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Division of Air Quality

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ATAST Response # 06020

Exterior Wipe Sampling Screening Program
Apex, NC

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Acronyms

COPC	Contaminants of Potential Concern
DAQ	Division of Air Quality
DENR	Department of Environment and Natural Resources
DHHS	Department of Health and Human Services
DPH	Division of Public Health
DWM	Division of Waste Management
DWQ	Division of Water Quality
ERG	Eastern Research Group
EQ	Environmental Quality (facility)
GC/MS	gas chromatograph/mass spectrophotometer
IC	ion Chromatography
ICP/MS	Inductively-Coupled Plasma/Mass Spectrometry
PAHs	Polycyclic Aromatic Hydrocarbons
TPB	Toxic Protection Branch
sq. cm.	square centimeter
sq. m.	square meter
µg	microgram

Acknowledgements

This report could not have been completed without the following members of the Toxics Protection Branch staff who tirelessly performed the canvass for sampling locations, and then collected the wipe samples:

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John Holland
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Mention of a commercial product does not imply endorsement by the State of North Carolina.

Introduction

Representatives of state and local agencies met on October 16, 2006, to discuss response efforts and citizens' concerns about potential health effects from the fire and explosions that occurred at the EQ facility in Apex, NC on October 5-6, 2006. This meeting, which occurred after the fire was effectively extinguished and the clean-up and remediation at that facility had begun, involved representatives from: the Town of Apex; Wake County; the Department of Environmental and Natural Resources (DENR) [Divisions of Waste Management (DWM); Water Quality (DWQ), and Air Quality (DAQ)]; and the Department of Health and Human Services (DHHS) and its Division of Public Health (DPH). While air monitoring during the fire indicated that concentrations of air pollutants were well below limits at which adverse health effects would be observed in the general population, nothing was known about pollutants that might have been deposited on the ground or exterior surfaces of buildings or infiltrated into homes, businesses, schools, and churches. To determine if pollutant deposition was a problem, DENR and DHHS jointly decided to design and implement a screening program using wipe samples collected inside and outside approximately 30 homes and buildings in the Apex, NC area. The Toxics Protection Branch (TPB) of the Division of Air Quality developed a sampling strategy for the screening program that included: (1) using local meteorological data obtained during the fire incident to determine sampling areas; (2) determining which chemical species to sample; (3) developing a list of sampling locations within those selected areas and sharing that list with DPH and DWM; and (4) conducting exterior wipe sampling at those selected locations. DPH conducted interior wipe sampling and mercury vapor sampling and DWM conducted soil sampling at those same selected locations. The goal of the screening program was to determine the levels of selected pollutants in the soil and settled dust on exterior and interior surfaces, and then to compare those levels with health-based screening values to assess the potential health impacts that could result from exposure of adults and children to those chemicals in the settled dust and soil.

Sampling Site Identification

On Thursday October 19, 2006 two TPB teams deployed to canvass sampling locations for the wipe sampling project.

Thirty sampling locations were initially considered for the screening project; 31 were finally selected. Highest priority was given for those locations located close in proximity to EQ and those generally downwind of EQ during the fire (the winds during the fire were generally from the east, changing over time to being from the north -- the "downwind" locations for sampling were those generally south to west of EQ. Because of meteorological conditions existing during the time of the fire, it could not be determined how deposition of particulate would be affected by distance from EQ, so locations were also selected at some distance from the fire. Locations were also selected both upwind and crosswind from the fire.

Each team conducted door-to-door canvassing in these selected areas on October 19, 2006. Because consent to perform the sampling was needed from the homeowners and business and school officials, each team targeted sites where people were present to be able to complete and sign the consent form. Sampling location selection was, therefore, not random, but for this screening process randomness was determined not to be a critical factor.

Sample collection from identified locations was begun and completed on Friday, October 20, 2006. On Friday evening, five additional locations were added to the original list at the request of the Town of Apex. The residents at these locations had expressed concerns about health effects, which manifested either during or immediately after the fire. These additional locations were sampled on Monday, October 23, 2006. All sampling locations are shown in Figure 1. The shaded areas in Figure 1 indicate the areas evacuated during the EQ fire. Site type identifications are listed in Table 1. For the purposes of this report, specific addresses are being withheld by request of several homeowners.

The Wipe Sampling Strategy

At each sampling location, wipe samples were collected on exterior surfaces located in the “front” and located in the “back.” The “front” was defined to be that side of the structure facing the EQ facility; the “back” was that side opposite the front. The strategy employed was similar to methods used in response to a fire that occurred at another EQ facility located in Romulus, Michigan¹.

Contaminants of Potential Concern (COPCs) voiced by Apex citizens attending the Town Council meeting on October 16, 2006 included heavy metals, mercury, and cyanides. Other COPCs were added by TPB in planning for the wipe sampling program. The COPC list is shown in Table 2.

Table 1. Site Locations for Wipe Sampling

Site ID	Site
1	Business 1
2	Residence 1
3	Residence 2
4	Residence 3
5	Residence 4
6	Residence 5
7	Business 2
8	School 1
9	Residential Area 1
10	Residence 6
11	Residence 7
12	Residence 8
13	Residence 9
14	Residence 10
21	Residence 11
22	Residence 12
23	Residence 13
24	Business 3
25	Residence 14
26	Residence 15
27	Residence 16
28	School 2
29	Residence 17
30	Church 1
31	Residence 18
32	Residence 19
33	Residence 20
34	Residence 21
35	Residence 22
36	Residence 23
37	Residential Area 2
41	Residence 24
42	Residence 25
43	Residence 26
44	Residence 27
45	Residence 28

Appendix D contains the specific sites from which samples were obtained at each sampling location.

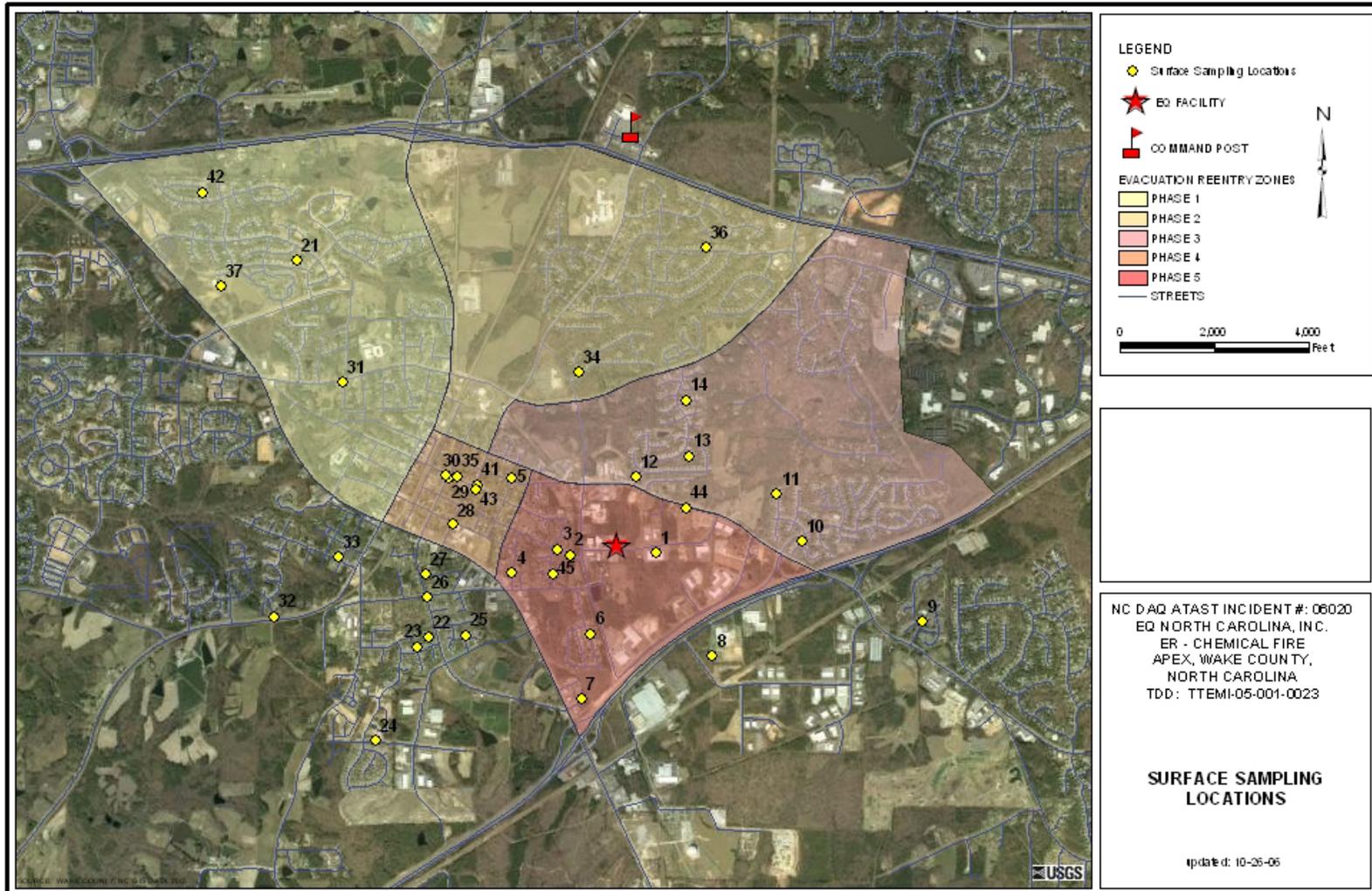
Table 2. COPC List

Metals	Anions	Polycyclic Aromatic Hydrocarbons (PAHs) PAH Scan
Arsenic	Cyanides	Acenaphthene
Barium		Acenaphthylene
Beryllium		Anthracene
Cadmium		Benzo (a) anthracene
Chromium		Benzo (a) pyrene
Cobalt		Benzo (b) fluoranthene
Copper		Benzo (e) pyrene
Lead		Benzo (g,h,i) perylene
Manganese		Benzo (k) fluoranthene
Mercury		Chrysene
Nickel		Coronene
Selenium		Dibenz (a,h) anthracene
Silver		Fluoranthene
Vanadium		Fluorene
Zinc		Indeno (1,2,3-cd)pyrene
		Naphthalene
		Perylene
		Phenanthrene
		Pyrene

The metals tested were based primarily on those selected for wipe sampling following the EQ-Romulus fire¹. Aluminum and iron were eliminated from the final list because of expected high background levels as well as exceedingly high screening levels. Calcium, magnesium, potassium, and sodium were eliminated because these are nutrients needed by humans for normal body function, and both background levels and screening levels for these elements were also expected to be elevated. The PAHs listed in Table 2 result from a “normal” PAH scan conducted by an analytical laboratory.

Wipe sampling for metals was conducted using Ghost wipes (cotton towelettes pre-moistened with de-ionized water); PAHs were sampled using glass fiber filters dampened with de-ionized water; and cyanides were sampled with cellulose filters dampened with de-ionized water. The sampling media were purchased from SKC, Inc. (Wipe Sampling Test Kit, Catalog No. 225-2401A).

Figure 1. Sampling Sites



At each sampling location (residence, business, school, church), TPB teams identified specific surfaces on which to take samples. The following priorities for which sampling were conducted at each site was determined prior to deployment to the field:

- Horizontal surfaces were given highest priority (e.g., railings, AC units)
- Non-porous surfaces were given highest priority (i.e. painted surfaces and metals)
- Surfaces must be exposed (i.e., not under a carport, overhang)
- If there were no horizontal surfaces, vertical surfaces would be sampled. Exposure and non-porous surface criteria still applied.

Two sets of three wipe samples were collected at each site – one set in the “front” location (side closest to the EQ facility) and one set in the “back” location (side farthest from the EQ facility). This strategy was also adopted in the wipe sampling conducted after the EQ-Romulus fire. Each set of wipe samples consisted of one wipe for metals, one for cyanides, and one for PAHs – a total of six samples per sampling location.

Each wipe sample consisted of wiping an area of approximately 100 square centimeters (sq. cm.) on each surface sampled. Templates of 100 sq. cm. area were used when possible; if not, the length and width of a sampling site was measured using a ruler and masking tape used to enclose that 100 sq. cm. area. The sampling medium was dampened with de-ionized water, if necessary, and then folded into quarters. The area was wiped, top to bottom, in a vertical pattern, the sampling medium was re-folded (so that a fresh quarter of the medium was exposed for sampling), and the area was re-wiped from left to right, in a horizontal pattern. The entire process was then repeated: re-folding of the sampling medium and horizontal and vertical wipes. The sampling medium was then placed in a sample container and labeled with the site number, location (front or back), and constituent (metal, PAH, cyanide). “APEX01FM” is the wipe sample collected in the “front” at location 01 for metals analysis.

To be able to characterize the metals, cyanide, and PAH background content on the sampling media used in the program, each team collected field blanks of both wet and dry sampling media. Three sets of field blanks were made by placing the sampling medium directly in the sample container after dampening with de-ionized water, if necessary (for wet blanks), or without dampening (for dry blanks). Field blanks were collected for each type of sample collected (metals, PAHs, and cyanides).

After sampling was completed, each team divided the containerized samples by COPC type and placed each sample type in a separate Zip-Loc® bag. Chain-of-custody forms and sample lists were created for each bag. The samples were then transported to the laboratory for analysis.

Health-based Benchmarks

The wipe sampling results are reported in units of $\mu\text{g}/100 \text{ sq. cm.}$ representing the mass of the analyte collected per 100 square centimeters of area sampled. The screening levels shown in Table 3 represent those levels above which there is increased probability of an adverse health impact resulting from exposure to the settled dust. The screening levels in Table 3 were adapted from those published by the Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Task Force Working Group². The risk established for these screening levels was set by the COPC Committee Working Group at 1×10^{-4} (a 1 in ten thousand risk). This risk level represents a reasonable compromise in sample collection and analysis for a screening program. The risk is somewhat more relaxed than usual, but to achieve a risk level of 1×10^{-6} (one in a million), a substantially greater area would have to be sampled, resulting potentially in a reduction in collection efficiency of particulate on the sampling medium. Analytical interferences would also be substantially increased. Adopting these health-based benchmarks also are advantageous because they have been peer-reviewed and accepted³.

Table 3. Screening Levels for Settled Dust

Analyte	Screening Level ($\mu\text{g}/100 \text{ sq.cm.}$)
Arsenic	3.87
Barium	1100
Beryllium	31.4
Cadmium	15.6
Chromium	47
Cobalt	314
Copper	627
Lead	2.70
Manganese	314
Mercury	1.57
Nickel	314
Selenium	78.4
Silver	78.4
Vanadium	110
Zinc	4700
Cyanides (total)	26.9
PAHs (total)	1.45

Laboratory Analysis

All samples were analyzed at the Research Triangle Park Laboratories of ERG.

Metals

Particulate matter collected on wipe samples was extracted in 25 mL of 4% ultra-pure nitric acid for 3 hours on a heated, sonicated extractor. After cooling, the extract was diluted to 50mL with de-ionized water. Metals were analyzed by ICP/MS (Inductively-Coupled Plasma/Mass Spectrometry) using Compendium Method IO-3.5⁴.

Cyanides

Wipe samples were prepared for analysis using NIOSH Method 6010⁵. The wipes were placed in sample vials and particulate matter was extracted using 10 mL 0.10N NaOH. The wipe samples were sonicated for 30 minutes, and analyzed for cyanides by ion chromatography using the analytical method described in EPA CTM-033.⁶

Polycyclic Aromatic Hydrocarbons (PAHs)

Immediately upon arrival, wipe samples were placed into vials and 40 mL of methylene chloride was added to each vial. A surrogate was added and the sample was sonicated for 30 minutes. The samples were dried by repeatedly pouring them through a filter containing sodium sulfate. The samples were concentrated to 1 mL by swirling in a heated RapidVap[®] solvent evaporator under a nitrogen atmosphere. The samples were then placed in a freezer until analysis. The samples were removed from the freezer, thawed, and then spiked with an internal standard and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) following EPA Compendium Method TO-13A⁷.

Summary of Results

Metals

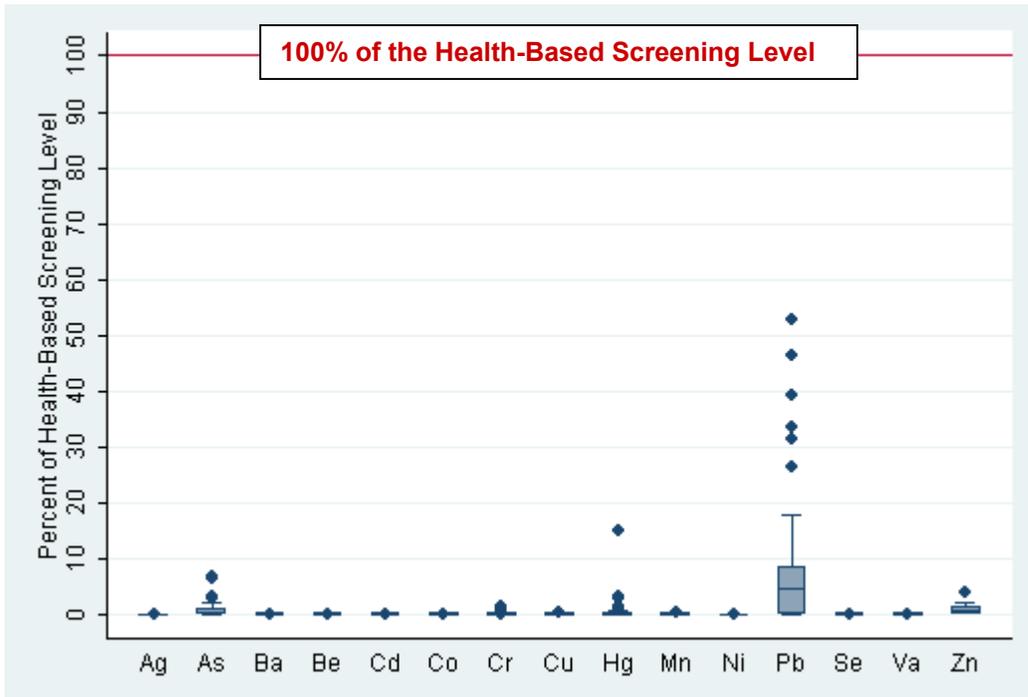
Two wipe samples were collected (one “front,” one “back”) at 36 sampling locations for a total of 72 samples. Table 4 shows the analytical results for metals. Column 1 lists the metal, Column 2 summarizes the number of wipe samples in which that metal was detected in the 72 samples collected; Column 3 summarizes the concentration range (minimum concentration, maximum concentration) detected, and Column 4 lists the health-based screening level for that metal. Arsenic, for example, was detected in 69 of 72 samples collected, and the concentration of arsenic in the wipe samples ranged from 0 µg/100sq.cm. to 0.258 µg/100sq.cm. compared to a screening level of 3.87 µg/100sq.cm. Appendix A contains the analytical results from each sampling location.

Table 4. Metal Concentrations in Exterior Settled Dust

Metal	No. Detections/ No. Samples	Concentration Range (µg/100sq.cm.)	Median Concentration (µg/100 sq.cm.)	Screening Level (µg/100 sq.cm.)
Arsenic	69/72	0 - 0.258	0.0194	3.87
Barium	68/72	0 - 2.50	0.00065	1100
Beryllium	68/72	0 - 0.001	0.0002	31.4
Cadmium	23/72	0 - 0.04	0	15.6
Chromium	36/72	0 - 0.74	0.001	47
Cobalt	72/72	0.0007 – 0.34	0.004	314
Copper	37/72	0 - 3.35	0.014	627
Lead	54/72	0 - 1.42	0.123	2.7
Manganese	64/72	0 - 1.08	0.164	314
Mercury	52/72	0 - 0.24	0.001	1.57
Nickel	13/72	0 - 0.09	0	314
Selenium	70/72	0 - 0.02	0.006	78.4
Silver	15/72	0 - 0.01	0	78.4
Vanadium	72/72	0.002 - 0.15	0.02	110
Zinc	47/72	0 – 191.3	33.6	4700

The metals results are also shown graphically in Figure 2. In this figure, the health-based screening level is set at 100% and each result is expressed as a percentage of the screening level (e.g., if the screening level is 10 µg/100 sq.cm. and an individual result is 1 µg/100 sq.cm., the percentage for that result would be $1/10 \times 100\% = 10\%$). As the graphic clearly shows, no metal concentration exceeded its health-based screening level. The largest percentage was for one wipe sample of lead, and that value was 53% of the screening level.

Figure 2. Metal Concentration as a Percentage of the Health-Based Screening Level



Ag: Silver **Cd:** Cadmium **Mn:** Manganese **Va:** Vanadium
As: Arsenic **Co:** Cobalt **Ni:** Nickel **Zn:** Zinc
Ba: Barium **Cu:** Copper **Pb:** Lead
Be: Beryllium **Hg:** Mercury **Se:** Selenium

Cyanides

Cyanides were not detected in any of the 72 wipe samples collected in the screening project. The detection limit for this analytical method was 0.40ug/100sq.cm. Appendix B contains the analytical results from each sampling location.

Table 5. Cyanide Concentration in Exterior Settled Dust

Analyte	No. detections/ No. samples	Concentration Range (ug/100 sq.cm.)	Screening Level (ug/100 sq.cm.)
Cyanide	0/72	No CN ⁻ Detected in any sample	26.9

Polycyclic Aromatic Hydrocarbons (PAHs)

A PAH scan was used to analyze PAH wipe samples. This scan reports the concentration of 18 PAHs. One PAH was detected in each of 8 wipe samples of the 72 wipe samples collected. The screening level for total PAHs collected on each wipe sample is 1.45µg/100 sq.cm. The maximum

concentration reported on any single wipe was 0.03µg/100 sq.cm. Appendix C contains the analytical results from each sampling location.

Table 6. Polycyclic Aromatic Hydrocarbon (PAH) Concentrations in Exterior Settled Dust

Analyte	No. detections/ No. samples	Concentration Range (µg/100sq.cm.)	Screening Level for total PAHs (µg/100sq.cm.)	PAH Detected
PAH (total)	1/72	0 – 0.01	1.45	Benzo(g,h,i)perylene
	4/72	0 – 0.01	1.45	Naphthalene
	1/72	0 – 0.01	1.45	Perylene
	1/72	0 – 0.03	1.45	Fluoranthene
	1/72	0 – 0.01	1.45	Benzo(a)anthracene

Analysis of Exterior Wipe Sampling Data

The data show that cyanides were not detected in any wipe sample. In addition, the data show that the total PAH concentration on any wipe sample is extremely low; there is virtually no variability in PAH concentration across wipe samples. Metals concentration showed the only variability in the data set. The variability of metals concentration in wipe samples is shown in Figure 3. Figure 4 shows that same variability excluding zinc (notice the change in the concentration axis).

Figure 3. Variability in Concentration of Metals in Exterior Wipe Samples

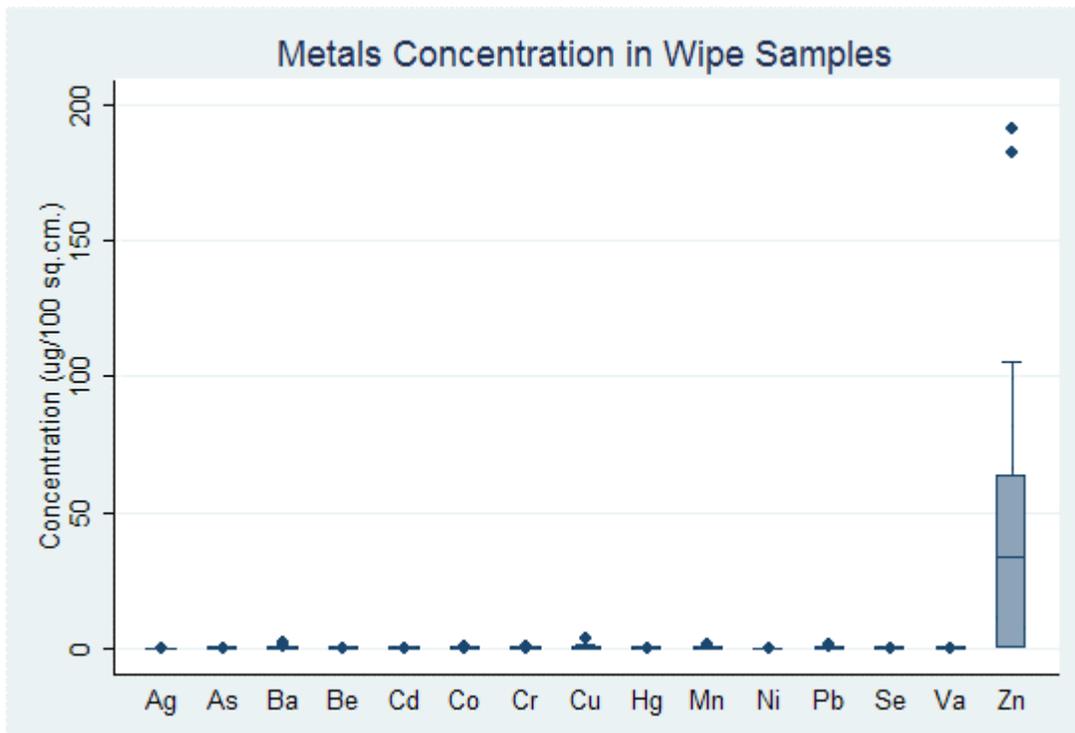
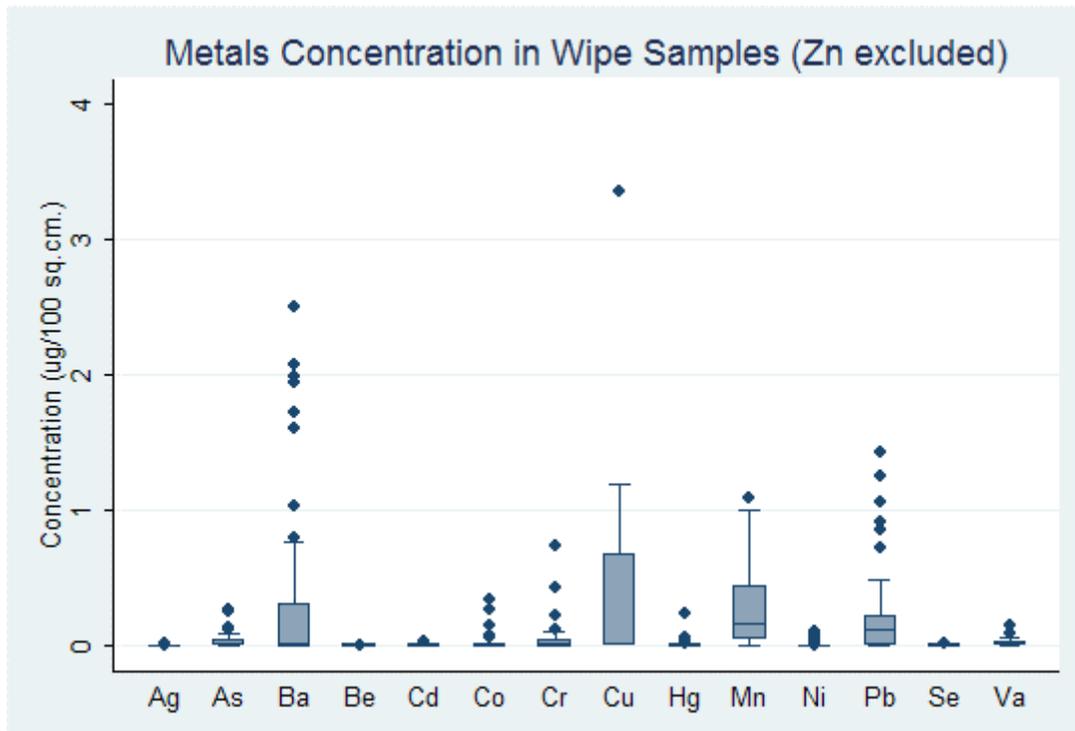


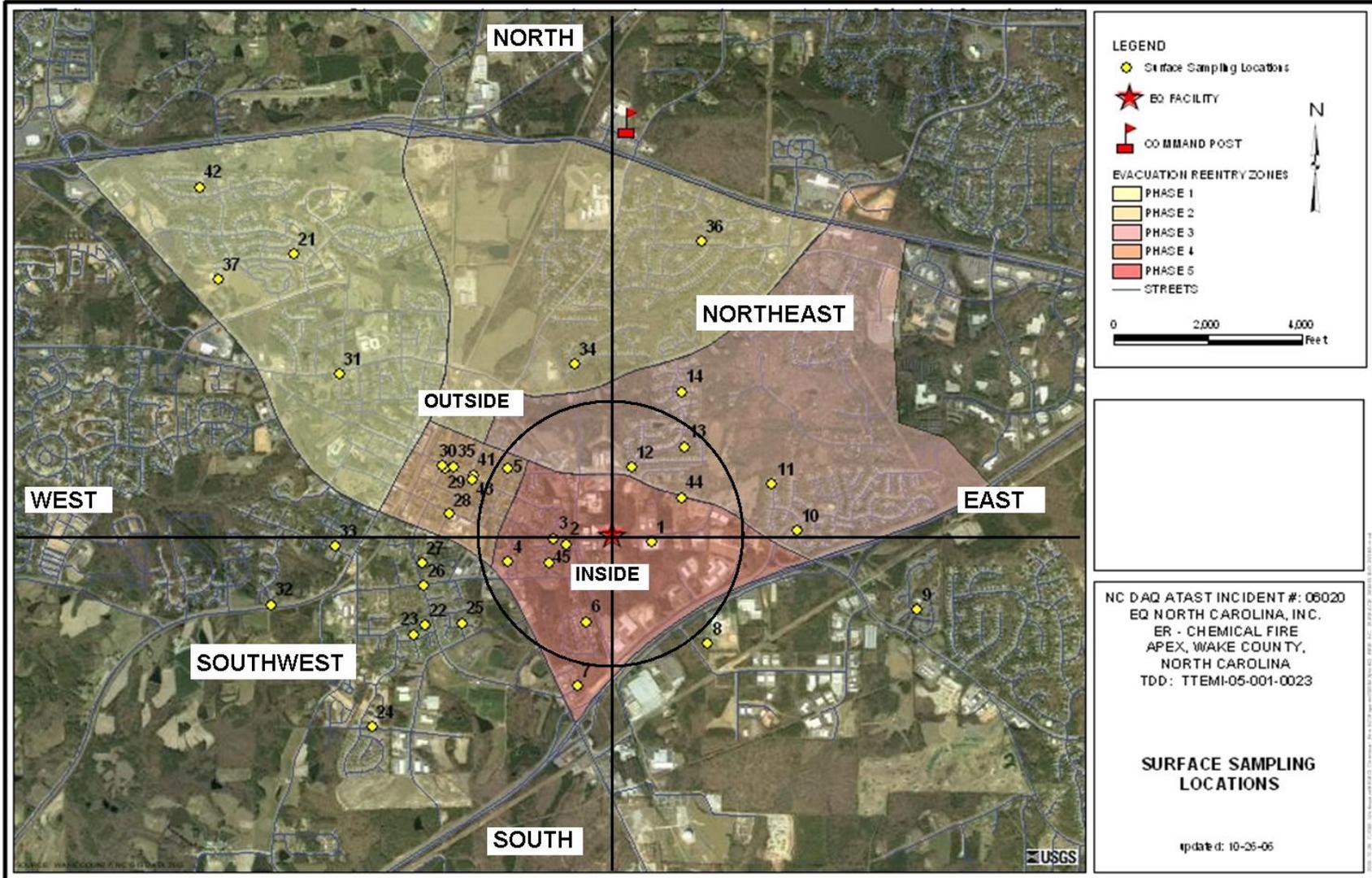
Figure 4. Metals Concentration in Wipe Samples (excluding Zinc)



While it has been shown that the maximum concentrations of each of these metals was much less than the health-based screening level established for each metal, the distribution of metals concentrations across sampling location warranted further examination. In the design stage of this screening program, it was thought that since the winds were primarily from the east on October 6, changing to being from the north on October 7, that particulate matter deposited on exterior surfaces at locations to the south and west (downwind) of the EQ facility might show higher concentrations of metals, cyanides, and/or PAHs than locations to the north and east (upwind). However, it was also possible that since the winds were light throughout most of the fire incident and since the fire burned hot, that particulate matter could possibly be deposited in other patterns – if particulate matter was deposited at all in the area around the EQ facility.

To examine the distribution of these metals across sampling location, the area around the EQ facility was divided in several ways. Referring to Figure 5, a horizontal line was drawn passing through the EQ facility. Sampling locations above this line were designated "NORTH"; below this line "SOUTH." Another line was drawn vertically through the EQ facility. Sampling locations to the right of this line were designated "EAST"; to the left of this line "WEST." A circle with a radius of ½ mile was drawn around the EQ facility. Sampling locations within this circle were "INSIDE"; all others were "OUTSIDE." Sampling locations in the sector from south of the EQ facility to west of the facility was designated "SOUTHWEST"; those locations in the sector from north of the EQ facility to east of the facility was designated "NORTHEAST." Comparing "NORTH" to "SOUTH," "EAST" to "WEST," "INSIDE" to "OUTSIDE," and "SOUTHWEST" to "NORTHEAST" yielded no discernible pattern of metal deposition. Metals concentration across re-entry phase was also examined and it was determined that there were no apparent differences in metals concentrations across re-entry phase.

Figure 5. Categorized Sampling Locations



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Appendix A
Metals Concentration by Sampling Location

SAMPLE	NAME	LOCATION	Metals Concentration (µg/100 sq.cm.)													
			Arsenic	Barium	Beryllium	Cadmium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Vanadium	Zinc
		SCR. LEVEL	3.87	1100	31.4	15.6	314	627	2.70	314	1.57	314	78.4	78.4	110	4700
APEX 01BM	Business 1	Back	0.0053	0.2765	0.0003	0.0154	0.0016	0.0000	0.1813	0.0604	0.2368	0	0.0051	0.0070	0.0139	44.0
<u>APEX 01FM</u>		Front	0.0298	1.0315	0.0006	0.0143	0.0072	0.0042	0.3233	0.1584	0.0018	0	0.0082	0.0023	0.0883	76.4
APEX 02FM	Residence 1	Front	0.0120	0.2785	0.0002	0.0130	0.0111	0.5922	0.0813	0.0644	0.0019	0	0.0099	0	0.0175	0
<u>APEX 02BM</u>		Back	0.0042	0.1585	0.0003	0.0137	0.0644	0.0000	0.2163	0.0074	0.0011	0	0.0049	0	0.0139	41.6
APEX 03BM	Residence 2	Back	0.0022	0.2945	0.0003	0.0122	0.0152	0.1422	0.0853	0.0244	0	0	0.0052	0.0079	0.0089	86.4
<u>APEX 03FM</u>		Front	0.0273	0.3845	0.0001	0.0367	0.0008	0.0000	0.2103	0.0000	0	0	0.0013	0.0022	0.0041	0
APEX 04BM	Residence 3	Back	0.0611	0.5205	0.0006	0.0144	0.0048	0.1302	0.1503	0.6594	0.0010	0	0.0032	0	0.0127	26.4
<u>APEX 04FM</u>		Front	0.0203	0.3235	0.0002	0.0115	0.0024	0.0000	0.2093	0.0624	0.0006	0	0.0202	0	0.0110	0
APEX 05BM	Residence 4	Back	0.0068	0.5645	0.0003	0.0126	0.0033	0.0000	0.1693	0.0194	0.0105	0	0.0012	0	0.0058	0
<u>APEX 05FM</u>		Front	0.0080	0.5905	0.0007	0.0121	0.0148	0.0000	0.2373	0.4394	0.0099	0.0059	0.0092	0	0.0460	84.4
APEX 06BM	Residence 5	Back	0.0439	0.7705	0.0001	0	0.0019	0.5022	0.9103	0.0214	0	0	0.0031	0.0007	0.0530	0
<u>APEX 06FM</u>		Front	0.0199	0.0000	0.0004	0	0.0034	0.3322	0	0.0214	0.0001	0	0.0088	0	0.0141	76.4
APEX 07BM	Business 2	Back	0.0063	1.7215	0	0.0137	0.0056	0.0000	0.2923	0.0000	0	0	0.0055	0.0060	0.0175	0
<u>APEX 07FM</u>		Front	0.0109	0.6685	0.0005	0.0150	0.0030	0.0000	0.1993	0.0204	0	0	0.0086	0.0042	0.0366	64.4
APEX 08BM	School 1	Back	0.0036	0.2105	0.0002	0.0137	0.0031	0.0000	0.2303	0.2814	0	0	0.0041	0	0.0205	0
<u>APEX 08FM</u>		Front	0.0052	2.0715	0.0001	0.0161	0.0010	0.0000	0.1893	0.0000	0	0	0.0009	0	0.0024	0
APEX 09BM	Residential Area 1	Back	0.0400	2.5015	0.0006	0	0.0126	0.7122	0.3043	0.1874	0.0017	0.0979	0.0124	0	0.0450	68.4
<u>APEX 09FM</u>		Front	0.0225	0.2055	0.0003	0	0.0036	0.5422	0.2083	0.0664	0.0245	0.0019	0.0046	0.0021	0.0161	39.6
APEX 10BM	Residence 6	Back	0.0639	0.1745	0.0006	0	0.3445	0.4522	0	0.2054	0.0007	0.0029	0.0086	0	0.0402	91.4
<u>APEX 10FM</u>		Front	0.0377	0.4565	0.0001	0.0105	0.0212	0.0000	0.2163	0.0000	0	0	0	0	0.0155	0
APEX 11BM	Residence 7	Back	0.1264	0.0155	0.0002	0	0.0049	0.7422	0.3243	0.0394	0	0	0.0099	0.0008	0.0350	105.4
<u>APEX 11FM</u>		Front	0.0422	0.4145	0.0001	0.0135	0.0034	0.0000	0.1613	0.0074	0	0.0239	0.0031	0.0037	0.0116	0
APEX 12BM	Residence 8	Back	0	0.2355	0.0001	0.0092	0.0010	0.0000	0	0.0000	0	0	0.0015	0.0021	0.0025	0
<u>APEX 12FM</u>		Front	0.0365	0	0.0005	0	0.0028	0.9622	0.0533	0.0314	0	0	0.0063	0	0.0220	69.4
APEX 13BM	Residence 9	Back	0.0258	0	0.0001	0	0.0036	0.6322	0	0.0000	0.0004	0	0.0056	0.0001	0.0143	94.4
<u>APEX 13FM</u>		Front	0.2494	0.5165	0.0003	0.0137	0.0201	0.3422	1.0603	0.1544	0.0114	0	0.0068	0	0.0460	0
APEX 14BM	Residence 10	Back	0.0035	0.5885	0.0002	0.0150	0.0007	0.0000	0.0213	0.0000	0	0	0.0012	0	0.0043	0
<u>APEX 14FM</u>		Front	0.0146	0.1435	0	0.0141	0.0123	0.0000	0.1203	0.0000	0	0	0.0065	0	0.0270	46.0
APEX 21BM	Residence 11	Back	0.0105	0.3585	0.0001	0	0.0019	0.0000	0	0.1424	0	0	0.0018	0	0.0113	0
<u>APEX 21FM</u>		Front	0.2584	0.4715	0.0006	0	0.0151	0.0342	0.0653	0.9454	0.0010	0	0.0127	0	0.0250	79.4

Appendix A
Metals Concentration by Sampling Location

SAMPLE	NAME	LOCATION	Metals Concentration (µg/100 sq.cm.)													
			Arsenic	Barium	Beryllium	Cadmium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Vanadium	Zinc
		SCR. LEVEL	3.87	1100	31.4	15.6	314	627	2.70	314	1.57	314	78.4	78.4	110	4700
APEX 22BM	Residence 12	Back	0.0416	0.3755	0.0002	0	0.0028	1.0622	0	0.1924	0.0044	0.0779	0.0073	0	0.0166	0
<u>APEX 22FM</u>		Front	0.0336	0.0465	0.0003	0.0079	0.0042	0.7922	0	0.8954	0.0062	0.0379	0.0110	0	0.0194	101.4
APEX 23BM	Residence 13	Back	0.0834	0.4265	0.0001	0	0.0105	1.0122	0.1113	0.0764	0.0000	0.0249	0.0046	0	0.0340	19.3
<u>APEX 23FM</u>		Front	0.0472	0.0485	0.0003	0	0.0077	0.5522	0.1853	0.1694	0.0013	0	0.0073	0	0.0372	63.4
APEX 24BM	Business 3	Back	0.0303	0.2435	0.0001	0	0.0025	0.7922	0	0.1404	0.0003	0.0229	0.0037	0	0.0188	0
<u>APEX 24FM</u>		Front	0.0245	0.0000	0.0001	0	0.0030	0.5822	0	0.4884	0.0007	0	0.0053	0	0.0194	38.1
APEX 25BM	Residence 14	Back	0.0438	0.3775	0.0001	0	0.0031	1.1922	0.3933	0.0954	0.0024	0	0.0044	0	0.0340	0
<u>APEX 25FM</u>		Front	0.0401	0.1545	0.0001	0	0.0045	0.9522	0	0.7294	0.0004	0	0.0086	0	0.0315	83.4
APEX 26BM	Residence 15	Back	0.0379	0.2775	0	0	0.0038	0.9022	0.0063	0.2944	0.0480	0	0.0067	0	0.0231	13.2
<u>APEX 26FM</u>		Front	0.0305	0.0945	0.0002	0	0.0040	0.7322	0.0373	0.5144	0.0017	0	0.0108	0	0.0329	71.4
APEX 27BM	Residence 16	Back	0.0824	0.1155	0.0004	0.0082	0.0038	0.8522	1.4203	0.3444	0	0	0.0225	0	0.0376	56.4
<u>APEX 27FM</u>		Front	0.0362	0.5685	0.0002	0	0.0043	0.8822	0.1433	0.7874	0.0094	0	0.0121	0	0.0411	48.7
APEX 28BM	School 2	Back	0.0001	0.2885	0.0001	0	0.0052	0.4822	0	0.2124	0.0006	0	0	0	0.0026	0
<u>APEX 28FM</u>		Front	0.0006	0.0575	0	0	0.0013	0.0000	0	0.7524	0.0008	0	0.0073	0	0.0034	39.4
APEX 29BM	Residence 17	Back	0.0150	0.3605	0.0001	0	0.0033	0.0000	0.3063	0.1824	0.0053	0	0.0023	0	0.0198	0
<u>APEX 29FM</u>		Front	0.0160	0.1435	0.0002	0	0.0012	0.0000	0.1023	0.4134	0.0054	0.0459	0.0040	0	0.0123	44.1
APEX 30BM	Church 1	Back	0	0.5855	0.0010	0	0.0024	0.0000	0.2403	0.2614	0.0010	0	0.0020	0	0.0489	2.2
<u>APEX 30FM</u>		Front	0.0159	0.4465	0.0003	0	0.2645	0.0000	0.0733	0.5704	0.0013	0	0.0129	0	0.0393	182.4
APEX 31BM	Residence 18	Back	0.0011	0.4365	0.0002	0	0.0060	0.0000	0.2253	0.1524	0.0114	0	0.0025	0	0.0188	0
<u>APEX 31FM</u>		Front	0.0004	0.0655	0.0001	0	0.0025	0.0000	0	0.6034	0.0031	0	0.0046	0	0.0022	46.8
APEX 32BM	Residence 19	Back	0.0494	0.1965	0.0004	0	0.0017	0.8222	0	0.1714	0.0066	0	0.0064	0.0060	0.0154	0
<u>APEX 32FM</u>		Front	0.1134	0.1895	0.0002	0	0.0061	0.0000	0.1113	0.7854	0.0233	0.0129	0.0099	0	0.0292	67.4
APEX 33BM	Residence 20	Back	0.0045	0.4455	0.0001	0	0.0042	0.0000	0	0.2774	0.0041	0	0.0013	0	0.0175	0
<u>APEX 33FM</u>		Front	0.0089	0.1755	0.0005	0	0.0201	0.3022	0.0923	1.0854	0.0085	0.0299	0.0044	0.0115	0.0347	49.3
APEX 34BM	Residence 21	Back	0.0129	0.3415	0	0	0.0077	0.0000	0	0.2074	0.0003	0	0.0054	0	0.0036	7.5
<u>APEX 34FM</u>		Front	0.0056	0.1995	0.0004	0	0.0034	0.0000	0.0413	1.0054	0.0221	0	0.0065	0	0.0142	76.4
APEX 35BM	Residence 22	Back	0.0126	0.7955	0.0005	0	0.0166	0.0232	0.1263	0.4354	0.0145	0	0.0046	0	0.0314	11.1
<u>APEX 35FM</u>		Front	0.0307	1.9415	0.0007	0	0.0183	0.0852	0.7133	0.4444	0.0119	0	0.0135	0	0.1468	28.3

Appendix A
Metals Concentration by Sampling Location

SAMPLE	NAME	LOCATION	Metals Concentration (µg/100 sq.cm.)													
			Arsenic	Barium	Beryllium	Cadmium	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Vanadium	Zinc
		SCR. LEVEL	3.87	1100	31.4	15.6	314	627	2.70	314	1.57	314	78.4	78.4	110	4700
APEX 36BM	Residence 23	Back	0.0152	0.5115	0.0004	0	0.0051	0.1252	0.0223	0.4724	0.0008	0	0.0056	0	0.0225	55.4
<u>APEX 36FM</u>		Front	0.0188	0.3245	0.0006	0	0.0072	0.0000	0.0323	0.7304	0.0052	0	0.0146	0	0.0417	191.4
APEX 37BM	Residential Area 2	Back	0	0.4445	0.0002	0	0.1525	0.0000	0.1303	0.1484	0.0003	0	0.0023	0	0.0127	0.7
<u>APEX 37FM</u>		Front	0.0094	0.0285	0	0	0.0015	0.0000	0	0.3884	0	0	0.0048	0	0.0024	19.1
APEX 41BM	Residence 24	Back	0.0031	0.2965	0.0002	0	0.0124	0.0000	0.0353	0.0374	0.0043	0	0.0030	0	0.0076	0
<u>APEX 41FM</u>		Front	0.0056	0.2085	0.0004	0	0.0091	0.0000	0.1403	0.1944	0.0234	0	0.0067	0	0.0453	47.0
APEX 42BM	Residence 25	Back	0.0129	0.2755	0.0002	0.0176	0.0020	0.0000	0.4863	0.0814	0.0187	0	0.0061	0	0.0208	37.7
<u>APEX 42FM</u>		Front	0.0055	0.3315	0.0001	0	0.0077	0.0000	0.1263	0.1064	0.0023	0	0.0017	0	0.0133	0
APEX 43BM	Residence 26	Back	0.0119	1.9815	0.0005	0	0.0718	0.1342	0.4253	0.6214	0.0531	0	0.0105	0	0.0466	63.4
<u>APEX 43FM</u>		Front	0.0705	1.6015	0.0013	0	0.0110	1.0622	0.8503	0.3034	0.0247	0.0159	0.0125	0	0.0542	44.3
APEX 44BM	Residence 27	Back	0.1194	0.0815	0.0004	0	0.0039	3.3522	1.2503	0.0794	0.0010	0	0.0077	0	0.0850	21.6
<u>APEX 44FM</u>		Front	0.1334	0.6495	0.0003	0	0.0030	0.9822	0.3733	0.0994	0.0017	0	0.0068	0	0.0386	55.4
APEX 45BM	Residence 28	Back	0.0531	0.0545	0.0001	0	0.0018	0.0000	0.0603	0.1074	0.0010	0	0.0126	0	0.0081	29.6
<u>APEX 45FM</u>		Front	0.0356	0.1715	0.0001	0	0.0061	0.9022	0	0.0744	0.0015	0	0.0071	0	0.0266	0

Appendix B

Cyanides Concentration by Sampling Location

SAMPLE	NAME	LOCATION	Cyanides
		SCR. LEVEL	29.6
APEX 01BM	Business 1	Back	ND
<u>APEX 01FM</u>		Front	ND
APEX 02FM	Residence 1	Front	ND
<u>APEX 02BM</u>		Back	ND
APEX 03BM	Residence 2	Back	ND
<u>APEX 03FM</u>		Front	ND
APEX 04BM	Residence 3	Back	ND
<u>APEX 04FM</u>		Front	ND
APEX 05BM	Residence 4	Back	ND
<u>APEX 05FM</u>		Front	ND
APEX 06BM	Residence 5	Back	ND
<u>APEX 06FM</u>		Front	ND
APEX 07BM	Business 2	Back	ND
<u>APEX 07FM</u>		Front	ND
APEX 08BM	School 1	Back	ND
<u>APEX 08FM</u>		Front	ND
APEX 09BM	Residential Area 1	Back	ND
<u>APEX 09FM</u>		Front	ND
APEX 10BM	Residence 6	Back	ND
<u>APEX 10FM</u>		Front	ND
APEX 11BM	Residence 7	Back	ND
<u>APEX 11FM</u>		Front	ND
APEX 12BM	Residence 8	Back	ND
<u>APEX 12FM</u>		Front	ND
APEX 13BM	Residence 9	Back	ND
<u>APEX 13FM</u>		Front	ND
APEX 14BM	Residence 10	Back	ND
<u>APEX 14FM</u>		Front	ND
APEX 21BM	Residence 11	Back	ND
<u>APEX 21FM</u>		Front	ND
APEX 22BM	Residence 12	Back	ND
<u>APEX 22FM</u>		Front	ND
APEX 23BM	Residence 13	Back	ND
<u>APEX 23FM</u>		Front	ND
APEX 24BM	Business 3	Back	ND
<u>APEX 24FM</u>		Front	ND
APEX 25BM	Residence 14	Back	ND
<u>APEX 25FM</u>		Front	ND
APEX 26BM	Residence 15	Back	ND
<u>APEX 26FM</u>		Front	ND
APEX 27BM	Residence 16	Back	ND
<u>APEX 27FM</u>		Front	ND

Appendix B

Cyanides Concentration by Sampling Location

<u>SAMPLE</u>	<u>NAME</u>	<u>LOCATION</u>	<u>Cyanides</u>
		SCR. LEVEL	29.6
APEX 28BM	School 2	Back	ND
<u>APEX 28FM</u>		Front	ND
APEX 29BM	Residence 17	Back	ND
<u>APEX 29FM</u>		Front	ND
APEX 30BM	Church 1	Back	ND
<u>APEX 30FM</u>		Front	ND
APEX 31BM	Residence 18	Back	ND
<u>APEX 31FM</u>		Front	ND
APEX 32BM	Residence 19	Back	ND
<u>APEX 32FM</u>		Front	ND
APEX 33BM	Residence 20	Back	ND
<u>APEX 33FM</u>		Front	ND
APEX 34BM	Residence 21	Back	ND
<u>APEX 34FM</u>		Front	ND
APEX 35BM	Residence 22	Back	ND
<u>APEX 35FM</u>		Front	ND
APEX 36BM	Residence 23	Back	ND
<u>APEX 36FM</u>		Front	ND
APEX 37BM	Residential Area 2	Back	ND
<u>APEX 37FM</u>		Front	ND
APEX 41BM	Residence 24	Back	ND
<u>APEX 41FM</u>		Front	ND
APEX 42BM	Residence 25	Back	ND
<u>APEX 42FM</u>		Front	ND
APEX 43BM	Residence 26	Back	ND
<u>APEX 43FM</u>		Front	ND
APEX 44BM	Residence 27	Back	ND
<u>APEX 44FM</u>		Front	ND
<u>APEX 45BM</u>	Residence 28	Back	ND
<u>APEX 45FM</u>		Front	ND

Appendix C
PAH Concentration by Sampling Location

		PAH Concentration (µg/100 sq.cm.)																		
SAMPLE	NAME	LOC.	Acenapth	Acenpthyl	B(a)A	B(a)P	B(b)F	B(e)P	B(g,h,i)P	B(k)F	Chrys	Corono	D(a,h)A	Fluor	I(cd)P	Naphth	Peryl	Phenan	Pyrene	Total
		SCR. LEVEL																		1.45
APEX 36BM	Residence 23	Back	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 36FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND	ND	0.03
APEX 37BM	Residential Area 2	Back	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 37FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 41BM	Residence 24	Back	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 41FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 42BM	Residence 25	Back	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 42FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	0.01
APEX 43BM	Residence 26	Back	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
APEX 43FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 44BM	Residence 27	Back	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 44FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 45BM	Residence 28	Back	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
APEX 45FM		Front	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

Acenapth: Acenaphthene
Acenpthyl: Acenaphthylene
B(a)A: Benzo(a)anthracene
B(a)P: Benzo(a)pyrene
B(b)F: Benzo(b)fluoranthene
B(e)P: Benzo(e)pyrene
B(g,h,i)P: Benzo(g,h,i)perylene
B(k)F: Benzo(k)fluoranthene
Chrys: Chrysene
Corono: Coronene
D(a,h)A: Dibenz(a,h)anthracene
Fluor: Fluoranthene
I(cd)P: Indeno(1,2,3-cd)pyrene
Naphth: Naphthalene
Peryl: Perylene
Phenan: Phenanthrene

Appendix D

Sampling Location Descriptions

SAMPLE	NAME	LOCATION DESCRIPTION	
APEX 01B	Business 1	Back	Base of plastic light pole
APEX 01F		Front	Metal electrical box
APEX 02F	Residence 1	Front	Bottom of fiberglass canoe
APEX 02B		Back	Top of fiberglass boat
APEX 03B	Residence 2	Back	Top of ceramic tile stoop
APEX 03F		Front	Plastic cover on electrical utility box
APEX 04B	Residence 3	Back	Top of glass deck table
APEX 04F		Front	Window glass
APEX 05B	Residence 4	Back	Wood-like siding
APEX 05F		Front	Top of A/C unit
APEX 06B	Residence 5	Back	Window glass
APEX 06F		Front	Metal roof of carport
APEX 07B	Business 2	Back	Metal, railing
APEX 07F		Front	Metal, transformer housing
APEX 08B	School 1	Back	Cultured stone building material
APEX 08F		Front	Fiberglass wall
APEX 09B	Residential Area 1	Back	Metal, box
APEX 09F		Front	Plastic, box
APEX 10B	Residence 6	Back	Wood-like siding
APEX 10F		Front	Painted metal electrical box
APEX 11B	Residence 7	Back	Painted wood railing
APEX 11F		Front	Engineered vinyl-like siding
APEX 12B	Residence 8	Back	Top of A/C unit
APEX 12F		Front	Painted metal door
APEX 13B	Residence 9	Back	Painted wood rail
APEX 13F		Front	Painted metal deck table (rusted)
APEX 14B	Residence 10	Back	Glass, deck table top
APEX 14F		Front	Transformer cover
APEX 21B	Residence 11	Back	Crawl space access door
APEX 21F		Front	Glass, garage door window
APEX 22B	Residence 12	Back	Wood, framing garage
APEX 22F		Front	Metal door
APEX 23B	Residence 13	Back	Wood-like siding
APEX 23F		Front	Wood-like siding
APEX 24B	Business 3	Back	Window glass
APEX 24F		Front	Window glass
APEX 25B	Residence 14	Back	Top of A/C unit
APEX 25F		Front	Wood-like siding
APEX 26B	Residence 15	Back	Window glass
APEX 26F		Front	Top of A/C unit
APEX 27B	Residence 16	Back	Metal Electrical Power box
APEX 27F		Front	Top of A/C Unit
APEX 28B	School 2	Back	Metal Access Panel
APEX 28F		Front	Window glass in door

Appendix D

Sampling Location Descriptions

<u>SAMPLE</u>	<u>NAME</u>	<u>LOCATION DESCRIPTION</u>	
<u>APEX 29B</u>	Residence 17	Back	Vinyl-like siding
<u>APEX 29F</u>		Front	Vinyl-like siding
<u>APEX 30B</u>	Church 1	Back	Wood-like siding
<u>APEX 30F</u>		Front	Side of plastic side
<u>APEX 31B</u>	Residence 18	Back	Top of A/C unit
<u>APEX 31F</u>		Front	Window glass
<u>APEX 32B</u>	Residence 19	Back	Window glass
<u>APEX 32F</u>		Front	Top of A/C Unit
<u>APEX 33B</u>	Residence 20	Back	Wood-like siding
<u>APEX 33F</u>		Front	Wood-like siding
<u>APEX 34B</u>	Residence 21	Back	Window glass garage door
<u>APEX 34F</u>		Front	Wood-like siding
<u>APEX 35B</u>	Residence 22	Back	Top of A/C unit
<u>APEX 35F</u>		Front	Side of metal dump trailer
<u>APEX 36B</u>	Residence 23	Back	Wood-like siding
<u>APEX 36F</u>		Front	Wood-like siding
<u>APEX 37B</u>	Residential Area 2	Back	Metal door
<u>APEX 37F</u>		Front	Window glass
<u>APEX 41B</u>	Residence 24	Back	Painted metal mailbox
<u>APEX 41F</u>		Front	Bottom of plastic bucket
<u>APEX 42B</u>	Residence 25	Back	Painted wood rail
<u>APEX 42F</u>		Front	Glass, deck table top
<u>APEX 43B</u>	Residence 26	Back	Top of A/C unit
<u>APEX 43F</u>		Front	Vinyl-like siding
<u>APEX 44B</u>	Residence 27	Back	Painted wood rail
<u>APEX 44F</u>		Front	Top of A/C unit
<u>APEX 45B</u>	Residence 28	Back	Window glass
<u>APEX 45F</u>		Front	Glass, pane leaning against the structure