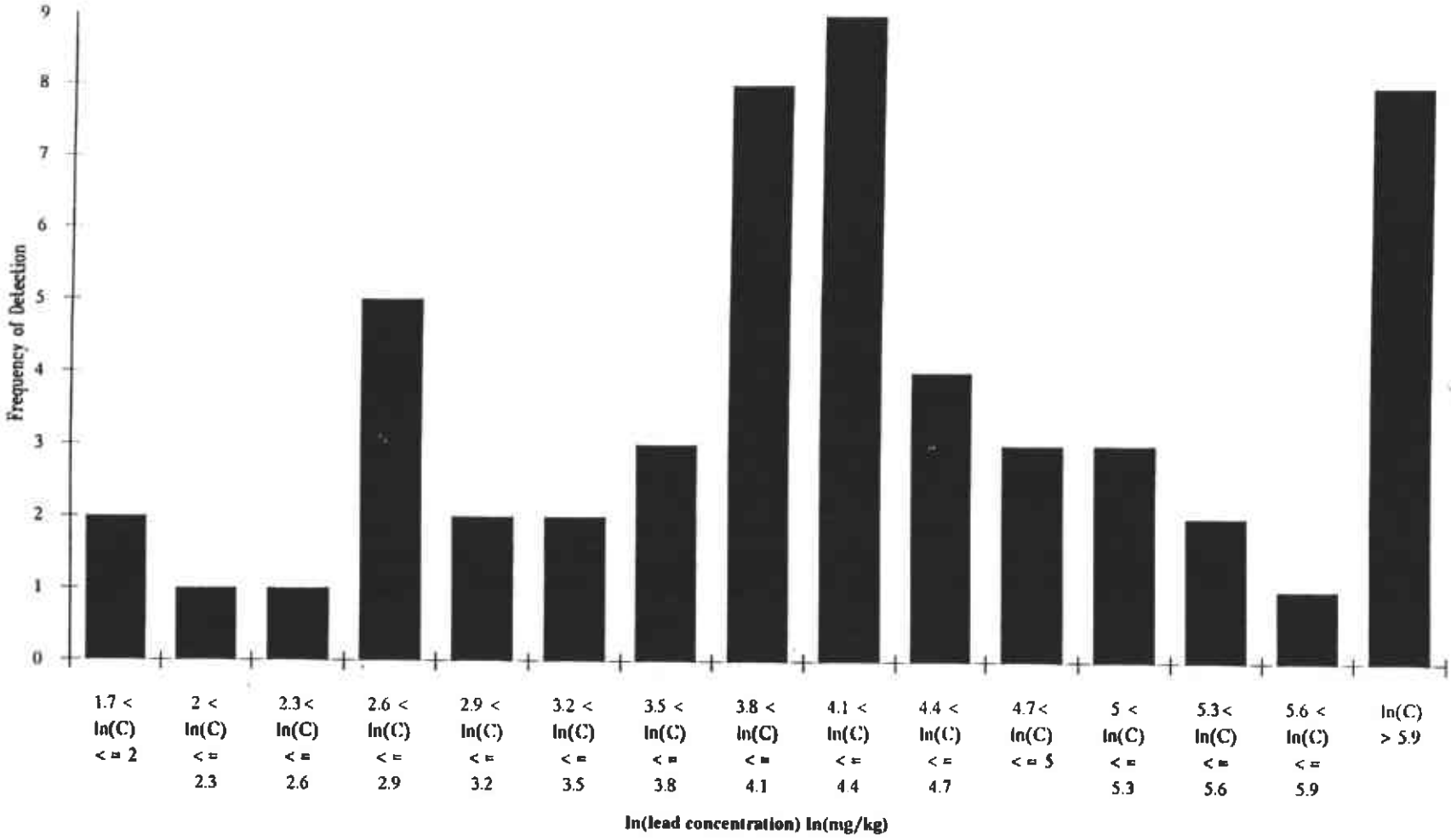
Histogram - Lead Concentrations in Phase II Audit Samples
Curoco Steel Systems
Albany, California

Figure 3A

Drafter: RS Date: 12/92 Contract Number: 03-1332E Approved: R. Ellgas Revised:

FIGURE 4A



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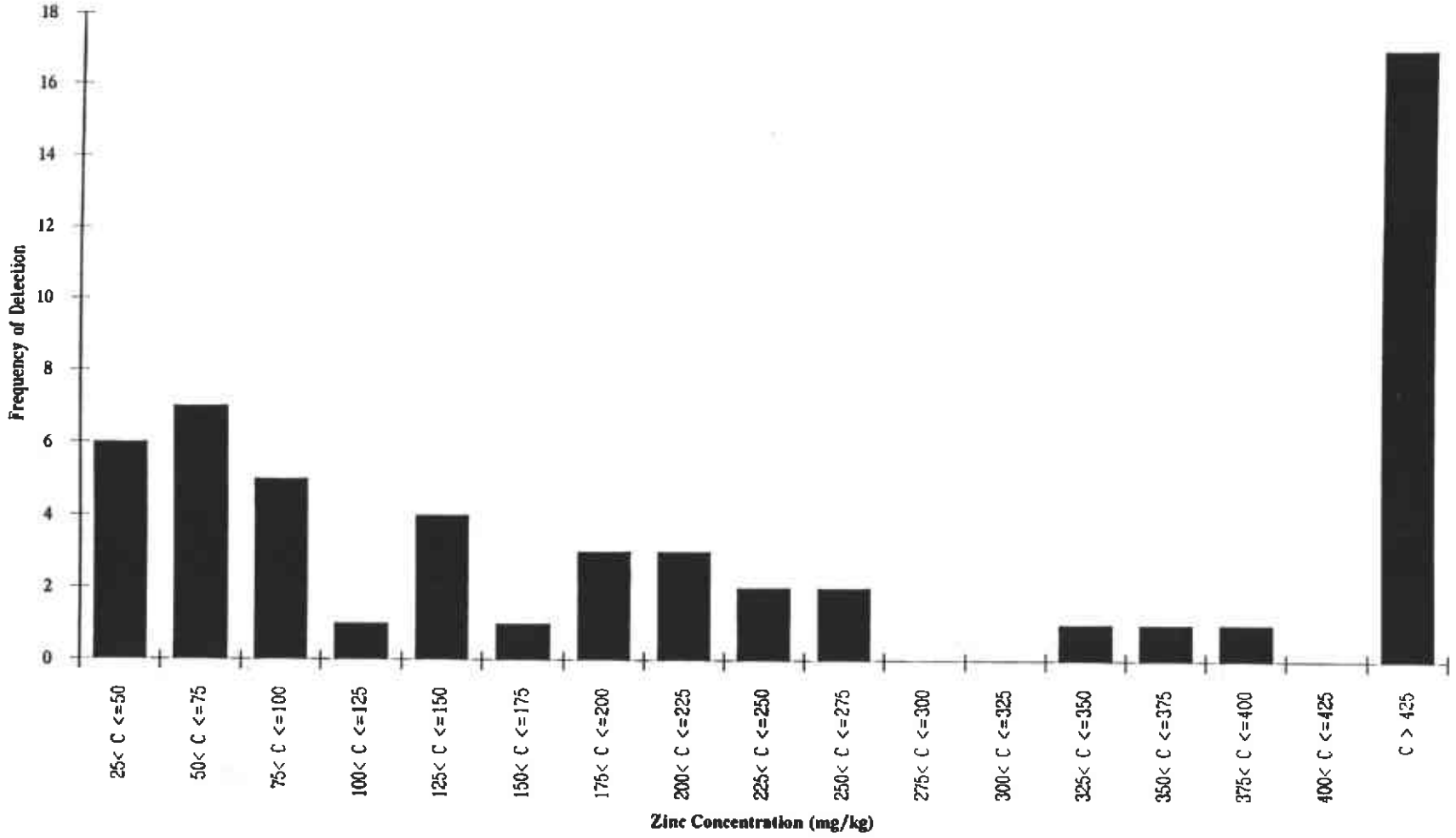
Histogram - Natural Log (ln) of Lead Concentrations in Phase II Audit Samples
Curoco Steel Systems
Albany, California

Figure 4A

Drafter: RS Date: 12/92 Contract Number: 03-1332E Approved: R. Ellgas Revised:

FIGURE 5A



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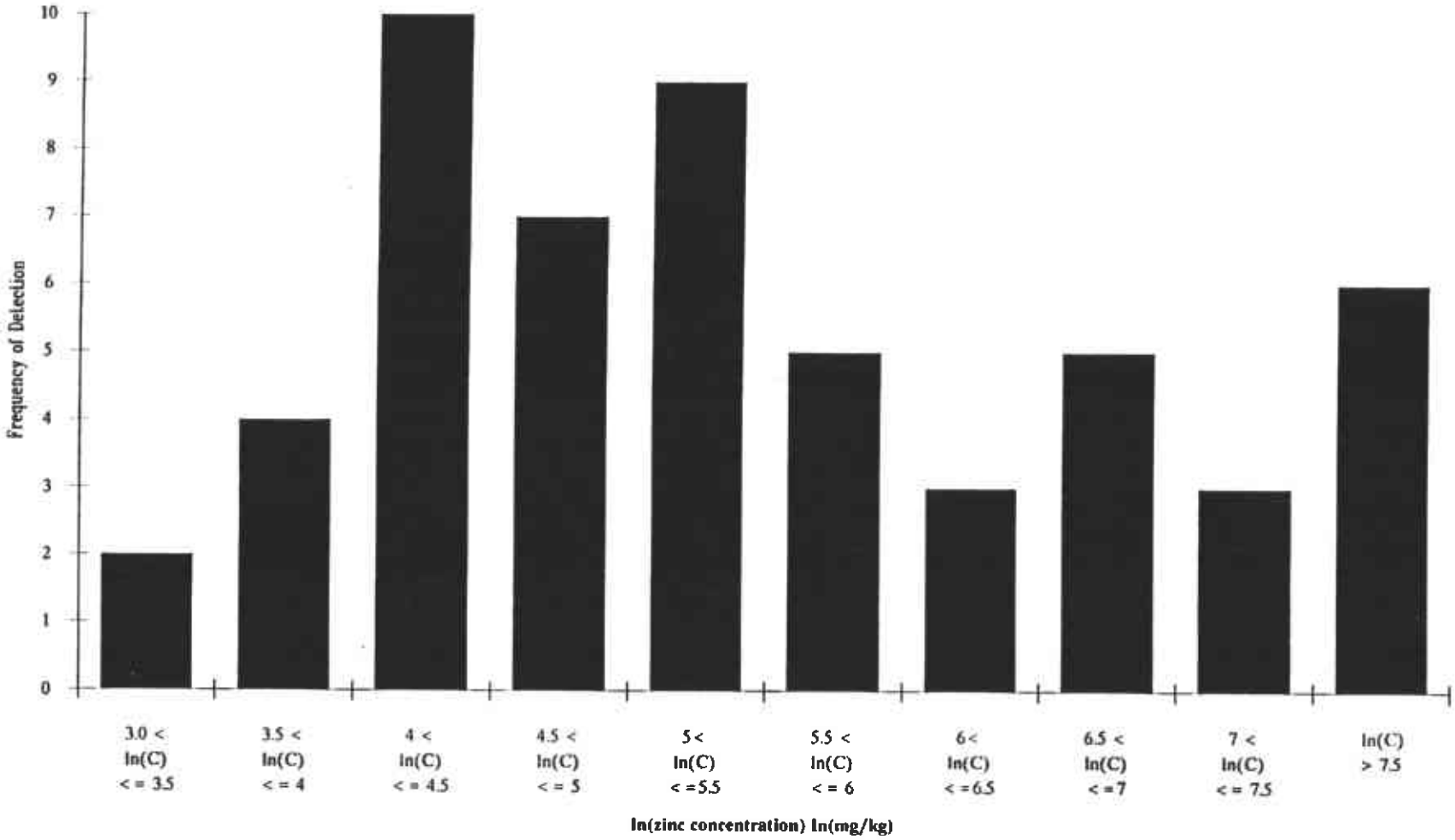
Histogram - Zinc Concentrations in Phase II Audit Samples
Curoco Steel Systems
Albany, California

Figure
5A

Drafter: RS Date: 12/92 Contract Number: 03-1332E Approved: R. Ellgas Revised:

FIGURE 6A



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Histogram - Natural Log (ln) of Zinc Concentrations in Phase II Audit Samples

Curoco Steel Systems
Albany, California

Figure **6A**

Drafter: RS Date: 12/92 Contract Number: 03-1332E Approved: R. Ellgas Revised:

TABLE 1

SOIL AND GROUND WATER SAMPLE ANALYSES RESULTS
UNDERGROUND STORAGE TANK REMOVAL
CUROCO STEEL SYSTEMS

		TPH-Volatile and Semivolatile								
Sample Number	**TPH by IR (mg/kg)**	**C4 to C12 (mg/kg)**	**C12 to C25 (mg/kg)**	**C25-C35 (mg/kg)**	**Benzene (mg/kg)**	**Ethylbenzene (mg/kg)**	**Toluene (mg/kg)**	**Xylenes (mg/kg)**	**Lead (mg/kg)**	**Organic Lead (mg/kg)**
South Wall @ 3'	<50				<0.1	<0.1	<0.1	<0.1		
North Wall @ 2'	50				<0.1	<0.1	<0.1	<0.1	10	<0.5
Pipeline @ 1½'	<50				<0.1	<0.1	<0.1	<0.1		
2' West @ 3'	<50				<0.1	<0.1	<0.1	<0.1		
Pit Water #1		3500[1]	6500[1]	<5000[1]	<3[1]	<3[1]	3.5[1]	12[1]		
Tank Contents		250	500	<100	<1	<1	<1	1.1		
A: Tank Contents		1.1	80							
B: Stockpile		0.1	<5							
C: Stockpile		<0.1	<5							
D: (Stockpile)		<0.1	<5							
E: (Tank Contents)		0.4	100							
F: (@ 2')	230				<0.005	<0.005	<0.005	<0.005		
G – 2	<50									
H – 2	sample held without analysis									
I – 2	sample held without analysis									

[1]concentrations in mg/l (water sample)