SOUTHERN ENVIRONMENTAL LAW CENTER

601 West Rosemary Street, Suite 220
Chapel Hill, NC 27516

Telephone 919-967-1450
Facsimile 919-929-9421

January 9, 2023

Via email

Mayor Jessica Anderson
Chapel Hill Town Council
Town Hall, Second Floor 405 Martin Luther King Jr. Blvd.
Chapel Hill, NC 27514-5705
mayorandcouncil@townofchapelhill.org

Ms. Sharon Poissant Eckard, PG
Eastern Branch Head, Brownfields Redevelopment Section
Division of Waste Management
North Carolina Department of Environmental Quality
217 West Jones Street
1646 Mail Service Center
Raleigh, NC 27699-1646
sharon.eckard@deq.nc.gov

Re: New Risk Information Regarding Coal Ash Contamination at 828 Martin Luther King Jr. Blvd.

Dear Mayor and Council, and Ms. Eckard,

Congratulations to Mayor Anderson and the new members of the Town Council. On behalf of Friends of Bolin Creek, we look forward to working with you to address the serious problem of coal ash contamination at 828 Martin Luther King Jr. Blvd.

We understand that the Town is currently working on an agreement with the North Carolina Department of Environmental Quality's Brownfields Redevelopment Section. We are writing you now to share links to two recent documents[1] that are directly relevant to that agreement and would likely change the conclusions of the risk assessment conducted by the town: (1) the U.S. Environmental Protection Agency's "Risk Assessment of Coal Combustion Residuals: Legacy Impoundments and CCR Management Units (Draft)" ("Draft Risk

[1] These documents are lengthy, so we have not attached them to this letter, but they are available at the links in the footnotes immediately below.

Assessment"),[2] assessing coal ash deposits like the MLK site in Chapel Hill, and (2) EPA's draft Integrated Risk Information System (IRIS) Toxicological Review of Inorganic Arsenic.[3]

These documents contain significant new information regarding unacceptable cancer and non-cancer risks from exposure to arsenic and radioactivity contained in coal ash deposits. While the Draft Risk Assessment was prepared as part of EPA's work on coal ash regulations at power plants, the information that it and the broader draft IRIS assessment contain is equally relevant to the contamination at the MLK site.[4] The Town must take bold action to address these serious risks.

Radioactivity

In the updated risk assessment, EPA found unacceptable health risks from radioactivity in coal ash. The radioisotopes in coal ash release gamma radiation, which can migrate through soil when ash is used as fill. **When Duke University scientists tested the coal ash at the MLK site, they found elevated levels of radioactivity similar to those in the EPA study.** Gordon Williams et al., *Coal Ash Legacy in Chapel Hill* (2022), at 5-6 (attached to this letter as Attachment 1). To our knowledge, the Town has not done its own testing for radium or other radionuclides; the testing the Town has done for radon does not address the serious risks from radioactivity that EPA has documented in the Draft Risk Assessment. The Town needs to do this sampling and incorporate the results into an updated risk assessment and any brownfields agreement.

Importantly, EPA found **cancer risks exceeding health standards when coal ash is mixed with soil at ratios that include very small amounts of coal ash** (1 and 2 percent of the soil mixture).[5] When coal ash constitutes **8 to 17 percent of the soil mixture, EPA found cancer risks above 1 in 10,000**.[6] According to EPA, "waste streams whose risks are calculated to be 1×10^{-4} [that is, 1 in 10,000] or higher generally will be considered to pose a substantial present or potential hazard to human health and the environment . . . ." 80 Fed. Reg. 21,302, 21,449 (Apr. 17, 2015). These findings are even more alarming because **at the MLK site the concentrations of coal ash in the soil are in many cases far higher than those EPA found to**

[2] *Available at* https://www.regulations.gov/document/EPA-HQ-OLEM-2020-0107-0887. *See also* U.S. Environmental Protection Agency, Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities; Legacy CCR Surface Impoundments, Notice of Data Availability, 88 Fed. Reg. 77,941 (Nov. 14, 2023).

[3] *Available at* https://www.regulations.gov/document/EPA-HQ-ORD-2012-0830-0056. *See also* Environmental Protection Agency, Availability of the Draft IRIS Toxicological Review of Inorganic Arsenic, 88 Fed. Reg.71,360 (Oct. 16, 2023).

[4] *See* Lisa Sorg, *Coal ash more hazardous than previously known, EPA says, could alter Chapel Hill cleanup plan*, NC Newsline (Jan. 5, 2024), https://ncnewsline.com/2024/01/05/coal-ash-more-hazardous-than-previously-known-epa-says-could-alter-chapel-hill-cleanup-plan/.

pose unacceptable risks, and there are areas of exposed coal ash as well as many areas where there is only very thin cover.

Arsenic

In the updated IRIS toxicity assessment for arsenic, EPA proposes to update arsenic toxicity standards based on the latest science. This is important because **there are high levels of arsenic in the coal ash and contaminated soil at the MLK site—as much as 141 times higher than North Carolina's Residential Preliminary Soil Remediation Goal (PSRG) and 32 times higher than the Commercial PSRG.** *E.g.*, Chapel Hill Risk Assessment Report (Oct. 7, 2021) at Appendix A, Table A-1; Results of Post-Data Gap Assessment (Dec. 1, 2020) at Table 1. The updated toxicity data would almost certainly change the Town's risk assessment results, as the **health risks at the MLK site are driven by exposure to arsenic**.

EPA's draft IRIS assessment finds significantly heightened health risks from inorganic arsenic. EPA proposes **raising the cancer potency estimate by 35 times, finding that much smaller amounts of arsenic are carcinogenic**. In addition, EPA found an **increased risk of heart disease** from arsenic ingestion and recommended that **the safe daily lifetime dose be 10 times lower than the current value**. These findings indicate serious harm from exposure to low levels of arsenic, which in turn raises the risk from exposure to coal ash. *See also* Draft Risk Assessment at 6-10.

All of this new information is very concerning. We recognize these are draft studies that are not yet official EPA policy, but because the Town and DEQ are making decisions now about the MLK site, we wanted to make sure you had this important information at the most relevant time—before a plan is finalized. We believe the Town's stated commitment to environmental and health protections mandates incorporating this new information, especially because it confirms that as scientific knowledge of coal ash contamination progresses, the dangers are far greater than originally understood. Given this concerning situation, Chapel Hill must act now to revise its plan to ensure maximum protectiveness for people, animals, and our water resources, including Bolin Creek—and not rely on minimum state law requirements and toxicity information that are rapidly becoming outdated.

Accordingly, the Town must sample for radionuclides and incorporate the results into its plans before moving forward, to ensure it is accounting for this serious risk. The new risk information from EPA makes clear that the Town cannot proceed safely without being fully informed of the radioactivity levels and risks at the MLK site. The risk assessment and brownfields agreement should likewise be revised to reflect EPA's new information on the dramatically increased health risks of arsenic in the studies discussed above. In short, any redevelopment plan and brownfields agreement for the MLK site need to be revised to address the even more serious risks posed by coal ash contamination that are disclosed in the EPA's recent studies.

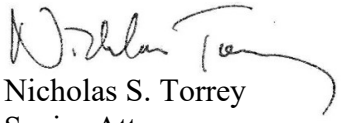
EPA notes in the Draft Risk Assessment that "any engineering controls currently present that would serve to limit exposure cannot be guaranteed to remain in place."[7] At the MLK site,

[7] Draft Risk Assessment at p. 7-2.

covering coal ash contamination with soil and building a retaining wall, as the Town has previously contemplated doing, are not sufficient to address the serious long-term risks. As we stated in our March 24, 2023 letter, we believe the Town should—at a minimum—commit to removing the most problematic areas of coal ash, including (1) the steep slope above the Bolin Creek Greenway and (2) all areas of contaminated soil and coal ash with more than a 1 in 1,000,000 cancer risk that would not be covered by a permanent structure, as well as (3) monitoring soil, groundwater, and Bolin Creek in perpetuity if any coal ash will be left in place at the site. The Town does not need to wait for the brownfields agreement to be put out for public comment or finalized to make these important commitments to the public.

Thank you for considering these comments.

Sincerely,



Nicholas S. Torrey
Senior Attorney
Southern Environmental Law Center

Pamela Schultz, Ph.D.
Environmental Engineer
Former Consultant for EPA Office of Solid Waste

Julie McClintock
Co-President
Friends of Bolin Creek

Attachment 1

Coal ash legacy in Chapel Hill

Gordon Williams,[1] Ellen Cowan,[2] Zhen Wang,[1] Robert Hill,[1] Avner Vengosh [1]

(1) Nicholas School of the Environment, Duke University
(2) Department of Geological and Environmental Sciences, Appalachian State University

Summary of Findings:

Results from optical and elemental analyses of soil samples collected from the hillside below 828 Martin Luther King Jr. Blvd. along Bolin Creek in Chapel Hill clearly indicate the occurrence of coal ash on site. The concentrations of toxic metals (e.g. As, Se, Mo, Sb, Tl) in the Chapel Hill coal ash are higher by up to 10 to 30-fold relative to the baseline concentrations of the North Carolina soil, and exceed EPA threshold guidelines for ecological standards, which may pose human and environmental health concerns. Likewise, the concentrations and distribution of the radionuclides radium-226 and radium-228 in the Chapel Hill coal ash are consistent with radionuclides occurrence in coal ash and are higher by 2- to 4-fold than common soils. The Chapel Hill coal ash is distinctive from modern Appalachian Fly Ash likely due to selective removal and atmospheric emission of small sphere particles during the historic coal combustion in the coal-fired power plant, prior to the mandatory installation of electrostatic precipitators or other particle filtration devices that aim to prevent small sphere atmospheric emissions.

Description of Sampling and Methods:

On the lower slope of the hillside below 828 Martin Luther King Jr. Blvd. visible eroding outcroppings of black sooty material, later identified as coal ash, were located and three cores at two locations were collected on August 2nd, 2022. During coring, the material was highly compressible such that the hand auger sank and compressed the material with little effort. As such the samples were collected at somewhat irregular intervals and often represent a mixture of several feet of compressed material (depth ranges are noted for each sample). At location B, cores B1 and B2 were taken as replicates where B2 was started about 3 feet up the hillside from B1 and both cores were completed when the hand auger reached an impenetrable layer. At location A, core A1 was completed into what appeared to be a native background soil that was underlying the landfill and an approximately 6-inch-deep sample of this soil was also collected. Physical observations and optical point counting analysis were performed using a polarizing microscope at Appalachian State University and trace element analyses were performed at the Duke Environmental Geochemistry Laboratory by inductively coupled plasma mass spectrometry. For elemental analyses, the bulk sample was fully digested. Detailed descriptions of both analytical methods are reported in Wang et al. (2021) [1].

Results:

For decades coal ash material originating from the University of North Carolina at Chapel Hill coal plant was placed in an open space near the Chapel Hill police station adjacent to Bolin Creek. New city plans to develop the property for low-income housing raise questions about the content and composition of the coal ash at this site and its potential effects on human health should

the site be used for housing. On August 2nd, 2022, three cores with a maximum depth of 4.5ft were collected from the site and were analyzed by microscopic point counting at Appalachian State University and analyzed for trace elements at the Duke Environmental Geochemistry Laboratory.

The optical survey under a microscope shows that the materials at the site are composed of nearly 100% coal ash with the one underlying soil composed of 37.7% ash particles (Table 1). The ash contained lacey ash and ash rods that are likely carbon rich and appear delicate as well as some clear spheres but also many plerospheres that are large in diameter (Figure 1). The occurrence of carbon in the Chapel Hill coal ash could reflect historic coal combustion under lower temperature, as compared to modern thermoelectric plants.

Sample	Percent Fly Ash	Description
A1 Surface	99.8	fine black powder
A1 0-3.5 ft	99.7	fine black powder
A1 3.5-4 ft	99.7	fine black powder
A1 4-4.5 ft	37.7	soil beneath ash
B1 Surface	99.8	fine black powder
B1 0-2.5 ft	99.7	fine black powder
B2 0-2 ft	99.7	fine black powder
B2 2-3 ft	99.7	fine black powder
B2 3 ft	99.4	fine black powder

Table 1 (above): *Sample list with optical and field descriptions*.

Element	A1	B1	B2
As	39.5	58.2	53.5
Se	12.9	6.1	8.7
Mo	8.6	5.2	5.1
Sb	4.7	6.2	5.9
Tl	2.0	3.0	2.7
V	120.0	173.7	162.5
Cr	63.4	95.4	90.3
Ni	42.1	77.7	73.6
Co	24.1	41.1	38.5
Zn	7.8	87.5	54.4
Cu	84.2	127.2	122.8
Li	61.5	95.5	86.8
Rb	96.9	132.1	122.6
Sr	458.1	623.9	625.3
Ba	2707.0	3363.5	3070.7
Th	10.4	14.7	13.7
U	4.2	6.1	5.9
Pb	35.3	35.4	35.9
Cd	0.3	0.5	0.5

Table 2 (right): *Average elemental composition of each core (A1, B1, B2) in mg/kg. Core A1 excludes the soil sample.*

Trace element data of the materials show elevated concentrations of toxic metals and metalloids (Table 2). The data were compared to two references, (1) the mean Appalachian fly ash composition that reflect the current coal ash that is generated today in North Carolina as reported in Wang et al. 2021, and (2) the mean North Carolina soil baseline composition reported by the USGS [1,2]. The mean Appalachian fly ash was used as a reference point since the UNC-Chapel Hill coal-fired power plant has been reported to primarily use Eastern Coal [3].

The high concentrations of trace elements data from Chapel Hill site, including As, Se, Mo, Sb, Tl, V, Cr, Ni, Co, Zn, Cu, Li, Rb, Sr, Ba, Th, U, Pb, and Cd, are consistent with previous reports of the enrichment of these elements in fly ash [1]. The elemental distribution patterns of the three cores resemble that of the Appalachian fly ash (Figure 2), suggesting that they are likely the same coal source. By comparison of the elemental concentrations to the NC baseline soil dataset, we show that all these elements are enriched in the Chapel Hill samples (except with Zn where all samples are slightly depleted or moderately enriched; Figure 2). For example, As and Se are

respectively 10-15-fold and 10-22-fold enriched relative to the average NC soil concentrations.

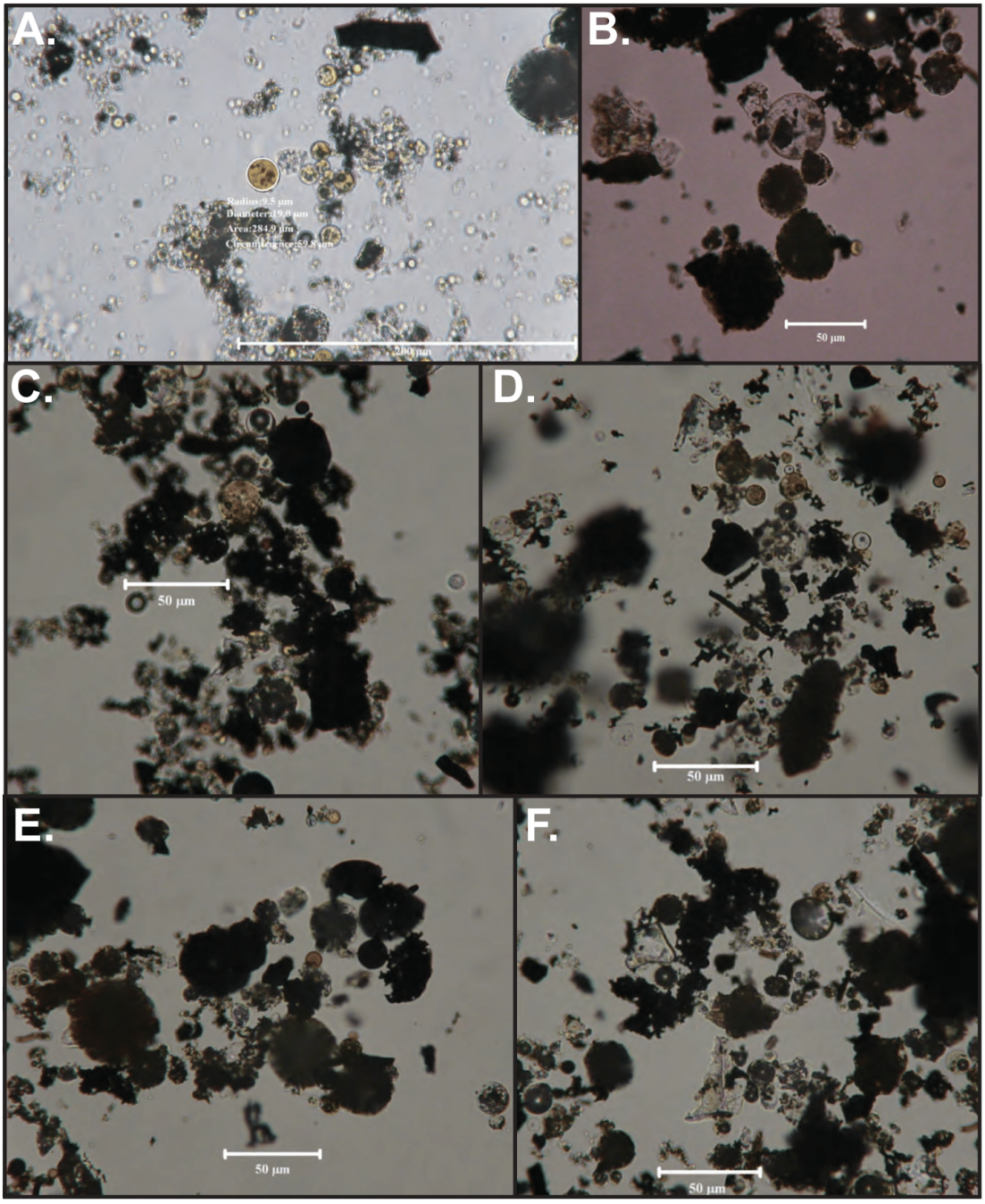


Figure 1: A. *Photomicrograph of modern Appalachian coal ash (APP-14). Note many small clear spheres. Circled orange sphere has a 9.5 µm diameter. Scale bar = 200 µm.* B.-F. *Photomicrographs of samples collected from Chapel Hill. Scale bar = 50 µm.* B. *Site A1 Surface, Plerosphere and black spheres up to 40 µm diameter.* C. *Site A1 3.5-4 ft, Spheres, opaque and amorphous particles* D. *Site A1 0-3.5 ft, Black spheres, rods, and lacey particles* E. *Site B2 0-2 ft, Black spheres up to 44 µm diameter, lacey and amorphous particles.* F. *Site B2, 0-2 ft, Spheres averaging 20 µm diameter and clear and black amorphous ash particles.*

Our data show that there is some mixing of the coal ash with the underlying local soil, as represented by sample A1 4-4.5 ft, which shows a lower coal ash percentage (37.7%) and lower trace metals concentrations. The concentrations of toxic metals in the Chapel Hill coal ash also exceed the aquatic freshwater sediment toxicity guidelines used by the U.S. EPA to define potential ecological impact including V (average value of 152 mg/kg versus 57 mg/kg guideline), As (50 mg/kg versus 10 mg/kg guideline), Sb (5.6 mg/kg versus 2 mg/kg guideline), Ni (64 mg/kg versus 23 mg/kg guideline), Se (9.2 mg/kg versus 2 mg/kg guideline), and Cu (111 mg/kg versus 31.6 mg/kg guideline) [4–7]. The concentration of As and Tl in the Chapel Hill coal ash were respectively just below and exceeding the EPA Regional Removal Management Levels for Chemicals (RMLs) threshold values for Residential Soils [8] (Figure 3). The RMLs are designed to assist decision-making concerning comprehensive environmental response, compensation, and Liability Act (CERCLA) removal actions at Superfund sites [8]. Overall, the data indicate that concentrations of toxic elements in the Chapel Hill site exceed the ecological threshold values for aquatic freshwater sediment toxicity and the levels of two highly toxic elements of As and Tl are close and exceed the maximum levels recommended by EPA for Residential Soils [8].

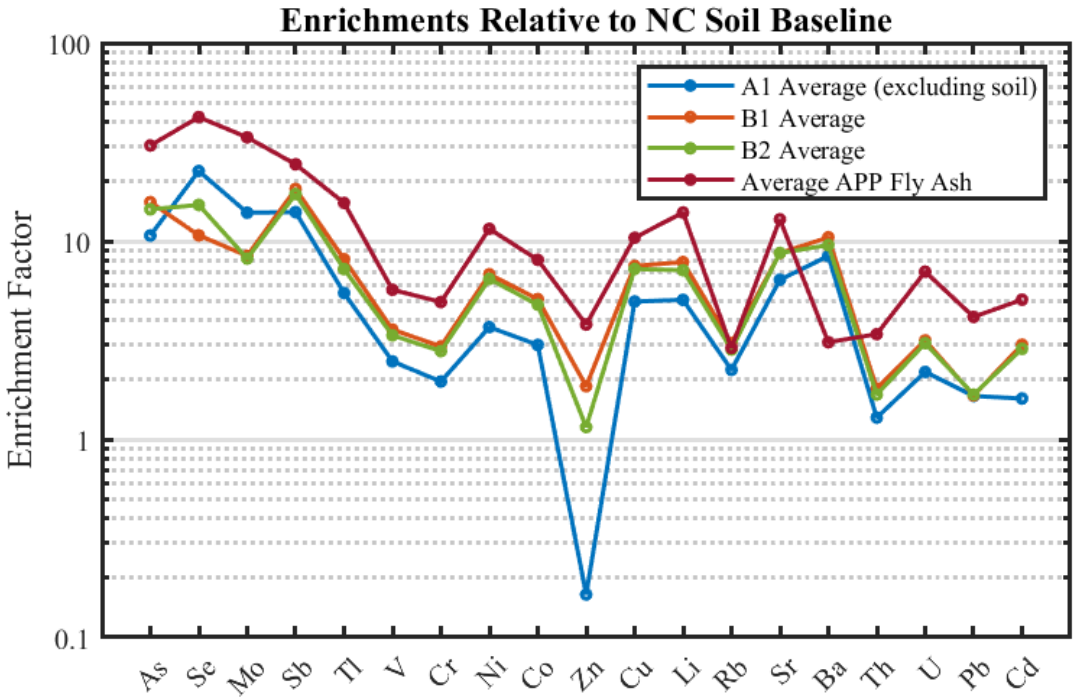


Figure 2: *The ratios between the average values of trace elements measured in the 3 cores from the Chapel Hill site (A1, B1, B2) and average of modern Appalachian fly ash currently generated in coal plants[9] relative to the NC soil baseline[2] (defined as "Enrichment factor"). The similarity in the patterns between the modern Appalachian fly ash (APP Fly Ash) and Chapel Hill coal ash reconfirm the presence of coal ash in the Chapel Hill site, yet with selective depletion of the small sphere particles that are differentially enriched in these elements. This observation is consistent with the microscopic observation of the presence of relatively large coal ash spheres in the Chapel Hill site (Fig. 1).*

A comparison of the composition of the Chapel Hill coal ash to the composition of modern produced Appalachian Fly Ash show relatively depleted concentrations in the characteristically

enriched elements, except for Ba of which all the Chapel Hill coal ash samples are relatively enriched (Figure 4). The relative lower concentrations of trace metals in the Chapel Hill coal ash are consistent with the microscopic observation of the coal ash that show that lacey ash and ash rods are most likely the particles that are carbon-rich (they look like soot). The Chapel Hill coal ash is characterized by large diameter spheres (black and plerospheres) and generally do not include small clear spheres that occur in modern fly ash (Figure 1). Since the Chapel Hill fly ash was generated before the air quality regulations that enforce the installation of electrostatic precipitators or other particle filtration devices, smaller particulate matter that is known to be enriched in many trace elements might have been emitted to the atmosphere and deposited widely over the surrounding region [10,11]. Consequently, the residual large spheres of the Chapel Hill coal ash contain relatively low trace elements concentrations when compared to the modern coal ash, but nonetheless higher than typical soils in North Carolina.

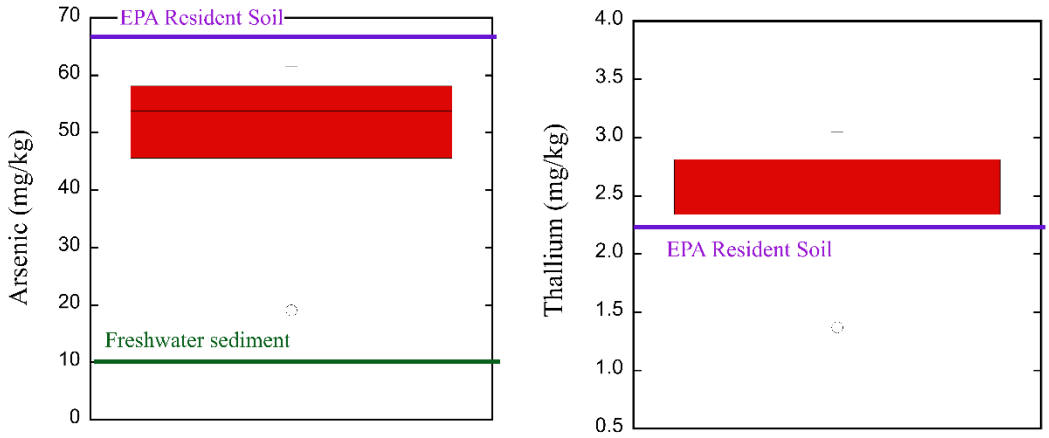


Figure 3: *Box plots of the arsenic and thallium concentrations in the Chapel Hill coal ash as compared to the ecological threshold values for aquatic freshwater sediment toxicity and the Regional Removal Management Levels for Chemicals (RMLs) threshold values for Residential Soils* [8].

In addition to trace elements, we analyzed the radionuclides ^{226}Ra, ^{228}Ra, and ^{210}Pb activities (amount of radioactivity, proportional to concentration) in three core samples. The total activity of Ra nuclides (i.e., ^{228}Ra + ^{226}Ra) of three select samples (i.e., A1 0-3.5 ft, B1 0-2.5 ft, and B2 2-3 ft) were 164 Bq/kg, 170 Bq/kg, and 156 Bq/kg, respectively, with a mean value of 163 Bq/kg. This value is about 60% of the total activity of Ra nuclides in modern Appalachian coal ash (mean = 283 Bq/kg) [9], which is consistent with the relatively lower concentration of other trace metals measured in the Chapel Hill coal ash (Figure 4). Based on the Th and U concentration data from the USGS NC soil survey [2], the estimated total Ra of average common soils in NC ranges from 43.9 Bq/kg in upper soil to 72.5 Bq/kg in deeper soil horizon (~ 100 cm). Therefore, the total activity of Ra nuclides in the Chapel Hill coal ash is higher by 2.2- to 3.7-fold than common soils. The ^{228}Ra/^{226}Ra activity ratio of the Chapel Hill coal ash (0.69) is also consistent with the composition of coal ash from eastern U.S. [9], and different from the ^{228}Ra/^{226}Ra in common soils in North Carolina (an activity ratio of 1.2) [1].

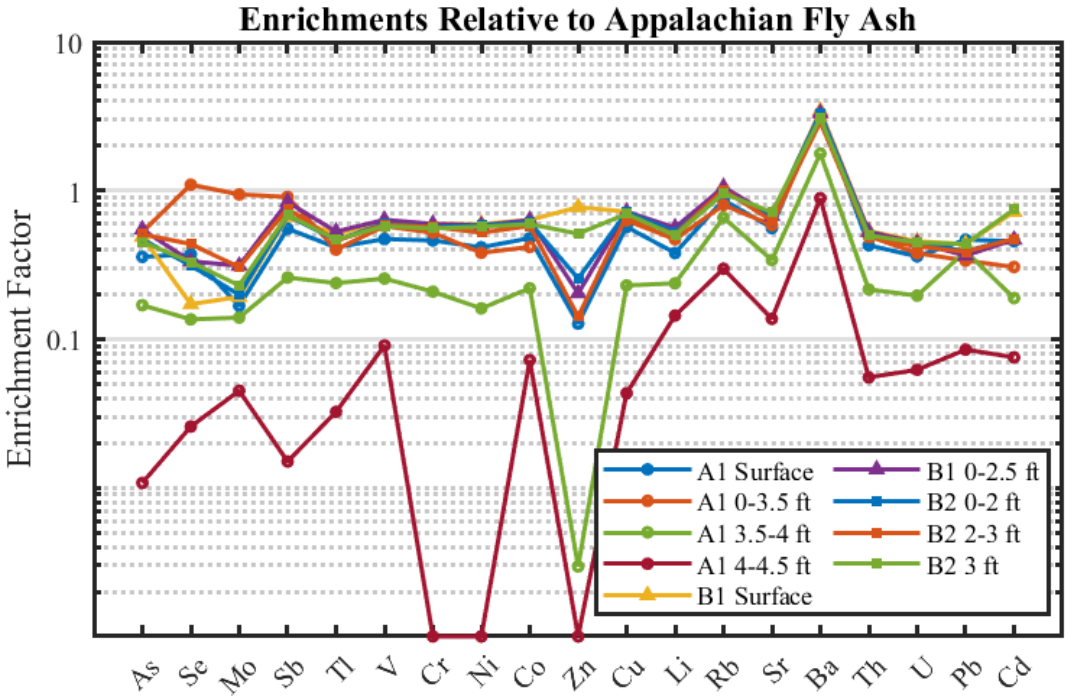


Figure 4: *Enrichment factors for samples relative to the mean values of modern Appalachian Fly Ash composition. Nearly all samples are depleted in elemental concentrations relative to the Appalachian Fly Ash. This is consistent with the theory that smaller, elementally enriched particles, were emitted to the atmosphere during coal combustion, resulting in the formation of larger, less enriched coal ash spheres that were placed in the Chapel Hill site. The soil sample, A1 4-4.5 ft shows some similar enrichment patterns to the other samples but largely is depleted in all elements listed which is consistent with our optical analysis that the soil contains only a small fraction coal ash.*

References:

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