Letter Health Consultation

Little Blue Run Solid Waste Disposal Impoundment Site
(Former Bruce Mansfield Power Plant's Waste Site)
Greene Township, Beaver County, Pennsylvania

Evaluation of Metals in Air (2013–2018)

July 2020

Prepared by:

pennsylvania DEPARTMENT OF HEALTH

Bureau of Epidemiology, Division of Environmental Health Epidemiology
Room 933 | Health and Welfare Building 625 Forster Street | Harrisburg, PA 17120-0701

Health Consultation: A Note of Explanation

The Pennsylvania Department of Health (PADOH) prepared this Letter Health Consultation for the Little Blue Run Solid Waste Disposal Impoundment, located in Greene Township, Beaver County, Pennsylvania. This publication was made possible by grant number CDC-RFA-TS17-170103CONT19 from the Agency for Toxic Substances Disease Registry (ATSDR). PADOH evaluated the data of known quality using approved methods, policies, and procedures existing at the date of publication. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of ATSDR or the Department of Health and Human Services.

Contact Information

PADOH at 717-787-3350, Env.health.concern@pa.gov, or visit us at
https://www.health.pa.gov/topics/envirohealth/Pages/Assessment.aspx

To: Nick Lazor, Air Quality Monitoring Division Chief, Department of Environmental Protection, Rachel Carson State Office Building, 400, Market Street, Harrisburg, PA

From: Sasidevi Arunachalam, Epidemiology Program Specialist, Department of Health, Division of Environmental Health, 625 Forster Street, Room 933, Harrisburg, PA

Date: July 28, 2020

In March of 2019, the Pennsylvania Department of Environmental Protection (PADEP) requested the Pennsylvania Department of Health (PADOH) to evaluate the air monitoring data collected from 2013 to 2018, near the Little Blue Run (LBR) coal ash impoundment site located in Hookstown, Greene Township, Beaver County, Pennsylvania. The First Energy Corporation (FEC) owns the LBR and the LBR was constructed by the former Bruce Mansfield Power Plant (BMPP) to dump their coal ash wastes. The United States district court entered a consent decree between FEC and the PADEP for the cessation of BMPP operations and the development of a closure plan for the LBR site. The PADEP conducted air monitoring near the LBR. The FEC provides clean water to the residents affected by LBR site. The LBR is not accessible to the public. The PADOH evaluated the available air monitoring data for potential health effects through the inhalation pathway of exposure.

Based on PADOH's data evaluation, arsenic and chromium were detected in air near the LBR at levels of health concern. Chronic exposure to the detected levels of arsenic and chromium may cause low increased cancer risk. The detected lead level of 0.051 $\mu g/m^3$ was well below the Environmental Protection Agency's (EPA) National Ambient Air Quality Standards (NAAQS) level of 0.15 $\mu g/m^3$. However, no blood lead level (BLL) is considered "safe," and the community of Hookstown has a risk factor for lead since 57% of homes were built before 1978 when lead-based paints were commonly used on houses. Hence, long-term low-level lead exposure from LBR along with the above-mentioned risk factor indicates that the community of Hookstown could possibly have lead-related health effects. Therefore, PADOH recommends PADEP to consider taking actions to reduce off-site lead emissions from the site by evaluating existing permits; and consider conducting additional air monitoring near community exposure locations; and characterize surface soil that may be impacted by air deposition through off-site coal ash migration. The PADOH recommends residents, particularly children, and pregnant women take steps to reduce lead exposures from other sources such as lead-based paint (living in homes built before 1978), brass and lead-containing toys, plastic products, jewelry, decorating ornaments, candies imported from other countries or traditional home remedies, hobby and occupationally related exposures; obtain blood lead testing for children and expectant mothers; and talk to their health professional or call PADOH's Lead Information Line at 1-800-440-LEAD (5323) if they have concerns. The PADOH recommends FEC to continue to preventing unauthorized site access; complete the site closing, capping, and covering activities as planned to mitigate the risk of potential off-site coal ash air emissions; continue providing clean water supplies to the affected residents; and conduct post-closure monitoring and maintenance as long as the environmental problems remain at the site. The PADOH will follow-up on recommendations, provide health education; and continue to review and evaluate any additional data as requested.

The remainder of this Letter Health Consultation presents detailed information in support of PADOH's analysis and conclusions.

Background

There are more than 1,100 coal ash waste sites nationwide, and Pennsylvania ranks first in the country for coal ash generation [Sarah 2017]. There are 77 coal ash waste sites in Pennsylvania, mostly in the southwest regions. Coal ash waste commonly contains high levels of heavy metals such as arsenic, boron, cadmium, chromium, lead, mercury, selenium, and other toxic pollutants. Currently, coal ash waste sites in Pennsylvania are regulated as beneficial use wastes, meaning they are less regulated than other types of similarly dangerous industrial waste. Since coal ash waste is regulated as a beneficial use waste, coal ash can mix with the air and water near communities. It has been reported that people who live near coal ash sites have experienced illnesses such as cancer, heart damage, lung disease, respiratory distress, kidney disease, reproductive problems, gastrointestinal illness, birth defects, and impaired bone growth in children [PSR 2010]. Due to the risk of deleterious health issues associated with chronic coal ash waste exposure, the EPA has identified the LBR as a high-hazard surface impoundment [EPA 2016].

Site Background

The LBR is one of the largest (1,695 acres) unlined coal ash impoundment sites in the United States, constructed in the 1970s to receive residual coal ash wastes through underground pipes from the former BMPP in Shippingport, Pennsylvania. The LBR site (the site) is in both Greene Township, Beaver County, Pennsylvania, and Hancock County, West Virginia (Figure 1). The site is about 3 miles southwest of BMPP and less than a mile south of the Ohio River. Georgetown Road bounds the site to the east, Red Dog Road to the south, and Pyramus Road to the west. Based on the 2018 Census report, approximately 2,000 people live in Greene Township, mostly in Hookstown, (Figure 1). Figure 2 shows the Greene Township zoning map. Greene Township is mostly agricultural land, and the proposed residential areas are within a few feet southeast of the site.

Based on phone communication with PADEP [PADEP 2020a], only the central portion of the site is fenced and gated near the wet areas (Figure 3: Pictures C, D, E, and F). The dry southeast side of the site (Figure 3: Pictures A and B) is only partially fenced, and the FEC security is currently monitoring access to the site. The site was receiving approximately 2.5 million tons of coal ash annually from the BMPP until 2016. As per the PADEP's public hearing in November 2018, the FEC has announced plans to close, cap, and cover the site by 2029 [Stonesifer 2018].

Statement of Issues

The LBR site contaminated air and groundwater. In 2012, the United States district court entered a consent decree between the FEC and the PADEP for the cessation of BMPP operations and the development of a closure plan for the site [PADEP 2014]. In 2015, FEC initiated the site's coal ash closure activities on the West Virginia side, focusing on smaller site areas closer to the community locations, where the highest coal ash emission exposures were expected to occur. Approximately 115 acres of the site have been capped at the West Virginia side [PADEP 2016]. The closure and the capping process on the Pennsylvania side of the site were scheduled to begin by the end of 2019; however, as of March 24, 2020, the process in this area has not begun [PADEP 2020b]. Based on the consent decree order, the PADEP has been monitoring the air quality near the site from 2013 to 2018. As per the consent decree order, FEC is providing clean water supplies such as filtration units, reverse osmosis, and treatment systems to the affected Greene Township residents. This health consultation provides an evaluation of the air data collected by PADEP near the site for potential health risks to Greene Township residents.

Air Monitoring

The PADEP conducted air monitoring at a single location near the site (near the source location) and collected 24-hour air samples every 6th day from November 2013 through June 2018 for a total of 251 samples. The PADEP used the available meteorological data to place the monitoring station in an expected predominant downwind location, which is on the mid-east property line of the site (Figure 1). The PADEP's Bureau of Laboratories analyzed the air samples.

Exposure Pathways

An exposure pathway is a description of the way that an environmental release moves from its source (where it began), to where, and how people can come into contact with (or get exposed to) the environmental contaminant. To determine whether residents are likely to be exposed to contaminants on their property, the PADOH evaluated the environmental and human components that could lead to human exposure. An exposure pathway includes the following five elements [ATSDR, 2005a]:

1. A contaminant source (e.g., industrial facilities utilizing hazardous materials, landfills, waste sites);
2. An environmental medium (or media) and transport mechanisms (e.g., water, soil, or air);
3. A point of exposure (e.g., ambient air, private residential well water or a building into which vapors enter, indoor air);
4. A route of exposure (e.g., ingestion or inhalation or dermal); and
5. A receptor population.

Exposure pathways are categorized as completed, potential, or eliminated. A completed exposure pathway is one in which all five elements are present. In a potential exposure pathway, at least one of the pathway's elements is uncertain, indicating that exposure to a contaminant could have occurred in the past, occurring presently, or could occur in the future. A pathway is eliminated when one or more elements are missing and are unlikely to be present [ATSDR, 2005a].

The physical and chemical properties of the waste material and the site design dictate the environmental fate of contaminants present on the site. Of the three primary routes of exposure, dermal exposure to site contaminants is unlikely due to the lack of unauthorized access to the property. The ingestion pathway of exposure through the consumption of contaminated water or food has been eliminated for the receptor populations since they have been provided with clean water supplies. Data were not available for the evaluation of potential incidental ingestion by way of contaminated residential soil through off-site transport of contaminants or by inhaling then swallowing particles from coal ash/dust. The most likely route of exposure for the site is expected to occur by inhalation of aerosolized coal ash. The PADOH further evaluated the potential inhalation exposure pathway to determine whether site-specific exposures were at high concentrations, frequent, and for a long period of time, enough to result in adverse health effects. Also, along with the inhalation, the potential incidental ingestion through inhalation of smaller particles from coal ash/dust, transported off-site by the wind, will be minimized when the LBR site closure, capping, and covering activities have been complete.

Methods and Data Screening

After identifying the potential inhalation exposure pathway, the PADOH screened the detected metals in the air near the site against available health comparison values (CV), using standard procedures as outlined in the Agency for Toxic Substances Disease Registry's (ATSDR) Public Health Guidance Manual [ATSDR 2005a]. The ATSDR CVs, such as cancer risk evaluation guides (CREG) and minimal risk levels (MRL) were used. The CREGs and MRLs are conservative estimates, below which no health effects would be expected, including uncertainty factors that account for the most sensitive populations. When an ATSDR CV is not available, screening values from environmental and other health agencies such as the EPA's regional screening level (RSL), NAAQS, and Texas Commission on Environmental Quality (TCEQ) were used. The CVs derived from other health agencies and environmental agencies (non-ATSDR CVs) were not reviewed/approved by ATSDR. We used non-ATSDR CVs only if ATSDR CVs were not available. A contaminant concentration above a CV will not necessarily be harmful. For a contaminant that exceeded a CV, a site-specific exposure evaluation was conducted to determine if health effects are expected to occur. An exposure point concentration (EPC) was calculated to estimate a chronic (long-term) exposure concentration statistically. The most commonly used EPC is the 95% upper confidence limit of the arithmetic mean (95 UCL). Next, EPCs were compared to health-based CVs to identify contaminants of concern for further evaluation.

Air Monitoring Results

Arsenic, cadmium, chromium, lead, manganese, nickel, and zinc were detected (Table 1). Based on PADOH's screening analysis, none of the maximum levels of the metals detected exceeded acute or intermediate screening levels except arsenic. The detected maximum arsenic level of 0.0172 µg/m^3 was one one-thousandth higher than EPA's RSL of 0.016 µg/m^3– within the margin of error for a single detection in 2017 out of 251 samples collected. The best estimate for chronic exposure, the 95 UCL of arsenic (0.0011 µg/m^3), was below the EPA RSL. In addition, annual average levels (95 UCLs) of arsenic were in a decreasing trend from the year 2013 to 2018 (Table 4 and Figure 4). The yearly average trend for cadmium, manganese, nickel, and zinc was following a similar decreasing trend, except chromium, which peaked in 2017. The average lead levels appear to increase (0.0013 to 0.0028 µg/m^3) from the year 2013 to 2018, with a slight decrease in the year 2016 (Table 4 and Figure 4). Based on PADOH's chronic exposure screening process and ATSDR's Public Health Assessment Site Tool screening analysis, none of the 95 UCL exceeded their respective non-cancer screening levels (Table 1 and Table 3). However, the 95 UCL of arsenic and chromium exceeded their respective ATSDR CREG values for potential cancer health effects. The chromium detections were not speciated to determine whether they were composed of trivalent chromium or hexavalent chromium (the more toxic form). Hence, the PADOH assumed hexavalent chromium to be ten percent of the total chromium detected (ten percent of 0.0054 µg/m^3 = 0.0005 µg/m^3) near the coal ash combustion sites [Stam *et al.* 2011]. Since ATSDR or other agencies have not developed a health-based guideline to evaluate exposure to lead, the PADOH evaluated lead by using the EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model to screen the lead results in air detected near the site. The PADOH also reviewed the Centers for Disease Control and Prevention's (CDC) 2012 to 2017 blood lead surveillance data (obtained from the Pennsylvania National Electronic Disease Surveillance System) for Beaver County and reviewed Hookstown City Data (Census.gov) for the potential lead exposure risk factor. Table 1, below, summarizes the metals detected, their range, EPC (95 UCL), respective health screening levels, and their typical range found in ambient air in the United States.

Table 1: Summary of metals detected near the Little Blue Run monitoring site, their respective health-based comparison values, screening levels and typical ambient levels in the U.S. (2013–2018)

Metals in air	**Range µg/m^3**	**95 UCL µg/m^3 (n=251)**	**CV µg/m^3**	**CV Source**	**Typical Ambient Air in the U.S. µg/m^3** (Source)
Arsenic	ND-0.0172	0.0011	0.00023 0.016	CREG EPA RSL	<0.001-0.03 (ATSDR 2007)
Cadmium	ND-0.0273	0.0003	0.00056 0.01 0.03	CREG ATSDR cMRL ATSDR aMRL	0.0001-0.005-Rural 0.002-0.015-Urban (ATSDR 2012a)
Chromium	ND-0.0350	0.0005*	0.00005 0.30	CREG ATSDR iMRL	<0.01-0.03 (ATSDR 2012b)
Lead	ND-0.0510	0.0024	0.15	NAAQS	0.050 (ATSDR 2019)
Manganese	ND-0.1856	0.0275	0.3	ATSDR cMRL	0.02 (ATSDR 2012c)
Nickel	ND-0.0197	0.0004	0.09	ATSDR cMRL	0.007-0.012 (ATSDR 2005b)
Zinc	ND-0.4019	0.0284	2	TCEQ	<1.00 (ATSDR 2005c)

Metals for further evaluation are highlighted in bold; *=Estimated hexavalent chromium; ND=non-detect; CV=health-based comparison value; CREG=cancer risk evaluation guide; ATSDR c/a/iMRL=Agency for Toxic Substances Disease Registry (ATSDR) chronic/acute/intermediate minimum risk level; EPA RSL=Environmental Protection Agency Regional Screening Level; NAAQS=National Ambient Air Quality Standards; 95 UCL=95% upper confidence limit of arithmetic mean; µg/m^3=micrograms per cubic meter; TCEQ=Texas Commission on Environmental Quality

Public Health Implications

In reviewing the site's air sampling data, lead and the EPC that exceeded a CV were further evaluated using other standards and or scientific studies to determine whether adverse health effects were likely to occur. The chronic EPC of cadmium, manganese, nickel, and zinc were detected below the health-CVs, hence not selected for further analysis.

Metals Selected for Further Analysis

Arsenic, chromium, and lead were selected for further analysis. The 95 UCL of arsenic (0.0011 µg/m^3) and the estimated hexavalent chromium (0.0005 µg/m^3) concentrations exceeded the ATSDR's CREG CV of 0.00023 µg/m^3 and 0.00005 µg/m^3, respectively (Table 2). The estimated lifetime cancer risk was calculated using the 95 UCL concentration of each metal in the air multiplied by the EPA's Inhalation Unit Risk (IUR), based on 78-year lifetime exposure.

Table 2: Lifetime cancer risk estimates of arsenic and chromium detected near Little Blue Run monitoring site, Beaver County, Pennsylvania, (2013–2018)

Metals in air	CV µg/m^3	CV source	95 UCL µg/m^3	IUR (µg/m^3)$^{-1}$	ELCR= 95 UCL x IUR
Arsenic	0.00023	CREG	0.0011	4.3E-03	4.7E-06
Hexavalent Chromium	0.00005	CREG	0.0005 (est.)	1.2E-02	6.0E-06

CV=comparison value; CREG=cancer risk evaluation guide; IUR=inhalation unit risk; 95 UCL= 95% upper confidence limit arithmetic mean; ELCR=Estimated Lifetime Cancer Risk; µg/m^3 = micro grams per cubic meter

Arsenic

Arsenic is a metalloid that occurs naturally in soil and may enter the air, water, and land from wind-blown dust. Industrial activities such as mining, smelting, and coal-fired power plants may also release arsenic into the environment. Typical background air levels of arsenic range from less than 0.001 µg/m^3 to 0.03 µg/m^3, depending on location, weather conditions, and the level of industrial activity in the area. Inhalation of arsenic from ambient air is usually a minor exposure route for the general population [ATSDR 2007]. Arsenic found in the environment combines with elements such as oxygen, chlorine, and sulfur to form inorganic arsenic. Inhalation of inorganic arsenic can increase the risk of lung, liver, bladder, kidney, and prostate cancers. The Department of Health and Human Services (DHHS) and EPA have determined inorganic arsenic as a human carcinogen. The International Agency for Research on Cancer (IARC) has also determined that inhalation of inorganic arsenic is carcinogenic to humans [ATSDR 2007].

The chronic exposure of arsenic level (95 UCL) detected near the site was below the EPA non-cancer RSL; hence adverse non-cancer health effects were not expected to occur.

The estimated lifetime cancer risk was calculated using the 95 UCL concentration (0.0011 µg/m^3) of arsenic in the air multiplied by the EPA IUR for arsenic at 0.00043 (µg/m^3)$^{-1}$. The estimated lifetime cancer risk for arsenic was about 5 in 1,000,000. The estimated lifetime cancer risk was low and falls within EPA's acceptable cancer risk range of 1 in 1,000,000 to 1 in 10,000.

Chromium

Chromium is a naturally occurring metal found in rocks, animals, plants, soil, volcanic dust, and gases. Chromium is present in the environment in several forms. The most common forms are trivalent chromium and hexavalent chromium. Trivalent chromium occurs naturally in the environment and is an essential nutrient, whereas hexavalent chromium is toxic, and it is produced by industrial processes such as steelmaking, chrome plating, making dyes and pigments, leather tanning and wood preserving. In the United States, approximately 2,700–2,900 tons of chromium are emitted to the atmosphere annually from anthropogenic sources, and approximately one-third is in the hexavalent form [ATSDR 2012b]. Typical background air levels of chromium range from less than 0.01 $\mu g/m^3$ to 0.03 $\mu g/m^3$, depending on location, weather conditions, and the level of industrial activity in the area [ATSDR 2012b]. Inhalation of hexavalent chromium can cause lung cancer and irritation of the skin and mucous membranes. The DHHS and EPA have designated hexavalent chromium as a known human carcinogen. The IARC has also established that hexavalent chromium is carcinogenic to humans [ATSDR 2012b].

The chronic exposure of chromium level (95 UCL) detected near the site was below the ATSDR chronic intermediate MRL; hence adverse non-cancer health effects were not expected to occur.

The estimated lifetime cancer risk was calculated using the 95 UCL concentration (0.0005 $\mu g/m^3$) of estimated hexavalent chromium in the air multiplied by the EPA IUR for chromium at 0.012 $(\mu g/m^3)^{-1}$. The estimated lifetime cancer risk for chromium was 6 in 1,000,000. The estimated lifetime cancer risk was low and falls within EPA's acceptable cancer risk range of 1 in 1,000,000 to 1 in 10,000.

Lead

Lead is a naturally occurring element in the earth's crust and can be found throughout our environment in the air, water, and soil. This element can also be present in the environment as pollution, particularly in urban areas, from sources related to human activity such as traffic emissions, industrial emissions, weathering of buildings, and pavement surfaces. Background levels of lead can vary greatly depending on the surrounding landscape. The typical background level of lead in the ambient air in the United States is 0.05 $\mu g/m^3$ [ATSDR 2019]. Any exposure to lead is unsafe and should be avoided. Lead is a potent neurotoxicant and can harm developing nervous systems. The developing nervous system in children is the most sensitive health endpoints associated with lead exposure. Pregnant women can transfer lead to her unborn baby and may have a higher risk of miscarriage. The unborn baby may have a higher risk for premature birth, low birth weight, learning and behavior problems, and damage to their developing brains. Due to the neurotoxic characteristics of lead exposure, even low levels of lead exposure have been shown to negatively impact intelligence quotient, the ability to focus, and academic achievement since the nervous system is the main target for lead toxicity in adults and children [Lanphear et al. 2005].

The detected lead level of 0.051 $\mu g/m^3$ was below the EPA's NAAQS level of 0.15 $\mu g/m^3$. However, no blood lead level (BLL) is considered "safe." Hence, PADOH evaluated lead in the air using EPA's IEUBK model. Based on IEUBK model, the average (geometric) BLL in children younger than six years who regularly breathe air at 0.15 µg/m^3 could have a BLL of 3 µg/dL and children 1-2 years could have a BLL of 3.5 µg/dL. The detected maximum lead level 0.05 µg/m^3 is much lower than 0.15 µg/m^3, hence we do not expect that breathing air with a lead level of 0.05 µg/m^3 near the site would affect BLLs. However, when PADOH reviewed the CDC's blood lead surveillance data (2012 to 2017), we found a higher percentage (8.3%) of children in Beaver County, Pennsylvania with BLL above the CDC's reference level of 5 µg/dL when compared with the state of Pennsylvania (5.5%) [NCEH 2019]. Additionally, PADOH reviewed City Data (Census.gov), which shows the community of Hookstown, Pennsylvania, has a risk factor for increased BLLs since 57% of homes were built before 1978 when lead-based paint was commonly used on houses.

Site Closure Plans

As mentioned earlier, under the statement of issues, FEC initiated the site closure plan in 2015, focusing on site areas closer to the community locations where the highest exposure emissions were expected to occur. At present, approximately 115 acres of the southwestern portion of the West Virginia side has been closed and capped using geomembrane and geotextile materials. The closed and capped areas were then covered with 1-foot cover soil for the permanent cover for grass seeded vegetation to minimize erosion and eliminate potential air emissions. The closure process for the site on the Pennsylvania side of the state boundary was scheduled to begin by the end of 2019; however, as of March 24, 2020, the process in this area has not begun [PADEP 2020b]. The closure plan depends on various factors such as general construction timelines as well as weather conditions (longer drying periods are required following rain events before construction could resume). The southeast portion of the site (Figure 3), which is closer to Greene Township residential locations, shows dry grassland (Pictures A and B). However, the north-central portion of the site is currently in coal ash and water "slurry" state. (Pictures C, D, E, and F). If the portions of the site, which are currently wet, desiccate, there is a risk of aerosolization of contaminated ash that can travel from the site to communities downwind.

Limitations

Along with the site air monitoring location, community air monitoring could have provided a more definitive assessment of human exposures and possible health effects. Potential past exposure from inhalation of ambient air near the site before 2013 when the site was actively receiving coal ash cannot be determined since the data is not available. The data presented in this evaluation is representative of contaminant concentrations at the time they were collected. Also, PADOH notes that the scientific understanding of the health effects of exposures to pollutant mixtures is less advanced. Scientists do not have a complete understanding of how simultaneous exposures to environmental contaminants may cause health effects.

Conclusions

Based on PADOH's data evaluation, arsenic and chromium were detected in air near the LBR at levels of health concern. Chronic exposure to the detected levels of arsenic and chromium may cause low increased cancer risk. The detected lead level of 0.051 µg/m^3 was well below the EPA' NAAQS level of 0.15 µg/m^3. However, no BLL is considered "safe," and the community of Hookstown has a risk factor for lead since 57% of homes were built before 1978 when lead-based paints were commonly used on houses. Hence, long-term low-level lead exposure from LBR along with the above-mentioned risk factor indicates that the community of Hookstown could possibly have lead-related health effects. This conclusion is based on assumptions that the detected concentrations remain the same throughout the lifetime of the exposure. This assumption is not a prediction of future pollutant levels.

Recommendations

The PADOH recommends that the PADEP take the following actions:

- Consider actions to reduce off-site lead emissions from the site by evaluating existing permits.

- Consider conducting additional air monitoring near community exposure locations; and characterize surface soil that may be impacted by air deposition through off-site coal ash migration.

The PADOH recommends that Greene Township residents take the following actions:

- Talk to physicians or PADOH if they are concerned about their health due to past exposures.

- Take steps to reduce the lead exposures in children and pregnant women (since lead can pass from a mother to her unborn baby); including avoiding sources that contain lead such as lead-based paint; brass; lead-containing toys, candies, or tableware; traditional folk medicines; contaminated soil/dust; and lead from hobbies or jobs (e.g., stained glass, firearm ammunition, fishing weights, welding, and home renovation).

- Obtain blood lead testing for children and pregnant mothers.

- Talk to their health professional or call PADOH's Lead Information Line at 1-800-440-LEAD (5323) if they have concerns about exposure to lead or want additional information about steps they can take to reduce lead exposures.

The PADOH recommends that the FEC take the following actions:

- Continue to prevent unauthorized site access.
- Complete the site closing, capping, and covering activities as planned to mitigate the risk of potential off-site coal ash air emissions.
- Continue monitoring the surface water and groundwater and take corrective action if any seepage is detected since the site is very close to the Ohio River, a drinking water source for many people.
- Continue providing clean water supplies to the affected Greene Township residents.
- Conduct post-closure monitoring and maintenance as long as the environmental problems remain at the site.

The PADOH will take the following actions:

- Continue their efforts to provide health education in communities known to have high lead exposures because any exposure to lead is unsafe and should be reduced or eliminated.
- Continue to review and evaluate any additional data provided for this site upon request.
- Follow-up on recommendations made to PADEP, FEC, and Greene Township residents.

References

Agency for Toxic Substances and Disease Registry [ATSDR]. 2005a. ATSDR Public Health Assessment Guidance Manual. Atlanta, GA: United States Department of Health and Human Services. https://www.atsdr.cdc.gov/hac/phamanual/toc.html

Agency for Toxic Substances and Disease Registry [ATSDR]. 2005b. Toxicological Profile for Nickel. https://www.atsdr.cdc.gov/toxprofiles/tp15.pdf

Agency for Toxic Substances and Disease Registry [ATSDR]. 2005c. Toxicological Profile for Zinc. https://www.atsdr.cdc.gov/toxprofiles/tp60.pdf

Agency for Toxic Substances and Disease Registry [ATSDR]. 2007. Toxicological Profile for Arsenic. https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf

Agency for Toxic Substances and Disease Registry [ATSDR]. 2012a. Toxicological Profile for Cadmium. https://www.atsdr.cdc.gov/toxprofiles/tp5.pdf

Agency for Toxic Substances and Disease Registry [ATSDR]. 2012b. Toxicological Profile for Chromium. https://www.atsdr.cdc.gov/toxprofiles/tp7.pdf

Agency for Toxic Substances and Disease Registry [ATSDR]. 2012c. Toxicological Profile for Manganese. https://www.atsdr.cdc.gov/toxprofiles/tp151.pdf

Agency for Toxic Substances and Disease Registry [ATSDR]. 2019. Toxicological Profile for Lead. https://www.atsdr.cdc.gov/toxfaqs/tfacts13.pdf

Environmental Protection Agency [EPA]. 2012. Arsenic Compounds. https://www.epa.gov/sites/production/files/2016-09/documents/arsenic-compounds.pdf

Environmental Protection Agency [EPA]. 2016. Coal Combustion Residuals - Surface Impoundments with High Hazard Potential Ratings. https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/html/indexi-2.html

National Center for Environmental Health [NCEH]. 2019. CDC's State Surveillance Data. https://www.cdc.gov/nceh/lead/data/state.htm

Pennsylvania Department of Environmental Protection [PADEP]. 2014. Joint Status Report of Progress Under Consent Decree. http://files.dep.state.pa.us/RegionalResources/SWRO/SWROPortalFiles/FirstEnergyConsentDecreeStatusReport.pdf

Pennsylvania Department of Environmental Protection [PADEP]. 2016. Closure and post-closure plan, Little Blue Run, Beaver County, Pennsylvania. Prepared for First Energy Corporation by Civil and Environmental Consultant Inc.

Pennsylvania Department of Environmental Protection [PADEP]. 2020a. Phone communication from Matthew D. Barch, P.G./Licensed Professional Geologist to Sasidevi Arunachalam/PADOH, on April 23, 2020.

Pennsylvania Department of Environmental Protection [PADEP]. 2020b. Email communication from Joseph, Thomas/Environmental Engineer Manager to Sasidevi Arunachalam/PADOH, on March 24, 2020

Physicians for Social Responsibility [PSR]. 2010. Coal Ash: Hazardous to Human Health. https://www.psr.org/wp-content/uploads/2018/05/coal-ash-hazardous-to-human-health.pdf

Arthur F. Stam, Ruud M., Henk W., Ronald J. E., Frank E. H., and Gerrit B., 2011. Chromium Speciation in Coal and Biomass Co-Combustion Products. Environ. Sci. Technol. 2011, 45, 6, 2450-2456.

Lanphear, BP et al., 2005. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. Environ. Health Perspect. 113(7): 894-899.

Sarah, R., 2017. Despite glut of coal ash, the United States is importing it from other countries https://www.mcall.com/business/mc-despite-glut-of-coal-ash-u-s-is-importing-it-from-other-countries-20170323-story.html

Stonesifer, J., 2018. PADEP considering updated permit for Little Blue Run, Bruce Mansfield plant. *The Beaver County Times.* https://www.timesonline.com/news/20181128/dep-considering-updated-permit-for-little-blue-run-bruce-mansfield-plant

Appendix

Figure 1: Map showing Little Blue Run site, monitoring location and potential community exposure location

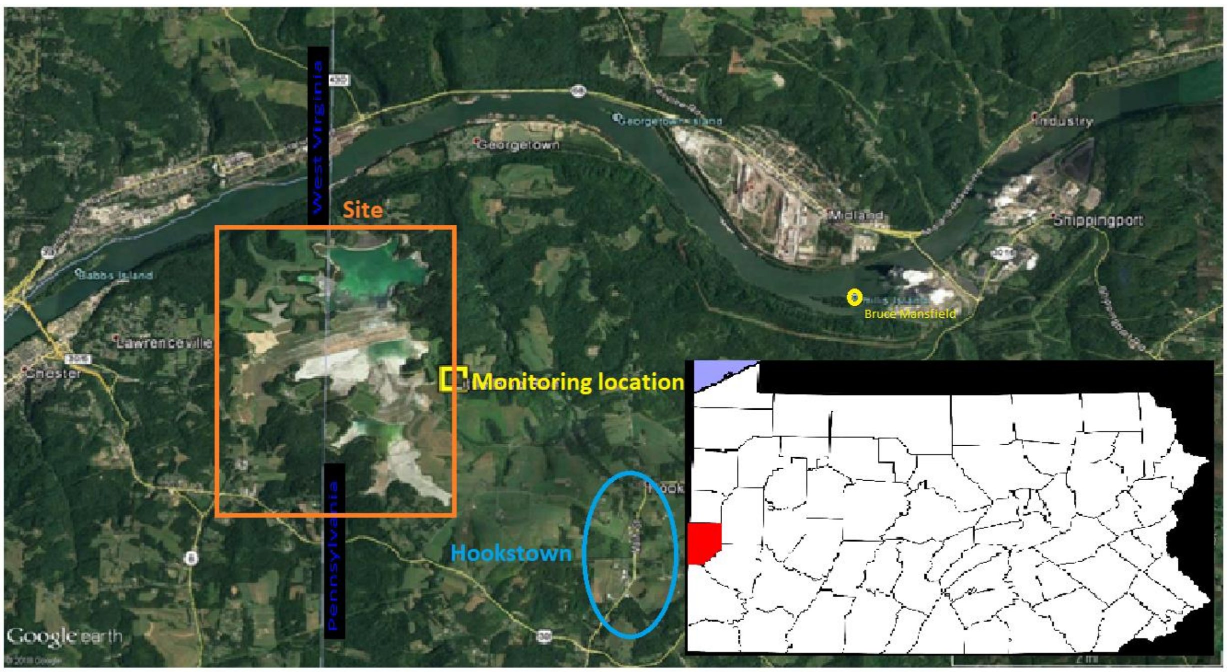


Figure 2: The Greene Township Zoning Map

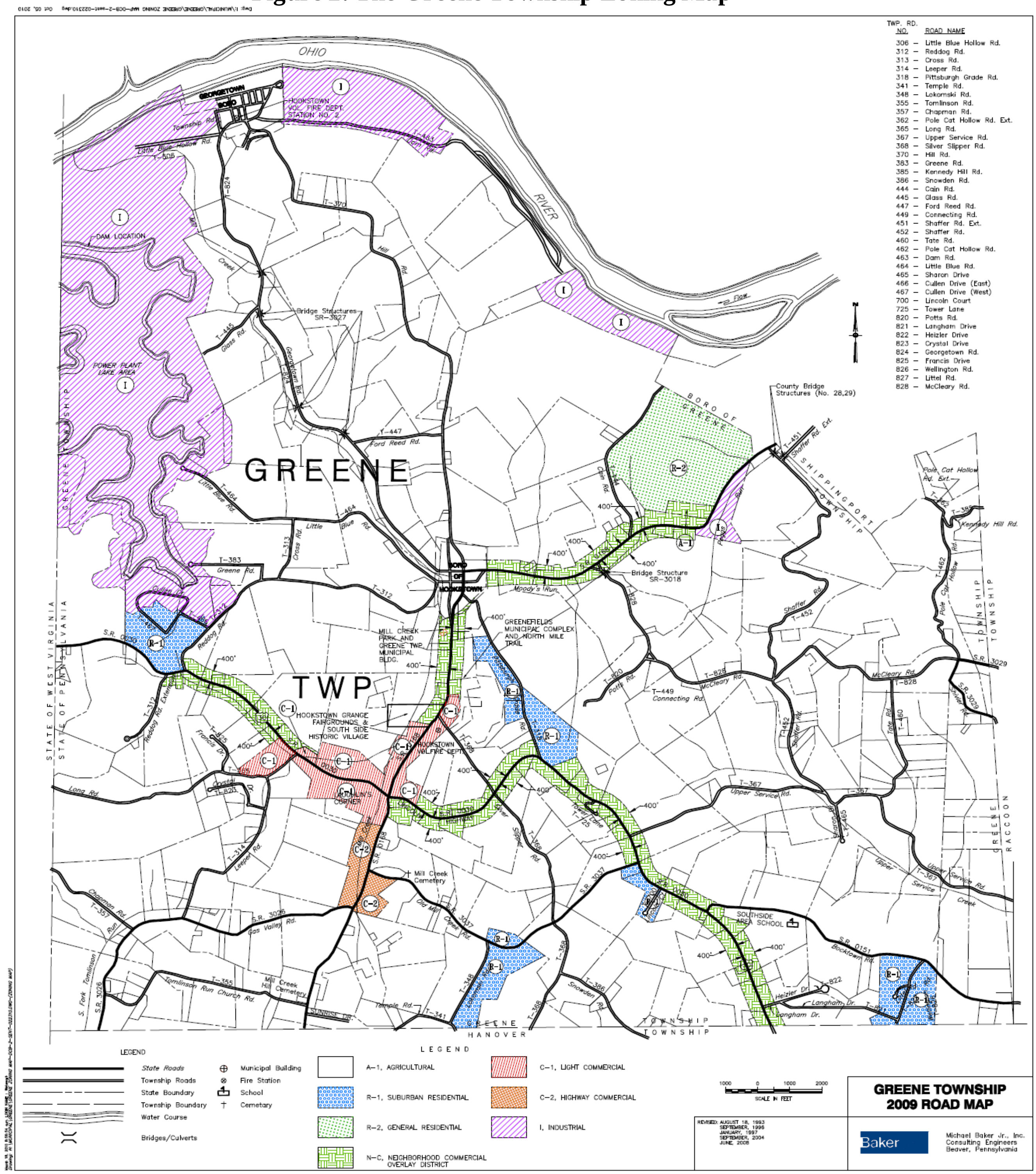
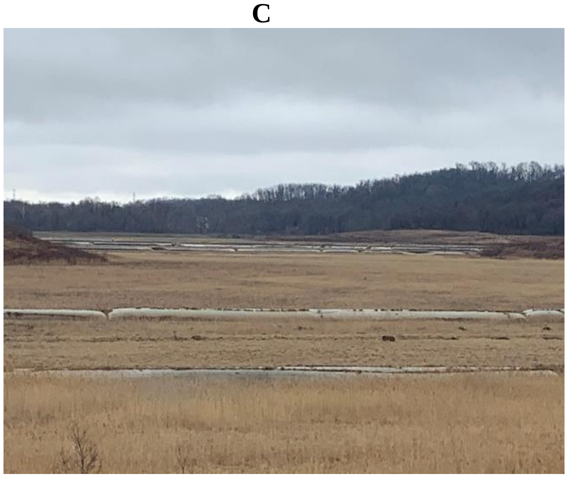


Figure 3. Photos of Little Blue Run Site

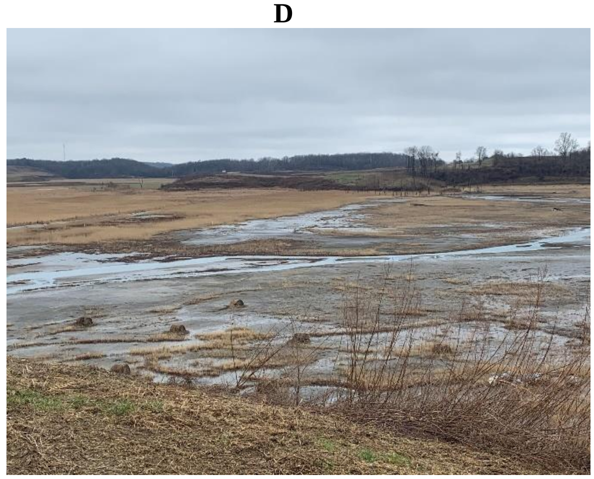
A

B

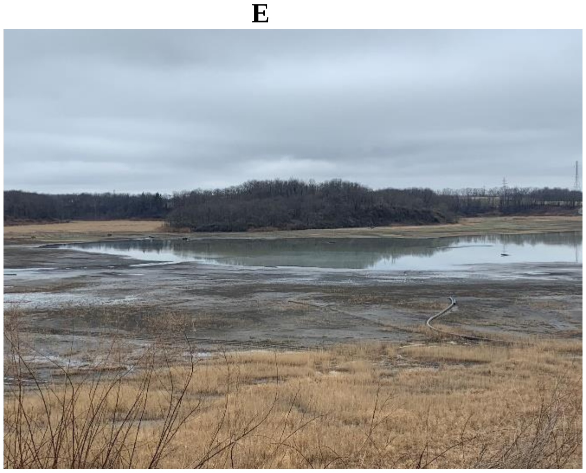
C



D



E



F

All photos were taken near the road on the East side of Little Blue Run beginning near the gate at the South end and heading North towards the dam (A to F) on March 19, 2020

Table 3: ATSDR's Public Health Assessment Screening Tool Results

Contaminant Name	Concentration	Unit	Above or Equal to Recommended ATSDR CV?	Above or Equal to Other CV?	CREG	Chronic EMEG	Int EMEG	RMEG	Acute EMEG
CHROMIUM, HEXAVALENT	0.0005	µg/m³	Yes [1]	No	5.2E-05 [1]	0.0050	0.0050	0.0080	NA
ARSENIC	0.0011	µg/m³	Yes [1]	NA	0.00023 [1]	NA	NA	NA	NA
CADMIUM	0.0003	µg/m³	No	No	0.00056 [#]	0.010	NA	NA	0.030
MANGANESE	0.0275	µg/m³	No	No	NA	0.30	NA	0.050 [#]	NA
LEAD	0.0024	µg/m³	NA	NA	NA	NA	NA	NA	NA
NICKEL	0.0004	µg/m³	No	No	NA	0.090 [#]	0.20	NA	NA
ZINC	0.0284	µg/m³	NA	NA	NA	NA	NA	NA	NA

[#] ***Recommended ATSDR CV.***

[1] ***Recommended ATSDR CV met or exceeded.***

Table 4: Summary of Annual (2013-2018) Average Concentration of Metals Detected near Little Blue Run Site (µg/m³)

Year	Arsenic	Cadmium	Chromium	Lead	Manganese	Nickel	Zinc
2013	0.0016	0.0001	0.0043	0.0013	0.0355	0.0014	0.0271
2014	0.0012	0.0003	0.0014	0.0016	0.0255	0.0008	0.0234
2015	0.0011	0.0002	0.002	0.0016	0.0312	0	0.0243
2016	0.0009	0.0001	0.001	0.0011	0.0175	0	0.0154
2017	0.0008	0.0001	0.0205	0.0019	0.0208	0.0003	0.0138
2018	0.0007	0	0.0028	0.0028	0.0175	0.0003	0.0124

Figure 4: Yearly Average Metals Concentration Trend from the Year 2013-2018