Letter Health Consultation

ARKANSAS MUNICIPAL WASTE-TO-ENERGY SITE

(a/k/a OSCEOLA INCINERATOR SITE)

OSCEOLA, MISSISSIPPI COUNTY, ARKANSAS

Prepared by
Arkansas Department of Health

JANUARY 22, 2013

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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LETTER HEALTH CONSULTATION

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Arkansas Department of Health

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Governor Mike Beebe
Paul K. Halverson, DrPH, FACHE, Director and State Health Officer

November 16, 2012

Althea Foster
On-Scene Coordinator
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue
Dallas, TX 75202

Dear Ms. Foster:

In response to a request from the U.S. Environmental Protection Agency (EPA) Region 6, the Arkansas Department of Health (ADH) has evaluated data from post-cleanup soil sampling. The soil samples were taken from the Arkansas Municipal Waste-to-Energy (AMWE) (a.k.a. Osceola Incinerator) site in Osceola, Mississippi County, Arkansas. The contaminants of concern (COCs) identified from the submitted data are arsenic, polycyclic aromatic hydrocarbons (PAHs), and Aroclor-1254 [a polychlorinated biphenyl (PCB)]. ADH has prepared this letter health consultation under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). This health consultation is meant to provide EPA with a data evaluation to assist with future action decisions.

Background and Statement of Issues

The former AMWE facility was comprised of a municipal incinerator and two warehouses where medical, industrial, and hazardous wastes were improperly stored. Previously, ADH/ATSDR identified and discussed on-site contamination issues in the document, "Health Consultation: Osceola Incinerator (Arkansas Municipal Waste-to-Energy)" dated April 20, 2005. [Note, the E.R. Moore building has been razed and the municipal incinerator building is no longer in use.] For this evaluation, the area of interest is the larger of the two warehouses, named the 'Parsons Warehouse.' Since an emergency removal action in 2003, the EPA, along with coordinated efforts by the Arkansas Department of Environmental Quality (ADEQ) and ADH, have been monitoring the clean-up progress at this site. EPA Region 6 has been the lead authority for the site since 2004. The EPA characterized, containerized, and staged the remaining waste in the Parsons Warehouse until the most significant Potential Responsible Parties (PRPs) completed removal of the majority of the containers in 2006, leaving some hazardous wastes on-site. Since 2005, the AMWE Parsons Warehouse site has been on the Arkansas Remedial Action Trust Fund Act (RATFA) State Priority List (SPL). ADEQ plans to remove the AMWE Parsons Warehouse site from the SPL once final remediation and data confirmation from EPA has occurred [1].

The Parsons Warehouse is part of a 2.5-acre site located in the city limits. This site is not fenced; therefore, the site property is accessible. However, building entrances are locked. The approximately 50,000-square-foot structure has a concrete floor and several loading dock areas along its southern exterior. It is bordered by an inactive warehouse facility to the north, Parsons Drive to the south, Highway 325 (Ohlendorf Road) to the west, and a scrap metal recycler to the east. The property is zoned as light industrial and has the potential to be used as commercial or light industrial property in the future. Land use within 0.25 miles of the site includes various commercial businesses, agricultural land, residences, and a small apartment complex. A residential subdivision is within 0.5 mile north and east of the site [1].

From June 2006 until June 2012, approximately 1,000 containers of hazardous waste remained on pallets in the Parsons Warehouse until negotiations with the remaining PRPs were completed, and the containers were removed [1]. After the final removal process in the summer of 2012, the EPA completed soil sampling around the perimeter of the Parsons Warehouse building on all sides (north, west, east, and south) to identify if any possible contamination could still remain on-site [2]. ADH was informed that during the final site-work at AMWE, a PRP hired contractors to evaluate the structural integrity of the Parsons Warehouse. Prior to any future use of the building by the City of Osceola, safety issues regarding building integrity may need to be re-addressed.

Discussion

Exposure to a COC is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (*e.g.*, contaminated on-site soil),
2. An environmental medium such as soil, water, or air that can hold or move the contamination,
3. A point at which people come in contact with a contaminated medium,
4. An exposure route, such as dermal contact, and
5. A population who could come in contact with the contaminants (*e.g.*, trespassers).

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. This evaluation focuses on possible current and future exposures. For this evaluation, potential pathways have been identified based on the criteria above. Although incidental ingestion of soil is a possible exposure pathway, it is unlikely to occur given the industrial or commercial uses of the property. The primary potential exposure pathway of concern is dermal (skin) contact with on-site soil by persons trespassing on the property. However, both the incidental ingestion of surface soil and dermal (skin exposure) pathways will be calculated for the purpose of this evaluation to ensure a conservative public health evaluation.

Soil samples were collected around the perimeter of the Parsons Warehouse from 13 designated grids (Labeled A – M) on June 19, 20, and 21, 2012. According to the data provided by EPA, four field samples and four field duplicates were collected from grid A, and four field samples were collected from each of the other grids (B – M). See Appendix A for map of grid locations. Collection depths (in inches) were: 0 – 0 (*i.e.*, top surface soil); 0 – 6; 6 – 12; 12 – 18; and 18 - 24. Samples were analyzed for: cyanide, metals, pesticides, volatile organic chemicals (VOCs); and semi-volatile organic chemicals (SVOCs), including PAHs and PCBs [3].

When evaluating public health due to environmental soil exposures, ADH typically uses ATSDR Health Comparison Values (HCVs) for soil, when available. HCVs are substance concentrations set well below levels that are known or anticipated to result in adverse health effects. Concentrations at or below the relevant HCV may reasonably be considered to be below levels of health concern. Evaluation of the EPA soil data indicated three contaminants with elevated concentrations above HCV levels. These three contaminants are: arsenic, PAHs, and Aroclor-1254 [a known commercial mixture of PCBs].

PAHs are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds. PAHs generally have a low degree of acute toxicity to humans. While not all PAHs are considered carcinogenic, the EPA has determined that benzo(a)anthracene,

benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene are probable human carcinogens [4]. These seven PAHs were individually analyzed in the soil samples collected at this site by EPA. Because of the complexity of PAH mixtures, the most active compound, benzo(a)pyrene [B(a)P], is used as the indicator compound. ADH compared these seven PAHs that are known or suspected to be human carcinogens to the ATSDR cancer risk evaluation guide of 0.1 parts per million (ppm), which was established for B(a)P. Toxicity equivalency factors (TEFs) were used to weight each PAH's toxicity relative to the toxicity of B(a)P. The TEF of B(a)P is set to 1. Multiplying the concentration of each PAH by its respective TEF produces a toxicity equivalence quotient (TEQ). The total TEQ at each sample location was used in this data evaluation.

Below in Table 1, the range (minimum and maximum) concentration of each surface soil contaminant is listed in ppm, along with the corresponding sample identification - grid, and depth in inches [3].

Table 1. Arkansas Municipal Waste-to-Energy (AMWE) Reported Data for Surface Soil Contamination

Contaminant	Sample ID	Depth (inches)	Minimum Concentration (ppm)	Maximum Concentration (ppm)	ATSDR HCV (soil screening in ppm)
Arsenic	AMWE-G-06-51	0 - 6	2.86	n/a	20 - child
Arsenic	AMWE-H-06-51	0 - 6	n/a	20	200 - adult
PAH TEQ	AMWE-F-06-51	0 - 6	0.204	n/a	0.1 - child
PAH TEQ	AMWE-M-00-51	0 - 0	n/a	3.82	0.1 - adult
Aroclor-1254 PCB	AMWE-E-06-51	0 - 6	0.034	n/a	1 - child
Aroclor-1254 PCB	AMWE-M-00-51	0 - 0	n/a	2.6	10 - adult

ppm = parts per million; ATSDR = Agency for Toxic Substances and Disease Registry; HCV = Health Comparison Values; PAH TEQ = polycyclic aromatic hydrocarbon toxicity equivalence quotient; PCB = polychlorinated biphenyl

The ATSDR non-cancer HCV for arsenic in soil is 20 milligrams per kilogram (mg/kg) or ppm for a child and 200 ppm for an adult. As previously stated, the ATSDR HCV for B(a)P in soil is 0.1 ppm for a child and adult (the cancer risk evaluation guide, *or* CREG, value). The ATSDR non-cancer HCV for Aroclor-1254 PCB in soil is 1 ppm for a child and 10 ppm for an adult [5].

The maximum concentrations of these three contaminants were used to calculate an exposure dose for a trespasser exposed to surface soil near the Parsons Warehouse through accidental (incidental) ingestion or dermal contact [6]. ADH identifies the adolescent (age 12 – 17 years) as the reasonably maximally exposed receptor to contaminants at this site, due to the proximity to residential and commercial areas within this community. Access to the Parsons Warehouse site is not restricted, and there is no fence around the property. The adolescent trespasser scenario is considered to be protective of individuals who may wander on to the AMWE site.

To put the calculated exposure doses into a meaningful context for non-cancer effects, a Hazard Quotient (HQ) value was calculated for the potentially exposed adolescent. An HQ is the average daily intake divided by a chemical specific ATSDR minimal risk level (MRL) or EPA reference dose (RfD). If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If the HQ exceeds one it does not mean adverse health effects will occur; rather, further evaluation of the exposure scenarios is necessary. This is because of the margin of safety built-in to the

calculation of all MRLs and RfDs. The larger the HQ value, the more likely it is that an adverse effect may possibly occur.

For the incidental ingestion pathway to surface soil exposure, the HQ for an adolescent trespasser scenario using the maximum concentration of arsenic is 0.0013, which is well below the recommended 1.0 value. There is no MRL or RfD for B(a)P equivalent (or PAH TEQ), and therefore no HQ is applicable for this contaminant. The HQ for an adolescent trespasser scenario using the maximum concentration of Aroclor-1254 is 0.0026, which is well below 1.0.

For the dermal pathway to surface soil exposure, the HQ for an adolescent trespasser scenario using the maximum concentration of arsenic is 0.27, which is below the recommended 1.0 value. There is no MRL or RfD for B(a)P equivalent (or PAH TEQ), and therefore no HQ is applicable for this contaminant. The HQ for an adolescent trespasser scenario using the maximum concentration of PCB is 0.54, which is below 1.0.

Because the three contaminants of concern are known or reasonably anticipated to be carcinogens, a lifetime cancer risk was calculated. For Lifetime Cancer Risk (LCR) ranges, EPA's target risk range was considered as an adequate level of health safety [*i.e.*, potential risks greater than one in 1,000,000 (or 1×10^{-6}), which likely represents no risk of cancer, but less than one in 10,000 (or 1×10^{-4})]. The estimated LCRs for an adolescent trespasser were calculated using maximum arsenic, PAH TEQ, or PCB concentrations in soil for the incidental ingestion or dermal pathway. The cumulative LCR for incidental ingestion with all contaminants in the surface soil for an adolescent is 6.1×10^{-7}. The cumulative LCR for dermal contact with all contaminants in the surface soil for an adolescent is 3.4×10^{-6}. This value is based on a one-year exposure time over a 70-year lifespan. See Appendix B for all individual variables and equations.

This conservative evaluation takes into account the adolescent receptor, who may be a more sensitive population than a fully-developed adult. Adults that experience the same exposure route, time, and concentration from these evaluated COCs would have lower calculated risk values. Future adult receptors potentially exposed to on-site COCs in the soil are not expected to experience adverse health effects.

Children are smaller than adults, and therefore result in higher doses of chemical exposure per body weight. Children, because of their developing body systems, tend to be more susceptible to the effects of chemical exposures. Also, children depend completely on adults for the identification of hazards and risk management in their lives. It should be noted that a potential health risk for a child trespassing at this site could be greater, but it is unlikely and unreasonable to assume a child would be on this property without adult supervision since this site is considered an industrial area and is bound to the west by a busy highway

Conclusions

The ADH/ATSDR concludes that adverse health effects (both non-cancer and/or cancer) are not expected for a future adolescent (or adult) trespasser from exposure to contaminants in the surface soil (either through incidental ingestion or dermal contact).

If requested, ADH/ATSDR will evaluate additional environmental data as they become available.

Recommendations

Based on the evaluation described above, ADH/ATSDR has no recommendations for the AMWE warehouse site. Public health education may be provided by ADH to the community as needed or requested.

Thank you for allowing the ADH Environmental Epidemiology Section and ATSDR the opportunity to work with your agency on this site. Please feel free to contact me at 501-280-4041 or ashley.whitlow@arkansas.gov, if you have any questions.

Sincerely,

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ADH Epidemiologist
ATSDR Health Assessor
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Enclosure: Appendices

Cc: Lori Simmons, M.S., Environmental Epidemiology Section Chief/ATSDR Program Coordinator, ADH
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References

1. Arkansas Department of Environmental Quality (ADEQ), "Arkansas Waste-to-Energy Warehouse State Priority List Site", September 2012. Accessed at: http://www.adeq.state.ar.us/ftproot/pub/hw/PriorityList/pdf/Arkansas%20Waste-to-Energy%20Warehouse%20Summary.pdf
2. U.S. Environmental Protection Agency (EPA), Figure 3-1 Sample Grid Map. Accessed through email correspondence with ATSDR and Althea Foster.
3. U.S. Environmental Protection Agency (EPA) Data tables "AMWE_Summary_20120823" and "AMWE_Summary_20120824_PAH". Accessed through email correspondence with ATSDR and Althea Foster.
4. Agency for Toxic Substances and Disease Registry (ATSDR), "Toxicological Profile for Polycyclic Aromatic Hydrocarbons (PAHs). U.S. Department of Health and Human Services; Atlanta, GA. August 1995.
5. Agency for Toxic Substances and Disease Registry (ATSDR); "Health Comparison Values". Accessed at: http://www.atsdr.cdc.gov/hac/PHAManual/ch7.html.
6. Agency for Toxic Substances and Disease Registry (ATSDR); "Exposure Dose Calculator".

Appendix A: Map of Soil Sampling Grids at Arkansas Municipal Waste-to-Energy Parsons Warehouse Site (Osceola, AR)

Figure Provided by U.S. EPA Region 6

Appendix B: Variables Used in Exposure Dose and Lifetime Cancer Risk Calculation Scenarios at the Arkansas Municipal Waste-to-Energy Site (Osceola, AR)

Exposure Dose Equation for Incidental (Accidental) Ingestion

ED = (C x IR x EF x BF x CF) / BW

ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
C = Contaminant Concentration (milligrams per kilogram, mg/kg)
IR = Intake Rate of Contaminated Soil Ingested per day
EF = Exposure Factor (unitless)
CF = Conversion Factor (1E-06)
BW = Body Weight (kilograms, kg)

Adolescent (Age 12 – 17 years) Scenario Variables:
C = 20 mg/kg arsenic; 3.82 mg/kg benzo(a)pyrene equivalent; 2.6 mg/kg aroclor-1254
IR = 1.0 mg/day
EF = 1; CF = 1E-06
BW = 50 kg

Exposure Dose Equation for Dermal (Skin) Contact

ED = (C x A x AF x EF x CF) / BW

ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
C = Contaminant Concentration (milligrams per kilogram, mg/kg)
A = Total Soil Adhered (milligrams, mg) = Exposed Skin Area x Soil Adherence Concentration
AF = Bioavailability Factor (unitless)
EF = Exposure Factor (unitless)
CF = Conversion Factor (1E-06)
BW = Body Weight (kilograms, kg)

Adolescent (Age 12 – 17 years) Scenario Variables:
C = 20 mg/kg arsenic; 3.82 mg/kg benzo(a)pyrene equivalent; 2.6 mg/kg aroclor-1254
A = 2048.25 mg (head, arms, hands, legs, feet exposed)
AF = 1E-01; EF = 1; CF = 1E-06
BW = 50 kg

Hazard Quotient Equation for Estimating Short-Term Health Effects

HQ = ED / RfD

HQ = Hazard Quotient (unitless)
ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
RfD = Reference Dose (milligrams per kilogram per day, mg/kg/day)

Lifetime Cancer Risk Equation for Estimating Possible Carcinogen Effects

LCR = ED x CSF x (estimated exposure years / 70 years lifetime)

LCR = Lifetime Cancer Risk (unitless)
ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
CSF = Cancer Slope Factor (1 / milligrams per kilogram per day, $mg/kg/day^{-1}$)
Estimated exposure year = 1 year / 70 years = 0.014

For Incidental Ingestion Values:
Arsenic LCR = 6.0E-07
PAH TEQ* LCR = 7.97E-09
Aroclor-1254 LCR = 5.2E-11

*PAH = polycyclic aromatic hydrocarbons;
TEQ = toxicity equivalence quotient from all benzo(a)pyrene toxicity equivalency factor concentrations

Cumulative LCR of adolescent trespasser scenario for incidental ingestion pathway = 6.1E-07

For Dermal Contact Values:
Arsenic LCR = 1.8E-06
PAH TEQ* LCR = 1.6E-06
Aroclor-1254 LCR = 1.1E-08

*PAH = polycyclic aromatic hydrocarbons;
TEQ = toxicity equivalence quotient from all benzo(a)pyrene toxicity equivalency factor concentrations

Cumulative LCR of adolescent trespasser scenario for dermal contact pathway = 3.4E-06