

RESIDUE CHARACTERIZATION REPORT

**ROTH STEEL COMPANY
SYRACUSE, NEW YORK**

DECEMBER, 1993

**W. Z. BAUMGARTNER & ASSOCIATES, INC.
Consulting Engineers
P. O. Box 786
Brentwood, TN 37024-0786**

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INTRODUCTION

Roth Steel Corporation is located on Hiawatha Boulevard in Syracuse, Onondaga County, New York. At the request of the New York Department of Environmental Conservation, the Company has investigated the chemical characteristics of shredder residue placed on its property. The investigation was conducted with the assistance of W. Z. Baumgartner & Associates, Inc., Consulting Engineers, in accordance with the Sampling and Characterization Plan developed by the Engineers and approved for use by the Department in its correspondence dated August 31, 1993.

SCOPE OF WORK

W. Z. Baumgartner & Associates, Inc., Consulting Engineers, performed the sample collection as described in the Sampling and Characterization Plan and in accordance with our sampling protocols established in the document entitled *Sampling, Analysis And Data Review Of Shredder Residue*. Individual samples were analyzed in accordance with Method 1311, Toxicity Characteristic Leaching Procedure (TCLP) and Method 8080 for polychlorinated biphenyls (PCB). Moisture content determinations were also performed.

FINDINGS

Each of the suspect areas, identified as Cell No. 1 and Cell No. 2, did contain shredder residue. Typically, one to four feet of sand or sandy soil cover and approximately two to four feet of shredder residue was encountered overlying material identified as Allied

waste. This material was found at depths of five to seven feet. Exhibit No. 4 presents the result of the Toxicity Characteristic Leaching Procedure conducted on Cell No. 1, Sample No. 8, while Exhibit No. 5 presents the results of TCLP cadmium and lead determinations. Exhibit No. 6 presents the result of the Toxicity Characteristic Leaching Procedure conducted on Cell No. 2, Sample No. 32, while Exhibit No. 7 presents the results of TCLP cadmium and lead determinations. Exhibit No. 8 presents the results of constituent PCB and moisture content determinations conducted on samples collected from Cell No. 1, while Exhibit No. 9 presents the results of constituent PCB and moisture content determinations for Cell No. 2. Appendix A contains statistical analyses of the PCB data generated for Cell No. 1 and Cell No. 2.

As shown in the Exhibits, none of the monitored TCLP parameters were present in either cell at concentrations subject to regulation pursuant to 40 CFR Part 261. Polychlorinated biphenyls were found to be present in samples obtained from Cell No. 1 at a mean concentration of 48.5 mg/kg (dry weight). Samples collected from Cell No. 2 indicate a mean PCB concentration of 78.0 mg/kg (dry weight). Based on this data, the material in Cell No. 2 may be subject to regulation pursuant to 40 CFR Part 761.

OPINIONS

The transport, fate and toxicity of polychlorinated biphenyls has been the subject of considerable study since the enactment of the Toxic Substances Control Act. Treatment technologies are being developed and refined at an ever increasing pace as more scientifically based information is accumulated. Recent toxicology studies indicate no causal link between PCB exposure and significant chronic health effects, namely cancer. While animal studies have been used to justify the human carcinogenic status of all PCB, the results of these same studies present inconclusive evidence of animal carcinogenicity for less highly chlorinated PCB,

such as those encountered at the subject site. OSHA has established a permissible exposure level (PEL) for Aroclor 1242 at a level 2.6 times the PEL for Aroclor 1260. Aroclor 1242 is the most prevalent compound in the subject area and is not identified nor confirmed as either a human or animal carcinogen in studies performed to date.¹

A number of studies regarding the transport and fate of PCB have been performed to date. These studies suggest less chlorinated isomers, such as Aroclor 1242, are more readily degraded by microbial activity than are more chlorinated isomers. PCB are hydrophobic and are readily absorbed onto available solid surfaces². Numerous studies confirm the immobility of PCB from solid material, and an EPA study specifically addressing shredder residue found PCB are less likely to migrate from shredder residue than from soil³. This affinity for solid matter may enhance the degradation of PCB by microbial activity^{4,5}. Several species of micro-organisms have been found to achieve significant degradation of PCB in relatively short periods of time. However, in the absence of sufficient microbial populations, little microbial degradation may be expected.

OBSERVATIONS AND RECOMMENDATIONS

Based on the data generated during the characterization, PCB is present in Cell No. 2 at a mean concentration of 78.0 mg/kg. While this concentration exceeds the regulatory threshold of 25 mg/kg, the shredder residue in question poses no imminent threat to human health or the environment. Exposure to PCB contained in the shredder residue would most likely occur from physical contact with the solid material, physical contact with affected groundwater or leachate and/or volatilization during excavation and transport.

Three remedial alternatives are offered for consideration. They are:

- 1) Removal and disposal in TSCA facility
- 2) Limit access/minimize infiltration
- 3) No action

The first alternative would involve excavation of all residue in Cell No. 2 and transporting to a TSCA land disposal facility in compliance with 40 CFR 761.75. The estimated cost of this alternative is \$1,385,500, which would not include confirmation analyses and engineering. The second option would include installation of secure fencing around the extents of Cell No. 2 and construction of an improved surface over the fill material. The estimated cost for this alternative is \$71,500 if a concrete surface is chosen, and \$38,750 if a compacted clay cap and vegetative cover is selected. The third alternative would require no action.

Based on the properties of PCB discussed in this report, the Engineers believe groundwater monitoring wells would be of little benefit in this situation. Installation and periodic monitoring costs would be better utilized in controlling access to the area. The most cost efficient alternative with respect to minimizing risk to human health and the environment would be Option 2 using a naturally vegetated surface over a layer of compacted clay. This alternative will a) immediately and effectively minimize the opportunity for exposure via physical contact, b) immediately and effectively reduce the amount of precipitation moving through the material in question and c) eliminate the opportunity for contaminant migration due to physical manipulation. This alternative will also allow the Company to evaluate developing technologies and allow for the application of remedial methods, such as in-situ bioremediation, with a minimal loss of capital expenditures. An infiltration gallery and leachate collection/recirculation system can be installed by trenching the soil/clay cap,

allowing the application of proprietary microbe cultures specifically engineered for the degradation of lower chlorinated isomers, such as Aroclor 1242. The Allied beds underlying Cell No. 2 should offer some attenuation of potential contaminant migration, should this migration be at issue. However, the solubility, mobility and adsorption properties of PCB previously discussed firmly establish Option 2 as the alternative of choice.

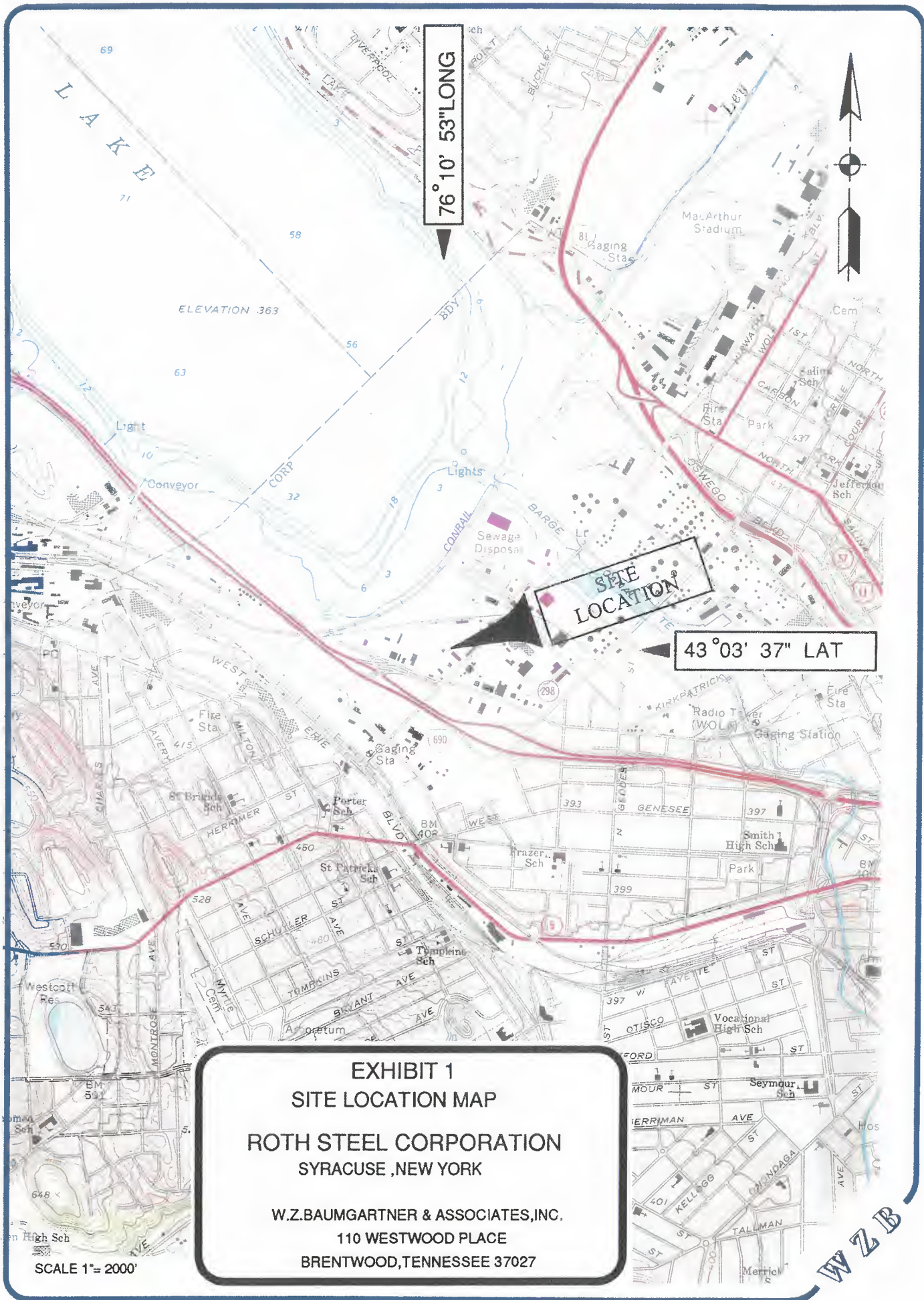
REFERENCES

- ¹ Harbison, Dr. R.D., Dr. R.C. James and Dr. S.M. Roberts, 1987, Biological Data Relevant To The Evaluation Of Carcinogenic Risk To Humans: University of Arkansas, School of Medicine, Division of Interdisciplinary Toxicology For Scientific Advisory Panel, Safe Drinking Water And Toxic Enforcement Act, State of California, pg iii-v, 26-29.
- ² Wilson, D.J., J.M. Brown and P.C. Sundareswaran 1981, Migration of Polychlorinated Biphenyls (PCBs) From Hazardous Waste Landfills: Review And Laboratory Study: Vanderbilt University, pg 7.
- ³ EPA, 1991, PCB, Lead and Cadmium Levels In Shredder Waste Materials: A Pilot Study: Office of Toxic Substance, Office of Solid Waste, EPA-560/5-90-008B, pg. 5-23,24,25,26,31.
- ⁴ EPA, 1980, Attenuation of Water-Soluble Polychlorinated Biphenyls By Earth Materials: Municipal Environmental Research Laboratory, EPA-600/2-80-027, pg iv, 1-13.
- ⁵ Prosser, H.J., 1985, Polychlorinated Biphenyls (PCBs) - Environmental Options For Disposal: Warren Spring Laboratory, Stevenage, Hertfordshire, UK, pg. 11.

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EXHIBITS

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76° 10' 53" LONG

43° 03' 37" LAT

SITE LOCATION

EXHIBIT 1
SITE LOCATION MAP
ROTH STEEL CORPORATION
SYRACUSE, NEW YORK
W.Z.BAUMGARTNER & ASSOCIATES, INC.
110 WESTWOOD PLACE
BRENTWOOD, TENNESSEE 37027

SCALE 1" = 2000'

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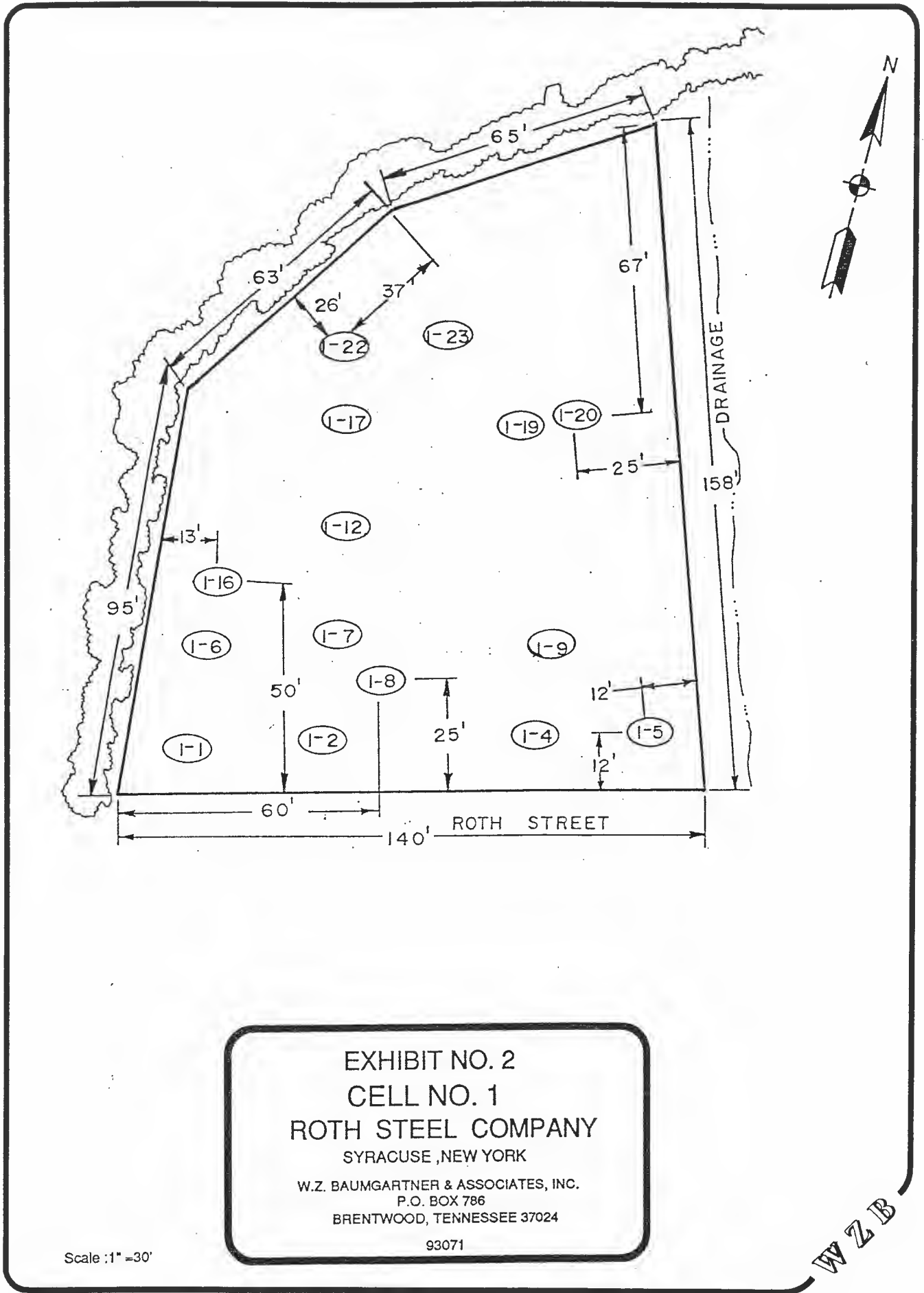
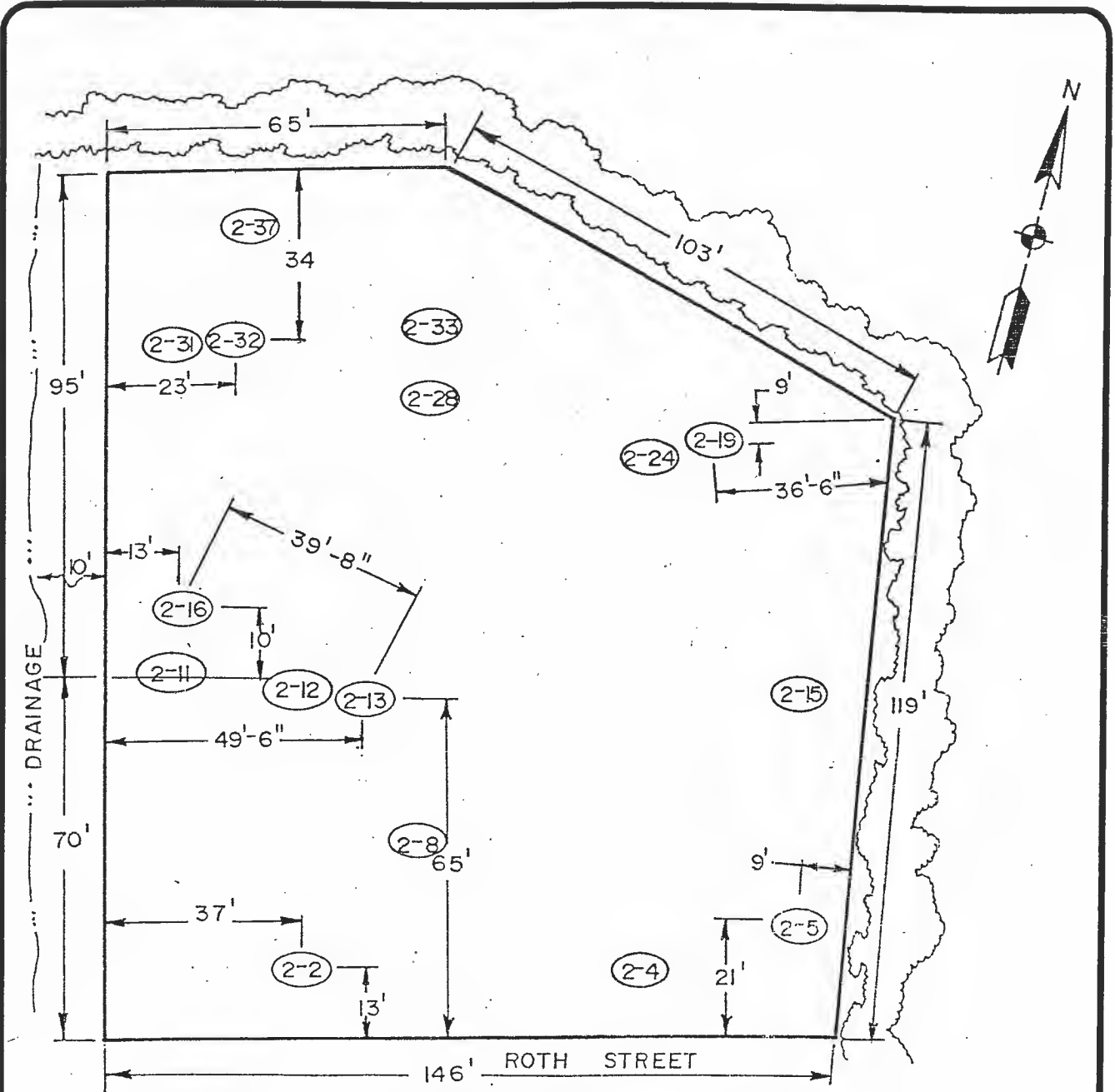


EXHIBIT NO. 2
CELL NO. 1
ROTH STEEL COMPANY
 SYRACUSE, NEW YORK
 W.Z. BAUMGARTNER & ASSOCIATES, INC.
 P.O. BOX 786
 BRENTWOOD, TENNESSEE 37024
 93071

Scale : 1" = 30'

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NOTE: TRENCH CUT FROM SAMPLE POINT 2-16 TO POINT 2-13
 NO SAMPLE WAS TAKEN AT POINT 2-13. PURPOSE OF
 TRENCH WAS TO SHOW CONSISTENCY OF MATERIALS.

EXHIBIT NO. 3
 CELL NO. 2
 ROTH STEEL COMPANY
 SYRACUSE, NEW YORK
 W.Z. BAUMGARTNER & ASSOCIATES, INC.
 P.O. BOX 786
 BRENTWOOD, TENNESSEE 37024
 93071

Scale : 1" = 30'

W Z B

EXHIBIT NO. 4

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 1

TCLP DETERMINATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	1-8	% SPIKE RECOVERY
	(30358)	(30358)

PARAMETER

TCLP EXTRACTABLE METALS¹

Arsenic	<0.10	92%
Barium	3.53	103%
Cadmium	<0.10	89%
Chromium, Total	<0.50	98%
Lead	<0.50	91%
Mercury	<0.010	102%
Selenium	<0.10	77%
Silver	<0.10	93%

TCLP SEMI-VOLATILE ORGANIC COMPOUNDS²

	(30354)	(30354)
Pyridine	<0.10	21
O-Cresol	<0.10	55
M,P-Cresol	0.14	52
1,4-Dichlorobenzene	<0.10	52
2,4-Dinitrotoluene	<0.10	59
Hexachlorobutadiene	<0.10	53
Hexachloroethane	<0.10	49
Nitrobenzene	<0.10	75
Pentachlorophenol	<0.10	64
2,4,5-Trichlorophenol	<0.10	81
2,4,6-Tri Cl Phenol	<0.10	66
Hexachlorobenzene	<0.10	65

EXHIBIT NO. 4 (CONTINUED)

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 1

TCLP DETERMINATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	1-8 (30402)	% SPIKE RECOVERY (30402)
PARAMETER		
TCLP VOLATILE ORGANIC COMPOUNDS ³		
Benzene	<0.10	82%
Carbon Tetrachloride	<0.10	78%
Chlorobenzene	<0.10	82%
Chloroform	<0.10	82%
1,2-Dichloroethane	<0.10	84%
1,1-Di-Ch-Ethylene	<0.10	80%
2-Butanone (Mek)	<1.0	40%
Tetrachloroethylene	<0.10	80%
Trichloroethylene	<0.10	78%
Vinyl Chloride	<0.10	70%

¹Method No. 6010/7740/7470/7060

²Method No. 3510/8270

³Method No. 8240

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Brentwood, TN 37024-0786

EXHIBIT NO. 5

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 1

TCLP EXTRACTABLE CADMIUM AND LEAD

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	CADMIUM (mg/l) ¹	LEAD (mg/l) ¹
1-1 (30815)	<0.10	<0.50
1-2 (30752)	<0.10	<0.50
1-4 (30813)	<0.10	<0.50
1-5 (30361)	0.16	<0.50
1-6 (30756)	<0.10	<0.50
1-7 (30753)	<0.10	<0.50
1-8 (30358)	<0.10	<0.50
1-9 (30359)	<0.10	<0.50
1-12 (30755)	<0.10	<0.50
1-16 (30356)	<0.10	<0.50
1-17 (30810)	0.10	<0.50
1-19 (30779)	<0.10	<0.50

EXHIBIT NO. 5 (CONTINUED)

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 1

TCLP EXTRACTABLE CADMIUM AND LEAD

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	CADMIUM (mg/l)	LEAD (mg/l)
1-20 (30357)	<0.10	<0.50
1-22 (30363)	<0.10	<0.50
1-23 (30754)	<0.10	<0.50
MEAN	0.10	<0.50
STANDARD DEVIATION	0.02	0.00
MEDIAN	<0.10	<0.50

¹EPA Method 1311

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EXHIBIT NO. 6 (CONTINUED)

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 2

TCLP DETERMINATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	2-32 (30403)	% SPIKE RECOVERY (30403)
PARAMETER		
TCLP VOLATILE ORGANIC COMPOUNDS ³		
Benzene	<0.10	84%
Carbon Tetrachloride	<0.10	78%
Chlorobenzene	<0.10	84%
Chloroform	<0.10	100%
1,2-Dichloroethane	<0.10	82%
1,1-Di-Cl-Ethylene	<0.10	96%
2-Butanone (Mek)	<1.0	50%
Tetrachloroethylene	<0.10	84%
Trichloroethylene	<0.10	76%
Vinyl Chloride	<0.10	84%

¹Method No. 6010/7740/7470/7060

²Method No. 3510/8270

³Method No. 8240

W. Z. BAUMGARTNER & ASSOCIATES, INC.

Consulting Engineers

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Brentwood, TN 37024-0786

EXHIBIT NO. 7

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 2

TCLP EXTRACTABLE CADMIUM AND LEAD

SEPTEMBER 22/OCTOBER 21, 1993

SAMPLE ID	CADMIUM (mg/l) ¹	LEAD (mg/l) ¹
2-2 (30364)	<0.10	<0.50
2-4 (30816)	<0.10	<0.50
2-5 (30780)	0.14	0.74
2-8 (30786)	0.11	<0.50
2-11 (30811)	0.13	<0.50
2-12 (30787)	0.17	<0.50
2-15 (30814)	0.13	<0.50
2-16 (30812)	<0.10	<0.50
2-19 (30362)	<0.10	<0.50
2-24 (30783)	<0.10	<0.50
2-28 (30781)	0.11	<0.50
2-31 (30782)	<0.10	<0.50

EXHIBIT NO. 7 (CONTINUED)

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 2

TCLP EXTRACTABLE CADMIUM AND LEAD

SEPTEMBER 22/OCTOBER 21, 1993

SAMPLE ID	CADMIUM (mg/l)	LEAD (mg/l)
2-32 (30360)	<0.10	<0.50
2-33 (30785)	<0.10	<0.50
2-37 (30784)	<0.10	<0.50
MEAN	0.11	0.52
STANDARD DEVIATION	0.02	0.06
MEDIAN	<0.10	<0.50

¹EPA Method 1311

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EXHIBIT NO. 8

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 1

PCB CONCENTRATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	PCB (mg/kg)		
	AS IS	% DRY WEIGHT	PCB AS DRY WEIGHT
1-1 (30698)	6.03	83.6	7.2
1-2 (30699)	29.7	82.6	35.9
1-4 (30700)	<5.6	88.1	<5.6
1-5 (30333)	33.9	80.6	42.0
1-6 (30702)	96.8	75.0	129.1
1-7 (30701)	43.4	79.5	54.6
1-8 (30330)	58.0	77.5	74.8
1-9 (30332)	55.0	81.3	67.6
1-12 (30703)	39.0	85.0	45.9
1-16 (30334)	24.5	84.4	29.0
1-17 (30704)	55.2	79.8	69.2

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EXHIBIT NO. 8 (CONTINUED)

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 1

PCB CONCENTRATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	PCB (mg/kg)		
	AS IS	% DRY WEIGHT	PCB AS DRY WEIGHT
1-19 (30706)	47.3	86.3	54.8
1-20 (30331)	77.0	81.3	94.9
1-22 (30335)	9.0	76.3	11.8
1-23 (30705)	<4.88	79.8	<4.88
MEAN	39.0	81.4	48.5
STANDARD DEVIATION	27.2	3.7	35.5
MEDIAN	39.0	81.3	45.9

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EXHIBIT NO. 9

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 2

PCB CONCENTRATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	PCB (mg/kg)		
	AS IS	% DRY WEIGHT	PCB AS DRY WEIGHT
2-2 (30337)	70.0	80.6	86.8
2-4 (30714)	75.7	82.2	92.1
2-5 (30713)	83.0	77.6	106.9
2-8 (30715)	71.6	83.0	86.3
2-11 (30717)	41.3	69.2	59.7
2-12 (30716)	45.8	78.7	58.2
2-15 (30712)	86.9	83.0	104.7
2-16 (30718)	48.2	82.3	58.6
2-19 (30336)	36.0	78.3	46.0
2-24 (30711)	85.5	82.8	103.3
2-28 (30710)	83.7	82.9	101.0

EXHIBIT NO. 9 (CONTINUED)

ROTH STEEL COMPANY
SYRACUSE, NEW YORK

WASTE CHARACTERIZATION
CELL 2

PCB CONCENTRATION

SEPTEMBER 22/OCTOBER 20, 1993

SAMPLE ID	PCB (mg/kg)		
	AS IS	% DRY WEIGHT	PCB AS DRY WEIGHT
2-31 (30709)	13.2	87.4	15.1
2-32 (30338)	60.0	83.8	71.6
2-33 (30708)	70.1	76.9	91.1
2-37 (30707)	74.1	83.8	88.4
MEAN	63.0	80.8	78.0
STANDARD DEVIATION	21.7	4.3	26.0
MEDIAN	70.1	82.3	86.8

W. Z. BAUMGARTNER & ASSOCIATES, INC.
Consulting Engineers
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Brentwood, TN 37024-0786

APPENDIX A

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APPENDIX A

ROTH STEEL CORPORATION
SYRACUSE, NEW YORK

OPTION 1

REMOVAL OF SHREDDER RESIDUE IN CELL NO. 2
TO TSCA FACILITY

Estimated Area	22,500 sf
Estimated Depth of Material	4 ft

Estimated Volume	90,000 cf
	= 3,333 cy

Unit Cost-Disposal	= \$400/cy
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Estimated Disposal Cost	= \$1,333,333
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Cover Excavation 1667 cy @ 3.00	= 5,000
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SR Excavation 3333 cy @ 5.00	= 16,665
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Clean Fill - Import 3333 cy @ 7.50	= 24,998
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Replace Cover 1667 cy @ 2.50	= 4,168
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Establish Vegetative Cover	= 1,336
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ESTIMATED COST	\$1,385,500
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Not including confirmation sampling; assuming transport up to 200 mi included in disposal cost

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APPENDIX A

ROTH STEEL CORPORATION
SYRACUSE, NEW YORK

OPTION 2

LIMIT ACCESS TO CELL NO. 2 AREA AND SURFACE

Clay Cap & Vegetative Cover

Signage	2,000
Cyclone Fencing - 600 LF	7,500
Clear & Grub Exist. Surface	2,000
Clay, Compacted to 95 % Std. Proctor Density, in place Est. 1000 cy (18" depth)	18,750
Topsoil, in place 425 cy	6,000
Seed & Mulch, including Fertilizer	2,500
<hr/>	
ESTIMATED COST	\$38,750

Concrete Surface

Signage	2,000
Cyclone Fencing	7,500
Clear & Grub Exist. Surface	2,000
Roll Subbase	1,650
Aggregate Base, 9", in place	15,000
Concrete, Portland Cement, 8"	33,350
Welded Wire Reinforcement	7,500
Moisture Retardant	2,500
<hr/>	
ESTIMATED COST	\$71,500

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APPENDIX B

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STATISTICAL ANALYSIS
For Less Than 50 Samples

Project: Roth Steel Company
 Project No: 93071
 Description: November 1993 - As is - Cell 1
 Filename: PCB41193
 Parameter: PCB

i	Sample ID	Concentration (mg/l)	Normal Curve Ordinate (mean) F(conc.)	a	W	Ln(conc.)	W (Lognormal)	Normal Curve Ordinate (Lognormal) F(ln(conc.))	(x-median)^2	Normal Curve Ordinate (median) F(conc.)
1	1-23	4.88	0.007	0.515	47.339	1.585	N/A	0.089	1,164.174	0.007
2	1-4	5.6	0.007	0.331	23.605	1.723	N/A	0.112	1,115.560	0.007
3	1-1	6.03	0.007	0.250	12.967	1.797	N/A	0.126	1,087.021	0.007
4	1-22	9	0.008	0.188	8.676	2.197	N/A	0.214	900.000	0.008
5	1-16	24.5	0.013	0.135	4.127	3.199	N/A	0.397	210.250	0.013
6	1-2	29.7	0.014	0.088	1.549	3.391	N/A	0.399	86.490	0.014
7	1-5	33.9	0.014	0.043	0.411	3.523	N/A	0.391	26.010	0.014
8	1-12	39	0.015	0.000	0.000	3.664	N/A	0.376	0.000	0.015
9	1-7	43.4	0.014	0.000	0.000	3.770	N/A	0.360	19.360	0.014
10	1-19	47.3	0.014	0.000	0.000	3.857	N/A	0.345	68.890	0.014
11	1-9	55	0.012	0.000	0.000	4.007	N/A	0.314	256.000	0.012
12	1-17	55.2	0.012	0.000	0.000	4.011	N/A	0.313	262.440	0.012
13	1-8	58	0.012	0.000	0.000	4.060	N/A	0.302	361.000	0.011
14	1-20	77	0.006	0.000	0.000	4.344	N/A	0.235	1,444.000	0.006
15	1-6	96.8	0.002	0.000	0.000	4.573	N/A	0.180	3,340.840	0.002

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Roth Steel Company
November 1993 - As is - Cell 1

PCB

Regulatory threshold (RT): 50
Number of samples (n): 15

Number of samples above regulatory threshold: 5
Percent of samples considered hazardous: 33.33%
Percent of samples considered non-hazardous: 66.67%

Mean: 39.021
Sample standard deviation: 27.179
Sample Variance: 738.716
Maximum concentration: 96.800
Minimum concentration: 4.880
Standard error: 7.018
Relative standard deviation (coefficient of variation): 0.697
Type of transformation required by SW-846: Arcsine transformation

TEST FOR NORMAL DISTRIBUTION:

Shapiro and Wilk W-test: 10342.03
d: 7
k: 0.941
W: 0.1
Significance: 0.901
Quantile: Normal distribution
Conclusion:

Number of samples required: 11.08588

Student t test calculations (mean):

Degree of freedom: 14
Two-tailed confidence interval probability: 0.2
One-tailed confidence interval probability: 0.1
t-value: 1.345
Lower confidence interval: 29.58189
Upper confidence interval: 48.45944

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Roth Steel Company
November 1993 - As is - Cell 1

PCB

LOGNORMAL:

Ln(RT): 3.912
Mean: 3.313
Sample standard deviation: 0.997
Sample Variance: 0.995
Standard error: 0.258
Relative standard deviation (coefficient of variation): 0.301

TEST FOR LOGNORMAL DISTRIBUTION:

Shapiro and Wilk W-test (lognormal):

d: N/A
k: NA
W: NA
Significance: NA
Quantile: NA
Conclusion: NA

Confidence interval calculations (lognormal):

Degree of freedom: NA
Two-tailed confidence interval probability: NA
One-tailed confidence interval probability: NA
H - lower confidence interval: NA
H - upper confidence interval: NA
Lower confidence interval: NA
Upper confidence interval: NA

Minimum variance unbiased estimators (MVU):

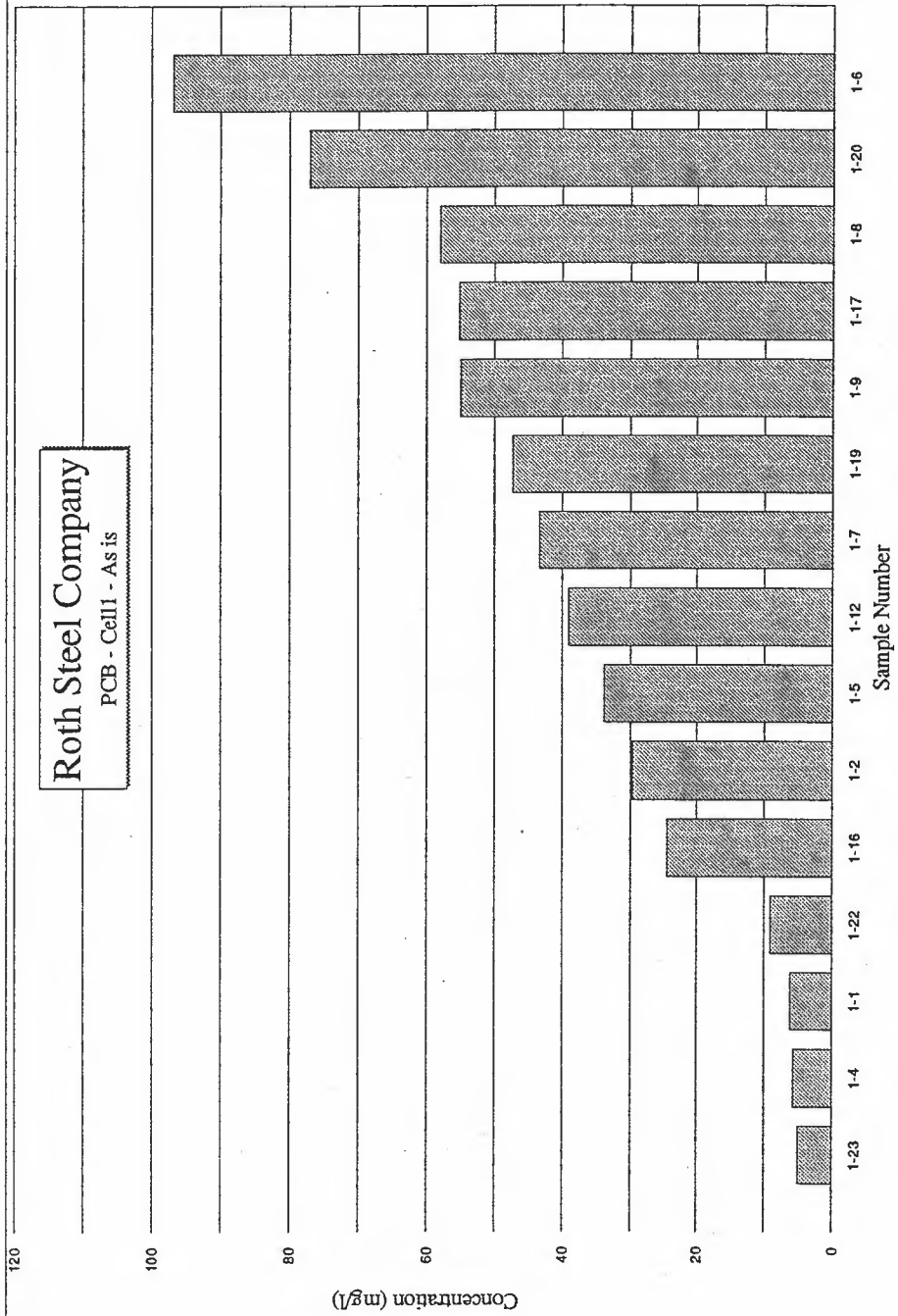
t(1): NA
t(2): NA
(Psi)/t(1): NA
(Psi)/t(2): NA
Mean: NA
Standard deviation: NA
Variance: NA

Median:

Mean-Median: 39
Type of skew: 0.02
Standard deviation (median): Right skewed
Variance (median): 27.18
Standard error (median): 738.72
Standard error (median): 7.02

W Z B

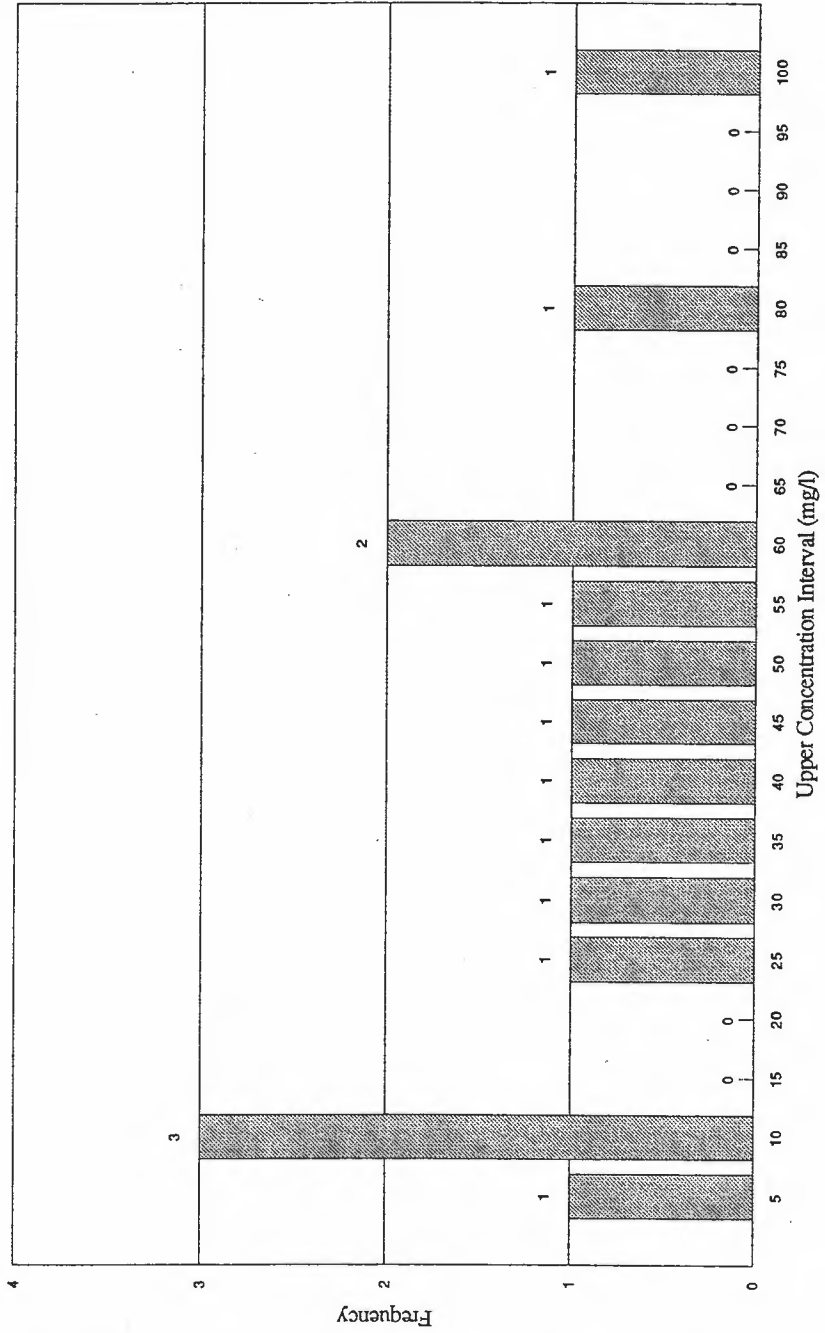
Roth Steel Company
PCB - Cell I - As is



November 1993

W Z B

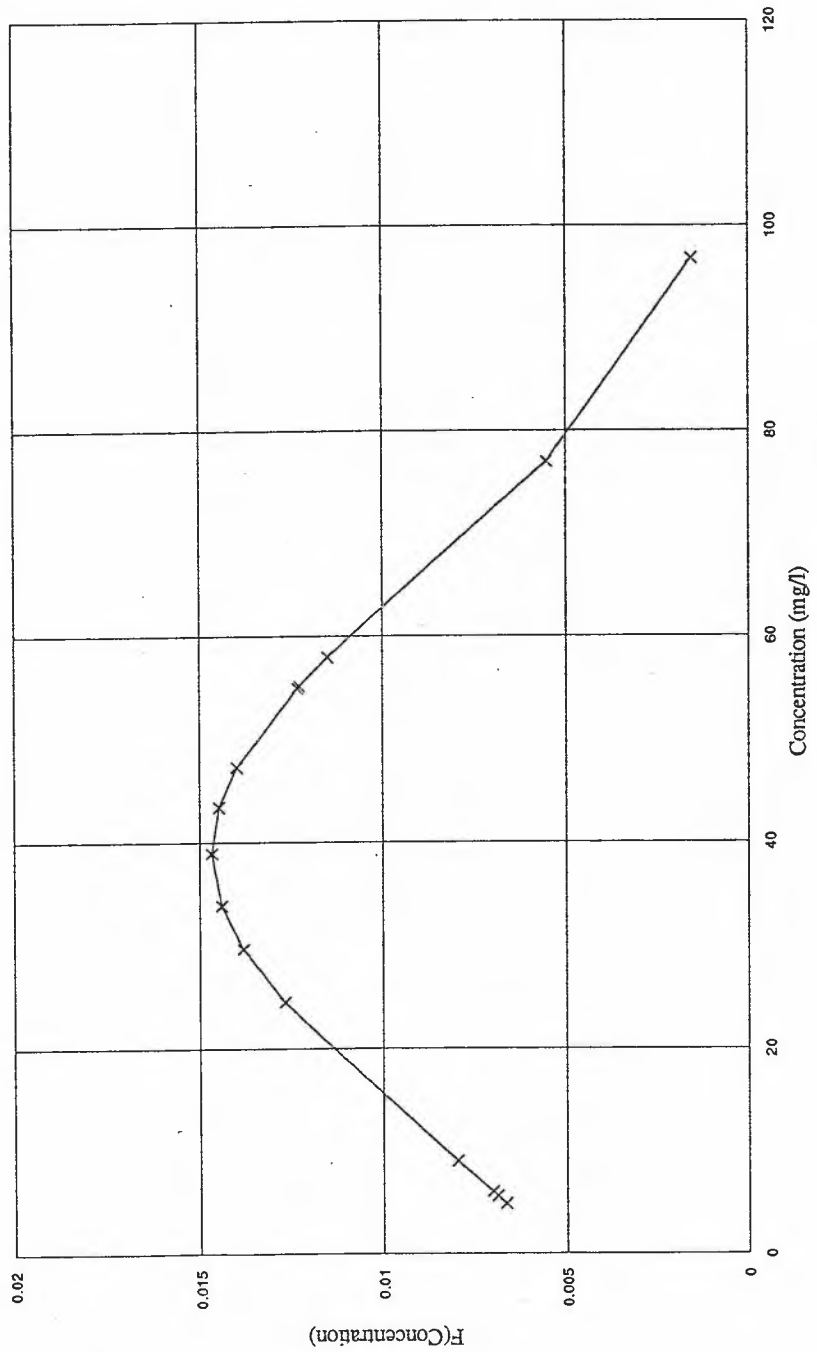
Roth Steel Company
PCB - Cell I - As is



Histogram
November 1993

WZB

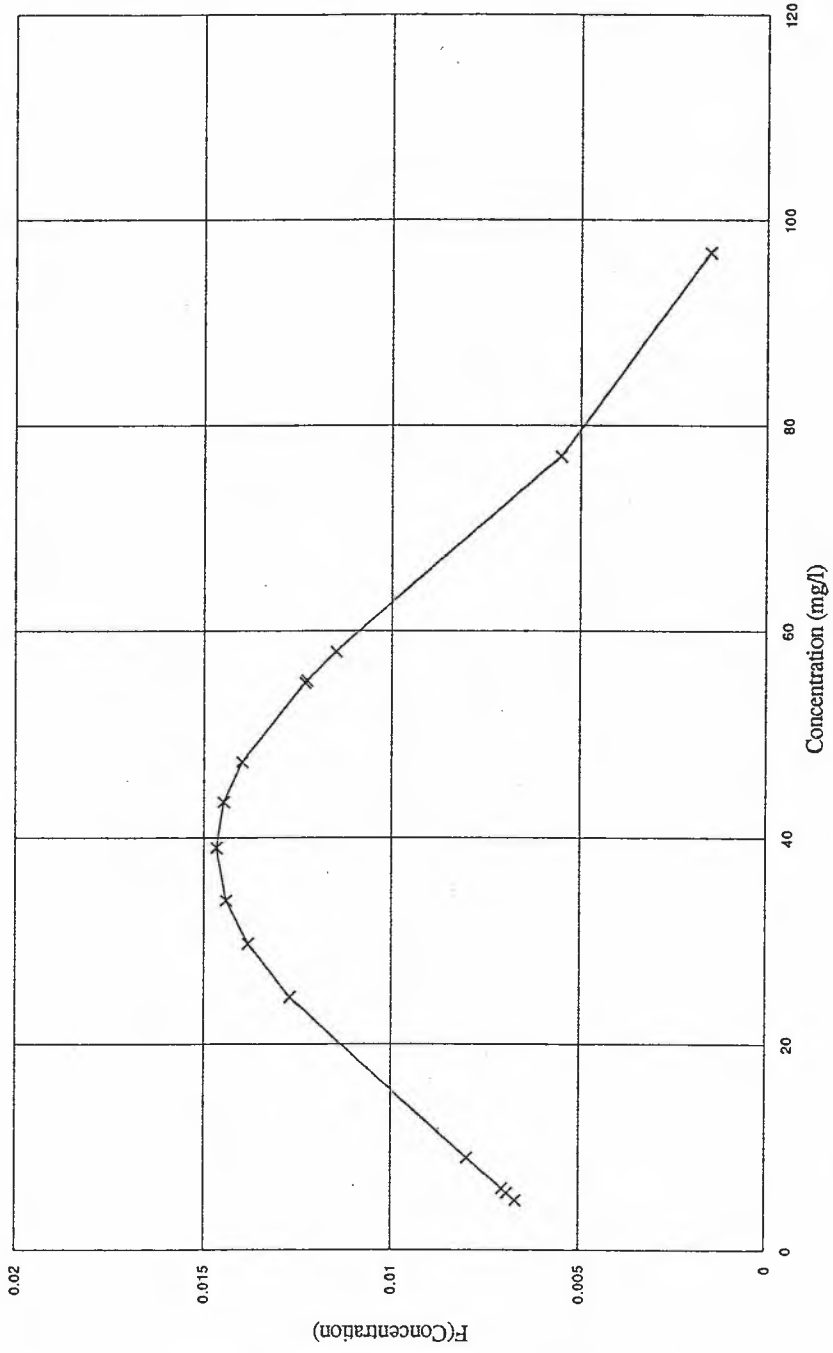
Roth Steel Company
PCB - Cell1 - As is



Normal Curve Based on Mean
November 1993

WZB

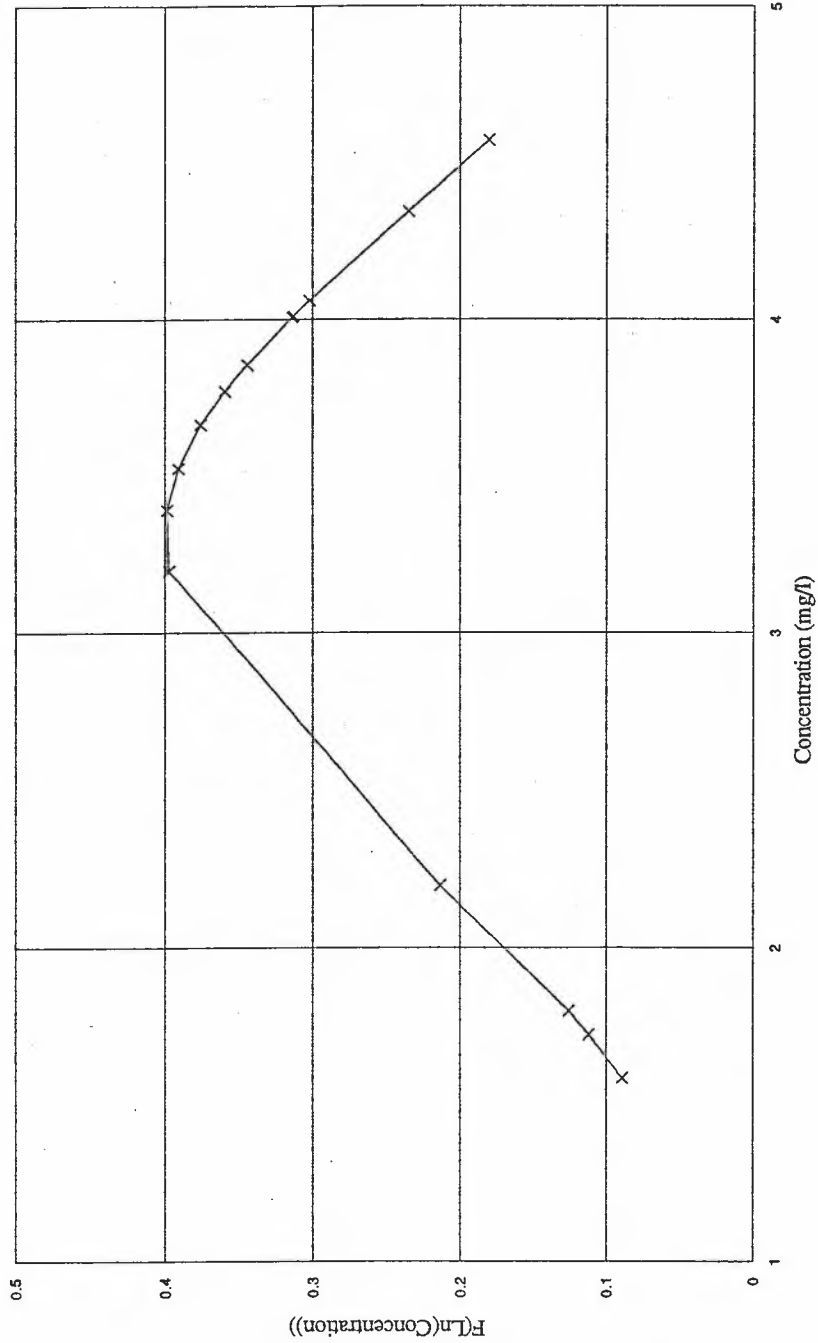
Roth Steel Company
PCB - Cell11 - As Is



Normal Curve Based on Median
November 1993

WZB

Roth Steel Company
PCB - Cell1 - As is



Lognormal Curve
November 1993

WZB

Roth Steel Company
November 1993 - Dry Weight - Cell 1

PCB

LOGNORMAL:

Ln(RT): 3.912
Mean: 3.496
Sample standard deviation: 1.055
Sample Variance: 1.113
Standard error: 0.272
Relative standard deviation (coefficient of variation): 0.302

TEST FOR LOGNORMAL DISTRIBUTION:

Shapiro and Wilk W-test (lognormal):

d: N/A
k: N/A
W: N/A
Significance: N/A
Quantile: N/A
Conclusion: N/A

Confidence interval calculations (lognormal):

Degree of freedom: NA
Two-tailed confidence interval probability: NA
One-tailed confidence interval probability: NA
H - lower confidence interval: NA
H - upper confidence interval: NA
Lower confidence interval: NA
Upper confidence interval: NA

Minimum variance unbiased estimators (MVU):

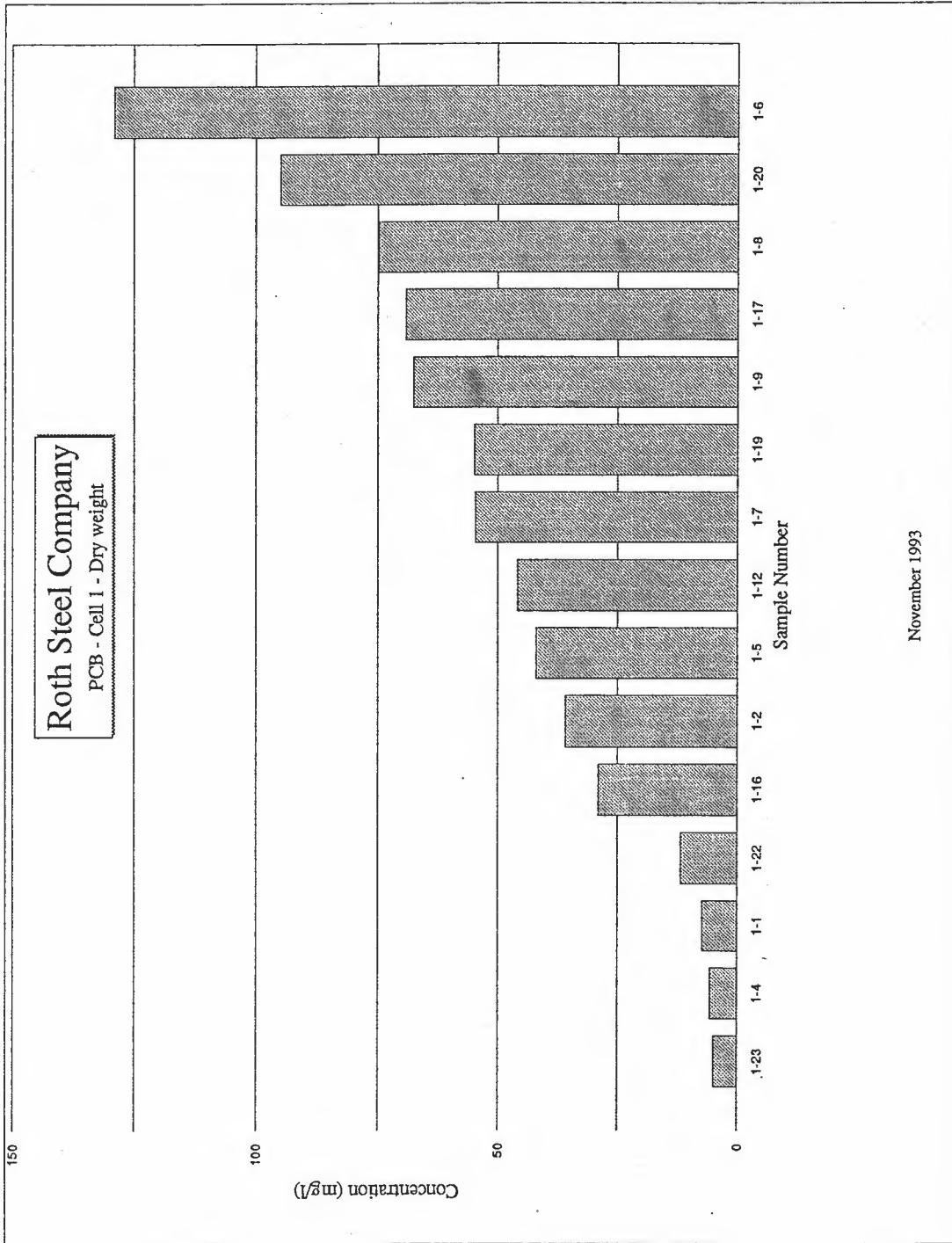
t(1): NA
t(2): NA
(Psi)/t(1): NA
(Psi)/t(2): NA
Mean: NA
Standard deviation: NA
Variance: NA

Median:

Mean-Median: 45.9
Type of skew: 2.59
Standard deviation (median): 35.55
Variance (median): 1,263.94
Standard error (median): 9.18
Right skewed

W Z B

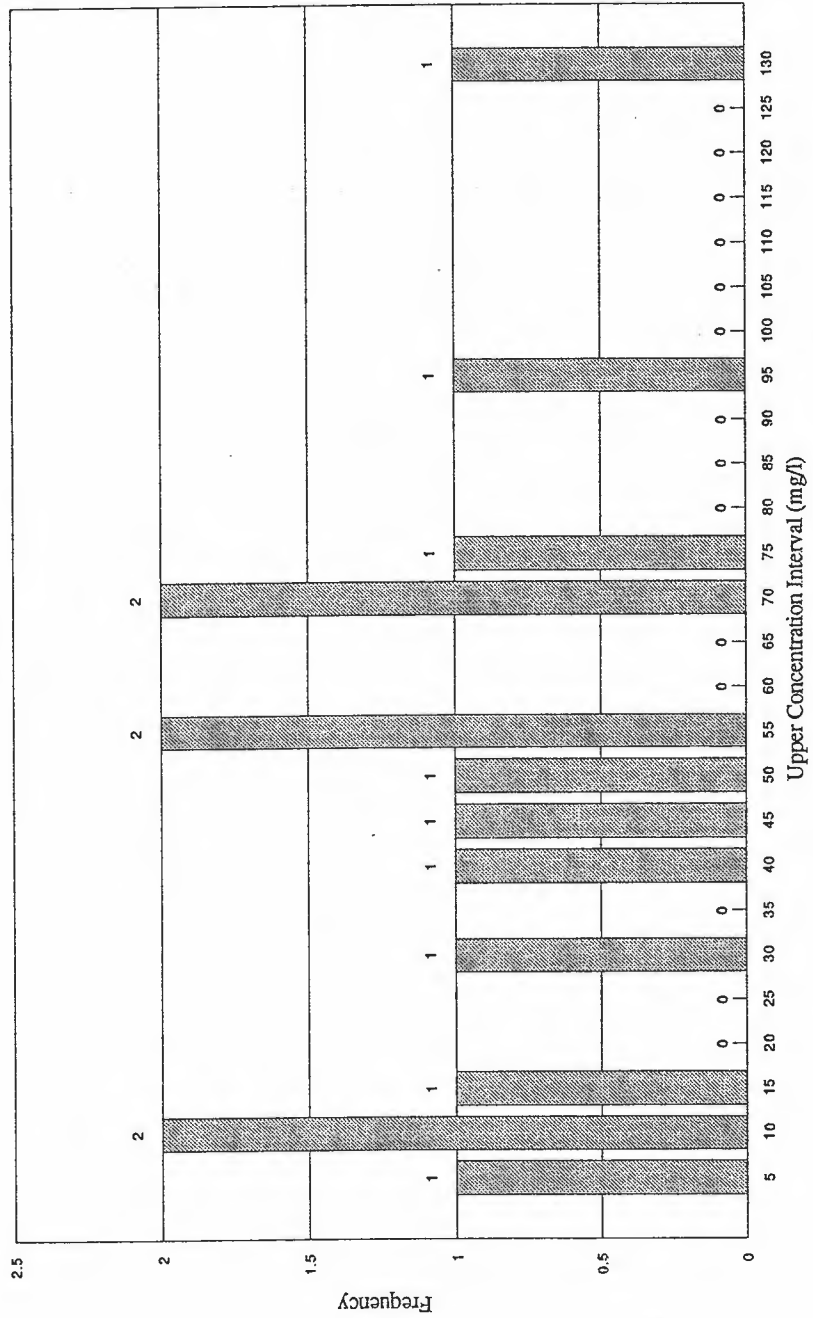
Roth Steel Company
PCB - Cell 1 - Dry weight



November 1993

W Z B

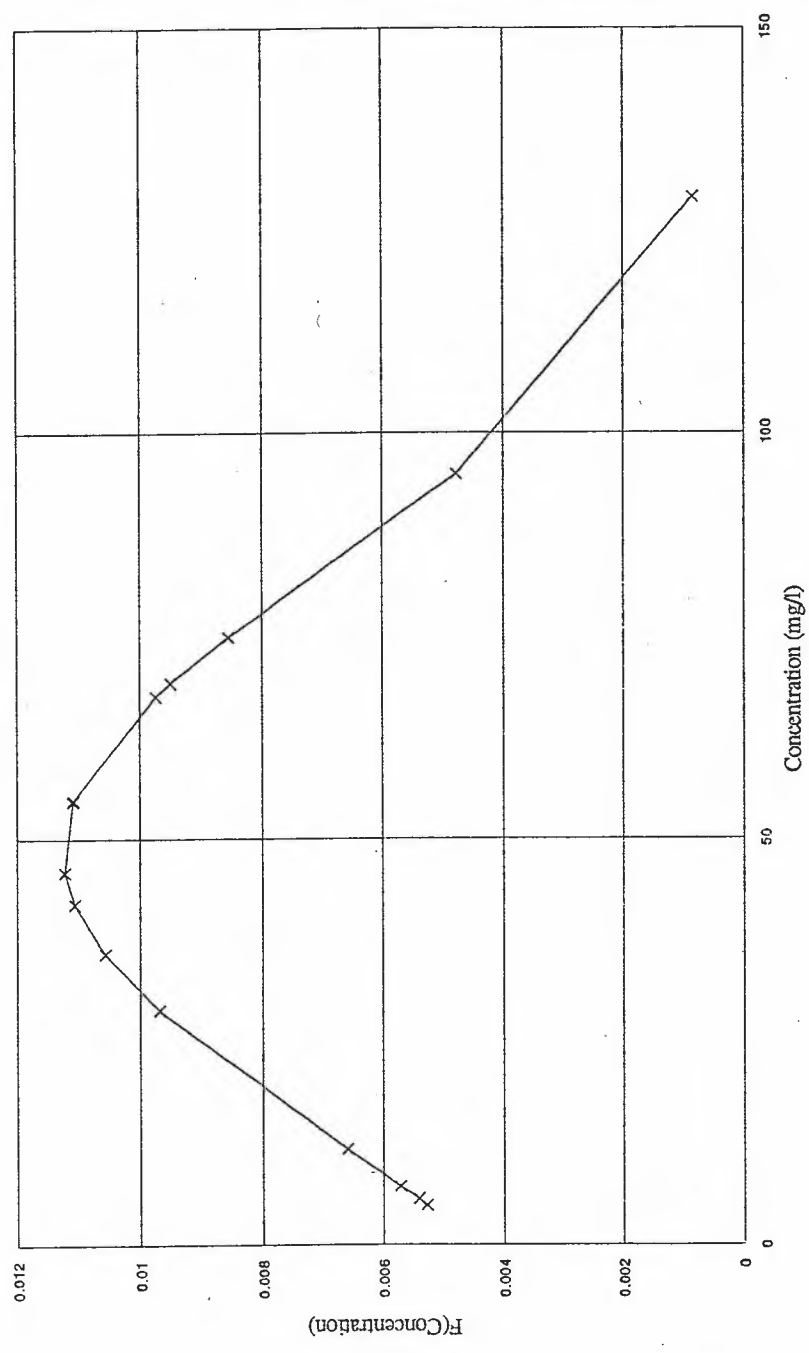
Roth Steel Company
PCB - Cell 1 - Dry weight



Histogram
November 1993

WZB

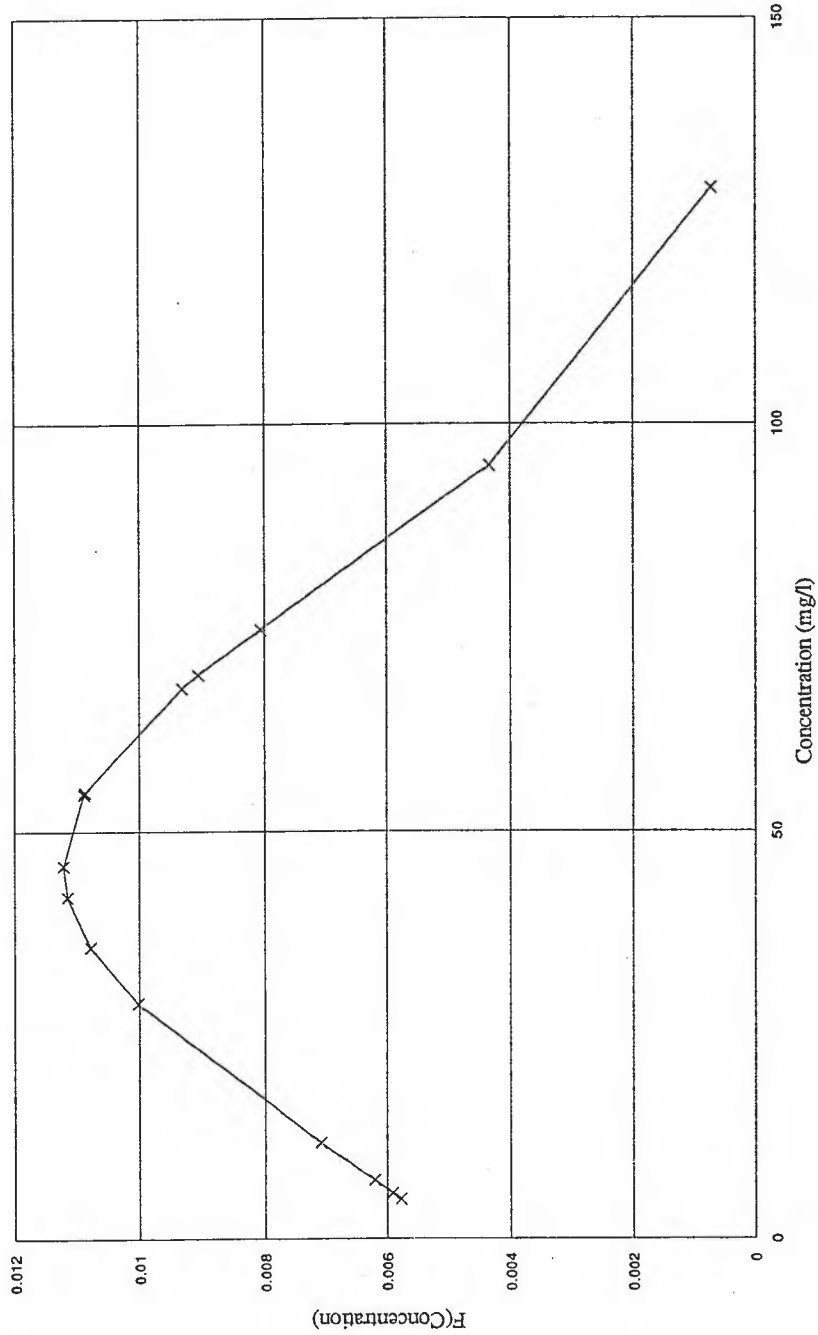
Roth Steel Company
PCB - Cell 1 - Dry weight



Normal Curve Based on Mean
November 1993

WZB

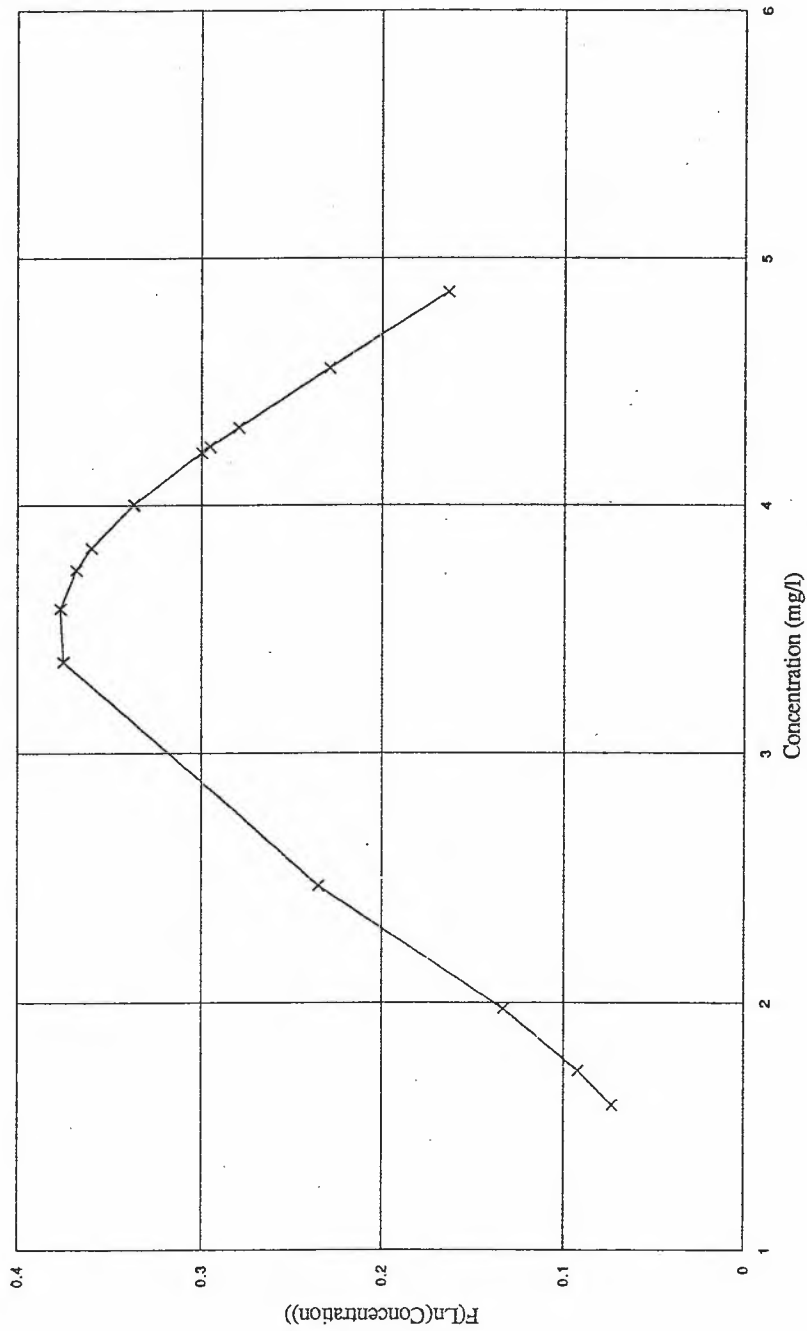
Roth Steel Company
PCB - Cell 1 - Dry weight



Normal Curve Based on Median
November 1993

WZB

Roth Steel Company
PCB - Cell 1 - Dry weight



Lognormal Curve
November 1993

WZB

STATISTICAL ANALYSIS
For Less Than 50 Samples

Project: Roth Steel Company
Project No: 93071

Description: November 1983 - As Is - Cell 2
Filename: PCB21193
Parameter: PCB

i	Sample ID	Concentration (mg/l)	Normal Curve Ordinate (mean) F(conc.)	a	W	Ln(conc.)	W (Lognormal)	W (Lognormal) F(ln(conc.))	Normal Curve Ordinate (Lognormal) F(ln(conc.))	(x-median) ²	Normal Curve Ordinate (median) F(conc.)
1	2-31	13.2	0.001	0.515	37.956	2.580	0.971	0.010	0.010	3,237.610	0.001
2	2-19	36	0.008	0.331	16.365	3.584	0.286	0.511	0.511	1,162.810	0.006
3	2-11	41.3	0.011	0.250	10.579	3.721	0.176	0.640	0.640	829.440	0.008
4	2-12	45.8	0.013	0.188	6.986	3.824	0.112	0.721	0.721	590.490	0.010
5	2-16	48.2	0.015	0.135	3.721	3.875	0.061	0.752	0.752	479.610	0.011
6	2-32	60	0.018	0.088	1.241	4.094	0.019	0.801	0.801	102.010	0.016
7	2-2	70	0.017	0.043	0.069	4.248	0.001	0.746	0.746	0.010	0.017
8	2-33	70.1	0.017	0.000	0.000	4.250	0.000	0.745	0.745	0.000	0.017
9	2-8	71.6	0.017	0.000	0.000	4.271	0.000	0.732	0.732	2.250	0.017
10	3-37	74.1	0.016	0.000	0.000	4.305	0.000	0.708	0.708	16.000	0.017
11	2-4	75.7	0.016	0.000	0.000	4.327	0.000	0.693	0.693	31.360	0.017
12	2-5	83	0.012	0.000	0.000	4.419	0.000	0.615	0.615	166.410	0.015
13	2-28	83.7	0.012	0.000	0.000	4.427	0.000	0.608	0.608	184.960	0.015
14	2-24	85.5	0.011	0.000	0.000	4.449	0.000	0.588	0.588	237.160	0.014
15	2-15	86.9	0.010	0.000	0.000	4.465	0.000	0.573	0.573	282.240	0.013

WZB

Roth Steel Company
November 1993 - As is - Cell 2

PCB

Regulatory threshold (RT): 50
Number of samples (n): 15

Number of samples above regulatory threshold: 10
Percent of samples considered hazardous: 66.67%
Percent of samples considered non-hazardous: 33.33%

Mean: 63.007
Sample standard deviation: 21.659
Sample Variance: 469.116
Maximum concentration: 86.900
Minimum concentration: 13.200
Standard error: 5.592
Relative standard deviation (coefficient of variation): 0.344
Type of transformation required by SW-846: Arcsine transformation

TEST FOR NORMAL DISTRIBUTION:

Shapiro and Wilk w-test:
d: 6567.63
k: 7
W: 0.901
Significance: 0.1
Quantile: 0.901
Conclusion: Distribution is not normal

Number of samples required: NA

Student t test calculations (mean):
Degree of freedom: NA
Two-tailed confidence interval probability: NA
One-tailed confidence interval probability: NA
t-value: NA
Lower confidence interval: NA
Upper confidence interval: NA

W Z B

Roth Steel Company
November 1993 - As is - Cell 2

PCB

LOGNORMAL:

Ln(RT): 3.912
Mean: 4.056
Sample standard deviation: 0.496
Sample Variance: 0.246
Standard error: 0.128
Relative standard deviation (coefficient of variation): 0.122

TEST FOR LOGNORMAL DISTRIBUTION:

Shapiro and Wilk W-test (lognormal):

d: 3.448
k: 0.000
W: 0.766
Significance: 0.1
Quantile: 0.9
Conclusion: Distribution is not lognormal

Confidence interval calculations (lognormal):

Degree of freedom: NA
Two-tailed confidence interval probability: NA
One-tailed confidence interval probability: NA
H - lower confidence interval: NA
H - upper confidence interval: NA
Lower confidence interval: NA
Upper confidence interval: NA

Minimum variance unbiased estimators (MVU):

t(1): NA
t(2): NA
(Psi)/t(1): NA
(Psi)/t(2): NA
Mean: NA
Standard deviation: NA
Variance: NA

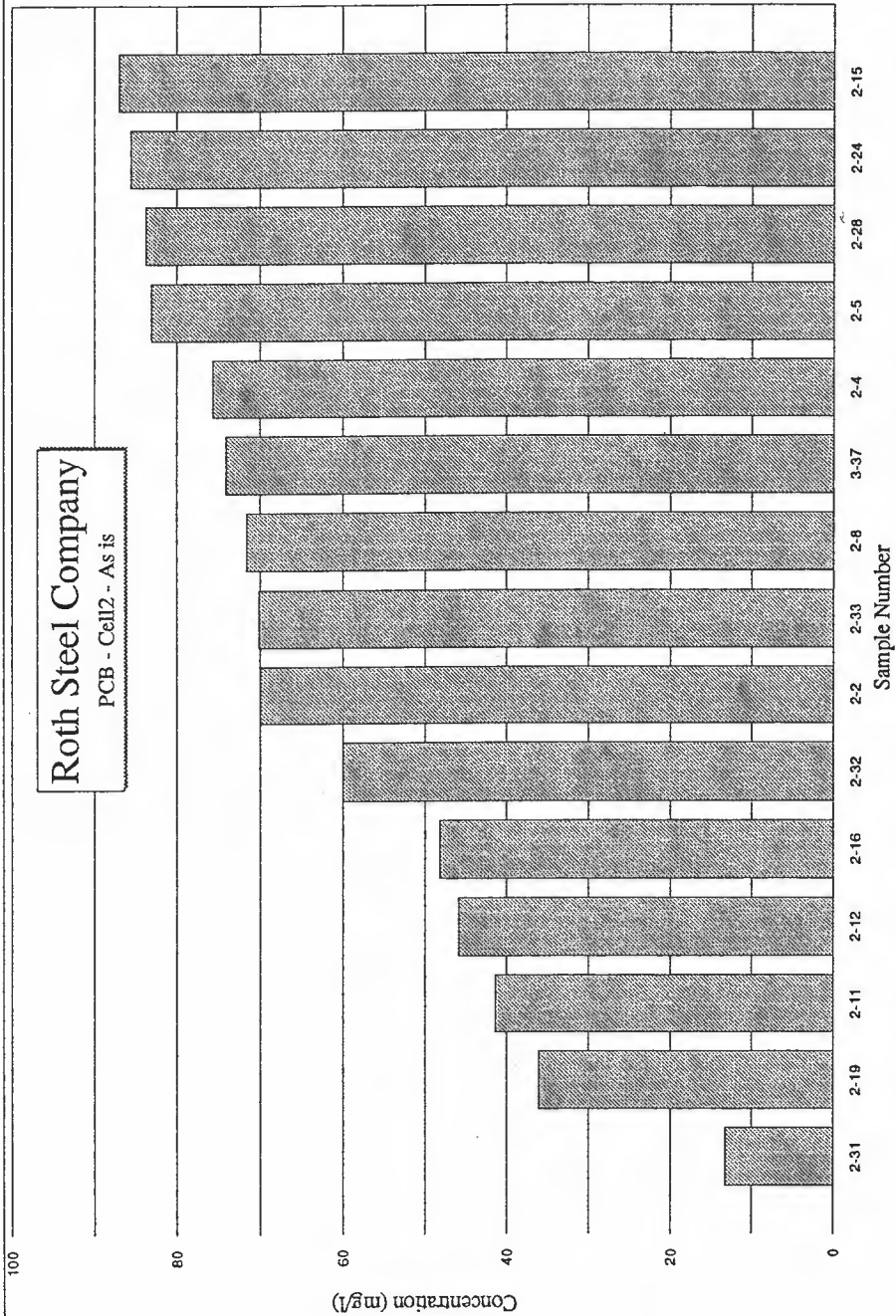
Median:

Mean-Median: 70.1
Type of skew: -7.09
Standard deviation (median): 22.87
Variance (median): 523.03
Standard error (median): 5.90

W Z B

Roth Steel Company

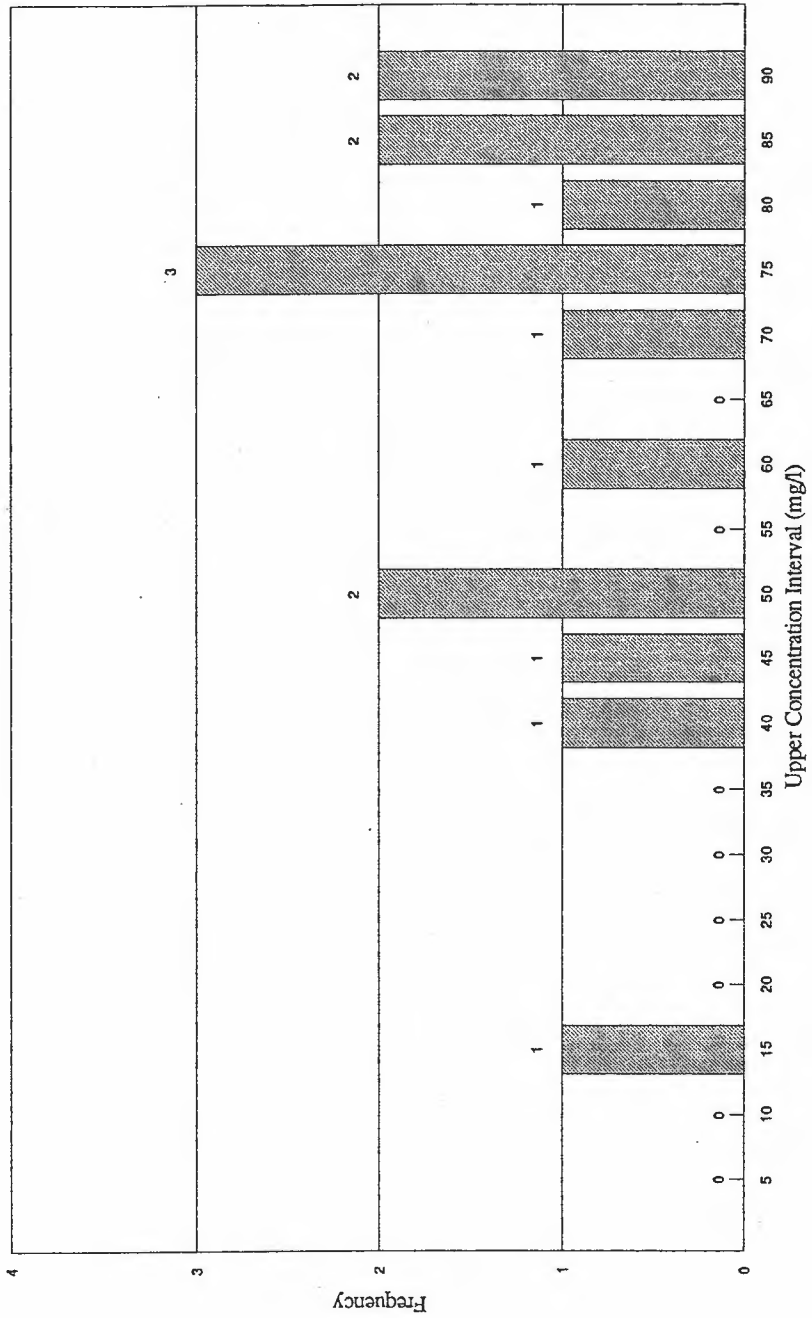
PCB - Cell2 - As is



November 1993

WZB

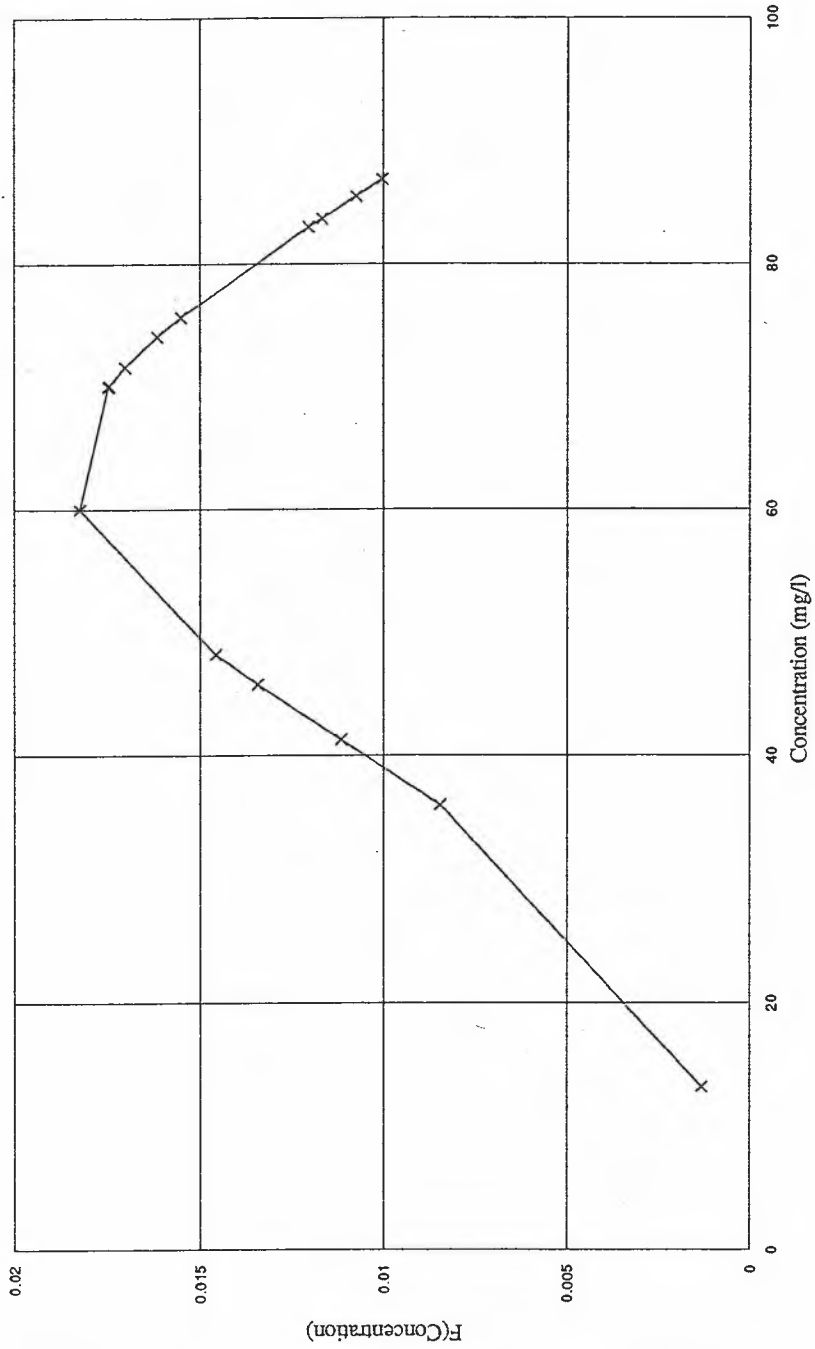
Roth Steel Company
PCB - Cell2 - As is



Histogram
November 1993

W Z B

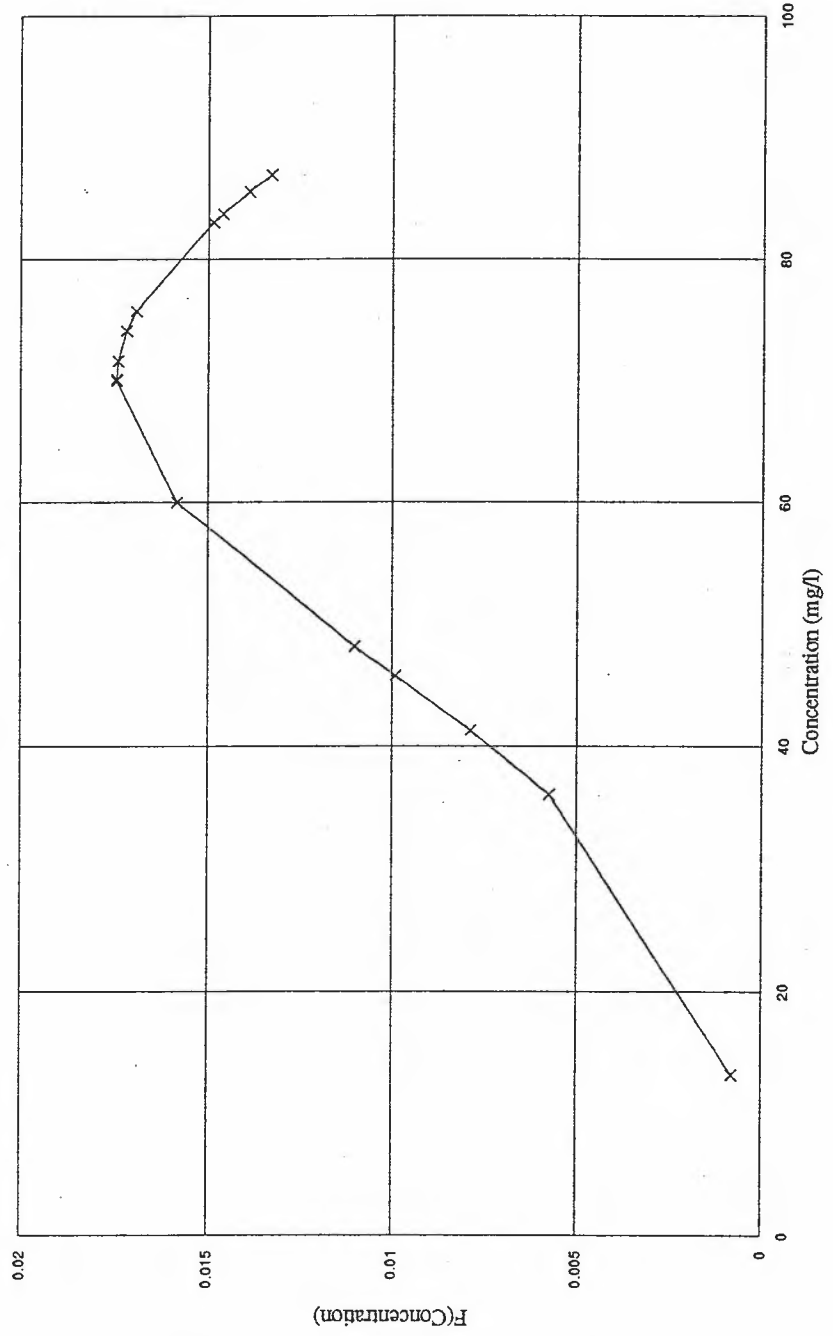
Roth Steel Company
PCB - Cell 2 - As is



Normal Curve Based on Mean
November 1993

WZB

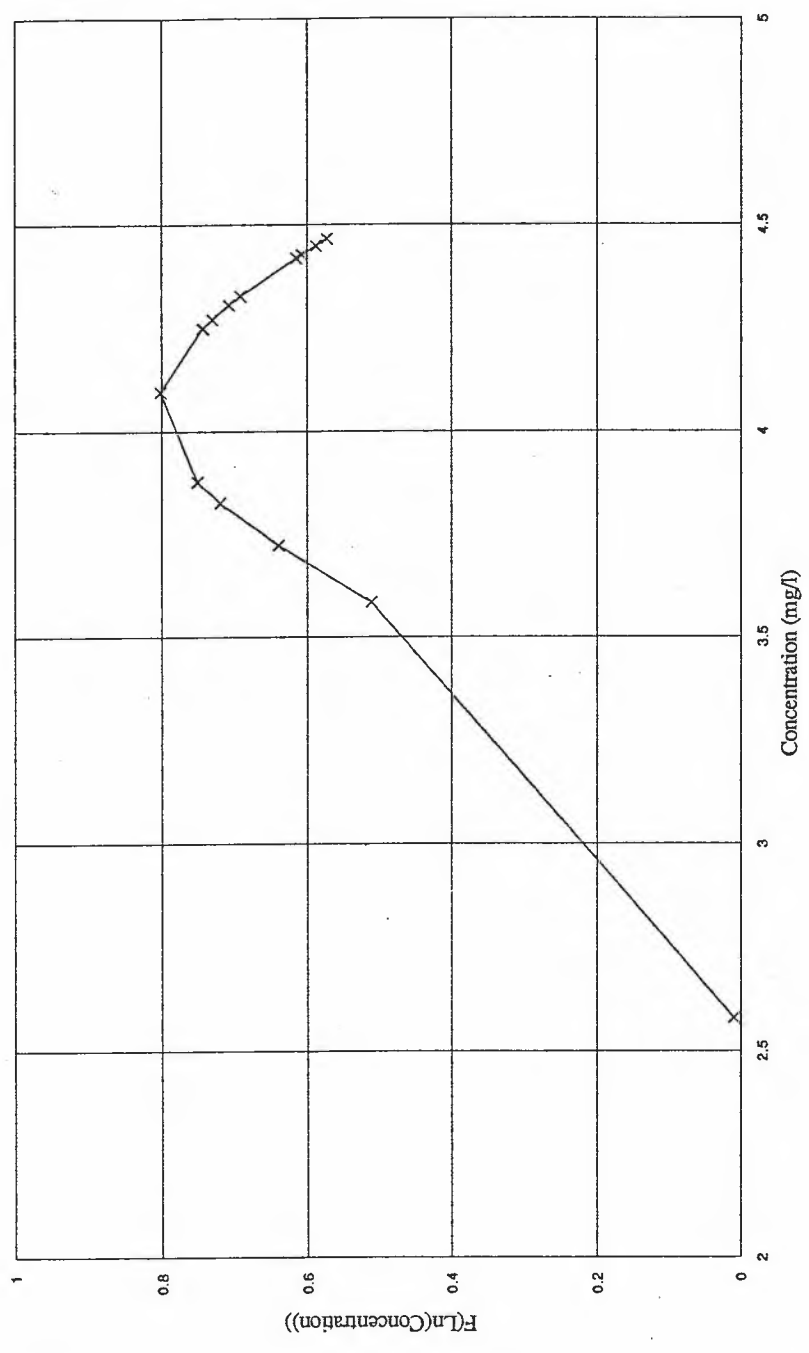
Roth Steel Company
PCB - Cell2 - As is



Normal Curve Based on Median
November 1993

WZB

Roth Steel Company
PCB - Cell2 - As is



Lognormal Curve
November 1993

W Z B

11/18/93

STATISTICAL ANALYSIS
For Less Than 50 Samples

Project: Roth Steel Company
 Project No: 93071
 Description: November 1993 - Dry Weight - Cell 2
 Filename: PCB_1193
 Parameter: PCB

i	Sample ID	Concentration (mg/l)	Normal Curve Ordinate (mean) F(conc.)	a	W	Ln(conc.)	W (Lognormal)	Normal Curve Ordinate (Lognormal) F(ln(conc.))	(x-median) ²	Normal Curve Ordinate (median) F(conc.)
1	2-31	15.1	0.001	0.515	47.277	2.715	1.008	0.007	5,140.890	0.000
2	2-19	46	0.007	0.331	19.274	3.829	0.271	0.540	1,664.640	0.005
3	2-12	58.2	0.011	0.250	11.252	4.064	0.143	0.730	817.960	0.008
4	2-16	58.6	0.012	0.188	7.963	4.071	0.102	0.734	795.240	0.009
5	2-11	59.7	0.012	0.135	4.384	4.089	0.059	0.745	734.410	0.009
6	2-32	71.6	0.015	0.088	1.716	4.271	0.021	0.795	231.040	0.012
7	2-8	86.3	0.015	0.043	0.113	4.458	0.001	0.741	0.250	0.014
8	2-2	86.8	0.014	0.000	0.000	4.464	0.000	0.738	0.000	0.014
9	3-37	88.9	0.014	0.000	0.000	4.488	0.000	0.724	4.410	0.014
10	2-33	91.1	0.014	0.000	0.000	4.512	0.000	0.708	18.490	0.014
11	2-4	92.1	0.013	0.000	0.000	4.523	0.000	0.700	28.090	0.014
12	2-28	101	0.010	0.000	0.000	4.615	0.000	0.628	201.640	0.013
13	2-24	103.3	0.010	0.000	0.000	4.638	0.000	0.608	272.250	0.012
14	2-15	104.3	0.009	0.000	0.000	4.647	0.000	0.599	306.250	0.012
15	2-5	106.9	0.008	0.000	0.000	4.672	0.000	0.577	404.010	0.011

W Z B

Roth Steel Company
November 1993 - Dry Weight - Cell 2

PCB

Regulatory threshold (RT): 50
Number of samples (n): 15

Number of samples above regulatory threshold: 13
Percent of samples considered hazardous: 86.67%
Percent of samples considered non-hazardous: 13.33%

Mean: 77.993
Sample standard deviation: 25.989
Sample Variance: 675.444
Maximum concentration: 106.900
Minimum concentration: 15.100
Standard error: 6.710
Relative standard deviation (coefficient of variation): 0.333
Type of transformation required by SW-846: Arcsine transformation

TEST FOR NORMAL DISTRIBUTION:

Shapiro and Wilk W-test: 9456.21
d: 7
k: 0.895
W: 0.1
Significance: 0.901
Quantile: Distribution is not normal
Conclusion: NA

Number of samples required: NA

Student t test calculations (mean):
Degree of freedom: NA
Two-tailed confidence interval probability: NA
One-tailed confidence interval probability: NA
t-value: NA
Lower confidence interval: NA
Upper confidence interval: NA

W Z B

Roth Steel Company
November 1993 - Dry Weight - Cell 2

PCB

LOGNORMAL:

Ln(RT): 3.912
Mean: 4.270
Sample standard deviation: 0.502
Sample Variance: 0.252
Standard error: 0.130
Relative standard deviation (coefficient of variation): 0.118

TEST FOR LOGNORMAL DISTRIBUTION:

Shapiro and Wilk W-test (lognormal):

d: 3.529
k: 0.000
W: 0.730
Significance: 0.1
Quantile: 0.9
Conclusion: Distribution is not lognormal

Confidence interval calculations (lognormal):

Degree of freedom: NA
Two-tailed confidence interval probability: NA
One-tailed confidence interval probability: NA
H - lower confidence interval: NA
H - upper confidence interval: NA
Lower confidence interval: NA
Upper confidence interval: NA

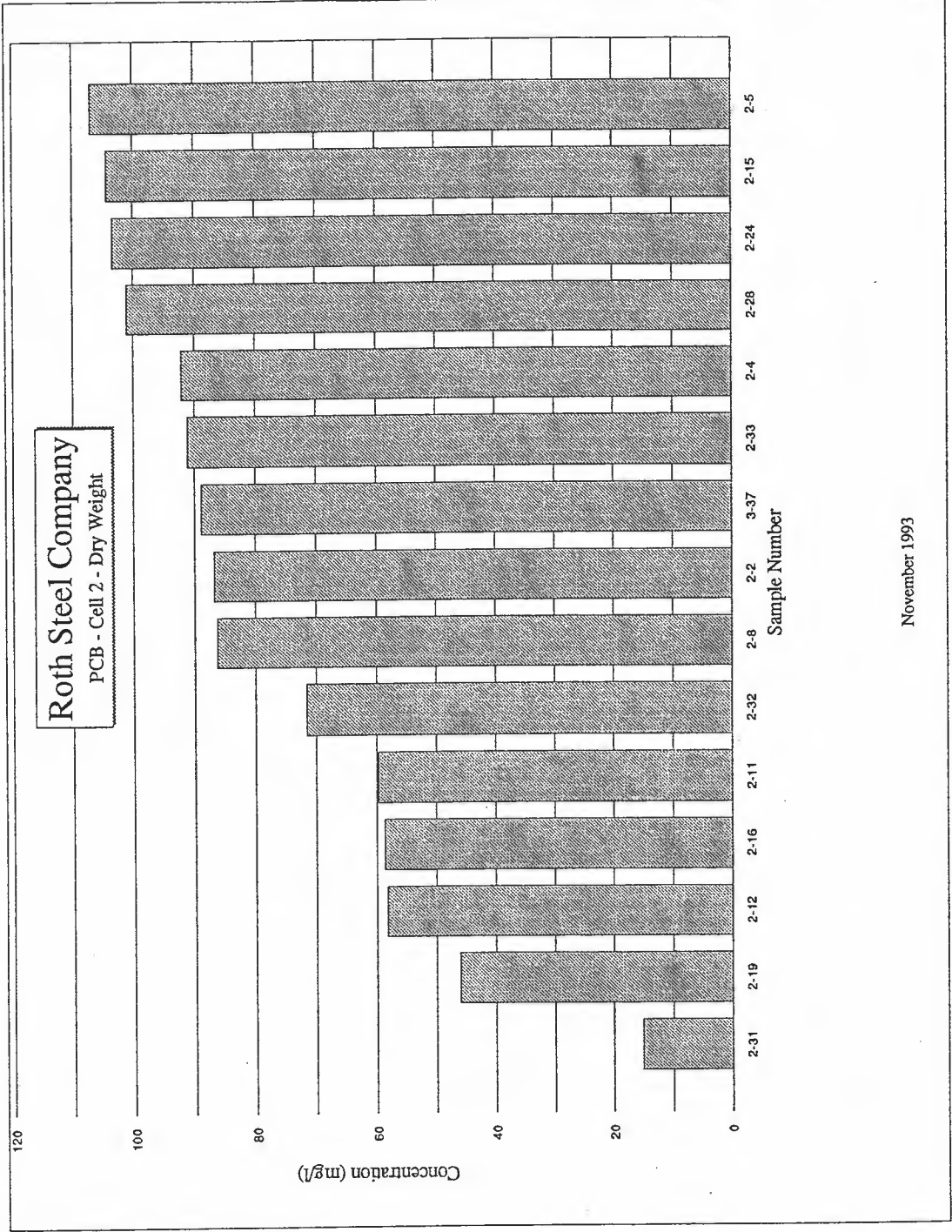
Minimum variance unbiased estimators (MVU):

t(1): NA
t(2): NA
(Psi)(t(1)): NA
(Psi)(t(2)): NA
Mean: NA
Standard deviation: NA
Variance: NA

Median:

Mean-Median: 86.8
Type of skew: -8.81
Standard deviation (median): 27.54
Variance (median): 758.54
Standard error (median): 7.11
Left skewed

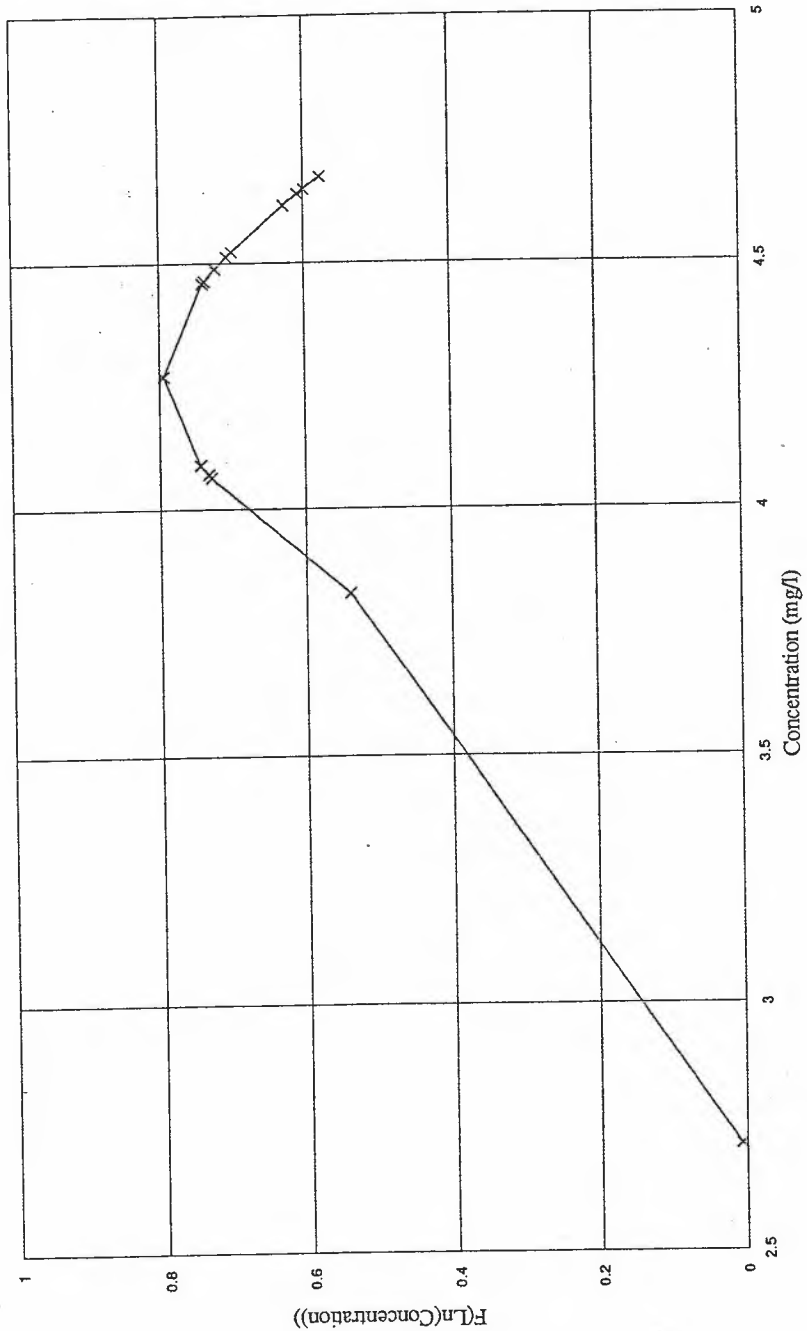
W Z B



November 1993

W Z B

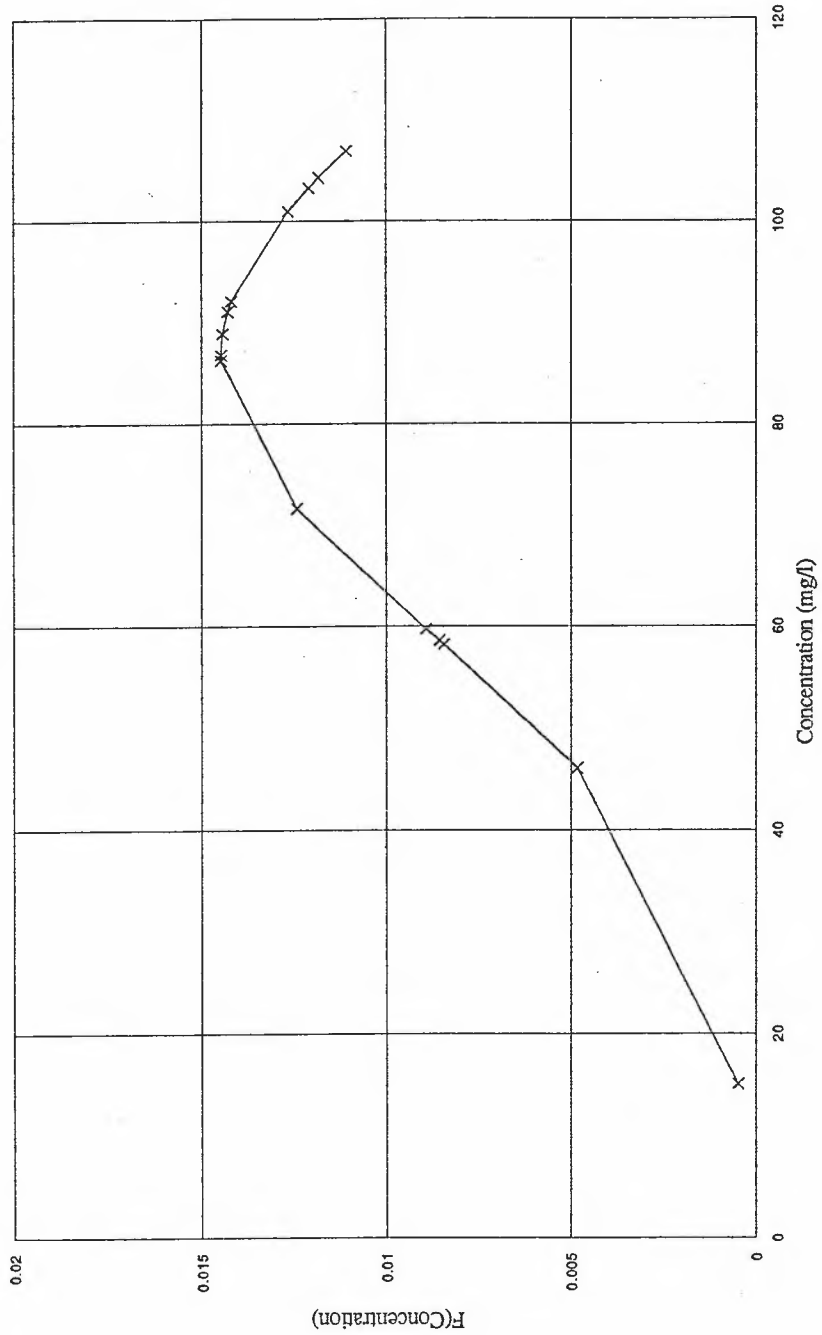
Roth Steel Company
PCB - Cell 2 - Dry Weight



Lognormal Curve
November 1993

WZB

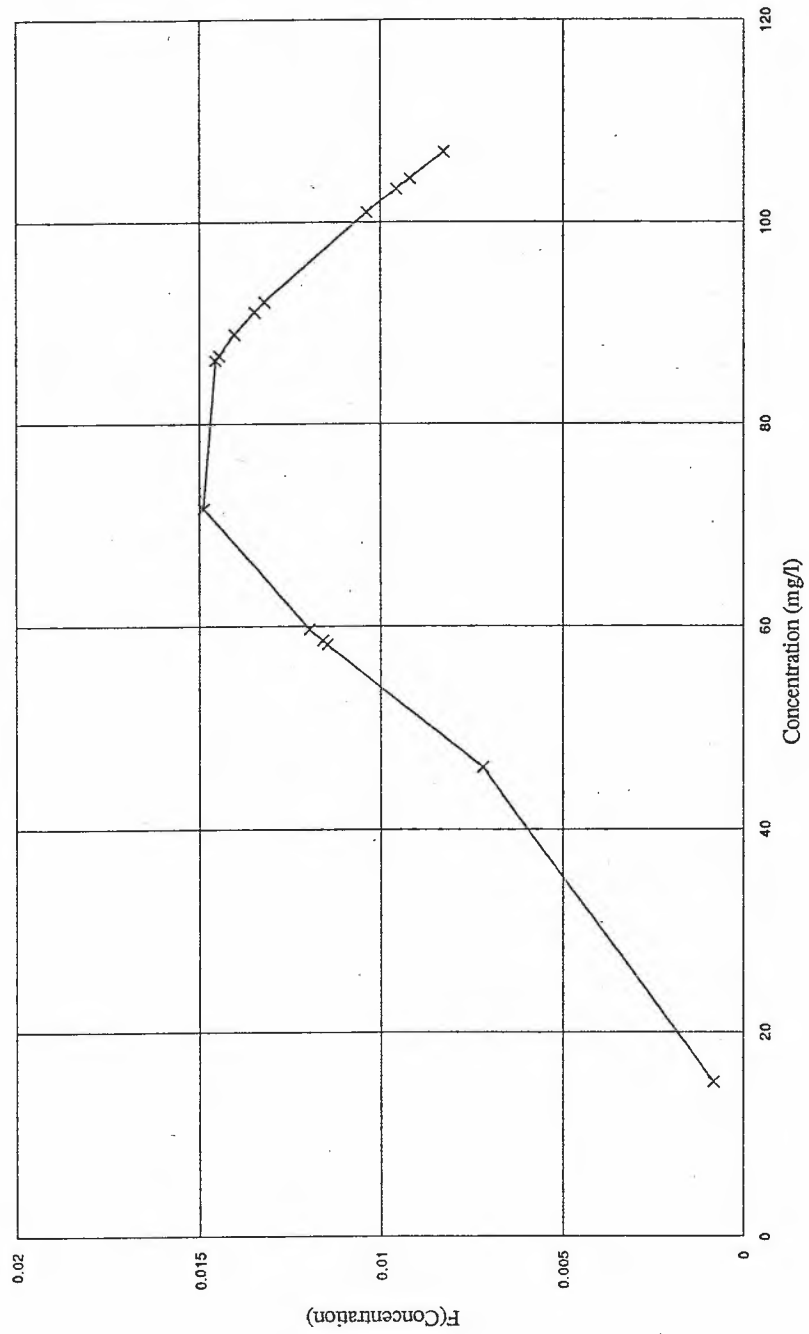
Roth Steel Company
PCB - Cell 2 - Dry Weight



Normal Curve Based on Median
November 1993

WZB

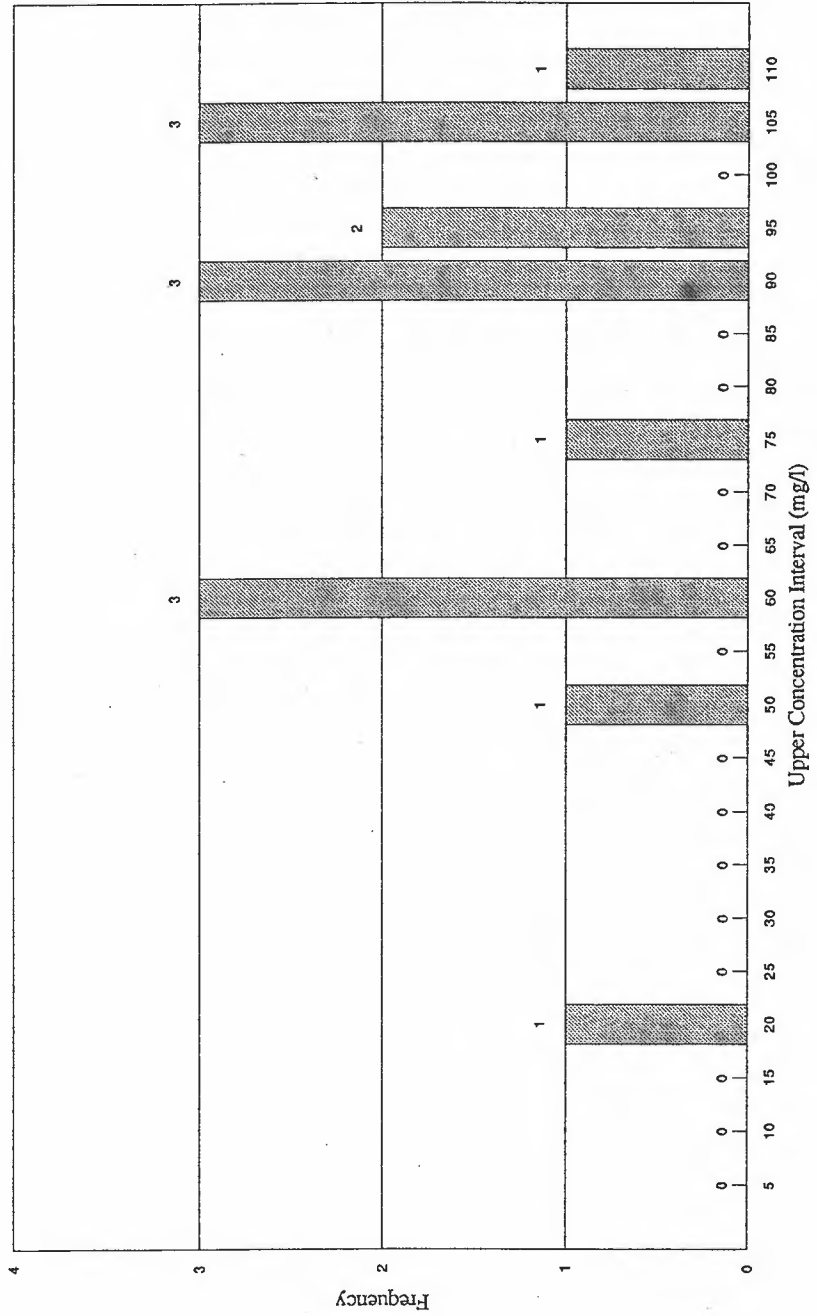
Roth Steel Company
PCB - Cell 2 - Dry Weight



Normal Curve Based on Mean
November 1993

WZB

Roth Steel Company
PCB - Cell 2 - Dry Weight



Histogram
November 1993

WZB

APPENDIX C
CHAIN OF CUSTODY FORMS

W Z B

W.Z. BAUMGARTNER & ASSOCIATES, INC.
CONSULTING ENGINEERS

SUITE 101
110 WESTWOOD PLACE
P.O. BOX 786
DRENTWOOD, TENNESSEE 37027
615-373-1572
FAX: 615-370-9292

CHAIN OF CUSTODY

Proj. No: 23071	Client: ROTH STEEL	Intended Analysis		Remarks (Include Preservatives Used)					
Location: SYRACUSE YARD-UNOFFICE CELL #2	Sampler Name (Print): WAYNE PARR	No. of Containers							
Samplers Signature: <i>Wayne Parr</i>									
Sta. No.	Date	Time (24 Hour Notation)	Comp	Grab	Station Location	No. of Containers	Relinquished By: (Signature)	Date/Time	Received By: (Signature)
	12/25/93			X	HOLE # 37	1	<i>Wayne Parr</i>		
	"	"		X	" # 33	1			
	"	"		X	" # 31	1			
	"	"		X	" # 28	1			
	"	"		X	" # 24	1			
	"	"		X	" # 15	1			
	"	"		X	" # 5	1			
	"	"		X	" # 4	1			
	"	"		X	" # 8	1			
	"	"		X	" # 12	1			
	"	"		X	" # 11	1			
	"	"		X	" # 16	1			
1	<i>Wayne Parr</i>					4			
2	<i>Wayne Parr</i>					5			
3	<i>Wayne Parr</i>								

Received for Laboratory By: (Signature) *Wayne Parr*
Custody Seals Intact: Yes No Temperature: (°C) _____

