

Health Consultation

RESIDENTIAL PESTICIDE CONTAMINATION

7125 ANDERSON ROAD

ALEXANDER, SALINE COUNTY, ARKANSAS

EPA FACILITY ID: ARR000011106

AUGUST 28, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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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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HEALTH CONSULTATION

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ALEXANDER, SALINE COUNTY, ARKANSAS

EPA FACILITY ID: ARR00011106

Prepared By:

Arkansas Department of Health
Under a Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Statement of Issues

On January 9, 2007, the Arkansas Department of Health and Human Services, Division of Health (ADOH) [now referred to as the Arkansas Department of Health (ADH)], was contacted by the Arkansas Department of Environmental Quality (ADEQ) regarding a residential property at 7125 Anderson Road, Alexander, Saline County, that had a known historical use and storage of the pesticide DDT (or dichlorodiphenyltrichloroethane). In 2002, the ADH Engineering Division, ADEQ, and the Arkansas State Plant Board (ASPB) worked jointly in order to identify the material when it was initially discovered under the crawl space of the residence. It is believed that it is commercial grade DDT that was voluntarily taken to the home by a previous owner in the late 1970's or early 1980's after the pesticide was banned. The ADH Engineering Division first tested the residence's water well in October 2002, which was found to have 57 parts per billion (ppb) of DDT. The ADH Engineering Division informed ADEQ and ASPB of the 2002 results. It was during the request by ADEQ on January 9, 2007, that a copy of the ADH Engineering Division well water report from October 2002 was first made available to ADH personnel working under the Agency for Toxic Substances and Disease Registry (ATSDR) cooperative agreement. On January 22, 2007, the remaining DDT and two 30-gallon drums with unknown contents were removed from the property by private contractors, hired by the homeowner and disposed of as hazardous waste by Clean Harbors Environmental Services. During the removal process, ADEQ requested that the ADH Engineering Division personnel and the ADH/ATSDR Cooperative Agreement personnel provide well water testing and evaluation of DDT on-site to verify clean-up and ensure that pesticide contamination was not a public health threat to nearby residents.

Background and History

The site at 7125 Anderson Road is solely residential, and is located on approximately 17 acres of land northwest of the city limits of Alexander, Saline County, Arkansas. The property is within a rural area. Approximately six to twelve homes within the area have not yet been connected to a municipal water supply. Currently, the home on the property is being rented to a family of four (two adults and two children), and they are using private well water as the sole source for drinking water and household water use.

In 2002, inspectors from ADEQ and ASPB discovered approximately 1,600 pounds of 50 percent wettable DDT under the crawl space of the house. It is believed that the former owner, who worked for a local pesticide company and is now deceased, stored the banned hazardous substance at his residence voluntarily. Recently, the DDT and two 30-gallon drums with unknown contents that were found after a follow-up inspection of the property were removed by private contractors and taken to Clean Harbors Environmental Services in El Dorado for proper treatment and disposal as hazardous waste; this was done at the present owner's expense.

In October 2002, the well water at 7125 Anderson Road was tested by ADH Engineering Division personnel, along with four other residential wells within a quarter-mile radius of the property. The well at 7125 Anderson Road was found to have 57 ppb of DDT in the water. The four surrounding wells on neighboring properties all showed no detectable levels of DDT in the water.

A follow-up inspection of the property by ADEQ officials on January 25, 2007, confirmed that all the bags of DDT and drums containing hazardous waste had been removed. However, debris still remained under the crawl space as evidenced by residual levels of a white, powdery substance that was observed on the ground inside the crawl space. On April 17, 2007, ADEQ collected six surface soil samples on the property. See Appendix, Figure 1 for the location of each surface soil sample. ADH made a site-visit the same day to inform residents of the plans for water sampling. On April 24, 2007, ADH Engineering Division personnel collected well water samples from the 7125 Anderson Road property, along with four other residential wells within a quarter-mile radius of the property (the same wells that were tested in 2002). See Appendix, Figure 2 for the location of each private well water sample.

Site Description

According to the Sampling and Analysis Plan prepared by ADEQ (2007), the natural topography of the property slopes east and west of the house, which is located approximately 480 feet above sea level. There is a pond located near the eastern edge of the property. The property is located approximately one mile north of the city limits of Alexander, and it is not located within a flood zone. Soils at the property consist of Carnasaw-Townley association, steep type soil, with very little Carnasaw-Townley association, undulating soils on the east and west fringes of the property; these type soils have a low water capacity and a low permeability [1].

Demographics

According to the U.S. Census Bureau 2005 American Community Survey for Saline County, Arkansas, the total population is 89,380. There are 5,101 children under five years old and 68,334 people 18 years and over in Saline County. Also, of the 36,356 occupied housing units listed, 27,143 are owner-occupied housing units and 9,213 are renter-occupied housing units [2].

The property is located in extreme northern Saline County within a rural residential area. One person who does not currently reside in the home owns the property. Residents on-site include a family of four that rent the property. The residence consists of a married couple with two children.

ADH received verbal consent from both the property owner(s), on July 10, 2007, and renter(s), on July 13, 2007, to include information such as property address, housing description, and owner/renter demographics, etc. in this ATSDR health consultation report.

Discussion

Exposure to contaminants of concern is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (e.g., chemical spill),
2. An environmental medium such as soil, water, or air that can hold or move the contamination,

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3. A point at which people come in contact with a contaminated medium (e.g., private well),
 4. An exposure route, such as drinking water from a well, and
 5. A population who could come in contact with the contaminants.

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. For the property at 7125 Anderson Road, Alexander, a complete exposure pathway exists for the residential adult and child exposed to contaminated surface soil located in the crawl space of the house through incidental ingestion and/or dermal contact.

ADEQ took six surface soil samples on the property at a depth of less than six inches each. Two samples were directly under the house in the crawl space where the DDT was formerly stored and could not be labeled with Global Positioning System (GPS) coordinates by ADEQ personnel. The other four samples were collected on-site surrounding the house and marked with GPS coordinates. One of the six samples was a duplicate for Quality Assurance/Quality Control (QA/QC) purposes.

The soils were tested for alpha- hexachlorocyclohexane (BHC), gamma-BHC, heptachlor, heptachlor-epoxide, technical chlordane, p-p- dichlorodiphenyldichloro-ethylene (DDE), endrin, endosulfan II, p-p- dichlorodiphenyldichloroethane (DDD), and p-p- dichlorodiphenyltrichloroethane (DDT). Of the chemicals tested, heptachlor, heptachlor-epoxide, technical chlordane, p-p-DDE, p-p-DDD, and p-p-DDT were detected above health screening levels [3]. These chemicals were further evaluated to find an exposure dose for the child and adult using the maximum detected value [4]. The maximum detected values of these chemicals were from the two surface soil samples taken directly in the crawl space area under the house. The calculated exposure dose was then used to determine the potential hazard quotient (HQ) and lifetime cancer risk (LCR) value of each chemical that exceeded its screening value. See Table 1 below for all calculations.

To put the calculated exposure doses into a meaningful context for non-cancer, acute effects [meaning a rapid onset of an illness, or an illness that happens in less than a year (i.e., short duration)], the HQ was calculated for each potentially exposed child and adult. An HQ is the average daily intake divided by a chemical specific reference dose (RfD). The Environmental Protection Agency (EPA) Region 6 Human Health Medium Specific Screening Level (HHMSSL) for each chemical was the source for the RfD [3]. 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, there is some possibility that non-cancer effects may occur, although an HQ above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all RfD values. The larger the HQ value, the more likely it is that an adverse effect may possibly occur.

Risks greater than one in 1,000,000 (or 1×10^{-6}), which represents no risk of cancer, but less than one in 10,000 (or 1×10^{-4}) are within the U.S. EPA's target risk range and considered an adequate level of health safety. If the additional LCR is greater than one in 10,000, it is generally considered an indicator that further evaluation or action to eliminate exposure would be warranted.

Calculations show that an adverse health effect potential for any person (child or adult) -even with only a one-time exposure to the contaminated soil from the crawl space- does exist. Specifically, if the individuals living on the property were to come into contact with the contaminated soil from the crawl space under the house, there is an elevated potential for non-cancer (short-term or acute) and cancer risks (long-term or chronic) from accidental ingestion and skin exposure to DDT. If the individuals living on the property were to come into contact with the contaminated soil from the crawl space under the house, there is an elevated potential only for cancer risk from accidental ingestion and skin exposure to DDD. If the individuals living on the property were to come into contact with the contaminated soil from the crawl space under the house, there is an elevated potential only for non-cancer risk from accidental ingestion and skin exposure to heptachlor-epoxide.

All calculated risks values from Table 1 are included for both infrequent contact (such as a maintenance worker involving a single exposure duration) and multiple contact with the contaminated surface soil in the crawl space of the house. High levels of DDT or DDD can affect the nervous system and may cause symptoms such as excitability, tremors, and seizures in some individuals. High levels of heptachlor epoxide may cause damage to your liver or nervous system. These health effects may be only temporary and depends on the duration of exposure [5].

Table 1. ADH/ATSDR Health Evaluation for Soil Data at 7125 Anderson Road, Alexander, AR collected by ADEQ on April 17, 2007 [6]

Compound	DDT	DDE	DDD	Technical Chlordane	Heptachlor-Epoxide	Heptachlor
Concentration (µg/g)	6800	56	5020	9.2	4.1	0.6
Child Ingestion HQ Child Ingestion LCR	170 3.7 x 10⁻³	n/a 3.1 x 10 ⁻⁵	n/a 1.9 x 10⁻³	0.24 5.4 x 10 ⁻⁶	3.92 6.0 x 10 ⁻⁵	0.02 4.30 x 10 ⁻⁶
Adult Ingestion HQ Adult Ingestion LCR	19.4 4.2 x 10⁻⁴	n/a 3.5 x 10 ⁻⁶	n/a 2.2 x 10⁻⁴	0.03 5.85 x 10 ⁻⁷	0.45 6.9 x 10 ⁻⁶	1.72 x 10 ⁻³ 5.0 x 10 ⁻⁷
Child Dermal HQ Child Dermal LCR	48 1.05 x 10⁻³	n/a 6.56 x 10 ⁻⁶	n/a 4.32 x 10⁻⁴	0.06 1.44 x 10 ⁻⁶	1.08 1.6 x 10 ⁻⁵	4.2 x 10 ⁻³ 1.22 x 10 ⁻⁶
Adult Dermal HQ Adult Dermal LCR	8.4 1.83 x 10⁻⁴	n/a 1.53 x 10 ⁻⁶	n/a 9.57 x 10 ⁻⁵	0.01 2.57 x 10 ⁻⁷	0.19 2.9 x 10 ⁻⁶	7.4 x 10 ⁻⁴ 2.14 x 10 ⁻⁷

n/a = no reference dose available for compound;

Values in **bold** exceed protective risk range of HQ > 1 or LCR of 1.0 x 10⁻⁶ to 1.0 x 10⁻⁴

All cancer risk calculations based on 9 year exposure duration.

ADH = Arkansas Department of Health; ATSDR = Agency for Toxic Substances and Disease Registry; ADEQ = Arkansas Department of Environmental Quality; HQ = Hazard Quotient (non-cancer); LCR = Lifetime Cancer Risk; µg/g = micrograms per gram.

Because there was known contamination of the property's well water in 2002, the well water was considered a potential exposure pathway. When the same well was tested in 2007 (for DDT only), it was reported as having 0.34 ppb of DDT in the well water. The other four well water samples tested off-site had no detectable levels of DDT [7].

After calculating an HQ and potential cancer risk value for the residential adult and child for ingestion (eating/drinking) and dermal (skin) contact with the well water, it was determined that there were no potential non-cancer or cancer exceedances. The potential exposure pathway from well water on the property was eliminated due to an incomplete exposure route (i.e., the exposure was below the acceptable EPA level of concern). See Table 2 below for all calculations of the well water on the property.

Table 2. ADH/ATSDR Health Evaluation for Well Water Data at 7125 Anderson Road, Alexander, Collected by ADH on April 24, 2007

Compound	Test Result	Exposure Pathway	Receptor	HQ (non-cancer)	LCR (cancer)*
DDT	0.34 ppb	Ingestion	Infant	0.068	1.2×10^{-5}
		Ingestion	Child	0.042	7.1×10^{-6}
		Ingestion	Adult	0.019	3.3×10^{-6}
DDT	0.34 ppb	Dermal Contact	Infant	0.0074	1.3×10^{-6}
		Dermal Contact	Child	0.0096	1.6×10^{-6}
		Dermal Contact	Adult	0.0084	1.4×10^{-6}

*Lifetime Cancer Risk (LCR) based on 70 year exposure for all receptors.
 Hazard Quotient (HQ) < 1 and LCR between 1×10^{-6} and 1×10^{-4} pass health criteria for all risks.

ADH = Arkansas Department of Health; ATSDR = Agency for Toxic Substances and Disease Registry; DDT = dichlorodiphenyltrichloroethane; ppb = parts per billion

The potential exposure pathway by inhalation (breathing) is eliminated due to the nature of the pesticide chemicals. DDT and similar compounds used for pesticides that get into the air are rapidly broken down by sunlight, usually within two days. These chemical components stick strongly to soil, and only a slight amount will go through the soil into groundwater [5]. Given the amount of time it has been between the DDT removal and when the bags of DDT were originally placed under the crawl space of the house (estimated as the early 1980's), any type of volatilization would have dissipated and would no longer be an exposure point at which people could have for potential contact.

Community Health Concerns

During the investigation of the residential pesticide contamination at 7125 Anderson Road, Alexander, no health concerns were presented to ADH.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Since there are small children known to be living on the property, adults and caregivers should be made aware of the potential on-site risks in order to prevent future exposure to the soils in the crawl space area of the house. During the site visit made by ADH it was observed that the door to the crawl space was open, and several toys designed for small children or toddlers were observed all around the outside of the house and near the area close to the crawl space where the DDT material was stored. See Appendix, Figure 3. Therefore, it could be deemed possible that a child could come into direct contact with the residual DDT. It is unknown whether or not the door to the crawl space has a lock on it. The potential for incidental (accidental) ingestion or dermal contact of contaminated surface soils through playing in those areas should be eliminated as soon as possible.

Conclusions

ADH has reviewed all site information and laboratory data and concludes that there is one complete exposure pathway for the on-site residents through surface soil *from the crawl space under the house* contaminated with DDT, DDD, and heptachlor-epoxide. Past and current contact with contaminated surface soil from the crawl space under the house on the property at 7125 Anderson Road, Alexander, poses a **public health hazard** since a potential exists for long-term exposures to hazardous substances by ingestion or dermal contact. However, if the homeowner(s) follow the recommendations presented by ADEQ, ADH, and ATSDR (such as debris and remnant soil removal and using a lock on the crawl space entrance), the site would represent **no apparent public health hazard** in the future. ADH concludes that there is **no apparent public health hazard** for the on-site residents through ingestion or dermal contact with private well water since DDT was not detected at a level to cause non-cancer or cancer risk exceedances. There is **no apparent public health hazard** from inhalation of contaminated soil or private well water on the residence since this is not a complete exposure pathway.

Recommendations

ADH recommends that any remaining surface soil under the crawl space of the house and on the property at 7125 Anderson Road, Alexander, that is contaminated with DDT and other pesticide-containing materials be properly removed and disposed of as hazardous waste. This action would eliminate the exposure pathway by ingestion or dermal contact of the contaminated surface soil. Until such a time that the contaminated surface soil can be properly removed, ADH recommends that the crawl-space door be closed and locked to prevent individuals (particularly children) from accessing the area.

Public Health Action Plan

The Public Health Action Plan implemented by ADH/ATSDR with regards to the residential pesticide contamination at 7125 Anderson Road, Alexander, Saline County, is as follows:

Completed Actions

- ADH personnel conducted a site visit to collect well water samples from the property and surrounding residences on October 8, 2002 and reported the test results on November 5, 2002.
- ADH personnel accompanied by ADEQ personnel conducted a site visit on April 17, 2007 to collect surface soil samples and inform neighboring residences of future well water sampling.
- ADH personnel conducted a site visit on April 24, 2007 to collect private well water samples from the property and surrounding residences.
- ADH evaluated private well water and surface soil sample data to determine public health risks.
- ADEQ wrote and sent a letter of finding to the homeowner(s) informing them of the surface soil results on June 6, 2007.
- ADH wrote and sent letters of findings to the homeowner(s) and home renter(s) informing them of the well water results on June 22, 2007.
- ADH sent an ATSDR Fact Sheet on DDT to the homeowner and home renters on June 22, 2007.
- ADH spoke with both the owner(s) and renter(s) to receive verbal consent to include specific address and housing information within this report. Certified letters were then mailed to both individuals confirming their verbal consent to allow ADH/ATSDR to use their information on July 13, 2007.
- ADH requested ADEQ to send a letter of finding(s) regarding the surface soil results to the renter(s) on July 13, 2007.

Current Actions

- ADH is working closely with the project manager of this site from ADEQ to ensure that all owner(s) and renter(s) are aware of the follow-up actions that still need to be carried out. The owner(s) is not in compliance, and ADEQ is in the process of sending a follow-up letter to the June 6, 2007 letter to recommend a final clean-up of remaining debris left from the DDT and/or hazardous waste removal. Any updates will be sent to ADH/ATSDR, and ADH will continue to check with ADEQ on a periodic basis until all removal has been deemed complete.

Future Activities

- Follow-up with ADEQ and the homeowner to ensure that all contaminated surface soil from the crawl-space of the house and surrounding property at 7125 Anderson Road, Alexander, has been removed and disposed of properly. This is based on a letter from ADEQ to the homeowner, dated June 6, 2007, which recommended “surface removal” of soil and debris under the crawl space of the residence within 30 days of receipt of the letter.
- This site will be referred to the ATSDR PART Workgroup for recommendation follow-up through the federal agency, since it is listed as a Category 2: Public Health Hazard Site.

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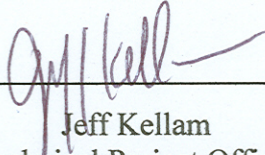
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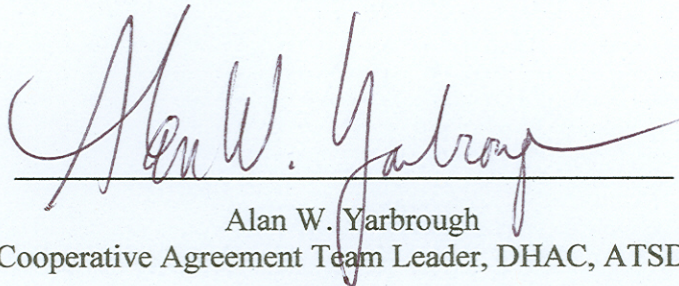
Certification

The Arkansas Department of Health prepared this health consultation for residential pesticide contamination at 7125 Anderson Road, Saline County, Alexander, Arkansas, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedure existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner.



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The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



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5. Agency for Toxic Substances and Disease Registry (ATSDR) ToxFAQs for DDT, DDE, DDD, and Heptachlor Epoxide. Available at: <http://www.astdr.cdc.gov/tfacts35.html>. Accessed June 13, 2007.
6. Arkansas Department of Environmental Quality (ADEQ), “Letter of finding to property owner Screening Comparison for Chemicals Detected in Soil Table”, EPA ID No. ARR000011106, Alexander, Saline County, Arkansas. June 7, 2007.
7. Arkansas Department of Health (ADH) Public Health Laboratory Organic Chemistry Unit, DDT Lab Results, May 3, 2007.
8. Randy Puckett (ADEQ Hazardous Waste Division), “Property Map,” May 2007.

Appendix – Figures

Figure 1. Location of six surface soil samples collected by the Arkansas Department of Environmental Quality on April 17, 2007 at 7125 Anderson Road Property

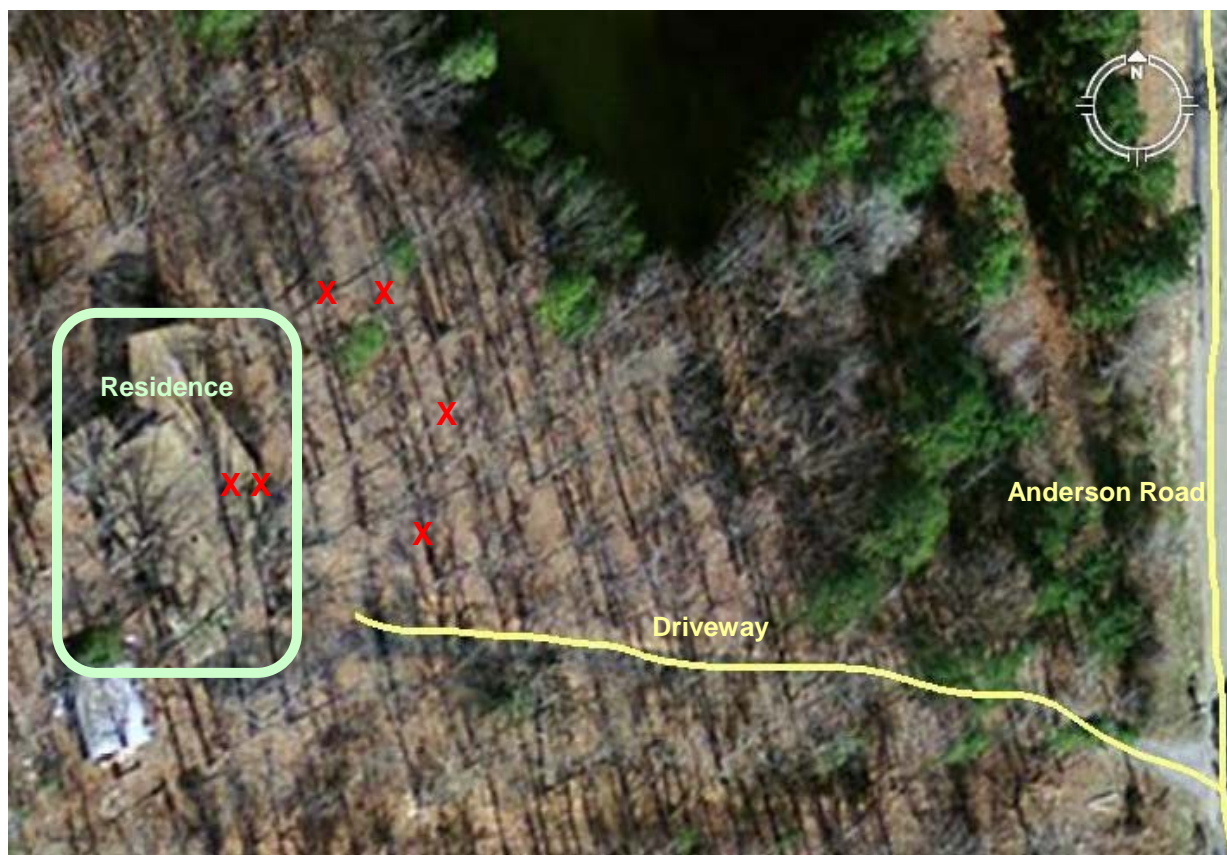


Figure 2. Location of five private well water samples collected by the Arkansas Department of Health on April 24, 2007 at 7125 Anderson Road Property and surrounding residences on Anderson Road and Bumpus Road [8].



Figure 3. Photographs from the Arkansas Department of Health (ADH) site visit to 7125 Anderson Road, Alexander, property on April 17, 2007.



Arkansas Department of Environmental Quality personnel collecting a surface soil sample on-site near the house.



Water faucet located at the back of the house where ADH Engineering personnel collected the on-site water sample.



Close-up view of entrance to crawl-space of house. Note on the top porch above the crawl-space is the front door entrance and evidence of recreational toys close to the contaminated soil.



Close-up of crawl-space floor. Note the residual white, powdery DDT and hazardous substance debris covering the floor space.