Health Consultation

GULFSIDE ELEMENTARY SCHOOL

HOLIDAY, PASCO COUNTY, FLORIDA

JULY 28, 1998

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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HEALTH CONSULTATION

GULFSIDE ELEMENTARY SCHOOL

HOLIDAY, PASCO COUNTY, FLORIDA

Prepared by:

Florida Department of Health
Bureau of Environmental Toxicology
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Background and Statement of Issues

In December 1997, the Pasco County School Board asked the Florida Department of Health (Florida DOH) to evaluate the potential health threat to students and staff from exposure to chemicals and radionuclides at the Gulfside Elementary School in Holiday, Florida (1). The school board is concerned that soil, construction materials, and air at the school may contain chemicals from the nearby Stauffer Chemical Company (Stauffer) Superfund site (CERCLIS No. FLD010596013). They are concerned that any chemical and radiological contaminants in the soil, construction materials, and air at the school may pose a health risk to adults working at or children attending the school.

This health consultation will assess the public health threat from contaminants found on the Gulfside Elementary School property. Florida DOH has evaluated the public health threat from materials on the Stauffer site in a previous report (2). The interpretation, advice, and recommendations presented in this report are situation-specific and should not be considered applicable to any other situations.

Gulfside Elementary School is located at 2329 Anclote Boulevard in Holiday, Pasco County, Florida (Figures 1 and 2). The school opened in the fall of 1977 and has about 690 children enrolled in grades pre-kindergarten (PK) through 5. The children range in age from 3 to 11 years. The student body is about 53% male and 47% female, and about 91% white, 2% black, 3% Hispanic, 2% Asian, and 2% Indian/other races. In addition to the regular school year from August to June, students may also attend summer session during the month of July. All students spend about one hour outside during the school day for recess or physical education/sports (3). The school is currently building a separate playground area for pre-kindergarten children. When construction is completed, these children will not have access to the rest of the school grounds. A groundcover in this playground area will reduce or eliminate contact with the soil.

According to 1990 census data (4), about 3,200 people live within a one mile radius of the school. Median family income in this area ranges from about $23,000-52,000 per year. Racial makeup of the population is about 96% white and 3.5% black. A hospital, a nursing home, and a children's group home are within one mile of the school. There are about 100 private wells within this same area.

Across Anclote Boulevard south of the school is the Stauffer Chemical Company site (Stauffer). The Stauffer site consists of two areas separated by Anclote Road (Figure 2). The main plant site is between Anclote Road and the Anclote River, about one mile east of the Gulf of Mexico, in Tarpon Springs, Pinellas County. The plant, which extracted elemental phosphorus from phosphate ore, is inactive. Many buildings and other structures have been dismantled and removed from the site. The area between Anclote Boulevard and Anclote Road contained production wells for process water and was used for storage of slag material. This slag is a gravel-like material produced by crushing solidified phosphate ore after the elemental phosphorus was extracted.

Soil and air at the school have been sampled on a number of occasions. In April 1989, contractors for the U.S. Environmental Protection Agency (EPA) collected two surface soil samples (depth not specified) from the school grounds (5). They analyzed the samples for chromium, lead, and manganese. On July 21, 1993, contractors for Stauffer collected three surface soil samples (0-3 inches deep) from the Gulfside property (6). They analyzed the samples

for metals, cyanide, fluoride, total phosphorus, radium-226, and polonium-210. On February 21, 1996, Stauffer contractors collected and analyzed nine more surface soil samples from the school (7).

Between July 10 and August 11, 1997, contractors for the Pasco County School Board collected 10 air samples (4 outside and 6 inside the school building) and 21 surface soil samples (0-3 inches deep) from the school grounds (8). They analyzed the air samples for phosphorus, phosphorus pentoxide, phosphoric acid, and asbestos. They analyzed the soil samples for total phosphorus, phosphoric acid, and asbestos.

On September 19, 1997, contractors for the Pasco County School Board collected three soil/aggregate samples from beneath asphalt paving, two samples of asphalt paving material, and one sample of roofing aggregate from the school building (9). Aggregate is gravel that was used as a construction material. This material was sampled because of concern that it may be slag that came from the Stauffer site (1). The contractors analyzed these samples for various radiological properties, including polonium-210 and radium-226.

Table 1 shows the maximum level of each chemical of potential health concern in the aggregate, soil, and air samples collected at the school. Chemicals not shown in the table are below levels of human health concern. We selected these chemicals based on community concerns and by comparing the maximum concentration to standard comparison values. A comparison value is used as a means of selecting environmental contaminants for further evaluation to determine whether exposure to them has public health significance. Those contaminants that are known or suspected human carcinogens were evaluated for both carcinogenic and non-carcinogenic adverse health effects.

Table 1. Maximum Contaminant Levels in Soil/Aggregate and Air Samples

CONTAMINANT	MAXIMUM CONCENTRATION-SOIL/AGGREGATE	MAXIMUM CONCENTRATION-AIR
ANTIMONY	13.2 mg/kg	NA
ARSENIC	0.6 mg/kg	NA
CHROMIUM	23.9 mg/kg	NA
PHOSPHORIC ACID	7.3 mg/kg	ND
PHOSPHORUS	NA	11 $\mu g/m^3$
POLONIUM-210	2.9 pCi/g	NA
RADIUM-226	1.99 pCi/g	NA
VANADIUM	17.2 mg/kg	NA

mg/kg - milligrams per kilogram of soil
$\mu g/m^3$ - micrograms per cubic meter of air
pCi/g - picoCuries per gram of aggregate
ND - not detected
NA - not analyzed
Sources: (5, 6, 7, 8, 9)

Discussion

To evaluate health effects, the Agency for Toxic Substances and Disease Registry (ATSDR) has developed Minimal Risk Levels (MRLs) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. ATSDR has developed an MRL for each route of exposure, such as ingestion, inhalation, and dermal contact, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 365 days), and chronic (greater than 365 days). ATSDR presents these MRLs in Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. The U.S. Environmental Protection Agency (EPA) has developed reference doses (RfDs) to evaluate non-cancer health effects resulting from exposure to chemicals at Superfund sites.

Both MRLs and RfDs are health guideline values that are usually derived from experimental animal data, based on broad assumptions, and corrected by a series of uncertainty factors. Thus, the values serve only as guidelines and not as absolute values that explicitly divide ranges of safety from ranges of risk. Additional medical or toxicological information must be evaluated to determine what adverse health effects are likely from exposure to chemicals of concern at a site.

Exposure in Children--Because this is an elementary school, the health effects from exposure to chemicals in young children are a special concern. Children are generally exposed to greater levels of contaminants in soil because their activities bring them into greater contact with the soil. They are often more sensitive to the effects of chemical exposures than adults. About 15% of children ages one to three exhibit a condition known as "pica" in which they eat relatively large amounts of soil (about 5,000 milligrams [1 teaspoon] per day) (10).

Because there is a pre-kindergarten class with three-year-olds, we have estimated the health effects from exposure in pica children using a soil ingestion rate of 5,000 milligrams (mg) per day. For children at the school who are above this age, we used a more typical soil ingestion rate of 200 mg per day to calculate their exposure. We assumed a body weight of 10 kilograms (kg) (about 23 pounds) for the pica children and 15 kg (about 35 pounds) for older children. We also assumed exposure was to the maximum level of each chemical in the soil samples. Since some children may attend summer school, we assumed that exposure could occur five days per week, year-round, for the seven years that a child could attend the school.

Pica Children--The maximum estimated daily dose of arsenic from incidental ingestion of soil by pica children at the school is 10 times less than ATSDR's chronic oral MRL (11). Arsenic is a known human carcinogen. However, lifetime exposure (70 years) to the maximum estimated daily dose of arsenic in soil at the school would result in no significant increase in the risk of cancer. Therefore, no illnesses are likely in pica children from incidental ingestion of arsenic in soil on the school grounds.

Arsenic is not readily absorbed through the skin. Direct skin contact with high levels of arsenic can cause redness and swelling. However, skin contact with the low levels of arsenic in the soil at the school is not likely to cause any irritation. Therefore, no illnesses are likely from skin contact with arsenic in the soil.

Very little is known about the health effects in humans who eat soil with low levels of antimony (12). Without human studies, the EPA has established a human reference dose for antimony based on studies in rats. Rats fed levels of antimony higher than those found at this school were less able to regulate their blood pressure. Their ability to regulate their blood pressure returned when they stopped eating antimony. Rats fed antimony similar to the low levels found at this school suffered no illnesses.

To be protective of human health, the EPA has established a human reference dose for antimony at a level 100 times lower than the lowest level causing this effect in rats. Although the maximum dose of antimony we calculated for a pica child at this school is above the EPA's human reference dose, it is still 10 times lower than the lowest level causing effects in rats. It is therefore unlikely that any human illness would result from incidental ingestion of antimony-contaminated soil by pica children at this school.

We do not know how readily antimony may be absorbed through the skin. However, antimony in soil binds very tightly to soil particles so that it cannot easily enter the body through the skin. Dermal exposure to antimony does not cause sensitization of the skin. Therefore, illnesses are not likely from skin contact with antimony in soil at the school.

The maximum estimated daily dose of chromium in pica children exceeds the EPA reference dose for this chemical. The only effect observed in humans exposed to chromium at this level, however, is a worsening of dermatitis (a skin disorder) in chromium-sensitive individuals. Chromium sensitivity usually occurs only in adult workers who breathe high levels of chromium for long periods or handle liquids or solids that have chromium in them (13). Small children are not likely to have received this kind of exposure and thus are unlikely to be chromium-sensitive. Therefore, it is not likely that illnesses will occur from incidental ingestion of chromium in soil on the school grounds.

Chromium is not readily absorbed through the skin. Skin rashes and other skin problems can occur in chromium-sensitive individuals whose skin is exposed to chromium. However, the amount of chromium necessary for this reaction is about 35 times the amount found in the soil at the school. Therefore, no illnesses are likely from skin contact with chromium in school soil.

The maximum estimated daily dose of vanadium in pica children slightly exceeds ATSDR's intermediate oral MRL. This dose, however, is 100 times less than the level at which minor effects have been observed in the kidneys of rats. No effects have been observed in humans at this level (14). Therefore, it is not likely that illnesses will occur from incidental ingestion of vanadium in soil on the school grounds.

Vanadium is unlikely to be absorbed through the skin. Contact with vanadium is not known to cause any skin problems. Therefore, no illnesses are likely from skin contact with vanadium in soil at the school.

Non-Pica Children--The maximum estimated daily dose of arsenic from incidental ingestion of soil by non-pica children at the school is more than 1000 times less than ATSDR's chronic oral MRL (11). Arsenic is a known human carcinogen. However, lifetime exposure to the maximum estimated daily dose of arsenic in soil at the school would result in no significant increase in the risk of cancer. Therefore, no illnesses are likely from incidental ingestion of arsenic in soil on the school grounds.

Arsenic is not readily absorbed through the skin. Direct skin contact with high levels of arsenic can cause redness and swelling. However, skin contact with the low levels of arsenic in the soil at the school is not likely to cause any irritation. Therefore, no illnesses are likely from skin contact with arsenic in the soil.

Antimony, chromium, and vanadium are all below levels of health concern in children who do not exhibit pica behavior.

Exposure in Adults--Adult employees of the elementary school who come in contact with the soil on the school grounds may be exposed to the chemicals found there. The maximum estimated exposure doses for adults are below levels of health concern for all chemicals. Therefore, illnesses are unlikely in adults who are exposed to chemicals in the soil at the school.

The maximum levels of radium-226 and polonium-210 in the soil and aggregate at the school are well within the natural range for these radionuclides (15, 16). Because the measured levels of radium-226 and polonium-210 are not elevated above naturally-occurring concentrations, no excess exposure is likely. Exposures to sources of background radiation at levels similar to these have not been shown to increase the risk of cancer (17). Radium-226 and polonium-210 are also not readily absorbed through the skin. Therefore, no illnesses are likely in children or adults from exposure to these radionuclides in soil and aggregate at the school.

Phosphoric acid measured in soil at the school is a weak acid. There is no evidence that illnesses result from contact with phosphoric acid (18). No asbestos was found in any soil samples at the school.

Phosphorus (elemental) in indoor and outdoor air samples was at a level below human health concern. No phosphorus pentoxide, phosphoric acid, or asbestos was found in any air samples at the school. Therefore, no illnesses are likely from inhalation of these chemicals.

Conclusions

Based upon the information reviewed, we conclude that illnesses are unlikely in adults, pica children, and non-pica children from exposure to contaminants in soil, aggregate, and air at the Gulfside Elementary School. Completion of the playground for pre-kindergarten students will eliminate any exposure of these children to chemicals in the soil. If additional information becomes available concerning chemical exposures at the Gulfside Elementary School, Florida DOH will evaluate that information to determine what actions, if any, are necessary.

Recommendations

The Florida Department of Health recommends no further public health actions regarding the soil, aggregate, and air at the school.

References

1. District School Board of Pasco County. Letter to Bruce Tuovila, Florida Department of Health, from George Renninger, District School Board of Pasco County, regarding a health assessment of potential risk from exposure to radionuclides. December 3, 1997.

2. Florida Department of Health. Preliminary Public Health Assessment for Stauffer Chemical Company/Tarpon Springs, Tarpon Springs, Pinellas County, Florida. FDOH: Tallahassee, August 4, 1993.

3. District School Board of Pasco County. Memorandum to Bruce Tuovila, Florida Department of Health, from George Renninger, Pasco County School Board regarding Gulfside Elementary School. February 26, 1998.

4. Bureau of the Census, U.S. Department of Commerce, Washington, DC, 1990 Census Data Files.

5. NUS Corporation. Interim Final Listing Site Inspection Report, Stauffer Chemical Company Site, Tarpon Springs, Pinellas County, Florida. March 11, 1991.

6. Roy F. Weston, Inc. Final Site Remedial Investigation Report, Stauffer Management Company, Tarpon Springs, Florida. December 1993.

7. Roy F. Weston, Inc. Analytical Results, Additional Soil Sampling Program, Gulfside Elementary School, Stauffer Management Company, Tarpon Springs, Florida Site. April, 1996.

8. Evans Environmental & Geological Science and Management, Inc. Gulfside Elementary School, Environmental Monitoring Program 1997. Summer 1997.

9. Evans Environmental & Geological Science and Management, Inc. Letter to George Renninger, Pasco County School Board, from Michael Garman, EE&GSM, regarding results of radiological analysis of soil/aggregate samples. October 29, 1997.

10. U.S. Environmental Protection Agency. Exposure Factors Handbook, Volume I, General Factors. EPA/600/P-95/002Fa. August 1997.

11. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Arsenic (Update). ATSDR: Atlanta, April 1993.

12. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Antimony. ATSDR: Atlanta, September 1992.

13. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Chromium (Update). ATSDR: Atlanta, April 1993.

14. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Vanadium. ATSDR: Atlanta, July 1992.

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18. Clayton CD and FE Clayton. Patty's Industrial Hygiene and Toxicology, Vol. 2A. New York: John Wiley & Sons, 1981:2125.

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CERTIFICATION

This Gulfside Elementary School Health Consultation was prepared by the Florida Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Roberta Erlwein
Technical Project Officer
Division of Health Assessment and Consultation (DHAC)
ATSDR

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

for Richard Gillig
Chief, SSAB, DHAC, ATSDR

Figure 1. State Map Showing Location of Pinellas and Pasco Counties.

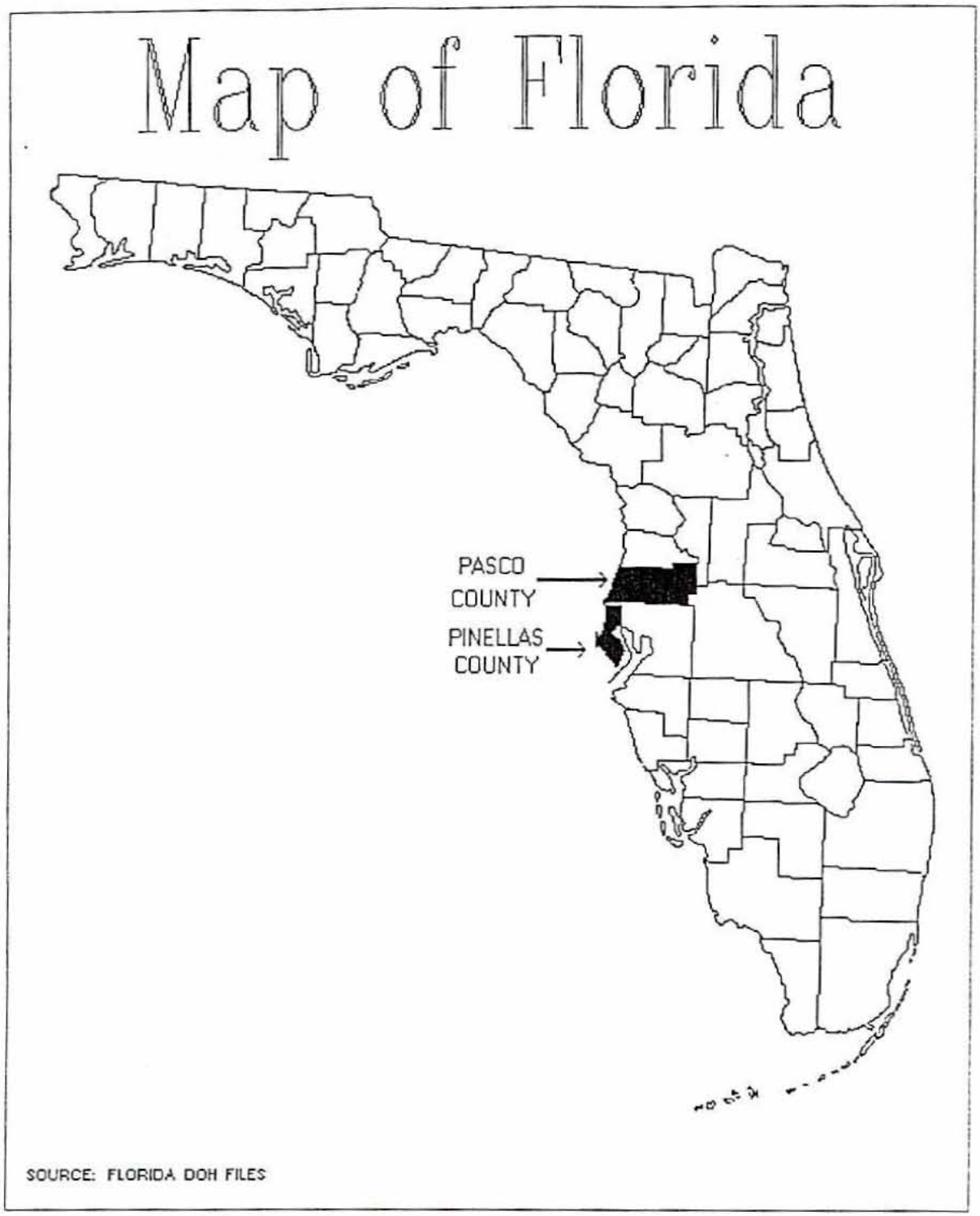


Figure 2. Location of Gulfside Elementary School

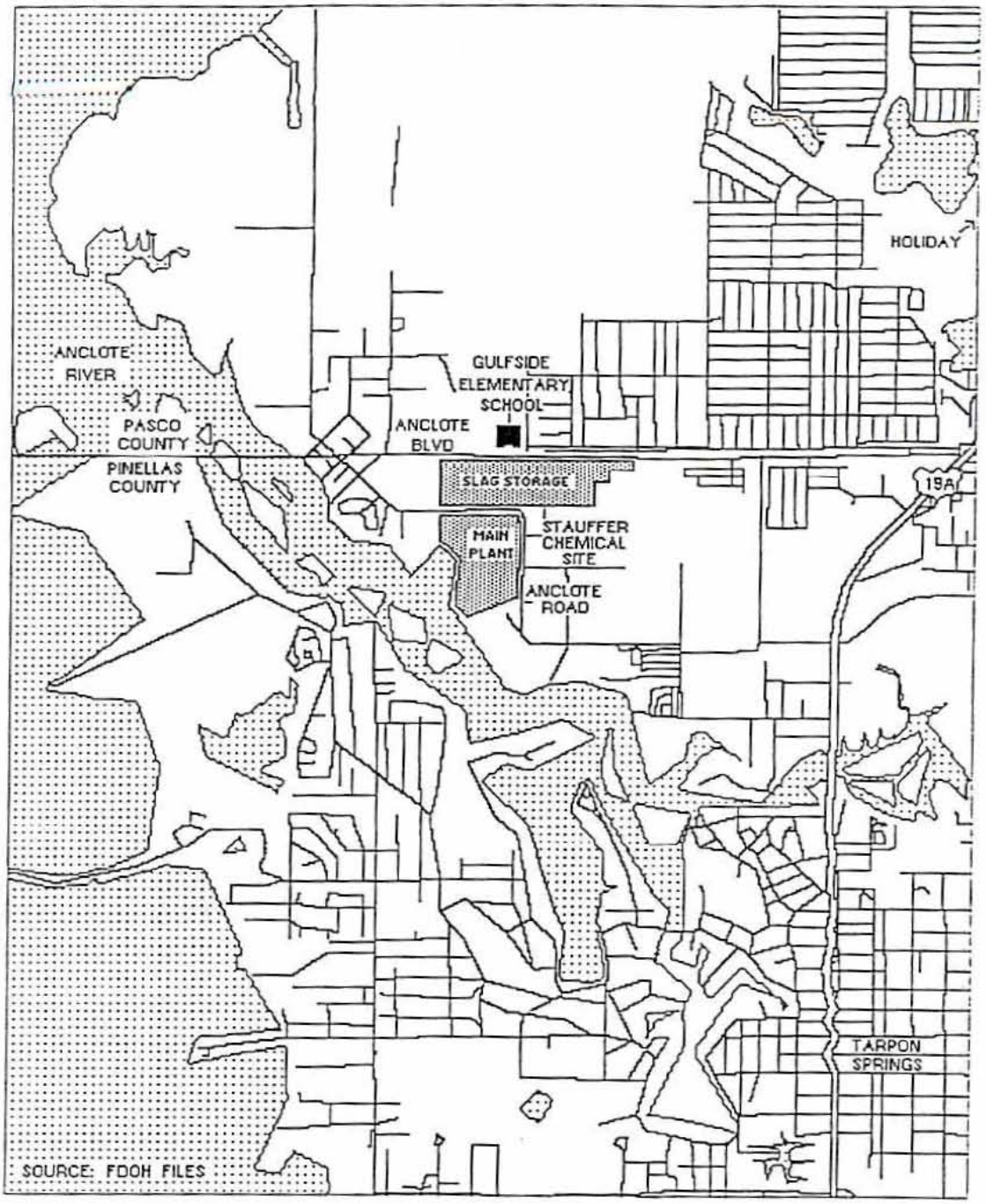
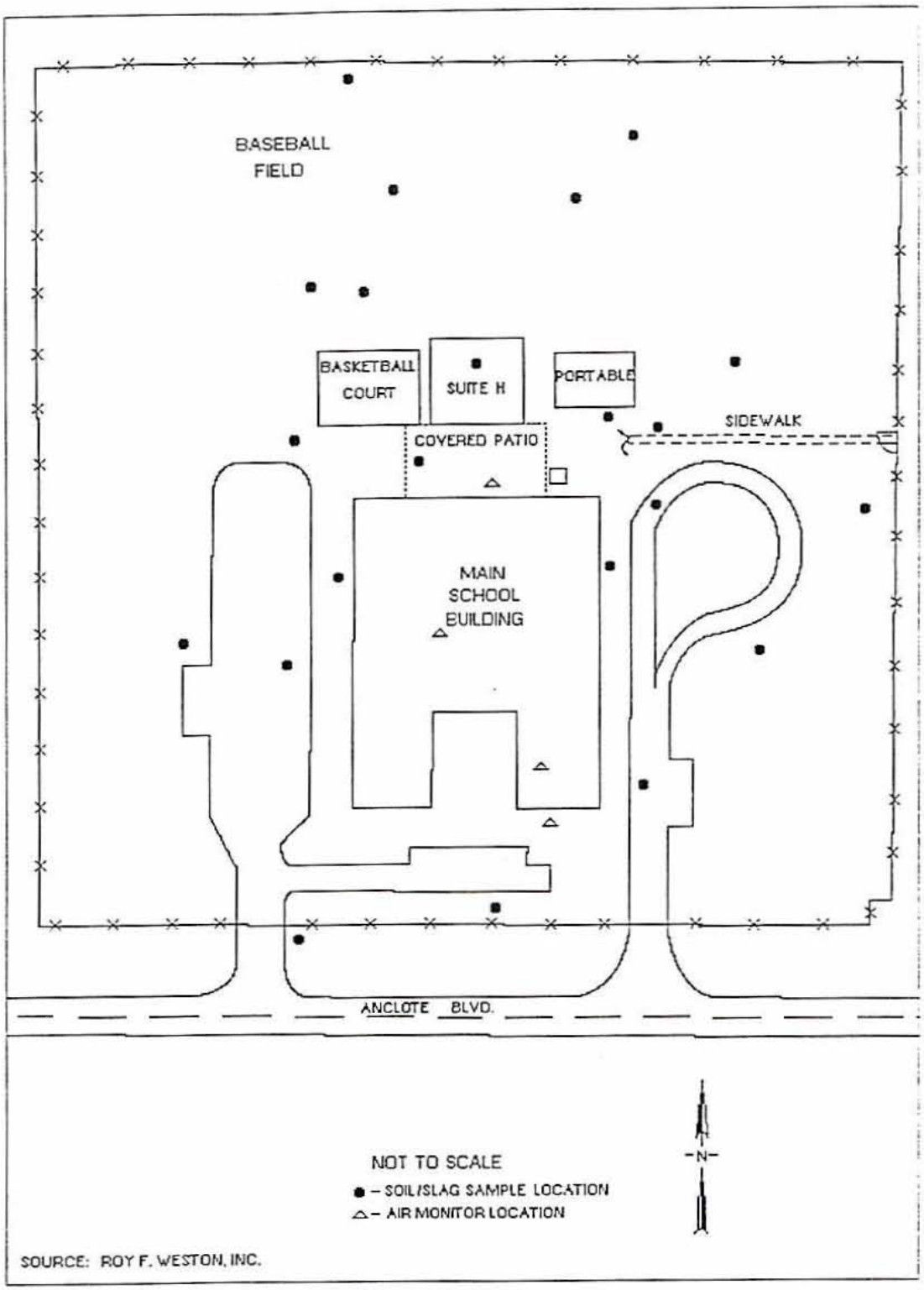


Figure 3. Sampling Locations at Gulfside Elementary School



Response to Public Comments

Presented below is a summary of the comments received during the public comment period and our responses.

1. One comment identified additional sampling data for the Gulfside Elementary School property.

The results of the 1989 sampling at the school were incorporated by reference in a later report evaluated for this health consultation. The report has been added as a separate reference to clarify the extent of sampling conducted as the school.

2. One comment indicated that analyses for phosphoric acid were actually for total phosphorus.

While soil samples analyzed by Stauffer contractors were only for total phosphorus, contractors for the school did analyze for phosphoric acid (ortho-phosphate). The health consultation has been amended to reflect that only total phosphorus was analyzed for by Stauffer contractors.

3. One comment suggested that 400 milligrams per day (mg/day) was a more appropriate ingestion rate for pica children than 5,000 mg/day.

The most recent version of the EPA Exposure Factors Handbook references the use of 5,000 mg/day in risk assessments conducted by EPA. The report also indicates that the Centers for Disease Control have used 10,000 mg/day. ATSDR uses 5,000 mg/day as an ingestion rate for pica children when information about actual ingestion rates are not known. We will continue to use 5,000 mg/day when no information is available about actual rates.

4. One comment indicated that the length of pica behavior in children was not clearly stated in the exposure assumptions.

Pica behavior, although most common in children 1-3 years old, can also occur in older children. Therefore, we have chosen to be conservative in our exposure estimates by using chronic (> 1 year) exposure reference guideline values.

5. Two comments expressed concern about the accuracy of the census data reported in the health consultation and the use of averages to describe the population within one mile of the school.

The most recent census data available to us is a 1994 update of the 1990 census. The data indicate the presence of about 100 private wells within one mile of the school. The reference to socioeconomic status has been changed to reflect the range of median family incomes in the area.

6. One comment concerned the use of the EPA reference dose in evaluating likely health effects from exposure to chemicals found in soil at the school.

An explanation of the nature and use of reference doses and minimal risk levels has been added to the health consultation.

7. One comment asked about the likelihood of children becoming chromium-sensitive from exposure to chromium in the soil.

Ingesting chromium has not been reported to cause chromium sensitivity in humans. People breathing chromium in the air or handling fluids or solid materials containing chromium can develop a sensitivity to chromium. People who become chromium-sensitive have generally received skin doses ten times higher than the maximum that a pica child could receive from contact with soil at the school. Those who become chromium-sensitive from breathing chromium have been exposed to inhalation doses at least 100 times higher than a pica child could receive from exposure to dust at the school. In addition, chromium sensitivity develops most readily from exposure to chromium VI. Chromium in soil is predominantly in the form of chromium III, which does not cause sensitivity reactions as readily as chromium VI. Therefore, it is unlikely that pica or non-pica children could develop chromium sensitivity from exposure to chromium in soil at the school.

8. One comment expressed concern that only surface soil samples 0-3 inches deep were collected and analyzed from the school grounds.

Students at the school are most likely to come in contact with chemicals that are in the first few inches of soil. Therefore, we consider it most important to determine the levels of contaminants that are present where children are likely to receive the highest exposure.

9. One comment indicated that the map of the school and Stauffer site was incorrect.

The map in the health consultation is adapted from figures in several reports and shows the correct relationship between the school and the Stauffer site.

10. One comment indicated that dermal and inhalation exposure to chemicals should have been considered in the health consultation.

Elemental phosphorus, phosphorus pentoxide, phosphoric acid, and asbestos were analyzed for in the air at the school. The possible health effects from inhalation of these chemicals were evaluated in the health consultation. Information about the effects of dermal exposure to chemicals found in the soil at the school has been added to the health consultation.