Anderson County Board of Commissioners
OPERATIONS COMMITTEE
AGENDA

August 9, 2021
6:00 p.m. Room 312

- **Call to Order**
- **Prayer / Pledge of Allegiance**
- **Approval of Agenda**
- **Appearance of Citizens**

- **Air B & B's - Collections –** Requested by the County Clerk, Jeff Cole
- **Short Term Rental Units** – Requested by the Law Director
- **Planning Commission** – Requested by Harold Evans
- **Zoning Reports** – Requested by Commissioner Wandell

A. Rezoning
   1. Is it consistent with the zoning in the surrounding area?
   2. What are the uses permitted in the new zone?

B. Permits Issued
   1. Residential building permits.
   2. Commercial building permits.
   3. Sign permits.

C. Subdivision Plats Approved

D. Codes Enforcement
   1. Zoning Violations.
   2. Building Code Violations / Stop Work Orders

E. BZA Activity
   1. Administrative Review.
   2. Special exceptions granted.
   3. Variances granted.

- **Requests from Mayor Frank**

1. Requesting motion of approval of Resolution No. 21-08-884 – Accepting Proposal of the TN Department of Transportation to Construct a Project Designated as Federal Project No. BR-STP-9(111), State Project No. 01003-2246-94, Bridge over Bull Run Creek: Route SR-9
2. Requesting motion of approval of Resolution No. 21-08-883 – Authorizing the county mayor to enter into the annual Payment-In-Lieu-of-Tax agreement with DOE.
3. Virtual Meeting Component

4. Claxton: Request motion to approve Resolution No. 21-08-885 Requesting Tennessee Department of Environment and Conservation and Tennessee Department of Health to test soils on Claxton park property leased from TVA by Anderson County Government.
5. Issues with parking on right of way on Clinton Highway.
6. Any updates requested by Commissioners

- **Isaiah House** – Letter in Support of - from Juvenile Judge Hunt

- **Updates** – Requested by Chairman Wandell

1. Ben's Mobile Home Park / Pine Meadows
2 East Wolfe Valley Convenience Center
3 Raccoon Valley West Bound School Safety Lights
4 Veterans Bridge Flag Placement
5 Clinton Highway – safety concerns cars and equipment on shoulders and right of ways

- **Anderson County Government 2022 Holiday Schedule**

New Business

Old Business

Adjournment

Anderson County Schools
Every Student, Every Day

Annette Prewitt <aprewitt@acs.ac>

Operations Agenda

1 message

Jay Yeager <jyeager@aclawdirector.com> Wed, Aug 4, 2021 at 11:11 AM
To: Annette Prewitt <aprewitt@acs.ac>

Annette:

Please add Short Term Rental Units to the Operations Agenda.

Thanks,

Jay

Anderson County Schools
Every Student, Every Day

Annette Prewitt <aprewitt@acs.ac>

Zoning Reports

1 message

Commissioner Tracy Wandell <twandell@andersoncountytn.gov> Wed, Jul 21, 2021 at 9:18 AM
To: Joshua Anderson <joshanderson1984@gmail.com>, Terry Frank <tfrank@andersoncountytn.gov>, Annette Prewitt <aprewitt@acs.ac>, Commissioner Tim Isbel <tisbel@andersoncountytn.gov>

Mayor, Chairman and Commissioner Isbel,

I wanted to ask if it would be possible to start getting some reports on these items listed below for our Commissioners.

It seems some of us miss a lot of what is going on in Zoning and BZA. If we were able to get regular updates I think it would be extremely helpful and help us respond to questions from our constituent's. I have added a list below as an example to be considered:

A. Rezoning

1. Is it consistent with the zoning in the surrounding area?
2. What are the uses permitted in the new zone?

B. Permits Issued

1. Residential building permits.
2. Commercial building permits.
3. sign permits.

C. Subdivision Plats Approved

D. Codes Enforcement.

1. Zoning violations.
2. Building code violations / Stop work orders

F. BZA Activity

1. Administrative review.
2. Special exceptions granted.
3. Variances granted.

If it makes sense to each of you I would like to consider adding to the Operations agenda in August for further discussions and also have Zonings input as well. I look forward to your feedback and questions.

Respectfully,
Tracy

Tracy L. Wandell
Anderson County Commissioner
District 1
twandell@andersoncountytn.gov
865-388-0921

ANDERSON COUNTY GOVERNMENT

TERRY FRANK
COUNTY MAYOR

August 2, 2021

Commissioner Tim Isbel
Chairman, Operations Committee

RE: AGENDA

Dear Chairman Isbel,

I wish to request the following items be added to the Agenda:

1. **Requesting Motion of approval of Resolution No. 21-08-884** Accepting Proposal of the Tennessee Department of Transportation to Construct a Project Designated as Federal Project No. BR-STP-9(111), State Project No. 01003-2246-94, **BRIDGE OVER BULL RUN CREEK: ROUTE SR-9.** *See attached resolution and exhibits.*
2. **Requesting Motion of approval of Resolution No. 21-08-883** Authorizing the county mayor to enter into the annual Payment-In-Lieu-of-Tax agreement with DOE. See attached resolution and exhibit. Acreage and tax rate remain the same as last fiscal year request. Anderson County received 2020's request of $640,393.14 on 3/23/2021.
3. **Virtual Meeting Component:** The Clerk, IT Director and I have discussed continuing virtual options for our Government Meetings. IT Director Young has kept licensing active. We also have clarification from the Office of Open Records on what is and is not allowable. Requesting motion on how to proceed, for example, will this be a vote of full commission to allow virtual participation; allow each committee chairman to decide? In addition, we need a process to ensure that any virtual component for presenters or guests is publicly shared in a timely manner with the public at large. **COMPTROLLER GUIDANCE ATTACHED.**
4. **Claxton: Request Motion to Approve Resolution No. 21-08-885 Requesting Tennessee Department of Environment and Conservation and Tennessee Department of Health to Test Soils on Claxton park property leased from TVA by Anderson County Government.** In addition, **Requesting Motion to Authorize Correspondence with TVA** to inquire if they have active and/or testing on the nearby "reservation" properties in Claxton and if so, if they would share results.

100 NORTH MAIN STREET, SUITE 208 • CLINTON, TENNESSEE • 37716
PHONE: (865) 457-6200 • EMAIL: TFRANK@ANDERSONTN.ORG

Attachments:

a. Anderson County's Lease Approved unanimously by Anderson County Board of Commissioners on Oct. 21, 2002. (Signed copy not on file) Map of leased property is an exhibit attached to lease.
b. Email from Mr. Yeager to Dr. Vengosh requesting intern testing locations so Anderson County can align/confirm testing locations/sites with leased property.
c. Dr. Vengosh study that "explores utility and sensitivity of using geochemical indicators... combined with physical observation by optical point counting, for detecting the presence of trace levels of coal fly ash particles in surface soils near two coal-fired plants in North Carolina and Tennessee."
d. Dr. Vengosh press release.
e. Email from Mr. Yeager to Dr. Vengosh regarding findings of violations of regulations or finding of hazardous levels in soil. Includes Dr. Vengosh response.
f. Helpful background information: Defining Coal Ash and Epidemiology.

Dr. Vengosh's press release regarding his report notes that the new testing method detected the "presence of fly ash particles so small that other tests might miss them." Vengosh also noted that "...because the proportion of the fly ash was low, the concentrations of toxic elements did not exceed human health guidelines for metals occurrence in soil."

However, if testing sites are confirmed to align with leased property by Anderson County Government, Commission may want to consider action regarding operations of the park to confirm that concentrations do not exceed human health guidelines. Resolution is not ready for the agenda deadline, but it will distributed once finalized.

5. Issues with Parking on Right of Way on Clinton Highway.
6. Any updates requested by Commissioners such as opiate timeline, Wolf Valley Convenience Center.

100 North Main Street, Suite 208 • Clinton, Tennessee • 37716
Phone: (865) 457-6200 • Email: tfrank@andersontn.org

Anderson County, Tennessee
Board of Commissioners

RESOLUTION NO. 21-08-884

ACCEPTANCE OF THE PROPOSAL OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION TO CONSTRUCT A PROJECT DESIGNATED AS FEDERAL PROJECT NO. BR-STP-9 (111), STATE PROJECT NO. 01003-2246-94, DESCRIBED AS BRIDGE OVER BULL RUN CREEK, LM 16.10, ROUTE: SR-9

WHEREAS, the Tennessee Department of Transportation has presented a Proposal to Anderson County, Tennessee, concerning Federal Project No. BR-STP-9 (111), State Project No. 01003-2246-94, described as bridge over Bull Run Creek, LM 16.10, Route: SR-9; and

WHEREAS, the Anderson County Board of Commissioners has determined that the above referenced project will benefit Anderson County, Tennessee, and the citizens thereof; and

WHEREAS, the Anderson County Board of Commissioners wishes to cooperate with the State of Tennessee, Department of Transportation, in its efforts to make road and bridge improvements in Anderson County, Tennessee; and

WHEREAS, the Proposal is incorporated herein by reference, the same as if copied herein verbatim, with a copy of said Proposal attached hereto; and

WHEREAS, the terms and conditions of said Proposal to Anderson County as submitted by the State of Tennessee, Department of Transportation, are accepted and approved by the Anderson County Board of Commissioners and Anderson County shall fulfill all obligations concomitant thereto.

NOW, THEREFORE, BE IT RESOLVED, by the Anderson County Board of Commissioners, meeting in regular session on the 16th day of August, 2021, that this resolution is duly passed and approved and shall take affect from and after its passage.

PASSED AND APPROVED this 16th day of August, 2021.

APPROVED:

Josh Anderson, Commission Chairman

Terry Frank, Anderson County Mayor

ATTEST:

Jeff Cole, Anderson County Clerk

ANDERSON COUNTY GOVERNMENT

TERRY FRANK
COUNTY MAYOR

COPY

July 28, 2021

Jay Yeager
Law Director

RE: Review TDOT Proposal to Anderson County

Dear Jay,

Would you please review for approval to form for the TDOT Proposal to Anderson County for S.R. 9 Bridge over Bull Run Creek?

I have included 3 originals for your review. If you wouldn't mind returning to my office upon review.

I will provide a copy to the Road Superintendent for his review, though I'm also aware that he is on an email distribution list for the project.

My best—and many thanks,

100 NORTH MAIN STREET, SUITE 208 • CLINTON, TENNESSEE • 37716
PHONE: (865) 457-6200 • EMAIL: TFRANK@ANDERSONTN.ORG

Copy

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
REGION 1 RIGHT OF WAY OFFICE
P. O. BOX 58
KNOXVILLE, TENNESSEE 37901
(865) 594-2496

CLAY BRIGHT
COMMISSIONER

BILL LEE
GOVERNOR

July 23, 2021

The Honorable Terry Frank
Mayor of Anderson County
100 N. Main Street, Room 208
Clinton, TN 37716-3617

RE: **PROPOSAL TO ANDERSON COUNTY**
Federal Project No.: BR-STP-9(111)
State Project No.: 01003-2246-94
Anderson County
Pin No.: 124128.00

S.R. 9: Bridge over Bull Run Creek, LM 16.10

Dear Mayor ~~Abbott~~: FRANK

A TDOT Right of Way Agent is handing you one (1) set of plans and three (3) copies of the proposal on the above referenced project. The State representative handing you the proposal will be willing to answer any questions you may have or obtain the answers for you. **Following acceptance, three (3) copies of each proposal should be returned to me, each accompanied by a certified copy of the ordinance or resolution, whichever is applicable.** An example of a resolution with the necessary legal language is attached.

It is to be noted that we cannot begin buying the rights-of-way for this project until the county has accepted the proposal and same has been reviewed and approved by the Department attorney. Therefore, your earliest attention to this matter will be appreciated.

We appreciate your cooperation and if we can be of assistance in any way, please do not hesitate to give us a call.

Yours truly,

Sheena Foster

Sheena Foster
ROW Manager 2
Right-of-Way Office
Attachment

PROPOSAL

OF THE DEPARTMENT OF TRANSPORTATION OF THE STATE OF TENNESSEE

TO THE COUNTY OF ANDERSON, TENNESSEE:

The DEPARTMENT OF TRANSPORTATION of the State of Tennessee, hereinafter "DEPARTMENT", proposes to construct a project in the County of Anderson, Tennessee, hereinafter "COUNTY", designated as Federal Project No. BR-STP-9(111), State Project No. 01003-2246-94 , that is described as "Bridge over Bull Run, LM 16.10(IA)", provided the COUNTY agrees to cooperate with the DEPARTMENT as set forth in this proposal, so that the general highway program may be carried out in accordance with the intent of the General Assembly of the State.

Accordingly, the parties agree as follows:

1. That in the event any civil actions in inverse condemnation or for damages are instituted by reason of the DEPARTMENT, or its contractor, going upon the highway right-of-way and easements, and constructing said project in accordance with the plans and as necessary to make the completed project functional, it will notify in writing the Attorney General of the State, whose address is 425 Fifth Avenue North, Nashville, Tennessee, 37243, of the institution of each civil action, the complaint and all subsequent pleadings, within ten (10) days after the service of each of the same, under penalty of defending such actions and paying any judgments which result therefrom at its own expense.

2. The COUNTY will close or otherwise modify any of its roads or other public ways if indicated on the project plans, as provided by law.

3. The COUNTY will transfer or cause to be transferred to the DEPARTMENT, without cost to the DEPARTMENT, all land owned by the COUNTY or by any of its instrumentalities as

required for right-of-way or easement purposes, provided such land is being used or dedicated for road or other public way purposes.

4. Where privately, publicly or cooperatively owned utility lines, facilities and systems for producing, transmitting or distributing communications, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, storm water not connected with highway drainage, and other similar commodities, including publicly owned facilities such as fire and police signal systems and street lighting systems are located within the right-of-way of any road or other public way owned by the COUNTY, or any of its instrumentalities, the COUNTY agrees that it will take any action necessary to require the removal or adjustment of any of the above-described facilities as would conflict with the construction of the project. But the foregoing may not be a duty of the COUNTY since it shall become operative only after the DEPARTMENT has been unsuccessful in its efforts to provide for said removals or adjustments for the benefit of the COUNTY.

The foregoing does not apply to those utility facilities which are owned by the COUNTY or one of its instrumentalities, it being understood that the COUNTY has the duty to relocate or adjust such facilities, if required, provided the COUNTY is notified to do so by the DEPARTMENT with detailed advice as to this duty of the COUNTY.

5. The COUNTY will maintain any frontage road to be constructed as part of the project;

6. After the project is completed and open to traffic, the COUNTY will accept jurisdiction and maintenance such parts of any existing DEPARTMENT highway to be replaced by the project, as shown on the attached map.

7. The COUNTY will make no changes or alter any segment of a road on its road system that lies within the limits of the right-of-way acquired for any interchange to be constructed as part of the project and will not permit the installation or relocation of any utility

facilities within the right-of-way of any such a segment of one of its roads without first obtaining the approval of the DEPARTMENT.

8. No provision hereof shall be construed as changing the maintenance responsibility of the COUNTY for such part of the project as may presently be on its highway, street, road or bridge system.

9. It is understood and agreed between the DEPARTMENT and the COUNTY that all traffic control signs for the control of traffic on a street under the jurisdiction of the COUNTY and located within the DEPARTMENT's right-of-way shall be maintained and replaced by the COUNTY.

10. When traffic control devices for the direction or warning of traffic, lighting of roadways or signing, or any of them, which are operated or function by the use of electric current are constructed or installed as part of the project, they will be furnished with electricity and maintained by the COUNTY.

11. If, as a result of acquisition and use of right-of-way for the project, any building and/or structure improvements become in violation of a COUNTY setback line or building and/or structure requirement, including, but not limited to, on-premise signs, the COUNTY agrees to waive enforcement of the COUNTY setback line or building and/or structure requirement and take other proper governmental action as necessary to accomplish such waiver.

12. If, as a result of acquisition and use of right-of-way for the project, any real property retained by any property owner shall become in violation of a COUNTY zoning regulation or requirement, the COUNTY agrees to waive enforcement of the COUNTY zoning regulation or requirement and take other proper governmental action as necessary to accomplish such waiver.

13. The COUNTY will not authorize encroachments of any kind upon the right-of-way, nor will the COUNTY authorize use of the easements for the project in any manner which affects

the DEPARTMENT's use thereof.

14. The COUNTY will obtain the approval of the DEPARTMENT before authorizing parking on the right-of-way and easements for the project.

15 The COUNTY will not install or maintain any device for the purpose of regulating the movement of traffic on the roadway except as warranted and in conformity with the Manual on Uniform Traffic Control Devices.

16. If the project is classified as full access control (i.e. a project which has no intersecting streets at grade), then the DEPARTMENT will maintain the completed project. If the project is not classified as full access control, then the DEPARTMENT will maintain the pavement from curb to curb where curbs exist, or will maintain full width of the roadway where no curb exist. The COUNTY agrees to maintain all other parts of non-access control projects; provided, however, that any retaining walls, box culverts, or other like structures constructed as part of the project that supports the structural integrity or stability of the roadway surface shall be maintained by the DEPARTMENT.

17. If a sidewalk is constructed as a component of this project, the COUNTY shall be responsible for maintenance of the sidewalk and shall assume all liability for third-party claims for damages arising from its use of the sidewalk or premises beyond the DEPARTMENT'S maintenance responsibilities as set forth in section 16 of this proposal.

18. When said project is completed, the COUNTY thereafter will not permit any additional median crossovers, the cutting of the pavement, curbs, gutters and sidewalks, by any person, firm, corporation, or governmental agency, without first obtaining the approval of the DEPARTMENT.

19. The DEPARTMENT will acquire the right-of-way and easements, construct the project and defend any inverse condemnation for damage or civil actions of which the Attorney

General has received the notice and pleadings provided for herein; provided, however, that if the project is being constructed pursuant to a contract administered by the DEPARTMENT's Local Programs Development Office, the terms of that contract shall control in the event of a conflict with this proposal.

20. The project plans hereinbefore identified by number and description are incorporated herein by reference and shall be considered a part of this proposal, including any revisions or amendments thereto, provided a copy of each is furnished the COUNTY.

21. The acceptance of this proposal shall be evidenced by the passage of a resolution or by other proper governmental action, which shall incorporate this proposal verbatim or make reference thereto.

IN WITNESS WHEREOF, the DEPARTMENT has caused this proposal to be executed by its duly authorized official on this the ____ day of _____, 20___.

THE COUNTY OF _____, TENNESSEE

BY: _____ DATE: _____
MAYOR

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BY: _____ DATE: _____
CLAY BRIGHT
COMMISSIONER

APPROVED AS TO FORM AND LEGALITY:

BY: _____ DATE: _____
JOHN REINBOLD
GENERAL COUNSEL

Anderson County, Tennessee
Board of Commissioners

RESOLUTION NO. 21-08-883

A RESOLUTION AUTHORIZING THE COUNTY MAYOR TO ENTER INTO A PAYMENT-IN-LIEU-OF-TAX AGREEMENT WITH THE DEPARTMENT OF ENERGY

WHEREAS, Anderson County has requested that the U.S. Department of Energy (DOE) render financial assistance to the County in the form of a payment-in-lieu-of-taxes on real property acquired for nuclear and other energy purposes; and

WHEREAS, DOE has agreed to aid Anderson County by making a payment-in-lieu-of-taxes in the amount of the ad valorem tax revenue loss for tax year which Anderson County has suffered by virtue of removal of said real property from taxable ownership provided Anderson County will accept such payment in release of tax claims, if any, it may have against DOE or its contractors engaged in the performance of functions of DOE in Anderson County; and

WHEREAS, Anderson County is authorized by state law to accept financial assistance from Federal agencies and to make agreements and execute instruments containing such terms and conditions as may be necessary for the purpose of obtaining such financial assistance.

NOW, THEREFORE, BE IT RESOLVED by the Anderson County Board of Commissioners, meeting in regular session at Clinton, Tennessee, on August 16, 2021, that Anderson County is hereby authorized to accept from DOE payment-in-lieu-of-taxes in full satisfaction and release of any claims for taxes against DOE and its contractors based on or measured by the value of Federal property utilized by such contractors in the performance of activities of DOE in Anderson County, provided that the acceptance of this payment shall not operate in any manner in prejudice of Anderson County's eligibility for payment-in-lieu-of-taxes based on the benefits and burdens test prescribed in Section 168 of the Atomic Energy Act.

BE IT FURTHER RESOLVED that Terry Frank, Anderson County Mayor, is authorized to execute, for and on behalf of Anderson County, the transmittal of a request for payment and an agreement with DOE for payment-in-lieu-of-taxes in the amount of $640,393.14 for 2021.

BE IT FURTHER RESOLVED that the calculated payment-in-lieu-of-taxes is based on the number of acres of DOE properties in the respective tax rate location.

ADOPTED this 16th day of August, 2021.

APPROVED:

Josh Anderson, Commission Chairman

Terry Frank, Anderson County Mayor

ATTEST: _____
Jeff Cole, County Clerk

EXHIBIT 1
Computation and Basis for Payment in Lieu of Taxes

2020 US DOE In-Lieu of Tax

Indicated per acre appraisal of subject property:	$ 9,083.00
DOE, Anderson County Acreage:	11,464.16
Appraisal:	$104,128,965.28
Assessment rate for farms:	25%
Assessment:	$26,032,241.32
County Tax Rate for Oak Ridge:	2.46
Indicated In Lieu of Tax for Anderson County	**$640,393.14**
Oak Ridge City Tax Rate	2.31
Indicated In Lieu of Tax for Oak Ridge	**$601,344.77**

2020

Intergovernmental Agreement between Anderson County and DOE, PILT

Indicated per acre appraisal of subject property:	$ 9,083.00 per acre
DOE, Anderson County Acreage:	11,464.16
Appraisal:	104,128,965.28
Assessment rate for farms:	25%
Assessment:	26,032,241.32
Anderson County Tax Rate for Oak Ridge:	2.46
Indicated In Lieu of Tax for Anderson County	**$640,393.14**

RE: PILT

bbrownacgis <bbrownacgis@gmail.com>
Tue 8/3/2021 9:32 AM
To: Terry Frank <tfrank@andersoncountytn.gov>
Yes, same acreage and total

Sent from my U.S.Cellular© Smartphone

-------- Original message --------
From: Terry Frank <tfrank@andersoncountytn.gov>
Date: 8/2/21 2:06 PM (GMT-06:00)
To: Bill Brown <bbrownacgis@gmail.com>
Subject: PILT

Billy,

I've attached the letter and exhibit for DOE for 2020. Will the acreage and total be the same for 2021, do you know?

I was going to submit to Operations on Wednesday and I wanted to confirm.

Hope all is well!

Terry

Terry Frank
Anderson County Mayor
100 North Main Street, Suite 208
Clinton, TN 37716
865.457.6200

Note: My email has changed to **tfrank@andersoncountytn.gov**

Item #3.

Regarding Inquiry 015562

Open Records <Open.Records@cot.tn.gov>
Mon 8/2/2021 11:13 AM

To: Terry Frank <tfrank@andersoncountytn.gov>
Cc: Open Records <Open.Records@cot.tn.gov>

Hi Terry,

Thank you for contacting the Office of Open Records Counsel about whether the public may participate virtually at a public meeting. The Tennessee Open Meetings Act ("TOMA") requires that all meetings of a governing body must be open to the public and that any discussion, deliberation, or voting by members of a governing body must occur publicly at a properly noticed open public meeting. Tenn. Code Ann. § 8-44-102 et seq. As such, members of the governing body must be physically present at a public meeting and cannot discuss or deliberate public business by electronic means. *Johnston v. Metro. Gov't of Nashville & Davidson Cnty*, 320 S.W.3d 299, 311 (Tenn. Ct. App. 2009). That said, however, TOMA does not prohibit members of the public from attending public meetings virtually or otherwise participating in a public meeting by virtual means. As such, members of the public and presenters at a public meeting could attend and speak at a public meeting by virtual means.

Please let us know if we can be of any further assistance.

Thanks!

Lee Pope
Open Records Counsel
Comptroller of the Treasury
Office of Open Records Counsel
425 Rep. John Lewis Way N. | Nashville, TN 37243
Open.Records@cot.tn.gov | 615.401.7891

TENNESSEE
COMPTROLLER
OF THE TREASURY

Mission: To Make Government Work Better

a.

OFFICE OF THE COUNTY ATTORNEY
ANDERSON COUNTY, TENNESSEE

166 FAIRBANKS ROAD
OAK RIDGE, TENNESSEE 37830

DAVID S. CLARK
County Attorney

N. JAY YEAGER
Assistant County Attorney

TELEPHONE: (865) 482-3933
FACSIMILE: (865) 482-4208

October 18, 2002

Mike Cox, Chairman
Anderson County Commission
119 Anderson County Courthouse
100 North Main Street
Clinton, Tennessee 37716

RE: Lease with TVA for Claxton Playground

Dear Chairman Cox:

During the Operations Committee meeting held on October 14, 2002 this office was requested to review and approve as to form a lease regarding the Claxton playground. This office has subsequently reviewed the lease and find it acceptable as to form only. However, we are concerned about the following content issues that need to be brought to your attention.

1) Anderson County Government is identified as the grantee in the lease and not the Claxton Optimist Club as originally represented. That means Anderson County is responsible for all legal duties and liabilities concerning this land.

2) Anderson County will be responsible for all maintenance and upkeep associated with this land.

3) Anderson County Government will be responsible for compliance with all federal and state mandates regarding the property. (i.e., ADA, EPA, Clean Water Act regs.)

4) The lease contains a "Release Clause" where the TVA and the United States of America will be held harmless by the County for claims, costs, expenses or liability resulting from use of the land.

5) The lease is for a term of thirty (30) years.

Please contact this office if clarification is needed or questions arise concerning this matter.

Respectfully,

N. Jay Yeager
Assistant County Attorney

a.

Prepared by:

TVA TRACT NO. XBRSP-6RE

Janice K. Pulver, Attorney
Tennessee Valley Authority
1101 Market Street, SP 3L
Chattanooga, Tennessee 37402-2801
(423) 751-2096

GRANT OF TERM RECREATIONAL EASEMENT

BULL RUN STEAM PLANT RESERVATION

THIS GRANT OF TERM EASEMENT, made and entered into by and between the UNITED STATES OF AMERICA (sometimes hereinafter referred to as "GRANTOR"), acting herein by and through its legal agent, the TENNESSEE VALLEY AUTHORITY (hereinafter sometimes referred to as "TVA"), a corporation created and existing under an Act of Congress, known as the Tennessee Valley Authority Act of 1933, as amended, and ANDERSON COUNTY, TENNESSEE, (sometimes hereinafter referred to as "GRANTEE").

WITNESSETH:

WHEREAS TVA is authorized by Public Law 87-852 to grant to an applicant, on behalf of the United States of America, such easements affecting federal property in its custody and control as TVA's Board of Directors determines will not be adverse to the interests of GRANTOR; and

WHEREAS in considering GRANTEE's application, TVA's Board of Directors has determined that the use of the land hereinafter described for the purposes hereinafter defined, and subject to the exceptions, reservations, covenants, conditions and/or limitations hereinafter set forth, will not be adverse to the interests of the GRANTOR; and

NOW, THEREFORE, in consideration of the sum of ELEVEN THOUSAND THREE HUNDRED AND NO/100 DOLLARS ($11,300.00), cash in hand paid, and other good and valuable consideration, the receipt of which is hereby acknowledged, the United States of America, acting by and through its legal agent TVA, does hereby bargain, sell, transfer, and convey unto GRANTEE, an easement and right-of-way for a term of thirty (30) years from the date hereof, subject to the exceptions, reservations, restrictions, covenants, conditions, and/or limitations hereinafter set forth, for the following uses and purposes, namely: the right to enter upon TVA Tract No. XBRSP-6RE to construct, maintain, and operate a public recreational area and appurtenances thereto, in accordance with plans approved in advance and in writing by TVA, all in, on, over, across, upon, through or under said tract of land located in the First Civil District of Anderson County, Tennessee (hereinafter referred to as the "easement area") and more particularly described in Exhibit A and shown on Exhibit B, both of which are attached hereto and made a part hereof.

Furthermore, GRANTOR conveys to GRANTEE the right to use, for purposes of ingress and egress to and from the easement area, any access road or roads, as located or as relocated at the sole discretion of GRANTOR, in, on, over, across, and upon TVA's property known as the Bull Run Steam Plant Reservation. Provided, by the acceptance hereof, GRANTEE agrees that it shall be responsible for any maintenance costs associated with its use of said road or roads. Provided further, it is understood and agreed that the provision of road access to and from said easement area does not imply an undertaking on the part of the GRANTOR to maintain any road or roads, and it shall not be liable for

the maintenance of said road or roads or for any damages resulting from the construction, maintenance or use thereof.

In the event GRANTEE shall cease to use such easement area for the purpose for which this easement is granted for a period of two (2) consecutive years or more or shall, regardless of the time period, initiate use of the area subject to such easement for some other purpose or shall abandon such easement or commit any breach of any of the conditions contained herein, in whole or in part, then GRANTOR, TVA, or their successors or assigns, may terminate the easement by written notice to GRANTEE, its successors and assigns, and take possession of the easement area as if this grant of easement had never been made. Such termination shall be effective as of the date of such notice; provided, however, that GRANTEE, its successors and assigns, shall have the right during a period of ninety (90) days immediately following the date of such notice of termination to remove any improvements placed by it on the easement area; and provided, further, that GRANTEE, its successors and assigns, shall restore the easement area to TVA's satisfaction, including any regrading or reseeding TVA may deem appropriate. Title to any such improvements not removed within such 90-day period shall become the property of TVA at TVA's option and may be removed at GRANTEE's expense. Any failure of GRANTOR, TVA, or their successors or assigns, to exercise such power of termination shall not be construed as a waiver of any of the conditions or rights of the GRANTOR, TVA, or their successors and assigns.

The easement area is conveyed subject to such rights as may be vested in the county and/or third parties to rights-of-way for roads, telephone lines, electric power distribution lines and other utilities.

GRANTOR reserves on and over the easement area: the right, for itself, its successors and assigns, to enter upon the easement area at all reasonable times to do any and all things which may be necessary or incidental to the operation of the Bull Run Steam Plant Reservation. To the extent that the exercise of the right to enter shall not unreasonably interfere with the rights granted hereunder, this right shall include, but not be limited to, by reason of lack of specific enumeration, the right to enter upon the easement area to inspect and examine the same; to access adjoining lands; and to construct, operate, and maintain boundary markers and survey monuments, gas pipelines, waterlines, sewerlines, electric power transmission lines, communication lines, and/or other facilities.

GRANTEE, by accepting this grant of easement, covenants and agrees on behalf of itself, its successors and assigns, that the following shall constitute real covenants which shall attach to and run with the easement hereby conveyed:

1. GRANTEE shall obtain all required permits for and shall control all emissions of pollutants that might be discharged directly or indirectly into the atmosphere, into any stream, lake, watercourse, reservoir, surface or subterranean waters, or into or over the ground from any part of the easement area in full compliance with all applicable standards and requirements relating to pollution control of any kind now in effect or hereafter established by or pursuant to federal, state, or local statutes, ordinances, or regulations.

2. All land-disturbing activities on the easement area shall be conducted in accordance with the best management practices as defined by Section 208 of the Clean Water Act and implementing regulations, to control erosion and sedimentation so as to prevent adverse impact on water quality and related aquatic interests.

3. GRANTEE shall not permit or suffer any offensive use of the easement area and shall keep the easement area at all times in a clean and sanitary condition.

4. GRANTEE further agrees that it will conduct its operations on the easement area in compliance with all regulations, procedures, practices, and standards which TVA has prescribed or may prescribe for

the Bull Run Steam Plant Reservation and its own operations thereon concerning water and air pollution, traffic control, and other matters which are in TVA's judgment necessary to protect the environment, the public, and/or TVA's operations and facilities, including any and all facilities which are presently in existence or are hereafter installed. In the event GRANTEE's activities upon the easement area, in the opinion of TVA, could damage TVA's power facilities or operations or harm or pose a threat of harm to the environment or public, GRANTEE shall immediately cease such activities upon notification by TVA, and GRANTEE shall not resume such activities until such regulations, procedures, practices, standards, or controls as TVA may reasonably prescribe to avoid such damage or harm have been met to the satisfaction of TVA.

5. GRANTEE shall conduct all activities on the easement area in compliance with all applicable laws and regulations.

6. No substances listed as hazardous (collectively, "Hazardous Substances") under the Resource Conservation and Recovery Act of 1976, as amended, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, the National Oil and Hazardous Substance Pollution Contingency Plan, or any other federal, state, or local law or regulation (collectively, "Environmental Laws") shall be brought onto or used on the easement area in violation of applicable Environmental Laws. No Hazardous Substances shall be disposed of or (within the meaning of applicable Environmental Laws) released on the easement area or abutting property by GRANTEE, its agents or contractors. If a release (as defined in applicable Environmental Laws) occurs, GRANTEE shall notify TVA within twenty-four (24) hours and shall notify federal, state, and local authorities in accordance with applicable laws and regulations. GRANTEE shall provide TVA copies of all correspondence and reports submitted to regulatory authorities in connection with any such release of Hazardous Substances on the easement area or the abutting property. GRANTEE shall, at its own expense, promptly and in accordance with any timetables prescribed by any governmental authority having controlling jurisdiction remediate any release of Hazardous Substances on the easement or the abutting property resulting from the act or omission of the GRANTEE or its contractors.

7. GRANTEE hereby releases and agrees to indemnify and hold harmless TVA, the United States, and their officers, agents, and employees from any claims, costs, expenses, or liability resulting from GRANTEE's activities on the easement area or from pollution or contamination of any kind occurring on or under, or emanating from, the easement area, which pollution or contamination occurs during the term of this easement or results from activities that occur during the term of this easement and was not caused by TVA or the United States and did not migrate to the easement area from other lands of TVA or the United States. The foregoing release and indemnity includes, without limitation, any claims for response costs under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and any amendments thereto. In the event this easement is assigned or transferred to any other party, the foregoing release and indemnity shall remain the obligation of GRANTEE, as well as the assignee or transferee of this easement.

   Notwithstanding any other provision that may be interpreted to the contrary, the requirements of this covenant 7. shall survive the expiration or termination of this grant of easement for whatever reason and shall remain the continuing obligation of GRANTEE; provided, however, that this release and indemnity shall not apply to pollution or contamination that occurs after the expiration or termination of this easement, unless such pollution or contamination is caused by the act or omission of the GRANTEE or its contractors.

8. GRANTEE may not assign, transfer, or convey this easement or any interest therein without TVA's written consent.

9. GRANTEE shall be responsible for and shall pay when due all taxes and assessments of whatever kind which are properly assessed upon the easement area due to GRANTEE's use thereof.

10. GRANTEE shall not disturb or alter in any way the existing state of any archeological sites, human remains, funerary objects, sacred objects, objects of cultural patrimony, or any other archeological resources which may be discovered or identified on or under the easement area as provided for in the Native American Graves Protection and Repatriation Act and the Archeological Resources Protection Act. Upon the discovery of any such items, GRANTEE shall immediately stop all activity in the area of the discovery, make a reasonable effort to protect such items, and notify TVA's Cultural Resources staff by telephone at 865-632-1578. GRANTEE shall also provide written notification of such discovery to TVA, Cultural Resources, Post Office Box 1589, Norris, Tennessee, 37828. GRANTEE shall not resume work in the area of the discovery until approved by TVA.

It is expressly understood and agreed that neither GRANTEE nor TVA will be considered the agent of the other for any purpose under this grant of easement. The United States, TVA, and their agents and employees undertake no obligation or duty (in tort, contract, strict liability, or otherwise) to GRANTEE, or any other party for any damages to property (real or personal) or personal injuries (including death) arising out of or in any way connected with the acts or omissions of GRANTEE, or any other persons.

GRANTOR makes no warranties or representations to GRANTEE or any other party, either express or implied, as to the adequacy, condition, safety, reliability, merchantability, suitability, or adaptability of the property for the purpose granted, or any means of access to or egress from the property provided or made available by this easement grant.

GRANTEE agrees to indemnify the GRANTOR and TVA against and save them harmless from all claims, damages, demands, actions, costs, and charges to which they or either of them may be subject or which they or either of them may have to pay by reason of any injury to any person or property, or loss of life or property suffered or sustained by any person whomsoever, resulting from or in any way connected with the condition or use of this easement area, including any means of ingress thereto or egress therefrom, except liability for personal injuries, property damage, or loss of life or property caused by the sole negligence of the GRANTOR or TVA.

TO HAVE AND TO HOLD said easement and right-of-way unto GRANTEE, its successors and assigns, for a term of thirty (30) years from the date hereof; subject, however to the conditions set forth herein.

And TVA does hereby covenant that the UNITED STATES OF AMERICA is seized and possessed of the easement area; that TVA as legal agent of the UNITED STATES OF AMERICA is duly authorized to convey the easement and right-of-way in, on, over, across, upon, through and under the same; that said easement area and right-of-way are free and clear of liens and encumbrances; and that, subject only to such exceptions, conditions, covenants, restrictions, reservations, and/or limitations as may be expressly mentioned above, it will warrant and defend the title thereto against the lawful demands of all persons claiming by, through, or under the UNITED STATES OF AMERICA or TVA, but not further or otherwise.

Wherever in this instrument the context requires, the singular number and masculine gender as herein used may be read as plural and feminine or neuter, respectively. The word GRANTEE shall be understood to include the successors and assigns of GRANTEE as approved by TVA.

TVA TRACT NO. XBRSP-6RE

IN WITNESS WHEREOF, the TENNESSEE VALLEY AUTHORITY, acting herein as legal agent of the UNITED STATES OF AMERICA, and being duly authorized to do so, has caused this instrument to be executed, in the name of the UNITED STATES OF AMERICA, by its authorized officers, and its corporate seal to be hereunto affixed this ____ day of _____, 2002.

UNITED STATES OF AMERICA
By TENNESSEE VALLEY AUTHORITY
its legal agent

ATTEST:

_____
J. WAYNE OWENS
Assistant Secretary

_____
DARLENE H. BRADLEY
Manager, Realty Services

STATE OF TENNESSEE)
) SS
COUNTY OF HAMILTON)

On the ____ day of _____, 2002, before me appeared DARLENE H. BRADLEY and J. WAYNE OWENS, to me personally known, who being by me duly sworn, did say that they are the Manager, Realty Services, and Assistant Secretary, respectively, of the TENNESSEE VALLEY AUTHORITY, a corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed, sealed, and delivered on behalf of said corporation, by authority of its Board of Directors, and as legal agent for the UNITED STATES OF AMERICA; and the said DARLENE H. BRADLEY and J. WAYNE OWENS acknowledge said instrument to be the free act and deed of the UNITED STATES OF AMERICA, as principal, and the TENNESSEE VALLEY AUTHORITY, as its agent.

WITNESS my hand and official seal of office this ____ day of _____, 2002.

_____
Notary Public

My commission expires: _____

TVA TRACT NO. XBRSP-6RE

The name and address of the owner of the aforedescribed easement is:

EASEMENT OWNER: Anderson County, Tennessee
100 North Main Street, Room 208
Clinton, Tennessee 37716
Telephone Number: 865-457-6200

The name and address of the legal owner is:

OWNER: United States of America
Tennessee Valley Authority
1101 Market Street, SP 3L
Chattanooga, Tennessee 37402-2801

[Tax Exempt -
T.C.A. § 67-5-203(a)(1)]

Tax map: _____

Parcel: _____

jkp:djb
xbrsp\6re\easement

TVA TRACT NO. XBRSP-6RE

EXHIBIT A
TO
GRANT OF TERM RECREATIONAL EASEMENT

BULL RUN STEAM PLANT RESERVATION

A parcel of land lying in the First Civil District of Anderson County, State of Tennessee, being on the Bull Run Steam Plant Reservation opposite Clinch River Mile 48L, as shown on US-TVA Drawing No. 49 MS 422 B 508(D) R.0 and being more particularly described as follows:

Commencing at an angle iron (found) (Coordinates: N. 599,696.07, E. 2,547,319.03), being Corner No. 3IE-2; thence N27°06'28"W, 88.77 feet to an angle iron (set), being Corner No. 6RE-1 and the Point Of Beginning:

> Thence leaving the point of beginning and with the southwestern line of the herein described parcel N34°44'42"W, 383.65 feet to an angle iron (set), being Corner No. 6RE-2; thence leaving the said southwestern line and with the northwestern line of the herein described parcel N53°55'20"E, 205.25 feet to an angle iron (set), being Corner No. 6RE-3; thence leaving the said northwestern line and with the northeastern line of the herein described parcel S40°06'37"E, 158.12 feet to an angle iron (set), being Corner No. 6RE-4; thence continuing with the said northeastern line N59°08'01"E, 39.35 feet to an angle iron (set), being Corner No. 6RE-5; thence continuing with the said northeastern line S31°22'14"E, 24.88 feet to an angle iron (set), being Corner No. 6RE-6; thence continuing with the said northeastern line S60°14'59"W, 39.76 feet to an angle iron (set), being Corner No. 6RE-7; thence continuing with the said northeastern line S12°56'21"E, 103.88 feet to an angle iron (set), being Corner No. 6RE-8; thence leaving the said northeastern line and with the southeastern line of the herein described parcel S23°38'51"W, 210.87 feet to the point of beginning and containing 1.568 acres, more or less.

Positions of corners and directions of lines are referred to the Tennessee State Coordinate System and NAD 27 Horizontal Datum. The elevations for establishing the contours are based on NGVD 1929.

Located on VTM Quad CLINTON, TN. 137-SW.

This description was prepared from Reservation Maps 49 MS 421 K 506-3, R.0, 43 MS 421 B 511-D-11 R.1, Land Sale Map 49 MS 422 B 507(D) R.0 and a survey dated April 8, 2002, by:

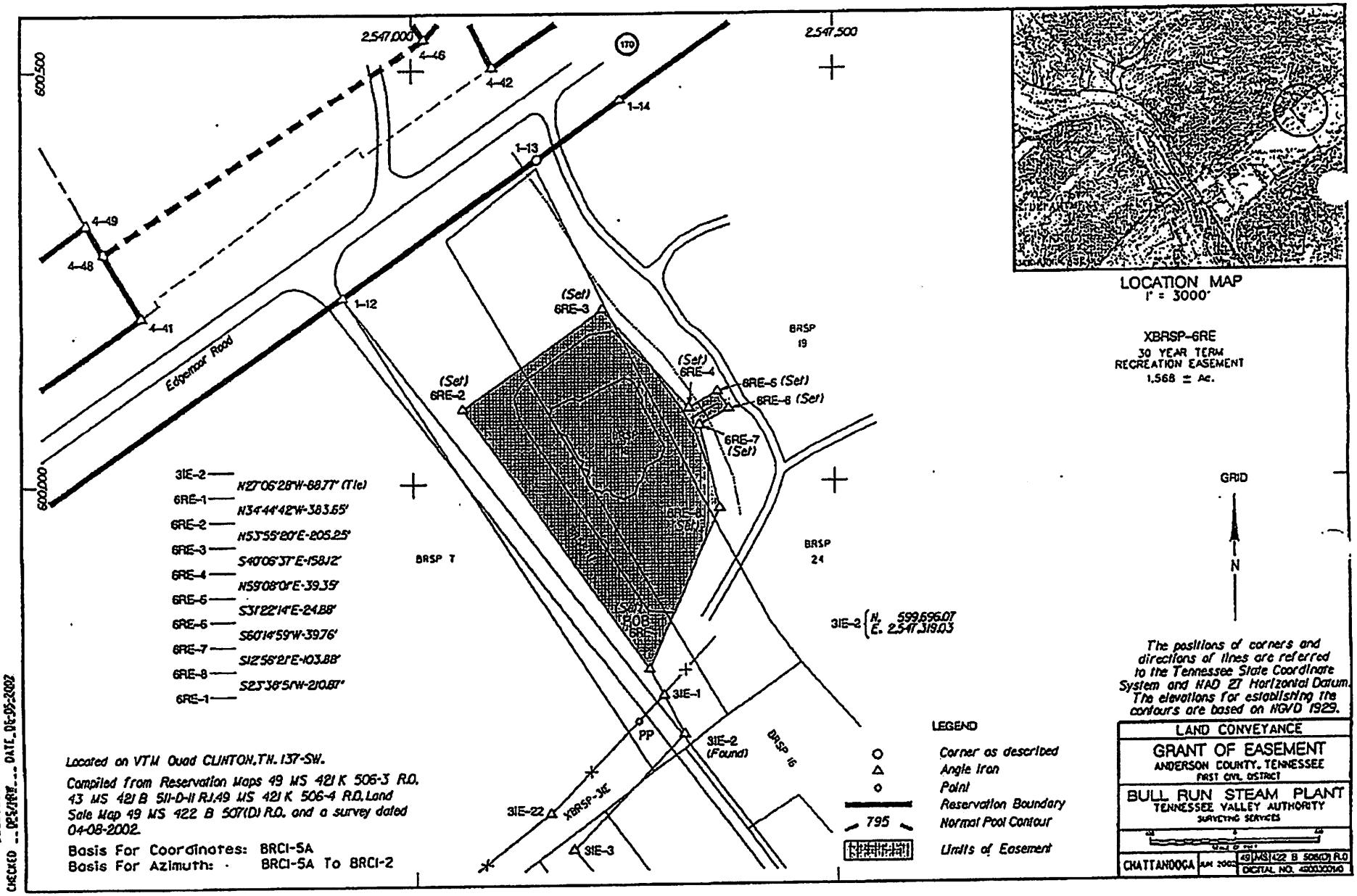
A. J. Monsees, RLS
Tennessee Valley Authority
MR 4B-C
Chattanooga, TN 37402-2801
TN License No. 1843

TVA TRACT NO. XBRSP-6RE

Subject property was acquired by virtue of the following instruments of record in the office of the Register of Deeds of Anderson County, Tennessee: 1) Warranty Deed dated November 20, 1961, from John E. Crowder and wife, Agnes J. Crowder, in Deed Book D, Volume 8, page 289 for TVA Tract No. BRSP-17; 2) the Warranty Deed dated November 13, 1961, from James R. Wilmoth and wife, Dorothy Wilmoth, in Deed Book D, Volume 8, page 185, for TVA Tract No. BRSP-18; and 3) Warranty Deed dated February 15, 1962, from Luther Hicks, Ernest T. Wallace, W. L. Moorehead and Charles Hughes, Trustees of Edgemoore Baptist Church of Clinton, Tennessee, in Deed Book F, Volume 8, page 185, for TVA Tract No. BRSP-19.

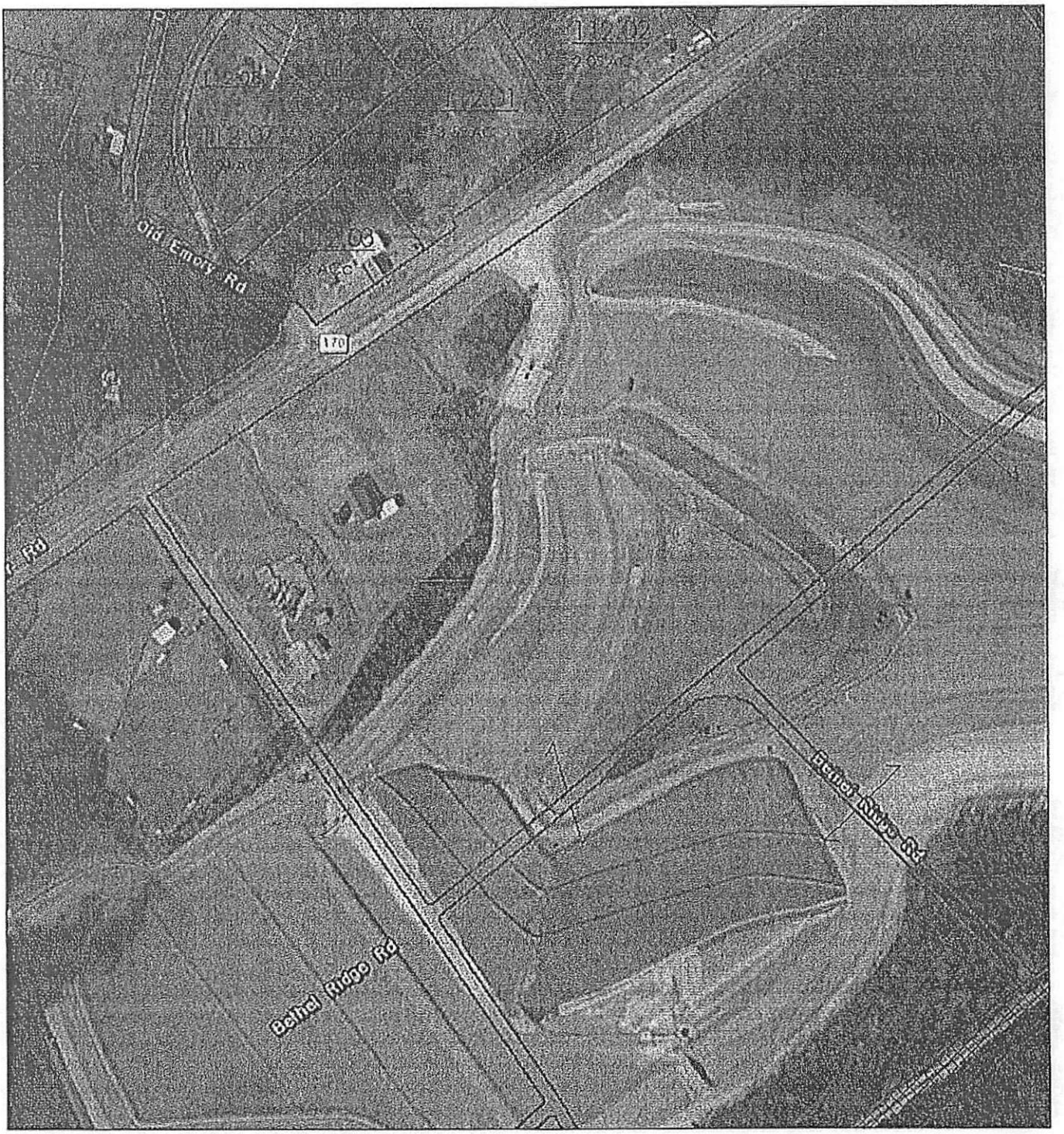
06-05-2002
date received 6/5/02

EXHIBIT B


2,547,000
2,547,500
600,500
600,000
4-46
4-42
4-49
4-48
4-41
1-14
1-13
1-12
170
Edgemoor Road
(Set)
6RE-3
(Set)
6RE-2
(Set)
6RE-4
6RE-5 (Set)
6RE-8 (Set)
6RE-7
(Set)
6RE-6
(Set)
POB
6RE-1
3IE-1
PP
3IE-2
(Found)
3IE-22
XBRSP-3IE
3IE-3
BRSP
19
BRSP
24
BRSP 7
BRSP 16
3IE-2 N. 599,696.07
E. 2,547,319.03
3IE-2
6RE-1
N27°06'28"W-88.77' (Tie)
6RE-1
N34°44'42"W-383.65'
6RE-2
N53°55'20"E-205.25'
6RE-3
S40°06'37"E-158.12'
6RE-4
N59°08'0"E-39.35'
6RE-5
S31°22'14"E-24.88'
6RE-6
S60°14'59"W-39.76'
6RE-7
S12°56'21"E-103.88'
6RE-8
S25°38'5"W-210.87'
6RE-1
Located on VTM Quad CLINTON, TN. 137-SW.
Compiled from Reservation Maps 49 MS 421 K 506-3 R.O. 43 MS 421 B 511-D-II R.I. 49 MS 421 K 506-4 R.O. Land Sale Map 49 MS 422 B 507(D) R.O. and a survey dated 04-08-2002.
Basis For Coordinates: BRCI-5A
Basis For Azimuth: BRCI-5A To BRCI-2
LOCATION MAP
1" = 3000'
XBRSP-6RE
30 YEAR TERM
RECREATION EASEMENT
1,568 ± Ac.
GRID
N
The positions of corners and directions of lines are referred to the Tennessee State Coordinate System and NAD 27 Horizontal Datum. The elevations for establishing the contours are based on NGVD 1929.
LEGEND
Corner as described
Angle Iron
Point
Reservation Boundary
795
Normal Pool Contour
Limits of Easement
LAND CONVEYANCE
GRANT OF EASEMENT
ANDERSON COUNTY, TENNESSEE
FIRST CIVIL DISTRICT
BULL RUN STEAM PLANT
TENNESSEE VALLEY AUTHORITY
SURVEYING SERVICES
CHATTANOOGA
49 MS 422 B 506(D) R.O.
DIGITAL NO. 490030040
SURVEYED ---- RLOSS ---- DATE 04-08-2002
COMPILED ---- JJH ---- DATE 05-29-2002
CHECKED ---- DESHART ---- DATE 05-29-2002

a.

Anderson County - Parcel: 101 009.00



Date: May 21, 2018
County: Anderson
Owner: TVA
Address: BULL RUN
Parcel Number: 101 009.00
Deeded Acreage: 0
Calculated Acreage: 674.5
Date of Imagery: 2015

b.

FW: Anderson County - Claxton Sampling Locations

Jay Yeager <jyeager@aclawdirector.com>
Tue 8/3/2021 5:35 PM
To: Terry Frank <tfrank@andersoncountytn.gov>
See below.

From: Jay Yeager
Sent: Tuesday, August 03, 2021 5:35 PM
To: Avner Vengosh, Ph.D. <vengosh@duke.edu>
Subject: Anderson County - Claxton Sampling Locations

Dr. Vengosh:
Can you please provide the exact sampling locations utilized in your study? This information would assist us immensely.
Thank you for your time in advance.
Sincerely,
Jay Yeager

NOTE: This email may contain PRIVILEGED and CONFIDENTIAL INFORMATION and is intended only for the use of the specific individual(s) to which it is addressed. You are hereby notified that any unauthorized use, dissemination or copying of this email or the information contained in it or attached to it is strictly prohibited. If you received this email in error, please immediately notify the person named above by reply mail and delete this email message immediately.

From: Avner Vengosh, Ph.D. <vengosh@duke.edu>
Sent: Thursday, July 29, 2021 5:29 PM
To: Jay Yeager <jyeager@aclawdirector.com>
Subject: Re: Anderson County Concerns

Mr. Yeager,

Thank you for your email. Unfortunately, I have no expertise capacity for addressing the important questions you have raised. I am an environmental scientists and our mission was to see if we can find fly ash in soils near Bull Run coal plant. Indeed, in our study, we were able to detect traces of fly ash in soils from different sites downwind from Bull Run plant. Yet the absolute concentrations of the toxic trace metals we found in the soil were below the threshold levels that define soil as hazardous. Therefore, there are no apparent violations of regulations with respect to contaminant level. Nonetheless, in our study and in press release we expressed concerns that finding traces of fly ash on soils could pose potential health risks upon long-term exposure through inhalation of the

nano fly ash particles in the dust. In order to determine the actual risks one would need to consult with an epidemiologist who might be able to translate the findings of our study to actual risks and whether closure of the park is needed. As stated, my team and myself do not have this type of expertise and therefore would not be able to advise you on that matter. I would suggest that the next step in evaluation would require a much larger investigation that would included larger sampling sites and conducting sampling over time, combined with a parallel health study of the local population to establish a link, if exists, between the occurrence of fly ash on surface soils and health in your community. 6.

Best regards,

Avner

Avner Vengosh, PhD
Duke University Distinguished Professor of Environmental Quality
Division of Earth and Climate Sciences
Levine Science Research Center, Box 90328, Room A207,
Duke University
Durham, NC 27708

Phones: office (919) 681-8050; Lab: (919) 681-0638; E-mail: vengosh@duke.edu
Duke web site: http://www.nicholas.duke.edu/people/faculty/vengosh.html
Group web site: http://sites.nicholas.duke.edu/avnervengosh/
Who we are: https://www.youtube.com/watch?v=WfpVAM82KuQ&trk=organization-update-content_share-video-embed_share-article_title

Editor, *GeoHealth*

From: Jay Yeager <jyeager@aclawdirector.com>
Date: Thursday, July 29, 2021 at 12:37 PM
To: Avner Vengosh <vengosh@duke.edu>
Subject: Anderson County Concerns

Dr. Vengosh:
First of all, I want to thank you for your time and efforts in Anderson County. I'm sure you, like Anderson County, share the same concerns about community health in our county and especially since the release of your recent findings related to the Claxton Community. Anderson County Government considers the health of our citizens to be of paramount importance, and thus, we are certainly uneasy with some of the findings and language in your recent report. We are certainly not challenging the results or the methodology utilized in the analyses, but the conclusions and somewhat ambiguous language regarding the Claxton playground is of deep concern to Anderson County Government. For your knowledge, the "Kids Palace" playground was built by the county in partnership with TVA who provided the property under a thirty (30) year lease. In return, the county is obligated to maintain the facility; therefore, in no uncertain terms, we need to know if you and your peers believe this playground poses a health risk to our citizens that necessitate closing the facility. If so, we feel as though we must take immediate action by whatever means to protect the health, safety and welfare of our citizens that frequent this playground.

We ask that you please help us with a few difficult questions that we have and provide us with your

Environmental Science & Technology

pubs.acs.org/est

Article

Evaluation and Integration of Geochemical Indicators for Detecting Trace Levels of Coal Fly Ash in Soils

Zhen Wang, Rachel M. Coyte, Ellen A. Cowan, Heather M. Stapleton, Gary S. Dwyer, and Avner Vengosh*

Cite This: https://doi.org/10.1021/acs.est.1c01215

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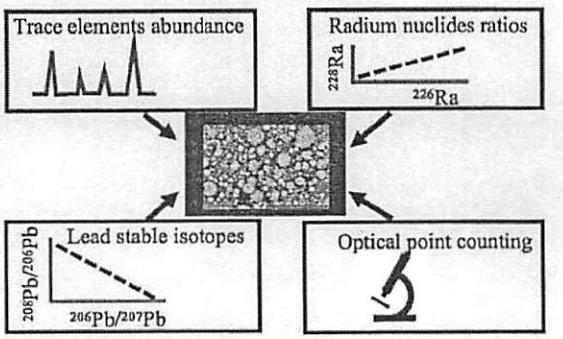
ABSTRACT: Coal combustion residuals (CCRs), in particular, coal fly ash, are one of the major industrial solid wastes in the U.S., and due to their high concentrations of toxic elements, they could pose environmental and human health risks. Yet detecting coal fly ash in the environment is challenging given its small particle size. Here, we explore the utility and sensitivity of using geochemical indicators (trace elements, Ra nuclides, and Pb stable isotopes), combined with physical observation by optical point counting, for detecting the presence of trace levels of coal fly ash particles in surface soils near two coal-fired power plants in North Carolina and Tennessee. Through experimental work, mixing models, and field data, we show that trace elements can serve as a first-order detection tool for fly ash presence in surface soils; however, the accuracy and sensitivity of detection is limited for cases with low fly ash proportion (i.e., <10%) in the soil, which requires the integration of more robust Ra and Pb isotopic tracers. This study revealed the presence of fly ash particles in surface soils from both the recreational and residential areas, which suggests the fugitive emission of fly ash from the nearby coal-fired power plants.



KEYWORDS: *coal combustion residuals, coal fly ash, surface soils, trace elements, Pb isotopes, Ra isotopes, soil geochemistry*

INTRODUCTION

Coal combustion residuals (CCRs) generically refer to the solid waste generated from the combustion of coal in coal-fired power plants, composed of fly ash, bottom ash, boiler slag, and flue-gas desulfurization products, of which fly ash is the most abundant component.[1,2] Over the last decades, coal combustion in the U.S. has generated a large volume of CCRs that were disposed of and accumulated in surface impoundments and landfills. In 2019, approximately 80 million tons of CCRs were produced.[1] Due to its massive volume, small particle size, and high concentrations of toxic elements such as Hg, As, Se, Cd, Cr, and Pb,[2−9] CCRs, and in particular fly ash, pose significant environmental and human health risks.[3,10−17] The impacts of CCRs on the environment have been demonstrated by extreme and acute incidents, such as coal ash spills from the Kingston Fossil Plant, Tennessee in 2008,[18−22] and the Dan River Steam Station, North Carolina in 2014.[23,24] In addition, chronic release of CCRs and its contaminants to the environment can also have significant effects, as shown by the leaking of effluents from surface impoundments and landfills, and discharge of CCR effluents into the aquatic environment.[2,25,26] Furthermore, fugitive emission of fine ash particulates from coal-fired power plants and subsequent deposition and resuspension in the surrounding terrestrial environment could expose residents to the ash particles and associated contaminants.[13,17,27−30] Regardless of the mechanisms by which CCRs enter the environment, the ability to detect their occurrence is critical for delineating the environmental impacts and risks of CCRs to human health.

The geochemistry of coal fly ash is largely distinctive from those of natural rocks, soils, and sediments.[11,31−34] Hence, once it is released to the environment, the geochemistry of the impacted natural reservoir is likely to be altered, thus facilitating the use of geochemical tools to detect the possible presence of fly ash and its associated contamination in the environment. Previous studies have demonstrated the utility of a variety of geochemical tools for tracing fly ash contamination of aquatic systems. Given the high mobility of certain toxic elements from fly ash, the occurrence of soluble elements, such as As, Se, B, and Sr, combined with distinctive signatures of B and Sr isotopes, have been used to delineate its impact on groundwater, surface water, and sediment pore water.[26,34−36] For the detection of the presence of fly ash solids in the environment, various isotope systems have been used as potential tracers. Lauer et al. showed that fly ash derived from

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Revised: May 22, 2021
Accepted: June 30, 2021

coals of the major coal-producing basins in the U.S. has a distinctively low $^{228}Ra/^{226}Ra$ activity ratios (<1) relative to the common $^{228}Ra/^{226}Ra$ activity ratios in soils (>1), suggesting the possibility of using $^{228}Ra/^{226}Ra$ activity ratios to identify fly ash in the environment.[37] Wang et al. showed that the Pb isotope composition of U.S. fly ash (i.e., $^{208}Pb/^{206}Pb$ vs $^{206}Pb/^{207}Pb$) is distinctive from those of both natural Pb in soils and major anthropogenic Pb sources (i.e., leaded gasoline and lead-based paint), making it a useful tracer of fly ash solids in the environment.[38] In addition, Sr, Hg, and Tl isotopes have also been suggested as potential tracers for delineating the occurrence of coal fly ash solids in the environment.[20,21,39−44] Furthermore, trace elements can also be indicative of the input of coal fly ash solids in the environment. Vengosh et al. identified the presence of fly ash solids in the bottom sediments of Sutton Lake near Wilmington, NC caused by multiple unmonitored coal ash spills, partially detected by high concentrations of trace elements (e.g., As, Se, Mo, Sb, and Tl) in the Sutton Lake sediments when compared with their occurrence in sediments from a background lake.[34] The presence of fly ash solids in the Sutton Lake sediments was further verified by Pb stable isotopes.[38]

While acute coal ash spills within the environment can be easily detected due to their large scales, tracing small quantities of fine fly ash particulates in soils and sediments derived from atmospheric deposition from nearby coal plants is much more challenging. Installation of high-efficiency pollution control devices in coal-fired power plants, including electrostatic precipitators and fabric filters, has significantly reduced the emission of fly ash from coal combustion by retaining the majority of ash particles.[45,46] Nonetheless, fine ash particles could still be uncaptured and accumulate in the terrestrial environment at relatively trace levels, particularly onto surface soils surrounding coal-fired power plants and coal ash disposal sites.[27,28,47,48] Previous studies have shown heavy-metal contamination in surface soils near coal-fired power plants and coal ash disposal sites;[49−65] however, no direct and definite links to coal ash source were established in these studies, reflecting the limitation of solely using chemistry data for identifying trace levels of coal fly ash in soils.

In this study, we aim to explore the utility of multiple geochemical methods, including trace elements, Ra isotopes, and Pb stable isotopes, as indicators for the presence of trace levels of coal fly ash particles in soils near coal-fired power plants and coal ash disposal sites. We evaluate the sensitivity of these methods by integrating observation and quantification of fly ash particles in soils, using point counting under polarized light microscope (PLM).[34,66−68] While some of these methods have been used individually, here, we present the first integration of geochemical methods for the purpose of tracking even trace levels of coal fly ash contamination in the environment. By integrating multiple geochemical tools and microscopic physical observation to investigate surface soil samples collected from areas adjacent to coal-fired power plants in North Carolina (NC) and Tennessee (TN), we demonstrate both their applicability and limitations for the detection of trace levels of coal fly ash presence in the environment.

MATERIALS AND METHODS

Sample Collection and Preparation. To examine the utility of geochemical tools for detecting coal fly ash in the environment, we collected and analyzed surface soils surrounding two operating coal-fired power plants, the Marshall Steam Station (2090 MW, began operation in 1965) near Lake Norman, NC, and the TVA Bull Run Steam Plant (865 MW, began operation in 1967) in Claxton, Anderson County, TN. To our knowledge, both the Marshall Steam Station and the Bull Run Steam Plant primarily burn coals sourced from the Appalachian (APP) Basin.

Surface soil samples were collected from recreational and residential areas near Lake Norman, NC ($n = 21$) and Claxton, Anderson County, TN ($n = 25$). Open, flat, and uncultivated natural grasslands were selected as sampling sites, where soil samples were collected from 5 cm depth below the surface using a stainless steel trowel. Each sample was a composite of three to five sub-samples collected from areas of approximately 5 m × 5 m to avoid sampling bias. Upon collection, all samples were stored and sealed in plastic bags or containers to avoid potential contamination. Maps showing the locations of coal-fired power plants and sampling sites are presented in the Supporting Information (Figure S1). As indicated by the wind rose diagrams, the majority of the sampling sites are located downwind of the coal plants, while the upwind Lake Norman State Park, northeast of the Marshall Steam Station (Figure S1a), and the upwind Haw Ridge Park, southwest of the Bull Run Steam Plant (Figure S1b), were selected for soil sampling to represent the respective local background soil according to the sampling guidelines for baseline soils by the U.S. Geological Survey (USGS).[69]

Prior to laboratory analysis, each soil sample was oven-dried at 50 °C until reaching a constant weight, plant residues and gravels were removed by hand, and the remaining soil was passed through a 2-mm sieve for homogenization. A subset of the sample by coning and quartering was ground using a ceramic mortar and pestle to pass through a 200-mesh stainless steel sieve for subsequent chemical analysis.

Laboratory and Statistical Analysis. *Trace Elements.* The concentrations of trace elements were measured on a Thermo Fisher XSeries II inductively coupled plasma mass spectrometer (ICP-MS) at Duke University. Samples were digested in a $HF–HNO_3$ mixture. The details of sample digestion and instrumental analysis have been documented in previous studies.[34,38,42] The efficiency of digestion and accuracy of measurement were assessed by measuring the National Institute of Standards and Technology (NIST) standard reference material (SRM) for trace elements in coal fly ash SRM 1633c as well as the U.S. Geological Survey (USGS) sedimentary rock standard SCo-1 (Cody Shale). The average percent recovery as well as relative standard deviations (RSDs) for all of the analyzed trace elements from repeated measurements of the reference materials over the course of analysis are presented in Table S1. The percent recovery for Cr in NIST 1633c is 80.4% (RSD = 5.2%, $n = 7$), lower than the average of 97.5% for all trace elements, while the percent recovery for Th in USGS SCo-1 is 80.7% (RSD = 12.2%, $n = 5$), lower than the average of 93.4% for all trace elements.

Radium Isotopes. The activities of ^{228}Ra and ^{226}Ra were determined on a Canberra DSA2000 broad-energy germanium γ detector surrounded by Pb shielding at Duke University. The sample packing and incubation followed the method reported previously.[37] Each measurement lasted for at least 86 000 s to minimize statistical counting error. Detector efficiencies were determined using a U–Th ore reference material (CCRMP DL-1a) packed and incubated in the same geometry as the samples.

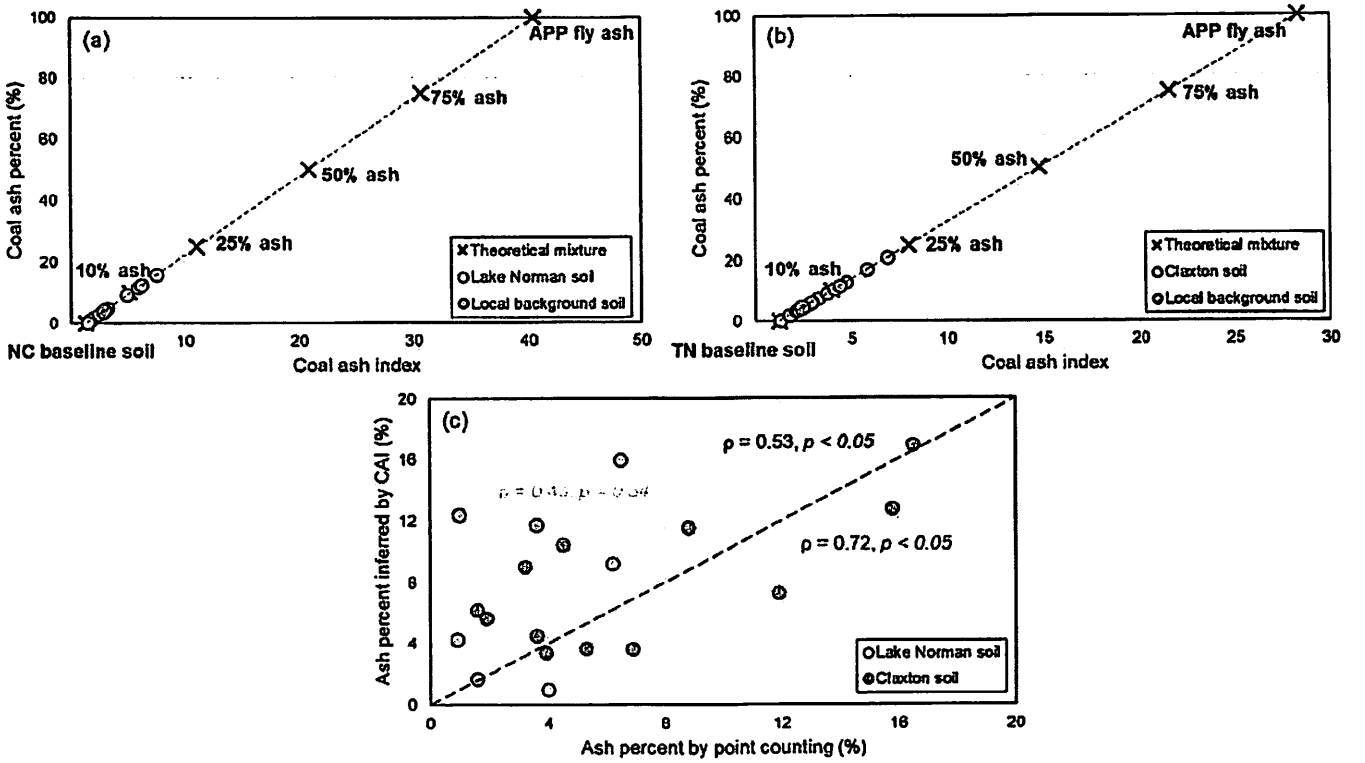

Figure 1. (a) Diagram of estimated ash percent (%) against coal ash index (CAI) of the surface soil samples from Lake Norman near the Marshall Steam Station, NC. The mixing line is defined by the theoretical mixing between the average NC baseline soil and the average APP fly ash. (b) Diagram of estimated ash percent (%) against CAI of the surface soil samples from Claxton near the Bull Run Steam Plant, TN. The mixing line is defined by the theoretical mixing between the average TN baseline soil and the average APP fly ash. The baseline soil data were compiled from the USGS database,[69] and the APP fly ash data were generated from this study. (c) Diagram of ash percent estimated by CAI against ash percent by point counting for the selected soil samples from Lake Norman and Claxton. Black dot line represents the 1:1 line.

Lead Stable Isotopes. The Pb stable isotope analysis (^{208}Pb, ^{207}Pb, ^{206}Pb, and ^{204}Pb) was performed on a Triton thermal ionization mass spectrometer (TIMS) at Duke University, using Faraday cups and operating in static mode. The sample digestion and Pb column separation and purification have been detailed in a previous study.[38] A common Pb standard NIST SRM 981 was measured regularly over the course of analysis (n = 36) and the mass bias for all isotope ratios was determined according to the expected values.[70] The analytical uncertainties (2SD) for $^{208}Pb/^{206}Pb$ and $^{206}Pb/^{207}Pb$ are 0.0013 and 0.0003, respectively.

Optical Point Counting. The percent of coal fly ash particles present in the soil samples was determined at 500× magnification using a Leica DMLP polarizing microscope equipped with a Swift model F automated point counter at Appalachian State University. Details of sample preparation, counting procedures, and method reproducibility, as well as photomicrographs of fly ash particles in soils, are presented in the Supporting Information. To produce representative counts, each sample was thoroughly homogenized when slides were made for microscopic observation and counting. The identification of coal fly ash, which is composed of distinctive spherical particles, was based on Fisher et al.[71] and Hower.[72]

Data Compilation and Statistical Analysis. The trace element data of the surface soils (top 5 cm) collected across North Carolina (n = 83) and Tennessee (n = 66) were compiled from the USGS database,[69] which represent the baseline geochemical characteristics for the statewide surface soils (referred to as baseline soil hereafter) (Table S2). The trace element data of coal fly ash samples derived from coals of the Appalachian Basin (APP) (n = 16), Illinois Basin (ILL) (n = 22), and Powder River Basin (PRB) (n = 7) were measured on ICP-MS, which have been partially reported in previous studies (Table S2).[38,42] Monte Carlo simulation was performed for the theoretical mixing of coal fly ash and soil, by following the mixing scenarios of 10, 25, 50, and 75% of fly ash addition in soil, and each scenario was composed of 500 simulated mixtures. To confirm its reproducibility, the simulation was repeated at least 10 times for each mixing scenario until its mean values and standard deviations were calculated. Nonparametric methods were employed for statistical analysis using R,[73] including Spearman's rank correlation for investigating the correlation of two variables and Mann–Whitney test for comparing the difference between two groups.

RESULTS AND DISCUSSION

Evaluation of Trace Element Indicators for the Presence of Coal Fly Ash in Soils. Analysis of the trace element composition of coal fly ash samples associated with coals of the major coal basins in the U.S., including the Appalachian (APP), Illinois (ILL), and Powder River (PRB) basins[38,42] is presented in Table S2. In spite of variations in trace metal concentrations, fly ash derived from combustion of coals from the different basins in the U.S. has distinctive geochemical characteristics relative to the baseline soils of North Carolina and Tennessee[69] (Table S2; Figure S2). Similar patterns are observed for fly ash that originated from

combustion of the APP and ILL coals, which have enrichment of As, Se, Mo, Sb, and Tl. In addition to these elements, PRB fly ash is also enriched in Se, Sr, and Ba relative to the baseline soils (Figure S2). Given both the Marshall Steam Station and Bull Run Steam Plant have utilized coals primarily derived from the Appalachian Basin, we used the APP fly ash data in this study (Table S2). To mimic the mechanical mixing between fly ash and soil, an archived NC surface soil sample known to have zero input from fly ash and a coal fly ash sample derived from APP coals was experimentally mixed in the laboratory, with weight percent of fly ash mixing of 10, 25, 50, and 75%. The actual measurements of trace elements in the soil–ash mixtures were compared to the theoretical calculations for the mixing combinations of the soil and fly ash (Table S3). Despite some variations, the measured values largely agree with the calculated values. The trace element concentrations of the soil–ash mixtures were then normalized to the average values of NC baseline soil, and the distribution curves of trace elements in the different mixtures are shown in Figure S3. While the distribution curves of trace elements in the original soil sample and fly ash sample are markedly different, increasing the fraction of fly ash in the soil–ash mixtures evidently causes divergence of the distribution curves from that of the pristine soil sample and resemblance to that of the fly ash sample (Figure S3).

Furthermore, mixing of fly ash and soil results in notable spikes of an assemblage of trace elements, including As, Se, Mo, Sb, and Tl in the soil–ash mixtures (Figure S3). To quantify the characteristic enrichment of the As–Se–Mo–Sb–Tl assembly in soil that resulted from mixing with fly ash, we define the coal ash index (CAI), which is the sum of the enrichment factors of each of the five characteristically enriched trace elements as normalized to their median concentrations in the background soil. To better reflect the relative contribution of fly ash as opposed to other potential contamination sources, the enrichment factors of these five elements are weighted by multiplying the percent weight of the enrichment factor of each element in fly ash (see details in Supporting Information). By calculating the CAI values, a linear relationship between CAI and estimated ash percent in the mixtures can be established. As shown in Figure S4, the relationship for the experimental mixing between CAI and ash percent largely fits with the theoretical mixing, suggesting the potential utility of CAI as an indicator for coal fly ash presence in soils, with the potential of estimating the relative input of fly ash in soils.

To demonstrate the application of the coal ash index, we calculated the CAI values using the weighted enrichment factors of the As–Se–Mo–Sb–Tl assembly for the investigated surface soil samples from Lake Norman and Claxton, respectively (Tables S4 and S5). The results are compared to the theoretical mixing relationship established between the averages of the statewide baseline soil and APP fly ash (Figure 1a,b). Most of the analyzed Lake Norman soil samples have CAI values that are similar to or lower than that of the background sample from Lake Norman State Park (corresponding to ash percent of <4%; Figure S1a). Yet a few samples (6 out of 20) yielded CAI values higher than that of the background soil, with the respective estimated fly ash percent being up to 16%, implying the possible presence of coal fly ash in these soil samples (Figure 1a; Table S4). The CAI values calculated for the Claxton surface soil samples were similarly compared to the ash percent following the theoretical mixing between the averages of the TN baseline soil and APP fly ash (Figure 1b). Compared to the Lake Norman soil samples, we find systematically higher CAI values in 21 out of the 24 soil samples from Claxton relative to the local background soil collected from the Haw Ridge Park (Figure S1b), with estimated coal ash percent up to 20% (Figure 1b; Table S5). To further assess the effectiveness of the CAI method, we employed optical point counting to physically identify and quantify fly ash within the soil samples, based on the fact that coal fly ash particles have distinctive spherical morphologies relative to typical mineral grains in soil and sediments (e.g., quartz, calcite, feldspar, and clay minerals).[66−68] The counting results confirm our hypothesis that the background soil samples from both Lake Norman and Claxton contain zero coal fly ash, even though the CAI values could suggest ~4.0 and ~2.1% of fly ash present, respectively (Tables S4 and S5). Besides the local background soils, seven more Lake Norman soil samples and 13 more Claxton soil samples were selected for optical point counting mostly due to their relatively high estimated ash percent by the CAI method (Tables S4 and S5). Fly ash was identified in all of the selected Lake Norman soil samples, including samples with both higher and lower CAI values than that of the background soil, although the point-counted ash percent is generally low, ranging from 0.9 to 6.5% (Table S4). Among the selected Claxton soil samples, fly ash was observed in 12 out 13, with the point-counted ash percent ranging from 1.6 to 16.5%. Sample CCS-15 was estimated to have the highest ash percent by the CAI method (~20.9%) but had no observable fly ash under microscope (Table S5), demonstrating that solely using the CAI method may result in false detection in some cases, and the need for multiple methods to validate the observation. The estimated ash percent values by CAI for the selected soil samples were plotted against the respective percent values by point counting (Figure 1c). The estimated ash percent for the selected soil samples from Lake Norman was not significantly correlated with that from point counting ($\rho = 0.43$, $p = 0.34$), with most of the CAI-estimated ash percent higher than the point-counted ash percent (Table S4; Figure 1c). In contrast, the selected soil samples from Claxton show a much better correlation between the CAI-estimated ash percent and the point-counted ash percent ($\rho = 0.72$, $p < 0.05$) (Figure 1c). Our data indicate that detecting trace levels of fly ash presence in the soil using the coal ash index (CAI) method can be useful, yet the accuracy of this method is limited, as indicated by the inconsistency between the CAI-estimated ash percent and the point-counted ash percent, particularly for the Lake Norman soil samples.

In addition to the enrichment of the As–Se–Mo–Sb–Tl assembly, the APP fly ash is typically enriched in a suite of trace metals relative to the baseline soils, including Li, V, Cr, Co, Ni, Cu, Zn, Rb, Sr, Ba, Th, and U. For each of the individual trace metals, the APP fly ash is significantly higher than the NC baseline and TN baseline soils, respectively, according to the results of Mann–Whitney test ($p < 0.01$) (Figure S5). Therefore, we performed a series of hypothetical mixing calculations between the APP fly ash and the baseline soils to test the potential of using all of the trace metals as indicators for the possible presence of fly ash in soils. Given that the trace element concentrations of both the APP coal fly ash and the NC and TN baseline soils exhibit large variations (Figure S5), we performed the mixing calculations using Monte Carlo simulations to incorporate the variability in the

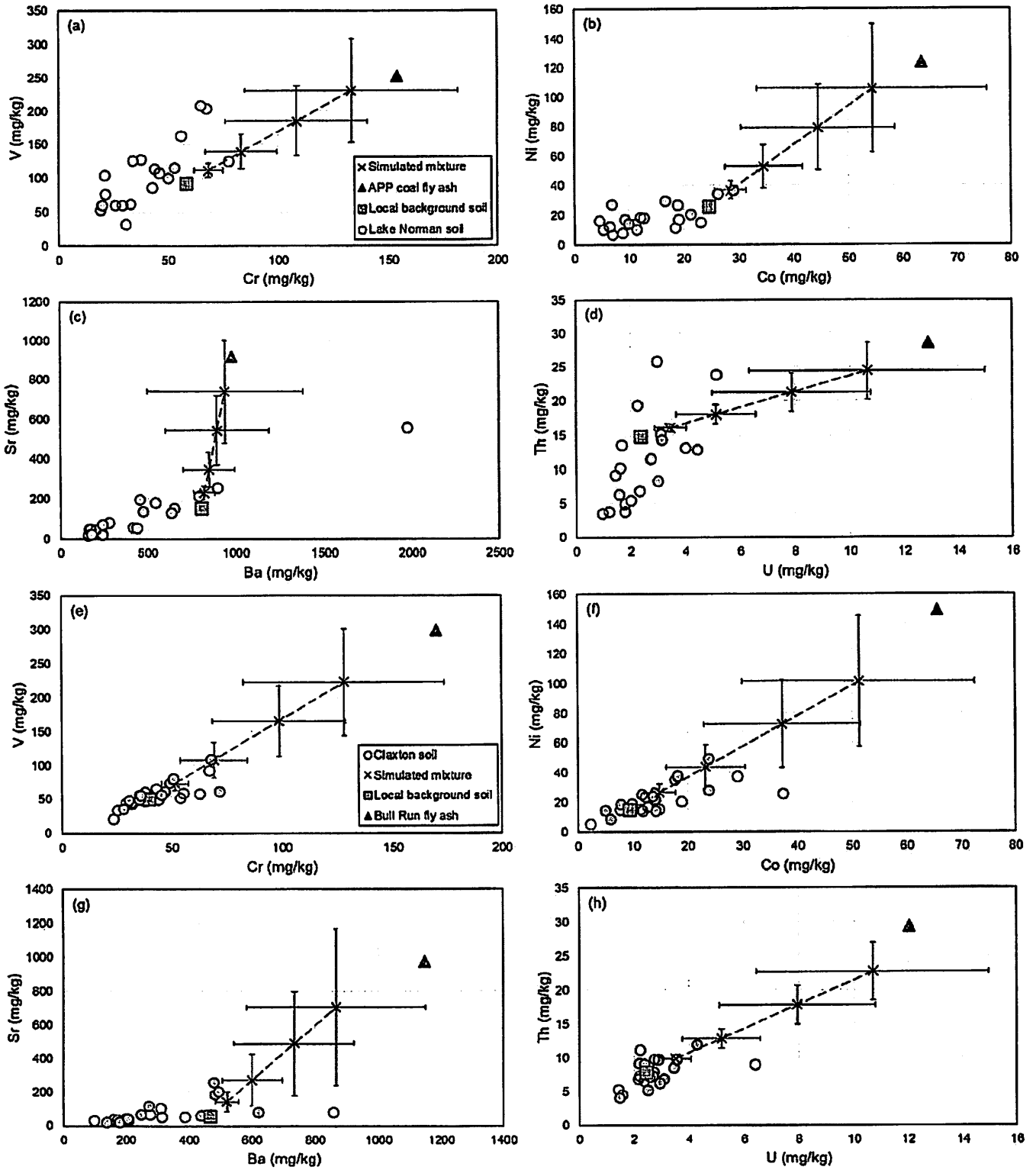

Figure 2. Biplots of trace metals for the surface soil samples collected from Lake Norman, NC and Claxton, Anderson County, TN. (a)–(d) depict the Lake Norman soil, where yellow circles represent the soil samples selected for optical point counting and physically identified to have fly ash presence under microscope, green square represents the background soil from the Lake Norman State Park, and black triangle represents the median value of APP fly ash. (e)–(h) depict the Claxton soil, where pink circles represent the soil samples selected for optical point counting and physically identified to have fly ash presence under microscope, green square represents the background soil from the Haw Ridge Park, and black triangle represents the fly ash sample from the Bull Run Steam Plant. Red mixing line is defined by Monte Carlo simulation between the APP fly ash and the respective local background soil, composed of four simulated mixtures with ash percent of 10, 25, 50, and 75%, respectively, with error bars denoting 95% confidence intervals.

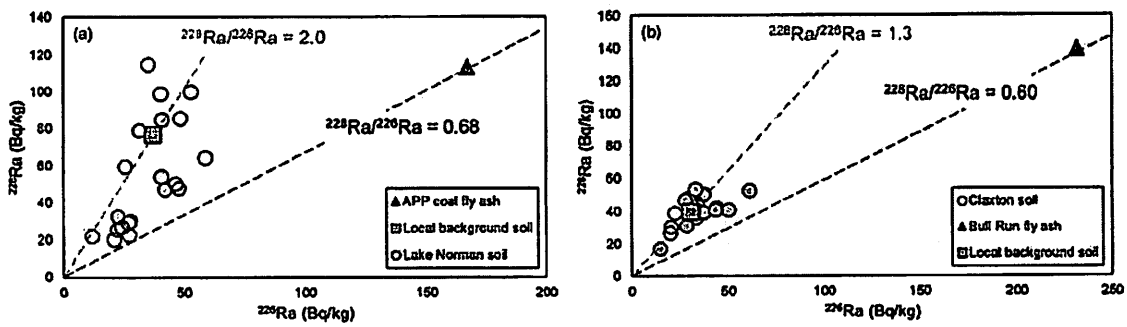

Figure 3. Diagram of ^{228}Ra vs ^{226}Ra for (a) Lake Norman, NC surface soil samples and (b) Claxton, TN surface soil samples. (a) Yellow circles represent the soil samples selected for point counting and physically identified with fly ash presence under microscope, green square represents the background soil from the Lake Norman State Park, and black triangle represents the median value of APP fly ash. The green dotted line marks the $^{228}Ra/^{226}Ra$ activity ratio of 2.0 for the local background soil of Lake Norman, and black dotted line marks the $^{228}Ra/^{226}Ra$ activity ratio of 0.68 for the median APP fly ash. (b) Pink circles represent the soil samples selected for point counting and physically identified as containing fly ash via microscopy, green square represents the background soil from the Haw Ridge Park, and black triangle represents the fly ash sample collected from the Bull Run Steam Plant. The green dotted line marks the $^{228}Ra/^{226}Ra$ activity ratio of 1.3 for the local background soil of Claxton, and black dotted line marks the $^{228}Ra/^{226}Ra$ activity ratio of 0.60 for the Bull Run fly ash sample. Error bars for the measured samples denote the average 2SD (2 × standard deviation) for ^{226}Ra (1.39 Bq/kg) and ^{228}Ra (2.76 Bq/kg), both of which do not extend past the symbol boundaries and thus are not shown.

concentration data. As with the experimental mixing, four scenarios with the weight percent of fly ash of 10, 25, 50, and 75% were applied to the mixing simulations. Under each mixing scenario, a total of 500 random mixtures were generated, and then the mean and standard deviations for each simulated mixture were calculated, which together define the simulated mixing lines as shown in Figures S5 and S6. Though the trace metal concentrations of APP coal fly ash are distinctively different from those of the NC and TN baseline soils, the results of the mixing simulation show that the simulated mixtures can span a wide range due to the large variations in the trace metal concentrations when the exact end members contributions of soil and fly ash are both unknown (Figures S5 and S6). In most cases, a low percentage of fly ash in the soil (i.e., <10%) does not yield appreciable differences relative to the majority of baseline soil, while increasing the fraction of fly ash leads to a more distinguishable soil–ash mixture from the baseline soil (Figures S5 and S6). This suggests that although trace metal concentrations have the potential to indicate fly ash presence in soils, they have limited sensitivity, particularly in detecting low levels of fly ash and in cases where the chemistry of the pristine soil end-member is not well defined.

However, when the pristine background soil composition is known, the performance of the hypothetical mixing using the trace metal concentrations can be significantly improved, as demonstrated by the two study sites. Since we have no information about the chemistry of fly ash generated specifically from the Marshall Steam Station in North Carolina, we used the median value of the APP fly ash (Table S2) as a reference for the fly ash end-member for the Lake Norman case because this plant has utilized primarily APP coals. For the Claxton case in Tennessee, we used data of actual fly ash collected directly from the Bull Run Steam Plant (Table S2). Mixing calculations were performed using the Monte Carlo method under the same scenarios as described above (i.e., 10, 25, 50, and 75% of fly ash addition) between the background soils and the APP and Bull Run fly ash. The selected trace metal concentrations in all of the soil samples are plotted in Figure 2. While the soil samples from Lake Norman did not follow the mixing lines derived from the mixing simulations and the theoretical mixing proportions were not consistent with actual counting data (Figure 2a–d), soil samples from Claxton showed a better agreement between the hypothetical mixing and the actual point-counted ash percent in the soils (Figure 2e–h). We conclude that the detection of fly ash using only the trace metal concentrations in soil samples with a low percentage of fly ash has limited sensitivity, whereas soil with higher fly ash percentages (i.e., >10%) showed higher correspondence between the theoretical mixing relationships and physical observation under microscope.

Evaluation of Radium Isotope Indicators for the Presence of Coal Fly Ash in Soils. Given the limitation of the trace element indicators, we also explored the applicability of using the abundance of Ra nuclides as a tracer of coal fly ash in soils. Radium is a naturally occurring radioactive material (NORM) that is derived from the decay chains of Th and U, where ^{228}Ra ($t_{1/2}$ = 5.7 years) is the decay product of ^{232}Th and ^{226}Ra ($t_{1/2}$ = 1601 years) is a progeny nuclide of the ^{238}U decay series. As with many other trace elements, Ra is also enriched in fine coal fly ash particles following coal combustion.[37] The average $^{228}Ra/^{226}Ra$ ratio and the total Ra activity of the APP fly ash are 0.67 and 283 Bq/kg, respectively, which reflects the Th/U activity ratio in the parent coals.[37] In contrast, the $^{228}Ra/^{226}Ra$ activity and the total Ra activity in average soil are 1.2 and 70 Bq/kg, respectively.[74] Consequently, the distinction in Ra abundance and the ratios between fly ash and common soil highlight the potential utility of Ra isotopes (i.e., $^{228}Ra/^{226}Ra$ activity ratio) as an indicator for the presence of fly ash in soils.

In the case of Lake Norman, the $^{228}Ra/^{226}Ra$ activity ratio of local background soil (2.0) is notably higher than that of APP coal fly ash. The $^{228}Ra/^{226}Ra$ activity ratios of the Lake Norman soil samples ranged from 0.8 to 3.2 (Figure 3a; Table S4). The soil samples selected for the optical point counting that were identified with fly ash presence clearly fall within the hypothetical mixing envelope between the background soil and APP fly ash, except for one sample, which had a $^{228}Ra/^{226}Ra$ ratio of 2.1, slightly higher than that of background soil. In the case of Claxton, the $^{228}Ra/^{226}Ra$ activity ratios for all of the soil samples ranged from 0.8 to 1.7 (Table S5), which is much narrower than those for the Lake Norman soil samples. The

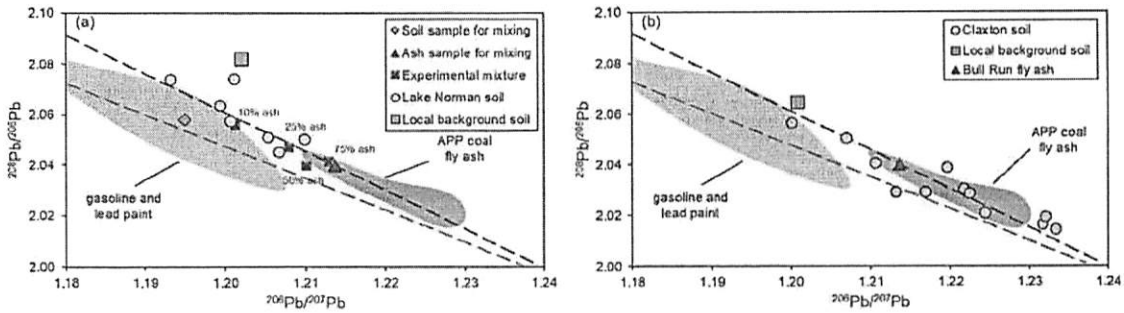

Figure 4. Diagrams of Pb isotope composition ($^{208}Pb/^{206}Pb$ vs $^{206}Pb/^{207}Pb$) of (a) selected Lake Norman, NC surface soil samples as well as soil–ash mixtures derived from the experimental mixing between an archived NC surface soil and an APP fly ash sample, and (b) selected Claxton, TN surface soil samples. Blue field represents the partial Pb isotope data compiled for leaded gasoline and lead-based paint in the U.S.[38] For context, gray field represents the Pb isotope data of the APP coal fly ash.[38] Blue dash line is the Pb regression line for gasoline and paint. Black dash line is the Pb regression line for the APP coal fly ash. Error bars that denote the analytical uncertainty 2SD (2 × standard deviation) for $^{208}Pb/^{206}Pb$ (0.0013) and $^{206}Pb/^{207}Pb$ (0.0003) do not extend past the symbol boundaries and thus are not shown.

$^{228}Ra/^{226}Ra$ activity ratio of the local background soil of Claxton is 1.3, which is lower than that of Lake Norman background soil, and yet still distinctly higher than that of coal fly ash from Bull Run Steam Plant ($^{228}Ra/^{226}Ra$ = 0.60; Figure 3b). Nine out of 12 samples that were identified as containing fly ash by optical point counting had $^{228}Ra/^{226}Ra$ ratios within the expected range between the background soil and fly ash, while the three samples with higher $^{228}Ra/^{226}Ra$ ratios had the lowest point-counted ash percent, 1.6, 1.9, and 3.2% (Table S5). One sample (i.e., CCS-15) had ^{228}Ra and ^{226}Ra activities close to that of the local background soil, which was consistent with the point counting results that did not indicate the presence of fly ash (Table S5). Overall, our data demonstrate the robustness of using Ra isotopes as an additional indicator for the presence of low levels of fly ash in soils, although the sensitivity of this tracer depends on the Ra activities and $^{228}Ra/^{226}Ra$ ratios of the background soil that could overlap with and mask the contribution of coal fly ash.

Evaluation of Lead Isotope Indicators for the Presence of Coal Fly Ash in Soils. In addition to trace elements and Ra isotopes, we further explored the applicability of Pb isotopes for detecting the occurrence of fly ash in soils. Lead naturally occurs in four stable isotopes, including one nonradiogenic isotope (i.e., ^{204}Pb), and three radiogenic isotopes: ^{208}Pb, a decay product of ^{232}Th, ^{206}Pb, a decay product of ^{238}U, and ^{207}Pb, a decay product of ^{235}U. Lead isotope ratios have been widely used for source tracing Pb contamination in the environment.[75] Typically, on a $^{208}Pb/^{206}Pb$ vs $^{206}Pb/^{207}Pb$ isotope diagram, the older Pb ore source appears to be in the upper left quadrant, while the younger Pb ore source is in the lower right quadrant.[38,76] The variations of $^{206}Pb/^{207}Pb$ ratios reflect the differences in the decay rates of the parent ^{238}U and ^{235}U nuclides and the differences in $^{208}Pb/^{206}Pb$ ratios generally reflect variations of the ratios of the parent isotopes ^{232}Th and ^{238}U.[76] The Pb isotope signature of the U.S. coal fly ash has been shown to be distinct from both natural soil and major anthropogenic Pb sources (i.e., leaded gasoline and lead-based paint), and thus it has been suggested for detecting the occurrence of coal ash in the environment.[38]

Figure 4a shows the Pb isotope compositions of the experimental mixtures composed of a NC surface soil sample and an APP fly ash sample. Evidently, the surface soil sample we used for the experiment has a Pb isotopic signature that reflects the leaded gasoline and lead-based paint isotope composition, which is distinctly different from that of the fly ash sample that is within the compositional field of APP fly ash (Figure 4a).[38] The four soil–ash mixtures, however, shift from the Pb regression line of gasoline and paint and display a clear two-end-member mixing array between the soil and fly ash samples (Table S3; Figure 4a). Despite some offsets from the mixing line, the experimental mixing results follow the expected mixing between the soil and fly ash samples and follow the Pb regression line of fly ash (Figure 4a). Therefore, we suggest that soil samples plotting along the Pb regression line of the APP fly ash likely indicate the possible presence of fly ash.

The Pb isotope ratios (i.e., $^{208}Pb/^{206}Pb$ and $^{206}Pb/^{207}Pb$) of the soil samples from Lake Norman and Claxton selected for point counting are presented in Tables S4 and S5 and plotted in Figure 4a,b, respectively. In the case of Lake Norman, the Pb isotope composition of the local background soil was clearly outside the compositional field and away from the regression line of the APP fly ash, consistent with the results that showed no presence of coal fly ash, as indicated by trace elements, Ra isotopes, and optical point-counting data (Figure 4a; Table S4). The Pb isotope compositions of the analyzed soil samples were different from that of the background soil and largely followed the APP fly ash regression line, except for one sample, which had the lowest counted ash percent of 0.9% (Figure 4a; Table S4). Similarly, the Pb isotope compositions of most of the analyzed soil samples from Claxton in TN that have shown evidence for fly ash presence were different from the Pb isotope composition of the local background soil, and most of these soil samples plotted along the regression line of the APP fly ash (Figure 4b; Table S5). While the analyzed soil samples from Lake Norman showed some offset from the compositional field of the APP fly ash (Figure 4a), most of the analyzed Claxton soil samples have Pb isotope compositions that overlap with the APP fly ash compositional field with notably higher $^{206}Pb/^{207}Pb$ and lower $^{208}Pb/^{206}Pb$ ratios (Figure 4b). In addition to the influence of coal fly ash, the systematically lower $^{208}Pb/^{206}Pb$ ratios observed in the Claxton soil samples are possibly due to a greater proportion of parent nuclide ^{238}U relative to ^{232}Th in the TN soils compared to NC soils, which is shown by the significantly higher U concentrations in the TN baseline soils (Table S2). Nonetheless, our data show that Pb isotopes can be a reliable indicator for the presence of coal fly ash in soils.

Integration and Implications. The results from this study show that the coal ash index (CAI), which features the enrichment of the As–Se–Mo–Sb–Tl assembly in fly ash, could provide a first-order evaluation of the possible presence of coal fly ash in soils, with the potential to estimate the ash percent. However, our data show that using the CAI as a sole indicator could result in an overestimation of the fly ash contribution, particularly when fly ash percentage in soils is low (e.g., <10%). Additionally, the ability to detect the presence of coal fly ash could be impeded by high concentrations of trace metals in the background soils and/or interference from trace metal contributions from other sources.[77,78] When the compositions of background soil and fly ash end members are unknown, the sensitivity of the trace-elements method is further decreased. We therefore posit that sole reliance on trace elements is not sufficient to detect the presence of trace levels of coal fly ash in soils. Instead, adding additional isotopic tracers such as Ra and Pb isotopes can serve as a more robust tool for detecting even trace levels of fly ash in soils. Consequently, to enhance the detectability of fly ash in soils, we suggest the integration all of these geochemical tools, which collectively can help to avoid potential detection bias and provide a better constraint on the results. The geochemical and isotopic methods provided in this study present another set of tools that can be used in concert with optical counting to detect the occurrence of coal fly ash and its associated contaminants in soils.

The presence of fly ash in soils implies two major potential pathways of human exposure: inhalation and ingestion. Due to the fine particles that are typically within the respirable range,[17] as well as the high abundances of toxic metals, fly ash poses concerning risks to human health, particularly for people working and living in communities near coal-fired power plants and coal ash disposal sites. For example, our data show that the Claxton soil samples with the highest counted ash percent (i.e., samples CCS-2, 3, 4; Table S5) were collected from a community park, which is commonly used for recreation by local residents. In spite of the relatively low concentrations of hazardous trace metals in the studied soil samples, which in most cases were below the guideline values recommended by the US EPA and other environmental agencies for hazardous trace metals in soils and dust (Figures S8 and S9), the detection of fly ash on surface soil in these communities could also indicate possible occurrence of fly ash in the nearby house dust.

Overall, in this study, we demonstrate the utility of using an integration of geochemical tools (i.e., trace elements, Ra and Pb isotopes) to detect trace levels of coal fly ash in surface soils collected from both recreational and residential areas near coal-fired power plants. Our data show evidence for the occurrence of fly ash particles, likely derived from fugitive emission from nearby coal power plants and deposition on the surrounding soils. Although we only observed relatively only low levels of heavy metals in the impacted soils, these soils could further become a source of human exposure to certain heavy metals tracked into house dust. This study focuses on developing reliable geochemical tools to identify low levels of coal fly ash in soils near coal plants, and yet future studies should investigate the time frame and mechanisms of fly ash deposition on surface soils. While fly ash emissions from coal-fired power plants in the U.S. were common before the installation of pollution control devices beginning 1970s,[79] the possibility of continued fugitive emission of fly ash particles from the Bull Run and Marshal Steam coal plants cannot be ruled out. It may be possible to determine the time frame of fly ash deposition on surface soils (i.e., legacy fly ash emissions vs recent fugitive emission) through analysis of the abundance of the ^{137}Cs radionuclide in coal fly ash-containing soils. ^{137}Cs was primarily derived from atmospheric nuclear weapons testing, which began in the early 1950s and peaked in 1963.[80] Coal fly ash co-occurring with elevated ^{137}Cs in soils from stable and undisturbed landscapes would indicate fly ash accumulation from the pre-1970s emission legacy, whereas relatively low ^{137}Cs would reflect more recent fly ash emission. Finally, while this study is focused on soils, the geochemical tools presented here can also be applied to detect the presence of coal ash solids in other environmental matrices, including house dust and aquatic sediments. Future research should expand this study and investigate the occurrence of fly ash in house dust in homes located near coal plants and the human health risks associated with chronic exposure to dust particles containing trace levels of fly ash.

■ ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available free of charge at https://pubs.acs.org/doi/10.1021/acs.est.1c01215.

Details of coal ash index (CAI) calculation; determination of percent ash by optical point counting; photomicrographs of fly ash particles identified in soils; maps of Lake Norman in North Carolina and Claxton in Tennessee showing sampling locations of surface soils surrounding the operating coal-fired power plants; distribution curves of trace elements in an archived surface soil from NC and an APP fly ash and their theoretical and experimental mixtures at mixing ratios of 10, 25, 50, and 75%; ash percent (%) vs coal ash index (CAI) plot of the mixing experiment using an archived NC surface soil sample and a fly ash sample derived from the Appalachian (APP) Basin coals; biplots of trace metal pairs for Monte Carlo simulated mixing between the APP fly ash and NC baseline soil (PDF)

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Notes

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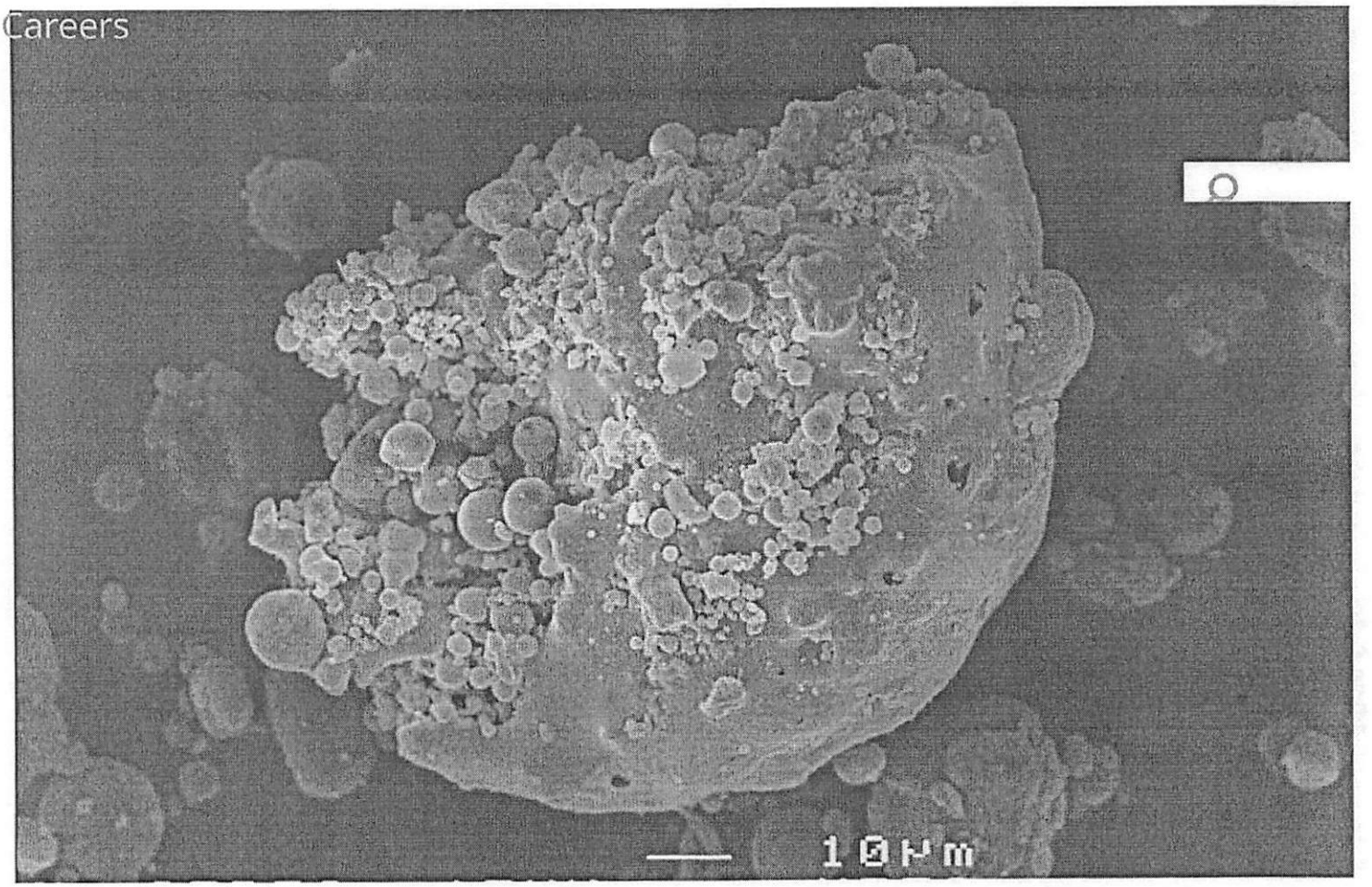

New Tests Can Detect Tiny but Toxic Particles of Coal Ash in Soil

Scientists at Duke University have developed a suite of four new tests that can be used to detect coal ash contamination in soil with unprecedented sensitivity.

July 22, 2021

DURHAM, N.C. – Scientists at Duke University have developed a suite of four new tests that can be used to detect coal ash contamination in soil with unprecedented sensitivity.

The tests are specifically designed to analyze soil for the presence of fly ash particles so small other tests

might miss them. d.

Fly ash is part of coal combustion residuals (CCRs) that are generated when a power plant burns pulverized coal. The tiny fly ash particles, which are often microscopic in size, contain high concentrations of arsenic, selenium and other toxic elements, many of which have been enriched through the combustion process.

While the majority of fly ash is captured by traps in the power plant and disposed to coal ash impoundments and landfills, some escapes and is emitted into the environment. Over time, these particles can accumulate in soil downwind from the plant, potentially posing risks to environment and human health.

"Because of the size of these particles, it's been challenging to detect them and measure how much fly ash has accumulated," said Avner Vengosh, Distinguished Professor of Environmental Quality at Duke's Nicholas School of the Environment. "Our new methods give us the ability to do that - with high level of certainty."

Coal combustion residuals are the largest industrial solid wastes produced in the United States. When soil contaminated with fly ash is disturbed or dug up, dust containing the ash can be transported through the air into nearby homes and other indoor environments. Inhaling dust that contains fly ash particles with high levels of toxic metals has been linked to lung and heart disease, cancer, nervous system disorders and other ill effects.

"Being able to trace the contamination back to its source location is essential for protecting public health and identifying where remediation efforts should be focused," said Zhen Wang, a doctoral student in Vengosh's lab at Duke, who led the study. "These new methods complement tests we've already developed for tracing coal ash in the environment and expand our range of investigation."

The new tests are designed to be used together to provide independent corroborations of whether fly ash particles are present in a soil sample and if so, at what proportion to the total soil.

"First, we measure the abundance of certain metals, such as arsenic, selenium and antimony, that we know are more enriched in coal ash than in normal soil," Wang said. "If these metals are present at higher-than-normal levels, we test the sample using two other geochemical indicators, radium nuclides and lead stable isotopes, which are more sensitive than trace metals and can be used to detect low occurrence of fly ash in soils. We also examine the soil under a microscope to test if we can physically identify fly ash particles and estimate what proportion of the soil they comprise."

Each method has its own strengths and weaknesses, and if used solely could lead to overestimates or underestimates the occurrence of fly in soil, Vengosh said. "By using all four together, we are able to verify the forensic investigation of fly ash presence in soils."

To assess the reliability of the new tests, the researchers analyzed surface soil from 21 sites downwind of the Tennessee Valley Authority's Bull Run Fossil Plant in Claxton, Tenn., and 20 sites downwind of Duke Energy's Marshall Steam Station on Lake Norman, N.C. The North Carolina samples came from Mooresville, a town located across the lake from the Marshall plant. Control samples were also collected at sites upwind of each plant.

The tests consistently showed that most of the samples collected downwind of both plants contained fly ash contamination, but because the proportion of the fly ash was low, the concentrations of toxic elements did not exceed human health guidelines for metals occurrence in soil.

The tests also showed that soil samples near Bull Run Fossil Plant in Tennessee generally contained significantly higher levels of fly ash than those from North Carolina, and that the highest concentration was in soil from the Claxton Community Park, a playground and recreational site located outside the Bull Run plant.

What does this all tell us?

"First, it confirms that our new tools perform consistently and, when used together, provide a reliable method for detecting contamination that other tests might miss," Vengosh said.

"Second, it underscores the need to regularly monitor sites in close downwind proximity to a coal-fired power plant, even if levels of contamination are below current safety thresholds. Fly ash accumulates over time, and risks can grow with repeat exposures to playground dust or home dust," Vengosh said.

"Low concentrations of toxic metals in soil does not equal to no risk," Vengosh said. "We need to understand how the presence of fly ash in soils near coal plants could affect the health of people who live there. Even if coal plants in the United States are shutting down or replaced by natural gas, the environmental legacy of coal ash in these areas will remain for decades to come."

The peer-reviewed study was published in July 20 in Environmental Science & Technology.

The study was co-authored by Ellen Cowan of Appalachian State University, and by Rachel Coyte, Heather Stapleton and Gary Dwyer, all of Duke. Support came from the National Science Foundation and from Mooresville, N.C., community funding, led by Susan Wind, a former resident.

CITATION: "Evaluation and Integration of Geochemical Indicators for Detecting Trace Levels of Coal Fly Ash in Soils," Zhewn Wang, Rachel M. Coyte, Ellen A. Cowan, Heather M. Stapleton, Gary S. Dwyer and Avner Vengosh; Environmental Science & Technology, 20 July, 2021. DOI: **10.1021/acs.est.1c01215** (https://pubmed.ncbi.nlm.nih.gov/34282893/)

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FEATURING: Avner Vengosh, Zhen Wang, Rachel Coyte, Heather Stapleton, Gary Dwyer

MEDIA CONTACT

Tim Lucas
(919) 613-8084
tdlucas@duke.edu

Note: Avner Vengosh is available for additional comment at **vengosh@duke.edu**.

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Fwd: Anderson County Concerns

Jay Yeager <jyeager@aclawdirector.com>
Fri 7/30/2021 8:40 AM
To: Terry Frank <tfrank@andersoncountytn.gov>

From: Jay Yeager <jyeager@aclawdirector.com>
Sent: Thursday, July 29, 2021 6:23 PM
To: Avner Vengosh, Ph.D.
Subject: Re: Anderson County Concerns

Thank you very much!

From: Avner Vengosh, Ph.D. <vengosh@duke.edu>
Sent: Thursday, July 29, 2021 5:28:35 PM
To: Jay Yeager <jyeager@aclawdirector.com>
Subject: Re: Anderson County Concerns

Mr. Yeager,

Thank you for your email. Unfortunately, I have no expertise capacity for addressing the important questions you have raised. I am an environmental scientists and our mission was to see if we can find fly ash in soils near Bull Run coal plant. Indeed, in our study, we were able to detect traces of fly ash in soils from different sites downwind from Bull Run plant. Yet the absolute concentrations of the toxic trace metals we found in the soil were below the threshold levels that define soil as hazardous. Therefore, there are no apparent violations of regulations with respect to contaminant level. Nonetheless, in our study and in press release we expressed concerns that finding traces of fly ash on soils could pose potential health risks upon long-term exposure through inhalation of the nano fly ash particles in the dust. In order to determine the actual risks one would need to consult with an epidemiologist who might be able to translate the findings of our study to actual risks and whether closure of the park is needed. As stated, my team and myself do not have this type of expertise and therefore would not be able to advise you on that matter. I would suggest that the next step in evaluation would require a much larger investigation that would included larger sampling sites and conducting sampling over time, combined with a parallel health study of the local population to establish a link, if exists, between the occurrence of fly ash on surface soils and health in your community.

Best regards,

Avner

Avner Vengosh, PhD
Duke University Distinguished Professor of Environmental Quality
Division of Earth and Climate Sciences
Levine Science Research Center, Box 90328, Room A207,
Duke University
Durham, NC 27708

Phones: office (919) 681-8050; Lab: (919) 681-0638; E-mail: vengosh@duke.edu
Duke web site: http://www.nicholas.duke.edu/people/faculty/vengosh.html
Group web site: http://sites.nicholas.duke.edu/avnervengosh/

Who we are: https://www.youtube.com/watch?v=WfpVAM82KuQ&trk=organization-update-content_share-video-embed_share-article_title

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Editor, *GeoHealth*

From: Jay Yeager <jyeager@aclawdirector.com>
Date: Thursday, July 29, 2021 at 12:37 PM
To: Avner Vengosh <vengosh@duke.edu>
Subject: Anderson County Concerns

Dr. Vengosh:
First of all, I want to thank you for your time and efforts in Anderson County. I'm sure you, like Anderson County, share the same concerns about community health in our county and especially since the release of your recent findings related to the Claxton Community. Anderson County Government considers the health of our citizens to be of paramount importance, and thus, we are certainly uneasy with some of the findings and language in your recent report. We are certainly not challenging the results or the methodology utilized in the analyses, but the conclusions and somewhat ambiguous language regarding the Claxton playground is of deep concern to Anderson County Government. For your knowledge, the "Kids Palace" playground was built by the county in partnership with TVA who provided the property under a thirty (30) year lease. In return, the county is obligated to maintain the facility; therefore, in no uncertain terms, we need to know if you and your peers believe this playground poses a health risk to our citizens that necessitate closing the facility. If so, we feel as though we must take immediate action by whatever means to protect the health, safety and welfare of our citizens that frequent this playground.

We ask that you please help us with a few difficult questions that we have and provide us with your honest belief on the steps and path forward Anderson County Government should take:

1. Does the findings of your study necessitate immediate closure of this park?
2. Should the adjacent Claxton Optimist ballfields be closed to public access?
3. Do you believe the playground at Claxton Elementary school is safe for students?
4. Is there any short-term remediation measures that the county should take to initiate clean-up of the fugitive dust or prevent additional exposure to the community?
5. Do you believe the findings of your study necessitate governmental health warnings for the Claxton Community concerning the air, ground water, or exposure of any type?

We deeply appreciate your assistance with this concerning matter and hope to hear back from you in the near future.

Sincerely,
Jay Yeager
Anderson County Law Director

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Coal Ash Basics

On this page

What is coal ash?

Coal ash, also referred to as coal combustion residuals or CCRs, is produced primarily from the burning of coal in coal-fired power plants. Coal ash includes a number of by-products produced from burning coal, including:

- **Fly Ash**, a very fine, powdery material composed mostly of silica made from the burning of finely ground coal in a boiler.
- **Bottom Ash**, a coarse, angular ash particle that is too large to be carried up into the smoke stacks so it forms in the bottom of the coal furnace.
- **Boiler Slag**, molten bottom ash from slag tap and cyclone type furnaces that turns into pellets that

Regulations

- EPA published regulations <https://epa.gov/coalash/coal-ash-rule> to address the risks from the disposal of the wastes generated by electric utilities and independent power producers.
- EPA finalized the first federal limits

have a smooth glassy appearance after it is cooled with water.

- **Flue Gas Desulfurization Material,** a material leftover from the process of reducing sulfur dioxide emissions from a coal-fired boiler that can be a wet sludge consisting of calcium sulfite or calcium sulfate or a dry powered material that is a mixture of sulfites and sulfates.

Other types of by-products are:

- fluidized bed combustion ash,
- cenospheres, and
- scrubber residues.

<https://epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule> on the levels of toxic metals in wastewater that can be discharged from power plants on November 3, 2015.

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What do power plants do with coal ash?

Coal ash is disposed of or used in different ways depending on:

- the type of by-product,
- the processes at the plant and
- the regulations the power plant has to follow.

Some power plants may dispose of it in surface impoundments or in landfills. Others may discharge it into a nearby waterway under the plant's water discharge permit <http://water.epa.gov/polwaste/npdes/>.

Coal ash may also be recycled into products like concrete or wallboard.

How much coal ash is there?

Coal ash is one of the largest types of industrial waste generated in the United States. According to the American Coal Ash Association's *Coal Combustion Product Production & Use Survey Report*, nearly 130 million tons of coal ash was generated in 2014.

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Why is coal ash reused?

Reusing coal ash can create many environmental, economic, and product benefits including:

- **Environmental benefits** such as reduced greenhouse gas emissions, reduced need for disposing in landfills, and reduced use of other materials.
- **Economic benefits** such as reduced costs associated with coal ash disposal, increased revenue from the sale of coal ash, and savings from using coal ash in place of other, more costly materials.
- **Product benefits** such as improved strength, durability, and workability of materials.

For more information, visit the coal ash reuse <https://epa.gov/coalash/coal-ash-reuse> Web page.

Why does EPA regulate coal ash?

Coal ash contains contaminants like mercury, cadmium and arsenic. Without proper management, these contaminants can pollute waterways, ground water, drinking water, and the air.

The need for federal action to help ensure protective coal ash disposal was highlighted by large spills near Kingston, TN and Eden, NC which caused widespread environmental and economic damage to nearby waterways and properties.

- Kingston, TN <https://epa.gov/tn/epa-response-kingston-tva-coal-ash-spill>
- Eden, NC

To address the risks from improper disposal and discharge of coal ash, EPA has established national rules for coal ash disposal and is strengthening existing controls on water discharges. For more information, visit the following Web pages.

- Regulations for the safe disposal of coal ash <https://epa.gov/coalash/coal-ash-rule>
- Water regulations on power plant discharges <https://epa.gov/node/246473>

Contact Us <https://epa.gov/coalash/forms/contact-us-about-coal-ash> to ask a question, provide feedback, or report a problem.

Who are epidemiologists?

When disease outbreaks or other threats emerge, epidemiologists are on the scene to investigate. Often called "Disease Detectives", epidemiologists search for the cause of disease, identify people who are at risk, determine how to control or stop the spread or prevent it from happening again. Physicians, veterinarians, scientists, and other health professionals often train to be "Disease Detectives".

What do epidemiologists do?

Like investigators at the scene of a crime, disease detectives begin by looking for clues. They systematically gather information, asking questions such as:

- Who is sick?
- What are their symptoms?
- When did they get sick?
- Where could they have been exposed?

Using statistical analysis, epidemiologists study answers to these questions to find out how a particular health problem was introduced.

Disease detectives identify new diseases that have never been seen before, such as Legionnaire's disease and SARS and the organisms that cause them.

Disease detectives use what they learn during the investigation and make recommendations to control the spread or prevent a future occurrence.

Learn more about CDC's disease detectives in the Epidemic Intelligence Service (EIS).

Page last reviewed: June 17, 2016
Content source: Deputy Director for Public Health Science and Surveillance, Center for Surveillance, Epidemiology, and Laboratory Services, Division of Scientific Education and Professional Development

What is Epidemiology?

Epidemiology is the method used to find the causes of health outcomes and diseases in populations. In epidemiology, the patient is the community and individuals are viewed collectively. By definition, epidemiology is the study (scientific, systematic, and data-driven) of the distribution (frequency, pattern) and determinants (causes, risk factors) of health-related states and events (not just diseases) in specified populations (neighborhood, school, city, state, country, global). It is also the application of this study to the control of health problems (Source: *Principles of Epidemiology, 3rd Edition*).

What public health problems or events are investigated?

Environmental exposures	• Lead and heavy metals • Air pollutants and other asthma triggers
Infectious diseases	• Foodborne illness • Influenza and pneumonia
Injuries	• Increased homicides in a community • National surge in domestic violence
Non-infectious diseases	• Localized or widespread rise in a particular type of cancer • Increase in a major birth defect
Natural disasters	• Hurricanes Katrina and Rita (2005) • Haiti earthquake (2010)
Terrorism	• World Trade Center (2001) • Anthrax release (2001)

Page last reviewed: June 17, 2016
Content source: Deputy Director for Public Health Science and Surveillance, Center for Surveillance, Epidemiology, and Laboratory Services, Division of Scientific Education and Professional Development

ANDERSON COUNTY JUVENILE COURT

BRIAN J. HUNT, JUDGE

101 S. Main St.
Suite 200
Clinton, TN 37716
Phone: (865) 457-6222
Fax: (865) 264-6249

August 3. 2021

Anderson County Commissioners

Dear Commissioners.

I am pleased to write a letter in support of the Isaiah House for Anderson County. This would be a great asset to our community and help alleviate the necessity of children sleeping in the DCS office waiting for foster care placement. There is an overwhelming number of children currently in our foster care system and no foster homes in which to place them. I fully support this project and am excited to see it get off the ground here in Anderson County.

Sincerely.

BJH

Brian J. Hunt
Juvenile Court Judge

Anderson County Schools
Every Student, Every Day

Annette Prewitt <aprewitt@acs.ac>

Operations agenda items requested

1 message

Commissioner Tracy Wandell <twandell@andersoncountytn.gov> Wed, Aug 4, 2021 at 9:06 AM
To: Tim Isbel <isbelt@ymail.com>, ACC - Annette Prewitt <APREWITT@acs.ac>

Chairman Isbel,

I respectfully request to add the following items to the Operations agenda for this month's meeting:

* Ben's Mobile Home / Pine Meadows - update
* East Wolfe Valley convenience center - update
* Racoon Valley west bound school safety lights - update
* Veterans Bridge flag placement - update
* Clinton Highway - safety concerns cars and equipment on shoulders and right of ways

Respectfully,
Tracy

Tracy L. Wandell
Anderson County Commissioner
District 1
twandell@andersoncountytn.gov
865-388-0921

Anderson County Government
Holiday Schedule
2022

▪ **News Years Day**	Friday	December 31, 2021
▪ **Martin Luther King, Jr. Day**	Monday	January 17, 2022
▪ **Presidents Day**	Monday	February 21
▪ **Good Friday**	Friday	April 15
▪ **Memorial Day**	Monday	May 30
▪ **Independence Day**	Monday Tuesday	July 4 July 5
▪ **Labor Day**	Monday	September 5
▪ **Veterans Day**	Friday	November 11
▪ **Thanksgiving**	Thursday Friday	November 24 November 25
▪ **Christmas**	Friday Monday	December 23 December 26