Topock Project Executive Abstract

<table>
<tr><td>Document Title:

Soil Background Investigation at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Submitting Agency: DTSC, DOI

Final Document? X Yes No</td><td>Date of Document: May 15, 2009

Who Created this Document?: (i.e. PG&E, DTSC, DOI, Other)

PG&E</td></tr>
<tr><td>Priority Status: HIGH ☐ MED X LOW
Is this time critical? Yes X No
<hr>Type of Document:
☐ Draft ☐ Report ☐ Letter ☒ Memo

☐ Other / Explain:</td><td>Action Required:
☒ Information Only ☐ Review & Comment
Return to:___________

By Date:_________

☐ Other / Explain:
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<tr><td>What does this information pertain to?
☐ Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)/Preliminary Assessment (PA)
☒ RCRA Facility Investigation (RFI)/Remedial Investigation (RI) (including Risk Assessment)
☐ Corrective Measures Study (CMS)/Feasibility Study (FS)
☐ Corrective Measures Implementation (CMI)/Remedial Action
☐ California Environmental Quality Act (CEQA)/Environmental Impact Report (EIR)
☐ Interim Measures
Other / Explain
This memo is required to establish background concentrations for inorganic chemicals and polycyclic aromatic hydrocarbons (PAHs) in soil in the vicinity of the PG&E Topock Compressor station. Site concentrations of these chemicals will be compared to the background concentrations to determine if the inorganic chemicals or PAHs are elevated or consistent with ambient background levels.</td><td>Is this a Regulatory Requirement?
☒ Yes
☐ No
If no, why is the document needed?</td></tr>
<tr><td>What is the consequence of NOT doing this item?
Would not be able to determine if detected concentrations of inorganic chemicals and PAHs were attributed to releases from compressor station activities or whether the values are consistent with background levels.

What is the consequence of DOING this item?
Determines the background concentrations of inorganic chemicals and PAHs in vicinity of PG&E Topock Compressor Station. Will allow the assessment of what detected concentrations of inorganic chemicals and PAHs may be attributed to compressor station activities allowing for site characterization, risk assessment, and other decision making purposes.</td><td>Other Justification/s:
☐ Permit ☐ Other / Explain:</td></tr>
</table>

Brief Summary of attached document:

The Soil Background Investigation Technical Memorandum presents the background investigation sampling rationale and approach, data quality evaluation, and calculates representative soil background values at the PG&E Topock Compressor Station. The background investigation was conducted in accordance with the *RCRA Facility Investigation/Remedial Investigation Soil Investigation Work Plan, Part A, PG&E Topock Compressor Station, Needles, California* (Part A Work Plan).

As described in the Part A Work Plan, the purpose of the soil background investigation is to collect additional background soil samples to augment the existing background data set and to establish background concentrations of inorganic chemicals and PAHs. The background values will be used to compare with site concentrations of these chemicals to determine if the inorganic chemicals or PAHs are elevated or consistent with ambient soil background levels.

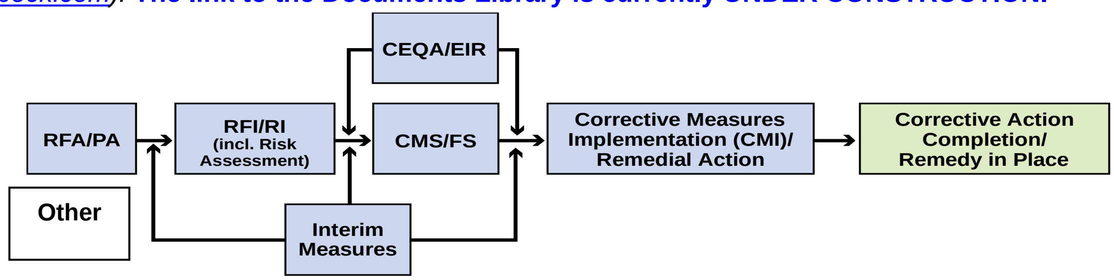
Written by: PG&E

Recommendations:
This Technical Memorandum is for your information only.

How is this information related to the Final Remedy or Regulatory Requirements:
The Soil Background Investigation Technical Memorandum calculates representative background concentrations for inorganic chemicals and PAHs in the vicinity of the PG&E Topock Compressor Station to be used for critical-decision making purposes including, risk assessments, site characterization, and site closure.

Other requirements of this information?
None.

Related Reports and Documents:
Click any boxes in the Regulatory Road Map (below) to be linked to the Documents Library on the DTSC Topock Web Site (www.dtsc-topock.com). **The link to the Documents Library is currently UNDER CONSTRUCTION.**



Legend
RFA/PA – RCRA Facility Assessment/Preliminary Assessment
RFI/RI – RCRA Facility Investigation/CERCLA Remedial Investigation (including Risk Assessment)
CMS/FS – RCRA Corrective Measure Study/CERCLA Feasibility Study
CEQA/EIR – California Environmental Quality Act/Environmental Impact Report

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May 15, 2009

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Denver Federal Center, Bldg. 56
Denver, CO 80225-0007

Subject: Revised Final Soil Background Investigation at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California Technical Memorandum

Dear Mr. Yue and Ms. Innis:

This letter transmits the Revised Final Background Investigation at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California Technical Memorandum.

This report incorporates revisions made in accordance with the response to comments and redline version of the Revised Technical Memorandum submitted to the agencies on March 12, 2009. DTSC and DOI granted concurrence of the Revised Technical Memorandum in e-mails dated May 12, 2009 and April 16, 2009, respectively. No additional changes have been made to the report.

Please contact me at (805) 234-2257 if you have any questions regarding the attached information or any other aspect of the RFI/RI activities.

Sincerely,

Yvonne Meeks

Yvonne Meeks
Topock Remediation Project Manager

Cc: Christopher Guerre, DTSC
Rick Newill, DOI

Enclosures

Soil Background Investigation at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California

PREPARED FOR: Pacific Gas & Electric Company

PREPARED BY: CH2M HILL

DATE: December 12, 2008

Revised: March 12, 2009

Finalized: May 15, 2009

Introduction

This technical memorandum presents the background investigation sampling rationale and approach, data quality evaluation, and methods used to develop representative soil background concentrations at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station, located in eastern San Bernardino County, California, approximately 12 miles southeast of Needles, California. The background investigation was conducted in accordance with the *RCRA Facility Investigation/Remedial Investigation Soil Investigation Work Plan, Part A, PG&E Topock Compressor Station, Needles, California* (Part A Work Plan) (CH2M HILL, 2006a).

As described in the Part A Work Plan, the purpose of the background investigation is to collect additional background soil samples to augment the existing background data set and to establish background concentrations of inorganic constituents and polycyclic aromatic hydrocarbons (PAHs). A primary purpose of establishing background concentrations is to facilitate the comparison of site concentrations of naturally occurring constituents of potential concerns (COPCs) to background concentrations to assess whether the delineation of nature and extent of contamination in soils at the various Solid Waste Management Units (SWMUs)/Areas of Concern (AOC) is adequate. The background data is an important input to the human health and ecological risk assessment and for the evaluation of the potential for inorganic constituents to leach to groundwater. Specific details of how the background data will be used can be found in the Human Health and Ecological Risk Assessment Work Plan (Arcadis 2008) and the Calculation of Soil Screening Levels for Protection of Groundwater at the PG&E Topock Compressor Station Technical Memorandum (CH2M HILL, 2008).

Approaches for selecting background sample locations, the analytical data quality review, the data evaluation procedures for defining the background data set, and derivation of the background threshold values are described in detail below.

1.0 Soil Background Sampling Rationale and Approach

This section summarizes the sample location selection rationale and approach for collecting the background soil samples.

Sample Location Rationale

Additional background samples were collected from various lithologic and geomorphic settings and soil types in the vicinity of the compressor station but in areas not expected to be impacted by compressor station activities. In the near vicinity of the Topock Compressor Station, the most prevalent geologic formations exposed at the ground surface include Tertiary Alluvium, Older Quaternary Alluvium, and Younger Quaternary Alluvium. Younger Quaternary Alluvium includes recent and Holocene surficial deposits and recent alluvial sediments in washes that represent a mix of local native soils and eroded materials from more distant areas. With the exception of portions of Debris Ravine (AOC 4) and East Ravine (AOC 10), all SWMUs and AOCs at the site are located in Tertiary Alluvium, Older Quaternary Alluvium, or recent wash deposits (Qya). Figure 1 provides a geologic map of the study area. Tertiary Alluvium on this figure appears as Toa; Older and Younger Quaternary Alluvium appear as Qa.

The southern part of Debris Ravine crosses the Chemehuevi Fault and lies on Miocene Conglomerate (Tmc). East Ravine areas are underlain by Tmc; however, surface soil in this area is primarily Quaternary Alluvium, and AOC 10 in East Ravine is primarily located within the wash area of the ravine in recent wash sediments. Further, Bat Cave Wash originates in and cuts through pre-Tertiary Bedrock (pTbr) prior to flowing north through Tertiary Alluvium west of the compressor station.

The existing data set, as defined in the Part A Work Plan, contains 34 soil samples: 19 soil samples from five Qa locations, 10 soil samples from four Toa locations, and five samples from three wash (Qya) locations. As few as 10 samples per unit would yield enough samples to perform standard statistical tests for the individual lithologic unit sample sets; however, a more robust sample population was desired to calculate more representative background concentrations. Therefore, the background sampling plan in the Part A Work Plan was designed to have at least 21 soil samples per formation or lithologic unit. To achieve the desired number of samples per lithologic unit, additional background samples from locations within units Toa, Qa, wash (Qya) were collected. Samples were also proposed to be collected from pre-Tertiary Bedrock (pTbr) due to its proximity to SWMU 1 and AOCs 4 and 10. The proposed background sampling plan consisted of 38 additional soil samples to be collected from one location in Qa, three locations in Toa, five locations in wash (Qya), and three locations in pTbr. As defined in the Part A Work Plan, the representative background depths for the soil background data set are defined as between 0 to 10 feet below ground surface (bgs); therefore, new background soil samples were proposed to be collected at specific depths between 0 to 10 feet bgs.

Subsequent to the finalization of the Part A Work Plan, the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and the United States Department of the Interior determined that Category 2 data, as defined in the *Final Soil and Sediment Data Usability Technical Memorandum, PG&E Topock Compressor Station*

(CH2M HILL, 2008a), could not be used for risk assessment purposes, including calculation of background soil concentrations.

Of the 34 existing background soil samples, 19 were considered Category 2 data and were excluded from the background data set; 14 of these existing soil samples were collected from in Qa, and five were collected from Toa. The remaining 15 existing background data set soil samples were considered Category 1 data. The exclusion of the Category 2 data from the existing background data set reduced the number of soil samples in the Qa from 21 to seven background samples. In the Toa, the number of soil samples was reduced from 21 to 16 background samples, which is an adequate background data set to perform standard statistical tests. During a site walk on May 21, 2008, DTSC and the United States Department of the Interior approved the use of five sample locations presented in the *Interim Measures No. 3 Closure Planning – Baseline Soil Sampling Work Plan, PG&E Topock Compressor Station* (CH2M HILL, 2006b) to replace the excluded existing background samples in the Qa lithologic unit. Figure 1 shows the final background sampling locations, both existing (Category 1 data only) and new locations.

Field Sampling Activities

Based on the criteria discussed above, 17 background sample locations (six locations in Qa, five locations in wash [Qya], three locations in Toa, and three locations in pTbr) were sampled between August and September 2008. Seventeen samples were collected from 0 to 0.5 foot bgs; three soil samples were collected from 1 to 2 feet bgs; 13 soil samples were collected from 2 to 3 feet bgs; 12 soil samples were collected from 5 to 6 feet bgs; and 10 soil samples from 9 to 10 feet were collected from these 17 sample locations. The 2-foot-bgs soil sample at location BKG-9 and the 10-foot-bgs soil sample at location BKG-12 were not collected because bedrock was encountered at 1 and 6 feet bgs, respectively, preventing the further advancement of the boring. In all, 55 background samples were collected during the Part A Phase 1 soil investigation.

As outlined in the Part A Work Plan, all soil samples were analyzed for Title 22 Metals by United States Environmental Protection Agency (USEPA) Method SW6010B, mercury by USEPA Method SW7471A, and hexavalent chromium by USEPA Method SW7199/SW3060A. Surface soil samples were also analyzed for PAHs by USEPA Method SW8270SIM. In addition, all surface soil samples were analyzed for Target Analyte List/Target Compound List pesticides by USEPA Method SW8081A. Because pesticides and PAHs would be largely due to aerial deposition from anthropogenic sources, only the surface soils were analyzed for these compounds.

Stainless-steel hand tools (i.e., trowel, mixing bowl, and sieve) were used to collect soil samples at locations BKG-8, BKG-9, and BKG-12. A sonic drilling rig was used at the 14 remaining sample locations to collect soil samples by driving a core sampling tube into soil. The core sampling tube was surrounded by an outer casing to obtain a minimally-disturbed soil sample. After the retrieval of the inner core sampling tube, the sample cores were logged. In general, soils in the Qa and wash (Qya) lithologic units were described as a combination of silt, gravel, and poorly-graded, fine-grained sand; Toa lithologic unit soils are described as silt with poorly-graded, fine-grained quartz sand; and pTbr lithologic unit soils are described as silty sand with poorly-graded, fine-grained sand.

The soil at the appropriate sample interval was placed into a stainless-steel bowl with the aid of a stainless-steel spoon and stainless-steel sieve when it was necessary to remove large debris and rocks. The soil was then mixed and transferred to the appropriate sampling containers using the stainless-steel spoon. The sample containers were labeled with unique sample identification numbers. Sample identifications, collection date, and time were recorded on a chain-of-custody form. The soil samples were sent to offsite laboratories for analyses.

All sampling equipment was decontaminated between each sample location following the decontamination procedures described in detail in the Part A Work Plan.

2.0 Analytical Data Quality Review

The laboratory analytical data, generated from the August and September 2008 background sampling event were independently reviewed by project chemists to assess data quality and to identify deviations from analytical requirements. The quality assurance and quality control requirements are outlined in the *Draft PG&E Program Quality Assurance Project Plan* (CH2M HILL, 2008b) and the *Draft Soil Addendum for the Topock Compressor Station, RCRA Facility Investigation/Remedial Investigation* (CH2M HILL, 2008c). Seventeen soil samples and four field duplicates were submitted to Advanced Technology Laboratory for the analysis of PAHs and pesticides. Fifty-five soil samples and four field duplicates were submitted to Advanced Technology Laboratory for Title 22 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc) and mercury analysis and to Truesdail Laboratory for the analysis of hexavalent chromium. A summary discussion of data quality for the background soil data is presented below. Additional detail is provided in the data validation reports, which are kept in the project files and are available upon request.

Matrix Spike Samples

Three samples had matrix spike and matrix spike duplicate results that were recovered less than the lower control limit (LCL) for antimony (USEPA Method SW6010B). The non-detected sample results were qualified as estimated and were flagged "UJ." One sample had a matrix spike duplicate result that recovered less than the LCL for barium (USEPA Method SW6010B). The detected sample result was qualified as estimated and was flagged "J." All other matrix spike acceptance criteria were met.

Quantitation and Sensitivity

One cobalt, one lead, six antimony, six cadmium, seven selenium, 40 molybdenum, 41 beryllium, 41 silver, and 41 thallium (USEPA Method SW6010B) non-detect sample results were reported from dilutions due to soil matrix issues. The reporting limits were elevated to reflect the dilutions; no flags were applied. All other non-detect samples results were reported from undiluted sample aliquots, and the method/analyte combinations meet the project reporting limit requirements.

Holding Time Data Qualification

All holding-time criteria were met.

Field Duplicates

All field duplicate acceptance criteria were met.

Method Blanks

All method blank acceptance criteria were met.

Equipment Blanks

All equipment blank acceptance criteria were met.

Laboratory Duplicates

All laboratory duplicate acceptance criteria for the methods were met.

Calibration

One continuing calibration standard had a recovery less than the LCL for benzo(b)fluoranthene. Three non-detect samples results associated with the continuing calibration were qualified as estimated and were flagged "UJ." All other calibration criteria were met.

Data Quality Review Conclusion

For background soil samples collected in August and September 2008 for the Topock Compressor Station soil background investigation, the completeness objectives were met for all method and analyte combinations. The analyses and data quality met the *Draft PG&E Program Quality Assurance Project Plan* (CH2M HILL, 2008b) and laboratory method quality control criteria, except as noted above. Overall, the analytical data are considered acceptable for use in investigation and risk assessment purposes, including calculating background values.

3.0 Combined Soil Background Data Results and Data Evaluation

This section summarizes the combined soil background analytical results, presents the data evaluation and the resulting background data set.

Combined Soil Background Data Results

Appendix A presents the analytical results for the combined soil background data results (existing Category 1 data and the newly-collected data). Notably, PAHs and pesticides were not detected above detection limits in any of the background soil samples analyzed.

Combined Soil Background Data Evaluation

This subsection discusses the evaluation of the combined soil background data with regard to soil types and depths and evaluation of outliers.

A combination of visual evaluation, statistical evaluation, and professional judgment were used to establish a soil background data set. One-half of the analytical reporting limit was used as a proxy concentration for inorganic results reported as not detected (except for the calculation of upper tolerance limits (UTLs) as discussed in the Summary Statistics section).To determine whether significant (practical or statistical) differences exist among the soil types and soil depths, two types of evaluation were performed:

1. Visual evaluation using graphical tools such as scatter, probability, and box-and-whisker plots, and

2. Statistical evaluation of the data using the analysis of variance (ANOVA), which includes a post hoc evaluation technique known as Tukey's test (Mason, Gunst, and Hess, 1993).

A. Visual Evaluation

To examine the relationship between depths and concentrations, the following depth partitioning was performed:

1. Partition soil into two depth intervals -- the first interval consists of the 0 to 0.5 feet below ground surface (bgs) and the second interval consists of all subsurface depths (1, 2, 3, 5, 6, 9, and 10 feet bgs). Note that most sample depths were recorded as the bottom of the sample interval.

2. Partition soil into four depth intervals -- the first interval is 0 to 0.5 feet bgs, the second interval consists of 1, 2, and 3 feet bgs, the third interval consists of 5 and 6 feet bgs, and the fourth interval consists of 9 and 10 feet bgs.

Scatter plots were then prepared for each constituent, displaying the concentrations by soil type and depth interval. Figures 2 and 3 present the scatter plots for the 2-depth and 4-depth partitioning, respectively. In these plots, blue-closed symbols represent detected values while green-open symbols represent proxy values of one-half of the reporting limit (i.e., non-detect samples). The frequencies of the detects for each partition are included at the top of each plot. In general, these plots suggest fairly consistent concentration spreads across each depth and soil type.

Additional visual evaluation was performed using the box-and-whisker plots (Figures 4 and 5). The box-and-whisker plot for each constituent presents the concentrations by soil type and depth separately. Box-and-whisker plots offer an improved view of the data as the number of results in each partition (lithology and depth) increases.

Box-and-whisker plots present information on the central tendency, variability, and skewness for a sample data set by sketching the center 50 percent of the concentrations with a box and illustrating the tail regions of the distribution with whiskers. For concentrations that extend further from the center than the whiskers, individual data symbols are plotted.

Specifically, these box-and-whisker plots are constructed as follows:

- The height of the box represents the interquartile range (IQR). The IQR is the distance between the 25^{th} and the 75^{th} percentiles.

- The horizontal line in the box interior represents the median.

- The vertical lines issuing from the box extend to the minimum and maximum measured values (as long as these minimum and maximum values do not extend further from the box than a distance of 1.5 times the IQR).
- Individual data symbols are used for concentrations that exceed the whiskers.

Scatter plots were also prepared for each constituent, presenting concentrations by soil type and depth separately (Figures 6 and 7). These plots along with the box-and-whisker plots show there are not significant differences in concentrations between soil types or depths.

B. Statistical Evaluation

In addition to the visual evaluation, statistical evaluation was also performed to determine whether significant (practical or statistical) differences exist among the soil types and soil depths. The statistical evaluation is performed in two steps, the initial ANOVA screen and the *post hoc* evaluation (Tukey's test).

Analysis of Variance (ANOVA)

The ANOVA is used as a screening tool to determine whether the mean values of multiple groups are statistically different from one another. Environmental data are often not consistently normally nor lognormally distributed, particularly because the data contain non-detects and outliers (USEPA, 2006). Thus, a nonparametric ANOVA, using the ranks of the data, as opposed to the concentrations themselves, was used for the background data. For instance, the lowest of five concentrations would have the rank of 1 while the highest would have the rank of 5.

The ANOVA calculates the probability that observed differences between the soil types or depths could be due to random variability in the data. This calculated probability was compared to a significance level of 0.05, which limits the potential false conclusion that the populations are not different (when actually, they are) to one in 20 times.

The ANOVA was performed on each constituent where at least 50 percent of the concentrations were detected. The constituents with a detect percentage of greater than 50 percent are arsenic, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc. When few detects are available, quantitative methods of evaluating differences between groups carry an increasing level of uncertainty as the number of detects decreases, and there are no standard methods recommended by guidance for these circumstances (i.e., multiple groups of data compared simultaneously). Therefore, for constituents that shared a detect percentage of less than 50 percent, soil types and depths were only evaluated visually, as described above. These constituents are beryllium, cadmium, hexavalent chromium, molybdenum, and selenium.

The ANOVA screening results suggest observed differences (at a significance level of 0.05) in the following groups: a) between soil types (arsenic, barium, chromium, copper, and nickel), b) between the two depth partitions (arsenic, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc) and c) between the four depth partitions (arsenic, barium, chromium, cobalt, copper, lead, and vanadium).

It is important to note that while the probabilities provide a quantitative measure of the degree of difference or similarity between soil types and depths, they should not be treated as precise representations of the actual confidences involved. For that to be true, the data would need to be balanced between the different partitions both in number of samples and variability. While this is not the case with most environmental evaluations, the ANOVA still offers useful insight into how similar the concentrations from the various partitions are to one another.

Realistic expectations from an evaluation of almost any data set with varying soil types and depths would suggest the presence of statistically significant differences for multiple constituents. Statistical differences from an ANOVA screening represent differences between partitions greater than the random variability in the data. Thus, if variability is small, even relatively minor differences between partitions (from a practical standpoint) may be statistically significant. From professional experience, it is not realistic to expect that all soil types or depths be statistically similar to one another in an evaluation (using ANOVA at a 0.05 significance level), regardless of the data set. As such, it is prudent to consider the practical significance of any statistical differences to gauge the usefulness of partitioning by soil type and/or depth. Complete reliance on statistical tests typically leads to varied assignments of soil types or depths which can be problematic in actual site comparisons since many actual site samples tend to straddle two or more of these partitions.

Post Hoc Evaluation (Tukey's Test)

In addition to the ANOVA screen, a *post hoc* evaluation technique, otherwise known as a test of contrasts, was also performed to determine which soil types (and subsequently depths) appeared statistically equivalent. Specifically, the Tukey's test (Mason, Gunst, and Hess, 1993) was performed to aid in this analysis. The Tukey's test was only performed on those constituents with a detect percentage of greater than 50 percent (arsenic, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc).

The results of the Tukey's test are presented as alphabetic characters (A, B, etc.) in Tables 1-3. In general, the application of Tukey's test (with a significance level of 0.05) is as follows:

1. For each constituent, the soil type with the highest mean value (of the ranks) is assigned the letter A. If the mean values of all soil types are statistically similar to one another, then they all are assigned the letter A. For example, as shown in Table 1, the zinc values are statistically similar for all four soil types; hence, they are all assigned the letter A. Further, all compounds with a detect percentage of less than 50 percent (beryllium, cadmium, hexavalent chromium, molybdenum, and selenium) were also assigned the letter A.

2. If the mean value (of the ranks) of a constituent from one soil type is statistically lower than the one designated as A, then it is designated as a B. For example, as shown in Table 1, the mean values of arsenic in soil types Qa and pTbr are statistically higher than the mean value of arsenic in soil types wash (Qya). Thus, arsenic soil types Qa and pTbr are assigned the letter A, and the arsenic soil type of wash (Qya) is assigned the letter B. If the mean value (of the ranks) of a constituent in still another soil type is statistically lower than the mean value (of the ranks) of the soil types assigned the letter B, then it is assigned the letter C and so on.

3. It is possible for the mean value (of the ranks) of a constituent to fall between two categories that are statistically different, where the intermediate value is not

statistically different from either of the other two. For example, as shown in Table 1, the mean value of arsenic in soil type Toa (designated AB) is not statistically different than soil types Qa or pTbr (each with the designation of A) nor statistically different than soil type wash (Qya) (with its designation of B). A soil type designated AB could potentially be grouped with either A or B soil types. In this evaluation, the dual groupings (e.g., AB) were consistently assigned to the lower category. In other words, ABs were considered together with Bs. For example, arsenic values in soil types Qa and pTbr were combined in an A group, while Toa and wash (Qya) were combined in a B group.

Once the soil type groupings were assigned, soil depth groupings were assigned using a similar process, as depicted in Tables 2 and 3, where depth was partitioned into two depth intervals and four depth intervals, respectively. The process began using the soil type groupings determined from the Tukey partitions in Table 1. Thus, for example, depth intervals were evaluated for one zinc soil type partition (Qa, Toa, wash [Qya], and pTbr), but depth intervals were evaluated for two arsenic soil type partitions (Qa and pTbr) and (Toa and wash [Qya]).

Table 4 and Table 5 consolidate the results of the Tukey soil type and depth partitions, with depth partitioned into two depth intervals and four depth intervals, respectively. Differences in soil type groupings and various depth intervals are displayed. The results suggest observed differences of the soil types and depths for arsenic, barium, chromium, cobalt, copper, lead, nickel, and vanadium. As with the initial ANOVA screening, the tables suggest that professional review of the soil types and depths should focus on these constituents, since these were the constituents for which multiple soil type or depth categories were suggested using the ANOVA techniques.

C. Combined Data Evaluation Conclusions

A comparison of data collected from the various lithologic units and the two depth intervals and four depth intervals shows that arsenic, barium, chromium, cobalt, copper, lead, nickel, and vanadium concentrations are very similar (i.e., well within an order of magnitude), and visual observations of the data plotted in the scatter plots in Figure 3 confirm that concentrations for the above-listed constituents are very similar.

After careful review of the various graphical plots, the observed statistical differences between soil types or depth intervals are not sufficient to require separation of the data into separate partitions per constituent. The one notable difference appears to involve depth differences for lead, where surface soil samples appear to contain slightly higher concentrations. The concentration differences do not justify partitioning the data for lead by depth because this separation would not impact the site characterization process. The calculated UTL difference between the two depths is only about 1 milligram per kilogram (mg/kg), and both concentrations are below 10 mg/kg. This difference, while statistically measurable, is not significant from a practical standpoint. A difference of 1 mg/kg would not trigger further site characterization or changes in remedial decisions. Therefore, based on the statistical evaluation and the professional review, the data set is recommended to be combined into a single background data set and not be partitioned into soil types or depth intervals. Table 6 summarizes the results of the statistical analyses and visual review for each inorganic constituent evaluated.

One benefit of not partitioning the background data is that site samples that do not conveniently match up with background depth intervals or discrete soil types will not fall outside the usefulness of this background data set. Further, the larger sample size offered by combining data across soil types and depths affords improved estimates of the background population, particularly of the upper tail. This advantage should only be relinquished if there are stark differences based on these lithologies and depth strata, which are not evident. Additionally, a background data with multiple partitions based on lithology or depths greatly increases the complexity of evaluation of the soil investigation data and performing the risk assessment.

D. Evaluation of Outliers

With the combination of all soil types and depths for each constituent, the outlier analysis was evaluated by considering all data for each constituent that was detected in each soil type. Similar to the evaluation for soil type and depth differences, a combination of visual evaluation, statistical evaluation, and professional judgment were used to identify potential outliers.

Statistical Evaluation

Per USEPA guidance (2006), Rosner's test was applied when the sample size for a constituent was more than 25, and with a 0.05 significance level. Based on professional judgment, mathematical outlier tests were not attempted when there were fewer than 25 percent detections (which is the case for beryllium, cadmium, hexavalent chromium, molybdenum, and selenium). Instead, visual evaluation of graphical plots was used to identify potential outliers for those constituents, as discussed below.

The Rosner's test was applied in such a way that multiple outliers would all be identified as mathematical outliers. With multiple outliers, a given extreme value may be masked by another, slightly lower value and initially may be found not to be a mathematical outlier. When testing for multiple outliers, however, both values may actually be outliers. For instance, if the lower of two elevated values was identified as an outlier, both of the values were designated as outliers.

The Rosner's test is based on an assumption of normality for those concentrations that remain after the statistical outlier(s) is excluded. Thus, various transformations were considered, based on the Shapiro-Wilk test (a test for normality) to achieve the best adherence to normality with the remaining concentrations (Gilbert, 1987; USEPA, 2006). The data were transformed using one of three transformations: (1) the square root transformation, (2) the cubic root transformation, and (3) the natural logarithmic transformation. The logarithmic transformation is a standard transformation in environmental applications, while the square root and cubic root transformations offer options for intermediate levels of data skewness.

The details of the Rosner's outlier analysis are provided in Table 7. This table presents the selected transformation that promotes the best adherence to normality with the remaining concentrations (after the potential outlier is removed). It also provides, for each result, the Rosner calculated statistic along with the critical value to which the statistic is compared. If the statistic is greater than the critical value, that result is considered a mathematical outlier. All results greater than that result are also considered mathematical outliers, even if their statistics did not surpass the critical value. One outlier, copper at a concentration of 23.2 mg/kg, was identified as a mathematical outlier. This sample has been removed from the data set.

Visual Evaluation

A visual evaluation of scatter plots (included in previous sections) and probability plots included in Figure 8 were also used to identify potential outliers. The probability plots show the actual concentrations versus the expected quantiles if the data were normal. Whether or not the data are normally distributed, viewing the data in a probability plot offers a good view of the data since each value can be seen on the plot (similar values do not overlap). While probability plots can offer visual support to a mathematical outlier test, they can also serve as a useful qualitative tool for visually assessing whether elevated concentrations are unusual relative to the other concentrations.

After review of the scatter plots and Figure 8, no outliers were identified by this visual assessment.

As directed by DTSC (DTSC 2007), outliers were also identified as those concentrations that exceed 1.5 times the IQR of the data set above the third quartile, as a simpler evaluation of identifying multiple outliers with each calculation. A list of the quartile-based outliers (including non-detect proxy values of one-half the reporting limit) is included in Table 8. Box and whisker plots of the combined data set are shown on Figure 9. The quartile-based outliers listed in Table 8 are essentially the outliers shown on Figure 9.

While the historical whisker length of 1.5 times the IQR provides convenient graphical representations of the data, they do not convey specific inferential confidence associated with any quartile-based outliers. The quartile-based outliers will also change depending on whether the data are transformed. Because the IQR-based approach is not a statistically rigorous way to identify outliers, no additional outliers were excluded from the background data set.

The data set was carefully reviewed, and the outlier analysis evaluated both statistical outliers, and outliers based on visual evaluation and professional judgment. Based on the review of the background data set concentrations, the concentrations are representative of the natural variability of metals in soil.

4.0 Calculation of Background Threshold Values

Summary statistics for each constituent in the background soil data set are presented in Table 9. These statistics include the mean, median, standard deviation, minimum detection limit, maximum detection limit, minimum detect, maximum detect, number of detects, number of samples, and percent detects for all concentrations retained in the data set after removal of outliers. These statistics also include the background threshold value (BTV) calculated for the background data as an upper threshold limit (UTL).

As defined in the Part A Work Plan (CH2M HILL, 2006a), the summary statistics include the calculation of 95 percent upper confidence limits of the 95^{th} percentile, known as 95/95 UTLs. The data for each constituent were evaluated with regard to sample size, percent detects, distribution, and variability to determine an appropriate calculation method as described in USEPA guidance (2007) and applied in ProUCL Version 4.0 software (for the calculation of the BTVs with this software, the necessary input for nondetects is the full reporting limit as opposed to one-half the reporting limit.)

For instance, normal UTLs are calculated using the following equation:

$$UTL = \bar{x} + (K \times s), \qquad (1)$$

Where

$\bar{x}$ is the sample mean.
K is the tolerance factor.
S is the sample standard deviation.

when the data are assumed to be normally distributed. A similar calculation is employed when the data are assumed to be lognormal, except that log-transformed versions of the data are used, with the eventual calculated UTL being inverted back into traditional units (mg/kg).

These UTLs were targeted to be 95/95 UTLs (upper tolerance limits, which are 95-percent upper confidence limits of the 95th percentile of the background population). Although the inability to assign an assumption of normality or lognormality to some cases resulted in a nonparametric approach (including the Kaplan Meier approach, which is a nonparametric alternative when non-detects are present and that do not require proxy substitutions for non-detects), which sometimes lack the flexibility to serve exactly as 95/95 UTL. The UTLs were calculated to serve as BTVs.

For those compounds that had fewer than 10 percent detections (beryllium, cadmium, hexavalent chromium), the BTV assigned was the maximum detection.

BTVs or background concentrations will be used for comparison to surface and subsurface soil inorganic data collected at and in the vicinity of the Topock Compressor Station. Individual site concentrations will be compared to the BTVs. Site concentrations that fall below these threshold values typically are considered not to exceed background. When all concentrations from a given site fall below the BTV, evidence points to the site as a whole as not exceeding background.

Because background threshold values are estimates of an upper percentile, it is clear that some concentrations equivalent to those from the background population will exceed this threshold. Comparison to the background threshold value offers information only on the upper tail of the site distribution. A series of statistical tests will be conducted to assess whether concentrations of constituents detected in the soil at the various units are elevated above background. There is no single statistical test that can be used to determine when concentrations in soil are equal to background levels. Rather, there are several tests that may be used to support this determination. To evaluate whether the concentrations of constituents across the exposure area are comparable to background concentrations, the use of both point estimates (e.g., background threshold values (BTV) as 95/95 UTLs [upper tolerance limits, which are 95-percent upper confidence limits of the 95th percentile of the background population]) and central tendency tests (which statistically determine whether a difference exists between site and background population distributions) may be used to compare the concentrations of site concentrations to background concentrations.

DTSC guidance suggests the use of the Wilcoxon Rank Sum (WRS) test as a supplemental test provided there are sufficient detections of the metal in question to allow a meaningful statistical comparison to be made.

The WRS test is a nonparametric test used for determining whether a difference exists between two populations. The WRS test can be used to test whether measurements from one population (such as the site population) tend to be shifted higher than those from another population (such as the background population) by statistically comparing the ranks from a combination of the two data sets and determining how likely those ranks could occur due to random noise in two equivalent populations. The WRS test offers evidence of whether an overall shift of concentrations occurs in the site data versus the background data, that is, the site concentrations are higher relative to the background concentrations than random variability could explain. Thus, in cases where exceedances of the background threshold value exist but these exceedances are possibly equivalent to elevated concentrations from the background population, the WRS test offers an opportunity to statistically address whether there is an overall shift of site concentrations over background concentrations.

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Tables

TABLE 1
Post Hoc Soil Type Comparisons
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	Soil Type Probabilities *	*Post Hoc* Tukey Groupings**			
		Qa	Toa	Wash	pTbr
Antimony	--	A	A	A	A
Arsenic	0.001	A	AB	B	A
Barium	0.037	A	A	A	A
Beryllium	--	A	A	A	A
Cadmium	--	A	A	A	A
Chromium	0.003	AB	A	A	B
Chromium, Hexavalent	--	A	A	A	A
Cobalt	0.701	A	A	A	A
Copper	0.005	B	AB	AB	A
Lead	0.090	AB	B	AB	A
Mercury	--	A	A	A	A
Molybdenum	--	A	A	A	A
Nickel	0.000	B	A	A	AB
Selenium	--	A	A	A	A
Silver	--	A	A	A	A
Thallium	--	A	A	A	A
Vanadium	0.208	A	A	A	A
Zinc	0.667	A	A	A	A

Notes:

-- Not calculated due to low percentage of detects (less than 50-percent)

* A probability of less than 0.05 means that there is statistical difference between the soil types.

** Tukey grouping designation:

1) If the mean value (of the ranks) in a soil type is highest, it will be assigned an "A", If the mean value (of the ranks) of all soil types are statistically similar to one another, then they all are assigned an "A".. If the mean value (of the ranks) of the same constituent in another soil type is statistically lower than the A group, it will be assigned a "B". If the mean value (of the ranks) of the same constituent in yet another soil type is statistically lower than the B group, it will be assigned a "C", and so on.
2) A soil type designated AB is not statistically distinguishable from either A or B groups
3) If a constituent has a low percentage of detects (less than 50-percent), it was assigned a default "A" across the soil types.

TABLE 2
Post Hoc Depth Comparisons with Two Depth Intervals
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

			Depth Intervals** (feet below ground surface)	
Parameter	**Soil Group**	**Depth Probabilities***	**0**	**1, 2, 3, 5, 6, 9, and 10**
Antimony	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Arsenic	Qa and pTbr	0.002	A	B
Arsenic	Toa and Wash (Qya)	0.087	A	A
Barium	Qa, Toa, Wash (Qya), and pTbr	0.016	A	B
Beryllium	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Cadmium	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Chromium	Qa and pTbr	0.062	A	A
Chromium	Toa and Wash (Qya)	0.011	B	A
Chromium, Hexavalent	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Cobalt	Qa, Toa, Wash (Qya), and pTbr	0.000	B	A
Copper	Toa and Wash (Qya)	0.005	A	B
Copper	pTbr	0.604	A	A
Lead	Qa Toa Wash (Qya)	0.000	A	B
Lead	pTbr	0.422	A	A
Mercury	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Molybdenum	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Nickel	Qa and pTbr	0.683	A	A
Nickel	Toa and Wash (Qya)	0.031	B	A
Selenium	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Silver	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Thallium	Qa, Toa, Wash (Qya), and pTbr	--	A	A
Vanadium	Qa, Toa, Wash (Qya), and pTbr	0.004	B	A
Zinc	Qa, Toa, Wash (Qya), and pTbr	0.912	A	A

Notes:

-- Not calculated due to low percentage of detects (less than 50-percent)

* A probability of less than 0.05 means that there appears to be a statistical difference between the depth intervals.

** Tukey grouping designation:

1) If the mean value (of the ranks) in a depth interval is highest, it will be assigned an “A”, If the mean value (of the ranks) of all soil types are statistically similar to one another, then they all are assigned an “A”. If the mean value (of the ranks) of the same constituent in another depth interval is statistically lower than the A group, it will be assigned a “B”.

2) If a constituent has a low percentage of detects (less than 50-percent), it will be assigned a default “A” across the depth intervals.

TABLE 3
Post Hoc Depth Comparisons with Four Depth Intervals
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	Soil Group	Depth Probabilities *	Depth Intervals** (feet below ground surface) 0	1,2,3	5,6	9,10
Antimony	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Arsenic	Qa and pTbr	0.009	A	AB	AB	B
Arsenic	Toa and Wash (Qya)	0.384	A	A	A	A
Barium	Qa, Toa, Wash (Qya), and pTbr	0.061	A	A	A	A
Beryllium	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Cadmium	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Chromium	Qa and pTbr	0.141	A	A	A	A
Chromium	Toa and Wash (Qya)	0.065	A	A	A	A
Chromium, Hexavalent	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Cobalt	Qa, Toa, Wash (Qya), and pTbr	0.000	C	B	AB	A
Copper	Qa, Toa, and Wash (Qya)	0.021	A	AB	B	AB
Copper	pTbr	0.885	A	A	A	A
Lead	Qa, Toa, and Wash (Qya)	0.000	A	B	B	B
Lead	pTbr	0.741	A	A	A	
Mercury	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Molybdenum	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Nickel	Qa and pTbr	0.941	A	A	A	A
Nickel	Toa and Wash (Qya)	0.173	A	A	A	A
Selenium	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Silver	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Thallium	Qa, Toa, Wash (Qya), and pTbr	--	A	A	A	A
Vanadium	Qa, Toa, Wash (Qya), and pTbr	0.006	B	AB	AB	A
Zinc	Qa, Toa, Wash (Qya), and pTbr	0.247	A	A	A	A

Notes:

-- Not calculated due to low percentage of detects (less than 50-percent)

* A probability of less than 0.05 means that there appears to be a statistical difference between the depth intervals.

** Tukey grouping designation:

1) If the mean value (of the ranks) in a depth interval is highest, it will be assigned an “A”, If the mean value (of the ranks) of all soil types are statistically similar to one another, then they all are assigned an “A”. If the mean value (of the ranks) of the same constituent in another depth interval is statistically lower than the A group, it will be assigned a “B”. If the mean value (of the ranks) of the same constituent in yet another depth interval is statistically lower than the B group, it will be assigned a “C”, and so on.
2) A soil type designated AB is not statistically distinguishable from either A or B groups.
3) If a constituent has a low percentage of detects (less than 50-percent), it will be assigned a default “A” across the depth intervals.

TABLE 4
Soil Type and Depth Statistical Categories with Two Depth Intervals
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	Soil Type	Depth Interval
Antimony	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Arsenic	Qa and pTbr	1
Arsenic	Qa and pTbr	2
Arsenic	Toa and Wash (Qya)	1 and 2
Barium	Qa, Toa, Wash (Qya), and pTbr	1
Barium	Qa, Toa, Wash (Qya), and pTbr	2
Beryllium	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Cadmium	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Chromium	Qa and pTbr	1 and 2
Chromium	Toa and Wash (Qya)	1
Chromium	Toa and Wash (Qya)	2
Chromium, Hexavalent	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Cobalt	Qa, Toa, Wash (Qya), and pTbr	1
Cobalt	Qa, Toa, Wash (Qya), and pTbr	2
Copper	Qa Toa Wash (Qya)	1
Copper	Qa Toa Wash (Qya)	2
Copper	pTbr	1 and 2
Lead	Qa, Toa, and Wash (Qya)	1
Lead	Qa, Toa, and Wash (Qya)	2
Lead	pTbr	1 and 2
Mercury	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Molybdenum	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Nickel	Qa and pTbr	1 and 2
Nickel	Toa and Wash (Qya)	1
Nickel	Toa and Wash (Qya)	2
Selenium	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Silver	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Thallium	Qa, Toa, Wash (Qya), and pTbr	1 and 2
Vanadium	Qa, Toa, Wash (Qya), and pTbr	1
Vanadium	Qa, Toa, Wash (Qya), and pTbr	2
Zinc	Qa, Toa, Wash (Qya), and pTbr	1 and 2

Notes:

1 Depth interval includes surface soil samples only (collected at 0 feet)

2 Depth interval includes soil samples collected at 1, 2, 3, 5, 6, 9, and 10 feet below ground surface

TABLE 5
Soil Type and Depth Statistical Categories with Four Depth Intervals
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	Soil Type	Depth Interval
Antimony	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Arsenic	Qa and pTbr	1
Arsenic	Qa and pTbr	2, 3, and 4
Arsenic	Toa and Wash (Qya)	1, 2, 3, and 4
Barium	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Beryllium	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Cadmium	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Chromium	Qa and pTbr	1, 2, 3, and 4
Chromium	Toa and Wash (Qya)	1, 2, 3, and 4
Chromium, Hexavalent	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Cobalt	Qa, Toa, Wash (Qya), and pTbr	1
Cobalt	Qa, Toa, Wash (Qya), and pTbr	2 and 3
Cobalt	Qa, Toa, and Wash (Qya)	4
Copper	Qa, Toa, and Wash (Qya)	1
Copper	Qa, Toa, and Wash (Qya)	2, 3, and 4
Copper	pTbr	1, 2, and 3
Lead	Qa, Toa, and Wash (Qya)	1
Lead	Qa, Toa, and Wash (Qya)	2, 3. and 4
Lead	pTbr	1, 2, and 3
Mercury	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Molybdenum	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Nickel	Qa and pTbr	1, 2, 3, and 4
Nickel	Toa and Wash (Qya)	1, 2, 3, and 4
Selenium	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Silver	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Thallium	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4
Vanadium	Qa, Toa, Wash (Qya), and pTbr	1, 2, and 3
Vanadium	Qa, Toa, Wash (Qya), and pTbr	1
Zinc	Qa, Toa, Wash (Qya), and pTbr	1, 2, 3, and 4

Notes:

1 Depth interval includes surface soil samples only (collected at 0 feet)

2 Depth interval includes soil samples collected at 1, 2, and 3 feet below ground surface

3 Depth interval includes soil samples collected at 5 and 6 feet below ground surface

5 Depth interval includes soil samples collected at 9 and 10 feet below ground surface

TABLE 6
Summary of Soil Grouping and Depth Interval Partitioning Evaluation
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

	Data Aggregation			
Analyte	**Separated by Soil Type**	**Separated by Depth Interval**	**Pool All Data**	**Basis**
Antimony	NA	NA	NA	This analyte was not detected above laboratory detection limits in any soil group or depth interval.
Arsenic			**X**	ANOVA (including the post *hoc* Tukey comparison) suggest a statistical difference between one or more of the soil groupings and/or depth intervals. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the soil groups and depth intervals are negligible. Therefore, the statistical differences between soil grouping and depth intervals are not sufficient to recommend partitioning of the dataset.
Barium			**X**	ANOVA (including the post *hoc* Tukey comparison) suggest a statistical difference between one or more of the soil groupings and/or depth intervals. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the soil groups and depth intervals are negligible. Therefore, the statistical differences between soil grouping and depth intervals are not sufficient to recommend partitioning of the dataset.
Beryllium			**X**	This analyte was detected in less than 50 percent of the samples. With so few detections quantitative methods could not be used to evaluate differences between soil groups or depth intervals. Instead, differences between soil groups and depth intervals for this analyte were only assessed visually. Visual review of scatter plots, box and whisker plots, and probability plots show that the concentration differences between the soil groups and depth intervals are negligible. Therefore, partitioning of the dataset is not recommended.
Cadmium			**X**	This analyte was detected in less than 50 percent of the samples. With so few detections quantitative methods could not be used to evaluate differences between soil groups or depth intervals. Instead, differences between soil groups and depth intervals for this analyte were only assessed visually. Visual review of scatter plots, box and whisker plots, and probability plots show that the concentration differences between the soil groups and depth intervals are negligible. Therefore, partitioning of the dataset is not recommended.
Chromium			**X**	ANOVA (including the post *hoc* Tukey comparison) suggest a statistical difference between one or more of the soil groupings and/or depth intervals. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the soil groups and depth intervals are negligible. Therefore, the statistical differences between soil grouping and depth intervals are not sufficient to recommend partitioning of the dataset.
Chromium, Hexavalent			**X**	This analyte was detected in less than 50 percent of the samples. With so few detections quantitative methods could not be used to evaluate differences between soil groups or depth intervals. Instead, differences between soil groups and depth intervals for this analyte were only assessed visually. Visual review of scatter plots, box and whisker plots, and probability plots show that the concentration differences between the soil groups and depth intervals are negligible. Therefore, partitioning of the dataset is not recommended.
Cobalt			**X**	ANOVA (including the *post hoc* Tukey comparison) suggest a statistical difference between one or more of the depth intervals, but not between soil groups. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the depth intervals are negligible. Therefore, the statistical differences between depth intervals are not sufficient to recommend partitioning of the dataset.

TABLE 6
Summary of Soil Grouping and Depth Interval Partitioning Evaluation
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

	Data Aggregation			
Analyte	**Separated by Soil Type**	**Separated by Depth Interval**	**Pool All Data**	**Basis**
Copper			**X**	ANOVA (including the post *hoc* Tukey comparison) suggest a statistical difference between one or more of the soil groupings and/or depth intervals. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the soil groups and depth intervals are negligible. Therefore, the statistical differences between soil grouping and depth intervals are not sufficient to recommend partitioning of the dataset.
Lead			**X**	ANOVA (including the *post hoc* Tukey comparison) suggest a statistical difference between one or more of the depth intervals, but not between soil groups. Visual review of scatter plots, box and whisker plots, and probability plots shows that lead concentrations are slightly higher in surface soil samples. However, the concentration differences do not justify partitioning the dataset for lead by depth because this separation would not impact the site characterization process. The calculation upper threshold limit difference between the two depths is only about 1 mg/kg, and both concentrations are below 10 mg/kg. A difference of 1 mg/kg would not trigger further site characterization or changes in remedial decisions; therefore, the statistical difference between depth intervals is not sufficient to recommend portioning of the dataset.
Mercury	NA	NA	NA	This analyte was not detected above laboratory detection limits in any soil group or depth interval.
Molybdenum			**X**	This analyte was detected in less than 50 percent of the samples. With so few detections quantitative methods could not be used to evaluate differences between soil groups or depth intervals. Instead, differences between soil groups and depth intervals for this analyte were only assessed visually. Visual review of scatter plots, box and whisker plots, and probability plots show that the concentration differences between the soil groups and depth intervals are negligible. Therefore, partitioning of the dataset is not recommended.
Nickel			**X**	ANOVA (including the *post hoc* Tukey comparison) suggest a statistical difference between one or more of the depth intervals, but not between soil groups. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the depth intervals are negligible. Therefore, the statistical differences between depth intervals are not sufficient to recommend partitioning of the dataset.
Selenium			**X**	This analyte was detected in less than 50 percent of the samples. With so few detections quantitative methods could not be used to evaluate differences between soil groups or depth intervals. Instead, differences between soil groups and depth intervals for this analyte were only assessed visually. Visual review of scatter plots, box and whisker plots, and probability plots show that the concentration differences between the soil groups and depth intervals are negligible. Therefore, partitioning of the dataset is not recommended.
Silver	NA	NA	NA	This analyte was not detected above laboratory detection limits in any soil group or depth interval.
Thallium	NA	NA	NA	This analyte was not detected above laboratory detection limits in any soil group or depth interval.

TABLE 6
Summary of Soil Grouping and Depth Interval Partitioning Evaluation
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Vanadium	**X**	ANOVA (including the *post hoc* Tukey comparison) suggest a statistical difference between one or more of the depth intervals, but not between soil groups. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the depth intervals are negligible. Therefore, the statistical differences between depth intervals are not sufficient to recommend partitioning of the dataset.
Zinc	**X**	ANOVA (including the *post hoc* Tukey comparison) suggest a statistical difference between one or more of the depth intervals, but not between soil groups. Visual review of scatter plots, box and whisker plots, and probability plots show that concentration differences between the depth intervals are negligible. Therefore, the statistical differences between depth intervals are not sufficient to recommend partitioning of the dataset.

Notes:

mg/kg Milligrams per kilogram
NA Not applicable

TABLE 7

Details on Mathematical Outlier Testing for Background Data

Soil Background Investigation

PG&E Topock Compressor Station, Needles, California

Parameter	Number of Samples When Potential Outlier Removed	Location	Transformed Result	Transformation	Original Result	Rosner's Critical Value	Rosner's Statistic	Exceeds Critical Value?	Result Identified as Mathematical Outlier?
Arsenic	58	BKG-08	2.289	Cubic Root	12	3.2	2.542	no	no
Arsenic	57	BKG-08	2.224	Cubic Root	11	3.19	2.494	no	no
Arsenic	56	BKG-17	2.110	Cubic Root	9.4	3.19	2.252	no	no
Arsenic	55	BKG-13	3.033	Square Root	9.2	3.18	2.525	no	no
Arsenic	54	BKG-14	2.793	Square Root	7.8	3.17	2.180	no	no
Barium	59	BKG-13	6.492	Logarithm	660	3.2	2.918	no	no
Barium	58	BKG-13	6.153	Logarithm	470	3.19	2.496	no	no
Barium	57	BKG-14	6.109	Logarithm	450	3.19	2.574	no	no
Barium	56	BKG-17	5.991	Logarithm	400	3.18	2.499	no	no
Barium	55	BKG-14	5.799	Logarithm	330	3.17	2.222	no	no
Chromium	69	BKG-07	7.280	Square Root	53	3.26	2.818	no	no
Chromium	68	BKG-07	45	None	45	3.25	2.869	no	no
Chromium	67	BKG-06	43	None	43	3.25	2.822	no	no
Chromium	66	BKG-07	36	None	36	3.24	2.056	no	no
Chromium	65	BKG-02	35	None	35	3.24	2.000	no	no
Cobalt	58	BKG-07	14	None	14	3.2	2.600	no	no
Cobalt	57	BKG-07	13	None	13	3.19	2.352	no	no
Cobalt	56	BKG-15	12	None	12	3.19	2.040	no	no
Cobalt	55	BKG-06	11	None	11	3.18	1.666	no	no
Cobalt	54	BKG-07	11	None	11	3.17	1.726	no	no
Copper	69	BGW-1	23.2	None	23.2	3.26	3.548	**yes**	**yes**
Copper	68	BKG-08	18	None	18	3.25	2.361	no	no
Copper	67	BKG-08	17	None	17	3.25	2.165	no	no
Copper	66	BKG-06	16	None	16	3.24	1.934	no	no
Copper	65	BKG-11	16	None	16	3.24	2.007	no	no
Lead	59	BKG-13	2.303	Logarithm	10	3.2	2.187	no	no
Lead	58	BKG-08	2.197	Logarithm	9	3.19	2.044	no	no
Lead	57	BKG-07	2.152	Logarithm	8.6	3.19	2.027	no	no
Lead	56	BKG-14	2.104	Logarithm	8.2	3.18	2.000	no	no
Lead	55	BKG-01	2.054	Logarithm	7.8	3.17	1.961	no	no
Nickel	69	BKG-07	31	None	31	3.26	2.608	no	no
Nickel	68	BKG-06	30	None	30	3.25	2.594	no	no
Nickel	67	BKG-07	29	None	29	3.25	2.571	no	no
Nickel	66	BKG-06	25	None	25	3.24	1.963	no	no
Nickel	65	BKG-08	25	None	25	3.24	2.039	no	no
Vanadium	59	BKG-06	59	None	59	3.2	2.773	no	no
Vanadium	58	BKG-07	52	None	52	3.19	2.174	no	no
Vanadium	57	BKG-08	47	None	47	3.19	1.677	no	no
Vanadium	56	BKG-07	46	None	46	3.18	1.611	no	no
Vanadium	55	BKG-08	46	None	46	3.17	1.665	no	no
Zinc	69	BGW-1	66.1	None	66.1	3.26	2.887	no	no
Zinc	68	BKG-08	58	None	58	3.25	2.257	no	no
Zinc	67	BKG-14	53	None	53	3.25	1.826	no	no
Zinc	66	EEBG-1	52.4	None	52.4	3.24	1.822	no	no
Zinc	65	BKG-08	51	None	51	3.24	1.727	no	no

Notes:

Rosner's Test not performed on constituents with fewer than 25 percent detections: (beryllium, cadmium, hexavalent chromium, molybdenum, and selenium).

TABLE 8
Concentrations Exceeding 1.5 times the Inter Quartile Range
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	Percent Detects *	Result (mg/kg)	Location	Depth	Qualifier	Detected?
Arsenic	98	12	BKG-08	0		Yes
Arsenic	98	11	BKG-08	1		Yes
Barium	100	660	BKG-13	0		Yes
Barium	100	470	BKG-13	9		Yes
Barium	100	450	BKG-13	0		Yes
Barium	100	330	BKG-14	9		Yes
Barium	100	400	BKG-14	0		Yes
Barium	100	320	BKG-17	5		Yes
Beryllium	7	2.5	BKG-03	2	U	No
Beryllium	7	2.55	BKG-03	5	U	No
Beryllium	7	2.55	BKG-03	9	U	No
Beryllium	7	2.55	BKG-06	2	U	No
Beryllium	7	2.6	BKG-06	9	U	No
Beryllium	7	2.7	BKG-07	9	U	No
Beryllium	7	2.5	BKG-08	0	U	No
Beryllium	7	2.5	BKG-08	1	U	No
Beryllium	7	2.55	BKG-13	0	U	No
Cadmium	2	0.55	BKG-07	9	U	No
Cadmium	2	2.5	BKG-08	0	U	No
Cadmium	2	2.5	BKG-08	1	U	No
Cadmium	2	1	BKG-09	0	U	No
Cadmium	2	1	BKG-12	0	U	No
Cadmium	2	1	BKG-12	2	U	No
Cadmium	2	1	BKG-12	5	U	No
Cadmium	2	1.1	BKG-13	9		Yes
Chromium	100	43	BKG-06	9		Yes
Chromium	100	53	BKG-07	5		Yes
Chromium	100	45	BKG-07	9		Yes
Chromium, Hexavalent	4	2.15	BGW-1	0	U	No
Chromium, Hexavalent	4	2	BGW-1	1	U	No
Chromium, Hexavalent	4	1.85	BGW-2	0	U	No
Chromium, Hexavalent	4	2	BGW-2	1	U	No
Chromium, Hexavalent	4	2.05	BGW-3	0	U	No
Chromium, Hexavalent	4	2.05	BGW-3	1	U	No
Chromium, Hexavalent	4	2	BGW-4	0	U	No
Chromium, Hexavalent	4	1.95	BGW-4	1	U	No
Chromium, Hexavalent	4	0.707	BKG-07	0		Yes
Chromium, Hexavalent	4	0.504	BKG-13	5		Yes
Chromium, Hexavalent	4	0.83	BKG-13	9		Yes
Chromium, Hexavalent	4	0.2175	BKG-13	0	U	No

TABLE 8
Concentrations Exceeding 1.5 times the Inter Quartile Range
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	Percent Detects *	Result (mg/kg)	Location	Depth	Qualifier	Detected?
Chromium, Hexavalent	4	0.255	EEBG-1	0	U	No
Chromium, Hexavalent	4	0.255	EEBG-2	0	U	No
Chromium, Hexavalent	4	0.25	EEBG-3	0	U	No
Cobalt	98	14	BKG-07	9		Yes
Copper	100	23.2	BGW-1	0		Yes
Copper	100	18	BKG-08	0		Yes
Lead	98	8.6	BKG-07	0		Yes
Lead	98	9	BKG-08	0		Yes
Lead	98	10	BKG-13	0		Yes
Molybdenum	18	2.5	BKG-03	2	U	No
Molybdenum	18	2.55	BKG-03	5	U	No
Molybdenum	18	2.55	BKG-03	9	U	No
Molybdenum	18	2.55	BKG-06	2	U	No
Molybdenum	18	2.6	BKG-06	9	U	No
Molybdenum	18	2.7	BKG-07	9	U	No
Molybdenum	18	2.5	BKG-08	0	U	No
Molybdenum	18	2.5	BKG-08	1	U	No
Molybdenum	18	2.55	BKG-13	0	U	No
Molybdenum	18	2.8	BKG-13	9		Yes
Selenium	12	0.927	BGW-1	1		Yes
Selenium	12	0.738	BGW-4	1	J	Yes
Selenium	12	1	BKG-06	5	U	No
Selenium	12	2.7	BKG-06	9		Yes
Selenium	12	1.6	BKG-07	0		Yes
Selenium	12	2.5	BKG-08	0	U	No
Selenium	12	2.5	BKG-08	1	U	No
Selenium	12	1	BKG-09	0	U	No
Selenium	12	1	BKG-12	0	U	No
Selenium	12	1	BKG-12	2	U	No
Selenium	12	1	BKG-12	5	U	No
Selenium	12	1.2	BKG-14	9		Yes
Selenium	12	1.8	BKG-15	2		Yes
Selenium	12	2	BKG-15	9		Yes
Vanadium	100	59	BKG-06	9		Yes
Zinc	100	66.1	BGW-1	0		Yes
Zinc	100	58	BKG-08	0		Yes

Notes:
mg/kg Milligrams per kilograms
U Not detected
*Constituents with percentages of detection less than 50 percent are shaded gray.

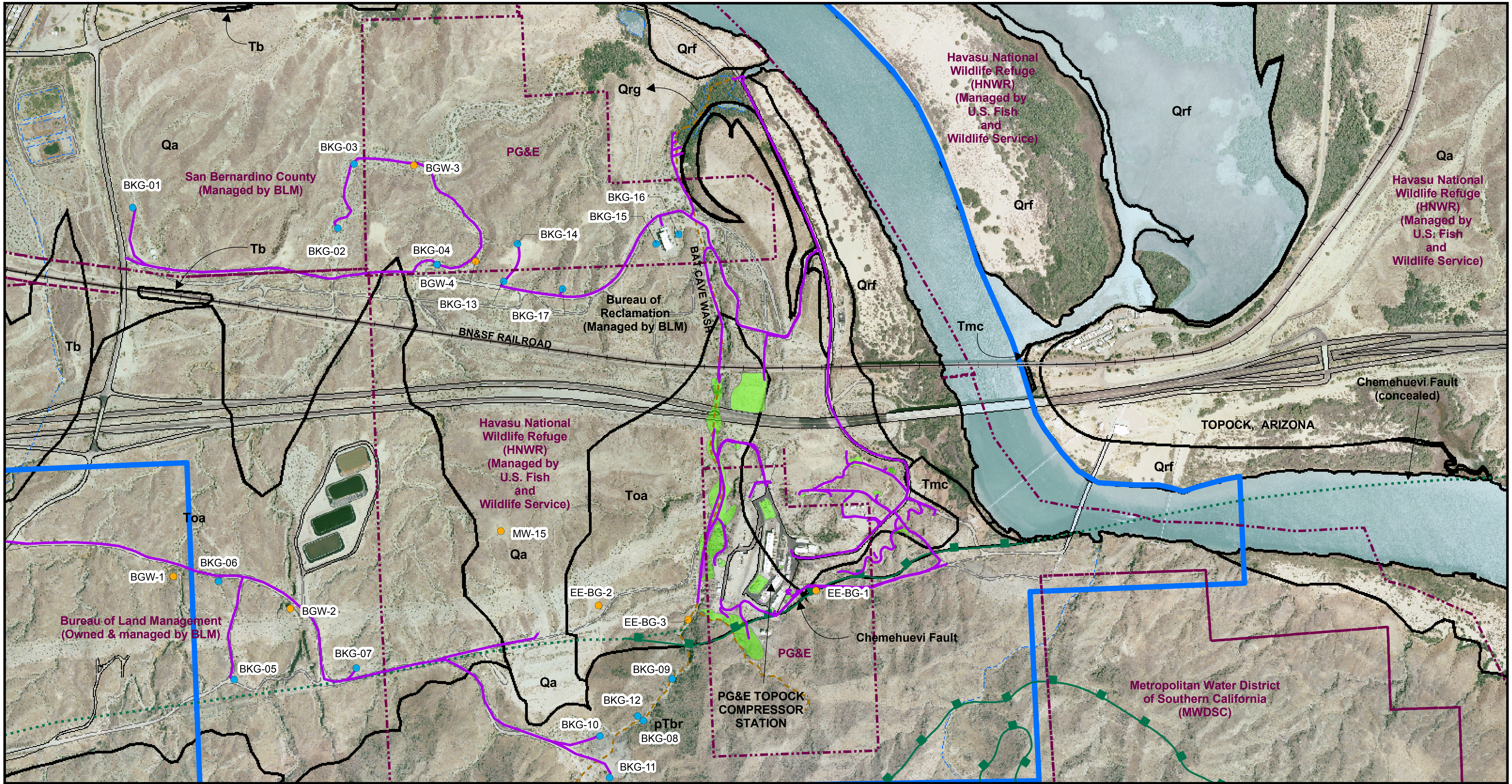
TABLE 9
Summary Statistics Including Background Threshold Values for Combined Background Data
Soil Background Investigation, Pacific Gas and Electric Topock Compressor Station, Needles, California

Parameter	BTV	BTV Basis (with target statistics a 95/95 UTL)	Mean (mg/kg)	Median (mg/kg)	Standard Deviation	Number of Detects	Number of Samples	Percent Detects	Minimum DL (mg/kg)	Maximum DL (mg/kg)	Minimum Detect (mg/kg)	Maximum Detect (mg/kg)
Antimony	NA	NA	1.23	1	0.784	0	55	0	2	10	NA	NA
Arsenic	11.0	Lognormal	3.95	3.5	2.38	58	59	98	1	1	0.884	12
Barium	410	Lognormal	165	135	110	60	60	100	NA	NA	48.4	660
Beryllium	0.672	Assigned Max	1.06	1	0.681	4	59	7	1	5.4	0.459	0.672
Cadmium	1.1	Assigned Max	0.621	0.5	0.398	1	55	2	1	5	1.1	1.1
Chromium	39.8	Normal	22.3	21.9	8.81	70	70	100	NA	NA	4.2	53
Chromium, Hexavalent	0.83	Assigned Max	0.422	0.204	0.585	3	70	4	0.05	4.3	0.504	0.83
Cobalt	12.7	Normal	7.76	7.6	2.4	58	59	98	5.1	5.1	2.3	14
Copper	18	Nonparametric	10.5	10.1	3.58	70	70	100	NA	NA	2.1	23.2
Copper (Outlier Removed)	16.8	Normal	10.5	10.1	3.58	70	70	100	NA	NA	2.1	18
Lead	8.39	Kaplan Meier	4.35	3.47	2.01	59	60	98	5.4	5.4	1.9	10
Mercury	NA	NA	0.0502	0.05	0.000957	0	55	0	0.099	0.11	NA	NA
Molybdenum	1.37	Lognormal	1.13	1	0.7	11	60	18	1	5.4	0.383	2.8
Nickel	27.3	Normal	15.4	15	5.97	70	70	100	NA	NA	2.6	31
Selenium	1.47	Normal	0.736	0.5	0.536	7	59	12	0.911	5	0.738	2.7
Silver	NA	NA	1.09	1	0.692	0	55	0	1	5.4	NA	NA
Thallium	NA	NA	2.19	2	1.36	0	55	0	2	11	NA	NA
Vanadium	52.2	Normal	34	34.1	9	60	60	100	NA	NA	9.4	59
Zinc	58.0	Nonparametric	36.8	35.5	10.1	70	70	100	NA	NA	8.4	66.1

Notes:

95/95 UTL Upper threshold limits, which are 95-percent upper confidence limits of the 95th percentile
BTV Background threshold value
DL Detection limit
mg/kg Milligrams per kilogram
NA Not applicable

Figures



LEGEND

Qrf = Quaternary Colorado River and recent Floodplain Deposits

Qrg = Quaternary River Gravels

Qa = Quaternary Alluvium and surficial deposits, undifferentiated

Tb = Bouse Formation

Toa = Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)

Tmc = Miocene Conglomerate (Bedrock)

pTbr = Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granitic Rocks)

Detachment Fault barbs on downthrown side

Detachment Fault concealed

Ravine

2008 Soil Background Location

Pre-Existing Background Soil Sample Locations

Solid Waste Management Unit (SWMU)

Area of Concern (AOC)

Vehicle Access Route *

Area of Potential Effects

N

0 750 1,500 Feet

NOTE:
Generalized surface geologic map compiled from Metzger and Loeltz (1973), John (1987), Howard and others (1997) and PG&E technical reports.

FIGURE 1
GEOLOGIC MAP OF STUDY AREA BACKGROUND SOIL SAMPLE LOCATIONS AND SWMUS/AOCS ACCESS ROUTES

TOPOCK SOIL BACKGROUND INVESTIGATION
PG&E TOPOCK COMPRESSOR STATION
NEEDLES, CALIFORNIA

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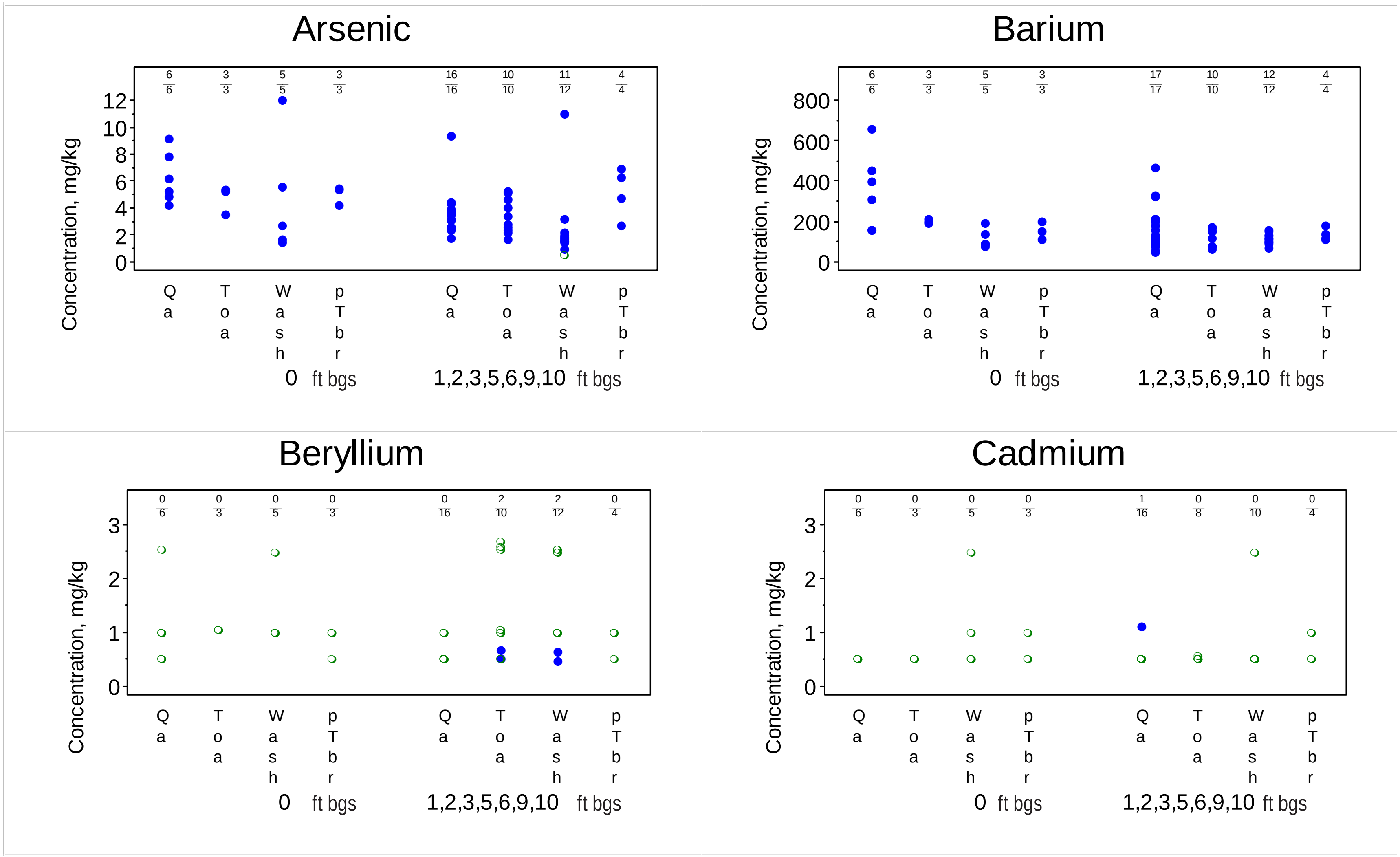

LEGEND

Qa = Quaternary Alluvium and Surficial deposits, undifferentiated
Toa = Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
Wash (Qya) = Recent wash deposits
pTbr = Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granite Rock)
ft bgs = feet below ground surface
mg/kg = milligram per kilogram

● Detected value
○ Non-detected value

FIGURE 2
SCATTER PLOTS BY FOUR SOIL TYPES AND TWO DEPTHS FOR BACKGROUND CONCENTRATIONS
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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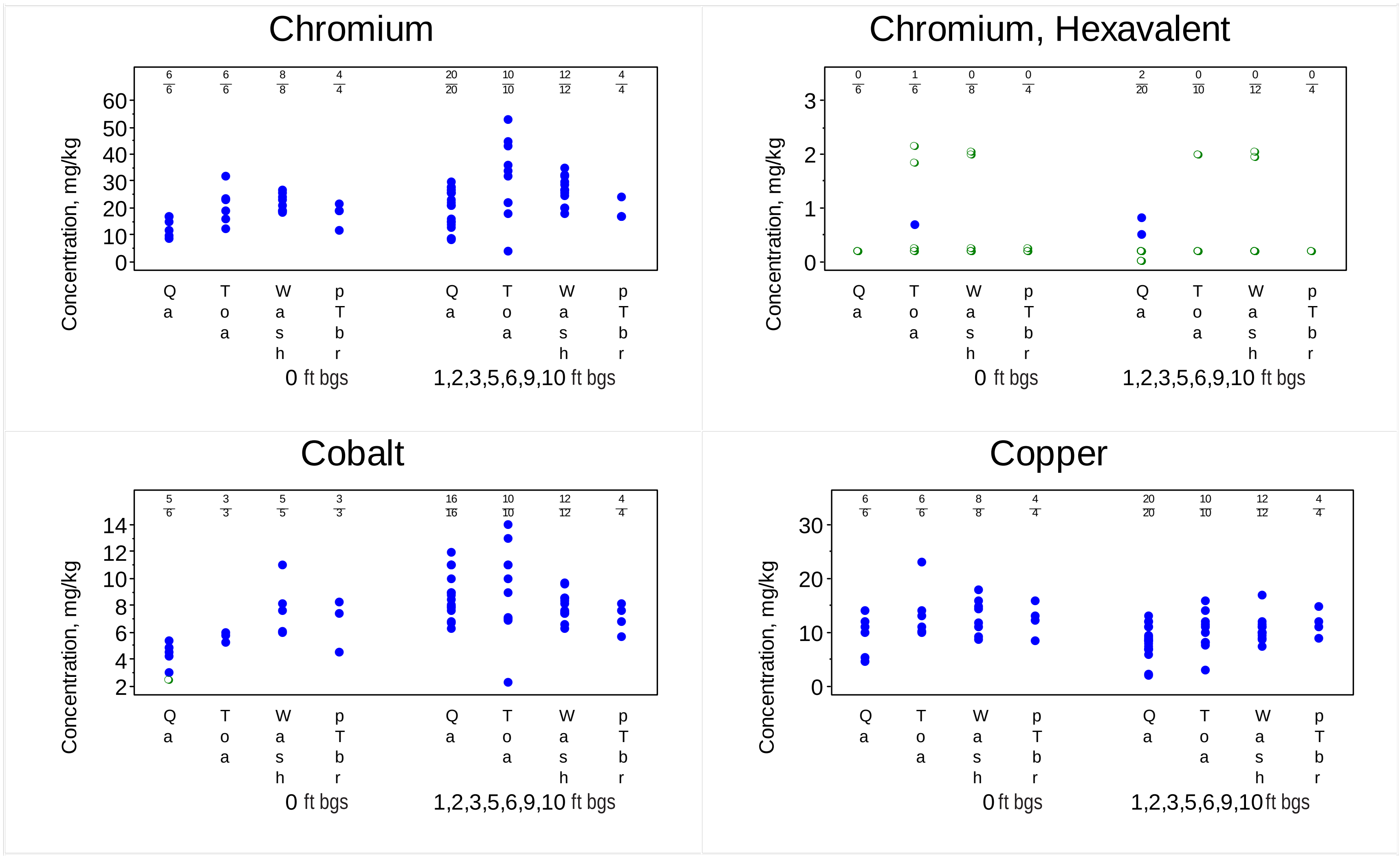

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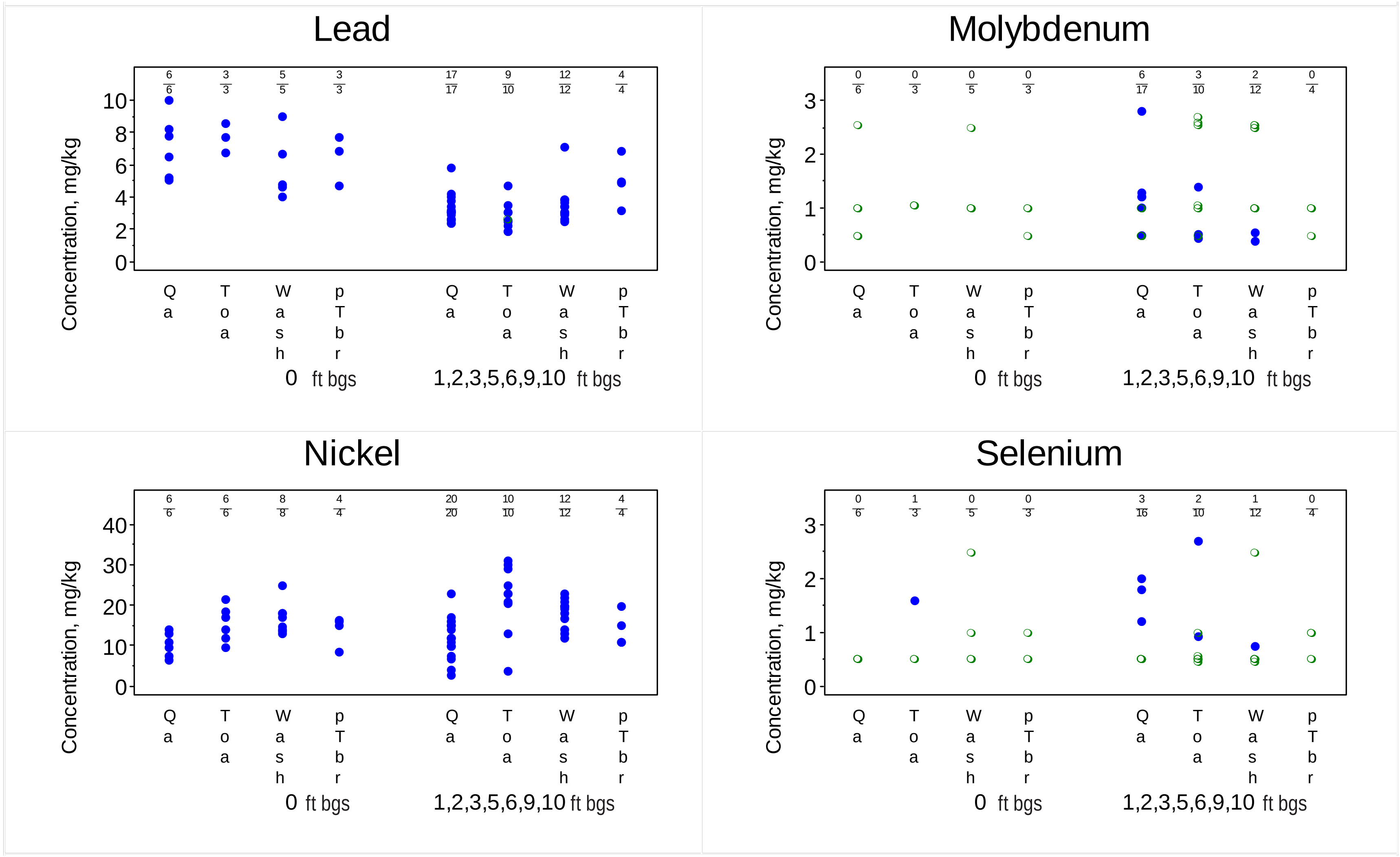

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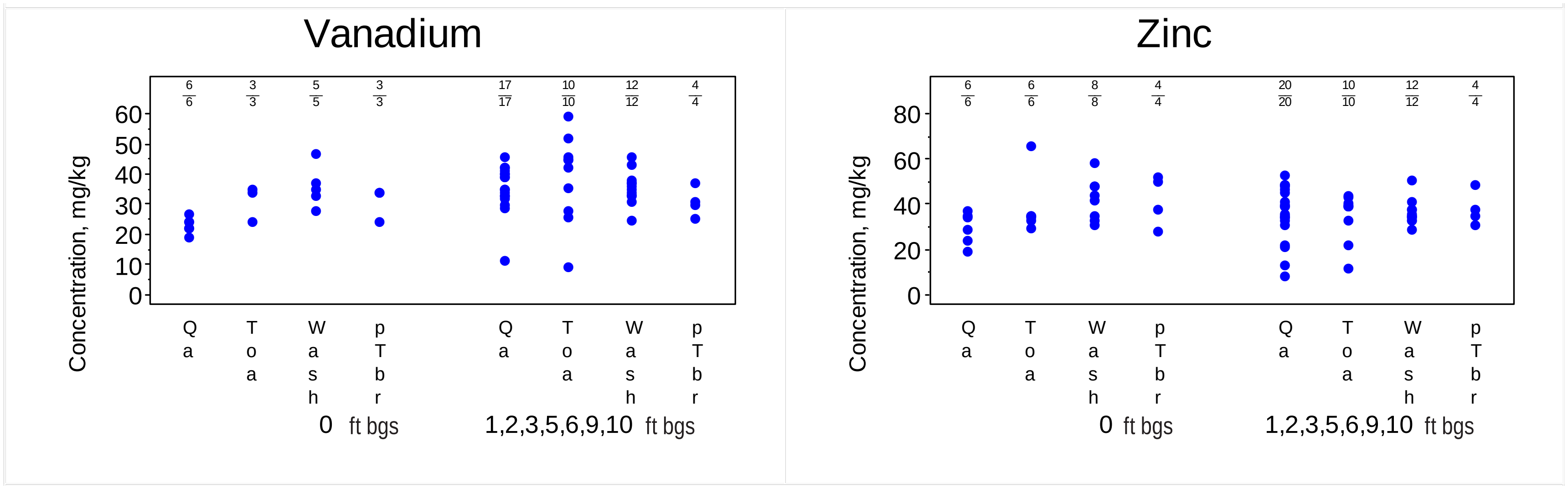

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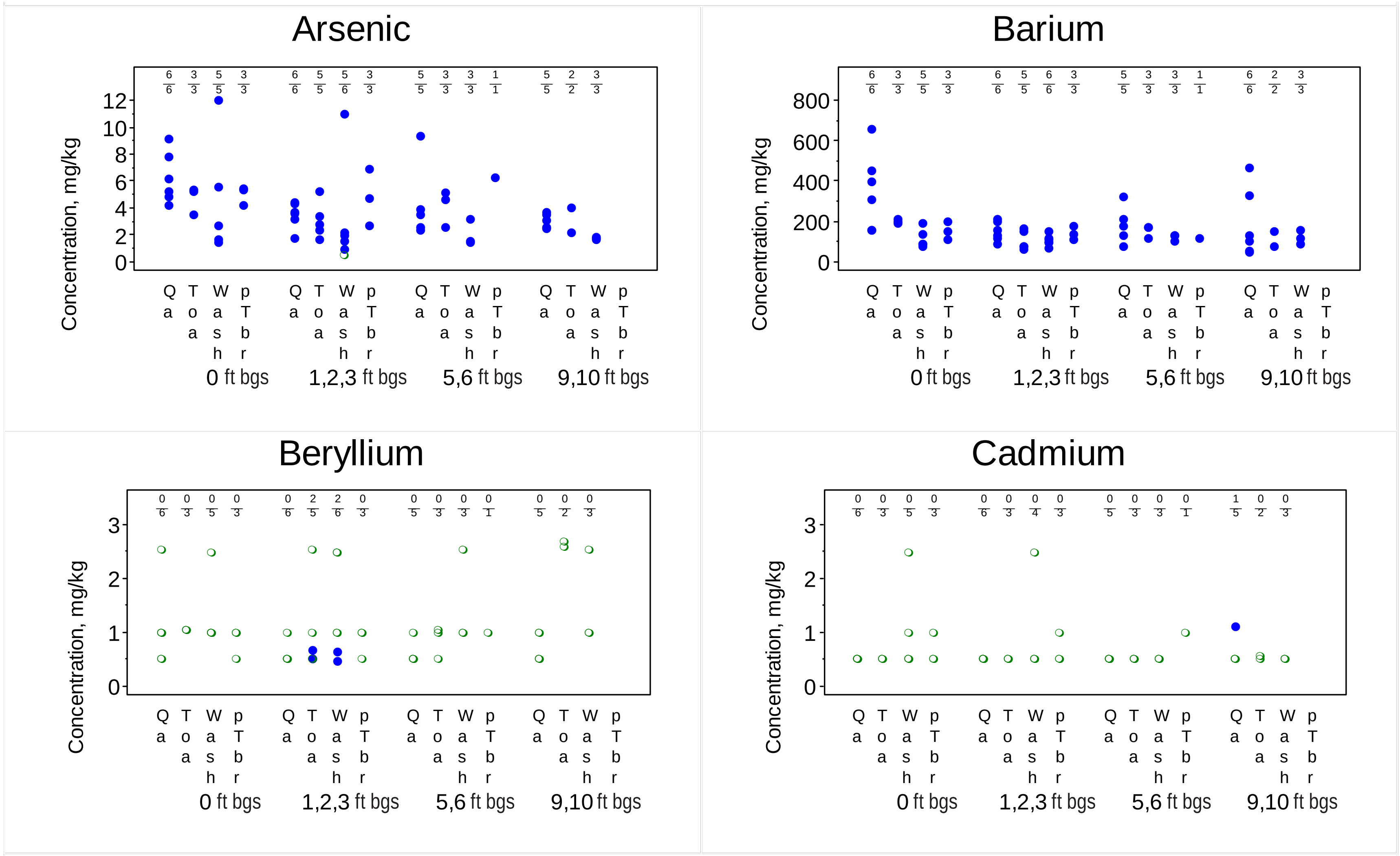

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FIGURE 3
SCATTER PLOTS BY FOUR SOIL TYPES AND FOUR DEPTHS FOR BACKGROUND CONCENTRATIONS
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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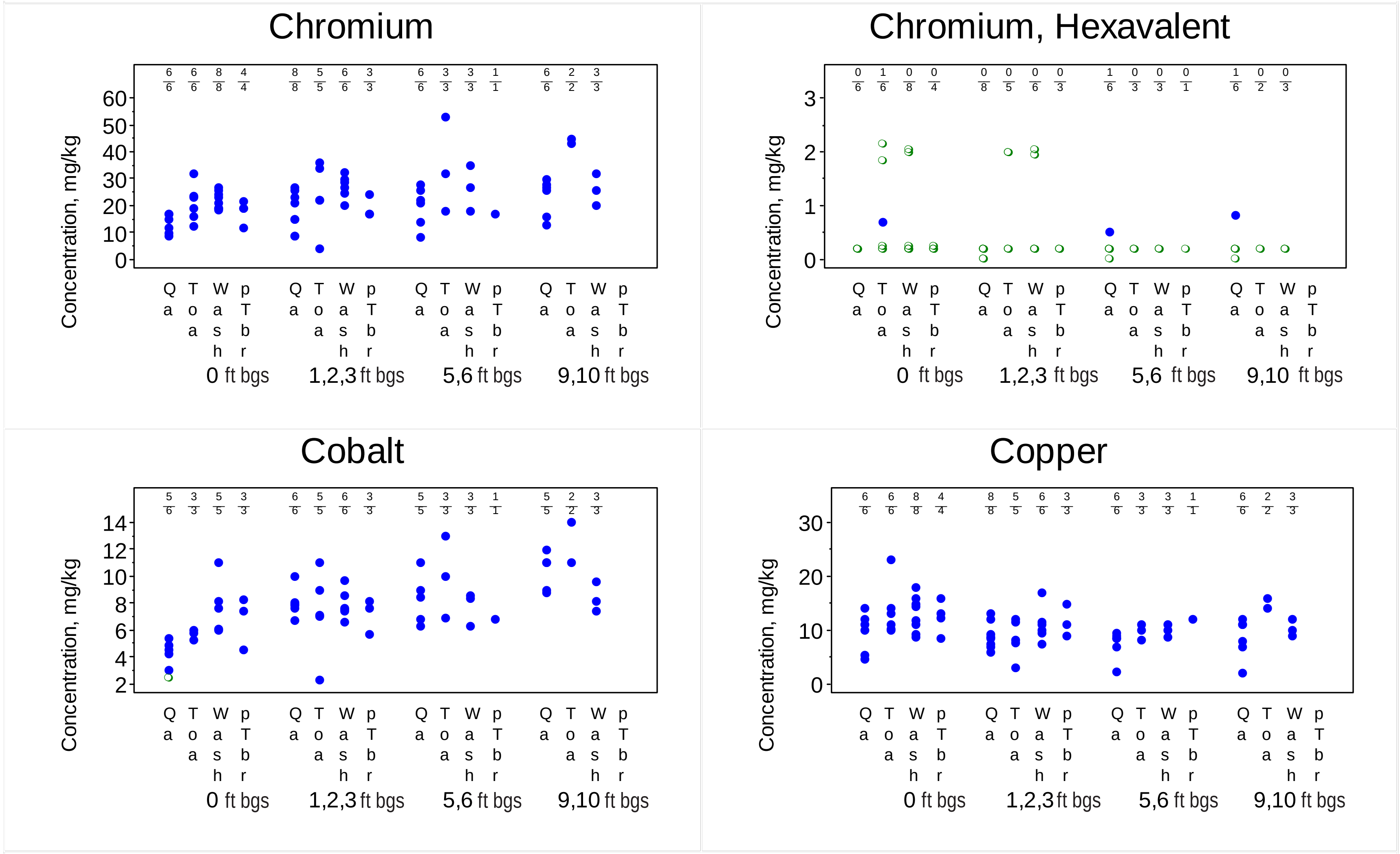

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- ● Detected value
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FIGURE 3
SCATTER PLOTS BY FOUR SOIL TYPES AND FOUR DEPTHS FOR BACKGROUND CONCENTRATIONS

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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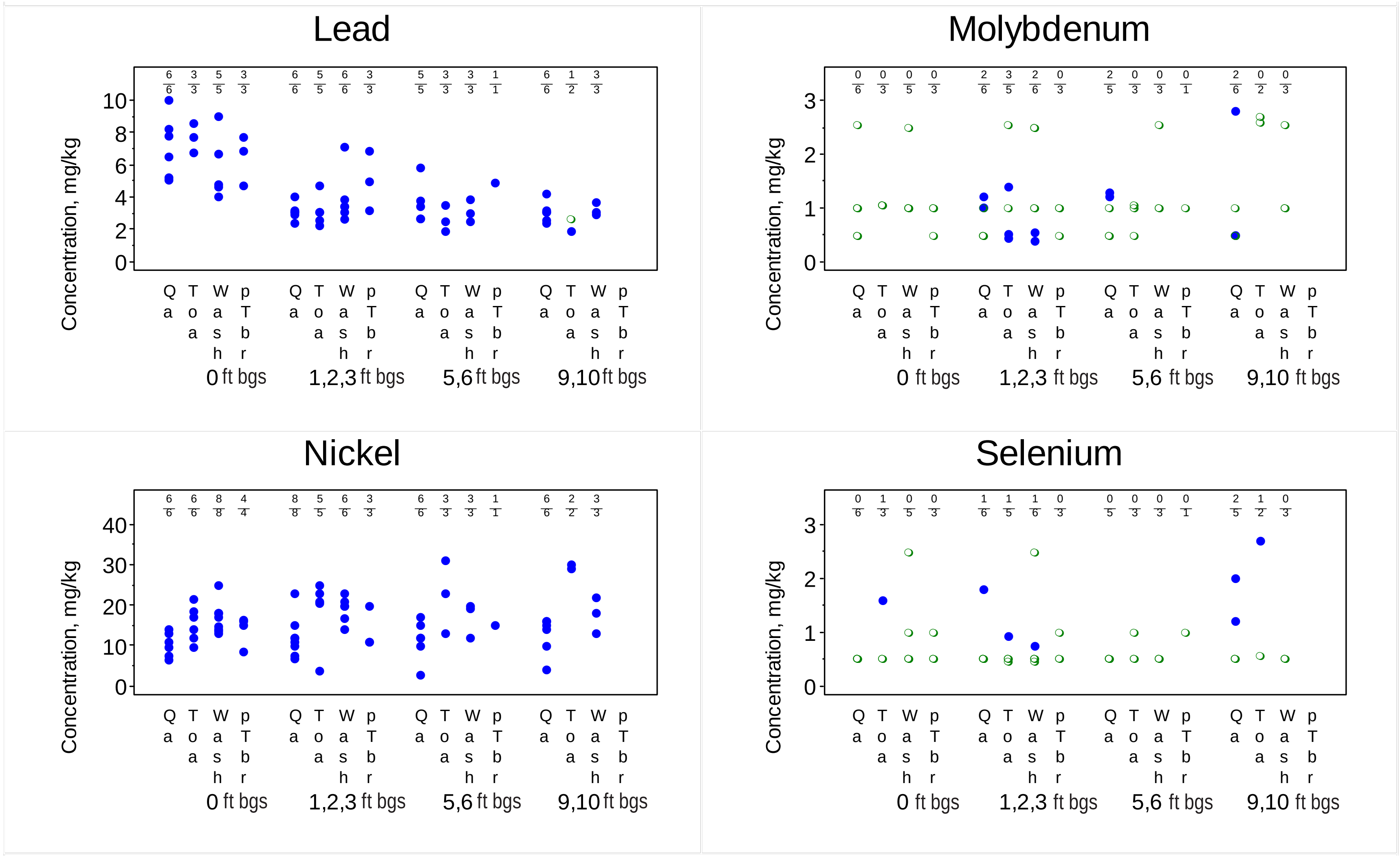

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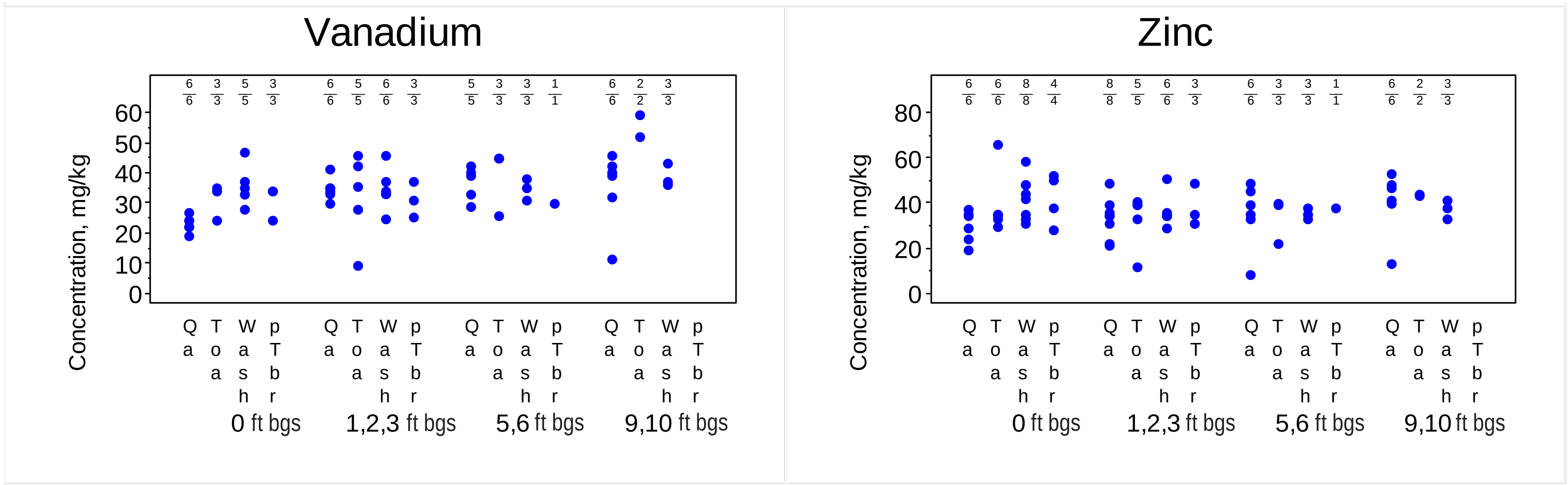

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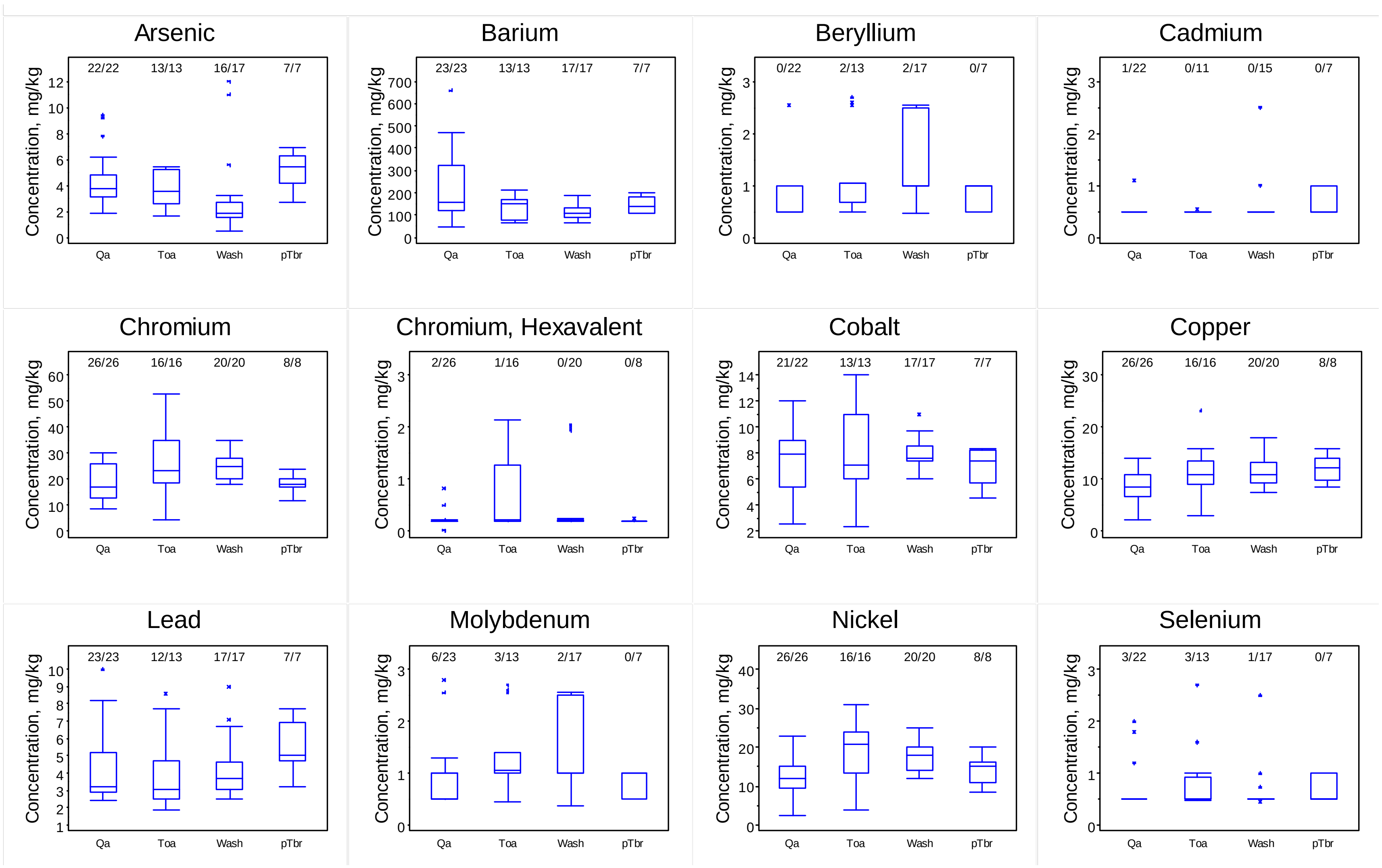

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mg/kg = milligram per kilogram

● Detected value
○ Non-detected value

FIGURE 4
BOX AND WHISKER PLOTS BY SOIL TYPES
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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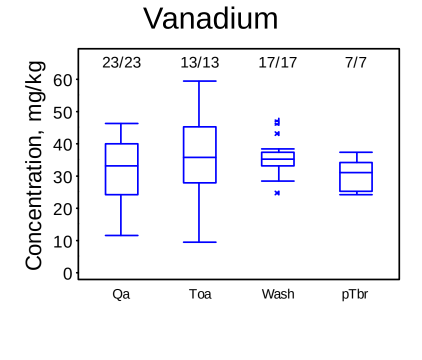

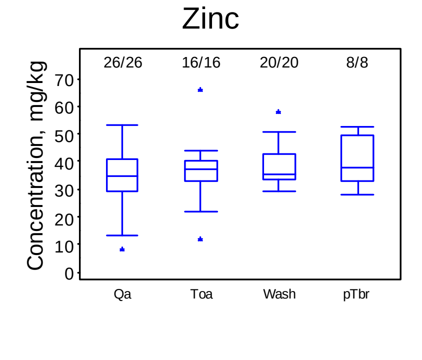

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○ Non-detected value

FIGURE 4
BOX AND WHISKER PLOTS BY SOIL TYPES
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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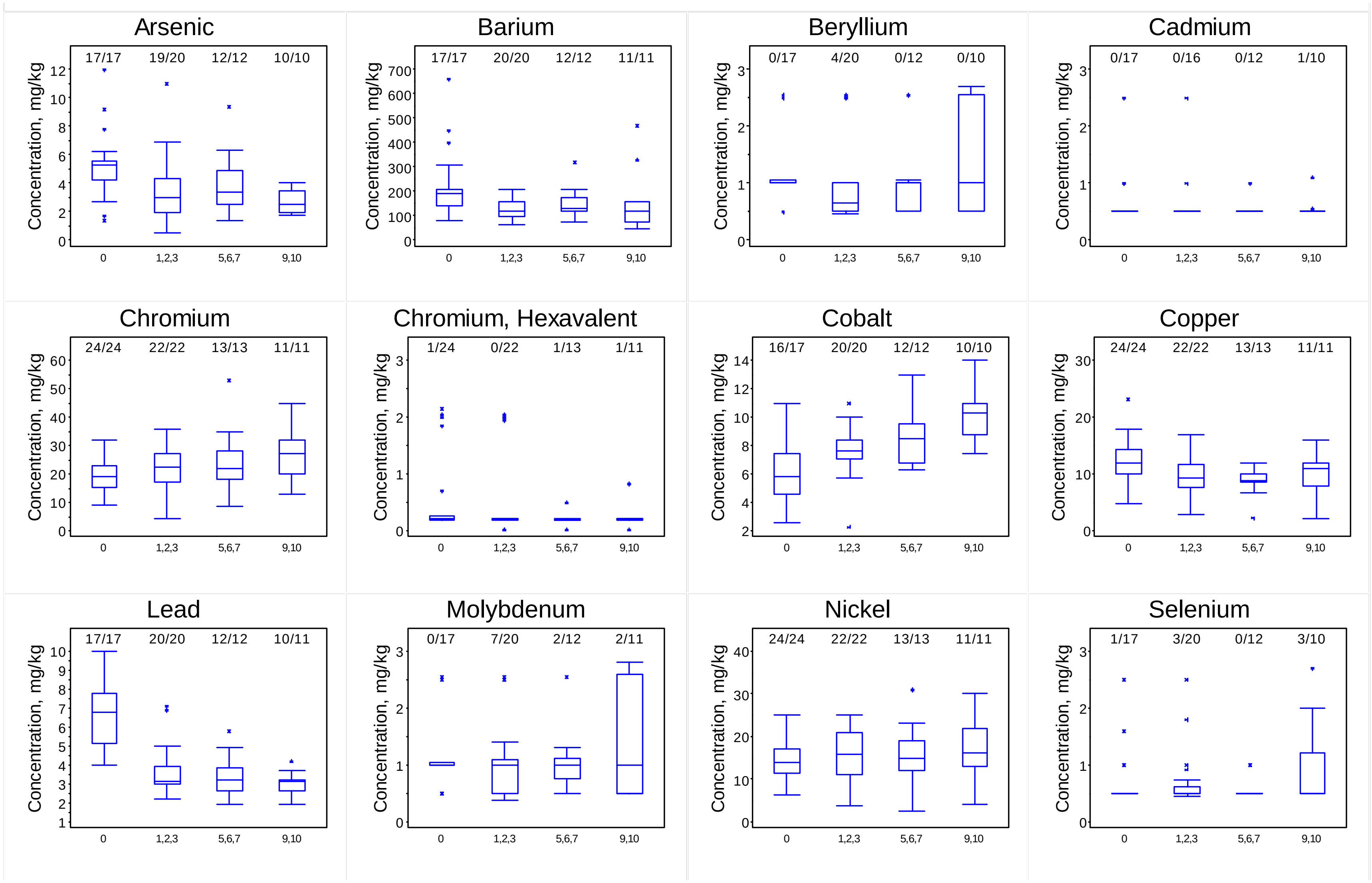

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FIGURE 5

BOX-AND-WHISKER PLOTS BY DEPTH

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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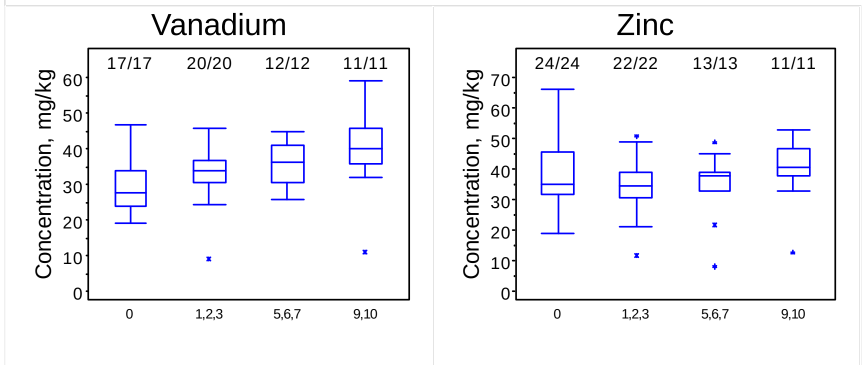

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FIGURE 5
BOX-AND-WHISKER PLOTS BY DEPTH
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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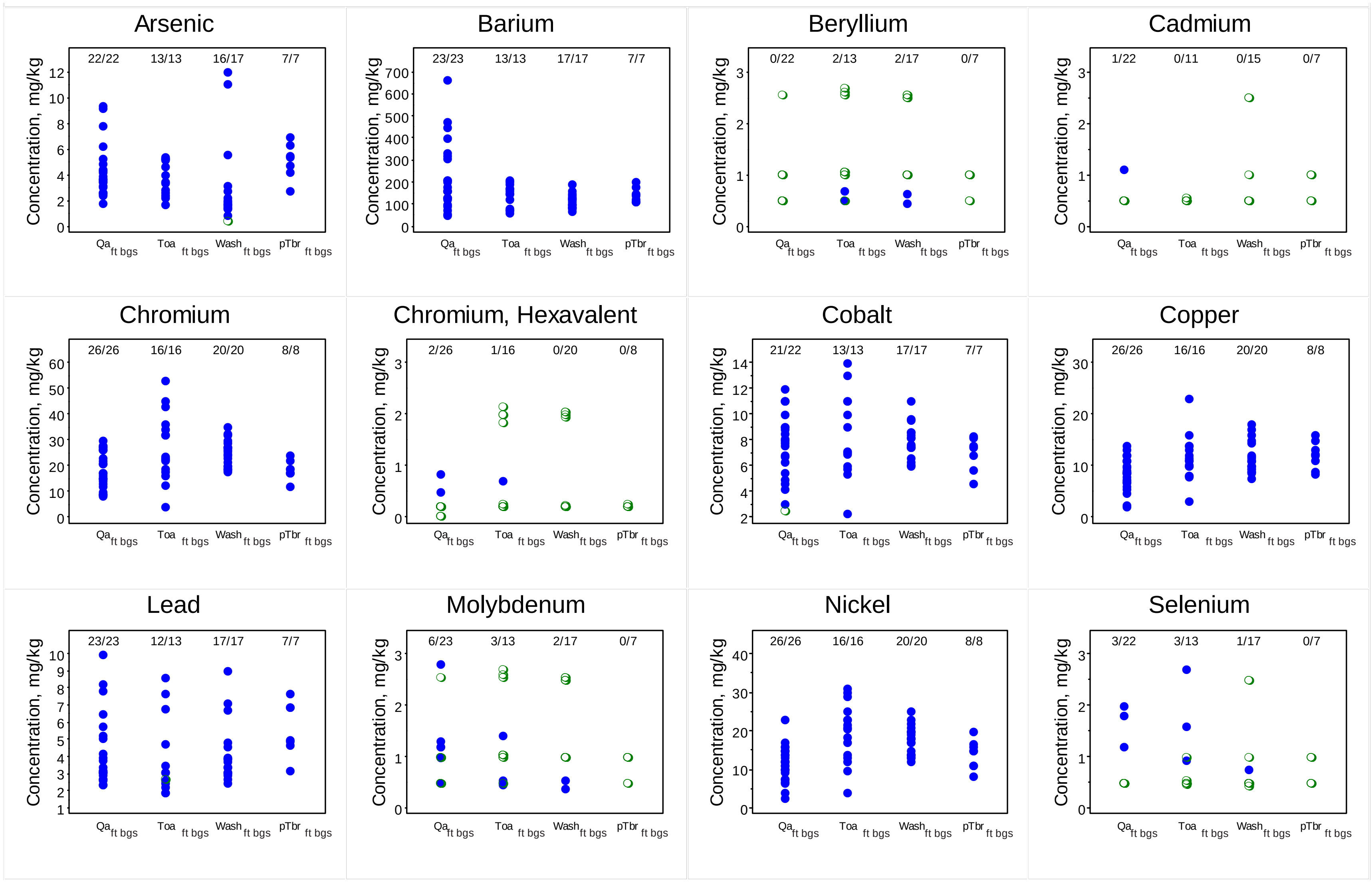

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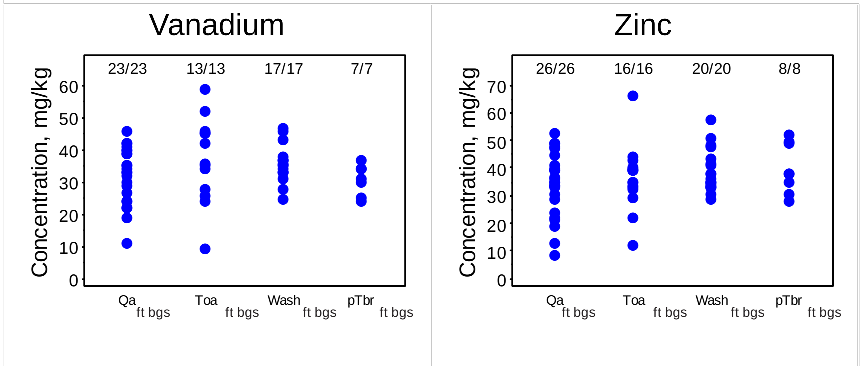
FIGURE 6
SCATTER PLOTS BY SOIL TYPE
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL

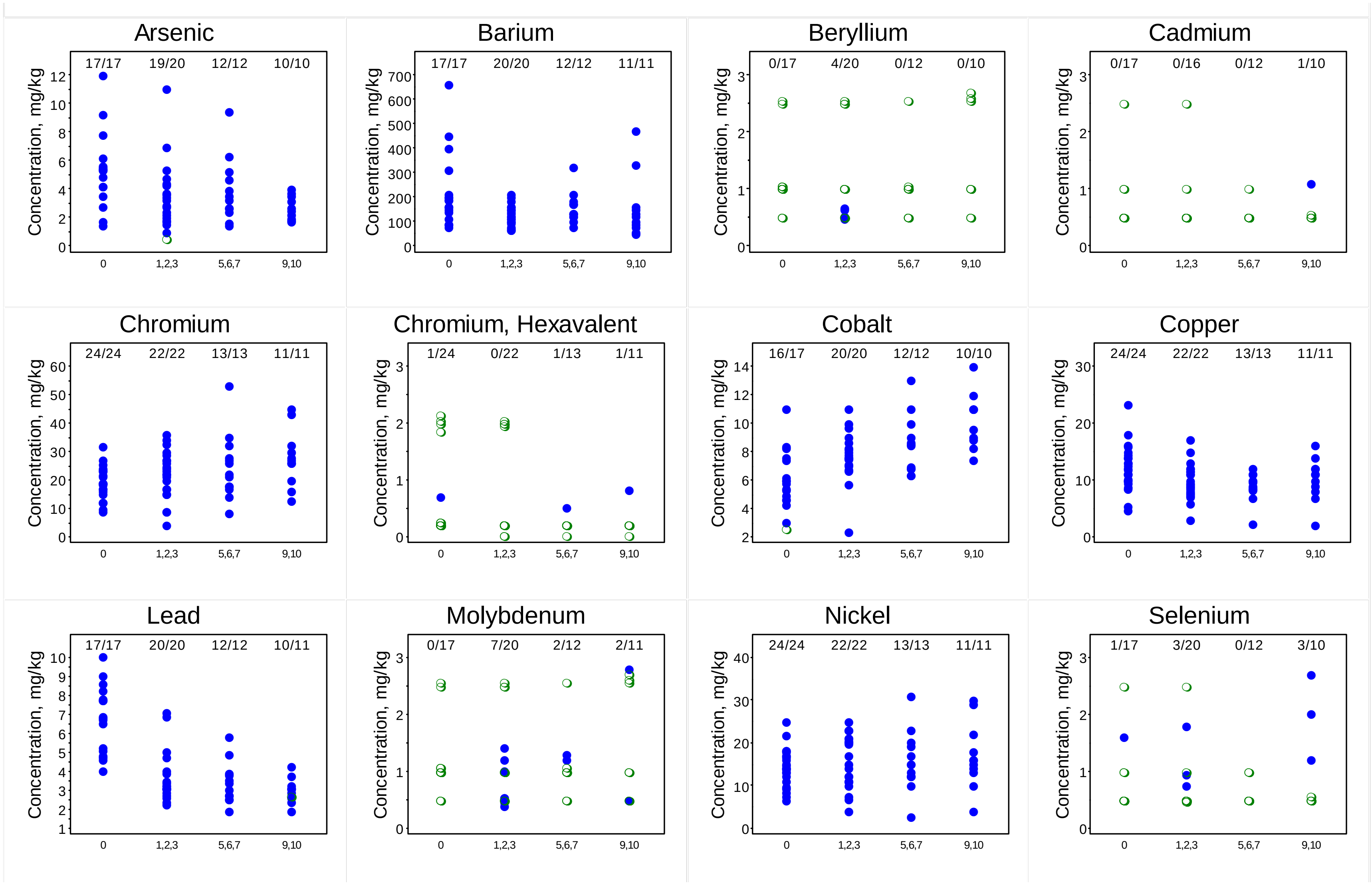


LEGEND

Qa = Quaternary Alluvium and Surficial deposits, undifferentiated
Toa = Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
Wash (Qya) = Recent wash deposits
pTbr = Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granite Rock)
ft bgs = feet below ground surface
mg/kg = milligram per kilogram

FIGURE 6
SCATTER PLOTS BY SOIL TYPE
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL



LEGEND

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Toa = Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)

Wash (Qya) = Recent wash deposits

pTbr = Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granite Rock)

mg/kg = milligram per kilogram

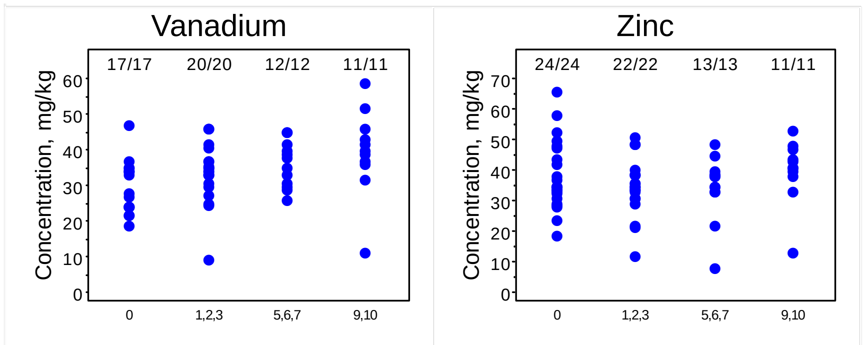
● Detected value

○ Non-detected value

FIGURE 7
SCATTER PLOTS BY DEPTH

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL



LEGEND

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Toa = Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
Wash (Qya) = Recent wash deposits
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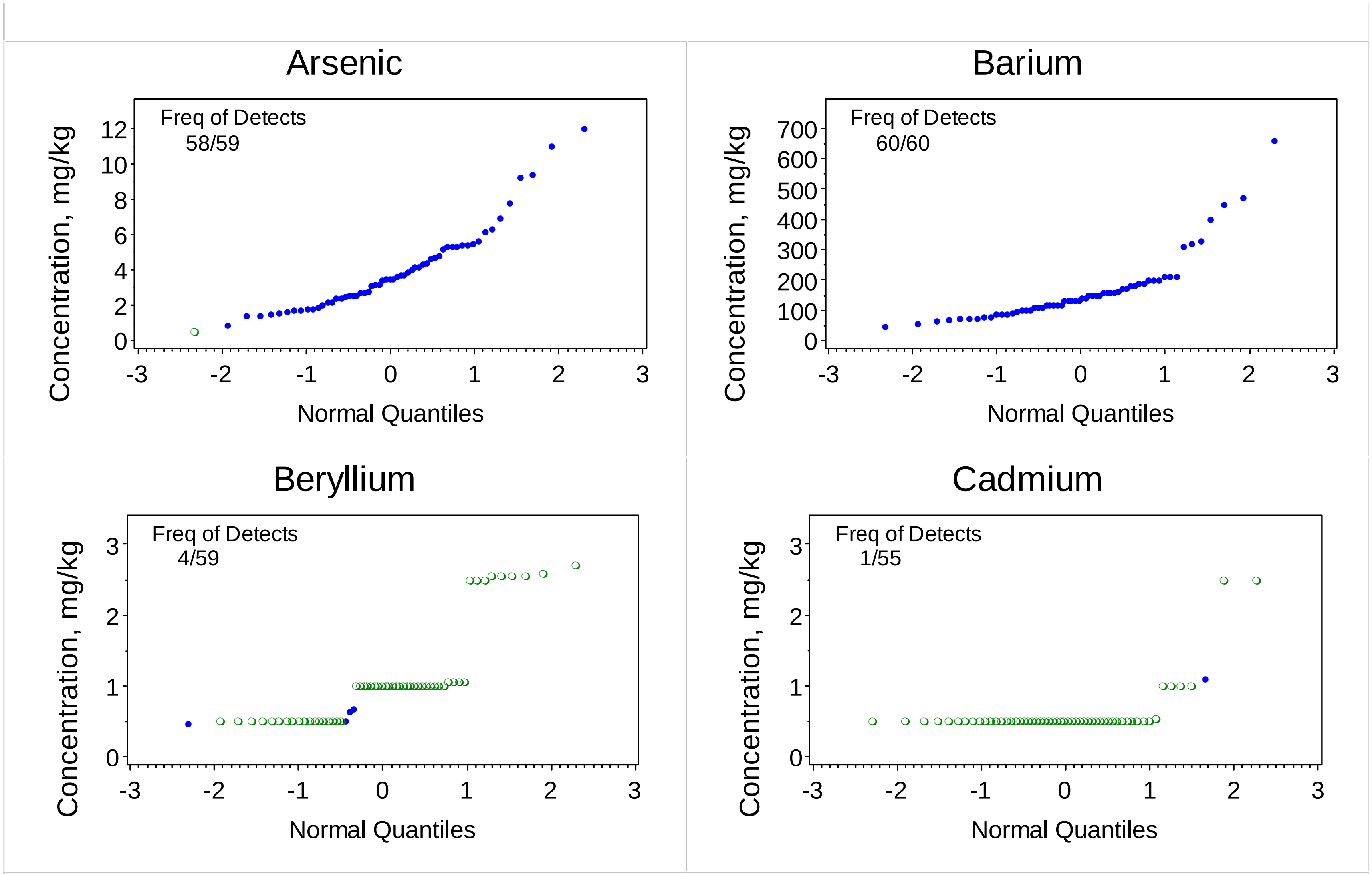
mg/kg = milligram per kilogram

● Detected value
○ Non-detected value

FIGURE 7
SCATTER PLOTS BY DEPTH
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL



LEGEND

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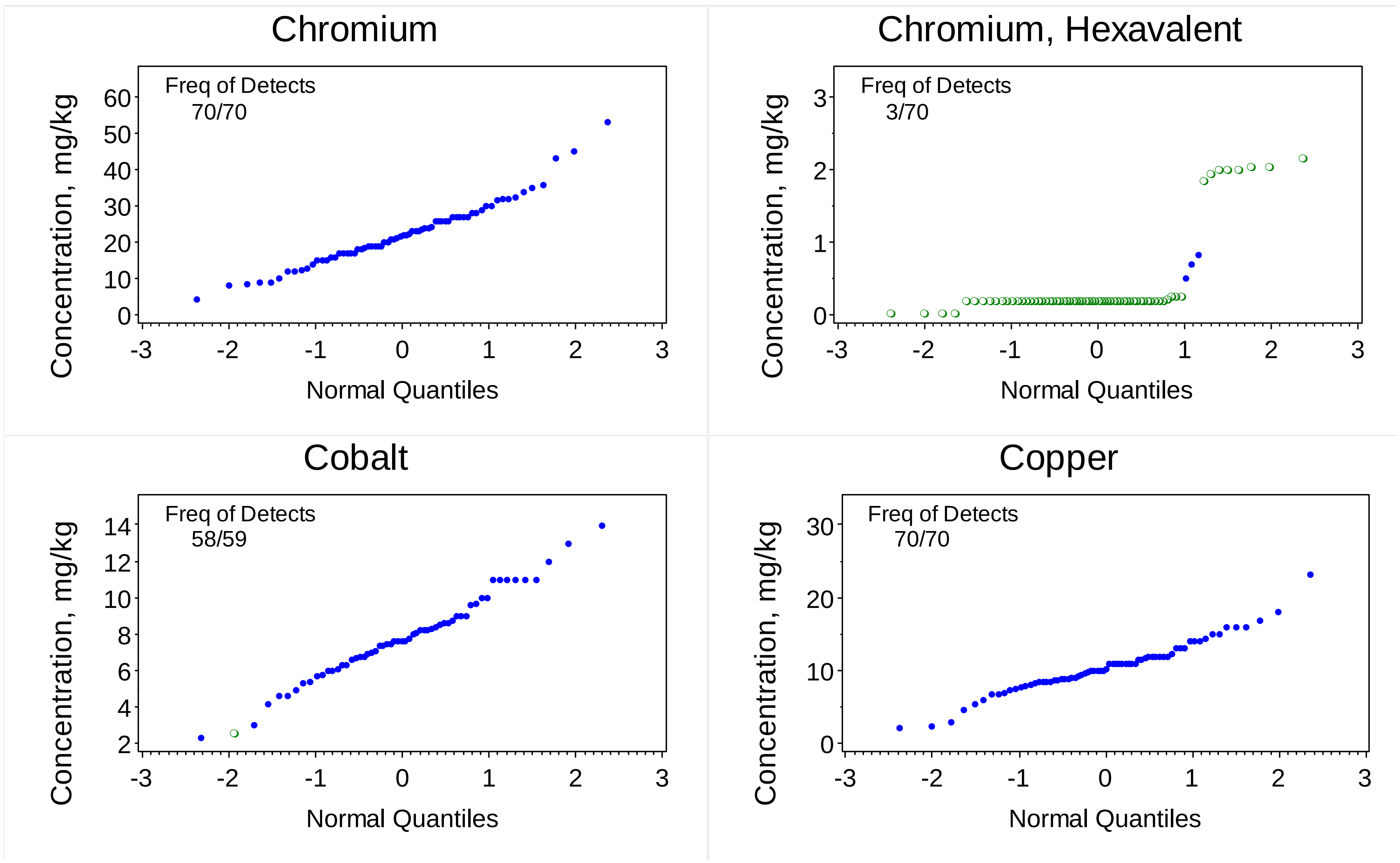
ft bgs = feet below ground surface
mg/kg = milligram per kilogram

● Detected value
○ Non-detected value

FIGURE 8
PROBABILITY PLOTS OF COMBINED DATA
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL



LEGEND

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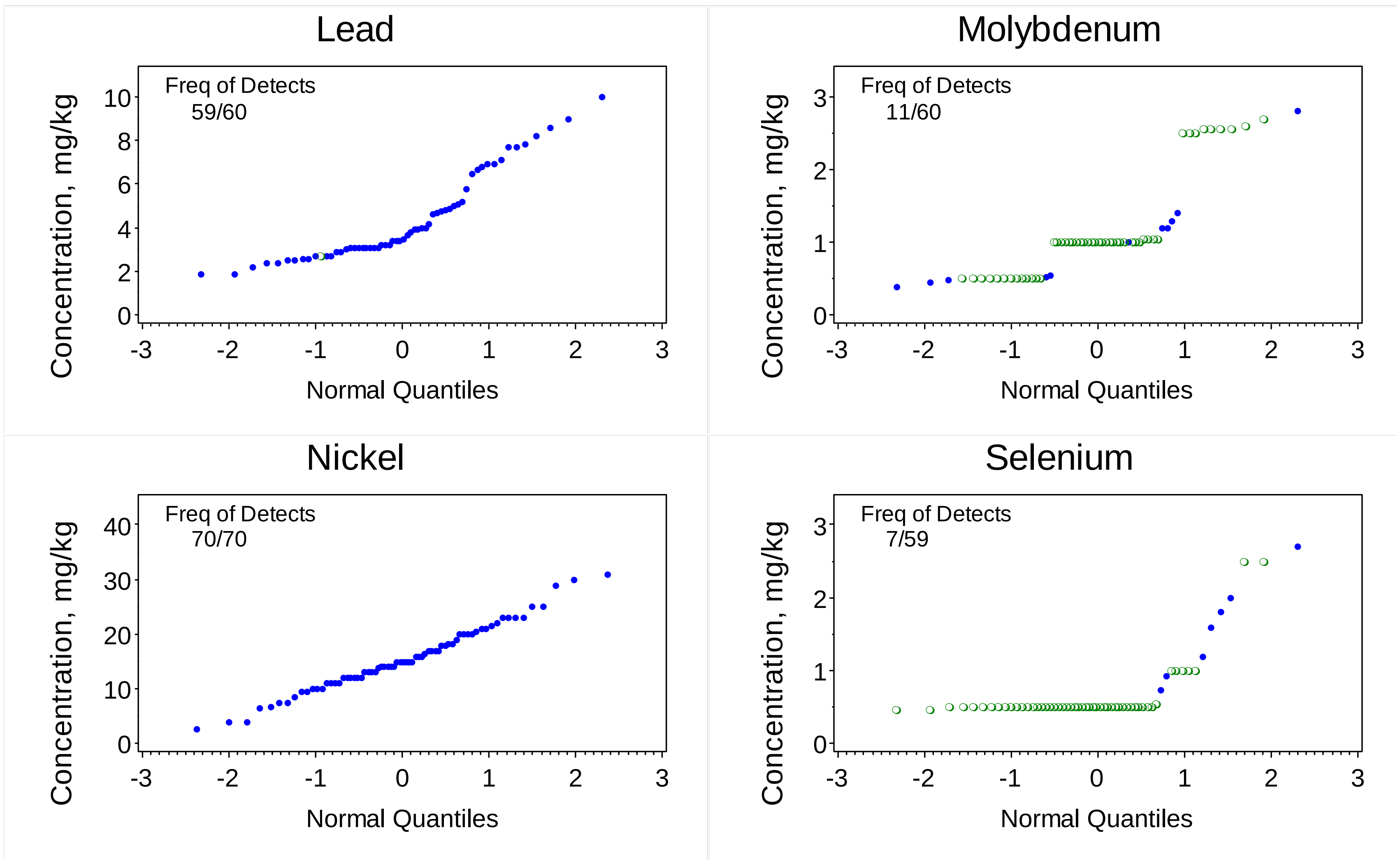
FIGURE 8
PROBABILITY PLOTS OF COMBINED DATA
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL



LEGEND

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Toa = Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
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● Detected value
○ Non-detected value

FIGURE 8
PROBABILITY PLOTS OF COMBINED DATA
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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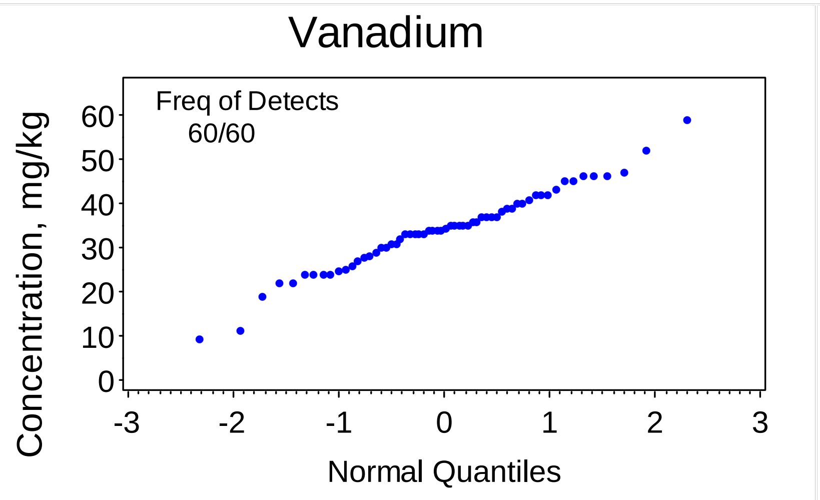

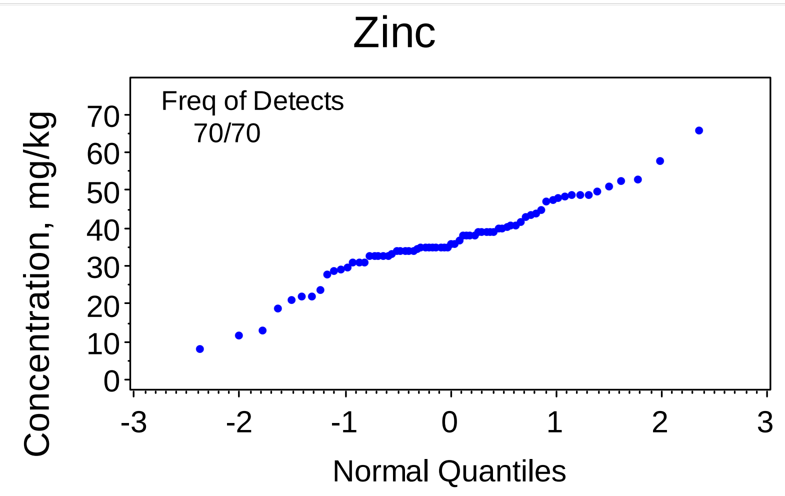

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FIGURE 8
PROBABILITY PLOTS OF COMBINED DATA
SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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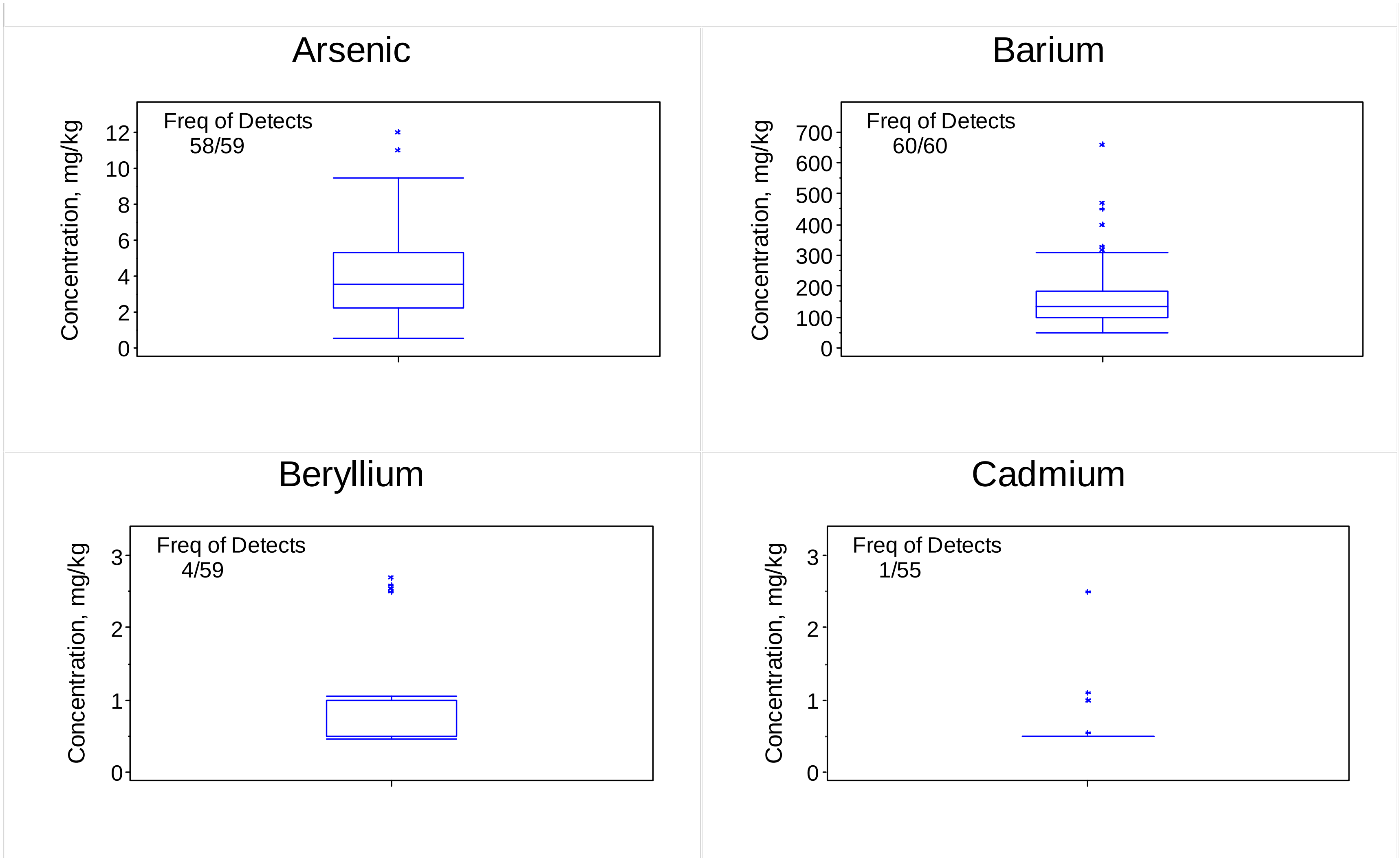

LEGEND

mg/kg = milligram per kilogram

- Detected value
- Non-detected value

FIGURE 9

BOX AND WHISKER PLOTS OF COMBINED DATA

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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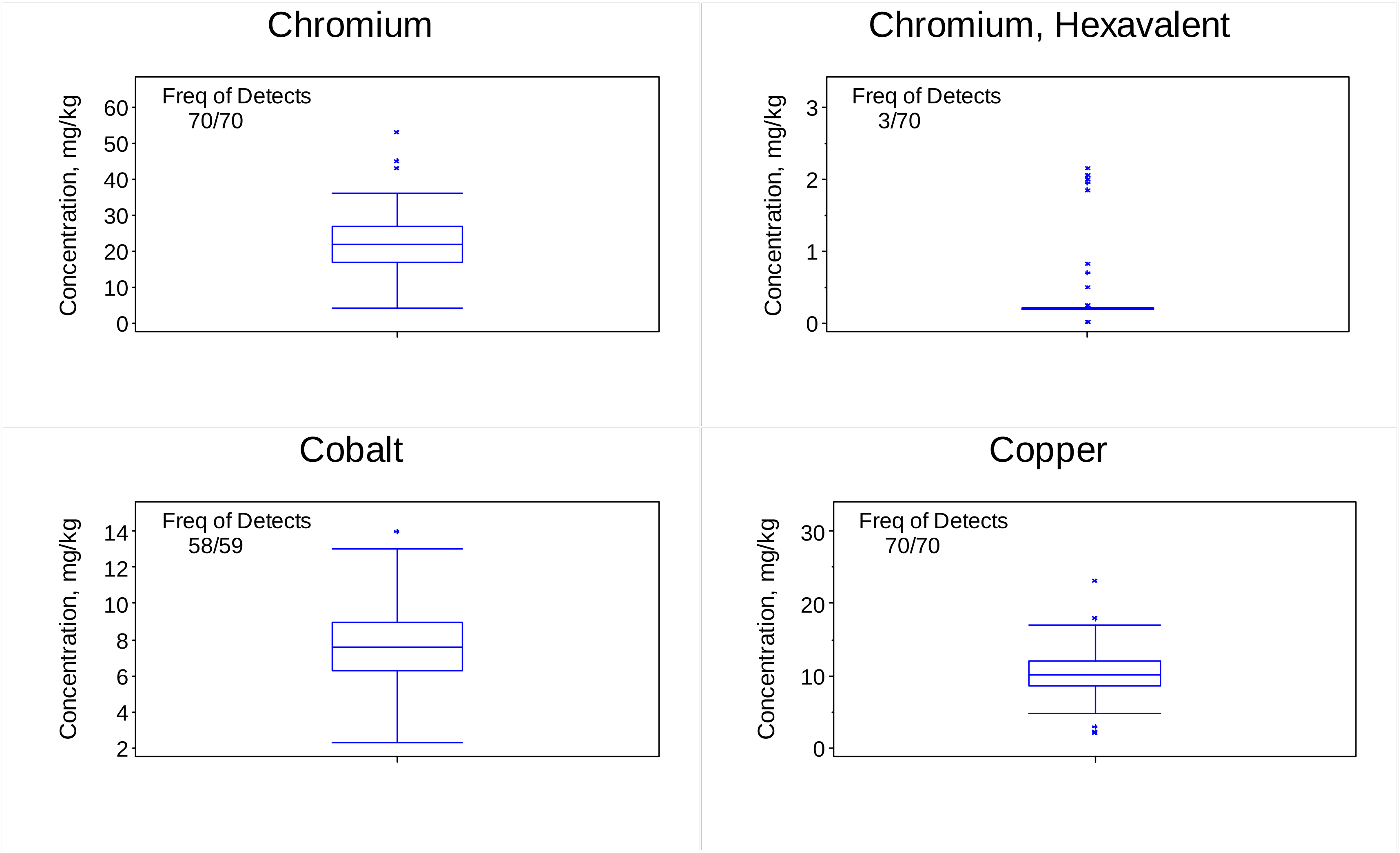


LEGEND

mg/kg = milligram per kilogram

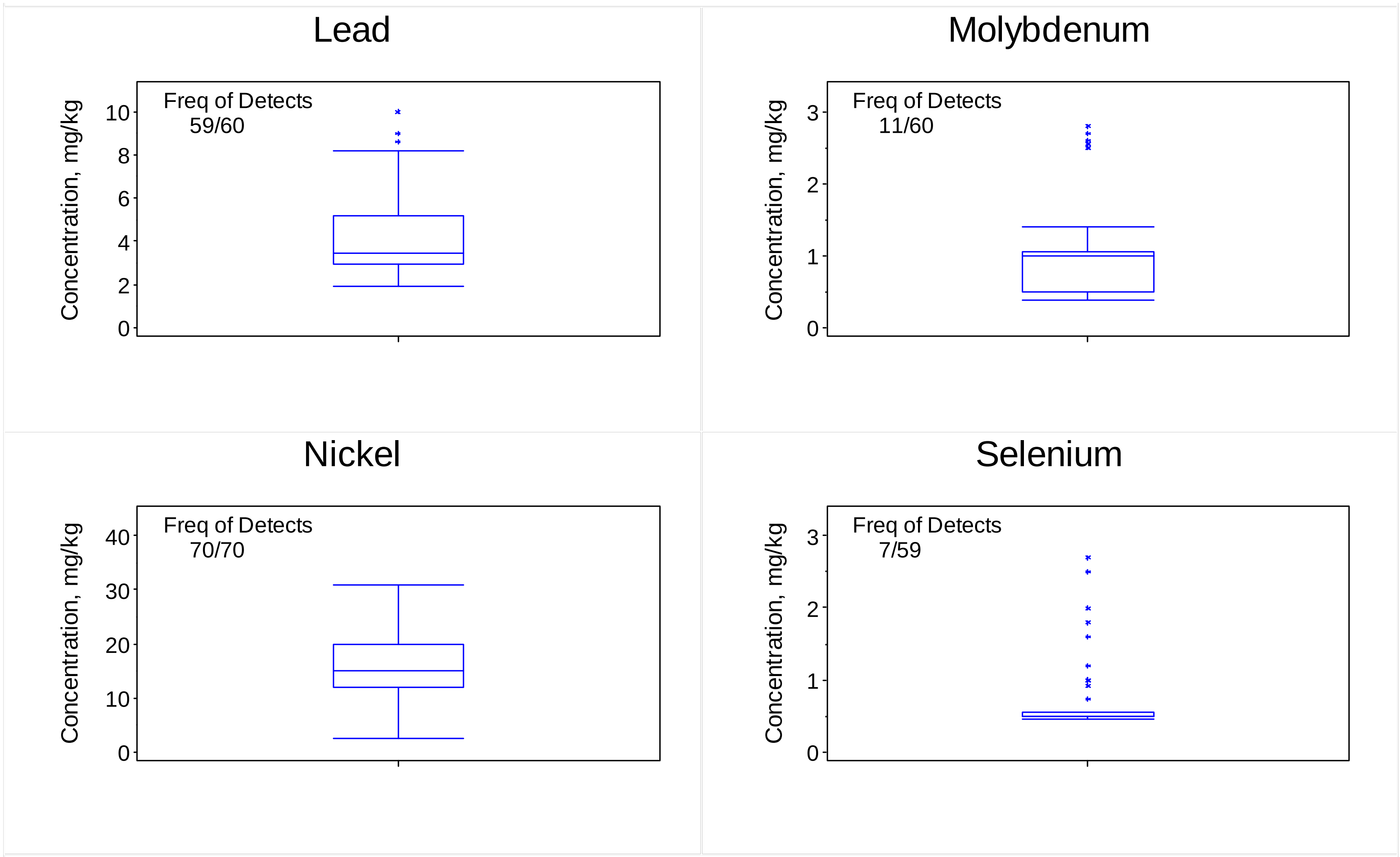
- Detected value
- Non-detected value

FIGURE 9

BOX AND WHISKER PLOTS OF COMBINED DATA

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL



LEGEND

mg/kg = milligram per kilogram

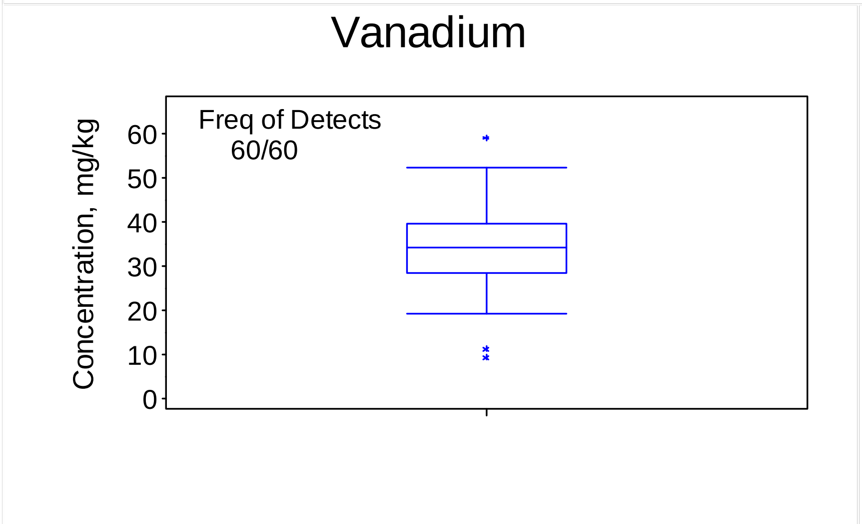
- Detected value
- Non-detected value

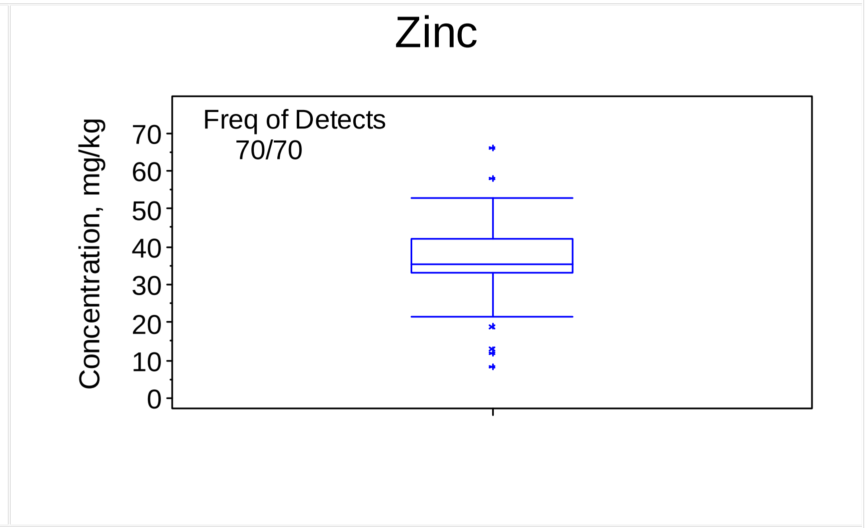
FIGURE 9

BOX AND WHISKER PLOTS OF COMBINED DATA

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

CH2MHILL





LEGEND

mg/kg = milligram per kilogram

- Detected value
- Non-detected value

FIGURE 9

BOX AND WHISKER PLOTS OF COMBINED DATA

SOIL BACKGROUND INVESTIGATION AT THE PACIFIC GAS AND ELECTRIC COMPANY TOPOCK COMPRESSOR STATION, NEEDLES, CALIFORNIA

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Appendix A
Data Set

Soil Sample Results; Metals
Background Data Set
Soil Background Investigation
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

					Metals (mg/kg)																	
Location	Lithologic Unit	Sample Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium, Hexavalent	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
BGW-1	Toa	02/19/03	0	N	---	---	---	---	---	31.8	ND (4.3)	---	23.2 ^	---	---	---	21.6	---	---	---	---	66.1
BGW-1	Toa	02/19/03	1	N	---	2.39	162	0.672	---	22	4 ^	7.09	11.6	4.75	---	0.529	20.4	0.927	---	---	35.7	33.1
BGW-2	Toa	02/19/03	0	N	---	---	---	---	---	23.7	ND (3.7)	---	10.2	---	---	---	18.3	---	---	---	---	29.5
BGW-2	Toa	02/19/03	1	N	---	1.68	63.5	0.512	---	22.3	ND (4)	7.02	7.73	2.59	---	0.451 J	21	ND (0.943)	---	---	27.7	40.5
BGW-3	Wash (Qya)	02/19/03	0	N	---	---	---	---	---	18.5	ND (4.1)	---	11.8	---	---	---	14.8	---	---	---	---	47.7
BGW-3	Wash (Qya)	02/19/03	1	N	---	1.51	97.3	0.636	---	24.5	ND (4.1)	7.44	11.5	3.43	---	0.542 J	19.9	ND (0.911)	---	---	34.2	34.6
BGW-4	Wash (Qya)	02/19/03	0	N	---	---	---	---	---	21.3	ND (4)	---	14.4	---	---	---	13.8	---	---	---	---	43.6
BGW-4	Wash (Qya)	02/19/03	1	N	---	0.884	66.9	0.459	---	32.4	ND (3.9)	7.61	7.5	3.08	---	0.383 J	16.9	0.738 J	---	---	24.6	29.1
BKG-01	Qa	09/18/08	0-0.5	N	ND (2)	4.2	310	ND (2)	ND (1)	17	ND (0.406)	4.9	14	7.8	ND (0.1)	ND (2)	14	ND (1)	ND (2)	ND (4.1)	24	34
BKG-01	Qa	09/18/08	2-3	N	ND (2)	3.2	200	ND (2)	ND (1)	27	ND (0.406)	7.8	13	3.2	ND (0.1)	ND (2)	23	ND (1)	ND (2)	ND (4)	35	31
BKG-02	Wash (Qya)	09/18/08	0-0.5	N	ND (2)	1.7	77	ND (2)	ND (1)	23	ND (0.41)	6	9.3	6.7	ND (0.1)	ND (2)	14	ND (1)	ND (2)	ND (4)	28	31
BKG-02	Wash (Qya)	09/18/08	2-3	N	ND (2)	2	120	ND (2)	ND (1)	29	ND (0.407)	7.5	10	3.4	ND (0.1)	ND (2)	20	ND (1)	ND (2)	ND (4.1)	33	34
BKG-02	Wash (Qya)	09/18/08	5-6	N	ND (2)	1.6	100	ND (2)	ND (1)	35	ND (0.405)	8.4	10	2.5	ND (0.1)	ND (2)	20	ND (1)	ND (2)	ND (4)	35	35
BKG-02	Wash (Qya)	09/18/08	9-10	N	ND (2)	1.7	88	ND (2)	ND (1)	26	ND (0.407)	8.2	9.9	2.9	ND (0.1)	ND (2)	18	ND (1)	ND (2)	ND (4.1)	36	38
BKG-03	Wash (Qya)	09/18/08	0-0.5	N	ND (2)	2.7	87	ND (2)	ND (1)	24	ND (0.41)	7.6	11	4.8	ND (0.1)	ND (2)	18	ND (1)	ND (2)	ND (4.1)	33	35
BKG-03	Wash (Qya)	09/18/08	2-3	N	ND (2)	ND (1)	99	ND (5)	ND (1)	30	ND (0.404)	8.6	11	2.7	ND (0.1)	ND (5)	21	ND (1)	ND (5)	ND (10)	37	36
BKG-03	Wash (Qya)	09/18/08	5-6	N	ND (2)	1.4	130	ND (5.1)	ND (1)	27	ND (0.404)	8.6	11	3	ND (0.1)	ND (5.1)	19	ND (1)	ND (5.1)	ND (10)	38	38
BKG-03	Wash (Qya)	09/18/08	9-10	N	ND (2)	1.8	160	ND (5.1)	ND (1)	32	ND (0.405)	9.6	12	3.1	ND (0.1)	ND (5.1)	22	ND (1)	ND (5.1)	ND (10)	43	41
BKG-04	Wash (Qya)	09/18/08	0-0.5	N	ND (2)	1.4	81	ND (2)	ND (1)	19	ND (0.408)	6.1	8.6	3.6	ND (0.1)	ND (2)	12	ND (1)	ND (2)	ND (4.1)	34	33
BKG-04	Wash (Qya)	09/18/08	0-0.5	FD	ND (2)	1.4	87	ND (2)	ND (1)	19	ND (0.409)	5.8	7.8	4	ND (0.1)	ND (2)	13	ND (1)	ND (2)	ND (4.1)	35	33
BKG-04	Wash (Qya)	09/18/08	2-3	N	ND (2)	2.2	110	ND (2)	ND (1)	20	ND (0.407)	6.6	9.5	3.9	ND (0.1)	ND (2)	14	ND (1)	ND (2)	ND (4.1)	33	35
BKG-04	Wash (Qya)	09/18/08	5-6	N	ND (2)	3.2	130	ND (2)	ND (1)	18	ND (0.409)	6.3	8.8	3.9	ND (0.1)	ND (2)	12	ND (1)	ND (2)	ND (4.1)	31	33
BKG-04	Wash (Qya)	09/18/08	9-10	N	ND (2)	1.9	120	ND (2)	ND (1)	20	ND (0.407)	7.4	9	3.7	ND (0.1)	ND (2)	13	ND (1)	ND (2)	ND (4.1)	37	33
BKG-05	Toa	09/19/08	0-0.5	N	ND (2.1)	5.4	200	ND (2.1)	ND (1)	19	ND (0.415)	6	14	7.7	ND (0.11)	ND (2.1)	14	ND (1)	ND (2.1)	ND (4.2)	35	35
BKG-05	Toa	09/19/08	2-3	N	ND (2)	3.4	77	ND (1)	ND (1)	4.2	ND (0.402)	2.3	3	3.1	ND (0.099)	1.4	3.9	ND (1)	ND (1)	ND (2)	9.4	12
BKG-05	Toa	09/19/08	5-6	N	ND (2)	2.6	170	ND (1)	ND (1)	18	ND (0.403)	6.9	8.2	1.9	ND (0.1)	ND (1)	13	ND (1)	ND (1)	ND (2)	26	22
BKG-06	Toa	09/19/08	0-0.5	N	ND (2.1)	3.5	210	ND (2.1)	ND (1)	23	ND (0.411)	5.8	11	6.8	ND (0.1)	ND (2.1)	17	ND (1)	ND (2.1)	ND (4.1)	34	35
BKG-06	Toa	09/19/08	2-3	N	ND (2)	2.8	73	ND (5.1)	ND (1)	34	ND (0.41)	9	12	3.1	ND (0.1)	ND (5.1)	25	ND (1)	ND (5.1)	ND (10)	42	39
BKG-06	Toa	09/19/08	5-6	N	ND (2)	5.2	170	ND (2)	ND (1)	32	ND (0.411)	10	11	3.5	ND (0.1)	ND (2)	23	ND (2)	ND (2)	ND (4.1)	45	40
BKG-06	Toa	09/19/08	9-10	N	ND (2.1)	4	150	ND (5.2)	ND (1)	43	ND (0.415)	11	16	1.9	ND (0.1)	ND (5.2)	30	2.7	ND (5.2)	ND (10)	59	43
BKG-07	Toa	09/19/08	0-0.5	N	ND (2.1)	4.7	190	ND (2.1)	ND (1.1)	16	ND (0.421)	4.8	10	8.4	ND (0.11)	ND (2.1)	12	ND (1.1)	ND (2.1)	ND (4.2)	24	33
BKG-07	Toa	09/19/08	0-0.5	FD	ND (2.1U)	5.3	190 J	ND (2.1)	ND (1)	15	0.707	5.3	9.8	8.6	ND (0.1)	ND (2.1)	12	1.6	ND (2.1)	ND (4.2)	22	34
BKG-07	Toa	09/19/08	2-3	N	ND (2)	5.3	150	ND (2)	ND (1)	36	ND (0.409)	11	8.1	2.2	ND (0.1)	ND (2)	23	ND (1)	ND (2)	ND (4.1)	46	39
BKG-07	Toa	09/19/08	5-6	N	ND (2.1)	4.6	120	ND (2.1)	ND (1)	53	ND (0.405)	13	10	2.5	ND (0.1)	ND (2.1)	31	ND (1)	ND (2.1)	ND (4.1)	45	39
BKG-07	Toa	09/19/08	9-10	N	ND (2.1)	2.2	74	ND (5.4)	ND (1.1)	45	ND (0.406)	14	14	ND (5.4)	ND (0.11)	ND (5.4)	29	ND (1.1)	ND (5.4)	ND (11)	52	44
BKG-08	Wash (Qya)	08/23/08	0-0.5	N	ND (10)	12	190	ND (5)	ND (5)	27	ND (0.402)	11	18	9	ND (0.1)	ND (5)	25	ND (5)	ND (5)	ND (10)	47	58
BKG-08	Wash (Qya)	08/23/08	1-2	N	ND (10U)	11	150	ND (5)	ND (5)	27	ND (0.402)	9.7	17	7.1	ND (0.1)	ND (5)	23	ND (5)	ND (5)	ND (10)	46	51
BKG-09	Wash (Qya)	08/23/08	0-0.5	N	ND (4)	5.6	140	ND (2)	ND (2)	19	ND (0.402)	8.2	15	4.6	ND (0.1)	ND (2)	17	ND (2)	ND (2)	ND (4)	37	42
BKG-10	pTbr	09/19/08	0-0.5	N	ND (2)	4.2	150	ND (1)	ND (1)	12	ND (0.404)	4.6	8.4	6.9	ND (0.099)	ND (1)	8.4	ND (1)	ND (1)	ND (2)	24	28
BKG-10	pTbr	09/19/08	1-2	N	ND (2)	4.7	180	ND (2)	ND (1)	17	ND (0.402)	5.7	8.9	5	ND (0.1)	ND (2)	11	ND (1)	ND (2)	ND (4)	25	31
BKG-11	pTbr	09/19/08	0-0.5	N	ND (2)	5.3	200	ND (2)	ND (1)	19	ND (0.412)	8.3	16	7.7	ND (0.1)	ND (2)	14	ND (1)	ND (2)	ND (4)	34	50
BKG-11	pTbr	09/19/08	0-0.5	FD	ND (2)	5.4	200	ND (2)	ND (1)	19	ND (0.403)	8.2	16	7.5	ND (0.1)	ND (2)	15	ND (1)	ND (2)	ND (4)	33	50
BKG-11	pTbr	09/19/08	1-2	N	ND (2)	2.7	110	ND (1)	ND (1)	17	ND (0.402)	7.6	11	3.2	ND (0.1)	ND (1)	11	ND (1)	ND (1)	ND (2)	31	35
BKG-12	pTbr	08/23/08	0-0.5	N	ND (4)	5.5	110	ND (2)	ND (2)	19	ND (0.401)	7.4	13	4.7	ND (0.1)	ND (2)	16	ND (2)	ND (2)	ND (4)	34	38
BKG-12	pTbr	08/23/08	2-3	N	ND (4)	6.9	140	ND (2)	ND (2)	24	ND (0.402)	8.2	15	6.9	ND (0.1)	ND (2)	20	ND (2)	ND (2)	ND (4)	37	49
BKG-12	pTbr	08/23/08	5-6	N	ND (4)	6.3	120	ND (2)	ND (2)	17	ND (0.403)	6.8	12	4.9	ND (0.1)	ND (2)	15	ND (2)	ND (2)	ND (4)	30	38

Appendix A-1
Soil Sample Results; Metals
Background Data Set
Soil Background Investigation
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

					Metals (mg/kg)																	
Location	Lithologic Unit	Sample Date	Depth (ft bgs)	Sample Type	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium, Hexavalent	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
BKG-13	Qa	09/20/08	0-0.5	N	ND (2.1)	9.2	660	ND (5.1)	ND (1)	17	ND (0.414)	ND (5.1)	11	10	ND (0.1)	ND (5.1)	13	ND (1)	ND (5.1)	ND (10)	27	37
BKG-13	Qa	09/20/08	2-3	N	ND (2)	3.6	130	ND (1)	ND (1)	21	ND (0.41)	8	8.7	3.1	ND (0.1)	1.2	12	ND (1)	ND (1)	ND (2)	35	39
BKG-13	Qa	09/20/08	5-6	N	ND (2)	3.9	74	ND (1)	ND (1)	26	0.504	9	9.6	3.8	ND (0.1)	ND (1)	15	ND (1)	ND (1)	ND (2)	40	45
BKG-13	Qa	09/20/08	9-10	N	ND (2)	3.7	470	ND (2)	1.1	30	0.83	9	6.8	3.1	ND (0.1)	2.8	14	ND (1)	ND (2)	ND (4)	39	41
BKG-14	Qa	09/20/08	0-0.5	N	ND (2)	7.8	380	ND (2)	ND (1)	15	ND (0.405)	4.6	11	8	ND (0.1)	ND (2)	11	ND (1)	ND (2)	ND (4)	24	29
BKG-14	Qa	09/20/08	0-0.5	FD	ND (2)	7.4	450	ND (2)	ND (1)	15	ND (0.417)	4.4	12	8.2	ND (0.1)	ND (2)	11	ND (1)	ND (2)	ND (4)	24	29
BKG-14	Qa	09/20/08	2-3	N	ND (2)	4.3	160	ND (1)	ND (1)	23	ND (0.406)	8.1	7	2.9	ND (0.1)	ND (1)	12	ND (1)	ND (1)	ND (2)	34	36
BKG-14	Qa	09/20/08	5-6	N	ND (2)	3.5	210	ND (1)	ND (1)	28	ND (0.408)	11	8.5	3.4	ND (0.1)	ND (1)	17	ND (1)	ND (1)	ND (2)	42	49
BKG-14	Qa	09/20/08	9-10	N	ND (2)	3.1	330	ND (1)	ND (1)	28	ND (0.408)	11	7.9	3.1	ND (0.1)	ND (1)	15	1.2	ND (1)	ND (2)	46	53
BKG-15	Qa	09/20/08	0-0.5	N	ND (2)	4.8	160	ND (1)	ND (1)	10	ND (0.404)	4.2	5.4	5.2	ND (0.1)	ND (1)	7.5	ND (1)	ND (1)	ND (2)	22	24
BKG-15	Qa	09/20/08	2-3	N	ND (2)	1.8	120	ND (1)	ND (1)	15	ND (0.408)	7.6	9.1	2.4	ND (0.1)	1	11	1.8	ND (1)	ND (2)	33	34
BKG-15	Qa	09/20/08	5-6	N	ND (2)	2.6	180	ND (1)	ND (1)	21	ND (0.407)	8.5	8.9	2.7	ND (0.1)	1.3	12	ND (1)	ND (1)	ND (2)	33	39
BKG-15	Qa	09/20/08	9-10	N	ND (2)	2.6	100	ND (2)	ND (1)	26	ND (0.409)	12	12	2.6	ND (0.1)	ND (2)	16	2	ND (2)	ND (4.1)	40	47
BKG-16	Qa	09/23/08	0-0.5	N	ND (2)	5.3	160	ND (2)	ND (1)	12	ND (0.435)	5.4	10	6.5	ND (0.1)	ND (2)	9.4	ND (1)	ND (2)	ND (4)	22	35
BKG-16	Qa	09/23/08	2-3	N	ND (2.1)	4.4	210	ND (1)	ND (1)	15	ND (0.407)	6.7	8.5	4	ND (0.1)	ND (1)	10	ND (1)	ND (1)	ND (2.1)	30	34
BKG-16	Qa	09/23/08	5-6	N	ND (2)	2.4	130	ND (1)	ND (1)	14	ND (0.406)	6.3	6.8	2.7	ND (0.1)	1.2	10	ND (1)	ND (1)	ND (2)	29	33
BKG-16	Qa	09/23/08	9-10	N	ND (2)	2.5	130	ND (1)	ND (1)	16	ND (0.41)	8.8	11	2.4	ND (0.1)	ND (1)	10	ND (1)	ND (1)	ND (2)	32	40
BKG-17	Qa	09/20/08	0-0.5	N	ND (2)	6.2	400	ND (1)	ND (1)	8.9	ND (0.403)	3	4.7	5.1	ND (0.1)	ND (1)	6.4	ND (1)	ND (1)	ND (2)	19	19
BKG-17	Qa	09/20/08	2-3	N	ND (2)	3.7	93	ND (1)	ND (1)	26	ND (0.411)	10	12	3.1	ND (0.1)	ND (1)	15	ND (1)	ND (1)	ND (2)	41	49
BKG-17	Qa	09/20/08	5-6	N	ND (2)	9.4	320	ND (2)	ND (1)	22	ND (0.406)	6.8	8.5	5.8	ND (0.099)	ND (2)	12	ND (1)	ND (2)	ND (4)	39	35
BKG-17	Qa	09/20/08	9-10	N	ND (2.1U)	3.5	56	ND (1)	ND (1)	27	ND (0.401)	11	11	4.2	ND (0.1)	ND (1)	16	ND (1)	ND (1)	ND (2.1)	42	48
EEBG-1	pTbr	04/13/99	0	N	---	---	---	---	---	21.8	0.51	---	12.4	---	---	---	16.5	---	---	---	---	52.4
EEBG-2	Toa	04/14/99	0	N	---	---	---	---	---	12.3	0.51	---	13.1	---	---	---	9.6	---	---	---	---	32.7
EEBG-3	Wash (Qya)	04/14/99	0	N	---	---	---	---	---	25.7	0.5	---	15.9	---	---	---	18.1	---	---	---	---	48.3
MW-15	Qa	07/10/97	1	N	---	---	---	---	---	8.6	ND (0.05)	---	7.3	---	---	---	6.7	---	---	---	---	22.2
MW-15	Qa	07/10/97	3	N	---	---	---	---	---	9	ND (0.05)	---	5.9	---	---	---	7.4	---	---	---	---	21.4
MW-15	Qa	07/10/97	6	N	---	---	---	---	---	8.4	ND (0.05)	---	2.3	---	---	---	2.6	---	---	---	---	8.4
MW-15	Qa	07/10/97	10	N	---	---	48.4	---	---	12.8	ND (0.05)	---	2.1	3.2	---	0.49	4	---	---	---	11.3	13

Notes:

ft bgs	feet below ground surface
mg/kg	milligrams per kilogram
N	primary sample
FD	field duplicate sample
^	This concentration was removed from the background dataset because it is considered an outlier
ND	not detected at listed reporting limit
J	estimated value
---	not analyzed
Qa	Quaternary Alluvium and surficial deposits undifferentiated
Toa	Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
pTbr	Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granitic Rock)
Wash (Qya)	Recent wash deposits

Appendix A-2
Soil Sample Results; PAHs
Background Data Set
Soil Background Investigation
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

					Polycyclic Aromatic Hydrocarbons (ug/kg)																	
Location	**Lithologic Unit**	**Sample Date**	**Depth (ft bgs)**	**Sample Type**	**1-Methylnaphthalene**	**2-Methylnaphthalene**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benzo (a) anthracene**	**Benzo (a) pyrene**	**Benzo (b) fluoranthene**	**Benzo (ghi) perylene**	**Benzo (k) fluoranthene**	**Chrysene**	**Dibenzo (a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno (1,2,3-cd) pyrene**	**Naphthalene**	**Phenanthrene**	**Pyrene**
BKG-01	Qa	09/18/08	0-0.5	N	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)
BKG-02	Wash (Qya)	09/18/08	0-0.5	N	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)
BKG-03	Wash (Qya)	09/18/08	0-0.5	N	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)
BKG-04	Wash (Qya)	09/18/08	0-0.5	N	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)
BKG-04	Wash (Qya)	09/18/08	0-0.5	FD	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)
BKG-05	Toa	09/19/08	0-0.5	N	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2U)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)
BKG-06	Toa	09/19/08	0-0.5	N	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)	ND (5.2)
BKG-07	Toa	09/19/08	0-0.5	N	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3U)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)
BKG-07	Toa	09/19/08	0-0.5	FD	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3U)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)	ND (5.3)
BKG-08	Wash (Qya)	08/23/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-09	Wash (Qya)	08/23/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-10	pTbr	09/19/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-11	pTbr	09/19/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-11	pTbr	09/19/08	0-0.5	FD	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-12	pTbr	08/23/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-13	Qa	09/20/08	0-0.5	N	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)	ND (5.1)
BKG-14	Qa	09/20/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-14	Qa	09/20/08	0-0.5	FD	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-15	Qa	09/20/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-16	Qa	09/23/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
BKG-17	Qa	09/20/08	0-0.5	N	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)

Notes:

ft bgs	feet below ground surface
ug/kg	micrograms per kilogram
N	primary sample
FD	field duplicate sample
ND	not detected at listed reporting limit
Qa	Quaternary Alluvium and surficial deposits undifferentiated
Toa	Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
pTbr	Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granitic Rock)
Wash (Qya)	Recent wash deposits

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Appendix A-3
Soil Sample Results; Pesticides
Background Data Set
Soil Background Investigation
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

					Pesticides (ug/kg)																				
Location	**Lithologic Unit**	**Sample Date**	**Depth (ft bgs)**	**Sample Type**	**4,4-DDD**	**4,4-DDE**	**4,4-DDT**	**Aldrin**	**alpha-BHC**	**alpha-Chlordane**	**beta-BHC**	**delta-BHC**	**Dieldrin**	**Endo sulfan I**	**Endo sulfan II**	**Endosulfan sulfate**	**Endrin**	**Endrin aldehyde**	**Endrin ketone**	**gamma-BHC**	**gamma-Chlordane**	**Heptachlor**	**Heptachlor Epoxide**	**Methoxy chlor**	**Toxaphene**
BKG-01	Qa	09/18/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.1)	ND (51)
BKG-02	Wash (Qya)	09/18/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.1)	ND (51)
BKG-03	Wash (Qya)	09/18/08	0-0.5	N	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2.1)	ND (1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.1)	ND (51)
BKG-04	Wash (Qya)	09/18/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.1)	ND (51)
BKG-04	Wash (Qya)	09/18/08	0-0.5	FD	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.1)	ND (51)
BKG-05	Toa	09/19/08	0-0.5	N	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2.1)	ND (1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.2)	ND (52)
BKG-06	Toa	09/19/08	0-0.5	N	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2.1)	ND (1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.2)	ND (52)
BKG-07	Toa	09/19/08	0-0.5	N	ND (2.1)	ND (2.1)	ND (2.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (2.1)	ND (1.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (5.3)	ND (53)
BKG-07	Toa	09/19/08	0-0.5	FD	ND (2.1)	ND (2.1)	ND (2.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (2.1)	ND (1.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (5.3)	ND (53)
BKG-08	Wash (Qya)	08/23/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-09	Wash (Qya)	08/23/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-10	pTbr	09/19/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-11	pTbr	09/19/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-11	pTbr	09/19/08	0-0.5	FD	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-12	pTbr	08/23/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-13	Qa	09/20/08	0-0.5	N	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2.1)	ND (1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (2.1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5.1)	ND (51)
BKG-14	Qa	09/20/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-14	Qa	09/20/08	0-0.5	FD	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-15	Qa	09/20/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-16	Qa	09/23/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)
BKG-17	Qa	09/20/08	0-0.5	N	ND (2)	ND (2)	ND (2)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (2)	ND (1)	ND (2)	ND (2)	ND (2)	ND (2)	---	ND (1)	ND (1)	ND (1)	ND (1)	ND (5)	ND (50)

Notes:

ft bgs	feet below ground surface
ug/kg	micrograms per kilogram
N	primary sample
FD	field duplicate sample
ND	not detected at listed reporting limit
Qa	Quaternary Alluvium and surficial deposits undifferentiated
Toa	Tertiary Alluvium (Fanglomerate of Metzger and Loeltz)
pTbr	Pre-Tertiary Bedrock (Metadiorite, Gneiss, Granitic Rock)
Wash (Qya)	Recent wash deposits