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HUNTERS POINT
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NAVY RESPONSES TO AGENCY COMMENTS

on

Draft Technical Memorandum,
Background Soil and Groundwater Conditions
Naval Station, Treasure Island
Hunters Point Annex
San Francisco, California

June 19, 1992

The following are Navy responses to EPA comments on the Draft Technical Memorandum, Background Soil and Groundwater Conditions. The comments are reprinted from EPA's letter of May 4, 1992.

MEMORANDUM COMMENTS

Comment 1: **I have reviewed the draft technical memo on Background Soil and Groundwater Conditions, Naval Station, Treasure Island Hunter's Point Annex, San Francisco, California dated March 19, 1992. In general, I find the approach of using population partitioning to determine background levels of metals in soil to be intriguing. However, several of the primary assumptions for the method are not met at this site. First, the method assumes that the population sampling is equal or favors the background population, the report does nothing to attempt to substantiate this important point. Intuitively, with a limited sampling favoring the contaminated area, any effect of the lower or background population will be masked and the method is not sensitive enough to overcome this flaw. Base-wide sampling should be included as well as a map showing the sampling point distribution to graphically illustrate the geographical distribution of the data set. Second, the assumption that mixing or mobility are limited may not apply for soils in the fill areas with multiple sources of material. Ground water would most likely mix on a time scale that would mask any population differentiation. Therefore, this approach is not appropriate and background determinations would not be significantly improved over purposeful background sampling and comparison to published values for the lithography (sic).**

Response: First, as discussed in the technical meeting on June 9, 1992, the vertical and horizontal distribution of the metals at Hunters Point Annex indicate that most soil borings are not contaminated. This conclusion is also supported by population partitioning analysis. For many metals (e.g., chromium, nickel, magnesium, and calcium), population partitioning curves indicated only one population in the data set used for the report; the data plotted on one line and no contaminated population was observed. For other metals (e.g., lead, arsenic, copper, and zinc), two populations were noted with the higher concentrations in the second, contaminated population comprising less than about 10 to 30 percent of the data indicating that this method can discern two different populations. Thus, the population sample used in the report did not favor contaminated samples; most samples used in the report were uncontaminated. The inferred flaw was not an issue for the generally uncontaminated data set used in the report.

Facility-wide sampling is not necessary because the fill materials, bay mud, and undifferentiated sands encountered at the IR sites used in the report consistently have the same geochemistry, regardless of location on the facility. For example, data from eight IR sites were presented at the technical meeting indicating that for serpentinite fill materials, the mean and range for chromium, nickel, and cobalt are comparable at all the IR sites. Furthermore, the surface area of the 12 IR and PA sites used in

the report represent approximately 30 to 40 percent of the surface area of the fill materials at HPA. Sampling of these sites produces a representative sample of the fill materials, bay mud, and undifferentiated upper sand units at HPA.

Second, no assumptions were made regarding limited mixing or mobility for soils in the fill areas. By definition, the serpentinite fill materials and non-serpentinite fill lithologies are considered mixtures -- the serpentinite fill consists of materials that visually are predominantly serpentinite fill mixed with other native materials and the non-serpentinite fill consists of other native rock types that are not visually composed of serpentinite materials. The bay mud and undifferentiated upper sand are clearly not mixtures of fill materials and represent native geologic materials.

As discussed in the report, groundwater was divided into four groupings on the basis of chloride content; high chloride content (saline) waters are found near the bay and fresh waters are found adjacent to the bedrock. Clearly, these waters have not mixed to create groundwater with one chemistry.

Finally, literature values for similar geologic materials were compiled and presented in the memorandum. These literature values indicate the HPA background levels are comparable to published values.

Comment 2: **This method could be appropriate when two distinct populations exist, but this does not appear to be the case for many of the chemicals of concern for Hunter's Point. In addition, the method of graphically determining the threshold level for each element is quite variable and dependent on professional judgment. A less variable method would be to determine the lower population mean and calculate the 95% upper confidence level of that mean concentration.**

Response: When two distinct populations do not exist i.e., when the background concentration range is so large that a few localized releases fall within the range and one cannot discern between the background population and localized releases, no commonly used method can be applied accurately. This limitation, therefore, is not specific to the method applied. Furthermore, the method does not require the existence of only two populations. As discussed in the technical meeting, the method was applied conservatively in selecting the threshold; for mono-population curves the thresholds were selected at the ends of the plotted curve and outliers far off the trend of the curve were ignored. For curves with two populations, thresholds were selected where the change in slope was first encountered. Both of these methods conservatively estimate the threshold, as shown at the technical meeting. The population mean was evaluated following removal of data above the threshold value.

Comment 3: There are several specific problems that I had with the presentation.

1. **Further description of the methodology used to determine normal or log-normal distribution should have been presented. In particular the decision point and critical factors.**

2. **Several different tests for normality could have been applied to substantiate the use of transformed data. In the present text it was not clear that the skewness was minimized for each threshold determination or just calculated after the threshold was picked.**

3. **What was the justification of separating PAHs based on lithography? Why not include the nondetections at 1/2 the detection limit as was done for the metals?**

Response:

1. The evaluation of normal or lognormal distributions was performed following selection of the threshold and removal of data above the threshold. The coefficient of variation test is an EPA-approved simple check for gross normality/non-normality of data (*EPA, 1989, Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance,* EPA/530-SW-89-026). The normality/non-normality of the data sets were qualitatively estimated using the coefficient of variation test.

2. As discussed at the technical meeting, the metals data were plotted on lognormal scales for ease of presentation and selection of the threshold. No a priori assumptions were made regarding element distributions. Normality of the data was not evaluated prior to plotting. The skewness was calculated for both the data sets presented in Table 3 and the background population data set presented in Table 6 (data from which values above the threshold were removed).

   In the original application of the population partitioning technique to HPA metals data (*HLA, 1990 Background Sampling Plan, Naval Station Treasure Island, Hunters Point Annex, San Francisco, California)*, the data were plotted on normal scales. The thresholds developed from these plots (using a smaller data set from OU II sites) are comparable to the thresholds developed from lognormal plots using a much larger data set from OUs I, II, III, IV, and PAs 16 and 18.

3. PAH data were not separated on the basis of lithography (sic). The PAH data were subdivided into total carcinogenic and total non-carcinogenic PAHs. In each category, detected concentrations for each PAH were added together. The non-detect data were not included because addition of the non-detect data to the detect population would have masked trends on the cumulative frequency plots.

BECHTEL REVIEW COMMENTS

Comment 1: **The objective of the analysis described in the technical memorandum is to evaluate the facility-wide background concentrations of metals and PAHs in soils and sediments and of metals in groundwater. The data set, composed of results from independent characterization of twelve sites, is not appropriate for determining facility-wide background concentrations of metals and PAHs. This is a fundamental defect in the design of the study. A facility-wide assessment requires facility-wide sampling and analysis.**

Response: See response to EPA Memorandum Comment 1. Facility-wide sampling is not required because the lithologic units encountered in the fill (e.g., serpentinite), the bay mud, and the undifferentiated sands are of the same geochemical character at each IR site and because most samples used in the report are uncontaminated.

Comment 2: **Sections 4.1.2 and 4.4.3. The concentration distributions of metals in soil are analyzed as if they are log-normal while the concentration distributions of PAHs are analyzed as if normal. The authors suggest that the concentrations of certain metals in soil and groundwater are normally distributed while others are log-normally distributed. No explanation is offered for these discrepancies.**

Response: See response to EPA Memorandum Comment 3. For the PAHs, threshold selection was easier when the data were plotted on normal scales. As discussed in the response to EPA Memorandum Comment 3, the coefficient of variation test was used to estimate the gross normality/non-normality of the data sets.

Comment 3: **Sections 3.2.1.2. Nondetect values were eliminated from the PAH data set but they were included in the metals data set. The authors discuss the metals data at low concentrations but fail to indicate the detection limits of the various analytes. This leads to confusion when interpreting the probability plots.**

Response: To clarify this point and to show the selected thresholds and detection limits on the population partitioning graphs, the graphics presented in the Appendix are being resubmitted with these responses. In the process of preparing the population partioning graphs minor errors were noted on Table 4, the compilation of threshold values. Table 4 is being resubmitted with these responses.

The range of detection limits for the metals data are included on Table 2 of the report. The resubmitted population partitioning graphs point out the common detection limits (at one-half the detection limit value).

Comment 4: **The probability plots often do not exhibit distinct linear regions suggesting the statistical/graphical analysis is not appropriate for this data set. In some cases the choice of linear regions and their intersection appears arbitrary (see, for example, Plates A9 and A17). The lines used to fit linear regions should be illustrated on the plots.**

Response: As shown on the resubmitted population partitioning plots, the lower regions on Plate A9 and Plate A17 represent regions where detection limit values were plotted at one-half the detection limit; one-half detection limits range from -2.30 to 2.01 ln units on Plate A9 and from -1.93 to 0.92 on Plate A17. Flat lines within these regions represent counting the same detection limit several times; flat lines indicating detection limit values were not evaluated in the population partitioning curves and the selection of thresholds.

Comment 5: The strength of the argument that background metal concentrations determined in this study are similar to background concentrations observed in similar soils worldwide is weakened by the variability of concentrations at the site (orders of magnitude in some cases) and worldwide (Table 12).

Response: The background metal concentrations reported in the literature are naturally quite variable depending on location and lithology. The HPA data set reflects that natural variation in geochemistry.

Comment 6: Section 4.1.2.1, Tables 7-11. The argument that sufficient samples have been collected to adequately characterize the facility-wide background concentrations of metals in several soil types is flawed. The equation discussed in this section is applicable to the analysis of data obtained from randomly collected samples. The data used in this study were not obtained as a result of facility-wide random sampling.

Response: See response to EPA Memorandum Comment 1 and Bechtel Comment 1. For the background population, facility-wide random sampling is less important since the number of samples for each lithology is large and the background population is similar at each site. The value in random sampling is that the population characteristics are known with a given statistical confidence with an optional number of samples. The larger the sample population, the less important it is to do random sampling because as "n" (the number of samples) increases, a greater proportion of the population is represented by the sample population.

Comment 7: In review of the methodology for determining background concentrations, a sensitivity analyses was used to assess, in some degree, the applicability of the statistical method used to establish the upper limit of background levels of concentrations of various elements and compounds. The sensitivity analysis suggests that, except in the particular case in which the background distribution does not significantly overlap the contaminant distribution--a case that is rarely observed in the data set--the method is very subjective and the determination of the upper limit can be highly uncertain. To determine background in a more statistically valid and robust manner, additional samples should be taken randomly in areas believed to be uncontaminated such as the residential area above the shipyard.

Attachment A provides information on the sensitivity analysis.

Response: As discussed in EPA Memorandum Comment 2, thresholds were conservatively selected from the population partitioning graphs. As presented in the following responses to the Attachment A comments, the thresholds (upper limits) selected for each sensitivity run from the population partitioning graph are equal to or less than the threshold value selected from the histogram plot.

With regard to sampling in uncontaminated areas, 20 samples were collected in 1987 from 17 borings augured into serpentinite and sandstone/shale bedrock lithologies at Housing Areas 1 and 2; the samples were analyzed for metals and organic compounds (*HLA, 1987*). Samples were collected from 0.3 to 5.5 feet below ground surface. Table 1 presents the metals results. Included on Table 1 are the ranges and arithmetic means for metals in serpentinite fill from Table 6 of the Technical Memorandum. Comparison of these data indicates that for most metals the mean values from the serpentinite fill are comparable to the mean values for the 20 Housing Area samples. In the technical meeting, it was suggested that concentration ranges are larger for the serpentinite fill than those for the Housing Area data because the serpentinite fill data set is larger (approximately 450 samples versus 20 samples); a larger data set would be expected to exhibit a wider range of values, as evidenced in the comparison of the two data sets.

Comment 8: The conclusions of the report, as presented, may be only roughly indicative of possible background levels of the evaluated contaminants. Inclusion of the degree of uncertainty (plus or minus) in Table 3 would improve the validity of these threshold concentrations.

Response: Table 3 provides statistics on the entire data set used in the report. Thresholds for the background populations are found in Table 4. Since thresholds are selected from graphical plots, no degree of uncertainty can be obtained. The data have an analytical uncertainty; however, analytical uncertainty is generally not reported with environmental data.

ATTACHMENT A COMMENTS

Comment 1: Sensitivity runs were conducted to highlight some of the particular concerns about applying the method of population partitioning. In these simple examples, two normally distributed distributions are assumed. Each is defined by its mean, standard deviation, and the number of observations (samples). No more than two distributions were considered, though, it is apparent that some of the data from HPA may show more than two distributions and have been so interpreted (see Plate A48). The application of the population partitioning method is tricky enough for two ideal normal distributions; the presence of more than two distributions that are usually overlapping and may or may not follow normal distributions adds to the uncertainty of the method.

Response: The method can be applied to populations with more than two subpopulations, and does not depend on normal distributions. As discussed below in the response to Comment 3, the lower concentrations

on Plate A48 do not represent a separate distribution; rather, they are an artifact of counting detection limit values several times.

Comment 2: **Four examples are attached. Example 1 is two distributions that are widely separated. Their frequency plots (similar to the upper histogram plots in the plates of the report) clearly shows two distributions. The associated probability plot shows a clear "hinge" that delineates the different distributions. In the report it is stated that the hinge may be used to estimate the upper threshold of the background (assumed lower concentration) distribution. For distributions of this kind, this method clearly works. Unfortunately, very little of the data show clear bi-modal character, and when it does, the distributions are not widely separated.**

Response: Comment acknowledged. Selection of the "hinge" at a value of about 0 clearly duplicates the maximum concentration of "population 1" as plotted on the histogram for Example 1. Much of the data shows no bimodal character because no contamination is observed; the data plot on one line (e.g., magnesium, iron, chromium, manganese, and sodium). As discussed in the response to Comment 4, thresholds were conservatively selected in cases where distributions were not widely separated.

Comment 3: **Example 2 tries to approximate Plate A48, where a closely spaced bi-modal distribution is apparent. The probability plot does show a hinge that could be interpreted as the upper limit of the lower distribution. For the data of Plate A48, however, there was a subtle bend at a higher concentration (12 mg/kg) that was interpreted in the report as the hinge. This implies that at least a third distribution is interpreted to be present, and that both distributions of the predominant bi-modal frequency plot are "background". The definition of background as associated with a distribution of lower concentration is ambiguous. How is one to know from this definition whether or not one or more of the interpreted distributions present are not all background, or not all contaminants? In analogous signal analysis applications, it is always difficult to differentiate the signal from the noise without some independent determination (sample) of the noise by itself.**

Response: The lower concentration data found on Plate A48 represent numerous values at one-half the detection limit and variable detection limits as shown on the resubmitted Plate A48. Plotting the same one-half detection limit value many times yields a flat line. The flat line is not representative of a true population distribution; flat lines indicating detection limit regions were not evaluated in the population partitioning curves and the selection of thresholds.

In Example 2, selection of the threshold at the "hinge" yields a threshold value slightly below 0. Comparison to the histogram for population 1 indicates that the selected threshold is below the highest concentration plotted for population 1 (slightly above 0). Therefore, application of the technique yields a conservative estimate of the threshold.

Comment 4: **Example 3 tries to approximate Plate A81. It is apparent here that there are at least two distributions that are significantly overlapping. In this case, the analysis was able to approximate an upper limit from the very gentle break in slope of the probability plot that is close to the value given in the report (ln (concentration) of about 4.8 to 5). From the general shape of the probability and frequency plots, it appears that most of the data in the report are of this type--that is, possible multiple distributions that are significantly overlapping. Delineating a hinge point for the upper limit of a lower distribution can be very subtle and subjective. The Plates should indicate where the hinges have been interpreted--this would probably clearly indicate the subtlety of this method.**

Response: As discussed in the technical meeting, thresholds for the type of plot illustrated in Example 3 were selected at locations on the cumulative frequency curve where curvature was first noted (at about 5 on the Example 3 plot). This procedure is conservative; the highest value for population 2 on the Example 3 histogram is about 7.5.

Comment 5: **Example 4 considers the complement of the case in example 3. In example 3, the distribution of the lower concentration (usually interpreted as background) was considered the dominant distribution. In example 4, the distribution of the higher concentrate is the dominant distribution. It should be apparent that the hinge point (an identifiable break in slope) is very difficult to determine, leading to a high uncertainty in picking the correct value (based on the frequency plot, about 6 or 7).**

Response: For concave curves such as those presented in Example 4, thresholds were not selected in the area of curvature; thresholds were selected at the end of the cumulative frequency curve. In Example 4, selection of the threshold at the end of the curve yields a value slightly higher than 9. This is lower than the maximum value for population 2 of about 10, as shown on the histogram plot.

Several metals, notably aluminum, barium, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, potassium, and sodium, displayed the type of curve presented in Example 4. Most of these metals are major elements; contamination is not expected for many of these metals and no contaminant population is expected. As mentioned in the report, the flattening may occur due to truncation of the distribution or due to plotting of normally distributed data on lognormal plots. For metals in which contamination might be expected (e.g., chromium, nickel, and cobalt), the observed patterns are most likely due to a population that is largely derived from serpentinite (which is naturally high in these metals) mixed with other materials with lower concentrations. Thus, the 90/10 mix used in Example 4 most likely represents the chemistry of a dominant serpentinite rock fill material diluted with materials such as sandstone and shale with lower concentrations. As discussed in the response to Bechtel Comment 7 the chromium, cobalt, and nickel values identified for serpentinite fill are comparable to concentrations at the Housing Area.

Comment 6: **The above examples were developed using two ideal normal distributions. The difficulty in applying the technique of population partitioning to distributions that significantly overlap is apparent. In the real world where there may be more than one or two distributions--some or all of which may not well approximate a normal (or log-normal!) distribution--which will further complicate the interpretation of the data using this technique. It appears much more straightforward to assess the background concentrations of the elements and compounds of interest by sampling areas that are believed not to be contaminated.**

Response: The method can be applied to populations with more than two subpopulations, and does not depend on the type of data distribution (normal or lognormal). See response to Bechtel Comment 7 for information regarding the results of sampling from areas at the facility believed to be uncontaminated.

The following are Navy responses to DTSC and RWQCB comments on the Draft Technical Memorandum, Background Soil and Groundwater Conditions. The comments are reprinted from the DTSC/RWQCB letter dated May 7, 1992.

ENCLOSURE A COMMENTS

GENERAL COMMENTS

Comment 1: **This document provides a useful overview of site specific levels of contamination, however, as has been stated on many occasions, the background threshold results may not be used as a site screening tool or as a basis for determining whether or not sites will be cleaned up. A risk analysis and subsequent risk management approach will be used to determine whether a site will be cleaned up.**

Response: The results developed using the approach taken in evaluating background soil and groundwater conditions are useful as more than an overview of site-specific levels of contamination. As noted in the response to Bechtel's Comment 1 and in the technical meeting presentation, samples were collected both within and outside IR boundaries and within and outside areas of concern at IR sites. In addition, samples collected at a site where the primary contaminants of concern are organic compounds are not necessarily contaminated with those metals addressed in the Technical Memorandum. Finally, the lithologies associated with the samples are representative of facility-wide lithologies and are therefore useful and applicable facility-wide.

Background threshold results will be used to assess the need for further investigation of sites. The Navy concurs that risk analysis and risk management approaches will be used to assess the need for cleanup of a specific site.

Comment 2: **The Department does not agree with the definition for "background". Background should describe the conditions which are present at the site prior to industrial activity.**

Response: The Technical Memorandum was specifically intended to characterize metals and PAH concentrations associated with geologic materials at HPA, including materials that comprise fill, and to distinguish these concentrations from any subsequent input associated with later industrial activity. Industrial activity is defined as facility-specific activities except emplacement of geologic materials used as fill. Certain other types of activities with a non-point, widespread character (e.g., deposition related to vehicle exhaust) are not considered facility-specific industrial activities in the analysis; therefore, threshold levels presented in the memorandum include both naturally occurring sources and, in some cases, non-point anthropogenic sources.

Comment 3: **The Department does not agree with the following assumptions in the report: a) there are only two distinct populations; b) all data is**

lognormally distributed; c) data was randomly collected from "uncontaminated" areas at Hunters Point.

Response: a) Two distinct populations are not a necessary assumption for the population partitioning technique; b) No assumptions were made regarding data distribution (see response to EPA Memorandum Comment 3); c) See response to EPA Memorandum Comment 1.

Comment 4: The use of this method requires an unacceptable level of subjective decision making in determining the inflection point of the curves which in turn determines the background threshold level.

Response: See responses to EPA Attachment A.

SPECIFIC COMMENTS

Comment 1: The method of graphical partitioning can be a reasonable approach for determining if soils are contaminated with trace elements. However, the complex mixtures of geologic materials used as fill material at Hunters Point make this procedure somewhat difficult to apply. The method was developed to detect anomalous trace element levels in mineral exploration. It does not define an upper confidence level for background data. The use of this method must consider natural geochemical associations and account for variable sources of fill material. The appropriateness of the chosen threshold level may be checked by mapping values to determine whether values exceeding the threshold level tend to be clustered. Clustering of high values would tend to confirm localized contamination.

Response: Comment acknowledged. The threshold is a better estimate of the total range of concentration than the upper (95 percent) confidence level. Natural geochemical associations and variable sources of fill materials were accounted for by sorting the data set into several lithologic types (e.g., serpentinite fill and bay mud). In the OU II Remedial Investigation Report (*HLA, 1992*), metal and PAH values above the threshold value were mapped. These maps clearly show the clustering of values above the threshold, as presented at the technical meeting. We agree that "clustering of high values would tend to confirm localized contamination" and suggest that the threshold values used in the OU II RI make sense.

Comment 2: A better criteria for determining whether fill material originated from serpentinites would be to observe levels of Mg, Fe, Ni, Co and Cr. Elevated concentrations of all of these elements should be a strong indicator of a serpentine origin and should be the primary factor in differentiating serpentine derived fill from other fill materials.

Response: It is well documented that serpentinite materials from the bedrock ridge at HPA were used for fill materials. The bedrock ridge is largely composed of serpentinite, as mapped by the U.S. Geological Survey (*Bonilla, 1971*). It is not necessary to rely on chemical data to resolve whether or not a rock material is of serpentinite origin. Visual inspection

and classification of rock and soil samples in the field is a standard technique used in field geology (and used by the USGS) and is accurate in differentiating serpentinite fill materials from other fill materials.

Comment 3: **Histograms and probability plots of PAHs should have been plotted from log transformed data since it is unlikely that "background" levels were detected and since contaminant levels in soils tend to be lognormally distributed.**

Response: PAH data were more readily evaluated when plotted on normal probability plots. The coefficient of variation test (Table 6) indicate the background PAH data may be normally distributed (i.e., the value is less than 1).

Comment 4: **Bimodal distributions shown in some of the histogram plots are probably more reflective of the natural geochemical differences one would find among the serpentine soils (Mg, Ni, Co, and Cr rich), non-serpentine soils and sands (Si rich/Fe poor).**

Response: Comment acknowledged.

Comment 5: **No justification is provided for assuming that "background" element levels in soil are lognormally distributed. In the absence of anthropogenic influences most of the major elements as well as some of the minor elements may be better represented by a normal (Gaussian) distribution. Several factors can affect the skewness of the data: 1) the volume of the soil or population sampled, 2) the physical size of the individual samples and 3) the homogeneity of the population. Large individual samples obtained from small homogeneous populations will more likely have data that is normally distributed. Generally, it is recommended that the method of graphical partitioning be initially done for untransformed data.**

Response: See response to EPA Memorandum Comment 3. No a priori assumptions were made regarding element distributions. As discussed in the technical meeting, data were plotted lognormally for ease of data analysis and to visually observe the entire range of concentrations.

Comment 6: **Table 4; Calculated threshold levels for Ba, Ca, Co, Ni, and K are almost identical to maximum concentrations found in site soils (Table 3). Thus, by the author's criteria, almost no values for these elements exceed background concentrations. These threshold levels should be reevaluated.**

Response: The Navy agrees that almost no values for these elements exceed the background concentrations.

Comment 7: **Table 12; Comparing site element data to published geochemical data may be inappropriate. The geochemical data cited are from total analyses of soils whereas soil analyses from Hunters Point are probably based on a partial nitric acid digestion procedure (EPA Method 3050) referenced in SW-846. In addition, for future reports please indicate the analyses method clearly in the tables.**

Response: All metals analyses were performed using the CLP metals method which digests the sample using nitric acid, hydrogen peroxide, and hydrochloric acid. Comparison of site data obtained using the CLP metals method to published geochemical data is a standard industry practice. Laboratories generally use the finer-grained portions (high surface area) of a sample for digestion; it is likely that acid digestion of these materials provides generally comparable data to total digestion. Note that the data collected from the Housing Area (see response to Bechtel Comment 7) was digested using nitric acid and is also comparable to published geochemical data for serpentinite rock materials. Evidently nitric acid adequately digests serpentinite materials.

ENCLOSURE B COMMENTS

The staff of the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) have completed their review of the above document. Based on our review, we recommend that the background concentrations of contaminants in soils and groundwater be determined by sampling in areas that are not known to have been contaminated by industrial activities at Hunters Point Annex. Sampling for sediment background concentrations should take place to greater depths, or in areas where dredging activities are not known to have taken place. In the vicinity of Hunters Point Annex, the depths to undisturbed sediments may be greater than 60 feet. In other areas of San Francisco Bay, where the grain size of the sediments is comparable, these depths may be as shallow as 10 to 20 feet. A sampling plan should be submitted that will present the number and locations of sampling sites to define background concentrations of inorganic and organic contaminants for all lithologies at Hunters Point Annex.

Presented below are general and specific comments that should be addressed.

Response: The intent of the analysis reported in the memorandum is to characterize metals and PAH concentrations associated with the geologic materials at HPA, including materials that comprise fill, and to distinguish these concentrations from any subsequent input associated with later industrial activity. Sediment samples have been collected (bay mud and undifferentiated upper sands); thresholds and statistics for these materials are presented in Tables 4 and 6, respectively, in the Technical Memorandum. No additional sampling is necessary.

GENERAL COMMENTS

Comment 1: The use of the "population partitioning" approach to the determination of "background" concentrations and contaminants "requires professional judgement to select threshold values and evaluate the presence or absence of normal and log-normal distribution patterns" (p. 19). In demonstrating the approach to the regulators, it was clear that there was ample room for disagreement among professionals about where and how to "draw the line" that would distinguish the "background" values from those of the "contaminated" samples.

Response: The selection of thresholds was done in a conservative manner and tends to underestimate thresholds for background concentration ranges.

Comment 2: There are several important assumptions on which the approach to determining "background" concentrations is based. The first assumption is that only two normal distributions are present, "background" and contaminated". There may, in fact, be three or more normally (or non-normally) distributed populations of contaminated material that represent various episodes or degrees of contamination. One hypothesis is that there exist at least three "populations" of fill, of each lithologic type: 1. baseline or "background" material; 2. somewhat contaminated material, due to shipbuilding activities of the WWII period; and 3. additionally contaminated material, due to illegal dumping and/or poor housekeeping practices of more recent tenants at the Base.

Response: The method can be applied to populations with more than two subpopulations, and does not depend on a priori assumptions regarding the distribution of subpopulations.

Comment 3: The second is that "during the site characterization studies, samples are collected, in part, from non-impacted or uncontaminated sources" (p. 3). How can we be sure that this assumption was not violated? Data generated from OUI (IR-1, IR-2, and IR-3), according to agreement reached by the Navy and the agencies (December 11 and 18, 1991), demonstrated that the entire area was considered to be contaminated, and no "clean" spots were identifiable. Can we assume that sufficient data has been gathered to show that other OUs do not demonstrate this pattern?

Response: See response to EPA Memorandum Comment 1 and DTSC General Comment 1. The Navy argues that uncontaminated areas were encountered both laterally and horizontally at the OU sites used in the Technical Memorandum, including, for example uncontaminated bay mud and undifferentiated upper sand units at OU I sites. OU I sites were not used in the development of background levels for PAHs nor were samples of industrial fill and dredged fill materials collected from OU I sites. Few samples of serpentinite fill materials were collected from OU I sites; these samples are a very small fraction of the number of samples used for the serpentinite fill data set. Although OU sites may be more contaminated than other OUs, samples from contaminated areas would tend to plot on the higher concentration areas of the population partitioning curves and would be recognizably different from low concentration background populations.

Comment 4: The third assumption is that soil and groundwater samples will be taken from normally distributed populations and that both the background and the contaminated populations will be normally distributed. While there is evidence that random sampling procedures performed on uncontaminated "background" populations are normally distributed, there is insufficient evidence presented to support the assumption that non-random sampling procedures performed on contaminated areas will also yield a normally distributed population of sample values.

Response: No assumptions were made regarding the distribution of the data sets.

Comment 5: The fourth assumption is that the "'background population'" represents a significant and distinguishable portion of the sampling population" (p. 4). There are two components to this assumption: a. that the uncontaminated area will be sampled a sufficient number of times to represent a "significant" number of samples; and b. that the two assumed normal population will be "distinguishable" from each other. With respect to component a. the sampling design is such that sampling points are clustered around areas of known or suspected contamination and the definition of the lateral and vertical extent of contamination at various sites has not been conclusively demonstrated. The Fleischauer and Korte, 1990 article, referenced as the basis for this approach, used a constructed data set with 10 percent contaminated samples and 90 percent uncontaminated samples to demonstrate the "sensitivity" of the method. Can we assume that, if the percentages of samples were reversed, that at least 10 percent of the samples used in the HLA background analysis were uncontaminated? How can that be demonstrated? With respect to component b., even if both populations were normally distributed, the variances of these populations cannot be assumed to be the same. In addition, if the variances of the two populations were large and/or overlapped significantly, it would be extremely difficult to distinguish the two populations.

Response: See responses to EPA Memorandum Comment 1, Attachment A Comment 5, and DTSC Comment 2. First, it is unreasonable to assume that samples collected from waste sites will be 90 percent contaminated. However, assuming this is true, see the response to Attachment A Comment 5. It was pointed out that in the analysis of the population partitioning graph for the Example 4 sensitivity run (90 percent contaminated/10 percent uncontaminated), a threshold equivalent to the maximum value for the background population as presented on the histogram plot was obtained. In Example 4, variances were large and the populations significantly overlapped, yet the populations were distinguishable and the threshold was correctly identified.

Comment 6: The fifth assumption is that the inclusion of data below the detection limit as one half of the detection limit would not adversely affect the normality of the distribution of the data and thus affect the validity of the analytical approach used. This problem was acknowledged by the inclusion of the statement that "inflection points are absent in curves of truncated distributions" (p. 20). However, no data or references were presented to demonstrate that the distributions of the data were not adversely affected.

Response: It is recognized that inclusion of data below the detection limit as one-half the detection limit may affect the distribution of a data set. In selection of thresholds on the population partitioning curves, flat areas at low concentrations are indicative of detection limit regions; these areas are artifacts of counting the same detection limit several times. Such regions were not used in the evaluation of the population partitioning curves.

The use of data at one-half the detection limits is standard industry practice for risk assessments and is recommended by EPA as a valid technique [*EPA, 1989, Risk Assessment Guidance for Superfund (RAGS)*].

Comment 7: **The sixth assumption is that inclusion of data qualified as "estimated" data would not affect the normal distributions of the "background" or "contaminated" populations. Neither statistical testing nor adequate literature reference was presented to show that this assumption was valid. If the qualified data is viewed as presence/absence data, then it is not normally distributed.**

Response: The use of "J" qualified (estimated) data is standard industry practice. For example, EPA recommends that for risk assessment purposes, "J" data are to be used the same way as data that do not have this qualifier (*EPA, 1989, RAGS*). Data qualified as estimated are not presence/absence data, they are data for which the value is an estimate.

Comment 8: **The Effects Range Low (ER-L) values for sediment-sorbed organic and inorganic contaminants, published in the NOAA Technical Memorandum, "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Programs" are used as a screening tool to suggest concentrations of contaminants at which adverse biological effects on biota may be expected to be observed. These are not cleanup levels. So-called "background" concentrations that exceed these levels are interpreted to reflect significant anthropogenic inputs and contaminant-stressed environments and, therefore, do not constitute accurate estimates of the true "background" concentration of inorganic analytes.**

Response: The 10 ER-Ls are derived from toxicity tests of biological effects on marine, estuarine, and freshwater organisms complied from national and foreign studies. As stated in the NOAA Technical Memorandum, "note that these ER-L and ER-M values are not to be construed as NOAA standards or criteria." Furthermore, the NOAA report rates the degree of confidence as being only "moderate" for most of the metals. As such, these values are very approximate, do not relate well to the specific conditions present in San Francisco Bay, and can be used only for gross comparison purposes.

The following table lists the sediment concentrations listed in the NOAA report at which no toxic effects were observed for San Francisco Bay sediments using *R. abronius* and bivalve larvae. Included on the table are the mean values for background bay mud samples from Table 6 and thresholds from Table 4 of the Technical Memorandum.

Metal	Species	Concentration No Toxic Effects San Francisco Bay Sediments (mg/kg)	Bay Mud Arithmetic Mean Concentration (mg/kg)	Bay Mud Threshold (mg/kg)
Antimony	*R. abronius* bivalve larvae	9.9±11.8 6.7±12.3	6.1	23
Arsenic	"	30.3±22.4 22±18.7	6.74	12
Cadmium	"	0.6±0.3 0.6±0.3	3.99	8.5
Chromium	"	202.6±97.3 150.2±85.9	109	650
Copper	"	75±43 47±26	34.8	150
Lead	"	54±36 43±33	6.52	12
Mercury	"	0.6±0.4 0.5±0.3	0.112	1.5
Nickel	"	108±27 102±44	128	1300
Silver	"	1.4±1.9 0.6±0.5	1.14	2.6
Zinc	"	177±96 136±78	65.6	106

With the exception of cadmium, all of the bay mud arithmetic means established in the Technical Memorandum are less than and/or within the uncertainty range of San Francisco Bay sediment concentrations for which no toxic effect was observed. For cadmium, the mean bay mud value was below the ER-L. With the exception of cadmium, chromium, and nickel, the thresholds developed for bay mud are within the uncertainty range or only slightly above the sediment concentration at which no effects were observed in the NOAA data set. This comparison indicates that when the HPA background data are compared to specific San Francisco Bay sediment toxicity data, they may not be considered toxic.

Comparison of HPA sediment data to ER-L values indicates that the derived NOAA ER-L values may overestimate the expected toxicity to organisms exposed to San Francisco Bay sediments and to bay mud at

HPA. The use of ER-L values that are derived from a data set that includes toxicity information derived from freshwater, estuarine and marine species not native to San Francisco Bay may be inappropriate. The assertion that the background levels "reflect significant anthropogenic inputs and contaminant-stressed environments" stretches the intent of the NOAA ER-Ls, which is to evaluate the potential for biological effects. This interpretation also ignores the strong possibility that bay mud at HPA received chromium and nickel-rich serpentinite materials sloughed off of the hillsides and into the Bay prior to any industrial or filling activities at the site.

SPECIFIC COMMENTS

Comment 1: **p. 1, Section 1.0: Notwithstanding the implication of the statement that, "the goals of the remedial investigation and risk assessment are to determine the impact of chemical exposures occurring only as a result of the site related contamination", cleanup levels established by the SFRWQCB will be determined which protect human health and the environment. If chemical contamination of fill is of sufficient magnitude to cause a potential threat to water quality or to the beneficial uses of the waters of the State, whether or not it is "site related" is irrelevant in determining the cleanup levels.**

Response: Comment noted. The Navy concurs that risk analysis and risk management approaches will be used in assessing the need for cleanup.

Comment 2: **p. 3, Section 1.1: The successful use of the "population partitioning" approach to determine cleanup levels for RCRA closure activity, and for a Superfund site in Colorado does not, on its face, demonstrate that the approach is appropriate for application to all Superfund sites. Site-specific differences between Hunters Point and other sites may make the universal application of this approach inappropriate. Careful review of the underlying assumptions and how the data fit those assumptions is necessary.**

Response: The point of referencing other sites where the population partitioning approach has been used successfully is to demonstrate the validity of the method. The other referenced sites are similar to HPA in the sense that they represent locations where native geologic materials have been contaminated and population partitioning graphs have been able to separate out distributions. Use of the technique at HPA is appropriate because the fill materials, bay mud, and undifferentiated upper sands at HPA are composed of native geologic materials that have been impacted by generally surficial releases of contaminants.

Comment 3: **p. 12, Section 3.1: The text identifies "two different types of background levels of chemical...[n]aturally occurring background levels...[and] [n]on-site related, ambient, or anthropogenic background levels." If the "contaminated" population is also sampled, then the total populations of samples would include at least three subpopulations and "(i)f multiple populations are present, the types of distributions, while**

interesting, are not germane to the issue of identifying background levels" (p. 14).

Response: Review of the population partitioning plots indicates that when detection limit areas are ignored, most of the metals plot as one or two populations. These two types of populations correspond to metals for which no contamination is observed (e.g., aluminum, calcium, chromium, and magnesium; plots are single lines) and for which some contamination is observed (e.g., lead, zinc, copper, arsenic, and vanadium; plots with two lines separated by a gentle hinge). For PAHs, the population partitioning plots represent the two populations -- anthropogenic and contaminated; the non-detect data that was not plotted would represent a possible third population of native geologic materials devoid of PAHs. See Comment 5 below.

Comment 4: p. 16, Section 3.2.1: The use of "J" and "UJ" qualified data in parametric statistical methods is of questionable value. See also, above, General Comments.

Response: See response to General Comment 7.

Comment 5: p. 18, Section 3.2.1: The background concentration of anthropogenic organic chemicals is zero.

Response: The RWQCB definition would exclude any organic chemical with an anthropogenic source from the definition of background. The Navy argues that inputs associated with non-point anthropogenic sources should be distinguished from inputs associated with facility-specific industrial activities.

Comment 6: p. 19, Section 3.2.1.2: The use of a value of one half of the detection limit may not eliminate the problems associated with statistical analyses of populations with truncated distributions. Data or references should have been provided that demonstrate that the inclusion of this data would not affect the normality (skewedness) of the distribution.

Response: See response to General Comment 5.

Comment 7: p. 28, Section 4.1.1.3: The background concentration of PAH is zero.

Response: As noted, for example, in RAGS (*EPA, 1989*) and Latimer et al. (*1990*), PAHs occur in the environment naturally and as the result of non-point anthropogenic sources. Such types of inputs are not associated with facility-specific industrial activities at HPA.

Comment 8: p. 34, Section 4.4.3: The proposed population partitioning approach presented in Fleischauer and Korte, 1990, was used on normally distributed populations of data, not on log-transformed populations of data.

Response: The population partitioning technique can be used on both normal and log-transformed data. The Fleischhauer and Korte (*1990*) article gives

an example for cadmium in which the data were transformed to natural logarithms and plotted on lognormal cumulative frequency plots.

Comment 9: **Table 3: The geometric means of the Bay Mud samples for antimony, total chromium, nickel and silver exceed the ER-L values for these inorganic analytes. These elevated concentrations of contaminants do not represent true background levels.**

Response: Table 3 presents statistics for the entire bay mud data set. Background conditions are presented in Table 6. See response to General Comment 8.

Comment 10: **Table 3: The arithmetic means of the Bay Mud samples for antimony, cadmium, total chromium, lead, nickel, and zinc exceed the ER-L values for these inorganic analytes. These elevated concentrations of contaminants do not represent true background levels.**

Response: Table 3 presents statistics for the entire bay mud data set. Background conditions are presented in Table 6. See response to General Comment 8.

Comment 11: **Table 4: The "background threshold" concentrations of the Bay Mud samples for antimony, cadmium, copper, mercury, nickel, silver, and zinc exceed the ER-L values for these inorganic analytes. These elevated concentrations of contaminants do not represent true background levels.**

Response: See response to General Comment 8.

Comment 12: **Table 6: The arithmetic and geometric means of the "background" concentrations of antimony, total chromium, nickel and silver equal or exceed the ER-L values for these inorganic analytes. These elevated concentrations of contaminants do not represent true background levels.**

Response: See response to General Comment 8.

TABLES

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Table 1. Comparison of HPA Housing Areas 1 and 2 Metals Data [1] to Serpentinite Fill Data [2]

Sample Number	Arsenic mg/kg	Antimony mg/kg	Barium mg/kg	Beryllium mg/kg	Cadmium mg/kg	Chromium mg/kg	Cobalt mg/kg	Copper mg/kg	Lead mg/kg	Molybdenum mg/kg	Nickel mg/kg	Selenium mg/kg	Silver mg/kg	Thallium mg/kg	Vanadium mg/kg	Zinc mg/kg
1-5.5	ND(20)	ND(20)	34.6	ND(2.0)	ND(2.0)	352	160	6	ND(2.0)	ND(2.0)	2400	ND(2.0)	ND(2.0)	ND(20)	37.8	45.8
2-1.5	ND(20)	ND(20)	76.2	ND(2.0)	ND(2.0)	199	97.4	4.6	ND(2.0)	ND(2.0)	306	ND(2.0)	ND(2.0)	ND(20)	44.2	17
2-5.0	ND(20)	ND(20)	77	ND(2.0)	ND(2.0)	124	105	6	ND(2.0)	ND(2.0)	362	ND(2.0)	ND(2.0)	ND(20)	44.8	26.4
3-1.0	ND(20)	ND(20)	8	ND(2.0)	ND(2.0)	191	134	ND(2.0)	ND(2.0)	ND(2.0)	1800	ND(2.0)	ND(2.0)	ND(20)	17.4	18.8
4-1.5	ND(20)	ND(20)	54.8	ND(2.0)	ND(2.0)	456	129	7.8	ND(2.0)	ND(2.0)	740	ND(2.0)	ND(2.0)	ND(20)	51	30
4-4.5	ND(20)	ND(20)	18.4	ND(2.0)	ND(2.0)	152	66.2	ND(2.0)	ND(2.0)	ND(2.0)	178	ND(2.0)	ND(2.0)	ND(20)	31.4	14.8
5-s1	ND(20)	ND(20)	36.2	ND(2.0)	ND(2.0)	752	154	16.6	48	ND(2.0)	2100	ND(2.0)	ND(2.0)	ND(20)	58.4	66.8
6-1.0	ND(20)	ND(20)	35.8	ND(2.0)	ND(2.0)	396	146	7.6	ND(2.0)	ND(2.0)	2030	ND(2.0)	ND(2.0)	ND(20)	25.6	25.2
14-4.5	ND(20)	ND(20)	47.4	ND(2.0)	ND(2.0)	452	129	12.4	ND(2.0)	ND(2.0)	1200	ND(2.0)	ND(2.0)	ND(20)	32.8	26.8
16-1.0	ND(20)	ND(20)	76.8	ND(2.0)	ND(2.0)	114	80.8	5	ND(2.0)	ND(2.0)	95	ND(2.0)	ND(2.0)	ND(20)	54	21.2
87-070.3	ND(20)	ND(20)	42.2	ND(2.0)	ND(2.0)	548	150	7.2	ND(2.0)	ND(2.0)	1900	ND(2.0)	ND(2.0)	ND(20)	53.8	33
9-1.5	ND(20)	ND(20)	218	ND(2.0)	ND(2.0)	135	136	48	ND(2.0)	ND(2.0)	93.8	ND(2.0)	ND(2.0)	ND(20)	68.8	46
10-1.0	ND(20)	ND(20)	90.8	ND(2.0)	ND(2.0)	128	119	7.6	ND(2.0)	ND(2.0)	89	ND(2.0)	ND(2.0)	ND(20)	70.4	23.8
10-4.0	ND(20)	ND(20)	3.6	ND(2.0)	ND(2.0)	856	109	6.4	ND(2.0)	ND(2.0)	1800	ND(2.0)	ND(2.0)	ND(20)	37.2	21.8
11-1.0	ND(20)	ND(20)	71	ND(2.0)	ND(2.0)	74.4	39	13	ND(2.0)	ND(2.0)	50.6	ND(2.0)	ND(2.0)	ND(20)	54.8	27.2
12-1.0	ND(20)	ND(20)	101	ND(2.0)	ND(2.0)	94.4	53.4	7.2	ND(2.0)	ND(2.0)	79.6	ND(2.0)	ND(2.0)	ND(20)	43.4	20.8
12-5.0	ND(20)	ND(20)	65.4	ND(2.0)	ND(2.0)	120	112	5	ND(2.0)	ND(2.0)	75.4	ND(2.0)	ND(2.0)	ND(20)	63.6	20.6
13-1.0	ND(20)	ND(20)	75.6	ND(2.0)	ND(2.0)	162	113	11.6	ND(2.0)	ND(2.0)	141	ND(2.0)	ND(2.0)	ND(20)	61.8	23.2
13-4.5	ND(20)	ND(20)	66.4	ND(2.0)	ND(2.0)	147	121	12.6	ND(2.0)	ND(2.0)	111	ND(2.0)	ND(2.0)	ND(20)	78.4	31.2
14-3.0	ND(20)	ND(20)	45	ND(2.0)	ND(2.0)	884	124	12	ND(2.0)	ND(2.0)	2070	ND(2.0)	ND(2.0)	ND(20)	31.8	24.9
Housing Area Statistics*, n = 20																
Maximum	10	10	218	1	1	884	160	48	48	1	2400	1	1	10	78.4	66.8
Minimum	10	10	3.6	1	1	74.4	39	1	1	1	50.6	1	1	10	17.4	14.8
Mean	10	10	62.2	1	1	317	114	9.9	3.35	1	881	1	1	10	48.1	28.3
Serpentinite Fill Statistics*, n = 450 [2]																
Maximum	15.7	16.7	1150	1.3	11	2710	159	109	13.8	5.4	3390	6.5	4.8	1.14	108	119
Minimum	0.145	0.1	1.6	0.04	0.075	1	2.8	0.95	0.105	0.05	11.6	0.125	0.1	0.03	3	8.85
Mean	2.78	3.73	127	0.374	2.6	381	51.9	35.1	4.77	1.86	839	0.392	0.845	0.372	50.9	52.3

ND(20) : Analyte was not detected at or above the detection limit of 20.

* : One half the detection limit is used for statistical calculations where analyte was not detected.

[1] HLA,1987, Subsurface Investigation, Proposed Housing Areas 1 and 2, Ex-Hunters Point Naval Shipyard, San Francisco, California. October 30.

[2] HLA,1992. Draft Technical Memorandum, Background Soil and Groundwater Conditions, Naval Station, Treasure Island, Hunters Point Annex, San Francisco, California. March 19.

TABLE 4. Estimated Upper Limit Concentrations (Threshold) of Background Population, Metals and PAH, Soils
Technical Memorandum, Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

Analyte	Entire Data Set (mg/kg)	Serpentinite Fill (mg/kg)	Non-Serpent-inite Fill (mg/kg)	Serpentinite Bedrock (mg/kg)	Bay Mud (mg/kg)	Undifferen-tiated Upper Sand (mg/kg)	0 to 2 Foot Sample Depth (mg/kg)	>2 Foot Sample Depth (mg/kg)
Al	45600	44300	43800	16700	38800	36300	38800	47200
Sb	25	20	17	29	23	22	25	20
As	13	16	11	5.4	12	6.3	14	14
Ba	2300	1150	2100	185	500	350	1420	2300
Be	1.3	1.3	1.0	0.5	1.1	1.3	1.6	1.4
Cd	13	11	13	8.0	8.5	14	12	12
Ca	321900	157000	225000	10400	309300	321900	283000	321400
Cr	2760	2760	1570	2040	650	930	1910	2760
Cr6+	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Co	380	160	208	380	75	200	130	380
Cu	120	110	120	50	150	135	115	120
Fe	60000	105000	68000	138000	83000	84100	56600	62200
Pb	20	14	13	17	12	10	13	20
Mg	255000	255000	211000	216000	157000	143000	208000	264000
Mn	5150	2980	5100	3520	1400	1930	4640	5150
Hg	4.5	4.5	3.8	0.4	1.5	3.1	3.9	3.6
Mo	12.5	5.4	6.5	5.8	8.3	4.9	5.8	6.7
Ni	6340	3400	3270	6340	1300	4460	3100	6340
K	5660	4100	5660	950	5650	2820	5660	5650
Se	7.0	6.5	3.3	ND (0.8)	2.6	ND (1.4)	3.9	7.0
Ag	5.2	4.9	4.2	ND (2.2)	2.6	ND (3.0)	2.8	5.2
Na	10600	4850	10600	1420	9200	5920	9200	9400
Tl	ND (4.1)	ND (2.7)	ND (4.1)	ND (4.0)	ND (2.0)	ND (2.7)	ND (4.1)	ND (4.1)
V	130	110	115	60	90	86	115	130
Zn	140	120	140	73	106	101	100	123
Group B								
PAH, carc.	0.43	*	*	*	*	*	*	*
PAH, noncarc.	0.81	*	*	*	*	*	*	*

* = not calculated

Note: For thresholds at ND, the full value of the detection limit was used as the threshold (not one-half detection limit).

APPENDIX A

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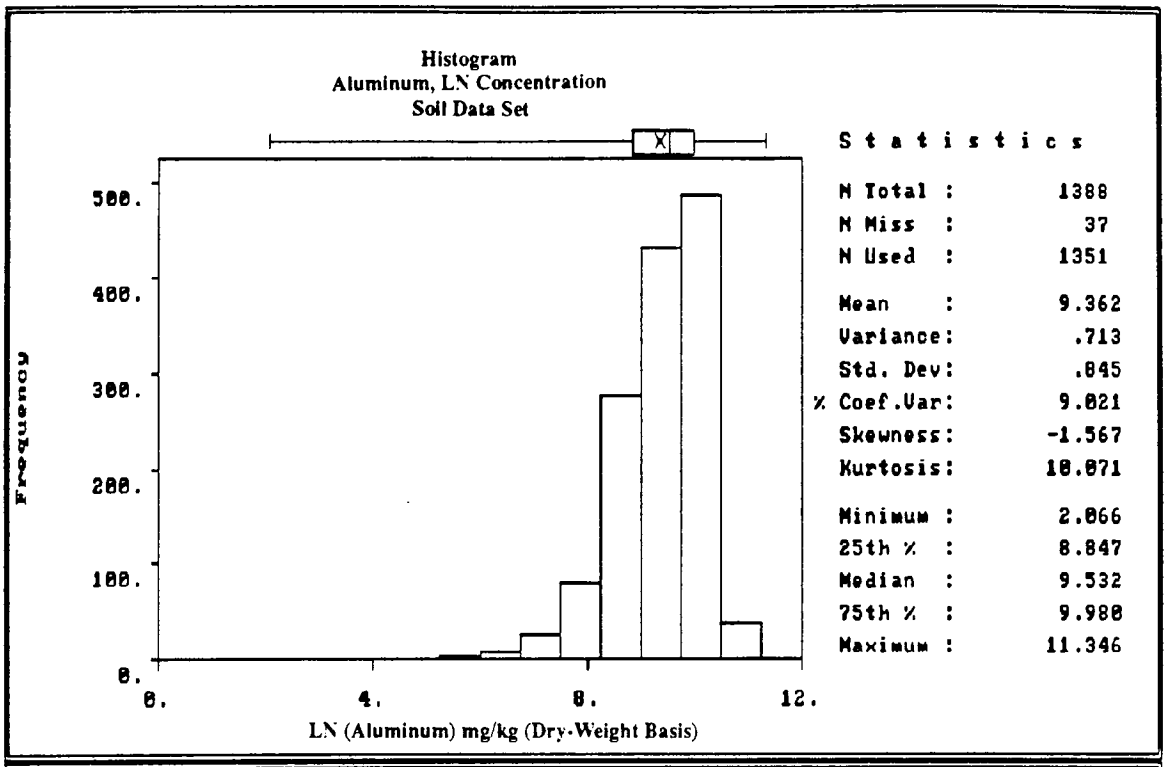
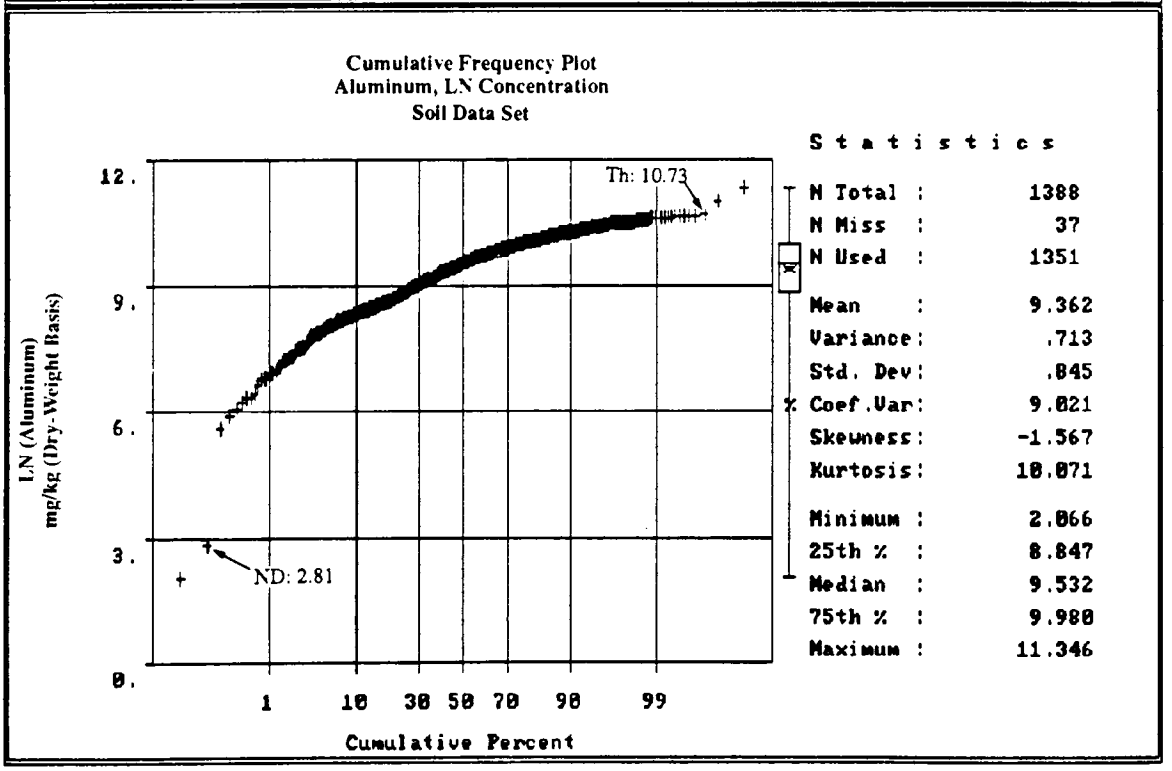
25762





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Harding Lawson Associates
Engineering and
Environmental Services

Aluminum, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A1

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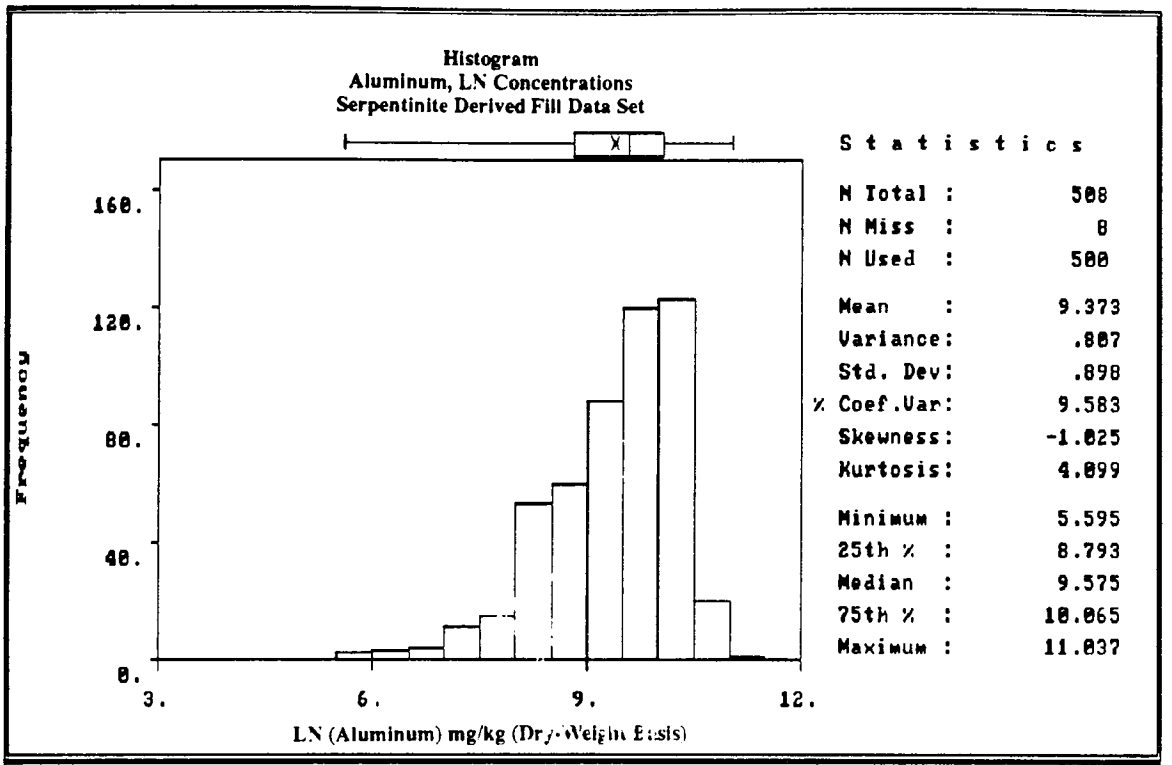
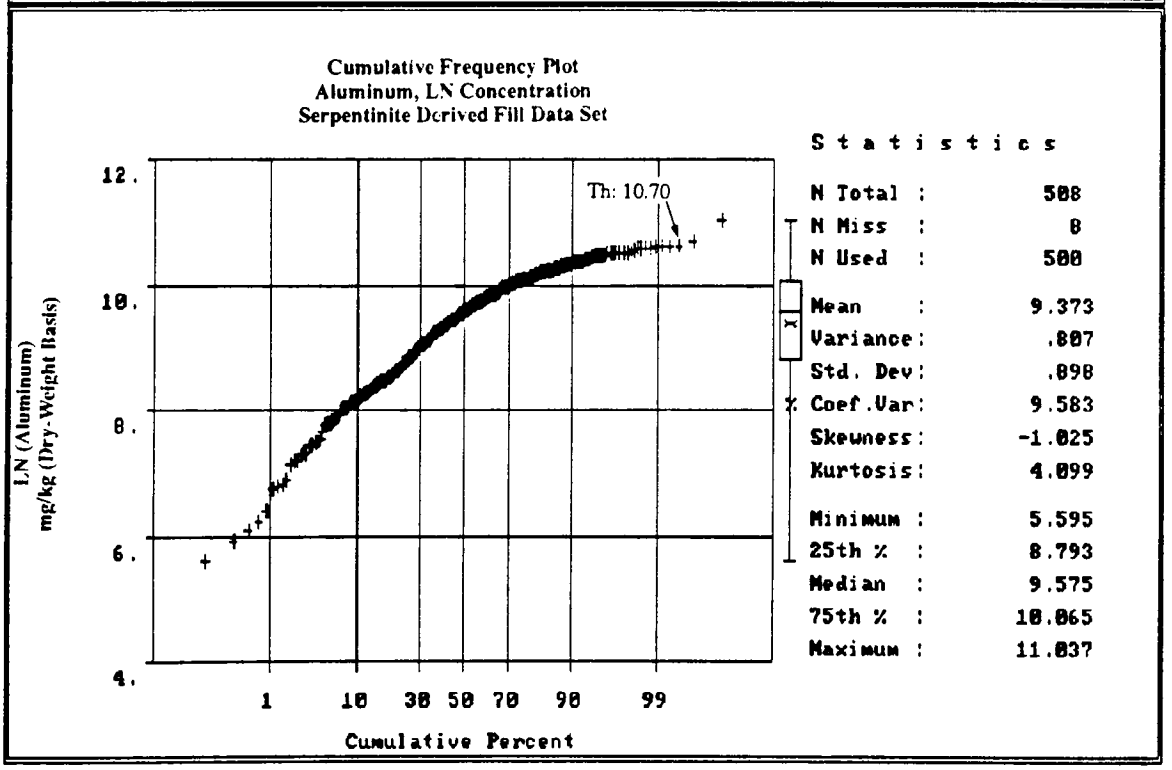
25763





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Aluminum, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A2

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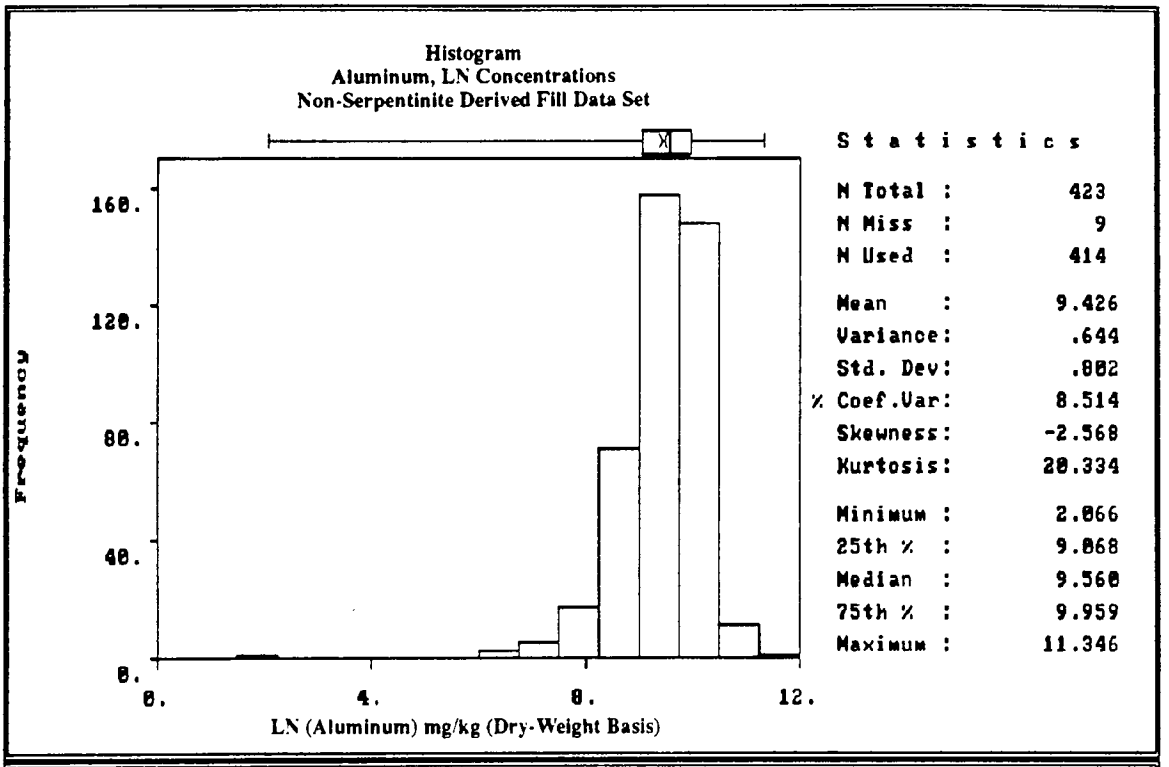
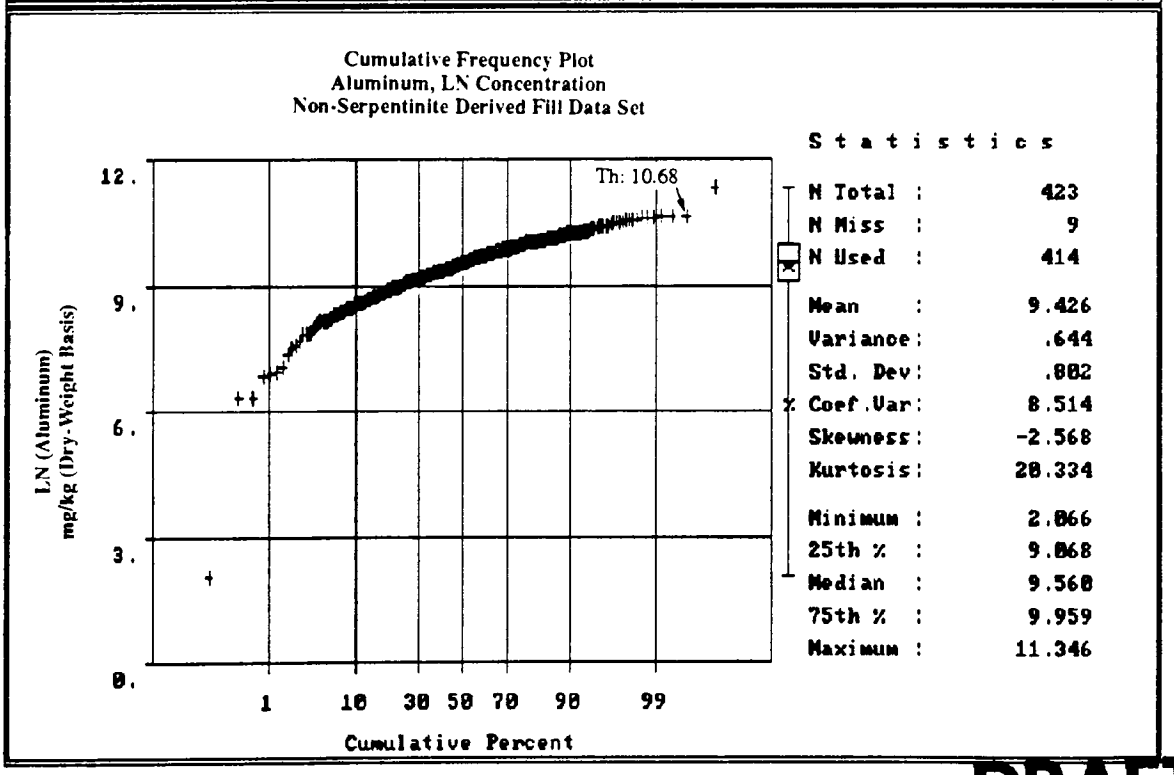
25764





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Aluminum, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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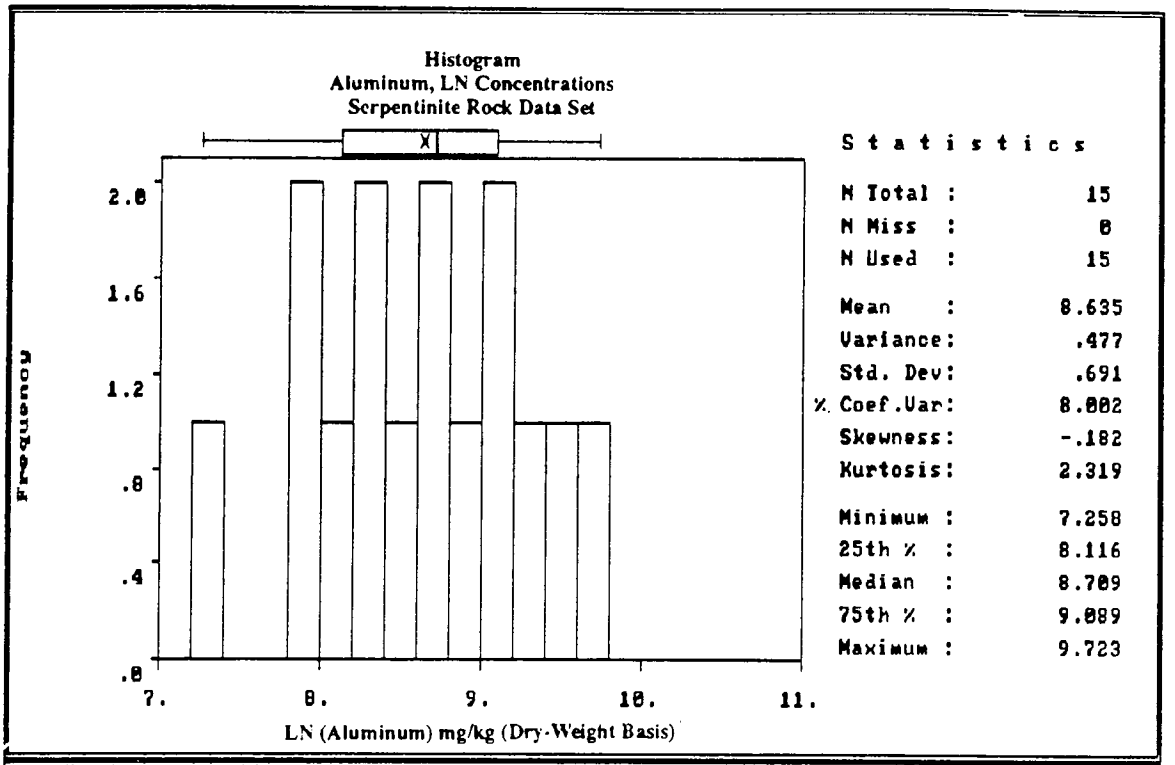
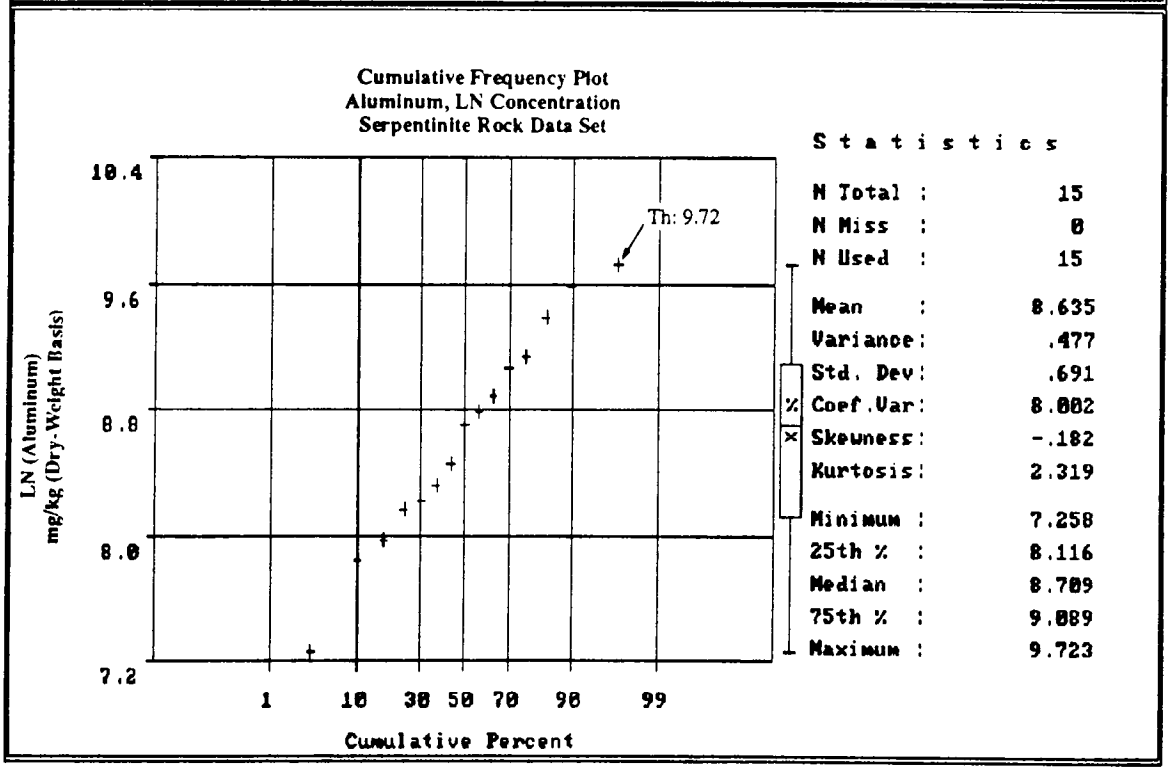
25765





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Aluminum, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A4

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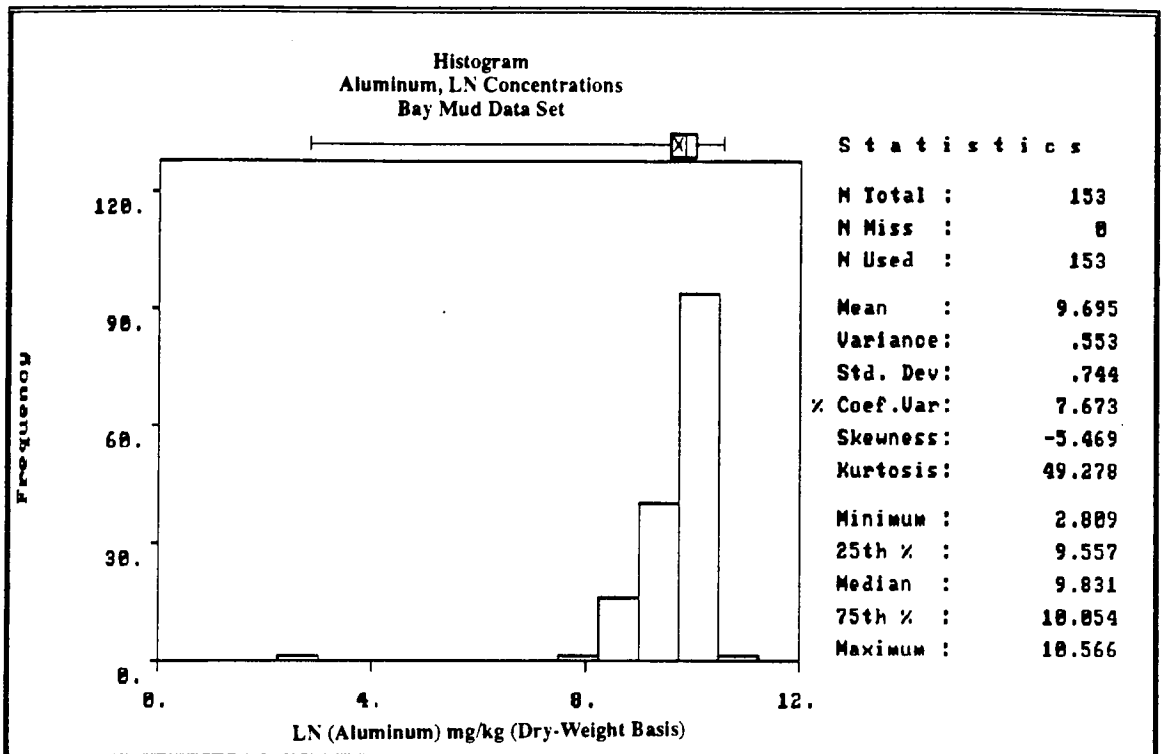
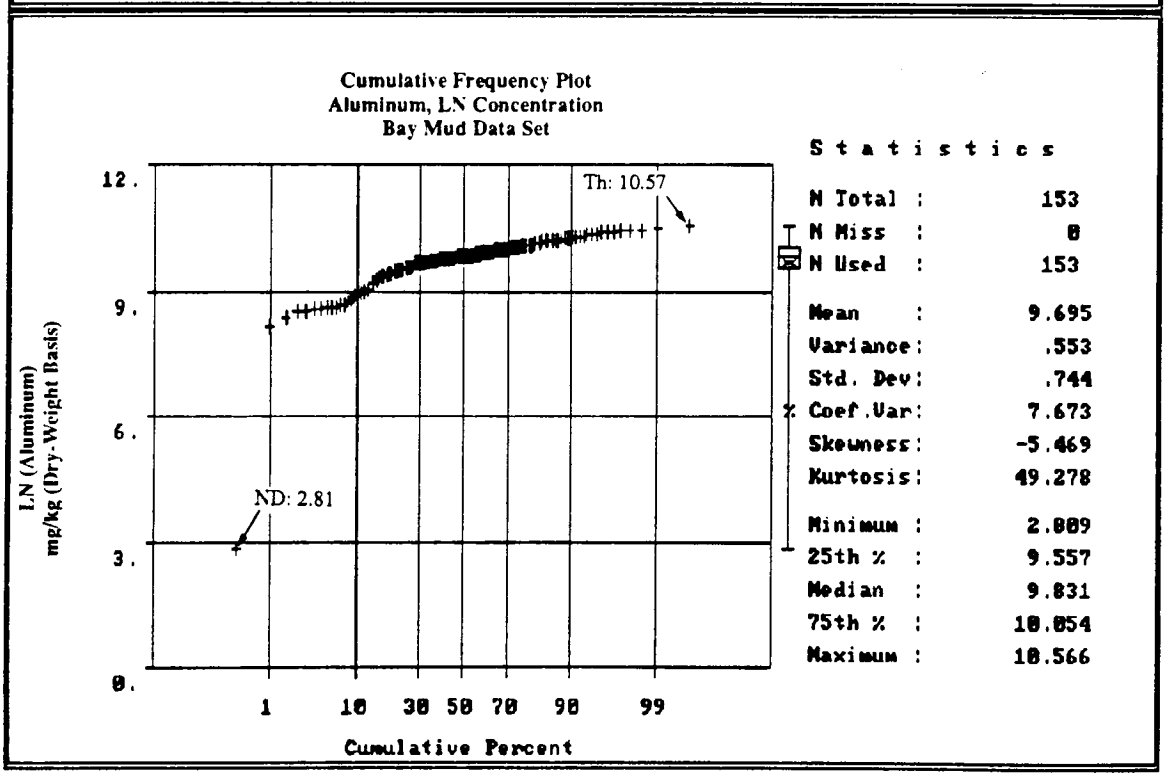
25766





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Environmental Services

Aluminum, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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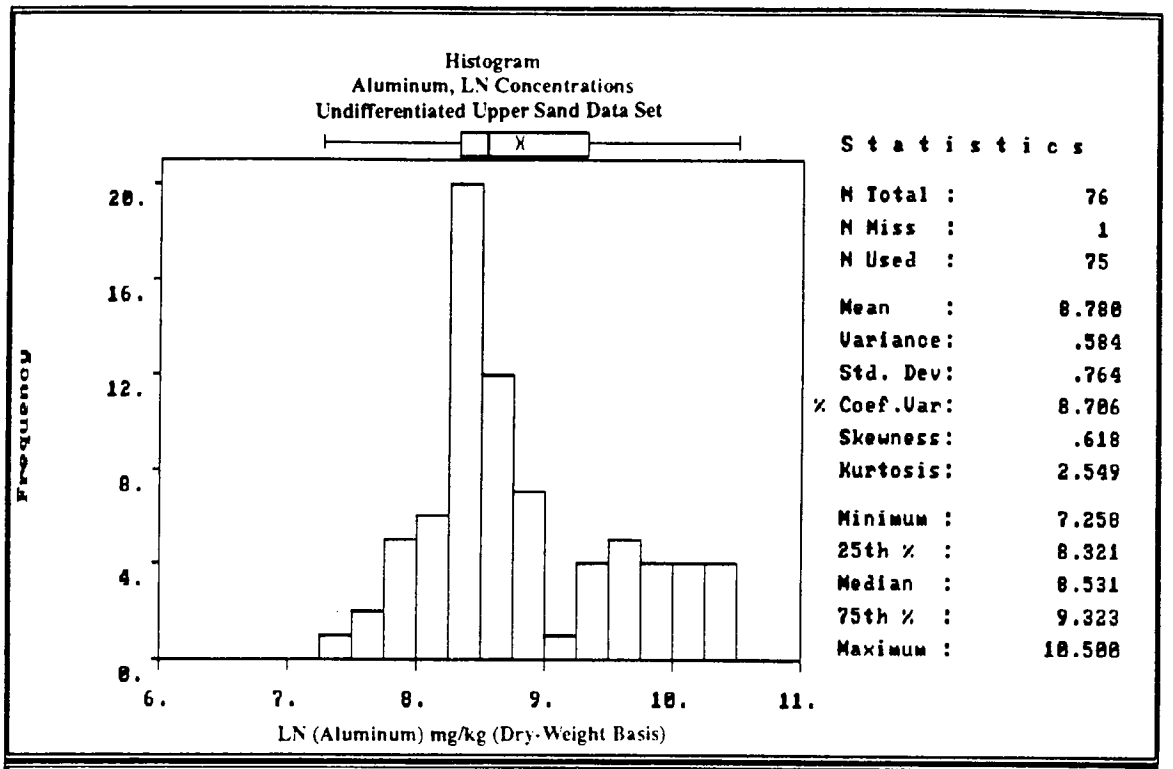
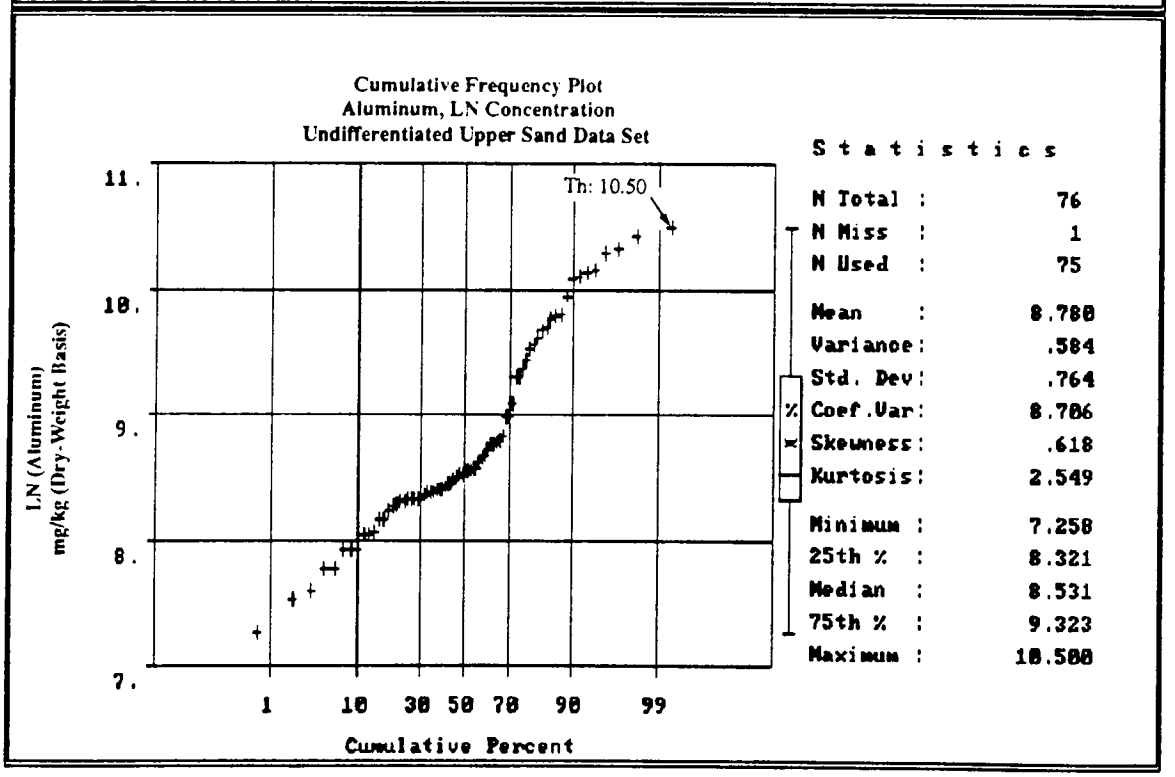
25767





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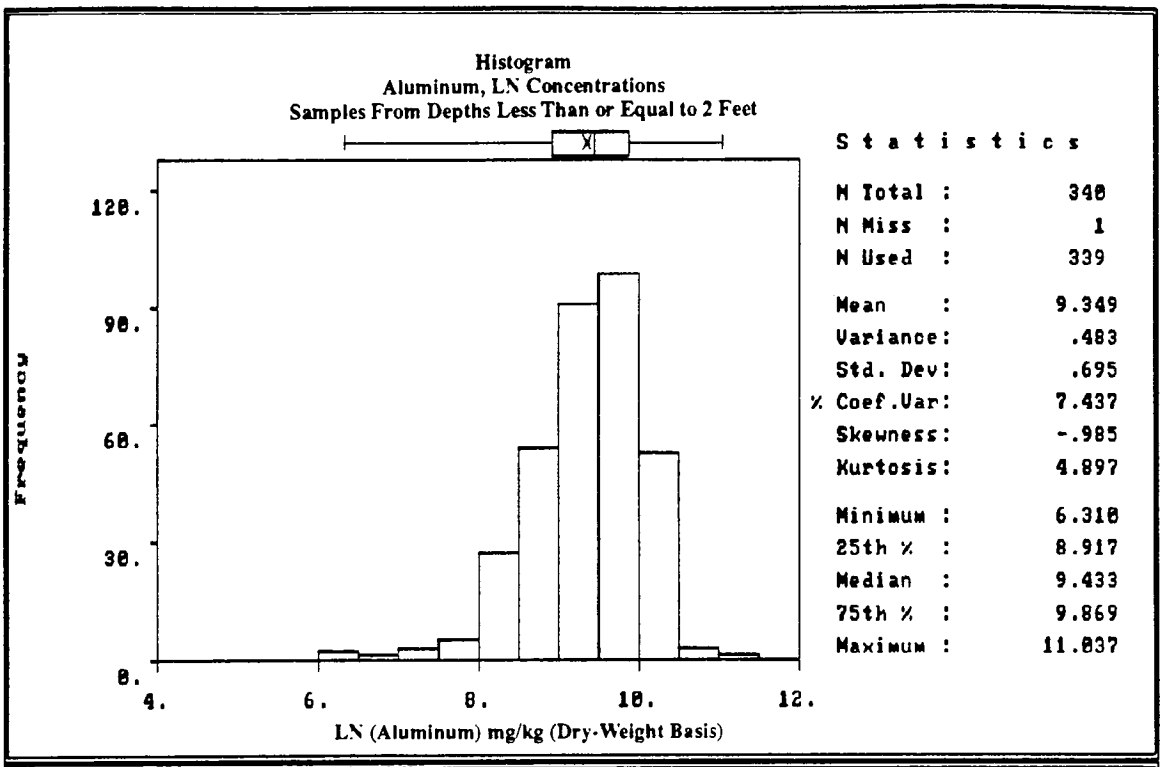
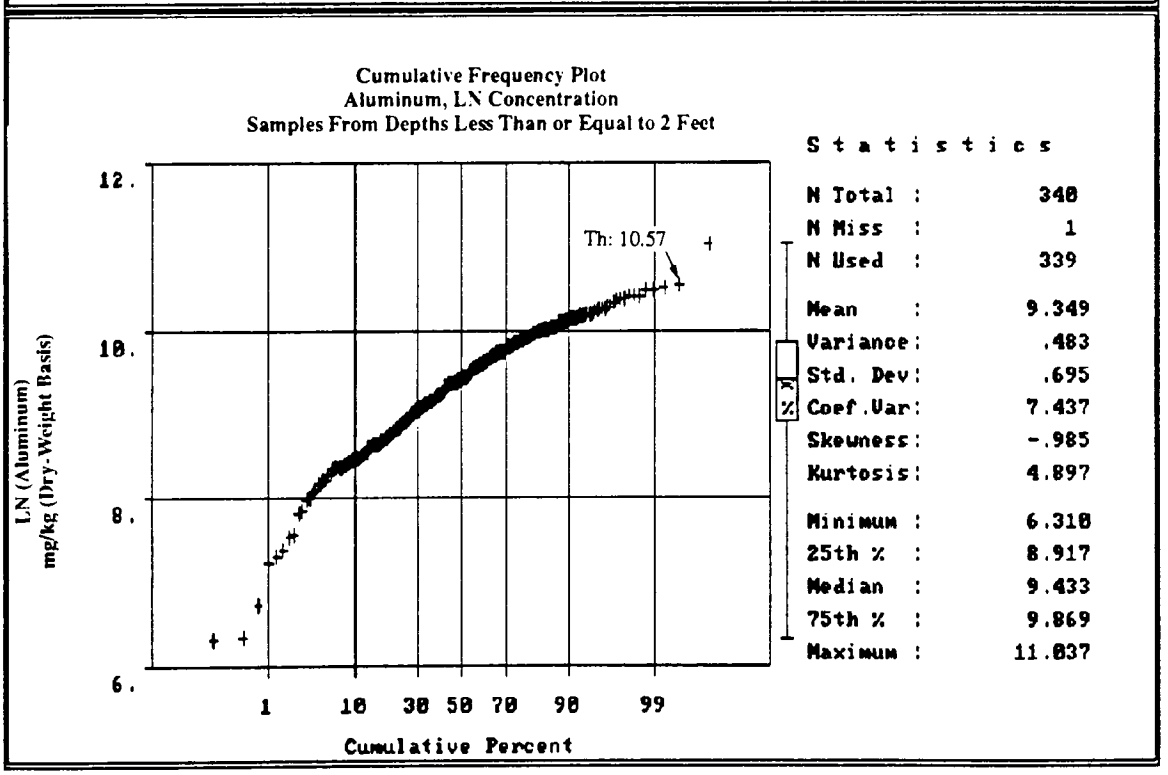
Aluminum, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25768





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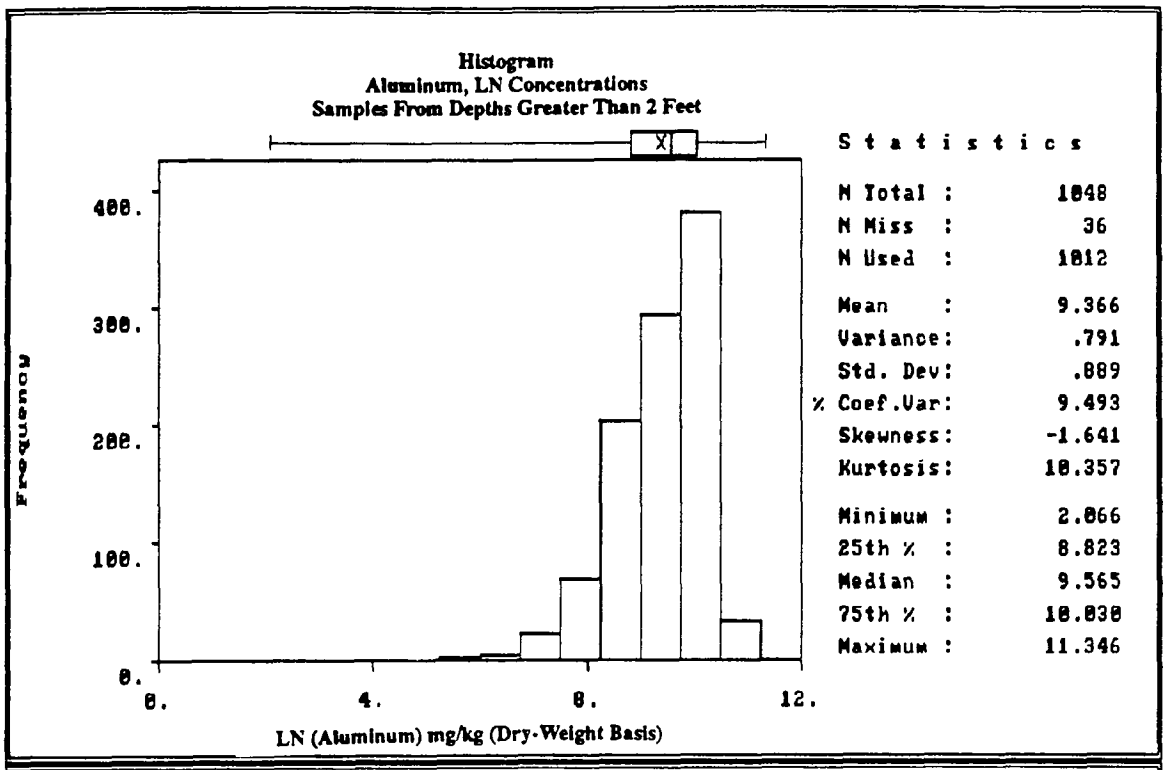
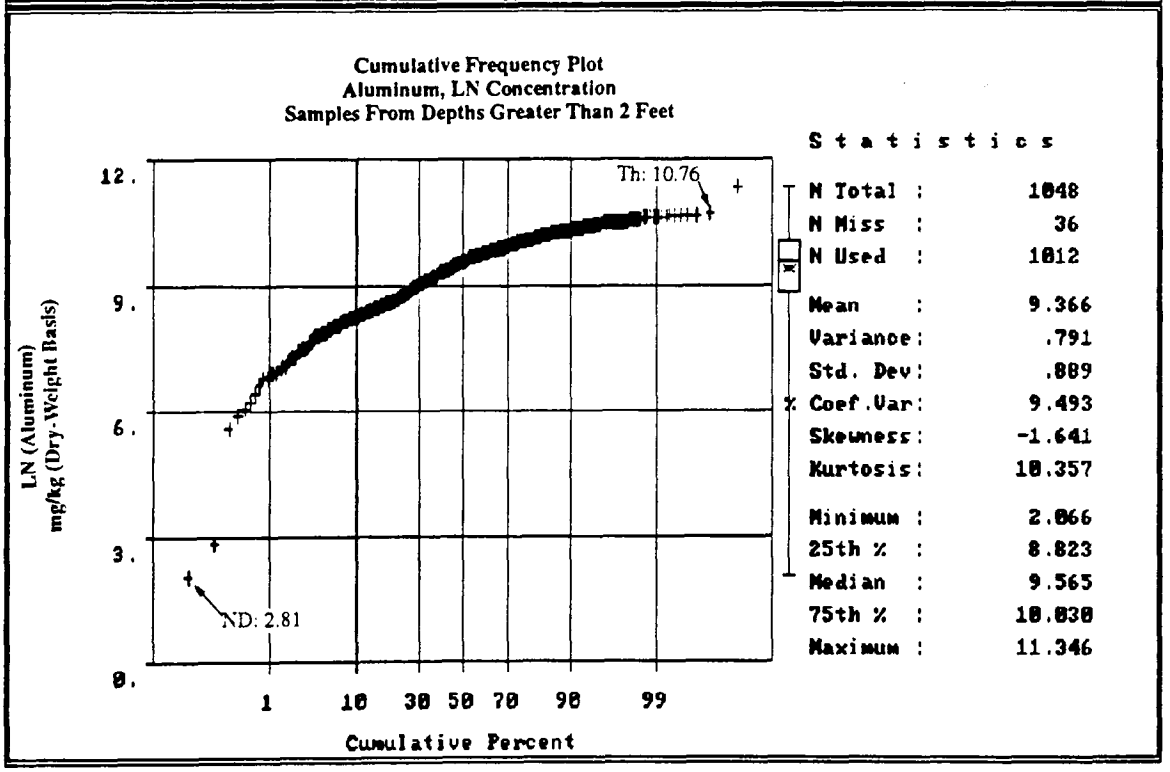
Aluminum, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A7**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	6/92

25769





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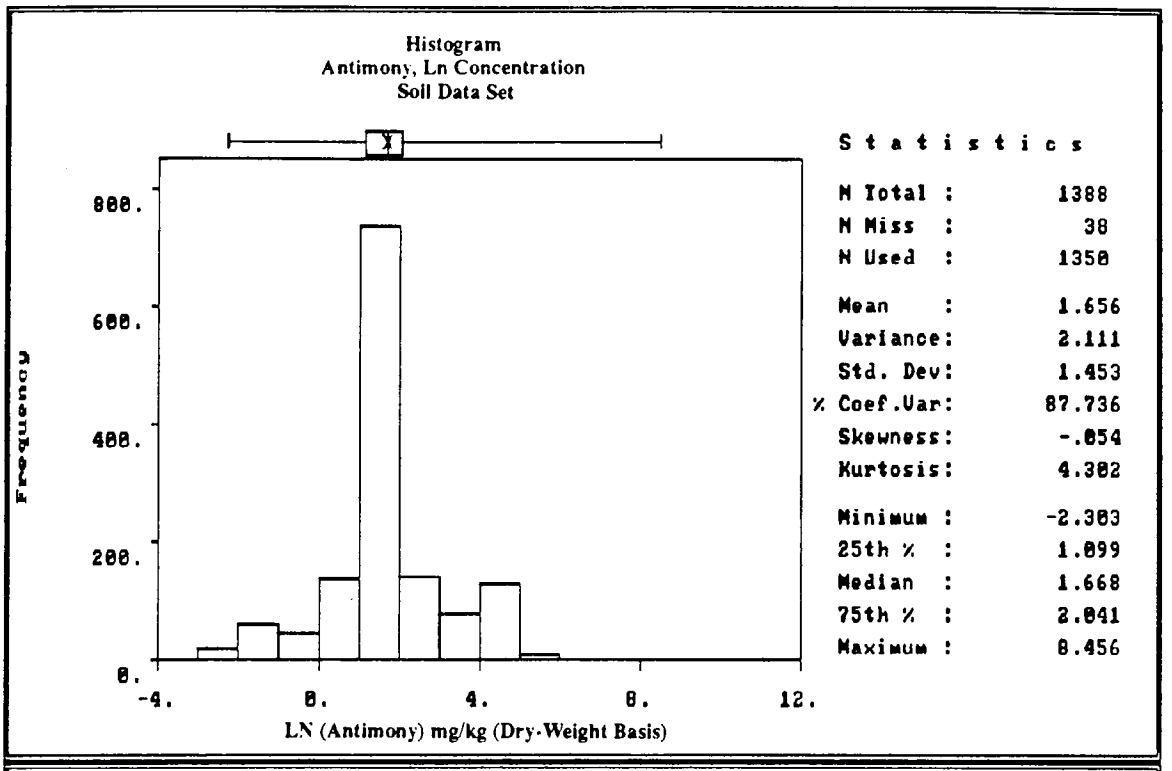
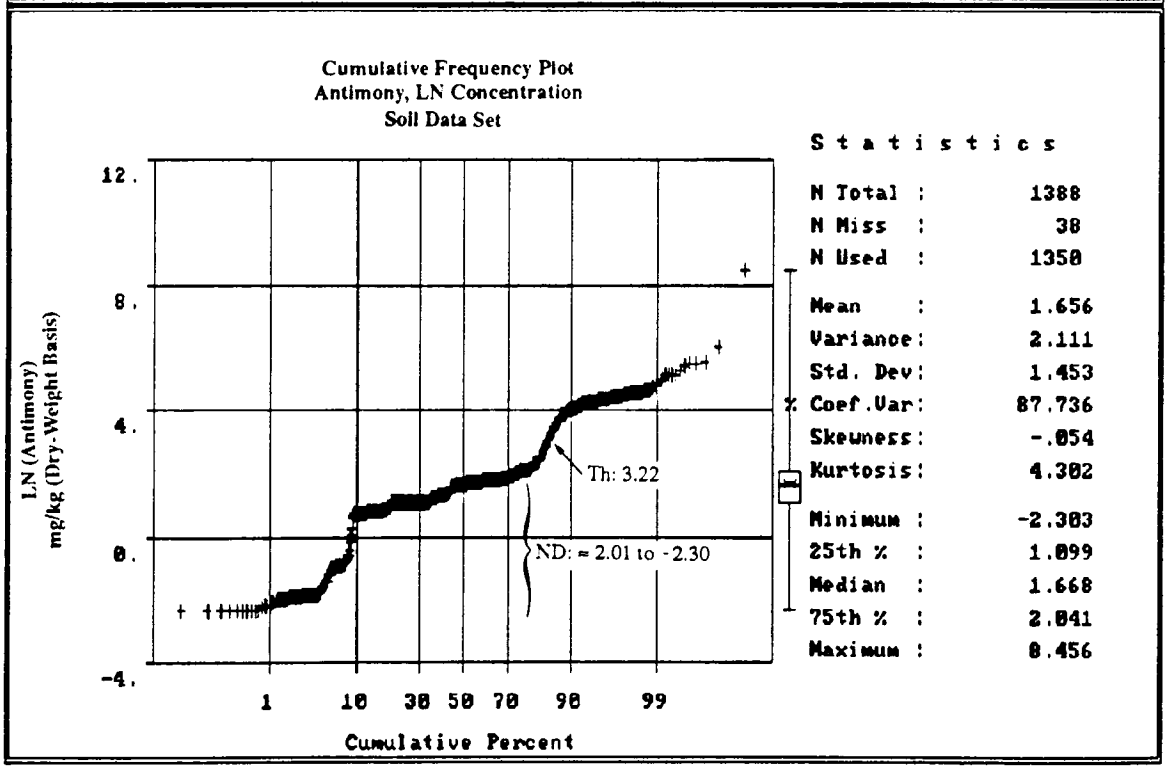
Aluminum, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25770





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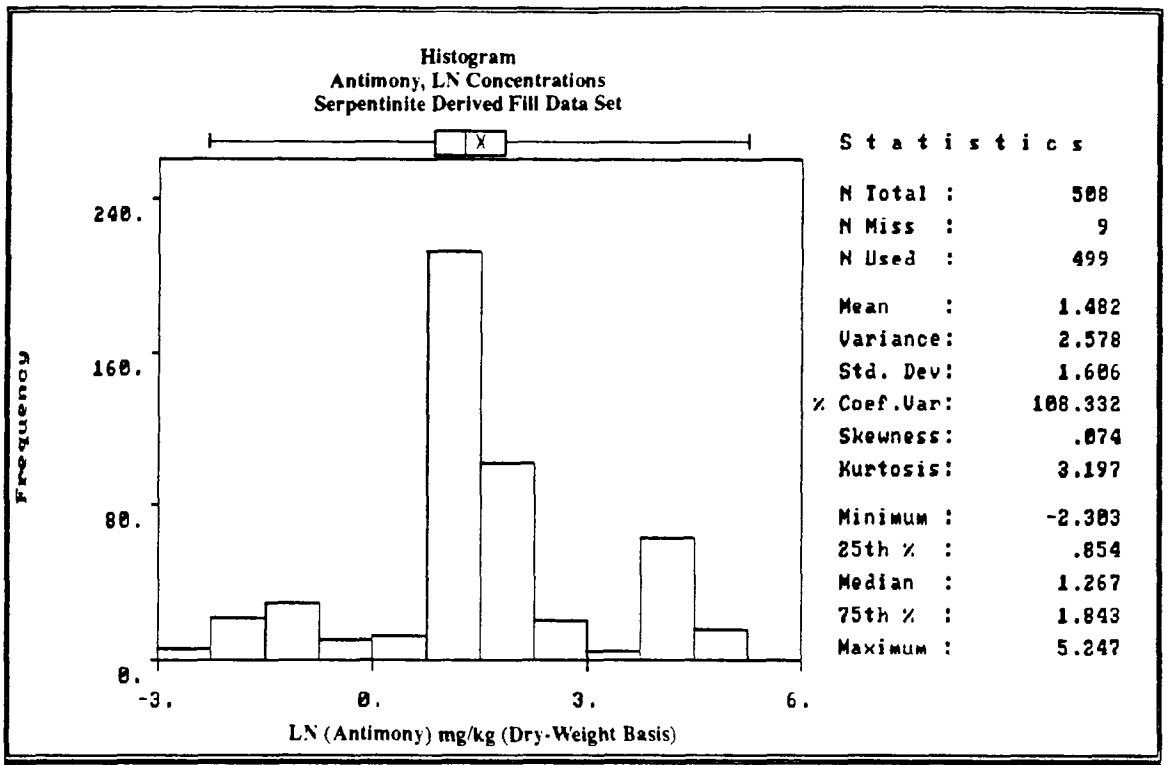
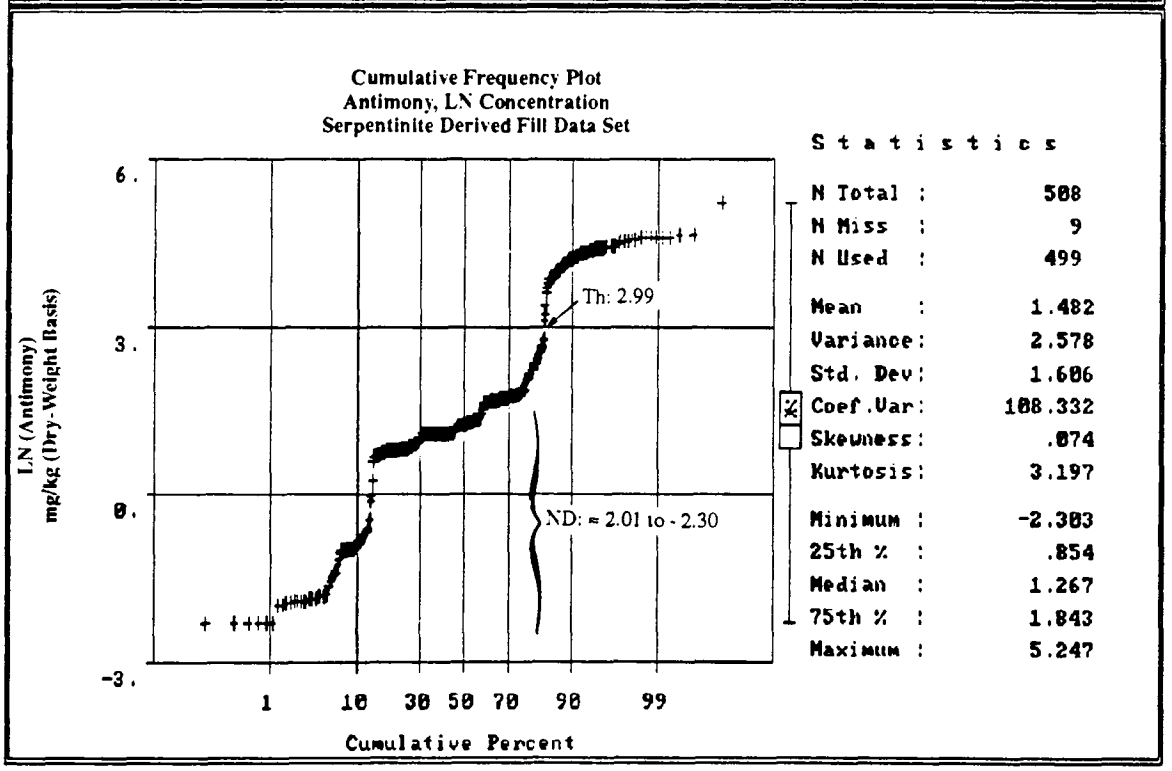
Antimony, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25771





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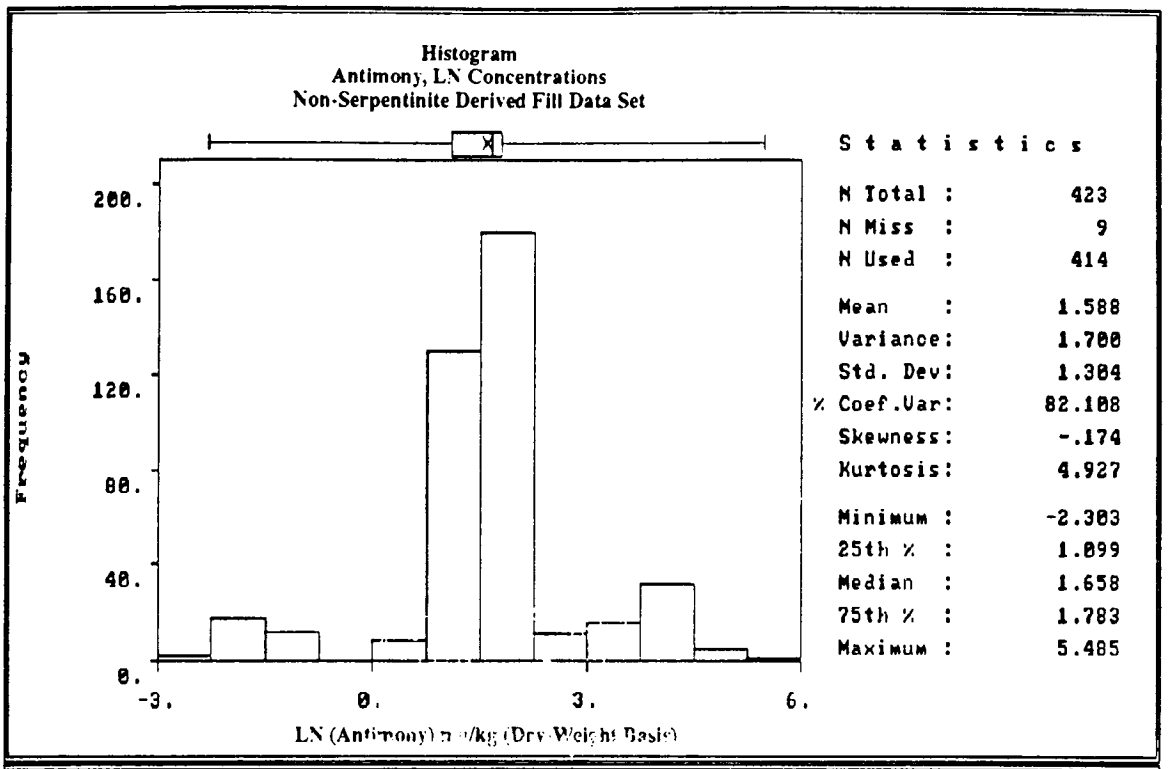
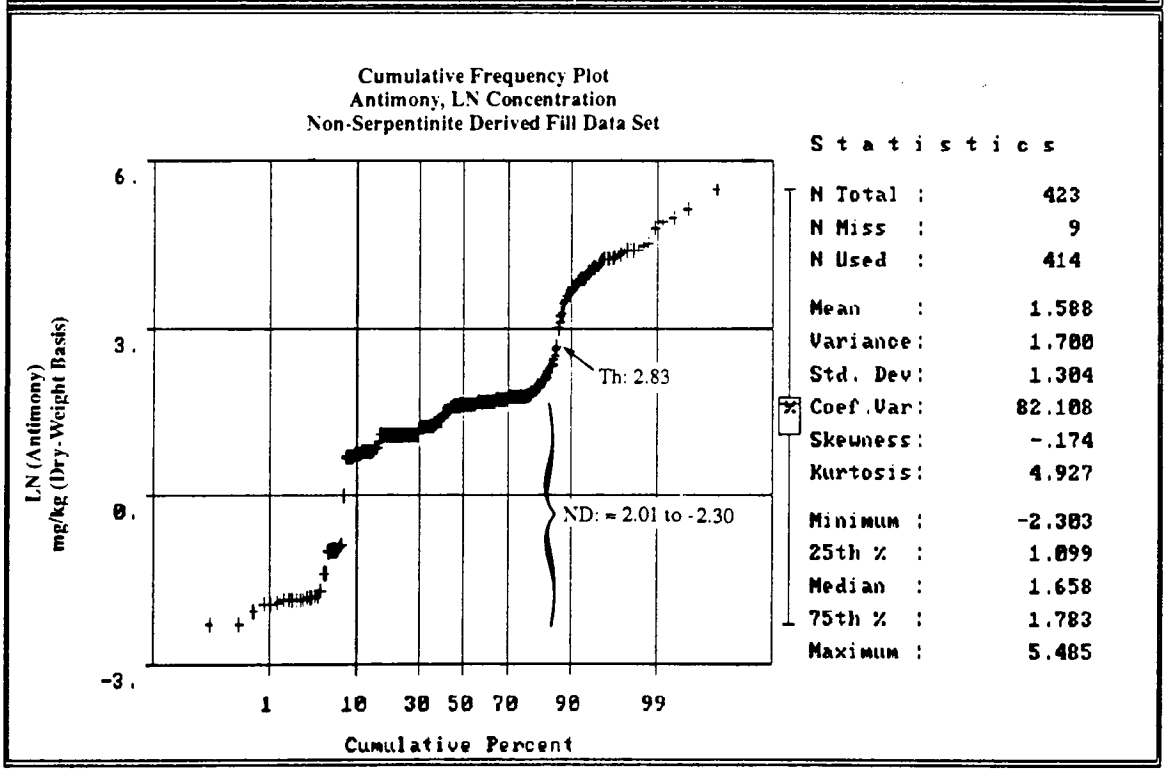
Antimony, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25772





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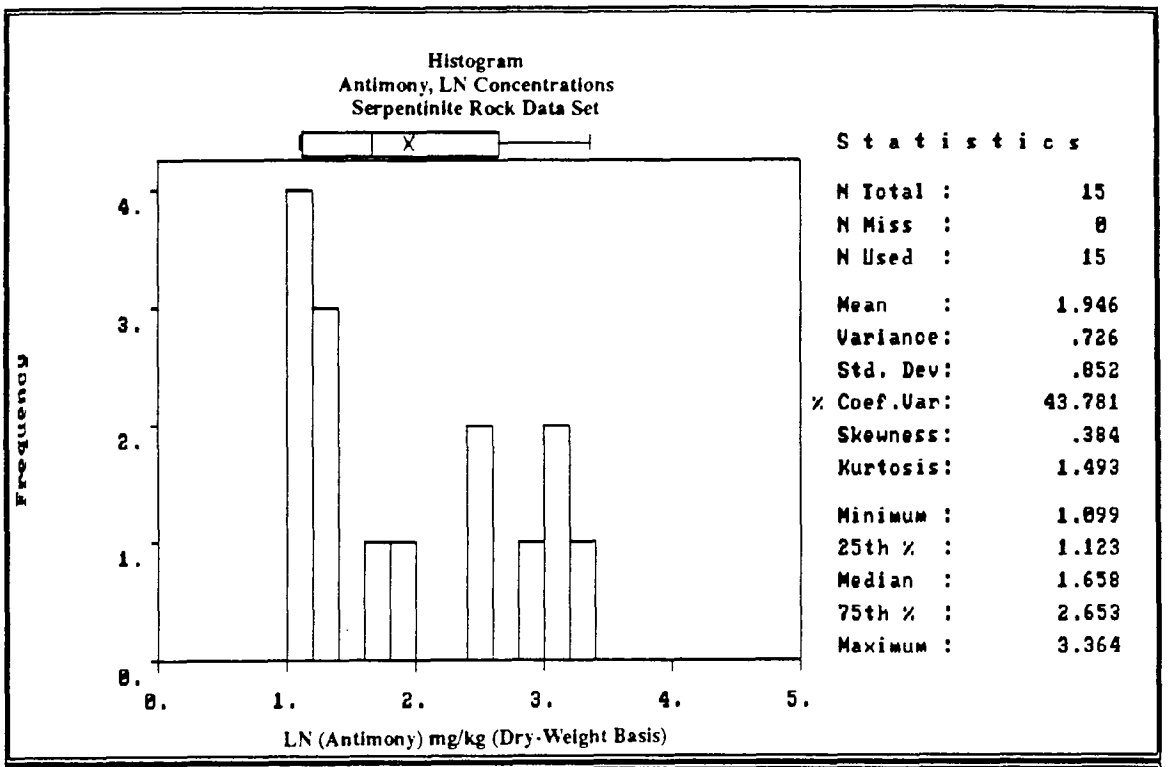
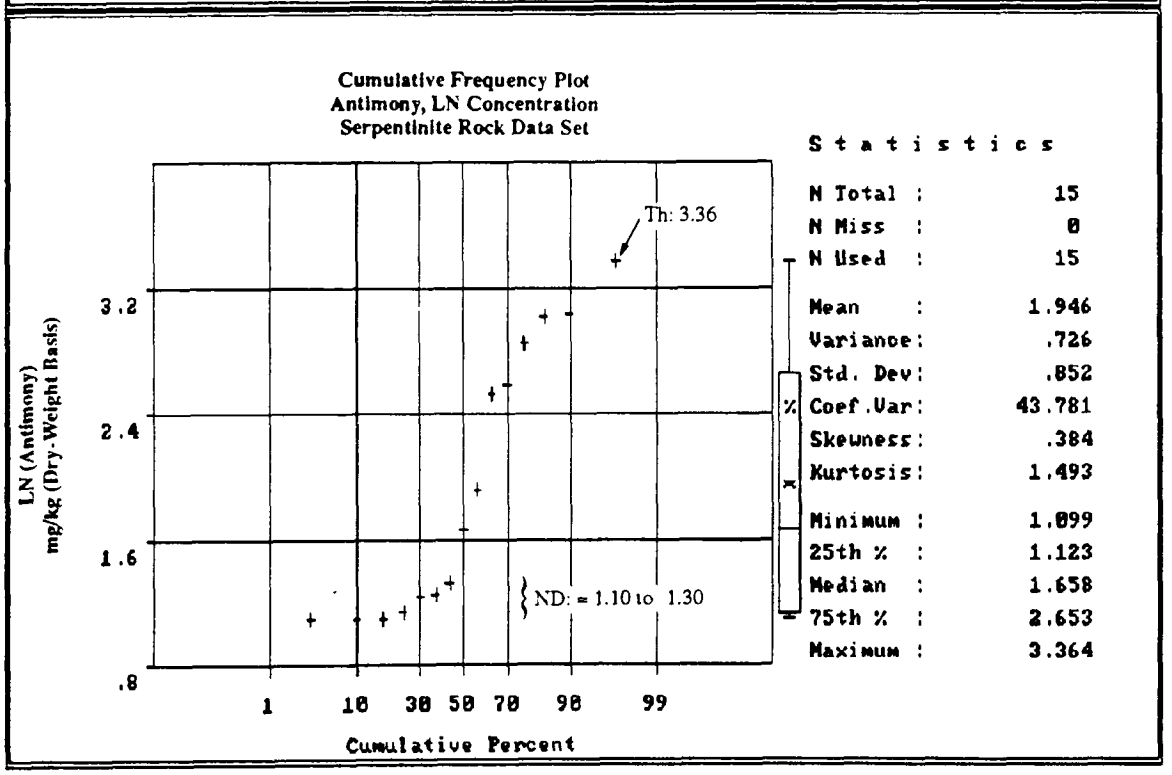
Antimony, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25773





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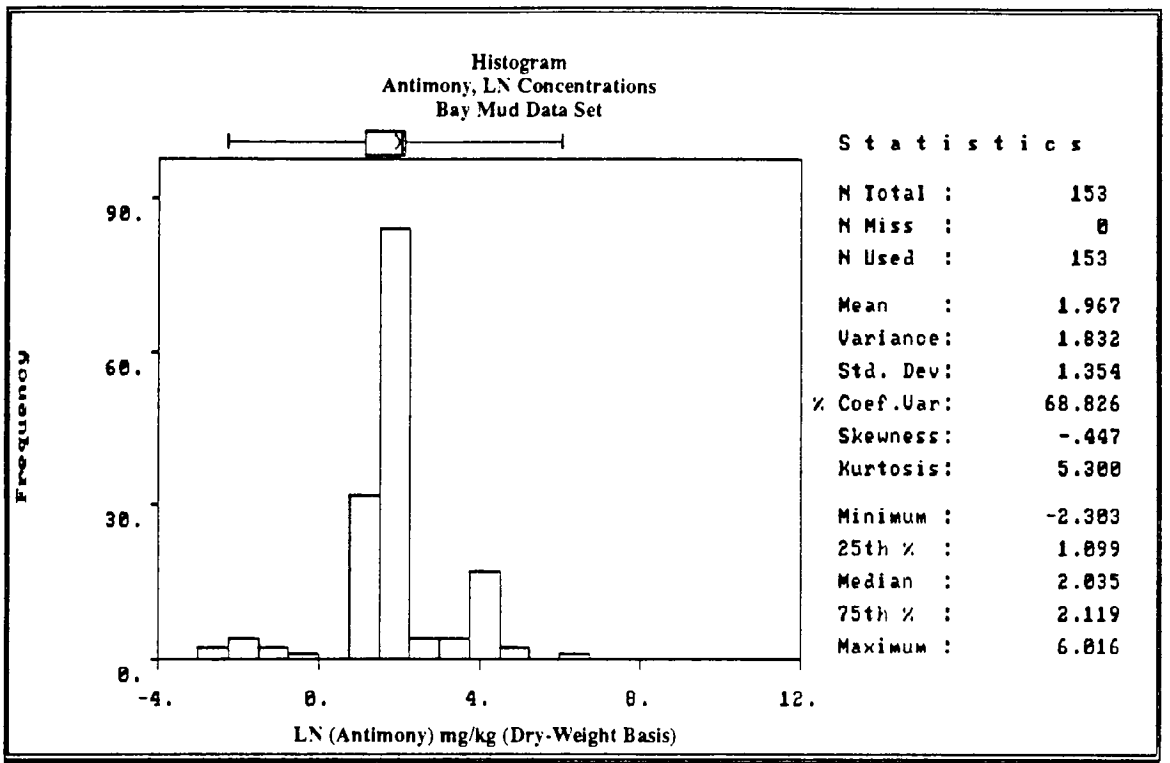
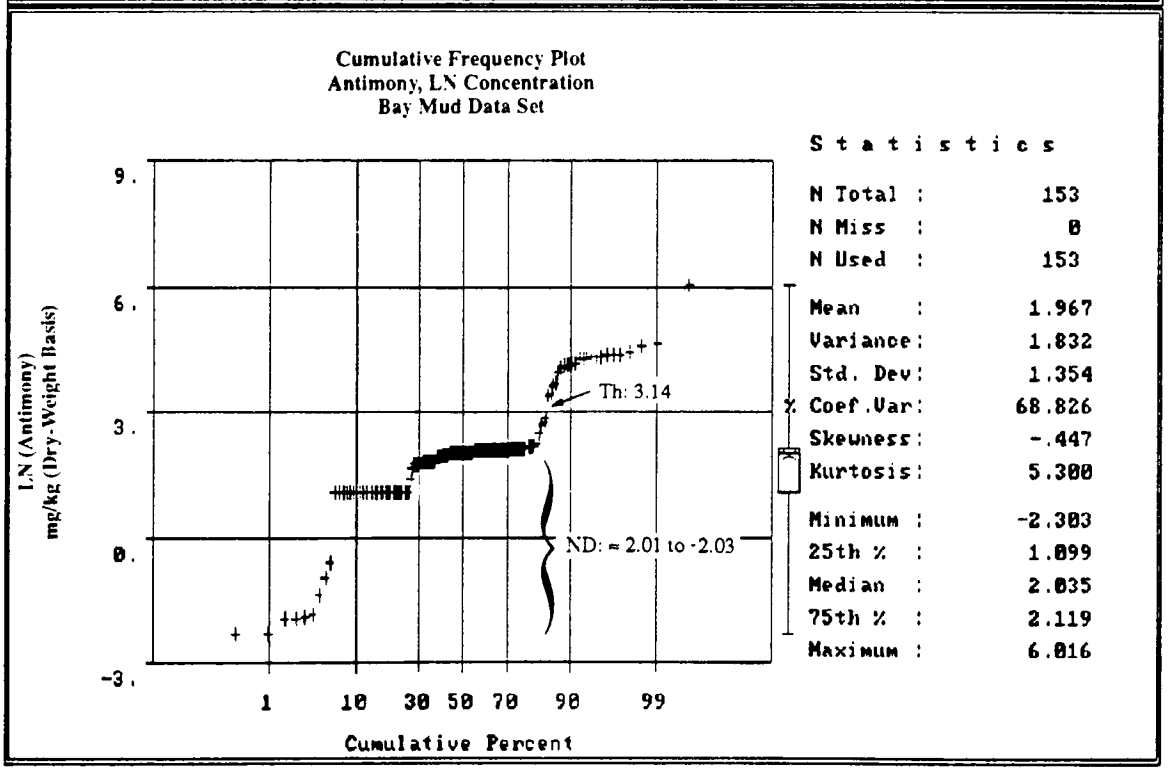
Antimony, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A12

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25774





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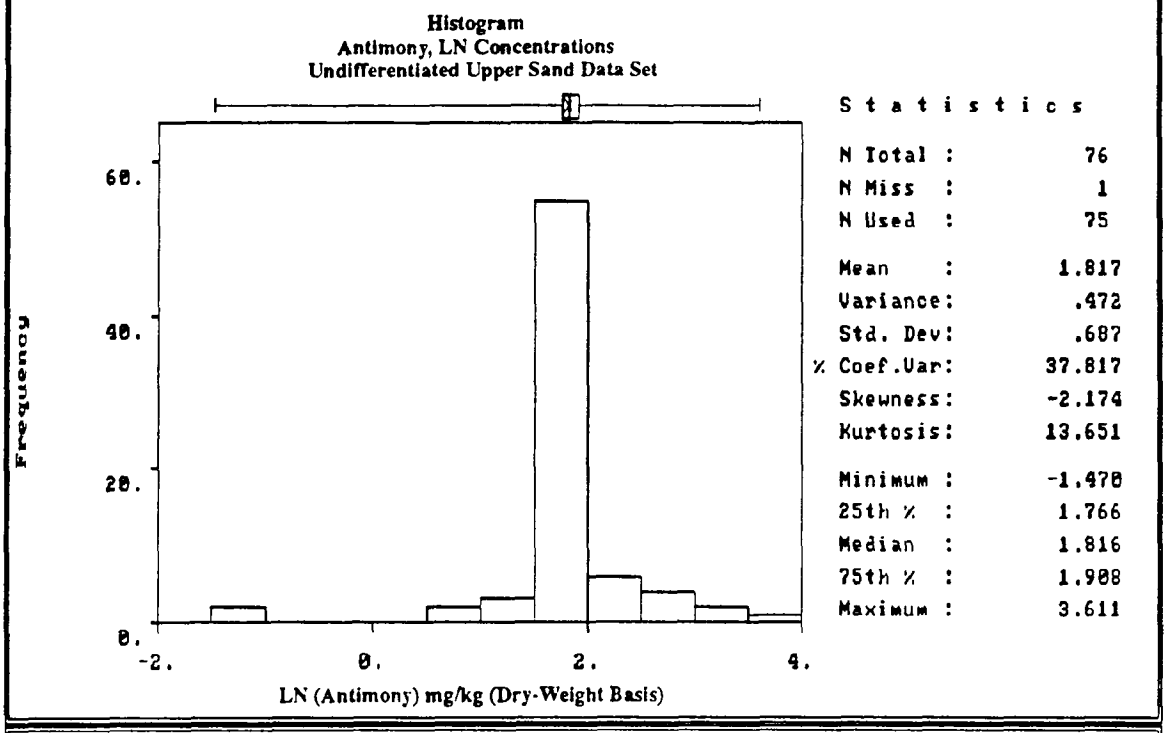
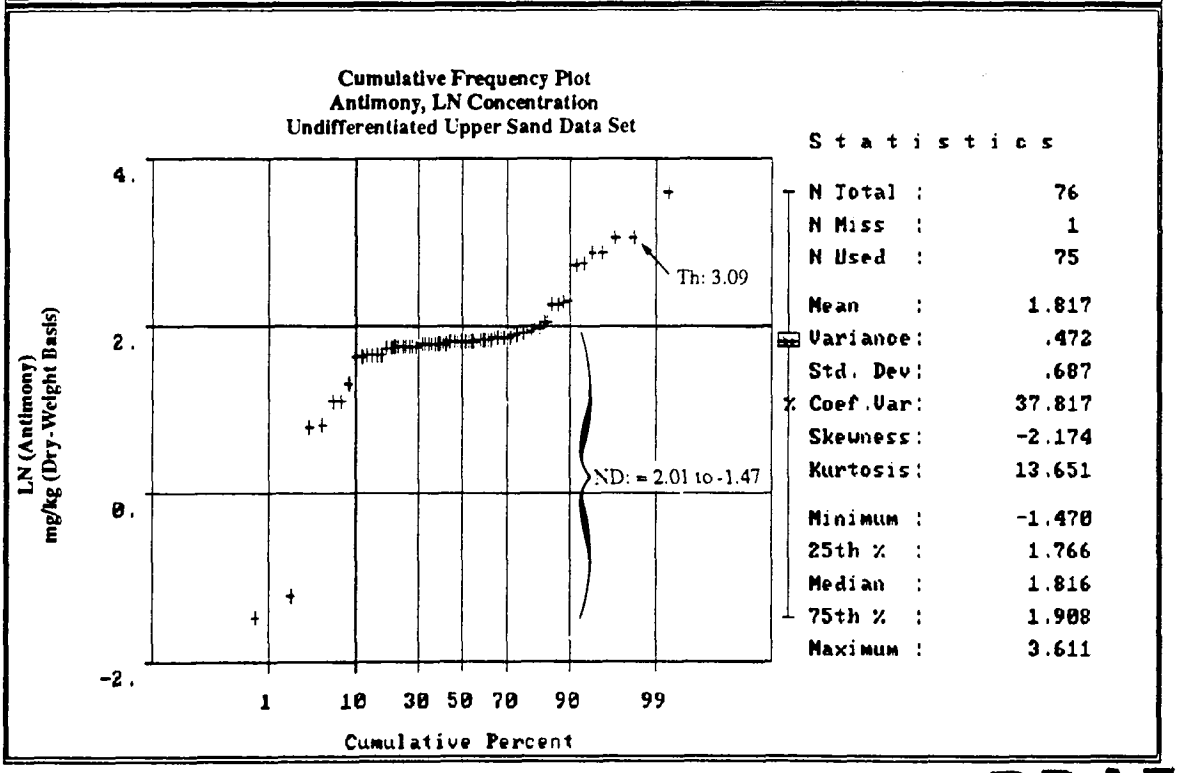
Antimony, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25775





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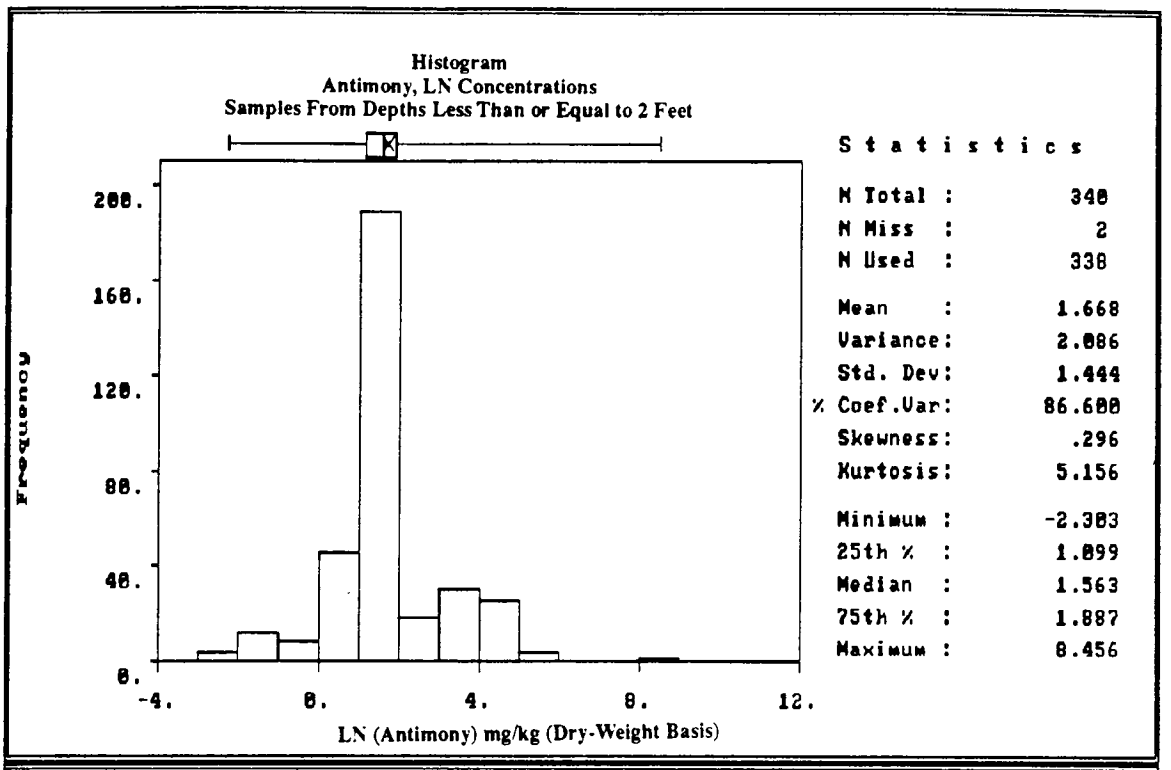
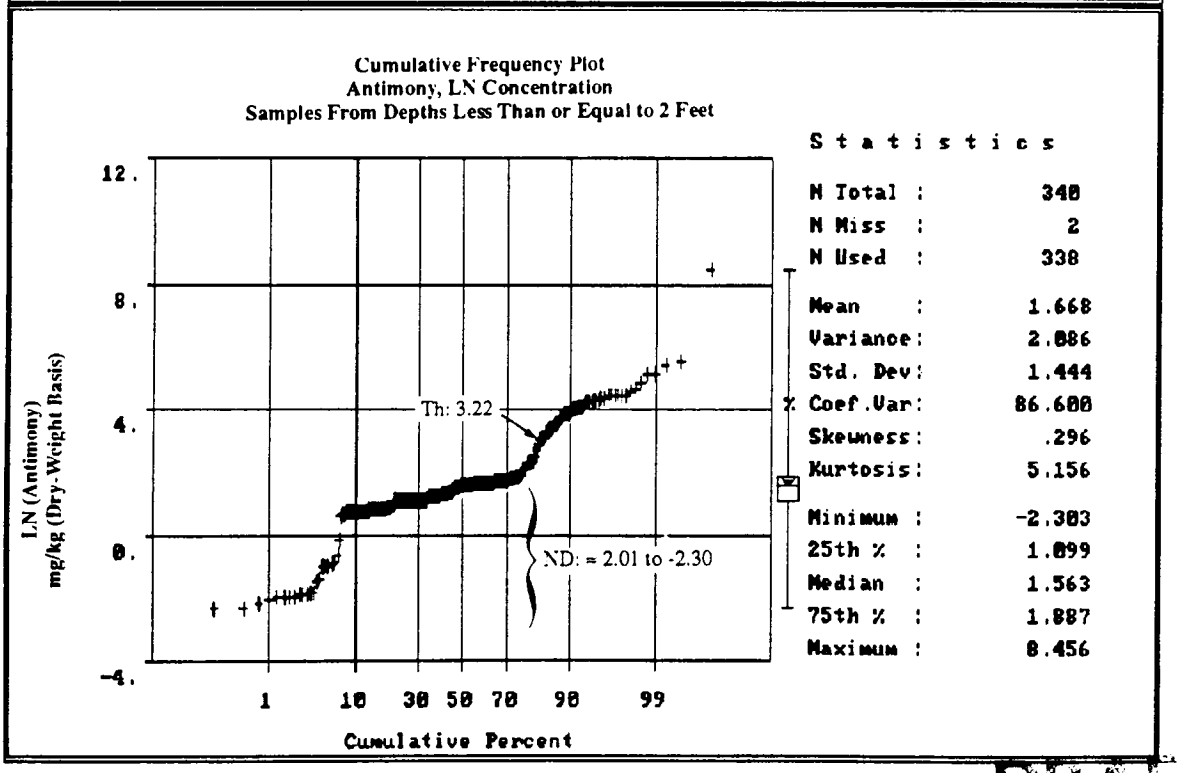
Antimony, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25776





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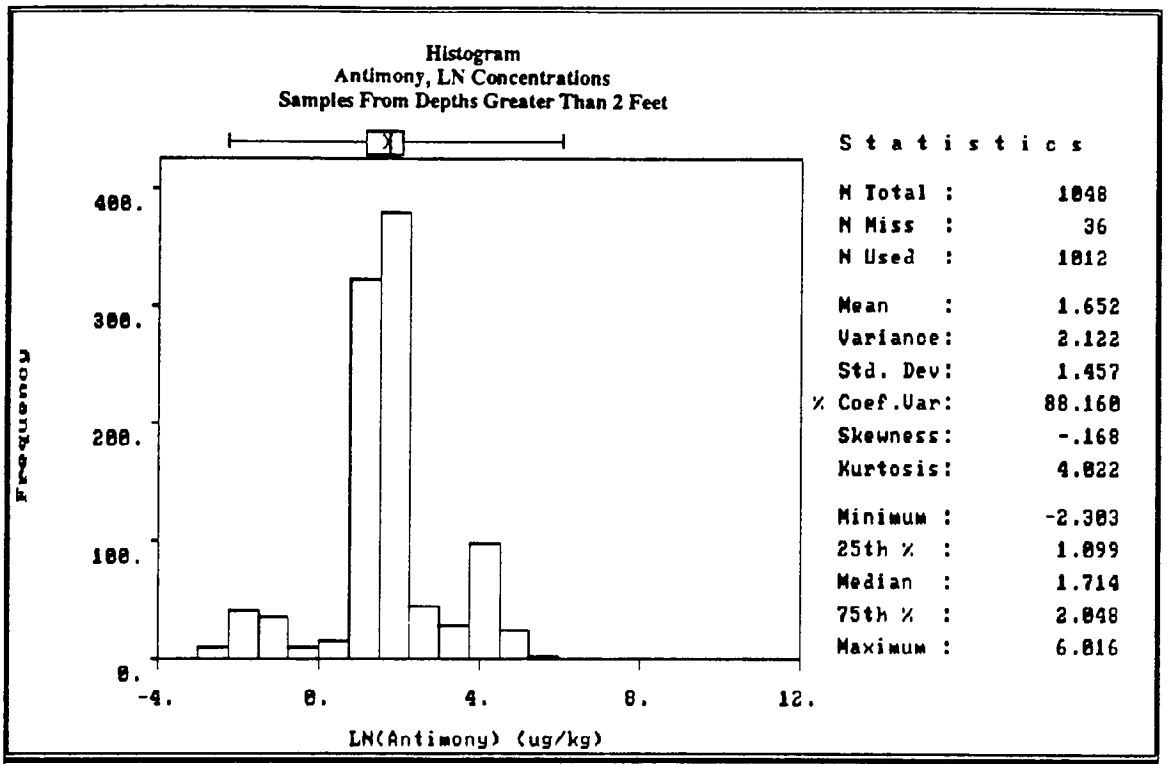
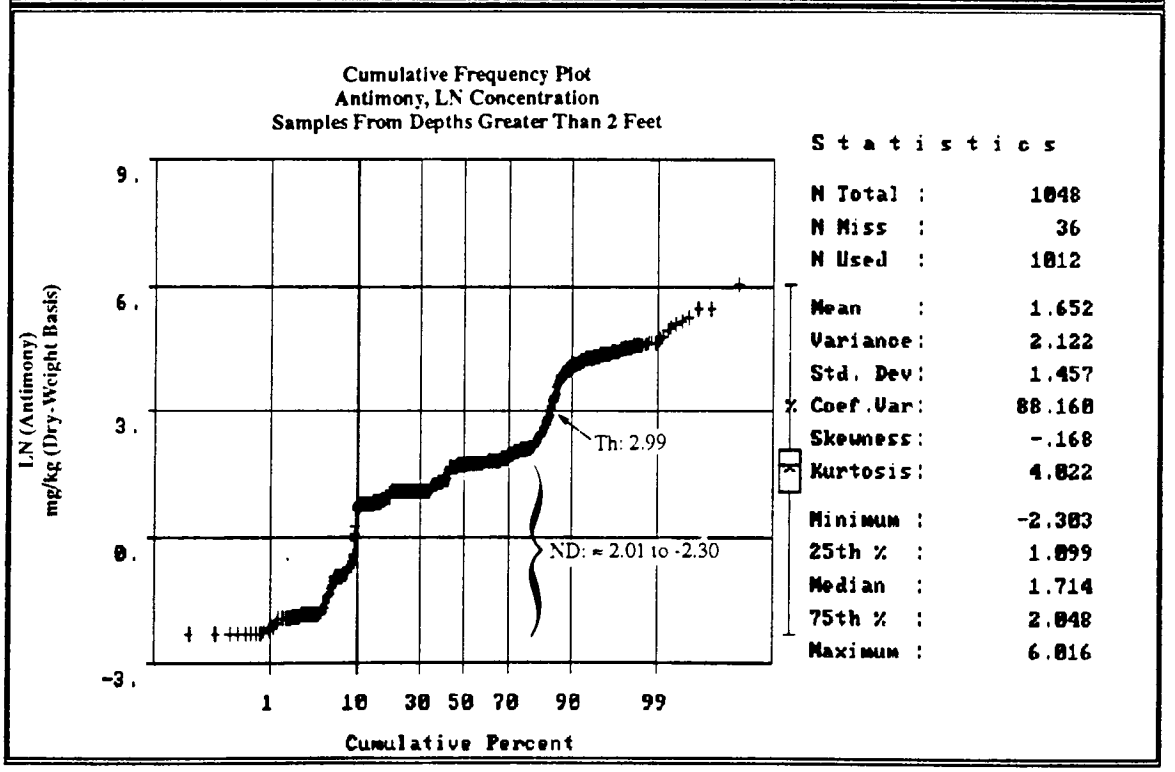
Antimony, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A15**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25777





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Antimony, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A16**

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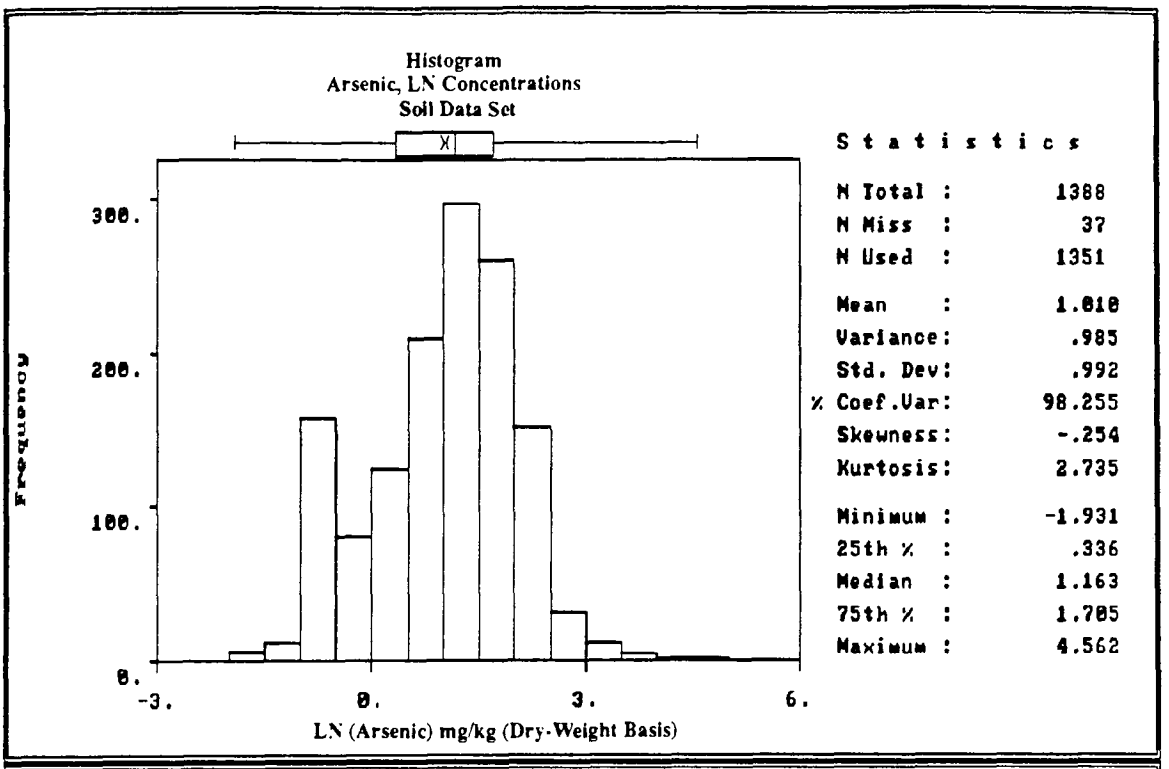
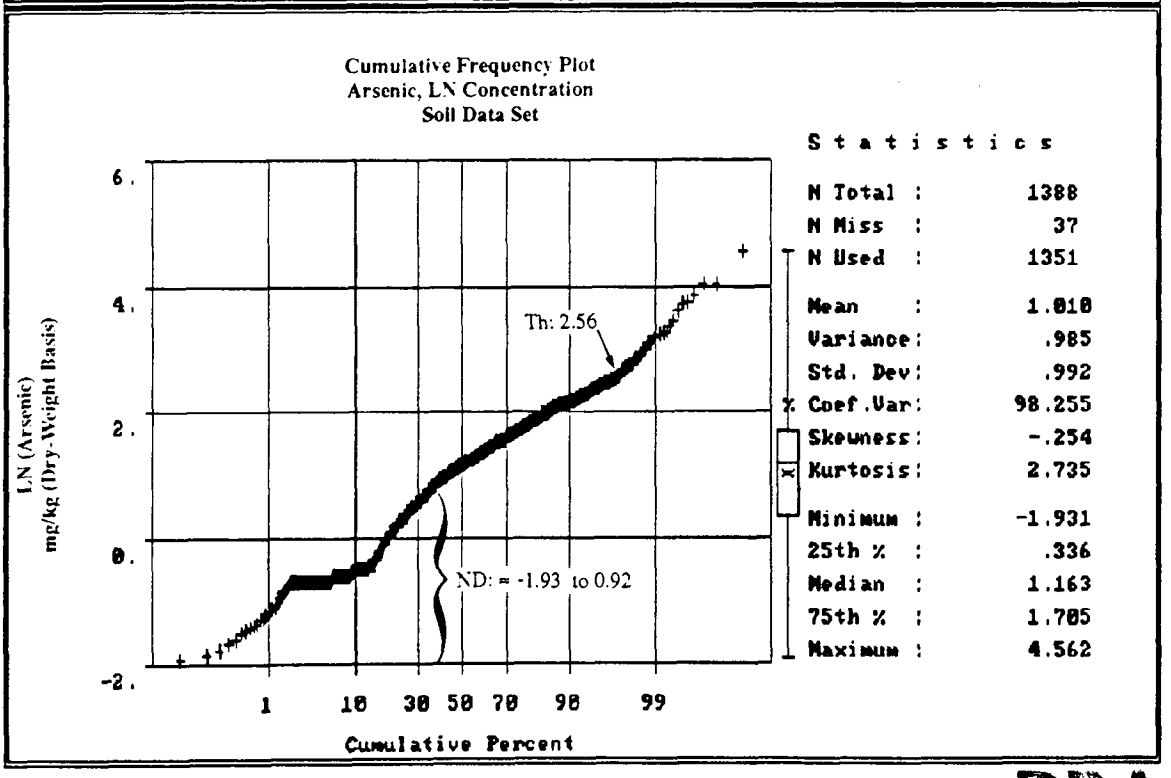
NJB	18639,580.02	CJM	2/92	6/92

25778





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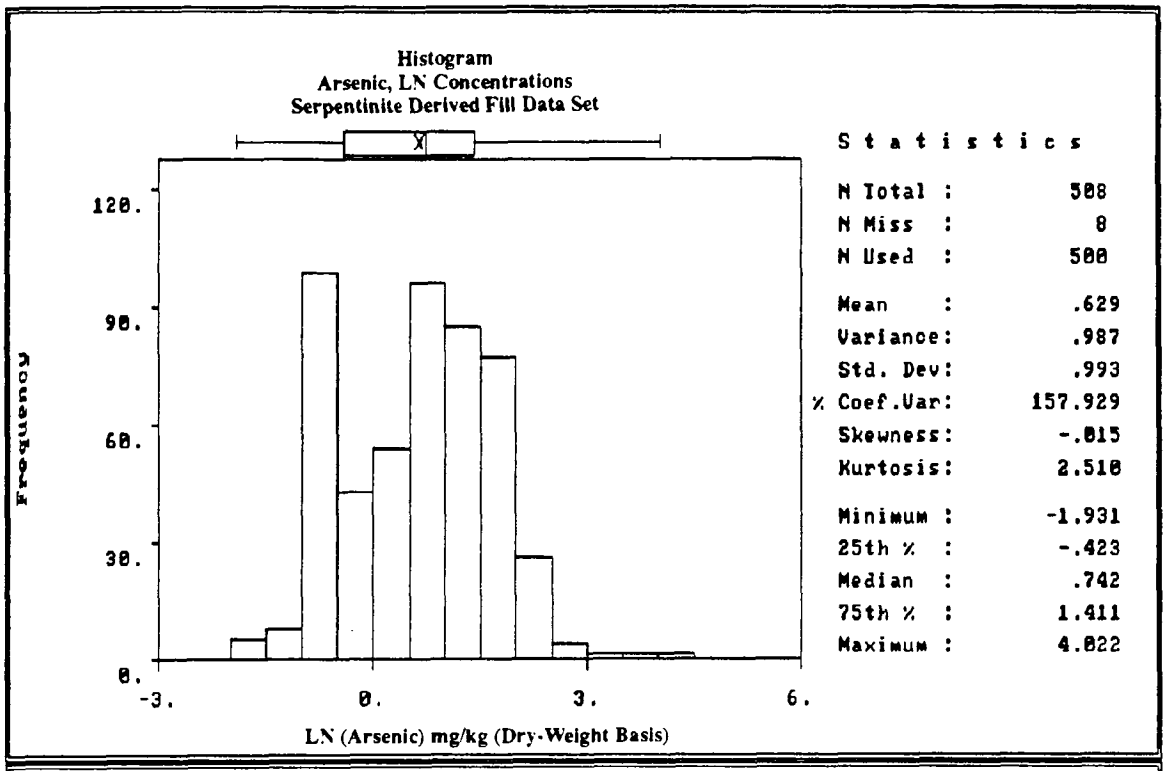
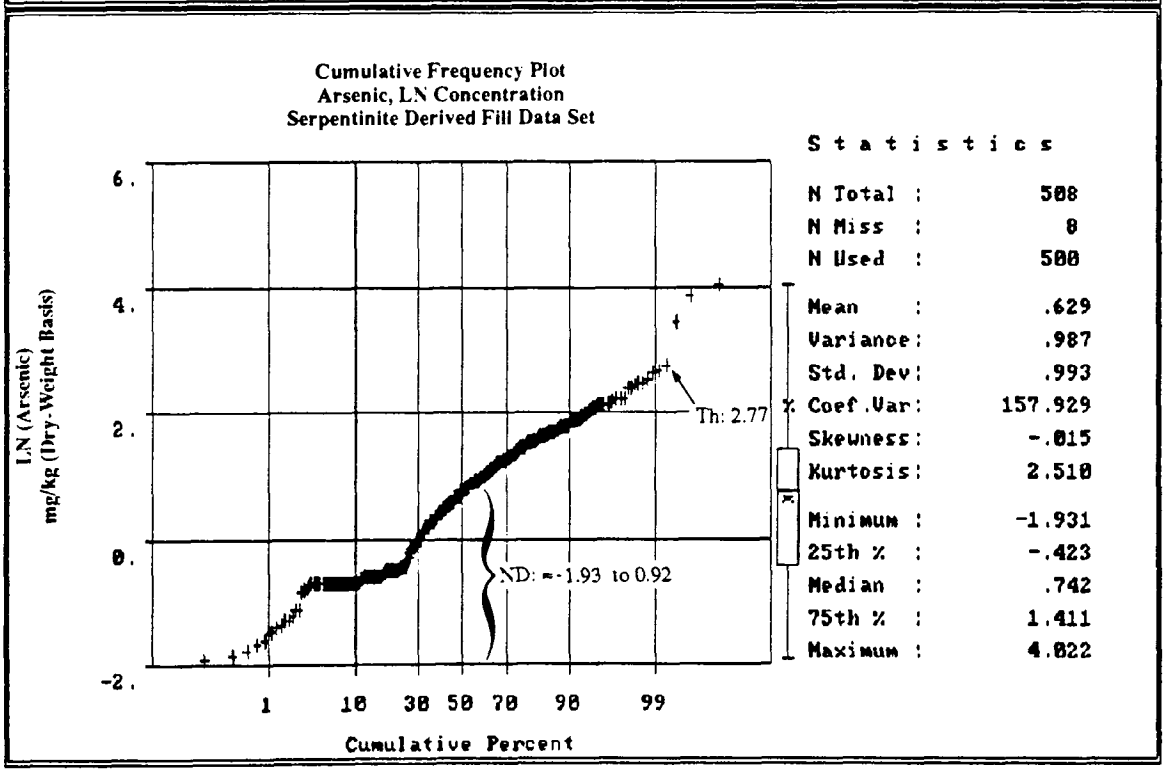
Arsenic, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A17

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25779





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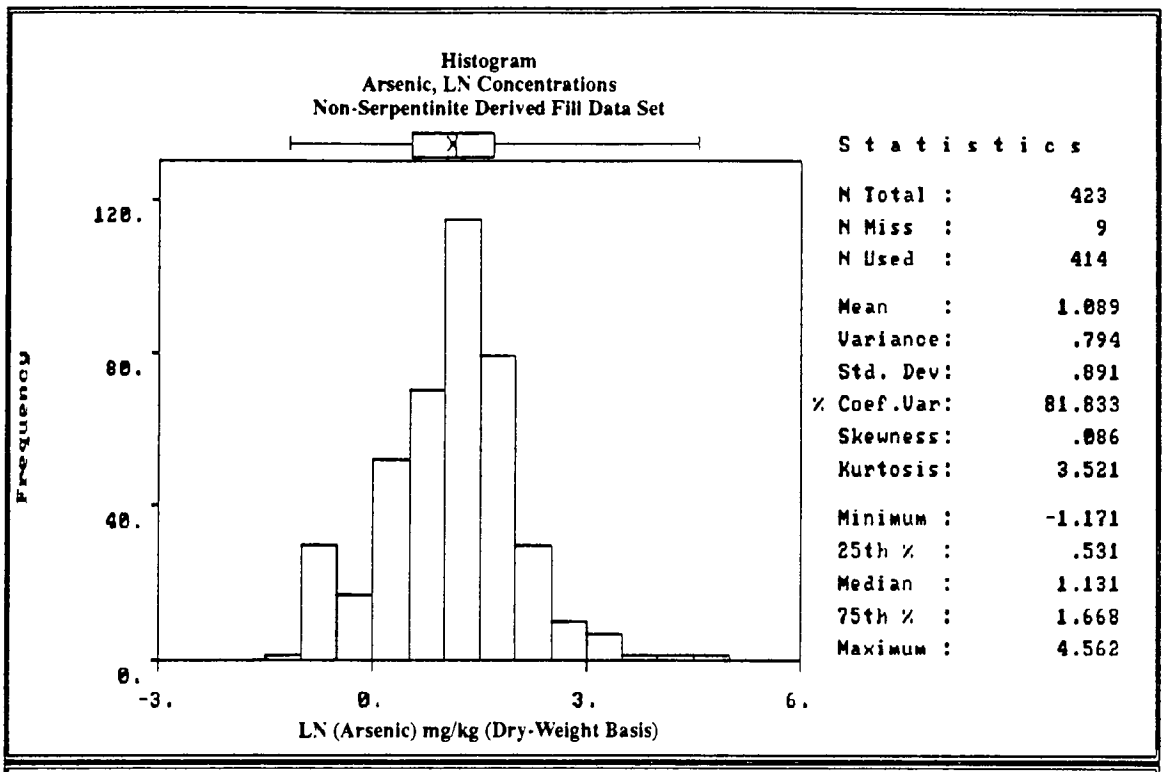
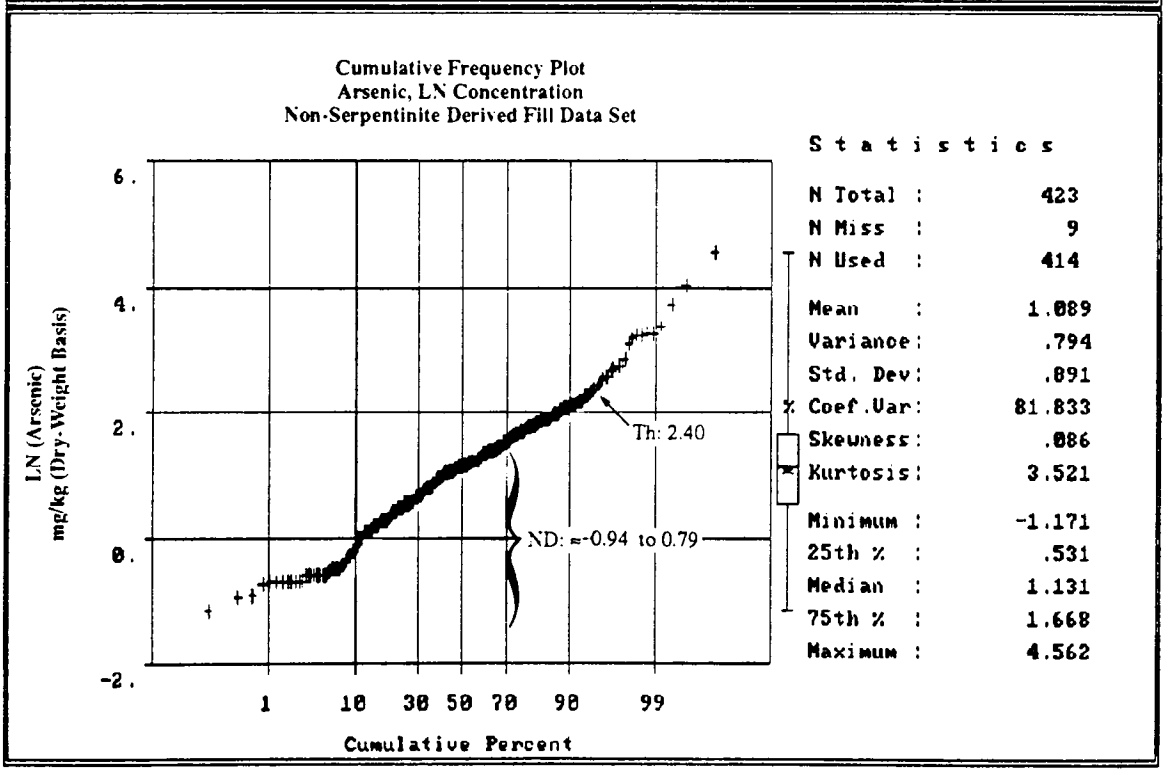
Arsenic, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25780





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Arsenic, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A19

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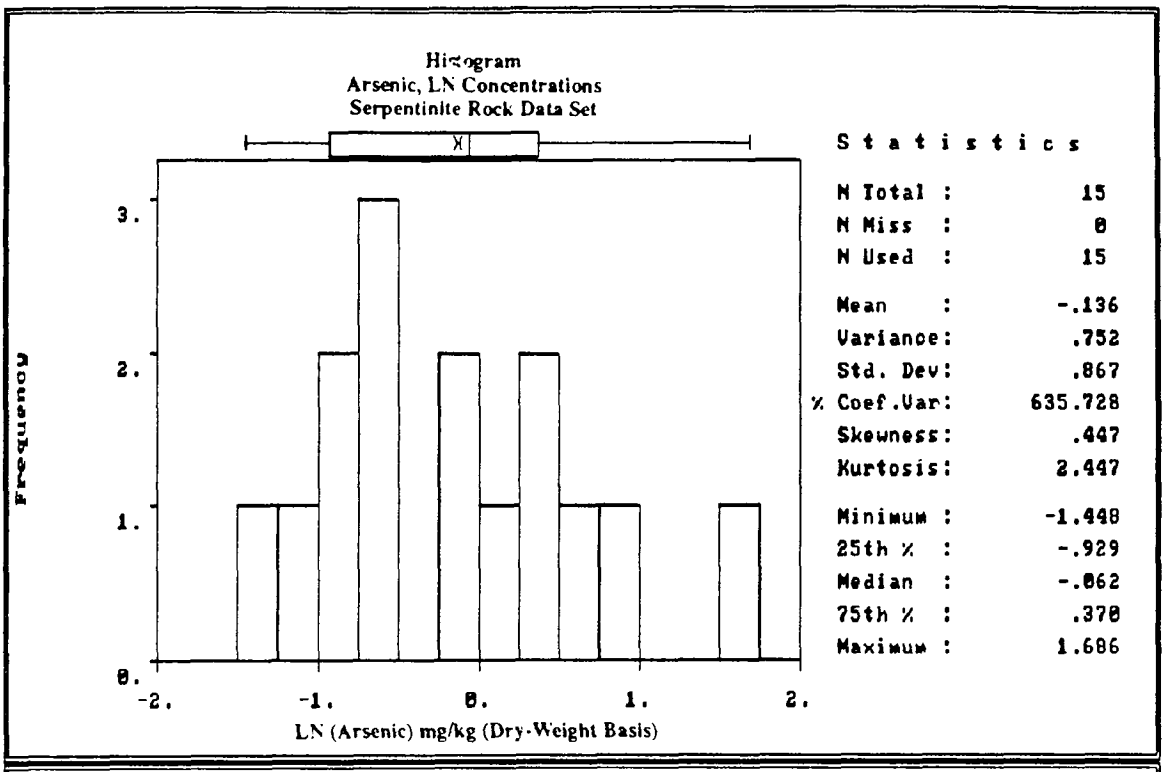
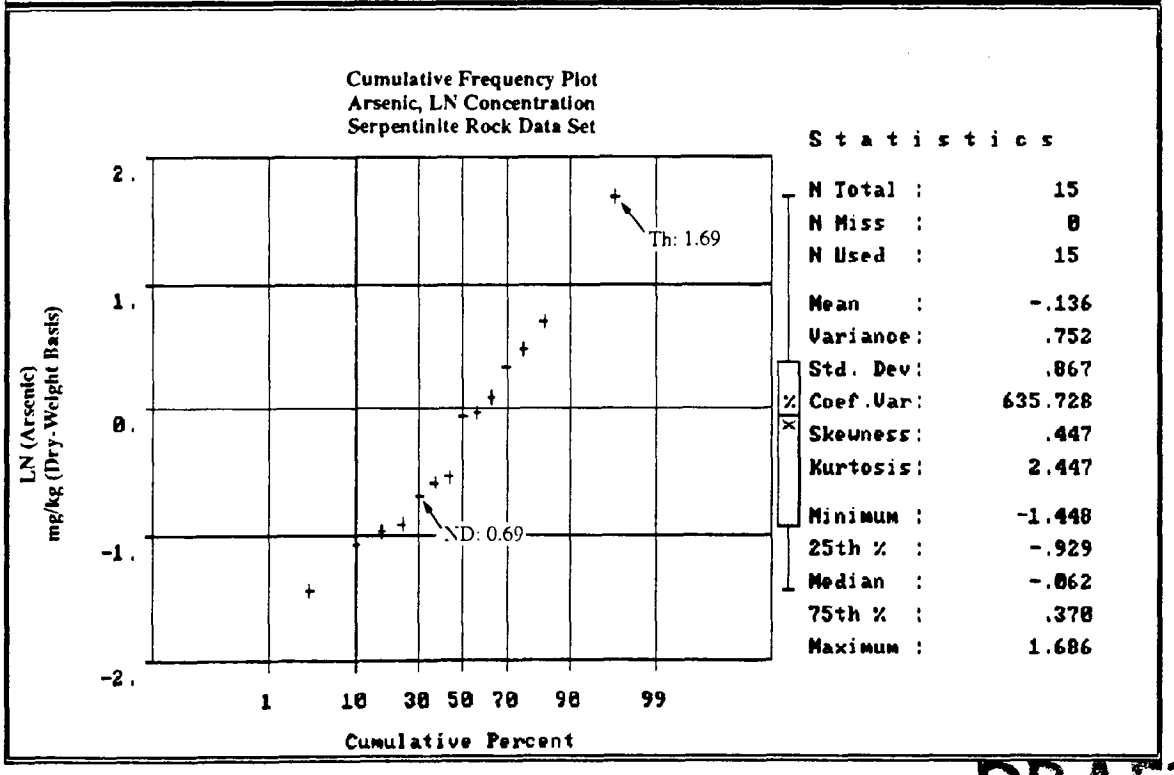
NJB	18639,580.02	CJM	2/92	6/92

25781





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Arsenic, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A20

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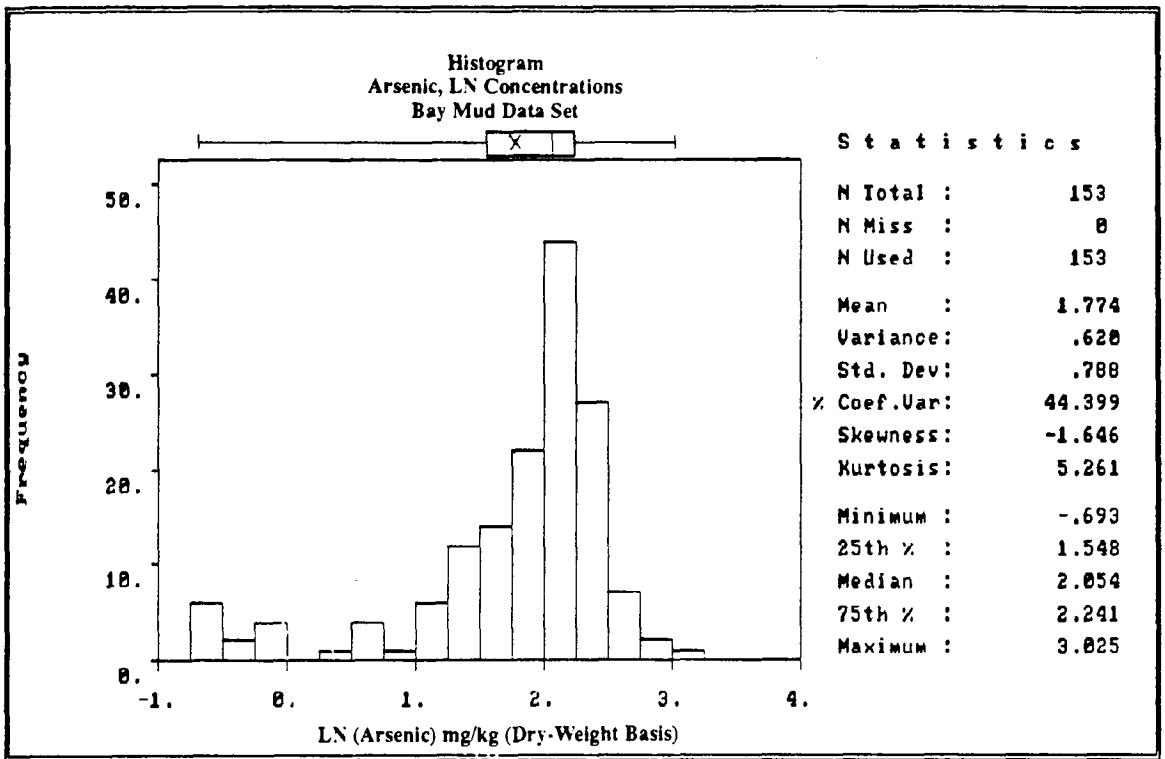
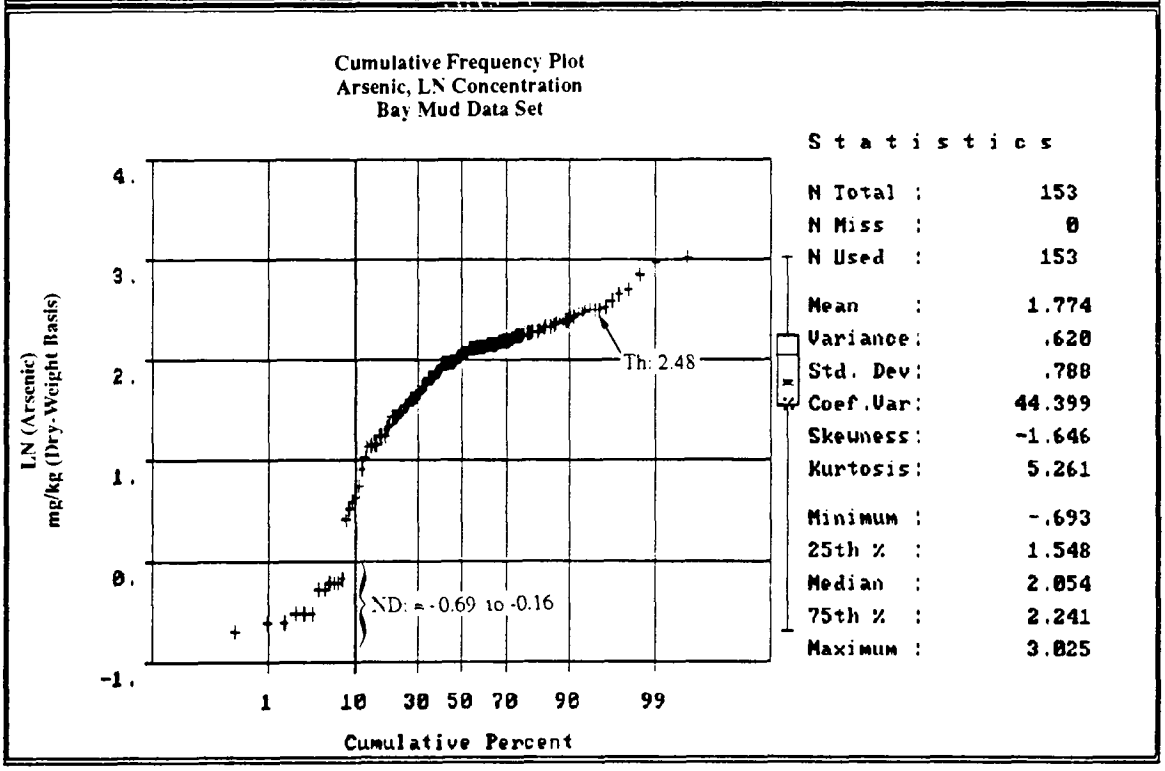
NJB	18639,580.02	CJM	2/92	6/92

25782





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Arsenic, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A21**

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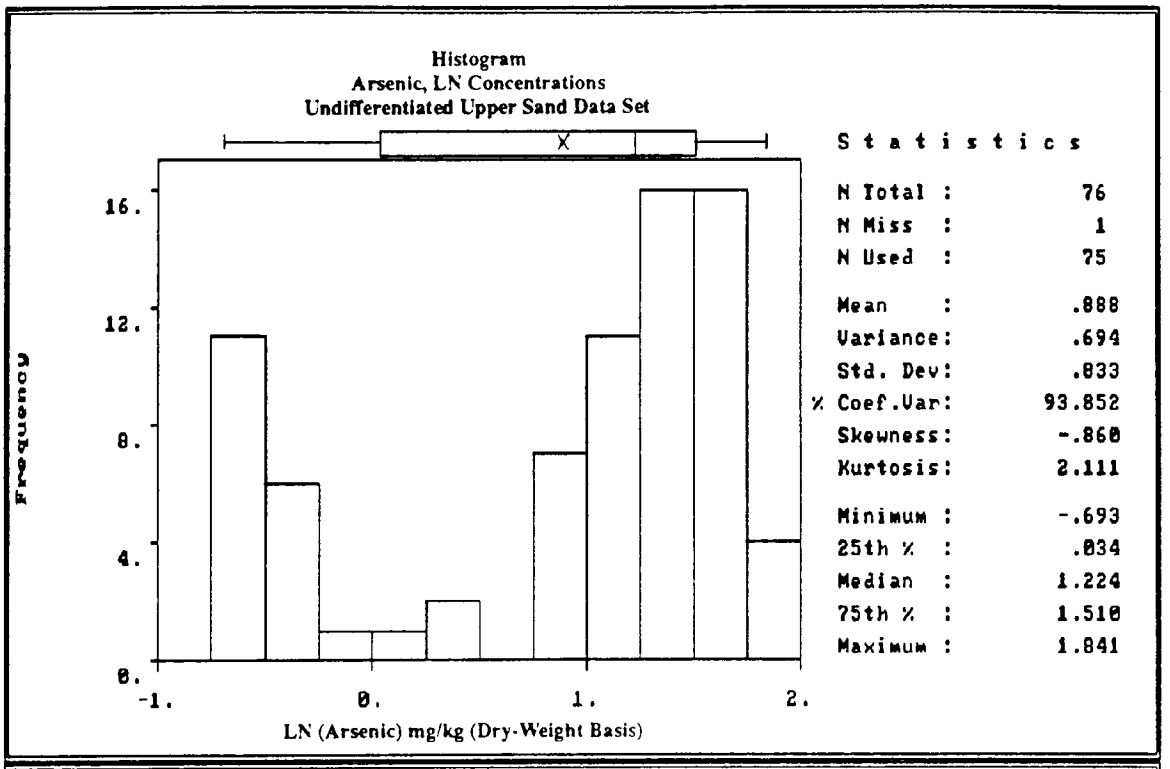
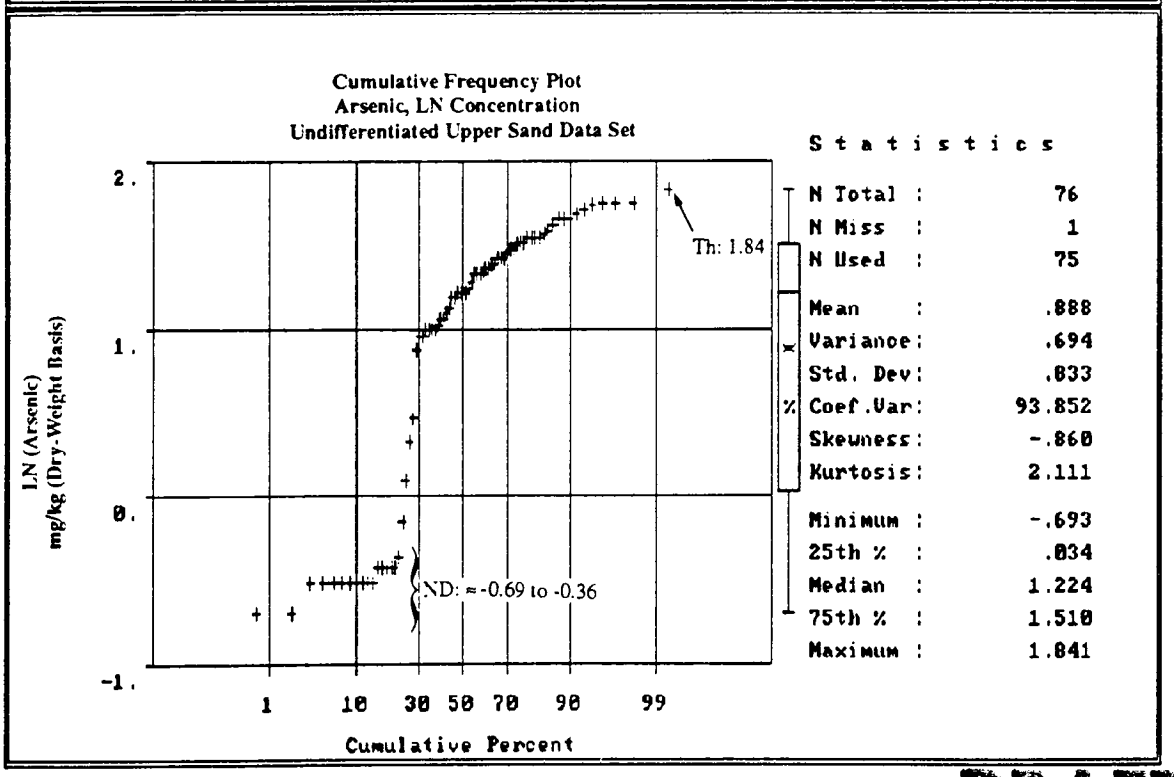
NJB	18639,580.02	CJM	2/92	6/92

25783





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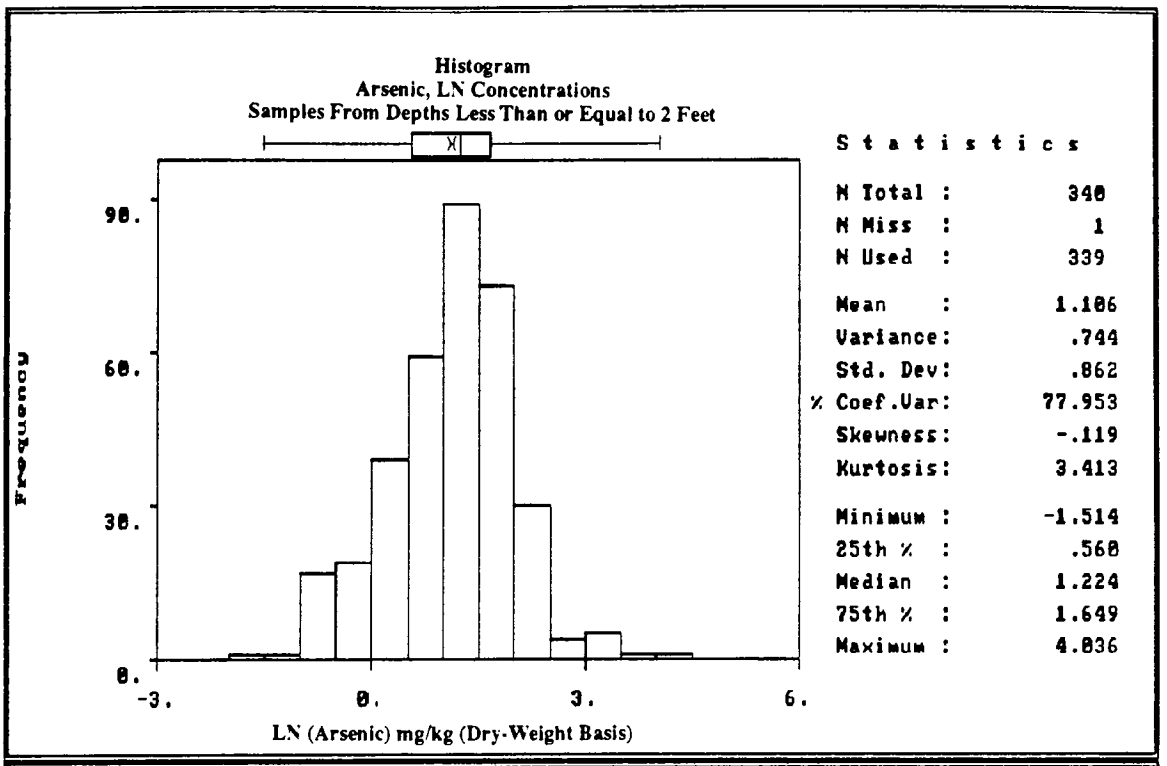
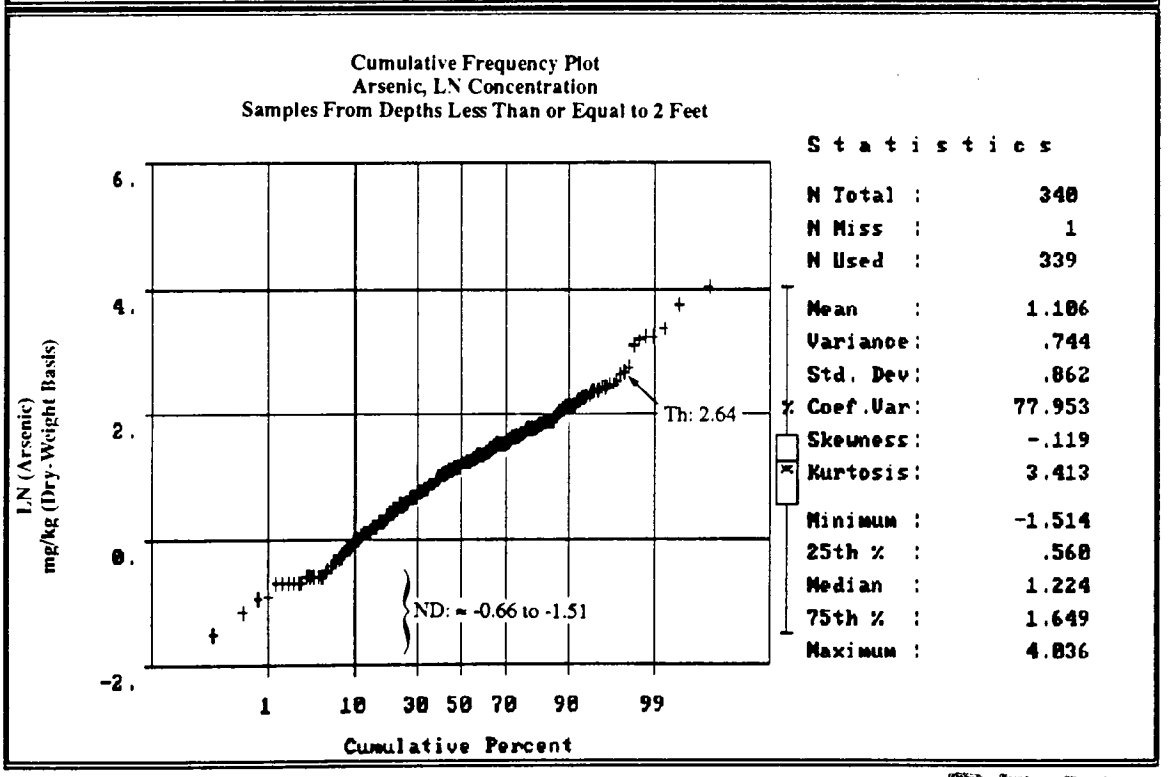
Arsenic, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A22

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25784





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Arsenic, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A23**

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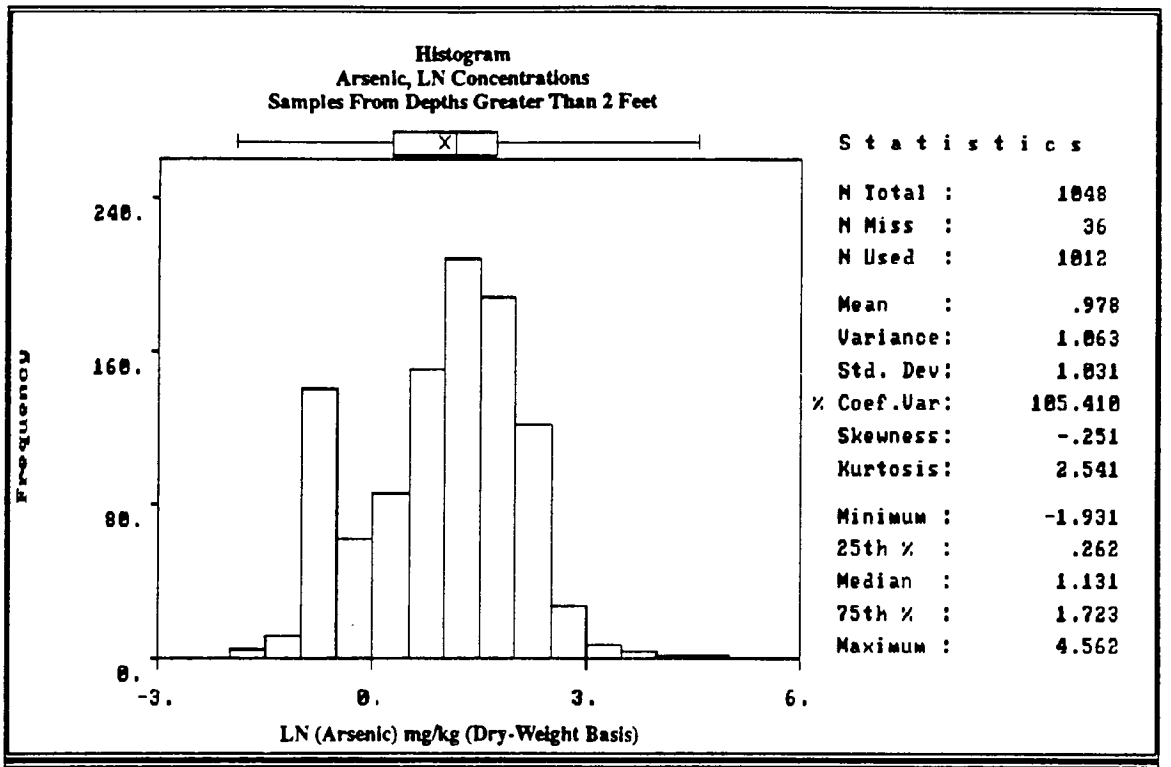
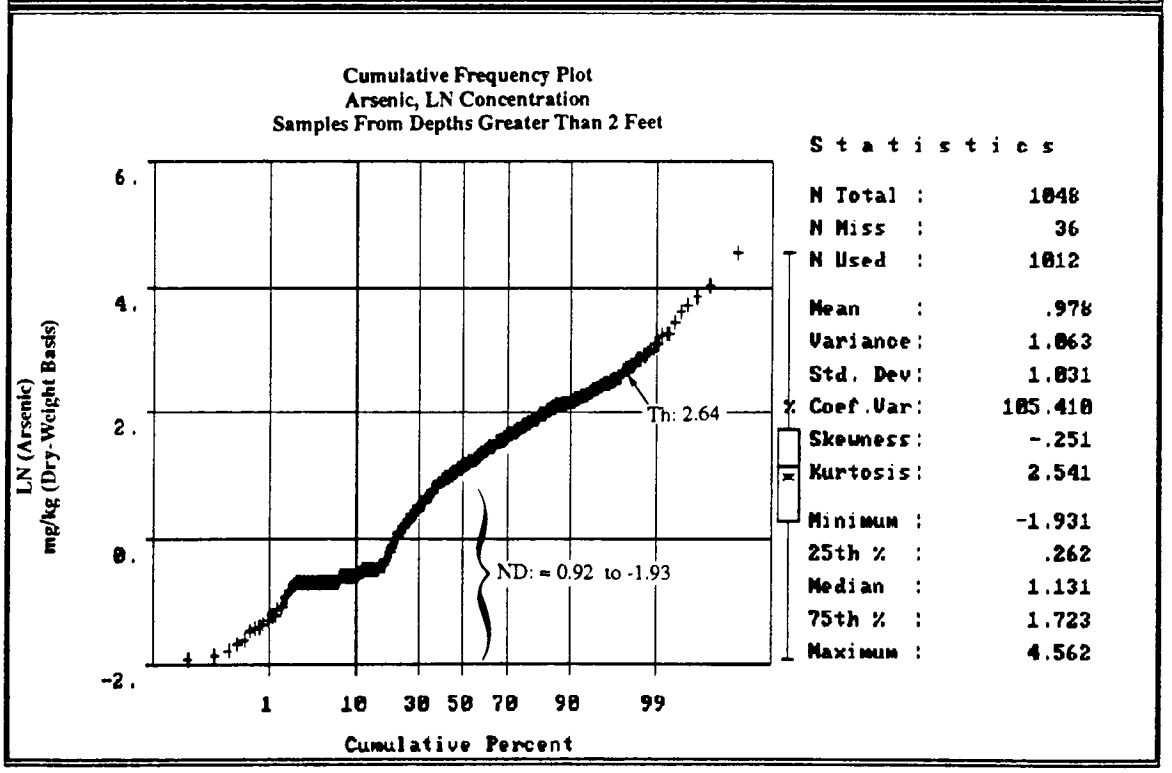
NJB	18639,580.02	GM	2/92	6/92

25785





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Arsenic, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A24**

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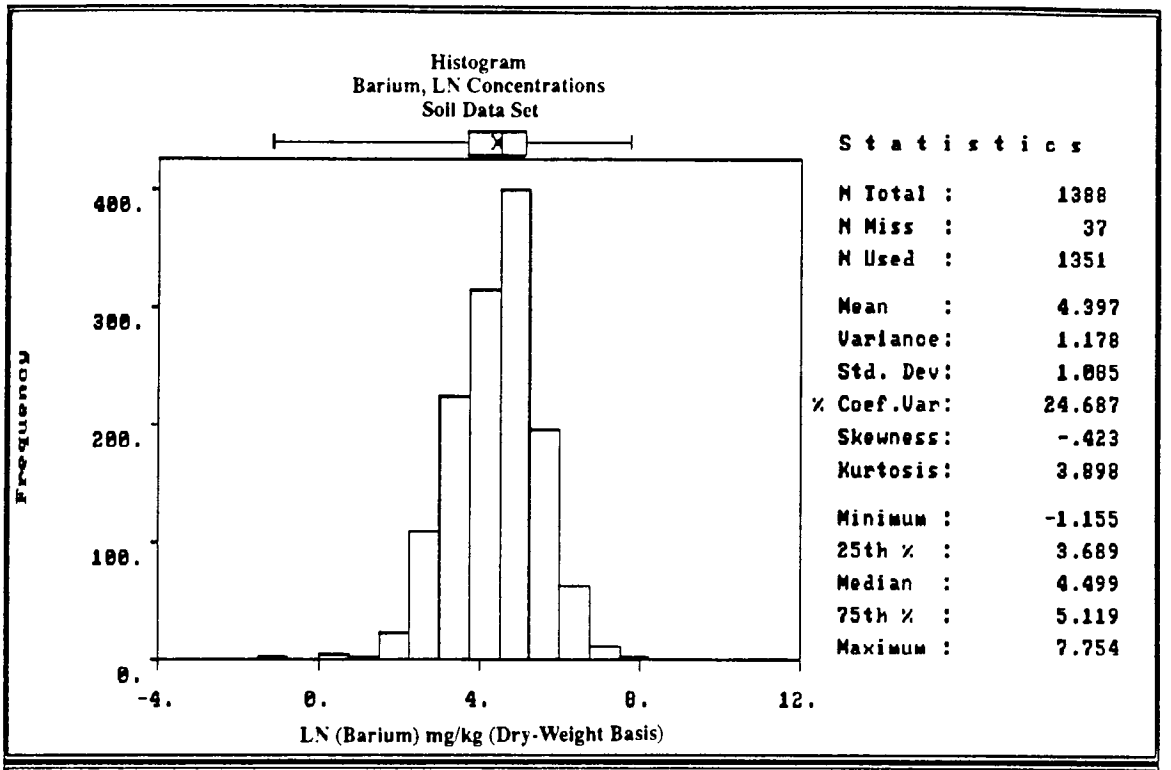
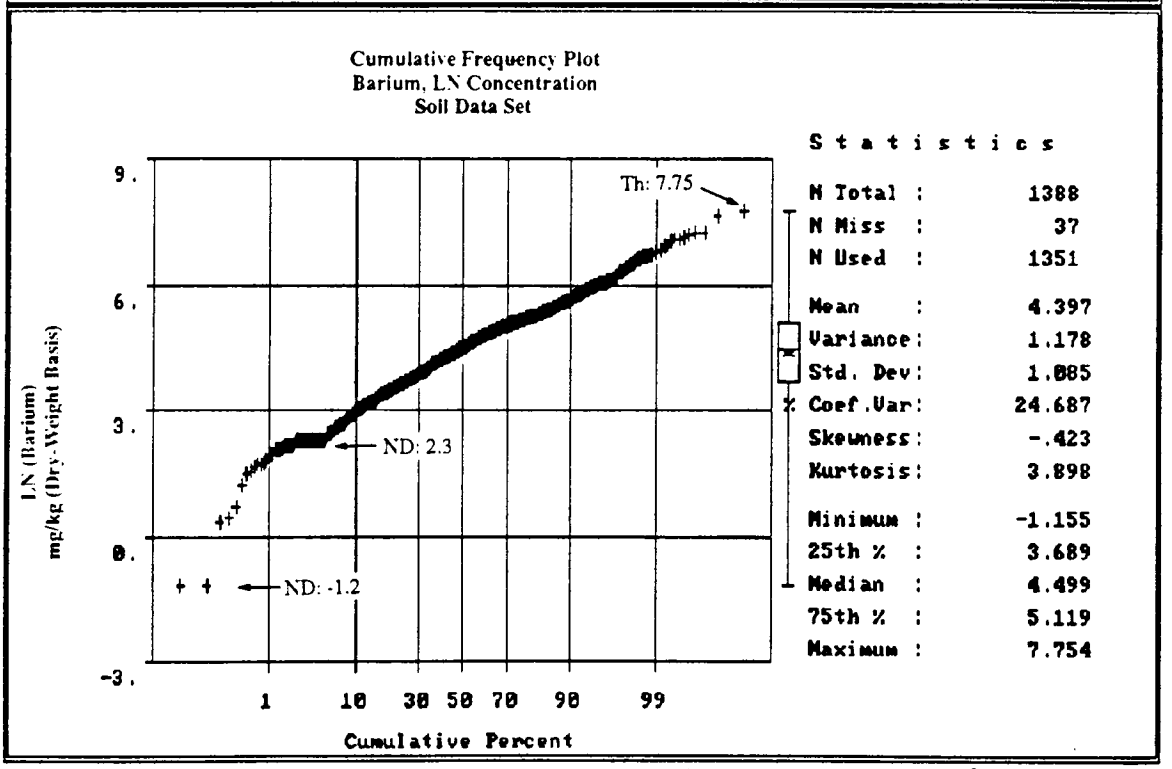
NJB	18639,580.02	CJM	2/92	6/92

25786





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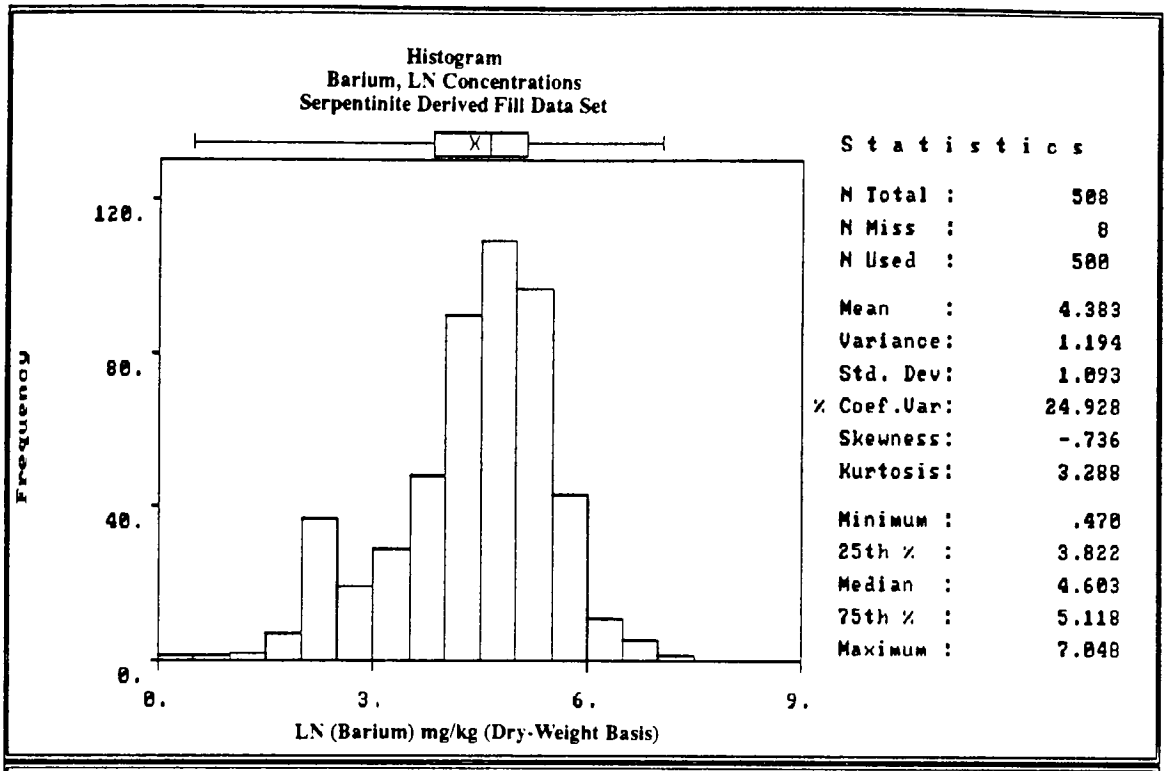
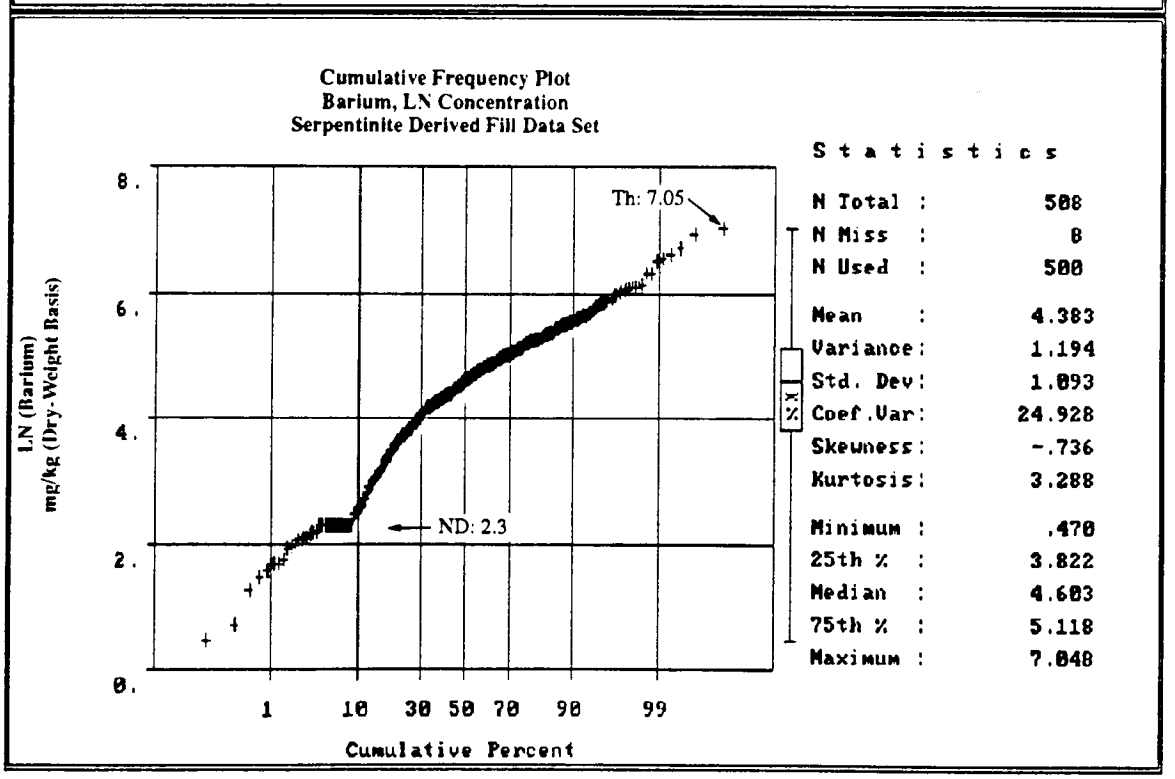
Barium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A25

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25787





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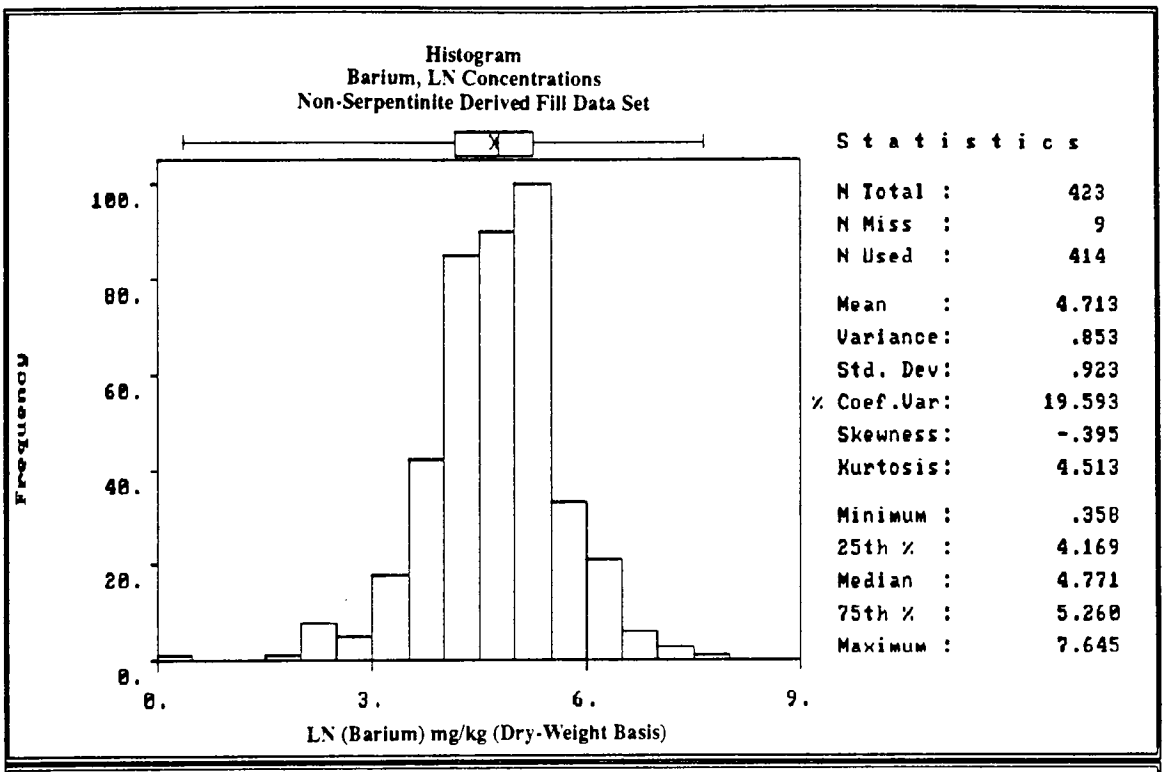
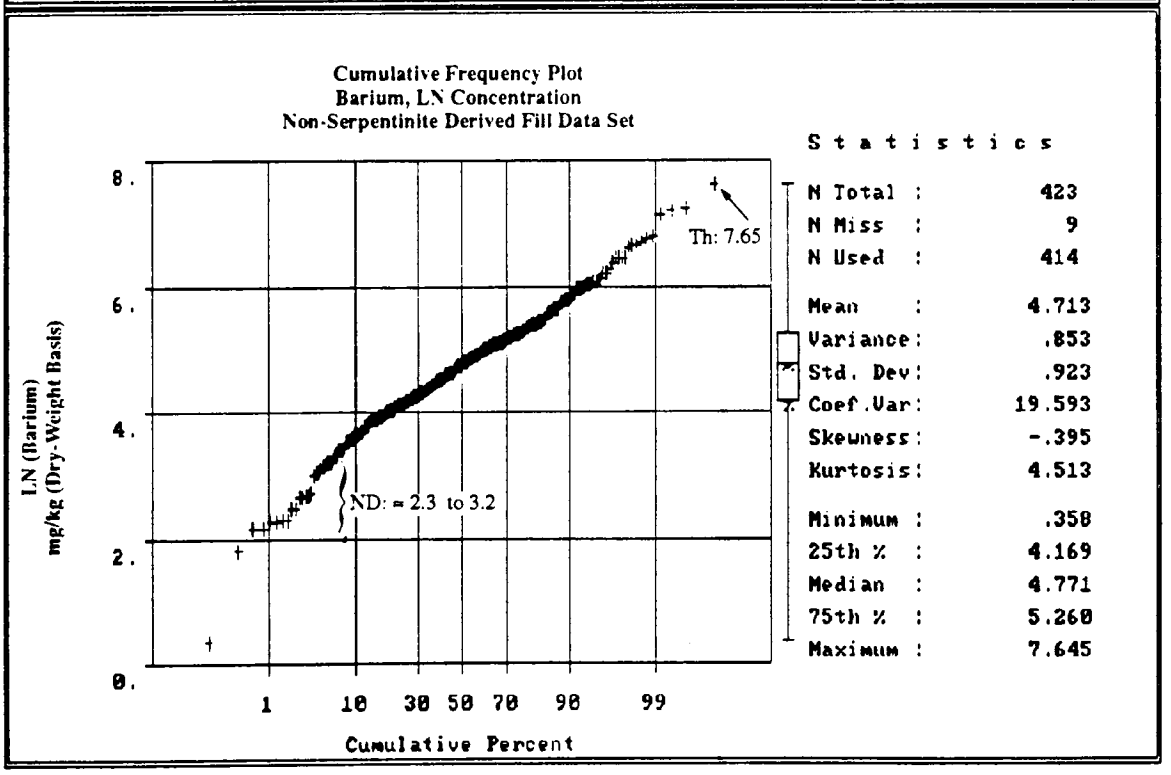
Barium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A26

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25788





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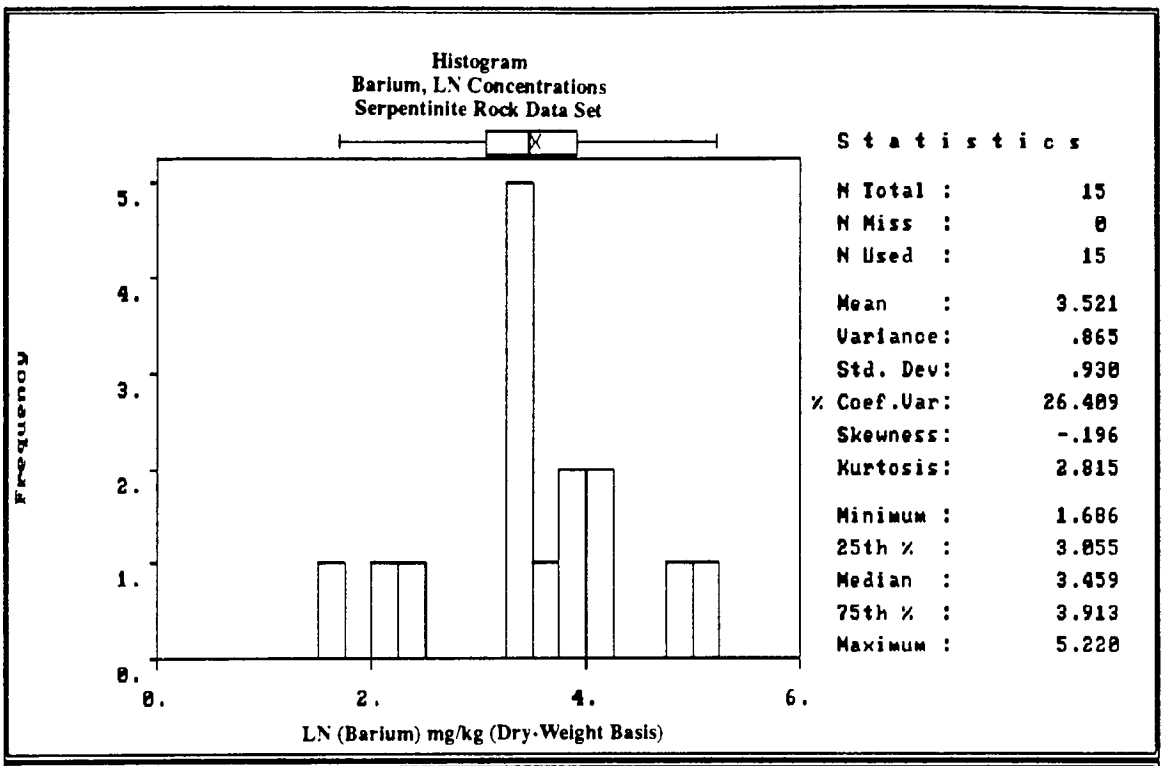
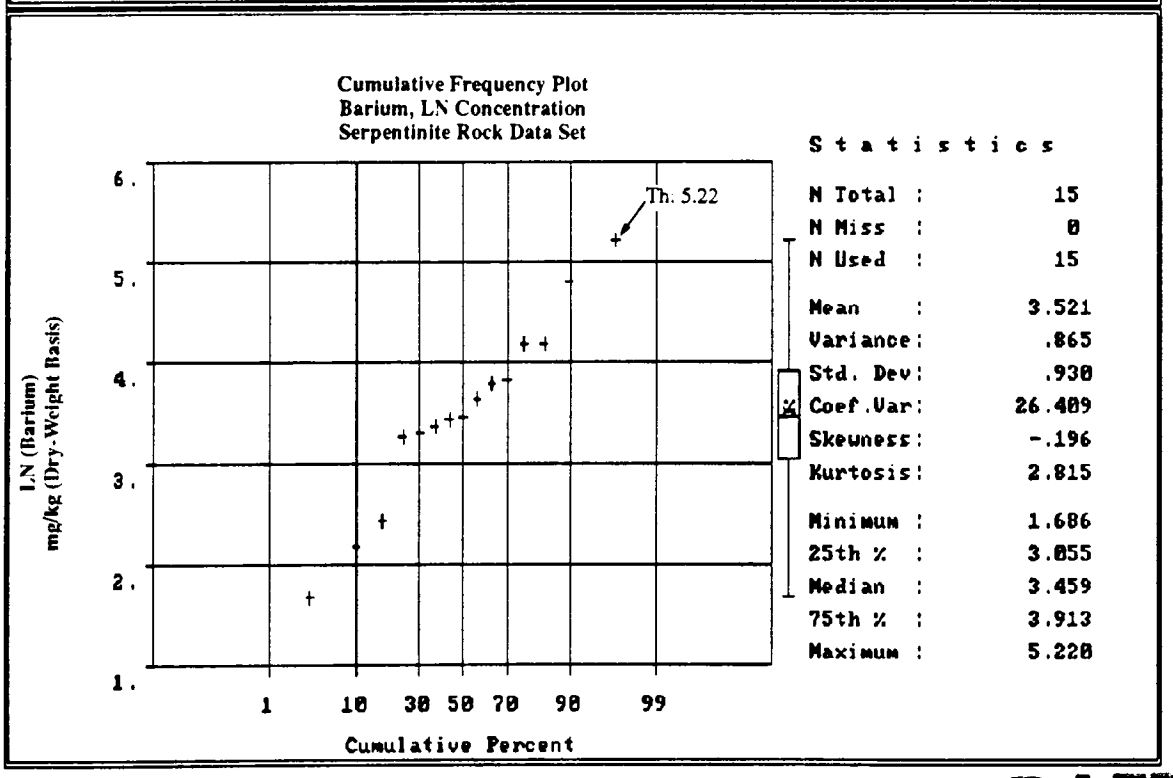
Barium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A27

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25789





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Barium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
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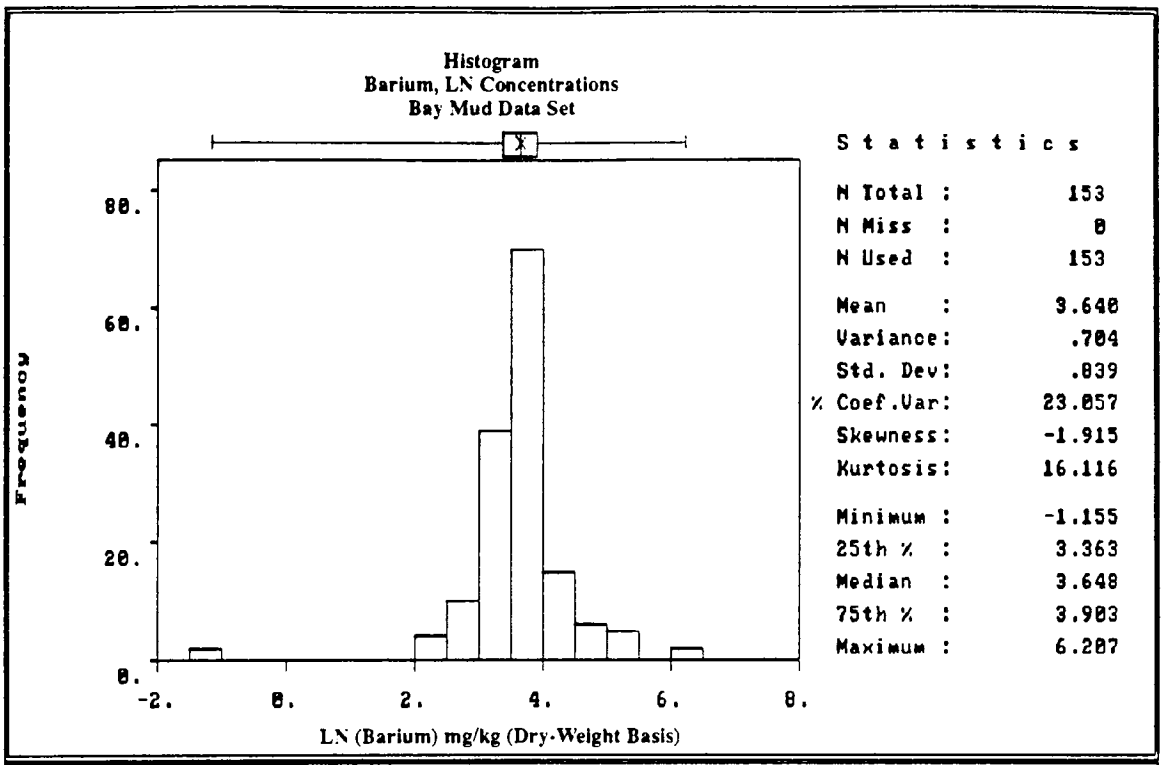
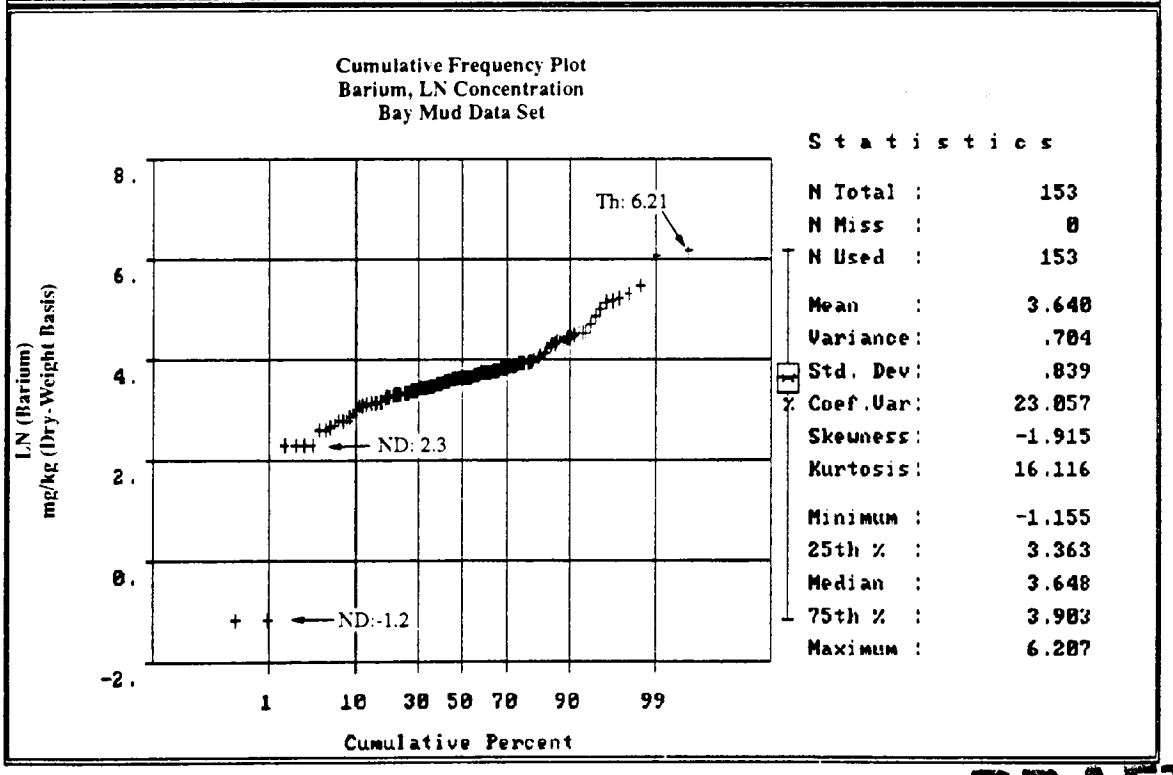
PLATE
A28

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25790





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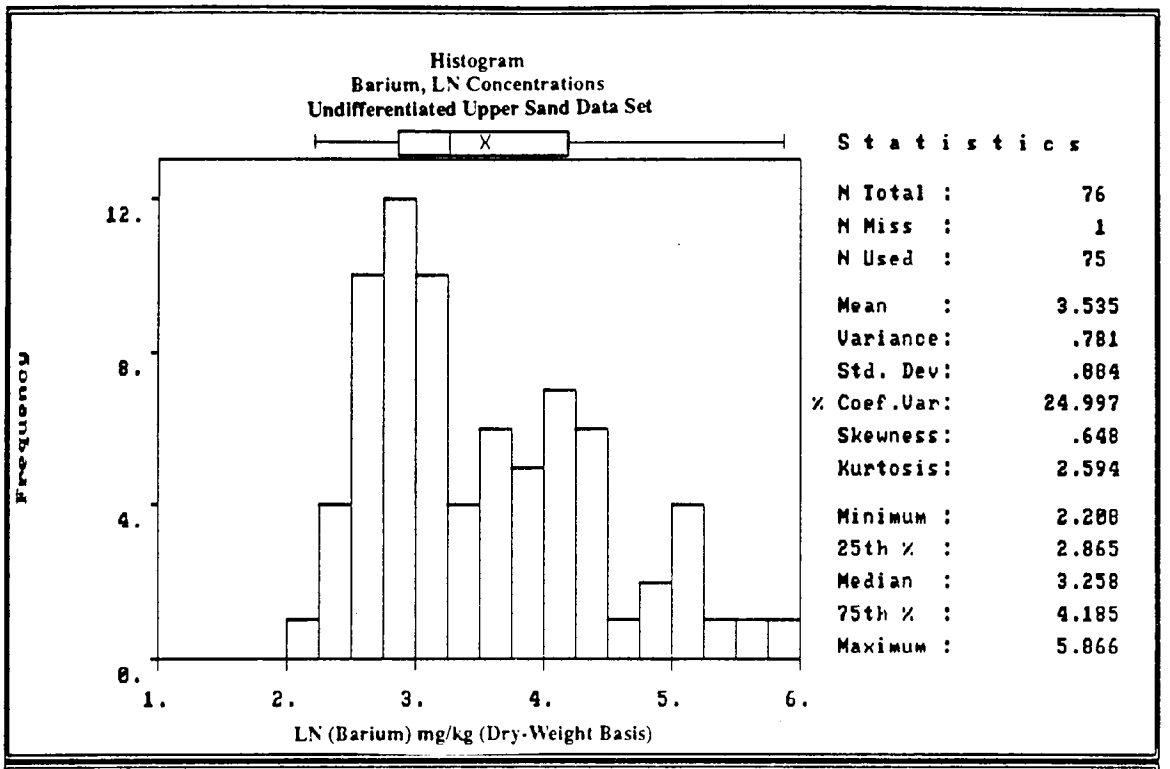
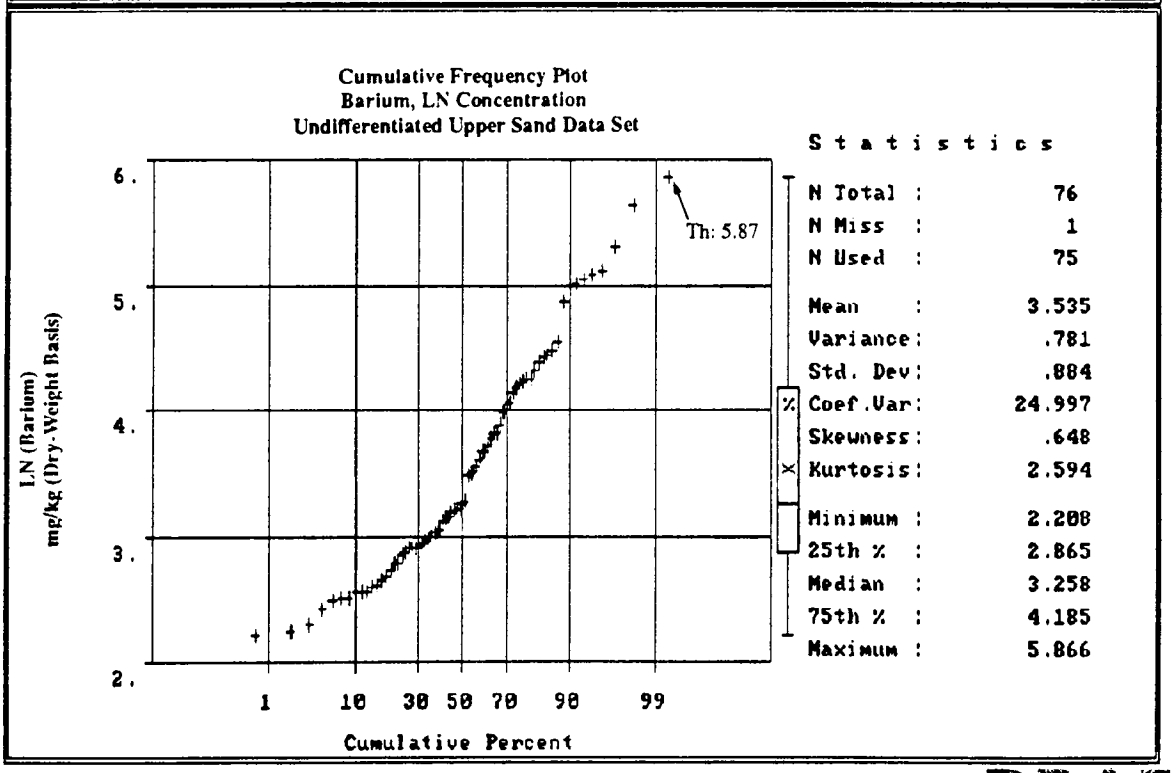
Barium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A29

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25791





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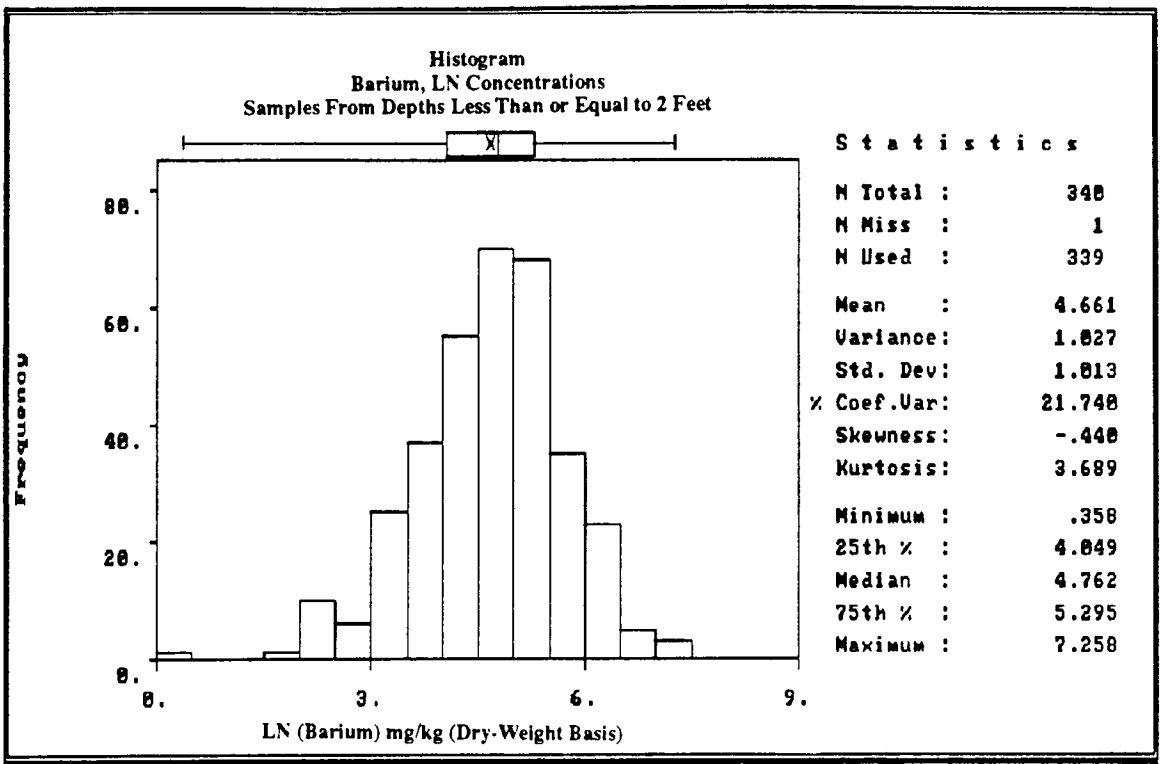
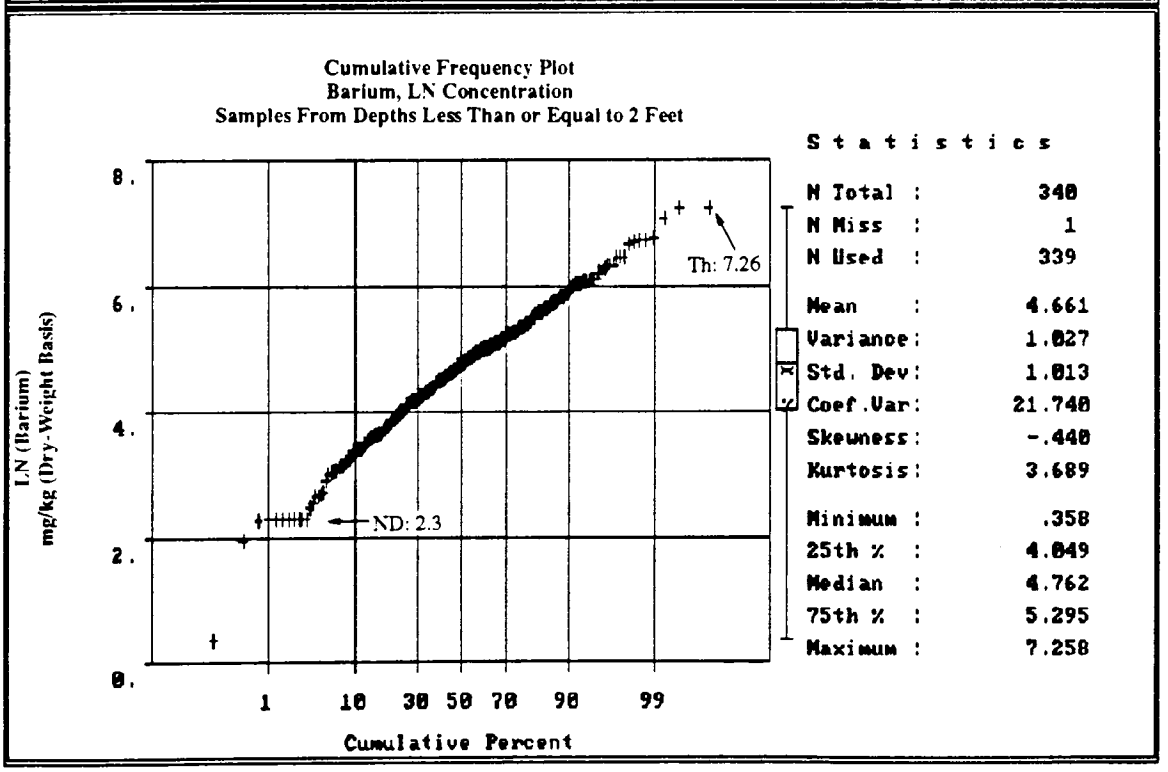
Barium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A30

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25792





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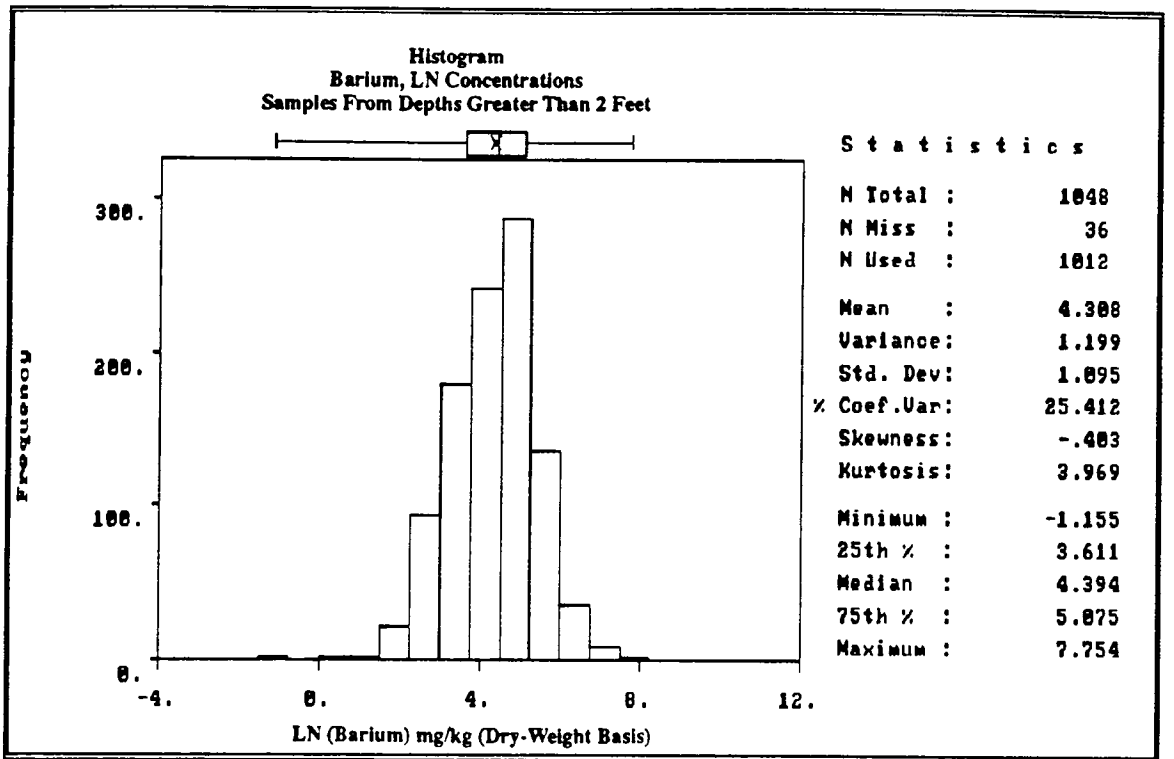
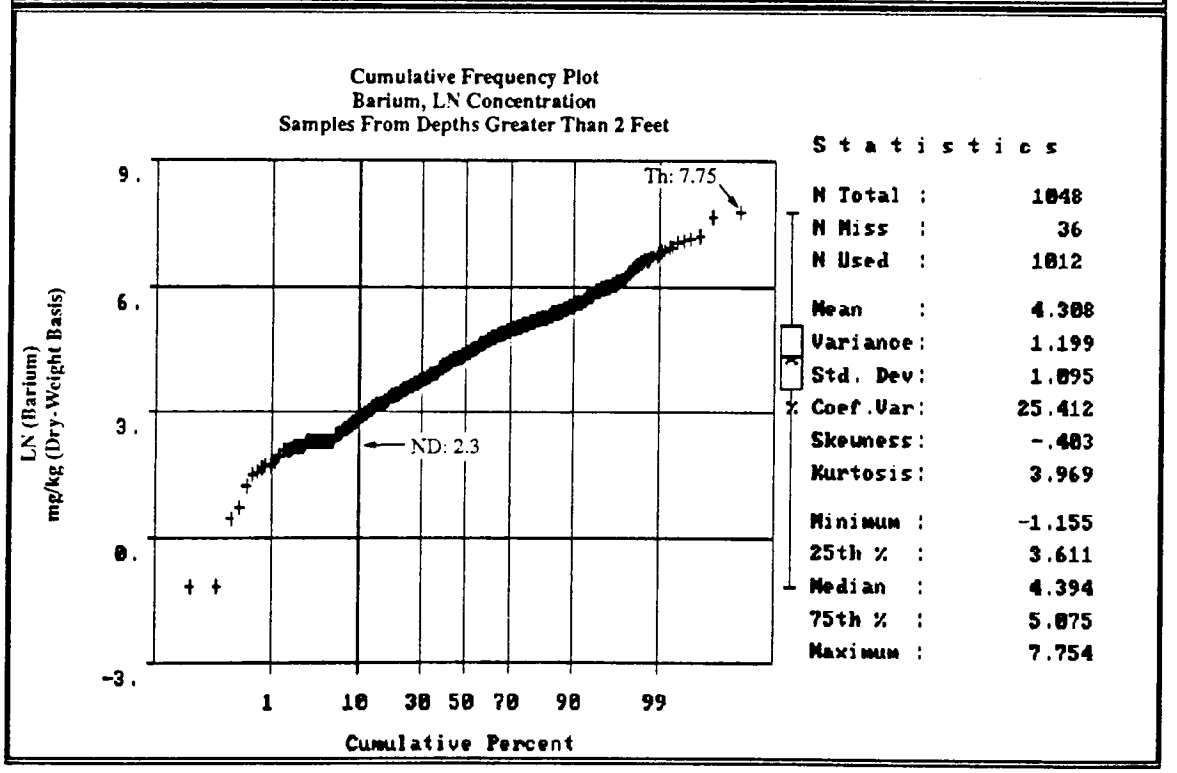
Barium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A31**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25793





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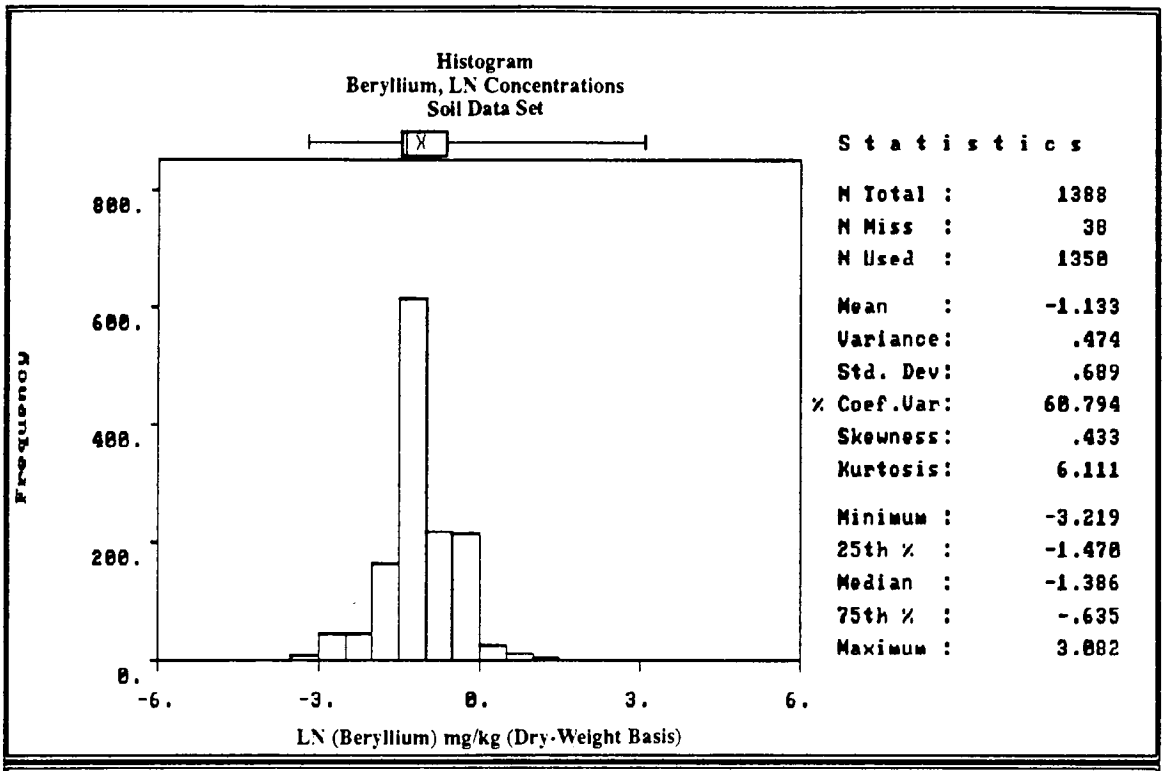
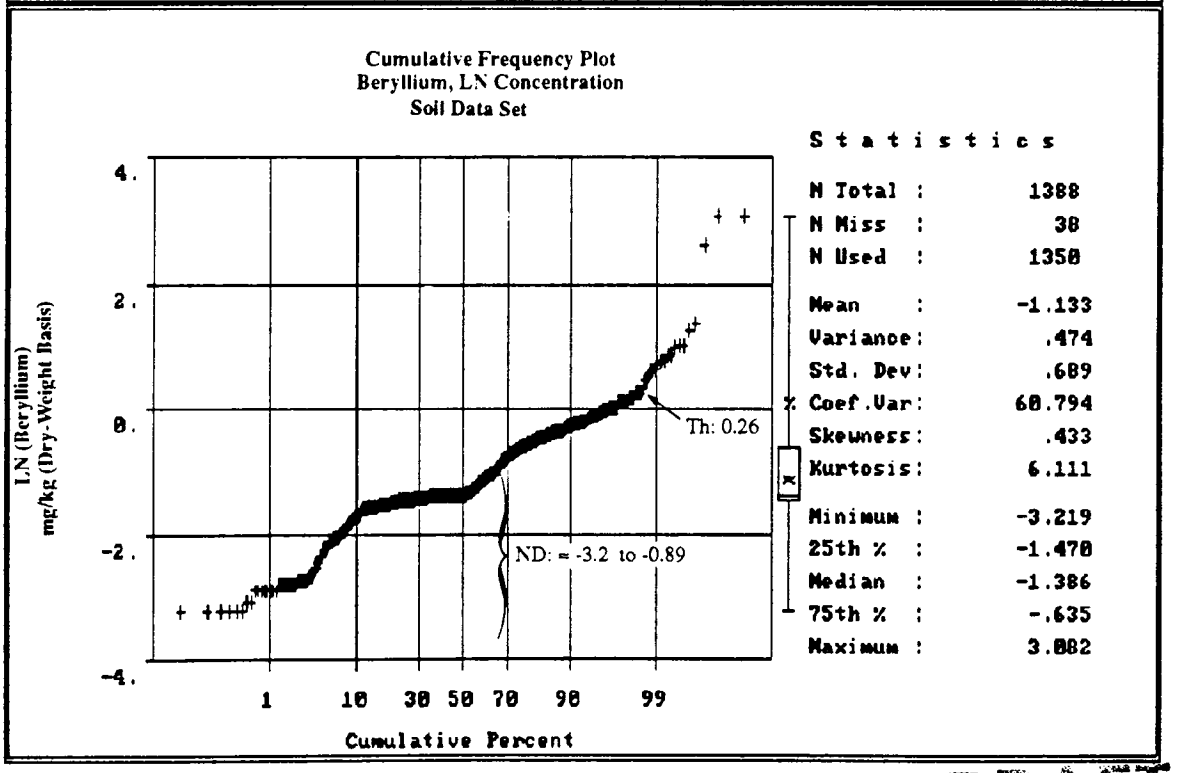
Barium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A32

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25794





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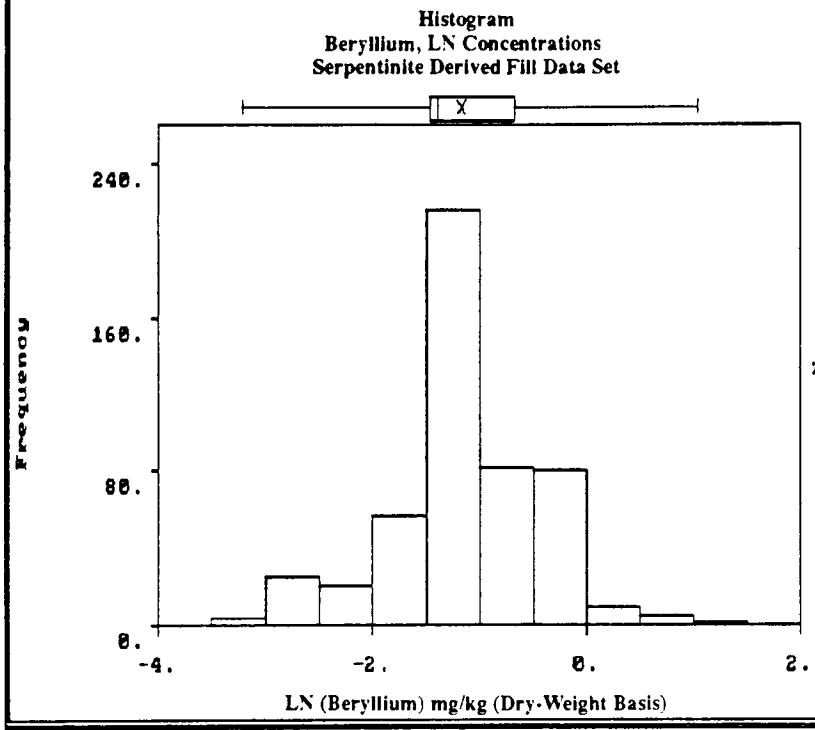
Beryllium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A33

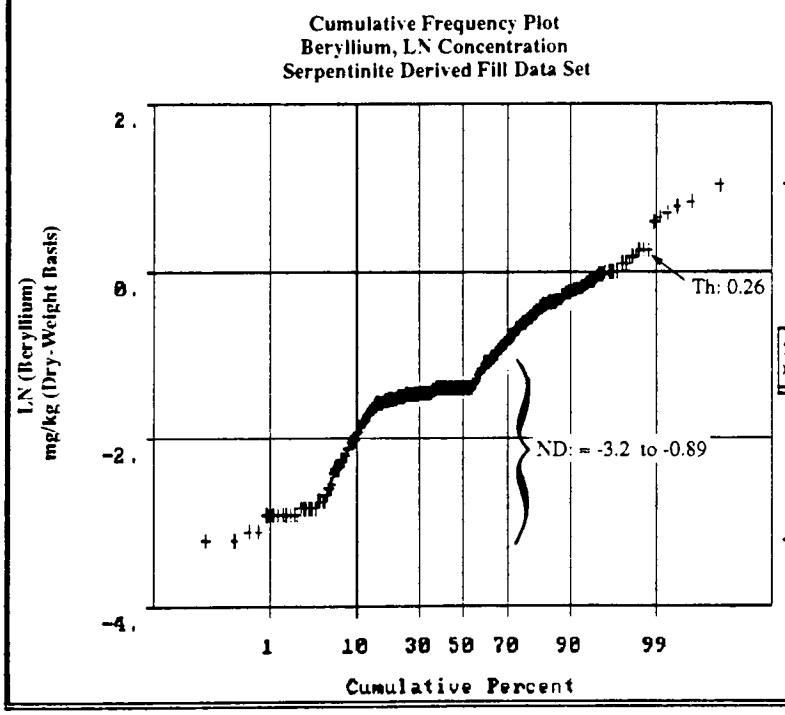
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25795



Statistics

N Total :	508
N Miss :	9
N Used :	499
Mean :	-1.177
Variance:	.502
Std. Dev:	.709
% Coef.Var:	60.216
Skewness:	-.143
Kurtosis:	3.596
Minimum :	-3.219
25th % :	-1.470
Median :	-1.386
75th % :	-.668
Maximum :	1.030



Statistics

N Total :	508
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Maximum :	1.030

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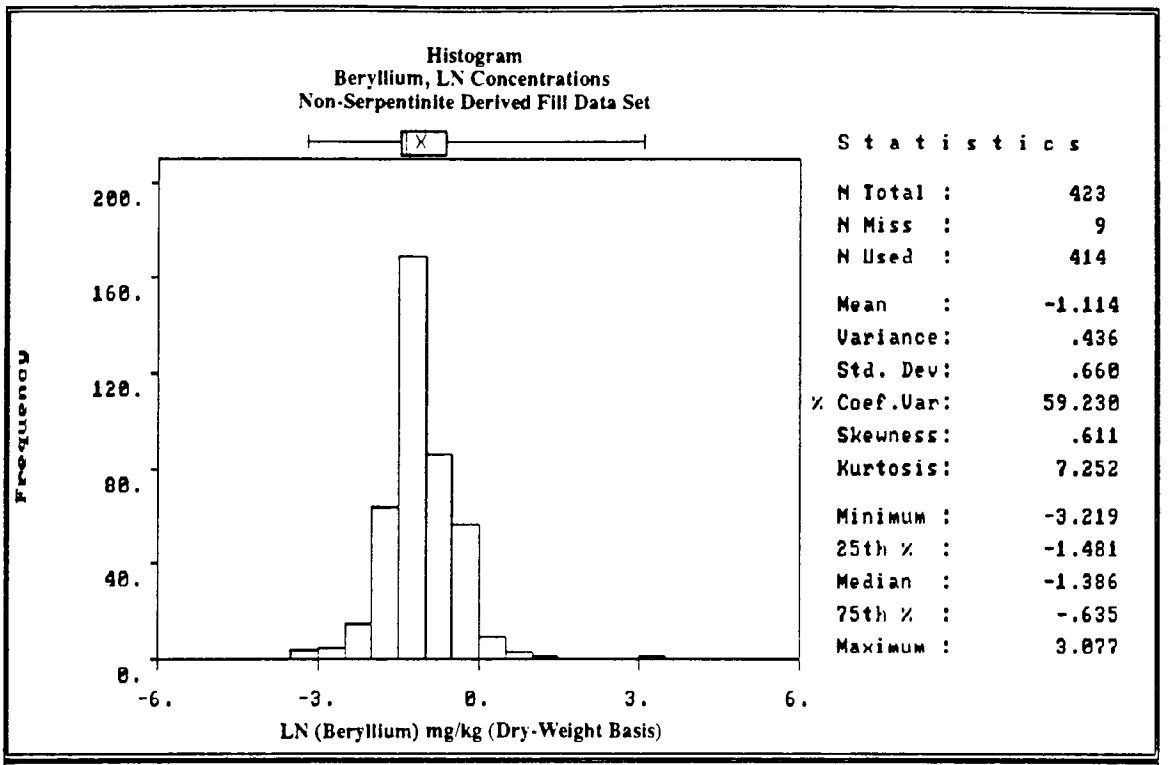
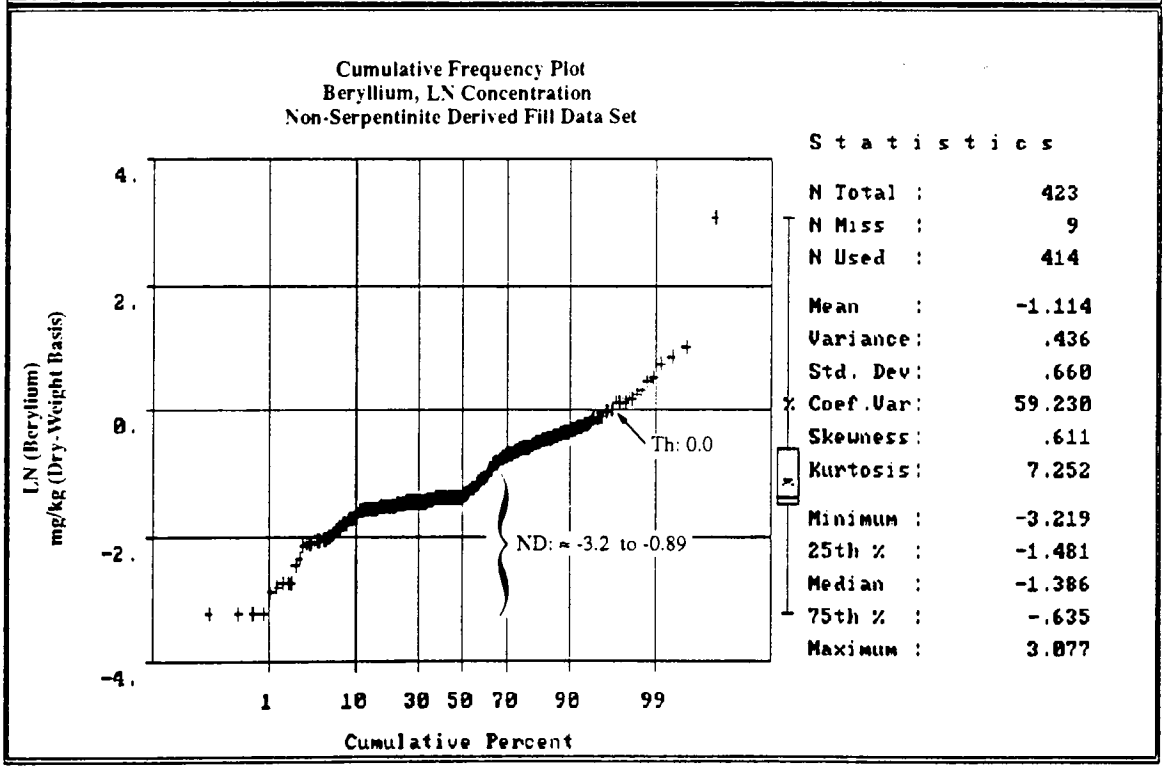
Beryllium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A34

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25796





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Beryllium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
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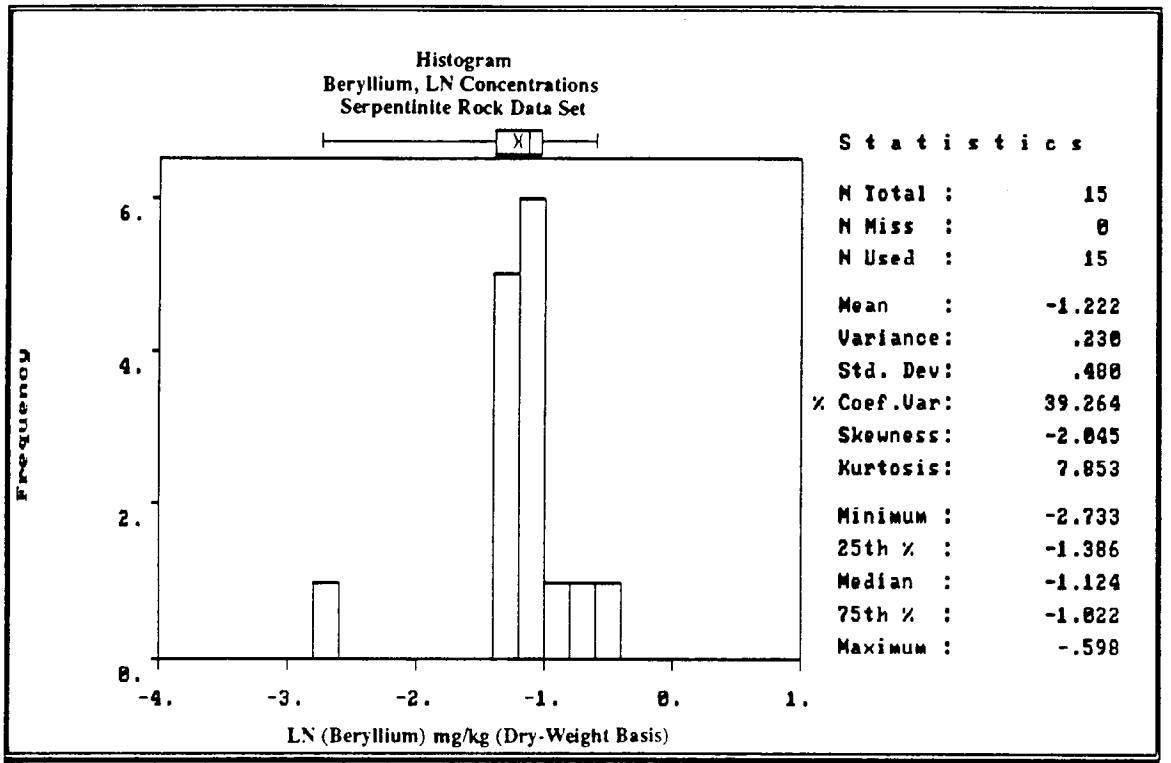
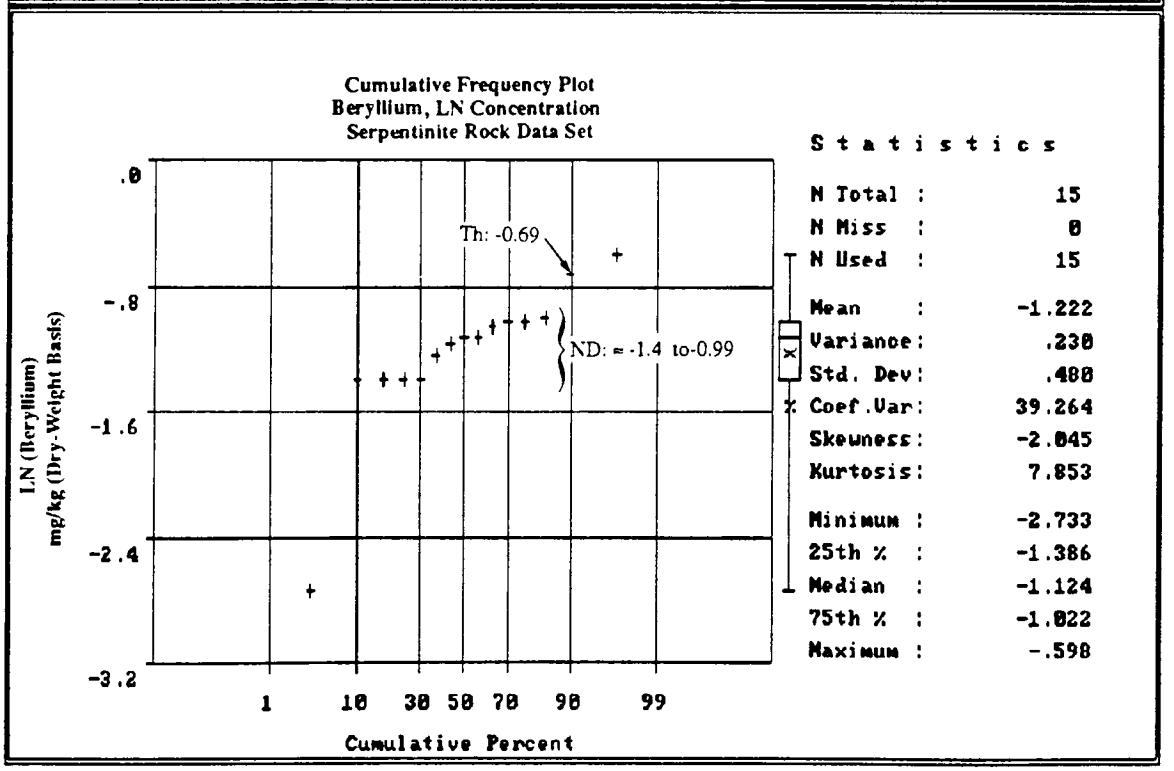
PLATE **A35**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25797





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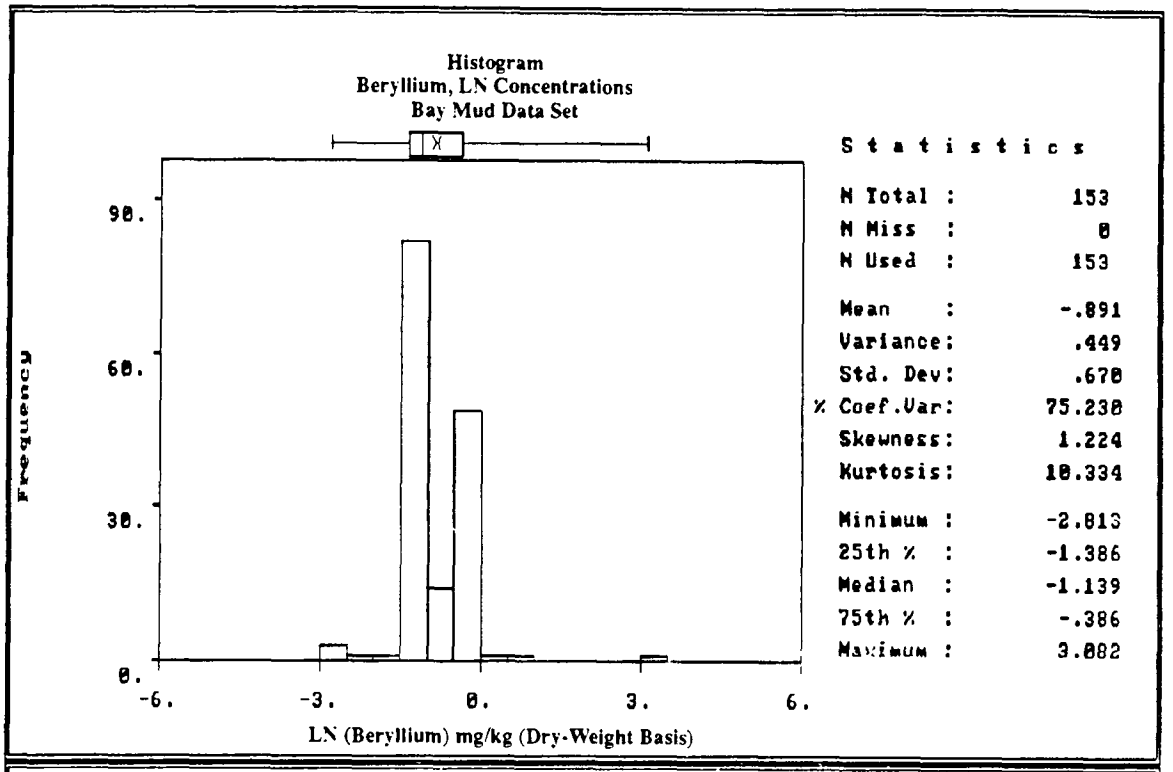
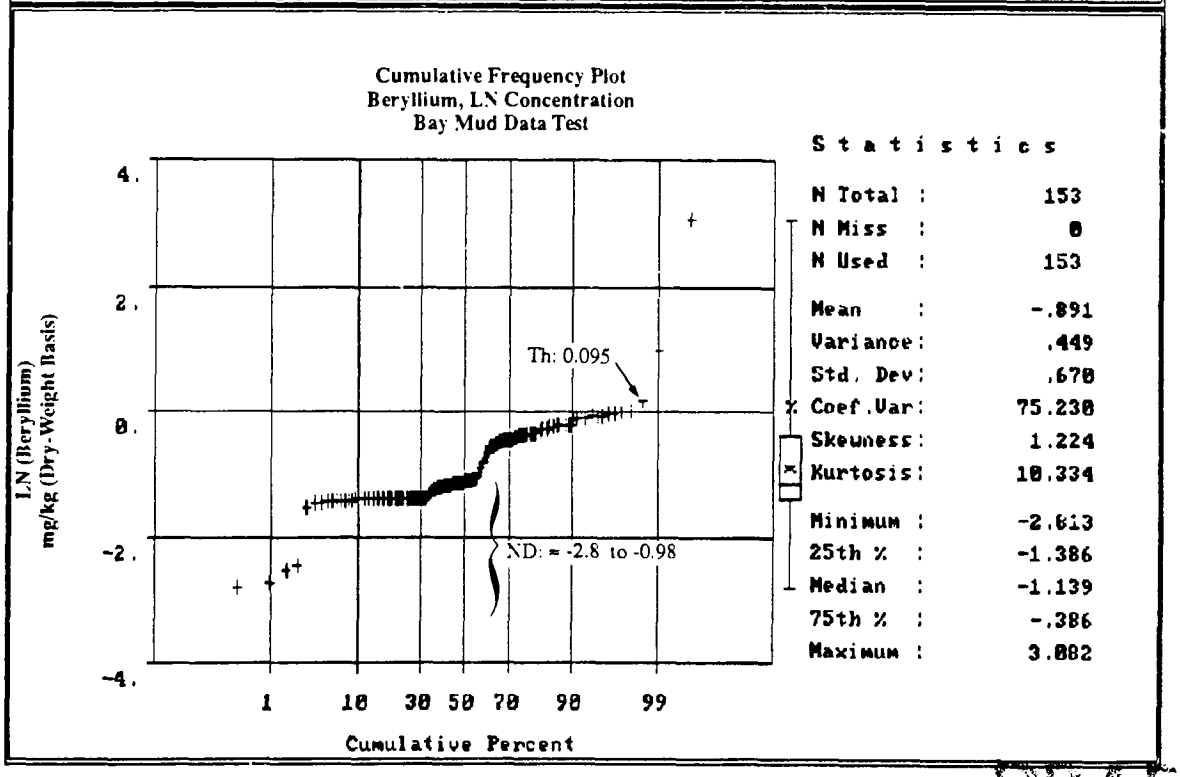
Beryllium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A36

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25798





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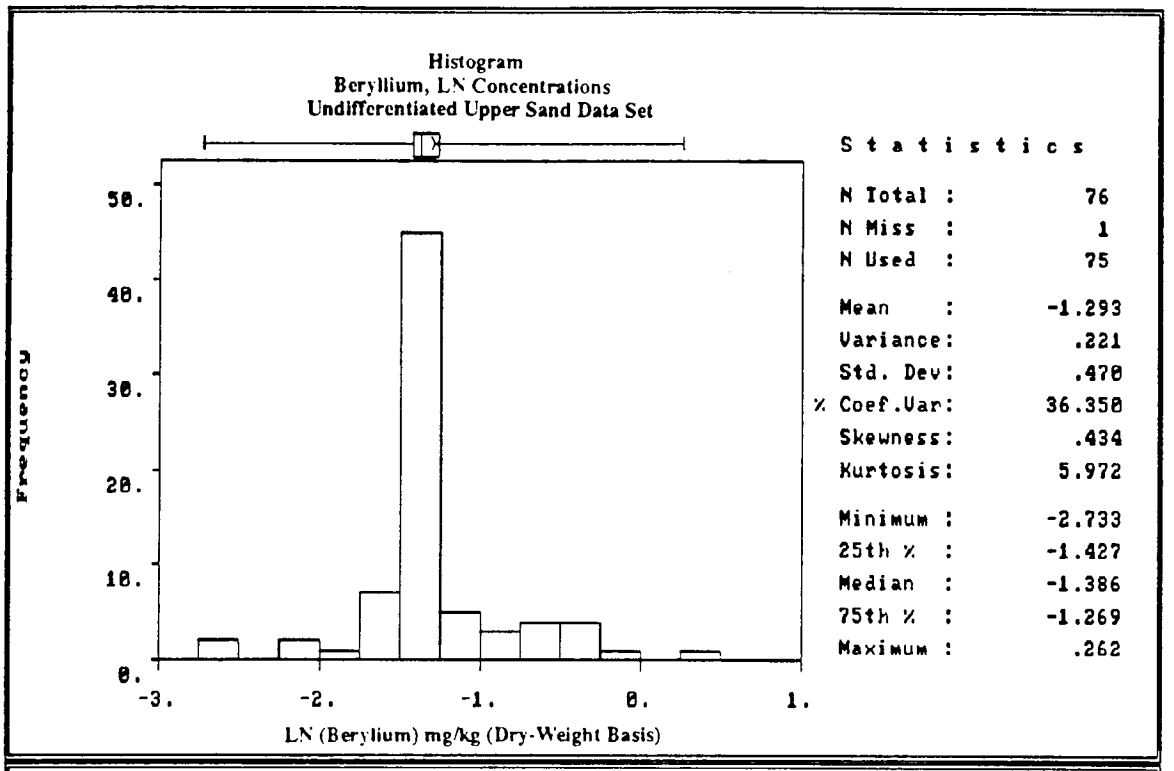
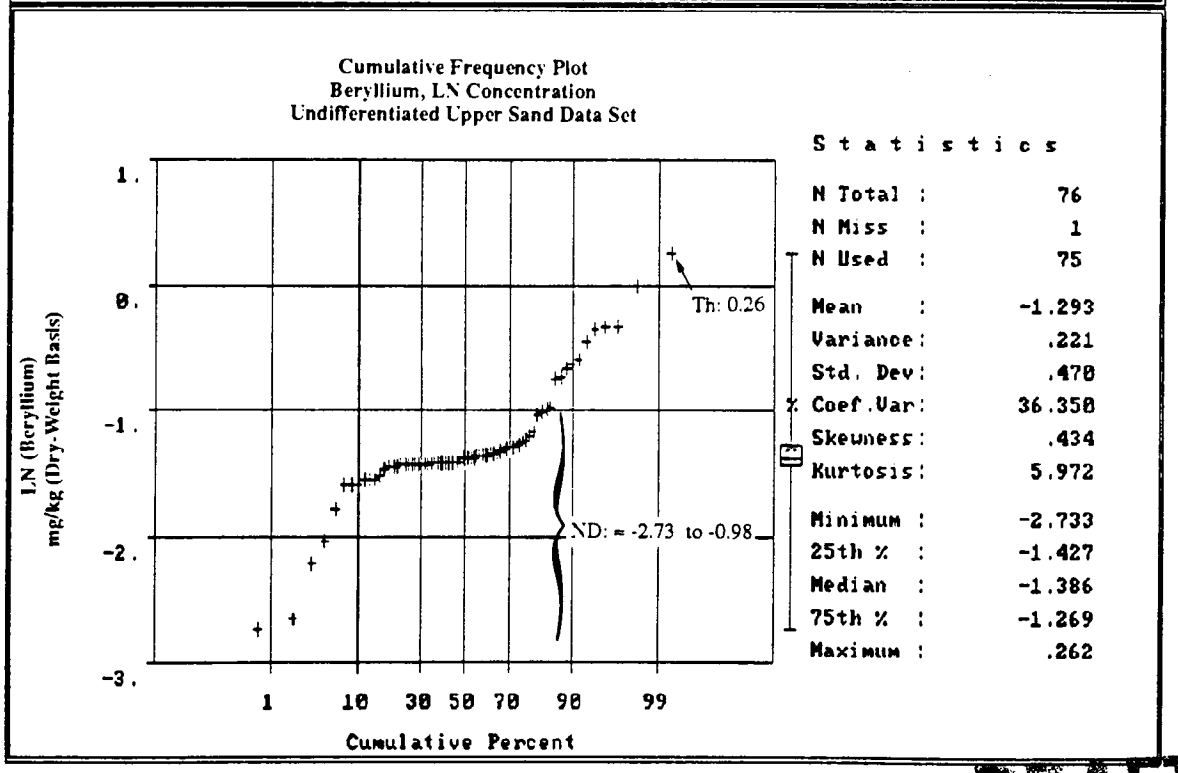
Beryllium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A37

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25799





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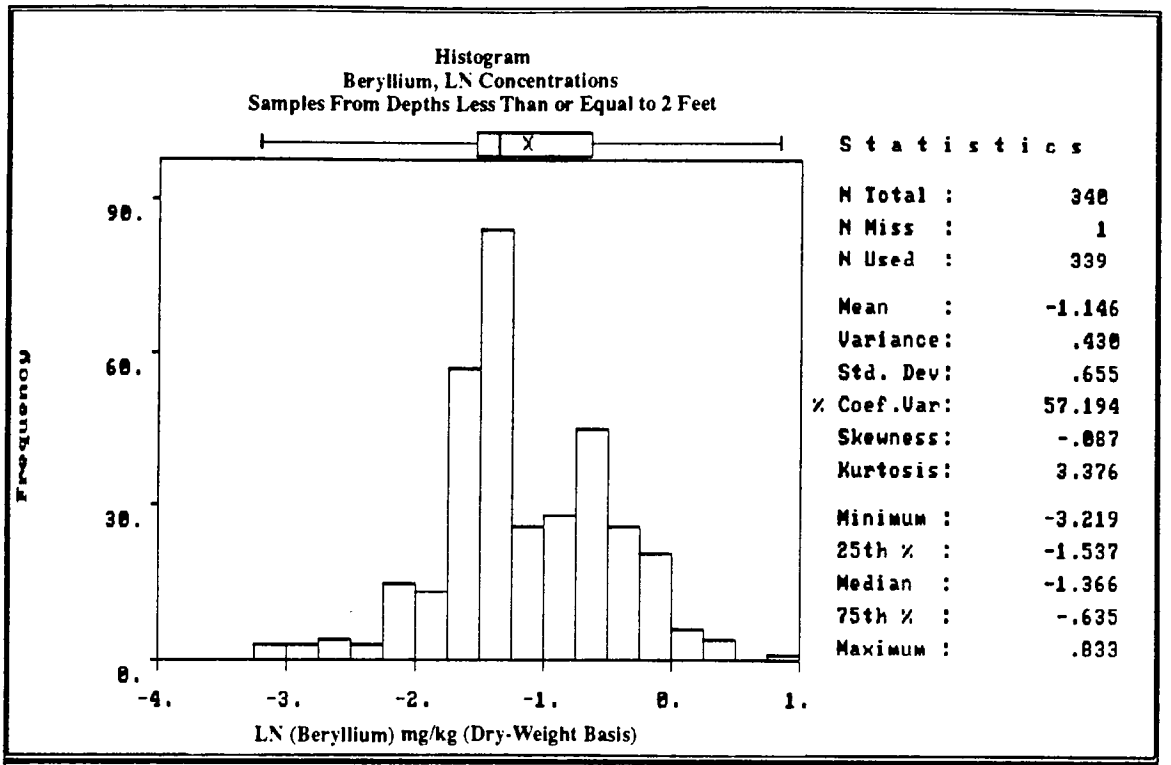
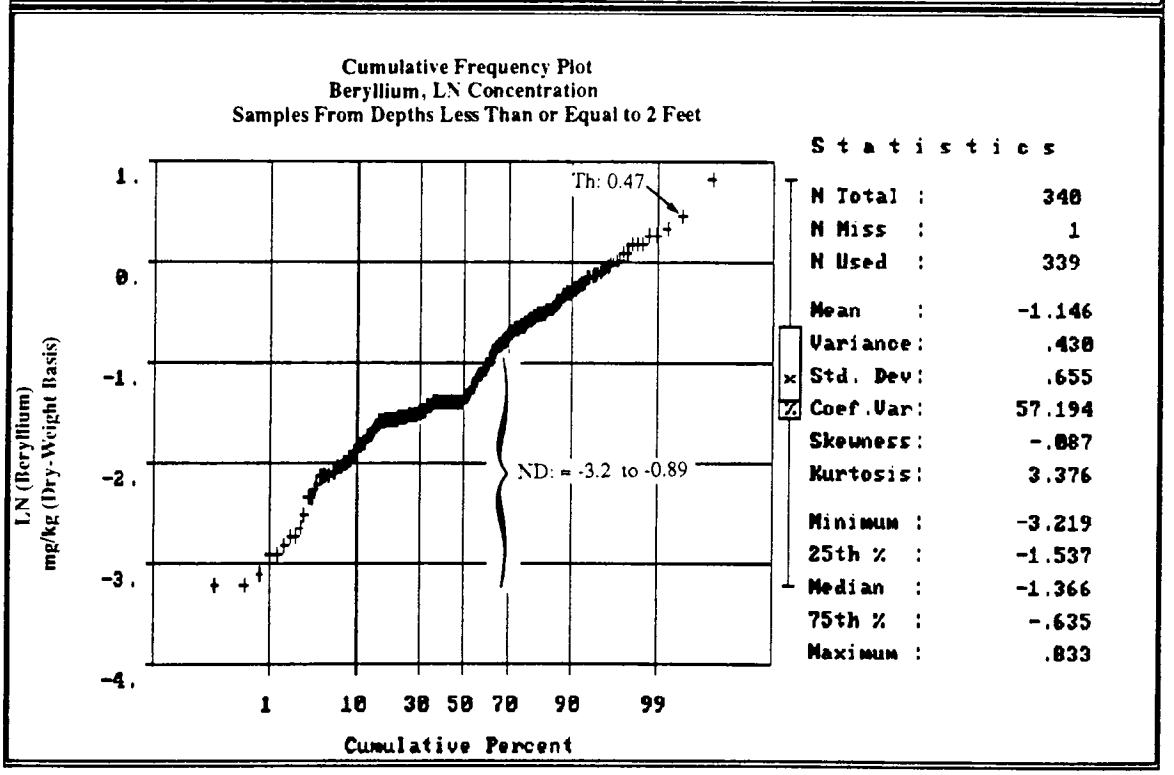
Beryllium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A38

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25800





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Beryllium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A39**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

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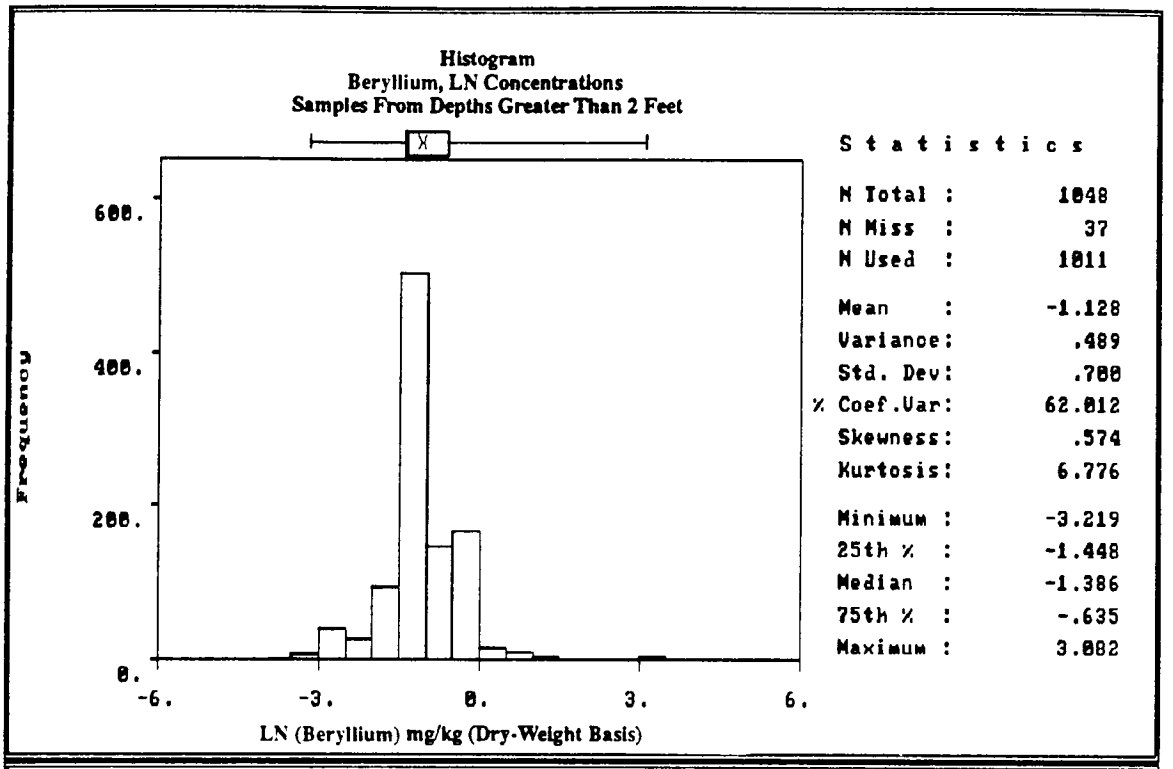

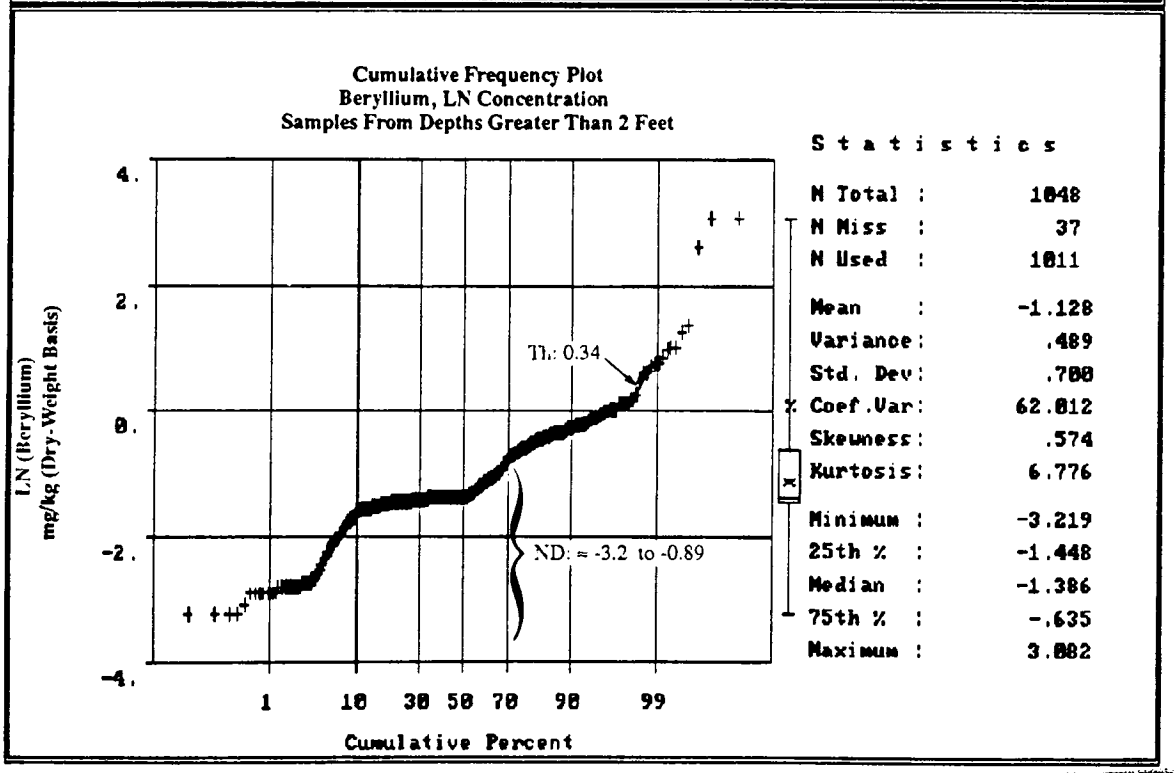

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Beryllium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A40**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

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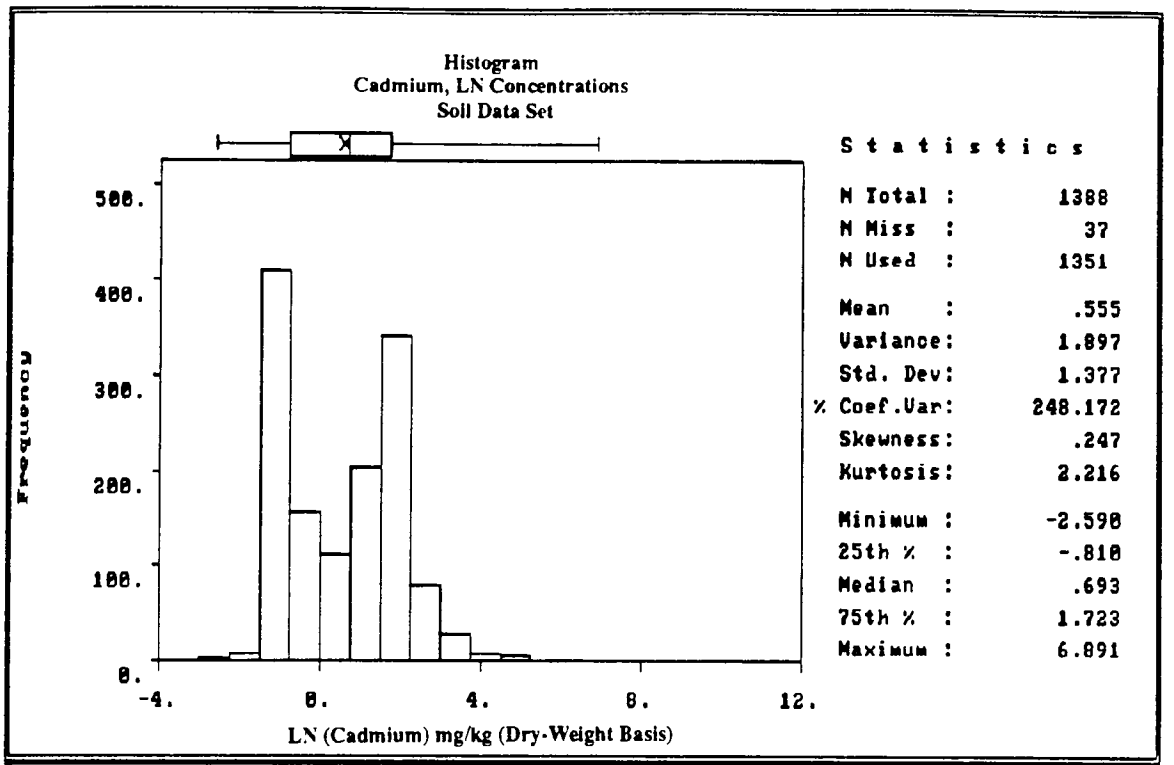

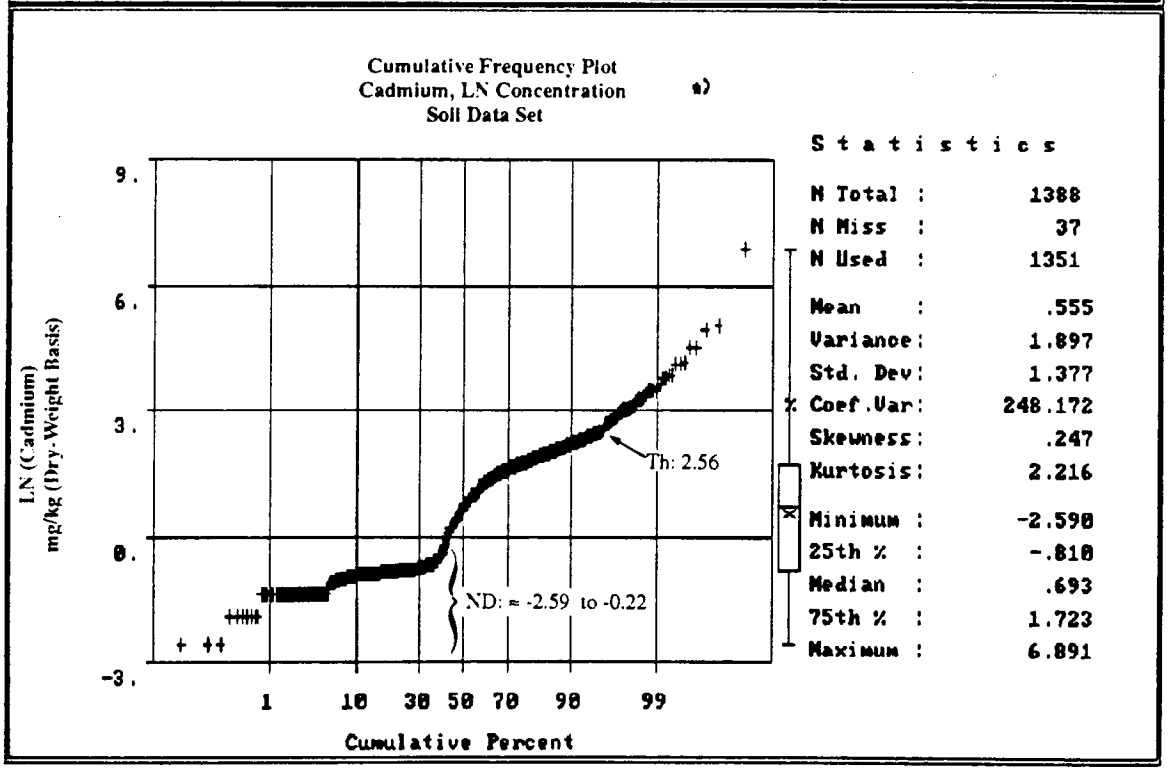

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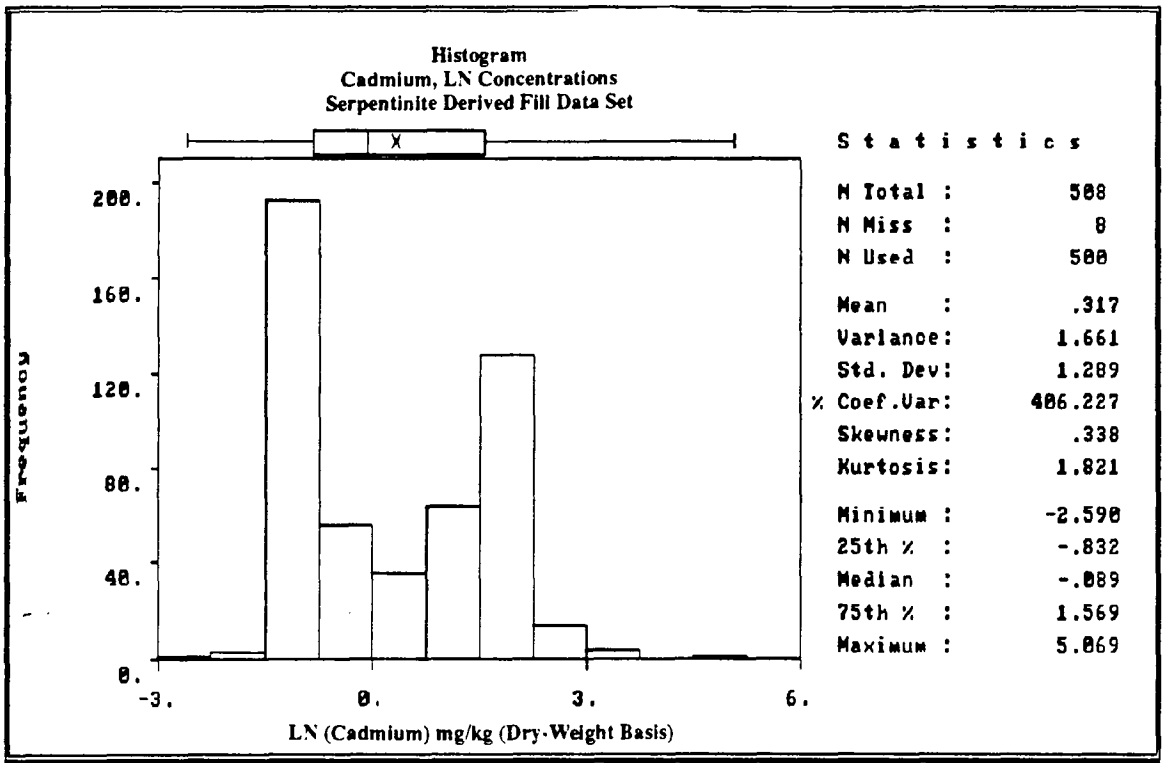
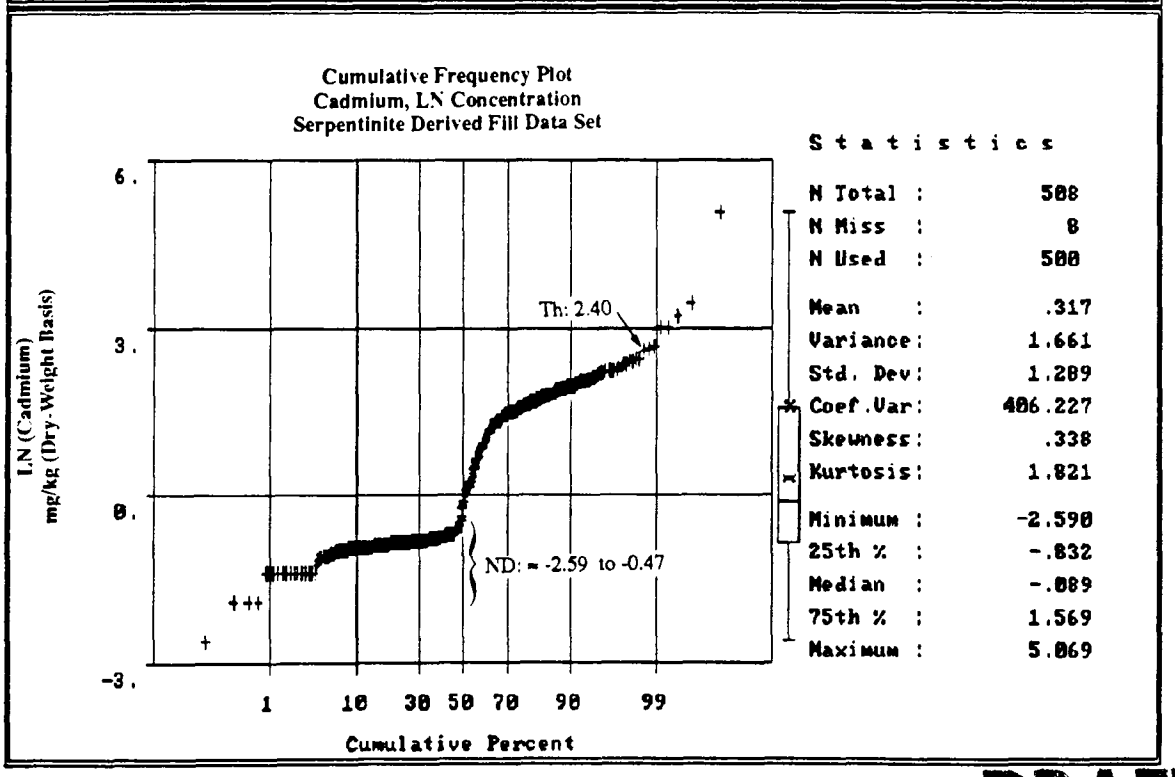
Cadmium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A41

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25803





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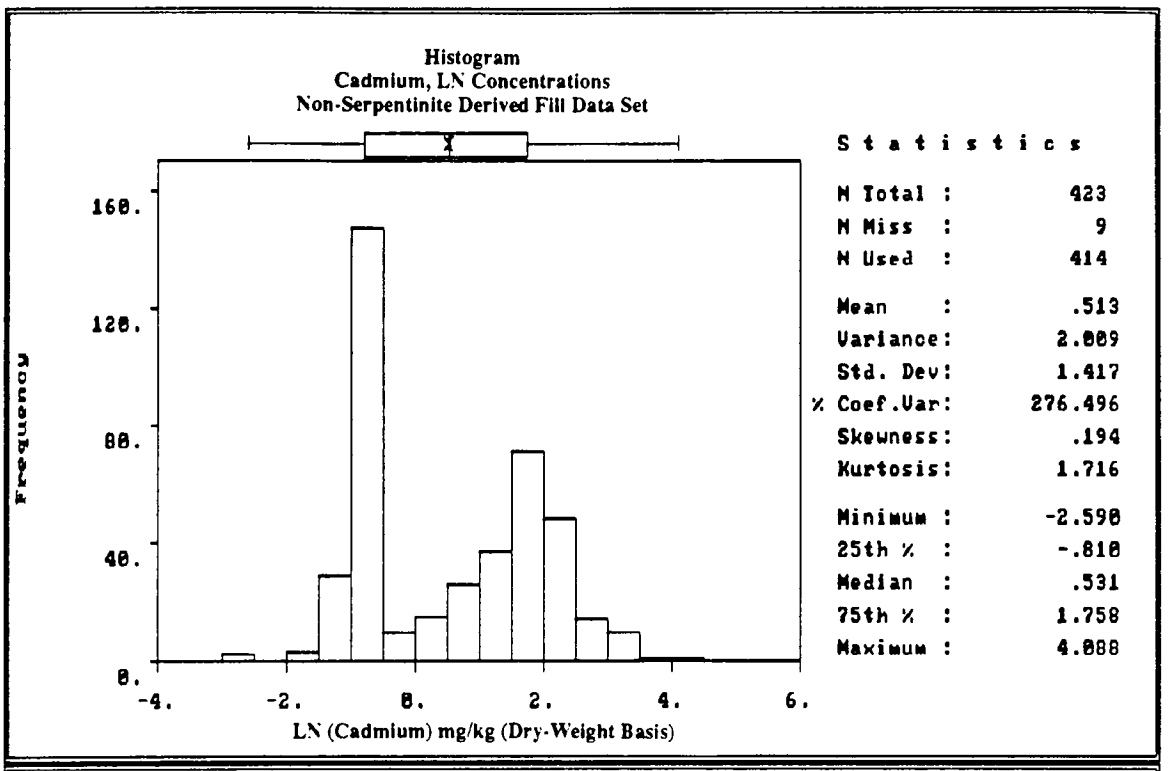
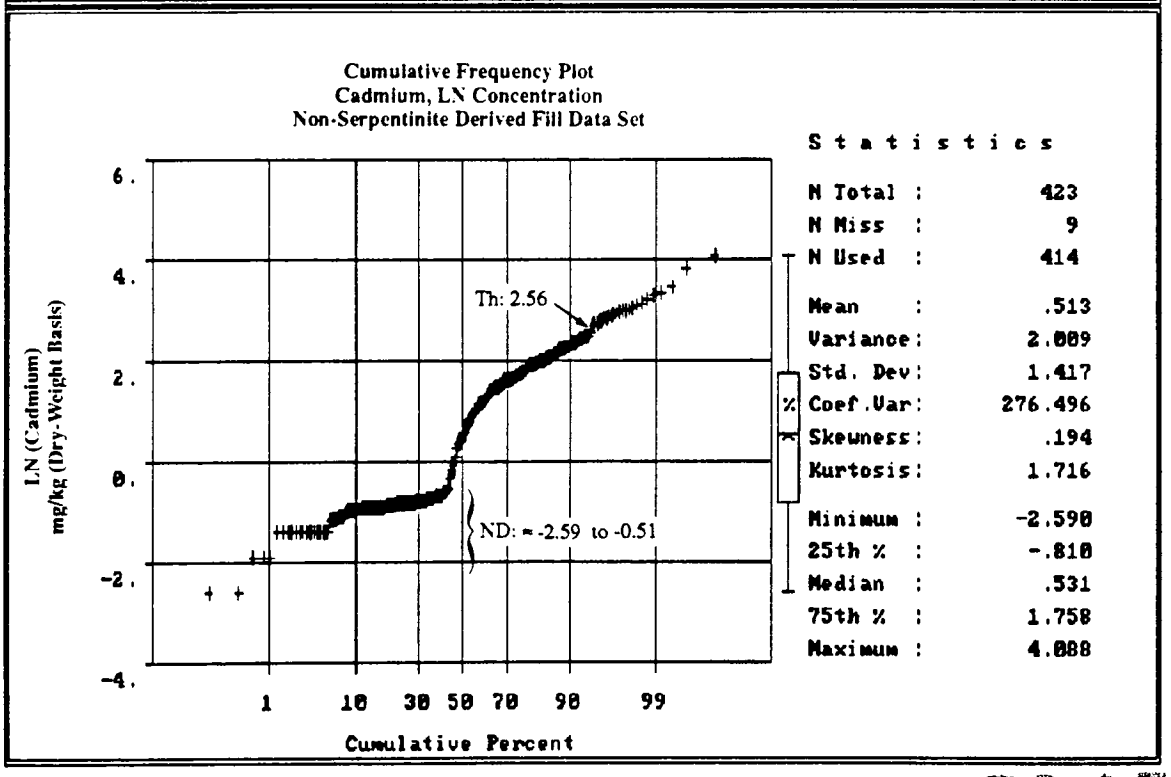
Cadmium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A42

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25804





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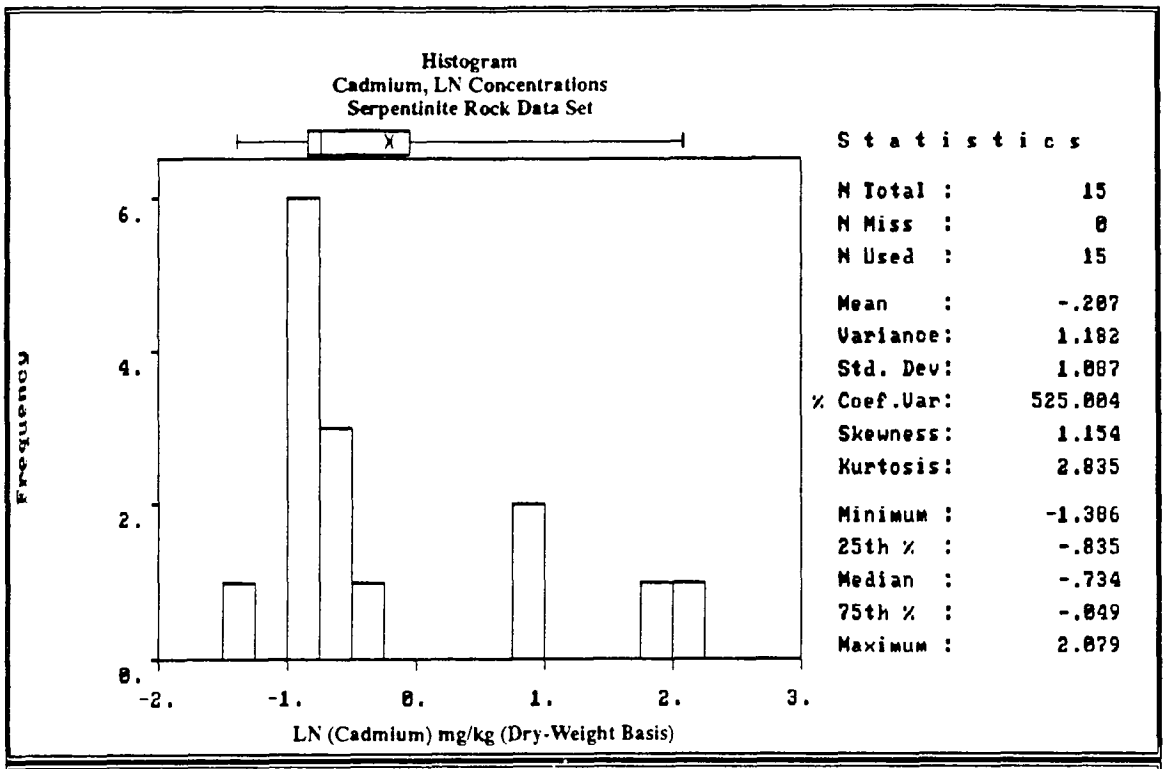
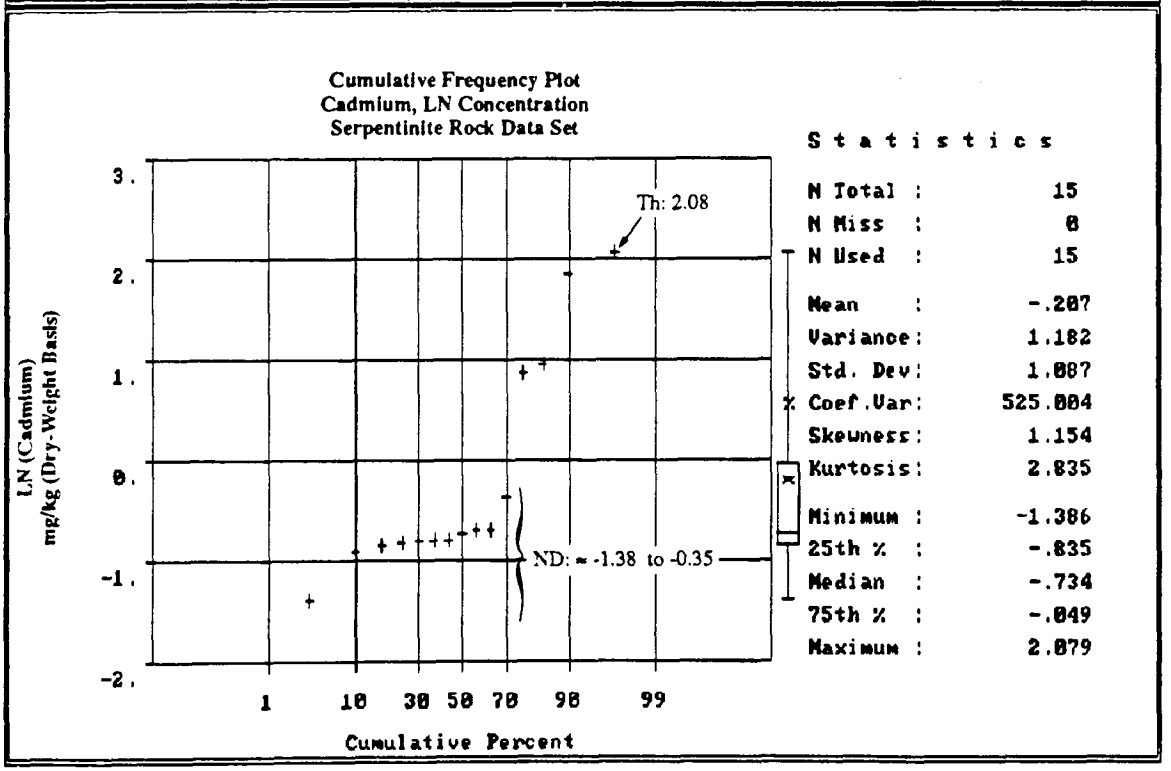
Cadmium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A43

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25805





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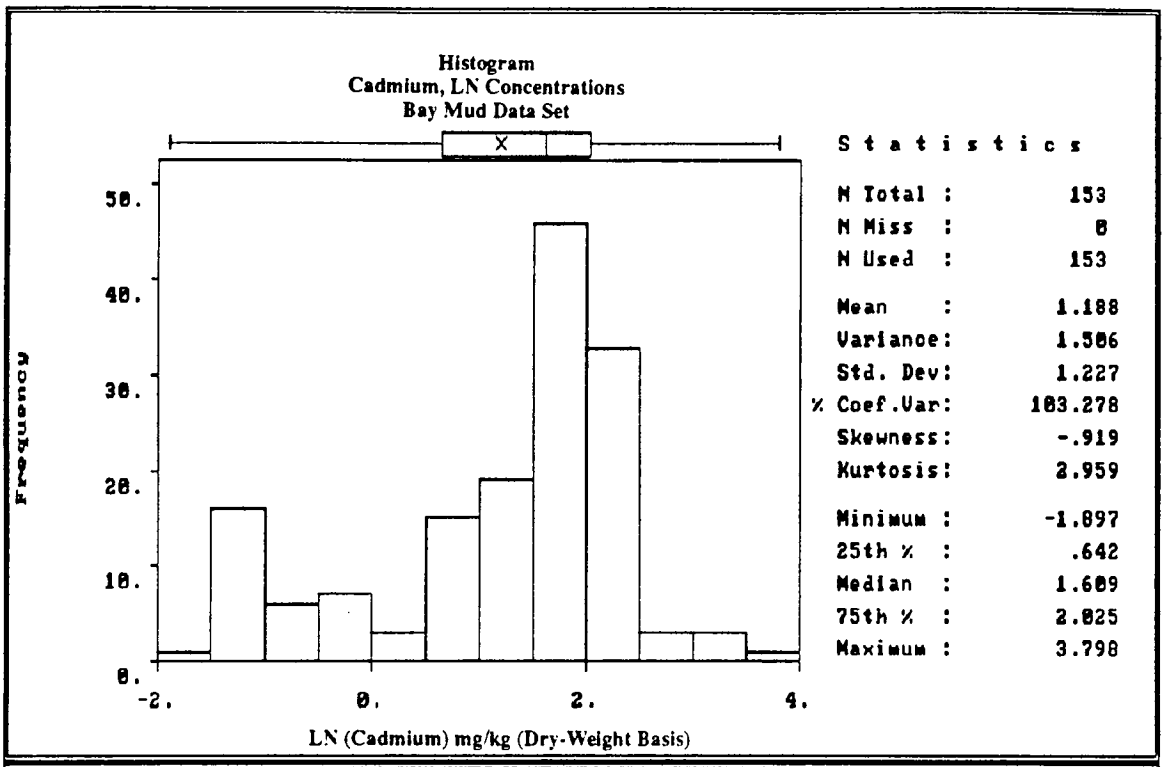
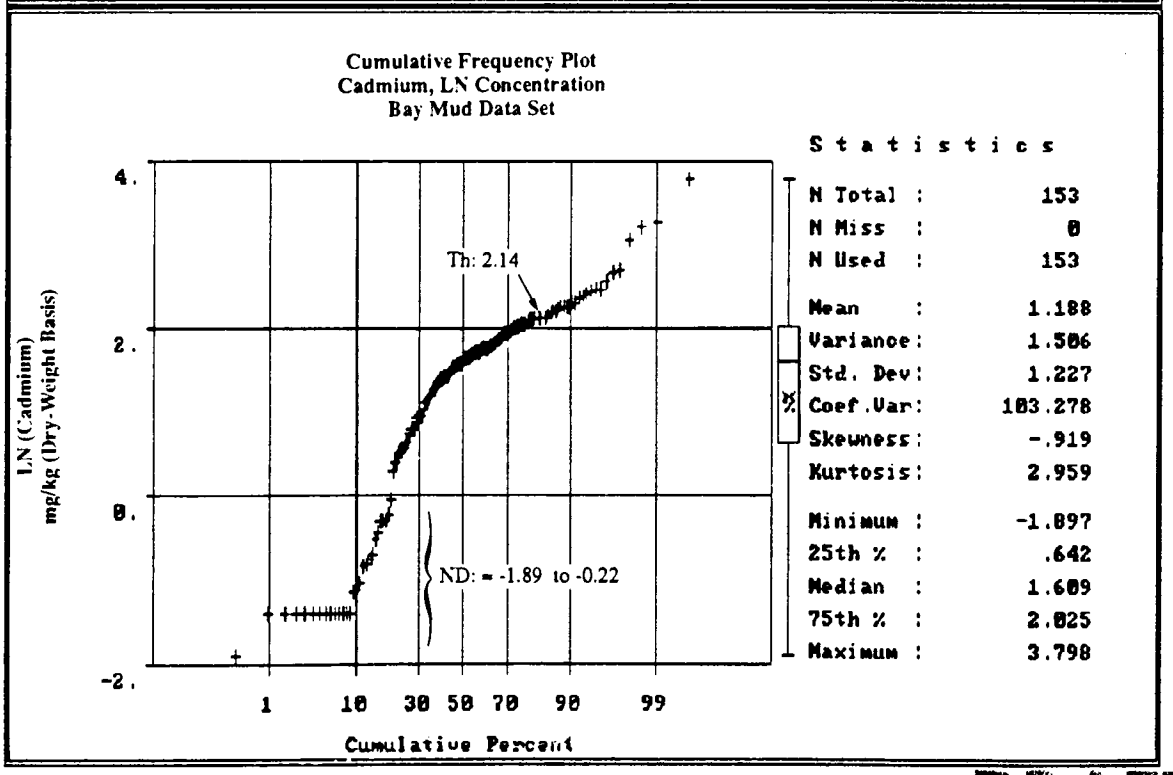
Cadmium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A44

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25806





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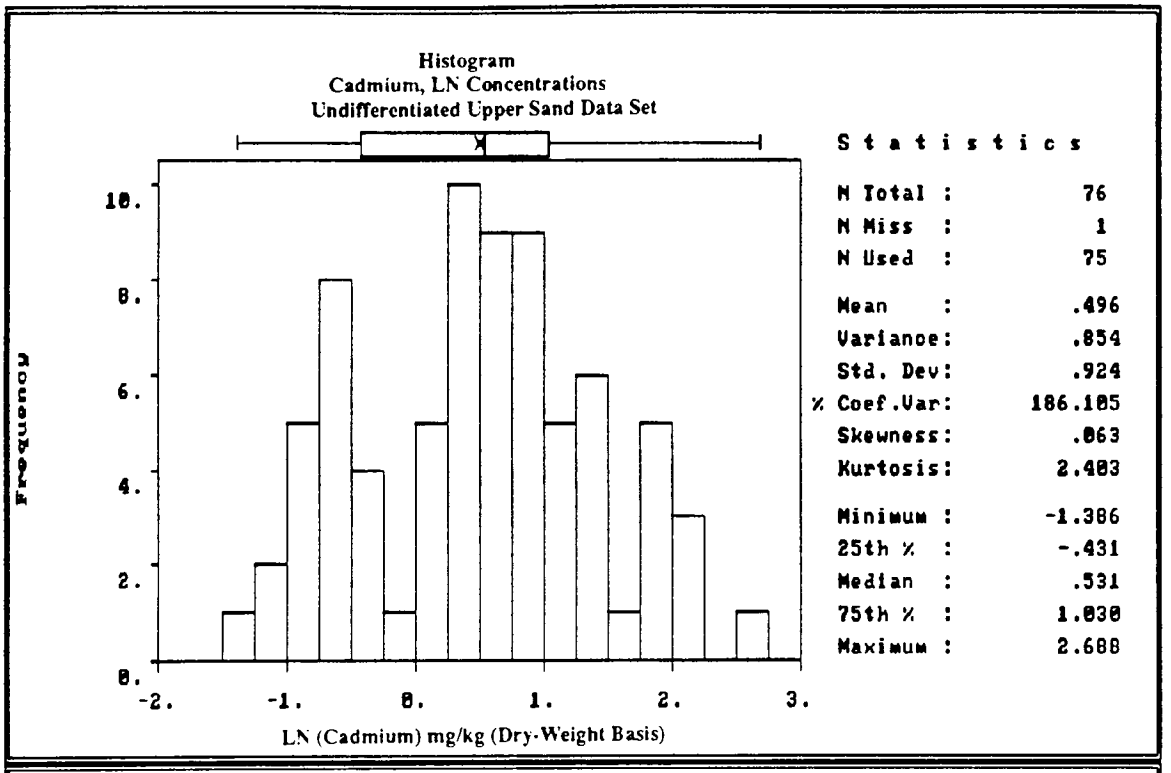
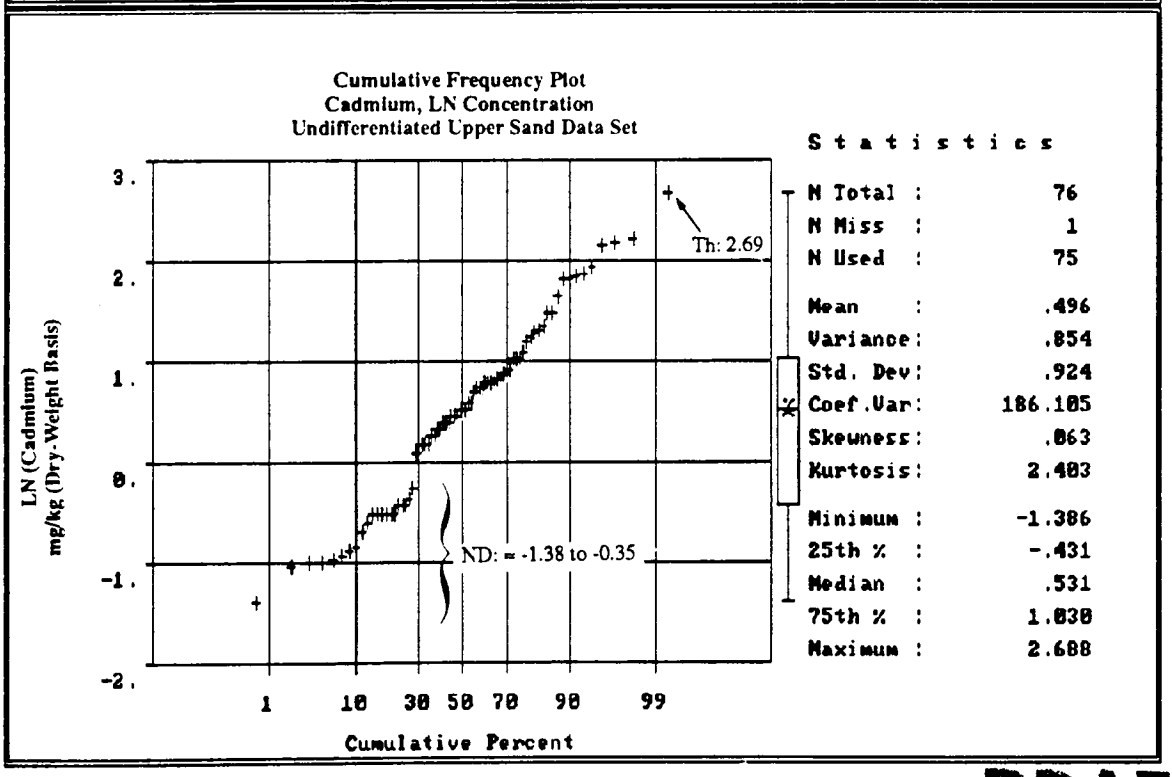
Cadmium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A45

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25807





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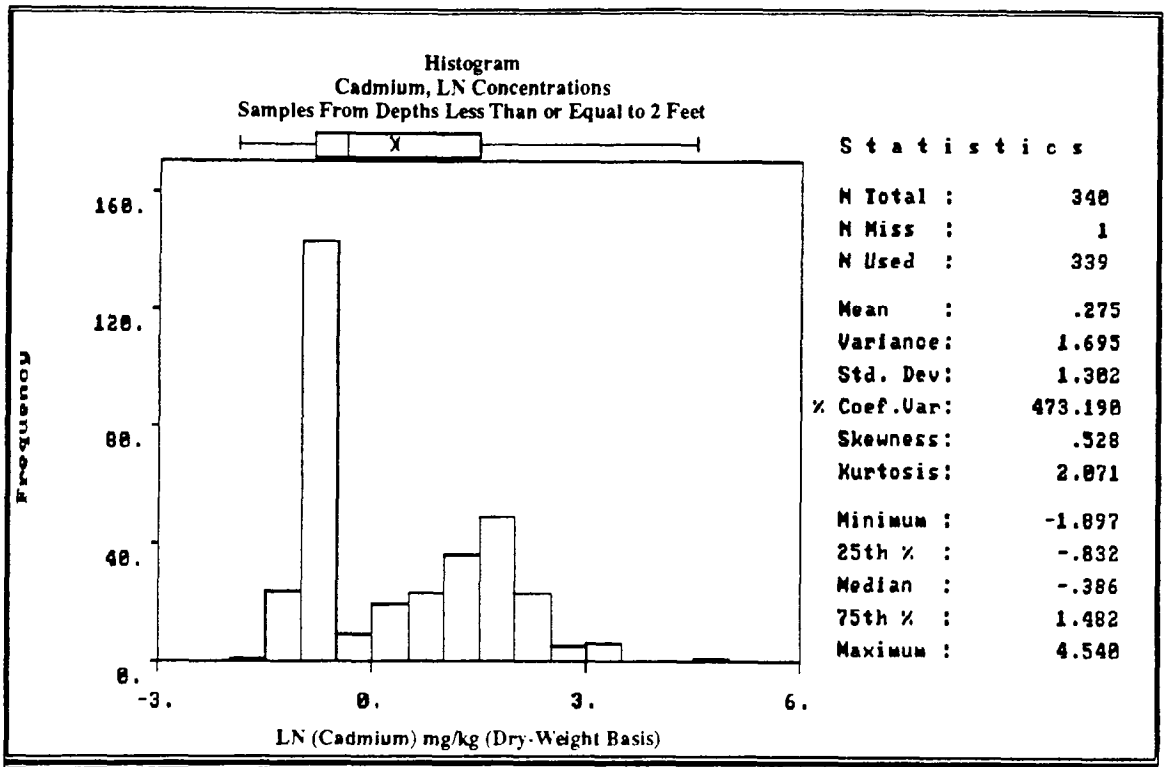
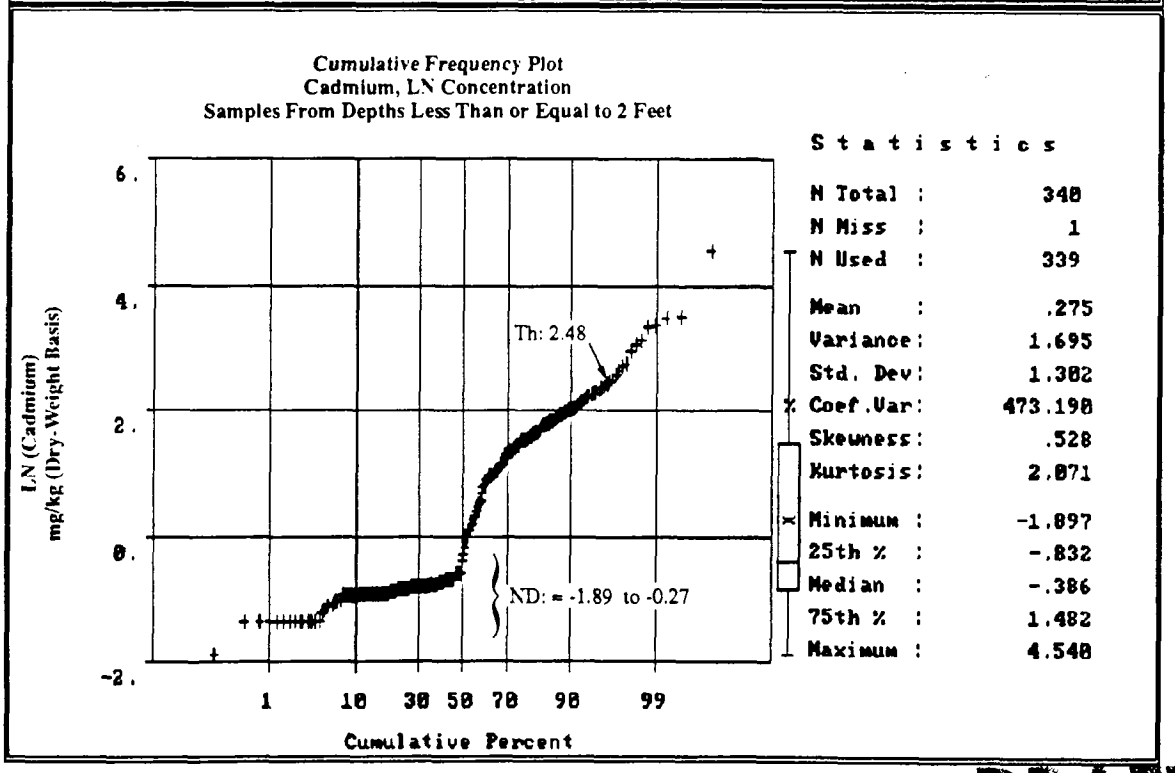
Cadmium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A46

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25808





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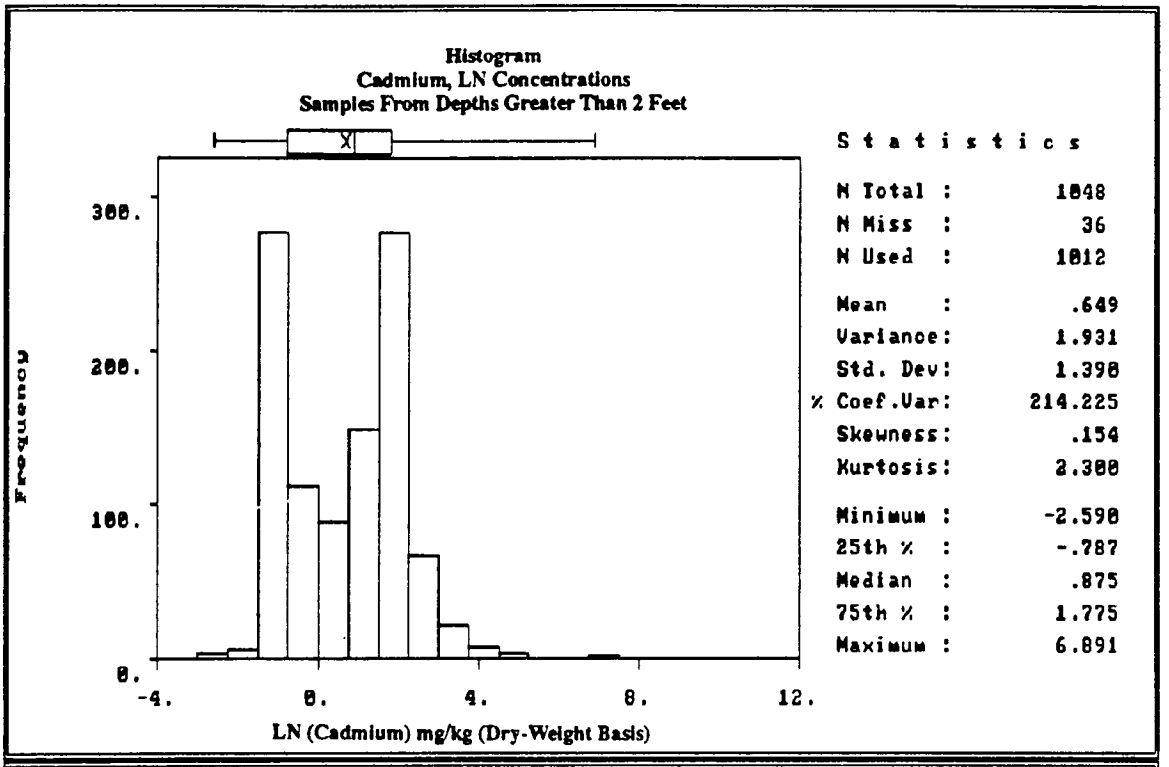
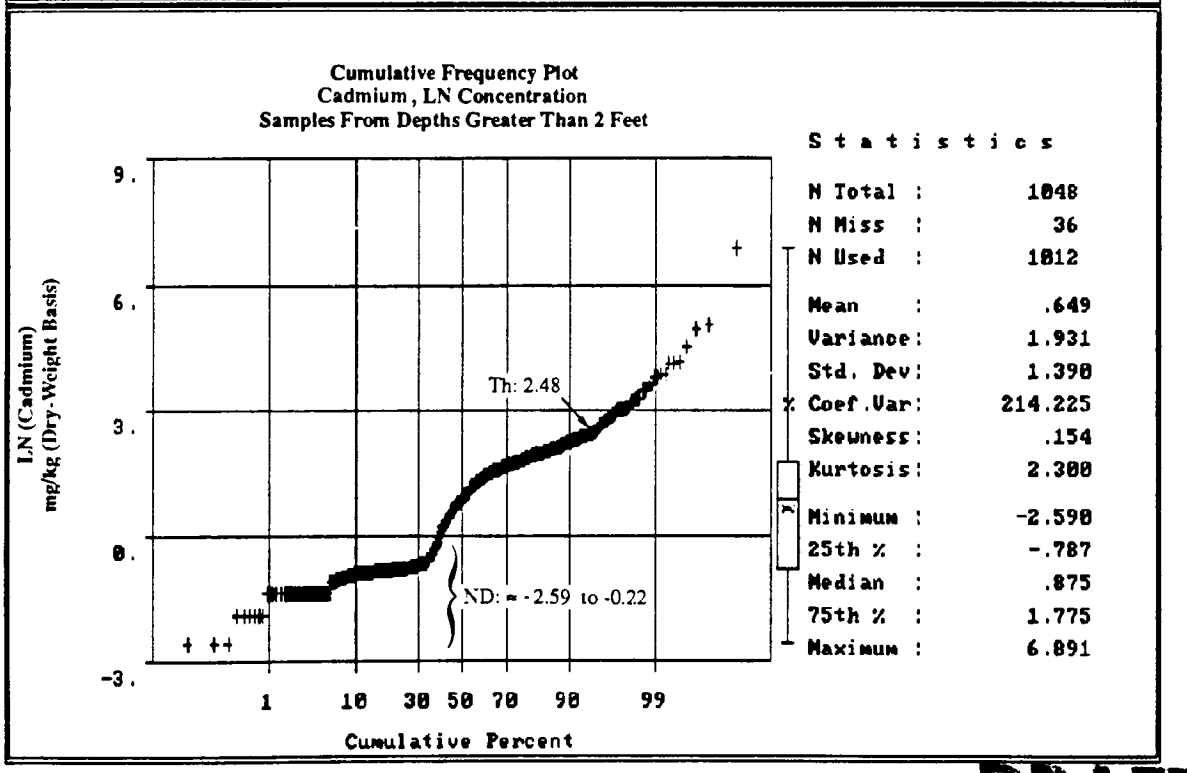
Cadmium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A47**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	6/92

25809





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Engineering and
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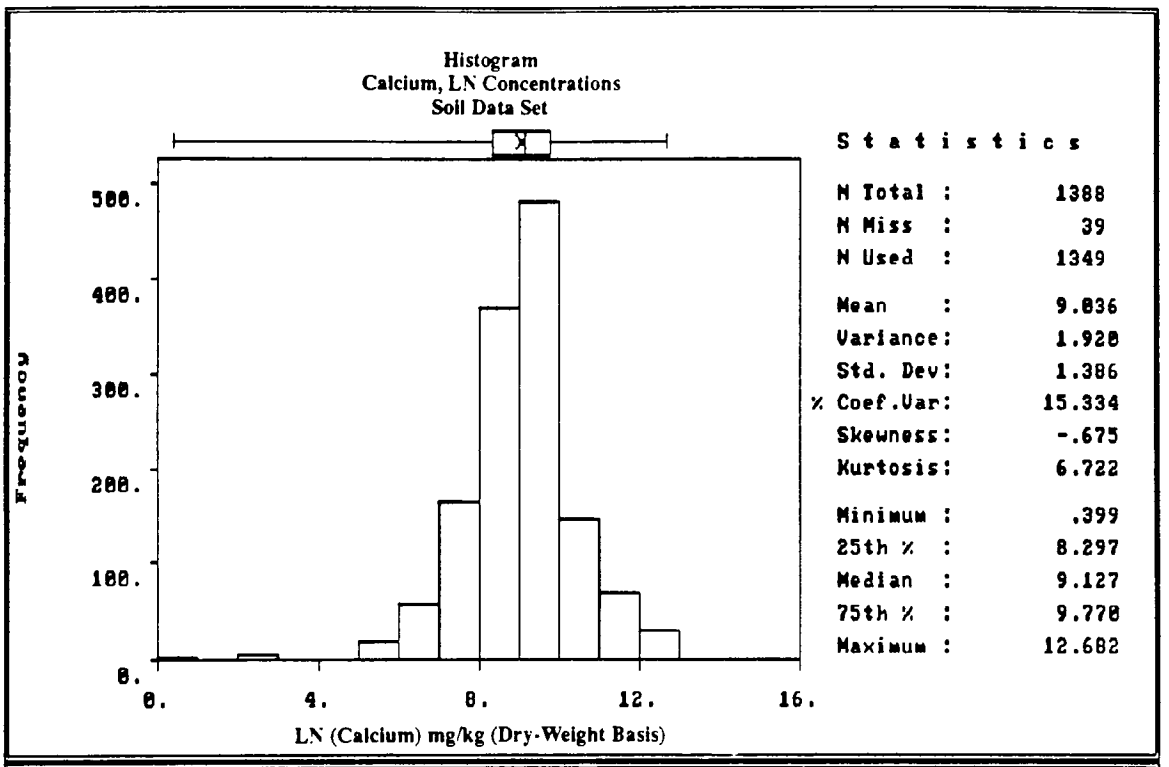
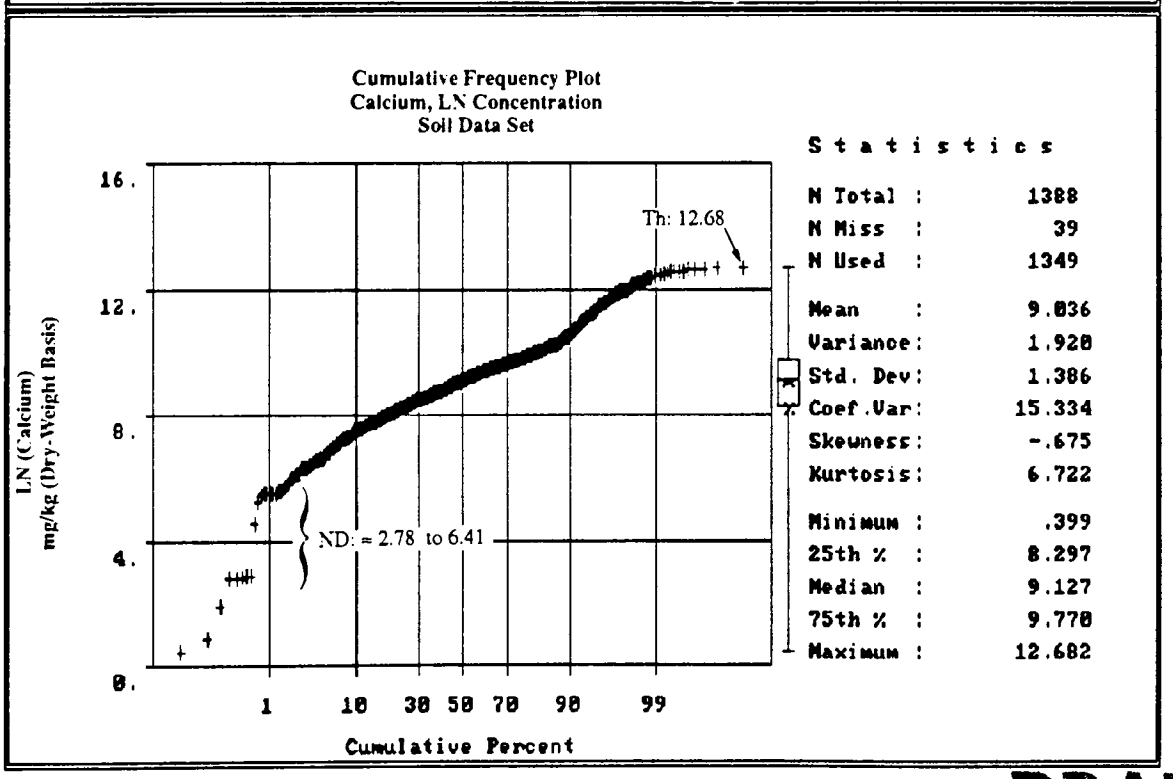
Cadmium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A48**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25810





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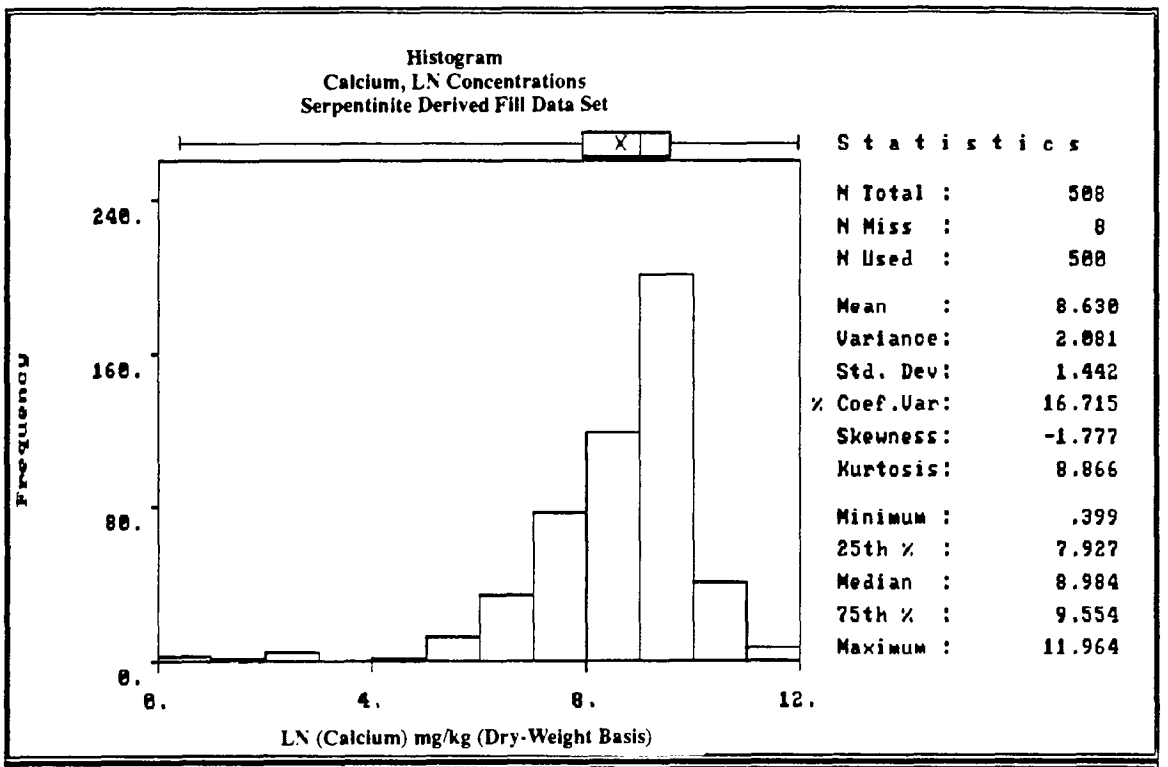
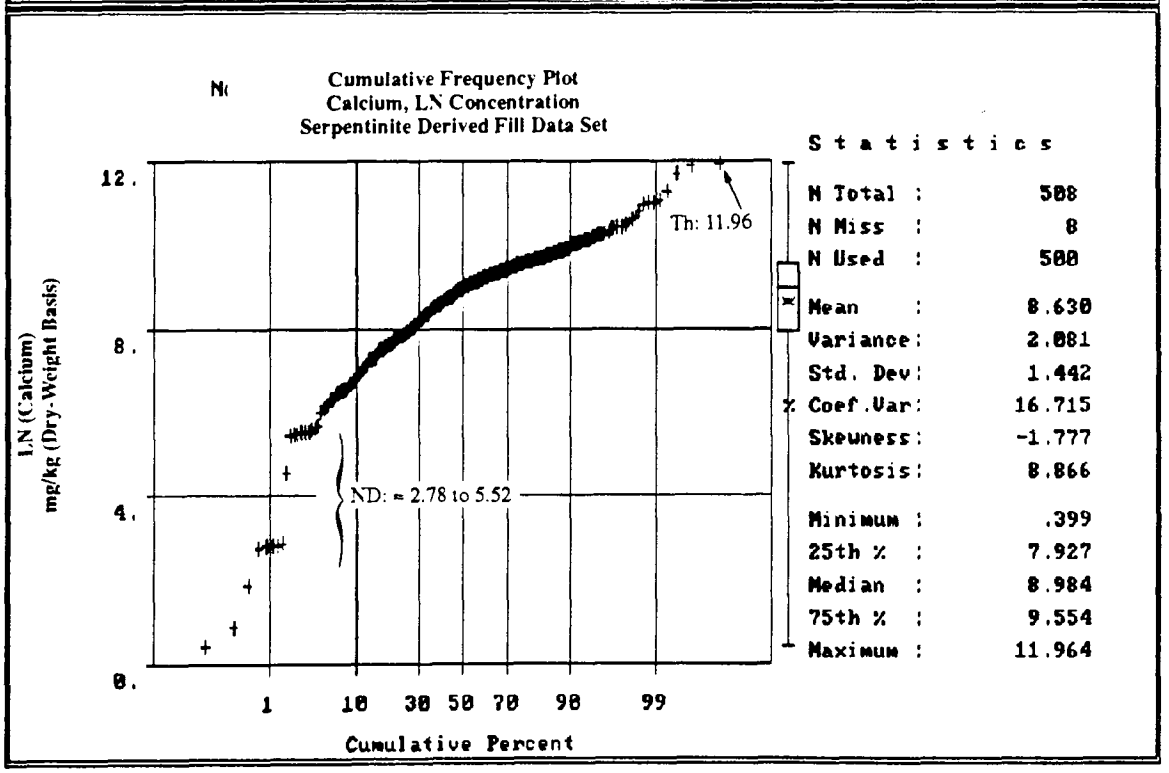
Calcium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A49

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25811





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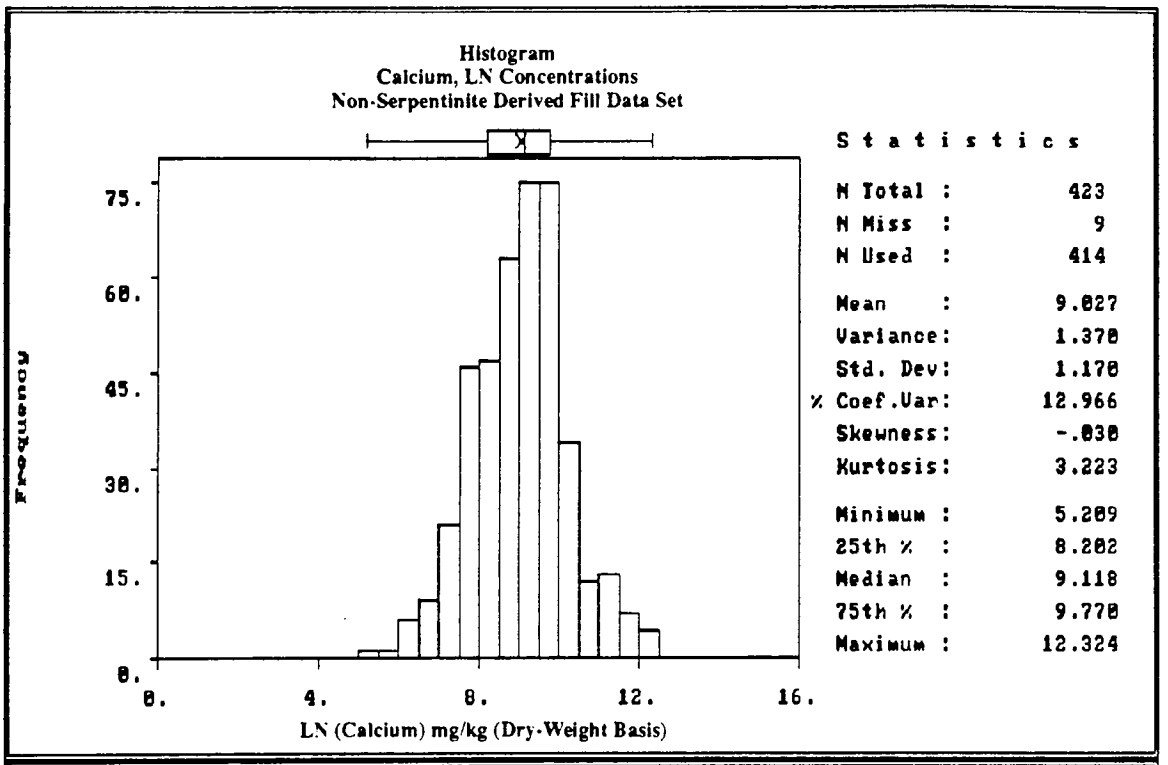
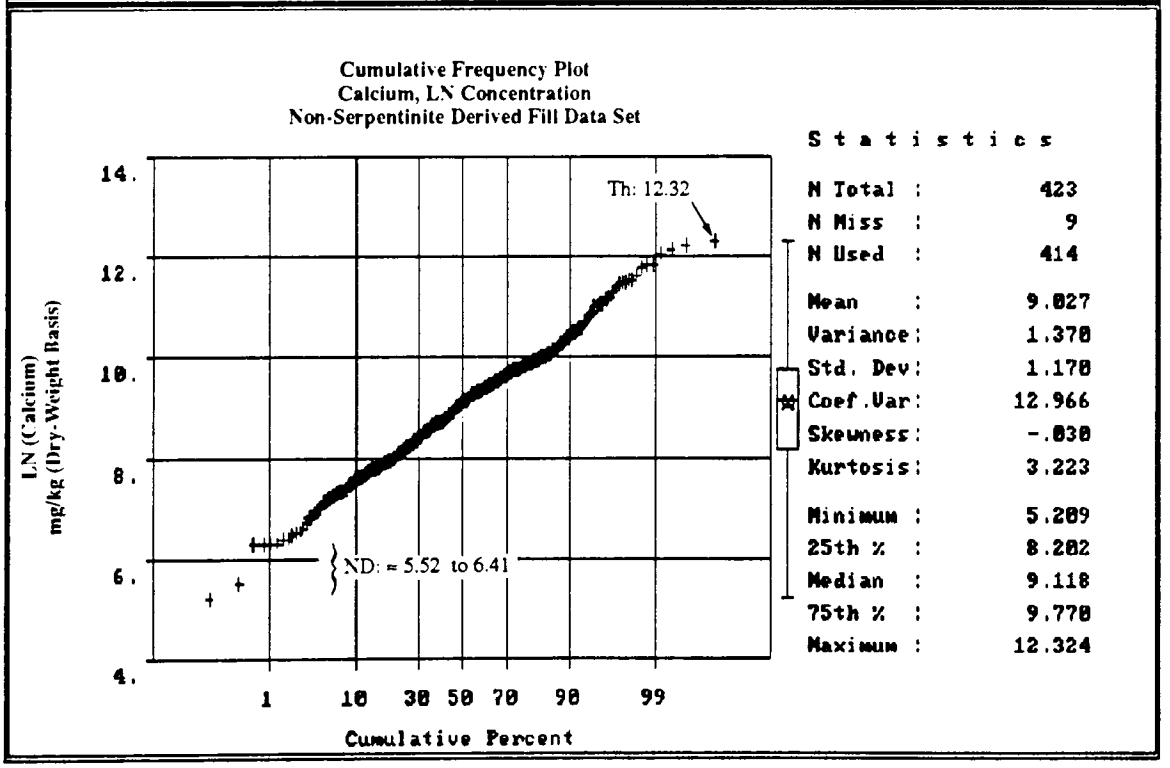
Calcium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A50

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25812





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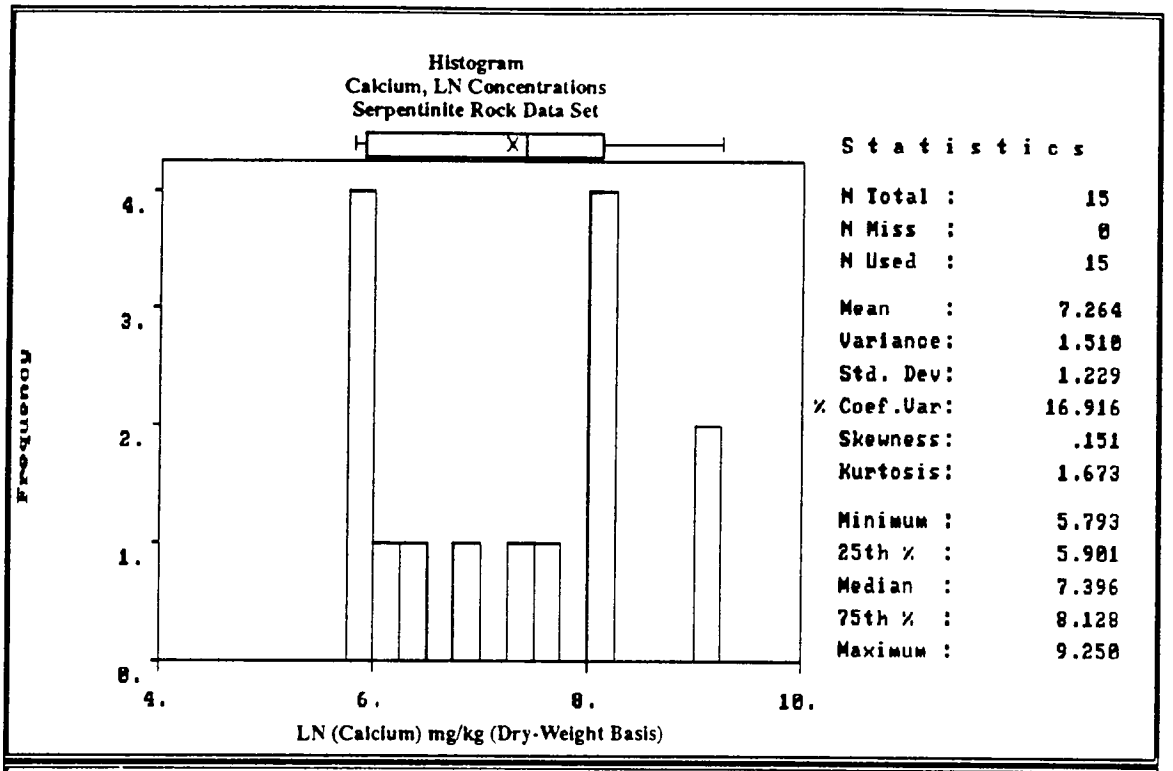
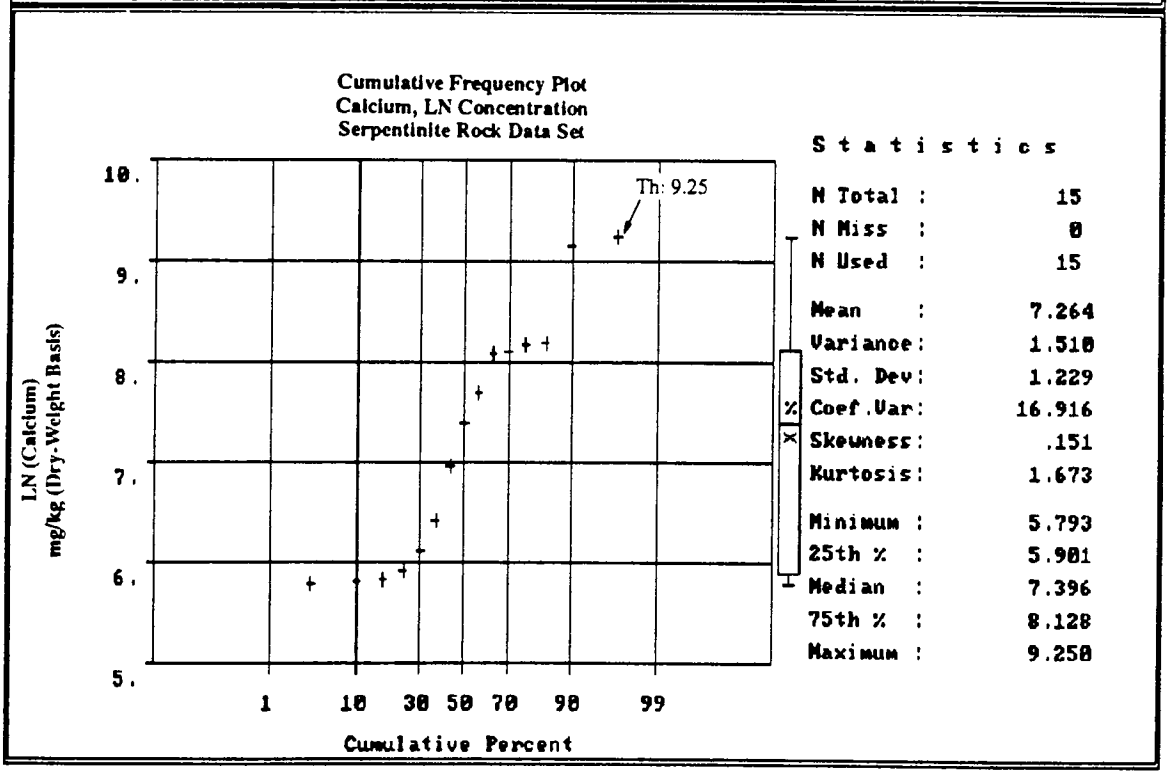
Calcium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A51

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25813





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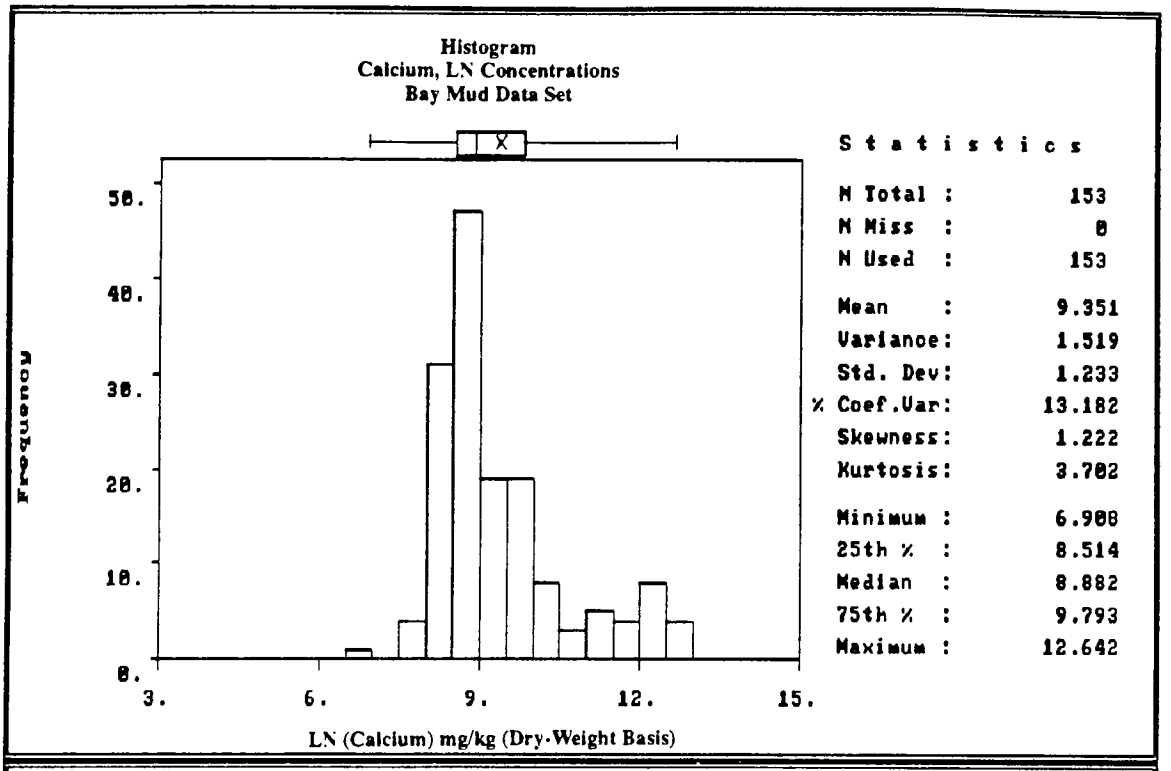
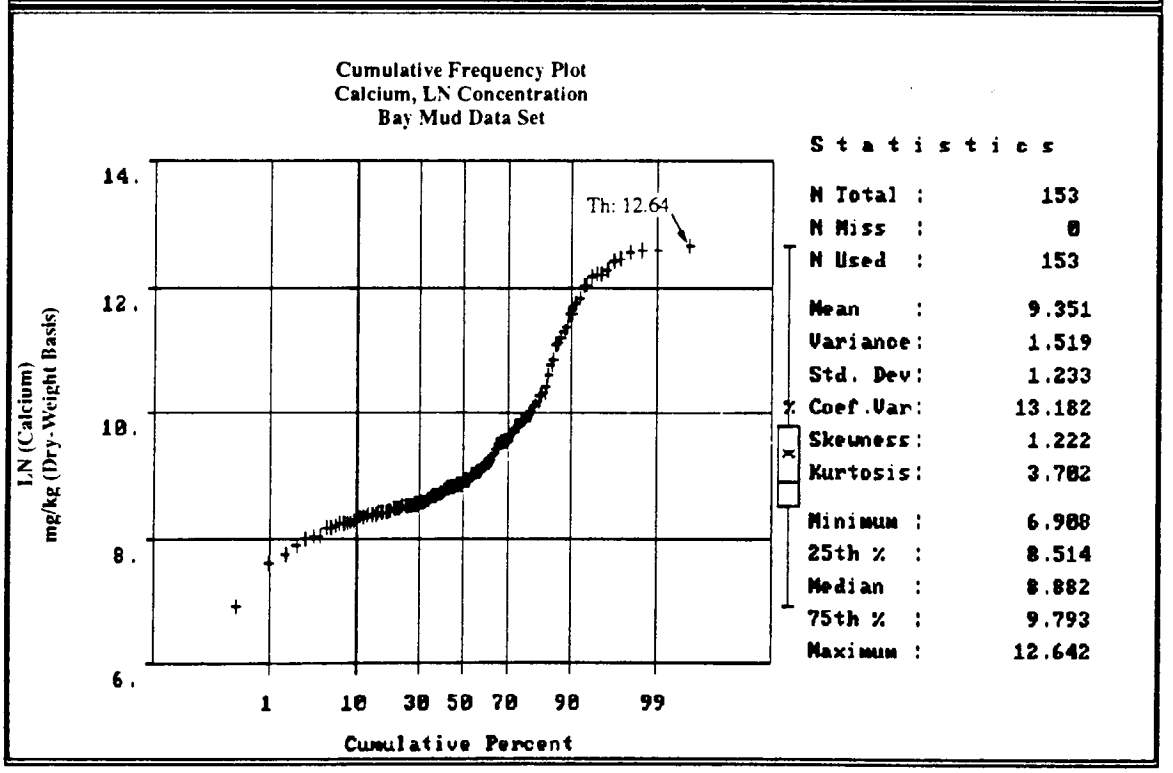
Calcium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A52

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	OJM	2/92	6/92

25814





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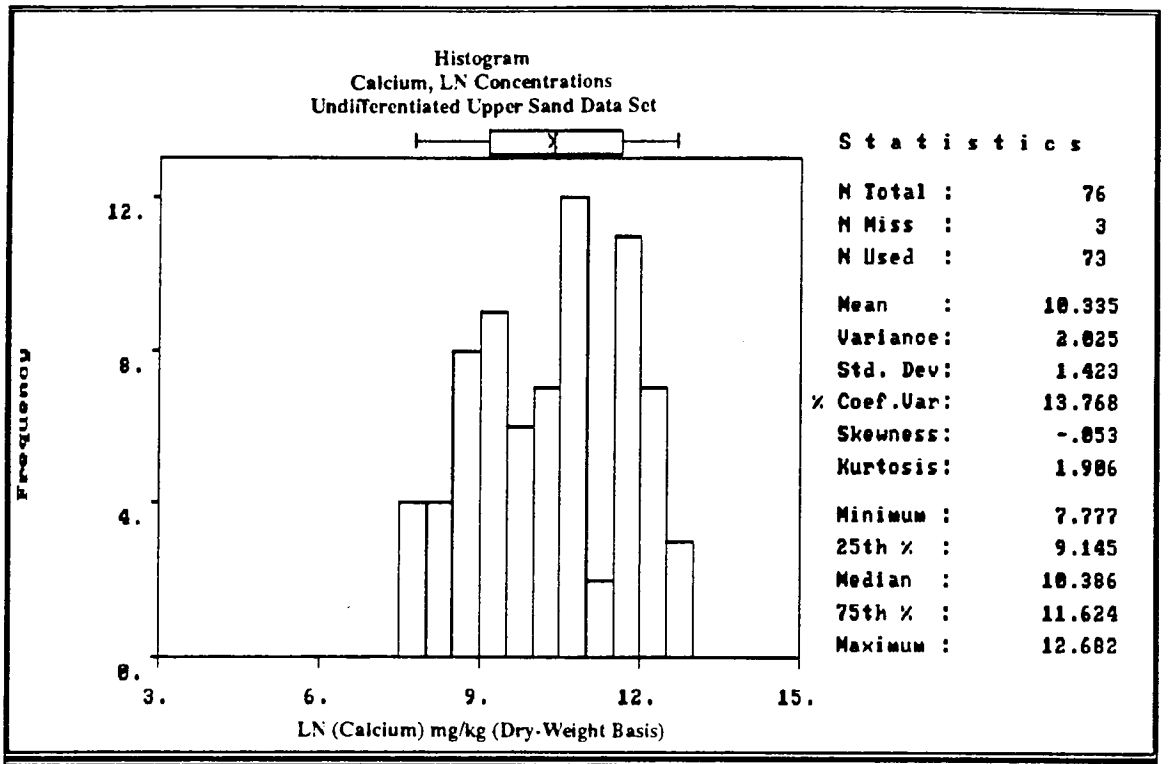
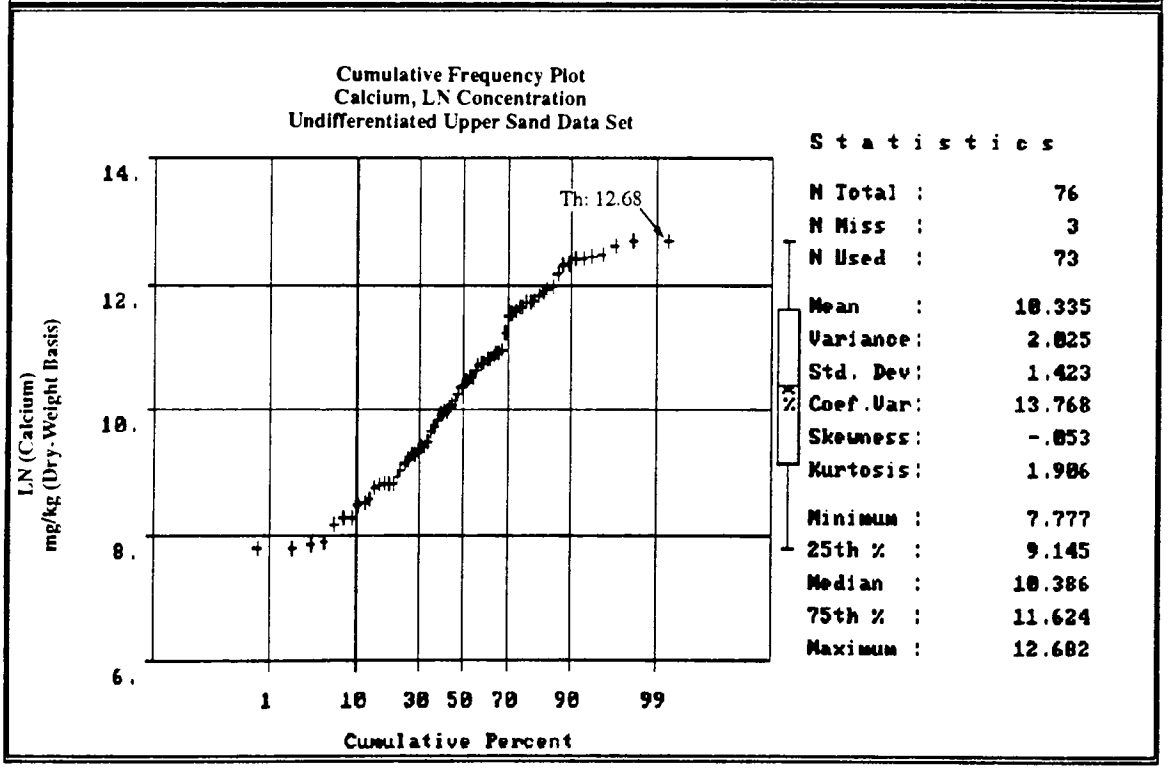
Calcium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A53

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25815





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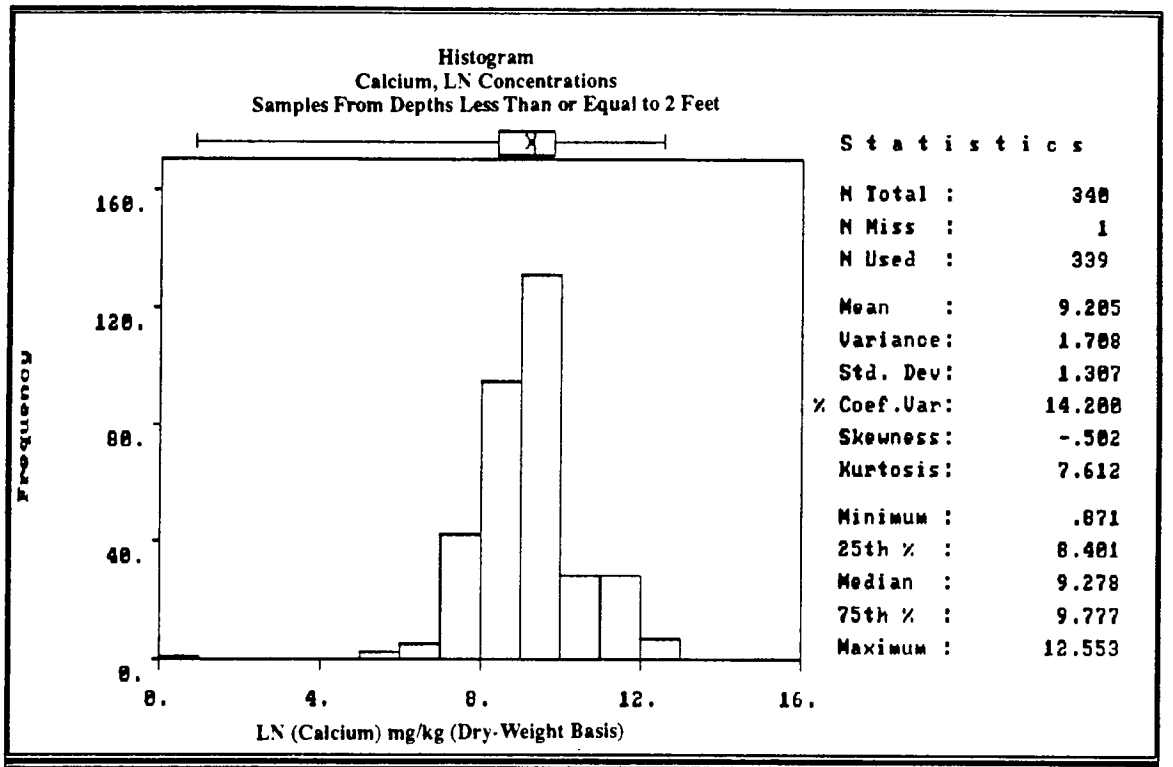
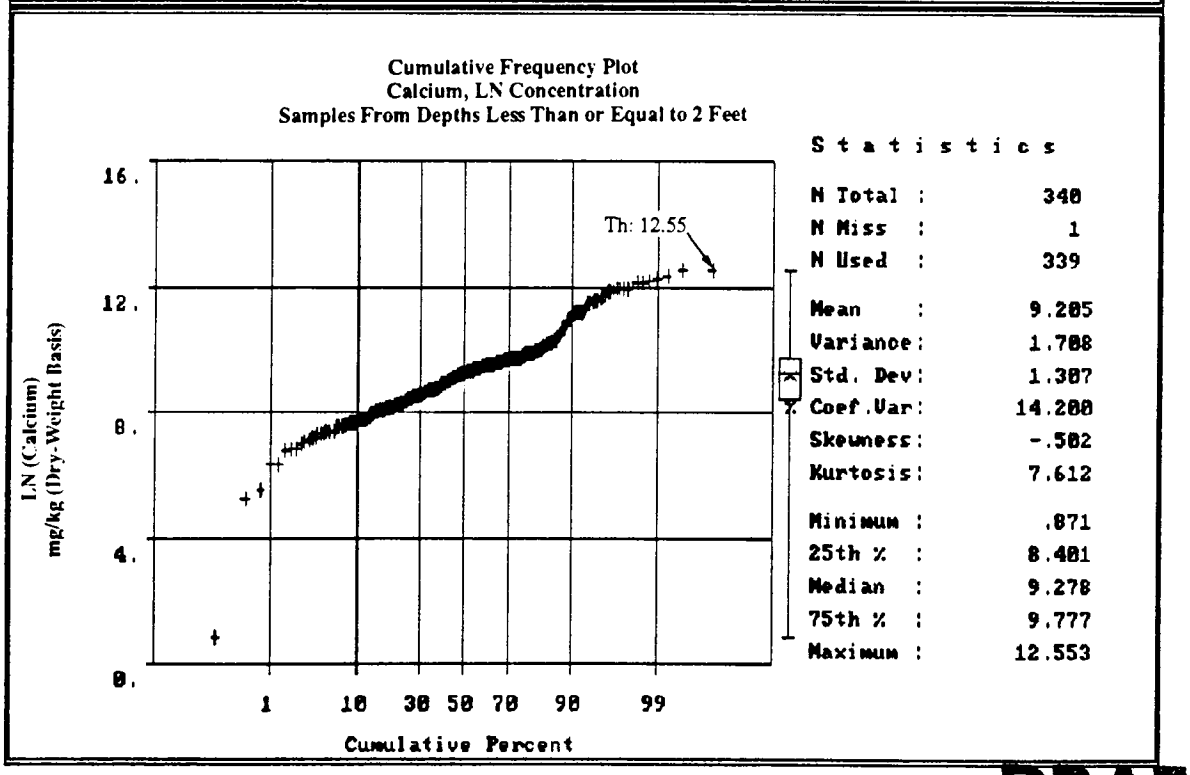
Calcium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A54

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25816





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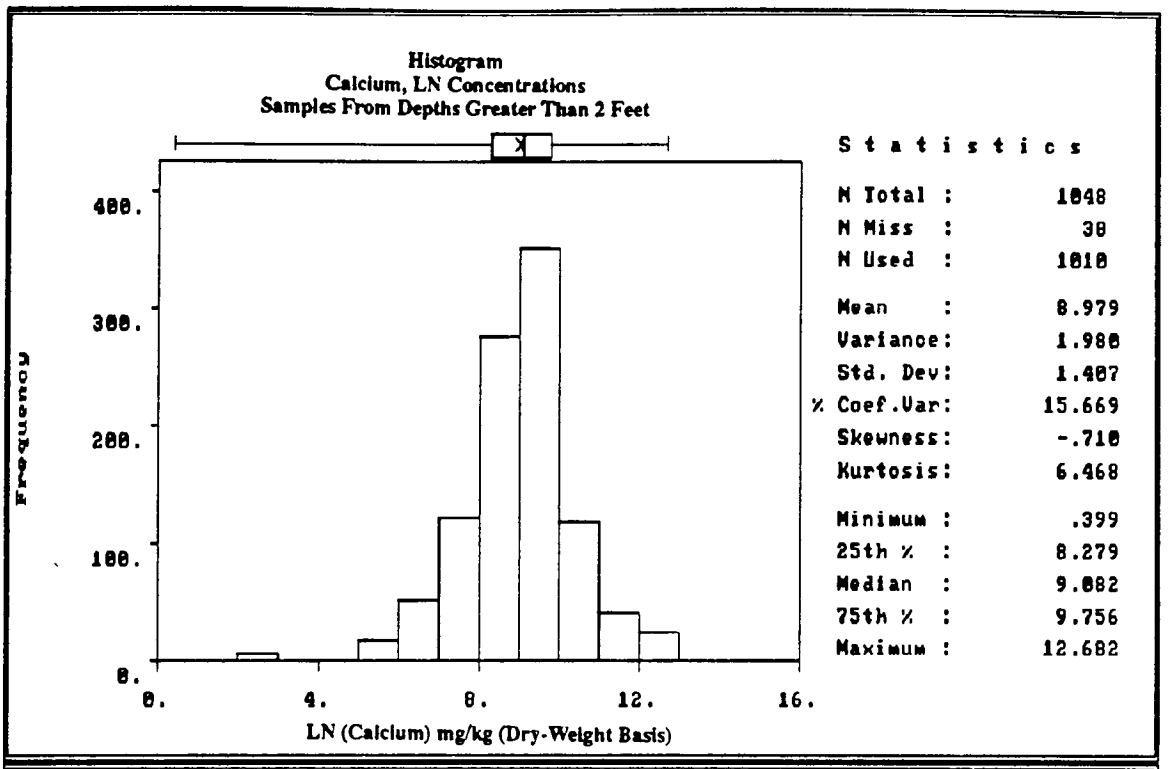
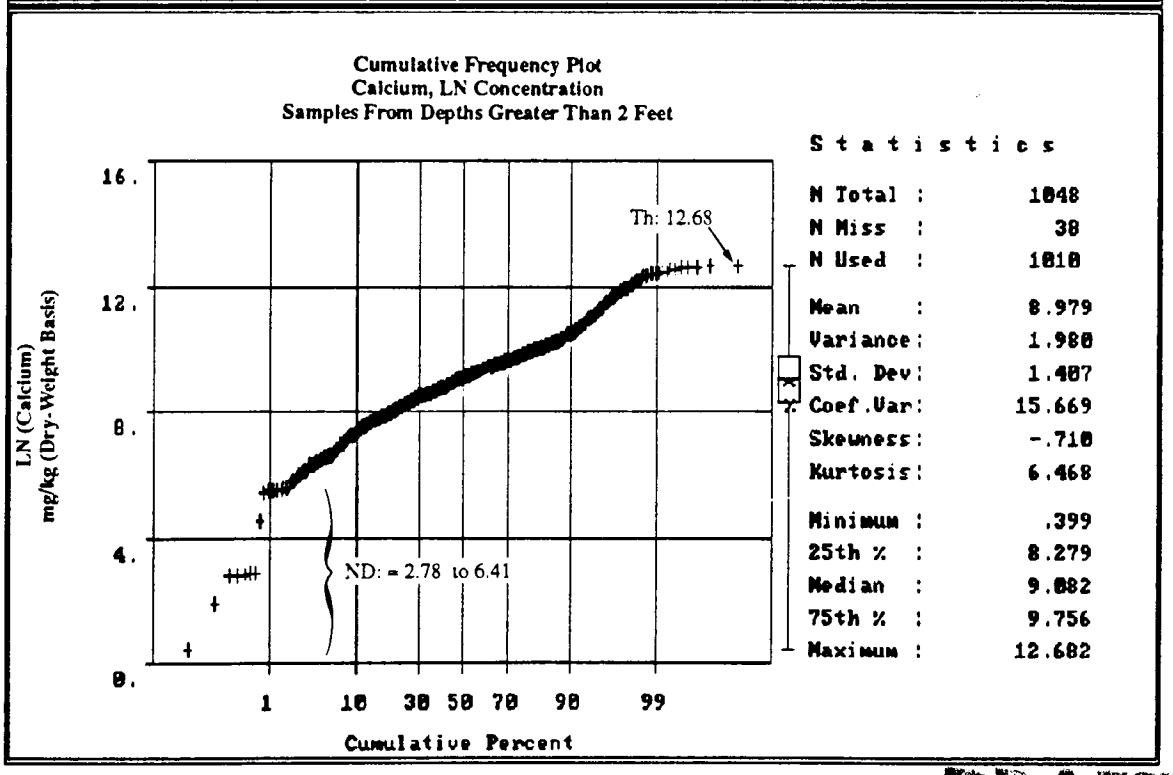
Calcium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A55**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25817





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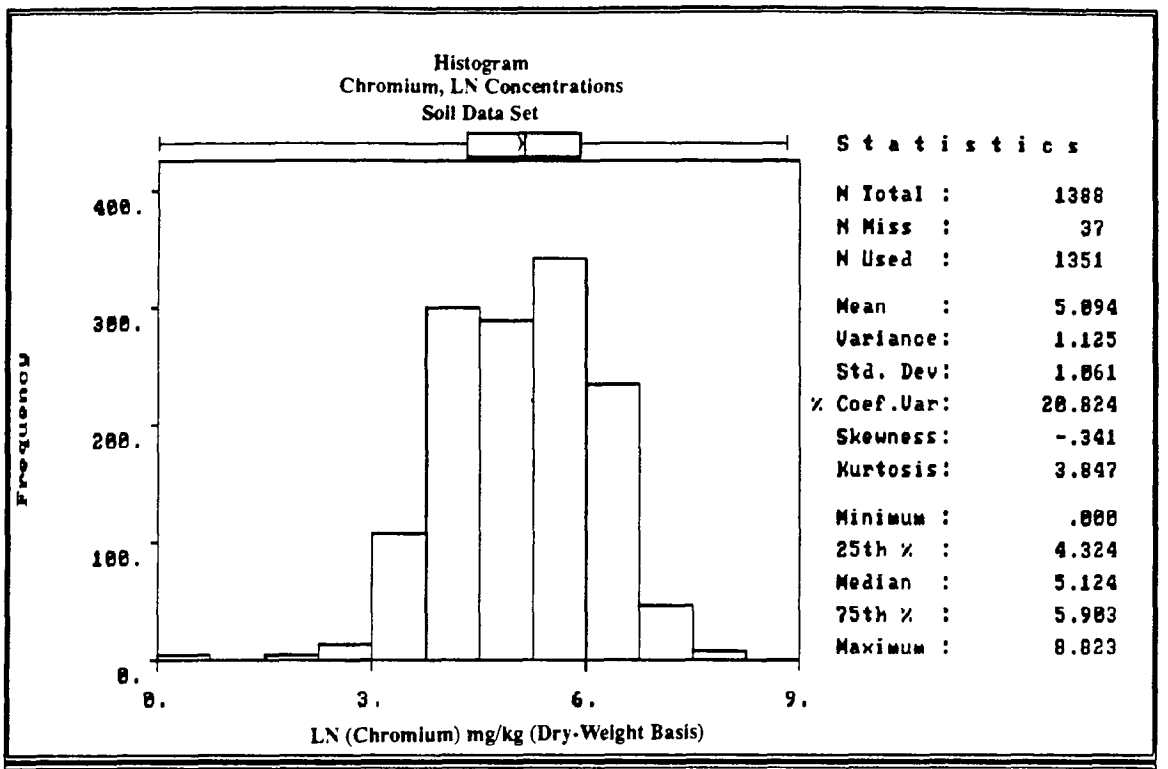
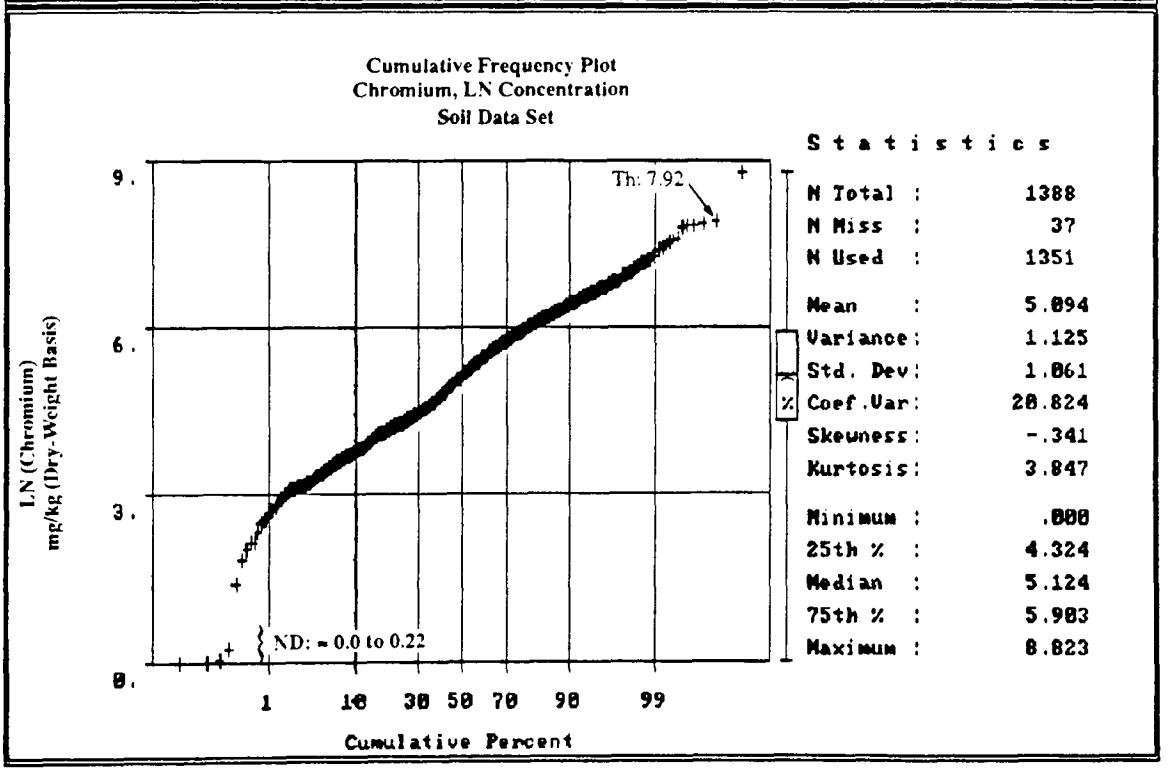
Calcium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A56

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25818





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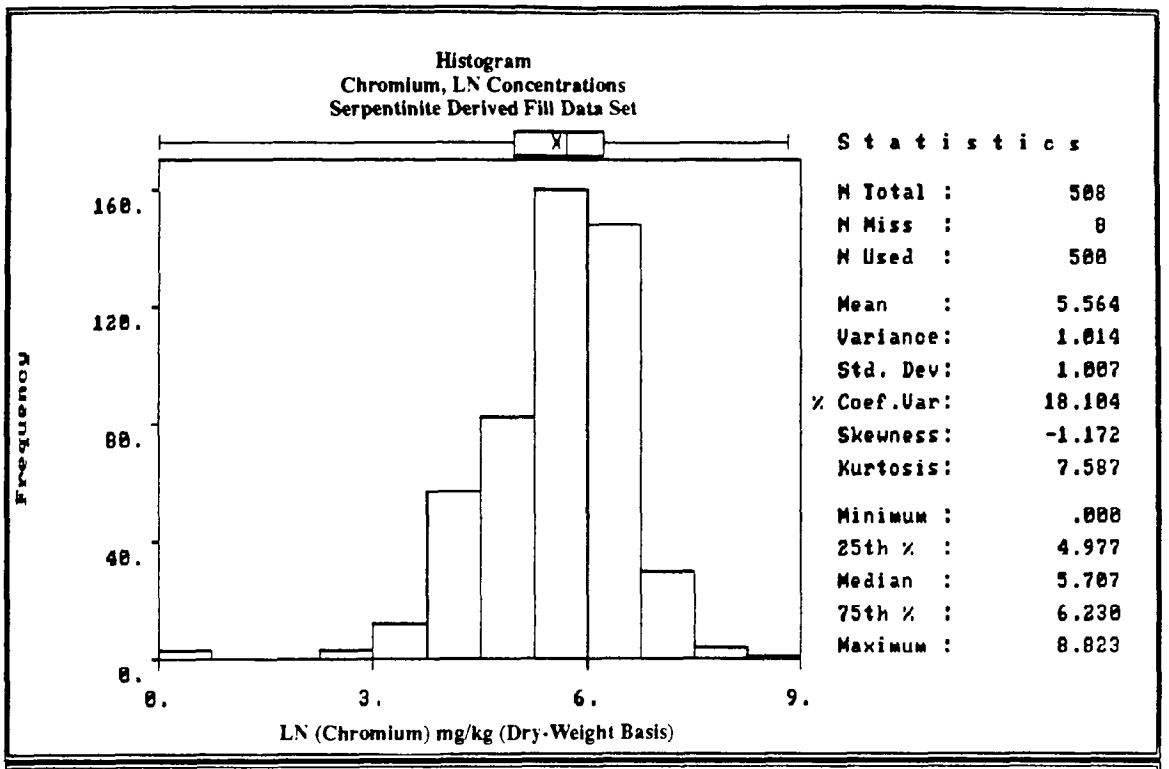
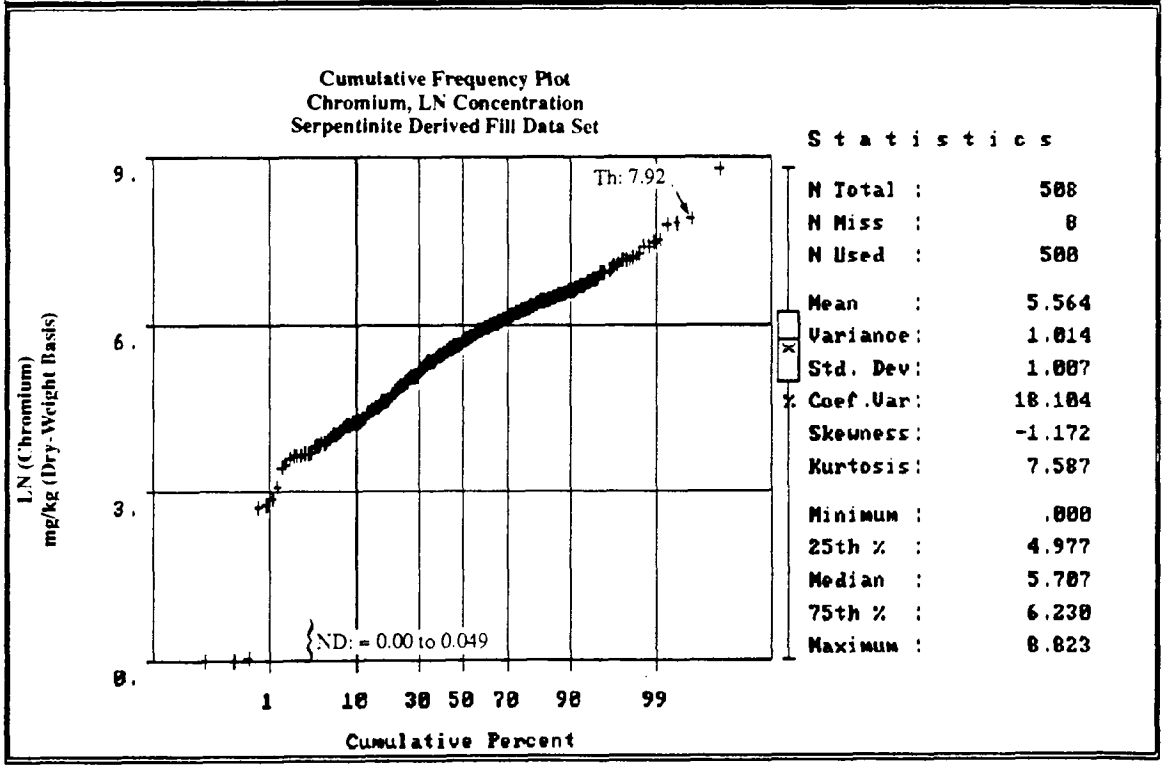
Chromium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A57

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25819





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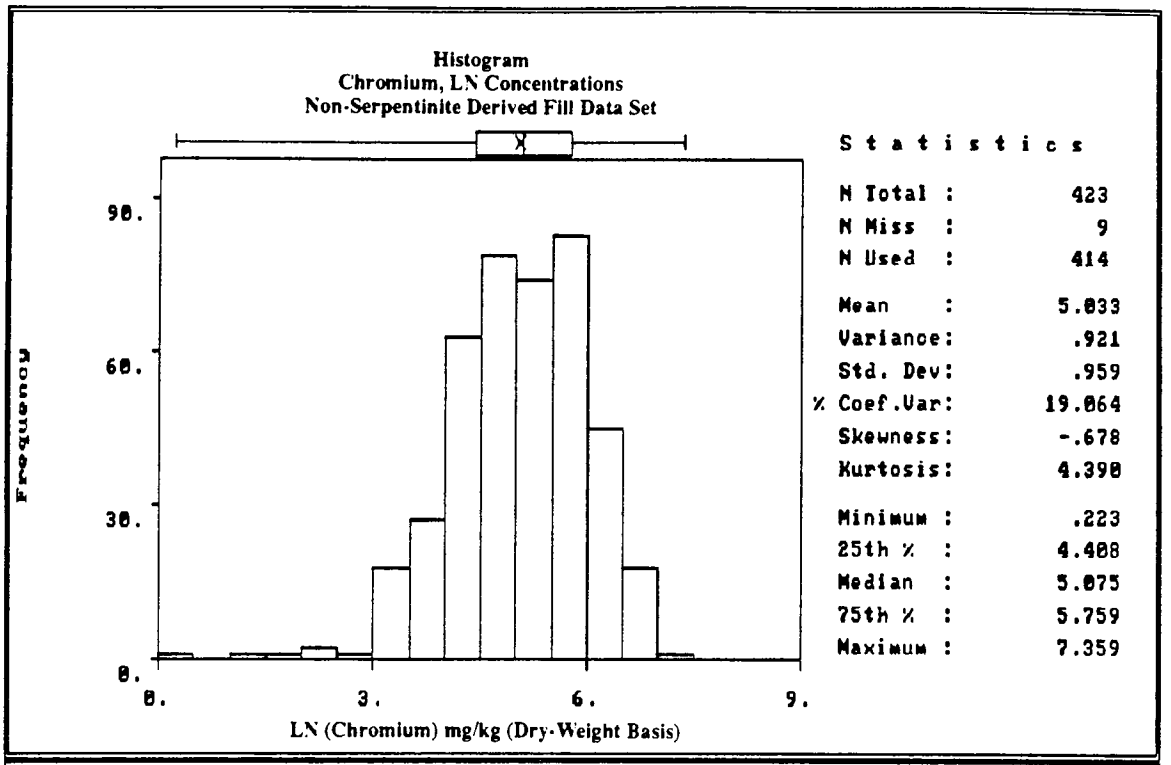
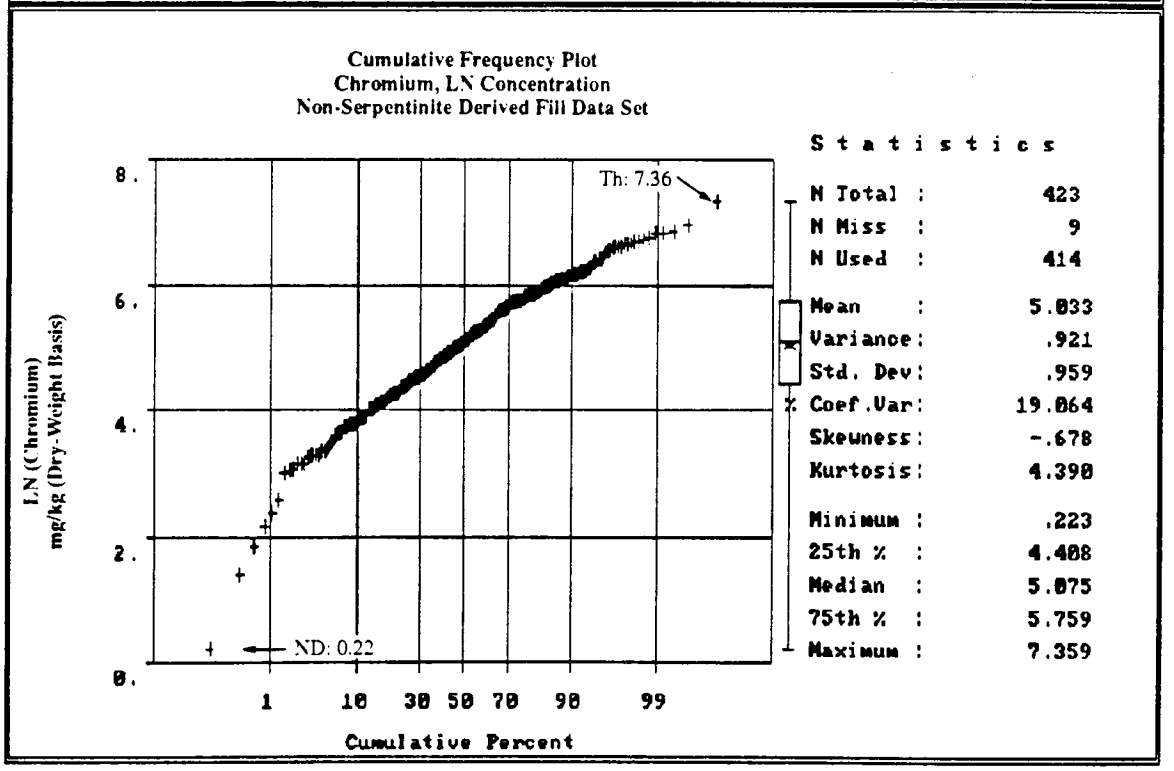
Chromium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A58

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25820





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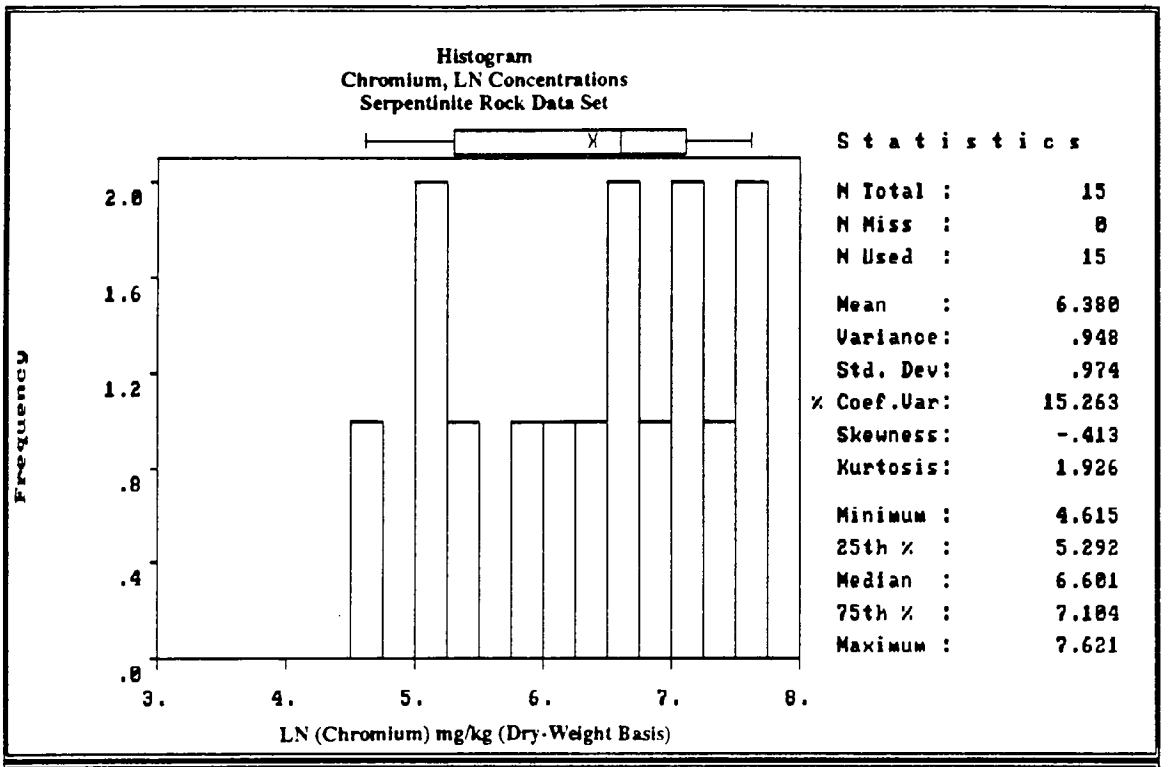
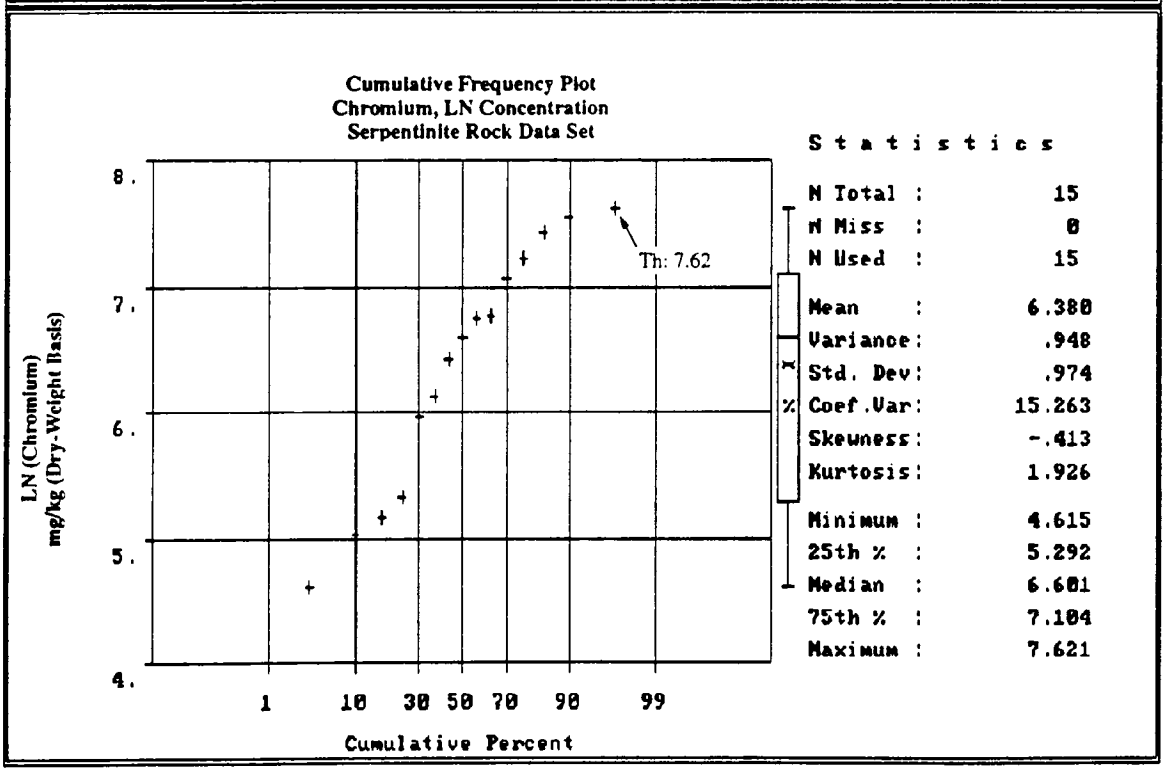
Chromium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A59

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25821





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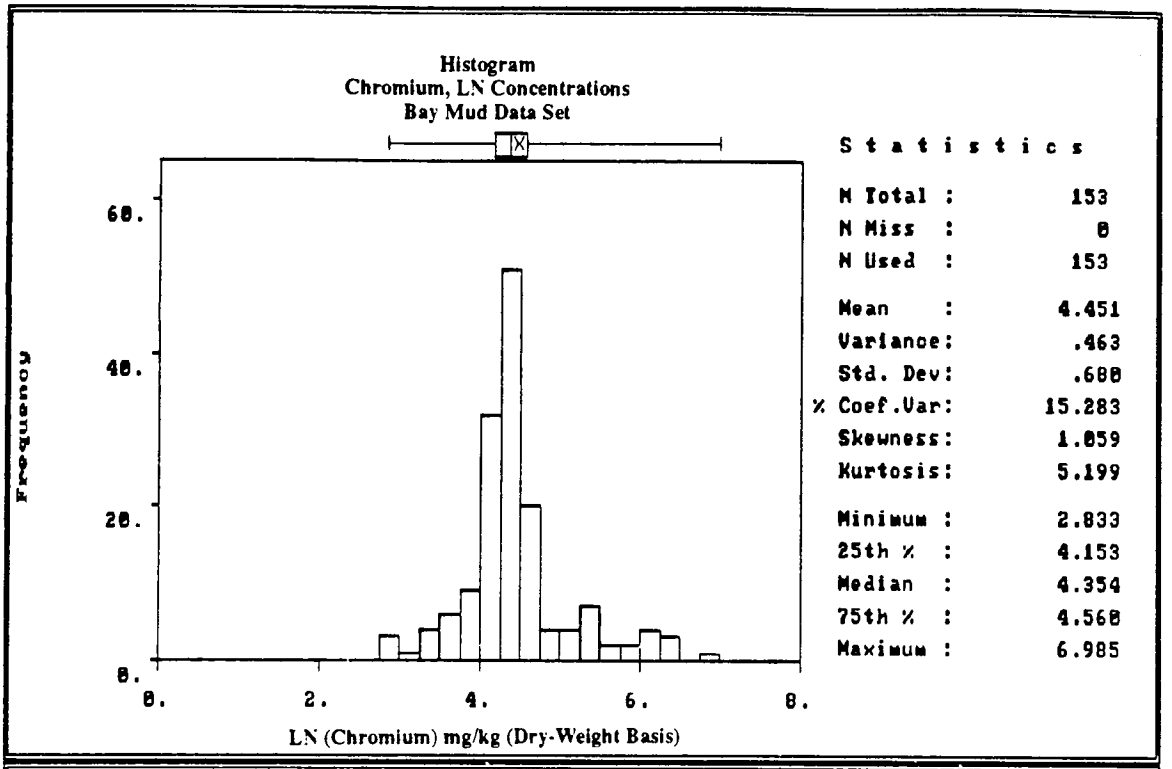
Environmental Services

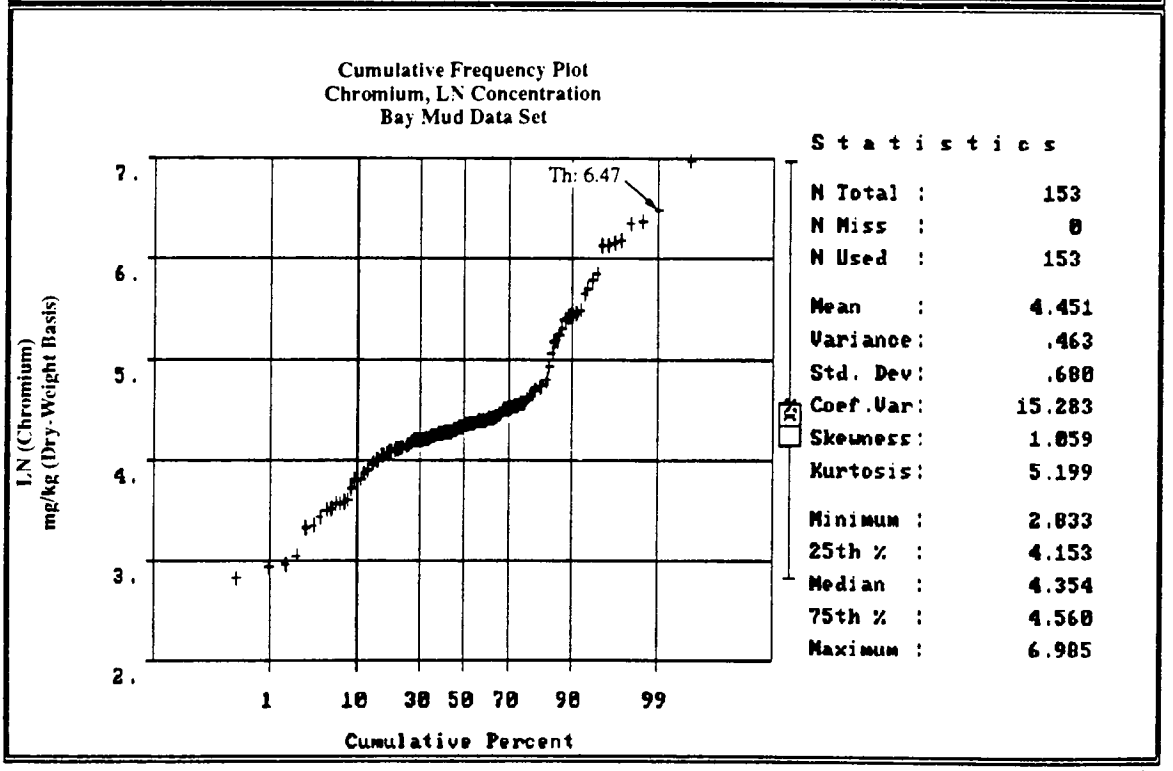
Chromium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A60

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25822





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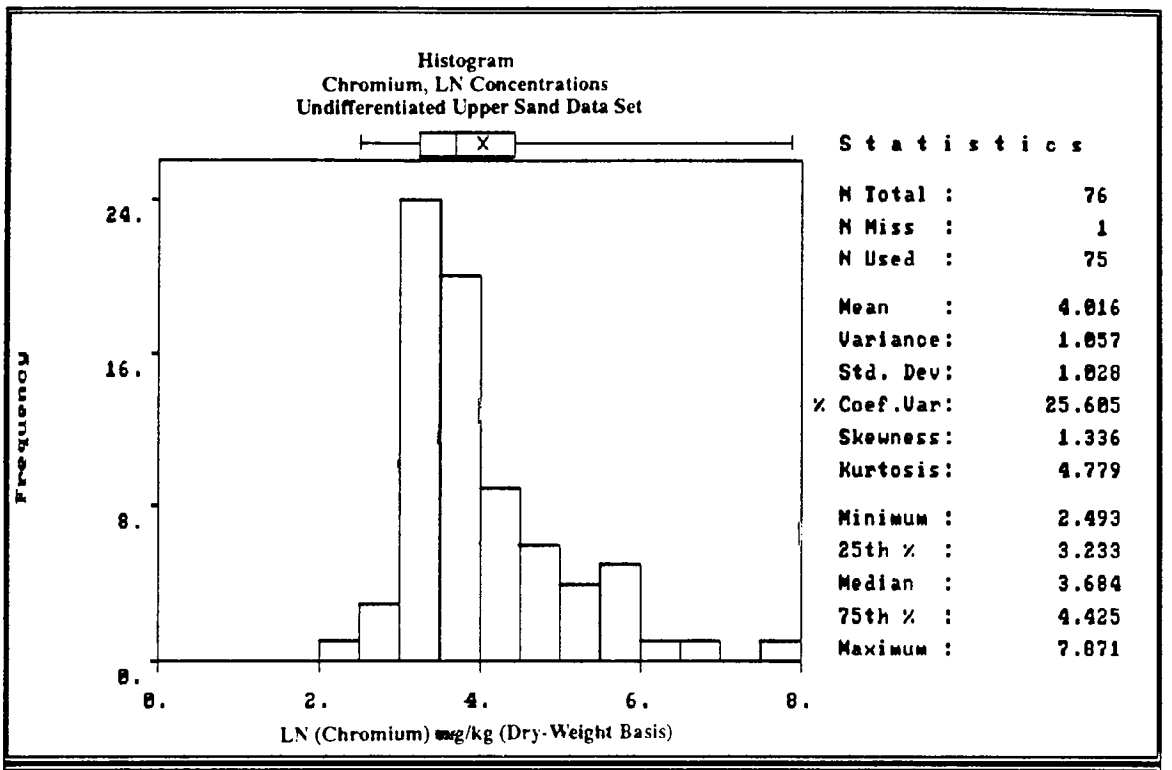
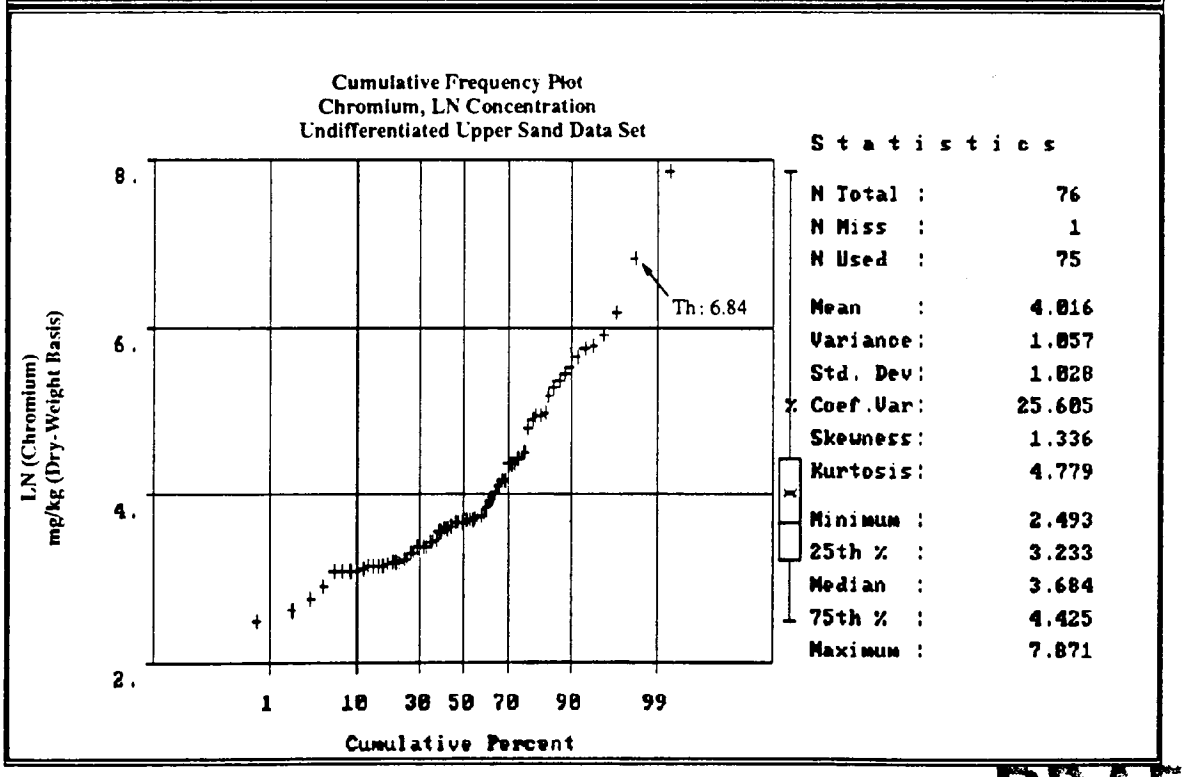
Chromium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A61

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25823





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Environmental Services

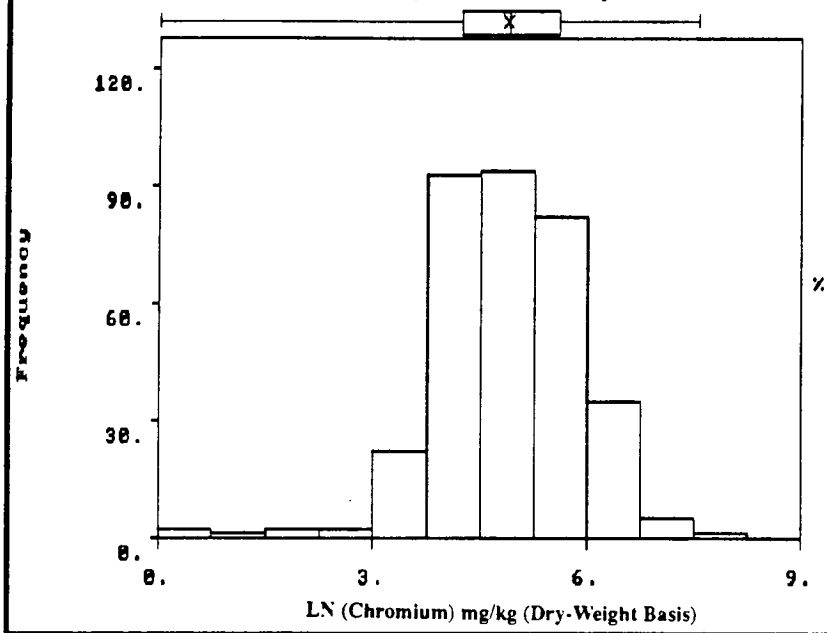
Chromium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A62

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

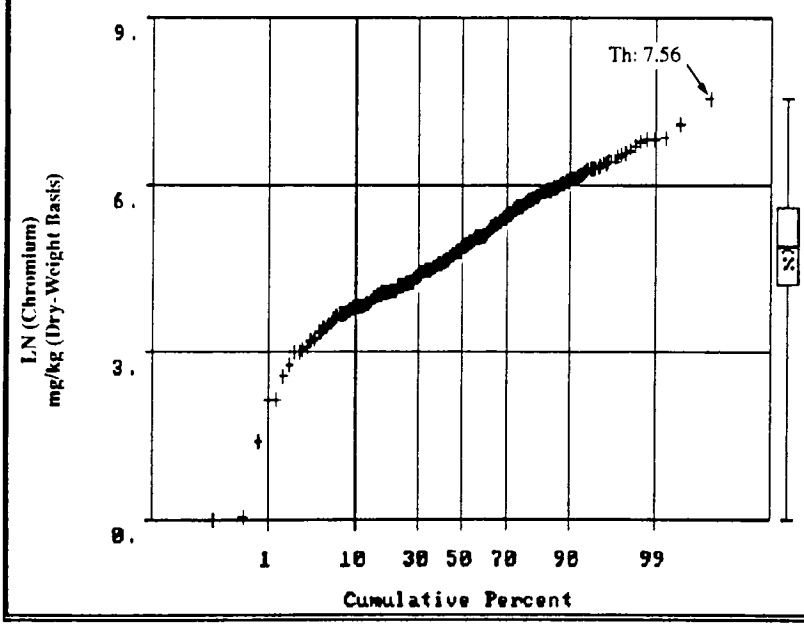
25824

Histogram
(Chromium), LN Concentrations
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	1
N Used :	339
Mean :	4.878
Variance:	.978
Std. Dev:	.989
% Coef.Var:	20.275
Skewness:	-.753
Kurtosis:	5.820
Minimum :	.000
25th % :	4.224
Median :	4.905
75th % :	5.595
Maximum :	7.555

Cumulative Frequency Plot
Chromium, LN Concentration
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	1
N Used :	339
Mean :	4.878
Variance:	.978
Std. Dev:	.989
Coef.Var:	20.275
Skewness:	-.753
Kurtosis:	5.820
Minimum :	.000
25th % :	4.224
Median :	4.905
75th % :	5.595
Maximum :	7.555

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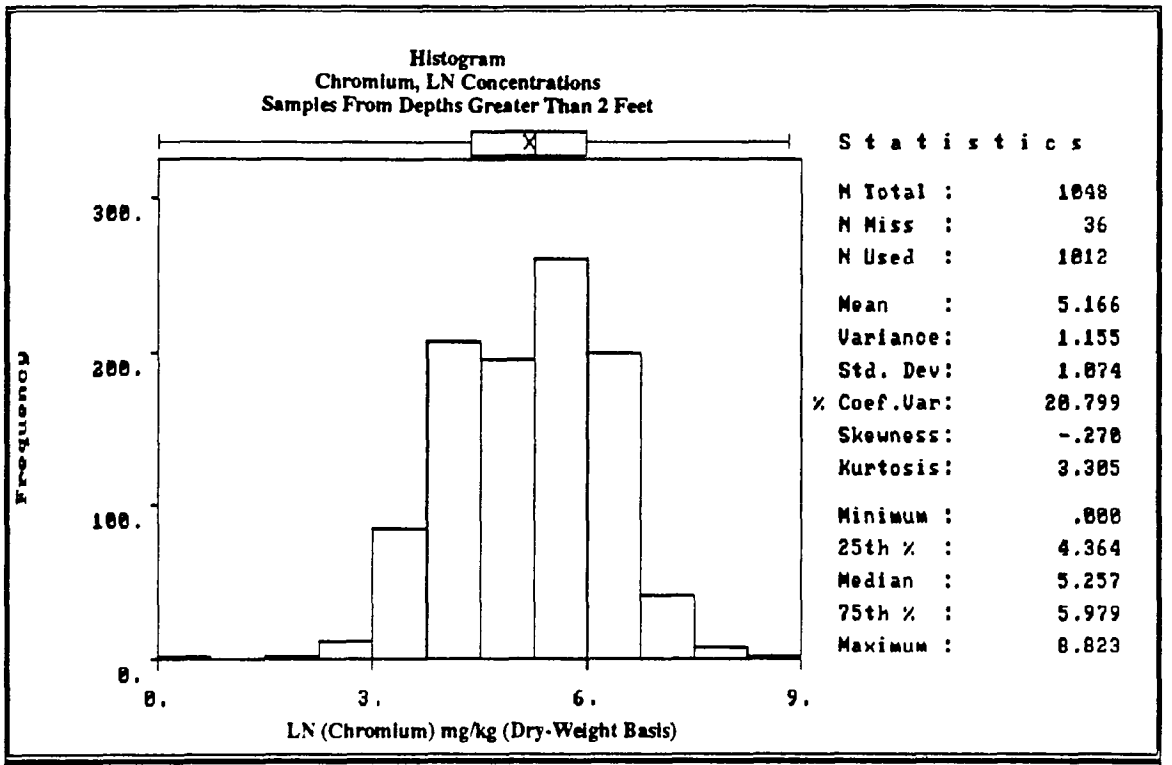
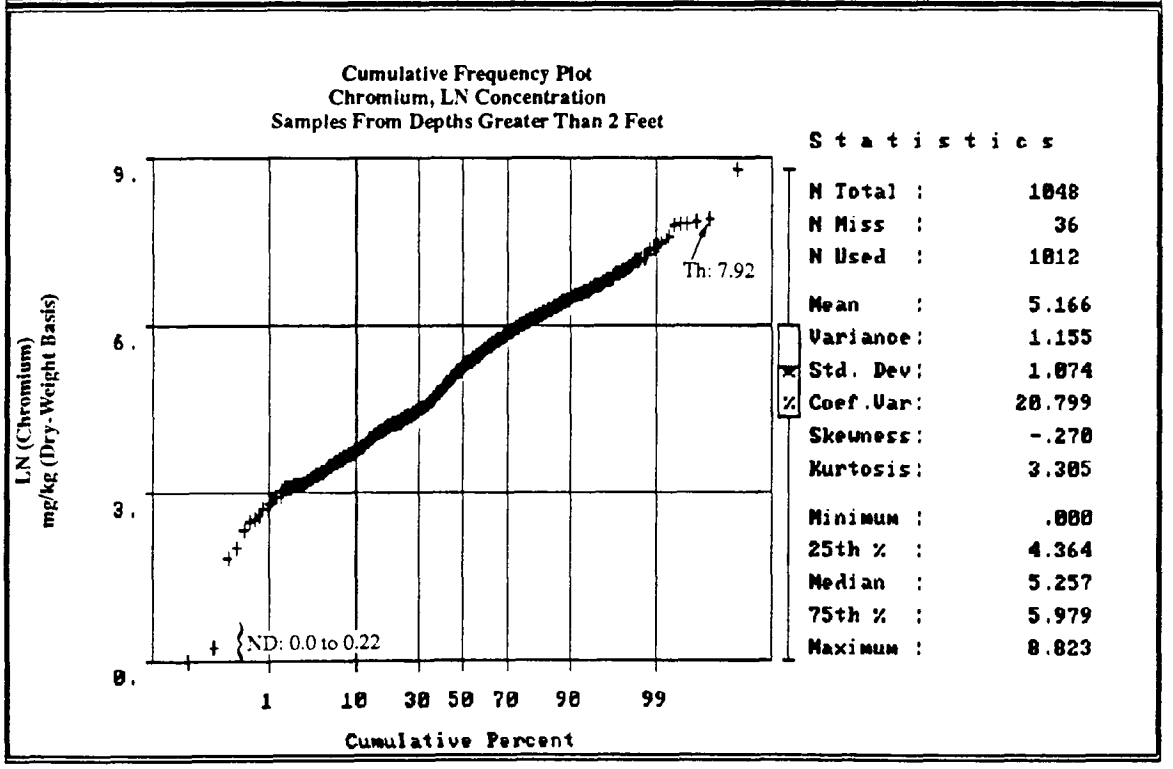
Chromium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A63

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25825





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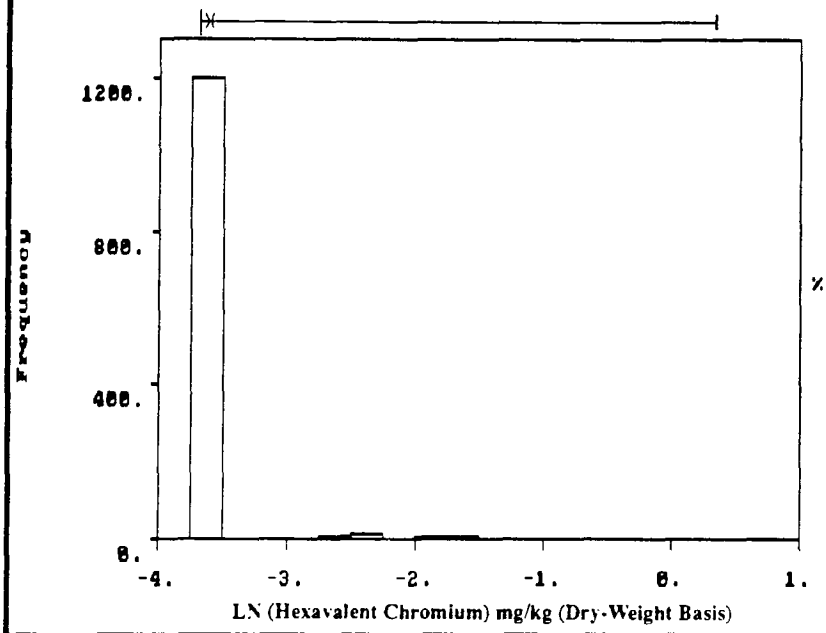
Chromium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A64

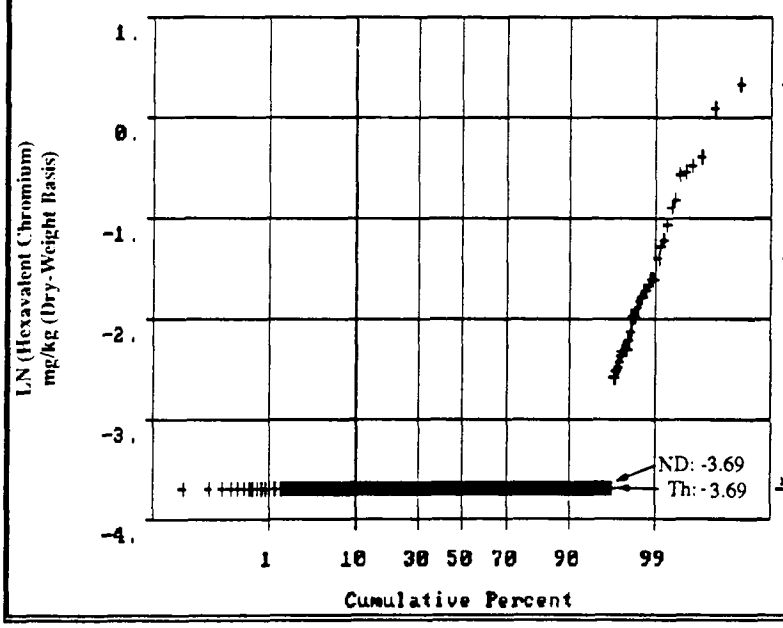
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

Histogram
Hexavalent Chromium, LN Concentrations
Soil Data Set



Statistics	
N Total :	1388
N Miss :	145
N Used :	1243
Mean :	-3.621
Variance:	.150
Std. Dev:	.387
% Coef.Var:	10.692
Skewness:	6.303
Kurtosis:	45.772
Minimum :	-3.689
25th % :	-3.689
Median :	-3.689
75th % :	-3.689
Maximum :	.336

Cumulative Frequency Plot
Hexavalent Chromium, LN Concentration
Soil Data Set



Statistics	
N Total :	1388
N Miss :	145
N Used :	1243
Mean :	-3.621
Variance:	.150
Std. Dev:	.387
% Coef.Var:	10.692
Skewness:	6.303
Kurtosis:	45.772
Minimum :	-3.689
25th % :	-3.689
Median :	-3.689
75th % :	-3.689
Maximum :	.336

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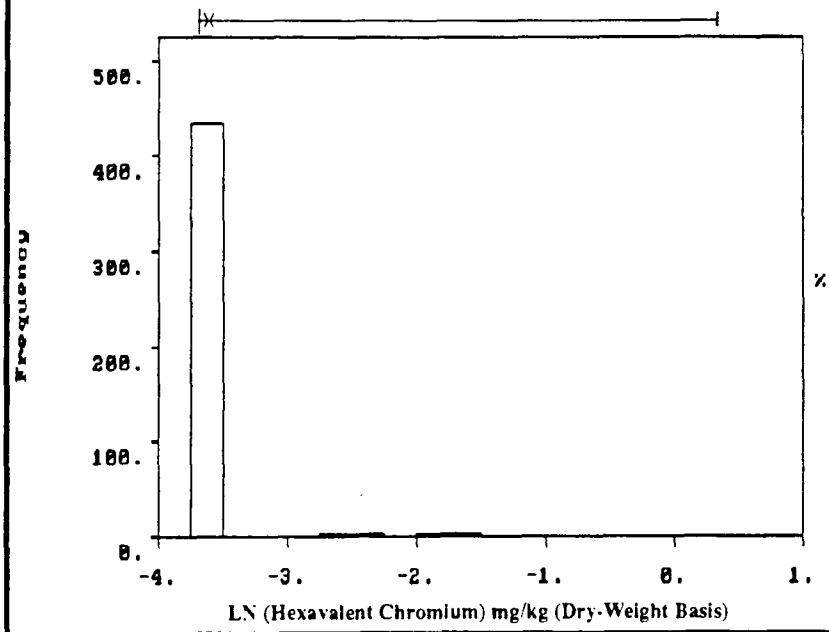
Hexavalent Chromium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A65

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

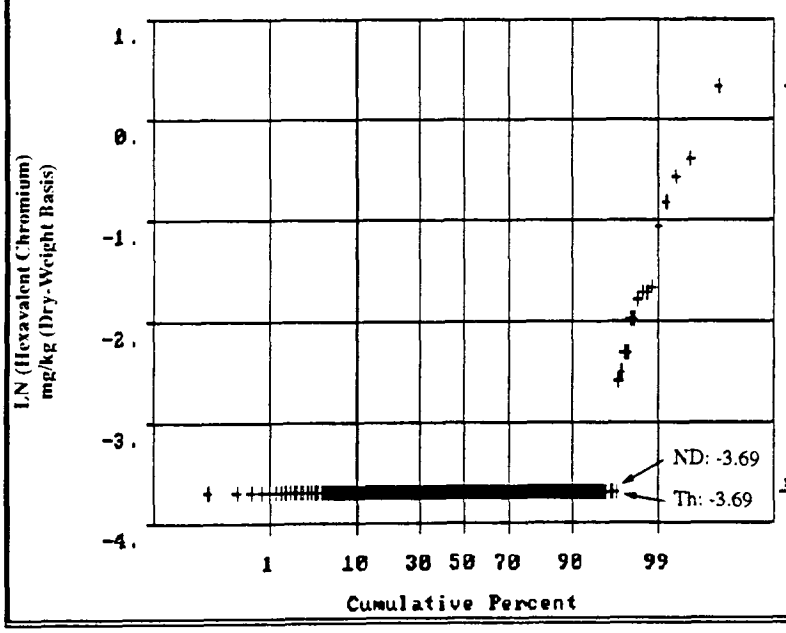
25827

Histogram
Hexavalent Chromium, LN Concentrations
Serpentinite Derived Fill Data Set



Statistics	
N Total :	505
N Miss :	55
N Used :	450
Mean :	-3.617
Variance:	.173
Std. Dev:	.416
% Coef.Var:	11.506
Skewness:	6.380
Kurtosis:	46.207
Minimum :	-3.689
25th % :	-3.689
Median :	-3.689
75th % :	-3.689
Maximum :	.336

Cumulative Frequency Plot
Hexavalent Chromium, LN Concentration
Serpentinite Derived Fill Data Set



Statistics	
N Total :	505
N Miss :	55
N Used :	450
Mean :	-3.617
Variance:	.173
Std. Dev:	.416
% Coef.Var:	11.506
Skewness:	6.380
Kurtosis:	46.207
Minimum :	-3.689
25th % :	-3.689
Median :	-3.689
75th % :	-3.689
Maximum :	.336

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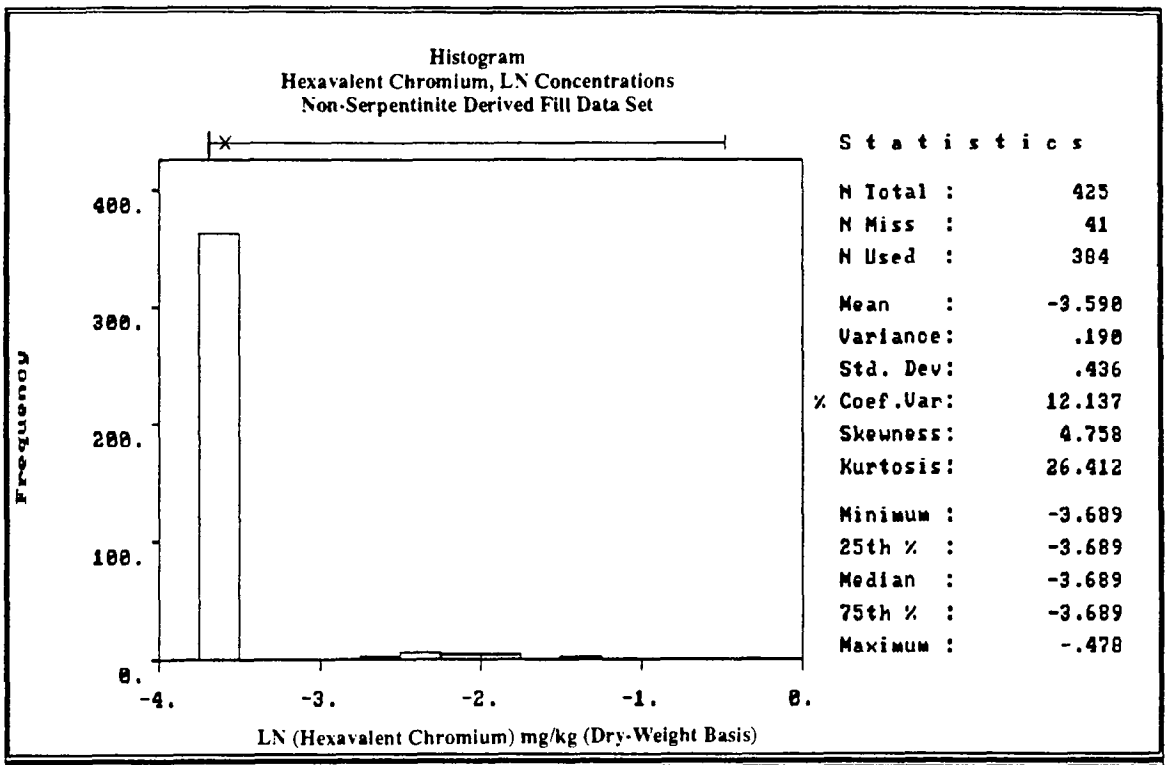
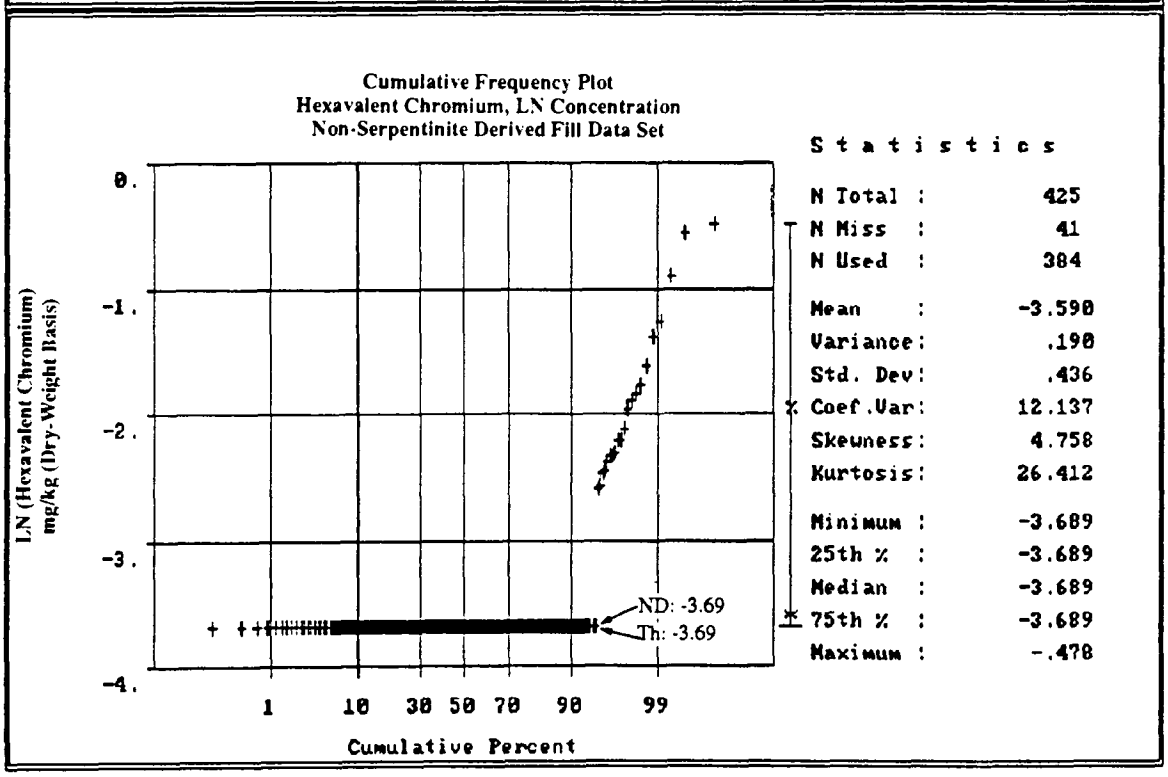
Hexavalent Chromium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A66

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25828





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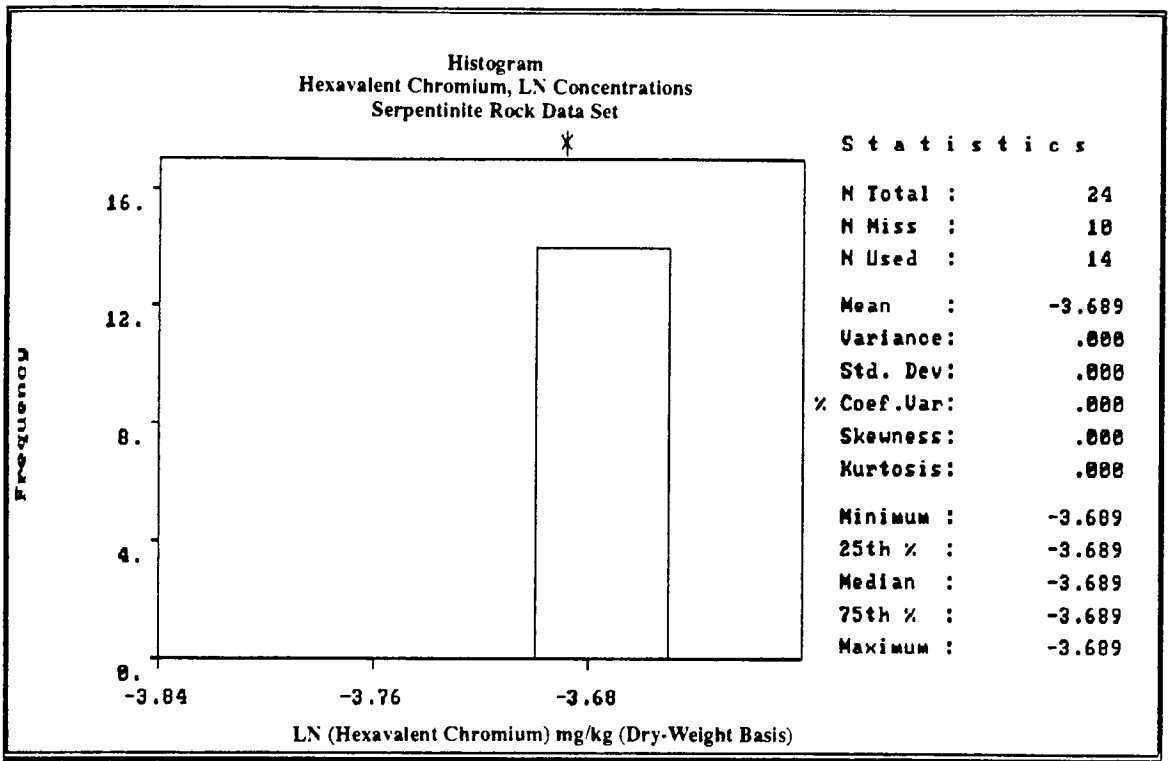
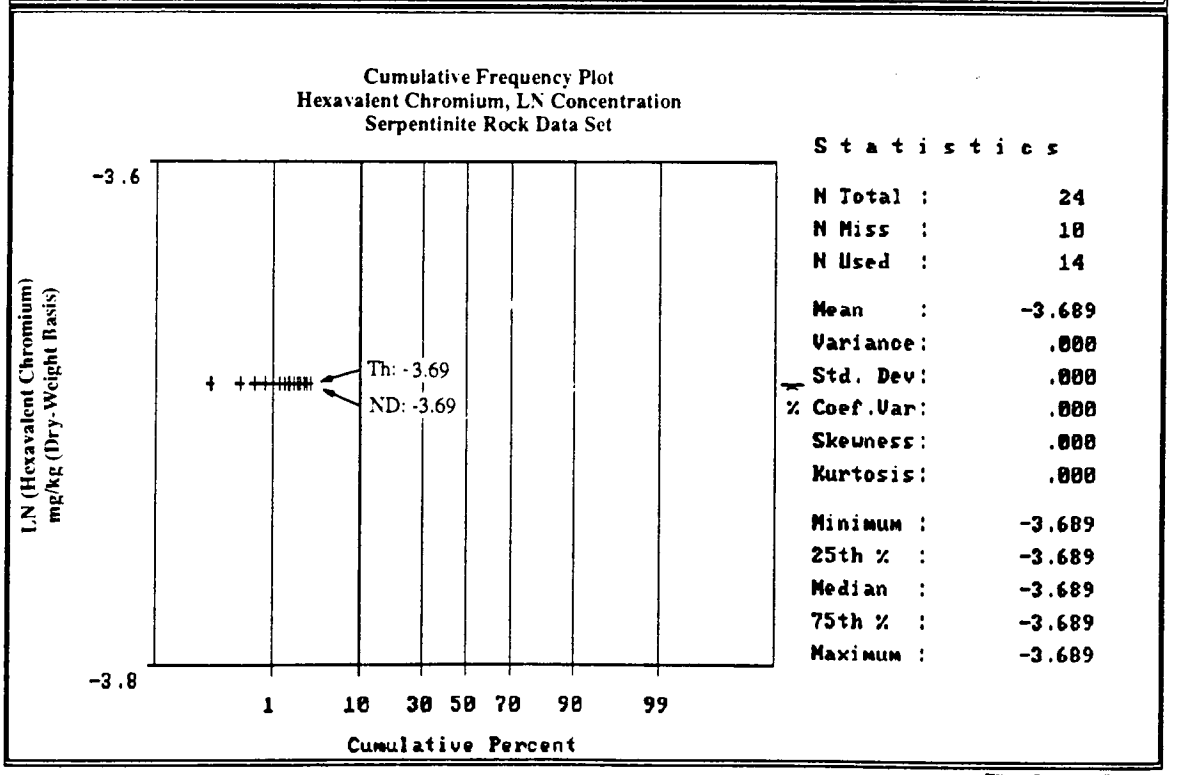
Hexavalent Chromium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A67**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25829





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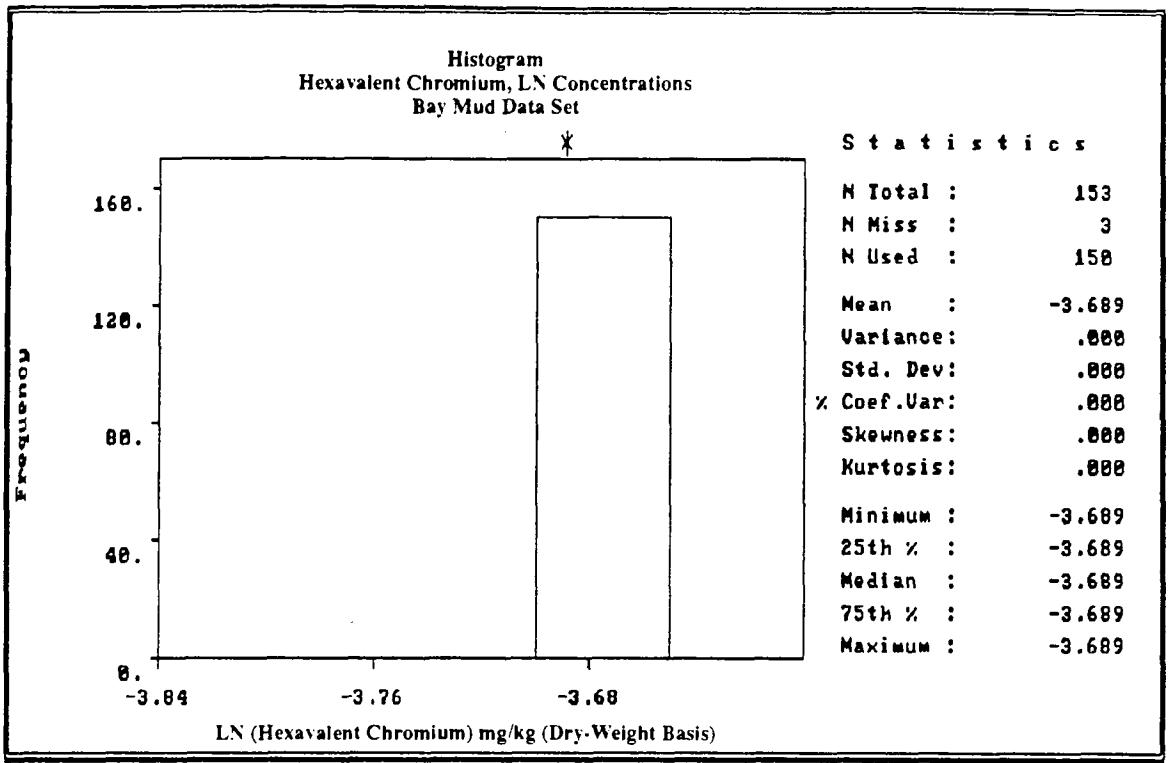
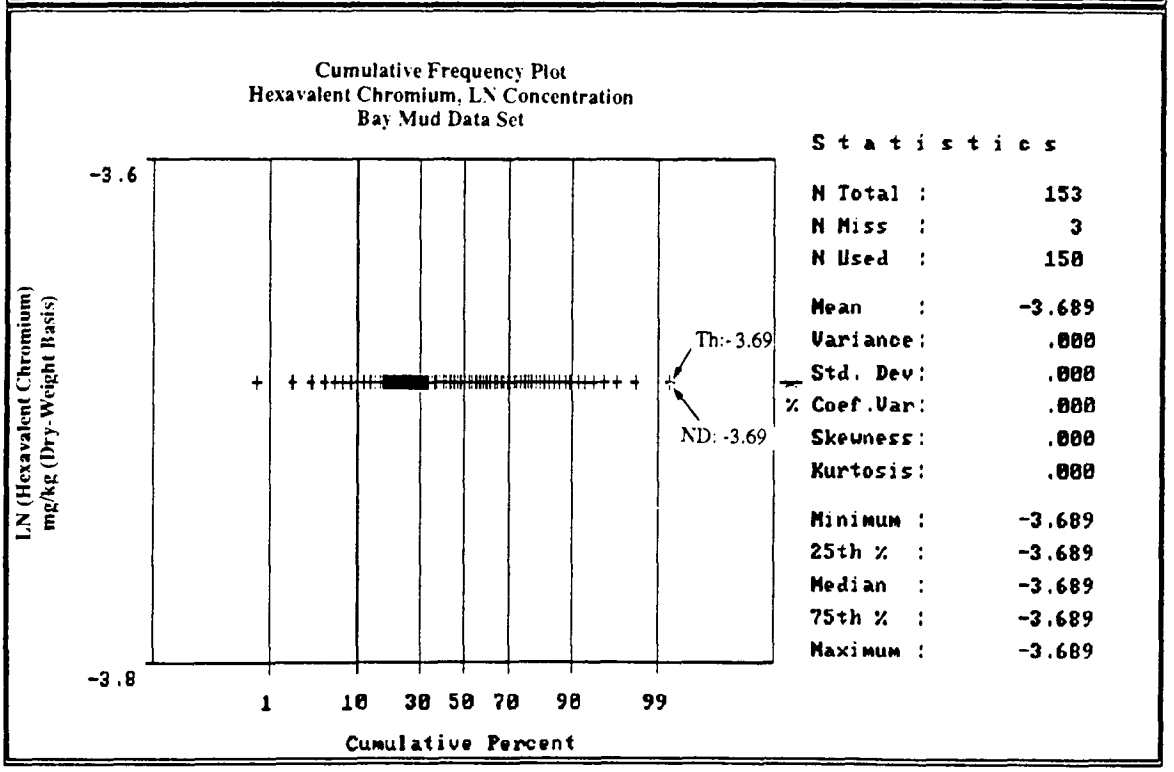
Hexavalent Chromium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A68**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25830





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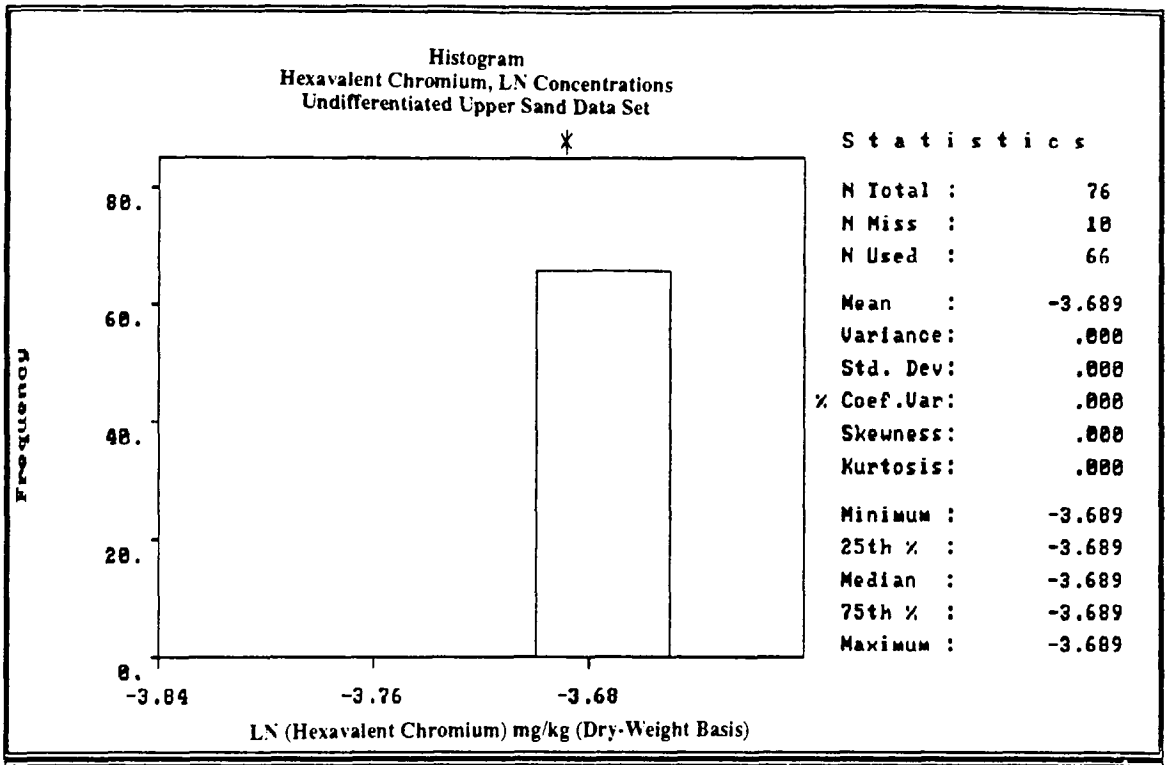
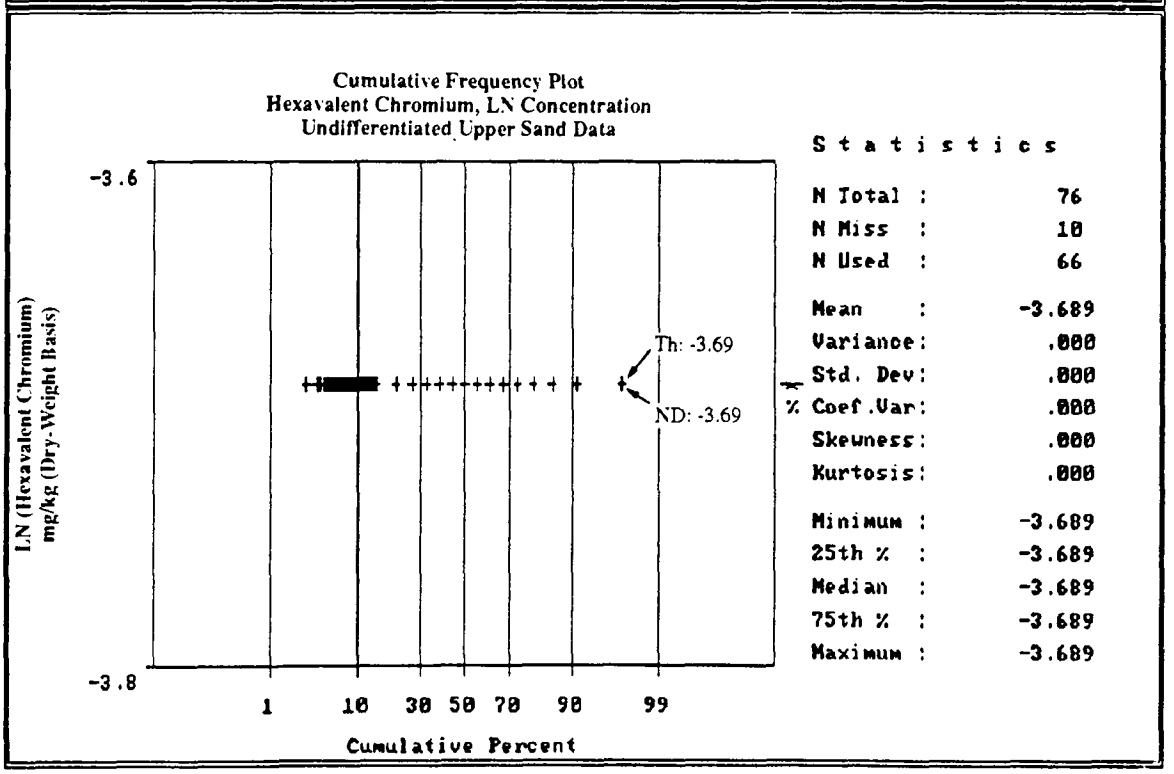
Hexavalent Chromium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A69

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25831





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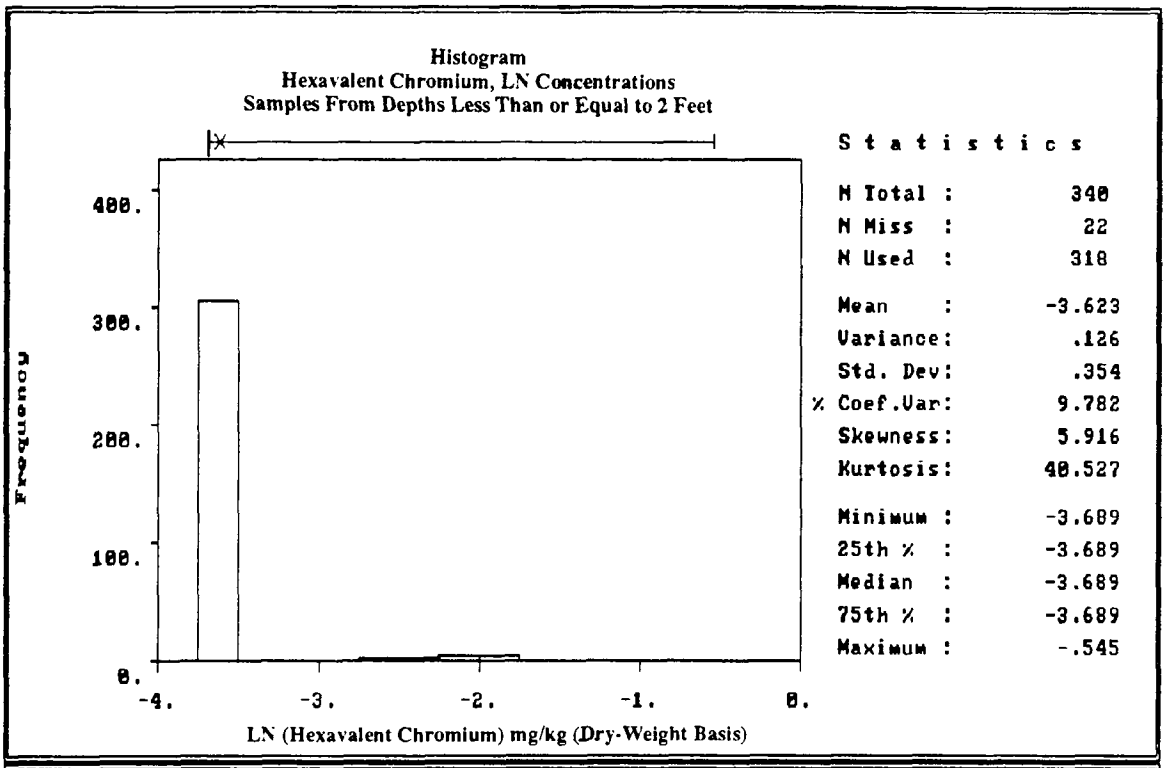
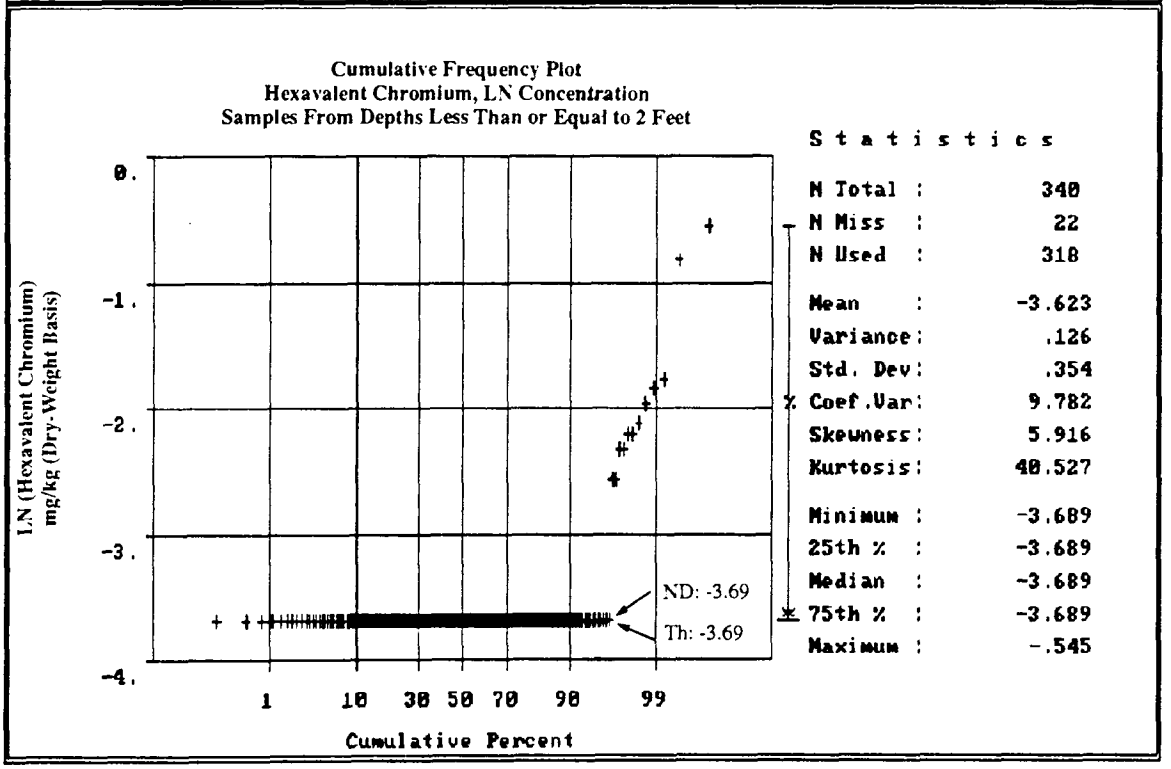
Hexavalent Chromium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A70**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25832





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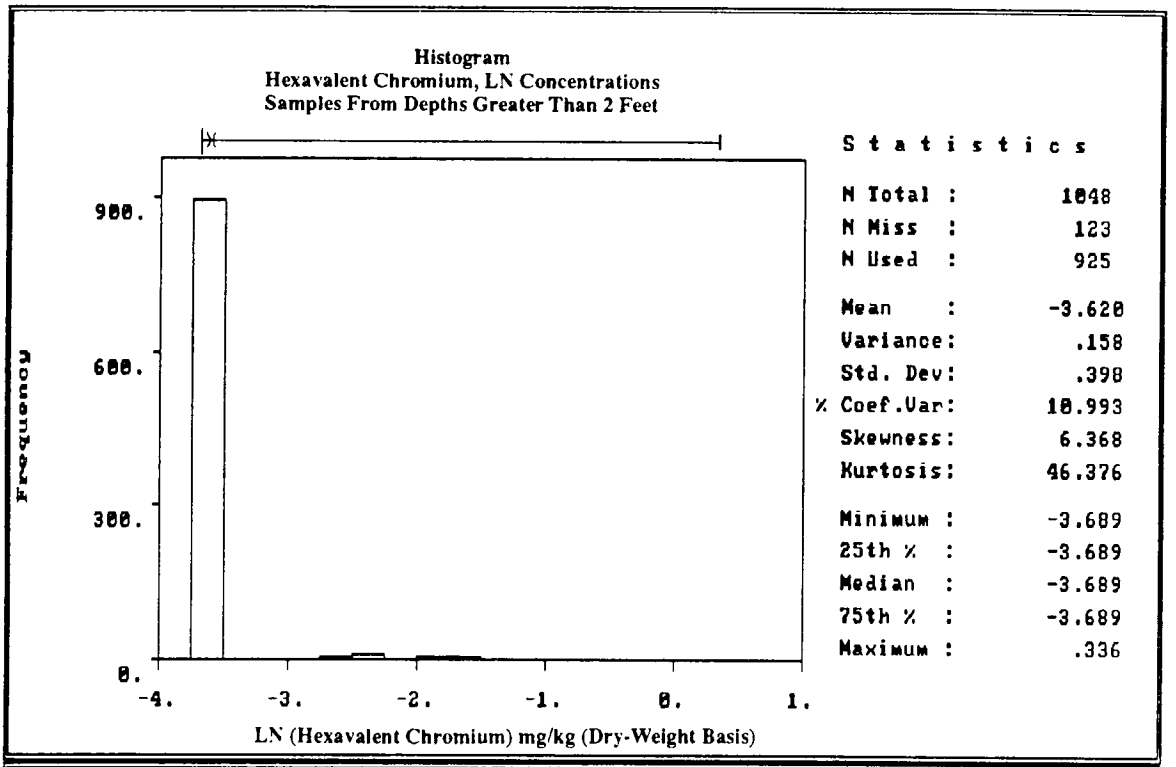
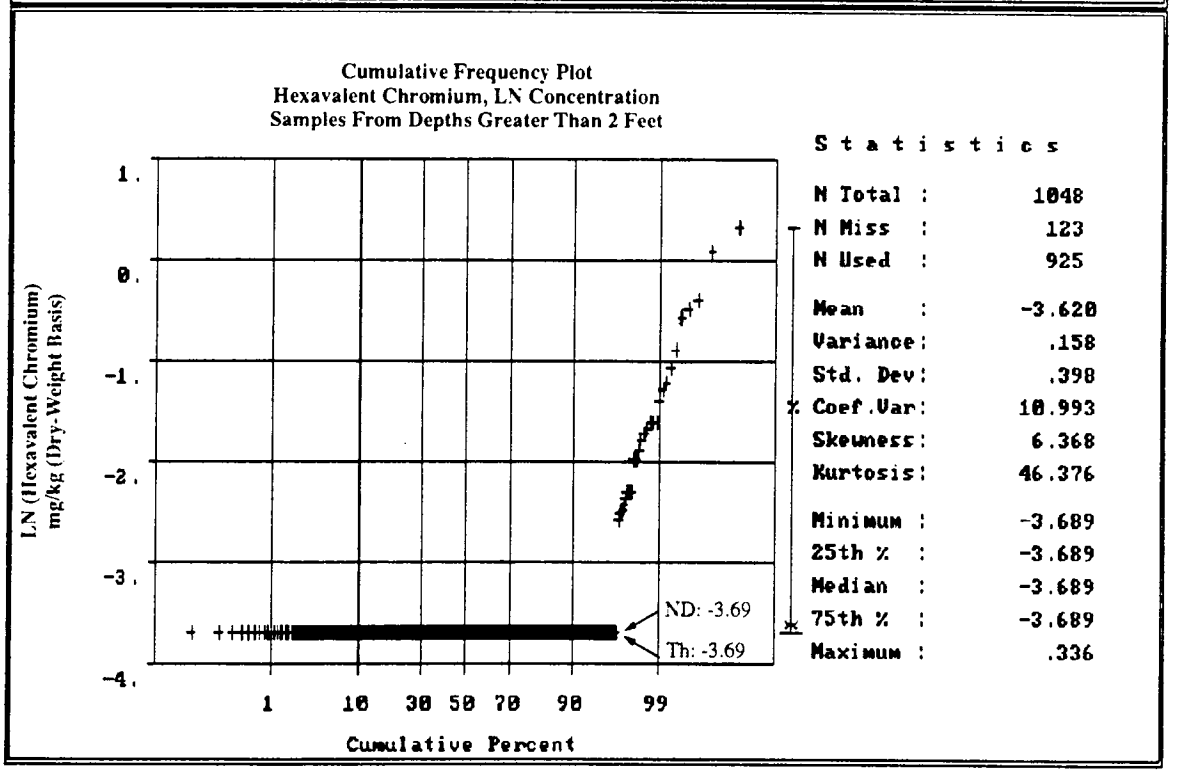
Hexavalent Chromium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A71**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25833





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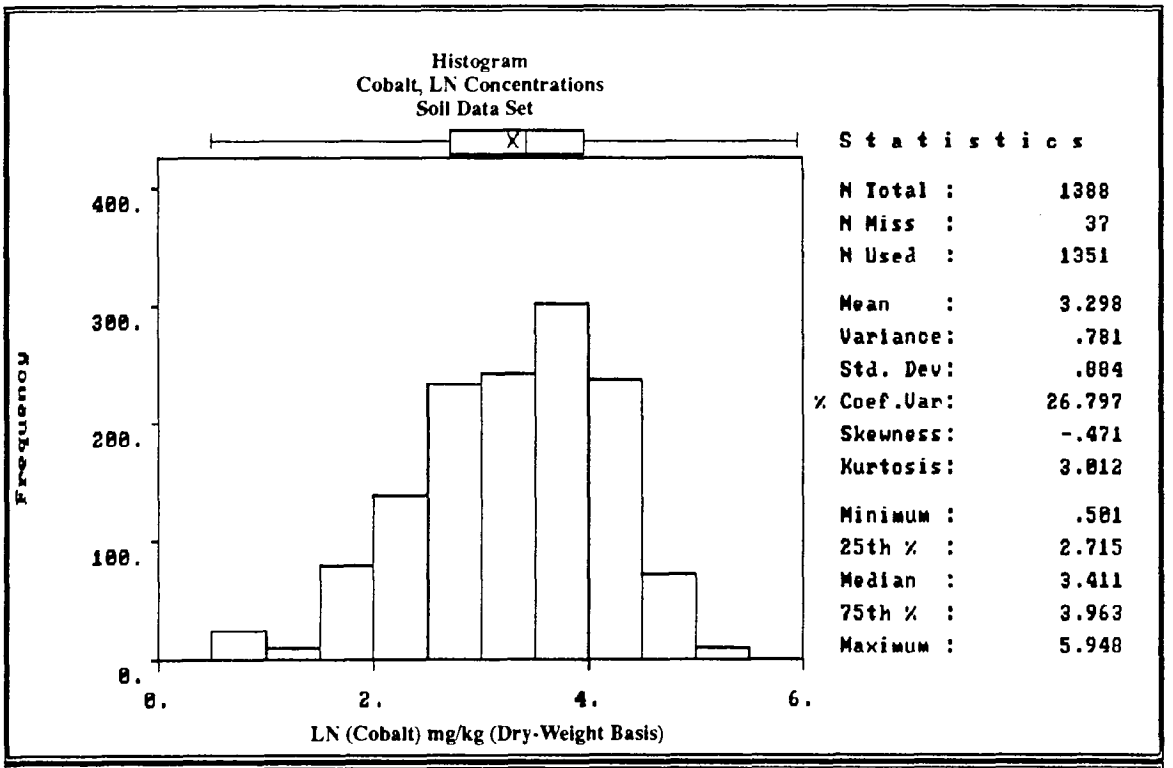
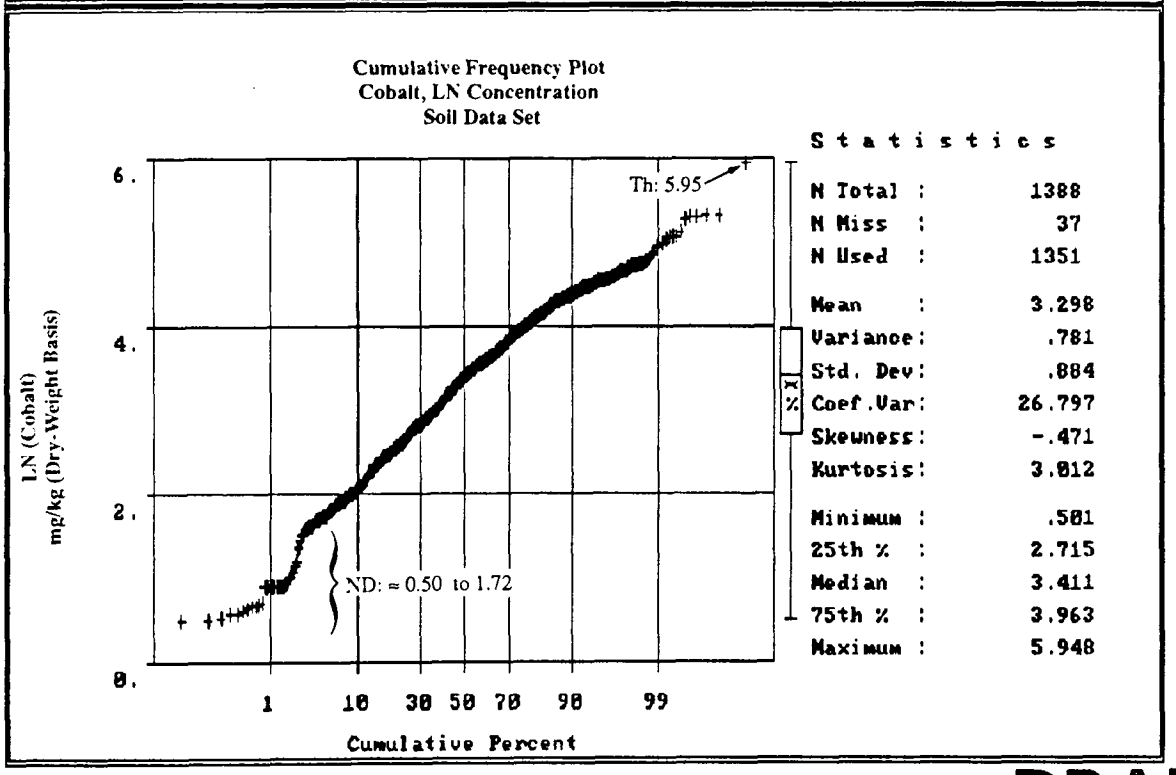
Hexavalent Chromium, Samples From Depths Greater Than 2 Feet PLATE
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

A72

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25834





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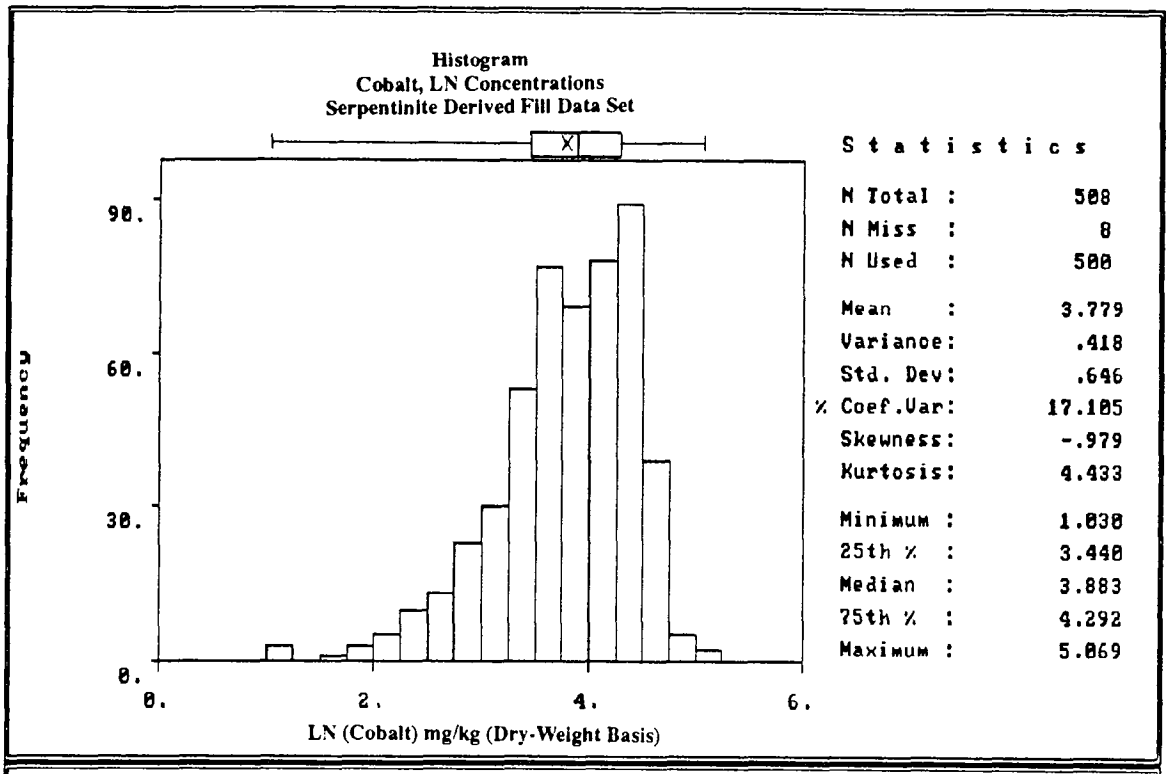
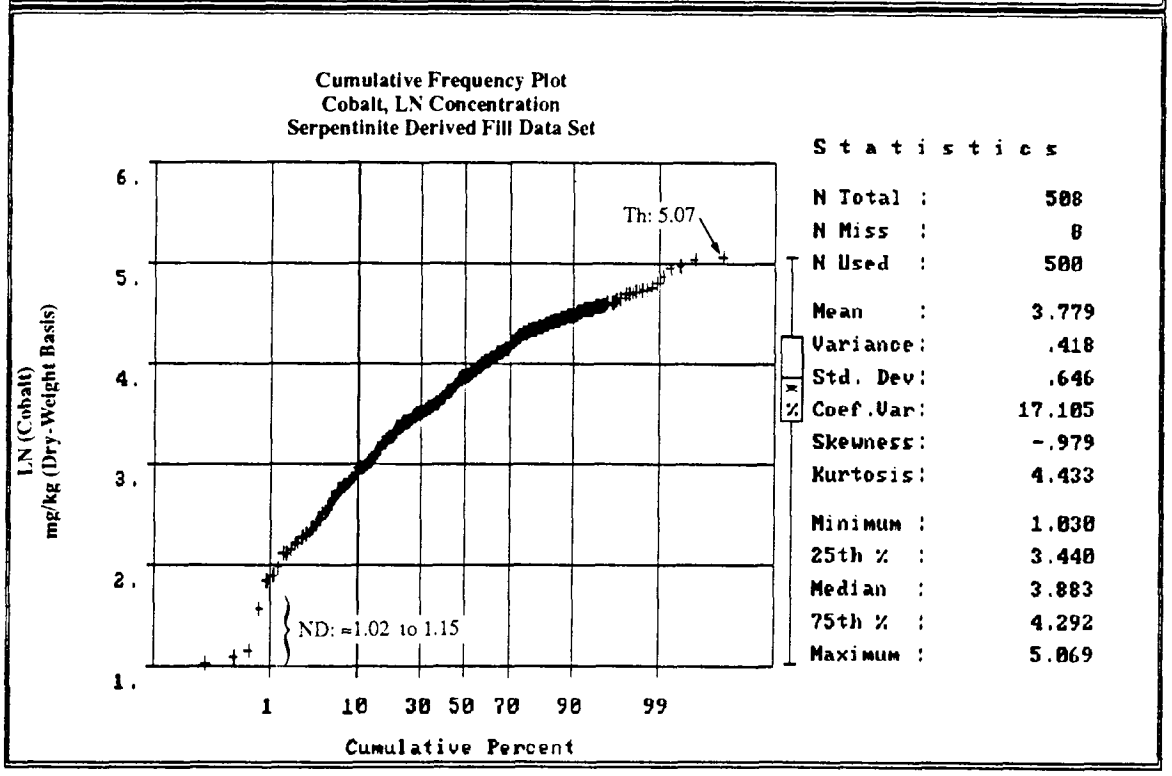
Cobalt, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A73

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25835





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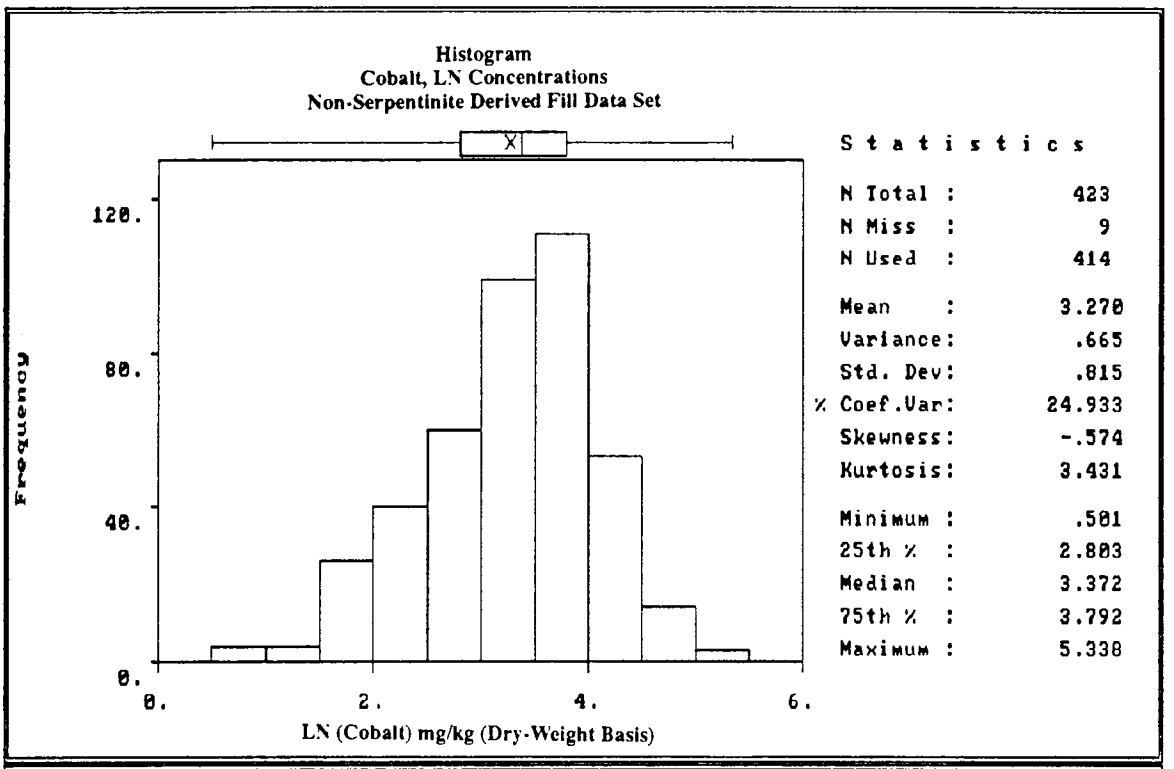
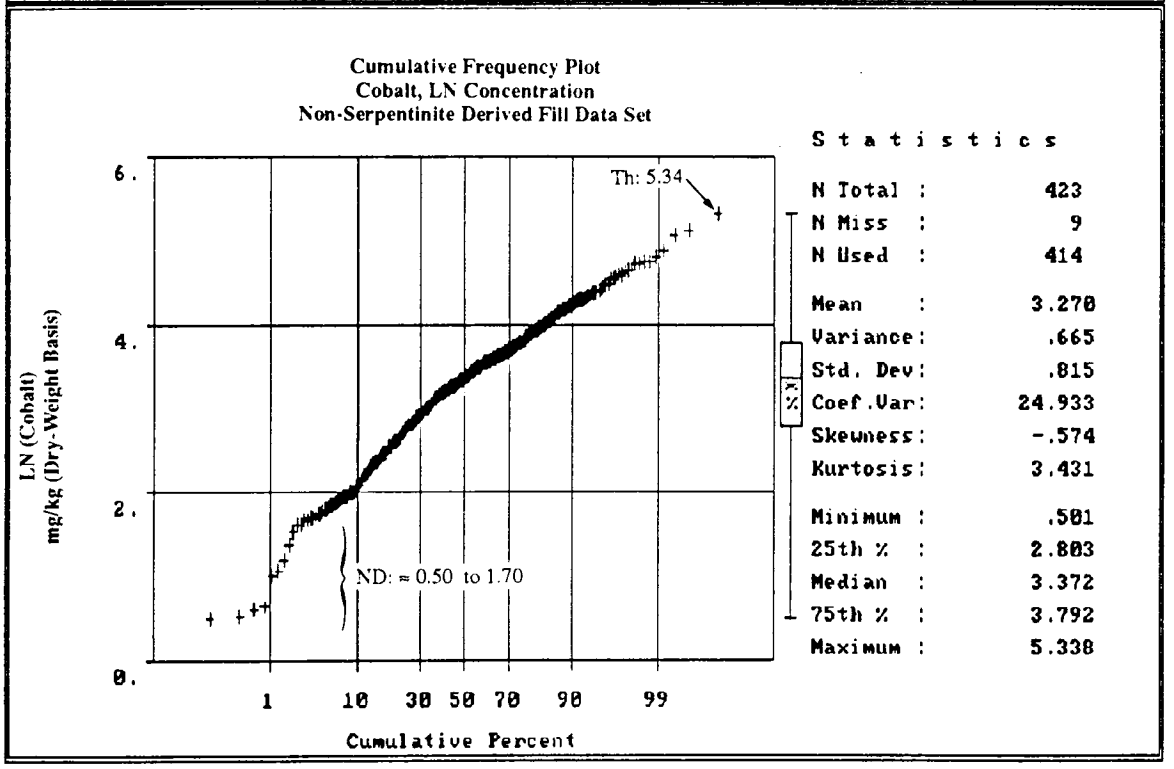
Cobalt, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A74

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25836





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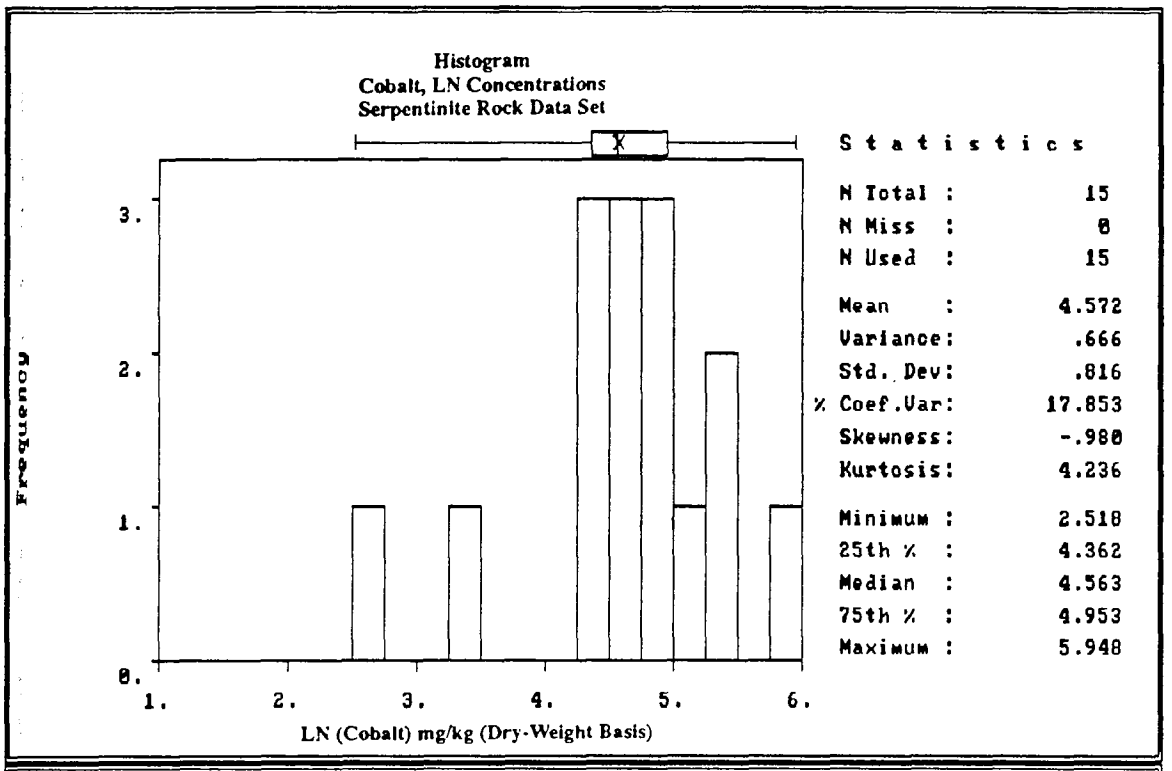
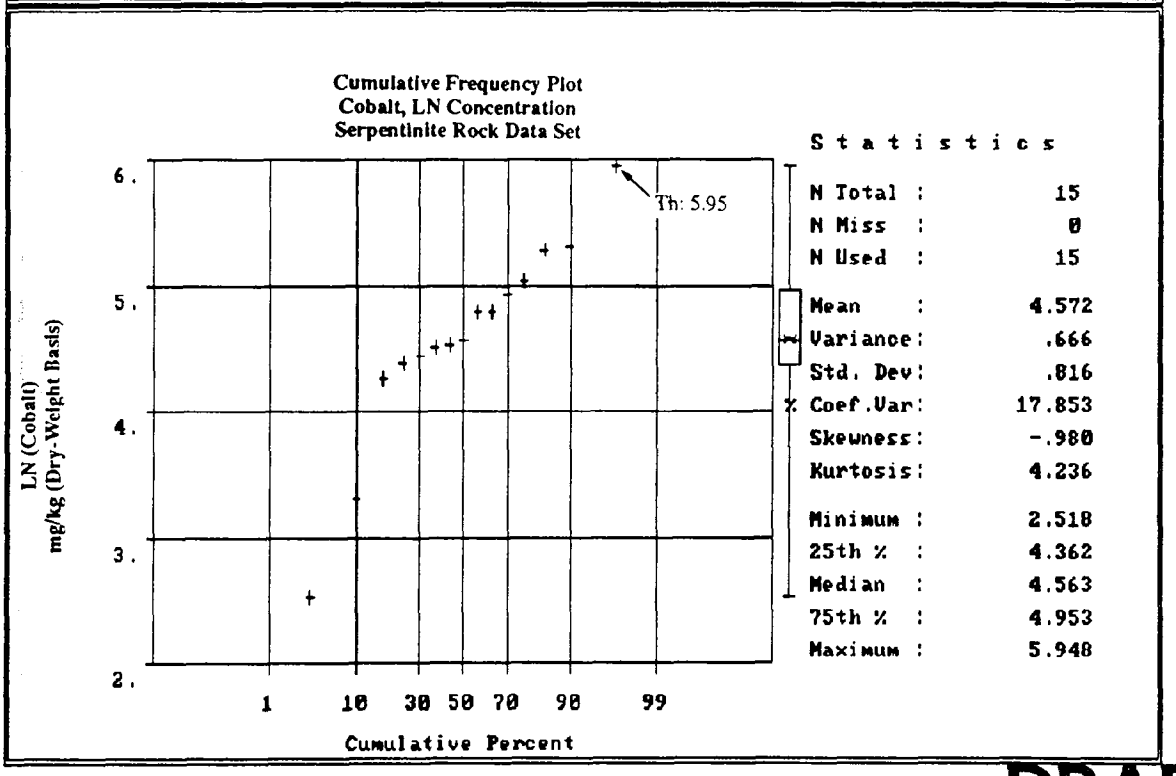
Cobalt, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A75

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25837





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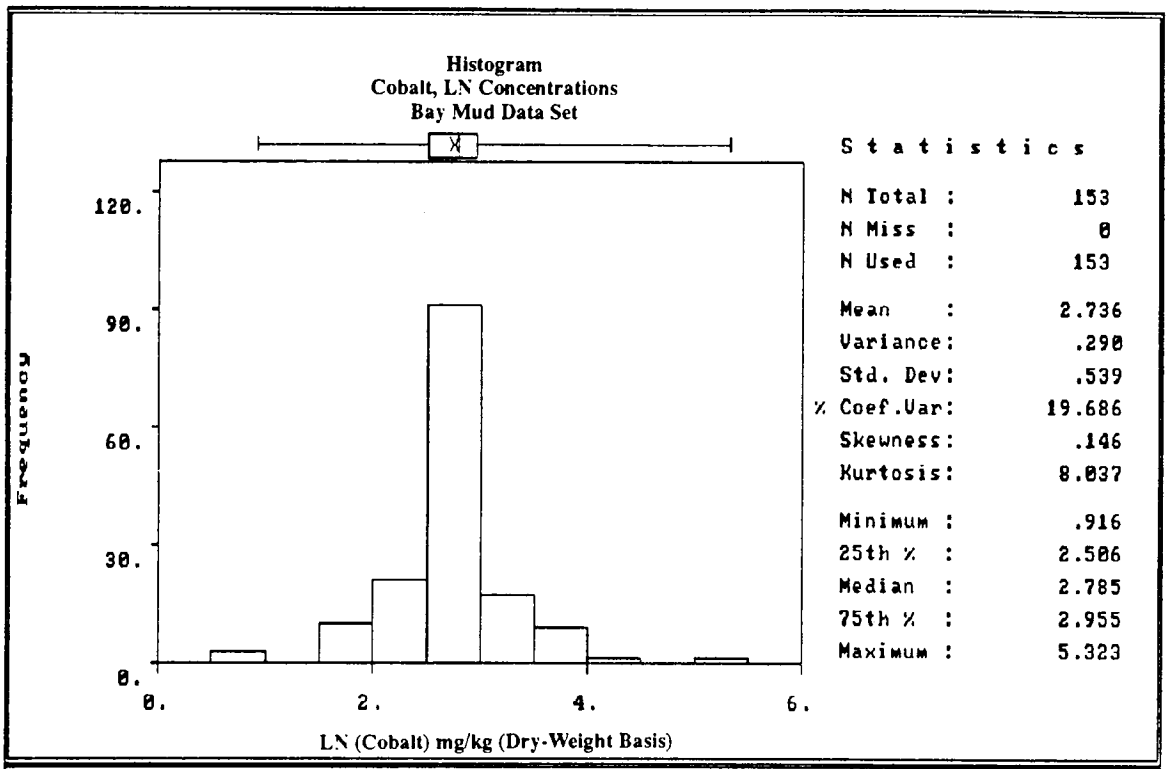
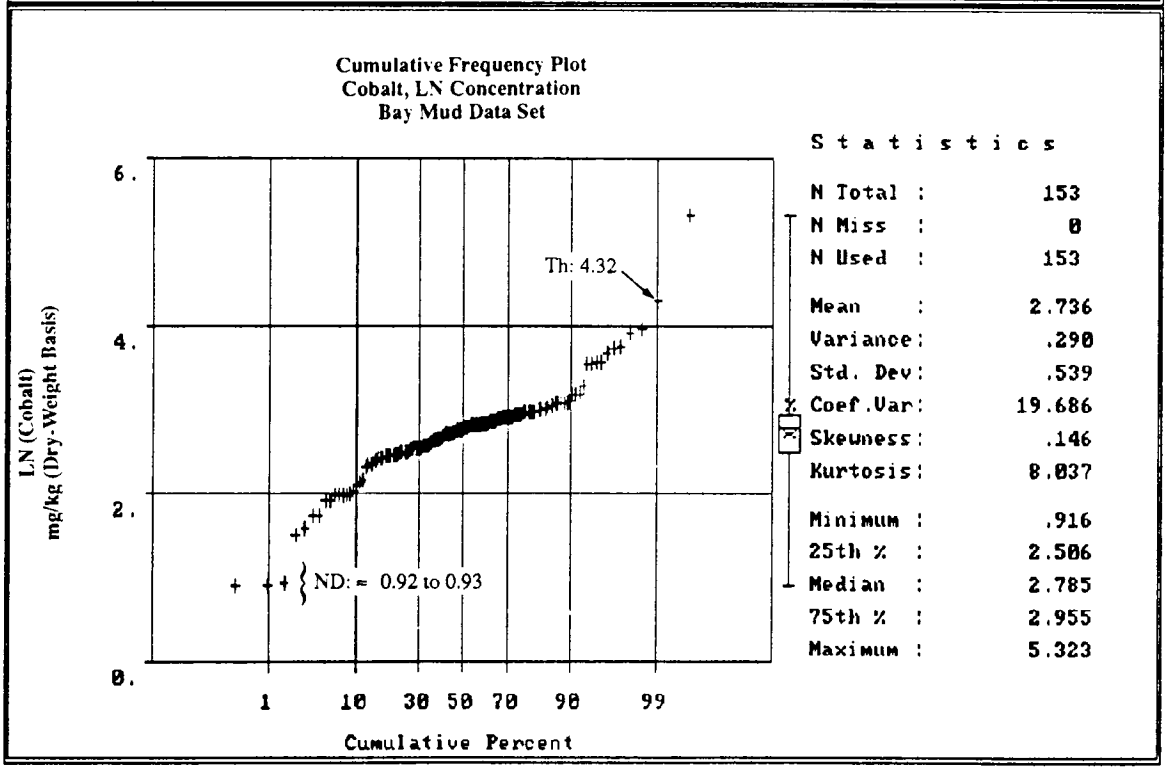
Cobalt, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A76

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25838





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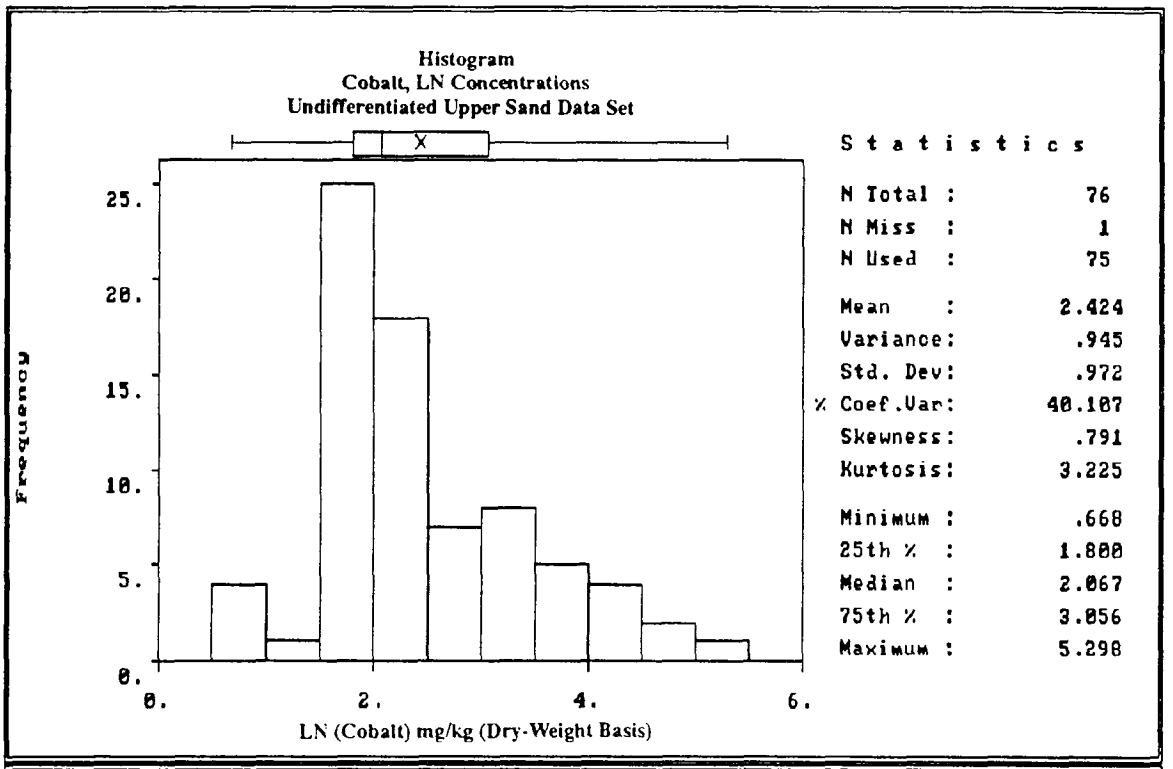
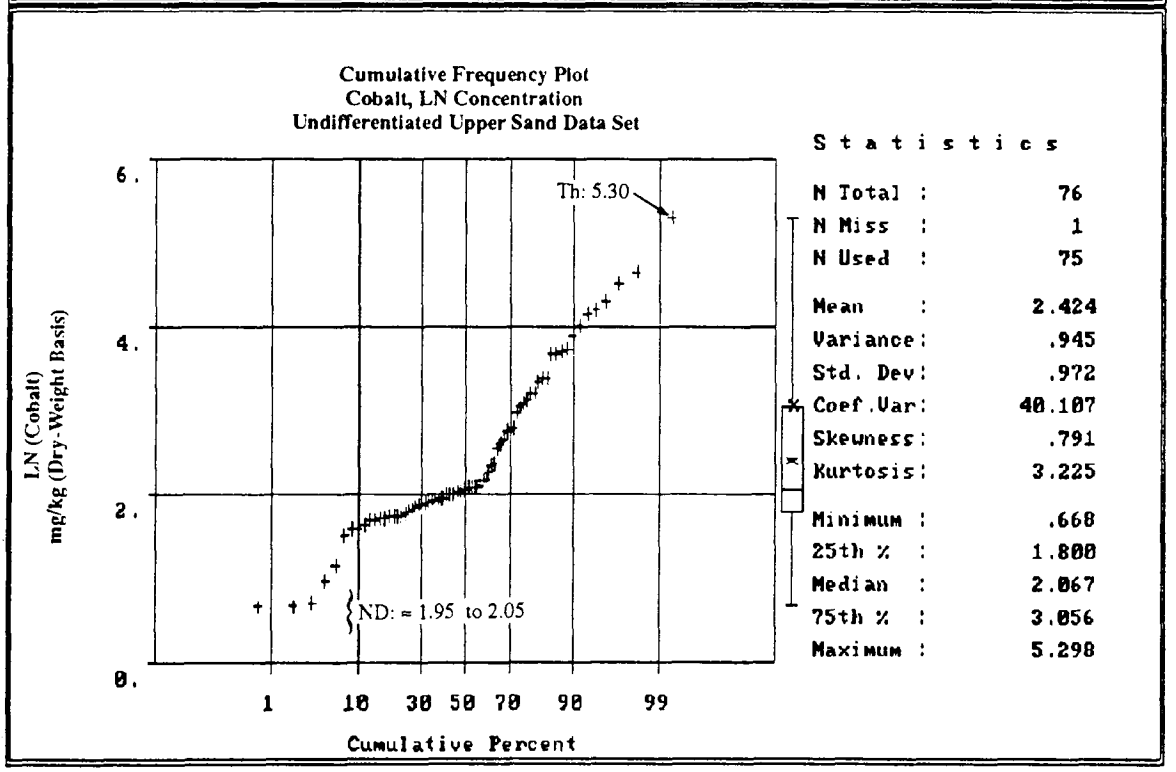
Cobalt, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A77

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25839





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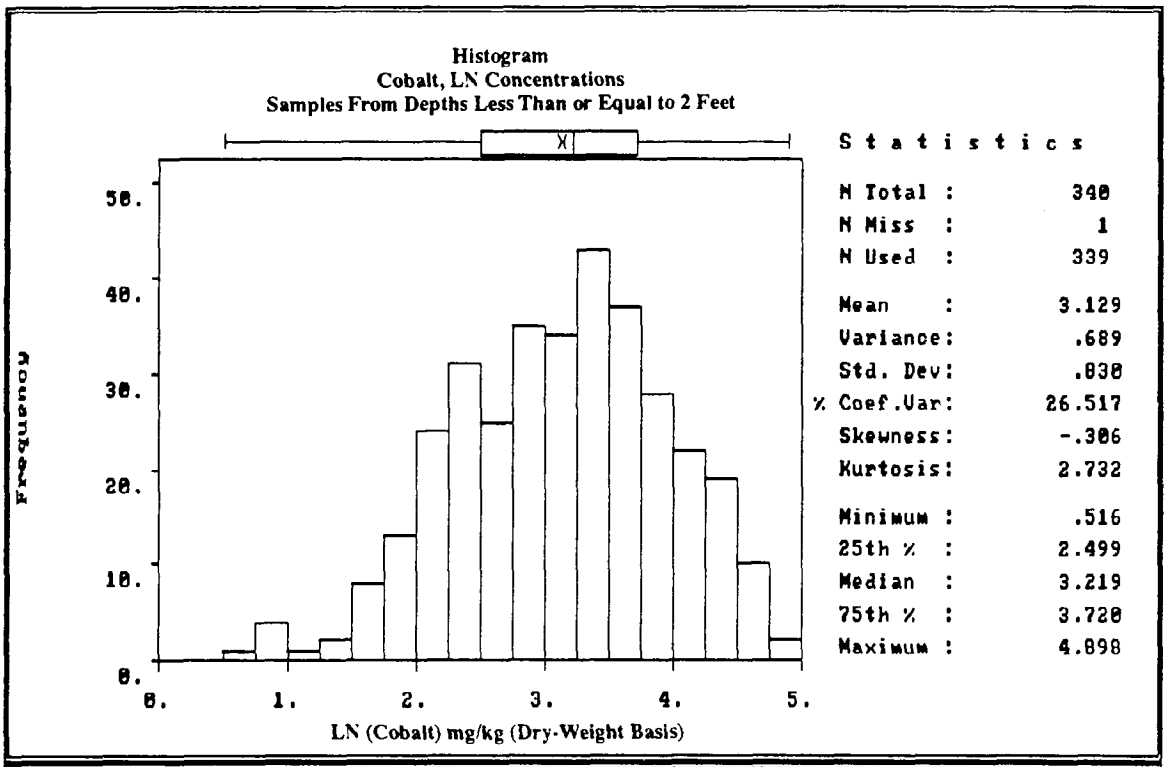
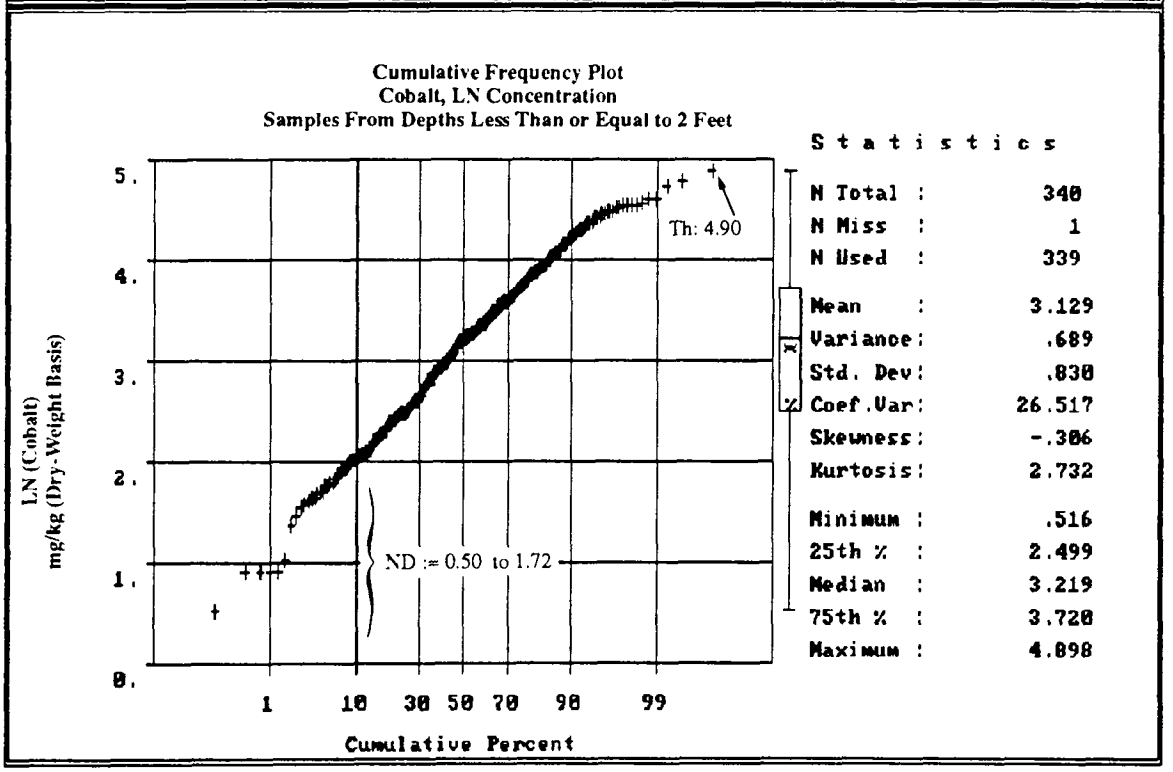
Cobalt, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A78

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25840





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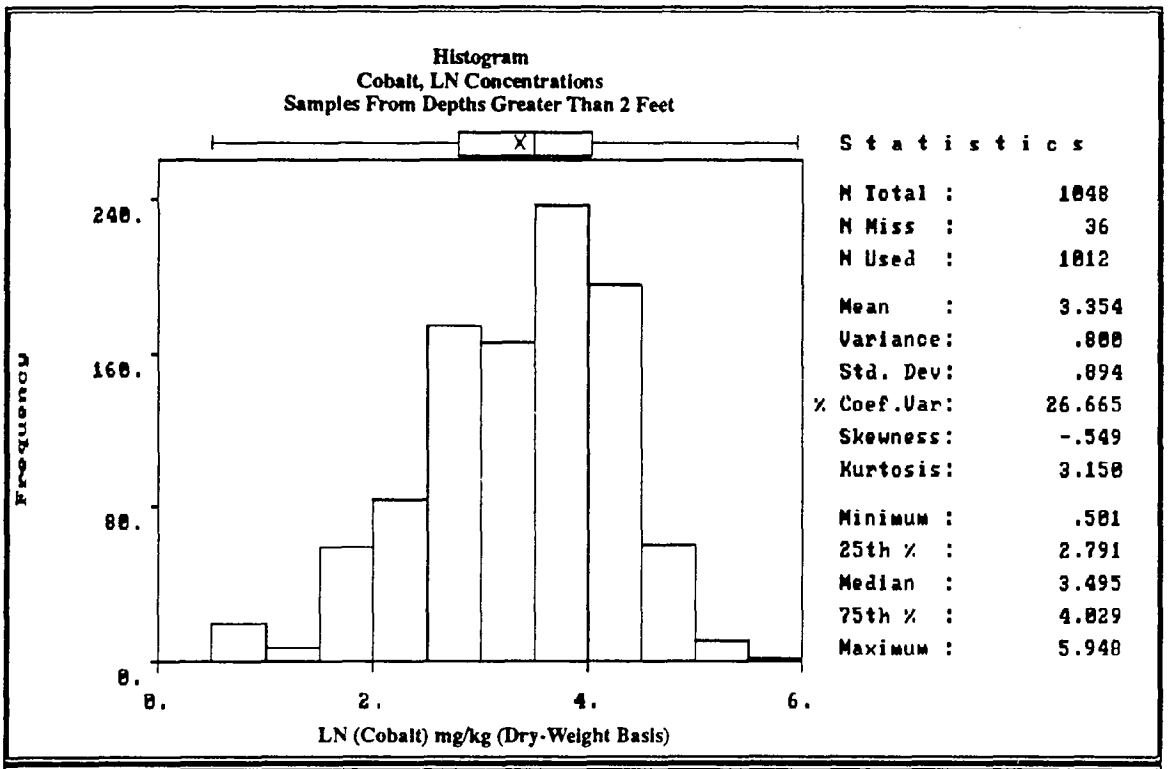
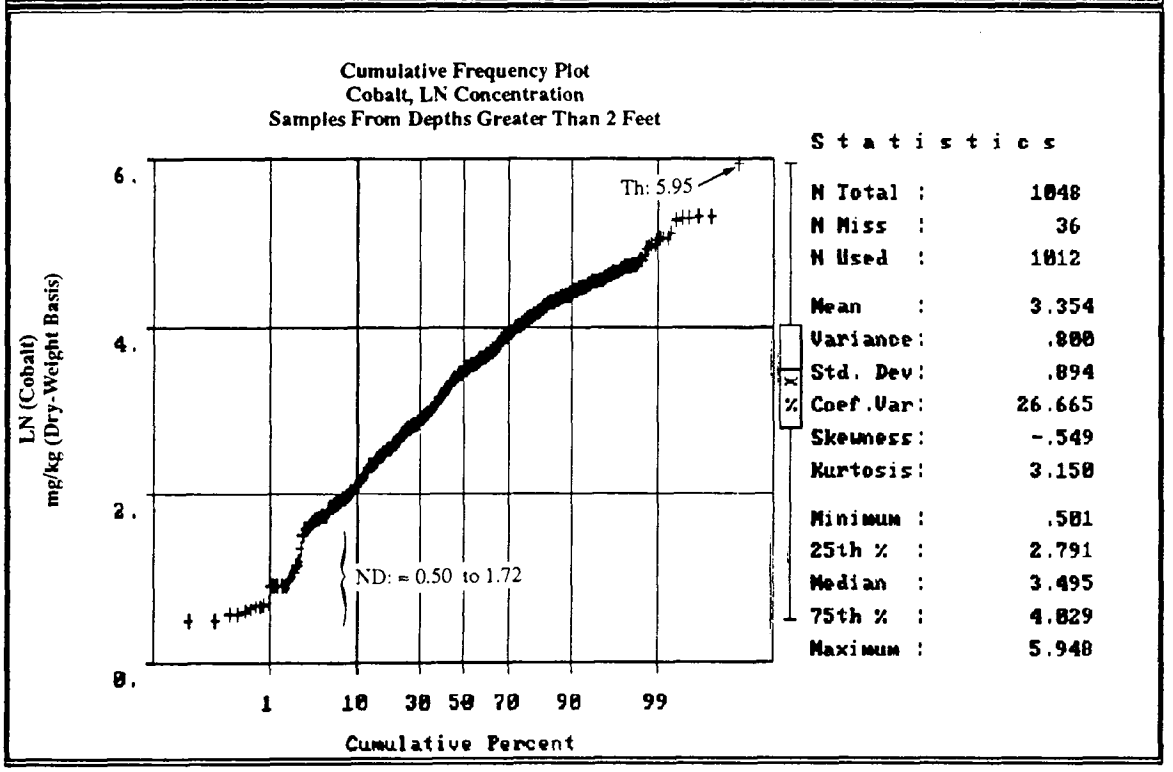
Cobalt, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A79

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25841





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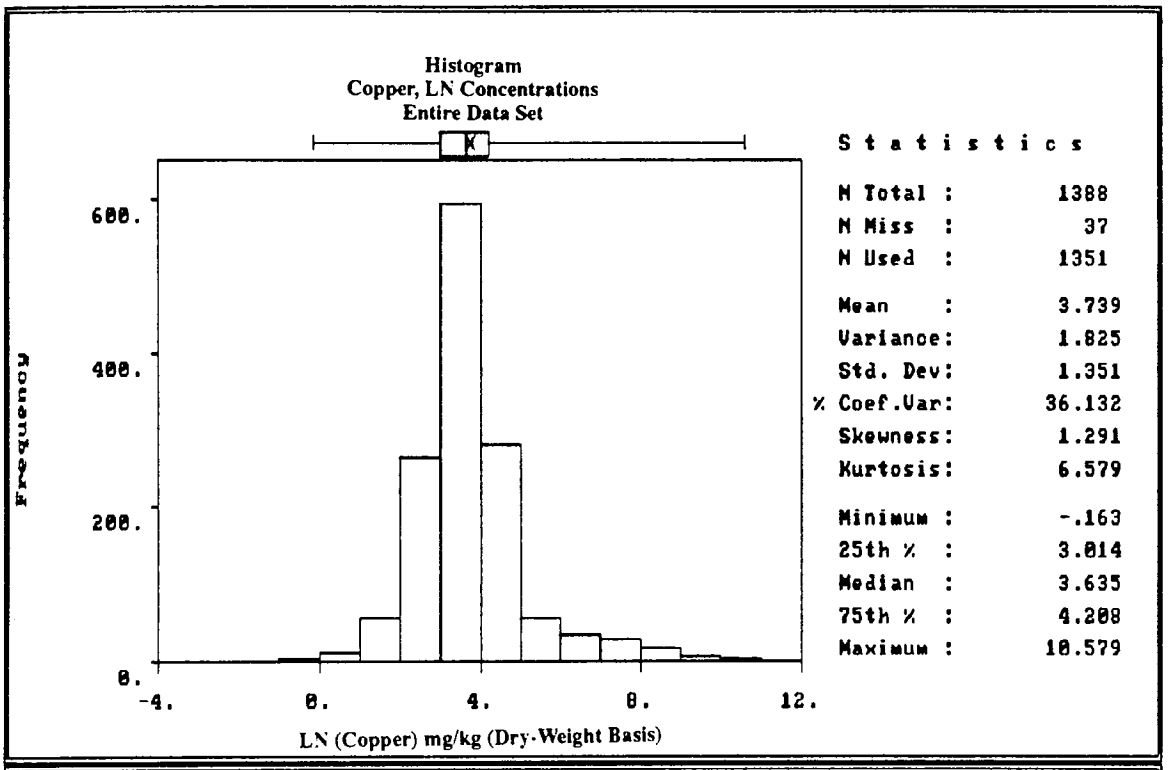
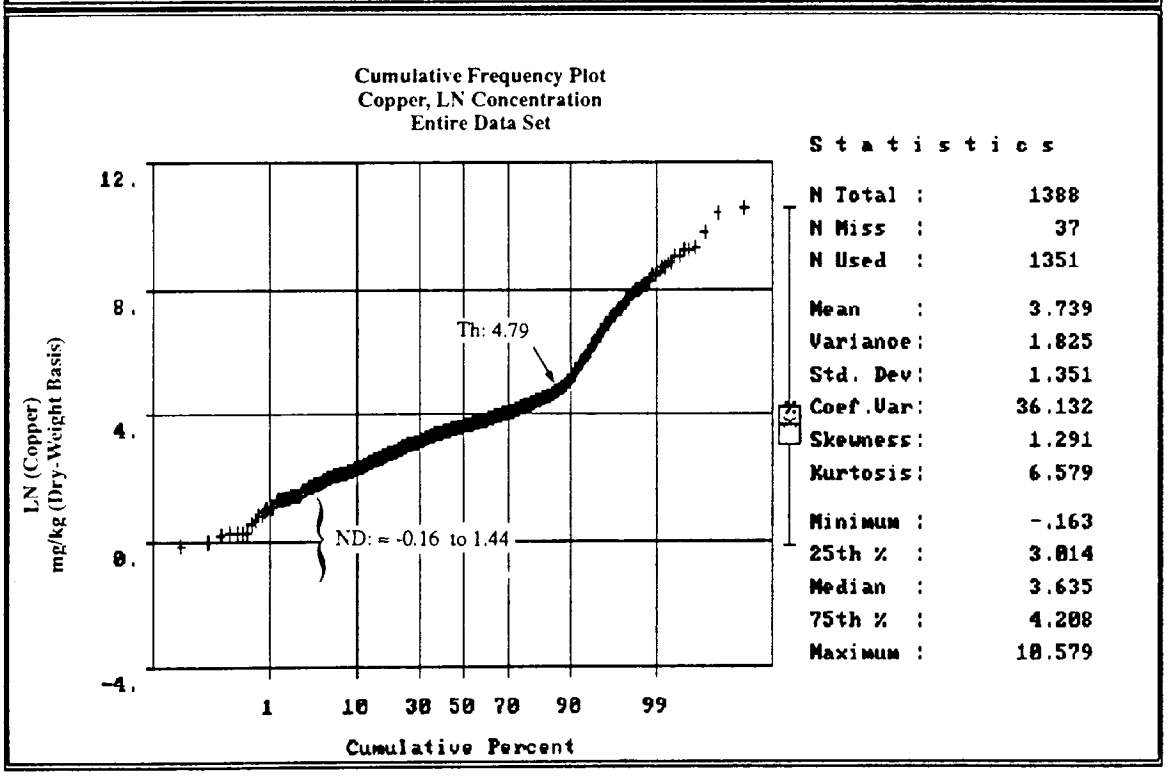
Cobalt, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A80

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25842





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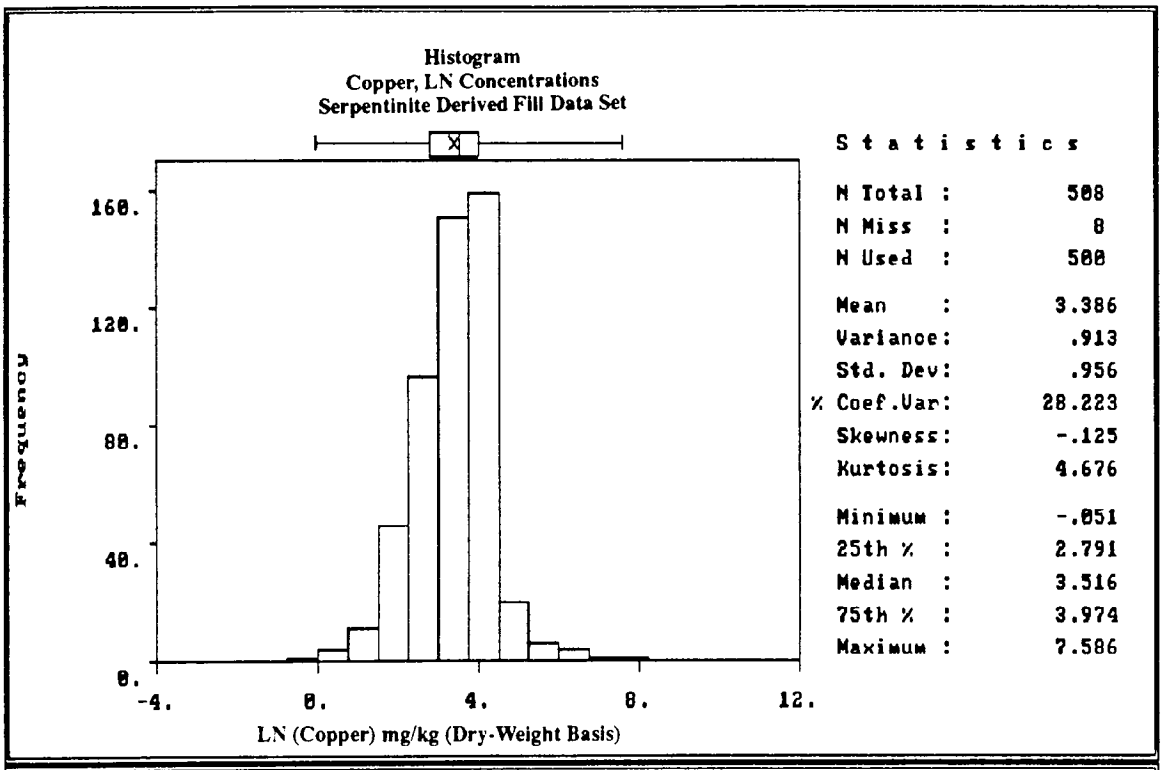
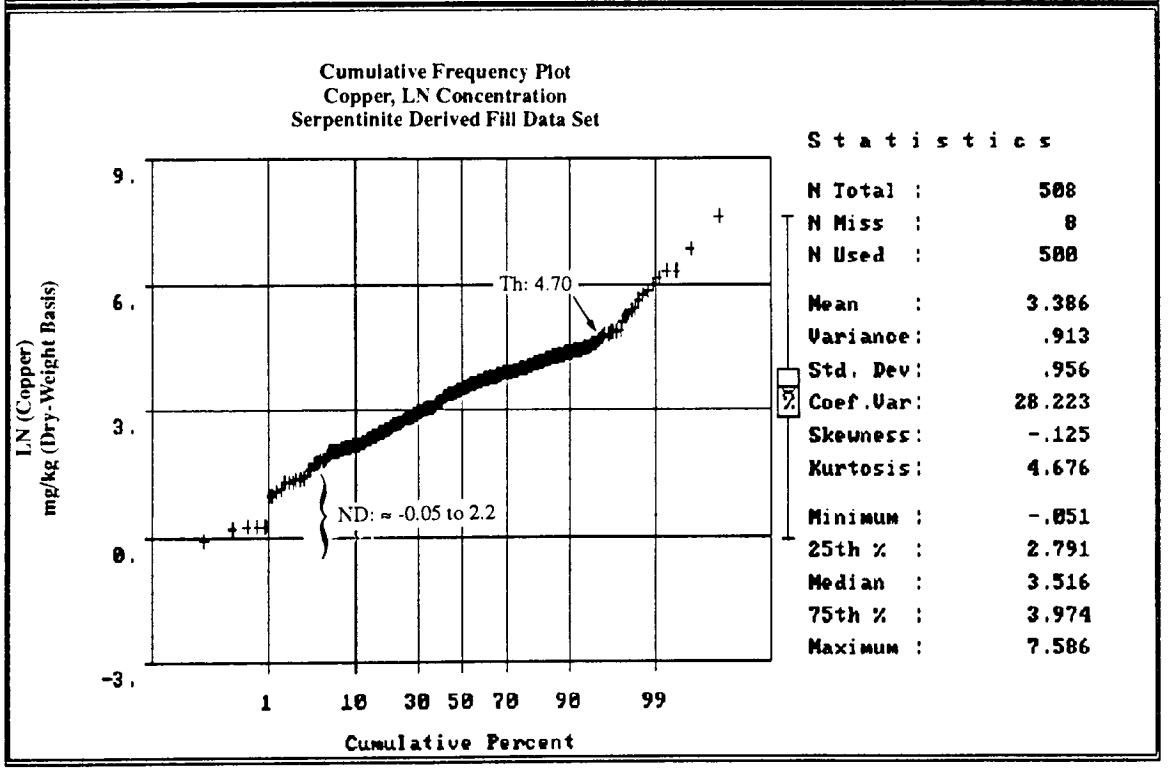
Copper, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A81

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25843





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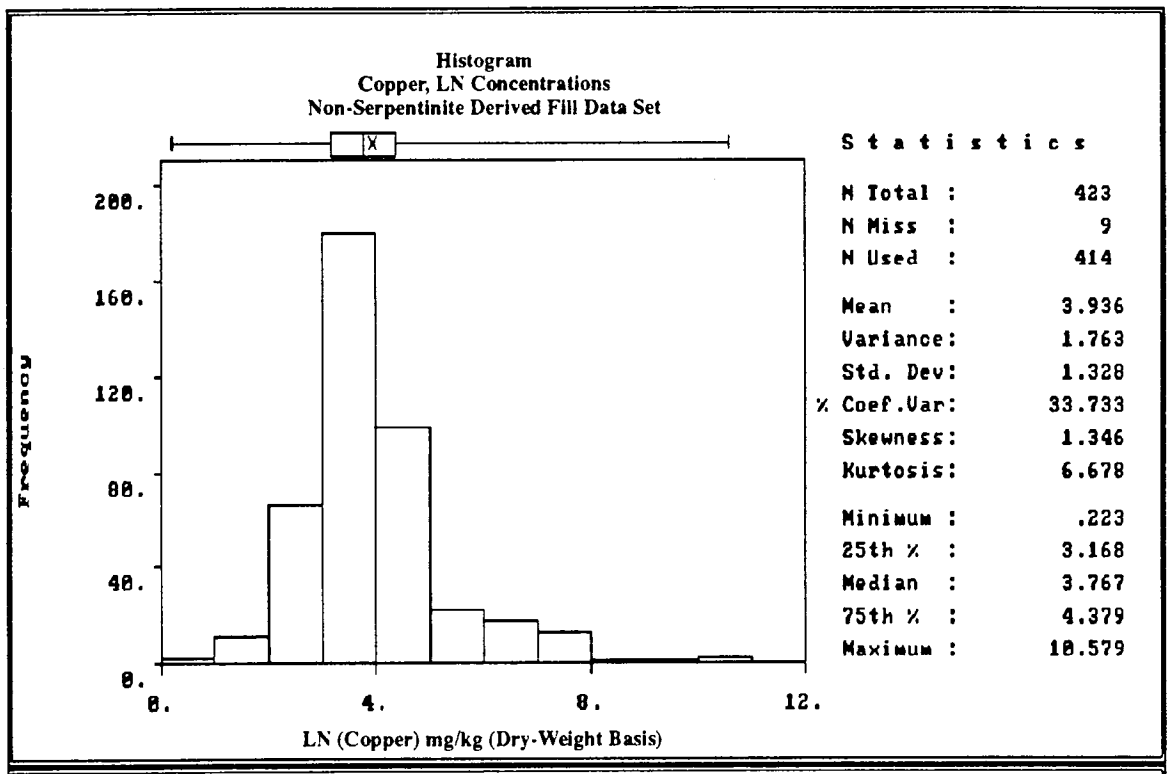
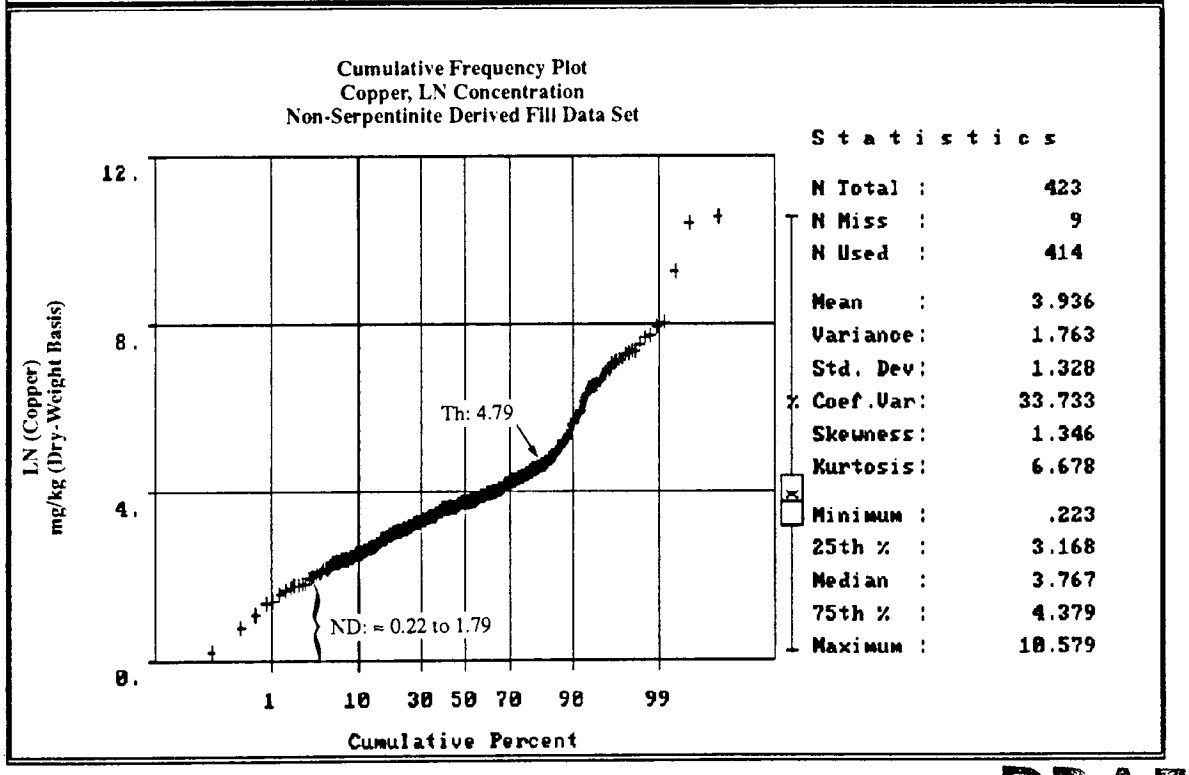
Copper, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A82

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25844





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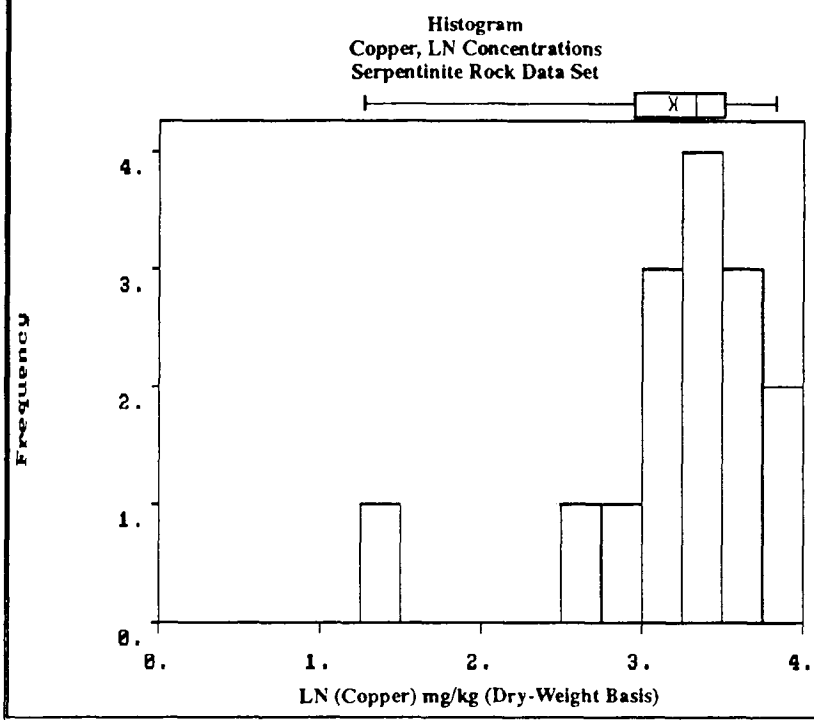
Copper, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A83

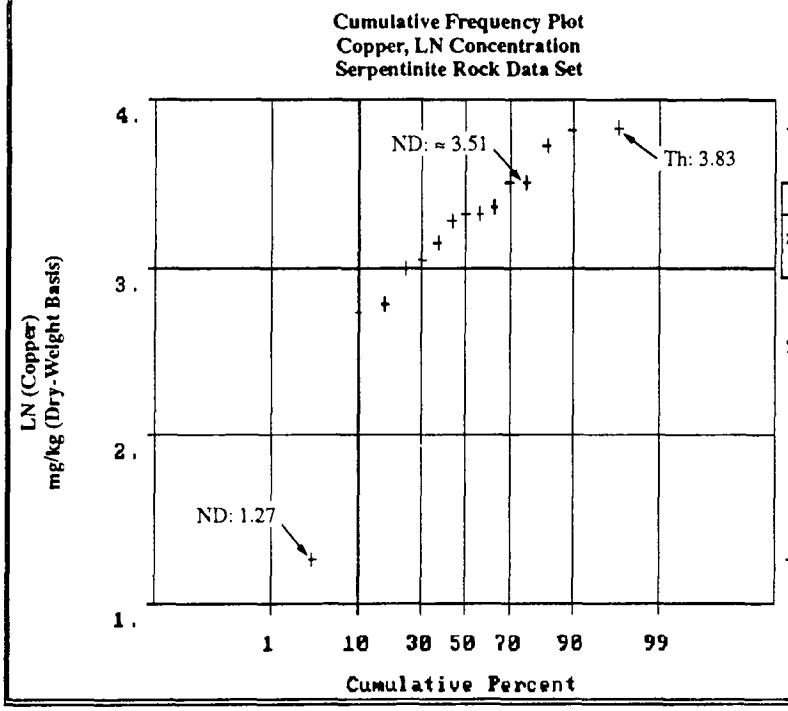
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25845



Statistics

N Total :	15
N Miss :	0
N Used :	15
Mean :	3.181
Variance:	.393
Std. Dev:	.627
% Coef.Var:	19.697
Skewness:	-1.917
Kurtosis:	6.925
Minimum :	1.267
25th % :	2.948
Median :	3.329
75th % :	3.506
Maximum :	3.829



Statistics

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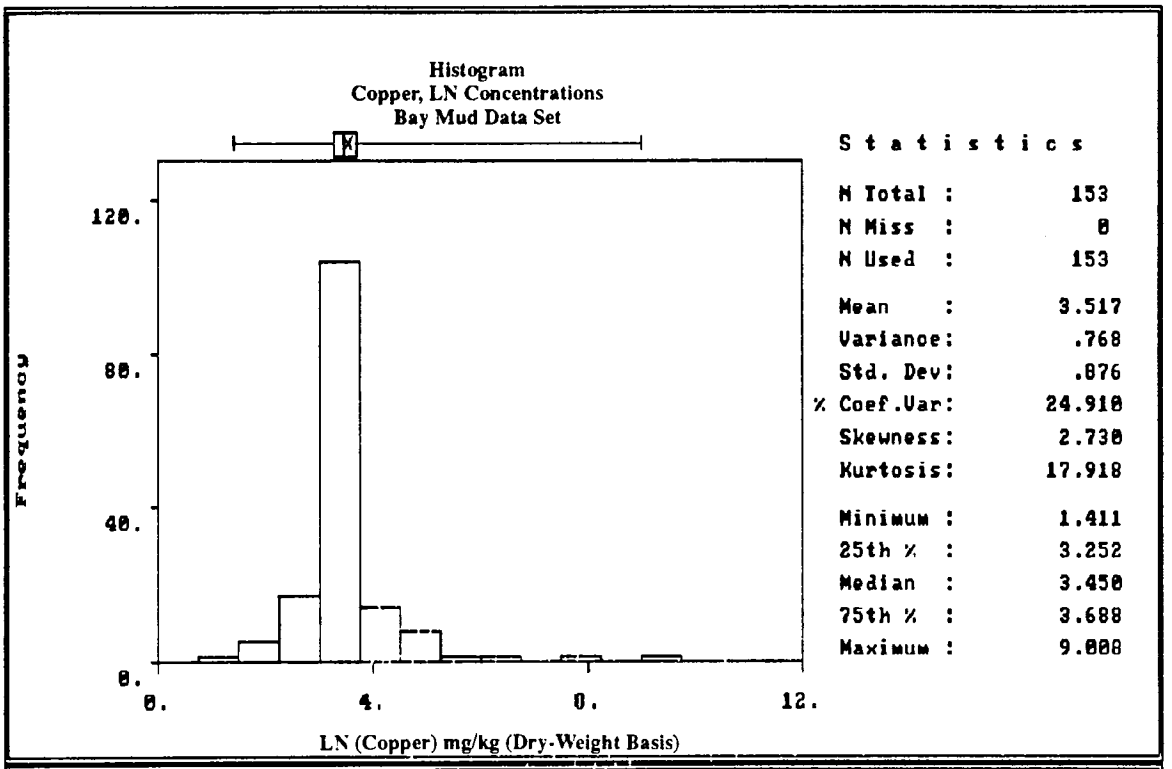
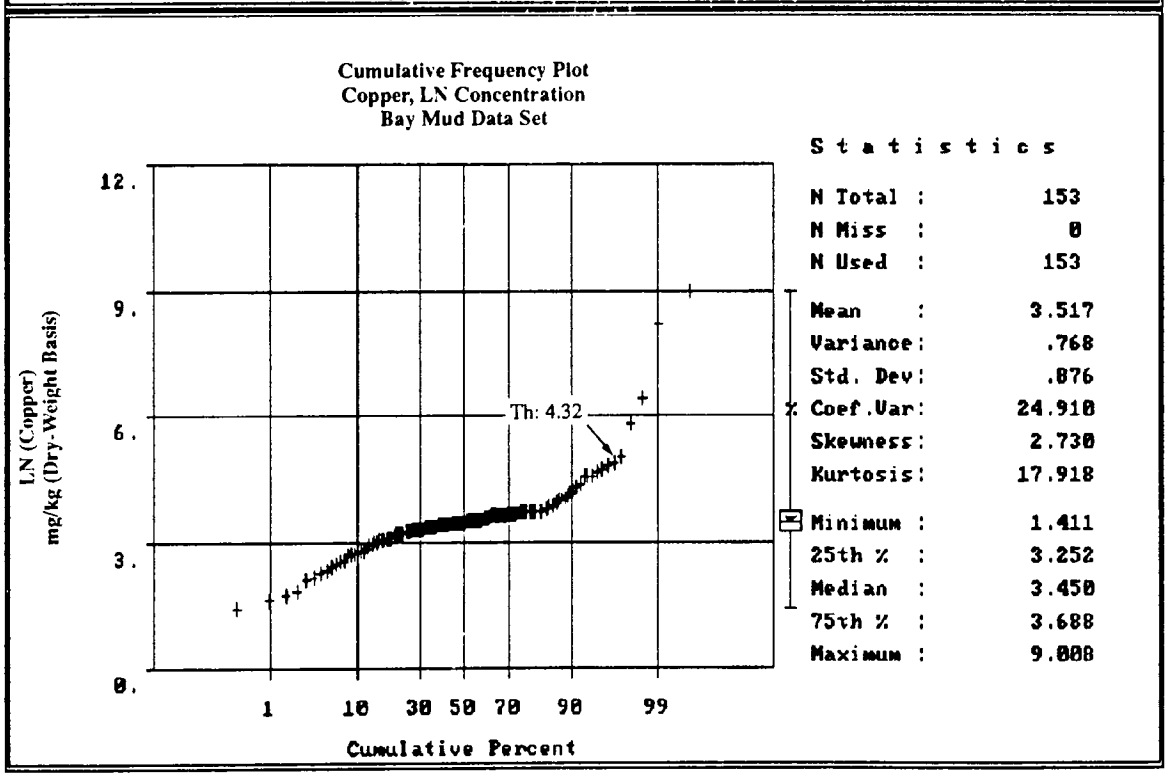
Copper, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A84

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25846





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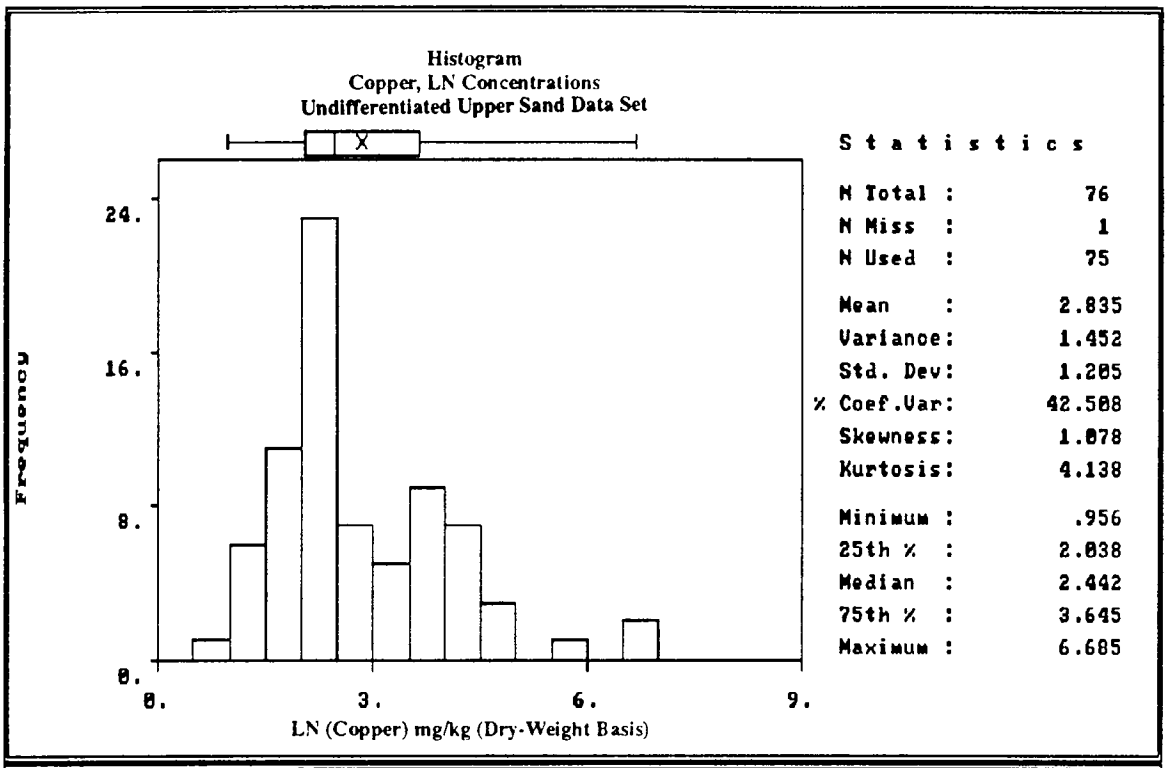
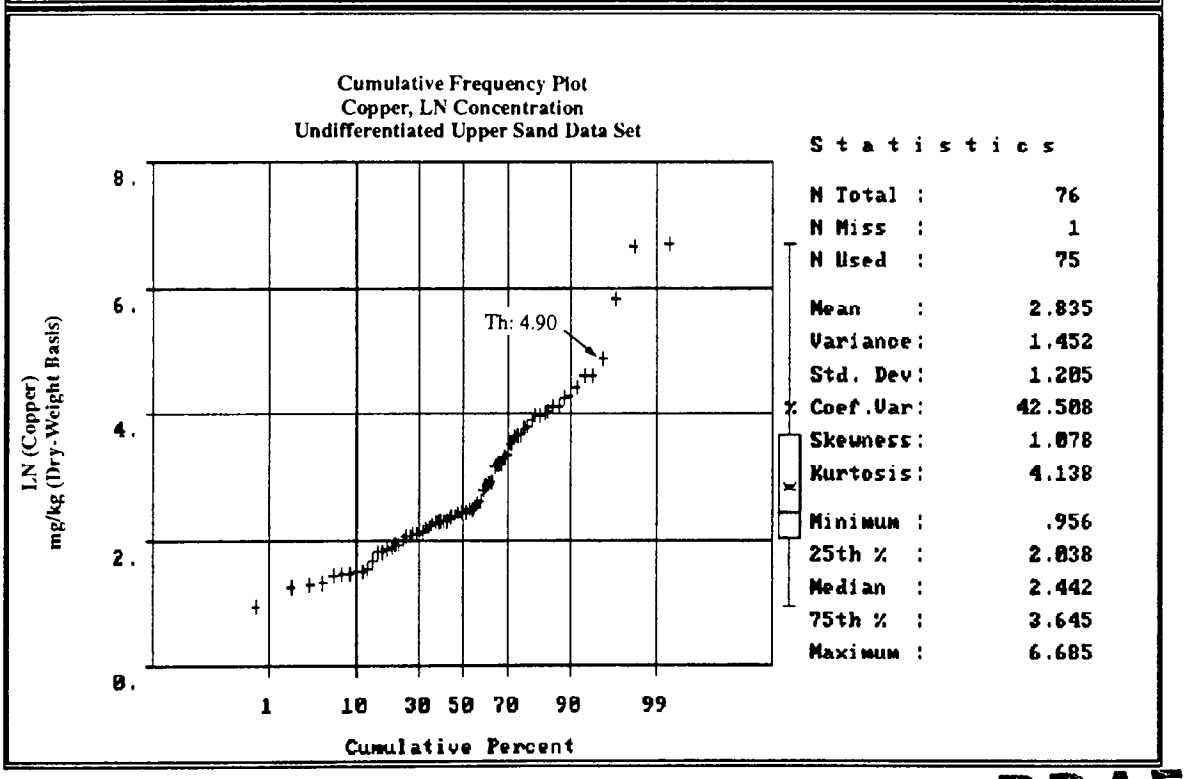
Copper, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A85

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25847





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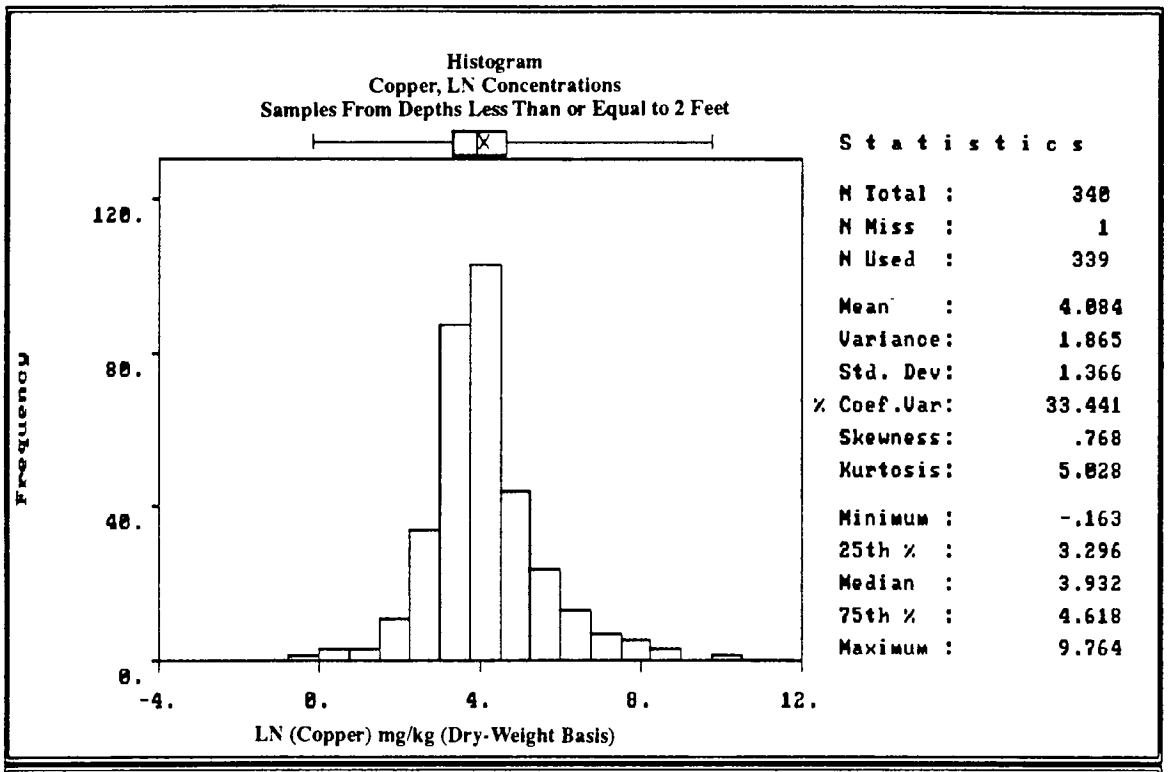
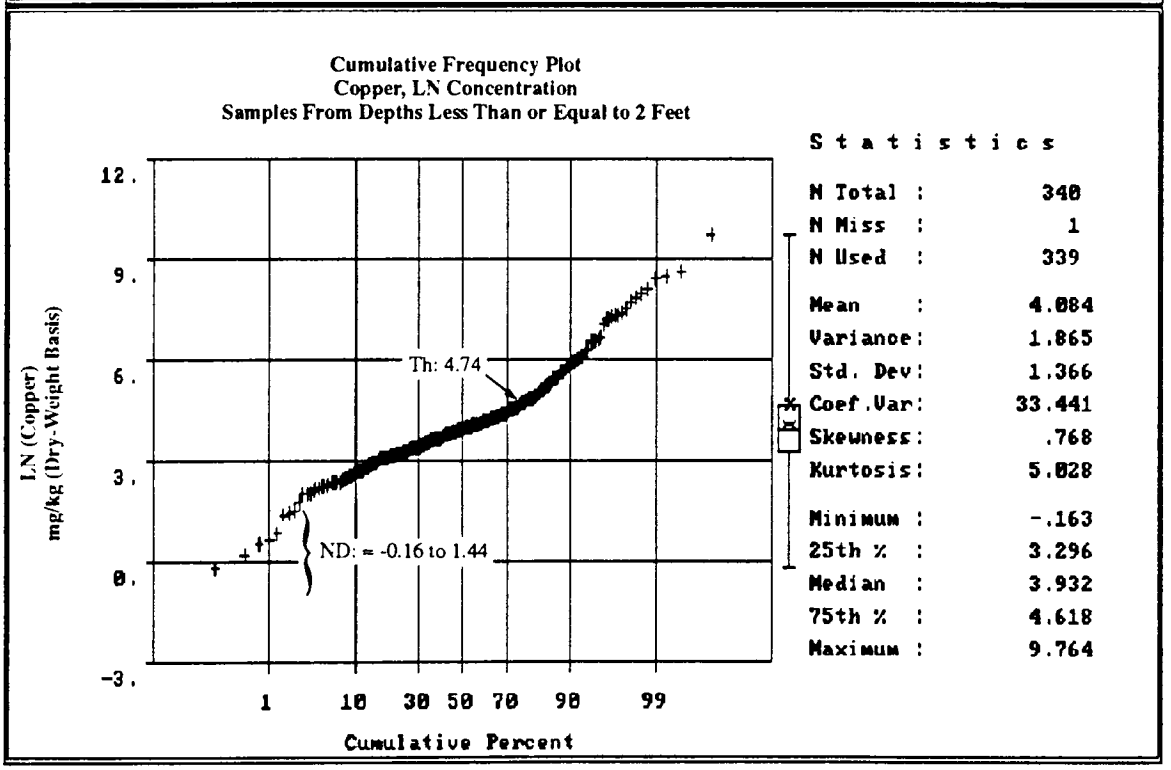
Copper, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A86

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25848





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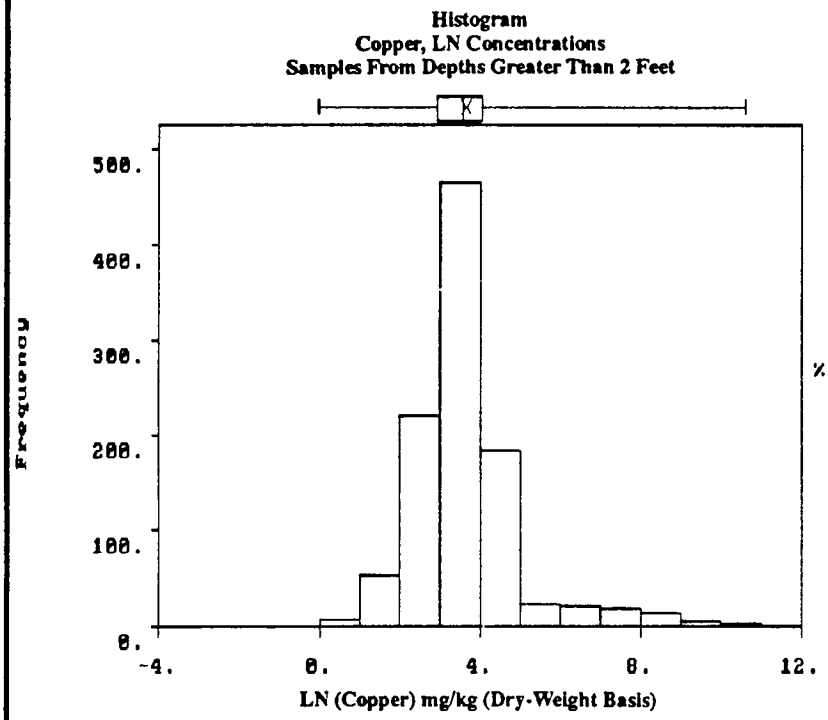
Copper, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A87

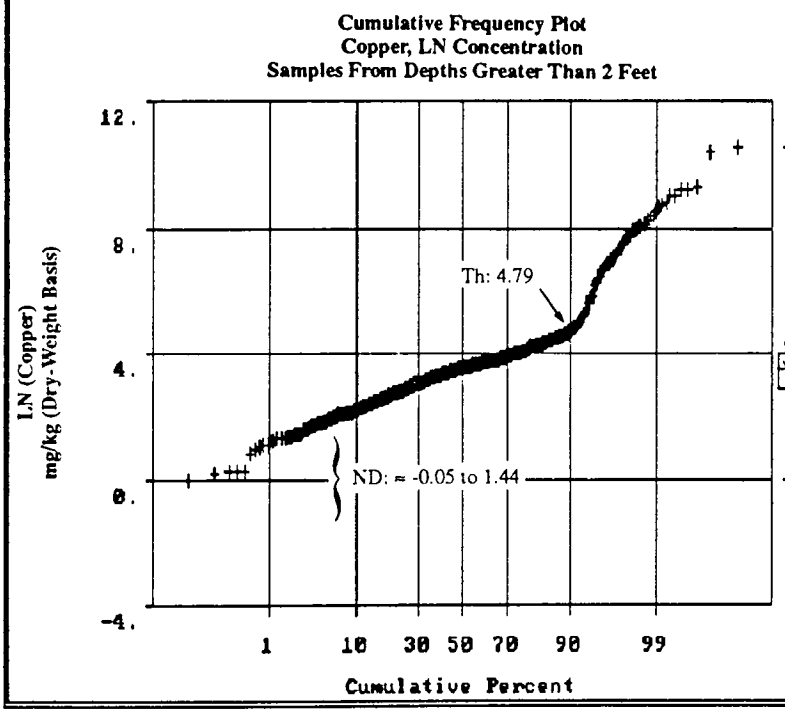
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25849



Statistics

N Total :	1048
N Miss :	36
N Used :	1012
Mean :	3.623
Variance:	1.760
Std. Dev:	1.327
% Coef.Var:	36.615
Skewness:	1.520
Kurtosis:	7.610
Minimum :	-.051
25th % :	2.901
Median :	3.551
75th % :	4.027
Maximum :	10.579



Statistics

N Total :	1048
N Miss :	36
N Used :	1012
Mean :	3.623
Variance:	1.760
Std. Dev:	1.327
Coef.Var:	36.615
Skewness:	1.520
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Minimum :	-.051
25th % :	2.901
Median :	3.551
75th % :	4.027
Maximum :	10.579

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Engineering and
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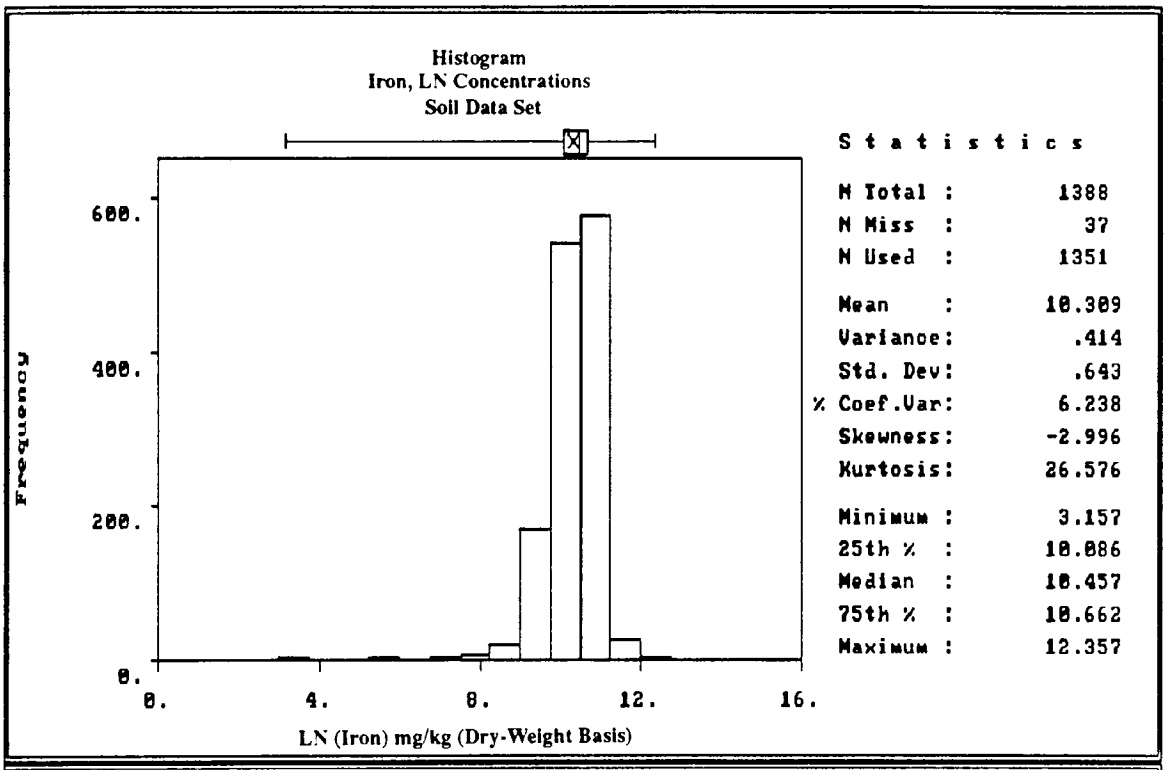
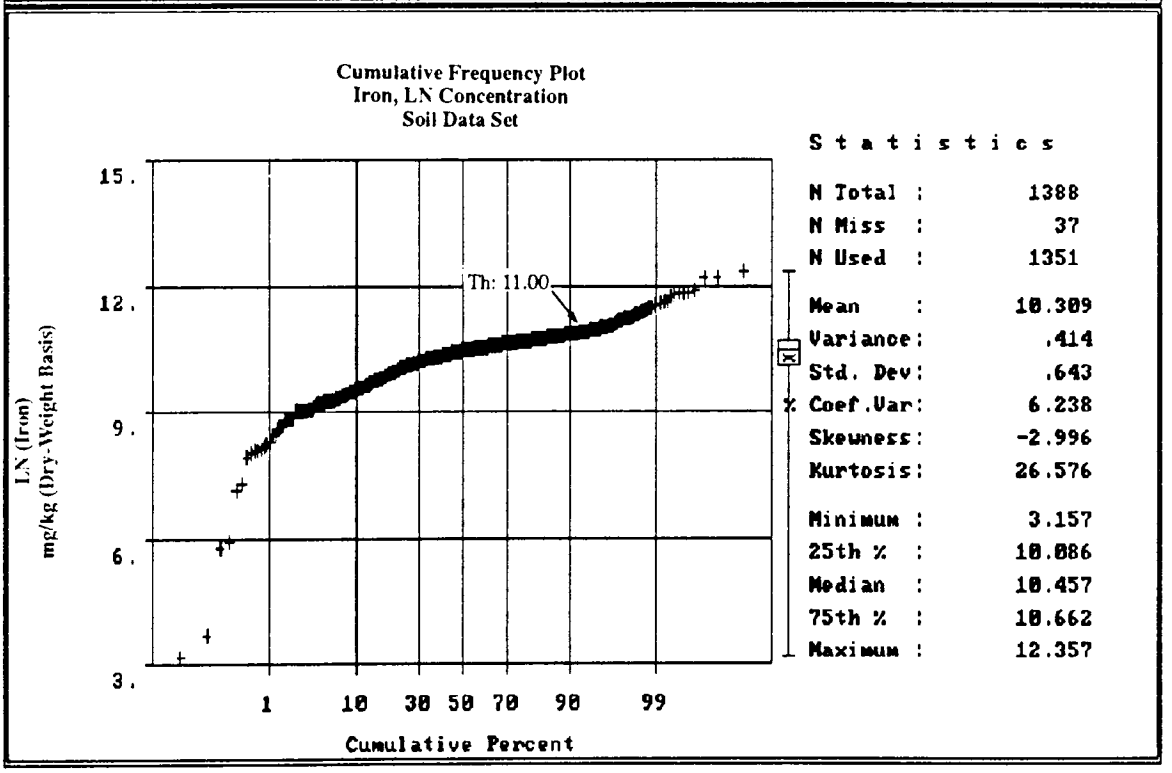
Copper, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A88

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CIM	2/92	6/92

25850





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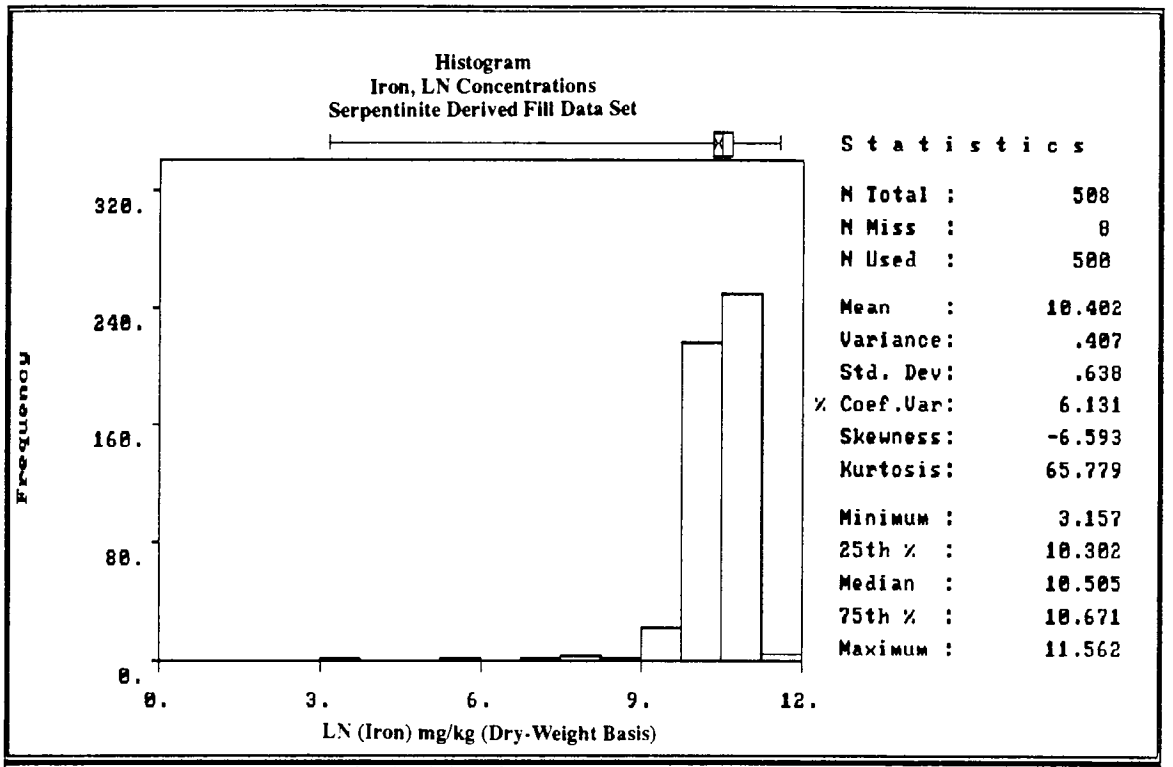
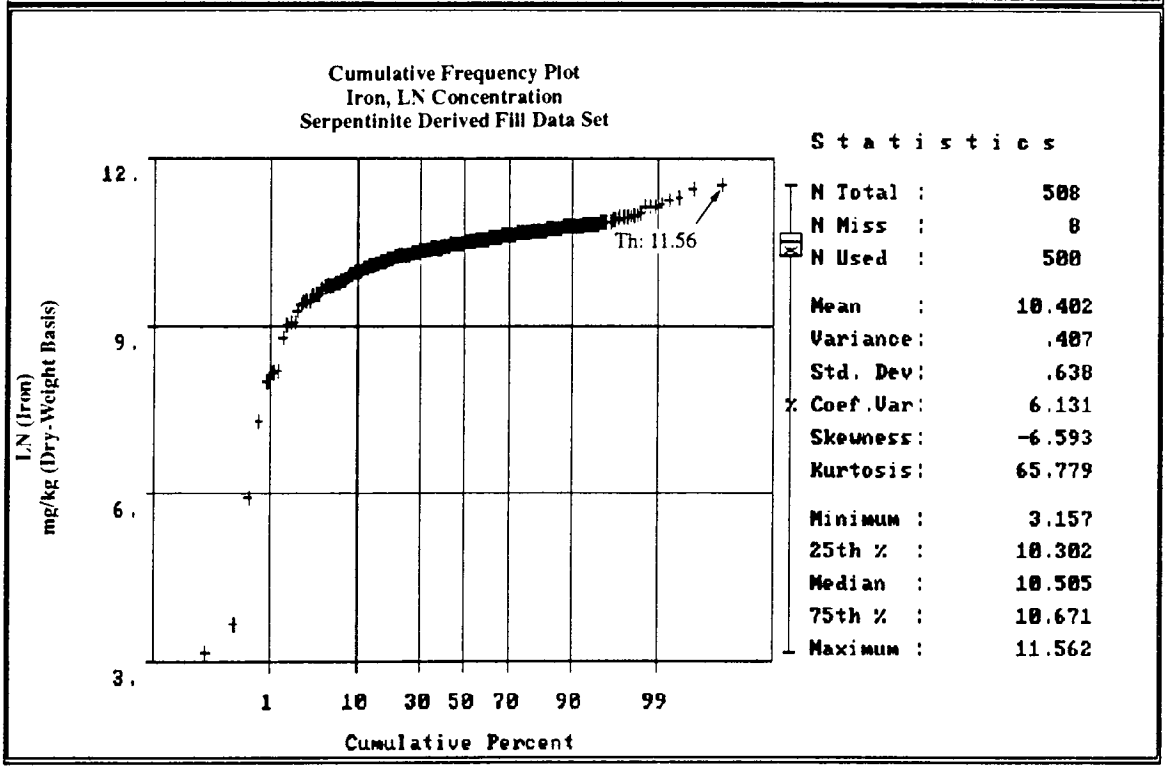
Iron, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A89

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25851





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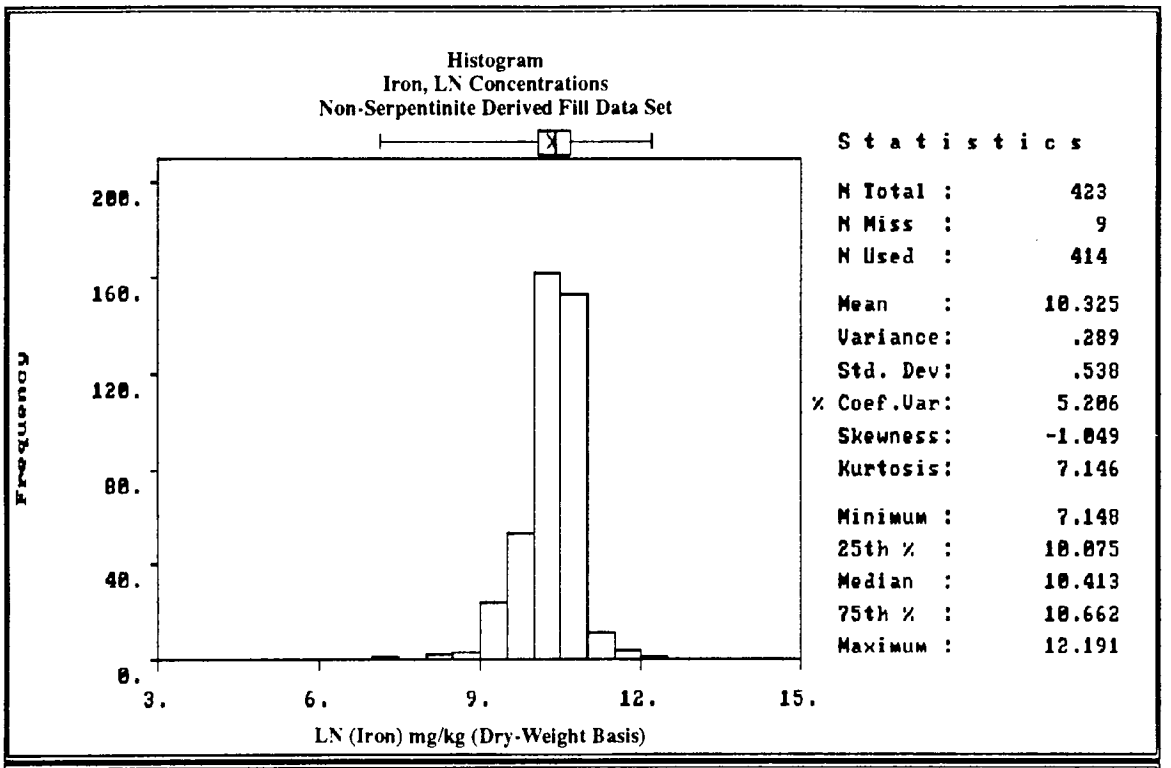
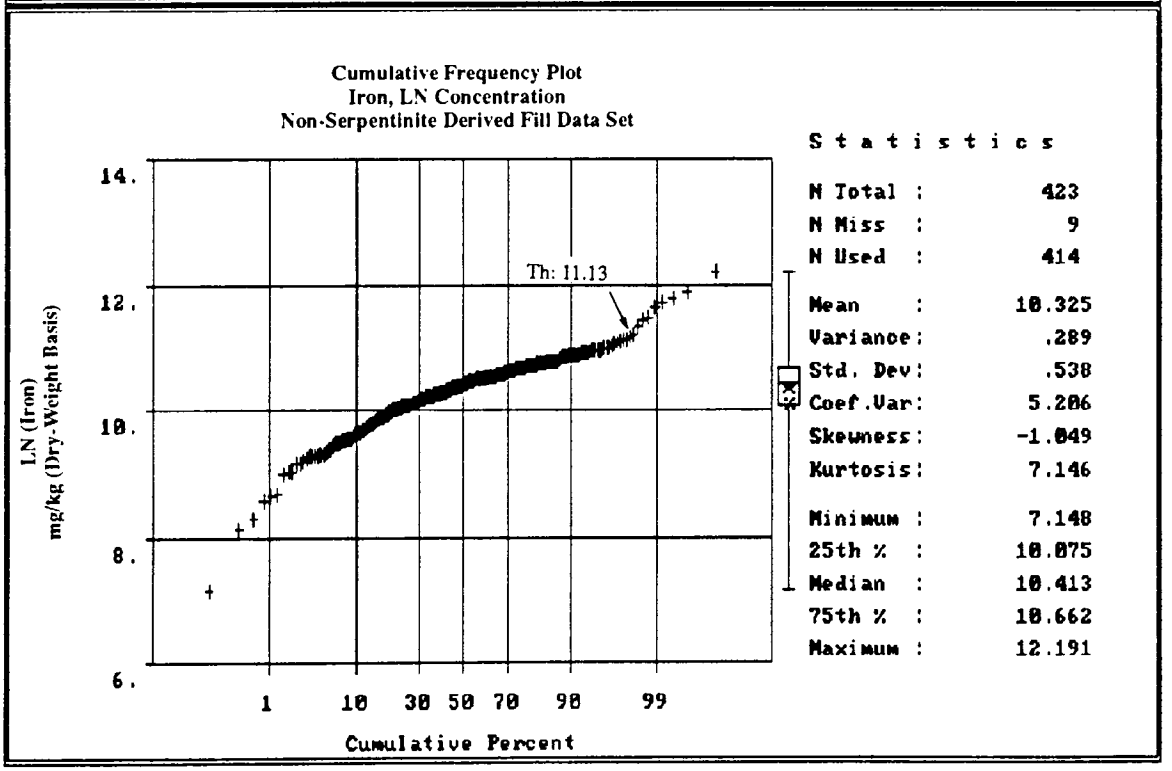
Iron, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A90

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25852





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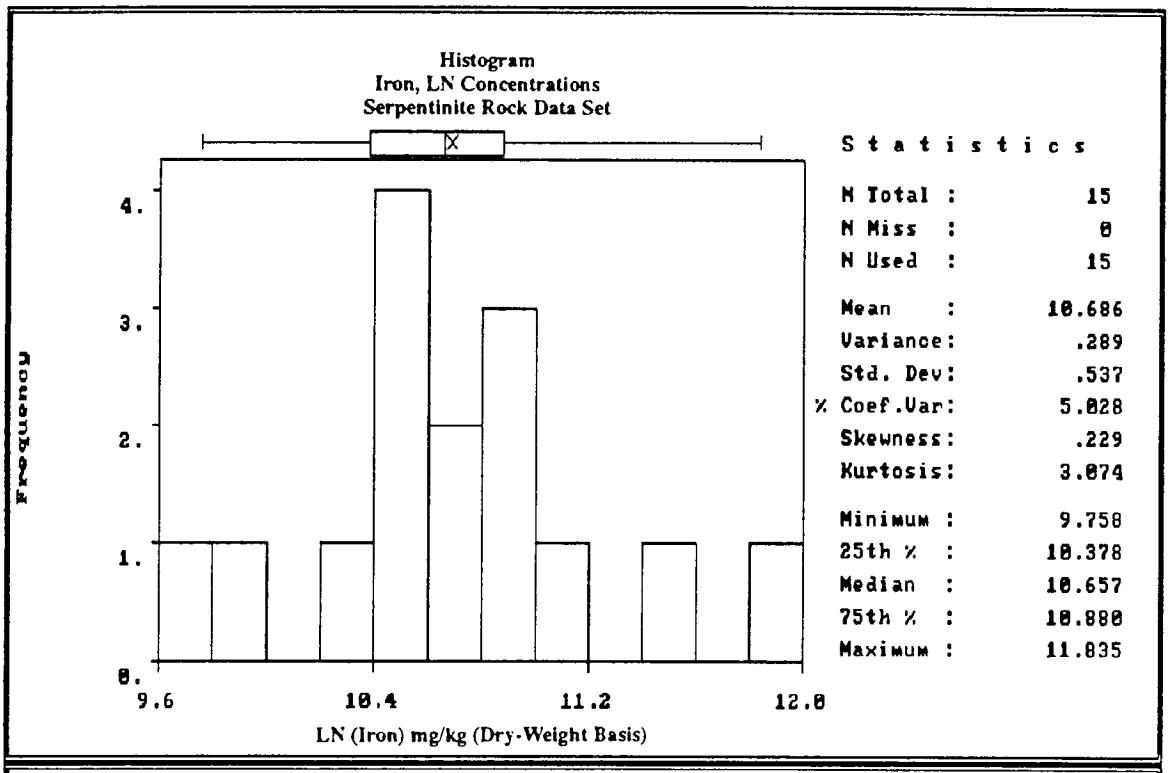
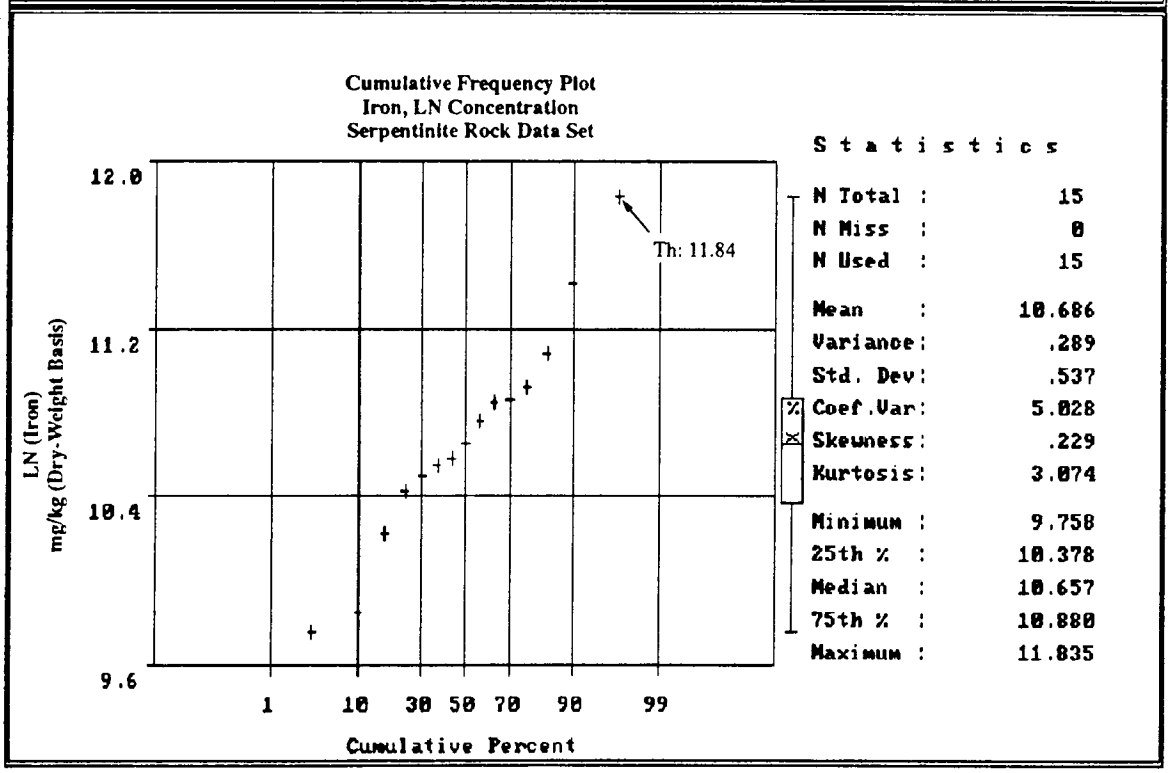
Iron, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A91

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25853





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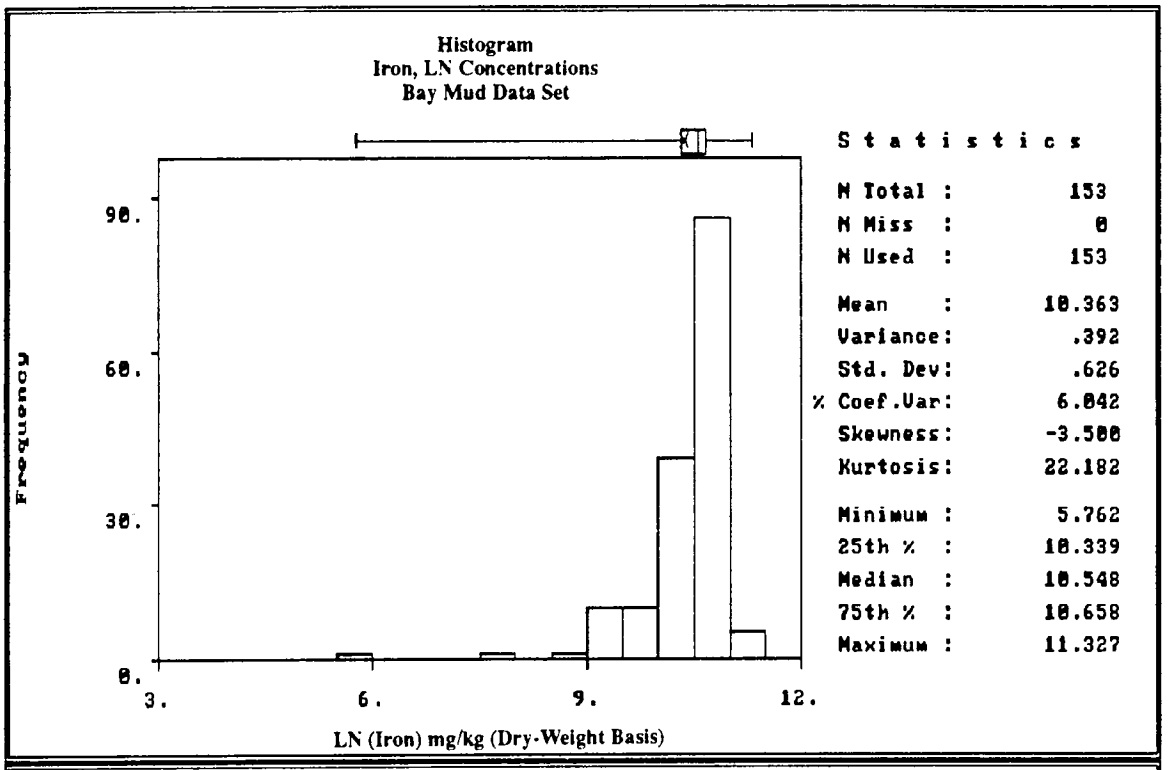
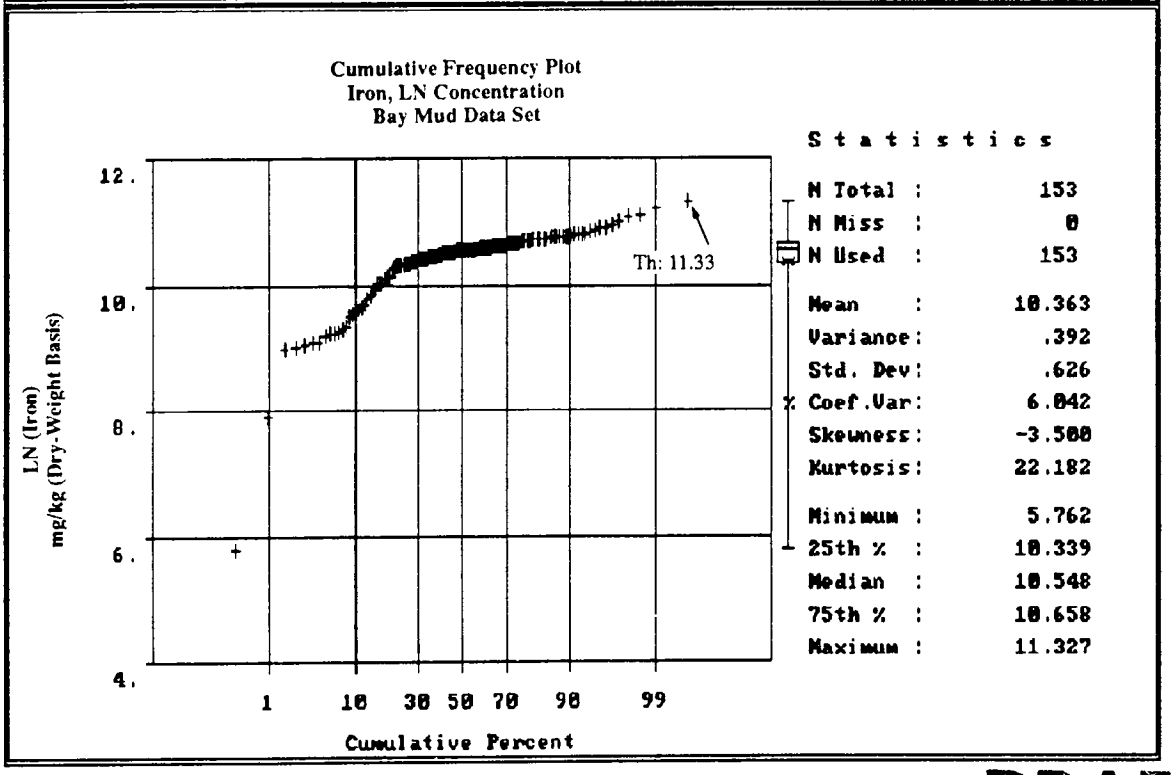
Iron, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A92

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CIM	2/92	6/92

25854





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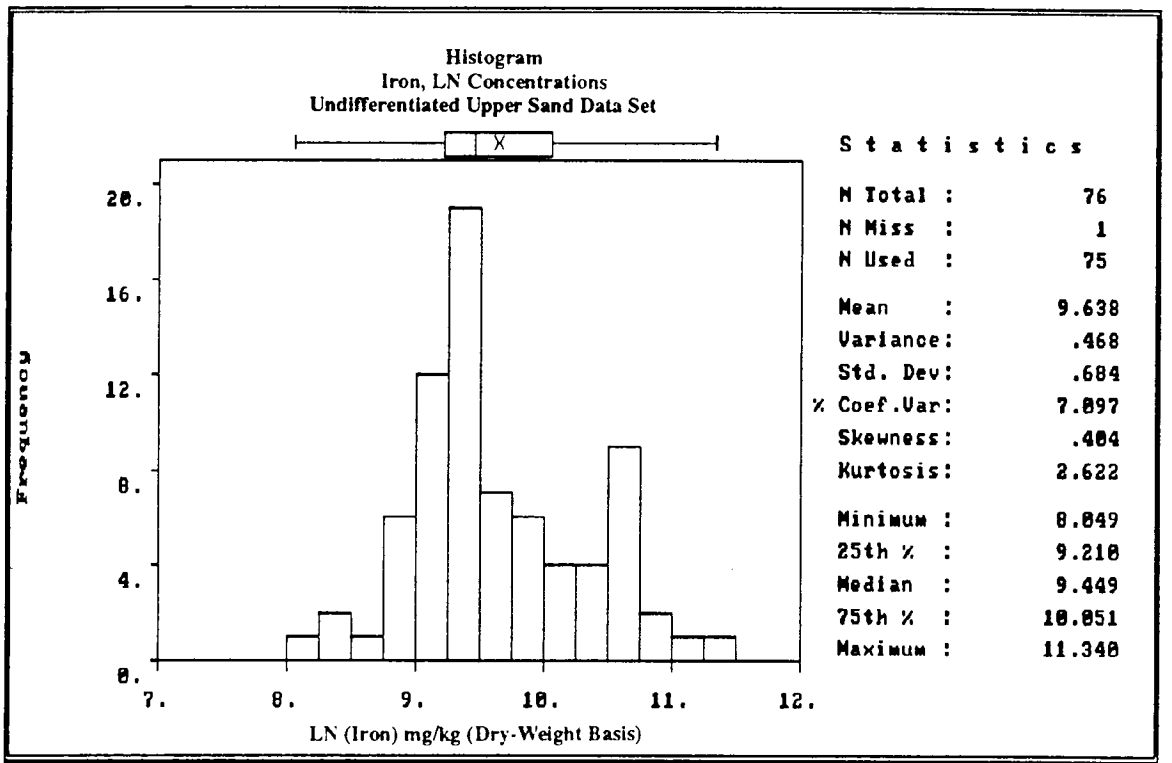
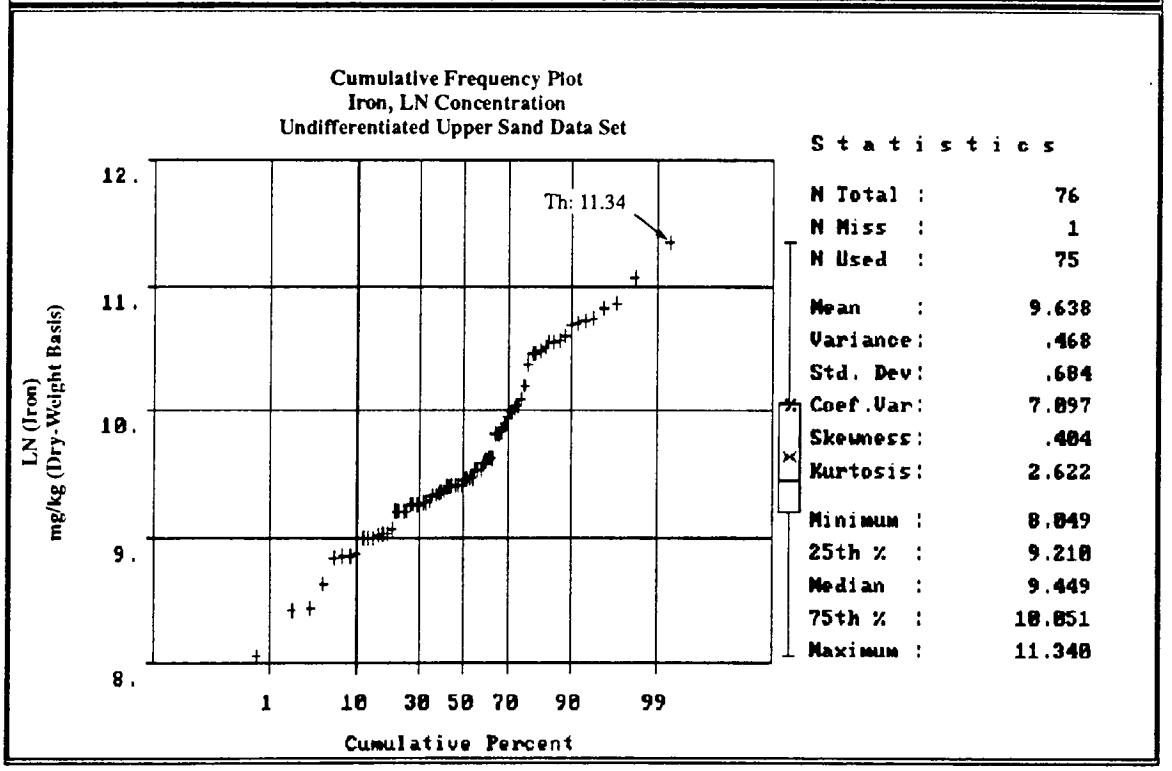
Iron, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A93

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25855





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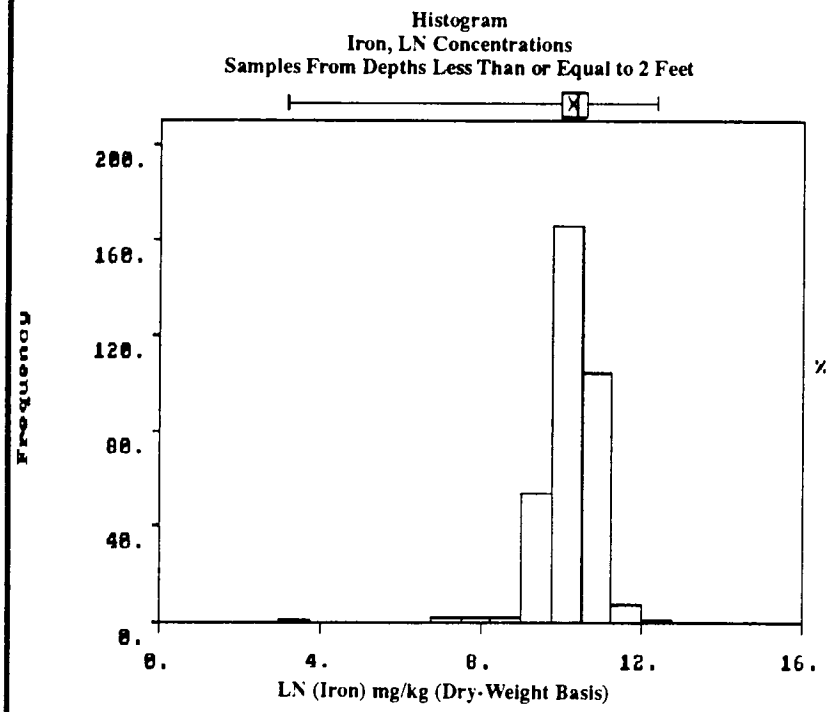
Iron, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A94

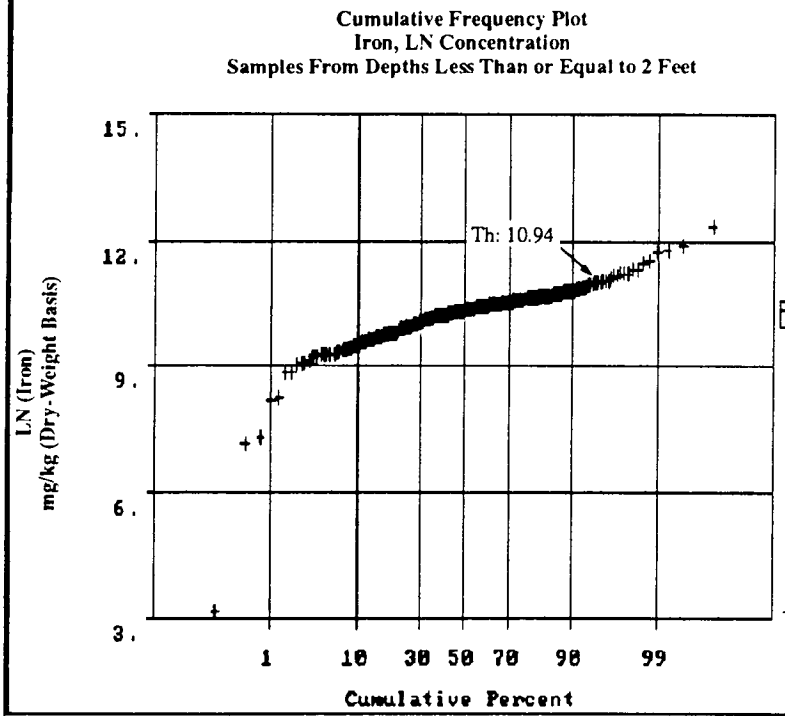
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25856



Statistics

N Total :	340
N Miss :	1
N Used :	339
Mean :	10.227
Variance:	.489
Std. Dev:	.699
% Coef.Var:	6.836
Skewness:	-3.588
Kurtosis:	34.636
Minimum :	3.157
25th % :	9.945
Median :	10.345
75th % :	10.580
Maximum :	12.357



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75th % :	10.580
Maximum :	12.357

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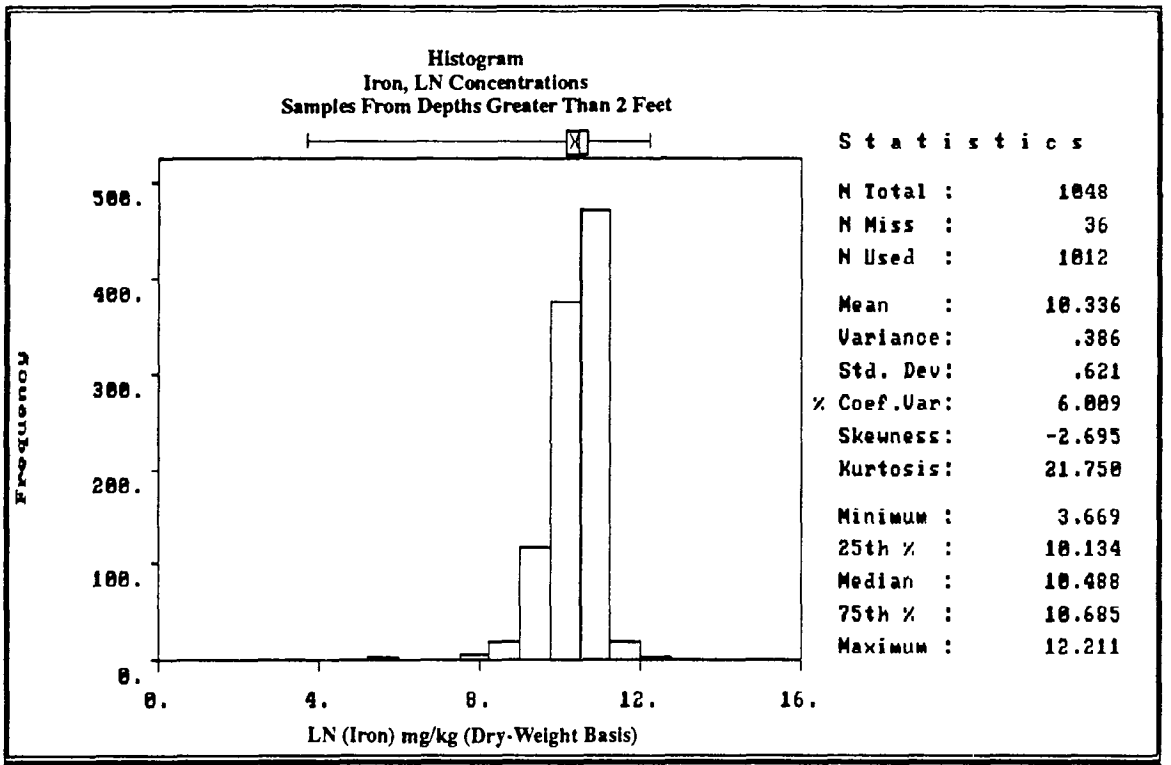
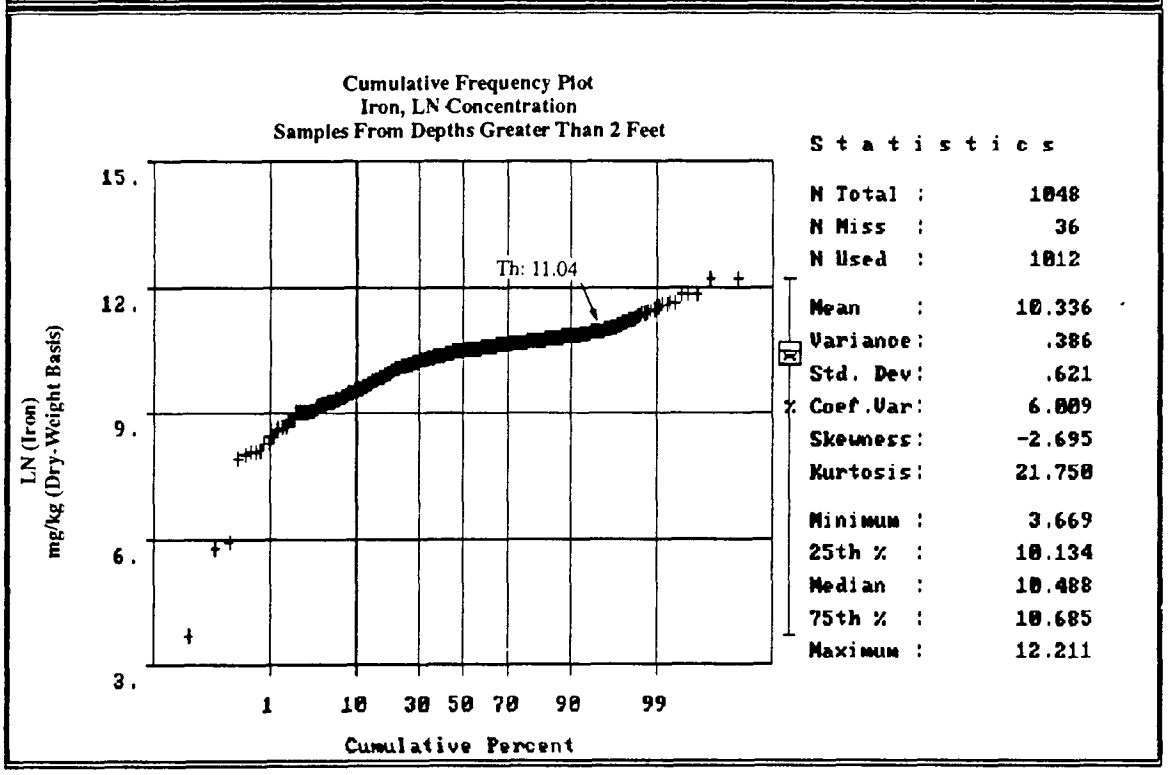
Iron, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A95

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CIM	2/92	6/92

25857





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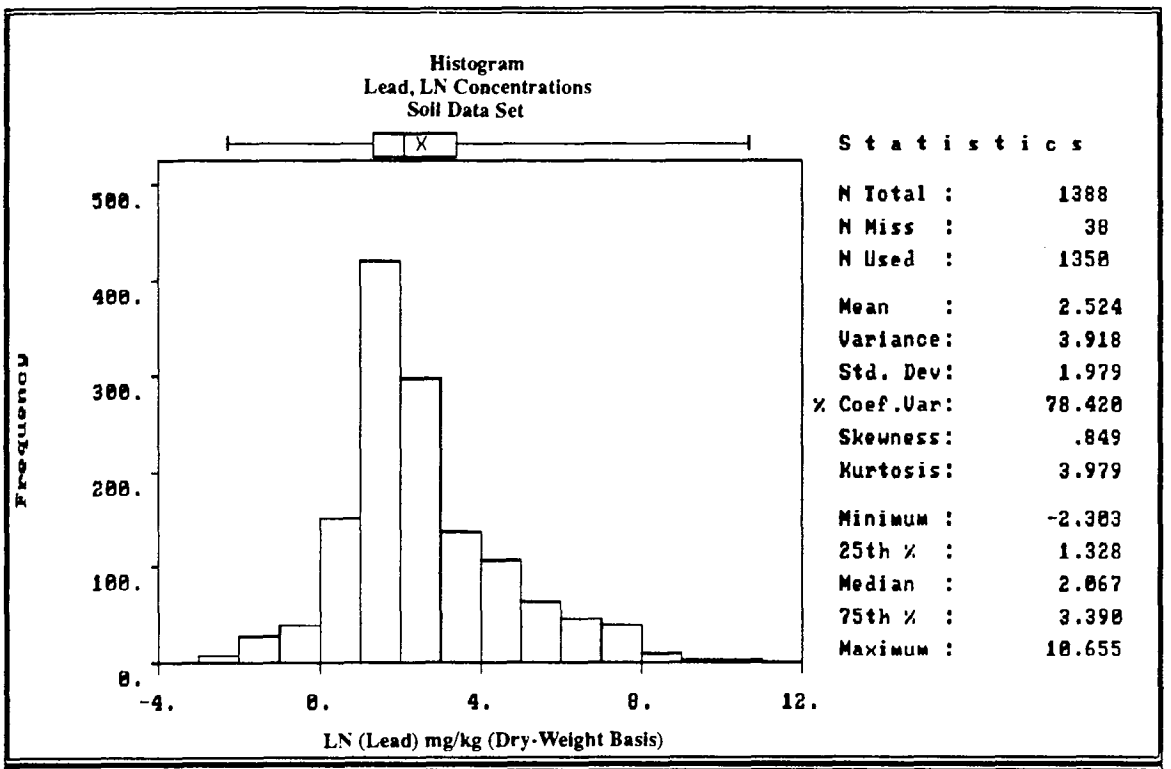
Engineering and
Environmental Services

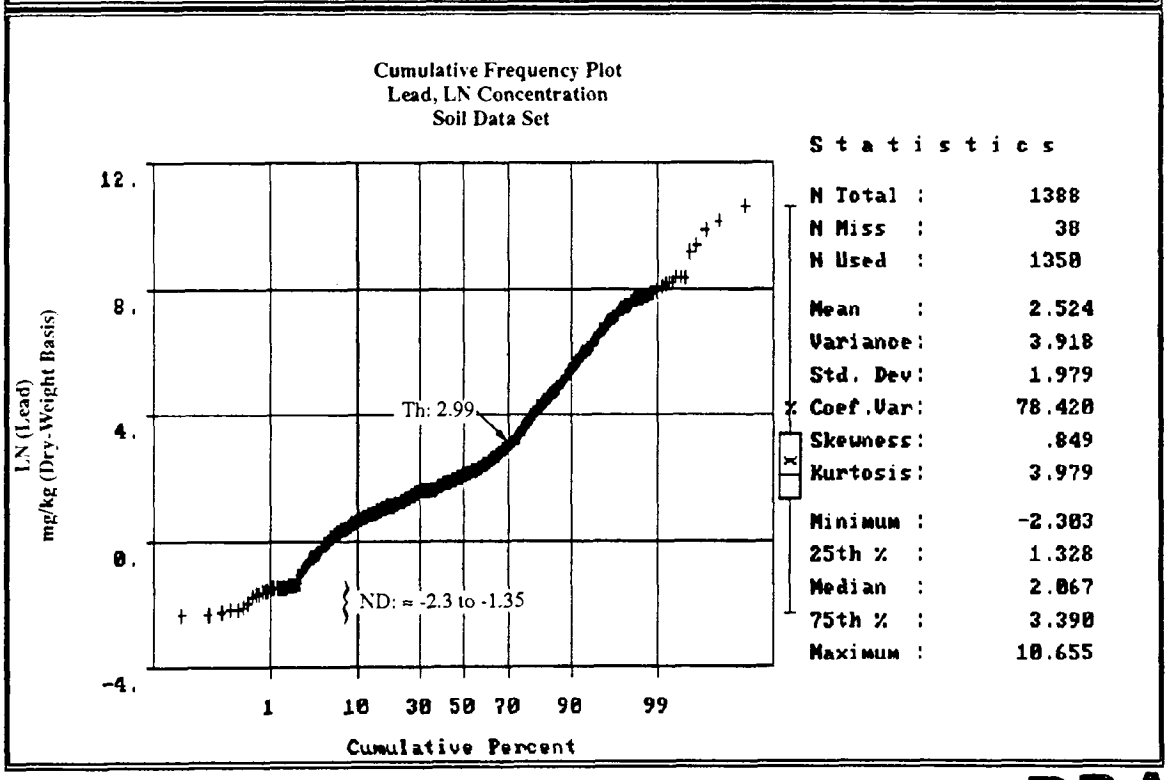
Iron, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A96

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25858





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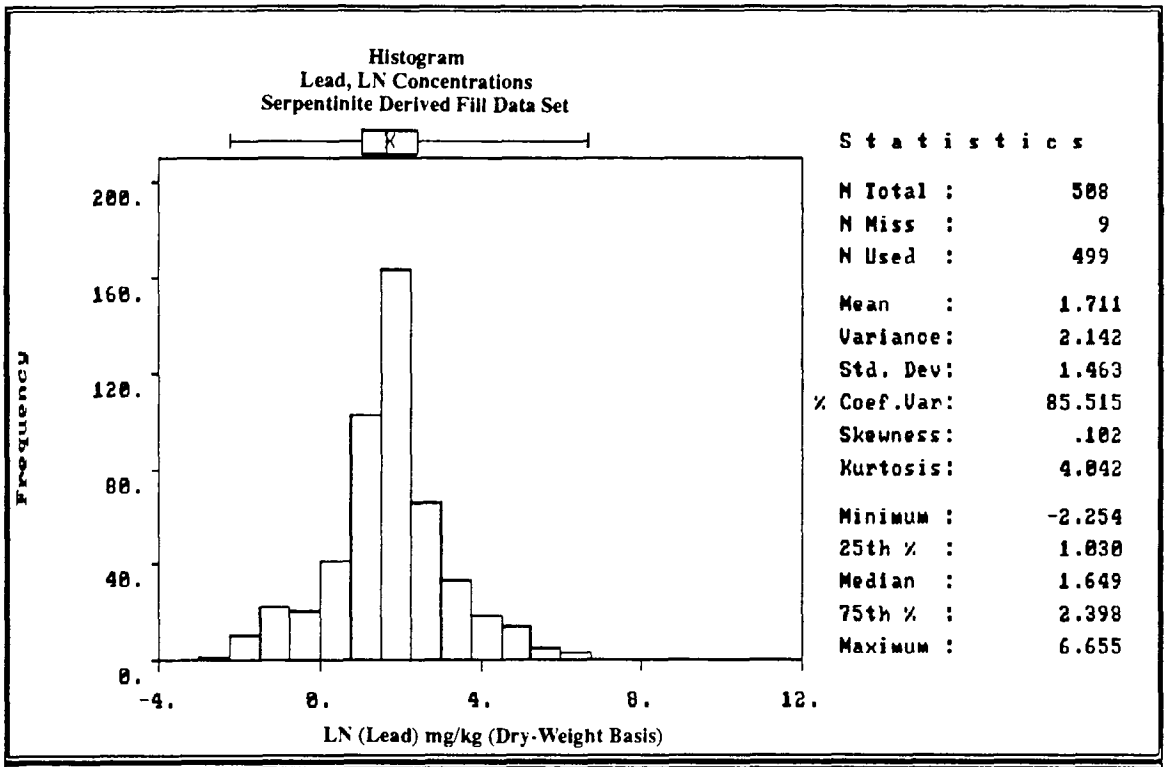
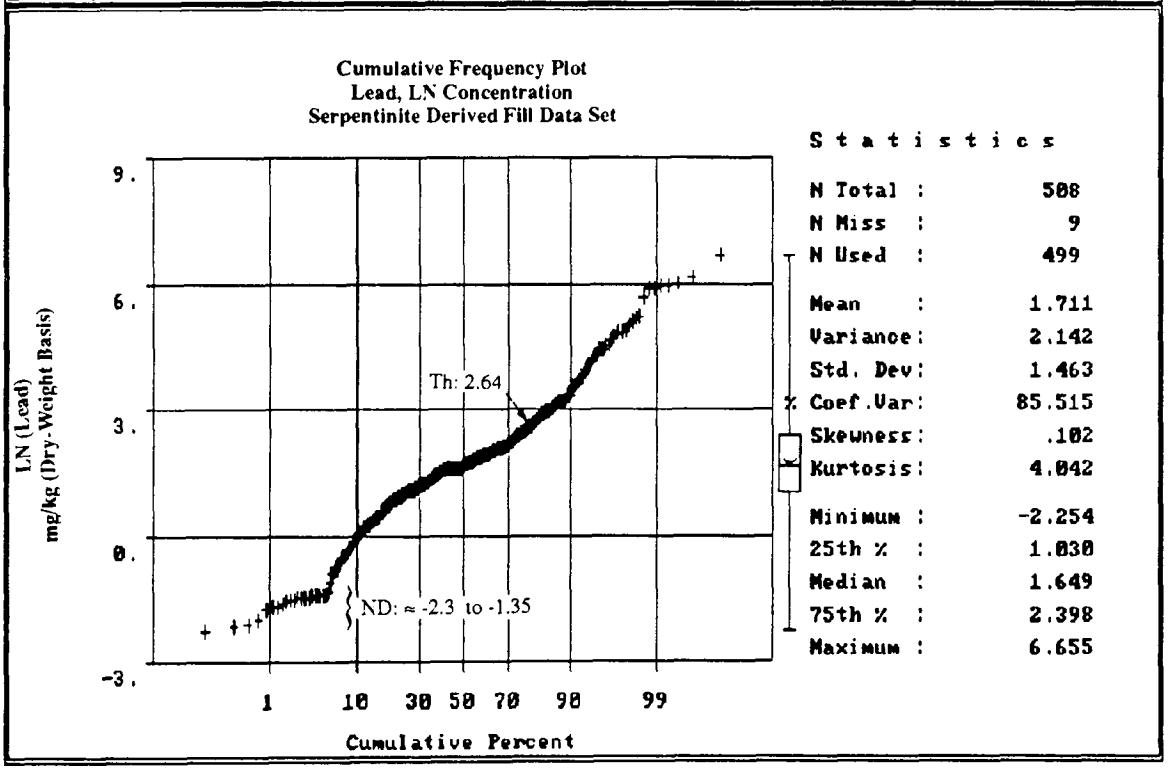
Lead, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A97

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25859





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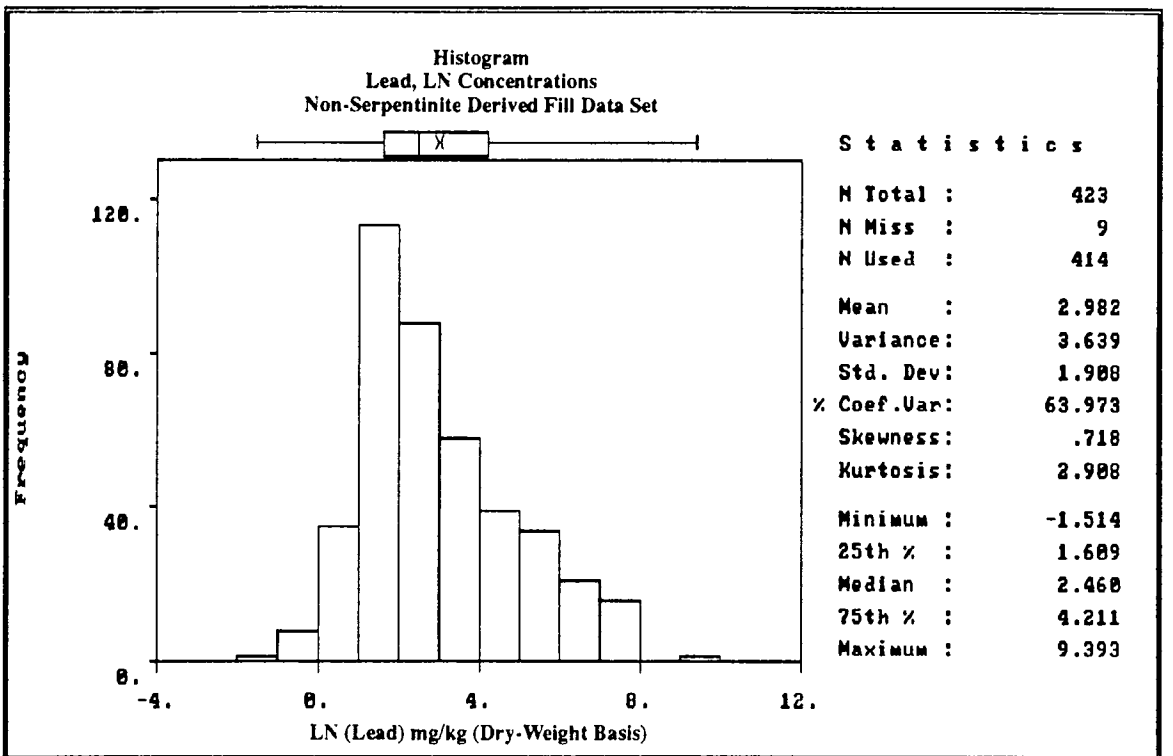
Engineering and
Environmental Services

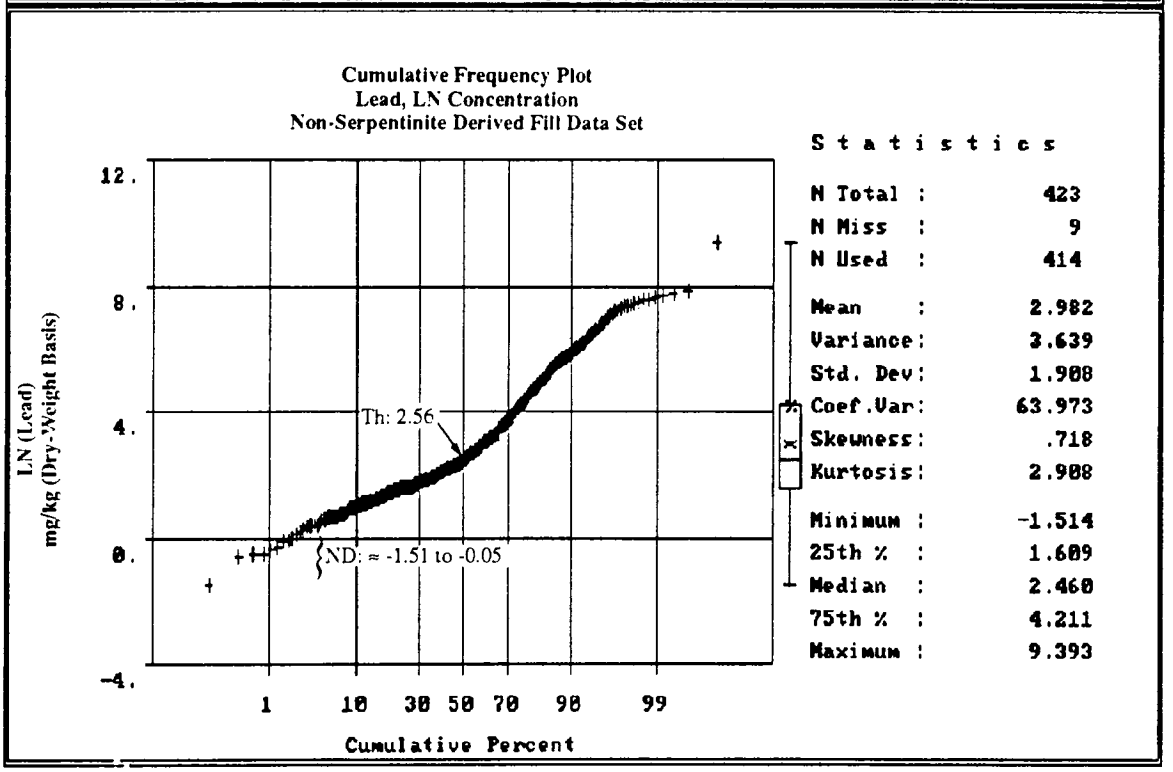
Lead, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A98

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25860





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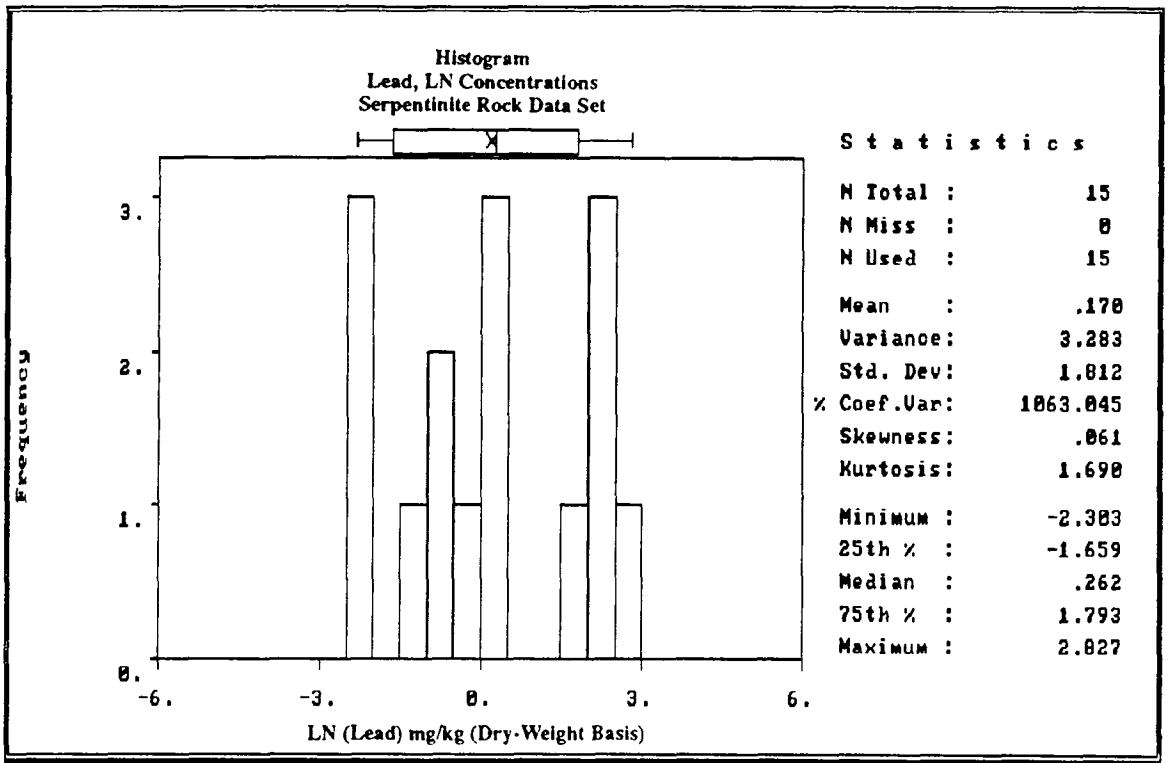
Environmental Services

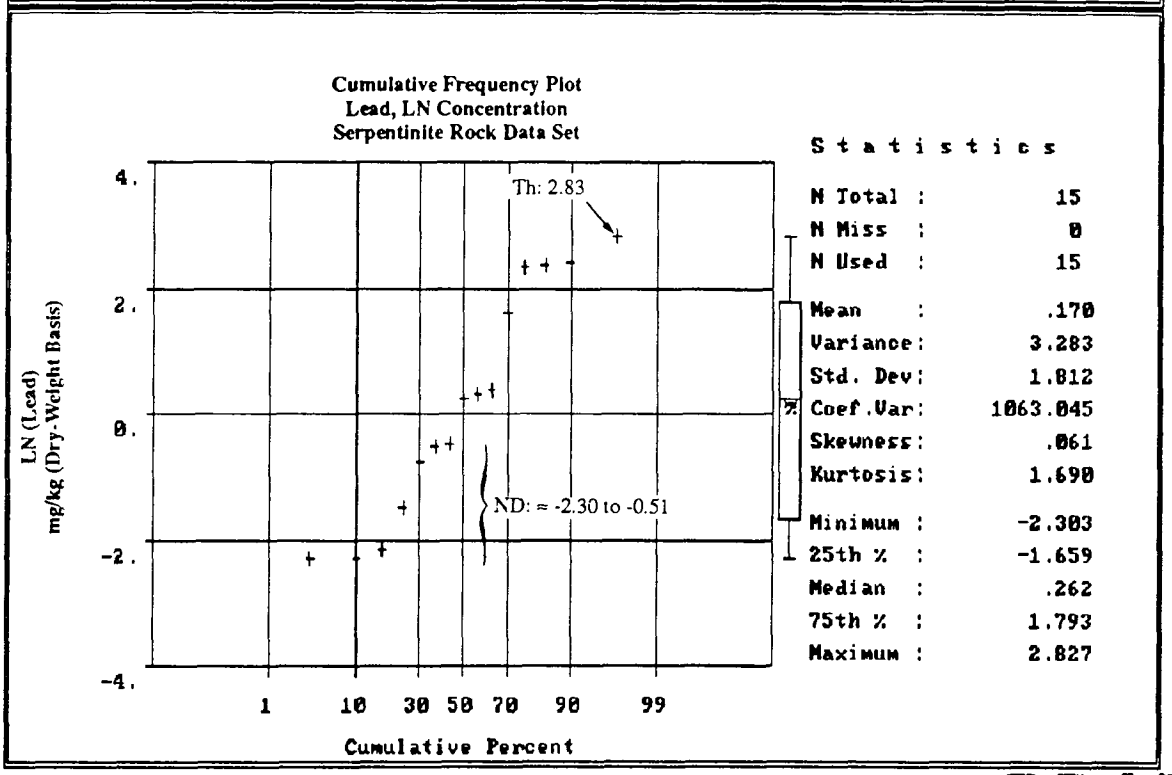
Lead, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A99

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25861





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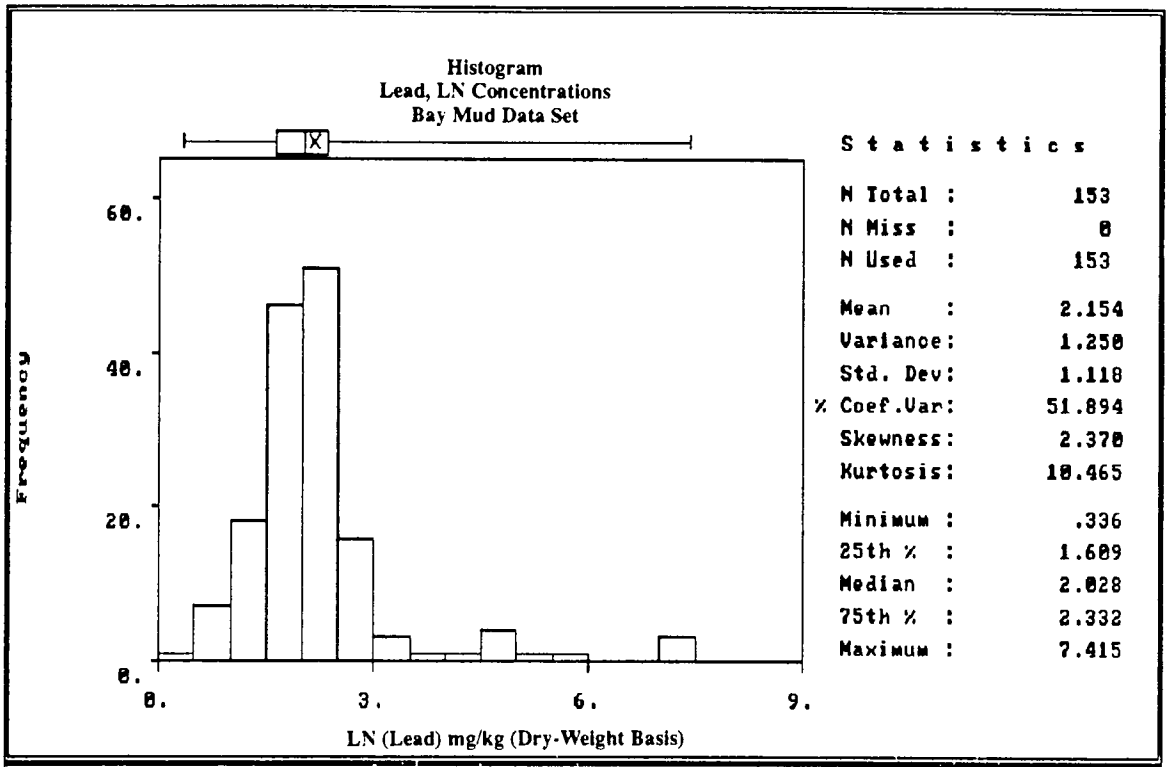
Environmental Services

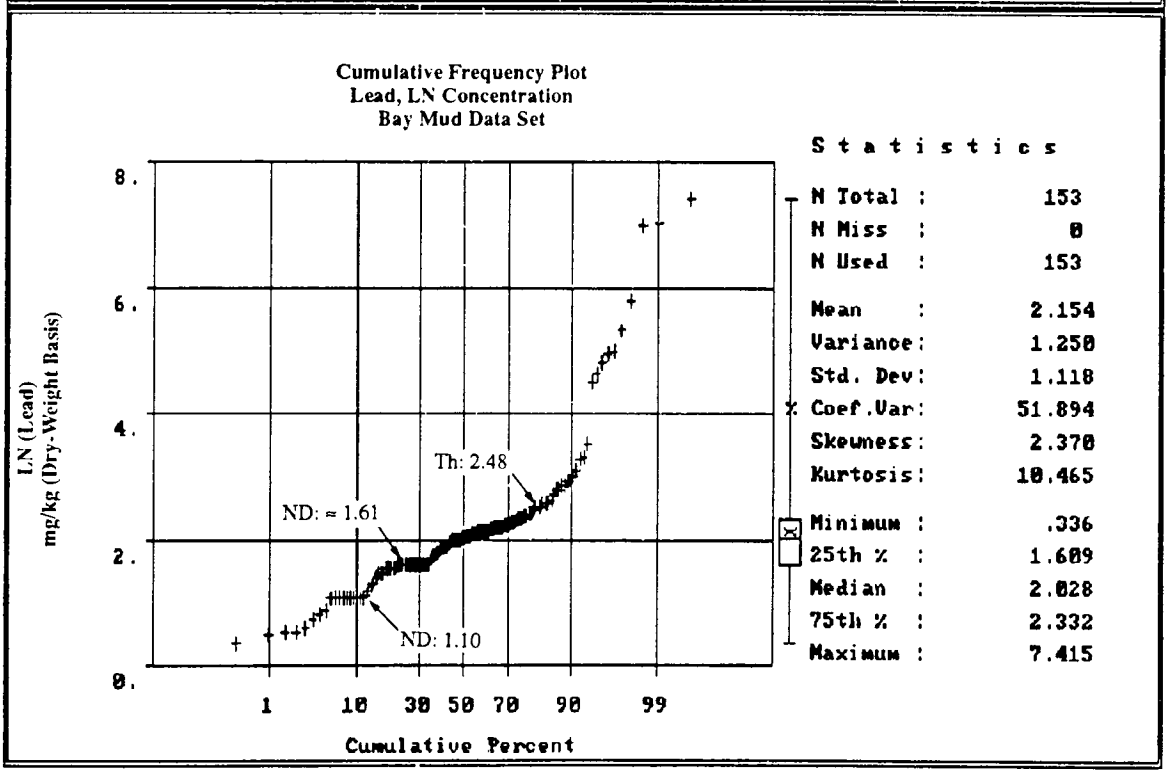
Lead, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A100

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25862





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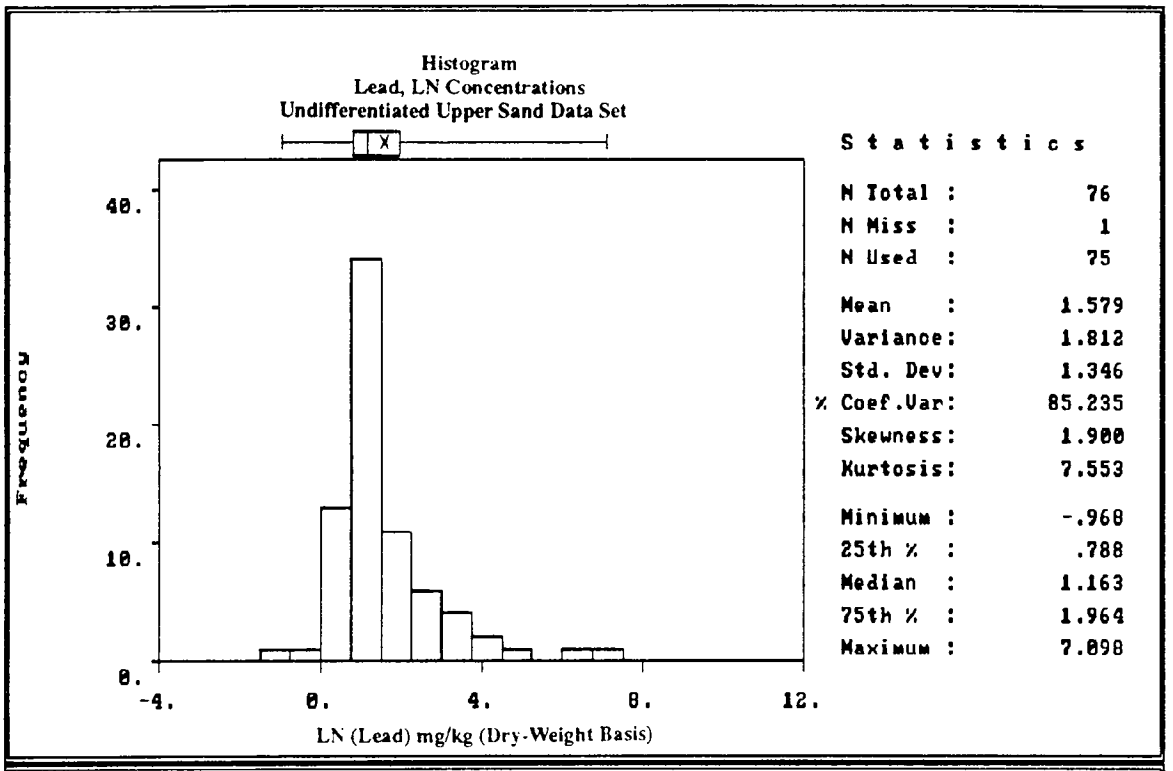
Engineering and
Environmental Services

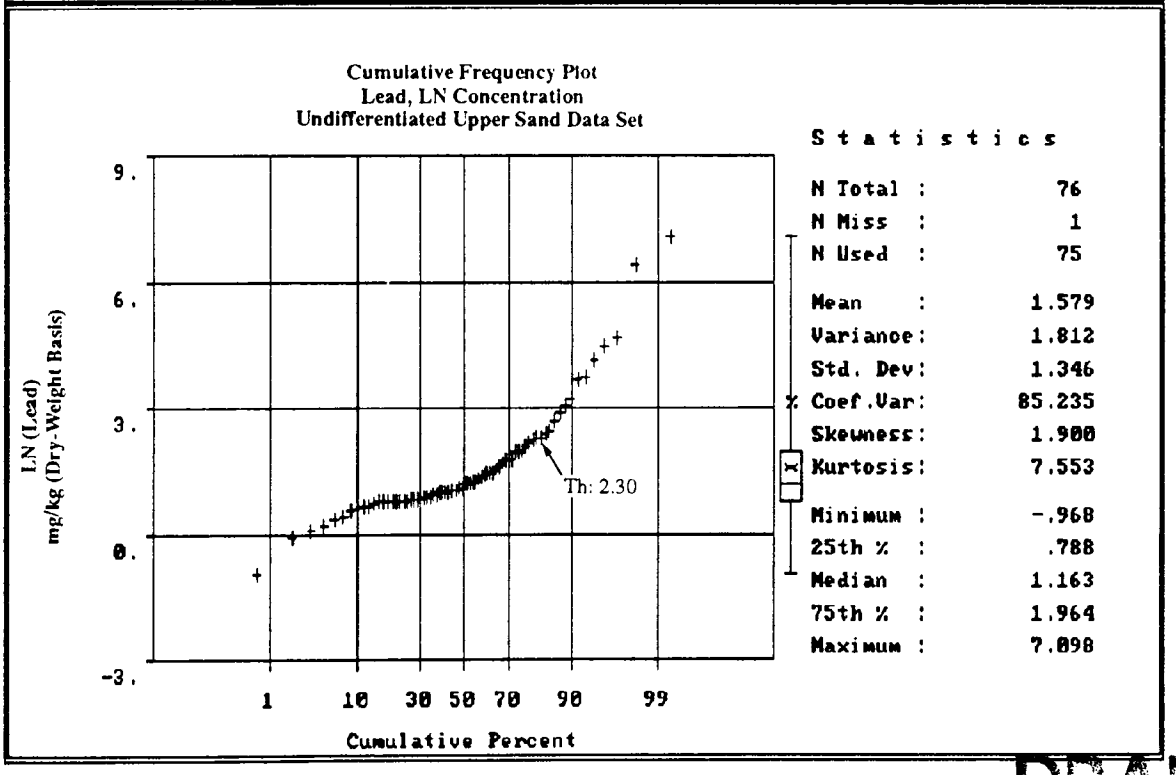
Lead, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A101

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25863





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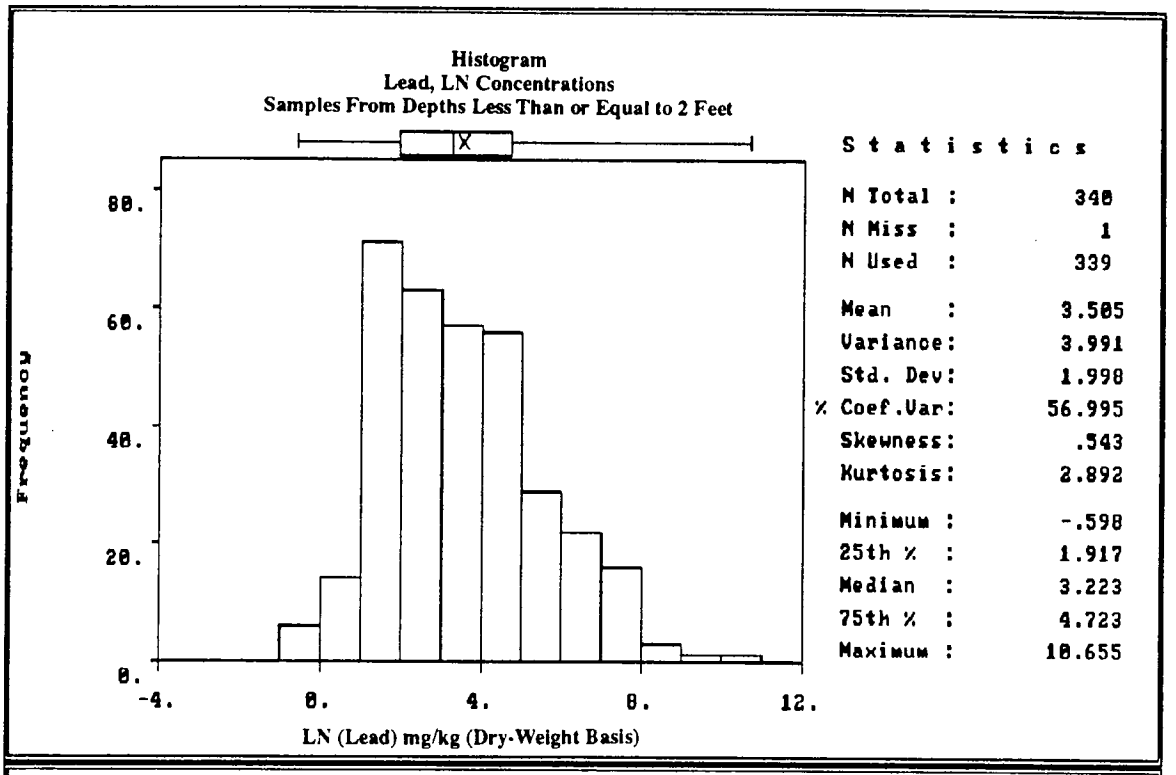
Engineering and
Environmental Services

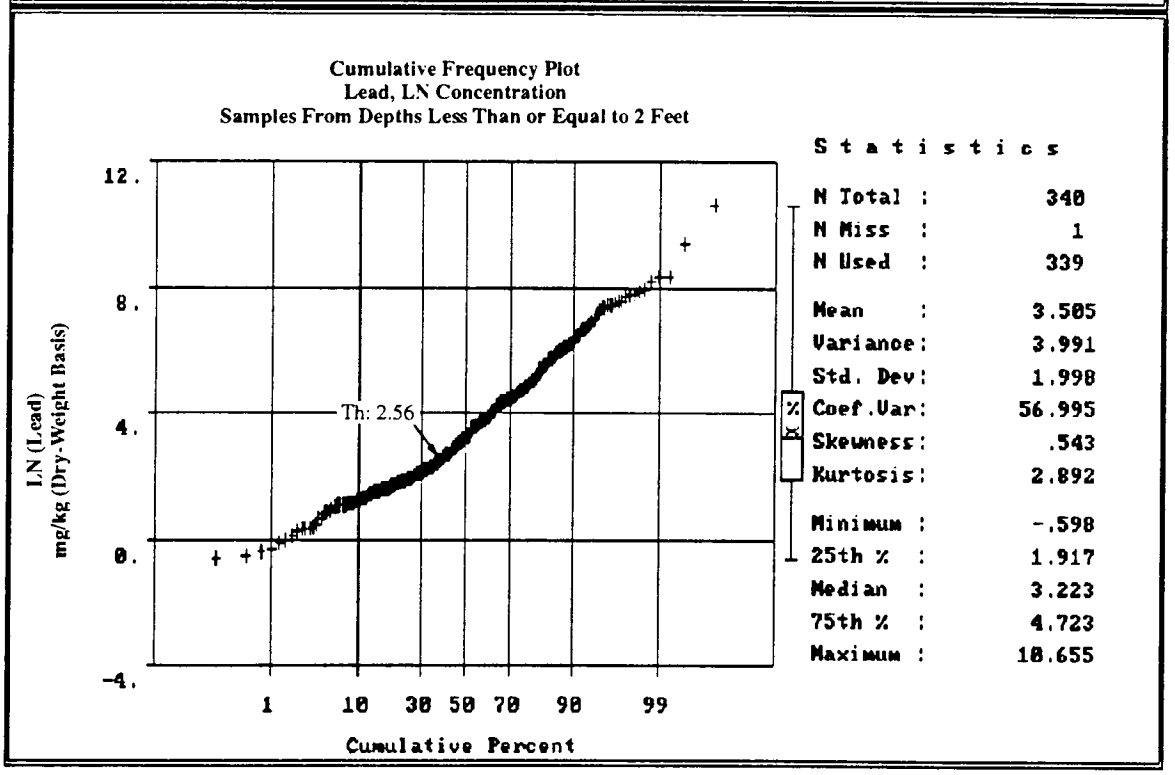
Lead, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A102

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25864





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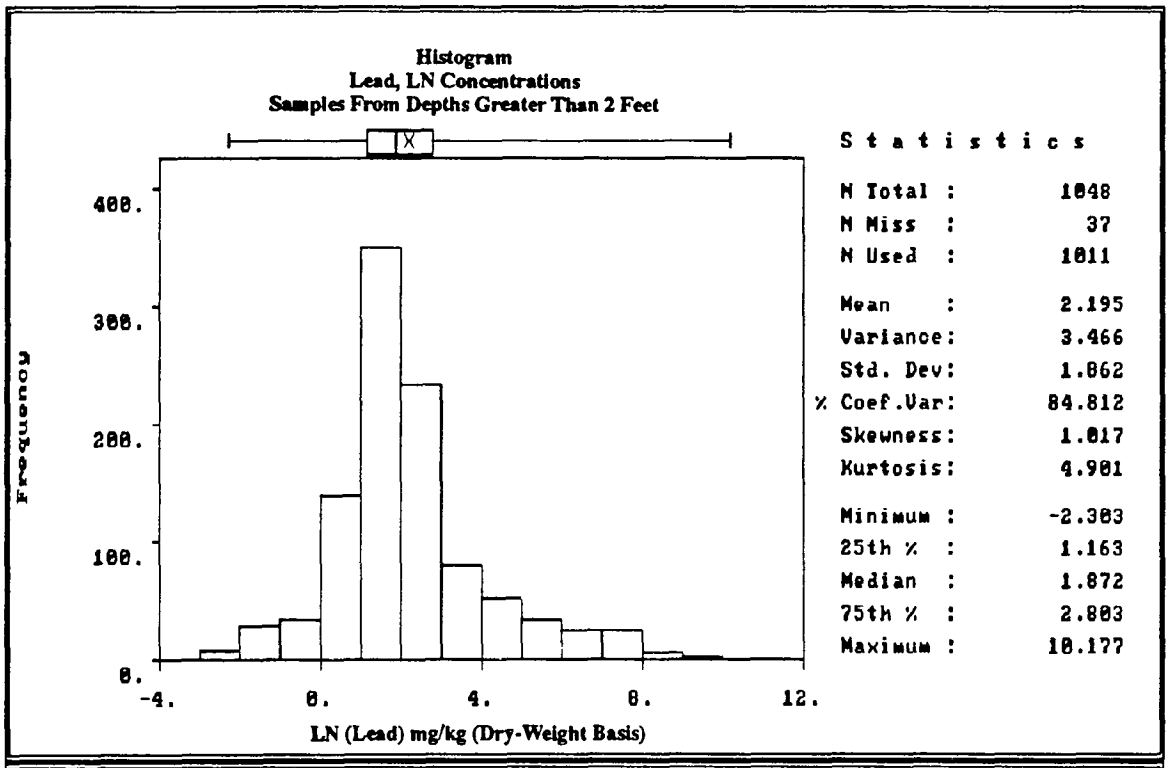
Engineering and Environmental Services

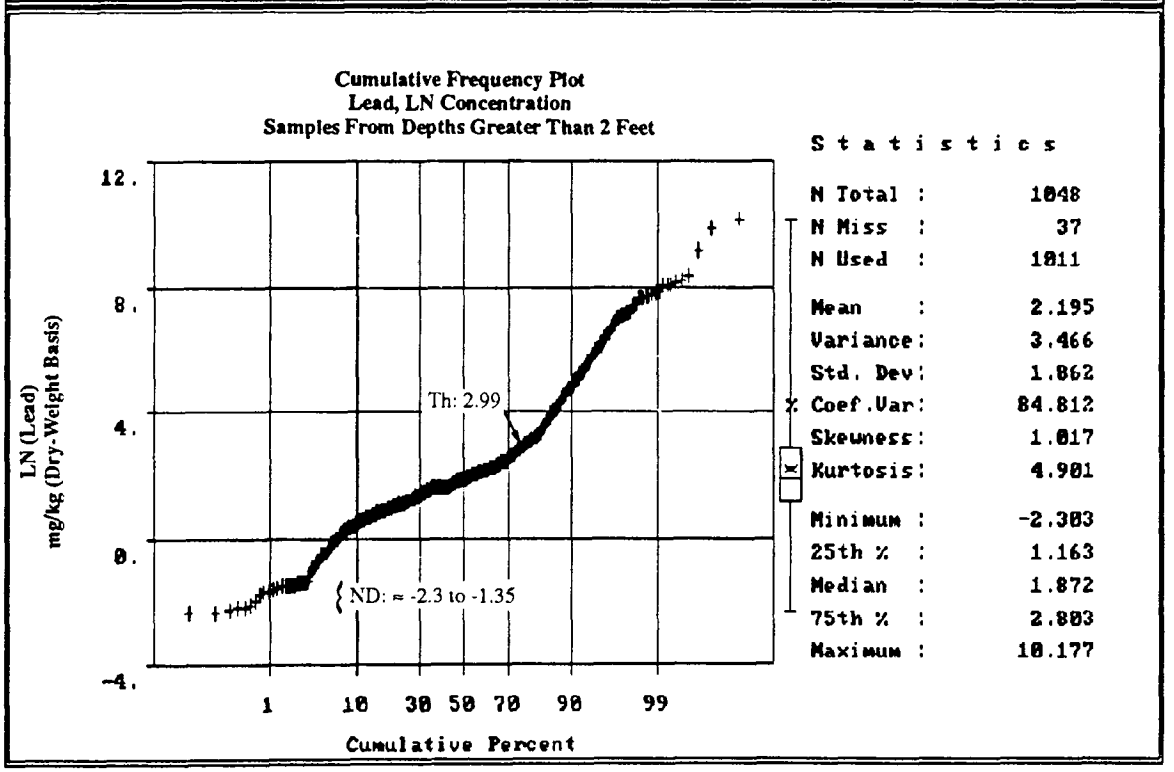
Lead, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A103**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25865





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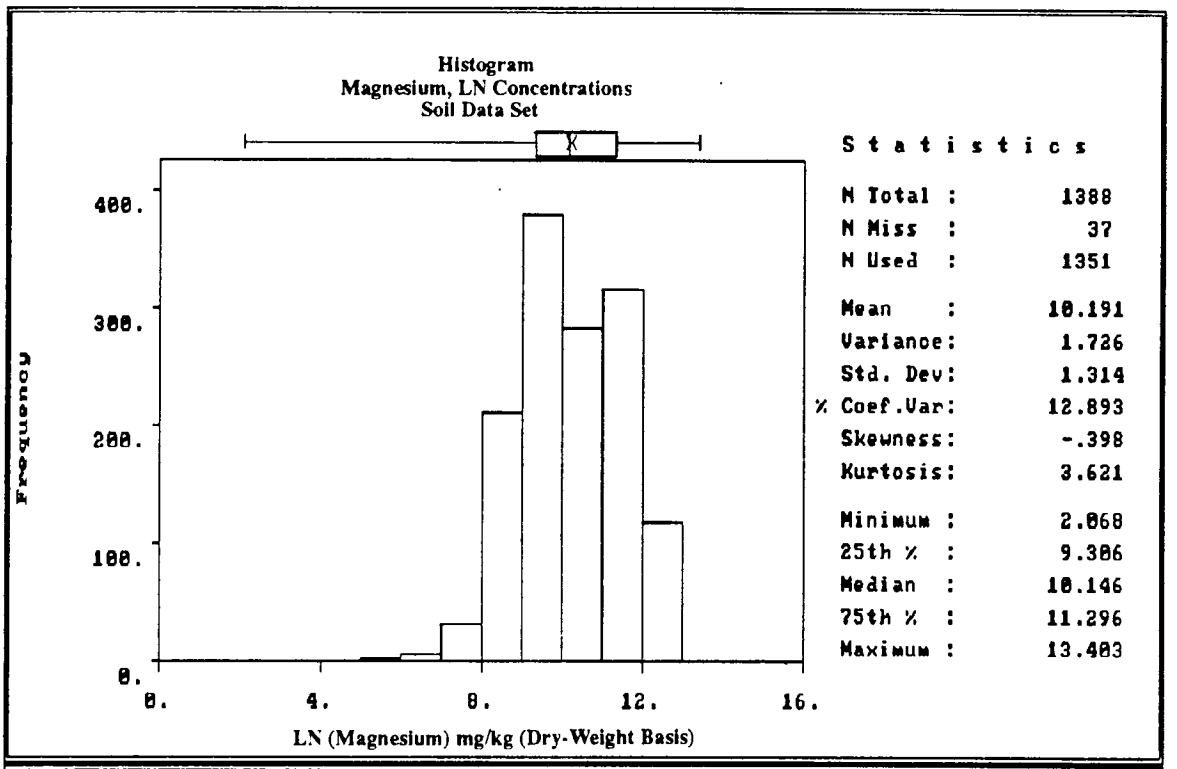
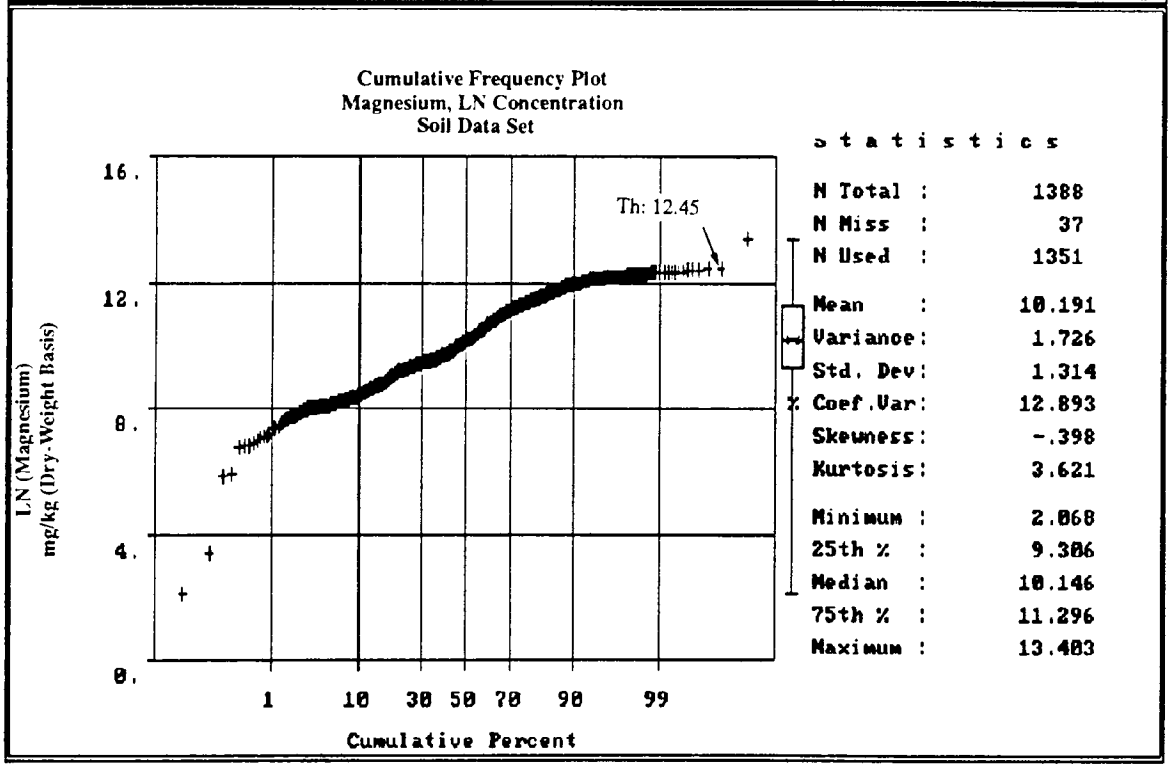
Engineering and
Environmental Services

Lead, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A104

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92





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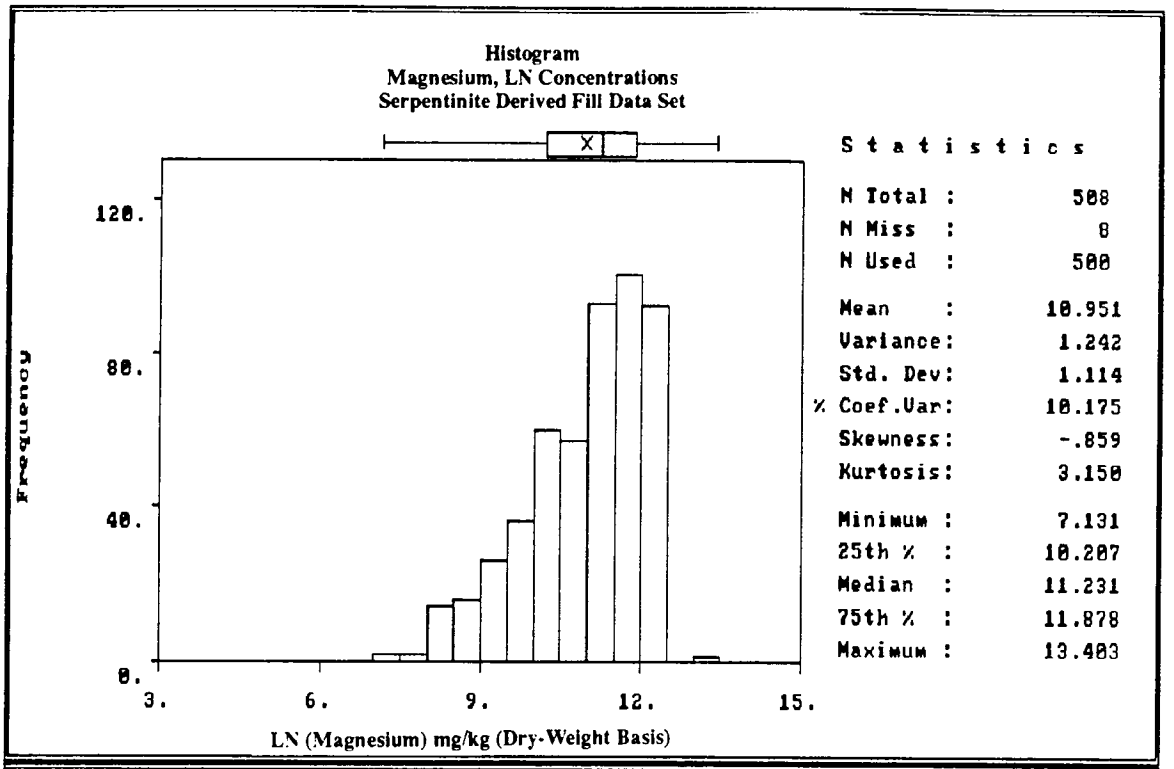
Engineering and
Environmental Services

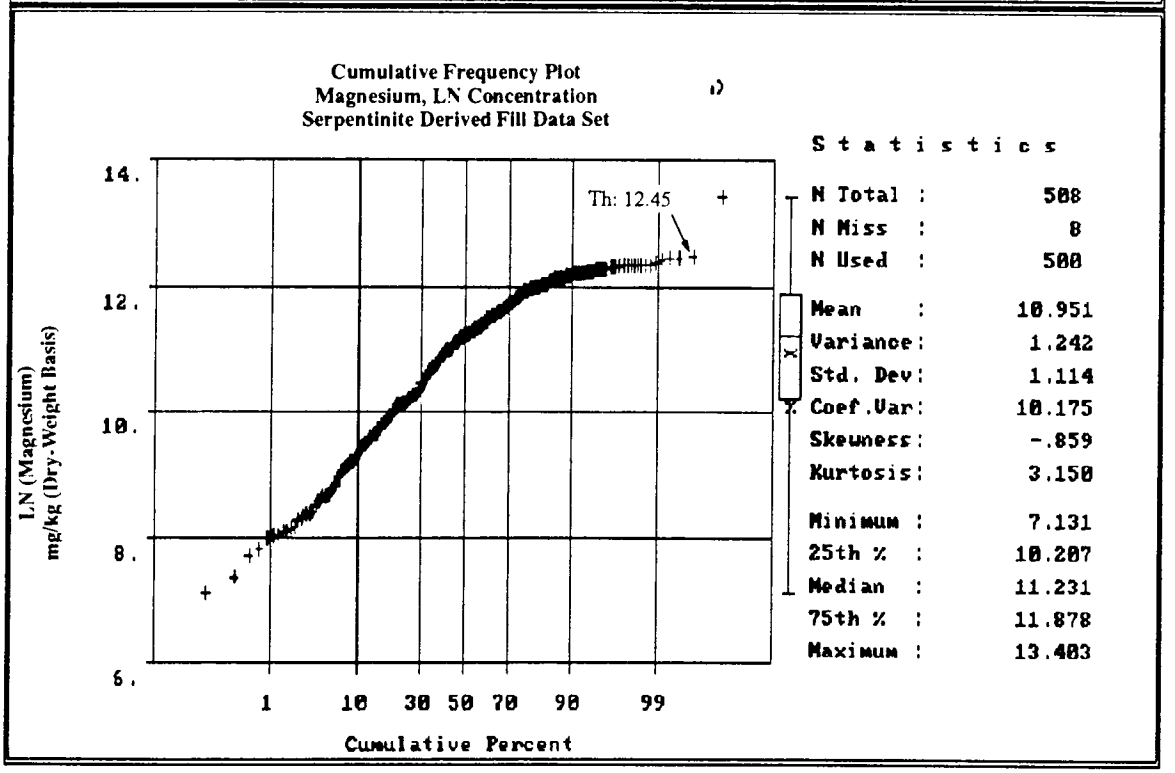
Magnesium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A105

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25867





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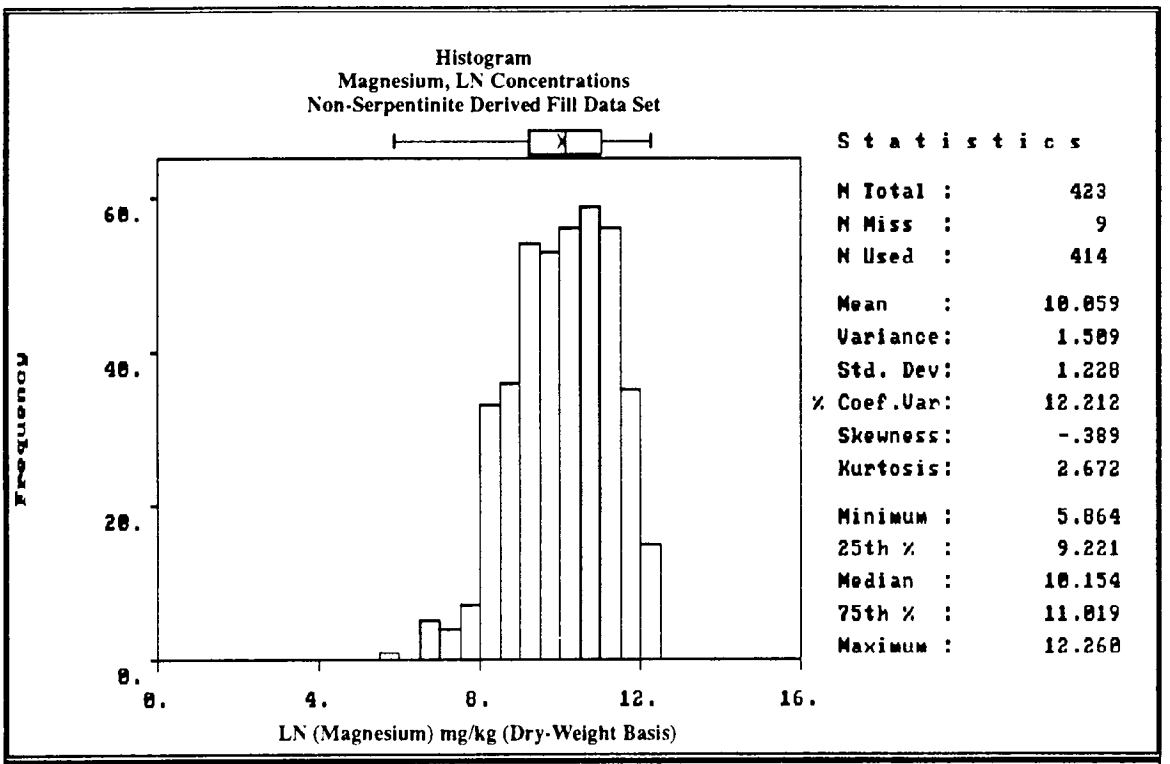
Environmental Services

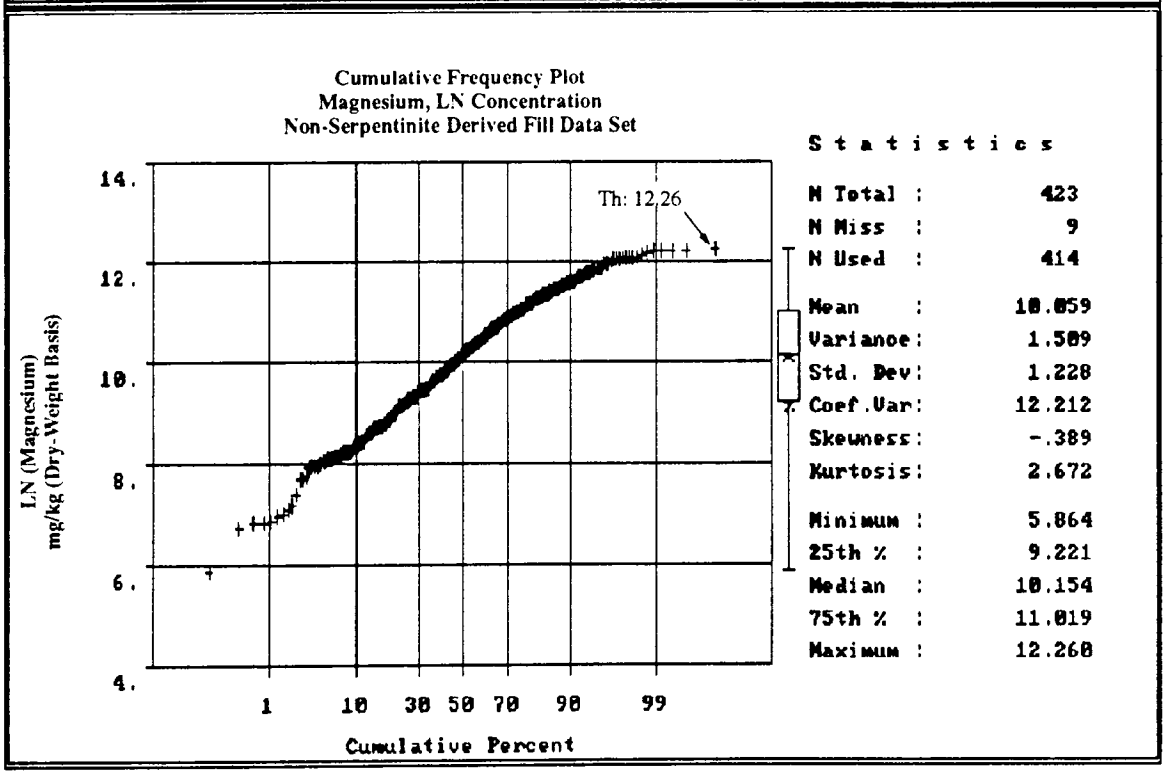
Magnesium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A106

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25868





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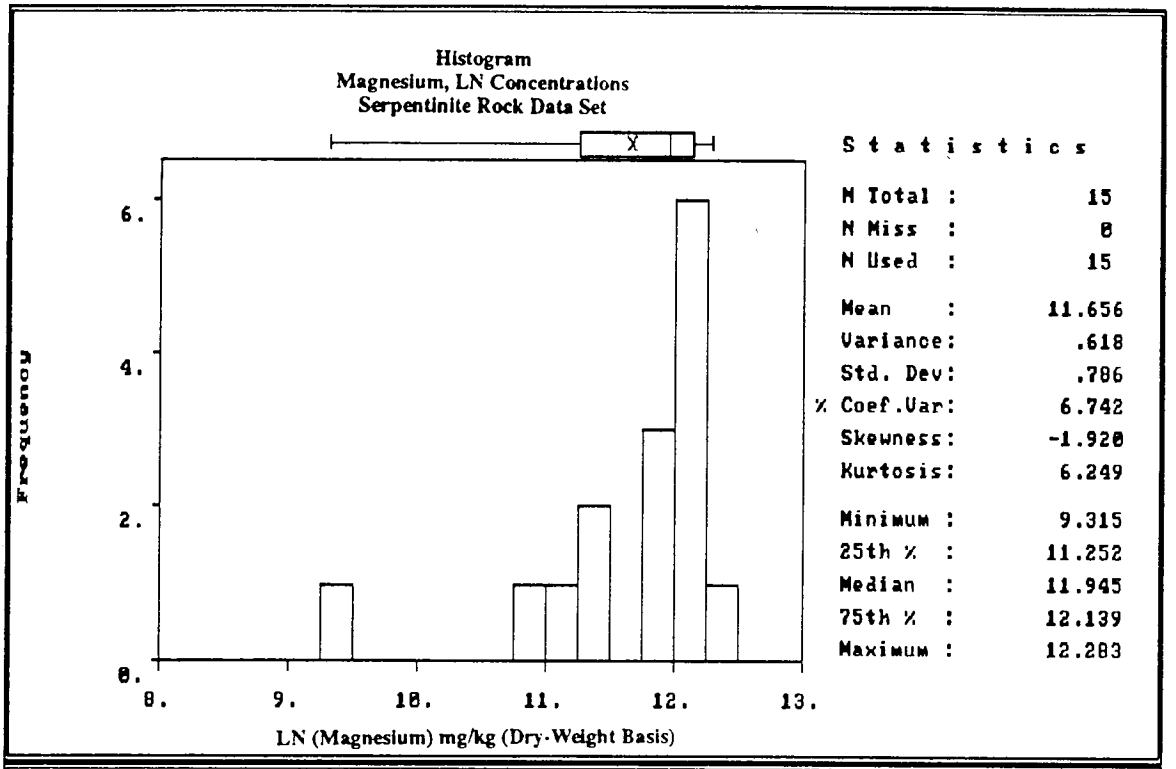
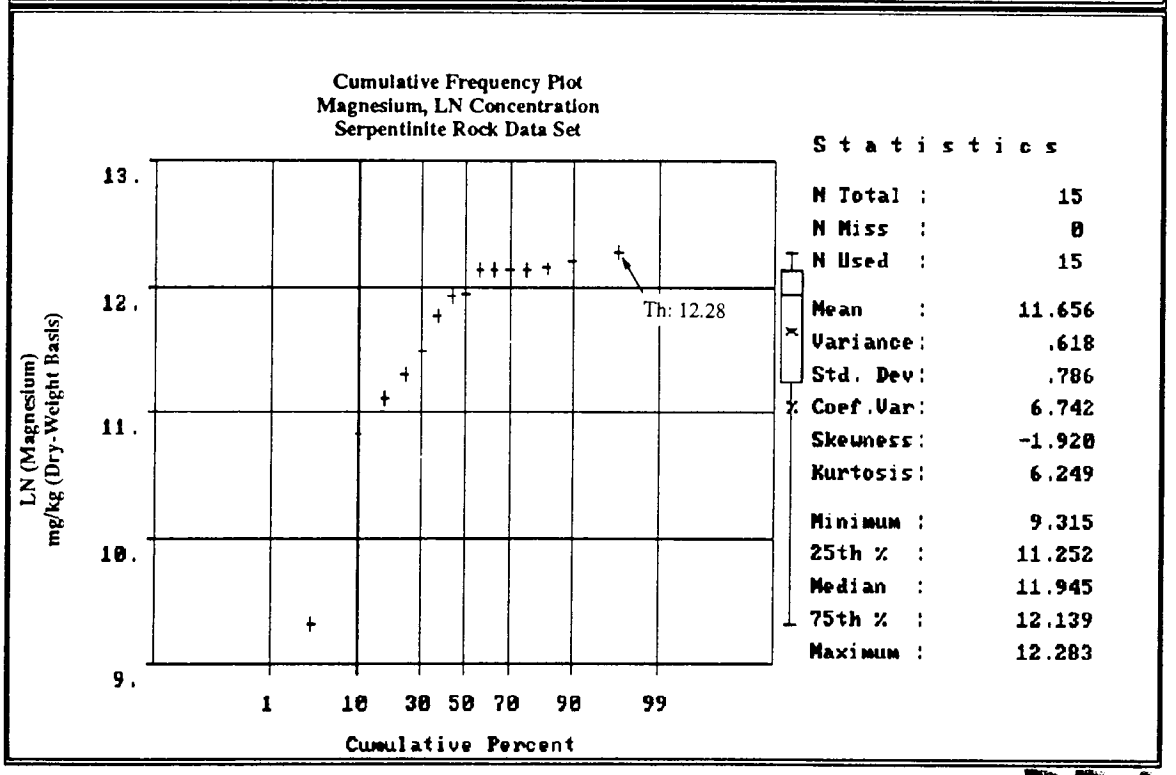
Magnesium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A107

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25869





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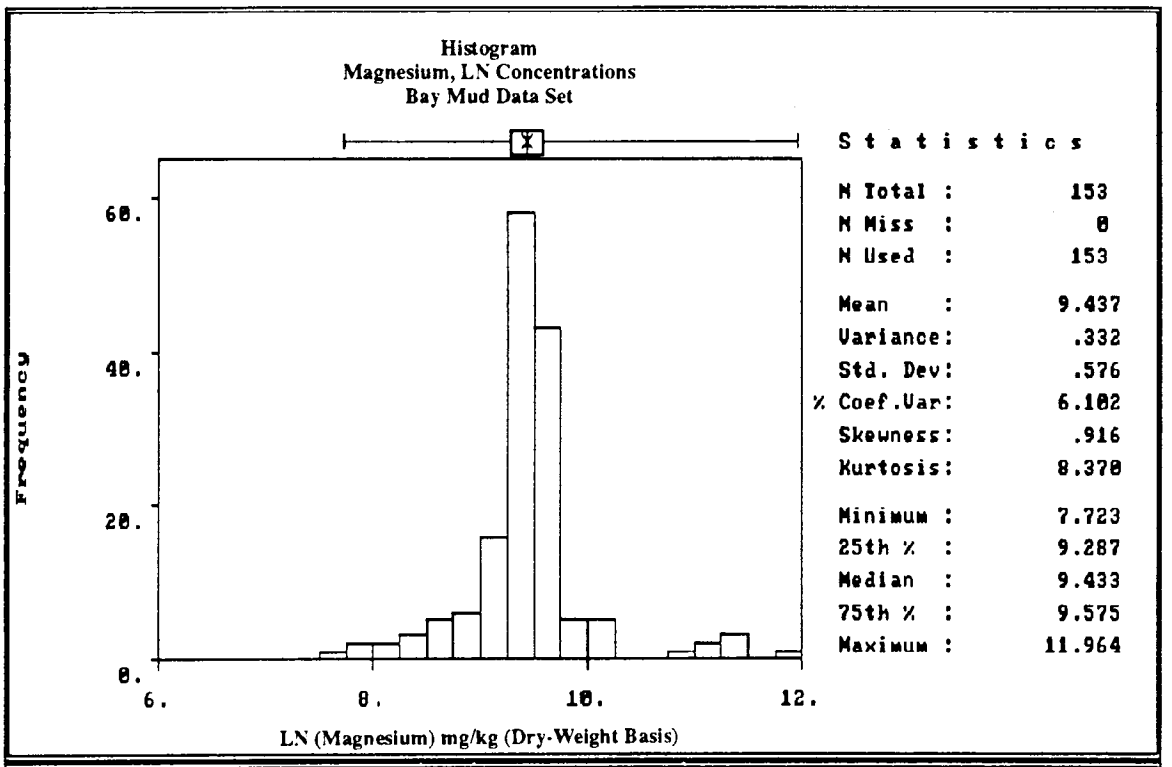
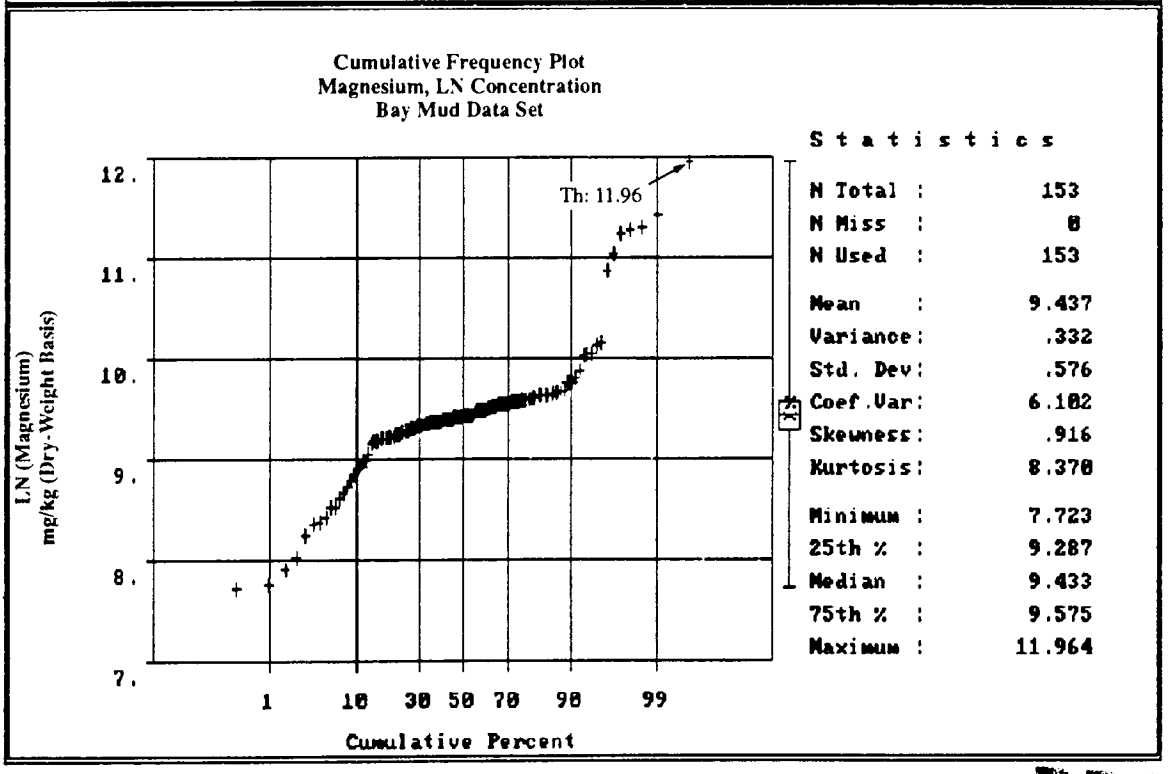
Magnesium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A108

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25870





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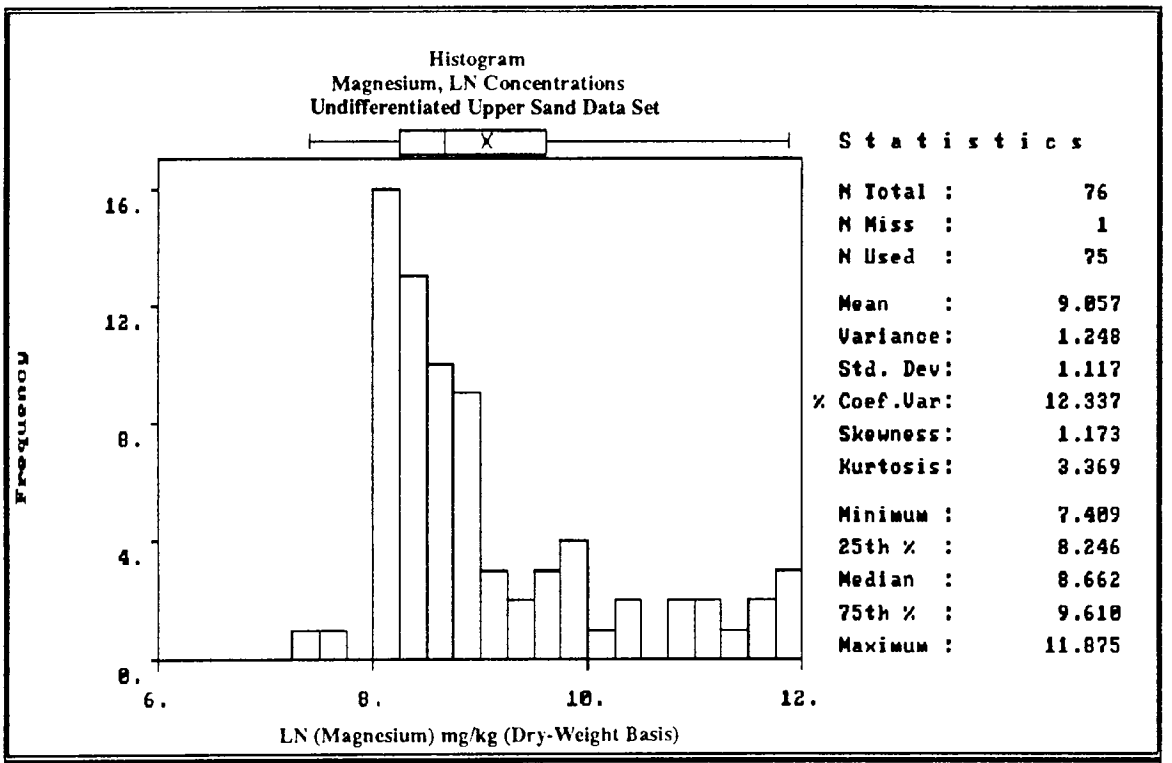
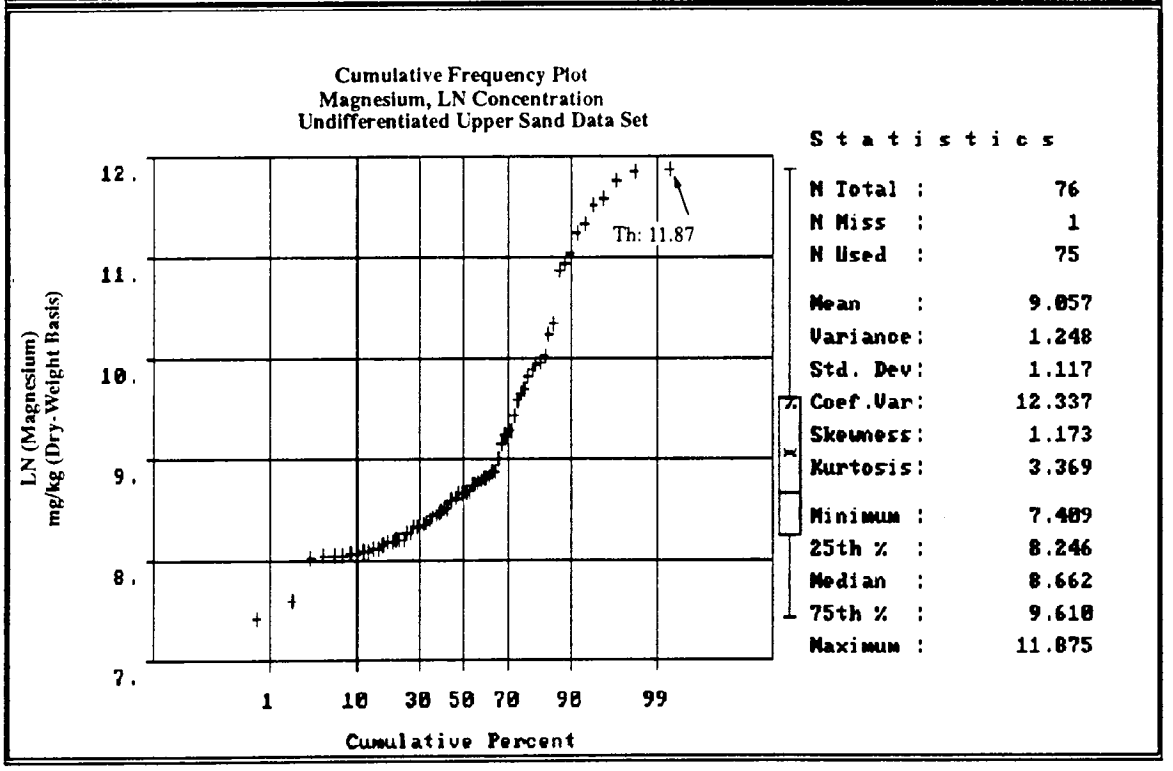
Magnesium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A109

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25871





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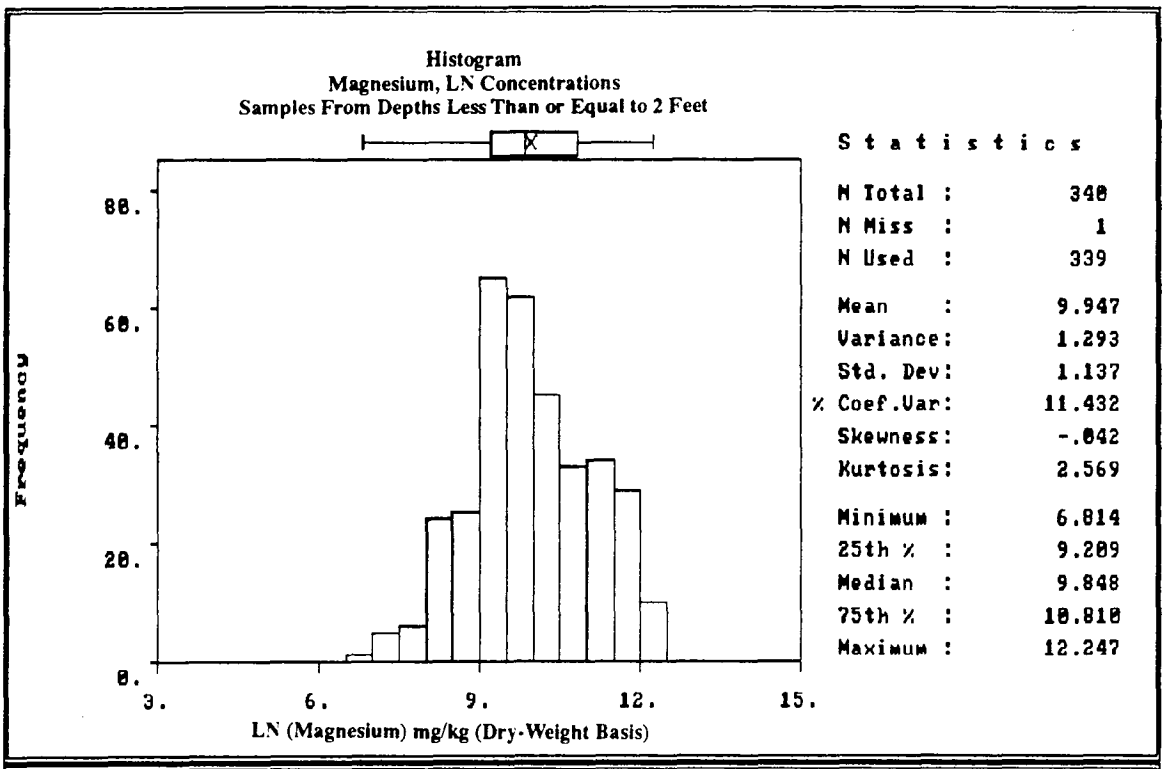
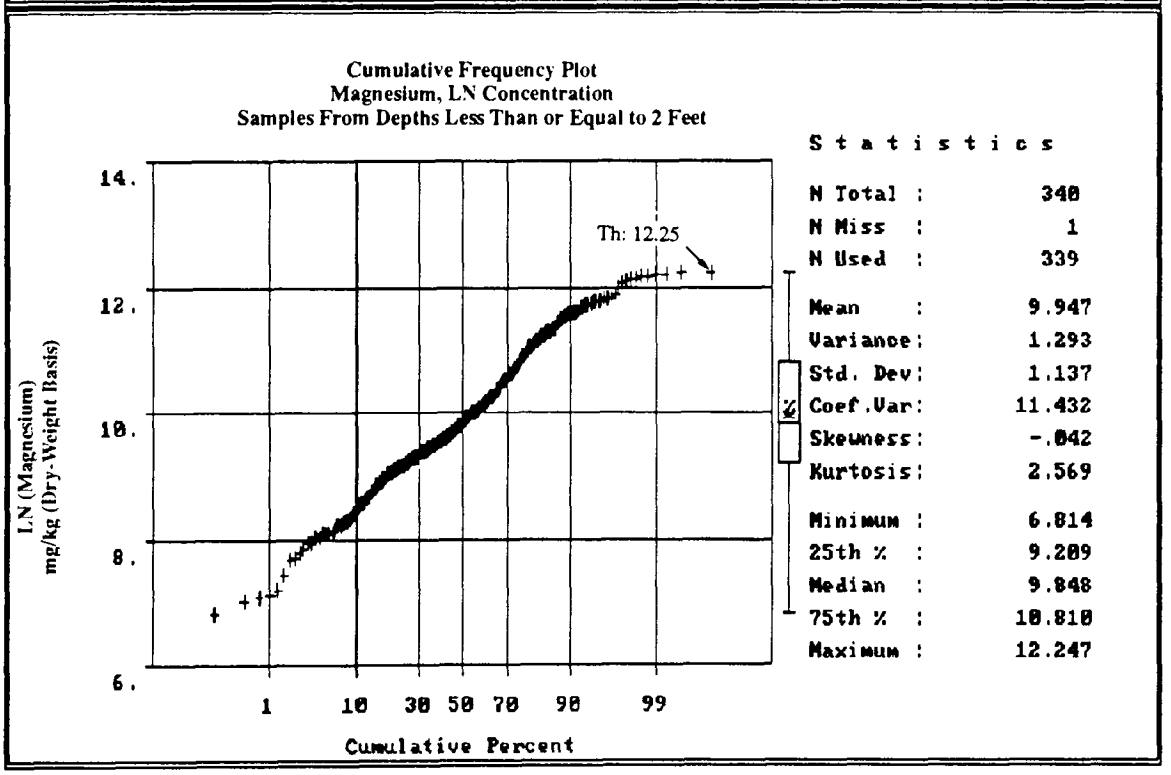
Magnesium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A110

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25872





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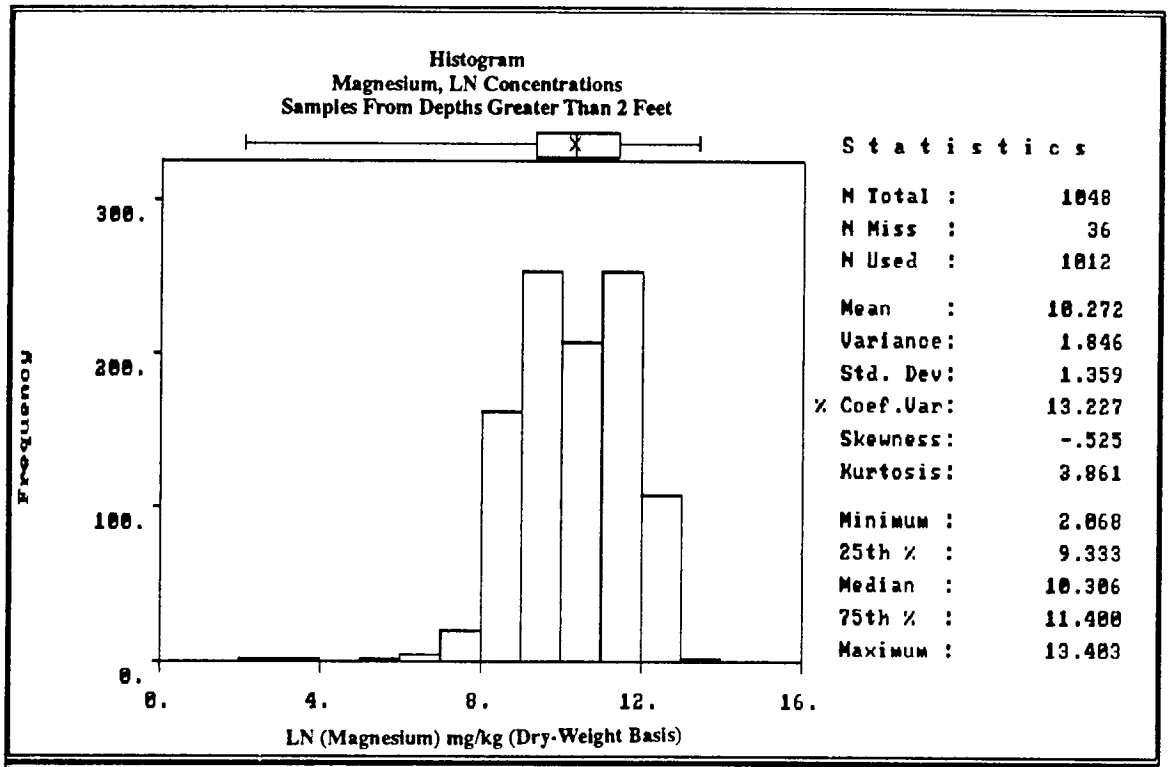
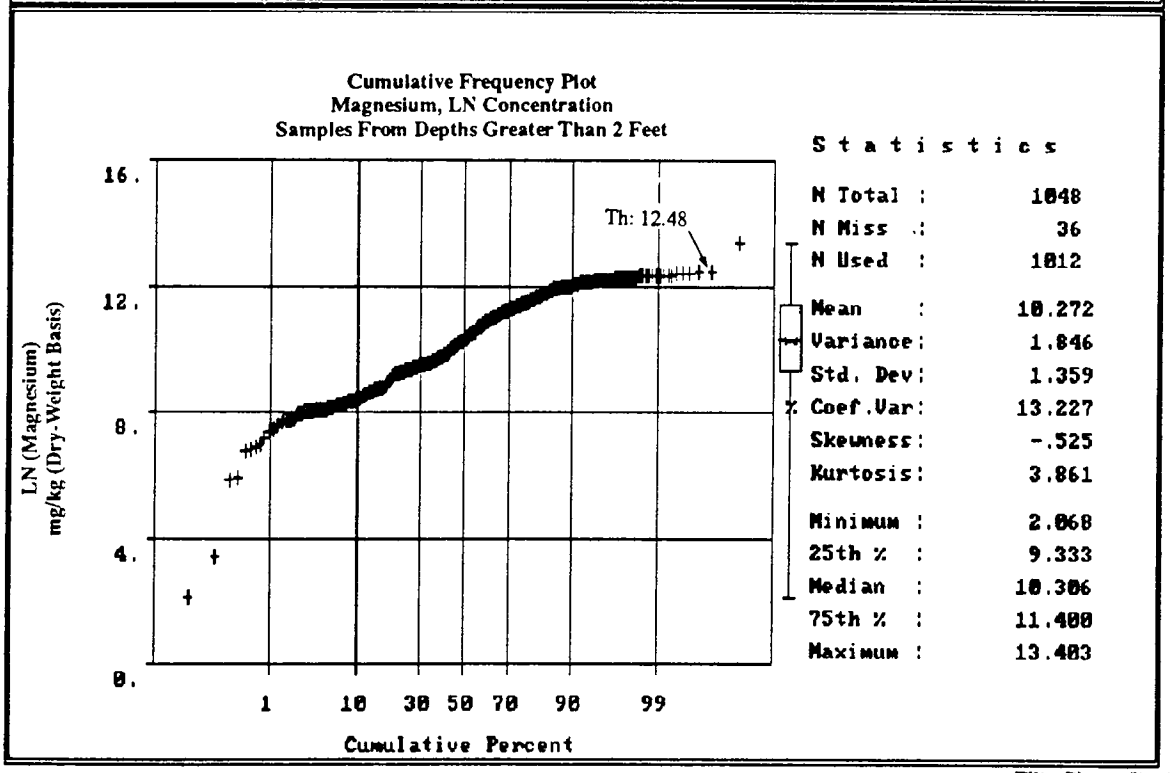
Magnesium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A111**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25873





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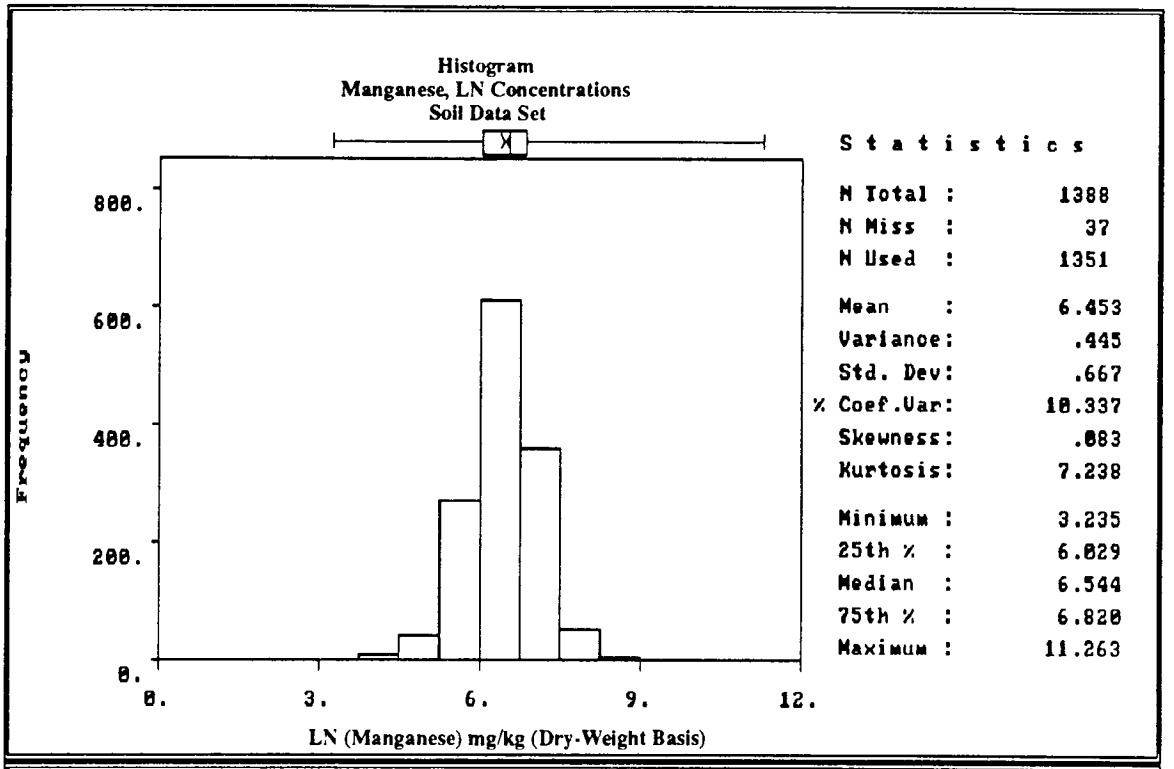
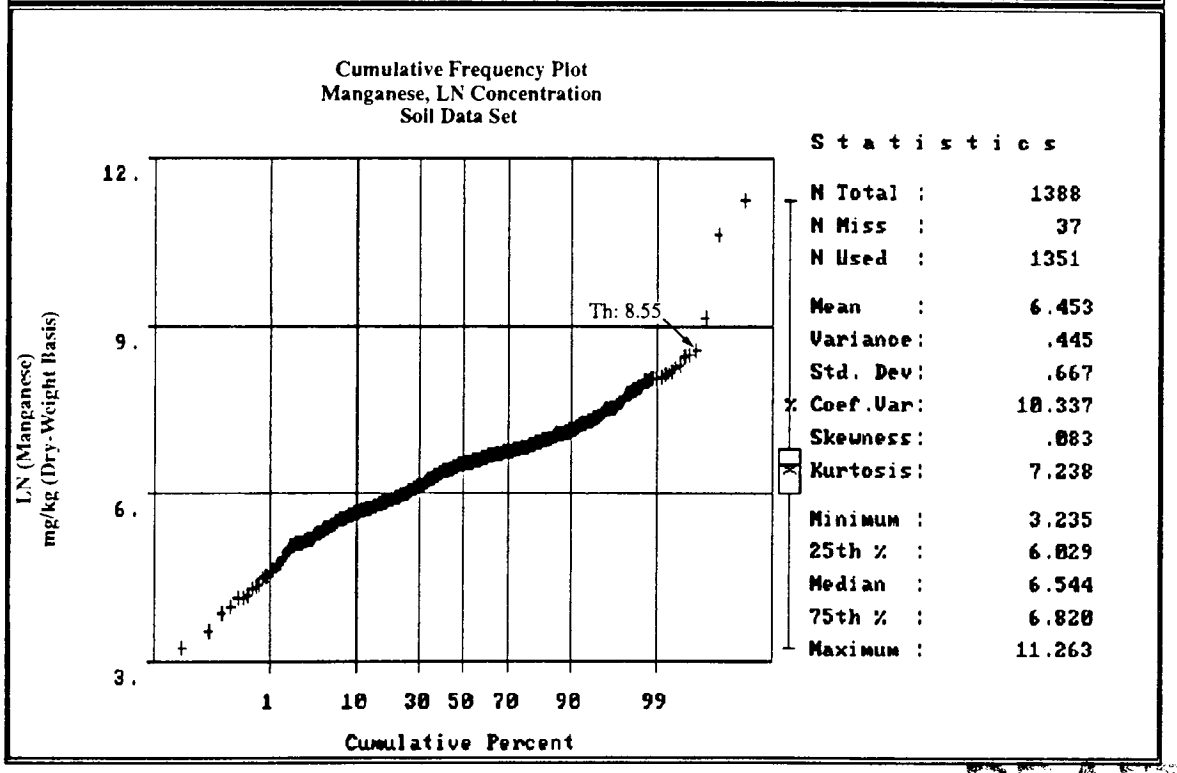
Magnesium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A112**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25874





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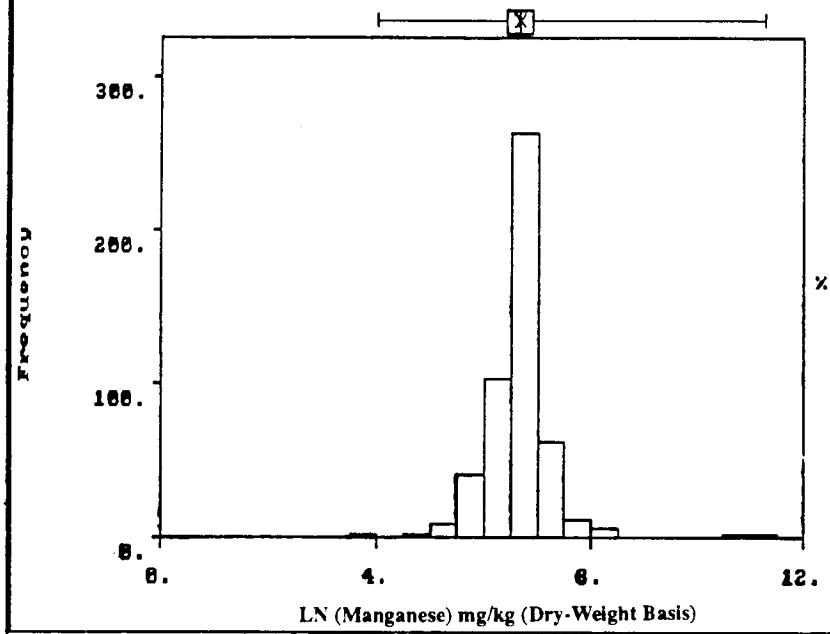
Manganese, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A113

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

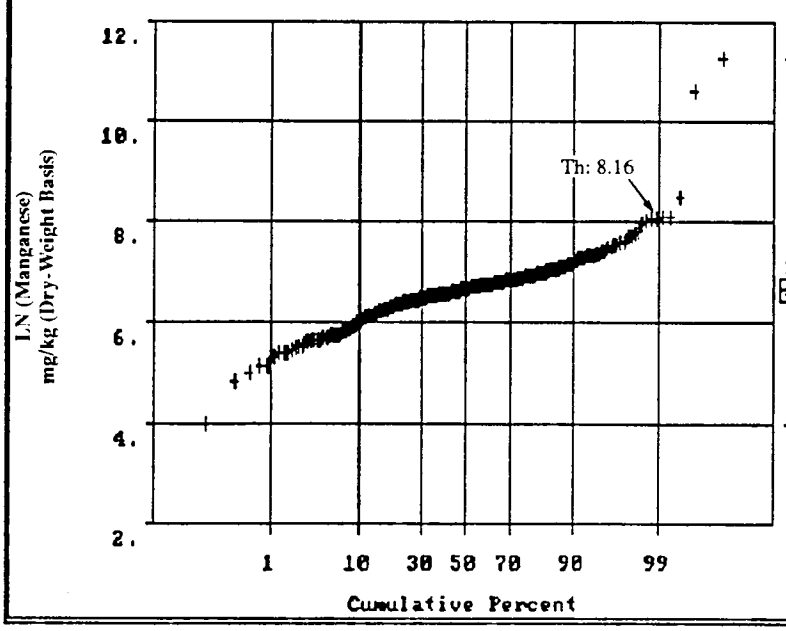
25875

Histogram
Manganese, LN Concentrations
Serpentinite Derived Fill Data Set



Statistics	
N Total :	508
N Miss :	0
N Used :	508
Mean :	6.650
Variance:	.319
Std. Dev:	.565
% Coef.Var:	8.491
Skewness:	1.417
Kurtosis:	17.343
Minimum :	3.989
25th % :	6.422
Median :	6.667
75th % :	6.882
Maximum :	11.263

Cumulative Frequency Plot
Manganese, LN Concentration
Serpentinite Derived Fill Data Set



Statistics	
N Total :	508
N Miss :	0
N Used :	508
Mean :	6.650
Variance:	.319
Std. Dev:	.565
Coef.Var:	8.491
Skewness:	1.417
Kurtosis:	17.343
Minimum :	3.989
25th % :	6.422
Median :	6.667
75th % :	6.882
Maximum :	11.263

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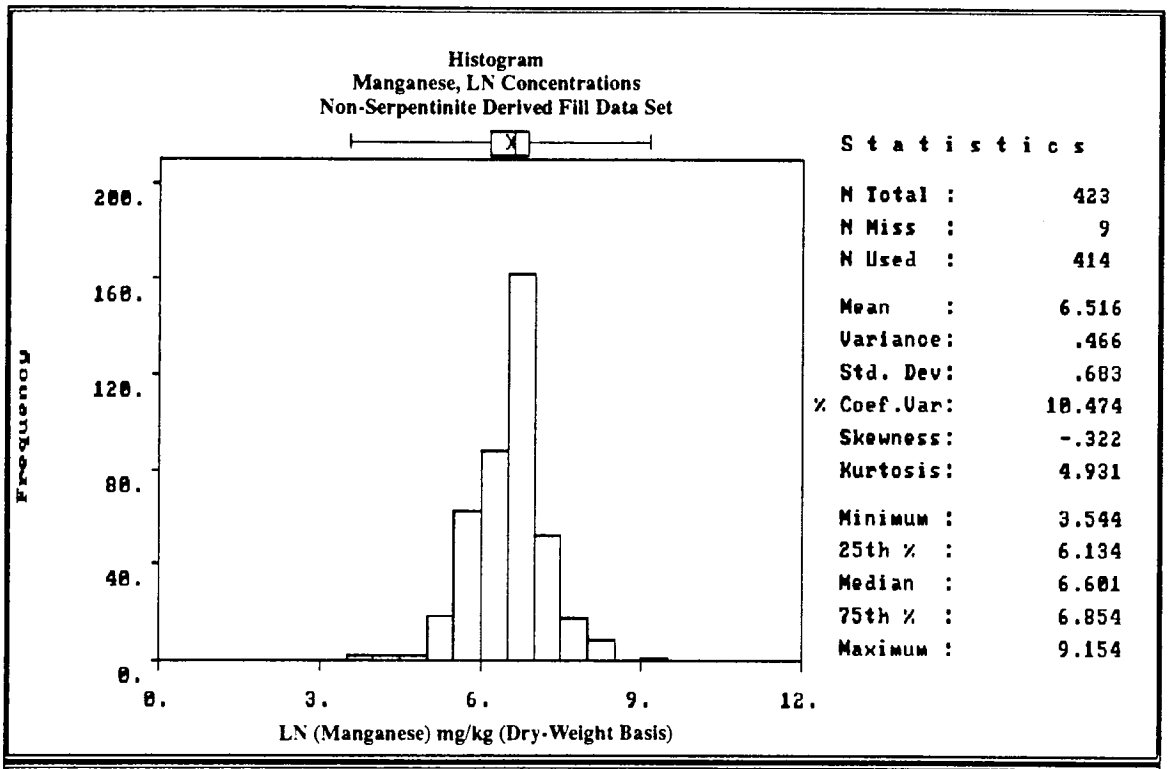
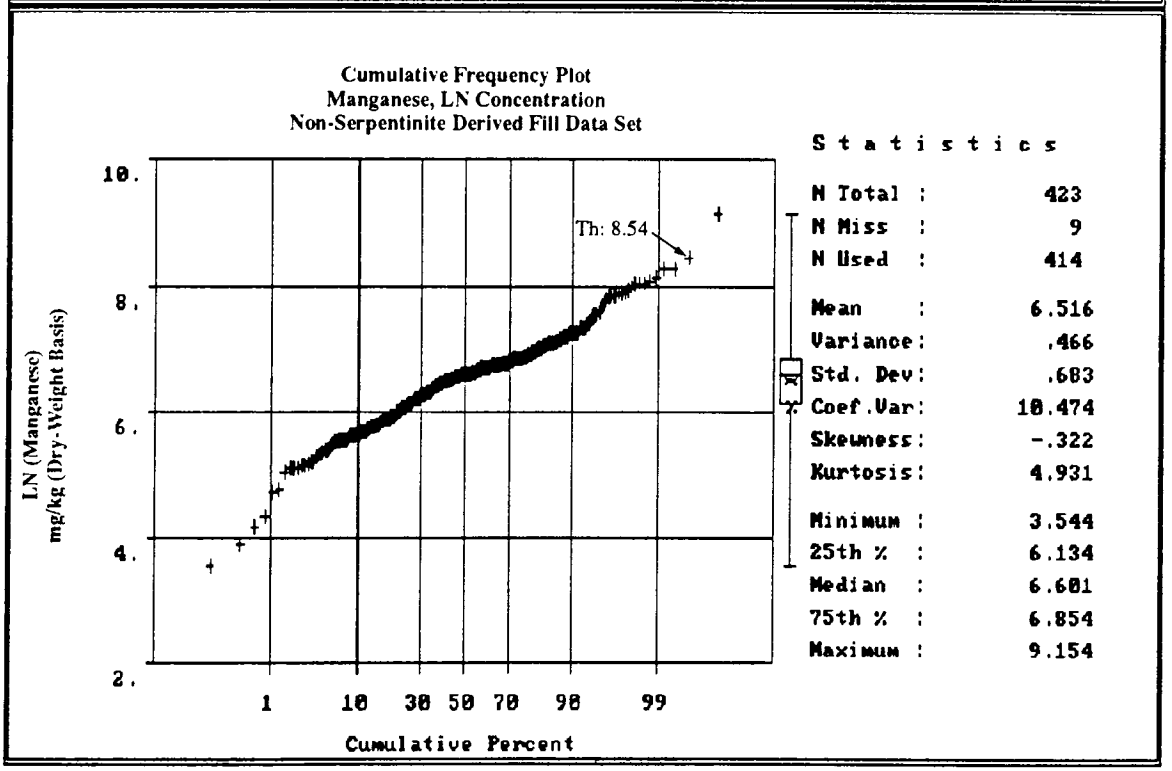
Manganese, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A114

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25876





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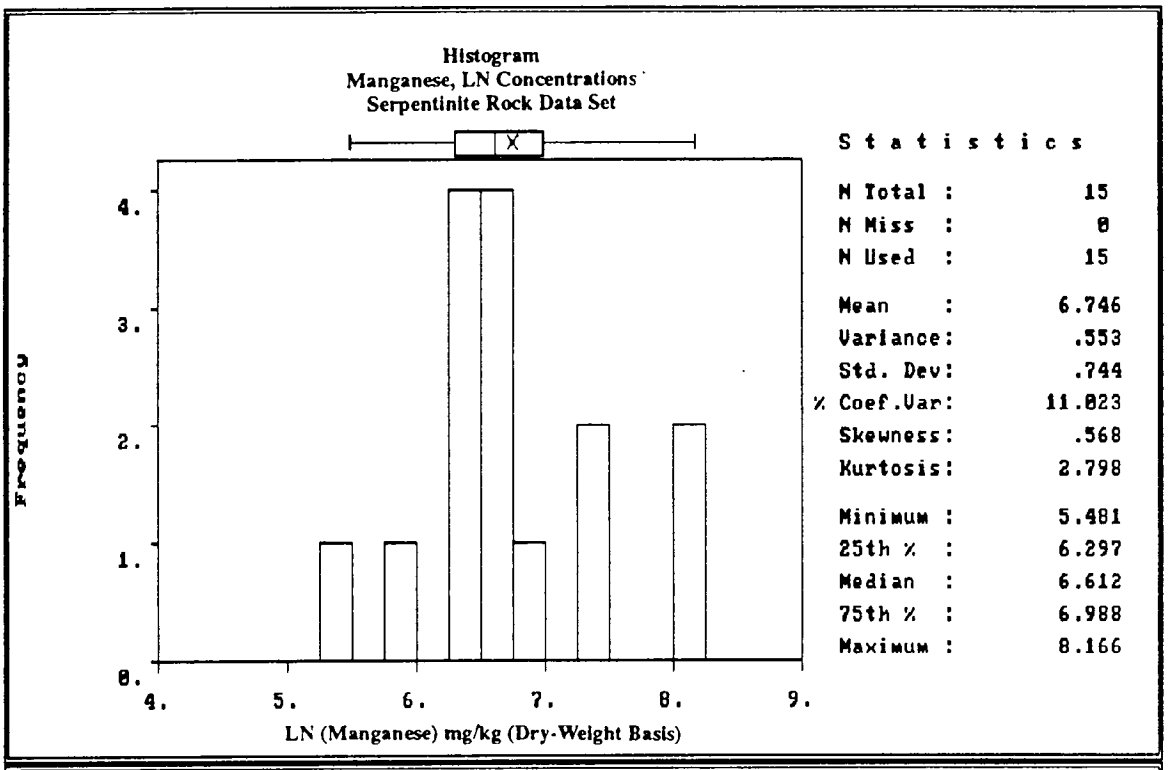
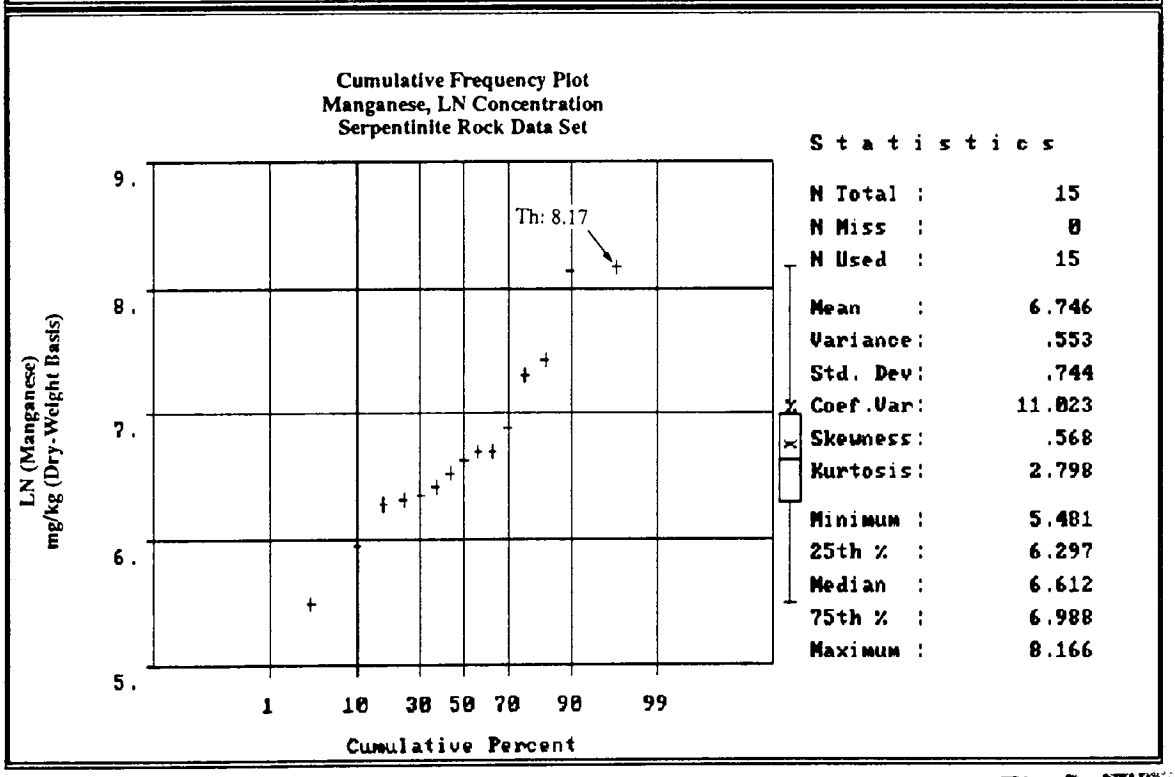
Manganese, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A115

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CTM	2/92	

25877





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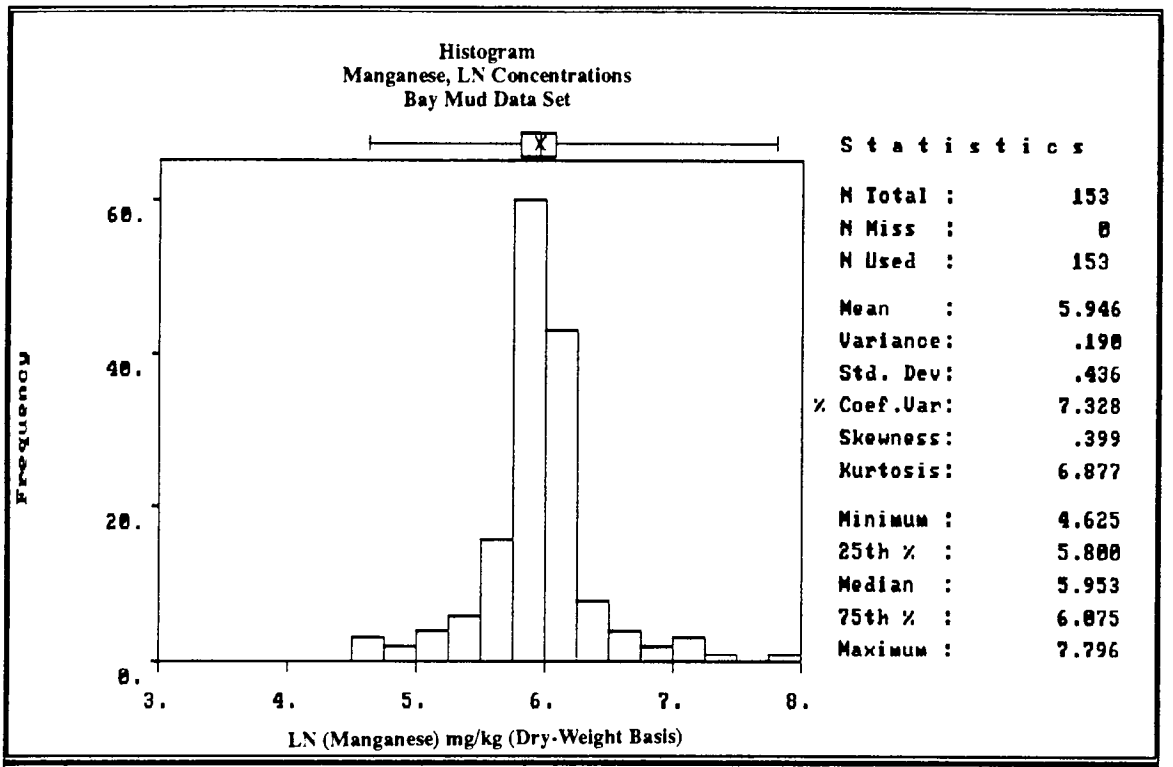
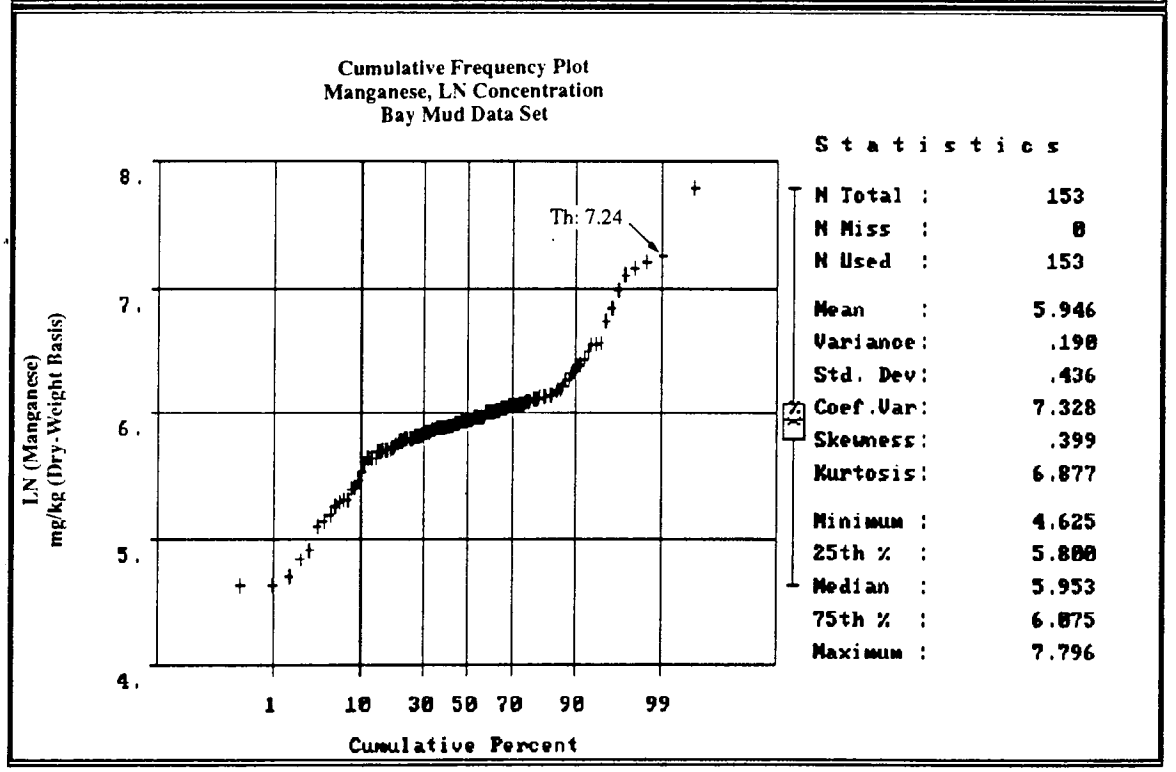
Manganese, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A116

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	

25878





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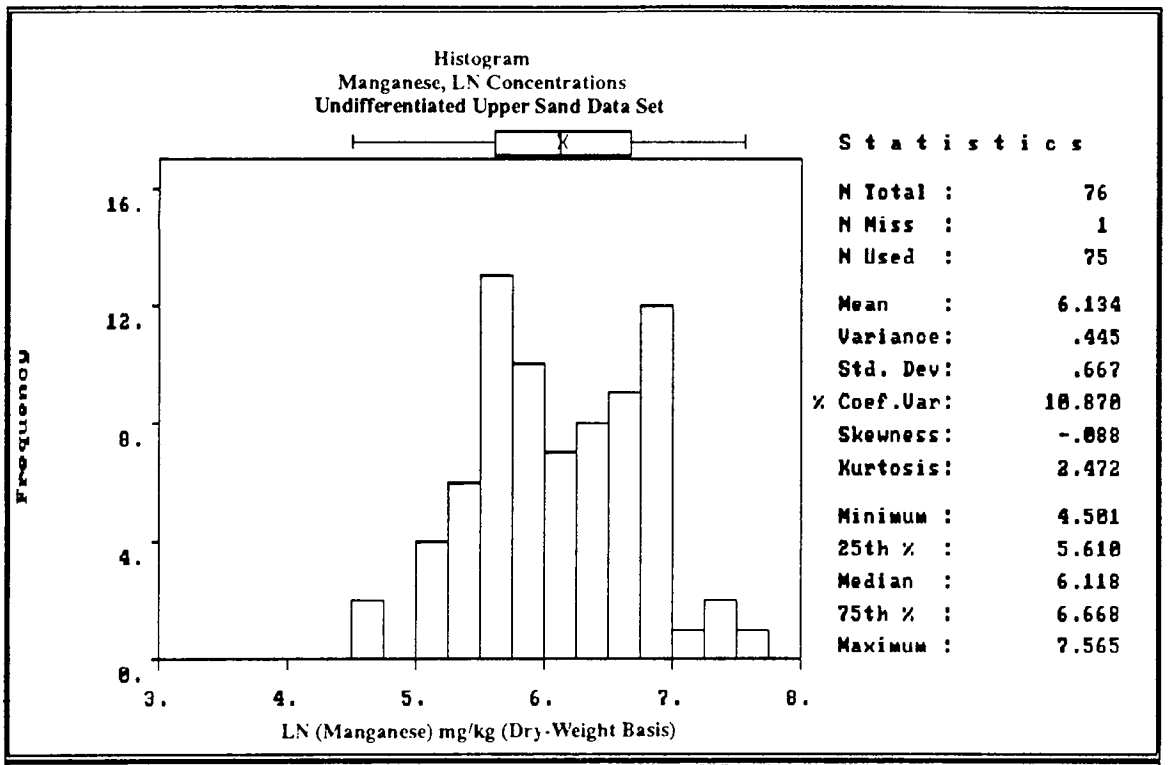
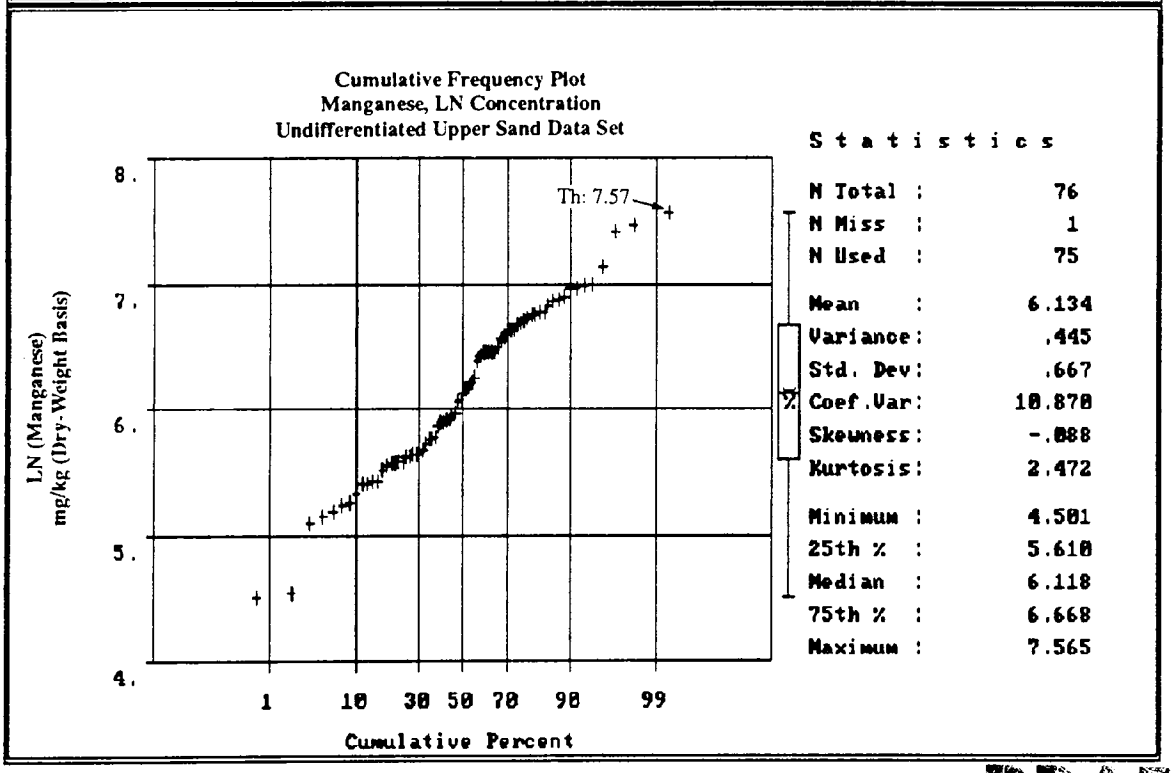
Manganese, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A117

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25879





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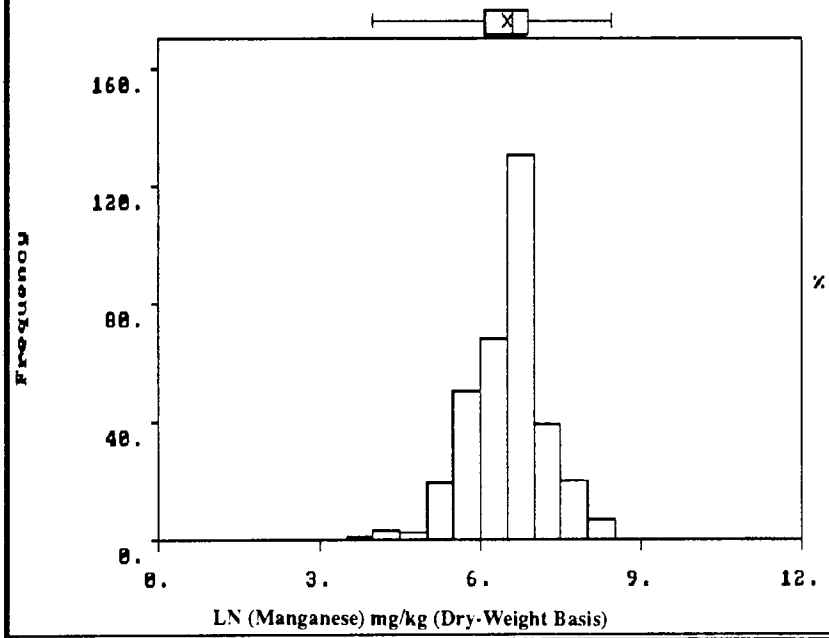
Manganese, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A118

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

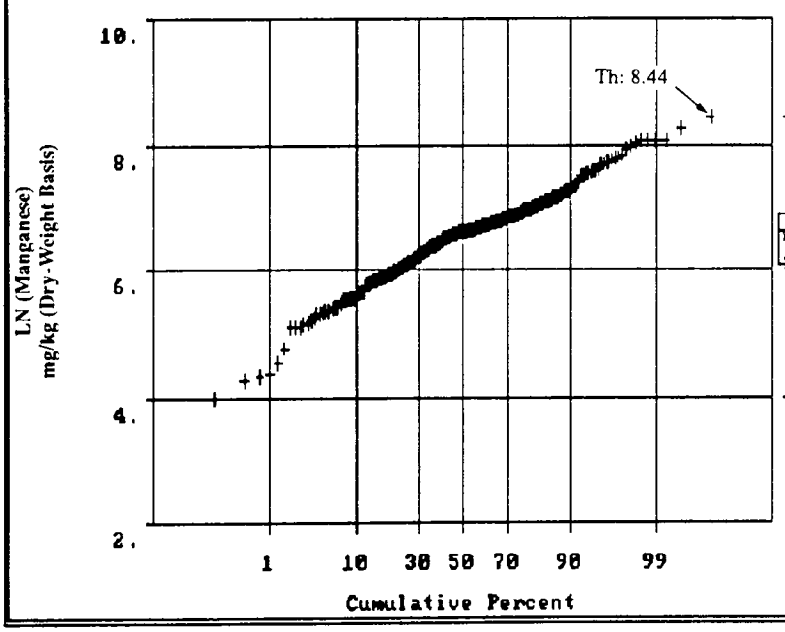
25880

Histogram
Manganese, LN Concentrations
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	1
N Used :	339
Mean :	6.511
Variance:	.470
Std. Dev:	.686
% Coef.Var:	10.528
Skewness:	-.377
Kurtosis:	3.945
Minimum :	3.989
25th % :	6.086
Median :	6.605
75th % :	6.892
Maximum :	8.442

Cumulative Frequency Plot
Manganese, LN Concentration
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	1
N Used :	339
Mean :	6.511
Variance:	.470
Std. Dev:	.686
Coef.Var:	10.528
Skewness:	-.377
Kurtosis:	3.945
Minimum :	3.989
25th % :	6.086
Median :	6.605
75th % :	6.892
Maximum :	8.442

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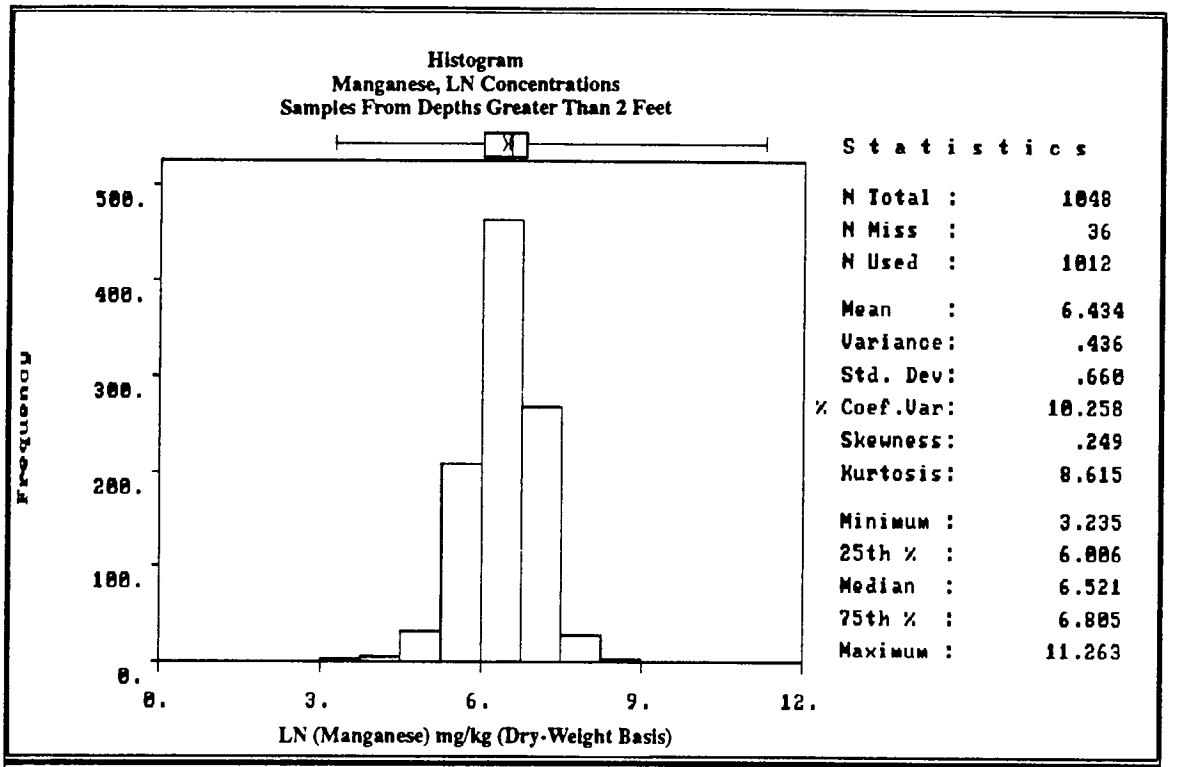
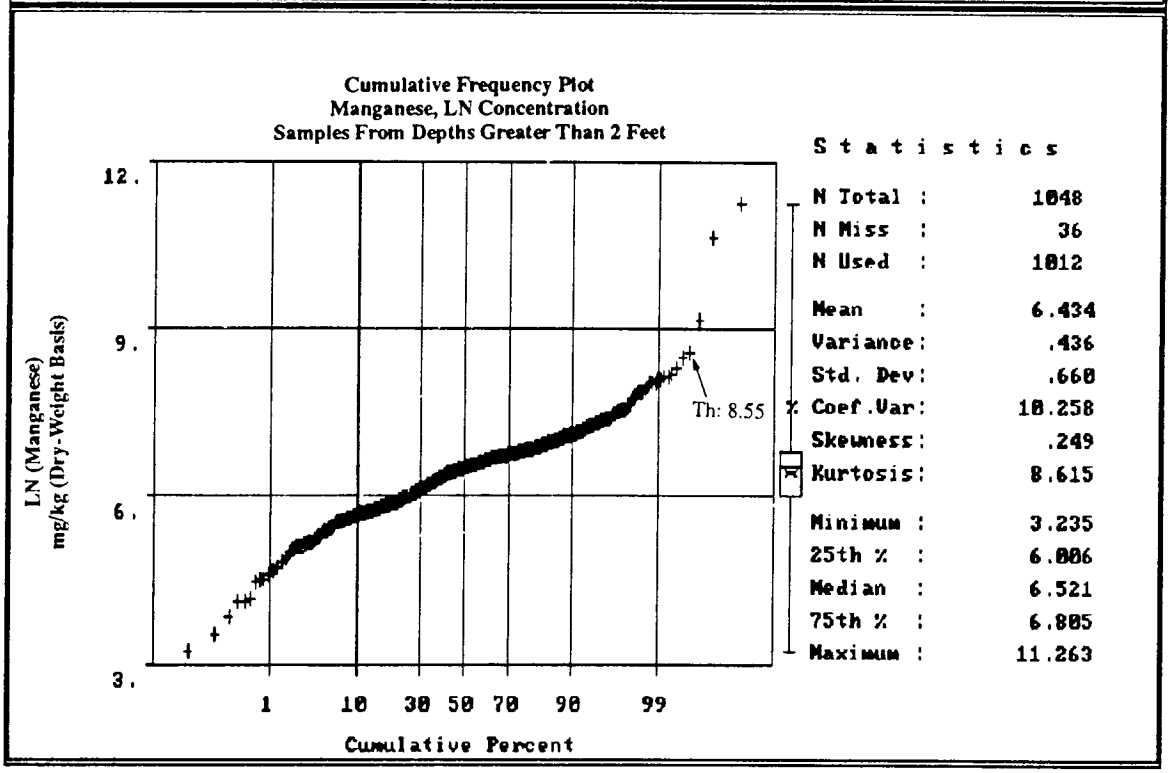
Manganese, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A119**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25881





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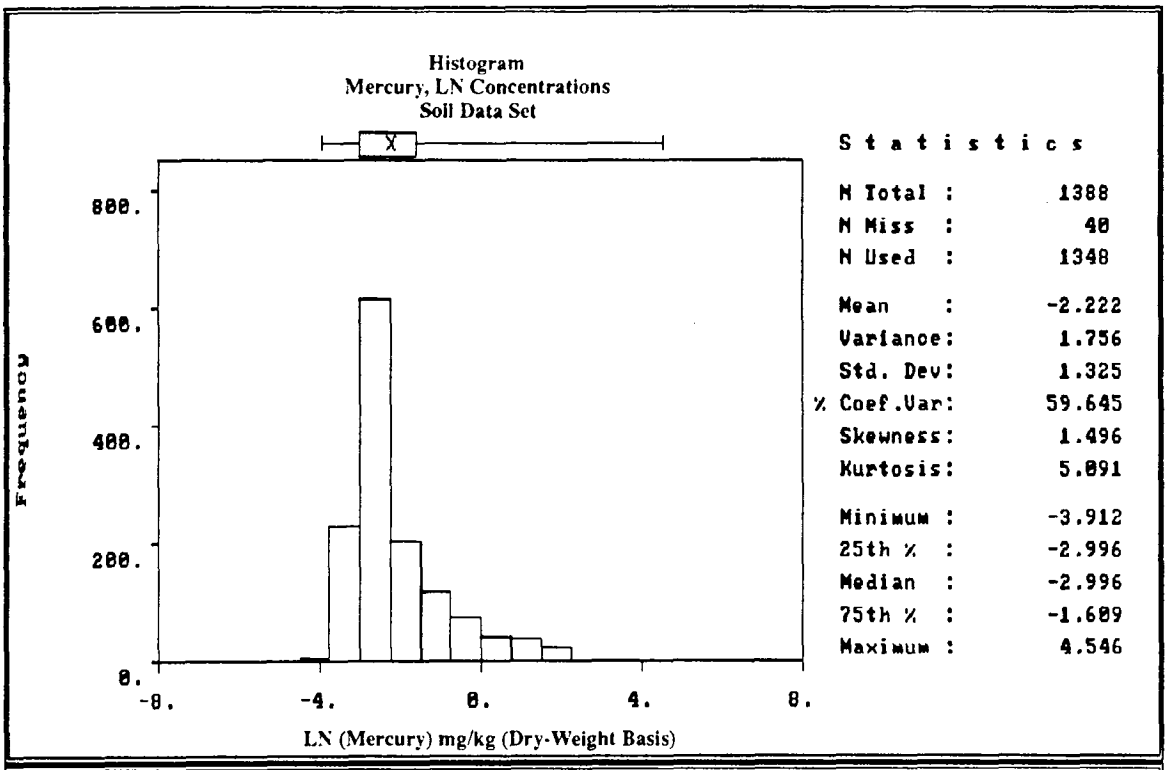
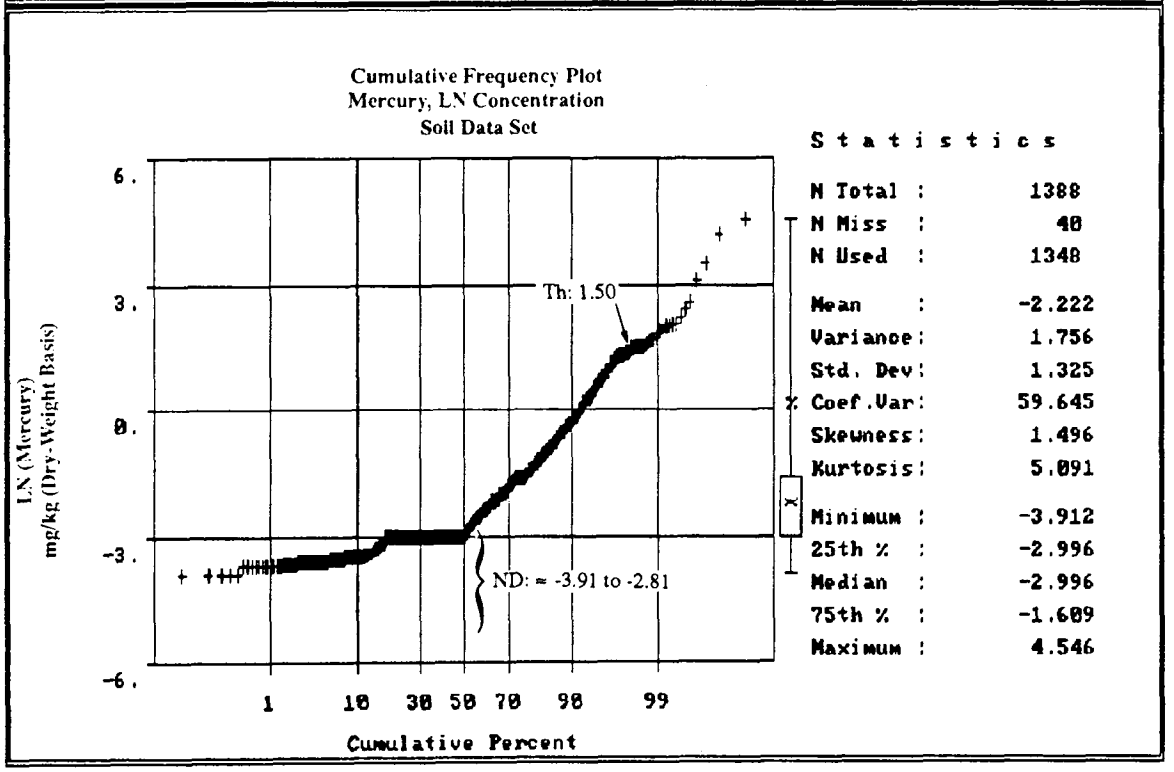
Manganese, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A120

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25882





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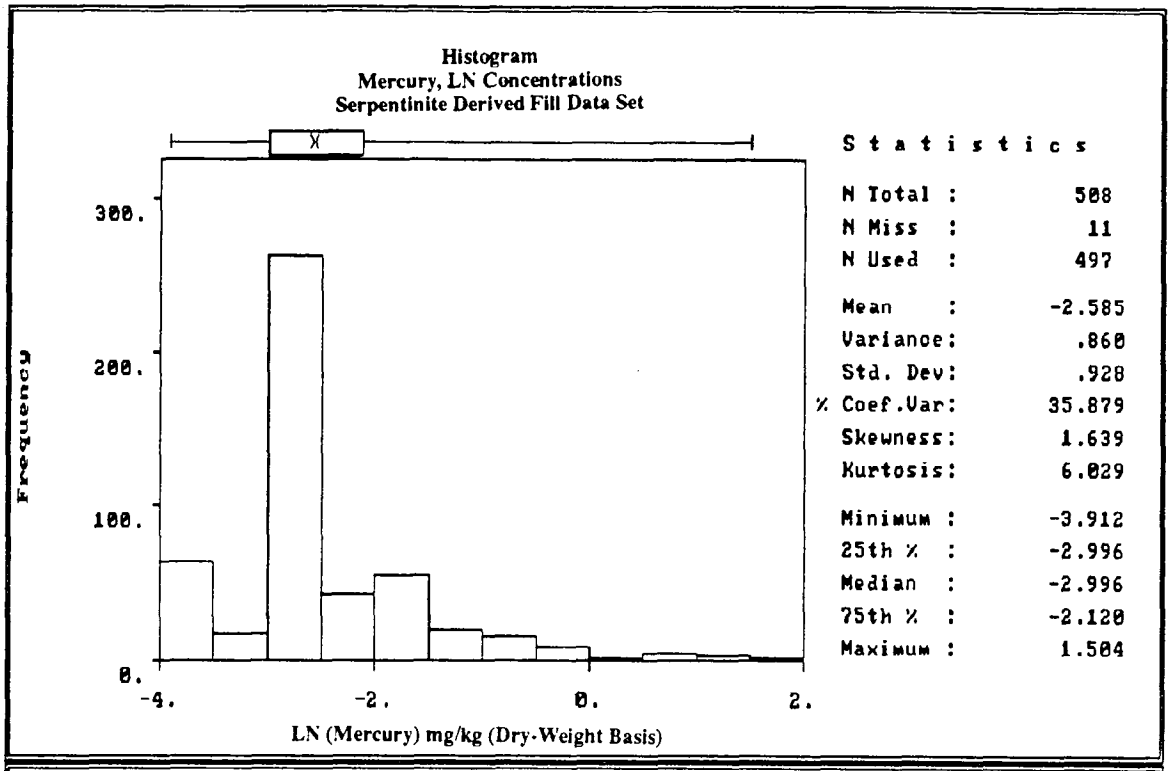
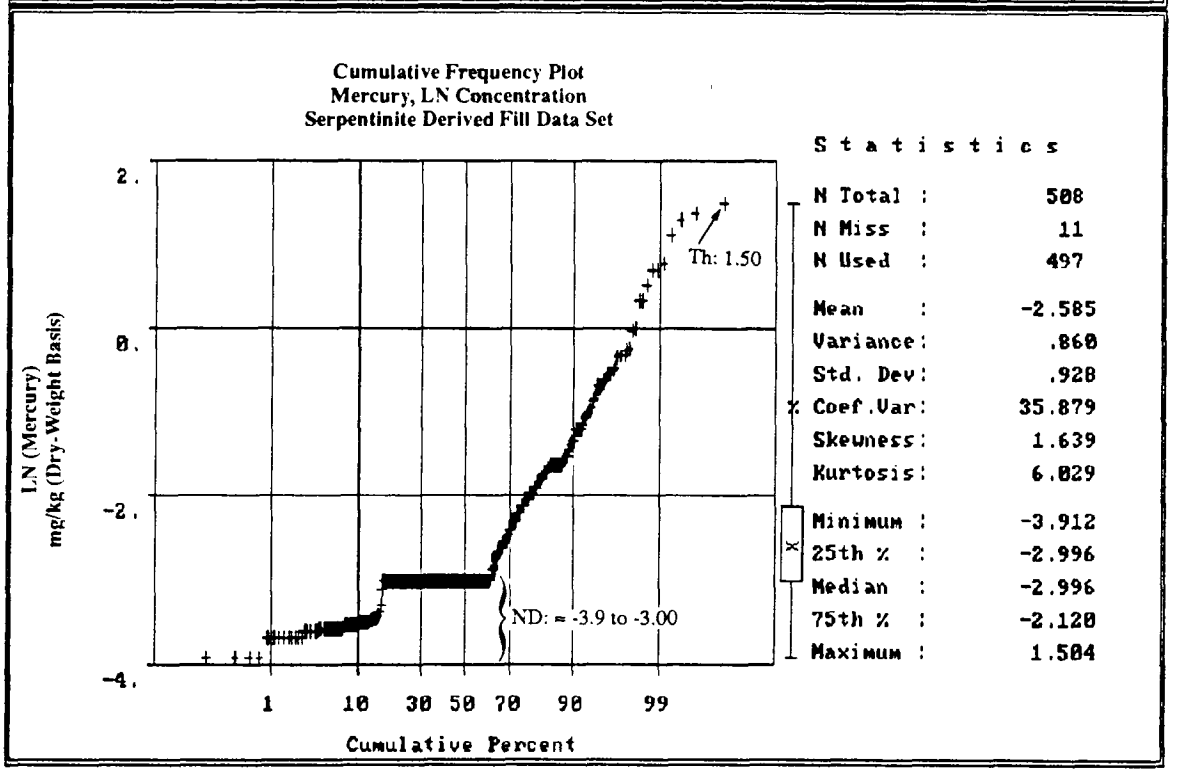
Mercury, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A121

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25883





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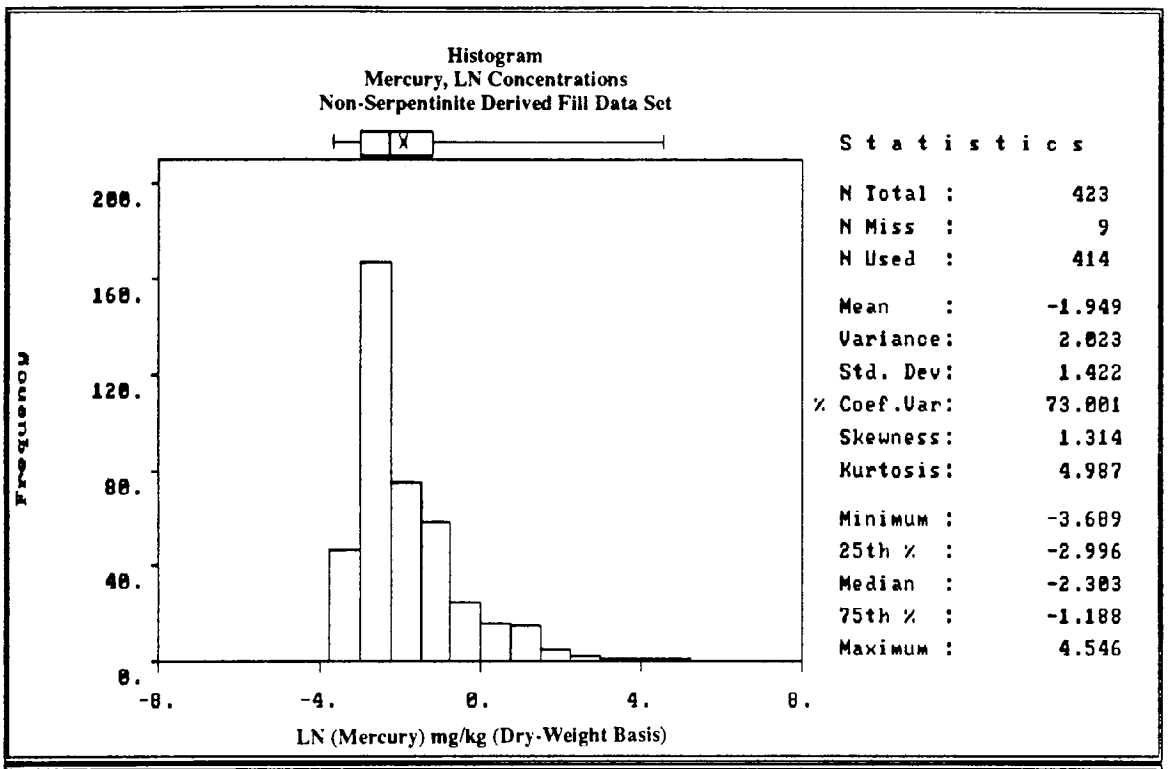
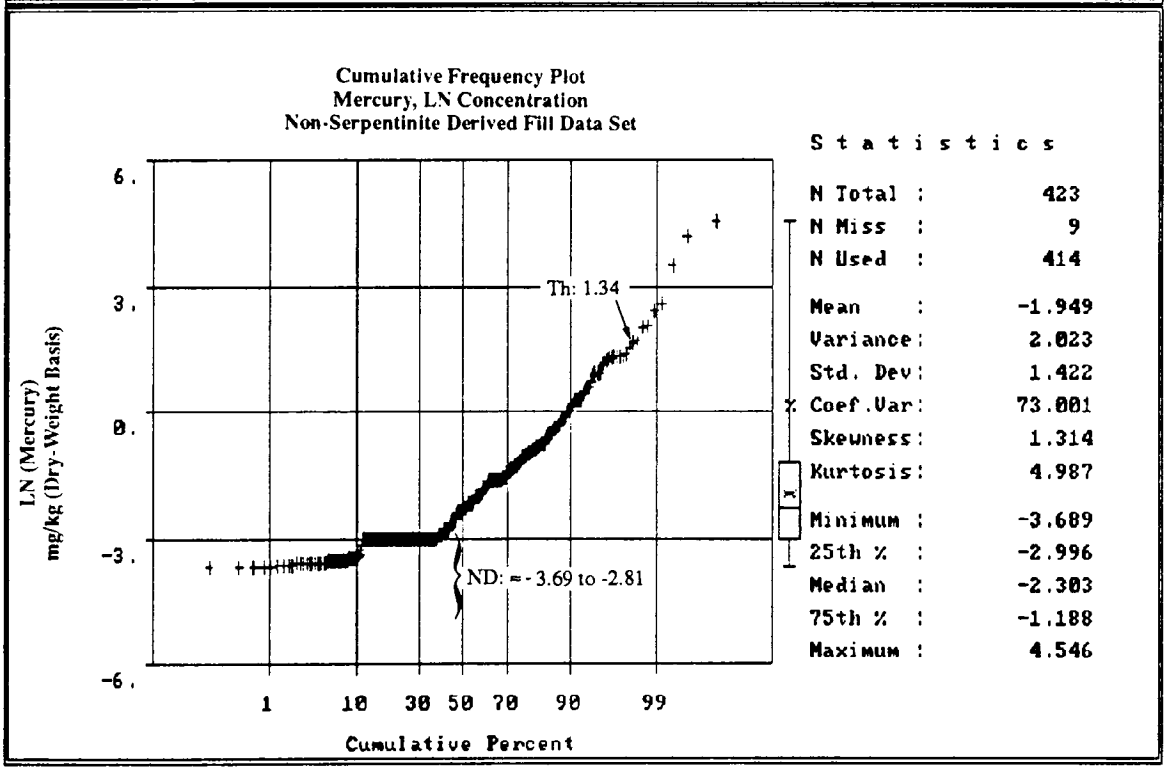
Mercury, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A122

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25884





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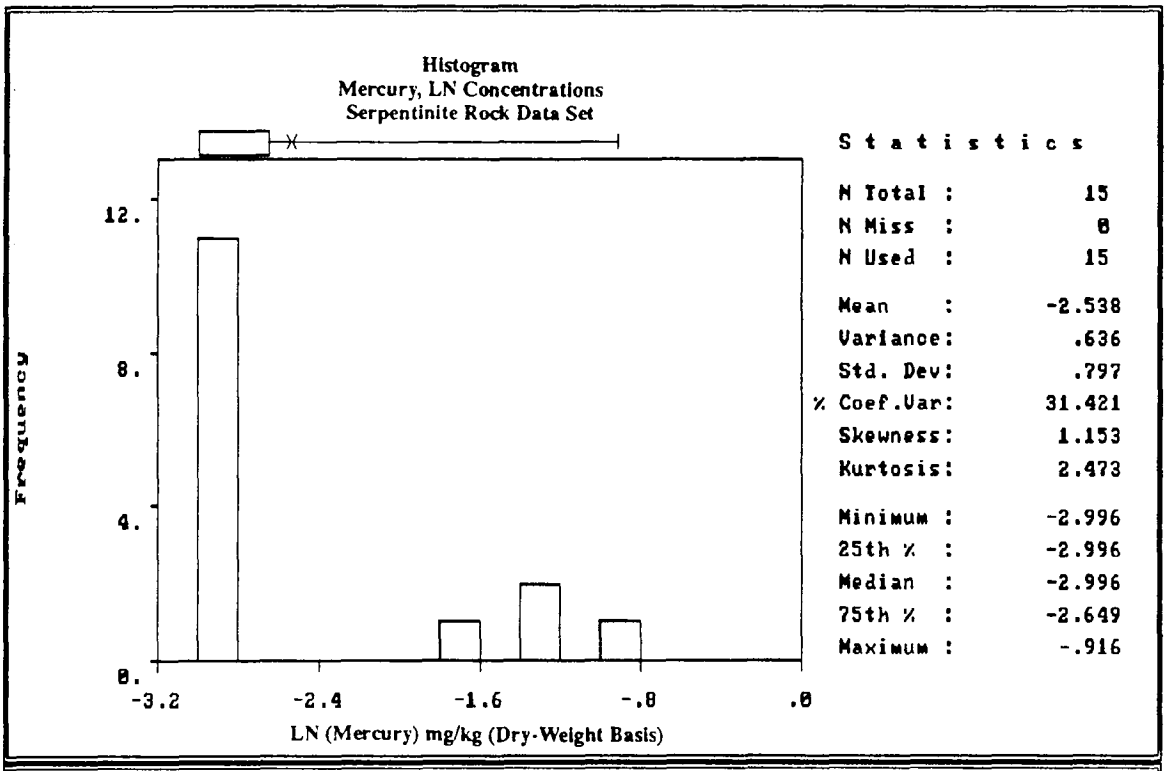
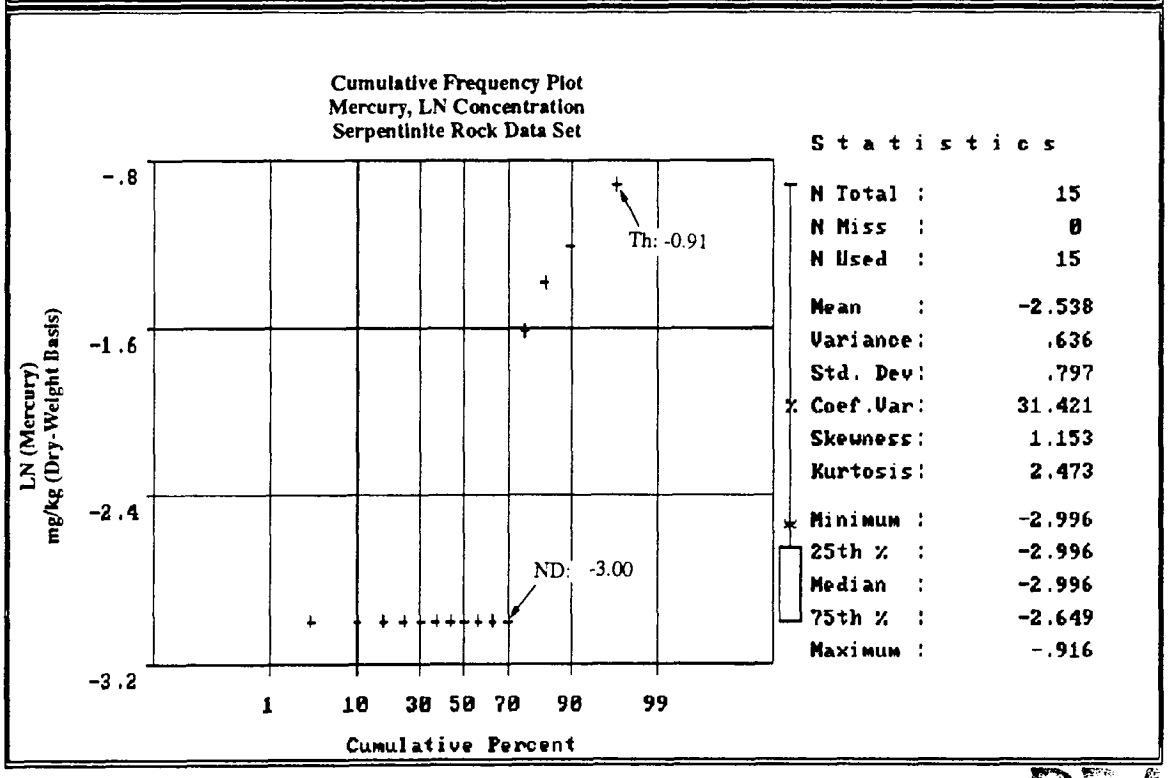
Mercury, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A123

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25885





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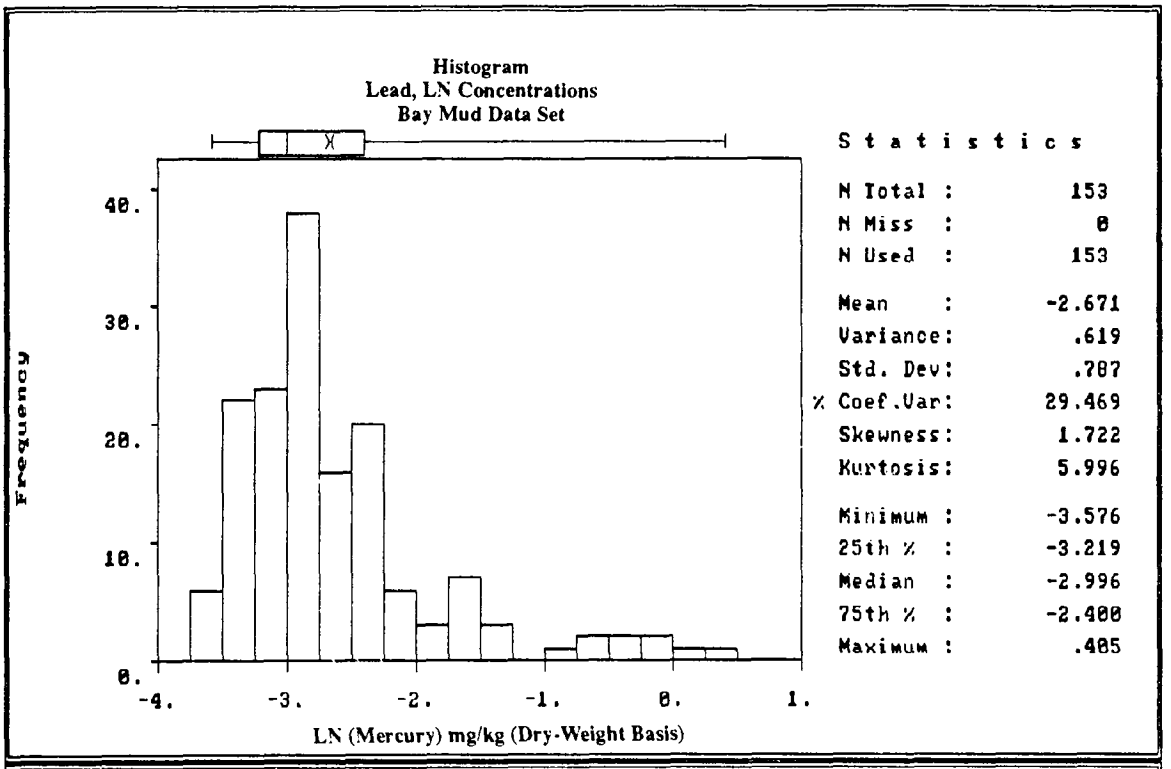
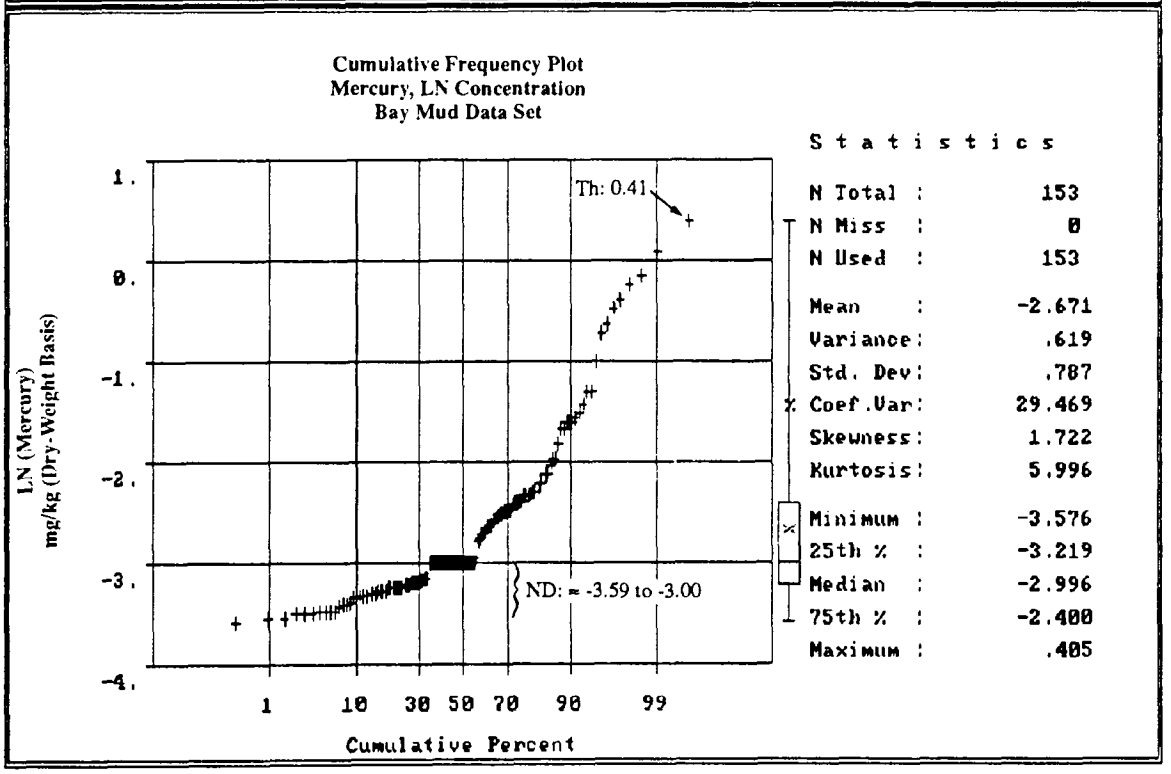
Mercury, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A124

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25886





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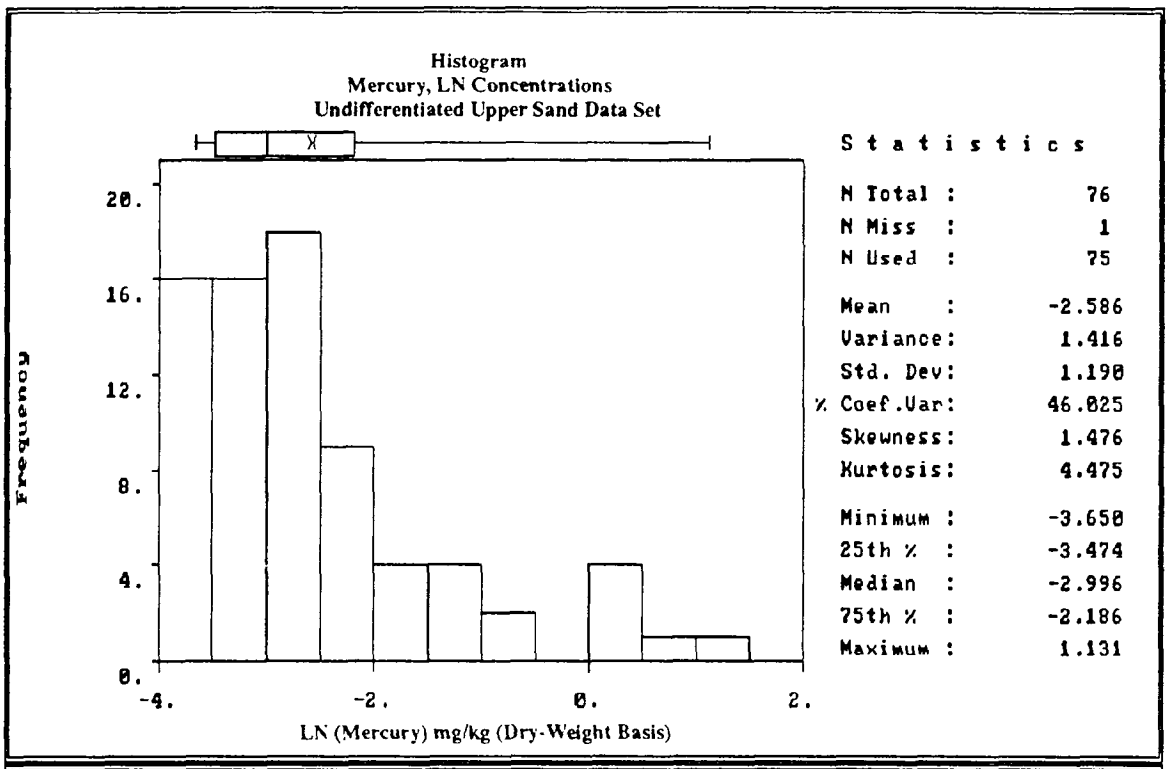
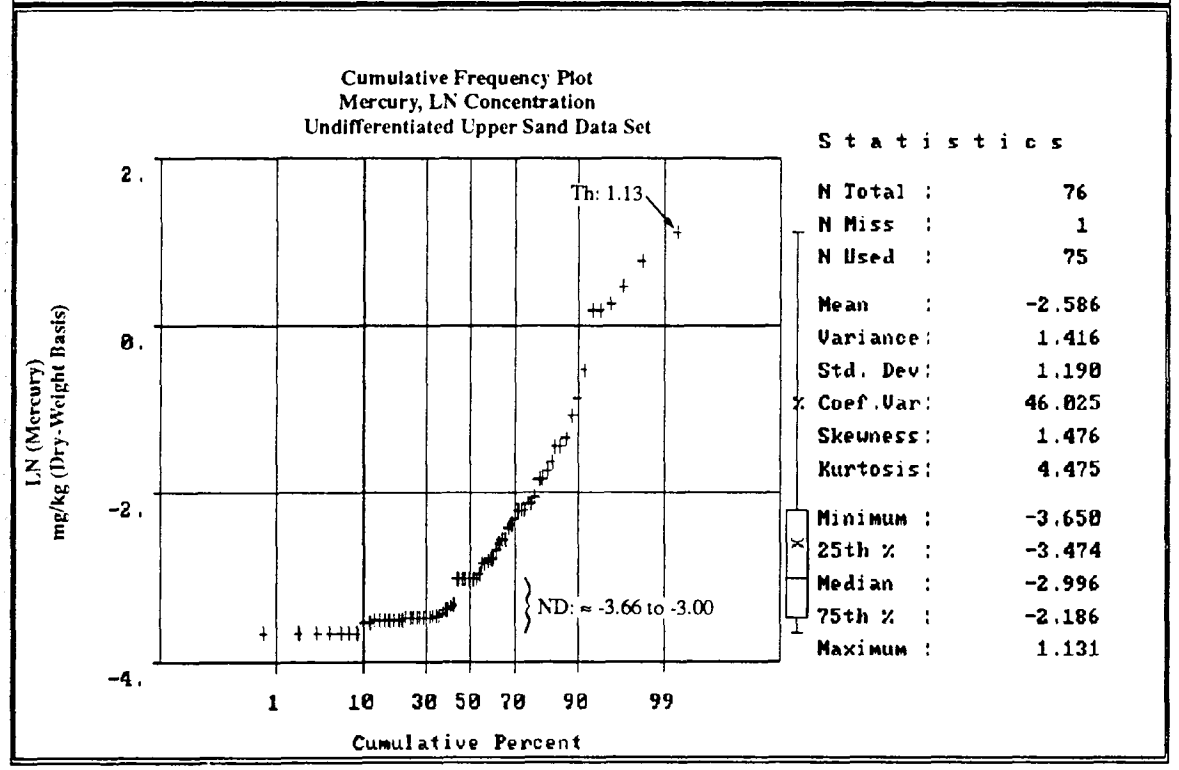
Mercury, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A125

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25887





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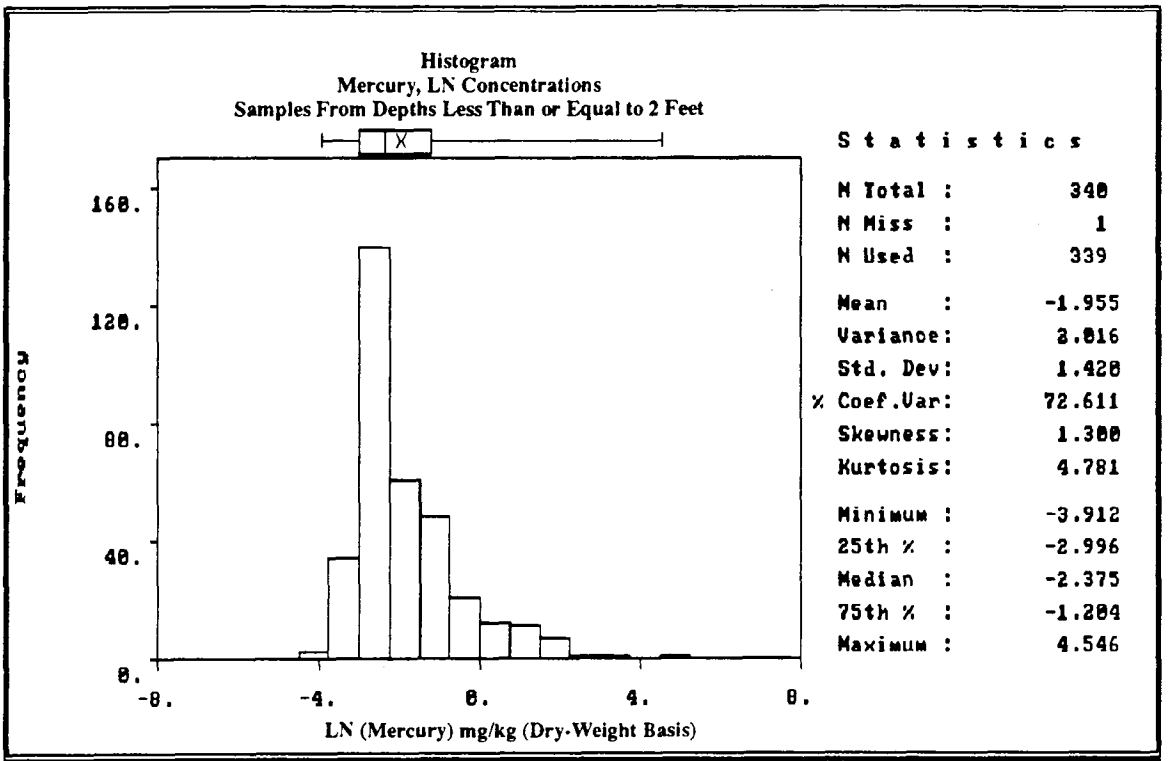
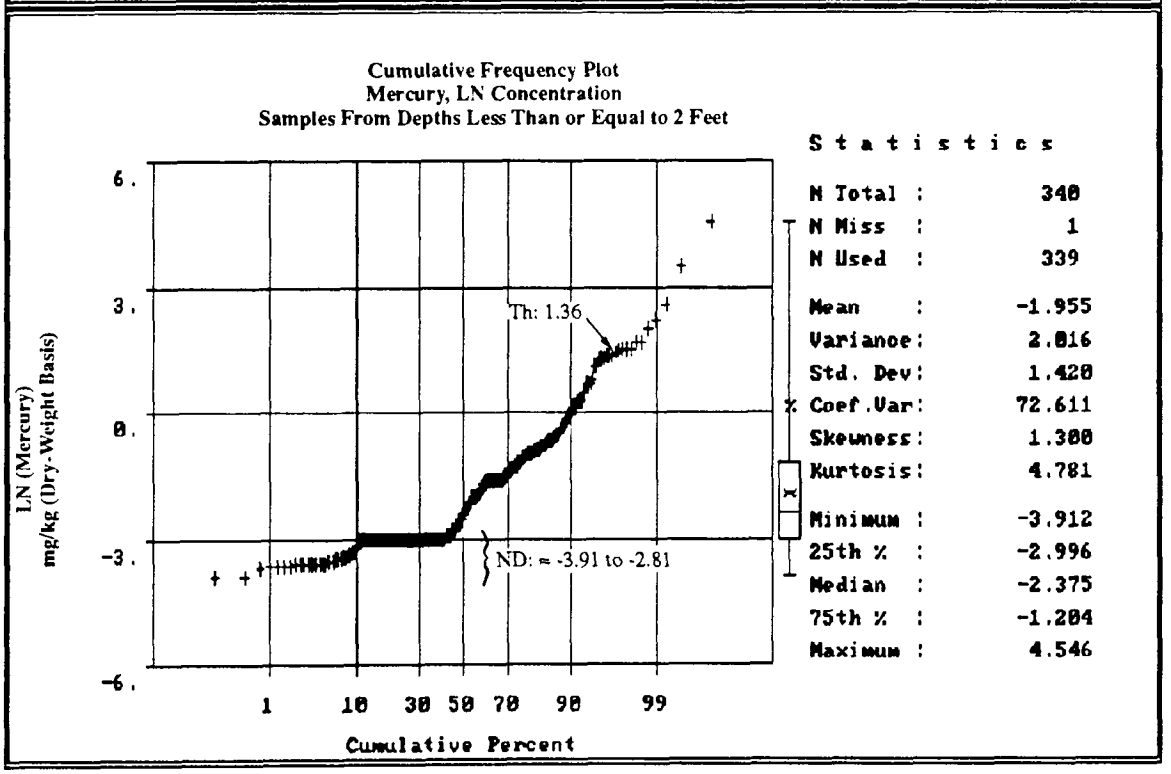
Mercury, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A126

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25888





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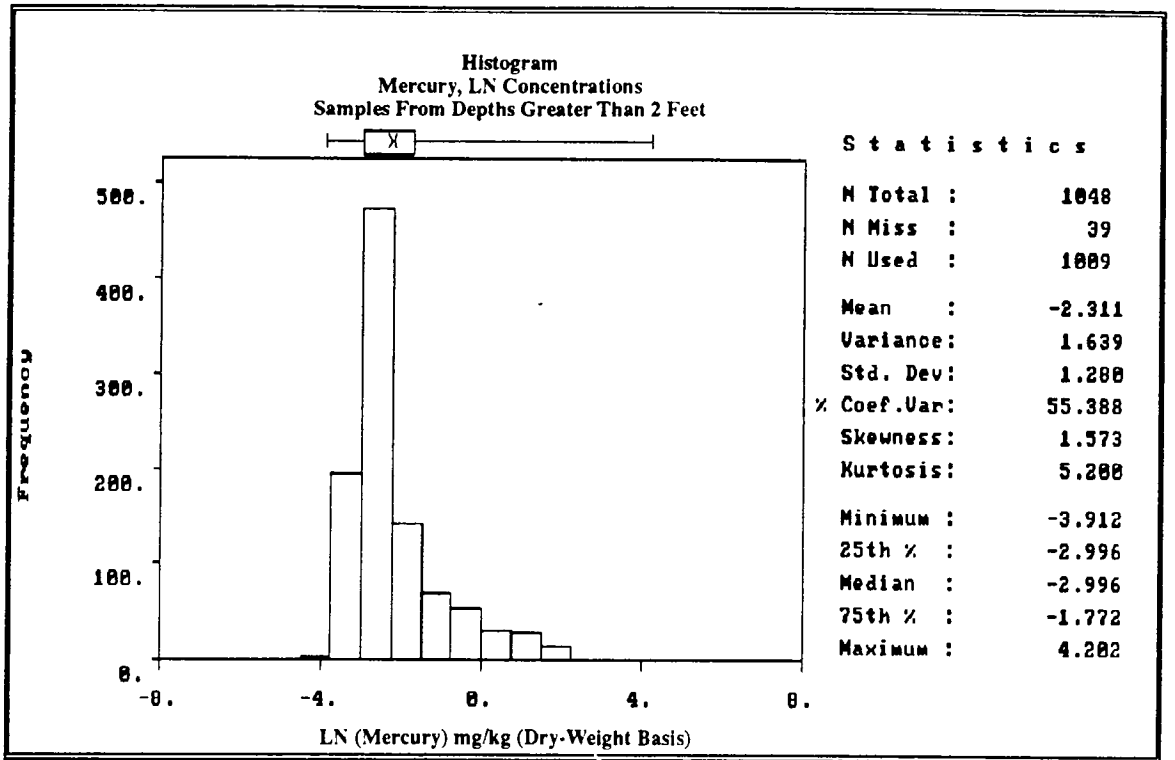
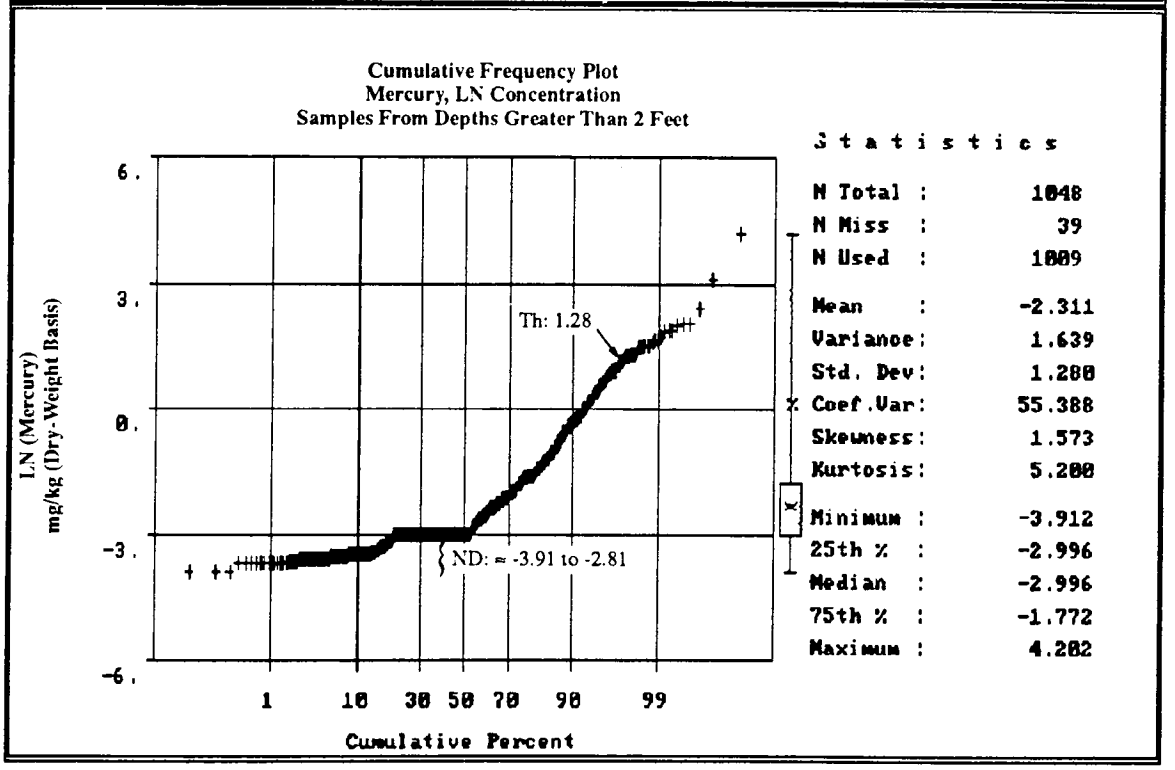
Mercury, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A127**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25889





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Engineering and
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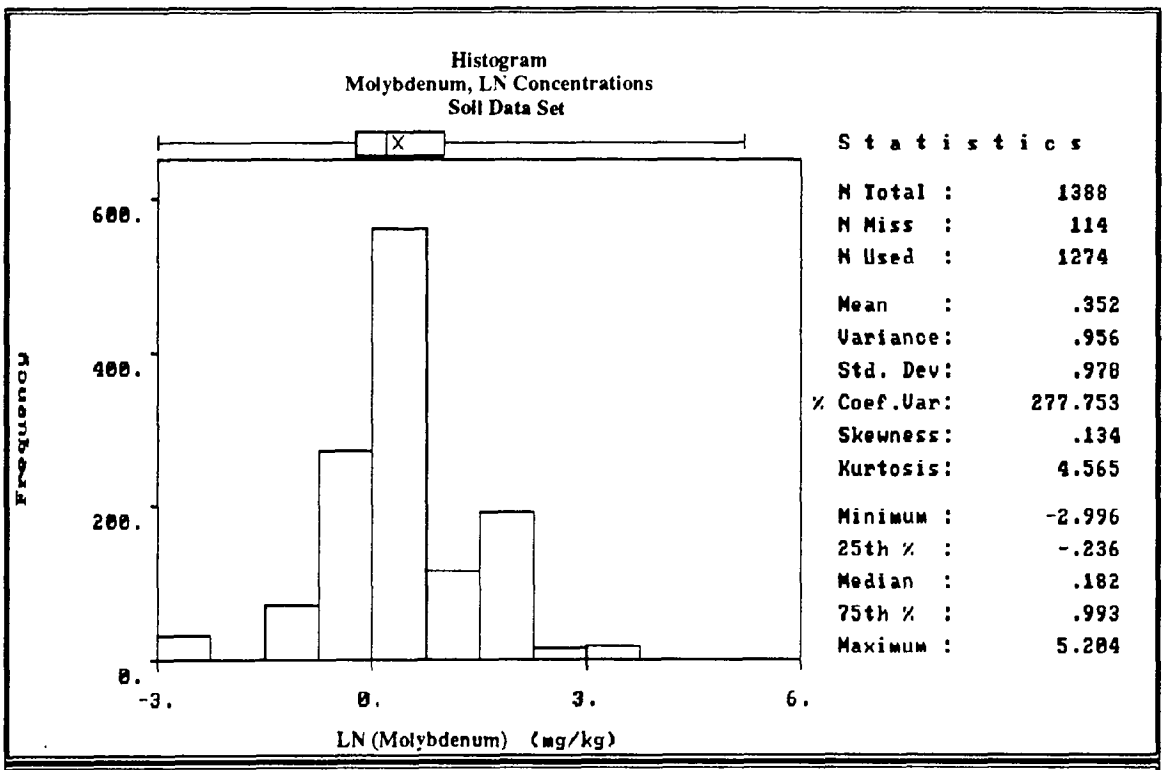
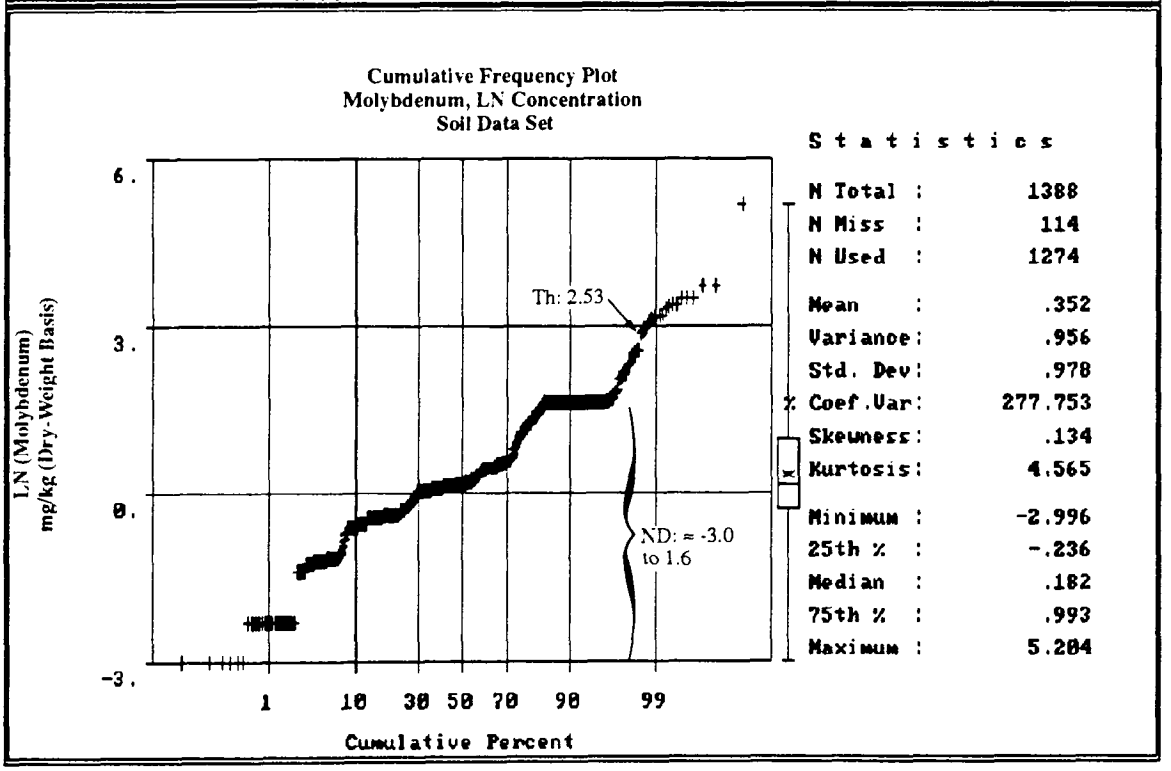
Mercury, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A128

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25890





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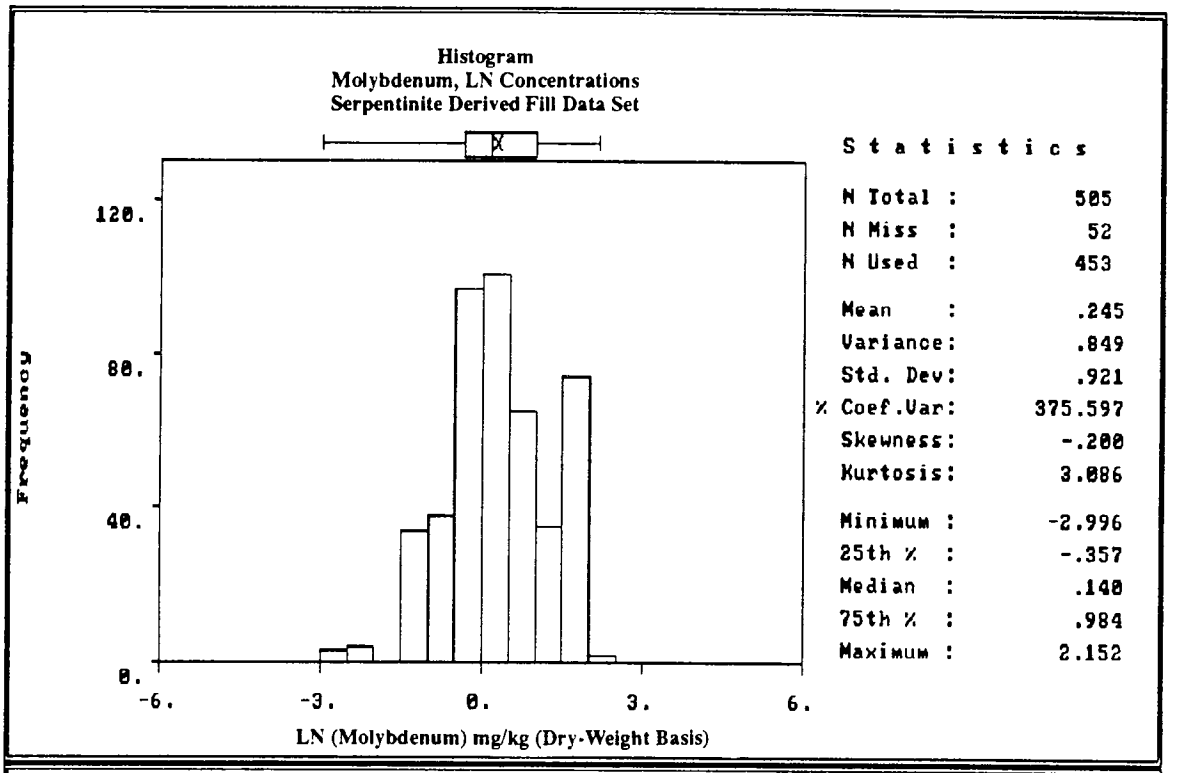
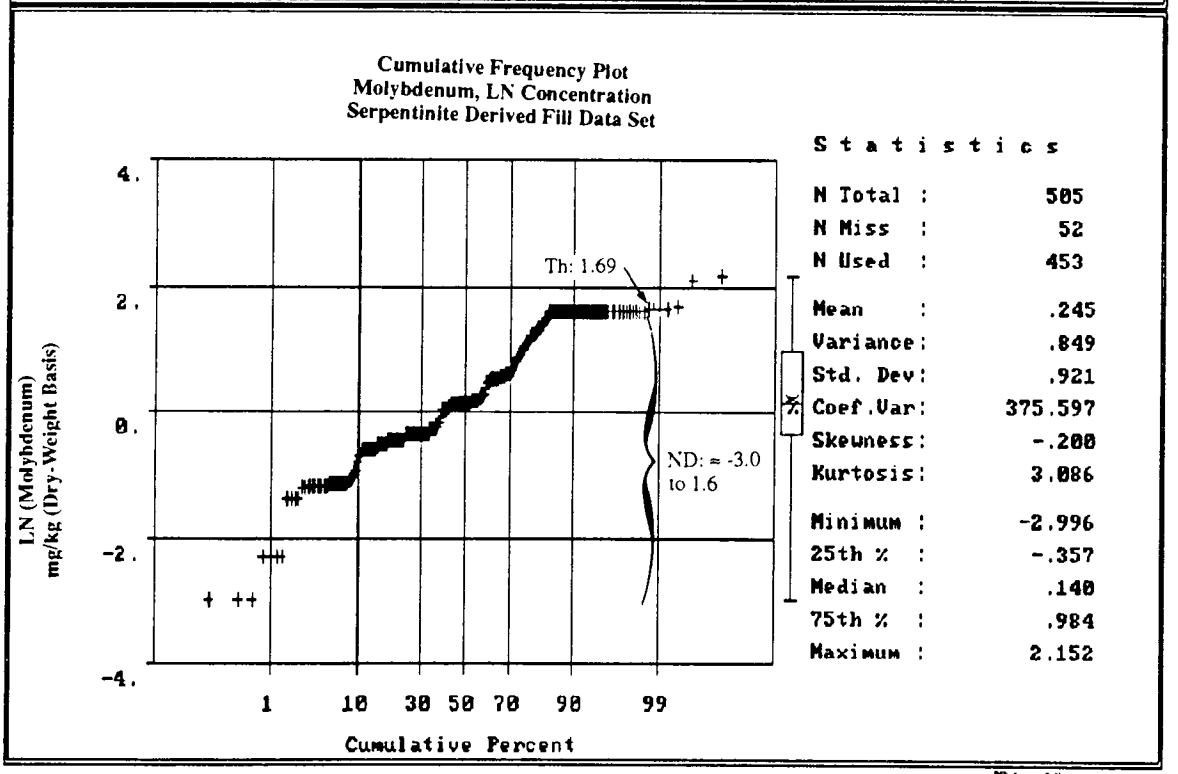
Molybdenum, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A129

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25891





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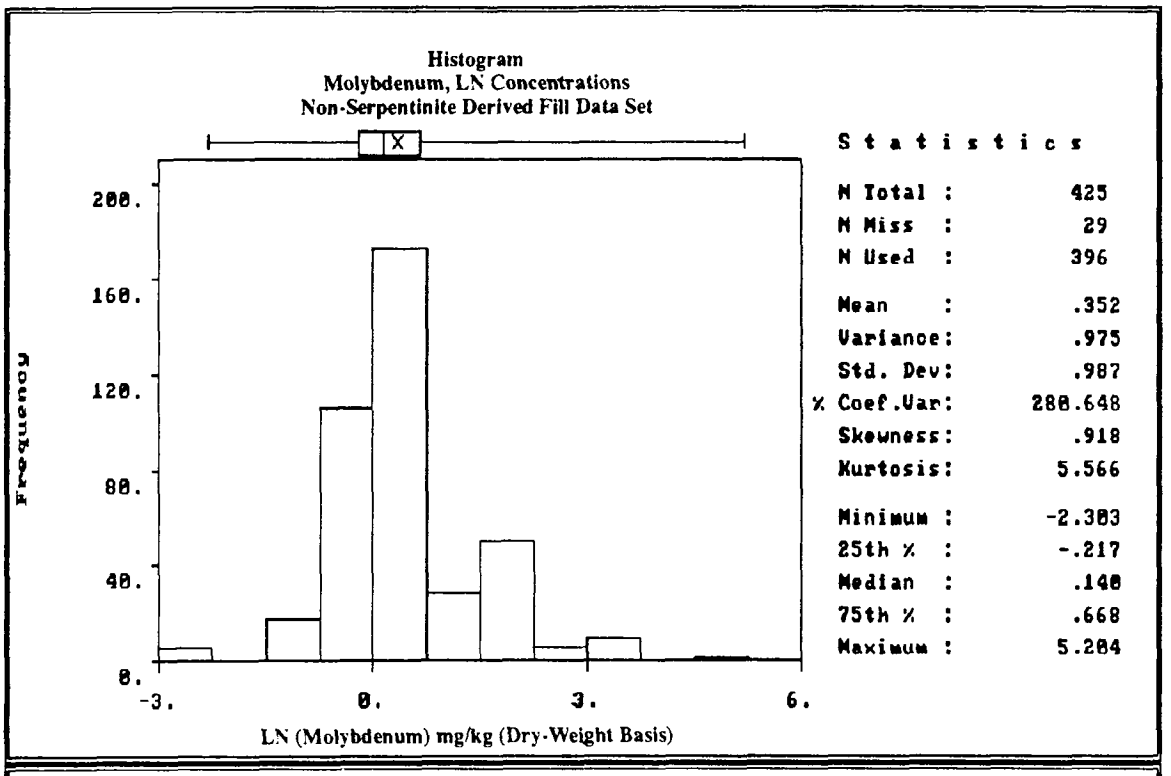
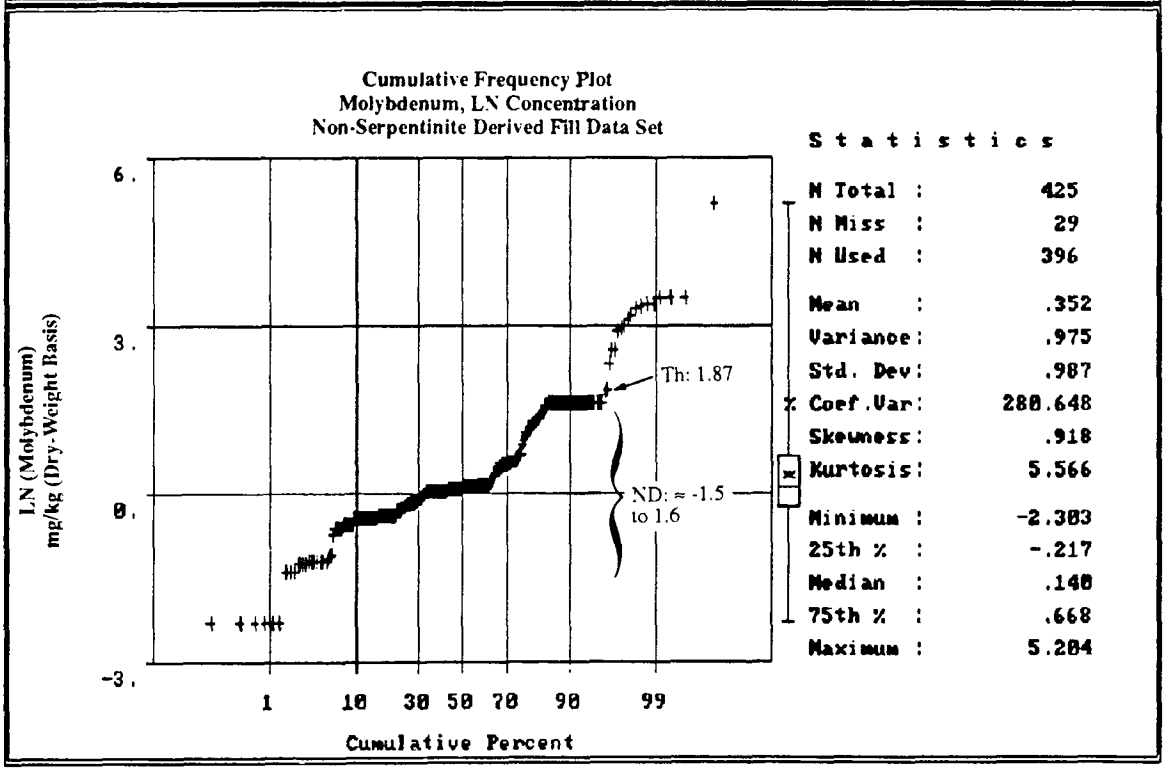
Molybdenum, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A130**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	OJM	2/92	6/92

25892





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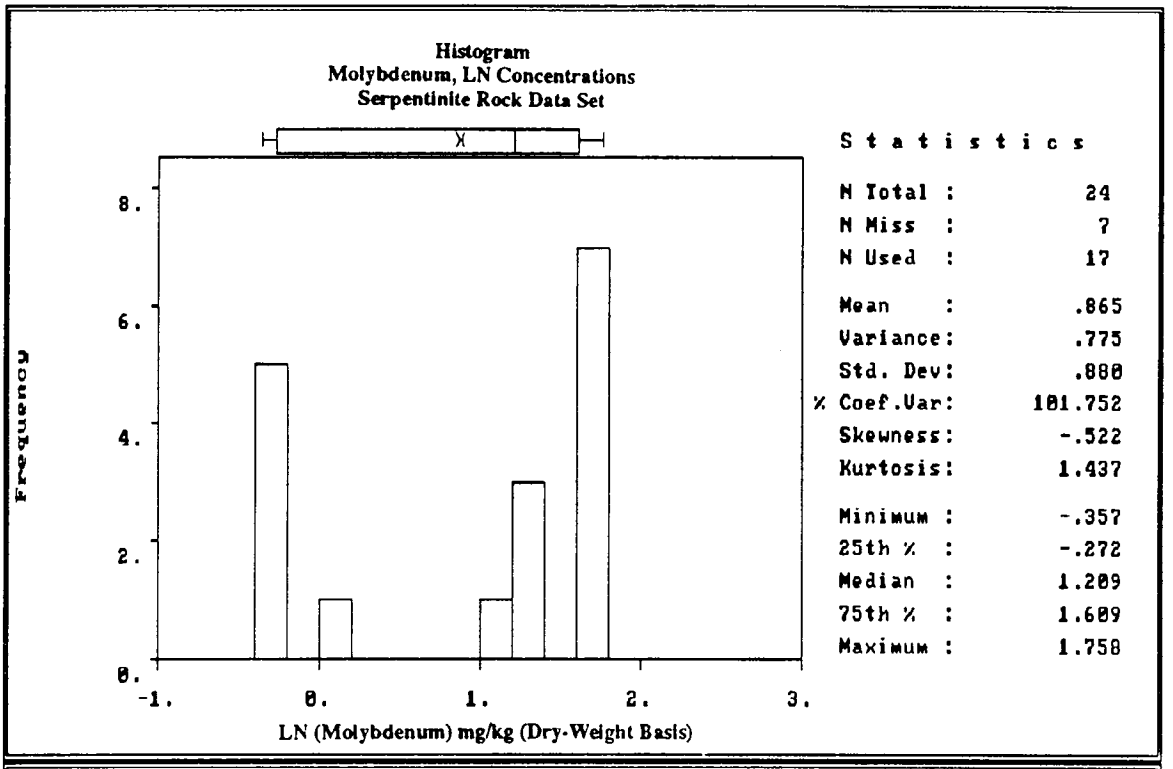
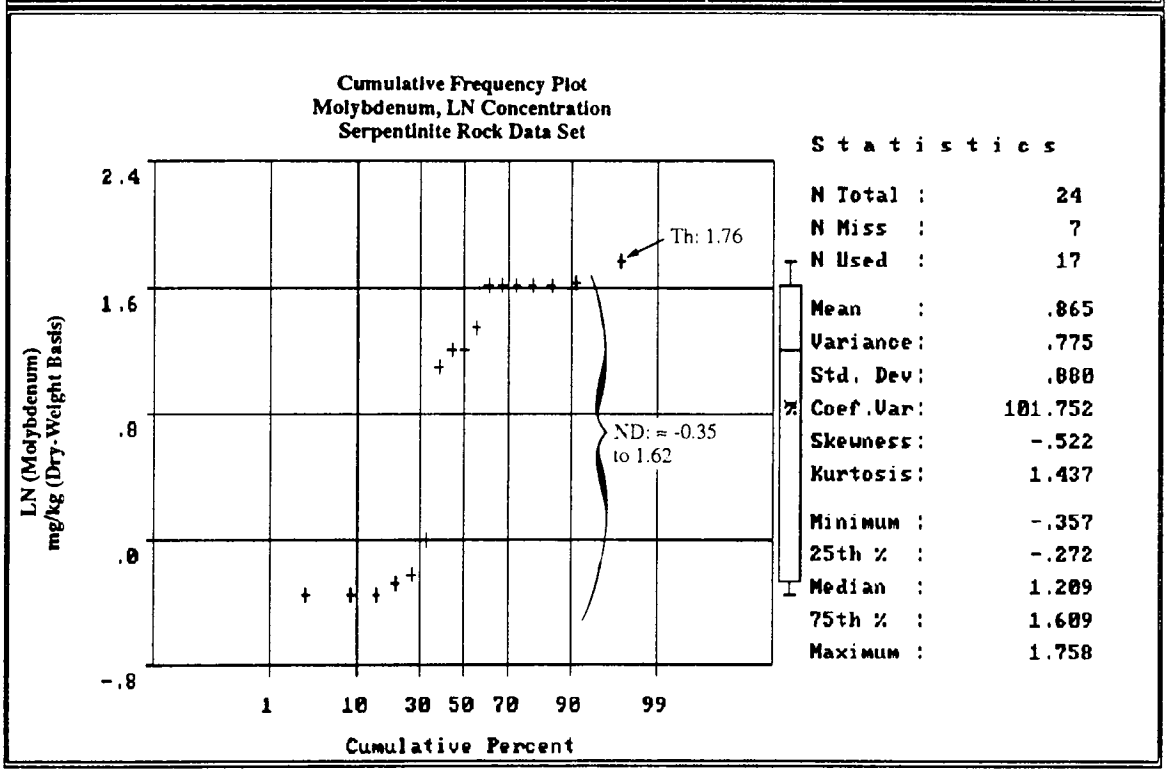
Molybdenum, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A131**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25893





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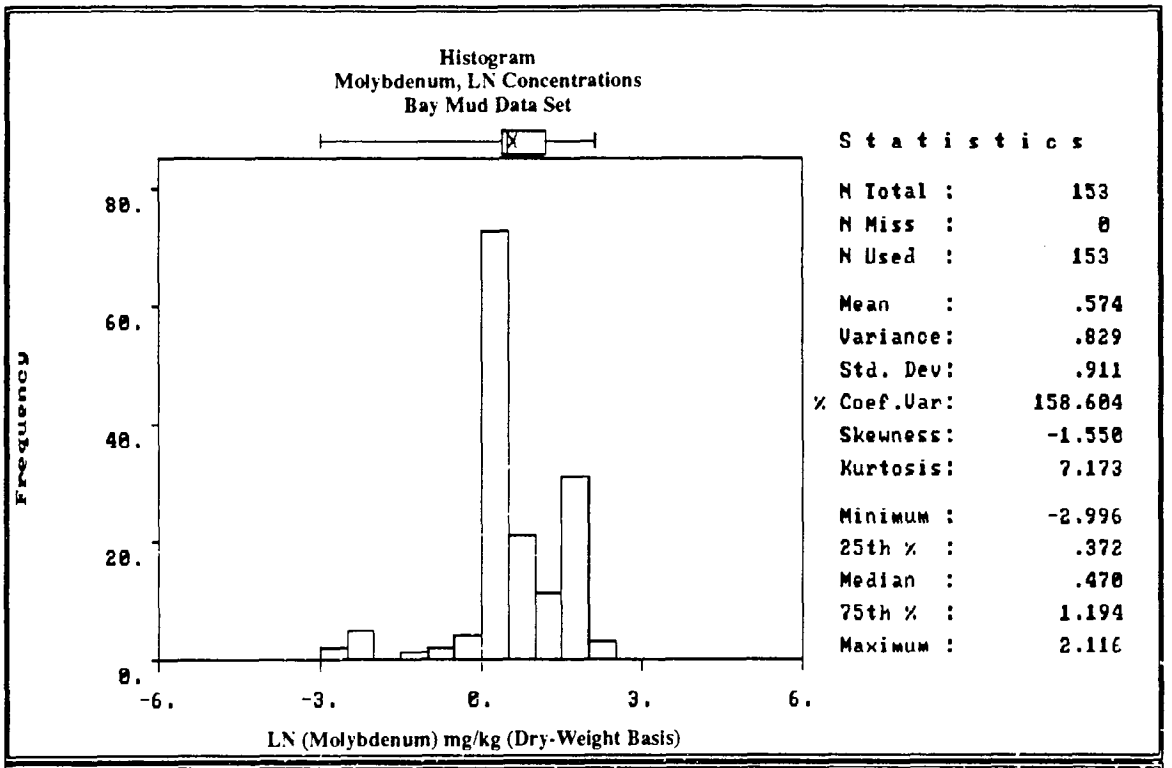
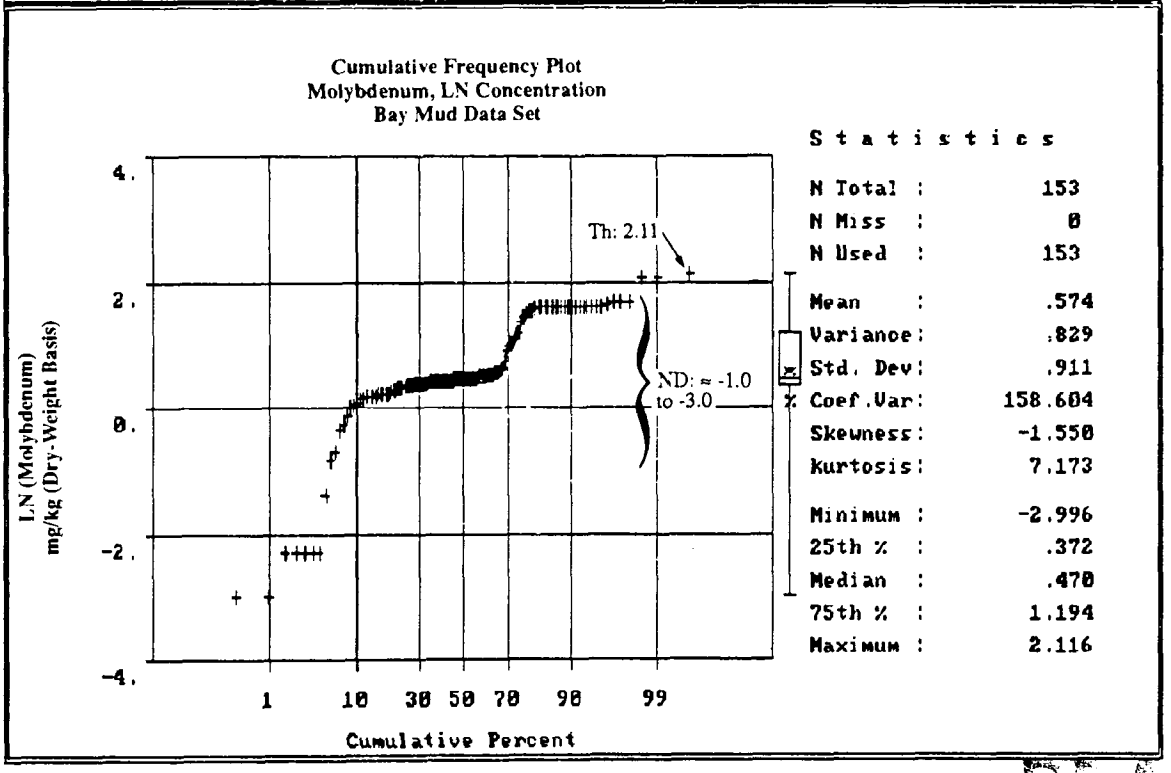
Molybdenum, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A132**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25894





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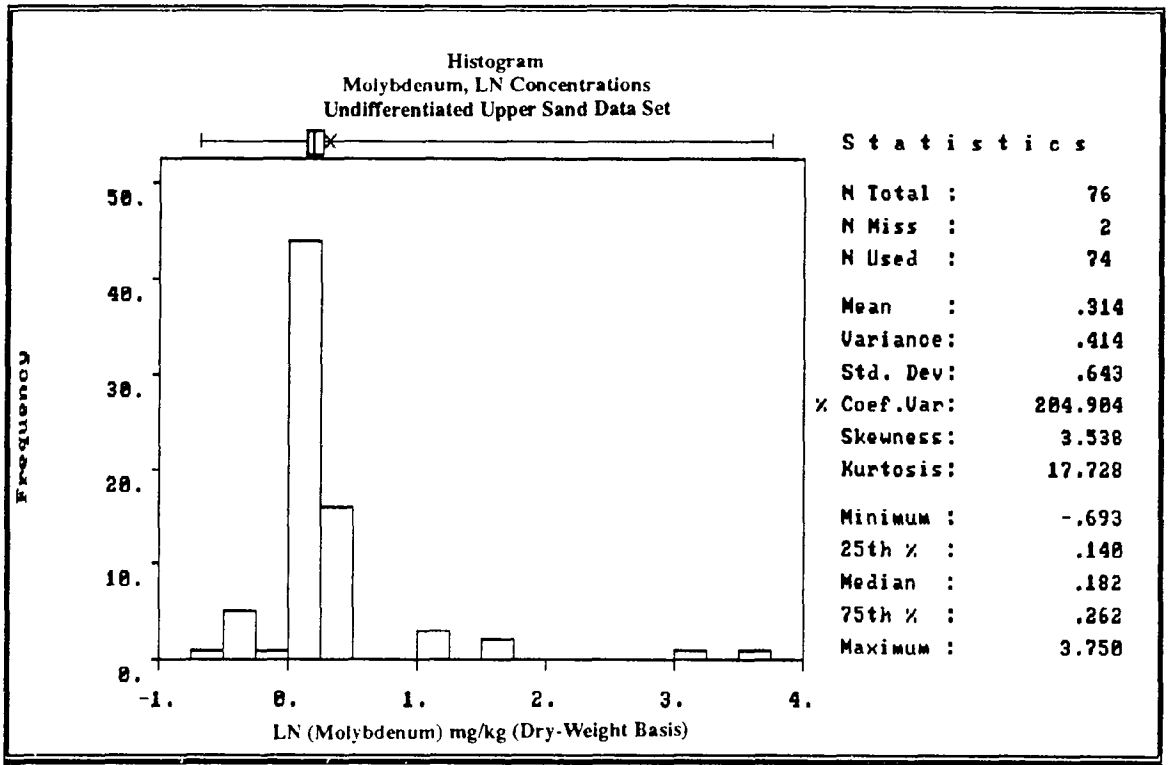
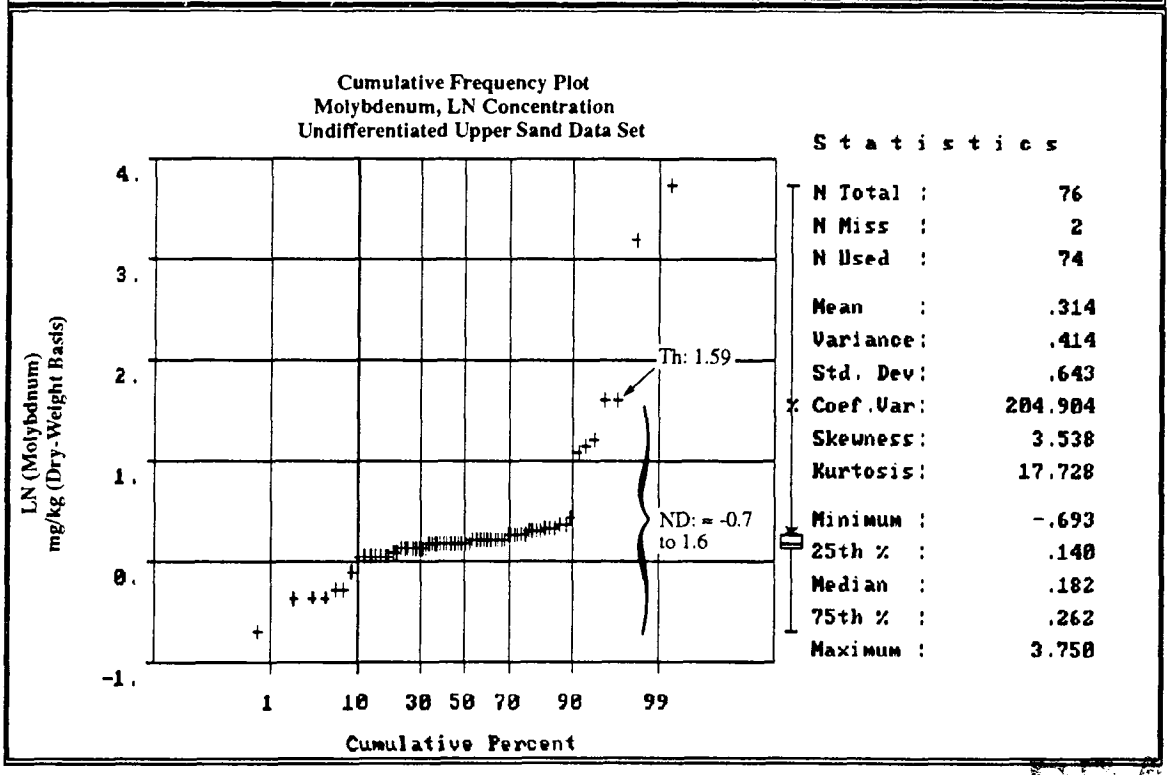
Molybdenum, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A133**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CTM	2/92	6/92

25895





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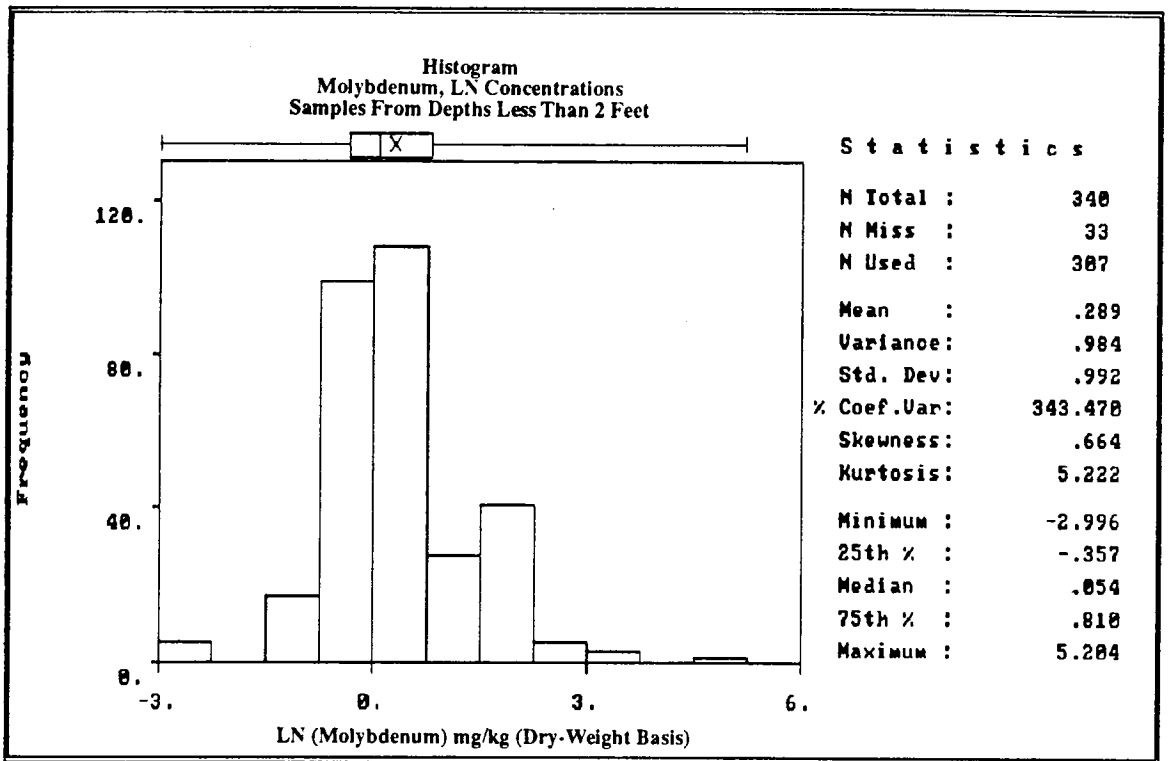
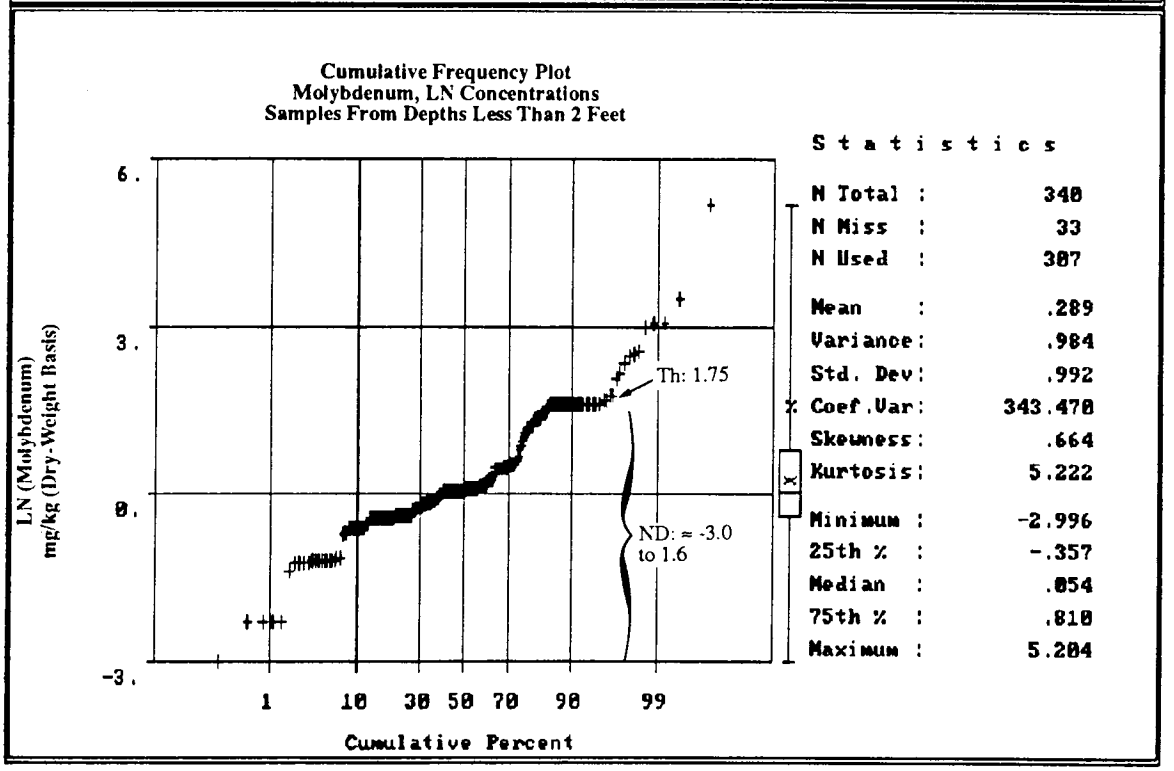
Molybdenum, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A134

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25896





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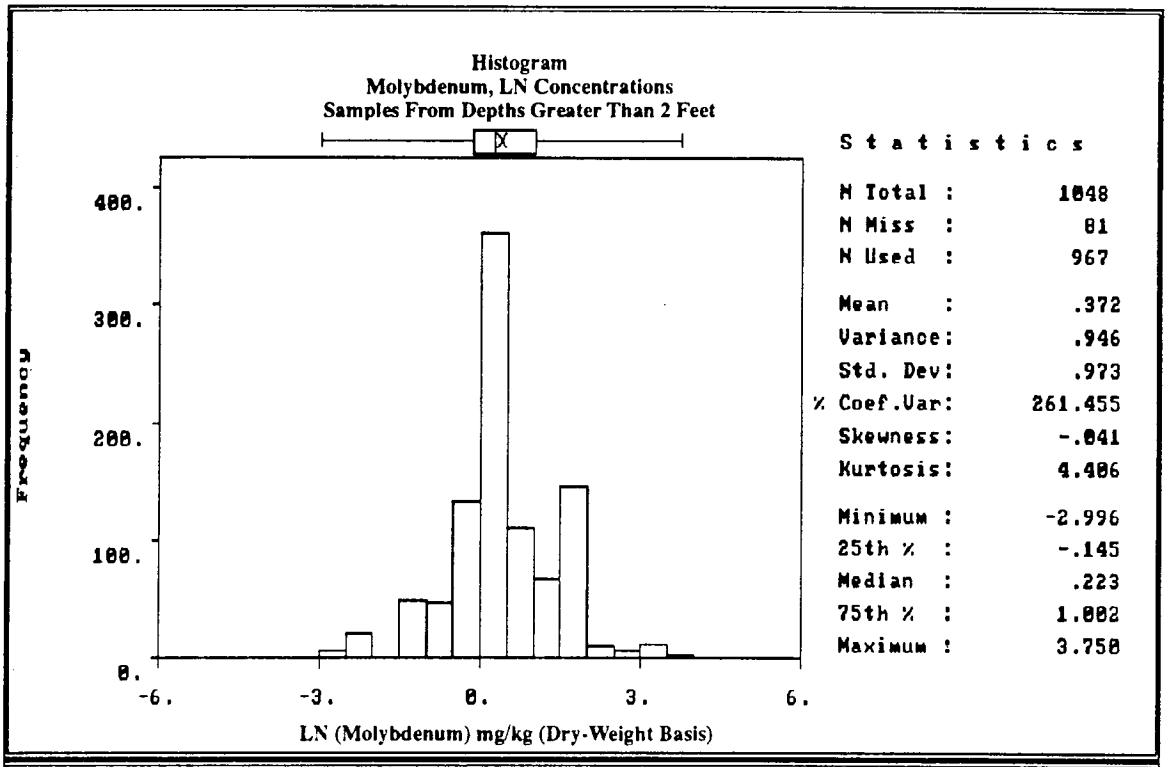
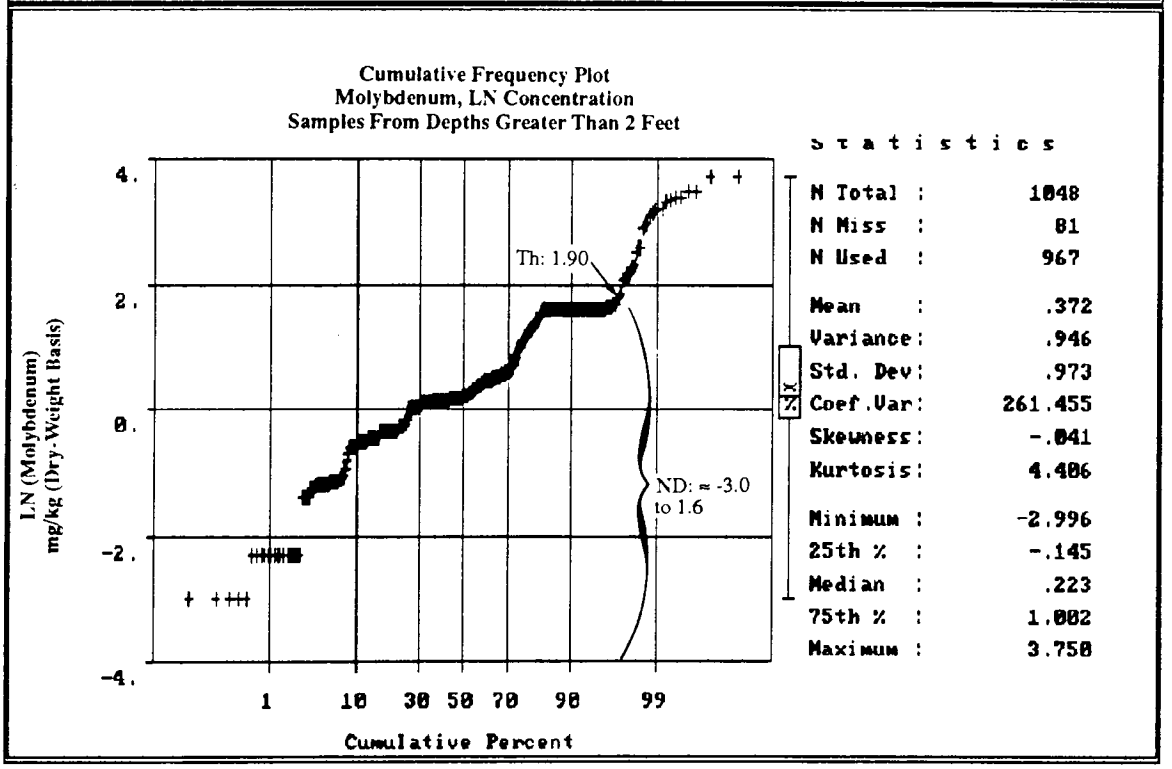
Molybdenum, Samples From Depths Less Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A135**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25897





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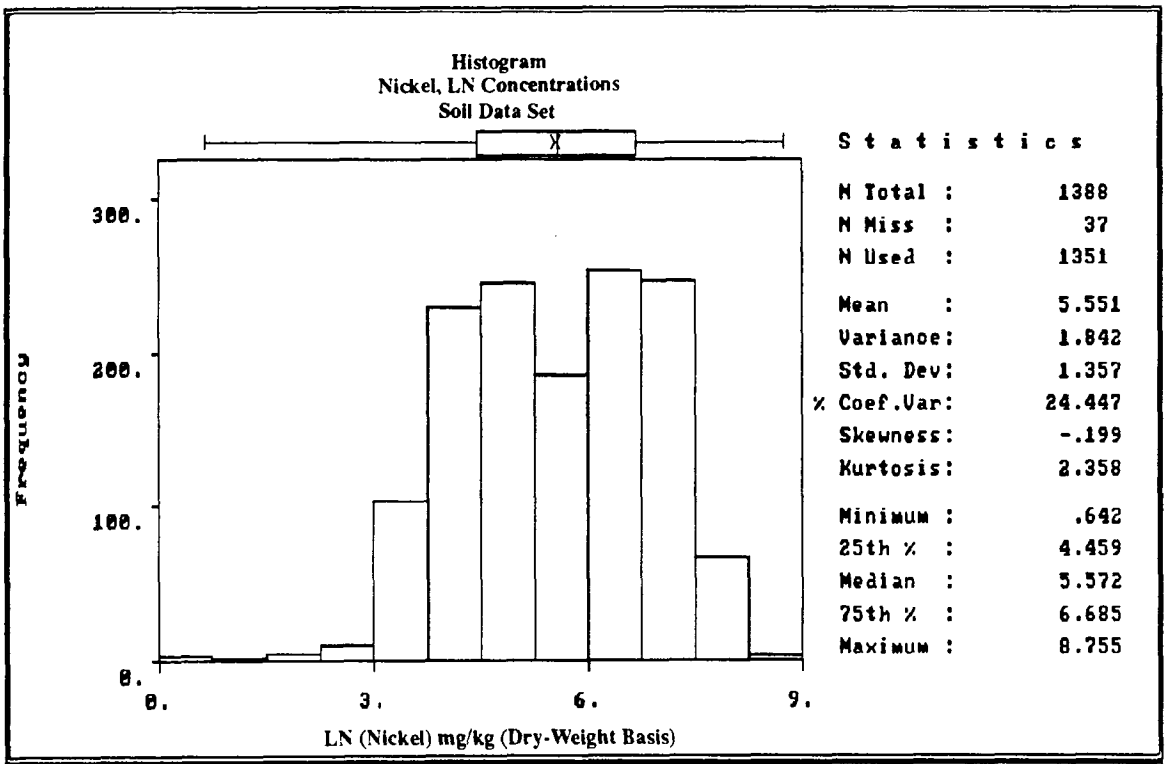
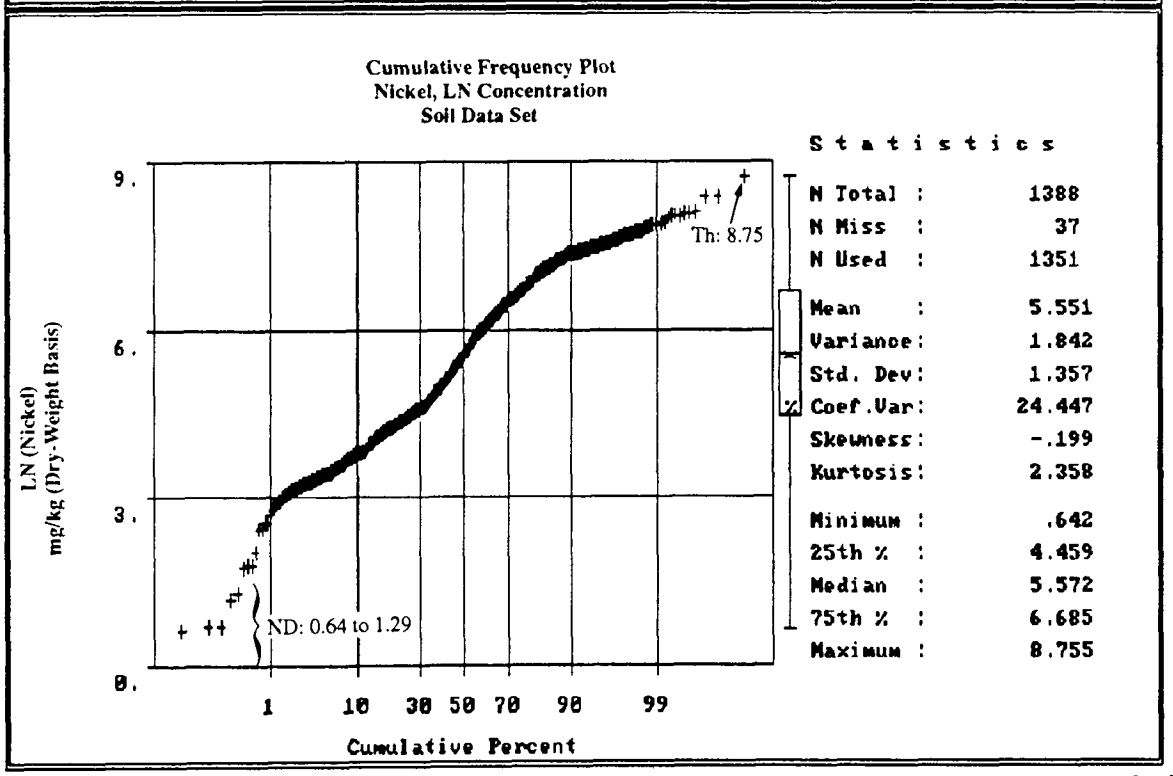
Molybdenum, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A136**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25898





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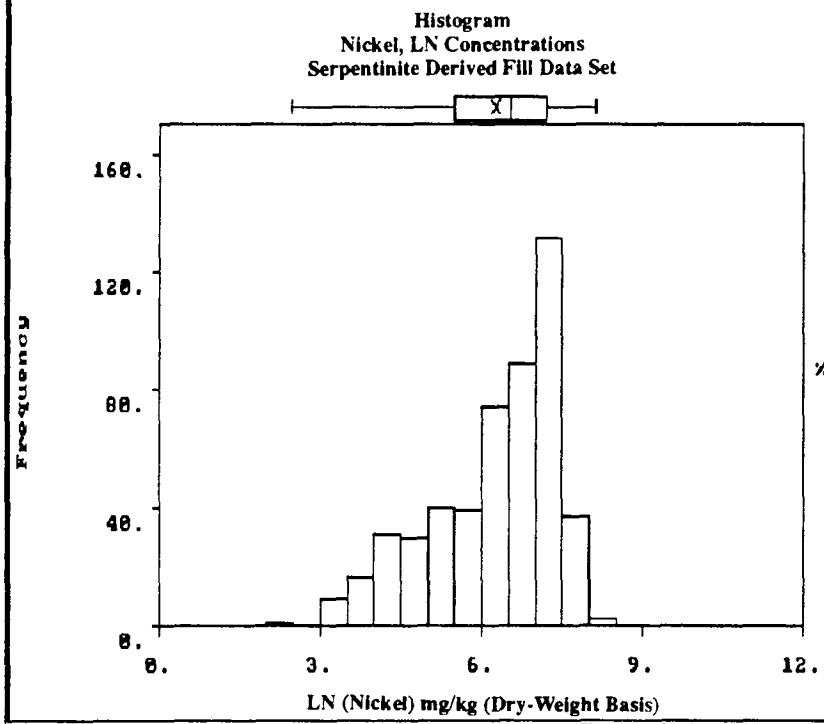
Nickel, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A137

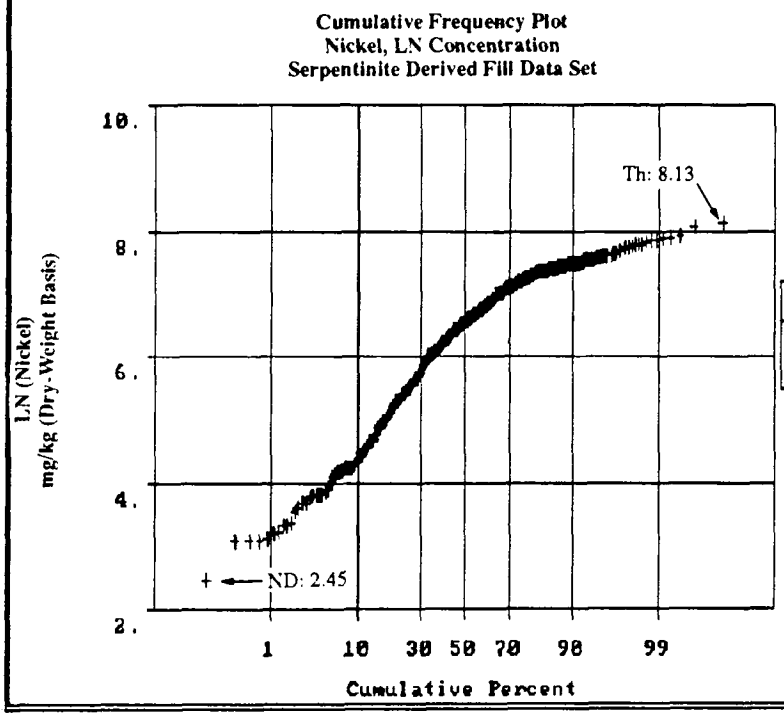
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25899



Statistics

N Total :	508
N Miss :	8
N Used :	500
Mean :	6.249
Variance:	1.367
Std. Dev:	1.169
% Coef.Var:	18.708
Skewness:	-.835
Kurtosis:	2.852
Minimum :	2.451
25th % :	5.481
Median :	6.548
75th % :	7.185
Maximum :	8.129



Statistics

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Maximum :	8.129

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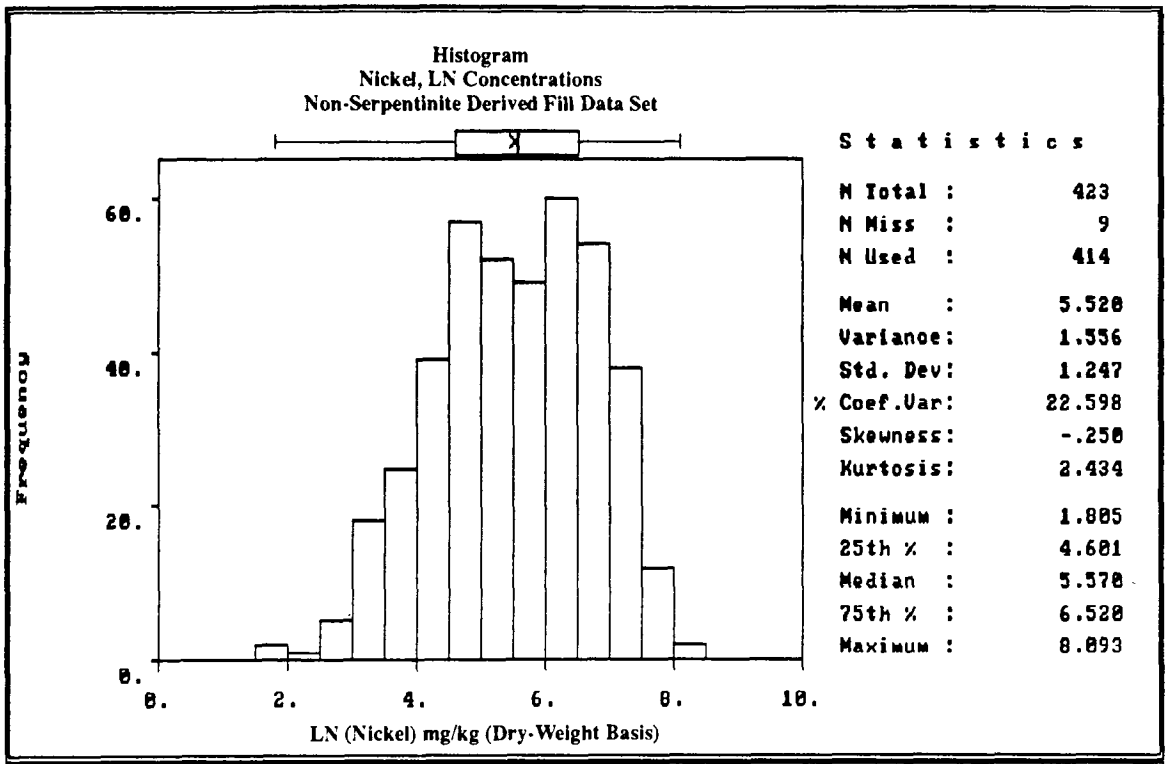
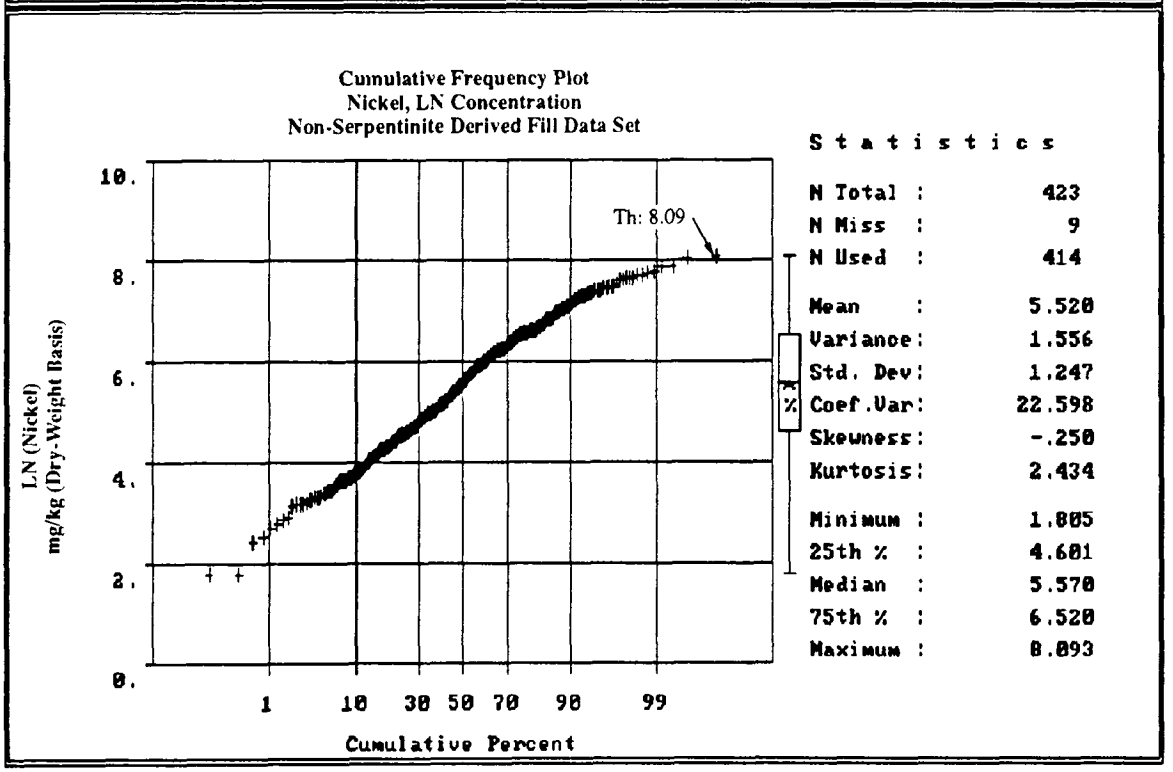
Nickel, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A138

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25900





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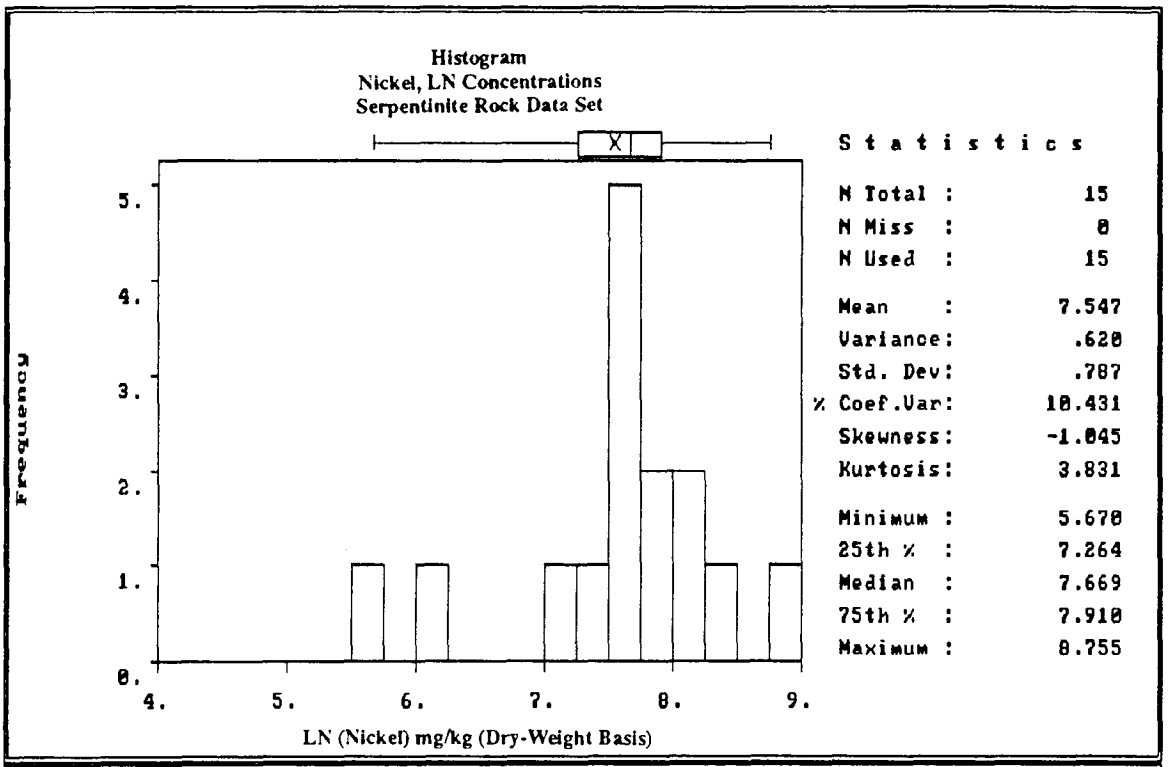
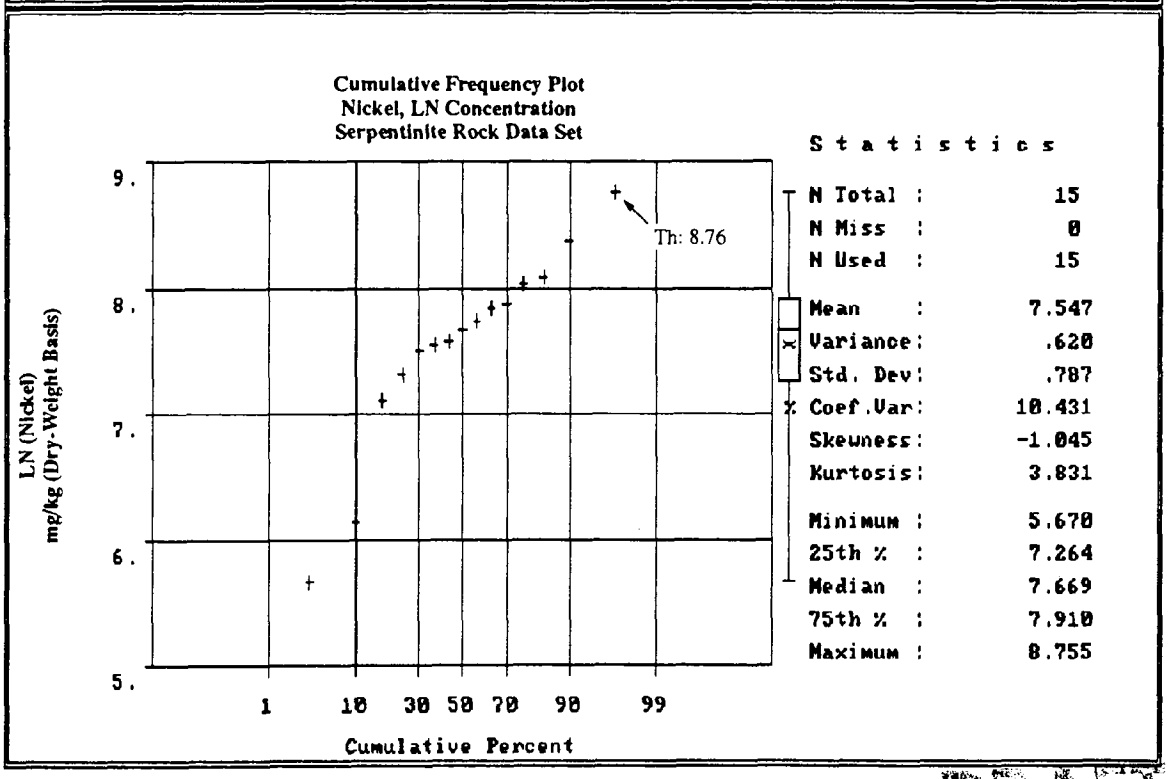
Nickel, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A139

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25901





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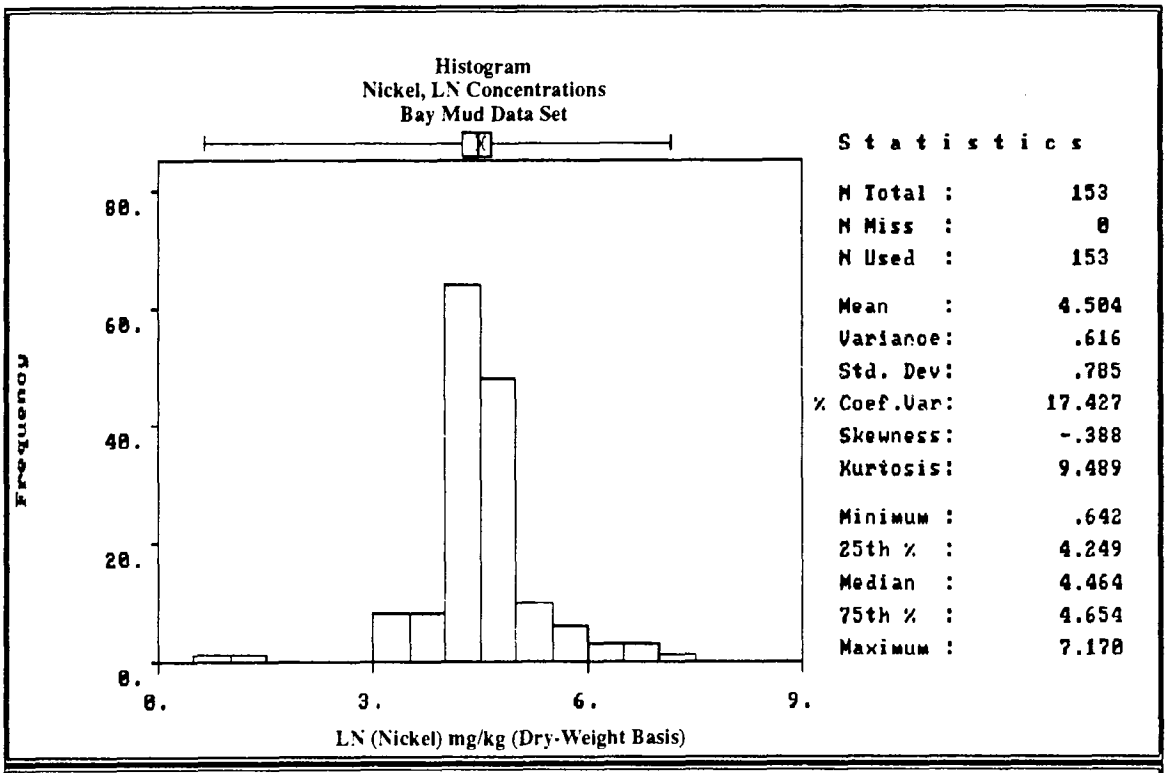
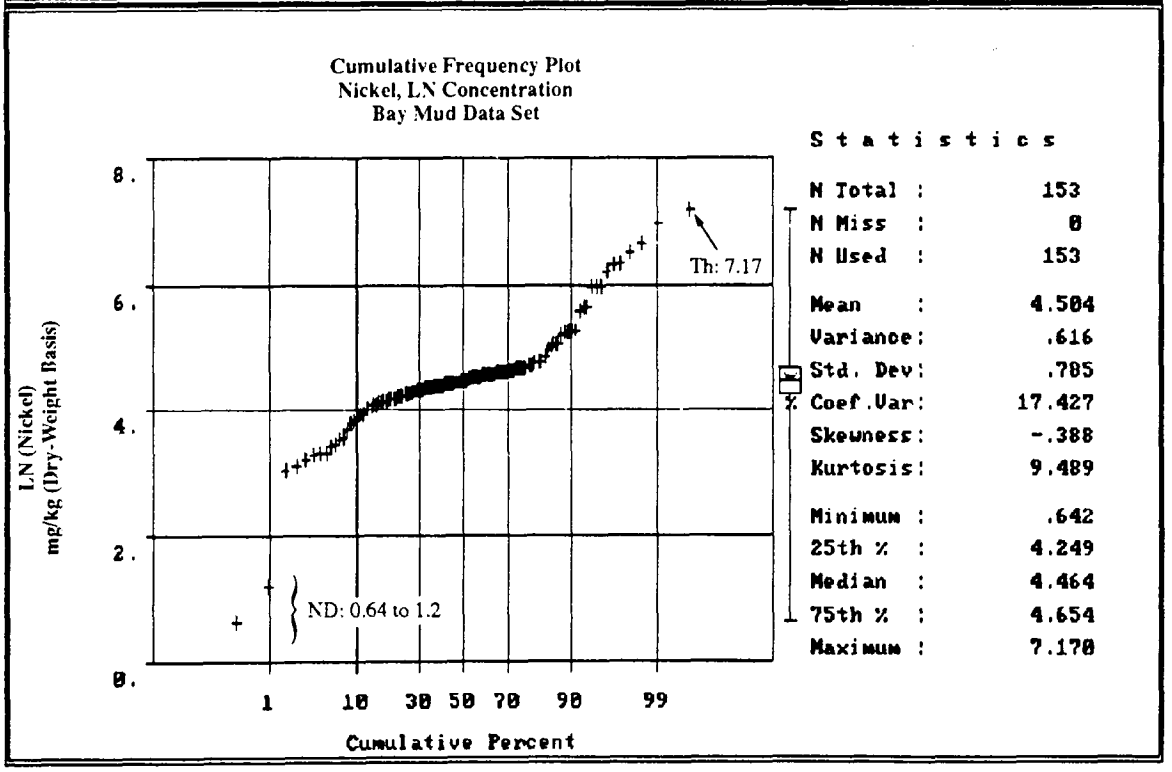
Nickel, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A140

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25902





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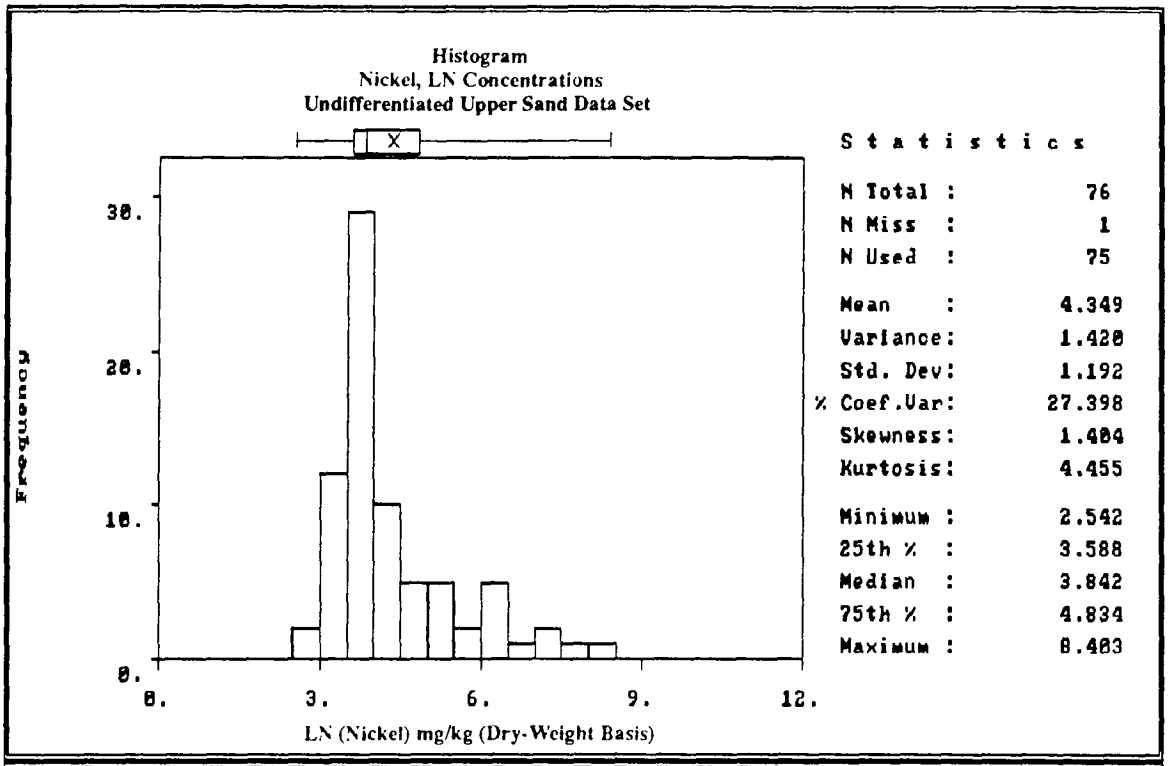
Environmental Services

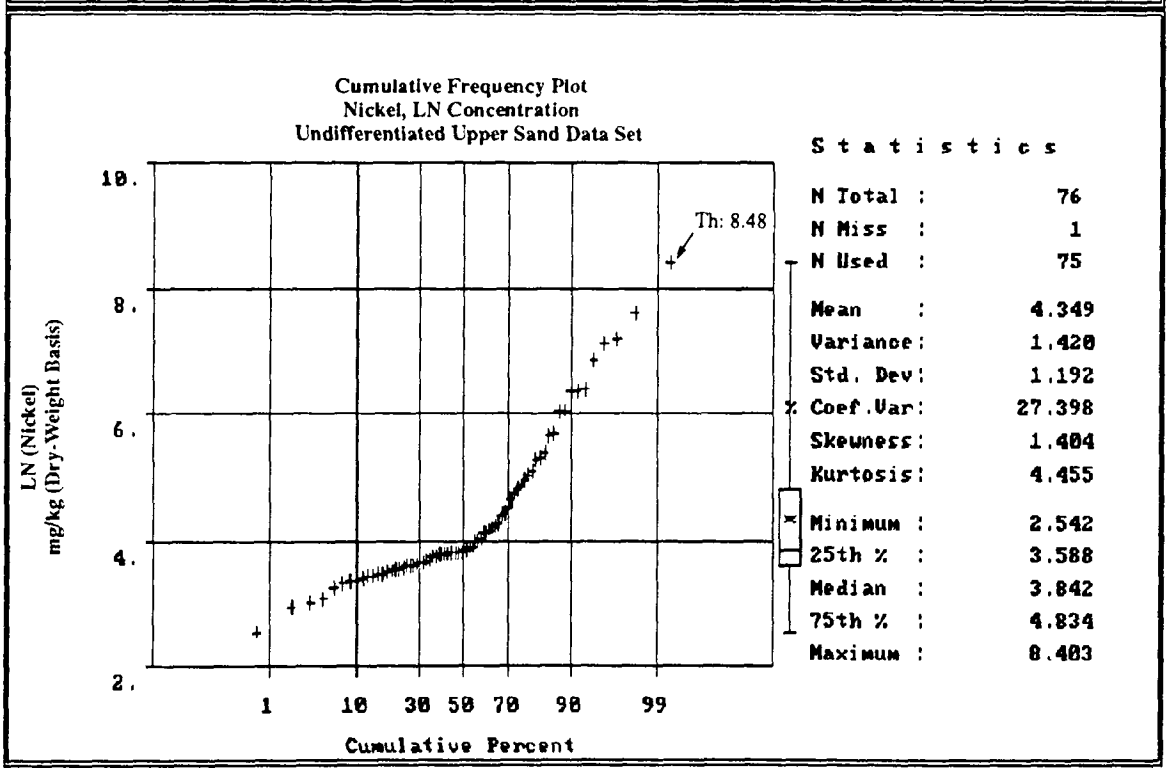
Nickel, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A141

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25903





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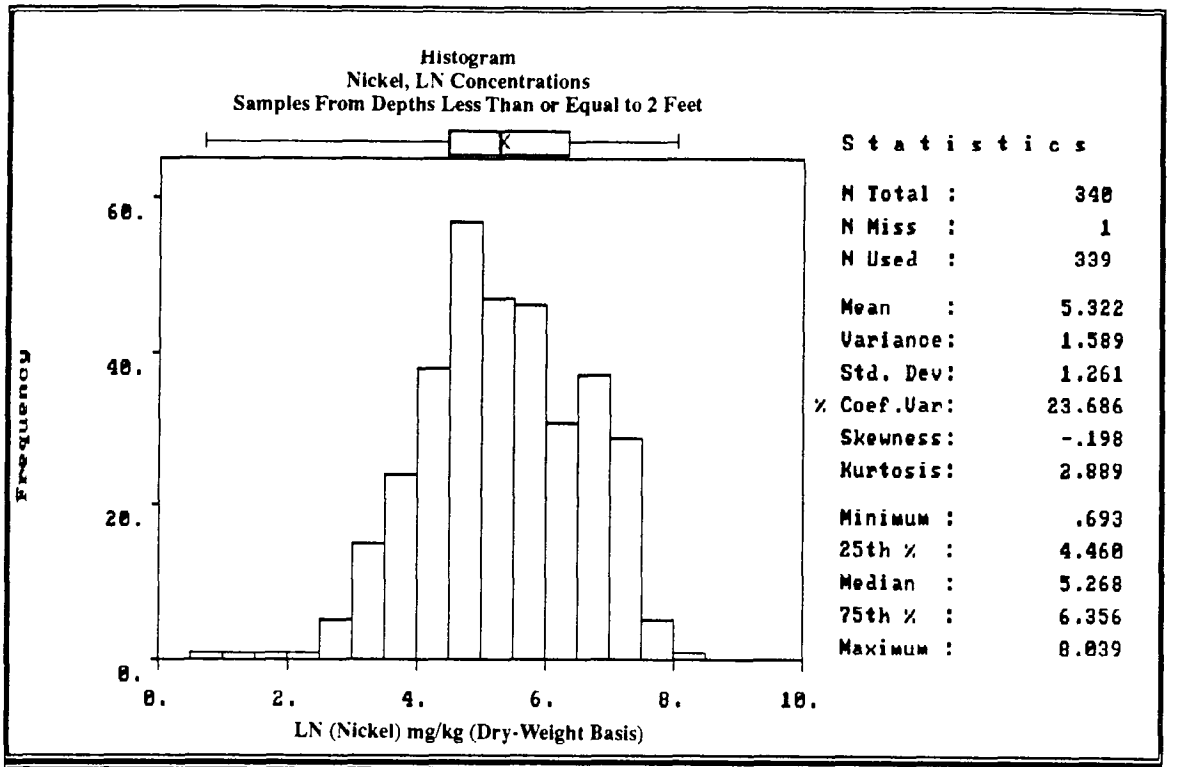
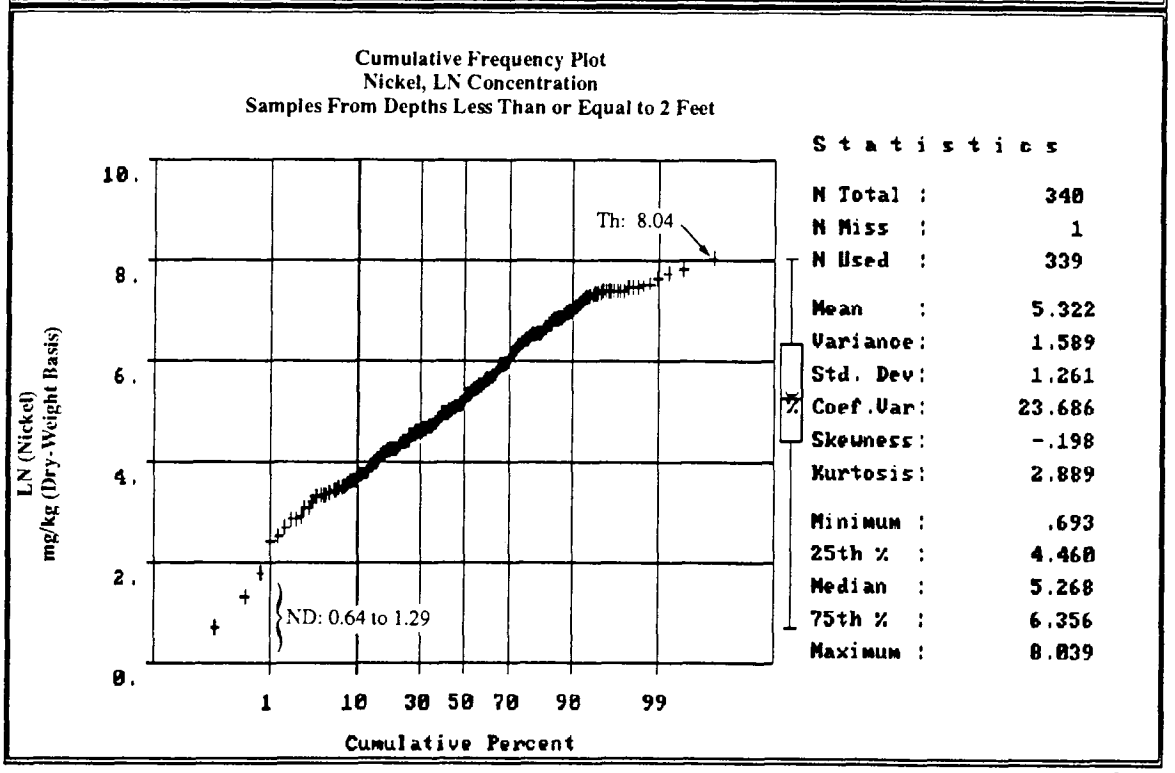
Nickel, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A142

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25904





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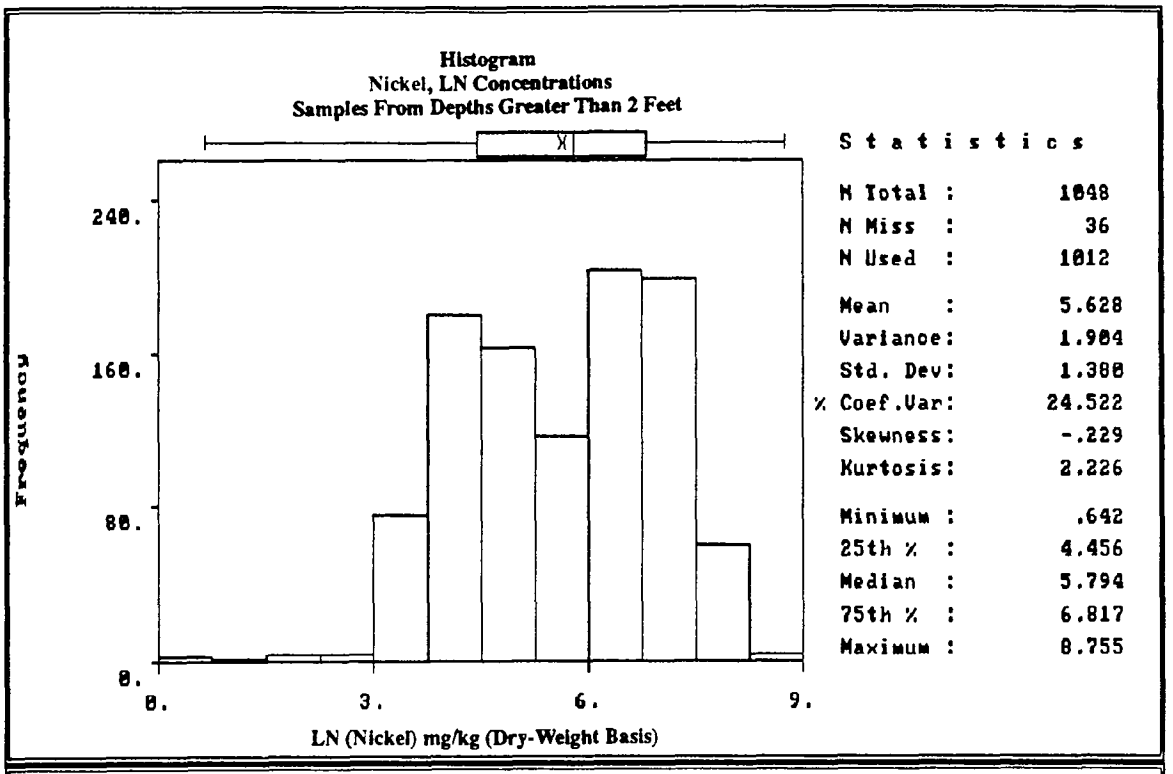
Environmental Services

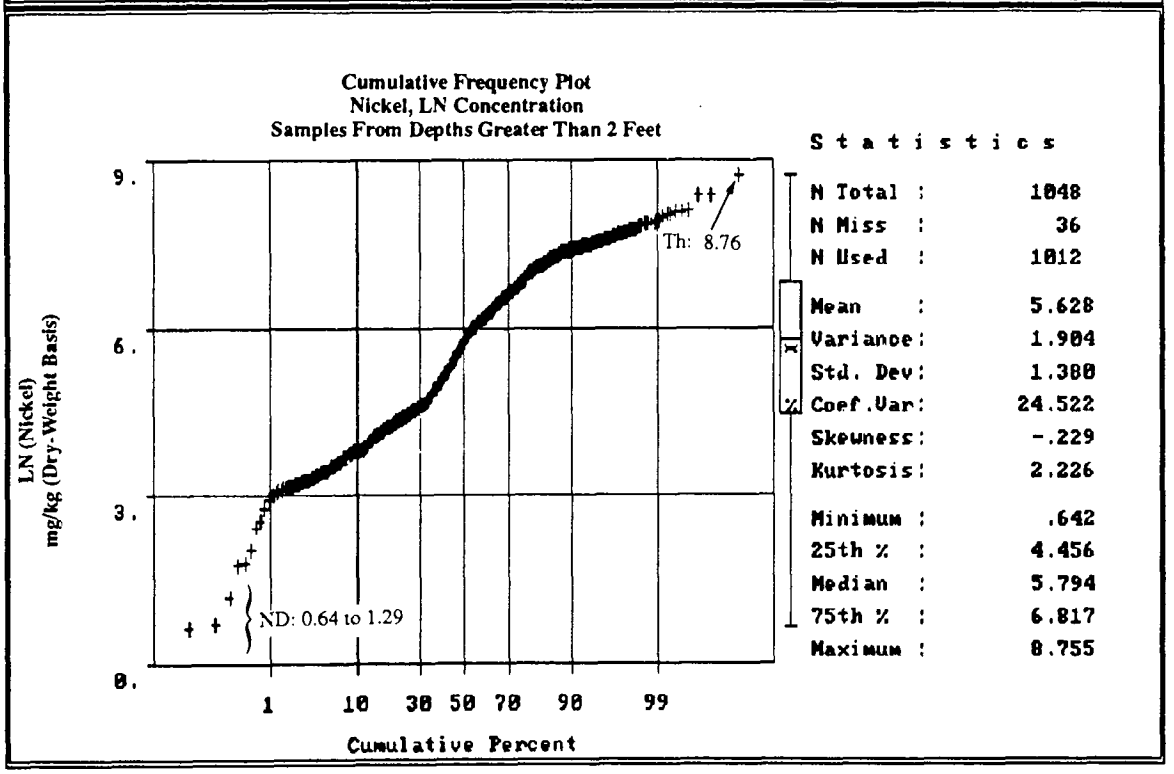
Nickel, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A143**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25905





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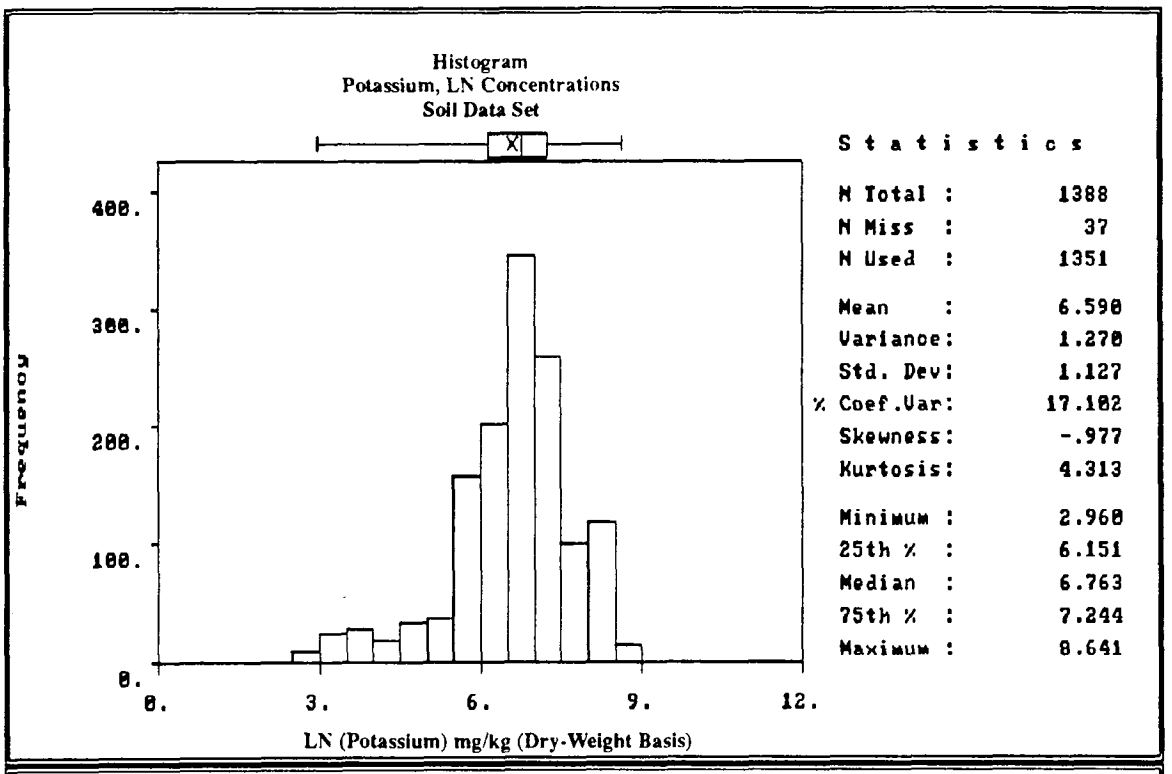
Environmental Services

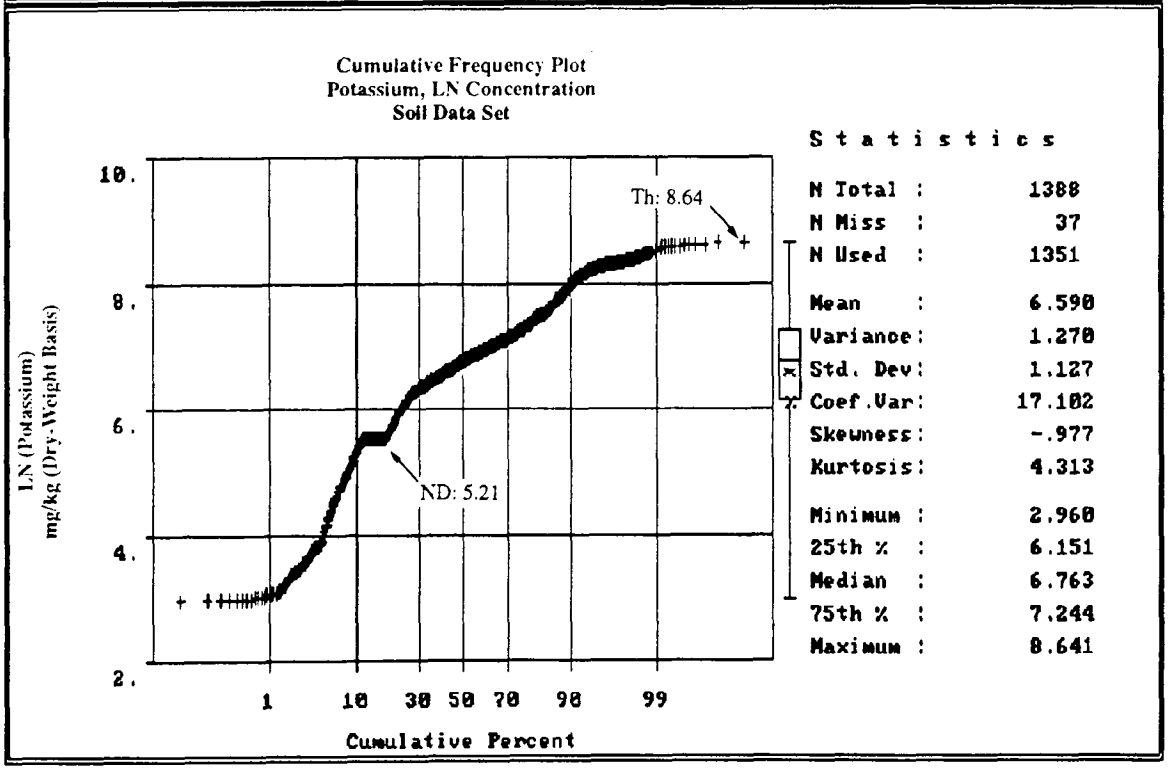
Nickel, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A144

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25906





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Potassium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A145

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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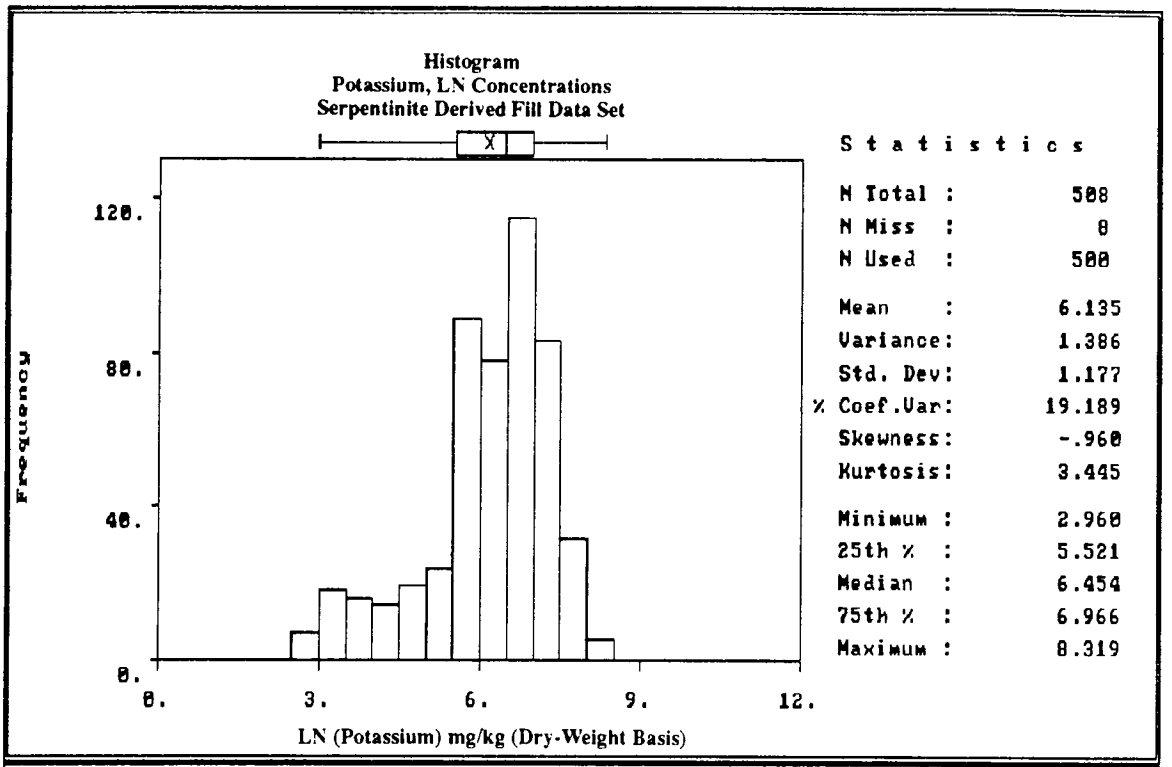

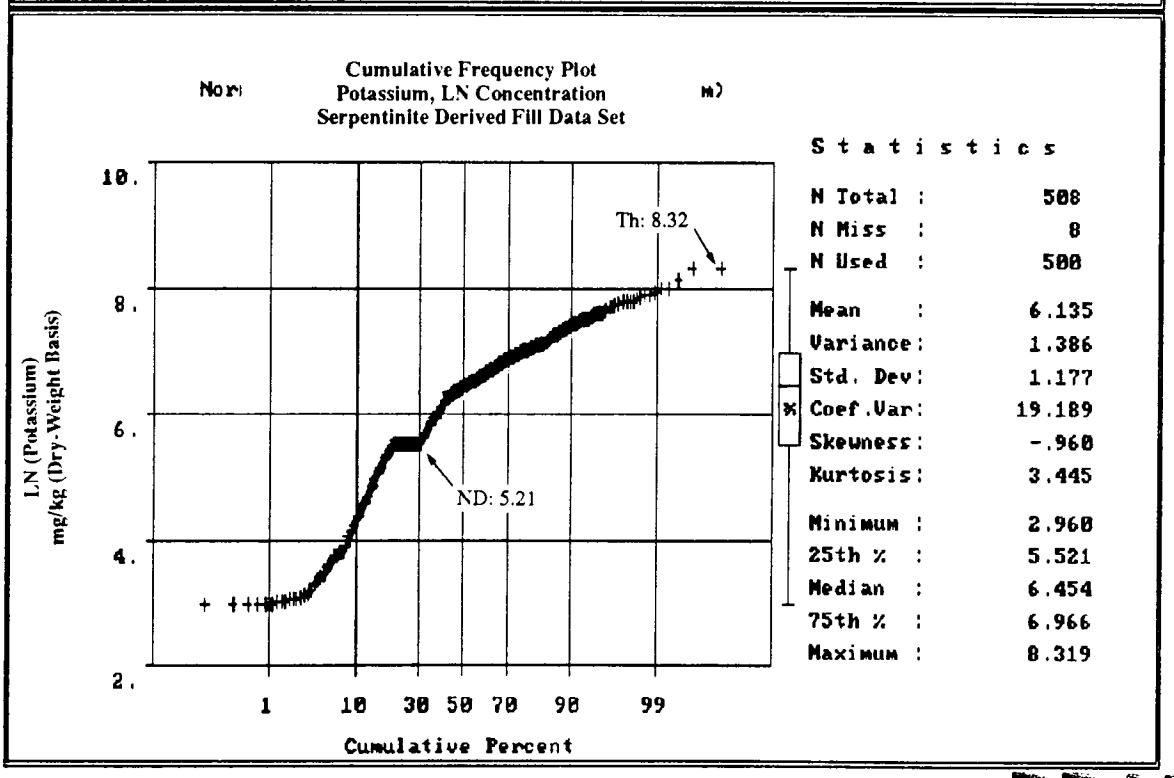

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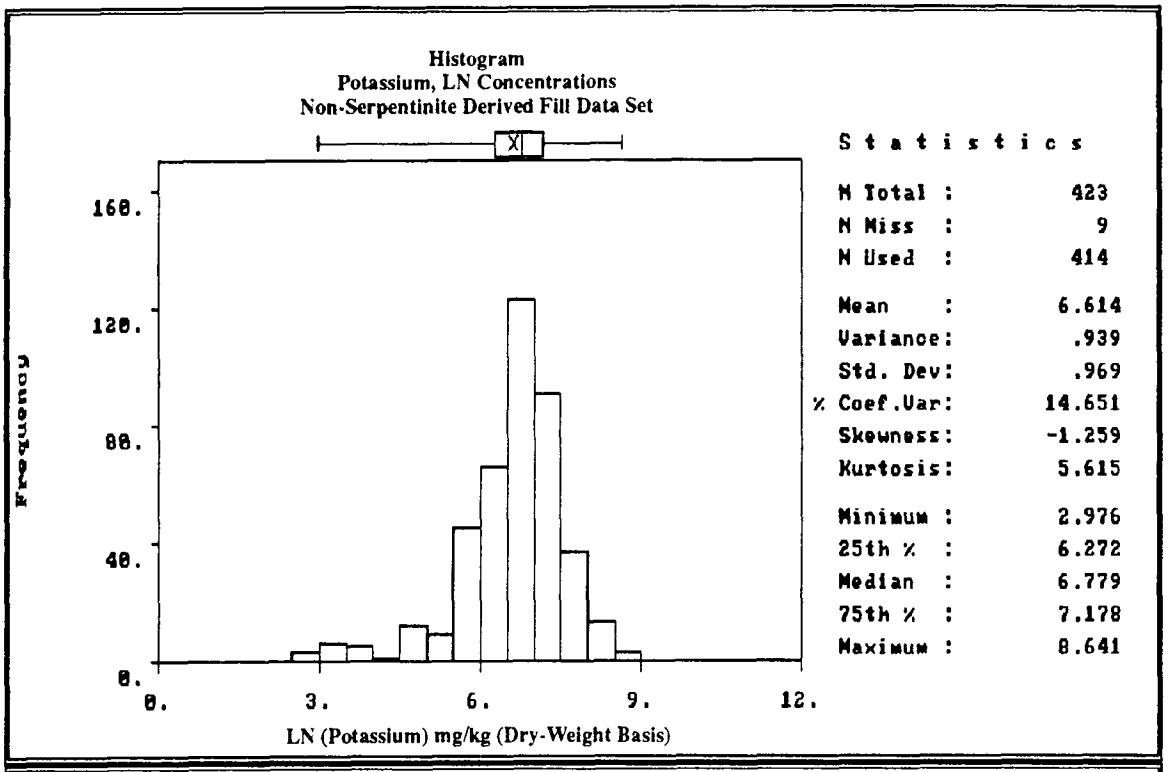
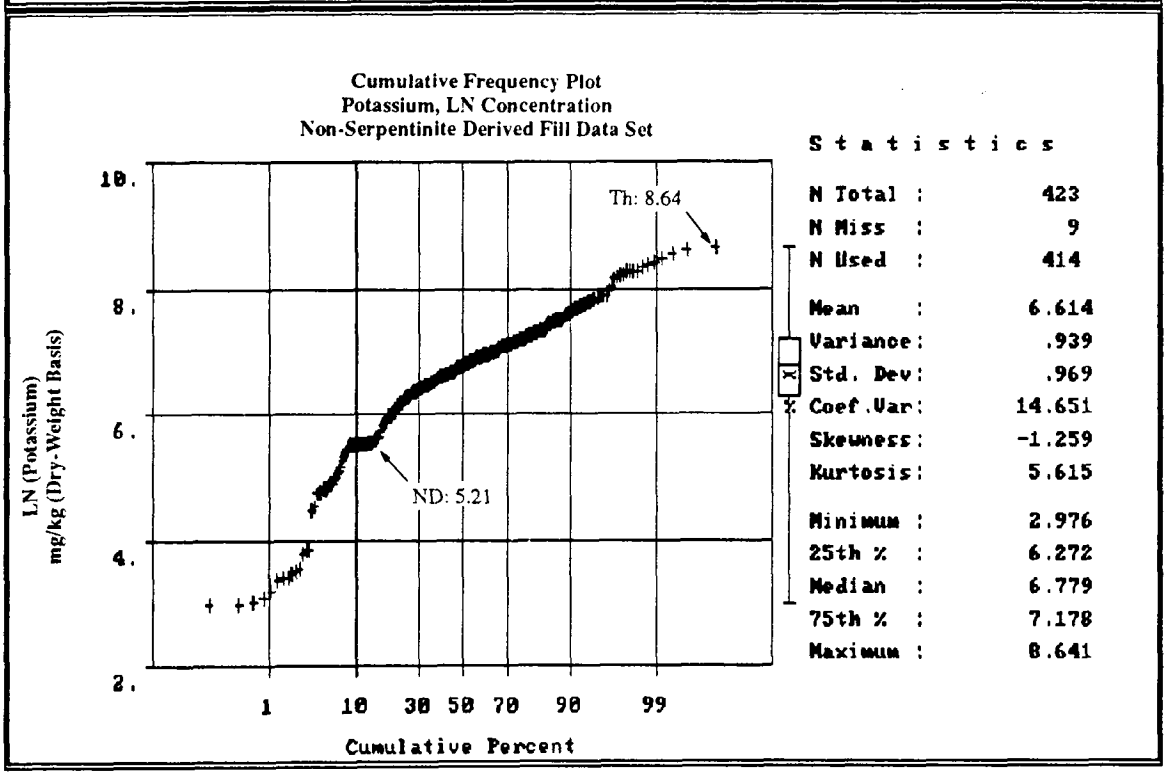
Potassium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A146

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25908





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Potassium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A147

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

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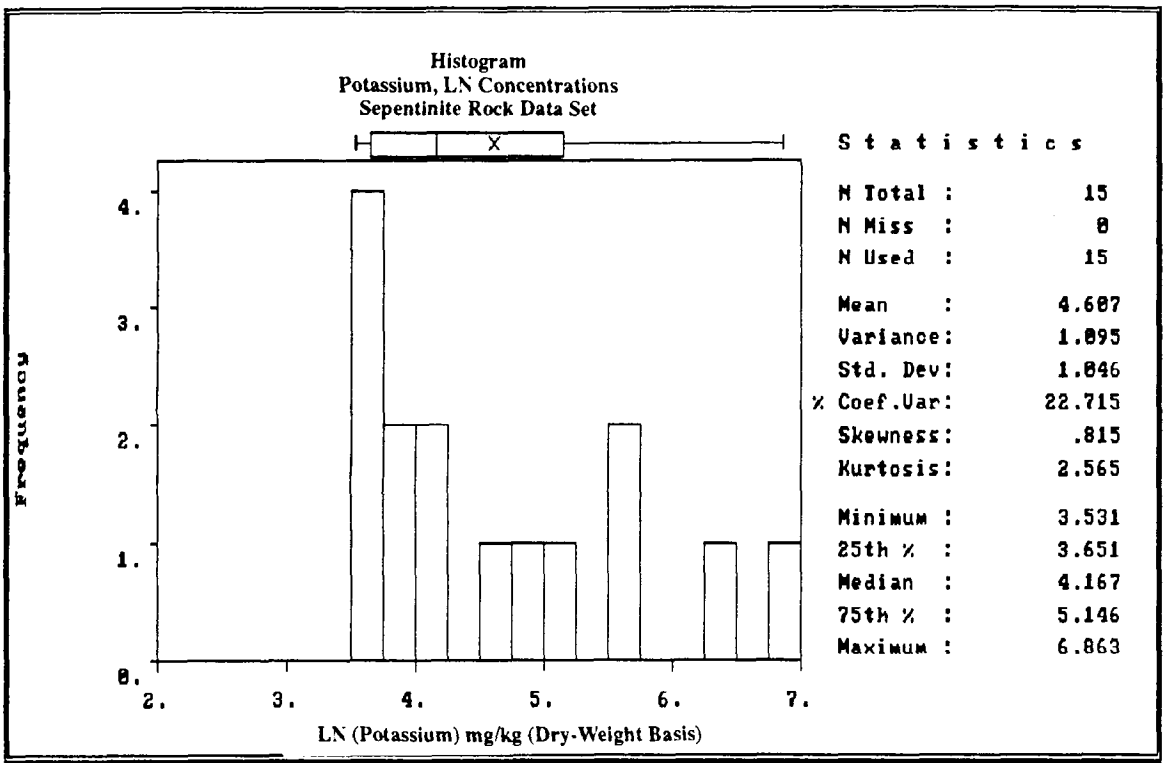

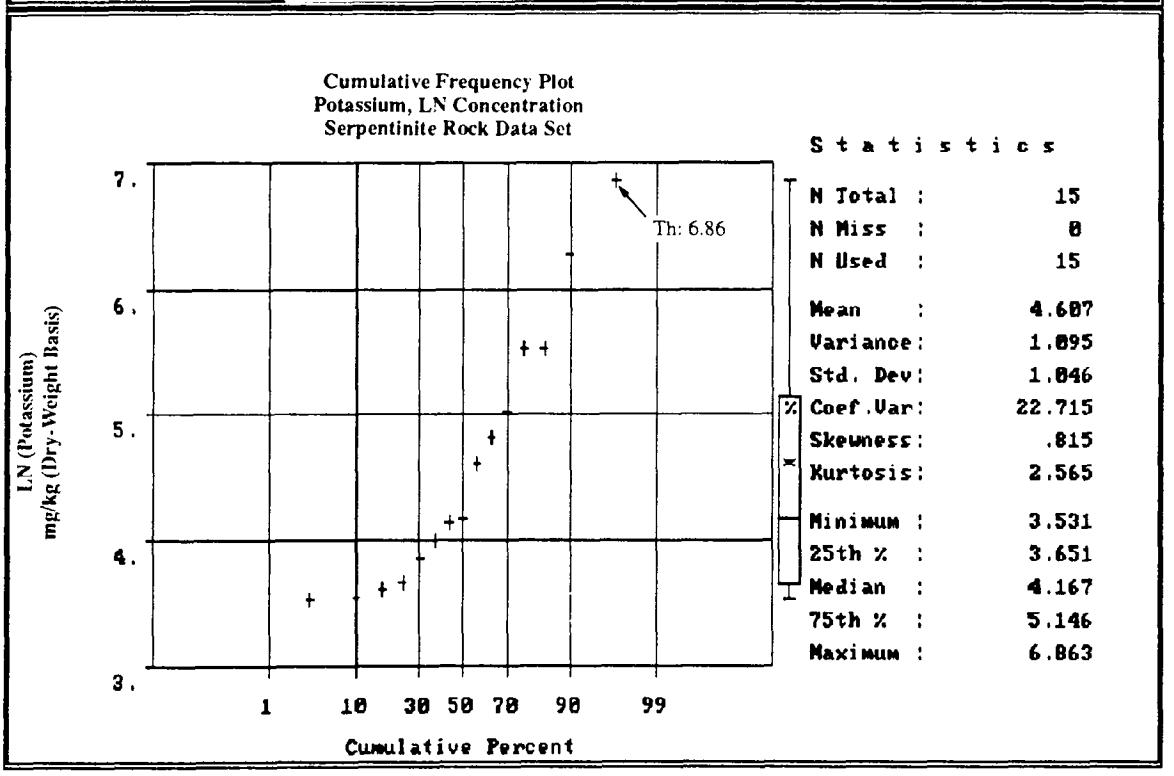

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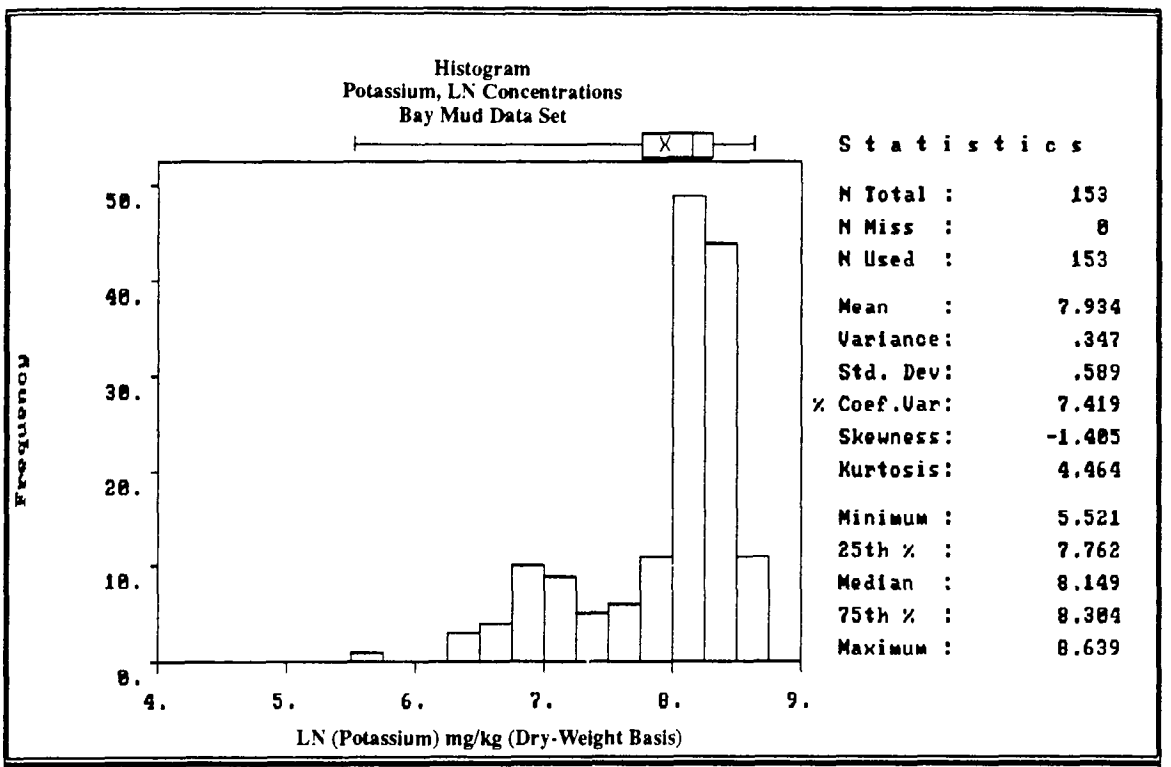
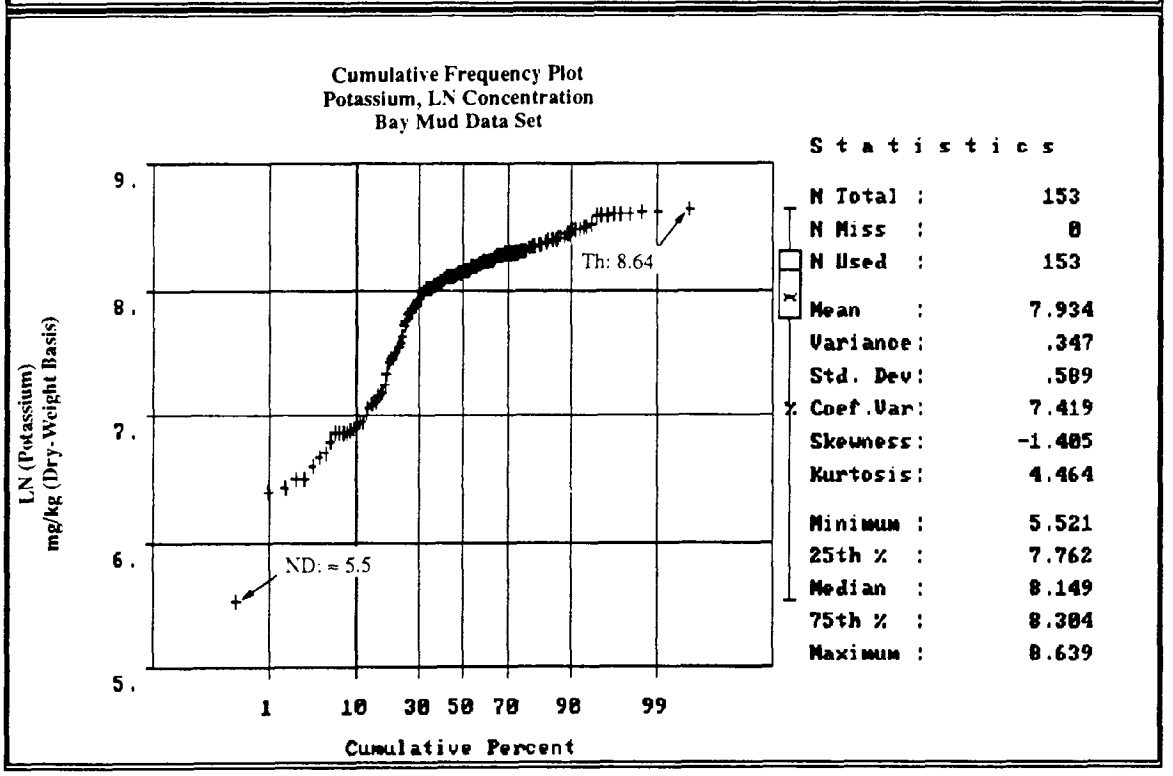
Potassium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A148

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CTM	2/92	6/92





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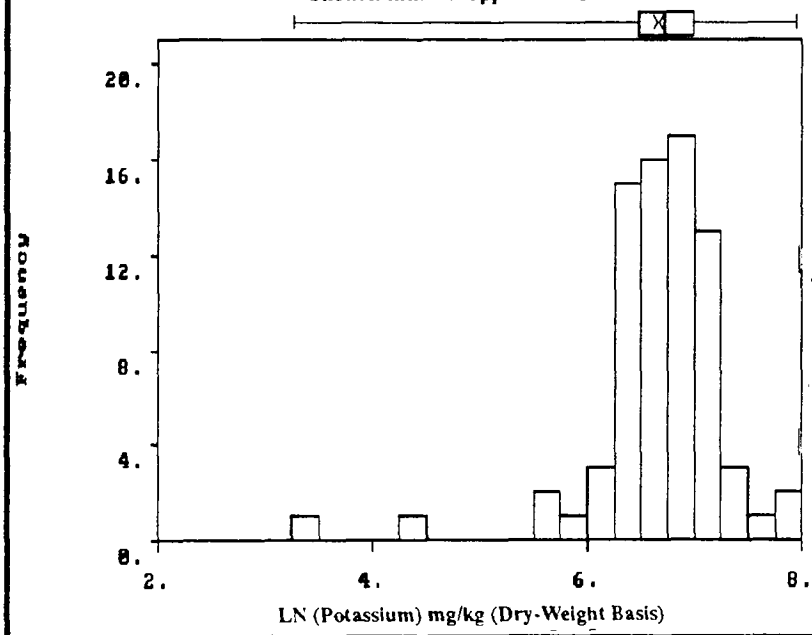
Potassium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A149

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

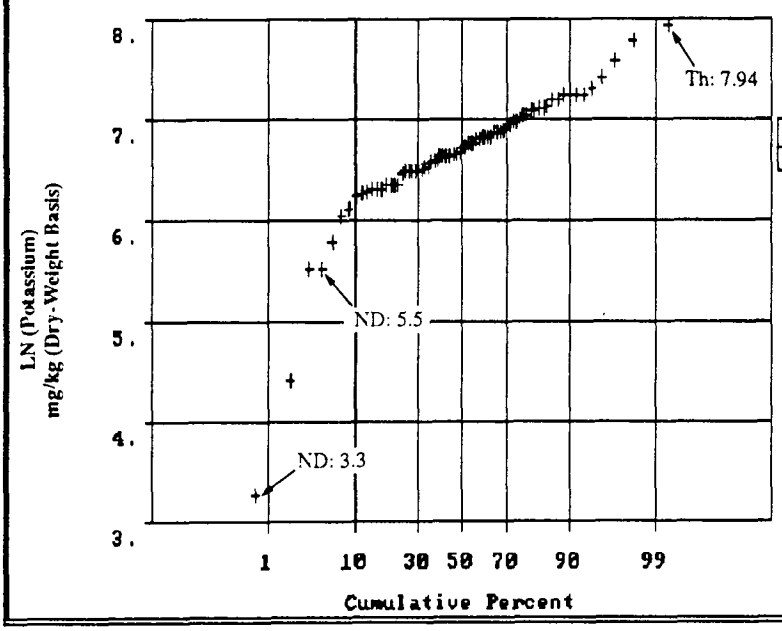
25911

Histogram
Potassium, LN Concentrations
Undifferentiated Upper Sand Data Set



Statistics	
N Total :	76
N Miss :	1
N Used :	75
Mean :	6.660
Variance:	.421
Std. Dev:	.648
% Coef.Var:	9.737
Skewness:	-2.389
Kurtosis:	13.150
Minimum :	3.260
25th % :	6.475
Median :	6.715
75th % :	6.998
Maximum :	7.944

Cumulative Frequency Plot
Potassium, LN Concentration
Undifferentiated Upper Sand Data Set



Statistics	
N Total :	76
N Miss :	1
N Used :	75
Mean :	6.660
Variance:	.421
Std. Dev:	.648
% Coef.Var:	9.737
Skewness:	-2.389
Kurtosis:	13.150
Minimum :	3.260
25th % :	6.475
Median :	6.715
75th % :	6.998
Maximum :	7.944

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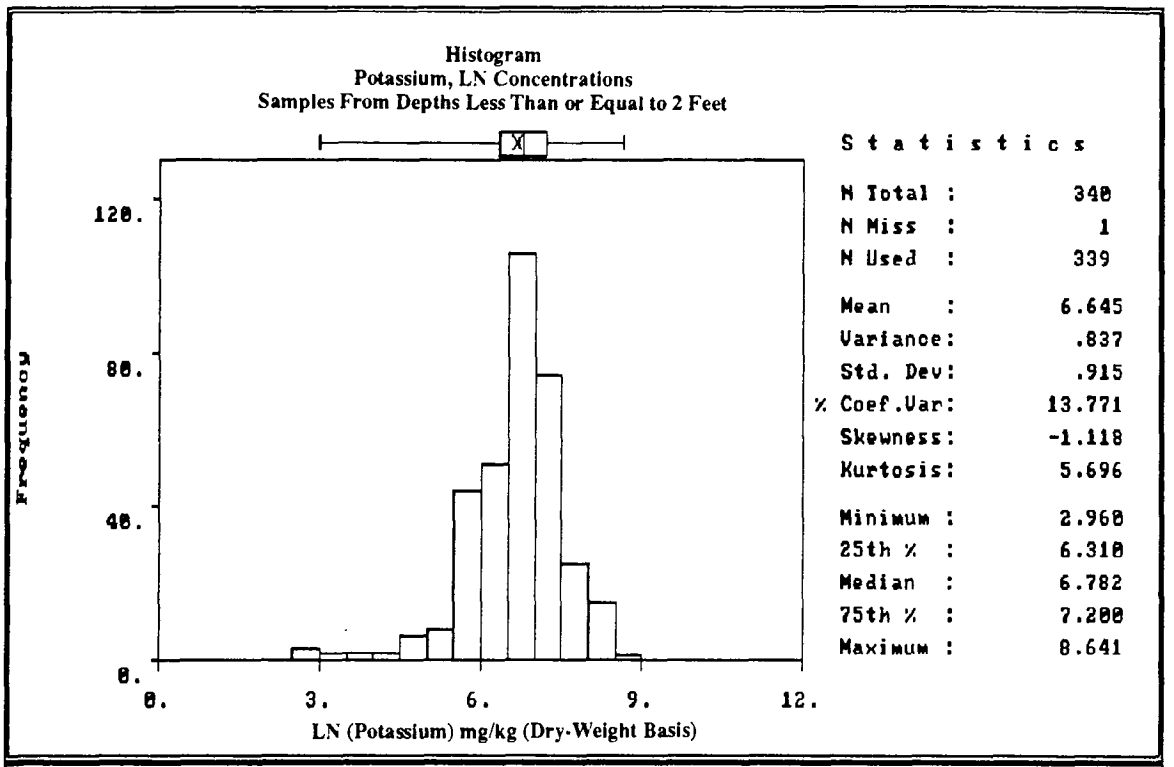
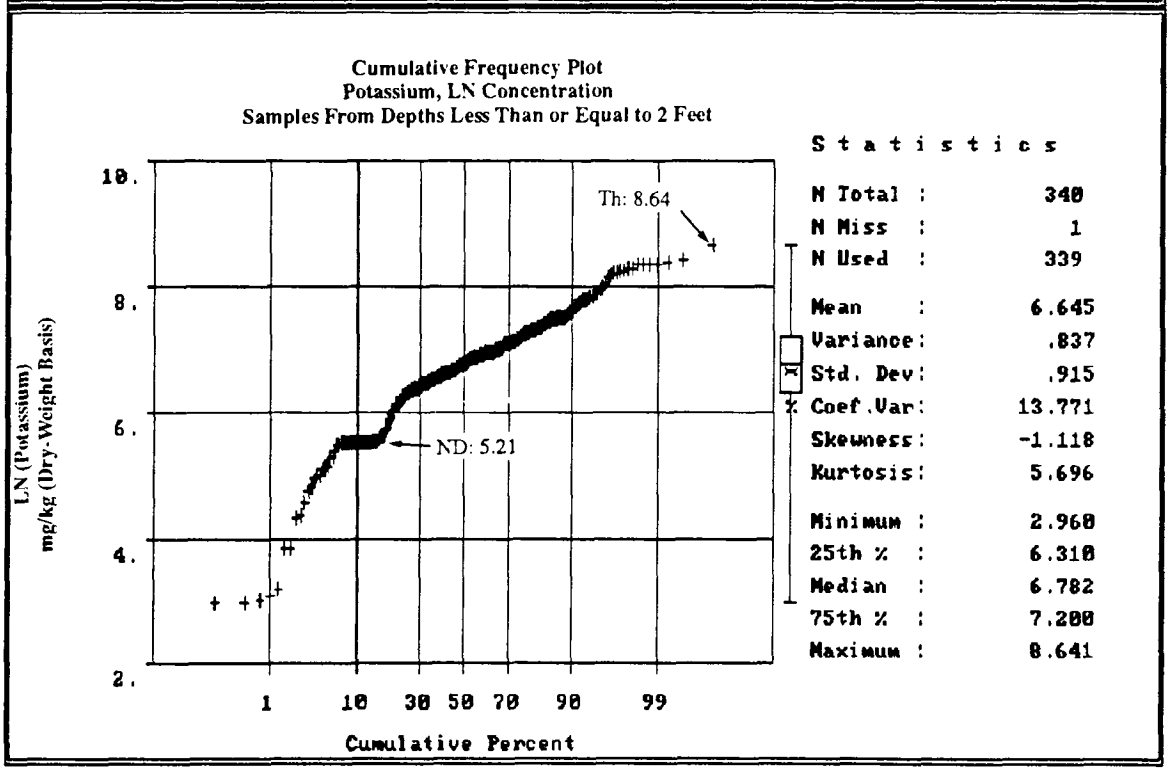
Potassium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A150

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25912





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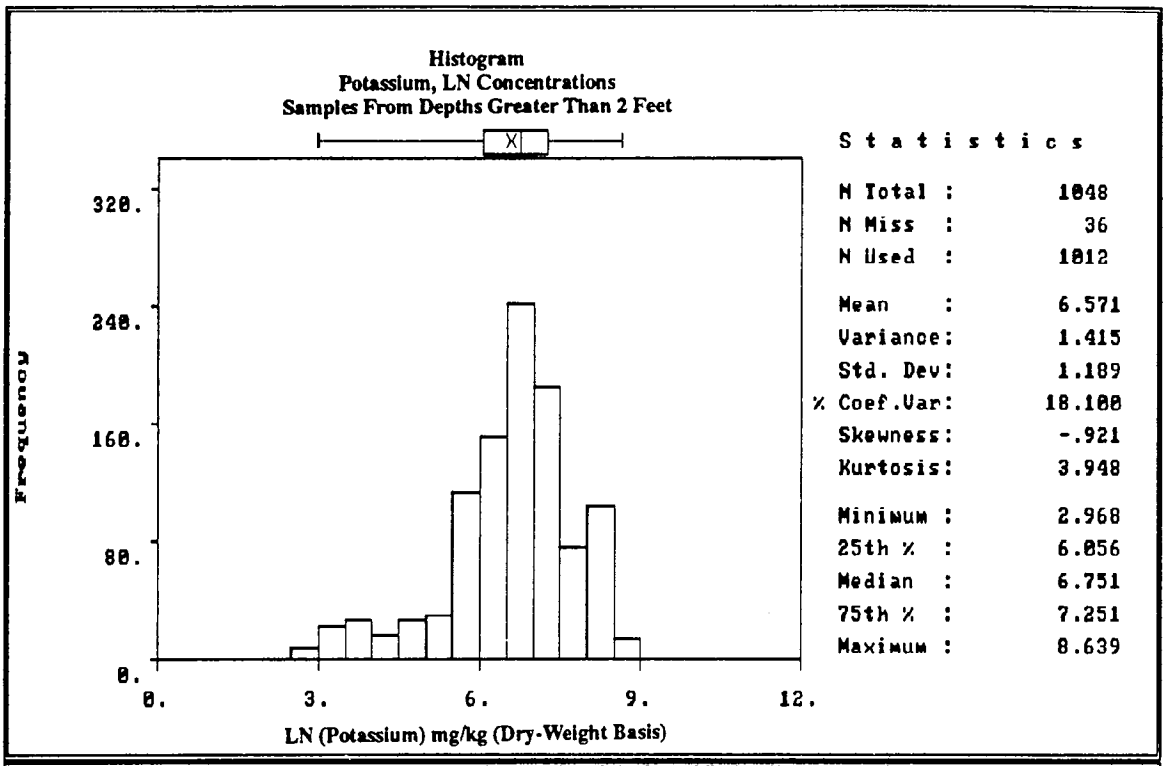
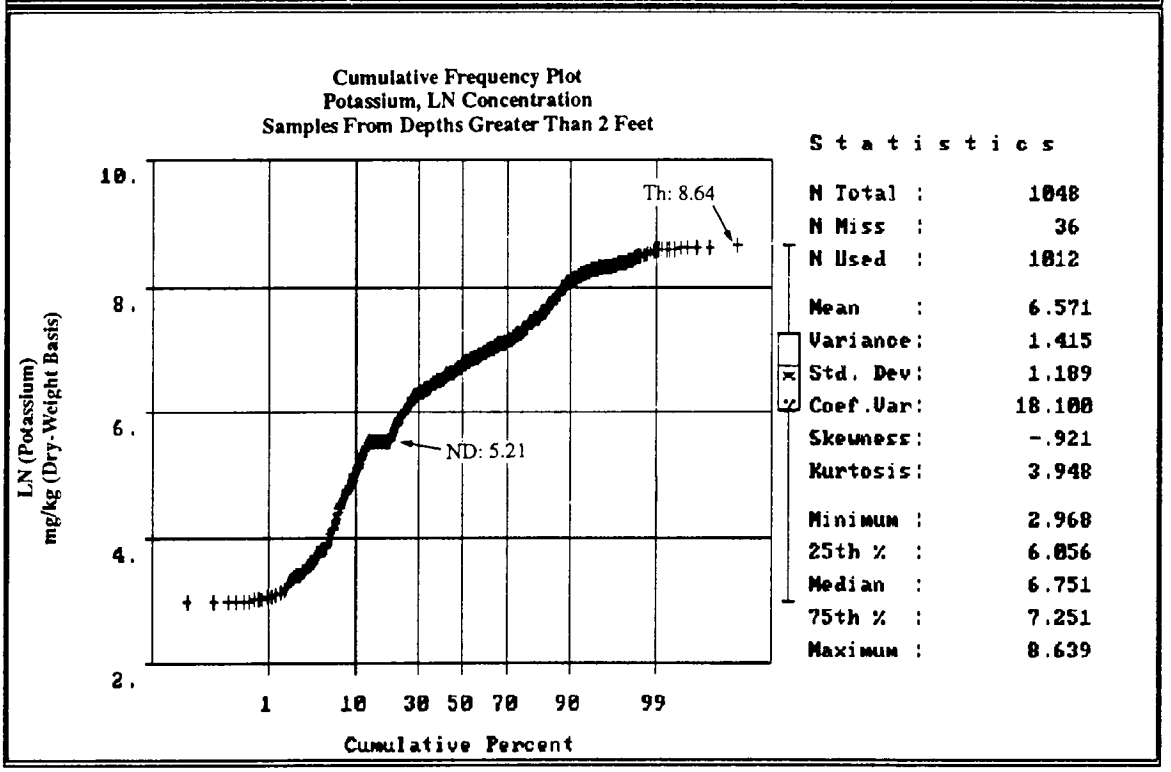
Potassium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A151**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25913





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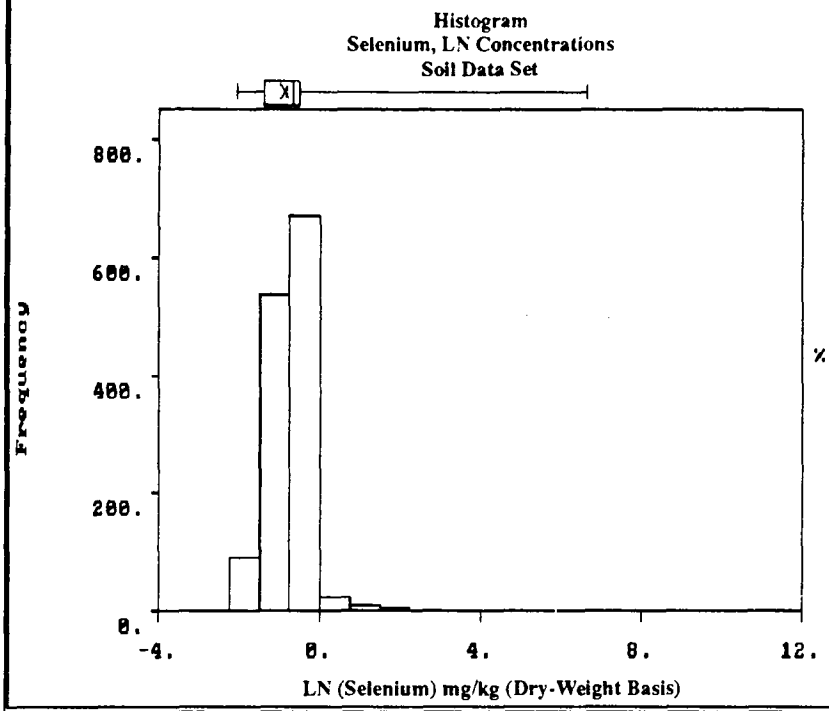
Potassium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A152**

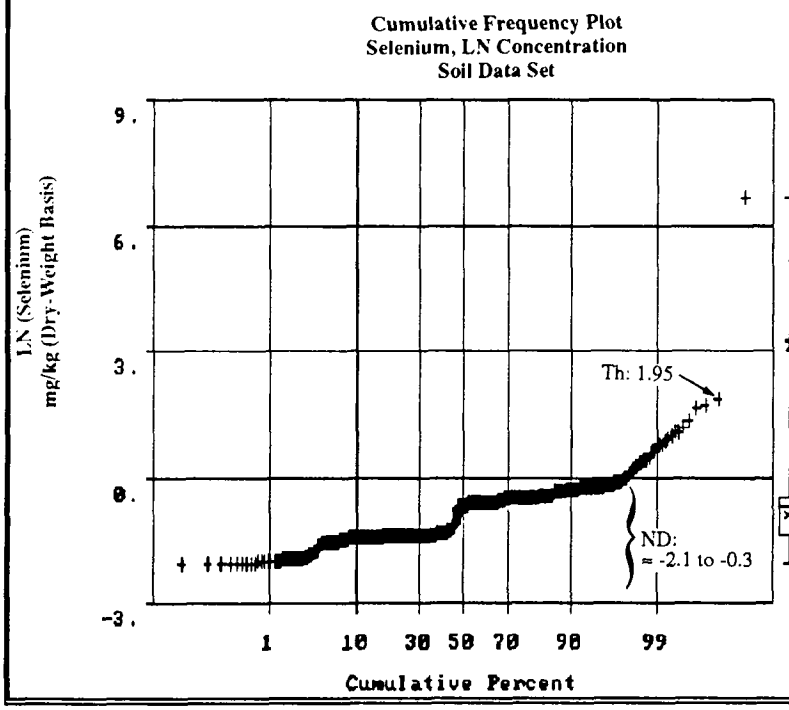
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25914



Statistics

N Total :	1388
N Miss :	58
N Used :	1330
Mean :	-.896
Variance:	.349
Std. Dev:	.591
% Coef.Var:	65.925
Skewness:	1.901
Kurtosis:	22.879
Minimum :	-2.079
25th % :	-1.386
Median :	-.693
75th % :	-.511
Maximum :	6.649



Statistics

N Total :	1388
N Miss :	58
N Used :	1330
Mean :	-.896
Variance:	.349
Std. Dev:	.591
% Coef.Var:	65.925
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Minimum :	-2.079
25th % :	-1.386
Median :	-.693
75th % :	-.511
Maximum :	6.649

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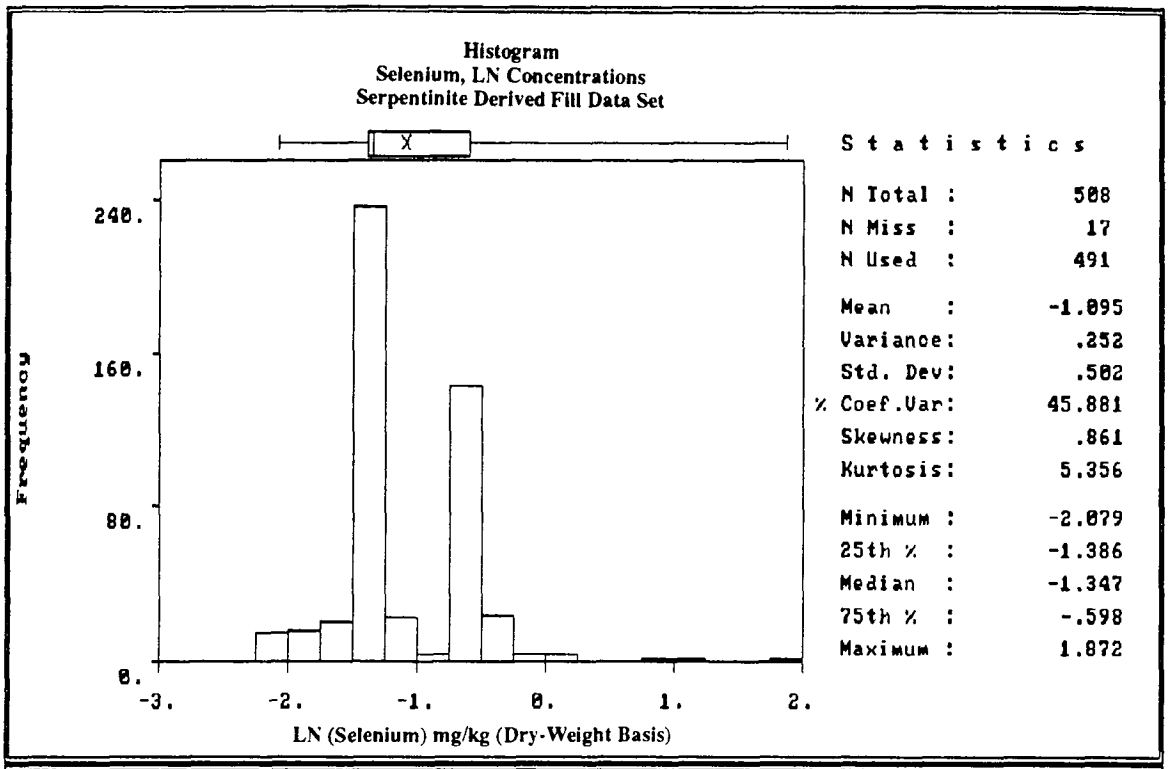
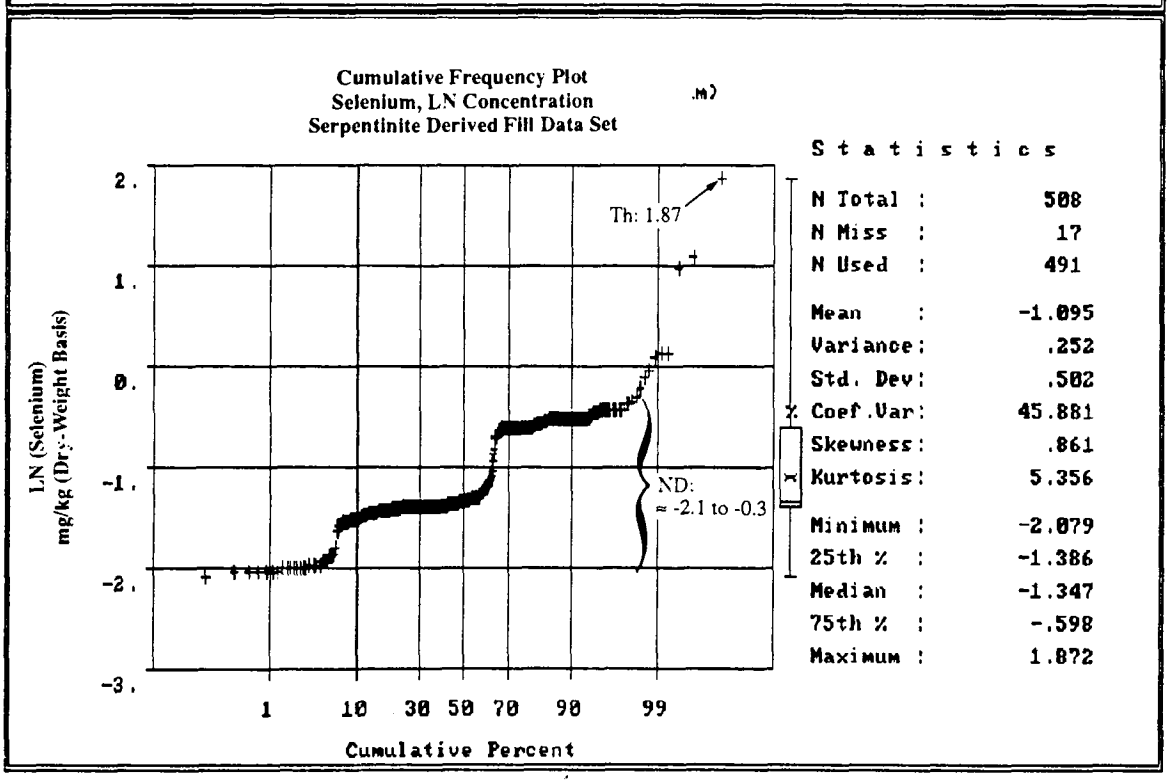
Selenium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A153

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25915





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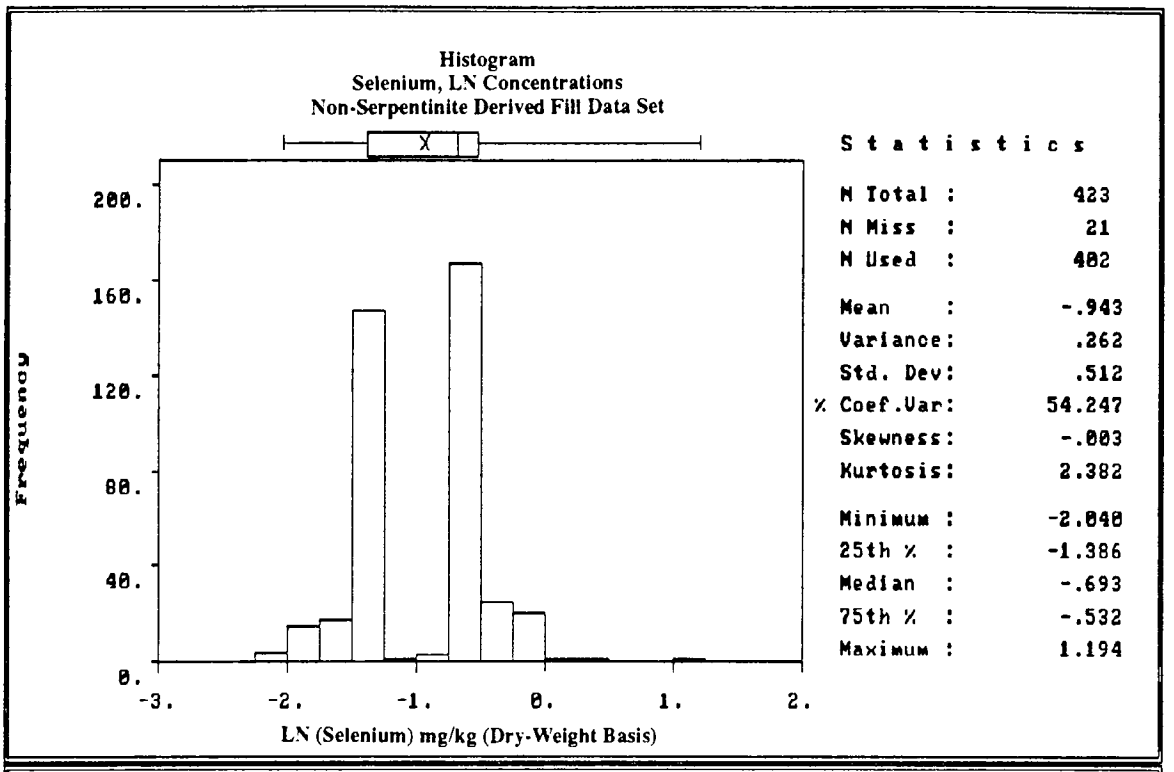
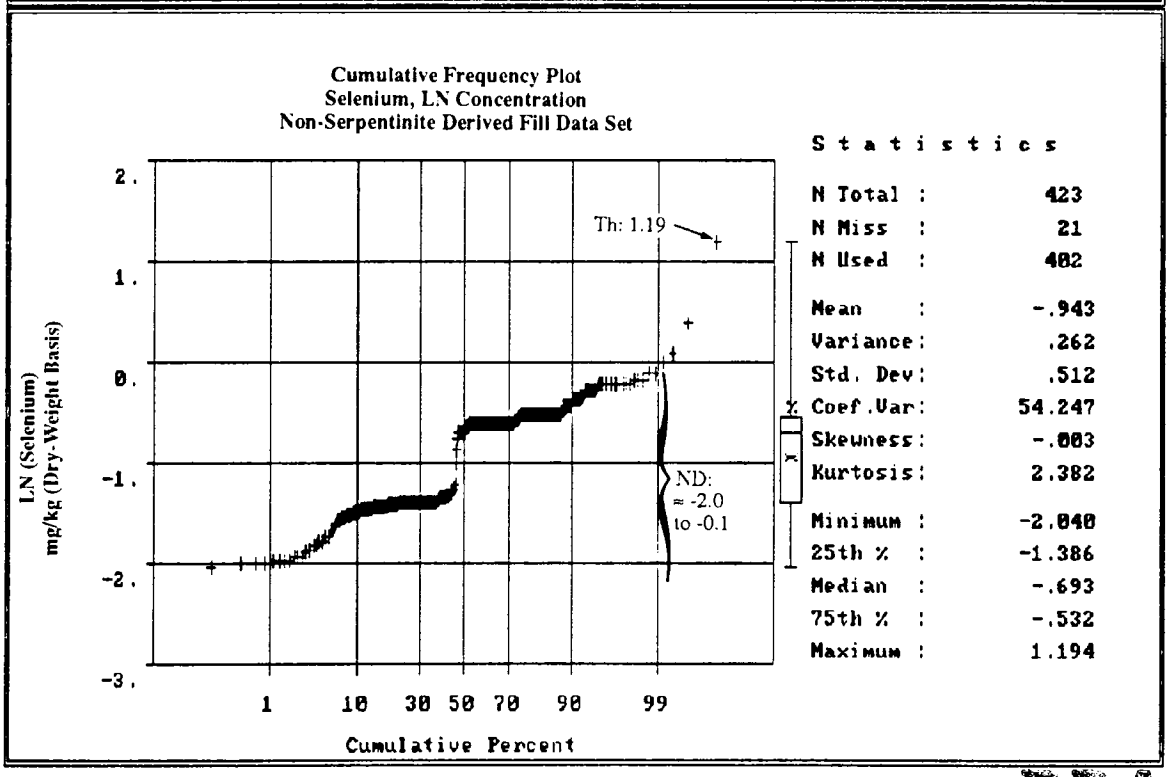
Selenium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A154

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25916





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Selenium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
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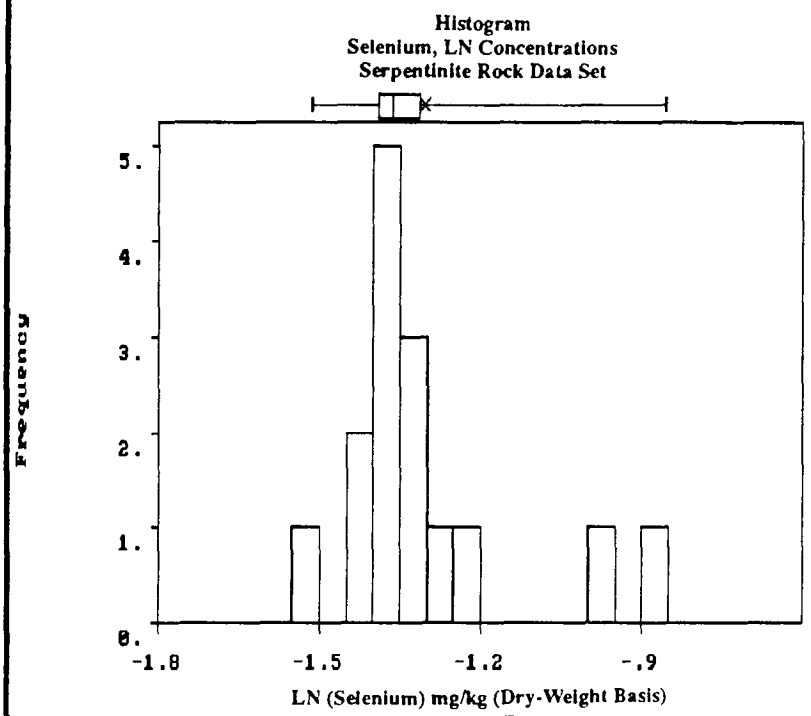
PLATE
A155

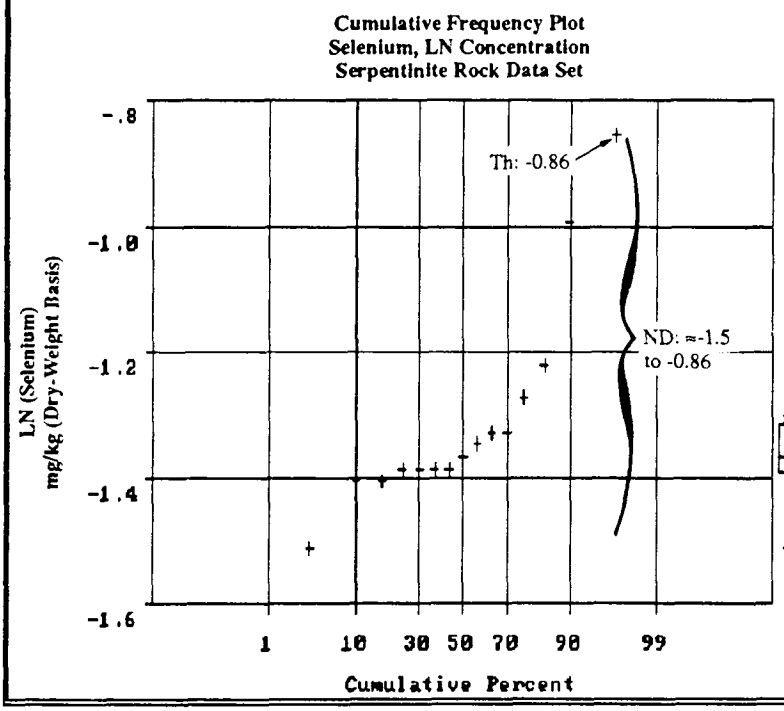
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25917



Statistics

N Total :	15
N Miss :	0
N Used :	15
Mean :	-1.306
Variance:	.029
Std. Dev:	.170
% Coef.Var:	13.010
Skewness:	1.637
Kurtosis:	4.850
Minimum :	-1.514
25th % :	-1.391
Median :	-1.366
75th % :	-1.314
Maximum :	-.856



Statistics

N Total :	15
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Mean :	-1.306
Variance:	.029
Std. Dev:	.170
% Coef.Var:	13.010
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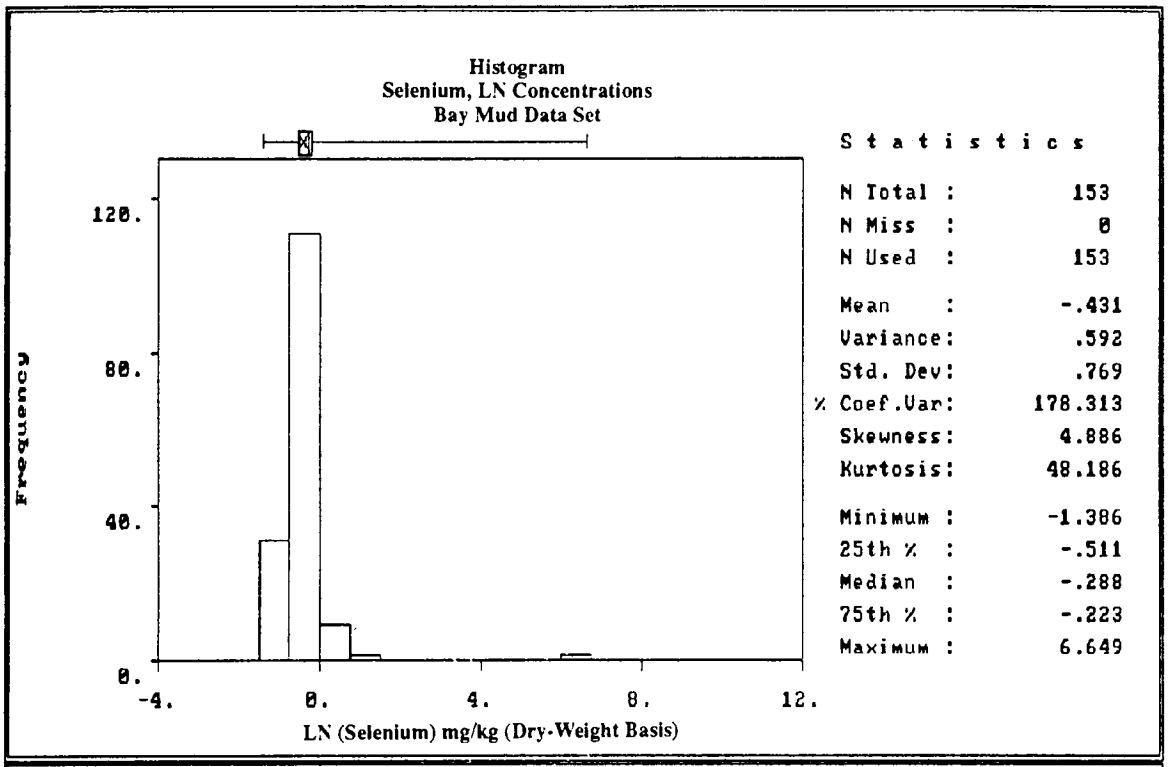
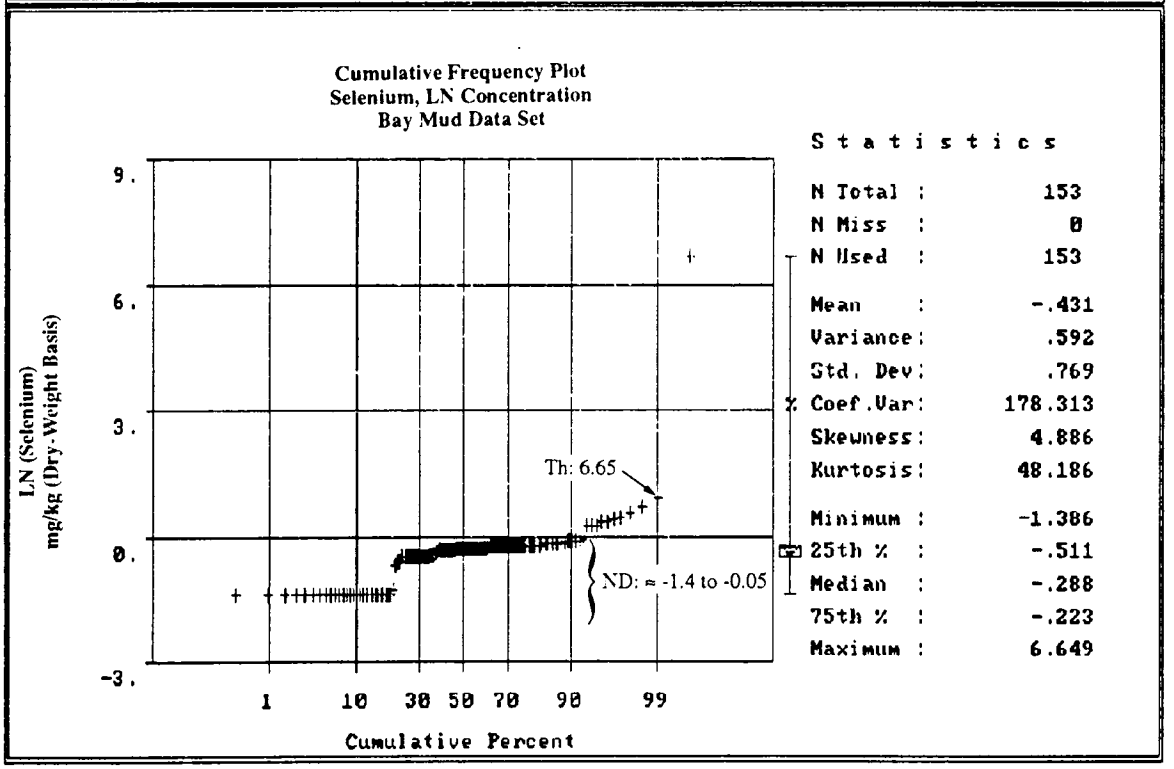
Selenium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A156

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25918





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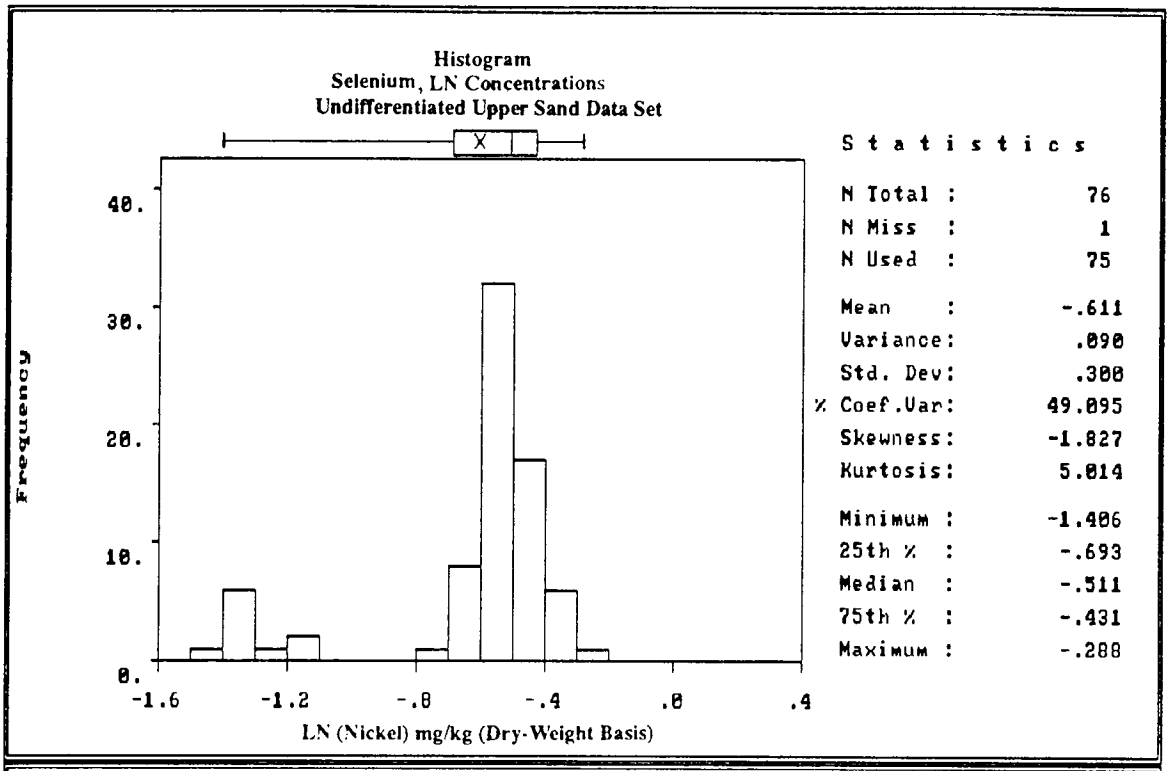
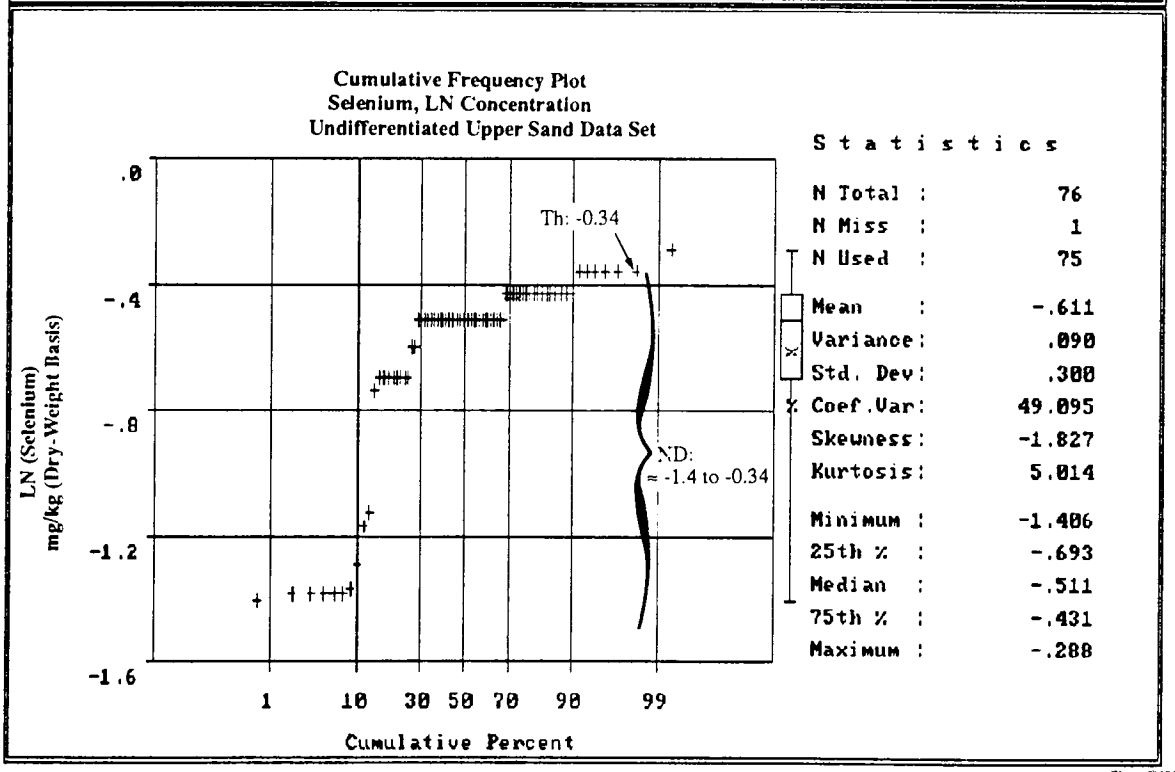
Selenium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A157

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25919





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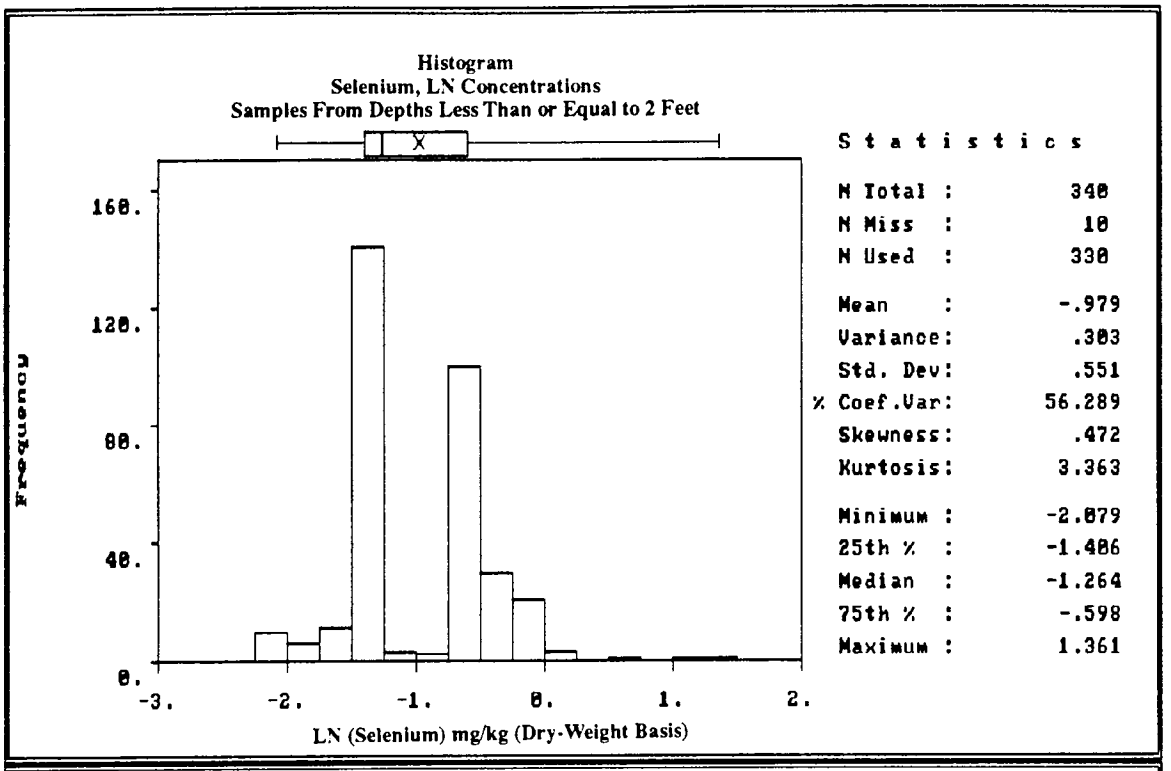
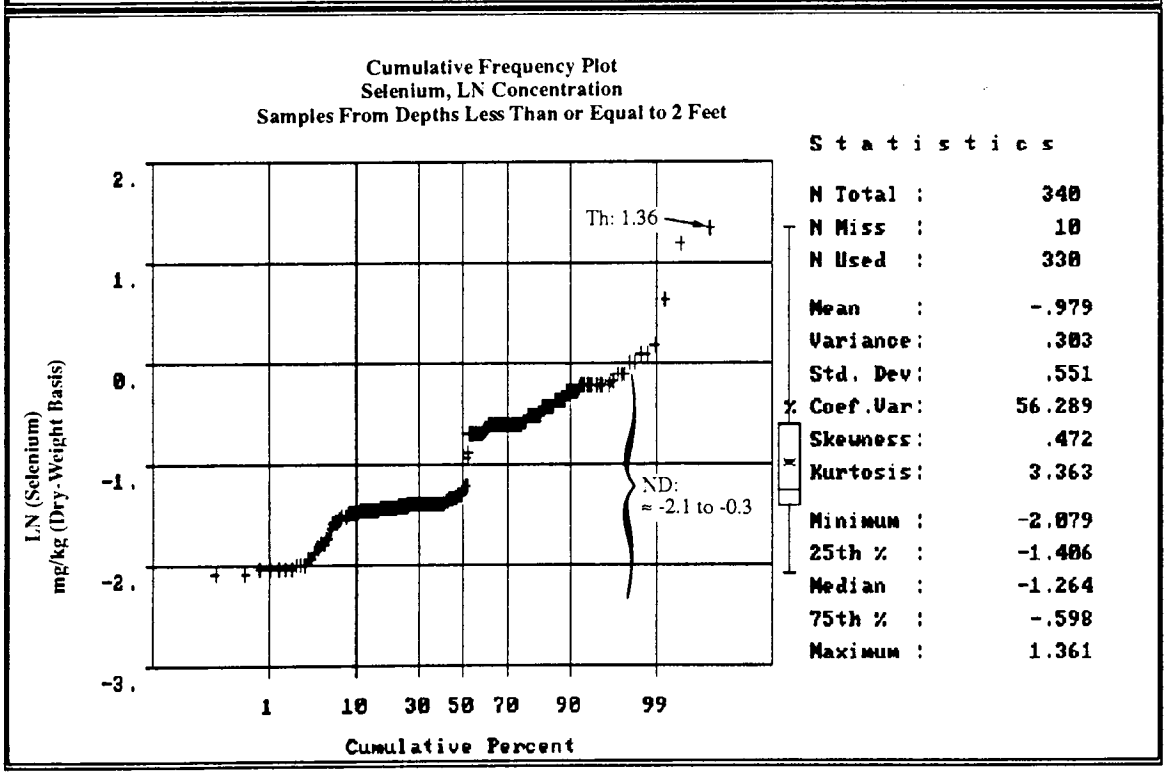
Selenium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A158

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25920





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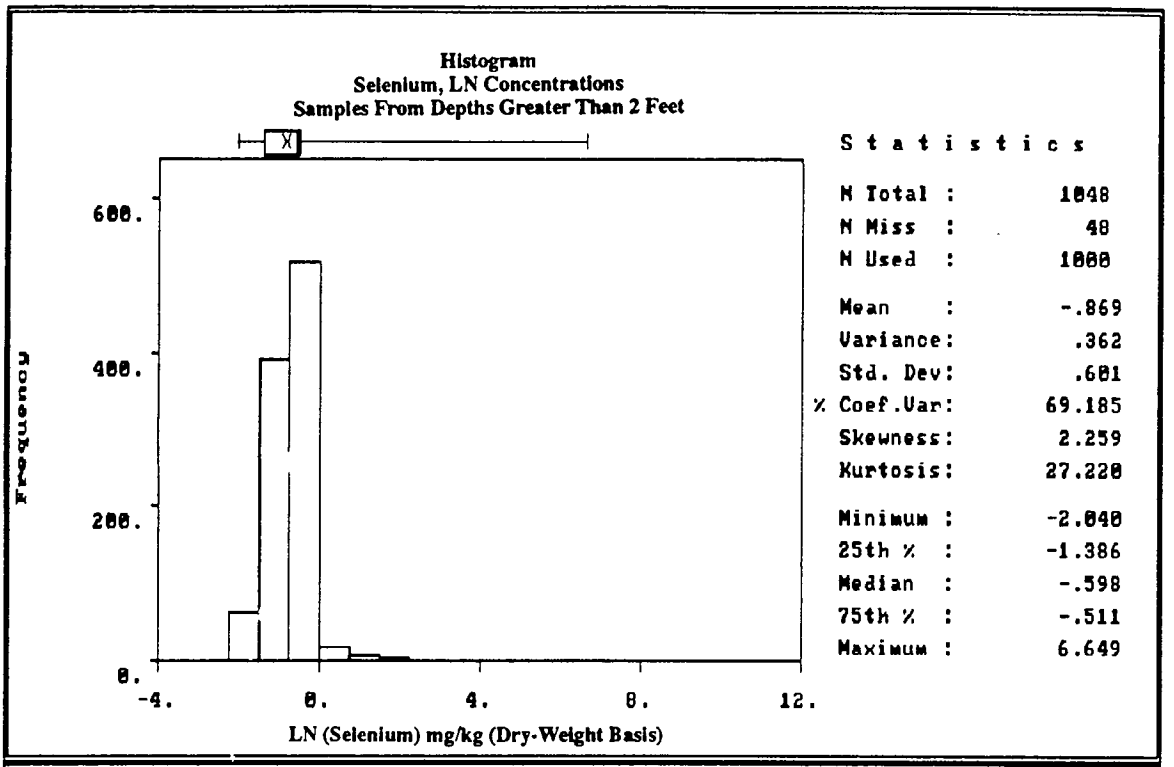
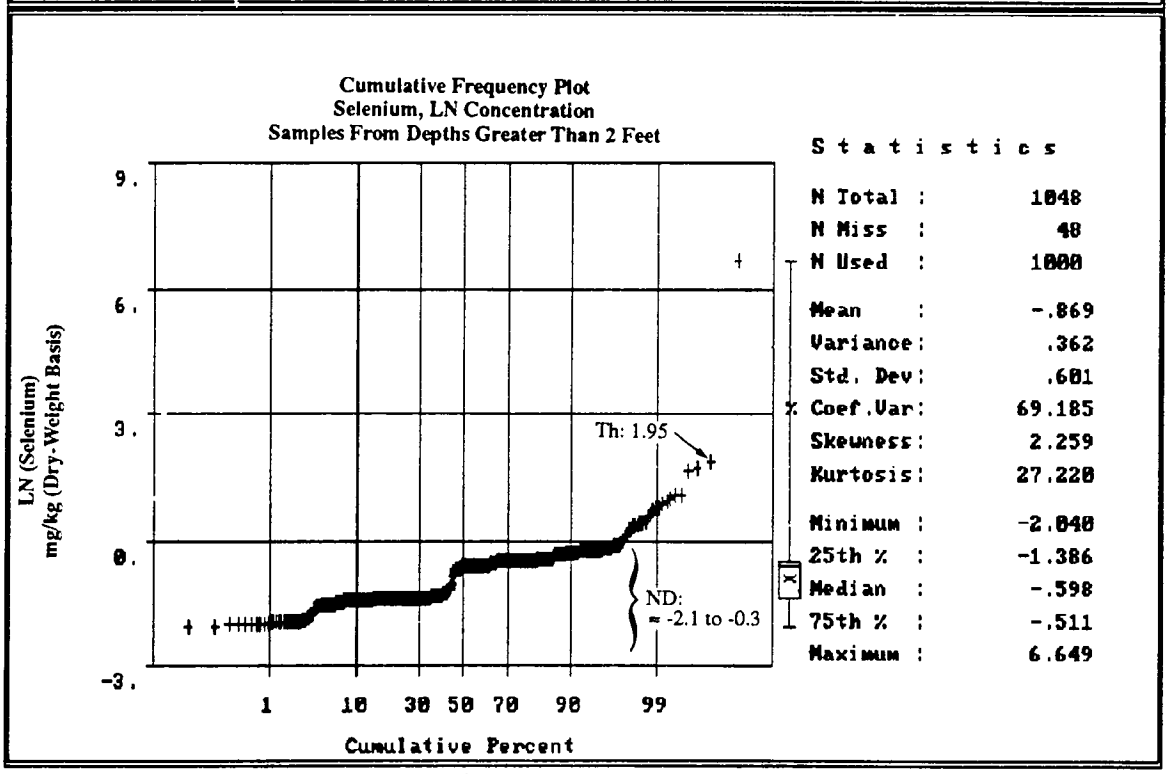
Selenium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A159**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25921





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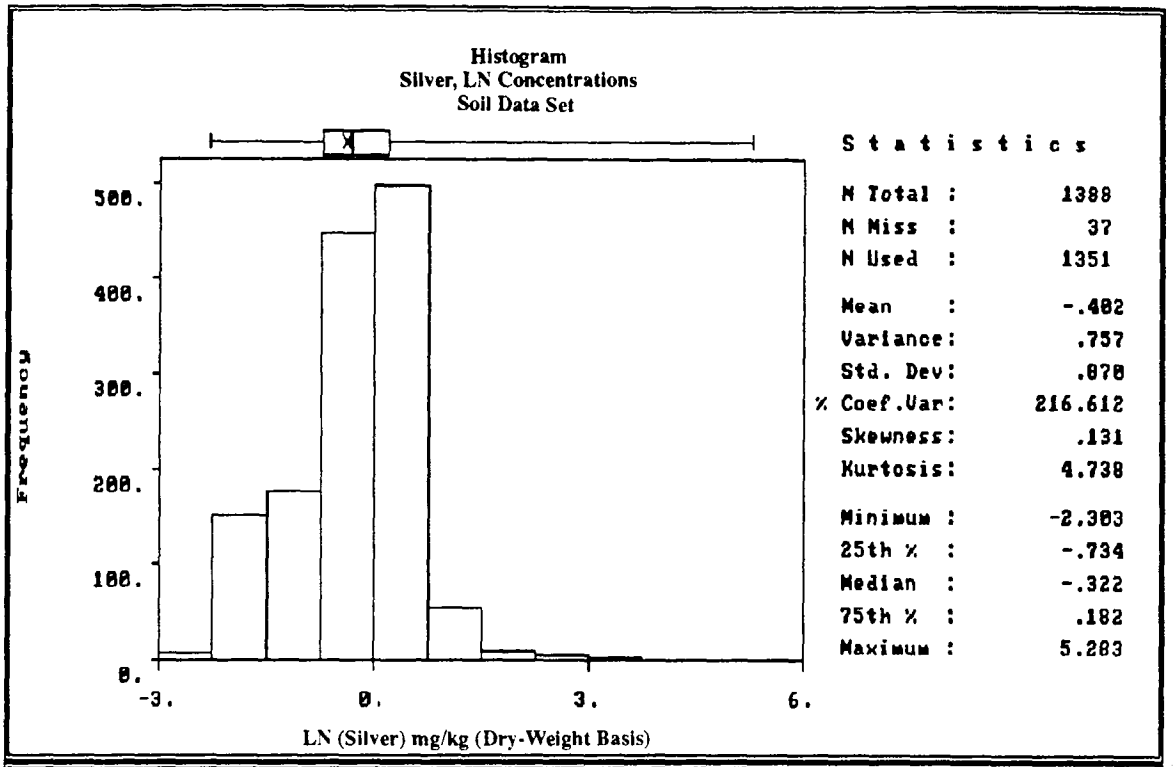
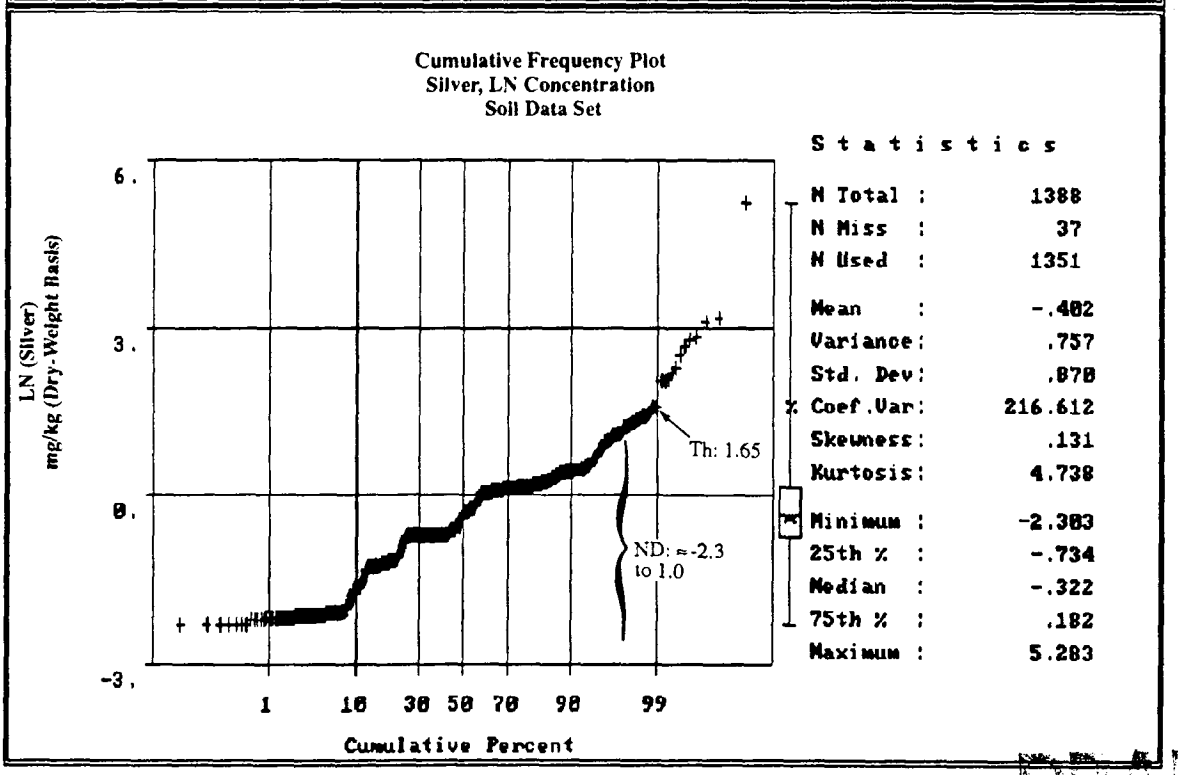
Selenium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A160

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25922





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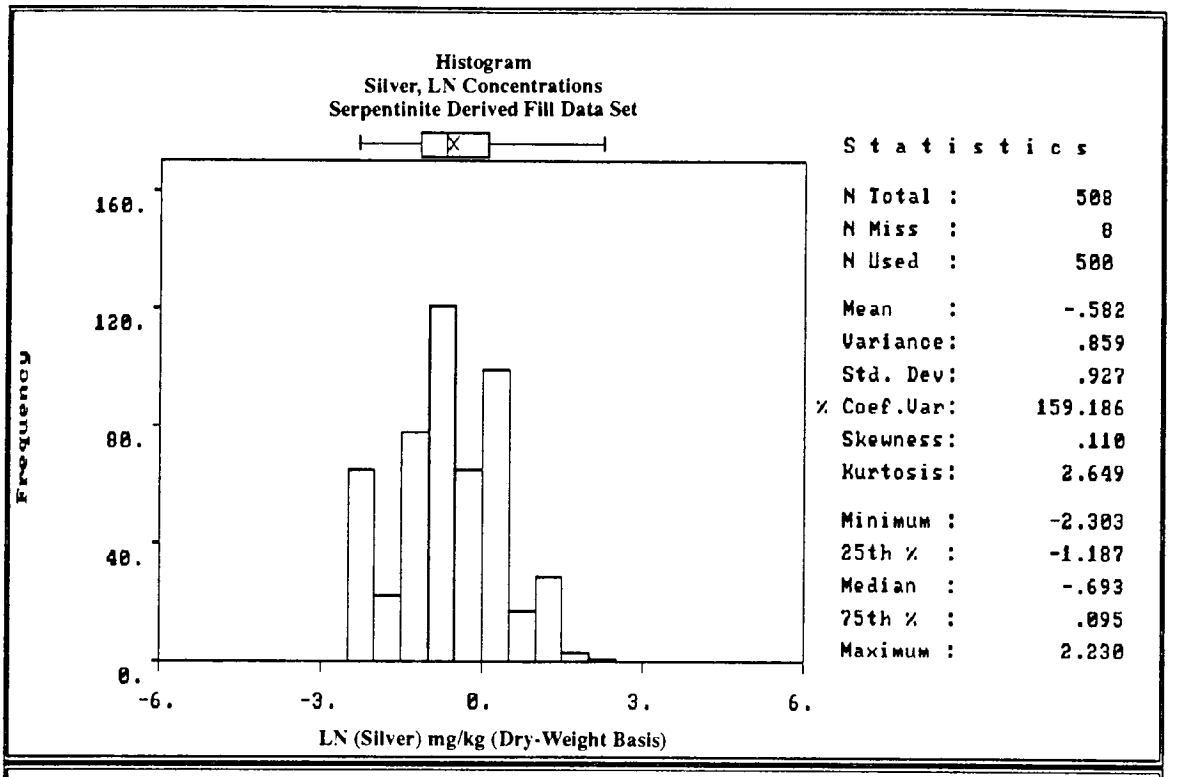
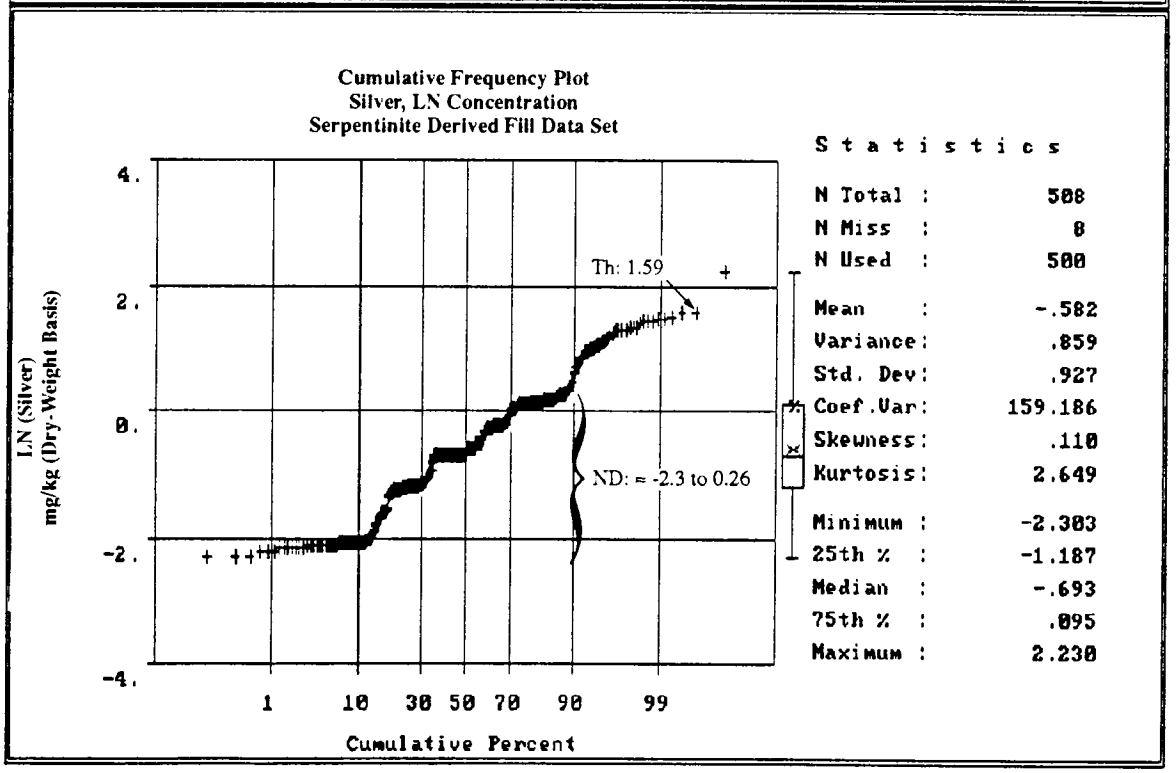
Silver, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A161

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25923





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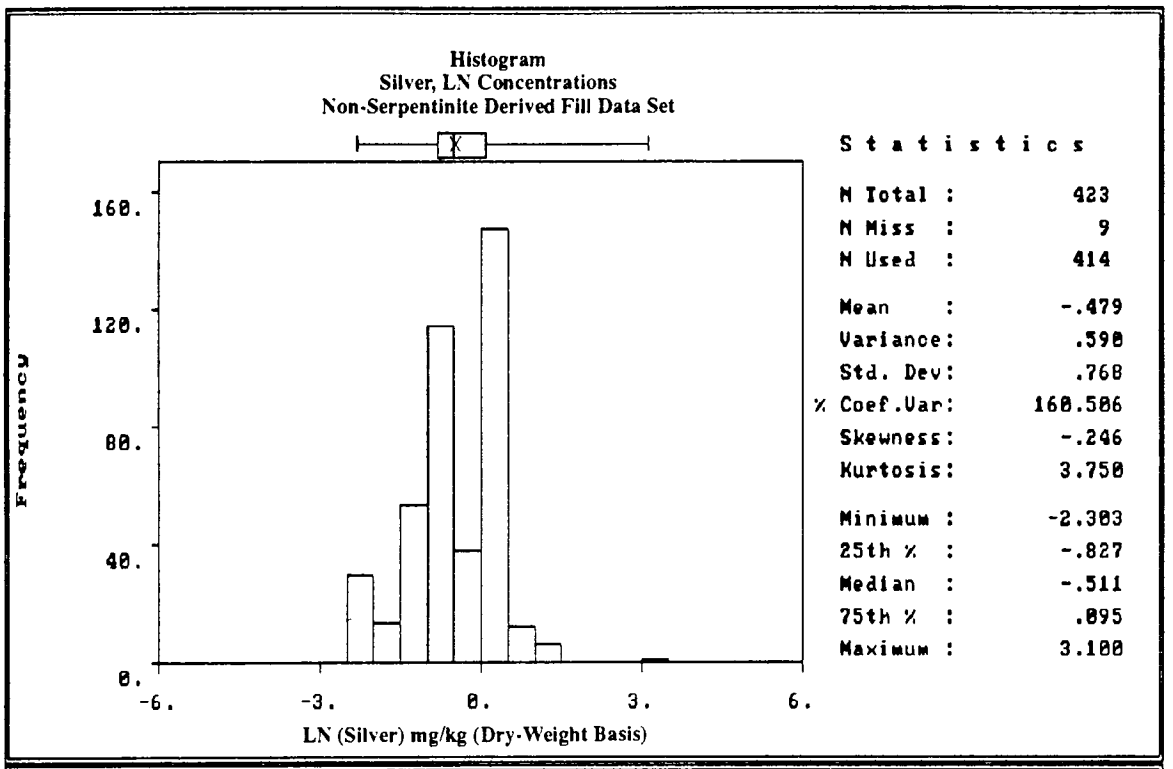
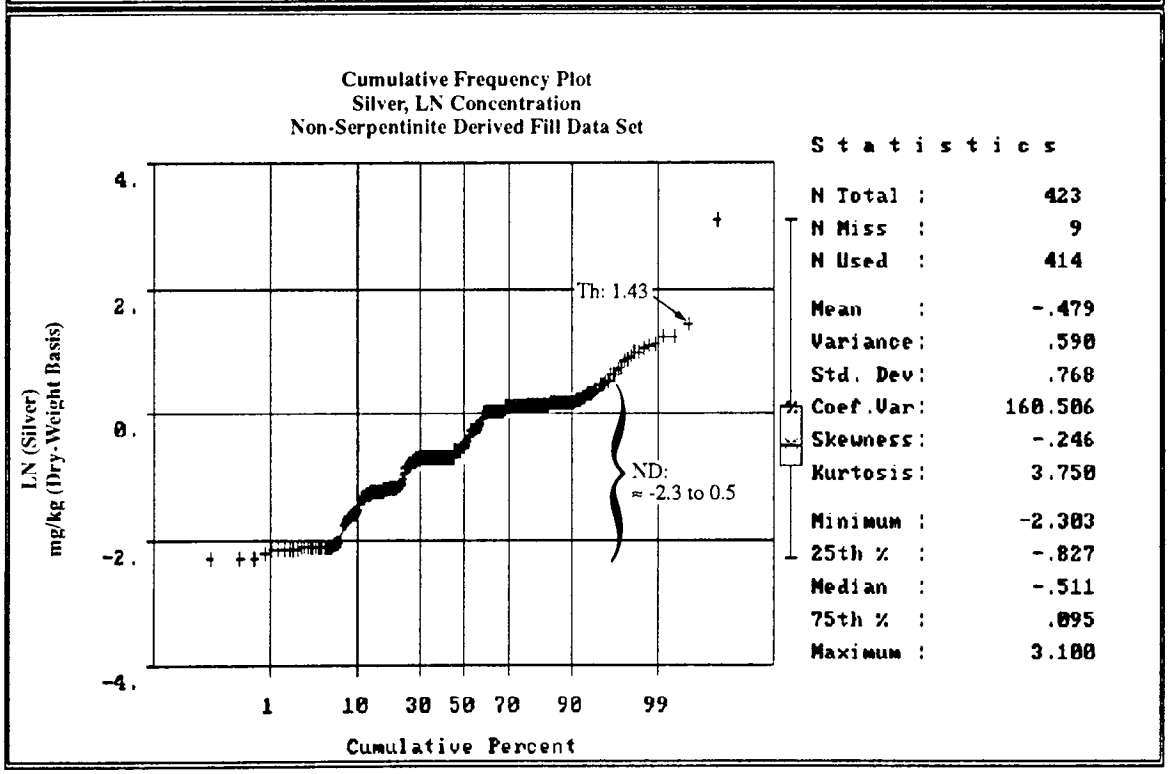
Silver, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A162

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25924





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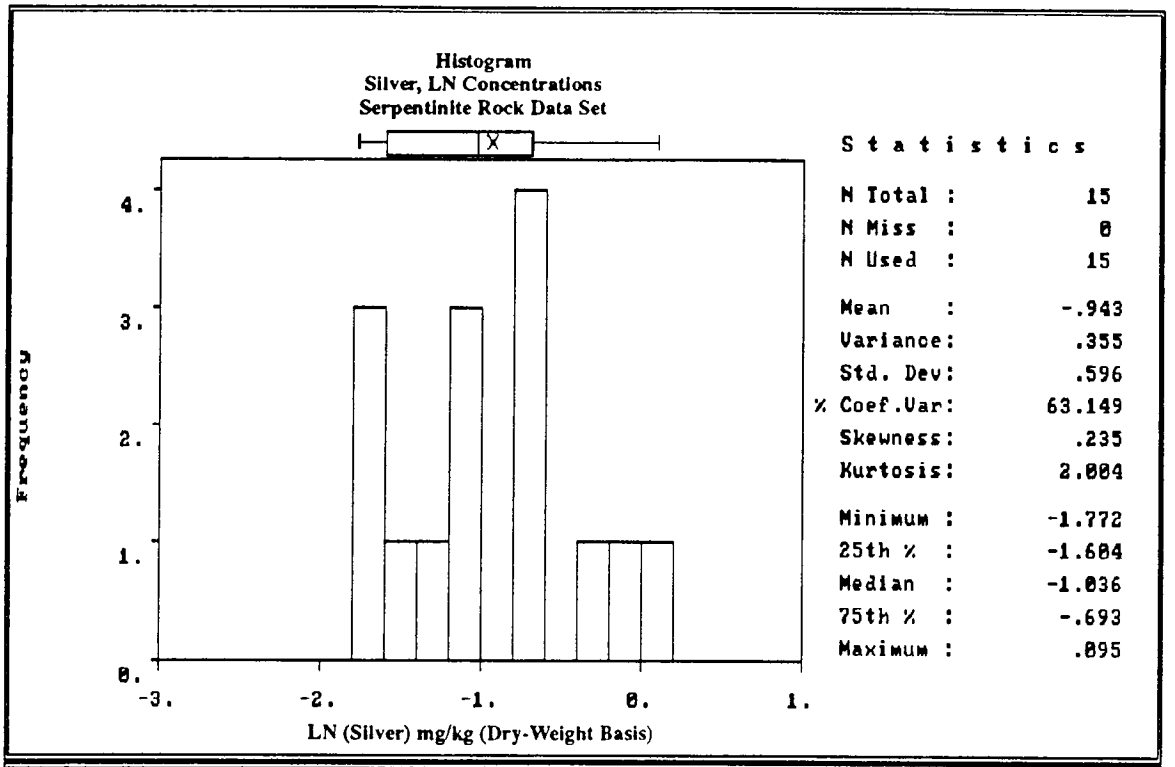
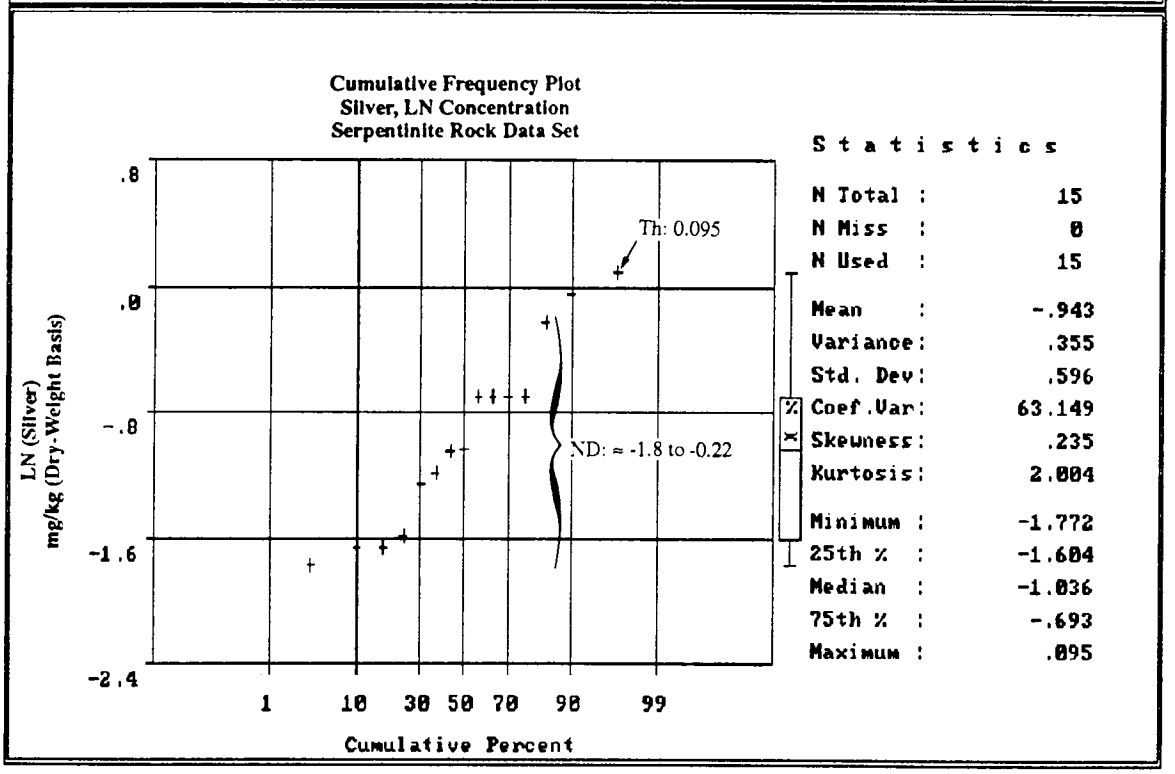
Silver, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A163

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CTM	2/92	6/92

25925





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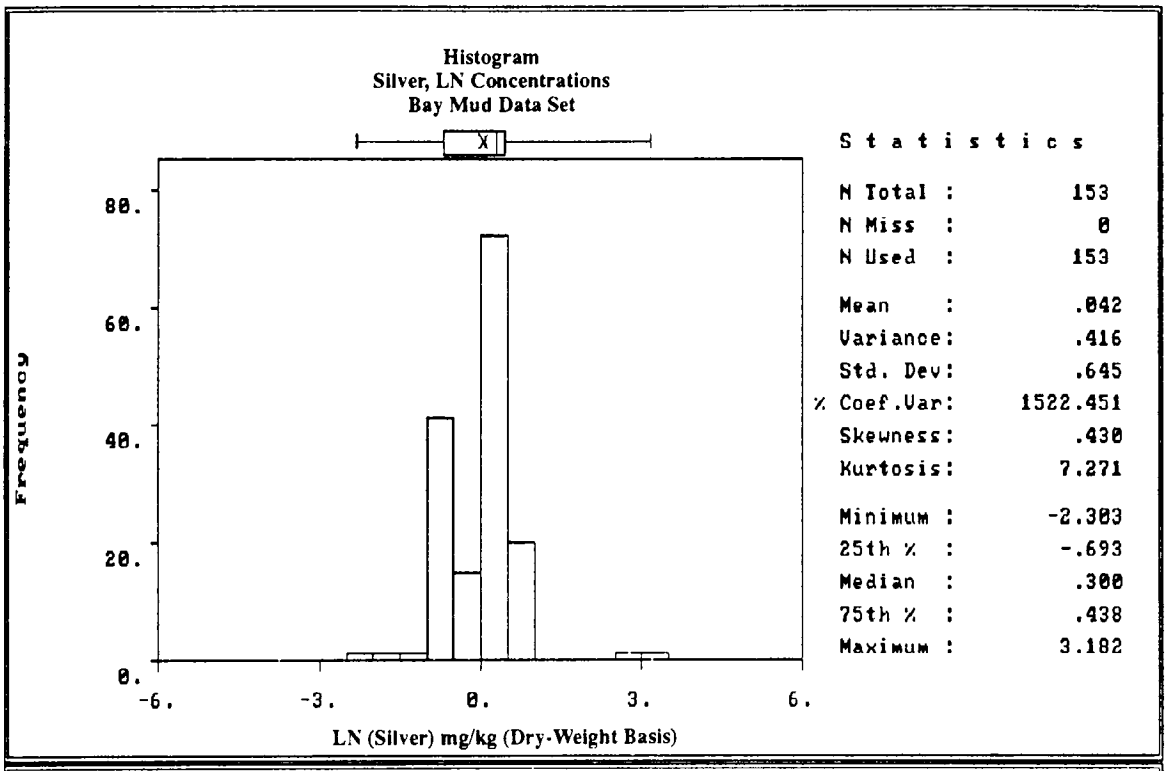
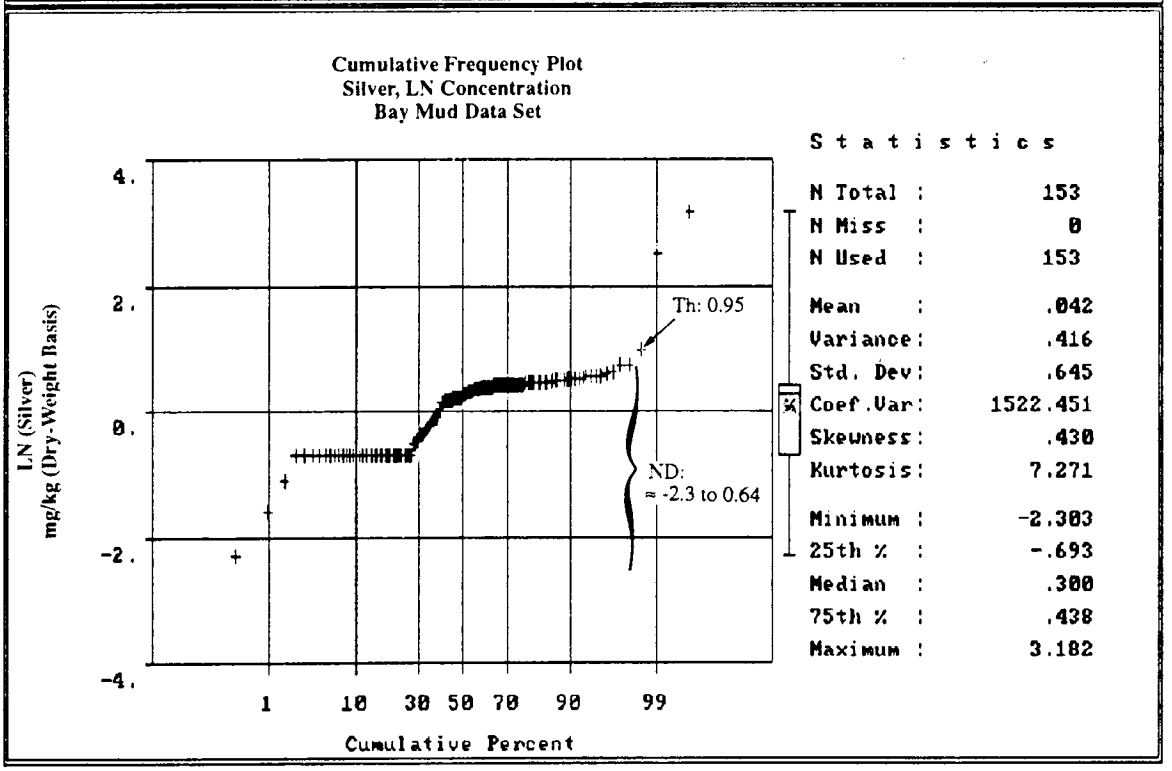
Silver, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A164

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	6/92

25926





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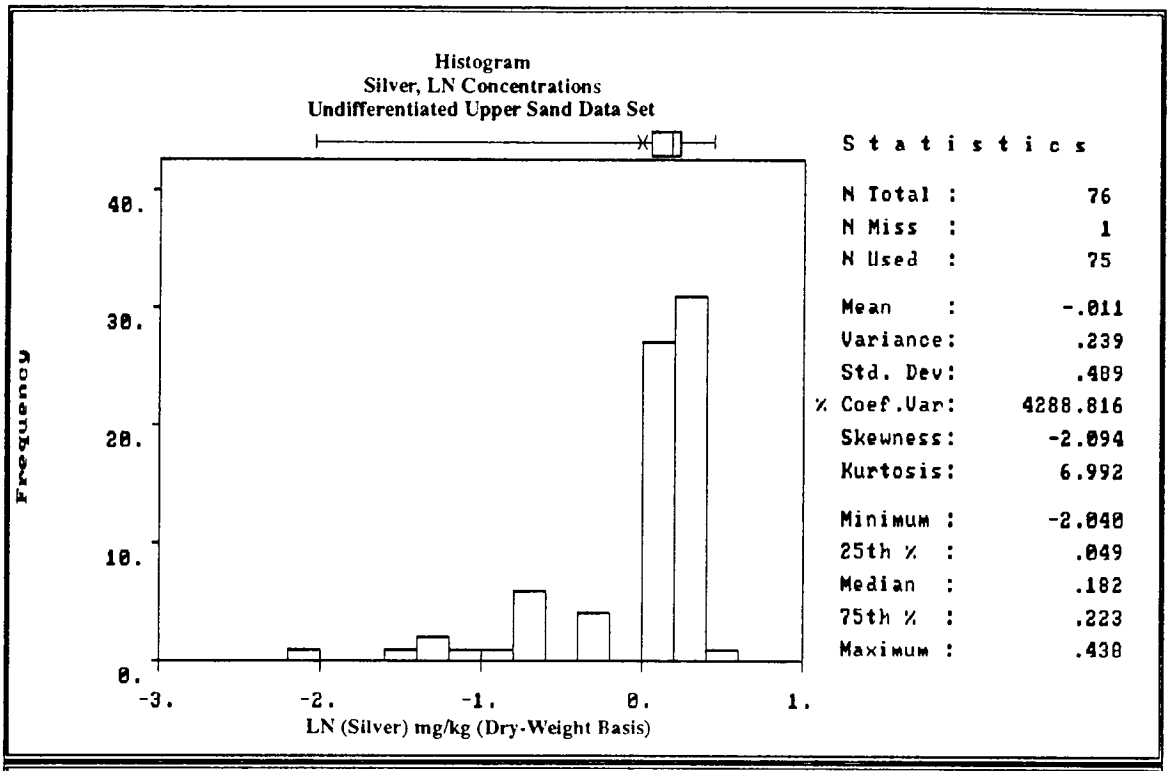
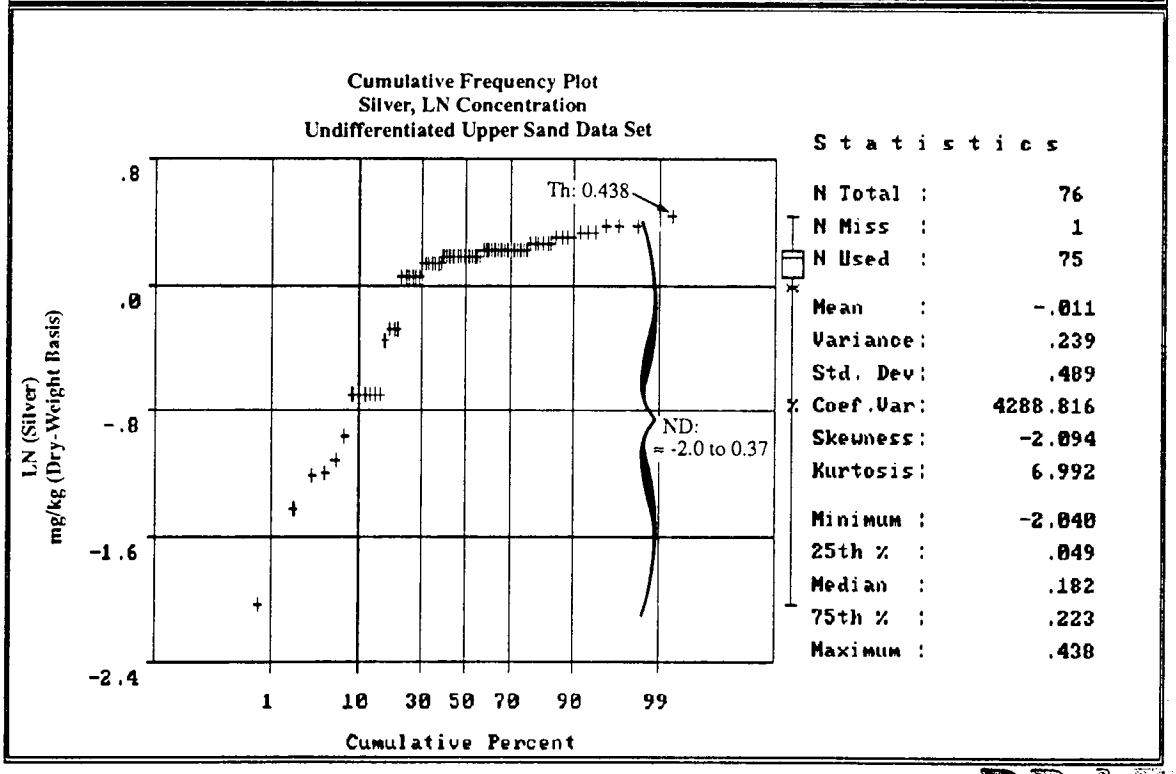
Silver, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A165

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25927





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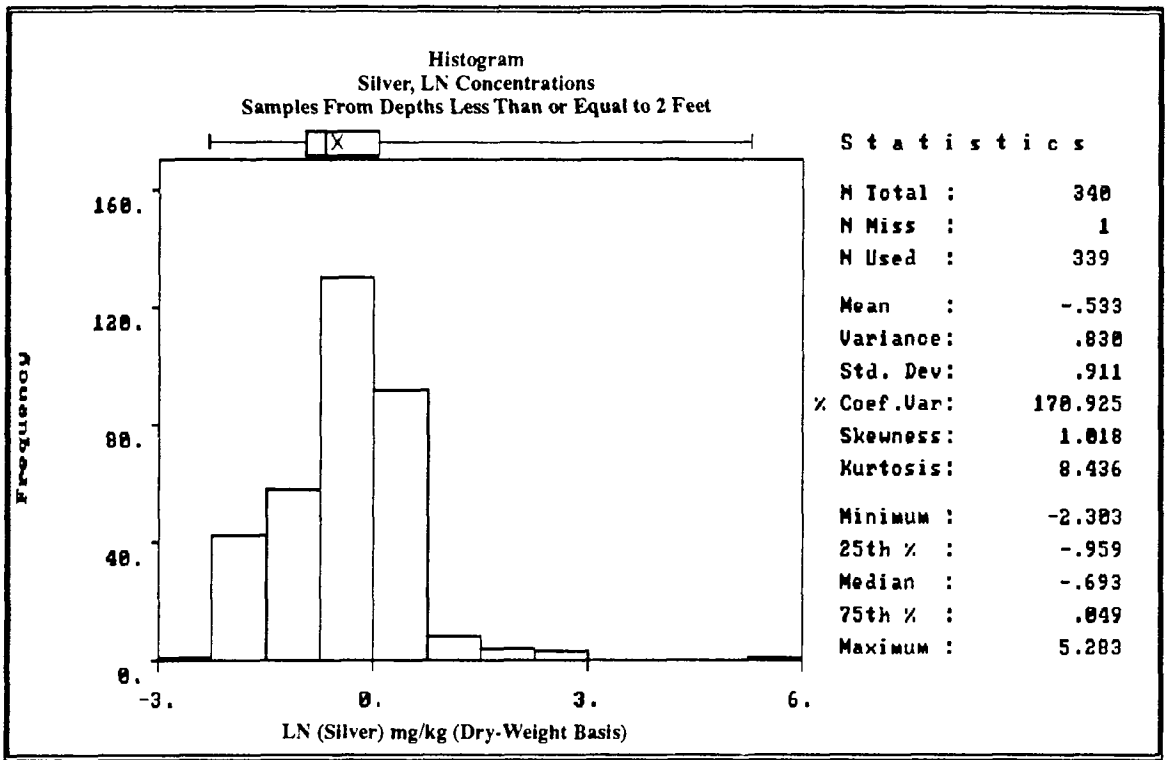
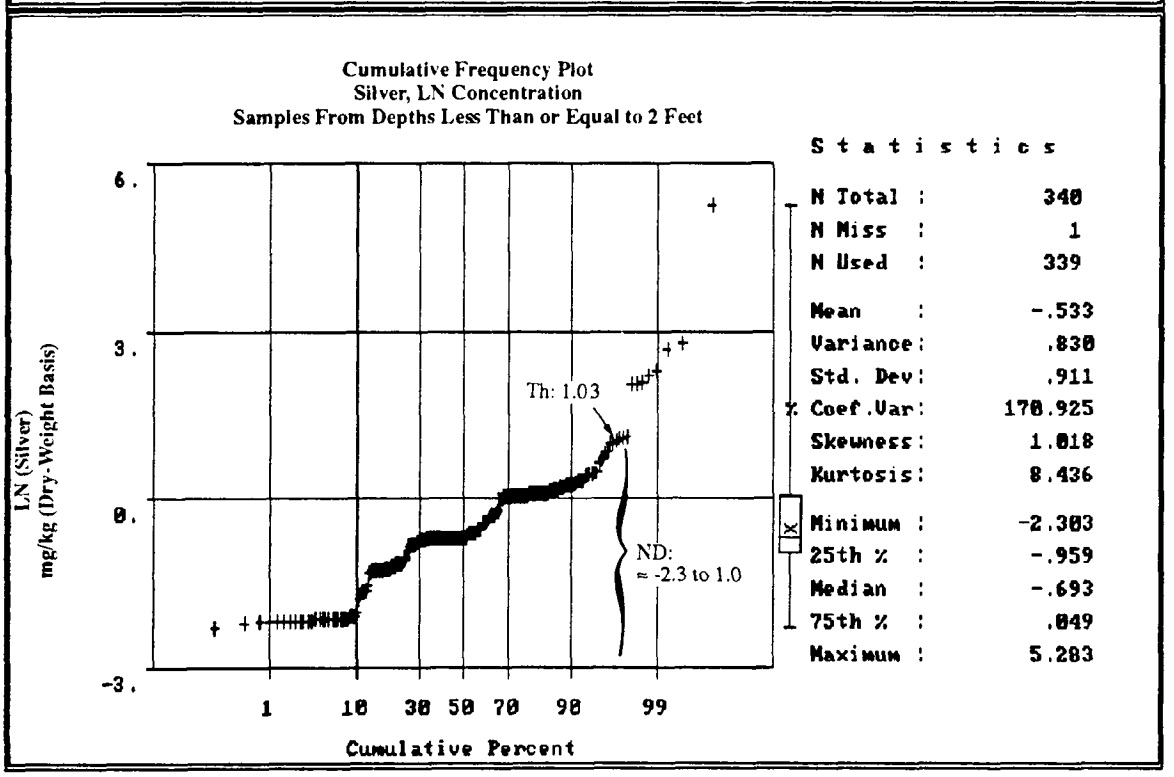
Silver, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A166

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	

25928





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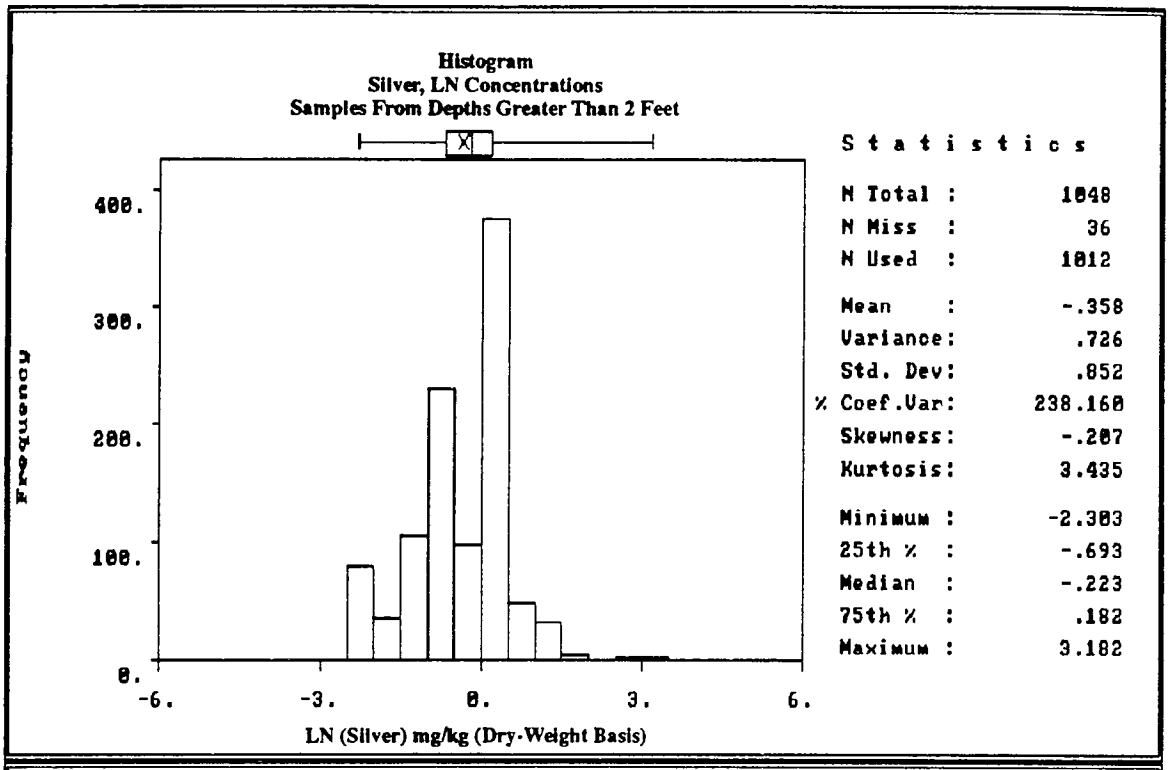
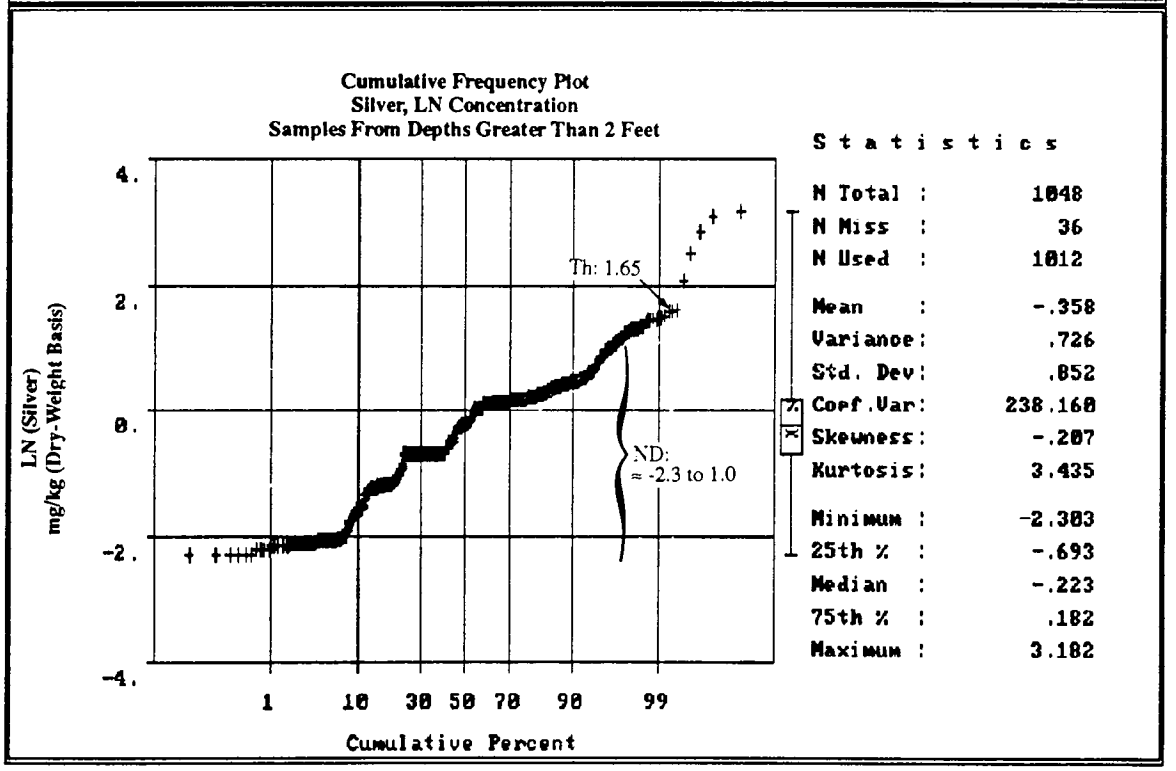
Silver, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A167**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25929





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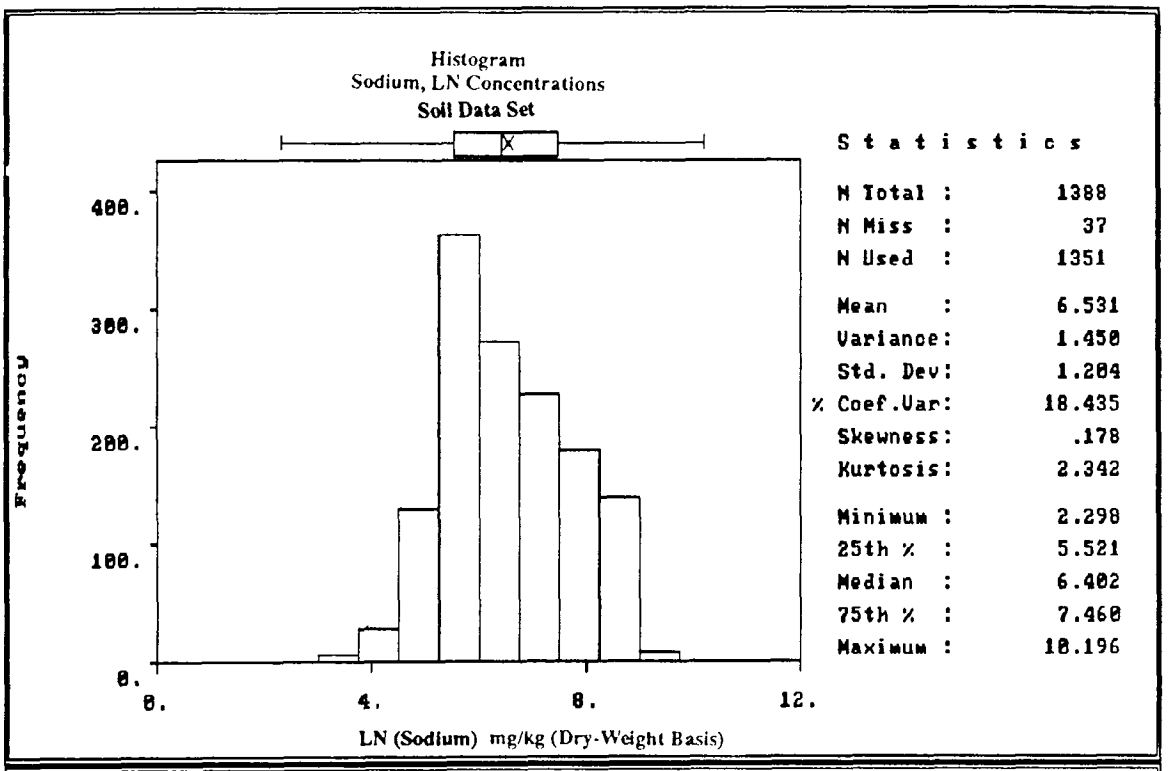
Engineering and
Environmental Services

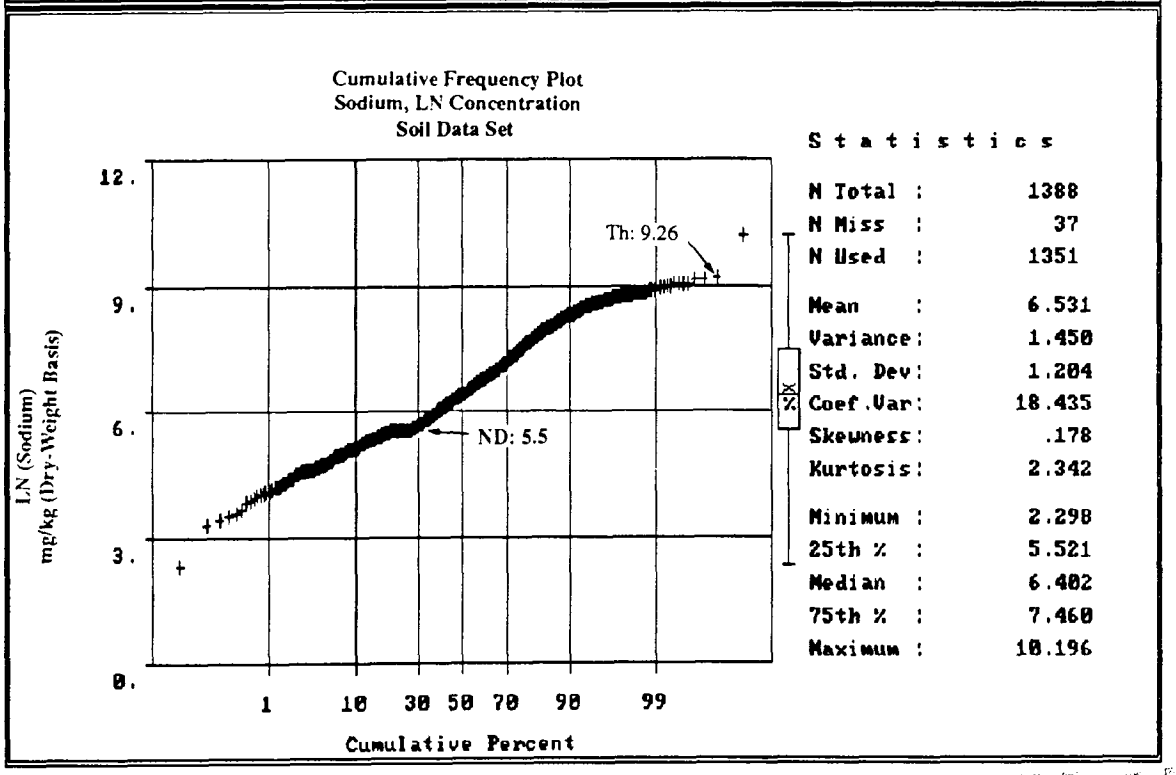
Silver, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A168

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25930





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Engineering and
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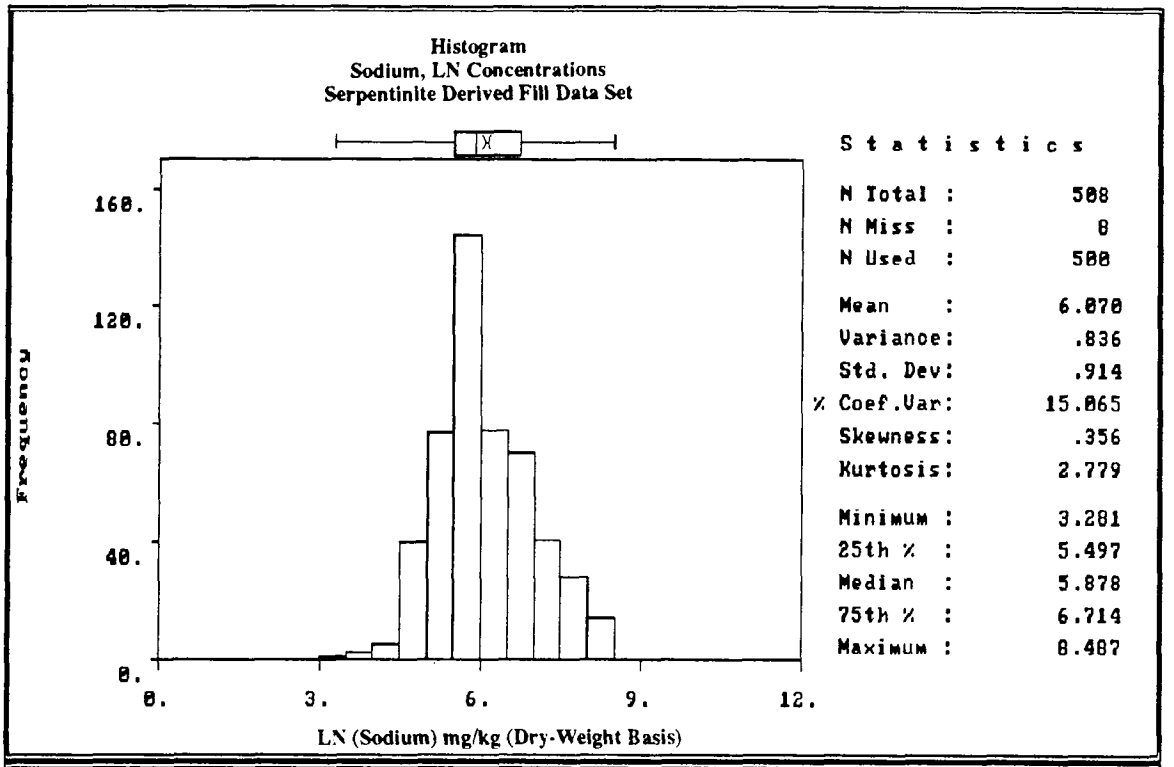
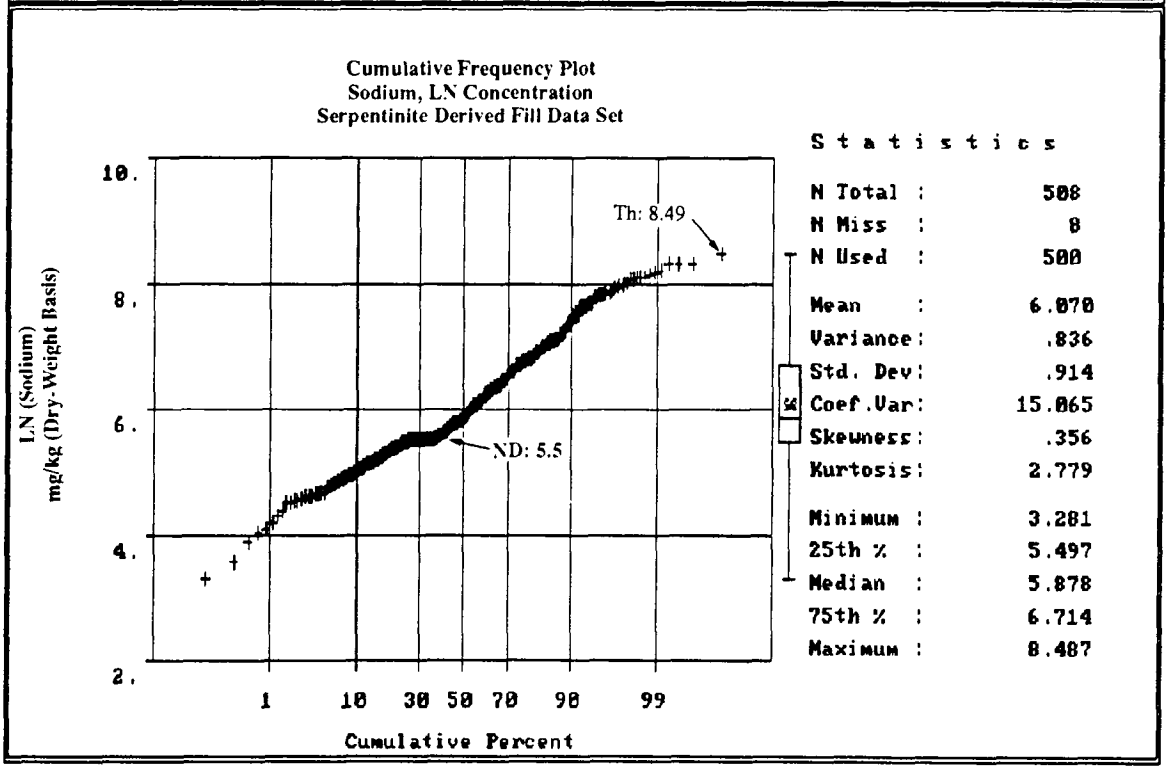
Sodium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A169

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25931





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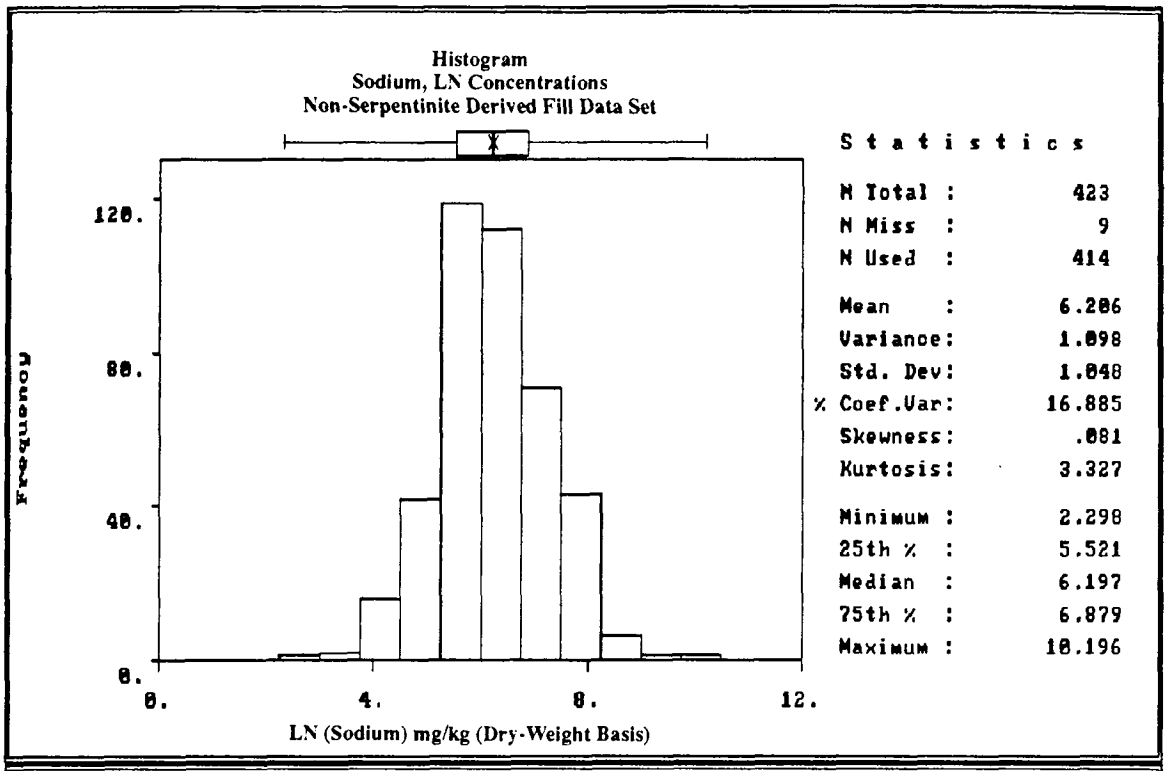
Environmental Services

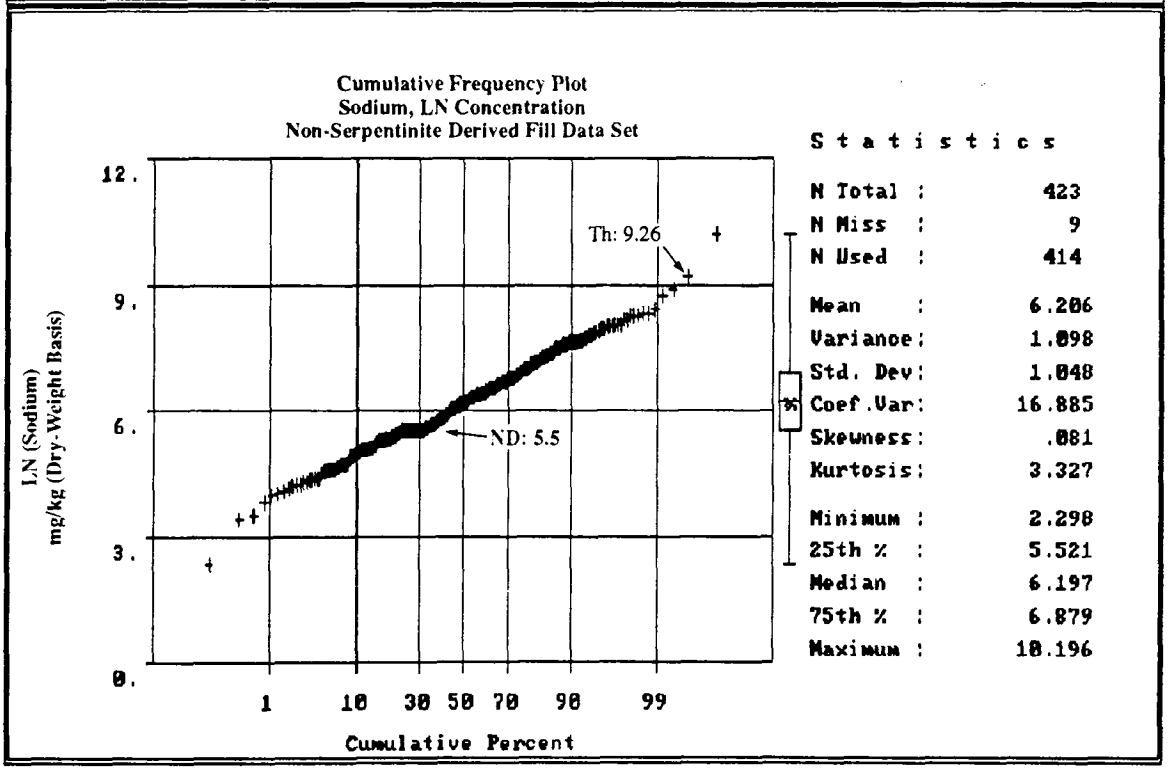
Sodium, Sepentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A170

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25932





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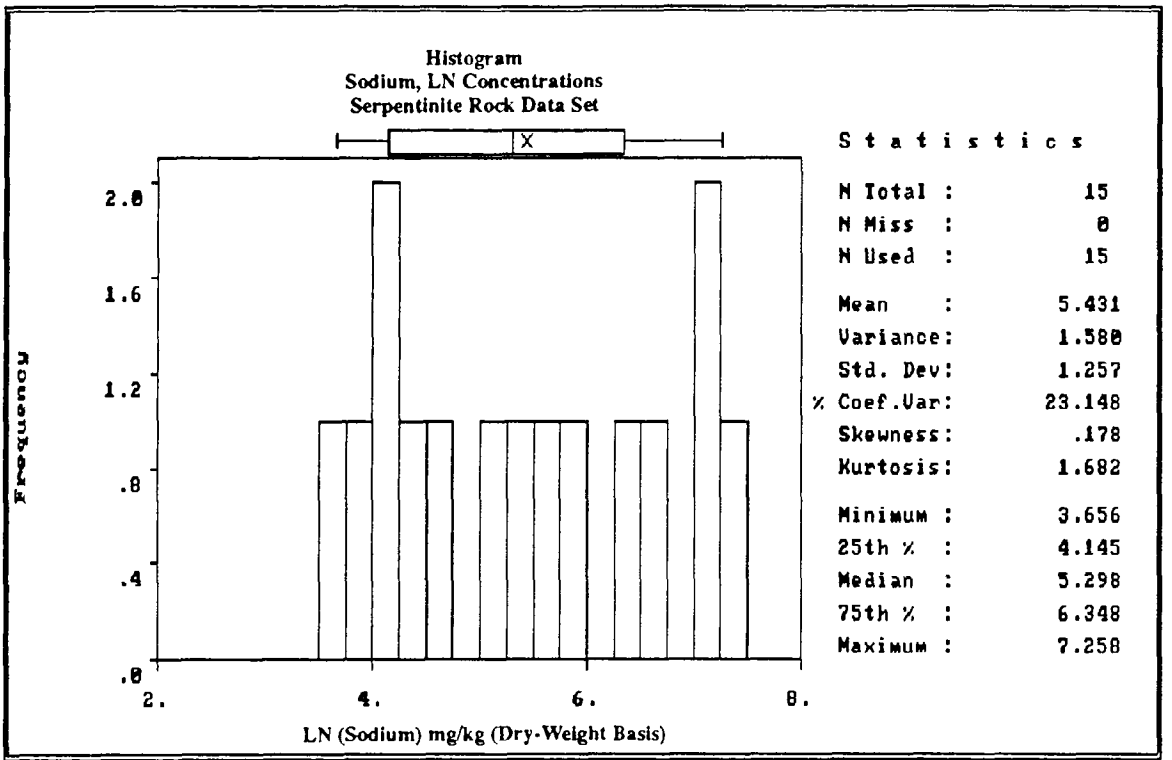
Environmental Services

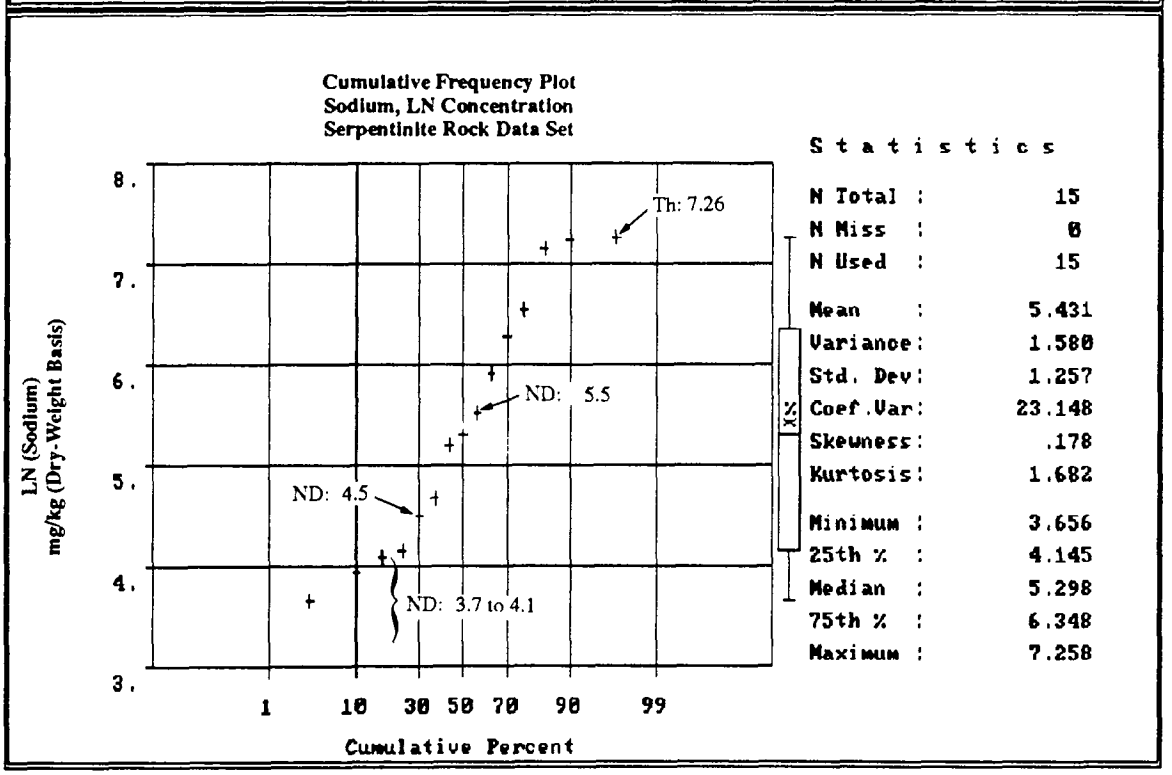
Sodium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A171

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CIM	2/92	6/92

25933





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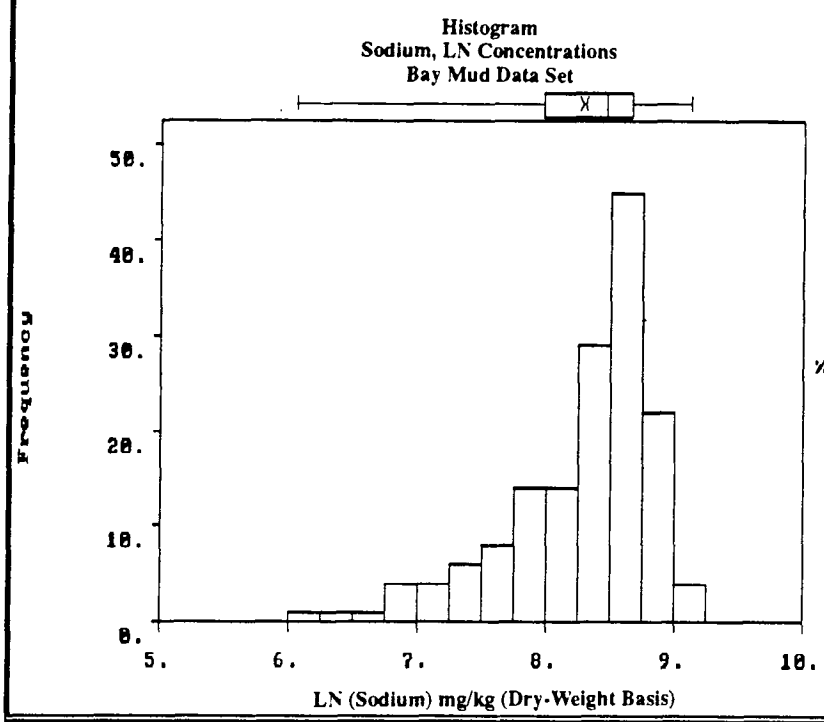
Sodium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A172

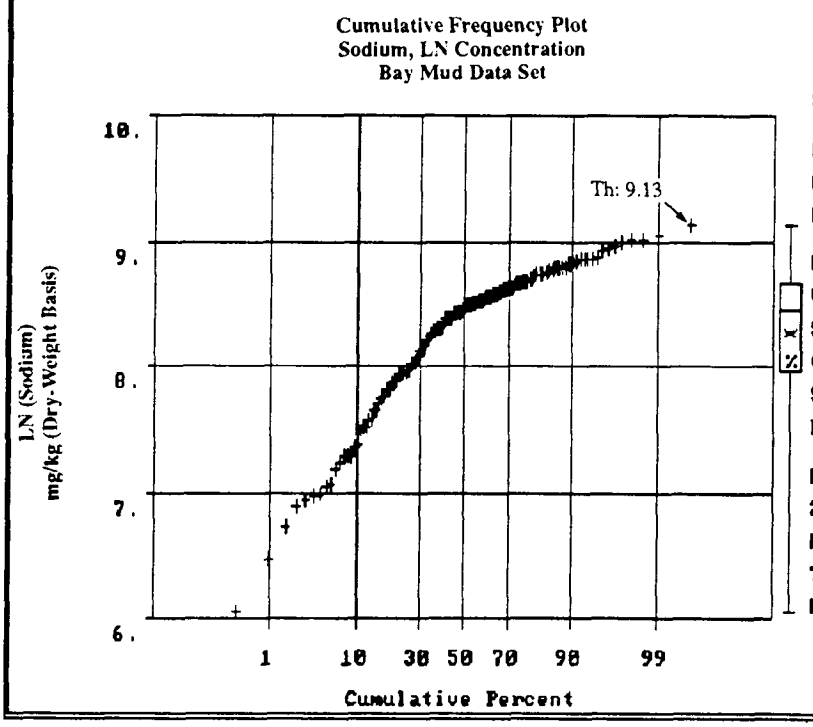
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25934



Statistics

N Total :	153
N Miss :	0
N Used :	153
Mean :	8.278
Variance:	.326
Std. Dev:	.571
% Coef.Var:	6.901
Skewness:	-1.291
Kurtosis:	4.473
Minimum :	6.047
25th % :	7.968
Median :	8.455
75th % :	8.665
Maximum :	9.127



Statistics

N Total :	153
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Mean :	8.278
Variance:	.326
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% Coef.Var:	6.901
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Minimum :	6.047
25th % :	7.968
Median :	8.455
75th % :	8.665
Maximum :	9.127

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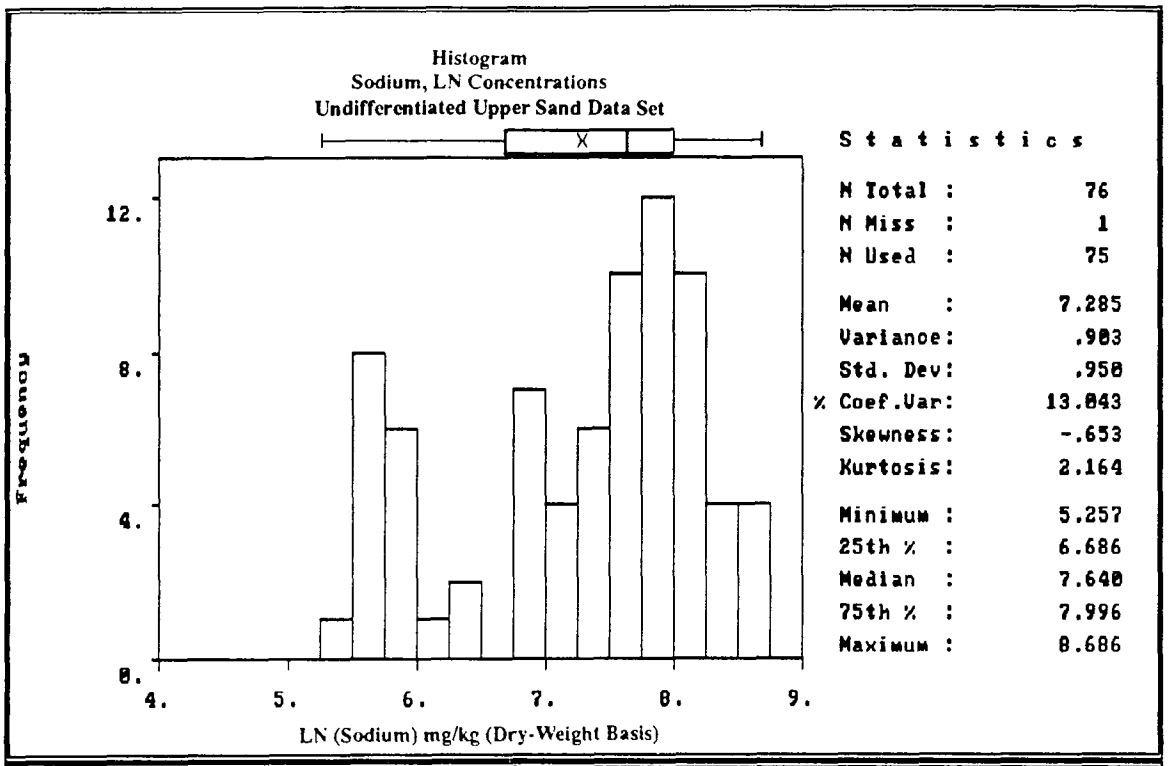
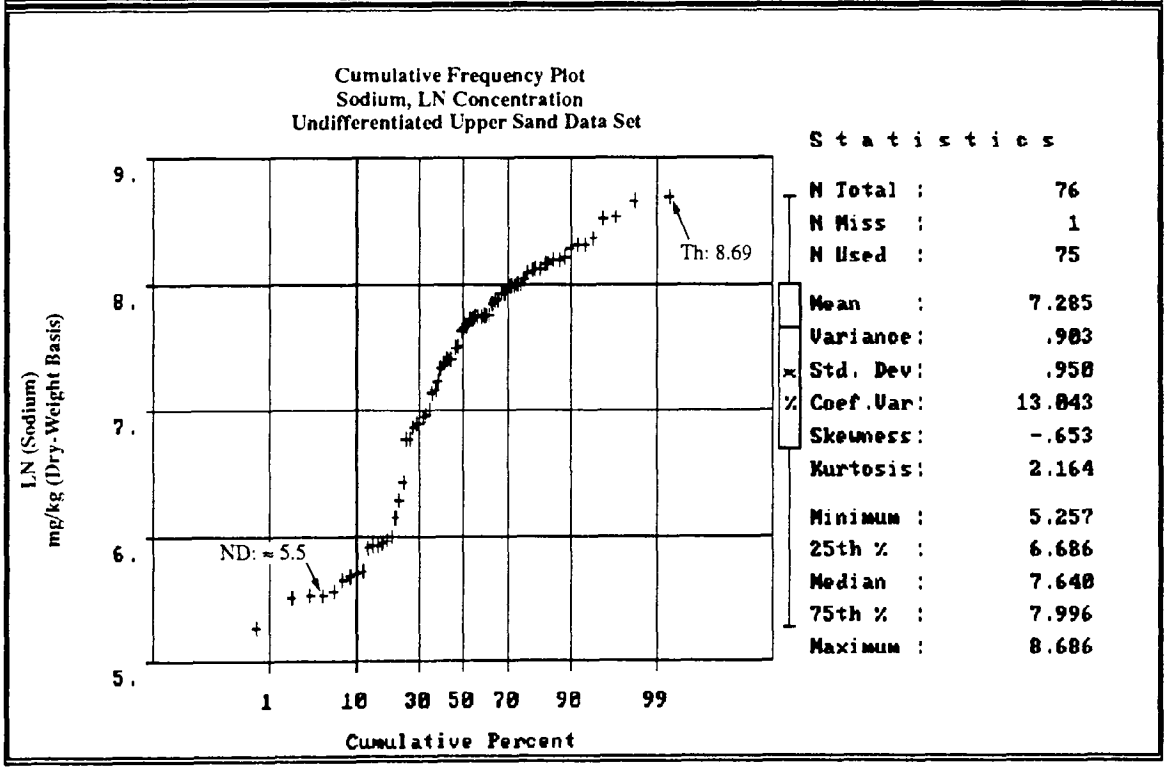
Sodium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A173

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25935





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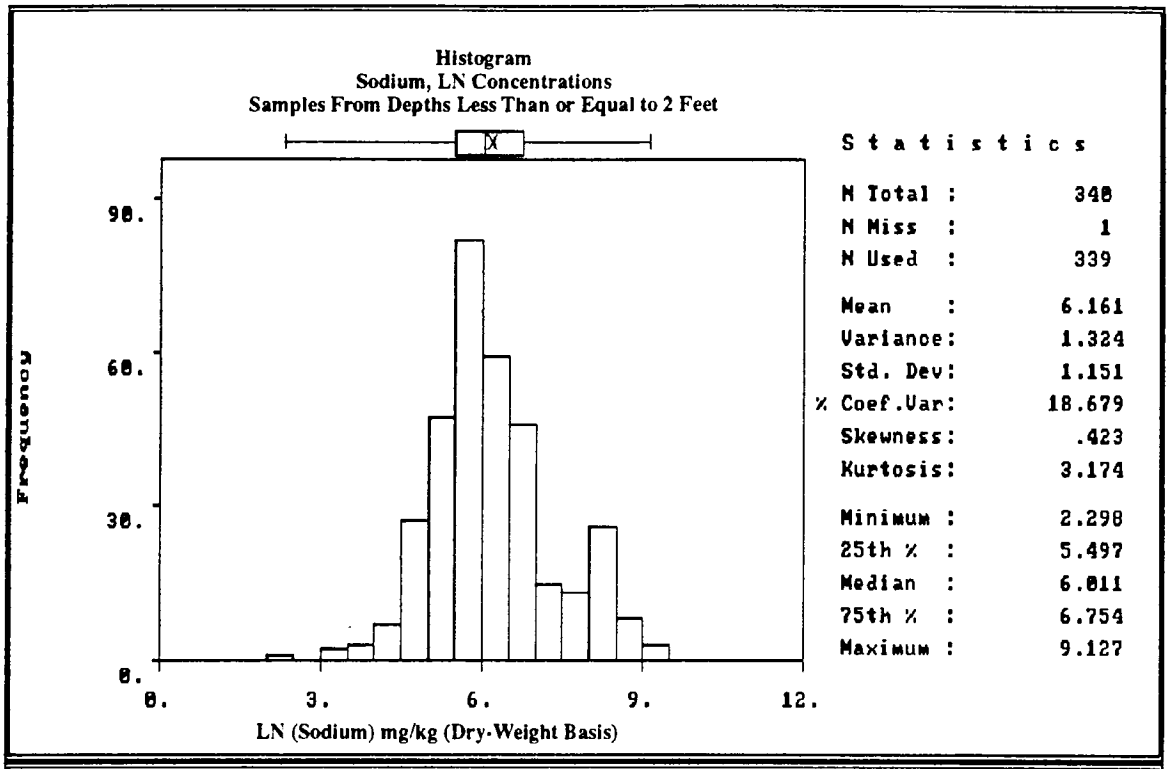
Environmental Services

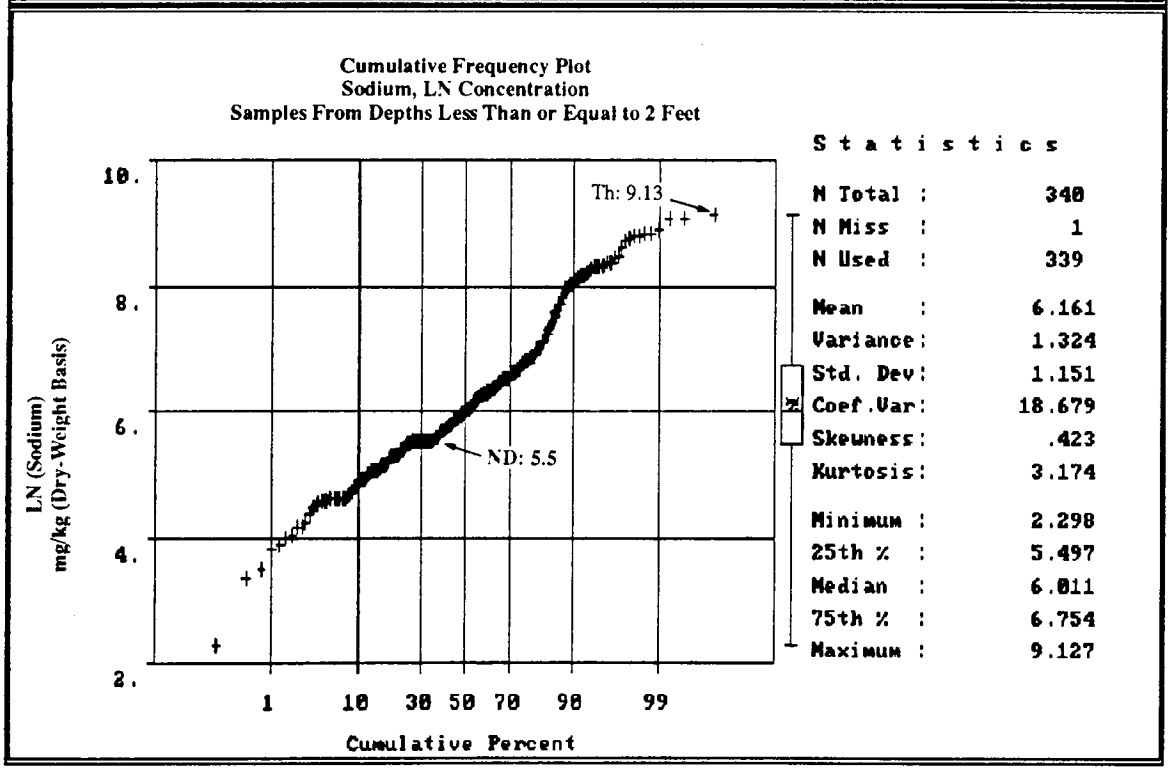
Sodium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A174

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25936





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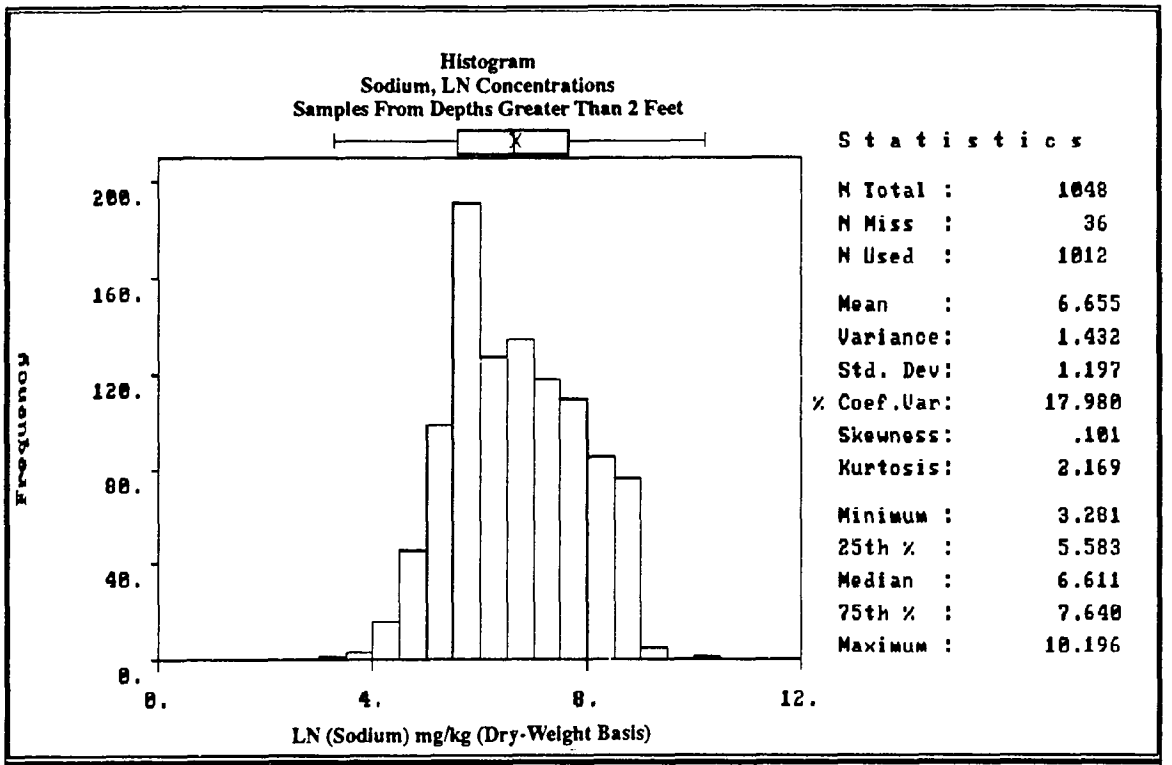
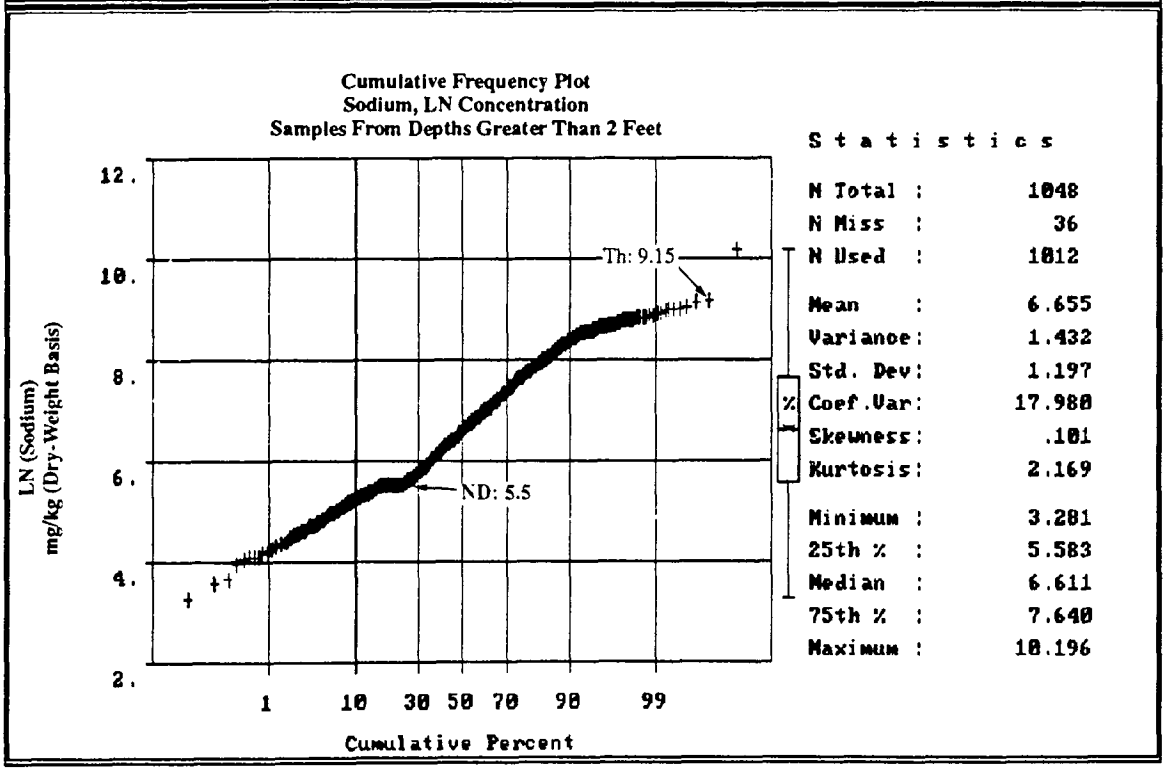
Sodium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A175**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	

25937





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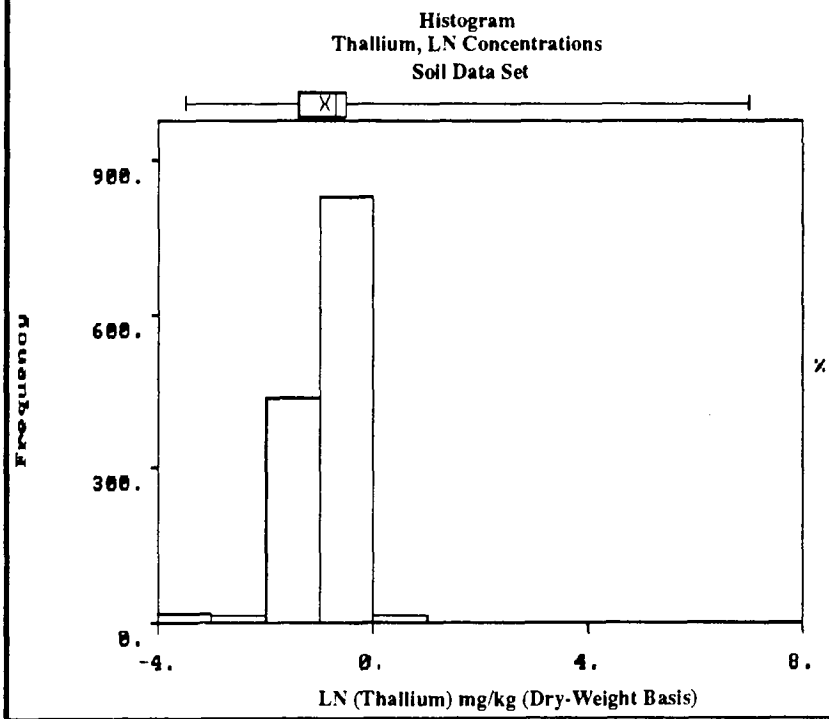
Environmental Services

Sodium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A176

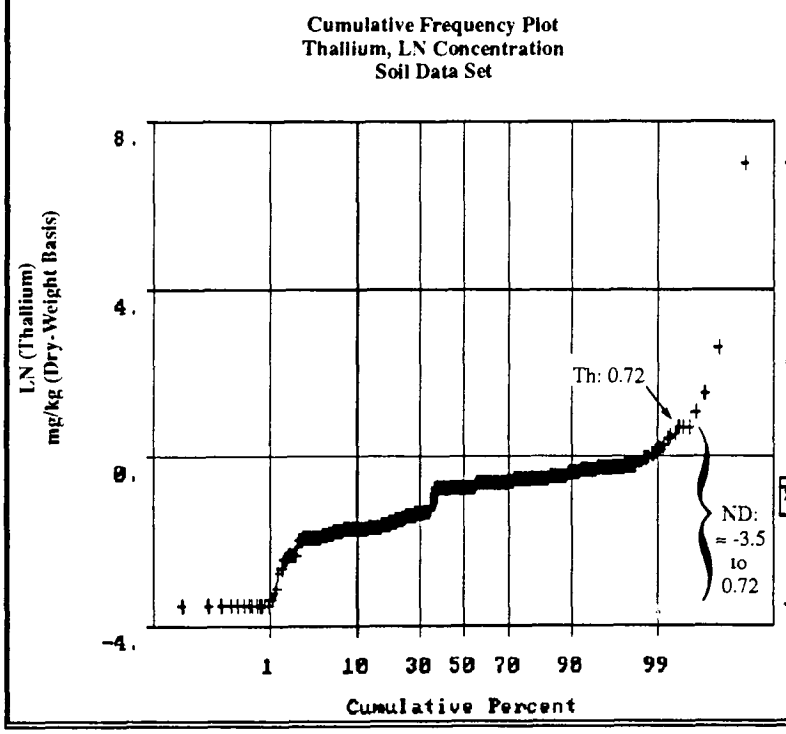
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25938



Statistics

N Total :	1388
N Miss :	75
N Used :	1313
Mean :	-.915
Variance:	.431
Std. Dev:	.656
% Coef.Var:	71.718
Skewness:	.528
Kurtosis:	20.999
Minimum :	-3.507
25th % :	-1.386
Median :	-.693
75th % :	-.511
Maximum :	7.003



Statistics

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N Miss :	75
N Used :	1313
Mean :	-.915
Variance:	.431
Std. Dev:	.656
% Coef.Var:	71.718
Skewness:	.528
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Minimum :	-3.507
25th % :	-1.386
Median :	-.693
75th % :	-.511
Maximum :	7.003

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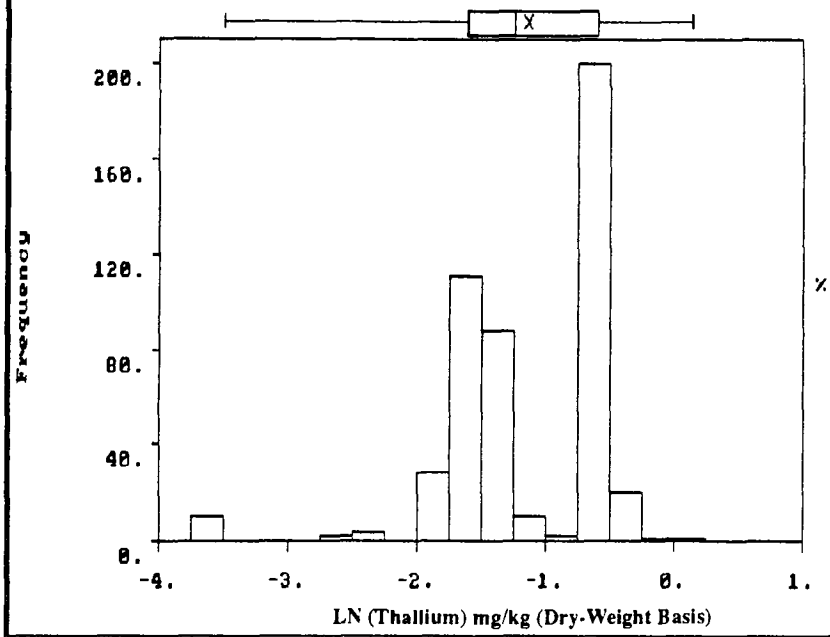
Thallium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A177

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	OJM	2/92	6/92

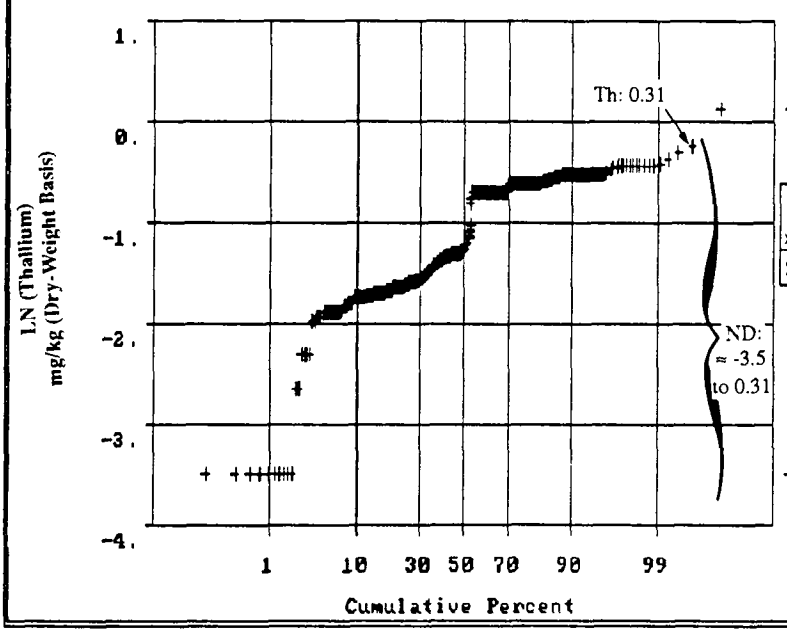
25939

Histogram
Thallium, LN Concentrations
Serpentinite Derived Fill Data Set



Statistics	
N Total :	508
N Miss :	31
N Used :	477
Mean :	-1.147
Variance:	.384
Std. Dev:	.619
% Coef.Var:	53.992
Skewness:	-1.134
Kurtosis:	5.289
Minimum :	-3.507
25th % :	-1.609
Median :	-1.255
75th % :	-.598
Maximum :	.131

Cumulative Frequency Plot
Thallium, LN Concentration
Serpentinite Derived Fill Data Set



Statistics	
N Total :	508
N Miss :	31
N Used :	477
Mean :	-1.147
Variance:	.384
Std. Dev:	.619
Coef.Var:	53.992
Skewness:	-1.134
Kurtosis:	5.289
Minimum :	-3.507
25th % :	-1.609
Median :	-1.255
75th % :	-.598
Maximum :	.131

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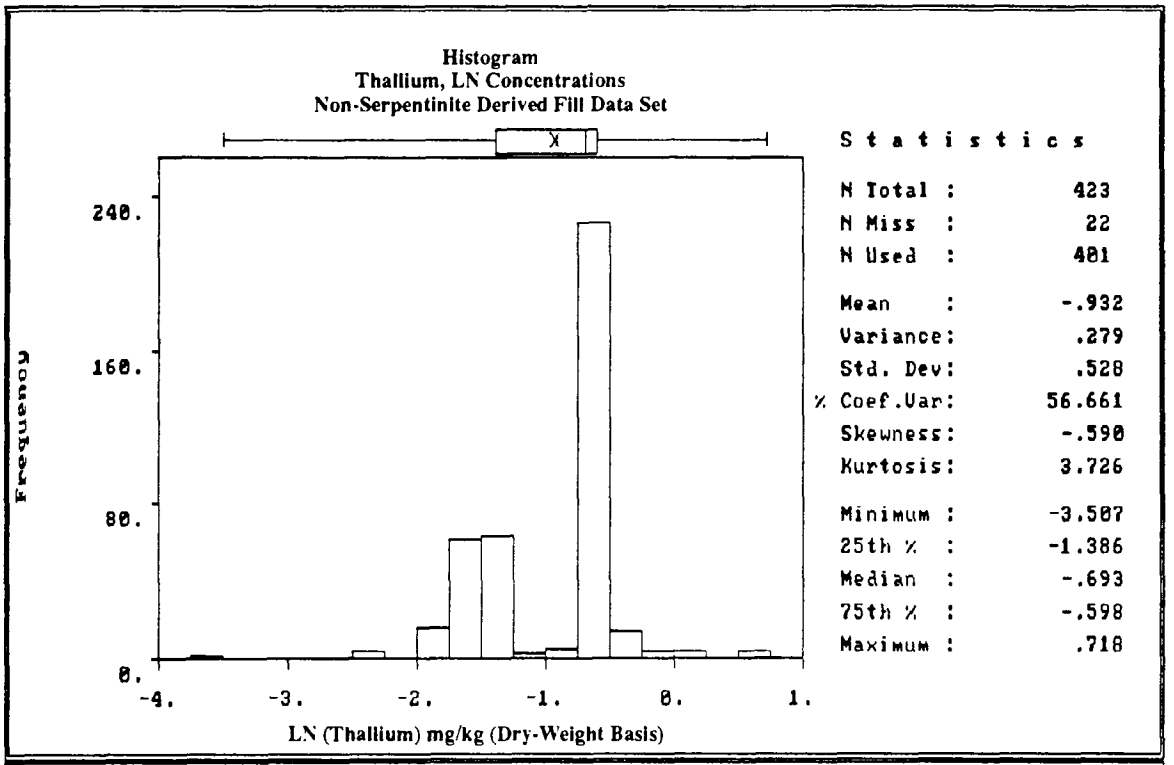
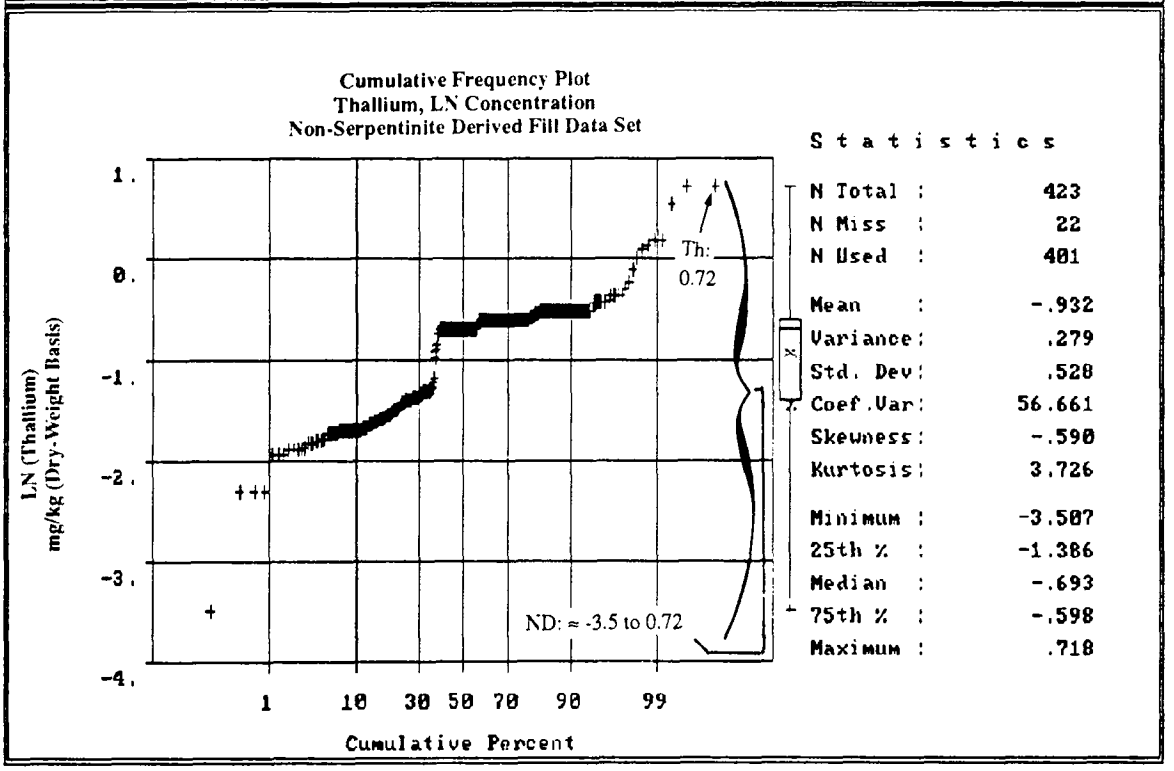
Thallium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A178

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25940





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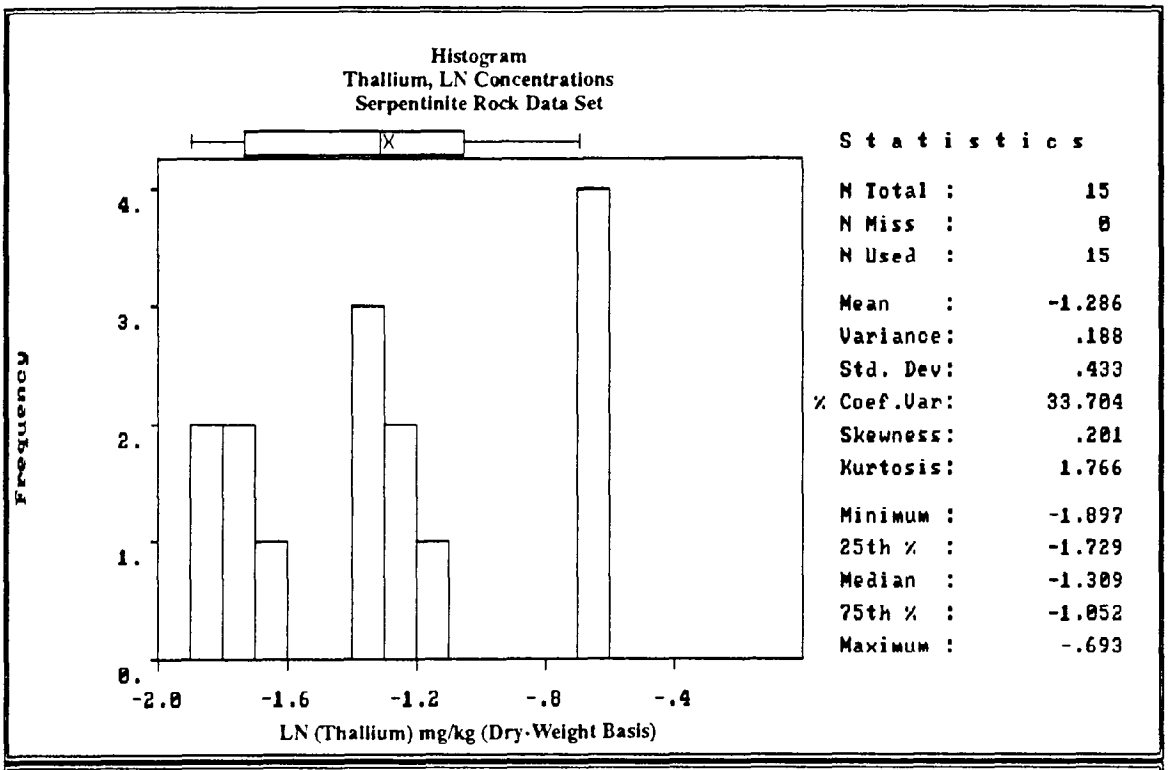
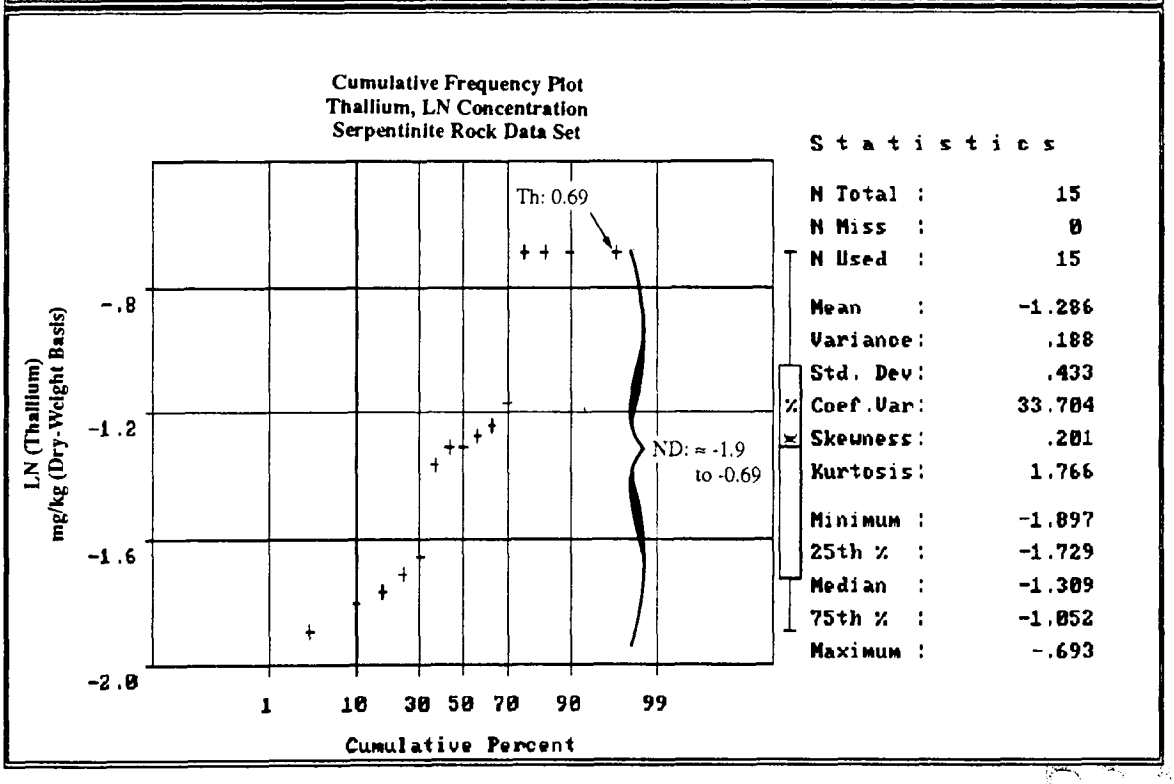
Thallium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A179

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25941





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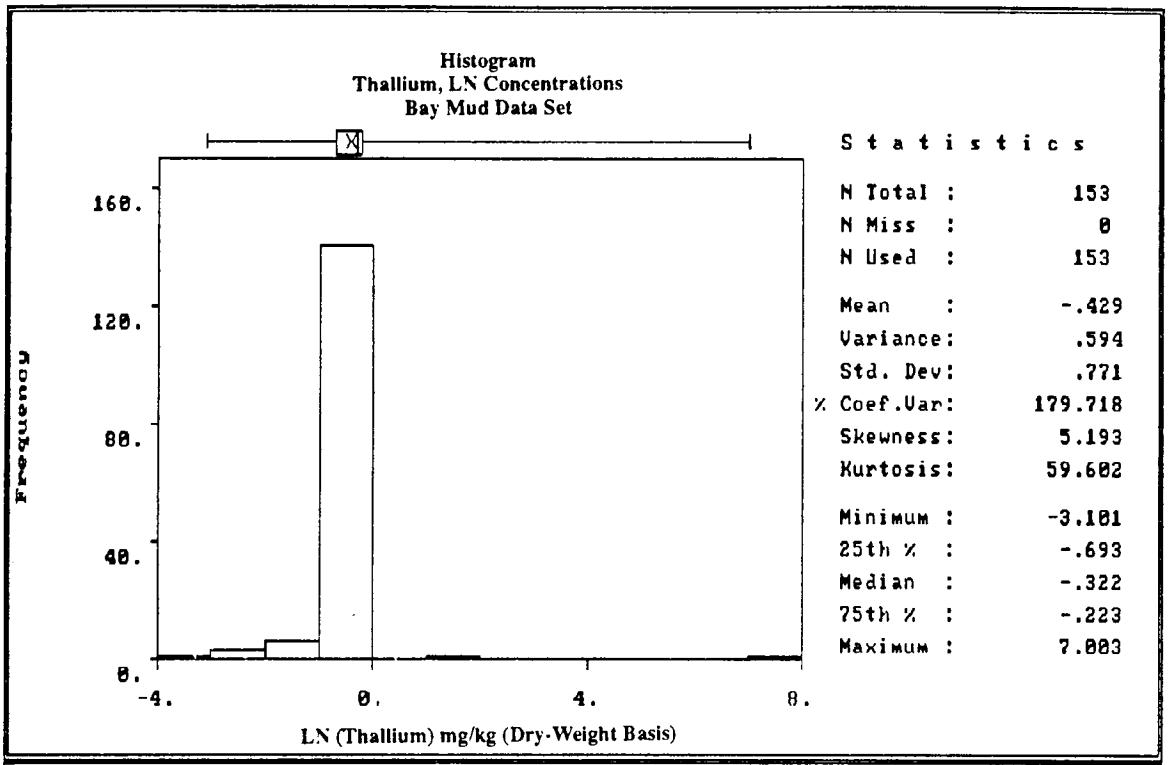
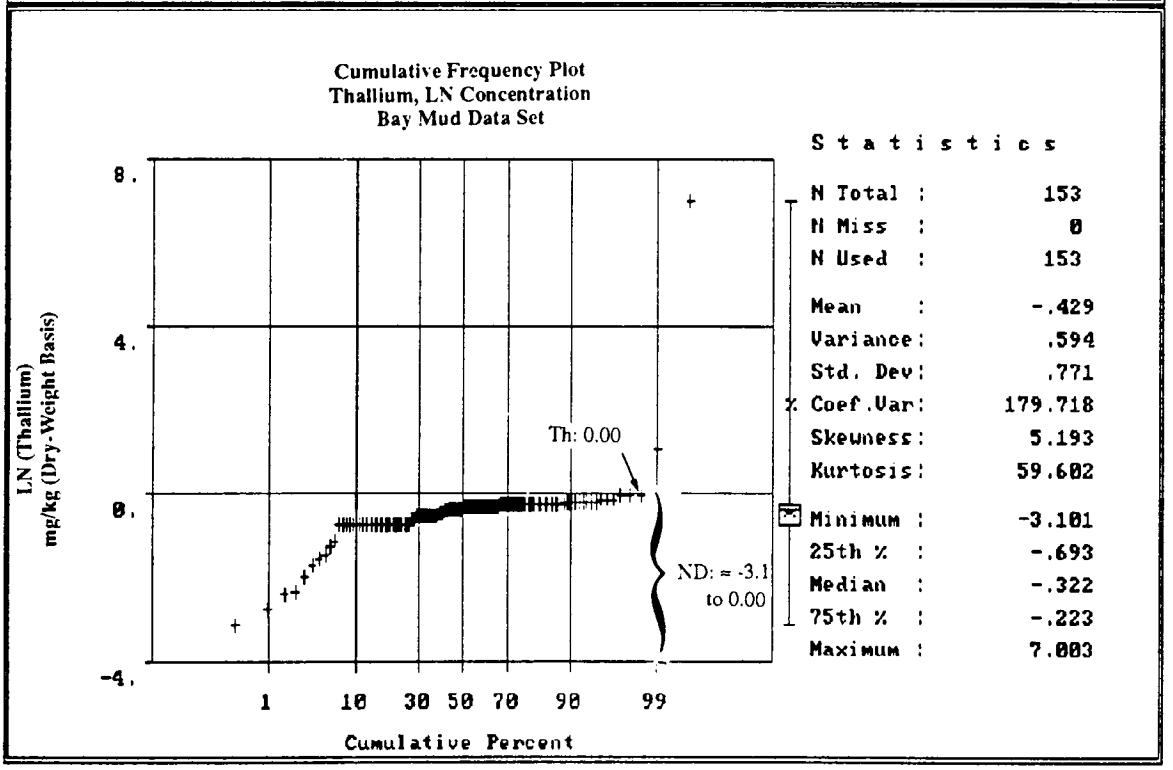
Thallium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A180

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25942





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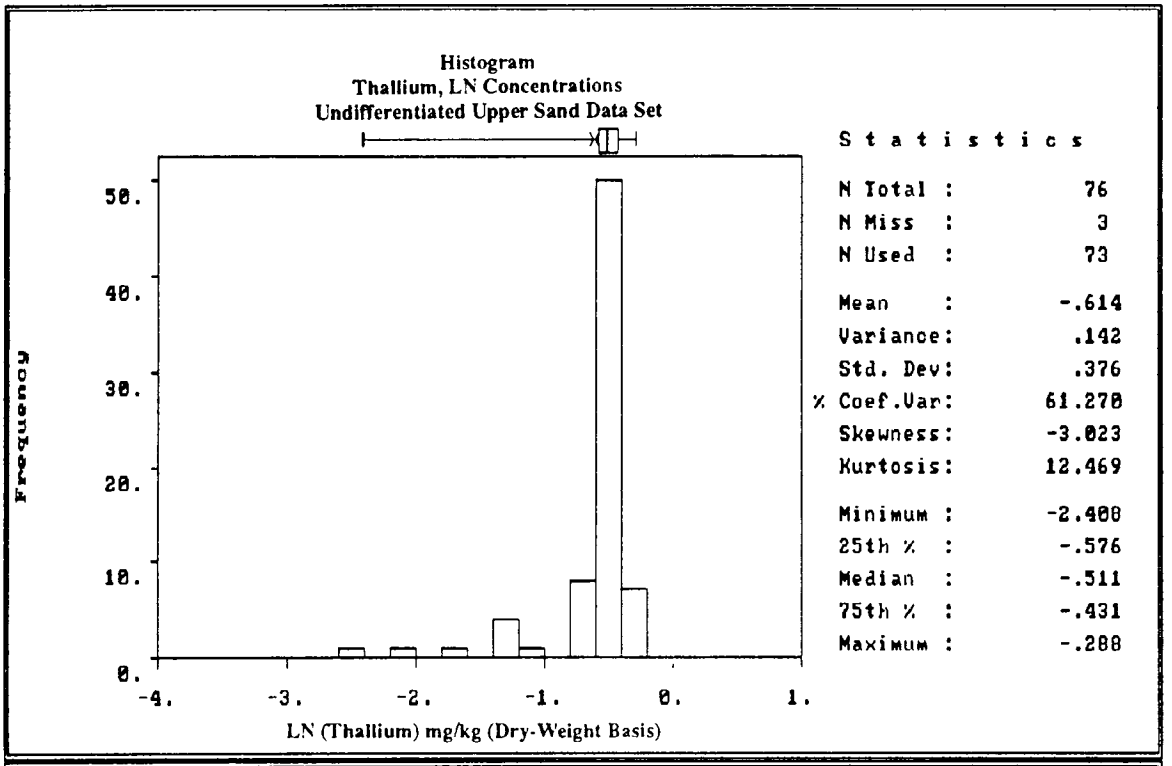
Environmental Services

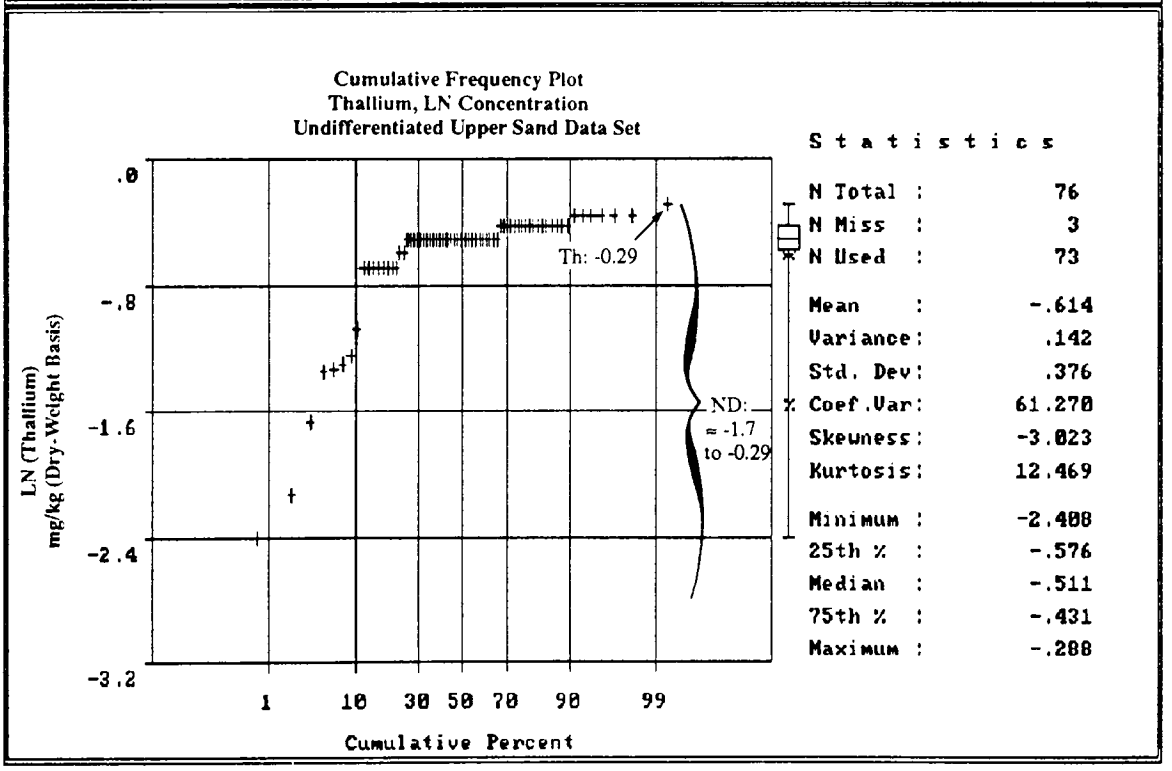
Thallium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A181

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

25943





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Environmental Services

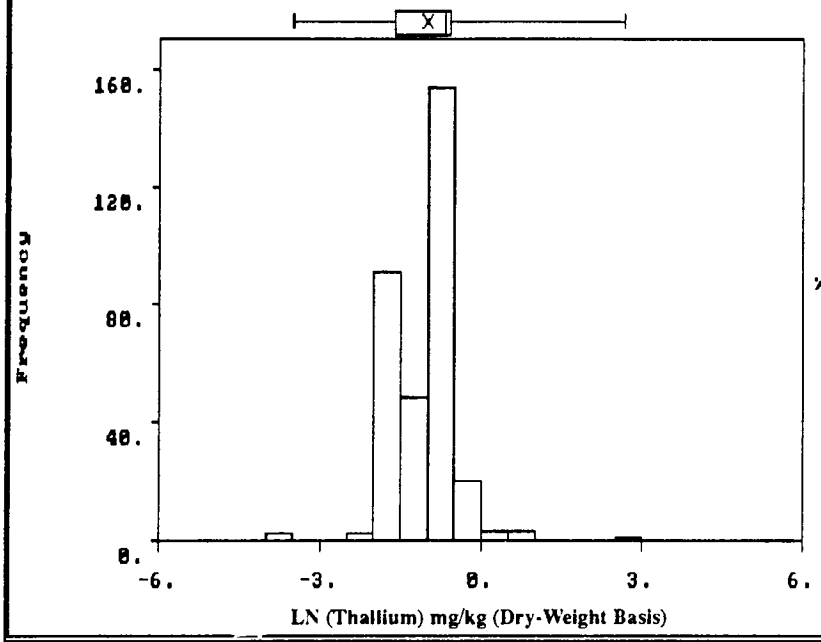
Thallium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A182

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

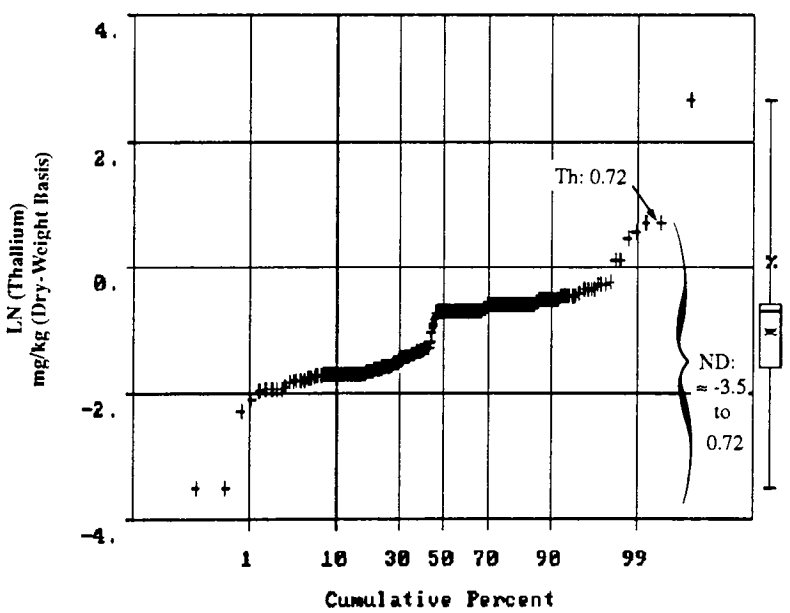
25944

Histogram
Thallium, LN Concentrations
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	16
N Used :	324
Mean :	-1.024
Variance:	.371
Std. Dev:	.609
% Coef.Var:	59.454
Skewness:	.285
Kurtosis:	7.307
Minimum :	-3.507
25th % :	-1.609
Median :	-.693
75th % :	-.598
Maximum :	2.653

Cumulative Frequency Plot
Thallium, LN Concentration
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	16
N Used :	324
Mean :	-1.024
Variance:	.371
Std. Dev:	.609
% Coef.Var:	59.454
Skewness:	.285
Kurtosis:	7.307
Minimum :	-3.507
25th % :	-1.609
Median :	-.693
75th % :	-.598
Maximum :	2.653

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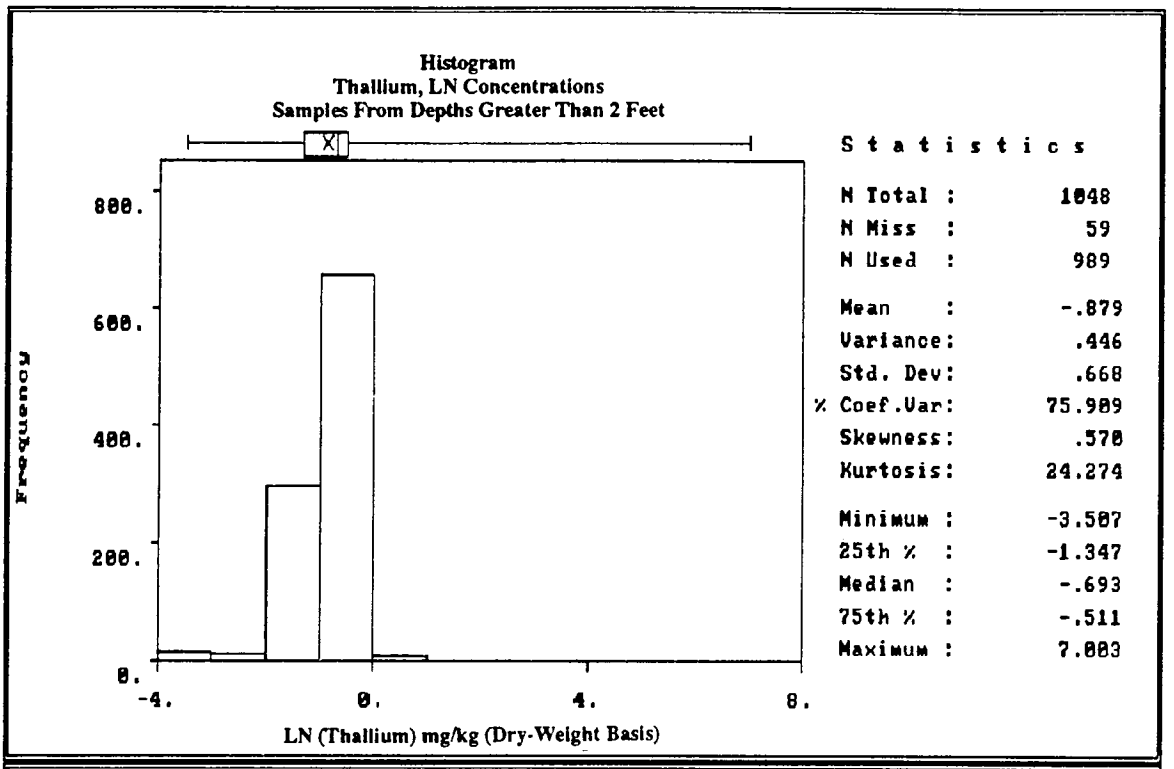
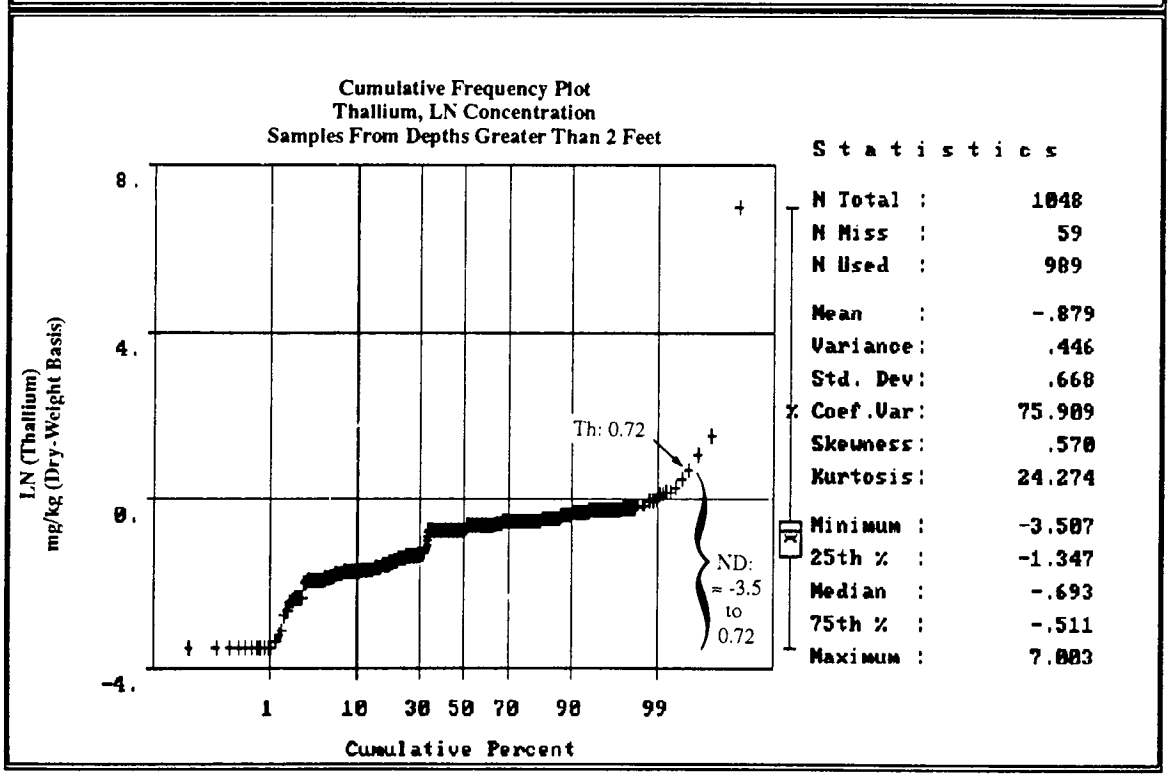
Thallium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A183

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25945





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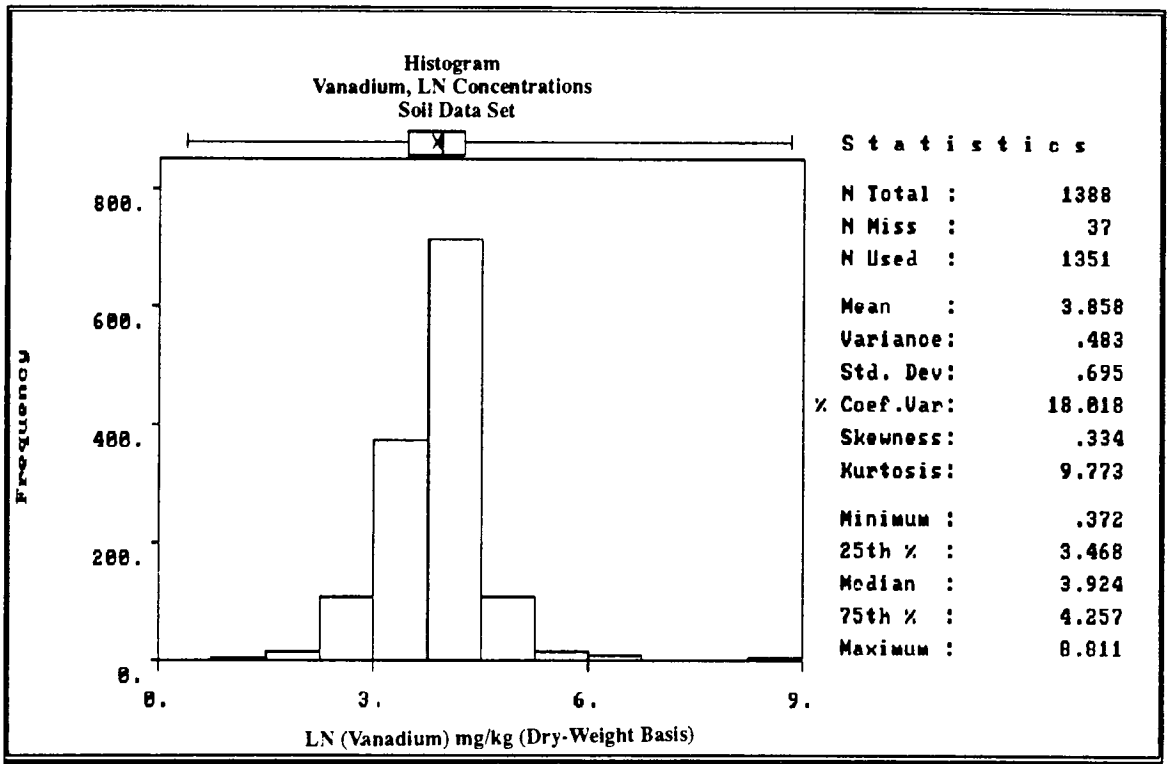
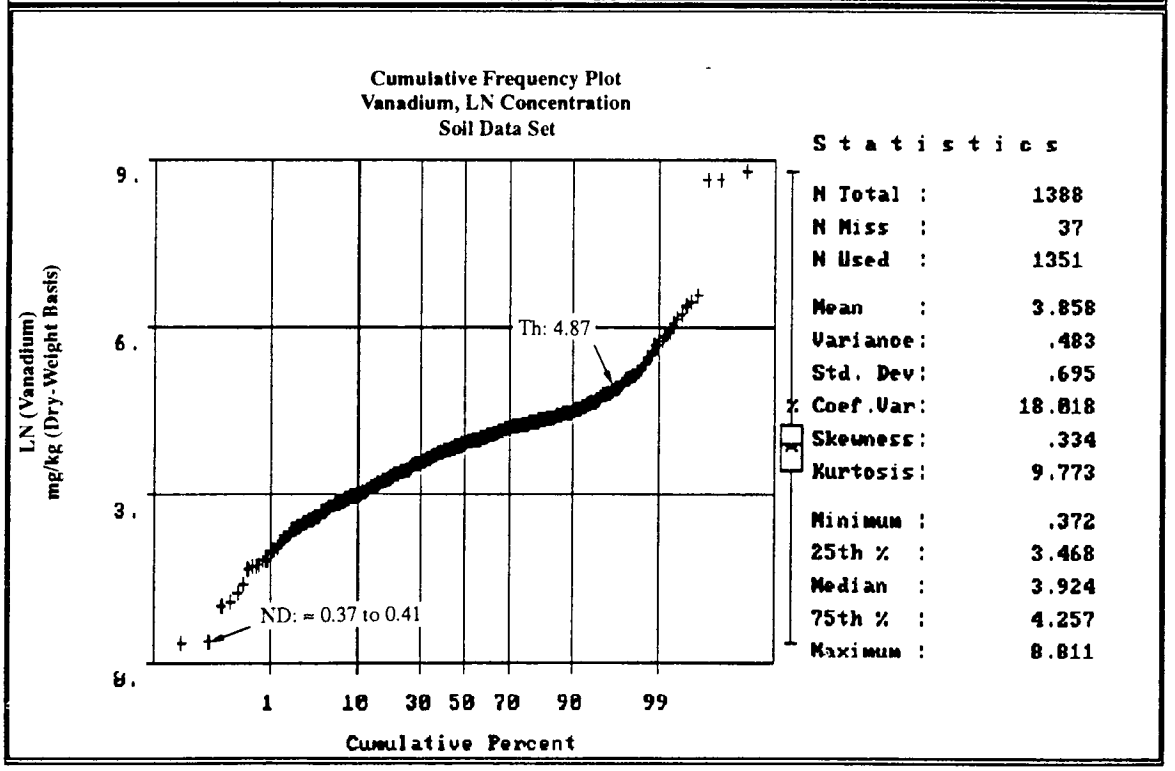
Thallium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **A184**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25946





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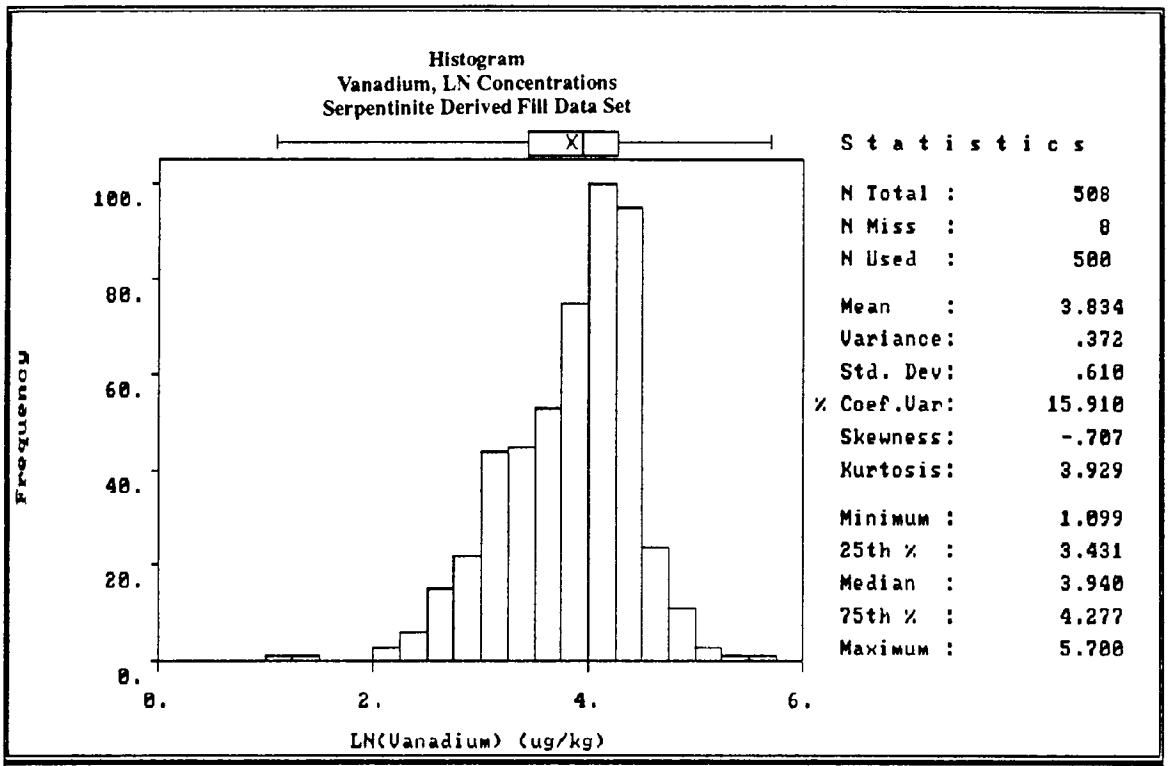
Engineering and
Environmental Services

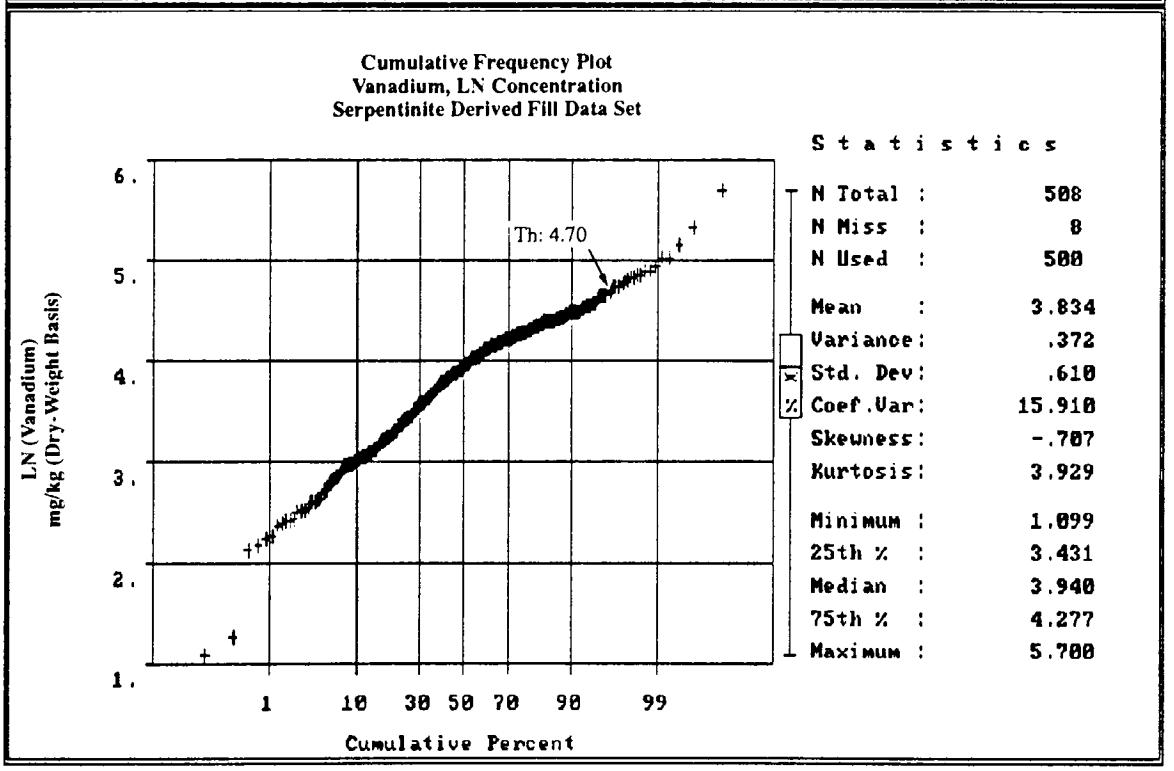
Vanadium, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A185

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25947





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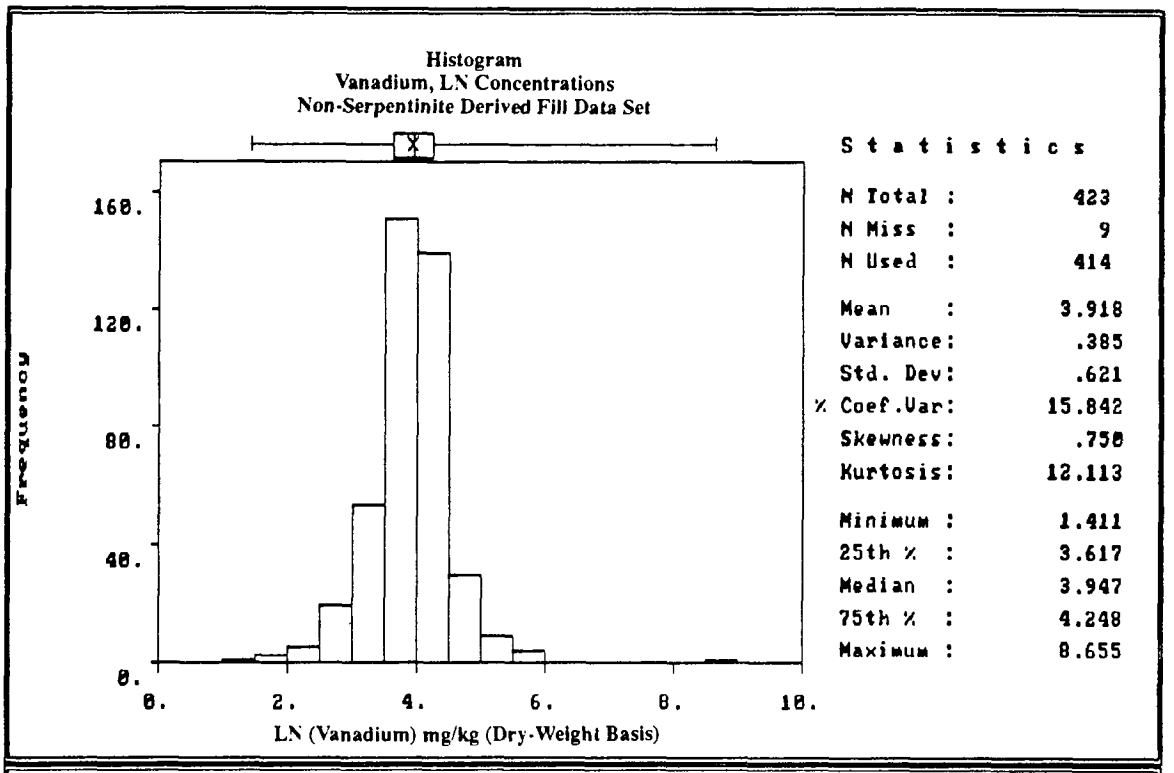
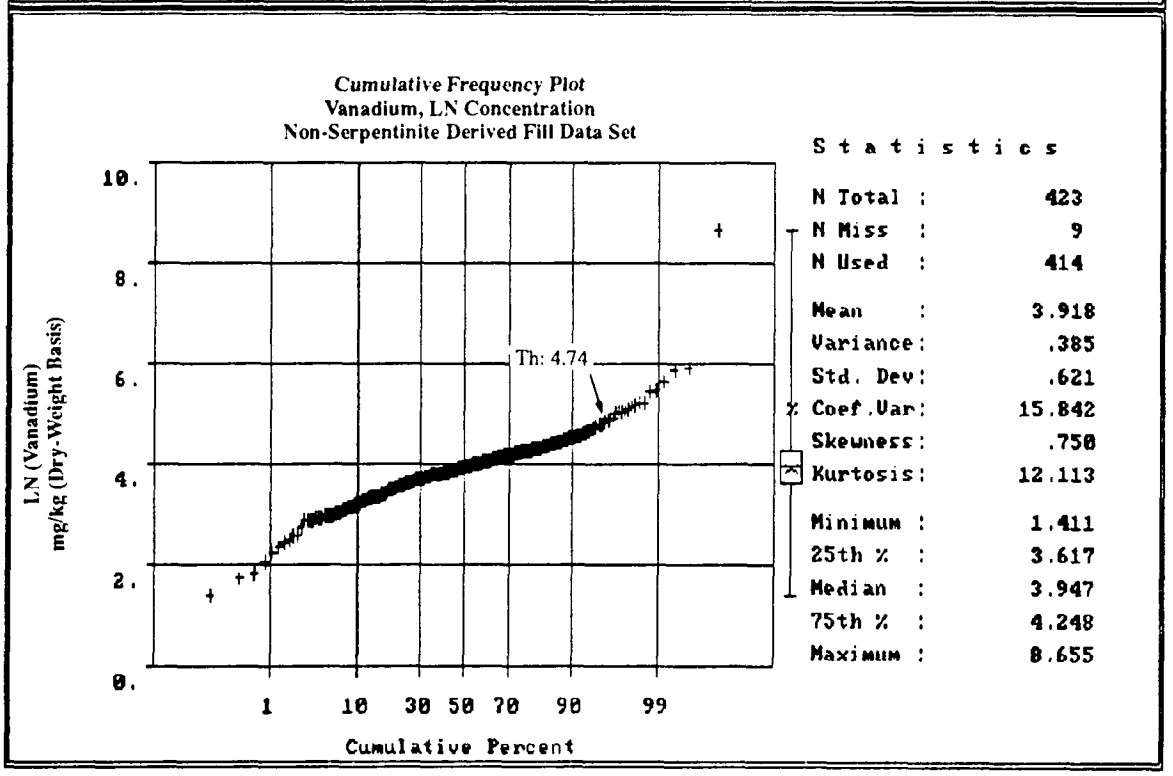
Vanadium, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A186

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25948





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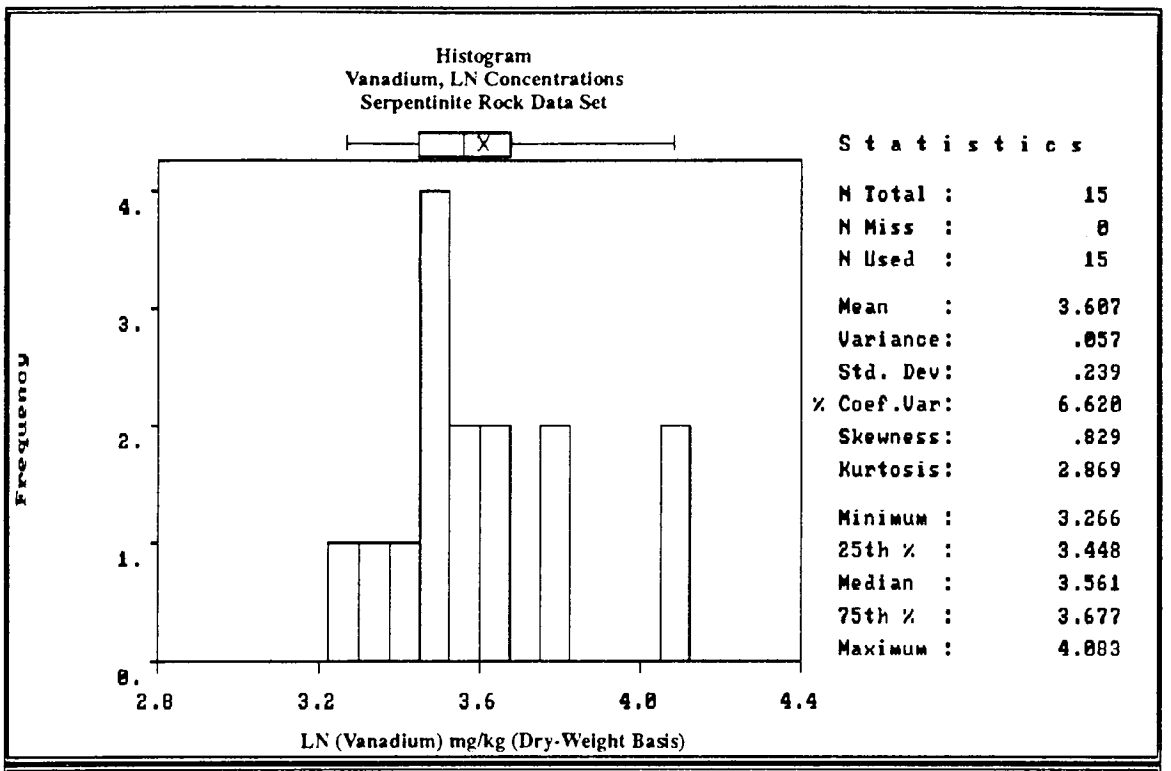
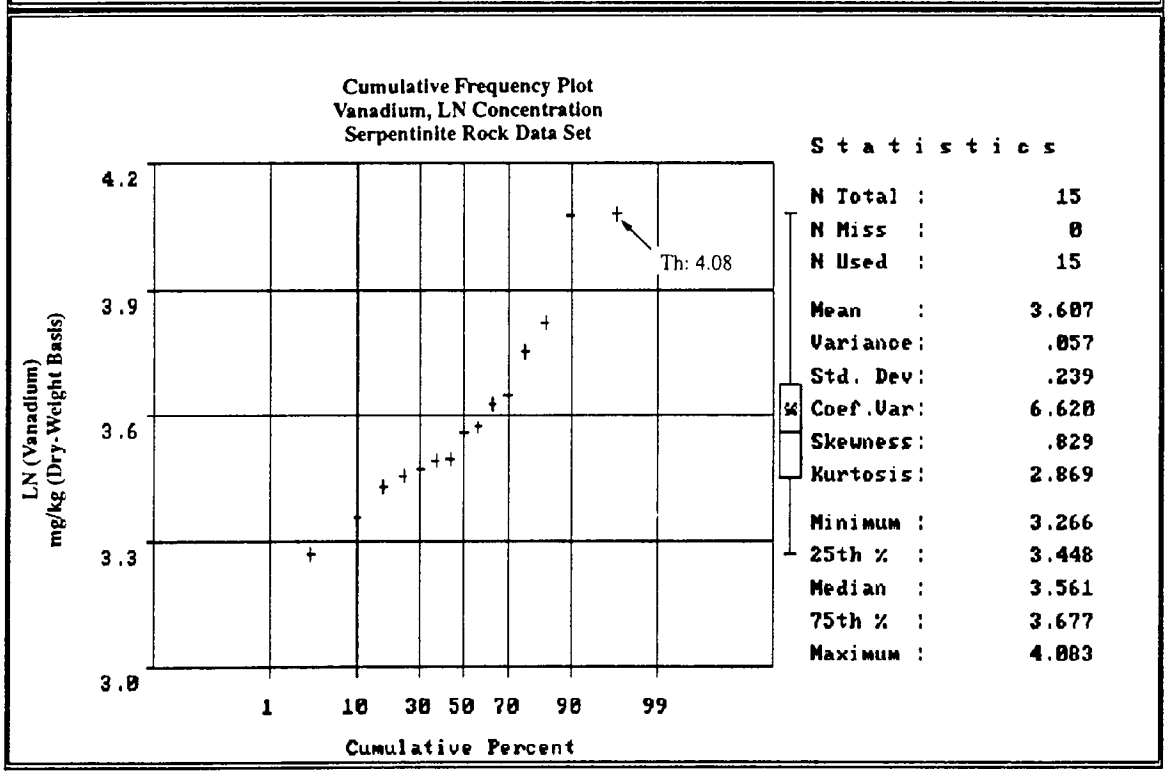
Vanadium, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A187

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25949





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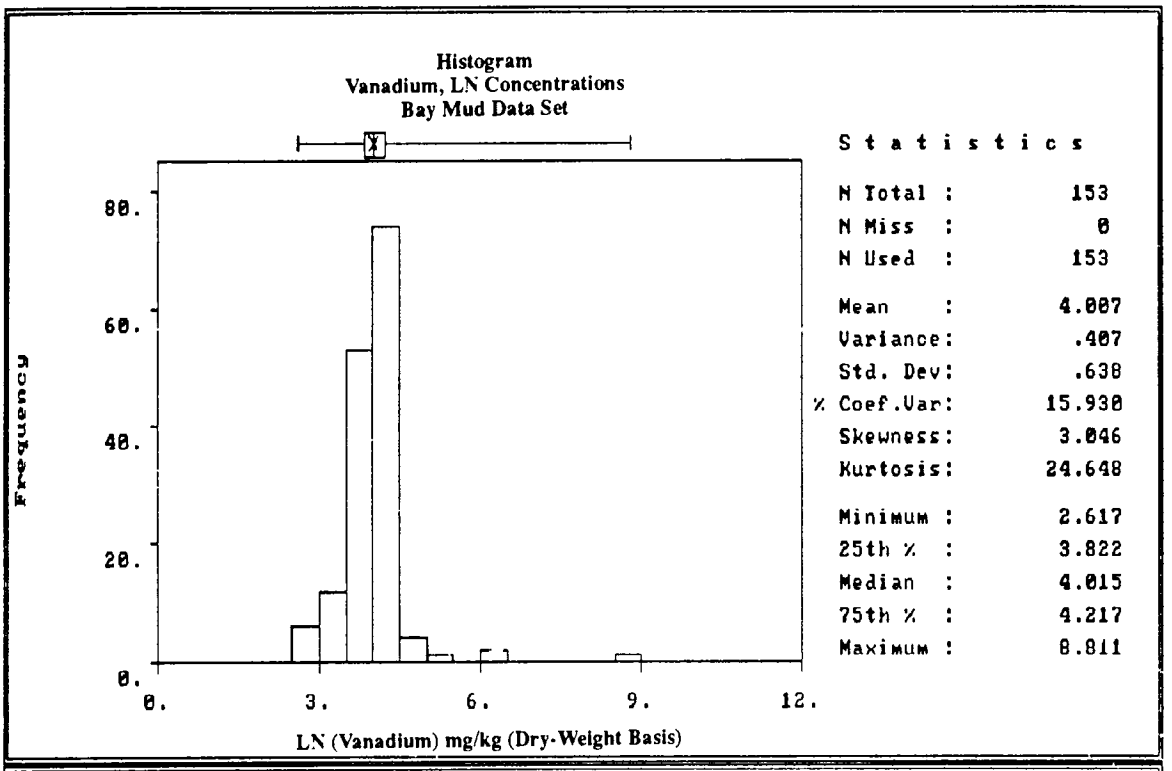
Environmental Services

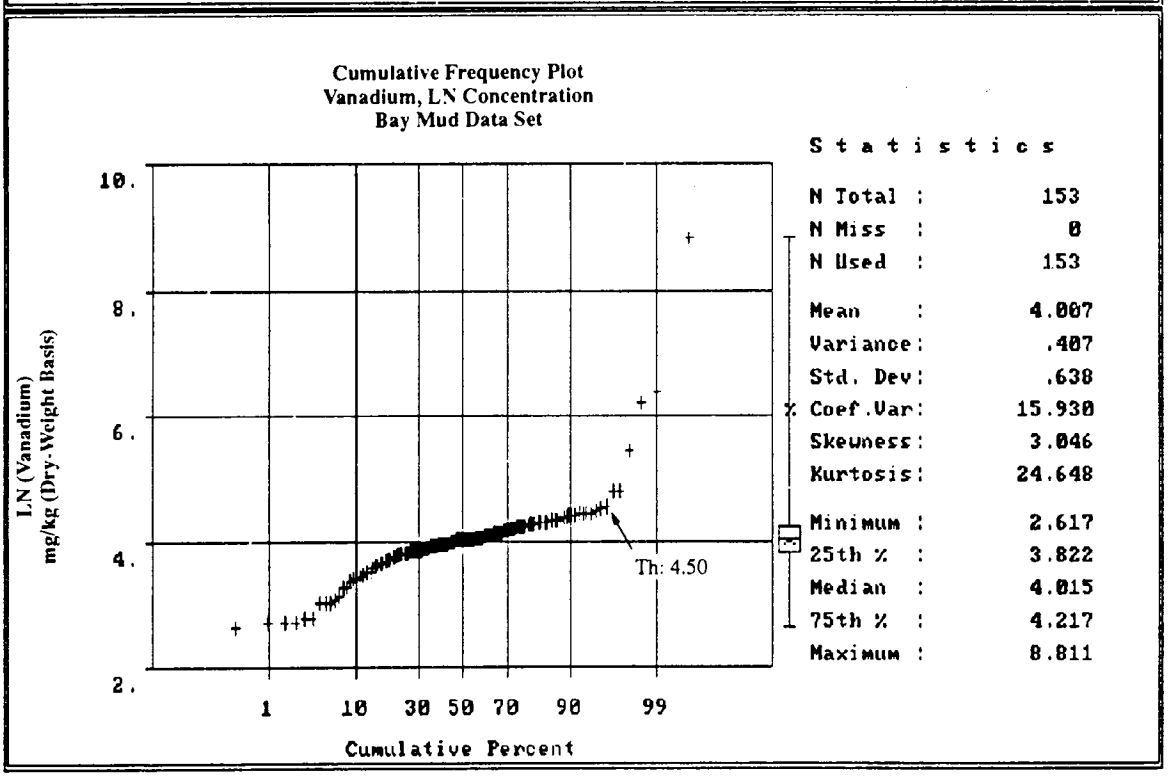
Vanadium, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A188

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25950





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Vanadium, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
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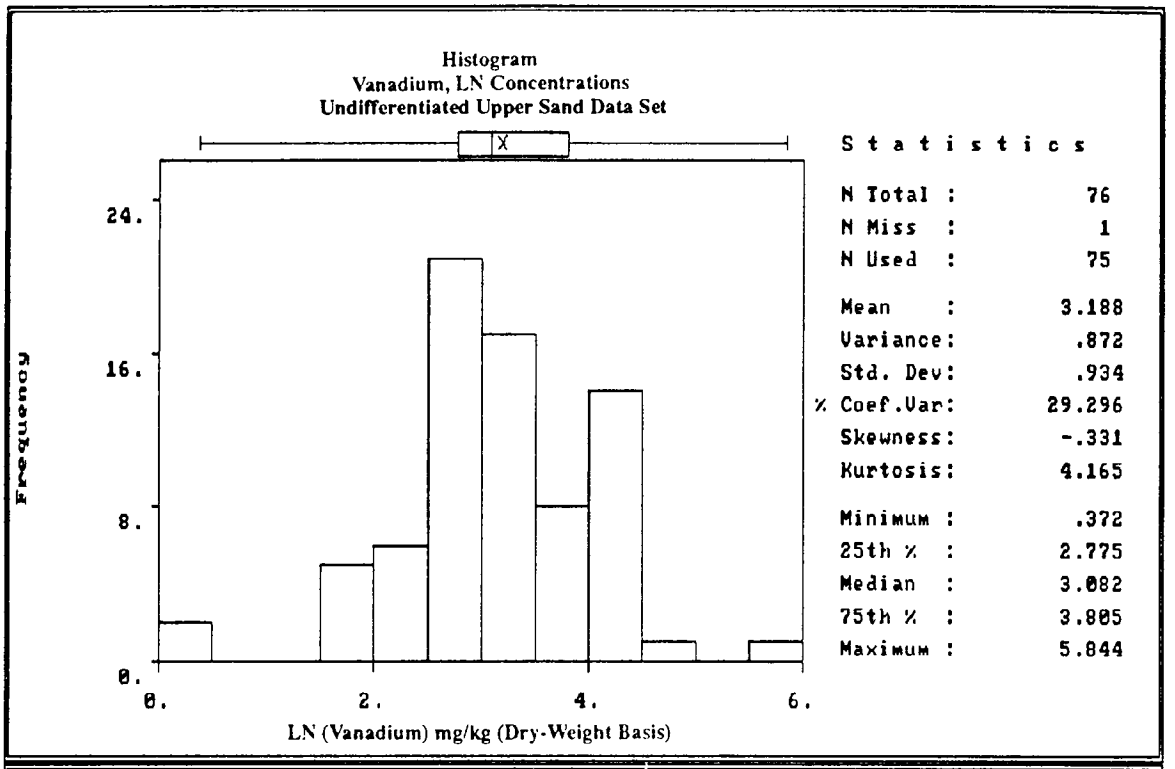
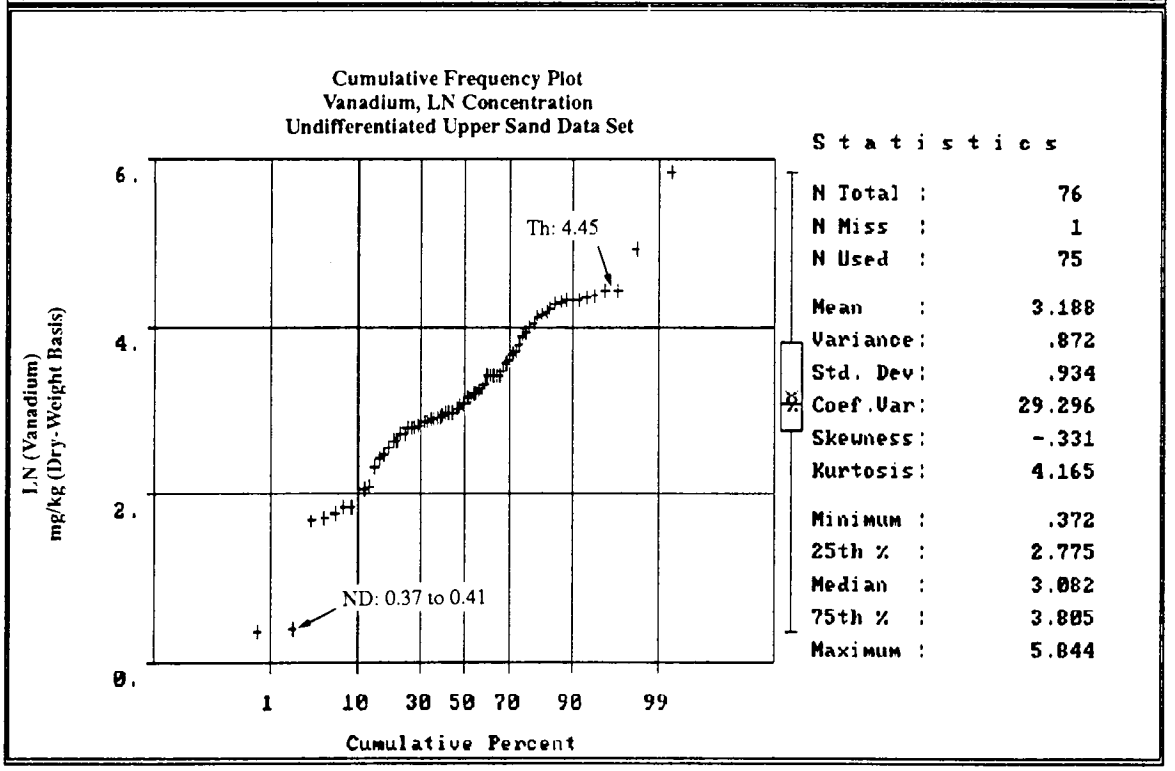
PLATE
A189

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25951





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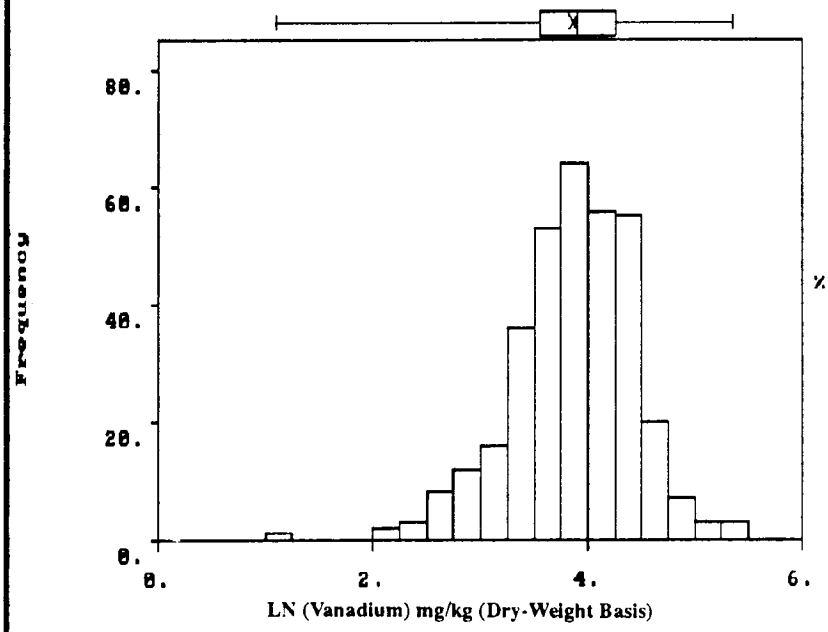
Vanadium, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A190

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

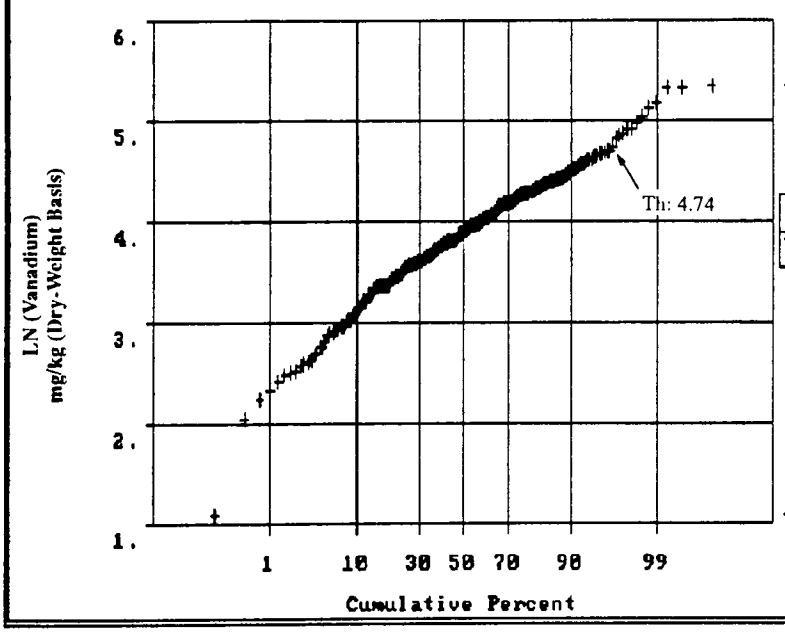
25952

Histogram
Vanadium, LN Concentrations
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	1
N Used :	339
Mean :	3.860
Variance:	.332
Std. Dev:	.576
% Coef.Var:	14.933
Skewness:	-.609
Kurtosis:	4.536
Minimum :	1.099
25th % :	3.558
Median :	3.902
75th % :	4.260
Maximum :	5.357

Cumulative Frequency Plot
Vanadium, LN Concentration
Samples From Depths Less Than or Equal to 2 Feet



Statistics	
N Total :	340
N Miss :	1
N Used :	339
Mean :	3.860
Variance:	.332
Std. Dev:	.576
Coef.Var:	14.933
Skewness:	-.609
Kurtosis:	4.536
Minimum :	1.099
25th % :	3.558
Median :	3.902
75th % :	4.260
Maximum :	5.357

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Vanadium, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
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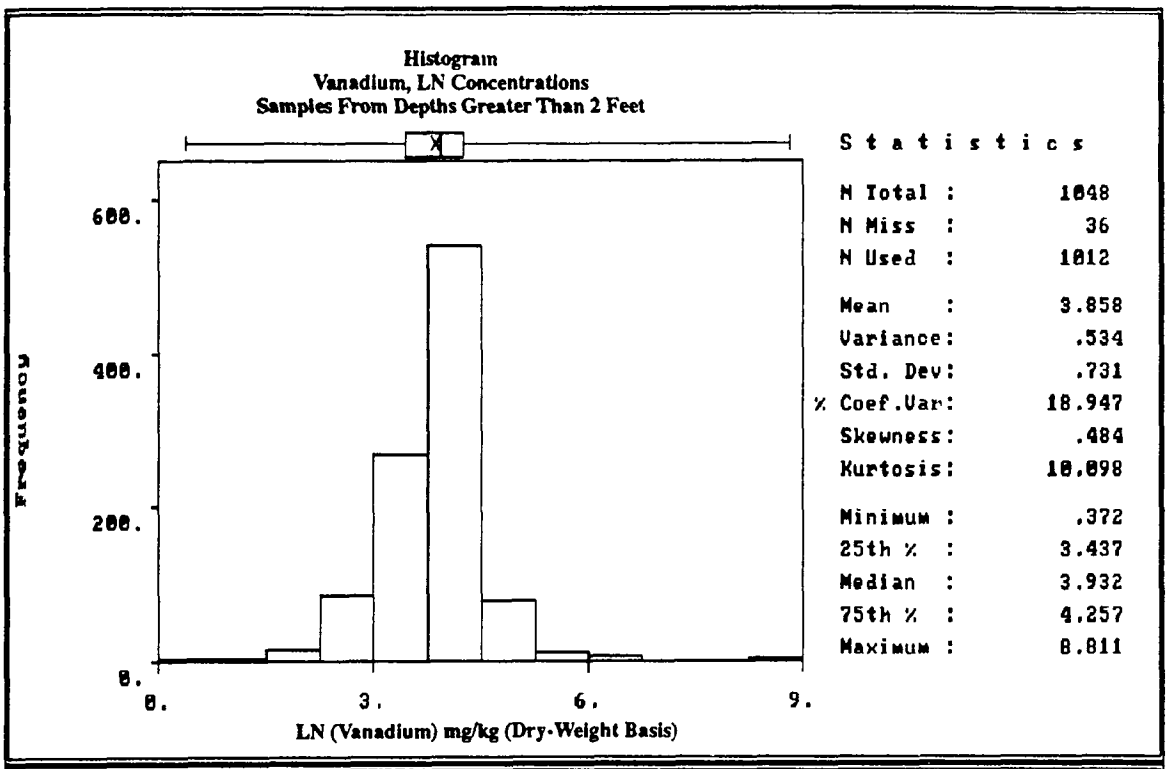
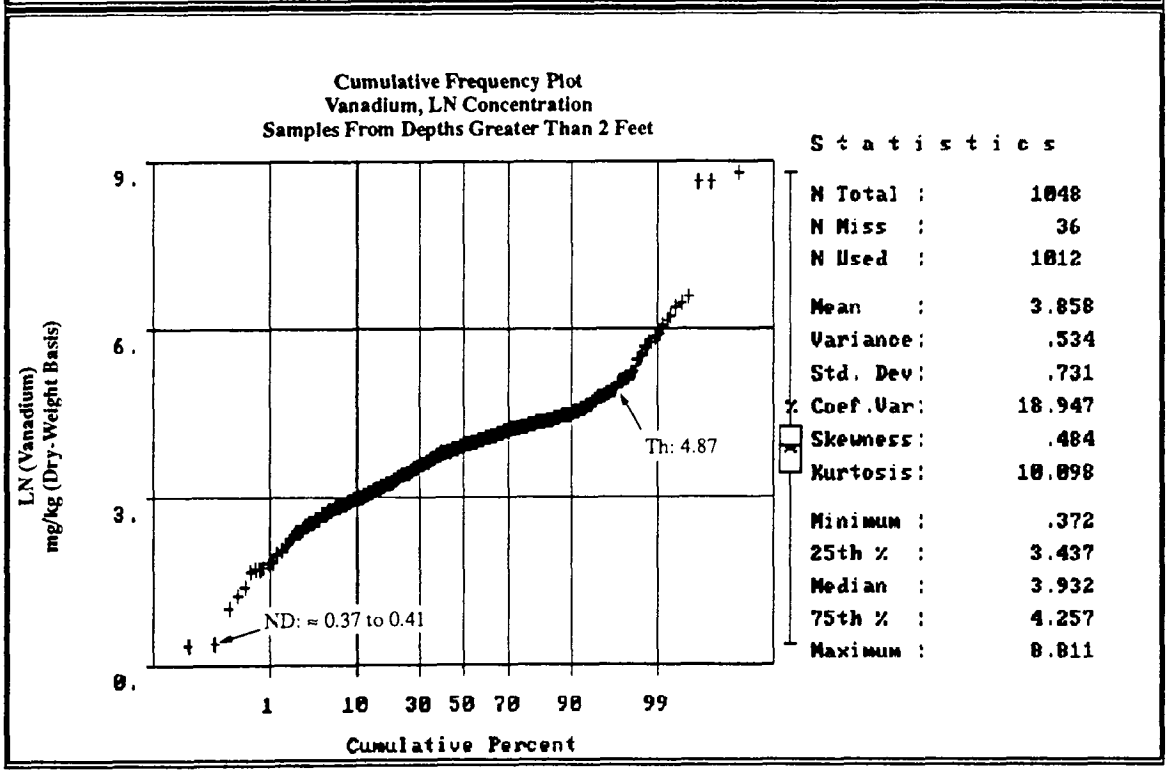
PLATE **A191**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25953





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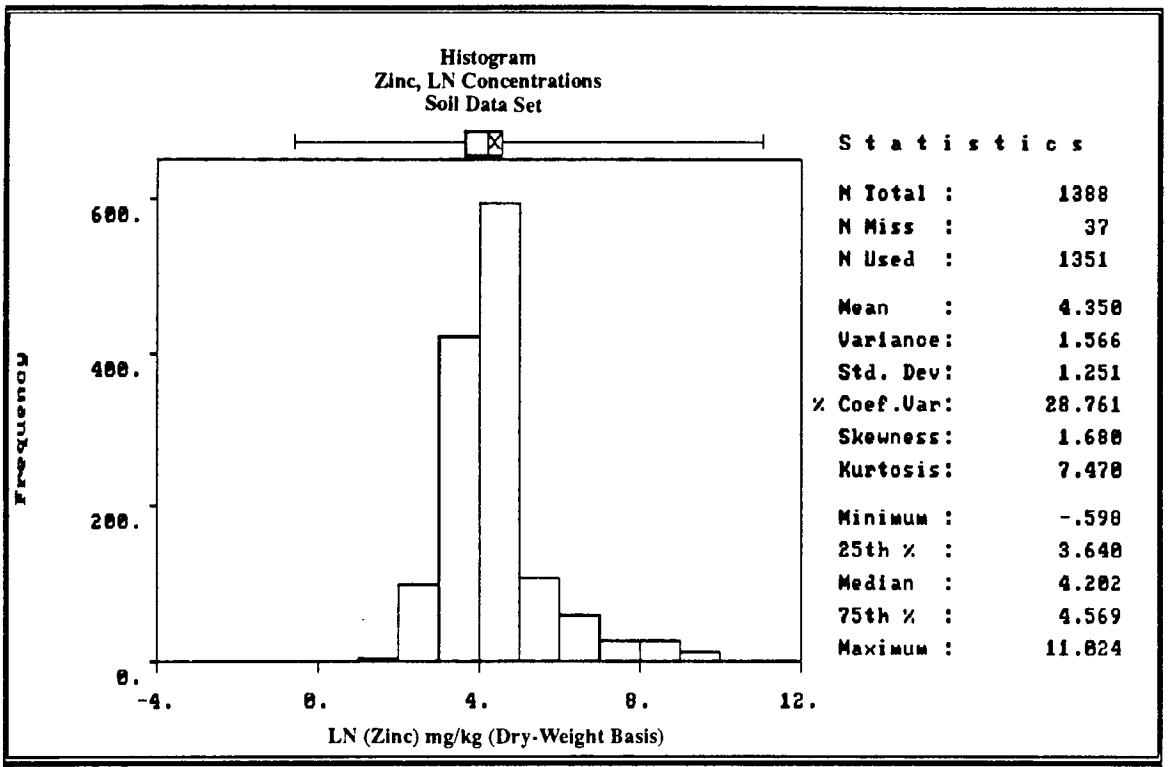
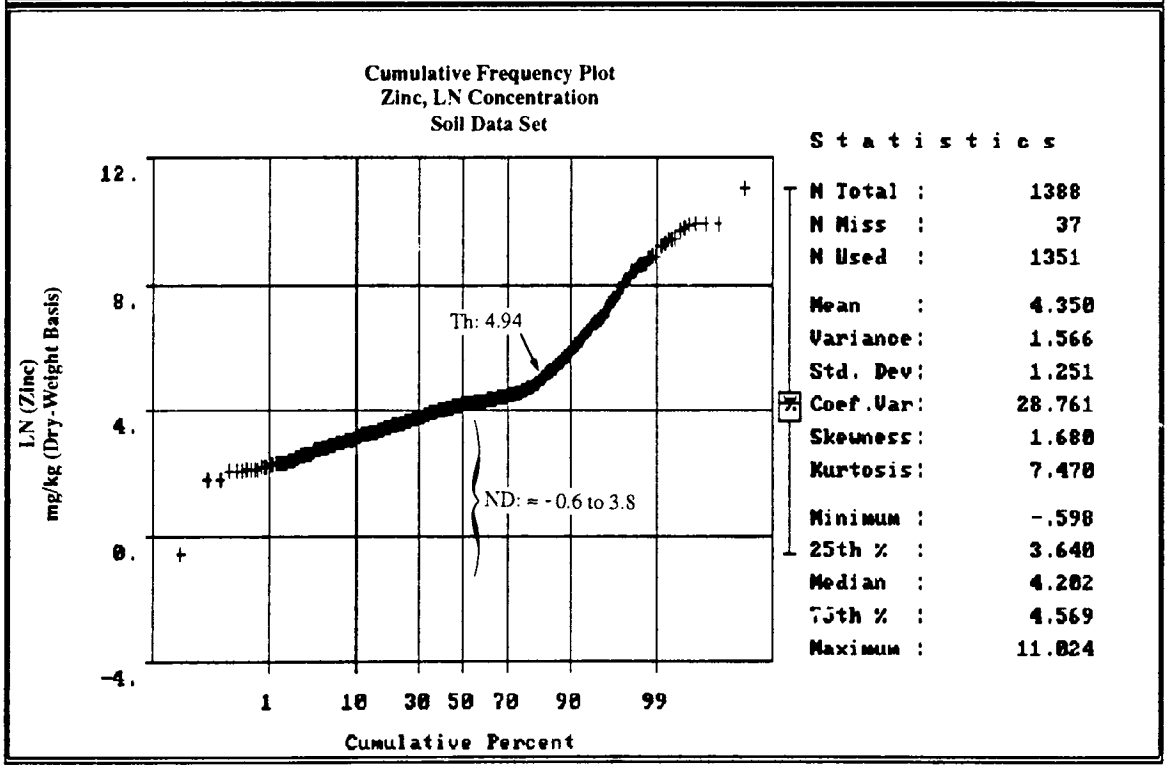
Vanadium, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A192

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25954





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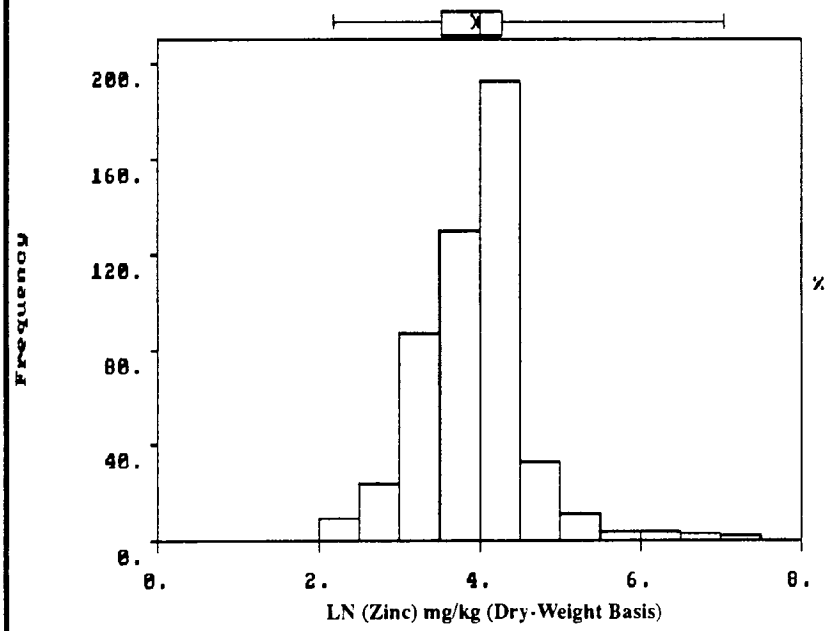
Zinc, Soil Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A193

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

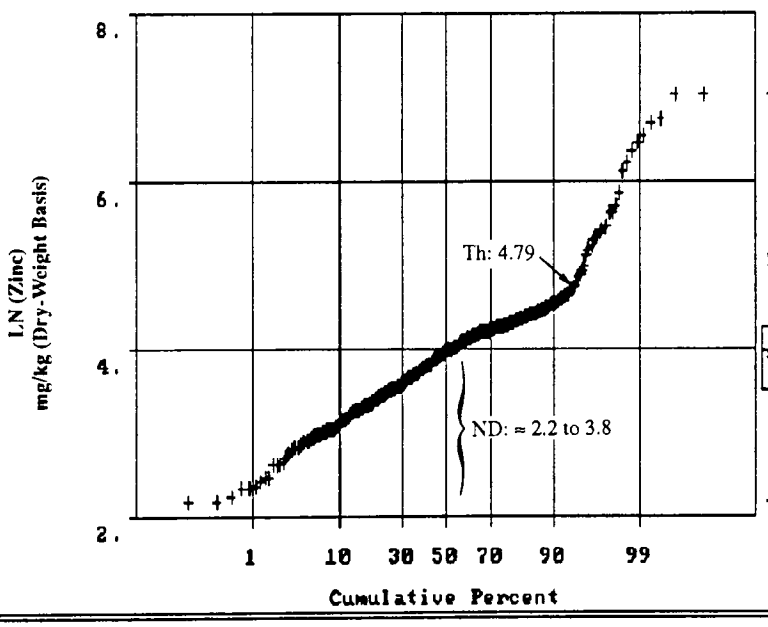
25955

Histogram
Zinc, LN Concentrations
Serpentinite Derived Fill Data Set



Statistics	
N Total :	508
N Miss :	8
N Used :	500
Mean :	3.948
Variance:	.471
Std. Dev:	.686
% Coef.Var:	17.383
Skewness:	.871
Kurtosis:	6.220
Minimum :	2.180
25th % :	3.520
Median :	3.999
75th % :	4.281
Maximum :	7.830

Cumulative Frequency Plot
Zinc, LN Concentration
Serpentinite Derived Fill Data Set



Statistics	
N Total :	508
N Miss :	8
N Used :	500
Mean :	3.948
Variance:	.471
Std. Dev:	.686
% Coef.Var:	17.383
Skewness:	.871
Kurtosis:	6.220
Minimum :	2.180
25th % :	3.520
Median :	3.999
75th % :	4.281
Maximum :	7.830

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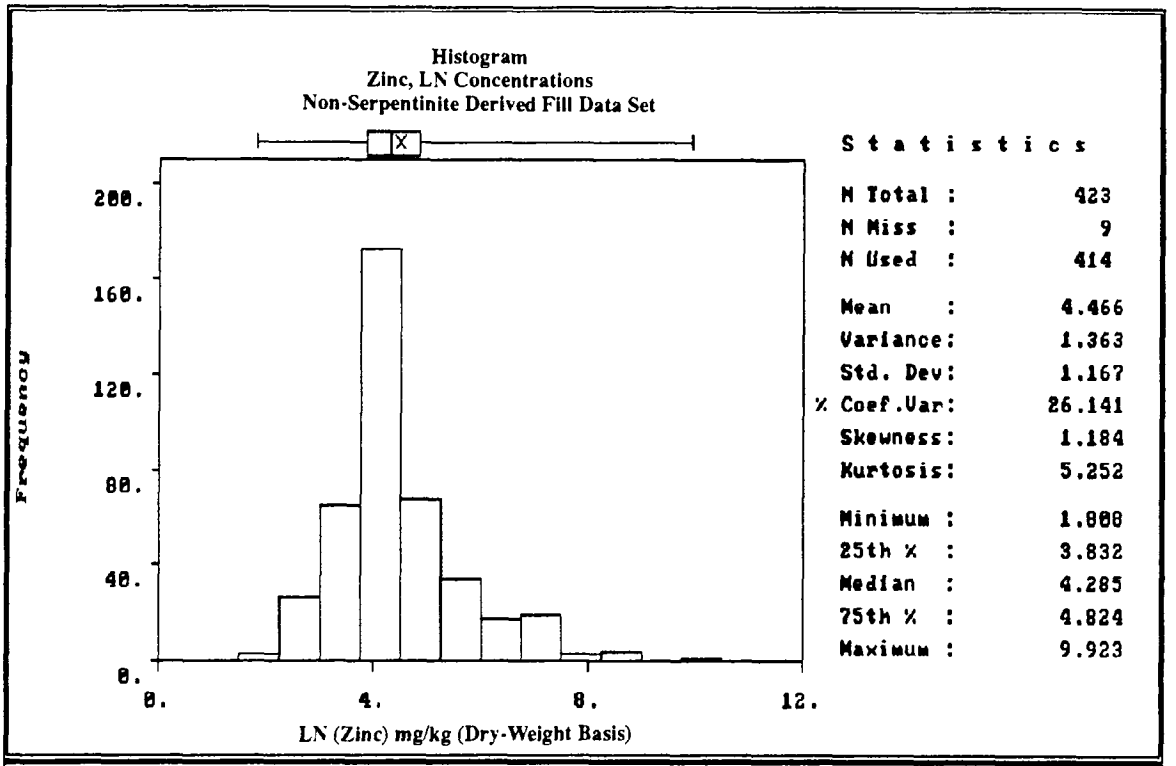
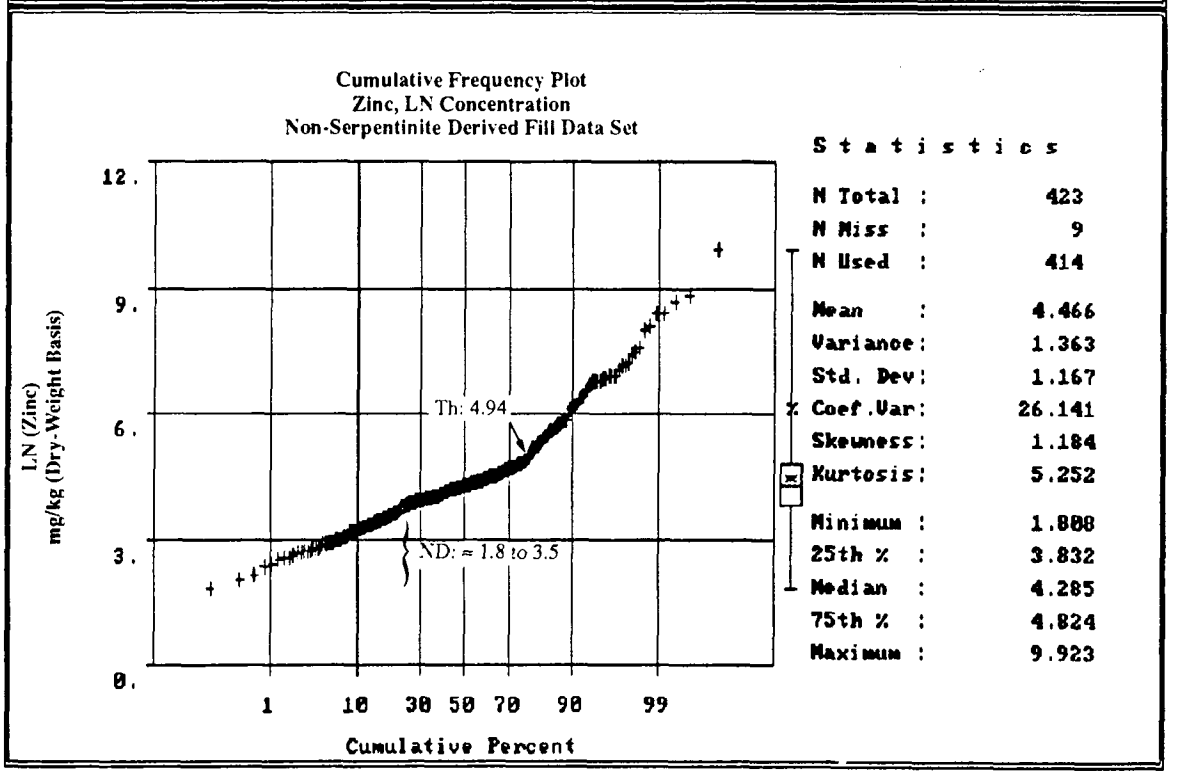
Zinc, Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A194

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	6/92

25956





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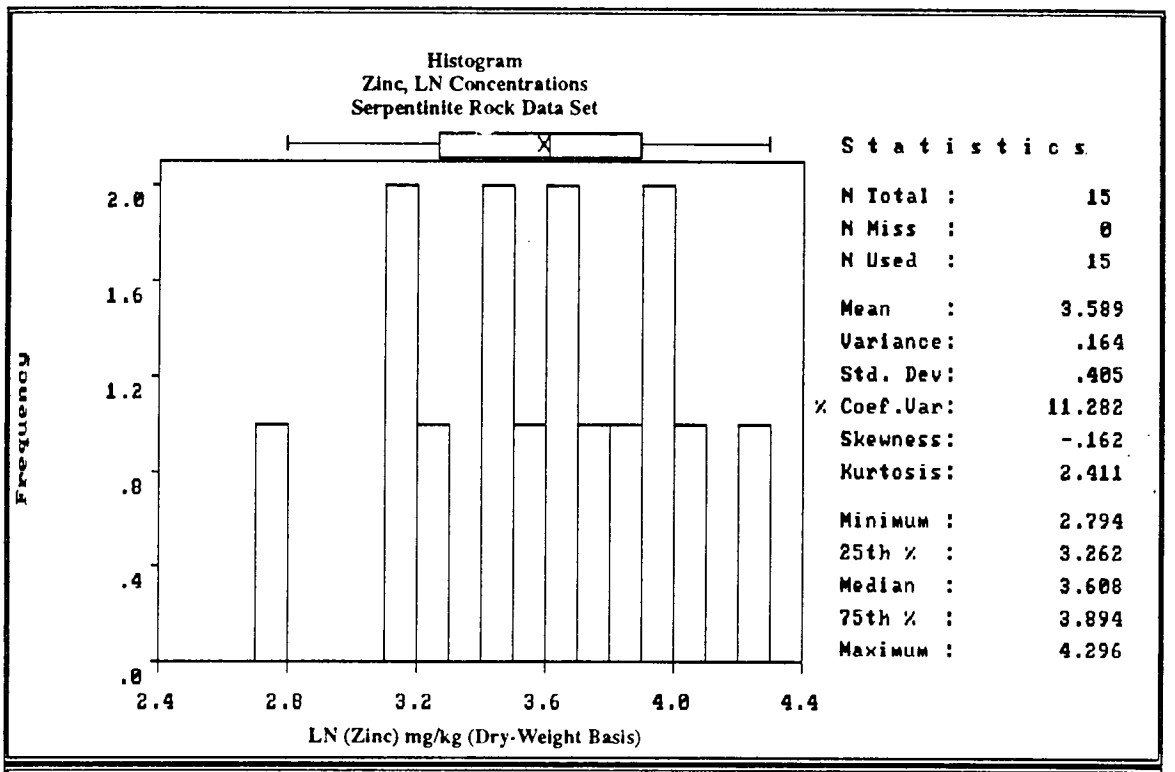
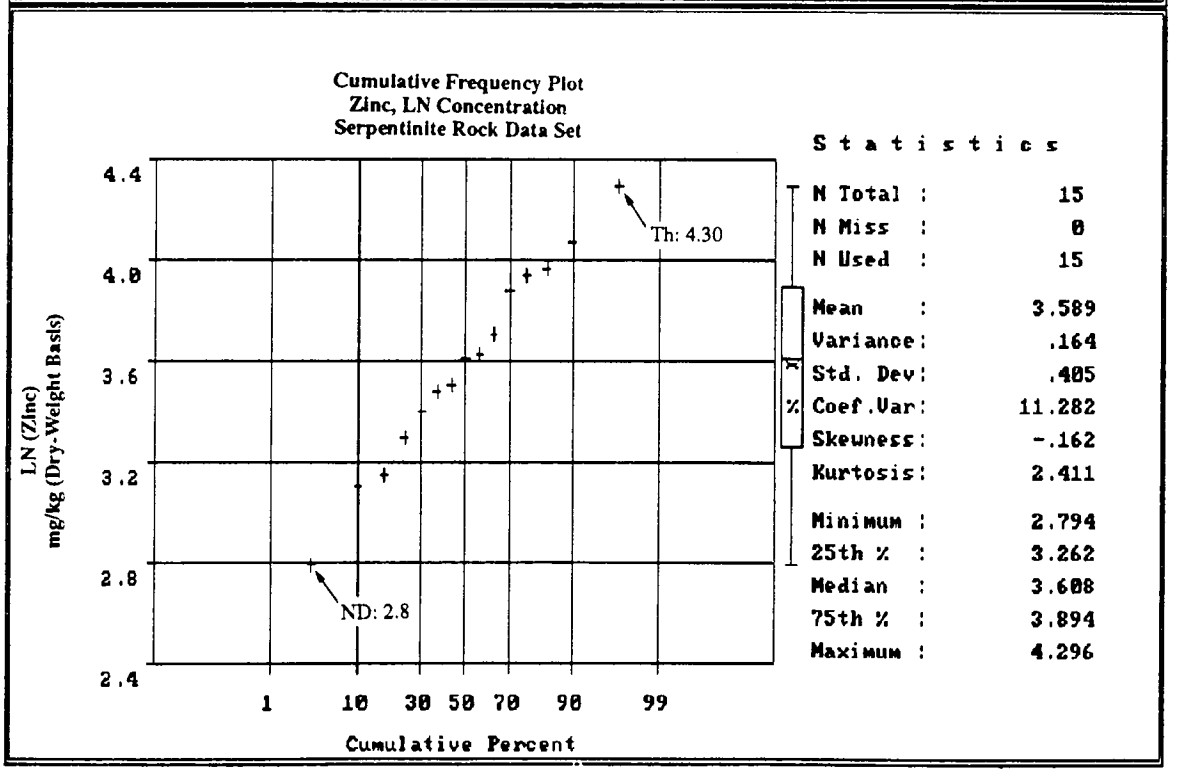
Zinc, Non-Serpentinite Derived Fill Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A195

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CTM	2/92	6/92

25957





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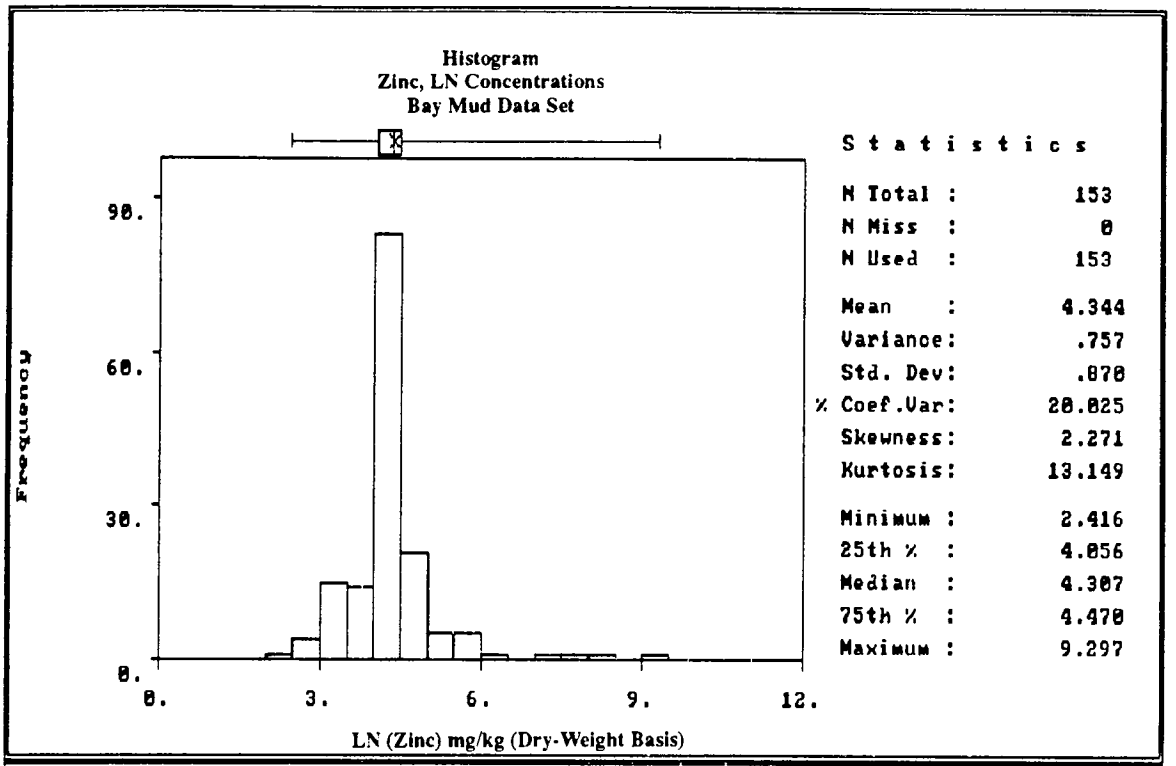
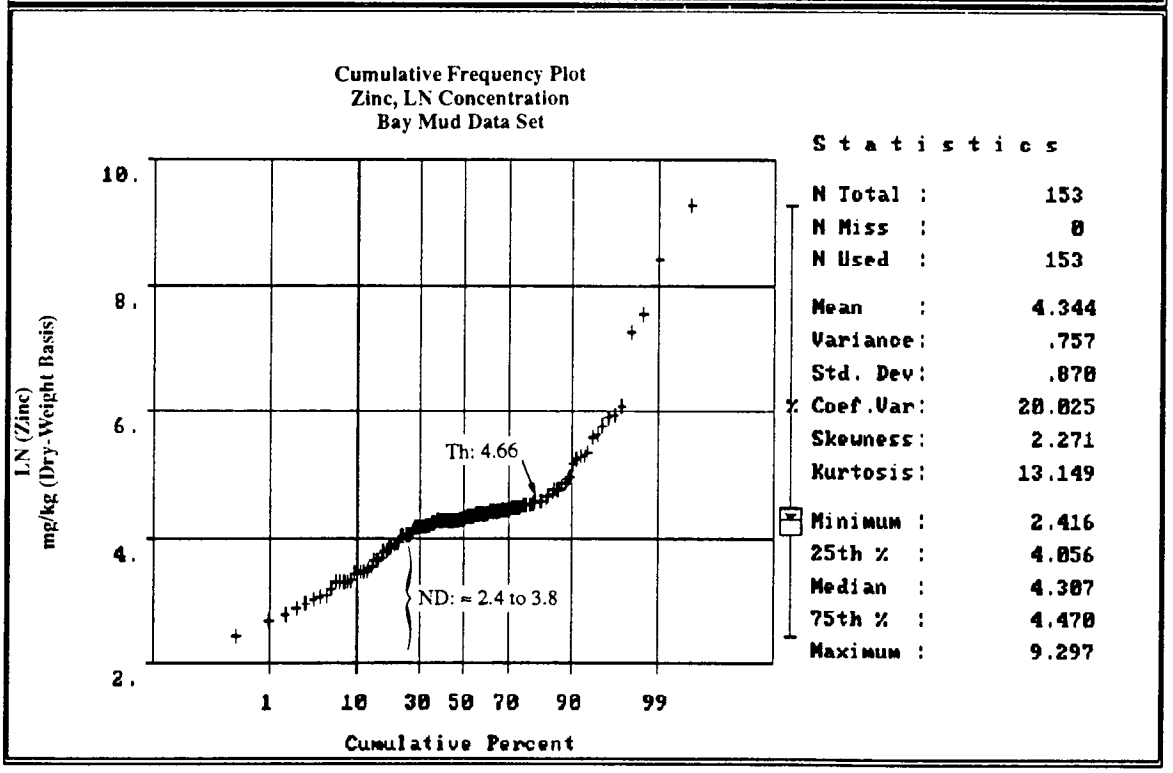
Zinc, Serpentinite Rock Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A196

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	6/92

25958





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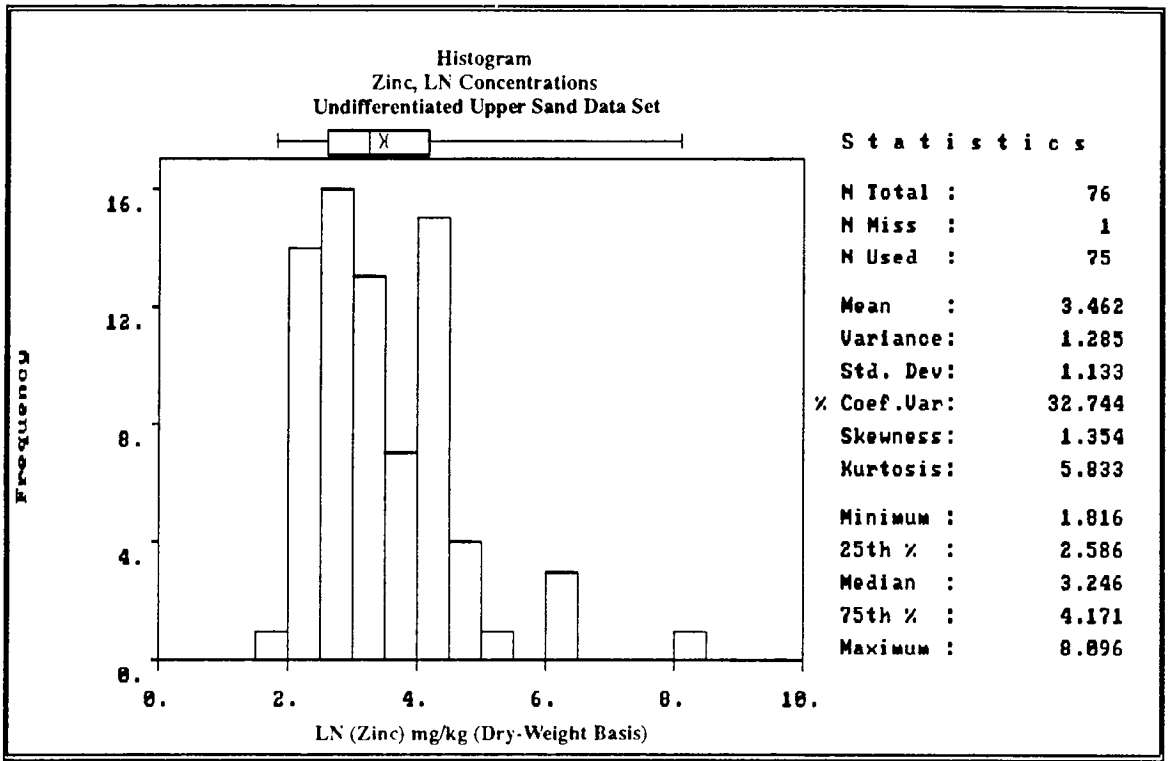
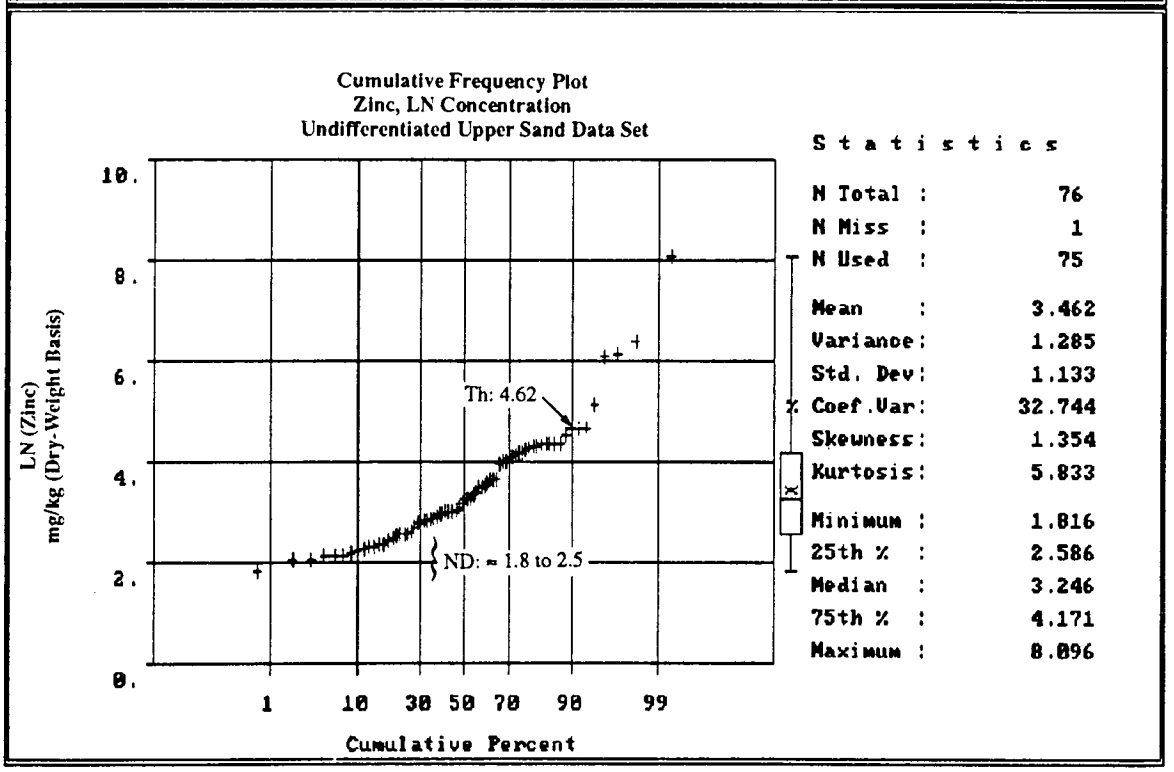
Zinc, Bay Mud Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A197

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25959





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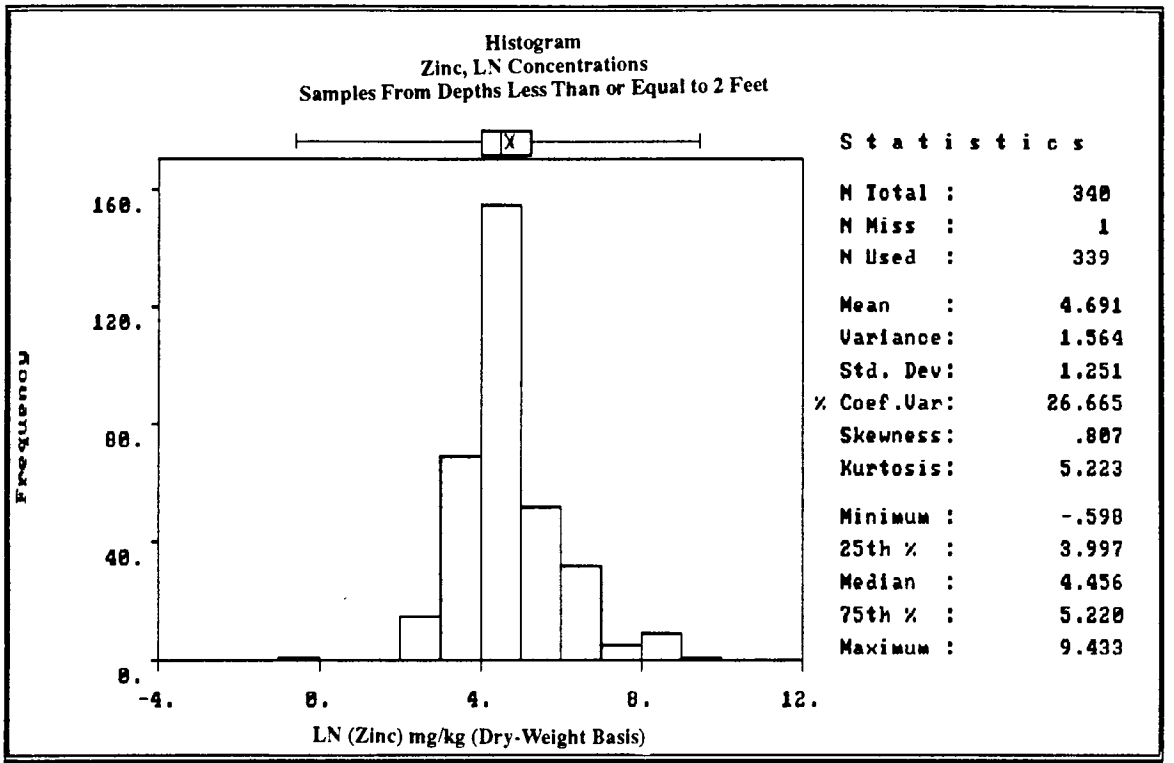
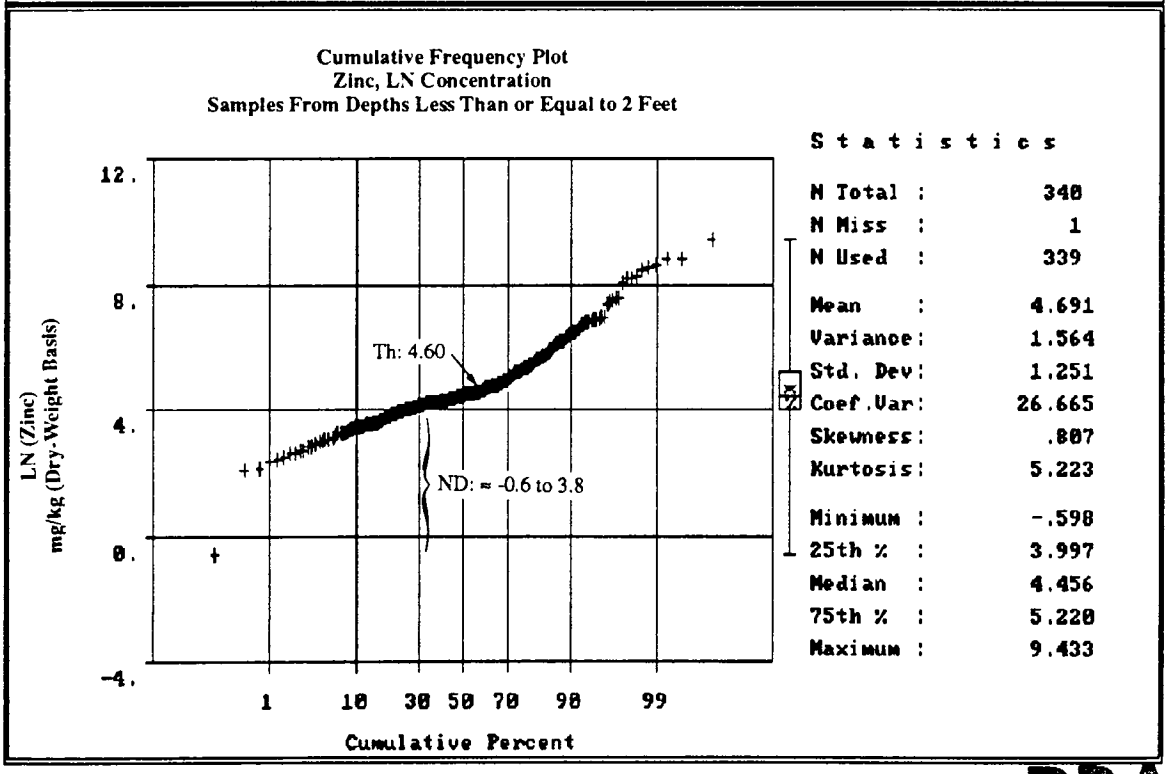
Zinc, Undifferentiated Upper Sand Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A198

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25960





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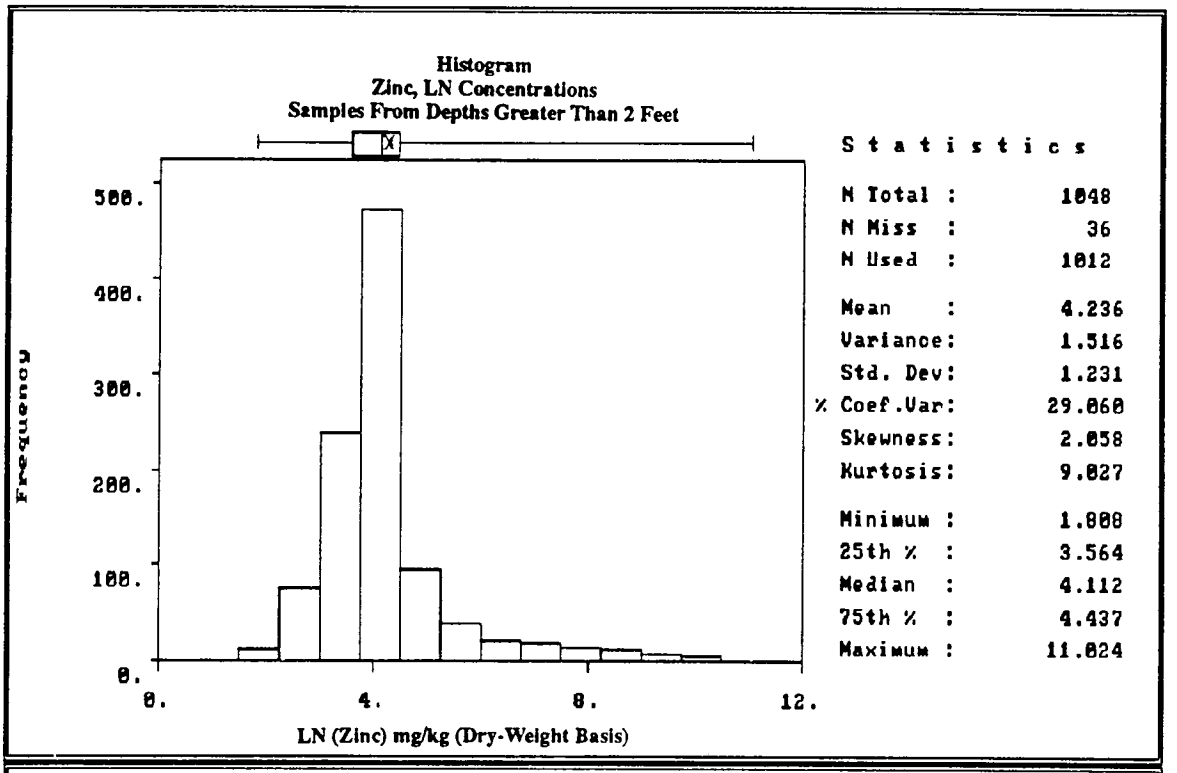
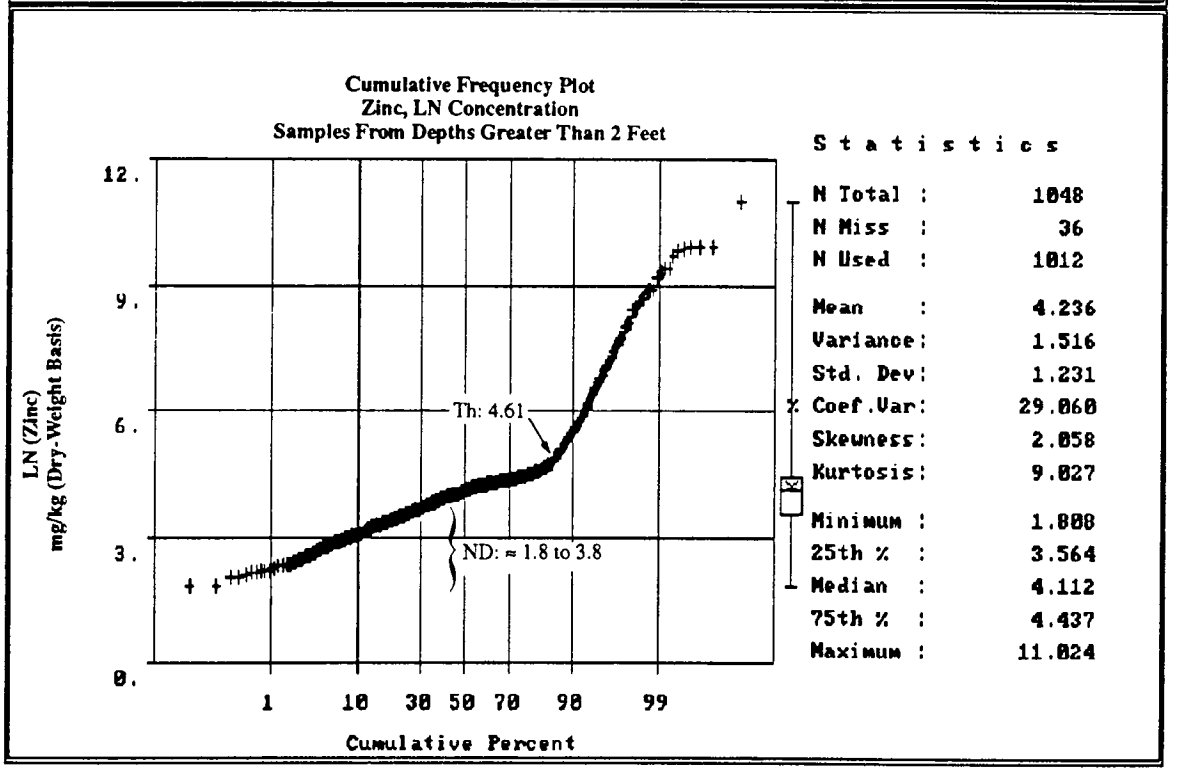
Zinc, Samples From Depths Less Than or Equal to 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A199

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25961





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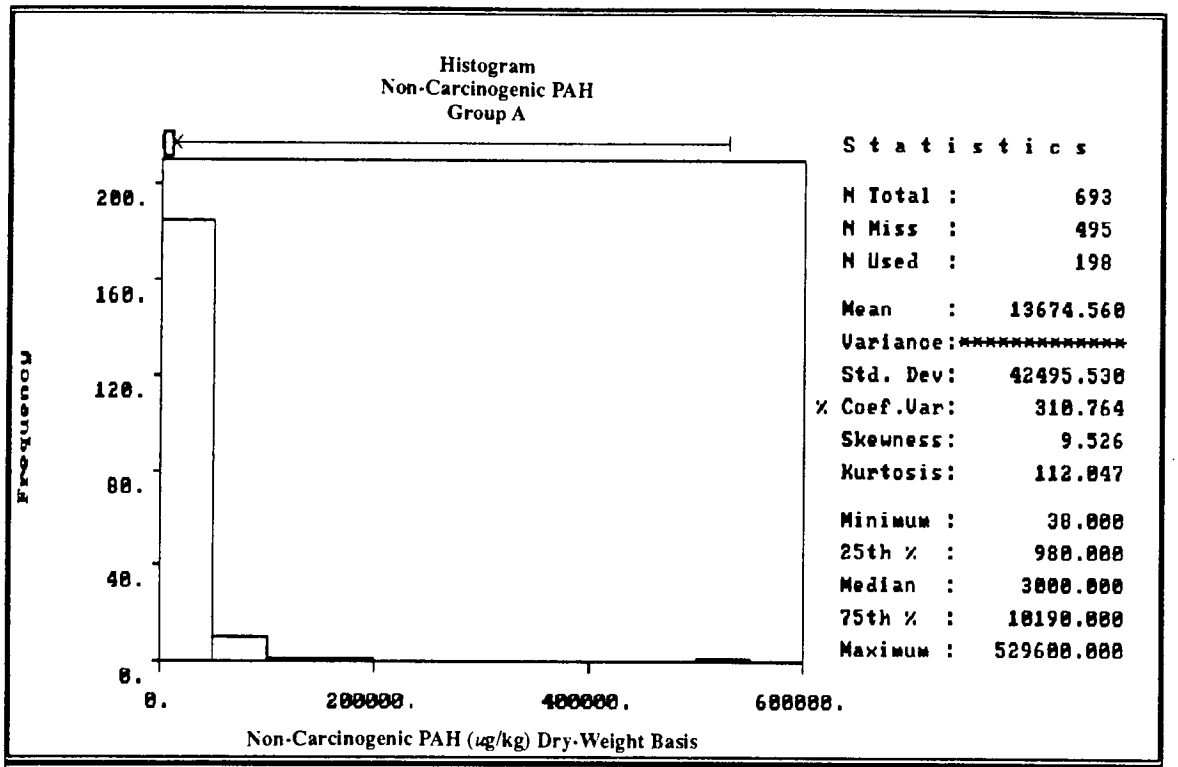
Environmental Services

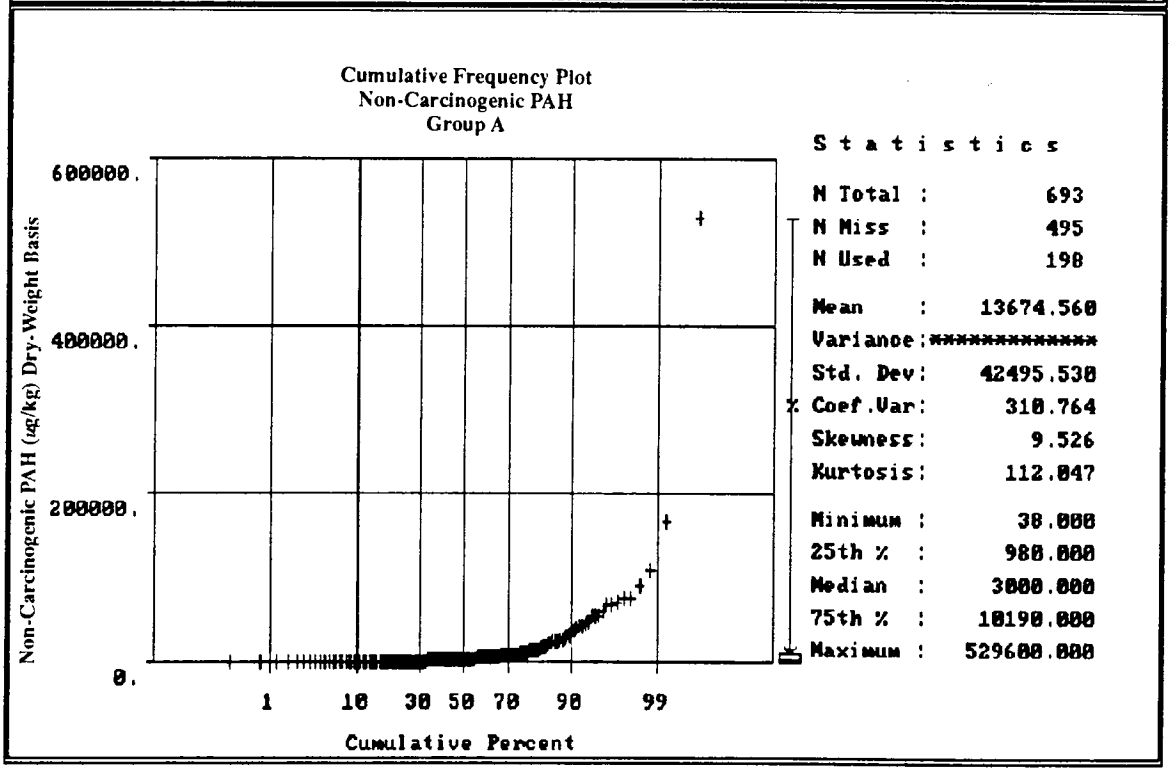
Zinc, Samples From Depths Greater Than 2 Feet
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A200

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25962





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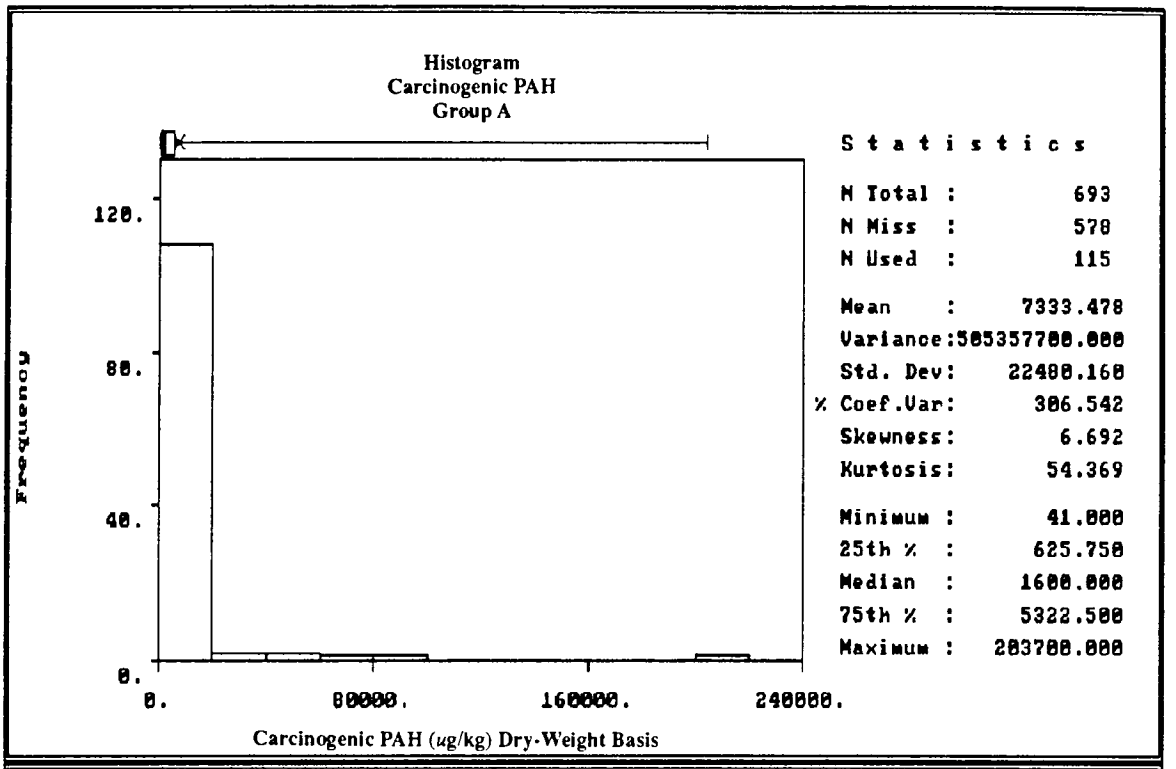
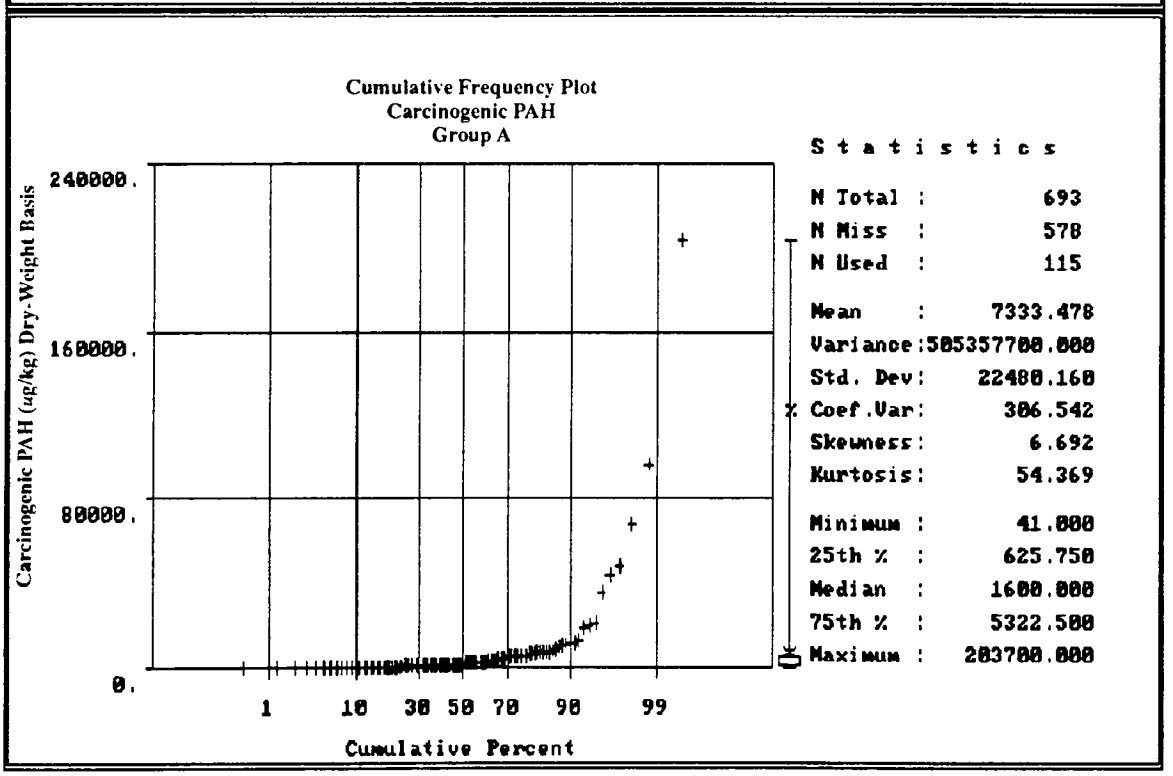
Non-Carcinogenic PAH, Group A Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A201

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	

25963





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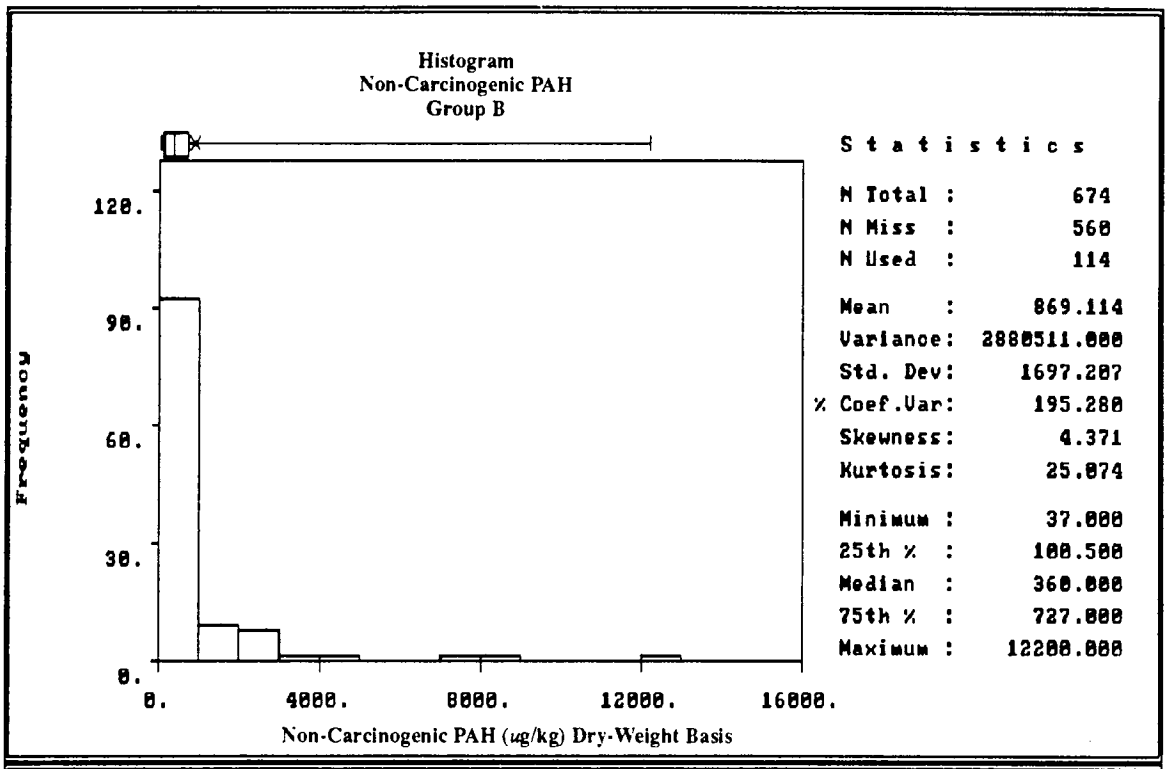
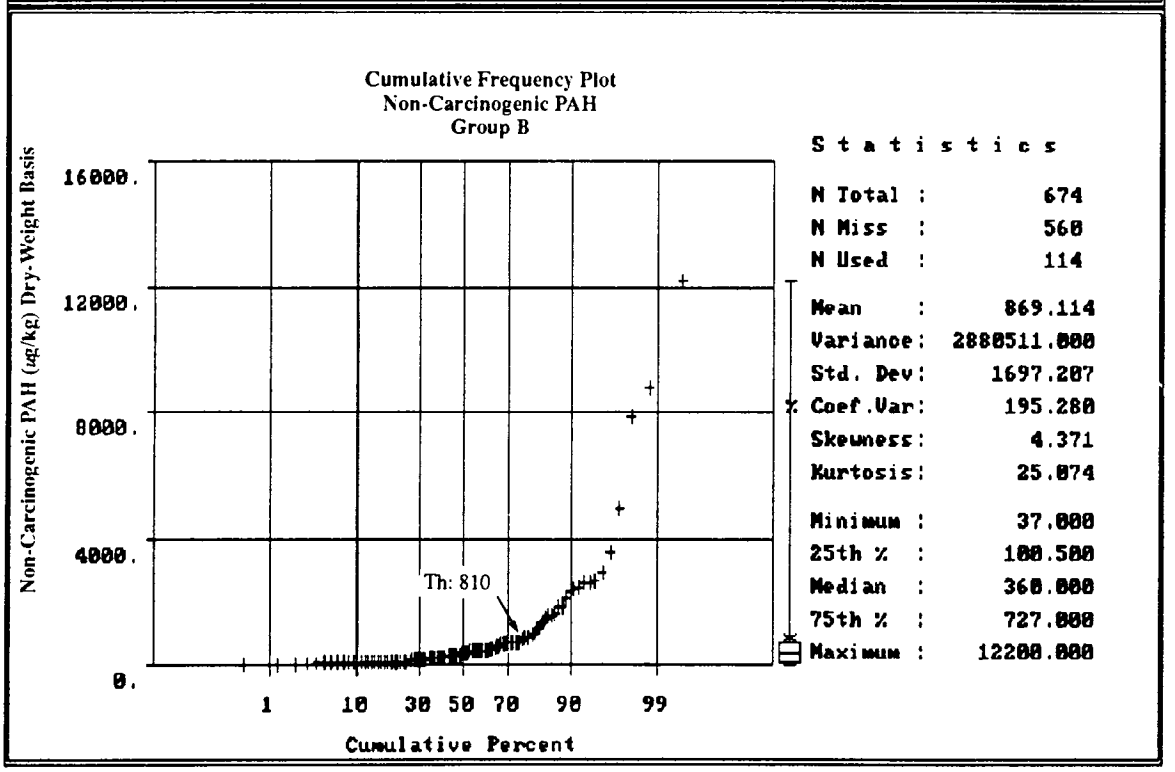
Carcinogenic PAH, Group A Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A202

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	

25964





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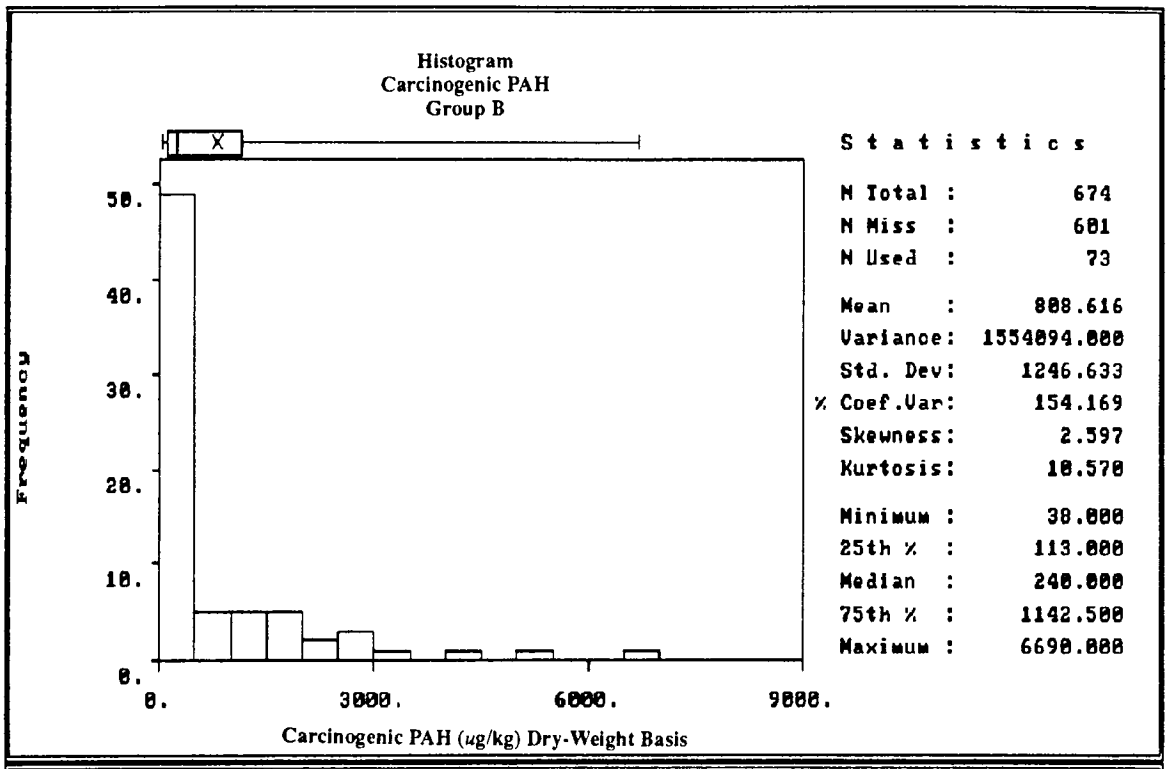
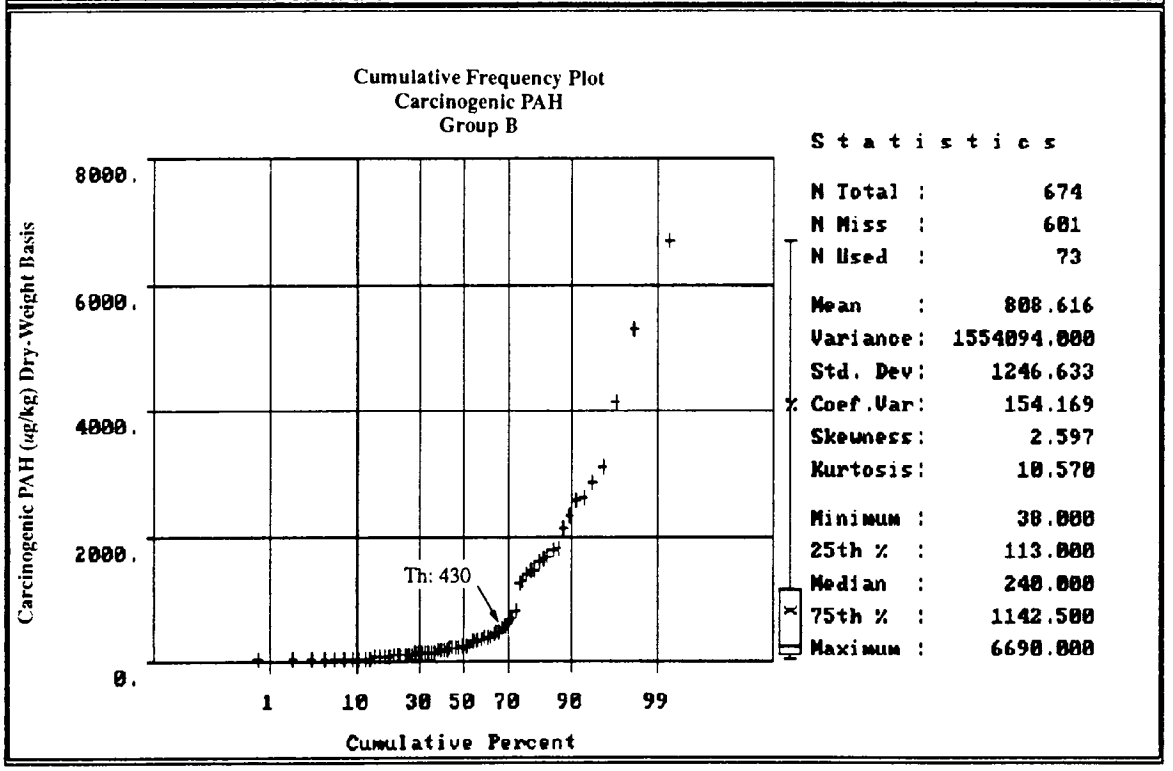
Non-Carcinogenic PAH, Group B Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A203

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92





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Carcinogenic PAH, Group B Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
A204

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GM	2/92	6/92

APPENDIX B

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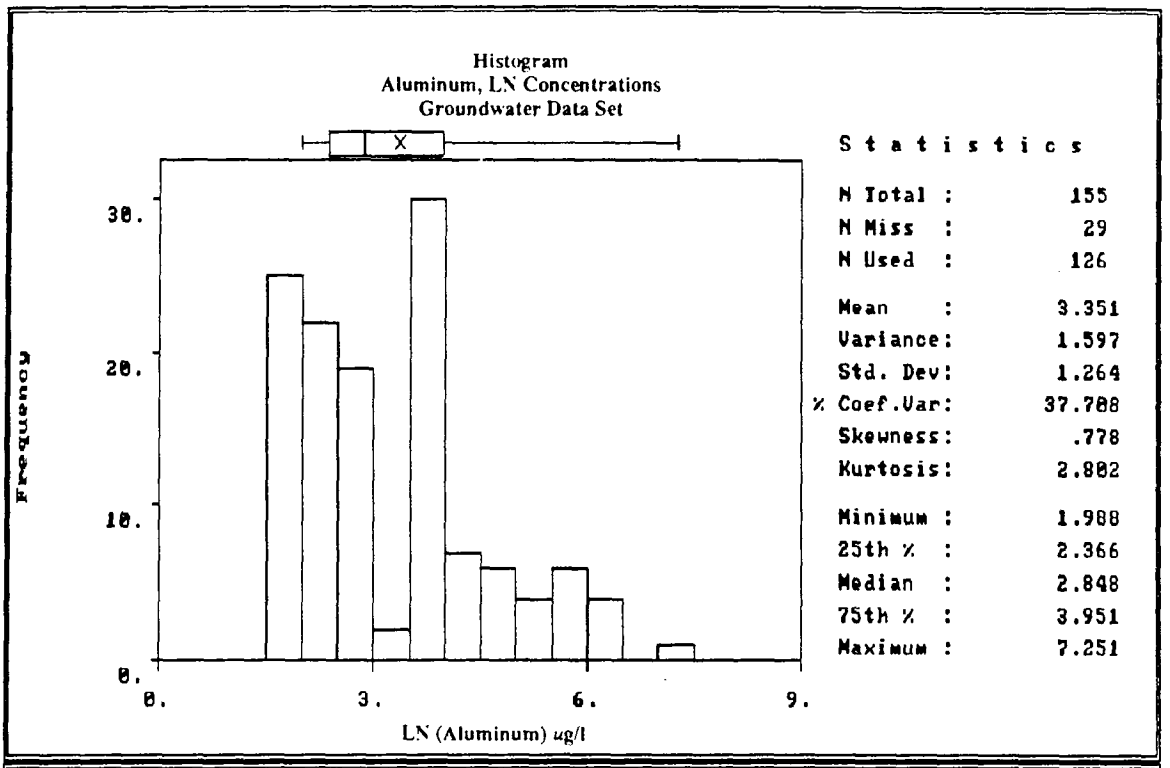
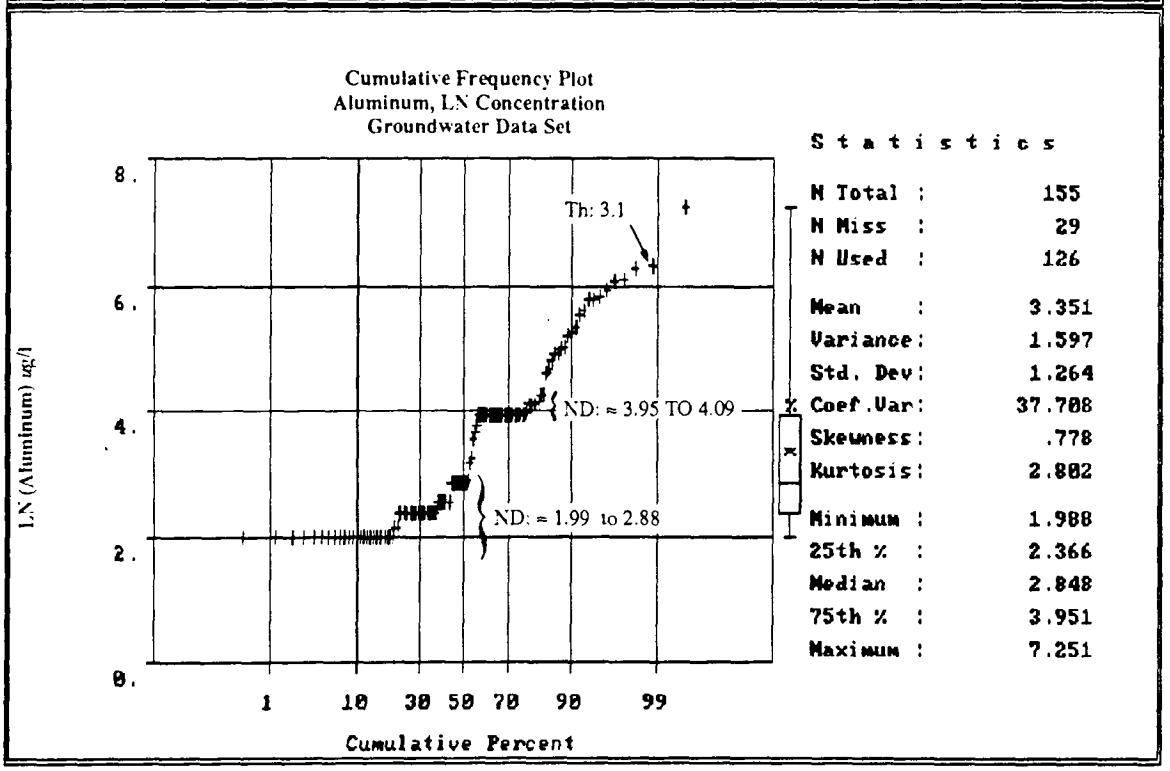
25966





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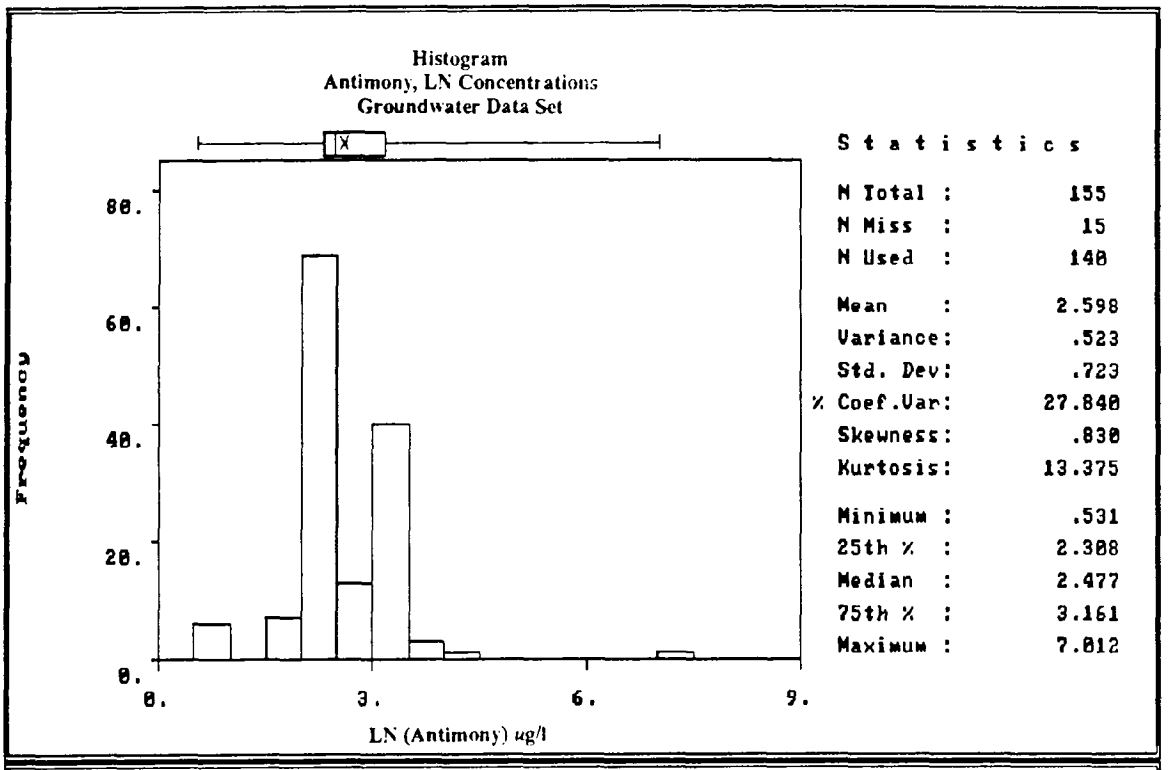
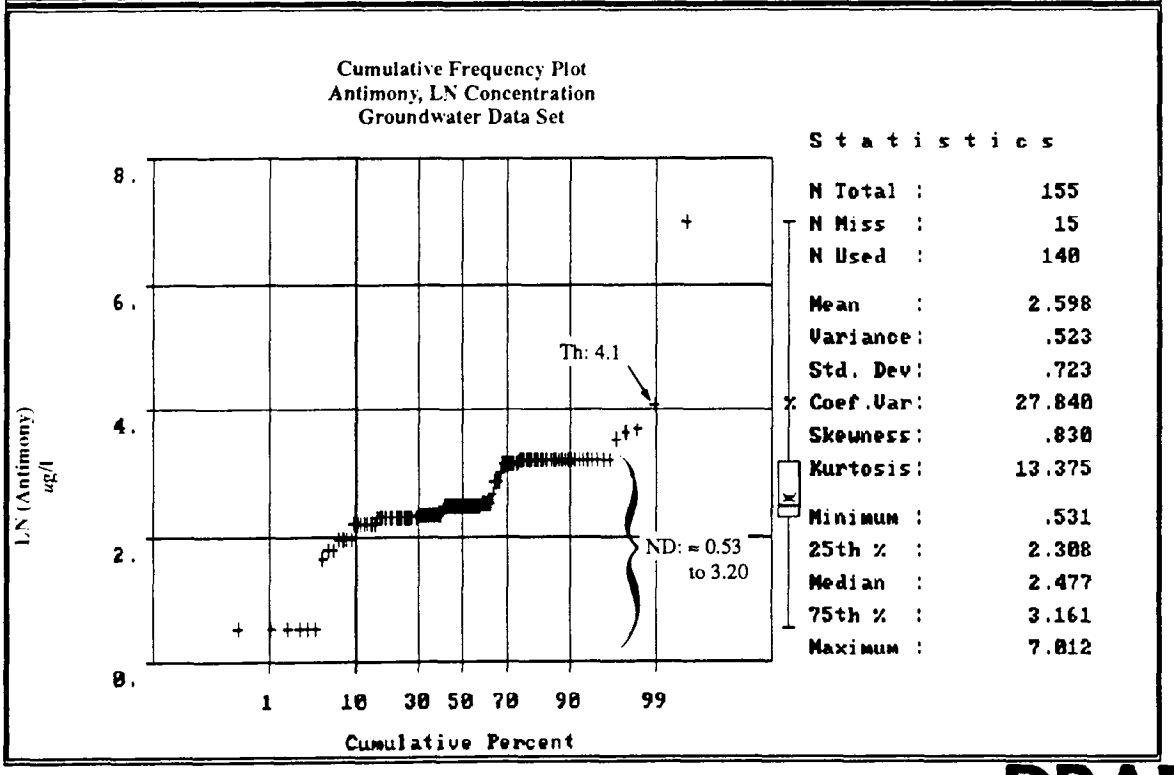
Aluminum, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25967





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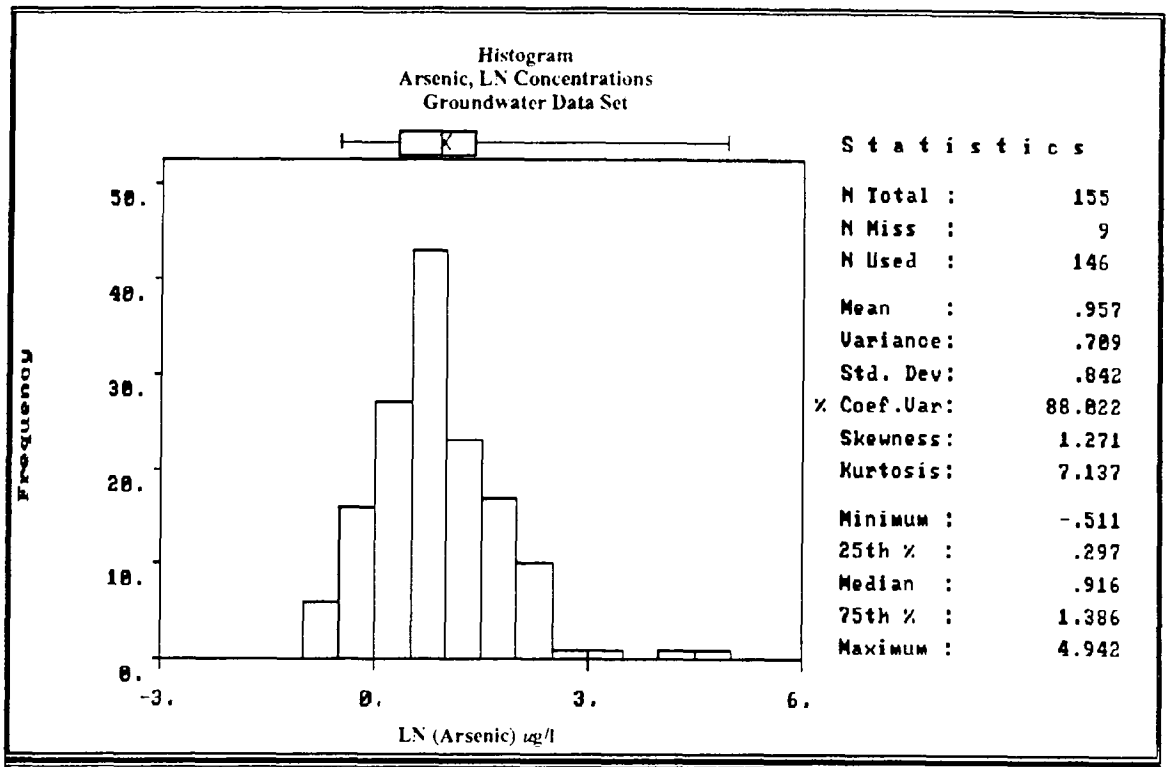
Engineering and Environmental Services

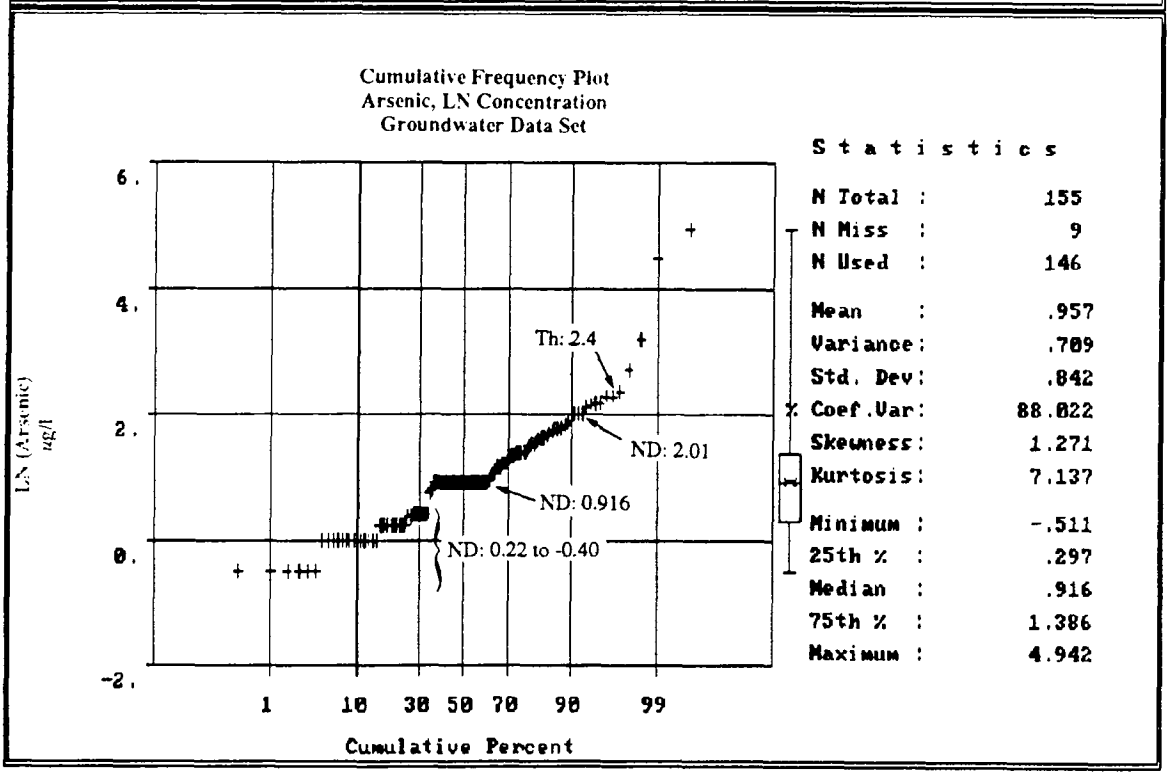
Antimony, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **B2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25968





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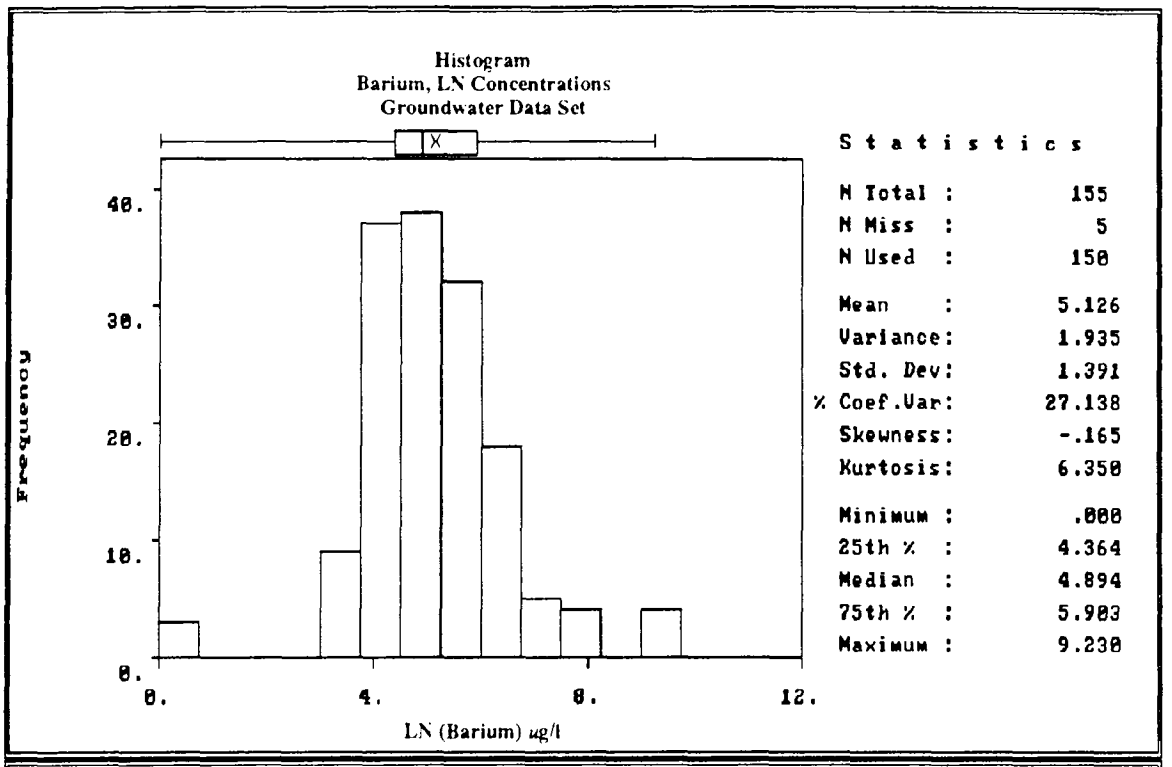
Engineering and
Environmental Services

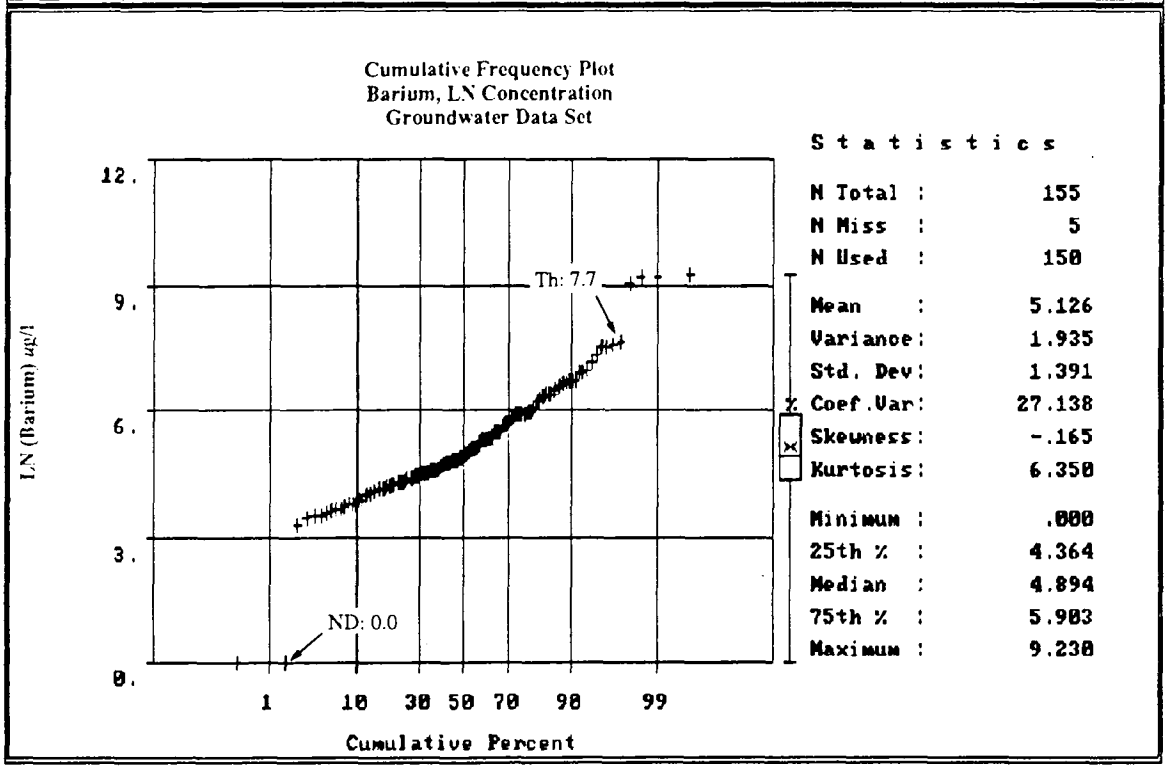
Arsenic, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25969





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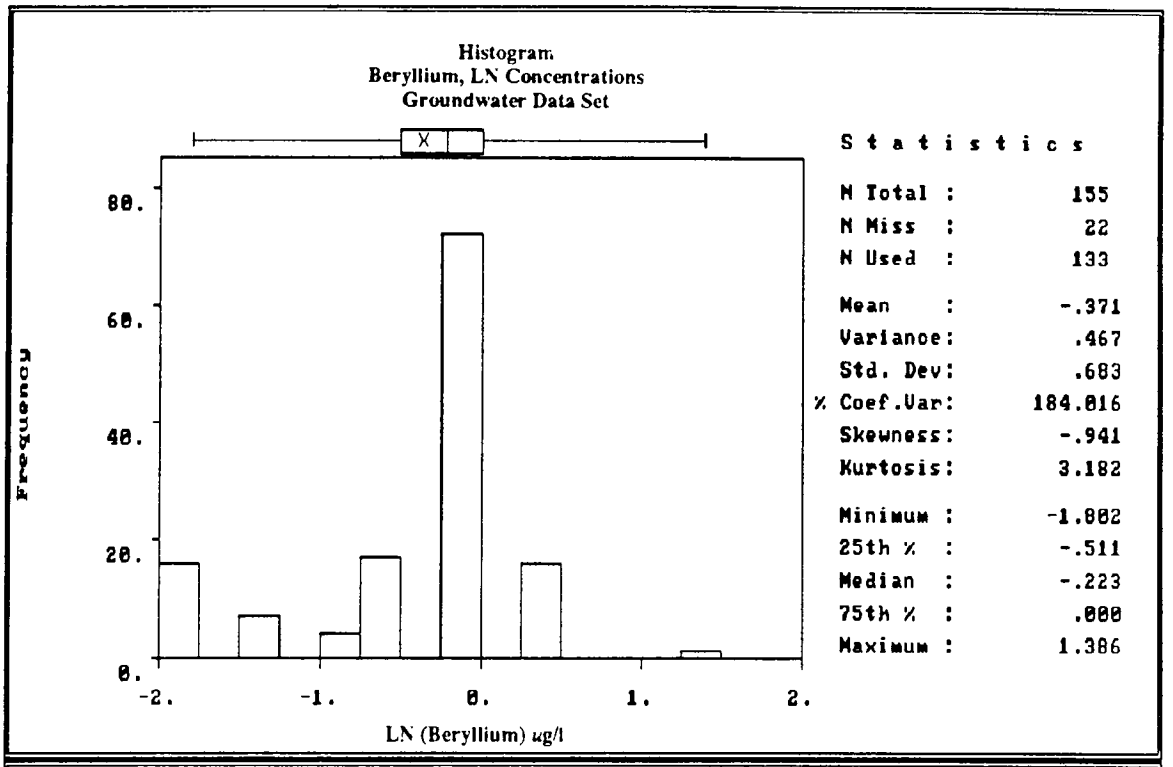
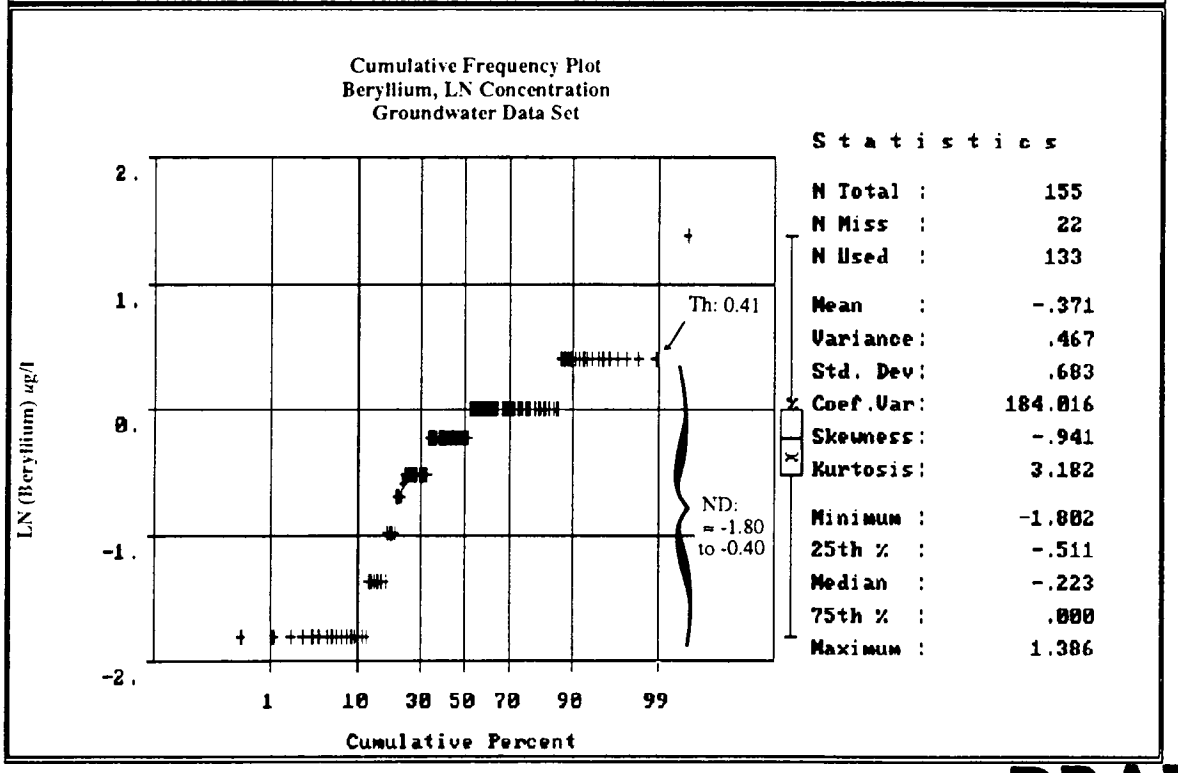
Barium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GTM	2/92	6/92

25970





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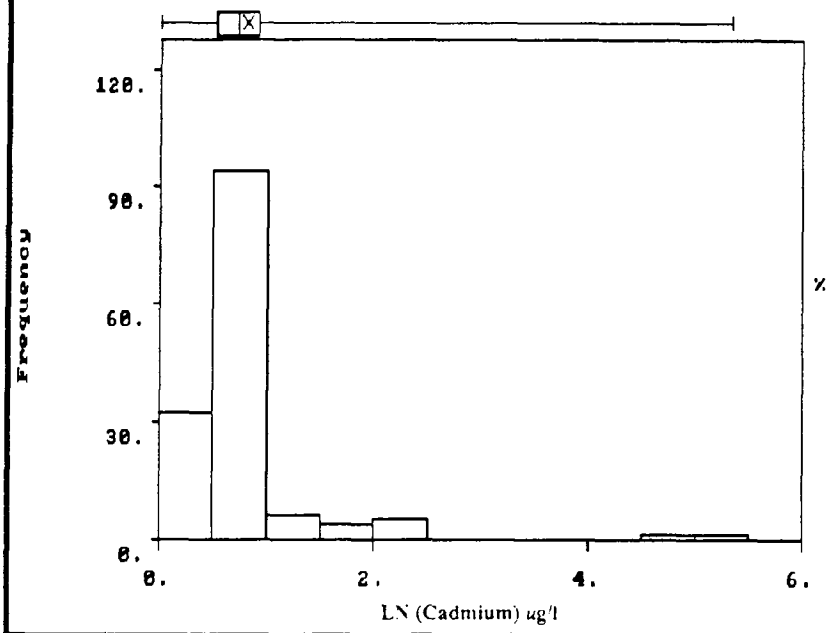
Beryllium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

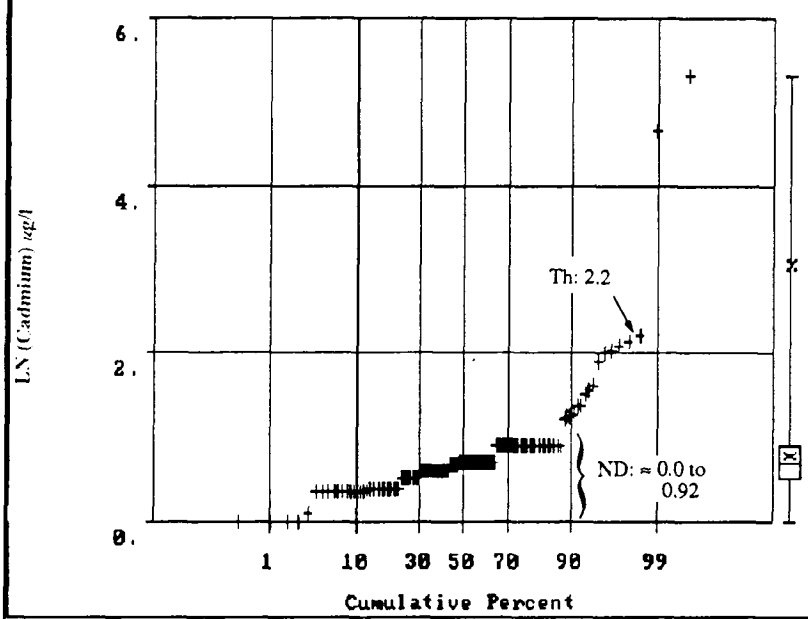
25971

Histogram
Cadmium, LN Concentrations
Groundwater Data Set



Statistics	
N Total :	155
N Miss :	12
N Used :	143
Mean :	.807
Variance:	.411
Std. Dev:	.641
% Coef.Var:	79.368
Skewness:	4.307
Kurtosis:	27.959
Minimum :	.000
25th % :	.531
Median :	.718
75th % :	.916
Maximum :	5.333

Cumulative Frequency Plot
Cadmium, LN Concentration
Groundwater Data Set



Statistics	
N Total :	155
N Miss :	12
N Used :	143
Mean :	.807
Variance:	.411
Std. Dev:	.641
% Coef.Var:	79.368
Skewness:	4.307
Kurtosis:	27.959
Minimum :	.000
25th % :	.531
Median :	.718
75th % :	.916
Maximum :	5.333

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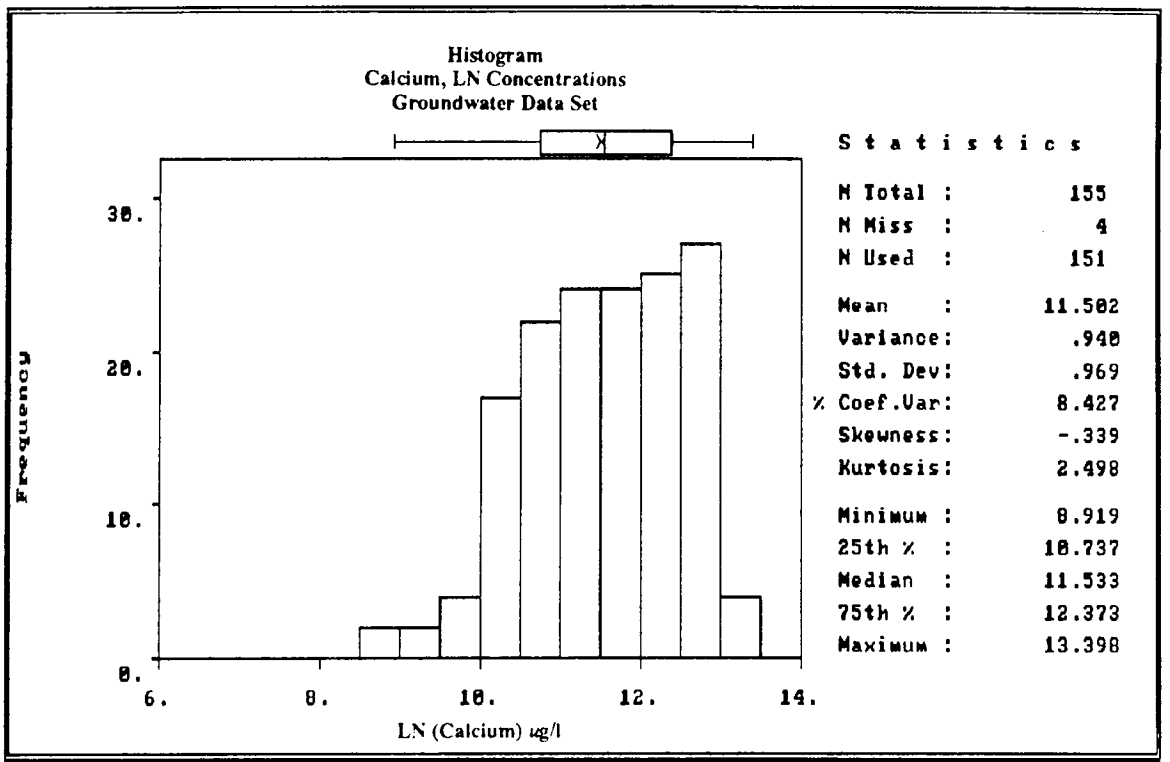
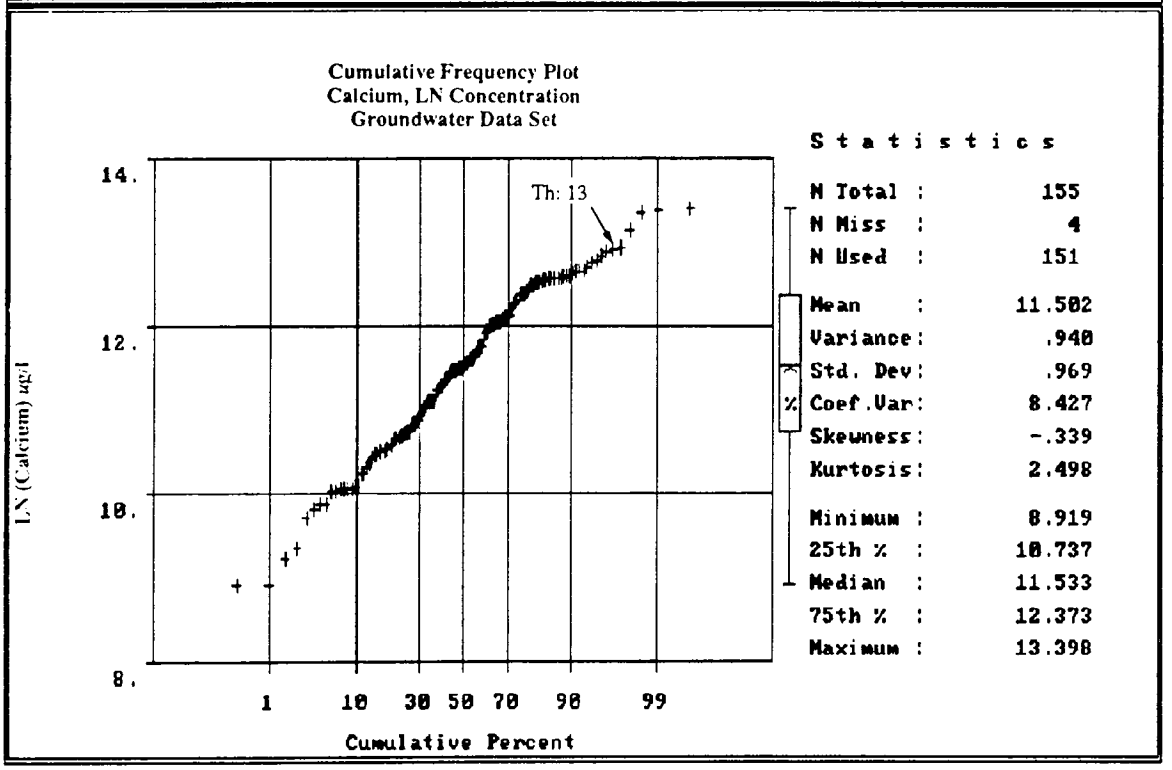
Cadmium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25972





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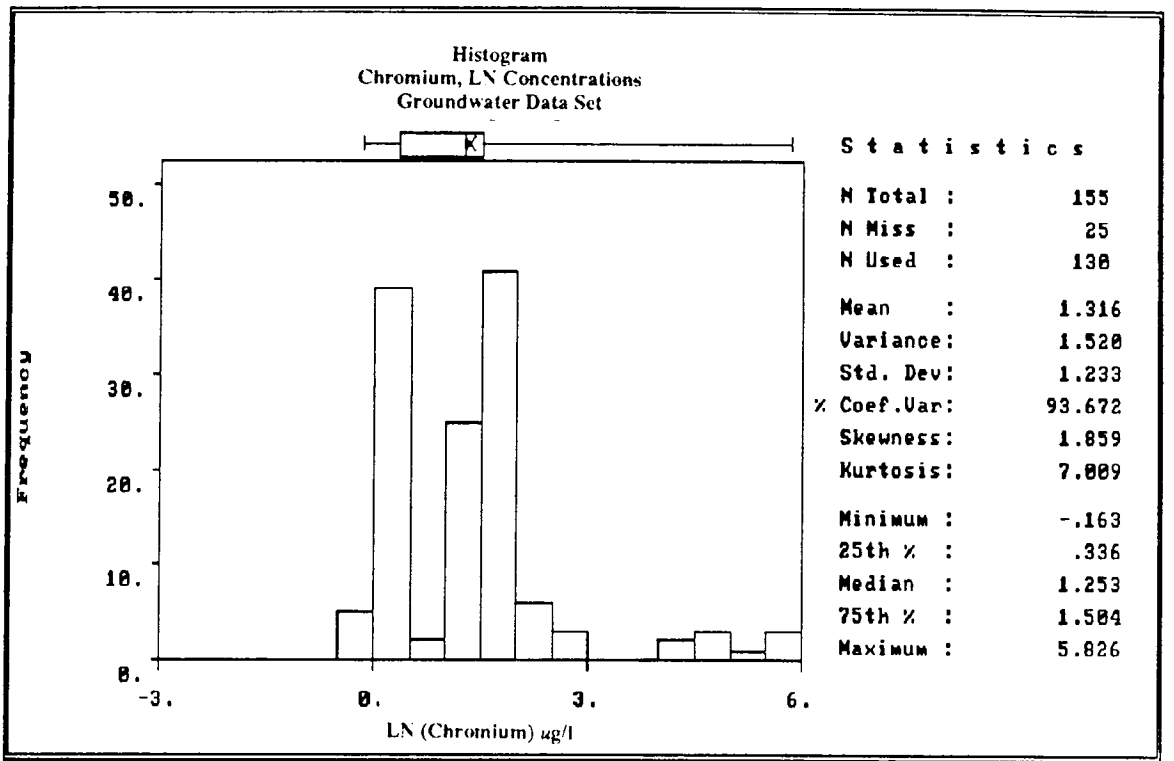
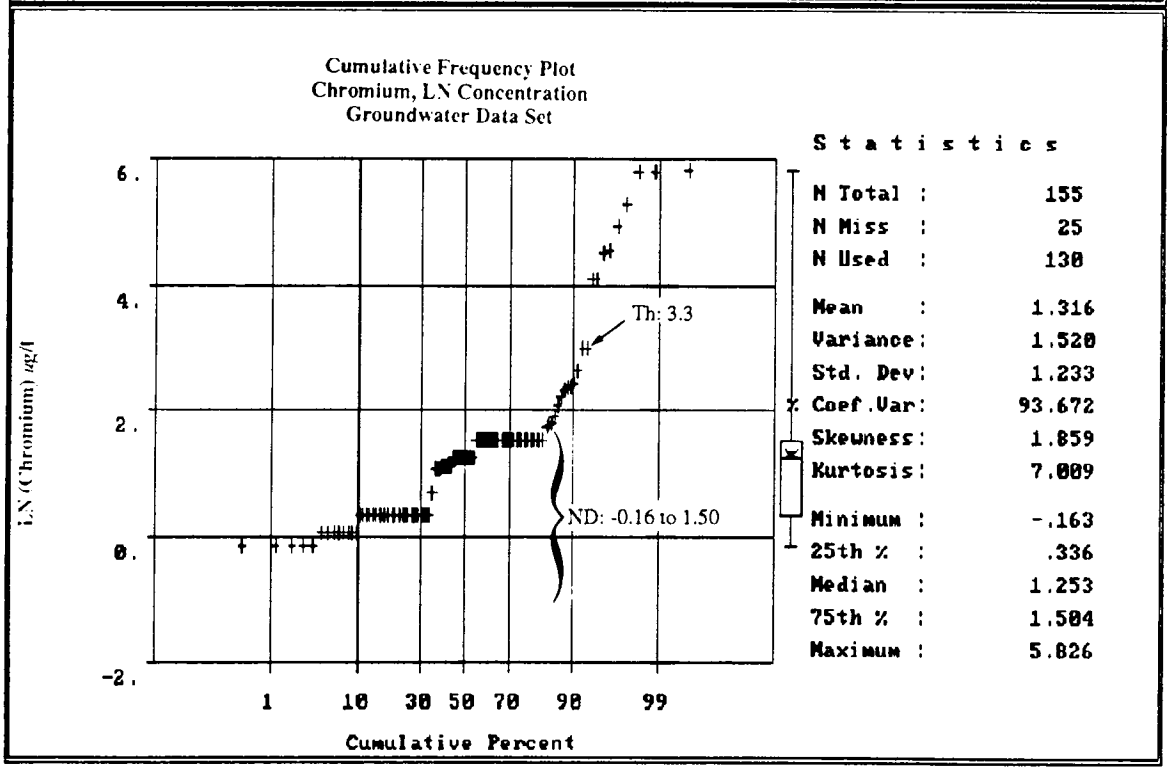
Calcium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25973





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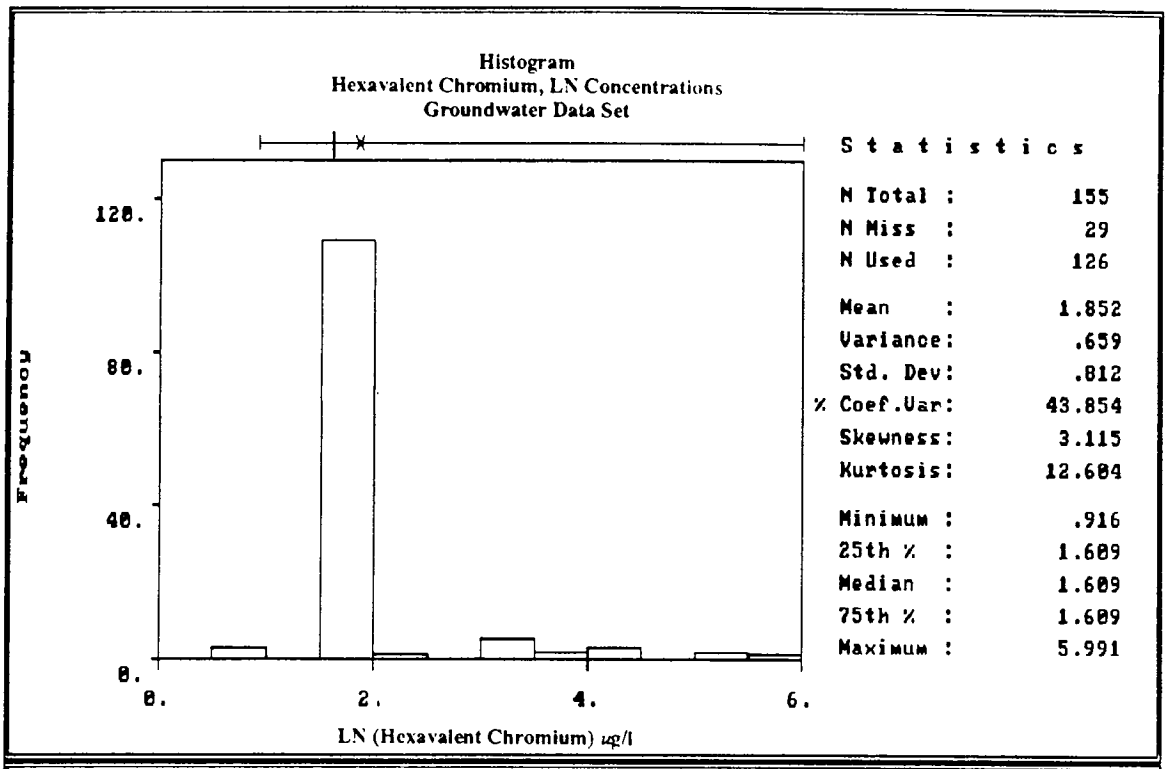
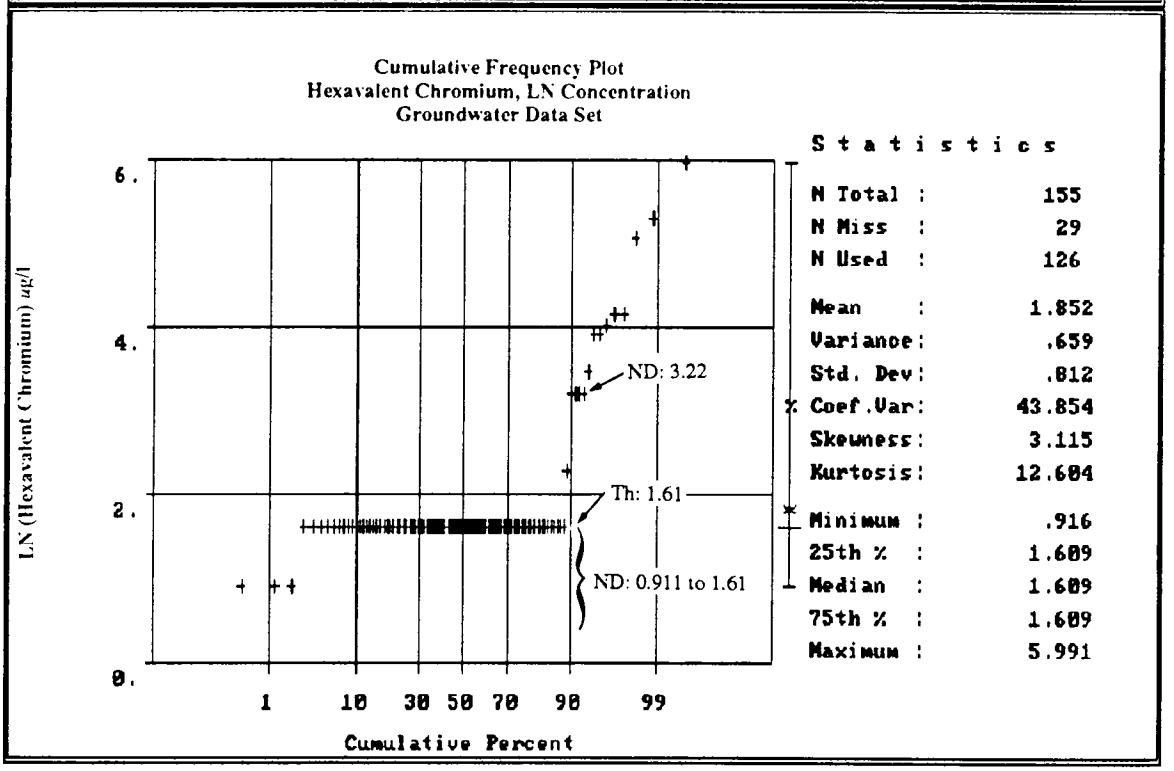
Chromium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

25974





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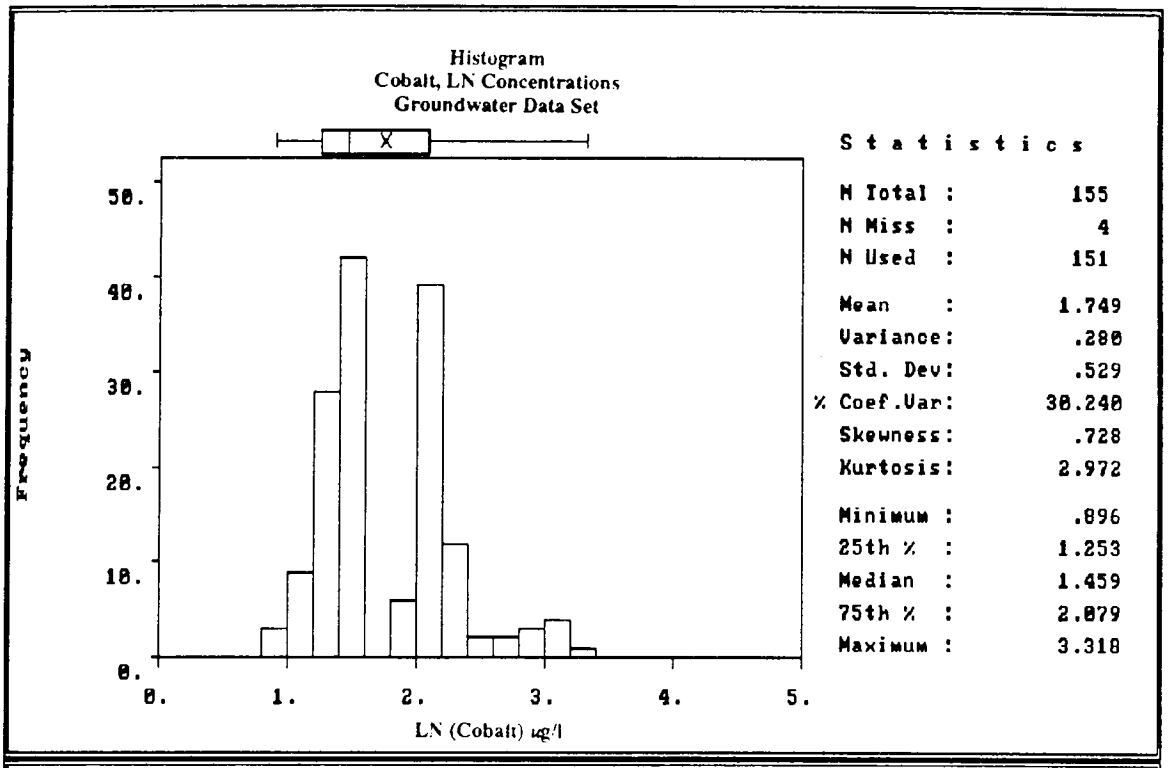
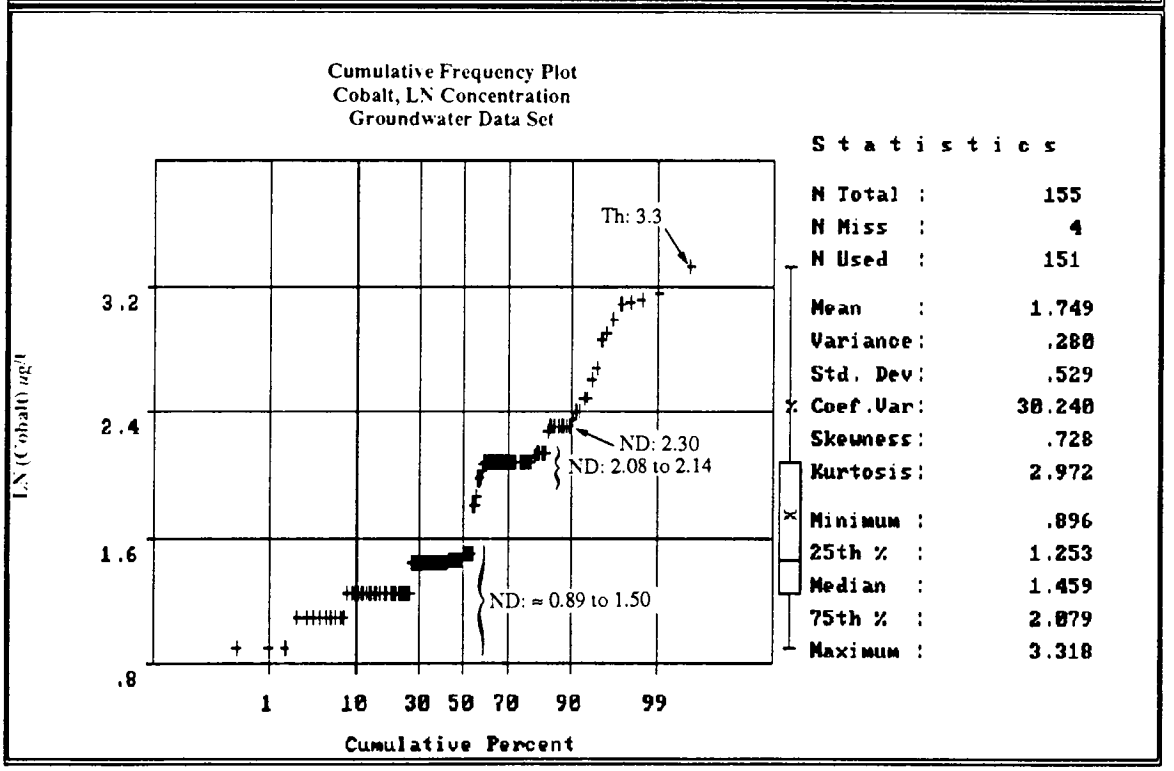
Hexavalent Chromium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25975





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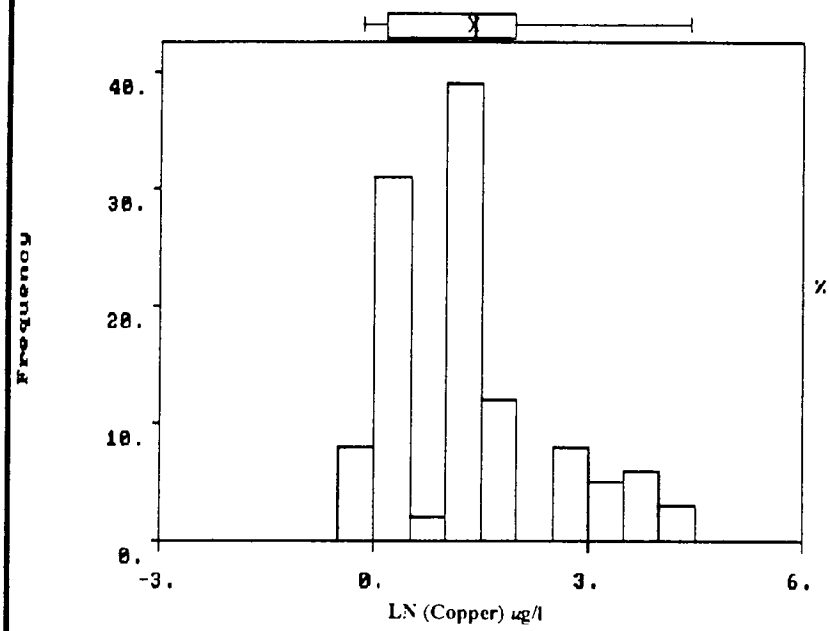
Cobalt, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92

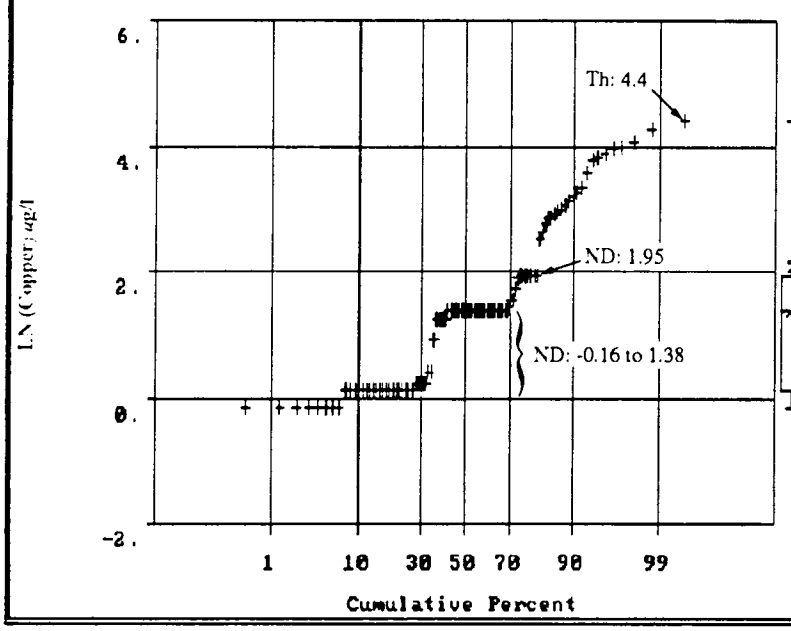
25976

Histogram
Copper, LN Concentrations
Groundwater Data Set



Statistics	
N Total :	155
N Miss :	41
N Used :	114
Mean :	1.365
Variance:	1.431
Std. Dev:	1.196
% Coef.Var:	87.602
Skewness:	.722
Kurtosis:	2.791
Minimum :	-.163
25th % :	.140
Median :	1.386
75th % :	1.946
Maximum :	4.409

Cumulative Frequency Plot
Copper, LN Concentration
Groundwater Data Set



Statistics	
N Total :	155
N Miss :	41
N Used :	114
Mean :	1.365
Variance:	1.431
Std. Dev:	1.196
% Coef.Var:	87.602
Skewness:	.722
Kurtosis:	2.791
Minimum :	-.163
25th % :	.140
Median :	1.386
75th % :	1.946
Maximum :	4.409

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Copper, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
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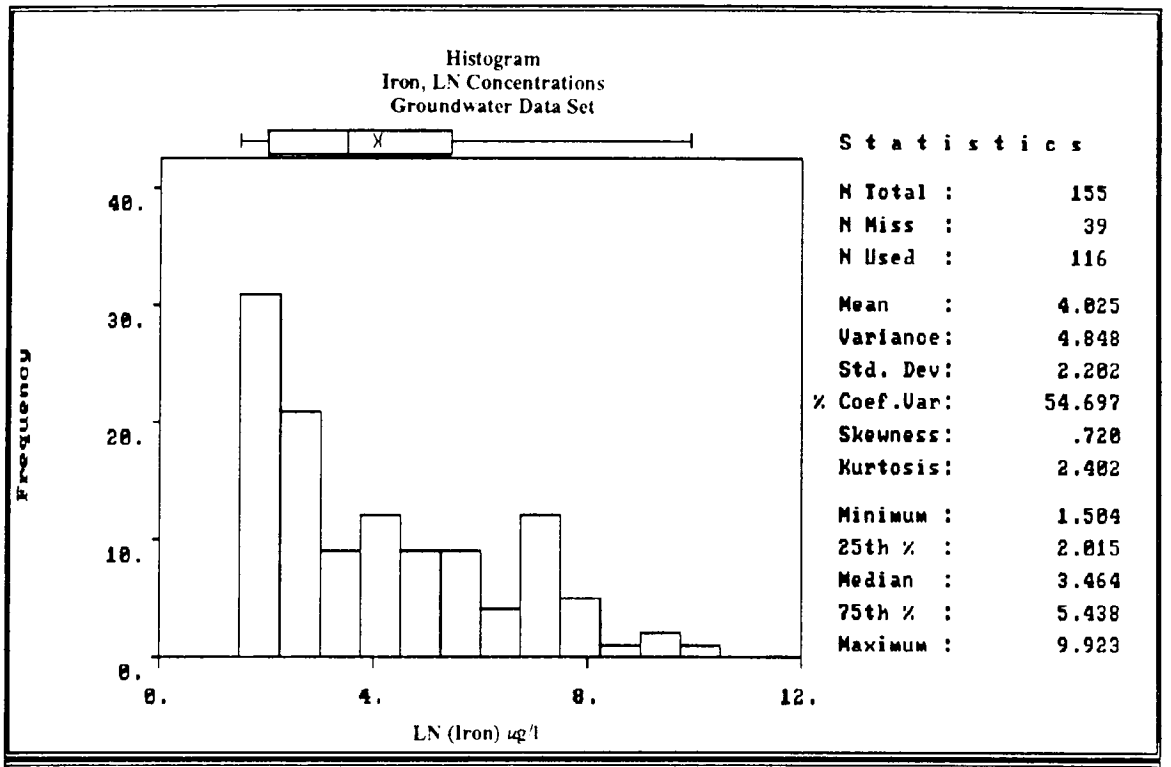
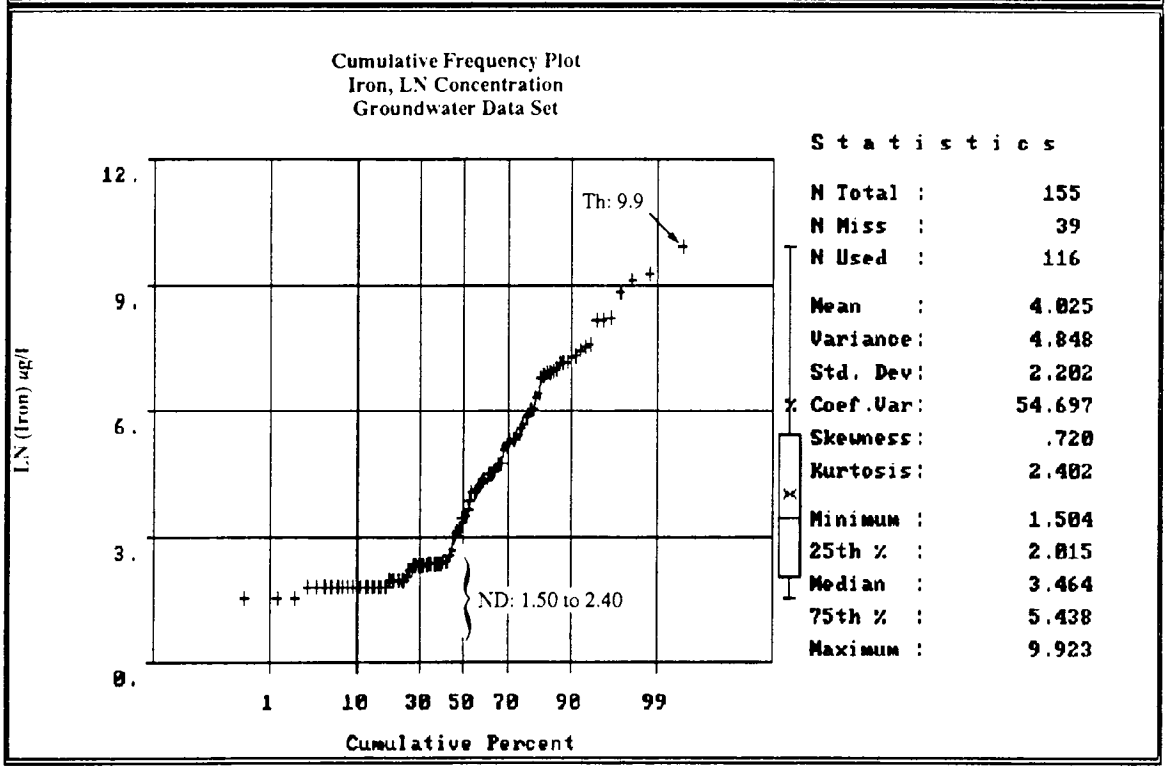
PLATE
B11

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25977





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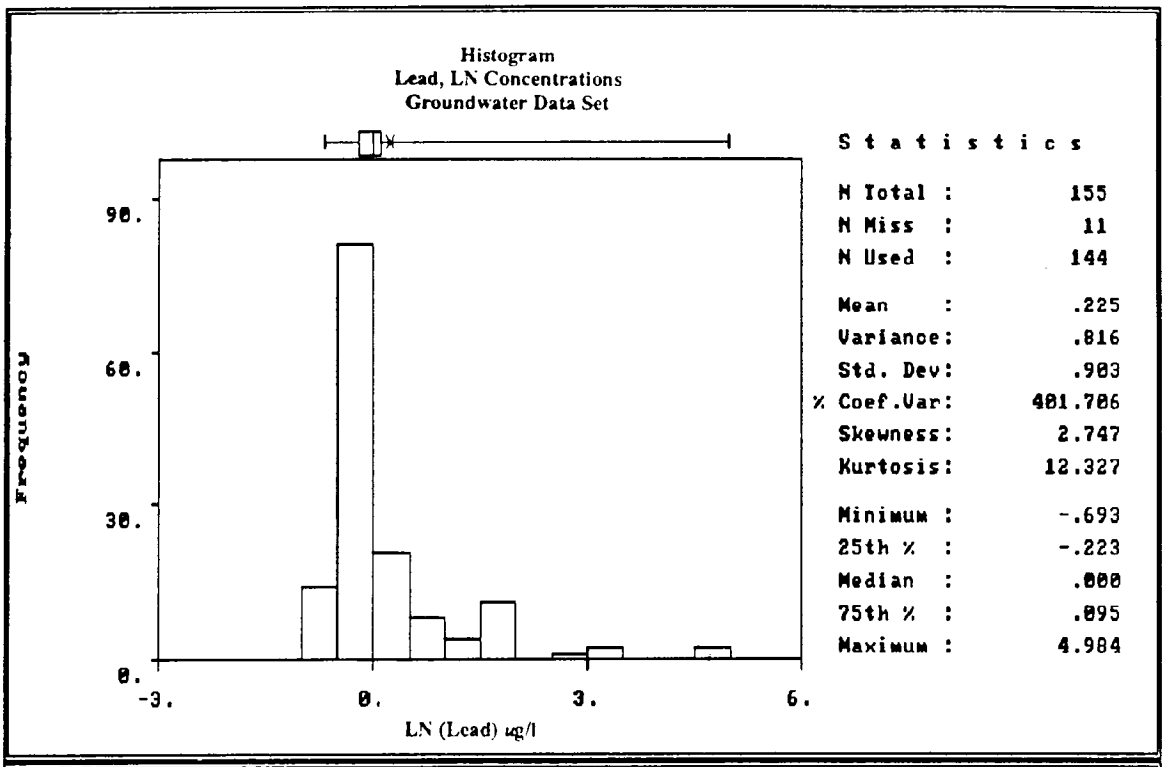
Environmental Services

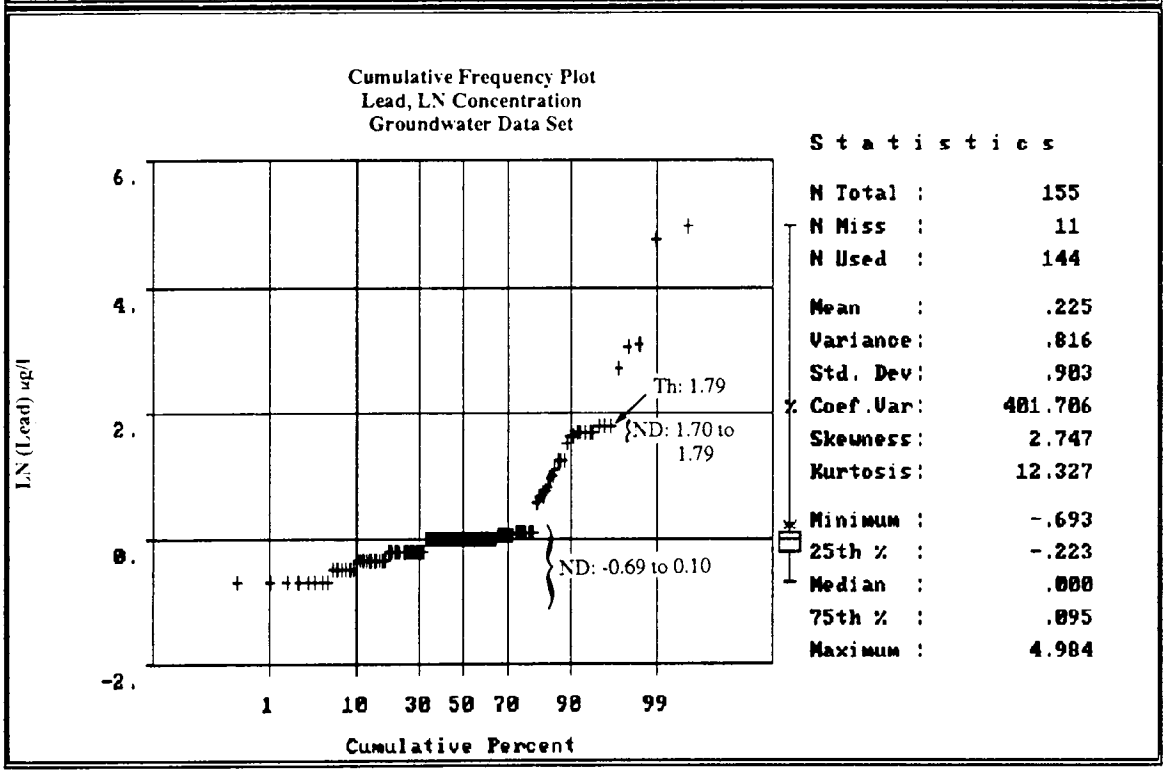
Iron, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B12

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25978





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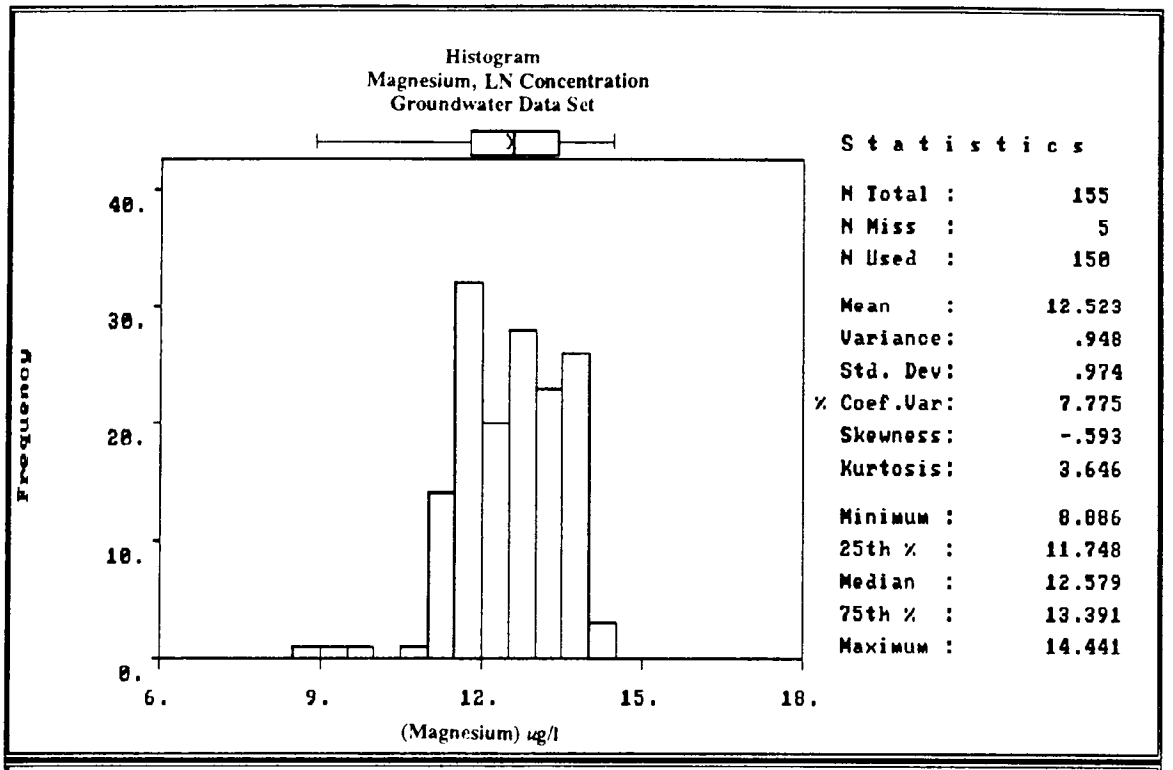
Environmental Services

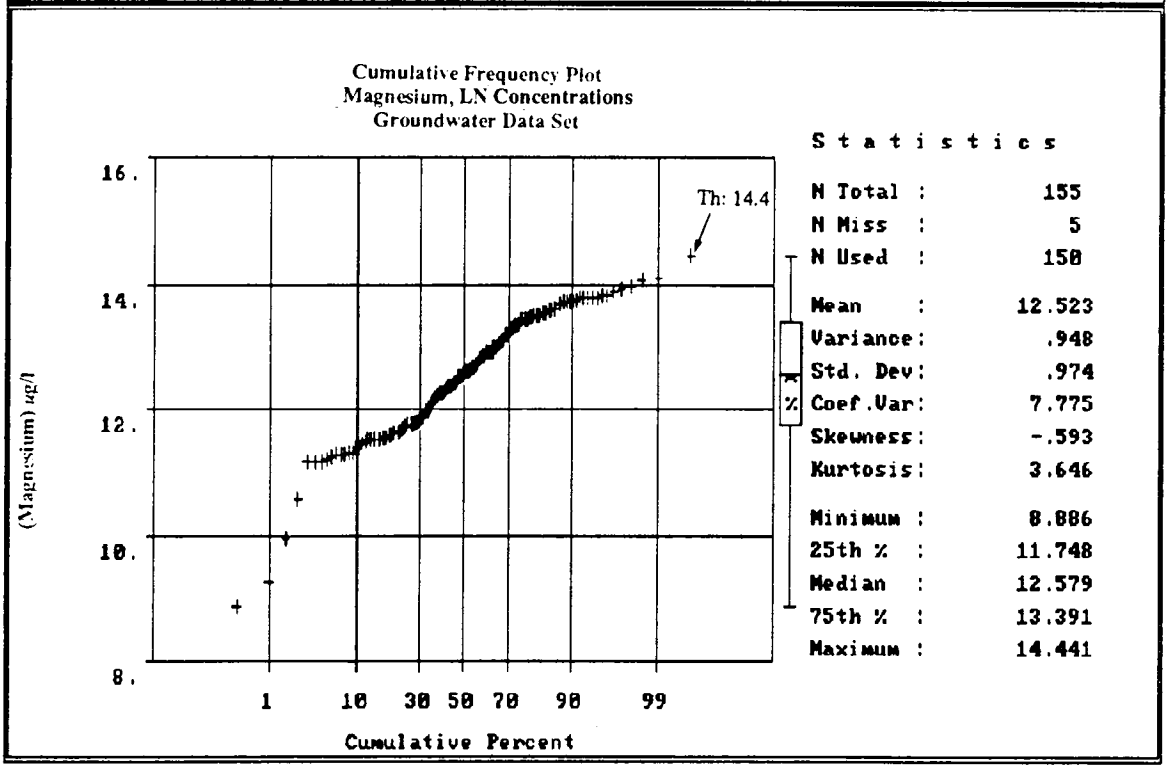
Lead, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25979





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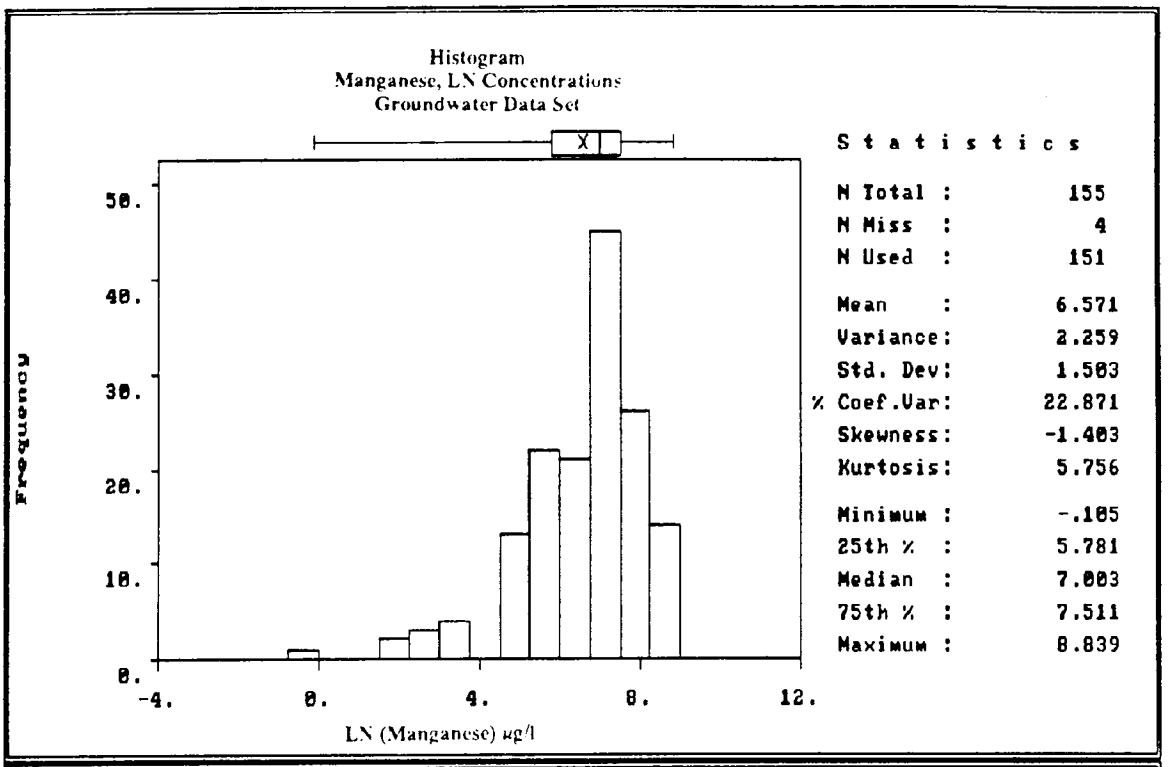
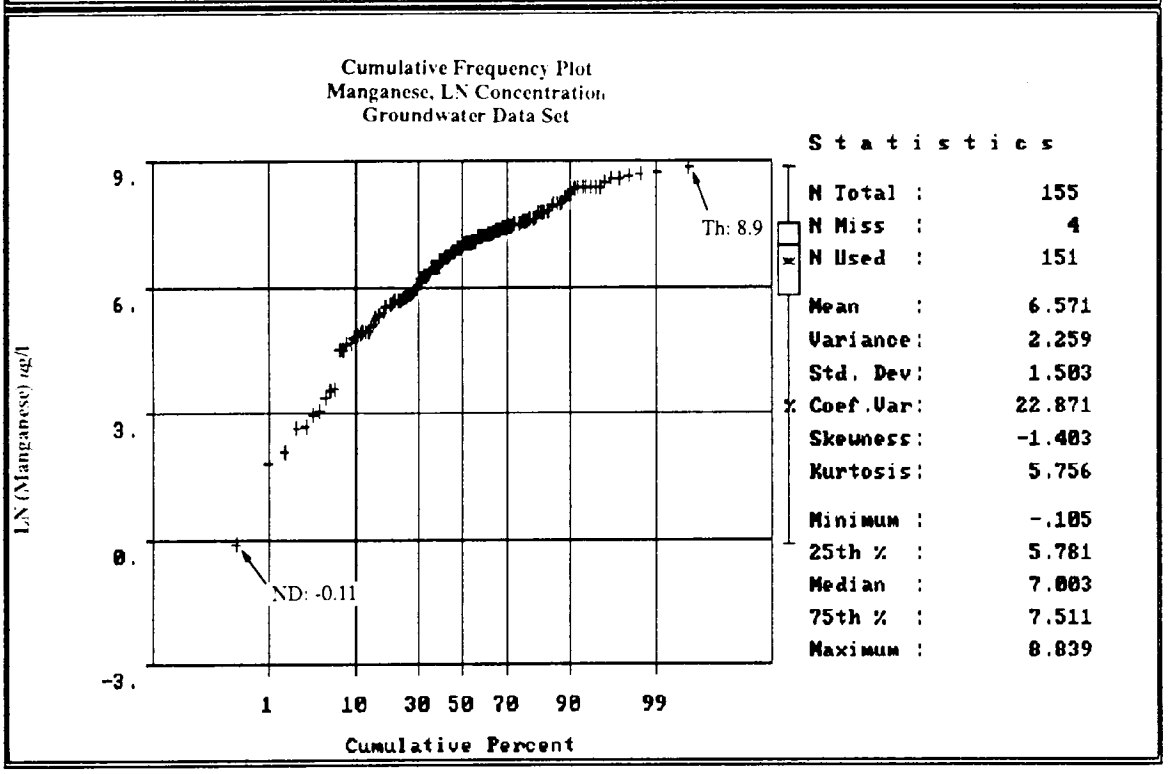
Magnesium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	

25980





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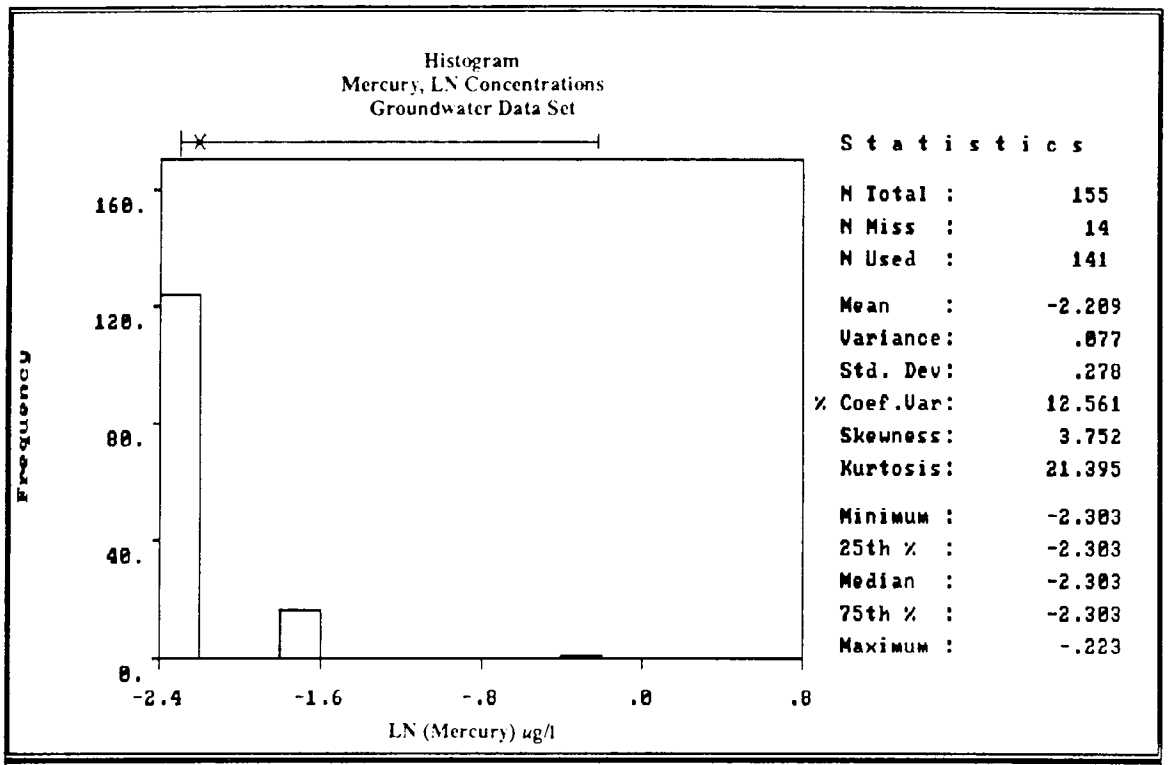
Environmental Services

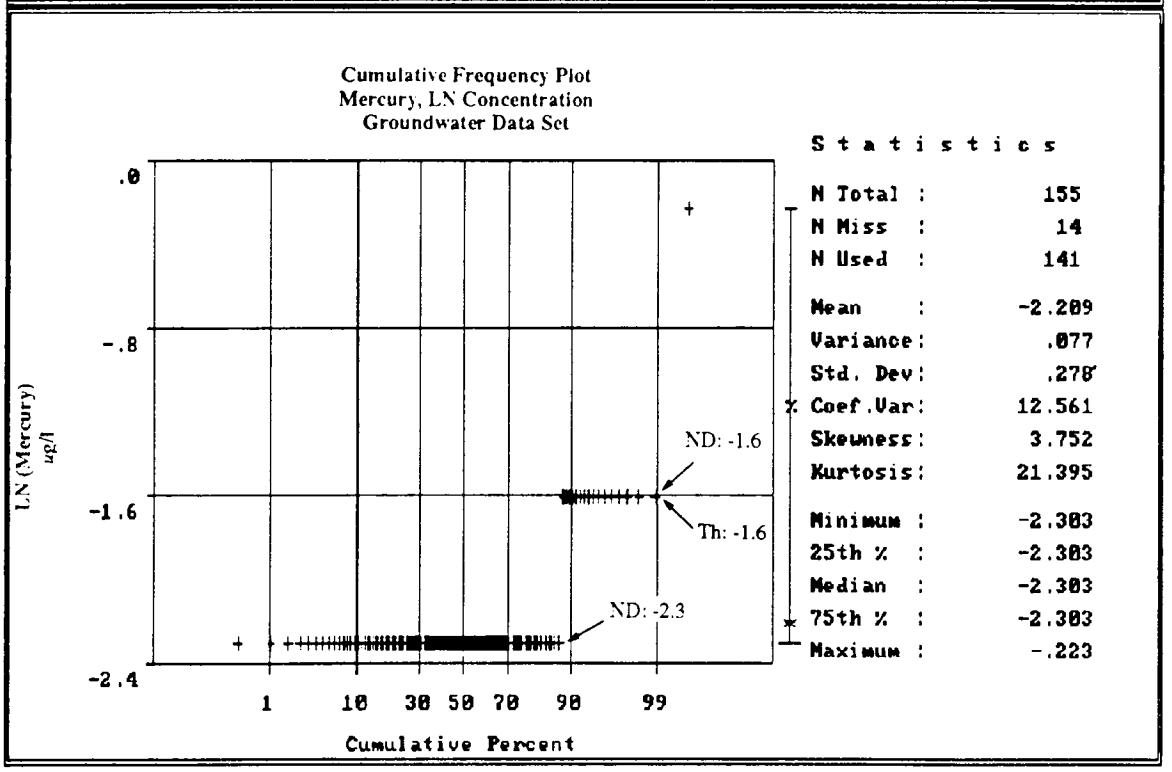
Manganese, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B15

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25981





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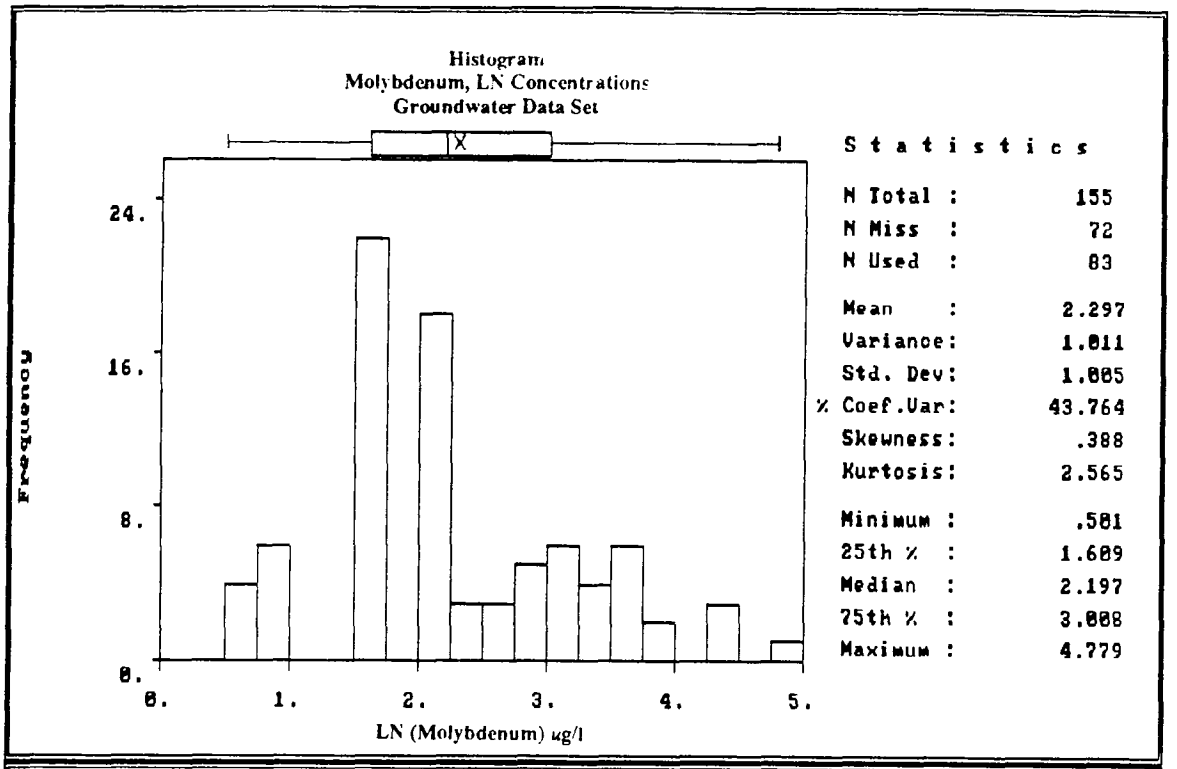
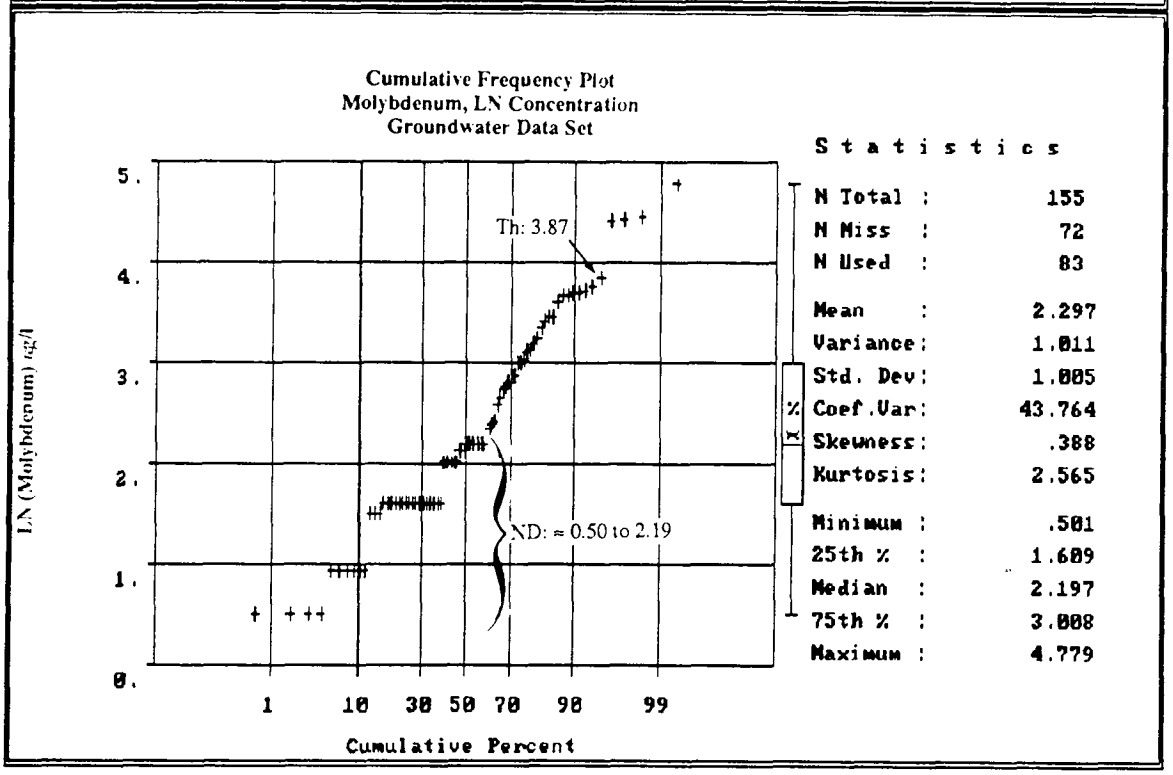
Mercury, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25982





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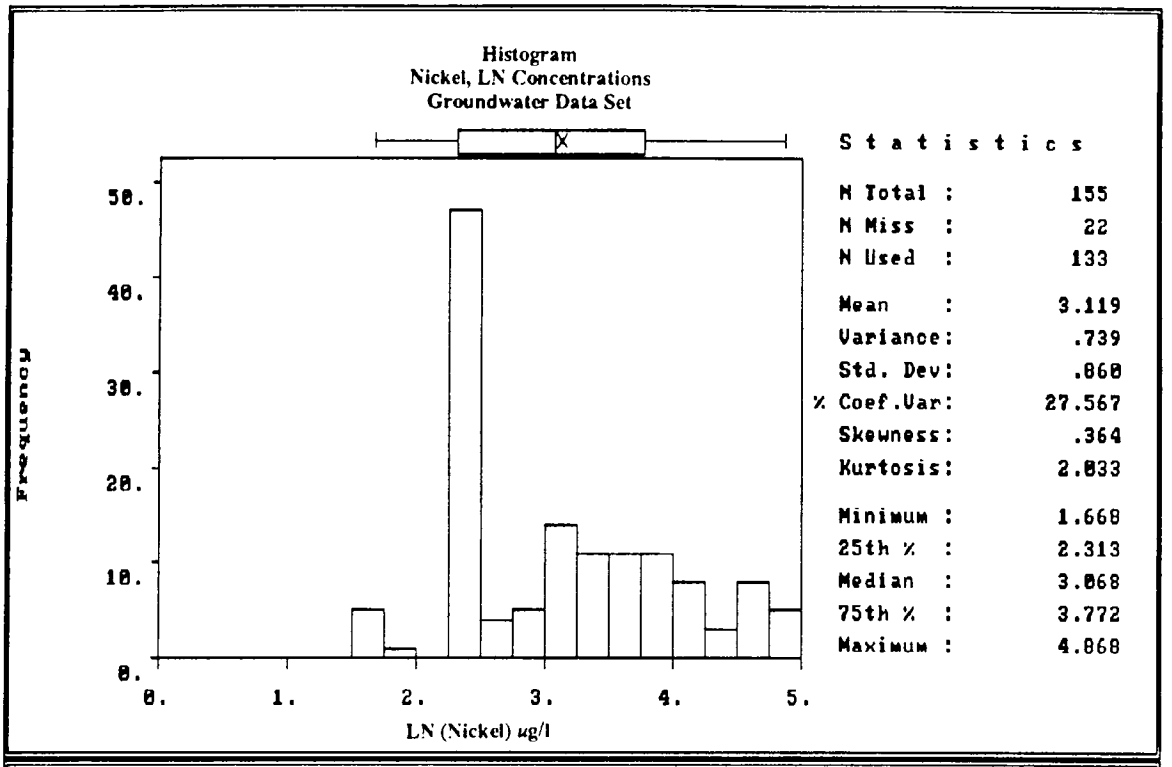
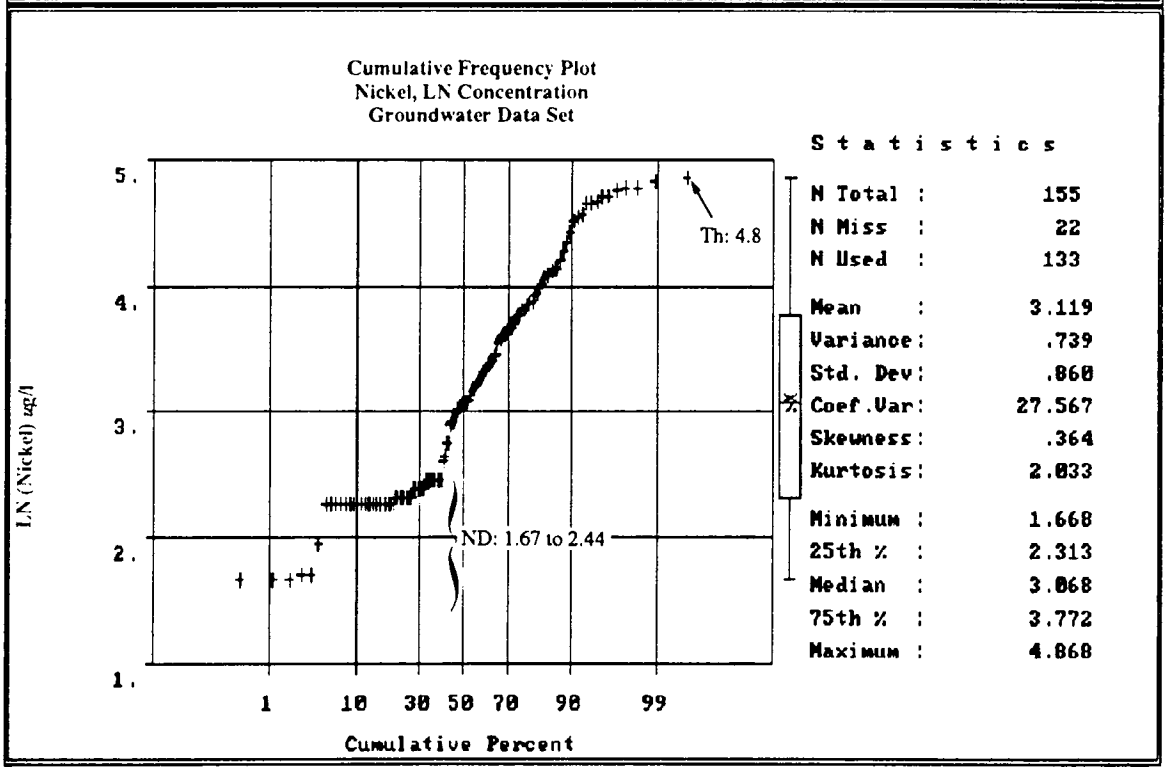
Molybdenum, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE **B17**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25983





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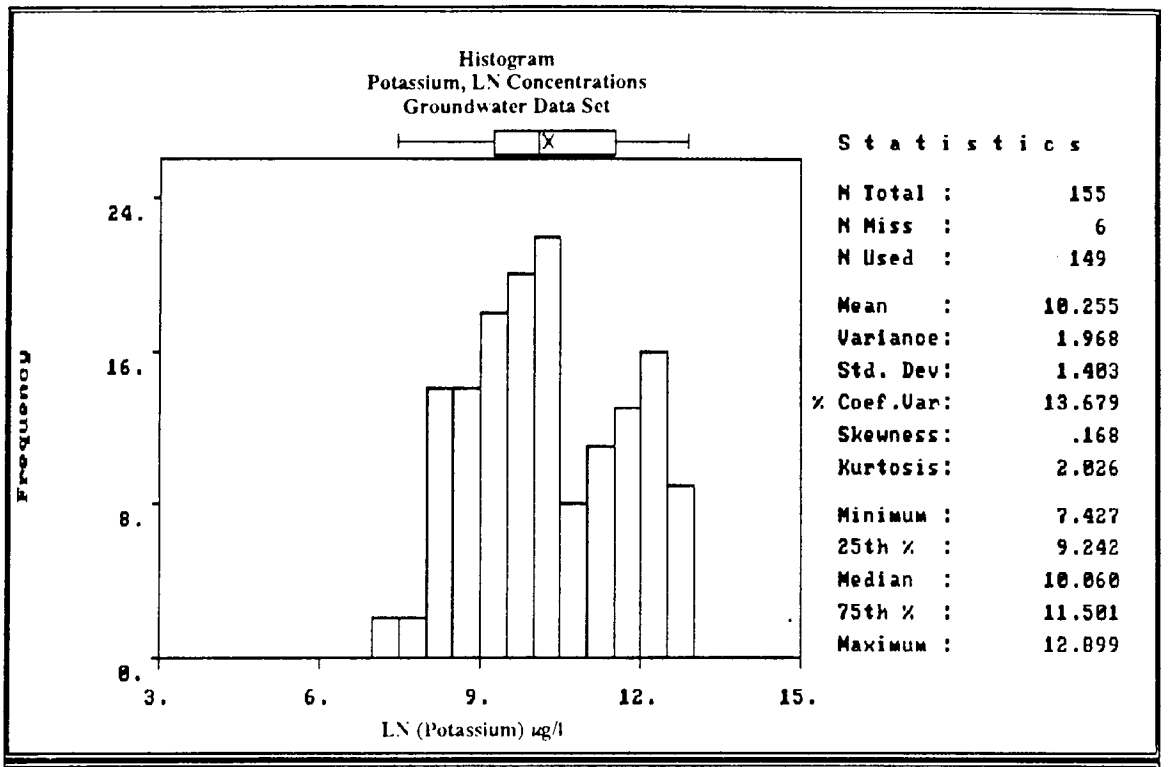
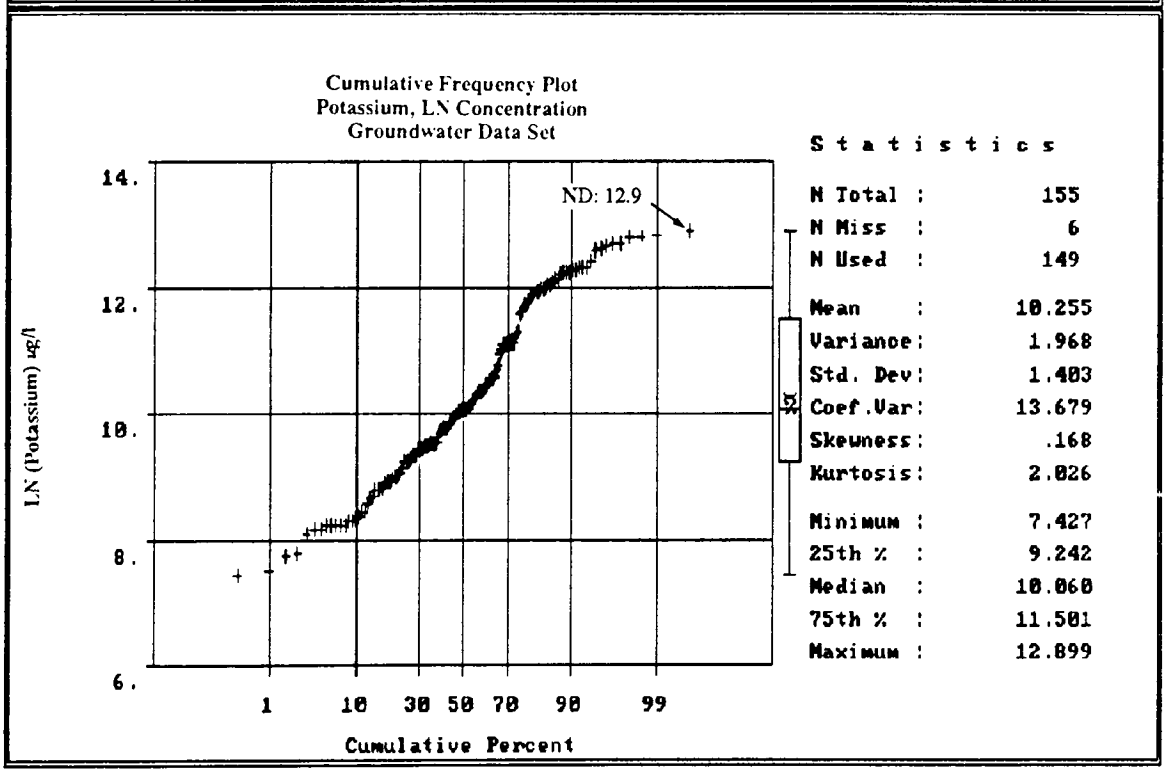
Nickel, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B18

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25984





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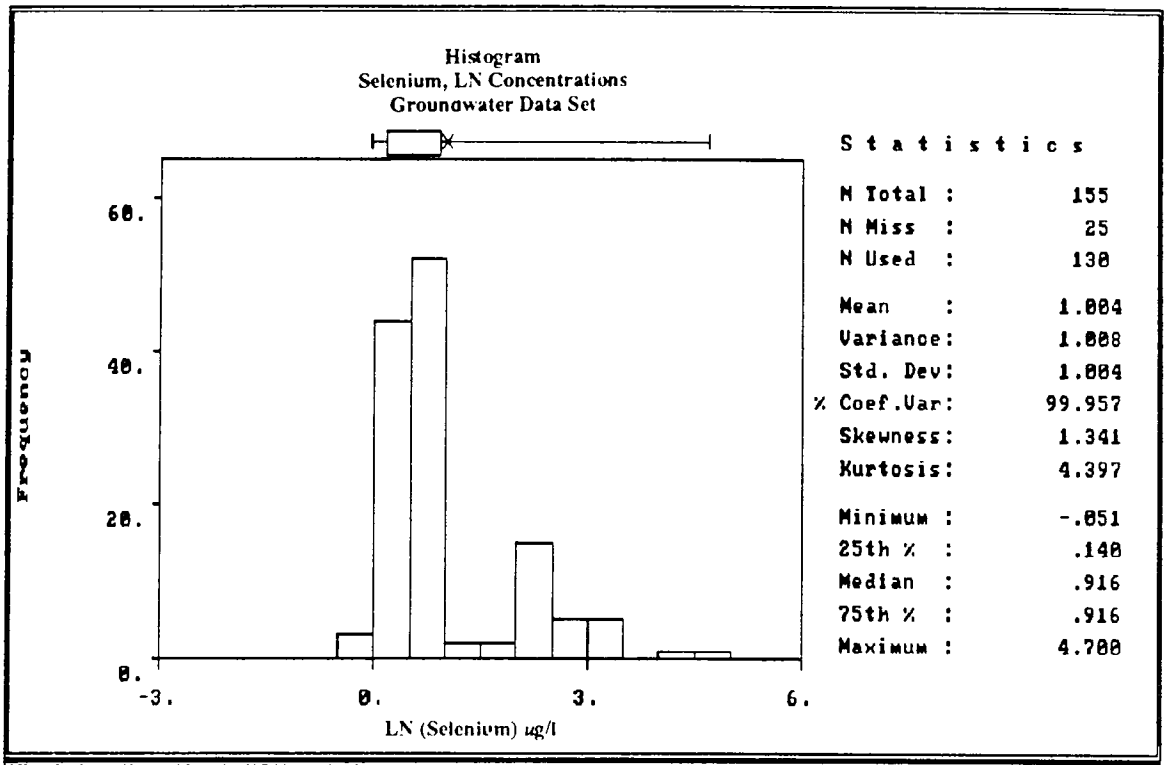
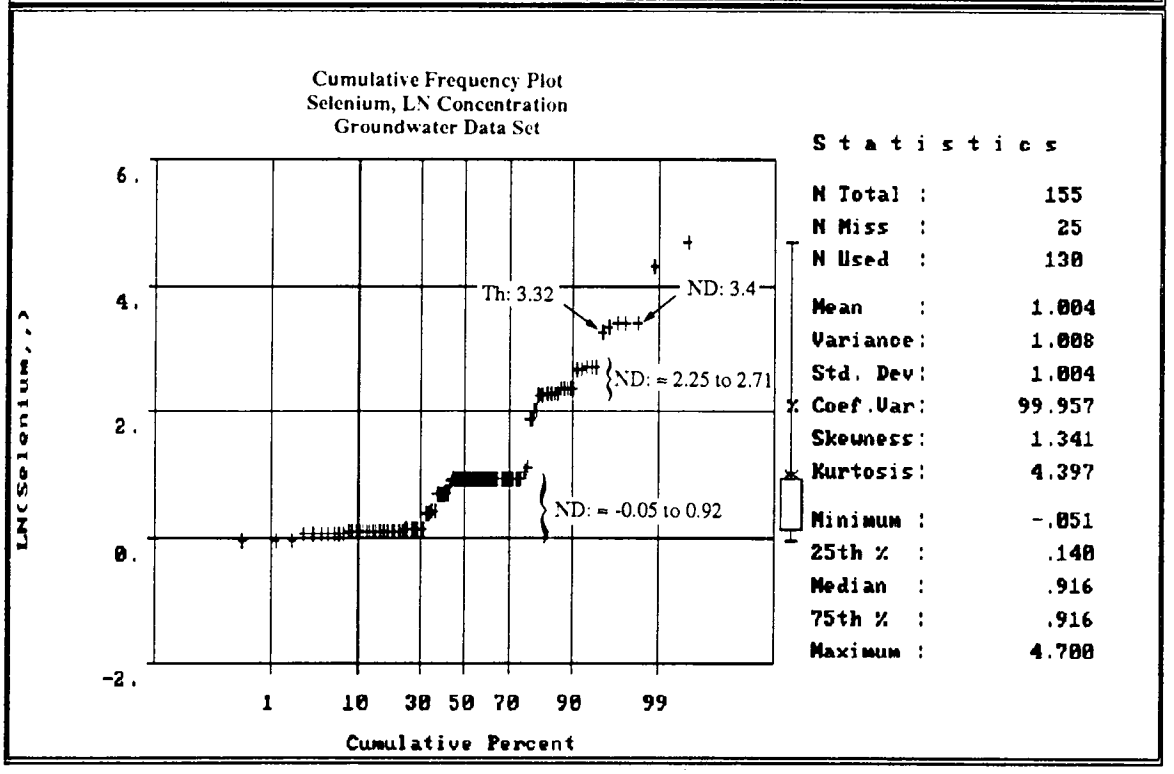
Potassium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B19

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25985





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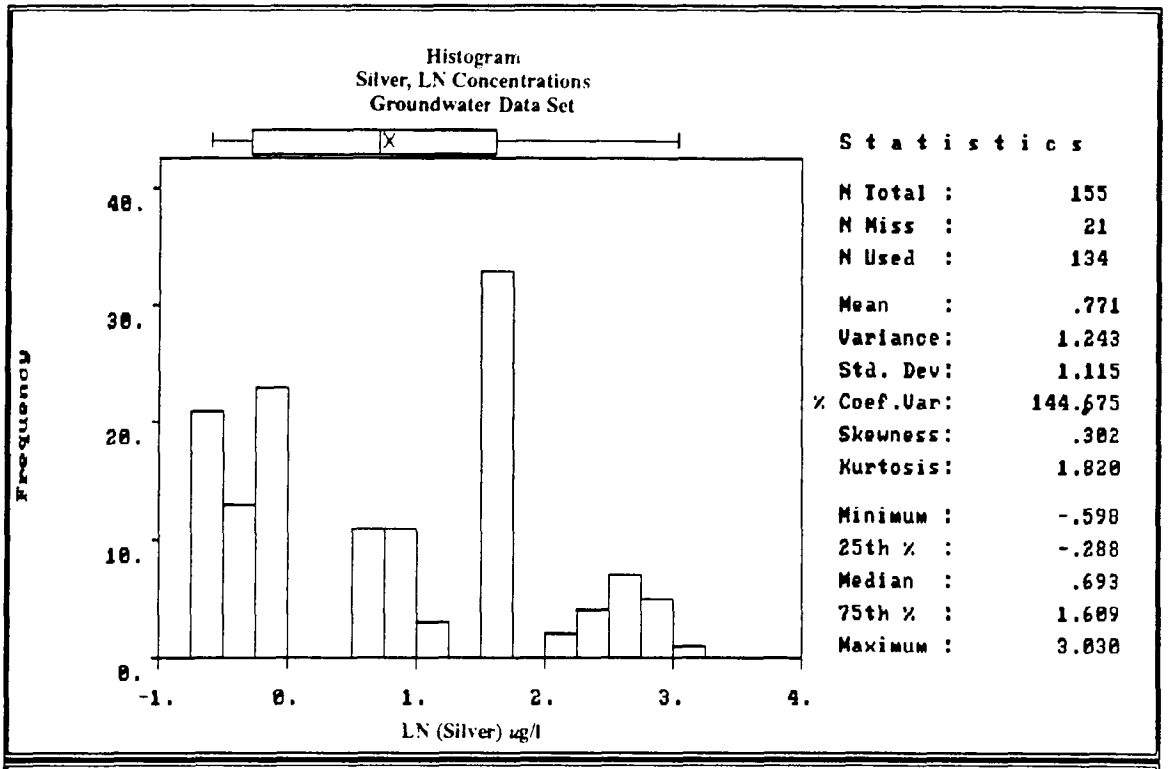
Environmental Services

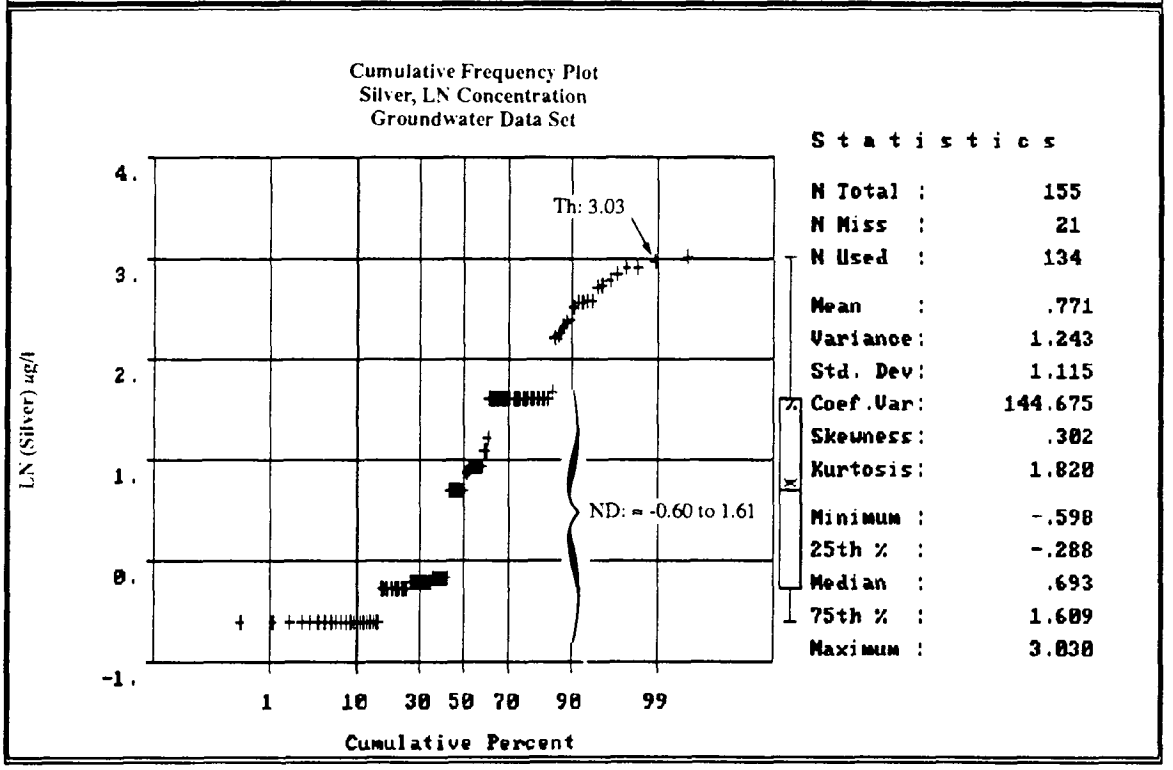
Selenium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B20

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25986





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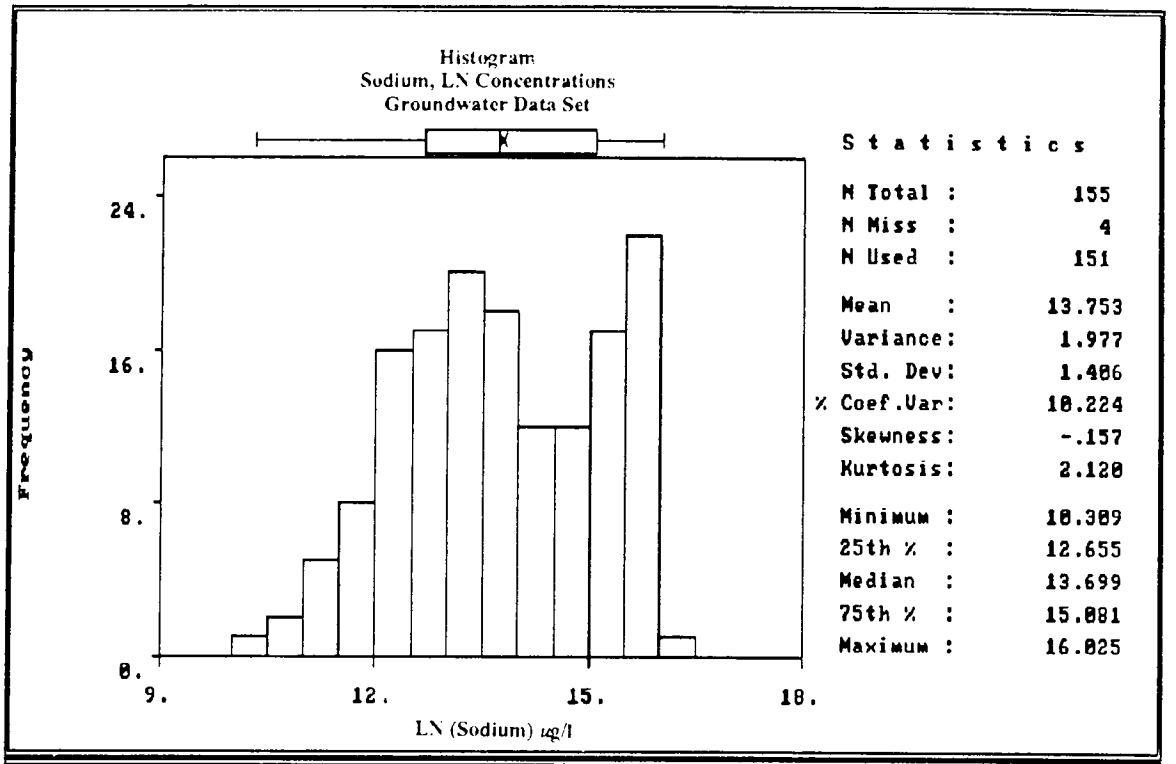
Engineering and Environmental Services

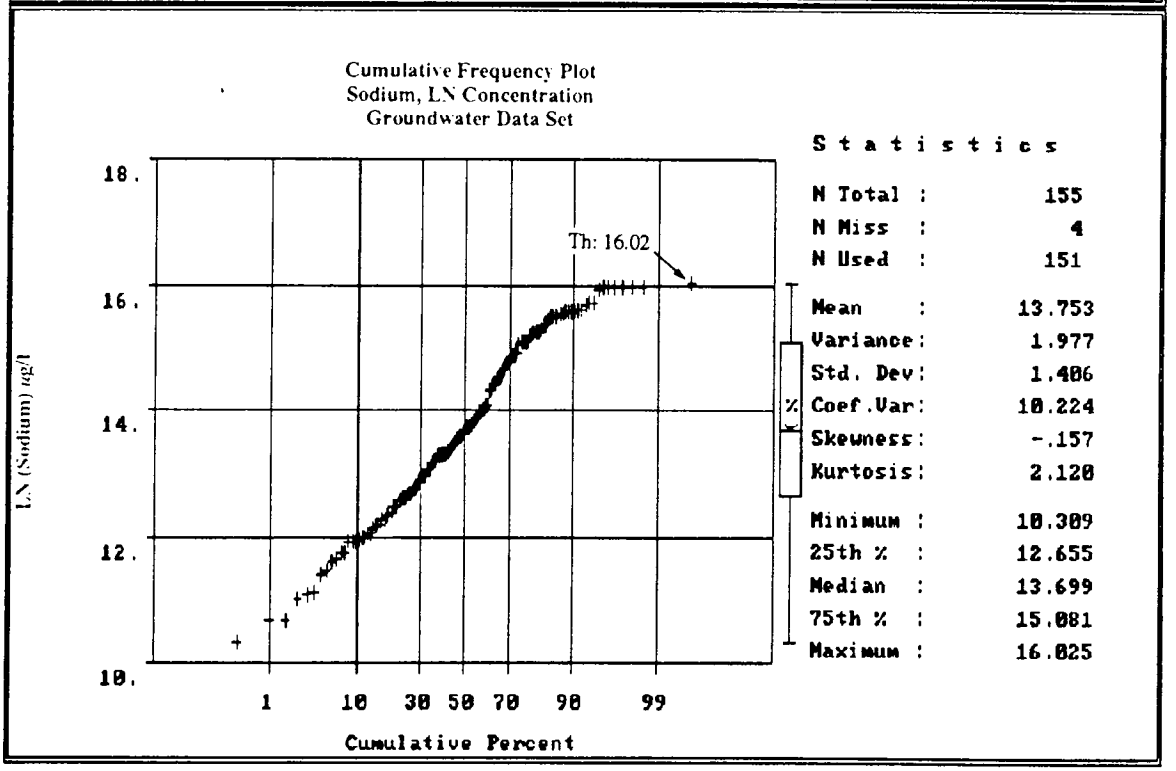
Silver, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B21

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CGM	2/92	6/92

25987





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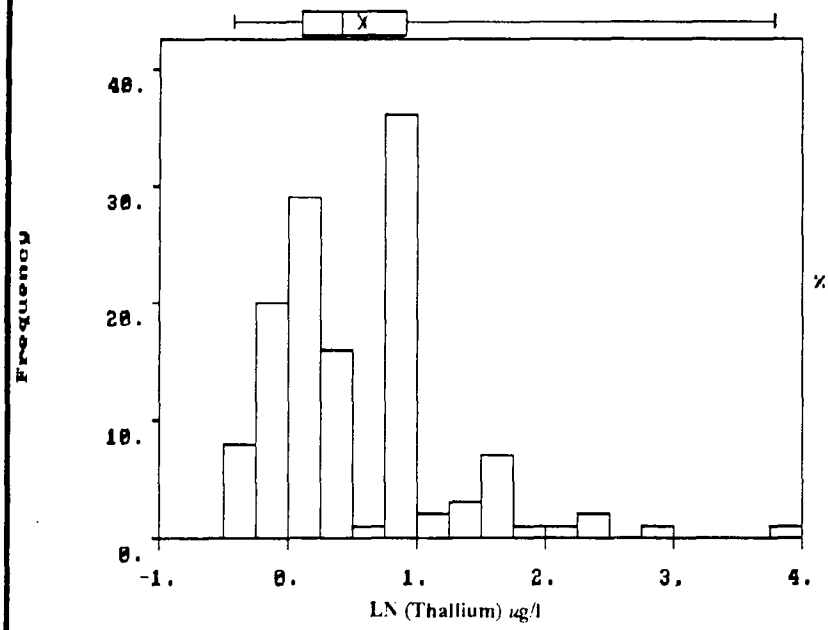
Sodium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B22

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02		2/92	6/92

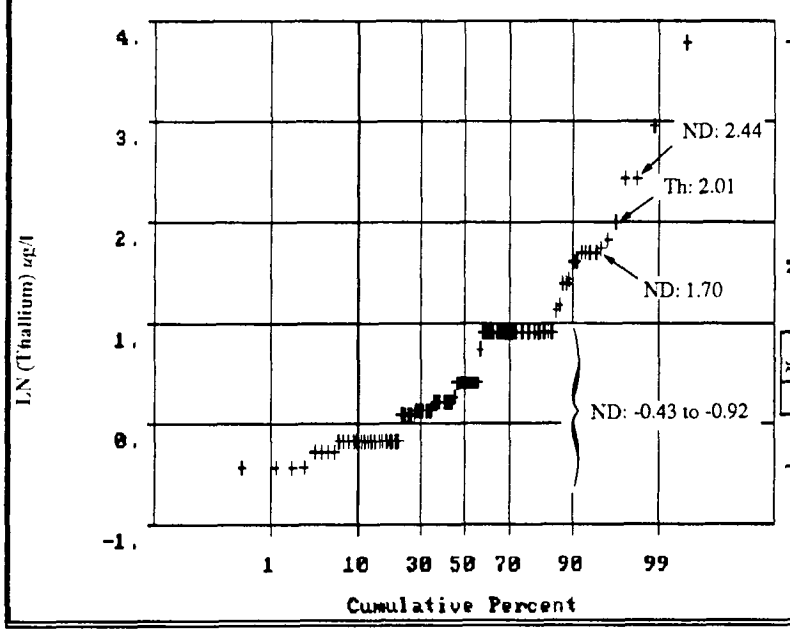
25988

Histogram
Thallium, LN Concentrations
Groundwater Data Set



Statistics	
N Total :	155
N Miss :	27
N Used :	128
Mean :	.566
Variance:	.517
Std. Dev:	.719
% Coef.Var:	126.940
Skewness:	1.332
Kurtosis:	5.877
Minimum :	-.431
25th % :	.095
Median :	.405
75th % :	.916
Maximum :	3.784

Cumulative Frequency Plot
Thallium, LN Concentration
Groundwater Data Set



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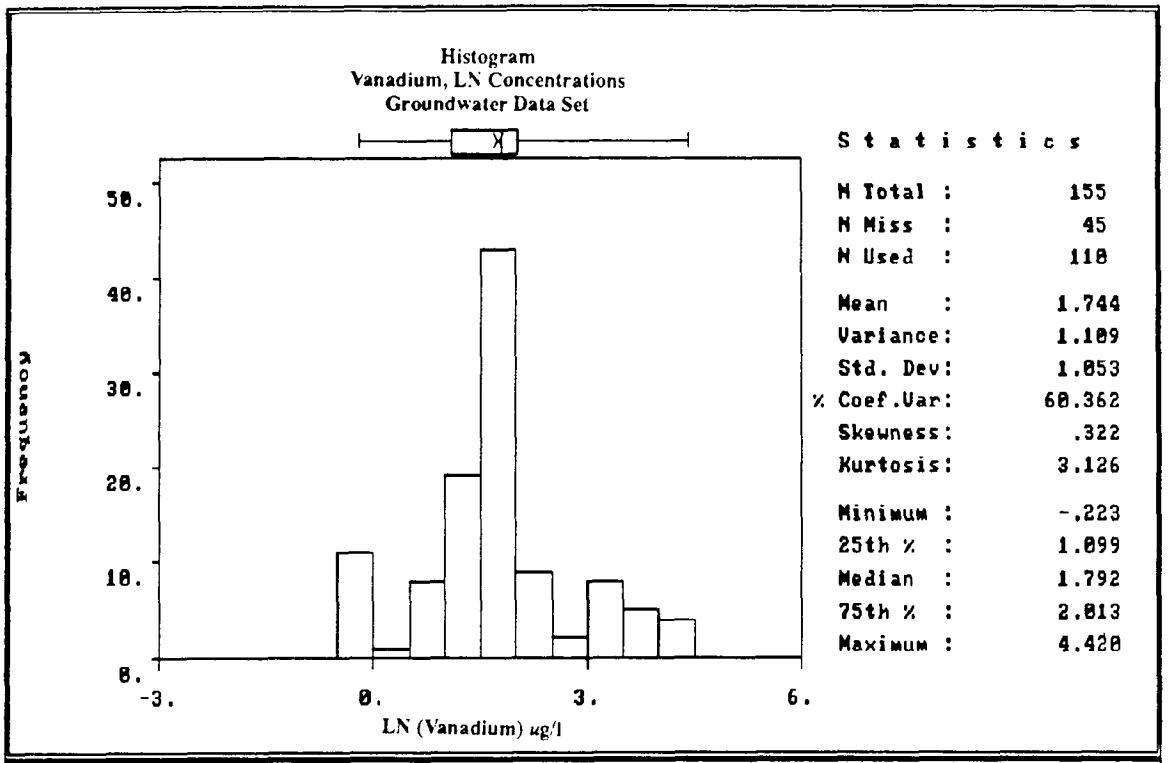
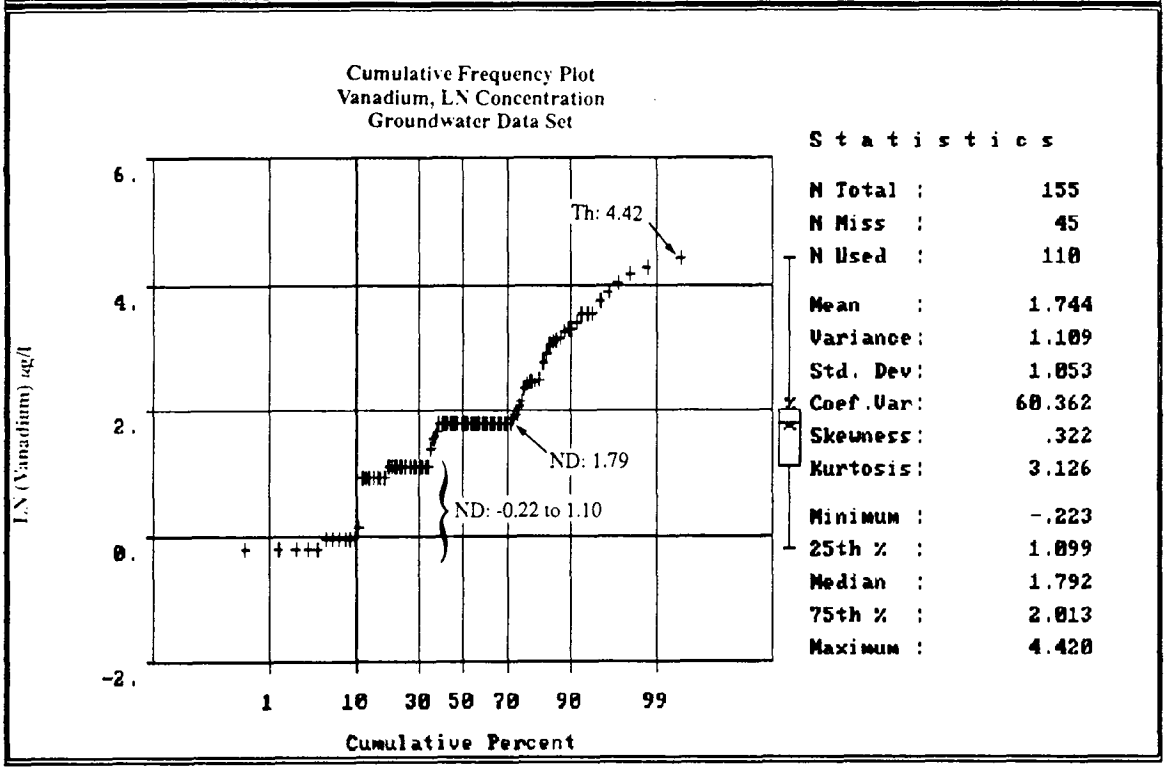
Thallium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B23

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92

25989





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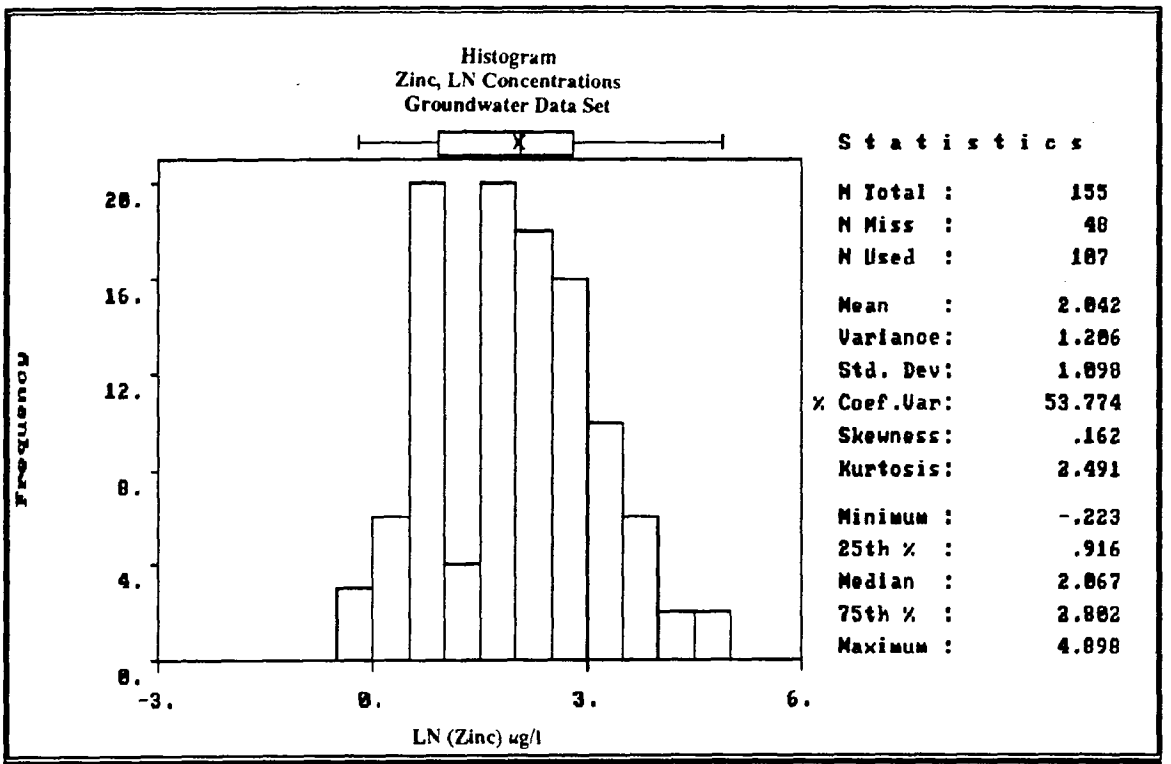
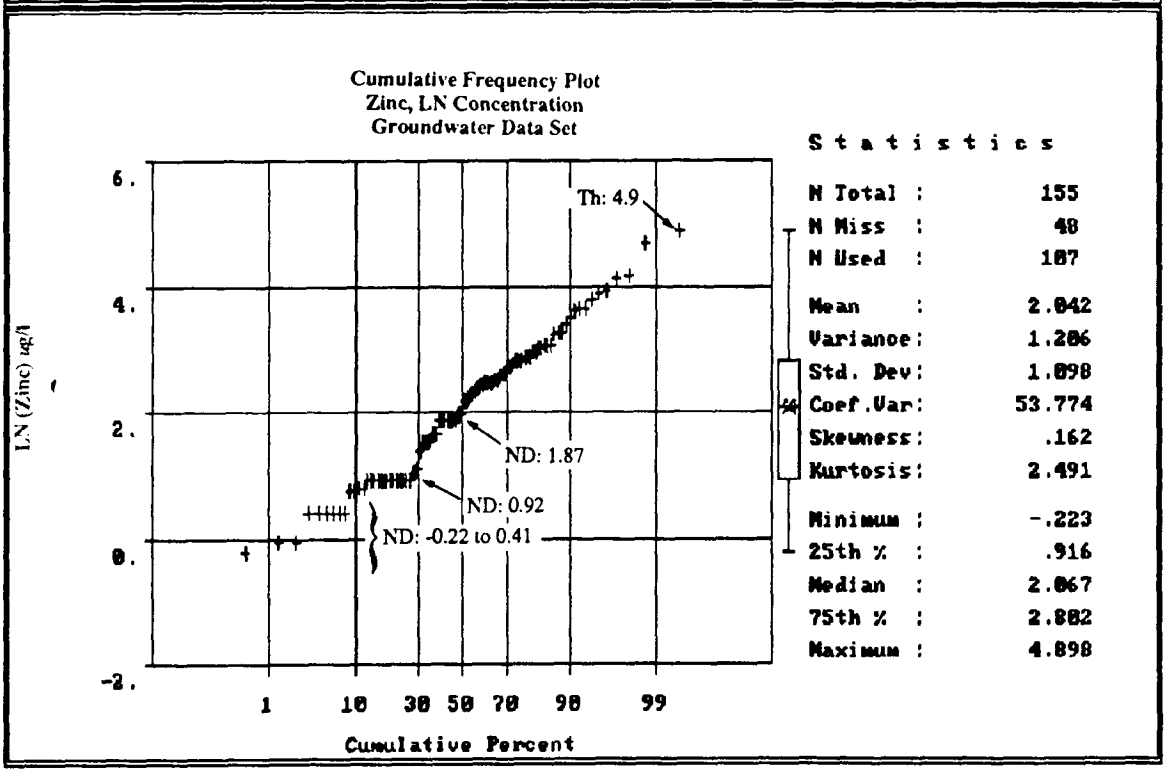
Vanadium, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B24

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	CJM	2/92	6/92





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Environmental Services

Zinc, Groundwater Data Set
Histogram and Cumulative Frequency Plot
Background Soil and Groundwater Conditions
Hunters Point Annex
San Francisco, California

PLATE
B25

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
NJB	18639,580.02	GJM	2/92	6/92