Health Assessment for

BEULAH SANITARY LANDFILL

CERCLIS NO. FLD980494660

ESCAMBIA, FLORIDA

MAY 31, 1990

THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i)(7)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

PRELIMINARY HEALTH ASSESSMENT

Beulah Sanitary Landfill

Proposed National Priorities List Update #7 Site

Escambia County, Ensley, Florida

Prepared by:

Florida Department of Health and Rehabilitative Services

Under Cooperative Agreement with the

Agency for Toxic Substances and Disease Registry

SUMMARY

The Beulah Landfill proposed National Priorities List (NPL) site is located three miles west of Ensley, Escambia County, Florida. On-site contaminants at probable health concern levels are lead, thallium, chloroform, benzene, polychlorinated biphenyls (PCBs) and chlordane. Based on site conditions, the contaminants found on site could readily migrate off site via surface water or ground water. Off-site migration poses a threat to human exposure through ingestion and dermal absorption of contaminated surface water or animals that live in surface water, ground water, or soils. To a lesser extent, contaminants may also migrate off site in air, thereby posing a potential threat to human exposure via inhalation of windblown particles and volatilized contaminants.

Based upon information reviewed, it is concluded that this site is of potential public health concern because of the risk to human health from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Human Exposure Pathways section below, human exposure to chlordane, thallium and PCBs could occur on site via incidental ingestion, inhalation and dermal absorption of the contaminated sludge.

BACKGROUND

A. Site Description

The 80-acre Beulah Landfill site is a former county sludge disposal and landfill site which operated from 1950 to 1984. The site is separated into two tracts of approximately equal size that were operated independently. Coffee Creek was rerouted to bisect the site (west to east): it flows into Eleven Mile Creek which borders the eastern side of the site (see Figure). Most of the land immediately surrounding the site is undeveloped. However, there are private homes south and southwest of the site and the nearest house is within 400 feet. Several homes lie within 1000 feet northeast and east of the site, but no development is present within a half mile due north or west of the site.

The landfill is owned by Escambia County. Initially the northern area of the site was used primarily for the disposal of municipal trash and the south side received municipal trash and industrial waste. Wastes were buried in unlined cells which varied in depth from four feet to 35 feet below the surface. The southern tract began receiving domestic sewage, domestic sludge and municipal wastewater treatment sludge in 1968. Sludges and other liquids initially received at the landfill were placed into unlined, bermed holding and drying ponds. These holding ponds became saturated with sludge and were subsequently filled with construction and demolition debris and other solid waste. The fill in the ponds was covered in 1976. In 1977, sludges were again deposited on top of the holding pond waste cells in the southern tract. From February 1980 until closure in 1984, the landfill operated under a consent order with the Florida Department of Environmental Regulation (DER) which stipulated the types of wastes which could be accepted.

Site conditions and stormwater management practices were and are conducive to the movement of contaminants off site via ground water percolation and surface water run-off. Highly permeable sands underlie the site because the southern half of the site overlies the original channel of Coffee Creek. In the past, these sands probably facilitated the rapid percolation of water from the sludges. During heavy rainfall, the overflow from the disposal ponds drains directly into Eleven Mile Creek via six ten-inch diameter drainage pipes. The clay berm which surrounds the disposal ponds has ruptured several times in the past, releasing the septic tank sludge directly into the creek. Leachate from the landfill was observed flowing into Coffee Creek during a DER site inspection in 1980. Currently there is a minimum of cover over mostly uncompacted solid waste and sludge. Escambia County was required by DER to submit a ground water monitoring plan to properly close the landfill. The county contracted Meister and Assoc., Inc. (M & A) for the design and implementation of a ground water monitoring system. M & A completed the plan and installed the wells before DER approved the monitoring system. DER is currently awaiting the submittal of a revised monitoring plan.

The county later contracted with HDR Techserv, Inc. who maintain that ground water flows in the direction of both Coffee and Eleven Mile Creeks and therefore, the site has "purged itself of contaminants due to the easy migration of water through the site and into the adjacent streams". HDR Techserv recommends stormwater control and an extensive ground water monitoring plan as the best final action solution. In addition to the sampling carried out by HDR Techserv and M & A, the site and surrounding area have been sampled several times since 1975 by DER and the U.S. Environmental Protection Agency (EPA).

B. Site Visit

A site visit was conducted by staff from the Florida Department of Health and Rehabilitative Services Health Office and ATSDR in March 1989. The site is not fenced, but access to the site is restricted by a line of 55-gallon drums which are connected with heavy gauge steel cable. This line of barrels and the trees which grow up to the edge of the road effectively block vehicle traffic. Recreational use of the site is indicated by the presence of shotgun-shell casings and a circle of beer bottles on the surface of the sludge in one of the lagoons. One excavated area of the site appears to have recently been used as a "track" for all-terrain vehicles, although it is not apparent how the vehicles entered the site.

Natural vegetation and planted pines have taken over much of the site. The pines do not grow in former sludge disposal areas. There are areas of erosion potential that exhibit little cover, exposed waste, steep sided slopes, and poor drainage. No apparent leachate seeps were noticed on the day of the site investigation. According to HDR Techserv, Inc., much of the solid waste at the surface of the site is compacted.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. On-Site Contamination

Contaminants at probable health concern levels were reported in ground water by Meister and Associates, Inc., in their 1985 Beulah Landfill Monitoring Plan for Escambia County. Contaminants at probable health concern levels were reported in sludge by the EPA in their Hazardous Waste Site Investigation Status reports (EPA, 1975 and EPA, 1980). Sampling results are listed below.

MEDIA	Contaminant	RANGE (UNIT)
Ground Water	Lead	20 - 70 ug/L
	Chloroform	6.0 - 130 ug/L
	Benzene	1.0 - 2.0 ug/L
Sludge	Alpha-chlordane	BDL - 0.40 mg/kg
	Gamma-chlordane	BDL - 0.40 mg/kg
	PCB-1260	BDL - 560 mg/kg
	Thallium	10 - 50 mg/kg

BDL - Below Detection Level

B. Off-site Contamination

Contaminants at probable health concern levels have not been reported off the site. The Hazardous Waste Site Investigation Status report (EPA, 1975) indicated that elevated levels of metals were present in surface water off site, although these levels do not exceed probable health concern levels.

C. Physical Hazards

Physical hazards posed by this site include the sludge which has not been covered, uncompacted solid waste at the land surface and possibly the wastes themselves including broken glass, rusted metal, etc. Some of the sludge contaminants are toxic, persistent, water soluble and reactive.

DEMOGRAPHICS

The former landfill is located three miles west of Ensley, northwest of Pensacola. There are two homes within 500 feet of the site and approximately 40 within a one-half mile. The area is rural, lightly developed, and because of its location at the confluence of two creeks, surrounded by wetlands. Most of the homes in the area are on higher ground northeast and southwest of the site. Potential receptors of contaminants include: 1) on-site workers, 2) nearby residents who have private potable wells or use Eleven Mile Creek for recreation, 3) fish, and 4) other plants and animals on the site or in the immediate vicinity.

In the past, a bulldozer operator was exposed to the sludge when the bulldozer sank into a very deep section of one of the sludge holding ponds. No injuries were reported at the time of the accident, but the operator complained of chronic infections afterward. At least one fish kill occurred when surface water run-off overflowed the containment berms and entered Eleven Mile Creek. Two private potable wells are located in the area. These two wells were used by the EPA (1980) as part of their Hazardous Waste Site Investigation sampling. In addition to these two wells, the Northwest Florida Water Management District well construction permit report shows domestic, irrigation and industrial wells in the area. A municipal supply well is located approximately 1.5 miles southeast of the site. This well, in conjunction with 31 other Escambia County Utility Authority wells, serves approximately 225,000 people.

EVALUATION

A. Site Characterization

1. Environmental Media

Specific background data prior to the beginning of landfill operations is nonexistent and records of the characteristics and quantity of waste

disposed of in the landfill were not kept. A Remedial Investigation/ Feasibility Study (RI/FS) has not been done for this site although an expanded site investigation has been performed.

The Beulah Landfill Monitoring Plan (Meister and Associates, 1985) prepared in compliance with the DER Application Form 17-1.216 noted only lead, chloroform and benzene in ground water. This plan utilized six monitoring wells on site: one in the northwest corner, one in the southwest corner, three in a cluster at the central part of the southern boundary, and one in the center. If HDR Techserv, Inc. is correct in their assessment that ground water flows primarily eastward but also toward both creeks, the contaminated ground water from the landfill may not be intercepted by these monitoring wells. The ground water would flow away from all the perimeter wells, and the well in the center of the site is on the site opposite Coffee Creek from the sludge disposal area.

The possibility that the monitoring wells may be placed upgradient of the contamination plume is compounded by two other possible problems that may inhibit contaminant detection. First, the monitoring wells may be too deep. The average level of the water table is thirty feet above the screened interval in all but one of the monitoring wells. If the ground water directly recharges the creeks these wells could be screened too deep to detect any contamination present in the shallow portion of the aquifer.

The second problem is inconsistent sampling methods. EPA utilized spot sludge sampling and discrete well sampling. These analyses indicate the presence of contaminants at levels of probable health concern. HDR Techserv, Inc. used the "composite" sampling technique, a technique which may serve to mask contaminant levels because composition acts to homogenize media, thereby diluting samples with elevated contaminant levels with those having lower levels of contaminants.

No on-site soil data was available for review. On-site and off-site sediment testing by EPA indicate there were no sediment contaminant problems. Methane generation was addressed but not remedied as part of the compliance monitoring. Other possible forms of air pollution, if any, were not addressed in the available documentation.

2. Demographics and Land Use

The Extended Site Investigation adequately addresses the demographics and land use of the area in the proximity of the site. Because on-site ground water monitoring has revealed contamination, off-site potable wells should continue to be monitored until magnitude, extent, speed, and direction of movement is established for the contaminated ground water plume.

3. Quality Assurance/Quality Control (QA/QC)

The QA/QC data that were included in the EPA Hazardous Waste Site Investigation Status reports (1975 and 1980) consisted of results for analyses of duplicate samples. QA/QC data reported by Meister and

Associates, Inc. (1985) include some samples labeled with numbers rather than well numbers. These numbered samples may be duplicates. The conclusions presented in this Preliminary Health Assessment are based on the available data, therefore the validity of the conclusions is dependent on the quality of the data provided.

B. Environmental Pathways

Environmental pathways of greatest potential concern are those that allow movement of contaminants off the site, where greater numbers of people may be exposed. Pathways include 1) ground water movement of contaminants and possible recharge of surface water by ground water, 2) rainfall which could carry contaminated sediments and soils, especially since erosion of the bermed area has been noted, and 3) possibly air movement of contaminated dust and vapors.

The contaminants at probable health concern levels in the sludge are alpha-chlordane, gamma-chlordane, PCB-1260 and thallium. These sludge contaminants can serve as a reservoir for further ground water contamination because of the ability of contaminants to mobilize as sediments or solvents in water. Rainfall run-off causes erosion of the bermed area around the former sludge holding ponds potentially allowing direct migration of sludge into Eleven Mile Creek. In addition, sludge and excess water are expelled through overflow pipes in the bermed wall into Eleven Mile Creek. Coffee Creek is also a receptor of run-off from the site. Although most of the sludge appears to have solidified, fish kills were attributed to liquid sludge overflow in the past.

Piezometric tests by the county's consultant, HDR Techserv, have established the hydraulic connection between the sludge and trash bermed area and the two creeks. They state that the local ground water flow regime is predominantly east toward Eleven Mile Creek which borders the eastern side of the landfill. There appears to be interaction between surficial ground water and both creeks. Contaminants found in on-site ground water include lead, chloroform, and benzene.

Surficial sands at the site are recent steam lag deposits. The southern portion of the landfill overlies the former path of Coffee Creek which was channeled to the north prior to trash and sludge burial on site. These surficial sands and buried wastes are up to 35 feet thick, and the ground water flow rate through the sediments averages 135 feet per year.

The surficial sands are underlain by mostly unconsolidated to poorly consolidated clastic deposits of sand and gravel, hence the name of the unconfined hydrogeologic unit in this area, the Sand-and-Gravel Aquifer. Discontinuous lenses of clay, ranging in thickness from a few inches to several tens of feet and extending in length to several miles, occur throughout the aquifer. The potable water producing zone below the site may be continuous down 600 feet or more, but area irrigation and domestic supply wells commonly vary from 90 to 150 feet in depth. Miocene clay layers underlie most of the producing portions of the Sand-and-Gravel Aquifer below 600 feet.

Other environmental pathways include air movement of contaminated dust and vapors. Methane has been detected on site but provisions for collection have not been taken to date. The only structure on the site that may collect methane is the storage building. The possibility of nearby houses trapping methane was not addressed in any of the information reviewed. Contaminated dust will be a concern to on-site workers if the county is permitted to cap the landfill, however, capping could increase the lateral migration of methane and other landfill gases.

C. Human Exposure Pathways

Contamination of environmental media could result in the following human exposure pathways.

1) Inadvertent ingestion and dermal absorption of contaminants from affected surface water and inhalation of volatilized contaminants re-entrained in dust or sediments may eventually be the human exposure pathways of greatest concern. Hydrogeologic conditions apparently cause shallow ground water to recharge Coffee Creek and Eleven Mile Creek. Contaminants including lead (from ground water), PCBs and thallium (from sludge) may bioaccumulate in aquatic organisms. However, food chain contamination has not been addressed or ruled out for this site.

2) Ingestion, inhalation and dermal absorption of contaminated soil or sediments may occur on site and off site. Site workers, trespassers or persons coming in contact with sediments from the former sludge pond are at risk of exposure to PCBs, thallium, chlordane and possibly other contaminants.

3) Ingestion and inhalation of contaminants volatilized from ground water during household uses and dermal absorption of contaminants in ground water are potential human exposure pathways. Until a contamination plume is defined, and the direction of the plume is determined, the nearest private potable wells should be monitored. Because a municipal supply well is located 1.5 miles southeast of the site and state regulations only mandate testing for volatile organic compounds every three years, the county may choose to increase the testing frequency for this well.

PUBLIC HEALTH IMPLICATIONS

Contaminants at probable health concern levels on site are lead, chloroform and benzene in ground water; and chlordane, thallium and PCBs in sludge. At the present time, there is no documented evidence of exposure to these compounds, and no contaminants have been identified off site. Human contact may occur in the future and at least one fish kill is known from the past. The toxic effects of these chemicals are summarized below.

Toxic effects statements can be misleading because they may be based on animal data and adverse health effects reported at high exposure rates in animals and humans. Data extrapolation is difficult because dose-response is not linear and may be related to length of exposure time in addition to exposure levels, and because differences in intraspecies responses may be small or very large. Human toxic response variability also adds to the uncertainty associated with making toxicity predictions. Human variability factors include genetic makeup, age, sex, the state of an individual's health, previous exposure to chemicals and psychological factors. The uncertainty in predicting toxicity is reflected in the probabilistic nature of most of the toxicity assessments that are made. They deal with a population, not an individual, and try to predict what percentage of people in that population will show a particular effect at a particular dose. Probabilistic assessment of toxicity is the best that can be done, and even this limited type of prediction is filled with uncertainties (Kamrin, 1988).

The health effects of human exposure to lead, chloroform and benzene via ground water migration off site are of potential concern. Lead exposure at low levels may effect a number of organ systems, and low blood levels have been associated with high blood pressure (no apparent threshold value) kidney damage and fetotoxicity. Increased risk of stroke, heart attack (and death) have also been reported at low levels of exposure (Hammond and Beliles, 1980). Children are especially susceptible to lead toxicity because they have greater sensitivity to lead and because children absorb greater relative amounts via the intestine. Repeated low doses may accumulate to toxic levels because lead is excreted very slowly. Lead exposure also adversely affects brain development and function in children (CDC, 1985).

Chronic inhalation exposure to high concentrations of chloroform could cause the following symptoms: fatigue, digestive complaints, dizziness, and mental dullness. Chronic chloroform overexposure has been shown to cause enlargement of the liver and kidney damage. Experimentation has indicated that chloroform is an animal carcinogen (Sittig, 1985).

Benzene is a known human carcinogen. Long-term low-level exposure may adversely affect the central nervous system and blood. Blood disorders linked to benzene exposure include anemia and bone marrow abnormalities. Occupational investigations have identified statistically significant increases in the incidence of leukemia in workers exposed to benzene via inhalation (IARC, 1982).

The health effects of human exposure to chlordane, thallium and PCBs in sludge via inhalation or ingestion of airborne dust or fumes, and skin absorption or skin and eye contact are of potential concern. Once absorbed, chlordane is extremely persistent and accumulates in fat. Chlordane is a stimulant of the central nervous system; and, because it is slowly metabolized, it has a high potential for cumulative neurotoxicity. Small amounts have caused severe toxicity in children, and chlordane exposure has been linked to leukemia and neuroblastoma. Chronic exposure in animals has been shown to produce degenerative changes in the liver, kidney, lungs, intestinal submucosa and heart (Sittig, 1985; Gosselin and others, 1984).

Thallium is an extremely toxic metal and low levels of exposure may be accompanied by acute illness, especially if low levels are ingested daily. Chronic exposure could allow tissue retention and any sudden release from tissue stores may precipitate acute toxic symptoms as in lead poisoning (Council on Drugs, 1957). Acute symptoms include internal hemorrhage, shock, delirium, convulsions, and coma. Death may occur from central nervous system damage. Convalescence is slow and may be accompanied by mild gastrointestinal disturbances, nervous disorders, brain disorders, skin eruptions and hair loss (Sittig, 1985; Gosselin and others, 1984). It is not likely that these health consequences will be seen due to thallium's presence at this site because no evidence of human exposure has been documented.

Both percutaneous and oral exposures to PCBs may lead to chloracne and liver toxicity in humans. Other symptoms of chronic exposure could include dark spots on the skin, slowing of nerve impulses in the extremities, blindness, water retention, nausea, vomiting and abdominal pain. Newborn infants that had been exposed to PCBs in utero have been reported to manifest skin discoloration, skin changes and overgrowth of gum tissues. PCBs are readily absorbed from the gastrointestinal tract and accumulate in fat. Dermal exposures in industrial workers have been reported to produce chloracne, and subsequently abdominal pain, vomiting and jaundice. Fatty degeneration of the liver and cirrhosis are longer term effects (Gosselin and others, 1984).

CONCLUSIONS AND RECOMMENDATIONS

Based upon information reviewed, it is concluded that this site is of potential public health concern because of the risk to human health from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in the Human Exposure Pathways section above, human exposure to chlordane, thallium and PCBs could occur on site via incidental ingestion, inhalation and dermal absorption of the contaminated sludge.

Off-site human exposure to sludge could occur via erosion or by wind action during site remediation. Site investigators have not agreed on ground water monitoring results, plume definition, or direction of plume movement. Based on some of the hydrogeologic work done on the site, site ground water could be recharging the creeks. Alternatively, ground water could travel south-southeast and be intercepted by private potable wells, in which case there may be a route for human exposure to lead, benzene and chloroform via the Sand-and-Gravel Aquifer.

The population at potential risk of exposure to sediments and surface water on the site includes persons who may come in contact with the site such as trespassers and remediation workers, people who use Eleven Mile Creek and Coffee Creek for fishing or recreation, and, if a ground water plume is moving off-site, residents with private potable wells downgradient of the site.

Surface water may be an important pathway for the movement of contaminants off the site. In addition, data from on-site monitoring wells suggest that contamination from the site is present in the Sand and Gravel Aquifer. However, none of the data collected to date indicate the presence of any contaminants off-site. The following recommendations are made to protect the public from potential health risks.

1. The contamination plume should be defined and the direction, extent and flow rate of the ground water should be determined. As a precaution before plume data is obtained, domestic water supply wells in the downgraded vicinity of the site should be regularly sampled to protect the nearby residents from possible exposure via ground water contamination.

2. As part of the delineation of the contamination plume, additional testing needs to be done on site and off site. On site, the migration of soils and sludge contaminants should be established, especially as this migration is controlled by erosion that allows sludge to move off the site. Off site surface water, soil and air samples should be monitored to enable adequate prediction of the possible exposure routes. These samples should be analyzed for compounds on the Hazardous Substances List, because it is possible all on-site contaminants may not have been identified.

3. A residential well survey should be completed, in conjunction with identification of a ground water contamination plume. This will enable precautions to be taken for potable well users downgraded of the plume, including the monitoring of drinking water.

4. Because the local source of potable water is an unconfined aquifer with an average water table level at 35 feet below land surface, it should be recommended that no drinking water wells be installed on the site or in the path of the contamination plume (still to be defined). Community officials may want to increase the monitoring frequency of the Dunaway (municipal supply) Well from the current requirement of once every three years.

5. On-site and off-site surface water should be regularly monitored.

6. If surface water and ground water monitoring consistently reveal contaminants at levels likely to be of health concern, then biological monitoring is also suggested to ensure that surface water contaminants, including those in sediments, will not result in food chain contamination. Specifically, this could include a survey of edible fish, shellfish, amphibians, game, wild plants, crops or of livestock in the vicinity of the site that are consumed locally or marketed for consumption. If consumed, samples of edible portions should be tested.

7. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended, the Beulah Landfill site has been evaluated for appropriate follow-up with respect to health effects studies. Inasmuch as there is no extant documentation or indication in the information and data reviewed for this Health Assessment that human exposure to on-site or off-site contaminants is currently occurring, or has occurred in the past, this site is not being considered for follow-up health studies at this time. When indicated by public health needs, and as resources permit, the evaluation of additional relevant health outcome data and community health concerns, if available, is recommended.

This Health Assessment was prepared by the Florida Department of Health and Rehabilitative Services Office of Toxicology and Hazard Assessment under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). The Division of Health Assessment and Consultation and the Division of Health Studies of ATSDR have reviewed this Health Assessment and concur with its findings.

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APPENDIX

Figure 1: Site Location.

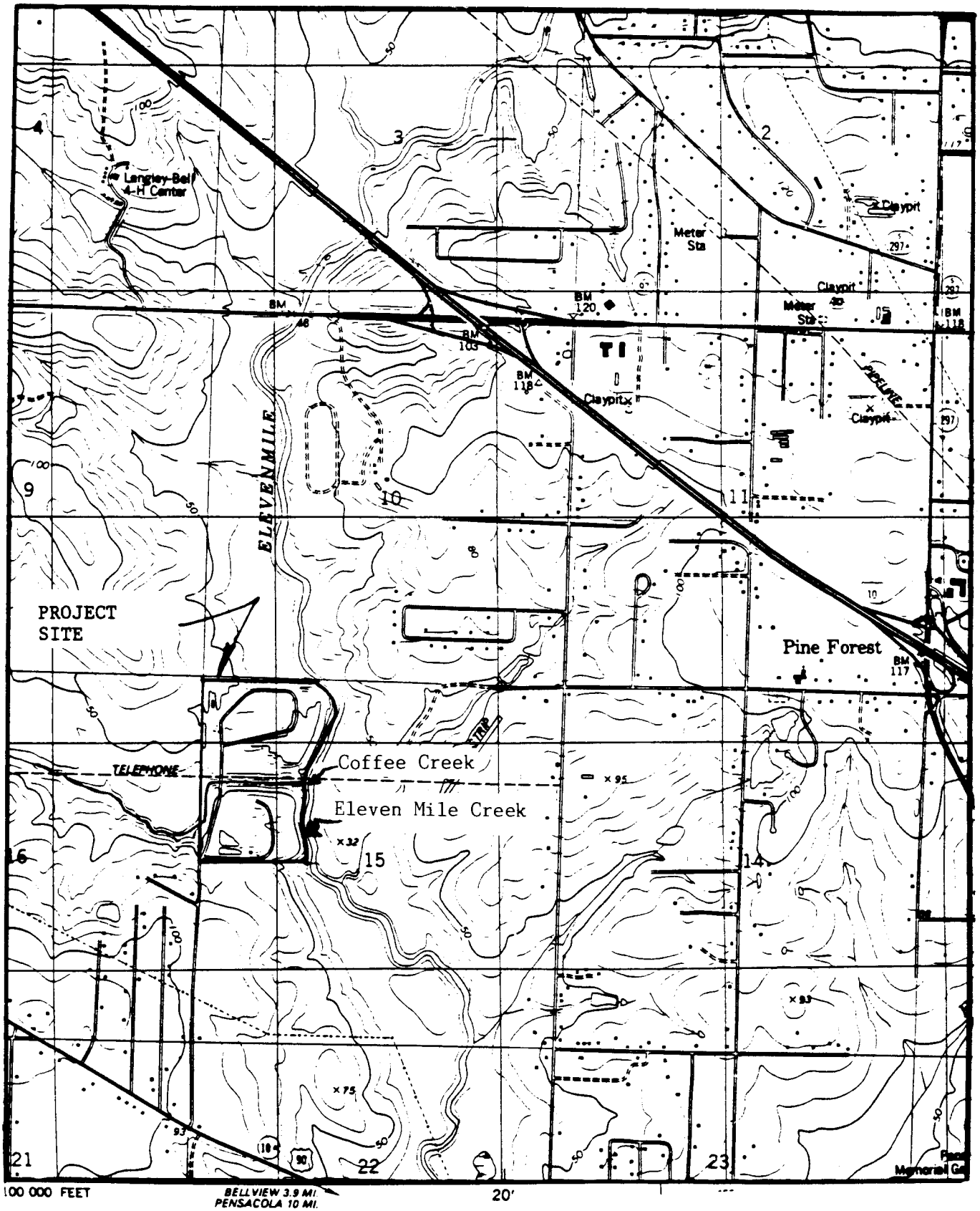

FIGURE 1 SITE LOCATION