ARCADIS U.S., Inc.
1 Executive Drive
Suite 303
Chelmsford
Massachusetts 01824
Tel 978.937.9999
Fax 978.937.7555
www.arcadis-us.com

ENVIRONMENT

Mr. Scott Miller
Remedial Project Manager
Superfund Remedial Branch, Section C
U.S. EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Subject:
Response to Comments on November 2013 Report:
Updated Off-Site Soil Data Summary and Fingerprinting Evaluation: (2009-2013)
Cabot / Koppers Superfund Site, Gainesville, Florida

Date:
July 30, 2014

Contact:
Paul Anderson

Phone:
978.322.4504

Email:
paul.anderson@arcadis-us.com

Our ref:
B0039228.0001

Dear Mr. Miller:

ARCADIS U.S., Inc. (ARCADIS), on behalf of Beazer East, Inc. (Beazer), submits these responses to comments on the *Updated Off-Site Soil Data Summary and Fingerprinting Evaluation: (2009-2013)* at the Cabot / Koppers Superfund Site in Gainesville, Florida (Site), which was submitted to the United States Environmental Protection Agency (USEPA) in November 2013 and referred to as the "November 2013 Report" in the remainder of this letter. This letter addresses comments provided by:

- Strategic Environmental Analysis, Inc. (letter to Scott Miller dated January 3, 2014);
- Alachua County Environmental Protection Department (ACEPD) via email from Dr. John Mousa to Scott Miller and Rusty Kestle dated January 6, 2014; and
- Florida Department of Environmental Protection (FDEP) prepared by the University of Florida (letter from Dr. Leah Stuchal and Dr. Stephen Roberts to Ligia Mora-Applegate dated January 21, 2014).

FDEP also provided an initial set of comments (via email from Kelsey Helton to Scott Miller and Rusty Kestle dated January 8, 2014). Those comments addressed additional potential off-Site sampling locations for the field effort planned in 2014. Those comments did not contain an evaluation of the data or analyses presented in the November 2013 Report and are not addressed further in this response.

The comments are presented below in bold font followed by our responses in normal font.

Strategic Environmental Analysis, Inc. Comments:

1. **This report:**

   - **Presents many of the figures derived based on homologue results, which were not included in the tables.**

   Response: Data have been provided to USEPA following each round of off-Site sampling since 2009. The data are also summarized and provided electronically in the *2014 Addendum to Updated Off-Site Soil Data Summary and Fingerprinting Evaluation: (2009-2013)* (2014 Addendum) submitted to USEPA in July 2014.

   - **Makes it difficult to fully explore the patterns and potential underlying causes. (The PCA plots only identify some of the samples. While it would not be possible to label each point, a table with the value being plotted for each sample would allow us to better understand the differences among samples using this exploratory technique. It would also be helpful to state on these figures the data included in the analysis (dioxins/ homologue or congener).**

   Response: Comment noted. The 2014 Addendum presents an updated principal component analysis (PCA), incorporating off-Site samples collected in 2014, and includes a table summarizing the PCA scores for each sample, which are the values being plotted on the figures summarizing the PCA results.

   As stated on page 23 of the November 2013 Report, the PCA was conducted using the homologue data set.

   - **Inappropriately reports the magnitude of background concentrations by including clear outliers.**

   Response: Beazer disagrees that the background evaluation is inappropriate. As discussed in greater detail in the response to Comment #2 below, background sampling locations were not affected by any known point sources. The background sample locations were approved by various stakeholders, including FDEP and USEPA, prior to collection of the samples. The samples represent background for similar areas in Gainesville. Additionally, USEPA guidance does not suggest that outlier tests be used as the sole basis to discard data from a background data set.

- **Identifies "clusters" of samples with patterns different from the Site based on statistical methods – without consideration of a conceptual model, transformations, and different laboratories.**

Response: See response to Comment #4 below regarding consideration of the conceptual model and transformations.

On-Site samples collected by Beazer were analyzed by two laboratories (i.e., Vista and CASE). All off-Site samples collected by Beazer were evaluated by a single laboratory (i.e., Vista). Samples collected by USEPA were analyzed by a different laboratory than those collected by Beazer.

To determine if the laboratory that conducted the polychlorinated dibenzodioxin and dibenzofuran (PCDD/F) analysis biased the results and affected the presence of clusters, samples groups that had data analyzed by different laboratories were plotted using the updated PCA results presented in the July 2014 Addendum. Two groups of samples were plotted. The first is on-Site samples analyzed by both Vista and CASE (Figures 1a, 1b, and 1c). The second is off-Site residential samples collected by Beazer to the north, west, and south (analyzed by Vista) and USEPA residential samples (Figures 2a, 2b, and 2c). Both groupings of samples show substantial overlap and not samples from a specific laboratory group separately from the other laboratory, indicating that the identity of the laboratory that conducted the analysis does not have any obvious effect on the location where a sample falls in the PCA plots.

- **Overstates the significance of relative congener concentrations in low concentrations samples with results below MDLs.**

Response: Congener concentrations were used by only one line of evidence developed for the fingerprinting: the ratio of 1,2,3,7,8- pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD) to octachlorodibenzo-p-dioxin (OCDD). 1,2,3,7,8-PeCDD was non-detect in only 14% of the off-Site samples. OCDD was always detected in the off-Site samples. For the samples in which 1,2,3,7,8-PeCDD was not detected, the 1,2,3,7,8-PeCDD/OCDD ratio was not calculated and the 1,2,3,7,8-PeCDD/OCDD ratio was not used as a line of evidence to determine if a sampling location was distinct from the Site. Thus, non-detect congener concentrations did not affect the determination of whether an off-Site sample is distinct from Site samples.

2. Background Concentrations.

Statistical comparisons indicate that dioxin in samples adjacent to the Site are clearly above background. Residential samples collected initially most accurately reflect background levels. There was effort to identify more likely impacted areas – and sample locations were not random. Background sample locations should not be impacted by point sources of dioxins. There were two clear outliers in these additional samples analyzed for dioxin – 30.2 ppt in the BGI samples and 71 ppt in the BGRS samples. These are clearly different from all other background samples, in areas with other potential sources, and should be excluded. EPA guidance states that sample locations affected by another contamination source are inappropriate background sample locations, and the data review should identify anomalies including potential outliers.

Site-specific background was calculated as 2 x the mean concentration, consistent with an option provided by EPA guidance. The dioxin background using that method is for residential (BGR) was 3.0 ppt. An optional approach may be using the total data set excluding the two outliers. This results in a mean of 2.16 ppt and background 4.3 ppt. A site-specific background of 16 ppt as shown in Table 2-4 is clearly inappropriate. Only 2 of 36 background samples exceeded 16 ppt – these were the outliers. All other results were below 16 ppt, and 34 of 36 were below the SCTL of 7 ppt. Similar issues may be present in the evaluation of PAH or arsenic results.

EPA guidance states background concentrations are not subtracted, but risks from background be discussed and considered in management decisions. The statements presented in the discussion of background risks on Page 29 are not accurate comparisons. However, it is of value to consider this further and more effectively communicate these issues.

Response: We do not know what statistical comparisons are being referred to by the statement in the comment that “dioxin in samples adjacent to the Site are clearly above background.”

Beazer disagrees that the residential background samples “collected initially most accurately reflect background levels.” Most of the initial residential background samples were collected in 2009 from residential neighborhoods built and developed more recently than the neighborhoods surrounding the Site. Additionally, most of the residential samples collected in 2009 were from areas

distant from busy roads and non-residential uses. Heavily travelled roads and non-residential land uses are in close proximity to the neighborhoods surrounding the Site. Both of these factors make it likely that far fewer non-Site related sources of dioxins/furans have affected most of the 2009 residential neighborhood background samples than are likely to have affected off-Site samples collected from the vicinity of the Site.

In fact, the 2009 data provide evidence for the importance of other potential sources. In 2009 four different residential neighborhoods were sampled. Between neighborhoods, the average tetrachlorodibenzo-p-dioxin toxic equivalent (TCDD-TEQ) concentration ranged from 0.6 to 3.3 pg/g, with a trend for higher concentrations in older neighborhoods. Thus, age and other characteristics of a neighborhood are an important considerations when determining applicability of background. Because of the differences in age and proximity to potential non-Site-related sources, most of the 2009 residential background samples are not an appropriate reference data set for the residential neighborhoods in the vicinity of the Site.

FDEP guidance for establishing background concentrations and comparing those to Site concentrations was followed. Specifically as stated in FDEP guidance (FDEP 2012):

“The background sampling area must be clearly unaffected by releases from the subject site, or any other site. When characterizing natural background conditions, samples are best taken from areas with minimal anthropogenic impact (e.g., natural areas and parks). In establishing anthropogenic background, sampling in areas where contaminants may accumulate should be avoided unless data are needed specifically for comparison with similar features found on a site. These data should be evaluated separately from other anthropogenic background samples. Because selection of background sampling locations is a matter of professional judgment, it is best to obtain concurrence from FDEP staff before obtaining background samples. The following areas are inappropriate to sample when determining soil background:

1. Fill areas;
2. Areas where known or suspected hazardous substances, petroleum, solid or hazardous wastes or waste waters are managed, treated, handled, stored or disposed;
3. Areas affected by runoff from a roadway;

4. Parking lots and areas affected by runoff from parking lots or other paved areas;
5. Railroad tracts or railway areas or other areas affected by their runoff;
6. Areas of concentrated air pollutant depositions or areas affected by their runoff;
7. Storm drains or ditches presently or historically receiving industrial or urban runoff."

All background sampling locations were selected with the goal of not being affected by any known point sources and in consideration of the guidance stated above. To Beazer's knowledge, background samples were not affected by the sources described in the above list. Additionally, the appropriateness of background sample locations was verified with various stakeholders, including FDEP and USEPA, prior to collection of the samples. Thus, the samples were collected to be representative of background locations and represent background for similar areas in Gainesville[1]. Further, USEPA guidance does not suggest that outlier tests be used to discard data from a data set. In *Statistical Methods for Practitioners* (USEPA 2006) it states that outlier tests should not be used alone to determine whether a data point should be removed from a data set and that, in the absence of data errors, outliers may represent true values of a distribution and indicate that there is more variability in the population than was expected. Given that FDEP guidance was followed when selecting background locations, no a priori reason exists to exclude any individual background location(s).

The discussion of background risks on page 29 does not "subtract" background concentrations as stated by the comment. In fact, the discussion on page 29 does exactly what the comment suggests should happen: the discussion on page 29 uses exactly the same assumptions used by FDEP to develop the default residential soil cleanup target level (SCTL) to estimate potential risks associated with background concentrations. The discussion then goes on to compare potential risks associated with background concentrations to potential risks associated with off-Site samples. Contrary to what is stated in the comment, the

[1] The selection process presented in FDEP guidance and followed to establish background for this Site is likely, in fact, to bias the background data set low because it excludes samples from locations that can be contacted by people and are also affected by sources of constituents, such as runoff from roadways.

statements on page 29 are accurate and, as the comment further suggests, can be considered and are made available to inform risk management decisions.

3. **Inferences of Non-Site Related Sources with Statistical Evaluation**

There are potential sources of dioxins that are not related to operations at the former Koppers Site. However, the data exploration and presentation is not sufficiently rigorous. There are many approaches to help explore patterns in complex data sets, and these techniques can be useful.

However, these types of evaluations of contaminant data require a much more rigorous analysis. As stated in Morrison and Murphy,

> ***"Identification of CDD/CDF sources in environmental and biological media is challenging because of low concentrations and associated analytical uncertainties; the potential need to compare data from different laboratories and different methodologies, the presence of multiple sources that are difficult to distinguish, particularly at low concentrations, and the confounding effects of chemical and biological transformations, particularly for airborne sources."***

Response: The comment contains several general statements, none of which are applicable to the evaluations conducted in the November 2013 Report. The analyses presented in the report are consistent with the methods suggested in Chapter 14 (Dioxins and Furans) of *Environmental Forensics: Contaminant Specific Guide* (Morrison and Murphy 2006).

- The majority of off-Site samples were collected by Beazer and all of those off-Site samples were analyzed by a highly respected laboratory that used accepted methods and followed rigorous quality assurance/quality control procedures that included validation of all samples. Thus, the off-Site data presented in the November 2013 Report collected by Beazer are of high quality and analytical uncertainties have been minimized, even when off-Site concentrations are low.

- As discussed in the response to Comment #1 above, inter-laboratory variation appears to introduce little uncertainty to the analyses presented in the November 2013 Report.

- The goal of the evaluations presented in the November 2013 report was not to distinguish and identify "multiple sources," only to identify samples where the fingerprint differed from most Site samples. The techniques used to

identify samples with a different fingerprint than most Site samples can be much simpler than if the source contributing to an off-Site sample needed to be identified. Regardless, the November 2013 Report used several lines of evidence to identify off-Site samples whose fingerprint differed from Site samples, including PCA, which is an accepted and rigorous statistical methodology.

Thus, contrary to the comment, a rigorous analysis using standardization methods; ratio analyses and a multivariate method (PCA) – all methods suggested and described in Chapter 14 of Morrison and Murphy – was presented in the November 2013 Report to distinguish between off-Site samples that have fingerprints that differ from the fingerprint of Site samples. Combined, the multiple lines of evidence represent a rigorous evaluation that provides clear evidence of the presence of other sources of dioxins and furans in the vicinity of the Site. The finding by the fingerprinting evaluation of the presence of other sources is confirmed by the background sampling, which found dioxins and furans in soils that were not affected by the Site.

4. **A conceptual model is needed, and the interpretation of the results should evaluate and present a discussion of uncertainties, not a simple conclusion that differences in patterns reflect alternate sources. For example,**

Response: The conceptual model that underpins the November 2013 Report is that Site-related constituents were transported off-Site via wind dispersion. The greatest potential for a Site-related effect, and thus a fingerprint consistent with on-Site samples, is near the Site. With distance from the Site, any potential influence of the Site on the fingerprint decreases and the fingerprint of non-Site-related sources should become more apparent[2]. The fingerprinting evaluation was conducted to determine if sources other than Site may be contributing to arsenic, polycyclic aromatic hydrocarbon (PAH), or dioxin/furan concentrations in off-Site sampling locations. The general change in fingerprints with distance from the Site, and the conceptual model, is confirmed by the off-Site data presented in the November 2013 Report.

[2] Background sampling conducted in Gainesville documented releases of arsenic, polycyclic aromatic hydrocarbons, and dioxins/furans by a variety of combustion and other sources.

It is not clear what uncertainties the reviewer would like discussed. As noted throughout the response to comments, the fingerprinting lines of evidence utilize rigorous analyses, and analyze primarily differences among homologue groups instead of congeners to avoid uncertainty introduced by censored data.

- **The onsite data are at typically at high concentrations with elevated concentrations present in subsurface samples at many locations. This can reduce the amount of censored data (below MDLs), and show many differences from samples with only surface impacts at very low concentrations.**

Response: Only on-Site surface soil data were used for the comparison to off-Site surface soil data. In addition, as discussed above, the vast majority of the data used in the fingerprinting evaluation were detected concentrations.

- **Chemical weathering or degradation must be considered. Air deposition in offsite areas may be susceptible to dechlorination, which would not be as easily observed in the onsite samples given the depth profile and overall mass.**

Response: If chemical weathering and degradation were important and explained the differences in fingerprints observed between on-Site and off-Site samples, then one would expect such differences to be visible in most off-Site samples, regardless distance from the Site. Weathering and degradation would be expected to result in a fingerprint pattern in most off-Site samples that would be distinguishable by the PCA and evident on the figures. However, for the most part, off-Site samples with unique fingerprints occur more often in samples more distant from the Site than near the Site. The much more likely explanation for this observed pattern, as discussed above in the response to the comment regarding the conceptual model, is a decrease in any potential Site-related contribution with distance from the Site and an increase in the relative contribution of sources unrelated to the Site with distance. Weathering and degradation would not be expected to change with distance from the Site.

As discussed above, only on-Site surface soil data were compared with off-Site surface soil samples. Therefore, the depth profile was the same for on-Site and off-Site samples.

- **The material storage yard results were provided by a different laboratory, with numerous qualifiers. While the data are "acceptable" it appears there may be analytical (as well as other reasons) for some of**

the differences observed (including very low concentration samples).

Response: The basis for the comment stating "it appears there may be analytical (as well as other reasons) for some of the differences observed" is not provided, so a response is not possible.

- **The data for the cluster at 6th Street by 28th Ave were reviewed. These patterns could easily be from photodegradation and runoff from the large paved area. Patterns are not like the "scrap wire and scrap car incineration" results presented by VanWijnen. Furans are not clearly different in these samples.**

Response: The fingerprint of the cluster samples was evaluated for evidence of photodegradation and it was found to be inconsistent with the characteristics of photodegradation reported by Tysklind (1992). As presented in the November 2013 Report: "Tysklind (1992) found that photodechlorination of OCDD resulted in an increase in 2,3,7,8 congeners such as 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD. However, while photolysis of OCDF also occurs, the pattern is not preferential to 2,3,7,8 congeners. In fact, Tysklind concludes that 2,3,7,8-TCDF and other 2,3,7,8 substituted PCDFs are "source related and not formed during photodecomposition". If photolysis took place in the cluster samples, then a decrease in the 2,3,7,8-TCDF/OCDF ratio should be observed while at the same time an increase in the TCDF/OCDF ratio should occur. No such pattern exists for the Off-Site West Cluster. In fact, the opposite is true. The cluster samples have some of the highest 2,3,7,8-TCDF and 1,2,3,7,8-PeCDF concentrations found in samples collected to the west of the Site. Increases in lower chlorinated 2,3,7,8 congeners are consistent with combustion sources. Low temperature "poor combustion" such as might occur in open areas has shown to result in the formation of lower chlorinated dioxins and furans (USEPA 2006)."

Further regarding this cluster, the report states that: "several non-residential uses are present in the vicinity of the Off-Site West Cluster, including an electronics shop. Specific operations at this electronics shop have not been investigated, but elevated 1,2,3,7,8-PeCDD would be consistent with the burning of scrap wire (van Wijnen et al. 1992)." This statement is true. Analytical results of soil samples with visible scrap wire presented by van Wijnen et al. (1992) had elevated concentrations of 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD relative to other congeners indicating that wire burning is a source of these congeners. In addition, the van Wijnen samples also had elevated levels of lower chlorinated furans, also consistent with the fingerprint of Off-Site West Cluster.

The evidence supports an alternate source of PCDD/Fs rather than photodegradation.

- **Shifts in ratios of TCDD/Total Homologue will occur in highly censored data, without regard to accuracy of any specific patterns. Note: I could not replicate the TCDD/Total Homologue ratios presented on Figure 2-21.**

Response: See the response to Comment #1 (fifth bullet), above regarding censored data. We do not know why the reviewer could not replicate the ratios presented in Figure 2-21. The figure shows the ratio of Total TCDD/Total Homologues.

ACEPD Comments

Comments 1 through 5 of the ACEPD comments addressed additional potential off-Site sampling locations for the field effort planned in spring of 2014. The comments did not contain an evaluation of the data or analyses presented in the November 2013 Report and are not addressed further in this response. The last three comments (6, 7 and 8) presented in the ACEPD comments are addressed below.

6) **In instances in the Executive Summary when discussing the measured off-site residential area soil concentrations of arsenic, PAHs and dioxins/furans, the report make comparisons to soil concentrations in "background" areas. The term "background" area as used in these comparisons (example page E-2) is somewhat confusing and appears to refer to a combination of residential and residential busy street background concentrations from areas away from influence of the Site. It is not clear if Arcadis meant to use this combination for background comparison purposes but ACEPD believes it is not appropriate to compare offsite residential soil concentrations to residential busy street background concentrations because with the possible exception of the parcels along 6th street, the majority of residential areas offsite the Koppers parcel are not on located busy streets. Residential areas soil concentrations should only be compared to residential area "background" data only which in Table 2-4 is labeled as BGR data.**

Response: It is unclear which background discussion on page E-2 is being referred to by the comment. The first mention of background on Page E-2 occurs in the discussion of arsenic concentrations. The comment is correct, that particular discussion does not differentiate between residential and residential busy street

samples. Such differentiation was not necessary for arsenic because a full residential busy street data set was not collected for arsenic (only five, not 15 residential busy street samples were analyzed for arsenic) and the highest arsenic concentration was detected in the residential samples. Thus, the discussion of arsenic background concentrations on page E-2 is not comparing arsenic concentrations of residential samples to the north and west and immediately adjacent to the Site to residential busy street background.

The next mention of background occurs in the discussion of the fingerprint of PAH samples to the north and west of this Site and is not a comparison of PAH concentrations in off-Site to concentrations in background samples. So the comment is not applicable to that discussion of background.

The third and last mention of background on page E-2 occurs in the discussion of off-Site PAH fingerprints and concentrations to the east and south of the Site. In this case the discussion refers to "other comparable background areas and neighborhoods of Gainesville." Given that NW 23rd Avenue to the south of the Site is a busy four-lane roadway and that most of the properties to the east and south of the Site are mixed use, comparison to residential busy street background concentrations and commercial/industrial background concentrations is appropriate. The residential background concentrations were not collected from areas comparable to most of the samples analyzed for PAHs to the south of the Site and do not represent an appropriate background data set.

7) **In several instances in the report when discussing the risks posed by the measured concentrations of arsenic, PAHs and dioxins/ furans in offsite soils, the phrase " do not pose an unacceptable risk" to residents is used. We do not believe that the use of this phrase is appropriate. While the overall human health risks as determined by the Florida Department of Health are very low for the maximum concentrations of soil contaminants measured in offsite samples not in the boundary area, the measured concentrations in several of the samples from residential properties offsite still exceed the State of Florida default residential SCTL for unrestricted residential use and by definition exceed the FDEP's acceptable risk level of this unrestricted use. We would recommend that the wording for describing the risk be changed to low or very low and not use the "no unacceptable risk" phrase.**

   Response: Beazer believes it is appropriate for the November 2013 Report to characterize off-Site impacts from the Site as "not associated with unacceptable risks." The conclusion is based on multiple lines of evidence including: the finding

that virtually all off-Site concentrations are less than USEPA preliminary remediation goals (PRGs) or fall within USEPA's allowable risk range; that virtually all off-Site TCDD-TEQ concentrations are less than the Site-specific clean-up level derived by Beazer using probabilistic methods; that the Florida Department of Health (FDOH) has characterized off-Site risks as "very low" (FDOH 2013); and that the numerous compounded conservative assumptions used to derive the default FDEP SCTLs greatly overstate potential risk.

8) **In the fingerprinting evaluation of the PAHs and the dioxin/furan, statements are made in the report that results of the fingerprinting analysis provide evidence that other sources of (PAHs or dioxins) exist or have existed near the Site and are influencing the composition of (PAHs or dioxins) found in certain offsite samples. While these comparisons may suggest that other sources may be contributing to the measured concentrations in some locations, it is not possible to completely rule out, especially for offsite samples adjacent or relatively near the former Koppers Site, that the Site itself may also be contributing to the observed concentrations above FDEP default residential and commercial/industrial criteria. Additionally, the report states that where the fingerprinting evaluation indicates a close match of offsite samples fingerprint or ratios to onsite fingerprint or ratios that this is not necessarily indicative of the Site being the source of the contamination. It seems that based on the reasoning used to declare that different fingerprint patterns may indicate a source other than the Site for the observed contamination, that an offsite fingerprint or ratio matching onsite data points should also provide a similar level of confidence that the Site is a potential contributing source to this observed offsite contamination.**

Response: As discussed above in response to Strategic Environmental Analysis Comment #4, the conceptual site model assumes that the Site has influenced off-Site sampling locations and the influence is greatest at locations closest to the Site and decreases with distance with distance from the Site. In general, the fingerprinting evaluation presented in the November 2013 Report confirms the conceptual site model. The comment is correct to point out that at locations adjacent to the Site, with fingerprints not distinct from the Site, the Site may be contributing to concentrations above the FDEP default SCTL.

The comment is incorrect in asserting that all off-Site locations with a fingerprint similar to the Site indicate a Site-related influence. Other sources of PCDD/Fs, unrelated to the Site can have a fingerprint indistinguishable from the Site because the Site is not the only source of a pentachlorophenol-like PCDD/F fingerprint in

Gainesville. Evidence of this is provided by one of the busy street residential samples, collected more than a mile away from the Site. This location could not have been influenced by the Site but has a fingerprint that falls within the Site envelope shown on the PCA figures in the November 2013 Report. Thus, the November 2013 Report is accurate in pointing out that, just because an off-Site location has a fingerprint similar to that of the Site, does not mean the Site was the source of the PCDD/Fs at that location.

FDEP (University of Florida) Comments:

1. **Delineation was completed to soil cleanup target levels (SCTLs) for current land use. As promulgated in Chapter 62-780, FAC, delineation should be completed to residential (unrestricted use) SCTLs. Delineation to residential SCTLs is necessary to determine where institutional controls are needed. It is important to note that the property owners must agree to institutional controls.**

   Response: The rule also allows for delineation to site-specific background.

2. **Although arsenic delineation is complete, BaP-TEQs and dioxin concentrations were not delineated to unrestricted use. Additional sampling appears necessary for these COCs, including:**

   a. **BaP-TEQs have not been delineated to the residential SCTL of 0.1 mg/kg to the southeast and northeast of the site. They have also not been delineated to the west of the site near the most southern residential area.**

   Response: Delineation of Site-related PAH to the southeast and northeast of the Site was completed to the applicable land use SCTLs or Site-specific background. A few off-Site samples to the southeast of the Site had BaP-TEQ concentrations greater than the applicable land-use SCTL and background. However, at the most distant off-Site location to the southeast, the PAH ratios differ from most ratios found in Site samples and are similar to ratios of background samples. The fluoranthene/pyrene (FL/Py) ratio of 1.3 at the most distant southeast off-Site sample (SS357) is higher than all but one on-Site sample and is similar to the mean FL/Py ratio measured in background industrial samples and to the maximum FL/Py ratio of both residential and residential busy street background samples (Table 2-3 of the November 2013 Report). The benzo(a)anthracene/benzo(a)pyrene (BaA/BaP) ratio of 0.6 for sample SS357 is about two thirds the mean BaA/BaP ratio of on-Site samples (0.9) and is similar

to the minimum BaA/BaP ratios measured in of both residential and residential busy street background samples (Table 2-3 of the November 2013 Report). The much greater similarity of the PAH ratios to background samples compared to Site samples for sample SS357 (the most distant off-Site southeast sampling location) indicates the presence of another source (or sources) of PAHs in this direction from the Site and that delineation of potentially Site-related PAH is complete to the southeast.

Reference by the comment that delineation to "the west of the site near the most southern residential area" is unclear. To the west of the Site, the four southern-most off-Site samples (SS14, SS15, SS16, and SS17) have BaP-TEQ concentrations less than the residential SCTL (Figure 2-10 of the November 2013 Report). The three samples along NW 28th Avenue immediately to the west of the Site (SS13, SS63, and SS65) have BaP-TEQ concentrations greater than the residential SCTL but share BaA/BaP ratios that are markedly distinct from the Site samples (Figure 2-13 of the November 2013 Report) indicating the presence of another source of PAHs at these sampling locations. Thus, delineation of potentially Site-related PAH is complete at these locations.

b. Dioxins have not been delineated to the residential SCTL of 7 ng/kg to the east and northeast of the site, and west of the site near the most southern residential area (Samples 262 and 263).

Response: To the east and northeast of the Site, delineation was completed to the applicable land use SCTL.

Additional samples for dioxins and furans were collected during February 2014 to the west of the Site in the vicinity of the samples SS262 and SS263. Results of those samples are presented in the July 2014 Addendum.

c. Dioxins have been delineated west of NW 6th Street. However, these samples are 200-400 feet west of NW 6th Street and may artificially increase the area of concern. We recommend additional samples to the west of NW 6th Street at NW 29th Ave (Samples 217 and 233) and west of NW 6th Street at NW 27th Ave (Samples 244, 247, and 249) to better define the extent of contamination.

Response: Additional samples for dioxins and furans were collected during February 2014 in the general area referred to by this comment. Results of those samples are presented in the July 2014 Addendum.

3. **Arcadis compares surface soil concentrations to several criteria including a site-specific residential SCTL of 95 ng/kg (ppt) TCDD derived by Beazer East in 2010. It is important to note that we did not agree with the derivation of this value and do not recommend its use for the protection of human health (letter to you dated November 8, 2010). The cleanup target level specified in the Record of Decision (7 ng/kg) is consistent with the residential SCTL promulgated in Chapter 62-777, FAC.**

   Response: Beazer recognizes that FDEP did not agree with the derivation of the Site-specific residential SCTL. However, such disagreement does not invalidate the greater scientific rigor of the 95 pg/g Site-specific SCTL and that Beazer continues to believe the Site-specific SCTL has more scientific basis than the default residential SCTL, that the Site-specific SCTL is conservative, and the Site-specific SCTL is protective at the FDEP allowable risk level.

4. **Industrial and residential busy street background BaP-TEQs exceeded the residential SCTL. This is not surprising since BaP-TEQs are often elevated near roads, parking lots, and asphalt walkways due to runoff from these structures. Close-up maps of the background locations were not provided so the proximity of these samples to other sources of PAHs is unclear. If background samples were taken adjacent to parking lots or roads, they would only be applicable for data collected near similar structures.**

   Response: As presented above in response to Strategic Environmental Analysis, Inc. Comment #2, the sample locations were selected to be in compliance with the requirements for selecting background locations as set forth by FDEP (FDEP 2012). No known point sources were present in the vicinity of these samples nor were they affected by runoff from the sources listed in the comment. Though photographs were not included in the November 2013 Report, stakeholders approved the background sample locations, including FDEP and USEPA. In short, the samples were collected from representative background locations and do represent background concentrations for similar areas in Gainesville.

5. **Page 9 states arsenic concentrations decline dramatically 100 feet from the site boundary. Although this is true for the northern, western, and southern boundaries where arsenic concentrations are low, it is unclear if the concentrations decline as quickly on the eastern property boundary (adjacent to the highest arsenic concentrations). The closest samples to the eastern property boundary appear to be between 300 and 500 feet from the site boundary.**

Response: Comment noted.

6. **The document states that off-site concentrations are not associated with unacceptable risk because they are within the range of background concentrations. This is not an accepted methodology for the comparison of site to background (FDEP, 2012; EPA, 2002; NAVFAC, 2002). For the purposes of this review, the lesser of twice the mean or the maximum detected background concentration was used for comparison to site concentrations (FDEP, 2012).**

Response: When describing the conclusions of the comparison of potential risks associated with samples near the Site and potential risks associated with background samples, the November 2013 Report states in the Executive Summary: "When such a comparison is conducted, the potential risks in the vicinity of the Site appear to be similar to or lower than the potential background excess lifetime cancer risks for a resident living near busy streets in other parts of Gainesville." A very similar statement is presented in the Conclusions (Section 3). Thus, contrary to what is stated in the comment, neither of these statements say "…that off-Site concentrations are not associated with unacceptable risk because they are within the range of background concentrations." The statements say that potential risks associated with off-Site samples in the vicinity of the Site are similar to or less than background, making no judgment about whether such risks are acceptable or not. As discussed in the response to Strategic Environmental Analysis, Inc. Comment #2 above, consistent with USEPA guidance, the statements are included in the November 2013 Report to provide perspective and help inform risk management decisions.

   a. **Among the background samples, one sample from a residential area and one sample from an industrial area exceeded the FDEP residential SCTL of 2.1 mg/kg (14.5 and 13.4 mg/kg, respectively). According to the Dixon's Outlier test, both concentrations are outliers at the 1% significance level. These samples likely represent small point source areas and should not be utilized in the background calculations.**

Response: As stated above in response to Strategic Environmental Analysis Comment #2, USEPA guidance does not suggest that Dixon's outlier test be used as the sole basis to discard data from a data set. In "Statistical Methods for Practitioners" (USEPA 2006) it states that outlier tests should not be used alone to determine whether a data point should be removed from a data set and that in the absence of data errors, outliers may represent true values of a distribution and indicate that there is more variability in the population than was expected.

Given that background sampling locations were identified consistent with FDEP guidance that is specifically designed to preclude collection of samples from areas that are affected by known or likely point and non-point sources, all the background data should be considered valid and representative of background in Gainesville.

b. The site-specific residential mean background arsenic concentration (excluding the outlier) is 0.9 mg/kg. Therefore, the off-site arsenic concentrations that exceed the SCTL of 2.1 mg/kg cannot be excluded based on residential background.

Response: See response to comment above regarding classification of some background samples as outliers.

c. Busy residential street background for BaP-TEQs (1.1 mg/kg; twice the mean) was utilized for comparison to BaP-TEQs south of the site (excepting Samples SS307 and SS353). This type of background was taken along University Avenue and NW 13th Street (highly trafficked four lane roads). It is not appropriate to compare this background value to two-lane roads that are not main avenues for traffic.

Response: The comment implies that all residential busy street background samples were collected from University Avenue and Northwest 13th Street. That is incorrect. Seven background locations were from University Avenue and three were from 13th Street. The remaining five were from other streets. Additionally, most of the residential busy street samples along University Avenue were actually collected from locations on smaller two lane roads and set back several tens of feet from the intersection of such roads with University Avenue. Such locations are representative of many of the off-Site sample locations to the south of the Site, represent an appropriate comparison, and were approved by several stakeholders including ACEPD.

7. Page 13 states if the PAH composition in off-site samples differs from those on-site, the majority of PAHs in the off-site sample are not from the site. This statement is not supported in the document, and does not appear defensible based on the current state of the science regarding the fingerprinting of environmental contaminants. Due to weathering and the possible presence of overlapping fingerprints, it is not possible to determine whether the site makes up a minority of the PAHs without further evaluation. Further analysis may include the use of additional PAH ratios, alkylated PAHs, or principal component analysis to elucidate probable

sources.

Response: As discussed on pages 13 and 14 of the November 2013 Report, the PAH fingerprinting used PAH ratios that were specifically selected because they have been shown to be conserved over a large concentration range and range of weathering conditions. Additionally, effects associated with weathering would be expected to occur in both on-Site and off-Site samples and would not be expected to cause the differences in PAH ratios that led to the conclusion that other sources are contributing PAH to off-Site samples. Thus, the conclusions of the report have accounted for the potential effects of weathering because the PAH ratios selected were to be conserved despite weathering of the PAH mixture.

The possibility of overlapping fingerprints does limit the ability of using just a single (or two) PAH ratios to quantify the relative contribution of different sources to a specific sample. However, to the extent that the ratios represent the combined contribution from a variety of sources and the ratios of off-Site samples are more similar to the ratios of background samples than they are to Site samples, that similarity to background indicates a greater contribution of background sources than the Site to a particular sampling location. The mean Site, industrial and residential busy street background FL/Py ratios are 0.9, 1.3 and 1.1, respectively (Table 2-3 of the November 2013 Report). The mean ratio of off-Site samples to the south was 1.2, and of the three samples to the west of the Site along NW 28th Avenue was 1.1 (Table 2-3 and Figure 2-12 of the November 2013 Report). These comparisons indicate the ratios of the off-Site locations are similar to ratios of background samples and not to ratios of most Site samples suggesting a substantial contribution of background sources to these off-Site locations, though quantification of the relative contributions cannot be determined from the FL/Py ratio alone.

8. **We disagree that the fingerprinting analysis indicated that BaP-TEQ exceedances to the south and west (south of NW 31st Avenue) of the site are not site-related. Although the fluoranthene/pyrene ratios of these samples differ from most of the samples taken on site, they are equivalent to ratios obtained from several site samples located on the adjacent site boundary. Excepting the southernmost locations where BaP-TEQs begin to increase and one southwest location with a BaP-TEO concentration in excess of 8700 mg/kg, there is no substantial evidence that these PAHs did not originate from the site.**

Response: The comment is incorrect in its characterization of FL/Py ratios in off-Site samples to the south the Site being "equivalent to ratios obtained from several site samples located on the adjacent site boundary." The average FL/Py ratio of the seven southern boundary samples shown on Figure 2-12 of the November 2013 Report is 1.06. The average ratio of the eight off-Site samples included in the cluster to the south of the Site is 1.28. Given the relatively narrow range of the FL/Py ratios in most Site samples and of a higher but also narrow range of FL/Py ratios in the cluster of samples to the south of the Site, these ratios are not "equivalent." In fact, all of the samples included in the off-Site cluster to the south of the Site have a FL/Py ratio equal to or greater than the highest ratio (1.19) observed among the seven samples along the southern Site boundary (Figure 2-12 of the November 2013 Report). The comment also fails to account for the finding that the FL/Py ratios in most background samples are higher than found in most Site samples and that the ratios observed in the off-Site samples included in the cluster to the south of the Site are consistent with the ratios in background samples. This similarity suggests that off-Site samples to the south of the Site may have been affected by the same kinds of sources that are reflected in background samples and not by the Site. In fact, the finding that the FL/Py ratio of on-Site samples along the southern Site boundary is different from the ratio of most Site samples and has similarity to background samples suggests that those on-Site samples may have been affected by background sources that are likely to be present along NW 23rd Avenue, which is in close proximity to those samples.

As stated above in response to Strategic Environmental Analysis Comment #2, samples to west of the Site (south of NW 31st Avenue) have markedly distinct BaA/BaP ratios that indicate the contribution of another source of PAH. These distinct ratios do provide substantial evidence that PAH at these locations did not originate from the Site.

9. Sections 2.5.2 and 2.5.3 compares the mean TCDD-TEQ concentrations north, east, and south of the site to FDEP SCTLs and the mean TCDD-TEQs for background. We have the following concerns with this comparison:

a. TCDD-TEQ concentrations were averaged over large residential and industrial areas surrounding the site. These averages have no meaning in terms of risk because they do not correspond to reasonable exposure areas for any given receptor.

Response: Mean concentrations were presented in the report; however, these were not used to determine possible risk. Mean concentrations are presented to demonstrate general trends in on-Site and off-Site data sets. Sections 2.5.2 and

2.5.3 of the November 2013 Report summarize and discuss data and trends, and compare data to various delineation benchmarks; they do not estimate potential risk. Sections 2.5.2 and 2.5.3 also compare sample by sample results to FDEP SCTLs and USEPA PRGs. Mean concentrations were not solely used to describe results.

b. Direct comparison of average or maximum concentrations is not a statistically valid method for determining if off-site samples are representative of background. We recommend using the methodology in the above cited background guidance (FDEP, 2012) to determine if off- site samples are indicative of background.

Response: As discussed in response to Strategic Environmental Analysis, Inc. Comment #2, above, FDEP guidance for comparing background and Site concentrations was followed. While some of the background locations may be outliers using a statistical test, all background the sampling locations were selected consistent with FDEP guidance and with the goal of not being affected by any known point sources or runoff from likely sources of constituents. To Beazer's knowledge, no such sources were present in the vicinity of these any background samples. The appropriateness of background sample locations was verified with various stakeholders, prior to collection of the samples. Thus, the samples were collected to be representative of background locations and do represent background for similar areas in Gainesville and no a priori reason exists to exclude any individual location(s). Background samples demonstrate that high concentrations are possible in samples not impacted by the Site.

10. Average percent composition for each TCDD-TEQ congener (Section 2.5.4.2) and average congener ratios (Section 2.5.4.3) were calculated for off-site and background areas. Averaging fingerprints across samples based on locations is not a valid methodology. The purpose of fingerprinting is to acquire a congener profile or ratio for a specific location and compare it to the site and/or background fingerprint. Averaging these profiles distorts them and results in a final profile that may be dissimilar from each of the individual location fingerprints. It cannot be used to determine similarity to or differences from any source of contamination.

Response: While average concentrations for each data set were presented to demonstrate general trends, the fingerprint evaluation did not use averages, but compared each sample to the others. All lines of evidence used in the fingerprinting evaluation (i.e., the PCA, the congener ratio, and the two

homologue ratios) presented results on a sample by sample basis and did not average fingerprints across samples.

Attached letter from Dr. Linda Young:

The final five paragraphs of the attached letter from Dr. Linda Young are presented below along with responses. These are the paragraphs judged to contain observations or comments about the analyses presented in the November 2013 Report.

The analysis considered three constituents thought to have the greatest potential to pose a potential human health risk: arsenic, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCCDD/Fs). Most of the analysis was a comparison of on-site and off-site numbers relative to FDEP default residential and commercial delineations based on scientific reasoning and did not involve any rigorous statistical treatment. This is reasonable for an exploratory approach. When elevated levels of a constituent occur only within a site and not in the surrounding area, such analyses may be sufficient. The rest of the review considers the cases for which additional analyses were presented.

Response: Comment noted.

For both arsenic and PAH levels, whether the off-site levels that were above the relevant FDEP delineation criteria might be site-related was evaluated using fingerprinting. The approach used here was not statistical and relies on a logical, scientific argument.

Response: Comment noted.

The fingerprinting analysis of PCDD/F levels was more in-depth. However, insufficient detail is given for a full statistical evaluation. For example, clusters of samples were formed (p. 20). How were the clusters selected? Was it through a clustering algorithm? If so, what method was used?

Response: The discussion on page 20 of the November 2013 report refers to a single cluster, the “Off-Site West Cluster.” As described in the November 2013 Report, the process of identifying the Off-Site West Cluster involved several elements. The Off-Site West Cluster was initially identified by the fact that higher TCDD-TEQ values were found in a group of adjacent samples near the corner of NW 6th Street and NW 28th Avenue. The elevated TCDD-TEQ concentration in this area

was inconsistent with the TCDD-TEQ concentrations and decreasing concentration vs. distance-from-Site trends observed in other off-Site samples. To evaluate whether other sources of dioxins/furans may have contributed to the cluster samples, the congener and homologue patterns in these samples were compared to the patterns observed in Site and other off-Site samples. Some of the ratios were found to differ from most Site and most off-Site west samples suggesting the "Off-Site West Cluster" samples may be influenced by a unique source of dioxins/furans[3]. The evaluation of homologue patterns was extended beyond congener and homologue ratios using PCA. As discussed in the November 2013 Report, the PCA confirmed that the Off-Site West Cluster samples had a homologue distribution that differed from Site samples. Thus, the Off-Site West Cluster is based on the combination of all of the lines of evidence described above (TCDD-TEQ concentration, congener and homologue ratios, and PCA).

PCA analysis was used to further evaluate PCDD/F levels. Often multiple transformations are considered in the use of PCA for fingerprinting (Shields, et al. 2006). It is assumed here that the standardized transformed variables, where the transformation was to percentages, were used though this is not explicitly stated. The dominant variables associated with each constituent were identified. However, it is common to actually provide the eigenvalue and coefficients associated with each PC so that the reader can make an assessment.

Response: The PCDD/Fs were transformed to proportions as described in Shields, et al. (2006) which is Chapter 14 of "Environmental Forensics" by Morrison and Murphy, 2006. A correlation matrix of the proportions was used for the PCA, consistent with this reference. The 2014 Addendum presents an updated PCA, incorporating off-Site samples collected in 2014 and tables summarizing the eigenvalues and eigenvectors as well as the individual PCA scores.

[3] As described in the November 2013 Report, cluster samples demonstrated a greater percentage of TEQ being associated with lower chlorinated (tetra-, penta-, and hexa-) dioxin and furan congeners as compared to Site and other off-Site samples. Also, there are similarities in composition of the cluster samples and the background samples. Cluster and background samples both showed a greater contribution from lower chlorinated dioxin and furan congeners to the overall TEQ

In summary, most of the analyses in this report are qualitative. The primary statistical analyses, based on PCA, did not include the detail common to such analyses, thereby preventing a full review.

Response: The July 2014 Addendum updates the PCA and provides the requested information enabling a full review.

Should you have any questions or comments, please do not hesitate to contact me.

Sincerely,

ARCADIS U.S., Inc.

Paul D. Anderson, Ph.D.
Vice President/Principal Scientist

Attachments:
Figure 1a. Principal Component Plot: PC2 vs. PC1
Figure 1b. Principal Component Plot: PC3 vs. PC1
Figure 1c. Principal Component Plot: PC4 vs. PC1
Figure 2a. Principal Component Plot: PC2 vs. PC1
Figure 2b. Principal Component Plot: PC3 vs. PC1
Figure 2c. Principal Component Plot: PC4 vs. PC1

Copies:
Mitchell Brourman, Beazer East, Inc.

References

Florida Department of Environmental Protection (FDEP). 2012. Guidance for Comparing Background and Site Chemical Concentrations in Soil. Bureau of Waste Cleanup, Program & Technical Support Section, Tallahassee, Florida. January.

Florida Department of Health (FDOH). 2013. Health Consultation Surface Soil in the Surrounding Areas, Cabot Carbon-Koppers Superfund Hazardous Waste Site, Gainesville, Alachua County, Florida.

Morrison and Murphy. 2006. Environmental Forensics: Contaminant Specific Guide. Robert D. Morrison and Brian Murphy. Elsevier Academic Press. 2006.

van Wijnen, J.H., A.K.D. Liem, K. Olie, and J.A. van Zorge. 1992. Soil contamination with PCDDs and PCDFs of small (illegal) scrap wire and scrap car incineration sites. *Chemosphere* 24(2):127-134.

United States Environmental Protection Agency (USEPA). 2006. Data Quality Assessment: Statistical Methods for Practitioners. Office of Environmental Information, Washington, DC. EPA/240/B-06/003. February.

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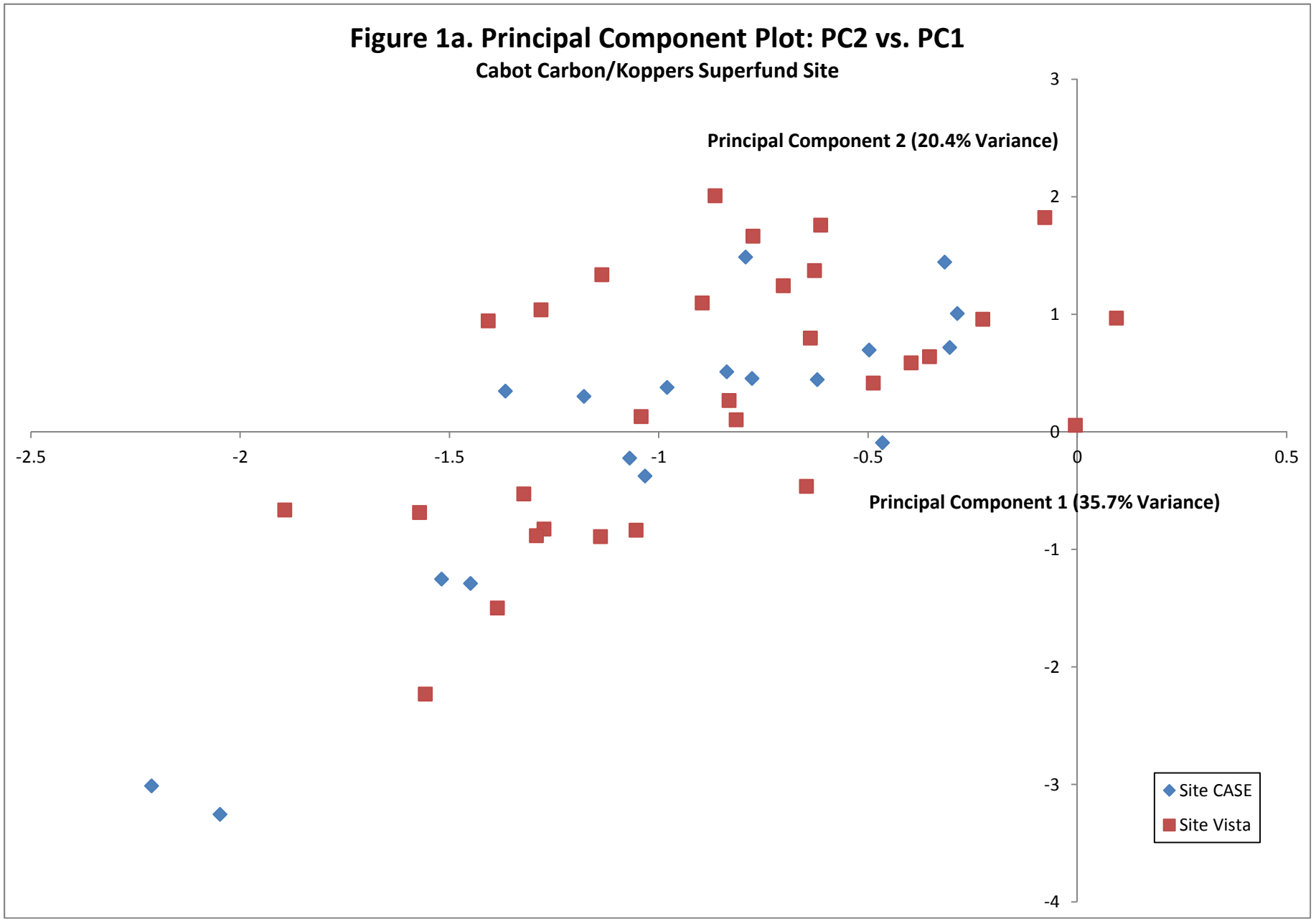
Figure 1a. Principal Component Plot: PC2 vs. PC1
Cabot Carbon/Koppers Superfund Site
Principal Component 2 (20.4% Variance)
Principal Component 1 (35.7% Variance)
3
2
1
0
-1
-2
-3
-4
-2.5
-2
-1.5
-1
-0.5
0
0.5
Site CASE
Site Vista

ARCADIS

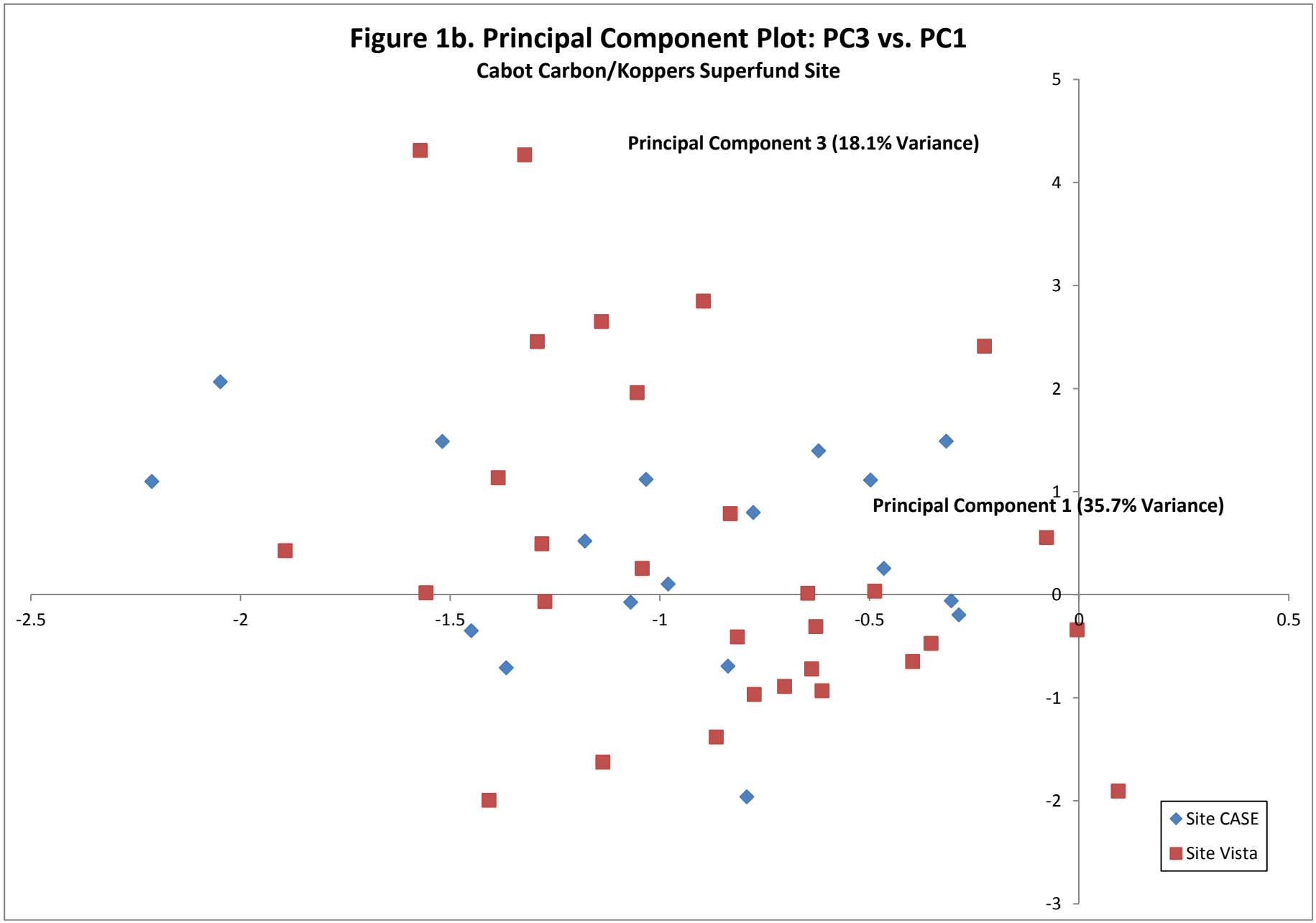
Figure 1b. Principal Component Plot: PC3 vs. PC1
Cabot Carbon/Koppers Superfund Site
Principal Component 3 (18.1% Variance)
Principal Component 1 (35.7% Variance)
5
4
3
2
1
0
-1
-2
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
Site CASE
Site Vista

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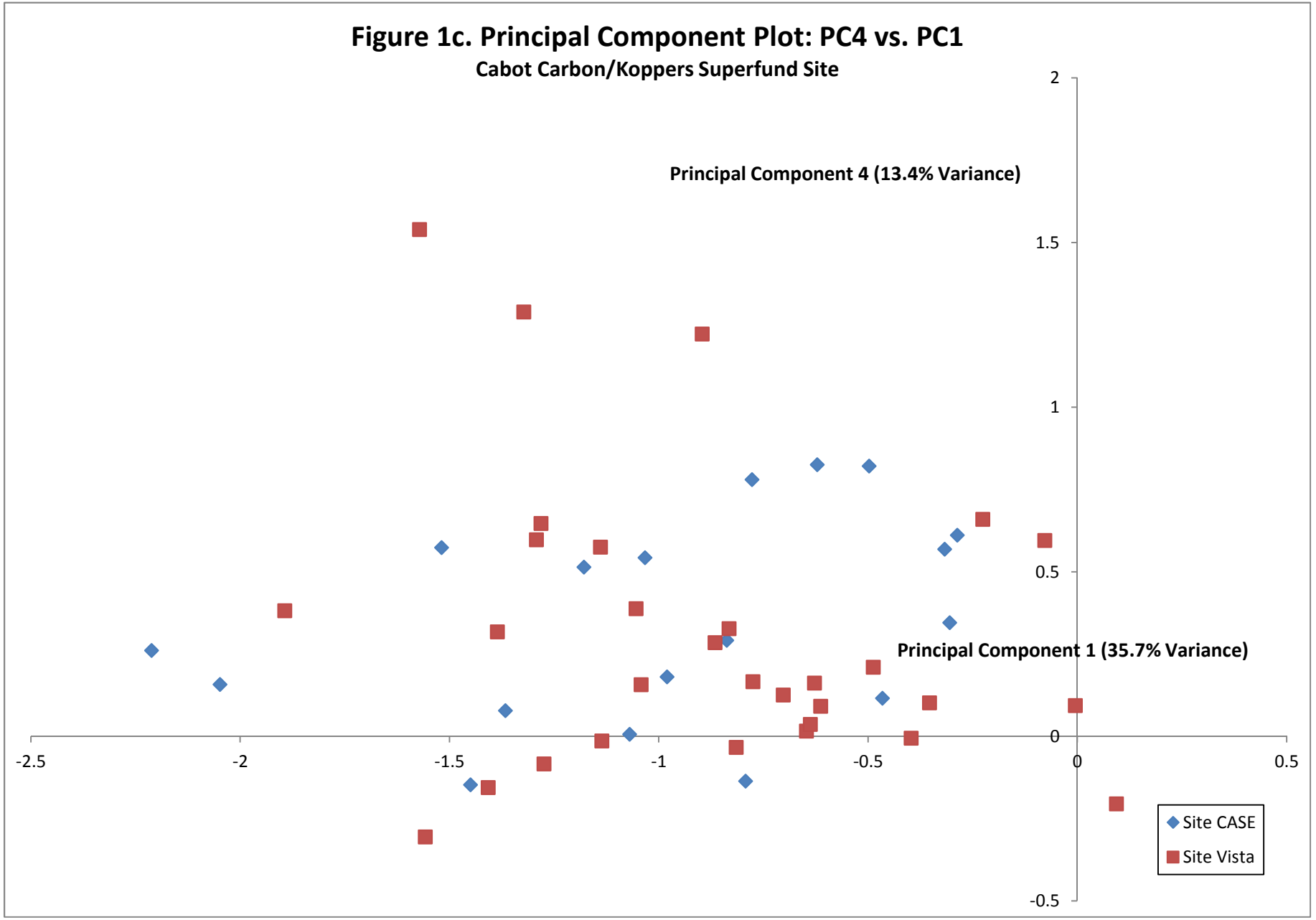
Figure 1c. Principal Component Plot: PC4 vs. PC1

Cabot Carbon/Koppers Superfund Site



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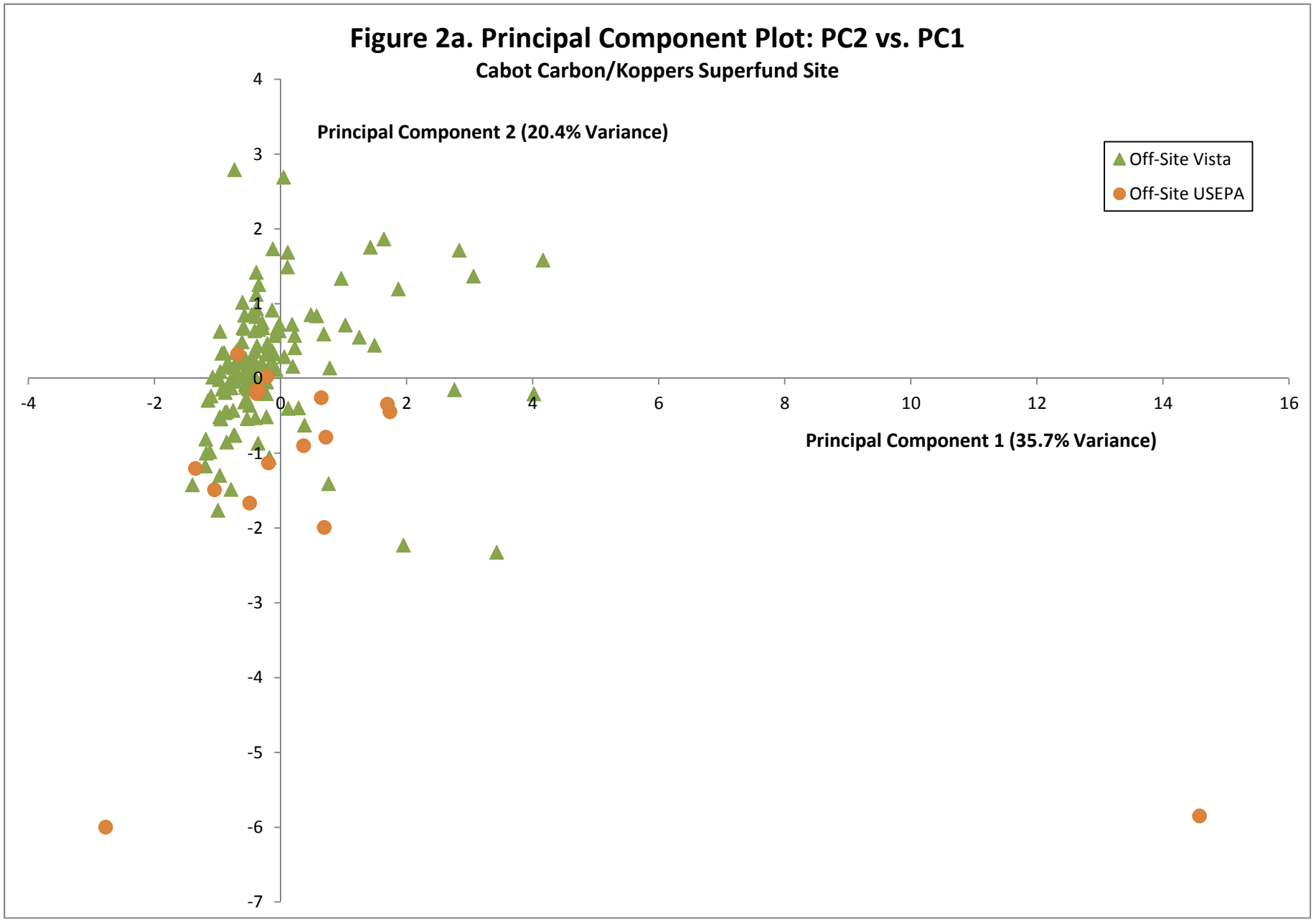
Figure 2a. Principal Component Plot: PC2 vs. PC1
Cabot Carbon/Koppers Superfund Site
Principal Component 2 (20.4% Variance)
Principal Component 1 (35.7% Variance)
Off-Site Vista
Off-Site USEPA
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-4
-2
0
2
4
6
8
10
12
14
16

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Figure 2b. Principal Component Plot: PC3 vs. PC1

Cabot Carbon/Koppers Superfund Site

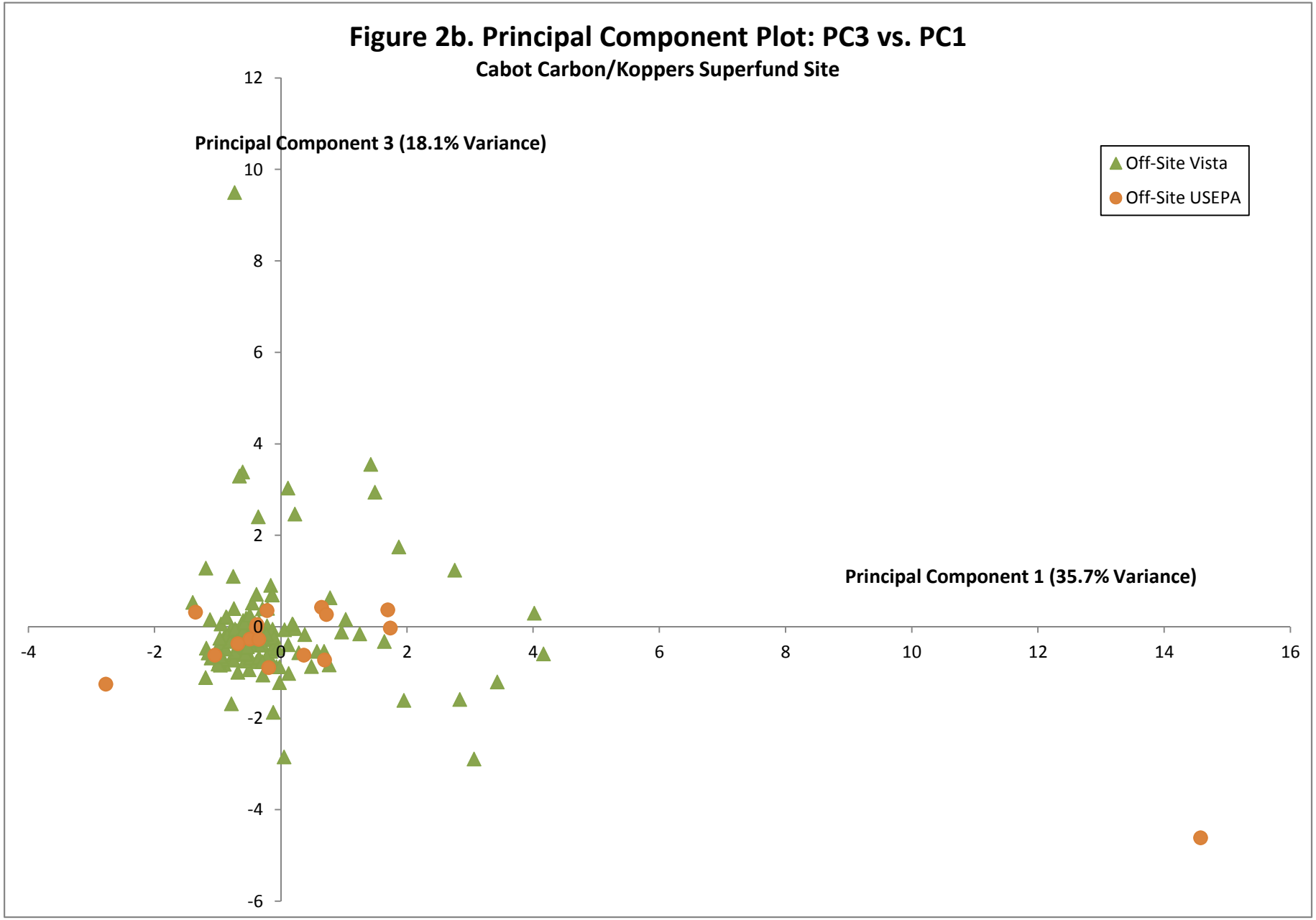

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Figure 2c. Principal Component Plot: PC4 vs. PC1

Cabot Carbon/Koppers Superfund Site