Follow-up Health Consultation

ANNISTON ARMY DEPOT

ANNISTON, ALABAMA

EPA FACILITY ID: AL3210020027

SEPTEMBER 30, 2008

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

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

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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Prepared by:

Site and Radiological Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Foreword

The Agency for Toxic Substances and Disease Registry (ATSDR), based in Atlanta, Georgia, is a federal public health agency of the U.S. Department of Health and Human Services. ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. This information is often provided in the form of public health assessments, health consultations, letter consultations, or could be technical assists. These health evaluations indicate if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped, reduced or prevented.

ATSDR and the Department of Defense (DoD) services have discussed ways in which to review previous recommendations made in health evaluations to ensure that the public health recommendations have been completed or are compatible with potential changes in current site use. Upon request, ATSDR performs follow-up evaluations on locations where health evaluations have been completed. ATSDR performs the follow-up evaluation by reviewing previous conclusions and recommendations; evaluating current site conditions and environmental remediation as necessary; and determining if there is a need for further review of environmental data.

Selection of a site for follow-up evaluation may be initiated for reasons, such as: Site clean-up and mitigation measures may have reduced or eliminated contamination and/or exposures; an incident or exercise may produce an immediate need to evaluate a pathway; a new method may be developed that allows us to measure chemicals or markers of exposure in a new way; new statistical tools or procedures may facilitate the investigation of a pathway in a new way; or new biomedical or toxicological studies may change the way we assess risks.

Findings on the follow-up efforts will be discussed with the services on a site by site basis. If further evaluation efforts are determined to be needed by ATSDR and the respective DoD service, a timeline to address this follow-up will be agreed upon by these parties. Should ATSDR decide that a public health evaluation is necessary and the DoD service does not concur, the agency may conduct the follow-up evaluation using other resources.

Exposure

As the first step in the evaluation, ATSDR scientists review environmental data to see what chemicals are present, where the chemicals were found, and how people might come into contact with the chemicals. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When environmental data does not allow ATSDR to fully evaluate exposure, the report will indicate what further sampling data is needed.

Health Based Screening/Data Reduction

ATSDR uses several screening values that are derived from human and animal exposure studies. The screening values are meant to be protective of health and to allow scientists to eliminate further analysis of those chemicals that could not pose a hazard. Further analysis of the pathway is necessary when a chemical exceeds a health-based screening value. The pathway analysis may use other situation-specific screening values or may involve actual health effects data.

Health Effects

If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these exposures may result in harmful effects. ATSDR recognizes that developing fetuses, infants, and children can be more sensitive to exposures than are adults. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable than adults. Thus, the health impact to the children is considered first when evaluating exposure and the potential adverse effects to a community. The health impacts to other groups within the community (such as the elderly, chronically ill, and people engaging in high-exposure practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic, and epidemiologic studies, to determine the likelihood of health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. In this case, this report suggests what further public health actions are needed.

Conclusions

This report evaluates the current status of a previously assessed site and presents conclusions about the public health threat, if any, posed by the site. These conclusions will include threats from individual pathways and a general conclusion of the health status of the site for the follow-up evaluation. Any health threats that have been determined for the general public as a result of this follow-up evaluation, including high-risk groups (such as children, the elderly, chronically ill people, and people engaging in high-risk practices), are summarized in the Conclusions section of the report. ATSDR has agreed to work with DoD and any other responsible parties to develop appropriate ways to stop or reduce exposure.

ATSDR is primarily an advisory agency, so its reports usually identify what actions are appropriate to be undertaken by DoD, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Summary

The Agency for Toxic Substances and Disease Registry (ATSDR) evaluated available environmental data and exposure information associated with the Anniston Army Depot (ANAD) and completed a public health assessment (PHA) of the ANAD site on January 12, 1999. This assessment did not identify any *completed* exposure pathways posing public health hazards. A health consultation (HC) was also completed on December 26, 2000 that found no apparent public health hazards from direct or indirect well water exposures at Cooper Catfish Lakes. However, the army purchased the Cooper property in the fall of 2007.[1] Recommendations from the 1999 PHA and the 2000 HC included continued monitoring of volatile organic compounds (VOCs) in the treated Cold Water Springs municipal water supply well and private off-site groundwater wells near the depot to ensure that future health hazards are not caused by changes in exposures to VOCs in the groundwater. Additionally, ATSDR agreed to review new data regarding hydrogeological characterization of the site.

This follow-up health consultation includes a review of information gathered since the 1999 PHA and the 2000 HC to evaluate whether any public health hazards have developed or been identified related to ANAD's groundwater contamination. Information reviewed includes water quality reports[2] from 2002 to 2008 and various technical environmental reports prepared by the Army and its consultants. ATSDR concludes from the review that the ANAD site currently poses *no apparent public health hazard* from direct exposure to groundwater, but that continued monitoring of the path and extent of groundwater contamination migrating from the ANAD site is still recommended due to the complex hydrogeology of the area and the large quantity of contamination still present in the subsurface. Additionally, review of a new pathway that poses an *indeterminate public health hazard*, vapor intrusion, is discussed.

Background

ANAD is an active facility occupying 15,200 acres in Calhoun County, Alabama, about 8 miles west of the city of Anniston (see Figure 1) and south of Fort McClellan's Pelham Range. The depot was built as an ammunition storage facility in the early 1940s. However, ANAD's mission was expanded during World War II to include combat equipment storage and maintenance. Part of the ANAD Reservation includes 6% of all of the U.S. Army's Chemical Weapons Stockpile. Since 1981, ANAD has disposed of its hazardous waste in licensed off-site landfills. Environmental management and cleanup activities at the site began in the late-1970's. The southeast industrial area of the ANAD site was placed on the National Priorities List in 1989, because waste from the facility's industrial processes had contaminated groundwater and on-site soil. The full extent of the groundwater contamination remains undefined due to lack of accurate geology data.

ATSDR previously identified the potential for exposure to trichloroethylene (TCE)-contaminated groundwater as the main concern from site contamination. Groundwater is used as a source for the local municipal water supply and private wells. Shallow and deep groundwater aquifers exist beneath the site and extend off-site through a network of complex hydrogeological structures.

Demographics and Land Use

Calhoun County is predominantly rural, especially to the north and west. Anniston is the largest City in Calhoun County and has an estimated population of 23,799.[3] Several other small communities border ANAD to the south and east, with the larger towns of Oxford and Coldwater located even further to the south and east. Figure 1 contains demographic statistics within one mile of the site from the 2000 U.S. Census.

Many people in Calhoun County, including residents of Anniston, Coldwater, and parts of Oxford, receive their water from the Anniston Water Works, as do the Army depots at ANAD and Fort McClellan. The primary water source for the Anniston Water Works is the Coldwater Spring, a groundwater source located 7 miles west of Anniston.[4] About 60,000 people (20,000 service connections) are served by Anniston Water Works.[5] TCE levels have been gradually increasing in Coldwater Spring since 2002.[6] A 2000 well survey also identified 70 private drinking water wells in the potentially susceptible area surrounding ANAD.[7] The 2000 U.S. Census showed 773 women of childbearing age, 314 children aged 6 and younger and 514 adults aged 65 and older were found to reside within one mile of ANAD (Figure 1).

Quality Assurance and Quality Control

The availability and reliability of information determine the validity of the analyses and conclusions drawn in this document. In preparing this document, ATSDR relied on environmental data and on discussions with ANAD representatives and other local and federal agency representatives. The majority of the environmental data presented herein come from monitoring programs and more detailed studies conducted by private contractors under contract with the U.S. Army. Quality assurance and quality control measures followed with regard to chain-of-custody, laboratory procedures, and data reporting are identified in the associated reports.

Discussion

ANAD is continuing its groundwater monitoring and public outreach efforts, as well as undertaking other studies to better define groundwater movement and to clarify the extent of possible TCE groundwater contamination associated with ANAD.

The Nature and Extent of Groundwater Contamination

An estimated 4,455,280 gallons (~27 million pounds) of TCE is present in groundwater at the ANAD.[8] Groundwater monitoring revealed that concentrations of TCE in a number of on-site monitoring wells exceeded the maximum contaminant level (MCL) of 5 μg/L, an enforceable drinking water standard considered protective of public health by the U.S. Environmental Protection Agency (EPA). Maximum concentrations for TCE in the Industrial, Northeast and Landfill Areas of the Southeast Industrial Area were respectively 25,000 μg/L, 130,000 μg/L and 53,000 μg/L.[9] Vinyl chloride concentrations were found to range from nondetect to 200 μg/L from June 2001 to June 2003 in one well.[10] Three geologic strata exist at the site: a weathered residuum (overburden) layer, a weathered bedrock layer and an unweathered bedrock layer. The

elevated TCE concentrations found during the 2004 sampling event were present in the upper layer, i.e. the residuum.[9] Due to the karst geology of the site, which has numerous fractures and subsurface caverns,[10] it is difficult to accurately determine groundwater flow from the site and possible contaminant migration. Groundwater flow at the site is generally towards the south, southeast and southwest.[10]

Exposures to TCE in the Public Water Supply

Surface water at the ANAD site infiltrates the complex geological structures below the site and ultimately recharges Coldwater Spring. Coldwater Spring is the primary source of water for the Anniston Water Works (AWW), which supplies water for the Anniston area. Work contracted by the U.S. Army Corps of Engineers included the analysis of VOCs, bis(2-ethylhexyl) phthalate and metals in water from 2002-2005 at the AWW Paul Krebs Treatment plant. Average TCE concentrations in the spring gradually increased from 3.4 µg/L in 2002 to 4.8 µg/L in 2006. Even though the TCE levels were below the MCL of 5 µg/L, an air stripping water purification system was installed in April 2005 as an added precaution.[11] The Army provided nearly $1.6 million to install the six packed column air stripper treatment train designed to remove TCE at the Paul B. Krebs Water Treatment Plant.[11] Post-treatment water was never observed to exceed the MCL of 5 µg/L and dropped to non-detect levels following installation of an air stripping treatment system in April 2005, except for a single 4 µg/L detection that occurred in November 2006.[6] No other constituents tested in the study exceeded their MCLs. In addition to Army monitoring, the AWW routinely analyzes for all VOCs, including TCE degradation products, under the Safe Drinking Water Act (SDWA), and, no exceedance of the MCL for TCE degradation products has been reported.[2]

The Safe Drinking Water Act requires public suppliers to test their water regularly for contaminants, including TCE. Anniston Water Works tests for TCE in the water supplied to the public either on a quarterly or annual basis. (Sampling frequency is increased to a quarterly basis, when the analytical detection limit for TCE is exceeded.) The AWW sampling shows that TCE concentrations have decreased significantly from approximately 4 µg/L to less than 0.5 µg/L, since installation of the air-stripping towers.[2] This data corroborates the U.S. Army Corps of Engineers results.[6] The Federal Drinking Water MCL considered safe for potable use is 5 µg/L for TCE. As shown in the table below, the drinking water supplied to the community has been consistently below this level. The MCL is a federally mandated drinking water limit and enforcement action is taken against public water suppliers who exceed this limit. Therefore, even if the Coldwater Spring supply water levels of TCE (or any of the other regulated chemicals, such as the TCE breakdown products cis-1,2-dichloroethylene and vinyl chloride) rise in the future, the treatment process must maintain the water supplied to the public below the MCL, switch to an alternative drinking water source or purify the contaminated water. The Anniston public water wells have been relocated in the past to protect the water supply from elevated levels of TCE in the groundwater. Annual drinking water monitoring results are available to the public for the AWW system at www.awwsb.org. More information on drinking water contaminants and MCLs can be found at http://www.epa.gov/safewater/contaminants/.

Coldwater Spring at the Paul E. Krebs Plant	*TCE (MCL 5 µg/L)*	*1,2-DCE(MCL 70 µg/L)*
2007	<0.5 µg/L	<0.5 µg/L
2006	<0.5 µg/L	<0.5 µg/L
2005	3.4 µg/L	0.6 µg/L
2004	3.7 µg/L	0.7 µg/L
2003	3.5 µg/L	0.7 µg/L
2002	4.1 µg/L	0.6 µg/L

Exposures to TCE in Private Wells

ANAD tested private drinking water wells in the area of the site to assess the possibility that private wells might contain ANAD-related TCE at concentrations greater than the MCL. ANAD defined a survey area to the east, south and west of the site and performed sampling of private wells in that 1.30 square mile area.[7] ANAD identified 123 wells in the survey area and the residents of those wells were contacted. ANAD identified 70 wells as the sole source of drinking water for residents and permission was granted to sample 66 of those wells. Permission to sample the remaining 4 wells was either denied, or the occupants/owners were not in residence to grant permission to sample.

ANAD tested the 66 private drinking water wells for VOCs in August 2001. All samples were below the detection limit for VOCs.[12] Additionally, 44 of the private wells were sampled in May of 2007 and found to contain contaminants below the MCLs.[13] Therefore, exposures to private well water near ANAD are *not likely to pose a health hazard*.

Residents who receive their drinking water from private wells are not required to test their well water. ANAD has provided testing of these wells and shared the results with the residents free of charge. However, EPA recommends testing all private water wells annually for contaminants. More information on testing of private water wells can be found at http://www.epa.gov/safewater/privatewells/.

Exposures to TCE in Indoor Air from Vapor Intrusion

Isoconcentration maps from the 2004 groundwater sampling event reveal that the elevated portions of the TCE and degradation plumes in the Southeast Industrial Area are contained on the site.[9] Therefore, the homes to the east of the Southeast Industrial Area are not expected to be susceptible to vapor intrusion from the migrating VOCs at this time, and the vapor intrusion pathway is considered to pose *no apparent public health hazard*. Further evaluation of this pathway may be warranted if volatile contaminants are found to have migrated below area residences in the future. Figure 2 was generated to identify individual off-site residences near the ANAD site boundary that may be compared to future isoconcentration maps of site related groundwater contamination. Such comparison may be used to evaluate future susceptibility of residences in this area to vapor intrusion.

Studies have shown that the TCE concentrations at the Coldwater Spring plant have been steadily increasing since 2002.[6] The source and pathway of TCE contaminating the Coldwater Spring well is unknown at this time. The Coldwater Spring plant is separated from the ANAD by approximately 1.5 miles of rural residential area. The geology below ANAD makes the migration of groundwater contamination and, thus, the off-gassing from groundwater contamination unpredictable. However, none of the residences near the ANAD facility have been shown to exist over contaminated aquifers, including the residences where private drinking water wells were sampled to the west of the Coldwater Spring plant. Additionally, a significant pressure gradient causing migration of volatiles from the subsurface into homes is not expected in this area, due to the region's warm climate. Therefore, the homes neighboring the ANAD are not expected to be susceptible to vapor intrusion from the migrating VOCs, and the vapor intrusion pathway is considered to pose *no apparent public health hazard*. Further evaluation of this pathway may be warranted if volatile contaminants are found to exist below area residences in the future.

Elevated concentrations of TCE and degradation products in groundwater onsite pose an *indeterminate public health hazard* from vapor intrusion to past, present and future onsite workers and other future populations that may inhabit onsite buildings in the area of groundwater contamination. The Army is presently investigating this pathway. Soil gas sampling was conducted in the summer of 2004, and the results will be analyzed and presented at a later date.[9] ATSDR is available to assist in review of this and other data that may become available, to evaluate the potential for this pathway to cause health effects.

Cooper Catfish Pond

Sampling in the fall of 1999 found elevated TCE (109 µg/L) and cis-1,2-dichloroethylene (155 µg/L) levels in the well used to fill the Cooper Catfish Lakes.[14] The spigot was removed and the well-head was plugged following these sampling events, though the well water still flows to the ponds via underground pipes. This prevents use of the water from the spigot as a potable source, but still allows replenishment of pond waters. Consumption of fish from these lakes were not expected to pose a public health hazard, because the levels detected in water were not high enough to pose a threat from fish taking up the VOCs.[15] In August 2000, the catfish lake well and four new monitoring wells installed on the property were sampled. The catfish lake well remained at 100 µg/L of TCE and the other wells did not have detectable amounts of contamination.[14] ATSDR maintains the conclusion from the 2000 Health Consultation[15] that direct and indirect exposures from contaminants in Cooper Catfish Lakes do not pose a public health hazard. The Army purchased the land where the Cooper Catfish Lakes were located in the fall of 2007 to allow continued monitoring of the off-site hydrogeologic conditions and no longer allows fishing in the ponds.[1]

Community Involvement

ATSDR Division of Regional Operations (ATSDR/DRO), regularly attends public availability sessions and actively works with community members with health concerns about exposure to site related chemicals in addition to PCBs from another site in Anniston. ATSDR/DRO

activities include providing health education materials, information on site-related contaminants and contact information for local health professionals.[16]

CHILD HEALTH CONSIDERATIONS

ATSDR recognizes that infants and children may be more sensitive to environmental exposure than adults in communities faced with contamination of their water or air. Children are smaller, therefore childhood exposure results in higher doses of chemical exposure per body weight. Children can sustain permanent damage if these factors lead to toxic exposure during critical growth stages. TCE is suspected to affect a developing fetus. ATSDR is committed to evaluating their special interests at sites such as ANAD, as part of the ATSDR Child Health Initiative. ATSDR evaluated the likelihood that children or pregnant mothers living near the ANAD site may have been or may be exposed to contaminants at levels of health concern. In the previous Health Consultation, ATSDR did not identify any situations in which children were likely to be, or have been, exposed to chemical contaminants attributed to the ANAD site. ATSDR has found no change to this assessment: direct exposure to groundwater poses *no apparent public health hazard* and indirect exposure to volatile chemicals migrating from groundwater into indoor air poses *no apparent public health hazard* from the ANAD site. None of the residences near the ANAD facility have been shown to exist over contaminated aquifers. Areas with contaminated groundwater on-site are for industrial use only, i.e. no children are expected in these areas. Further evaluation of childhood exposures (direct or indirect) may be warranted if volatile contaminants are found to exist below area residences or if future use of the ANAD facility changes to allow children's presence within 100' of contaminated groundwater on-site.

Conclusions

On the basis of ATSDR's evaluation of environmental information collected during site characterization and remedial processes since 1999, ATSDR concludes the following:

1. *Municipal Water*: The public drinking from Anniston Water Works poses *no public health hazards* related to VOCs. The Anniston Water Works drinking water supplied to the public does not contain VOCs at concentrations greater than the MCL. Public water supplies, such as the Anniston Water Works, are tested regularly, so residents served by public supplies will not be exposed to dangerous VOC concentrations in their drinking water.

2. *Private Well Water*: Water from private wells near ANAD poses *no apparent public health hazards*. ANAD has identified and tested 66 private wells in the areas near the depot that are most likely to be affected by VOC contamination from ANAD. None of the private wells contained VOCs at concentrations greater than the MCL. ANAD continues to characterize groundwater/contaminant flow from the site and to monitor on-site, site boundary, off-site, and private well water quality to prevent a public health hazard from occurring.

3. *Vapor Intrusion*: None of the residences near the ANAD facility have been shown to exist over contaminated aquifers. Additionally, a significant pressure gradient causing migration of volatiles from the subsurface into homes is not expected in this area, due to the warm

climate region. Therefore, exposure to vapors migrating from the subsurface into buildings and residences off-site are expected to pose *no apparent public health hazard*. However, onsite buildings currently within 100 feet of the onsite contaminated groundwater plumes pose an *indeterminate public health hazard*.

Recommendations

1. ATSDR recommends continued efforts to define the possible extent of off-site groundwater contamination and its migration, due to the complex hydrogeology of the site.
2. ATSDR recommends that ANAD continue efforts to identify and test private wells in the potentially contaminated areas.
3. ATSDR recommends that ANAD continue monitoring of susceptible drinking water sources (public and private) for TCE and its degradation products cis-1,2-dichloroethylene and vinyl chloride.
4. ATSDR recommends evaluation of the vapor intrusion pathway
    - for occupied on-site buildings within 100 feet of contaminated groundwater plumes
    - for occupied off-site buildings, if volatile contaminants are found in groundwater within 100 feet of the buildings in the future.
    - for underground conduits on ANAD where people may enter

Public Health Action Plan

The Public Health Action Plan (PHAP) for ANAD contains a description of actions taken, and those to be taken, by ATSDR, the Army, and ANAD at, and in, the vicinity of the site after completion of this public health assessment. The PHAP is designed to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action to mitigate and prevent adverse human health effects resulting from potential exposure to hazardous substances in the environment. The public health actions that are completed, being implemented, or planned are as follow:

Completed Actions

1. ANAD identified and sampled private wells in the vicinity of the ANAD site .
2. ANAD conducted monthly sampling of the water source for AWW (Coldwater Spring) at an upwelling near the plant, at the plant intake, and at the tap post-treatment.

Ongoing Actions

1. ANAD will continue monitoring groundwater, conducting fault and geophysical studies. These activities will provide information to determine if TCE groundwater concentrations

may exceed the MCL in off-site areas in the future. Future monitoring may provide more complete information on the potential for contaminated groundwater migration.

2. ANAD continues to offer sampling and analysis to private well owners near the site. If VOCs are detected in well water, ANAD will provide bottled drinking water to the well owners. The water will then be treated (with a home water treatment unit provided by ANAD) until the water is safe to drink.
3. In early 2008, the Army initiated a workplan that will identify any potential vapor intrusion pathways onsite. The purpose of the vapor intrusion monitoring plan will be to address potential indoor inhalation risk, in accordance with relevant Alabama Department of Environmental Management, Army and EPA guidelines. The plan should cover the buildings within the Southeast Industrial Area of the depot that are identified to potentially have indoor inhalation risk as a result of impacts from contaminated groundwater at the Southeast Industrial Area.

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[12] *NPL fact sheet*, Anniston Army Depot, Southeast Industrial Area, FY05

[13] *Results of 2007 Annual Private Well Sampling*, Memorandum from Brian Murray, Science Applications International Corporation, to Pat Smith, Anniston Army Depot, July 19, 2007.

[14] *Anniston Army Depot, Alabama, Army Defense Environmental Restoration Program Installation Action Plan*, July 31, 2006.

[15] *Health Consultation, Anniston Army Depot (SE Industrial Area)*, Bynum, Calhoun County, Alabama, December 26, 2000.

[16] Carl Blair, Regional Representative, ATSDR/DRO, personal communication, September 12, 2007.

Figure 1. Anniston Army Depot Demographics Information

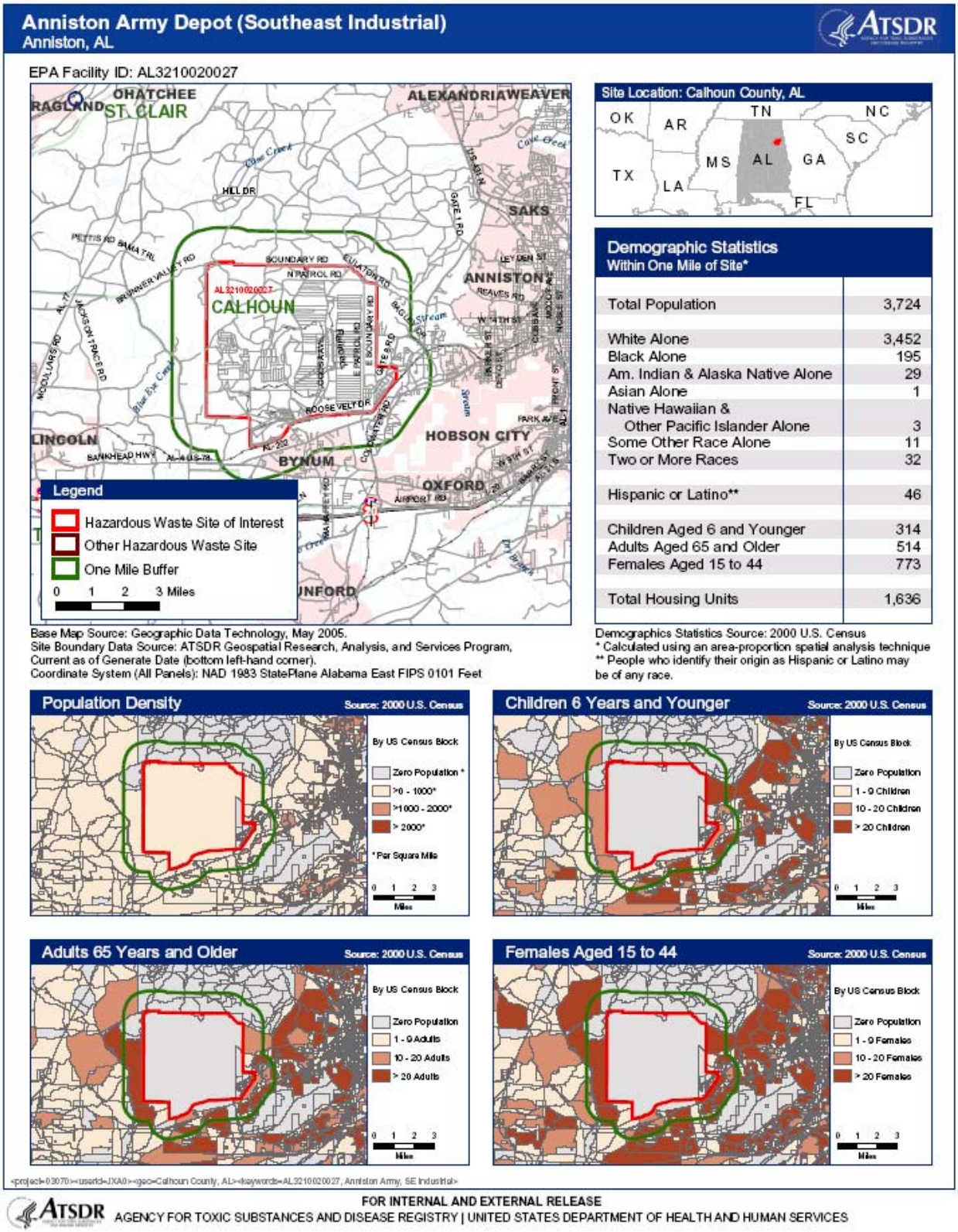

Figure 2. Residences Bordering Southeast Industrial Area Complex