Department of Energy
Oak Ridge Operations
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

October 12, 1995

Mr. Tony Able
Remedial Project Manager
United States Environmental Protection Agency
Region IV
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Ms. Caroline Patrick Haight, Director
Division of Waste Management
Kentucky Department for Environmental Protection
14 Reilly Road, Frankfort Office Park
Frankfort, Kentucky 40601

SUMMARY OF CHANGES AND ERRATA SHEET FOR BACKGROUND CONCENTRATIONS AND HUMAN HEALTH RISK-BASED SCREENING CRITERIA FOR METALS IN SOIL AT THE PADUCAH GASEOUS DIFFUSION PLANT (PGDP) (DOE/ORO/07-1417-D1)

Dear Mr. Able and Ms. Haight:

Enclosed is the summary of changes to the document resulting from regulatory input in July 1995. Also enclosed are errata sheets for the Environmental Protection Agency (EPA) and the Kentucky Division of Waste Management (KDWM) distribution of the documents. These corrections have already been made in the remainder of the D1 distribution list.

If you have any questions or require additional information, please call Carlos R. Alvarado at (502) 441-6804.

Sincerely,

Jimmie C Hodges

Jimmie C. Hodges, Site Manager
Paducah Site Office

EF-22:Alvarado

Enclosure

cc: P. A. Gourieux, LMES/PGDP
J. C. Massey, LMES/PGDP
J. W. Morgan, LMES/PGDP
R. C. Sleeman, EW-91
J. Stickney, KDEP/Frankfort
T. Taylor, KDEP/Frankfort
D. J. Wilkes, JEG/PGDP
H. K. Young, LMES/PGDP

ATTACHMENT B

Errata Sheet

This attachment contains errata for DOE/OR/07-1417&D1. These errata only apply to the six copies of the document distributed to C. P. Haight and T. M. Taylor of the Commonwealth of Kentucky and the five copies sent to T. Able of the United States Environmental Protection Agency. All other copies of the document were distributed after the errors were corrected. Please note, T. M. Taylor of the Commonwealth of Kentucky was inadvertently sent an additional copy of DOE/OR/07-1417&D1. In total, T. M. Taylor received five copies instead of the four copies indicated on the enclosed distribution sheet. The additional copy may be returned, discarded, or kept at the discretion of T.M. Taylor. Please note, materials to update the additional copy sent to T. M. Taylor are included in his errata package if the additional copy is to be kept. If this copy is to be discarded, please discard the errata material for this copy of the document as well.

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1) Remove the cover of the document. Replace with cover in the errata package.

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DOE/OR/07-1417&D1

Background Concentrations and Human Health Risk-based Screening Criteria for Metals in Soil at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

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2107-4

September 22, 1995

Mr. Tony Able
Remedial Project Manager
United States Environmental Protection Agency
Region IV
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Ms. Caroline Patrick Haight, Director
Division of Waste Management
Kentucky Department for Environmental Protection
14 Reilly Road, Frankfort Office Park
Frankfort, Kentucky 40601

TRANSMITTAL OF THE BACKGROUND CONCENTRATIONS AND HUMAN HEALTH RISK-BASED SCREENING CRITERIA FOR METALS IN SOIL AT THE PADUCAH GASEOUS DIFFUSION PLANT (PGDP)

Dear Mr. Able and Ms. Haight:

Enclosed is a copy of the subject report. This document provides background for metals in PGDP soils and will be used to help establish site cleanup levels, as well as screening characterization of all soils at PGDP. This document incorporates the Kentucky Division of Waste Management (KDWM) comments and concerns from a June 1995 document review and a July 25, 1995, comment resolution meeting in Frankfort.

The inorganic background concentrations were developed using existing data from previous field work at PGDP, primarily the CH_2M Hill Phase I and Phase II Site Investigations. However, these reports indicated that data was insufficient without further fieldwork to close data gaps for all radionuclide background concentrations of concern, and several inorganic elements of concern. A workplan is currently being developed, to be transmitted to you on September 30, 1995, to address radionuclides and the few specific inorganic elements of concern.

Contingent upon funding constraints imposed on the Paducah program, the current projected date of fieldwork to collect radionuclide background is now early Fiscal Year (FY) 1997. If you have any questions or require additional information, please call Carlos R. Alvarado at (502) 441-6804.

Sincerely,

Jimmie C Hodges

Jimmie C. Hodges, Site Manager
Paducah Site Office

EF-22:Alvarado

Enclosure

cc: C. R. Alvarado, EF-22
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J. W. Morgan, MMES/PGDP
R. C. Sleeman, EW-91
D. J. Wilkes, JEG/Paducah

DOE/OR/07-1417&D1
formerly KY/EM-77

Background Concentrations and Human Health Risk-based Screening Criteria for Metals in Soil at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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Date Issued—September 1995

Prepared by
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Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
under budget and reporting code EW 20

Paducah Gaseous Diffusion Plant
Paducah, Kentucky 42002
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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PREFACE

This report presents background concentrations and human health risk-based screening criteria for selected inorganic analytes in soil at the Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky. The work was performed under Work Breakdown Structure 1.4.12.7.1.02.04 entitled Corrective Measures for Offsite Contamination. Screening criteria are required for Resource Conservation and Recovery Act Appendix IX and Contract Laboratory Program total analyte list inorganic analytes to ensure that remedial investigations and feasibility studies for identified areas of concern and solid waste management units at PGDP focus on those contaminants that may influence human health risk. In addition, appropriate screening criteria are needed to determine if areas currently not under investigation should be added to the list of those areas to be investigated at PGDP. These values are to be used when completing work plans and reports produced as part of the environmental restoration and waste management programs at PGDP.

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ACKNOWLEDGMENTS

The authors would like to thank Leslie Bloom and Beth Ladd for their invaluable support on this report. Their knowledge and skills were instrumental to the completion of this report.

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FIGURES

TABLES

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
EPA	(United States) Environmental Protection Agency
RCRA	Resource Conservation and Recovery Act
PGDP	Paducah Gaseous Diffusion Plant
PRGs	Preliminary Remediation Goals

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EXECUTIVE SUMMARY

Screening criteria for Resource Conservation and Recovery Act (RCRA) Appendix IX and Contract Laboratory Program (CLP) total analyte list inorganic analytes are required to ensure that remedial investigations and feasibility studies for identified areas of concern and solid waste management units at the Paducah Gaseous Diffusion Plant (PGDP) focus on those contaminants that may drive human health risk at these units. In addition, appropriate screening criteria are needed to determine if areas currently not under investigation (i.e., "new" areas) should be added to the list of those areas to be investigated at the PGDP. This report derives both background and direct contact human health risk-based concentrations that can be used to screen for contamination in near surface (0 to 1 ft below ground surface) and subsurface (greater than 1 ft below ground surface) soil samples taken at the PGDP. In addition, screening levels for soil recently provided in the Commonwealth of Kentucky's *Risk Assessment Guidance* (401 KAR 100:050) are presented for comparison.

Background values presented in this report were calculated from data collected during previous investigations at the PGDP and are the upper limit of the 95% confidence interval of the 95th percentile of the range of the probable background concentration for each inorganic analyte. Human health risk-based screening values presented in this report were calculated following guidance provided by the United States Environmental Protection Agency as modified by material provided by the Commonwealth of Kentucky's *Risk Assessment Guidance* (401 KAR 100:050). Tables ES-1 and ES-2 present the screening criteria for surface and subsurface soil, respectively. These tables are identical to those presented in Chapter 4 as Table 4.1 and 4.2, respectively.

Table E.1. Values for use in screening concentration of metals[a] in near surface soils (0 to 1 ft below ground surface) in potential areas of concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Aluminum	7429-90-5	1.3E+04	---	---	---	---	7.7E+04
Antimony (Metallic)	7440-36-0	8.4E-01	1.1E+00	HI	6.4E-02	HI	3.1E+01[j]
Arsenic (Inorganic)	7440-38-2	1.2E+01	8.5E-01	ECR	9.2E-02	ECR	3.2E-01[k]
Barium	7440-39-3	2.0E+02	6.6E+02	HI	3.8E+01	HI	5.3E+03[l]
Beryllium	7440-41-7	1.8E+01	9.2E-03	ECR	1.0E-03	ECR	1.4E-01[m]
Cadmium (Diet)	7440-43-9	2.6E+00	1.4E+00	HI	8.1E-02	HI	3.8E+01[n]
Calcium	7440-70-2	2.0E+05	---	---	---	---	---
Chromium (III) (Insoluble Salts)	16065-83-1	1.6E+01	7.1E+02	HI	4.0E+01	HI	---
Chromium (VI)	18540-29-9	[o]	1.4E+01	HI	8.0E-01	HI	3.0E+01
Cobalt	7440-48-4	1.4E+01	---	---	---	---	---
Copper	7440-50-8	1.9E+01	---	---	---	---	2.8E+03[p]
Cyanide (CN-)	57-12-5	[q]	4.3E+02	HI	2.5E+01	HI	1.3E+03[r]
Iron	7439-89-6	2.8E+04	---	---	---	---	---
Lead and Compounds	7439-92-1	3.6E+01	---	---	---	---	2.0E+01[s]
Magnesium	7439-95-4	7.7E+03	---	---	---	---	---
Manganese (Diet)	7439-96-5	1.5E+03	7.6E+02	HI	4.4E+01	HI	3.8E+02[t]
Mercury (Elemental)	7439-97-6	2.0E-01	4.3E-03	HI	2.4E-04	HI	---
Mercury (Inorganic)	7439-97-6	2.0E-01	2.9E+00	HI	1.6E-01	HI	2.3E+01

Table E.1. (continued)

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Nickel (Soluble Salts)	7440-02-0	2.1E+01	6.5E+02	HI	3.8E+01	HI	1.5E+03
Potassium	7440-09-7	1.3E+03	---	---	---	---	---
Selenium	7782-49-2	8.0E-01	2.4E+02	HI	1.4E+01	HI	3.8E+02
Silver	7440-22-4	2.3E+00	1.1E+02	HI	6.7E+00	HI	3.8E+02[u]
Sodium	7440-23-5	3.2E+02	---	---	---	---	---
Sulfide	---	[o]	---	---	---	---	---
Thallium	7440-28-0	4.4E-01	---	---	---	---	---
Tin	7440-31-5	[o]	8.0E+03	HI	4.6E+02	HI	4.6E+04[v]
Vanadium (Metallic)	7440-62-2	3.8E+01	9.9E+00	HI	5.6E-01	HI	5.4E+02
Zinc (Metallic)	7440-66-6	6.5E+01	7.5E+03	HI	4.4E+02	HI	2.3E+04

Notes:
Cells with dashes (—) indicate that data are not available or not applicable.
All values in mg/kg.

a Includes analytes found on Target Analyte List, as defined by EPA in 1988 CLP Statement of Work, and RCRA Appendix IX list of constituents.
b Analyte name.
c Chemical Analytical Service Registry Number.
d Value for use in screening to determine if analyte was detected at a naturally occurring concentration. Chapter 2 provides details on how these were derived. Values match those contained in Table 2.14, Column 2, except values are rounded to two significant digits.
e Industrial use human health risk-based screening value (IPRG) calculated using either a Hazard Index (HI) of 0.1 or an Excess Lifetime Cancer Risk (ECR) of 1×10^{-6} as the target value. The lesser of the HI and ECR based values is presented. See Section 3 for the method used to derive these values.
f Indicator of target value used to calculate IPRG. HI indicates that IPRG is based on a HI of 0.1; ECR indicates that IPRG is based on an ECR of 1×10^{-6}.
g Residential use human health risk-based screening value (RPRG) calculated using as either a HI of 0.1 or an ECR of 1×10^{-6} as the target value. The lessor of the HI and ECR based values is presented. See Section 3 for the method used to derive these values.
h Indicator of target value used to calculate RPRG. HI indicates that the RPRG is based on a HI of 0.1; ECR indicates that RPRG is based on an ECR of 1×10^{-6}.

Table E.1. (continued)

[i] Soil screening value presented in Commonwealth of Kentucky's *Risk Assessment Guidance, Appendix A* (Commonwealth of Kentucky 1995b). This guidance states that these values are to be multiplied by 0.1 if the site being screened has more than 5 chemicals present. Also, this guidance states that these screening values are not applicable to sites at which more than one media may be contaminated.

[j] Value is that for "Antimony and compounds" in *Risk Assessment Guidance, Appendix A*.

[k] Value is that for "Arsenic (cancer endpoint) in *Risk Assessment Guidance, Appendix A*.

[l] Value is that for "Barium and compounds" in *Risk Assessment Guidance, Appendix A*.

[m] Value is that for "Beryllium and compounds" in *Risk Assessment Guidance, Appendix A*.

[n] Value is that for "Cadmium and compounds" in *Risk Assessment Guidance, Appendix A*.

[o] Data concerning this analyte were not collected during the Phases I and II Site Investigations. Therefore, a background concentration could not be established.

[p] Value is that for "Copper and compounds" in *Risk Assessment Guidance, Appendix A*.

[q] Cyanide is not expected to be naturally occurring at PGDP; therefore, a background value was not derived.

[r] Value is that for "Free cyanide" in *Risk Assessment Guidance, Appendix A*.

[s] Value is that for "Lead" in *Risk Assessment Guidance, Appendix A*. This guidance states that the screening value for lead does not need to be multiplied by 0.1 even if more than 5 chemicals are present at the site being evaluated.

[t] Value is that for "Manganese and compounds" in *Risk Assessment Guidance, Appendix A*.

[u] Value is that for "Silver and compounds" in *Risk Assessment Guidance, Appendix A*.

[v] Value is that for "Tin and compunds" in *Risk Assessment Guidance, Appendix A*. A Chemical Abstract Service Registry Number is not provided in the guidance for this chemical.

Table E.2. Values for use in screening concentration of metals[a] in subsurface soils (greater than 1 ft below ground surface) in potential areas of concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Aluminum	7429-90-5	1.2E+04	---	---	---	---	7.7E+04
Antimony (Metallic)	7440-36-0	1.3E+01	1.1E+00	HI	6.4E-02	HI	3.1E+01[j]
Arsenic (Inorganic)	7440-38-2	7.9E+00	8.5E-01	ECR	9.2E-02	HI	3.2E-01[k]
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Calcium	7440-70-2	6.1E+03	---	---	---	---	---
Chromium (III) (Insoluble Salts)	16065-83-1	4.3E+01	7.1E+02	HI	4.0E+01	HI	---
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Cobalt	7440-48-4	1.3E+01	---	---	---	---	---
Copper	7440-50-8	2.5E+01	---	---	---	---	2.8E+03[p]
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Iron	7439-89-6	2.8E+04	---	---	---	---	---
Lead and Compounds	7439-92-1	2.3E+01	---	---	---	---	2.0E+01[s]
Magnesium	7439-95-4	2.1E+03	---	---	---	---	---
Manganese (Diet)	7439-96-5	8.2E+02	7.6E+02	HI	4.4E+01	HI	3.8E+02[t]
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Mercury (Inorganic)	7439-97-6	1.3E-01	2.9E+00	HI	1.6E-01	HI	2.3E+01

Table E.2. (continued)

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Nickel (Soluble Salts)	7440-02-0	2.2E+01	6.5E+02	HI	3.8E+01	HI	1.5E+03
Potassium	7440-09-7	9.5E+02	---	---	---	---	---
Selenium	7782-49-2	7.0E-01	2.4E+02	HI	1.4E+01	HI	3.8E+02
Silver	7440-22-4	2.7E+00	1.1E+02	HI	6.7E+00	HI	3.8E+02[u]
Sodium	7440-23-5	3.4E+02	---	---	---	---	---
Sulfide	---	[o]	---	---	---	---	---
Thallium	7440-28-0	3.8E-01	---	---	---	---	---
Tin	7440-31-5	[o]	8.0E+03	HI	4.6E+02	HI	4.6E+04[v]
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Notes:
Cells with dashes (---) indicate data is not available or not applicable.
All values in mg/kg.

a Includes analytes found on Target Analyte List, as defined by EPA in 1988 CLP Statement of Work, and RCRA Appendix IX list of constituents.
b Analyte name.
c Chemical Analytical Service Registry Number.
d Value for use in screening to determine if analyte was detected at a naturally occurring concentration. Chapter 2 provides details on how these were derived. Values match those contained in Table 2.15, Column 2, except values are rounded to two significant digits.
e Industrial use human health risk-based screening value (IPRG) calculated using as the target value either a Hazard Index (HI) of 0.1 or an Excess Lifetime Cancer Risk (ECR) of 1×10^{-6}. The lesser of the HI and ECR based values is presented. See Chapter 3 for the method used to derive these values.
f Indicator of target value used to calculate IPRG. HI indicates that IPRG is based on a HI of 0.1; ECR indicates that IPRG is based on an ECR of 1×10^{-6}.
g Residential use human health risk-based screening value (RPRG) calculated using as the target value either a HI of 0.1 or an ECR of 1×10^{-6}. The lessor of the HI and ECR based values is presented. See Chapter 3 for the method used to derive these values.
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Table E.2. (continued)

[i] Value in Commonwealth of Kentucky *Risk Assessment Guidance, Appendix A* (Commonwealth of Kentucky 1995b). This guidance states that these values are to be multiplied by 0.1 if the site being screened has more than 5 chemicals present. Also, this guidance states that these screening values are not applicable at sites at which more than one media may be contaminated.

[j] Value is that for "Antimony and compounds" in *Risk Assessment Guidance, Appendix A*.

[k] Value is that for "Arsenic (cancer endpoint) in *Risk Assessment Guidance, Appendix A*.

[l] Value is that for "Barium and compounds" in *Risk Assessment Guidance, Appendix A*.

[m] Value is that for "Beryllium and compounds" in *Risk Assessment Guidance, Appendix A*.

[n] Value is that for "Cadmium and compounds" in *Risk Assessment Guidance, Appendix A*.

[o] Data concerning this analyte were not collected during the Phases I and II Site Investigations. Therefore, a background concentration could not be established.

[p] Value is that for "Copper and compounds" in *Risk Assessment Guidance, Appendix A*.

[q] Cyanide is not expected to be naturally occurring at PGDP. Therefore, a background value was not derived.

[r] Value is that for "Free cyanide" in *Risk Assessment Guidance, Appendix A*.

[s] Value is that for "Lead" in *Risk Assessment Guidance, Appendix A*. This guidance states that the soil screening value for lead does not need to be multiplied by 0.1 even if more than 5 chemicals are present at the site being evaluated.

[t] Value is that for "Manganese and compounds" in *Risk Assessment Guidance, Appendix A*.

[u] Value is that for "Silver and compounds" in *Risk Assessment Guidance, Appendix A*.

[v] Value is that for "Tin and compunds" in *Risk Assessment Guidance, Appendix A*. A Chemical Abstract Service Registry Number is not provided in the guidance for this chemical.

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1. INTRODUCTION

For the Paducah Gaseous Diffusion Plant (PGDP) to plan remedial investigations, complete final remedial investigation and feasibility study reports, and identify potential "new" release locations, both the background concentrations for all constituents that might be detected in environmental samples and the appropriate risk-based screening criteria must be established. However, as noted in regulatory agency comments on *Results of the Site Investigation, Phase II, at the Paducah Gaseous Diffusion Plant* (CH2M Hill 1991), the reference sampling performed during the site investigations was not adequate to establish background concentrations in soils at the PGDP using simple statistical calculations. Similarly, the agencies have stated that the methods used to establish risk-based screening criteria were not adequately supported in earlier documents.

This report provides soil background concentrations for inorganic analytes (i.e., metals) on the Resource Conservation and Recovery Act (RCRA) Appendix IX and Contract Laboratory Program (CLP) total analyte lists and documents the source or derivation of these values. This report also provides and documents the derivation of the risk-based screening criteria (preliminary remediation goals) for the aforementioned analytes. Finally, this report summarizes the results of these calculations and compares each analyte's background concentration with its respective health-based screening criteria.

This report is a revision of a technical memorandum numbered KY/EM-77 (Energy Systems 1995). This revised report incorporates issues and comments provided by the regulatory agencies following their review of the earlier report. A response table for these comments is provided in Appendix C.

1.1 REGULATORY ISSUES

Guidance provided by the United States Environmental Protection Agency (EPA) recommends the establishment of background concentrations early in the remedial investigation/feasibility study process to ensure that only site-related contaminants are considered when planning clean-up activities (EPA 1988, 1989a, 1989b, and 1992c). Similarly, the Commonwealth of Kentucky encourages that background be established so that these values can be used to guide clean-up decisions (Commonwealth of Kentucky 1995a, 1995b, and 1995c). Therefore, background concentrations are needed when initiating or finalizing all clean-up activities at PGDP.

Similarly, guidance provided by EPA and the Commonwealth of Kentucky recommends the use of risk-based screening criteria early in the clean-up process (EPA 1991c and Commonwealth of Kentucky 1995c). Therefore, human health risk-based screening criteria are needed when initiating all cleanup activities at PGDP.

1.2 ORGANIZATION OF THE REPORT

This report is presented in four chapters. Chapter 1 discusses the need for background and risk-based screening criteria, considers some regulatory issues, and states how the report is organized. Chapter 2 presents a general overview of the basis of the method used to establish background values, describes the data set and its evaluation, and discusses the results of the data evaluation, including a comparison of the calculated values to various values found in the literature. Chapter 3 describes the methods used to calculate the human health risk-based screening criteria and presents these criteria. Chapter 4 presents tables combining the background values, the human health risk-based screening criteria, and the recently released Commonwealth of Kentucky soil screening levels; compares these values for each inorganic analyte within each soil depth classification; and provides some general conclusions regarding this analysis.

To simplify the use and review of this report, all figures and tables cited in each chapter are presented at the end of their respective chapter. Figures and tables were not incorporated into the text because of their number and size. In addition, three appendixes are presented that provide information which can be used to further evaluate the results presented in this report. Appendix A presents the output from the statistics program used to evaluate the data (SAS® 1990), and Appendix B provides unit data sheets for those solid waste management units appearing in data evaluation tables presented in Chapter 2. Finally, as noted previously, Appendix C presents the response table to comments received from the regulatory agencies following their informal review of the earlier version of this report (Energy Systems 1995).

2. DERIVATIONS OF BACKGROUND CONCENTRATIONS FOR METALS IN SOIL

With the completion of *Inorganic Soil and Groundwater Chemistry Near Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (Moore 1995), it became apparent that background or nonsite-related concentrations for some metals in soil could be established using existing environmental data. This chapter describes the basis of the method used to establish background values using existing data, including a list of other sites where this method was used; the data set from which background was derived; how this data set was evaluated; and the method used to calculate the background values. This chapter concludes with a comparison of the derived upper limits for background against values obtained from the literature and a discussion of these comparisons. Throughout this chapter, the term "background values" is used whenever referring to the derived upper limit of the background distribution.

2.1 BASIS OF METHOD

This section discusses the basis of the use of graphical data evaluation to delimit populations of data and the use of the resampling technique to select particular values from a population of observations. These overviews are presented separate from the actual data evaluation and background value calculations so that later data-specific discussions can be simplified.

It should be noted that the methods described in the following material have been used at other contaminated sites to establish background values and clean-up standards, have appeared in the peer reviewed literature (Fleishhauer and Korte 1989), and are recognized by the EPA. Sites where the methods have been or are being used to establish background values include DOE facilities at Hanford, WA; Lawrence Livermore, CA, Sandia, NM, and Portsmouth, OH. A site where these methods were used to set clean-up standards (approved by EPA Region VII) is the DOE facility in Kansas City [*North Lagoon Resource Conservation and Recovery Act (RCRA) Closure, U. S. Department of Energy (DOE) Kansas City Plant*, D. E. Brown, AlliedSignal, Inc.]. Finally, EPA recognition is shown by the inclusion of these methods in both its recently released *Soil Screening Guidance* (EPA 1994) and its GEO-EAS software for evaluating data.

2.1.1 Delimitation of Populations

When using data collected from areas not known to be uncontaminated with an analyte of interest, the primary issue becomes the delimitation of populations or the segregation of observations from samples taken in areas contaminated with the analyte from samples taken in areas not contaminated with the analyte. There are several methods which can be used to segregate the populations. Primarily, these methods range from performing a statistical analysis of the data (e.g., contingency analysis, factor analysis) to determine relationships among multiple parameters followed by an evaluation of the results to performing a graphical evaluation of the data followed by a statistical analysis. In this report, the second of these general procedures was followed. Only this procedure will be discussed at length in this report.

To understand the segregation of populations of geochemical data using graphical techniques, it is important to understand how contamination is distributed near most spill sites. Figure 2.1 illustrates this distribution. As indicated, at most spill sites or at sites where contaminants are from a point source (e.g., burial grounds, scrap piles), there is an area of high levels of contamination at the point source (i.e., "spill" in Fig. 2.1), an area of lower levels of contamination along migration pathways leading from the point source (i.e., "dispersion halo" in Fig. 2.1), and uncontaminated areas around the dispersion halo (i.e., "uncontaminated soil" in Fig. 2.1). Because most sampling activities for point sources of contamination are interested in both the level or nature of contamination at the point source and the extent of this contamination, during the site investigation samples are collected at the point source, in the dispersion halo, and in areas of no contamination. The distribution of concentrations of contaminants along any transect through the point source from such a sampling activity will appear as indicated in the graph shown at the top of Fig. 2.1. As indicated, high concentrations of the chemicals in the spilled material are detected in samples collected near the point source, lower concentrations are detected in samples collected in the dispersion halo, and even lower concentrations are detected in samples collected in "uncontaminated soil." Interestingly, this profile matches that seen when samples are taken during mineral exploration. During mineral exploration, higher concentrations of the mineral of interest are seen in samples collected closer to naturally enriched areas and lower concentrations are seen in samples collected from areas away from the enriched areas. This fact was noted by Fleischhauer and Korte (1989) who proposed that it would be possible to use techniques used for mineral exploration to formulate clean-up standards for trace minerals.

In their work, Fleischhauer and Korte note that it is possible to plot data collected during remedial investigations and use these plots to segregate populations of contaminated samples from populations of uncontaminated samples utilizing the methods discussed by Tennant and White (1959), Lepeltier (1969), and Sinclair (1976). As noted by Fleishhauer and Korte, the plot showing the greatest utility early in the data evaluation is a cumulative probability plot in which the concentration of the analyte on the appropriate scale is plotted against the cumulative frequency on normal probability paper. An illustration of this type of graph is presented in Fig. 2.2.

In this probability plot, taken from Fleischhauer and Korte (1989), the distribution of three samples drawn from two populations are indicated. The first population, from which sample A was drawn, is a population derived by randomly selecting observations from a sample with a mean of 10 and a standard deviation of 3.

The second population, from which sample B was drawn, is a population derived by randomly selecting observations from a sample with a mean 27 and a standard deviation of 8. In sample A, the values range from 2 to 17. In sample B, the values range from 10 to 49. Therefore, the samples drawn from the two populations overlap. In addition, as can be seen, the distribution of points plotted for both samples A and B fall on straight lines when plotted on normal probability paper. This is not surprising because the populations from which the samples were drawn were normally distributed by definition, and the primary purpose of plotting on normal probability paper is to test the assumption of normality (Dixon and Massey 1969). Of greater interest is the distribution of points obtained when samples A and B are combined into a composite A+B sample. When plotted, sample A+B encompasses the entire range of values in both samples A and B (range of 2 to 49), but the points no longer fall along a single line. In fact, if sample A+B was analyzed to determine if the sample followed a normal distribution (i.e., such as by using a numeric test for normality), it would be determined that this sample does deviate from a normal distribution. This deviation is indicated in the plot by the "hinge" or "deflection point" seen toward the middle of the plot of sample A+B. However, even with the "hinge," two possible straight lines are in this plot. These are a line drawn through the points down from the left hand corner toward the "hinge" (line 1) and a line drawn through the points up from the right hand corner toward the "hinge" (line 2).

If it is assumed that A represents a sample drawn from a population of observations representing natural or uncontaminated conditions and that B represents a sample drawn from a population of observations representing contaminated conditions, the utility of the cumulative probability plots in segregating populations is seen. Using this assumption, it is discovered that the "hinge" is the approximate location at which observations from sample A end and observations from sample B begin. In fact, it is seen that line 1 is the line encompassing the range of observations from sample B and that line 2 is the line encompassing the observations from sample B. That is, the "hinge" represents a "threshold" value that can be used to segregate the population of observations that sample A represents from the population of observations that sample B represents (Tenant and White 1959).

In Fig. 2.2, the threshold value (i.e., the value at the "hinge") is approximately 15. Therefore, all observations below this value are assigned to the natural population of observations, and all observations above this point are assigned to the contaminated population of observations. That is, the range of natural background derived from the plot is from 2 to 15. However, because both samples A and B were derived, it is known that the range of sample A is really from 2 to 17 and the range for sample B is from 10 to 49. Therefore, some observations really drawn from the natural population (i.e., that from which sample A was drawn) are assigned to the contaminated population of observations, and some observations really drawn from the contaminated population (i.e., that from which sample B was drawn) are assigned to the natural population. This effect can be seen in Fig. 2.3 in which a histogram illustrating the combined sample A+B is presented. In this histogram, the large hatched areas represent observations drawn from the contaminated population (sample B), and the dotted areas represent observations drawn from the natural population (sample A). This histogram illustrates that the segration populations using the cumulative probability plot was not "perfect" but did yield a nearly ideal result.

As noted by Fleischhauer and Korte (1990), the plot in Fig. 2.2 and the histogram shown in Fig. 2.3 represent ideal conditions. In these figures, only two populations are represented by the samples, the data are censored (i.e., no values are available for that detection limit), and the distributions for both populations from which the samples are drawn are normal. In most situations when "real" data are used, more than two populations are represented in the data set; censored data are common, especially for trace metals; and the underlying distributions only approximate a normal distribution. Each of these issues is discussed in the following material.

2.1.1.1 The effect of the presence of more than two populations

When more than two populations are represented in the data, multiple deflection points or "hinges" are seen in the data's cumulative probability plot. In this situation, it becomes difficult to select which deflection point should be selected as the threshold value (i.e., selected as the maximum background concentration). Normally, more than two populations are seen if multiple geological formations are sampled when compiling the data or if several distinct areas of contamination are represented in the data. In the first case, the deflection points tend to show only minor changes in direction (i.e., the lines drawn through the points tend to intersect at large angles); however, in the second case, the deflection points still tend to show major changes in direction (i.e., the lines drawn through the points meet at angles that are more acute.) While these are general guidelines, some plots with multiple populations represented are still very difficult to interpret. In cases where no clear threshold is seen because of multiple deflection points, additional lines of evidence such as additional plots (e.g., histograms) and the geographical distribution of sampling locations must be considered. How this information can be used is discussed in Sect. 2.1.1.4.

2.1.1.2 The effect of censored data

If the data being plotted are censored (as is the case for many trace inorganic analytes), then the cumulative probability plots tend to display deflection points that are an artifact of censoring and not of concentration distribution (Fleischhauer and Korte 1989). In fact, if a data set containing many censored points is plotted, the major deflection point seen in the plot is likely to be at the minimum reported value or at the detection limit used to censor the data. Generally, two approaches can be used to overcome this obstacle. The first is to devise a distribution for the censored observations by assuming that the nondetected concentrations follow the distribution seen elsewhere in the data. The second is to ignore the censored data points when constructing the plots. Of these, the first is of less use when attempting to determine a threshold value to separate the background distribution from the contaminated distribution because the assumption of a distribution for the censored data will bias the plot. In the current report, the second approach was used because this approach does not bias the selection of the threshold value.

2.1.1.3 The effect of underlying distributions that are not normal

When using cumulative probability plots to segregate populations, an underlying distribution for the populations must be assumed so that an appropriate Y-axis can be chosen. Generally, if the wrong underlying distribution is selected, then deflection points that are not "real" will be created as an artifact of the method. Fortunately, experience has shown that the underlying distribution for the concentration of most inorganic analytes follows a log normal distribution (EPA 1989a, Ott 1995, Koch and Link 1971). However, although data can be transformed to approximate normality by using a natural log function, this transformation may still result in a distribution of the data that is too peaked (i.e., kurtosis) or have tails that are longer on one side of the distribution than the other (i.e., skewness). If either of these conditions exist, then the deflection points may be created as an artifact of the method. This type of problem cannot be rectified by directly working with the cumulative probability plot; instead, additional lines of evidence, such as histograms and the geographical distribution of sampling locations, must be used to determine which of the deflection points best represents the threshold value

2.1.1.4 Use of additional lines of evidence

As noted in Sects. 2.1.1.1 through 2.1.1.3, it is necessary to consider additional lines of evidence when selecting the threshold values that will be used to delimit populations. Two additional lines of evidence are mentioned previously; these are the use of additional plots such as histograms and the consideration of the geographical distribution of the sampling locations. A third line of evidence is best described as "professional judgment." Each of these lines of evidence is discussed in the following paragraphs.

Additional plots, such as histograms, can provide valuable information that can be used to select appropriate threshold values. Histograms can easily illustrate the skewness and kurtosis of the data's distribution and can even indicate multiple distributions if the background data distribution is sufficiently removed from the contaminated data distribution.

The consideration of the geographical distribution of sampling locations is very valuable when segregating data from populations that show marked overlap in their distributions. In this situation, examination of a list of the sampling locations of the observations closest to the selected threshold will reveal if the data contain a geographical bias. If most observations closest to the threshold are from one location, and it is known that this location does not differ geochemically from other locations due to natural processes, then the threshold should be reduced to ensure that these observations are not included in the calculation of the background value.

As indicated throughout this discussion, "professional judgment" must be used when interpreting the graphs and selecting threshold values to be used to represent the maximum background concentration. Clearly, the choice of the graphical threshold is arbitrary and will vary among analysts (Fleischhauer and Korte 1989). Similarly, how to use the additional information, such as additional plots and the geographical distribution of sampling location, is based on the analysts knowledge of the site and its history. Finally, it should be noted that only professional judgment can be used to determine if an anomalous observation represents contamination or is the result of some natural process. There are several reasons, besides contamination, that can result in higher than expected results.

Most of the elements of concern in this report are known as trace elements because they typically occur in concentrations ranging from less than one to a few tens of mg/kg. However, these elements are not always uniformly distributed throughout the geologic media. When several samples are collected in the field, several kg of material are sent to the laboratory. At the laboratory, a subsample is taken, dried, homogenized, and subsampled again. Occasionally, the subsample collected for analysis will contain a rock or soil fragment that is heavily enriched in a particular element. If this rock or soil fragment is contained in the subsample that is analyzed, then that subsample may present a very high concentration of one or more trace elements, even though the full sample has an average concentration that is within a background range. This is called the nugget effect (Davis 1986) and should be expected in large data sets.

Another source of anomalous data that needs to be addressed by professional judgment is variability in analysis. False positives are especially common for metals and are expected in any program that produces a large quantity of data. Some causes of these false positives are general cleanliness (road and house dust can contain 100 to 1000 mg/kg of lead, cadmium, and zinc), inter-element spectral interferences and physical interferences because of dissolved salts (EPA 1990). Indeed as noted in the EPA publication, "effectiveness of matrix modifiers, selective volatilization, and background correction to eliminate non-specific absorbance varies with the type of instrument, wavelengths and sample matrix." The extent to which these factors are balanced depends on the skill of the analyst. Another factor that may impact the variability seen in the analysis is the spectrum of elements for which analyses were performed. To perform multi-element analyses cost-effectively, it is usually necessary for the analyst to use compromises in instrumental conditions. In other words, the calibration of the instrument may provide the best possible data set for the suite of elements under consideration, but for certain elements the calibration of the instrument may not be optimum. This "general calibration" will also result in some false positive (and negatives) in a large data set.

2.1.2 Use of Resampling to Derive Limits on Background

In this report, resampling is used to derive the limits on background. In particular, the method of resampling used was the "bootstrap" method. This statistical technique is neither new nor innovative. The bootstrap term was coined by Efron (1982, 1993), the idea of resampling statistics as a teaching tool was developed by Simon (1991), and a prediction that resampling techniques, such as the bootstrap, will become the method of choice for statistical inference as computing power increase was predicted by Romesburg (1985). This section describes the bootstrap resampling method and discusses how it was applied in this report.

2.1.2.1 Description of bootstrap resampling

This section provides a general discussion of resampling. A detailed discussion of how this technique was applied in this report is in Sect. 2.1.2.2.

Assume a random sample, S_0, of size n is taken from a population, U, of size N. Assume N is essentially infinite. Suppose one wanted to estimate a population parameter of interest, P (for example, the 99[th] percentile), by a statistic, p, derived from the sample data. A classic method is to assume that the population follows a specific distribution (e.g., normal, log normal, etc.) and use the properties of the assumed distribution to make statistical inferences about P. However, it is well-known that environmental data often do not closely follow assumed theoretical distributions (Koch and Link 1971). Therefore, inferences made using the assumed distributions may be incorrect.

Furthermore, the level of error is not known. One way to overcome this problem is to use the sample data to create an empirical distribution of *p* from which inferences regarding *P* can be made. This is the idea behind computer-intensive resampling techniques such as the bootstrap method.

The bootstrap technique is straightforward. This technique randomly samples, with replacement, from the original sample, S_0, *B* times. These *B* computer-generated samples, S_1, S_2, S_3, ...S_B, provide a basis for an empirical distribution of *p*. For example, the 99th percentiles of S_1, S_2, S_3, ...S_B can all be calculated. This set of 99th percentiles then provides an empirical (i.e., based on the original) sample distribution from which confidence intervals can be directly estimated without assuming a theoretical distribution.

A limitation of resampling techniques should be mentioned. No amount of resampling can provide valid statistical inference from a sample, S_0, that does not genuinely represent the population of concern. However, this problem exists with all statistical techniques, including those that rely on assuming that the sample data belong to a theoretical distribution. Therefore, professional judgment must be used to determine if the sample adequately represents the population prior to applying any statistical technique.

2.1.2.2 Application of resampling in this report

In this report, resampling (bootstrap) was used to derive the upper limit of background concentration, or background value for all analytes. Generally, for each analyte, a threshold value, or maximum background concentration was selected to segregate the background observations from the contaminated observations. As noted in Sect. 2.1.1, this threshold was used by combining information from cumulative probability plots, histograms, geographical sampling distribution, and professional judgment. After the threshold was selected, all observations with concentrations greater than the threshold value were deleted from the data set, including any nondetected values. Nondetected (i.e., "U" qualified data) observations **greater than** the threshold were deleted from the data because it is not known what is the real concentration in these observations and because these data, if left in the analysis, would have positively biased the selection of the percentile used as the basis for the calculation of the background value. Therefore, by deleting nondetected observations greater than the threshold value, the calculated background value was less or "more conservative."

After segregating the population, the data were analyzed using a program written using SAS® analytical software (SAS 1990). This program performed the bootstrap resampling and determined the upper limit of the 95% confidence interval on the 95th percentile of the range of background concentrations.

It should be noted that the selection of the point chosen for the background value (i.e., the upper limit of the 95% confidence interval on the 95th percentile of the range of background concentrations) was based on a combination of professional judgment and a search of available guidance. The only guidance found was that provided in the *How Clean is Clean Policy* report (Ohio EPA 1990). This guidance states that the background value will be the 95% upper tolerance limit. This value is equivalent to what was selected for use in this report. A higher or lower value could just as easily be selected if the consensus among stakeholders is that this value is either too conservative or too liberal.

2.2 DESCRIPTION OF DATA SET USED TO DERIVE BACKGROUND

This section describes the data set used to derive background for the PGDP. This section begins with a general description of the data set and concludes with a detailed description of the data for each analyte.

2.2.1 General Description

Data used in this report were from the Phases I and II Site Investigations performed at the PGDP in 1989 through 1991. These data were used in this work because they represent the largest validated data set available at the PGDP and contain samples from locations both on or off the PGDP. In addition, these data come from a variety of depths. Sampling depths represented in the data set range from 0 to 0.5 ft below ground surface to more than 190 ft below ground surface. In addition, because these data were collected primarily to determine the extent and not the nature of contamination at the PGDP, most sampling locations represented in the data set are those in the "dispersion halo" or "uncontaminated soil" areas shown in Fig. 2.1. However, it should be noted that some observations in the data set do come from samples collected within identified waste units. For example, a whole series of samples was collected during the excavation of waste pits at the C-747-A Burial Ground (SWMU 7). These types of observations do come from samples collected in what is identified as the "spill site" in Fig. 2.1.

As indicated previously, important considerations in the selection of this data set were that it is large, contains observations from samples from a variety of locations and sampling depths, and is of known quality. A large data set was desirable because a large data set provides clearer cumulative probability plots from which threshold values can be selected. A data set with observations from a variety of locations and sampling depths was desirable because this gives greater certainty that the samples represent a variety of geologic formations and are less likely to be all from areas contaminated with the analytes being evaluated. (Please see Fig. 2.1). A data set of known quality was desired because this analysis relies heavily on professional judgment; the data quality documentation reduces the number of decisions that must be made regarding data quality. [A complete description of these data, including the methods used to collect samples and a comparison to quality parameters can be found in the Phase I and Phase II reports (CH2M Hill 1991 and 1992, respectively). Because the quality assurance sections in these reports is lengthy, it will not be repeated here.]

The data set did contain a number of "R" qualified observations. In preparing the data sets for the analysis, "R" qualified data were deleted. These data were deleted because EPA guidance states that "R" qualified data should not be used because of discrepancies between quality control data and prescribed criteria. [See CH2M Hill (1992), page 4A-3, for a discussion of "R" qualified data.] All other data, including nondetects (i.e., "U" qualified data), were used in the analysis.

In addition, before beginning the analysis, data were divided into two depth classifications. These were surface, which includes data from samples with a lower most sampling depth of 1 ft below surface, and subsurface, which includes data from samples with a lower most sampling depth greater than 1 ft below surface. These sampling intervals were selected because they are consistent with current risk assessment guidance. In this guidance, surface soil is defined as that collected up to 1 ft below surface and subsurface soil is defined as that soil collected below 1 ft below surface. It can be argued that this division was arbitrary and that a better way to segregate the data would have been by geological unit. Data were not segregated by geological unit for three reasons. First, geological units are not identified in the current data set, and any assignment to geological unit based on boring or drilling logs would have been arbitrary. Second, there are currently no plans to consider geological units when performing risk assessments at the PGDP. (The aforementioned depth classifications will be used.) Third, geological units in relation to the inaccuracies in the background values can be handled easily as a risk management item during the feasibility study process.

2.2.2 Description of Data by Analyte

This section provides summary statistics for each analyte within depth classification. The material summarized in Tables 2.1, 2.2, 2.3, and 2.4. Information in these tables was drawn from the statistical output contained in Appendix A.

2.2.2.1 Aluminum

A total of 737 observations were in the aluminum data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. All observations in both the surface and subsurface data sets were detects. The range of surface data was from 15,677 to 1,119 mg/kg; the range of subsurface data was from 43,044 to 159 mg/kg.

2.2.2.2 Antimony

A total of 581 observations were in the antimony data set. Of these, 48 observations were placed in the surface classification, and 533 were placed in the subsurface classification. Of the 48 observations in the surface classification, only 4 were detects. Of the 533 observations in the subsurface classification, only 35 were detects. The range of all surface data was from 12.9 to 0.33 mg/kg; the range of the detects was 1.60 to 0.39 mg/kg. The range of all subsurface data was from 45.2 to 0.33 mg/kg; the range of the detects was 45.2 to 0.90 mg/kg.

2.2.2.3 Arsenic

A total of 737 observations were in the arsenic data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 74 were detects. Of the 662 observations in the subsurface classification, 586 were detects. The range of all surface data was from 46.1 to 0.24 mg/kg; the range of the detects was 46.1 to 1.20 mg/kg. The range of all subsurface data was from 42.1 to 0.16 mg/kg; the range of the detects was also 42.1 to 0.16 mg/kg.

2.2.2.4 Barium

A total of 737 observations were in the barium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, all were detects. The range of all surface data and detected surface data was from 198 to 14.0 mg/kg. The range of all subsurface data and detected subsurface data was from 659 to 1.99 mg/kg.

2.2.2.5 Beryllium

A total of 737 observations were in the beryllium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 70 were detects. Of the 662 observations in the subsurface classification, 589 were detects. The range of all surface data and detected surface data was from 24.0 to 0.17 mg/kg. The range of all subsurface data was from 25.0 to 0.005 mg/kg; the range of the detects was 25.0 to 0.01 mg/kg.

2.2.2.6 Cadmium

A total of 728 observations were in the cadmium data set. Of these, 71 observations were placed in the surface classification, and 657 were placed in the subsurface classification. Of the 71 observations in the surface classification, 41 were detects. Of the 657 observations in the subsurface classification, only 210 were detects. The range of all surface data was from 9.68 to 0.57 mg/kg; the range of the detects was 9.68 to 0.77 mg/kg. The range of all subsurface data was from 235 to 0.13 mg/kg; the range of the detects was 235 to 0.22 mg/kg.

2.2.2.7 Calcium

A total of 737 observations, were in the calcium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 659 were detects. The range of all surface data and detected surface data was from 293,608 to 446 mg/kg. The range of all subsurface data and detected subsurface data was from 235,625 to 1.72 mg/kg.

2.2.2.8 Chromium

A total of 737 observations were in the chromium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 74 were detects. Of the 662 observations in the subsurface classification, 629 were detects. The range of all surface data was from 257 to 2.61 mg/kg; the range of the detected surface data was 257 to 2.69 mg/kg. The range of all subsurface data was from 503 to 0.48 mg/kg; the range of the detected subsurface data was 503 to 0.49 mg/kg.

2.2.2.9 Cobalt

A total of 737 observations were in the cobalt data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 578 were detects. The range of all surface data and detected surface data was from 30.0 to 1.20 mg/kg. The range of all subsurface data was from 68.7 to 0.58 mg/kg; the range of the detected subsurface data was 68.7 to 0.72 mg/kg.

2.2.2.10 Copper

A total of 737 observations were in the copper data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 609 were detects. The range of all surface data and detected surface data was from 230 to 2.51 mg/kg. The range of all subsurface data was from 18,770 to 0.64 mg/kg; the range of detected subsurface data was 18,770 to 0.92 mg/kg.

2.2.2.11 Cyanide

A total of 709 observations were in the cyanide data set. Of these, 67 observations were placed in the surface classification, and 642 were placed in the subsurface classification. Of the 67 observations in the surface classification, 1 was a detect. Of the 642 observations in the subsurface classification, 6 were detects. The range of all surface data and was from 0.86 to 0.32 mg/kg; the lone detected value was 0.71 mg/kg The range of all subsurface data was from 1.40 to 0.12 mg/kg; the range of detected subsurface data was from 1.11 to 0.32 mg/kg.

2.2.2.12 Iron

A total of 737 observations were in the iron data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. All observations in both the surface and subsurface classifications were detects. The range of surface data was from 54,176 to 3,498 mg/kg. The range of subsurface data was from 97,734 to 545 mg/kg.

2.2.2.13 Lead

A total of 737 observations were in the lead data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 655 were detects. The range of all surface data and detected surface data was from 324 to 3.10 mg/kg. The range of all subsurface data was from 1,164 mg/kg to 0.48; the range of detected subsurface data was from 1,164 to 0.66 mg/kg.

2.2.2.14 Magnesium

A total of 737 observations were in the magnesium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 659 were detects. The range of all surface data and detected surface data was from 8,267 to 257 mg/kg. The range of all subsurface data and detected subsurface data was from 12,582 to 16.7 mg/kg.

2.2.2.15 Manganese

A total of 737 observations were in the manganese data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 659 were detects. The range of all surface data and detected surface data was from 2,697 to 25.0 mg/kg. The range of all subsurface data and detected subsurface data was from 8,103 to 1.70 mg/kg.

2.2.2.16 Mercury

A total of 730 observations were in the mercury data set. Of these, 75 observations were placed in the surface classification, and 655 were placed in the subsurface classification. Of the 75 observations in the surface classification, 12 were detects. Of the 655 observations in the subsurface classification, only 44 were detects. The range of all surface data was from 7.69 to 0.02 mg/kg; the range of detected surface data was from 7.69 to 0.10 mg/kg. The range of all subsurface data was from 11.9 to 0.001 mg/kg; the range of the detected subsurface data was from 11.9 to 0.01 mg/kg.

2.2.2.17 Nickel

A total of 737 observations were in the nickel data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 72 were detects. Of the 662 observations in the subsurface classification, 563 were detects. The range of all surface data and detected surface data was from

84.8 to 5.21 mg/kg. The range of all subsurface data was from 12,332 to 0.84 mg/kg; the range of detected subsurface data was from 12,332 to 0.92 mg/kg.

2.2.2.18 Potassium

A total of 737 observations were in the potassium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 60 were detects. Of the 662 observations in the subsurface classification, 471 were detects. The range of all surface data was from 2,080 to 110 mg/kg; the range of the detected surface data was from 2,080 to 129 mg/kg. The range of all subsurface data and detected subsurface data was from 25,084 to 35.9 mg/kg.

2.2.2.19 Selenium

A total of 716 observations were in the selenium data set. Of these, 73 observations were placed in the surface classification, and 643 were placed in the subsurface classification. Of the 73 observations in the surface classification, 23 were detects. Of the 643 observations in the subsurface classification, 82 were detects. The range of all surface data was from 25.0 to 0.11 mg/kg; the range of detected surface data was from 25.0 to 0.16 mg/kg. The range of all subsurface data was from 3.82 to 0.09 mg/kg; the range of the detected subsurface data was from 0.87 to 0.09 mg/kg.

2.2.2.20 Silver

A total of 737 observations were in the silver data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 35 were detects. Of the 662 observations in the subsurface classification, 110 were detects. The range of all surface data was from 42.1 to 0.49 mg/kg; the range of the detected surface data was from 42.1 to 1.20 mg/kg. The range of all subsurface data was from 14.0 to 0.28 mg/kg; the range of the detected subsurface data was from 14.0 to 0.32 mg/kg.

2.2.2.21 Sodium

A total of 737 observations were in the sodium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 56 were detects. Of the 662 observations in the subsurface classification, 508 were detects. The range of all surface data and detected surface data was from 620 to 25 mg/kg. The range of all subsurface data and detected subsurface data was from 8,185 to 3.10 mg/kg.

2.2.2.22 Thallium

A total of 729 observations were in the thallium data set. Of these, 74 observations were placed in the surface classification, and 655 were placed in the subsurface classification. Of the 74 observations in the surface classification, 13 were detects. Of the 655 observations in the subsurface classification, 32 were detects. The range of all surface data was from 9.97 to 0.22 mg/kg; the range of the detected surface data was from 1.40 to 0.25 mg/kg. The range of all subsurface data was from 11.0 to 0.16 mg/kg; the range of the detected subsurface data was 0.41 to 0.17 mg/kg.

2.2.2.23 Vanadium

A total of 737 observations were in the vanadium data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, all were detects. Of the 662 observations in the subsurface classification, 652 were detects. The range of all surface data and detected surface data was from 70.1 to 2.29 mg/kg. The range of all subsurface data was from 68.7 to 0.71 mg/kg; the range of the detected subsurface data was 68.7 to 1.00 mg/kg.

2.2.2.24 Zinc

A total of 737 observations were in the zinc data set. Of these, 75 observations were placed in the surface classification, and 662 were placed in the subsurface classification. Of the 75 observations in the surface classification, 74 were detects. Of the 662 observations in the subsurface classification, 661 were detects. The range of all surface data and detected surface data was from 392 to 15 mg/kg. The range of all subsurface data and detected subsurface data was from 1,130 to 0.83 mg/kg.

2.3 DERIVATION OF BACKGROUND VALUES

This section discusses the segregation of the data sets. This discussion begins with a general overview of the process followed and continues with four examples. In addition, this section presents the maximum background values selected for each inorganic analyte within depth classification and the summary statistics for each background population. This section is supported by several tables and figures and two appendices. Figures 2.4 through 2.147 present the cumulative probability plots and histograms used to graphically examine the data and select maximum background values. Tables 2.5 and 2.6 present the five samples with the highest reported concentrations for the inorganic analytes in the unreduced or unsegregated data sets in surface and subsurface soil, respectively. These tables are used to determine if the original data set shows a geographical bias in sampling location.

Table 2.7 presents the selected maximum values in each of the original data sets, the maximum background values selected in Moore (1995), and the maximum background values selected in the current report. Tables 2.8 and 2.9 show the summary statistics for all observations and for detected observations, respectively, that have concentrations that are less than selected maximum background values in surface soil. Tables 2.10 and 2.11 show the summary statistics for all observations and for detected observations, respectively, that have concentrations that fall below the selected maximum background values in subsurface soil. Tables 2.12 and 2.13 present the five samples with the highest reported values for the inorganic analytes in the reduced or background data sets in surface and subsurface classifications, respectively. As with Tables 2.5 and 2.6, Tables 2.10 through 2.13 are used to examine the background data sets for geographical bias in sampling location.

Appendix A presents the statics output used to generate the summary statistics and evaluate the data. Much of the material in this appendix is summarized on Tables 2.5 through 2.13. In Appendix A, the material on pages 10 through 69 is for the complete data sets, and the material on pages 70 through 123 is for the reduced or background data sets. Information explaining this output is presented at the beginning of Appendix A. Finally, Appendix B presents unit data sheets for solid waste management units appearing in the tables used to examine the data sets for geographical bias (i.e., Tables 2.5, 2.6, and 2.10 through 2.13.

When reading the following discussion, the reader must remember that the method used to segregate data sets and determine background concentrations was not based solely on statistics or solely on geochemistry. In segregating populations and deriving background concentrations, these disciplines supported each other. As Koch and Link (1980) note: "geologic processes must be invoked and theory is needed to untangle mixed distributions."

2.3.1 General Description

For each inorganic analyte within depth classification, the following enumerated process was used. Please see the examples in the following section for specific details.

1. Examine the cumulative probability plot to identify potential deflection points.

2. Examine the histograms showing all observations and detected observations and verify that the deflection points are not due to censored data and to confirm that specific deflection points are matched by the frequency of observations at specific concentrations.

3. Examine the summary showing those samples with the highest concentrations in the complete data set. If geographical bias is detected and only one population is indicated by the plots and histograms, reexamine the cumulative probability plot and select a lower deflection point as the maximum background concentrations.

4. Select a maximum background value and compare this maximum background value to published ranges. If the maximum background value falls within published ranges (see Tables 2.14 and 2.15) and is consistent with the geochemistry at the PGDP or falls outside published ranges but is consistent with the geochemistry at the PGDP, then construct tentative background data sets. If the maximum background value falls outside the published range, and this value is not consistent with the geochemistry at the PGDP, then reevaluate the cumulative probability plots and select another deflection point.

5. Compile and evaluate the summary showing those samples with the highest concentration in the reduced or background data set. If these samples are not free of geographical bias, then reevaluate the cumulative probability plot and select another deflection point.

6. Construct the background data set by deleting all observations with concentrations greater than the selected maximum background value.

7. Using the background data set and resampling, derive the 95% upper confidence limit on the 95^{th} percentile.

Please note, for some data sets, the cumulative probability plots indicated a single population but a geographical bias was found in the sampling locations. That is, all the samples with higher concentrations were from one or two locations. This was interpreted as indicating that there was such significant overlap in the contaminated and background populations that the individual populations could not be delimited on the plots. In this situation, the geographical location data were examined in more detail, and a concentration was chosen that represented a point at which the geographical bias was reduced or eliminated. Normally, this meant finding the point in the data set where one or more sample locations in Tables 2.12 or 2.13 was at an off-site location.

One general observation made early on in the evaluation of the geographical distribution of the subsurface data needs to be noted. Early on, it was determined that most of the high concentration observations for aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, potassium, sodium, and zinc in subsurface soil were from test pit samples collected at C-747-A Burial Ground (SWMU 7). This result was interpreted to mean that samples from these locations could not be part of any background data set and represented contamination. Therefore, observations from these locations were deleted from all subsurface data sets.

2.3.2 Example #1: Derivation of background value for calcium in surface soil

The derivation of the calcium background value in surface soil is presented as an example of a well-behaved data set. The derivation of the background value for many of the major ions (i.e. aluminum, iron, magnesium) followed this variation of the evaluation process.

Graphical depictions of the surface calcium data set are in Figs. 2.22, 2.23, and 2.24. Univariate statistics for the complete calcium surface data set are presented on page 16 of Appendix A. The five observations in the calcium data set with the greatest concentrations are shown in Table 2.5. The selected maximum background for calcium is in Table 2.7. Univariate statistics for the background or reduced data set are on page 76 of Appendix A. A summary of the material on page 76 is in Tables 2.8 (all observations) and 2.10 (detected observations). Finally, the list of the five highest observations in the reduced data set is in Table 2.12.

Generally, the cumulative probability plot for calcium (Fig. 2.6) indicates a single population. The plot does show a noticeable deflection point near natural log 9; however, this is not a reasonable maximum background value. Selection of this value would mean that the maximum background concentration for calcium would be approximately 8130 mg/kg. While this is in the common range for calcium reported by Lindsay (1979) (7000 to 500,000 mg/kg), it is not consistent with the calcium concentrations expected in the loess soils at the PGDP. Therefore, a single population is assumed.

The histograms for calcium (Figs. 2.22, all observations, and 2.23, detected observations) show a pattern similar to that seen in the cumulative probability plot. There is a dip at midpoint natural log 10 and a small "stack" at midpoint natural log 11.

Examination of the five highest calcium concentrations in the data set (Table 2.5) shows that the samples locations are somewhat scattered. Two of the samples were from one location, but these are duplicates. Therefore, there does not seem to be a geographical bias to the samples near the upper end of the distribution.

The aforementioned factors suggest that the maximum background value for calcium in surface soil is 293,000 mg/kg. This value matches the value selected in Moore (1995) as shown in Table 2.7.

Once segregated at the maximum background value, the background data set is found to contain 75 total observations and 74 detected observations. The summary statistics for all observations in the background data set are in Table 2.8; the summary statistics for the detected values in the background data set are in Table 2.10. Finally, the five greatest concentrations in the reduced data set are presented in Table 2.12. (Note, these match the locations in Table 2.5.)

Using 293,000 mg/kg as the maximum background, the median of the data set is found to be 4188 mg/kg. The 95% upper confidence limit is 200,000 mg/kg (Table 2.14).

2.3.2 Example #2: Derivation of background value for arsenic in surface soil

The derivation of the arsenic background value in surface soil is presented as an example of a well-behaved data set that is bimodal. The derivation of many of the other trace elements followed this variation of the evaluation process.

Graphical depictions of the surface arsenic data set are in Figs. 2.10, 2.11, and 2.12. Univariate statistics for the complete arsenic surface data set are presented on page 12 of Appendix A. The five observations in the arsenic data set with the greatest concentrations are shown in Table 2.5. The selected maximum background for arsenic is in Table 2.7. Univariate statistics for the background or reduced data set are on page 72 of Appendix A. A summary of the material on page 72 is in Tables 2.8 (all observations) and 2.10 (detected observations). Finally, the list of the five highest observations in the reduced data set is in Table 2.12.

Generally, the cumulative probability plot for arsenic (Fig. 2.12) indicates two populations. The plot shows an obvious deflection point near natural log 2.5. This may be a logical maximum background value because this value (12.2 mg/kg) is well within the published ranges. Lindsay (1979) reports that the common range of arsenic in soils is from 1 to 50 mg/kg. Kabata-Pendias and Pendias (1984) report a range of 2 to 22 mg/kg.

Similarly, the histograms for arsenic (Figs. 2.10, all observations, and 2.11, detected observations) show a "dip" at midpoint natural log 3.25 and a "stack" at midpoint natural log 3.75. The "dip" and "stack" are consistent with a bimodal distribution.

Examination of the five highest arsenic concentrations in the complete data set (Table 2.5) show that the sample locations are geographically biased. Three of the top five samples came from SWMU 97, and the other two came from SWMUs 2 & 3. This is also consistent with the observation that there are two populations in the data set. (Note, a description of all SWMUs mentioned in this discussion are in Appendix B.)

The aforementioned factors suggest that the maximum background value for arsenic in surface soil is 12.0 mg/kg as indicated in Table 2.7. This value is less than the value selected in Moore (1995) (20 mg/kg).

Once segregated at the maximum background value, the background data set is found to contain 69 total observations. Of these, 68 are detected observations. The summary statistics for all observations in the reduced data set are in Table 2.8; the summary statistics for the detected values in the reduced data set are in Table 2.10. Finally, the five greatest concentrations in the reduced data set are presented in Table 2.12. (Note, the geographical distribution in the reduced data set is much better. In fact, two of the five sampling locations with the highest concentrations are offsite.)

Using 12 mg/kg as the maximum background, the median of the data set is found to be 5.37 mg/kg. The 95% upper confidence limit is 12 mg/kg (Table 2.14).

2.3.3 Example #3: Derivation of background value for antimony in surface soil

The derivation of the antimony background value in surface soil is presented as an example of the evaluation of a data set that has few detected values. The derivation of background values for other data sets with few detected values followed this variation of the evaluation process.

Graphical depictions of the surface antimony data set are in Figs. 2.7, 2.8, and 2.9. Univariate statistics for the complete antimony surface data set are presented on page 11 of Appendix A. The five observations in the antimony data set with the greatest concentrations are shown in Table 2.5. The selected maximum background for antimony is in Table 2.7. Univariate statistics for the background or reduced data set are on page 71 of Appendix A. A summary of the material on page 71 is in Tables 2.8 (all observations) and 2.10 (detected observations). Finally, the list of the five highest observations in the reduced data set is in Table 2.12.

Generally, little can be said about the cumulative probability plot for antimony (Figure 2.9). Because there are only four observations with detected values, the plot is very sparse. Similarly, the histogram showing all data provides little information because the majority of the observations are nondetects and are "stacked" at midpoint natural log -1.0 (Fig. 2.8). However, Fig. 2.7 does indicate that many of the nondetects have values that exceed the maximum detected value, and Fig. 2.8 does show that the detected value at natural log 0.6 may not be consistent with the rest of the data.

Examination of the five highest antimony concentrations in the data set (Table 2.5) show that the samples with the highest concentrations were all collected at SWMU 81. Therefore, there is a geographical bias to the data set. (Please note, these observations are all nondetects; therefore, this conclusion is tentative.)

The aforementioned factors suggest that the maximum background value for antimony in surface soil is very small and may be below the detection limit. In any case, the value cannot exceed the maximum detected concentration (1.8 mg/kg) under evaluation rules established earlier. However, because this value is widely spaced from the next highest detect (0.84 mg/kg), and because antimony concentrations in soil are expected to be low at the PGDP, the antimony concentration selected as maximum background is 0.84 mg/kg. This value is markedly less than the value selected in Moore (1995) (45 mg/kg) as shown in Table 2.7.

Once segregated at the maximum background value, the background data set is found to contain 27 total observations. The reduction in number of observations resulted from the deletion from the data set all nondetects with concentrations greater than the maximum selected background. The summary statistics for all observations in the reduced data set are in Table 2.8; the summary statistics for the detected values (N=3) in the reduced data set are in Table 2.10. Finally, the five greatest concentrations in the reduced data set are presented in Table 2.12. Note that the geographical distribution of sampling locations at the selected background is widely scattered.

Using 0.84 mg/kg as the maximum background value, the median of the data set is found to be 0.35 mg/kg. The 95% upper confidence limit is 0.84 mg/kg (Table 2.14).

2.3.4 Example #4: Derivation of background value for beryllium in surface soil

The derivation of the beryllium background value in surface soil is presented as an example of an evaluation that relied on the geographical distribution of samples to select a maximum background value.

Graphical depictions of the surface beryllium data set are in Figs. 2.16, 2.17, and 2.18. Univariate statistics for the complete beryllium surface data set are presented on page 14 of Appendix A. The five observations in the beryllium data set with the greatest concentrations are shown in Table 2.5. The selected maximum background for beryllium is in Table 2.7. Univariate statistics for the background or reduced data set are on page 74 of Appendix A. A summary of the material on page 74 is in Tables 2.8 (all observations) and 2.10 (detected observations). Finally, the list of the five highest observations in the reduced data set is in Table 2.12.

Generally, the cumulative probability plot for beryllium (Fig. 2.18) indicates two populations. The plot shows a major deflection point near natural log 0; however, this may not be a reasonable maximum background value. Selection of this value would mean that the maximum background concentration for beryllium is approximately 1 mg/kg. This is not be a reasonable maximum background value for beryllium because this value is very near the lower end of the published ranges and selection of this value would dismiss a group of samples from widely scattered geographical locations. (Wide-spread contamination with beryllium is not expected at the PGDP). Lindsay (1979) reports that the common range of beryllium in soils is from 0.1 to 40 mg/kg. Kabata-Pendias and Pendias (1984) reports a range of 1 to 3. Note, the upper end of the distribution with the greater concentrations is also not a reasonable background value (24.0 mg/kg). The histograms for beryllium (Figs. 2.16, all observation, and 2.17, detected observations) confirm the presence of the two well-defined populations seen in the cumulative probability plot.

Examination of the five highest beryllium concentrations in the data set (Table 2.5) show that the sample locations are geographically biased with two of the five highest concentrations from samples taken at SWMU 7 and another two from SWMU 97. Therefore, the data from the upper population is biased by sampling location to some extent.

The aforementioned factors suggest that the maximum background value for beryllium in surface soil cannot be selected using the graphical method alone. A "good" deflection point is not obvious. As noted previously, in this case the geographical distribution data was examined in more detail, and a maximum background value was selected at the point in the data set where the geographical bias becomes minimal. The point selected for beryllium is the concentration in sample UP001 (18 mg/kg). This sample was collected offsite near Hwy 258 during the Phase II Site Investigation. The selected maximum background value is slightly less than the value selected in Moore (1995) (25 mg/kg) as shown in Table 2.7.

Once segregated at the maximum background value, the background data set was found to contain 71 total observations and 66 detected observations. The summary statistics for all observations in the reduced data set are in Table 2.8; the summary statistics for the detected values in the reduced data set are in Table 2.10. Finally, the five greatest concentrations in the reduced data set are presented in Table 2.12. Note, in Table 2.12, the geographical distribution is improved with two of the five samples coming from off-site locations. (However, the other three observations come from SWMU 7 which makes the selected maximum background value suspect.)

Using 18 mg/kg as the maximum background value, the median of the data set is found to be 0.88 mg/kg. The 95% upper confidence limit is 18 mg/kg (Table 2.14).

2.4 EVALUATION OF BACKGROUND VALUES

The results of the analysis are presented in Tables 2.14 and 2.15 for near surface and subsurface soil, respectively. In reviewing the information in the table, it should be recognized that the 95% upper bound of the 95th percentile data from the PGDP should typically be at the high end of the published ranges and exceed average values. However, the value for the PGDP should typically fall within the range of values reported for soils. Discussions about the results for each element follow. Within the discussions, the terms *enriched* and *depleted* will be used frequently. These terms are borrowed from economic geology and refer to concentrations of an element in the soil (relative to crustal or general soil concentrations) that are either higher (i.e., enriched) or lower (i.e., depleted) due to a variety of natural geochemical processes and geological phenomena. Potential enrichment by man-made events (*anthropogenic enrichment*) is also discussed. A general summary of the results appears at the end of this section.

2.4.1 Aluminum

The background values for aluminum are 13,300 and 12,000 for surface and subsurface soil, respectively. These values are near the low end of the published ranges and much less than the average for soils reported by Lindsay (1979) (71,000 mg/kg) and the crustal average reported by Taylor (1964) (82,300). The result for surface soil is consistent with the types of soil found at the PGDP. At the PGDP, surface soils are primarily composed of loess (i.e., wind deposited, predominantly silt-sized particles). Mineralogically, loess soils consist primarily of silica minerals partially cemented together with calcium and are low in aluminum-containing clay minerals.

Therefore, the low aluminum concentration results for soils are not unexpected. The result for subsurface soil is more difficult to explain and may be an anomalous result.

2.4.2 Antimony

The background values for antimony are 0.84 and 13.4 mg/kg for surface and subsurface soil, respectively. The value for surface soil is well within the published ranges and near the crustal average reported by Taylor (1964) (0.2 mg/kg). In addition, this result is consistent with the concentration for antimony provided by the Commonwealth of Kentucky (< 1 mg/kg) after their review of the previous version of this document (Energy Systems 1995). (In the comment set, the Commonwealth of Kentucky states that the concentration provided was that seen from background sampling at other sites across the state and within the Jackson Purchase Region. This comment set is reproduced in Appendix C.) However, the value for subsurface soil falls well outside of the published ranges, greatly exceeds the crustal average, and is 13 times higher than the concentration provided by the Commonwealth of Kentucky. This result is unexpected because antimony is relatively rare in the environment and is typically found in association with arsenic, lead, silver, copper, and other chalcophile elements (i.e., elements commonly found in sulfide minerals), which are not particularly enriched in the PGDP environment.

One possible explanation for the high background concentration is deposition from automobile exhaust (Huang et al. 1994); however, this explanation is not consistent with the relatively low background concentrations of other automobile exhaust-derived elements such as zinc or with the low background value seen in surface soil. Another explanation for the high background concentration may be an analytical error. Analysis of antimony is difficult because the most sensitive spectral line used to measure antimony is in the ultraviolet region of the electromagnetic spectrum where loss of light, spectral interferences, and nonspecific absorption can cause false positives. The presence of false positives could cause the background value to be inflated. However, this explanation is also not consistent with the lower value derived for surface soils. Because the subsurface concentration is inconsistent with that expected, the recently released *Project Plan for Background Soils Project for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1995) proposes confirming this value with additional sampling.

2.4.3 Arsenic

The background values for arsenic are 12 and 7.9 mg/kg in the surface and subsurface soil, respectively. These values are well within the published ranges for arsenic and only slightly exceed the soils average provided by Lindsay (1979) (5 mg/kg). These values are in excess of the crustal average reported by Taylor (1964) (1.8 mg/kg). However, these values are consistent with the concentration provided by the Commonwealth of Kentucky in their comments on the previous version of this report (< 8 mg/kg). Therefore, the results for arsenic appear to be appropriate.

2.4.4 Barium

The background values for barium are 195 and 172 mg/kg, repectively. These values are near the low end of the published ranges and are less than the soils average provided by Lindsay (1979) (430 mg/kg) and the crustal average provided by Taylor (1964) (425 mg/kg). Therefore, the results for barium appear to be appropriate.

2.4.5 Beryllium

The background values for beryllium are 18 and 1.3 mg/kg, respectively. The value for subsurface soil is well within the published ranges and less than the soils average provided by

Lindsay (1979) (6 mg/kg). This value is also less than the crustal average provided by Taylor (1964) (2.8 mg/kg) and the value provided by the Commonwealth of Kentucky in their comments on the previous version of this document (< 5 mg/kg). However, the beryllium value for surface soils exceeds that typical for most soils. This result indicates that there is a local enrichment of this element in surface soil. However, it should be noted that the background value of 18 mg/kg, as compared to the common range of 0.1 to 40 mg/kg (Lindsay 1979) is still reasonable. Because the surface value may be anomalous, the recently released *Project Plan for Background Soils Project for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1995) proposes confirming this value with additional sampling.

2.4.6 Cadmium

The background values for cadmium are 2.6 and 2.2 mg/kg, respectively. These values exceed the published ranges, the soils average in Lindsay (1979) (0.06 mg/kg), and the crustal average provided by Taylor (1964) (0.2 mg/kg). However, these values are less than upper limit background values reported in two references suggested by the Commonwealth of Kentucky in their comments on the earlier version of this report. These values are 2.9 mg/kg (Logan and Miller 1983) and 11.7 mg/kg (Wells et al. 1993). The reason for the possible local enrichment of cadmium is unknown, but as with antimony, this element is subject to a number of common analytical interferences. Therefore, analytical error may explain the high cadmium background value. It should be noted that human activity is not a likely cause of the local enrichment. This is because other elements (i.e., lead, nickel, zinc) that behave similarly to cadmium after release to the environment do not show higher than expected background concentrations. These elements would also be expected to be enriched in surface soils if human activity were the explanation for the high cadmium background.

2.4.7 Calcium

The calcium background values for surface and subsurface soil are 200,000 and 6130 mg/kg, respectively. The value for surface soil is quite high but within the published ranges for soils. This value does exceed the soils average in Lindsay (1979) (13,700 mg/kg) and the crustal average reported by Taylor (41,500 mg/ kg); however, the result for surface soil is consistent with the presence of loess soils at the PGDP. As indicated earlier, loess tends to have a high calcium content. Therefore, the very high calcium background value in surface soil is reasonable. The value for subsurface soil is very low compared to the surface soil value. This value is less than the published ranges and less than all other values. This may be an anomalous result.

2.4.8 Chromium

The chromium background values for surface and subsurface soil are 16 and 42.5 mg/kg, respectively. These values are within the published ranges and less than the soils average (100 mg/kg) and crustal average (100 mg/kg) reported by Lindsay (1979) and Taylor (1964), respectively. These values are also consistent with values provided in three references mentioned in the Commonwealth of Kentucky in their comments on the previous draft of this document. These values are 23 mg/kg (Logan and Miller 1983), 35 mg/kg (Wells et al. 1993), and 140 mg/kg (Karathanasis and Seta 1993). Therefore, the chromium background concentrations are reasonable.

2.4.9 Cobalt

The cobalt background values for surface and subsurface soil are 14 and 13.3 mg/kg, respectively. These results are well within the published ranges and similar to the soils average (8 mg/kg) and crustal average (25 mg/kg) reported by Lindsay (1979) and Taylor (1964), respectively. These values are also similar to the value provided by the Commonwealth of Kentucky in their comments on the earlier version of this report (< 10 mg/kg). It should be noted that cobalt is one of the easiest of the heavy elements to analyze. This fact and the fact that the results show that cobalt is not particularly enriched at the PGDP indicate that the higher than expected antimony and cadmium results reported previously may be incorrect.

2.4.10 Copper

The copper background values for surface and subsurface soils are 19 and 24.5 mg/kg, respectively. These results are well within the published ranges and similar to the soils average (30 mg/kg) and crustal average (55 mg/kg) reported by Lindsay (1979) and Taylor (1964), respectively. These values are also less than upper limit value reported by Logan and Miller (1983) and value reported by Karathanasis and Seta (1993) (37 and 34 mg/kg, respectively). The copper results are also reasonable with respect to the abundance of other easily analyzed elements such as cobalt. Therefore, the background values for copper are reasonable.

2.4.11 Cyanide (CN^-)

Cyanide is not normally considered to be naturally occurring. Therefore, any cyanide detected in soil samples should be considered to be due to contamination or due to analytical error. A background value for cyanide was not established.

2.4.12 Iron

The iron background values for surface and subsurface soils are 27,600 and 28,100, respectively. These values are less than the soils average (38,000 mg/kg) and crustal average (56,300) reported by Lindsay (1979) and Taylor (1964), respectively. Iron is one of the most abundant elements in the lithosphere. Therefore, the background results for iron appear to be reasonable.

2.4.13 Lead

The lead background values for surface and subsurface soil are 36 and 22.5 mg/kg, respectively. The lead results are consistent with published ranges but are greater than the soils average (10 mg/kg) and crustal average (12.5 mg/kg) reported by Lindsay (1979) and Taylor (1964), respectively. These values are also consistent with upper limit values found in Logan and Miller (1983) and Wells et al. (39 and 64 mg/kg, respectively) and the value reported by Karathanasis and Seta (1993) (76 mg/kg). Indeed, because human activities have added much lead to the environment, the results for lead at the PGDP are lower than that which would be detected in many urban soils and road and house dusts.

2.4.14 Magnesium

The magnesium background values for surface and subsurface soils are 7740 and 2140 mg/kg, respectively. These values are near the high end and near the middle range of published values. These values are consistent with the soils average (5,000 mg/kg) and crustal average (23,300) reported by Lindsay (1979) and Taylor (1964), respectively. In addition, these values are consistent with the background values for calcium reported earlier. Calcium behaves similarly to magnesium in the environment.

2.4.15 Manganese

The manganese background values for surface and subsurface soil are 1450 and 821 mg/kg, respectively. These values are within the published ranges. These values are also consistent with the soils average reported by Lindsay (1979) (600 mg/kg) , the crustal average reported by Taylor

(1964) (950 mg/kg), and the mean plus one standard deviation value reported by Karathanasis and Seta (1993) (1,330 mg/kg) . The result for near surface soil is greater than that for subsurface soil, but this is expected because manganese forms insoluble precipitates in oxidizing environments.

2.4.16 Mercury

The mercury background values for surface and subsurface soils are 0.20 and 0.13 mg/kg, respectively. These values are within the published ranges. However these values exceed the soils average (0.03 mg/kg) and crustal average (0.08 mg/kg) reported by Lindsay (1979) and Taylor (1964), respectively. These values are similar to the value provided by the Commonwealth of Kentucky in their comments on a previous version of this report (< 0.2 mg/kg). The results for mercury appear reasonable. However, because the earlier draft of this report derived a much higher background value for mercury in surface soil, mercury is on the analyte list in *Project Plan for Background Soils Project for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1995). The results in this version of the report indicate that confirmation sampling may not be required.

2.4.17 Nickel

The nickel background values for surface and subsurface soils are 21 and 22 mg/kg, respectively. These values are within published ranges. In addition, these values are less than the soils average (40 mg/kg) reported by Lindsay (1979), the crustal average (75 mg/kg) reported by Taylor (1964), the upper limits (38 and 30 mg/kg) reported by Logan and Miller (1983) and Wells et al. (1993), respectively, the value (40 mg/kg) reported by Karathanasis and Seta (1993), and the value (< 25 mg/kg) provided by the Commonwealth of Kentucky in comments on a previous version of this report. Therefore, the results for nickel are reasonable.

2.4.18 Potassium

The potassium background values for surface and subsurface soil are 1250 and 945 mg/kg, respectively. These values are within published ranges. However, they are less than the soils average reported by Lindsay (1979) (8,300 mg/kg) and the crustal average reported by Taylor (1964) (20,900 mg/kg). These results are less than expected because potassium is an abundant element in the lithosphere. The low potassium background concentration may be due to the high solubility of many potassium salts and minerals. Therefore, the background values for potassium appear to be reasonable.

2.4.19 Selenium

The selenium background values for surface and subsurface soils are 0.80 and 0.70 mg/kg, respectively. These values are within published ranges. The background values do exceed the soils average reported by Lindsay (1979) (0.3 mg/kg) and the crustal average reported by Taylor (1964) (0.05 mg/kg). However, because selenium is another element that is difficult to analyze, the higher than expected background concentrations may be due to false positive results in the data set. Common causes for false positives are nonspecific absorbance and other interferences. In any case, the background values for selenium are reasonable.

2.4.20 Silver

The silver background values for surface and subsurface soils are 2.3 and 2.7 mg/kg, respectively. These values are within the published range. However, these values do exceed the soils average reported by Lindsay (1979) (0.05 mg/kg) and the crustal avearge reported by Taylor (1964)

(0.07 mg/kg). This result should not be due to analytical problems because silver is one of the easiest elements to quantify analytically. Therefore, either there is a local enrichment of silver in soils at the PGDP or the analytical data, as a whole, are biased high.

2.4.21 Sodium

The sodium background values for surface and subsurface soils are 317 and 343 mg/kg, respectively. These values are below the published range, an order of magnitude less than the soils average reported by Lindsay (1979) (6300 mg/kg) and nearly two orders of magnitude less than the crustal average reported by Taylor (1964) (23,600 mg/kg). Sodium is one of the most abundant elements in the lithosphere. However, these results are consistent with the results for potassium which behaves similarly to sodium. The low sodium results may be a consequence of the high solubility of many sodium salts and minerals. The results for sodium background appear to be reasonable.

2.4.22 Sulfide

The data set used to determine the background concentrations did not contain any results of sulfide analyses. Therefore, it was not possible to calculate a background for sulfides. However, it is questionable if a background for sulfide in soil is necessary as indicated by the following discussion.

Sulfur compounds are found in numerous industrial formulations, and, when released to a highly reducing environment, the sulfur in these compounds can form sulfide salts with common soil elements such as iron. However, unless very high concentrations of sulfide salts are present in soil exposed to oxygen, it is not likely that the sulfide salts would pose a risk to human health or the environment. Under conditions of high sulfide salt concentrations and oxygenation, it is possible that an acid drainage from soil could result. These latter conditions are not of concern at the PGDP because these conditions are likely only at industrial facilities which refine ores (i.e., coal and hardrock mines).

Please note that the published concentrations presented in Tables 2.14 and 2.15 are for total sulfur in soil and not for sulfides in soil. Total sulfur concentrations are presented because the listed references did not contain any information concerning regional sulfide concentrations. In addition, it is likely that total sulfur values will be of more use in the future if sulfur analyses for soil are performed at the PGDP. This is because total sulfur analyses are likely to be used as a surrogate for sulfide analyses if sulfur releases to soil are deemed to be of concern. Sulfide analyses on soils are difficult and very expensive.

2.4.23 Thallium

The thallium background values for surface and subsurface soil are 0.44 and 0.38 mg/kg, respectively. This value is consistent with the crustal average reported by Taylor (1964) (0.45 mg/kg); however, this value does exceed the value provided by the Commonwealth of Kentucky in comments on the earlier version of this report (< 0.10 mg/kg). Therefore, the background values for thallium may be anomalous. However, given the lack of information concerning natural thallium concentrations in soil, it is difficult to be certain if the thallium background concentrations are greater than expected due to analytical problems or the consequence of a local enrichment. It should be noted that thallium releases to soil from processes at the PGDP are not likely. The primary industrial uses of thallium are as a component of some electrical switches and as a neutron absorber in the production of nuclear weapons components. Neither of these activities have occurred at the PGDP. In addition, it should be noted that the literature indicates that thallium is a very rare element. For example, in a report summarizing the ambient levels of dissolved metals in surface and groundwater in the United States, thallium was detected in only seven of 301,000 water samples (Eckel and Jacob 1988). Given the uncertainties in the thallium concentration, it was determined that the background thallium concentrations should be confirmed. This element is included in the analyte list contained in the recently released *Project Plan for Background Soils Project for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1995).

2.4.24 Tin

The data set used to determine the background concentrations for soil did not contain any results of tin analyses. Therefore, it was not possible to calculate a background for tin in soil. However, it is questionable if a background for tin in soil is necessary as indicated by the following discussion.

The primary industrial use of tin is as a component in plating, and once incorporated into plating material, the tin metal is essentially insoluble. However, if tin chemicals are used (e.g., stannous chloride), they are highly reactive and, once in the environment, will form SnO_2, which is highly insoluble. Because process information indicates that the PGDP did not use tin or tin chemicals, releases of tin are not expected. Furthermore, it should be noted that analyses for tin in soil are not required as part of EPA's Contract Laboratory Program total analyte list. Therefore, a requirement for analyses for tin in soil as part of remedial investigations at the PGDP is not expected.

2.4.25 Vanadium

The vanadium background values for surface and subsurface soils are 38 and 37 mg/kg, respectively. These values are near the low end of the published ranges and less than the soils average (100 mg/kg) reported by Lindsay (1979) and the crustal average (135 mg/kg) reported by Taylor (1964). However, these background concentrations exceed the value (< 10 mg/kg) provided by the Commonwealth of Kentucky in comments on an earlier draft of this report. The background values for vanadium appear reasonable.

2.4.26 Zinc

The zinc background values for surface and subsurface soils are 65 and 60 mg/kg, respectively. These results are consistent with published ranges and are similar to the soils average reported by Lindsay (1979) (50 mg/kg) and the crustal average reported by Taylor (1964) (70 mg/kg). These results are markedly less than the upper limit reported by Logan and Miller (1983) (138 mg/kg) and the mean plus one standard deviation value reported by Karathanasis and Seta (1993) (90 mg/kg). These results are consistent with depth indicating that surface soils for this study are not significantly affected by wind-blown transport of heavy metals.

2.4.27 General Summary

This section summarizes the results by depth classification and reiterates which background values should be confirmed with additional sampling. This section concludes with a general geochemical interpretation of the results.

In the surface soil depth classification, the background results for aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, potassium, sodium, vanadium, and zinc are reasonable. However, the background results for cadmium, silver, thallium are above their expected results, and the background value for beryllium is greatly in excess of its expected value. Based on these results, beryllium background concentration should be confirmed with additional sampling. However, confirmatory sampling for cadmium, silver, and thallium can be considered.

In the subsurface depth classification, the background results for aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc are reasonable. However, the background results for cadmium, silver, and thallium are above their expected result, and the background value for antimony is greatly in excess of its expected value. Based on these results, the antimony background concentration should be confirmed with additional sampling. However, confirmatory sampling for cadmium, silver, and thallium can be considered.

Generally, this summary indicates that the data sets used to calculate the surface and subsurface background values for most elements were appropriate and that appropriate background screening values have been derived. This conclusion is based on the fact that the easily analyzed elements that are commonly introduced by human activities, including long-range atmospheric transport (i.e., cobalt, copper, lead, nickel, and zinc) display background values that are reasonable. Similarly, the results for the more abundant elements not normally affected by human activity (i.e., aluminum, calcium, iron, magnesium, potassium, and sodium) are reasonable and consistent with the natural environment and particularly the loess soils found at the PGDP. However, a few elements do show somewhat anomalous concentrations. Results for antimony (subsurface) and beryllium (surface) are clearly unusually high and should be confirmed. Results for cadmium, silver, and thallium in both the surface and subsurface are elevated and may need to be confirmed. (Please see Chapter 4 for more on confirmatory sampling.)

It should be noted that the suggestion for confirmatory sampling should not be used to conclude that any inorganic analytes have been widely released to the environment at the PGDP. To the contrary, the suggestion for additional sampling is to confirm that the higher than expected background for these inorganic analytes is due to natural local enrichment. Because information regarding the abundance of these trace elements in soils is limited, the background results for these inorganic analytes may be correct. A high natural abundance of these trace elements at the PGDP is a justifiable explanation for the background concentrations that were observed.

FIGURES FOR CHAPTER 2

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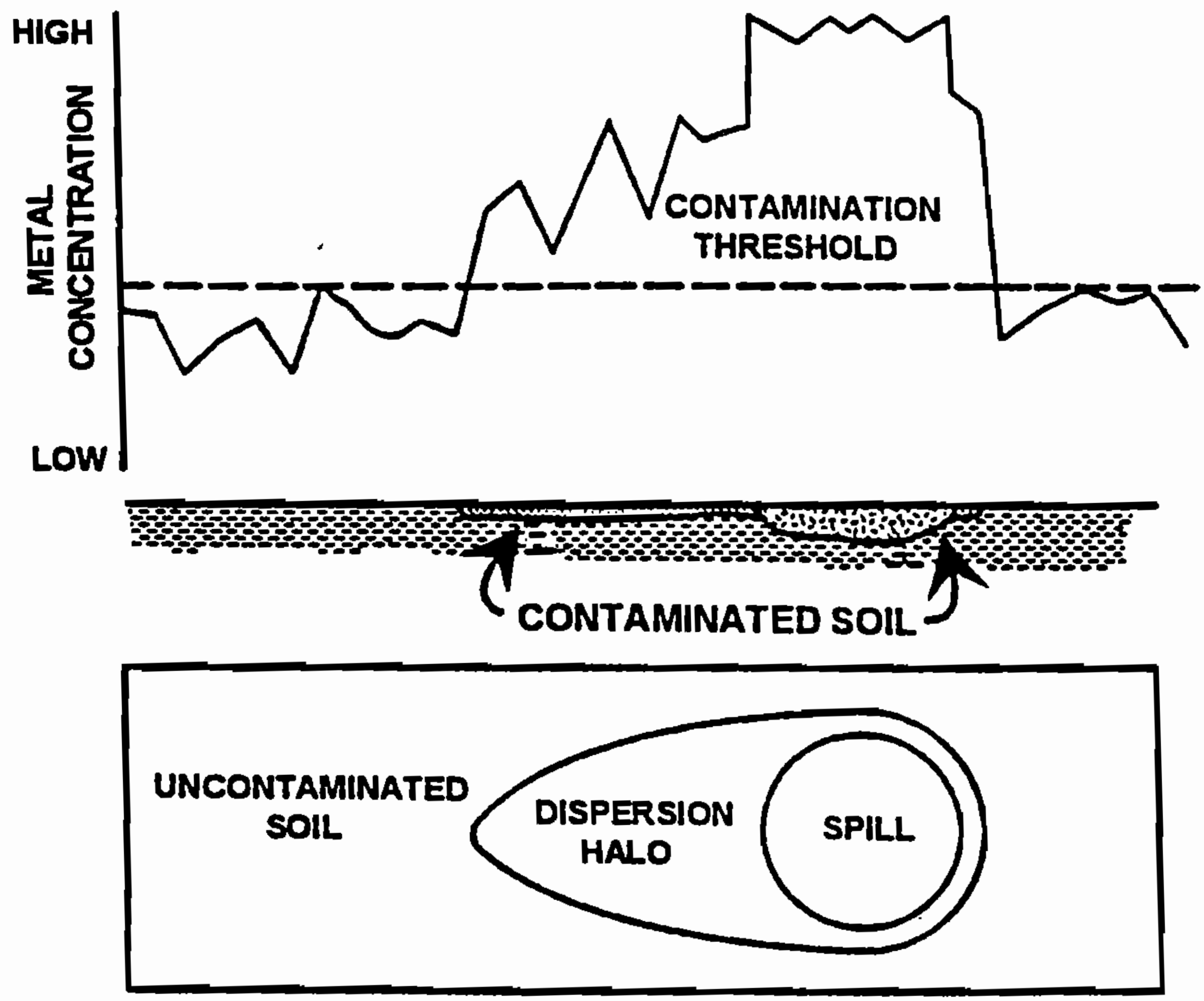


Figure 2.1. Hypothetical Sampling Transect through a Spill Site (after Rose et al. 1979. p. 35).

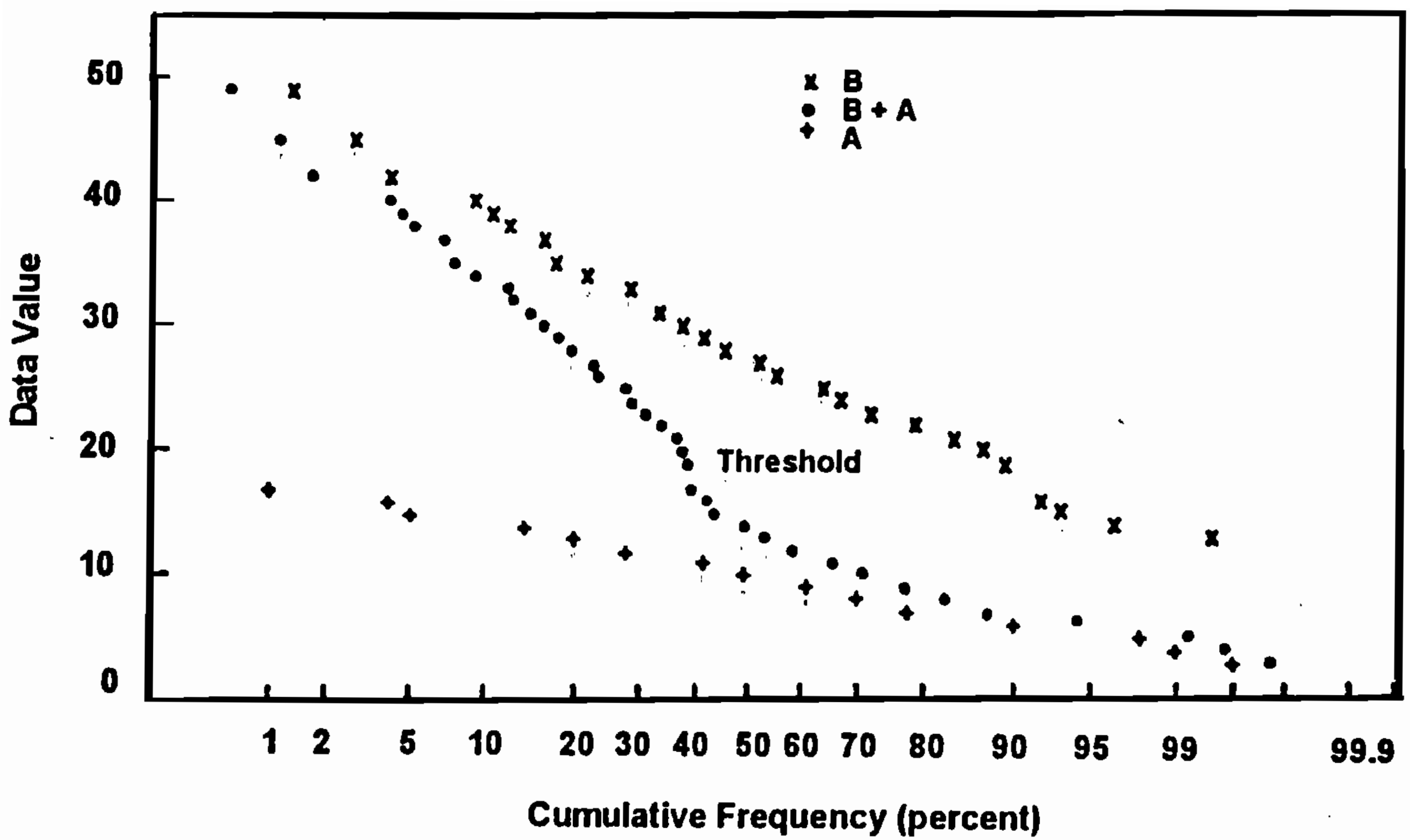


Figure 2.2. Probability Plot of Model Sampling Data from a Normal Population. (Fleischhauer and Korte 1989).

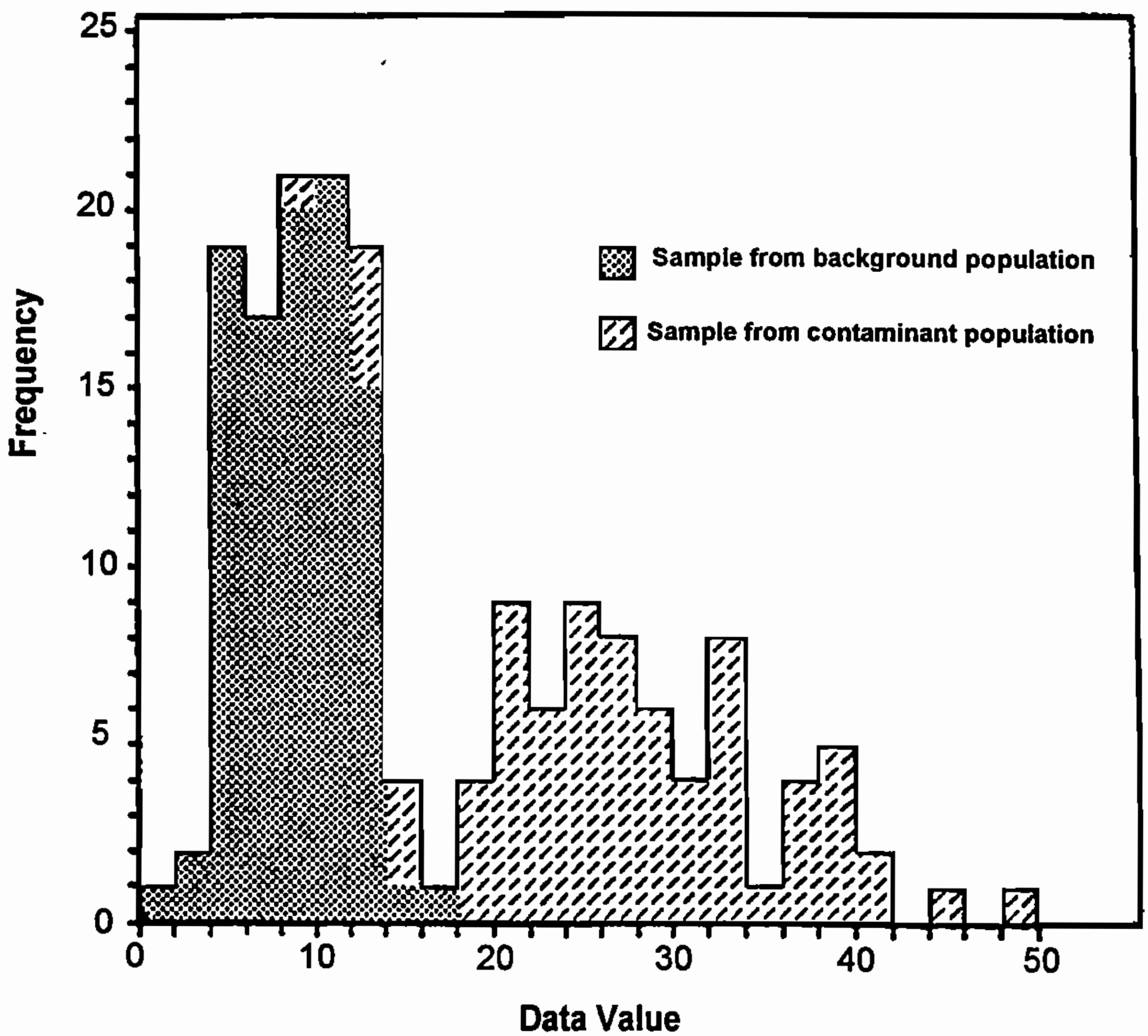


Figure 2.3. Histogram of Model Data Simulating a Mixture of Two Normal Populations. See Curve A+B in Figure 2.2 (Fleischhauer and Korte 1989).

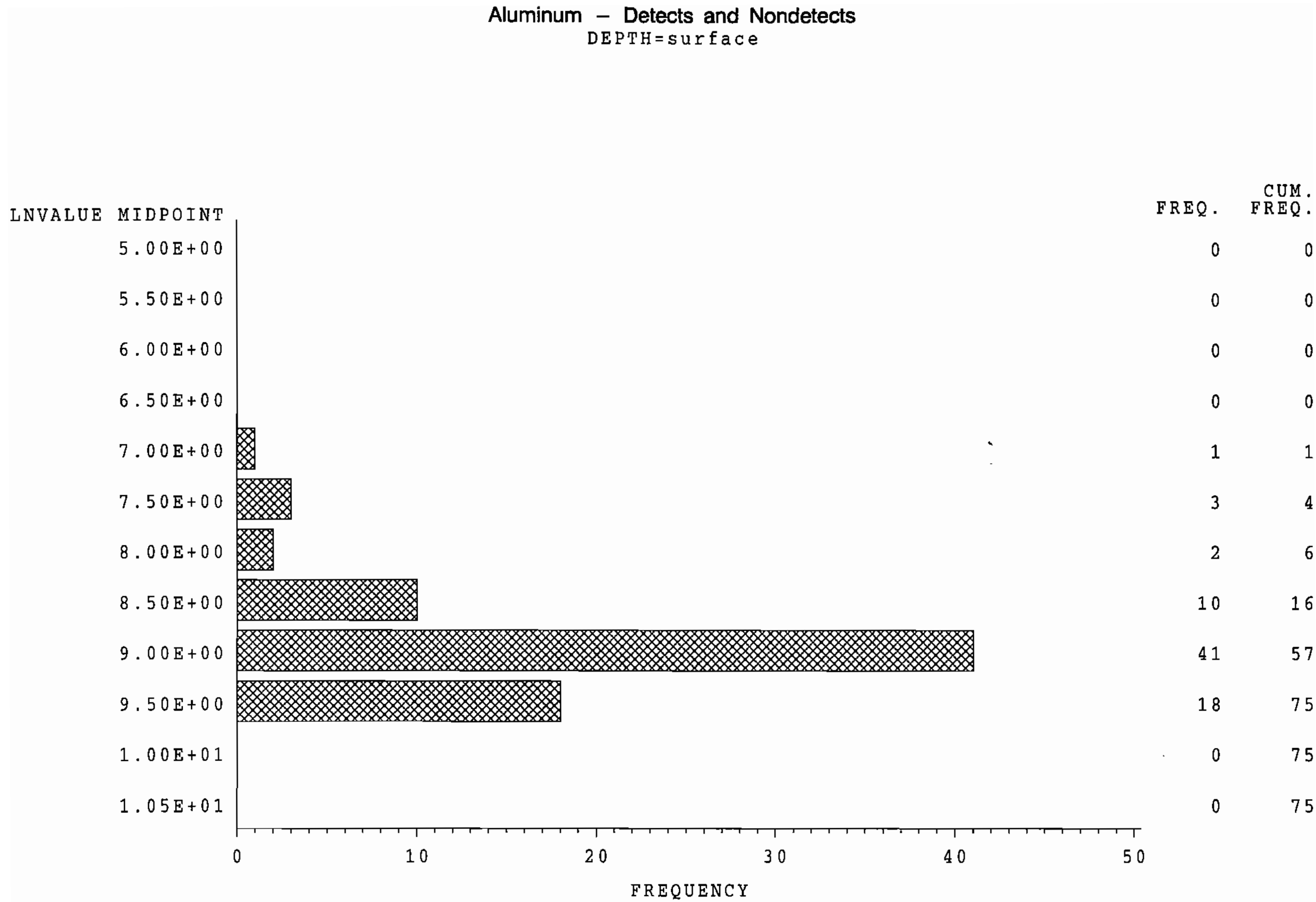


Figure 2.4. Histogram for Aluminum; All Observations; Surface Classification.

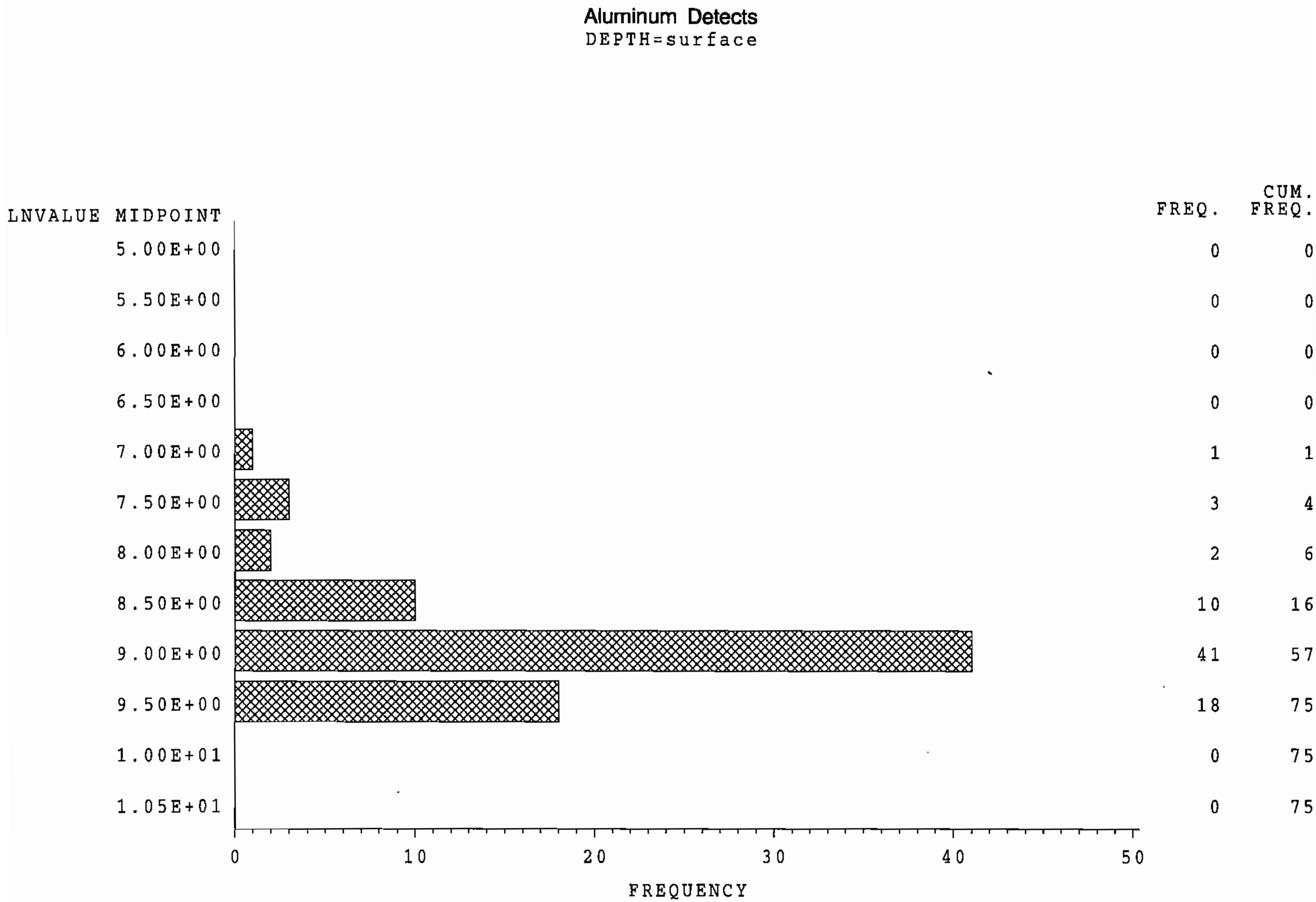


Figure 2.5. Histogram for Aluminum; Detected Observations; Surface Classification.

Aluminum Near Surface Detects 0 - 1 ft.

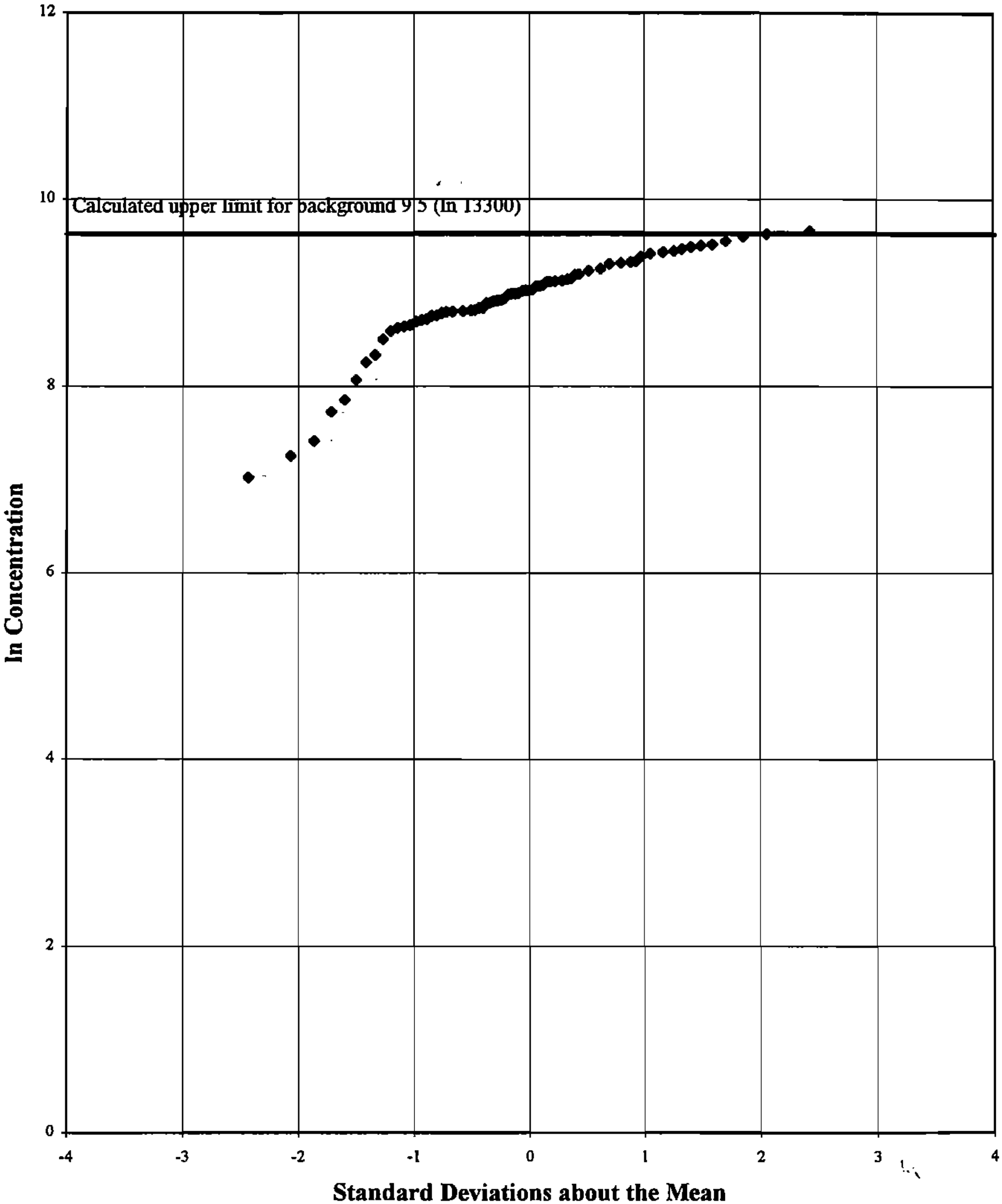


Figure 2.6. Cumulative Probability Plot for Aluminum; Detected Observations; Surface Classification.

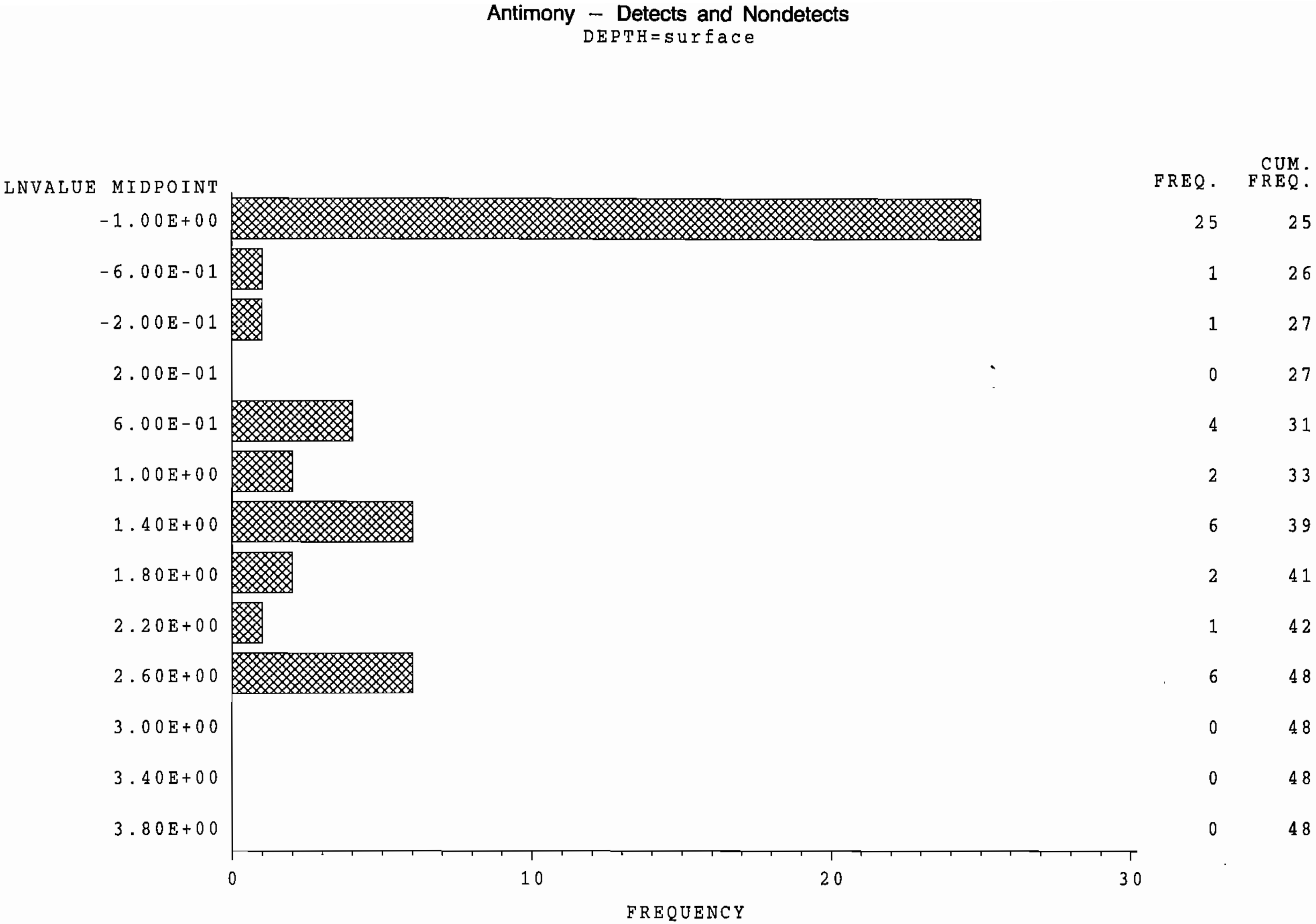
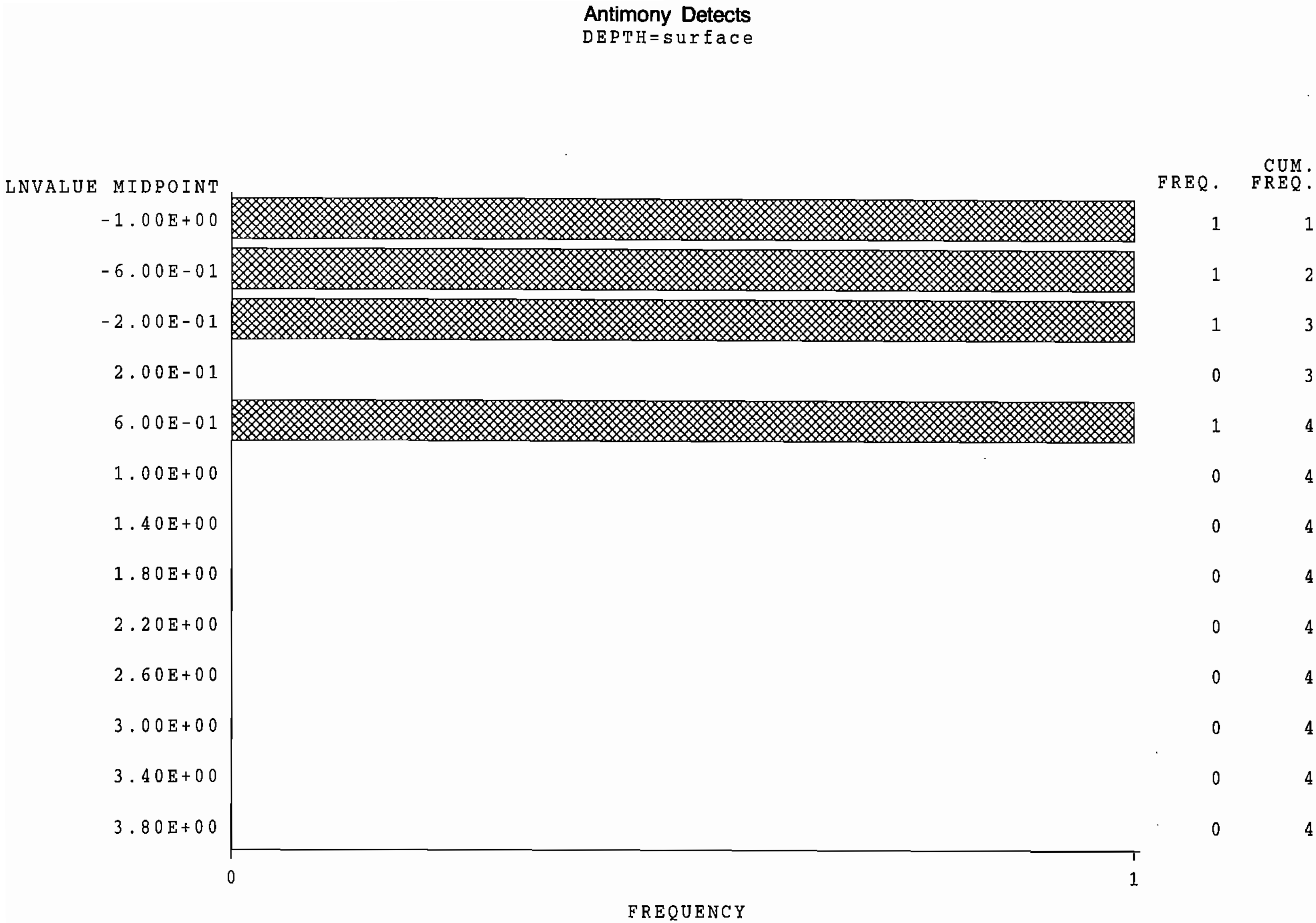


Figure 2.7. Histogram for Antimony; All Observations; Surface Classification.



LNVALUE MIDPOINT	FREQ.	CUM. FREQ.
-1.00E+00	1	1
-6.00E-01	1	2
-2.00E-01	1	3
2.00E-01	0	3
6.00E-01	1	4
1.00E+00	0	4
1.40E+00	0	4
1.80E+00	0	4
2.20E+00	0	4
2.60E+00	0	4
3.00E+00	0	4
3.40E+00	0	4
3.80E+00	0	4

Figure 2.8. Histogram for Antimony; Detected Observations; Surface Classification.

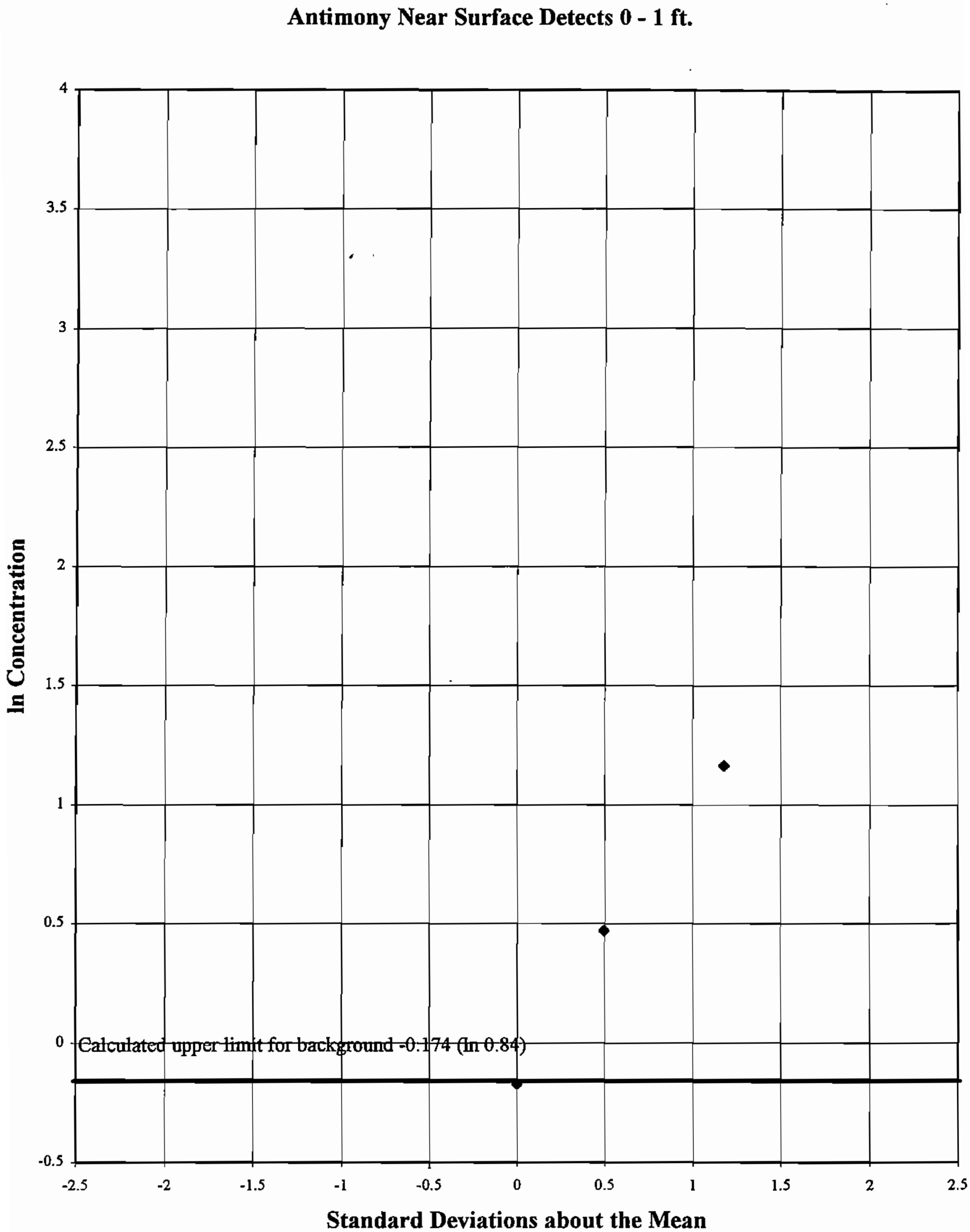


Figure 2.9. Cumulative Probability Plot for Antimony; Detected Observations; Surface Classification.

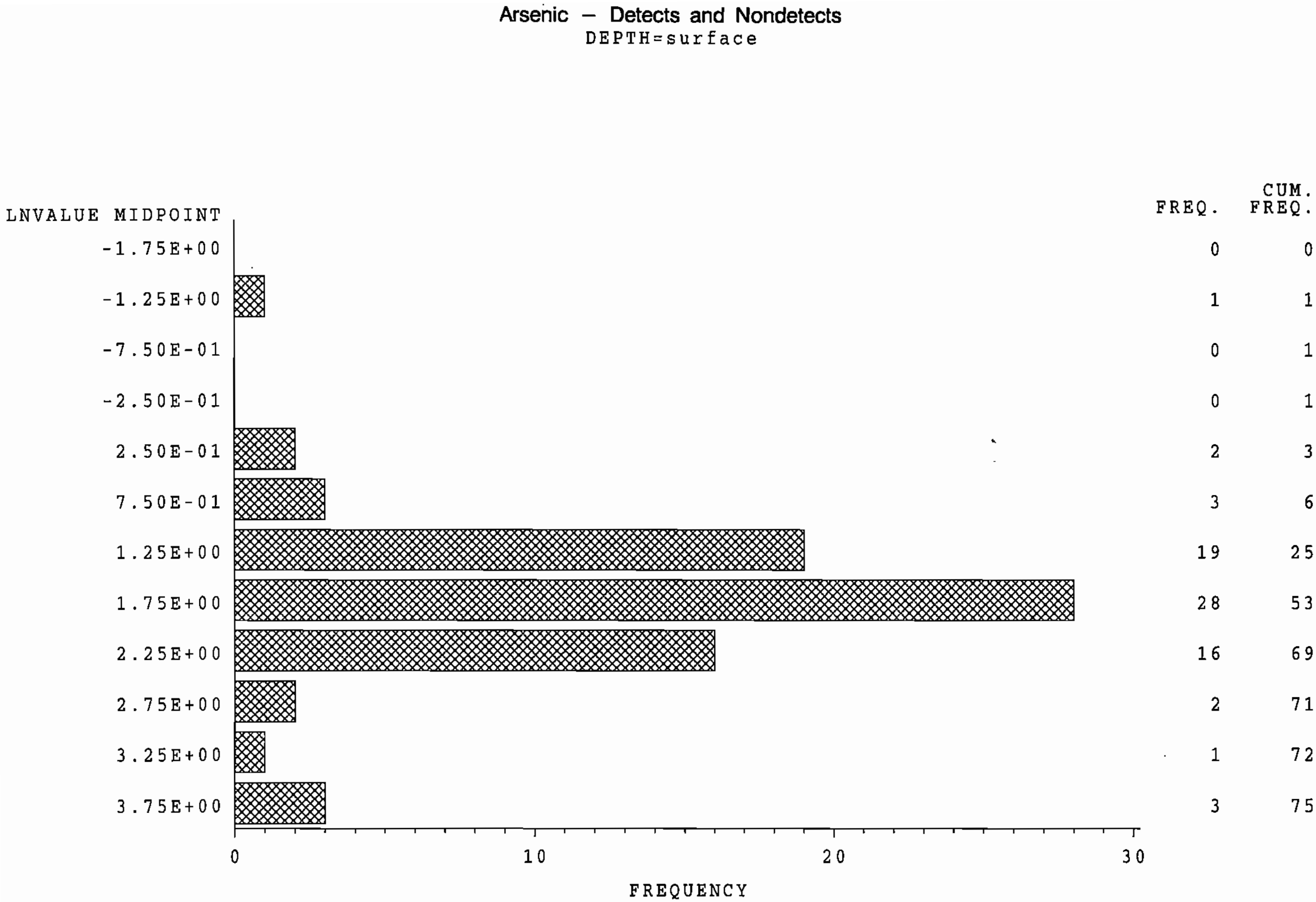


Figure 2.10. Histogram for Arsenic; All Observations; Surface Classification.

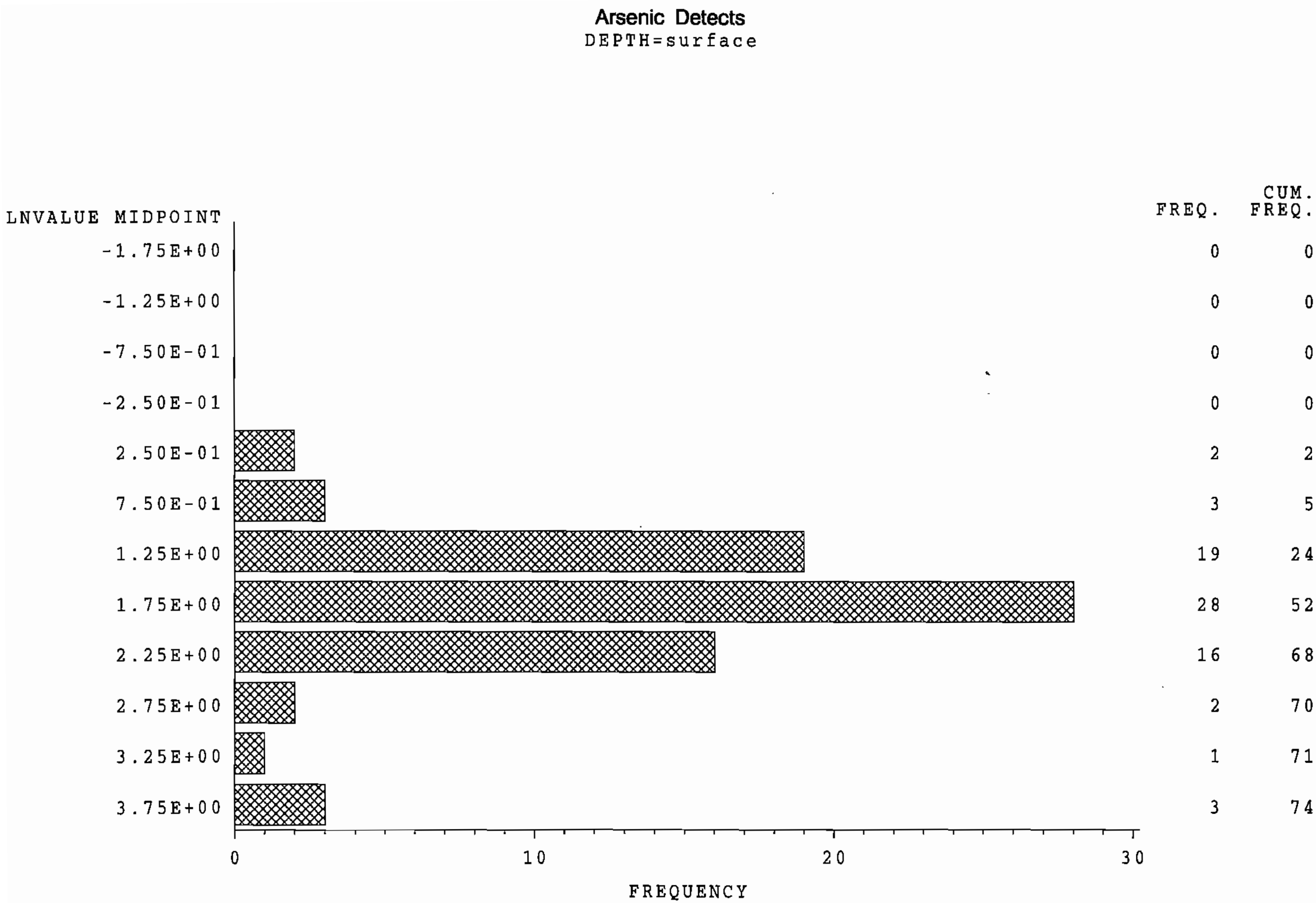


Figure 2.11. Histogram for Arsenic; Detected Observations; Surface Classification.

Arsenic Near Surface Detects 0 - 1 ft.

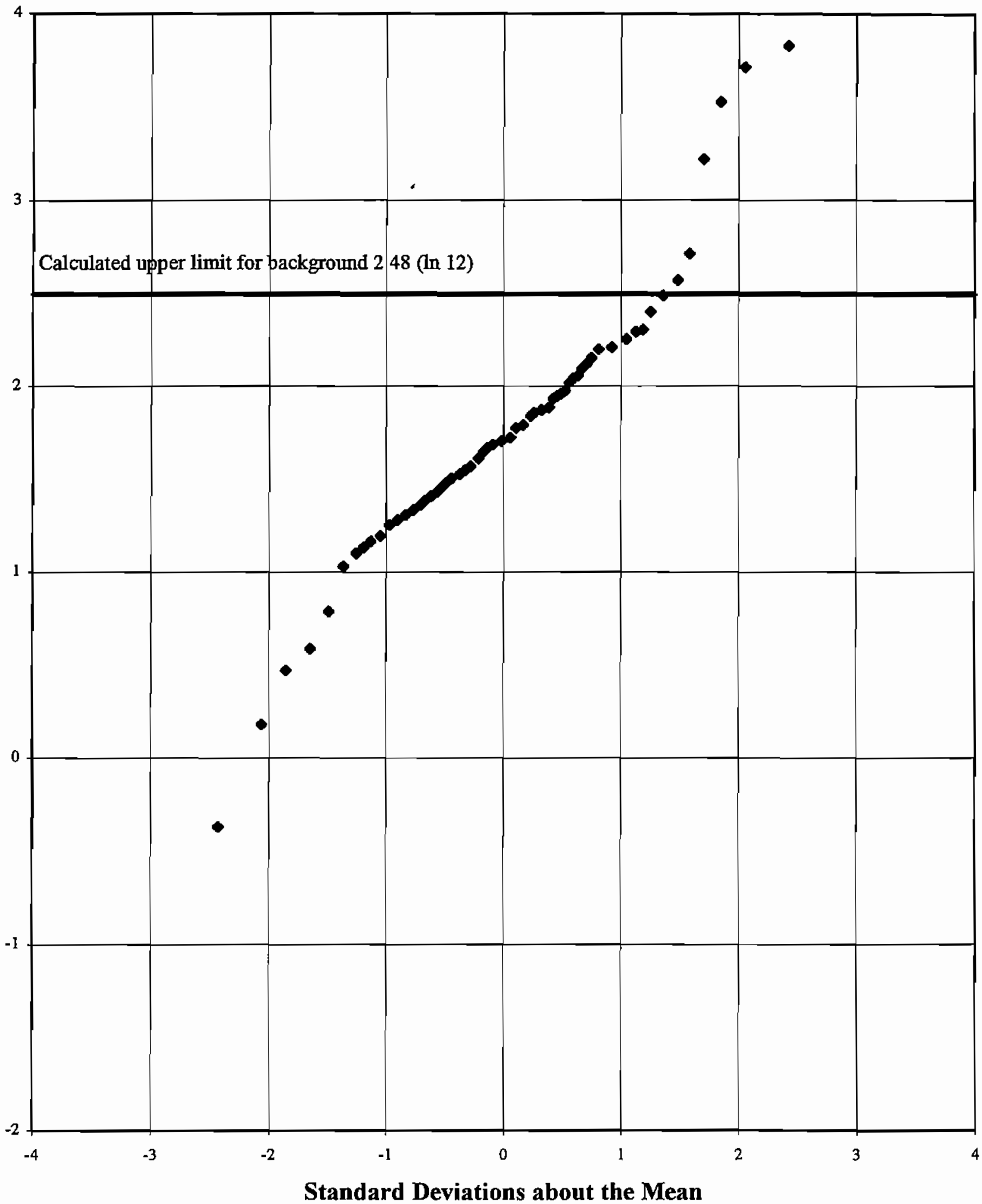


Figure 2.12. Cumulative Probability Plot for Arsenic; Detected Observations; Surface Classification.

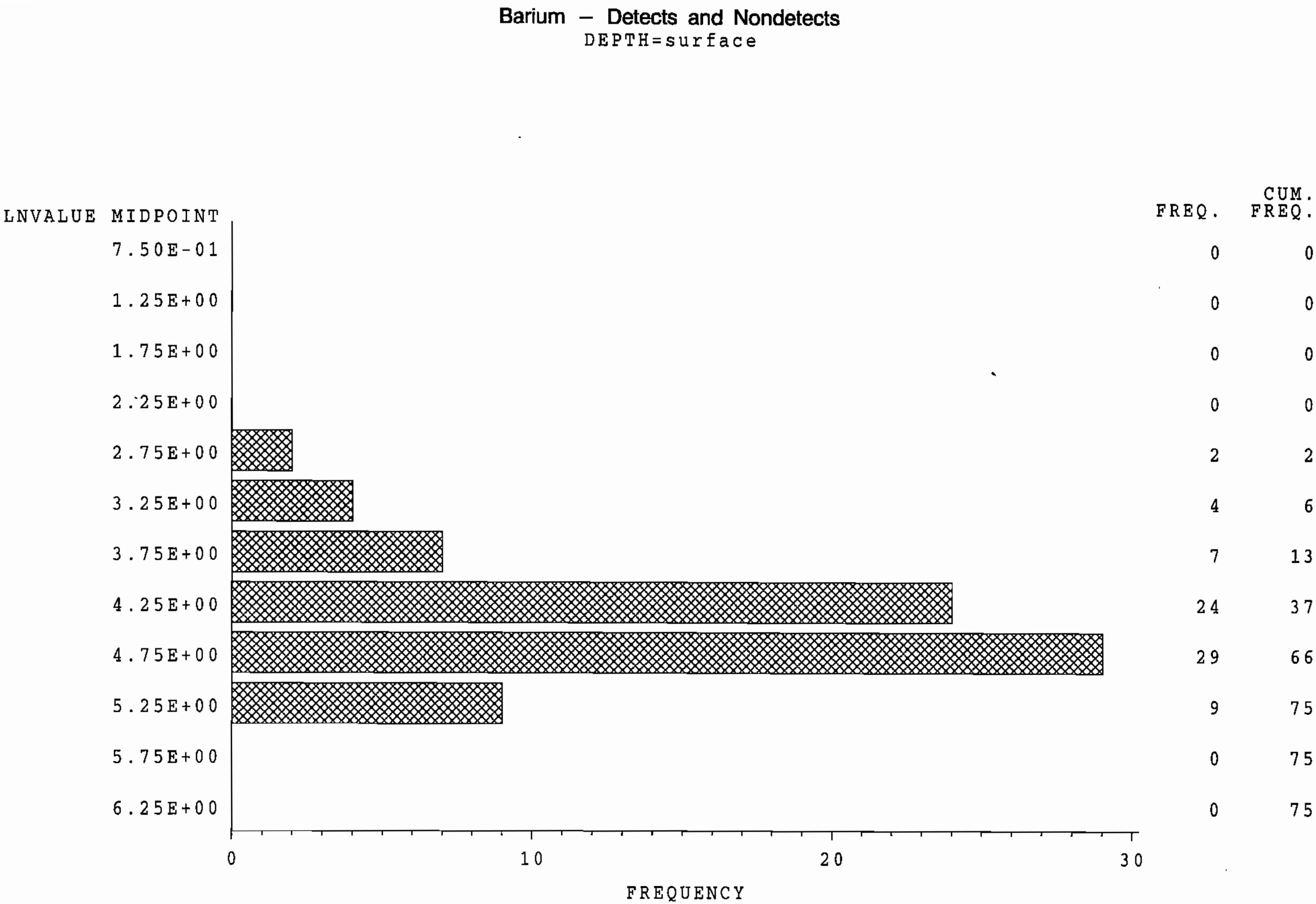


Figure 2.13. Histogram for Barium; All Observations; Surface Classification.

Barium Detects
DEPTH=surface

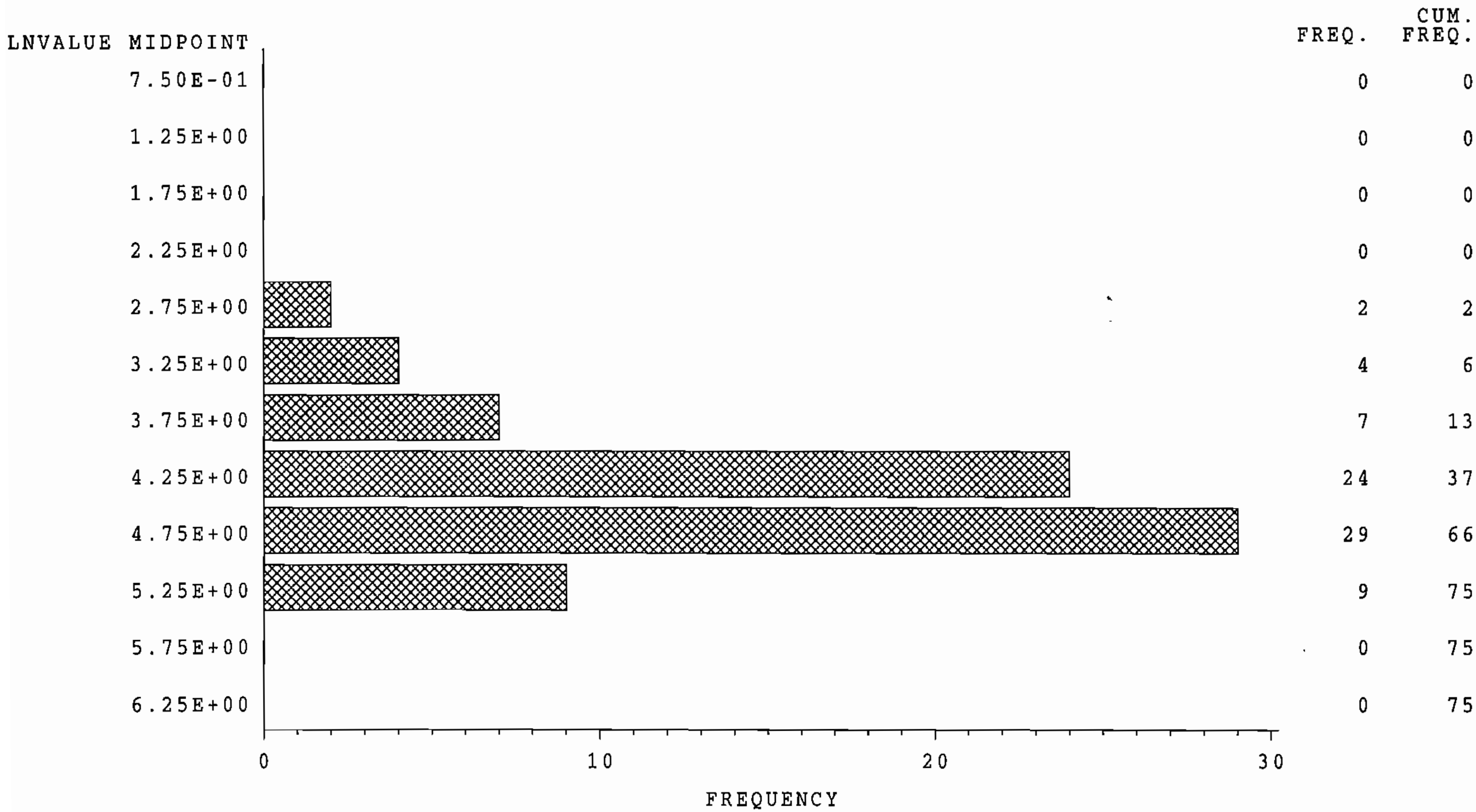


Figure 2.14. Histogram for Barium; Detected Observations; Surface Classification.

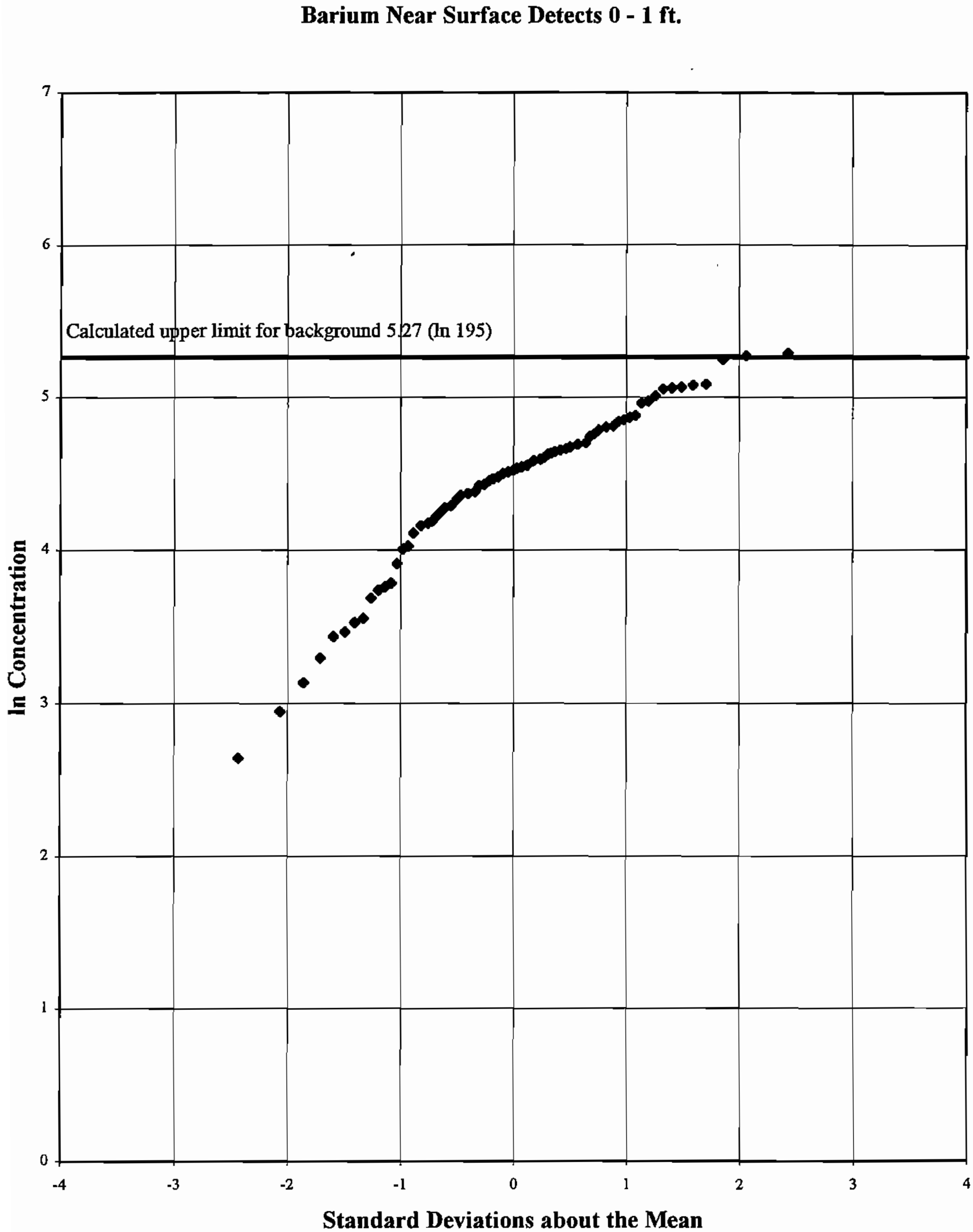


Figure 2.15. Cumulative Probability Plot for Barium; Detected Observations; Surface Classification.

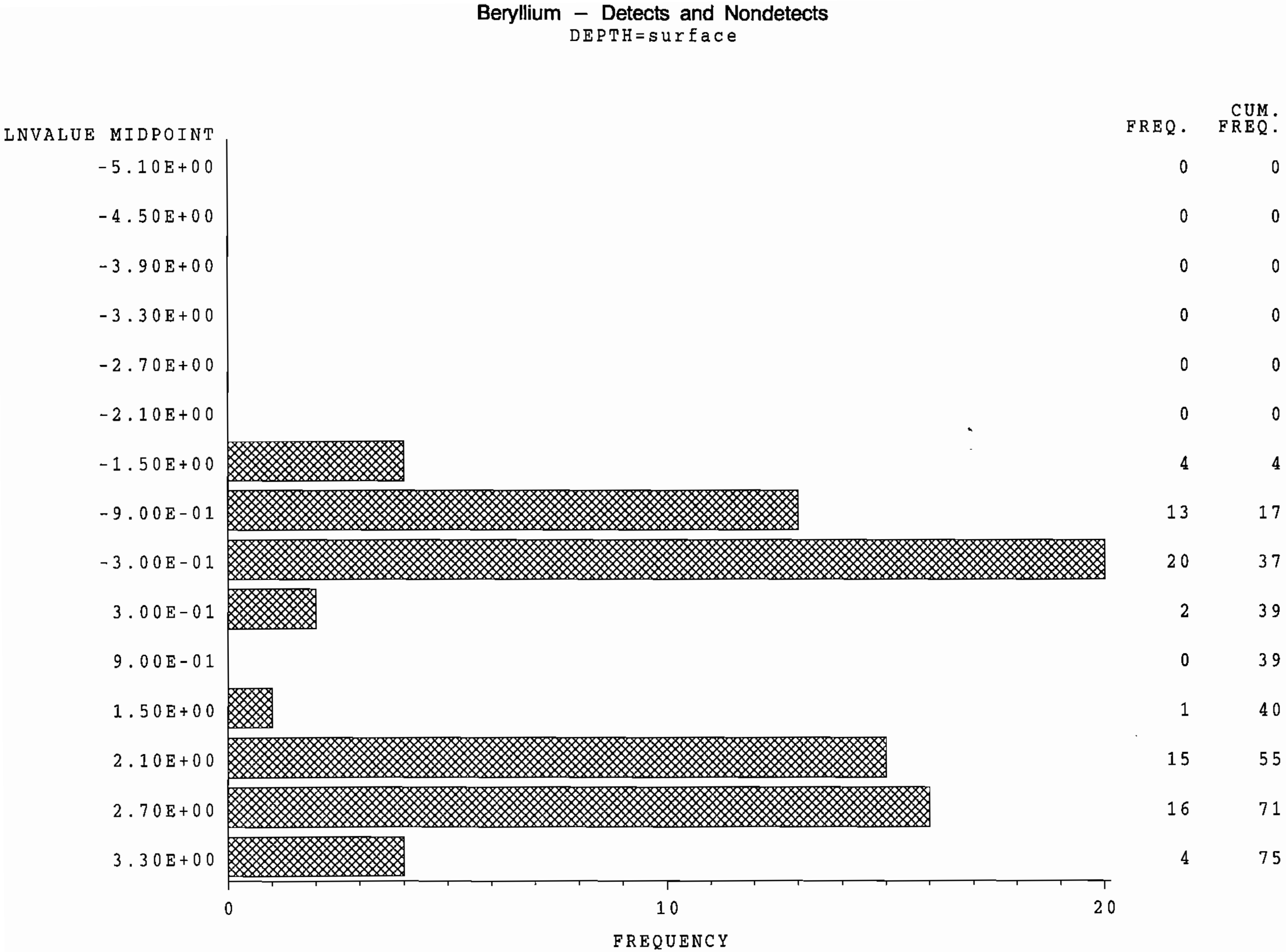


Figure 2.16. Histogram for Beryllium; All Observations; Surface Classification.

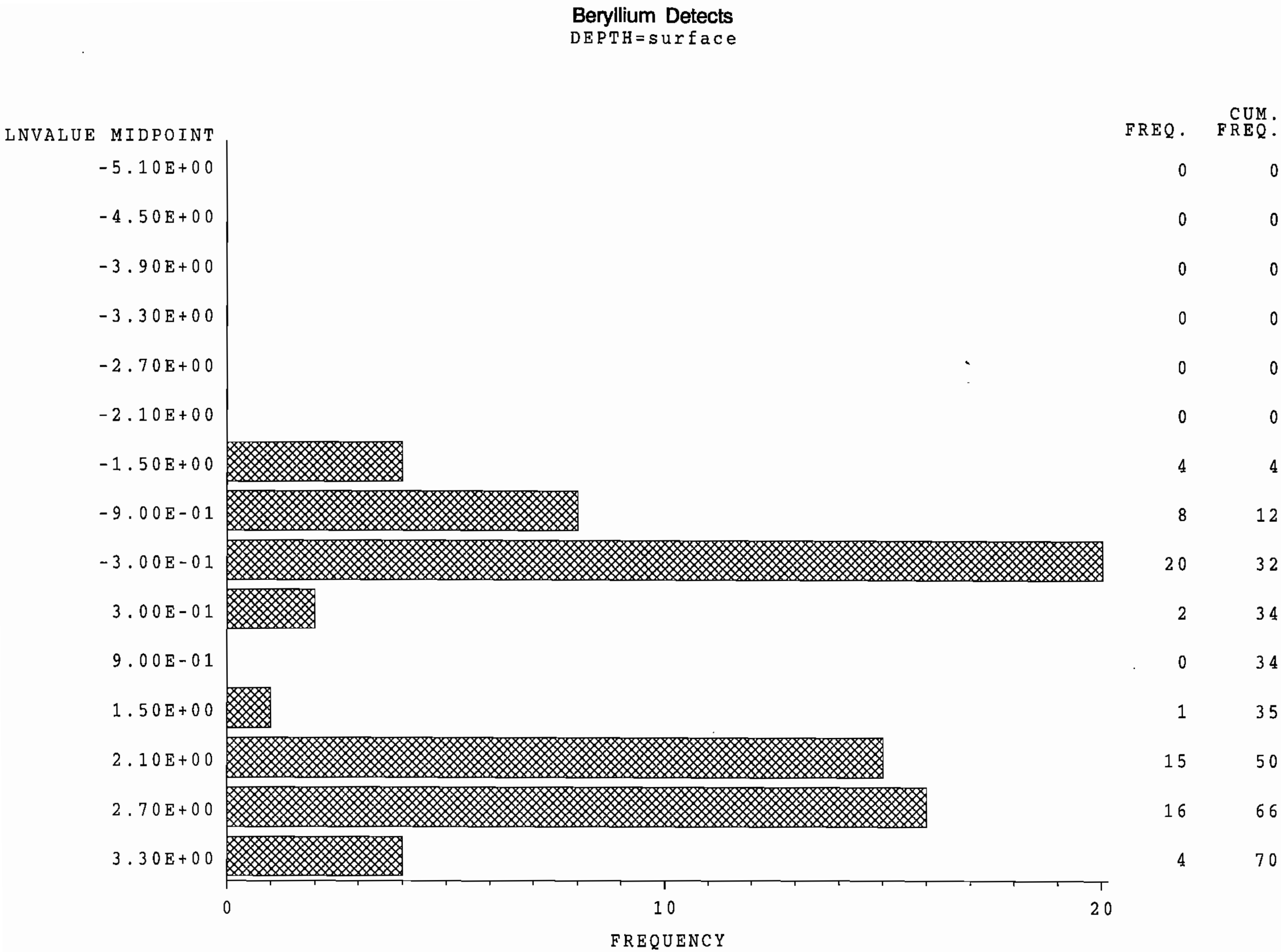


Figure 2.17. Histogram for Beryllium; Detected Observations; Surface Classification.

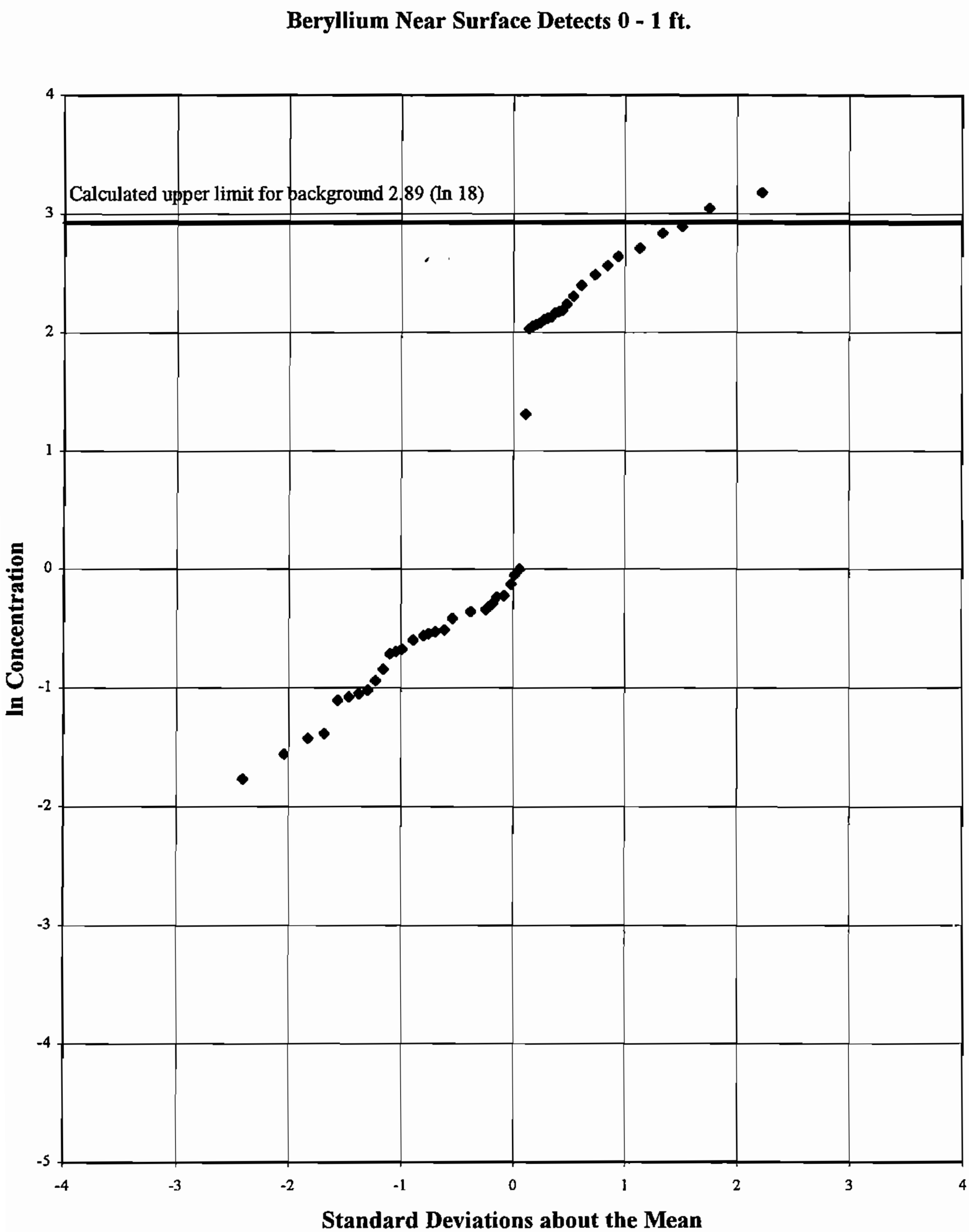


Figure 2.18. Cumulative Probability Plot for Beryllium; Detected Observations; Surface Classification.

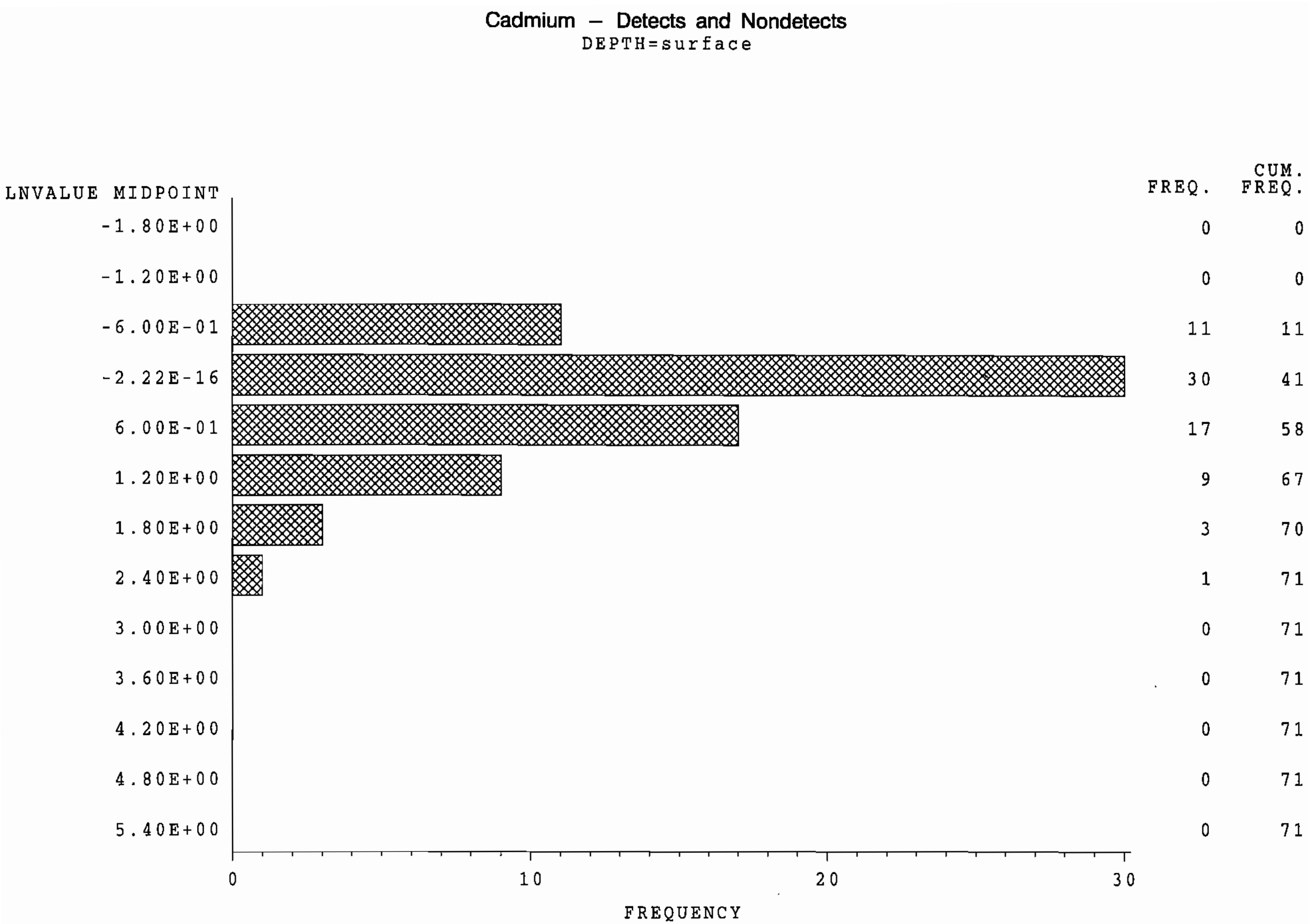


Figure 2.19. Histogram for Cadmium; All Observations; Surface Classification.

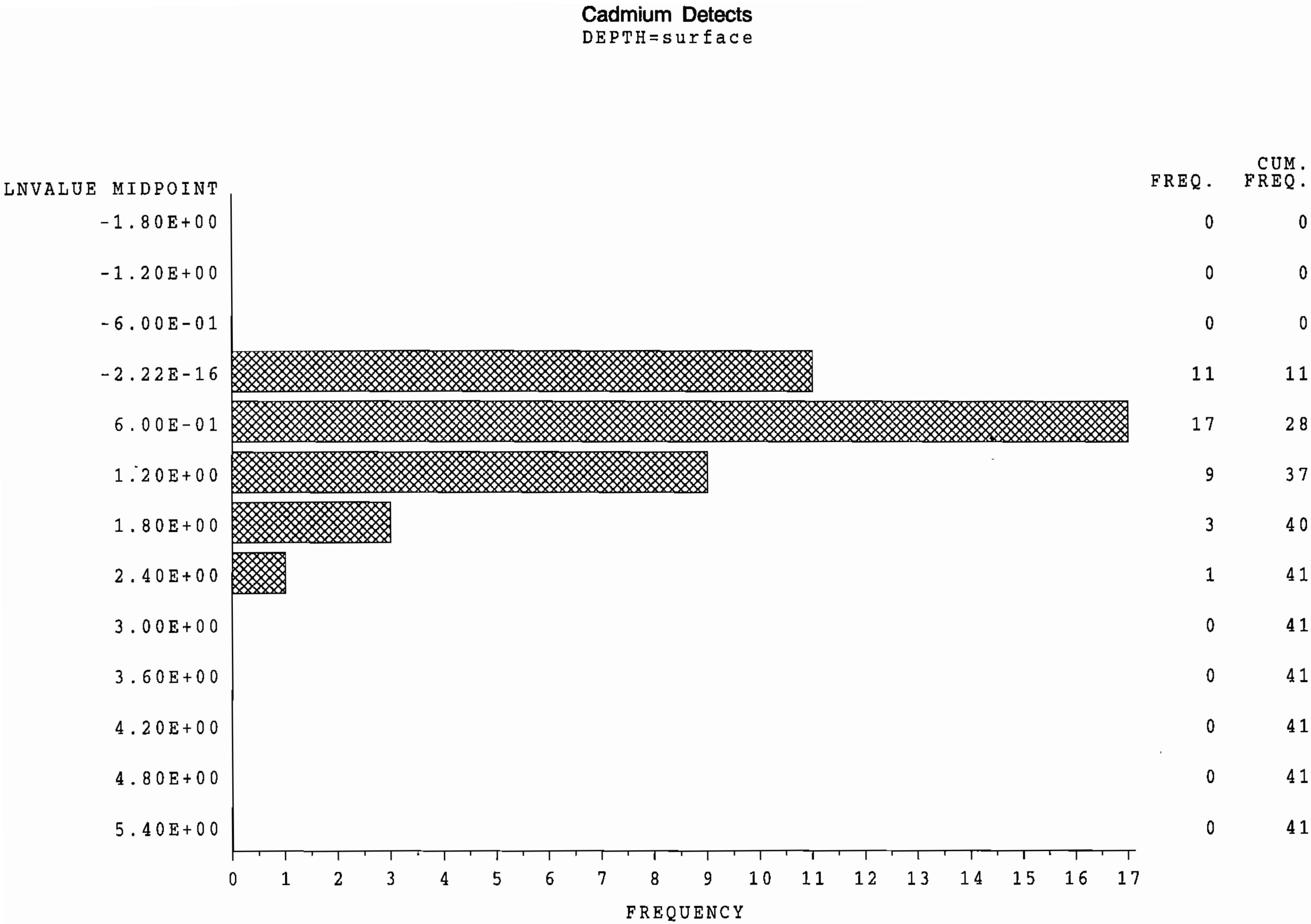


Figure 2.20. Histogram for Cadmium; Detected Observations; Surface Classification.

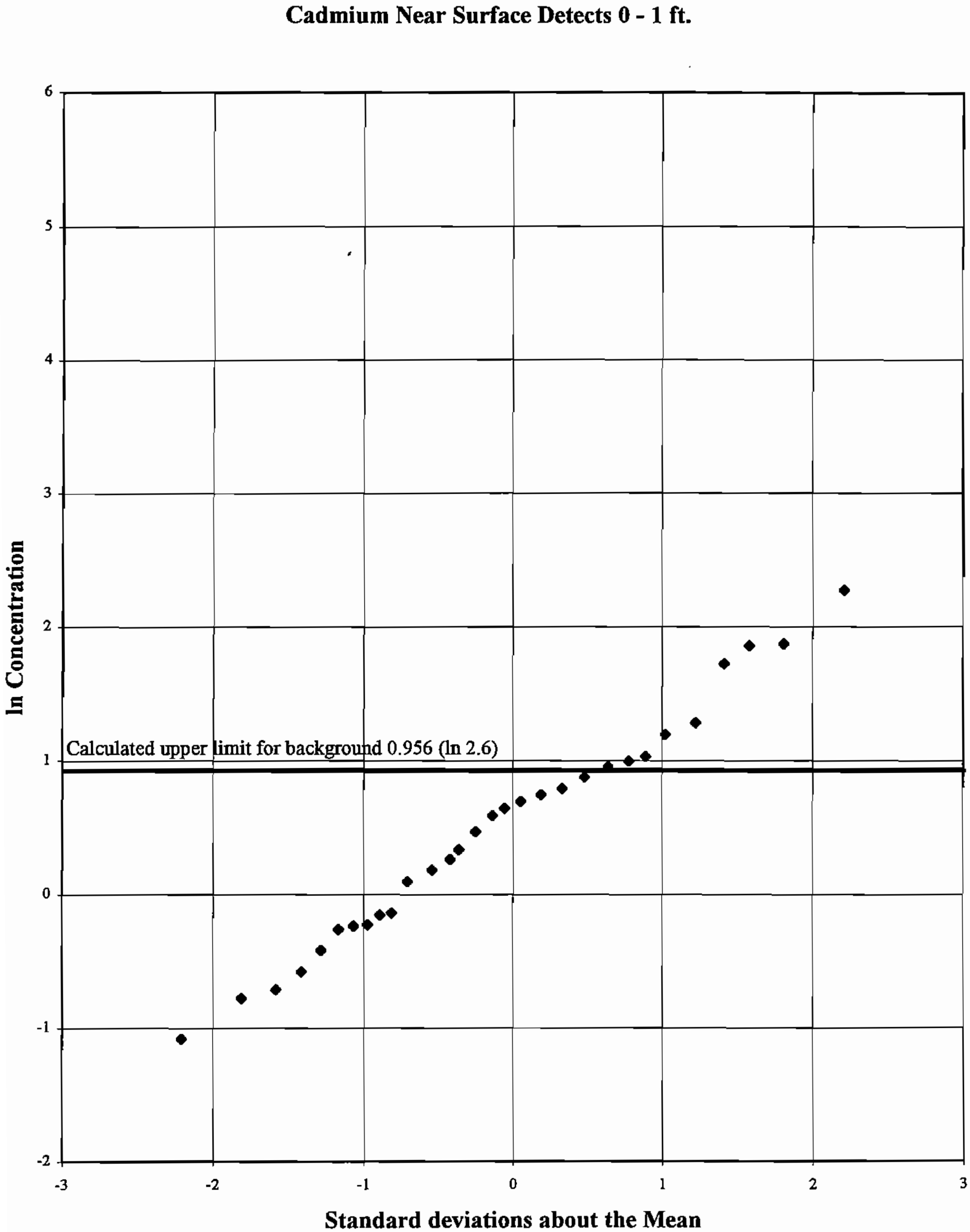


Figure 2.21. Cumulative Probability Plot for Cadmium; Detected Observations; Surface Classification.

Calcium -- Detects and Nondetects
DEPTH=surface

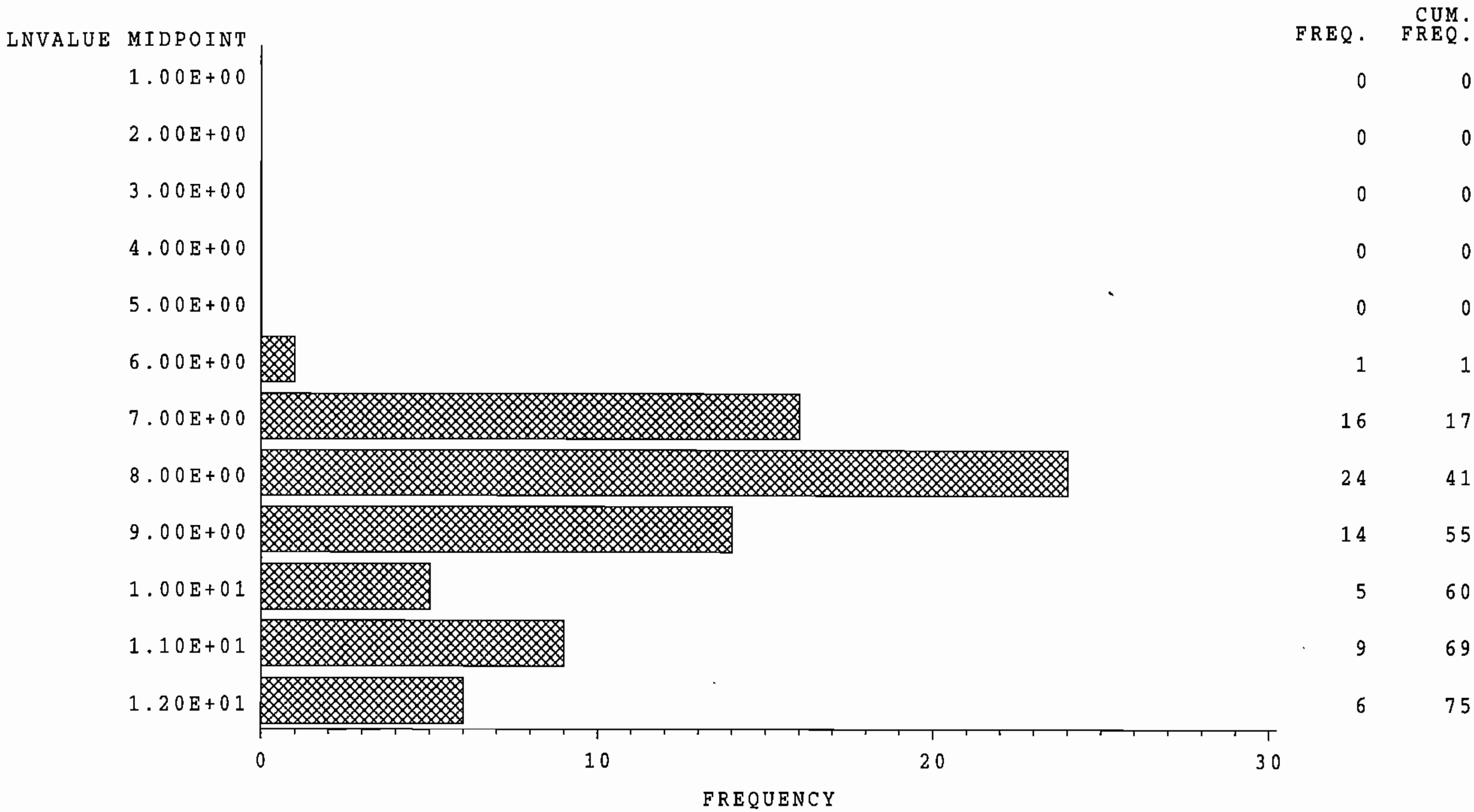


Figure 2.22. Histogram for Calcium; All Observations; Surface Classification.

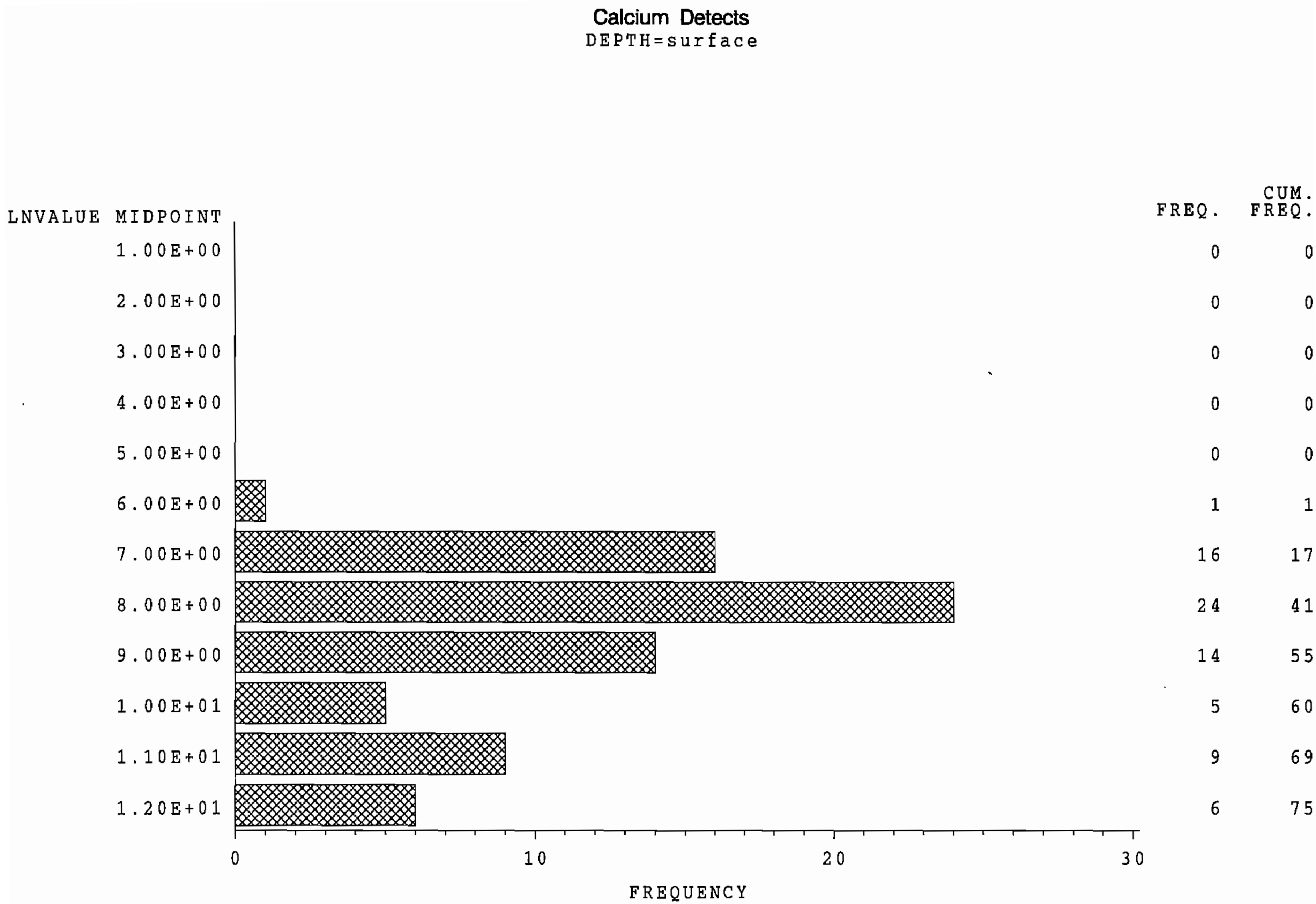


Figure 2.23. Histogram for Calcium; Detected Observations; Surface Classification.

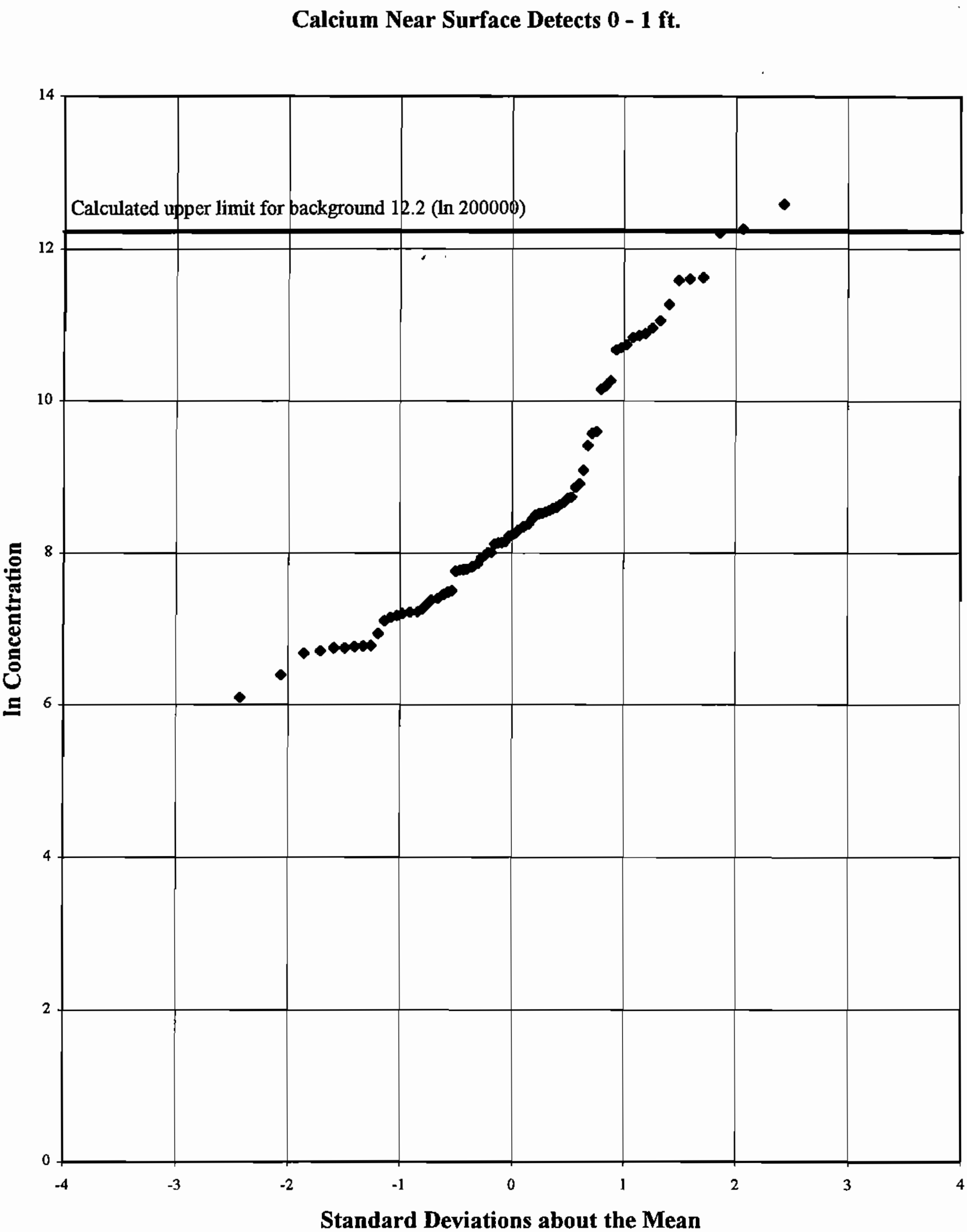


Figure 2.24. Cumulative Probability Plot for Calcium; Detected Observations; Surface Classification.

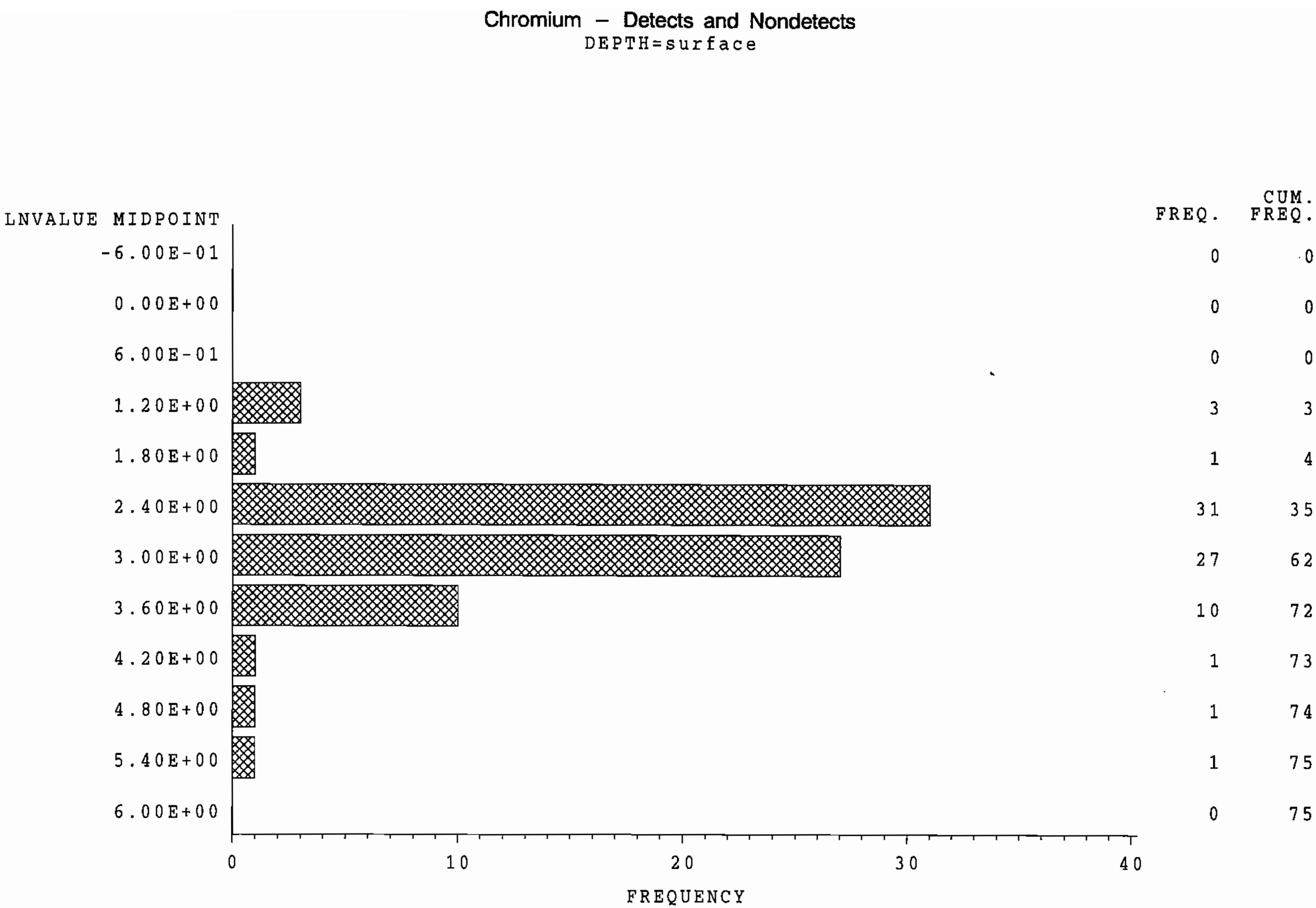


Figure 2.25. Histogram for Chromium; All Observations; Surface Classification.

Chromium Detects
DEPTH=surface

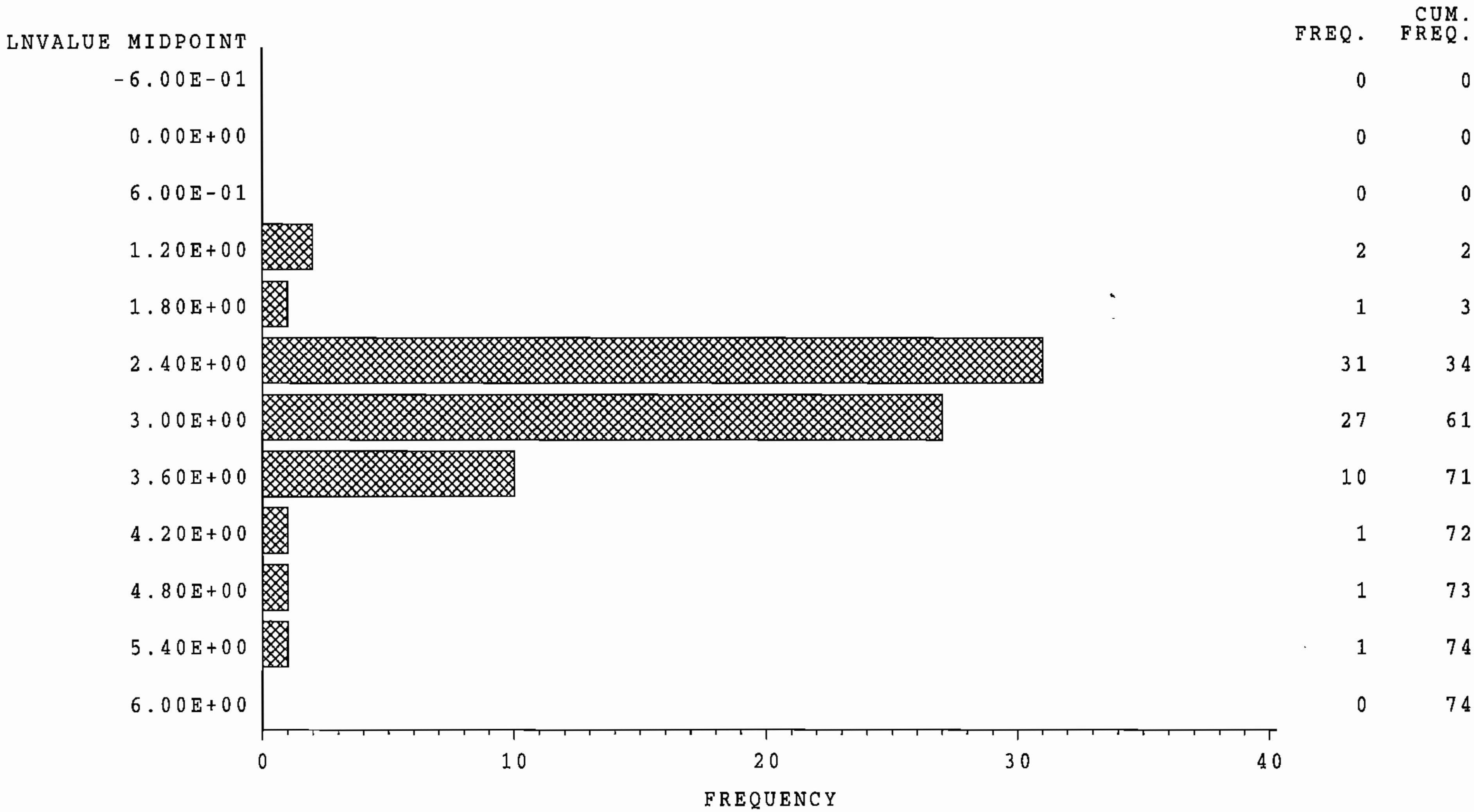


Figure 2.26. Histogram for Chromium; Detected Observations; Surface Classification.

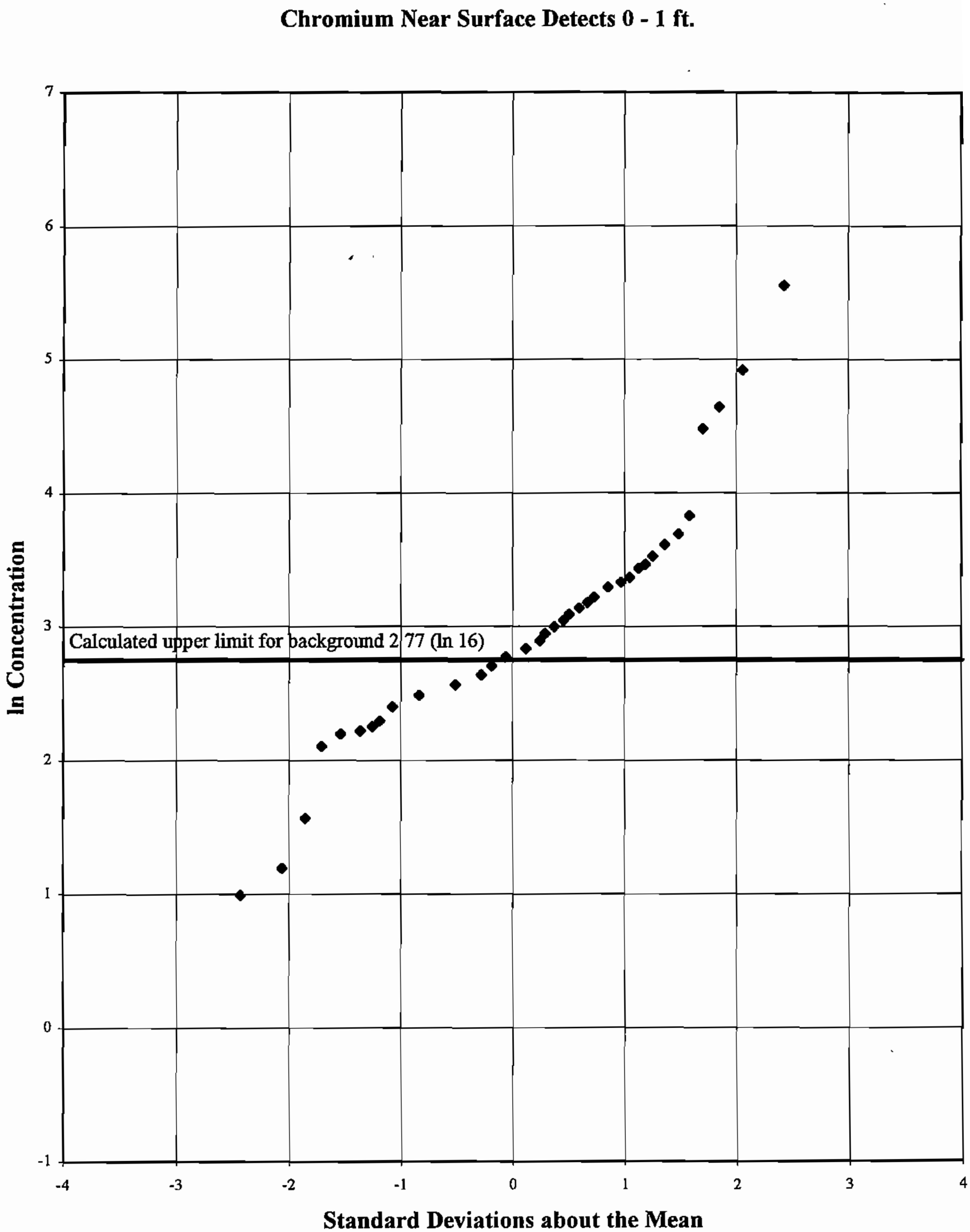


Figure 2.27. Cumulative Probability Plot for Chromium; Detected Observations; Surface Classification.

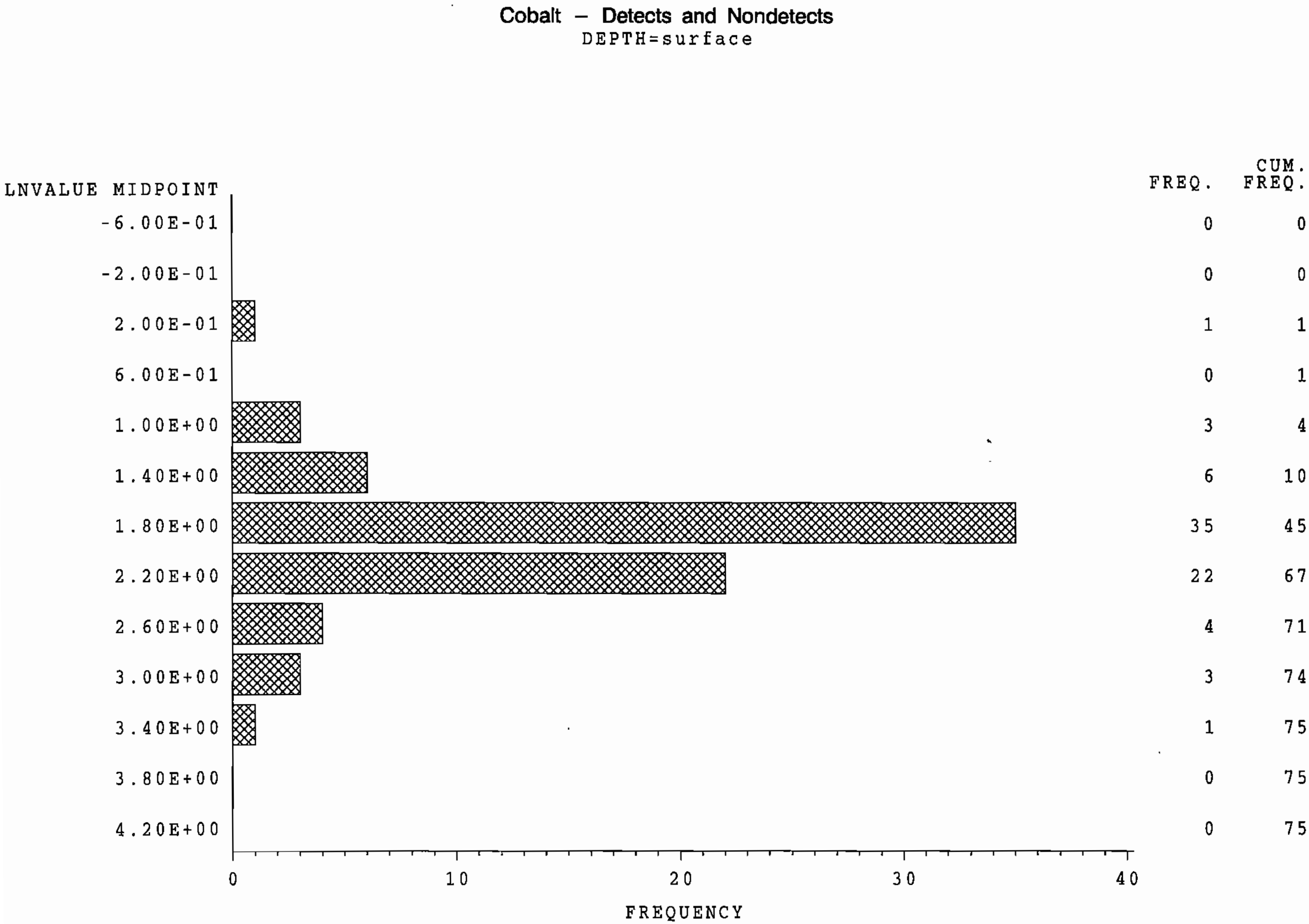


Figure 2.28. Histogram for Cobalt; All Observations; Surface Classification.

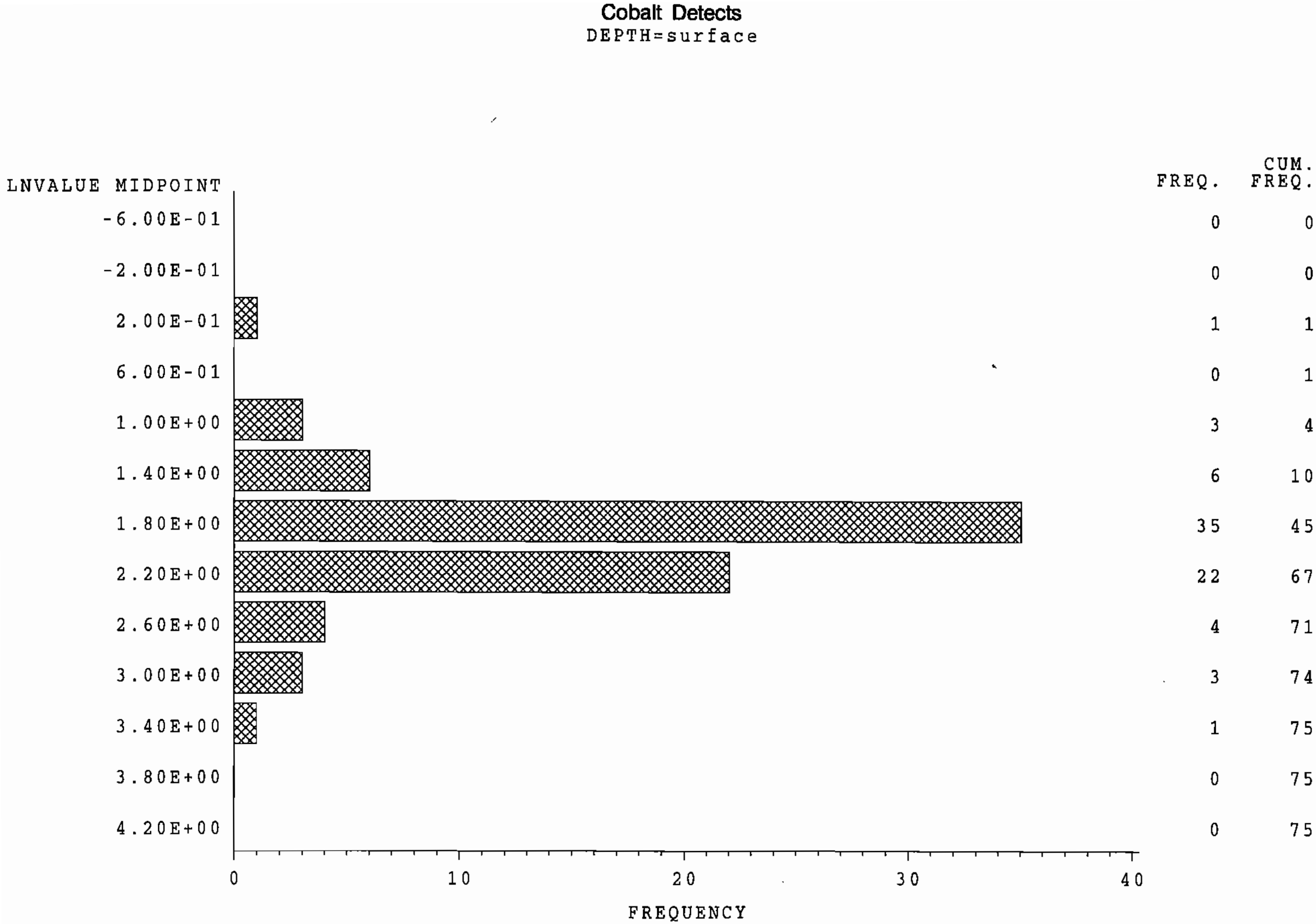


Figure 2.29. Histogram for Cobalt; Detected Observations; Surface Classification.

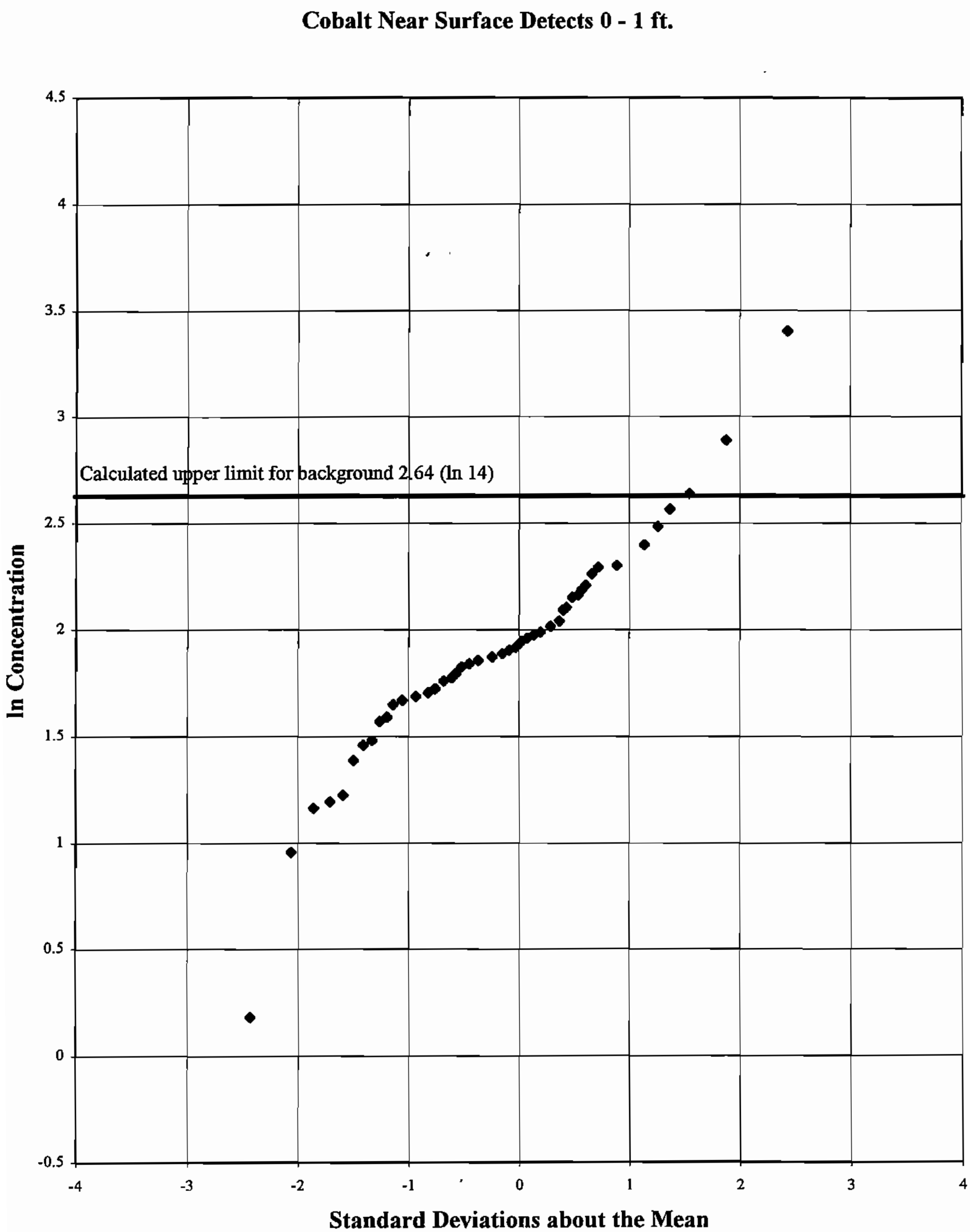


Figure 2.30. Cumulative Probability Plot for Cobalt; Detected Observations; Surface Classification.

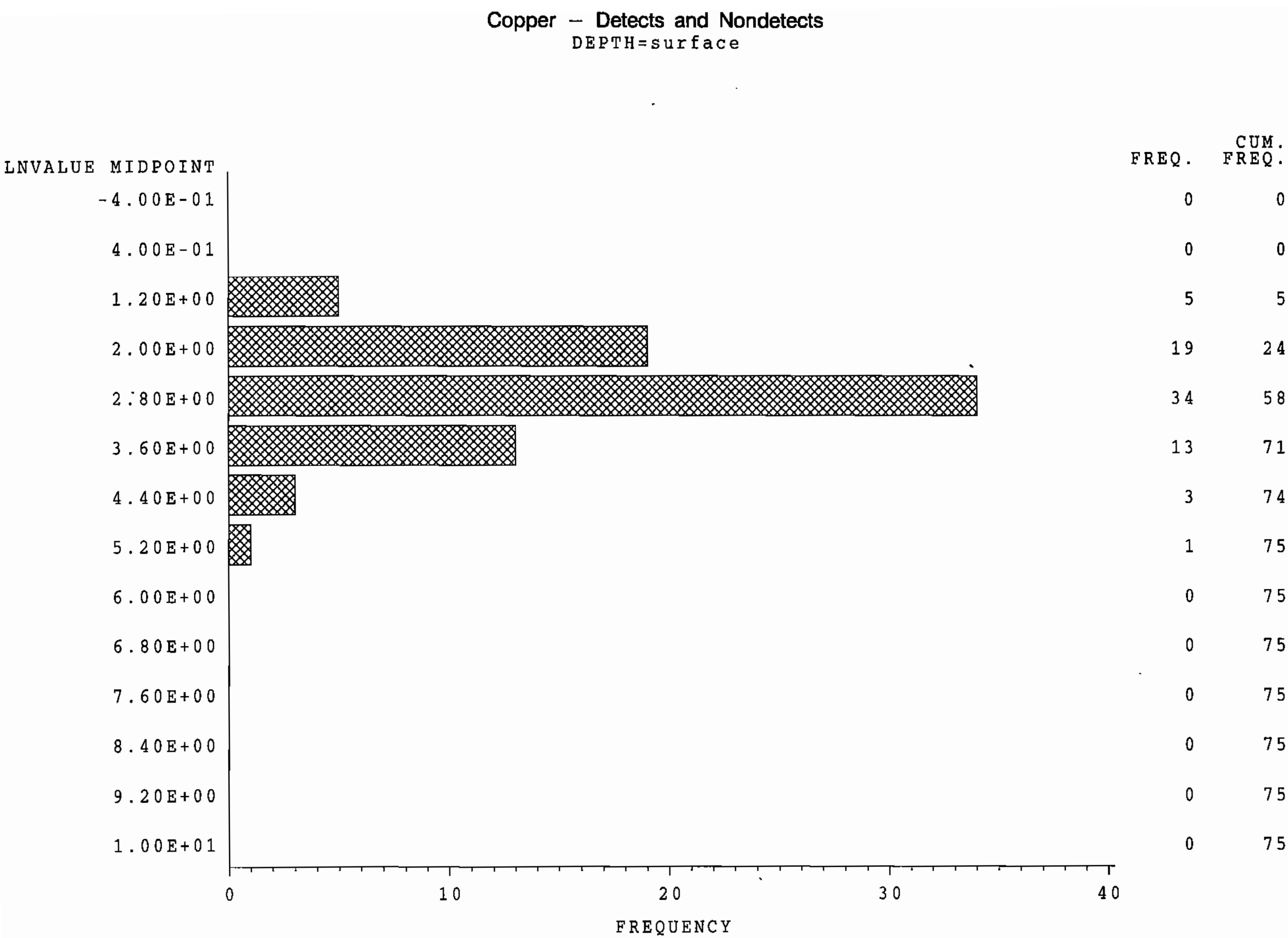


Figure 2.31. Histogram for Copper; All Observations; Surface Classification.

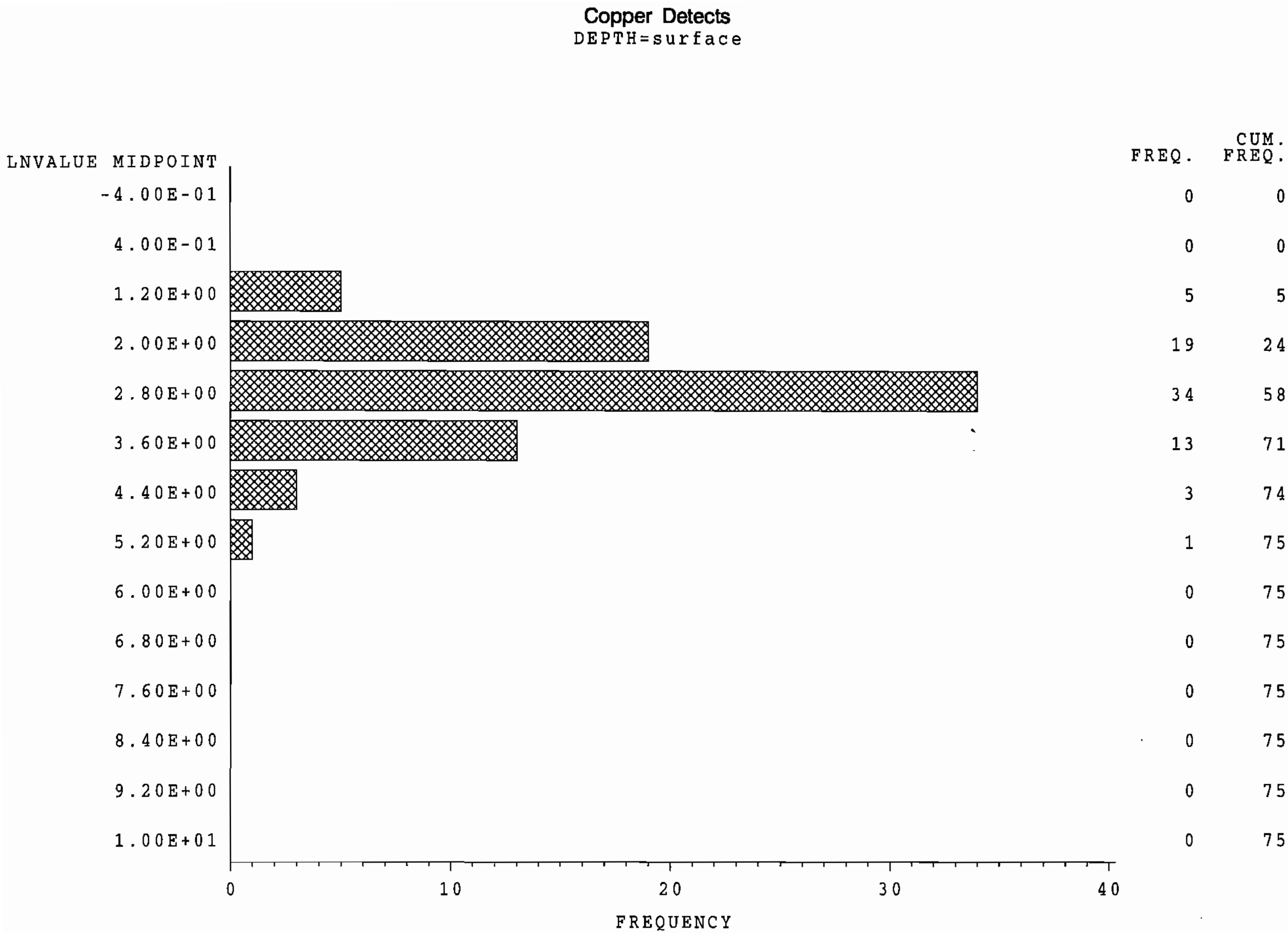


Figure 2.32. Histogram for Copper; Detected Observations; Surface Classification.

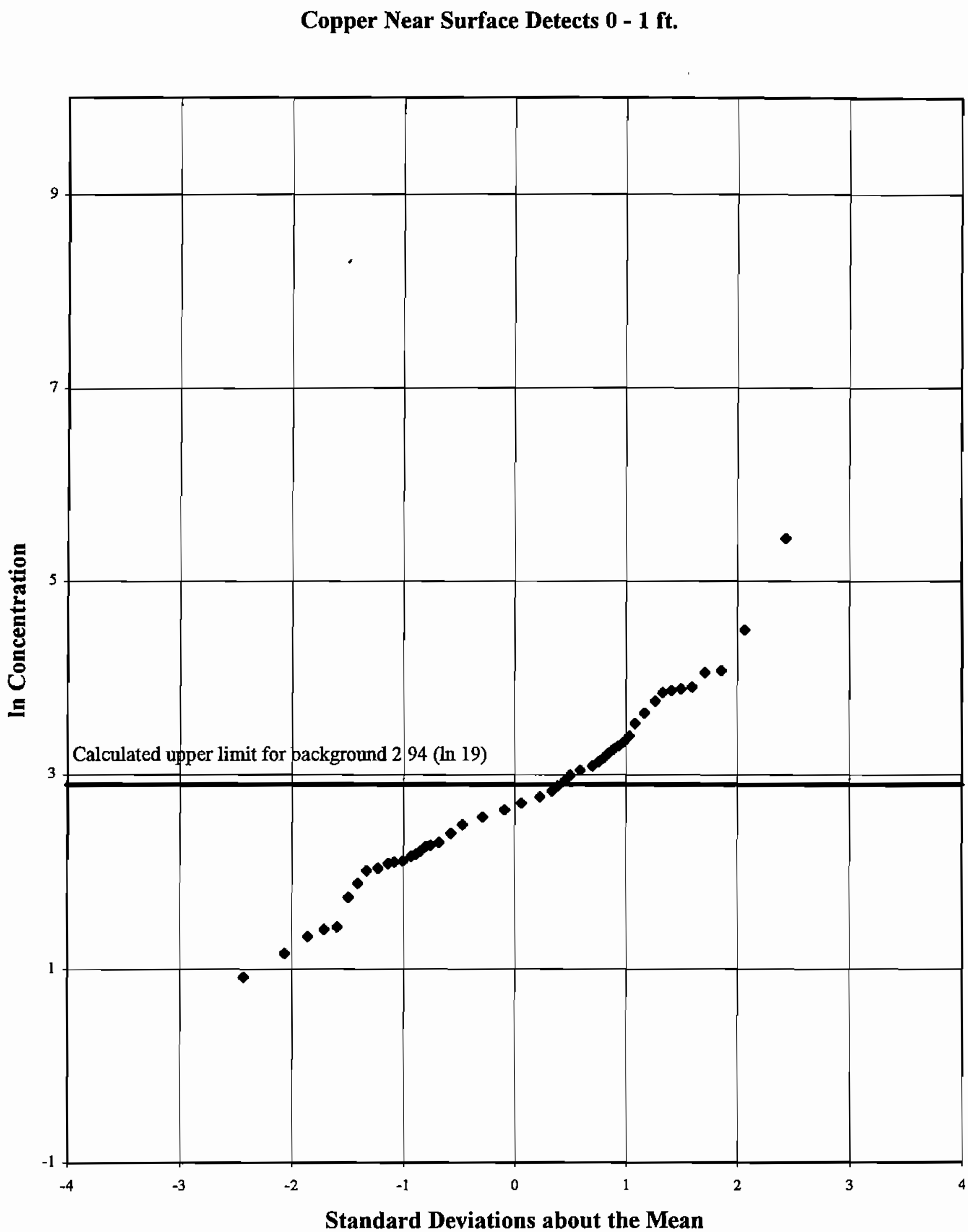


Figure 2.33. Cumulative Probability Plot for Copper; Detected Observations; Surface Classification.

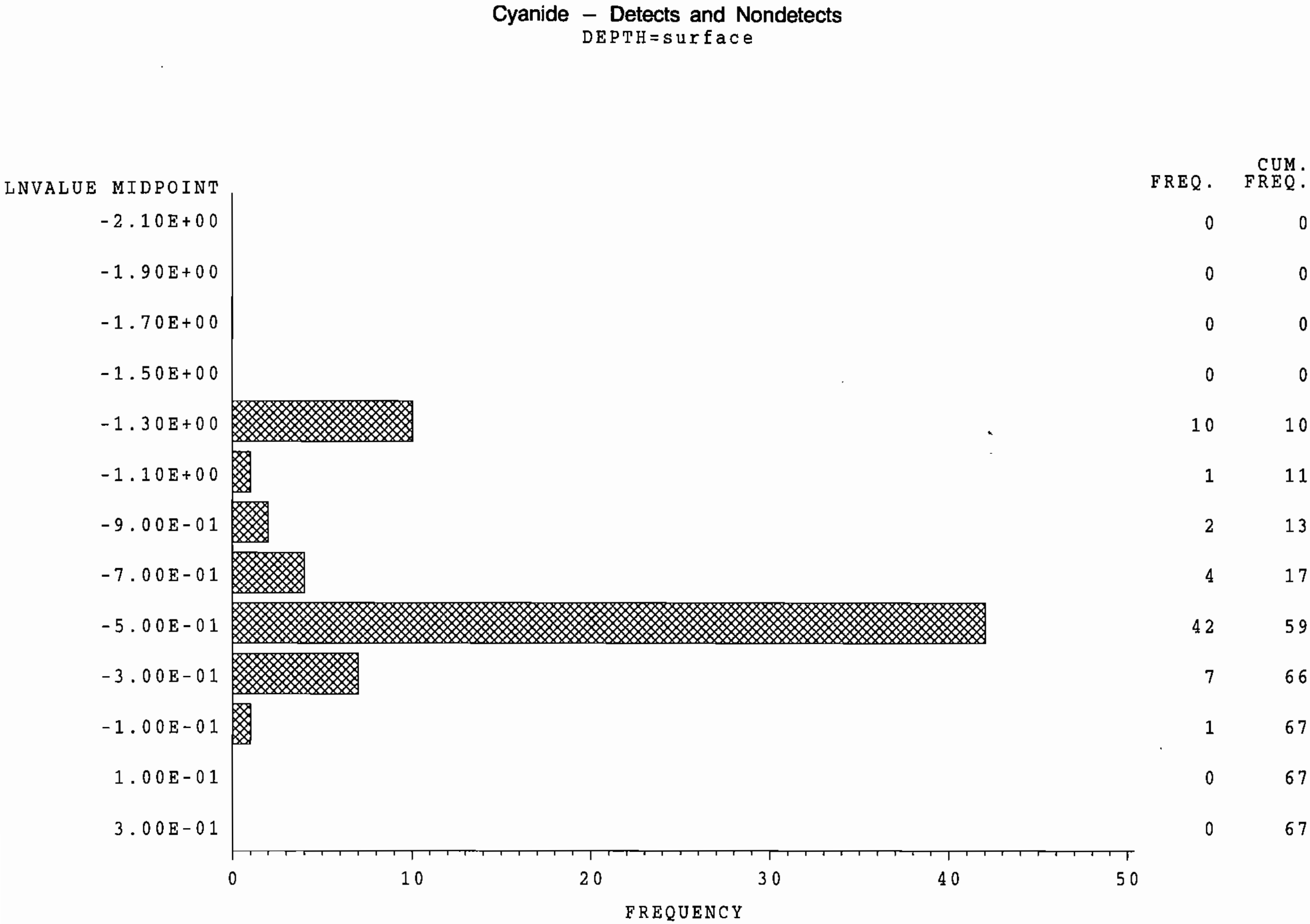


Figure 2.34. Histogram for Cyanide; All Observations; Surface Classification.

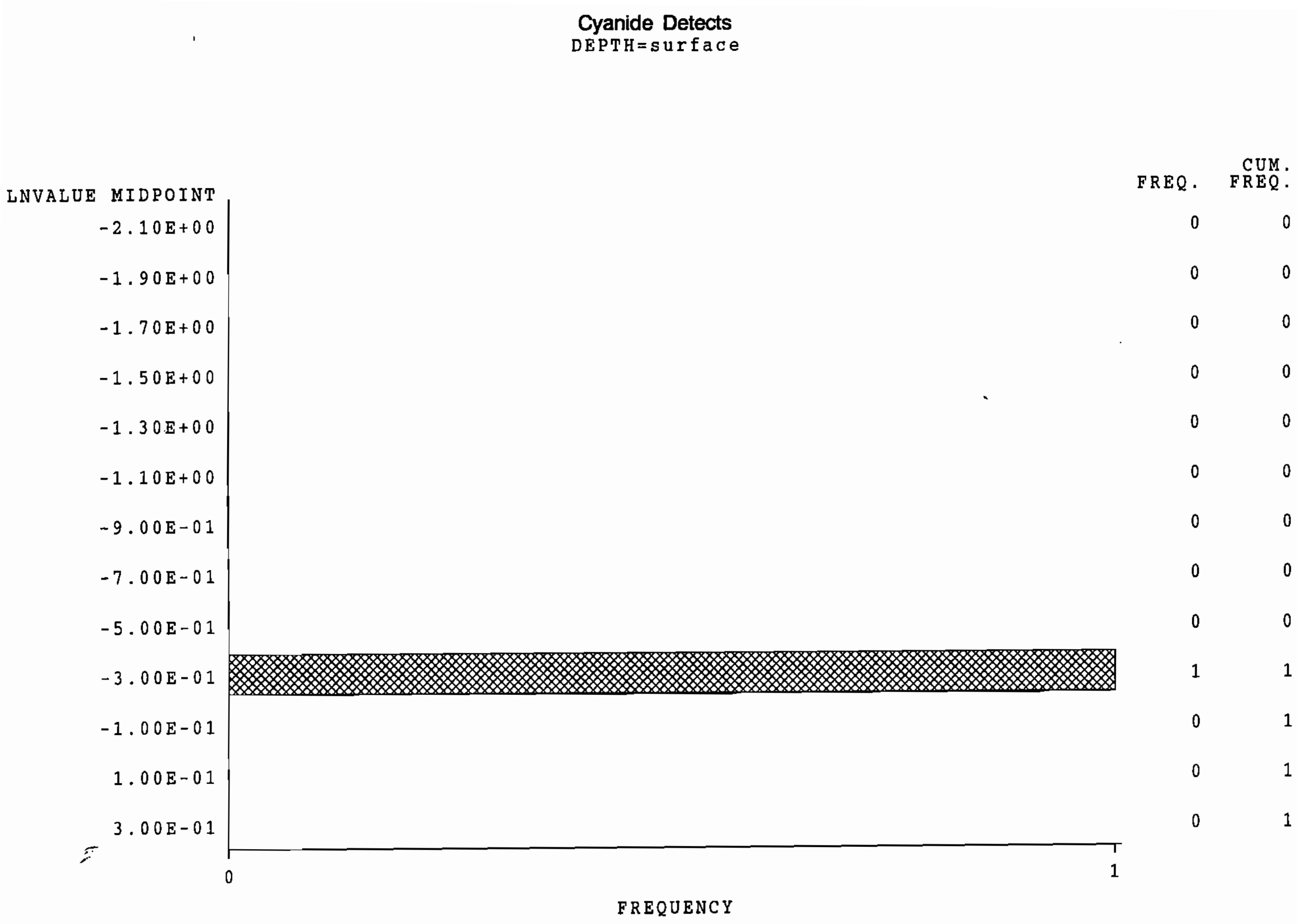


Figure 2.35. Histogram for Cyanide; Detected Observations; Surface Classification.

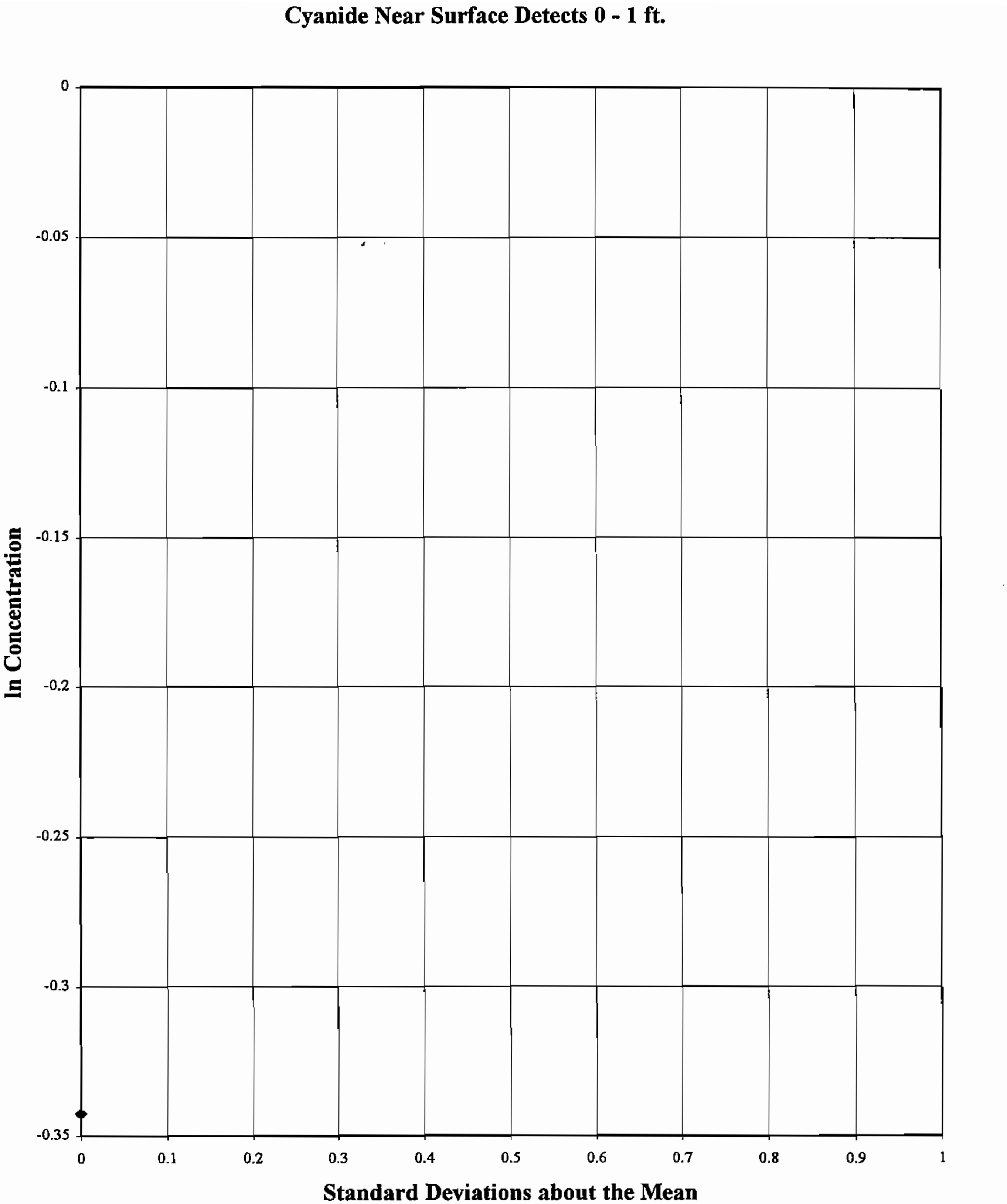


Figure 2.36. Cumulative Probability Plot for Cyanide; Detected Observations; Surface Classification.

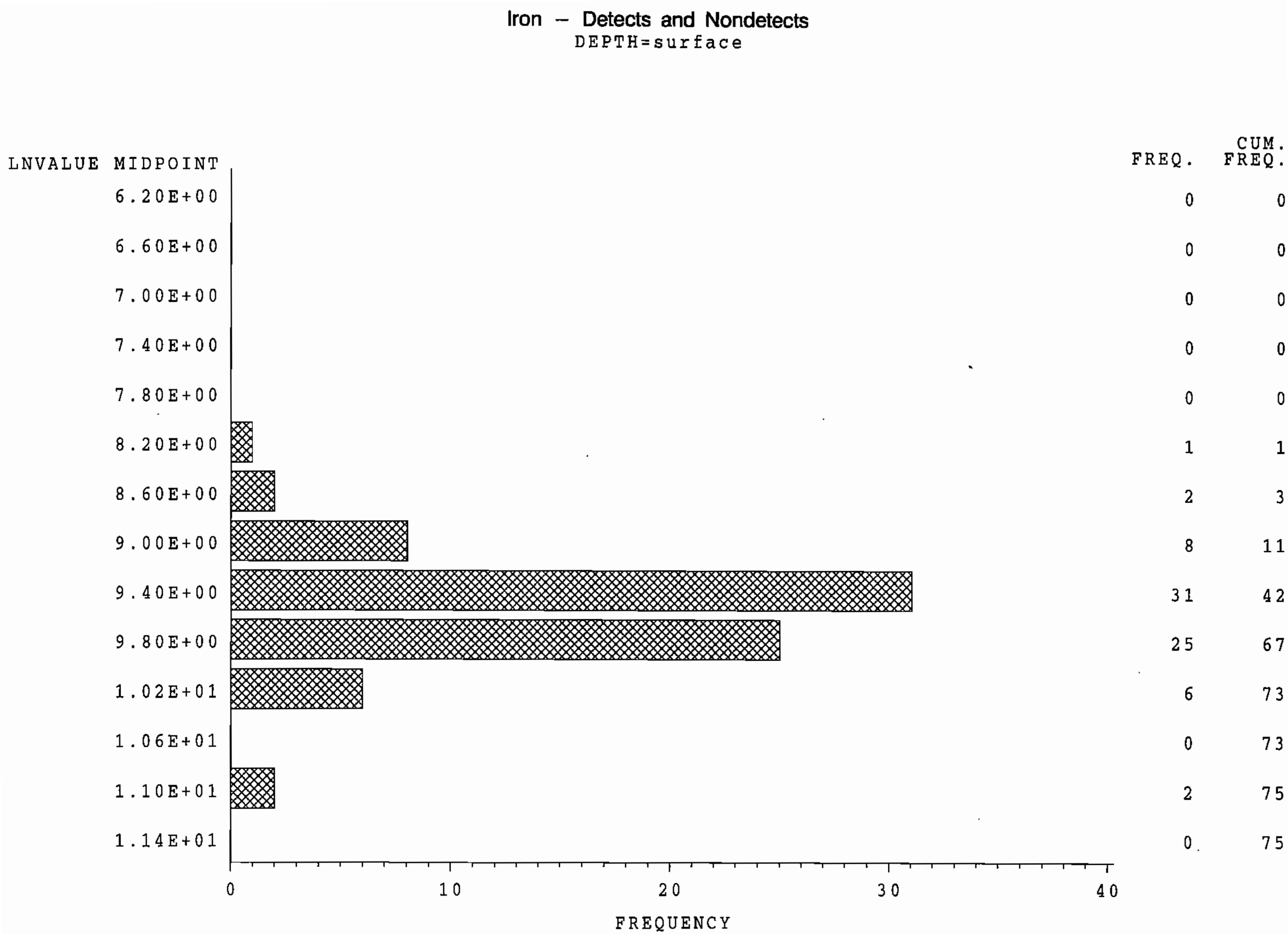


Figure 2.37. Histogram for Iron; All Observations; Surface Classification.

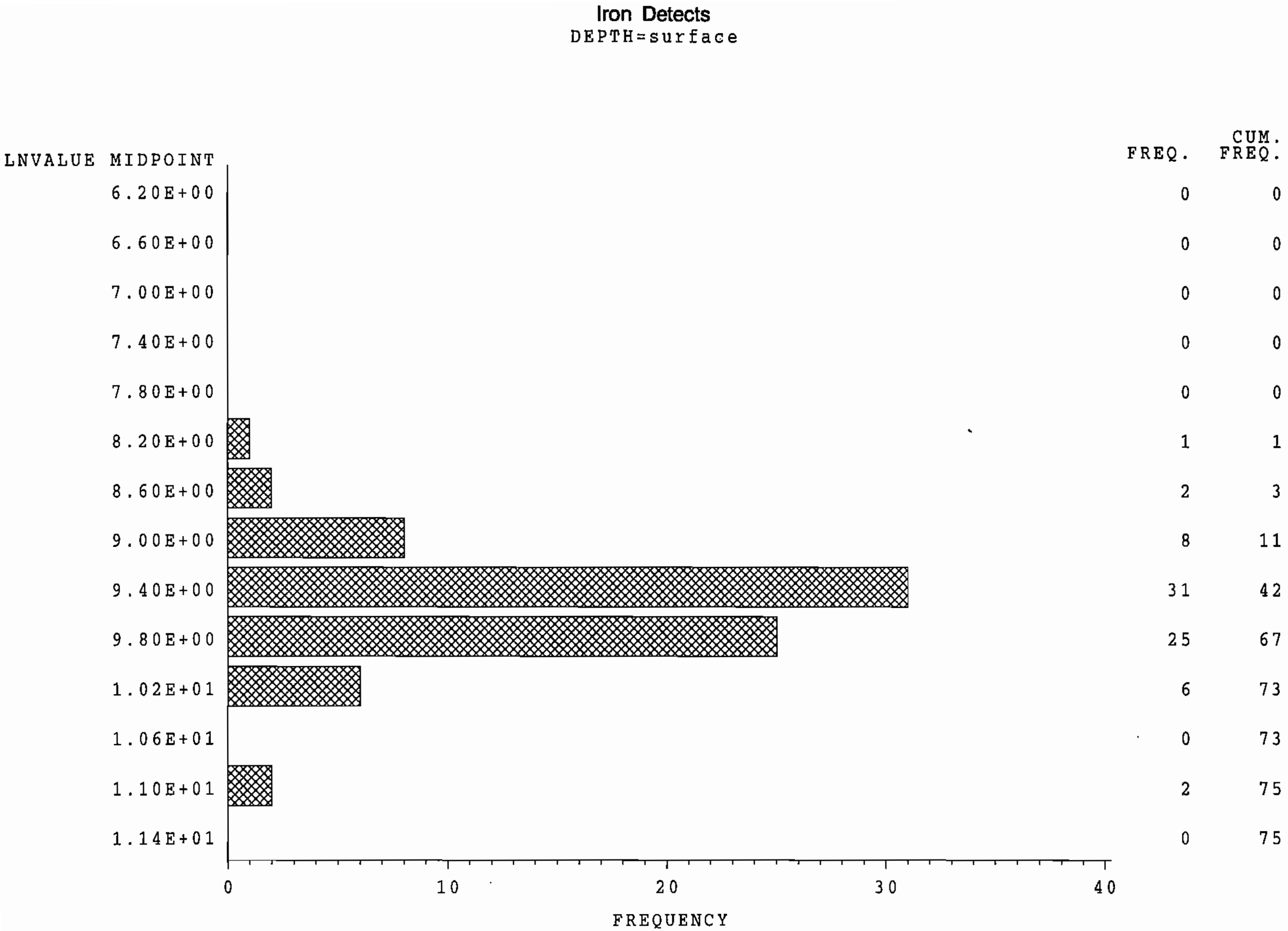


Figure 2.38. Histogram for Iron; Detected Observations; Surface Classification.

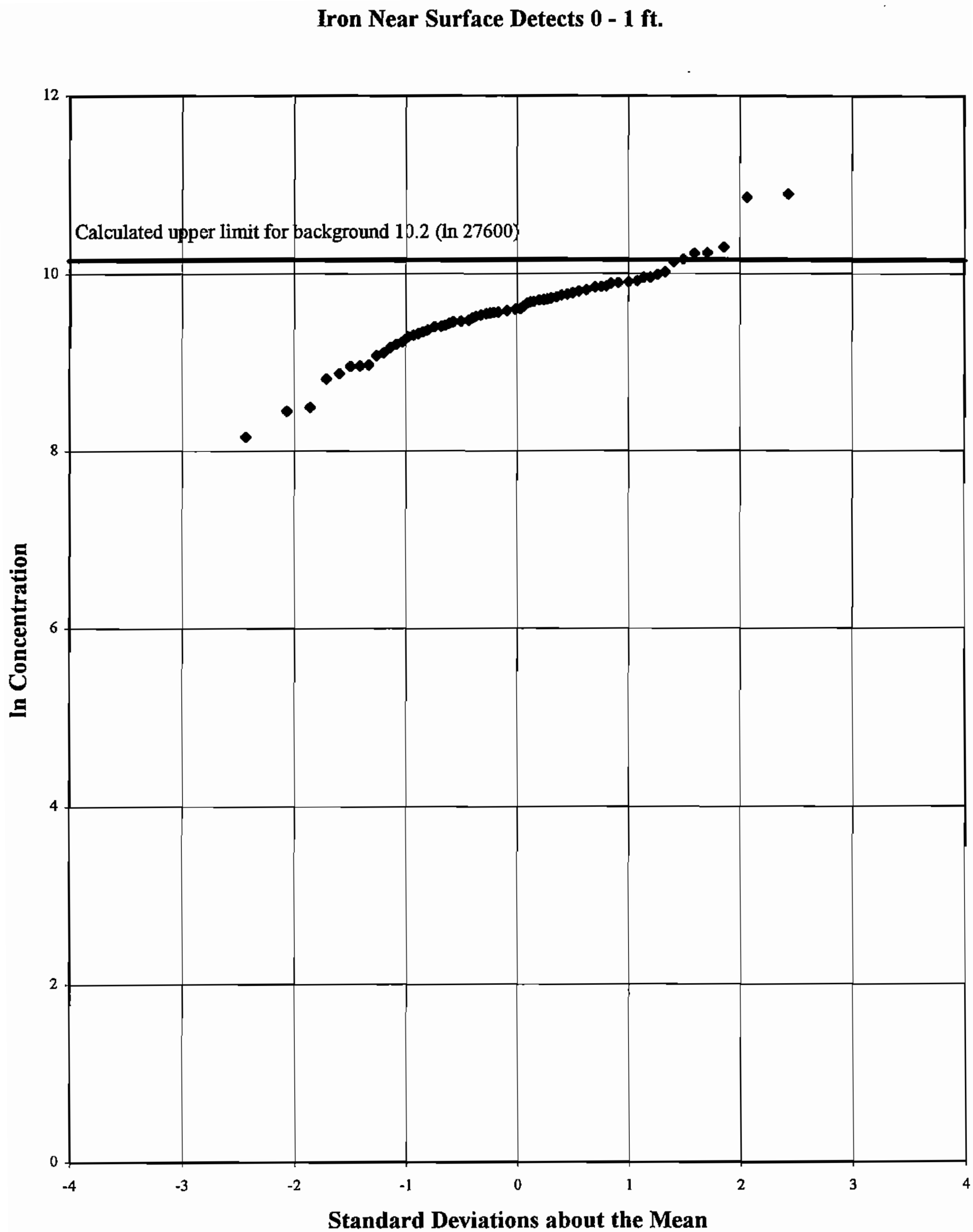


Figure 2.39. Cumulative Probability Plot for Iron; Detected Observations; Surface Classification.

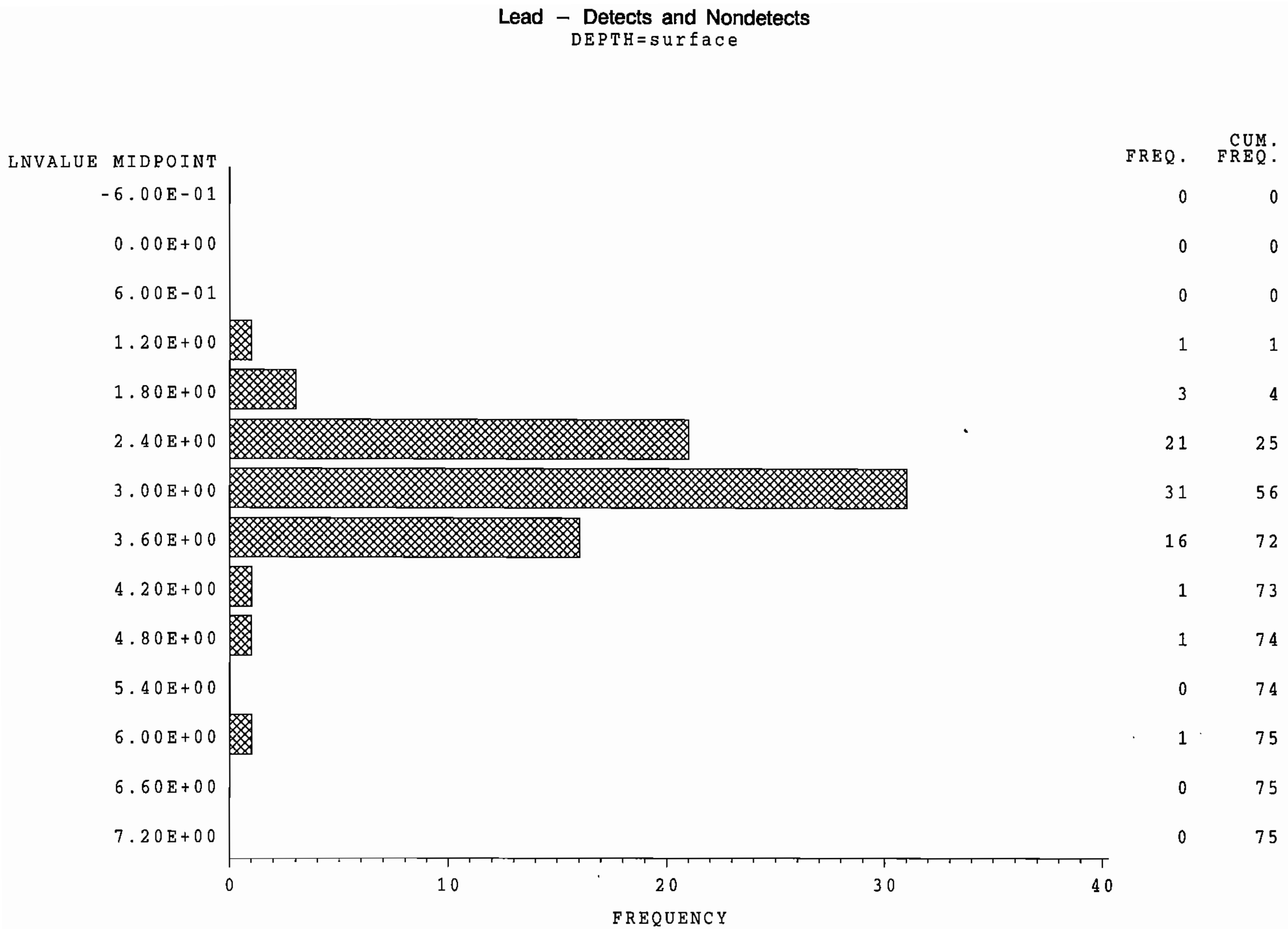


Figure 2.40. Histogram for Lead; All Observations; Surface Classification.

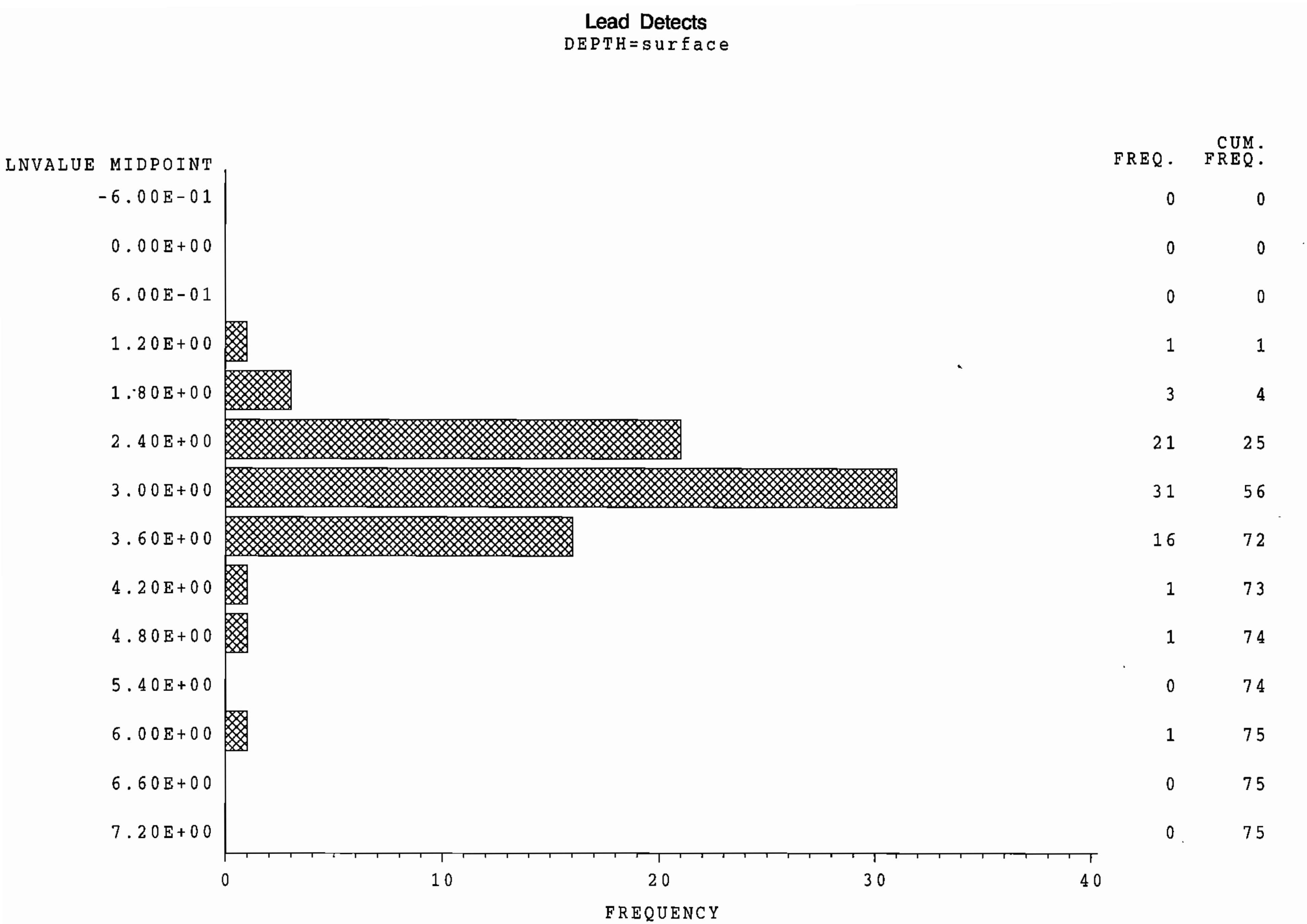


Figure 2.41. Histogram for Lead; Detected Observations; Surface Classification.

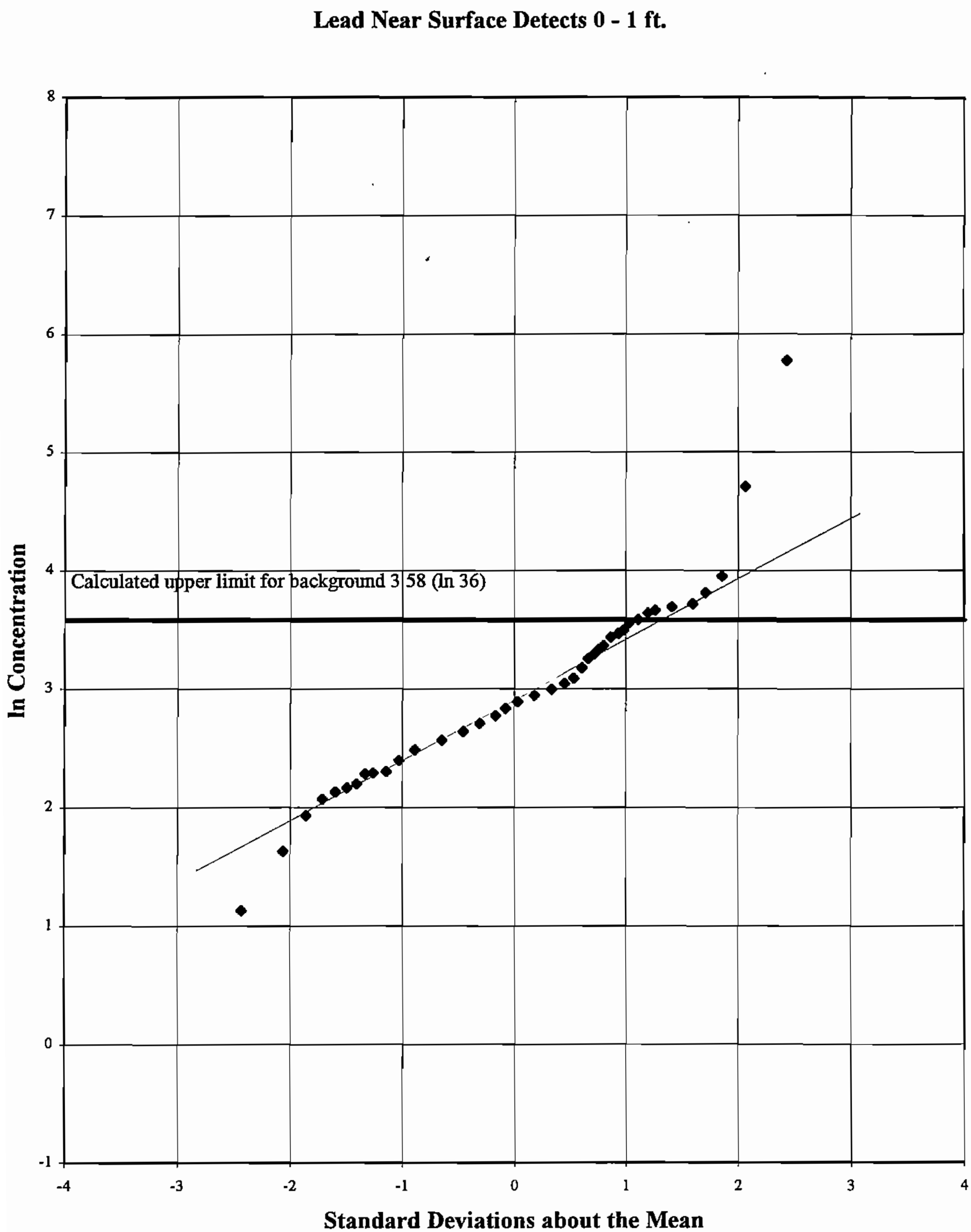


Figure 2.42. Cumulative Probability Plot for Lead; Detected Observations; Surface Classification.

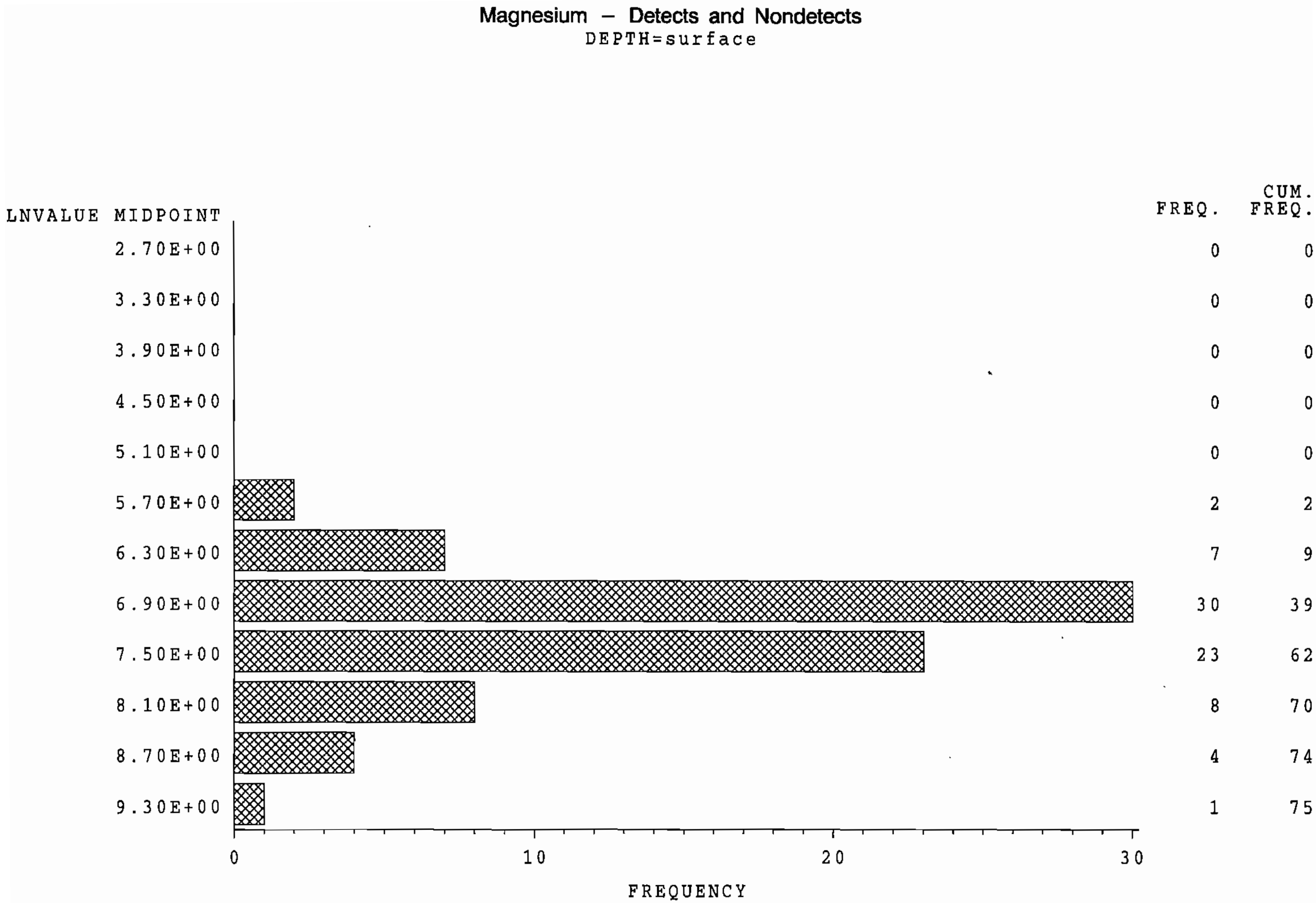


Figure 2.43. Histogram for Magnesium; All Observations; Surface Classification.

Magnesium Detects
DEPTH=surface

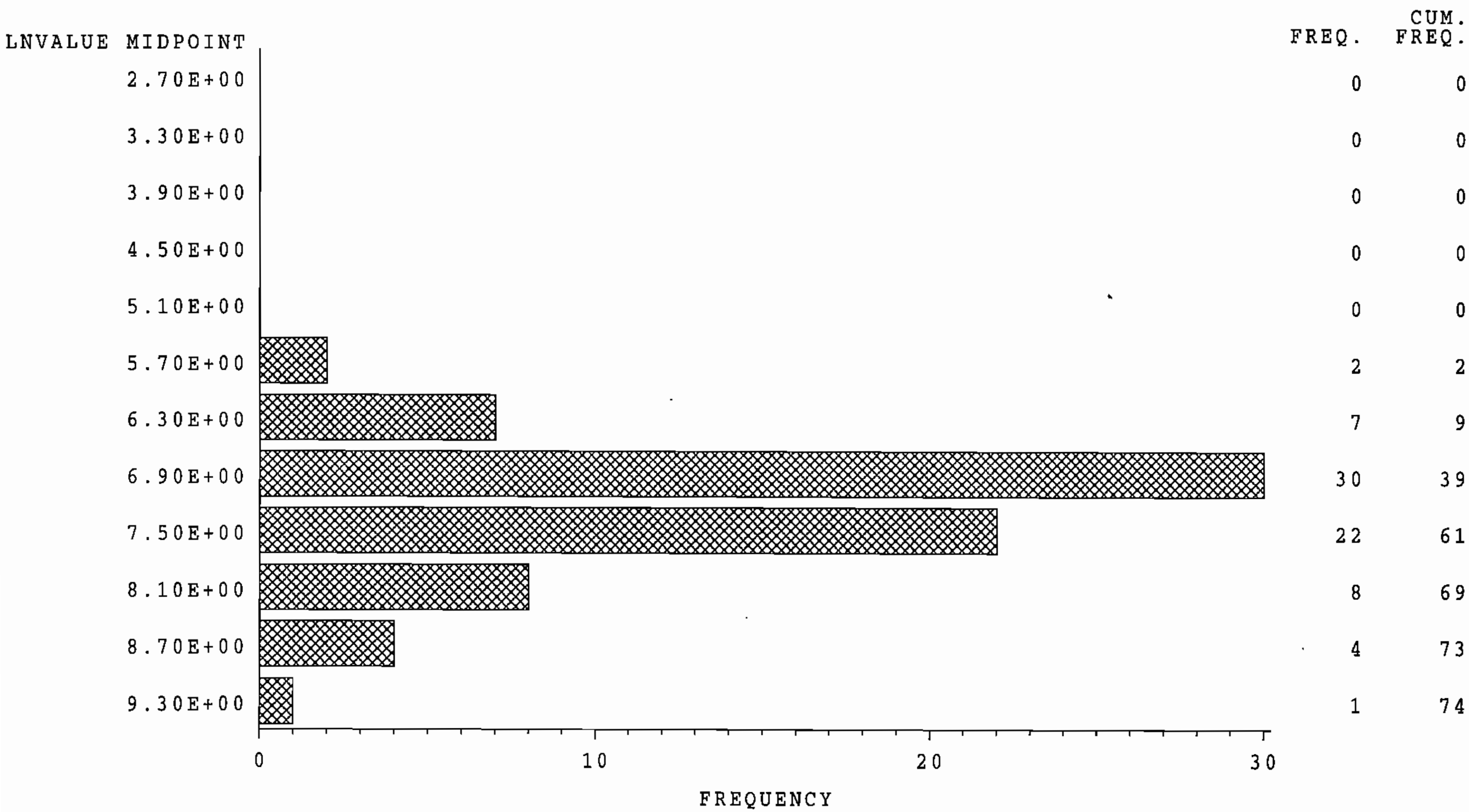


Figure 2.44. Histogram for Magnesium; Detected Observations; Surface Classification.

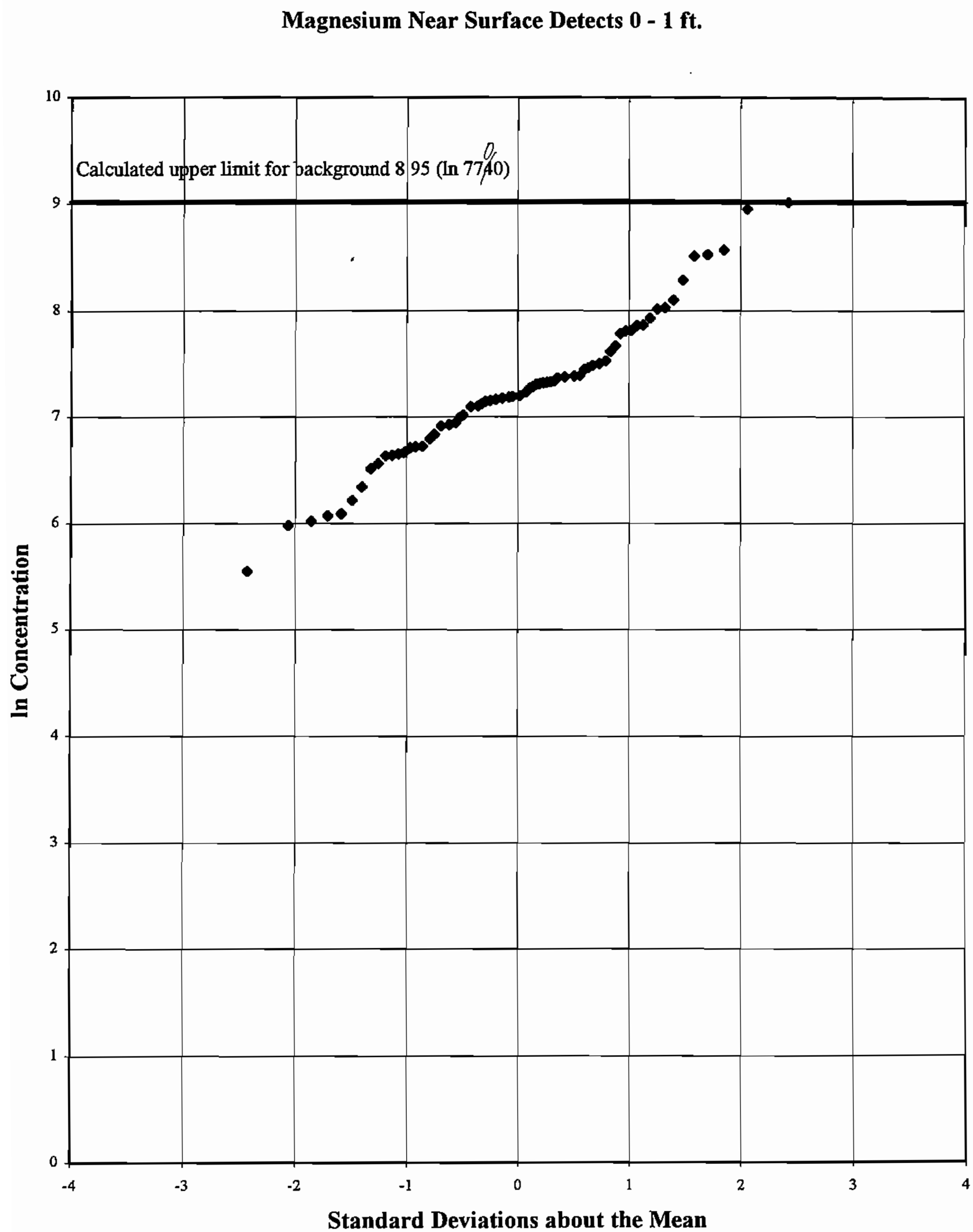


Figure 2.45. Cumulative Probability Plot for Magnesium; Detected Observations; Surface Classification.

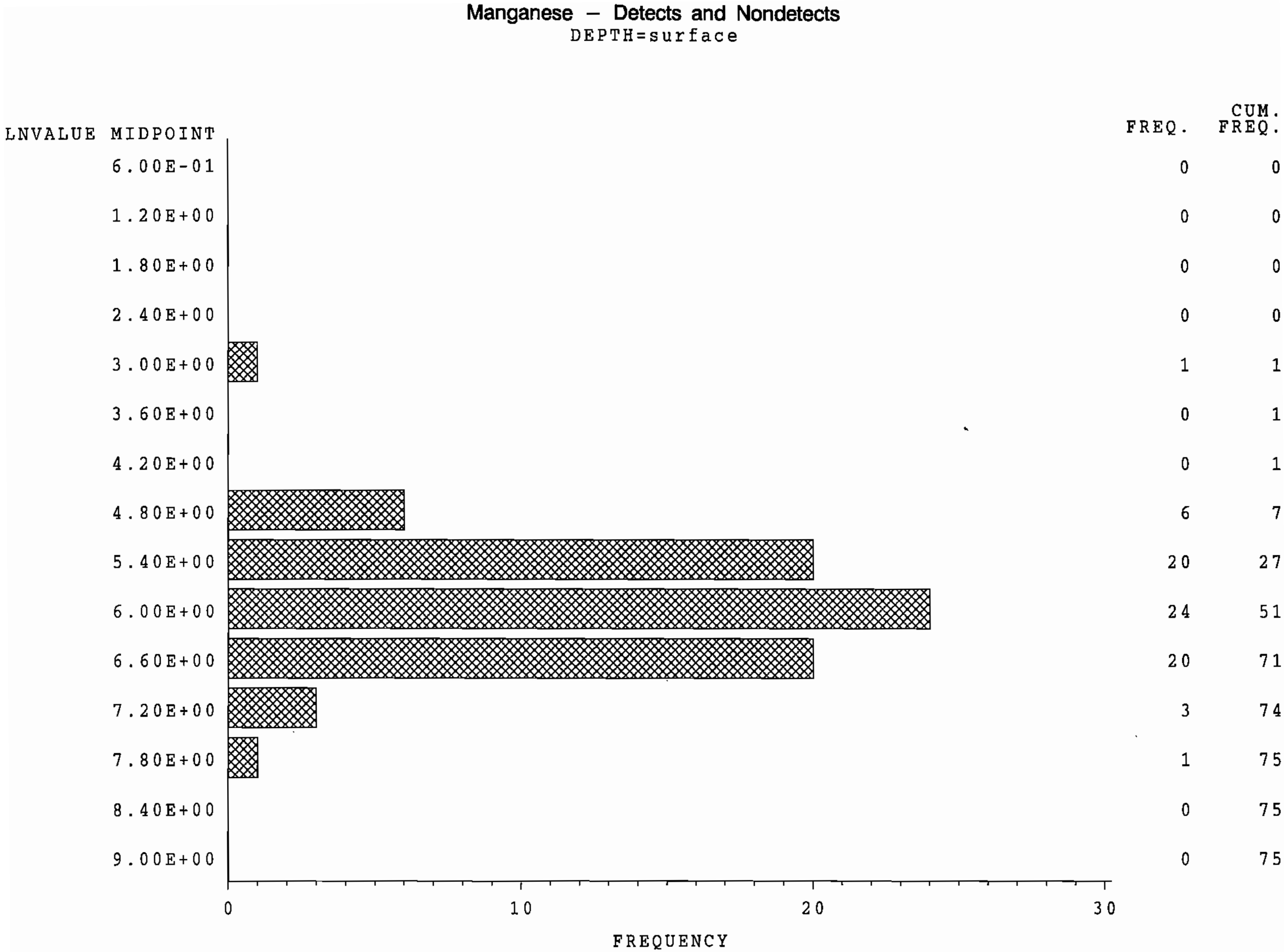


Figure 2.46. Histogram for Manganese; All Observations; Surface Classification.

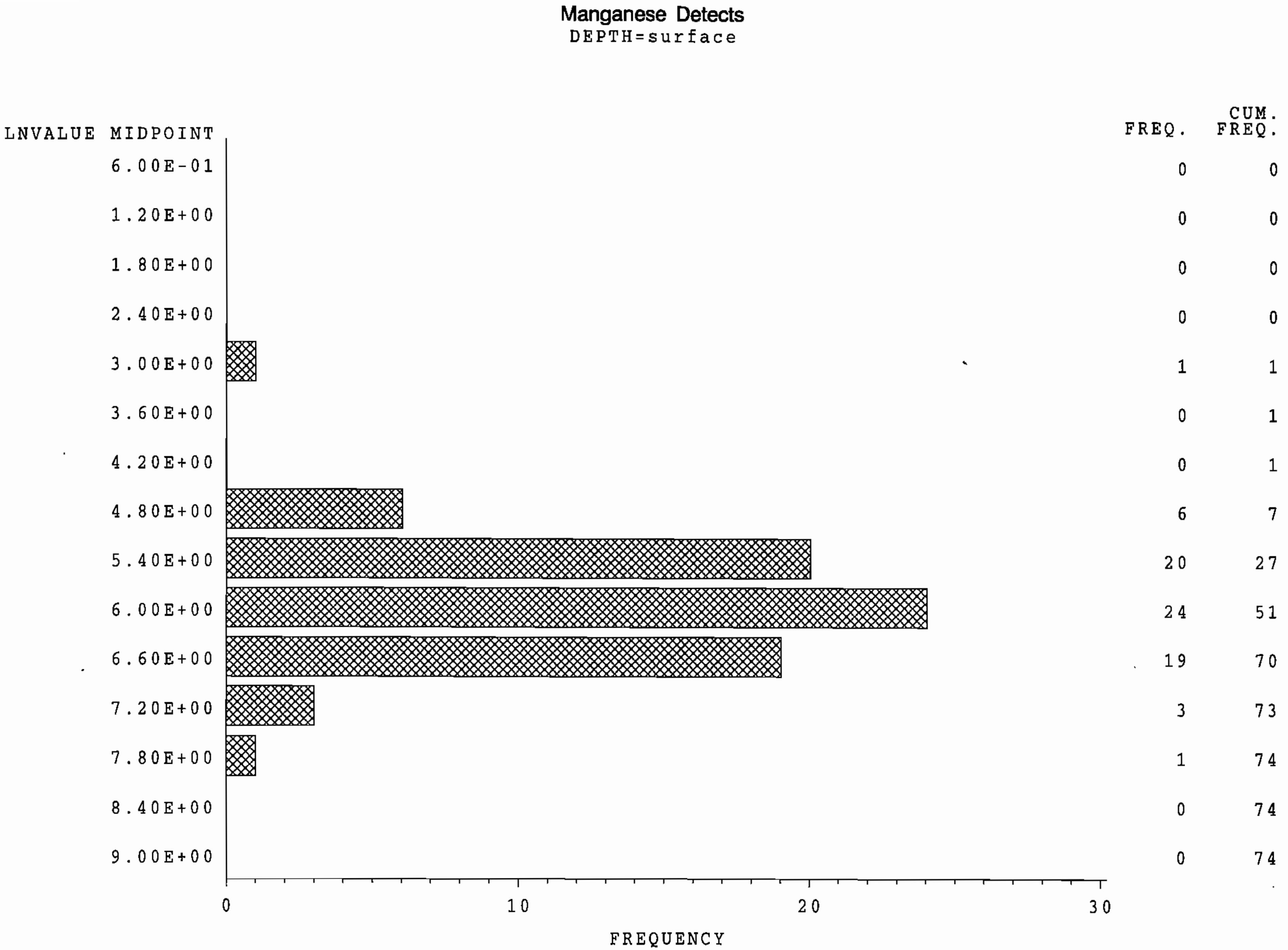


Figure 2.47. Histogram for Manganese; Detected Observations; Surface Classification.

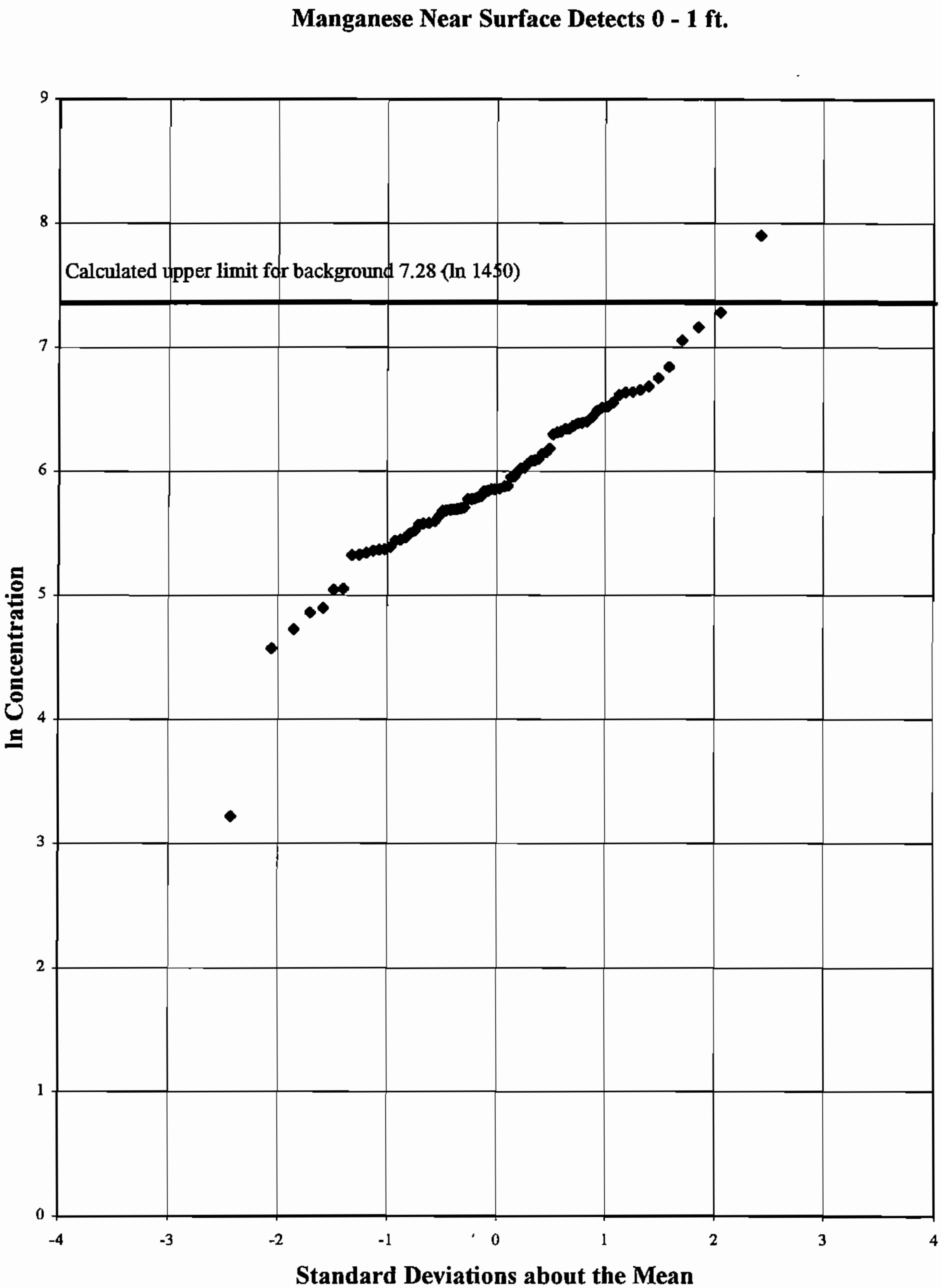


Figure 2.48. Cumulative Probability Plot for Manganese; Detected Observations; Surface Classification.

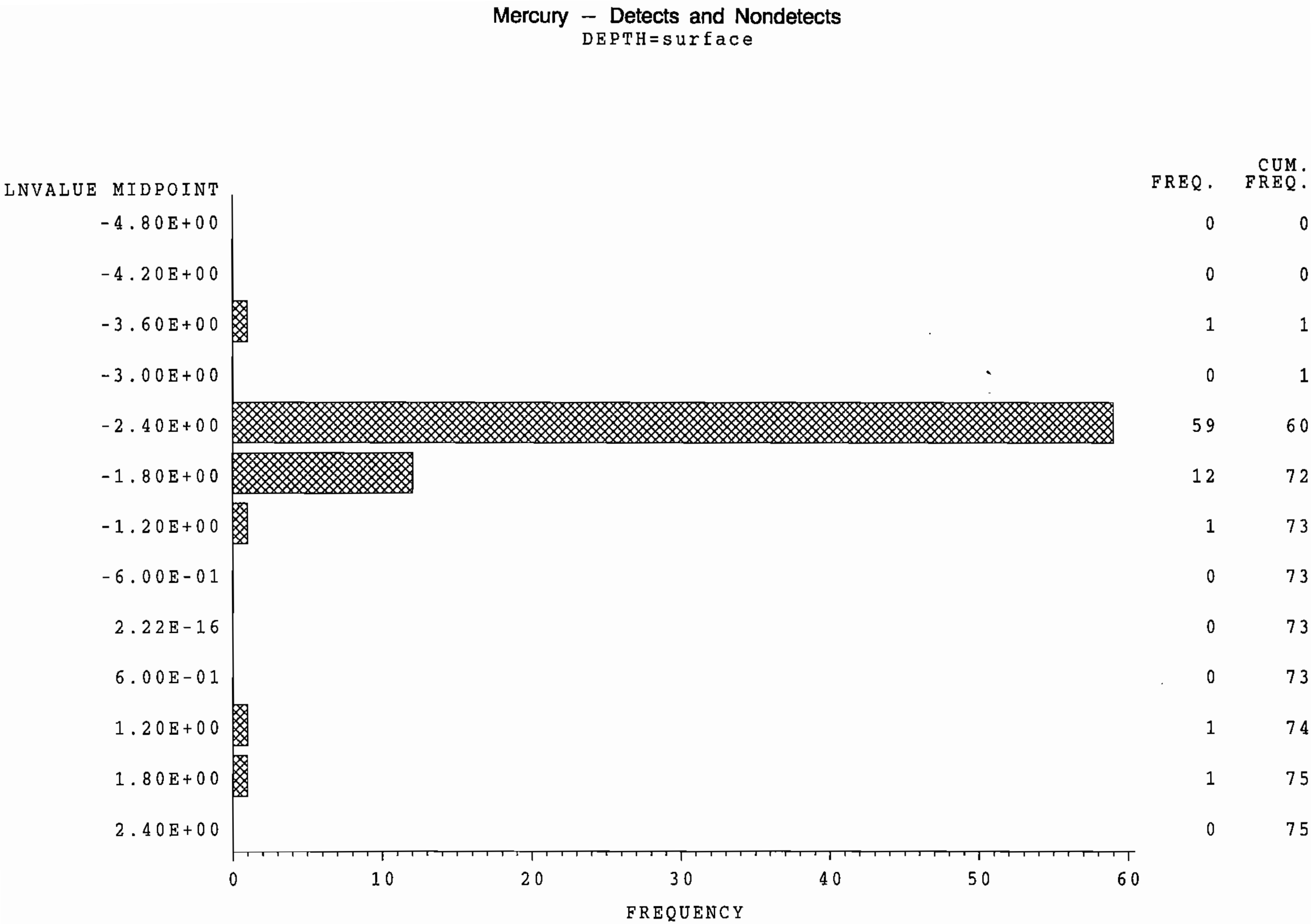


Figure 2.49. Histogram for Mercury; All Observations; Surface Classification.

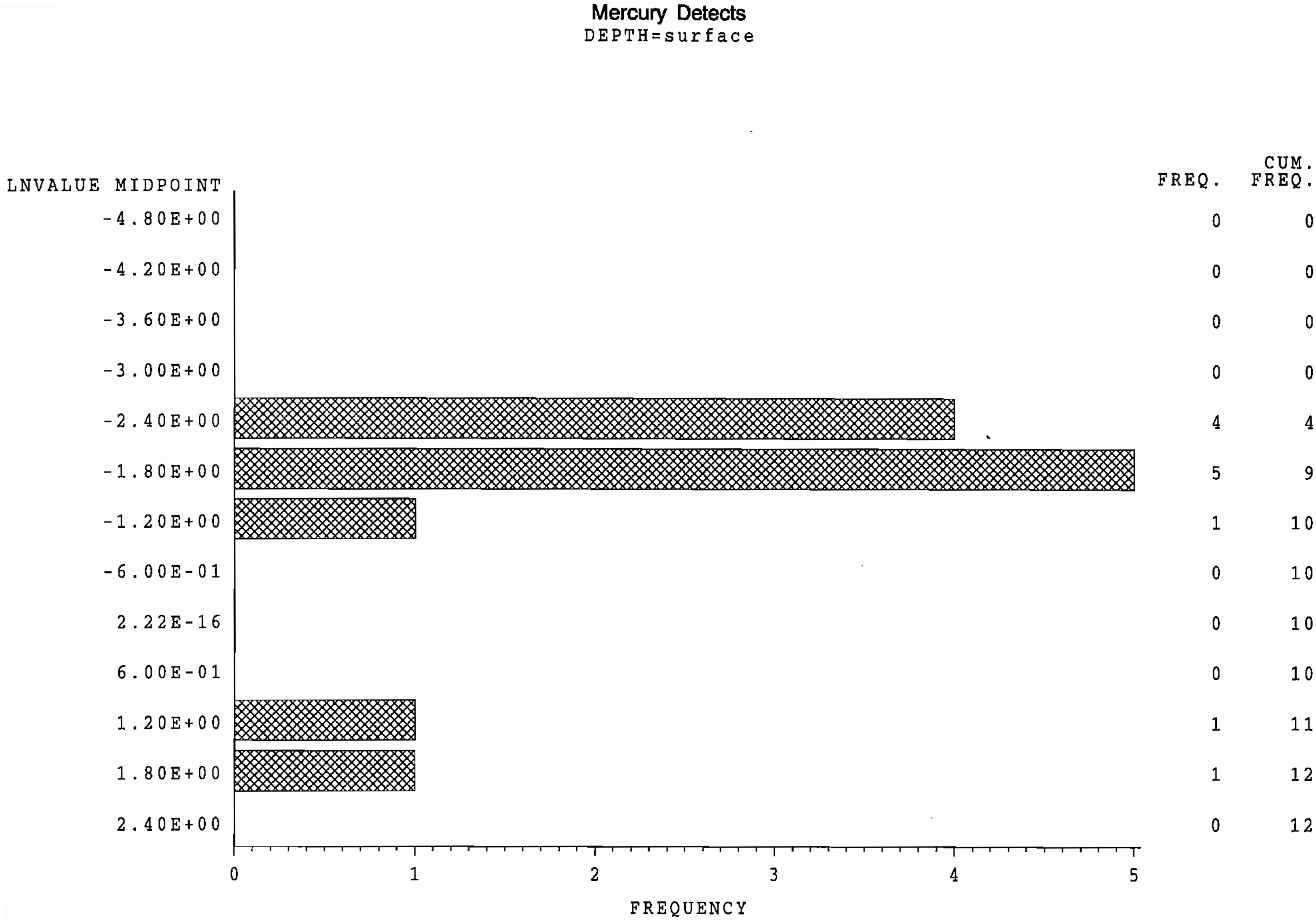


Figure 2.50. Histogram for Mercury; Detected Observations; Surface Classification.

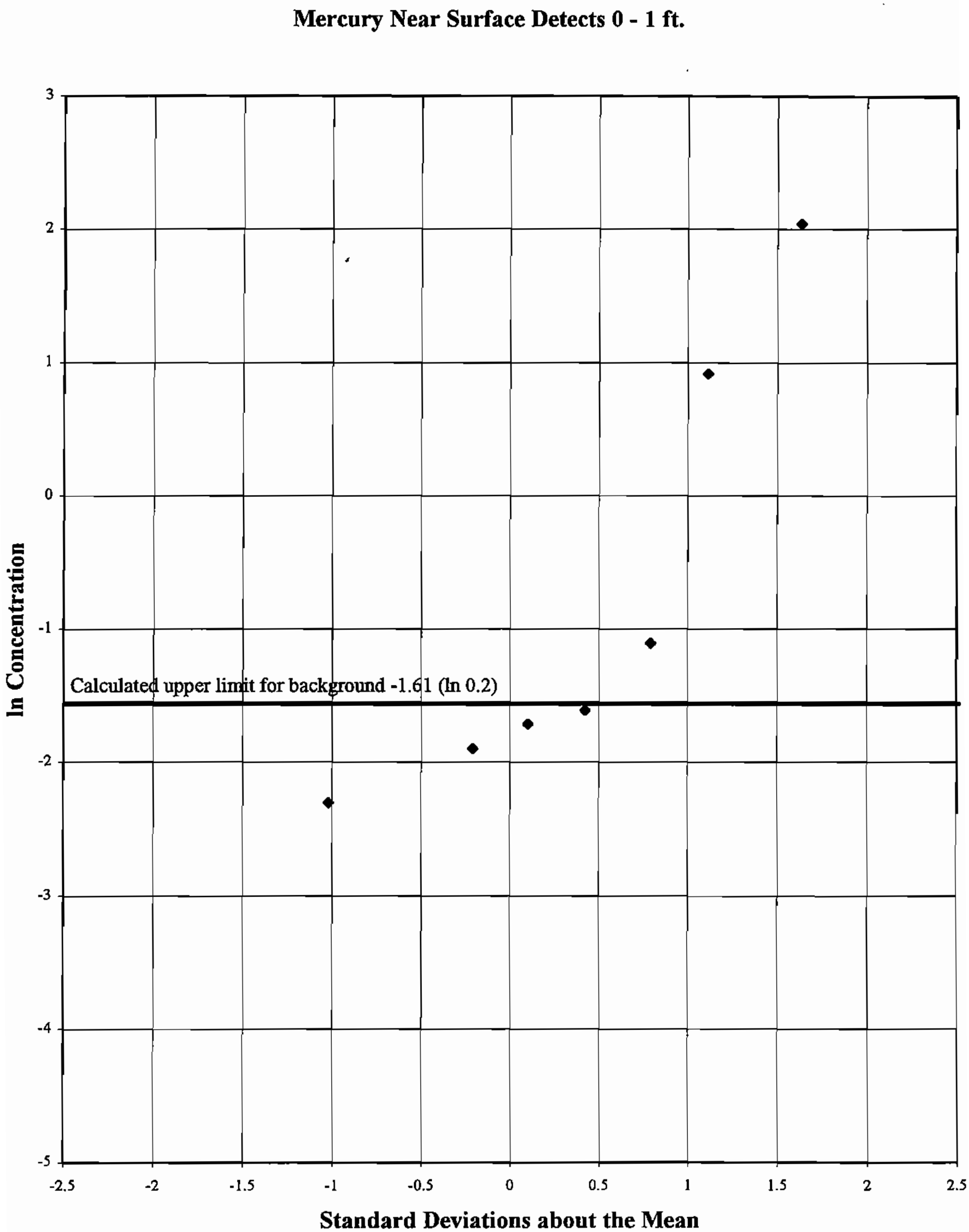


Figure 2.51. Cumulative Probability Plot for Mercury; Detected Observations; Surface Classification.

Nickel – Detects and Nondetects

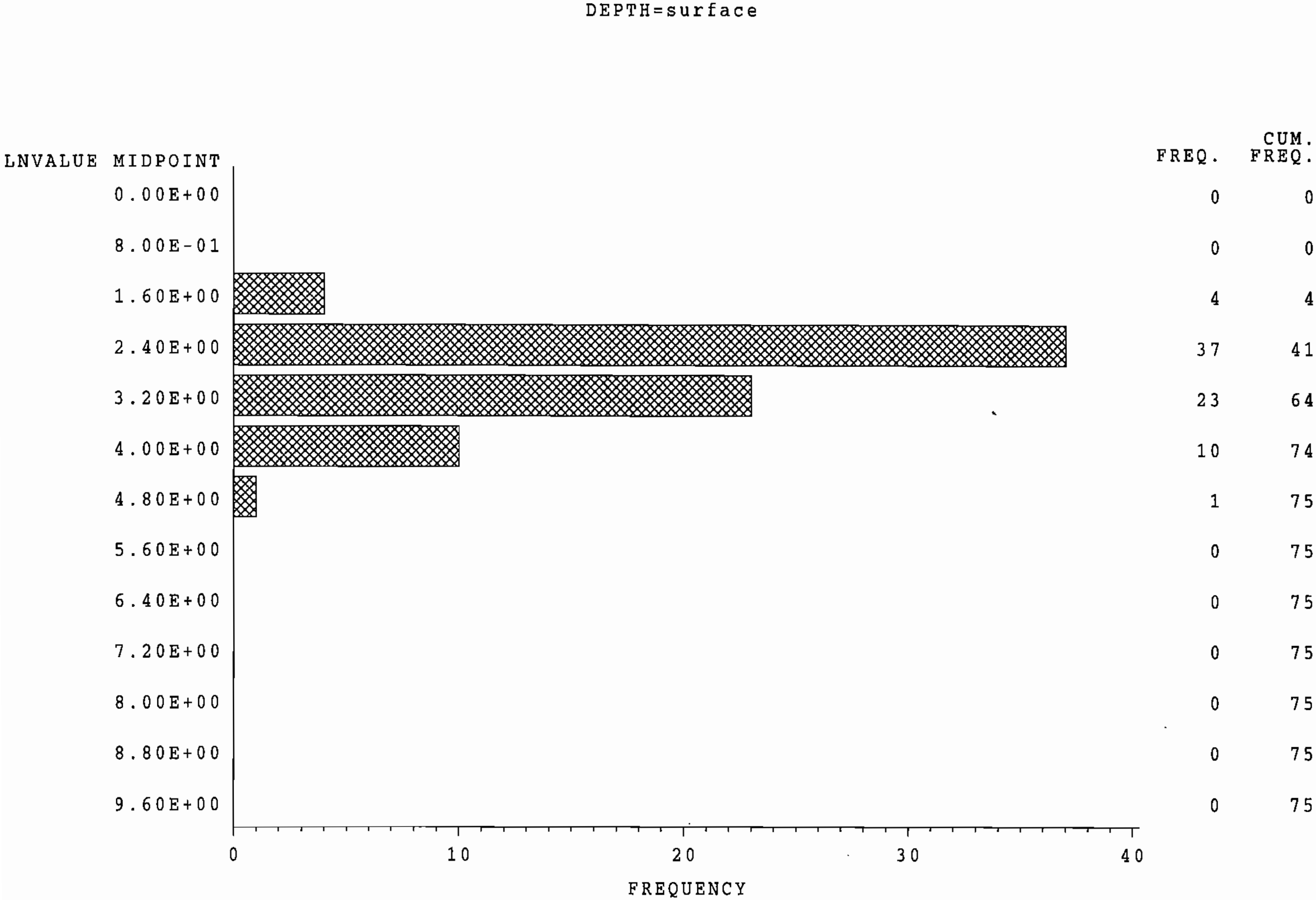


Figure 2.52. Histogram for Nickel; All Observations; Surface Classification.

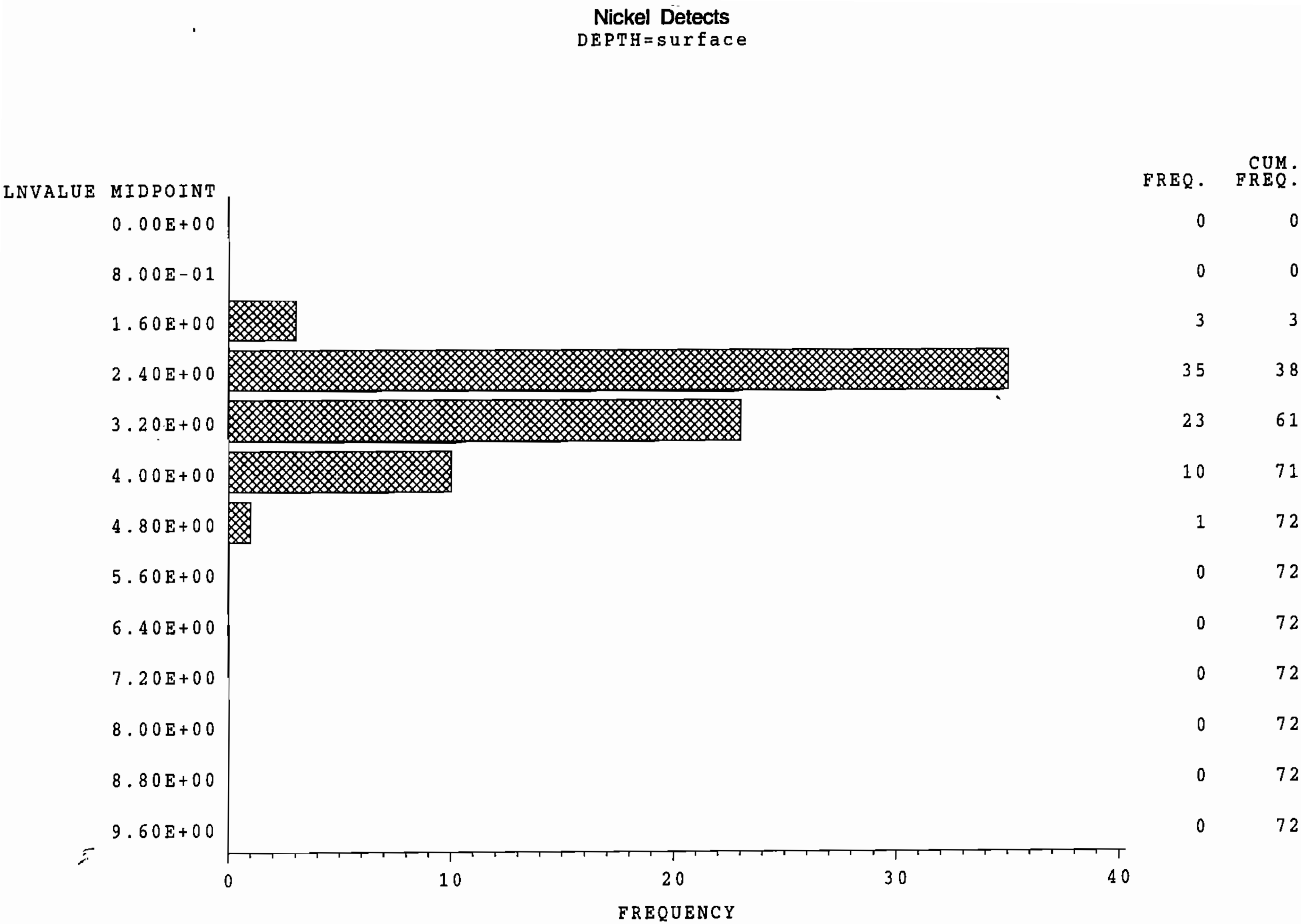


Figure 2.53. Histogram for Nickel; Detected Observations; Surface Classification.

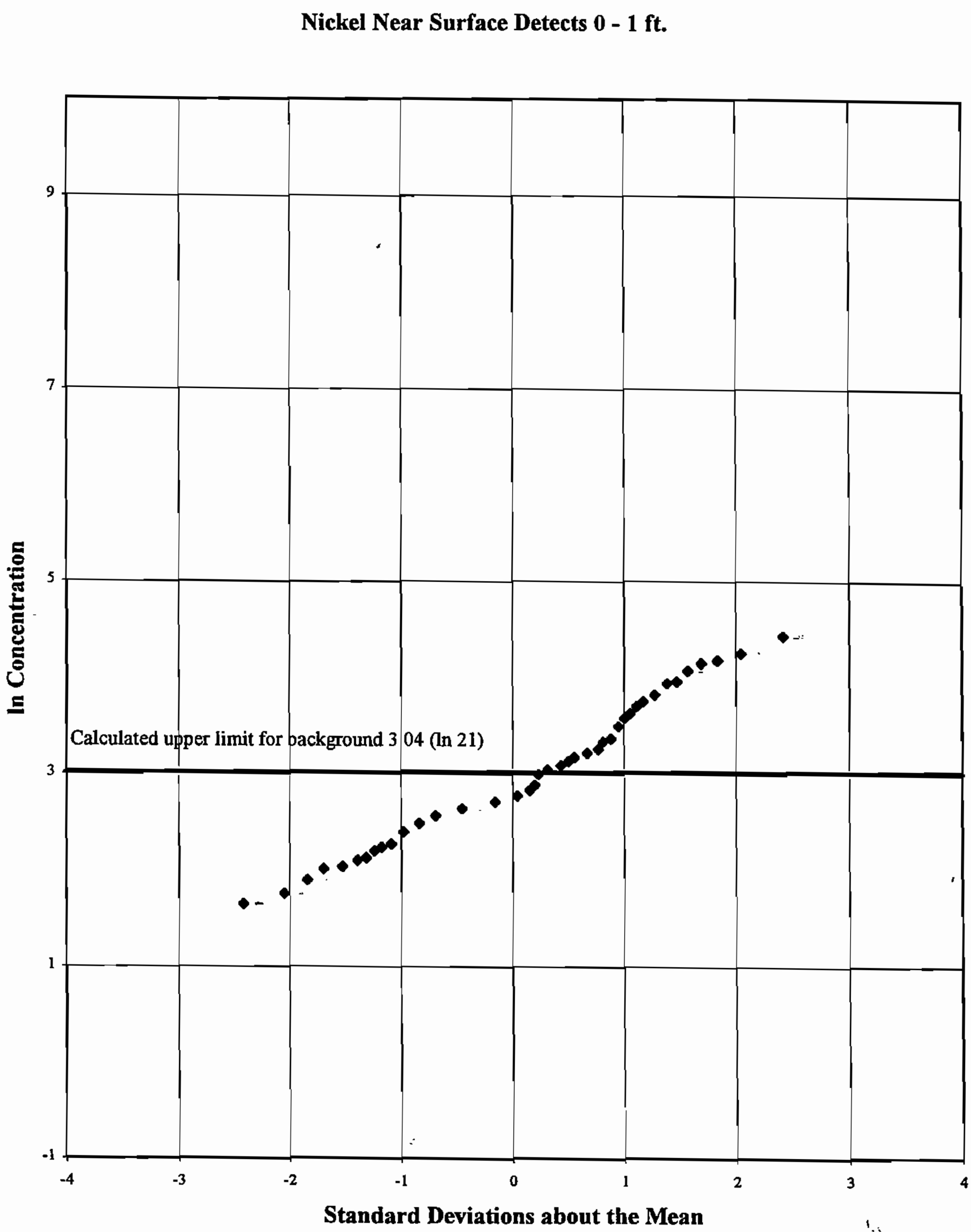


Figure 2.54. Cumulative Probability Plot for Nickel; Detected Observations; Surface Classification.

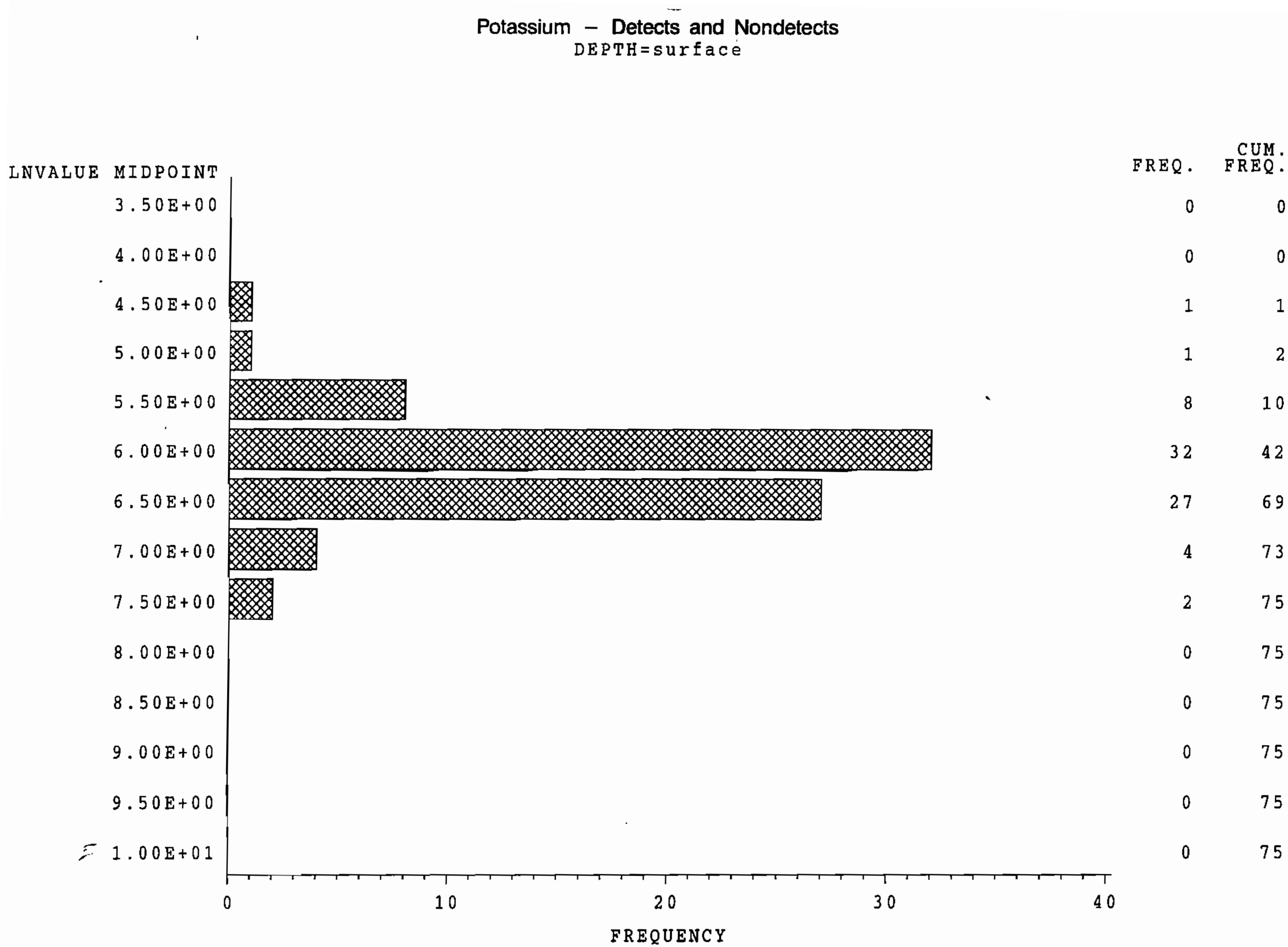


Figure 2.55. Histogram for Potassium; All Observations; Surface Classification.

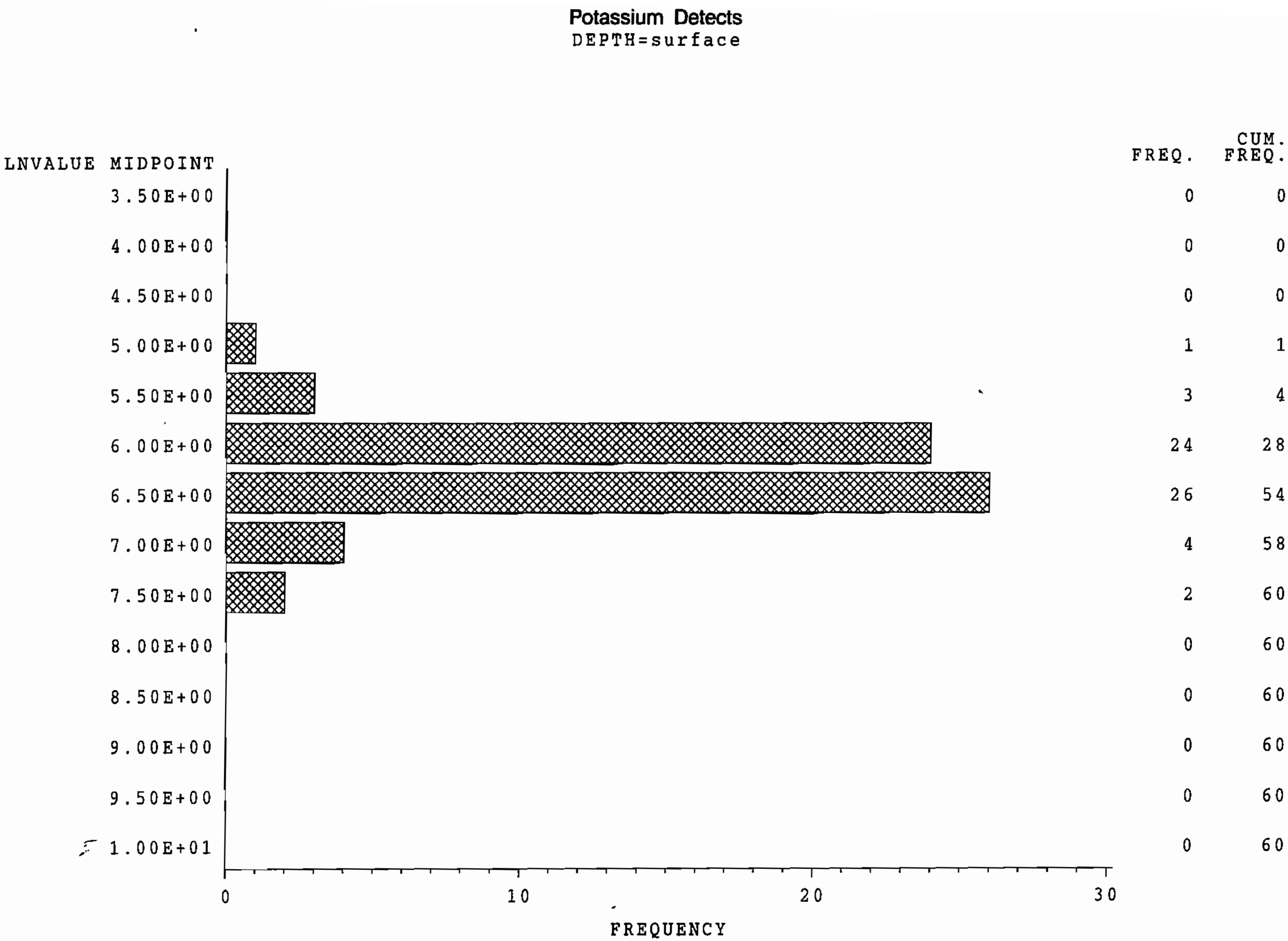


Figure 2.56. Histogram for Potassium; Detected Observations; Surface Classification.

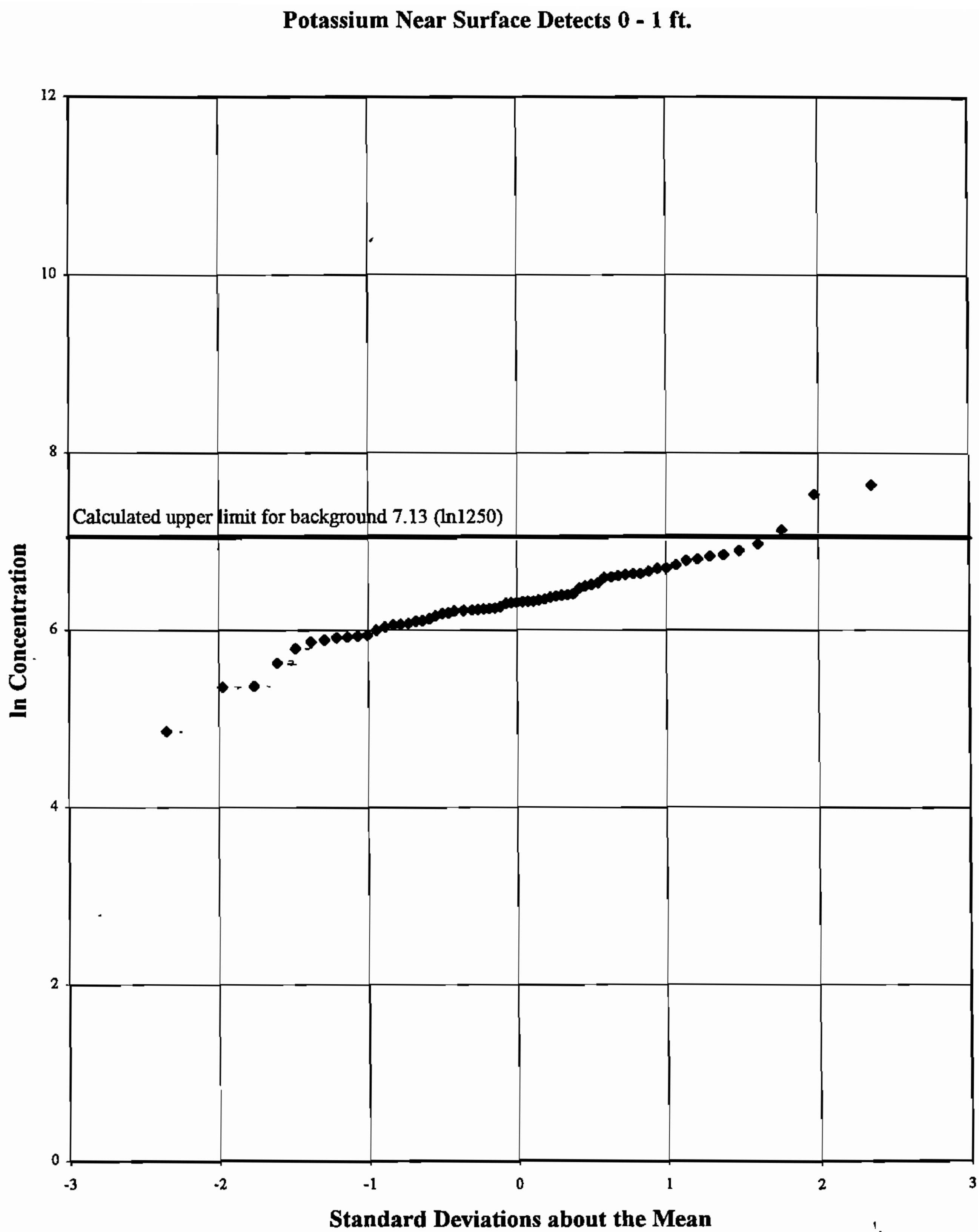


Figure 2.57. Cumulative Probability Plot for Potassium; Detected Observations; Surface Classification.

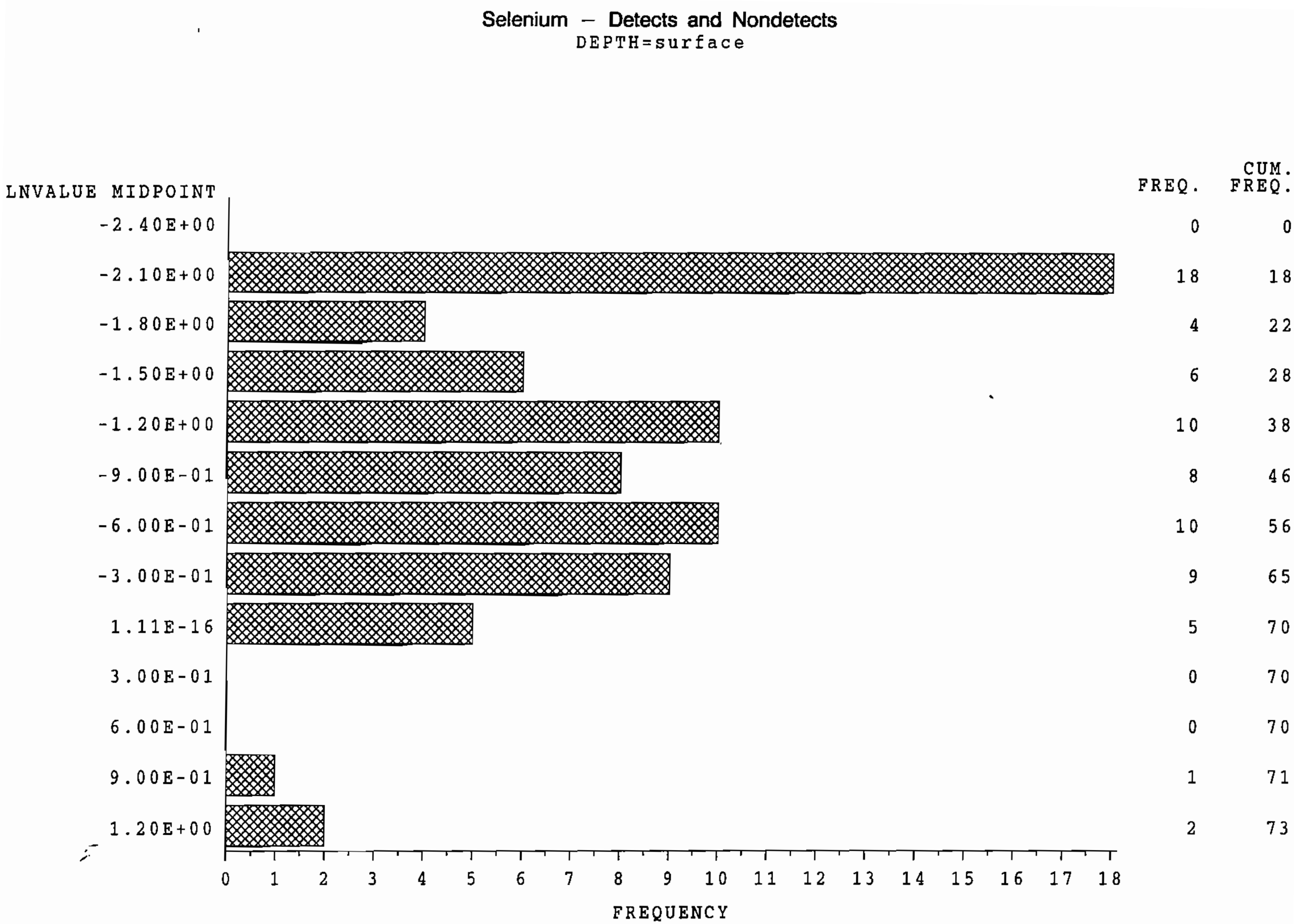


Figure 2.58. Histogram for Selenium; All Observations; Surface Classification.

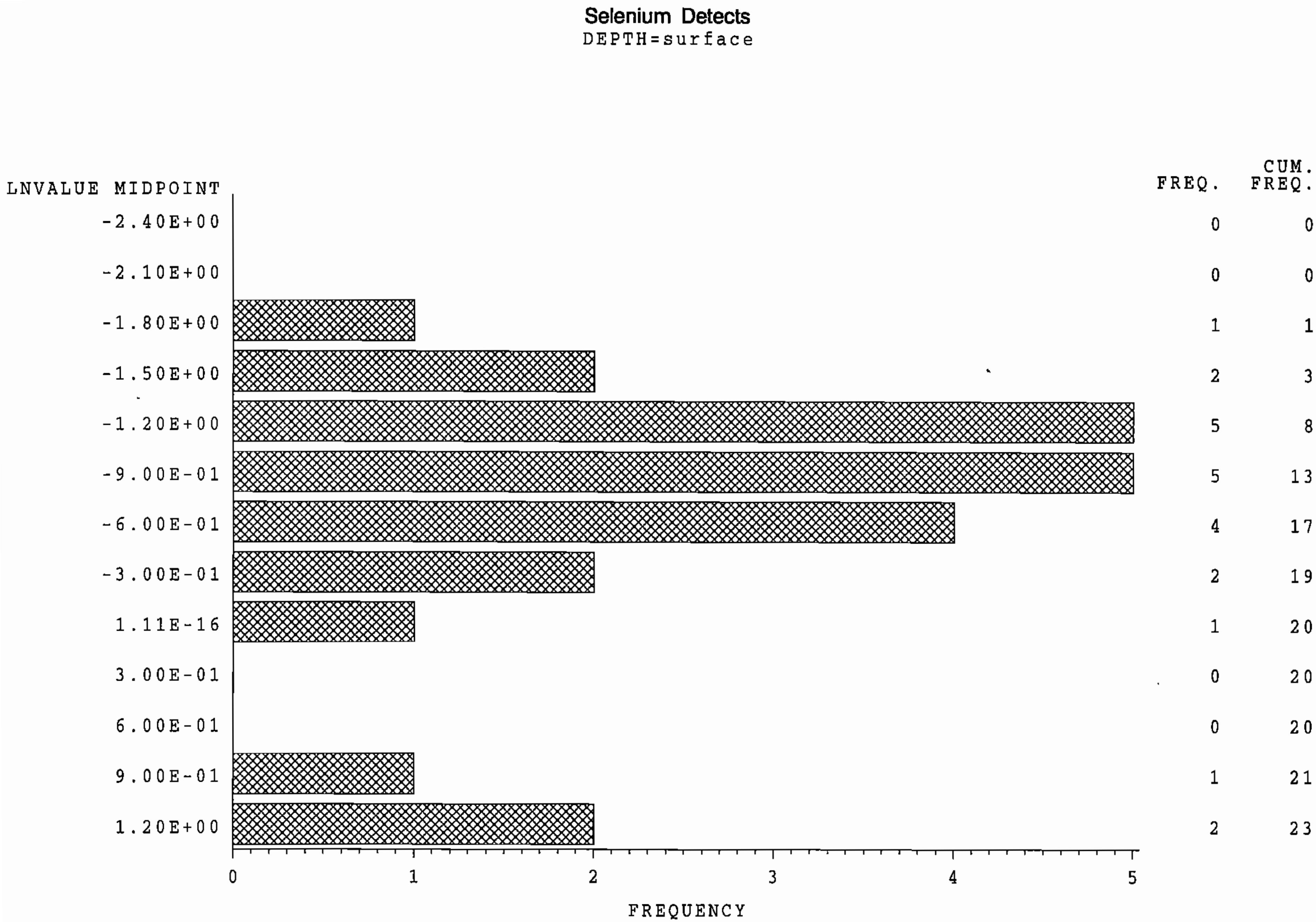


Figure 2.59. Histogram for Selenium; Detected Observations; Surface Classification.

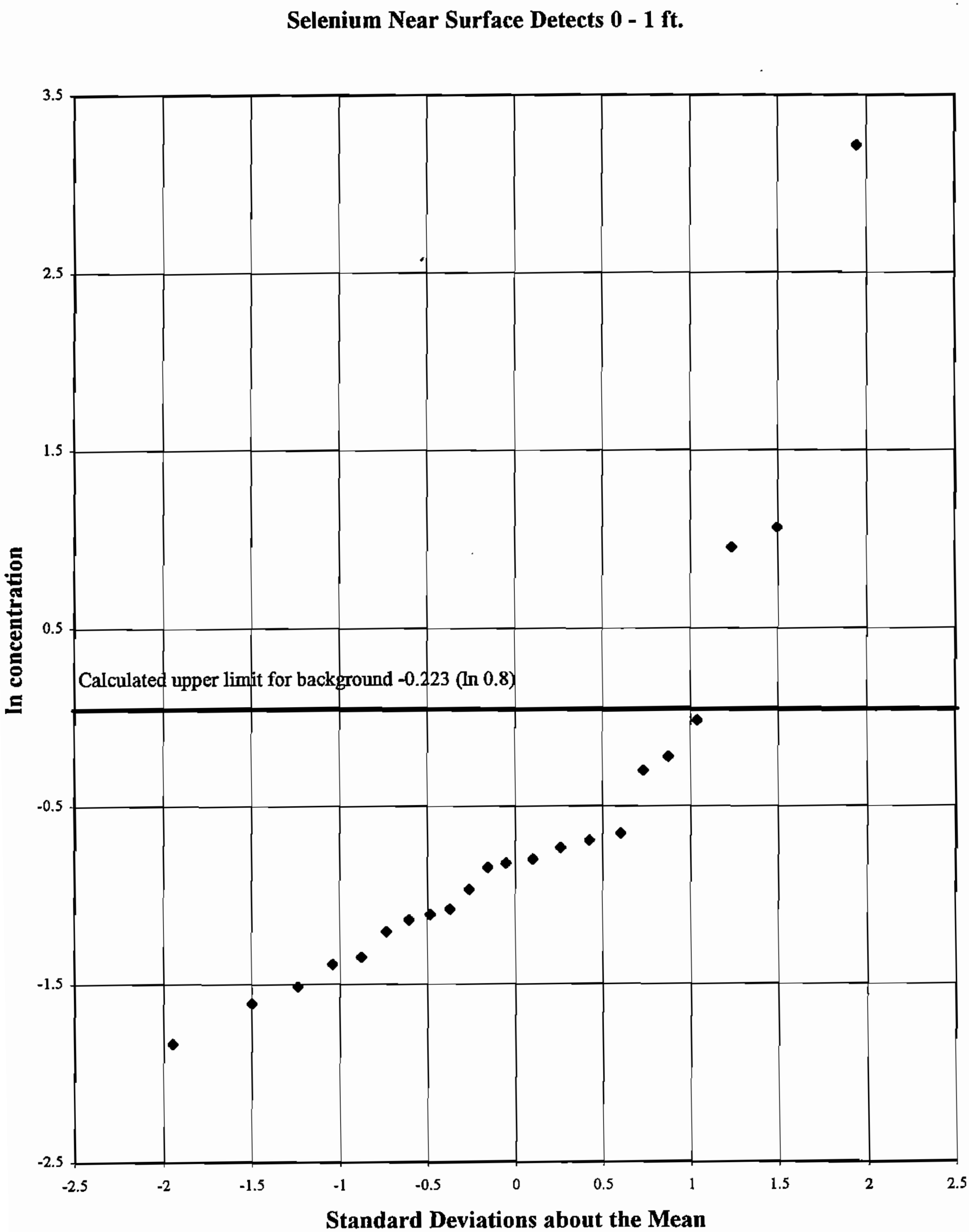


Figure 2.60. Cumulative Probability Plot for Selenium; Detected Observations; Surface Classification.

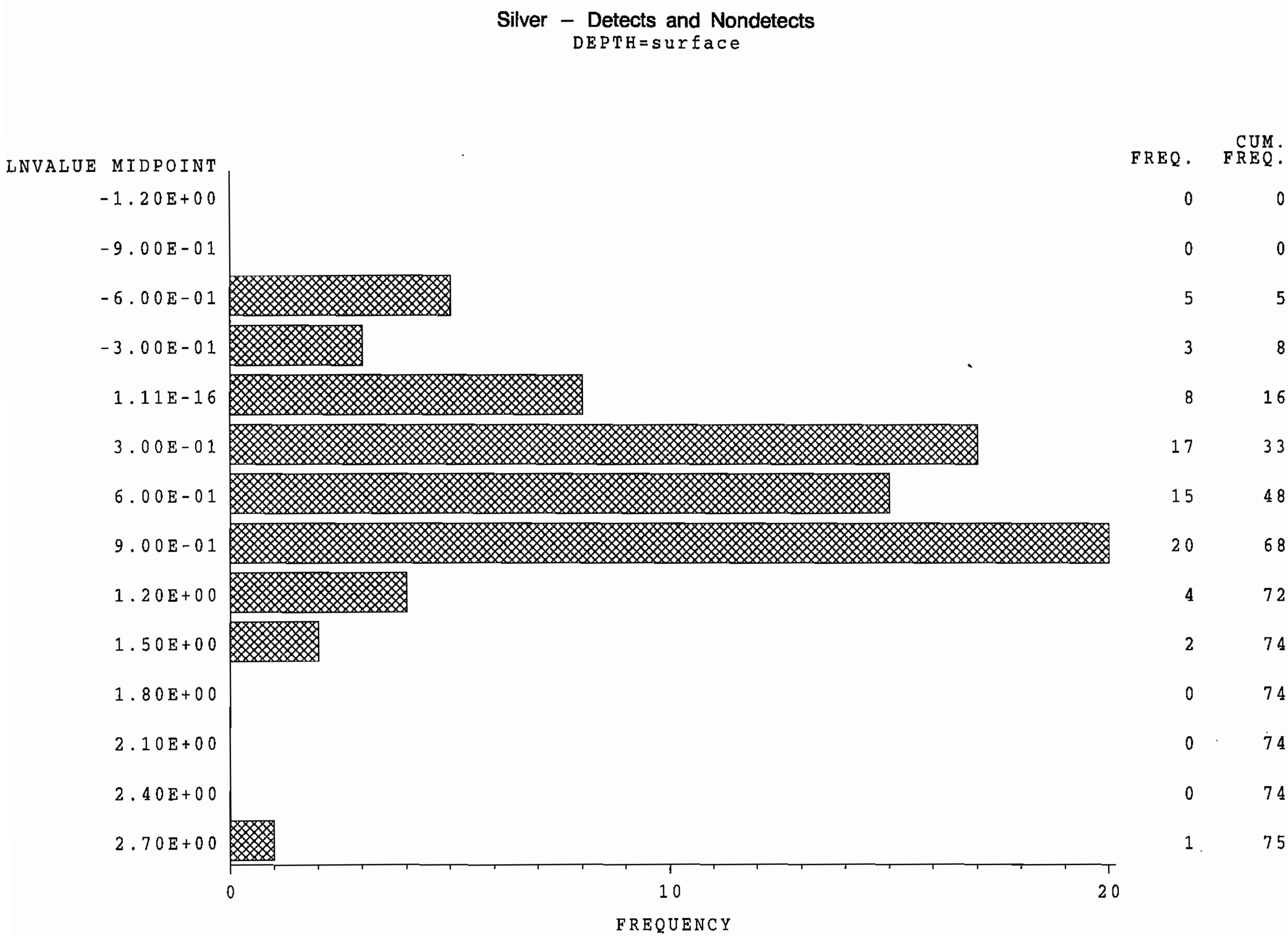


Figure 2.61. Histogram for Silver; All Observations; Surface Classification.

Silver Detects
DEPTH=surface

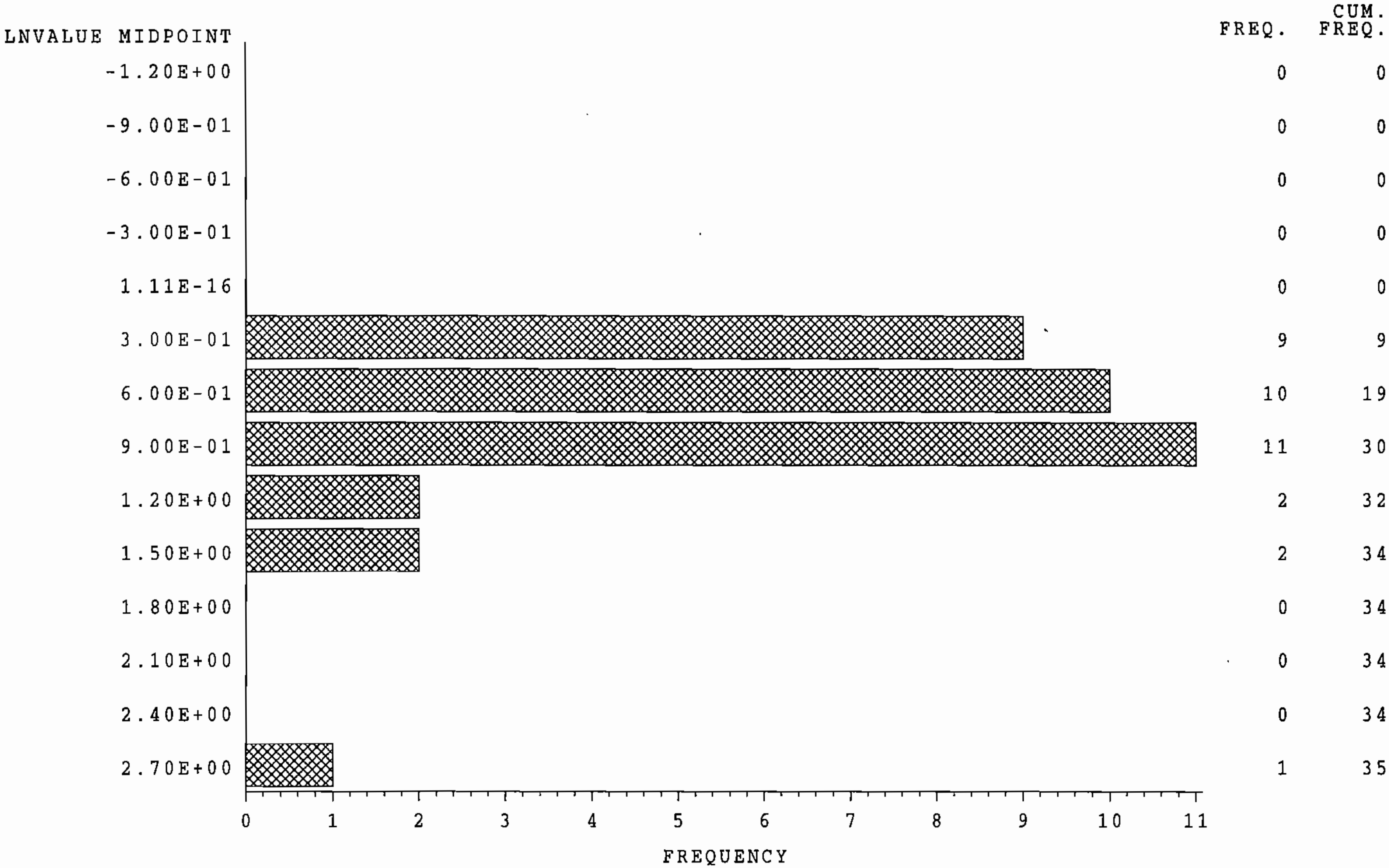


Figure 2.62. Histogram for Silver; Detected Observations; Surface Classification.

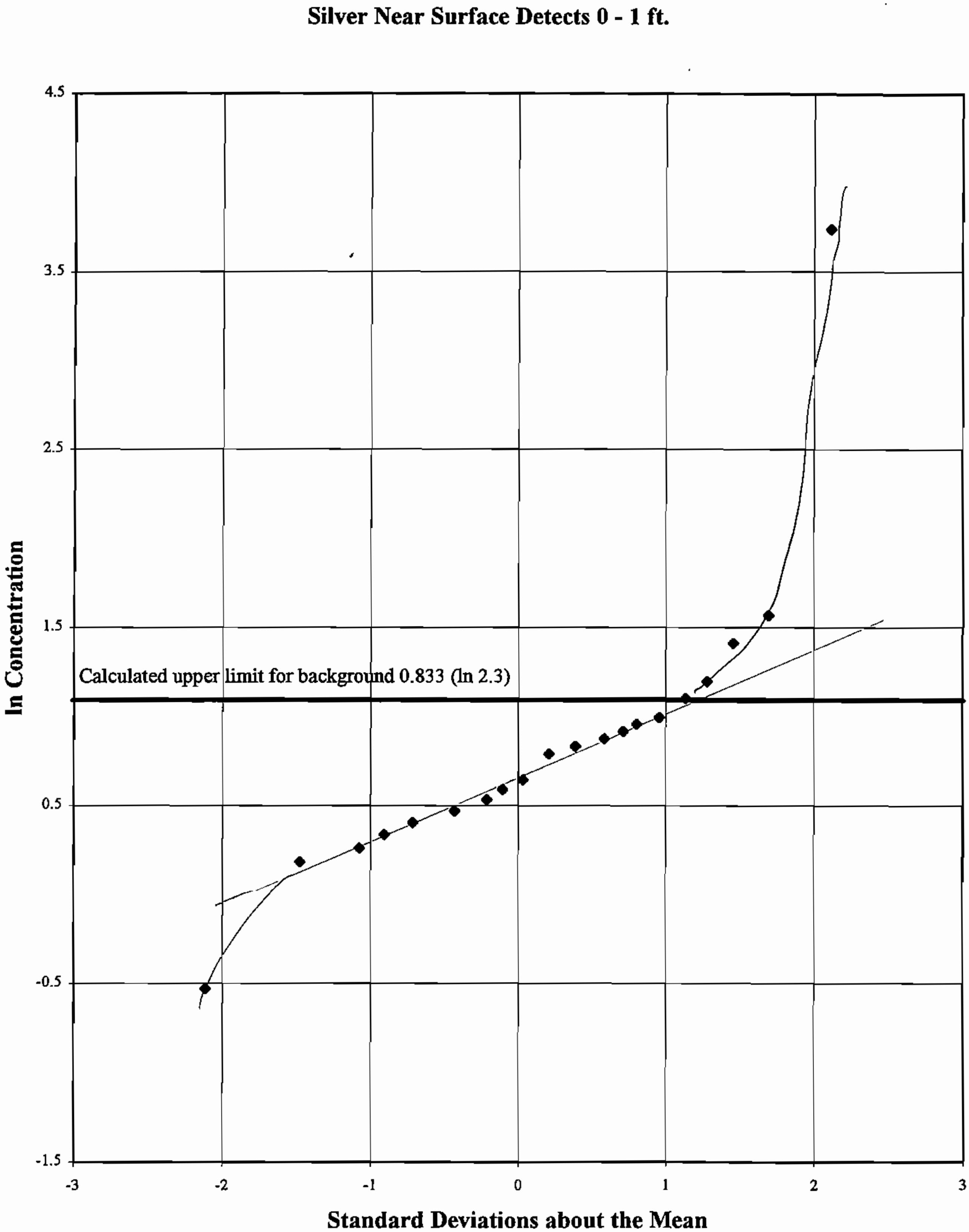


Figure 2.63. Cumulative Probability Plot for Silver; Detected Observations; Surface Classification.

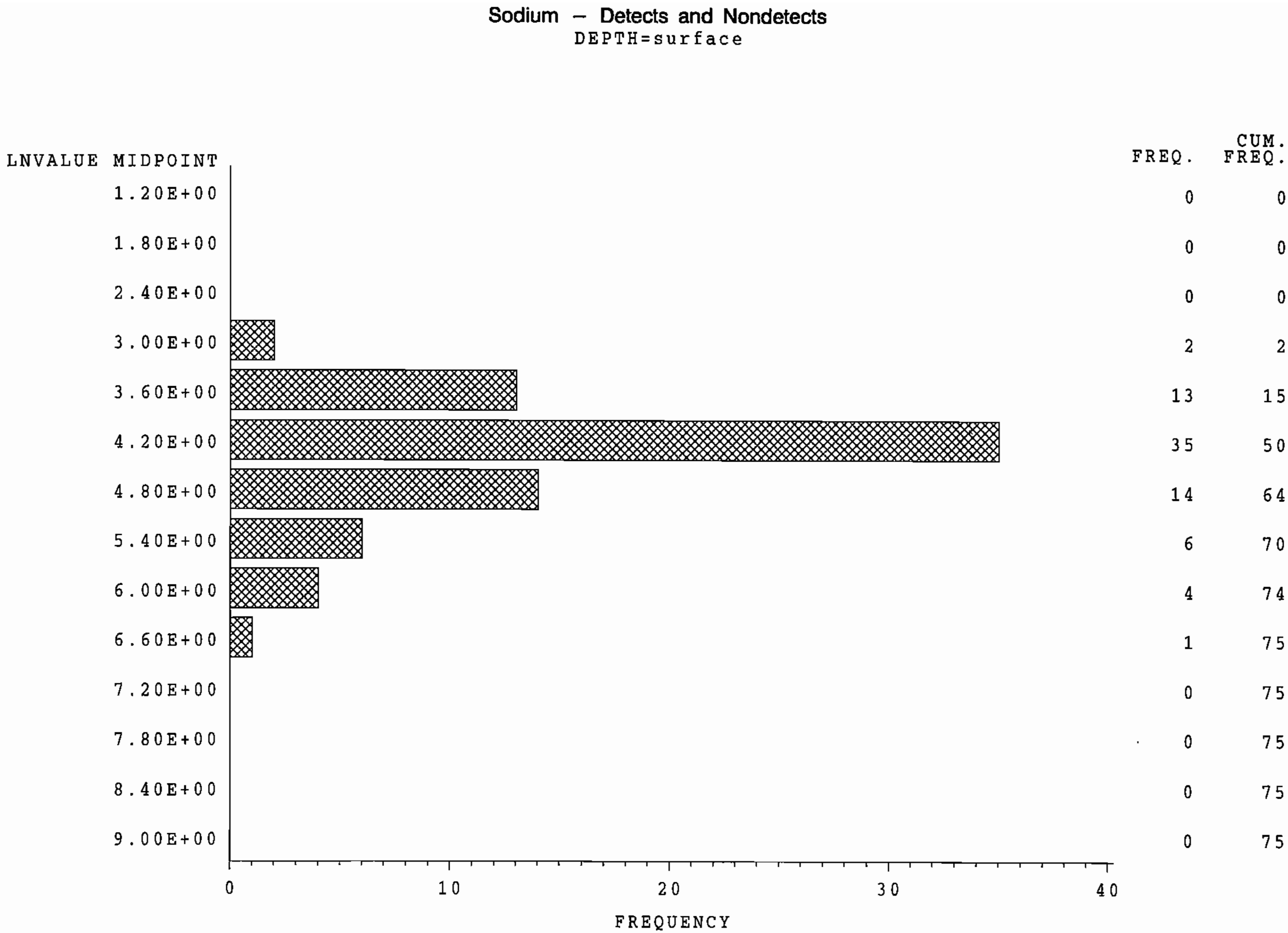


Figure 2.64. Histogram for Sodium; All Observations; Surface Classification.

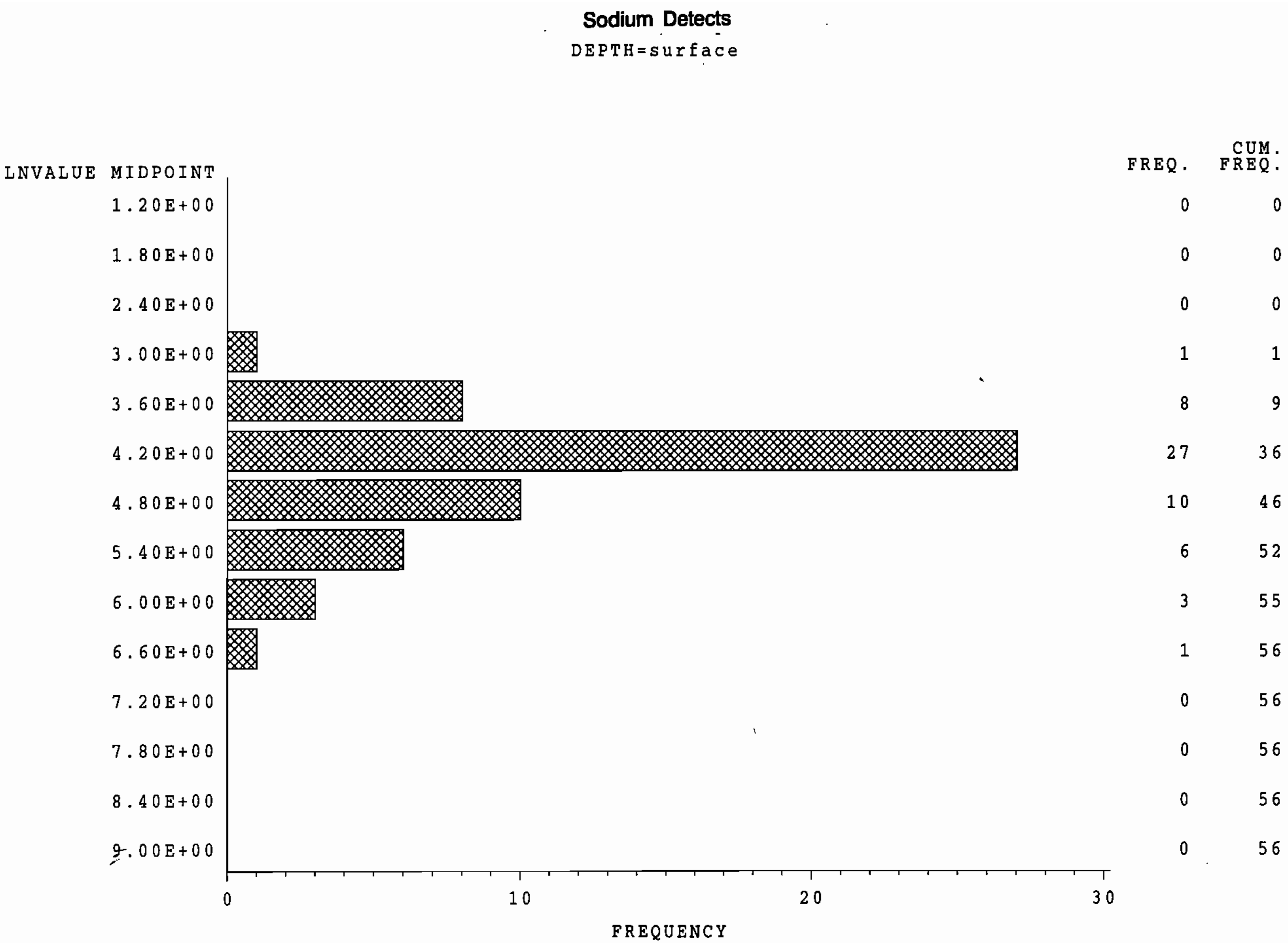


Figure 2.65. Histogram for Sodium; Detected Observations; Surface Classification.

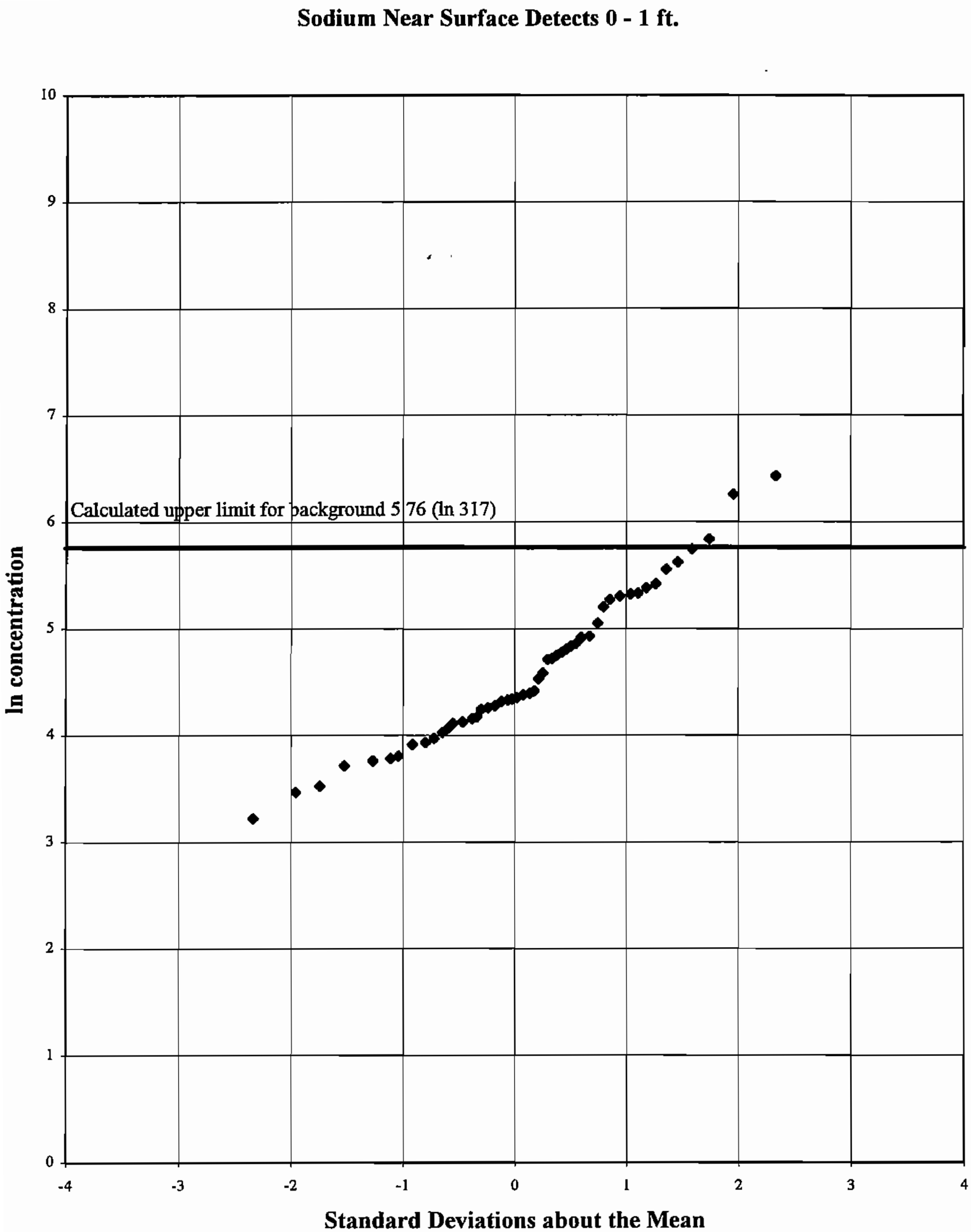


Figure 2.66. Cumulative Probability Plot for Sodium; Detected Observations; Surface Classification.

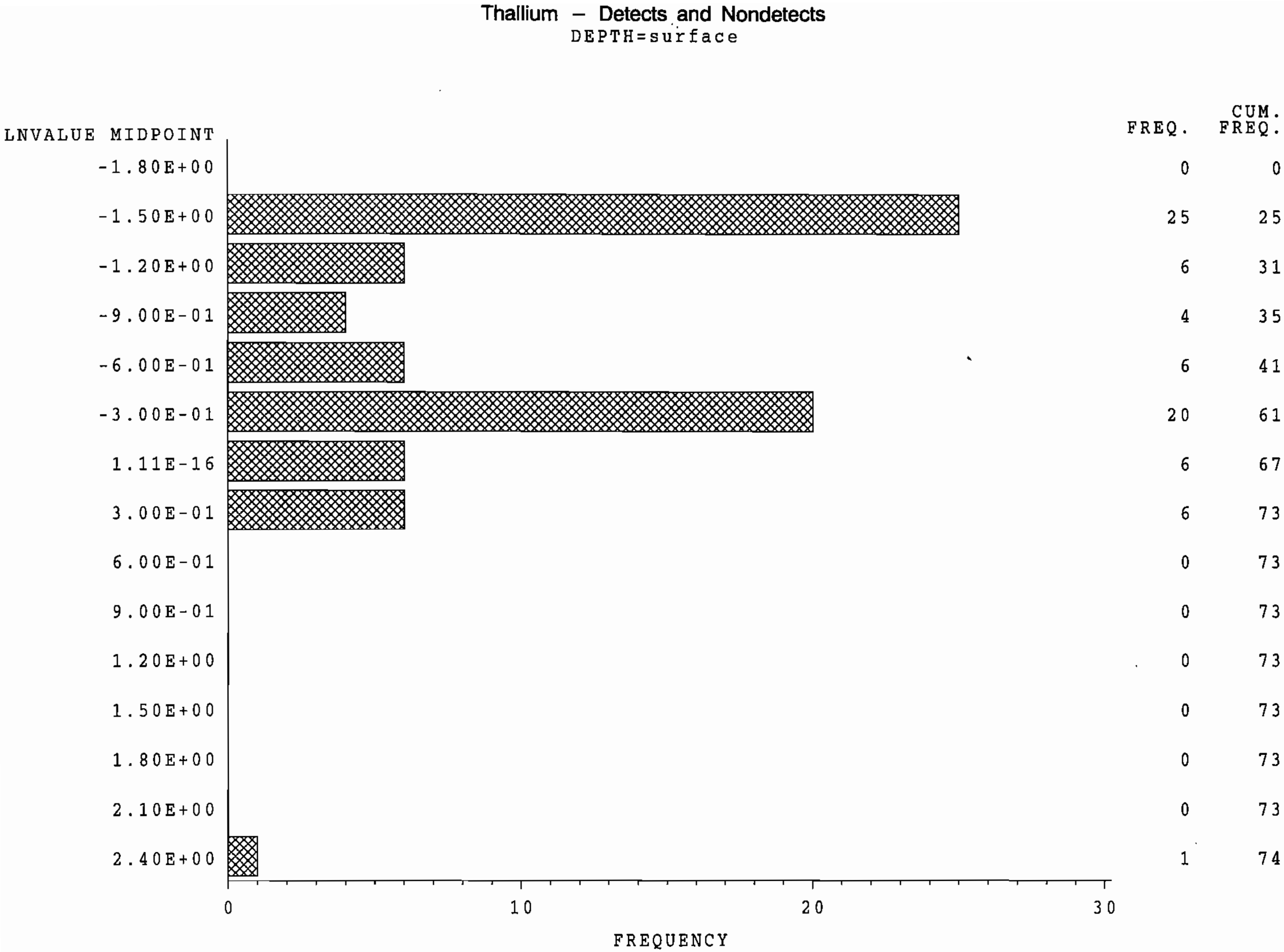
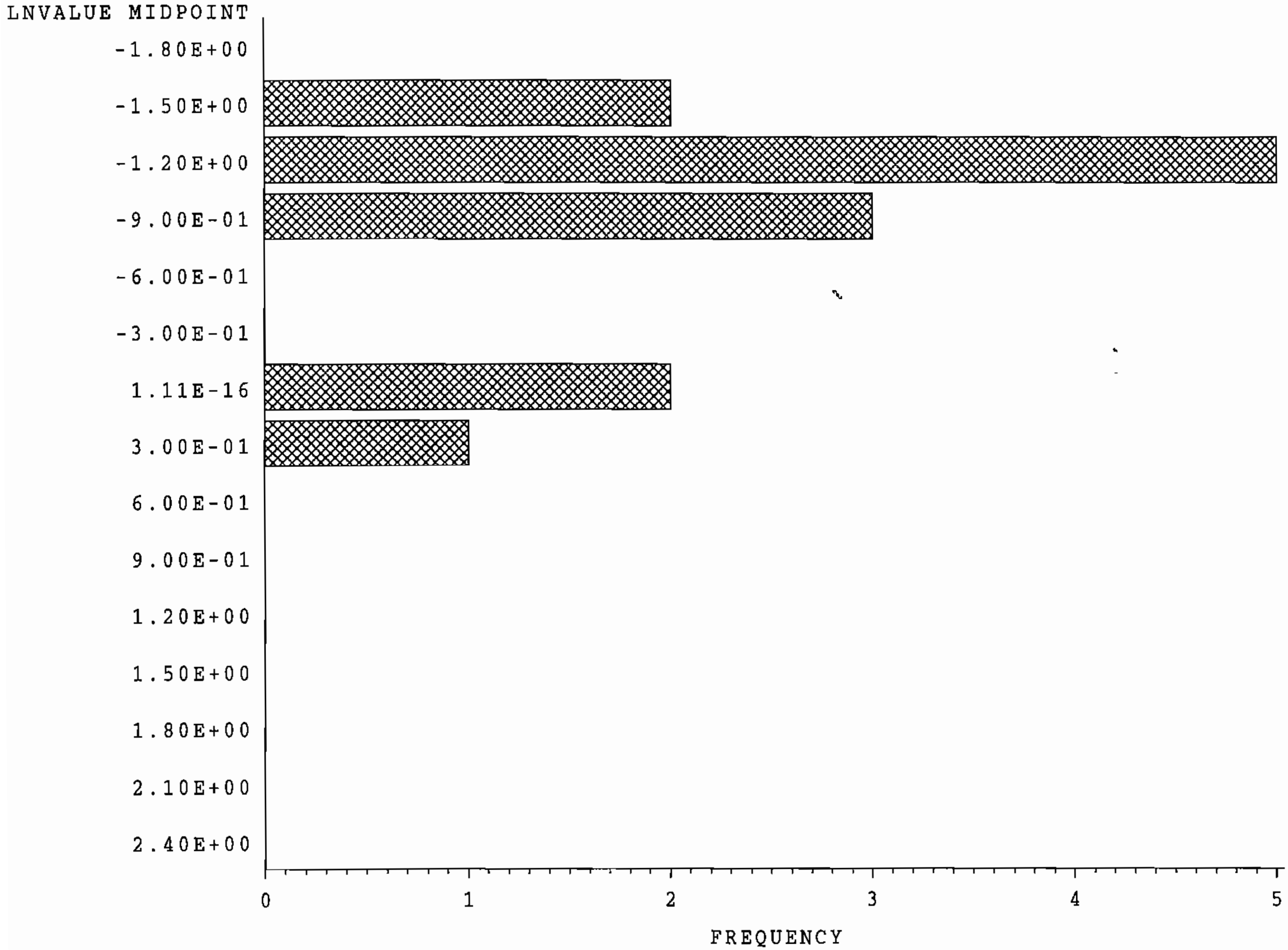


Figure 2.67. Histogram for Thallium; All Observations; Surface Classification.

Thallium Detects
DEPTH=surface



FREQ.	CUM. FREQ.
0	0
2	2
5	7
3	10
0	10
0	10
2	12
1	13
0	13
0	13
0	13
0	13
0	13
0	13
0	13

Figure 2.68. Histogram for Thallium; Detected Observations; Surface Classification.

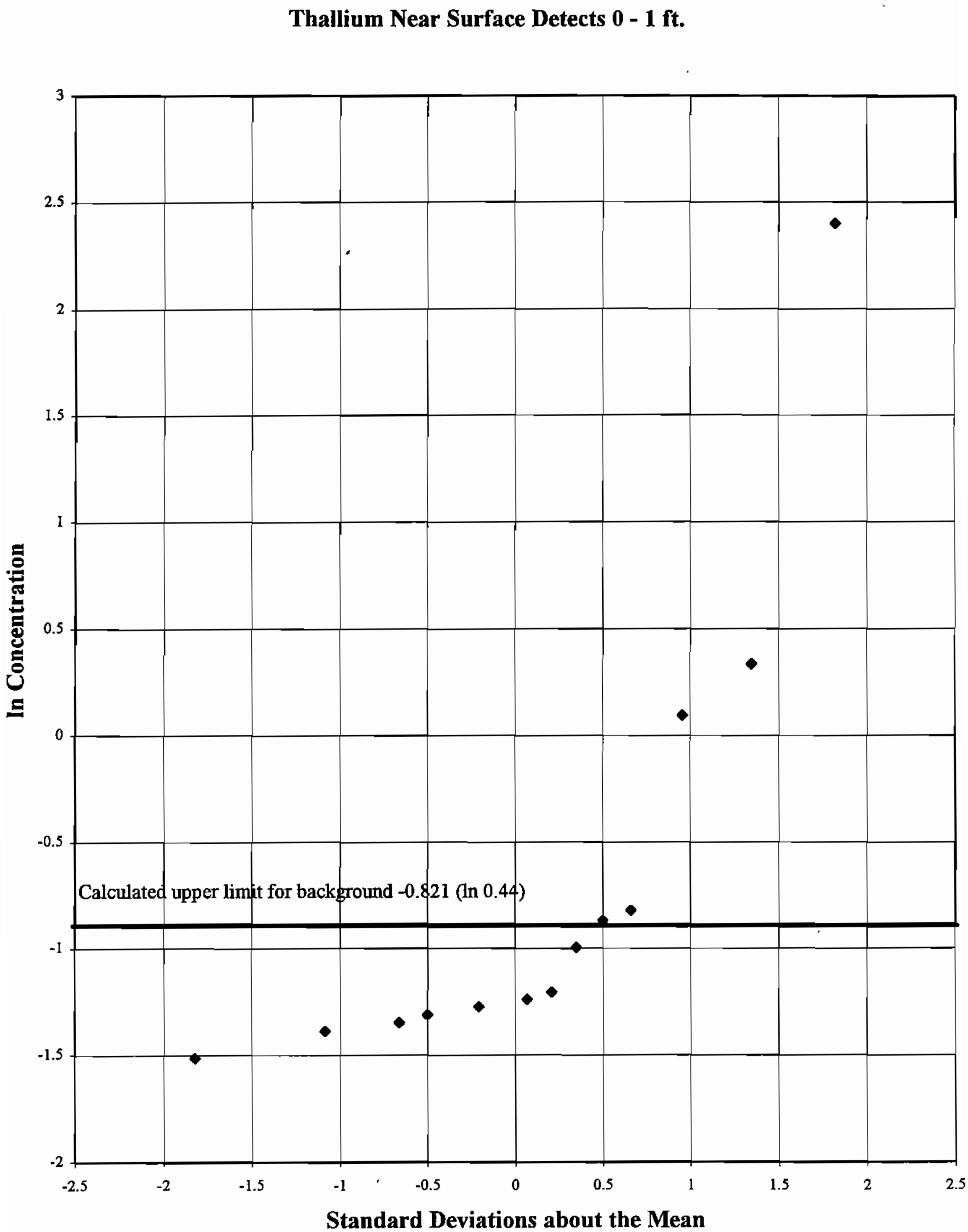


Figure 2.69. Cumulative Probability Plot for Thallium; Detected Observations; Surface Classification.

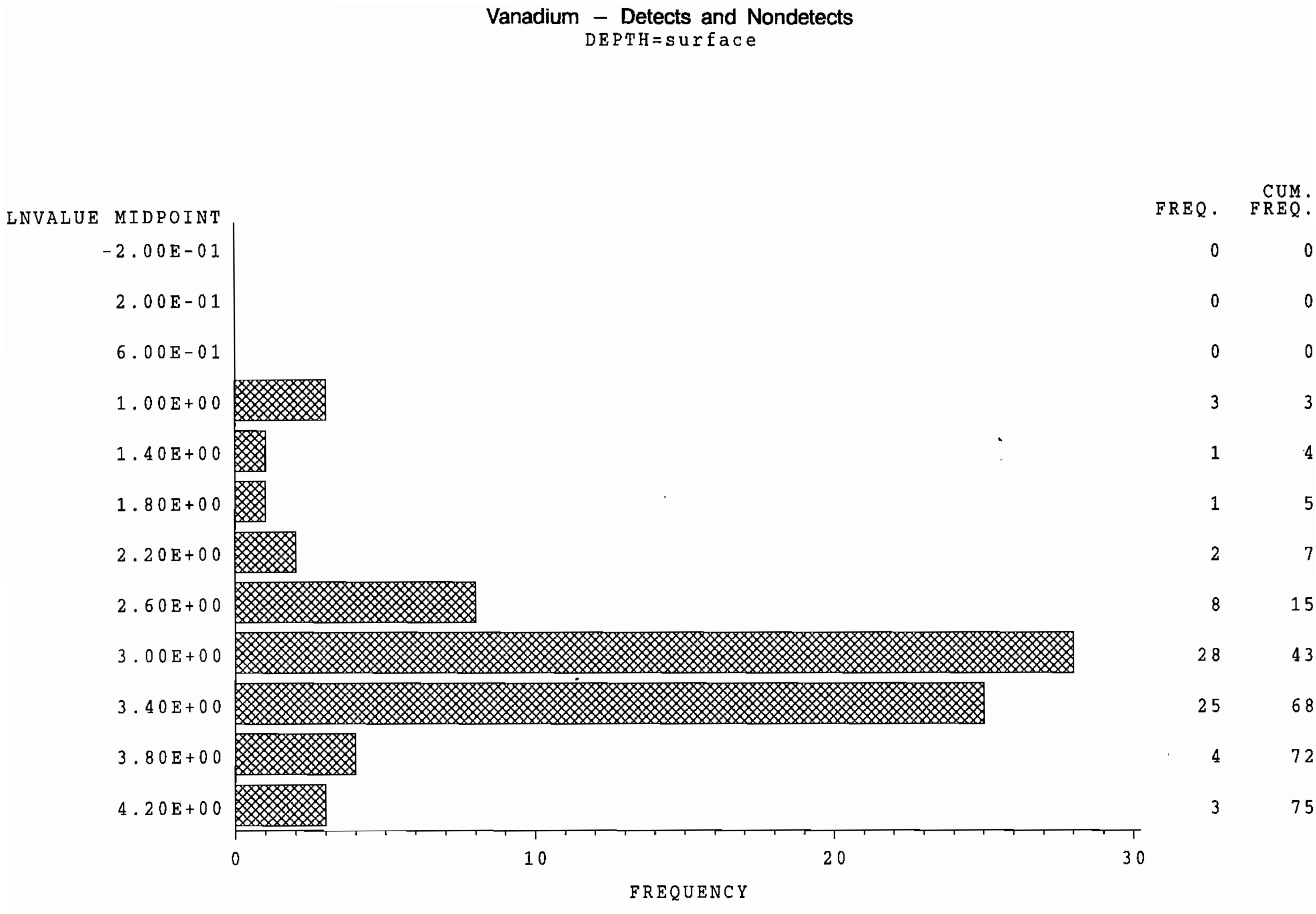


Figure 2.70. Histogram for Vanadium; All Observations; Surface Classification.

Vanadium Detects
DEPTH=surface

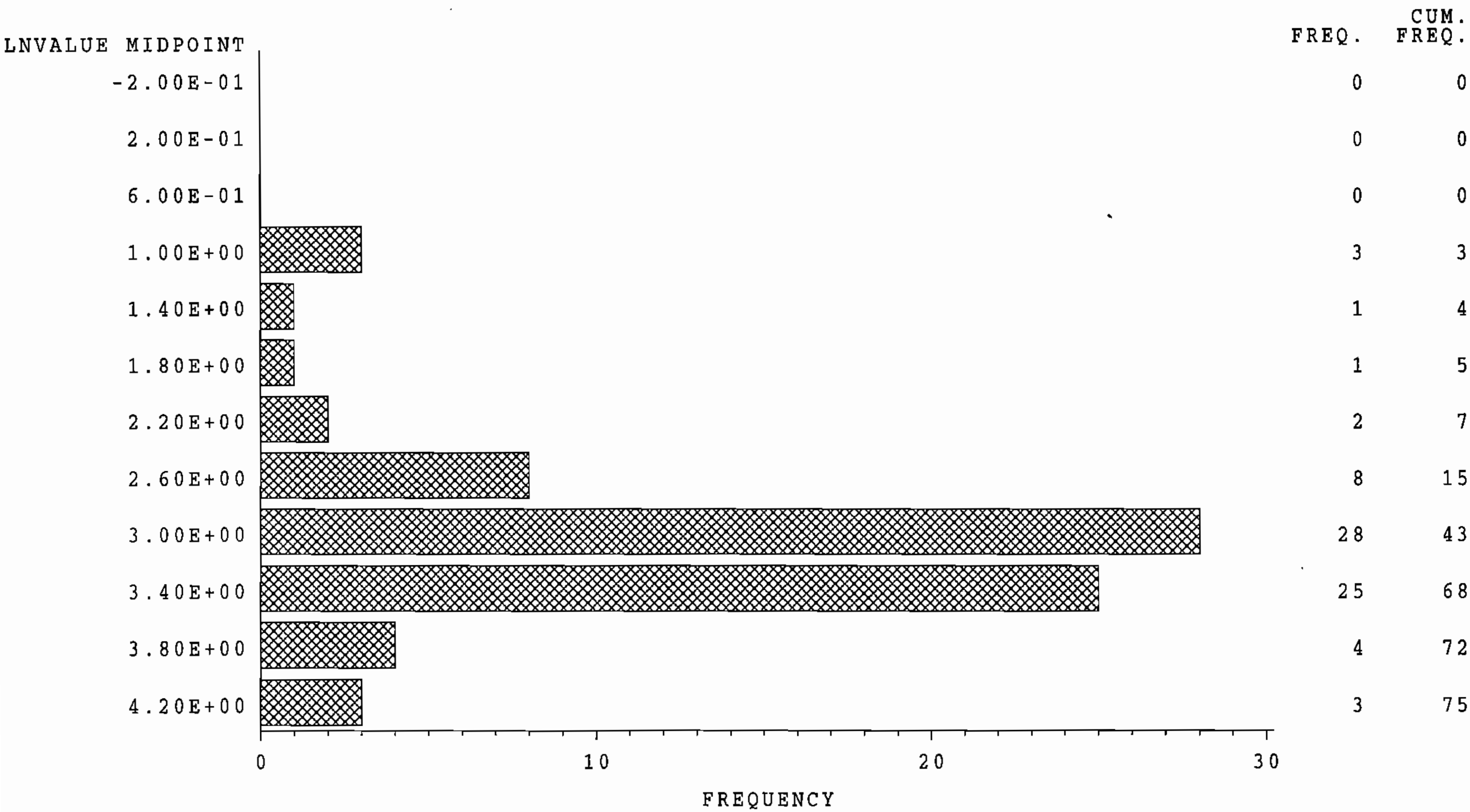


Figure 2.71. Histogram for Vanadium; Detected Observations; Surface Classification.

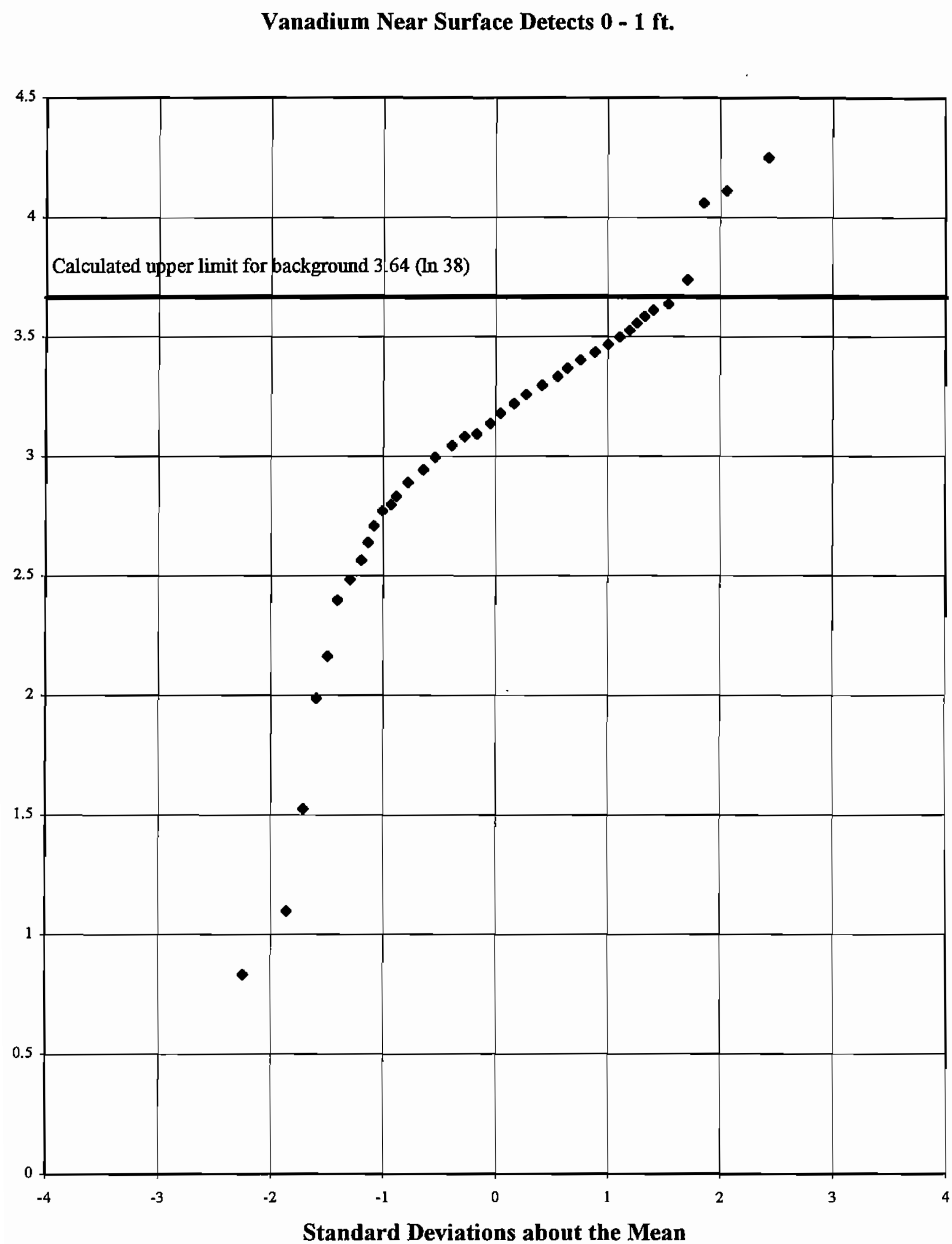


Figure 2.72. Cumulative Probability Plot for Vanadium; Detected Observations; Surface Classification.

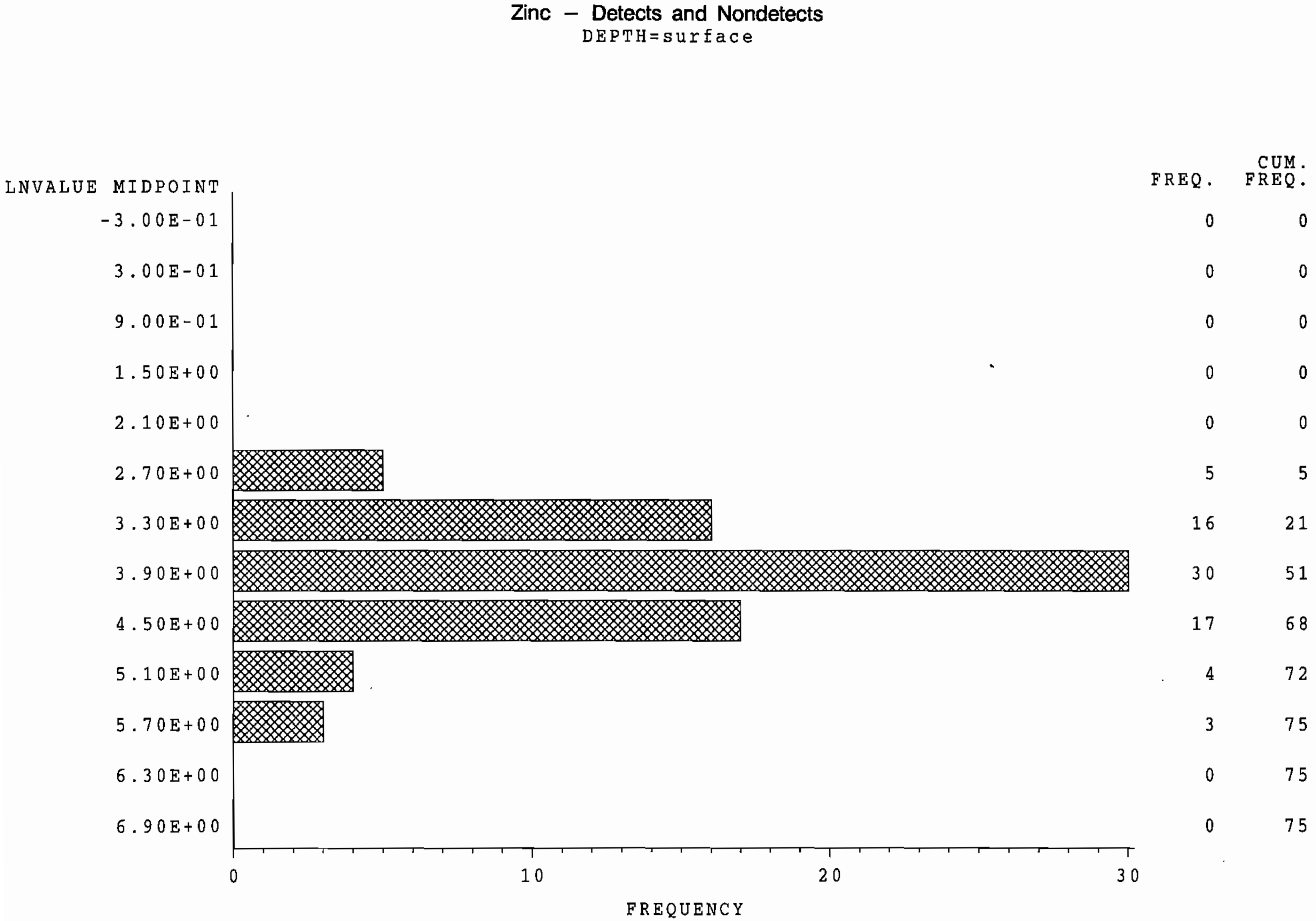


Figure 2.73. Histogram for Zinc; All Observations; Surface Classification.

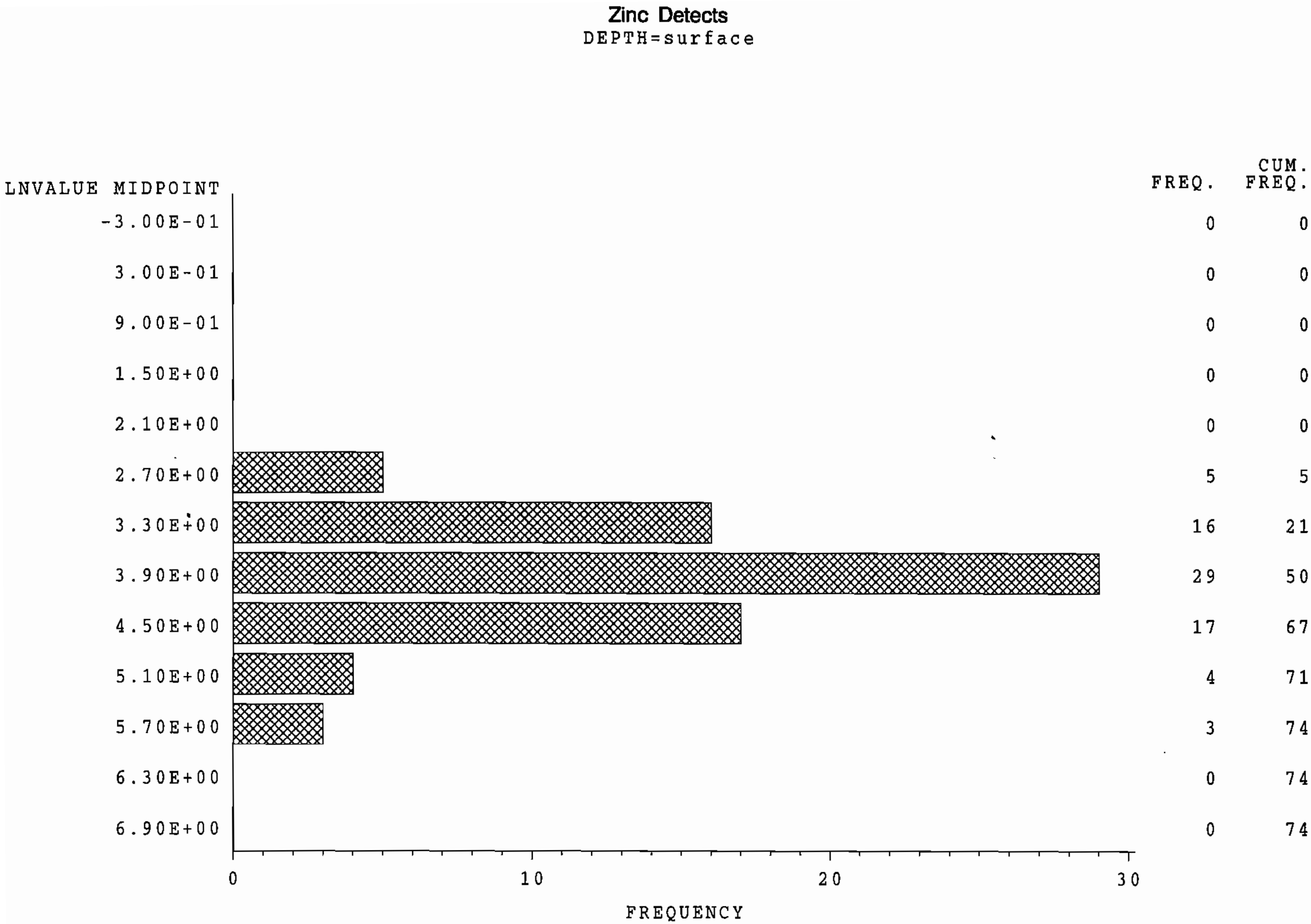


Figure 2.74. Histogram for Zinc; Detected Observations; Surface Classification.

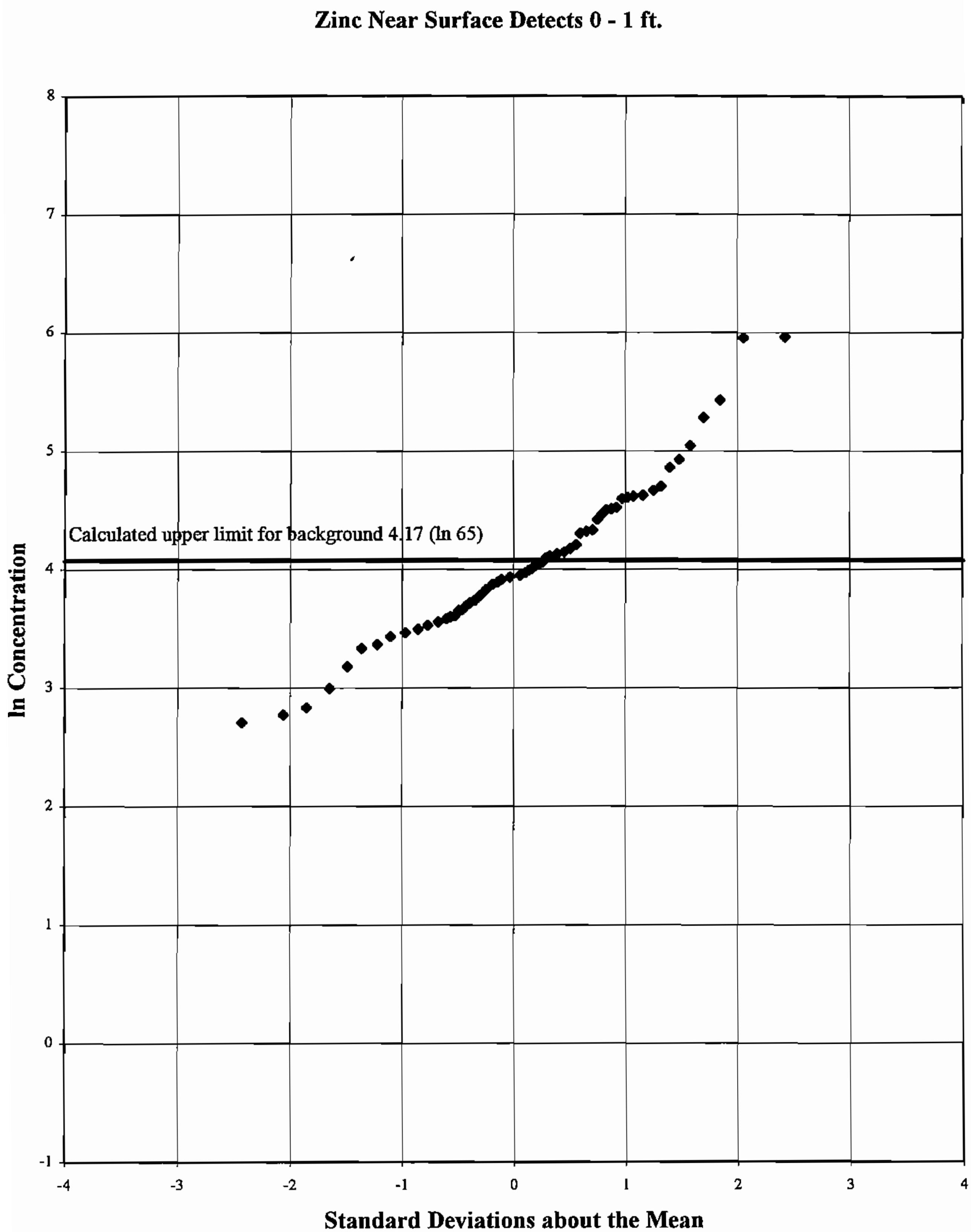


Figure 2.75. Cumulative Probability Plot for Zinc; Detected Observations; Surface Classification.

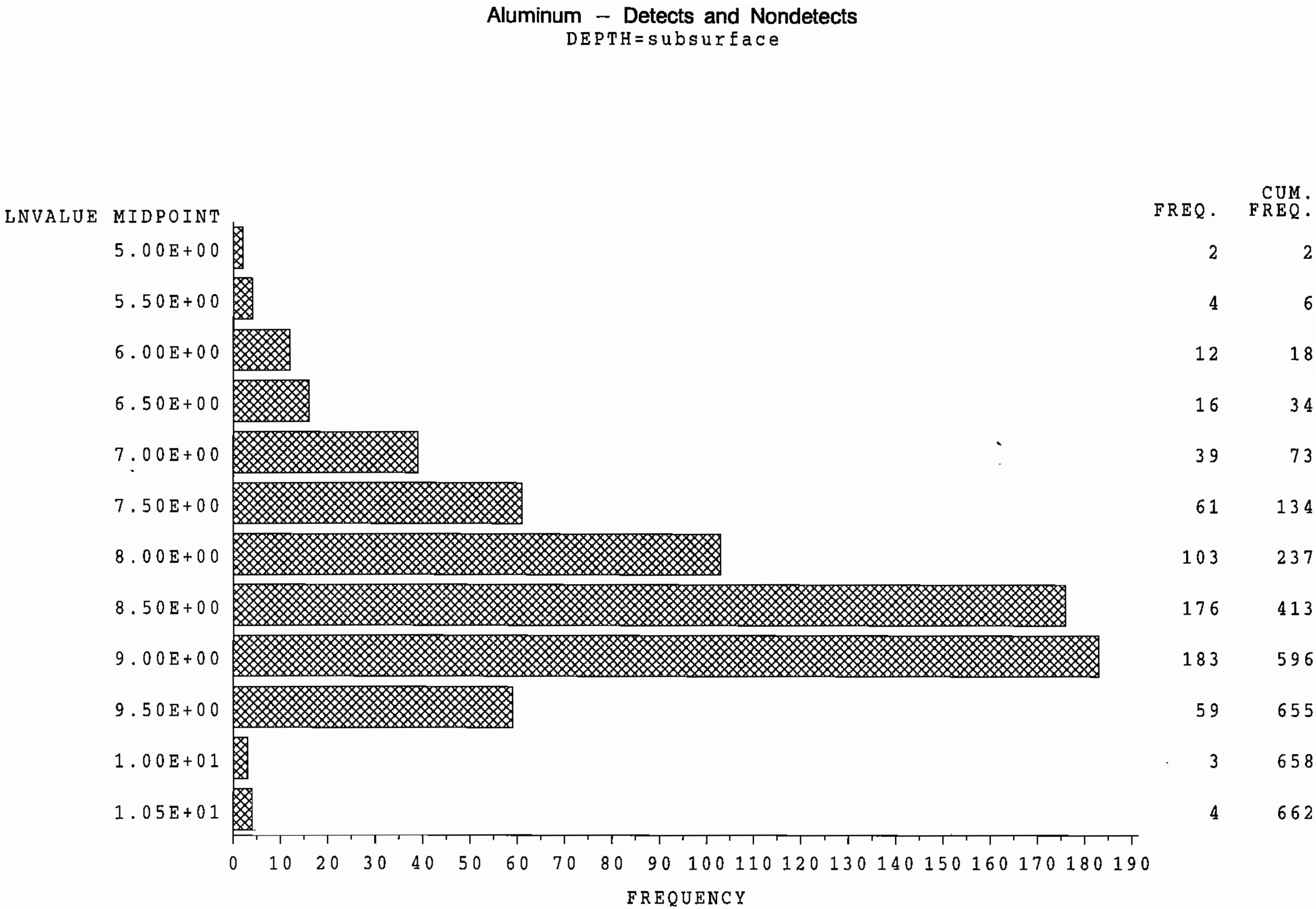


Figure 2.76. Histogram for Aluminum; All Observations; Subsurface Classification.

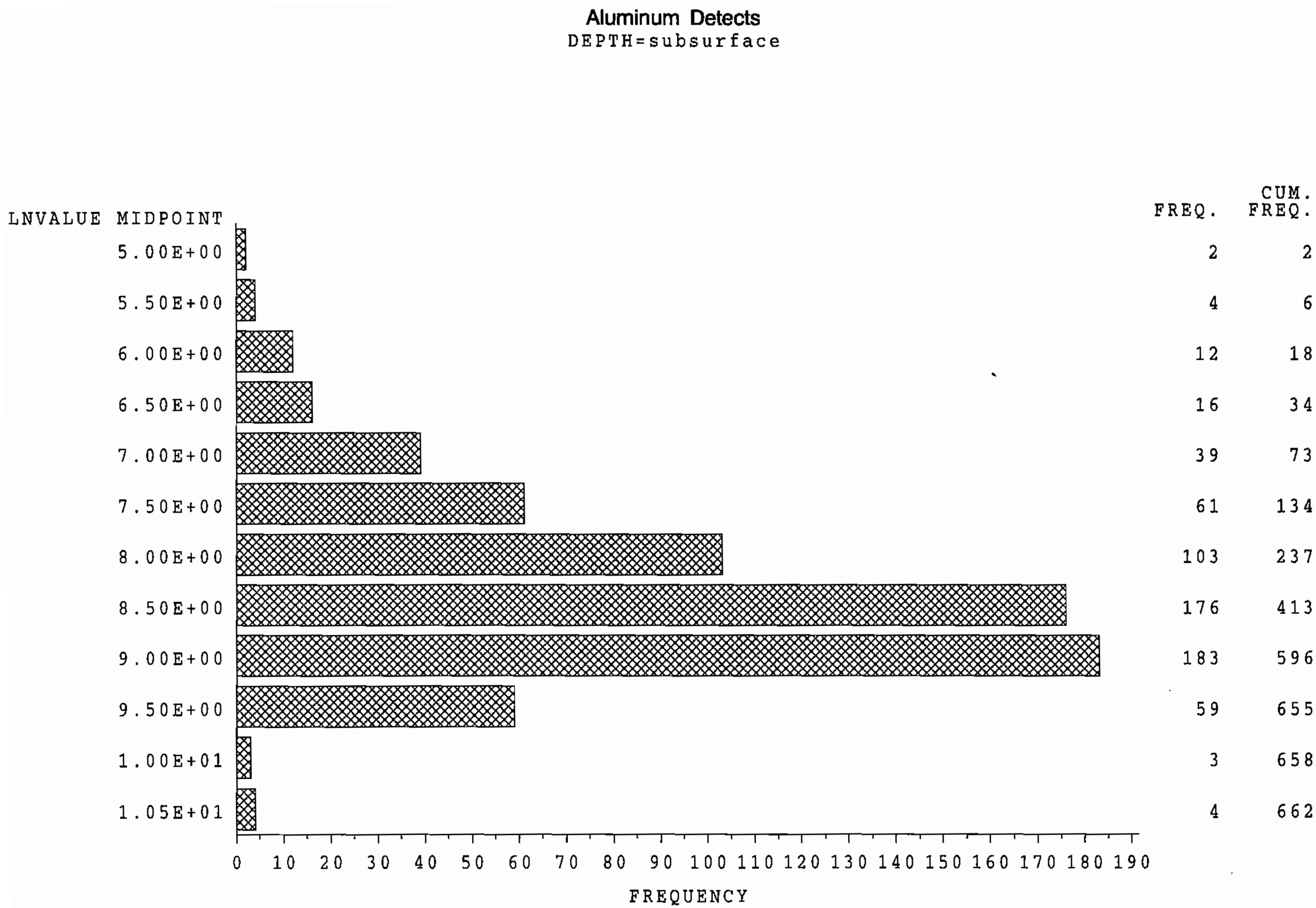


Figure 2.77. Histogram for Aluminum; Detected Observations; Subsurface Classification.

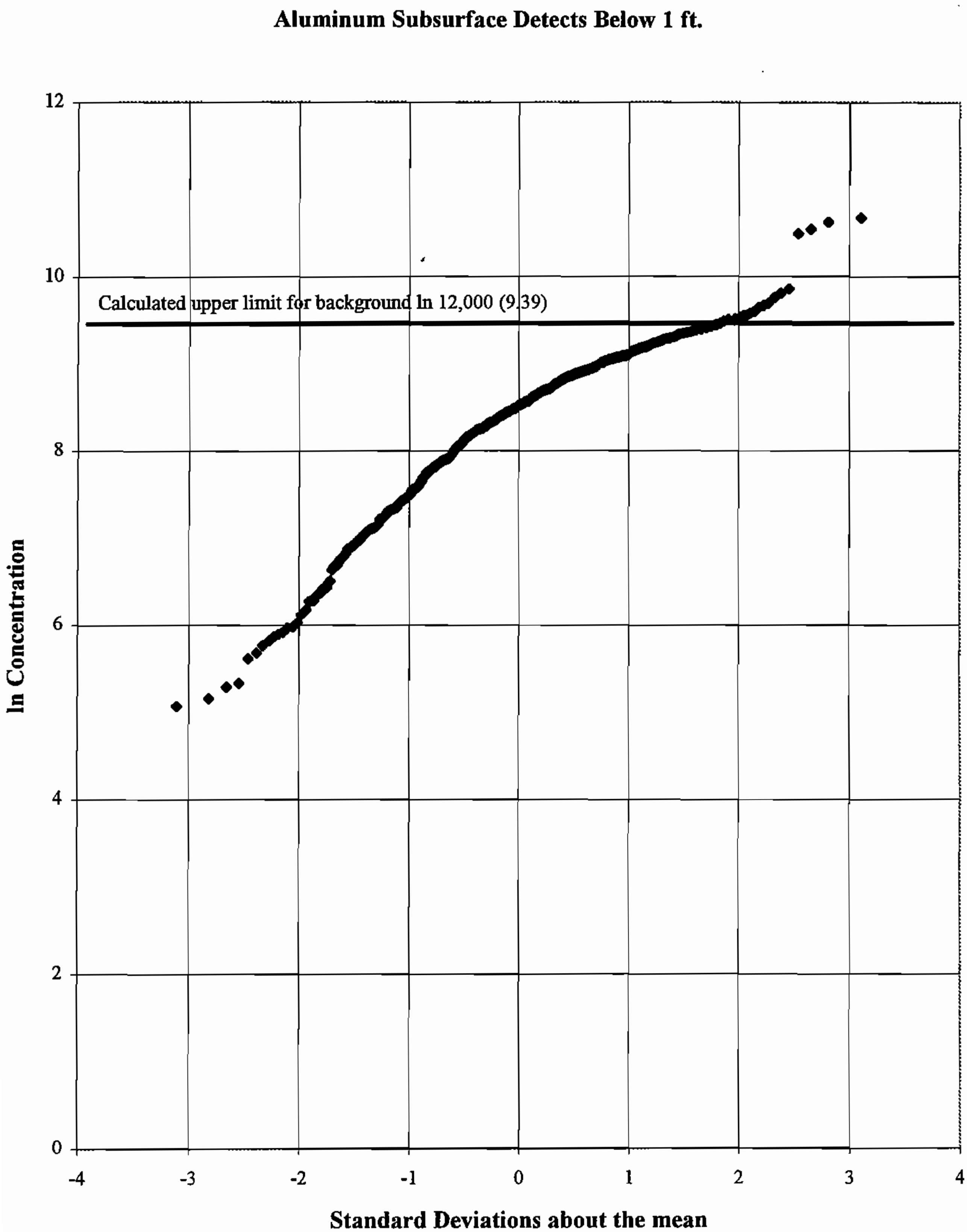


Figure 2.78. Cumulative Probability Plot for Aluminum; Detected Observations; Subsurface Classification.

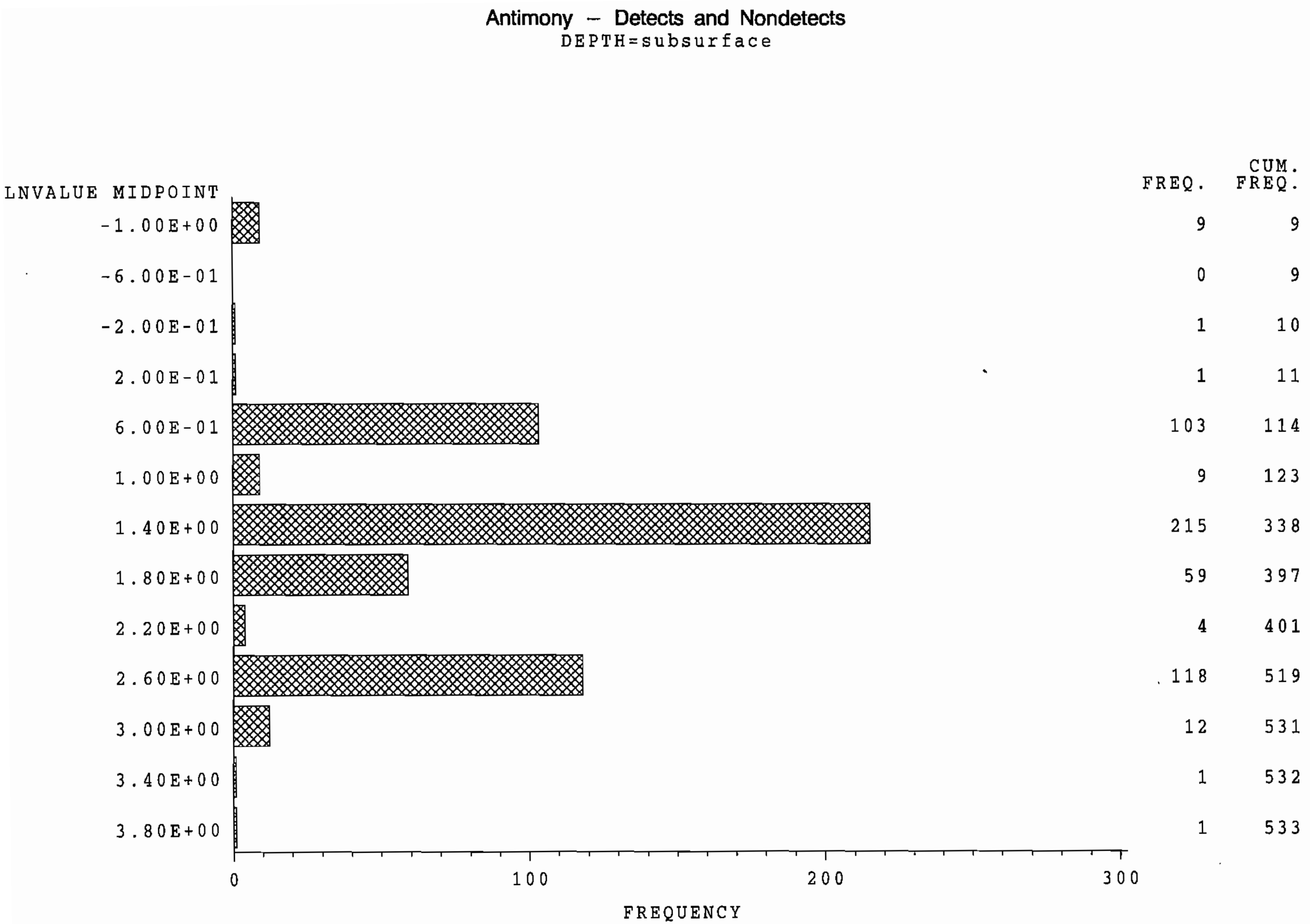


Figure 2.79. Histogram for Antimony; All Observations; Subsurface Classification.

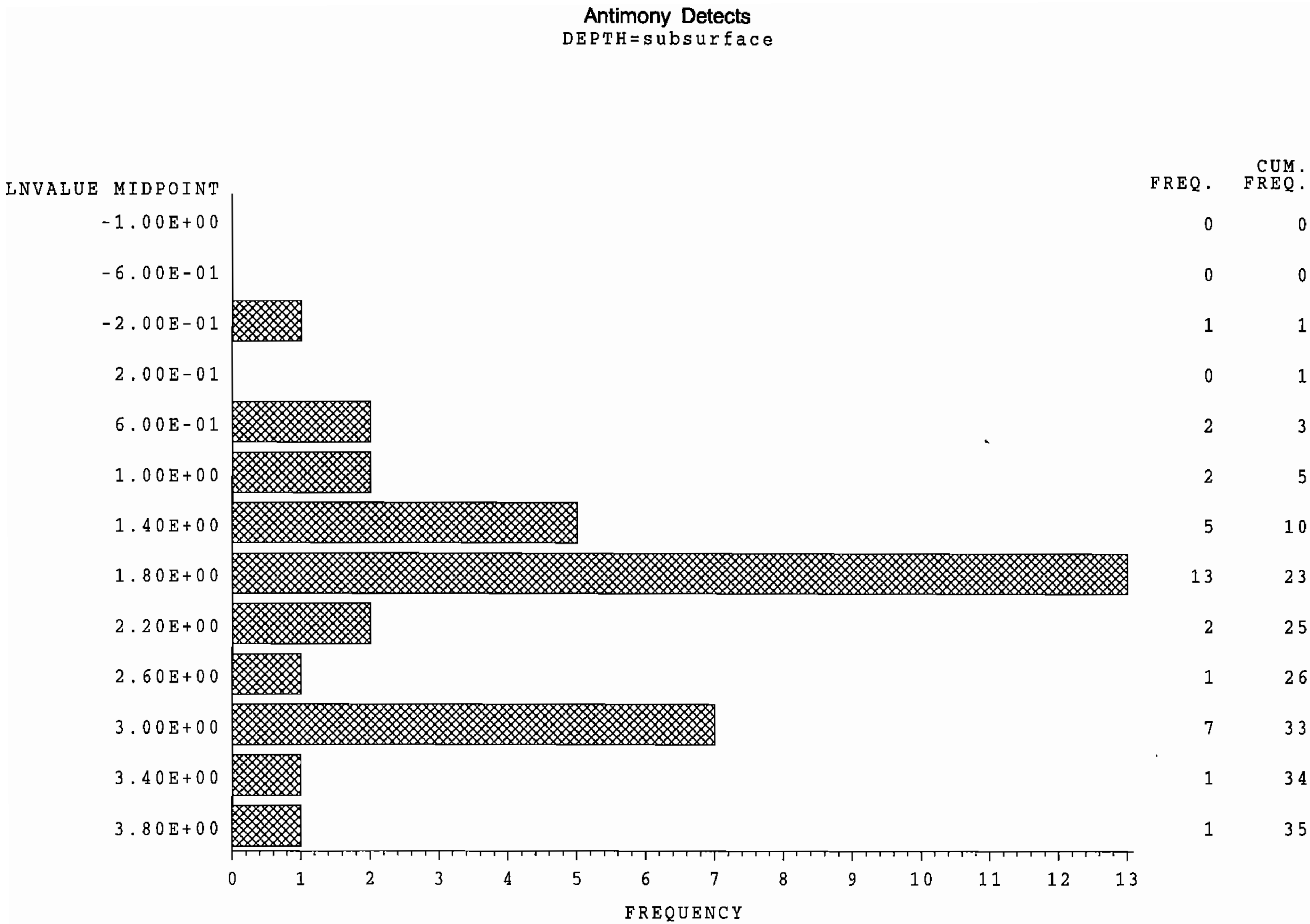


Figure 2.80. Histogram for Antimony; Detected Observations; Subsurface Classification.

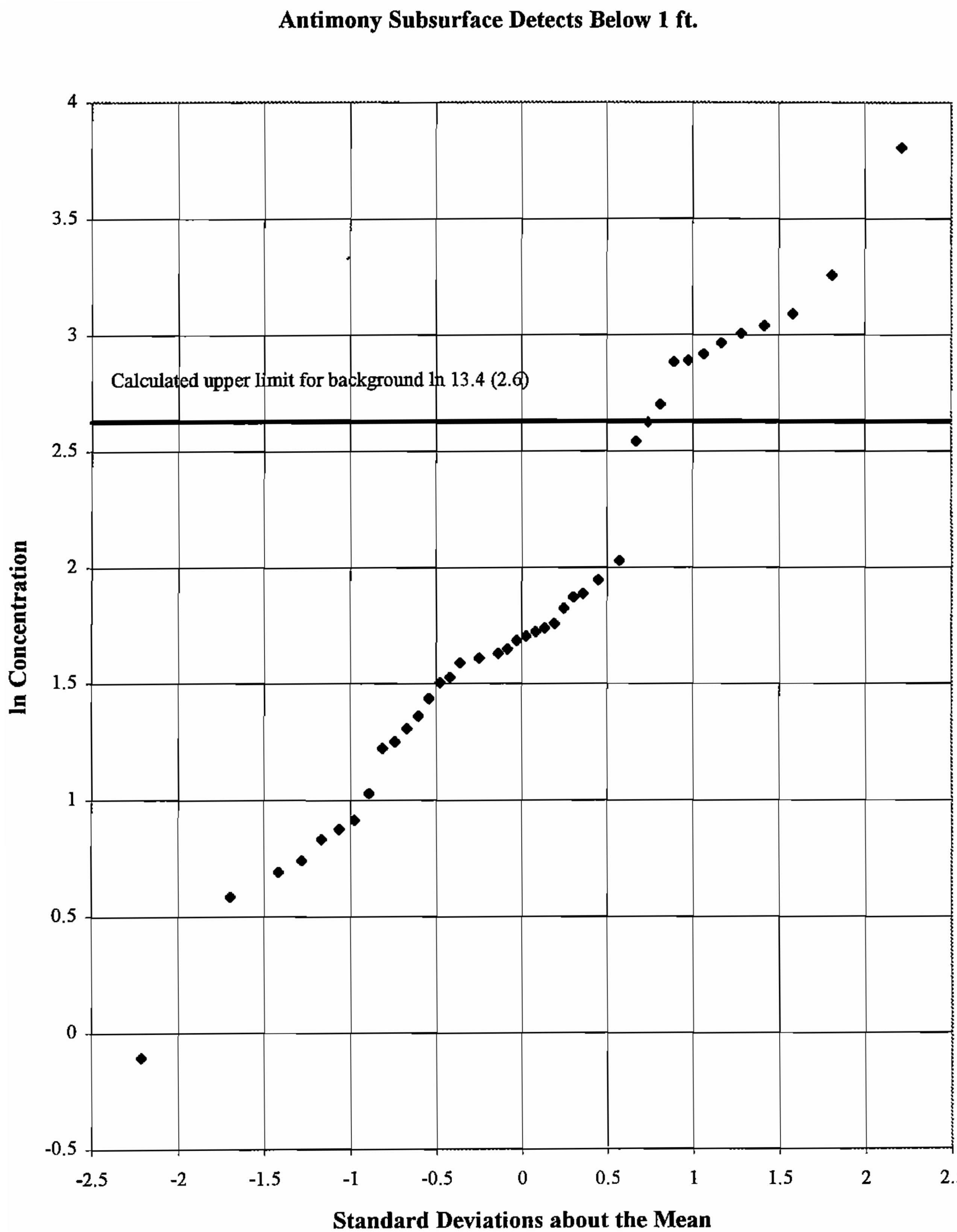


Figure 2.81. Cumulative Probability Plot for Antimony; Detected Observations; Subsurface Classification.

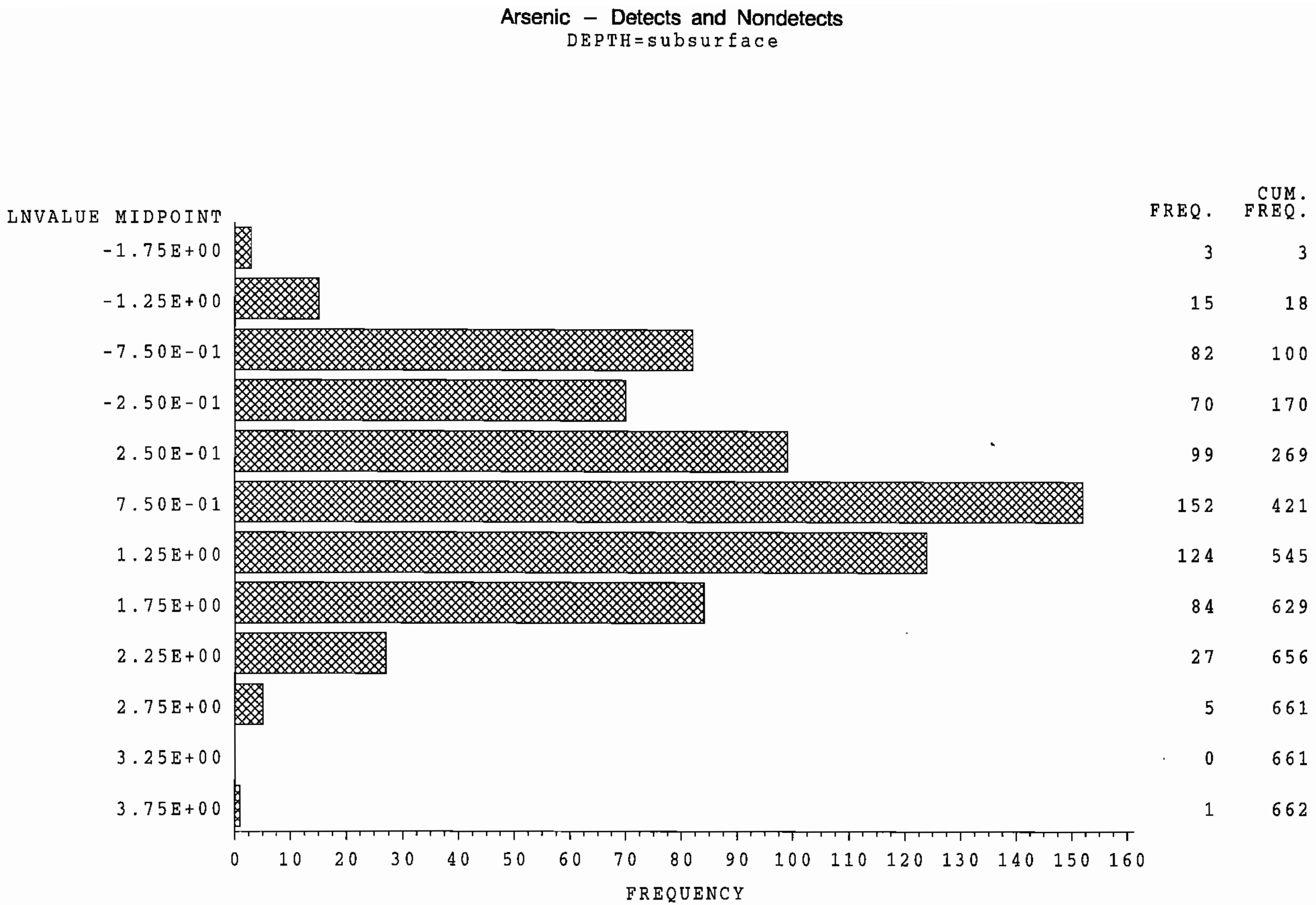
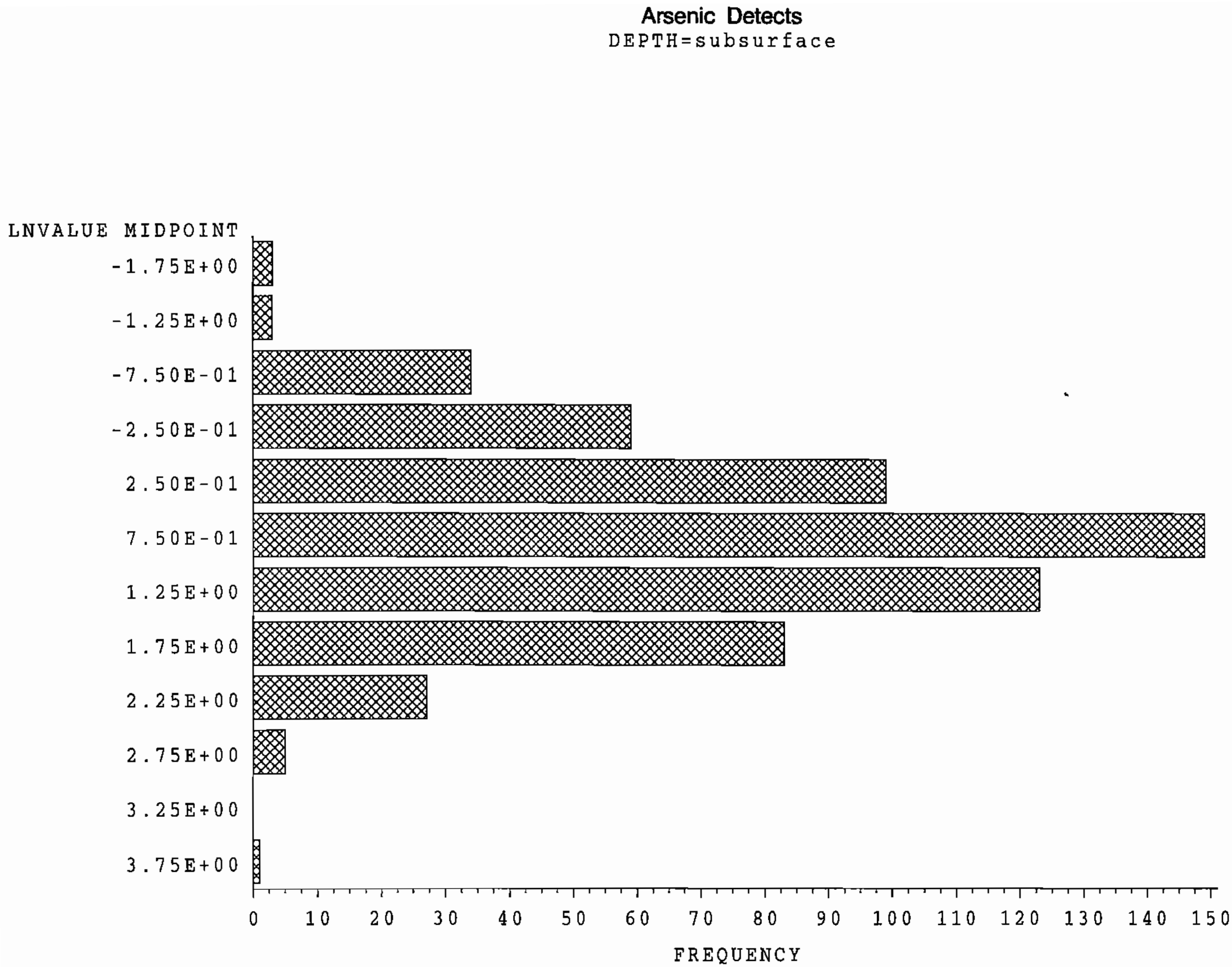


Figure 2.82. Histogram for Arsenic; All Observations; Subsurface Classification.



LNVALUE MIDPOINT	FREQ.	CUM. FREQ.
-1.75E+00	3	3
-1.25E+00	3	6
-7.50E-01	34	40
-2.50E-01	59	99
2.50E-01	99	198
7.50E-01	149	347
1.25E+00	123	470
1.75E+00	83	553
2.25E+00	27	580
2.75E+00	5	585
3.25E+00	0	585
3.75E+00	1	586

Figure 2.83. Histogram for Arsenic; Detected Observations; Subsurface Classification.

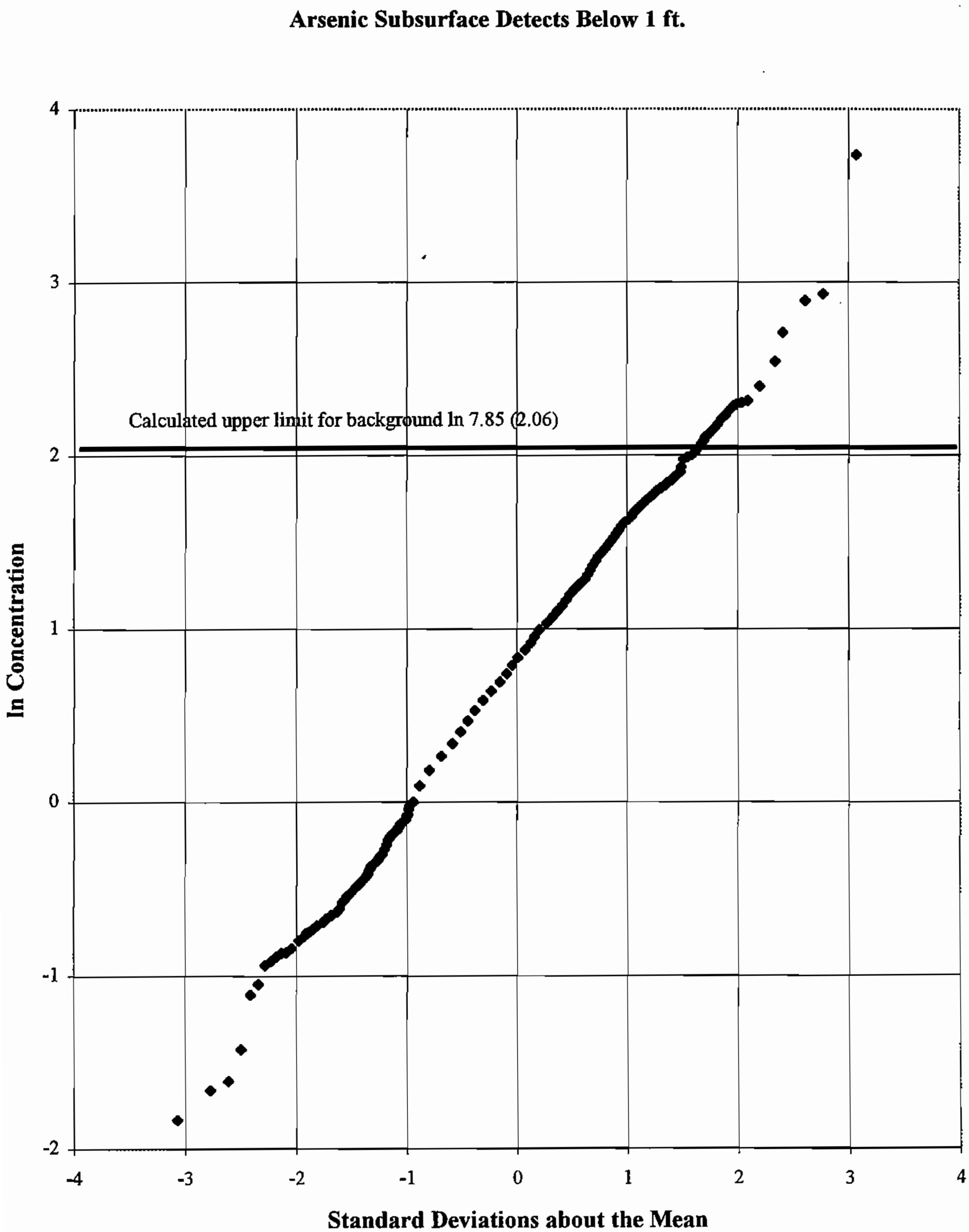


Figure 2.84. Cumulative Probability Plot for Arsenic; Detected Observations; Subsurface Classification.

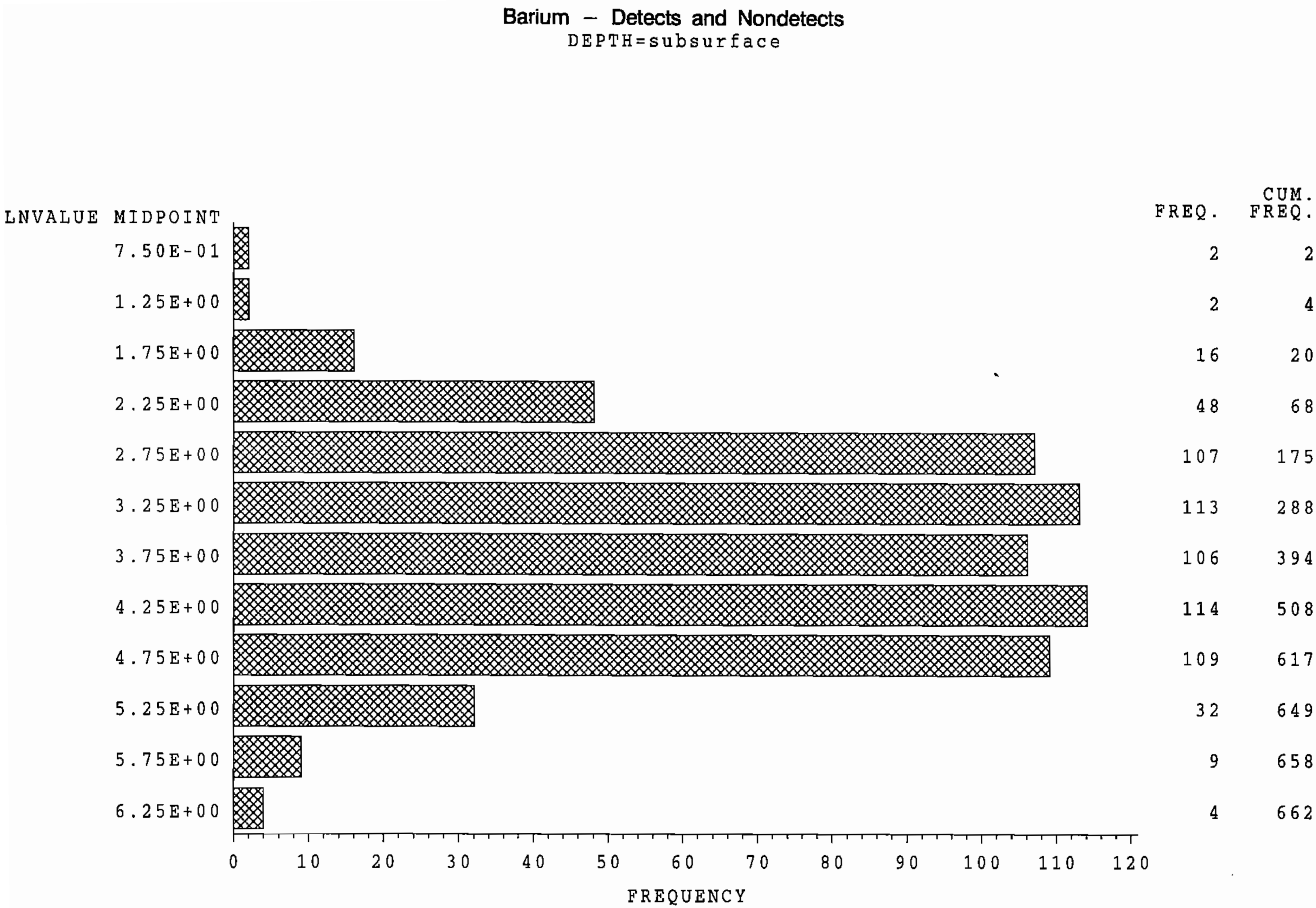


Figure 2.85. Histogram for Barium; All Observations; Subsurface Classification.

Barium Detects

DEPTH=subsurface

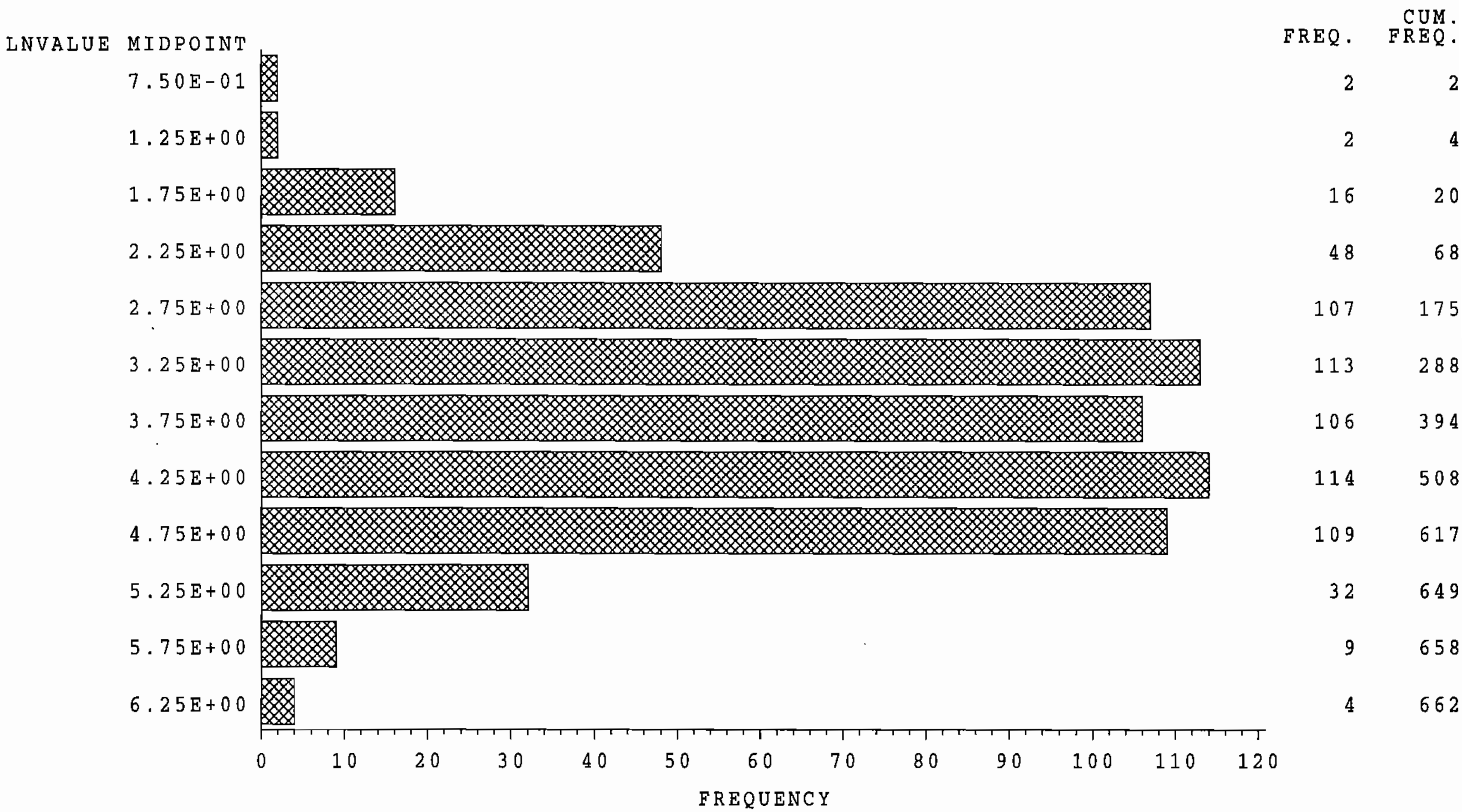


Figure 2.86. Histogram for Barium; Detected Observations; Subsurface Classification.

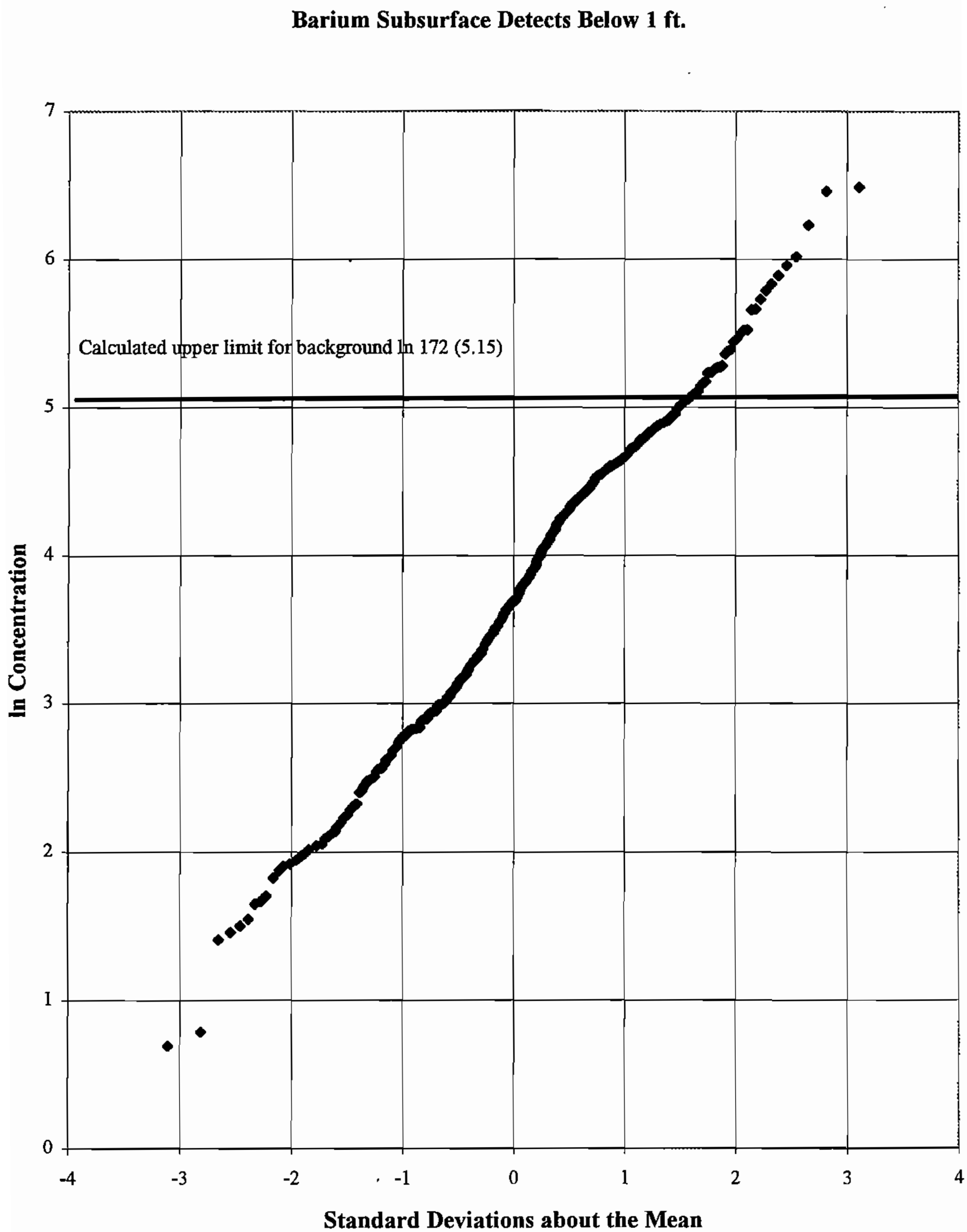


Figure 2.87. Cumulative Probability Plot for Barium; Detected Observations; Subsurface Classification.

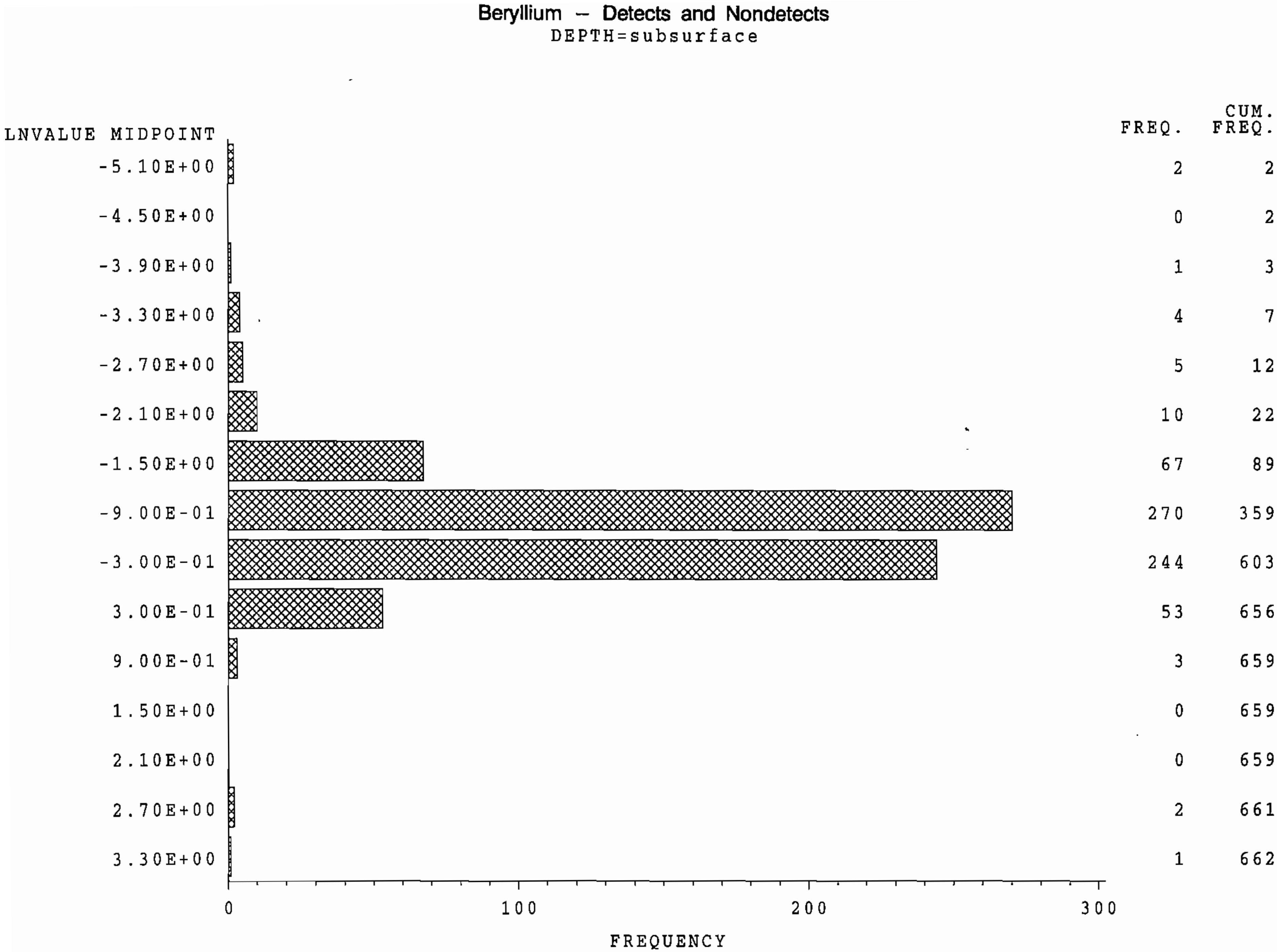


Figure 2.88. Histogram for Beryllium; All Observations; Subsurface Classification.

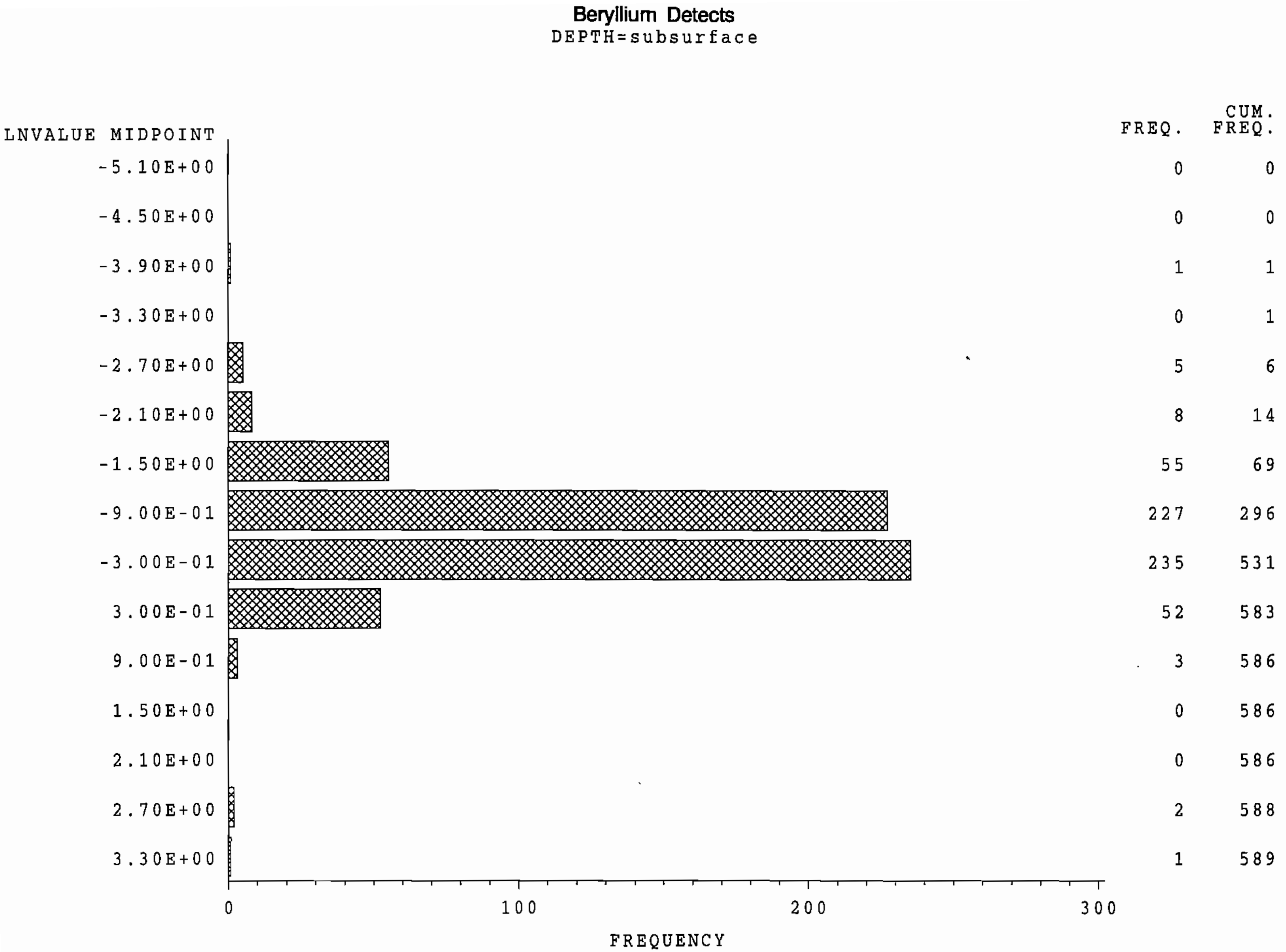


Figure 2.89. Histogram for Beryllium; Detected Observations; Subsurface Classification.

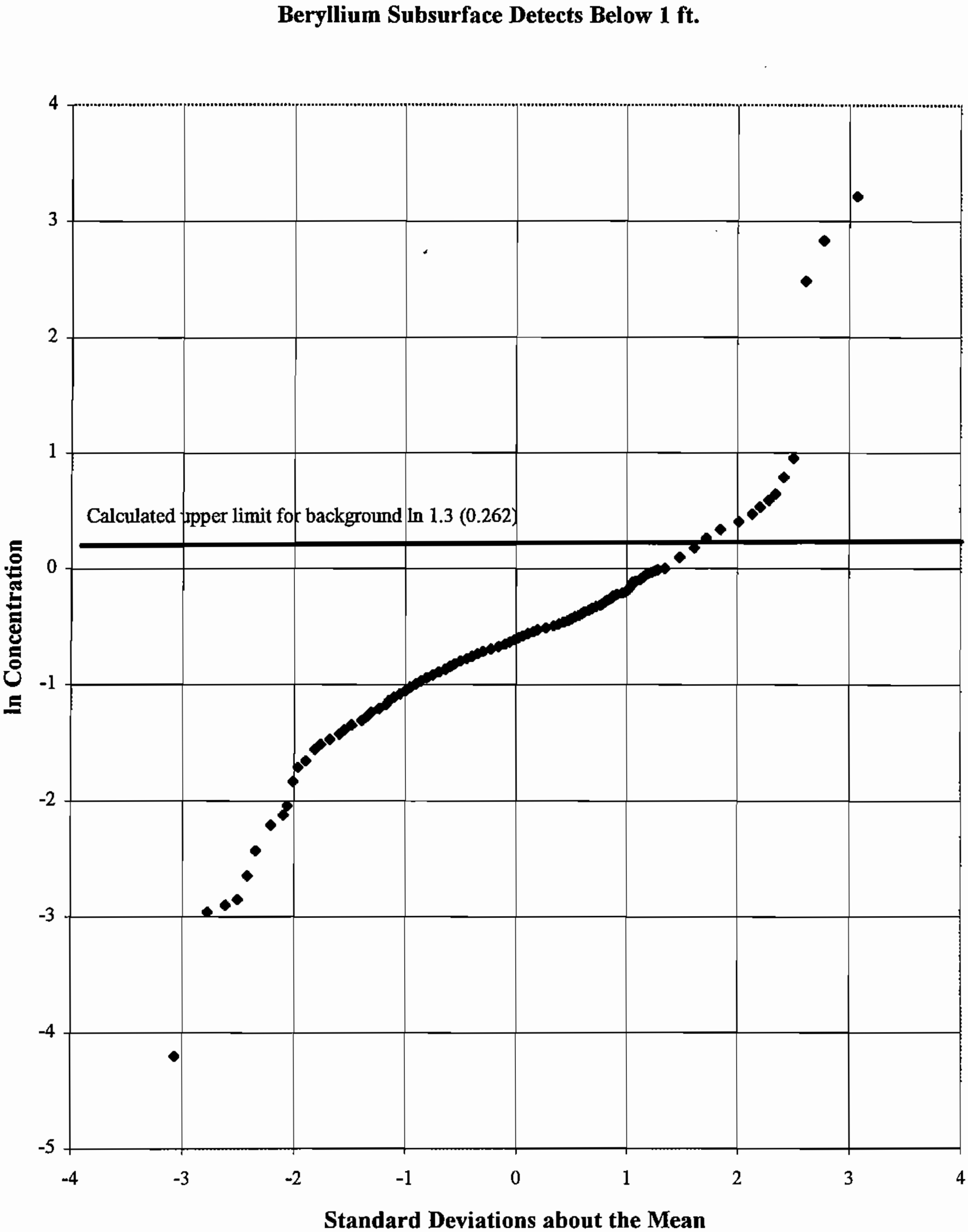


Figure 2.90. Cumulative Probability Plot for Beryllium; Detected Observations; Subsurface Classification.

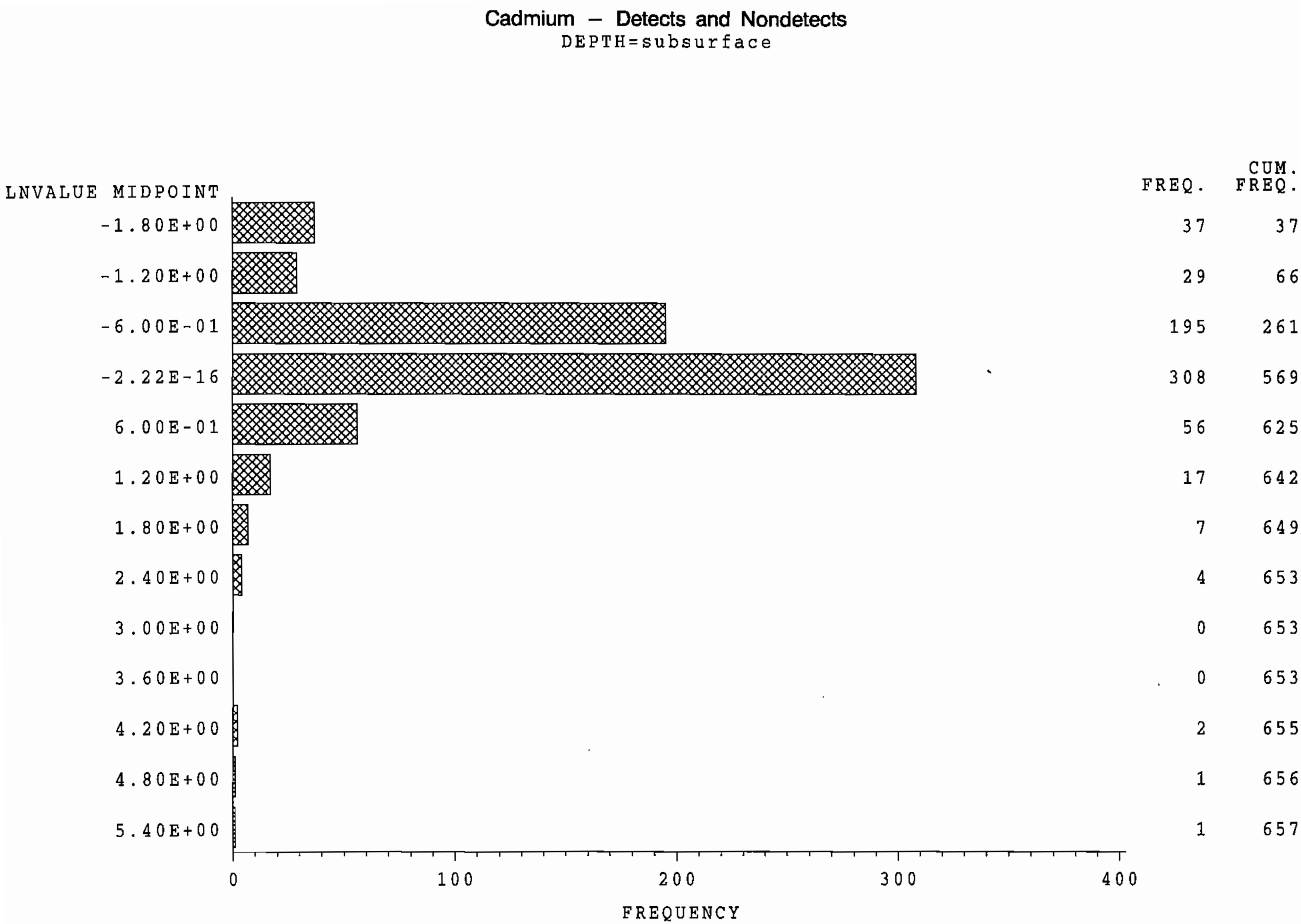


Figure 2.91. Histogram for Cadmium; All Observations; Subsurface Classification.

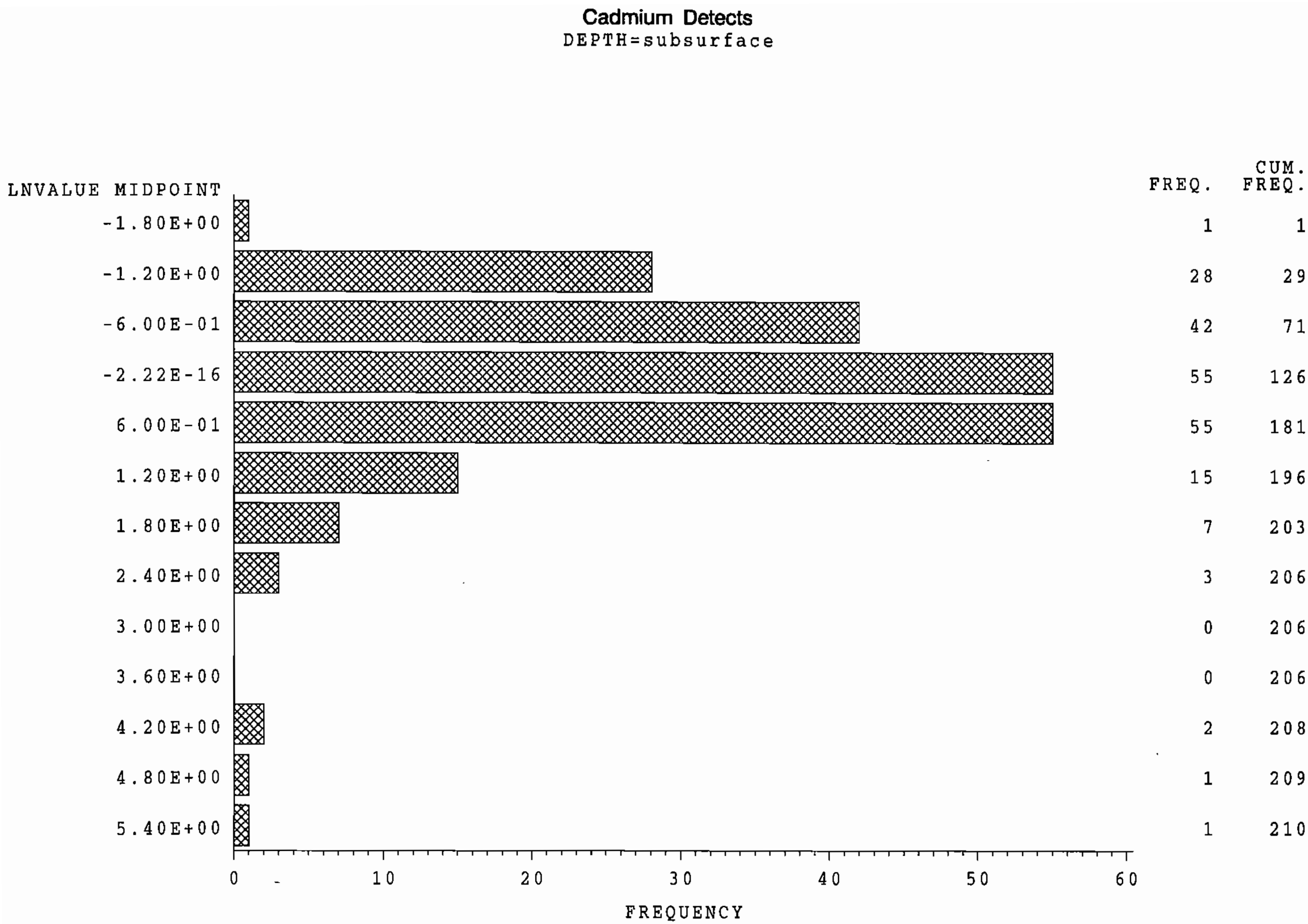


Figure 2.92. Histogram for Cadmium; Detected Observations; Subsurface Classification.

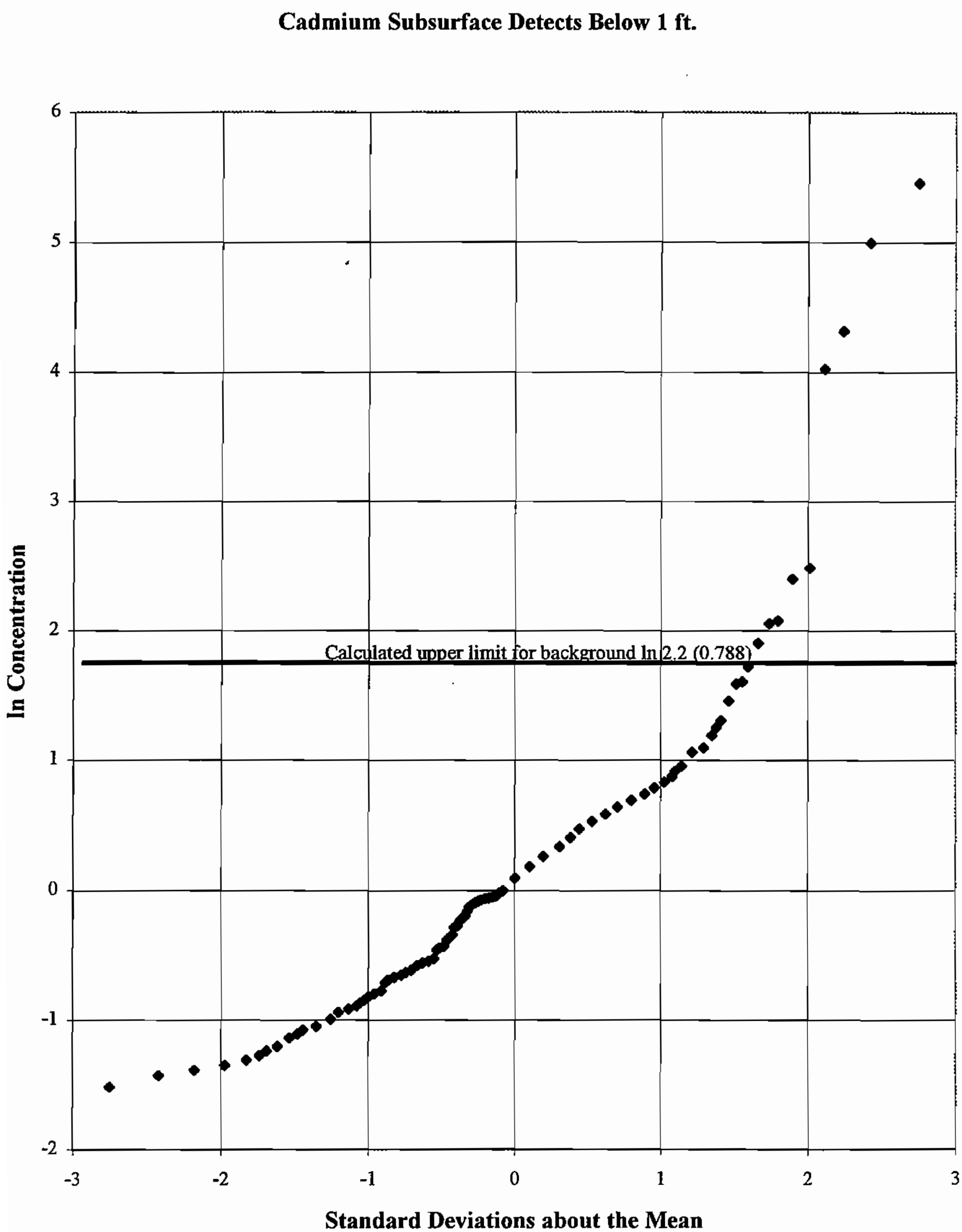


Figure 2.93. Cumulative Probability Plot for Cadmium; Detected Observations; Subsurface Classification.

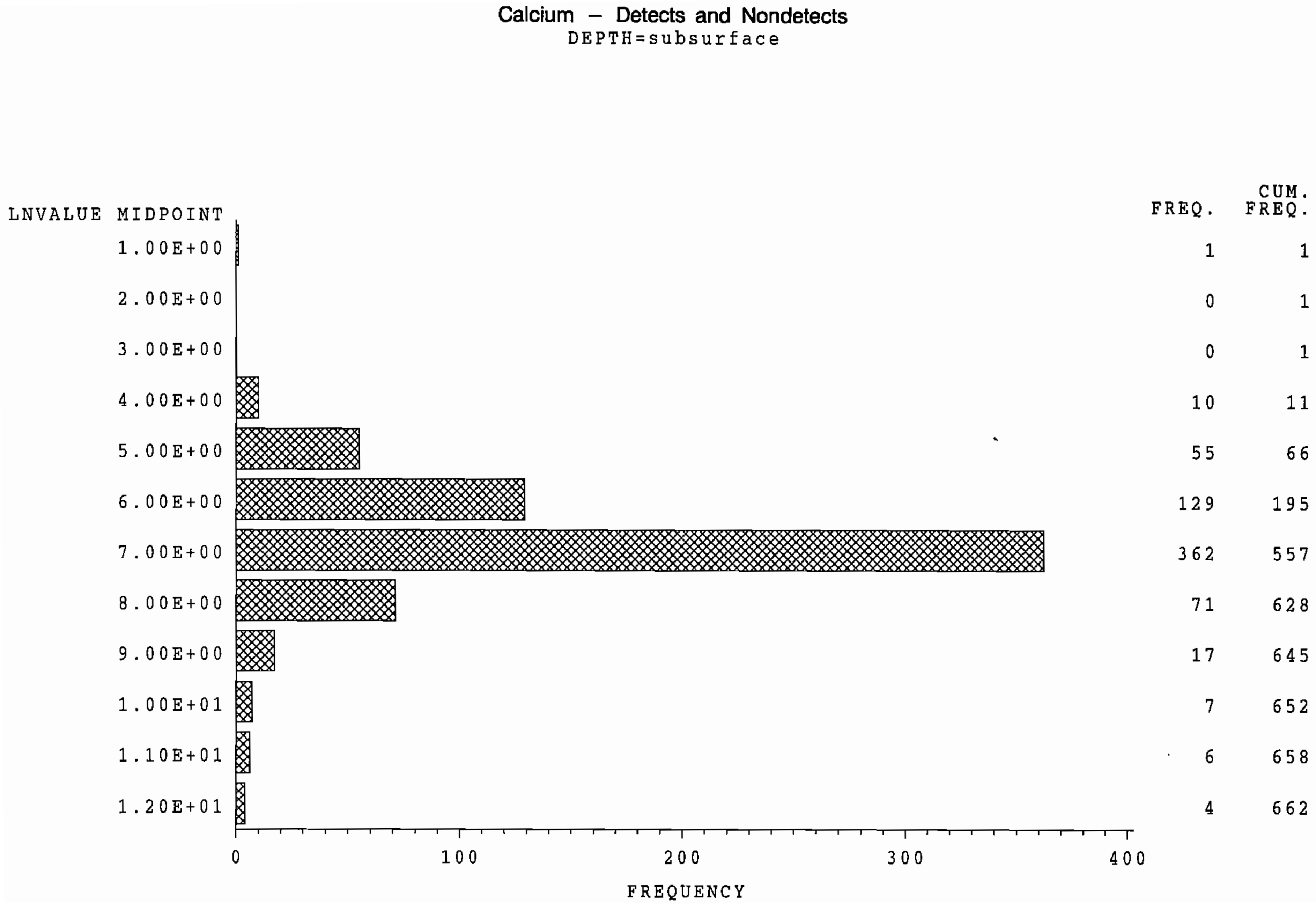


Figure 2.94. Histogram for Calcium; All Observations; Subsurface Classification.

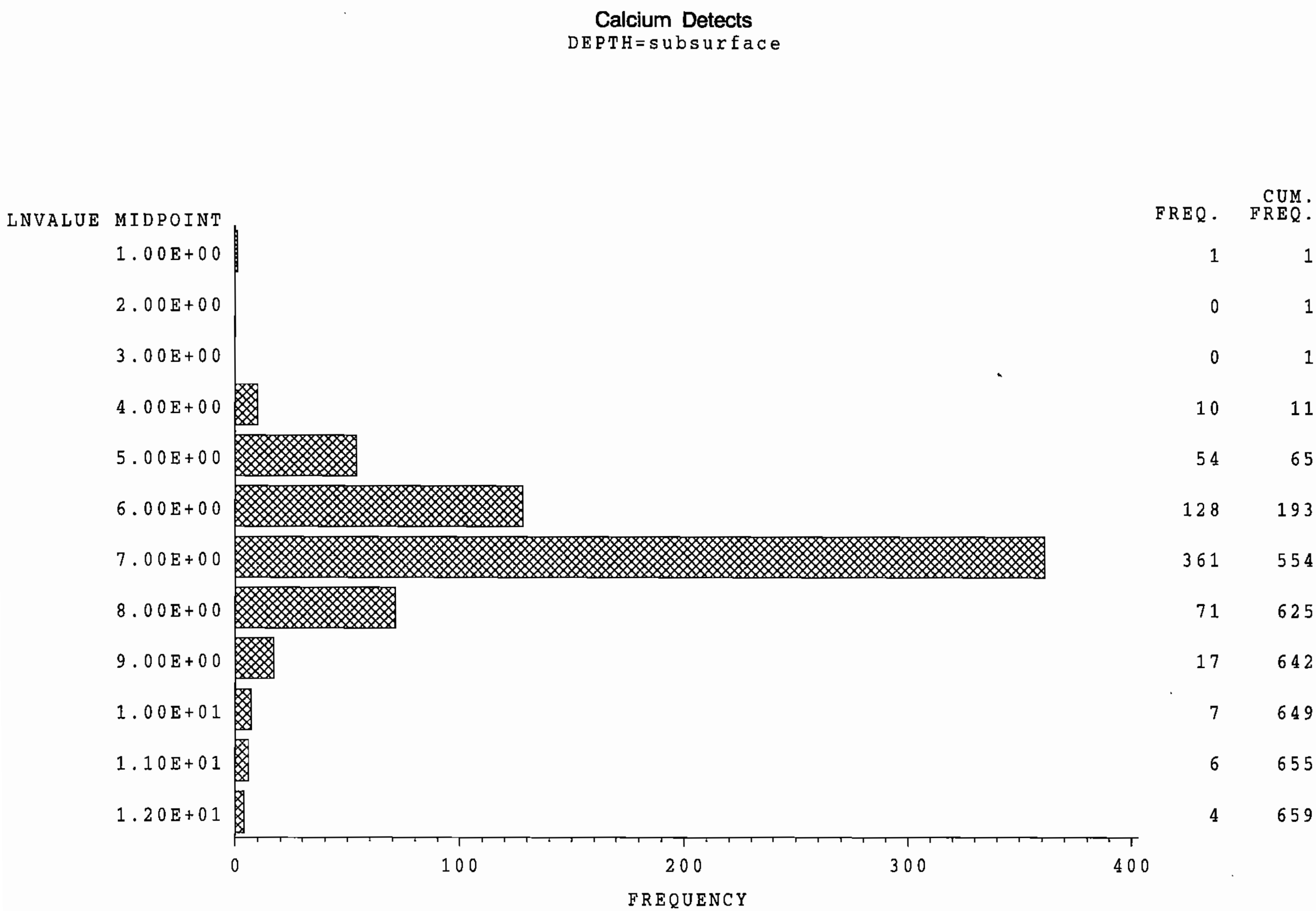


Figure 2.95. Histogram for Calcium; Detected Observations; Subsurface Classification.

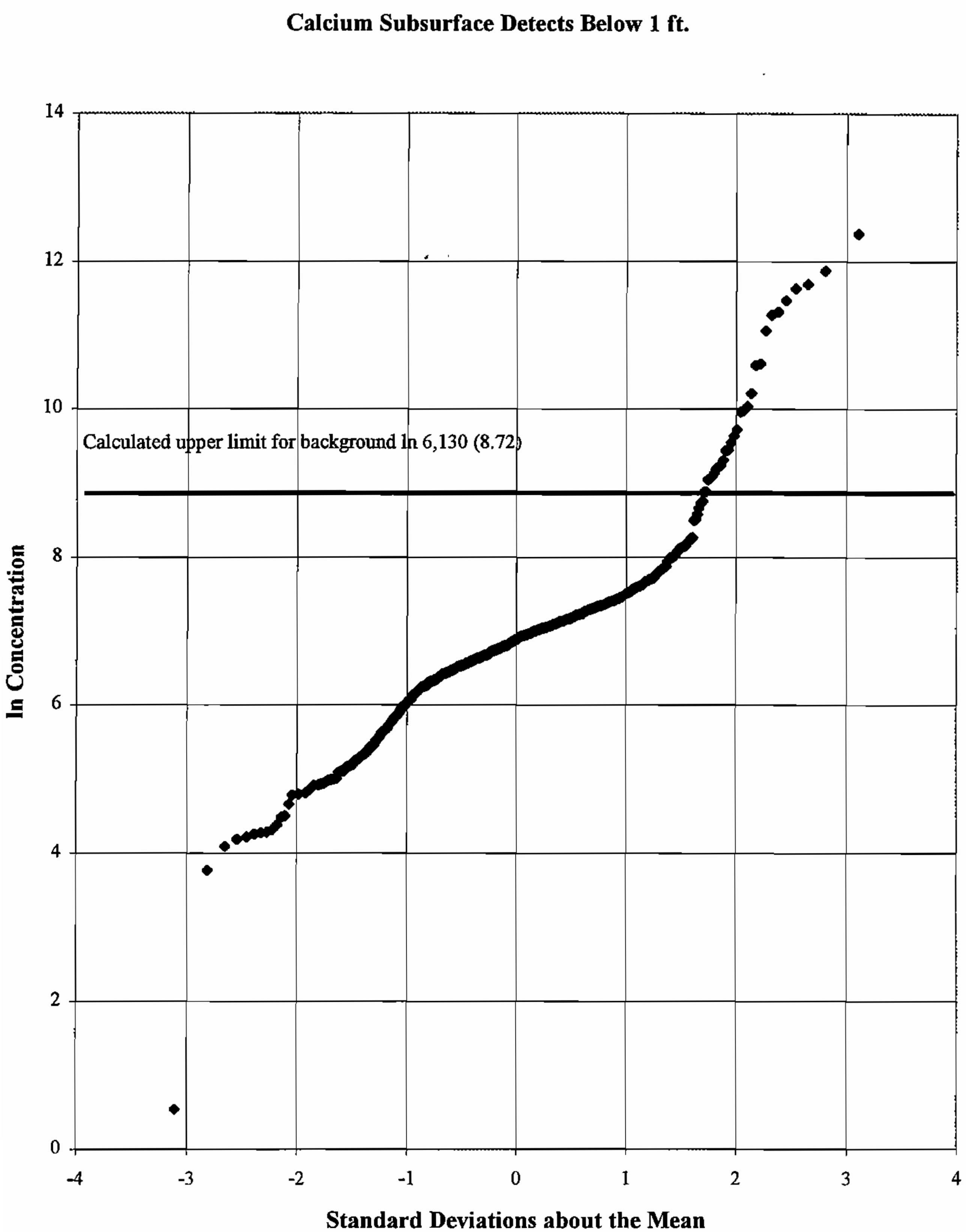


Figure 2.96. Cumulative Probability Plot for Calcium; Detected Observations; Subsurface Classification.

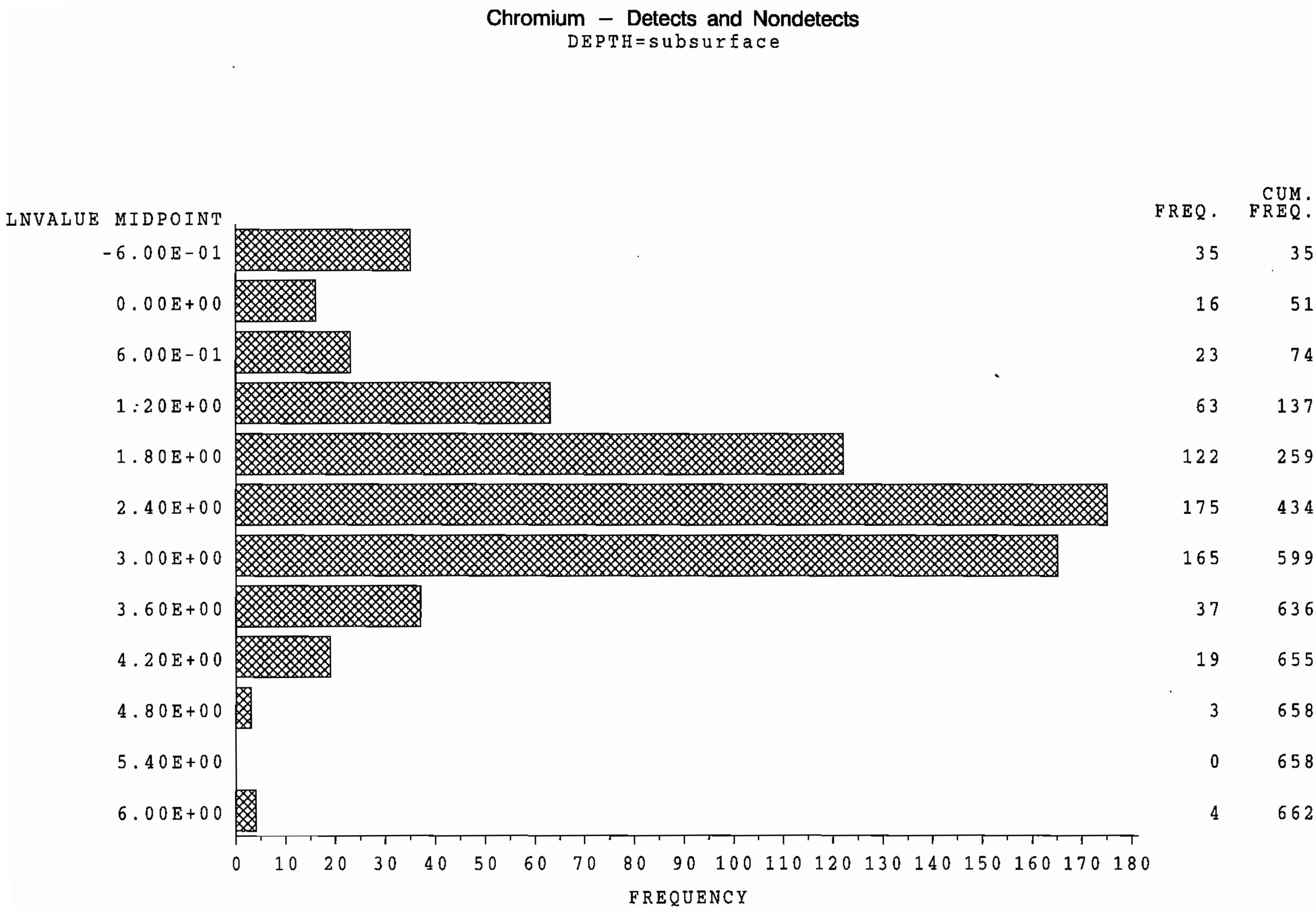


Figure 2.97. Histogram for Chromium; All Observations; Subsurface Classification.

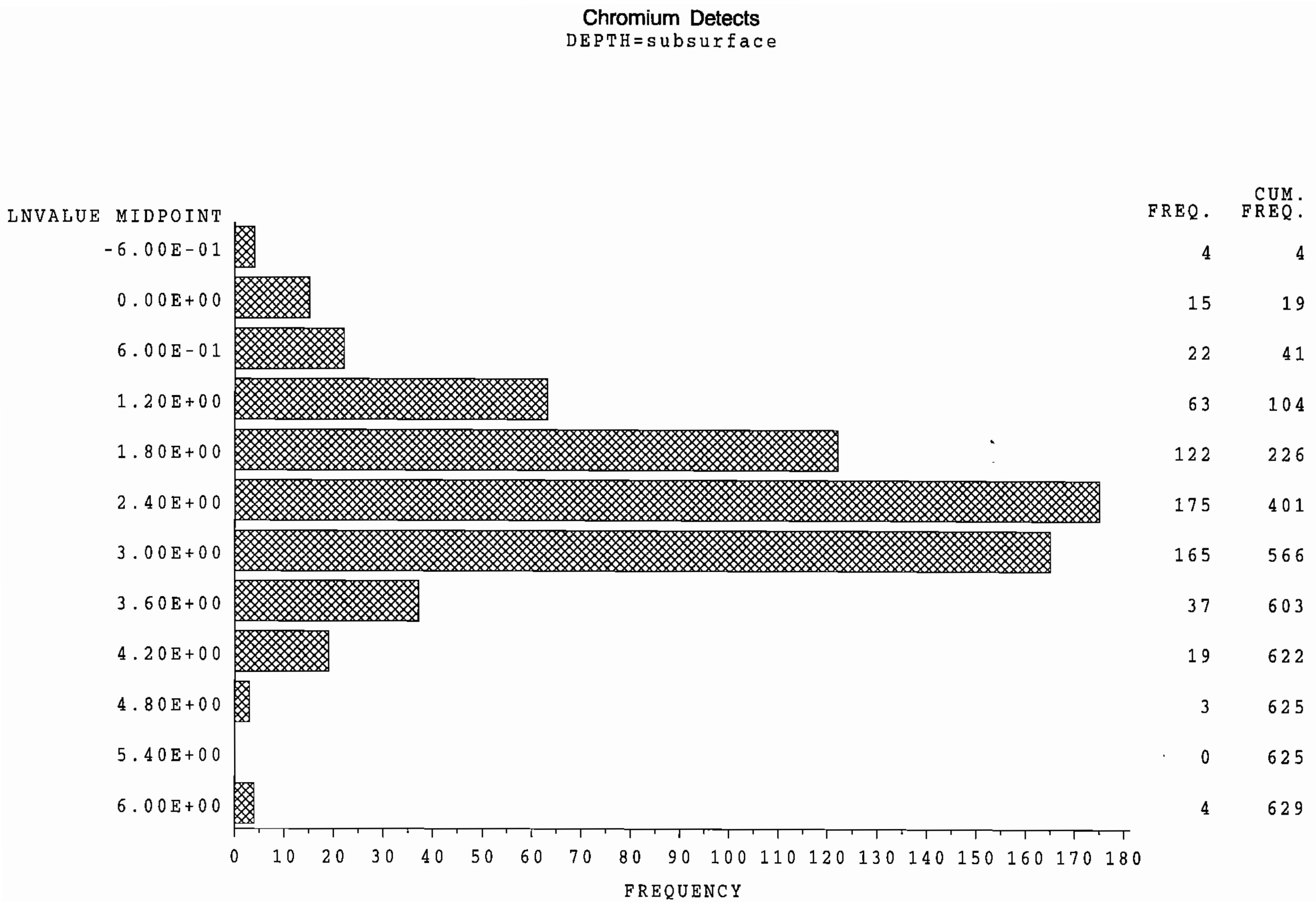


Figure 2.98. Histogram for Chromium; Detected Observations; Subsurface Classification.

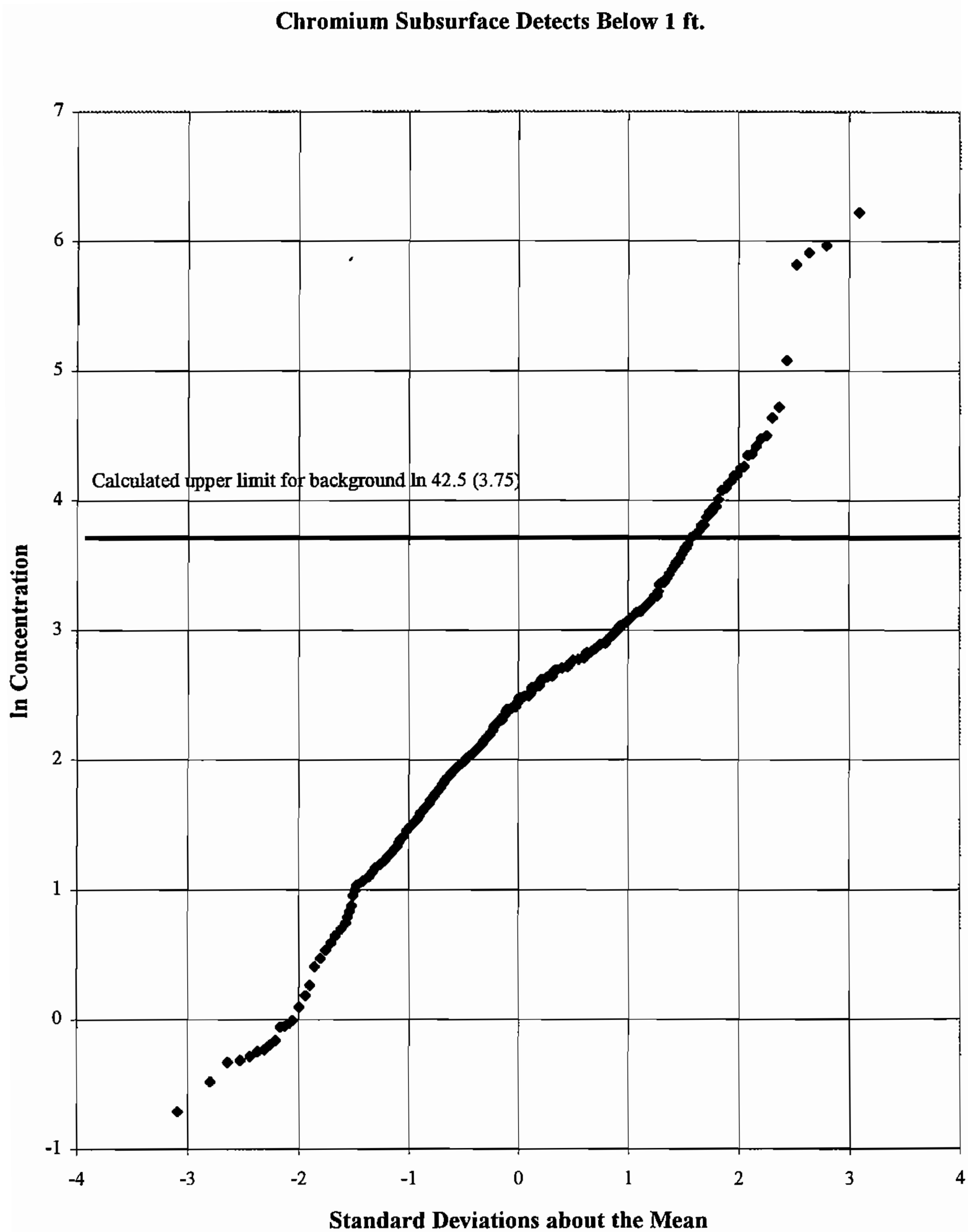


Figure 2.99. Cumulative Probability Plot for Chromium; Detected Observations; Subsurface Classification.

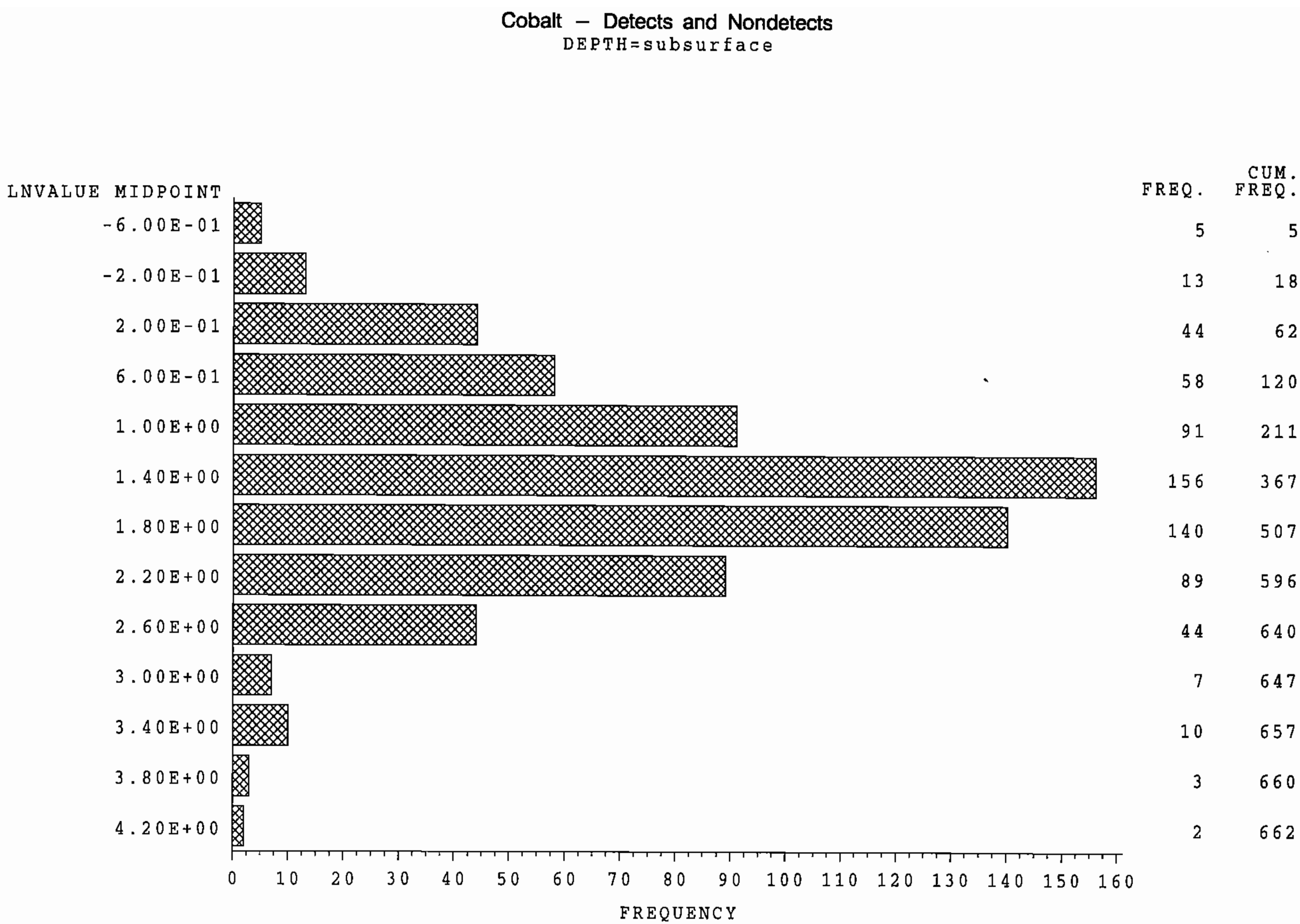


Figure 2.100. Histogram for Cobalt; All Observations; Subsurface Classification.

Cobalt Detects
DEPTH=subsurface

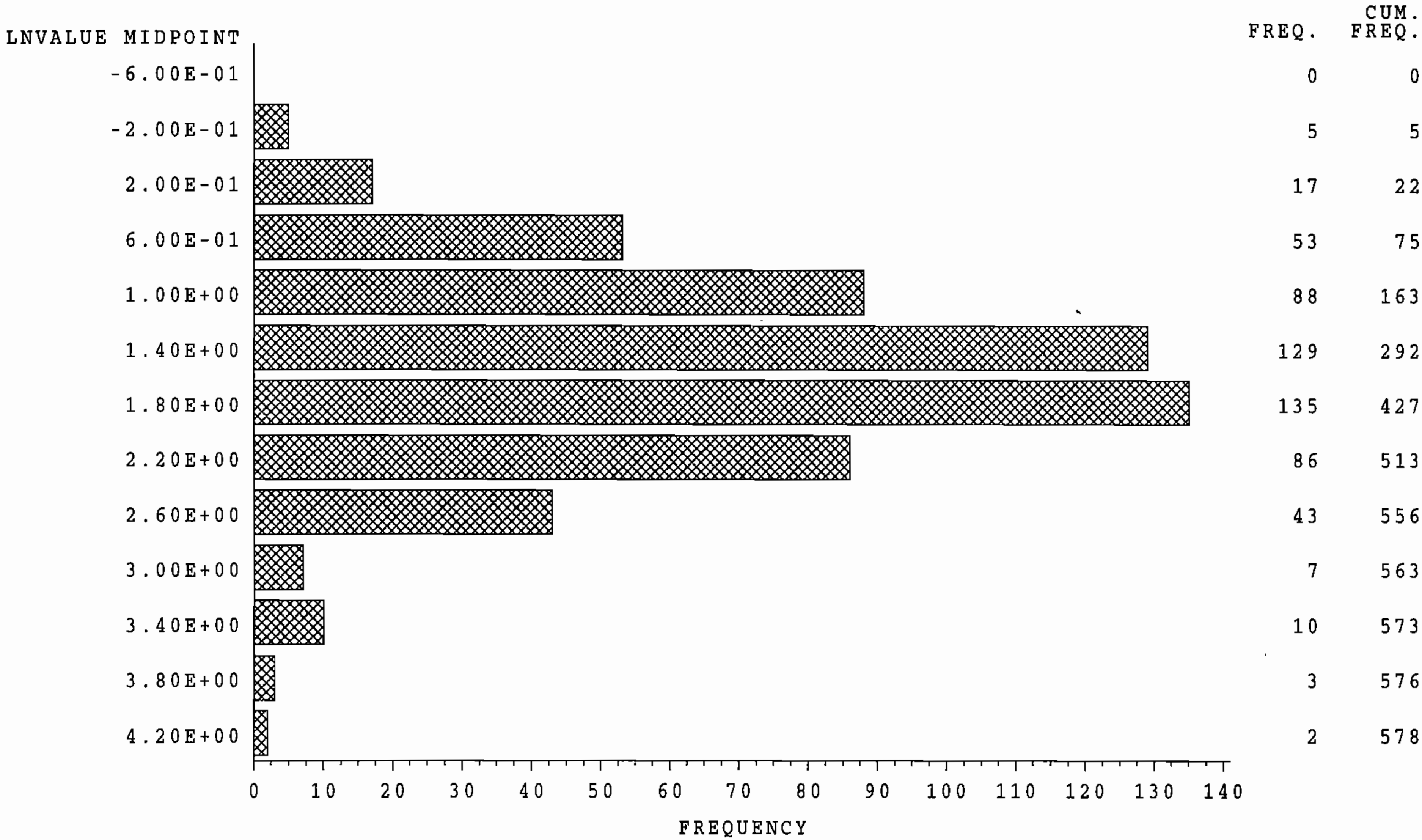


Figure 2.101. Histogram for Cobalt; Detected Observations; Subsurface Classification.

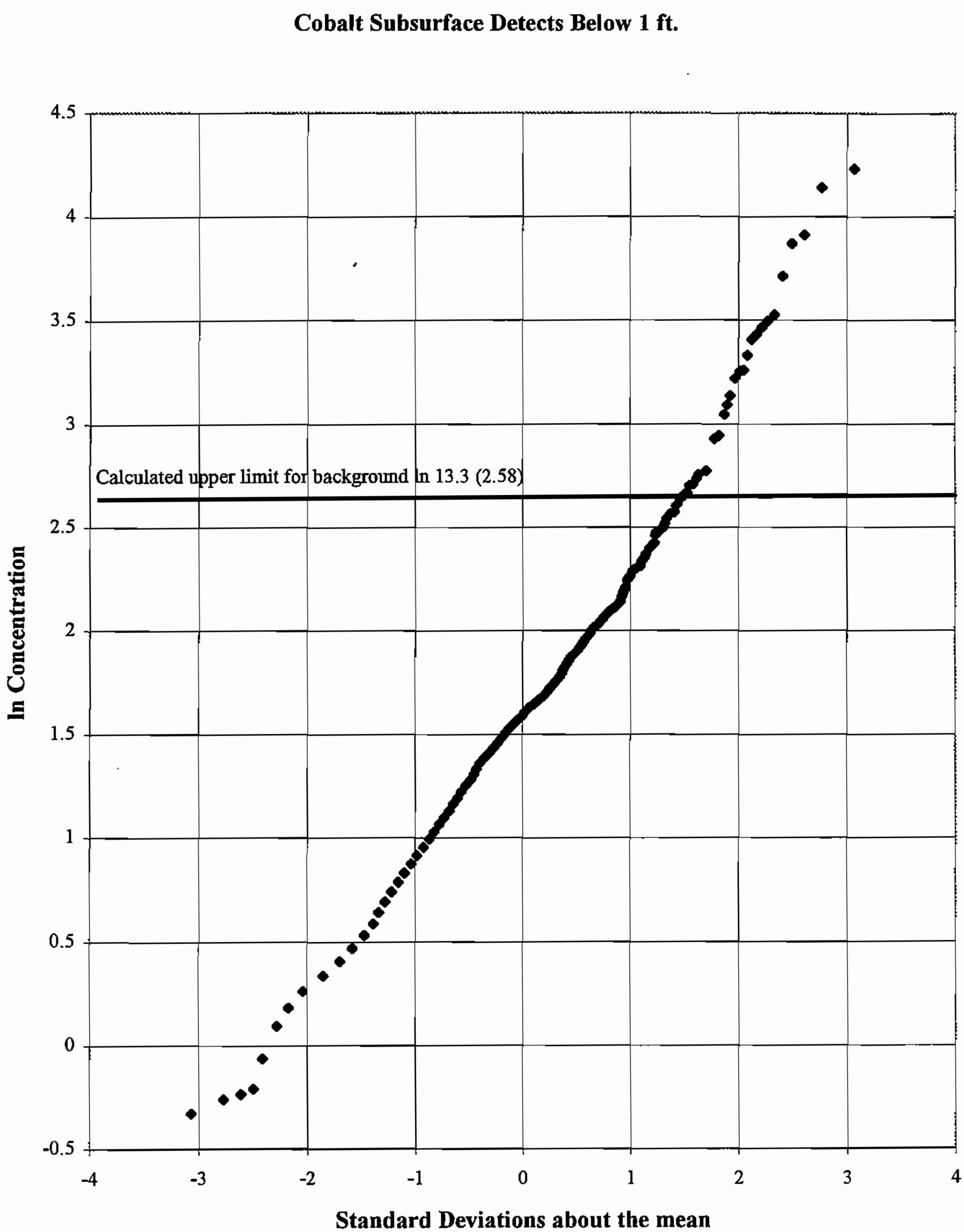
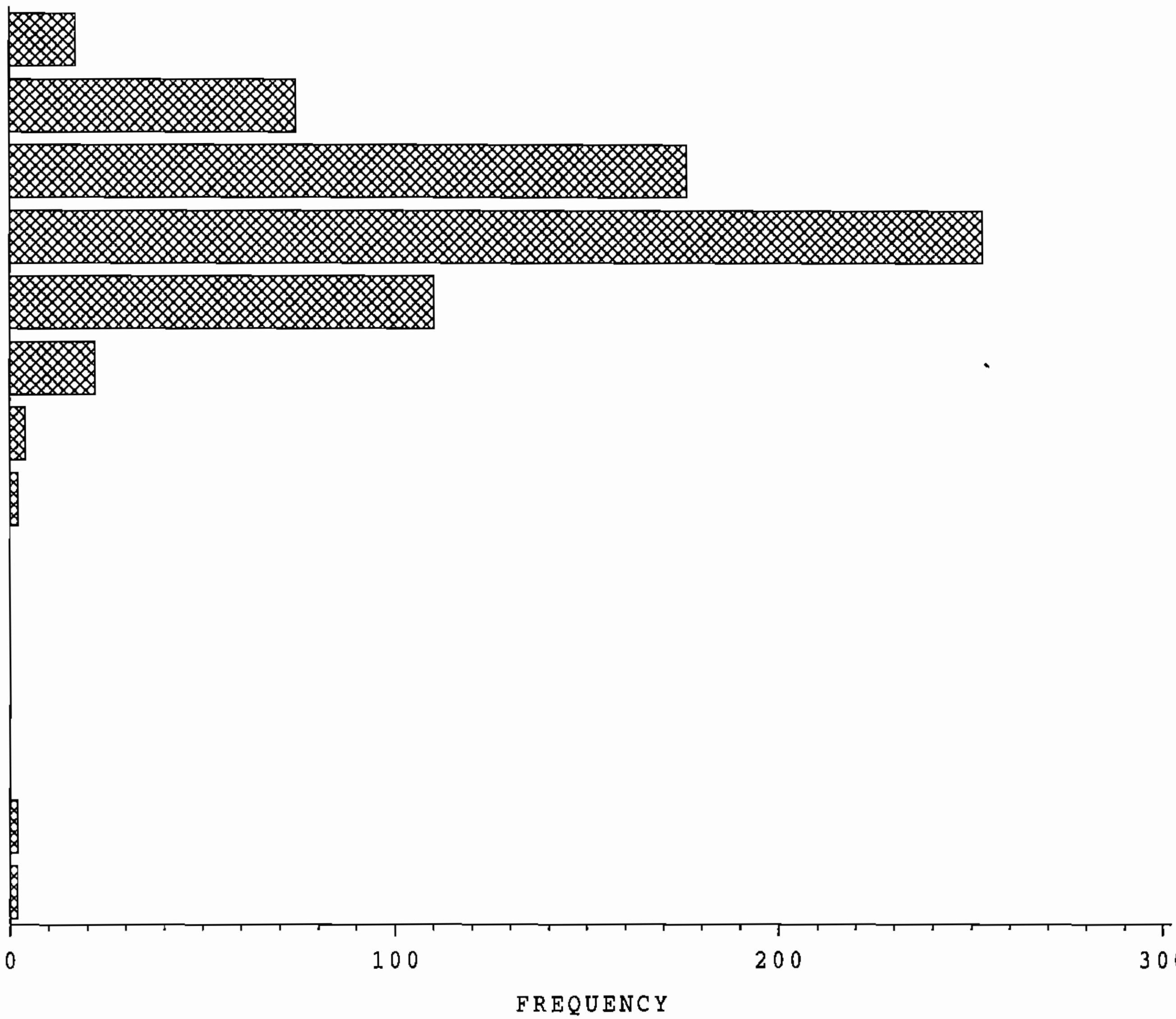


Figure 2.102. Cumulative Probability Plot for Cobalt; Detected Observations; Subsurface Classification.

Copper -- Detects and Nondetects

DEPTH=subsurface



LNVALUE MIDPOINT	FREQ.	CUM. FREQ.
-4.00E-01	17	17
4.00E-01	74	91
1.20E+00	176	267
2.00E+00	253	520
2.80E+00	110	630
3.60E+00	22	652
4.40E+00	4	656
5.20E+00	2	658
6.00E+00	0	658
6.80E+00	0	658
7.60E+00	0	658
8.40E+00	0	658
9.20E+00	2	660
1.00E+01	2	662

Figure 2.103. Histogram for Copper; All Observations; Subsurface Classification.

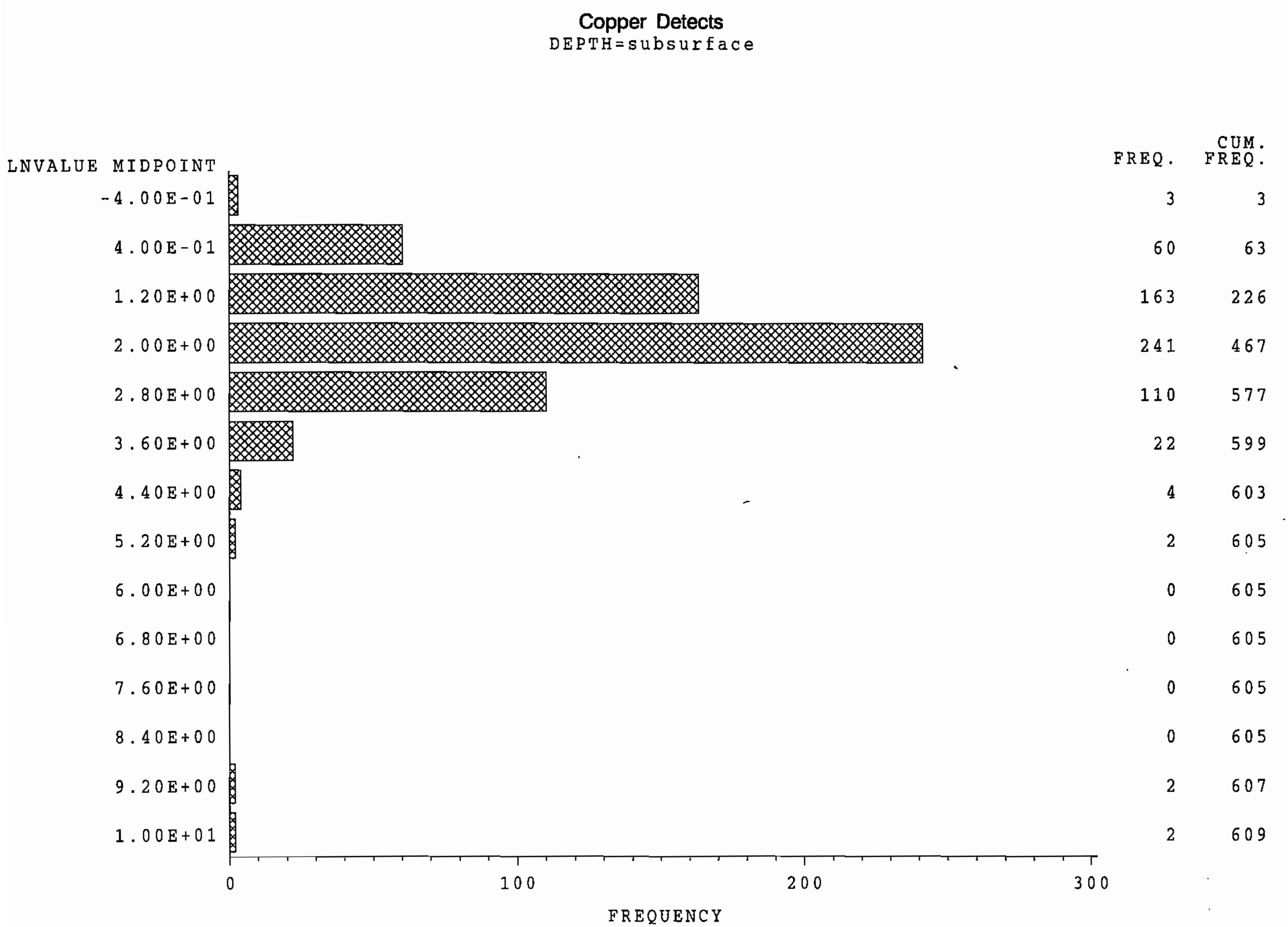


Figure 2.104. Histogram for Copper; Detected Observations; Subsurface Classification.

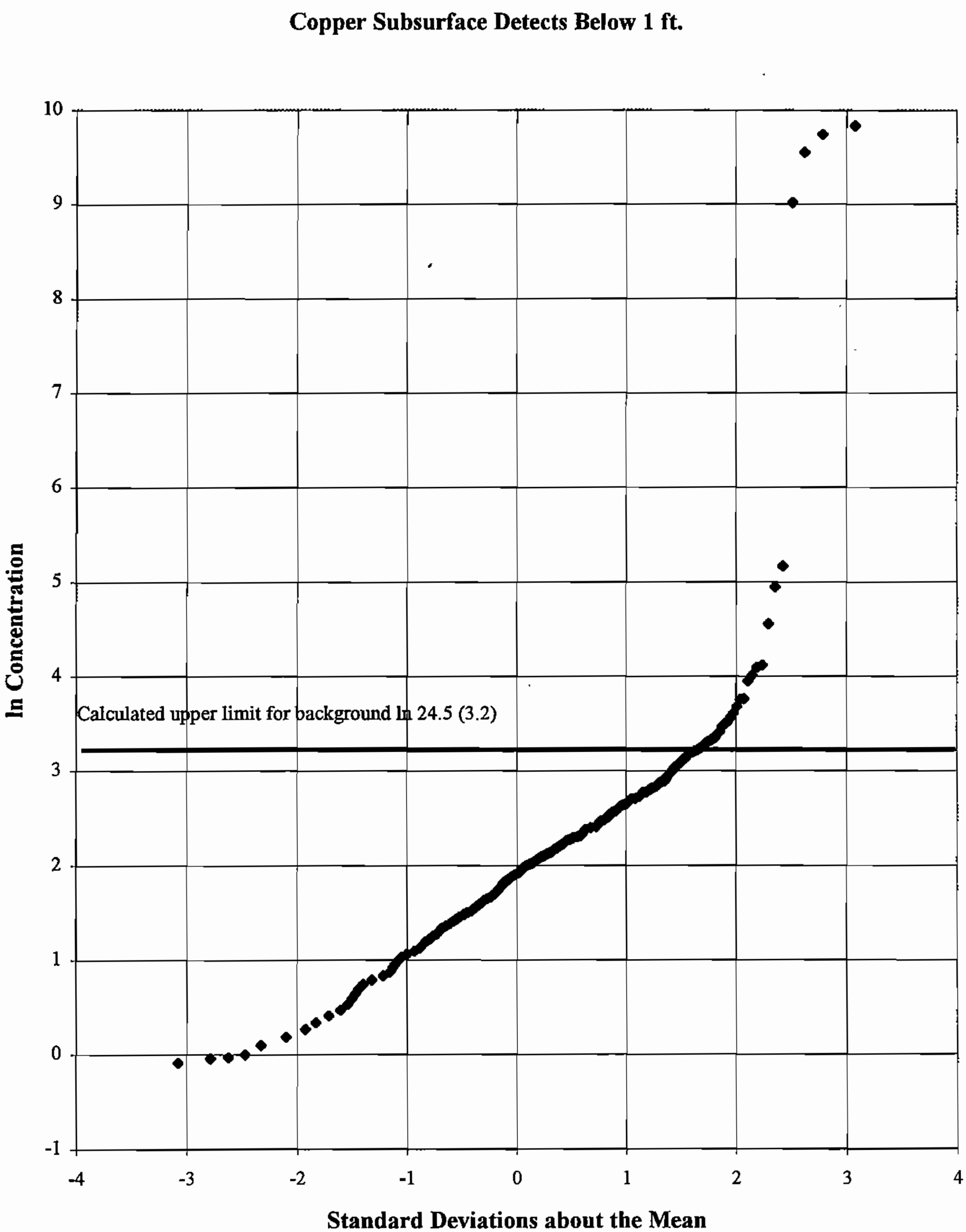


Figure 2.105. Cumulative Probability Plot for Copper; Detected Observations; Subsurface Classification.

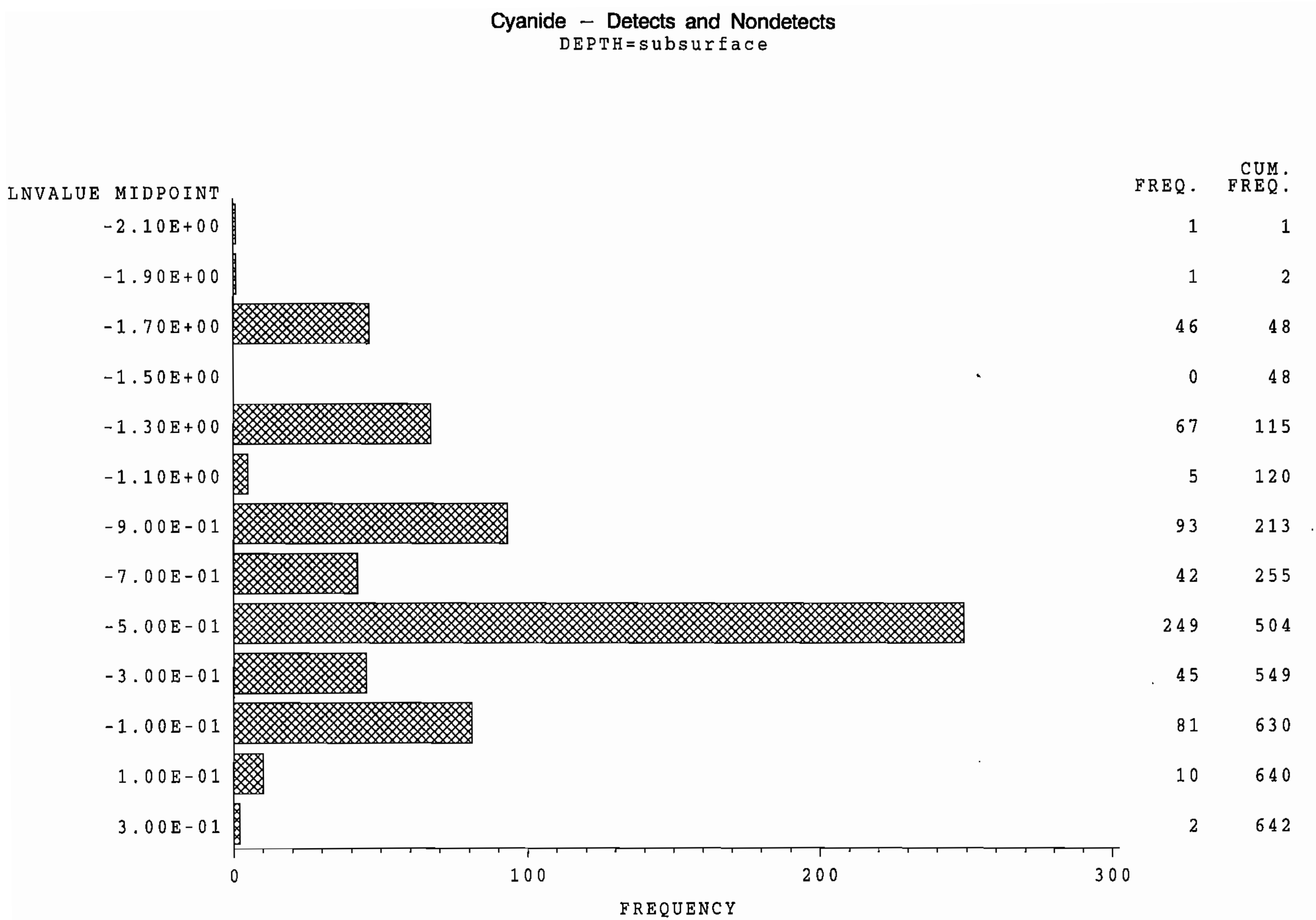


Figure 2.106. Histogram for Cyanide; All Observations; Subsurface Classification.

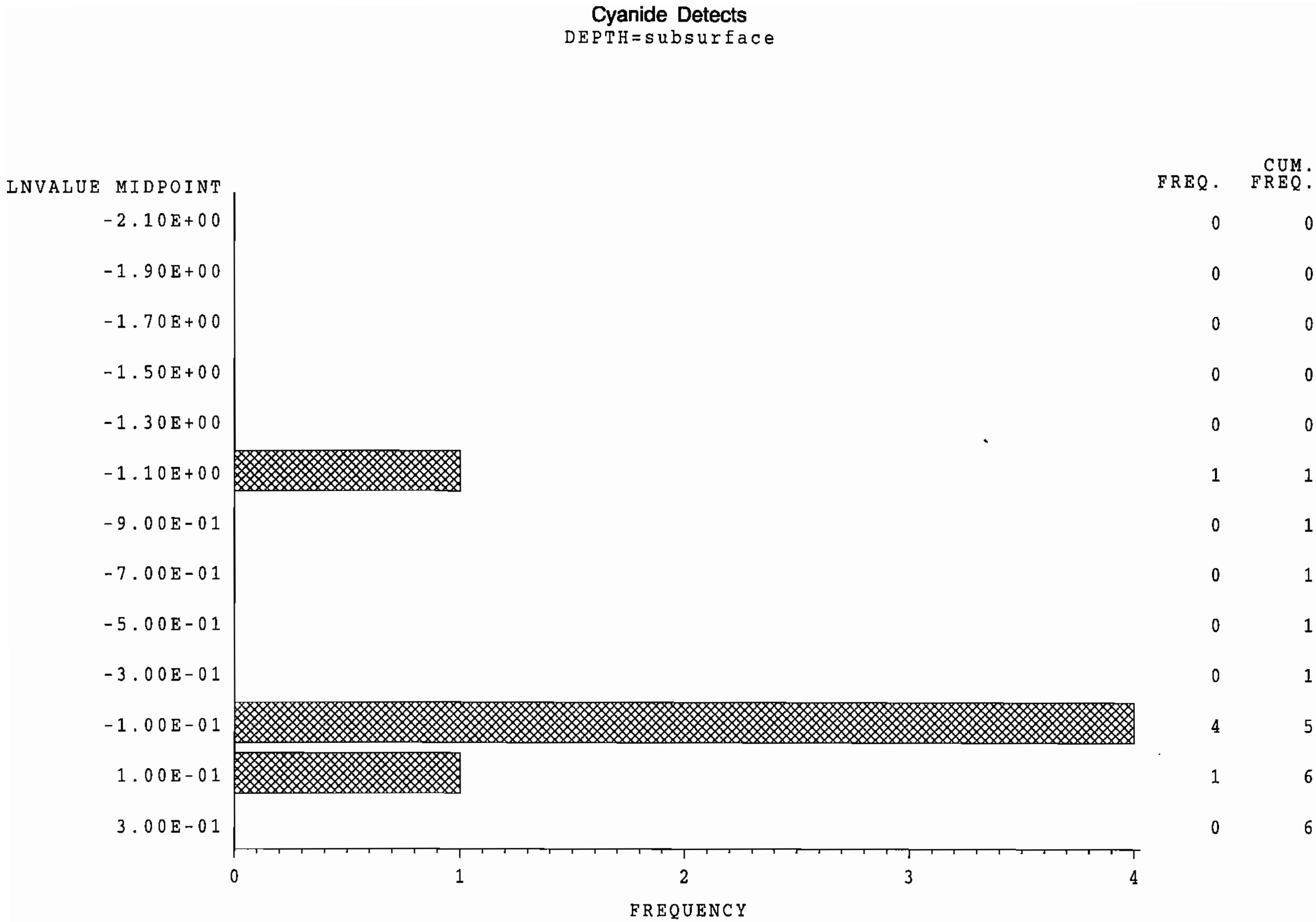


Figure 2.107. Histogram for Cyanide; Detected Observations; Subsurface Classification.

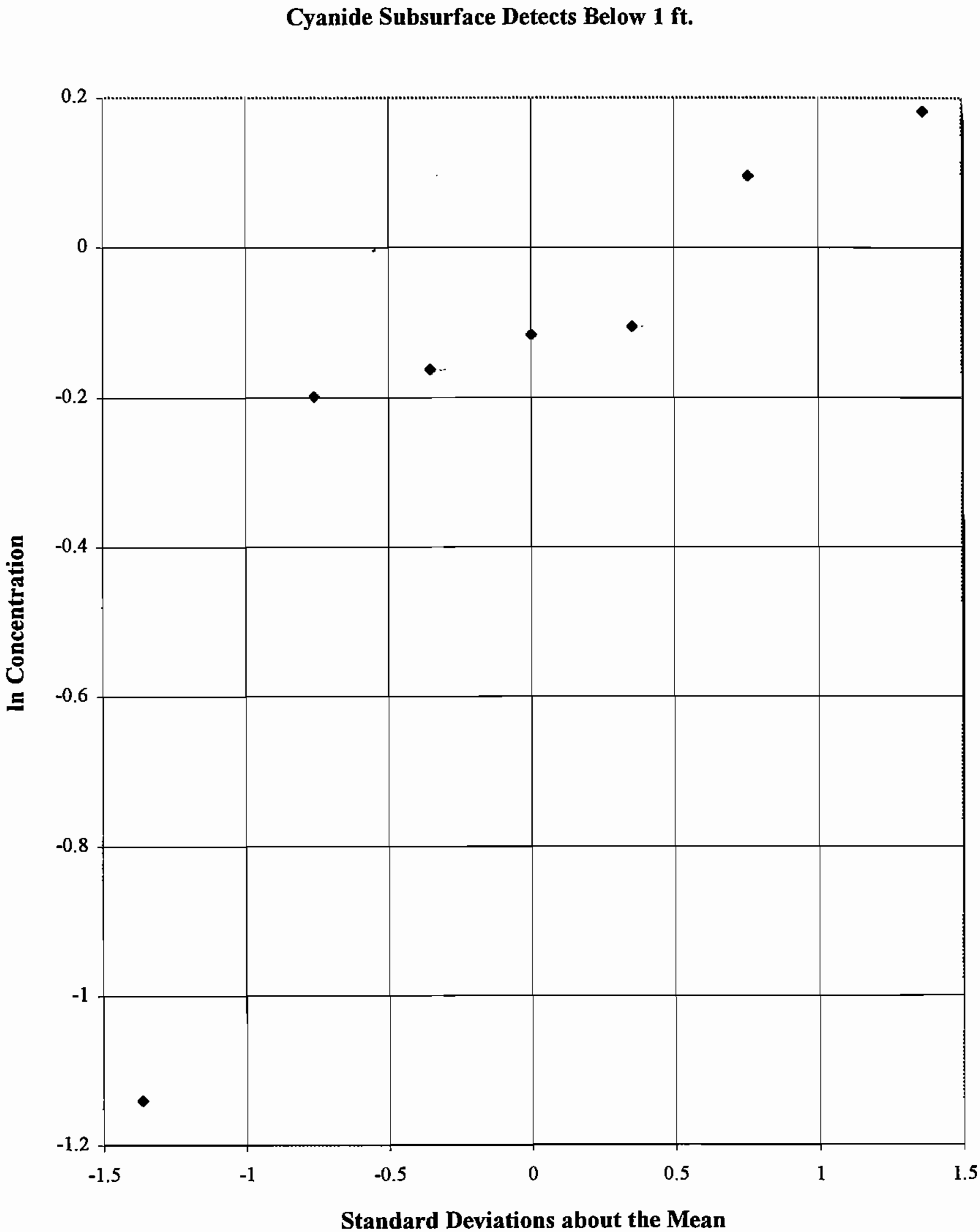


Figure 2.108. Cumulative Probability Plot for Cyanide; Detected Observations; Subsurface Classification.

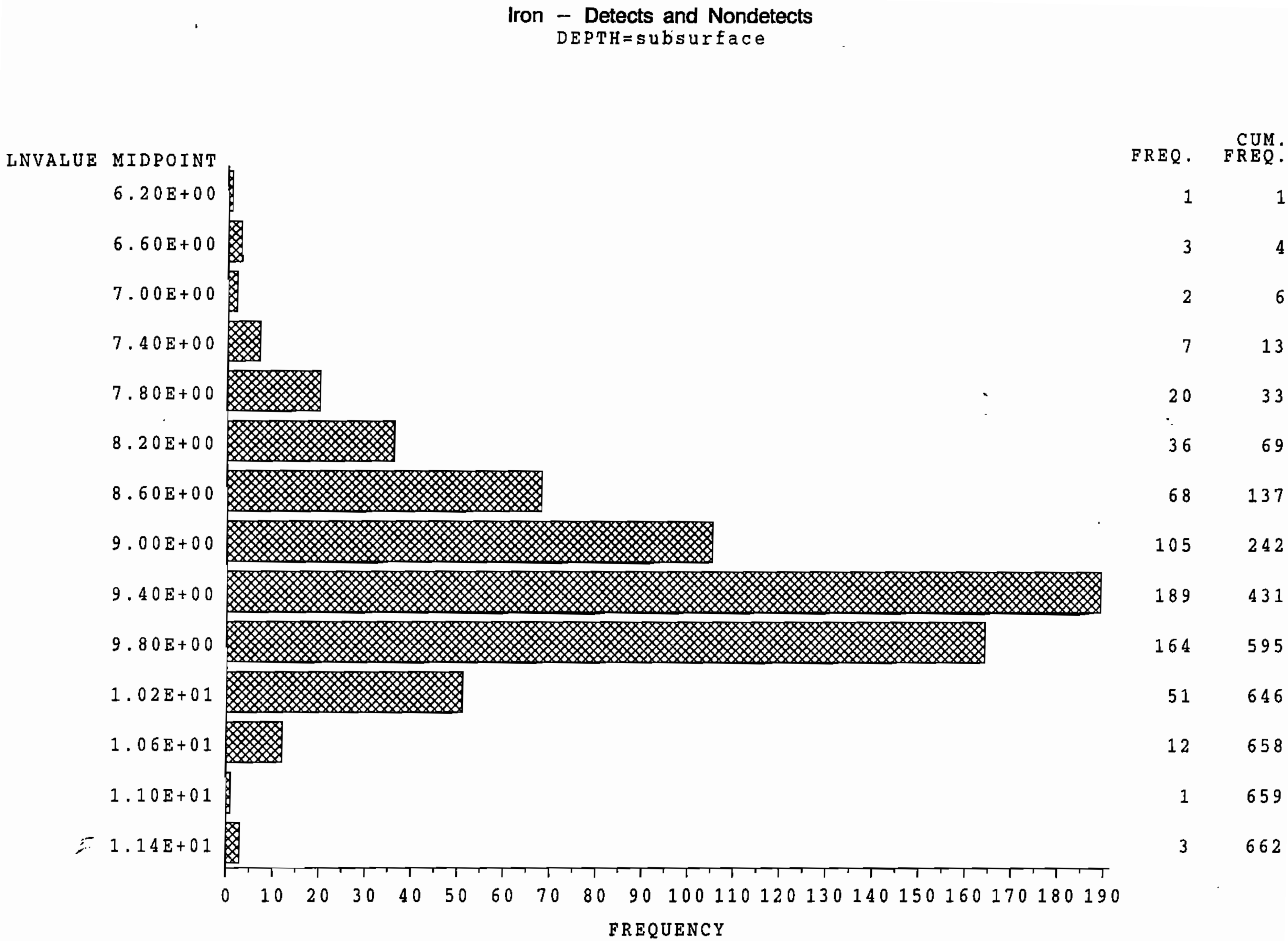


Figure 2.109. Histogram for Iron; All Observations; Subsurface Classification.

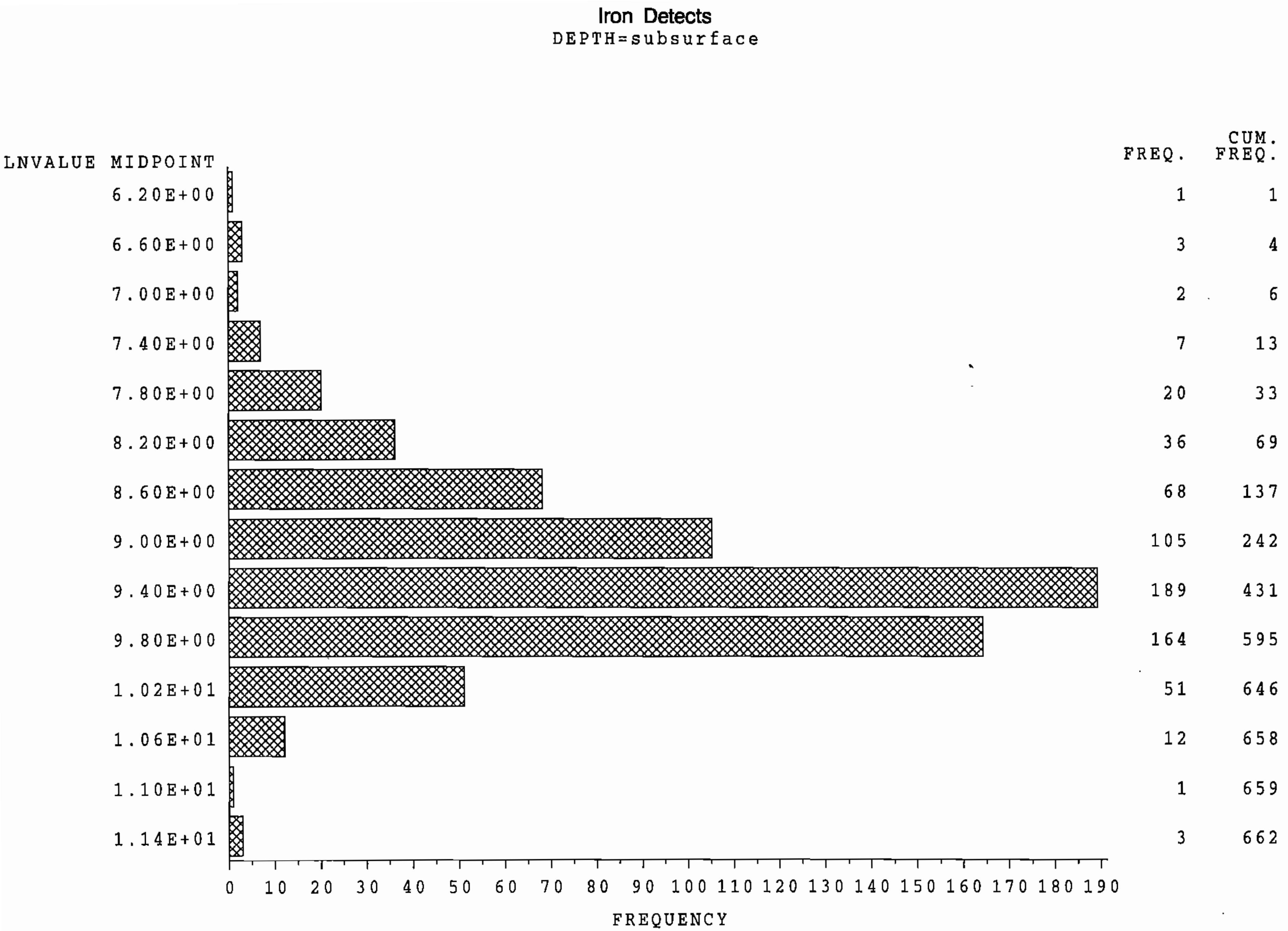


Figure 2.110. Histogram for Iron; Detected Observations; Subsurface Classification.

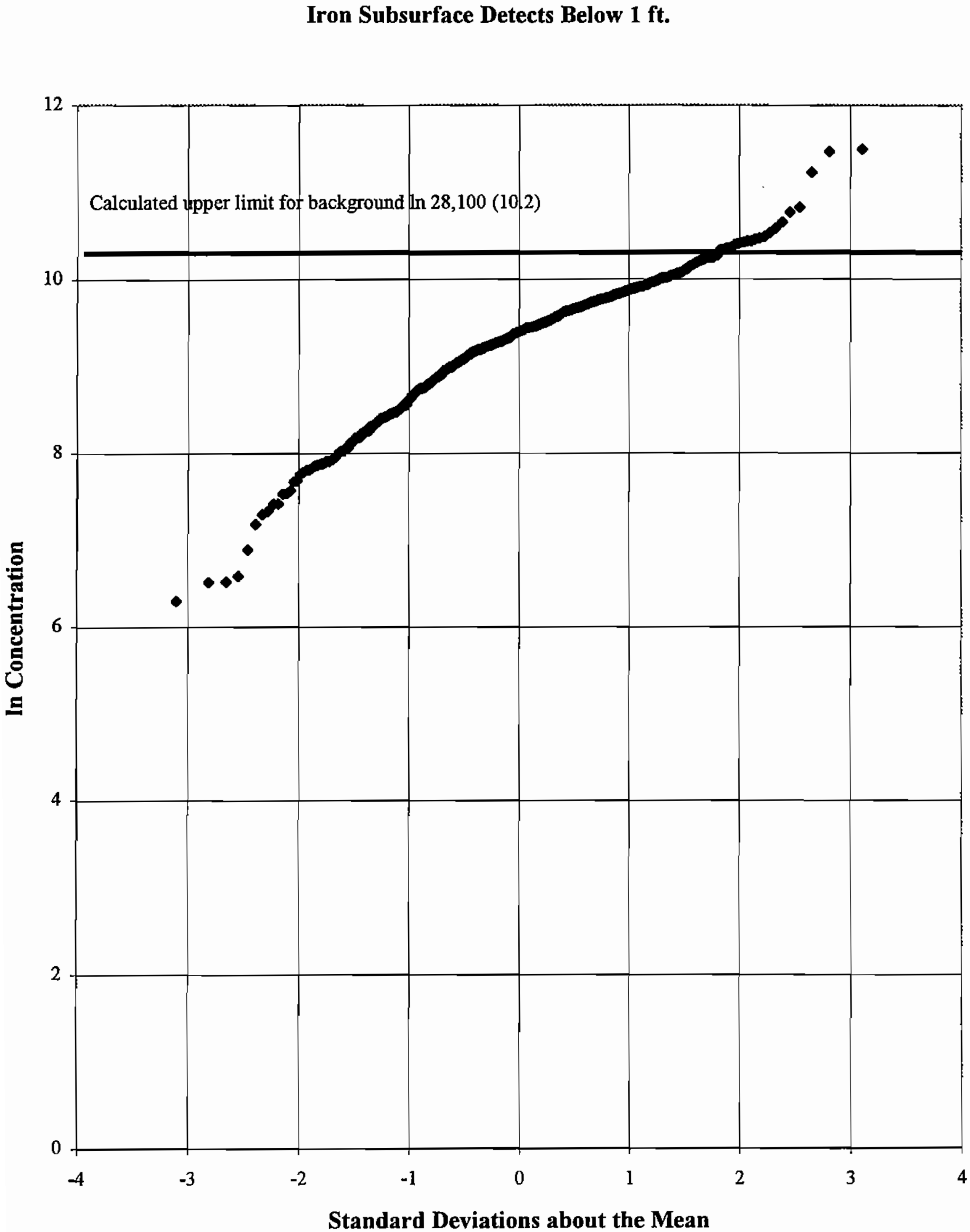


Figure 2.111. Cumulative Probability Plot for Iron; Detected Observations; Subsurface Classification.

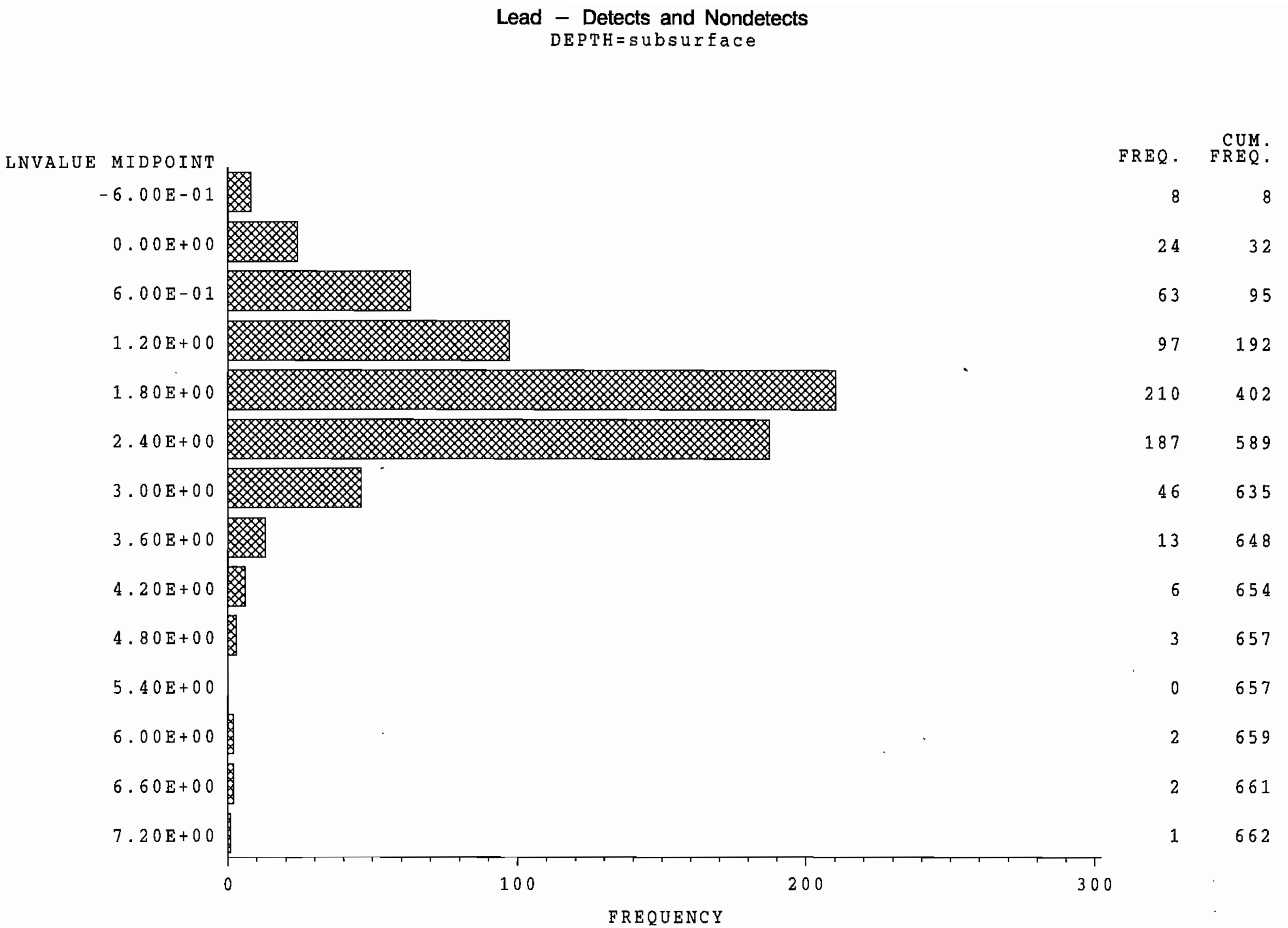
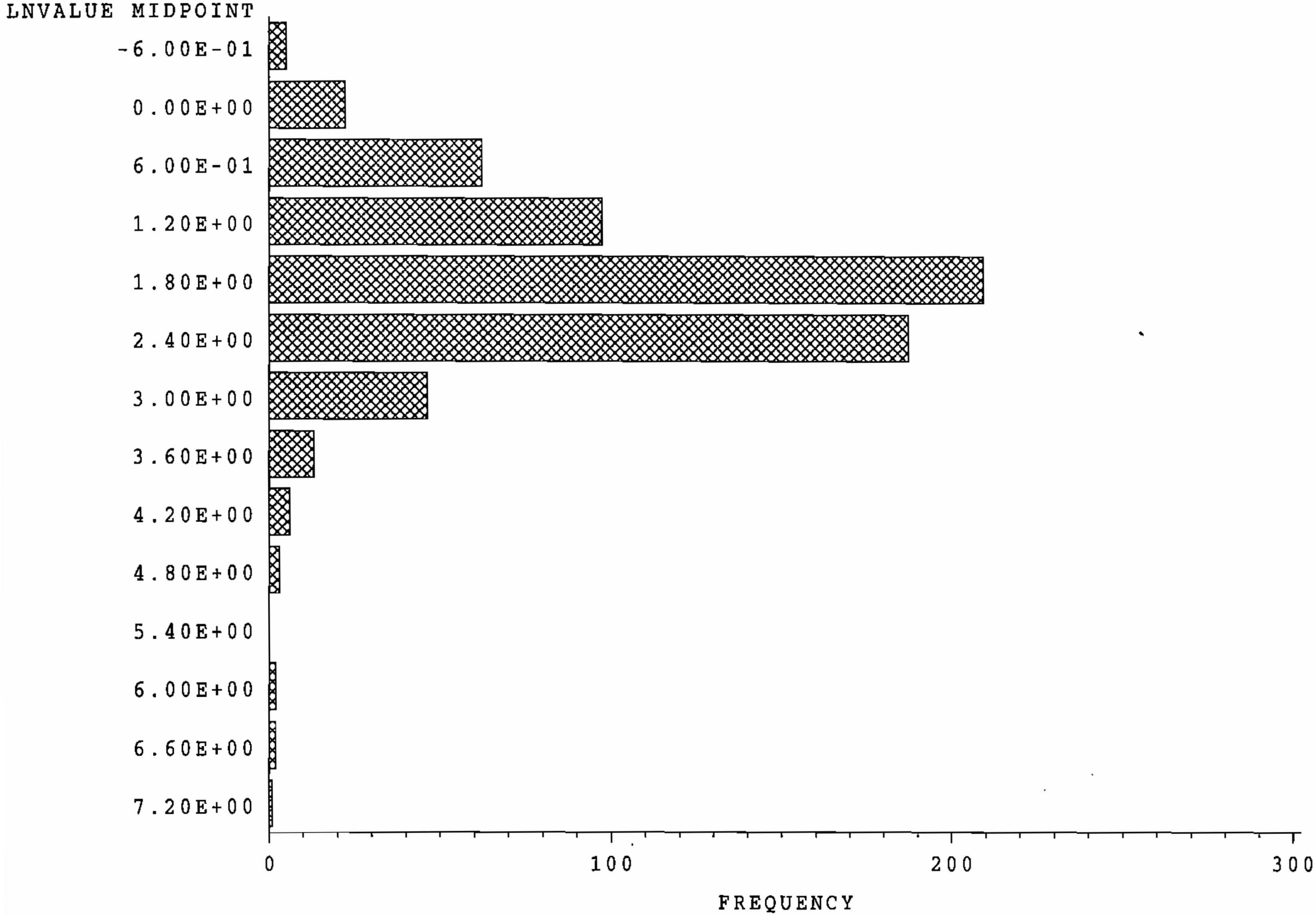


Figure 2.112. Histogram for Lead; All Observations; Subsurface Classification.

Lead Detects
DEPTH=subsurface



FREQ.	CUM. FREQ.
5	5
22	27
62	89
97	186
209	395
187	582
46	628
13	641
6	647
3	650
0	650
2	652
2	654
1	655

Figure 2.113. Histogram for Lead; Detected Observations; Subsurface Classification.

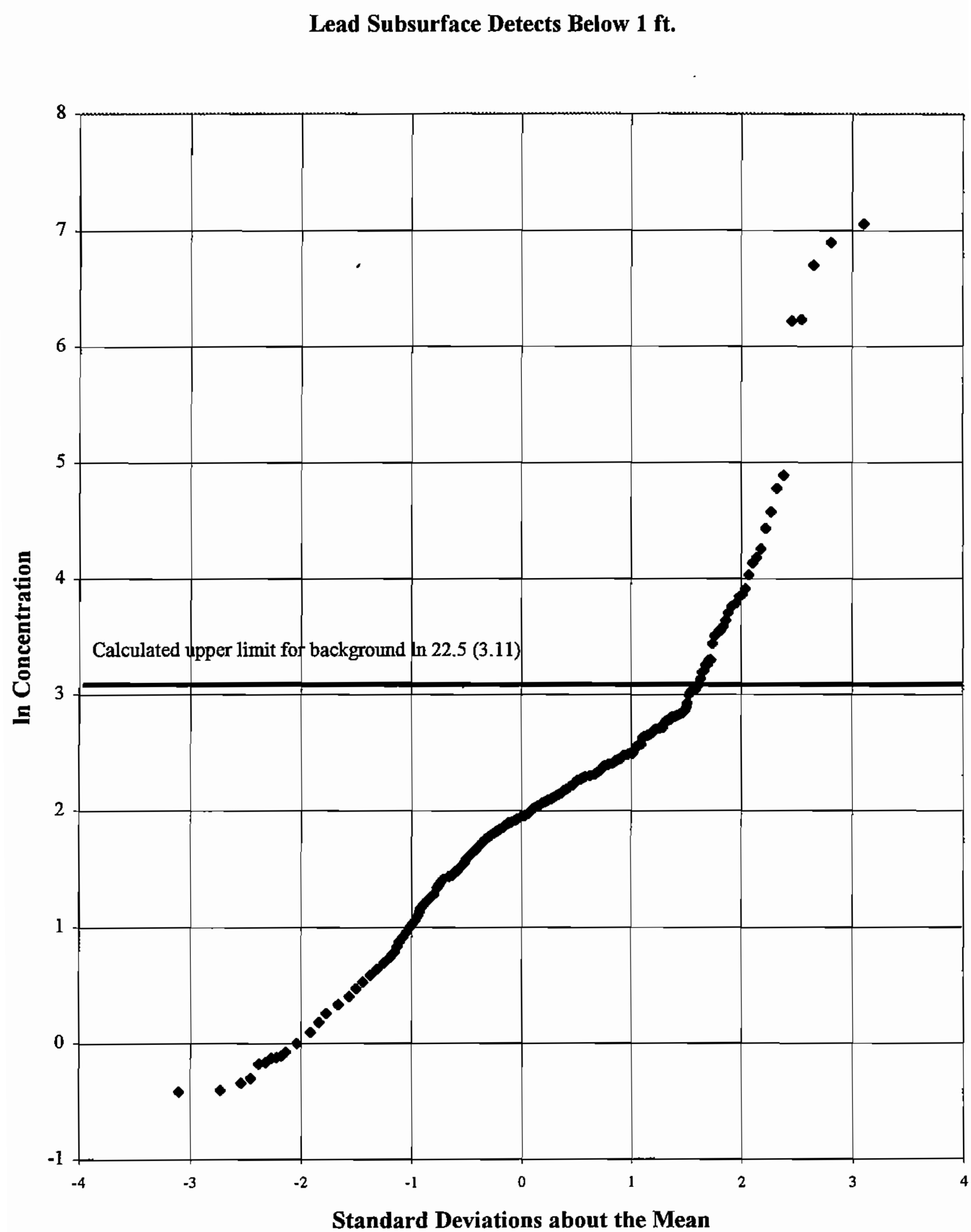


Figure 2.114. Cumulative Probability Plot for Lead; Detected Observations; Subsurface Classification.

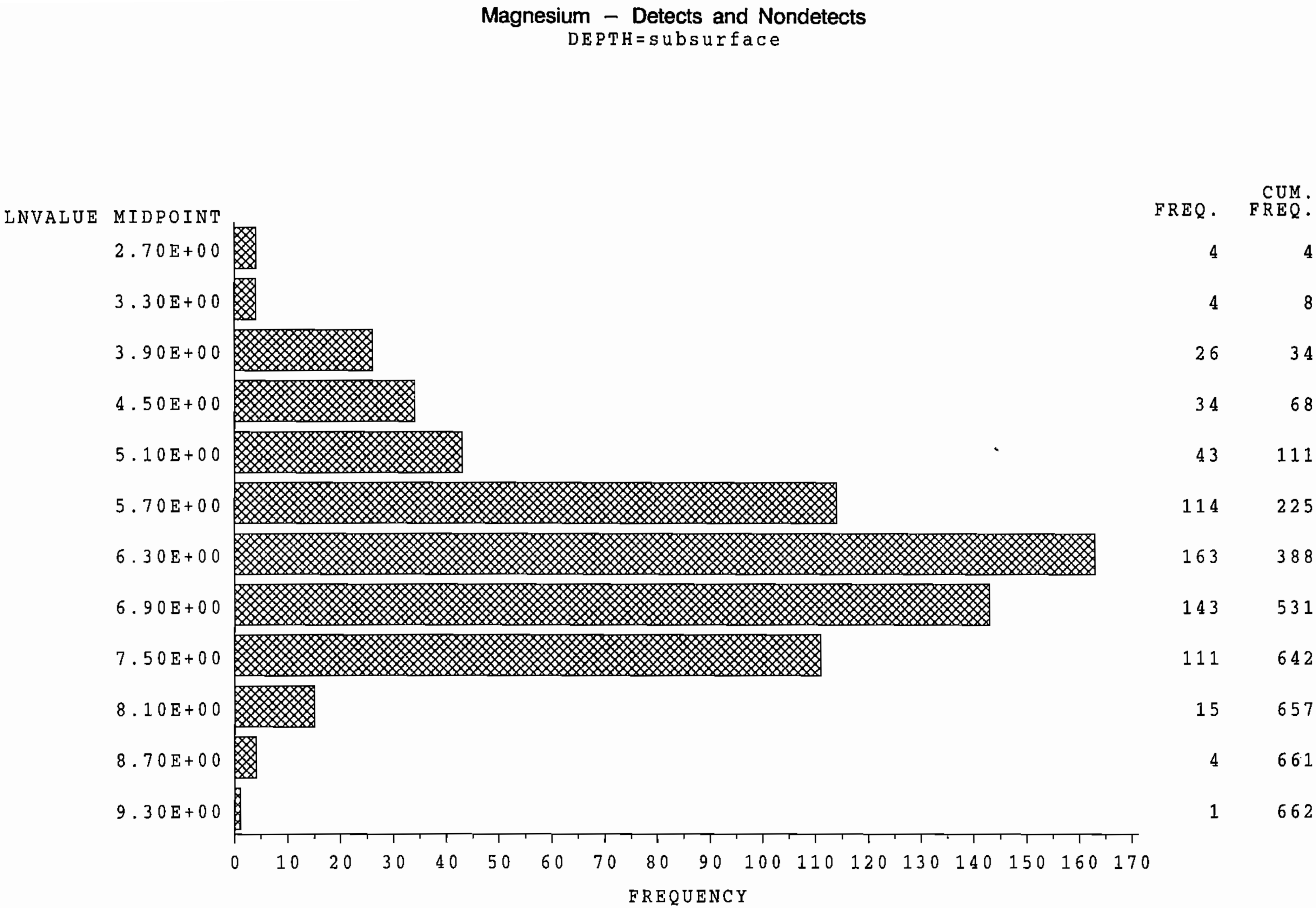


Figure 2.115. Histogram for Magnesium; All Observations; Subsurface Classification.

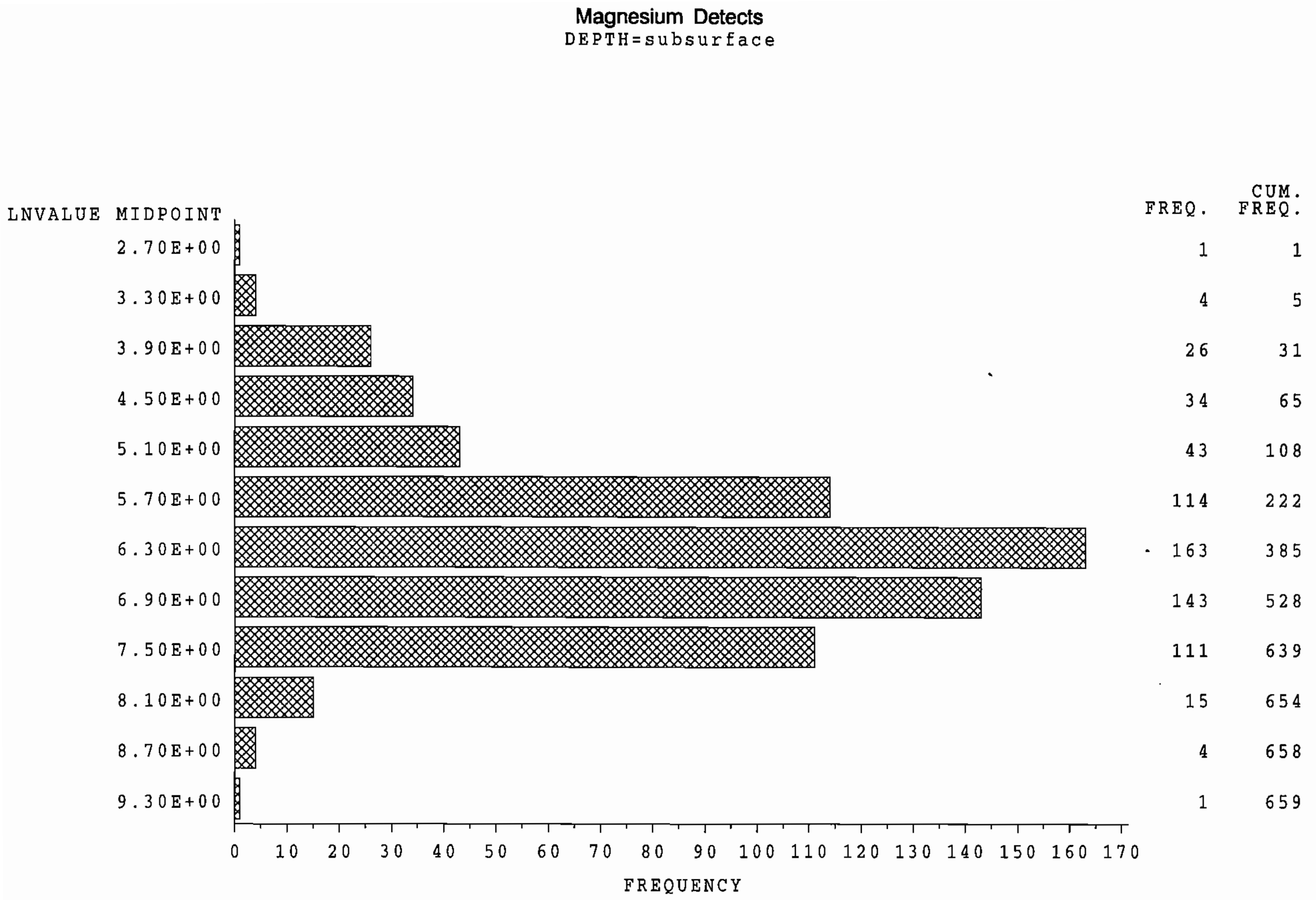


Figure 2.116. Histogram for Magnesium; Detected Observations; Subsurface Classification.

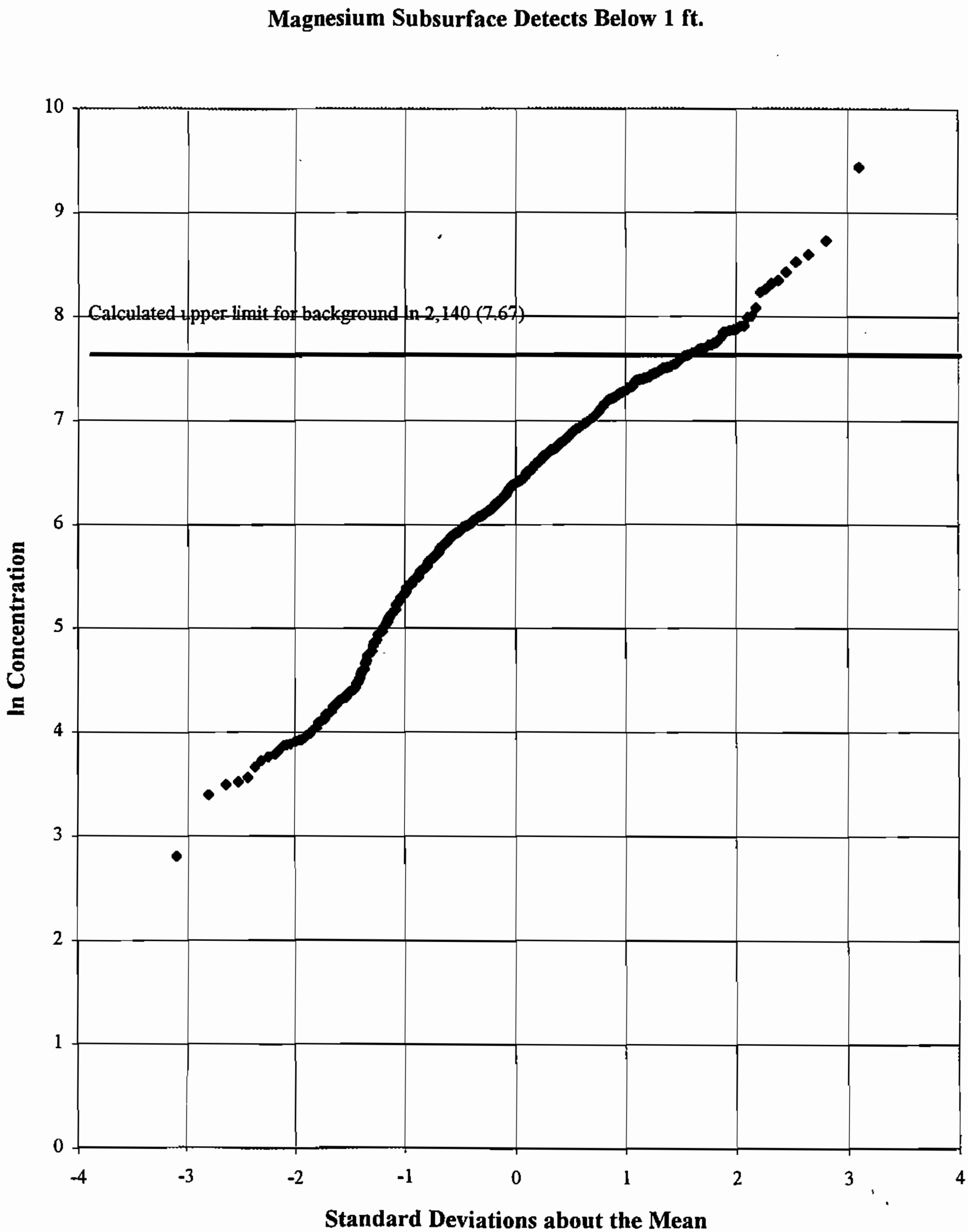


Figure 2.117. Cumulative Probability Plot for Magnesium; Detected Observations; Subsurface Classification.

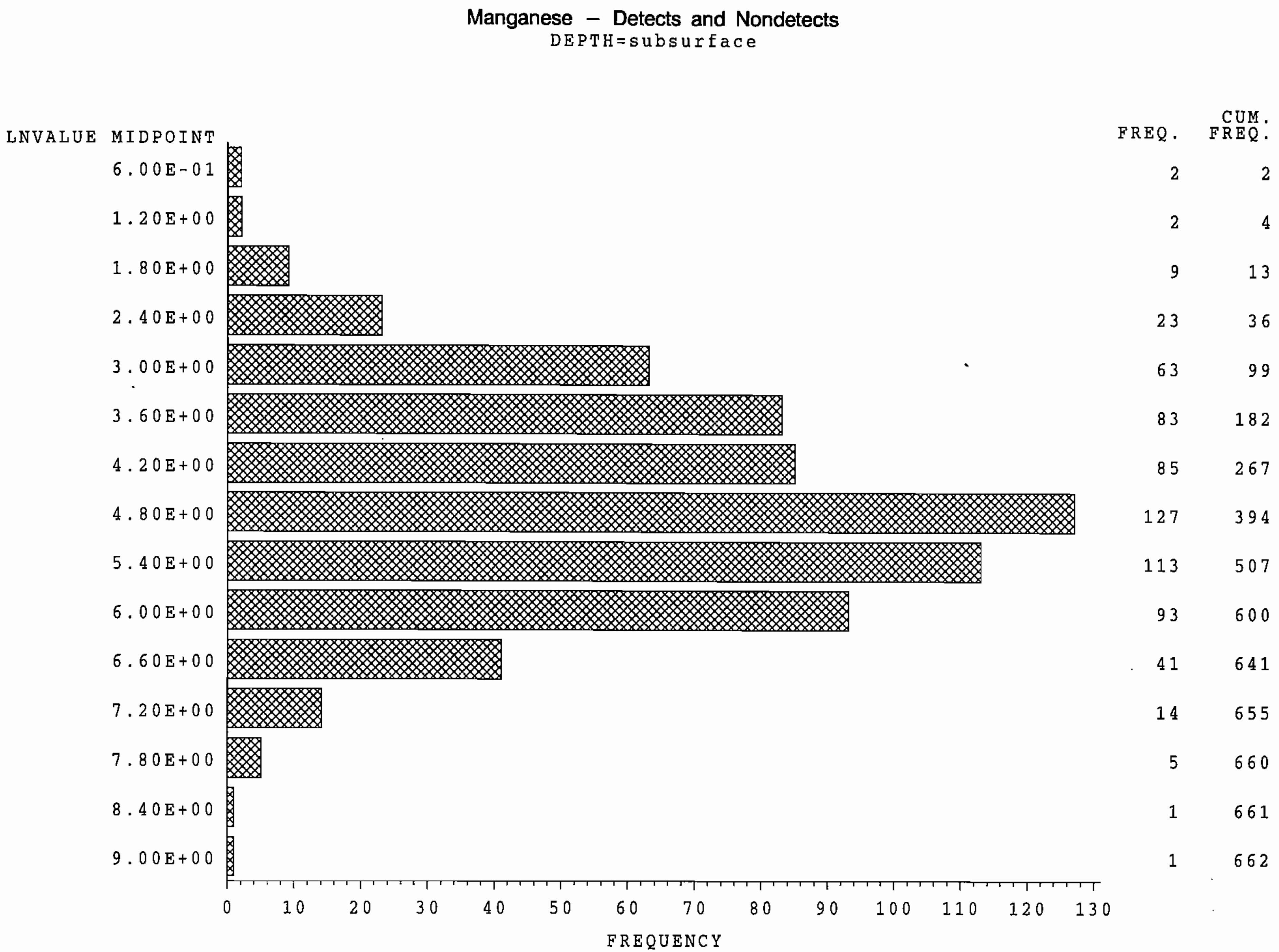
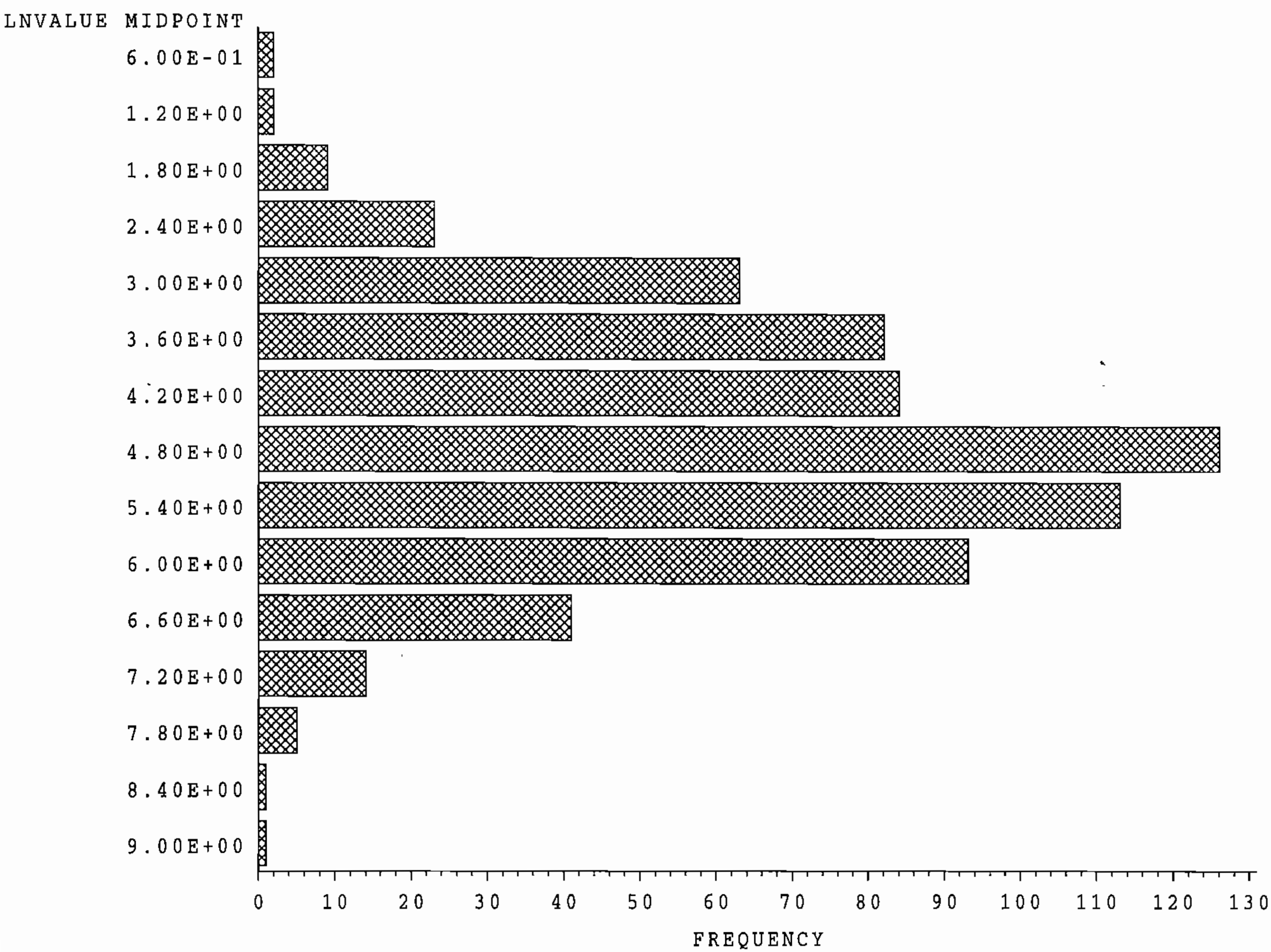


Figure 2.118. Histogram for Manganese; All Observations; Subsurface Classification.

Manganese Detects
DEPTH=subsurface



LNVALUE MIDPOINT	FREQ.	CUM. FREQ.
6.00E-01	2	2
1.20E+00	2	4
1.80E+00	9	13
2.40E+00	23	36
3.00E+00	63	99
3.60E+00	82	181
4.20E+00	84	265
4.80E+00	126	391
5.40E+00	113	504
6.00E+00	93	597
6.60E+00	41	638
7.20E+00	14	652
7.80E+00	5	657
8.40E+00	1	658
9.00E+00	1	659

Figure 2.119. Histogram for Manganese; Detected Observations; Subsurface Classification.

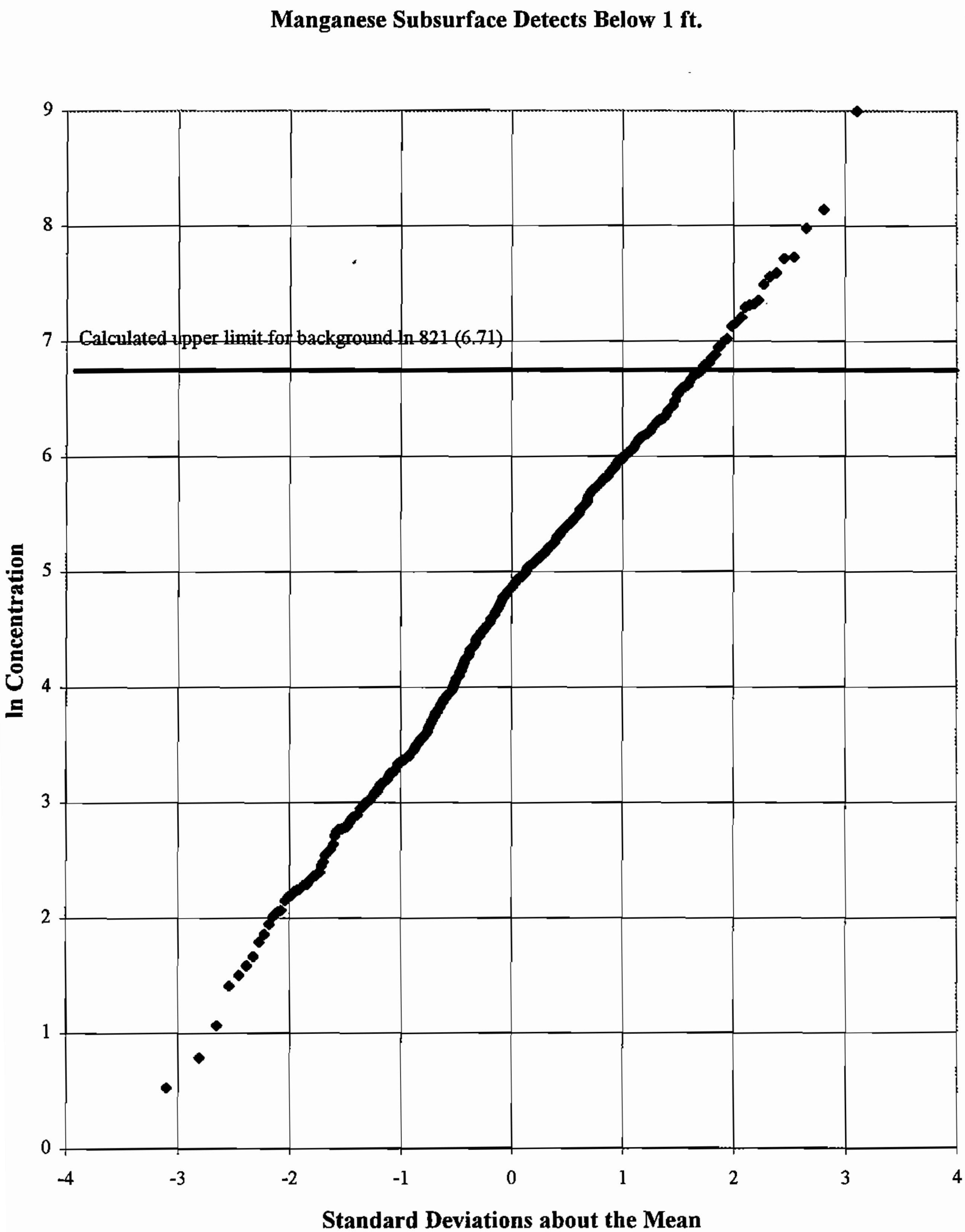


Figure 2.120. Cumulative Probability Plot for Manganese; Detected Observations; Subsurface Classification.

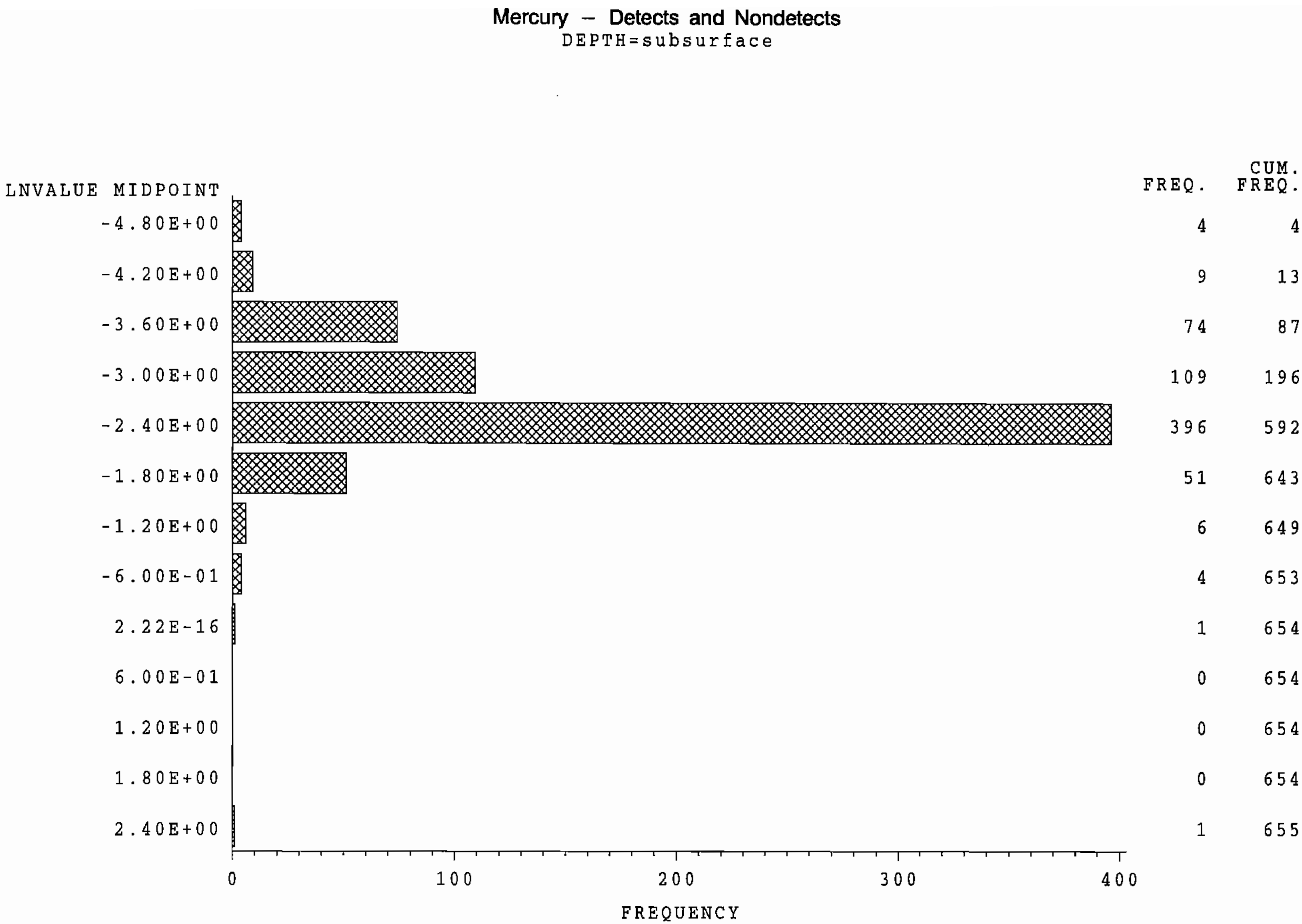


Figure 2.121. Histogram for Mercury; All Observations; Subsurface Classification.

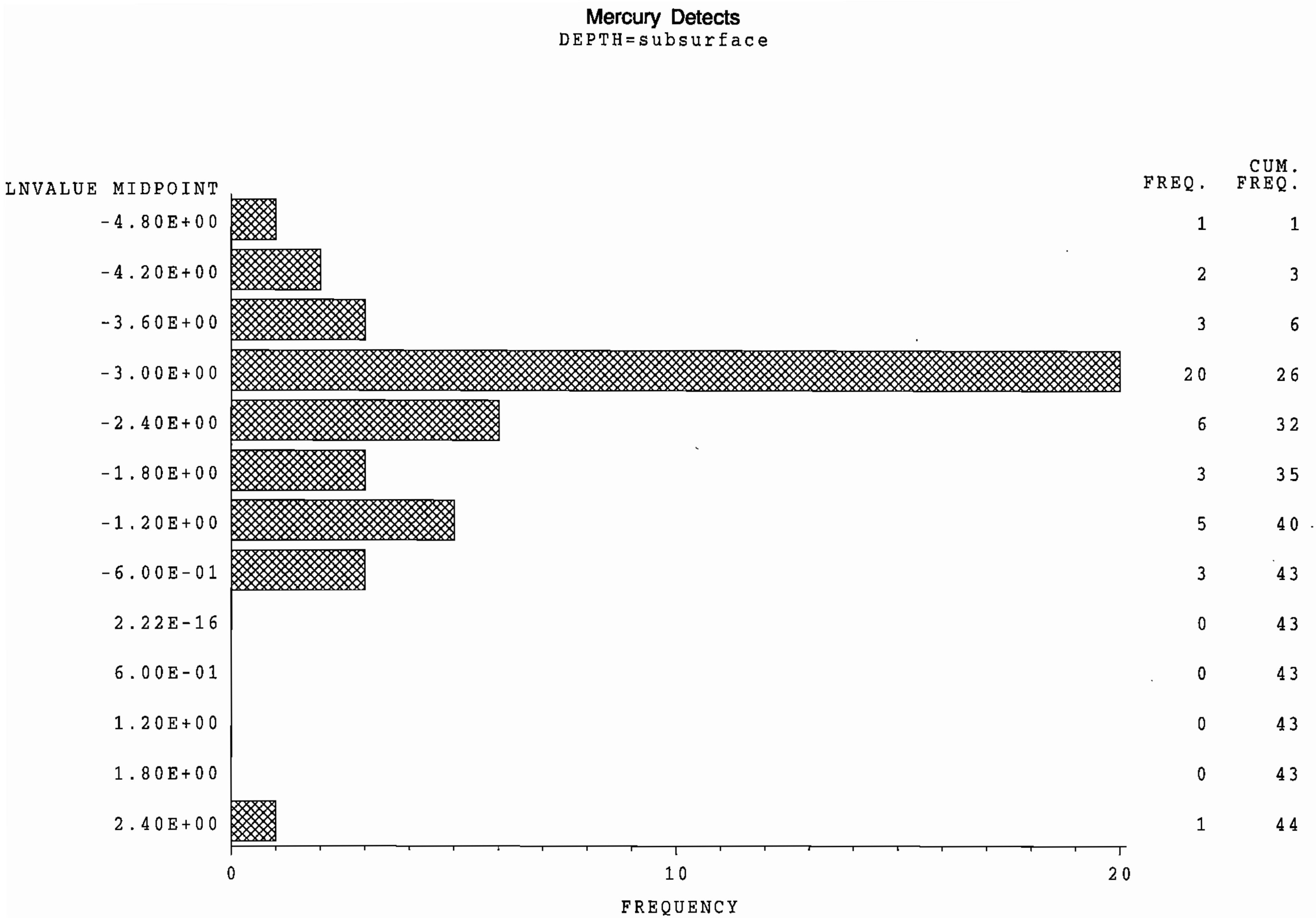


Figure 2.122. Histogram for Mercury; Detected Observations; Subsurface Classification.

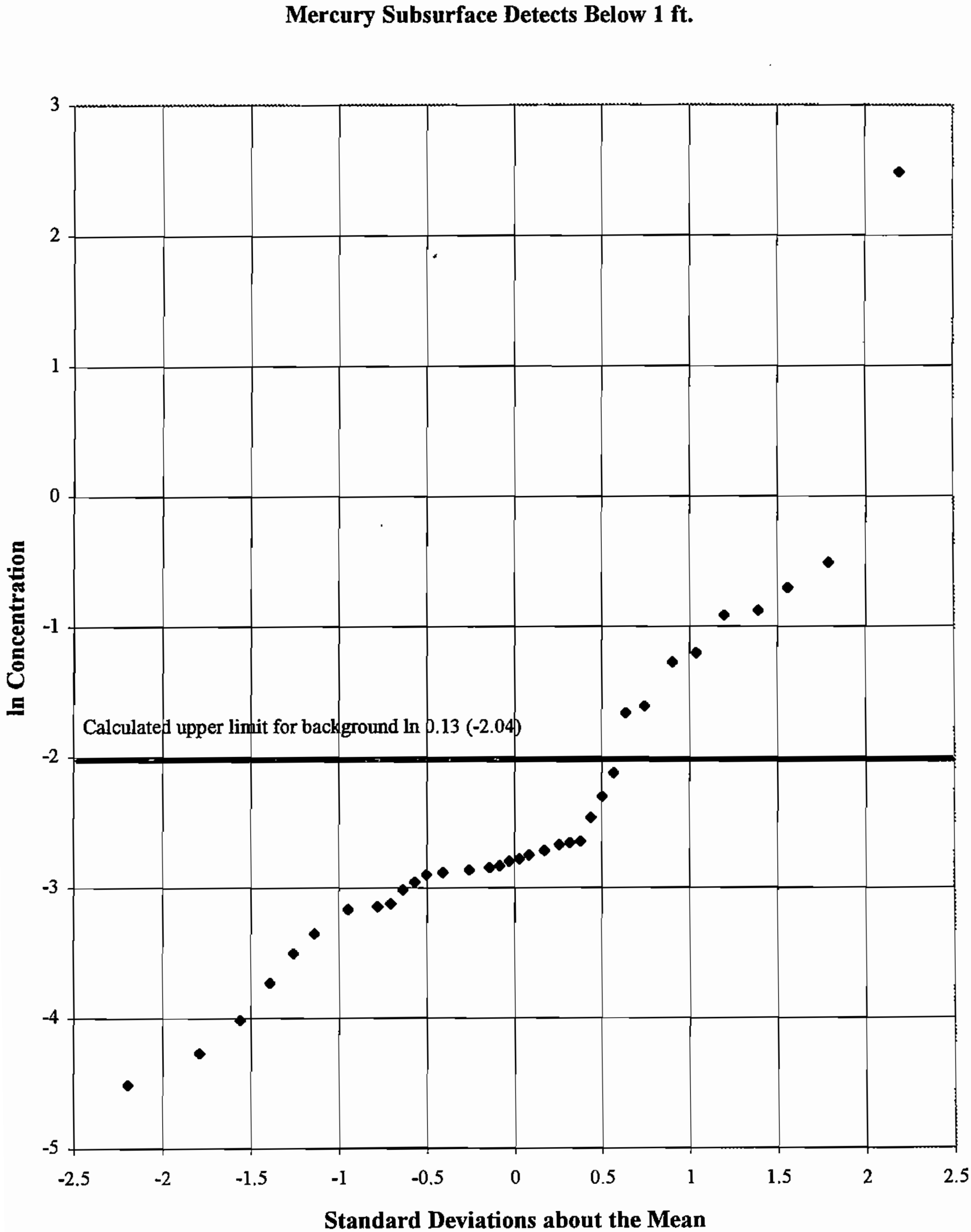


Figure 2.123. Cumulative Probability Plot for Mercury; Detected Observations; Subsurface Classification.

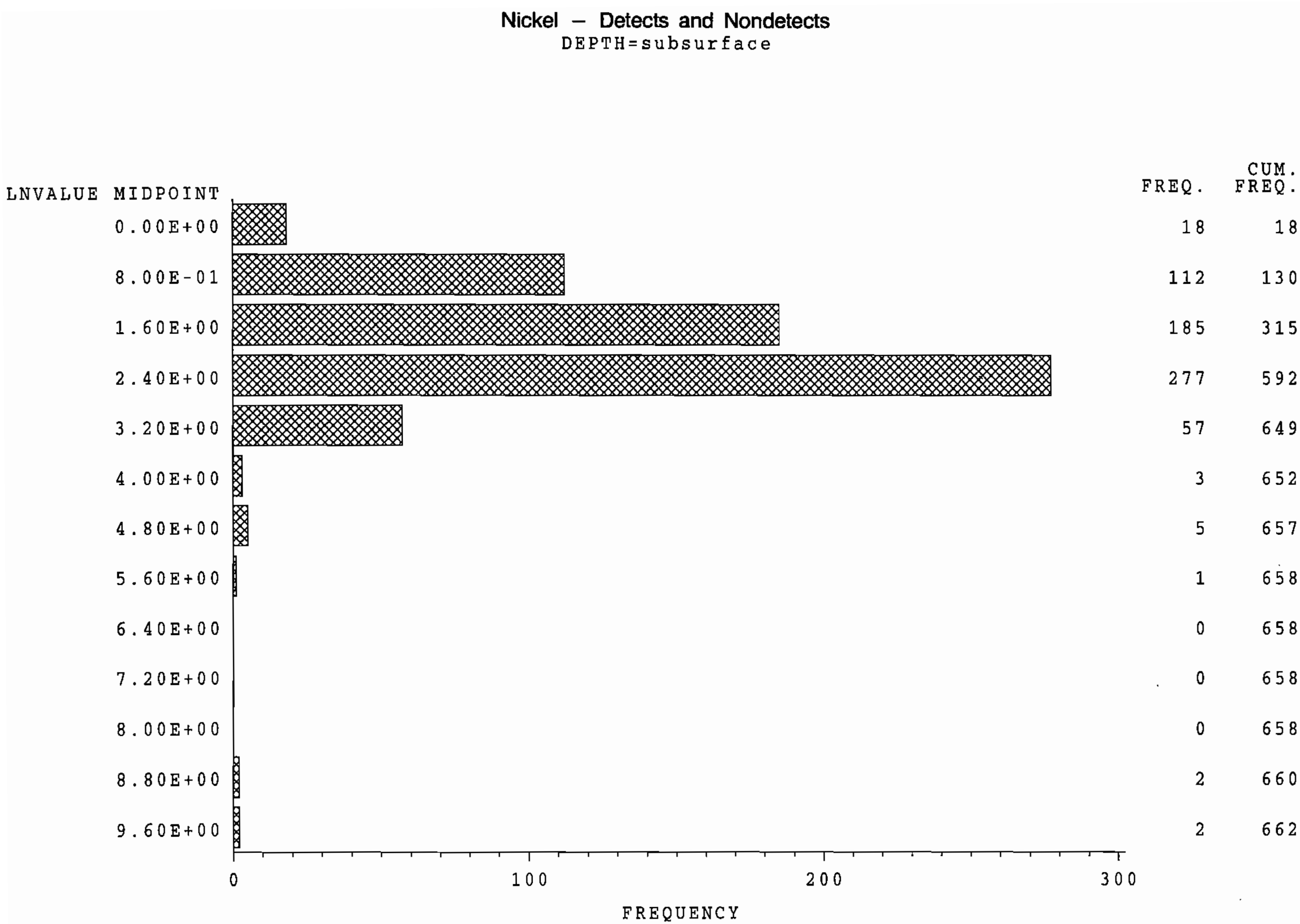


Figure 2.124. Histogram for Nickel; All Observations; Subsurface Classification.

Nickel Detects
DEPTH=subsurface

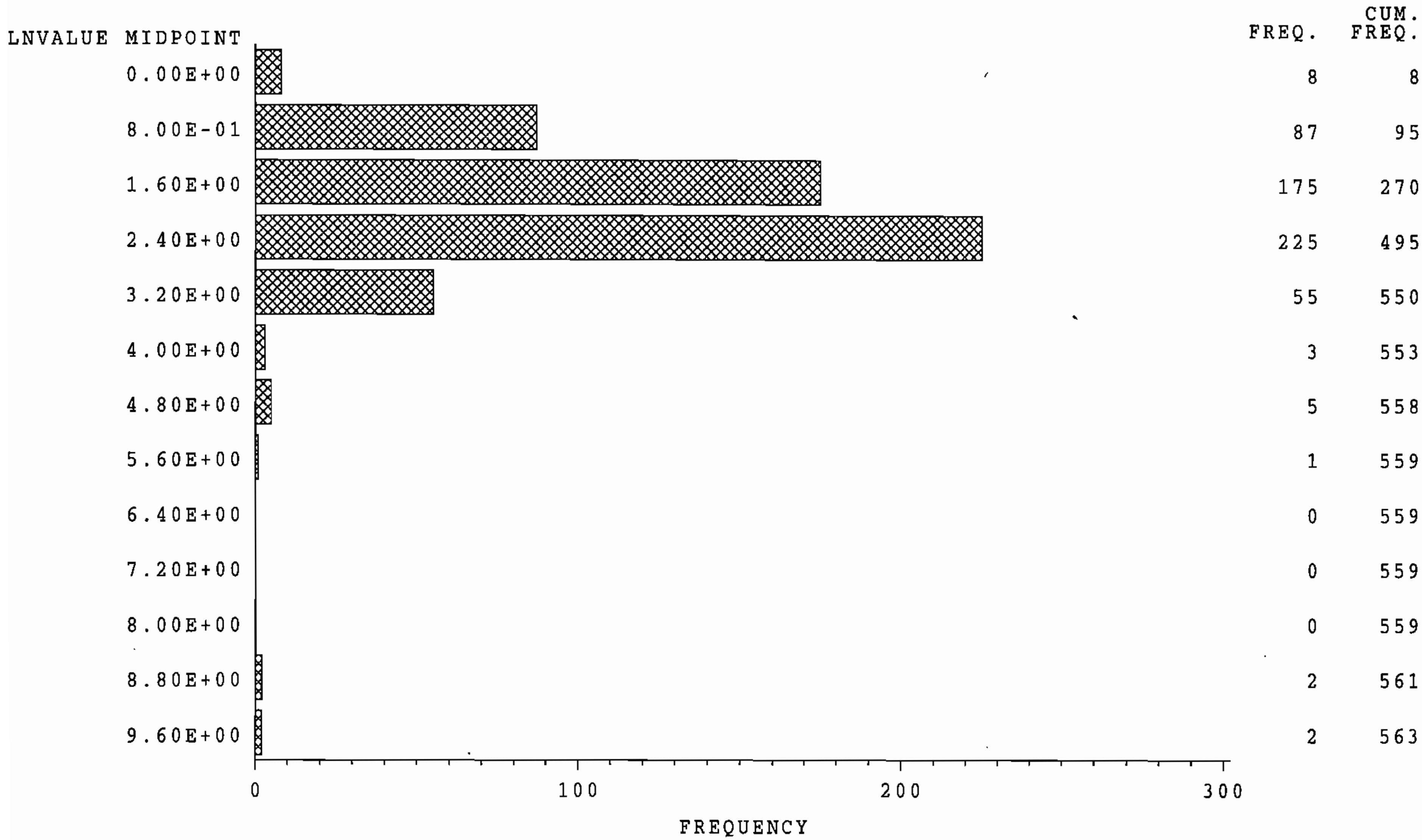


Figure 2.125. Histogram for Nickel; Detected Observations; Subsurface Classification.

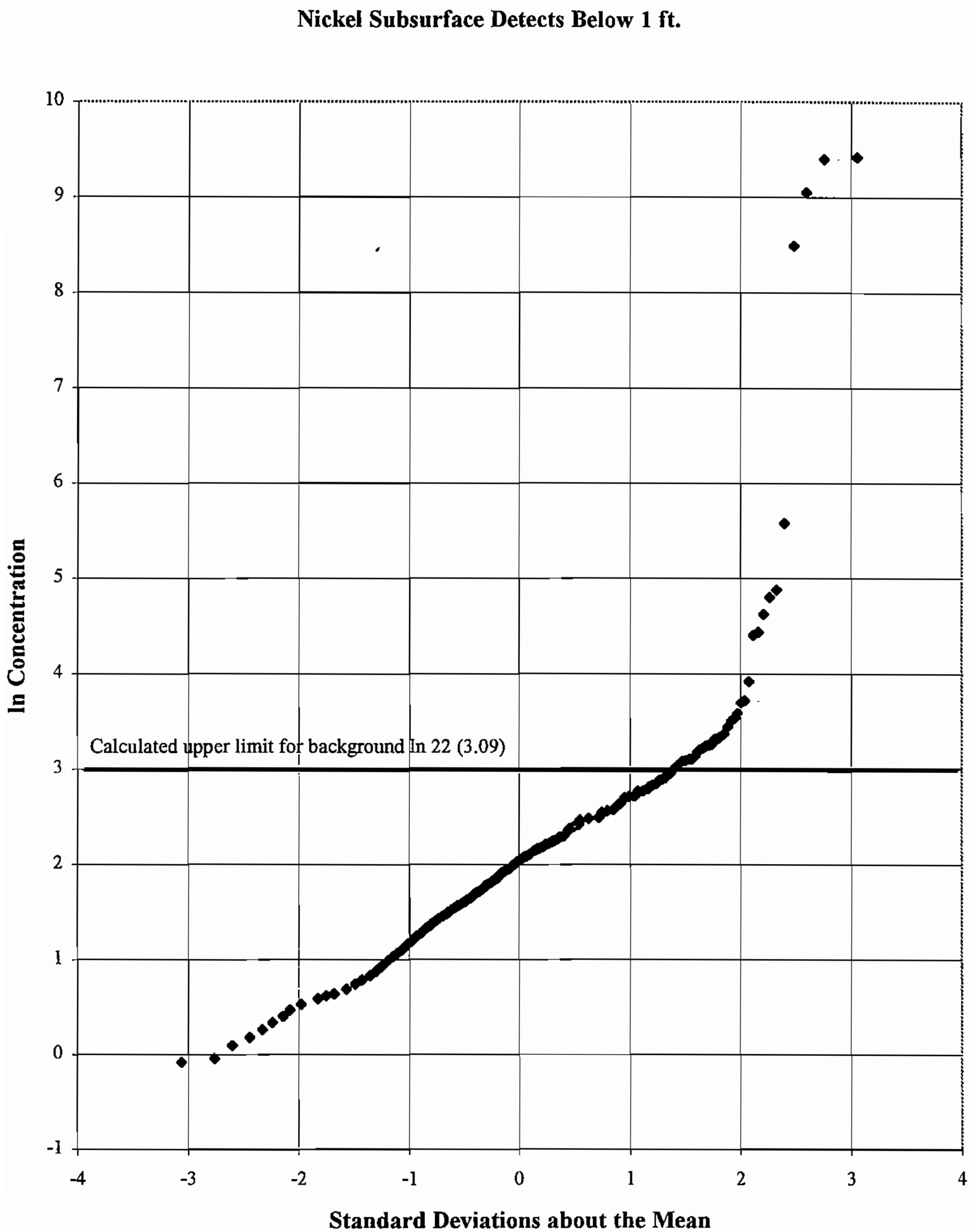


Figure 2.126. Cumulative Probability Plot for Nickel; Detected Observations; Subsurface Classification.

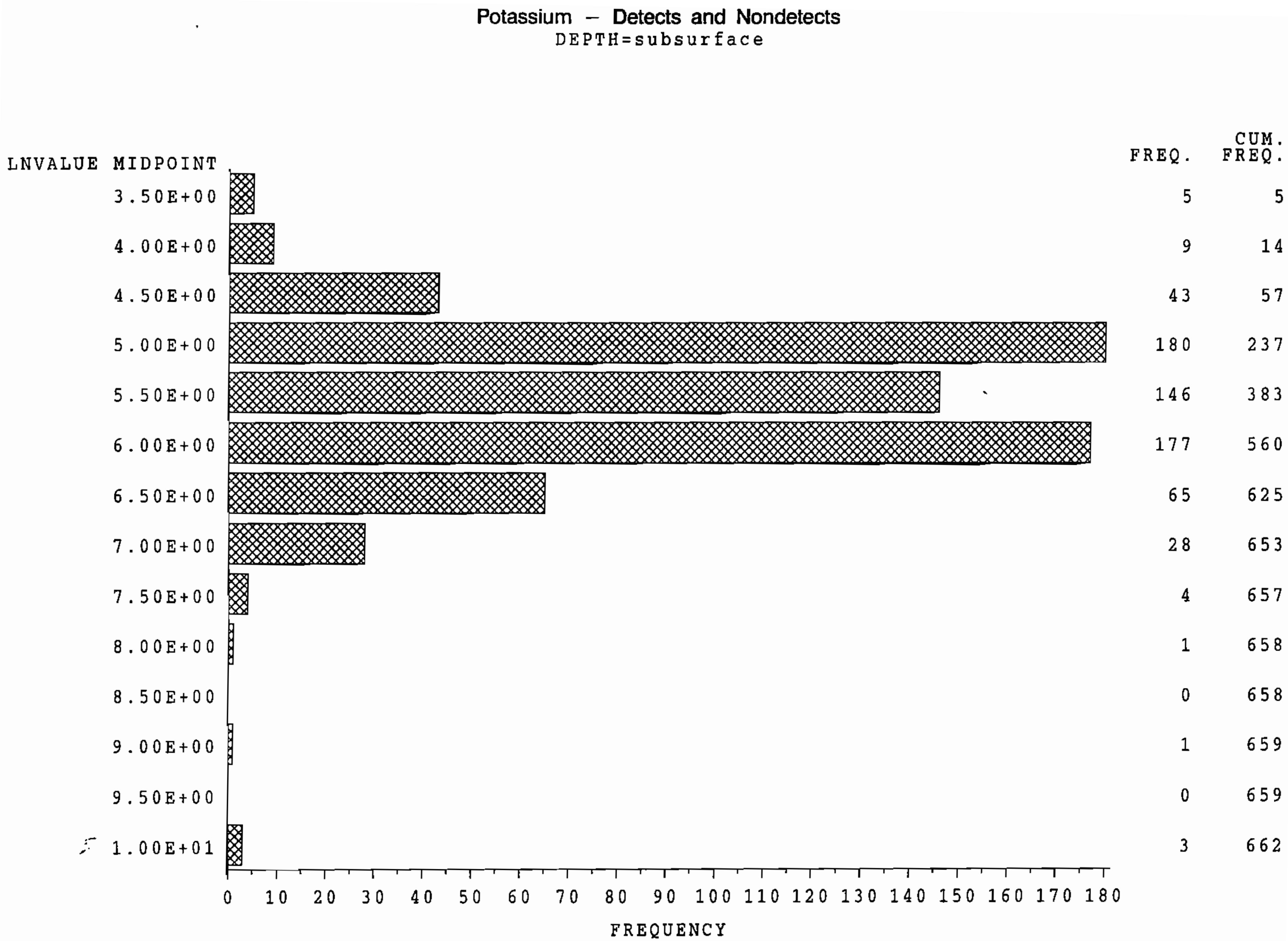


Figure 2.127. Histogram for Potassium; All Observations; Subsurface Classification.

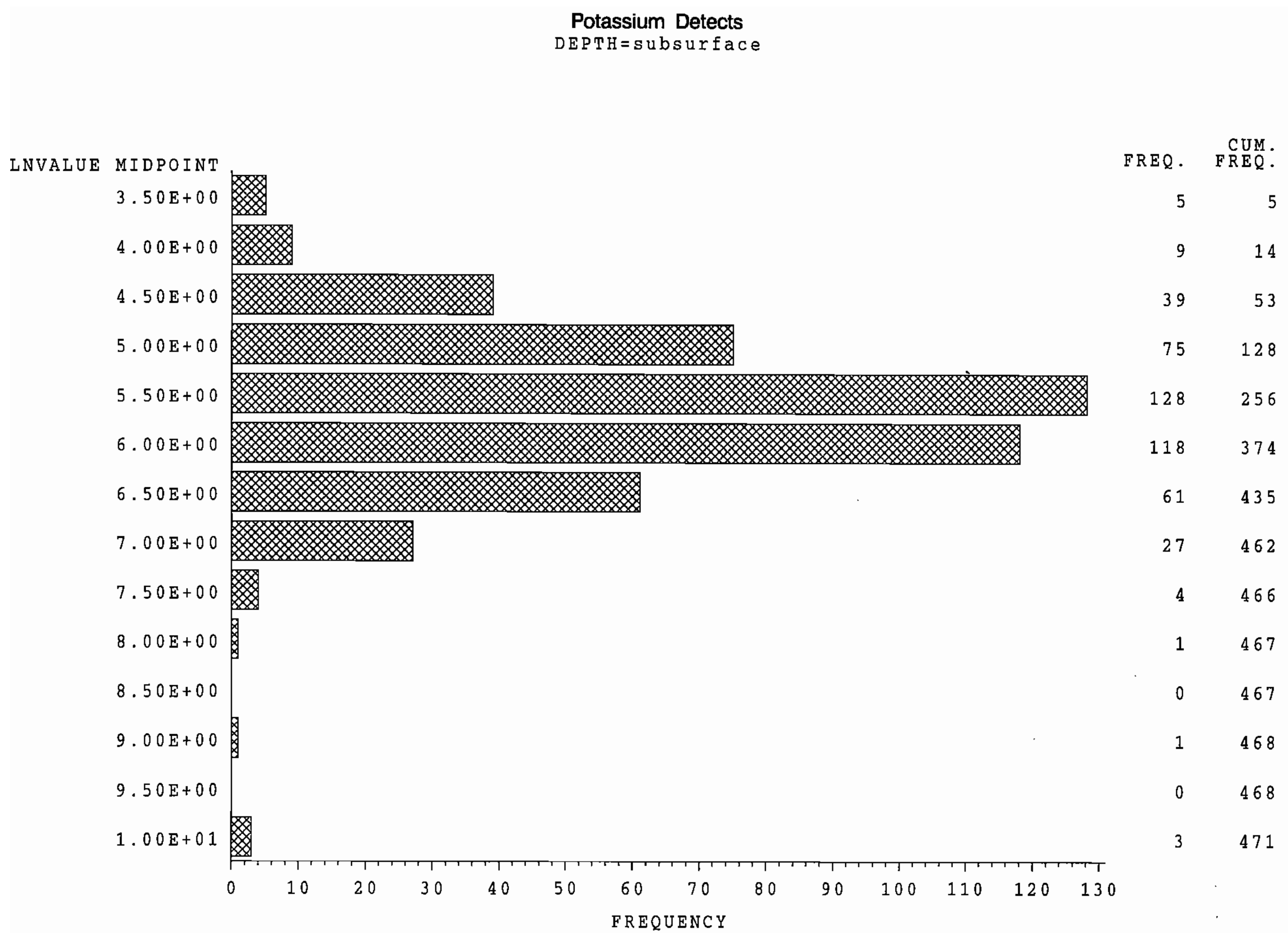


Figure 2.128. Histogram for Potassium; Detected Observations; Subsurface Classification.

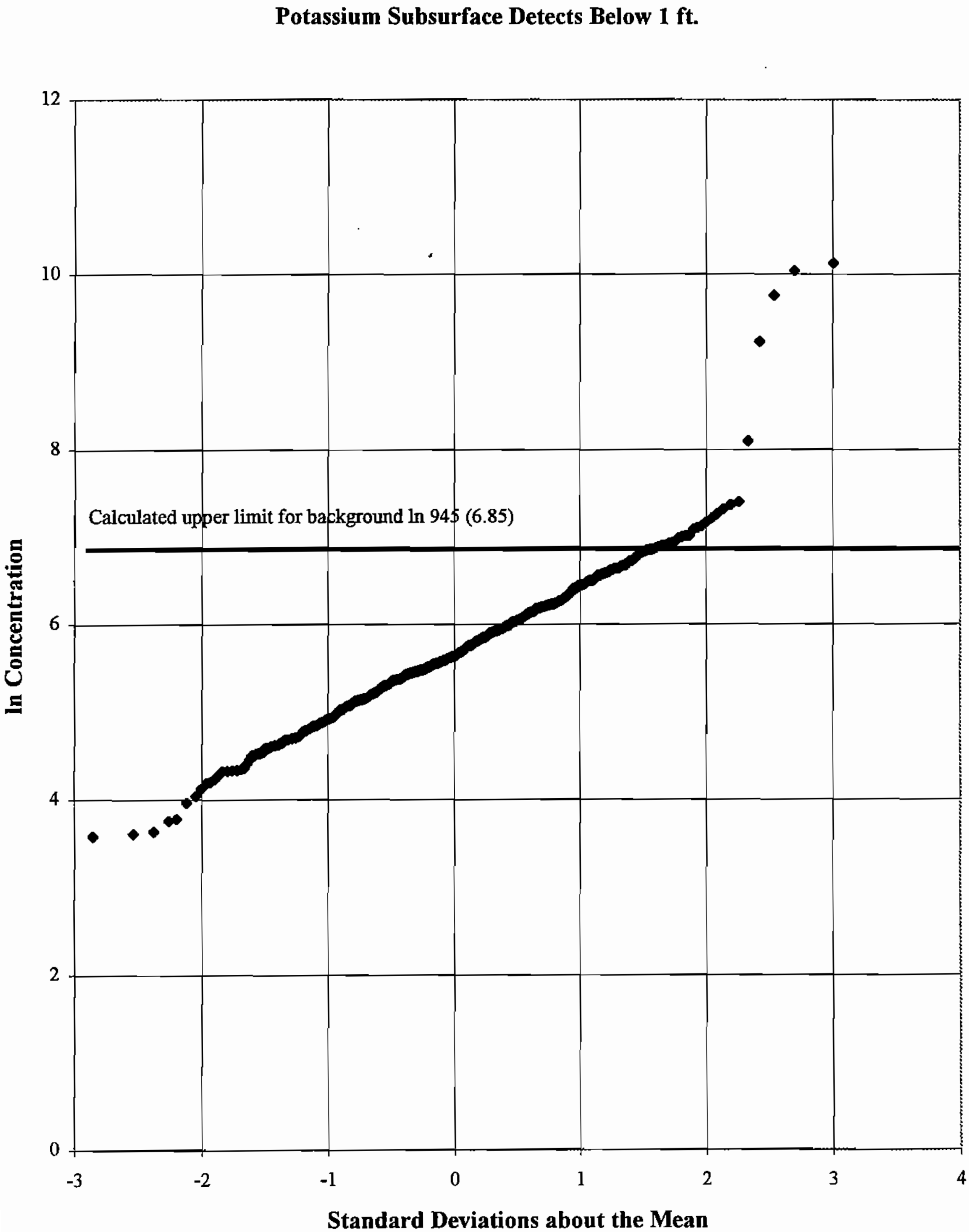


Figure 2.129. Cumulative Probability Plot for Potassium; Detected Observations; Subsurface Classification.

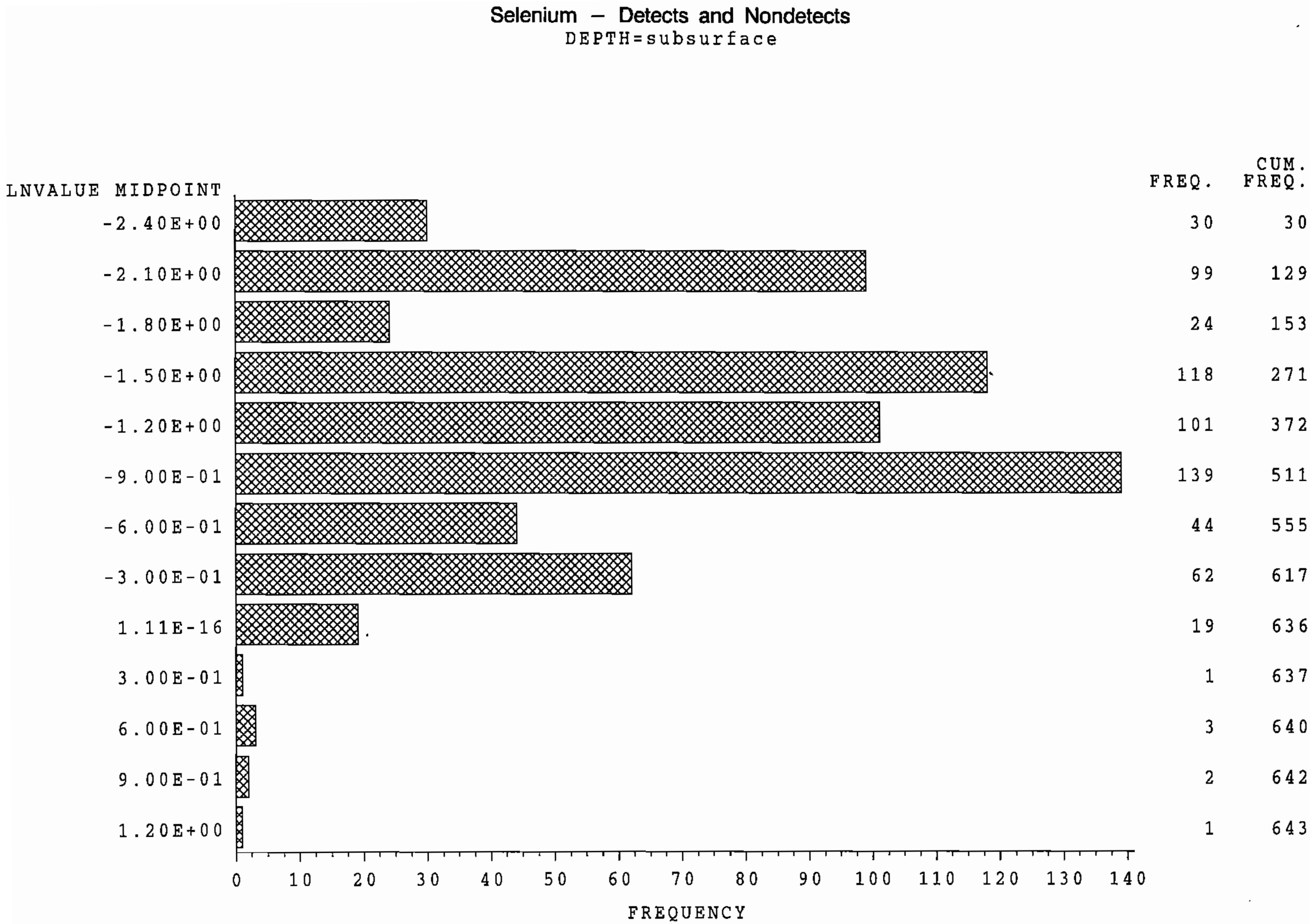


Figure 2.130. Histogram for Selenium; All Observations; Subsurface Classification.

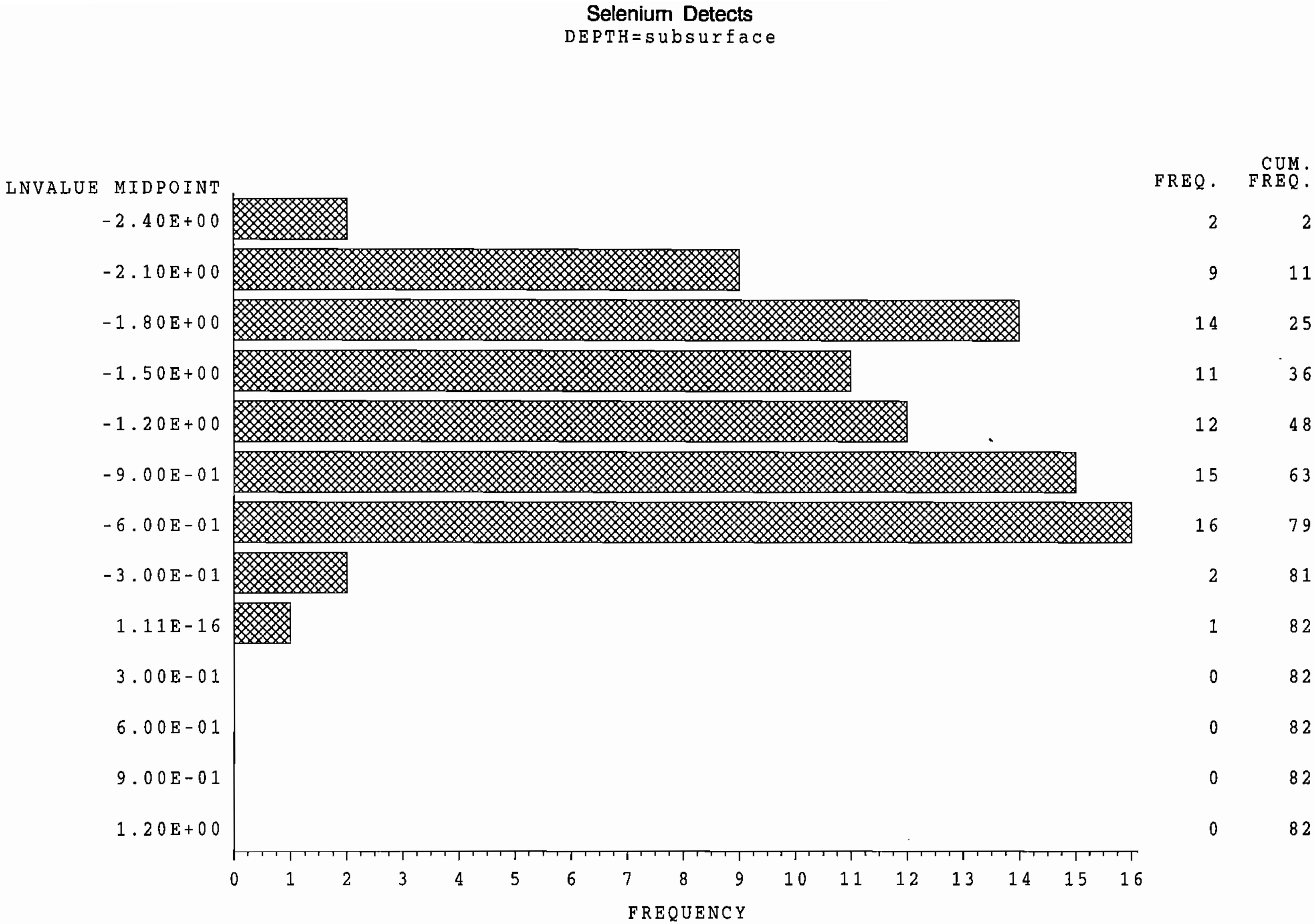


Figure 2.131. Histogram for Selenium; Detected Observations; Subsurface Classification.

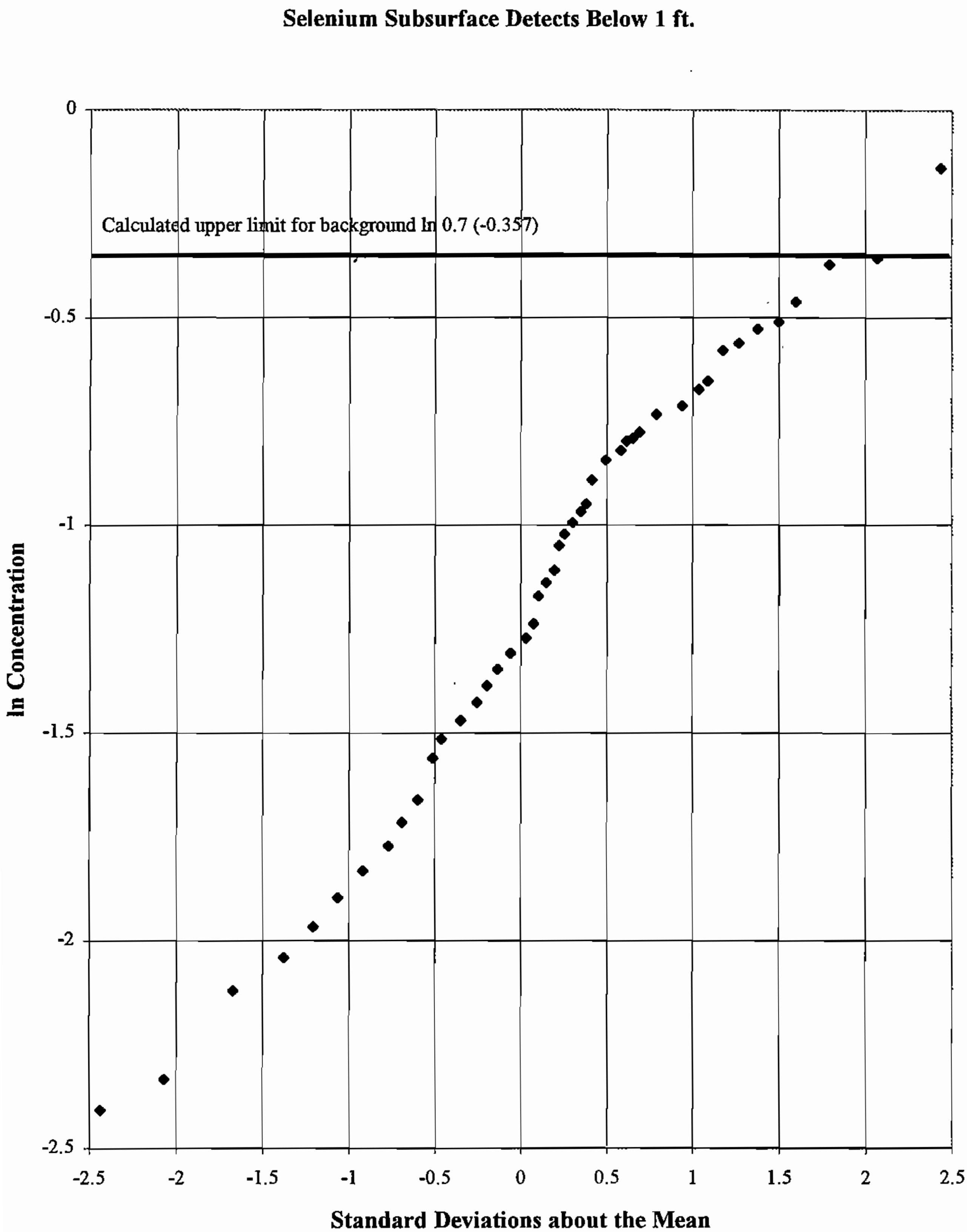


Figure 2.132. Cumulative Probability Plot for Selenium; Detected Observations; Subsurface Classification.

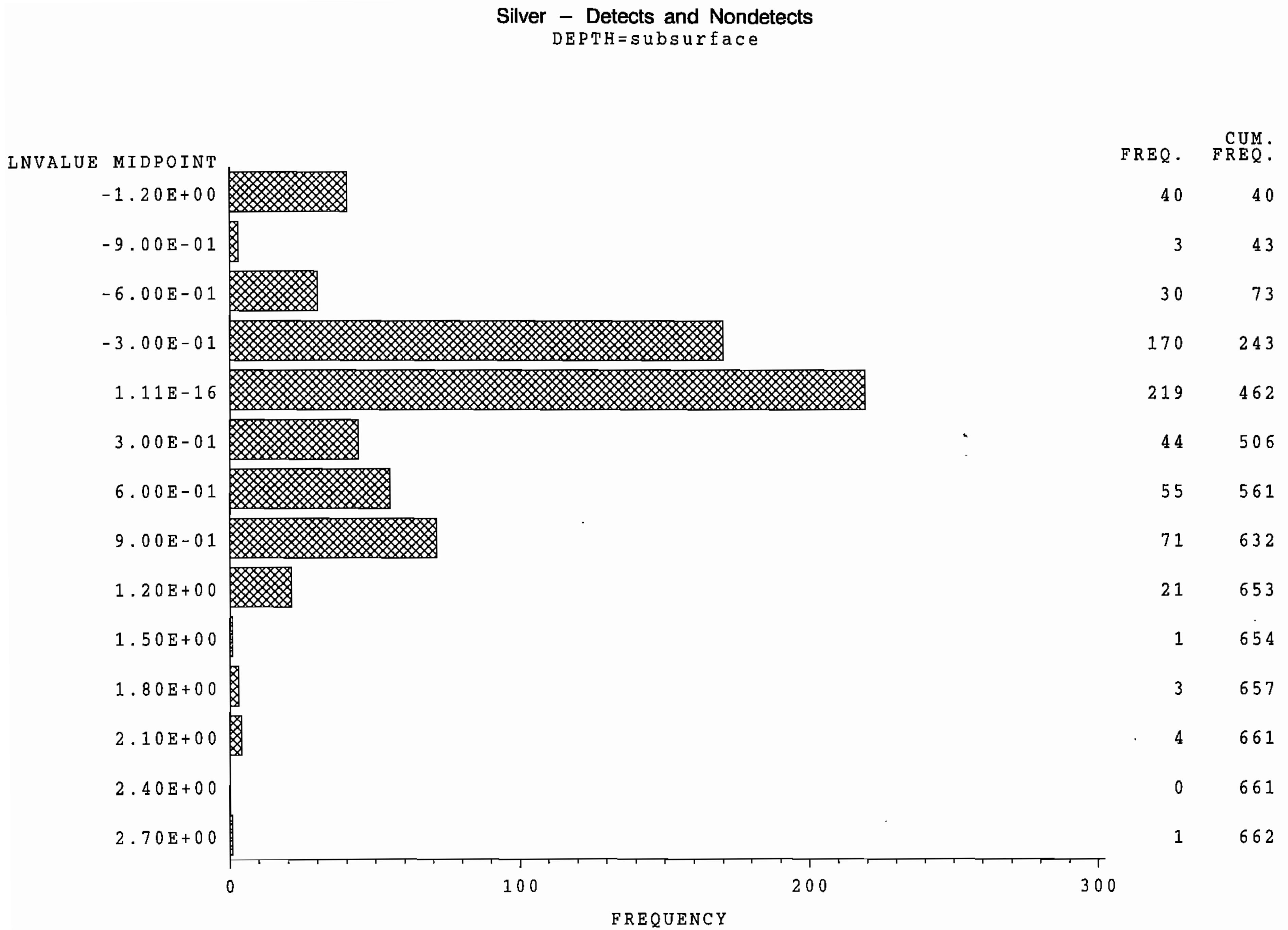


Figure 2.133. Histogram for Silver; All Observations; Subsurface Classification.

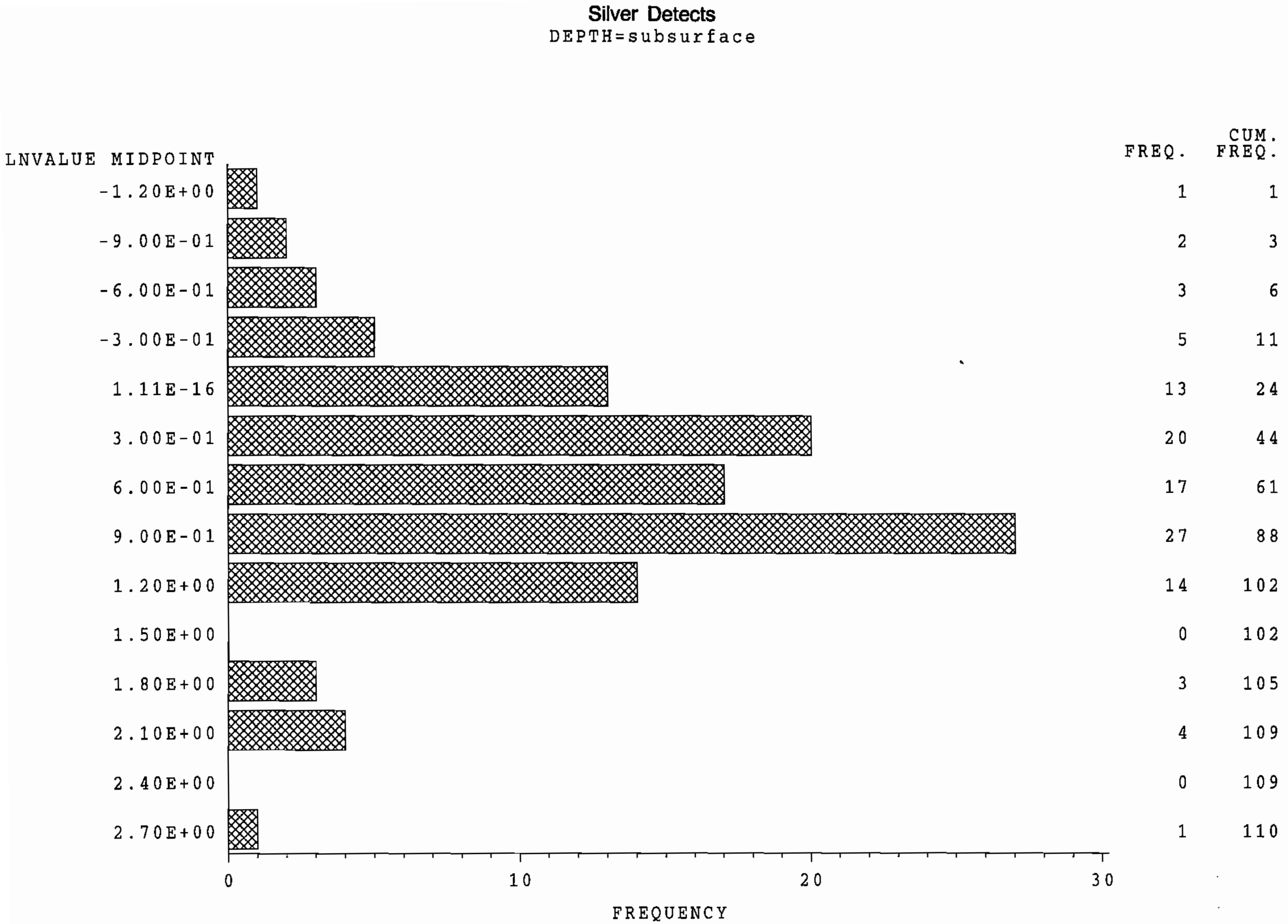


Figure 2.134. Histogram for Silver; Detected Observations; Subsurface Classification.

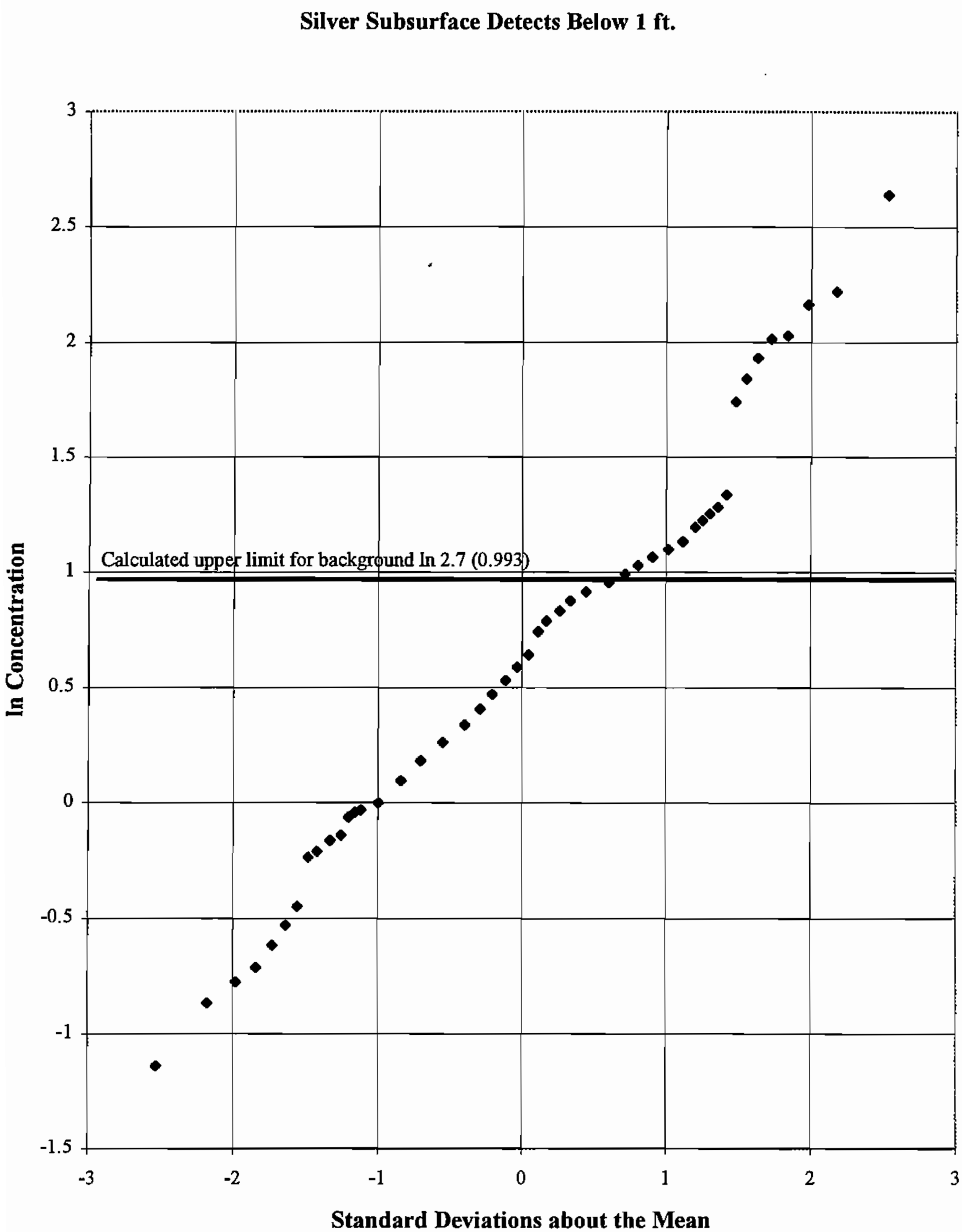


Figure 2.135. Cumulative Probability Plot for Silver; Detected Observations; Subsurface Classification.

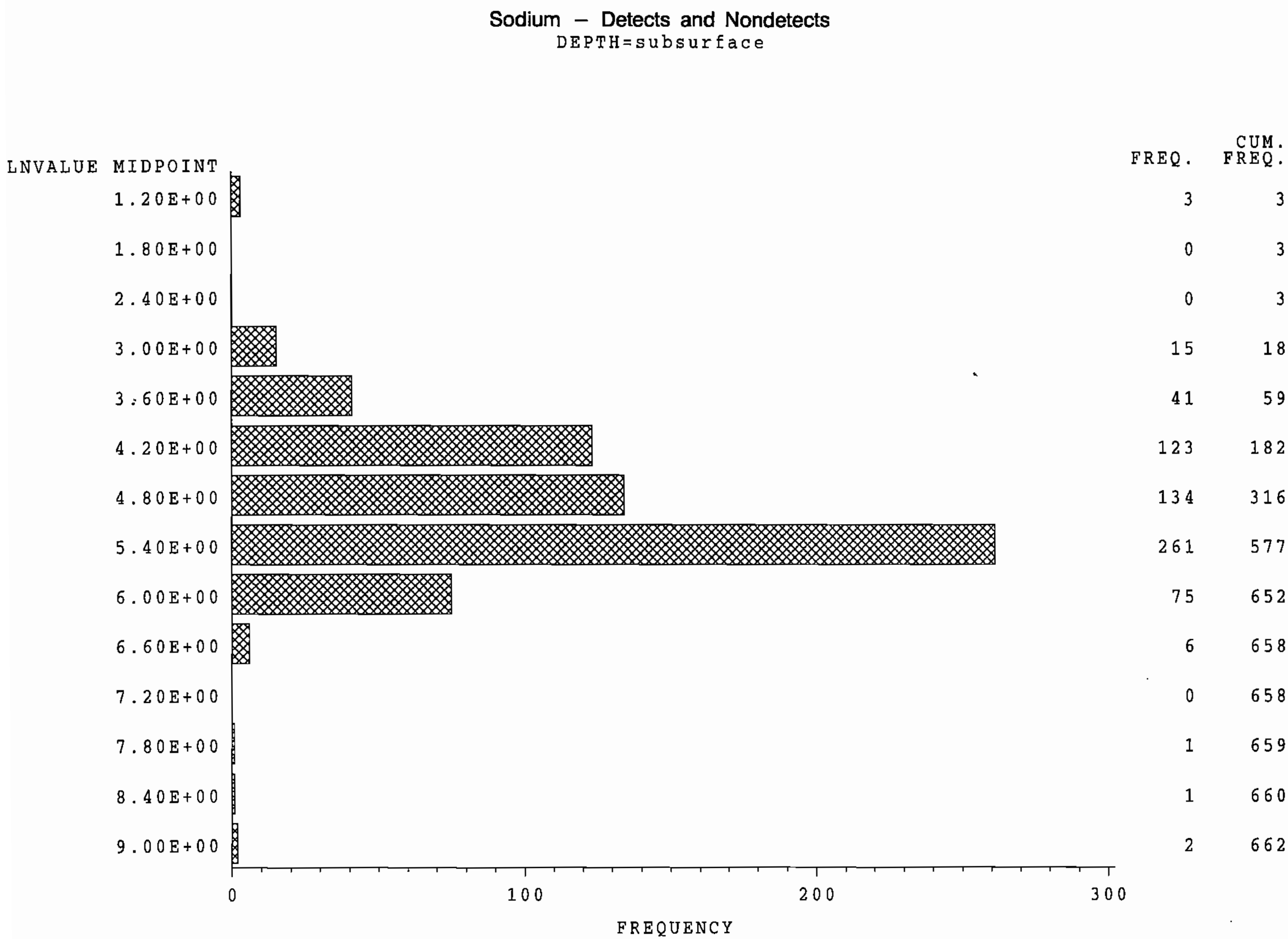


Figure 2.136. Histogram for Sodium; All Observations; Subsurface Classification.

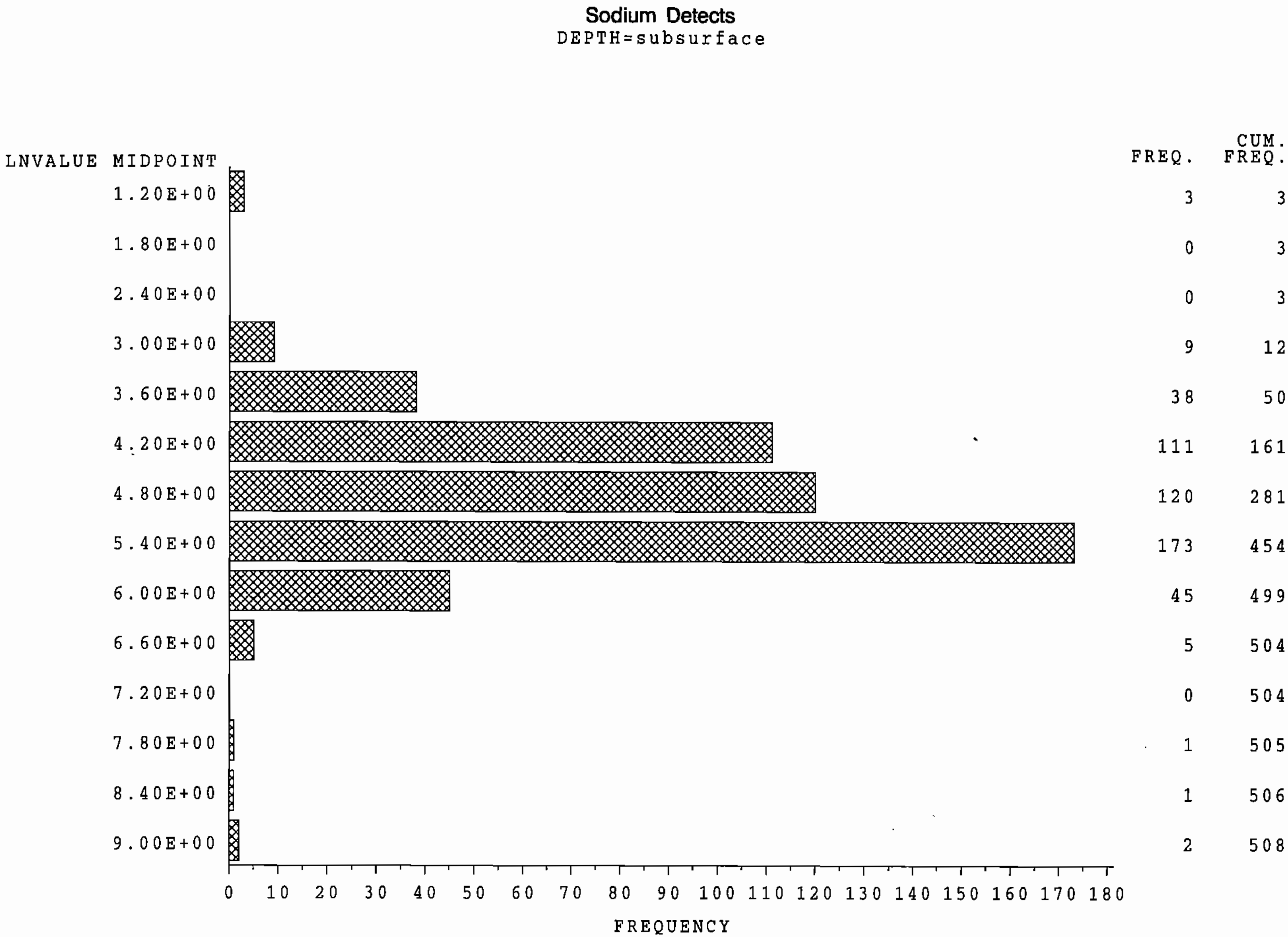


Figure 2.137. Histogram for Sodium; Detected Observations; Subsurface Classification.

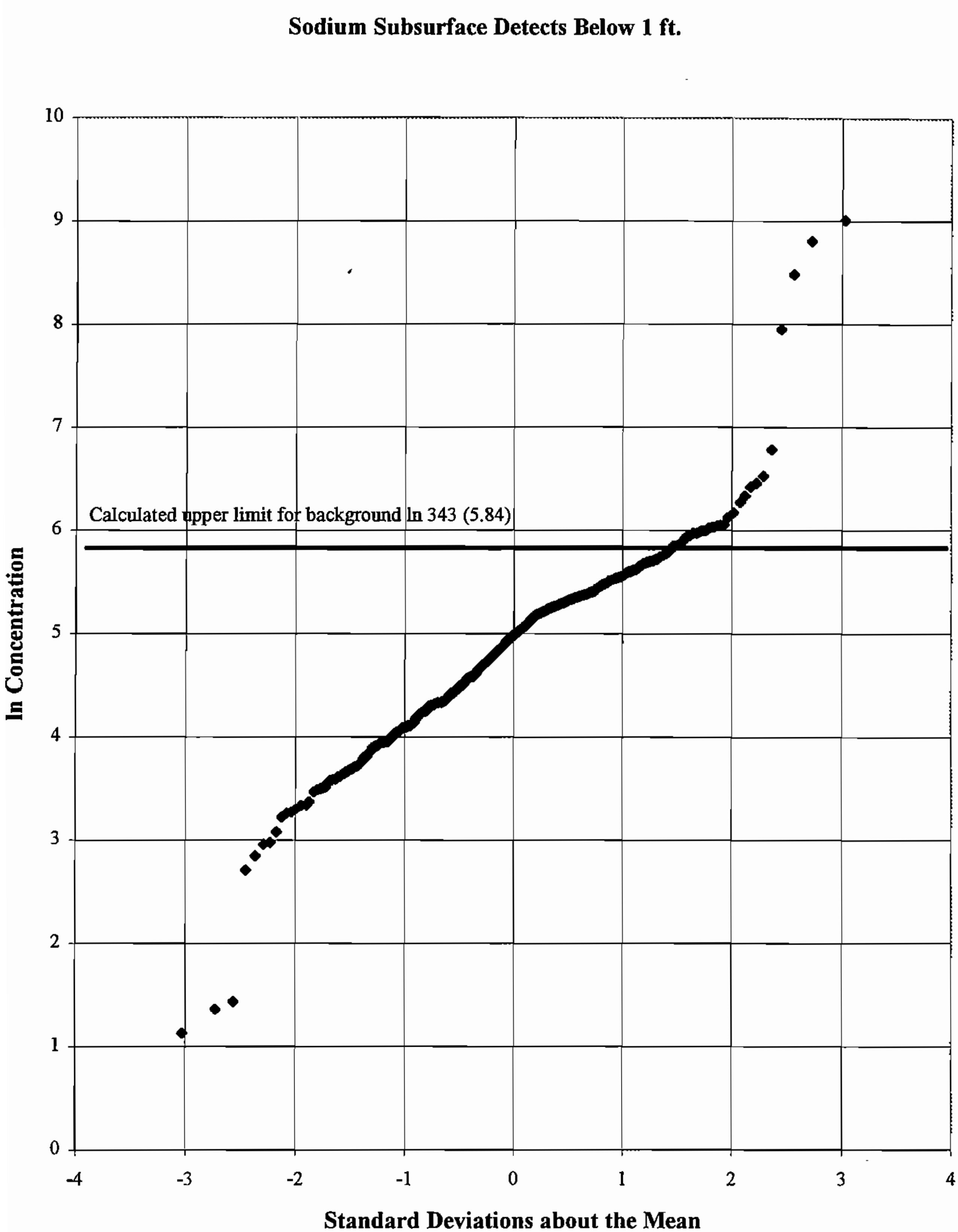


Figure 2.138. Cumulative Probability Plot for Sodium; Detected Observations; Subsurface Classification.

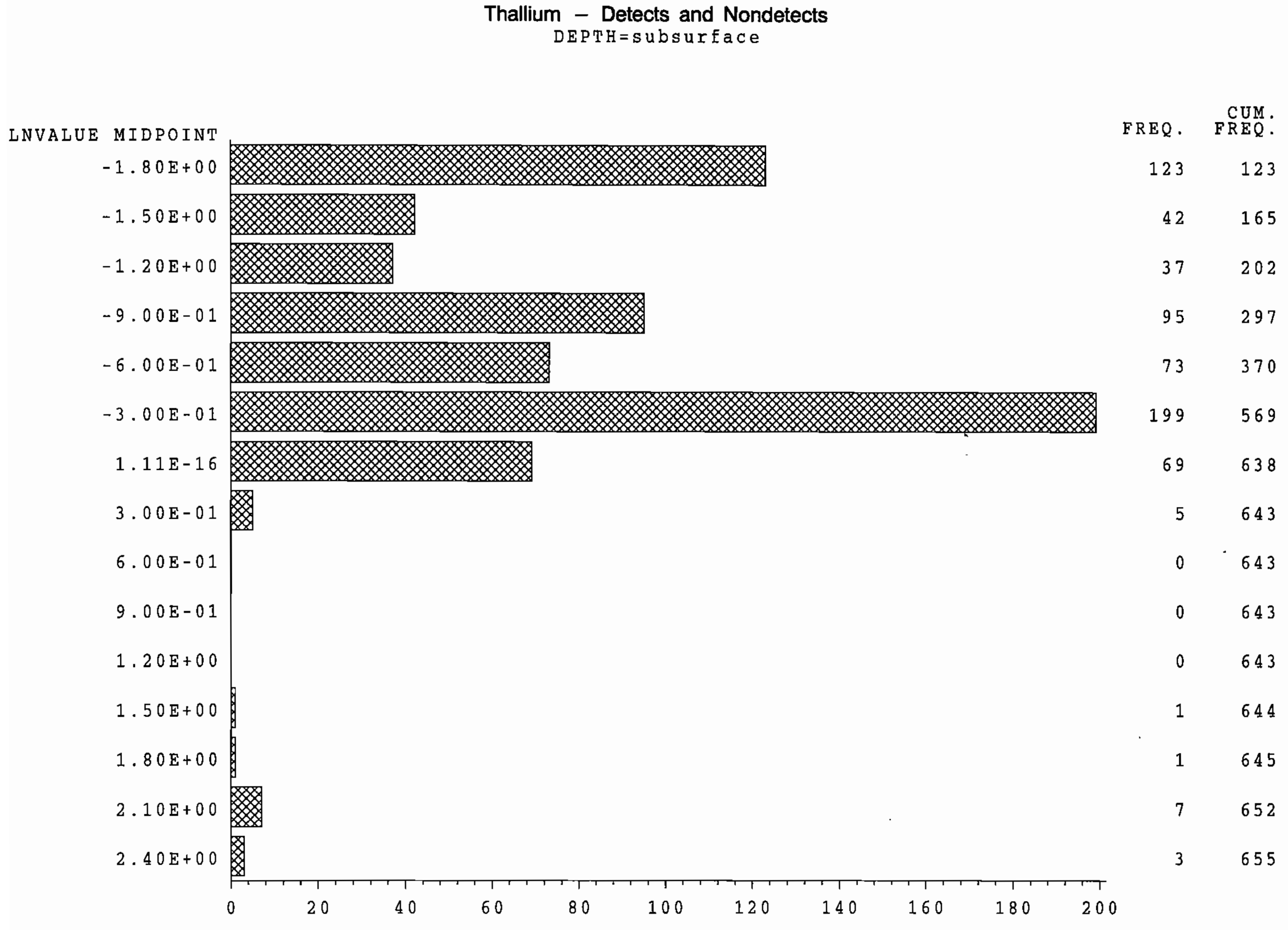


Figure 2.139. Histogram for Thallium; All Observations; Subsurface Classification.

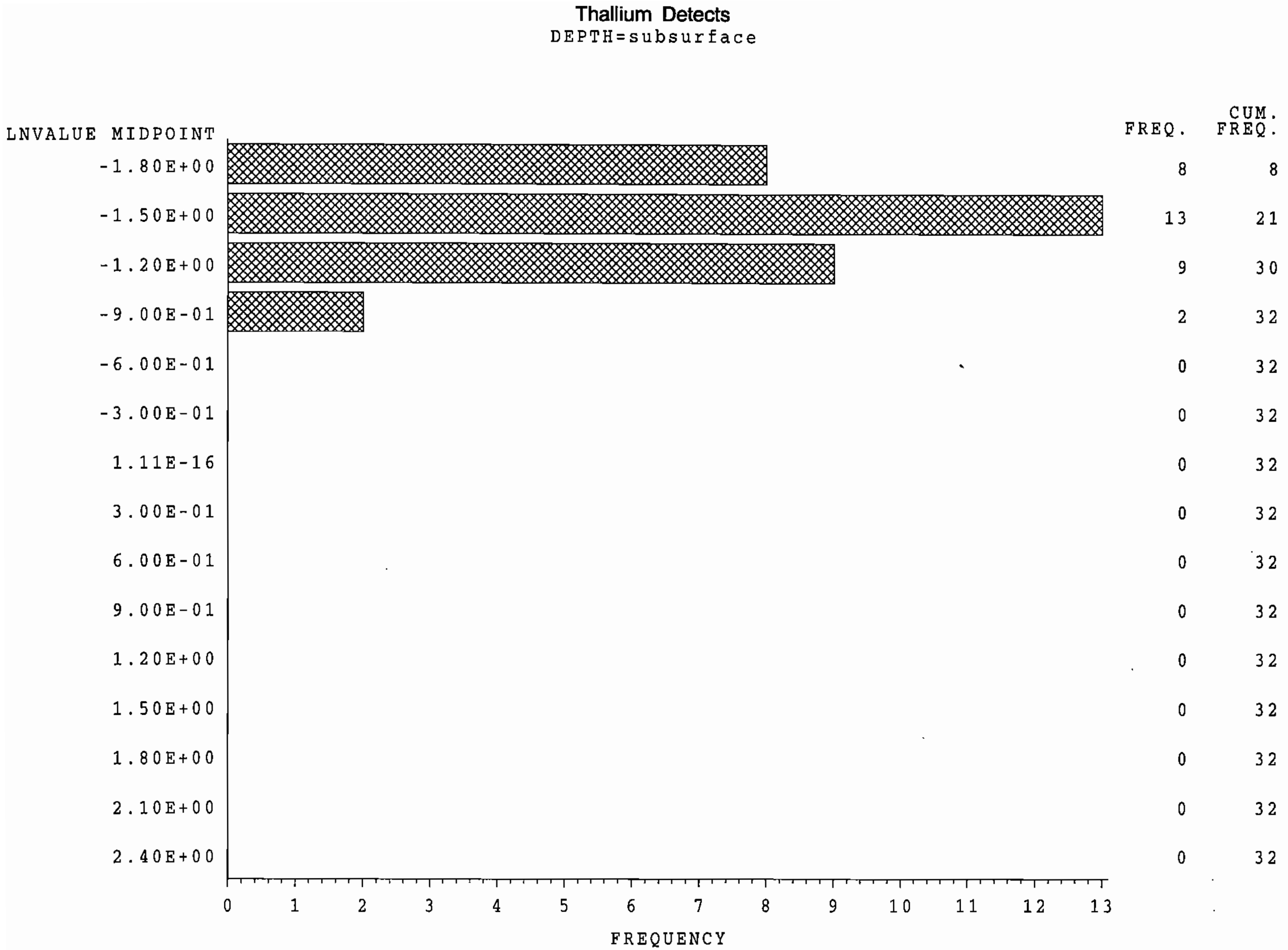


Figure 2.140. Histogram for Thallium; Detected Observations; Subsurface Classification.

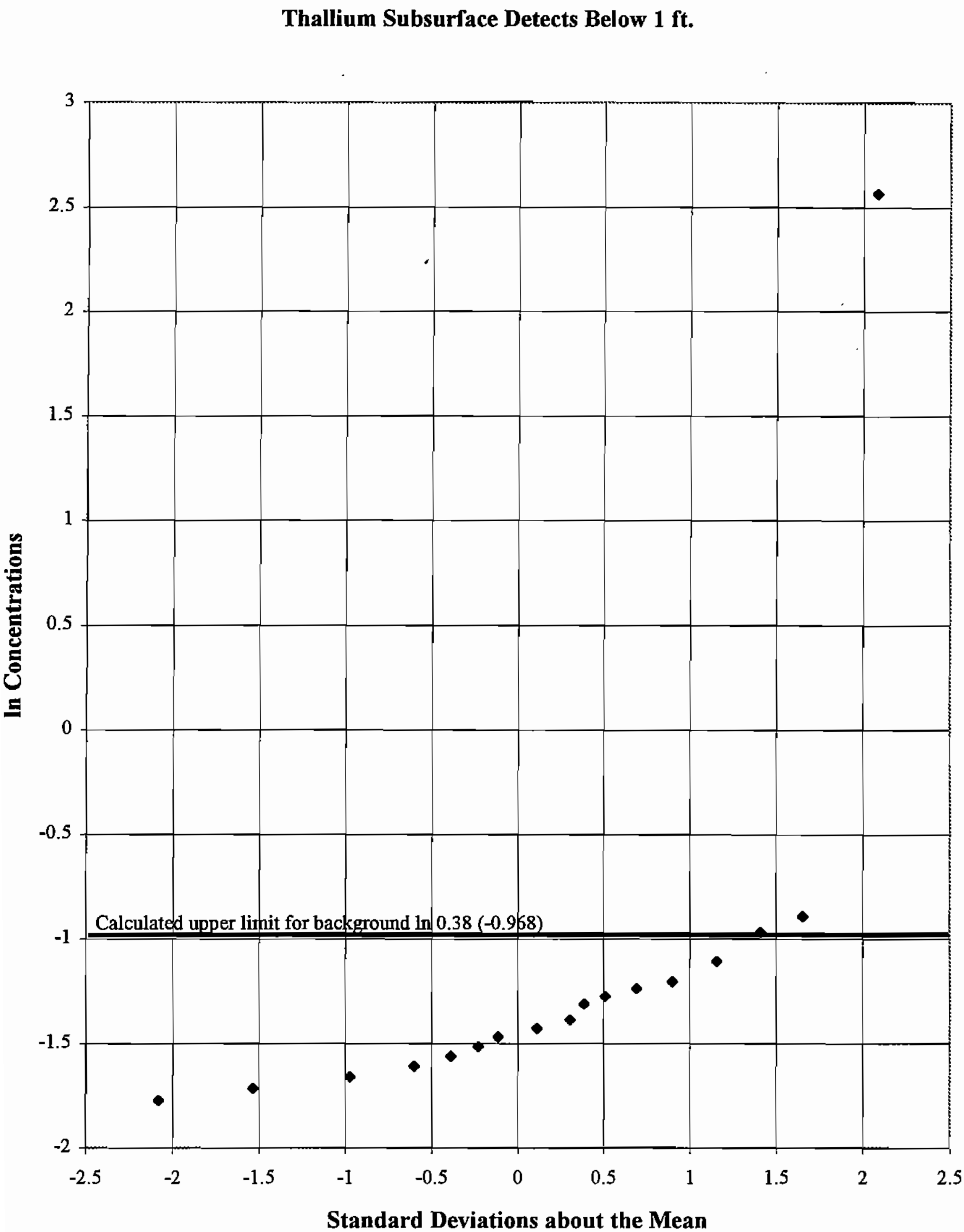


Figure 2.141. Cumulative Probability Plot for Thallium; Detected Observations; Subsurface Classification.

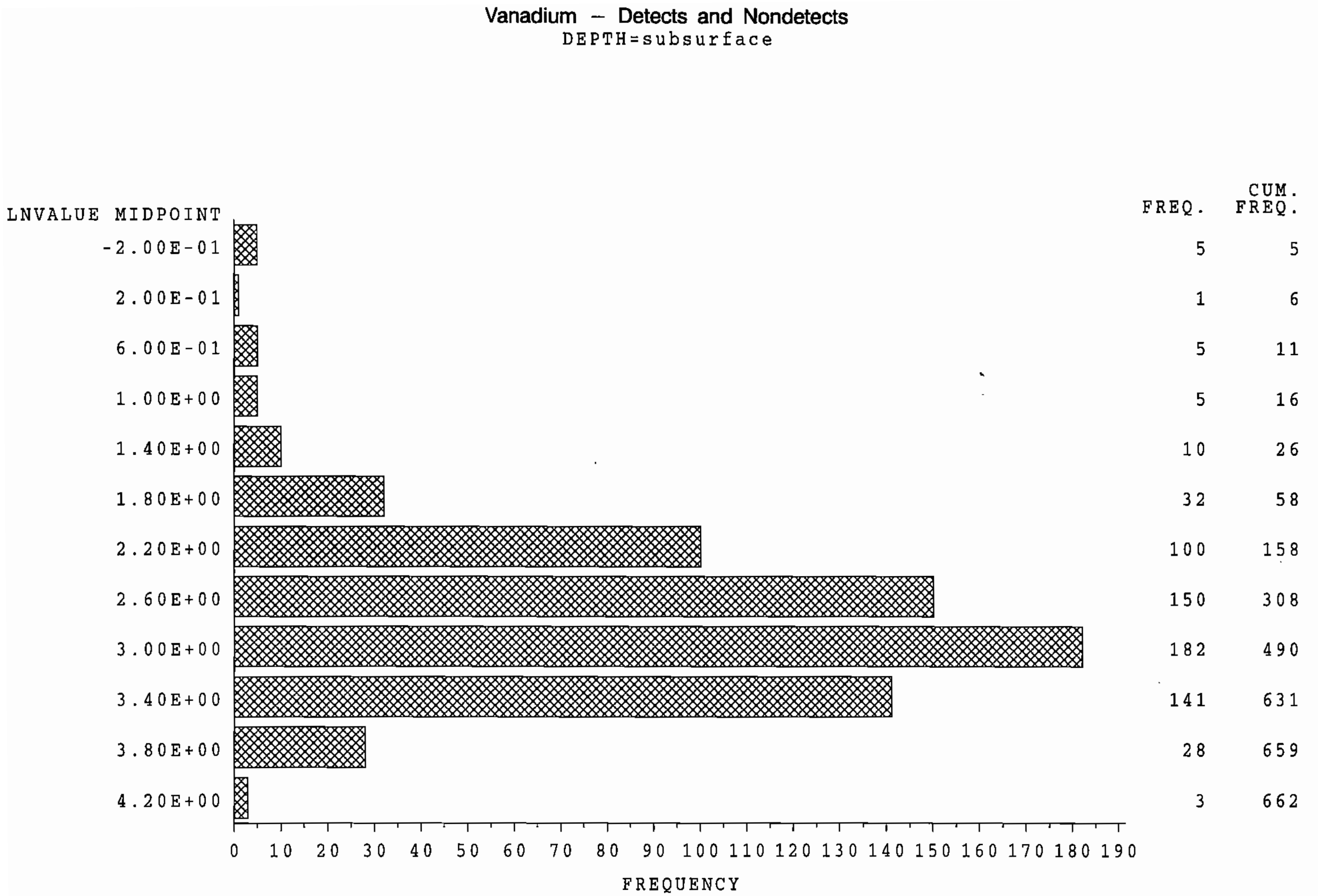


Figure 2.142. Histogram for Vanadium; All Observations; Subsurface Classification.

Vanadium Detects

DEPTH=subsurface

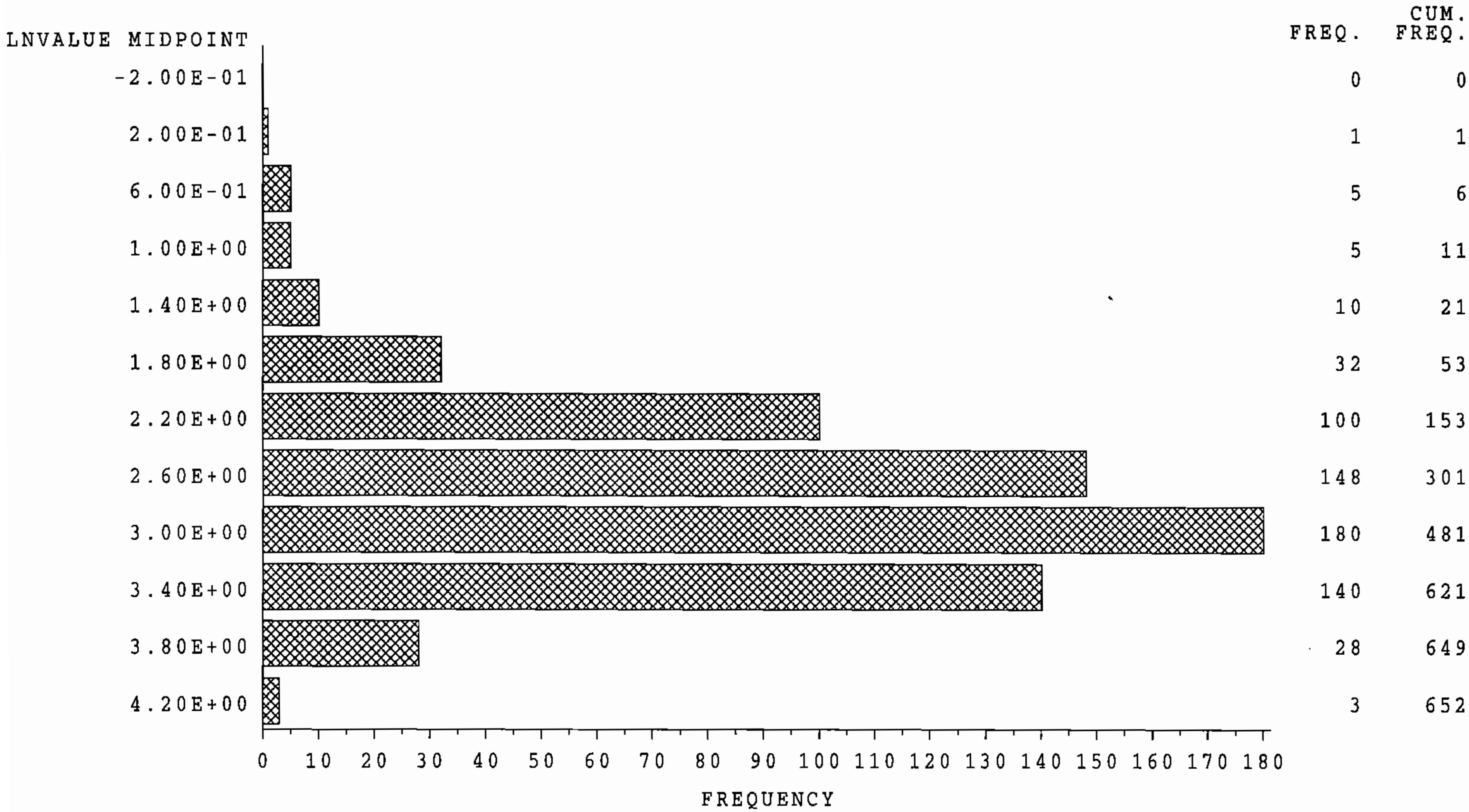


Figure 2.143. Histogram for Vanadium; Detected Observations; Subsurface Classification.

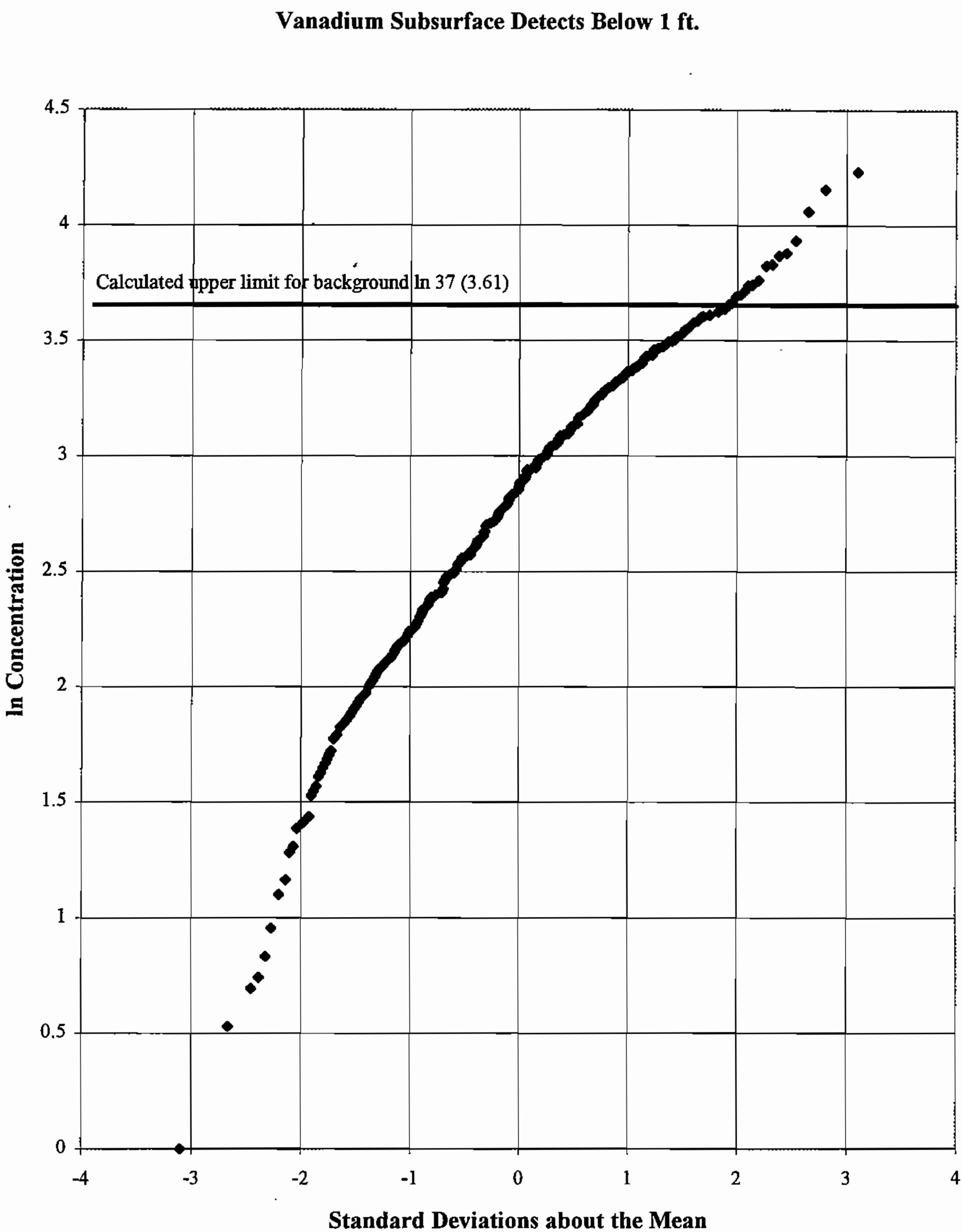


Figure 2.144. Cumulative Probability Plot for Vanadium; Detected Observations; Subsurface Classification.

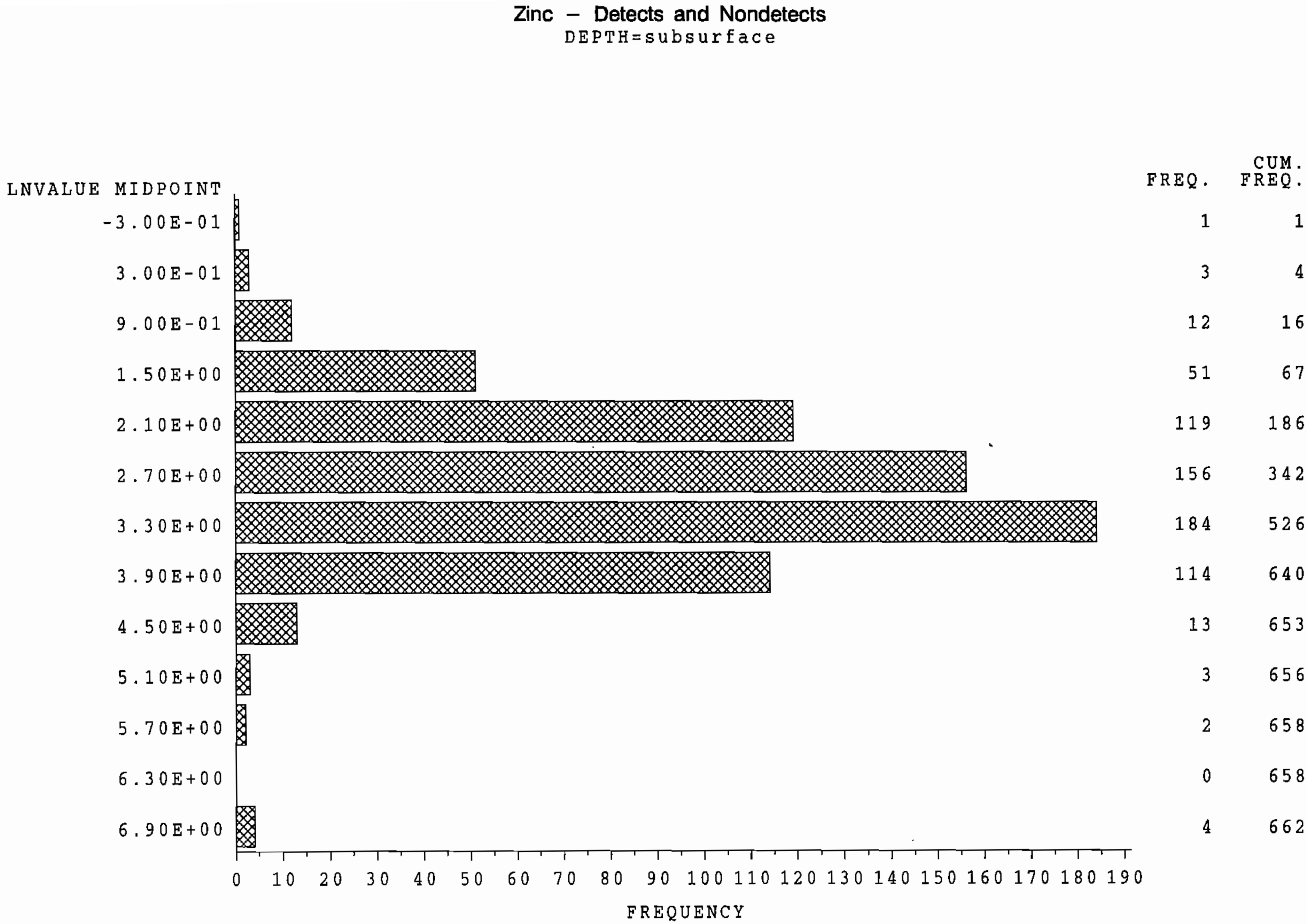


Figure 2.145. Histogram for Zinc; All Observations; Subsurface Classification.

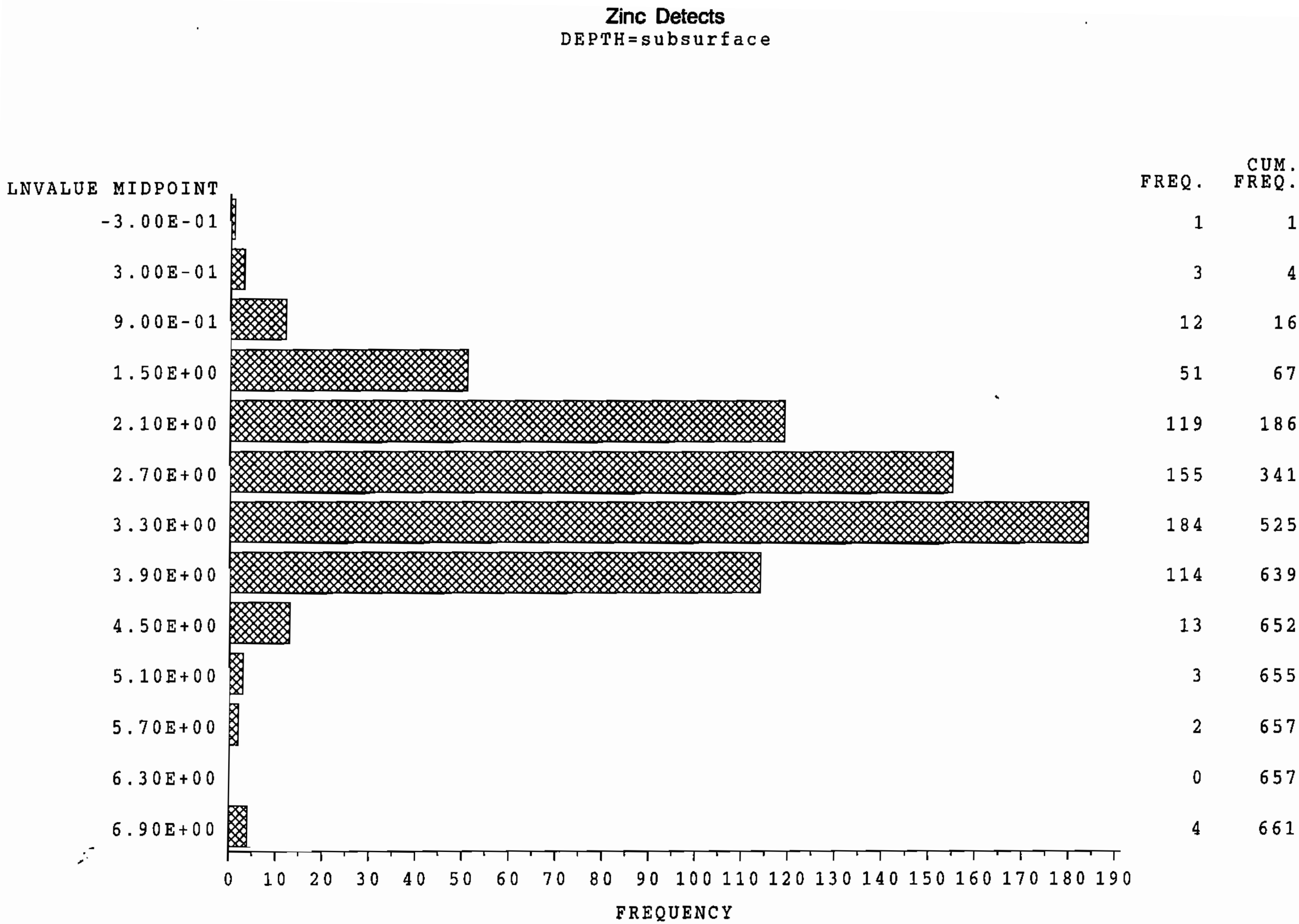


Figure 2.146. Histogram for Zinc; Detected Observations; Subsurface Classification.

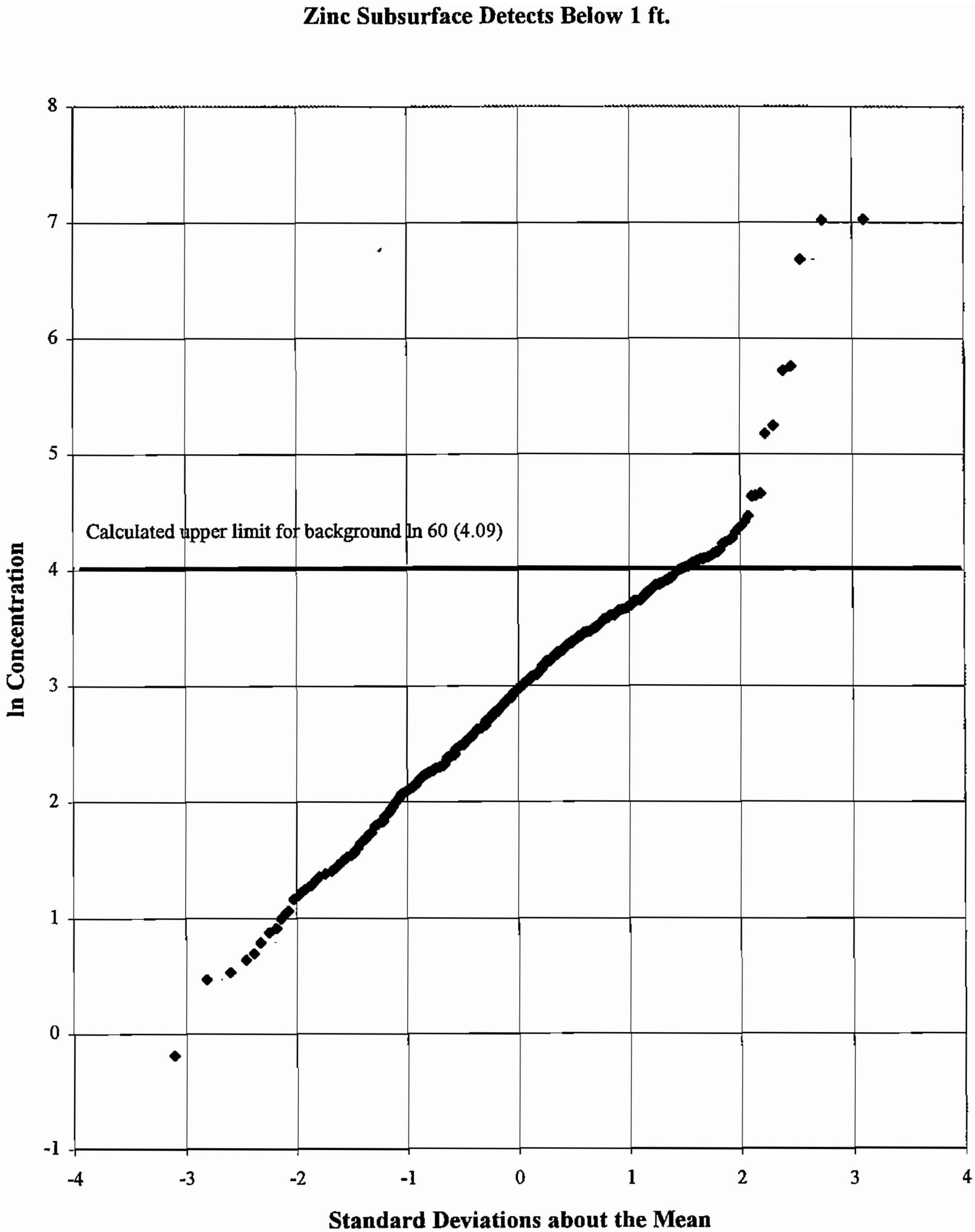


Figure 2.147. Cumulative Probability Plot for Zinc; Detected Observations; Subsurface Classification.

TABLES FOR CHAPTER 2

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Table 2.1. Number of observations and quartiles for inorganic analytes; all observations[a]; surface classification (0 to 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Aluminum	75	9.66 (15,677)	9.24 (10,301)	9.00 (8,103)	8.78 (6,503)	7.02 (1,119)
Antimony	48	2.56 (12.9)	1.42 (4.14)	-0.95 (0.39)	-1.05 (0.35)	-1.11 (0.33)
Arsenic	75	3.83 (46.1)	2.15 (8.58)	1.70 (5.47)	1.36 (3.90)	-1.43 (0.24)
Barium	75	5.29 (198)	4.70 (110)	4.51 (90.9)	4.17 (64.7)	2.64 (14.0)
Beryllium	75	3.18 (24.0)	2.48 (11.9)	0.00 (1.00)	-0.60 (0.55)	-1.77 (0.17)
Cadmium	71	2.27 (9.68)	0.79 (2.20)	0.10 (1.11)	-0.22 (0.80)	-0.56 (0.57)
Calcium	75	12.59 (293,608)	9.60 (14,765)	8.34 (4,188)	7.77 (2,368)	6.10 (446)
Chromium	75	5.55 (257)	3.22 (25.0)	2.77 (16.0)	2.48 (11.9)	0.96 (2.61)
Cobalt	75	3.40 (30.0)	2.26 (9.58)	1.90 (6.69)	1.72 (5.58)	0.18 (1.20)
Copper	75	5.44 (230)	3.14 (23.1)	2.71 (15.0)	2.27 (9.68)	0.92 (2.51)
Cyanide	67	-0.15 (0.86)	-0.46 (0.63)	-0.53 (0.59)	-0.62 (0.54)	-1.31 (0.32)
Iron	75	10.90 (54,176)	9.81 (18,215)	9.58 (14,472)	9.40 (12,088)	8.16 (3,498)
Lead	75	5.78 (324)	3.33 (27.9)	2.89 (18.0)	2.56 (12.9)	1.13 (3.10)
Magnesium	75	9.02 (8,267)	7.50 (1,808)	7.19 (1,326)	6.84 (934)	5.55 (257)
Manganese	75	7.90 (2,697)	6.39 (596)	5.86 (351)	5.58 (265)	3.22 (25.0)
Mercury	75	2.04 (7.69)	-2.12 (0.12)	-2.30 (0.10)	-2.30 (0.10)	-3.77 (0.02)
Nickel	75	4.44 (84.8)	3.22 (25.0)	2.77 (16.0)	2.48 (11.9)	1.65 (5.21)
Potassium	75	7.64 (2,080)	6.47 (645)	6.22 (503)	5.97 (392)	4.70 (110)
Selenium	73	3.22 (25.0)	-0.65 (0.52)	-1.11 (0.33)	-1.90 (0.15)	-2.21 (0.11)

Table 2.1. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Silver	75	3.74 (42.1)	0.83 (2.30)	0.53 (1.70)	0.18 (1.20)	-0.71 (0.49)
Sodium	75	6.43 (620)	4.74 (114)	4.26 (70.8)	3.91 (49.9)	3.22 (25.0)
Thallium	74	2.30 (9.97)	-0.22 (0.80)	-0.68 (0.51)	-1.39 (0.25)	-1.51 (0.22)
Vanadium	75	4.25 (70.1)	3.33 (27.9)	3.09 (22.0)	2.89 (18.0)	0.83 (2.29)
Zinc	75	5.97 (392)	4.42 (83.1)	3.95 (51.9)	3.56 (35.2)	2.71 (15.0)

[a] Values qualified with "R" were not included in this summary.

[b] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 9.66. The untransformed value equal to ln 9.66 is 15,667. All untransformed values are in mg/kg.

Table 2.2. Number of observations and quartiles for inorganic analytes; all observations[a]; subsurface classification (greater than 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Aluminum	662	10.67 (43,044)	8.95 (7,708)	8.52 (5,014)	7.90 (2,697)	5.07 (159)
Antimony	533	3.81 (45.2)	2.40 (11.0)	1.53 (4.62)	1.25 (3.49)	-1.11 (0.33)
Arsenic	662	3.74 (42.1)	1.25 (3.49)	0.69 (1.99)	-0.07 (0.93)	-1.83 (0.16)
Barium	662	6.49 (659)	4.44 (84.8)	3.69 (40.0)	3.00 (20.1)	0.69 (1.99)
Beryllium	662	3.22 (25.0)	-0.37 (0.69)	-0.65 (0.52)	-0.89 (0.41)	-5.30 (0.005)
Cadmium	657	5.46 (235)	-0.08 (0.92)	-0.23 (0.79)	-0.36 (0.70)	-2.04 (0.13)
Calcium	662	12.37 (235,625)	7.29 (1,466)	6.88 (973)	6.41 (608)	0.54 (1.72)
Chromium	662	6.22 (503)	2.83 (16.9)	2.40 (11.0)	1.69 (5.42)	-0.73 (0.48)
Cobalt	662	4.23 (68.7)	1.96 (7.10)	1.53 (4.62)	1.03 (2.80)	-0.54 (0.58)
Copper	662	9.84 (18,770)	2.35 (10.5)	1.84 (6.30)	1.25 (3.50)	-0.45 (0.64)
Cyanide	642	0.34 (1.40)	-0.45 (0.64)	-0.54 (0.58)	-0.87 (0.42)	-2.12 (0.12)
Iron	662	11.49 (97,734)	9.74 (16,983)	9.39 (11,968)	8.95 (7,708)	6.30 (545)
Lead	662	7.06 (1,164)	2.31 (10.1)	1.95 (7.03)	1.41 (4.10)	-0.73 (0.48)
Magnesium	662	9.44 (12,582)	7.01 (1,108)	6.39 (596)	5.77 (321)	2.81 (16.7)
Manganese	662	9.00 (8,103)	5.58 (265)	4.86 (129)	3.78 (43.8)	0.53 (1.70)
Mercury	655	2.48 (11.9)	-2.13 (0.12)	-2.30 (0.10)	-2.78 (0.06)	-4.61 (0.001)
Nickel	662	9.42 (12,332)	2.48 (11.9)	2.05 (7.77)	1.41 (4.10)	-0.17 (0.84)
Potassium	662	10.13 (25,084)	6.01 (407)	5.55 (257)	5.12 (167)	3.58 (35.9)
Selenium	643	1.34 (3.82)	-0.82 (0.44)	-1.20 (0.30)	-1.58 (0.21)	-2.45 (0.09)

Table 2.2. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Silver	662	2.64 (14.0)	0.34 (1.40)	-0.04 (0.96)	-0.25 (0.78)	-1.27 (0.28)
Sodium	662	9.01 (8,185)	5.47 (237)	5.17 (176)	4.43 (83.9)	1.13 (3.10)
Thallium	655	2.40 (11.0)	-0.27 (0.76)	-0.62 (0.54)	-1.39 (0.25)	-1.83 (0.16)
Vanadium	662	4.23 (68.7)	3.22 (25.0)	2.86 (17.5)	2.46 (11.7)	-0.34 (0.71)
Zinc	662	7.03 (1,130)	3.50 (33.1)	2.98 (19.7)	2.32 (10.2)	-0.19 (0.83)

[a] Values qualified with "R" were not included in this summary.

[b] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 10.67. The untransformed value is equal to ln 10.67 is 43,045. All untransformed values are in mg/kg.

Table 2.3. Number of observations and quartiles for inorganic analytes; detected observations[a]; surface classification (0 to 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Aluminum	75	9.66 (15,677)	9.24 (10,301)	9.00 (8,103)	8.79 (6,568)	7.02 (1,119)
Antimony	4	0.47 (1.60)	0.15 (1.16)	-0.36 (0.70)	-0.74 (0.48)	-0.94 (0.39)
Arsenic	74	3.83 (46.1)	2.15 (8.58)	1.70 (5.47)	1.39 (4.01)	0.18 (1.20)
Barium	75	5.29 (198)	4.70 (110)	4.51 (90.9)	4.17 (64.7)	2.64 (14.0)
Beryllium	70	3.18 (24.0)	2.48 (11.9)	1.67 (5.31)	-0.53 (0.59)	-1.77 (0.17)
Cadmium	41	2.27 (9.68)	0.99 (2.69)	0.74 (2.10)	0.26 (1.30)	-0.26 (0.77)
Calcium	75	12.59 (293,608)	9.60 (14,765)	8.34 (4,188)	7.77 (2,368)	6.10 (446)
Chromium	74	5.55 (257)	3.22 (25.0)	2.77 (16.0)	2.48 (11.9)	0.99 (2.69)
Cobalt	75	3.40 (30.0)	2.26 (9.58)	1.90 (6.69)	1.72 (5.58)	0.18 (1.20)
Copper	75	5.44 (230)	3.14 (23.1)	2.71 (15.0)	2.27 (9.68)	0.92 (2.51)
Cyanide	1	-0.34 (0.71)	NA	NA	NA	NA
Iron	75	10.90 (54,176)	9.81 (18,215)	9.58 (14,472)	9.40 (12,088)	8.16 (3,498)
Lead	75	5.78 (324)	3.33 (27.9)	2.89 (18.0)	2.56 (12.9)	1.13 (3.10)
Magnesium	75	9.02 (8,267)	7.45 (1,720)	7.18 (1,313)	6.84 (934)	5.55 (257)
Manganese	74	7.90 (2,697)	6.37 (584)	5.86 (351)	5.58 (265)	3.22 (25.0)
Mercury	12	2.04 (7.69)	-1.36 (0.26)	-1.81 (0.16)	-2.30 (0.10)	-2.30 (0.10)
Nickel	72	4.44 (84.8)	3.22 (25.0)	2.77 (16.0)	2.56 (12.9)	1.65 (5.21)
Potassium	60	7.64 (2,080)	6.52 (679)	6.30 (545)	6.07 (433)	4.86 (129)
Selenium	23	3.22 (25.0)	-0.30 (0.74)	-0.80 (0.45)	-1.14 (0.32)	-1.83 (0.16)

Table 2.3. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Silver	35	3.74 (42.1)	0.92 (2.51)	0.64 (1.90)	0.41 (1.51)	0.18 (1.20)
Sodium	56	6.43 (620)	4.82 (124)	4.32 (75.2)	3.97 (53.0)	3.22 (25.0)
Thallium	13	0.34 (1.40)	-0.82 (0.44)	-1.20 (0.30)	-1.27 (0.28)	-1.39 (0.25)
Vanadium	75	4.25 (70.1)	3.33 (27.9)	3.09 (22.0)	2.89 (18.0)	0.83 (2.29)
Zinc	74	5.97 (392)	4.41 (82.3)	3.95 (51.9)	3.56 (35.2)	2.71 (15.0)

Notes:
NA indicates that a value was not available; the number of samples in which cyanide was detected was too small too allow calculation of the these values.

[a] Values qualified with "R" were not included in this summary.

[b] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 9.66. The untransformed value equal to ln 9.66 is 15,667. All untransformed values are in mg/kg.

Table 2.4. Number of observations and quartiles for inorganic analytes; detected observations[a]; subsurface classification (greater than 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Aluminum	662	10.67 (43,044)	8.95 (7,708)	8.52 (5,014)	7.90 (2,697)	5.07 (159)
Antimony	35	3.81 (45.2)	2.88 (17.8)	1.72 (5.58)	1.53 (4.62)	-0.11 (0.90)
Arsenic	586	3.74 (42.1)	1.36 (3.90)	0.83 (2.29)	0.26 (1.30)	-1.83 (0.16)
Barium	662	6.49 (659)	4.44 (84.8)	3.69 (40.0)	3.00 (20.1)	0.69 (1.99)
Beryllium	589	3.22 (25.0)	-0.36 (0.70)	-0.62 (0.54)	-0.89 (0.41)	-4.20 (0.01)
Cadmium	210	5.46 (235)	0.64 (1.90)	0.10 (1.11)	-0.58 (0.56)	-1.51 (0.22)
Calcium	659	12.37 (235,625)	7.29 (1,466)	6.88 (973)	6.41 (608)	0.54 (1.72)
Chromium	629	6.22 (503)	2.83 (16.9)	2.45 (11.6)	1.84 (6.30)	-0.71 (0.49)
Cobalt	578	4.23 (68.7)	2.01 (7.46)	1.59 (4.90)	1.13 (3.10)	-0.33 (0.72)
Copper	609	9.84 (18,770)	2.40 (11.0)	1.92 (6.82)	1.34 (3.82)	-0.08 (0.92)
Cyanide	6	0.10 (1.11)	-0.11 (0.90)	-0.14 (0.87)	-0.20 (0.82)	-1.14 (0.32)
Iron	662	11.49 (97,734)	9.74 (16,983)	9.39 (11,968)	8.95 (7,708)	6.30 (545)
Lead	655	7.06 (1,164)	2.32 (10.2)	1.95 (7.03)	1.44 (4.22)	-0.41 (0.66)
Magnesium	659	9.44 (12,582)	7.01 (1,108)	6.40 (602)	5.77 (321)	2.81 (16.7)
Manganese	659	9.00 (8,103)	5.60 (270)	4.86 (129)	3.78 (43.8)	0.53 (1.70)
Mercury	44	2.48 (11.9)	-1.64 (0.19)	-2.79 (0.06)	-3.07 (0.05)	-4.51 (0.01)
Nickel	563	9.42 (12,332)	2.48 (11.9)	2.04 (7.69)	1.46 (4.31)	-0.08 (0.92)
Potassium	471	10.13 (25,084)	6.19 (488)	5.64 (281)	5.18 (178)	3.58 (35.9)
Selenium	82	-0.14 (0.87)	-0.79 (0.45)	-1.29 (0.28)	-1.71 (0.18)	-2.41 (0.09)

Table 2.4. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[b]	75% [b]	Median[b]	25% [b]	Minimum[b]
Silver	110	2.64 (14.0)	0.99 (2.69)	0.61 (1.84)	0.18 (1.20)	-1.14 (0.32)
Sodium	508	9.01 (8,185)	5.38 (217)	4.98 (145)	4.33 (75.9)	1.13 (3.10)
Thallium	32	-0.89 (0.41)	-1.26 (0.28)	-1.45 (0.23)	-1.64 (0.19)	-1.77 (0.17)
Vanadium	652	4.23 (68.7)	3.22 (25.0)	2.86 (17.5)	2.46 (11.7)	0.00 (1.00)
Zinc	661	7.03 (1,130)	3.50 (33.1)	2.99 (19.9)	2.32 (10.2)	-0.19 (0.83)

[a] Values qualified with "R" were not included in this summary.

[b] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 10.67. The untransformed value is equal to 10.67 is 43,044. All untransformed values are in mg/kg.

Table 2.5. Five samples with highest reported values for inorganic analytes; all observations; surface classification (0 to 1 foot below surface)

Analyte	Identifiers[a]	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Aluminum	ln(Conc)	9.66	9.60	9.52	9.50	9.47
	Sample ID	14176	14159	5103	14166	5053
	Station ID	UP003	H372	H027	H351	H041
	Location	Hwy 358+996	SWMU 7	5 mi NE of Plant	SWMU 97	SWMU 81
Antimony	ln(Conc)	2.56	2.56	2.56	2.56	2.54
	Sample ID	5063	5058	5056	5053	13067
	Station ID	H043	H042	H041	H041	H219
	Location	SWMU 81	SWMU 81	SWMU 81	SWMU 81	SWMU 10
Arsenic	ln(Conc)	3.83	3.71	3.53	3.22	2.71
	Sample ID	14166	14165	14167	14041	14040
	Station ID	H351	H351	H352	H262	H262
	Location	SWMU 97	SWMU 97	SWMU 97	SWMU 2 & 3	SWMU 2 & 3
Barium	ln(Conc)	5.29	5.27	5.25	5.09	5.08
	Sample ID	14165	14167	14166	14041	14145
	Station ID	H351	H352	H351	H262	H362
	Location	SWMU 97	SWMU 97	SWMU 97	SWMU 2 & 3	SWMU 30
Beryllium	ln(Conc)	3.18	3.18	3.04	3.04	2.89
	Sample ID	14159	14145	14166	14165	14164
	Station ID	H372	H362	H351	H351	H372
	Location	SWMU 7	SWMU 30	SWMU 97	SWMU 97	SWMU 7
Cadmium	ln(Conc)	2.27	1.87	1.86	1.72	1.28
	Sample ID	14139	14090	5047	14167	14166
	Station ID	H364	H210	H051	H352	H351
	Location	SWMU 30	SWMU 1	SWMU 1	SWMU 97	SWMU 97
Calcium	ln(Conc)	12.59	12.25	12.21	11.62	11.60
	Sample ID	14016	14000	14020	14019	14102
	Station ID	H252	H255	H257	H257	H211
	Location	SWMU 13	SWMU 92	SWMU 11	SWMU 11	SWMU 7 & 30
Chromium	ln(Conc)	5.55	4.92	4.48	3.83	3.69
	Sample ID	14090	5050	5037	14006	14159
	Station ID	H210	H052	H048	H251	H372
	Location	SWMU 1	SWMU 1	SWMU 33	SWMU 12	SWMU 7
Cobalt	ln(Conc)	3.40	2.89	2.89	2.89	2.64
	Sample ID	14158	14166	14165	14009	14131
	Station ID	H369	H351	H351	H254	UP002
	Location	SWMU 7	SWMU 97	SWMU 97	SWMU 7	Hwy 725
Copper	ln(Conc)	5.44	4.50	4.08	4.06	3.91
	Sample ID	14090	14138	14165	14166	14139
	Station ID	H210	H373	H351	H351	H364
	Location	SWMU 1	SWMU 30	SWMU 97	SWMU 97	SWMU 30

Table 2.5. (continued)

Analyte	Identifiers[a]	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Cyanide	ln(Conc)	-0.15	-0.27	-0.31	-0.31	-0.34
	Sample ID	5127	14167	14041	14013	14090
	Station ID	H037	H352	H262	H264	H210
	Location	SWMU 80	SWMU 97	SWMU 2 & 3	SWMU 5	SWMU 1
Iron	ln(Conc)	10.90	10.86	10.30	10.23	10.23
	Sample ID	14041	14040	14145	14133	14159
	Station ID	H262	H262	H362	UP001	H372
	Location	SWMU 2 & 3	SWMU 2 & 3	SWMU 30	Hwy 358	SWMU 7
Lead	ln(Conc)	5.78	4.71	3.95	3.81	3.71
	Sample ID	14090	14167	14020	14138	5099
	Station ID	H210	H352	H257	H373	H027
	Location	SWMU 1	SWMU 97	SWMU 11	SWMU 30	5 mi NE of Plant
Magnesium	ln(Conc)	9.02	8.95	8.57	8.53	8.51
	Sample ID	14167	14016	14102	14020	14000
	Station ID	H352	H252	H211	H257	H255
	Location	SWMU 97	SWMU 13	SWMU 7 & 30	SWMU 11	SWMU 92
Manganese	ln(Conc)	7.90	7.28	7.16	7.06	6.75
	Sample ID	14131	14175	5087	14158	5096
	Station ID	UP002	UP005	H023	H369	H030
	Location	Hwy 725	Hwy 60+ Kelly Rd	Woodville Rd	SWMU 7	5 mi NW of Plant
Mercury	ln(Conc)	2.04	0.92	-1.11	-1.61	-1.61
	Sample ID	14090	14140	14041	14067	14101
	Station ID	H210	H365	H262	H331	H212
	Location	SWMU 1	SWMU 30	SWMU 2 & 3	SWMU 81	SWMU 7 & 30
Nickel	ln(Conc)	4.44	4.19	4.16	4.08	3.97
	Sample ID	14090	14143	5050	14140	14138
	Station ID	H210	H361	H052	H365	H373
	Location	SWMU 1	SWMU 30	SWMU 1	SWMU 30	SWMU 30
Potassium	ln(Conc)	7.64	7.53	7.13	6.98	6.84
	Sample ID	14166	14165	5103	14167	14016
	Station ID	H351	H351	H027	H352	H252
	Location	SWMU 97	SWMU 97	5 mi NE of Plant	SWMU 97	SWMU 13
Selenium	ln(Conc)	3.22	1.06	0.96	0.00	0.00
	Sample ID	14167	14166	14165	5063	5058
	Station ID	H352	H351	H351	H043	H042
	Location	SWMU 97	SWMU 97	SWMU 97	SWMU 81	SWMU 81

Table 2.5. (continued)

Analyte	Identifiers[a]	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Silver	ln(Conc)	3.74	1.57	1.41	1.19	1.10
	Sample ID	14090	14003	14167	14041	14140
	Station ID	H210	H253	H352	H262	H262
	Location	SWMU 1	SWMU 30	SWMU 97	SWMU 2 & 3	SWMU 2 & 3
Sodium	ln(Conc)	6.43	6.26	5.84	5.76	5.74
	Sample ID	14165	14047	14041	5127	5096
	Station ID	H351	H261	H262	H037	H030
	Location	SWMU 97	SWMU 2 & 3	SWMU 2 & 3	SWMU 80	5 mi NW of Plant
Thallium	ln(Conc)	2.30	0.34	0.26	0.26	0.18
	Sample ID	14000	14166	14041	14040	14029
	Station ID	H255	H351	H262	H262	H256
	Location	SWMU 92	SWMU 97	SWMU 2 & 3	SWMU 2 & 3	SWMU 92
Vanadium	ln(Conc)	4.25	4.11	4.06	3.74	3.64
	Sample ID	14166	14165	14167	14090	14169
	Station ID	H351	H351	H352	H210	H354
	Location	SWMU 97	SWMU 97	SWMU 97	SWMU 1	SWMU 100
Zinc	ln(Conc)	5.97	5.96	5.43	5.28	5.04
	Sample ID	14090	14020	14167	14019	14138
	Station ID	H210	H257	H352	H257	H373
	Location	SWMU 1	SWMU 11	SWMU 97	SWMU 11	SWMU 30

[a] Sample IDs, Station IDs, and Locations taken from CH2M Hill (1991 and 1992).

Table 2.6. Five samples with highest reported values for inorganic analytes; all observations; subsurface classification (greater than 1 foot below surface)

Analyte	Identifiers	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Aluminum	ln(Conc)[a]	10.67	10.62	10.54	10.49	9.86
	Sample ID[b]	14193	14192	14194	14191	14189
	Station ID[c]	TP003	TP003	TP003	TP003	TP002
	Depth[d]	10	8	10	6	5
	Location[e]	Test Pit 3[f]	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 2
Antimony	ln(Conc)	3.81	3.26	3.09	3.04	3.04
	Sample ID	14192	14191	14194	13152	13005
	Station ID	TP003	TP003	TP003	H210	MW172
	Depth	8	6	10	20	5
	Location	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 1	North of C-745-C
Arsenic	ln(Conc)	3.74	2.93	2.89	2.77	2.71
	Sample ID	14192	13002	14191	14194	5074
	Station ID	TP003	MW171	TP003	TP003	H055
	Depth	8	5	6	10	2
	Location	Test Pit 3	East of C-745-C	Test Pit 3	Test Pit 3	SWMU 79
Barium	ln(Conc)	6.49	6.45	6.23	6.01	5.96
	Sample ID	14192	14194	14191	14193	14189
	Station ID	TP003	TP003	TP003	TP003	TP002
	Depth	8	10	6	10	4
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 2
Beryllium	ln(Conc)	3.22	2.83	2.48	0.96	0.79
	Sample ID	14184	14182	14183	4274	13152
	Station ID	H380	H381	H382	MW097	H210
	Depth	6	6	4	48	20
	Location	SWMU 26	SWMU 26	SWMU 26	Northeast of Plant	SWMU 1
Cadmium	ln(Conc)	5.46	5.00	4.32	4.03	2.55
	Sample ID	14192	14194	14191	14193	13027
	Station ID	TP003	TP003	TP003	TP003	MW175
	Depth	8	10	6	10	15
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 47
Calcium	ln(Conc)	12.37	11.88	11.70	11.64	11.48
	Sample ID	5071	5077	5001	14184	14018
	Station ID	H054	H056	H013	H380	H252
	Depth	2	2	2	6	6
	Location	SWMU 79	SWMU 79	North plant boundary	SWMU 26	SWMU 13
Chromium	ln(Conc)	6.22	5.97	5.91	5.82	5.08
	Sample ID	14192	14191	14194	14193	4345
	Station ID	TP003	TP003	TP003	TP003	H002
	Depth	8	6	10	10	67
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 2 & 3

Table 2.6. (continued)

Analyte	Identifiers	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Cobalt	ln(Conc)	4.23	4.14	3.91	3.87	3.71
	Sample ID	14191	14192	14194	4401	14031
	Station ID	TP003	TP003	TP003	H010	H256
	Depth	6	8	10	60	6
	Location	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 30	SWMU 92
Copper	ln(Conc)	9.84	9.75	9.55	9.02	5.16
	Sample ID	14192	14191	14194	14193	14186
	Station ID	TP003	TP003	TP003	TP003	TP001
	Depth	8	6	10	10	5
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 1
Cyanide	ln(Conc)	0.34	0.26	0.18	0.18	0.18
	Sample ID	4130	4095	5067	4219	4218
	Station ID	MW122	MW121	H053	H009	H009
	Depth	157	192	2	38	32
	Location	East of plant	Northwest of plant	SWMU 79	SWMU 1	SWMU 1
Iron	ln(Conc)	11.49	11.46	11.22	10.82	10.77
	Sample ID	14192	14191	14194	14193	13059
	Station ID	TP003	TP003	TP003	TP003	H219
	Depth	8	6	10	10	30
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 10
Lead	ln(Conc)	7.06	6.90	6.70	6.23	6.22
	Sample ID	14194	14192	14191	14189	14193
	Station ID	TP003	TP003	TP003	TP002	TP003
	Depth	10	8	6	5	10
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 2	Test Pit 3
Magnesium	ln(Conc)	9.44	8.73	8.60	8.52	8.43
	Sample ID	5071	14018	5077	14192	5067
	Station ID	H054	H252	H056	TP003	H053
	Depth	2	6	2	8	2
	Location	SWMU 79	SWMU 13	SWMU 79	Test Pit 3	SWMU 79
Manganese	ln(Conc)	9.00	8.14	7.98	7.73	7.72
	Sample ID	14189	14031	13104	14192	14005
	Station ID	TP002	H256	H225	TP003	H253
	Depth	5	6	5	8	6
	Location	Test Pit 2	SWMU 92	SWMU 4	Test Pit 3	SWMU 30
Mercury	ln(Conc)	2.48	0.06	-0.51	-0.62	-0.71
	Sample ID	14183	13353	14189	4266	13129
	Station ID	H382	H221	TP002	MW097	H203
	Depth	4	5	5	6	65
	Location	SWMU 26	SWMU 2	Test Pit 2	Northeast of Plant	SWMU 91
Nickel	ln(Conc)	9.42	9.40	9.05	8.49	5.58
	Sample ID	14191	14192	14194	19193	14184
	Station ID	TP003	TP002	TP003	TP003	H380
	Depth	6	8	10	10	6
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 26

Table 2.6. (continued)

Analyte	Identifiers	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Potassium	ln(Conc)	10.13	10.04	9.76	9.23	8.10
	Sample ID	14192	14191	14194	14193	13339
	Station ID	TP003	TP003	TP003	TP003	H206
	Depth	8	6	10	10	100
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 11
Selenium	ln(Conc)	1.34	0.99	0.79	0.74	0.74
	Sample ID	4236	4238	4240	4242	4239
	Station ID	H004	H004	H004	H006	H004
	Depth	50	56	70	6	64
	Location	SWMU 18	SWMU 18	SWMU 18	SWMU 17	SWMU 18
Silver	ln(Conc)	2.64	2.22	2.16	2.03	2.01
	Sample ID	13149	14194	14191	13361	14186
	Station ID	H210	TP003	TP003	H221	TP001
	Depth	5	10	6	40	5
	Location	SWMU 1	Test Pit 3	Test Pit 3	SWMU 2	Test Pit 1
Sodium	ln(Conc)	9.01	8.81	8.48	7.95	6.78
	Sample ID	14192	14191	14194	14193	13152
	Station ID	TP003	TP003	TP003	TP003	H210
	Depth	8	6	10	10	20
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 1
Thallium	ln(Conc)	2.40	2.30	2.26	2.24	2.23
	Sample ID	14008	14045	13123	14046	13133
	Station ID	H251	H263	MW181	H263	H208
	Depth	6	4	10	6	10
	Location	SWMU 12	SWMU 5	SWMU 9 & 10	SWMU 5	SWMU 1
Vanadium	ln(Conc)	4.23	4.16	4.06	3.93	3.88
	Sample ID	13152	13348	4407	13012	13016
	Station ID	H210	H214	H011	MW169	MW163
	Depth	20	30	12	5	55
	Location	SWMU 1	SWMU 4	SWMU 7 & 30	North of C-745-C	SWMU 99
Zinc	ln(Conc)	7.03	7.02	7.02	6.68	5.76
	Sample ID	14192	14194	14191	14193	5077
	Station ID	TP003	TP003	TP003	TP003	H056
	Depth	8	10	6	10	2
	Location	Test Pit 3	Test Pit 3	Test Pit 3	Test Pit 3	SWMU 79

[a] Natural log of the analytes concentration in the sample.
[b] The sample identifier used in either the Phase I or Phase II Site Investigation (CH2M Hill 1991 and 1992).
[c] The sampling location identifier used in either the Phase I or Phase II Site Investigation (CH2M Hill 1991 and 1992).
[d] Lower most depth, in feet, of sampled interval.
[e] Solid Waste Mangement Unit, Area of Concern, or other description of the area from which the sample was taken.
[f] Sample taken from test pit excavation at SWMU 7 during the Phase II Site Investigation.

Table 2.7. Maximum detected values in Site Investigation data set, maximum background values reported in Moore 1995, and maximum background values selected

Analyte	Maximum Detected Values		Reported in Moore (1995)		Selected Values	
	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil	Surface Soil	Subsurface Soil
Aluminum	15,700	43,100	18,000	18,000	15,700	17,300
Antimony	1.6	45.0	45	21	0.84	20.9
Arsenic	46.0	42.0	20	20	12.0	18.7
Barium	198	657	360	360	198	341
Beryllium	24	25.0	25	2.6	18.0	2.6
Cadmium	9.7	235	12	5.6	2.6	5.6
Calcium	293,000	236,000	293,000	236,000	293,000	236,000
Chromium	258	505	160	160	16.0	112
Cobalt	30.0	69	70	70	14.0	16.0
Copper	231	18,700	70	63	19.0	61.5
Cyanide (CN^-)	0.7	1.4	NR	NR	NA	NA
Iron	54,000	97,600	29,100	52,000	27,700	47,400
Lead	323	1,160	40	130	38.0	119
Magnesium	8,250	12,600	12,600	3,250	8,250	3,250
Manganese	2,700	8,090	3,400	2,900	2,700	1,920
Mercury	7.7	12.0	2.5	2.5	0.33	0.42
Nickel	85.0	12,300	100	100	21.0	84.7
Potassium	2,080	25,000	2,000	2,000	1,870	1,640
Selenium	25.0	0.9	4	4	0.98	0.87
Silver	42.0	14.0	10	10	2.3	3.8
Sodium	620	8,170	600	900	344	404
Sulfide	NA	NA	NR	NR	NA	NA
Thallium	1.4	0.41	NR	NR	0.44	0.41
Tin	NA	NA	NR	NR	NA	NA
Vanadium	70.0	68.9	70	70	38.0	68.9
Zinc	390	1,130	110	190	65.0	190

Notes:
NA indicates that information required to estimate the parameter was not available..
NR indicates that a value was not reported in Moore (1995).

Table 2.8. Number of observations and quartiles for inorganic analytes; all observations[a]; reduced data set[b]; surface classification (0 to 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Aluminum	73	9.52 (13,630)	9.24 (10,301)	8.99 (8,022)	8.79 (6,568)	7.02 (1,119)
Antimony	27	-0.17 (0.84)	-0.99 (0.37)	-1.05 (0.35)	-1.05 (0.35)	-1.11 (0.33)
Arsenic	69	2.48 (11.9)	1.96 (7.10)	1.67 (5.31)	1.34 (3.82)	-1.43 (0.24)
Barium	75	5.29 (198)	4.70 (110)	4.51 (90.9)	4.17 (64.7)	2.64 (14.0)
Beryllium	71	2.89 (18.0)	2.40 (11.0)	-0.13 (0.88)	-0.60 (0.55)	-1.77 (0.17)
Cadmium	60	0.96 (2.61)	0.53 (1.70)	-0.02 (0.98)	-0.25 (0.78)	-0.56 (0.57)
Calcium	74	12.25 (208,981)	9.57 (14,328)	8.34 (4,188)	7.77 (2,368)	6.10 (446)
Chromium	42	2.77 (16.0)	2.64 (14.0)	2.52 (12.4)	2.29 (9.87)	0.96 (2.61)
Cobalt	71	2.64 (14.0)	2.16 (8.67)	1.89 (6.62)	1.70 (5.47)	0.18 (1.20)
Copper	49	2.94 (18.9)	2.64 (14.0)	2.48 (11.9)	2.12 (8.33)	0.92 (2.51)
Cyanide	NA	NA	NA	NA	NA	NA
Iron	72	10.23 (27,723)	9.77 (17,501)	9.57 (14,328)	9.38 (11,849)	8.16 (3,498)
Lead	66	3.64 (38.1)	3.09 (22.0)	2.86 (17.5)	2.56 (12.9)	1.13 (3.10)
Magnesium	75	9.02 (8,267)	7.50 (1,808)	7.19 (1,326)	6.84 (934)	5.55 (257)
Manganese	75	7.90 (2,697)	6.39 (596)	5.86 (351)	5.58 (265)	3.22 (25.0)
Mercury	73	-1.11 (0.33)	-2.21 (0.11)	-2.30 (0.10)	-2.30 (0.10)	-3.77 (0.02)
Nickel	48	3.04 (20.9)	2.71 (15.0)	2.64 (14.0)	2.26 (9.58)	1.65 (5.21)
Potassium	74	7.53 (1,863)	6.41 (608)	6.22 (503)	5.97 (392)	4.70 (110)
Selenium	66	-0.02 (0.98)	-0.69 (0.50)	-1.20 (0.30)	-2.12 (0.12)	-2.21 (0.11)

Table 2.8. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75%[c]	Median[c]	25%[c]	Minimum[c]
Silver	61	0.83 (2.29)	0.74 (2.10)	0.41 (1.51)	0.10 (1.11)	-0.71 (0.49)
Sodium	73	5.84 (344)	4.71 (111)	4.26 (70.8)	3.91 (49.9)	3.22 (25.0)
Thallium	35	-0.82 (0.44)	-1.35 (0.26)	-1.43 (0.24)	-1.47 (0.23)	-1.51 (0.22)
Vanadium	71	3.64 (38.1)	3.30 (27.1)	3.09 (22.0)	2.89 (18.0)	0.83 (2.29)
Zinc	51	4.17 (64.7)	3.95 (51.9)	3.71 (40.9)	3.47 (32.1)	2.71 (15.0)

[a] Values qualified with "R" were not included in this summary.

[b] Values shown are for the data set in which all values greater than the selected maximum background are deleted.

[c] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 9.66. The untransformed value equal to 9.52 is 13,630. All untransformed values are in mg/kg.

Table 2.9. Number of observations and quartiles for inorganic analytes; all observations[a]; reduced data set[b]; subsurface classification (greater than 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Aluminum	647	9.76 (17,327)	8.93 (7,555)	8.49 (4,866)	7.89 (2,670)	5.07 (159)
Antimony	521	3.04 (20.9)	2.02 (7.54)	1.53 (4.62)	1.27 (3.56)	-0.94 (0.39)
Arsenic	648	2.93 (18.7)	1.24 (3.46)	0.69 (1.99)	-0.11 (0.90)	-1.83 (0.16)
Barium	647	5.83 (340)	4.42 (83.1)	3.66 (38.9)	2.95 (19.1)	0.69 (1.99)
Beryllium	645	0.96 (2.61)	-0.37 (0.69)	-0.65 (0.52)	-0.89 (0.41)	-5.30 (0.005)
Cadmium	642	1.72 (5.58)	-0.09 (0.91)	-0.24 (0.79)	-0.36 (0.70)	-2.04 (0.13)
Calcium	648	12.37 (235,626)	7.27 (1,437)	6.87 (963)	6.39 (596)	0.54 (1.72)
Chromium	647	4.72 (112)	2.79 (16.3)	2.40 (11.0)	1.65 (5.21)	-0.73 (0.48)
Cobalt	630	2.77 (16.0)	1.89 (6.62)	1.48 (4.39)	0.99 (2.69)	-0.54 (0.58)
Copper	647	4.12 (61.6)	2.30 (9.97)	1.82 (6.17)	1.22 (3.39)	-0.45 (0.64)
Cyanide	NA	NA	NA	NA	NA	NA
Iron	648	10.77 (47,572)	9.73 (16,815)	9.38 (11,849)	8.94 (7,631)	6.30 (545)
Lead	647	4.78 (119)	2.30 (9.98)	1.93 (6.89)	1.41 (4.10)	-0.73 (0.48)
Magnesium	643	8.09 (3,262)	6.98 (1,075)	6.37 (584)	5.72 (305)	2.81 (16.6)
Manganese	645	7.56 (1,920)	5.51 (247)	4.83 (125)	3.75 (42.5)	0.53 (1.70)
Mercury	637	-0.88 (0.41)	-2.14 (0.12)	-2.30 (0.10)	-2.83 (0.06)	-4.61 (0.01)
Nickel	645	4.44 (84.8)	2.40 (11.0)	2.03 (7.61)	1.41 (4.10)	-0.17 (0.84)
Potassium	647	7.40 (1,636)	5.99 (399)	5.52 (250)	5.11 (166)	3.58 (35.9)
Selenium	606	-0.11 (0.90)	-0.84 (0.43)	-1.20 (0.30)	-1.58 (0.21)	-2.45 (0.09)

Table 2.9. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Silver	643	1.34 (3.82)	0.26 (1.30)	-0.04 (0.96)	-0.26 (0.77)	-1.27 (0.28)
Sodium	626	6.00 (403)	5.43 (228)	5.11 (166)	4.41 (82.3)	1.13 (3.10)
Thallium	279	-0.89 (0.41)	-1.05 (0.35)	-1.56 (0.21)	-1.71 (0.18)	-1.83 (0.16)
Vanadium	648	4.23 (68.7)	3.22 (25.0)	2.84 (17.1)	2.42 (11.2)	-0.34 (0.71)
Zinc	647	5.25 (191)	3.48 (32.5)	2.94 (18.9)	2.30 (10.0)	-0.19 (0.83)

[a] Values qualified with "R" were not included in this summary.

[b] Values shown are for the data set in which all values greater than the selected maximum background are deleted.

[c] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 9.76. The untransformed value is equal to 10.67 is 17,327. All untransformed values are in mg/kg.

Table 2.10. Number of observations and quartiles for inorganic analytes; detected observations[a]; reduced data set[b]; surface classification (0 to 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Aluminum	73	9.52 (13,630)	9.24 (10,301)	8.99 (8,022)	8.79 (6,568)	7.02 (1,119)
Antimony	3	-0.17 (0.84)	NA	-0.54 (0.58)	NA	-0.94 (0.39)
Arsenic	68	2.48 (11.9)	1.97 (7.17)	1.68 (5.37)	1.35 (3.86)	0.18 (1.20)
Barium	75	5.29 (198)	4.70 (110)	4.51 (90.9)	4.17 (64.7)	2.64 (14.0)
Beryllium	66	2.89 (18.0)	2.40 (11.0)	0.00 (1.00)	-0.54 (0.58)	-1.77 (0.17)
Cadmium	30	0.96 (2.61)	0.74 (2.10)	0.53 (1.70)	0.18 (1.20)	-0.26 (0.77)
Calcium	74	12.25 (208,981)	9.57 (14,328)	8.34 (4,188)	7.77 (2,368)	6.10 (446)
Chromium	41	2.77 (16.0)	2.64 (14.0)	2.56 (12.9)	2.40 (11.0)	0.99 (2.69)
Cobalt	71	2.64 (14.0)	2.16 (8.67)	1.89 (6.62)	1.70 (5.47)	0.18 (1.20)
Copper	49	2.94 (18.9)	2.64 (14.0)	2.48 (11.9)	2.12 (8.33)	0.92 (2.51)
Cyanide	NA	NA	NA	NA	NA	NA
Iron	72	10.23 (27,723)	9.77 (17,501)	9.57 (14,328)	9.38 (11,849)	8.16 (3,498)
Lead	66	3.64 (38.1)	3.09 (22.0)	2.86 (17.5)	2.56 (12.9)	1.13 (3.10)
Magnesium	74	9.02 (8,267)	7.45 (1,808)	7.18 (1,313)	6.84 (934)	5.55 (257)
Manganese	74	7.90 (2,697)	6.37 (584)	5.86 (351)	5.58 (265)	3.22 (25.0)
Mercury	10	-1.11 (0.33)	-1.61 (0.20)	-1.90 (0.15)	-2.30 (0.10)	-2.30 (0.10)
Nickel	45	3.04 (20.9)	2.71 (15.0)	2.64 (14.0)	2.40 (11.0)	1.65 (5.21)
Potassium	59	7.53 (1,863)	6.51 (672)	6.30 (545)	6.06 (428)	4.86 (129)
Selenium	20	-0.02 (0.98)	-0.69 (0.50)	-0.83 (0.44)	-1.17 (0.31)	-1.83 (0.16)

Table 2.10. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Silver	24	0.83 (2.29)	0.64 (1.90)	0.47 (1.60)	0.37 (1.45)	0.18 (1.20)
Sodium	54	5.84 (344)	4.78 (119)	4.30 (73.7)	3.97 (53.0)	3.22 (25.0)
Thallium	10	-0.82 (0.44)	-0.99 (0.37)	-1.26 (0.28)	-1.35 (0.26)	-1.39 (0.25)
Vanadium	71	3.64 (38.1)	3.30 (27.1)	3.09 (22.0)	2.89 (18.0)	0.83 (2.29)
Zinc	50	4.17 (64.7)	3.95 (51.9)	3.70 (40.4)	3.47 (32.1)	2.71 (15.0)

Notes:
NA indicates that a value was not available; the number of samples in which cyanide was detected was too small to calculate these values.

[a] Values qualified with "R" were not included in this summary.
[b] Values shown are for the data set in which all values greater than the selected maximum background are deleted.
[c] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 9.52. The untransformed value equal to 9.52 is 13,630. All untransformed values are in mg/kg.

Table 2.11. Number of observations and quartiles for inorganic analytes; detected observations[a]; reduced data set[b]; subsurface classification (greater than 1 foot below surface)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Aluminum	647	9.76 (17,327)	8.93 (7,555)	8.49 (4,866)	7.89 (2,670)	5.07 (159)
Antimony	30	3.04 (20.9)	2.03 (7.61)	1.67 (5.31)	1.50 (4.48)	-0.11 (0.90)
Arsenic	572	2.93 (18.7)	1.28 (3.60)	0.79 (2.20)	0.26 (1.30)	-1.83 (0.16)
Barium	647	5.83 (340)	4.42 (83.1)	3.66 (38.9)	2.95 (19.1)	0.69 (1.99)
Beryllium	573	0.96 (2.61)	-0.36 (0.70)	-0.62 (0.54)	-0.89 (0.41)	-4.20 (0.01)
Cadmium	196	1.72 (5.58)	0.53 (1.70)	0.00 (1.00)	-0.62 (0.54)	-1.51 (0.22)
Calcium	645	12.37 (235,626)	7.27 (1,437)	6.87 (963)	6.39 (596)	0.54 (1.72)
Chromium	614	4.72 (112)	2.83 (16.9)	2.41 (11.1)	1.81 (6.11)	-0.71 (0.49)
Cobalt	546	2.77 (16.0)	1.95 (7.03)	1.57 (4.81)	1.10 (3.00)	-0.33 (0.72)
Copper	594	4.12 (61.6)	2.40 (11.0)	1.90 (6.69)	1.34 (3.82)	-0.08 (0.92)
Cyanide	NA	NA	NA	NA	NA	NA
Iron	648	10.77 (47,572)	9.73 (16,815)	9.38 (11,849)	8.94 (7,631)	6.30 (545)
Lead	640	4.78 (119)	2.30 (9.98)	1.93 (6.89)	1.42 (4.14)	-0.42 (0.66)
Magnesium	640	8.09 (3,262)	6.98 (1,075)	6.37 (584)	5.73 (308)	2.81 (16.6)
Manganese	642	7.56 (1,920)	5.52 (250)	4.83 (125)	3.75 (42.5)	0.53 (1.70)
Mercury	36	-0.88 (0.41)	-2.67 (0.07)	-2.86 (0.06)	-3.16 (0.04)	-4.51 (0.01)
Nickel	546	4.44 (84.8)	2.48 (11.9)	2.00 (7.39)	1.46 (4.31)	-0.08 (0.92)
Potassium	456	7.40 (1,636)	6.14 (464)	5.62 (276)	5.16 (174)	3.58 (35.9)
Selenium	77	-0.14 (0.87)	-0.78 (0.46)	-1.24 (0.29)	-1.77 (0.17)	-2.41 (0.09)

Table 2.11. (continued)

Analyte	Number of Observations	Quartiles				
		Maximum[c]	75% [c]	Median[c]	25% [c]	Minimum[c]
Silver	99	1.34 (6.82)	0.92 (2.51)	0.53 (1.70)	0.18 (1.20)	-1.14 (0.32)
Sodium	480	6.00 (403)	5.35 (211)	4.95 (141)	4.33 (75.9)	1.13 (3.10)
Thallium	32	-0.89 (0.41)	-1.26 (0.28)	-1.45 (0.23)	-1.64 (0.19)	-1.77 (0.17)
Vanadium	638	4.23 (68.7)	3.22 (25.0)	2.84 (17.1)	2.45 (11.6)	0.00 (1.00)
Zinc	646	5.25 (191)	3.48 (32.5)	2.94 (18.9)	2.30 (10.0)	-0.19 (0.83)

[a] Values qualified with "R" were not included in this summary.
[b] Values shown are for the data set in which all values greater than the selected maximum background are deleted.
[c] The first value listed is the quartile for the distribution of the data transformed using the natural log function. The second value, in parenthesis, is the untransformed equivalent of the natural log. For example, the maximum natural log observation for aluminum is 9.76. The untransformed value is equal to 9.76 is 17,327. All untransformed values are in mg/kg.

Table 2.12. Five samples with highest reported values for inorganic analytes; all observations; reduced data set; surface classification (0 to 1 foot below surface)

Analyte	Identifiers[a]	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Aluminum	ln(Conc)	9.66	9.60	9.52	9.50	9.47
	Sample ID	14176	14159	5103	14166	5053
	Station ID	UP003	H372	H027	H351	H041
	Location	Hwy 358+996	SWMU 7	5 mi NE of Plant	SWMU 97	SWMU 81
Antimony	ln(Conc)	-0.17	-0.55	-0.94	-0.97	-0.97
	Sample ID	14166	14167	14131	14130	14169
	Station ID	H351	H352	UP002	UP004	H354
	Location	SWMU 97	SWMU 97	Hwy 725	Hwy 996+1420	SWMU 100
Arsenic	ln(Conc)	2.48	2.48	2.40	2.30	2.29
	Sample ID	14131	14176	14036	14169	5053
	Station ID	UP002	UP003	H265	H354	H041
	Location	Hwy 725	Hwy 358+996	SWMU 95	SWMU 100	SWMU 81
Barium	ln(Conc)	5.29	5.27	5.25	5.09	5.08
	Sample ID	14165	14167	14166	14041	14145
	Station ID	H351	H352	H351	H262	H362
	Location	SWMU 97	SWMU 97	SWMU 97	SWMU 2 & 3	SWMU 30
Beryllium	ln(Conc)	2.89	2.89	2.83	2.83	2.71
	Sample ID	14133	14164	14157	14176	14158
	Station ID	UP001	H372	H371	UP003	H369
	Location	Hwy 358	SWMU 7	SWMU 7	Hwy 358+996	SWMU 7
Cadmium	ln(Conc)	0.96	0.96	0.88	0.88	0.88
	Sample ID	14164	14133	14176	14169	14157
	Station ID	H372	UP001	UP003	H354	H371
	Location	SWMU 7	Hwy 358	Hwy 358+996	SWMU 100	SWMU 7
Calcium	ln(Conc)	12.59	12.25	12.21	11.62	11.60
	Sample ID	14016	14000	14020	14019	14102
	Station ID	H252	H255	H257	H257	H211
	Location	SWMU 13	SWMU 92	SWMU 11	SWMU 11	SWMU 7 & 30
Chromium	ln(Conc)	2.77	2.77	2.77	2.77	2.77
	Sample ID	5040	5127	14100	14146	14175
	Station ID	H049	H037	H213	H363	UP005
	Location	North of C-745-C	SWMU 80	SWMU 7 & 30	SWMU 30	Hwy 60+Kelly Rd
Cobalt	ln(Conc)	2.64	2.64	2.56	2.56	2.40
	Sample ID	14131	14026	14047	14145	14041
	Station ID	UP002	H258	H261	H362	H262
	Location	Hwy 725	SMWU 1	SWMU 2 & 3	SWMU 2 & 3	SWMU 2 & 3

Table 2.12. (continued)

Analyte	Identifiers[a]	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Copper	ln(Conc)	2.94	2.89	2.89	2.83	2.77
	Sample ID	5099	14102	14164	14145	5096
	Station ID	H027	H211	H372	H362	H030
	Location	5 mi NE of plant	SWMU 7 & 30	SWMU 7	SWMU 30	5 mi NW of plant
Cyanide	ln(Conc)	NA	NA	NA	NA	NA
	Sample ID					
	Station ID					
	Location					
Iron	ln(Conc)	10.23	10.23	10.16	10.12	10.02
	Sample ID	14133	14159	5056	5053	14176
	Station ID	UP001	H372	H041	H041	UP003
	Location	Hwy 358	SWMU 7	SWMU 81	SWMU 81	Hwy 358+996
Lead	ln(Conc)	3.64	3.58	3.58	3.56	3.50
	Sample ID	5093	5040	5103	5087	14103
	Station ID	H029	H049	H027	H023	H211
	Location	5 mi SW of plant	SWMU 33	5 mi NE of plant	Woodville Rd	SWMU 7 & 30
Magnesium	ln(Conc)	9.02	8.95	8.57	8.53	8.51
	Sample ID	14167	14016	14102	14020	14000
	Station ID	H352	H252	H211	H257	H255
	Location	SWMU 97	SWMU 13	SWMU 7 & 30	SWMU 11	SWMU 92
Manganese	ln(Conc)	7.90	7.28	7.16	7.06	6.75
	Sample ID	14131	14175	5087	14158	5096
	Station ID	UP002	UP005	H023	H369	H030
	Location	Hwy 725	Hwy 60+ Kelly Rd	Woodville Rd	SWMU 7	5 mi NW of Plant
Mercury	ln(Conc)	-1.11	-1.61	-1.61	-1.61	-1.71
	Sample ID	14041	14100	14101	14167	5050
	Station ID	H262	H213	H212	H352	H052
	Location	SWMU 2 & 3	SWMU 7 & 30	SWMU 7 & 30	SWMU 97	SWMU 1
Nickel	ln(Conc)	3.04	3.04	3.04	3.00	2.89
	Sample ID	14003	14159	14176	14158	14175
	Station ID	H253	H372	UP003	H369	UP005
	Location	SWMU 30	SWMU 7	Hwy 358+996	SWMU 7	Hwy 60+Kelly Rd
Potassium	ln(Conc)	7.53	7.13	6.98	6.84	6.79
	Sample ID	14165	5103	14167	14016	14176
	Station ID	H351	H027	H352	H252	UP003
	Location	SWMU 97	5 mi NE of Plant	SWMU 97	SWMU 13	Hwy 358+996

Table 2.12. (continued)

Analyte	Identifiers[a]	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Selenium	ln(Conc)	-0.02	-0.22	-0.22	-0.22	-0.22
	Sample ID	14090	5090	5096	5099	5105
	Station ID	H210	H024	H030	H027	H028
	Location	SWMU 1	Woodville & Metropolis Lake Rd	5 mi NW of plant	5 mi NE of plant	5 mi SE of plant
Silver	ln(Conc)	0.83	0.83	0.83	0.83	0.83
	Sample ID	5058	5037	5084	5090	5096
	Station ID	H042	H042	H026	H024	H030
	Location	SWMU 81	SWMU 81	Ogden Landing Rd	SW of plant	5 mi NW of plant
Sodium	ln(Conc)	5.84	5.76	5.74	5.62	5.55
	Sample ID	14041	5127	5096	14040	14166
	Station ID	H262	H037	H030	H262	H351
	Location	SWMU 2 & 3	SWMU 80	5 mi NW of Plant	SWMU 2 & 3	SWMU 97
Thallium	ln(Conc)	-0.82	-0.87	-0.99	-1.02	-1.20
	Sample ID	14176	14175	14090	10367	14133
	Station ID	UP003	UP005	H210	H219	UP001
	Location	Hwy 358+996	Hwy 60+Kelly Rd	SWMU 1	SWMU 10	Hwy 358
Vanadium	ln(Conc)	3.64	3.64	3.61	3.58	3.56
	Sample ID	5103	14169	14176	14100	14175
	Station ID	H027	H354	UP003	H213	UP005
	Location	5 mi NE of plant	SWMU 100	Hwy 358+996	SWMU 7 & 30	Hwy 60+Kelly Rd
Zinc	ln(Conc)	4.17	4.17	4.14	4.13	4.13
	Sample ID	5096	5099	14044	5034	14144
	Station ID	H030	H027	H263	H047	H361
	Location	5 mi NW of plant	5 mi NE of plant	SWMU 5	SWMU 33	SWMU 7 & 30

Notes
NA indicates that data were not derived. Background for cyanide was not determined because cyanide is not expected to be naturally occurring at the PGDP.

[a] Sample IDs, Station IDs, and Locations taken from CH2M Hill (1991 and 1992).

Table 2.13. Five samples with highest reported values for inorganic analytes; all observations; reduced data set; subsurface classification (greater than 1 foot below surface)

Analyte	Identifiers	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Aluminum	ln(Conc)[a]	9.76	9.69	9.66	9.64	9.60
	Sample ID[b]	4057	13152	4451	13104	14182
	Station ID[c]	MW121	H210	MW132	H225	H381
	Depth[d]	44	20	6	5	6
	Location[e]	NW of plant	SWMU 1	NE of plant	SWMU 4	SWMU 26
Antimony	ln(Conc)	3.04	3.04	3.01	2.97	2.97
	Sample ID	13152	13005	13021	13062	13030
	Station ID	H210	MW172	MW172	MW183	MW175
	Depth	20	5	5	20	30
	Location	SWMU 1	North of C-745-C	North of C-745-C	SWMU 8	SWMU 47
Arsenic	ln(Conc)	2.93	2.71	2.54	2.40	2.40
	Sample ID	13002	5074	13249	4123	4432
	Station ID	MW171	H055	H202	MW122	H012
	Depth	5	2	5	122	12
	Location	East of C-745-C	SWMU 79	SWMU 91	East of plant	SWMU 7
Barium	ln(Conc)	5.83	5.79	5.73	5.67	5.66
	Sample ID	4401	14031	4374	13269	13104
	Station ID	H010	H256	H008	H227	H225
	Depth	60	6	56	15	5
	Location	SWMU 30	SWMU 92	SWMU 3	SWMU 4	SWMU 4
Beryllium	ln(Conc)	0.96	0.79	0.64	0.59	0.53
	Sample ID	4274	13152	4065	13248	4329
	Station ID	MW097	H210	MW121	H202	H010
	Depth	48	20	86	5	54
	Location	NE of plant	SWMU 1	NW of plant	SWMU 91	SWMU 30
Cadmium	ln(Conc)	1.72	1.46	1.46	1.39	1.31
	Sample ID	13023	13059	13111	13152	13044
	Station ID	MW172	H219	H225	H210	MW187
	Depth	20	30	35	20	20
	Location	North of C-745-C	SWMU 10	SWMU 4	SWMU 1	SWMU 20
Calcium	ln(Conc)	12.37	11.88	11.70	11.64	11.48
	Sample ID	5071	5077	5001	14184	14018
	Station ID	H054	H056	H013	H380	H252
	Depth	2	2	2	6	6
	Location	SWMU 79	SWMU 79	North plant boundary	SWMU 26	SWMU 13
Chromium	ln(Conc)	4.72	4.63	4.50	4.48	4.42
	Sample ID	4144	4404	4348	4445	13063
	Station ID	H005	H010	H002	H012	MW183
	Depth	36	66	73	70	20
	Location	SWMU 18	SWMU 30	SWMU 2 & 3	SWMU 7	SWMU 8

Table 2.13. (continued)

Analyte	Identifiers	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Cobalt	ln(Conc)	2.77	2.77	2.77	2.77	2.77
	Sample ID	4180	4274	4329	13070	13290
	Station ID	MW140	MW097	H010	H219	H202
	Depth	108	48	54	40	55
	Location	NW of plant	NE of plant	SWMU 30	SWMU 10	SWMU 91
Copper	ln(Conc)	4.12	4.10	4.01	3.95	3.76
	Sample ID	13041	13149	13009	13036	4318
	Station ID	MW185	H210	MW163	MW178	H010
	Depth	20	5	10	29	6
	Location	SWMU 7	SWMU 1	East of C-746-G	SWMU 40	SWMU 30
Cyanide	ln(Conc)	NA	NA	NA	NA	NA
	Sample ID					
	Station ID					
	Depth					
	Location					
Iron	ln(Conc)	10.77	10.65	10.58	10.53	10.49
	Sample ID	13059	4508	4372	4274	13189
	Station ID	H219	MW133	H008	MW097	H201A
	Depth	30	48	44	48	30
	Location	SWMU 10	NE of plant	SWMU 3	NE of plant	SWMU 91
Lead	ln(Conc)	4.78	4.43	4.25	4.18	4.14
	Sample ID	14183	5077	13149	13226	13107
	Station ID	H382	H056	H210	H223	H225
	Depth	4	2	5	30	20
	Location	SWMU 26	SWMU 79	SWMU 1	SWMU 97	SWMU 4
Magnesium	ln(Conc)	8.09	8.01	7.99	7.92	7.91
	Sample ID	13301	13086	14007	4451	13072
	Station ID	H206	H220	H251	MW132	H212
	Depth	5	5	4	6	10
	Location	SWMU 11	SWMU 2 & 3	SWMU 12	NE of plant	SWMU 7 & 30
Manganese	ln(Conc)	7.56	7.49	7.35	7.32	7.31
	Sample ID	13089	14184	13356	4374	13208
	Station ID	H220	H380	H221	H008	H209
	Depth	10	6	15	56	15
	Location	SWMU 2 & 3	SWMU 26	SWMU 2	SWMU 3	SWMU 1
Mercury	ln(Conc)	-0.88	-1.14	-1.27	-1.27	-1.61
	Sample ID	13247	4133	4281	13149	4021
	Station ID	H227	MW134	MW097	H210	MW120
	Depth	5	96	84	5	59
	Location	SWMU 4	NW of plant	NE of plant	SWMU 1	SE of plant

Table 2.13. (continued)

Analyte	Identifiers	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Nickel	ln(Conc)	4.44	3.92	3.71	3.69	3.58
	Sample ID	13049	13247	4407	13210	14045
	Station ID	MW188	H227	H011	H209	H263
	Depth	20	5	12	20	4
	Location	SWMU 1	SWMU 4	SWMU 7 & 30	SWMU 1	SWMU 5
Potassium	ln(Conc)	7.40	7.37	7.32	7.27	7.24
	Sample ID	13063	4095	4057	13062	4067
	Station ID	MW183	MW121	MW121	MW183	MW121
	Depth	20	192	44	20	97
	Location	SWMU 8	NW of plant	NW of plant	SWMU 8	NW of plant
Selenium	ln(Conc)	-0.11	-0.11	-0.14	-0.22	-0.22
	Sample ID	5067	4117	4467	4520	4130
	Station ID	H053	MW122	MW132	MW133	MW122
	Depth	2	91	90	100	157
	Location	SWMU 79	East of plant	NE of plant	NE of plant	East of plant
Silver	ln(Conc)	1.34	1.28	1.25	1.25	1.22
	Sample ID	4236	4057	4233	14028	4056
	Station ID	H004	MW121	H004	H258	MW121
	Depth	38	44	44	6	44
	Location	SWMU 18	NW of plant	SWMU 18	SWMU 1	NW of plant
Sodium	ln(Conc)	6.00	6.00	6.00	5.98	5.98
	Sample ID	13073	4350	4065	13063	13041
	Station ID	H212	H007	MW121	MW183	MW185
	Depth	10	9	86	20	20
	Location	SWMU 7 & 30	SWMU 11	NW of plant	SWMU 8	SWMU 7
Thallium	ln(Conc)	-0.89	-0.89	-0.94	-0.94	-0.94
	Sample ID	14034	14184	13064	13080	14038
	Station ID	H260	H380	H222	H219	H265
	Depth	4	6	5	45	6
	Location	SWMU 1	SWMU 26	SWMU 97	SWMU 10	SWMU 95
Vanadium	ln(Conc)	4.23	4.16	4.06	3.93	3.88
	Sample ID	13152	13348	4407	13012	13016
	Station ID	H210	H214	H011	MW169	MW163
	Depth	20	30	12	5	55
	Location	SWMU 1	SWMU 4	SWMU 7 & 30	North of C-745-C	SWMU 99
Zinc	ln(Conc)	5.25	5.25	4.66	4.64	4.63
	Sample ID	4180	14045	13063	13055	13149
	Station ID	MW140	H263	MW183	H211	H210
	Depth	108	4	20	15	5
	Location	NW of plant	SWMU 5	SWMU 8	SWMU 7 & 30	SWMU 1

Table 2.13. (continued)

Notes

NA indicates that data were not derived. Background for cyanide was not determined because cyanide is not expected to be naturally occurring at the PGDP.

[a] Natural log of the analytes concentration in the sample.

[b] The sample identifier used in either the Phase I or Phase II Site Investigation (CH2M Hill 1991 and 1992).

[c] The sampling location identifier used in either the Phase I or Phase II Site Investigation (CH2M Hill 1991 and 1992).

[d] Lower most depth, in feet, of sampled interval.

[e] Solid Waste Mangement Unit, Area of Concern, or other description of the area from which the sample was taken.

Table 2.14. Comparison of upper limit for metal background concentrations (mg/kg) in near surface soils to published concentrations

Metal	Calculated upper limit for background	Selected maximum background concentration	Soils, average, Lindsay (1979)	Soils, common range, Lindsay (1979)	Soils, common range, Kabata- Pendias and Pendias (1984)	Crustal average, Taylor (1964)	Soils, Shacklett and Boerngen (1984)
Aluminum	13,300	15,700	71,000	10,000 to 300,000	Not Reported	82,300	72,000
Antimony	0.84	0.84	Not Reported	Not Reported	0.05 to 4	0.2	0.66
Arsenic	12	12.0	5	1 to 50	2 to 22	1.8	7.2
Barium	195	198	430	100 to 3,000	200 to 1,500	425	580
Beryllium	18	18.0	6	0.1 to 40	1 to 3	2.8	0.92
Cadmium	2.6	2.6	0.06	0.01 to 0.7	0.4 to 1.5	0.2	Not Reported
Calcium	200,000	293,000	13,700	7,000 to 500,000	Not Reported	41,500	24,000
Chromium	16	16.0	100	1 to 1,000	10 to 100	100	54
Cobalt	14	14.0	8	1 to 40	3 to 30	25	9.1
Copper	19	19.0	30	2 to 100	5 to 100	55	25
Cyanide (CN^-)	---[a]	Not Reported	Not Reported	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Iron	27,600	27,700	38,000	Not Reported	Not Reported	56,300	26,000
Lead	36	38.0	10	2 to 200	10 to 30	12.5	19
Magnesium	7,740	8,250	5,000	600 to 6,000	Not Reported	23,300	9,000
Manganese	1,450	2,700	600	20 to 3,000	50 to 1,500	950	550
Mercury	0.20	0.33	0.03	0.01 to 0.3	0.01 to 0.4	0.08	0.09
Nickel	21	21.0	40	5 to 500	3 to 30	75	19
Potassium	1,250	1,870	8,300	400 to 30,000	Not Reported	20,900	15,000
Selenium	0.80	0.98	0.3	0.1 to 2	0.02 to 2	0.05	0.39
Silver	2.3	2.3	0.05	0.1 to 5	Not Reported	0.07	Not Reported

Table 2.14. (continued)

Metal	Calculated upper limit for background	Selected maximum background concentration	Soils, average, Lindsay (1979)	Soils, common range, Lindsay (1979)	Soils, common range, Kabata- Pendias and Pendias (1984)	Crustal average, Taylor (1964)	Soils, Shacklett and Boerngen (1984)
Sodium	317	344	6,300	750 to 7,500	Not Reported	23,600	12,000
Sulfide	---[b]	NA	600[c]	30 to 10,000[c]	Not Reported	260[c]	1,600[c]
Thallium	0.44	0.44	Not Reported	Not Reported	Not Reported	0.45	Not Reported
Tin	---[b]	NA	40	2 to 200	Not Reported	2	1.3
Vanadium	38	38	100	20 to 500	20 to 300	135	80
Zinc	65	65	50	10 to 300	20 to 110	70	60

[a] Cyanide is not expected to be naturally occurring at PGDP.
[b] Data concerning this analyte were not collected during the Phases I and II Site Investigations. Therefore, background concentrations could not be established.
[c] Values is for sulfur analyzed as total sulfur.

Table 2.15. Comparison of upper limit for metal background concentrations (mg/kg) in subsurface soils to published concentrations

Metal	Calculated upper limit for background	Selected maximum background concentration	Soils, average, Lindsay (1979)	Soils, common range, Lindsay (1979)	Soils, common range, Kabata-Pendias and Pendias (1984)	Crustal average, Taylor (1964)	Soils, Shaklett and Boerngen (1984)
Aluminum	12,000	17,300	71,000	10,000 to 300,000	Not Reported	82,300	72,000
Antimony	13.4	20.9	Not Reported	Not Reported	0.05 to 4	0.2	0.66
Arsenic	7.9	18.7	5	1 to 50	2 to 22	1.8	7.2
Barium	172	341	430	100 to 3,000	200 to 1,500	425	580
Beryllium	1.3	2.6	6	0.1 to 40	1 to 3	2.8	0.92
Cadmium	2.2	5.6	0.06	0.01 to 0.7	0.4 to 1.5	0.2	Not Reported
Calcium	6,130	236,000	13,700	7,000 to 500,000	Not Reported	41,500	24,000
Chromium	42.5	112	100	1 to 1,000	10 to 100	100	54
Cobalt	13.3	16.0	8	1 to 40	3 to 30	25	9.1
Copper	24.5	61.5	30	2 to 100	5 to 100	55	25
Cyanide (CN^-)	---[a]	Not Available	Not Reported	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Iron	28,100	47,400	38,000	Not Reported	Not Reported	56,300	26,000
Lead	22.5	119	10	2 to 200	10 to 30	12.5	19
Magnesium	2,140	3,250	5,000	600 to 6,000	Not Reported	23,300	9,000
Manganese	821	1,920	600	20 to 3,000	50 to 1,500	950	550
Mercury	0.13	0.42	0.03	0.01 to 0.3	0.01 to 0.4	0.08	0.09
Nickel	22.0	84.7	40	5 to 500	3 to 30	75	19
Potassium	945	1,640	8,300	400 to 30,000	Not Reported	20,900	15,000
Selenium	0.70	0.87	0.3	0.1 to 2	0.02 to 2	0.05	0.39
Silver	2.7	3.8	0.05	0.1 to 5	Not Reported	0.07	Not Reported

Table 2.15. (continued)

Metal	Calculated upper limit for background	Selected maximum background concentration	Soils, average, Lindsay (1979)	Soils, common range, Lindsay (1979)	Soils, common range, Kabata-Pendias and Pendias (1984)	Crustal average, Taylor (1964)	Soils, Shaklett and Boerngen (1984)
Sodium	343	404	6,300	750 to 7,500	Not Reported	23,600	12,000
Sulfide	---[b]	Not Available	600[c]	30 to 10,000[c]	Not Reported	260[c]	1,600[c]
Thallium	0.38	0.41	Not Reported	Not Reported	Not Reported	0.45	Not Reported
Tin	---[b]	Not Available	40	2 to 200	Not Reported	2	1.3
Vanadium	37.0	68.9	100	20 to 500	20 to 300	135	80
Zinc	60.0	190	50	10 to 300	20 to 110	70	60

[a] Cyanide is not expected to be naturally occurring at PGDP.
[b] Data concerning this analyte were not collected during the Phases I and II Site Investigations. Therefore, background concentrations could not be established.
[c] Value is for sulfur analyzed as total sulfur.

3. RISK-BASED SCREENING CRITERIA FOR DIRECT CONTACT WITH METALS IN SOIL

This chapter describes the methods and presents the parameters used to calculate the risk-based screening criteria (i.e., preliminary remediation goals). Most parameters are presented in the text following each section's equations. However, chemical-specific parameters are presented in Tables 3.1 and 3.2 (all tables can be found at the end of this chapter.) In all cases, the parameters used are consistent with the most recent EPA Region IV guidance except where the Commonwealth of Kentucky Department of Environmental Protection requested that alternative parameters be used in their recently released draft guidance on risk assessment (Commonwealth of Kentucky 1995b). All parameters presented with the equations are enumerated, and the reference list for these items is presented in Subsect. 3.4. Much of the information presented in this chapter was taken from *Preliminary Remediation Goals for Use at the U.S. Department of Energy Oak Ridge Operations Office* (ORNL 1995).

Three important factors must be remembered when using the site-specific risk-based screening criteria presented in this chapter. These factors are:

- only the criteria for direct contact by human receptors with metals in near surface and subsurface soil are presented in this chapter (risk-based screening criteria for soil that may be protective of groundwater users are not presented),
- the criteria presented are applicable for protection of human health only (it would not be appropriate to use the criteria to screen environmental concentrations for protection of non-human receptors as in an ecological risk assessment), and
- the criteria are not clean-up goals (clean-up goals can only be established after the completion of a baseline risk assessment and feasibility study; however, the risk-based screening criteria presented in this report can be used to screen potential remedies early in the remedial investigation/feasibility study process).

3.1 RESIDENTIAL USE SCREENING VALUES

For residential land use, the risk-based screening criteria were calculated by considering incidental ingestion of soil, inhalation of dust and particulates emitted by soil, and dermal absorption of contaminants in soil. For hazard screening criteria, child parameters (aged 1 to 7) were used in the calculations because children are the most sensitive endpoint when calculating a daily dose. For cancer risk-based screening criteria, a combination of child (aged 1 through 6) and adult (aged 7 to 40) parameters was used. Cancer risk-based screening criteria calculations combined child and adult parameters because cancer calculations require the consideration of a lifetime dose. The risk-based screening criteria for residential use are presented in Table 3.3.

Generally, EPA guidance (EPA 1991b) recommends that risk-based screening criteria (i.e., preliminary remediation goals) be calculated by rearranging the risk equations used in standard baseline human health risk assessments and solving for concentrations of constituents in an environmental medium instead of for a risk value (i.e., excess cancer risk or hazard quotient). For the calculation of hazard risk-based screening critera, this procedure was followed. However, for cancer risk-based screening criteria, this approach was not used because it is time-consuming and difficult to rearrange the very complex risk equations that result when multiple age cohorts and multiple exposure routes are considered. (As noted earlier, for cancer risk-based screening criteria it is necessary to consider lifetime dose. This requires the incorporation of multiple age cohorts in the equations.) To simplify this calculation, cancer risk-based screening criteria for residents were calculated using an alternate procedure. The procedure is described in the following text and presented in Subsect. 3.1.2.

- The standard equations used to calculate excess cancer risk were formulated for each of the exposure routes for all age cohorts and exposure routes.

- The excess cancer risk for each analyte was calculated assuming a concentration in soil of 1 mg/kg.

- The cancer risk-based screening value was calculated by equating the assumed concentration (i.e., 1 mg/kg) divided by the excess cancer risk for that concentration to the unknown PRG concentration divided by the target excess cancer risk (i.e., 1×10^{-6}).

3.1.1 Calculation of Residential Use Hazard Risk-based Screening Criteria

This subsection presents the equations and parameters used to calculate the hazard risk-based screening criteria for residential use. Exposure routes included in the calculations are incidental ingestion of soil, inhalation of particulates and vapors emitted by soil, and dermal contact with soil. All parameters are for a child aged 1 through 6 years old. The equation used is as follows:

$$C = \frac{T \times BW \times AT}{EF \times ED[(TV_o \times CF \times IR_a \times FI) + (TV_i \times (\frac{1}{VF} + \frac{1}{PEF}) \times IR_{air}) + (TV_{ad} \times CF_d \times SA \times AF \times ABS)]} \qquad (1)$$

where:

Parameters	Definition (units)	Default Value
ABS	absorption factor **(unitless)**	0.05 [1]
AF	adherence factor **(mg/cm²)**	1.0 [1, 9]
AT	averaging time **(yr × day/yr)**	6 × 365 (child) [1, 5]
BW	body weight - child **(kg)**	14.5 [1]
C	inorganic risk-based screening criterium in soil **(mg/kg)**	-
CF	units conversion factor **(kg/mg)**	10^{-6}
CF_d	units conversion factor - dermal **(kg-cm²)/(mg-m²)**	0.01
ED	exposure duration **(yr)**	6 [1]
EF	exposure frequency **(day/yr)**	350 [1, 5]
FI	fraction ingested **(unitless)**	1 [1, 10]
IR_o	incidental ingestion rate **(mg/day)**	200 [1, 5]
IR_{air}	total inhalation rate **(m³/day)**	20 [1, 7]
PEF	particulate emission factor **(m³/kg)**	4.28×10^9 (see Eq. 8) [6]
SA	child body surface area (arms, hands, legs, feet) **(m²/day)**	0.3730 [1]

Parameters	Definition (units)	Default Value
RfD_{ad}	absorbed chronic reference dose **(mg/kg-day)**	chemical-specific [3]
RfD_i	inhalation chronic reference dose **(mg/kg-day)**	chemical-specific [3]
RfD_o	oral chronic reference dose **(mg/kg-day)**	chemical-specific [3]
THI	target hazard index **(unitless)**	0.1
TV_{ad}	absorbed toxicity value	$1/RfD_{ad}$
TV_i	inhalation toxicity value	$1/RfD_i$
TV_o	oral toxicity value	$1/RfD_o$
VF	volatilization factor (applicable to volatile analytes only; not used for the inorganic analytes considered) **(m^3/day)**	chemical-specific [6]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

3.1.2 Calculation of Residential Use Cancer Risk-based Screening Criteria

This subsection presents the equations and parameters used to calculate the cancer risk-based screening criteria for residential use. Exposure routes included in the calculations are incidental ingestion of soil, inhalation of particulates and vapors emitted by soil, and dermal contact with soil. As noted earlier, these calculations were not performed by rearranging the risk equation but by solving for the risk presented by a concentration of 1 mg/kg and equating this to the target excess cancer risk and the unknown concentration. Rearranging this equation yields Eq. 2.

$$C = \frac{UC \times TR}{ECR} \qquad \textbf{(2)}$$

where:

Parameters	Definition (units)	Default Value
C	cancer risk-based screening criterium **(mg/kg)**	-
ECR	excess cancer risk **(unitless)**	see Eq. 3
TR	target excess cancer risk **(unitless)**	1×10^{-6} [1, 5]
Unit Conc	unit concentration **(mg/kg)**	1

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

The following equations show how each part of Eq. 2 was derived.

Calculation of excess cancer risk using unit concentration:

$$ECR = (CDI_o \times SF_o) + (CDA_d \times SF_{ad}) + (CDI_i \times SF_i) \qquad \textbf{(3)}$$

where:

Parameters	Definition (units)	Default Value
CDI_o	Incidental ingestion chronic daily intake **(mg/kg-day)**	see Eq. 4

Parameters	Definition (units)	Default Value
CDI_{ad}	Dermal chronic daily absorbed dose **(mg/kg-day)**	see Eq. 5
CDI_i	Inhalation chronic daily intake **(mg/kg-day)**	see Eq. 6
SF_{ad}	Absorbed dose slope factor **($(mg/kg\text{-}day)^{-1}$)**	chemical-specific [3]
SF_i	Inhalation slope factor **($(mg/kg\text{-}day)^{-1}$)**	chemical-specific [3]
SF_o	Oral slope factor **($(mg/kg\text{-}day)^{-1}$)**	chemical-specific [3]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

Calculation of chronic daily intake from incidental ingestion:

$$CDI_o = \frac{C_s \times IR_{child} \times FI \times EF_{child} \times ED_{child}}{BW_{child} \times AT} + \frac{C_s \times IR_{adult} \times FI \times EF_{adult} \times ED_{adult}}{BW_{adult} \times AT} \quad \textbf{(4)}$$

where:

Parameters	Definition (units)	Default Value
CDI_o	Incidental ingestion chronic daily intake **(mg/kg-day)**	-
AT	averaging time **(yr × day/yr)**	70 × 365 [1, 5]
BW_{adult}	adult body weight **(kg)**	70 [1, 5]
BW_{child}	child body weight **(kg)**	14.5 [1]
C_s	concentration of inorganic analyte in soil **(mg/kg)**	1
ED_{adult}	adult exposure duration **(yr)**	34 [1, 5]
ED_{child}	child exposure duration **(yr)**	6 [1,5]
EF_{adult}	adult exposure frequency **(days/yr)**	350 [1,5]
EF_{child}	child exposure frequency **(days/yr)**	350 [1,5]
FI	fraction ingested **(unitless)**	1 [1, 5]
IR_{adult}	soil ingestion rate for adult **(mg/day)**	100 [1, 5]
IR_{child}	soil ingestion rate for child **(mg/day)**	200 [1, 5]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

Calculation of chronic daily absorbed dose from dermal contact:

$$CDI_{ad} = \frac{C_s \times CF_d \times SA_{child} \times AF \times ABS \times EF_{child} \times ED_{child}}{BW_{child} \times AT} + \frac{C_s \times CF_d \times SA_{adult} \times AF \times ABS \times EF_{adult} \times ED_{adult}}{BW_{adult} \times AT} \quad \textbf{(5)}$$

where:

Parameters	Definition (units)	Default Value
CDI_{ad}	Dermal chronic daily absorbed dose **(mg/kg-day)**	-
ABS	absorption factor **(unitless)**	0.05 [1]
AF	adherance factor **(mg/cm^2)**	1 [1, 7]

Parameters	Definition (units)	Default Value
AT	averaging time (**yr × day/yr**)	70 × 365 [1, 5]
BW_{adult}	adult body weight (**kg**)	70 [1, 5]
BW_{child}	child body weight (**kg**)	14.5 [1]
C_s	concentration of inorganic analyte in soil (**mg/kg**)	1
CF_d	unit conversion factor **(kg-cm²)/(mg-m²)**	0.01
ED_{adult}	adult exposure duration (**yr**)	34 [1, 5]
ED_{child}	child exposure duration (**yr**)	6 [1,5]
EF_{adult}	adult exposure frequency (**days/yr**)	350 [1,5]
EF_{child}	child exposure frequency (**days/yr**)	350 [1,5]
SA_{adult}	adult body surface area (arms and hands) (**m²/day**)	0.35 [1]
SA_{child}	child body surface area (arms, hands, legs, feet) (**m²/day**)	0.373 [1]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

Calculation of chronic daily intake from inhalation of particulates and vapors.

$$CDI_i = \frac{C_s \times IR_{air} \times EF_{child} \times ED_{child} \times (\frac{1}{VF} + \frac{1}{PEF})}{BW_{child} \times AT} + \frac{C_s \times IR_{air} \times EF_{adult} \times ED_{adult} \times (\frac{1}{VF} + \frac{1}{PEF})}{BW_{adult} \times AT} \qquad \textbf{(6)}$$

where:

Parameters	Definition (units)	Default Value
CDI_i	Inhalation chronic daily intake (**mg/kg-day**)	-
AT	averaging time (**yr × day/yr**)	70 × 365 [1, 5]
BW_{adult}	adult body weight (**kg**)	70 [1, 5]
BW_{child}	child body weight (**kg**)	14.5 [1]
C_s	concentrations of inorganic analyte in soil (**mg/kg**)	1
ED_{adult}	adult exposure duration (**yr**)	34 [1]
ED_{child}	child exposure duration (**yr**)	6 [1, 5]
EF_{adult}	adult exposure frequency (**day/yr**)	350 [1, 5]
EF_{child}	child exposure frequency (**day/yr**)	350 [1, 5]
IR_{air}	inhalation rate (**m³/day**)	20 [1]
PEF	particulate emission factor (**m³/day**)	4.28 × 10^9 (see Eq. 8) [6]
VF	volatilization factor (applicable to volatile analytes only; not used for inorganic analytes considered) (**m³/day**)	chemical-specific [6]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

3.2 INDUSTRIAL USE SCREENING VALUES

The industrial use risk-based screening criteria were calculated by considering incidental ingestion of soil, inhalation of dust and particulates emitted by soil, and dermal absorption of contaminants in soil. Under the industrial land use scenario, workers are expected to be exposed routinely during the work day to contaminants within the commercial area or industrial site. It is assumed that the use of heavy equipment and related traffic in and around contaminated soils results in the production of particulates. Because only one age cohort is considered in the calculation of the industrial risk-based screening critieria, both the hazard and the cancer criteria can be calculated using the same equation. However, the parameters used in the equation do vary between the hazard and cancer endpoints. Both sets of parameters are shown in the list presented following Eq. 7. The hazard and cancer industrial use risk-based screening criteria calculated using this equation are in Table 3.4.

$$C = \frac{T \times BW \times AT}{EF \times ED \times [(TV_o \times CF \times IR_s) + (TV_i \times (\frac{1}{VF} + \frac{1}{PEF}) \times IR_a) + (TV_{ad} \times CF_d \times SA \times AF \times ABS \times ET \times CF_2)]} \quad (7)$$

where:

Parameters	Definition (units)	Default Value
ABS	absorption factor **(unitless)**	0.05 (inorganic)
AF	adherence factor **(mg/cm²)**	1 [1, 9]
AT	averaging time **(yr × day/yr)**	70 × 365 (cancer) [1,5] 25 × 365 (hazard)[1, 5]
BW	adult body weight **(kg)**	70 [5]
C	chemical risk-based screening criterium in soil **(mg/kg)**	-
CF	units conversion factor **(kg/mg)**	10^{-6}
CF_2	units conversion factor **(day/hr)**	1/24
CF_d	units conversion factor - dermal **(kg-cm²)/(mg-m²)**	0.01
ED	exposure duration **(yr)**	25 [1, 5]
EF	exposure frequency **(day/yr)**	250 [1, 5]
ET	exposure time **(hr/day)**	8 [1, 7]
IR_a	total inhalation rate **(m³/day)**	20 [1, 5]
IR_s	soil ingestion rate **(mg/day)**	50 [1, 5]
PEF	particulate emission factor **(m³/kg)**	4.28×10^9 [6]
RfD_{ad}	absorbed chronic reference dose **(mg/kg-day)**	chemical-specific [3]
RfD_i	inhalation chronic reference dose **(mg/kg-day)**	chemical-specific [3]
RfD_o	oral chronic reference dose **(mg/kg-day)**	chemical-specific [3]
SA	adult surface area (head, hands, arms) **(m²/day)**	0.43 [1]
SF_{ad}	absorbed dose slope factor **((mg/kg-day)⁻¹)**	chemical-specific [3]
SF_i	inhalation slope factor **((mg/kg-day)⁻¹)**	chemical-specific [3]
SF_o	oral slope factor **((mg/kg-day)⁻¹)**	chemical-specific [3]
T	target **(unitless)**	TR (cancer) [3] THI (hazard)
THI	target hazard index **(unitless)**	0.1
TR	target excess individual lifetime cancer risk **(unitless)**	1×10^{-6}
TV_{ad}	absorbed toxicity value	SF_{ad} (cancer) $1/RfD_{ad}$ (hazard)
TV_i	inhalation toxicity value	SF_i (cancer) $1/RfD_i$ (hazard)
TV_o	oral toxicity value	SF_o (cancer) $1/RfD_o$ (hazard)

Parameters	Definition (units)	Default Value
VF	volatilization factor (applicable to volatile analytes only; not used for inorganic analytes considered) **(m^3/day)**	chemical-specific [6]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

3.3 SUPPORTING EQUATION

This section presents the equation used to calculate the particulate emission factor, which is used in the calcuation of both the residential and industrial risk-based screening criteria. This factor appears in the inhalation exposure route portion of the equations used to calculate the residential and industrial use risk-based screening criteria.

$$PEF = Q/C \times \frac{3600\ sec/hr}{RSF \times (1 - G) \times (U_m/U_t)^3 \times F(x)} \qquad \textbf{(8)}$$

where:

Parameters	Definition (units)	Default Value
F(X)	function dependent on U_m / U_t **(unitless)**	0.0497 [2]
G	fraction of vegetative cover **(unitless)**	0 [6]
PEF	particulate emission factor **(m^3/kg)**	4.28×10^9 [6]
Q/C	inverse of the normalized concentration; represents the emission flux **(g/m^2-s)** per unit concentration **(kg/m^3)**	92.5247 [6]
RSF	respirable fraction **(g/m^2-hr)**	0.036 [6]
U_m	mean annual wind speed **(m/s)**	4.5 [6]
U_t	equivalent threshold value of wind speed at 10 m **(m/s)**	12.8 [6]

*(**Please note that numbers in brackets correspond with their respective references presented in Sect. 3.4.**)*

3.4 REFERENCES FOR EQUATIONS

This section presents the references enumerated in this chapter. This reference list is provided here to simplify the review of the equations presented earlier. In addition, these references are listed in Chapter 5.

[1] Commonwealth of Kentucky. 1995b. *Risk Assessment Guidance, Appendix C.* Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, 14 Reilly Road, Frankfort, Kentucky 40601. June 1995.

[2] Cowherd, C., G. Muleski, P. Engelhart, and D. Gillete. 1985. *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination.* Prepared for EPA Office of Health and Environmental Assessment. EPA/600/8-85/002.

[3] Oak Ridge National Laboratory (ORNL). 1994. *Toxicity Values for Use in Hazardous Waste Risk Assessment and Remediation. Vol. I.* ES/ER/TM-76. Biomedical and Environmental Analysis Section. Health Sciences Research Division. Oak Ridge, Tennessee.

[4] Oak Ridge National Laboratory (ORNL). 1995. *Preliminary Remediation Goals for Use at the U.S. Department of Energy Oak Ridge Operations Office*. ES/ER/TM-106. Environmental Restoration Risk Assessment Program. Oak Ridge, Tennessee.

[5] United States Environmental Protection Agency (EPA). 1991a. *Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)*. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

[6] United States Environmental Protection Agency (EPA). 1991b. Appendix D of *Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)*. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

[7] United States Environmental Protection Agency (EPA). 1991c. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance Standard Default Exposure Factors*. OSWER Directive 9285.6-03. Office of Emergency and Remedial Response. Toxics Integration Branch.

[8] United States Environmental Protection Agency (EPA). 1992a. *Dermal Exposure Assessment: Principles and Application*. Interim Report. EPA/600/8-91/011B. Office of Research and Development, Washington, D.C.

[9] United States Environmental Protection Agency (EPA) Region IV. 1992b. New Interim Region IV Guidance. Memorandum from Region IV, Atlanta, Georgia. February 11, 1992.

[10] Maximum value used; equivalent to 100%

TABLES FOR CHAPTER 3

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Table 3.1. Chemical-specific parameters used in calculation of screening values based on systemic toxicity

Inorganic Analyte	CASRN	Oral		Inhalation		Dermal Absorption	
		RfD	Ref	RfD	Ref	RfD	Ref
Aluminum	007429-90-5	---	--	---	--	---	1, 2
Antimony (Metallic)	007440-36-0	4.0E-04	a	---	--	8.0E-06	3
Arsenic (Inorganic)	007440-38-2	3.0E-04	a	---	--	1.2E-04	4
Barium	007440-39-3	7.0E-02	a	1.4E-04	b,c	4.9E-03	5
Beryllium	007440-41-7	5.0E-03	a	---	--	5.0E-05	6, 7
Cadmium (Diet)	007440-43-9	1.0E-03	a	---	--	1.0E-05	8, 9, 10, 11
Chromium (III) (Insoluble Salts)	016065-83-1	1.0E+00	a	---	--	5.0E-03	12
Chromium (VI)	018540-29-9	5.0E-03	a	---	--	1.0E-04	13
Cobalt	007440-48-4	---	--	---	--	---	14
Copper	007440-50-8	---	d	---	--	---	1
Cyanide (CN-)	000057-12-5	2.0E-02	a	---	--	3.4E-03	15
Iron	007439-89-6	---	--	---	--	---	14
Lead and Compounds	007439-92-1	---	--	---	--	---	14
Magnesium	007439-95-4	---	--	---	--	---	14
Manganese (Diet)	007439-96-5	1.4E-01	a	1.4E-05	a	5.6E-03	16
Mercury (Elemental)	007439-97-6	3.0E-04	--	8.6E-05	a	3.0E-08	14, 17
Mercury (Inorganic)	007439-97-6	3.0E-04	b	8.6E-05	b	2.1E-05	14
Nickel (Soluble Salts)	007440-02-0	2.0E-02	a	---	--	5.4E-03	18
Selenium	007782-49-2	5.0E-03	a	---	--	2.2E-03	19
Silver	007440-22-4	5.0E-03	a	---	--	9.0E-04	20
Thallium (Soluble Salts)	007440-28-0	---	--	---	--	---	21

Table 3.1. (continued)

Inorganic Analyte	CASRN	Oral		Inhalation		Dermal Absorption	
		RfD	Ref	RfD	Ref	RfD	Ref
Tin	007440-31-5	6.0E-01	b	---	--	6.0E-02	14
Vanadium (Metallic)	007440-62-2	7.0E-03	b	---	--	7.0E-05	22, 23
Zinc (Metallic)	007440-66-6	3.0E-01	a	---	--	6.0E-02	24

Reference notes:

--- Indicates data are not available.

a Source: Integrated Risk Information System (IRIS)

b Source: Health and Environmental Affects Summary Table (HEAST) 1993

c This value was derived using a method that is not consistent with the interim inhalation procedure used by the RfD/RfC Work Group (see HEAST Table 2 for details).

d HEAST concluded that the toxicity data were inadequate to calculate an oral RfD for copper and substituted the current drinking water standard (MCLG) of 1.3 mg/L.

Dermal Absorption references:

1 Venugopal, B. and T. D. Luckey. 1978. Metal Toxicity in Mammals-2. Chemical Toxicity of Metals and Metalloids. Plenum Press, pp. 104-112.

2 Kortus, J. 1967. The carbohydrate metabolism accompanying intoxication by aluminum salts in the rat. Experientia 23:912.

3 Gerber, G. B., J. Maes, and B. Eykens. 1982. Transfer of antimony and arsenic to the developing organism. Arch. Toxicol. 49:159.

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8 Foulkes, E. C. 1986. Absorption of cadmium. In: Handbook of Experimental Pharmocology. Vol. 80, E.C. Foulkes, ed., Springer-Verlag, Berlin, pp. 75-100.

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Table 3.1. (continued)

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16 EPA (United States Environmental Protection Agency). 1990. Integrated Risk Information System (IRIS). Health Assessment for Manganese. On Line. (Verification date 6/21/90). OHEA, ECAO.

17 ATSDR (Agency for Toxic Substances and Disease Registry). 1989. Toxicological Profile for Mercury. ATSDR/U.S. Public Health Service.

18 ATSDR (Agency for Toxic Substances and Disease Registry). 1993. Toxicological Profile for Nickel. ATSDR/U.S. Public Health Service.

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22 Curran, G. L. and R. E. Burch. 1967. Biological and health effects of vanadium. In: Proceedings on the Conference on Trace Substances in Environmental Health, D. D. Hemphill Ed. University of Missouri, Columbia, MO, pp. 96-104.

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Table 3.2. Chemical-specific parameters used in calculation of screening values based on carcinogenesis

Inorganic Analyte	CASRN	Oral		Inhalation		Dermal Absorption	
		SF	Ref	SF	Ref	SF	Ref
Aluminum	007429-90-5	---	--	---	--	---	1, 2
Antimony (Metallic)	007440-36-0	---	--	---	--	---	3
Arsenic (Inorganic)	007440-38-2	1.5E+00	a	5.0E+01	b	3.7E+00	4
Barium	007440-39-3	---	--	---	--	---	5
Beryllium	007440-41-7	4.3E+00	a	8.4E+00	b	4.3E+02	6, 7
Cadmium (Diet)	007440-43-9	---	--	6.1E+00	b	---	8, 9, 10, 11
Chromium (III) (Insoluble Salts)	016065-83-1	---	--	---	--	---	12
Chromium (VI)	018540-29-9	---	--	4.1E+01	b	---	13
Cobalt	007440-48-4	---	--	---	--	---	14
Copper	007440-50-8	---	--	---	--	---	1
Cyanide (CN-)	000057-12-5	---	--	---	--	---	15
Iron	007439-89-6	---	--	---	--	---	14
Lead and Compounds	007439-92-1	---	--	---	--	---	14
Magnesium	007439-95-4	---	--	---	--	---	14
Manganese (Diet)	007439-96-5	---	--	---	--	---	16
Mercury (Elemental)	007439-97-6	---	--	---	--	---	14, 17
Mercury (Inorganic)	007439-97-6	---	--	---	--	---	14
Nickel (Soluble Salts)	007440-02-0	---	--	---	--	---	18
Selenium	007782-49-2	---	--	---	--	---	19
Silver	007440-22-4	---	--	---	--	---	20
Thallium (Soluble Salts)	007440-28-0	---	--	---	--	---	21

Table 3.2. (continued)

Inorganic Analyte	CASRN	Oral		Inhalation		Dermal Absorption	
		SF	Ref	SF	Ref	SF	Ref
Tin	007440-31-5	---	--	---	--	---	14
Vanadium (Metallic)	007440-62-2	---	--	---	--	---	22, 23
Zinc (Metallic)	007440-66-6	---	--	---	--	---	24

Reference notes:

--- Indicates data are not available.

a Source: Integrated Risk Information System (IRIS)

b Source: Health and Environmental Affects Summary Table (HEAST) 1993

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Table 3.2. (continued)

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Table 3.3. Risk-based screening criteria for exposure to metals[a] in soil under a residential use scenario

Inorganic Analyte[b]	CASRN[c]	Ingestion (mg/kg)		Dermal Contact (mg/kg)		Inhalation (mg/kg)		Ingestion + Dermal Contact + Inhalation (mg/kg)	
		Cancer[d]	Systemic Toxicity[e]	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity
Aluminum	007429-90-5	---	---	---	---	---	---	---	---
Antimony (Metallic)	007440-36-0	---	3.0E+00	---	6.5E-02	---	---	---	6.4E-02
Arsenic (Inorganic)	007440-38-2	3.7E-01	2.3E+00	1.2E-01	1.0E+00	3.5E+02	---	9.2E-02	8.2E-01
Barium	007440-39-3	---	5.3E+02	---	4.0E+01	---	4.6E+04	---	3.8E+01
Beryllium	007440-41-7	1.3E-01	3.8E+01	1.0E-03	4.1E-01	2.1E+03	---	1.0E-03	4.0E-01
Cadmium (Diet)	007440-43-9	---	7.6E+00	---	8.1E-02	2.9E+03	---	---	8.1E-02
Calcium	007440-70-2	---	---	---	---	---	---	---	---
Chromium (III) (Insoluble Salts)	016065-83-1	---	7.6E+03	---	4.1E+01	---	---	---	4.0E+01
Chromium (VI)	018540-29-9	---	3.8E+01	---	8.1E-01	4.2E+02	---	---	8.0E-01
Cobalt	007440-48-4	---	---	---	---	---	---	---	---
Copper	007440-50-8	---	---	---	---	---	---	---	---
Cyanide (CN-)	000057-12-5	---	1.5E+02	---	2.8E+01	---	---	---	2.5E+01
Iron	007439-89-6	---	---	---	---	---	---	---	---
Lead And Compounds	007439-92-1	---	---	---	---	---	---	---	---
Magnesium	007439-95-4	---	---	---	---	---	---	---	---
Manganese (Diet)	007439-96-5	---	1.1E+03	---	4.5E+01	---	4.6E+03	---	4.4E+01
Mercury (Elemental)	007439-97-6	---	2.3E+00	---	2.4E-04	---	2.8E+04	---	2.4E-04
Mercury (Inorganic)	007439-97-6	---	2.3E+00	---	1.7E-01	---	2.8E+04	---	1.6E-01
Nickel (Soluble Salts)	007440-02-0	---	1.5E+02	---	4.4E+01	---	---	---	3.8E+01

Table 3.3. (continued)

Inorganic Analyte[b]	CASRN[c]	Ingestion (mg/kg)		Dermal Contact (mg/kg)		Inhalation (mg/kg)		Ingestion + Dermal Contact + Inhalation (mg/kg)	
		Cancer[d]	Systemic Toxicity[e]	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity
Potassium	007440-09-7	---	---	---	---	---	---	---	---
Selenium	007782-49-2	---	3.8E+01	---	1.8E+01	---	---	---	1.4E+01
Silver	007440-22-4	---	3.8E+01	---	7.3E+00	---	---	---	6.7E+00
Sodium	007440-23-5	---	---	---	---	---	---	---	---
Sulfide	---	---	---	---	---	---	---	---	---
Thallium (Soluble Salts)	007440-28-0	---	---	---	---	---	---	---	---
Tin	007440-31-5	---	4.5E+03	---	4.9E+02	---	---	---	4.6E+02
Vanadium (Metallic)	007440-62-2	---	5.3E+01	---	5.7E-01	---	---	---	5.6E-01
Zinc (Metallic)	007440-66-6	---	2.3E+03	---	4.9E+02	---	---	---	4.4E+02

Notes:
Cells containing dashes (---) indicate data are not available to calculate a value.

[a] Includes analytes found on Target Analyte List, as defined by EPA in 1988 CLP Statement of Work, and RCRA Appendix IX list of constituents.
[b] Analyte name.
[c] Chemical Analytical Service Registry Number.
[d] Screening criteria (i.e., preliminary remediation goals) calculated using a target excess lifetime cancer risk of 1×10^{-6}.
[e] Screening criteria (i.e., preliminary remediation goals) calculated using a target hazard quotient of 0.1.

Table 3.4. Risk-based screening criteria for exposure to metals[a] in soil under the industrial use scenario

Inorganic Analyte[b]	CASRN[c]	Ingestion (mg/kg)		Dermal Contact (mg/kg)		Inhalation (mg/kg)		Ingestion + Dermal Contact + Inhalation (mg/kg)	
		Cancer[d]	Systemic Toxicity[e]	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity
Aluminum	007429-90-5	---	---	---	---	---	---	---	---
Antimony (Metallic)	007440-36-0	---	8.2E+01	---	1.1E+00	---	---	---	1.1E+00
Arsenic (Inorganic)	007440-38-2	3.8E+00	6.1E+01	1.1E+00	1.8E+01	1.2E+03	---	8.5E-01	1.4E+01
Barium	007440-39-3	---	1.4E+04	---	7.0E+02	---	3.1E+05	---	6.6E+02
Beryllium	007440-41-7	1.3E+00	1.0E+03	9.3E-03	7.1E+00	7.3E+03	---	9.2E-03	7.1E+00
Cadmium (Diet)	007440-43-9	---	2.0E+02	---	1.4E+00	---	1.0E+04	---	1.4E+00
Calcium	007440-07-2	---	---	---	---	---	---	---	---
Chromium (III) (Insoluble Salts)	016065-83-1	---	2.0E+05	---	7.1E+02	---	---	---	7.1E+02
Chromium (VI)	018540-29-9	---	1.0E+03	---	1.4E+01	1.5E+03	---	1.5E+03	1.4E+01
Cobalt	007440-48-4	---	---	---	---	---	---	---	---
Copper	007440-50-8	---	---	---	---	---	---	---	---
Cyanide (CN-)	000057-12-5	---	4.1E+03	---	4.8E+02	---	---	---	4.3E+02
Iron	007439-89-6	---	---	---	---	---	---	---	---
Lead And Compounds	007439-92-1	---	---	---	---	---	---	---	---
Magnesium	007439-95-4	---	---	---	---	---	---	---	---
Manganese (Diet)	007439-96-5	---	2.9E+04	---	8.0E+02	---	3.1E+04	---	7.6E+02
Mercury (Elemental)	007439-97-6	---	6.1E+01	---	4.3E-03	---	1.9E+05	---	4.3E-03
Mercury (Inorganic)	007439-97-6	---	6.1E+01	---	3.0E+00	---	1.9E+05	---	2.9E+00
Nickel (Soluble Salts)	007440-02-0	---	4.1E+03	---	7.7E+02	---	---	---	6.5E+02

Table 3.4. (continued)

Inorganic Analyte[b]	CASRN[c]	Ingestion (mg/kg)		Dermal Contact (mg/kg)		Inhalation (mg/kg)		Ingestion + Dermal Contact + Inhalation (mg/kg)	
		Cancer[d]	Systemic Toxicity[e]	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity	Cancer	Systemic Toxicity
Potassium	007440-09-7	---	---	---	---	---	---	---	---
Selenium	007782-49-2	---	1.0E+03	---	3.1E+02	---	---	---	2.4E+02
Silver	007440-22-4	---	1.0E+03	---	1.3E+02	---	---	---	1.1E+02
Sodium	007440-23-5	---	---	---	---	---	---	---	---
Sulfide	---	---	---	---	---	---	---	---	---
Thallium (Soluble Salts)	007440-28-0	---	---	---	---	---	---	---	---
Tin	007440-31-5	---	1.2E+05	---	8.6E+03	---	---	---	8.0E+03
Vanadium (Metallic)	007440-62-2	---	1.4E+03	---	1.0E+01	---	---	---	9.9E+00
Zinc (Metallic)	007440-66-6	---	6.1E+04	---	8.6E+03	---	---	---	7.5E+03

Notes:
Cells containing dashes indicate (---) that data are not available to calculate a value.

[a] Includes analytes found on Target Analyte List, as defined by EPA in 1988 CLP Statement of Work, and RCRA Appendix IX list of constituents.
[b] Analyte name.
[c] Chemical Analytical Service Registry Number.
[d] Screening criteria (i.e., preliminary remediation goals) calculated using a target excess lifetime cancer risk of 1×10^{-6}.
[e] Screening criteria (i.e., preliminary remediation goals) calculated using a target hazard quotient of 0.1.

4. DISCUSSION AND CONCLUSIONS

This chapter discusses the results presented in Chapters 2 and 3. In primary focus of this discussion is the comparison of each analyte's background concentrations with that analyte's health-based screening criteria. In addition, this chapter presents general conclusions regarding the background values derived in Chapter 2 and values obtained from the literature, the comparison of the background values and the risk-based screening criteria, the need for additional sampling to confirm some background values, the results of this report versus those contained in the earlier iteration of this report, and the application of the background values and risk-based screening criteria.

4.1 COMPARISON OF BACKGROUND VALUES AND RISK-BASED SCREENING CRITERIA

This subsection compares the background values and the risk-based screening criteria. Comparisons of the surface soil background values and the risk-based screening criteria are presented in Figs. 4.1 and 4.2 and Table 4.1 (figures and tables are presented at the end of this chapter). Comparisons of the subsurface background values and the risk-based screening criteria are shown in Figs. 4.3 and 4.4 and Table 4.2.

4.1.1 Aluminum

The background values for aluminum in surface and subsurface soil are 13,000 and 12,000 mg/kg, respectively. Because no approved toxicity values are available, human health risk-based screening criteria could not be calculated for this analyte. Therefore, it is not possible to compare these background values to risk-based screening criteria. However, the Commonwealth of Kentucky does provide a soil screening value for aluminum (77,000 mg/kg). The background values for aluminum are less than the state screening value.

4.1.2 Antimony

The background value for antimony in surface soil is 0.84 mg/kg. This value is less than the industrial use risk-based screening value (1.1 mg/kg) but is greater than the residential use risk-based sceening value (0.064 mg/kg). The surface soil background value is much smaller than the soil screening value provided by the Commonwealth of Kentucky (31 mg/kg).

The background value for antimony in subsurface soil is 13 mg/kg. This value is markedly greater than both the industrial use and residential use screening values (1.1 mg/kg and 0.064 mg/kg, respectively). However, the subsurface soil background value is less than the soil screening value provided by the Commonwealth of Kentucky (31 mg/kg).

4.1.3 Arsenic

The background values for arsenic in surface and subsurface soil are 12 and 7.9 mg/kg, respectively. These values are greater than both the industrial use and residential use screening criteria (0.85 and 0.092 mg/kg, respectively). The background values are also much greater than the soil screening value provided by the Commonwealth of Kentucky (0.32 mg/kg).

4.1.4 Barium

The background values for barium in surface and subsurface soil are 200 and 170 mg/kg, respectively. These values are less than the industrial use risk-based screening value (660 mg/kg) but greater than the residential use risk-based screening value (38 mg/kg). The background values are markedly less than the Commonwealth of Kentucky's soil screening value (5300 mg/kg).

4.1.5 Beryllium

The background values for beryllium in surface and subsurface soil are 18 and 1.3 mg/kg, respectively These values are much greater than both the industrial use and residential use screening criteria (0.0092 and 0.001 mg/kg, respectively). The background values are also markedly greater than the Commonwealth of Kentucky's soil screening value (0.14 mg/kg).

4.1.6 Cadmium

The background values for cadmium in surface and subsurface soil are 2.6 and 2.2 mg/kg, respectively. These values are greater than both the industrial use and residential use screening values (1.4 and 0.082 mg/kg, respectively). However, these values are markedly less than the Commonwealth of Kentucky's soil screening value (38 mg/kg).

4.1.7 Calcium

The background values for calcium in surface soil and subsurface soil are 200,000 and 6100 mg/kg, respectively. These values cannot be compared against risk-based screening criteria because these values could not be calculated; no approved toxicity values for calcium exist. In addition, the Commonwealth of Kentucky does not provide a soil screening value for calcium.

4.1.8 Chromium III and Chromium VI

The background value for chromium III in surface soil is 16 mg/kg. A background value for chromium VI in surface soil was not derived because data were not available. The chromium III background value is less than both the industrial use and residential use screening criteria (710 and 40 mg/kg, respectively). There is no Commonwealth of Kentucky soil screening value for chromium III. However, the Commonwealth of Kentucky does provide a soil screening value for chromium VI (30 mg/kg). This screening value is greater than both the industrial use and residential use screening criteria derived in Chapter 3 for chromium VI (14 and 0.8 mg/kg, respectively).

The background value for chromium III in subsurface soil is 43 mg/kg. As with surface soil, a background value for chromiumVI in subsurface soil could not be derived because data were not available. The chromium III background value is less than the industrial use risk-based screening value (710 mg/kg) but slightly exceeds the residential use screening value (40 mg/kg). As noted previously, no Commonwealth of Kentucky soil screening value exists for chromium III.

4.1.9 Cobalt

The background values for cobalt in surface soil and subsurface soil are 14 and 13 mg/kg, respectively. These values cannot be compared against risk-based screening criteria because these values could not be derived; approved toxicity information for cobalt does not exist. In addition, the Commonwealth of Kentucky does not provide a soil screening value for cobalt.

4.1.10 Copper

The background values for copper in surface and subsurface soil are 19 and 26 mg/kg, respectively. These values cannot be compared against risk-based screening criteria because these values could not be derived for copper; approved toxicity information for copper does not exist. However, the Commonwealth of Kentucky does provide a soil screening value for copper (2800 mg/kg). The background values are considerably less than this soil screening value.

4.1.11 Cyanide

Background values for cyanide were not derived because, as discussed in Chapter 2, cyanide is not expected to be naturally occurring in soil at the PGDP. The risk-based screening criteria for industrial and residential use are 430 and 25 mg/kg, respectively. These values are less than the Commonwealth of Kentucky's soil screening value (1300 mg/kg).

4.1.12 Iron

The background value for iron in both surface and subsurface soil is 28,000 mg/kg. This value cannot be compared against risk-based screening criteria because these values could not be derived; approved toxicity information for iron does not exist. In addition, the Commonwealth of Kentucky does not provide a soil screening value for iron.

4.1.13 Lead

The background values for lead in surface and subsurface soil are 36 and 23 mg/kg, respectively. These values cannot be compared to risk-based screening criteria bacause these values could not be derived for lead. The method used to derive screening criteria in Chapter 3 is not applicable to lead. However, the Commonwealth of Kentucky does provide a soil screening value for lead (20 mg/kg). The background values exceed this soil screening value.

4.1.14 Magnesium

The background values for magnesium in surface and subsurface soil are 7700 and 2100 mg/kg, respectively. These values cannot be compared to risk-based screening criteria because these values could not be derived; approved toxicity values for magnesium do not exist. In addition, the Commonwealth of Kentucky does not provide a soil screening value for magnesium.

4.1.15 Manganese

The background values for manganese in surface and subsurface soil are 1500 and 820 mg/kg, respectively. These values exceed both the industrial use and residential use risk-based screening values (760 and 44 mg/kg, respectively). The background value also exceeds the soil screening value provided by the Commonwealth of Kentucky (380 mg/kg).

4.1.16 Mercury (Elemental) and Mercury (Inorganic)

The background value for both elemental mercury and inorganic mercury in surface soil is 0.20 mg/kg. This value greatly exceeds the industrial use and residential use risk-based screening values derived for elemental mercury (0.0043 and 0.00024 mg/kg, respectively). However, this value is less than the industrial use risk-based screening value (2.9 mg/kg) and only slightly exceeds the residential use risk-based screening value (0.16 mg/kg) derived for inorganic mercury. In addition, the background value is markedly less than the soil screening value provided by the Commonwealth of Kentucky for inorganic mercury (23 mg/kg). The Commonwealth of Kentucky does not provide a soil screening value for elemental mercury.

The background value for both elemental mercury and inorganic mercury in subsurface soil is 0.13 mg/kg. This value greatly exceeds the industrial use and residential use risk-based screening values derived for elemental mercury (0.0043 and 0.00024 mg/kg, respectively). However, this value is less than both the industrial use and residential use risk-based screening values derived for inorganic mercury (2.9 and 0.16 mg/kg, respectively). In addition, the background value is markedly less than the soil screening value provided by the Commonwealth of Kentucky for inorganic mercury (23 mg/kg). As noted earlier, the Commonwealth of Kentucky does not provide a soil screening value for elemental mercury.

4.1.18 Nickel

The background values for nickel in surface and subsurface soils are 21 and 22 mg/kg, respectively. These values are less than both the industrial use and residential use risk-based screening values (650 and 38 mg/kg, respectively). The background values are also markedly less than the soil screening value provided by the Commonwealth of Kentucky (1500 mg/kg).

4.1.19 Potassium

The background values for potassium in surface and subsurface soils are 1300 and 950 mg/kg, respectively. These values cannot be compared against risk-based screening criteria because these values could not be derived; approved toxicity information for potassium does not exist. Similarly, the Commonwealth of Kentucky does not provide a soil screening value for potassium.

4.1.20 Selenium

The background values for selenium in surface and subsurface soil are 0.8 and 0.7 mg/kg, respectively. These values are markedly less than both the industrial use and residential use risk-based screening criteria (240 and 14 mg/kg, respectively). The background values are also markedly less than the soil screening value provided by the Commonwealth of Kentucky (380 mg/kg).

4.1.21 Silver

The background values for silver in surface and subsurface soils are 2.3 and 2.7 mg/kg, repectively. These values are less than both the industrial use and residential use risk-based screening criteria (110 and 6.7 mg/kg, respectively). The background values are also markedly less than the soil screening value provided by the Commonwealth of Kentucky (380 mg/kg).

4.1.22 Sodium

The background values for sodium in surface and subsurface soils are 320 and 340 mg/kg, respectively. These values cannot be compared against risk-based screening criteria because these values could not be derived; approved toxicity information for sodium does not exist. Similarly, the Commonwealth of Kentucky does not provide a soil screening value for sodium.

4.1.23 Sulfide

No screening criteria for sulfide, including a background value, could be derived. A background value could not be derived because data were not available. Risk-based screening criteria could not be derived because approved toxicity information does not exist. Finally, the Commonwealth of Kentucky does not provide a soil screening value for sulfide.

4.1.24 Thallium

The background values for thallium in surface and subsurface soils are 0.44 and 0.38 mg/kg, respectively. These values cannot be compared against risk-based screening criteria because these values could not be derived; approved toxicity information for thallium does not exist. Similarly, the Commonwealth of Kentucky does not provide a soil screening value for thallium.

4.1.25 Tin

A background value for tin could not be derived as part of this work because data were not available. However, both industrial and residential use risk-based screening criteria were derived (8000 and 460 mg/kg, respectively). These criteria are markedly less than the soil screening value provided by the Commonwealth of Kentucky (46,000 mg/kg).

4.1.26 Vanadium

The background values for vanadium in surface and subsurface soils are 38 and 37 mg/kg, respectively. These values exceed both the industrial use and residential use risk-based screening criteria (9.9 and 0.56 mg/kg, respectively). However, the background values are less than the soil screening value provided by the Commonwealth of Kentucky (540 mg/kg).

4.1.27 Zinc

The background values for zinc in surface and subsurface soils are 65 and 60 mg/kg, respectively. These values are markedly less than both the industrial use and residential use risk-based screening criteria (7500 and 440 mg/kg, respectively). The background values are also markedly less than the soil screening value provided by the Commonwealth of Kentucky (23,000 mg/kg).

4.2 GENERAL CONCLUSIONS

This subsection presents general conclusions concerning the comparison of the background values to values found in the literature, the comparison of background values and risk-based screening criteria, the need for confirming some background values with additional sampling, and the results of this D1 version of this document and the earlier version. In addition, this subsection discusses the application of the background values and risk-based screening criteria in remedial investigation and feasibility studies and when evaluating "new" areas of concern.

4.2.1 Comparison of Background Values and Values Found in the Literature

As indicated in Tables 2.14 and 2.15 and discussed in Chapter 2, the background values derived in this report compare favorably with the values reported in the literature. For surface soil, the concentrations of all inorganic analytes except for cadmium and sodium have estimated maximum background concentrations that fall within one or more of the ranges found in the literature. Similarly, the derived upper limit for background concentrations for all inorganic analytes in surface soil except cadmium and sodium fall within one or more of the ranges presented. For subsurface soil, all inorganic analytes except antimony, cadmium, mercury, and sodium have maximum background concentrations that fall within one or more of the ranges taken from the literature. Of these, only the derived upper limits for background concentration for antimony, cadmium, and sodium have values that do not fall within one or more of the ranges presented. These results indicate that the maximum values selected for background concentrations using the method presented in this document yielded background screening values that are consistent with the literature for most analytes. However, as noted in Chapter 2, the derived upper limits for background for most inorganic analytes are less than expected. This general observation indicates that the selected screening threshhold (i.e., the 95% upper limit of the 95th percentile) may be too conservative.

4.2.2 Comparison of Background Values and Risk-Based Screening Criteria

In the comparison of background values to risk-based screening criteria, the following inorganic analytes were found to have upper limits for background greater than their respective industrial use risk-based screening criteria: antimony (subsurface soil), arsenic (surface and subsurface soils), beryllium (surface and subsurface soils), cadmium (surface and subsurface soils), manganese (surface and subsurface soils), mercury (elemental) (surface and subsurface soils), and vanadium (surface and subsurface soils). The following inorganic analytes were found to have upper limits for background greater than their respective residential use risk-based screening criteria: antimony (surface and subsurface soils), arsenic (surface and subsurface soils), barium (surface and subsurface soils), beryllium (surface and subsurface soils), cadmium (surface and subsurface soils), chromium III (subsurface soil), manganese (surface and subsurface soils), mercury (elemental) (surface and subsurface soils), mercury (inorganic) (surface soil), and vanadium (surface and subsurface soils). However, only the following inorganic analytes were found to have upper limits for background greater than their respective Commonwealth of Kentucky soil screening value: arsenic (surface and subsurface soils), beryllium (surface and subsurface soils), lead (surface and subsurface soils), and manganese (surface and subsurface soils). [It should be noted that the Commonwealth of Kentucky's guidance on use of its soil screening values directs that the values should be multiplied by 0.1 if more than five chemicals are believed to be at the a potentially contaminated site. If the soil screening values are multiplied by 0.1, aluminum (surface and subsurface soils) and antimony (subsurface soil) are added to the previous list.]

These results indicate that the risk-based screening criteria derived in Chapter 3 are very conservative and that the Commonwealth of Kentucky soil screening criteria are only slightly less conservative. Therefore, the risk-based soil screening criteria derived in Chapter 3 are appropriate for use in screening information from potentially contaminated sites when "new" areas of concern are identified and in determining which chemicals should be retained in the list of chemicals of potential concern when it is produced in the data evaluation step of a baseline human health risk assessment.

4.2.3 Confirmatory Sampling

Taken together, the information in Subsects. 4.2.1 and 4.2.2 indicate that some confirmatory sampling may be necessary to conclusively establish background concentrations for some inorganic analytes in soil at the PGDP. Currently, the *Project Plan for the Background Soils Project for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1995) calls for confirmatory sampling for antimony, beryllium, thallium, and mercury. The decision to perform confirmatory sampling for these four analytes rested upon the PGDP personnel review of the results of the previous version of this document and comments received from the Commonwealth of Kentucky about the previous version of this document. In the previous version of this document, markedly greater upper limits for background concentration for these analytes were derived (13, 24, 1.4, 2.5 mg/kg in surface soil and 20.2, 1.8, 1.0, and 0.49 in subsurface soil for antimony, beryllium, thallium, and mercury, respectively, versus 0.84, 18, 0.44, 0.20 mg/kg in surface soil and 13.4, 1.3, 0.38, and 0.13 mg/kg in subsurface soil, respectively, in this version of the report).

Contrary to the decision made after review of the earlier version of this document, the results of the current version of this document indicate that this analyte list should be changed. The results of the current version of this document indicate that confirmatory sampling for both antimony and beryllium is still needed because the derived background concentrations for antimony (subsurface) and beryllium (surface) are still much greater than the concentrations expected in western Kentucky and greatly in excess of thier risk-based screening criteria. However, the results in the current document indicate that confirmatory sampling for mercury and thallium may not be needed. The upper limits for mercury and thallium both fall well within their expected ranges at 0.20 and 0.13 mg/kg (surface and subsurface soil) and 0.44 and 0.38 mg/kg (surface and subsurface soil), respectively, and, in the case of mercury, do not greatly exceed the risk-based screening criteria [assuming the criteria for mercury (inorganic) are used]. Thallium does not have risk-based screening criteria.

The argument could be made that confirmatory sampling for both calcium and sodium should be considered. Confirmatory sampling for these analytes could be suggested because the upper limit of background concentrations derived for these common inorganic analytes are much less than expected (calcium in subsurface soil and sodium in both surface and subsurface soils). The need for confirmatory sampling could be justified because the very low background values for these analytes should be confirmed to ensure that unneccessary actions are not taken to address perceived contamination by these analytes. However, because neither of these analytes are known to be toxic at concentrations expected to be found at contaminated sites at PGDP, confirmatory sampling for calcium and sodium is unnecessary.

4.2.4 Comparison Against Results of Earlier Version of this Document

As noted in the previous subsection, the results of this version of this document vary markedly from the results presented in the earlier version for some analytes. Changes in the results for upper limits for background concentration are due to three factors. These are discussed in the following paragraphs.

First, the data sets underwent a much more refined evaluation in this version of the document. In the previous version of the document, the maximum background values used to delimit the background population of observations from the contaminated population of observations for most analytes were drawn without extensive evaluation from *Inorganic Soil and Groundwater Chemistry Near Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (Moore 1995). However, in this version of the document, the maximum background values were selected independently and used not only cumulative probability plots used by Moore but also histograms and sample distribution information. Of the additional information used in selecting the maximum background concectration, the sample distribution information proved the most valuable. (It should be noted that examining the sample distribution information was a suggestion provided in comments from the Commonwealth of Kentucky.) The use of this information resulted in the discovery that, for some analytes, many of the observations near the upper end of what was previously thought to be the background distribution were from samples collected at or near one or two units, indicating that the concentrations in these samples were probably not representative of the background distribution. Generally, this information resulted in the selection of a lower maximum background concentration for most analytes [see Table 2.7 for a comparison of the maximum background values selected in Moore (1995) and those selected in the current version of this report].

Second, a lower upper limit for background concentration was selected in this report than in the previous version of this document. In the previous version of the document, the value selected as the upper limit of background was the upper limit of the 90% confidence interval on the 99th percentile of the range of background values. In this version of the document, the value selected as the upper limit of background was the upper limit of the 95% confidence interval on the 95th percentile of the range of background values. This lower limit was selected because it is equivalent to the value recommended by the state of Ohio in its *How Clean Is Clean* report (Ohio EPA 1991), which is one of the few documents to provide definitive guidance on how background concentrations are to be calculated. The earlier limit was selected using the professional judgment of the authors of the document.

Finally, the third factor resulting in lower upper limits for background concentration in this document versus the previous version of the document is that background limits suggested in comments by the Commonwealth of Kentucky were considered when reviewing the results of the background concentration calculations. The background limits suggested in the Commonwealth of Kentucky comments are as follows: antimony (< 1 mg/kg), arsenic (< 8 mg/kg), beryllium (< 5 mg/kg), chromium VI (< 0.05 mg/kg), cobalt (< 10 mg/kg), mercury (< 0.2 mg/kg), nickel (< 25 mg/kg), thallium (< 0.10 mg/kg), and vanadium (< 10 mg/kg). However, it should be noted that of the three factors resulting in lowered upper limits for background, the consideration of suggested limits listed in the comments played the smallest role in the revision of the document. This is because these suggested limits were purposely not considered until after the maximum background values were selected to not bias the selection of these values. Interestingly, although the limits suggested by the Commonwealth of Kentucky were used in this way, only the calculated upper limits of background for beryllium (18 mg/kg), thallium (0.44 mg/kg), and vanadium (38 mg/kg) in surface soil and antimony (13.4 mg/kg), thallium (0.38 mg/kg), and vanadium (37 mg/kg) in subsurface soil markedly exceed these suggested limits in the revised report.

In addition to changes in upper limits of background concentrations, the revised document contains human health risk-based screening criteria with markedly smaller values. The smaller risk-based screening criteria derived in the current report are due to two factors. First, in this version of the document, the default exposure parameters suggested by the Commonwealth of Kentucky in their recently released guidance document (Commonwealth of Kentucky 1995c) were used when deriving the screening criteria. In the earlier version of the document, the default exposure parameters suggested by EPA Region IV were used. Because the exposure parameters recommended by the Commonwealth of Kentucky are much more conservative, the screening criteria that were derived for this version of the document are reduced in most cases by more than an order of magnitude. Second, in this revision of the document, the residential use risk-based screening criteria based on the target hazard index of 0.1 are lower because these were calculated using the exposure defaults for a child from 1 through 6 years of age versus the exposure defaults for an adult resident as used in the earlier version of the document. The use of the child exposure defaults reduced the residential use screening criteria by about a factor of 2.

4.2.5 Application of Background Values and Risk-based Screening Criteria

As noted in Chapter 1, the background values and the risk-based screening criteria were derived for use in planning and completing final remedial investigations and feasibility study reports and in identifying "new" release locations. When planning remedial investigations, the background values and risk-based screening criteria should be used to screen any exisiting data to identify chemicals of potential concern. Such screening will enable the work plan to target these chemicals in the sampling and analysis plan.

When planning feasibility studies, the background values and risk-based screening criteria should be used as the background-based and risk-based preliminary remediation goals of choice. Used as preliminary remediation goals, the background values and risk-based screening criteria should enable risk managers to identify tentative remedies early in the clean-up process. When completing final remedial investigation reports and feasibility studies, the background values and the risk-based screening criteria should be used when detemining the extent of contamination and identifying chemicals of potential concern during the data evaluation step of baseline risk assessment.

In the data evaluation step, the background values should be used to screen site data to ensure that inorganic analytes at concentrations less than background are not retained as chemicals of potential concern. (Note that inorganic analytes removed using a comparison to background should still be evaluated in the baseline risk assessment. They are simply not retained as chemicals of potential concern.) The risk-based screening values should be used to reduce the list of chemicals of potential concern to ensure that only chemicals that may contribute significantly to risk are retained. (Note that any inorganic analytes removed from the list of chemicals of potential concern using the risk-based screening values should be qualitatively evaluated in the baseline human health risk assessment.) Finally, when using the background values and risk-based screening criteria to identify "new" potential release areas, available data should be directly compared to the background values first to determine if chemicals are at a site at concentrations in excess of background and second to determine which chemicals should be compared against risk-based screening criteria. A comparison of the available data against risk-based screening criteria will allow for a quick determination of the level of risk posed by chemicals released at the site and of the importance of the level of contamination suspected to be present at the "new" site.

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FIGURES FOR CHAPTER 4

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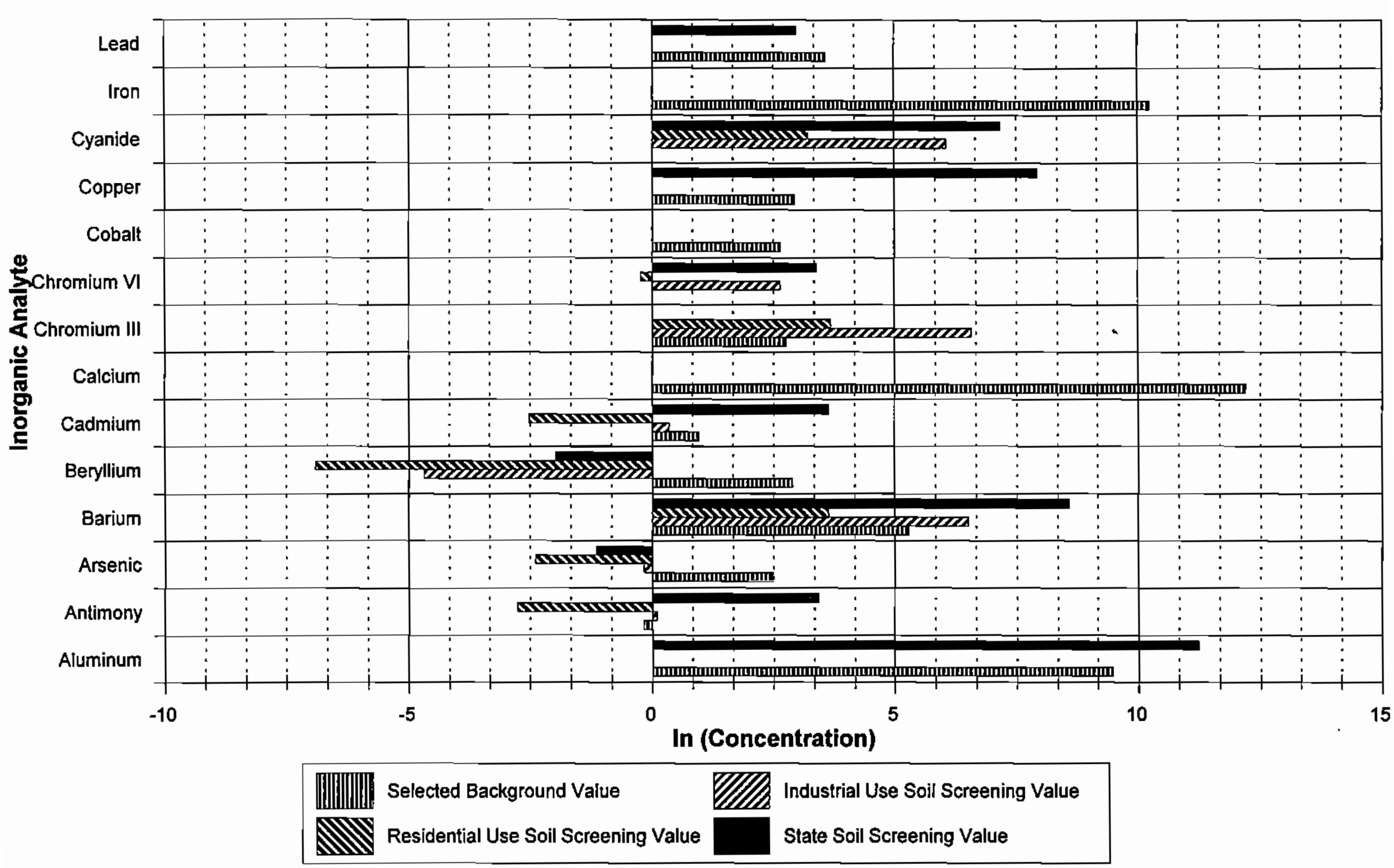

Figure 4.1. Comparison of surface soil background values and risk-based screening values for aluminum, antimony, arsenic, barium, cadmium, calcium, chromium (III and VI), cobalt, copper, cyanide, iron, and lead.

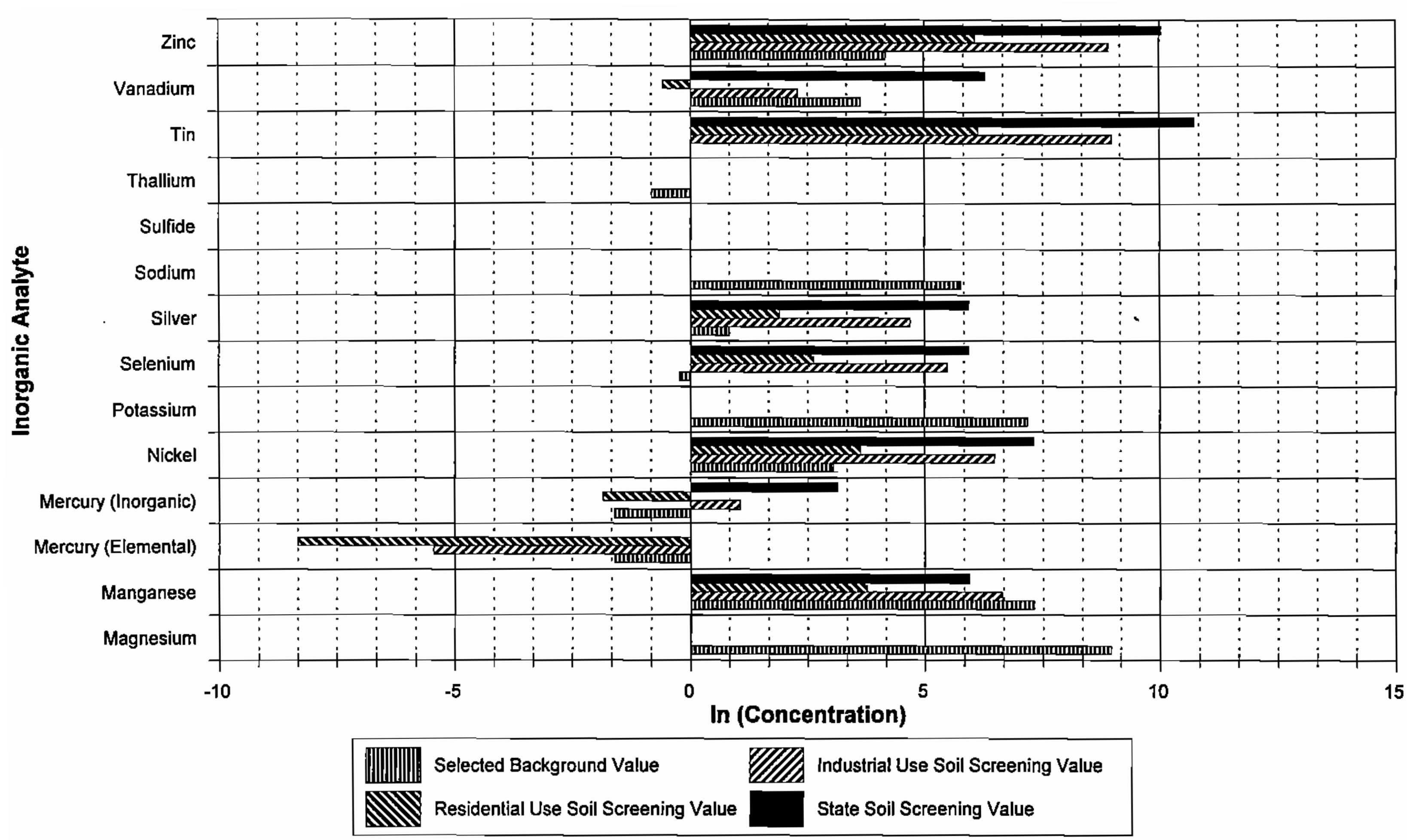

Figure 4.2. Comparison of surface soil background values and risk-based screening values for magnesium, manganese, mercury (elemental and inorganic), nickel, potassium, selenium, silver, sodium, sulfide, thallium, vanadium, and zinc.

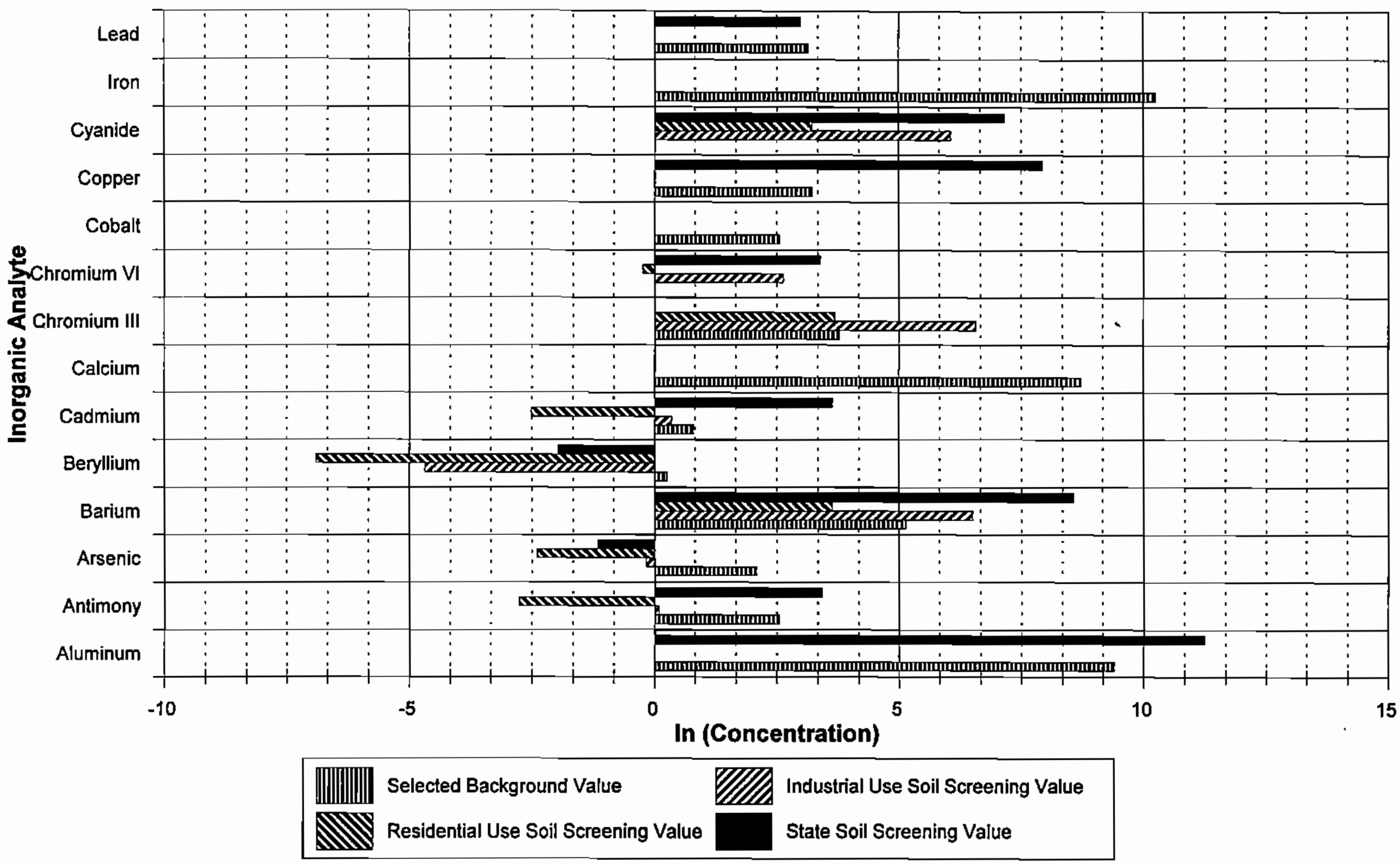

Figure 4.3. Comparison of subsurface soil background values and risk-based screening values for aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium (III and VI), cobalt, copper, cyanide, iron, and lead.

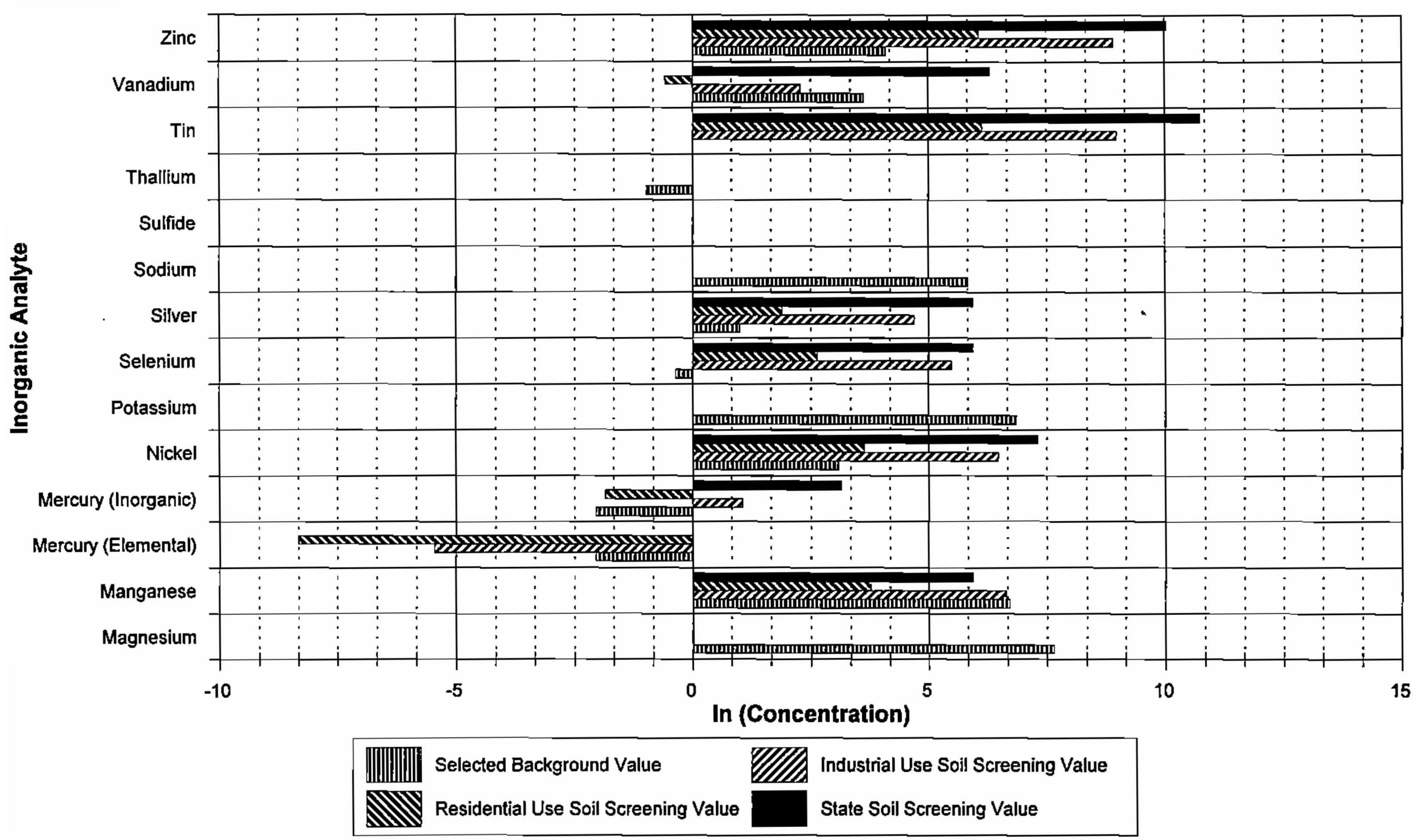

Figure 4.4. Comparison of subsurface soil background values and risk-based screening values for magnesium, manganese, mercury (elemental and inorganic), nickel, potassium, selenium, silver, sodium, sulfide, thallium, tin, vanadium, and zinc.

TABLES FOR CHAPTER 4

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Table 4.1. Values for use in screening concentration of metals[a] in near surface soils (0 to 1 ft below ground surface) in potential areas of concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Aluminum	7429-90-5	1.3E+04	---	---	---	---	7.7E+04
Antimony (Metallic)	7440-36-0	8.4E-01	1.1E+00	HI	6.4E-02	HI	3.1E+01[j]
Arsenic (Inorganic)	7440-38-2	1.2E+01	8.5E-01	ECR	9.2E-02	ECR	3.2E-01[k]
Barium	7440-39-3	2.0E+02	6.6E+02	HI	3.8E+01	HI	5.3E+03[l]
Beryllium	7440-41-7	1.8E+01	9.2E-03	ECR	1.0E-03	ECR	1.4E-01[m]
Cadmium (Diet)	7440-43-9	2.6E+00	1.4E+00	HI	8.1E-02	HI	3.8E+01[n]
Calcium	7440-70-2	2.0E+05	---	---	---	---	---
Chromium (III) (Insoluble Salts)	16065-83-1	1.6E+01	7.1E+02	HI	4.0E+01	HI	---
Chromium (VI)	18540-29-9	[o]	1.4E+01	HI	8.0E-01	HI	3.0E+01
Cobalt	7440-48-4	1.4E+01	---	---	---	---	---
Copper	7440-50-8	1.9E+01	---	---	---	---	2.8E+03[p]
Cyanide (CN-)	57-12-5	[q]	4.3E+02	HI	2.5E+01	HI	1.3E+03[r]
Iron	7439-89-6	2.8E+04	---	---	---	---	---
Lead and Compounds	7439-92-1	3.6E+01	---	---	---	---	2.0E+01[s]
Magnesium	7439-95-4	7.7E+03	---	---	---	---	---
Manganese (Diet)	7439-96-5	1.5E+03	7.6E+02	HI	4.4E+01	HI	3.8E+02[t]
Mercury (Elemental)	7439-97-6	2.0E-01	4.3E-03	HI	2.4E-04	HI	---
Mercury (Inorganic)	7439-97-6	2.0E-01	2.9E+00	HI	1.6E-01	HI	2.3E+01
Nickel (Soluble Salts)	7440-02-0	2.1E+01	6.5E+02	HI	3.8E+01	HI	1.5E+03
Potassium	7440-09-7	1.3E+03	---	---	---	---	---
Selenium	7782-49-2	8.0E-01	2.4E+02	HI	1.4E+01	HI	3.8E+02

Table 4.1. (continued)

[s] Value is that for "Lead" in *Risk Assessment Guidance, Appendix A*. This guidance states that this value does not need to be multiplied by 0.1 even if more than 5 chemicals are suspected of being present at the site being evaluated.

[t] Value is that for "Manganese and compounds" in *Risk Assessment Guidance, Appendix A*.

[u] Value is that for "Silver and compounds" in *Risk Assessment Guidance, Appendix A*.

[v] Value is that for "Tin and compunds" in *Risk Assessment Guidance, Appendix A*. A Chemical Abstract Service Registry Number is not provided in the guidance for this chemical.

Table 4.1. (continued)

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Silver	7440-22-4	2.3E+00	1.1E+02	HI	6.7E+00	HI	3.8E+02[n]
Sodium	7440-23-5	3.2E+02	---	---	---	---	---
Sulfide	---	[o]	---	---	---	---	---
Thallium	7440-28-0	4.4E-01	---	---	---	---	---
Tin	7440-31-5	[o]	8.0E+03	HI	4.6E+02	HI	4.6E+04[v]
Vanadium (Metallic)	7440-62-2	3.8E+01	9.9E+00	HI	5.6E-01	HI	5.4E+02
Zinc (Metallic)	7440-66-6	6.5E+01	7.5E+03	HI	4.4E+02	HI	2.3E+04

Notes:
Cells with dashes (—) indicate that data are not available or not applicable.
All values in mg/kg.

a Includes analytes found on Target Analyte List, as defined by EPA in 1988 CLP Statement of Work, and RCRA Appendix IX list of constituents.
b Analyte name.
c Chemical Analytical Service Registry Number.
d Value for use in screening to determine if analyte was detected at a naturally occurring concentration. Chapter 2 provides details on how these were derived. Values match those contained in Table 2-14, Column 2, except values are rounded to two significant digits.
e Industrial use human health risk-based screening value (IPRG) calculated using either a Hazard Index (HI) of 0.1 or an Excess Lifetime Cancer Risk (ECR) of 1×10^{-6} as a target value. The lesser of the HI and ECR based values is presented. See Section 3 for the method used to derive these values.
f Indicator of target value used to calculate IPRG. HI indicates that IPRG is based on a HI of 0.1; ECR indicates that IPRG is based on an ECR of 1×10^{-6}.
g Residential use human health risk-based screening value (RPRG) calculated using as target values a HI of 0.1 or an ECR of 1×10^{-6}. The lessor of the HI and ECR based values is presented. See Section 3 for the method used to derive these values.
h Indicator of target value used to calculate RPRG. HI indicates that the RPRG is based on a HI of 0.1; ECR indicates that RPRG is based on an ECR of 1×10^{-6}.
i Value in Commonwealth of Kentucky *Risk Assessment Guidance, Appendix A* (Commonwealth of Kentucky 1995b). This guidance states that these values are to be multiplied by 0.1 if the site being screened has more than 5 chemicals present. Also, this guidance states that these screening values are not applicable at sites at which multiple media may be contaminated.
j Value is that for "Antimony and compounds" in *Risk Assessment Guidance, Appendix A*.
k Value is that for "Arsenic (cancer endpoint) in *Risk Assessment Guidance, Appendix A*.
l Value is that for "Barium and compounds" in *Risk Assessment Guidance, Appendix A*.
m Value is that for "Beryllium and compounds" in *Risk Assessment Guidance, Appendix A*.
n Value is that for "Cadmium and compounds" in *Risk Assessment Guidance, Appendix A*.
o Data concerning this analyte were not collected during the Phases I and II Site Investigations. Therefore, background concentrations could not be established.
p Value is that for "Copper and compounds" in *Risk Assessment Guidance, Appendix A*.
q Cyanide is not expected to be naturally occurring at PGDP. Therefore, a background value was not derived.
r Value is that for "Free cyanide" in *Risk Assessment Guidance, Appendix A*.

Table 4.2. Values for use in screening concentration of metals[a] in subsurface soils (greater than 1 ft below ground surface) in potential areas of concern at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Aluminum	7429-90-5	1.2E+04	---	---	---	---	7.7E+04
Antimony (Metallic)	7440-36-0	1.3E+01	1.1E+00	HI	6.4E-02	HI	3.1E+01[j]
Arsenic (Inorganic)	7440-38-2	7.9E+00	8.5E-01	ECR	9.2E-02	HI	3.2E-01[k]
Barium	7440-39-3	1.7E+02	6.6E+02	HI	3.8E+01	HI	5.3E+03[l]
Beryllium	7440-41-7	1.3E+00	9.2E-03	ECR	1.0E-03	ECR	1.4E-01[m]
Cadmium (Diet)	7440-43-9	2.2E+00	1.4E+00	HI	8.1E-02	HI	3.8E+01[n]
Calcium	7440-70-2	6.1E+03	---	---	---	---	---
Chromium (III) (Insoluble Salts)	16065-83-1	4.3E+01	7.1E+02	HI	4.0E+01	HI	---
Chromium (VI)	18540-29-9	[o]	1.4E+01	HI	8.0E-01	HI	3.0E+01
Cobalt	7440-48-4	1.3E+01	---	---	---	---	---
Copper	7440-50-8	2.5E+01	---	---	---	---	2.8E+03[p]
Cyanide (CN-)	57-12-5	[q]	4.3E+02	HI	2.5E+01	HI	1.3E+03[r]
Iron	7439-89-6	2.8E+04	---	---	---	---	---
Lead and Compounds	7439-92-1	2.3E+01	---	---	---	---	2.0E+01[s]
Magnesium	7439-95-4	2.1E+03	---	---	---	---	---
Manganese (Diet)	7439-96-5	8.2E+02	7.6E+02	HI	4.4E+01	HI	3.8E+02[t]
Mercury (Elemental)	7439-97-6	1.3E-01	4.3E-03	HI	2.4E-04	HI	---
Mercury (Inorganic)	7439-97-6	1.3E-01	2.9E+00	HI	1.6E-01	HI	2.3E+01
Nickel (Soluble Salts)	7440-02-0	2.2E+01	6.5E+02	HI	3.8E+01	HI	1.5E+03
Potassium	7440-09-7	9.5E+02	---	---	---	---	---
Selenium	7782-49-2	7.0E-01	2.4E+02	HI	1.4E+01	HI	3.8E+02

Table 4.2. (continued)

Inorganic Analyte[b]	CASNUM[c]	THRESH[d]	IPRG[e]	INTARGET[f]	RPRG[g]	RETARGET[h]	SCREENING[i]
Silver	7440-22-4	2.7E+00	1.1E+02	HI	6.7E+00	HI	3.8E+02[u]
Sodium	7440-23-5	3.4E+02	---	---	---	---	---
Sulfide	---	[o]	---	---	---	---	---
Thallium	7440-28-0	3.8E-01	---	---	---	---	---
Tin	7440-31-5	[o]	8.0E+03	HI	4.6E+02	HI	4.6E+04[v]
Vanadium (Metallic)	7440-62-2	3.7E+01	9.9E+00	HI	5.6E-01	HI	5.4E+02
Zinc (Metallic)	7440-66-6	6.0E+01	7.5E+03	HI	4.4E+02	HI	2.3E+04

Notes:
Cells containing dashes (—) indicate data is not available or not applicable.
All values in mg/kg.

[a] Includes analytes found on Target Analyte List, as defined by EPA in 1988 CLP Statement of Work, and RCRA Appendix IX list of constituents.
[b] Analyte name.
[c] Chemical Analytical Service Registry Number.
[d] Value for use in screening to determine if analyte was detected at a naturally occurring concentration. Chapter 2 provides details on how these were derived. Values match those contained in Table 2-15, Column 2, except values are rounded to two significant digits.
[e] Industrial use human health risk-based screening criteria (IPRG) calculated using as the target value either a Hazard Index (HI) of 0.1 or an Excess Lifetime Cancer Risk (ECR) of 1×10^{-6}. The lesser of the HI and ECR based values is presented. See Chapter 3 for the method used to derive these values.
[f] Indicator of target value used to calculate IPRG. HI indicates that IPRG is based on a HI of 0.1; ECR indicates that IPRG is based on an ECR of 1×10^{-6}.
[g] Residential scenario preliminary remediation goal (RPRG) calculated using as the target value either a HI of 0.1 or an ECR of 1×10^{-6}. The lessor of the HI and ECR based values is presented. See Chapter 3 for the method used to derive these values.
[h] Indicator of target value used to calculate RPRG. HI indicates that the RPRG is based on a HI of 0.1; ECR indicates that RPRG is based on an ECR of 1×10^{-6}.
[i] Value in Commonwealth of Kentucky *Risk Assessment Guidance, Appendix A* (Commonwealth of Kentucky 1995b). This guidance states that these values are to be multiplied by 0.1 if the site being screened has more than 5 chemicals present. Also, this guidance states that these screening values are not applicable at sites at which multiple media may be contaminated.
[j] Value is that for "Antimony and compounds" in *Risk Assessment Guidance, Appendix A*.
[k] Value is that for "Arsenic (cancer endpoint) in *Risk Assessment Guidance, Appendix A*.
[l] Value is that for "Barium and compounds" in *Risk Assessment Guidance, Appendix A*.
[m] Value is that for "Beryllium and compounds" in *Risk Assessment Guidance, Appendix A*.
[n] Value is that for "Cadmium and compounds" in *Risk Assessment Guidance, Appendix A*.
[o] Data concerning this analyte were not collected during the Phases I and II Site Investigations. Therefore, background concentrations could not be established.
[p] Value is that for "Copper and compounds" in *Risk Assessment Guidance, Appendix A*.
[q] Cyanide is not expected to be naturally occurring at PGDP. Therefore, background values for cyanide were not derived.
[r] Value is that for "Free cyanide" in *Risk Assessment Guidance, Appendix A*.

Table 4.2. (continued)

[s] Value is that for "Lead" in *Risk Assessment Guidance, Appendix A*. This guidance states that this value does not need to be multiplied by 0.1 if more than 5 chemicals are present at the site being evaluated.

[t] Value is that for "Manganese and compounds" in *Risk Assessment Guidance, Appendix A*.

[u] Value is that for "Silver and compounds" in *Risk Assessment Guidance, Appendix A*.

[v] Value is that for "Tin and compunds" in *Risk Assessment Guidance, Appendix A*. A Chemical Abstract Service Registry Number is not provided in the guidance for this chemical.

5. REFERENCES

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Appendix A

STATISTICS OUTPUT

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APPENDIX A - STATISTICS OUTPUT

This appendix presents the univariate statistics and correlation matrices generated by the Statistical Analysis System (SAS 1995) software. This material was used to evaluate the data set and determine the background concentrations presented in Chapter 2. The following material defines each of the items presented in this appendix.

Page A-9 presents the simple statistics for the complete data set by depth of sampling (i.e., surface and subsurface classifications). The following information is presented on page A-9.

Variables — This is a list of the 24 variables included in the analysis. Please note that all values are the natural logs of the concentration reported for each observation. The definition of each of the variables listed is presented in the following text.

LNAL — This is the identifier used for aluminum. LN indicates that the analysis used the natural log of the aluminum concentration.

LNSB — This is the identifier for antimony. LN indicates that the analysis used the natural log of the antimony concentration.

LNAS — This is the identifier used for arsenic. LN indicates that the analysis used the natural log of the arsenic concentration.

LNBA — This is the identifier used for barium. LN indicates that the analysis used the natural log of the barium concentration.

LNBE — This is the identifier used for beryllium. LN indicates that the analysis used the natural log of the beryllium concentration.

LNCD — This is the identifier used for cadmium. LN indicates that the analysis used the natural log of the cadmium concentration.

LNCA — This is the identifier used for calcium. LN indicates that the analysis used the natural log of the calcium concentration.

LNCH — This is the identifier used for chromium. LN indicates that the analysis used the natural log of the chromium concentration.

LNCO — This is the identifier used for cobalt. LN indicates that the analysis used the natural log of the cobalt concentration.

LNCU — This is the identifier used for copper. LN indicates that the analysis used the natural log of the copper concentration.

LNCN — This is the identifier used for cyanide. LN indicates that the analysis used the natural log of the cyanide concentration.

LNFE — This is the identifier used for iron. LN indicates that the analysis used the natural log of the iron concentration.

LNPB — This is the identifier used for lead. LN indicates that the analysis used the natural log of the lead concentration.

LNMG	This is the identifier used for magnesium. LN indicates that the analysis used the natural log of the magnesium concentration.
LNMN	This is the identifier used for manganese. LN indicates that the analysis used the natural log of the manganese concentration.
LNHG	This is the identifier used for mercury. LN indicates that the analysis used the natural log of the mercury concentration.
LNNI	This is the identifier used for nickel. LN indicates that the analysis used the natural log of the nickel concentration.
LNSE	This is the identifier used for selenium. LN indicates that the analysis used the natural log of the selenium concentration.
LNAG	This is the identifier used for silver. LN indicates that the analysis used the natural log of the silver concentration.
LNNA	This is the identifier used for sodium. LN indicates that the analysis used the natural log of the sodium concentration.
LNTL	This is the identifier used for thallium. LN indicates that the analysis used the natural log of the thallium concentration.
LNV	This is the identifier used for vanadium. LN indicates that the analysis used the natural log of the vanadium concentration.
LNZN	This is the identifier used for zinc. LN indicates that the analysis used the natural log of the zinc concentration.
N	This is the number of observations used in the analysis for each analyte within the depth classification prior to segregating the background population from the contaminated population.
Mean	This is the arithmetic mean of the observations for each analyte within the depth classification.
Std Dev	This is the standard deviation for the analyte within the depth classification.
Sum	This is the sum of the analytes' observations within the depth classification.
Minimum	This is the smallest concentration for the analyte within the depth classification. The value presented is the natural log of the concentration.
Maximum	This is the greatest concentration for the analyte within the depth classification. The value presented is the natural log of the concentration.

Pages A-10 through A-33 present the univariate statistics within the surface classification for each of the analytes prior to delimitation of the natural (background) population of observations from the contaminated population of observations. On each of these pages, the statistics for the complete data set are presented at the top of the page, and the statistics for detected observations are presented at the bottom of the page. Within each of these groups (i.e., complete and detected), the following material is presented.

N	The number of observations used to generate the statistics.
Sum Wgts	The sum of the weights attached to each observation. Because weighting was not used, this value equals "N."
Mean	The arithmetic mean of the observations.
Sum	The arithmetic sum of observations.
Std Dev	The standard deviation of the data.
Variance	The variance of the data.
Skewness	A measure of how closely the spread of the data follows a normal distribution. Values close to zero indicate that the spread of the data is similar to that for a normal distribution. Negative values indicate that the tail of the distribution toward small observations is longer than that expected in a normal distribution. Positive values indicate that the tail of the distribution toward the large observations is longer than that expected in a normal distribution.
Kurtosis	A measure of how "peaked" the distribution is. Values close to zero indicate that the data follow a normal distribution. Negative values indicate that the distribution is flatter than a normal distribution. Positive values indicate that the distribution is more preaked than a normal distribution.
USS	The uncorrected sum of squares for the data.
CSS	The corrected sum of squares for the data.
CV	The coefficient of variation for the data.
T:Mean=0	The result of the test using, as the null hypothesis, the fact that the mean of the data set equals zero. The result of this test is not important to the data evaluation.
Pr>|T|	The probability that a t-statistic greater than that obtained for the aforementioned null hypothesis will be received. As noted, the result of this test is not important to the data evaluation.
Num ^=0	The number of observations not equal to zero in the data set.
Num > 0	The number of observations with a value greater than zero in the data set.
M(Sign)	A test statistic used to determine if the population mean is zero. This test statistic was not used in the evaluation of the data set.
Pr>=|M|	The probability of a greater value for "M." As noted, this test statistic was not used in the evaluation of the data set.

Sgn Rank The centered Wilcoxon signed rank statistic for testing the hypothesis that the population mean is zero. This test statistic was not used in the evaluation of the data set.

Pr>=|S| The probability of a greater value for "S." As noted, this test statistic was not used in the evaluation of the data set.

W:Normal A test statistic used to measure how closely the distribution of the data set follows a normal distribution. Values close to one indicate that the data set follows a normal distribution.

Pr<W The probability that a smaller value for "W" will be received. Values less than 0.01 indicate that the distribution of the data deviates significantly from a normal distribution.

Quantiles These are descriptive statistics based on order for the data set. "(Def=5)" indicates that only 5 of these descriptive statistics were requested.

100% Max The maximum value in the data set.

75% Q3 The value at the 75th percentile of the data set.

50% Med The value at the 50th percentile or median.

25% Q1 The value at the 25th percentile.

0% Min The minimum value in the data set.

Range The result of [100% Max - 0% Min].

Q3-Q1 The result of [75% Q3 - 25% Q2].

Mode The value observed with the greatest frequency.

99% The value at the 99th percentile.

95% The value at the 95th percentile.

10% The value at the 10th percentile.

1% The value at the first percentile.

Extremes The four columns below this label present the five smallest and the the five greatest observations contained in the data set. In addition to presenting these values (under "Lowest" and "Highest," respectively), the sample number for that value is presented under "ID."

Stem Leaf This is a stem and leaf diagram. The values under "stem" are the leading digits of the natural log of the concentration for a particular observation. The values under "leaf" is the last digit of the natural log of the concentration for the observation. (Note, if the data set is large, as are the data sets for the subsurface soil, then the "leaves" are replaced by asterisks (*).) The values under "#" are the number of observations within each stem group. This diagram is similar to the histograms presented in Chapter 2 except that the y-axis is reversed.

Boxplot This is another graphical representation of the data. In the box plot, the median is the line dissecting the central rectangle. The top and bottom lines of the central rectangle are the 75th and 25th percentiles, respectively. The symbols above and below the rectangle represent the range and the maximum and minimum values. Please note, for some box plots not all three lines are shown for the central rectangle. This indicates that the median and the 75th or 25th percentiles have the same or very similar values. Similarly, for some box plots, symbols indicating the range, maximum, or minimum values are not presented. This indicates that these values are also similar to the 75th and 25th percentiles.

Normal Probability Plot

This is a plot of the rank score of each observation versus the natural log of each observation. This plot is identical to the larger normal cumulative probability plots presented in Chapter 2. On these plots, the asterisks (*) represent the observations, and the crosses (+) represent the area in which the observations should fall if the transformed data followed a normal distribution.

Pages A-34 through A-37 present boxplots for each analyte in the surface classification on a unified scale. The boxplots for the complete data set are presented on pages A-34 and A-35, and the boxplots for only detected observations are presented on pages A-36 and A-37. These plots display the information discussed previously.

Pages A-38 through A-61 present the univariate statistics discussed earlier for the complete and detected data sets for the subsurface depth classification. The information presented on these pages is the same as that defined above.

Pages A-62 through A-65 present boxplots for the subsurface depth observations on a unified scale. The boxplots for the complete data set are on pages A-62 and A-63, and the boxplots for the detected observations are presented on pages A-64 and A-65 These plots display the information discussed previously.

Pages A-66 through A-69 present the correlation matrices for the complete data set for both the surface and subsurface classifications. The order in which the information is presented on these pages is described under the title bar. As indicated in the title bar, the following is presented at each intersection.

Pearson Correlation Coefficient

This is the simple correlation coefficient for the two analytes at the intersection. It is a measure of the strength and direction of the relationship between the magnitude of the concentrations of the two analytes. Values that deviate from zero indicate that there is some type of relationship between the two analytes. Positive values indicate that the greater concentrations for one analyte tend to be seen in the same samples in which the greater concentrations for the second analyte are seen, or that the smaller concentrations for one analyte tend to be seen in the same samples in which the smaller concentrations for the second analyte are seen. Negative values indicate that the smaller concentrations for one analyte within a sample are related to larger concentrations for the second analyte within a sample, or that the larger concentrations for one analyte within a sample are related to smaller concentrations for the second analyte within a sample. Therefore, positive correlation coefficients indicate that the two analytes' concentrations are directly related, and negative correlation coefficients indicate that the two analytes' concentrations are inversely related.

Prob > |R| under Ho: Rho=0

This is the probability for the test of the null hypothesis that the correlation coefficient at the intersection equals sero. If this value is small (i.e., less than .01), then the correlation coefficient differs significantly from zero. Therefore, a small value indicates that the correlation between the two analytes at the intersection is statistically significant.

Number of Observations

This reports the number of observations used to generate the correlation coefficient.

Pages A-70 through A-123 present the univariate statistics for the background population. That is, these pages present the univariate statistics for the surface and subsurface classifications after each analyte's observations with concentrations greater than the selected maximum background concentrations for the analyte (as reported in Tables 2.14 and 2.15) were deleted from the data set. Pages A-70 through A-96 present the univariate statistics for the surface data set. Pages 97 through 123 present the data for the subsurface data set. All information presented in these pages is that defined earlier.

-- DEPTH=surface --

Simple Statistice
All Observations

24 Variables: LNAL LNSB LNAS LNBA LNBE LNCD LNCA LNCH LNCO LNCU LNCN LNFE LNPB LNMG LNMN LNHG LNNI LNK LNSE LNAG LNNA LNTL LNV LNZN

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
LNAL	75	8.917146	0.505918	668.785937	7.021084	9.661416
LNSB	48	0.142105	1.393546	6.821019	-1.049820	2.564949
LNAS	75	1.723396	0.754329	129.254672	-1.427116	3.828641
LNBA	75	4.400594	0.540953	330.044573	2.639057	5.288267
LNBE	75	0.853785	1.621803	64.033882	-1.771957	3.178054
LNCD	71	0.310103	0.655895	22.017290	-0.562119	2.272126
LNCA	75	8.756547	1.530307	656.741008	6.100319	12.587928
LNCH	75	2.823978	0.710730	211.798383	0.955511	5.552960
LNCO	75	1.960227	0.466609	147.017014	0.182322	3.401197
LNCU	75	2.751744	0.769432	206.380773	0.916291	5.442418
LNCN	67	-0.616860	0.284773	-41.329600	-1.309333	-0.150823
LNFE	75	9.569519	0.449993	717.713922	8.160518	10.896739
LNPB	75	2.952217	0.657599	221.416291	1.131402	5.777652
LNMG	75	7.222300	0.652882	541.672515	5.549076	9.017968
LNMN	75	5.923466	0.679201	444.259981	3.218876	7.901007
LNHG	75	-2.128726	0.672597	-159.654484	-3.772261	2.041220
LNNI	75	2.881036	0.616949	216.077705	1.648659	4.442651
LNK	75	6.198335	0.493563	464.875089	4.700480	7.640123
LNSE	73	-1.068210	0.949024	-77.979600	-2.207275	3.218876
LNAG	75	0.502246	0.615645	37.668413	-0.713350	3.737670
LNNA	75	4.384467	0.688198	328.835005	3.218876	6.429719
LNTL	74	-0.717890	0.714457	-53.123900	-1.514128	2.302585
LNV	75	3.037400	0.610664	227.804993	0.832909	4.248495
LNZN	75	4.011788	0.649062	300.884114	2.708050	5.966147

-- DEPTH=subsurface --

Simple Statistics
All Observations

24 Variables: LNAL LNSB LNAS LNBA LNBE LNCD LNCA LNCH LNCO LNCU LNCN LNFE LNPB LNMG LNMN LNHG LNNI LNK LNSE LNAG LNNA LNTL LNV LNZN

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
LNAL	662	8.354939	0.858224	5530.969745	5.068904	10.671278
LNSB	533	1.549561	0.765183	825.915900	-1.108663	3.806662
LNAS	662	0.615238	0.918381	407.287651	-1.832581	3.737670
LNBA	662	3.699417	0.945365	2449.013777	0.693147	6.487684
LNBE	662	-0.679801	0.663204	-450.027948	-5.298317	3.218876
LNCD	657	-0.190440	0.721318	-125.120000	-2.040221	5.459586
LNCA	662	6.849507	1.104820	4534.373726	0.542324	12.371587
LNCH	662	2.198567	1.099021	1455.451403	-0.725670	6.224558
LNCO	662	1.486014	0.770470	983.741380	-0.544727	4.234107
LNCU	662	1.822125	1.056853	1206.247001	-0.446287	9.836279
LNCN	642	-0.669220	0.439712	-429.639000	-2.120264	0.336472
LNFE	662	9.282350	0.684372	6144.915969	6.300786	11.488633
LNPB	662	1.866139	0.939653	1235.384079	-0.725670	7.056175
LNMG	662	6.275156	1.038888	4154.153233	2.809403	9.441452
LNMN	662	4.715378	1.276385	3121.580087	0.530628	8.998384
LNHG	655	-2.515860	0.592590	-1647.890000	-4.605170	2.484907
LNNI	662	1.950534	0.979634	1291.253450	-0.174353	9.417355
LNK	662	5.611639	0.751715	3714.904733	3.583519	10.126631
LNSE	643	-1.222950	0.636640	-786.355000	-2.453408	1.335001
LNAG	662	0.050334	0.586773	33.320942	-1.272966	2.639057
LNNA	662	4.956872	0.812687	3281.449208	1.131402	9.008224
LNTL	655	-0.758410	0.713541	-496.761000	-1.832581	2.397895
LNV	662	2.773911	0.637630	1836.329108	-0.339677	4.232656
LNZN	662	2.916849	0.880551	1930.954181	-0.186330	7.029973

```
--------------------------------------------------- DEPTH=Surface ANALYSIS=Aluminum ---------------------------------------------------

                                                         All Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                                      Extremes

 N               75  Sum Wgts         75      100% Max  9.661416      99%  9.661416       Lowest     ID     Highest    ID
 Mean      8.917146  Sum        668.7859       75% Q3   9.239899      95%  9.495519      7.021084(  14147) 9.472705(   5053)
 Std Dev   0.505918  Variance   0.255953       50% Med  9.002085      90%  9.425452      7.258412(  14020) 9.495519(  14166)
 Skewness  -1.74412  Kurtosis   3.858095       25% Q1   8.785692      10%  8.338067      7.414573(  14000) 9.517825(   5103)
 USS       5982.602  CSS        18.94049        0% Min  7.021084       5%  7.727535      7.727535(  14019) 9.602382(  14159)
 CV        5.673537  Std Mean   0.058418                               1%  7.021084      7.855545(  14016) 9.661416(  14176)
 T:Mean=0   152.643  Pr>|T|       0.0001      Range     2.640332
 Num ^= 0        75  Num > 0          75      Q3-Q1     0.454207
 M(Sign)       37.5  Pr>=|M|      0.0001      Mode      8.808369
 Sgn Rank      1425  Pr>=|S|      0.0001
 W:Normal  0.849025  Pr<W         0.0001

       Stem Leaf                     #             Boxplot                             Normal Probability Plot
         96 06                       2                |                  9.7+                                          ++++ *   *
         94 3344702                  7                |                     |                                     ++**** **
         92 00444661122349          14             +-----+                  |                                 ******
         90 022347782223356         15             *-----*                  |                           ******
         88 000111124400123589      18             |  +  |                  |                     *******+
         86 346022569                9             +-----+                  |                *****++++
         84 19                       2                |                     |               **++++
         82 64                       2                |                     |             **++
         80 6                        1                0                     |         ++++*
         78 6                        1                0                     |     ++++   *
         76 3                        1                0                     |+++      *
         74 1                        1                *                     |        *
         72 6                        1                *                     |      *
         70 2                        1                *                  7.1+ *
            ----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                                   -2        -1         0        +1        +2
```

```
                                                       Detected Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                                      Extremes

 N               75  Sum Wgts         75      100% Max  9.661416      99%  9.661416       Lowest     ID     Highest    ID
 Mean      8.917146  Sum        668.7859       75% Q3   9.239899      95%  9.495519      7.021084(  14147) 9.472705(   5053)
 Std Dev   0.505918  Variance   0.255953       50% Med  9.002085      90%  9.425452      7.258412(  14020) 9.495519(  14166)
 Skewness  -1.74412  Kurtosis   3.858095       25% Q1   8.785692      10%  8.338067      7.414573(  14000) 9.517825(   5103)
 USS       5982.602  CSS        18.94049        0% Min  7.021084       5%  7.727535      7.727535(  14019) 9.602382(  14159)
 CV        5.673537  Std Mean   0.058418                               1%  7.021084      7.855545(  14016) 9.661416(  14176)
 T:Mean=0   152.643  Pr>|T|       0.0001      Range     2.640332
 Num ^= 0        75  Num > 0          75      Q3-Q1     0.454207
 M(Sign)       37.5  Pr>=|M|      0.0001      Mode      8.808369
 Sgn Rank      1425  Pr>=|S|      0.0001
 W:Normal  0.849025  Pr<W         0.0001

       Stem Leaf                     #             Boxplot                             Normal Probability Plot
         96 06                       2                |                  9.7+                                          ++++ *   *
         94 3344702                  7                |                     |                                     ++**** **
         92 00444661122349          14             +-----+                  |                                 ******
         90 022347782223356         15             *-----*                  |                           ******
         88 000111124400123589      18             |  +  |                  |                     *******+
         86 346022569                9             +-----+                  |                *****++++
         84 19                       2                |                     |               **++++
         82 64                       2                |                     |             **++
         80 6                        1                0                     |         ++++*
         78 6                        1                0                     |     ++++   *
         76 3                        1                0                     |+++      *
         74 1                        1                *                     |        *
         72 6                        1                *                     |      *
         70 2                        1                *                  7.1+ *
            ----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                                   -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Surface ANALYSIS=Antimony -------------------------------------------------

                                             All Observations
Variable=LNVALUE

                 Moments                                Quantiles(Def=5)                                  Extremes

N                48  Sum Wgts        48     100% Max  2.564949     99%  2.564949        Lowest    ID       Highest    ID
Mean       0.142105  Sum       6.821019      75% Q3   1.423036     95%  2.564949      -1.10866(  14164) 2.541602(  10367)
Std Dev    1.393546  Variance   1.94197      50% Med   -0.9546     90%  2.541602      -1.10866(  14159) 2.564949(   5053)
Skewness   0.612338  Kurtosis  -1.25795      25% Q1   -1.04982     10%  -1.07881      -1.10866(  14157) 2.564949(   5056)
USS         92.2419  CSS        91.2726       0% Min  -1.10866      5%  -1.10866      -1.10866(  14147) 2.564949(   5058)
CV         980.6483  Std Mean  0.201141                              1%  -1.10866      -1.07881(  14143) 2.564949(   5063)
T:Mean=0   0.706492  Pr>|T|      0.4834     Range     3.673612
Num ^= 0         48  Num > 0         21     Q3-Q1     2.472858
M(Sign)          -3  Pr>=|M|     0.4709     Mode      -1.04982
Sgn Rank         81  Pr>=|S|     0.4114
W:Normal   0.771312  Pr<W        0.0001

     Stem Leaf                      #             Boxplot                          Normal Probability Plot
       24 0846666                   7                |               2.5+                                        ***  +*
       22                                            |                  |                                      *   ++
       20                                            |                  |                                          +
       18                                            |                  |                                        ++
       16 13                        2                |                  |                                     **+
       14 1437                      4             +-----+               |                                  *** +
       12 24                        2             |     |               |                                 ** ++
       10 9                         1             |     |               |                                 * +
        8 3                         1             |     |               |                                *++
        6                                         |     |           0.7+                                +
        4 7773                      4             |     |               |                             **
        2                                         |     |               |                             +
        0                                         |  +  |               |                           ++
       -0 7                         1             |     |               |                         + *
       -2                                         |     |               |                        +
       -4 4                         1             |     |               |                     ++    *
       -6                                         |     |               |                     +
       -8 999997774                 9             *-----*               |                   ++  *****
      -10 1111885555555522         16             +-----+          -1.1+    *   * * ** * ** **
          ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
     Multiply Stem.Leaf by 10**-1                                             -2        -1         0        +1        +2

                                             Detected Observations
Variable=LNVALUE

                 Moments                                Quantiles(Def=5)                                  Extremes

N                 4  Sum Wgts         4     100% Max  0.470004     99%  0.470004        Lowest    ID       Highest    ID
Mean       -0.29767  Sum       -1.19069      75% Q3   0.147825     95%  0.470004      -0.94161(  14131)        .(       )
Std Dev    0.600062  Variance  0.360075      50% Med  -0.35954     90%  0.470004      -0.54473(  14167) -0.94161(  14131)
Skewness   0.531298  Kurtosis   -0.0488      25% Q1   -0.74317     10%  -0.94161      -0.17435(  14166) -0.54473(  14167)
USS        1.434657  CSS       1.080224       0% Min  -0.94161      5%  -0.94161      0.470004(  14165) -0.17435(  14166)
CV         -201.585  Std Mean  0.300031                              1%  -0.94161             .(       ) 0.470004(  14165)
T:Mean=0   -0.99214  Pr>|T|      0.3943     Range     1.411612
Num ^= 0          4  Num > 0          1     Q3-Q1     0.890993
M(Sign)          -1  Pr>=|M|     0.6250     Mode      -0.94161
Sgn Rank         -3  Pr>=|S|     0.3750
W:Normal   0.986257  Pr<W        0.9148

     Stem Leaf                      #             Boxplot                          Normal Probability Plot
        4 7                         1                |               0.5+                                       * +++
        2                                            |                  |                                     +++
        0                                         +-----+               |                                 ++++
       -0 7                         1             |     |               |                              +*+
       -2                                         *--+--*               |                           +++
       -4 4                         1             |     |               |                       ++*+
       -6                                         +-----+               |                    +++
       -8 4                         1                |             -0.9+                 +*+
          ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
     Multiply Stem.Leaf by 10**-1                                             -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Surface ANALYSIS=Arsenic -------------------------------------------------

                                                              All Observations
Variable=LNVALUE

                 Moments                                     Quantiles(Def=5)                                    Extremes

N                75  Sum Wgts        75      100% Max  3.828641       99%  3.828641        Lowest     ID      Highest    ID
Mean       1.723396  Sum       129.2547       75% Q3   2.151762       95%  3.218876     -1.42712(  14103)  2.70805(   14040)
Std Dev    0.754329  Variance  0.569013       50% Med  1.704748       90%  2.484907     0.182322(  14003) 3.218876(   14041)
Skewness   -0.39503  Kurtosis  4.383669       25% Q1   1.360977       10%  1.029619     0.470004(  14147) 3.526361(   14167)
USS        264.8639  CSS       42.10693        0% Min  -1.42712        5%  0.587787     0.587787(  14019) 3.713572(   14165)
CV         43.76994  Std Mean  0.087102                                 1%  -1.42712     0.587787(  14013) 3.828641(   14166)
T:Mean=0   19.78585  Pr>|T|      0.0001      Range     5.255758
Num ^= 0         75  Num > 0         74      Q3-Q1     0.790786
M(Sign)        36.5  Pr>=|M|     0.0001      Mode      1.704748
Sgn Rank       1403  Pr>=|S|     0.0001
W:Normal    0.93558  Pr<W        0.0011

   Stem Leaf                          #             Boxplot                              Normal Probability Plot
      3 578                           3                0               3.75+                                                 *  *   *+
      3 2                             1                |                   |                                               *++++++
      2 5567                          4                |                   |                                         +++**+
      2 0001122222233334             16             +-----+                |                                  ++*********
      1 5555556666677777788888899999 28             *--+--*                |                          **********
      1 00112223333344444            17             +-----+            1.25+                ***********+    .
      0 5668                          4                |                   |             *+**+++
      0 2                             1                |                   |      ++*+*+
     -0                                                                    |+++
     -0                                                                    |
     -1 4                             1                *              -1.25+ *
        ----+----+----+----+----+---                                        +----+----+----+----+----+----+----+----+----+----+
                                                                               -2        -1         0        +1        +2

                                                              Detected Observations
Variable=LNVALUE

                 Moments                                     Quantiles(Def=5)                                    Extremes

N                74  Sum Wgts        74      100% Max  3.828641       99%  3.828641        Lowest     ID      Highest    ID
Mean        1.76597  Sum       130.6818       75% Q3   2.151762       95%  3.218876     0.182322(  14003)  2.70805(   14040)
Std Dev    0.662572  Variance  0.439001       50% Med  1.704748       90%  2.484907     0.470004(  14147) 3.218876(   14041)
Skewness   0.724103  Kurtosis  1.849014       25% Q1   1.386294       10%  1.098612     0.587787(  14019) 3.526361(   14167)
USS        262.8272  CSS       32.04708        0% Min  0.182322        5%  0.587787     0.587787(  14013) 3.713572(   14165)
CV         37.51884  Std Mean  0.077022                                 1%  0.182322     0.788457(  14020) 3.828641(   14166)
T:Mean=0   22.92801  Pr>|T|      0.0001      Range      3.64632
Num ^= 0         74  Num > 0         74      Q3-Q1     0.765468
M(Sign)          37  Pr>=|M|     0.0001      Mode      1.704748
Sgn Rank     1387.5  Pr>=|S|     0.0001
W:Normal   0.949936  Pr<W        0.0132

      Stem Leaf                 #              Boxplot                              Normal Probability Plot
        38 3                    1                 0                 3.9+                                                        *
        36 1                    1                 0                    |                                                    *
        34 3                    1                 0                    |                                                  *     +
        32 2                    1                 |                    |                                                 *   +++
        30                                        |                    |                                                  +++
        28                                        |                    |                                               +++
        26 1                    1                 |                    |                                            ++*
        24 0886                 4                 |                    |                                         +++**
        22 001115590            9                 |                    |                                      +*****
        20 4525                 4              +-----+                 |                                   +***
        18 46793567             8              |     |                 |                                ++***
        16 11579900027999      14              *--+--*                 |                             *****
        14 11468003377         11              |     |                 |                         ****
        12 5814469              7              +-----+                 |                     ****+
        10 3303699              7                 |                    |                 *****++
         8                                        |                    |                 +++
         6 9                    1                 |                    |              ++*
         4 799                  3                 |                    |           *+*
         2                                                             |       +++
         0 8                    1                 0                 0.1++*
           ----+----+----+----+                                        +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                        -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Surface ANALYSIS=Barium -------------------------------------------------

                                                    All Observations
Variable=LNVALUE

                  Moments                                    Quantiles(Def=5)                                      Extremes

N                75  Sum Wgts        75     100% Max  5.288267       99%  5.288267        Lowest    ID     Highest    ID
Mean       4.400594  Sum       330.0446      75% Q3    4.70048       95%  5.087596      2.639057(  14147) 5.081404(  14145)
Std Dev    0.540953  Variance   0.29263      50% Med   4.51086       90%  5.056246      2.944439(  14020) 5.087596(  14041)
Skewness   -1.01977  Kurtosis  1.168851      25% Q1   4.174387       10%  3.555348      3.135494(  14016) 5.247024(  14166)
USS        1474.047  CSS       21.65461       0% Min  2.639057        5%  3.295837      3.295837(  14142)    5.273(  14167)
CV         12.29272  Std Mean  0.062464                               1%  2.639057      3.433987(   5084) 5.288267(  14165)
T:Mean=0   70.45027  Pr>|T|      0.0001     Range      2.64921
Num ^= 0         75  Num > 0         75     Q3-Q1     0.526093
M(Sign)        37.5  Pr>=|M|     0.0001     Mode      4.369448
Sgn Rank       1425  Pr>=|S|     0.0001
W:Normal   0.928096  Pr<W        0.0003

       Stem Leaf                     #             Boxplot                         Normal Probability Plot
         52 579                      3                |               5.3+                                          +++* *    *
         50 166789                   6                |                  |                                      **** *
         48 0145786                  7                |                  |                                  ****
         46 1345567999069           13             +-----+               |                              ******
         44 2357880112344588        16             *--+--*               |                         *****+
         42 2589967778              10             |     |               |                     *****++
         40 1316679                  7             +-----+               |                  *****++
         38 1                        1                |                  |                +*++
         36 9468                     4                |                  |             ++***
         34 3736                     4                |                  |         +++***
         32 0                        1                0                  |     ++++ *
         30 4                        1                0                  |+++     *
         28 4                        1                0                  |      *
         26 4                        1                0               2.7+ *
            ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                            -2        -1         0        +1        +2
```

```
                                                    Detected Observations
Variable=LNVALUE

                  Moments                                    Quantiles(Def=5)                                      Extremes

N                75  Sum Wgts        75     100% Max  5.288267       99%  5.288267        Lowest    ID     Highest    ID
Mean       4.400594  Sum       330.0446      75% Q3    4.70048       95%  5.087596      2.639057(  14147) 5.081404(  14145)
Std Dev    0.540953  Variance   0.29263      50% Med   4.51086       90%  5.056246      2.944439(  14020) 5.087596(  14041)
Skewness   -1.01977  Kurtosis  1.168851      25% Q1   4.174387       10%  3.555348      3.135494(  14016) 5.247024(  14166)
USS        1474.047  CSS       21.65461       0% Min  2.639057        5%  3.295837      3.295837(  14142)    5.273(  14167)
CV         12.29272  Std Mean  0.062464                               1%  2.639057      3.433987(   5084) 5.288267(  14165)
T:Mean=0   70.45027  Pr>|T|      0.0001     Range      2.64921
Num ^= 0         75  Num > 0         75     Q3-Q1     0.526093
M(Sign)        37.5  Pr>=|M|     0.0001     Mode      4.369448
Sgn Rank       1425  Pr>=|S|     0.0001
W:Normal   0.928096  Pr<W        0.0003

       Stem Leaf                     #             Boxplot                         Normal Probability Plot
         52 579                      3                |               5.3+                                          +++* *    *
         50 166789                   6                |                  |                                      **** *
         48 0145786                  7                |                  |                                  ****
         46 1345567999069           13             +-----+               |                              ******
         44 2357880112344588        16             *--+--*               |                         *****+
         42 2589967778              10             |     |               |                     *****++
         40 1316679                  7             +-----+               |                  *****++
         38 1                        1                |                  |                +*++
         36 9468                     4                |                  |             ++***
         34 3736                     4                |                  |         +++***
         32 0                        1                0                  |     ++++ *
         30 4                        1                0                  |+++     *
         28 4                        1                0                  |      *
         26 4                        1                0               2.7+ *
            ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                            -2        -1         0        +1        +2
```

--- DEPTH=Surface ANALYSIS=Beryllium ---

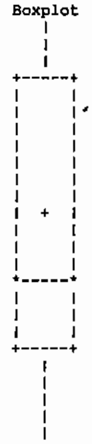
All Observations

Variable=LNVALUE

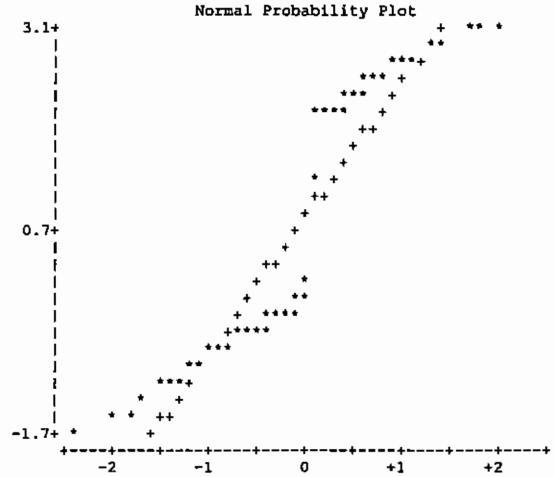
```
                 Moments                              Quantiles(Def=5)                                     Extremes

N                75  Sum Wgts          75     100% Max  3.178054      99%  3.178054      Lowest     ID     Highest      ID
Mean       0.853785  Sum         64.03388      75% Q3   2.484907      95%  3.044522    -1.77196(  14016) 2.890372(  14164)
Std Dev    1.621803  Variance    2.630246      50% Med         0      90%  2.833213    -1.56065(  14000) 3.044522(  14165)
Skewness   0.052183  Kurtosis    -1.77582      25% Q1   -0.59784      10% -1.02165     -1.42712(  14020) 3.044522(  14166)
USS        249.3094  CSS         194.6382       0% Min  -1.77196       5% -1.38629     -1.38629(  14006) 3.178054(  14145)
CV         189.9545  Std Mean     0.18727                              1% -1.77196     -1.10866(  10367) 3.178054(  14159)
T:Mean=0    4.55912  Pr>|T|        0.0001     Range     4.950011
Num ^= 0         73  Num > 0           36     Q3-Q1     3.082744
M(Sign)        -0.5  Pr>=|M|       1.0000     Mode      -0.35667
Sgn Rank      643.5  Pr>=|S|       0.0002
W:Normal   0.821102  Pr<W          0.0001
```

```
      Stem Leaf                     #
        30 4488                     4
        28 3399                     4
        26 4441111                  7
        24 0088886                  7
        22 400                      3
        20 3578023679              10
        18
        16
        14
        12 1                        1
        10
         8
         6
         4
         2
         0 00                       2
        -0 35                       2
        -2 666666422                9
        -4 643112                   6
        -6 199999000                9
        -8 442                      3
       -10 1852                     4
       -12 9                        1
       -14 63                       2
       -16 7                        1
           ----+----+----+----+
     Multiply Stem.Leaf by 10**-1
```

Boxplot



Normal Probability Plot



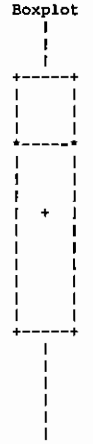
Detected Observations

Variable=LNVALUE

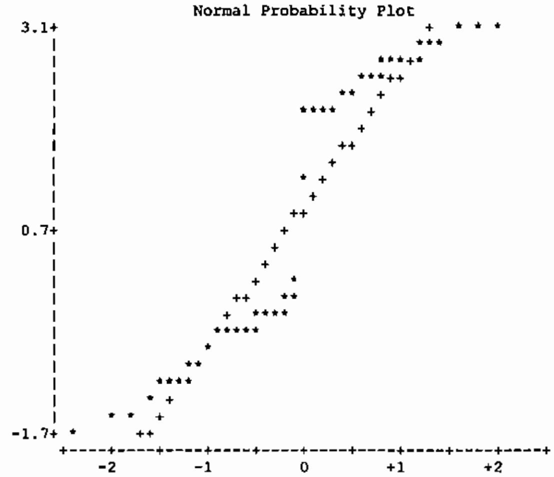
```
                 Moments                              Quantiles(Def=5)                                     Extremes

N                70  Sum Wgts          70     100% Max  3.178054      99%  3.178054      Lowest     ID     Highest      ID
Mean       0.966106  Sum         67.62745      75% Q3   2.484907      95%  3.044522    -1.77196(  14016) 2.890372(  14164)
Std Dev    1.621318  Variance    2.628671      50% Med  1.668241      90%  2.833213    -1.56065(  14000) 3.044522(  14165)
Skewness   -0.08989  Kurtosis     -1.7526      25% Q1   -0.52763      10% -1.03574     -1.42712(  14020) 3.044522(  14166)
USS        246.7136  CSS         181.3783       0% Min  -1.77196       5% -1.38629     -1.38629(  14006) 3.178054(  14145)
CV         167.8198  Std Mean    0.193785                              1% -1.77196     -1.10866(  10367) 3.178054(  14159)
T:Mean=0   4.985468  Pr>|T|        0.0001     Range     4.950011
Num ^= 0         68  Num > 0           36     Q3-Q1     3.012539
M(Sign)           2  Pr>=|M|       0.7163     Mode      -0.35667
Sgn Rank        641  Pr>=|S|       0.0001
W:Normal   0.826672  Pr<W          0.0001
```

```
      Stem Leaf                     #
        30 4488                     4
        28 3399                     4
        26 4441111                  7
        24 0088886                  7
        22 400                      3
        20 3578023679              10
        18
        16
        14
        12 1                        1
        10
         8
         6
         4
         2
         0 00                       2
        -0 35                       2
        -2 666666422                9
        -4 643112                   6
        -6 19000                    5
        -8 44                       2
       -10 1852                     4
       -12 9                        1
       -14 63                       2
       -16 7                        1
           ----+----+----+----+
     Multiply Stem.Leaf by 10**-1
```

Boxplot



Normal Probability Plot



DEPTH=Surface ANALYSIS=Cadmium

All Observations

Variable=LNVALUE

Moments

N	71	Sum Wgts	71
Mean	0.310103	Sum	22.01729
Std Dev	0.655895	Variance	0.430199
Skewness	0.89504	Kurtosis	0.174617
USS	36.94152	CSS	30.1139
CV	211.5091	Std Mean	0.07784
T:Mean=0	3.983824	Pr>|T|	0.0002
Num ^= 0	68	Num > 0	38
M(Sign)	4	Pr>=|M|	0.3961
Sgn Rank	488	Pr>=|S|	0.0023
W:Normal	0.890404	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.272126	99%	2.272126
75% Q3	0.788457	95%	1.722767
50% Med	0.09531	90%	1.193922
25% Q1	-0.22314	10%	-0.3285
0% Min	-0.56212	5%	-0.37106
		1%	-0.56212
Range	2.834245		
Q3-Q1	1.011601		
Mode	-0.22314		

Extremes

Lowest	ID	Highest	ID
-0.56212(	14032)	1.280934(	14166)
-0.47804(	14033)	1.722767(	14167)
-0.41552(	5084)	1.856298(	5047)
-0.37106(	14029)	1.871802(	14090)
-0.35667(	5093)	2.272126(	14139)

```
Stem Leaf                    #     Boxplot
  22 7                       1        |
  20                                  |
  18 67                      2        |
  16 2                       1        |
  14                                  |
  12 88                      2        |
  10 399                     3        |
   8 8886699                 7        |
   6 449944499               9     +-----+
   4 7779                    4     |     |
   2 64                      2     |  +  |
   0 0000000888             10     *-----*
  -0 5434                    4     |     |
  -2 76663330976554222222222 23    +-----+
  -4 682                     3        |
     ----+----+----+----+---
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot

```
 2.3+                                                  *
    |
    |                                             * *  +++
    |                                            *  +++
    |                                             +++
    |                                          **+
    |                                       +++
 0.9+                                    ***
    |                                ****
    |                              ***
    |                           ++++*
    |                         ++****
    |                     +++ **
    |               ** ** *******
-0.5+ *     * *     +++
     +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	41	Sum Wgts	41
Mean	0.707875	Sum	29.02289
Std Dev	0.592241	Variance	0.350749
Skewness	0.483239	Kurtosis	0.314301
USS	34.57456	CSS	14.02997
CV	83.66458	Std Mean	0.092492
T:Mean=0	7.653327	Pr>|T|	0.0001
Num ^= 0	41	Num > 0	36
M(Sign)	15.5	Pr>=|M|	0.0001
Sgn Rank	396.5	Pr>=|S|	0.0001
W:Normal	0.958527	Pr<W	0.2019

Quantiles(Def=5)

100% Max	2.272126	99%	2.272126
75% Q3	0.993252	95%	1.856298
50% Med	0.741937	90%	1.280934
25% Q1	0.262364	10%	-0.13926
0% Min	-0.26136	5%	-0.22314
		1%	-0.26136
Range	2.533491		
Q3-Q1	0.730888		
Mode	0.182322		

Extremes

Lowest	ID	Highest	ID
-0.26136(	14147)	1.280934(	14166)
-0.23572(	5050)	1.722767(	14167)
-0.22314(	5127)	1.856298(	5047)
-0.15082(	14132)	1.871802(	14090)
-0.13926(	14019)	2.272126(	14139)

```
Stem Leaf                    #     Boxplot
  22 7                       1        0
  20
  18 67                      2        |
  16 2                       1        |
  14                                  |
  12 88                      2        |
  10 399                     3        |
   8 8886699                 7     +-----+
   6 449944499               9     *--+--*
   4 7779                    4     |     |
   2 64                      2     +-----+
   0 00888                   5        |
  -0 54                      2        |
  -2 642                     3        |
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot

```
 2.3+                                                  *
    |                                                 ++++
    |                                            *  *+++
    |                                           * +++
    |                                         ++++
    |                                       ++**
    |                                    ++***
    |                                 +*** *
    |                              *****
    |                           ***+
    |                        +**
    |                     *** *
    |                 +*+*
-0.3+  *    *+++
     +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

```
----------------------------------------------- DEPTH=Surface ANALYSIS=Calcium -----------------------------------------------

                                                        All Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                                  Extremes

 N                75  Sum Wgts        75     100% Max  12.58793     99%  12.58793      Lowest     ID     Highest     ID
 Mean       8.756547  Sum        656.741      75% Q3   9.595603     95%  11.61729     6.100319(  14036)  11.5991(  14102)
 Std Dev    1.530307  Variance  2.341839      50% Med   8.34284     90%  11.05089     6.679599(   5103) 11.61729(  14019)
 Skewness   0.810091  Kurtosis  -0.21365      25% Q1   7.770645     10%   7.17012     6.709304(  14157) 12.20607(  14020)
 USS        5924.079  CSS       173.2961       0% Min  6.100319      5%  6.747587     6.747587(  14026) 12.25486(  14000)
 CV         17.47614  Std Mean  0.176705                             1%  6.100319     6.768493(   5084) 12.58793(  14016)
 T:Mean=0   49.55472  Pr>|T|      0.0001     Range     6.487609
 Num ^= 0         75  Num > 0         75     Q3-Q1     1.824958
 M(Sign)        37.5  Pr>=|M|     0.0001     Mode      7.396335
 Sgn Rank       1425  Pr>=|S|     0.0001
 W:Normal   0.906448  Pr<W        0.0001

      Stem Leaf                     #             Boxplot                               Normal Probability Plot
        12 6                        1                0              12.75+                                                  *+
        12 23                       2                |                   |                                           * * +++
        11 666                      3                |                   |                                      ** *++++
        11 013                      3                |                   |                                     **+++
        10 777899                   6                |                   |                                 ****++
        10 223                      3                |                   |                               **+++
         9 66                       2             +-----+                |                             +**+
         9 14                       2             |     |                |                          +++ *
         8 5555666677799           13             |  +  |                |                       ++*****
         8 000111222333344         15             *-----*                |                    ******
         7 55588888899             11             +-----+                |                 +****
         7 112233444                9                |                   |           *******
         6 7778                     4                |                   |     * ** *+++
         6 1                        1                |               6.25+ *     ++++
           ----+----+----+----+                                           +----+----+----+----+----+----+----+----+----+----+
                                                                                -2        -1         0        +1        +2

                                                      Detected Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                                  Extremes

 N                75  Sum Wgts        75     100% Max  12.58793     99%  12.58793      Lowest     ID     Highest     ID
 Mean       8.756547  Sum        656.741      75% Q3   9.595603     95%  11.61729     6.100319(  14036)  11.5991(  14102)
 Std Dev    1.530307  Variance  2.341839      50% Med   8.34284     90%  11.05089     6.679599(   5103) 11.61729(  14019)
 Skewness   0.810091  Kurtosis  -0.21365      25% Q1   7.770645     10%   7.17012     6.709304(  14157) 12.20607(  14020)
 USS        5924.079  CSS       173.2961       0% Min  6.100319      5%  6.747587     6.747587(  14026) 12.25486(  14000)
 CV         17.47614  Std Mean  0.176705                             1%  6.100319     6.768493(   5084) 12.58793(  14016)
 T:Mean=0   49.55472  Pr>|T|      0.0001     Range     6.487609
 Num ^= 0         75  Num > 0         75     Q3-Q1     1.824958
 M(Sign)        37.5  Pr>=|M|     0.0001     Mode      7.396335
 Sgn Rank       1425  Pr>=|S|     0.0001
 W:Normal   0.906448  Pr<W        0.0001

      Stem Leaf                     #             Boxplot                               Normal Probability Plot
        12 6                        1                0              12.75+                                                  *+
        12 23                       2                |                   |                                           * * +++
        11 666                      3                |                   |                                      ** *++++
        11 013                      3                |                   |                                     **+++
        10 777899                   6                |                   |                                 ****++
        10 223                      3                |                   |                               **+++
         9 66                       2             +-----+                |                             +**+
         9 14                       2             |     |                |                          +++ *
         8 5555666677799           13             |  +  |                |                       ++*****
         8 000111222333344         15             *-----*                |                    ******
         7 55588888899             11             +-----+                |                 +****
         7 112233444                9                |                   |           *******
         6 7778                     4                |                   |     * ** *+++
         6 1                        1                |               6.25+ *     ++++
           ----+----+----+----+                                           +----+----+----+----+----+----+----+----+----+----+
                                                                                -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Surface ANALYSIS=Chromium -------------------------------------------------
```

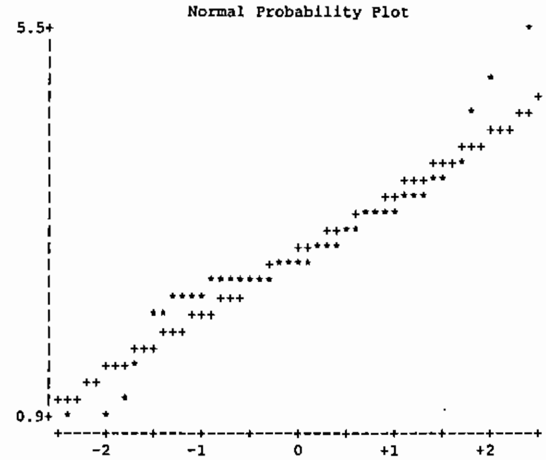
All Observations

Variable=LNVALUE

```
                Moments                                  Quantiles(Def=5)                                  Extremes

N             75  Sum Wgts         75      100% Max  5.55296      99%  5.55296      Lowest     ID    Highest     ID
Mean    2.823978  Sum        211.7984       75% Q3  3.218876      95%  3.828641    0.955511(  14047) 3.688879(  14159)
Std Dev  0.71073  Variance   0.505136       50% Med 2.772589      90%  3.526361    0.993252(  14044) 3.828641(  14006)
Skewness 0.671341 Kurtosis   3.761242       25% Q1  2.484907      10%  2.219203    1.193922(  14016) 4.477337(   5037)
USS     635.4942  CSS         37.3801        0% Min 0.955511       5%  1.568616    1.568616(  14026) 4.919981(   5050)
CV      25.16767  Std Mean   0.082068                              1%  0.955511    2.104134(  14036)  5.55296(  14090)
T:Mean=0 34.41024 Pr>|T|       0.0001      Range    4.597448
Num ^= 0      75  Num > 0          75      Q3-Q1    0.733969
M(Sign)     37.5  Pr>=|M|      0.0001      Mode     2.564949
Sgn Rank    1425  Pr>=|S|      0.0001
W:Normal 0.91792  Pr<W         0.0001
```

```
   Stem Leaf                      #             Boxplot
     54 5                         1                *
     52
     50
     48 2                         1                0
     46
     44 8                         1                0
     42
     40
     38 3                         1                |
     36 119                       3                |
     34 373                       3                |
     32 220000377                 9             +-----+
     30 00044448                  8             |     |
     28 333399                    6             |  +  |
     26 44441177777              11             *-----*
     24 00088888886666666666     20             +-----+
     22 002259                    6                |
     20 0                         1                |
     18                                            |
     16                                            |
     14 7                         1                |
     12
     10 9                         1                0
      8 69                        2                0
        ----+----+----+----+
   Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



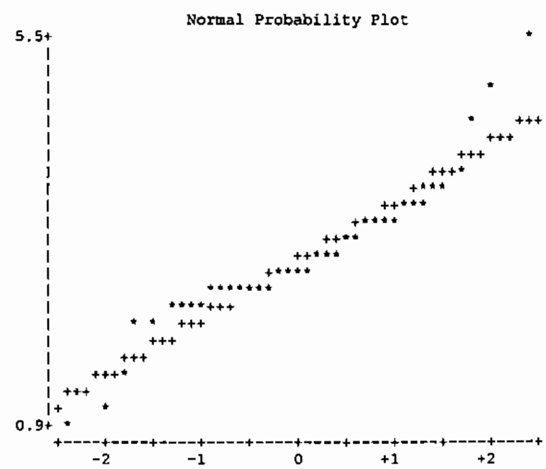
Detected Observations

Variable=LNVALUE

```
                Moments                                  Quantiles(Def=5)                                  Extremes

N             74  Sum Wgts         74      100% Max  5.55296      99%  5.55296      Lowest     ID    Highest     ID
Mean    2.849228  Sum        210.8429       75% Q3  3.218876      95%  3.828641    0.993252(  14044) 3.688879(  14159)
Std Dev 0.680871  Variance   0.463586       50% Med 2.772589      90%  3.526361    1.193922(  14016) 3.828641(  14006)
Skewness 0.950905 Kurtosis    4.16912       25% Q1  2.484907      10%  2.219203    1.568616(  14026) 4.477337(   5037)
USS     634.5812  CSS        33.84175        0% Min 0.993252       5%  2.104134    2.104134(  14036) 4.919981(   5050)
CV      23.89669  Std Mean    0.07915                              1%  0.993252    2.197225(  14033)  5.55296(  14090)
T:Mean=0 35.99798 Pr>|T|       0.0001      Range    4.559708
Num ^= 0      74  Num > 0          74      Q3-Q1    0.733969
M(Sign)       37  Pr>=|M|      0.0001      Mode     2.564949
Sgn Rank  1387.5  Pr>=|S|      0.0001
W:Normal 0.915626 Pr<W         0.0001
```

```
   Stem Leaf                      #             Boxplot
     54 5                         1                *
     52
     50
     48 2                         1                0
     46
     44 8                         1                0
     42
     40
     38 3                         1                |
     36 119                       3                |
     34 373                       3                |
     32 220000377                 9             +-----+
     30 00044448                  8             |     |
     28 333399                    6             |  +  |
     26 44441177777              11             *-----*
     24 00088888886666666666     20             +-----+
     22 002259                    6                |
     20 0                         1                |
     18                                            |
     16                                            |
     14 7                         1                |
     12
     10 9                         1                0
      8 9                         1                0
        ----+----+----+----+
   Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



```
------------------------------------------------- DEPTH=Surface ANALYSIS=Cobalt -------------------------------------------------

                                                          All Observations
Variable=LNVALUE

              Moments                                        Quantiles(Def=5)                                    Extremes

 N                75  Sum Wgts        75      100% Max  3.401197       99%  3.401197        Lowest     ID      Highest     ID
 Mean       1.960227  Sum        147.017       75% Q3   2.261763       95%  2.890372      0.182322(   14147) 2.639057(   14131)
 Std Dev    0.466609  Variance  0.217724       50% Med  1.902108       90%  2.564949      0.955511(   14020) 2.890372(   14009)
 Skewness   -0.23094  Kurtosis  3.011469       25% Q1   1.722767       10%  1.481605      1.163151(   14000) 2.890372(   14165)
 USS        304.2983  CSS       16.11158        0% Min  0.182322        5%  1.193922      1.193922(   14016) 2.890372(   14166)
 CV         23.80383  Std Mean  0.053879                                1%  0.182322      1.223775(   10367) 3.401197(   14158)
 T:Mean=0   36.38176  Pr>|T|      0.0001      Range     3.218876
 Num ^= 0         75  Num > 0         75      Q3-Q1     0.538997
 M(Sign)        37.5  Pr>=|M|     0.0001      Mode      2.302585
 Sgn Rank       1425  Pr>=|S|     0.0001
 W:Normal   0.961153  Pr<W        0.0693

    Stem Leaf                      #             Boxplot                               Normal Probability Plot
      34 0                         1                0              3.5+                                                     *
      32                                                              |
      30                                                              |                                                   +++
      28 999                       3                |                 |                                               **+***
      26 44                        2                |                 |                                           **++
      24 00066                     5                |                 |                                       +++**
      22 166000000                 9             +-----+              |                                   ******
      20 1111905569               10             |     |              |                               ++****
      18 224466677779000235667    21             *--+--*              |                        *******
      16 57799900266679           14             +-----+              |                 *******+
      14 6879                      4                |                 |              ****+++
      12 29                        2                |                 |           +**+
      10 69                        2                |                 |       ++**
       8 6                         1                |                 | ++++*
       6                                                              |+
       4                                                              |
       2                                                              |
       0 8                         1                0              0.1+ *
         ----+----+----+----+-                                         +----+----+----+----+----+----+----+----+----+----+
    Multiply Stem.Leaf by 10**-1                                                -2        -1         0        +1        +2

                                                          Detected Observations
Variable=LNVALUE

              Moments                                        Quantiles(Def=5)                                    Extremes

 N                75  Sum Wgts        75      100% Max  3.401197       99%  3.401197        Lowest     ID      Highest     ID
 Mean       1.960227  Sum        147.017       75% Q3   2.261763       95%  2.890372      0.182322(   14147) 2.639057(   14131)
 Std Dev    0.466609  Variance  0.217724       50% Med  1.902108       90%  2.564949      0.955511(   14020) 2.890372(   14009)
 Skewness   -0.23094  Kurtosis  3.011469       25% Q1   1.722767       10%  1.481605      1.163151(   14000) 2.890372(   14165)
 USS        304.2983  CSS       16.11158        0% Min  0.182322        5%  1.193922      1.193922(   14016) 2.890372(   14166)
 CV         23.80383  Std Mean  0.053879                                1%  0.182322      1.223775(   10367) 3.401197(   14158)
 T:Mean=0   36.38176  Pr>|T|      0.0001      Range     3.218876
 Num ^= 0         75  Num > 0         75      Q3-Q1     0.538997
 M(Sign)        37.5  Pr>=|M|     0.0001      Mode      2.302585
 Sgn Rank       1425  Pr>=|S|     0.0001
 W:Normal   0.961153  Pr<W        0.0693

    Stem Leaf                      #             Boxplot                               Normal Probability Plot
      34 0                         1                0              3.5+                                                     *
      32                                                              |
      30                                                              |                                                   +++
      28 999                       3                |                 |                                               **+***
      26 44                        2                |                 |                                           **++
      24 00066                     5                |                 |                                       +++**
      22 166000000                 9             +-----+              |                                   ******
      20 1111905569               10             |     |              |                               ++****
      18 224466677779000235667    21             *--+--*              |                        *******
      16 57799900266679           14             +-----+              |                 *******+
      14 6879                      4                |                 |              ****+++
      12 29                        2                |                 |           +**+
      10 69                        2                |                 |       ++**
       8 6                         1                |                 | ++++*
       6                                                              |+
       4                                                              |
       2                                                              |
       0 8                         1                0              0.1+ *
         ----+----+----+----+-                                         +----+----+----+----+----+----+----+----+----+----+
    Multiply Stem.Leaf by 10**-1                                                -2        -1         0        +1        +2
```

DEPTH=Surface ANALYSIS=Copper

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	2.751744	Sum	206.3808
Std Dev	0.769432	Variance	0.592025
Skewness	0.500631	Kurtosis	1.441003
USS	611.7169	CSS	43.80988
CV	27.96161	Std Mean	0.088846
T:Mean=0	30.97194	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.976693	Pr<W	0.4618

Quantiles(Def=5)

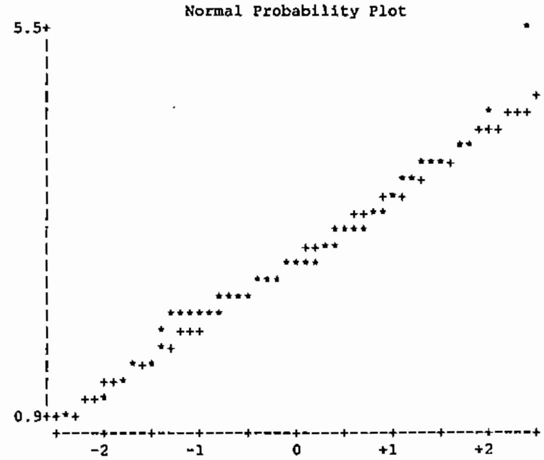
100% Max	5.442418	99%	5.442418
75% Q3	3.135494	95%	4.060443
50% Med	2.70805	90%	3.850148
25% Q1	2.272126	10%	2.014903
0% Min	0.916291	5%	1.410987
		1%	0.916291
Range	4.526127		
Q3-Q1	0.863368		
Mode	2.564949		

Extremes

Lowest	ID	Highest	ID
0.916291(	14010)	3.912023(	14139)
1.163151(	14009)	4.060443(	14166)
1.335001(	14157)	4.077537(	14165)
1.410987(	14142)	4.49981(	14138)
1.435085(	14016)	5.442418(	14090)

```
Stem Leaf                  #          Boxplot
  54 4                     1             0
  52
  50
  48
  46
  44 0                     1             0
  42
  40 68                    2             |
  38 5791                  4             |
  36 446                   3             |
  34 03                    2             |
  32 2603                  4             |
  30 044449948             9          +-----+
  28 3994                  4          |     |
  26 444411111777         12          *--+--*
  24 00888666666          11          |     |
  22 267000                6          +-----+
  20 144902269             9             |
  18 9                     1             |
  16 4                     1             |
  14 14                    2             |
  12 4                     1             |
  10 6                     1             |
   8 2                     1             0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	2.751744	Sum	206.3808
Std Dev	0.769432	Variance	0.592025
Skewness	0.500631	Kurtosis	1.441003
USS	611.7169	CSS	43.80988
CV	27.96161	Std Mean	0.088846
T:Mean=0	30.97194	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.976693	Pr<W	0.4618

Quantiles(Def=5)

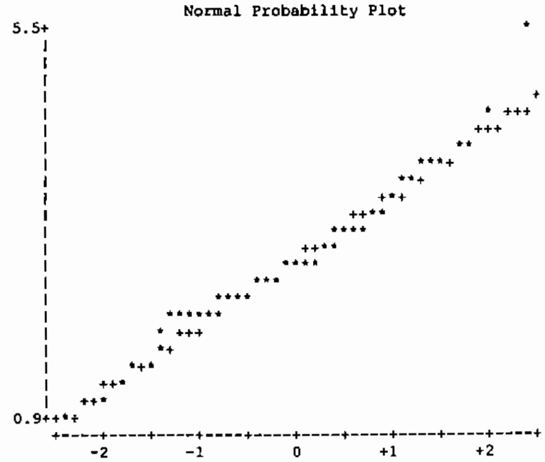
100% Max	5.442418	99%	5.442418
75% Q3	3.135494	95%	4.060443
50% Med	2.70805	90%	3.850148
25% Q1	2.272126	10%	2.014903
0% Min	0.916291	5%	1.410987
		1%	0.916291
Range	4.526127		
Q3-Q1	0.863368		
Mode	2.564949		

Extremes

Lowest	ID	Highest	ID
0.916291(	14010)	3.912023(	14139)
1.163151(	14009)	4.060443(	14166)
1.335001(	14157)	4.077537(	14165)
1.410987(	14142)	4.49981(	14138)
1.435085(	14016)	5.442418(	14090)

```
Stem Leaf                  #          Boxplot
  54 4                     1             0
  52
  50
  48
  46
  44 0                     1             0
  42
  40 68                    2             |
  38 5791                  4             |
  36 446                   3             |
  34 03                    2             |
  32 2603                  4             |
  30 044449948             9          +-----+
  28 3994                  4          |     |
  26 444411111777         12          *--+--*
  24 00888666666          11          |     |
  22 267000                6          +-----+
  20 144902269             9             |
  18 9                     1             |
  16 4                     1             |
  14 14                    2             |
  12 4                     1             |
  10 6                     1             |
   8 2                     1             0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



```
------------------------------------------------ DEPTH=Surface ANALYSIS=Cyanide ------------------------------------------------

                                                         All Observations
Variable=LNVALUE

                 Moments                                     Quantiles(Def=5)                                      Extremes

N              67  Sum Wgts          67      100% Max  -0.15082       99%  -0.15082        Lowest     ID     Highest      ID
Mean     -0.61686  Sum         -41.3296       75% Q3   -0.46204       95%  -0.31471      -1.30933(    5084) -0.34249(   14090)
Std Dev  0.284773  Variance    0.081096       50% Med  -0.52763       90%  -0.37106      -1.23787(    5050) -0.31471(   14013)
Skewness -1.35776  Kurtosis    0.681564       25% Q1   -0.61619       10%  -1.20397      -1.20397(    5105) -0.31471(   14041)
USS       30.8469  CSS         5.352328        0% Min  -1.30933        5%  -1.20397      -1.20397(    5103) -0.27444(   14167)
CV        -46.165  Std Mean    0.034791                                1%  -1.30933      -1.20397(    5099) -0.15082(    5127)
T:Mean=0 -17.7306  Pr>|T|        0.0001      Range     1.15851
Num ^= 0       67  Num > 0            0      Q3-Q1     0.154151
M(Sign)     -33.5  Pr>=|M|       0.0001      Mode      -1.20397
Sgn Rank    -1139  Pr>=|S|       0.0001
W:Normal 0.759935  Pr<W          0.0001
                                                    Missing Value        .
                                                    Count                3
                                                    % Count/Nobs      4.29

      Stem Leaf                     #             Boxplot                              Normal Probability Plot
        -1 5                        1                0             -0.175+                                            ++       *
        -2                                                                |                                         ++
        -2 7                        1             |                       |                                   .    +       *
        -3 411                      3             |                       |                                      ++   **
        -3 977                      3             |                       |                                    ++  **
        -4 222                      3             |                       |                                  ++ ***
        -4 9998888886666655        16          +-----+                    |                               ******
        -5 4444433333331111        16          *-----*                    |                        *******++
        -5 88886                    5          |     |                    |                    ***     ++
        -6 322200                   6          +--+--+                    |                  **     ++
        -6                                        |                       |                       +
        -7                                        |                       |                     ++
        -7                                        |                       |                   ++
        -8 42                       2             |                       |                 *++
        -8                                                                |                 +
        -9                                                                |               ++
        -9                                                                |             ++
       -10                                                                |           ++
       -10                                                                |          +
       -11 4                        1             *                       |        ++      *
       -11                                                                |      ++
       -12 400000000                9             *                       |    ++* *  * * *
       -12                                                                |  +
       -13 1                        1             *                -1.325++*
           ----+----+----+----+                                           +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                              -2        -1         0        +1        +2


                                                         Detected Observations
Variable=LNVALUE

                 Moments                                     Quantiles(Def=5)                                      Extremes

N               1  Sum Wgts           1      100% Max  -0.34249       99%  -0.34249        Lowest     ID     Highest      ID
Mean     -0.34249  Sum         -0.34249       75% Q3   -0.34249       95%  -0.34249      -0.34249(   14090)        .(        )
Std Dev         .  Variance           .       50% Med  -0.34249       90%  -0.34249             .(        )        .(        )
Skewness        .  Kurtosis           .       25% Q1   -0.34249       10%  -0.34249             .(        )        .(        )
USS        0.1173  CSS                0        0% Min  -0.34249        5%  -0.34249             .(        )        .(        )
CV              .  Std Mean           .                                1%  -0.34249             .(        ) -0.34249(   14090)
T:Mean=0        .  Pr>|T|         .          Range            0
Num ^= 0        1  Num > 0            0      Q3-Q1            0
M(Sign)      -0.5  Pr>=|M|       1.0000      Mode      -0.34249
Sgn Rank     -0.5  Pr>=|S|       1.0000
W:Normal        .  Pr<W           .
```

------------------------------ DEPTH=Surface ANALYSIS=Iron ------------------------------

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	9.569519	Sum	717.7139
Std Dev	0.449993	Variance	0.202494
Skewness	-0.16454	Kurtosis	2.209698
USS	6883.162	CSS	14.98453
CV	4.702356	Std Mean	0.051961
T:Mean=0	184.1684	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.955973	Pr<W	0.0321

Quantiles(Def=5)

100% Max	10.89674	99%	10.89674
75% Q3	9.814656	95%	10.22919
50% Med	9.581904	90%	10.01682
25% Q1	9.400961	10%	8.968269
0% Min	8.160518	5%	8.811354
		1%	8.160518
Range	2.736221		
Q3-Q1	0.413696		
Mode	9.464983		

Extremes

Lowest	ID	Highest	ID
8.160518(	14000)	10.22557(	14159)
8.451053(	14016)	10.22919(	14133)
8.4929(	14147)	10.29553(	14145)
8.811354(	14006)	10.86092(	14040)
8.874868(	14036)	10.89674(	14041)

```
   Stem Leaf                     #             Boxplot
    108 60                       2                0
    106
    104
    102 330                      3                |
    100 236                      3                |
     98 011555699125            12             +-----+
     96 000390011244568         15             |     |
     94 0012466667023355677888  22             *--+--*
     92 0391247                  7                |
     90 707                      3                |
     88 17567                    5                |
     86
     84 59                       2                0
     82
     80 6                        1                0
        ----+----+----+----+--
   Multiply Stem.Leaf by 10**-1
```

```
                         Normal Probability Plot
   10.9+                                                  *  *
       |                                                   +++
       |                                                ++++
       |                                             *+**
       |                                         +++**
       |                                    +******
       |                               +*****
    9.5+                          *********
       |                       ****+++
       |                     **++
       |                  *+***
       |              ++++
       |++++ * *
       |
    8.1+ *
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	9.569519	Sum	717.7139
Std Dev	0.449993	Variance	0.202494
Skewness	-0.16454	Kurtosis	2.209698
USS	6883.162	CSS	14.98453
CV	4.702356	Std Mean	0.051961
T:Mean=0	184.1684	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.955973	Pr<W	0.0321

Quantiles(Def=5)

100% Max	10.89674	99%	10.89674
75% Q3	9.814656	95%	10.22919
50% Med	9.581904	90%	10.01682
25% Q1	9.400961	10%	8.968269
0% Min	8.160518	5%	8.811354
		1%	8.160518
Range	2.736221		
Q3-Q1	0.413696		
Mode	9.464983		

Extremes

Lowest	ID	Highest	ID
8.160518(	14000)	10.22557(	14159)
8.451053(	14016)	10.22919(	14133)
8.4929(	14147)	10.29553(	14145)
8.811354(	14006)	10.86092(	14040)
8.874868(	14036)	10.89674(	14041)

```
   Stem Leaf                     #             Boxplot
    108 60                       2                0
    106
    104
    102 330                      3                |
    100 236                      3                |
     98 011555699125            12             +-----+
     96 000390011244568         15             |     |
     94 0012466667023355677888  22             *--+--*
     92 0391247                  7                |
     90 707                      3                |
     88 17567                    5                |
     86
     84 59                       2                0
     82
     80 6                        1                0
        ----+----+----+----+--
   Multiply Stem.Leaf by 10**-1
```

```
                         Normal Probability Plot
   10.9+                                                  *  *
       |                                                   +++
       |                                                ++++
       |                                             *+**
       |                                         +++**
       |                                    +******
       |                               +*****
    9.5+                          *********
       |                       ****+++
       |                     **++
       |                  *+***
       |              ++++
       |++++ * *
       |
    8.1+ *
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

-- DEPTH=Surface ANALYSIS=Lead --

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	2.952217	Sum	221.4163
Std Dev	0.657599	Variance	0.432436
Skewness	0.961341	Kurtosis	4.348761
USS	685.6693	CSS	32.00027
CV	22.27474	Std Mean	0.075933
T:Mean=0	38.87926	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.947719	Pr<W	0.0087

Quantiles(Def=5)

100% Max	5.777652	99%	5.777652
75% Q3	3.332205	95%	3.806662
50% Med	2.890372	90%	3.688879
25% Q1	2.564949	10%	2.282382
0% Min	1.131402	5%	2.066863
		1%	1.131402
Range	4.64625		
Q3-Q1	0.767255		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
1.131402(	5114)	3.713572(	5099)
1.629241(	14157)	3.806662(	14138)
1.931521(	14010)	3.951244(	14020)
2.066863(	14142)	4.70953(	14167)
2.128232(	10367)	5.777652(	14090)

```
Stem Leaf                   #             Boxplot
  56 8                      1                *
  54
  52
  50
  48
  46 1                      1                0
  44
  42
  40
  38 15                     2                |
  36 469991                 6                |
  34 3370688                7                |
  32 66037                  5             +-----+
  30 00000449998           11             |     |
  28 33999994444           11             *--+--*
  26 4444111177            10             |     |
  24 8888866666            10             +-----+
  22 08900                  5                |
  20 736                    3                |
  18 3                      1                |
  16 3                      1                |
  14
  12
  10 3                      1                0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
 5.7+                                                    *
    |
    |
    |
    |
    |                                                 *
    |                                                    +++
    |                                                 ++++
    |                                              +++
    |                                           +++ **
    |                                       +*****
    |                                    +***
    |                                 ++**
    |                              ++***
    |                           ******
    |                        ****
    |                    *****
    |                 ****++
    |            * **++
    |           *+++
    |         *++
    |  +++
    |++
 1.1+ *
     +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	2.952217	Sum	221.4163
Std Dev	0.657599	Variance	0.432436
Skewness	0.961341	Kurtosis	4.348761
USS	685.6693	CSS	32.00027
CV	22.27474	Std Mean	0.075933
T:Mean=0	38.87926	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.947719	Pr<W	0.0087

Quantiles(Def=5)

100% Max	5.777652	99%	5.777652
75% Q3	3.332205	95%	3.806662
50% Med	2.890372	90%	3.688879
25% Q1	2.564949	10%	2.282382
0% Min	1.131402	5%	2.066863
		1%	1.131402
Range	4.64625		
Q3-Q1	0.767255		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
1.131402(	5114)	3.713572(	5099)
1.629241(	14157)	3.806662(	14138)
1.931521(	14010)	3.951244(	14020)
2.066863(	14142)	4.70953(	14167)
2.128232(	10367)	5.777652(	14090)

```
Stem Leaf                   #             Boxplot
  56 8                      1                *
  54
  52
  50
  48
  46 1                      1                0
  44
  42
  40
  38 15                     2                |
  36 469991                 6                |
  34 3370688                7                |
  32 66037                  5             +-----+
  30 00000449998           11             |     |
  28 33999994444           11             *--+--*
  26 4444111177            10             |     |
  24 8888866666            10             +-----+
  22 08900                  5                |
  20 736                    3                |
  18 3                      1                |
  16 3                      1                |
  14
  12
  10 3                      1                0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
 5.7+                                                    *
    |
    |
    |
    |
    |                                                 *
    |                                                    +++
    |                                                 ++++
    |                                              +++
    |                                           +++ **
    |                                       +*****
    |                                    +***
    |                                 ++**
    |                              ++***
    |                           ******
    |                        ****
    |                    *****
    |                 ****++
    |            * **++
    |           *+++
    |         *++
    |  +++
    |++
 1.1+ *
     +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

-- DEPTH=Surface ANALYSIS=Magnesium --

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	7.2223	Sum	541.6725
Std Dev	0.652882	Variance	0.426255
Skewness	0.348415	Kurtosis	0.933293
USS	3943.664	CSS	31.54285
CV	9.039806	Std Mean	0.075388
T:Mean=0	95.80133	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.964608	Pr<W	0.1124

Quantiles(Def=5)

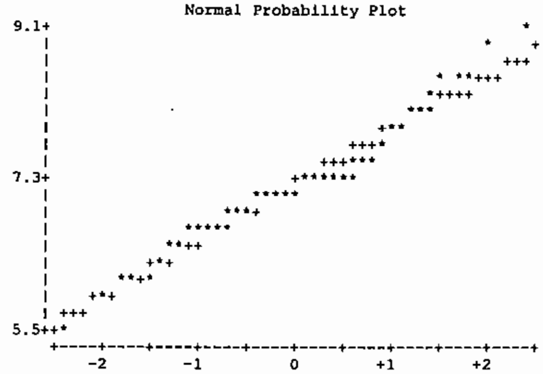
100% Max	9.017968	99%	9.017968
75% Q3	7.495542	95%	8.525161
50% Med	7.185387	90%	8.02617
25% Q1	6.841615	10%	6.51323
0% Min	5.549076	5%	6.073045
		1%	5.549076
Range	3.468892		
Q3-Q1	0.653926		
Mode	7.098376		

Extremes

Lowest	ID	Highest	ID
5.549076(	14147)	8.513185(	14000)
5.983936(	14157)	8.525161(	14020)
6.023448(	14142)	8.571681(	14102)
6.073045(	14164)	8.954157(	14016)
6.09131(	5084)	9.017968(	14167)

```
Stem Leaf                     #       Boxplot
  90 2                        1          0
  88 5                        1          0
  86
  84 137                      3          0
  82 9                        1          |
  80 130                      3          |
  78 1163                     4          |
  76 78                       2          |
  74 50003                    5       +-----+
  72 0047911234788889        16       |  +  |
  70 200012555688899         15       *-----*
  68 422339                   6       +-----+
  66 346712339                9          |
  64 16                       2          |
  62 25                       2          |
  60 279                      3          |
  58 8                        1          |
  56
  54 5                        1          0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Variable=LNVALUE

Moments

N	74	Sum Wgts	74
Mean	7.218608	Sum	534.177
Std Dev	0.65655	Variance	0.431057
Skewness	0.363756	Kurtosis	0.908413
USS	3887.481	CSS	31.46718
CV	9.095238	Std Mean	0.076322
T:Mean=0	94.58054	Pr>|T|	0.0001
Num ^= 0	74	Num > 0	74
M(Sign)	37	Pr>=|M|	0.0001
Sgn Rank	1387.5	Pr>=|S|	0.0001
W:Normal	0.963819	Pr<W	0.1041

Quantiles(Def=5)

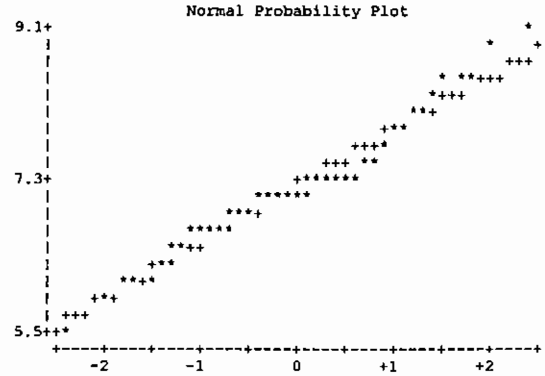
100% Max	9.017968	99%	9.017968
75% Q3	7.45008	95%	8.525161
50% Med	7.181585	90%	8.02617
25% Q1	6.841615	10%	6.51323
0% Min	5.549076	5%	6.073045
		1%	5.549076
Range	3.468892		
Q3-Q1	0.608464		
Mode	7.098376		

Extremes

Lowest	ID	Highest	ID
5.549076(	14147)	8.513185(	14000)
5.983936(	14157)	8.525161(	14020)
6.023448(	14142)	8.571681(	14102)
6.073045(	14164)	8.954157(	14016)
6.09131(	5084)	9.017968(	14167)

```
Stem Leaf                     #       Boxplot
  90 2                        1          0
  88 5                        1          0
  86
  84 137                      3          0
  82 9                        1          |
  80 130                      3          |
  78 1163                     4          |
  76 78                       2          |
  74 5003                     4       +-----+
  72 0047911234788889        16       |  +  |
  70 200012555688899         15       *-----*
  68 422339                   6       +-----+
  66 346712339                9          |
  64 16                       2          |
  62 25                       2          |
  60 279                      3          |
  58 8                        1          |
  56
  54 5                        1          0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



```
------------------------------------------------ DEPTH=Surface ANALYSIS=Manganese ------------------------------------------------

                                                    All Observations
Variable=LNVALUE

                  Moments                               Quantiles(Def=5)                                  Extremes

 N                75  Sum Wgts        75    100% Max  7.901007      99%  7.901007       Lowest      ID      Highest     ID
 Mean       5.923466  Sum         444.26     75% Q3   6.390241      95%  7.056175     3.218876(   14166) 6.754604(    5096)
 Std Dev    0.679201  Variance  0.461314     50% Med  5.857933      90%  6.641182     4.574711(   14147) 7.056175(   14158)
 Skewness   -0.50429  Kurtosis  3.004363     25% Q1    5.57973      10%   5.32301     4.727388(   14020) 7.162397(    5087)
 USS        2665.696  CSS       34.13722      0% Min  3.218876       5%  4.859812     4.859812(   14013) 7.279319(   14175)
 CV         11.46627  Std Mean  0.078427                             1%  3.218876      4.89784(    5056) 7.901007(   14131)
 T:Mean=0   75.52806  Pr>|T|      0.0001    Range     4.682131
 Num ^= 0         75  Num > 0         75    Q3-Q1     0.810511
 M(Sign)        37.5  Pr>=|M|     0.0001    Mode      5.583496
 Sgn Rank       1425  Pr>=|S|     0.0001
 W:Normal   0.972153  Pr<W        0.2889

      Stem Leaf                     #             Boxplot                              Normal Probability Plot
        78 0                        1                0              7.9+                                                 *
        76                                                              |                                                 +
        74                                                              |                                              +++
        72 8                        1                |                  |                                            +*+
        70 66                       2                |                  |                                         +**
        68                                           |                  |                                     +++
        66 244685                   6                |                  |                                  +*****
        64 0491267                  7                |                  |                                *****
        62 02345799                 8             +-----+               |                             ****
        60 03369909                 8             |     |               |                           ***
        58 0445668856              10             *--+--*               |                        ***
        56 04889001789             11             |     |               |                    ****
        54 5607888                  7             +-----+               |                 ****+
        52 2346779                  7                |                  |             *****+
        50 45                       2                |                  |            *+**
        48 60                       2                |                  |        *+*+
        46 3                        1                |                  |      +*+
        44 7                        1                |                  |   ++*
        42                                                              |+++
        40                                                              |
        38                                                              |
        36                                                              |
        34                                                              |
        32 2                        1                0              3.3+ *
           ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                              -2        -1         0        +1        +2

                                                  Detected Observations
Variable=LNVALUE

                  Moments                               Quantiles(Def=5)                                  Extremes

 N                74  Sum Wgts        74    100% Max  7.901007      99%  7.901007       Lowest      ID      Highest     ID
 Mean       5.914718  Sum       437.6891     75% Q3   6.368187      95%  7.056175     3.218876(   14166) 6.754604(    5096)
 Std Dev    0.679569  Variance  0.461814     50% Med  5.857933      90%  6.641182     4.574711(   14147) 7.056175(   14158)
 Skewness   -0.48303  Kurtosis  3.040397     25% Q1    5.57973      10%   5.32301     4.727388(   14020) 7.162397(    5087)
 USS         2622.52  CSS       33.71241      0% Min  3.218876       5%  4.859812     4.859812(   14013) 7.279319(   14175)
 CV         11.48946  Std Mean  0.078998                             1%  3.218876      4.89784(    5056) 7.901007(   14131)
 T:Mean=0   74.87148  Pr>|T|      0.0001    Range     4.682131
 Num ^= 0         74  Num > 0         74    Q3-Q1     0.788457
 M(Sign)          37  Pr>=|M|     0.0001    Mode      5.583496
 Sgn Rank     1387.5  Pr>=|S|     0.0001
 W:Normal   0.971903  Pr<W        0.2855

      Stem Leaf                     #             Boxplot                              Normal Probability Plot
        78 0                        1                0              7.9+                                                 *
        76                                                              |                                                 +
        74                                                              |                                              +++
        72 8                        1                |                  |                                            +*+
        70 66                       2                |                  |                                         +**
        68                                           |                  |                                       ++
        66 244685                   6                |                  |                                    *****
        64 049126                   6                |                  |                                 ****
        62 02345799                 8             +-----+               |                              ****
        60 03369909                 8             |     |               |                           ***
        58 0445668856              10             *--+--*               |                        ****
        56 04889001789             11             |     |               |                    ****
        54 5607888                  7             +-----+               |                *****
        52 2346779                  7                |                  |            *****+
        50 45                       2                |                  |           **++
        48 60                       2                |                  |        *+*+
        46 3                        1                |                  |      +*+
        44 7                        1                |                  |   ++*
        42                                                              |+++
        40                                                              |
        38                                                              |
        36                                                              |
        34                                                              |
        32 2                        1                0              3.3+ *
           ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                              -2        -1         0        +1        +2
```

```
---------------------------------------------------- DEPTH=Surface ANALYSIS=Mercury ----------------------------------------------------

                                                      All Observations
Variable=LNVALUE

                 Moments                                    Quantiles(Def=5)                                   Extremes

N                75  Sum Wgts         75       100% Max   2.04122       99%   2.04122          Lowest    ID      Highest    ID
Mean       -2.12873  Sum        -159.654        75% Q3  -2.12026       95%  -1.60944       -3.77226(  10367) -1.60944(  14101)
Std Dev    0.672597  Variance   0.452387        50% Med -2.30259       90%  -1.89712       -2.65926(   5127) -1.60944(  14167)
Skewness    4.44526  Kurtosis   25.31125        25% Q1  -2.30259       10%  -2.30259       -2.52573(  14010) -1.10866(  14041)
USS        373.3374  CSS        33.47663         0% Min -3.77226        5%  -2.30259       -2.30259(  14176) 0.916291(  14140)
CV         -31.5962  Std Mean   0.077665                                1%  -3.77226       -2.30259(  14175)  2.04122(  14090)
T:Mean=0   -27.4091  Pr>|T|       0.0001       Range     5.813481
Num ^= 0         75  Num > 0           2       Q3-Q1     0.182322
M(Sign)       -35.5  Pr>=|M|      0.0001       Mode     -2.30259
Sgn Rank      -1409  Pr>=|S|      0.0001
W:Normal   0.459674  Pr<W         0.0001

                  Histogram                        #             Boxplot                          Normal Probability Plot
   2.25+*                                          1                *                 2.25+                                                    *
        .                                                                                 |
        .                                                                                 |
        .*                                         1                *                     |                                               *
        .                                                                                 |
        .                                                                                 |                                                    +
  -0.75+                                                                         -0.75+                                            ++++++++
        .*                                         1                *                     |                                    +++++++ *
        .****                                      7                0                     |                            ++++++++ ** *  *
        .*******************************          62             +--+--+                  |        * *************************
        .*                                         2                0                     |     * *      +++++++
        .                                                                                 |     ++++++++
  -3.75+*                                          1                *             -3.75++*+++
        ----+----+----+----+----+----+-                                                    +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 2 counts                                                          -2        -1         0        +1        +2

                                                      Detected Observations
Variable=LNVALUE

                 Moments                                    Quantiles(Def=5)                                   Extremes

N                12  Sum Wgts         12       100% Max   2.04122       99%   2.04122          Lowest    ID      Highest    ID
Mean       -1.34078  Sum        -16.0894        75% Q3  -1.35905       95%   2.04122       -2.30259(  14141) -1.60944(  14100)
Std Dev    1.387926  Variance   1.926338        50% Med -1.80596       90%  0.916291       -2.30259(  14104) -1.60944(  14101)
Skewness   1.885077  Kurtosis    2.77909        25% Q1  -2.30259       10%  -2.30259       -2.30259(  14103) -1.10866(  14041)
USS        42.76214  CSS        21.18972         0% Min -2.30259        5%  -2.30259       -2.30259(  14102) 0.916291(  14140)
CV         -103.516  Std Mean    0.40066                                1%  -2.30259       -1.89712(  14040)  2.04122(  14090)
T:Mean=0   -3.34644  Pr>|T|       0.0065       Range     4.343805
Num ^= 0         12  Num > 0           2       Q3-Q1     0.943535
M(Sign)          -4  Pr>=|M|      0.0386       Mode     -2.30259
Sgn Rank        -30  Pr>=|S|      0.0142
W:Normal   0.705883  Pr<W         0.0006

     Stem Leaf                     #             Boxplot                          Normal Probability Plot
        2 0                        1                *                 2.25+                                                  *     +
        1                                                                 |                                                    ++++
        1                                                                 |                                                ++++
        0 9                        1              0 .                 0.75+                                          *  +++
        0                                                                 |                                          ++++
       -0                                                                 |                                       +++
       -0                                                            -0.75+                                   ++++
       -1 1                        1             +--+--+                  |                               ++++    *
       -1 99766                    5             *-----*                  |                            ++*+* * *
       -2 3333                     4             +-----+             -2.25+          *    *  *+++
          ----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
                                                                                -2        -1         0        +1        +2
```

```
--------------------------------------------------- DEPTH=Surface ANALYSIS=Nickel ---------------------------------------------------

                                                   All Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                                   Extremes

 N                75  Sum Wgts        75    100% Max  4.442651       99%  4.442651          Lowest     ID      Highest     ID
 Mean       2.881036  Sum       216.0777     75% Q3   3.218876       95%  4.077537        1.648659(  14000) 3.970292(  14138)
 Std Dev    0.616949  Variance  0.380626     50% Med  2.772589       90%  3.828641        1.757858(  14010) 4.077537(  14140)
 Skewness   0.409902  Kurtosis  -0.16468     25% Q1   2.484907       10%  2.104134        1.856298(  14036) 4.158883(   5050)
 USS         650.694  CSS       28.16633      0% Min  1.648659        5%  1.902108        1.902108(  14016) 4.189655(  14143)
 CV         21.41414  Std Mean  0.071239                              1%  1.648659        2.014903(  14142) 4.442651(  14090)
 T:Mean=0   40.44176  Pr>|T|      0.0001    Range     2.793993
 Num ^= 0         75  Num > 0         75    Q3-Q1     0.733969
 M(Sign)        37.5  Pr>=|M|     0.0001    Mode      2.639057
 Sgn Rank       1425  Pr>=|S|     0.0001
 W:Normal   0.966219  Pr<W        0.1395

       Stem Leaf                      #          Boxplot                               Normal Probability Plot
         44 4                         1             0                 4.5+                                                   *+
         42                                                              |                                                +++
         40 869                       3             |                    |                                            **+++
         38 3357                      4             |                    |                                       ***+++
         36 416                       3             |                    |                                    **++
         34 08                        2             |                    |                                 +*+
         32 22226377                  8          +-----+                 |                              ****
         30 0444999488               10          |     |          3.1+                              +***
         28 339                       3          |  +  |                 |                           ++**
         26 4444444411111117777      19          *-----*                 |                      *******
         24 00888666                  8          +-----+                 |                   ***+
         22 0470                      4             |                    |                +**+
         20 144037                    6             |                    |            *****
         18 60                        2             |                    |         **++
         16 56                        2             |                 1.7+ *    *++
            ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                              -2        -1         0        +1        +2

                                                   Detected Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                                   Extremes

 N                72  Sum Wgts        72    100% Max  4.442651       99%  4.442651          Lowest     ID      Highest     ID
 Mean       2.913112  Sum       209.7441     75% Q3   3.218876       95%  4.077537        1.648659(  14000) 3.970292(  14138)
 Std Dev    0.607566  Variance  0.369137     50% Med  2.772589       90%  3.828641        1.757858(  14010) 4.077537(  14140)
 Skewness    0.38954  Kurtosis  -0.10855     25% Q1   2.564949       10%  2.128232        1.902108(  14016) 4.158883(   5050)
 USS        637.2167  CSS       26.20872      0% Min  1.648659        5%  2.014903        2.014903(  14142) 4.189655(  14143)
 CV         20.85627  Std Mean  0.071602                              1%  1.648659         2.04122(  14130) 4.442651(  14090)
 T:Mean=0   40.68457  Pr>|T|      0.0001    Range     2.793993
 Num ^= 0         72  Num > 0         72    Q3-Q1     0.653926
 M(Sign)          36  Pr>=|M|     0.0001    Mode      2.639057
 Sgn Rank       1314  Pr>=|S|     0.0001
 W:Normal   0.966883  Pr<W        0.1640

       Stem Leaf                      #          Boxplot                               Normal Probability Plot
         44 4                         1             0                 4.5+                                                   *+
         42                                                              |                                                +++
         40 869                       3             |                    |                                           * *+*+
         38 3357                      4             |                    |                                       ****++
         36 416                       3             |                    |                                    ***++
         34 08                        2             |                    |                                 **+
         32 22226377                  8          +-----+                 |                              +***
         30 0444999488               10          |     |          3.1+                              ****
         28 339                       3          |  +  |                 |                           ++**
         26 4444444411111117777      19          *-----*                 |                      *******
         24 00888666                  8          +-----+                 |                   ***+
         22 047                       3             |                    |                 **+
         20 14403                     5             |                    |            **+**
         18 0                         1             |                    |          *++
         16 56                        2             |                 1.7+ *    *++
            ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                              -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Surface ANALYSIS=Potassium ------------------------------------------------

                                                     All Observations
Variable=LNVALUE

                 Moments                                      Quantiles(Def=5)                                   Extremes

 N               75  Sum Wgts        75     100% Max  7.640123        99%  7.640123        Lowest     ID     Highest    ID
 Mean      6.198335  Sum       464.8751      75% Q3   6.473891        95%  6.975414       4.70048(  14147) 6.838405(  14016)
 Std Dev   0.493563  Variance  0.243604      50% Med  6.224558        90%  6.714171      4.859812(   5050) 6.975414(  14167)
 Skewness  -0.12675  Kurtosis  1.872826      25% Q1   5.971262        10%  5.616771      5.293305(  14019) 7.130899(   5103)
 USS       2899.478  CSS        18.0267       0% Min   4.70048         5%  5.361292      5.361292(  14157) 7.533694(  14165)
 CV        7.962826  Std Mean  0.056992                                1%   4.70048      5.370638(  14164) 7.640123(  14166)
 T:Mean=0  108.7586  Pr>|T|      0.0001     Range     2.939643
 Num ^= 0        75  Num > 0         75     Q3-Q1     0.502629
 M(Sign)       37.5  Pr>=|M|     0.0001     Mode       4.70048
 Sgn Rank      1425  Pr>=|S|     0.0001
 W:Normal  0.965974  Pr<W        0.1350

      Stem Leaf                     #             Boxplot                                 Normal Probability Plot
        76 4                        1                0               7.7+                                                 *
        74 3                        1                0                   |                                             *    +
        72                                                               |                                              ++++
        70 3                        1                |               7.1+                                          +*++
        68 48                       2                |                   |                                     ++*+*
        66 013360149                9                |                   |                                 +*****
        64 0179149                  7             +-----+            6.5+                              +****
        62 1223445600122245789     19             *--+--*                |                        ********
        60 0112235666801369        16             |     |                |                   ******+
        58 79123457                 8             +-----+            5.9+               *****+
        56 2309                     4                |                   |            ***++
        54 5                        1                |                   |         ++*+
        52 9678                     4                |               5.3+     ++** **
        50                                                               | ++++
        48 6                        1                0                   |+    *
        46 0                        1                0               4.7+ *
           ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                                -2        -1         0        +1        +2

                                                     Detected Observations
Variable=LNVALUE

                 Moments                                      Quantiles(Def=5)                                   Extremes

 N               60  Sum Wgts        60     100% Max  7.640123        99%  7.640123        Lowest     ID     Highest    ID
 Mean      6.297506  Sum       377.8504      75% Q3    6.52275        95%  7.053156      4.859812(   5050) 6.838405(  14016)
 Std Dev   0.453496  Variance  0.205658      50% Med  6.301699        90%  6.765308      5.361292(  14157) 6.975414(  14167)
 Skewness  0.074889  Kurtosis  2.508452      25% Q1   6.068401        10%  5.879056      5.370638(  14164) 7.130899(   5103)
 USS       2391.649  CSS       12.13384       0% Min  4.859812         5%   5.49913      5.627621(  14029) 7.533694(  14165)
 CV        7.201194  Std Mean  0.058546                                1%  4.859812       5.78996(  14044) 7.640123(  14166)
 T:Mean=0   107.565  Pr>|T|      0.0001     Range     2.780311
 Num ^= 0        60  Num > 0         60     Q3-Q1     0.454348
 M(Sign)         30  Pr>=|M|     0.0001     Mode      4.859812
 Sgn Rank       915  Pr>=|S|     0.0001
 W:Normal  0.956891  Pr<W        0.0729

      Stem Leaf                     #             Boxplot                                 Normal Probability Plot
        76 4                        1                0               7.7+                                                *
        74 3                        1                0                   |                                            *     +
        72                                                               |                                             +++++
        70 3                        1                |                   |                                         +*++
        68 48                       2                |                   |                                     ++*+*
        66 01336049                 8                |                   |                                ++*****
        64 0179149                  7             +-----+                |                            ++****
        62 1223445600122245789     19             *--+--*            6.3+                     **********
        60 0366801369              10             +-----+                |                 *****+
        58 791234                   6                |                   |            *****++
        56 39                       2                |                   |         **+++
        54                                                               |      ++++
        52 67                       2                0                   | +++++* *
        50                                                               |+
        48 6                        1                0               4.9+ *
           ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                                -2        -1         0        +1        +2
```

```
--------------------------------------------------- DEPTH=Surface ANALYSIS=Selenium ---------------------------------------------------

                                                            All Observations
Variable=LNVALUE

                  Moments                                     Quantiles(Def=5)                                  Extremes

 N                73  Sum Wgts        73       100% Max  3.218876       99%  3.218876        Lowest     ID      Highest     ID
 Mean       -1.06821  Sum       -77.9796        75% Q3  -0.65393       95%         0      -2.20727(  14164)         0(   5058)
 Std Dev    0.949024  Variance  0.900647        50% Med -1.10866       90%   -0.0202      -2.20727(  14159)         0(   5063)
 Skewness   1.395958  Kurtosis  4.529283        25% Q1  -1.89712       10%  -2.12026      -2.20727(  14157) 0.955511(  14165)
 USS        148.1456  CSS        64.8466         0% Min -2.20727        5%  -2.20727      -2.20727(  14147) 1.064711(  14166)
 CV         -88.8421  Std Mean  0.111075                                1%  -2.20727      -2.20727(  14143) 3.218876(  14167)
 T:Mean=0   -9.61706  Pr>|T|      0.0001       Range     5.426151
 Num ^= 0         69  Num > 0          3       Q3-Q1     1.243194
 M(Sign)       -31.5  Pr>=|M|     0.0001       Mode      -2.12026
 Sgn Rank    -1081.5  Pr>=|S|     0.0001
 W:Normal   0.885911  Pr<W        0.0001

      Stem Leaf                     #             Boxplot                                  Normal Probability Plot
         3 2                        1                *                3.25+                                                  *
         2                                                                |
         2                                                                |
         1                                                                |
         1 01                       2                |                    |                                           * ++++
         0                                           |                    |                                        +*+++
         0 0000                     4                |                    |                                    +****
        -0 4432222220              10                |                    |                               +****+* *
        -0 9888887777777776        16             +-----+                 |                           *******
        -1 333222211100            12             *--+--*                 |                       +****
        -1 9887665555              10             +-----+                 |                   ++*****
        -2 222222111111111110      18                |               -2.25+ *   * * ****+*+**
           ----+----+----+----+                                            +----+----+----+----+----+----+----+----+----+----+
                                                                              -2        -1         0        +1        +2

                                                            Detected Observations
Variable=LNVALUE

                  Moments                                     Quantiles(Def=5)                                  Extremes

 N                23  Sum Wgts        23       100% Max  3.218876       99%  3.218876        Lowest     ID      Highest     ID
 Mean       -0.57144  Sum       -13.1432        75% Q3  -0.30111       95%  1.064711      -1.83258(  14100) -0.22314(   5090)
 Std Dev    1.082079  Variance  1.170895        50% Med -0.79851       90%  0.955511      -1.60944(  14132)  -0.0202(  14090)
 Skewness   2.253151  Kurtosis  6.321306        25% Q1  -1.13943       10%  -1.51413      -1.51413(  14141) 0.955511(  14165)
 USS        33.27028  CSS       25.75969         0% Min -1.83258        5%  -1.60944      -1.34707(  14133) 1.064711(  14166)
 CV         -189.359  Std Mean  0.225629                                1%  -1.83258      -1.20397(  14026) 3.218876(  14167)
 T:Mean=0   -2.53267  Pr>|T|      0.0190       Range     5.051457
 Num ^= 0         23  Num > 0          3       Q3-Q1     0.838329
 M(Sign)        -8.5  Pr>=|M|     0.0005       Mode      -0.79851
 Sgn Rank        -89  Pr>=|S|     0.0041
 W:Normal   0.772813  Pr<W        0.0001

      Stem Leaf                     #             Boxplot                                  Normal Probability Plot
         3 2                        1                *                 3.5+                                         *
         2                                                                |                                                  ++
         1 01                       2                0                    |                                         *++++++++
         0                                           |                    |                                 +++++++*++
        -0 88887777320             11             +--+--+                 |                         ****+***++*** *
        -1 865321110                9             +-----+              -1.5+      *    * +*++*****+*
           ----+----+----+----+                                            +----+----+----+----+----+----+----+----+----+----+
                                                                              -2        -1         0        +1        +2
```

-- DEPTH=Surface ANALYSIS=Silver --

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	0.502246	Sum	37.66841
Std Dev	0.615645	Variance	0.379019
Skewness	1.690349	Kurtosis	9.267959
USS	46.96622	CSS	28.04743
CV	122.5786	Std Mean	0.071089
T:Mean=0	7.065063	Pr>|T|	0.0001
Num ^= 0	74	Num > 0	61
M(Sign)	24	Pr>=|M|	0.0001
Sgn Rank	1124.5	Pr>=|S|	0.0001
W:Normal	0.883408	Pr<W	0.0001

Quantiles(Def=5)

100% Max	3.73767	99%	3.73767
75% Q3	0.832909	95%	1.193922
50% Med	0.530628	90%	0.993252
25% Q1	0.182322	10%	-0.18633
0% Min	-0.71335	5%	-0.4943
		1%	-0.71335
Range	4.45102		
Q3-Q1	0.650588		
Mode	0.182322		

Extremes

Lowest	ID	Highest	ID
-0.71335(	14032)	1.098612(	14140)
-0.63488(	14033)	1.193922(	14041)
-0.51083(	14010)	1.410987(	14167)
-0.4943(	14036)	1.568616(	14003)
-0.47804(	14016)	3.73767(	14090)

```
      Stem Leaf                     #             Boxplot                                  Normal Probability Plot
        36 4                        1                *                   3.7+                                                 *
        34                                                                  |
        32                                                                  |
        30                                                                  |
        28                                                                  |
        26                                                                  |
        24                                                                  |
        22                                                                  |
        20                                                                  |                                                  +
        18                                                                  |                                               +++
        16                                                                  |                                           ++++
        14 17                       2                |                   1.5+                                        +++* *
        12                                           |                      |                                     +++
        10 0009                     4                |                      |                                  +++  ** *
         8 3333333338882699        16             +-----+                   |                              ********
         6 44444449999             11             |     |                   |                          ****
         4 11177773399             11             *--+--*                   |                       ****
         2 66664                    5             |     |                   |                     **+
         0 000888888888            12             +-----+                   |                ****
        -0 944544                   6                |                      |            ****+
        -2 9                        1                |                      |           *++
        -4 1980                     4                |                      |       **+**
        -6 13                       2                |                  -0.7+ *  +*++
           ----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                              -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	35	Sum Wgts	35
Mean	0.764968	Sum	26.77387
Std Dev	0.619012	Variance	0.383176
Skewness	3.420371	Kurtosis	15.67779
USS	33.50912	CSS	13.02797
CV	80.91998	Std Mean	0.104632
T:Mean=0	7.311025	Pr>|T|	0.0001
Num ^= 0	35	Num > 0	35
M(Sign)	17.5	Pr>=|M|	0.0001
Sgn Rank	315	Pr>=|S|	0.0001
W:Normal	0.684464	Pr<W	0.0001

Quantiles(Def=5)

100% Max	3.73767	99%	3.73767
75% Q3	0.916291	95%	1.568616
50% Med	0.641854	90%	1.193922
25% Q1	0.405465	10%	0.262364
0% Min	0.182322	5%	0.182322
		1%	0.182322
Range	3.555348		
Q3-Q1	0.510826		
Mode	0.470004		

Extremes

Lowest	ID	Highest	ID
0.182322(	14157)	1.098612(	14140)
0.182322(	14103)	1.193922(	14041)
0.182322(	14102)	1.410987(	14167)
0.262364(	14156)	1.568616(	14003)
0.262364(	14100)	3.73767(	14090)

```
      Stem Leaf                     #             Boxplot                                  Normal Probability Plot
         3 7                        1                *                  3.75+                                              *
         3                                                                  |
         2                                                                  |
         2                                                                  |                                             ++++++
         1 6                        1                |                      |                                     +++++*++
         1 000124                   6                |                      |                             +++++++* **
         0 555555666688888999      18             +--+--+                   |                     +***+*+*** ***
         0 222333444                9             +-----+               0.25+     *  *  **++**+***++
           ----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
                                                                                -2        -1         0        +1        +2
```

```
---------------------------------------------------- DEPTH=Surface ANALYSIS=Sodium ----------------------------------------------------

                                                          All Observations
Variable=LNVALUE

                  Moments                                     Quantiles(Def=5)                                   Extremes

N               75  Sum Wgts         75     100% Max  6.429719      99%  6.429719       Lowest     ID     Highest     ID
Mean      4.384467  Sum         328.835      75% Q3   4.736198      95%  5.758902     3.218876(  14147) 5.743003(   5096)
Std Dev   0.688198  Variance   0.473616      50% Med   4.26268      90%  5.420535     3.258097(  14131) 5.758902(   5127)
Skewness  0.929173  Kurtosis   0.662338      25% Q1   3.912023      10%  3.610918     3.433987(  14132) 5.840642(  14041)
USS       1476.814  CSS        35.04762       0% Min  3.218876       5%  3.465736     3.465736(  14157)  6.25575(  14047)
CV        15.69628  Std Mean   0.079466                              1%  3.218876     3.526361(   5114) 6.429719(  14165)
T:Mean=0  55.17394  Pr>|T|       0.0001     Range     3.210844
Num ^= 0        75  Num > 0          75     Q3-Q1     0.824175
M(Sign)       37.5  Pr>=|M|      0.0001     Mode      3.912023
Sgn Rank      1425  Pr>=|S|      0.0001
W:Normal  0.930839  Pr<W         0.0005

       Stem Leaf                     #             Boxplot                          Normal Probability Plot
         64 3                        1                0            6.5+                                                   *
         62 6                        1                0               |                                               *
         60                                                          |                                                    ++
         58 4                        1                |              |                                           *  +++
         56 246                      3                |              |                                       ** *+++
         54 25                       2                |              |                                      **+++
         52 128                      3                |              |                                    **++
         50 6                        1                |              |                                  +*+
         48 1462                     4                |          4.9+                                +***
         46 1512458                  7             +-----+           |                             +****
         44 1238                     4             |     |           |                          +++**
         42 5668223468899           13             *--+--*           |                       +*****
         40 33613336777             11             |     |           |                    +****
         38 1111111377              10             +-----+           |                *****
         36 1911668                  7                |              |            *****
         34 37388                    5                |              |       **  **++
         32 26                       2                |          3.3+ *    *  +++
            ----+----+----+----+                                      +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                        -2        -1         0        +1        +2

                                                          Detected Observations
Variable=LNVALUE

                  Moments                                     Quantiles(Def=5)                                   Extremes

N               56  Sum Wgts         56     100% Max  6.429719      99%  6.429719       Lowest     ID     Highest     ID
Mean       4.46966  Sum         250.301      75% Q3   4.824233      95%  5.840642     3.218876(  14147) 5.624018(  14040)
Std Dev   0.700345  Variance   0.490483      50% Med  4.317488      90%   5.55296     3.465736(  14157) 5.743003(   5096)
Skewness  0.915341  Kurtosis    0.49616      25% Q1   3.970292      10%    3.7612     3.526361(   5114) 5.840642(  14041)
USS       1145.737  CSS        26.97658       0% Min  3.218876       5%  3.526361     3.713572(  14164)  6.25575(  14047)
CV        15.66887  Std Mean   0.093588                              1%  3.218876     3.713572(   5099) 6.429719(  14165)
T:Mean=0  47.75913  Pr>|T|       0.0001     Range     3.210844
Num ^= 0        56  Num > 0          56     Q3-Q1     0.853941
M(Sign)         28  Pr>=|M|      0.0001     Mode      3.912023
Sgn Rank       798  Pr>=|S|      0.0001
W:Normal  0.928836  Pr<W         0.0031

       Stem Leaf                     #             Boxplot                          Normal Probability Plot
         64 3                        1                0            6.5+                                                  *
         62 6                        1                0               |                                              *    +
         60                                                          |                                                  +++
         58 4                        1                |              |                                             * +++
         56 24                       2                |              |                                         ** ++
         54 25                       2                |              |                                        **+++
         52 128                      3                |              |                                     ***++
         50 6                        1                |              |                                    +*+
         48 1462                     4             +-----+       4.9+                                 +***
         46 258                      3             |     |           |                              +++**
         44 238                      3             |  +  |           |                            ++ **
         42 566822346889            12             *-----*           |                         +******
         40 36133367                 8             |     |           |                      *****
         38 1111377                  7             +-----+           |                   ****
         36 11668                    5                |              |              ****+*+
         34 73                       2                |              |          * *  +++
         32 2                        1                |          3.3+  *    +++
            ----+----+----+----+                                      +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                        -2        -1         0        +1        +2
```

```
-------------------------------------------- DEPTH=Surface ANALYSIS=Thallium --------------------------------------------

                                                  All Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                              Extremes

N                74  Sum Wgts         74      100% Max  2.302585      99%  2.302585       Lowest     ID     Highest     ID
Mean       -0.71789  Sum        -53.1239       75% Q3   -0.22314      95%  0.262364     -1.51413(  14159) 0.182322(  14029)
Std Dev    0.714457  Variance   0.510449       50% Med  -0.68325      90%   0.09531     -1.51413(  14157) 0.262364(  14040)
Skewness   1.026079  Kurtosis   2.518581       25% Q1   -1.38629      10%  -1.46968     -1.51413(  14147) 0.262364(  14041)
USS        75.39989  CSS         37.2628        0% Min  -1.51413       5%  -1.51413     -1.51413(  14101) 0.336472(  14166)
CV         -99.5218  Std Mean   0.083054                               1%  -1.51413     -1.46968(  14156) 2.302585(  14000)
T:Mean=0   -8.64366  Pr>|T|       0.0001      Range     3.816713
Num ^= 0         74  Num > 0          11      Q3-Q1     1.163151
M(Sign)         -26  Pr>=|M|      0.0001      Mode      -0.22314
Sgn Rank    -1206.5  Pr>=|S|      0.0001
W:Normal   0.856328  Pr<W         0.0001

      Stem Leaf                     #             Boxplot                              Normal Probability Plot
        22 0                        1                0              2.3+                                                   *
        20                                                             |
        18                                                             |
        16                                                             |
        14                                                             |
        12                                                             |
        10                                                             |                                                    +
         8                                                             |                                                 +++
         6                                                             |                                              +++
         4                                                             |                                           +++
         2 664                      3                |                 |                                        +++ ** *
         0 0000888                  7                |                 |                                      *** *
        -0 611                      3                |                 |                                   +**
        -2 666666665222222222      18             +-----+              |                              *******
        -4 2                        1             |     |              |                            **++
        -6 397720                   6             *--+--*              |                          ***
        -8 972                      3             |     |              |                        +**
       -10 2                        1             |     |              |                     +++ *
       -12 9999999557740           13             +-----+              |                  ++******
       -14 111177777773333333      18                |             -1.5+ *     * ** * *+****
           ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                          -2        -1         0        +1        +2
```

```
                                                  Detected Observations
Variable=LNVALUE

                 Moments                                  Quantiles(Def=5)                              Extremes

N                13  Sum Wgts         13      100% Max  0.336472      99%  0.336472       Lowest     ID     Highest     ID
Mean       -0.86639  Sum        -11.2631       75% Q3   -0.82098      95%  0.336472     -1.38629(  14169)  -0.8675(  14175)
Std Dev    0.623782  Variance   0.389104       50% Med  -1.20397      90%   0.09531     -1.38629(  14148) -0.82098(  14176)
Skewness   1.177121  Kurtosis   -0.20197       25% Q1   -1.27297      10%  -1.38629     -1.34707(   5127)  0.09531(  14165)
USS        14.42748  CSS        4.669252        0% Min  -1.38629       5%  -1.38629     -1.27297(  14168)  0.09531(  14167)
CV         -71.9978  Std Mean   0.173006                               1%  -1.38629     -1.27297(  14164) 0.336472(  14166)
T:Mean=0   -5.00786  Pr>|T|       0.0003      Range     1.722767
Num ^= 0         13  Num > 0           3      Q3-Q1     0.451985
M(Sign)        -3.5  Pr>=|M|      0.0923      Mode      -1.38629
Sgn Rank      -39.5  Pr>=|S|      0.0032
W:Normal   0.774284  Pr<W         0.0028

      Stem Leaf                     #             Boxplot                              Normal Probability Plot
         2 4                        1                0              0.3+                                              *+++
         0 00                       2                0                 |                                   *    * ++++
        -0                                                             |                                       +++
        -2                                                             |                                    +++
        -4                                                        -0.5+                                 +++
        -6                                                             |                             +++
        -8 972                      3             +--+--+              |                         ++++* * *
       -10                                        |     |              |                      +++
       -12 9957740                  7             *-----*         -1.3+         *     *    *+*    * *
           ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                          -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Surface ANALYSIS=Vanadium ------------------------------------------------

                                                    All Observations
Variable=LNVALUE

                Moments                              Quantiles(Def=5)                                Extremes

N                75  Sum Wgts        75    100% Max  4.248495      99%  4.248495        Lowest     ID     Highest     ID
Mean         3.0374  Sum        227.805     75% Q3   3.332205      95%   3.73767      0.832909(   14147) 3.637586(   14169)
Std Dev    0.610664  Variance  0.372911     50% Med  3.091042      90%  3.583519      0.832909(   14040)  3.73767(   14090)
Skewness   -1.75089  Kurtosis  4.723443     25% Q1   2.890372      10%  2.484907      1.098612(   14041) 4.060443(   14167)
USS        719.5303  CSS       27.59541      0% Min  0.832909       5%  1.526056      1.526056(   14016) 4.110874(   14165)
CV         20.10484  Std Mean  0.070513                             1%  0.832909      1.987874(   14006) 4.248495(   14166)
T:Mean=0   43.07547  Pr>|T|      0.0001    Range     3.415586
Num ^= 0         75  Num > 0         75    Q3-Q1     0.441833
M(Sign)        37.5  Pr>=|M|     0.0001    Mode      3.044522
Sgn Rank       1425  Pr>=|S|     0.0001
W:Normal   0.837246  Pr<W        0.0001

       Stem Leaf                     #             Boxplot                              Normal Probability Plot
         42 5                        1                0               4.3+                                                 +++ *
         40 61                       2                0                  |                                             ++*+*
         38                                                              |                                          +++
         36 1444                     4                |                  |                                      +++ *  *
         34 003770368                9                |                  |                                   ++******
         32 2222666000000377        16             +-----+               |                               ******
         30 00044444499999948888    20             *--+--*               |                         ******+
         28 039999444                9             +-----+               |                     *****+++
         26 4177                     4                |                  |                  *** ++++
         24 0886                     4                |                  |                 ***+++
         22                                                              |               *+++
         20 6                        1                0                  |             ++*
         18 9                        1                0                  |        ++++ *
         16                                                              |   +++
         14 3                        1                *                  |++        *
         12                                                              |
         10 0                        1                *                  |         *
          8 33                       2                *               0.9+ *    *
            ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                            -2        -1         0        +1        +2
```

```
                                                    Detected Observations
Variable=LNVALUE

                Moments                              Quantiles(Def=5)                                Extremes

N                75  Sum Wgts        75    100% Max  4.248495      99%  4.248495        Lowest     ID     Highest     ID
Mean         3.0374  Sum        227.805     75% Q3   3.332205      95%   3.73767      0.832909(   14147) 3.637586(   14169)
Std Dev    0.610664  Variance  0.372911     50% Med  3.091042      90%  3.583519      0.832909(   14040)  3.73767(   14090)
Skewness   -1.75089  Kurtosis  4.723443     25% Q1   2.890372      10%  2.484907      1.098612(   14041) 4.060443(   14167)
USS        719.5303  CSS       27.59541      0% Min  0.832909       5%  1.526056      1.526056(   14016) 4.110874(   14165)
CV         20.10484  Std Mean  0.070513                             1%  0.832909      1.987874(   14006) 4.248495(   14166)
T:Mean=0   43.07547  Pr>|T|      0.0001    Range     3.415586
Num ^= 0         75  Num > 0         75    Q3-Q1     0.441833
M(Sign)        37.5  Pr>=|M|     0.0001    Mode      3.044522
Sgn Rank       1425  Pr>=|S|     0.0001
W:Normal   0.837246  Pr<W        0.0001

       Stem Leaf                     #             Boxplot                              Normal Probability Plot
         42 5                        1                0               4.3+                                                 +++ *
         40 61                       2                0                  |                                             ++*+*
         38                                                              |                                          +++
         36 1444                     4                |                  |                                      +++ *  *
         34 003770368                9                |                  |                                   ++******
         32 2222666000000377        16             +-----+               |                               ******
         30 00044444499999948888    20             *--+--*               |                         ******+
         28 039999444                9             +-----+               |                     *****+++
         26 4177                     4                |                  |                  *** ++++
         24 0886                     4                |                  |                 ***+++
         22                                                              |               *+++
         20 6                        1                0                  |             ++*
         18 9                        1                0                  |        ++++ *
         16                                                              |   +++
         14 3                        1                *                  |++        *
         12                                                              |
         10 0                        1                *                  |         *
          8 33                       2                *               0.9+ *    *
            ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                            -2        -1         0        +1        +2
```

-------- DEPTH=Surface ANALYSIS=Zinc --------

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	4.011788	Sum	300.8841
Std Dev	0.649062	Variance	0.421282
Skewness	0.670238	Kurtosis	1.06482
USS	1238.258	CSS	31.17484
CV	16.17887	Std Mean	0.074947
T:Mean=0	53.52817	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.960895	Pr<W	0.0668

Quantiles(Def=5)

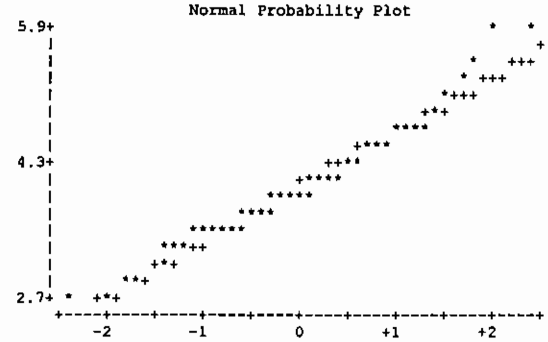
100% Max	5.966147	99%	5.966147
75% Q3	4.418841	95%	5.283204
50% Med	3.951244	90%	4.70048
25% Q1	3.555348	10%	3.332205
0% Min	2.70805	5%	2.995732
		1%	2.70805
Range	3.258097		
Q3-Q1	0.863493		
Mode	3.931826		

Extremes

Lowest	ID	Highest	ID
2.70805(	14142)	5.043425(	14138)
2.772589(	5084)	5.283204(	14019)
2.833213(	14157)	5.429346(	14167)
2.995732(	14016)	5.958425(	14020)
2.995732(	14000)	5.966147(	14090)

```
Stem Leaf                     #     Boxplot
  58 67                       2        0
  56
  54 3                        1        |
  52 8                        1        |
  50 4                        1        |
  48 63                       2        |
  46 0122260                  7        |
  44 27012                    5     +-----+
  42 00223                    5     |     |
  40 1369133477              10     |  +  |
  38 379133335579            12     *-----*
  36 01691448                 8     |     |
  34 33770033668             11     +-----+
  32 3377                     4        |
  30 008                      3        |
  28 3                        1        |
  26 17                       2        |
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Variable=LNVALUE

Moments

N	74	Sum Wgts	74
Mean	4.013136	Sum	296.9721
Std Dev	0.653387	Variance	0.426914
Skewness	0.659952	Kurtosis	1.007902
USS	1222.954	CSS	31.16475
CV	16.2812	Std Mean	0.075955
T:Mean=0	52.83593	Pr>|T|	0.0001
Num ^= 0	74	Num > 0	74
M(Sign)	37	Pr>=|M|	0.0001
Sgn Rank	1387.5	Pr>=|S|	0.0001
W:Normal	0.961556	Pr<W	0.0761

Quantiles(Def=5)

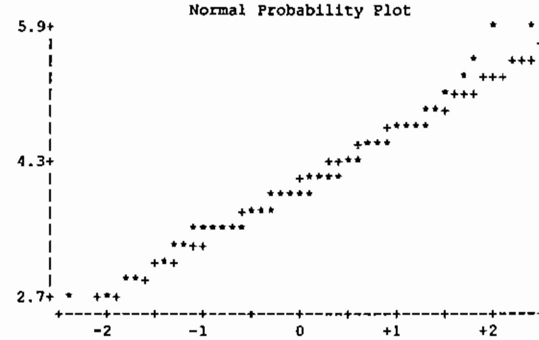
100% Max	5.966147	99%	5.966147
75% Q3	4.418841	95%	5.283204
50% Med	3.951244	90%	4.70048
25% Q1	3.555348	10%	3.332205
0% Min	2.70805	5%	2.995732
		1%	2.70805
Range	3.258097		
Q3-Q1	0.863493		
Mode	3.931826		

Extremes

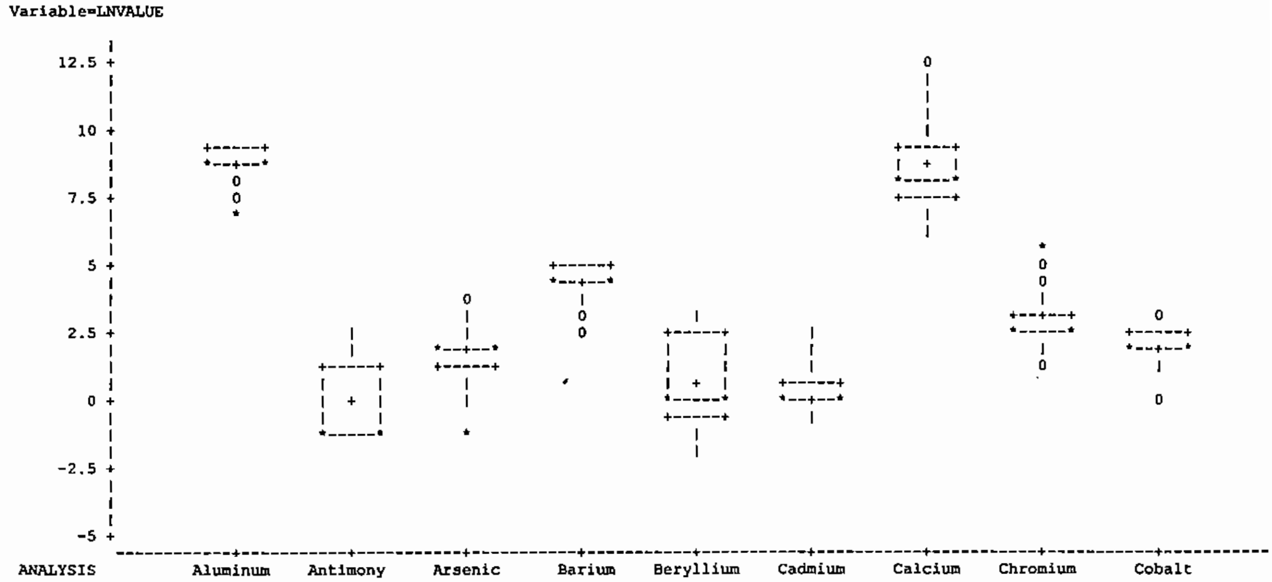
Lowest	ID	Highest	ID
2.70805(	14142)	5.043425(	14138)
2.772589(	5084)	5.283204(	14019)
2.833213(	14157)	5.429346(	14167)
2.995732(	14016)	5.958425(	14020)
2.995732(	14000)	5.966147(	14090)

```
Stem Leaf                     #     Boxplot
  58 67                       2        0
  56
  54 3                        1        |
  52 8                        1        |
  50 4                        1        |
  48 63                       2        |
  46 0122260                  7        |
  44 27012                    5     +-----+
  42 00223                    5     |     |
  40 1369133477              10     |  +  |
  38 37933335579             11     *-----*
  36 01691448                 8     |     |
  34 33770033668             11     +-----+
  32 3377                     4        |
  30 008                      3        |
  28 3                        1        |
  26 17                       2        |
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

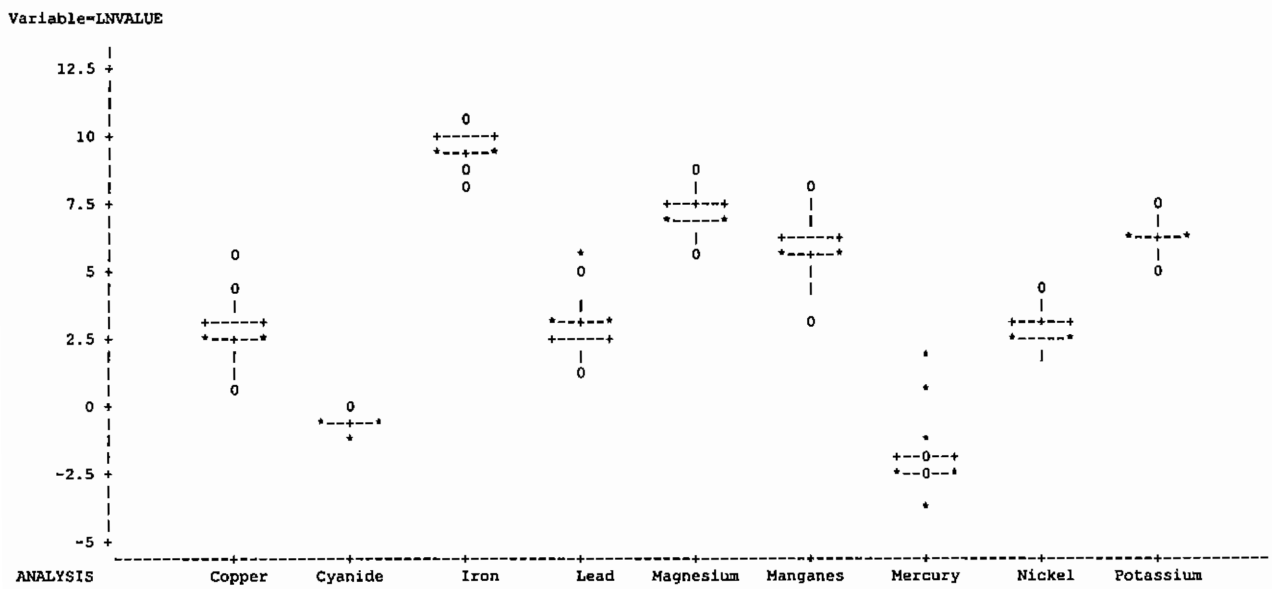
Normal Probability Plot



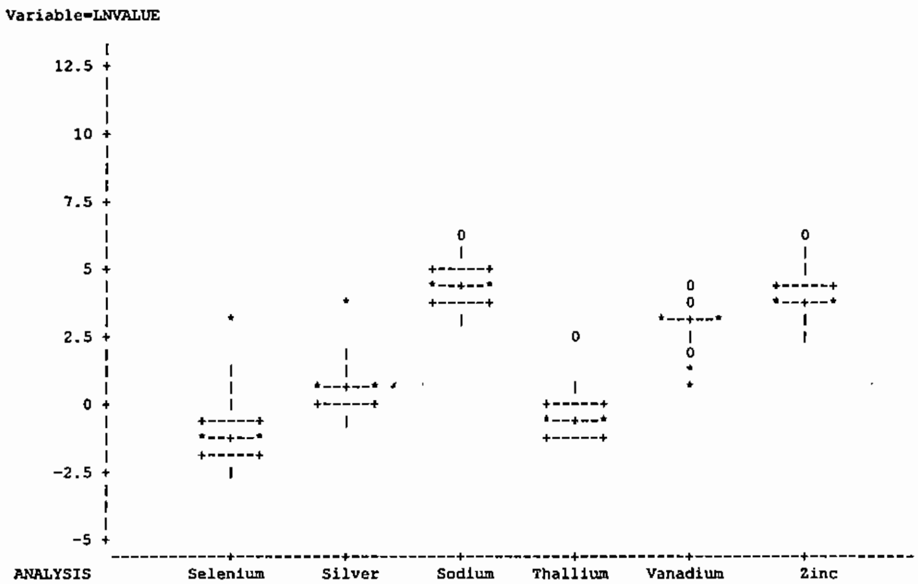
All Observations - Surface
Schematic Plots



All Observations - Surface
Schematic Plots

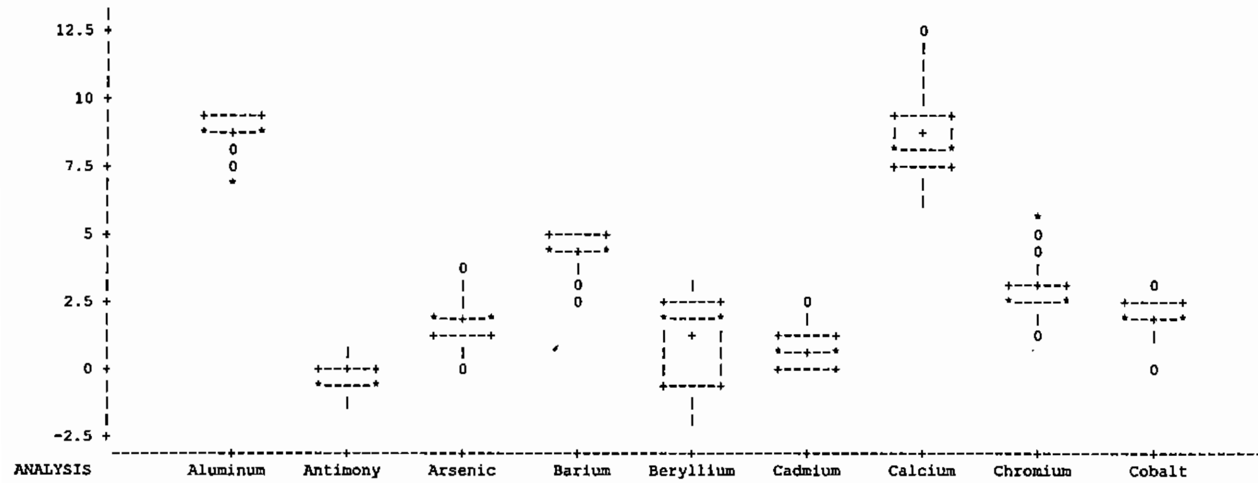


All Observations - Surface
Schematic Plots



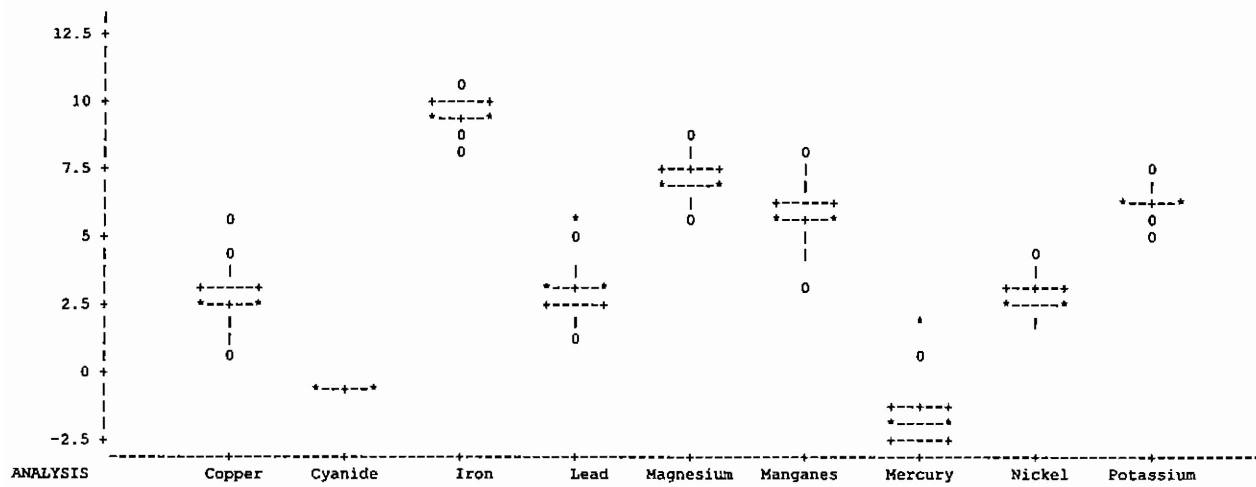
Detected Observations - Surface
Schematic Plots

Variable=LNVALUE



Detected Observations - Surface
Schematic Plots

Variable=LNVALUE



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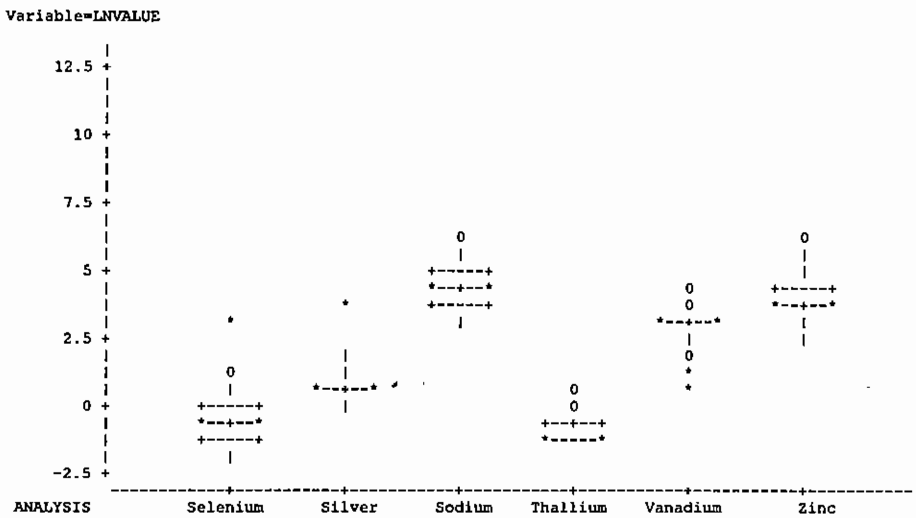
Detected Observations - Surface
Schematic Plots



```
--------------------------------------------- DEPTH=Subsurface ANALYSIS=Aluminum ---------------------------------------------

                                                      All Observations
Variable=LNVALUE

                Moments                                   Quantiles(Def=5)                                  Extremes

N                662  Sum Wgts       662     100% Max  10.67128       99%  9.758462       Lowest     ID     Highest     ID
Mean        8.354939  Sum        5530.97      75% Q3   8.947676       95%  9.392662     5.068904(   4224) 9.857444(   14189)
Std Dev     0.858224  Variance  0.736548      50% Med   8.52218       90%  9.249561     5.159055(  13282) 10.48849(   14191)
Skewness    -0.96477  Kurtosis  1.214443      25% Q1   7.897296       10%  7.162397     5.288267(  13181) 10.54006(   14194)
USS         46697.77  CSS       486.8581       0% Min  5.068904        5%  6.721426     5.332719(  13284) 10.62376(   14192)
CV          10.27205  Std Mean  0.033356                               1%  5.762051     5.616771(  13283) 10.67128(   14193)
T:Mean=0    250.4793  Pr>|T|      0.0001     Range     5.602374
Num ^= 0         662  Num > 0        662     Q3-Q1      1.05038
M(Sign)          331  Pr>=|M|     0.0001     Mode      7.565275
Sgn Rank    109726.5  Pr>=|S|     0.0001
W:Normal     0.93139  Pr<W        0.0001

               Histogram                         #   Boxplot                    Normal Probability Plot
 10.75+*                                         3     0        10.75+                                                  *
      .*                                         1     |             |                                             +++++*
      .****                                     16     |             |                                       +++++*******
      .*********************************       132     |             |                              *************
      .**********************************************  184  +-----+     |                       ********
      .************************************    142  |  +  |     |                 *******+
      .********************                     77  +-----+     |             *****+
      .***************                          58     |             |        +*****
      .******                                   21     |             |  +++++***
      .****                                     14     0             |++++ ****
      .***                                      10     0             |*****
  5.25+*                                         4     0         5.25+*
       ----+----+----+----+----+----+----+----+--                     +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 4 counts                                       -2        -1         0        +1        +2
```

```
                                                    Detected Observations
Variable=LNVALUE

                Moments                                   Quantiles(Def=5)                                  Extremes

N                662  Sum Wgts       662     100% Max  10.67128       99%  9.758462       Lowest     ID     Highest     ID
Mean        8.354939  Sum        5530.97      75% Q3   8.947676       95%  9.392662     5.068904(   4224) 9.857444(   14189)
Std Dev     0.858224  Variance  0.736548      50% Med   8.52218       90%  9.249561     5.159055(  13282) 10.48849(   14191)
Skewness    -0.96477  Kurtosis  1.214443      25% Q1   7.897296       10%  7.162397     5.288267(  13181) 10.54006(   14194)
USS         46697.77  CSS       486.8581       0% Min  5.068904        5%  6.721426     5.332719(  13284) 10.62376(   14192)
CV          10.27205  Std Mean  0.033356                               1%  5.762051     5.616771(  13283) 10.67128(   14193)
T:Mean=0    250.4793  Pr>|T|      0.0001     Range     5.602374
Num ^= 0         662  Num > 0        662     Q3-Q1      1.05038
M(Sign)          331  Pr>=|M|     0.0001     Mode      7.565275
Sgn Rank    109726.5  Pr>=|S|     0.0001
W:Normal     0.93139  Pr<W        0.0001

               Histogram                         #   Boxplot                    Normal Probability Plot
 10.75+*                                         3     0        10.75+                                                  *
      .*                                         1     |             |                                             +++++*
      .****                                     16     |             |                                       +++++*******
      .*********************************       132     |             |                              *************
      .**********************************************  184  +-----+     |                       ********
      .************************************    142  |  +  |     |                 *******+
      .********************                     77  +-----+     |             *****+
      .***************                          58     |             |        +*****
      .******                                   21     |             |  +++++***
      .****                                     14     0             |++++ ****
      .***                                      10     0             |*****
  5.25+*                                         4     0         5.25+*
       ----+----+----+----+----+----+----+----+--                     +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 4 counts                                       -2        -1         0        +1        +2
```

--- DEPTH=Subsurface ANALYSIS=Antimony ---

All Observations

Variable=LNVALUE

Moments

N	533	Sum Wgts	533
Mean	1.549561	Sum	825.9159
Std Dev	0.765183	Variance	0.585506
Skewness	-0.32897	Kurtosis	0.727821
USS	1591.296	CSS	311.489
CV	49.38066	Std Mean	0.033144
T:Mean=0	46.7527	Pr>|T|	0.0001
Num ^= 0	533	Num > 0	523
M(Sign)	256.5	Pr>=|M|	0.0001
Sgn Rank	70145.5	Pr>=|S|	0.0001
W:Normal	0.916825	Pr<W	0.0001

Quantiles(Def=5)

100% Max	3.806662	99%	3.005683
75% Q3	2.397895	95%	2.587764
50% Med	1.526056	90%	2.564949
25% Q1	1.252763	10%	0.587787
0% Min	-1.10866	5%	0.530628
		1%	-0.96758
Range	4.915325		
Q3-Q1	1.145132		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
-1.10866(	14185)	3.039749(	13005)
-1.04982(	14188)	3.044522(	13152)
-1.04982(	14187)	3.091042(	14194)
-0.99425(	14196)	3.258097(	14191)
-0.96758(	14197)	3.806662(	14192)

```
                  Histogram                              #      Boxplot
   3.9+*                                                 1         |
      .                                                            |
      .                                                            |
      .*                                                 1         |
      .*                                                 4         |
   2.9+**                                                8         |
      .**                                                8         |
      .****************************                    110         |
      .*                                                 2      +-----+
      .*                                                 2      |     |
   1.9+*                                                 3      |     |
      .**************                                   56      |     |
      .***************************************         156      *--+--*
      .***************                                  59      +-----+
      .**                                                7         |
   0.9+*                                                 2         |
      .*************                                    49         |
      .**************                                   54         |
      .*                                                 1         |
      .                                                            |
  -0.1+*                                                 1         |
      .
      .
      .
      .**                                                6         0
  -1.1+*                                                 3         0
       ----+----+----+----+----+----+----+----
       * may represent up to 4 counts
```

```
                  Normal Probability Plot
   3.9+                                                        *
      |
      |                                                        +
      |                                                     +++*
      |                                                 +++ ***
   2.9+                                              ++ ***
      |                                           +++***
      |                                   ***********
      |                                   * +++
      |                                  +*+
   1.9+                                +++*
      |                             ++****
      |                        ********
      |                    ****++
      |                    ****+
   0.9+                  +*
      |                *****
      |       *********
      |      *  ++
      |     +++
  -0.1+   +*
      |+++
      |
      |
      |** *
  -1.1+*
       +----+----+----+----+----+----+----+----+----+----+
              -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	35	Sum Wgts	35
Mean	1.924065	Sum	67.34229
Std Dev	0.853164	Variance	0.727889
Skewness	0.136388	Kurtosis	-0.06107
USS	154.3192	CSS	24.74824
CV	44.34175	Std Mean	0.144211
T:Mean=0	13.34201	Pr>|T|	0.0001
Num ^= 0	35	Num > 0	34
M(Sign)	16.5	Pr>=|M|	0.0001
Sgn Rank	314	Pr>=|S|	0.0001
W:Normal	0.947518	Pr<W	0.1233

Quantiles(Def=5)

100% Max	3.806662	99%	3.806662
75% Q3	2.884801	95%	3.258097
50% Med	1.722767	90%	3.039749
25% Q1	1.526056	10%	0.875469
0% Min	-0.10536	5%	0.693147
		1%	-0.10536
Range	3.912023		
Q3-Q1	1.358744		
Mode	1.609438		

Extremes

Lowest	ID	Highest	ID
-0.10536(	14183)	3.005683(	13021)
0.693147(	13225)	3.039749(	13005)
0.741937(	4515)	3.091042(	14194)
0.875469(	4520)	3.258097(	14191)
0.916291(	13251)	3.806662(	14192)

```
   Stem Leaf                     #             Boxplot
      3 8                        1                |
      3 00013                    5                |
      2 7999                     4             +-----+
      2 00                       2             |     |
      1 5566666677778999        16             *--+--*
      1 33                       2                |
      0 7799                     4                |
      0                                           |
     -0 1                        1                |
        ----+----+----+----+
```

```
                  Normal Probability Plot
   3.75+                                                 ++*+++
       |                                             * **+++
       |                                        *****++
       |                                   +++++
   1.75+                          *************
       |                        *+++++
       |                  *++++*+
       |       ++++++
  -0.25++++ *
        +----+----+----+----+----+----+----+----+----+----+
               -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Subsurface ANALYSIS=Arsenic ------------------------------------------------

                                                    All Observations
Variable=LNVALUE

              Moments                                  Quantiles(Def=5)                                  Extremes

 N              662  Sum Wgts        662     100% Max   3.73767      99%  2.397895        Lowest    ID      Highest     ID
 Mean      0.615238  Sum        407.2877      75% Q3   1.252763      95%  1.987874      -1.83258(   4502)  2.70805(   5074)
 Std Dev   0.918381  Variance   0.843424      50% Med  0.693147      90%  1.757858      -1.66073(   4503) 2.772589(  14194)
 Skewness   -0.1426  Kurtosis   -0.51331      25% Q1   -0.07257      10%  -0.79851      -1.60944(   4414) 2.890372(  14191)
 USS        808.082  CSS        557.5031       0% Min  -1.83258       5%  -0.92887      -1.42712(   4456) 2.928524(  13002)
 CV        149.2725  Std Mean   0.035694                               1%   -1.1301        -1.1301(  13283)  3.73767(  14192)
 T:Mean=0  17.23651  Pr>|T|       0.0001     Range      5.570251
 Num ^= 0       656  Num > 0         486     Q3-Q1      1.325334
 M(Sign)        158  Pr>=|M|      0.0001     Mode       0.262364
 Sgn Rank   69443.5  Pr>=|S|      0.0001
 W:Normal  0.970615  Pr<W         0.0001

                 Histogram                       #             Boxplot                        Normal Probability Plot
   3.75+*                                        1                0               3.75+                                                  *
       .                                                                              |
       .**                                       5                |                   |                                              +++**
       .*******                                 27                |                   |                                          +*******
       .*********************                   84                |                   |                                    ********
       .*******************************        124             +-----+                |                             .  *******
       .**************************************  152             *--+--*                |                         ******+
       .*************************               99             |     |                |                    ******
       .******************                      70             +-----+                |               ++****
       .*********************                   82                |                   |        **********
       .****                                    15                |                   |*  *****+
  -1.75+*                                        3                |             -1.75+*+
        ----+----+----+----+----+----+----+---                                         +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                      -2        -1         0        +1        +2

                                                  Detected Observations
Variable=LNVALUE

              Moments                                  Quantiles(Def=5)                                  Extremes

 N              586  Sum Wgts        586     100% Max   3.73767      99%  2.541602        Lowest    ID      Highest     ID
 Mean      0.787582  Sum        461.5233      75% Q3   1.335001      95%   2.04122      -1.83258(   4502)  2.70805(   5074)
 Std Dev   0.812464  Variance   0.660098      50% Med  0.832909      90%  1.808289      -1.66073(   4503) 2.772589(  14194)
 Skewness  -0.14535  Kurtosis   0.046017      25% Q1   0.262364      10%  -0.35667      -1.60944(   4414) 2.890372(  14191)
 USS       749.6449  CSS        386.1572       0% Min  -1.83258       5%  -0.63488      -1.42712(   4456) 2.928524(  13002)
 CV        103.1592  Std Mean   0.033563                               1%  -1.04982      -1.10866(   4410)  3.73767(  14192)
 T:Mean=0  23.46609  Pr>|T|       0.0001     Range      5.570251
 Num ^= 0       580  Num > 0         481     Q3-Q1      1.072637
 M(Sign)        191  Pr>=|M|      0.0001     Mode       0.262364
 Sgn Rank   69563.5  Pr>=|S|      0.0001
 W:Normal  0.987611  Pr<W         0.7703

                 Histogram                       #             Boxplot                        Normal Probability Plot
   3.75+*                                        1                0               3.75+                                                  *
       .                                                                              |
       .**                                       5                |                   |                                                +***
       .*******                                 27                |                   |                                          +*******
       .*********************                   83                |                   |                                    ********
       .*******************************        123             +-----+                |                              *******
       .**************************************  149             *--+--*                |                        *******
       .*************************               99             +-----+                |                  *******
       .***************                         59                |                   |             ******
       .*********                               34                |                   |    *********
       .*                                        3                0                   |***
  -1.75+*                                        3                0             -1.75+*
        ----+----+----+----+----+----+----+---                                         +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                      -2        -1         0        +1        +2
```

```
----------------------------------------------- DEPTH=Subsurface ANALYSIS=Barium -----------------------------------------------

                                                       All Observations
Variable=LNVALUE

                 Moments                               Quantiles(Def=5)                                    Extremes

N              662  Sum Wgts        662     100% Max  6.487684      99%  5.831882          Lowest     ID     Highest     ID
Mean      3.699417  Sum        2449.014      75% Q3   4.442651      95%  5.099866        0.693147(  13284) 5.955837(  14189)
Std Dev   0.945365  Variance   0.893715      50% Med  3.688879      90%  4.859812        0.788457(  13039) 6.013715(  14193)
Skewness  -0.05124  Kurtosis   -0.37293      25% Q1   2.995732      10%  2.484907        1.410987(  13237) 6.228511(  14191)
USS       9650.668  CSS        590.7456       0% Min  0.693147       5%  2.128232        1.458615(   4517) 6.459904(  14194)
CV        25.55444  Std Mean   0.036743                              1%  1.648659        1.504077(  13282) 6.487684(  14192)
T:Mean=0  100.6845  Pr>|T|       0.0001     Range     5.794537
Num ^= 0       662  Num > 0         662     Q3-Q1     1.446919
M(Sign)        331  Pr>=|M|      0.0001     Mode      2.833213
Sgn Rank  109726.5  Pr>=|S|      0.0001
W:Normal  0.979701  Pr<W         0.0185

                  Histogram                       #             Boxplot                         Normal Probability Plot
   6.25+**                                        4                |               6.25+                                               *
       .***                                       9                |                   |                                          +*****
       .***********                              32                |                   |                                   +******
       .**************************************  109                |                   |                          *********
       .*************************************** 114             +-----+                |                     ******+
       .*************************************   106             *--+--*                |                 *****+
       .*************************************** 113             |     |                |            +*****
       .*************************************   107             +-----+                |       ********
       .****************                         48                |                   |  *******
       .******                                   16                |                   |*******+
       .*                                         2                |                   |*+
   0.75+*                                         2                0               0.75+*
        ----+----+----+----+----+----+----+---                                          +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 3 counts                                                      -2        -1         0        +1        +2
```

```
                                                     Detected Observations
Variable=LNVALUE

                 Moments                               Quantiles(Def=5)                                    Extremes

N              662  Sum Wgts        662     100% Max  6.487684      99%  5.831882          Lowest     ID     Highest     ID
Mean      3.699417  Sum        2449.014      75% Q3   4.442651      95%  5.099866        0.693147(  13284) 5.955837(  14189)
Std Dev   0.945365  Variance   0.893715      50% Med  3.688879      90%  4.859812        0.788457(  13039) 6.013715(  14193)
Skewness  -0.05124  Kurtosis   -0.37293      25% Q1   2.995732      10%  2.484907        1.410987(  13237) 6.228511(  14191)
USS       9650.668  CSS        590.7456       0% Min  0.693147       5%  2.128232        1.458615(   4517) 6.459904(  14194)
CV        25.55444  Std Mean   0.036743                              1%  1.648659        1.504077(  13282) 6.487684(  14192)
T:Mean=0  100.6845  Pr>|T|       0.0001     Range     5.794537
Num ^= 0       662  Num > 0         662     Q3-Q1     1.446919
M(Sign)        331  Pr>=|M|      0.0001     Mode      2.833213
Sgn Rank  109726.5  Pr>=|S|      0.0001
W:Normal  0.979701  Pr<W         0.0185

                  Histogram                       #             Boxplot                         Normal Probability Plot
   6.25+**                                        4                |               6.25+                                               *
       .***                                       9                |                   |                                          +*****
       .***********                              32                |                   |                                   +******
       .**************************************  109                |                   |                          *********
       .*************************************** 114             +-----+                |                     ******+
       .*************************************   106             *--+--*                |                 *****+
       .*************************************** 113             |     |                |            +*****
       .*************************************   107             +-----+                |       ********
       .****************                         48                |                   |  *******
       .******                                   16                |                   |*******+
       .*                                         2                |                   |*+
   0.75+*                                         2                0               0.75+*
        ----+----+----+----+----+----+----+---                                          +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 3 counts                                                      -2        -1         0        +1        +2
```

```
----------------------------------------------- DEPTH=Subsurface ANALYSIS=Beryllium -----------------------------------------------

                                                    All Observations
Variable=LNVALUE

                Moments                                 Quantiles(Def=5)                                 Extremes

 N               662  Sum Wgts        662     100% Max  3.218876     99%  0.587787        Lowest     ID      Highest     ID
 Mean        -0.6798  Sum        -450.028      75% Q3  -0.37106      95%  0.182322      -5.29832(   4187) 0.788457(   13152)
 Std Dev    0.663204  Variance    0.43984      50% Med -0.65393      90% -0.03046       -5.29832(   4185) 0.955511(    4274)
 Skewness   -1.24131  Kurtosis    12.9156      25% Q1    -0.8916     10% -1.30933       -4.19971(   4183) 2.484907(   14183)
 USS        596.6636  CSS        290.7344       0% Min -5.29832       5% -1.56065       -3.54046(  13037) 2.833213(   14182)
 CV         -97.5587  Std Mean   0.025776                             1% -3.44202       -3.50656(  13038) 3.218876(   14184)
 T:Mean=0   -26.3732  Pr>|T|       0.0001     Range     8.517193
 Num ^= 0        651  Num > 0          48     Q3-Q1     0.520534
 M(Sign)      -277.5  Pr>=|M|      0.0001     Mode      -0.69315
 Sgn Rank     -99196  Pr>=|S|      0.0001
 W:Normal     0.8567  Pr<W         0.0001

                  Histogram                          #    Boxplot                     Normal Probability Plot
   3.25+*                                            1       *         3.25+                                                *
       .*                                            1       *             |                                                *
       .*                                            1       *             |                                                *
       .                                                                   |
       .                                                                   |
       .*                                            6       0             |                                        ++++****
       .********                                    50       0             |                                  ++***********
       .************************                   168    +-----+          |                           +***********
       .********************************************   308    *--+--*          |                ***************
       .*************                               88       |             |        ********++++
       .***                                         20       0             |     ****+++
       .**                                           8       0             |++++***
       .*                                            4       *             |  ***
       .*                                            2       *             | **
       .*                                            2       *             |*
       .*                                            1       *             |*
       .                                                                   |
  -5.25+*                                            2       *        -5.25+*
        ----+----+----+----+----+----+----+----+----                        +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 7 counts                                           -2        -1         0        +1        +2

                                                    Detected Observations
Variable=LNVALUE

                Moments                                 Quantiles(Def=5)                                 Extremes

 N               589  Sum Wgts        589     100% Max  3.218876     99%  0.641854        Lowest     ID      Highest     ID
 Mean       -0.62054  Sum        -365.498      75% Q3  -0.35667      95%  0.182322      -4.19971(   4183) 0.788457(   13152)
 Std Dev    0.582073  Variance   0.338809      50% Med -0.61619      90% -0.01005       -2.95651(  13087) 0.955511(    4274)
 Skewness   0.211856  Kurtosis   9.486874      25% Q1    -0.8916     10% -1.23787       -2.90042(   4172) 2.484907(   14183)
 USS        426.0254  CSS        199.2199       0% Min -4.19971       5% -1.46968       -2.84731(   4517) 2.833213(   14182)
 CV         -93.8012  Std Mean   0.023984                             1% -2.43042       -2.64508(   4181) 3.218876(   14184)
 T:Mean=0   -25.8731  Pr>|T|       0.0001     Range     7.418581
 Num ^= 0        578  Num > 0          47     Q3-Q1     0.534923
 M(Sign)        -242  Pr>=|M|      0.0001     Mode      -0.51083
 Sgn Rank   -77163.5  Pr>=|S|      0.0001
 W:Normal   0.919422  Pr<W         0.0001

                  Histogram                          #    Boxplot                     Normal Probability Plot
   3.25+*                                            1       *         3.25+                                                *
       .*                                            1       *             |                                                *
       .*                                            1       *             |                                                *
   1.75+                                                               1.75+
       .                                                                   |
       .*                                            6       0             |                                          ++****
   0.25+*********                                   49       0         0.25+                                   ++**********
       .***************************                162    +-----+          |                          ***********
       .*********************************************   266    *--+--*          |              *************
  -1.25+**************                              79       |        -1.25+      *********++
       .**                                          12       0             |  +++****++
       .**                                           7       0             |++***
  -2.75+*                                            4       *        -2.75+**
       .                                                                   |
       .                                                                   |
  -4.25+*                                            1       *        -4.25+*
        ----+----+----+----+----+----+----+----+----                        +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 6 counts                                           -2        -1         0        +1        +2
```

```
----------------------------------------------- DEPTH=Subsurface ANALYSIS=Cadmium ----------------------------------------------

                                                    All Observations
Variable=LNVALUE

                  Moments                                   Quantiles(Def=5)                                 Extremes

 N              657  Sum Wgts        657     100% Max  5.459586       99%  2.397895          Lowest    ID      Highest    ID
 Mean      -0.19044  Sum         -125.12      75% Q3  -0.08338       95%  0.875469      -2.04022(   4454) 2.549445(   13027)
 Std Dev   0.721318  Variance   0.520299      50% Med -0.23319       90%  0.530628      -1.77196(   4247) 4.025352(   14193)
 Skewness  2.247345  Kurtosis   14.39552      25% Q1  -0.35667       10% -0.91629       -1.77196(   4246) 4.317488(   14191)
 USS       365.1441  CSS        341.3163       0% Min -2.04022        5% -1.51413        -1.7148(   4414) 4.997212(   14194)
 CV        -378.762  Std Mean   0.028141                              1% -1.66073        -1.7148(   4245) 5.459586(   14192)
 T:Mean=0   -6.7673  Pr>|T|       0.0001     Range     7.499806
 Num ^= 0       652  Num > 0         118     Q3-Q1     0.273293
 M(Sign)       -208  Pr>=|M|      0.0001     Mode     -0.35667
 Sgn Rank    -55781  Pr>=|S|      0.0001
 W:Normal  0.793332  Pr<W         0.0001

                    Histogram                          #  Boxplot                      Normal Probability Plot
  5.25+*                                               1     *         5.25+                                                   *
      .*                                               1     *             |                                                   *
      .*                                               2     *             |                                                   *
  3.75+                                                                3.75+
      .                                                                    |
      .*                                               1     *             |                                                   *
  2.25+*                                               5     *         2.25+                                                ***
      .*                                               5     *             |                                              **  ++
      .**                                             12     *             |                                           ****+++
  0.75+*****                                          42     0         0.75+                                     +++*****
      .******                                         54     0             |                               ++++++****
      .************************************************  424  +--+--+       |                     *******************
 -0.75+******                                         52     0        -0.75+                *****+++++
      .***                                            21     0             |           +++***++
      .****                                           36     *             |**********
 -2.25+*                                               1     *        -2.25+*
       ----+----+----+----+----+----+----+----+----+---                     +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 9 counts                                           -2        -1         0        +1        +2

                                                   Detected Observations
Variable=LNVALUE

                  Moments                                   Quantiles(Def=5)                                 Extremes

 N              210  Sum Wgts        210     100% Max  5.459586       99%  4.317488          Lowest    ID      Highest    ID
 Mean      0.143045  Sum        30.03954      75% Q3   0.641854       95%  1.902108      -1.51413(   4465) 2.484907(   14186)
 Std Dev   1.034441  Variance   1.070069      50% Med   0.09531       90%  1.098612      -1.42712(   4505) 4.025352(   14193)
 Skewness  1.756222  Kurtosis   6.226008      25% Q1  -0.57982       10% -1.02204       -1.38629(   4504) 4.317488(   14191)
 USS       227.9413  CSS        223.6443       0% Min -1.51413        5% -1.20397        -1.38629(   4466) 4.997212(   14194)
 CV        723.1556  Std Mean   0.071383                              1% -1.38629        -1.34707(   4172) 5.459586(   14192)
 T:Mean=0  2.003909  Pr>|T|       0.0464     Range     6.973713
 Num ^= 0       207  Num > 0         110     Q3-Q1     1.221672
 M(Sign)        6.5  Pr>=|M|      0.4043     Mode       0.09531
 Sgn Rank     863.5  Pr>=|S|      0.3181
 W:Normal  0.880644  Pr<W         0.0001

   Stem Leaf                                           #    Boxplot                      Normal Probability Plot
      5 5                                              1       *        5.75+
      5 0                                              1       *            |                                                    *
      4                                                                     |                                                   *
      4 03                                             2       0        4.25+                                                 **
      3                                                                     |
      3                                                                     |
      2 5                                              1       0        2.75+                                                  +++
      2 1144                                           4       |            |                                              *****++
      1 5566799                                        7       |            |                                           +***+
      1 000111111233                                  12       |        1.25+                                       +++****
      0 55555555555556666666666667777777777788888899  44    +-----+         |                                  +*******
      0 00011111111111222222333333333333333333444     41    *--+--*         |                             *******
     -0 4444444333322222111111111111111000            34    |     |    -0.25+                        +*****
     -0 9999999988888888777777776666666666555555      40    +-----+         |                 ********
     -1 4443333322211110000000                        22       |            | *  *  **  *****+
     -1 5                                              1       |       -1.75+*    +++++
        ----+----+----+----+----+----+----+----+----                        +----+----+----+----+----+----+----+----+----+----+
                                                                                -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Calcium

All Observations

Variable=LNVALUE

Moments

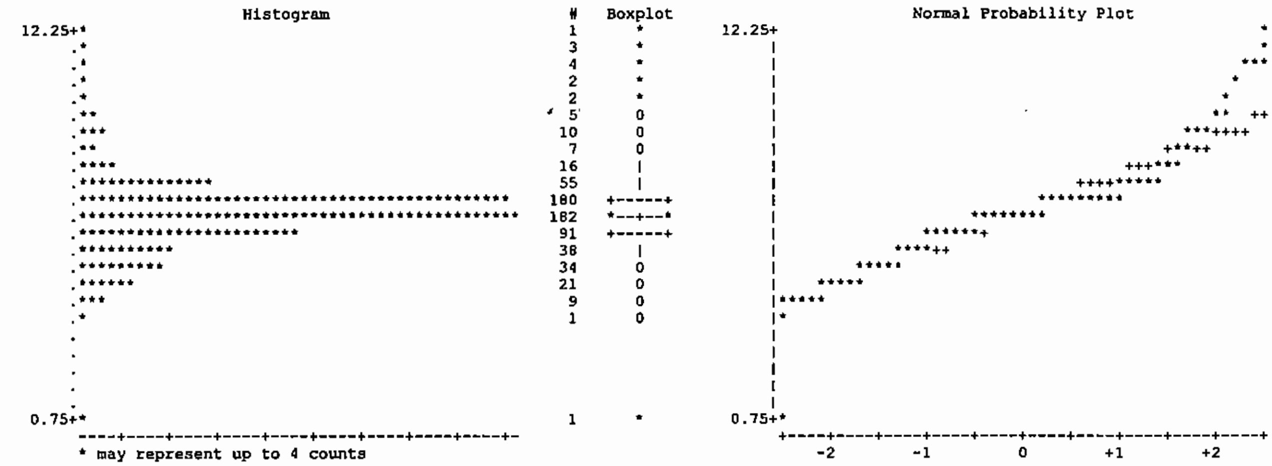
N	662	Sum Wgts	662
Mean	6.849507	Sum	4534.374
Std Dev	1.10482	Variance	1.220628
Skewness	0.705183	Kurtosis	5.591065
USS	31865.06	CSS	806.8353
CV	16.12993	Std Mean	0.04294
T:Mean=0	159.5132	Pr>|T|	0.0001
Num ^= 0	662	Num > 0	662
M(Sign)	331	Pr>=|M|	0.0001
Sgn Rank	109726.5	Pr>=|S|	0.0001
W:Normal	0.911305	Pr<W	0.0001

Quantiles(Def=5)

100% Max	12.37159	99%	11.2734
75% Q3	7.286192	95%	8.507143
50% Med	6.880384	90%	7.766417
25% Q1	6.405228	10%	5.521461
0% Min	0.542324	5%	5.003946
		1%	4.282206
Range	11.82926		
Q3-Q1	0.880963		
Mode	7.222566		

Extremes

Lowest	ID	Highest	ID
0.542324(	13333)	11.47522(	14018)
3.76584(	13284)	11.63514(	14184)
4.094345(	13238)	11.69525(	5001)
4.189655(	4315)	11.87757(	5077)
4.222445(	13283)	12.37159(	5071)



Detected Observations

Variable=LNVALUE

Moments

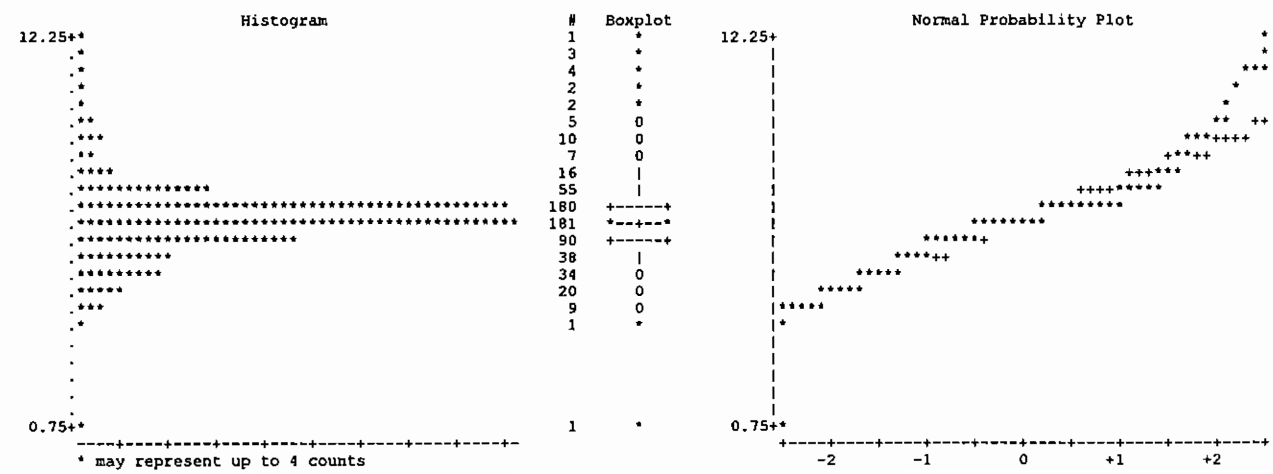
N	659	Sum Wgts	659
Mean	6.853852	Sum	4516.688
Std Dev	1.104433	Variance	1.219773
Skewness	0.705813	Kurtosis	5.616812
USS	31759.32	CSS	802.6104
CV	16.11405	Std Mean	0.043023
T:Mean=0	159.3081	Pr>|T|	0.0001
Num ^= 0	659	Num > 0	659
M(Sign)	329.5	Pr>=|M|	0.0001
Sgn Rank	108735	Pr>=|S|	0.0001
W:Normal	0.910854	Pr<W	0.0001

Quantiles(Def=5)

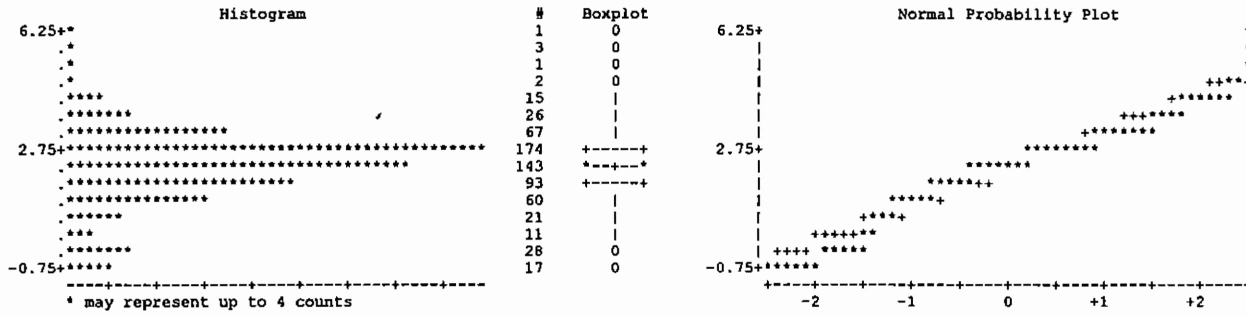
100% Max	12.37159	99%	11.2734
75% Q3	7.287561	95%	8.577347
50% Med	6.880384	90%	7.779049
25% Q1	6.416732	10%	5.521461
0% Min	0.542324	5%	5.003946
		1%	4.282206
Range	11.82926		
Q3-Q1	0.870828		
Mode	7.222566		

Extremes

Lowest	ID	Highest	ID
0.542324(	13333)	11.47522(	14018)
3.76584(	13284)	11.63514(	14184)
4.094345(	13238)	11.69525(	5001)
4.189655(	4315)	11.87757(	5077)
4.222445(	13283)	12.37159(	5071)

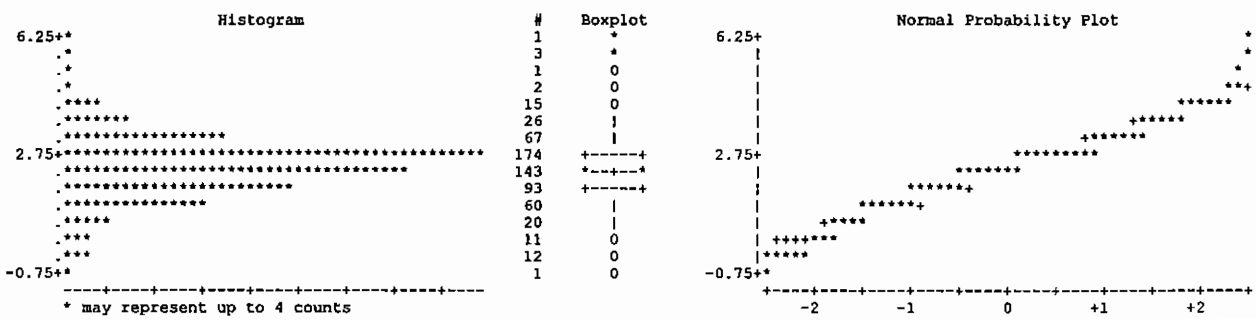


```
---------------------------------------------- DEPTH=Subsurface ANALYSIS=Chromium ----------------------------------------------

                                              All Observations
Variable=LNVALUE

              Moments                                 Quantiles(Def=5)                                 Extremes

N               662  Sum Wgts        662     100% Max  6.224558      99%  4.634729       Lowest     ID     Highest     ID
Mean       2.198567  Sum        1455.451      75% Q3   2.833213      95%   3.73767     -0.72567(  13143) 5.081404(   4345)
Std Dev    1.099021  Variance   1.207846      50% Med  2.397895      90%  3.258097     -0.70928(  13311) 5.820083(  14193)
Skewness   -0.49801  Kurtosis   1.163888      25% Q1   1.686399      10%  0.693147     -0.67727(  13125) 5.913503(  14194)
USS        3998.294  CSS        798.3865       0% Min  -0.72567       5%  -0.31471     -0.67334(  13186) 5.966147(  14191)
CV         49.98804  Std Mean   0.042715                              1%  -0.62736     -0.63299(  13213) 6.224558(  14192)
T:Mean=0   51.47103  Pr>|T|       0.0001     Range     6.950229
Num ^= 0        662  Num > 0         617     Q3-Q1     1.146814
M(Sign)         286  Pr>=|M|      0.0001     Mode      2.639057
Sgn Rank   108256.5  Pr>=|S|      0.0001
W:Normal   0.938508  Pr<W         0.0001
```



* may represent up to 4 counts

```
                                              Detected Observations
Variable=LNVALUE

              Moments                                 Quantiles(Def=5)                                 Extremes

N               629  Sum Wgts        629     100% Max  6.224558      99%  4.634729       Lowest     ID     Highest     ID
Mean       2.338241  Sum        1470.754      75% Q3   2.833213      95%    3.7612     -0.70928(  13311) 5.081404(   4345)
Std Dev     0.93592  Variance   0.875946      50% Med  2.451005      90%  3.349904     -0.47642(  13265) 5.820083(  14193)
Skewness   -0.05909  Kurtosis    1.62891      25% Q1    1.84055      10%  1.193922      -0.3285(  13233) 5.913503(  14194)
USS        3989.071  CSS        550.0943       0% Min  -0.70928       5%  0.693147     -0.31471(  13198) 5.966147(  14191)
CV         40.02667  Std Mean   0.037318                              1%  -0.23572     -0.28768(  13288) 6.224558(  14192)
T:Mean=0   62.65791  Pr>|T|       0.0001     Range     6.933835
Num ^= 0        629  Num > 0         616     Q3-Q1     0.992664
M(Sign)       301.5  Pr>=|M|      0.0001     Mode      2.639057
Sgn Rank    98909.5  Pr>=|S|      0.0001
W:Normal   0.968092  Pr<W         0.0001
```



* may represent up to 4 counts

```
-------------------------------------------------- DEPTH=Subsurface ANALYSIS=Cobalt --------------------------------------------------

                                                            All Observations
Variable=LNVALUE

                  Moments                                      Quantiles(Def=5)                                    Extremes

 N              662  Sum Wgts        662      100% Max  4.234107        99%  3.496508        Lowest      ID     Highest     ID
 Mean      1.486014  Sum        983.7414       75% Q3   1.960095        95%   2.70805      -0.54473(   4517) 3.713572(  14031)
 Std Dev    0.77047  Variance   0.593624       50% Med  1.526056        90%  2.397895      -0.54473(   4515) 3.871201(   4401)
 Skewness  0.083126  Kurtosis   0.492869       25% Q1   1.029619        10%  0.405465      -0.52763(   4516) 3.912023(  14194)
 USS       1854.239  CSS        392.3857        0% Min  -0.54473         5%  0.262364      -0.40048(   4415) 4.143135(  14192)
 CV        51.84811  Std Mean   0.029945                                 1%  -0.31471      -0.40048(   4173) 4.234107(  14191)
 T:Mean=0  49.62449  Pr>|T|       0.0001      Range     4.778834
 Num ^= 0       661  Num > 0         643      Q3-Q1     0.930475
 M(Sign)      312.5  Pr>=|M|      0.0001      Mode      0.262364
 Sgn Rank  108731.5  Pr>=|S|      0.0001
 W:Normal  0.979137  Pr<W         0.0113

                 Histogram                            #      Boxplot                     Normal Probability Plot
  4.3+*                                               1         0            4.3+                                                  *
     .*                                               1         0               |                                                  *
     .*                                               2         0               |                                                  *
     .**                                              1         0               |                                                  *
     .***                                             5         0               |                                               ***+
     .***                                             5         |               |                                            ** ++
     .**                                              3         |               |                                           **++
     .**                                              4         |               |                                          **
     .************                                   23         |               |                                       ****
     .***********                                    21         |               |                                    +***
     .******************                             35         |               |                                  ****
     .***************************                    54         |               |                               ****
  1.9+*****************************                  57      +-----+         1.9+                             ***
     .******************************************     83      |     |            |                         *****
     .*****************************************      82      *--+--*            |                      ****
     .*************************************          74      |     |            |                   ****
     .**************************                     52      +-----+            |                 ***+
     .********************                           39         |               |               ***
     .**************                                 27         |               |             ***
     .****************                               31         |               |          +***
     .****************                               31         |               |        *****
     .*******                                        13         |               |      ***
     .**                                              3         |               |    +**
     .*****                                          10         |               | *****
 -0.5+***                                             5         0           -0.5+*
      ----+----+----+----+----+----+----+----+--                                +----+----+----+----+----+----+----+----+----+----+
      * may represent up to 2 counts                                                     -2        -1         0        +1        +2

                                                          Detected Observations
Variable=LNVALUE

                  Moments                                      Quantiles(Def=5)                                    Extremes

 N              578  Sum Wgts        578      100% Max  4.234107        99%  3.526361        Lowest      ID     Highest     ID
 Mean      1.596614  Sum        922.8427       75% Q3   2.014903        95%  2.772589       -0.3285(   4361) 3.713572(  14031)
 Std Dev   0.709754  Variance   0.503751       50% Med  1.589235        90%  2.484907      -0.26136(  13237) 3.871201(   4401)
 Skewness  0.315309  Kurtosis    0.68797       25% Q1   1.131402        10%  0.693147      -0.23572(  13164) 3.912023(  14194)
 USS       1764.088  CSS        290.6645        0% Min   -0.3285         5%  0.405465      -0.21072(   4414) 4.143135(  14192)
 CV        44.45373  Std Mean   0.029522                                 1%   0.09531      -0.06188(   4514) 4.234107(  14191)
 T:Mean=0  54.08236  Pr>|T|       0.0001      Range     4.562611
 Num ^= 0       578  Num > 0         573      Q3-Q1     0.883501
 M(Sign)        284  Pr>=|M|      0.0001      Mode      0.955511
 Sgn Rank   83628.5  Pr>=|S|      0.0001
 W:Normal  0.979468  Pr<W         0.0292

                 Histogram                            #      Boxplot                     Normal Probability Plot
  4.3+*                                               1         0            4.3+                                                  *
     .*                                               1         0               |                                                  *
     .*                                               2         0               |                                                  *
     .*                                               1         0               |                                                 *
     .***                                             5         0               |                                              ***
     .***                                             5         |               |                                              ** +++
     .**                                              3         |               |                                            ++++
     .**                                              4         |               |                                          +*+
     .************                                   23         |               |                                        ****
     .**********                                     20         |               |                                      ***
     .*****************                              34         |               |                                   +***
     .**************************                     52      +-----+            |                                ****
     .****************************                   55      |     |            |                            +***
     .****************************************       80      |     |            |                          *****
     .****************************************       79      *--+--*            |                       ****
     .*************************                      50      |     |            |                    ****
     .*************************                      49      +-----+            |                  ***
     .********************                           39         |               |               ***
     .*************                                  25         |               |             ****
     .**************                                 28         |               |          *****
     .*******                                        13         |               |       ****+
     .**                                              4         |               |   **++
     .*                                               1         |               |+*+
 -0.3+**                                              4         0           -0.3+*
      ----+----+----+----+----+----+----+----+                                  +----+----+----+----+----+----+----+----+----+----+
      * may represent up to 2 counts                                                     -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Subsurface ANALYSIS=Copper ------------------------------------------------

                                                  All Observations
Variable=LNVALUE

                 Moments                                         Quantiles(Def=5)                                   Extremes

N              662  Sum Wgts        662      100% Max   9.836279     99%  4.553877       Lowest    ID      Highest    ID
Mean      1.822125  Sum  ·     1206.247       75% Q3   2.351375     95%  3.198673     -0.44629(  13333) 5.164786(  14186)
Std Dev   1.056853  Variance   1.116937       50% Med   1.84055     90%  2.815409     -0.43078(  13332) 9.016756(  14193)
Skewness  2.283523  Kurtosis   16.05847       25% Q1   1.252763     10%  0.587787     -0.43078(  13331)  9.55393(  14194)
USS       2936.229  CSS        738.2956        0% Min  -0.44629      5%  0.182322     -0.30111(  13131) 9.746834(  14191)
CV        58.00109  Std Mean   0.041076                              1%  -0.20089     -0.28236(  13264) 9.836279(  14192)
T:Mean=0  44.36013  Pr>|T|       0.0001      Range     10.28257
Num ^= 0       660  Num > 0         643      Q3-Q1     1.098612
M(Sign)        313  Pr>=|M|      0.0001      Mode      2.397895
Sgn Rank    108696  Pr>=|S|      0.0001
W:Normal  0.860903  Pr<W         0.0001

                    Histogram                       #     Boxplot                      Normal Probability Plot
   9.75+*                                           3        *           9.75+                                                     *
       .*                                           1        *               |                                                     *
   8.75+                                                                 8.75+
       .                                                                     |
   7.75+                                                                 7.75+
       .                                                                     |
   6.75+                                                                 6.75+
       .                                                                     |
   5.75+                                                                 5.75+
       .*                                           1        0               |                                                     *
   4.75+*                                           2        0           4.75+                                                    **
       .*                                           3        0               |                                                 ***++
   3.75+**                                          7        |           3.75+                                              ++++**
       .********                                   30        |               |                                         +++*****
   2.75+*******************                        76        |           2.75+                                    ++********
       .*****************************************  164    +-----+            |                               ********
   1.75+*************************************     141    *--+--*        1.75+                         *******
       .****************************              115    +-----+            |                    ******
   0.75+***************                            57        |           0.75+               *****+
       .************                               45        |               |        *******
  -0.25+*****                                      17        0          -0.25+******++
        ----+----+----+----+----+----+----+----+-                            +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                              -2        -1         0        +1        +2

                                                  Detected Observations
Variable=LNVALUE

                 Moments                                         Quantiles(Def=5)                                   Extremes

N              609  Sum Wgts        609      100% Max   9.836279     99%  4.553877       Lowest    ID      Highest    ID
Mean       1.91568  Sum        1166.649       75% Q3   2.397895     95%  3.218876     -0.08338(  13263) 5.164786(  14186)
Std Dev   1.022396  Variance   1.045294       50% Med  1.916923     90%  2.833213     -0.04082(  13203) 9.016756(  14193)
Skewness  2.739913  Kurtosis   19.10657       25% Q1   1.335001     10%  0.788457     -0.03046(  13339)  9.55393(  14194)
USS       2870.466  CSS        635.5385        0% Min  -0.08338      5%  0.470004            0(  13311) 9.746834(  14191)
CV        53.36986  Std Mean    0.04143                              1%   0.09531            0(  13294) 9.836279(  14192)
T:Mean=0  46.23944  Pr>|T|       0.0001      Range      9.91966
Num ^= 0       607  Num > 0         604      Q3-Q1     1.062894
M(Sign)      300.5  Pr>=|M|      0.0001      Mode      2.397895
Sgn Rank     92258  Pr>=|S|      0.0001
W:Normal  0.833702  Pr<W         0.0001

                    Histogram                       #     Boxplot                      Normal Probability Plot
   9.75+*                                           3        *           9.75+                                                     *
       .*                                           1        *               |                                                     *
   8.75+                                                                 8.75+
       .                                                                     |
   7.75+                                                                 7.75+
       .                                                                     |
   6.75+                                                                 6.75+
       .                                                                     |
   5.75+                                                                 5.75+
       .*                                           1        0               |                                                     *
   4.75+*                                           2        0           4.75+                                                    **
       .*                                           3        0               |                                                 **+++
   3.75+**                                          7        |           3.75+                                              ++++**
       .********                                   30        |               |                                         +++******
   2.75+*******************                        76        |           2.75+                                    ++********
       .*****************************************  161    +-----+            |                               ********
   1.75+**********************************        130    *--+--*        1.75+                         *******
       .***************************               108    +-----+            |                   *******
   0.75+**************                             51        |           0.75+              ******++
       .*********                                  33        |               |** ********++
  -0.25+*                                           3        |          -0.25+* +++++
        ----+----+----+----+----+----+----+----+-                            +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                              -2        -1         0        +1        +2
```

```
----------------------------------------------- DEPTH=Subsurface ANALYSIS=Cyanide -----------------------------------------------

                                                        All Observations
Variable=LNVALUE

                Moments                                   Quantiles(Def=5)                                   Extremes

 N               642  Sum Wgts       642      100% Max   0.336472       99%   0.182322        Lowest     ID      Highest     ID
 Mean       -0.66922  Sum       -429.639       75% Q3   -0.45099       95%  -0.12783      -2.12026(   4242) 0.182322(   4218)
 Std Dev    0.439712  Variance  0.193347       50% Med  -0.54473       90%  -0.17435      -1.83258(   4140) 0.182322(   4219)
 Skewness   -0.85759  Kurtosis  0.484198       25% Q1    -0.8675       10%  -1.20397      -1.77196(   4502) 0.182322(   5067)
 USS        411.4587  CSS       123.9352        0% Min  -2.12026        5%   -1.7148      -1.77196(   4501) 0.262364(   4095)
 CV         -65.7051  Std Mean  0.017354                                1%  -1.77196      -1.77196(   4465) 0.336472(   4130)
 T:Mean=0   -38.5628  Pr>|T|      0.0001      Range      2.456736
 Num ^= 0        642  Num > 0         12      Q3-Q1      0.416515
 M(Sign)        -309  Pr>=|M|     0.0001      Mode       -1.20397
 Sgn Rank    -102473  Pr>=|S|     0.0001
 W:Normal    0.90861  Pr<W        0.0001
                                                    Missing Value          .
                                                    Count                  8
                                                    % Count/Nobs        1.23

                    Histogram                         #          Boxplot                             Normal Probability Plot
   0.35+*                                             1             0           0.35+                                                  ++*
       .*                                             1             0               |                                              +++  *
       .**                                            6             0               |                                            ++  ***
       .*                                             4             |               |                                          ++  **
       .***                                          11             |               |                                       +++ ****
  -0.15+******************                           70             |          -0.15+                                     ********
       .**********                                   37             |               |                                 ***
       .**                                            8             |               |                               +*
       .***********************                      90          +-----+            |                             *****
       .****************************************    159          *-----*            |                        ********
  -0.65+******                                       23          |  +  |       -0.65+                       **  ++
       .*****                                        19          |     |            |                       * ++
       .*********************                        84          +-----+            |                    *****+
       .***                                           9             |               |                   **++
       .                                                            |               |                   ++
  -1.15+**                                            5             |          -1.15+                +++*
       .*****************                            65             |               |              ******
       .*                                             2             |               |            ++*
       .                                                                            |          ++
       .                                                                            |       +++
  -1.65+***                                          10             0          -1.65+   ++      **
       .*********                                    36             0               |**********
       .*                                             1             0               |*
       .                                                                            |
       .                                                                            |
  -2.15+*                                             1             *          -2.15+*
        ----+----+----+----+----+----+----+----+                                    +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                   -2        -1         0        +1        +2

                                                      Detected Observations
Variable=LNVALUE

                Moments                                   Quantiles(Def=5)                                   Extremes

 N                 6  Sum Wgts         6      100% Max    0.09531       99%    0.09531        Lowest     ID      Highest     ID
 Mean       -0.27116  Sum       -1.62699       75% Q3   -0.10536       95%    0.09531      -1.13943(   4306) -0.19845(   4321)
 Std Dev    0.437422  Variance  0.191338       50% Med  -0.13953       90%    0.09531      -0.19845(   4321) -0.16252(   4370)
 Skewness   -2.13431  Kurtosis  4.990597       25% Q1   -0.19845       10%   -1.13943      -0.16252(   4370) -0.11653(   4266)
 USS        1.397871  CSS       0.956689        0% Min  -1.13943        5%   -1.13943      -0.11653(   4266) -0.10536(   4372)
 CV         -161.312  Std Mean  0.178577                                1%   -1.13943      -0.10536(   4372)  0.09531(   4318)
 T:Mean=0   -1.51848  Pr>|T|      0.1894      Range      1.234744
 Num ^= 0          6  Num > 0          1      Q3-Q1       0.09309
 M(Sign)          -2  Pr>=|M|     0.2188      Mode       -1.13943
 Sgn Rank       -9.5  Pr>=|S|     0.0625
 W:Normal   0.710075  Pr<W        0.0077

      Stem Leaf                     #           Boxplot                             Normal Probability Plot
         0 0                        1              0                   0.1+                                   ++++   *
        -0 621                      3           +-----+                   |                     *   *   *+++*
        -2 0                        1           +--+--+                   |                         ++++
        -4                                                           -0.5+                     +++++
        -6                                                                |                +++++
        -8                                                                |            ++++
       -10 4                        1              *                 -1.1+       +++++   *
           ----+----+----+----+                                            +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                             -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Iron

All Observations

Variable=LNVALUE

Moments

N	662	Sum Wgts	662
Mean	9.28235	Sum	6144.916
Std Dev	0.684372	Variance	0.468364
Skewness	-0.82324	Kurtosis	1.694905
USS	57348.85	CSS	309.5889
CV	7.372826	Std Mean	0.026599
T:Mean=0	348.9755	Pr>|T|	0.0001
Num ^= 0	662	Num > 0	662
M(Sign)	331	Pr>=|M|	0.0001
Sgn Rank	109726.5	Pr>=|S|	0.0001
W:Normal	0.952965	Pr<W	0.0001

Quantiles(Def=5)

100% Max	11.48863	99%	10.57643
75% Q3	9.735069	95%	10.20729
50% Med	9.392662	90%	10.00333
25% Q1	8.95157	10%	8.361708
0% Min	6.300786	5%	8.003029
		1%	7.299797
Range	5.187847		
Q3-Q1	0.783499		
Mode	9.441452		

Extremes

Lowest	ID	Highest	ID
6.300786(	13108)	10.76638(	13059)
6.516193(	13234)	10.82377(	14193)
6.523562(	13214)	11.22391(	14194)
6.58755(	13191)	11.46268(	14191)
6.891626(	13036)	11.48863(	14192)

```
              Histogram                          #             Boxplot
 11.5+*                                          2                0
     .*                                          1                0
     .
     .*                                          1                |
     .*                                          2                |
     .****                                      10                |
     .******                                    18                |
     .***********                               33                |
     .***********************                   67                |
     .*********************************         97             +-----+
     .*********************************         99             |     |
     .******************************            90             *--+--*
     .********************                      60             |     |
  8.9+***************                           45             +-----+
     .************                              34                |
     .************                              34                |
     .*******                                   19                |
     .******                                    17                |
     .******                                    16                |
     .**                                         4                0
     .**                                         5                0
     .*                                          2                0
     .*                                          1                0
     .*                                          1                0
     .
     .*                                          3                *
  6.3+*                                          1                *
      ----+----+----+----+----+----+----+---
      * may represent up to 3 counts
```

```
                     Normal Probability Plot
 11.5+                                                  *
     |                                                  *
     |
     |                                                ++*
     |                                             +++ **
     |                                           +++****
     |                                        ++*****
     |                                     ++****
     |                                  ******
     |                               *****
     |                           *****
     |                        ****+
     |                      ****+
  8.9+                   ***+
     |                 ***
     |               ****
     |             +**
     |          ++***
     |       ++***
     | +++ *
     |+  **
     |  *
     | *
     |*
     |
     |*
  6.3+*
      +----+----+----+----+----+----+----+----+----+----+
          -2       -1        0       +1       +2
```

Detected Observations

Variable=LNVALUE

Moments

N	662	Sum Wgts	662
Mean	9.28235	Sum	6144.916
Std Dev	0.684372	Variance	0.468364
Skewness	-0.82324	Kurtosis	1.694905
USS	57348.85	CSS	309.5889
CV	7.372826	Std Mean	0.026599
T:Mean=0	348.9755	Pr>|T|	0.0001
Num ^= 0	662	Num > 0	662
M(Sign)	331	Pr>=|M|	0.0001
Sgn Rank	109726.5	Pr>=|S|	0.0001
W:Normal	0.952965	Pr<W	0.0001

Quantiles(Def=5)

100% Max	11.48863	99%	10.57643
75% Q3	9.735069	95%	10.20729
50% Med	9.392662	90%	10.00333
25% Q1	8.95157	10%	8.361708
0% Min	6.300786	5%	8.003029
		1%	7.299797
Range	5.187847		
Q3-Q1	0.783499		
Mode	9.441452		

Extremes

Lowest	ID	Highest	ID
6.300786(	13108)	10.76638(	13059)
6.516193(	13234)	10.82377(	14193)
6.523562(	13214)	11.22391(	14194)
6.58755(	13191)	11.46268(	14191)
6.891626(	13036)	11.48863(	14192)

```
              Histogram                          #             Boxplot
 11.5+*                                          2                0
     .*                                          1                0
     .
     .*                                          1                |
     .*                                          2                |
     .****                                      10                |
     .******                                    18                |
     .***********                               33                |
     .***********************                   67                |
     .*********************************         97             +-----+
     .*********************************         99             |     |
     .******************************            90             *--+--*
     .********************                      60             |     |
  8.9+***************                           45             +-----+
     .************                              34                |
     .************                              34                |
     .*******                                   19                |
     .******                                    17                |
     .******                                    16                |
     .**                                         4                0
     .**                                         5                0
     .*                                          2                0
     .*                                          1                0
     .*                                          1                0
     .
     .*                                          3                *
  6.3+*                                          1                *
      ----+----+----+----+----+----+----+---
      * may represent up to 3 counts
```

```
                     Normal Probability Plot
 11.5+                                                  *
     |                                                  *
     |
     |                                                ++*
     |                                             +++ **
     |                                           +++****
     |                                        ++*****
     |                                     ++****
     |                                  ******
     |                               *****
     |                           *****
     |                        ****+
     |                      ****+
  8.9+                   ***+
     |                 ***
     |               ****
     |             +**
     |          ++***
     |       ++***
     | +++ *
     |+  **
     |  *
     | *
     |*
     |
     |*
  6.3+*
      +----+----+----+----+----+----+----+----+----+----+
          -2       -1        0       +1       +2
```

```
--------------------------------------------------- DEPTH=Subsurface ANALYSIS=Lead ---------------------------------------------------

                                                        All Observations
Variable=LNVALUE

                   Moments                                     Quantiles(Def=5)                               Extremes

 N               662  Sum Wgts        662     100% Max  7.056175      99%  4.779123        Lowest    ID      Highest     ID
 Mean       1.866139  Sum        1235.384      75% Q3   2.312535      95%  3.135494      -0.72567(   13283)  6.22059(   14193)
 Std Dev    0.939653  Variance   0.882947      50% Med   1.94591      90%   2.70805      -0.56037(   13229) 6.230481(   14189)
 Skewness   0.783135  Kurtosis   4.741921      25% Q1   1.410987      10%  0.641854      -0.55165(   13284) 6.695799(   14191)
 USS        2889.027  CSS        583.6281       0% Min  -0.72567       5%  0.336472      -0.41552(   13280) 6.895683(   14192)
 CV         50.35277  Std Mean   0.036521                              1%  -0.34249      -0.40048(   13282) 7.056175(   14194)
 T:Mean=0    51.0982  Pr>|T|       0.0001     Range     7.781846
 Num ^= 0        657  Num > 0         641     Q3-Q1     0.901548
 M(Sign)       312.5  Pr>=|M|      0.0001     Mode      2.302585
 Sgn Rank   107670.5  Pr>=|S|      0.0001
 W:Normal   0.926957  Pr<W         0.0001

                  Histogram                          #      Boxplot                     Normal Probability Plot
   7.25+*                                            1         *           7.25+                                                   *
       .*                                            2         *               |                                                   *
       .*                                            2         *               |                                                   *
       .                                                                       |
       .                                                                       |
       .*                                            3         0               |                                                  **
       .*                                            5         0               |                                                *****+++
       .***                                         13         0               |                                             ****++
   3.25+***                                         15         |           3.25+                                         ++****
       .************                                60         |               |                                   +++*******
       .******************************************  206     +-----+            |                           **********
       .*********************************           163     *--+--*            |                     ********
       .*****************                           83      +-----+            |                 *****++
       .************                                57         |               |             *****
       .********                                    36         0               |       *******
       .***                                         13         0               |*+****
  -0.75+*                                            3         0          -0.75+*
        ----+----+----+----+----+----+----+----+--                             +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 5 counts                                                 -2        -1         0        +1        +2

                                                      Detected Observations
Variable=LNVALUE

                   Moments                                     Quantiles(Def=5)                               Extremes

 N               655  Sum Wgts        655     100% Max  7.056175      99%  4.779123        Lowest    ID      Highest     ID
 Mean       1.885957  Sum        1235.302      75% Q3   2.322388      95%  3.190476      -0.41552(   13280)  6.22059(   14193)
 Std Dev    0.920141  Variance   0.846659      50% Med   1.94591      90%   2.70805      -0.40048(   13282) 6.230481(   14189)
 Skewness   0.912794  Kurtosis   5.084717      25% Q1   1.435085      10%  0.693147      -0.40048(    4348) 6.695799(   14191)
 USS        2883.441  CSS         553.715       0% Min  -0.41552       5%  0.336472      -0.34249(   13246) 6.895683(   14192)
 CV         48.78906  Std Mean   0.035953                              1%  -0.16252      -0.30111(   13203) 7.056175(   14194)
 T:Mean=0   52.45636  Pr>|T|       0.0001     Range     7.471691
 Num ^= 0        650  Num > 0         639     Q3-Q1     0.887303
 M(Sign)         314  Pr>=|M|      0.0001     Mode      2.302585
 Sgn Rank   105605.5  Pr>=|S|      0.0001
 W:Normal    0.92262  Pr<W         0.0001

                  Histogram                          #     Boxplot                      Normal Probability Plot
   7.25+*                                            1        *            7.25+                                                   *
       .*                                            2        *                |                                                   *
       .*                                            2        *                |                                                   *
   5.75+                                                                   5.75+
       .                                                                       |
       .*                                            3        0                |                                                  **
   4.25+*                                            5        0            4.25+                                                **+++
       .***                                         13        0                |                                             ****++
       .***                                         15        |                |                                         ++****
   2.75+************                                60        |            2.75+                                   +++*******
       .*****************************************   205    +-----+             |                           **********
       .*********************************           163    *--+--*             |                     ********
   1.25+*****************                           83     +-----+         1.25+                 *****+
       .************                                57        |                |             ******
       .*******                                     35        0                |     *******
  -0.25+***                                         11        0           -0.25+*****
        ----+----+----+----+----+----+----+----+-                              +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 5 counts                                                 -2        -1         0        +1        +2
```

---------- DEPTH=Subsurface ANALYSIS=Magnesium ----------

All Observations

Variable=LNVALUE

Moments

N	662	Sum Wgts	662
Mean	6.275156	Sum	4154.153
Std Dev	1.038888	Variance	1.079288
Skewness	-0.65206	Kurtosis	0.451664
USS	26781.37	CSS	713.4094
CV	16.55557	Std Mean	0.040378
T:Mean=0	155.4121	Pr>|T|	0.0001
Num ^= 0	662	Num > 0	662
M(Sign)	331	Pr>=|M|	0.0001
Sgn Rank	109726.5	Pr>=|S|	0.0001
W:Normal	0.958706	Pr<W	0.0001

Quantiles(Def=5)

100% Max	9.441452	99%	8.3163
75% Q3	7.012115	95%	7.659171
50% Med	6.390241	90%	7.46164
25% Q1	5.765191	10%	4.779123
0% Min	2.809403	5%	4.189655
		1%	3.526361
Range	6.632049		
Q3-Q1	1.246924		
Mode	6.975414		

Extremes

Lowest	ID	Highest	ID
2.809403(	13333)	8.427268(	5067)
2.833213(	13282)	8.523175(	14192)
2.901422(	13283)	8.597851(	5077)
2.906901(	13284)	8.732305(	14018)
3.401197(	4315)	9.441452(	5071)

```
                 Histogram                            #   Boxplot
9.25+*                                                 1      0
    .*                                                 3      |
    .***                                               7      |
    .*****************                                50      |
    .***********************************             105   +-----+
    .**********************************************  137   |     |
    .*********************************************   134   *--+--*
    .********************************                 96   +-----+
    .*****************                                50      |
    .********                                         24      |
    .***********                                      31      |
    .******                                           18      0
    .*                                                 2      0
2.75+**                                                4      0
     ----+----+----+----+----+----+----+----+----+-
     * may represent up to 3 counts
```

```
                   Normal Probability Plot
9.25+                                                 *
    |                                              +++*
    |                                         ++++*****
    |                                    +*********
    |                               *******
    |                         *******
    |                    ******+
    |               ******+
    |            ****+
    |       +++***
    |   +++******
    |++*******
    |**
2.75+*
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	659	Sum Wgts	659
Mean	6.29061	Sum	4145.512
Std Dev	1.015591	Variance	1.031425
Skewness	-0.57612	Kurtosis	0.257351
USS	26756.47	CSS	678.6778
CV	16.14456	Std Mean	0.039562
T:Mean=0	159.0071	Pr>|T|	0.0001
Num ^= 0	659	Num > 0	659
M(Sign)	329.5	Pr>=|M|	0.0001
Sgn Rank	108735	Pr>=|S|	0.0001
W:Normal	0.963217	Pr<W	0.0001

Quantiles(Def=5)

100% Max	9.441452	99%	8.3163
75% Q3	7.012115	95%	7.673223
50% Med	6.398595	90%	7.467371
25% Q1	5.774552	10%	4.828314
0% Min	2.809403	5%	4.248495
		1%	3.723281
Range	6.632049		
Q3-Q1	1.237564		
Mode	6.975414		

Extremes

Lowest	ID	Highest	ID
2.809403(	13333)	8.427268(	5067)
3.401197(	4315)	8.523175(	14192)
3.496508(	4338)	8.597851(	5077)
3.526361(	4173)	8.732305(	14018)
3.566712(	13334)	9.441452(	5071)

```
                 Histogram                            #   Boxplot
9.25+*                                                 1      0
    .*                                                 3      |
    .***                                               7      |
    .*****************                                50      |
    .***********************************             105   +-----+
    .**********************************************  137   |     |
    .*********************************************   134   *--+--*
    .********************************                 96   +-----+
    .*****************                                50      |
    .********                                         24      |
    .***********                                      31      |
    .******                                           18      0
    .*                                                 2      0
2.75+*                                                 1      0
     ----+----+----+----+----+----+----+----+----+-
     * may represent up to 3 counts
```

```
                   Normal Probability Plot
9.25+                                                 *
    |                                              +++*
    |                                         ++++*****
    |                                    +*********
    |                               *******
    |                         *******
    |                    ******+
    |               ******+
    |            ****+
    |       +++***
    |   ++++*****
    |*******
    |*
2.75+*
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Manganese

All Observations

Variable=LNVALUE

Moments

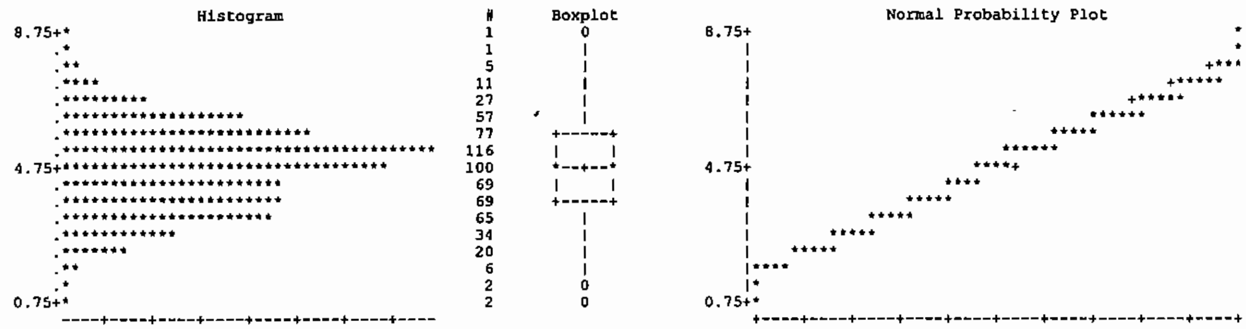
N	662	Sum Wgts	662
Mean	4.715378	Sum	3121.58
Std Dev	1.276385	Variance	1.629159
Skewness	-0.16668	Kurtosis	-0.09142
USS	15796.3	CSS	1076.874
CV	27.06856	Std Mean	0.049608
T:Mean=0	95.05256	Pr>|T|	0.0001
Num ^= 0	662	Num > 0	662
M(Sign)	331	Pr>=|M|	0.0001
Sgn Rank	109726.5	Pr>=|S|	0.0001
W:Normal	0.985409	Pr<W	0.4635

Quantiles(Def=5)

100% Max	8.998384	99%	7.56008
75% Q3	5.583496	95%	6.689599
50% Med	4.859812	90%	6.257668
25% Q1	3.781914	10%	3.025291
0% Min	0.530628	5%	2.595255
		1%	1.667707
Range	8.467756		
Q3-Q1	1.801582		
Mode	3.178054		

Extremes

Lowest	ID	Highest	ID
0.530628(	13310)	7.718685(	14005)
0.788457(	13223)	7.727535(	14192)
1.064711(	4514)	7.979339(	13104)
1.410987(	4517)	8.140316(	14031)
1.504077(	13173)	8.998384(	14189)



* may represent up to 3 counts

Detected Observations

Variable=LNVALUE

Moments

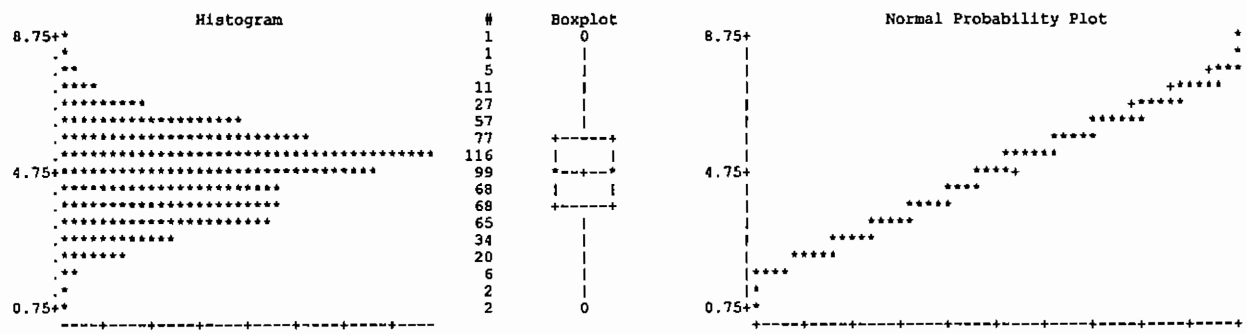
N	659	Sum Wgts	659
Mean	4.717505	Sum	3108.836
Std Dev	1.27853	Variance	1.634638
Skewness	-0.17062	Kurtosis	-0.09742
USS	15741.54	CSS	1075.592
CV	27.10182	Std Mean	0.049804
T:Mean=0	94.72057	Pr>|T|	0.0001
Num ^= 0	659	Num > 0	659
M(Sign)	329.5	Pr>=|M|	0.0001
Sgn Rank	108735	Pr>=|S|	0.0001
W:Normal	0.985153	Pr<W	0.4295

Quantiles(Def=5)

100% Max	8.998384	99%	7.56008
75% Q3	5.602119	95%	6.710523
50% Med	4.859812	90%	6.263398
25% Q1	3.781914	10%	3.015535
0% Min	0.530628	5%	2.564949
		1%	1.667707
Range	8.467756		
Q3-Q1	1.820205		
Mode	3.178054		

Extremes

Lowest	ID	Highest	ID
0.530628(	13310)	7.718685(	14005)
0.788457(	13223)	7.727535(	14192)
1.064711(	4514)	7.979339(	13104)
1.410987(	4517)	8.140316(	14031)
1.504077(	13173)	8.998384(	14189)



* may represent up to 3 counts

-- DEPTH=Subsurface ANALYSIS=Mercury --

All Observations

Variable=LNVALUE

Moments

N	655	Sum Wgts	655
Mean	-2.51586	Sum	-1647.89
Std Dev	0.59259	Variance	0.351163
Skewness	0.421067	Kurtosis	8.847374
USS	4375.508	CSS	229.6604
CV	-23.5542	Std Mean	0.023154
T:Mean=0	-108.656	Pr>|T|	0.0001
Num ^= 0	655	Num > 0	2
M(Sign)	-325.5	Pr>=|M|	0.0001
Sgn Rank	-107033	Pr>=|S|	0.0001
W:Normal	0.87585	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.484907	99%	-0.91629
75% Q3	-2.12863	95%	-2.04022
50% Med	-2.30259	90%	-2.10373
25% Q1	-2.78062	10%	-3.38139
0% Min	-4.60517	5%	-3.44202
		1%	-4.13517
Range	7.090077		
Q3-Q1	0.651989		
Mode	-2.30259		

Extremes

Lowest	ID	Highest	ID
-4.60517(	13019)	-0.70522(	13129)
-4.60517(	13013)	-0.61619(	4266)
-4.60517(	13003)	-0.51083(	14189)
-4.50986(	13007)	0.058269(	13353)
-4.2687(	13018)	2.484907(	14183)

```
                 Histogram                               #  Boxplot
 2.25+*                                                  1     *
     .
     .
     .
     .*                                                  1     *
     .
     .*                                                  6     0
-1.25+*                                                  4     0
     .*                                                  6     |
     .***********************************************  369  +-----+
     .******************                               140  +--+--+
     .*************                                    104     |
     .**                                                12     0
     .*                                                  8     0
-4.75+*                                                  4     0
      ----+----+----+----+----+----+----+----+---
     * may represent up to 8 counts
```

```
                      Normal Probability Plot
 2.25+                                                        *
     |
     |
     |
     |                                                        *
     |
     |                                                      ***
-1.25+                                                +++**+++
     |                                           +++++++++ **
     |                                  *********************
     |                           ********++
     |                ***********
     |++++*****+
     |*****
-4.75+*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	44	Sum Wgts	44
Mean	-2.42672	Sum	-106.776
Std Dev	1.214563	Variance	1.475163
Skewness	1.644139	Kurtosis	5.025329
USS	322.5459	CSS	63.43202
CV	-50.0496	Std Mean	0.183102
T:Mean=0	-13.2533	Pr>|T|	0.0001
Num ^= 0	44	Num > 0	1
M(Sign)	-21	Pr>=|M|	0.0001
Sgn Rank	-480	Pr>=|S|	0.0001
W:Normal	0.869163	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.484907	99%	2.484907
75% Q3	-1.63508	95%	-0.70522
50% Med	-2.78875	90%	-0.91629
25% Q1	-3.06975	10%	-3.50656
0% Min	-4.50986	5%	-4.01738
		1%	-4.50986
Range	6.994767		
Q3-Q1	1.434666		
Mode	-3.17009		

Extremes

Lowest	ID	Highest	ID
-4.50986(	13007)	-0.91629(	14192)
-4.2687(	13011)	-0.87948(	13247)
-4.01738(	13008)	-0.70522(	13129)
-3.7297(	13016)	-0.51083(	14189)
-3.50656(	13010)	2.484907(	14183)

```
  Stem Leaf                  #           Boxplot
     2 5                     1              0
     2
     1
     1
     0
     0
    -0
    -0 99975                 5              |
    -1 332                   3              |
    -1 766                   3           +-----+
    -2 31                    2           |  +  |
    -2 99999988887777765    17           *-----*
    -3 42221100              8           +-----+
    -3 75                    2              |
    -4 30                    2              |
    -4 5                     1              |
       ----+----+----+----+
```

```
                      Normal Probability Plot
 2.75+
     |                                                    *
     |
 1.25+
     |                                                       +
     |                                                   +++++
-0.25+                                               ++++
     |                                          *+*++* *
     |                                      +**+
-1.75+                                  ++**
     |                              ++++***
     |                         ****+*** **
-3.25+                    ******+
     |                ***+++
     |            *+*+++
-4.75+       *++++
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Subsurface ANALYSIS=Nickel ------------------------------------------------

                                                              All Observations
Variable=LNVALUE

                 Moments                                        Quantiles(Def=5)                                      Extremes

 N              662  Sum Wgts        662       100% Max  9.417355        99%  4.804021          Lowest    ID      Highest    ID
 Mean      1.950534  Sum        1291.253        75% Q3   2.484907        95%  3.109061        -0.17435(   13175) 5.575949(   14184)
 Std Dev   0.979634  Variance   0.959683        50% Med  2.047672        90%  2.833213        -0.08338(   13164)   8.4929(   14193)
 Skewness  2.321242  Kurtosis   16.23701        25% Q1   1.410987        10%  0.693147        -0.04082(   13225) 9.048997(   14194)
 USS       3152.984  CSS        634.3503         0% Min  -0.17435         5%  0.500775               0(   13339) 9.400961(   14192)
 CV        50.22389  Std Mean   0.038075                                  1%  0.182322         0.09531(   13236) 9.417355(   14191)
 T:Mean=0  51.22933  Pr>|T|       0.0001       Range     9.591708
 Num ^= 0       661  Num > 0         658       Q3-Q1      1.07392
 M(Sign)      327.5  Pr>=|M|      0.0001       Mode      2.484907
 Sgn Rank  109388.5  Pr>=|S|      0.0001
 W:Normal  0.849662  Pr<W         0.0001

                    Histogram                         #     Boxplot                       Normal Probability Plot
   9.25+*                                             3        *            9.25+                                                     *
       .                                                                         |
       .*                                             1        *                 |                                                     *
       .                                                                         |
       .                                                                         |
       .                                                                         |
       .                                                                         |
       .*                                             1        0                 |                                                     *
       .                                                                         |
       .*                                             3        0                 |                                                   **
       .*                                             2        0                 |                                                  +*+++
       .**                                            6        |                 |                                             ++++**
       .******                                       30        |                 |                                        ++++******
       .******************                           89        |                 |                                   ++*********
       .*******************************************  212    +-----+              |                             **********
       .***************************                  132    |  +  |              |                      ******+
       .****************                              80    +-----+              |                  *****+
       .***************                               71       |                 |            ********
       .******                                        29       |                 |*********++
  -0.25+*                                             3        |           -0.25+*+++++
        ----+----+----+----+----+----+----+----+---                               +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 5 counts                                                 -2        -1         0        +1        +2

                                                              Detected Observations
Variable=LNVALUE

                 Moments                                        Quantiles(Def=5)                                      Extremes

 N              563  Sum Wgts        563       100% Max  9.417355        99%  4.882802          Lowest    ID      Highest    ID
 Mean      2.028431  Sum        1142.007        75% Q3   2.484907        95%  3.206803        -0.08338(   13164) 5.575949(   14184)
 Std Dev   0.983565  Variance     0.9674        50% Med   2.04122        90%  2.890372        -0.04082(   13225)   8.4929(   14193)
 Skewness  2.691789  Kurtosis   18.01614        25% Q1   1.458615        10%  0.875469         0.09531(   13236) 9.048997(   14194)
 USS       2860.162  CSS        543.6788         0% Min  -0.08338         5%  0.641854         0.182322(  13227) 9.400961(   14192)
 CV        48.48894  Std Mean   0.041452                                  1%  0.262364         0.182322(  13226) 9.417355(   14191)
 T:Mean=0  48.93409  Pr>|T|       0.0001       Range     9.500736
 Num ^= 0       563  Num > 0         561       Q3-Q1     1.026292
 M(Sign)      279.5  Pr>=|M|      0.0001       Mode      2.484907
 Sgn Rank     79380  Pr>=|S|      0.0001
 W:Normal  0.830493  Pr<W         0.0001

                    Histogram                         #     Boxplot                       Normal Probability Plot
   9.25+*                                             3        *            9.25+                                                     *
       .                                                                         |
       .*                                             1        *                 |                                                     *
       .                                                                         |
       .                                                                         |
       .                                                                         |
       .                                                                         |
       .*                                             1        *                 |                                                    *
       .                                                                         |
       .*                                             3        0                 |                                                   **
       .*                                             2        0                 |                                                  **+++
       .**                                            6        |                 |                                             ++++***
       .********                                     29        |                 |                                        ++++******
       .**********************                       86        |                 |                                   ++*********
       .*****************************************   162     +--+--+              |                            ********
       .********************************            125     |     |              |                      ******
       .********************                         77     +-----+              |                ******+
       .***************                              57        |                 |       *********+
       .***                                           9        |                 |* ***+++++
  -0.25+*                                             2        0           -0.25+*++++
        ----+----+----+----+----+----+----+----+--                                +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                 -2        -1         0        +1        +2
```

```
--------------------------------------------- DEPTH=Subsurface ANALYSIS=Potassium ---------------------------------------------

                                                   All Observations
Variable=LNVALUE

                Moments                                  Quantiles(Def=5)                                 Extremes

N                662  Sum Wgts       662      100% Max  10.12663      99%  7.371489      Lowest    ID     Highest    ID
Mean        5.611639  Sum       3714.905       75% Q3   6.011267      95%  6.822197    3.583519(  4173) 8.098643(  13339)
Std Dev     0.751715  Variance  0.565076       50% Med   5.55296      90%  6.507278    3.583519(  4168) 9.230143(  14193)
Skewness    1.061394  Kurtosis  5.157859       25% Q1   5.117994      10%  4.820282    3.610918(  4348) 9.758462(  14194)
USS         21220.22  CSS       373.5153        0% Min  3.583519       5%  4.592085    3.637586(  4386) 10.03889(  14191)
CV          13.39565  Std Mean  0.029216                               1%   3.78419    3.637586(  4283) 10.12663(  14192)
T:Mean=0    192.0725  Pr>|T|      0.0001      Range     6.543112
Num ^= 0         662  Num > 0        662      Q3-Q1     0.893273
M(Sign)          331  Pr>=|M|     0.0001      Mode      5.948035
Sgn Rank    109726.5  Pr>=|S|     0.0001
W:Normal    0.942756  Pr<W        0.0001

                Histogram                       #     Boxplot                        Normal Probability Plot
 10.25+*                                        2        *         10.25+                                                    *
      .*                                        1        *              |                                                    *
      .*                                        1        *              |                                                    *
      .                                                                 |
      .*                                        1        0              |                                                    *
      .                                                                 |
      .***                                     13        0              |                                              ******+
      .***********                             51        |              |                                      +*******
      .********************                   102     +-----+           |                                +*******
      .***********************************    173     *--+--*           |                         +*******
      .******************************************  207     +-----+      |                 **********
      .*****************                       85        |              |          ********+
      .****                                    17        |              |   *****+++
  3.75+**                                       9        0          3.75+***+
       ----+----+----+----+----+----+----+----+--                       +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 5 counts                                          -2        -1         0        +1        +2


                                                 Detected Observations
Variable=LNVALUE

                Moments                                  Quantiles(Def=5)                                 Extremes

N                471  Sum Wgts       471      100% Max  10.12663      99%  8.098643      Lowest    ID     Highest    ID
Mean        5.693422  Sum       2681.602       75% Q3   6.188264      95%  6.898715    3.583519(  4173) 8.098643(  13339)
Std Dev     0.825116  Variance  0.680816       50% Med  5.638355      90%  6.635947    3.583519(  4168) 9.230143(  14193)
Skewness    0.876477  Kurtosis   4.38811       25% Q1    5.17615      10%   4.70048    3.610918(  4348) 9.758462(  14194)
USS         15587.48  CSS       319.9836        0% Min  3.583519       5%   4.41522    3.637586(  4386) 10.03889(  14191)
CV          14.49244  Std Mean  0.038019                               1%  3.637586    3.637586(  4283) 10.12663(  14192)
T:Mean=0    149.7507  Pr>|T|      0.0001      Range     6.543112
Num ^= 0         471  Num > 0        471      Q3-Q1     1.012114
M(Sign)        235.5  Pr>=|M|     0.0001      Mode      5.141664
Sgn Rank       55578  Pr>=|S|     0.0001
W:Normal     0.94873  Pr<W        0.0001

                Histogram                       #     Boxplot                        Normal Probability Plot
 10.25+*                                        2        *         10.25+                                                    *
      .*                                        1        *              |                                                    *
      .*                                        1        *              |                                                   *
      .                                                                 |
      .*                                        1        0              |                                                  *
      .                                                                 |                                                 ++++
      .****                                    12        |              |                                           ++*******
      .****************                        48        |              |                                     +*********
      .******************************          90     +-----+           |                               ********
      .*****************************************  123     *--+--*       |                         *******
      .************************************    109     +-----+          |                  ********
      .********************                    59        |              |          ********
      .******                                  16        |              |    *****+
  3.75+***                                      9        0          3.75+*****
       ----+----+----+----+----+----+----+----+--                       +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 3 counts                                          -2        -1         0        +1        +2
```

---- DEPTH=Subsurface ANALYSIS=Selenium ----

All Observations

Variable=LNVALUE

Moments

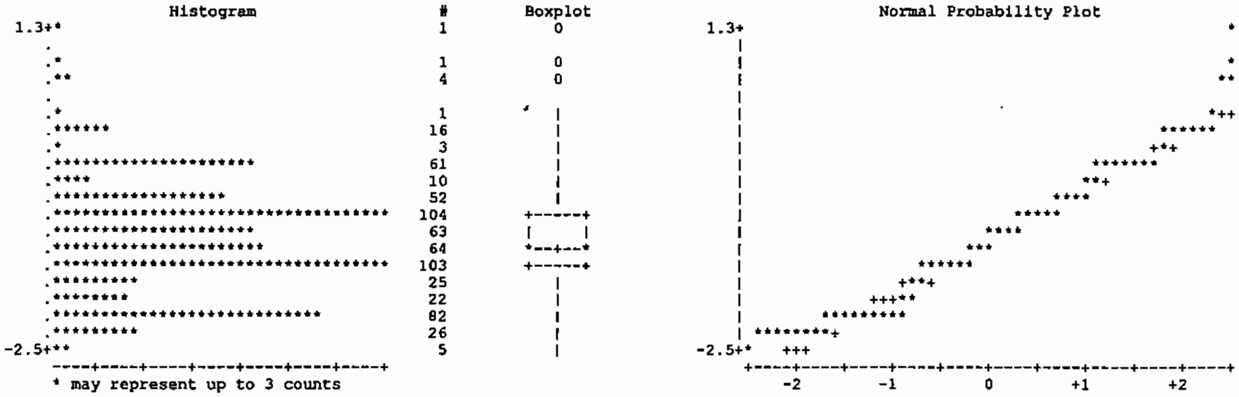
N	643	Sum Wgts	643
Mean	-1.22295	Sum	-786.355
Std Dev	0.63664	Variance	0.405311
Skewness	0.265103	Kurtosis	0.037279
USS	1221.881	CSS	260.2096
CV	-52.0579	Std Mean	0.025107
T:Mean=0	-48.7101	Pr>|T|	0.0001
Num ^= 0	628	Num > 0	8
M(Sign)	-306	Pr>=|M|	0.0001
Sgn Rank	-97718	Pr>=|S|	0.0001
W:Normal	0.963081	Pr<W	0.0001

Quantiles(Def=5)

100% Max	1.335001	99%	0.262364
75% Q3	-0.82326	95%	-0.24846
50% Med	-1.20397	90%	-0.35667
25% Q1	-1.57504	10%	-2.04022
0% Min	-2.45341	5%	-2.12026
		1%	-2.3969
Range	3.788409		
Q3-Q1	0.751781		
Mode	-2.04022		

Extremes

Lowest	ID	Highest	ID
-2.45341(	4140)	0.741937(	4239)
-2.41912(	4465)	0.741937(	4242)
-2.40795(	4464)	0.788457(	4240)
-2.40795(	4141)	0.993252(	4238)
-2.40795(	4133)	1.335001(	4236)



Detected Observations

Variable=LNVALUE

Moments

N	82	Sum Wgts	82
Mean	-1.26136	Sum	-103.432
Std Dev	0.542303	Variance	0.294092
Skewness	-0.11483	Kurtosis	-0.9805
USS	154.2867	CSS	23.82149
CV	-42.9934	Std Mean	0.059887
T:Mean=0	-21.0623	Pr>|T|	0.0001
Num ^= 0	82	Num > 0	0
M(Sign)	-41	Pr>=|M|	0.0001
Sgn Rank	-1701.5	Pr>=|S|	0.0001
W:Normal	0.956996	Pr<W	0.0274

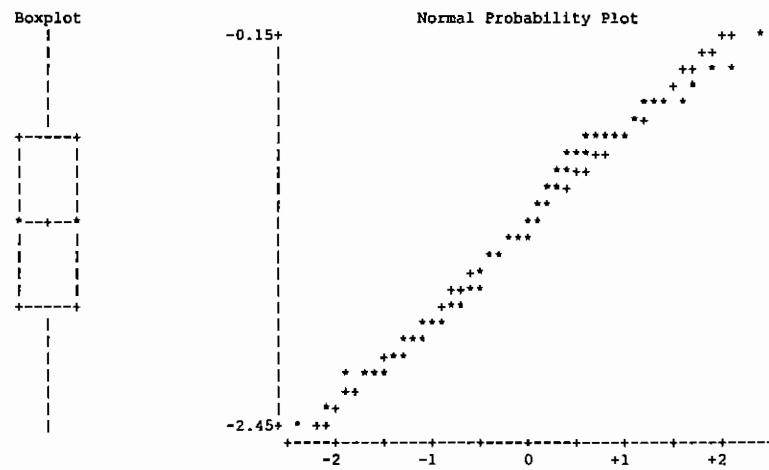
Quantiles(Def=5)

100% Max	-0.13926	99%	-0.13926
75% Q3	-0.79186	95%	-0.51083
50% Med	-1.29115	90%	-0.57982
25% Q1	-1.7148	10%	-1.96611
0% Min	-2.40795	5%	-2.12026
		1%	-2.40795
Range	2.268684		
Q3-Q1	0.922935		
Mode	-2.12026		

Extremes

Lowest	ID	Highest	ID
-2.40795(	4141)	-0.51083(	5001)
-2.33304(	4455)	-0.46204(	13122)
-2.12026(	4459)	-0.37106(	4272)
-2.12026(	4456)	-0.35667(	4050)
-2.12026(	4453)	-0.13926(	4467)

```
Stem Leaf                   #
  -1 4                      1
  -2
  -3 76                     2
  -4 6                      1
  -5 886331                 6
  -6 75                     2
  -7 983333111              9
  -8 9444420                7
  -9 9975                   4
 -10 52                     2
 -11 7441                   4
 -12 774                    3
 -13 99951111               8
 -14 77773                  5
 -15 611                    3
 -16 6666                   4
 -17 7771                   4
 -18 3333                   4
 -19 77700                  5
 -20 44                     2
 -21 2222                   4
 -22
 -23 3                      1
 -24 1                      1
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```



DEPTH=Subsurface ANALYSIS=Silver

All Observations

Variable=LNVALUE

Moments

N	662	Sum Wgts	662
Mean	0.050334	Sum	33.32094
Std Dev	0.586773	Variance	0.344303
Skewness	0.471523	Kurtosis	1.199106
USS	229.2614	CSS	227.5843
CV	1165.765	Std Mean	0.022806
T:Mean=0	2.207079	Pr>|T|	0.0277
Num ^= 0	633	Num > 0	264
M(Sign)	-52.5	Pr>=|M|	0.0001
Sgn Rank	-642	Pr>=|S|	0.8892
W:Normal	0.935415	Pr<W	0.0001

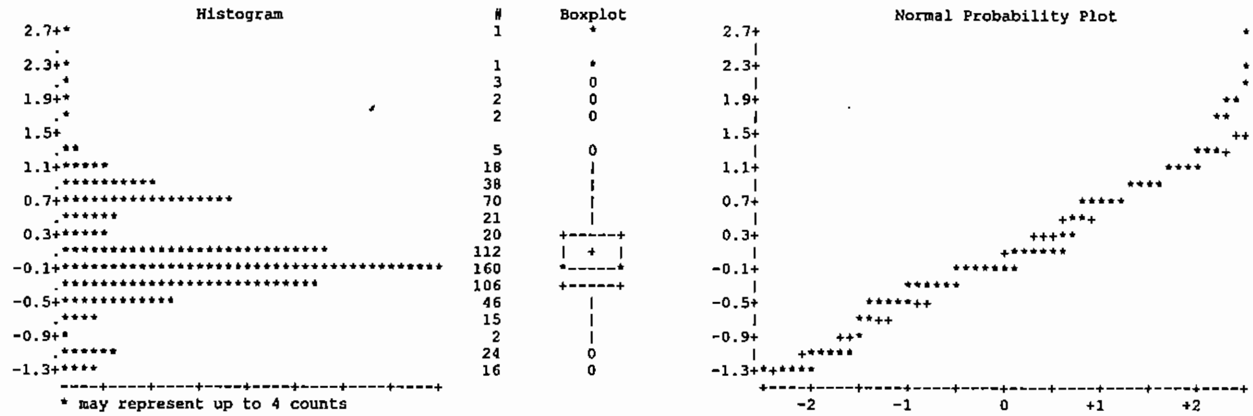
Quantiles(Def=5)

100% Max	2.639057	99%	1.84055
75% Q3	0.336472	95%	0.993252
50% Med	-0.04082	90%	0.832909
25% Q1	-0.24846	10%	-0.47804
0% Min	-1.27297	5%	-1.13943
		1%	-1.20397
Range	3.912023		
Q3-Q1	0.584934		
Mode	0.788457		

Extremes

Lowest	ID	Highest	ID
-1.27297(	4140)	2.014903(	14186)
-1.23787(	4465)	2.028148(	13361)
-1.23787(	4464)	2.163323(	14191)
-1.23787(	4150)	2.219203(	14194)
-1.23787(	4141)	2.639057(	13149)

Histogram / Boxplot / Normal Probability Plot



* may represent up to 4 counts

Detected Observations

Variable=LNVALUE

Moments

N	110	Sum Wgts	110
Mean	0.609932	Sum	67.09247
Std Dev	0.65658	Variance	0.431098
Skewness	0.228199	Kurtosis	0.87948
USS	87.91147	CSS	46.98966
CV	107.6482	Std Mean	0.062602
T:Mean=0	9.742929	Pr>|T|	0.0001
Num ^= 0	105	Num > 0	90
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	2339.5	Pr>=|S|	0.0001
W:Normal	0.973571	Pr<W	0.2104

Quantiles(Def=5)

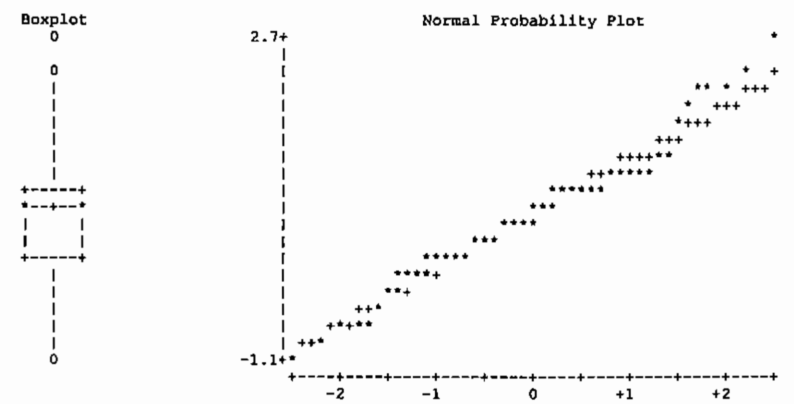
100% Max	2.639057	99%	2.219203
75% Q3	0.993252	95%	1.931521
50% Med	0.61482	90%	1.238269
25% Q1	0.182322	10%	-0.15089
0% Min	-1.13943	5%	-0.52763
		1%	-0.8675
Range	3.778492		
Q3-Q1	0.81093		
Mode	0.916291		

Extremes

Lowest	ID	Highest	ID
-1.13943(	4510)	2.014903(	14186)
-0.8675(	4454)	2.028148(	13361)
-0.77653(	4457)	2.163323(	14191)
-0.71335(	4453)	2.219203(	14194)
-0.61619(	4508)	2.639057(	13149)

```
Stem Leaf                      #
  26 4                         1
  24
  22 2                         1
  20 136                       3
  18 43                        2
  16 4                         1
  14
  12 2584                      4
  10 336666003339             12
   8 3333382222222266669999   22
   6 444444999                 9
   4 11177773333999           14
   2 666666444444             12
   0 00000000088888           14
  -0 664643                    6
  -2 41                        2
  -4 35                        2
  -6 812                       3
  -8 7                         1
 -10 4                         1
     ----+----+----+----+--
Multiply Stem.Leaf by 10**-1
```

Boxplot / Normal Probability Plot



DEPTH=Subsurface ANALYSIS=Sodium

All Observations

Variable=LNVALUE

Moments

N	662	Sum Wgts	662
Mean	4.956872	Sum	3281.449
Std Dev	0.812687	Variance	0.660459
Skewness	-0.31811	Kurtosis	3.259019
USS	16702.29	CSS	436.5636
CV	16.39515	Std Mean	0.031586
T:Mean=0	156.9328	Pr>|T|	0.0001
Num ^= 0	662	Num > 0	662
M(Sign)	331	Pr>=|M|	0.0001
Sgn Rank	109726.5	Pr>=|S|	0.0001
W:Normal	0.947636	Pr<W	0.0001

Quantiles(Def=5)

100% Max	9.008224	99%	6.458338
75% Q3	5.472271	95%	5.948035
50% Med	5.170484	90%	5.746203
25% Q1	4.430817	10%	3.939638
0% Min	1.131402	5%	3.583519
		1%	2.844909
Range	7.876822		
Q3-Q1	1.041454		
Mode	4.330733		

Extremes

Lowest	ID	Highest	ID
1.131402(	4353)	6.782192(	13152)
1.360977(	4352)	7.948032(	14193)
1.435085(	4351)	8.480529(	14194)
2.70805(	13211)	8.806873(	14191)
2.778819(	13297)	9.008224(	14192)

```
                Histogram                         #      Boxplot
 9.25+*                                            1         *
    .*                                             1         *
    .*                                             1         0
    .*                                             1         0
    .
    .*                                             2         |
    .*****                                        21         |
    .**************************                  130         |
 5.25+********************************************218      +-----+
    .*********************                       105      |  +  |
    .*********************                       103      +-----+
    .**********                                   50         |
    .****                                         18         |
    .**                                            8         0
    .
    .
 1.25+*                                            3         0
     ----+----+----+----+----+----+----+----+----
     * may represent up to 5 counts

                    Normal Probability Plot
 9.25+                                                     *
     |                                                     *
     |                                                     *
     |                                                     *
     |
     |                                          ++++++**
     |                                    ++++********
     |                              ***********
 5.25+                     **********
     |                 *****++
     |            *******
     |       ******
     | +++******
     |*****
     |
     |
 1.25+*
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	508	Sum Wgts	508
Mean	4.877476	Sum	2477.758
Std Dev	0.827056	Variance	0.684022
Skewness	0.001392	Kurtosis	3.893989
USS	12432.01	CSS	346.7992
CV	16.95664	Std Mean	0.036695
T:Mean=0	132.9205	Pr>|T|	0.0001
Num ^= 0	508	Num > 0	508
M(Sign)	254	Pr>=|M|	0.0001
Sgn Rank	64643	Pr>=|S|	0.0001
W:Normal	0.955183	Pr<W	0.0001

Quantiles(Def=5)

100% Max	9.008224	99%	6.529419
75% Q3	5.384485	95%	5.97381
50% Med	4.97671	90%	5.70711
25% Q1	4.330733	10%	3.912023
0% Min	1.131402	5%	3.589059
		1%	2.95491
Range	7.876822		
Q3-Q1	1.053751		
Mode	4.330733		

Extremes

Lowest	ID	Highest	ID
1.131402(	4353)	6.782192(	13152)
1.360977(	4352)	7.948032(	14193)
1.435085(	4351)	8.480529(	14194)
2.70805(	13211)	8.806873(	14191)
2.844909(	13282)	9.008224(	14192)

```
                Histogram                      #      Boxplot
 9.25+*                                        1         *
    .*                                         1         *
    .*                                         1         0
    .*                                         1         0
    .
    .*                                         2         |
    .****                                     14         |
    .********************                     79         |
 5.25+**************************************  152     +------+
    .************************                 96      *--+--*
    .************************                 93      +------+
    .************                             48         |
    .****                                     13         |
    .*                                         4         0
    .
    .
 1.25+*                                        3         0
     ----+----+----+----+----+----+----+---
     * may represent up to 4 counts

                    Normal Probability Plot
 9.25+                                                     *
     |                                                     *
     |                                                     *
     |                                                     *
     |
     |                                               +++**+
     |                                         ++++*****
     |                                   +*********
 5.25+                        **********
     |                   ******+
     |             *******
     |       *******
     |   *****+
     |****
     |
     |
 1.25+*
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Thallium

All Observations

Variable=LNVALUE

Moments

N	655	Sum Wgts	655
Mean	-0.75841	Sum	-496.761
Std Dev	0.713541	Variance	0.50914
Skewness	0.838544	Kurtosis	2.817381
USS	709.7282	CSS	332.9777
CV	-94.0833	Std Mean	0.02788
T:Mean=0	-27.2025	Pr>|T|	0.0001
Num ^= 0	651	Num > 0	25
M(Sign)	-300.5	Pr>=|M|	0.0001
Sgn Rank	-97691	Pr>=|S|	0.0001
W:Normal	0.866401	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.397895	99%	2.163323
75% Q3	-0.27312	95%	-0.0202
50% Med	-0.61619	90%	-0.11766
25% Q1	-1.38629	10%	-1.7148
0% Min	-1.83258	5%	-1.77196
		1%	-1.77196
Range	4.230477		
Q3-Q1	1.113172		
Mode	-0.35667		

Extremes

Lowest	ID	Highest	ID
-1.83258(	4421)	2.230014(	13133)
-1.83258(	4379)	2.24071(	14046)
-1.83258(	4348)	2.261763(	13123)
-1.83258(	4247)	2.302585(	14045)
-1.83258(	4246)	2.397895(	14008)

```
                 Histogram                              #      Boxplot
  2.3+**                                                5         0
     .*                                                 4         0
     .*                                                 2         0
     .
     .
     .*                                                 1         |
     .                                                            |
  0.9+                                                            |
     .                                                            |
     .*                                                 1         |
     .*                                                 1         |
     .****                                             15         |
     .*********************                            82         |
     .******************************************      166      +-----+
 -0.5+*************                                    49      |     |
     .*********                                        34      *--+--*
     .**********                                       37      |     |
     .******************                               73      |     |
     .*******                                          26      +-----+
     .*****                                            19         |
     .**********************************              135         |
 -1.9+**                                                5         |
      ----+----+----+----+----+----+----+----+--
     * may represent up to 4 counts
```

```
                   Normal Probability Plot
   2.3+                                                  *
      |                                                ***
      |                                                **
      |
      |
      |                                                *
      |                                                   +
   0.9+                                                 +++
      |                                               ++
      |                                           +++ *
      |                                        +++   *
      |                                     +++  ****
      |                                  ++*********
      |                              ********
  -0.5+                           ***+++
      |                           ***+
      |                         ***
      |                      ****
      |                   +**
      |                ++++**
      | ****************
  -1.9+*      +++
       +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

Detected Observations

Variable=LNVALUE

Moments

N	32	Sum Wgts	32
Mean	-1.4303	Sum	-45.7697
Std Dev	0.228827	Variance	0.052362
Skewness	0.58321	Kurtosis	-0.39044
USS	67.08785	CSS	1.62321
CV	-15.9985	Std Mean	0.040451
T:Mean=0	-35.3588	Pr>|T|	0.0001
Num ^= 0	32	Num > 0	0
M(Sign)	-16	Pr>=|M|	0.0001
Sgn Rank	-264	Pr>=|S|	0.0001
W:Normal	0.944038	Pr<W	0.1194

Quantiles(Def=5)

100% Max	-0.8916	99%	-0.8916
75% Q3	-1.25542	95%	-0.96758
50% Med	-1.4484	90%	-1.10866
25% Q1	-1.63508	10%	-1.66073
0% Min	-1.77196	5%	-1.7148
		1%	-1.77196
Range	0.880359		
Q3-Q1	0.379665		
Mode	-1.66073		

Extremes

Lowest	ID	Highest	ID
-1.77196(	4378)	-1.20397(	14182)
-1.7148(	4388)	-1.10866(	4244)
-1.7148(	4148)	-1.10866(	4276)
-1.66073(	4342)	-0.96758(	13081)
-1.66073(	4327)	-0.8916(	14184)

```
   Stem Leaf                    #         Boxplot
     -8 9                       1            |
     -9 7                       1            |
    -10                                      |
    -11 11                      2            |
    -12 774400                  6         +-----+
    -13 91                      2         |     |
    -14 773333                  6         *--+--*
    -15 6661                    4         |     |
    -16 6666611                 7         +-----+
    -17 711                     3            |
        ----+----+----+----+
   Multiply Stem.Leaf by 10**-1
```

```
                   Normal Probability Plot
  -0.85+                                                *  ++
       |                                             *  +++++
       |                                            ++++
  -1.15+                                        ++*+
       |                                   ***+*+
       |                               ++*+
  -1.45+                            ++**+*
       |                        +++***
       |                   **+****
  -1.75+     *     *++++
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Vanadium

All Observations

Variable=LNVALUE

Moments

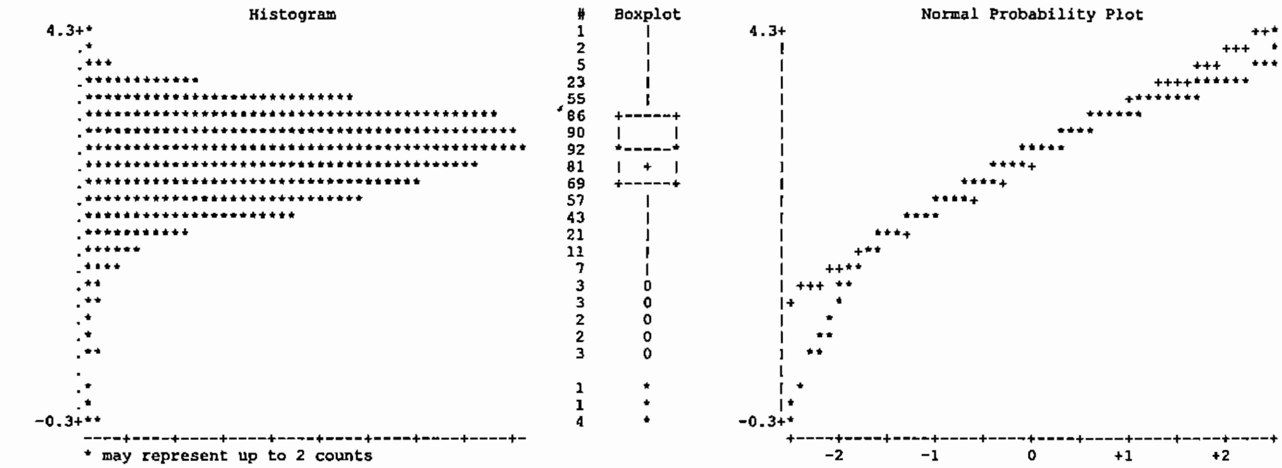
N	662	Sum Wgts	662
Mean	2.773911	Sum	1836.329
Std Dev	0.63763	Variance	0.406572
Skewness	-1.39154	Kurtosis	3.915454
USS	5362.558	CSS	268.744
CV	22.98667	Std Mean	0.024782
T:Mean=0	111.9316	Pr>|T|	0.0001
Num ^= 0	661	Num > 0	656
M(Sign)	325.5	Pr>=|M|	0.0001
Sgn Rank	109380.5	Pr>=|S|	0.0001
W:Normal	0.913066	Pr<W	0.0001

Quantiles(Def=5)

100% Max	4.232656	99%	3.828641
75% Q3	3.218876	95%	3.583519
50% Med	2.85647	90%	3.465736
25% Q1	2.459589	10%	2.054124
0% Min	-0.33968	5%	1.774952
		1%	0.530628
Range	4.572334		
Q3-Q1	0.759287		
Mode	2.944439		

Extremes

Lowest	ID	Highest	ID
-0.33968(	13203)	3.8795(	13016)
-0.28236(	13282)	3.933784(	13012)
-0.21196(	13283)	4.060443(	4407)
-0.20702(	13284)	4.155753(	13348)
-0.05657(	13285)	4.232656(	13152)



Detected Observations

Variable=LNVALUE

Moments

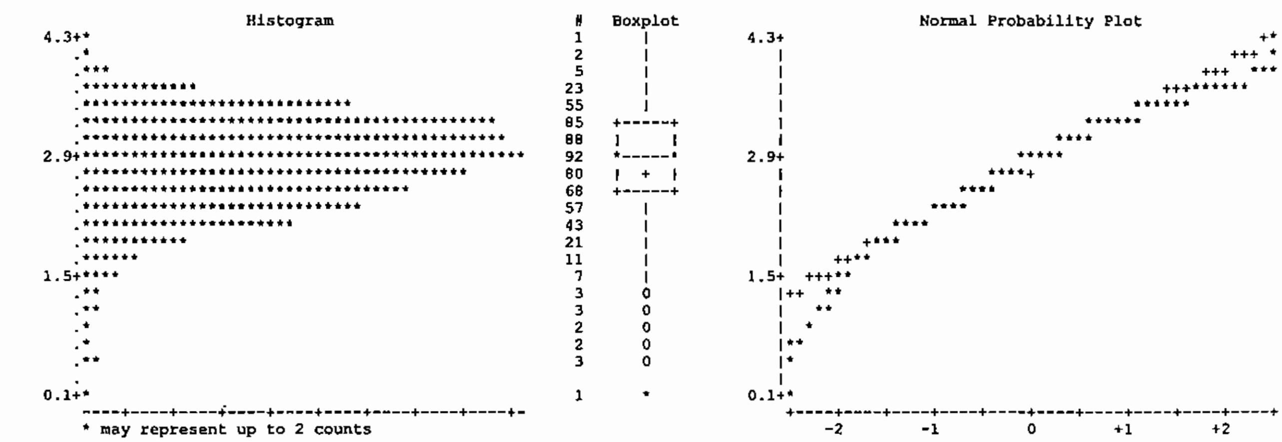
N	652	Sum Wgts	652
Mean	2.795827	Sum	1822.879
Std Dev	0.585504	Variance	0.342815
Skewness	-0.90589	Kurtosis	1.682969
USS	5319.626	CSS	223.1726
CV	20.94208	Std Mean	0.02293
T:Mean=0	121.9282	Pr>|T|	0.0001
Num ^= 0	651	Num > 0	651
M(Sign)	325.5	Pr>=|M|	0.0001
Sgn Rank	106113	Pr>=|S|	0.0001
W:Normal	0.953182	Pr<W	0.0001

Quantiles(Def=5)

100% Max	4.232656	99%	3.828641
75% Q3	3.218876	95%	3.583519
50% Med	2.862185	90%	3.465736
25% Q1	2.4681	10%	2.079442
0% Min	0	5%	1.824549
		1%	0.832909
Range	4.232656		
Q3-Q1	0.750776		
Mode	2.944439		

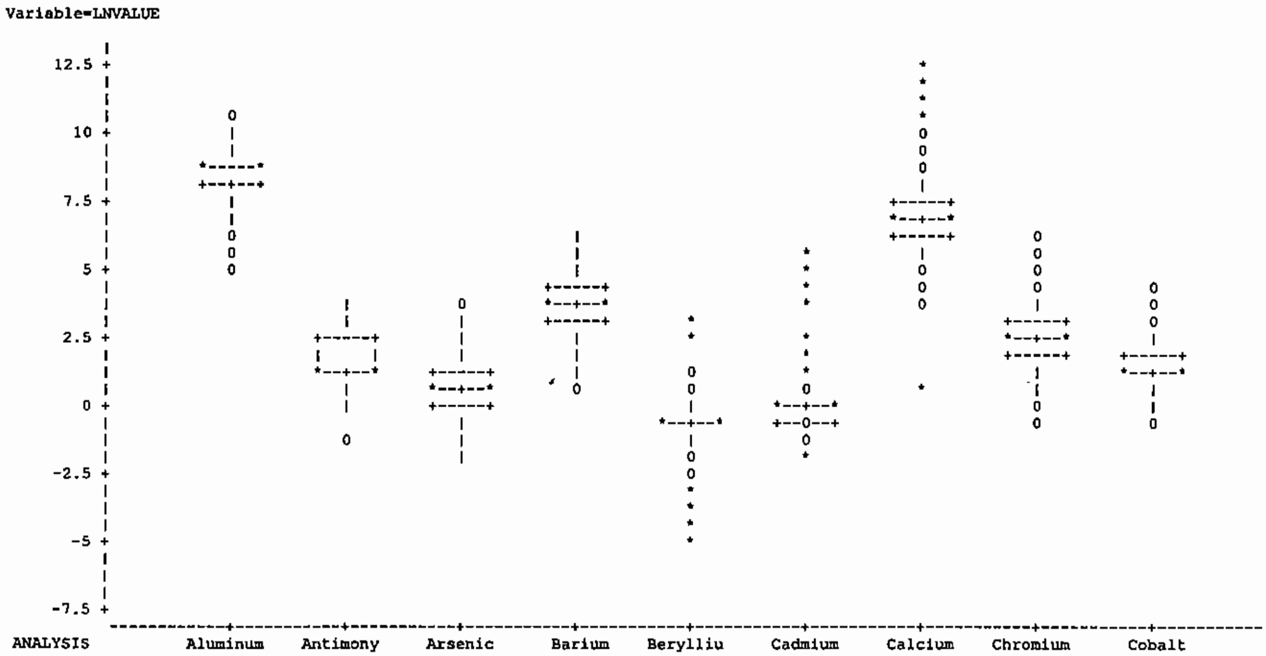
Extremes

Lowest	ID	Highest	ID
0(	13131)	3.8795(	13016)
0.530628(	13280)	3.933784(	13012)
0.530628(	13278)	4.060443(	4407)
0.530628(	13132)	4.155753(	13348)
0.693147(	13234)	4.232656(	13152)

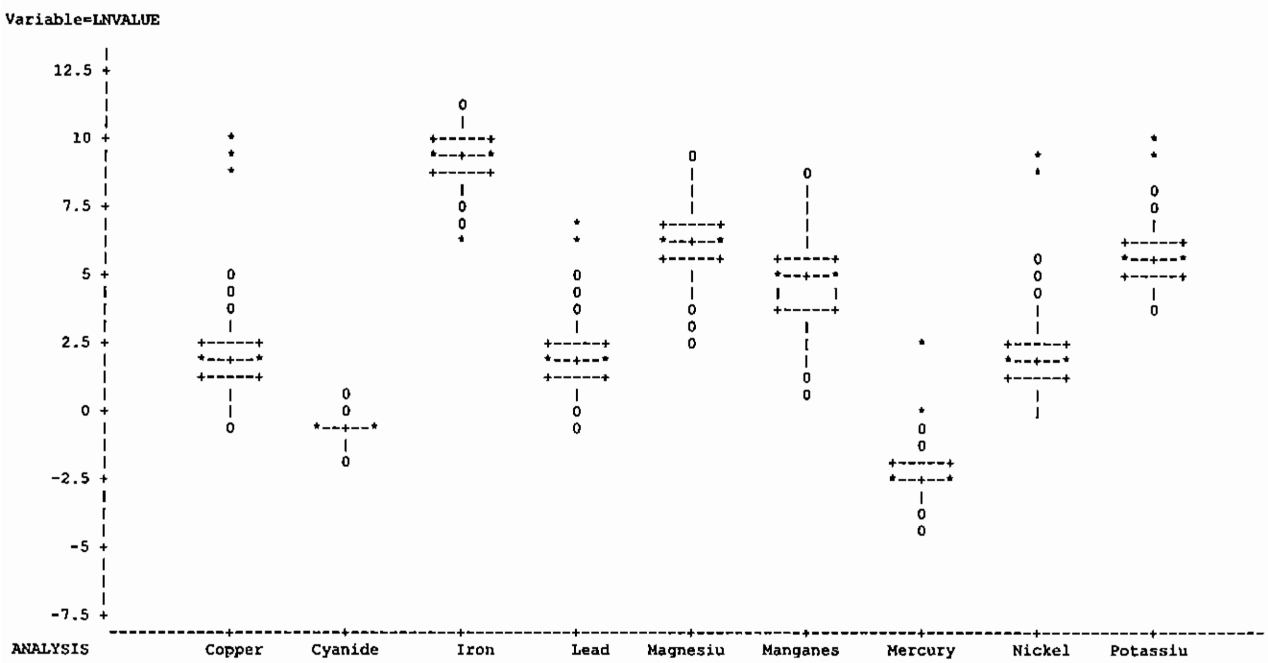


```
------------------------------------------------- DEPTH=Subsurface ANALYSIS=Zinc ------------------------------------------------

                                                         All Observations
Variable=LNVALUE

                  Moments                                   Quantiles(Def=5)                                     Extremes

N               662  Sum Wgts        662      100% Max  7.029973      99%  5.247024          Lowest    ID      Highest    ID
Mean       2.916849  Sum        1930.954       75% Q3   3.496508      95%  4.094345        -0.18633(  13306) 5.758902(   5077)
Std Dev    0.880551  Variance   0.775369       50% Med  2.978048      90%  3.883624        0.470004(  13260) 6.682109(  14193)
Skewness   0.295369  Kurtosis   2.266405       25% Q1   2.322388      10%  1.791759        0.530628(  13308) 7.021084(  14191)
USS        6144.821  CSS         512.519        0% Min -0.18633        5%  1.435085        0.530628(  13307) 7.021084(  14194)
CV         30.18841  Std Mean   0.034224                               1%  0.788457        0.641854(  13294) 7.029973(  14192)
T:Mean=0   85.22926  Pr>|T|       0.0001      Range     7.216302
Num ^= 0        662  Num > 0         661      Q3-Q1      1.17412
M(Sign)         330  Pr>=|M|      0.0001      Mode      2.484907
Sgn Rank   109725.5  Pr>=|S|      0.0001
W:Normal   0.968508  Pr<W         0.0001

                  Histogram                        #             Boxplot                          Normal Probability Plot
   7.25+*                                          3                *                   7.25+                                         *
       .*                                          1                0                       |                                         *
       .                                                                                    |
   5.75+*                                          2                0                   5.75+                                        **
       .*                                          3                |                       |                                      **++
       .*                                          3                |                       |                                    +++**+
   4.25+**********                                37                |                   4.25+                                ++*******
       .****************************             112                |                       |                           ********
       .****************************************  159             +-----+                   |                      ********
   2.75+**********************************       134             *--+--*               2.75+                 ******
       .******************************           119             +-----+                    |            *******
       .*************                             51                |                       |       ******
   1.25+*******                                   27                |                   1.25+  ******
       .***                                        9                0                       |*****
       .*                                          1                0                       |*
  -0.25+*                                          1                0                  -0.25+*
        ----+----+----+----+----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                            -2        -1         0        +1        +2

                                                       Detected Observations
Variable=LNVALUE

                  Moments                                   Quantiles(Def=5)                                     Extremes

N               661  Sum Wgts        661      100% Max  7.029973      99%  5.247024          Lowest    ID      Highest    ID
Mean       2.917039  Sum        1928.163       75% Q3   3.496508      95%  4.094345        -0.18633(  13306) 5.758902(   5077)
Std Dev    0.881204  Variance    0.77652       50% Med  2.985682      90%  3.883624        0.470004(  13260) 6.682109(  14193)
Skewness   0.294516  Kurtosis   2.258538       25% Q1   2.322388      10%  1.791759        0.530628(  13308) 7.021084(  14191)
USS        6137.031  CSS        512.5032        0% Min -0.18633        5%  1.435085        0.530628(  13307) 7.021084(  14194)
CV         30.20884  Std Mean   0.034275                               1%  0.788457        0.641854(  13294) 7.029973(  14192)
T:Mean=0   85.10727  Pr>|T|       0.0001      Range     7.216302
Num ^= 0        661  Num > 0         660      Q3-Q1      1.17412
M(Sign)       329.5  Pr>=|M|      0.0001      Mode      2.484907
Sgn Rank   109394.5  Pr>=|S|      0.0001
W:Normal   0.968483  Pr<W         0.0001

                  Histogram                        #             Boxplot                          Normal Probability Plot
   7.25+*                                          3                *                   7.25+                                         *
       .*                                          1                0                       |                                         *
       .                                                                                    |
   5.75+*                                          2                0                   5.75+                                        **
       .*                                          3                |                       |                                      **++
       .*                                          3                |                       |                                    +++**+
   4.25+**********                                37                |                   4.25+                                +*********
       .****************************             112                |                       |                           ********
       .****************************************  159             +-----+                   |                      ********
   2.75+**********************************       133             *--+--*               2.75+                 ******
       .******************************           119             +-----+                    |            *******
       .*************                             51                |                       |       ******
   1.25+*******                                   27                |                   1.25+  ******
       .***                                        9                0                       |*****
       .*                                          1                0                       |*
  -0.25+*                                          1                0                  -0.25+*
        ----+----+----+----+----+----+----+----+                                             +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                            -2        -1         0        +1        +2
```

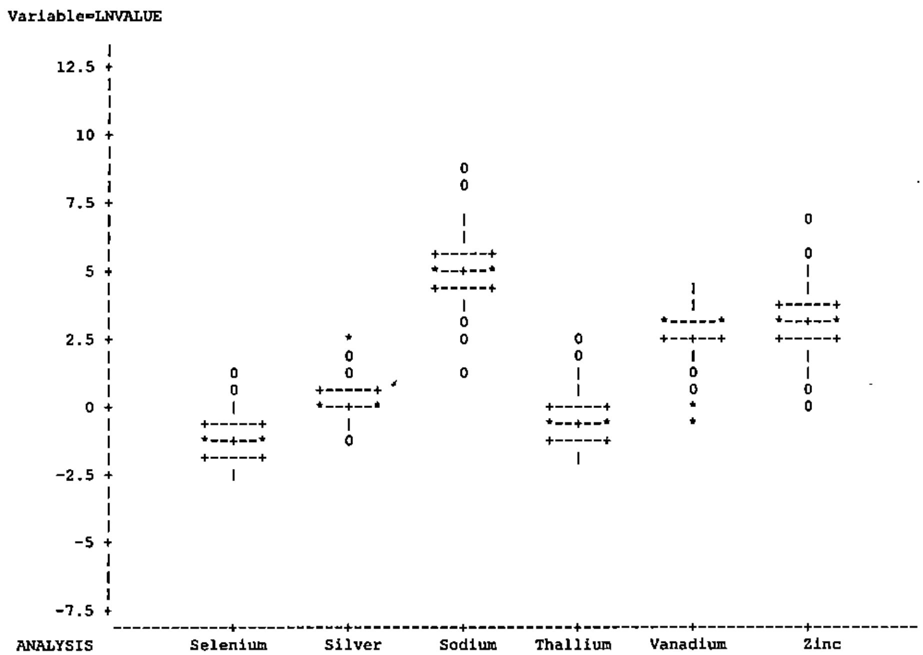
All Observations - Subsurface
Schematic Plots



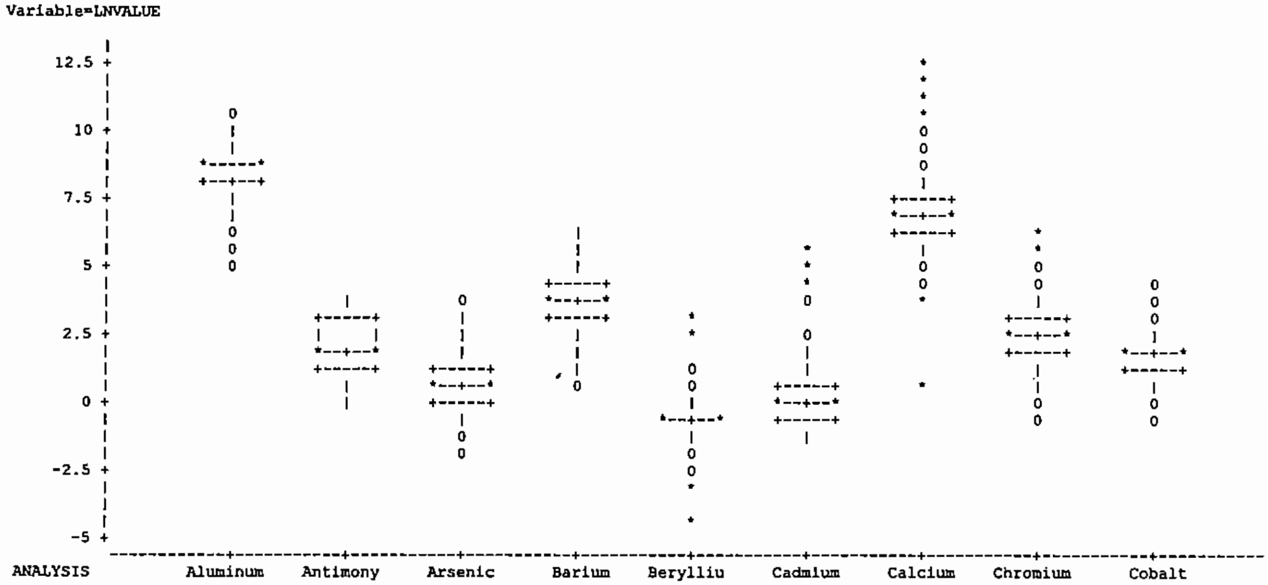
All Observations - Subsurface
Schematic Plots

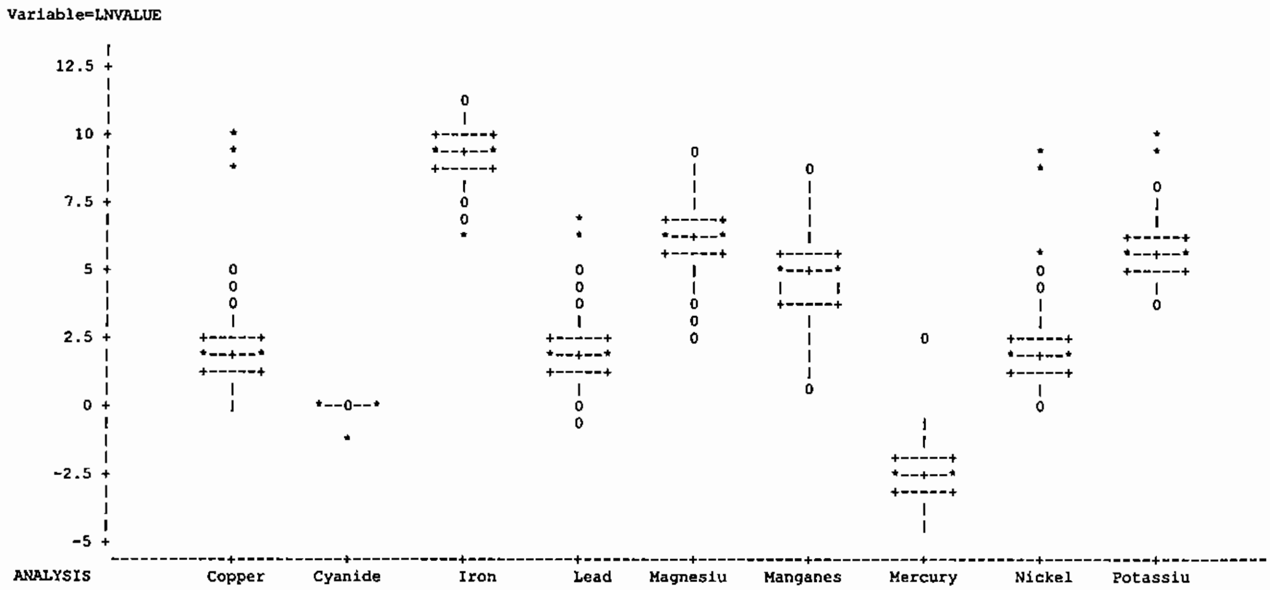


All Observations - Subsurface
Schematic Plots

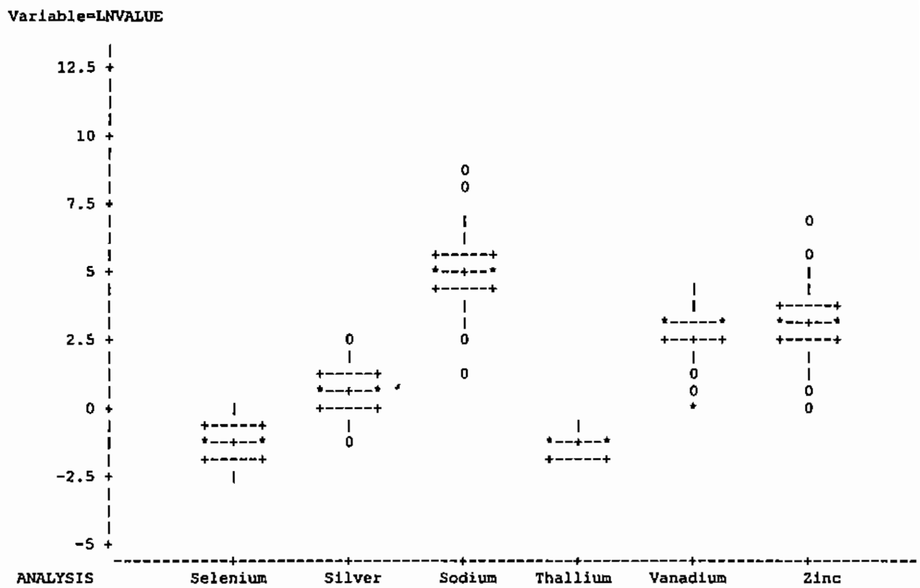


Detected Observations - Subsurface
Schematic Plots





Detected Observations - Subsurface
Schematic Plots



Correlation Analysis
All Observations

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / Number of Observations

	LNAL	LNSB	LNAS	LNBA	LNBE	LNCD	LNCA	LNCH	LNCO	LNCU	LNCN	LNFE
LNAL	1.00000 0.0 75	-0.13002 0.2662 75	0.38733 0.0006 75	0.64099 0.0001 75	0.44289 0.0001 75	0.31491 0.0059 75	-0.34208 0.0027 75	0.21997 0.0579 75	0.54290 0.0001 75	0.23437 0.0430 75	-0.02164 0.8568 72	0.58814 0.0001 75
LNSB	-0.13002 0.2662 75	1.00000 0.0 75	-0.00180 0.9878 75	0.04474 0.7031 75	-0.85107 0.0001 75	-0.62016 0.0001 75	-0.06155 0.5999 75	-0.25688 0.0261 75	-0.11506 0.3256 75	-0.06572 0.5754 75	-0.69950 0.0001 72	-0.09793 0.4033 75
LNAS	0.38733 0.0006 75	-0.00180 0.9878 75	1.00000 0.0 75	0.45985 0.0001 75	0.22302 0.0544 75	0.21705 0.0614 75	-0.24858 0.0315 75	0.03011 0.7976 75	0.44112 0.0001 75	0.26329 0.0225 75	0.15513 0.1932 72	0.46757 0.0001 75
LNBA	0.64099 0.0001 75	0.04474 0.7031 75	0.45985 0.0001 75	1.00000 0.0 75	0.20827 0.0730 75	0.20740 0.0742 75	-0.29995 0.0089 75	0.00403 0.9726 75	0.65468 0.0001 75	0.24511 0.0340 75	0.06161 0.6072 72	0.50677 0.0001 75
LNBE	0.44289 0.0001 75	-0.85107 0.0001 75	0.22302 0.0544 75	0.20827 0.0730 75	1.00000 0.0 75	0.75135 0.0001 75	-0.10768 0.3578 75	0.38843 0.0006 75	0.31116 0.0066 75	0.28804 0.0122 75	0.44731 0.0001 72	0.40512 0.0003 75
LNCD	0.31491 0.0059 75	-0.62016 0.0001 75	0.21705 0.0614 75	0.20740 0.0742 75	0.75135 0.0001 75	1.00000 0.0 75	0.09899 0.3981 75	0.44174 0.0001 75	0.29198 0.0110 75	0.50110 0.0001 75	0.37696 0.0011 72	0.33328 0.0035 75
LNCA	-0.34208 0.0027 75	-0.06155 0.5999 75	-0.24858 0.0315 75	-0.29995 0.0089 75	-0.10768 0.3578 75	0.09899 0.3981 75	1.00000 0.0 75	0.11227 0.3376 75	-0.22456 0.0528 75	0.08057 0.4920 75	0.00078 0.9948 72	-0.38897 0.0006 75
LNCH	0.21997 0.0579 75	-0.25688 0.0261 75	0.03011 0.7976 75	0.00403 0.9726 75	0.38843 0.0006 75	0.44174 0.0001 75	0.11227 0.3376 75	1.00000 0.0 75	-0.01509 0.8977 75	0.63493 0.0001 75	0.00478 0.9682 72	0.12402 0.2891 75
LNCO	0.54290 0.0001 75	-0.11506 0.3256 75	0.44112 0.0001 75	0.65468 0.0001 75	0.31116 0.0066 75	0.29198 0.0110 75	-0.22456 0.0528 75	-0.01509 0.8977 75	1.00000 0.0 75	0.15552 0.1828 75	0.18091 0.1283 72	0.54540 0.0001 75
LNCU	0.23437 0.0430 75	-0.06572 0.5754 75	0.26329 0.0225 75	0.24511 0.0340 75	0.28804 0.0122 75	0.50110 0.0001 75	0.08057 0.4920 75	0.63493 0.0001 75	0.15552 0.1828 75	1.00000 0.0 75	0.07075 0.5548 72	0.31020 0.0068 75
LNCN	-0.02164 0.8568 72	-0.69950 0.0001 72	0.15513 0.1932 72	0.06161 0.6072 72	0.44731 0.0001 72	0.37696 0.0011 72	0.00078 0.9948 72	0.00478 0.9682 72	0.18091 0.1283 72	0.07075 0.5548 72	1.00000 0.0 72	0.15015 0.2081 72
LNFE	0.58814 0.0001 75	-0.09793 0.4033 75	0.46757 0.0001 75	0.50677 0.0001 75	0.40512 0.0003 75	0.33328 0.0035 75	-0.38897 0.0006 75	0.12402 0.2891 75	0.54540 0.0001 75	0.31020 0.0068 75	0.15015 0.2081 72	1.00000 0.0 75
LNPB	0.03531 0.7636 75	0.02283 0.8458 75	0.29769 0.0095 75	0.18899 0.1044 75	0.05978 0.6105 75	0.32088 0.0050 75	0.19470 0.0942 75	0.39404 0.0005 75	0.12581 0.2822 75	0.63936 0.0001 75	0.06248 0.6021 72	0.10369 0.3760 75
LNMG	0.04291 0.7147 75	-0.00461 0.9687 75	0.05185 0.6586 75	0.08211 0.4837 75	-0.06500 0.5795 75	0.15296 0.1901 75	0.69060 0.0001 75	-0.03844 0.7434 75	0.00553 0.9624 75	0.15897 0.1731 75	0.05645 0.6376 72	-0.13273 0.2563 75
LNMN	0.21626 0.0624 75	-0.02420 0.8367 75	0.02460 0.8341 75	0.37629 0.0009 75	0.06188 0.5979 75	-0.04866 0.6785 75	-0.21578 0.0630 75	-0.21525 0.0637 75	0.29420 0.0104 75	-0.28933 0.0118 75	-0.19713 0.0970 72	0.08107 0.4893 75
LNHG	0.07874 0.5019 75	-0.15463 0.1853 75	0.13551 0.2464 75	0.14254 0.2225 75	0.13698 0.2412 75	0.27657 0.0163 75	0.09267 0.4291 75	0.39995 0.0004 75	0.09302 0.4273 75	0.48237 0.0001 75	0.18904 0.1118 72	0.16057 0.1688 75
LNNI	0.31360 0.0061 75	-0.26700 0.0206 75	0.17598 0.1310 75	0.33610 0.0032 75	0.40801 0.0003 75	0.46301 0.0001 75	0.14740 0.2070 75	0.60601 0.0001 75	0.33206 0.0036 75	0.78525 0.0001 75	0.18379 0.1222 72	0.36041 0.0015 75
LNK	0.53107 0.0001 75	-0.07012 0.5500 75	0.51277 0.0001 75	0.52137 0.0001 75	0.21879 0.0593 75	0.23865 0.0392 75	-0.02275 0.8464 75	-0.01971 0.8667 75	0.44705 0.0001 75	0.23627 0.0413 75	0.04552 0.7042 72	0.32197 0.0048 75
LNSE	0.20900 0.0719 75	0.50204 0.0001 75	0.54565 0.0001 75	0.43106 0.0001 75	-0.28552 0.0130 75	-0.09893 0.3984 75	-0.11198 0.3388 75	0.01026 0.9304 75	0.23322 0.0440 75	0.19134 0.1001 75	-0.21438 0.0706 72	0.12122 0.3002 75
LNAG	0.28584 0.0129 75	0.12378 0.2901 75	0.27825 0.0156 75	0.29344 0.0106 75	0.14665 0.2093 75	0.32498 0.0044 75	-0.09552 0.4149 75	0.36341 0.0014 75	0.25761 0.0257 75	0.60912 0.0001 75	-0.11915 0.3188 72	0.42109 0.0002 75
LNNA	0.07823 0.5047 75	0.12645 0.2797 75	0.21390 0.0654 75	0.24139 0.0369 75	-0.06616 0.5728 75	0.09066 0.4392 75	0.27366 0.0175 75	-0.02047 0.8616 75	0.28650 0.0127 75	0.29639 0.0098 75	0.20171 0.0893 72	0.18522 0.1116 75
LNTL	-0.34798 0.0022 75	0.65480 0.0001 75	0.12612 0.2810 75	0.04745 0.6861 75	-0.66569 0.0001 75	-0.40063 0.0004 75	0.04682 0.6900 75	-0.15546 0.1829 75	-0.01835 0.8758 75	0.02290 0.8453 75	-0.19378 0.1029 72	-0.21341 0.0660 75
LNV	0.74981 0.0001 75	-0.15948 0.1717 75	0.29980 0.0090 75	0.42689 0.0001 75	0.45702 0.0001 75	0.38514 0.0006 75	-0.15166 0.1940 75	0.27066 0.0188 75	0.41688 0.0002 75	0.17636 0.1301 75	-0.06645 0.5792 72	0.29718 0.0096 75
LN2N	-0.04063 0.7293 75	-0.11621 0.3208 75	0.08668 0.4596 75	0.07217 0.5383 75	0.13762 0.2390 75	0.33611 0.0032 75	0.23152 0.0457 75	0.40657 0.0003 75	0.05008 0.6696 75	0.69525 0.0001 75	0.25996 0.0274 72	0.13332 0.2542 75

--- DEPTH=surface ---

Correlation Analysis
All Observations

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / Number of Observations

	LNPB	LNMG	LNMN	LNHG	LNNI	LNK	LNSE	LNAG	LNNA	LNTL	LNV	LNZN
LNAL	0.03531	0.04291	0.21626	0.07874	0.31360	0.53107	0.20900	0.28584	0.07823	-0.34798	0.74981	-0.04063
	0.7636	0.7147	0.0624	0.5019	0.0061	0.0001	0.0719	0.0129	0.5047	0.0022	0.0001	0.7293
	75	75	75	75	75	75	75	75	75	75	75	75
LNSB	0.02283	-0.00461	-0.02420	-0.15463	-0.26700	-0.07012	0.50204	0.12378	0.12645	0.65480	-0.15948	-0.11621
	0.8458	0.9687	0.8367	0.1853	0.0206	0.5500	0.0001	0.2901	0.2797	0.0001	0.1717	0.3208
	75	75	75	75	75	75	75	75	75	75	75	75
LNAS	0.29769	0.05185	0.02460	0.13551	0.17598	0.51277	0.54565	0.27825	0.21390	0.12612	0.29980	0.08668
	0.0095	0.6586	0.8341	0.2464	0.1310	0.0001	0.0001	0.0156	0.0654	0.2810	0.0090	0.4596
	75	75	75	75	75	75	75	75	75	75	75	75
LNBA	0.18899	0.08211	0.37629	0.14254	0.33610	0.52137	0.43106	0.29344	0.24139	0.04745	0.42689	0.07217
	0.1044	0.4837	0.0009	0.2225	0.0032	0.0001	0.0001	0.0106	0.0369	0.6861	0.0001	0.5383
	75	75	75	75	75	75	75	75	75	75	75	75
LNBE	0.05978	-0.06500	0.06188	0.13698	0.40801	0.21879	-0.28552	0.14665	-0.06616	-0.66569	0.45702	0.13762
	0.6105	0.5795	0.5979	0.2412	0.0003	0.0593	0.0130	0.2093	0.5728	0.0001	0.0001	0.2390
	75	75	75	75	75	75	75	75	75	75	75	75
LNCD	0.32088	0.15296	-0.04866	0.27657	0.46301	0.23865	-0.09893	0.32498	0.09066	-0.40063	0.38514	0.33611
	0.0050	0.1901	0.6785	0.0163	0.0001	0.0392	0.3984	0.0044	0.4392	0.0004	0.0006	0.0032
	75	75	75	75	75	75	75	75	75	75	75	75
LNCA	0.19470	0.69060	-0.21578	0.09267	0.14740	-0.02275	-0.11198	-0.09552	0.27366	0.04682	-0.15166	0.23152
	0.0942	0.0001	0.0630	0.4291	0.2070	0.8464	0.3388	0.4149	0.0175	0.6900	0.1940	0.0457
	75	75	75	75	75	75	75	75	75	75	75	75
LNCH	0.39404	-0.03844	-0.21525	0.39995	0.60601	-0.01971	0.01026	0.36341	-0.02047	-0.15546	0.27066	0.40657
	0.0005	0.7434	0.0637	0.0004	0.0001	0.8667	0.9304	0.0014	0.8616	0.1829	0.0188	0.0003
	75	75	75	75	75	75	75	75	75	75	75	75
LNCO	0.12581	0.00553	0.29420	0.09302	0.33206	0.44705	0.23322	0.25761	0.28650	-0.01835	0.41688	0.05008
	0.2822	0.9624	0.0104	0.4273	0.0036	0.0001	0.0440	0.0257	0.0127	0.8758	0.0002	0.6696
	75	75	75	75	75	75	75	75	75	75	75	75
LNCU	0.63936	0.15897	-0.28933	0.48237	0.78525	0.23627	0.19134	0.60912	0.29639	0.02290	0.17636	0.69525
	0.0001	0.1731	0.0118	0.0001	0.0001	0.0413	0.1001	0.0001	0.0098	0.8453	0.1301	0.0001
	75	75	75	75	75	75	75	75	75	75	75	75
LNCN	0.06248	0.05645	-0.19713	0.18904	0.18379	0.04552	-0.21438	-0.11915	0.20171	-0.19378	-0.06645	0.25996
	0.6021	0.6376	0.0970	0.1118	0.1222	0.7042	0.0706	0.3188	0.0893	0.1029	0.5792	0.0274
	72	72	72	72	72	72	72	72	72	72	72	72
LNFE	0.10369	-0.13273	0.08107	0.16057	0.36041	0.32197	0.12122	0.42109	0.18522	-0.21341	0.29718	0.13332
	0.3760	0.2563	0.4893	0.1688	0.0015	0.0048	0.3002	0.0002	0.1116	0.0660	0.0096	0.2542
	75	75	75	75	75	75	75	75	75	75	75	75
LNPB	1.00000	0.37095	-0.11219	0.46300	0.43274	0.34857	0.42818	0.50048	0.22081	0.20992	0.19497	0.73735
	0.0	0.0011	0.3379	0.0001	0.0001	0.0022	0.0001	0.0001	0.0569	0.0707	0.0937	0.0001
	75	75	75	75	75	75	75	75	75	75	75	75
LNMG	0.37095	1.00000	0.00216	0.10585	0.16237	0.31946	0.21098	0.02346	0.38461	0.09780	0.15688	0.32639
	0.0011	0.0	0.9853	0.3661	0.1640	0.0052	0.0692	0.8416	0.0007	0.4038	0.1789	0.0043
	75	75	75	75	75	75	75	75	75	75	75	75
LNMN	-0.11219	0.00216	1.00000	-0.10756	-0.18233	0.06211	-0.01315	-0.06266	-0.26590	-0.22197	0.19309	-0.29606
	0.3379	0.9853	0.0	0.3583	0.1174	0.5965	0.9108	0.5933	0.0211	0.0556	0.0970	0.0099
	75	75	75	75	75	75	75	75	75	75	75	75
LNHG	0.46300	0.10585	-0.10756	1.00000	0.46889	0.13366	0.10298	0.59578	0.06328	0.02673	0.03697	0.40741
	0.0001	0.3661	0.3583	0.0	0.0001	0.2529	0.3793	0.0001	0.5896	0.8199	0.7529	0.0003
	75	75	75	75	75	75	75	75	75	75	75	75
LNNI	0.43274	0.16237	-0.18233	0.46889	1.00000	0.25577	0.02907	0.39540	0.30457	-0.16899	0.21844	0.58737
	0.0001	0.1640	0.1174	0.0001	0.0	0.0268	0.8044	0.0004	0.0079	0.1472	0.0597	0.0001
	75	75	75	75	75	75	75	75	75	75	75	75
LNK	0.34857	0.31946	0.06211	0.13366	0.25577	1.00000	0.44539	0.21334	0.35506	0.04774	0.38396	0.10081
	0.0022	0.0052	0.5965	0.2529	0.0268	0.0	0.0001	0.0661	0.0018	0.6842	0.0007	0.3895
	75	75	75	75	75	75	75	75	75	75	75	75
LNSE	0.42818	0.21098	-0.01315	0.10298	0.02907	0.44539	1.00000	0.30819	0.22214	0.56877	0.27475	0.18003
	0.0001	0.0692	0.9108	0.3793	0.8044	0.0001	0.0	0.0071	0.0554	0.0001	0.0171	0.1222
	75	75	75	75	75	75	75	75	75	75	75	75
LNAG	0.50048	0.02346	-0.06266	0.59578	0.39540	0.21334	0.30819	1.00000	0.07603	0.09361	0.21620	0.33721
	0.0001	0.8416	0.5933	0.0001	0.0004	0.0661	0.0071	0.0	0.5168	0.4244	0.0625	0.0031
	75	75	75	75	75	75	75	75	75	75	75	75
LNNA	0.22081	0.38461	-0.26590	0.06328	0.30457	0.35506	0.22214	0.07603	1.00000	0.18258	-0.03041	0.33386
	0.0569	0.0007	0.0211	0.5896	0.0079	0.0018	0.0554	0.5168	0.0	0.1169	0.7956	0.0034
	75	75	75	75	75	75	75	75	75	75	75	75
LNTL	0.20992	0.09780	-0.22197	0.02673	-0.16899	0.04774	0.56877	0.09361	0.18258	1.00000	-0.27616	0.06299
	0.0707	0.4038	0.0556	0.8199	0.1472	0.6842	0.0001	0.4244	0.1169	0.0	0.0165	0.5914
	75	75	75	75	75	75	75	75	75	75	75	75
LNV	0.19497	0.15688	0.19309	0.03697	0.21844	0.38396	0.27475	0.21620	-0.03041	-0.27616	1.00000	0.04342
	0.0937	0.1789	0.0970	0.7529	0.0597	0.0007	0.0171	0.0625	0.7956	0.0165	0.0	0.7115
	75	75	75	75	75	75	75	75	75	75	75	75
LNZN	0.73735	0.32639	-0.29606	0.40741	0.58737	0.10081	0.18003	0.33721	0.33386	0.06299	0.04342	1.00000
	0.0001	0.0043	0.0099	0.0003	0.0001	0.3895	0.1222	0.0031	0.0034	0.5914	0.7115	0.0
	75	75	75	75	75	75	75	75	75	75	75	75

--- DEPTH=subsurface ---

Correlation Analysis
All Observations

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / Number of Observations

	LNAL	LNSB	LNAS	LNBA	LNBE	LNCD	LNCA	LNCH	LNCO	LNCU	LNCN	LNFE
LNAL	1.00000	0.14101	0.53834	0.70739	0.38262	0.25390	0.57916	0.30418	0.35944	0.60092	-0.06000	0.50922
	0.0	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.1253	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNSB	0.14101	1.00000	0.15855	0.13741	0.00022	0.21266	0.11481	0.14382	0.10380	0.33885	-0.04982	0.13885
	0.0003	0.0	0.0001	0.0004	0.9956	0.0001	0.0031	0.0002	0.0075	0.0001	0.2033	0.0003
	662	662	662	662	662	662	662	662	662	662	654	662
LNAS	0.53834	0.15855	1.00000	0.58121	0.27226	0.25884	0.39641	0.50512	0.40044	0.61467	-0.11368	0.53060
	0.0001	0.0001	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0036	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNBA	0.70739	0.13741	0.58121	1.00000	0.39207	0.24468	0.52752	0.23232	0.57789	0.58160	-0.02517	0.45911
	0.0001	0.0004	0.0001	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.5205	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNBE	0.38262	0.00022	0.27226	0.39207	1.00000	0.14492	0.21718	0.18326	0.44076	0.23754	-0.07806	0.51771
	0.0001	0.9956	0.0001	0.0001	0.0	0.0002	0.0001	0.0001	0.0001	0.0001	0.0460	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNCD	0.25390	0.21266	0.25884	0.24468	0.14492	1.00000	0.19383	0.24514	0.30441	0.50128	0.24254	0.40456
	0.0001	0.0001	0.0001	0.0001	0.0002	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNCA	0.57916	0.11481	0.39641	0.52752	0.21718	0.19383	1.00000	0.12511	0.22463	0.45028	-0.02105	0.24290
	0.0001	0.0031	0.0001	0.0001	0.0001	0.0001	0.0	0.0013	0.0001	0.0001	0.5910	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNCH	0.30418	0.14382	0.50512	0.23232	0.18326	0.24514	0.12511	1.00000	0.18350	0.57222	-0.07251	0.40184
	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0013	0.0	0.0001	0.0001	0.0639	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNCO	0.35944	0.10380	0.40044	0.57789	0.44076	0.30441	0.22463	0.18350	1.00000	0.39108	0.01878	0.51912
	0.0001	0.0075	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0	0.0001	0.6317	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNCU	0.60092	0.33885	0.61467	0.58160	0.23754	0.50128	0.45028	0.57222	0.39108	1.00000	-0.02992	0.48015
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0	0.4449	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNCN	-0.06000	-0.04982	-0.11368	-0.02517	-0.07806	0.24254	-0.02105	-0.07251	0.01878	-0.02992	1.00000	0.03748
	0.1253	0.2033	0.0036	0.5205	0.0460	0.0001	0.5910	0.0639	0.6317	0.4449	0.0	0.3386
	654	654	654	654	654	654	654	654	654	654	654	654
LNFE	0.50922	0.13885	0.53060	0.45911	0.51771	0.40456	0.24290	0.40184	0.51912	0.48015	0.03748	1.00000
	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.3386	0.0
	662	662	662	662	662	662	662	662	662	662	654	662
LNPB	0.66273	0.18228	0.54615	0.56003	0.17141	0.37716	0.57739	0.23451	0.29120	0.63389	-0.02022	0.38778
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.6057	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNMG	0.81902	0.16027	0.53866	0.78448	0.29293	0.18068	0.75362	0.12908	0.38285	0.55870	-0.01774	0.35700
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0009	0.0001	0.0001	0.6507	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNMN	0.37379	0.08615	0.49983	0.68705	0.28912	0.27682	0.28526	0.18339	0.71952	0.37185	0.09901	0.47460
	0.0001	0.0267	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0113	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNHG	-0.04119	-0.17018	-0.08648	0.07084	0.11272	0.14096	0.10172	-0.24063	0.14533	-0.08547	0.36342	-0.03990
	0.2899	0.0001	0.0261	0.0685	0.0037	0.0003	0.0088	0.0001	0.0002	0.0279	0.0001	0.3054
	662	662	662	662	662	662	662	662	662	662	654	662
LNNI	0.42408	0.27645	0.59272	0.56172	0.35692	0.49689	0.32455	0.59455	0.58156	0.81027	0.01243	0.55674
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.7510	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNK	0.53482	0.21483	0.43476	0.54564	0.32336	0.27367	0.41054	0.25664	0.44969	0.53097	-0.08779	0.37394
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0248	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNSE	0.01913	0.30475	-0.02493	0.07426	0.13211	-0.01237	0.07346	-0.29288	0.09481	-0.13731	-0.13572	-0.09584
	0.6232	0.0001	0.5219	0.0562	0.0007	0.7507	0.0589	0.0001	0.0147	0.0004	0.0005	0.0136
	662	662	662	662	662	662	662	662	662	662	654	662
LNAG	0.18113	0.51502	0.14693	0.24888	0.17834	0.37013	0.20815	-0.05276	0.29620	0.24512	0.14072	0.15409
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.1751	0.0001	0.0001	0.0003	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNNA	0.40874	0.19430	0.38077	0.37477	0.03487	0.25880	0.31628	0.39423	0.17429	0.57969	0.08292	0.31238
	0.0001	0.0001	0.0001	0.0001	0.3704	0.0001	0.0001	0.0001	0.0001	0.0001	0.0340	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNTL	0.02233	0.08002	-0.04351	0.14455	0.09014	0.03330	0.13277	-0.47896	0.08597	-0.18940	0.04200	-0.10568
	0.5662	0.0396	0.2636	0.0002	0.0204	0.3924	0.0006	0.0001	0.0270	0.0001	0.2835	0.0065
	662	662	662	662	662	662	662	662	662	662	654	662
LNV	0.71147	0.19244	0.51741	0.41672	0.39802	0.23692	0.39937	0.49038	0.26238	0.52599	-0.07919	0.59853
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0429	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662
LNZN	0.39682	0.25378	0.57560	0.61314	0.31430	0.37672	0.33696	0.50169	0.51983	0.72731	0.01827	0.53100
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.6410	0.0001
	662	662	662	662	662	662	662	662	662	662	654	662

---------- DEPTH=subsurface ----------

Correlation Analysis
All Observations

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / Number of Observations

	LNPB	LNMG	LNMN	LNHG	LNNI	LNK	LNSE	LNAG	LNNA	LNTL	LNV	LNZN
LNAL	0.66273	0.81902	0.37379	-0.04119	0.42408	0.53482	0.01913	0.18113	0.40874	0.02233	0.71147	0.39682
	0.0001	0.0001	0.0001	0.2899	0.0001	0.0001	0.6232	0.0001	0.0001	0.5662	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNSB	0.18228	0.16027	0.08615	-0.17018	0.27645	0.21483	0.30475	0.51502	0.19430	0.08002	0.19244	0.25378
	0.0001	0.0001	0.0267	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0396	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNAS	0.54615	0.53866	0.49983	-0.08648	0.59272	0.43476	-0.02493	0.14693	0.38077	-0.04351	0.51741	0.57560
	0.0001	0.0001	0.0001	0.0261	0.0001	0.0001	0.5219	0.0001	0.0001	0.2636	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNBA	0.56003	0.78448	0.68705	0.07084	0.56172	0.54564	0.07426	0.24888	0.37477	0.14455	0.41672	0.61314
	0.0001	0.0001	0.0001	0.0685	0.0001	0.0001	0.0562	0.0001	0.0001	0.0002	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNBE	0.17141	0.29293	0.28912	-0.11272	0.35692	0.32336	0.13211	0.17834	-0.03487	0.09014	0.39802	0.31430
	0.0001	0.0001	0.0001	0.0037	0.0001	0.0001	0.0007	0.0001	0.3704	0.0204	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNCD	0.37716	0.18068	0.27682	0.14096	0.49689	0.27367	-0.01237	0.37013	0.25880	0.03330	0.23692	0.37672
	0.0001	0.0001	0.0001	0.0003	0.0001	0.0001	0.7507	0.0001	0.0001	0.3924	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNCA	0.57739	0.75362	0.28526	0.10172	0.32455	0.41054	0.07346	0.20815	0.31628	0.13277	0.39937	0.33696
	0.0001	0.0001	0.0001	0.0088	0.0001	0.0001	0.0589	0.0001	0.0001	0.0006	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNCH	0.23451	0.12908	0.18339	-0.24063	0.59455	0.25664	-0.29288	-0.05276	0.39423	-0.47896	0.49038	0.50169
	0.0001	0.0009	0.0001	0.0001	0.0001	0.0001	0.0001	0.1751	0.0001	0.0001	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNCO	0.29120	0.38285	0.71952	0.14533	0.58156	0.44969	0.09481	0.29620	0.17429	0.08597	0.26238	0.51983
	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0147	0.0001	0.0001	0.0270	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNCU	0.63389	0.55870	0.37185	-0.08547	0.81027	0.53097	-0.13731	0.24512	0.57969	-0.18940	0.52599	0.72731
	0.0001	0.0001	0.0001	0.0279	0.0001	0.0001	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNCN	-0.02022	-0.01774	0.09901	0.36342	0.01243	-0.08779	-0.13572	0.14072	0.08292	0.04200	-0.07919	0.01827
	0.6057	0.6507	0.0113	0.0001	0.7510	0.0248	0.0005	0.0003	0.0340	0.2835	0.0429	0.6410
	654	654	654	654	654	654	654	654	654	654	654	654
LNFE	0.38778	0.35700	0.47460	-0.03990	0.55674	0.37394	-0.09584	0.15409	0.31238	-0.10568	0.59853	0.53100
	0.0001	0.0001	0.0001	0.3054	0.0001	0.0001	0.0136	0.0001	0.0001	0.0065	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNPB	1.00000	0.68611	0.36170	0.03622	0.43969	0.47206	0.01898	0.22268	0.44363	0.04354	0.51988	0.38521
	0.0	0.0001	0.0001	0.3521	0.0001	0.0001	0.6260	0.0001	0.0001	0.2633	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNMG	0.68611	1.00000	0.43420	0.05928	0.41869	0.61097	0.14346	0.25132	0.40136	0.18357	0.53797	0.46026
	0.0001	0.0	0.0001	0.1276	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNMN	0.36170	0.43420	1.00000	0.17173	0.52259	0.34844	0.07677	0.28263	0.17079	0.13508	0.21196	0.54706
	0.0001	0.0001	0.0	0.0001	0.0001	0.0001	0.0483	0.0001	0.0001	0.0005	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNHG	0.03622	0.05928	0.17173	1.00000	0.06514	0.11432	0.41071	0.44325	-0.26173	0.46125	-0.19271	-0.02814
	0.3521	0.1276	0.0001	0.0	0.0940	0.0032	0.0001	0.0001	0.0001	0.0001	0.0001	0.4698
	662	662	662	662	662	662	662	662	662	662	662	662
LNNI	0.43969	0.41869	0.52259	0.06514	1.00000	0.55935	-0.02660	0.33654	0.44638	-0.12540	0.35435	0.79766
	0.0001	0.0001	0.0001	0.0940	0.0	0.0001	0.4944	0.0001	0.0001	0.0012	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNK	0.47206	0.61097	0.34844	0.11432	0.55935	1.00000	0.26329	0.35336	0.18737	0.08353	0.34260	0.54145
	0.0001	0.0001	0.0001	0.0032	0.0001	0.0	0.0001	0.0001	0.0001	0.0317	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNSE	0.01898	0.14346	0.07677	0.41071	-0.02660	0.26329	1.00000	0.58919	-0.34263	0.67935	-0.08598	-0.06883
	0.6260	0.0002	0.0483	0.0001	0.4944	0.0001	0.0	0.0001	0.0001	0.0001	0.0270	0.0768
	662	662	662	662	662	662	662	662	662	662	662	662
LNAG	0.22268	0.25132	0.28263	0.44325	0.33654	0.35336	0.58919	1.00000	-0.07620	0.50512	0.08544	0.22020
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0	0.0500	0.0001	0.0279	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNNA	0.44363	0.40136	0.17079	-0.26173	0.44638	0.18737	-0.34263	-0.07620	1.00000	-0.29190	0.41088	0.39021
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0500	0.0	0.0001	0.0001	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNTL	0.04354	0.18357	0.13508	0.46125	-0.12540	0.08353	0.67935	0.50512	-0.29190	1.00000	-0.15836	-0.13811
	0.2633	0.0001	0.0005	0.0001	0.0012	0.0317	0.0001	0.0001	0.0001	0.0	0.0001	0.0004
	662	662	662	662	662	662	662	662	662	662	662	662
LNV	0.51988	0.53797	0.21196	-0.19271	0.35435	0.34260	-0.08598	0.08544	0.41088	-0.15836	1.00000	0.29671
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0270	0.0279	0.0001	0.0001	0.0	0.0001
	662	662	662	662	662	662	662	662	662	662	662	662
LNZN	0.38521	0.46026	0.54706	-0.02814	0.79766	0.54145	-0.06883	0.22020	0.39021	-0.13811	0.29671	1.00000
	0.0001	0.0001	0.0001	0.4698	0.0001	0.0001	0.0768	0.0001	0.0001	0.0004	0.0001	0.0
	662	662	662	662	662	662	662	662	662	662	662	662

```
------------------------------------------------ DEPTH=Surface ANALYSIS=Aluminum ------------------------------------------------

                                                        All Observations
Variable=LNVALUE

                Moments                                 Quantiles(Def=5)                                      Extremes

 N                73  Sum Wgts        73      100% Max  9.517825      99%  9.517825         Lowest      ID     Highest    ID
 Mean       8.897564  Sum       649.5221       75% Q3   9.239899      95%  9.441452       7.021084(  14147) 9.441452(  14165)
 Std Dev    0.498456  Variance  0.248458       50% Med  8.994669      90%  9.392662       7.258412(  14020) 9.441452(  14175)
 Skewness   -1.83908  Kurtosis  4.060651       25% Q1   8.785692      10%  8.338067       7.414573(  14000) 9.472705(   5053)
 USS        5797.054  CSS       17.88901        0% Min  7.021084       5%  7.727535       7.727535(  14019) 9.495519(  14166)
 CV         5.602164  Std Mean   0.05834                               1%  7.021084       7.855545(  14016) 9.517825(   5103)
 T:Mean=0   152.5126  Pr>|T|      0.0001      Range     2.496741
 Num ^= 0         73  Num > 0         73      Q3-Q1     0.454207
 M(Sign)        36.5  Pr>=|M|     0.0001      Mode      8.808369
 Sgn Rank     1350.5  Pr>=|S|     0.0001
 W:Normal   0.828492  Pr<W        0.0001

       Stem Leaf                    #             Boxplot                          Normal Probability Plot
         95 02                      2                |              9.55+                                        ++      *
         94 33447                   5                |                  |                                      ++***   * *
         93 1122349                 7                |                  |                                    *****
         92 0044466                 7             +-----+               |                                 ***
         91 2223356                 7             |     |               |                              ****
         90 02234778                8             |     |           9.05+                           ****+
         89 00123589                8             *--+--*               |                         ***++
         88 0001111244             10             |     |               |                      *****++
         87 022569                  6             +-----+               |                    **   ++
         86 346                     3                |                  |                 ***   ++
         85 19                      2                |              8.55+                **   ++
         84                                          |                  |                   ++
         83 4                       1                |                  |               * ++
         82 6                       1                |                  |               *+
         81                                          |                  |            +++
         80 6                       1                0              8.05+          ++  *
         79                                                             |        ++
         78 6                       1                0                  |     ++    *
         77 3                       1                0                  |  ++      *
         76                                                             |+
         75                                                         7.55+
         74 1                       1                *                  |       *
         73                                                             |
         72 6                       1                *                  |     *
         71                                                             |
         70 2                       1                *              7.05+ *
            ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                           -2        -1         0        +1        +2
```

Detected Observations


```
                Moments                                 Quantiles(Def=5)                                      Extremes

 N                73  Sum Wgts        73      100% Max  9.517825      99%  9.517825         Lowest      ID     Highest    ID
 Mean       8.897564  Sum       649.5221       75% Q3   9.239899      95%  9.441452       7.021084(  14147) 9.441452(  14165)
 Std Dev    0.498456  Variance  0.248458       50% Med  8.994669      90%  9.392662       7.258412(  14020) 9.441452(  14175)
 Skewness   -1.83908  Kurtosis  4.060651       25% Q1   8.785692      10%  8.338067       7.414573(  14000) 9.472705(   5053)
 USS        5797.054  CSS       17.88901        0% Min  7.021084       5%  7.727535       7.727535(  14019) 9.495519(  14166)
 CV         5.602164  Std Mean   0.05834                               1%  7.021084       7.855545(  14016) 9.517825(   5103)
 T:Mean=0   152.5126  Pr>|T|      0.0001      Range     2.496741
 Num ^= 0         73  Num > 0         73      Q3-Q1     0.454207
 M(Sign)        36.5  Pr>=|M|     0.0001      Mode      8.808369
 Sgn Rank     1350.5  Pr>=|S|     0.0001
 W:Normal   0.828492  Pr<W        0.0001

       Stem Leaf                    #             Boxplot                          Normal Probability Plot
         95 02                      2                |              9.55+                                        ++      *
         94 33447                   5                |                  |                                      ++***   * *
         93 1122349                 7                |                  |                                    *****
         92 0044466                 7             +-----+               |                                 ***
         91 2223356                 7             |     |               |                              ****
         90 02234778                8             |     |           9.05+                           ****+
         89 00123589                8             *--+--*               |                         ***++
         88 0001111244             10             |     |               |                      *****++
         87 022569                  6             +-----+               |                    **   ++
         86 346                     3                |                  |                 ***   ++
         85 19                      2                |              8.55+                **   ++
         84                                          |                  |                   ++
         83 4                       1                |                  |               * ++
         82 6                       1                |                  |               *+
         81                                          |                  |            +++
         80 6                       1                0              8.05+          ++  *
         79                                                             |        ++
         78 6                       1                0                  |     ++    *
         77 3                       1                0                  |  ++      *
         76                                                             |+
         75                                                         7.55+
         74 1                       1                *                  |       *
         73                                                             |
         72 6                       1                *                  |     *
         71                                                             |
         70 2                       1                *              7.05+ *
            ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                           -2        -1         0        +1        +2
```

--- DEPTH=Surface ANALYSIS=Antimony ---

All Observations

Variable=LNVALUE

Moments

N	27	Sum Wgts	27
Mean	-0.98403	Sum	-26.5689
Std Dev	0.193078	Variance	0.037279
Skewness	3.484786	Kurtosis	12.9506
USS	27.11384	CSS	0.969256
CV	-19.6211	Std Mean	0.037158
T:Mean=0	-26.4825	Pr>|T|	0.0001
Num ^= 0	27	Num > 0	0
M(Sign)	-13.5	Pr>=|M|	0.0001
Sgn Rank	-189	Pr>=|S|	0.0001
W:Normal	0.529256	Pr<W	0.0001

Quantiles(Def=5)

100% Max	-0.17435	99%	-0.17435
75% Q3	-0.99425	95%	-0.54473
50% Med	-1.04982	90%	-0.94161
25% Q1	-1.04982	10%	-1.10866
0% Min	-1.10866	5%	-1.10866
		1%	-1.10866
Range	0.934309		
Q3-Q1	0.05557		
Mode	-1.04982		

Extremes

Lowest	ID	Highest	ID
-1.10866(	14164)	-0.96758(	14169)
-1.10866(	14159)	-0.96758(	14175)
-1.10866(	14157)	-0.94161(	14131)
-1.10866(	14147)	-0.54473(	14167)
-1.07881(	14143)	-0.17435(	14166)

```
Stem Leaf                    #         Boxplot
 -1 7                        1            *
 -2
 -3
 -4
 -5 4                        1            *
 -6
 -7
 -8
 -9 999997774                9         +--+--+
-10 885555555522            12         *-----*
-11 1111                     4            |
    ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

```
                    Normal Probability Plot
-0.15+                                                   *
     |
     |
     |
     |                                          *  ++++++
-0.65+                                        +++++
     |                                   +++++
     |                              +++++
     |                         ++++******  * *
     |               * **+*+*+* *
-1.15+     *    *  * *++++
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Moments

N	3	Sum Wgts	3
Mean	-0.55356	Sum	-1.66069
Std Dev	0.383704	Variance	0.147229
Skewness	-0.10357	Kurtosis	.
USS	1.213753	CSS	0.294457
CV	-69.3153	Std Mean	0.221532
T:Mean=0	-2.4988	Pr>|T|	0.1297
Num ^= 0	3	Num > 0	0
M(Sign)	-1.5	Pr>=|M|	0.2500
Sgn Rank	-3	Pr>=|S|	0.2500
W:Normal	0.999583	Pr<W	0.9610

Quantiles(Def=5)

100% Max	-0.17435	99%	-0.17435
75% Q3	-0.17435	95%	-0.17435
50% Med	-0.54473	90%	-0.17435
25% Q1	-0.94161	10%	-0.94161
0% Min	-0.94161	5%	-0.94161
		1%	-0.94161
Range	0.767255		
Q3-Q1	0.767255		
Mode	-0.94161		

Extremes

Lowest	ID	Highest	ID
-0.94161(	14131)	.(	)
-0.54473(	14167)	.(	)
-0.17435(	14166)	-0.94161(	14131)
.(	)	-0.54473(	14167)
.(	)	-0.17435(	14166)

```
Stem Leaf                    #         Boxplot
 -1 7                        1         +-----+
 -2                                    |     |
 -3                                    |     |
 -4                                    |     |
 -5 4                        1         *--+--*
 -6                                    |     |
 -7                                    |     |
 -8                                    |     |
 -9 4                        1         +-----+
    ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

```
                    Normal Probability Plot
-0.15+                                            *++
     |                                         +++
     |                                       ++
     |                                    +++
-0.55+                                 +*+
     |                               ++
     |                            +++
     |                         +++
-0.95+                       ++*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

---------- DEPTH=Surface ANALYSIS=Arsenic ----------

All Observations

Variable=LNVALUE

Moments

N	69	Sum Wgts	69
Mean	1.589771	Sum	109.6942
Std Dev	0.610173	Variance	0.372311
Skewness	-1.99121	Kurtosis	7.855541
USS	199.7059	CSS	25.31715
CV	38.38117	Std Mean	0.073456
T:Mean=0	21.64244	Pr>|T|	0.0001
Num ^= 0	69	Num > 0	68
M(Sign)	33.5	Pr>=|M|	0.0001
Sgn Rank	1185.5	Pr>=|S|	0.0001
W:Normal	0.875796	Pr<W	0.0001

Quantiles(Def=5)

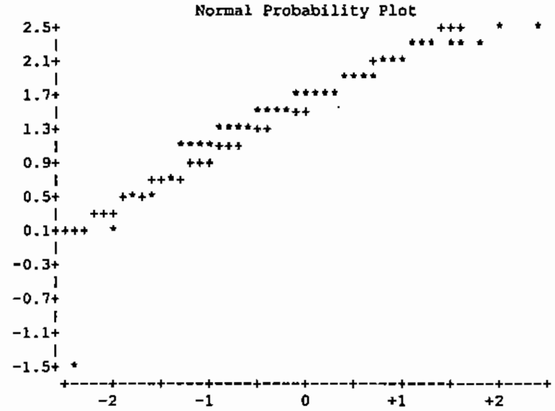
100% Max	2.484907	99%	2.484907
75% Q3	1.960095	95%	2.302585
50% Med	1.667707	90%	2.251292
25% Q1	1.335001	10%	1.029619
0% Min	-1.42712	5%	0.587787
		1%	-1.42712
Range	3.912023		
Q3-Q1	0.625094		
Mode	1.704748		

Extremes

Lowest	ID	Highest	ID
-1.42712(	14103)	2.292535(	5053)
0.182322(	14003)	2.302585(	14169)
0.470004(	14147)	2.397895(	14036)
0.587787(	14019)	2.484907(	14131)
0.587787(	14013)	2.484907(	14176)

```
Stem Leaf                     #       Boxplot
  24 088                      3          |
  22 001115590                9          |
  20 4525                     4          |
  18 46793567                 8       +-----+
  16 11579900027999          14       *-----*
  14 11468003377             11       |  +  |
  12 5814469                  7       +-----+
  10 3303699                  7          |
   8                                     |
   6 9                        1          |
   4 799                      3          |
   2                                     |
   0 8                        1          0
  -0
  -2
  -4
  -6
  -8
 -10
 -12
 -14 3                        1          *
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Moments

N	68	Sum Wgts	68
Mean	1.634137	Sum	111.1213
Std Dev	0.489924	Variance	0.240025
Skewness	-0.59581	Kurtosis	0.442567
USS	197.6692	CSS	16.08169
CV	29.98057	Std Mean	0.059412
T:Mean=0	27.50519	Pr>|T|	0.0001
Num ^= 0	68	Num > 0	68
M(Sign)	34	Pr>=|M|	0.0001
Sgn Rank	1173	Pr>=|S|	0.0001
W:Normal	0.962861	Pr<W	0.1111

Quantiles(Def=5)

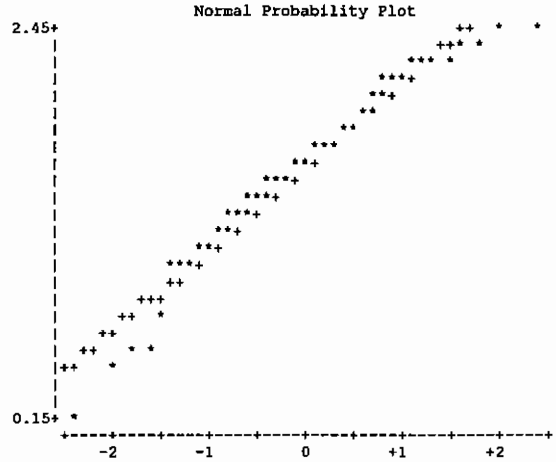
100% Max	2.484907	99%	2.484907
75% Q3	1.967088	95%	2.302585
50% Med	1.677053	90%	2.251292
25% Q1	1.347989	10%	1.029619
0% Min	0.182322	5%	0.587787
		1%	0.182322
Range	2.302585		
Q3-Q1	0.619099		
Mode	1.704748		

Extremes

Lowest	ID	Highest	ID
0.182322(	14003)	2.292535(	5053)
0.470004(	14147)	2.302585(	14169)
0.587787(	14019)	2.397895(	14036)
0.587787(	14013)	2.484907(	14131)
0.788457(	14020)	2.484907(	14176)

```
Stem Leaf                     #       Boxplot
  24 088                      3          |
  23 0                        1          |
  22 00111559                 8          |
  21 25                       2          |
  20 45                       2          |
  19 3567                     4       +-----+
  18 4679                     4       |     |
  17 00027999                 8       |     |
  16 115799                   6       *--+--*
  15 003377                   6       |     |
  14 11468                    5       |     |
  13 14469                    5       +-----+
  12 58                       2          |
  11 03699                    5          |
  10 33                       2          |
   9                                     |
   8                                     |
   7 9                        1          |
   6                                     |
   5 99                       2          |
   4 7                        1          |
   3
   2
   1 8                        1          0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



-- DEPTH=Surface ANALYSIS=Barium --

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	4.400594	Sum	330.0446
Std Dev	0.540953	Variance	0.29263
Skewness	-1.01977	Kurtosis	1.168851
USS	1474.047	CSS	21.65461
CV	12.29272	Std Mean	0.062464
T:Mean=0	70.45027	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.928096	Pr<W	0.0003

Quantiles(Def=5)

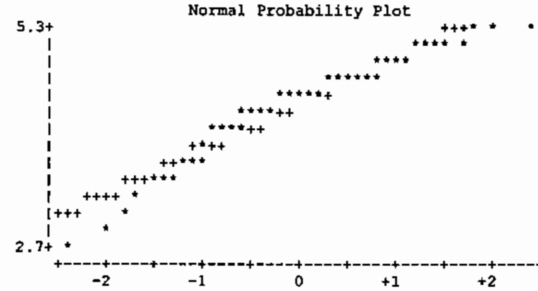
100% Max	5.288267	99%	5.288267
75% Q3	4.70048	95%	5.087596
50% Med	4.51086	90%	5.056246
25% Q1	4.174387	10%	3.555348
0% Min	2.639057	5%	3.295837
		1%	2.639057
Range	2.64921		
Q3-Q1	0.526093		
Mode	4.369448		

Extremes

Lowest	ID	Highest	ID
2.639057(	14147)	5.081404(	14145)
2.944439(	14020)	5.087596(	14041)
3.135494(	14016)	5.247024(	14166)
3.295837(	14142)	5.273(	14167)
3.433987(	5084)	5.288267(	14165)

```
Stem Leaf                  #             Boxplot
  52 579                   3                |
  50 166789                6                |
  48 0145786               7                |
  46 1345567999069        13             +-----+
  44 2357880112344588     16             *--+--*
  42 2589967778           10             |     |
  40 1316679               7             +-----+
  38 1                     1                |
  36 9468                  4                |
  34 3736                  4                |
  32 0                     1                0
  30 4                     1                0
  28 4                     1                0
  26 4                     1                0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Moments

N	75	Sum Wgts	75
Mean	4.400594	Sum	330.0446
Std Dev	0.540953	Variance	0.29263
Skewness	-1.01977	Kurtosis	1.168851
USS	1474.047	CSS	21.65461
CV	12.29272	Std Mean	0.062464
T:Mean=0	70.45027	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.928096	Pr<W	0.0003

Quantiles(Def=5)

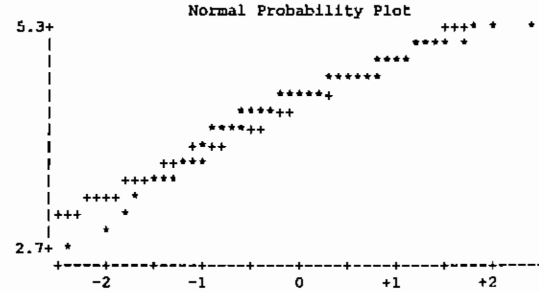
100% Max	5.288267	99%	5.288267
75% Q3	4.70048	95%	5.087596
50% Med	4.51086	90%	5.056246
25% Q1	4.174387	10%	3.555348
0% Min	2.639057	5%	3.295837
		1%	2.639057
Range	2.64921		
Q3-Q1	0.526093		
Mode	4.369448		

Extremes

Lowest	ID	Highest	ID
2.639057(	14147)	5.081404(	14145)
2.944439(	14020)	5.087596(	14041)
3.135494(	14016)	5.247024(	14166)
3.295837(	14142)	5.273(	14167)
3.433987(	5084)	5.288267(	14165)

```
Stem Leaf                  #             Boxplot
  52 579                   3                |
  50 166789                6                |
  48 0145786               7                |
  46 1345567999069        13             +-----+
  44 2357880112344588     16             *--+--*
  42 2589967778           10             |     |
  40 1316679               7             +-----+
  38 1                     1                |
  36 9468                  4                |
  34 3736                  4                |
  32 0                     1                0
  30 4                     1                0
  28 4                     1                0
  26 4                     1                0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



-- DEPTH=Surface ANALYSIS=Beryllium --

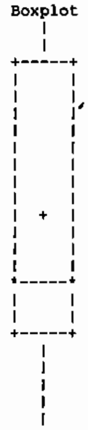
All Observations

Variable=LNVALUE

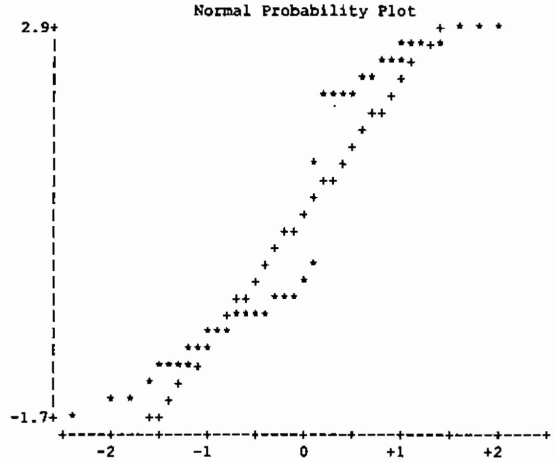
```
              Moments                              Quantiles(Def=5)                              Extremes

N               71  Sum Wgts         71    100% Max  2.890372      99%  2.890372      Lowest     ID      Highest     ID
Mean      0.726602  Sum        51.58873     75% Q3   2.397895      95%  2.833213    -1.77196(  14016)  2.70805(  14175)
Std Dev   1.572472  Variance   2.472667     50% Med -0.12783       90%  2.70805     -1.56065(  14000) 2.833213(  14157)
Skewness  0.136404  Kurtosis   -1.77289     25% Q1  -0.59784       10% -1.02165     -1.42712(  14020) 2.833213(  14176)
USS       210.5711  CSS        173.0867      0% Min -1.77196        5% -1.38629     -1.38629(  14006) 2.890372(  14133)
CV        216.4145  Std Mean   0.186618                             1% -1.77196     -1.10866(  10367) 2.890372(  14164)
T:Mean=0  3.893524  Pr>|T|       0.0002    Range     4.662329
Num ^= 0        69  Num > 0          32    Q3-Q1     2.995732
M(Sign)       -2.5  Pr>=|M|      0.6305    Mode     -0.35667
Sgn Rank     500.5  Pr>=|S|      0.0022
W:Normal  0.811113  Pr<W         0.0001
```

```
  Stem Leaf                     #
    28 3399                     4
    26 4441111                  7
    24 0088886                  7
    22 400                      3
    20 3578023679              10
    18
    16
    14
    12 1                        1
    10
     8
     6
     4
     2
     0 00                       2
    -0 35                       2
    -2 666666422                9
    -4 643112                   6
    -6 199999000                9
    -8 442                      3
   -10 1852                     4
   -12 9                        1
   -14 63                       2
   -16 7                        1
       ----+----+----+----+
  Multiply Stem.Leaf by 10**-1
```

Boxplot



Normal Probability Plot

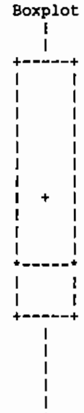


Detected Observations

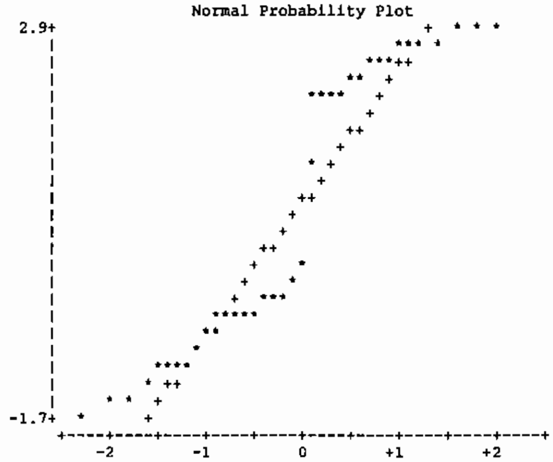
```
              Moments                              Quantiles(Def=5)                              Extremes

N               66  Sum Wgts         66    100% Max  2.890372      99%  2.890372      Lowest     ID      Highest     ID
Mean      0.836095  Sum         55.1823     75% Q3   2.397895      95%  2.833213    -1.77196(  14016)  2.70805(  14175)
Std Dev   1.577913  Variance    2.48981     50% Med         0      90%  2.70805     -1.56065(  14000) 2.833213(  14157)
Skewness  -0.00813  Kurtosis   -1.77858     25% Q1  -0.54473       10% -1.04982     -1.42712(  14020) 2.833213(  14176)
USS       207.9753  CSS        161.8376      0% Min -1.77196        5% -1.38629     -1.38629(  14006) 2.890372(  14133)
CV         188.724  Std Mean   0.194228                             1% -1.77196     -1.10866(  10367) 2.890372(  14164)
T:Mean=0  4.304718  Pr>|T|       0.0001    Range     4.662329
Num ^= 0        64  Num > 0          32    Q3-Q1     2.942622
M(Sign)          0  Pr>=|M|      1.0000    Mode     -0.35667
Sgn Rank       508  Pr>=|S|      0.0004
W:Normal  0.817285  Pr<W         0.0001
```

```
  Stem Leaf                     #
    28 3399                     4
    26 4441111                  7
    24 0088886                  7
    22 400                      3
    20 3578023679              10
    18
    16
    14
    12 1                        1
    10
     8
     6
     4
     2
     0 00                       2
    -0 35                       2
    -2 666666422                9
    -4 643112                   6
    -6 19000                    5
    -8 44                       2
   -10 1852                     4
   -12 9                        1
   -14 63                       2
   -16 7                        1
       ----+----+----+----+
  Multiply Stem.Leaf by 10**-1
```

Boxplot



Normal Probability Plot



---------- DEPTH=Surface ANALYSIS=Cadmium ----------

All Observations

Variable=LNVALUE

Moments

N	60	Sum Wgts	60
Mean	0.105474	Sum	6.32846
Std Dev	0.45152	Variance	0.203871
Skewness	0.567668	Kurtosis	-1.13818
USS	12.69586	CSS	12.02837
CV	428.0855	Std Mean	0.058291
T:Mean=0	1.809444	Pr>|T|	0.0755
Num ^= 0	57	Num > 0	27
M(Sign)	-1.5	Pr>=|M|	0.7914
Sgn Rank	141.5	Pr>=|S|	0.2643
W:Normal	0.869745	Pr<W	0.0001

Quantiles(Def=5)

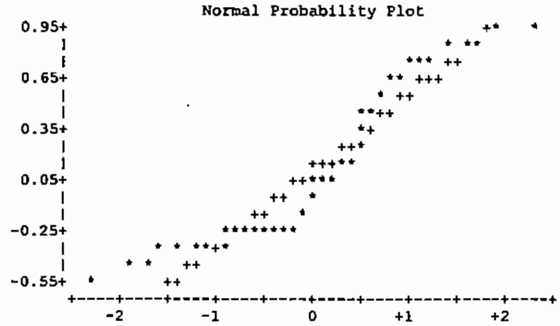
100% Max	0.955511	99%	0.955511
75% Q3	0.528895	95%	0.875469
50% Med	-0.02041	90%	0.788457
25% Q1	-0.24846	10%	-0.35667
0% Min	-0.56212	5%	-0.39329
		1%	-0.56212
Range	1.51763		
Q3-Q1	0.777357		
Mode	-0.22314		

Extremes

Lowest	ID	Highest	ID
-0.56212(	14032)	0.875469(	14157)
-0.47804(	14033)	0.875469(	14169)
-0.41552(	5084)	0.875469(	14176)
-0.37106(	14029)	0.955511(	14133)
-0.35667(	5093)	0.955511(	14164)

```
Stem Leaf                  #        Boxplot
   9 66                    2           |
   8 888                   3           |
   7 44499                 5           |
   6 4499                  4           |
   5 9                     1        +-----+
   4 777                   3        |     |
   3 4                     1        |     |
   2 6                     1        |     |
   1 0000888               7        |  +  |
   0 000                   3        |     |
  -0 4                     1        *-----*
  -1 543                   3        |     |
  -2 976554222222222      15        +-----+
  -3 76663330              8           |
  -4 82                    2           |
  -5 6                     1           |
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Moments

N	30	Sum Wgts	30
Mean	0.444469	Sum	13.33406
Std Dev	0.389621	Variance	0.151804
Skewness	-0.50198	Kurtosis	-1.03588
USS	10.3289	CSS	4.402324
CV	87.65987	Std Mean	0.071135
T:Mean=0	6.24827	Pr>|T|	0.0001
Num ^= 0	30	Num > 0	25
M(Sign)	10	Pr>=|M|	0.0003
Sgn Rank	198.5	Pr>=|S|	0.0001
W:Normal	0.906585	Pr<W	0.0130

Quantiles(Def=5)

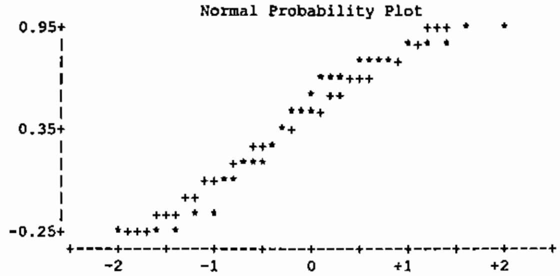
100% Max	0.955511	99%	0.955511
75% Q3	0.741937	95%	0.955511
50% Med	0.528895	90%	0.875469
25% Q1	0.182322	10%	-0.18698
0% Min	-0.26136	5%	-0.23572
		1%	-0.26136
Range	1.216876		
Q3-Q1	0.559616		
Mode	0.182322		

Extremes

Lowest	ID	Highest	ID
-0.26136(	14147)	0.875469(	14157)
-0.23572(	5050)	0.875469(	14169)
-0.22314(	5127)	0.875469(	14176)
-0.15082(	14132)	0.955511(	14133)
-0.13926(	14019)	0.955511(	14164)

```
Stem Leaf                  #        Boxplot
   9 66                    2           |
   8 888                   3           |
   7 44499                 5        +-----+
   6 4499                  4        |     |
   5 9                     1        *-----*
   4 777                   3        |  +  |
   3 4                     1        |     |
   2 6                     1        |     |
   1 00888                 5        +-----+
   0                                   |
  -0                                   |
  -1 54                    2           |
  -2 642                   3           |
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



--- DEPTH=Surface ANALYSIS=Calcium ---

All Observations

Variable=LNVALUE

Moments

N	74	Sum Wgts	74
Mean	8.704771	Sum	644.1531
Std Dev	1.47313	Variance	2.170112
Skewness	0.781624	Kurtosis	-0.25855
USS	5765.623	CSS	158.4182
CV	16.92325	Std Mean	0.171248
T:Mean=0	50.8314	Pr>|T|	0.0001
Num ^= 0	74	Num > 0	74
M(Sign)	37	Pr>=|M|	0.0001
Sgn Rank	1387.5	Pr>=|S|	0.0001
W:Normal	0.907679	Pr<W	0.0001

Quantiles(Def=5)

100% Max	12.25486	99%	12.25486
75% Q3	9.568015	95%	11.5991
50% Med	8.34284	90%	10.9578
25% Q1	7.770645	10%	7.17012
0% Min	6.100319	5%	6.747587
		1%	6.100319
Range	6.154544		
Q3-Q1	1.79737		
Mode	7.396335		

Extremes

Lowest	ID	Highest	ID
6.100319(	14036)	11.58058(	14010)
6.679599(	5103)	11.5991(	14102)
6.709304(	14157)	11.61729(	14019)
6.747587(	14026)	12.20607(	14020)
6.768493(	5084)	12.25486(	14000)

```
   Stem Leaf                       #             Boxplot
     12 23                         2                |
     11 666                        3                |
     11 013                        3                |
     10 777899                     6                |
     10 223                        3                |
      9 66                         2             +-----+
      9 14                         2             |     |
      8 5555666677799             13             |  +  |
      8 000111222333344           15             *-----*
      7 55588888899               11             +-----+
      7 112233444                  9                |
      6 7778                       4                |
      6 1                          1                |
        ----+----+----+----+
```

```
                      Normal Probability Plot
   12.25+                                                  *  +*+
        |                                             * **++++
        |                                           ** +++
        |                                        *****++
        |                                        **+++
        |                                      +*+
    9.25+                                   +++*
        |                               +++****
        |                            ******
        |                        +****
        |                   *******
        |       *  ** *+++
    6.25+ *       ++++
         +----+----+----+----+----+----+----+----+----+----+
              -2        -1         0        +1        +2
```

Detected Observations

Moments

N	74	Sum Wgts	74
Mean	8.704771	Sum	644.1531
Std Dev	1.47313	Variance	2.170112
Skewness	0.781624	Kurtosis	-0.25855
USS	5765.623	CSS	158.4182
CV	16.92325	Std Mean	0.171248
T:Mean=0	50.8314	Pr>|T|	0.0001
Num ^= 0	74	Num > 0	74
M(Sign)	37	Pr>=|M|	0.0001
Sgn Rank	1387.5	Pr>=|S|	0.0001
W:Normal	0.907679	Pr<W	0.0001

Quantiles(Def=5)

100% Max	12.25486	99%	12.25486
75% Q3	9.568015	95%	11.5991
50% Med	8.34284	90%	10.9578
25% Q1	7.770645	10%	7.17012
0% Min	6.100319	5%	6.747587
		1%	6.100319
Range	6.154544		
Q3-Q1	1.79737		
Mode	7.396335		

Extremes

Lowest	ID	Highest	ID
6.100319(	14036)	11.58058(	14010)
6.679599(	5103)	11.5991(	14102)
6.709304(	14157)	11.61729(	14019)
6.747587(	14026)	12.20607(	14020)
6.768493(	5084)	12.25486(	14000)

```
   Stem Leaf                       #             Boxplot
     12 23                         2                |
     11 666                        3                |
     11 013                        3                |
     10 777899                     6                |
     10 223                        3                |
      9 66                         2             +-----+
      9 14                         2             |     |
      8 5555666677799             13             |  +  |
      8 000111222333344           15             *-----*
      7 55588888899               11             +-----+
      7 112233444                  9                |
      6 7778                       4                |
      6 1                          1                |
        ----+----+----+----+
```

```
                      Normal Probability Plot
   12.25+                                                  *  +*+
        |                                             * **++++
        |                                           ** +++
        |                                        *****++
        |                                        **+++
        |                                      +*+
    9.25+                                   +++*
        |                               +++****
        |                            ******
        |                        +****
        |                   *******
        |       *  ** *+++
    6.25+ *       ++++
         +----+----+----+----+----+----+----+----+----+----+
              -2        -1         0        +1        +2
```

---------- DEPTH=Surface ANALYSIS=Chromium ----------

All Observations

Variable=LNVALUE

Moments

N	42	Sum Wgts	42
Mean	2.38726	Sum	100.2649
Std Dev	0.439189	Variance	0.192887
Skewness	-2.25601	Kurtosis	4.830663
USS	247.2668	CSS	7.908359
CV	18.39719	Std Mean	0.067768
T:Mean=0	35.22679	Pr>|T|	0.0001
Num ^= 0	42	Num > 0	42
M(Sign)	21	Pr>=|M|	0.0001
Sgn Rank	451.5	Pr>=|S|	0.0001
W:Normal	0.699956	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.772589	99%	2.772589
75% Q3	2.639057	95%	2.772589
50% Med	2.524928	90%	2.772589
25% Q1	2.292535	10%	2.104134
0% Min	0.955511	5%	1.193922
		1%	0.955511
Range	1.817077		
Q3-Q1	0.346523		
Mode	2.564949		

Extremes

Lowest	ID	Highest	ID
0.955511(	14047)	2.772589(	5040)
0.993252(	14044)	2.772589(	5127)
1.193922(	14016)	2.772589(	14100)
1.568616(	14026)	2.772589(	14146)
2.104134(	14036)	2.772589(	14175)

```
Stem Leaf                  #     Boxplot
  27 1177777               7        |
  26 4444                  4     +-----+
  25 6666666666           10     *-----*
  24 0008888888           10     |     |
  23                             |  +  |
  22 002259                6     +-----+
  21 0                     1        |
  20
  19
  18
  17
  16
  15 7                     1        0
  14
  13
  12
  11 9                     1        *
  10
   9 69                    2        *
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
 2.75+                                       ++*** *      *
     |                                    +++**
     |                               *******
     |                           *****++
     |                        **   ++
     |                     *** +++
     |                   **   ++
     |                       ++
     |                     +++
 1.85+                   ++
     |                 ++
     |               ++
     |           +++  *
     |         ++
     |       ++
     |+
     |               *
     |
 0.95+    *   *
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Moments

N	41	Sum Wgts	41
Mean	2.422181	Sum	99.30941
Std Dev	0.381066	Variance	0.145211
Skewness	-2.4403	Kurtosis	6.53877
USS	246.3538	CSS	5.808457
CV	15.73236	Std Mean	0.059513
T:Mean=0	40.70034	Pr>|T|	0.0001
Num ^= 0	41	Num > 0	41
M(Sign)	20.5	Pr>=|M|	0.0001
Sgn Rank	430.5	Pr>=|S|	0.0001
W:Normal	0.717847	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.772589	99%	2.772589
75% Q3	2.639057	95%	2.772589
50% Med	2.564949	90%	2.772589
25% Q1	2.397895	10%	2.197225
0% Min	0.993252	5%	1.568616
		1%	0.993252
Range	1.779337		
Q3-Q1	0.241162		
Mode	2.564949		

Extremes

Lowest	ID	Highest	ID
0.993252(	14044)	2.772589(	5040)
1.193922(	14016)	2.772589(	5127)
1.568616(	14026)	2.772589(	14100)
2.104134(	14036)	2.772589(	14146)
2.197225(	14033)	2.772589(	14175)

```
Stem Leaf                  #     Boxplot
  27 1177777               7        |
  26 4444                  4     +-----+
  25 6666666666           10     *-----*
  24 0008888888           10     +--+--+
  23                                |
  22 002259                6        |
  21 0                     1        |
  20
  19
  18
  17
  16
  15 7                     1        *
  14
  13
  12
  11 9                     1        *
  10
   9 9                     1        *
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
 2.75+                                       +++** *      *
     |                                    ++***
     |                               *******
     |                           ****+++
     |                        *** +++
     |                     **** ++
     |                  * *   +++
     |                      +++
     |                    ++
 1.85+                 +++
     |               ++
     |           +++
     | +++          *
     |+
     |
     |
     |            *
     |
 0.95+    *
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

-- DEPTH=Surface ANALYSIS=Cobalt --

All Observations

Variable=LNVALUE

Moments

N	71	Sum Wgts	71
Mean	1.90063	Sum	134.9447
Std Dev	0.399777	Variance	0.159821
Skewness	-1.16894	Kurtosis	4.083863
USS	267.6674	CSS	11.1875
CV	21.03391	Std Mean	0.047445
T:Mean=0	40.05984	Pr>|T|	0.0001
Num ^= 0	71	Num > 0	71
M(Sign)	35.5	Pr>=|M|	0.0001
Sgn Rank	1278	Pr>=|S|	0.0001
W:Normal	0.931215	Pr<W	0.0008

Quantiles(Def=5)

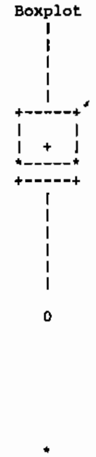
100% Max	2.639057	99%	2.639057
75% Q3	2.163323	95%	2.564949
50% Med	1.88707	90%	2.302585
25% Q1	1.704748	10%	1.481605
0% Min	0.182322	5%	1.193922
		1%	0.182322
Range	2.456736		
Q3-Q1	0.458575		
Mode	2.302585		

Extremes

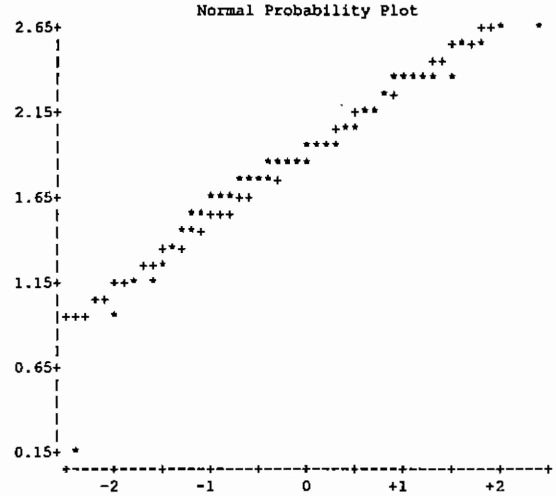
Lowest	ID	Highest	ID
0.182322(	14147)	2.397895(	14175)
0.955511(	14020)	2.564949(	14047)
1.163151(	14000)	2.564949(	14145)
1.193922(	14016)	2.639057(	14026)
1.223775(	10367)	2.639057(	14131)

```
Stem Leaf                     #
  26 44                       2
  25 66                       2
  24 000                      3
  23 000000                   6
  22 166                      3
  21 05569                    5
  20 11119                    5
  19 000235667                9
  18 224466677779            12
  17 00266679                 8
  16 577999                   6
  15 79                       2
  14 68                       2
  13 9                        1
  12 2                        1
  11 69                       2
  10
   9 6                        1
   8
   7
   6
   5
   4
   3
   2
   1 8                        1
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Boxplot



Normal Probability Plot



Detected Observations

Moments

N	71	Sum Wgts	71
Mean	1.90063	Sum	134.9447
Std Dev	0.399777	Variance	0.159821
Skewness	-1.16894	Kurtosis	4.083863
USS	267.6674	CSS	11.1875
CV	21.03391	Std Mean	0.047445
T:Mean=0	40.05984	Pr>|T|	0.0001
Num ^= 0	71	Num > 0	71
M(Sign)	35.5	Pr>=|M|	0.0001
Sgn Rank	1278	Pr>=|S|	0.0001
W:Normal	0.931215	Pr<W	0.0008

Quantiles(Def=5)

100% Max	2.639057	99%	2.639057
75% Q3	2.163323	95%	2.564949
50% Med	1.88707	90%	2.302585
25% Q1	1.704748	10%	1.481605
0% Min	0.182322	5%	1.193922
		1%	0.182322
Range	2.456736		
Q3-Q1	0.458575		
Mode	2.302585		

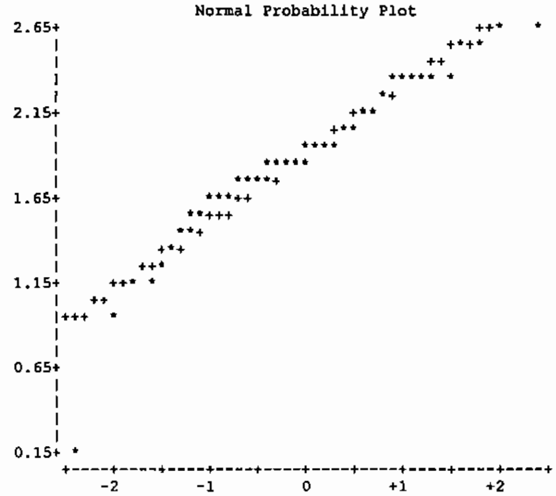
Extremes

Lowest	ID	Highest	ID
0.182322(	14147)	2.397895(	14175)
0.955511(	14020)	2.564949(	14047)
1.163151(	14000)	2.564949(	14145)
1.193922(	14016)	2.639057(	14026)
1.223775(	10367)	2.639057(	14131)

```
Stem Leaf                     #
  26 44                       2
  25 66                       2
  24 000                      3
  23 000000                   6
  22 166                      3
  21 05569                    5
  20 11119                    5
  19 000235667                9
  18 224466677779            12
  17 00266679                 8
  16 577999                   6
  15 79                       2
  14 68                       2
  13 9                        1
  12 2                        1
  11 69                       2
  10
   9 6                        1
   8
   7
   6
   5
   4
   3
   2
   1 8                        1
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Boxplot

Normal Probability Plot



-- DEPTH=Surface ANALYSIS=Copper --

All Observations

Variable=LNVALUE

Moments

N	49	Sum Wgts	49
Mean	2.327285	Sum	114.037
Std Dev	0.466162	Variance	0.217307
Skewness	-1.23999	Kurtosis	1.298365
USS	275.8273	CSS	10.43072
CV	20.03027	Std Mean	0.066595
T:Mean=0	34.94711	Pr>|T|	0.0001
Num ^= 0	49	Num > 0	49
M(Sign)	24.5	Pr>=|M|	0.0001
Sgn Rank	612.5	Pr>=|S|	0.0001
W:Normal	0.886498	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.944439	99%	2.944439
75% Q3	2.639057	95%	2.890372
50% Med	2.484907	90%	2.772589
25% Q1	2.116256	10%	1.435085
0% Min	0.916291	5%	1.335001
		1%	0.916291
Range	2.028148		
Q3-Q1	0.522802		
Mode	2.564949		

Extremes

Lowest	ID	Highest	ID
0.916291(	14010)	2.772589(	14176)
1.163151(	14009)	2.833213(	14145)
1.335001(	14157)	2.890372(	14102)
1.410987(	14142)	2.890372(	14164)
1.435085(	14016)	2.944439(	5099)

```
Stem Leaf                     #             Boxplot
  29 4                        1                |
  28 399                      3                |
  27 11111777                 8                |
  26 4444                     4             +-----+
  25 666666                   6             |     |
  24 00888                    5             *-----*
  23 000                      3             |  +  |
  22 267                      3             |     |
  21 02269                    5             +-----+
  20 1449                     4                |
  19                                           |
  18 9                        1                |
  17 4                        1                |
  16                                           |
  15                                           |
  14 14                       2                |
  13 4                        1                |
  12
  11 6                        1                0
  10
   9 2                        1                0
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
2.95+                                                  ++       *
    |                                                ++ * *
2.75+                                             ***** *
    |                                           ***
2.55+                                        ***+
    |                                      **++
2.35+                                  ***++
    |                                  **++
2.15+                              * *++
    |                            ***+++
1.95+                             ++
    |                          *+
1.75+                        +*
    |                      ++
1.55+                    ++
    |                 ++   **
1.35+             +++    *
    | ++
1.15++         *
    |
0.95+    *
     +----+----+----+----+----+----+----+----+----+----+
              -2        -1         0        +1        +2
```

Detected Observations

Moments

N	49	Sum Wgts	49
Mean	2.327285	Sum	114.037
Std Dev	0.466162	Variance	0.217307
Skewness	-1.23999	Kurtosis	1.298365
USS	275.8273	CSS	10.43072
CV	20.03027	Std Mean	0.066595
T:Mean=0	34.94711	Pr>|T|	0.0001
Num ^= 0	49	Num > 0	49
M(Sign)	24.5	Pr>=|M|	0.0001
Sgn Rank	612.5	Pr>=|S|	0.0001
W:Normal	0.886498	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.944439	99%	2.944439
75% Q3	2.639057	95%	2.890372
50% Med	2.484907	90%	2.772589
25% Q1	2.116256	10%	1.435085
0% Min	0.916291	5%	1.335001
		1%	0.916291
Range	2.028148		
Q3-Q1	0.522802		
Mode	2.564949		

Extremes

Lowest	ID	Highest	ID
0.916291(	14010)	2.772589(	14176)
1.163151(	14009)	2.833213(	14145)
1.335001(	14157)	2.890372(	14102)
1.410987(	14142)	2.890372(	14164)
1.435085(	14016)	2.944439(	5099)

```
Stem Leaf                     #             Boxplot
  29 4                        1                |
  28 399                      3                |
  27 11111777                 8                |
  26 4444                     4             +-----+
  25 666666                   6             |     |
  24 00888                    5             *-----*
  23 000                      3             |  +  |
  22 267                      3             |     |
  21 02269                    5             +-----+
  20 1449                     4                |
  19                                           |
  18 9                        1                |
  17 4                        1                |
  16                                           |
  15                                           |
  14 14                       2                |
  13 4                        1                |
  12
  11 6                        1                0
  10
   9 2                        1                0
     ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
2.95+                                                  ++       *
    |                                                ++ * *
2.75+                                             ***** *
    |                                           ***
2.55+                                        ***+
    |                                      **++
2.35+                                  *****++
    |                                  **++
2.15+                              * *++
    |                            ***+++
1.95+                             ++
    |                          *+
1.75+                        +*
    |                      ++
1.55+                    ++
    |                 ++   **
1.35+             +++    *
    | ++
1.15++         *
    |
0.95+    *
     +----+----+----+----+----+----+----+----+----+----+
              -2        -1         0        +1        +2
```

--- DEPTH=Surface ANALYSIS=Iron ---

All Observations

Variable=LNVALUE

Moments

N	72	Sum Wgts	72
Mean	9.523066	Sum	685.6607
Std Dev	0.391329	Variance	0.153139
Skewness	-1.07133	Kurtosis	1.967327
USS	6540.465	CSS	10.87283
CV	4.109277	Std Mean	0.046119
T:Mean=0	206.4908	Pr>|T|	0.0001
Num ^= 0	72	Num > 0	72
M(Sign)	36	Pr>=|M|	0.0001
Sgn Rank	1314	Pr>=|S|	0.0001
W:Normal	0.933189	Pr<W	0.0010

Quantiles(Def=5)

100% Max	10.22919	99%	10.22919
75% Q3	9.772773	95%	10.12663
50% Med	9.568015	90%	9.908475
25% Q1	9.384152	10%	8.968269
0% Min	8.160518	5%	8.811354
		1%	8.160518
Range	2.068669		
Q3-Q1	0.38862		
Mode	9.464983		

Extremes

Lowest	ID	Highest	ID
8.160518(	14000)	10.01682(	14176)
8.451053(	14016)	10.12663(	5053)
8.4929(	14147)	10.162(	5056)
8.811354(	14006)	10.22557(	14159)
8.874868(	14036)	10.22919(	14133)

```
 Stem Leaf                      #             Boxplot
  102 33                        2                |
  101 36                        2                |
  100 2                         1                |
   99 125                       3                |
   98 011555699                 9                |
   97 0011244568               10             +-----+
   96 00039                     5             |     |
   95 023355677888             12             *--+--*
   94 0012466667               10             |     |
   93 1247                      4             +-----+
   92 039                       3                |
   91 07                        2                |
   90 7                         1                |
   89 567                       3                |
   88 17                        2                |
   87
   86
   85
   84 59                        2                0
   83
   82
   81 6                         1                *
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                         Normal Probability Plot
  10.25+                                                  ++*   *
       |                                               +++*
       |                                             ++*
       |                                          +++**
       |                                        *****
       |                                   ****
       |                                 **+
   9.55+                             ******
       |                         *****++
       |                       ** ++
       |                     **+++
       |                   **+
       |                 ++*
       |               ++*
   8.85+          ++**
       |       +++
       |    ++
       |++
       |       * *
       |
       |
   8.15+ *
        +----+----+----+----+----+----+----+----+----+----+
             -2        -1         0        +1        +2
```

Detected Observations

Moments

N	72	Sum Wgts	72
Mean	9.523066	Sum	685.6607
Std Dev	0.391329	Variance	0.153139
Skewness	-1.07133	Kurtosis	1.967327
USS	6540.465	CSS	10.87283
CV	4.109277	Std Mean	0.046119
T:Mean=0	206.4908	Pr>|T|	0.0001
Num ^= 0	72	Num > 0	72
M(Sign)	36	Pr>=|M|	0.0001
Sgn Rank	1314	Pr>=|S|	0.0001
W:Normal	0.933189	Pr<W	0.0010

Quantiles(Def=5)

100% Max	10.22919	99%	10.22919
75% Q3	9.772773	95%	10.12663
50% Med	9.568015	90%	9.908475
25% Q1	9.384152	10%	8.968269
0% Min	8.160518	5%	8.811354
		1%	8.160518
Range	2.068669		
Q3-Q1	0.38862		
Mode	9.464983		

Extremes

Lowest	ID	Highest	ID
8.160518(	14000)	10.01682(	14176)
8.451053(	14016)	10.12663(	5053)
8.4929(	14147)	10.162(	5056)
8.811354(	14006)	10.22557(	14159)
8.874868(	14036)	10.22919(	14133)

```
 Stem Leaf                      #             Boxplot
  102 33                        2                |
  101 36                        2                |
  100 2                         1                |
   99 125                       3                |
   98 011555699                 9                |
   97 0011244568               10             +-----+
   96 00039                     5             |     |
   95 023355677888             12             *--+--*
   94 0012466667               10             |     |
   93 1247                      4             +-----+
   92 039                       3                |
   91 07                        2                |
   90 7                         1                |
   89 567                       3                |
   88 17                        2                |
   87
   86
   85
   84 59                        2                0
   83
   82
   81 6                         1                *
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                         Normal Probability Plot
  10.25+                                                  ++*   *
       |                                               +++*
       |                                             ++*
       |                                          +++**
       |                                        *****
       |                                   ****
       |                                 **+
   9.55+                             ******
       |                         *****++
       |                       ** ++
       |                     **+++
       |                   **+
       |                 ++*
       |               ++*
   8.85+          ++**
       |       +++
       |    ++
       |++
       |       * *
       |
       |
   8.15+ *
        +----+----+----+----+----+----+----+----+----+----+
             -2        -1         0        +1        +2
```

--- DEPTH=Surface ANALYSIS=Lead ---

All Observations

Variable=LNVALUE

Moments

N	66	Sum Wgts	66
Mean	2.7989	Sum	184.7274
Std Dev	0.479356	Variance	0.229782
Skewness	-0.69225	Kurtosis	1.334204
USS	531.9695	CSS	14.93583
CV	17.12657	Std Mean	0.059005
T:Mean=0	47.43528	Pr>|T|	0.0001
Num ^= 0	66	Num > 0	66
M(Sign)	33	Pr>=|M|	0.0001
Sgn Rank	1105.5	Pr>=|S|	0.0001
W:Normal	0.963236	Pr<W	0.1242

Quantiles(Def=5)

100% Max	3.637586	99%	3.637586
75% Q3	3.091042	95%	3.555348
50% Med	2.861793	90%	3.433987
25% Q1	2.564949	10%	2.197225
0% Min	1.131402	5%	2.066863
		1%	1.131402
Range	2.506184		
Q3-Q1	0.526093		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
1.131402(	5114)	3.496508(	14103)
1.629241(	14157)	3.555348(	5087)
1.931521(	14010)	3.583519(	5040)
2.066863(	14142)	3.583519(	5103)
2.128232(	10367)	3.637586(	5093)

```
   Stem Leaf                    #          Boxplot              Normal Probability Plot
     36 4                       1             |         3.65+                                          ++     *
     35 0688                    4             |             |                                        +*  *
     34 337                     3             |             |                                     ****
     33 037                     3             |             |                                    *+
     32 66                      2             |             |                                  **
     31 8                       1             |         3.15+                                +*
     30 0000044999             10          +-----+          |                              +**
     29 4444                    4          |     |          |                           ****
     28 3399999                 7          *--+--*          |                        ***+
     27 111177                  6          |     |          |                      ***+
     26 4444                    4          |     |      2.65+                     **
     25 66666                   5          +-----+          |                  ***
     24 88888                   5             |             |                ***
     23 00                      2             |             |              **+
     22 089                     3             |             |             **
     21 36                      2             |         2.15+          ***
     20 7                       1             |             |         *+
     19 3                       1             |             |       *+
     18                                                     |     ++
     17                                                     |   ++
     16 3                       1             0         1.65++++  *
     15                                                     |
     14                                                     |
     13                                                     |
     12                                                     |
     11 3                       1             0         1.15+  *
        ----+----+----+----+                                 +----+----+----+----+----+----+----+----+----+----+
   Multiply Stem.Leaf by 10**-1                                    -2        -1         0        +1        +2
```

Detected Observations

Moments

N	66	Sum Wgts	66
Mean	2.7989	Sum	184.7274
Std Dev	0.479356	Variance	0.229782
Skewness	-0.69225	Kurtosis	1.334204
USS	531.9695	CSS	14.93583
CV	17.12657	Std Mean	0.059005
T:Mean=0	47.43528	Pr>|T|	0.0001
Num ^= 0	66	Num > 0	66
M(Sign)	33	Pr>=|M|	0.0001
Sgn Rank	1105.5	Pr>=|S|	0.0001
W:Normal	0.963236	Pr<W	0.1242

Quantiles(Def=5)

100% Max	3.637586	99%	3.637586
75% Q3	3.091042	95%	3.555348
50% Med	2.861793	90%	3.433987
25% Q1	2.564949	10%	2.197225
0% Min	1.131402	5%	2.066863
		1%	1.131402
Range	2.506184		
Q3-Q1	0.526093		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
1.131402(	5114)	3.496508(	14103)
1.629241(	14157)	3.555348(	5087)
1.931521(	14010)	3.583519(	5040)
2.066863(	14142)	3.583519(	5103)
2.128232(	10367)	3.637586(	5093)

```
   Stem Leaf                    #          Boxplot              Normal Probability Plot
     36 4                       1             |         3.65+                                          ++     *
     35 0688                    4             |             |                                        +*  *
     34 337                     3             |             |                                     ****
     33 037                     3             |             |                                    *+
     32 66                      2             |             |                                  **
     31 8                       1             |         3.15+                                +*
     30 0000044999             10          +-----+          |                              +**
     29 4444                    4          |     |          |                           ****
     28 3399999                 7          *--+--*          |                        ***+
     27 111177                  6          |     |          |                      ***+
     26 4444                    4          |     |      2.65+                     **
     25 66666                   5          +-----+          |                  ***
     24 88888                   5             |             |                ***
     23 00                      2             |             |              **+
     22 089                     3             |             |             **
     21 36                      2             |         2.15+          ***
     20 7                       1             |             |         *+
     19 3                       1             |             |       *+
     18                                                     |     ++
     17                                                     |   ++
     16 3                       1             0         1.65++++  *
     15                                                     |
     14                                                     |
     13                                                     |
     12                                                     |
     11 3                       1             0         1.15+  *
        ----+----+----+----+                                 +----+----+----+----+----+----+----+----+----+----+
   Multiply Stem.Leaf by 10**-1                                    -2        -1         0        +1        +2
```

------ DEPTH=Surface ANALYSIS=Magnesium ------

All Observations

Variable=LNVALUE

Moments

N	75	Sum Wgts	75
Mean	7.2223	Sum	541.6725
Std Dev	0.652882	Variance	0.426255
Skewness	0.348415	Kurtosis	0.933293
USS	3943.664	CSS	31.54285
CV	9.039806	Std Mean	0.075388
T:Mean=0	95.80133	Pr>|T|	0.0001
Num ^= 0	75	Num > 0	75
M(Sign)	37.5	Pr>=|M|	0.0001
Sgn Rank	1425	Pr>=|S|	0.0001
W:Normal	0.964608	Pr<W	0.1124

Quantiles(Def=5)

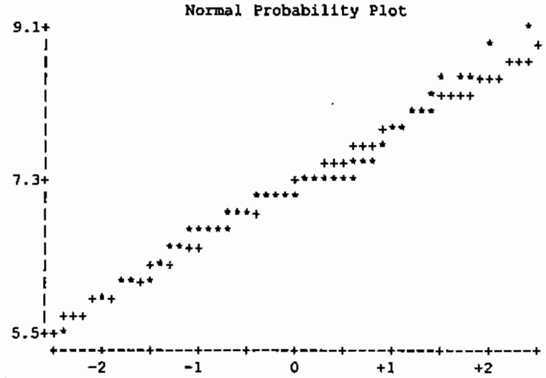
100% Max	9.017968	99%	9.017968
75% Q3	7.495542	95%	8.525161
50% Med	7.185387	90%	8.02617
25% Q1	6.841615	10%	6.51323
0% Min	5.549076	5%	6.073045
		1%	5.549076
Range	3.468892		
Q3-Q1	0.653926		
Mode	7.098376		

Extremes

Lowest	ID	Highest	ID
5.549076(	14147)	8.513185(	14000)
5.983936(	14157)	8.525161(	14020)
6.023448(	14142)	8.571681(	14102)
6.073045(	14164)	8.954157(	14016)
6.09131(	5084)	9.017968(	14167)

```
Stem Leaf                  #         Boxplot
  90 2                     1            0
  88 5                     1            0
  86
  84 137                   3            0
  82 9                     1            |
  80 130                   3            |
  78 1163                  4            |
  76 78                    2            |
  74 50003                 5         +-----+
  72 0047911234788889     16         |  +  |
  70 200012555688899      15         *-----*
  68 422339                6         +-----+
  66 346712339             9            |
  64 16                    2            |
  62 25                    2            |
  60 279                   3            |
  58 8                     1            |
  56
  54 5                     1            0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Moments

N	74	Sum Wgts	74
Mean	7.218608	Sum	534.177
Std Dev	0.65655	Variance	0.431057
Skewness	0.363756	Kurtosis	0.908413
USS	3887.481	CSS	31.46718
CV	9.095238	Std Mean	0.076322
T:Mean=0	94.58054	Pr>|T|	0.0001
Num ^= 0	74	Num > 0	74
M(Sign)	37	Pr>=|M|	0.0001
Sgn Rank	1387.5	Pr>=|S|	0.0001
W:Normal	0.963819	Pr<W	0.1041

Quantiles(Def=5)

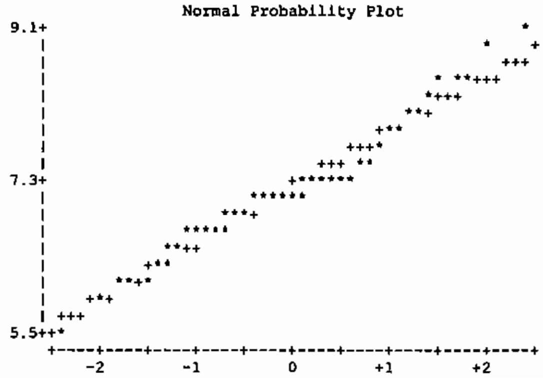
100% Max	9.017968	99%	9.017968
75% Q3	7.45008	95%	8.525161
50% Med	7.181585	90%	8.02617
25% Q1	6.841615	10%	6.51323
0% Min	5.549076	5%	6.073045
		1%	5.549076
Range	3.468892		
Q3-Q1	0.608464		
Mode	7.098376		

Extremes

Lowest	ID	Highest	ID
5.549076(	14147)	8.513185(	14000)
5.983936(	14157)	8.525161(	14020)
6.023448(	14142)	8.571681(	14102)
6.073045(	14164)	8.954157(	14016)
6.09131(	5084)	9.017968(	14167)

```
Stem Leaf                  #         Boxplot
  90 2                     1            0
  88 5                     1            0
  86
  84 137                   3            0
  82 9                     1            |
  80 130                   3            |
  78 1163                  4            |
  76 78                    2            |
  74 5003                  4         +-----+
  72 0047911234788889     16         |  +  |
  70 200012555688899      15         *-----*
  68 422339                6         +-----+
  66 346712339             9            |
  64 16                    2            |
  62 25                    2            |
  60 279                   3            |
  58 8                     1            |
  56
  54 5                     1            0
     ----+----+----+----+
Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



```
------------------------------------------------ DEPTH=Surface ANALYSIS=Manganese ------------------------------------------------

                                              All Observations
Variable=LNVALUE

              Moments                                  Quantiles(Def=5)                                 Extremes

N               75  Sum Wgts        75     100% Max  7.901007      99%  7.901007      Lowest     ID    Highest    ID
Mean      5.923466  Sum         444.26      75% Q3   6.390241      95%  7.056175    3.218876(  14166) 6.754604(  5096)
Std Dev   0.679201  Variance  0.461314      50% Med  5.857933      90%  6.641182    4.574711(  14147) 7.056175( 14158)
Skewness  -0.50429  Kurtosis  3.004363      25% Q1    5.57973      10%   5.32301    4.727388(  14020) 7.162397(  5087)
USS       2665.696  CSS       34.13722       0% Min  3.218876       5%  4.859812    4.859812(  14013) 7.279319( 14175)
CV        11.46627  Std Mean  0.078427                              1%  3.218876     4.89784(   5056) 7.901007( 14131)
T:Mean=0  75.52806  Pr>|T|      0.0001     Range     4.682131
Num ^= 0        75  Num > 0         75     Q3-Q1     0.810511
M(Sign)       37.5  Pr>=|M|     0.0001     Mode      5.583496
Sgn Rank      1425  Pr>=|S|     0.0001
W:Normal  0.972153  Pr<W        0.2889

     Stem Leaf                     #             Boxplot                             Normal Probability Plot
       78 0                        1                0             7.9+                                                  *
       76                                                             |                                                 +
       74                                                             |                                               +++
       72 8                        1                |                 |                                            +*+
       70 66                       2                |                 |                                         +**
       68                                           |                 |                                      +++
       66 244685                   6                |                 |                                   +*****
       64 0491267                  7                |                 |                                 ****
       62 02345799                 8             +-----+              |                              ****
       60 03369909                 8             |     |              |                            ***
       58 0445668856              10             *--+--*              |                         ***
       56 04889001789             11             |     |              |                      ****
       54 5607888                  7             +-----+              |                   ****+
       52 2346779                  7                |                 |               *****+
       50 45                        2               |                 |              *+++
       48 60                        2               |                 |           *+*+
       46 3                         1               |                 |         +*+
       44 7                         1               |                 |    ++*
       42                                                             |+++
       40                                                             |
       38                                                             |
       36                                                             |
       34                                                             |
       32 2                        1                0             3.3+ *
          ----+----+----+----+                                        +----+----+----+----+----+----+----+----+----+----+
     Multiply Stem.Leaf by 10**-1                                          -2        -1         0        +1        +2

                                            Detected Observations

              Moments                                  Quantiles(Def=5)                                 Extremes

N               74  Sum Wgts        74     100% Max  7.901007      99%  7.901007      Lowest     ID    Highest    ID
Mean      5.914718  Sum       437.6891      75% Q3   6.368187      95%  7.056175    3.218876(  14166) 6.754604(  5096)
Std Dev   0.679569  Variance  0.461814      50% Med  5.857933      90%  6.641182    4.574711(  14147) 7.056175( 14158)
Skewness  -0.48303  Kurtosis  3.040397      25% Q1    5.57973      10%   5.32301    4.727388(  14020) 7.162397(  5087)
USS        2622.52  CSS       33.71241       0% Min  3.218876       5%  4.859812    4.859812(  14013) 7.279319( 14175)
CV        11.48946  Std Mean  0.078998                              1%  3.218876     4.89784(   5056) 7.901007( 14131)
T:Mean=0  74.87148  Pr>|T|      0.0001     Range     4.682131
Num ^= 0        74  Num > 0         74     Q3-Q1     0.788457
M(Sign)         37  Pr>=|M|     0.0001     Mode      5.583496
Sgn Rank    1387.5  Pr>=|S|     0.0001
W:Normal  0.971903  Pr<W        0.2855

     Stem Leaf                     #             Boxplot                             Normal Probability Plot
       78 0                        1                0             7.9+                                                  *
       76                                                             |                                                 +
       74                                                             |                                               +++
       72 8                        1                |                 |                                            +*+
       70 66                       2                |                 |                                         +**
       68                                           |                 |                                       ++
       66 244685                   6                |                 |                                    *****
       64 049126                   6                |                 |                                 ****
       62 02345799                 8             +-----+              |                              ****
       60 03369909                 8             |     |              |                            ***
       58 0445668856              10             *--+--*              |                         ****
       56 04889001789             11             |     |              |                      ****
       54 5607888                  7             +-----+              |                   *****
       52 2346779                  7                |                 |               *****+
       50 45                        2               |                 |              **++
       48 60                        2               |                 |           *+*+
       46 3                         1               |                 |         +*+
       44 7                         1               |                 |    ++*
       42                                                             |+++
       40                                                             |
       38                                                             |
       36                                                             |
       34                                                             |
       32 2                        1                0             3.3+ *
          ----+----+----+----+                                        +----+----+----+----+----+----+----+----+----+----+
     Multiply Stem.Leaf by 10**-1                                          -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Surface ANALYSIS=Mercury -------------------------------------------------

                                                   All Observations
Variable=LNVALUE

                  Moments                               Quantiles(Def=5)                                  Extremes

 N                73  Sum Wgts         73      100% Max  -1.10866      99%  -1.10866        Lowest     ID      Highest     ID
 Mean       -2.22756  Sum        -162.612       75% Q3   -2.20727      95%  -1.60944      -3.77226(  10367)  -1.7148(    5050)
 Std Dev    0.291141  Variance   0.084763       50% Med  -2.30259      90%  -1.96611      -2.65926(   5127) -1.60944(   14100)
 Skewness   -0.83385  Kurtosis    13.3588       25% Q1   -2.30259      10%  -2.30259      -2.52573(  14010) -1.60944(   14101)
 USS        368.3312  CSS        6.102955        0% Min  -3.77226       5%  -2.30259      -2.30259(  14176) -1.60944(   14167)
 CV           -13.07  Std Mean   0.034076                              1%  -3.77226      -2.30259(  14175) -1.10866(   14041)
 T:Mean=0   -65.3713  Pr>|T|       0.0001      Range     2.663598
 Num ^= 0         73  Num > 0           0      Q3-Q1      0.09531
 M(Sign)       -36.5  Pr>=|M|      0.0001      Mode     -2.30259
 Sgn Rank    -1350.5  Pr>=|S|      0.0001
 W:Normal    0.66318  Pr<W         0.0001

            Histogram                   #            Boxplot                        Normal Probability Plot
  -1.1+*                                1               *             -1.1+                                                  *
      .                                                                    |
      .                                                                    |                                              ++++
      .**                               4               *                  |                                          **++++*+
      .**                               3               0                  |                                   ++++++*+
      .*****                            9               0                  |                             +++++++*** *
      .***************************     53            +--+--+               |          ***********************
      .*                                1               0                  |        *     +++++++
      .*                                1               *                  |      *+++++++
      .                                                                    |++++++
      .                                                                    |
      .                                                                    |
      .                                                                    |
  -3.7+*                                1               *             -3.7+ *
       ----+----+----+----+----+--                                         +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 2 counts                                          -2        -1         0        +1        +2
                                                  Detected Observations

                  Moments                               Quantiles(Def=5)                                  Extremes

 N                10  Sum Wgts         10      100% Max  -1.10866      99%  -1.10866        Lowest     ID      Highest     ID
 Mean       -1.90469  Sum        -19.0469       75% Q3   -1.60944      95%  -1.10866      -2.30259(  14141) -1.89712(   14040)
 Std Dev     0.40517  Variance   0.164163       50% Med  -1.89712      90%  -1.35905      -2.30259(  14104)  -1.7148(    5050)
 Skewness   0.648912  Kurtosis   -0.14185       25% Q1   -2.30259      10%  -2.30259      -2.30259(  14103) -1.60944(   14100)
 USS        37.75597  CSS        1.477463        0% Min  -2.30259       5%  -2.30259      -2.30259(  14102) -1.60944(   14101)
 CV         -21.2722  Std Mean   0.128126                              1%  -2.30259      -1.89712(  14040) -1.10866(   14041)
 T:Mean=0   -14.8658  Pr>|T|       0.0001      Range     1.193922
 Num ^= 0         10  Num > 0           0      Q3-Q1     0.693147
 M(Sign)          -5  Pr>=|M|      0.0020      Mode     -2.30259
 Sgn Rank      -27.5  Pr>=|S|      0.0020
 W:Normal   0.872423  Pr<W         0.1019

      Stem Leaf                     #            Boxplot                    Normal Probability Plot
       -10 1                        1               |               -1.1+                                      *  +++++
       -12                                          |                   |                                  +++++
       -14                                          |                   |                             +++++
       -16 111                      3            +-----+            -1.7+                        ++*++*
       -18 00                       2            *--+--*                |                   ++*+*
       -20                                       |     |                |              +++++
       -22 0000                     4            +-----+            -2.3+     *  ++*++*  *
           ----+----+----+----+                                          +----+----+----+----+----+----+----+----+----+----+
       Multiply Stem.Leaf by 10**-1                                          -2        -1         0        +1        +2
```

------------ DEPTH=Surface ANALYSIS=Nickel ------------

All Observations

Variable=LNVALUE

Moments

N	48	Sum Wgts	48
Mean	2.509847	Sum	120.4727
Std Dev	0.346666	Variance	0.120177
Skewness	-0.68694	Kurtosis	-0.185
USS	308.0162	CSS	5.648333
CV	13.81224	Std Mean	0.050037
T:Mean=0	50.15989	Pr>|T|	0.0001
Num ^= 0	48	Num > 0	48
M(Sign)	24	Pr>=|M|	0.0001
Sgn Rank	588	Pr>=|S|	0.0001
W:Normal	0.928138	Pr<W	0.0071

Quantiles(Def=5)

100% Max	3.044522	99%	3.044522
75% Q3	2.70805	95%	3.044522
50% Med	2.639057	90%	2.890372
25% Q1	2.256418	10%	2.014903
0% Min	1.648659	5%	1.856298
		1%	1.648659
Range	1.395864		
Q3-Q1	0.451632		
Mode	2.639057		

Extremes

Lowest	ID	Highest	ID
1.648659(	14000)	2.890372(	14175)
1.757858(	14010)	2.995732(	14158)
1.856298(	14036)	3.044522(	14003)
1.902108(	14016)	3.044522(	14159)
2.014903(	14142)	3.044522(	14176)

```
   Stem Leaf                    #             Boxplot
     30 0444                    4                |
     29                                          |
     28 339                     3                |
     27 11111117777            11             +-----+
     26 44444444                8             *-----*
     25 666                     3             |  +  |
     24 00888                   5             |     |
     23 0                       1             |     |
     22 047                     3             +-----+
     21 037                     3                |
     20 144                     3                |
     19 0                       1                |
     18 6                       1                |
     17 6                       1                |
     16 5                       1                |
        ----+----+----+----+
    Multiply Stem.Leaf by 10**-1
```

```
                       Normal Probability Plot
       3.05+                                                 +*+*   *
           |                                              ++*
           |                                           ++***
           |                                       ****** *
           |                                   *****++
           |                                  **+++
           |                               **++
       2.35+                             **+
           |                           +**
           |                        +***
           |                     +**
           |                  +++*
           |               +++ *
           |  +++   *
       1.65+++ *
           +----+----+----+----+----+----+----+----+----+----+
                -2        -1         0        +1        +2
```

Detected Observations

Moments

N	45	Sum Wgts	45
Mean	2.536423	Sum	114.139
Std Dev	0.33825	Variance	0.114413
Skewness	-0.83925	Kurtosis	0.224701
USS	294.539	CSS	5.034179
CV	13.33572	Std Mean	0.050423
T:Mean=0	50.30254	Pr>|T|	0.0001
Num ^= 0	45	Num > 0	45
M(Sign)	22.5	Pr>=|M|	0.0001
Sgn Rank	517.5	Pr>=|S|	0.0001
W:Normal	0.916327	Pr<W	0.0032

Quantiles(Def=5)

100% Max	3.044522	99%	3.044522
75% Q3	2.70805	95%	3.044522
50% Med	2.639057	90%	2.890372
25% Q1	2.397895	10%	2.04122
0% Min	1.648659	5%	1.902108
		1%	1.648659
Range	1.395864		
Q3-Q1	0.310155		
Mode	2.639057		

Extremes

Lowest	ID	Highest	ID
1.648659(	14000)	2.890372(	14175)
1.757858(	14010)	2.995732(	14158)
1.902108(	14016)	3.044522(	14003)
2.014903(	14142)	3.044522(	14159)
2.04122(	14130)	3.044522(	14176)

```
   Stem Leaf                    #             Boxplot
     30 0444                    4                |
     29                                          |
     28 339                     3                |
     27 11111117777            11             +-----+
     26 44444444                8             *-----*
     25 666                     3             |  +  |
     24 00888                   5             +-----+
     23                                          |
     22 047                     3                |
     21 03                      2                |
     20 144                     3                |
     19 0                       1                0
     18
     17 6                       1                0
     16 5                       1                0
        ----+----+----+----+
    Multiply Stem.Leaf by 10**-1
```

```
                       Normal Probability Plot
       3.05+                                                 ++* *    *
           |                                              +++*
           |                                           +++***
           |                                       ***** *
           |                                  *****++
           |                                 **+++
           |                               **++
       2.35+                             **+
           |                           +**
           |                        +***
           |                     +**
           |                  ++*
           |               +++
           | +++    *
       1.65++  *
           +----+----+----+----+----+----+----+----+----+----+
                -2        -1         0        +1        +2
```

```
----------------------------------------------- DEPTH=Surface ANALYSIS=Potassium -----------------------------------------------

                                                                 All Observations
Variable=LNVALUE

                Moments                                       Quantiles(Def=5)                                      Extremes

 N                74  Sum Wgts          74      100% Max  7.533694        99%  7.533694          Lowest     ID      Highest     ID
 Mean       6.178851  Sum          457.235       75% Q3    6.40688        95%  6.838405         4.70048(   14147) 6.790097(   14176)
 Std Dev    0.466991  Variance     0.21808       50% Med  6.221579        90%  6.703188        4.859812(    5050) 6.838405(   14016)
 Skewness   -0.43736  Kurtosis    1.762248       25% Q1   5.971262        10%  5.616771        5.293305(   14019) 6.975414(   14167)
 USS        2841.107  CSS         15.91985        0% Min   4.70048         5%  5.361292        5.361292(   14157) 7.130899(    5103)
 CV         7.557886  Std Mean    0.054287                                 1%   4.70048        5.370638(   14164) 7.533694(   14165)
 T:Mean=0   113.8192  Pr>|T|        0.0001      Range     2.833213
 Num ^= 0         74  Num > 0           74      Q3-Q1     0.435618
 M(Sign)          37  Pr>=|M|       0.0001      Mode       4.70048
 Sgn Rank     1387.5  Pr>=|S|       0.0001
 W:Normal   0.970523  Pr<W          0.2438

       Stem Leaf                     #             Boxplot                                  Normal Probability Plot
         74 3                        1                0                7.5+                                                   *
         72                                                                |                                               ++++
         70 3                        1                0                    |                                           ++*+
         68 48                       2                |                    |                                       +++**
         66 013360149                9                |                    |                                   ******
         64 0179149                  7             +-----+                 |                              ++****
         62 1223445600122245789     19             *-----*                 |                        ********
         60 0112235666801369        16             |  +  |             6.1+                    ******+
         58 79123457                 8             +-----+                 |                ******++
         56 2309                     4                |                    |             ***++
         54 5                        1                |                    |          +++*
         52 9678                     4                0                    |      ++** **
         50                                                                |+++++
         48 6                        1                0                    |    *
         46 0                        1                0                4.7+ *
            ----+----+----+----+                                            +----+----+----+----+----+----+----+----+----+----+
        Multiply Stem.Leaf by 10**-1                                            -2        -1         0        +1        +2
                                                                 Detected Observations

                Moments                                       Quantiles(Def=5)                                      Extremes

 N                59  Sum Wgts          59      100% Max  7.533694        99%  7.533694          Lowest     ID      Highest     ID
 Mean        6.27475  Sum         370.2102       75% Q3   6.510258        95%  6.975414        4.859812(    5050) 6.790097(   14176)
 Std Dev    0.421423  Variance    0.177598       50% Med  6.298949        90%  6.740519        5.361292(   14157) 6.838405(   14016)
 Skewness   -0.31427  Kurtosis    2.520496       25% Q1   6.061457        10%  5.866468        5.370638(   14164) 6.975414(   14167)
 USS        2333.277  CSS         10.30066        0% Min  4.859812         5%  5.370638        5.627621(   14029) 7.130899(    5103)
 CV         6.716178  Std Mean    0.054865                                 1%  4.859812         5.78996(   14044) 7.533694(   14165)
 T:Mean=0   114.3678  Pr>|T|        0.0001      Range     2.673881
 Num ^= 0         59  Num > 0           59      Q3-Q1     0.448801
 M(Sign)        29.5  Pr>=|M|       0.0001      Mode      4.859812
 Sgn Rank        885  Pr>=|S|       0.0001
 W:Normal   0.967734  Pr<W          0.2494

       Stem Leaf                     #             Boxplot                                  Normal Probability Plot
         74 3                        1                0                7.5+                                                  *
         72                                                                |                                               ++++
         70 3                        1                |                    |                                           +*++
         68 48                       2                |                    |                                       ++*+*
         66 01336049                 8                |                    |                                  +******
         64 0179149                  7             +-----+                 |                             ++*****
         62 1223445600122245789     19             *--+--*                 |                       *********
         60 0366801369              10             +-----+                 |                  *****++
         58 791234                   6                |                    |             *****++
         56 39                       2                |                    |          +**++
         54                                                                |      ++++
         52 67                       2                0                    |+++++ * *
         50                                                                |
         48 6                        1                0                4.9+  *
            ----+----+----+----+                                            +----+----+----+----+----+----+----+----+----+----+
        Multiply Stem.Leaf by 10**-1                                            -2        -1         0        +1        +2
```

---------- DEPTH=Surface ANALYSIS=Selenium ----------

All Observations

Variable=LNVALUE

Moments

N	66	Sum Wgts	66
Mean	-1.26089	Sum	-83.2187
Std Dev	0.688456	Variance	0.473971
Skewness	0.008496	Kurtosis	-1.32413
USS	135.7378	CSS	30.80811
CV	-54.6008	Std Mean	0.084743
T:Mean=0	-14.879	Pr>|T|	0.0001
Num ^= 0	66	Num > 0	0
M(Sign)	-33	Pr>=|M|	0.0001
Sgn Rank	-1105.5	Pr>=|S|	0.0001
W:Normal	0.89696	Pr<W	0.0001

Quantiles(Def=5)

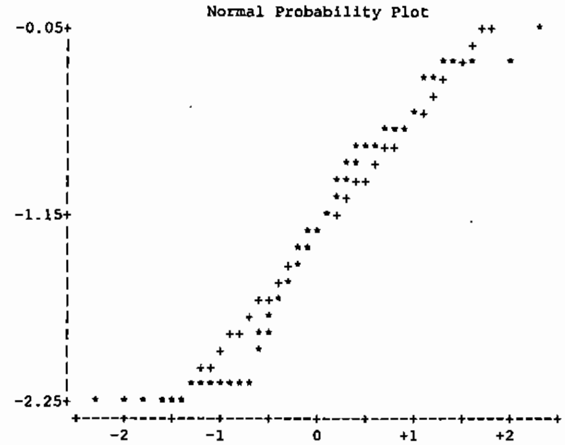
100% Max	-0.0202	99%	-0.0202
75% Q3	-0.69315	95%	-0.22314
50% Med	-1.20397	90%	-0.24846
25% Q1	-2.12026	10%	-2.12026
0% Min	-2.20727	5%	-2.20727
		1%	-2.20727
Range	2.187072		
Q3-Q1	1.427116		
Mode	-2.12026		

Extremes

Lowest	ID	Highest	ID
-2.20727(	14164)	-0.22314(	5096)
-2.20727(	14159)	-0.22314(	5099)
-2.20727(	14157)	-0.22314(	5103)
-2.20727(	14147)	-0.22314(	5105)
-2.20727(	14143)	-0.0202(	14090)

```
 Stem Leaf                     #     Boxplot
   -0 2                        1        |
   -1                                   |
   -2 522222                   6        |
   -3 660                      3        |
   -4                                   |
   -5 8                        1        |
   -6 999995                   6     +-----+
   -7 311                      3     |     |
   -8 42200                    5     |     |
   -9 772                      3     |     |
  -10 8                        1     |     |
  -11 41                       2     |     |
  -12 74000                    5     *--+--*
  -13 55                       2     |     |
  -14 77                       2     |     |
  -15 11                       2     |     |
  -16 611                      3     |     |
  -17 7                        1     |     |
  -18 3                        1     |     |
  -19 70                       2     |     |
  -20                                |     |
  -21 22222222222             11     +-----+
  -22 111111                   6        |
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot



Detected Observations

Moments

N	20	Sum Wgts	20
Mean	-0.91911	Sum	-18.3823
Std Dev	0.456939	Variance	0.208793
Skewness	-0.04448	Kurtosis	0.004336
USS	20.8625	CSS	3.967072
CV	-49.7151	Std Mean	0.102175
T:Mean=0	-8.99552	Pr>|T|	0.0001
Num ^= 0	20	Num > 0	0
M(Sign)	-10	Pr>=|M|	0.0001
Sgn Rank	-105	Pr>=|S|	0.0001
W:Normal	0.977457	Pr<W	0.8810

Quantiles(Def=5)

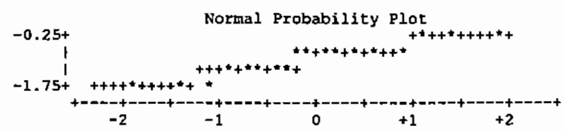
100% Max	-0.0202	99%	-0.0202
75% Q3	-0.69315	95%	-0.12167
50% Med	-0.83248	90%	-0.26212
25% Q1	-1.1717	10%	-1.56178
0% Min	-1.83258	5%	-1.72101
		1%	-1.83258
Range	1.812379		
Q3-Q1	0.478556		
Mode	-0.79851		

Extremes

Lowest	ID	Highest	ID
-1.83258(	14100)	-0.69315(	14032)
-1.60944(	14132)	-0.65393(	14169)
-1.51413(	14141)	-0.30111(	14006)
-1.34707(	14133)	-0.22314(	5090)
-1.20397(	14026)	-0.0202(	14090)

```
 Stem Leaf                     #     Boxplot
   -0 320                      3        |
   -0 88887777                 8     +--+--+
   -1 321110                   6     +-----+
   -1 865                      3        |
      ----+----+----+----+
```

Normal Probability Plot



-- DEPTH=Surface ANALYSIS=Silver --

All Observations

Variable=LNVALUE

Moments

N	61	Sum Wgts	61
Mean	0.327486	Sum	19.97667
Std Dev	0.426833	Variance	0.182187
Skewness	-0.64028	Kurtosis	-0.38163
USS	17.47328	CSS	10.9312
CV	130.3362	Std Mean	0.05465
T:Mean=0	5.992388	Pr>|T|	0.0001
Num ^= 0	60	Num > 0	47
M(Sign)	17	Pr>=|M|	0.0001
Sgn Rank	652	Pr>=|S|	0.0001
W:Normal	0.907542	Pr<W	0.0001

Quantiles(Def=5)

100% Max	0.832909	99%	0.832909
75% Q3	0.741937	95%	0.832909
50% Med	0.405465	90%	0.832909
25% Q1	0.09531	10%	-0.28768
0% Min	-0.71335	5%	-0.4943
		1%	-0.71335
Range	1.546259		
Q3-Q1	0.646627		
Mode	0.182322		

Extremes

Lowest	ID	Highest	ID
-0.71335(	14032)	0.832909(	5096)
-0.63488(	14033)	0.832909(	5099)
-0.51083(	14010)	0.832909(	5103)
-0.4943(	14036)	0.832909(	5105)
-0.47804(	14016)	0.832909(	5114)

```
 Stem Leaf               #        Boxplot
    8 333333333          9           |
    7 44449999           8        +------+
    6 444                3        |      |
    5 3399               4        |      |
    4 1117777            7        *------*
    3 4                  1        |  +   |
    2 6666               4        |      |
    1 00888888888       11        +------+
    0 0                  1           |
   -0 544                3           |
   -1 944                3           |
   -2 9                  1           |
   -3                                |
   -4 980                3           |
   -5 1                  1           |
   -6 3                  1           |
   -7 1                  1           |
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                      Normal Probability Plot
  0.85+                                            **** ** *   *
      |                                       *****++
      |                                      **++
      |                                   **++
      |                                ****++
      |                                *+
      |                             **
      |                         *****
  0.05+                       **+
      |                    ++*
      |                  **
      |                ++*
      |             +++
      |          ++ * **
      |        ++ *
      | +++  *
 -0.75++ *
       +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

Detected Observations

Moments

N	24	Sum Wgts	24
Mean	0.506451	Sum	12.15482
Std Dev	0.212716	Variance	0.045248
Skewness	0.087752	Kurtosis	-0.97658
USS	7.196524	CSS	1.040704
CV	42.00125	Std Mean	0.04342
T:Mean=0	11.66389	Pr>|T|	0.0001
Num ^= 0	24	Num > 0	24
M(Sign)	12	Pr>=|M|	0.0001
Sgn Rank	150	Pr>=|S|	0.0001
W:Normal	0.934692	Pr<W	0.1274

Quantiles(Def=5)

100% Max	0.832909	99%	0.832909
75% Q3	0.641854	95%	0.832909
50% Med	0.470004	90%	0.832909
25% Q1	0.370969	10%	0.182322
0% Min	0.182322	5%	0.182322
		1%	0.182322
Range	0.650588		
Q3-Q1	0.270885		
Mode	0.470004		

Extremes

Lowest	ID	Highest	ID
0.182322(	14157)	0.788457(	14101)
0.182322(	14103)	0.788457(	14165)
0.182322(	14102)	0.832909(	5058)
0.262364(	14156)	0.832909(	5084)
0.262364(	14100)	0.832909(	5090)

```
 Stem Leaf               #        Boxplot
    8 333                3           |
    7 99                 2           |
    6 444                3        +------+
    5 339                3        |  +   |
    4 1117777            7        *------*
    3 4                  1        +------+
    2 66                 2           |
    1 888                3           |
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                      Normal Probability Plot
  0.85+                                           * +*++++*
      |                                        **+++
      |                                   ***++
      |                              ++***
      |                         *****+*
      |                      ++*+
      |                 +++++**
  0.15+          *+++*  *
       +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

-- DEPTH=Surface ANALYSIS=Sodium --

All Observations

Variable=LNVALUE

Moments

N	73	Sum Wgts	73
Mean	4.330816	Sum	316.1495
Std Dev	0.614102	Variance	0.377121
Skewness	0.683652	Kurtosis	0.068815
USS	1396.338	CSS	27.15273
CV	14.17982	Std Mean	0.071875
T:Mean=0	60.25466	Pr>|T|	0.0001
Num ^= 0	73	Num > 0	73
M(Sign)	36.5	Pr>=|M|	0.0001
Sgn Rank	1350.5	Pr>=|S|	0.0001
W:Normal	0.942598	Pr<W	0.0044

Quantiles(Def=5)

100% Max	5.840642	99%	5.840642
75% Q3	4.70953	95%	5.624018
50% Med	4.26268	90%	5.32301
25% Q1	3.912023	10%	3.610918
0% Min	3.218876	5%	3.465736
		1%	3.218876
Range	2.621766		
Q3-Q1	0.797507		
Mode	3.912023		

Extremes

Lowest	ID	Highest	ID
3.218876(	14147)	5.55296(	14166)
3.258097(	14131)	5.624018(	14040)
3.433987(	14132)	5.743003(	5096)
3.465736(	14157)	5.758902(	5127)
3.526361(	5114)	5.840642(	14041)

```
   Stem Leaf                     #             Boxplot
     58 4                        1                |
     56 246                      3                |
     54 25                       2                |
     52 128                      3                |
     50 6                        1                |
     48 1462                     4                |
     46 1512458                  7             +-----+
     44 1238                     4             |     |
     42 5668223468899           13             *--+--*
     40 33613336777             11             |     |
     38 1111111377              10             +-----+
     36 1911668                  7                |
     34 37388                    5                |
     32 26                       2                |
        ----+----+----+----+
    Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot

```
5.9+                                                *+
    |                                         * * *+++
    |                                       **  +++
    |                                     **  +++
    |                                    *+++
    |                                 +***
    |                              +***
    |                           ++**
    |                       ++****
    |                    +****
    |                 ****
    |            *****
    |       * ***++
3.3+  *   * +++
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

Detected Observations

Moments

N	54	Sum Wgts	54
Mean	4.400287	Sum	237.6155
Std Dev	0.609434	Variance	0.37141
Skewness	0.654642	Kurtosis	-0.09923
USS	1065.261	CSS	19.68474
CV	13.84988	Std Mean	0.082934
T:Mean=0	53.05801	Pr>|T|	0.0001
Num ^= 0	54	Num > 0	54
M(Sign)	27	Pr>=|M|	0.0001
Sgn Rank	742.5	Pr>=|S|	0.0001
W:Normal	0.943043	Pr<W	0.0205

Quantiles(Def=5)

100% Max	5.840642	99%	5.840642
75% Q3	4.779123	95%	5.624018
50% Med	4.297077	90%	5.384495
25% Q1	3.970292	10%	3.7612
0% Min	3.218876	5%	3.526361
		1%	3.218876
Range	2.621766		
Q3-Q1	0.808832		
Mode	3.912023		

Extremes

Lowest	ID	Highest	ID
3.218876(	14147)	5.420535(	10367)
3.465736(	14157)	5.55296(	14166)
3.526361(	5114)	5.624018(	14040)
3.713572(	14164)	5.743003(	5096)
3.713572(	5099)	5.840642(	14041)

```
   Stem Leaf                     #             Boxplot
     58 4                        1                |
     56 24                       2                |
     54 25                       2                |
     52 128                      3                |
     50 6                        1                |
     48 1462                     4                |
     46 258                      3             +-----+
     44 238                      3             |  +  |
     42 566822346889            12             *-----*
     40 36133367                 8             |     |
     38 1111377                  7             +-----+
     36 11668                    5                |
     34 73                       2                |
     32 2                        1                |
        ----+----+----+----+
    Multiply Stem.Leaf by 10**-1
```

Normal Probability Plot

```
5.9+                                               *++
    |                                         * *+++
    |                                       **  +++
    |                                    ***+++
    |                                   *+++
    |                                ***
    |                             ++**
    |                         ++++**
    |                      +*******
    |                   *****
    |               **+*
    |          ***+*+
    |      *  *+++
3.3+  *   +++
     +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

DEPTH=Surface ANALYSIS=Thallium

Variable=LNVALUE

All Observations

Moments

N	35	Sum Wgts	35
Mean	-1.35498	Sum	-47.4244
Std Dev	0.175801	Variance	0.030906
Skewness	1.887321	Kurtosis	3.029286
USS	65.31013	CSS	1.050807
CV	-12.9744	Std Mean	0.029716
T:Mean=0	-45.598	Pr>|T|	0.0001
Num ^= 0	35	Num > 0	0
M(Sign)	-17.5	Pr>=|M|	0.0001
Sgn Rank	-315	Pr>=|S|	0.0001
W:Normal	0.747673	Pr<W	0.0001

Quantiles(Def=5)

100% Max	-0.82098	99%	-0.82098
75% Q3	-1.34707	95%	-0.8675
50% Med	-1.42712	90%	-1.02165
25% Q1	-1.46968	10%	-1.51413
0% Min	-1.51413	5%	-1.51413
		1%	-1.51413
Range	0.693147		
Q3-Q1	0.122602		
Mode	-1.46968		

Extremes

Lowest	ID	Highest	ID
-1.51413(	14159)	-1.20397(	14133)
-1.51413(	14157)	-1.02165(	10367)
-1.51413(	14147)	-0.99425(	14090)
-1.51413(	14101)	-0.8675(	14175)
-1.46968(	14156)	-0.82098(	14176)

```
   Stem Leaf                     #             Boxplot
     -8 2                        1                *
     -8 7                        1                *
     -9
     -9 9                        1                0
    -10 2                        1                0
    -10
    -11
    -11
    -12 40                       2                |
    -12 77                       2                |
    -13                                           |
    -13 999999955                9             +--+--+
    -14 3333333                  7             *-----*
    -14 7777777                  7             +-----+
    -15 1111                     4                |
        ----+----+----+----+
   Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
 -0.825+                                                    *
       |                                                *
       |                                                      ++
       |                                            *    +++
       |                                           *  +++
       |                                             +++
       |                                          +++
 -1.175+                                       +++
       |                                    +++ **
       |                                  ++  **
       |                               +++  **
       |                            +++*****
       |                         +*****
       |                     *******
 -1.525+      *    *  ** +++
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

Detected Observations

Moments

N	10	Sum Wgts	10
Mean	-1.17902	Sum	-11.7902
Std Dev	0.209571	Variance	0.04392
Skewness	0.875183	Kurtosis	-0.75563
USS	14.2961	CSS	0.395281
CV	-17.7751	Std Mean	0.066272
T:Mean=0	-17.7905	Pr>|T|	0.0001
Num ^= 0	10	Num > 0	0
M(Sign)	-5	Pr>=|M|	0.0020
Sgn Rank	-27.5	Pr>=|S|	0.0020
W:Normal	0.856007	Pr<W	0.0658

Quantiles(Def=5)

100% Max	-0.82098	99%	-0.82098
75% Q3	-0.99425	95%	-0.82098
50% Med	-1.25542	90%	-0.84424
25% Q1	-1.34707	10%	-1.38629
0% Min	-1.38629	5%	-1.38629
		1%	-1.38629
Range	0.565314		
Q3-Q1	0.352821		
Mode	-1.38629		

Extremes

Lowest	ID	Highest	ID
-1.38629(	14169)	-1.23787(	14149)
-1.38629(	14148)	-1.20397(	14133)
-1.34707(	5127)	-0.99425(	14090)
-1.27297(	14168)	-0.8675(	14175)
-1.27297(	14164)	-0.82098(	14176)

```
   Stem Leaf                     #             Boxplot
     -8 72                       2                |
     -9 9                        1             +-----+
    -10                                        |     |
    -11                                        |  +  |
    -12 7740                     4             *-----*
    -13 995                      3             +-----+
        ----+----+----+----+
   Multiply Stem.Leaf by 10**-1
```

```
                     Normal Probability Plot
  -0.85+                                               *   +*+++
       |                                             * +++++
       |                                          +++++
       |                                      +++++
       |                                  +*++* *  *
  -1.35+          *    *++*+
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

DEPTH=Surface ANALYSIS=Vanadium

All Observations

Variable=LNVALUE

Moments

N	71	Sum Wgts	71
Mean	2.980951	Sum	211.6475
Std Dev	0.575861	Variance	0.331615
Skewness	-2.24788	Kurtosis	5.730848
USS	654.1239	CSS	23.21307
CV	19.31801	Std Mean	0.068342
T:Mean=0	43.61809	Pr>|T|	0.0001
Num ^= 0	71	Num > 0	71
M(Sign)	35.5	Pr>=|M|	0.0001
Sgn Rank	1278	Pr>=|S|	0.0001
W:Normal	0.76305	Pr<W	0.0001

Quantiles(Def=5)

100% Max	3.637586	99%	3.637586
75% Q3	3.295837	95%	3.583519
50% Med	3.091042	90%	3.465736
25% Q1	2.890372	10%	2.484907
0% Min	0.832909	5%	1.526056
		1%	0.832909
Range	2.804677		
Q3-Q1	0.405465		
Mode	3.044522		

Extremes

Lowest	ID	Highest	ID
0.832909(	14147)	3.555348(	14175)
0.832909(	14040)	3.583519(	14100)
1.098612(	14041)	3.610918(	14176)
1.526056(	14016)	3.637586(	5103)
1.987874(	14006)	3.637586(	14169)

```
 Stem Leaf                    #        Boxplot
   36 144                     3           |
   34 003770368               9           |
   32 2222666000000377       16        +-----+
   30 00044444499999948888   20        *-----*
   28 039999444               9        +--+--+
   26 4177                    4           |
   24 0886                    4           |
   22
   20 6                       1           0
   18 9                       1           0
   16
   14 3                       1           *
   12
   10 0                       1           *
    8 33                      2           *
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

```
                      Normal Probability Plot
 3.7+                                          ++++   * *
    |                                       ++*******
    |                                   *******
    |                              ******+
    |                         *****++++
    |                     *** +++
    |                   **++++
 2.3+                  *++
    |              +++*
    |          +++  *
    |     +++
    |++          *
    |
    |          *
 0.9+ *    *
     +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Moments

N	71	Sum Wgts	71
Mean	2.980951	Sum	211.6475
Std Dev	0.575861	Variance	0.331615
Skewness	-2.24788	Kurtosis	5.730848
USS	654.1239	CSS	23.21307
CV	19.31801	Std Mean	0.068342
T:Mean=0	43.61809	Pr>|T|	0.0001
Num ^= 0	71	Num > 0	71
M(Sign)	35.5	Pr>=|M|	0.0001
Sgn Rank	1278	Pr>=|S|	0.0001
W:Normal	0.76305	Pr<W	0.0001

Quantiles(Def=5)

100% Max	3.637586	99%	3.637586
75% Q3	3.295837	95%	3.583519
50% Med	3.091042	90%	3.465736
25% Q1	2.890372	10%	2.484907
0% Min	0.832909	5%	1.526056
		1%	0.832909
Range	2.804677		
Q3-Q1	0.405465		
Mode	3.044522		

Extremes

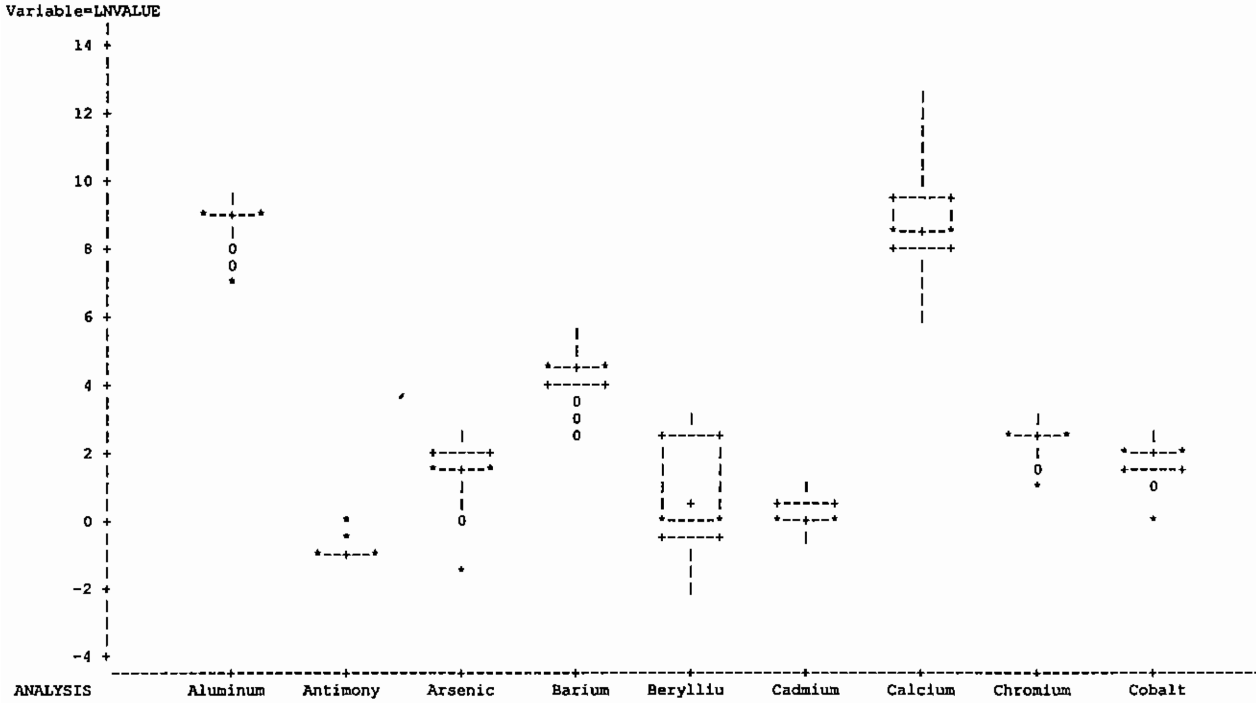
Lowest	ID	Highest	ID
0.832909(	14147)	3.555348(	14175)
0.832909(	14040)	3.583519(	14100)
1.098612(	14041)	3.610918(	14176)
1.526056(	14016)	3.637586(	5103)
1.987874(	14006)	3.637586(	14169)

```
 Stem Leaf                    #        Boxplot
   36 144                     3           |
   34 003770368               9           |
   32 2222666000000377       16        +-----+
   30 00044444499999948888   20        *-----*
   28 039999444               9        +--+--+
   26 4177                    4           |
   24 0886                    4           |
   22
   20 6                       1           0
   18 9                       1           0
   16
   14 3                       1           *
   12
   10 0                       1           *
    8 33                      2           *
      ----+----+----+----+
 Multiply Stem.Leaf by 10**-1
```

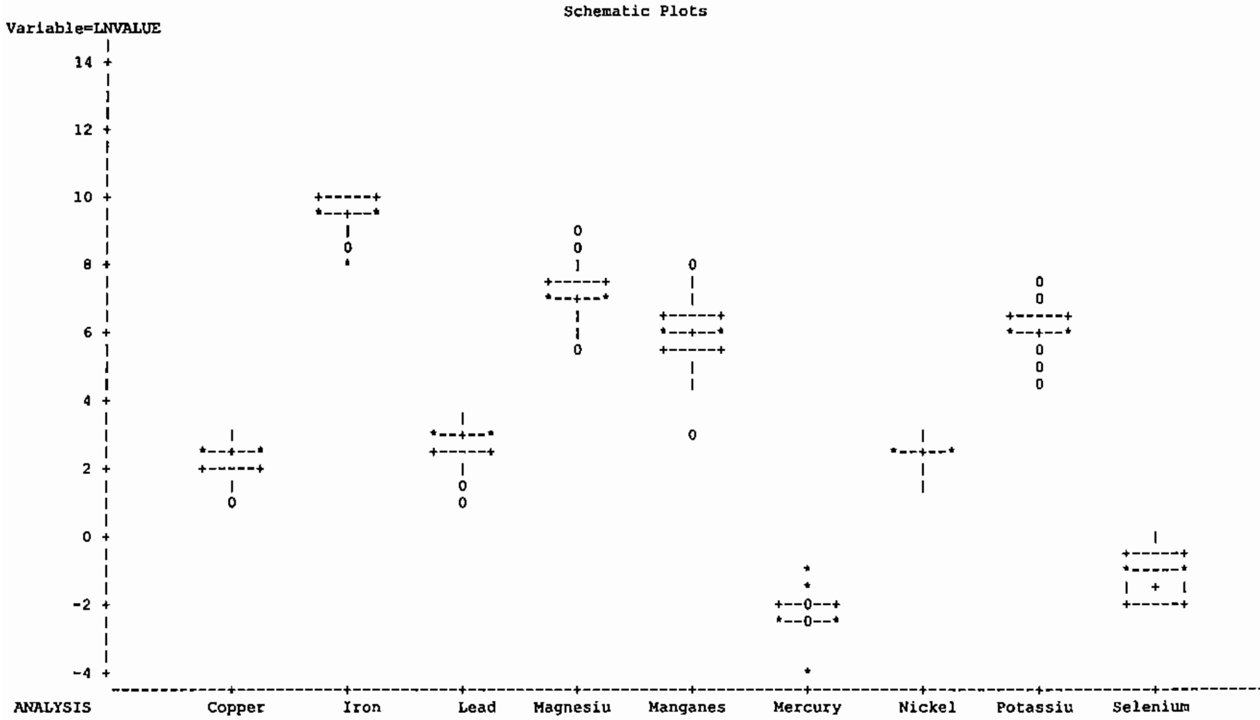
```
                      Normal Probability Plot
 3.7+                                          ++++   * *
    |                                       ++*******
    |                                   *******
    |                              ******+
    |                         *****++++
    |                     *** +++
    |                   **++++
 2.3+                  *++
    |              +++*
    |          +++  *
    |     +++
    |++          *
    |
    |          *
 0.9+ *    *
     +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Surface ANALYSIS=Zinc -------------------------------------------------

                                                            All Observations
Variable=LNVALUE

                 Moments                                      Quantiles(Def=5)                                   Extremes

 N                51  Sum Wgts         51       100% Max  4.174387       99%  4.174387        Lowest    ID      Highest    ID
 Mean        3.66854  Sum        187.0956        75% Q3   3.951244       95%  4.143135       2.70805(  14142) 4.127134(   5034)
 Std Dev    0.376081  Variance   0.141437        50% Med  3.713572       90%  4.110874      2.772589(   5084) 4.127134(  14144)
 Skewness   -0.79158  Kurtosis    0.14601        25% Q1   3.465736       10%  3.178054      2.833213(  14157) 4.143135(  14044)
 USS        693.4394  CSS        7.071843         0% Min   2.70805        5%  2.833213      2.995732(  14016) 4.174387(   5096)
 CV         10.25151  Std Mean   0.052662                                 1%   2.70805      2.995732(  14000) 4.174387(   5099)
 T:Mean=0   69.66218  Pr>|T|       0.0001       Range     1.466337
 Num ^= 0         51  Num > 0          51       Q3-Q1     0.485508
 M(Sign)        25.5  Pr>=|M|      0.0001       Mode      3.931826
 Sgn Rank        663  Pr>=|S|      0.0001
 W:Normal   0.921651  Pr<W         0.0024

      Stem Leaf                     #             Boxplot                               Normal Probability Plot
        41 133477                   6                |                4.15+                                     **+ *  *
        40 1369                     4                |                    |                                  ***
        39 133335579                9             +-----+                 |                              ******
        38 379                      3             |     |                 |                             **+++
        37 1448                     4             *-----*                 |                           **++
        36 0169                     4             |  +  |                 |                         ***
        35 0033668                  7             |     |                 |                       ****
        34 3377                     4             +-----+             3.45+                    ***+
        33 3377                     4                |                    |                 ***+
        32                                           |                    |                +++
        31 8                        1                |                    |            +++*
        30 00                       2                |                    |          ++
        29                                           |                    |       +++  *  *
        28 3                        1                |                    |    +++   *
        27 17                       2                0                2.75+++*    *
           ----+----+----+----+                                           +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                             -2        -1         0        +1        +2
                                                         Detected Observations

                 Moments                                      Quantiles(Def=5)                                   Extremes

 N                50  Sum Wgts         50       100% Max  4.174387       99%  4.174387        Lowest    ID      Highest    ID
 Mean       3.663671  Sum        183.1835        75% Q3   3.951244       95%  4.143135       2.70805(  14142) 4.127134(   5034)
 Std Dev    0.378271  Variance   0.143089        50% Med  3.701226       90%  4.119004      2.772589(   5084) 4.127134(  14144)
 Skewness   -0.75987  Kurtosis   0.092505        25% Q1   3.465736       10%  3.086893      2.833213(  14157) 4.143135(  14044)
 USS        678.1355  CSS        7.011374         0% Min   2.70805        5%  2.833213      2.995732(  14016) 4.174387(   5096)
 CV         10.32493  Std Mean   0.053496                                 1%   2.70805      2.995732(  14000) 4.174387(   5099)
 T:Mean=0   68.48539  Pr>|T|       0.0001       Range     1.466337
 Num ^= 0         50  Num > 0          50       Q3-Q1     0.485508
 M(Sign)          25  Pr>=|M|      0.0001       Mode      3.931826
 Sgn Rank      637.5  Pr>=|S|      0.0001
 W:Normal    0.92409  Pr<W         0.0036

      Stem Leaf                     #             Boxplot                               Normal Probability Plot
        41 133477                   6                |                4.15+                                     **+ * *
        40 1369                     4                |                    |                                  ***
        39 33335579                 8             +-----+                 |                              *****
        38 379                      3             |     |                 |                            **+++
        37 1448                     4             *-----*                 |                          ***+
        36 0169                     4             |  +  |                 |                        ***
        35 0033668                  7             |     |                 |                      ***
        34 3377                     4             +-----+             3.45+                  ***+
        33 3377                     4                |                    |               ***++
        32                                           |                    |              +++
        31 8                        1                |                    |            ++*
        30 00                       2                |                    |         +++
        29                                           |                    |      +++  *  *
        28 3                        1                |                    |    ++    *
        27 17                       2                0                2.75++++*   *
           ----+----+----+----+                                           +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                             -2        -1         0        +1        +2
```

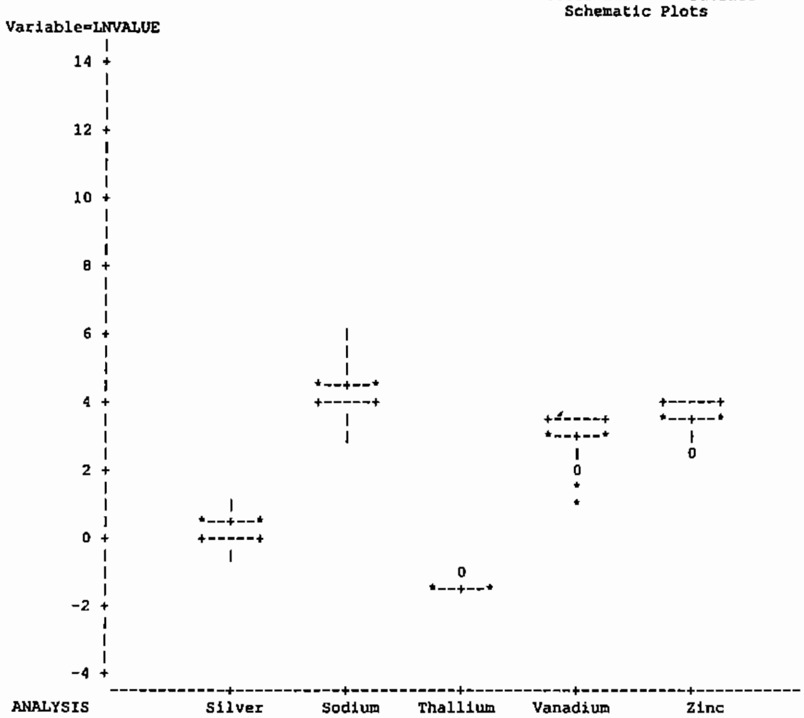
All Observations - Surface
Schematic Plots



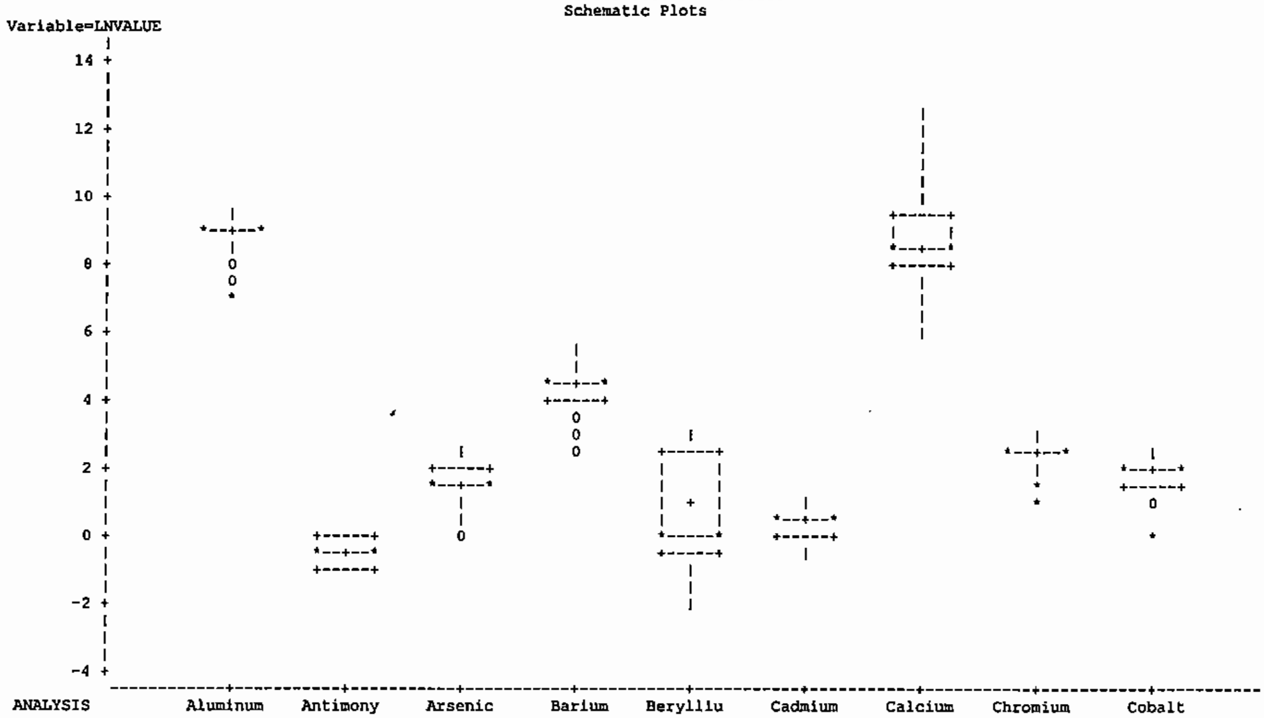
All Observations Surface
Schematic Plots



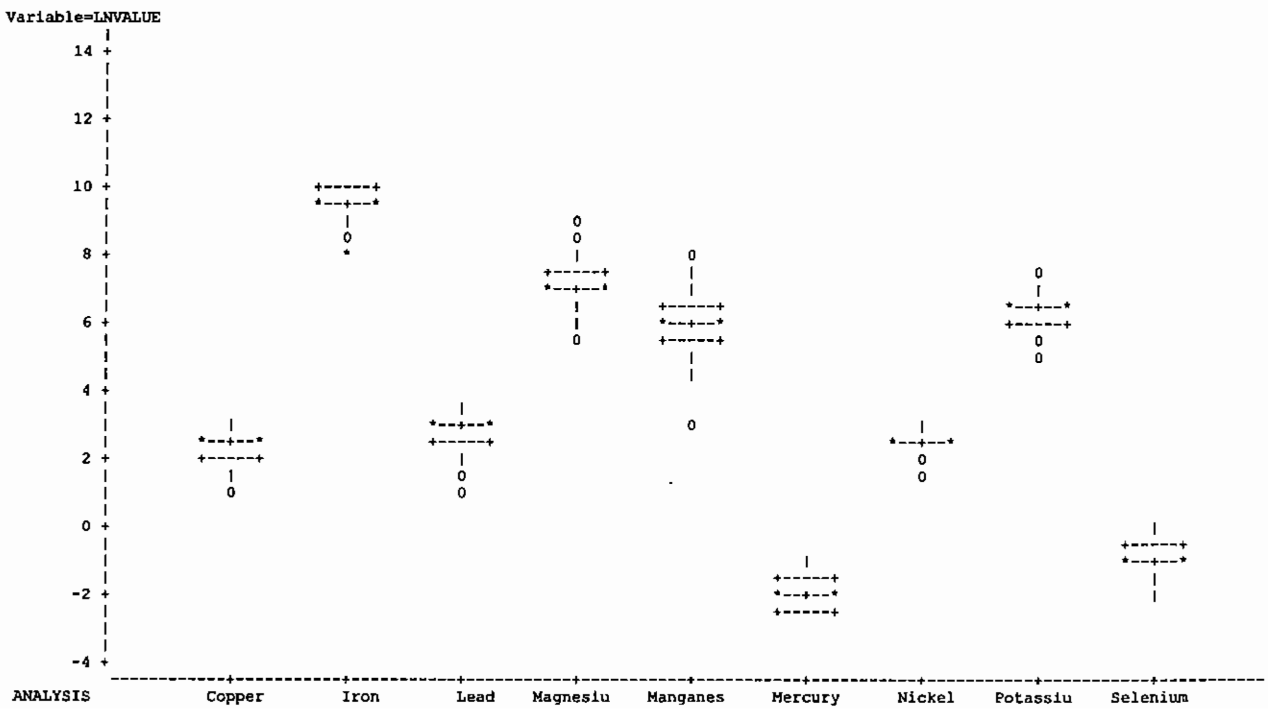
All Observations - Surface
Schematic Plots



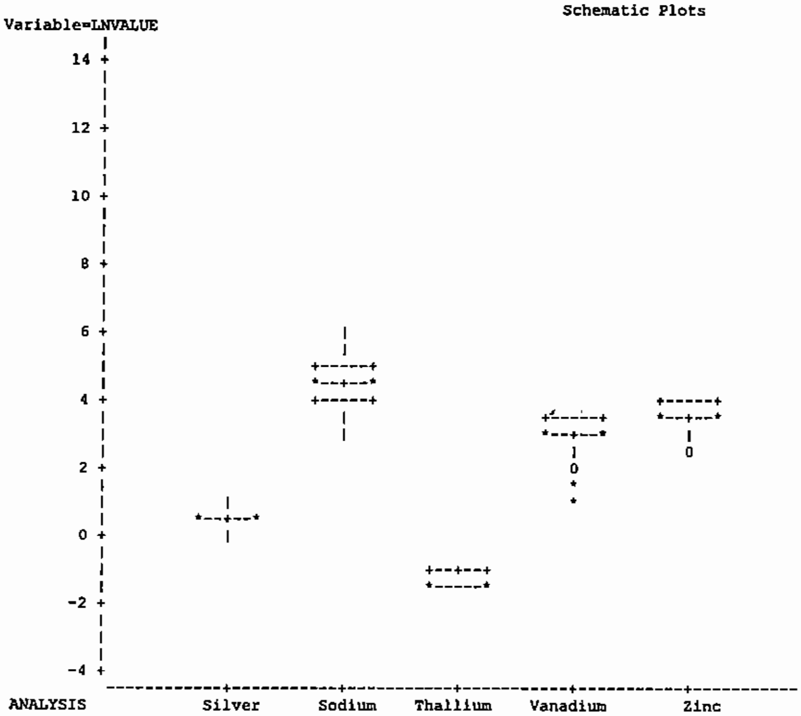
Detected Observations - Surface
Schematic Plots



Detected Observations - Surface
Schematic Plots



Detected Observations - Surface
Schematic Plots



--- DEPTH=Subsurface ANALYSIS=Aluminum ---

All Observations

Variable=LNVALUE

Moments

N	647	Sum Wgts	647
Mean	8.324993	Sum	5386.27
Std Dev	0.839316	Variance	0.704452
Skewness	-1.09957	Kurtosis	1.186834
USS	45295.74	CSS	455.0759
CV	10.08189	Std Mean	0.032997
T:Mean=0	252.296	Pr>|T|	0.0001
Num ^= 0	647	Num > 0	647
M(Sign)	323.5	Pr>=|M|	0.0001
Sgn Rank	104814	Pr>=|S|	0.0001
W:Normal	0.912198	Pr<W	0.0001

Quantiles(Def=5)

100% Max	9.758462	99%	9.55393
75% Q3	8.930626	95%	9.35876
50% Med	8.490849	90%	9.220291
25% Q1	7.886081	10%	7.130899
0% Min	5.068904	5%	6.690842
		1%	5.762051
Range	4.689558		
Q3-Q1	1.044545		
Mode	7.565275		

Extremes

Lowest	ID	Highest	ID
5.068904(	4224)	9.595603(	14182)
5.159055(	13282)	9.642123(	13104)
5.288267(	13181)	9.661416(	4451)
5.332719(	13284)	9.692767(	13152)
5.616771(	13283)	9.758462(	4057)

```
   Histogram                                    #   Boxplot
9.7+**                                          4      |
   .*********                                  17      |
   .************************                   48      |
   .************************************       71      |
   .****************************************   80   +-----+
   .*********************************          66   |     |
   .**************************************     75   *-----*
   .*******************************            62   |  +  |
   .********************                       40   |     |
   .*********************                      41   +-----+
   .************                               23      |
   .***************                            29      |
   .************                               24      |
   .*********                                  18      |
   .******                                     12      |
   .****                                        8      |
   .***                                         5      |
   .***                                         6      0
   .**                                          4      0
   .****                                        7      0
   .**                                          3      0
   .
   .*                                           2      0
5.1+*                                           2      0
    ----+----+----+----+----+----+----+----+
    * may represent up to 2 counts
```

```
                 Normal Probability Plot
9.7+                                          ++        *
   |                                      +++    ******
   |                                    +*******
   |                                 *****
   |                             *****
   |                          ****+
   |                        ***++
   |                     ***++
   |                   ****++
   |                 ****++
   |               **+
   |             ***
   |           ***
   |         +**
   |      ++***
   |    ++ **
   |  ++  **
   |+++   **
   |    **
   |  ***
   | **
   |
   |*
5.1+*
    +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

Detected Observations

Moments

N	647	Sum Wgts	647
Mean	8.324993	Sum	5386.27
Std Dev	0.839316	Variance	0.704452
Skewness	-1.09957	Kurtosis	1.186834
USS	45295.74	CSS	455.0759
CV	10.08189	Std Mean	0.032997
T:Mean=0	252.296	Pr>|T|	0.0001
Num ^= 0	647	Num > 0	647
M(Sign)	323.5	Pr>=|M|	0.0001
Sgn Rank	104814	Pr>=|S|	0.0001
W:Normal	0.912198	Pr<W	0.0001

Quantiles(Def=5)

100% Max	9.758462	99%	9.55393
75% Q3	8.930626	95%	9.35876
50% Med	8.490849	90%	9.220291
25% Q1	7.886081	10%	7.130899
0% Min	5.068904	5%	6.690842
		1%	5.762051
Range	4.689558		
Q3-Q1	1.044545		
Mode	7.565275		

Extremes

Lowest	ID	Highest	ID
5.068904(	4224)	9.595603(	14182)
5.159055(	13282)	9.642123(	13104)
5.288267(	13181)	9.661416(	4451)
5.332719(	13284)	9.692767(	13152)
5.616771(	13283)	9.758462(	4057)

```
   Histogram                                    #   Boxplot
9.7+**                                          4      |
   .*********                                  17      |
   .************************                   48      |
   .************************************       71      |
   .****************************************   80   +-----+
   .*********************************          66   |     |
   .**************************************     75   *-----*
   .*******************************            62   |  +  |
   .********************                       40   |     |
   .*********************                      41   +-----+
   .************                               23      |
   .***************                            29      |
   .************                               24      |
   .*********                                  18      |
   .******                                     12      |
   .****                                        8      |
   .***                                         5      |
   .***                                         6      0
   .**                                          4      0
   .****                                        7      0
   .**                                          3      0
   .
   .*                                           2      0
5.1+*                                           2      0
    ----+----+----+----+----+----+----+----+
    * may represent up to 2 counts
```

```
                 Normal Probability Plot
9.7+                                          ++        *
   |                                      +++    ******
   |                                    +*******
   |                                 *****
   |                             *****
   |                          ****+
   |                        ***++
   |                     ***++
   |                   ****++
   |                 ****++
   |               **+
   |             ***
   |           ***
   |         +**
   |      ++***
   |    ++ **
   |  ++  **
   |+++   **
   |    **
   |  ***
   | **
   |
   |*
5.1+*
    +----+----+----+----+----+----+----+----+----+----+
         -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Antimony

All Observations

Variable=LNVALUE

Moments

N	521	Sum Wgts	521
Mean	1.570576	Sum	818.2703
Std Dev	0.697507	Variance	0.486516
Skewness	0.009015	Kurtosis	-0.32481
USS	1538.145	CSS	252.9885
CV	44.4109	Std Mean	0.030558
T:Mean=0	51.39599	Pr>|T|	0.0001
Num ^= 0	521	Num > 0	518
M(Sign)	257.5	Pr>=|M|	0.0001
Sgn Rank	67772.5	Pr>=|S|	0.0001
W:Normal	0.908784	Pr<W	0.0001

Quantiles(Def=5)

100% Max	3.044522	99%	2.923162
75% Q3	2.028148	95%	2.580217
50% Med	1.526056	90%	2.564949
25% Q1	1.269761	10%	0.587787
0% Min	-0.94161	5%	0.530628
		1%	0.470004
Range	3.986131		
Q3-Q1	0.758388		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
-0.94161(	14184)	2.965273(	13030)
-0.94161(	14182)	2.970414(	13062)
-0.10536(	14183)	3.005683(	13021)
0.336472(	14043)	3.039749(	13005)
0.405465(	13318)	3.044522(	13152)

```
                 Histogram                     #      Boxplot
   3.1+*                                        3        |
      .**                                       7        |
   2.7+**                                       8        |
      .****************************           110        |
   2.3+*                                        2        |
      .*                                        2     +-----+
   1.9+*                                        3     |     |
      .**************                          55     |     |
   1.5+****************************************  156     *--+--*
      .***************                         59     +-----+
   1.1+**                                       7        |
      .*                                        2        |
   0.7+*************                           49        |
      .**************                          54        |
   0.3+*                                        1        |
      .
  -0.1+*                                        1        0
      .
  -0.5+
      .
  -0.9+*                                        2        0
       ----+----+----+----+----+----+----+----
       * may represent up to 4 counts
```

```
                    Normal Probability Plot
     3.1+                                                 +++ *
        |                                              +++*****
     2.7+                                           +++***
        |                                     ************
     2.3+                                     *  ++
        |                                     *++
     1.9+                                 ++**
        |                              ++****
     1.5+                          ********
        |                      *****+
     1.1+                      *++
        |                   +++*
     0.7+                 +*****
        | *************
     0.3+*       +++
        |   +++
    -0.1+*+++
        |
    -0.5+
        |
    -0.9+*
         +----+----+----+----+----+----+----+----+----+----+
             -2        -1         0        +1        +2
```

Detected Observations

Moments

N	30	Sum Wgts	30
Mean	1.753046	Sum	52.59137
Std Dev	0.747486	Variance	0.558735
Skewness	-0.03086	Kurtosis	0.344276
USS	108.3984	CSS	16.20331
CV	42.63926	Std Mean	0.136472
T:Mean=0	12.8455	Pr>|T|	0.0001
Num ^= 0	30	Num > 0	29
M(Sign)	14	Pr>=|M|	0.0001
Sgn Rank	231.5	Pr>=|S|	0.0001
W:Normal	0.930646	Pr<W	0.0594

Quantiles(Def=5)

100% Max	3.039749	99%	3.039749
75% Q3	2.028148	95%	3.005683
50% Med	1.667529	90%	2.941522
25% Q1	1.504077	10%	0.808703
0% Min	-0.10536	5%	0.693147
		1%	-0.10536
Range	3.14511		
Q3-Q1	0.524071		
Mode	1.609438		

Extremes

Lowest	ID	Highest	ID
-0.10536(	14183)	2.884801(	13080)
0.693147(	13225)	2.917771(	13022)
0.741937(	4515)	2.965273(	13030)
0.875469(	4520)	3.005683(	13021)
0.916291(	13251)	3.039749(	13005)

```
   Stem Leaf                    #          Boxplot
      3 000                     3             0
      2 799                     3             0
      2 00                      2          +-----+
      1 556666667778999        15          *--+--*
      1 33                      2             |
      0 7799                    4             0
      0
     -0 1                       1             *
        ----+----+----+----+
```

```
                    Normal Probability Plot
   3.25+                                              *+++*+++
       |                                       **+*+*++
       |                                 +++**+
       |                     ****+*********
       |                  +**++++
       |            *+*+*+*
       |    +++++++
  -0.25+++    *
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

-- DEPTH=Subsurface ANALYSIS=Arsenic --

All Observations

Variable=LNVALUE

Moments

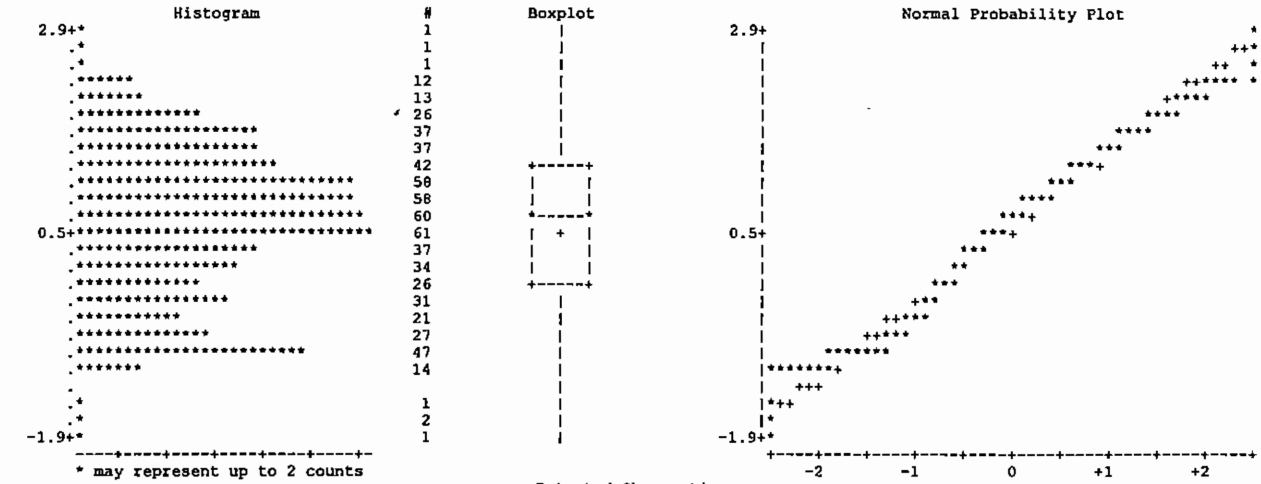
N	648	Sum Wgts	648
Mean	0.587741	Sum	380.8559
Std Dev	0.90165	Variance	0.812973
Skewness	-0.20324	Kurtosis	-0.68024
USS	749.8381	CSS	525.9937
CV	153.4096	Std Mean	0.03542
T:Mean=0	16.59339	Pr>|T|	0.0001
Num ^= 0	642	Num > 0	472
M(Sign)	151	Pr>=|M|	0.0001
Sgn Rank	64956.5	Pr>=|S|	0.0001
W:Normal	0.963564	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.928524	99%	2.397895
75% Q3	1.238269	95%	1.987874
50% Med	0.693147	90%	1.740466
25% Q1	-0.10536	10%	-0.80744
0% Min	-1.83258	5%	-0.93395
		1%	-1.1301
Range	4.761105		
Q3-Q1	1.34363		
Mode	0.262364		

Extremes

Lowest	ID	Highest	ID
-1.83258(	4502)	2.397895(	5020)
-1.66073(	4503)	2.397895(	13058)
-1.60944(	4414)	2.541602(	13249)
-1.42712(	4456)	2.70805(	5074)
-1.1301(	13283)	2.928524(	13002)



Detected Observations

Moments

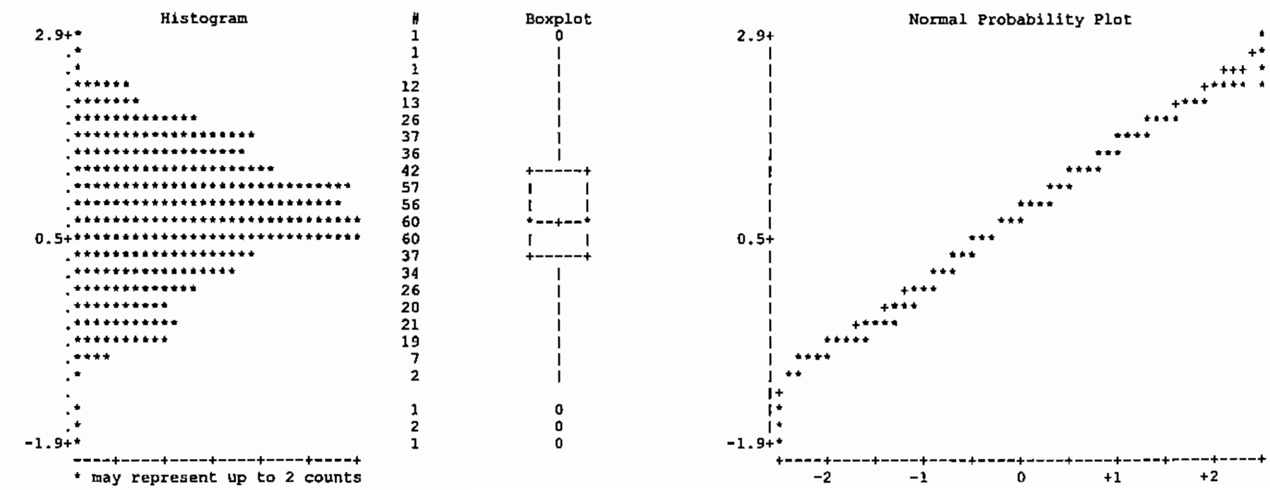
N	572	Sum Wgts	572
Mean	0.760649	Sum	435.0915
Std Dev	0.794518	Variance	0.631259
Skewness	-0.24003	Kurtosis	-0.16945
USS	691.401	CSS	360.4489
CV	104.4526	Std Mean	0.03322
T:Mean=0	22.89701	Pr>|T|	0.0001
Num ^= 0	566	Num > 0	467
M(Sign)	184	Pr>=|M|	0.0001
Sgn Rank	65579.5	Pr>=|S|	0.0001
W:Normal	0.980788	Pr<W	0.0726

Quantiles(Def=5)

100% Max	2.928524	99%	2.397895
75% Q3	1.280934	95%	1.987874
50% Med	0.788457	90%	1.774952
25% Q1	0.262364	10%	-0.35667
0% Min	-1.83258	5%	-0.65393
		1%	-1.04982
Range	4.761105		
Q3-Q1	1.01857		
Mode	0.262364		

Extremes

Lowest	ID	Highest	ID
-1.83258(	4502)	2.397895(	5020)
-1.66073(	4503)	2.397895(	13058)
-1.60944(	4414)	2.541602(	13249)
-1.42712(	4456)	2.70805(	5074)
-1.10866(	4410)	2.928524(	13002)



-- DEPTH=Subsurface ANALYSIS=Barium --

All Observations

Variable=LNVALUE

Moments

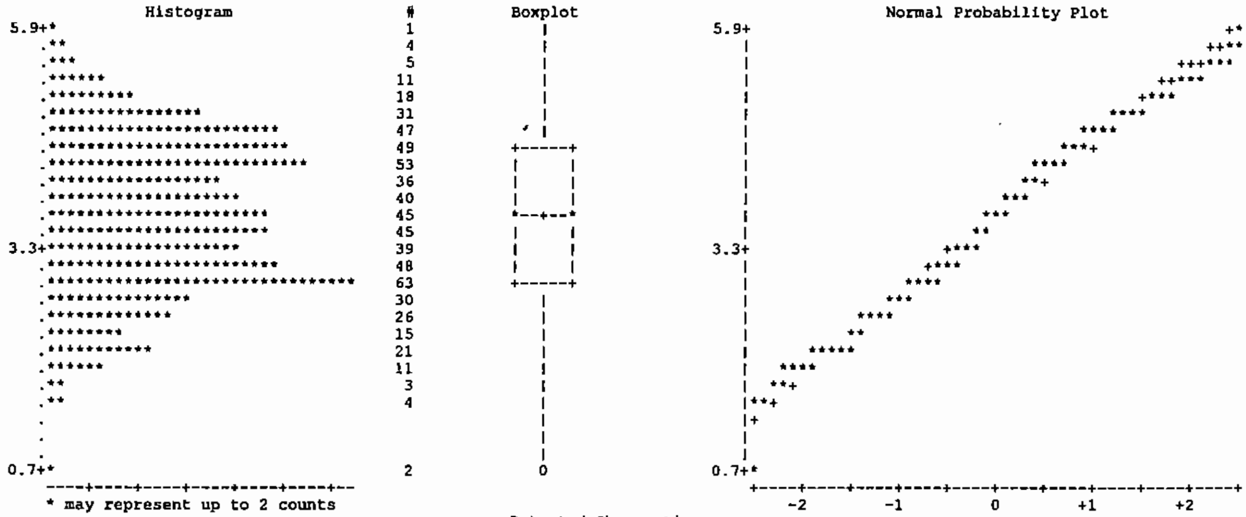
N	647	Sum Wgts	647
Mean	3.66609	Sum	2371.96
Std Dev	0.919607	Variance	0.845676
Skewness	-0.1473	Kurtosis	-0.55774
USS	9242.124	CSS	546.307
CV	25.08413	Std Mean	0.036153
T:Mean=0	101.4035	Pr>|T|	0.0001
Num ^= 0	647	Num > 0	647
M(Sign)	323.5	Pr>=|M|	0.0001
Sgn Rank	104814	Pr>=|S|	0.0001
W:Normal	0.972877	Pr<W	0.0001

Quantiles(Def=5)

100% Max	5.831882	99%	5.517453
75% Q3	4.418841	95%	5.056246
50% Med	3.663562	90%	4.836282
25% Q1	2.949688	10%	2.484907
0% Min	0.693147	5%	2.104134
		1%	1.648659
Range	5.138735		
Q3-Q1	1.469152		
Mode	2.833213		

Extremes

Lowest	ID	Highest	ID
0.693147(	13284)	5.659482(	13104)
0.788457(	13039)	5.666427(	13269)
1.410987(	13237)	5.7301(	4374)
1.458615(	4517)	5.786897(	14031)
1.504077(	13282)	5.831882(	4401)



Detected Observations

Moments

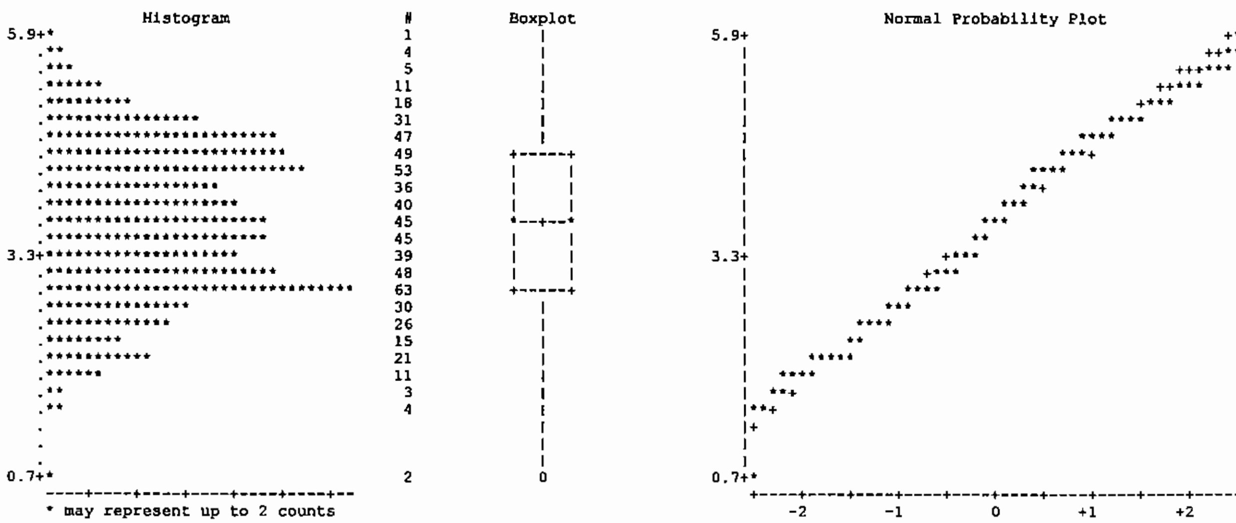
N	647	Sum Wgts	647
Mean	3.66609	Sum	2371.96
Std Dev	0.919607	Variance	0.845676
Skewness	-0.1473	Kurtosis	-0.55774
USS	9242.124	CSS	546.307
CV	25.08413	Std Mean	0.036153
T:Mean=0	101.4035	Pr>|T|	0.0001
Num ^= 0	647	Num > 0	647
M(Sign)	323.5	Pr>=|M|	0.0001
Sgn Rank	104814	Pr>=|S|	0.0001
W:Normal	0.972877	Pr<W	0.0001

Quantiles(Def=5)

100% Max	5.831882	99%	5.517453
75% Q3	4.418841	95%	5.056246
50% Med	3.663562	90%	4.836282
25% Q1	2.949688	10%	2.484907
0% Min	0.693147	5%	2.104134
		1%	1.648659
Range	5.138735		
Q3-Q1	1.469152		
Mode	2.833213		

Extremes

Lowest	ID	Highest	ID
0.693147(	13284)	5.659482(	13104)
0.788457(	13039)	5.666427(	13269)
1.410987(	13237)	5.7301(	4374)
1.458615(	4517)	5.786897(	14031)
1.504077(	13282)	5.831882(	4401)



```
---------------------------------------------- DEPTH=Subsurface ANALYSIS=Beryllium ----------------------------------------------

                                              All Observations
Variable=LNVALUE

                Moments                                  Quantiles(Def=5)                                  Extremes

 N               645  Sum Wgts        645     100% Max  0.955511      99%  0.470004       Lowest    ID     Highest     ID
 Mean        -0.6945  Sum         -447.95      75% Q3  -0.37106       95%   0.09531    -5.29832(   4187) 0.530628(  13249)
 Std Dev    0.625413  Variance   0.391141      50% Med -0.65393       90%  -0.04082    -5.29832(   4185) 0.587787(  13248)
 Skewness   -2.30054  Kurtosis   12.48605      25% Q1    -0.8916      10%  -1.30933    -4.19971(   4183) 0.641854(   4065)
 USS        562.9941  CSS        251.8948       0% Min  -5.29832       5%  -1.60445    -3.54046(  13037) 0.788457(  13152)
 CV         -90.0527  Std Mean   0.024626                              1%  -3.44202    -3.50656(  13038) 0.955511(   4274)
 T:Mean=0   -28.2022  Pr>|T|       0.0001     Range     6.253829
 Num ^= 0        634  Num > 0          45     Q3-Q1     0.520534
 M(Sign)        -272  Pr>=|M|      0.0001     Mode      -0.69315
 Sgn Rank   -95690.5  Pr>=|S|      0.0001
 W:Normal   0.853491  Pr<W         0.0001

                   Histogram                       #   Boxplot                 Normal Probability Plot
  0.75+*                                           6      0         0.75+                                              ++++**
      .********                                   50      0             |                                       ++**********
      .************************                  165   +-----+          |                               **********
      .*******************************************299   *--+--*          |                   ***************
      .*************                              86      |             |           *******++++
      .***                                        20      0             |     +*****+++
 -2.25+**                                          8      0        -2.25+++++***
      .*                                           4      *             |  ***
      .*                                           2      *             | **
      .*                                           2      *             |**
      .*                                           1      *             |*
      .                                                                 |
 -5.25+*                                           2      *        -5.25+*
       ----+----+----+----+----+----+----+----+---                        +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 7 counts                                          -2        -1         0        +1        +2
                                              Detected Observations

                Moments                                  Quantiles(Def=5)                                  Extremes

 N               573  Sum Wgts        573     100% Max  0.955511      99%  0.530628       Lowest    ID     Highest     ID
 Mean       -0.63538  Sum        -364.073      75% Q3  -0.35667       95%  0.182322    -4.19971(   4183) 0.530628(  13249)
 Std Dev     0.53129  Variance    0.28227      50% Med -0.61619       90%   -0.0202    -2.95651(  13087) 0.587787(  13248)
 Skewness   -1.11517  Kurtosis   5.328671      25% Q1    -0.8916      10%  -1.23787    -2.90042(   4172) 0.641854(   4065)
 USS        392.7836  CSS        161.4582       0% Min  -4.19971       5%  -1.46968    -2.84731(   4517) 0.788457(  13152)
 CV         -83.6176  Std Mean   0.022195                              1%  -2.43042    -2.64508(   4181) 0.955511(   4274)
 T:Mean=0   -28.6273  Pr>|T|       0.0001     Range     5.155217
 Num ^= 0        562  Num > 0          44     Q3-Q1     0.534923
 M(Sign)        -237  Pr>=|M|      0.0001     Mode      -0.51083
 Sgn Rank   -74356.5  Pr>=|S|      0.0001
 W:Normal   0.945885  Pr<W         0.0001

                   Histogram                       #   Boxplot                 Normal Probability Plot
   0.9+*                                           1      0          0.9+                                                    *
      .*                                           2      0             |                                                   +*
      .****                                       10      0             |                                              **** *
      .****                                       12      |             |                                          +****
      .**********                                 30      |             |                                      +******
  -0.1+*************                              38      |         -0.1+                                  +*****
      .***********************                    67   +-----+          |                              +******
      .******************************************124   |     |          |                         *******
      .****************************************  120   *--+--*          |                    ******
      .***********************                    68   +-----+          |                *****+
  -1.1+***********                                33      |         -1.1+            ****++
      .************                               34      |             |        *****+
      .*****                                      15      |             |      ***+
      .**                                          5      0             |   +**
      .*                                           2      0             |++++ *
  -2.1+*                                           2      0         -2.1+    **
      .**                                          4      0             |  ***
      .*                                           1      0             |  *
      .*                                           1      *             | *
      .*                                           3      *             |*
  -3.1+                                                             -3.1+
      .                                                                 |
      .                                                                 |
      .                                                                 |
      .                                                                 |
  -4.1+*                                           1      *         -4.1+*
       ----+----+----+----+----+----+----+----+--                        +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 3 counts                                          -2        -1         0        +1        +2
```

--- DEPTH=Subsurface ANALYSIS=Cadmium ---

All Observations

Variable=LNVALUE

```
              Moments                                   Quantiles(Def=5)                                  Extremes

N               642  Sum Wgts       642     100% Max   1.722767      99%  1.193922        Lowest     ID      Highest     ID
Mean       -0.25578  Sum       -164.212      75% Q3   -0.09431       95%  0.693147      -2.04022(   4454) 1.308333(  13044)
Std Dev    0.541557  Variance  0.293284      50% Med  -0.23572       90%  0.336472      -1.77196(   4247) 1.386294(  13152)
Skewness   -0.24585  Kurtosis  1.962078      25% Q1   -0.35667       10% -0.91629       -1.77196(   4246) 1.458615(  13059)
USS        229.9977  CSS        187.995       0% Min  -2.04022        5% -1.51413        -1.7148(   4414) 1.458615(  13111)
CV         -211.726  Std Mean  0.021374                               1% -1.66073        -1.7148(   4245) 1.722767(  13023)
T:Mean=0   -11.9672  Pr>|T|      0.0001     Range      3.762987
Num ^= 0        637  Num > 0        104     Q3-Q1      0.262364
M(Sign)      -214.5  Pr>=|M|     0.0001     Mode       -0.35667
Sgn Rank     -59981  Pr>=|S|     0.0001
W:Normal   0.890874  Pr<W        0.0001
```

```
             Histogram                                   #     Boxplot                       Normal Probability Plot
   1.7+*                                                 1        *          1.7+                                                  *
      .*                                                 2        *             |                                                  *
      .*                                                 3        *             |                                                 **
      .**                                                7        *             |                                              ****+
      .**                                               10        *             |                                          ***+++
      .****                                             19        0             |                                       ****+
      .****                                             22        0             |                                     ***
      .****                                             20        0             |                                  ++***
      .*****                                            25        |             |                              ++++ **
      .*************************                       155     +-----+          |                           *********
      .****************************************        243     *--+--*          |                  ***********
      .********                                         43        |             |              **** ++++
      .****                                             21        0             |             **++++
      .***                                              13        0             |            **+
      .**                                                9        0             |         +++*
      .**                                               10        *             |     ++++ **
      .****                                             20        *             | +++  ****
      .***                                              18        *             |*******
      .                                                                         |
  -2.1+*                                                 1        *         -2.1+*
       ----+----+----+----+----+----+----+----+--                                +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 6 counts                                                 -2        -1         0        +1        +2
```

Detected Observations

```
              Moments                                   Quantiles(Def=5)                                  Extremes

N               196  Sum Wgts       196     100% Max   1.722767      99%  1.458615        Lowest     ID      Highest     ID
Mean       -0.03318  Sum        -6.5039      75% Q3    0.530628      95%  1.064711      -1.51413(   4465) 1.252763(   4386)
Std Dev    0.712809  Variance  0.508096      50% Med          0      90%  0.832909      -1.42712(   4505) 1.308333(  13044)
Skewness    -0.0939  Kurtosis  -0.80321      25% Q1   -0.61619       10% -1.04982       -1.38629(   4504) 1.458615(  13059)
USS        99.29454  CSS       99.07872       0% Min  -1.51413        5% -1.23787       -1.38629(   4466) 1.458615(  13111)
CV          -2148.1  Std Mean  0.050915                               1% -1.42712       -1.34707(   4172) 1.722767(  13023)
T:Mean=0   -0.65174  Pr>|T|      0.5153     Range      3.236894
Num ^= 0        193  Num > 0         97     Q3-Q1      1.146814
M(Sign)         0.5  Pr>=|M|     1.0000     Mode        0.09531
Sgn Rank       -381  Pr>=|S|     0.6251
W:Normal   0.961586  Pr<W        0.0007
```

```
    Stem Leaf                       #          Boxplot                       Normal Probability Plot
      16 2                          1             |            1.7+                                                   ++*
      14 66                         2             |               |                                                ++* *
      12 51                         2             |               |                                             ++**
      10 6660009                    7             |               |                                          +****
       8 333382666                  9             |               |                                       +***
       6 4444499999994444999       19             |               |                                   *****
       4 1117777773333333999999    22          +-----+            |                                ****
       2 666666666444444444        18          |     |            |                             ****+
       0 00000000000000888888      20          *-----*         0.1+                           ***+
      -0 6321998776666555432       19          |  +  |            |                        ****
      -2 97649774110               11          |     |            |                      +**
      -4 886664443365533           15          |     |            |                    +***
      -6 88197775533222            14          +-----+            |                  +***
      -8 9944222297442000          16             |               |               +****
     -10 441855555                  9             |               |            +***
     -12 9955117400                10             |               |     ***+***
     -14 13                         2             |          -1.5+**  ++
         ----+----+----+----+--                                   +----+----+----+----+----+----+----+----+----+----+
    Multiply Stem.Leaf by 10**-1                                        -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Calcium

All Observations

Variable=LNVALUE

Moments

N	648	Sum Wgts	648
Mean	6.817766	Sum	4417.913
Std Dev	1.080219	Variance	1.166872
Skewness	0.688252	Kurtosis	6.207195
USS	30875.26	CSS	754.9663
CV	15.84417	Std Mean	0.042435
T:Mean=0	160.6638	Pr>|T|	0.0001
Num ^= 0	648	Num > 0	648
M(Sign)	324	Pr>=|M|	0.0001
Sgn Rank	105138	Pr>=|S|	0.0001
W:Normal	0.905793	Pr<W	0.0001

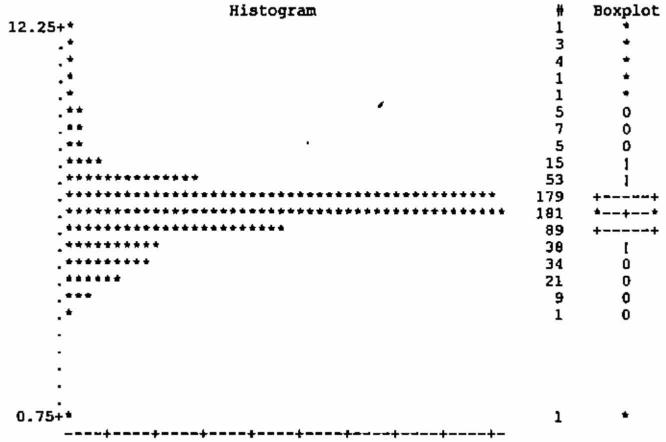
Quantiles(Def=5)

100% Max	12.37159	99%	11.2734
75% Q3	7.26543	95%	8.185907
50% Med	6.865368	90%	7.696213
25% Q1	6.386879	10%	5.459586
0% Min	0.542324	5%	5.003946
		1%	4.282206
Range	11.82926		
Q3-Q1	0.87855		
Mode	7.222566		

Extremes

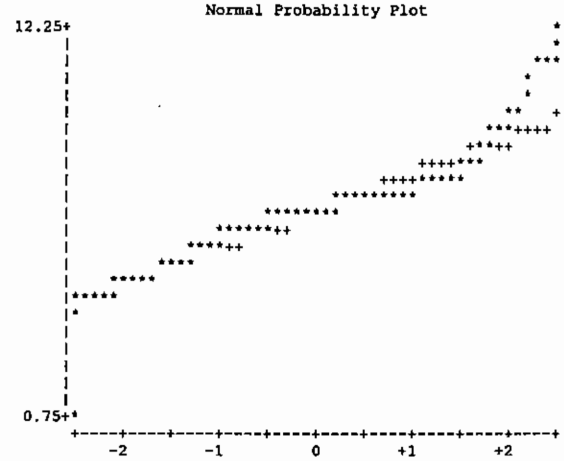
Lowest	ID	Highest	ID
0.542324(	13333)	11.47522(	14018)
3.76584(	13284)	11.63514(	14184)
4.094345(	13238)	11.69525(	5001)
4.189655(	4315)	11.87757(	5077)
4.222445(	13283)	12.37159(	5071)

Histogram, # , Boxplot



* may represent up to 4 counts

Normal Probability Plot



Detected Observations

Moments

N	645	Sum Wgts	645
Mean	6.822058	Sum	4400.227
Std Dev	1.079827	Variance	1.166026
Skewness	0.689066	Kurtosis	6.237515
USS	30769.52	CSS	750.9207
CV	15.82846	Std Mean	0.042518
T:Mean=0	160.4505	Pr>|T|	0.0001
Num ^= 0	645	Num > 0	645
M(Sign)	322.5	Pr>=|M|	0.0001
Sgn Rank	104167.5	Pr>=|S|	0.0001
W:Normal	0.90528	Pr<W	0.0001

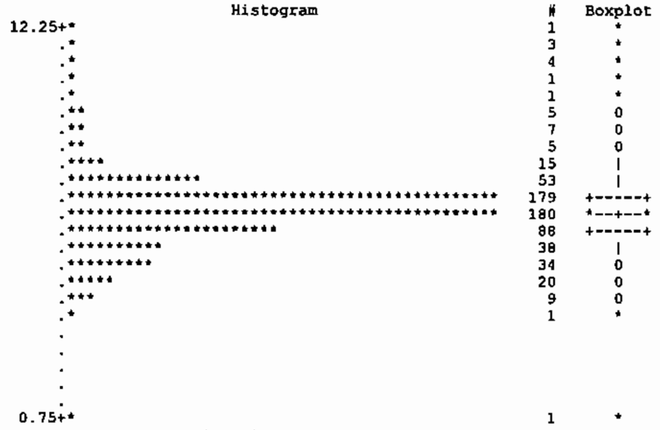
Quantiles(Def=5)

100% Max	12.37159	99%	11.2734
75% Q3	7.26543	95%	8.185907
50% Med	6.869014	90%	7.696213
25% Q1	6.391917	10%	5.493061
0% Min	0.542324	5%	5.003946
		1%	4.282206
Range	11.82926		
Q3-Q1	0.873513		
Mode	7.222566		

Extremes

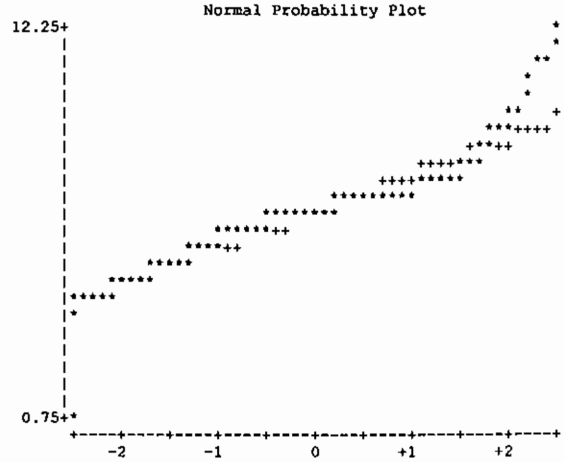
Lowest	ID	Highest	ID
0.542324(	13333)	11.47522(	14018)
3.76584(	13284)	11.63514(	14184)
4.094345(	13238)	11.69525(	5001)
4.189655(	4315)	11.87757(	5077)
4.222445(	13283)	12.37159(	5071)

Histogram, # , Boxplot



* may represent up to 4 counts

Normal Probability Plot



```
------------------------------------------------ DEPTH=Subsurface ANALYSIS=Chromium ------------------------------------------------

                                                        All Observations
Variable=LNVALUE

                 Moments                                      Quantiles(Def=5)                                   Extremes

N               647  Sum Wgts        647       100% Max  4.718499       99%  4.347694          Lowest     ID     Highest     ID
Mean         2.1584  Sum        1396.484        75% Q3   2.785011       95%  3.637586        -0.72567(  13143) 4.416428(  13063)
Std Dev    1.056978  Variance   1.117202        50% Med  2.397895       90%  3.218876        -0.70928(  13311) 4.477337(   4445)
Skewness   -0.79636  Kurtosis   0.698608        25% Q1   1.648659       10%  0.693147        -0.67727(  13125)  4.49981(   4348)
USS        3735.884  CSS        721.7127         0% Min  -0.72567        5%   -0.3285        -0.67334(  13186) 4.634729(   4404)
CV         48.97045  Std Mean   0.041554                                 1%  -0.62736        -0.63299(  13213) 4.718499(   4144)
T:Mean=0   51.94193  Pr>|T|       0.0001       Range      5.444169
Num ^= 0        647  Num > 0         602       Q3-Q1      1.136353
M(Sign)       278.5  Pr>=|M|      0.0001       Mode        2.70805
Sgn Rank     103344  Pr>=|S|      0.0001
W:Normal   0.926697  Pr<W         0.0001

                   Histogram                            #     Boxplot                            Normal Probability Plot
   4.75+*                                               2        0             4.75+                                                ++*
       .****                                           13        0                 |                                            ++******
       .*******                                        26        |                 |                                       ++*******
       .*****************                              66        |                 |                                  ++******
       .*******************************************   169     +-----+              |                            *********
       .************************************          141     *--+--*              |                      *******+
       .************************                       93     +-----+              |                  *****++
       .***************                                60        |                 |              *****+
       .******                                         21        |                 |           +***+
       .***                                            11        |                 |      +++++**
       .*******                                        28        0                 |+++++ *****
  -0.75+*****                                          17        0            -0.75+*******
        ----+----+----+----+----+----+----+----+---                                 +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                   -2        -1         0        +1        +2

                                                        Detected Observations

                 Moments                                      Quantiles(Def=5)                                   Extremes

N               614  Sum Wgts        614       100% Max  4.718499       99%  4.347694          Lowest     ID     Highest     ID
Mean       2.299327  Sum        1411.787        75% Q3   2.833213       95%  3.713572        -0.70928(  13311) 4.416428(  13063)
Std Dev    0.885355  Variance   0.783853        50% Med  2.411429       90%  3.258097        -0.47642(  13265) 4.477337(   4445)
Skewness   -0.47391  Kurtosis   0.721184        25% Q1   1.808289       10%  1.163151         -0.3285(  13233)  4.49981(   4348)
USS        3726.661  CSS        480.5018         0% Min  -0.70928        5%  0.641854        -0.31471(  13198) 4.634729(   4404)
CV         38.50495  Std Mean    0.03573                                 1%  -0.23572        -0.28768(  13288) 4.718499(   4144)
T:Mean=0   64.35283  Pr>|T|       0.0001       Range      5.427775
Num ^= 0        614  Num > 0         601       Q3-Q1      1.024925
M(Sign)         294  Pr>=|M|      0.0001       Mode        2.70805
Sgn Rank    94244.5  Pr>=|S|      0.0001
W:Normal   0.966511  Pr<W         0.0001

                   Histogram                            #     Boxplot                            Normal Probability Plot
   4.75+*                                               2        0             4.75+                                                  *
       .****                                           13        0                 |                                              ******
       .*******                                        26        |                 |                                         +******
       .*****************                              66        |                 |                                   +*******
       .*******************************************   169     +-----+              |                            *********
       .************************************          141     *--+--*              |                     *******+
       .************************                       93     +-----+              |                 ******+
       .***************                                60        |                 |            ******
       .*****                                          20        |                 |       +++***
       .***                                            11        0                 |+++++***
       .***                                            12        0                 |******
  -0.75+*                                               1        0            -0.75+*
        ----+----+----+----+----+----+----+----+---                                 +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 4 counts                                                   -2        -1         0        +1        +2
```

-- DEPTH=Subsurface ANALYSIS=Cobalt --

All Observations

Variable=LNVALUE

Moments

N	630	Sum Wgts	630
Mean	1.411636	Sum	889.3306
Std Dev	0.694022	Variance	0.481666
Skewness	-0.37819	Kurtosis	-0.16985
USS	1558.379	CSS	302.9679
CV	49.16435	Std Mean	0.02765
T:Mean=0	51.05285	Pr>|T|	0.0001
Num ^= 0	629	Num > 0	611
M(Sign)	296.5	Pr>=|M|	0.0001
Sgn Rank	98403.5	Pr>=|S|	0.0001
W:Normal	0.96405	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.772589	99%	2.772589
75% Q3	1.88707	95%	2.517696
50% Med	1.481605	90%	2.302585
25% Q1	0.993252	10%	0.405465
0% Min	-0.54473	5%	0.262364
		1%	-0.31471
Range	3.317316		
Q3-Q1	0.893818		
Mode	0.262364		

Extremes

Lowest	ID	Highest	ID
-0.54473(	4517)	2.772589(	4329)
-0.54473(	4515)	2.772589(	13070)
-0.52763(	4516)	2.772589(	13290)
-0.40048(	4415)	2.772589(	14022)
-0.40048(	4173)	2.772589(	14184)

```
                   Histogram                              #     Boxplot
  2.7+************                                        23       |
     .**********                                          20       |
     .*****************                                   34       |
     .**************************                          51       |
     .***************************                         54    +-----+
     .******************************************          83    |     |
     .****************************************            80    *--+--*
     .*************************************               74    |     |
  1.1+**************************                          52    |     |
     .********************                                39    +-----+
     .**************                                      27       |
     .****************                                    31       |
     .****************                                    31       |
     .*******                                             13       |
     .**                                                   3       |
     .*****                                               10       |
 -0.5+***                                                  5       0
      ----+----+----+----+----+----+----+----+--
      * may represent up to 2 counts
```

```
                      Normal Probability Plot
  2.7+                                                ********
     |                                             ****
     |                                          ****
     |                                      *****
     |                                    ***
     |                                ****
     |                             ****
     |                          ****
  1.1+                      ****
     |                    ***+
     |                  +**
     |               +***
     |            +****
     |         +***
     |  +++**
     |+*****
 -0.5+*
      +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

Detected Observations

Moments

N	546	Sum Wgts	546
Mean	1.517275	Sum	828.4319
Std Dev	0.622615	Variance	0.387649
Skewness	-0.22866	Kurtosis	-0.24242
USS	1468.227	CSS	211.2686
CV	41.03506	Std Mean	0.026645
T:Mean=0	56.94312	Pr>|T|	0.0001
Num ^= 0	546	Num > 0	541
M(Sign)	268	Pr>=|M|	0.0001
Sgn Rank	74628.5	Pr>=|S|	0.0001
W:Normal	0.972113	Pr<W	0.0001

Quantiles(Def=5)

100% Max	2.772589	99%	2.772589
75% Q3	1.94591	95%	2.564949
50% Med	1.568616	90%	2.332144
25% Q1	1.098612	10%	0.641854
0% Min	-0.3285	5%	0.405465
		1%	0.09531
Range	3.101093		
Q3-Q1	0.847298		
Mode	0.955511		

Extremes

Lowest	ID	Highest	ID
-0.3285(	4361)	2.772589(	4329)
-0.26136(	13237)	2.772589(	13070)
-0.23572(	13164)	2.772589(	13290)
-0.21072(	4414)	2.772589(	14022)
-0.06188(	4514)	2.772589(	14184)

```
                   Histogram                              #     Boxplot
  2.7+************                                        23       |
     .**********                                          19       |
     .*****************                                   33       |
  2.1+*************************                           49       |
     .**************************                          52    +-----+
     .****************************************            80    |     |
  1.5+***************************************             77    *--+--*
     .*************************                           50    |     |
     .*************************                           49    +-----+
  0.9+********************                                39       |
     .*************                                       25       |
     .**************                                      28       |
  0.3+*******                                             13       |
     .**                                                   4       |
     .*                                                    1       |
 -0.3+**                                                   4       0
      ----+----+----+----+----+----+----+----+
      * may represent up to 2 counts
```

```
                      Normal Probability Plot
  2.7+                                                ******* *
     |                                             ****
     |                                          ****
  2.1+                                       ****
     |                                    ***
     |                                *****
  1.5+                            *****
     |                          ***+
     |                       ****
  0.9+                   ****
     |                +***
     |             *****
  0.3+     ****
     | +***
     |+*
 -0.3+*
      +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Copper

All Observations

Variable=LNVALUE

Moments

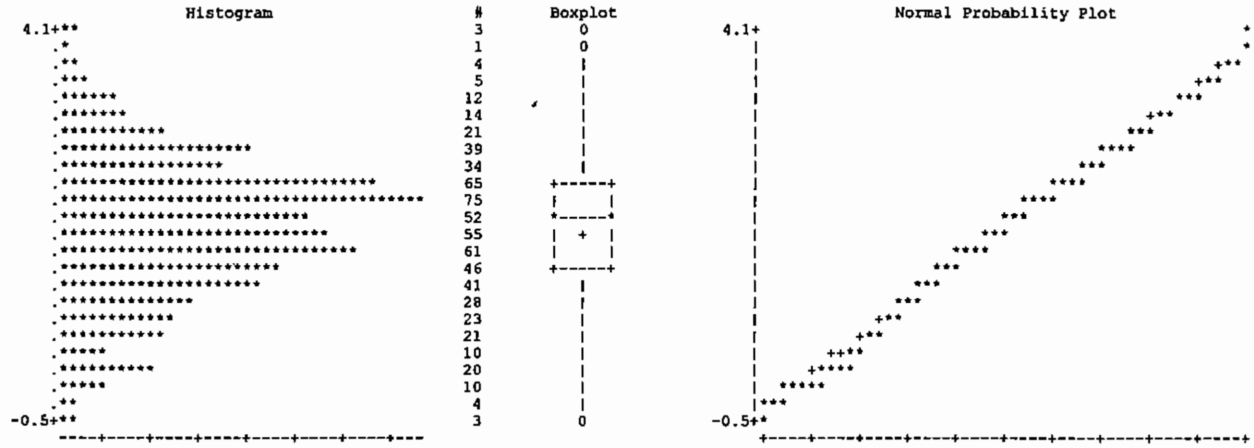
N	647	Sum Wgts	647
Mean	1.752763	Sum	1134.038
Std Dev	0.847819	Variance	0.718796
Skewness	-0.1678	Kurtosis	-0.13727
USS	2452.043	CSS	464.3425
CV	48.37039	Std Mean	0.033331
T:Mean=0	52.58629	Pr>|T|	0.0001
Num ^= 0	645	Num > 0	628
M(Sign)	305.5	Pr>=|M|	0.0001
Sgn Rank	103798.5	Pr>=|S|	0.0001
W:Normal	0.976915	Pr<W	0.0014

Quantiles(Def=5)

100% Max	4.119037	99%	3.681351
75% Q3	2.302585	95%	3.091042
50% Med	1.824549	90%	2.772589
25% Q1	1.223775	10%	0.530628
0% Min	-0.44629	5%	0.182322
		1%	-0.20089
Range	4.565324		
Q3-Q1	1.07881		
Mode	2.397895		

Extremes

Lowest	ID	Highest	ID
-0.44629(	13333)	3.7612(	4318)
-0.43078(	13332)	3.953165(	13036)
-0.43078(	13331)	4.010963(	13009)
-0.30111(	13131)	4.09601(	13149)
-0.28236(	13264)	4.119037(	13041)



* may represent up to 2 counts

Detected Observations

Moments

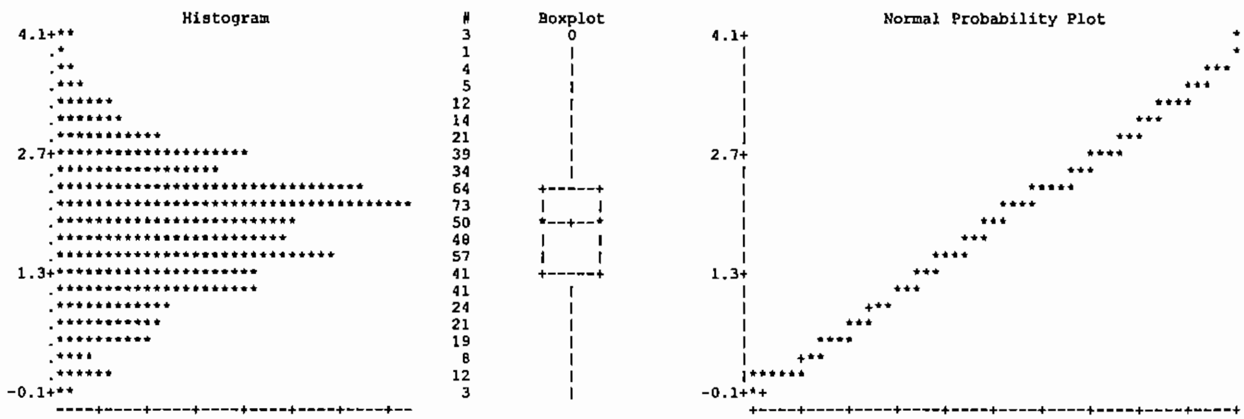
N	594	Sum Wgts	594
Mean	1.842492	Sum	1094.44
Std Dev	0.78967	Variance	0.623578
Skewness	-0.02863	Kurtosis	-0.1837
USS	2386.28	CSS	369.782
CV	42.85879	Std Mean	0.032401
T:Mean=0	56.86608	Pr>|T|	0.0001
Num ^= 0	592	Num > 0	589
M(Sign)	293	Pr>=|M|	0.0001
Sgn Rank	87758	Pr>=|S|	0.0001
W:Normal	0.979009	Pr<W	0.0182

Quantiles(Def=5)

100% Max	4.119037	99%	3.758872
75% Q3	2.397895	95%	3.161247
50% Med	1.902108	90%	2.80336
25% Q1	1.335001	10%	0.788457
0% Min	-0.08338	5%	0.405465
		1%	0.09531
Range	4.202419		
Q3-Q1	1.062894		
Mode	2.397895		

Extremes

Lowest	ID	Highest	ID
-0.08338(	13263)	3.7612(	4318)
-0.04082(	13203)	3.953165(	13036)
-0.03046(	13339)	4.010963(	13009)
0(	13311)	4.09601(	13149)
0(	13294)	4.119037(	13041)



* may represent up to 2 counts

-- DEPTH=Subsurface ANALYSIS=Iron --

All Observations

Variable=LNVALUE

Moments

N	648	Sum Wgts	648
Mean	9.263267	Sum	6002.597
Std Dev	0.670373	Variance	0.449399
Skewness	-0.98434	Kurtosis	1.572437
USS	55894.42	CSS	290.7614
CV	7.236892	Std Mean	0.026335
T:Mean=0	351.7511	Pr>|T|	0.0001
Num ^= 0	648	Num > 0	648
M(Sign)	324	Pr>=|M|	0.0001
Sgn Rank	105138	Pr>=|S|	0.0001
W:Normal	0.940947	Pr<W	0.0001

Quantiles(Def=5)

100% Max	10.76638	99%	10.45737
75% Q3	9.729134	95%	10.16585
50% Med	9.384294	90%	9.985068
25% Q1	8.941802	10%	8.354674
0% Min	6.300786	5%	7.98956
		1%	7.299797
Range	4.465592		
Q3-Q1	0.787332		
Mode	9.441452		

Extremes

Lowest	ID	Highest	ID
6.300786(	13108)	10.4857(	13189)
6.516193(	13234)	10.52675(	4274)
6.523562(	13214)	10.57643(	4372)
6.58755(	13191)	10.65254(	4508)
6.891626(	13036)	10.76638(	13059)

```
          Histogram                          #         Boxplot
 10.7+*                                      2            |
     .****                                   10           |
     .******                                 18           |
     .***********                            31           |
     .**********************                 64           |
     .********************************       95        +-----+
     .*********************************      97        |     |
     .******************************         89        *--+--*
     .********************                   60        |     |
     .***************                        45        +-----+
     .************                           34           |
  8.5+************                           34           |
     .*******                                19           |
     .******                                 17           |
     .******                                 16           |
     .**                                     4            0
     .**                                     5            0
     .*                                      2            0
     .*                                      1            0
     .*                                      1            0
     .
     .*                                      3            0
  6.3+*                                      1            *
      ----+----+----+----+----+----+---
      * may represent up to 3 counts
```

```
                     Normal Probability Plot
 10.7+                                                  +++  *
     |                                               +++ *****
     |                                            +++*****
     |                                         ++******
     |                                       *****
     |                                  ******
     |                              *****+
     |                           *****++
     |                        *****++
     |                      *****++
     |                    ****+
  8.5+                 ***
     |              +***
     |           ++***
     |        ++*****
     | +++ **
     |+  **
     |  *
     | *
     |*
     |
     |*
  6.3+*
      +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

Detected Observations

Moments

N	648	Sum Wgts	648
Mean	9.263267	Sum	6002.597
Std Dev	0.670373	Variance	0.449399
Skewness	-0.98434	Kurtosis	1.572437
USS	55894.42	CSS	290.7614
CV	7.236892	Std Mean	0.026335
T:Mean=0	351.7511	Pr>|T|	0.0001
Num ^= 0	648	Num > 0	648
M(Sign)	324	Pr>=|M|	0.0001
Sgn Rank	105138	Pr>=|S|	0.0001
W:Normal	0.940947	Pr<W	0.0001

Quantiles(Def=5)

100% Max	10.76638	99%	10.45737
75% Q3	9.729134	95%	10.16585
50% Med	9.384294	90%	9.985068
25% Q1	8.941802	10%	8.354674
0% Min	6.300786	5%	7.98956
		1%	7.299797
Range	4.465592		
Q3-Q1	0.787332		
Mode	9.441452		

Extremes

Lowest	ID	Highest	ID
6.300786(	13108)	10.4857(	13189)
6.516193(	13234)	10.52675(	4274)
6.523562(	13214)	10.57643(	4372)
6.58755(	13191)	10.65254(	4508)
6.891626(	13036)	10.76638(	13059)

```
          Histogram                          #         Boxplot
 10.7+*                                      2            |
     .****                                   10           |
     .******                                 18           |
     .***********                            31           |
     .**********************                 64           |
     .********************************       95        +-----+
     .*********************************      97        |     |
     .******************************         89        *--+--*
     .********************                   60        |     |
     .***************                        45        +-----+
     .************                           34           |
  8.5+************                           34           |
     .*******                                19           |
     .******                                 17           |
     .******                                 16           |
     .**                                     4            0
     .**                                     5            0
     .*                                      2            0
     .*                                      1            0
     .*                                      1            0
     .
     .*                                      3            0
  6.3+*                                      1            *
      ----+----+----+----+----+----+---
      * may represent up to 3 counts
```

```
                     Normal Probability Plot
 10.7+                                                  +++  *
     |                                               +++ *****
     |                                            +++*****
     |                                         ++******
     |                                       *****
     |                                  ******
     |                              *****+
     |                           *****++
     |                        *****++
     |                      *****++
     |                    ****+
  8.5+                 ***
     |              +***
     |           ++***
     |        ++*****
     | +++ **
     |+  **
     |  *
     | *
     |*
     |
     |*
  6.3+*
      +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Subsurface ANALYSIS=Lead ------------------------------------------------

                                                          All Observations
Variable=LNVALUE

                  Moments                                         Quantiles(Def=5)                                        Extremes

N                 647  Sum Wgts        647      100% Max  4.779123       99%  3.912023        Lowest     ID     Highest    ID
Mean          1.81502  Sum        1174.318       75% Q3   2.302585       95%  3.015535      -0.72567(  13283) 4.135167(  13107)
Std Dev      0.833149  Variance   0.694137       50% Med  1.931521       90%  2.701361      -0.56037(  13229) 4.180522(  13226)
Skewness     -0.27054  Kurtosis   0.733639       25% Q1   1.410987       10%  0.587787      -0.55165(  13284) 4.254193(  13149)
USS          2579.824  CSS        448.4127        0% Min  -0.72567        5%  0.336472      -0.41552(  13280) 4.430817(   5077)
CV           45.90301  Std Mean   0.032754                                1%  -0.34249      -0.40048(  13282) 4.779123(  14183)
T:Mean=0     55.41291  Pr>|T|       0.0001      Range     5.504794
Num ^= 0          642  Num > 0         626      Q3-Q1     0.891598
M(Sign)           305  Pr>=|M|      0.0001      Mode      2.302585
Sgn Rank     102795.5  Pr>=|S|      0.0001
W:Normal     0.964527  Pr<W         0.0001

                   Histogram                              #       Boxplot                     Normal Probability Plot
   4.75+*                                                 1          0          4.75+                                                  *
       .*                                                 5          0              |                                                 **
       .***                                              12          0              |                                            *****++
       .***                                              15          |              |                                        +*****+
       .************                                     60          |              |                                  ++*******
       .*****************************************       201       +-----+           |                           ***********
       .*********************************               161       *--+--*           |                     *******+
       .*****************                                83       +-----+           |                *****+
       .************                                     57          |              |           +*****
       .********                                         36          0              |     ++******
       .***                                              13          0              |******
  -0.75+*                                                 3          0         -0.75+*
        ----+----+----+----+----+----+----+----+-                                    +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 5 counts                                                   -2        -1         0        +1        +2

                                                        Detected Observations

                  Moments                                         Quantiles(Def=5)                                        Extremes

N                 640  Sum Wgts        640      100% Max  4.779123       99%  3.912023        Lowest     ID     Highest    ID
Mean         1.834743  Sum        1174.236       75% Q3   2.302585       95%  3.025244      -0.41552(  13280) 4.135167(  13107)
Std Dev      0.810549  Variance    0.65699       50% Med  1.931521       90%  2.701361      -0.40048(  13282) 4.180522(  13226)
Skewness     -0.18177  Kurtosis     0.6922       25% Q1   1.423036       10%  0.641854      -0.40048(   4348) 4.254193(  13149)
USS          2574.238  CSS        419.8166        0% Min  -0.41552        5%  0.336472      -0.34249(  13246) 4.430817(   5077)
CV            44.1778  Std Mean    0.03204                                1%  -0.16252      -0.30111(  13203) 4.779123(  14183)
T:Mean=0     57.26456  Pr>|T|       0.0001      Range     5.194639
Num ^= 0          635  Num > 0         624      Q3-Q1     0.879549
M(Sign)         306.5  Pr>=|M|      0.0001      Mode      2.302585
Sgn Rank       100783  Pr>=|S|      0.0001
W:Normal     0.965487  Pr<W         0.0001

                   Histogram                                #       Boxplot                   Normal Probability Plot
    4.7+*                                                   1          0          4.7+                                                   *
       .*                                                   1          0             |                                                   *
       .*                                                   1          0             |                                                   *
       .**                                                  3          0             |                                                  **
       .**                                                  3          0             |                                                ** +
       .***                                                 5          0             |                                              ***++
       .***                                                 5          |             |                                             **+
       .***                                                 5          |             |                                          +**
       .*****                                               9          |             |                                        +***
       .********                                           16          |             |                                    ++***
       .****************                                   32          |             |                                  +****
       .***********************                            45          |             |                              ++***
       .****************************************           79       +-----+          |                           ****
    2.1+********************************************       88       |     |       2.1+                       *****
       .********************************************       88       *--+--*          |                   ****+
       .***************************                        54       |     |          |                ****+
       .**************************                         52       +-----+          |              ****++
       .**************                                     28          |             |            ***+
       .***********                                        22          |             |           **+
       .**********                                         19          |             |         +**
       .*************                                      25          |             |      ++***
       .************                                       23          |             |     +****
       .*******                                            13          |             |  ++***
       .******                                             12          0             | +****
       .***                                                 6          0             |+****
       .*                                                   2          0             |**
   -0.5+**                                                  3          0         -0.5+*
        ----+----+----+----+----+----+----+----+----                                 +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 2 counts                                                   -2        -1         0        +1        +2
```

```
---------------------------------------------- DEPTH=Subsurface ANALYSIS=Magnesium ----------------------------------------------

                                                    All Observations
Variable=LNVALUE

                Moments                              Quantiles(Def=5)                                   Extremes

 N               643  Sum Wgts       643     100% Max   8.08641      99%  7.874739          Lowest    ID     Highest    ID
 Mean       6.232231  Sum        4007.325     75% Q3    6.975414      95%   7.60589       2.809403(  13333) 7.908387(  13072)
 Std Dev    1.011762  Variance   1.023662     50% Med   6.371612      90%  7.414573       2.833213(  13282) 7.915713(   4451)
 Skewness   -0.78299  Kurtosis   0.373609     25% Q1    5.720312      10%  4.744932       2.901422(  13283) 7.992945(  14007)
 USS        25631.77  CSS        657.1909      0% Min   2.809403       5%  4.174387       2.906901(  13284) 8.006368(  13086)
 CV         16.23434  Std Mean     0.0399                              1%  3.526361       3.401197(   4315)  8.08641(  13301)
 T:Mean=0   156.1963  Pr>|T|       0.0001    Range      5.277008
 Num ^= 0        643  Num > 0         643    Q3-Q1      1.255102
 M(Sign)       321.5  Pr>=|M|      0.0001    Mode       6.975414
 Sgn Rank     103523  Pr>=|S|      0.0001
 W:Normal   0.939189  Pr<W         0.0001

                  Histogram                       #   Boxplot                 Normal Probability Plot
   8.25+*                                         2      |          8.25+                                         +++++  *
       .****************                         48      |              |                                    +************
       .***********************************     102      |              |                              ********
       .**********************************************  134   +-----+   |                        *******
       .*********************************************   132   *--+--*   |                    ******+
       .*********************************                96   +-----+   |                *****+
       .*****************                        50      |              |            *****
       .********                                 24      |              |        ++****
       .***********                              31      |              |   ++++*****
       .******                                   18      0              |++******
       .*                                         2      0              | *
   2.75+**                                        4      0          2.75+*
        ----+----+----+----+----+----+----+----+----+                   +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 3 counts                                         -2        -1         0        +1        +2

                                                    Detected Observations

                Moments                              Quantiles(Def=5)                                   Extremes

 N               640  Sum Wgts       640     100% Max   8.08641      99%  7.874739          Lowest    ID     Highest    ID
 Mean       6.247943  Sum        3998.683     75% Q3    6.975414      95%  7.608371       2.809403(  13333) 7.908387(  13072)
 Std Dev    0.987661  Variance   0.975473     50% Med   6.374172      90%  7.417576       3.401197(   4315) 7.915713(   4451)
 Skewness   -0.70945  Kurtosis   0.149158     25% Q1    5.726848      10%  4.779123       3.496508(   4338) 7.992945(  14007)
 USS        25606.87  CSS        623.3275      0% Min   2.809403       5%  4.225099       3.526361(   4173) 8.006368(  13086)
 CV         15.80777  Std Mean   0.039041                              1%  3.723281       3.566712(  13334)  8.08641(  13301)
 T:Mean=0   160.0366  Pr>|T|       0.0001    Range      5.277008
 Num ^= 0        640  Num > 0         640    Q3-Q1      1.248566
 M(Sign)         320  Pr>=|M|      0.0001    Mode       6.975414
 Sgn Rank     102560  Pr>=|S|      0.0001
 W:Normal   0.943958  Pr<W         0.0001

                  Histogram                       #   Boxplot                 Normal Probability Plot
   8.25+*                                         2      |          8.25+                                         +++++  *
       .****************                         48      |              |                                    +************
       .***********************************     102      |              |                              ********
       .**********************************************  134   +-----+   |                        *******
       .*********************************************   132   *--+--*   |                    ******+
       .*********************************                96   +-----+   |                *****+
       .*****************                        50      |              |            ****+
       .********                                 24      |              |        ++****
       .***********                              31      |              |   ++++*****
       .******                                   18      0              |********
       .*                                         2      0              |*
   2.75+*                                         1      0          2.75+*
        ----+----+----+----+----+----+----+----+----+                   +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 3 counts                                         -2        -1         0        +1        +2
```

-- DEPTH=Subsurface ANALYSIS=Manganese --

All Observations

Variable=LNVALUE

Moments

N	645	Sum Wgts	645
Mean	4.661276	Sum	3006.523
Std Dev	1.236819	Variance	1.529722
Skewness	-0.27873	Kurtosis	-0.26899
USS	14999.38	CSS	985.1411
CV	26.53392	Std Mean	0.0487
T:Mean=0	95.71465	Pr>|T|	0.0001
Num ^= 0	645	Num > 0	645
M(Sign)	322.5	Pr>=|M|	0.0001
Sgn Rank	104167.5	Pr>=|S|	0.0001
W:Normal	0.976141	Pr<W	0.0006

Quantiles(Def=5)

100% Max	7.56008	99%	7.20786
75% Q3	5.505332	95%	6.593045
50% Med	4.828314	90%	6.196444
25% Q1	3.747148	10%	3.015535
0% Min	0.530628	5%	2.564949
		1%	1.667707
Range	7.029452		
Q3-Q1	1.758183		
Mode	3.178054		

Extremes

Lowest	ID	Highest	ID
0.530628(	13310)	7.31322(	13208)
0.788457(	13223)	7.319865(	4374)
1.064711(	4514)	7.352441(	13356)
1.410987(	4517)	7.489971(	14184)
1.504077(	13173)	7.56008(	13089)

```
                Histogram                        #          Boxplot
 7.75+*                                          1             |
     .****                                      10             |
     .*********                                 26             |
     .******************                        53             |
     .************************                  72          +-----+
     .***************************************  116          |     |
     .**********************************       100          *--+--*
 4.25+***********************                   69          |     |
     .***********************                   69          +-----+
     .**********************                    65             |
     .************                              34             |
     .*******                                   20             |
     .**                                         6             |
     .*                                          2             0
 0.75+*                                          2             0
      ----+----+----+----+----+----+----+----
     * may represent up to 3 counts
```

```
                     Normal Probability Plot
 7.75+                                                      ++*
     |                                                  ++*****
     |                                              +******
     |                                          ******
     |                                      *****
     |                                  ******
     |                              *****
 4.25+                           ****
     |                        +****
     |                    ******
     |                *****
     |            *****
     |+***
     |*
 0.75+*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Moments

N	642	Sum Wgts	642
Mean	4.663207	Sum	2993.779
Std Dev	1.238994	Variance	1.535105
Skewness	-0.28229	Kurtosis	-0.27446
USS	14944.61	CSS	984.0024
CV	26.56956	Std Mean	0.048899
T:Mean=0	95.3637	Pr>|T|	0.0001
Num ^= 0	642	Num > 0	642
M(Sign)	321	Pr>=|M|	0.0001
Sgn Rank	103201.5	Pr>=|S|	0.0001
W:Normal	0.975814	Pr<W	0.0004

Quantiles(Def=5)

100% Max	7.56008	99%	7.20786
75% Q3	5.521461	95%	6.593045
50% Med	4.828314	90%	6.196444
25% Q1	3.747148	10%	3.015535
0% Min	0.530628	5%	2.564949
		1%	1.667707
Range	7.029452		
Q3-Q1	1.774313		
Mode	3.178054		

Extremes

Lowest	ID	Highest	ID
0.530628(	13310)	7.31322(	13208)
0.788457(	13223)	7.319865(	4374)
1.064711(	4514)	7.352441(	13356)
1.410987(	4517)	7.489971(	14184)
1.504077(	13173)	7.56008(	13089)

```
                Histogram                        #          Boxplot
 7.75+*                                          1             |
     .****                                      10             |
     .*********                                 26             |
     .******************                        53             |
     .************************                  72          +-----+
     .***************************************  116          |     |
     .*********************************         99          *--+--*
 4.25+***********************                   68          |     |
     .***********************                   68          +-----+
     .**********************                    65             |
     .************                              34             |
     .*******                                   20             |
     .**                                         6             |
     .*                                          2             0
 0.75+*                                          2             0
      ----+----+----+----+----+----+----+----
     * may represent up to 3 counts
```

```
                     Normal Probability Plot
 7.75+                                                      ++*
     |                                                  ++*****
     |                                              +******
     |                                          ******
     |                                      *****
     |                                  ******
     |                              *****
 4.25+                           ****
     |                        +****
     |                    ******
     |                *****
     |            *****
     |+***
     |*
 0.75+*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Mercury

All Observations

Variable=LNVALUE

Moments

N	637	Sum Wgts	637
Mean	-2.54865	Sum	-1623.49
Std Dev	0.528417	Variance	0.279225
Skewness	-1.07255	Kurtosis	1.197774
USS	4315.298	CSS	177.5871
CV	-20.7332	Std Mean	0.020937
T:Mean=0	-121.731	Pr>|T|	0.0001
Num ^= 0	637	Num > 0	0
M(Sign)	-318.5	Pr>=|M|	0.0001
Sgn Rank	-101602	Pr>=|S|	0.0001
W:Normal	0.868268	Pr<W	0.0001

Quantiles(Def=5)

100% Max	-0.87948	99%	-1.93794
75% Q3	-2.13707	95%	-2.06357
50% Med	-2.30259	90%	-2.10373
25% Q1	-2.83022	10%	-3.38139
0% Min	-4.60517	5%	-3.44202
		1%	-4.13517
Range	3.725693		
Q3-Q1	0.693147		
Mode	-2.30259		

Extremes

Lowest	ID	Highest	ID
-4.60517(	13019)	-1.60944(	4021)
-4.60517(	13013)	-1.27297(	4281)
-4.60517(	13003)	-1.27297(	13149)
-4.50986(	13007)	-1.13943(	4133)
-4.2687(	13018)	-0.87948(	13247)

```
                 Histogram                                #    Boxplot
 -0.9+*                                                   1       0
     .*                                                   1       |
     .*                                                   2       |
     .                                                            |
     .*                                                   2       |
     .*                                                   2       |
     .*******************************************       214    +-----+
     .***********************                           114    *-----*
     .**************                                     67    |  +  |
     .***************                                    73    |     |
     .*******                                            33    +-----+
     .*****                                              22       |
     .***********                                        51       |
     .********                                           37       |
     .*                                                   3       |
     .*                                                   3       0
     .**                                                  6       0
     .*                                                   2       0
     .*                                                   1       0
 -4.7+*                                                   3       0
      ----+----+----+----+----+----+----+----+---
      * may represent up to 5 counts
```

```
                       Normal Probability Plot
 -0.9+                                                        *
     |                                                        *
     |                                                     +++*
     |                                                 ++++
     |                                             +++       *
     |                                          ++++        *
     |                                   *******************
     |                               *******++
     |                             ***+++
     |                         *****++
     |                       **++
     |                    ++***
     |                ++*****
     |            *****
     | ++++*
     |++  **
     | ***
     | *
     |*
 -4.7+*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Moments

N	36	Sum Wgts	36
Mean	-2.82747	Sum	-101.789
Std Dev	0.746387	Variance	0.557094
Skewness	0.453656	Kurtosis	1.491944
USS	307.3036	CSS	19.49828
CV	-26.3977	Std Mean	0.124398
T:Mean=0	-22.7293	Pr>|T|	0.0001
Num ^= 0	36	Num > 0	0
M(Sign)	-18	Pr>=|M|	0.0001
Sgn Rank	-333	Pr>=|S|	0.0001
W:Normal	0.916528	Pr<W	0.0113

Quantiles(Def=5)

100% Max	-0.87948	99%	-0.87948
75% Q3	-2.66645	95%	-1.27297
50% Med	-2.8647	90%	-1.66073
25% Q1	-3.15832	10%	-3.7297
0% Min	-4.50986	5%	-4.2687
		1%	-4.50986
Range	3.630383		
Q3-Q1	0.491866		
Mode	-3.17009		

Extremes

Lowest	ID	Highest	ID
-4.50986(	13007)	-2.12026(	4218)
-4.2687(	13011)	-1.66073(	4280)
-4.01738(	13008)	-1.27297(	4281)
-3.7297(	13016)	-1.27297(	13149)
-3.50656(	13010)	-0.87948(	13247)

```
   Stem Leaf                     #             Boxplot
     -0 9                        1                *
     -1 33                       2                0
     -1 7                        1                0
     -2 31                       2                |
     -2 99999988887777765       17             +--+--+
     -3 42221100                 8             +-----+
     -3 75                       2                |
     -4 30                       2                0
     -4 5                        1                0
        ----+----+----+----+
```

```
                          Normal Probability Plot
 -0.75+                                                      *   +
      |                                                 * *+++++++
      |                                              +*++++
      |                                         ++++***
 -2.75+                                 *************
      |                            **+****++
      |                       ++*+*+
      |   +++++**+*
 -4.75++++ *
       +----+----+----+----+----+----+----+----+----+----+
           -2        -1         0        +1        +2
```

DEPTH=Subsurface ANALYSIS=Nickel

All Observations

Variable=LNVALUE

Moments

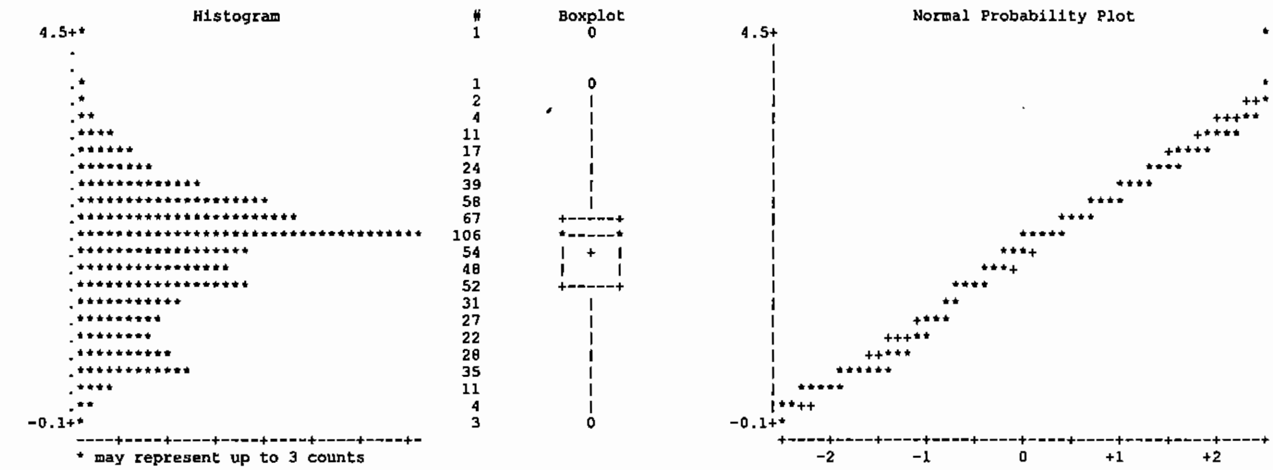
N	645	Sum Wgts	645
Mean	1.876115	Sum	1210.094
Std Dev	0.767562	Variance	0.589152
Skewness	-0.26905	Kurtosis	-0.24843
USS	2649.689	CSS	379.4138
CV	40.91232	Std Mean	0.030223
T:Mean=0	62.07628	Pr>|T|	0.0001
Num ^= 0	644	Num > 0	641
M(Sign)	319	Pr>=|M|	0.0001
Sgn Rank	103838	Pr>=|S|	0.0001
W:Normal	0.970355	Pr<W	0.0001

Quantiles(Def=5)

100% Max	4.439116	99%	3.50255
75% Q3	2.397895	95%	3.044522
50% Med	2.028148	90%	2.772589
25% Q1	1.410987	10%	0.693147
0% Min	-0.17435	5%	0.500775
		1%	0.182322
Range	4.613469		
Q3-Q1	0.986908		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
-0.17435(	13175)	3.583519(	4318)
-0.08338(	13164)	3.693867(	13210)
-0.04082(	13225)	3.713572(	4407)
0(	13339)	3.918005(	13247)
0.09531(	13236)	4.439116(	13049)



Detected Observations

Moments

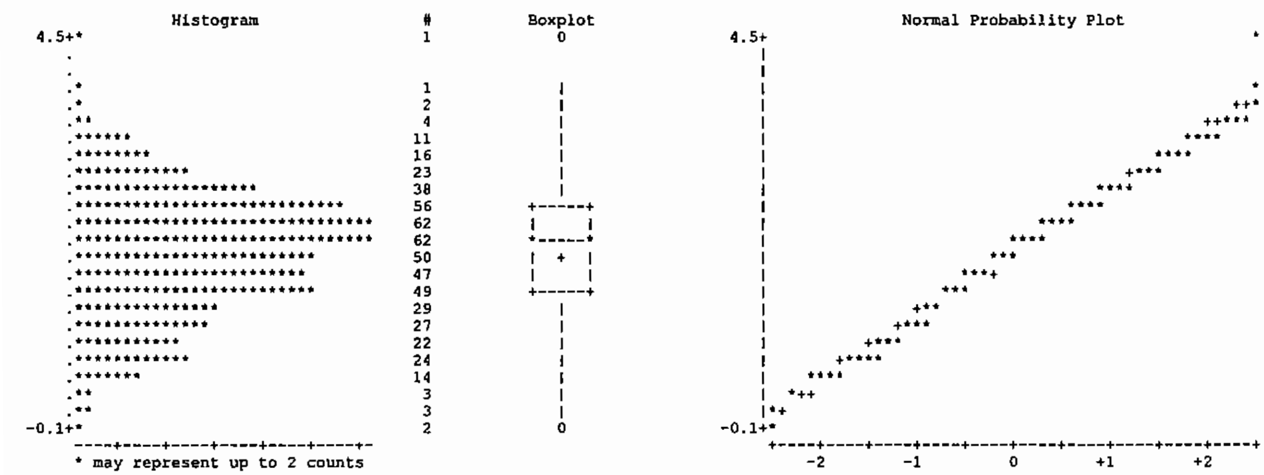
N	546	Sum Wgts	546
Mean	1.942944	Sum	1060.848
Std Dev	0.736592	Variance	0.542567
Skewness	-0.15143	Kurtosis	-0.21175
USS	2356.867	CSS	295.6992
CV	37.91111	Std Mean	0.031523
T:Mean=0	61.63535	Pr>|T|	0.0001
Num ^= 0	546	Num > 0	544
M(Sign)	271	Pr>=|M|	0.0001
Sgn Rank	74662.5	Pr>=|S|	0.0001
W:Normal	0.981621	Pr<W	0.1298

Quantiles(Def=5)

100% Max	4.439116	99%	3.526361
75% Q3	2.484907	95%	3.091042
50% Med	2.00148	90%	2.833213
25% Q1	1.458615	10%	0.875469
0% Min	-0.08338	5%	0.641854
		1%	0.262364
Range	4.522497		
Q3-Q1	1.026292		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
-0.08338(	13164)	3.583519(	4318)
-0.04082(	13225)	3.693867(	13210)
0.09531(	13236)	3.713572(	4407)
0.182322(	13227)	3.918005(	13247)
0.182322(	13226)	4.439116(	13049)



------------------------------ DEPTH=Subsurface ANALYSIS=Potassium ------------------------------

All Observations

Variable=LNVALUE

Moments

N	647	Sum Wgts	647
Mean	5.574244	Sum	3606.536
Std Dev	0.672585	Variance	0.45237
Skewness	0.070919	Kurtosis	0.047795
USS	20395.94	CSS	292.2311
CV	12.06594	Std Mean	0.026442
T:Mean=0	210.81	Pr>|T|	0.0001
Num ^= 0	647	Num > 0	647
M(Sign)	323.5	Pr>=|M|	0.0001
Sgn Rank	104814	Pr>=|S|	0.0001
W:Normal	0.97606	Pr<W	0.0005

Quantiles(Def=5)

100% Max	7.402452	99%	7.17012
75% Q3	5.991465	95%	6.728629
50% Med	5.517453	90%	6.498282
25% Q1	5.105945	10%	4.804021
0% Min	3.583519	5%	4.54542
		1%	3.78419
Range	3.818933		
Q3-Q1	0.885519		
Mode	5.948035		

Extremes

Lowest	ID	Highest	ID
3.583519(	4173)	7.244228(	4067)
3.583519(	4168)	7.26543(	13062)
3.610918(	4348)	7.319865(	4057)
3.637586(	4386)	7.371489(	4095)
3.637586(	4283)	7.402452(	13063)

```
           Histogram                        #      Boxplot
  7.5+*                                     1         0
     .**                                    5         0
  7.1+***                                   7         |
     .******                               17         |
  6.7+*******                              19         |
     .**********                           28         |
  6.3+**********                           30         |
     .******************                   53         |
  5.9+********************************     94      +-----+
     .****************                     46      |     |
  5.5+**********************               64      *--+--*
     .***********************              69      |     |
  5.1+***********************************  103     +-----+
     .****************                     48         |
  4.7+*********                            27         |
     .*****                                13         |
  4.3+****                                 11         |
     .*                                     3         |
  3.9+*                                     2         |
     .**                                    5         0
  3.5+*                                     2         0
      ----+----+----+----+----+----+----+
      * may represent up to 3 counts
```

```
                 Normal Probability Plot
  7.5+                                                  *
     |                                                 **
  7.1+                                              ***+
     |                                          ****+
  6.7+                                       ****+
     |                                     ***+
  6.3+                                   ***
     |                                ****
  5.9+                            *****
     |                          ***
  5.5+                       ****
     |                    +***
  5.1+                ******
     |            ****+
  4.7+         ****+
     |       ***+
  4.3+    ****
     |  +**
  3.9+++**
     |***
  3.5+*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

Detected Observations

Moments

N	456	Sum Wgts	456
Mean	5.643055	Sum	2573.233
Std Dev	0.729751	Variance	0.532537
Skewness	-0.16867	Kurtosis	-0.06715
USS	14763.2	CSS	242.3044
CV	12.93185	Std Mean	0.034174
T:Mean=0	165.1284	Pr>|T|	0.0001
Num ^= 0	456	Num > 0	456
M(Sign)	228	Pr>=|M|	0.0001
Sgn Rank	52098	Pr>=|S|	0.0001
W:Normal	0.978122	Pr<W	0.0314

Quantiles(Def=5)

100% Max	7.402452	99%	7.21524
75% Q3	6.143112	95%	6.854355
50% Med	5.622209	90%	6.620073
25% Q1	5.159055	10%	4.70048
0% Min	3.583519	5%	4.364372
		1%	3.637586
Range	3.818933		
Q3-Q1	0.984056		
Mode	5.141664		

Extremes

Lowest	ID	Highest	ID
3.583519(	4173)	7.21524(	4375)
3.583519(	4168)	7.26543(	13062)
3.610918(	4348)	7.319865(	4057)
3.637586(	4386)	7.371489(	4095)
3.637586(	4283)	7.402452(	13063)

```
           Histogram                        #      Boxplot
  7.5+*                                     1         |
     .**                                    4         |
  7.1+****                                  7         |
     .*********                            17         |
  6.7+*********                            18         |
     .*************                        25         |
  6.3+***************                      30         |
     .*********************                42      +-----+
  5.9+************************             48      |     |
     .**********************               43      *--+--*
  5.5+******************************       60      |     |
     .*********************                42      |     |
  5.1+******************                   35      +-----+
     .**************                       27         |
  4.7+************                         23         |
     .******                               11         |
  4.3+******                               11         |
     .**                                    3         |
  3.9+*                                     2         |
     .***                                   5         0
  3.5+*                                     2         0
      ----+----+----+----+----+----+
      * may represent up to 2 counts
```

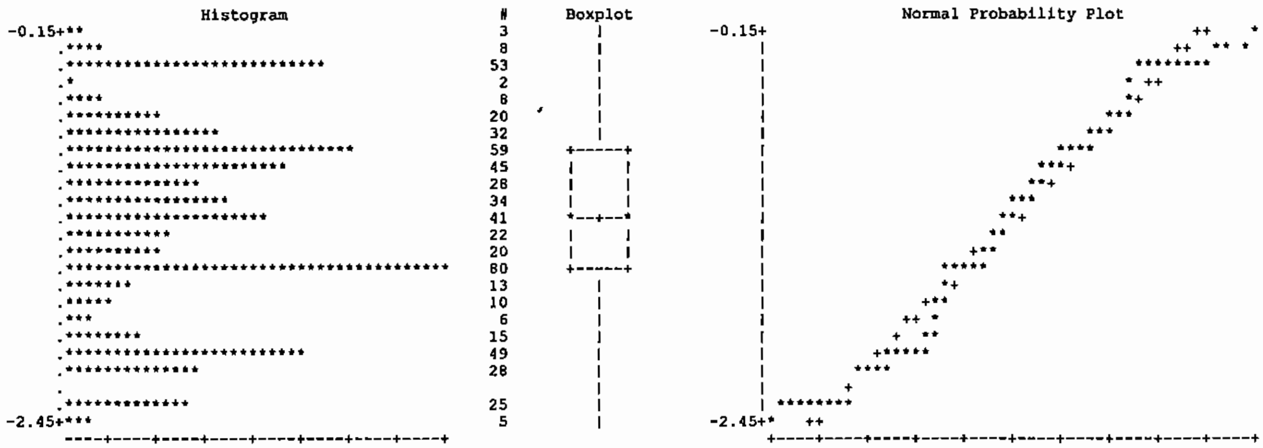
```
                 Normal Probability Plot
  7.5+                                                  *
     |                                               +***
  7.1+                                            +***
     |                                        *****
  6.7+                                      ***
     |                                   ****
  6.3+                                 ***
     |                              ***
  5.9+                           ****
     |                         ***
  5.5+                     *****
     |                   ***
  5.1+                ****
     |              ***
  4.7+           ***
     |        +***
  4.3+      ****
     |   ++*
  3.9++++ *
     |** *
  3.5+*
      +----+----+----+----+----+----+----+----+----+----+
          -2        -1         0        +1        +2
```

-- DEPTH=Subsurface ANALYSIS=Selenium --

All Observations

Variable=LNVALUE

```
              Moments                          Quantiles(Def=5)                              Extremes

N              606  Sum Wgts        606   100% Max  -0.10536     99%  -0.22314     Lowest      ID    Highest     ID
Mean      -1.26604  Sum         -767.22    75% Q3   -0.84165     95%  -0.35667   -2.45341(   4140) -0.22314(   4130)
Std Dev   0.575083  Variance   0.330721    50% Med  -1.20397     90%  -0.37106   -2.41912(   4465) -0.22314(   4520)
Skewness  -0.14487  Kurtosis   -0.85175    25% Q1   -1.57504     10%  -2.04022   -2.40795(   4464) -0.13926(   4467)
USS       1171.416  CSS         200.086     0% Min  -2.45341      5%  -2.12026   -2.40795(   4141) -0.10536(   4117)
CV        -45.4238  Std Mean   0.023361                           1%   -2.3969   -2.40795(   4133) -0.10536(   5067)
T:Mean=0  -54.1942  Pr>|T|       0.0001   Range      2.348047
Num ^= 0       606  Num > 0           0   Q3-Q1      0.733389
M(Sign)       -303  Pr>=|M|      0.0001   Mode       -2.04022
Sgn Rank  -91960.5  Pr>=|S|      0.0001
W:Normal  0.944435  Pr<W         0.0001
```

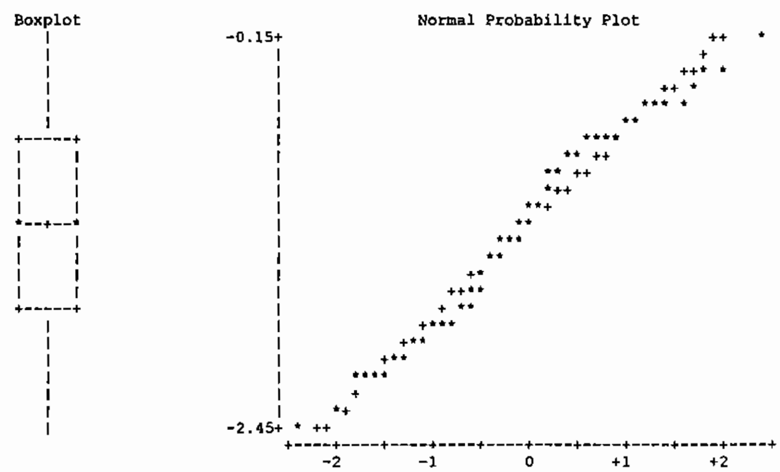


* may represent up to 2 counts

Detected Observations

```
              Moments                          Quantiles(Def=5)                              Extremes

N               77  Sum Wgts         77   100% Max  -0.13926     99%  -0.13926     Lowest      ID    Highest     ID
Mean      -1.24623  Sum        -95.9599    75% Q3   -0.77653     95%  -0.46204   -2.40795(   4141) -0.51083(   5001)
Std Dev   0.555607  Variance   0.308699    50% Med  -1.23787     90%  -0.56212   -2.33304(   4455) -0.46204(  13122)
Skewness  -0.18912  Kurtosis   -1.03674    25% Q1   -1.77196     10%  -2.04022   -2.12026(   4459) -0.37106(   4272)
USS       143.0495  CSS        23.46113     0% Min  -2.40795      5%  -2.12026   -2.12026(   4456) -0.35667(   4050)
CV        -44.5829  Std Mean   0.063317                           1%  -2.40795   -2.12026(   4453) -0.13926(   4467)
T:Mean=0  -19.6823  Pr>|T|       0.0001   Range      2.268684
Num ^= 0        77  Num > 0           0   Q3-Q1      0.995428
M(Sign)      -38.5  Pr>=|M|      0.0001   Mode       -2.12026
Sgn Rank   -1501.5  Pr>=|S|      0.0001
W:Normal  0.949044  Pr<W         0.0095
```

```
  Stem Leaf                     #
    -1 4                        1
    -2
    -3 76                       2
    -4 6                        1
    -5 886331                   6
    -6 75                       2
    -7 983333111                9
    -8 9444420                  7
    -9 9975                     4
   -10 52                       2
   -11 7441                     4
   -12 774                      3
   -13 9995111                  7
   -14 7777                     4
   -15 1                        1
   -16 666                      3
   -17 7771                     4
   -18 3333                     4
   -19 77700                    5
   -20 44                       2
   -21 2222                     4
   -22
   -23 3                        1
   -24 1                        1
       ----+----+----+----+
  Multiply Stem.Leaf by 10**-1
```



```
------------------------------------------------- DEPTH=Subsurface ANALYSIS=Silver -------------------------------------------------

                                                   All Observations
Variable=LNVALUE

                  Moments                                    Quantiles(Def=5)                                   Extremes

N               643  Sum Wgts       643      100% Max  1.335001      99%  1.163151        Lowest    ID      Highest    ID
Mean       0.018613  Sum       11.96796       75% Q3   0.262364      95%  0.955511      -1.27297(   4140) 1.223775(   4056)
Std Dev    0.543366  Variance  0.295247       50% Med  -0.04082      90%  0.788457      -1.23787(   4465) 1.252763(   4233)
Skewness   0.060655  Kurtosis  0.079808       25% Q1   -0.26136      10%   -0.4943      -1.23787(   4464) 1.252763(  14028)
USS        189.7714  CSS       189.5487        0% Min  -1.27297       5%  -1.13943      -1.23787(   4150) 1.280934(   4057)
CV         2919.334  Std Mean  0.021428                               1%  -1.20397      -1.23787(   4141) 1.335001(   4236)
T:Mean=0   0.868604  Pr>|T|      0.3854      Range     2.607967
Num ^= 0        614  Num > 0        246      Q3-Q1     0.523729
M(Sign)         -61  Pr>=|M|     0.0001      Mode      0.788457
Sgn Rank      -4769  Pr>=|S|     0.2785
W:Normal    0.92779  Pr<W        0.0001

                   Histogram                        #      Boxplot                       Normal Probability Plot
   1.3+**                                           5         0            1.3+                                              ++**
      .*****                                       17         0               |                                           *******
      .**********                                  38         |               |                                        ******
      .*****************                           69         |               |                                   ******+
      .******                                      21         |               |                                  **++
      .****                                        16      +-----+            |                               +++*
      .****************************               109      |  +  |            |                           ++*****
      .****************************************   160      *-----*            |                       ********
      .***************************                105      +-----+            |                  ******
      .************                                46         |               |               *****++
      .****                                        15         |               |             **++
      .*                                            2         |               |         +++*
      .******                                      24         0               |     +++*****
  -1.3+****                                        16         0           -1.3+******
       ----+----+----+----+----+----+----+----+                               +----+----+----+----+----+----+----+----+----+----+
       * may represent up to 4 counts                                              -2        -1         0        +1        +2

                                                 Detected Observations

                  Moments                                    Quantiles(Def=5)                                   Extremes

N                99  Sum Wgts        99      100% Max  1.335001      99%  1.335001        Lowest    ID      Highest    ID
Mean       0.489619  Sum       48.47226       75% Q3   0.916291      95%  1.193922      -1.13943(   4510) 1.193922(   4407)
Std Dev    0.530974  Variance  0.281933       50% Med  0.530628      90%  1.098612       -0.8675(   4454) 1.223775(   4056)
Skewness   -0.73254  Kurtosis  0.189343       25% Q1   0.182322      10%  -0.16252      -0.77653(   4457) 1.252763(   4233)
USS        51.36238  CSS       27.62945        0% Min  -1.13943       5%  -0.61619      -0.71335(   4453) 1.280934(   4057)
CV         108.4464  Std Mean  0.053365                               1%  -1.13943      -0.61619(   4508) 1.335001(   4236)
T:Mean=0   9.174926  Pr>|T|      0.0001      Range     2.474435
Num ^= 0         94  Num > 0         79      Q3-Q1     0.733969
M(Sign)          32  Pr>=|M|     0.0001      Mode      0.916291
Sgn Rank     1801.5  Pr>=|S|     0.0001
W:Normal   0.938118  Pr<W        0.0002

      Stem Leaf                       #           Boxplot                    Normal Probability Plot
        13 4                          1              |             1.35+                                          ++       *
        12 258                        3              |                 |                                       ++  ** *
        11 003339                     6              |                 |                                     ++****
        10 33666                      5              |                 |                                   ****
         9 2222222266669999          16           +-----+              |                              ******
         8 333338                     6           |     |          0.85+                              ****++
         7 44999                      5           |     |              |                             ***++
         6 444                        3           |     |              |                            **+
         5 3333999                    7           *-----*              |                          ***+
         4 1117777                    7           |  +  |              |                        **+
         3 44444                      5           |     |          0.35+                      **+
         2 666666                     6           |     |              |                     **
         1 000088888                  9           +-----+              |                  **
         0 00000                      5              |                 |                ****
        -0 643                        3              |                 |              **
        -1 664                        3              |            -0.15+            **
        -2 41                         2              |                 |           *+
        -3                                           |                 |         ++
        -4 5                          1              |                 |        ++ *
        -5 3                          1              |                 |      ++ *
        -6 2                          1              |            -0.65+    ++   *
        -7 81                         2              |                 | ++   **
        -8 7                          1              |                 |+    *
        -9                                                             |
       -10                                                             |
       -11 4                          1              0            -1.15+*
           ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
      Multiply Stem.Leaf by 10**-1                                          -2        -1         0        +1        +2
```

```
------------------------------------------------- DEPTH=Subsurface ANALYSIS=Sodium -------------------------------------------------

                                                     All Observations
Variable=LNVALUE

                 Moments                                      Quantiles(Def=5)                                  Extremes

 N              626  Sum Wgts       626     100% Max  6.001415       99%   5.97381       Lowest    ID     Highest    ID
 Mean      4.890427  Sum       3061.408      75% Q3   5.429346       95%  5.780744     1.131402(   4353) 5.976351(  13041)
 Std Dev   0.739824  Variance  0.547339      50% Med  5.108967       90%   5.68358     1.360977(   4352) 5.983936(  13063)
 Skewness  -1.12858  Kurtosis  1.933069      25% Q1   4.406719       10%  3.916015     1.435085(   4351) 5.996452(   4065)
 USS       15313.68  CSS        342.087       0% Min  1.131402        5%  3.555348      2.70805(  13211) 5.998937(   4350)
 CV          15.128  Std Mean  0.029569                               1%  2.844909     2.778819(  13297) 6.001415(  13073)
 T:Mean=0  165.3887  Pr>|T|      0.0001     Range     4.870013
 Num ^= 0       626  Num > 0        626     Q3-Q1     1.022626
 M(Sign)        313  Pr>=|M|     0.0001     Mode      4.330733
 Sgn Rank   98125.5  Pr>=|S|     0.0001
 W:Normal  0.912844  Pr<W        0.0001

                    Histogram                          #        Boxplot                          Normal Probability Plot
    6.1+*                                              1           |                 6.1+                                        +++      *
       .**********                                    28           |                    |                                      ++  *********
       .*******************                           55           |                    |                                   +*******
       .*****************************                 87        +-----+                 |                                ******
       .***************************************      115        |     |                 |                            ******
    5.1+********************                          58        *-----*                 5.1+                       ***+++
       .**************                                41        |  +  |                 |                        ****++
       .*************                                 37        |     |                 |                      ***+
       .*****************                             49        +-----+                 |                   ****+
       .***************                               45           |                    |                 ***
    4.1+***********                                   32           |                 4.1+             +***
       .*********                                     26           |                    |           ***
       .******                                        16           |                    |        +***
       .*****                                         13           |                    |     ++***
       .***                                            9           |                    |   ++***
    3.1+*                                              3           |                 3.1++++  **
       .**                                             6           0                    | ****
       .*                                              2           0                    |**
       .                                                                                |
       .                                                                                |
    2.1+                                                                             2.1+
       .                                                                                |
       .                                                                                |
       .*                                              1           0                    |*
       .*                                              1           0                    |*
    1.1+*                                              1           *                 1.1+*
        ----+----+----+----+----+----+----+----                                        +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 3 counts                                                      -2        -1         0        +1        +2

                                                     Detected Observations

                 Moments                                      Quantiles(Def=5)                                  Extremes

 N              480  Sum Wgts       480     100% Max  6.001415       99%  5.976351       Lowest    ID     Highest    ID
 Mean      4.804681  Sum       2306.247      75% Q3   5.354222       95%  5.762051     1.131402(   4353) 5.976351(  13041)
 Std Dev   0.733766  Variance  0.538413      50% Med   4.94876       90%  5.620394     1.360977(   4352) 5.983936(  13063)
 Skewness  -1.00994  Kurtosis  2.143182      25% Q1   4.330733       10%  3.858622     1.435085(   4351) 5.996452(   4065)
 USS       11338.68  CSS       257.8998       0% Min  1.131402        5%  3.580733      2.70805(  13211) 5.998937(   4350)
 CV         15.2719  Std Mean  0.033492                               1%  2.844909     2.844909(  13282) 6.001415(  13073)
 T:Mean=0  143.4589  Pr>|T|      0.0001     Range     4.870013
 Num ^= 0       480  Num > 0        480     Q3-Q1     1.023489
 M(Sign)        240  Pr>=|M|     0.0001     Mode      4.330733
 Sgn Rank     57720  Pr>=|S|     0.0001
 W:Normal  0.933691  Pr<W        0.0001

                    Histogram                          #        Boxplot                          Normal Probability Plot
    6.1+*                                              1           |                 6.1+                                        +++      *
       .**********                                    19           |                    |                                     +++**********
       .*****************                             33           |                    |                                  +******
       .************************                      48           |                    |                               *****
       .****************************************      80        +-----+                 |                           ******
    5.1+************************                      47        |     |                 5.1+                      ****++
       .********************                          39        *--+--*                 |                      ****+
       .*****************                             34        |     |                 |                    ***
       .*********************                         41        |     |                 |                 ****
       .**********************                        43        +-----+                 |               ***
    4.1+**************                                28           |                 4.1+            ***
       .************                                  24           |                    |          ***
       .********                                      16           |                    |       ****
       .******                                        11           |                    |     +***
       .****                                           8           |                    |   ****
    3.1+*                                              1           |                 3.1+ +++*
       .**                                             3           |                    |+ **
       .*                                              1           0                    | *
       .                                                                                |
       .                                                                                |
    2.1+                                                                             2.1+
       .                                                                                |
       .                                                                                |
       .*                                              1           0                    |*
       .*                                              1           0                    |*
    1.1+*                                              1           *                 1.1+*
        ----+----+----+----+----+----+----+----+----                                   +----+----+----+----+----+----+----+----+----+----+
        * may represent up to 2 counts                                                      -2        -1         0        +1        +2
```

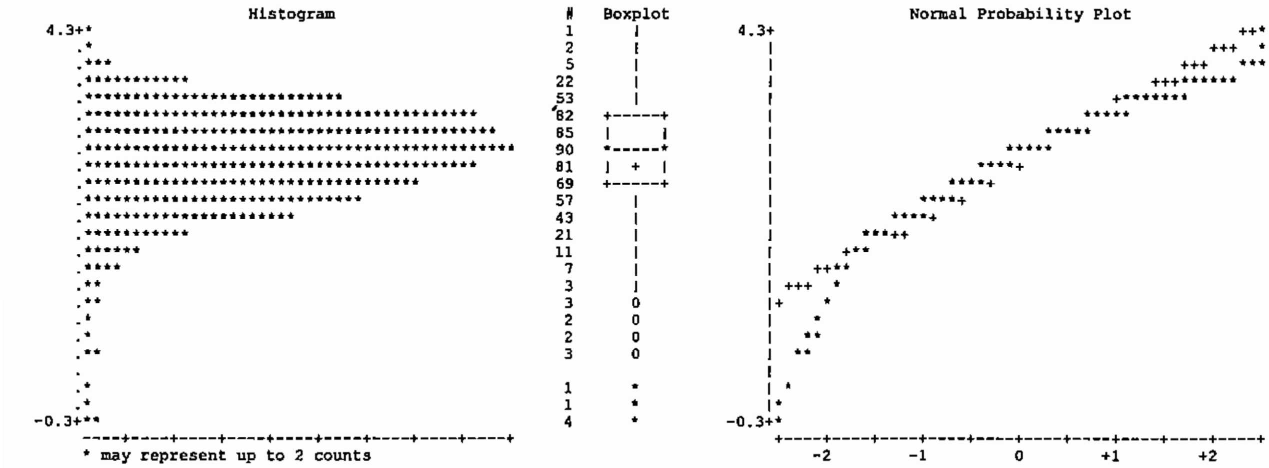
```
---------------------------------------------- DEPTH=Subsurface ANALYSIS=Thallium ----------------------------------------------

                                                    All Observations
Variable=LNVALUE

               Moments                               Quantiles(Def=5)                                  Extremes

N                279  Sum Wgts        279      100% Max   -0.8916       99%  -0.94161        Lowest    ID       Highest    ID
Mean        -1.40639  Sum        -392.382       75% Q3   -1.04982       95%  -0.96758      -1.83258(   4421) -0.94161(   13064)
Std Dev     0.323732  Variance   0.104802       50% Med  -1.56065       90%  -0.99425      -1.83258(   4379) -0.94161(   13080)
Skewness    0.228831  Kurtosis   -1.74595       25% Q1    -1.7148       10%  -1.77196      -1.83258(   4348) -0.94161(   14038)
USS         580.9763  CSS        29.13508        0% Min  -1.83258        5%  -1.77196      -1.83258(   4247)  -0.8916(   14034)
CV          -23.0187  Std Mean   0.019381                                1%  -1.83258      -1.83258(   4246)  -0.8916(   14184)
T:Mean=0     -72.564  Pr>|T|       0.0001      Range     0.940983
Num ^= 0         279  Num > 0           0      Q3-Q1     0.664976
M(Sign)       -139.5  Pr>=|M|      0.0001      Mode       -1.7148
Sgn Rank      -19530  Pr>=|S|      0.0001
W:Normal    0.787175  Pr<W         0.0001

  Stem Leaf                                                #  Boxplot                         Normal Probability Plot
    -8 99                                                  2     |       -0.875+                                                 ++     *
    -9 444                                                 3     |             |                                                +    ***
    -9 999999999999999999977777777777                     30     |             |                                         ******** *
   -10 222222222222222222222222222222                     30     |             |                                   *******+
   -10 88888888888885555555555555555555555555             38  +-----+          |                               **     ++
   -11 4111                                                4  |     |          |                               *    ++
   -11                                                        |     |          |                                   +
   -12 4400                                                4  |     |          |                               *  ++
   -12 77                                                  2  |     |          |                              ***+
   -13 1111                                                4  |     |          |                              *+
   -13 999955555                                           9  |     |          |                             **
   -14 33333                                               5  |  +  |          |                          ++*
   -14 77                                                  2  |     |          |                           +  *
   -15 1                                                   1  |     |          |                         ++   *
   -15 666666                                              6  *-----*          |                        +    *
   -16 11111111111111111                                  17  |     |          |                      ++  ***
   -16 6666666666666666666666666666666666666              37  |     |          |                    ++ ****
   -17 111111111111111111111111111111111111111111111111   48  +-----+          |                  *******
   -17 77777777777777777777777777777777                   32     |             |      ***********
   -18 33333                                               5     |       -1.825+* ***          +
       ----+----+----+----+----+----+----+----+----+---                     +----+----+----+----+----+----+----+----+----+----+
  Multiply Stem.Leaf by 10**-1                                                    -2        -1         0        +1        +2

                                                    Detected Observations

               Moments                               Quantiles(Def=5)                                  Extremes

N                 32  Sum Wgts         32      100% Max   -0.8916       99%   -0.8916        Lowest    ID       Highest    ID
Mean         -1.4303  Sum        -45.7697       75% Q3   -1.25542       95%  -0.96758      -1.77196(   4378) -1.20397(   14182)
Std Dev     0.228827  Variance   0.052362       50% Med   -1.4484       90%  -1.10866       -1.7148(   4388) -1.10866(    4244)
Skewness     0.58321  Kurtosis   -0.39044       25% Q1   -1.63508       10%  -1.66073       -1.7148(   4148) -1.10866(    4276)
USS         67.08785  CSS         1.62321        0% Min  -1.77196        5%   -1.7148      -1.66073(   4342) -0.96758(   13081)
CV          -15.9985  Std Mean   0.040451                                1%  -1.77196      -1.66073(   4327)  -0.8916(   14184)
T:Mean=0    -35.3588  Pr>|T|       0.0001      Range     0.880359
Num ^= 0          32  Num > 0           0      Q3-Q1     0.379665
M(Sign)          -16  Pr>=|M|      0.0001      Mode      -1.66073
Sgn Rank        -264  Pr>=|S|      0.0001
W:Normal    0.944038  Pr<W         0.1194

     Stem Leaf                     #             Boxplot                          Normal Probability Plot
       -8 9                        1                |             -0.85+                                                  *  ++
       -9 7                        1                |                  |                                               * +++++
      -10                                           |                  |                                             ++++
      -11 11                       2                |             -1.15+                                         +*+*
      -12 774400                   6             +-----+               |                                     ***+*+
      -13 91                       2             |     |               |                                 ++*+
      -14 773333                   6             *--+--*          -1.45+                             ++***+*
      -15 6661                     4             |     |               |                          +++***
      -16 6666611                  7             +-----+               |                      **+****
      -17 711                      3                |             -1.75+     *     *++++
          ----+----+----+----+                                         +----+----+----+----+----+----+----+----+----+----+
     Multiply Stem.Leaf by 10**-1                                           -2        -1         0        +1        +2
```

```
------------------------------------------------ DEPTH=Subsurface ANALYSIS=Vanadium ------------------------------------------------
```

All Observations

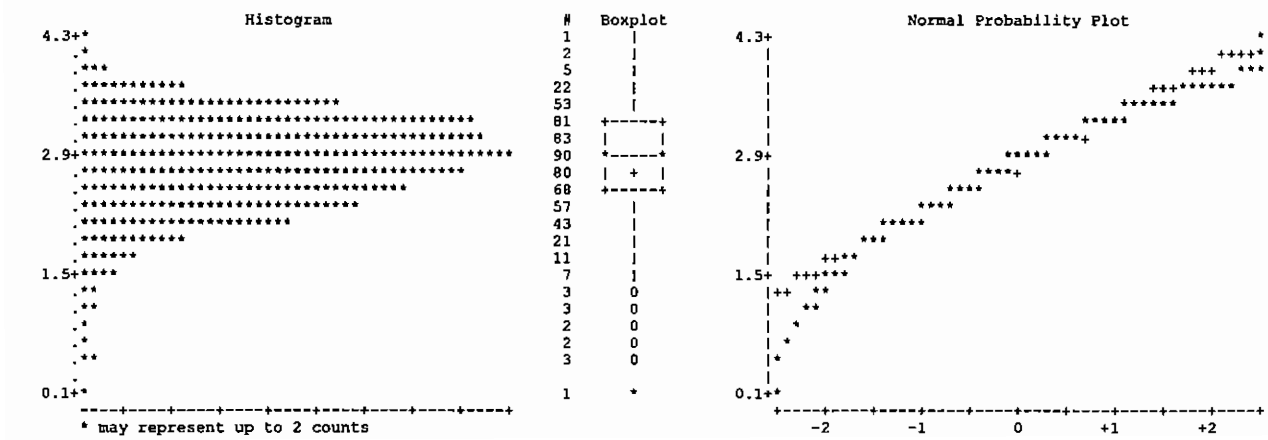
Variable=LNVALUE

```
            Moments                              Quantiles(Def=5)                                 Extremes

N              648  Sum Wgts        648    100% Max  4.232656      99%  3.828641      Lowest      ID     Highest     ID
Mean      2.763854  Sum        1790.977     75% Q3   3.218876      95%  3.583519    -0.33968(  13203)    3.8795(  13016)
Std Dev   0.640008  Variance    0.40961     50% Med  2.839078      90%  3.465736    -0.28236(  13282) 3.933784(  13012)
Skewness  -1.37228  Kurtosis    3.85897     25% Q1   2.415914      10%   2.04122    -0.21196(  13283) 4.060443(   4407)
USS       5215.018  CSS        265.0177      0% Min  -0.33968       5%  1.722767    -0.20702(  13284) 4.155753(  13348)
CV        23.15636  Std Mean   0.025142                             1%  0.530628    -0.05657(  13285) 4.232656(  13152)
T:Mean=0  109.9303  Pr>|T|       0.0001    Range     4.572334
Num ^= 0       647  Num > 0         642    Q3-Q1     0.802962
M(Sign)      318.5  Pr>=|M|      0.0001    Mode      2.995732
Sgn Rank    104799  Pr>=|S|      0.0001
W:Normal  0.914823  Pr<W         0.0001
```



Detected Observations

```
            Moments                              Quantiles(Def=5)                                 Extremes

N              638  Sum Wgts        638    100% Max  4.232656      99%  3.828641      Lowest      ID     Highest     ID
Mean      2.786093  Sum        1777.527     75% Q3   3.218876      95%  3.583519           0(  13131)    3.8795(  13016)
Std Dev   0.587321  Variance   0.344946     50% Med  2.841994      90%  3.465736    0.530628(  13280) 3.933784(  13012)
Skewness  -0.88353  Kurtosis   1.648802     25% Q1   2.451005      10%  2.066863    0.530628(  13278) 4.060443(   4407)
USS       5172.086  CSS        219.7303      0% Min         0       5%  1.791759    0.530628(  13132) 4.155753(  13348)
CV        21.08044  Std Mean   0.023252                             1%  0.832909    0.693147(  13234) 4.232656(  13152)
T:Mean=0  119.8204  Pr>|T|       0.0001    Range     4.232656
Num ^= 0       637  Num > 0         637    Q3-Q1     0.767871
M(Sign)      318.5  Pr>=|M|      0.0001    Mode      2.995732
Sgn Rank  101601.5  Pr>=|S|      0.0001
W:Normal  0.955036  Pr<W         0.0001
```



--- DEPTH=Subsurface ANALYSIS=Zinc ---

All Observations

Variable=LNVALUE

Moments

N	647	Sum Wgts	647
Mean	2.874496	Sum	1859.799
Std Dev	0.810087	Variance	0.65624
Skewness	-0.38497	Kurtosis	0.047963
USS	5769.915	CSS	423.9312
CV	28.18187	Std Mean	0.031848
T:Mean=0	90.25731	Pr>|T|	0.0001
Num ^= 0	647	Num > 0	646
M(Sign)	322.5	Pr>=|M|	0.0001
Sgn Rank	104813	Pr>=|S|	0.0001
W:Normal	0.978722	Pr<W	0.0089

Quantiles(Def=5)

100% Max	5.247024	99%	4.418841
75% Q3	3.48124	95%	4.060443
50% Med	2.944439	90%	3.871201
25% Q1	2.302585	10%	1.791759
0% Min	-0.18633	5%	1.435085
		1%	0.788457
Range	5.433354		
Q3-Q1	1.178655		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
-0.18633(	13306)	4.634729(	13149)
0.470004(	13260)	4.644391(	13055)
0.530628(	13308)	4.663439(	13063)
0.530628(	13307)	5.247024(	4180)
0.641854(	13294)	5.247024(	14045)

```
                 Histogram                        #         Boxplot
   5.25+*                                         2            |
       .*                                         3            |
       .**********                               37            |
       .****************************            112            |
       .**************************************  151         +-----+
       .**********************************      134         *--+--*
       .******************************          119         +-----+
       .*************                            51            |
       .*******                                  27            |
       .***                                       9            0
       .*                                         1            0
  -0.25+*                                         1            0
        ----+----+----+----+----+----+----+---
        * may represent up to 4 counts
```

```
                          Normal Probability Plot
   5.25+                                                        *
       |                                                    +++**
       |                                              +***********
       |                                        *********
       |                                  *******
       |                            *******
       |                      *******
       |                 ******
       |  ++*******
       |*****
       |*
  -0.25+*
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

Detected Observations

Moments

N	646	Sum Wgts	646
Mean	2.874625	Sum	1857.008
Std Dev	0.810708	Variance	0.657247
Skewness	-0.38516	Kurtosis	0.043592
USS	5762.124	CSS	423.9242
CV	28.20221	Std Mean	0.031897
T:Mean=0	90.12248	Pr>|T|	0.0001
Num ^= 0	646	Num > 0	645
M(Sign)	322	Pr>=|M|	0.0001
Sgn Rank	104489.5	Pr>=|S|	0.0001
W:Normal	0.978618	Pr<W	0.0081

Quantiles(Def=5)

100% Max	5.247024	99%	4.418841
75% Q3	3.48124	95%	4.060443
50% Med	2.944439	90%	3.871201
25% Q1	2.302585	10%	1.791759
0% Min	-0.18633	5%	1.435085
		1%	0.788457
Range	5.433354		
Q3-Q1	1.178655		
Mode	2.484907		

Extremes

Lowest	ID	Highest	ID
-0.18633(	13306)	4.634729(	13149)
0.470004(	13260)	4.644391(	13055)
0.530628(	13308)	4.663439(	13063)
0.530628(	13307)	5.247024(	4180)
0.641854(	13294)	5.247024(	14045)

```
                 Histogram                        #         Boxplot
   5.25+*                                         2            |
       .*                                         3            |
       .**********                               37            |
       .****************************            112            |
       .**************************************  151         +-----+
       .**********************************      133         *--+--*
       .******************************          119         +-----+
       .*************                            51            |
       .*******                                  27            |
       .***                                       9            0
       .*                                         1            0
  -0.25+*                                         1            0
        ----+----+----+----+----+----+----+---
        * may represent up to 4 counts
```

```
                          Normal Probability Plot
   5.25+                                                        *
       |                                                    +++**
       |                                              +***********
       |                                        *********
       |                                  *******
       |                            *******
       |                      *******
       |                 ******
       |  ++*******
       |*****
       |*
  -0.25+*
        +----+----+----+----+----+----+----+----+----+----+
            -2        -1         0        +1        +2
```

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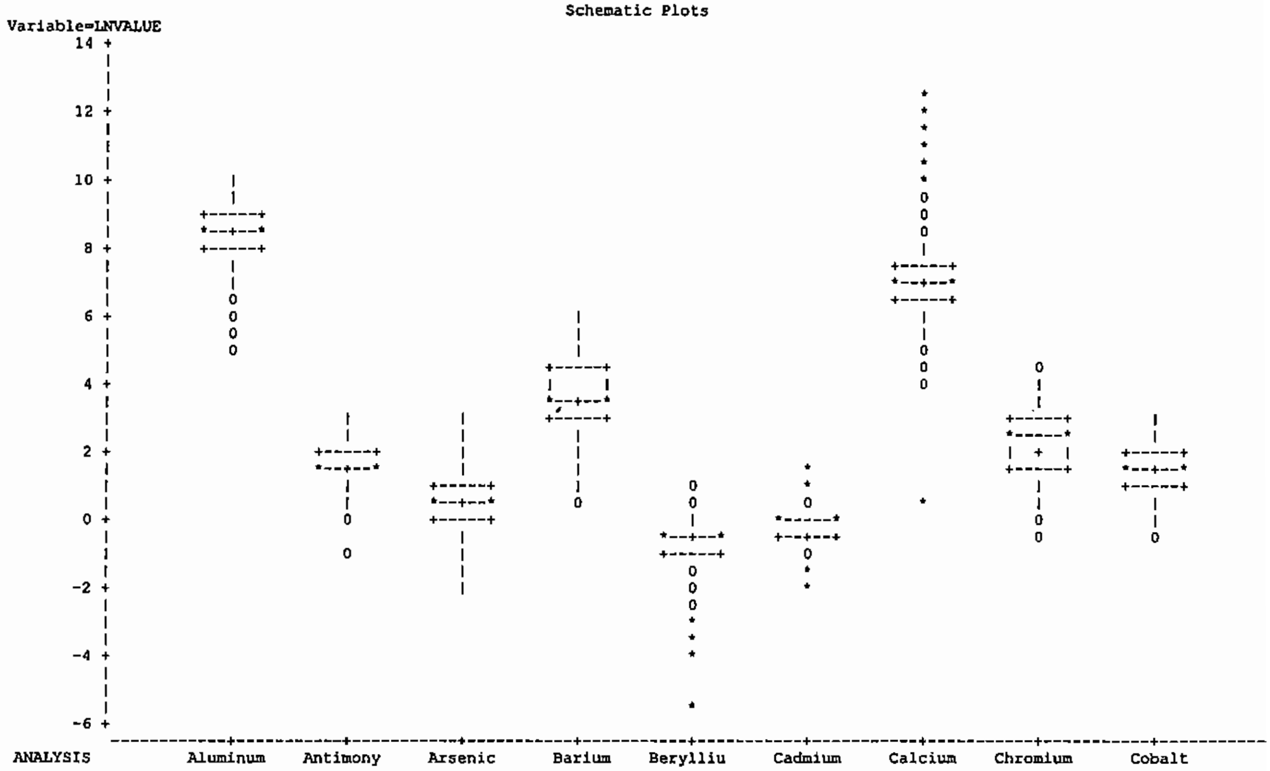
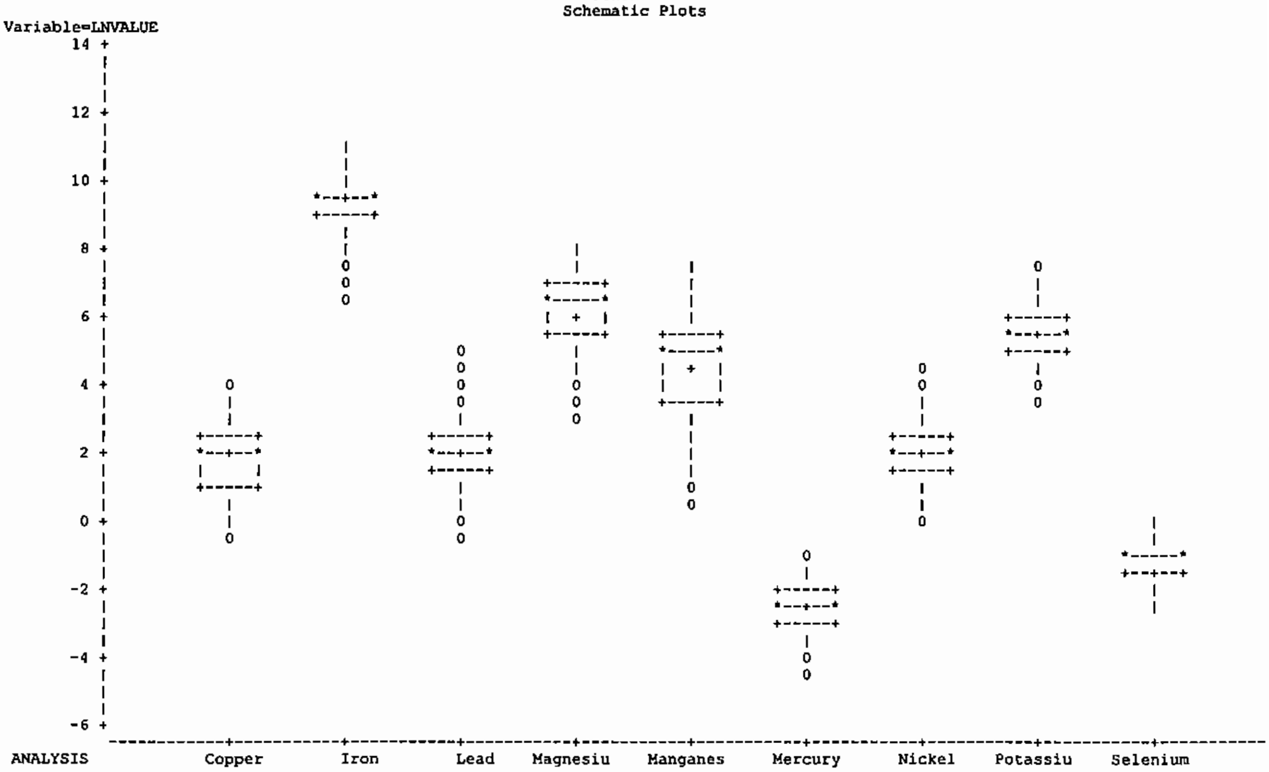
All Observations - Subsurface
Schematic Plots

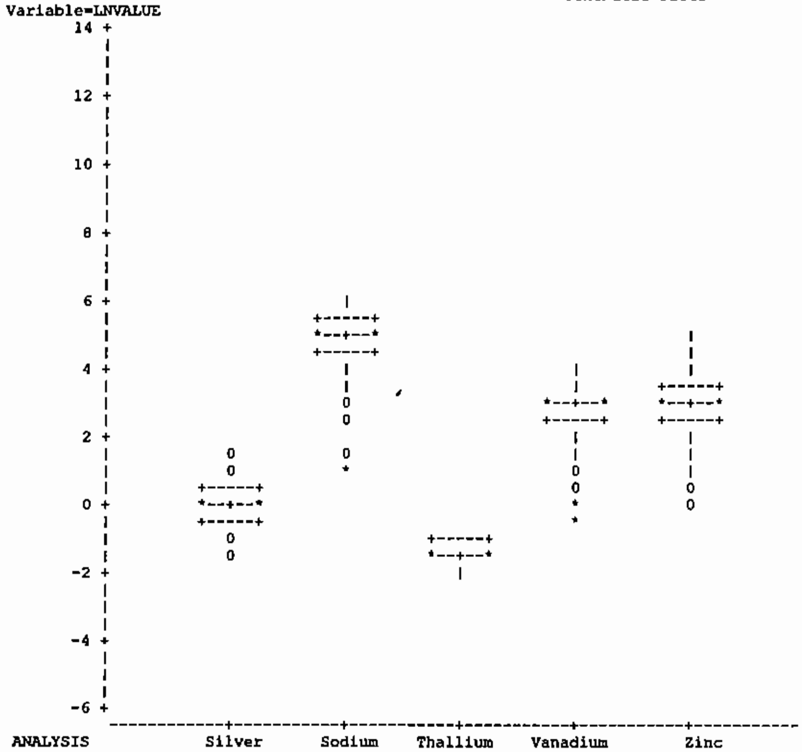


All Observations - Subsurface
Schematic Plots

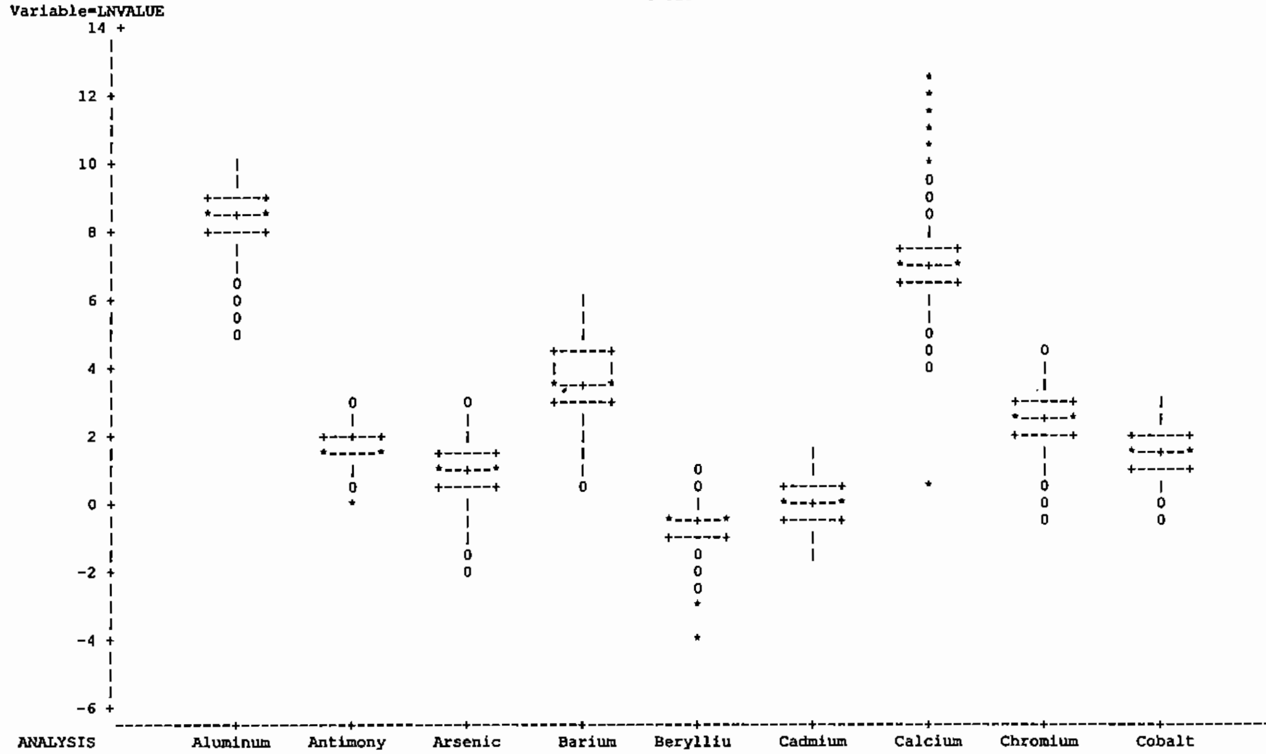


A-121

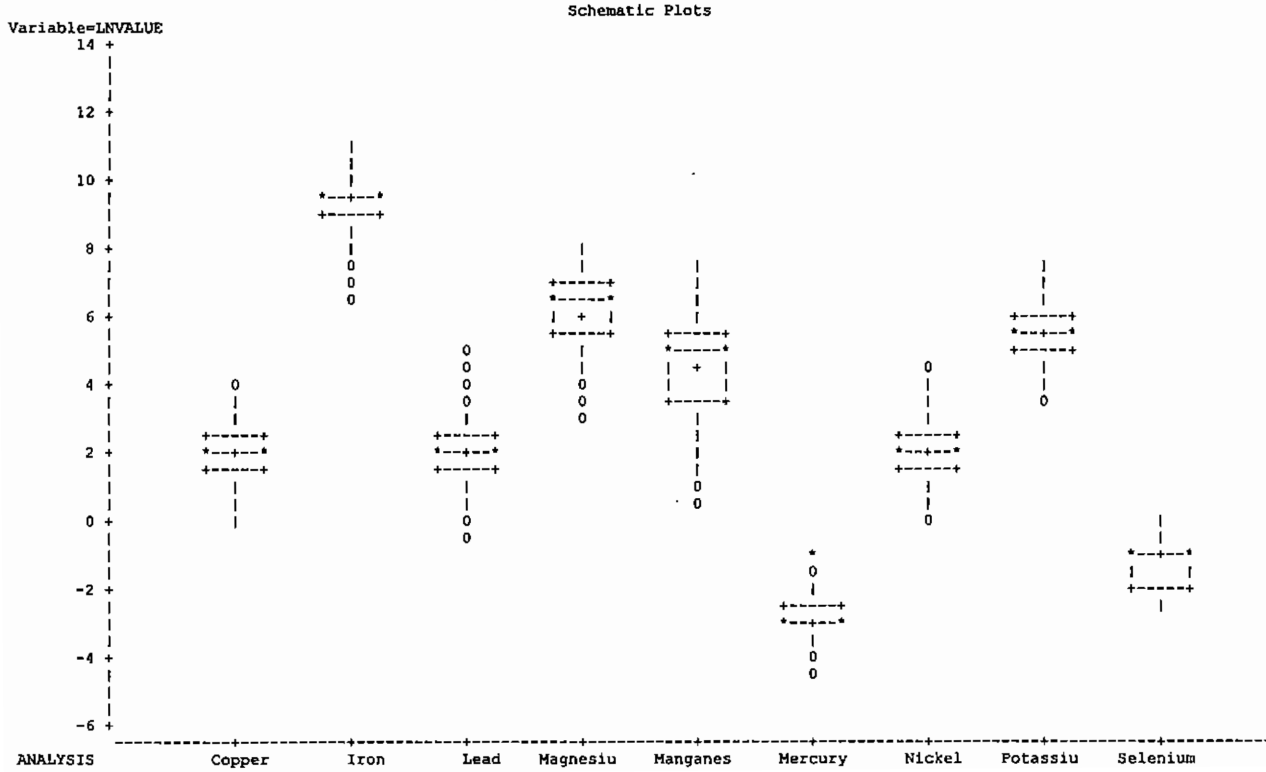
All Observations - Subsurface
Schematic Plots



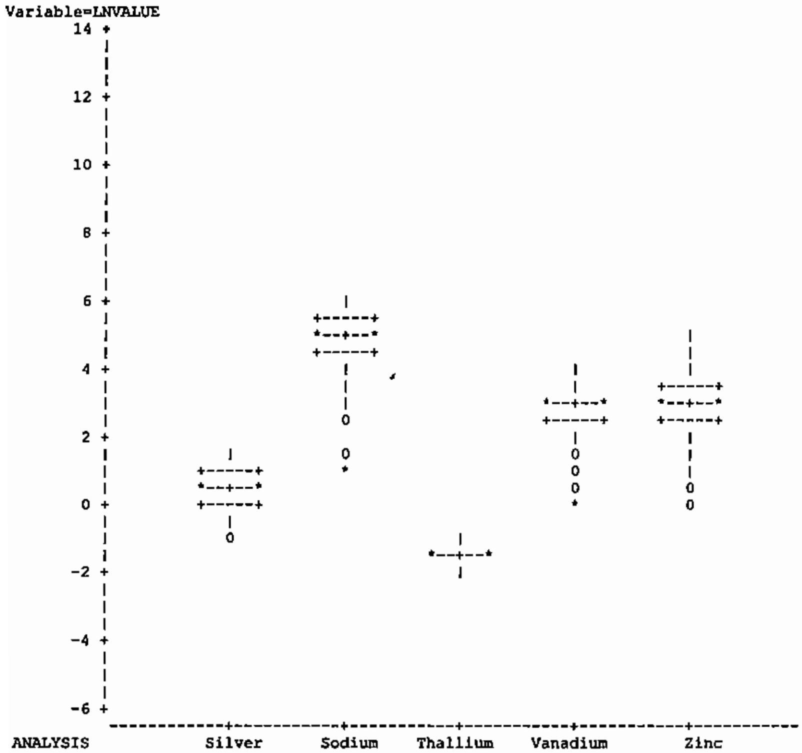
Detected Observations - Subsurface
Schematic Plots



Detected Observations - Subsurface
Schematic Plots



Detected Observations - Subsurface
Schematic Plots



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Appendix B

UNIT DATA SHEETS

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B-3

UNIT DATA SHEETS

This appendix contains the unit data sheets for those solid waste management units appearing at least once in Tables 2.5, 2.6, 2.12, and 2.13. On these sheets the following information is provided:

- the solid waste management unit identification number,
- the unit name,
- the regulatory status of the unit,
- a description of the location of the unit;
- the approximate dimensions of the unit,
- the capacity of the unit (if applicable),
- the function of the unit,
- the operational status of the unit,
- the dates the unit operated,
- a brief decription of the site and the process that occurred at the site,
- a description of the waste at the site (if any),
- the quantity of waste at the site (if any),
- a discussion of past releases (if any), and
- a brief discription of the results of previous investigation activities at the unit.

UNIT NUMBER 1

UNIT NAME C-747-C Oil Landfarm

REGULATORY STATUS 3004(u)

LOCATION Extreme west-central area of plant site (Map Location 1)

APPROXIMATE DIMENSIONS 2,250 ft^2

CAPACITY

FUNCTION Utilized for biodegradation of waste oils

OPERATIONAL STATUS Inactive

DATES OPERATED 1975 to 1979

SITE/PROCESS DESCRIPTION: The site consisted of two plots of about 1125 ft^2 each. The area was initially plowed to a depth of 1 to 2 ft. Waste oil was spread on the surface. Periodically lime and fertilizer were spread on the sites and the surface plowed. Oil was added at intervals of 3 to 4 months.

WASTE DESCRIPTION: Waste lubricating oil contaminated with uranium, PCBs, and possibly trichloroethylene/ trichloroethane (F001). Contaminant levels range from nondetectable to 100,000+ ppm. Contaminant levels usually fall in the range of 25 to 10,000 ppm.

WASTE QUANTITY: 5000+ gal

DOCUMENTATION OF RELEASES: No information available.

DOCUMENTATION OF NO RELEASE: No information available.

RFI NECESSARY: Yes.

UNIT NUMBER 2

UNIT NAME C-749 Uranium Burial Ground

REGULATORY STATUS 3004(u)

LOCATION North of Virginia Ave., western area of plant site (Map location 2)

APPROXIMATE DIMENSIONS 32,000 ft² (160' x 200'); Depth ~17 ft
CAPACITY
FUNCTION Burial ground for uranium and uranium-contaminated wastes
OPERATIONAL STATUS Inactive
DATES OPERATED 1951(?) to 1974

SITE/PROCESS DESCRIPTION: The site consisted of a pit excavated to a depth of 16 to 17 ft. As waste was interred, it was covered with 2 to 3 ft of earth. A 6-in. clay cap was installed in 1982.

WASTE DESCRIPTION: The majority of the waste consisted of pyrophoric forms of uranium metal (D003). Petroleum-based and synthetic oils were used to stabilize the material, and a quantity of this oil was buried with the waste. Other forms of uranium including oxides of uranium (solid and dissolved in aqueous solutions) and UF_4 were buried in smaller quantities. Approximately 400 to 500 gallons of contaminated trichloroethylene (F001) were also buried.

WASTE QUANTITY: Uranium ~245,000 kg
Oils ~53,000 gal
TCE ~450 gal

DESCRIPTION OF RELEASES: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 3

UNIT NAME C-404 Low-Level Radioactive Waste Burial Ground

REGULATORY STATUS RCRA Subtitle C landfill

LOCATION North of Virginia Ave., west-central portion of plant (Map location 3)

APPROXIMATE DIMENSIONS ~53,200 ft^2 (140' x 380'); Depth ~9 ft

FUNCTION Utilized for the disposal of solid uranium-bearing wastes. A small number of encapsulated sources were placed in the upper portion of the landfill.

OPERATIONAL STATUS Inactive

DATES OPERATED 1951 to 1986

SITE/PROCESS DESCRIPTION: Originally constructed as an above-ground holding pond with a tamped earth floor and clay dike walls. Liquid uranium-bearing wastes were treated in the pond in the 1950s. This was discontinued and solid contaminated scrap was placed in the site until it was filled in the mid-1970s. At that time the burial of containerized and bulk wastes on top of the filled-in pond area was begun. A partial clay cap was installed on the eastern end of the site in 1982.

WASTE DESCRIPTION: In the holding pond area the waste consists of uranium precipitated from aqueous solutions, UF_4, uranium metal, uranium oxides, and contaminated trash. The upper tier of wastes contains the same type of wastes plus smelter furnace liners and ~450 drums of EP Toxic hazardous wastes. (D006, D008, and D010)

WASTE QUANTITY: Uranium ~3,000,000 kg
Total volume ~260,000 ft^3

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: No, The final post-closure monitoring plan will provide the necessary data.

UNIT NUMBER 3 (con't)

UNIT NAME C-404 Low-Level Radioactive Waste Burial Ground

ADDITIONAL REFERENCES:

Closure Plan, C-404 Low-level Radioactive Waste Burial Ground, KY/B-257

Groundwater Protection Program, C-404 Low-level Radioactive Waste Burial Ground, prepared by EDGe, Inc.

Exposure Information Report, C-404 Low-level Radioactive Waste Burial Grour
KY/B-260

UNIT NUMBER 4

UNIT NAME C-747 Contaminated Burial Yard

REGULATORY STATUS 3004(u)

LOCATION Immediately south of Virginia Ave., between 4th and 6th Streets (Map location 4)

APPROXIMATE DIMENSIONS 8300 ft² (50' x 165'); Depth ~15 ft

FUNCTION Utilized for the burial of uranium-contaminated trash and equipment. Some trash was burned prior to being covered.

OPERATIONAL STATUS Inactive

DATES OPERATED 1951 to 1958

SITE/PROCESS DESCRIPTION: The site consists of two pits (50' x 15' and 50' 150'), evacuated to a depth of about 15 ft. The waste placed in the area w covered with 2 to 3 ft of soil. A 6-in. clay cap was installed in 1982.

WASTE DESCRIPTION: Contaminated and uncontaminated trash, some of which w burned, was buried at the site. Scrapped equipment (steel, Monel, etc.) w surface contamination from the enrichment process was also buried.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 5

UNIT NAME C-746-F Classified Scrap Yard

REGULATORY STATUS Active Subtitle D landfill

LOCATION Northwest area of security site (Map location 5)

APPROXIMATE DIMENSIONS 168,000 ft^2 (840' x 200'); Depth 8-12 ft

FUNCTION Burial ground for the disposal of contaminated and uncontaminated classified scrap.

OPERATIONAL STATUS Active

DATES OPERATED 1965(?) to present

SITE/PROCESS DESCRIPTION: Disposal pits are excavated as needed. Waste covered with 2 to 3 ft of earth.

WASTE DESCRIPTION: Security classified wastes, some radionuclide contaminated wastes.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 7

UNIT NAME C-747-A Burial Ground

REGULATORY STATUS 3004(u)

LOCATION Extreme northwest corner of security area (Map location 7)

APPROXIMATE DIMENSIONS
Area A - 19,250 ft^2 (70' x 275'), Depth 10-12 ft;
Area B - 10,200 ft^2 (60' x 170'), Depth 6-7 ft;
Area C - 9,600 ft^2 (60' x 160'), Depth 6-7 ft;
Area D - 2,100 ft^2 (15' x 140'), Depth 6-7 ft;
Area E - 1,500 ft^2 (15' x 100'), Depth 6-7 ft;
Area F - 400 ft^2 (20' x 20'), Depth 6-7 ft;
Area G - 3,600 ft^2 (30' x 120'), Depth 6-7 ft

FUNCTION Used for the burial of a wide variety of trash, equipment, and scrap metal

OPERATIONAL STATUS Inactive

DATES OPERATED 1957 to 1979

SITE/PROCESS DESCRIPTION: Burial pits were excavated, filled with trash which was then covered with about 3 ft of earth.

WASTE DESCRIPTION:
Area A - noncombustible trash and some contaminated equipment;
Areas B, C, and G - noncombustible contaminated and uncontaminated trash and equipment;
Areas D and E - contaminated concrete;
Area F - uranium contaminated scrap metal and equipment

WASTE QUANTITY:
Area A - 100,000 ft^3;
Area B - unknown;
Area C - unknown;
Area D - ~10 tons;
Area E - ~10 tons;
Area F - unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

Rev. 1
2.10/92

UNIT NUMBER: SWMU 8

UNIT NAME: C-746-K Sanitary Landfill

REGULATORY STATUS: 3004u

LOCATION: Southwest of security area, immediately south of C-611 (Map locat 8)

APPROXIMATE DIMENSIONS: Roughly circular, 200 to 250 ft in diameter

FUNCTION: Utilized as a sanitary waste landfill

OPERATIONAL STATUS: Inactive

DATES OPERATED: 1951(?) to 1982

SITE/PROCESS DESCRIPTION: Originally used for the disposal of steam plant fly-ash from coal burning. Trenches were cut in ash and were used for the burning of trash until 1967. After that date trash was buried without burning. The site depth is approx. 20ft. with al waste originally placed aboveground. A clay cap installed in 1982.

WASTE DESCRIPTION: Fly ash from coal-burning operations, sanitary trash (burned and unburned), possibly some slightly contamina trash. Update 2/10/92 On 1/31/92 Seepage in a ditch adjacent to the unit consisting of white and dark brown material has been identified. Initial analysis has identified volatiles and metals. Volatile analysis has identified Trichloroethene (5 ug/l), 1,1-Dichloroethene ug/l), 1,1-Dichloroethane (7 ug/l), and Trans-1,2-Dichloroethene (52 ug/l) present in the seepa More sampling has been initiated to provide additional information on volatiles and metals. Sandbags have bee placed in the ditch to contain the seepage.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available Update 2/10/92 Refer to I Description section.

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes Update 2/10/92 This unit has been placed in WAG 13 and scheduled to have the draft RFI work plan issued in March, 1993. PGDP recommends upgrading this SWMU from its presen to the RFI for WAGs 1 and 7 which is scheduled to have the draft RFI work plan issued in September, 1992.

UNIT NUMBER 9

UNIT NAME C-746-S Residential Landfill

REGULATORY STATUS Subtitle D sanitary landfill

LOCATION Approximately 1/4 mile north of plant, immediately north of KY-358 (Map location 9)

APPROXIMATE DIMENSIONS 20.2 acres

FUNCTION Utilized for the disposal of uncontaminated trash.

OPERATIONAL STATUS Active

DATES OPERATED 1982 to present

SITE/PROCESS DESCRIPTION: Area is organized into 6 cells. Each cell is initially lined with 12 in. of clay covered with compacted soil. Trash is compacted and daily covered with soil. When the cell is filled, it is c... with clay and covered with soil.

WASTE DESCRIPTION: Uncontaminated trash and garbage

WASTE QUANTITY: ~380,000 ft^3

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: No. Unit is permitted and operated according to Kentucky regulations.

UNIT NUMBER 10

UNIT NAME C-746-T Inert Landfill

REGULATORY STATUS Subtitle D industrial landfill

LOCATION Approximately 1/4 mile north of security area, immediately north of KY-358 (Map location 10)

APPROXIMATE DIMENSIONS 20.1 acres

FUNCTION Utilized for industrial trash disposal

OPERATIONAL STATUS Active

DATES OPERATED 1950 to present

SITE/PROCESS DESCRIPTION: Industrial wastes such as construction debris a: placed in the landfill cell. Steam plant fly ash is used as a filler material. The cells are closed by covering with clay as required by the operating permit.

WASTE DESCRIPTION: Construction waste such as concrete, wood, rock. Fly : from coal-burning operations is used as fill. A small amount of uncontaminated scrap metal is also burned.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: No. Unit is permitted and operated according to Kentucky regulations.

UNIT NUMBER 11

UNIT NAME C-400 Trichloroethylene Leak Site

REGULATORY STATUS Spill site, 3004(u)

LOCATION Southwest corner of C-400 (Map location 11)

APPROXIMATE DIMENSIONS Unknown

FUNCTION None

OPERATIONAL STATUS None

DATES OPERATED N/A

SITE/PROCESS DESCRIPTION: In mid-1986 the leakage of trichloroethylene from an underground storm sewer was discovered. The TCE was released to sewer from the C-400 degreaser area. It was not known that the sump discharged to the sewer.

WASTE DESCRIPTION: Trichloroethylene (F001)

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: See Site/Process Description

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 12

UNIT NAME C-747-A UF_4 Drum Storage Yard

REGULATORY STATUS 3004(u)

LOCATION Northwest corner of security area (Map location 12)

APPROXIMATE DIMENSIONS 20,000 ft² (100' x 200')

FUNCTION Scrap metal yard

OPERATIONAL STATUS Active

DATES OPERATED 1979 to present

SITE/PROCESS DESCRIPTION: Above-ground metal waste pile

WASTE DESCRIPTION: Drums used for the storage of UF_4. The drums are emptied, rinsed, and crushed prior to placement in the yard.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 13

UNIT NAME C-746-P Clean Scrap Yard

REGULATORY STATUS 3004(u)

LOCATION Northwest corner of plant site (Map location 13)

APPROXIMATE DIMENSIONS 294,000 ft^2 (290' x 1076')

FUNCTION Used for the accumulation of scrap metal

OPERATIONAL STATUS Active

DATES OPERATED 1950s to present

SITE/PROCESS DESCRIPTION: Above-ground scrap yard used for the accumulati of clean scrap metal prior to sale to scrap metal reclaimers.

WASTE DESCRIPTION: Clean scrap metal of all types

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes.

UNIT NUMBER 17

UNIT NAME C-616-E Sludge Lagoon

REGULATORY STATUS 3004(u)

LOCATION North of plant security area outside fence (Map location 17)

APPROXIMATE DIMENSIONS 215,000 ft^2; Depth 12.5 ft

FUNCTION Surface impoundment

OPERATIONAL STATUS Active

DATES OPERATED 1977 to present

SITE/PROCESS DESCRIPTION: The lagoon is an L-shaped impoundment constructed with a clay floor placed at ground level and earth/clay walls.

WASTE DESCRIPTION: Sludge containing trivalent chromium from the C-616 water treatment facility. The sludge has been EP-Toxicity tested and is nonhazardous (see attachment).

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 18

UNIT NAME C-616-F Full-Flow Lagoon

REGULATORY STATUS 3004(u)

LOCATION North of plant security fence, outside of security area (Map location 18)

APPROXIMATE DIMENSIONS 366,000 ft² (285' x 1285'); Depth 12 ft

FUNCTION Surface impoundment

OPERATIONAL STATUS Active

DATES OPERATED 1977 to present

SITE/PROCESS DESCRIPTION: Rectangular above-ground surface impoundment use as an overflow receiver from the C-616-E Sludge Lagoon and as a settling pc for the north-south ditch flow. The lagoon is constructed with an on-grade clay floor and above-ground dike walls.

WASTE DESCRIPTION: Some solids (chromium sludge) from C-616-E and some solids (primarily fly ash) from the north-south ditch.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE:

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 20

UNIT NAME C-410-E HF Emergency Holding Pond

REGULATORY STATUS 3004(u)

LOCATION At HF tank farm east of C-410 (Map location 20)

APPROXIMATE DIMENSIONS 600 ft² (20' x 30'); Depth 7 ft

FUNCTION Designed as a holding area for releases of HF

OPERATIONAL STATUS Active

DATES OPERATED Never used for original purpose; constructed 1950s

SITE/PROCESS DESCRIPTION: Below-grade lagoon with earth floor and wire-reinforced grout walls.

WASTE DESCRIPTION: No known waste

WASTE QUANTITY: None

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: No, the unit has never received any type of waste.

UNIT NUMBER 26

UNIT NAME C-400 to C-404 Underground Transfer Line

REGULATORY STATUS 3004(u)

LOCATION C-400 to C-404 (Map location 26)

APPROXIMATE DIMENSIONS 4-in steel line, ~1500 ft long

FUNCTION Transfer of uranium-contaminated solutions from C-400 to C-404

OPERATIONAL STATUS Inactive

DATES OPERATED 1951 to 1956

SITE/PROCESS DESCRIPTION: Waste solutions contaminated with uranium were transferred from C-400 to C-404 for settling prior to discharge.

WASTE DESCRIPTION: Aqueous solutions containing uranium and other radionuclides.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 30

UNIT NAME C-747-A Burn Area

REGULATORY STATUS 3004(u)

LOCATION Western section of C-747-A burial ground (Map location 30)

APPROXIMATE DIMENSIONS Unknown

FUNCTION Used for burning combustible trash

OPERATIONAL STATUS Inactive

DATES OPERATED 1951 to 1970

SITE/PROCESS DESCRIPTION: Burn area

WASTE DESCRIPTION: Combustible trash

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 33

UNIT NAME C-728 Motor Cleaning Facility

REGULATORY STATUS 3004(u)

LOCATION North of C-720 (Map location 33)

APPROXIMATE DIMENSIONS

FUNCTION Motor cleaning unit

OPERATIONAL STATUS Active

DATES OPERATED 1957 to present

SITE/PROCESS DESCRIPTION: Until ~1975, motors were cleaned by dipping in a tank containing mineral spirits. This operation was discontinued and a steam cleaning unit and a water treatment unit were installed.

WASTE DESCRIPTION: Mineral spirits containing grease, oil, and uranium. Aqueous solutions of uranium, NaOH.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information available

RFI NECESSARY: Yes

UNIT NUMBER 40

UNIT NAME C-403 Neutralization Tank

REGULATORY STATUS 3004(u)

LOCATION Northeast corner of C-400 (Map location 40)

APPROXIMATE DIMENSIONS 24'4" square, 18' deep

FUNCTION Hold-up tank

OPERATIONAL STATUS Active

DATES OPERATED 1950s to present

SITE/PROCESS DESCRIPTION: In-ground concrete tank acid-brick lined.

WASTE DESCRIPTION: Currently used for the collection of UF_6 cylinder hydrostatic test water and area runoff. Previously used for hold-up/neutralization of uranium-bearing waste solutions.

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE: No information

RFI NECESSARY: Yes

UNIT NUMBER 47

UNIT NAME C-400 Technetium Storage Tank Area

REGULATORY STATUS 3004(u)

LOCATION C-400, west side, outside of building (Map location 47)

APPROXIMATE DIMENSIONS 4,000-gal

FUNCTION Waste solution storage

OPERATIONAL STATUS Inactive (tank has been removed)

DATES OPERATED Early 1960s

SITE/PROCESS DESCRIPTION: A 4000-gal tank was used to store a waste solution of chromium and Technetium-99. The tank was located on a concrete pad outside of the C-400 building.

WASTE DESCRIPTION: The aqueous waste containing chromium and Tc-99

WASTE QUANTITY: ~200-gal in tank. No spills known to have occurred. Tank removed in December 1986.

DESCRIPTION OF RELEASE: No information available

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 79

UNIT NAME C-611 PCB Spill Site

REGULATORY STATUS CERCLA

LOCATION C-611 Transformer area (Map location 79)

APPROXIMATE DIMENSIONS

FUNCTION Spill site

OPERATIONAL STATUS N/A

DATES OPERATED Date of release unknown

SITE/PROCESS DESCRIPTION: Spill site

WASTE DESCRIPTION: PCBs

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: Transformer oils containing PCBs were released to soils in the vicinity.

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 80

UNIT NAME C-540A PCB Spill Site

REGULATORY STATUS CERCLA

LOCATION C-540A (Map location 80)

APPROXIMATE DIMENSIONS

FUNCTION Spill site

OPERATIONAL STATUS N/A

DATES OPERATED Releases occurred from the 1950s to about 1970.

SITE/PROCESS DESCRIPTION: Spill site

WASTE DESCRIPTION: PCBs

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: Transformer oils containing PCBs were released soils in the vicinity.

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 81

UNIT NAME C-541-A PCB Spill Site

REGULATORY STATUS CERCLA

LOCATION C-541-A (Map location 81)

APPROXIMATE DIMENSIONS

FUNCTION Spill site

OPERATIONAL STATUS N/A

DATES OPERATED Releases occurred from the 1950s to about 1976

SITE/PROCESS DESCRIPTION: Spill site

WASTE DESCRIPTION: PCBs

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: Transformer oils containing PCBs were released to soils in the area.

DOCUMENTATION OF NO RELEASE:

RFI NECESSARY: Yes

UNIT NUMBER 91

UNIT NAME UF$_6$ Cylinder Drop Test Pit

REGULATORY STATUS: CERCLA

LOCATION: Between Virginia Avenue and C-745(B) Cylinder Yard

APPROXIMATE DIMENSIONS: Approximately 12 X 5 ft.

FUNCTION: Used to freeze steel cylinders

OPERATIONAL STATUS: Inactive

DATES OPERATED: 1979

SITE/PROCESS DESCRIPTION: Steel cylinders were submerged in a pit containi a trichloroethylene (TCE)/dry ice slush to freeze the cylinders prior to conducting a drop test to determine structural integrity.

WASTE DESCRIPTION: TCE

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: TCE may be leaching from the pit into surrounding soil

DOCUMENTATION OF NO RELEASE: Field screening of samples from a boring dri adjacent to the pit indicated elevated levels of potential VOC at shallow depths. The boring was conducted during the CERCLA Groundwater Investigat 1990.

RFI NECESSARY: Yes

UNIT NUMBER 92

UNIT NAME Fill Area for Dirt from C-420 PCB Spill Site

REGULATORY STATUS: CERCLA

LOCATION: North of C-331, west of water towers

APPROXIMATE DIMENSIONS: Unknown

FUNCTION: N/A

OPERATIONAL STATUS: N/A

DATES OPERATED: NA

SITE/PROCESS DESCRIPTION: PCB contaminated soil from transformer failure (August 1967) at C-420 area was transported to this location and spread on ground as fill material.

WASTE DESCRIPTION: PCBs

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: PCB contaminated soil spread and used as fill.

DOCUMENTATION OF NO RELEASE: N/A

RFI NECESSARY: Yes

UNIT NUMBER: SWMU 95

UNIT NAME: KOW Burn Area

REGULATORY STATUS: CERCLA

LOCATION: Northeast of C-746(K) inactive sanitary landfill

APPROXIMATE DIMENSIONS: Unknown

FUNCTION: Burn and burial of waste from KOW

OPERATIONAL STATUS: Inactive

DATES OPERATED: Approximately 1941-1945

SITE/PROCESS DESCRIPTION: It is assumed that waste was placed on the ground surface, burned, and buried in place.

WASTE DESCRIPTION: Unknown

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: A review of draft analytical data from preliminary soil sampling suggests the presence of trinitrotoluene (TNT) at elevated levels. In addition, the results suggest the presence of other semivolatiles at lower concentrations. Soil gas sampling detected trichloroethene, carbon tetrachloride, and toluene.

DOCUMENTATION OF NO RELEASE: N/A

RFI NECESSARY: This area is included in this PA because it is on DOE property. A preliminary site investigation is currently being performed at this site under the U. S. Army's Defense Environmental Restoration Program. All future response action at this site should be coordinated with the Department of Defense.

UNIT NUMBER SWMU 97

UNIT NAME C-601 Diesel Spill

REGULATORY STATUS: AOC (CERCLA)

LOCATION: East Side of C-600

APPROXIMATE DIMENSIONS: Unknown

FUNCTION: Diesel fuel storage tank

OPERATIONAL STATUS: Active

DATES OPERATED: 1951 - present

SITE/PROCESS DESCRIPTION: Storage tanks for storage of fuel oil

WASTE DESCRIPTION: Diesel fuel constituents were observed in soils during the Phase II investigation

WASTE QUANTITY: Unknown

DESCRIPTION OF RELEASE: On March 9, 1979 a spill of approximately 17,000 gal. of no. 2 fuel oil occurred at the C-601 fuel oil tank area. Refer to the Phase II report for concentrations of contaminants in the soil.

DOCUMEMTATION OF NO RELEASE: N/A

RFI NECESSARY: YES
This unit underwent a priortized RFI under the CERCLA ACO. It was determined that it was not a source of Off-site contamination. However, Polycyclic Aromatic hydrocarbons were detected at up to 8 parts per million from the Phase II Site Investigation under an Administrative Consent Order. PCB was detected in a sample at less than one part per million. See the Phase II Investigation Report for additional details. Thi unit will be further addressed with WAG 9 in accordance with the RFI schedule outlined in the HSWA Permit.

UNIT NUMBER SWMU 99

UNIT NAME C-745 Kellogg Building Site

REGULATORY STATUS: AOC (CERCLA)

LOCATION: East Side of Plant. C-746-D Classified Scrapyard

APPROXIMATE DIMENSIONS: approximately 320 ft wide by 480 ft long

FUNCTION: Pipe Fabrication for initial construction of plant

OPERATIONAL STATUS: inactive

DATES OPERATED: Early to mid-1950's

SITE/PROCESS DESCRIPTION: Pipe fabrication which included pipe cleaning activities

WASTE DESCRIPTION: possible TCE

WASTE QUANTITY: unknown

DESCRIPTION OF RELEASE: TCE may have been released to the ground surface near the building site. Refer to the Phase II report for additional details.

DOCUMENTATION OF NO RELEASE: N/A

RFI NECESSARY: YES
This area underwent a prioritized RFI under the CERCLA ACO. Results of prioritized investigation did not indicate this unit to be a significant contribution to offsite contamination. This area will be addressed with WAG 5. The RFI plan for this WAG is due in June, 1992.

UNIT NUMBER SWMU 100

UNIT NAME Fire Training Area

REGULATORY STATUS: AOC (CERCLA)

LOCATION: South of C-747 Oil Land Farm and at the west side of 4th street

APPROXIMATE DIMENSIONS: 20ft x 20ft

FUNCTION: Combustible liquids may have been burned in pits for fire training exercises. the area is still utilized for fire training with the combustible liquids contained in a metal pan

OPERATIONAL STATUS: In place

DATES OPERATED: 1982 - 1987

SITE/PROCESS DESCRIPTION: Waste oils, solvents, and other combustible liquids may have been burned at this location for fire training exercises

WASTE DESCRIPTION: possible TCE or PCB-contaminated waste oils and solvents

WASTE QUANTITY: unknown

DESCRIPTION OF RELEASE: Unburned materials may have been released to the ground. Refer to the Phase II report for additional details.

DOCUMENTATION OF NO RELEASE: N/A

RFI NECESSARY: YES
This area underwent a prioritized RFI under the CERCLA ACO. Results of prioitized investigation did not indicate this unit to be a significant contribution to offsite contamination. This area will be addressed with WAG 1. The RFI plan for this WAG will be submitted inaccordance with the schedule in the HSWA permit.

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Appendix C

RESPONSE TO COMMENTS ON KY/EM-77

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RESPONSE TO COMMENTS ON KY/EM-77

This appendix contains the comment response summary to comments received from the regulatory agencies. Items in bold type refer to areas of the revised document where the comment is specifically addressed. Note that not all items contain bold type because the response to some comments led to major changes of the document.

Comment Response Summary

Background Concentrations and Human Health Risk-based Screening Criteria for Metals in Soil at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky KY/EM-77 (Issued April 1995)

Comment Number	Page; Section; Paragraph	Comment	Response
General Comments			
1		According to Section 2.1 (page A-1.3) data collected during the Phase I and II Site Investigations were used to calculate background soil concentrations (CH2M Hill, 1991 and CH2M Hill, 1992). These samples apparently represent the largest data set available and were "taken from across the Paducah Gaseous Diffusion Plant..." However, no additional information is provided in the current document to demonstrate that these samples were collected appropriately from only background areas (those clearly known to be to be not contaminated) such that the samples adequately represent the background population.	The authors agree with the reviewer that it would be important for samples to have originated from areas of no known contamination if the background values were derived by simply calculating the summary statistics from all available data. However, because the data were segregated into contaminated and not contaminated populations using cumulative probability plots prior to data summarization, the issue raised in the comment is not valid. However, the author recognizes, because of this comment, that the importance of data segregation using cumulative probability plots was not adequately explained in the document. The revised document will contain an expanded discussion of data segregation using cumulative probability plots and other information. **[See Chapter 2 of the revised document.]**
2		High values (mercury, cadmium, antimony, and selenium) determined by comparison with published data ranges are generally attributed to analytical problems. It is not clear why these difficulties would not also lead to similar high values in the published data sets if similar analytical methods were used. State the difference in analytical methods employed in the current study from those used to establish data ranges in the literature. If different methods were not employed, state other possible factors that could attribute to the elevated levels obtained from Paducah.	A general discussion of analytical interference will be added to the introduction to Section 2.3, "Results," of Appendix A. This discussion will relate the following fact with appropriate references. The range of values published in the literature was derived using analytical techniques different from those commonly used to analyze samples from potentially contaminated sites. Generally, a laboratory, when directed to determine the concentration of a single analyte in a sample, will optimize the

Comment Response Summary
Background Concentrations and Human Health Risk-based Screening Criteria for Metals in Soil at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
KY/EM-77 (Issued April 1995)

Comment Number	Page; Section; Paragraph	Comment	Response
2 (cont.)			analytical procedures for that analyte (i.e., the laboratory will set the instruments to minimize interferences with the target analyte). However, when directed to determine the concentration of a suite of analytes, the laboratory will optimize the analytical procedures for the suite of analytes. This difference results in some sacrifice in analytical accuracy for trace elements. Because the primary use of data from samples collected at contaminated sites is to determine how best to protect human health and the environment, the direction of analytical bias allowed by most laboratories is positive in most suite analyses of trace elements. That is, the results for a sample analyzed for a suite of analytes will yield a result for a trace element that is greater than that which would result if the analyses was for the trace element alone. As noted in the report, the elements listed in the comment are those which are expected to be present at trace amounts and are, therefore, those which may have their analytical results most affected by being part of an analysis which considers a suite of analytes. In addition, it should be noted that DOE was also concerned about the high background values for mercury and antimony presented in the report. Therefore, at data quality objective meetings for a proposed background soils project at PGDP (in which samples will be collected from areas outside of known plant influence), it was determined that additional data to

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2 (cont.)			verify the elevated background mercury and antimony concentrations should be collected. In addition, it was determined that thallium analyses should be included. Finally, DOE is currently developing an estimate of the cost of including analyses for cadmium and selenium as part of the proposed background project. If analyses for these metals are included in the proposed background project, these analytes will need to be discussed.
3		State the justification for selecting the upper limit of the 90th confidence interval of the 99th percentile value of the range of each analyte as the upper limit of "background" concentration.	The upper limit of the 90th confidence interval of the 99th percentile was selected as the threshold value because it was believed by the authors that this value best represented the upper range of background and would preclude the cleanup of sites that are not contaminated. **In the revised document, the threshhold value used is the 95% upper limit of the confidence interval on the 95th percentile. This value was chosen because it is consistent with the State of Ohio's *How Clean Is Clean*; one of the few guidance documents that actually presents a method to set background (i.e., the 95% upper tolerance limit).**

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4		In situations where the data do not plot as a single straight line (Beryllium near surface samples, for example) no information or discussion is provided with respect to possible mechanisms or circumstances that could contribute to the observed distribution. One advantage of the plotting technique employed is that it visually indicates the possibility of individual data groups in the overall population. Yet when that is apparently the case, the situation is simply neglected and the 99th percentile is still used as the upper limit of background concentration.	Generally, the analyses of cumulative probability plots performed in the "Moore Report" were used to justify the segregation of populations (as is stated in Appendix A; Section 2.1). Therefore, the discussion of the plots was limited in this document. However, because the revised document will not referènce the "Moore Report," the revised document will include an expanded discussion of the cumulative probability plots. **[See Chapter 2 of the revised document.]** It should be noted that in the case of beryllium, the reviewer is correct in noting that there is the possibility of two populations; however, it is also important to note that the lower population has a maximum value of about 1 mg/kg. This value is near the minimum value of the ranges taken from the literature reported in Table A-2, near the average reported by Shaklette and Boerngen (1984), and one-sixth of the soil average reported by Lindsay (1979). Therefore, the maximum of the "lower population" is not a reasonable value, and the observed distribution may be an artifact of the laboratory analyses.

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5		It would have been very helpful to have the data for each analyte plotted at the same scale for both near surface and subsurface samples. This would facilitate comparison of the data to evaluate the potential presence of surface and subsurface sources for individual analytes. Better yet, both near surface and subsurface sampling results for each analyte could have been plotted on the same graph at the same scale for direct comparison.	Such plots could be constructed, but the value of such plots is not clear. First, it would not be appropriate to use the plots to look for sources of contamination. This is because the geographical location of the individual data points are not considered in constructing the plots. Second, because the data source for each plot is all available data, trying to force data to some scale could bias the analysis of the plot and lead to inaccurate population identification. Similarly, plotting both surface and subsurface data on the same plot could lead to a bias in the plot analysis because the perceived population structure of one data group (e.g., surface soil) could inadvertently lead the analyst to conclude the same structure exists in the other data group. **Because of these concerns, the large plots presented in the revised document are not plotted on the same scale; however, Appendix A of the revised document does contain boxplots with all analytes on the same scale.**

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6		Geochemical processes or geological occurrences of materials that would lead one to expect differences in the distribution of concentrations between near surface and subsurface samples need to be discussed. Include any general trends with depth of sampling. Discuss the reasoning behind using the division of less than one foot and greater than one foot depth. This reviewer suggests looking at a more appropriate division based on the actual physical system at the site.	The analysis of trends could be an interesting exercise, but the authors believe that the results of such an analysis would be of limited value. First, the division currently used is arbitrary (as discussed below), and any perceived trend would be a function of an administrative decision. Second, the cumulative probability plots are not adequate to identify reasons for differences between surface and subsurface soils, and any discussion of differences would be speculative. It should be noted that the discussion in Appendix A; Section 2.3 does discuss some of the observed differences and speculates on cause. The decision to divide the data into a near surface (i.e., less than 1 ft below ground surface) and subsurface (i.e., greater than 1 ft below ground surface) was based on how data are utilized in risk assessment for contaminated sites. This division was made to ensure that the appropriate background value (by depth) was used when site data are screened against background during the data evaluation step of the risk assessment. The discussion of this will be expanded in the revised document. Dividing the data set by geological unit could be performed by examining the boring logs associated with the sample collection performed during the Phases I and II Site Investigations. However, the authors believe that results of the analysis of data segregated by geological unit would be of

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6 (cont.)			little use. Currently there are no plans to screen data from SWMUs against background within geologic unit.
		Specific Comments	
1	Page 7; Table 1	Although our agency (KYDEP) principally samples areas that have been identified as contaminated, in perusal of that information and the background samples collected at those sites, some of the THRESH numbers are elevated over what has been seen across the state and within the Jackson Purchase Region. Antimony, arsenic, beryllium, chromium (VI), cobalt, mercury, nickel, thallium, and vanadium are at greater levels than we normally have seen at other sites. In general, at these sites, we found surficial antimony under 1.0 mg/kg, arsenic under 8.0 mg/kg, beryllium under 5.0 mg/kg, chromium (VI) below detection limits (>0.05 mg/kg), cobalt less than 10 mg/kg, mercury under 0.2 mg/kg, nickel less than 25 mg/kg, thallium under detection limits (>0.10), and vanadium less than 10 mg/kg.	It is noted that the THRESH values for some analytes are greater than the concentrations "normally seen" for these analytes when examining data from other sites. However, it should be remembered that the THRESH values represent the upper end of distribution of background concentrations. If the "normally seen" values are measures of central tendency (i.e., means, medians), then it is not surprising that the THRESH values for some analytes are greater. Additional information regarding the data presented in the comment is required to determine the importance of the comparison made. Also, as noted in General Comment #2, additional work to verify the background concentrations of antimony, mercury, and thallium is planned. The value given for chromium VI THRESH will be removed from the table. **In the revised document, the upper limits for background for these analytes are compared to these suggested values. See Subsect. 4.2.**

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Comment Number	Page; Section; Paragraph	Comment	Response
2	Page A-1.3	The use of samples taken from both contaminated and "noncontaminated" areas to derive a background (Moore, 1995. Inorganic Soil and Groundwater Chemistry near PGDP, Paducah, Kentucky ORNL/TM-12897) is potentially useful to determine the ambient concentrations in the area. However, we question the procedure in determining the natural background concentrations for these metals. The apparent fact that the facility soil metal sample concentrations are within the upperbound interval of data that includes principally samples taken on the facility is not surprising, the subpart is representative of the whole. It is always difficult to ascertain whether site soil concentrations of metals are elevated over natural background levels when the concentrations do not show large differences. To address this problem, USEPA has outlined procedures to determine how much sampling is necessary and what sort of performance criteria should be applied to assess the differences. This information is in USEPA, 1992. "Guidance for Data Usability in Risk Assessment (Part A, Part B)." Office of Emergency and Remedial Response, Washington, D. C. Publication 9285.7-09A, 9285.7-09B.	The authors agree that the use of the analytical technique is useful in establishing ambient concentrations. However, the authors would argue that the ambient concentrations are representative of the background concentrations. The comment does not recognize that the THRESH values reported in Tables 1 and 2 do not encompass all inorganic concentrations collected at the PGDP. Moore (1995) notes in several places that inorganic contamination does exist at PGDP. Samples from these areas were not included in the statistical analyses which developed the THRESH values. The authors are aware that USEPA has produced guidance material for sampling. However, the authors believe that the argument on page A-1.3 in paragraph 3 is valid. If samples are collected during a site investigation that show concentrations slightly above established background values, then it is difficult to know if these slightly elevated levels are due to contamination or natural variation. Professional judgement, including geochemical information, must be employed when determining if such sites need to be remediated.

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Comment Number	Page; Section; Paragraph	Comment	Response
2 (cont.)		The Kentucky Department for Environmental Protection (KYDEP) has used several procedures to determine if on-site levels are elevated over background. A simple comparison of means, site concentrations above the mean background are considered to be "elevated" (It should be noted this does not mean that toxic conditions exist, but it indicates chemicals for concern for the assessment, which may eliminate the low-risk metals as chemicals of concern). Another comparison that has been applied is collection of sufficient samples from background areas to determine a mean and a variation about that mean in the 10 - 15% range. This mean value is then compared to waste areas having been sampled sufficiently to have a similarly low variation, a comparison of like to like (mean to mean). Another method that has been applied by KYDEP is to ignore background and base chemicals of concern on risk. Metals present on-site below a hazard quotient of 0.1 or a cancer risk of 1×10^{-6} are eliminated as chemicals of concern.	The authors appreciate the reviewer's information concerning how KYDEP has utilized background concentrations when evaluating site data in the past. However, the authors do not believe that simple comparisons of means are appropriate when determining if contamination exists. This method ensures that at least some analytes which have detected concentrations within the distribution of background concentrations will be included as chemicals of potential concern for the site just by chance alone. Ultimately, this may lead to unnecessary remedial actions. Additional information on the comparisons described is requested. The authors agree with the risk "benchmarks" provided in the comment. They are the same target risks used to generate the human health risk-based screening criteria listed in Tables 1 and 2. **They are also the target risks values used to derive the risk screening criteria in the revised document.**
3	Page A-1.4	The logic behind the "outlier" identification does not appear to have a statistical basis. If this process is supposed to be so relevant, since, it is "statistically"-based, then why were those samples that exceeded the mean thrown out?	The method used to identify outliers is based on a graphical data evaluation technique as described in the document. It must be noted that not all statistical techniques rely on numerical values. Many common statistical data exploratory techniques (e.g., stem-and -leaf diagrams) rely on graphical displays of data to make determinations.

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Comment Number	Page; Section; Paragraph	Comment	Response
3 (cont.)			Values exceeding the "mean" were not removed from the data set prior to analysis. As stated on page A-1.4 in the first paragraph, the "maximum background values" supplied by Moore 1995 (for all analytes except thallium) were used to identify values that were clearly greater than the maximum value in the background distribution. These values were excluded from the data set. Please note, the analysis did not exclude any values less than the maximum value unless the validation qualifier for that sample indicated that the result was unusable (i.e., "R"). It should be noted that the maximum value used for the analysis could vary slightly from that used if a different professional performs the analysis of the cumulative probability plots. Therefore, in the revised document the maximum values (i.e., the value where there is a clear demarcation between populations on the cumulative probability graphs) may differ because Moore (1995) will not be used as a reference. **[The selected maximum values in the revised document do indeed vary from those selected by Moore. Please see Table 2.7 of the revised document.]**

Comment Response Summary

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Comment Number	Page; Section; Paragraph	Comment	Response
4	No Locator	Other references on potential background metal concentrations in the area include: 1. Wells, K.L., Henson, and G. Kelly. 1993. Content of Some Heavy Metals in Soil and Corn Grain. Communications Soil Science Plant Analysis , 24(19 & 20), 2617-2628. 2) Karathanasis, A.D., and S.K. Seta. 1993. Background Levels of Heavy Metals in some Kentucky Soils. Bulletin No. 727. University of Kentucky College of Agriculture Experiment Station, Lexington, KY. 3) Logan, T. J., and R. H. Miller. 1983. Background Levels of Heavy Metals in Ohio Farm Soils. Research Circular 275. Ohio State University, Ohio Agricultural Research and Development Center, Woosten, Ohio.	These references will be consulted, and values from them will be incorporated into the revised document if possible.
5	Page A-3.5	In application of the Bootstrap technique, how sure is the statistician that the samples drawn for inference are part of the "real" population, or has this assessment been skewed by throwing out the supposed outliers and non-detects.	The statistician is not responsible for determining if the data base represents the "real" population. The individuals responsible for evaluating the cumulative probability plots and determining that the data represented the "real" population were those authors with suitable training in the physical sciences. A basic criteria for the analysis was the value chosen as the maximum background. If this value was incorrectly chosen, the analysis could result in an incorrect THRESH value.

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Comment Number	Page; Section; Paragraph	Comment	Response
5 (cont.)			Nondetects were **not** removed from the data set prior to the bootstrap analysis. Nondetects are important to the analysis as they represent the lower portion of the distribution of background concentrations. **[Note, nondetect (U qualified) values greater than the selected maximum background value were deleted from the data set in the analysis performed when preparing the revised document. This is because leaving these values in the data set biased the data set high. Please see the data evaluation discussion in Chapter 2 of the revised document.]**
6	Appendix B	As has been noted in previous comments on the facility, KYDEP has a recommended default dermal absorption factor of 0.05 for metals (KRS 224.01-004, 401 Kentucky Administrative Regulation 100:050). Obviously, intake calculations using 5.0% versus 0.1 % would result in that portion of the equation being 50X higher, and result in lower risk-based clean-up concentration or background value.	The authors recognize that several past comments have indicated the state's preference for the higher absorption value and appreciate that a reference is included in this comment. This absorption value will be used in the revised document. **[All defaults provided by the Commonwealth of Kentucky are utilized in the derivation of the risk screening criteria in the revised document. Please see Chapter 3 of the revised document.]**

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Comment Number	Page; Section; Paragraph	Comment	Response
10	Page A-1.5; Section 2.3.6	The data suggest that cadmium may be from an anthropogenic source. However, the authors also state that other elements that are sometimes geochemically associated with cadmium are not found in elevated concentrations. Therefore, they suggest that an anthropogenic source is not likely and that analytical error is again used as the primary explanation for cadmium's significant occurrence. However, using the absence of other chalcophile elements (e.g., Pb, Zn) to discount an anthropogenic source on cadmium seems unreasonable. For example, these other elements may not have been used in a particular industrial process that may have released cadmium to soils, so there presence would be limited at the site while cadmium could be found in relative abundance. Geochemical association of trace elements is relevant when studying natural distribution in rock or ore bodies, but not at industrial sites.	The authors agree that a more expansive discussion of this phenomenon should be included in the revised text. The discussion in the revised document will be expanded. The expanded discussion will include at minimum the following material. The occurrence of lead and zinc with cadmium is not only because of their natural geochemical association. For example, cadmium concentrations are commonly elevated in soils along roadways. This enrichment is due to releases from brake linings and tires on vehicles. However, in areas of cadmium enrichment, lead and zinc are also commonly found to be elevated because these elements are also released to the environment by vehicles during use. Similarly, increased concentrations of cadmium are sometimes found in soils near plating shops. However, even in this situation increased concentrations of other metals commonly used in plating (lead, zinc, copper) are expected. At PGDP, the increased cadmium concentration is not found in concert with these other metals. This fact, and the fact that there is no known industrial use of cadmium at PGDP, leads to the conclusion that the increased cadmium concentration is due to either a localized natural enrichment or some sort of analytical error which led to the reporting of increased concentrations. The first of these does not seem reasonable because the other chalcophile elements (e.g., lead, zinc) were not found to be elevated. Therefore, the second of these arguments is the most likely cause of the elevated cadmium concentrations.

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Comment Number	Page; Section; Paragraph	Comment	Response
10 (cont.)			In addition, please see General Comment #2 for additional information concerning analytical error and trace metals and the potential verification of the cadmium background concentrations.
11	Page A-4.4; Antimony Probability Plot	The data and discussions are not consistent. None of the data shown on the graph exceed the 99th percentile although it is stated in the discussion that antimony concentrations are anomalously high. Also, the threshold value (99th percentile) shown of the graph is wrong. The natural log of 13 is 2.56, not 1.3 as indicated on the graph.	The authors will correct the mathematical error and place the THRESH value line in the correct location in the revised document. Regarding the fact that the THRESH line appears to be greater than the maximum detect. This phenomenon was due to including nondetects in the analysis. In the case of some of the trace metals (e.g., antimony), some of the detection limits for the nondetects actually exceed the highest detected concentration. Because it was assumed that the detection limit for the nondetected value was the concentration detected, the range of background concentrations actually may exceed the range displayed in the plots. This is a shortcoming of the presentation of plots in the document. The revised document will explain this phenomenon in detail. **[As noted in a previous response, nondetect values greater than the value selected as the maximum background value were not included in the analysis supporting the revised document. This error does not appear in the revised document.]**
			In addition, please see General Comment #2 regarding confirmation of the antimony background concentrations.

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Comment Number	Page; Section; Paragraph	Comment	Response
12	Page A-4.18	Inaccurate 99th percentile shown on graph, ln 85 = 4.4, not 4.51 as shown.	This correction will be incorporated into the revised document.
13	Appendix A	Several of the probability graphs show significant changes in slope, or separate groupings of concentration data which usually indicate that two separate populations exist. These trends are not mentioned in the text, but they are significant and may indicate contamination of several elements even though the actual high values found in samples do not exceed geochemical criteria or ranges of elemental distributions derived from the literature. Examples of these graphs are listed below: For graphs of geochemical data collected 0-1 feet below the surface: beryllium, thallium, selenium, mercury, and lead. For graphs of data representing samples from depths greater than 1 foot: copper, cadmium, nickel, boron, antimony, potassium, zinc, lead, and mercury.	Please see response to General Comment #4. These issues will be discussed in the revised document. **[Please see Chapter 2 of the revised document. Also, please see the plots for the reduced data set in Appendix A. Most plots using the reduced data no longer show multiple defections.]**

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			In addition, please see General Comment #2 regarding confirmation of the antimony background concentrations.

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Comment Number	Page; Section; Paragraph	Comment	Response
14	Appendix B	Although the title of this report sets human risk-based screening criteria for metals as a main subject, the discussion of the calculations, findings, and significance of the calculated values is brief and not presented well.	The authors agree that this information could be expanded. The revised document will contain an expanded discussion of the calculation of the parameters including tables of toxicity values and the calculated PRGs for both excess cancer risk and hazard quotient. A discussion of the significance of the human health risk-based screening criteria in regard to the THRESH values and how these values should be applied will be included in the revised document as well. **[Please see Chapters 3 and 4 of the revised document.]**

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