Health Assessment for

ASBESTOS DISPOSAL SITE (ADS) NATIONAL PRIORITIES LIST (NPL) SITE

MORRIS COUNTY, NEW JERSEY

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

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SUMMARY

The Asbestos Disposal Site (ADS) consists of four sites located in Morris County, New Jersey which together comprise a National Priority List (NPL) Site. The sites are called Millington, Great Swamp, New Vernon Road, and White Bridge Road. The Millington and the Great Swamp (areas A and B) Sites are in moderately populated areas. On-site heavy metals and asbestos are the primary contaminants of concern for all of the sites. Off-site concerns are raised by polynuclear aromatic hydrocarbons (PAHs) and lead. Drums were found at the Great Swamp Site which contained high levels of volatile organic compounds (VOCs). Ten private wells were sampled and analyzed near the sites (excluding Millington). Except for one well contaminated with chromium, no significant contamination was detected. A surface drinking water intake located about 10 miles down-river from the sites did not show any significant chemical or asbestos contamination. An asbestos mound located at the Millington Site was determined by engineering analysis to be unstable with a high potential for landslides. Currently, inhalation and ingestion of contaminated soil constitute the primary routes of asbestos and metals exposure for people that work on-site (employees, remedial and construction workers) and for children that exhibit pica. All sites except Great Swamp Site A currently pose a minimal on-site public health concern by heavy metals-contaminated soil. However, the Great Swamp A Site poses a potential health concern if the heavily contaminated soil areas are left accessible to the public and the areas are not remediated. The potential routes of metals exposure are ingestion and inhalation of contaminated soil. Based on the available information, the off-site public health threat by PAHs exposure appears to be minimal, if normal activities do not expose the public to the contaminated sediments. Current information on fish and fish consumption in the vicinity of the sites is not sufficient for an evaluation of the off-site public health consequences of metals found in the sediments and surface waters. Human exposure to air-borne asbestos fibers released from asbestos wastes and asbestos-containing building materials at the sites pose a potential health risk. Although a potential exists for human exposure to on-site/off-site contaminants, there are no indications in the information and in the data reviewed for this Health Assessment that human exposure is presently occurring or has occurred in the past. However, remedial actions should be started to insure that contaminants are controlled along the Environmental Protection Agency's (EPA) guidelines.

BACKGROUND

A. SITE DESCRIPTION

The Asbestos Disposal Sites (ADS) are located in southeastern Morris County, New Jersey and consist of four sites near Millington, New Jersey.

The four sites are:

1. The Millington Site located at 50 Division Avenue.
2. The former Dietzman Tract located in the Great Swamp National Wildlife Refuge in Harding Township, New Jersey.
3. The property located at 257 New Vernon Road in Passaic Township, New Jersey.
4. The property located at 651 White Bridge Road in Passaic Township, New Jersey.

Millington Site: The Millington Site (see Appendix, Figure 1) encompasses 11 acres located at 50 Division Avenue in Millington, New Jersey. Site boundaries are the Millington Train Station to the north, the Passaic River to the west, commercial establishments to the east, and private residences to the south. The site housed the asbestos processing plant used by manufacturers of asbestos products.

The manufacturing of asbestos products began at this site in 1927 by a company which fiberized the asbestos for sale until 1946. Another company owned the plant from 1946 to 1953 and manufactured asbestos roofing and siding. Water from the manufacturing process was treated by impoundment to settle the asbestos fibers. The settled fibers were removed periodically and covered with dirt on the site. In 1953, the property changed ownership, and asbestos roofing and siding were continually produced until 1975. During this period, waste that was not recycled consisted of broken siding and fibers. These waste products were used as landfilling material at the other three locations. Phenylmercuric acetate (PMA) was used as a paint solvent in the process of coating the asbestos shingles from 1959 to 1972. Waste material from the cleaning process was discharged into a pit west of the plant. The plant was closed in 1975. In 1978, the facilities were transferred to another owner, who has divided the plant and leased the space to other manufacturing and service industries.

The Millington Site contains the largest volume of landfilled asbestos wastes. The wastes are present on the site as subsurface fill or as part of an asbestos waste mound. The waste mound is located along the Passaic River and is composed of loose asbestos fibers. The mound is about 300 feet long, 45 feet wide and 26-30 feet thick. Over 90 percent of the site contains asbestos waste products.

Great Swamp Site: Two areas (A and B) compose the Great Swamp Site (see Appendix, Figure 2) located in the Great Swamp National Wildlife Refuge. This site is approximately 1.7 miles southeast of the Township of New Vernon.

Area A is composed of 4-5 acres; area B consists of approximately one acre located about 500 feet north of area A. Both areas are bordered by Great Brook and are littered with a variety of refuse, including asbestos products, metals, bottles, etc. Operations started at the areas about 1918 and continued with the sites being used as a refuse disposal area for approximately 40 years. The disposal site conducted an open operation until 1965, when state landfilling controls were enacted. The two disposal areas were then operated as "modified operations" when household refuse was mixed with asbestos refuse until 1968. In 1967 and 1972, The Great Swamp National Wildlife Refuge obtained ownership of the properties.

In the Great Swamp Site, area A contained asbestos waste products that had been landfilled throughout to a depth of about 12 feet. Area B contained loose asbestos fibers which were dumped into an open pit along with refuse. About 35% of area B appears to have asbestos fill; the thickness of the waste is unknown.

New Vernon Road Site: This site (see Appendix, Figure 2) consists of approximately 30 acres of land off New Vernon Road, in Meyersville, New Jersey, about one mile south of the Great Swamp Site.

The New Vernon Road Site was operated as a corn and dairy cattle farm from 1945-1980. During the late 1960's, asbestos refuse consisting of loose asbestos fibers, broken asbestos tiles and sidings was landfilled in two areas of the site. A small depression in the westernmost section of the property was filled first. Then, a larger depression in the middle of the property was filled. Both areas were later graded and seeded. In 1980, the property was transferred to another private individual.

The New Vernon Road Site contains asbestos wastes in a small landfill area in front of the private residence, in the main landfill area in the center of the property, along the dirt path that traverses north-south along the middle of the property, and in the area of the shed located next to the private residence. The thickness of the waste is not known.

White Bridge Road Site: This site, (see Appendix, Figure 2) consists of about 12 acres located in Meyersville, New Jersey. The site is bordered by the Great Swamp National Wildlife Refuge to the east and south and by private residences to the north and west. The site was a farm until 1969, when the current owner conducted landfilling operations similar to those at the New Vernon Road Site from 1970 to 1975. Asbestos waste from the Millington facility was dumped along designated areas in the eastern portion of the property. When the dumping was completed, the area was graded and seeded. The property was then converted into a horse farm with stable, pastures, and riding ring by the present owners.

The White Bridge Road Site has asbestos contamination in the eastern section of the property and along the main driveway. The main landfill area consists of that from a riding tract to a small part of a grazing field. The thickness of the asbestos wastes averages between two to four and one-half feet.

B. SITE VISIT

A site visit was deemed unnecessary for the preparation of this Health Assessment.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

TABLE 1

SITE	Contaminant	GROUNDWATER Sample Dates: October, 1986 ug/l maximum (max)	SOIL August, September, 1986 mg/kg (max)
Millington	Mercury	6.9	7.8
	Asbestos*	Less than detection limit	NT
Great Swamp A:	Mercury	4.7	152
	Cadmium	24	70.5
	Lead	273	183
	Beryllium	3.4	87.9
	Silver	12	71.9
	1,1-dichloroethene	61	—
	Asbestos	130,000 fibers/liter	NT
Great Swamp B:	Mercury	—	41.9
	Cadmium	—	38.3
	Asbestos	390,000 fibers/liter	NT
New Vernon Road	Mercury	4.5	—
	Asbestos*	Less than detection limit	NT
White Bridge Road	Mercury	—	4.2
	Cadmium	—	2.3
	Antimony	—	84
	Asbestos*	Less than detection limit	NT

*Detection Limit-100,000 fibers/liter
NT-Not Analyzed
—-Not Detected
ug/l- micrograms per liter
mg/kg- milligrams per kilogram

B. OFF-SITE CONTAMINATION

See Appendix, Table 2, Surface Water Contamination
See Appendix, Table 3, Sediment Contamination

Chromium was detected in one residential well sample at 310 ug/l near the White Bridge Road Site. The chromium contamination may or may not be site-related. On-site groundwater sampling did not reveal the presence of chromium.

C. PHYSICAL HAZARDS

Fred C. Hart Associates, Inc. (1987) conducted a slope stability analysis of the asbestos mound at the Millington Site because the existing slopes were thought to be at risk of possible landslides. The existing slopes are steep, and in some areas are one and one-half horizontal to one vertical (34 degree angle). The analysis concluded that the existing slope is highly unstable and that the risk of a possible landslide is significant. Increased stabilization of the slope would be possible by cutting back the face of the slope to a smaller, more stable angle.

DEMOGRAPHICS

Within a one-mile radius of the Millington Site, there are approximately 200 residences with about 640 residents. North of the Millington Site is the Millington train station, and it is located about 300 feet away from the asbestos mound. Approximately 100 people frequent the Train station each day. A school with a student population of 243 is located about one mile east of the site. The Millington Site itself is currently active, having 21 businesses and employing approximately 150-200 people.

In the Great Swamp Site vicinity, residential areas are estimated to be within one-half to one mile away. The total number of people located within a one-mile radius of the site was estimated at 256.

The New Vernon Road Site was described as being in a remote area, with the Great Swamp National Wildlife Refuge bordering the eastern part of the site. The estimated number of people located in the area was ten, the property residents and work personnel.

The White Bridge Road Site borders the Great Swamp National Wildlife Refuge on the eastern side of the site. The total number of people on-site estimated to be affected were two residents and 12 individuals who keep their horses at the stables. Two residences are located west and south of the site and the number of people were estimated to be six.

EVALUATION

A. SITE CHARACTERIZATION (DATA NEEDS AND EVALUATION)

1. Environmental Media:

Air: Asbestos air sampling was conducted for all four sites whenever test bore or test pit operations occurred. Before drilling commenced at the Millington Site, rain had occurred for two or three days. This condition probably affected the air sampling, as most of the augured samples were damp. Asbestos data were not available for ambient air monitoring on the perimeter of the sites or downwind of the sites. These data, if taken during a dry, windy period, would be valuable in evaluating the impact of asbestos in the atmosphere on downgradient populations.

No ambient air sampling data for VOCs were available for an evaluation.

Soil: Asbestos surface soil data on the counts of types of fibers (amosite, chrysotile, crocidolite, other forms) greater than 5 micron per cubic centimeter (um/cc) were not available. This information would be helpful in estimating the effects of asbestos fugitive dust and inadvertent soil ingestion on potential receptors.

Biota: Moderate to high levels of lead were found in the sediments. Elevated levels of lead, chromium, and cadmium were in some surface water samples. Bioaccumulation in fish may be a factor in human exposure to metals, especially lead and cadmium. Data on fish bioassays for lead and cadmium were unavailable for our evaluation.

Information on game animals, consumable wild plants, crops or livestock in the areas of the sites was unavailable for an evaluation.

Groundwater: For all sites, private well locations within a one-half mile radius were not available. Also unavailable were well depths and construction details. This information would be useful in determining wells that may be affected by site contaminants. Information on earth faults, if any, in the site areas is needed to evaluate fully the potential for contaminant migration. Contamination of the private well near the White Bridge Road Site with 310 ug/l of chromium may or may not be site-related. On-site monitoring wells did not indicate the presence of chromium. Further sampling and monitoring is recommended to determine the source(s) of chromium in the well water.

Fred C. Hart Associates, Inc. (1987) noted that a confining unit of clay and silt bed existed beneath the upper aquifer that average 60 feet in thickness and that contaminants are unlikely to migrate through such a mass. Not enough is known about the private well depths, locations, construction and the local geology and hydrogeology to make a definitive statement.

2. Demographics and Land Use:

Detailed demographic data were unavailable for our evaluation. Additional information with respect to the estimated population within a one-half mile radius of the site areas that would be useful in our evaluation includes: the number and location of all residences, locations of schools, hospitals, population distribution by age, sex, socioeconomic status, ethnic background, and the occupations of employed persons.

Detailed data on the land use in the vicinity of the sites would also be helpful in our evaluation.

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

This Health Assessment is based on compiled data from the DRAFT REMEDIAL INVESTIGATION REPORT, ASBESTOS DISPOSAL SITE, MORRIS COUNTY, NEW JERSEY, MAY 29, 1987. It was noted in the Draft Remedial Investigation Report that samples for metals analyses were filtered before laboratory analyses were conducted. This may or may not indicate metals concentrations that are lower than actual concentrations because of the filtering out of particulates from the sample. It was also not clear if the samples for asbestos analyses were filtered by a 0.45 micron filter before laboratory analyses were conducted. If the samples were filtered, the total counts of asbestos fibers of 5 micron lengths or greater would not be accurate. It is not known if the samples were processed through the EPA Contract Laboratory Program which utilize prescribed QA/QC programs to review the data before use. Insufficient information was available to further comment on the validity of the data.

B. ENVIRONMENTAL PATHWAYS

Results of air sampling from the test borings and the test pits for the Millington Site indicate that asbestos fibers were not found above the detection limit (0.01 fibers/cc) for the test boring activities. One test pit sample indicated the presence of amosite amphibole asbestos at a concentration of 0.2978 fibers/cc. Drilled samples from the Great Swamp Site exhibited asbestos concentrations of 0.069 fibers/cc or less. Drilled samples from New Vernon Road had asbestos concentrations of 0.032 fiber/cc or less. Drilled samples from the White Bridge Road Site did not show asbestos levels above the detection limit.

Soil samples were taken from each site and analyzed for metals, VOCs, semi-volatile organic compounds (semi-VOCs), phenols, and cyanides. Levels of mercury were found in the soils for three of the four sites as follows: Millington-(7.8 mg/kg, max), Great Swamp-(A-152 mg/kg, max., B-41.9 mg/kg, max.), White Bridge Road-(4.2 mg/kg, max.). Levels of cadmium were also found at two sites: Great Swamp-(A-70.5 mg/kg, max., B-38.3 mg/kg, max.), White Bridge Road-(2.3 mg/kg, max.). Two other metals were found in moderate concentrations at Great Swamp: Site A-beryllium-87.9 mg/kg, max. and silver-71.9 mg/kg, max. Antimony was found at the White Bridge Road Site in soils at 84 mg/kg, max. Minimal health hazards were expected from the concentrations of VOCs, semi-VOCs, phenols, and cyanides that were found in the soil samples at the four sites.

Surface water and sediment samples were collected along the Passaic River and its tributaries, Great Brook and Black Brook. Surface water flow is generally toward the Passaic River. Some surface water contamination by high levels of metals is present; however, it is not known if these levels were because of on-site or off-site contamination. High levels of cadmium (563 ug/l, max.), chromium (163 ug/l, max.), and lead (570 ug/l, max.) were found in some surface water samples. Asbestos was also found in some surface water samples at a maximum of 3,200,000 fibers per liter. The United States Environmental Protection Agency's (USEPA) Proposed Maximum Contaminant Level Goal (PMCLG) for asbestos in drinking water is 7,100,000 fibers per liter. Some sediment samples indicated high levels of polynuclear aromatic hydrocarbons (PAHs). Levels of phenanthrene, fluoranthene, pyrene, chrysene, and benzo(a)pyrene were 53 mg/kg, 52 mg/kg, 62 mg/kg, 24 mg/kg, and 18 mg/kg, respectively. One sediment sample adjacent to a road showed a high level of lead (1,480 mg/kg, estimated) which was speculated to result from road runoff. Other sediment samples indicated lead levels less than 70 mg/kg.

A total of ten private wells were sampled near three sites (Millington excluded). The sample data did not reveal any significant contamination except for one well with an estimated chromium concentration of 310 ug/l in the vicinity of the White Bridge Road Site. The chromium contamination may or may not be site-related. The two other private wells near the site did not indicate chromium contamination and the on-site groundwater monitoring wells did not indicate chromium contamination. The EPA Maximum Contaminant Level (MCL) for chromium in public drinking water supplies is 50 ug/l. At the New Vernon Road Site, it appears that the private wells tested are located hydraulically upgradient of the site. If so, these wells are not expected to be affected by groundwater contamination from the site.

Approximately 80 private wells are present in the vicinity of the Great Swamp Site. The data did not indicate the number of private wells in the vicinity of the New Vernon Road Site. The number of private wells in the vicinity of White Bridge Road Site was reported to be 300. For the three previous sites, it was noted that a confining unit of clay and silt beds existed beneath the upper aquifer that average 60 feet in thickness and that it is highly unlikely that contaminants are capable of migrating through such a unit. However, our opinion is that not enough is known about the private well depths, locations, construction and the local geology and hydrological to make a definitive statement. Fred C. Hart Associates, Inc. (1987) indicates 36 private wells exist within a one-mile radius of the Millington Site. No data were available on the location, depths, or construction of the wells. These wells were indicated to be upgradient of the Millington Site. No confining layer between the upper aquifer and bedrock was found under the Millington Site. No fault investigations appear to have been conducted. In addition, no samples were taken from any of these private wells. Therefore, it is not assured that these wells are not affected by site contamination.

Groundwater monitoring at the four sites indicated that some chemical contamination is present. Groundwater results that may potentially impact human health for each of the sites are as follows:

Millington: The site aquifer is located within the unconsolidated silty-clay unit that lies over bedrock. The unit is found from one to thirty feet below the surface and ranges from one to four and one-half feet in thickness. Groundwater flow is in an east-west direction toward the Passaic River. Some monitoring wells show moderate levels of mercury in the groundwater (6.9 ug/l, max.). No asbestos was found in any of the samples above the detection limit of 100,000 fibers per liter.

Great Swamp Site: Area A- The upper aquifer unit in area A is composed of unconsolidated organic silt deposits interbedded with inorganic clay, silt and sand. The deposit ranges from five to ten feet thick and lies over a silt/clay unit approximately sixty feet thick that confines the water in the lower sand and gravel bedrock aquifers. The upper aquifer is shallow and is approximately two feet below the surface. Groundwater flow is in a northeast to southwest direction. Moderate levels of cadmium (24 ug/l, max.) and mercury (4.7 ug/l, max.) were found in some groundwater samples. One monitoring well indicated a high level of lead (273 ug/l) and beryllium (3.4 ug/l). Asbestos was found at a maximum concentration of 390,000 fibers per liter. VOC analyses revealed the presence of 1,1-dichloroethene at 61 ug/l in one monitoring well. Area B: The upper aquifer unit at area B consists of a coarse silty-sand unit that ranges from two and one-half to seven and one-half feet thick with lenses of silty-clay. Groundwater flow is in a northeast to southwest direction. No unusual concentrations of metals were found and no asbestos was found above the detection limit of 100,000 fibers per liter.

New Vernon Road Site: The upper aquifer unit at this site consists of organic silts and peat deposits that are interbedded with inorganic silts, clays and sands. Two-thirds of the western portion of the site is a layer of asbestos fill ranging from two and one-half to four and one-half feet thick. The water-bearing unit varies in depth from one to five feet below the surface. Groundwater flow direction is from southwest to northeast. Groundwater is flowing through the asbestos dump toward the swamp located east of the property. Mercury was found in one groundwater sample at a concentration of 4.5 ug/l. Asbestos was not found above the detection limit.

White Bridge Road Site: The upper aquifer unit consists of organic silty peat and silty sand deposit that is approximately nine feet thick. The aquifer is approximately one-half to six feet below the surface. The groundwater flow direction is northeast to west toward the swamp area behind the property. No unusual levels of metals were found and no asbestos was found above the detection limit.

All four sites were evaluated with respect to VOCs, semi-VOCs, phenols, pesticides, and PCBs. An evaluation of the data did not reveal any contamination of significance by these compounds for any of the four sites.

Aquatic biota were sampled in the downstream rivers and creeks to evaluate the impact of the four sites on the aquatic ecosystem. It does not appear that the aquatic communities are stressed by any site contaminants; however, fish bioassays were not conducted to determine if bioaccumulation of heavy metals has occurred.

Drums were found in the Great Swamp Site area A. Analyses of the contents indicated the presence of metals, a pesticide, and VOCs. High levels of VOCs were found (methylene chloride-130,000 mg/kg, max., trichlorofluoromethane-6,700 mg/l, max., toluene-35,000 mg/kg, max., chlorobenzene-42 mg/kg, max., trichloroethene-21 mg/kg, max., and hexachlorobutadiene-20 mg/kg, max.), which may explain some of the low-level site contamination by VOCs in the groundwater and soils.

C. HUMAN EXPOSURE PATHWAYS

Inhalation is a human exposure pathway for asbestos at all four sites. The asbestos wastes at the sites are composed of loose fibers, chips, broken roofing sheets and siding tiles. The wastes are scattered throughout the sites, with some asbestos wastes exposed at the surface. Although a minimal amount of asbestos was detected during Remedial Investigation from drilling and opening of test pit activities, site winds were limited (less than 5 MPH) during much of the sampling. Some samples were also taken after a period of rain, which would influence the amount of particulates generated. The probability that loose asbestos fibers would be entrained by the wind and transported on or off-site appears high. Dust generating activities such as remedial actions or construction during dry weather would result in asbestos dust inhalation. Horseback riding at the White Bridge Road Site would generate asbestos laden fugitive dust. Fred C. Hart Associates, Inc. (1987) did not include specific demographic data on the residences near the sites. The sites do not appear to be fenced. Some sites appear to be near large numbers of residences such as the Millington and the Great Swamp Sites. It is conceivable that children could play in the asbestos contaminated soils at both sites and in the asbestos mound at Millington with subsequent exposure from the dust generated. Surface soils asbestos data were lacking; therefore the amount of exposure could not be estimated and evaluated. Fred C. Hart Associates, Inc. (1987) estimated that the number of people exposed via the inhalation of asbestos dust on and off-site is: Millington-940, Great Swamp-256, New Vernon Road-10, and White Bridge Road-15.

Ingestion represents another route of exposure for asbestos. There are several potential sources, mainly drinking of well or surface water, and soil. As noted previously, the ten private wells that were sampled did not indicate any asbestos contamination, and that only the monitoring wells in the Great Swamp Site showed asbestos contamination at 390,000 fibers per liter maximum. The asbestos PMCLG is 7,100,000 fibers per liter. A surface drinking water intake exists about 10 miles downstream from these sites. A sample of the raw water at the intake did not reveal asbestos levels above the detection limit; however, it is not known if any other commercial or private users consume surface waters near the sites. Inadvertent asbestos-contaminated soil ingestion may occur as a result of nail biting and eating for on-site employees, remedial and construction workers, or children playing on-site. Since no data were available for asbestos surface soil levels, an evaluation of the exposure levels was not possible. Dermal exposure to asbestos is not expected to be marked, unless such exposure eventually leads to inhalation or ingestion of the fibers.

The groundwater, surface water, sediment, and soil at the four sites are contaminated in varying degrees by metals. Potential exposure routes for metals include ingestion of surface or groundwater, ingestion of soil, and inhalation of fugitive dust. The metals of concern are mercury, cadmium, lead, beryllium, silver, chromium, and antimony. The ingestion of surface water does not appear to be a likely exposure pathway because the nearest surface drinking water intake is 10 miles downstream from the sites and sampling of the water intake did not indicate any marked metals contamination. However, it is not known if any other commercial, industrial, or private individuals use surface water as a potable water source. As noted in the Environmental Pathways Section of this report, further investigation is required before a definitive statement can be made on any potential hazards associated with the ingestion of groundwater. An evaluation of the existing data on the ten private wells sampled did not indicate any significant hazards owing to metals contamination except for one private well user with a chromium level of 310 ug/l.

The ingestion of soils and inhalation of fugitive dust are the most probable exposure pathways for metals contaminated soil. The routes of exposure are the same as discussed above for asbestos. Dermal contact with metals did not appear to be a likely exposure pathway. Metals are poorly absorbed through the skin barrier unless the exposed person has open wounds or other lesions impairing the skin as a protective barrier.

Some sediment samples exhibited high concentrations of PAHs and lead. The most probable exposure pathway for PAHs would be through dermal exposure. However, since the PAHs contamination did not appear to be widespread, the hazard may be minimal. Ingestion of sediments directly or indirectly through eating aquatic life may be a major exposure pathway for the lead. However, biota sample data on bioaccumulation of lead were not available for an evaluation.

One monitoring well at the Great Swamp Site area A exhibited a high concentration of 1,1-dichloroethene. Potential routes of exposure for the VOCs include ingestion, dermal absorption and inhalation. Since this compound was not found in other monitoring wells and the private wells sampled near the site, this hazard is likely to be minimal.

PUBLIC HEALTH IMPLICATIONS

Asbestos was found primarily in the soil and groundwater. Heavy metals contaminated mainly the soil, sediment, and surface water. The air sampling data were not adequate to determine if airborne asbestos is a problem. Air samples at the Millington Site were collected during drilling and boring activities following a wet period. The on-site driveways for most of the sites are unpaved and could become dusty during a dry period. Windborne asbestos particle counts could reach a level of public health concern.

The most important human exposure pathway for asbestos is the inhalation of respirable asbestos fibers. The sites pose a potential hazard to on-site workers, trespassers, and the local community. The ingestion of fibers may also be an exposure pathway of concern for workers or children who may come into contact with site materials. In addition to environmental exposures, the improper handling of work clothing from on-site workers may also pose a danger. There are reports of "family" cases of asbestos-related disease in individuals who never worked with asbestos, but who lived in the same house with an asbestos worker. Workers can carry the fibers home in their clothing and hair and expose other family members.

Asbestos exposure may cause two primary classes of health effects. The first is asbestosis, a non-malignant disease characterized by a progressive scarring of the lung and pleura. This condition progresses slowly over many decades, and may continue even after asbestos exposure has ceased. One theory for asbestosis is that asbestos fibers, after being inhaled into the lungs, are very poorly removed. The fibers remain in place indefinitely and act as an ongoing inflammatory stimulus.

The other major class of asbestos-related health effects is mesothelioma and lung cancer. There are numerous published examples of the occurrence of mesothelioma and lung cancer after apparently trivial exposure to asbestos.

All asbestos-related malignancies have a latency period. There is a considerable time interval between asbestos exposure and when lung cancer, mesothelioma, or the other asbestos-related cancers are seen. This latency period may vary from twenty to forty years, although some cases may occur earlier.

Most investigators agree that there is no evidence for a "threshold" dose for asbestos below which adverse health effects would not be expected. This implies that there is no safe dose of asbestos and that any increment in exposure, no matter how small, results in an increased risk of adverse health effects including mesothelioma and lung cancer.

Currently, air data do not indicate significant contamination by asbestos. However, fugitive dust generation and ingestion of contaminated soil are expected to be important routes of human exposure to asbestos, since the contaminated areas of the site are open. Asbestos surface soil data and ambient air data during dry, windy periods are needed before the public health implication of the asbestos contamination can be fully evaluated.

Several heavy metals (lead, beryllium, cadmium, silver, mercury) were detected in top-soil, sediment, and some surface waters from the sites. The concentrations of some of these heavy metals represent a current or potential public health threat.

Lead poisoning is common in young children, affecting conduct and intellectual performance. These children usually have a medical history of one or more symptoms such as pica, anorexia, vomiting, malaise, and convulsions due to increased intercalation pressure. Children show weight loss, weakness, anemia and permanent neurological and mental deterioration. However, lead poisoning in adults are usually the result of occupational exposures, mainly to inhalation of lead dust or fumes. One groundwater monitoring well (GS-5) in the Great Swamp Site contained lead contamination at a concentration of 273 ug/l. However, lead contamination has not impacted private wells that were sampled near the vicinity of Great Swamp. Nevertheless, lead is bioaccumulative and the levels reported in top-soil, sediment and some surface water from the site may pose a health concern.

Chromium was detected in water from one private well (PW-2) in the vicinity of the White Bridge Road Site at a concentration of 310 ug/l. This concentration is in excess of the USEPA's current drinking water standard of 50 ug/l for chromium. This contamination may or may not be site-related. Chromium was not found in the other private wells near the site or in the on-site groundwater monitoring wells.

Chromium is considered to be an essential nutrient which helps to maintain normal glucose, cholesterol, and fat metabolism. However, there are two major forms of chromium. Hexavalent chromium [chromium (VI)] is one form that possesses irritating properties. Short-term, high-level exposure may result in adverse effects at the site of contact, such as ulcers of the skin, irritation and perforation of the nasal mucosa, and irritation of the gastrointestinal tract. Chromium (VI) may also cause adverse effects in the kidney and liver. The second form of chromium, trivalent chromium [chromium (III)], does not possess these properties and is an essential nutrient. Chromium in food is mostly in the trivalent state.

Cadmium is a naturally occurring element in the earth's crust. Pure cadmium is a soft silver-white metal, but this form is not common in the environment. Human exposure to small quantities of cadmium occurs from widely distributed sources in air, water, soil, and food. Cadmium can enter the blood by absorption from the stomach or intestines after food or water ingestion orby absorption from the lungs after inhalation. Very little cadmium enters the body through the skin.

Cadmium may cause a number of adverse health effects. Ingestion of high doses causes severe irritation to the stomach which may lead to vomiting and diarrhea. Inhalation of high doses may cause severe irritation of the lungs. The severe effects resulting from various levels and durations of cadmium exposure are as follows:

1. Kidney damage may occur from excessive cadmium exposure from inhalation or ingestion. The kidney disease is usually not life threatening, but can lead to the formation of kidney stones and effects on the skeletal system that are equally painful and debilitating.

2. Lung damage, such as fibrosis or emphysema, has been observed in workers where air cadmium concentration is high.

3. High blood pressure has been observed in animals exposed to cadmium. The role of cadmium exposure in human hypertension is controversial and requires further research.

Other tissues and systems reported to be injured by cadmium exposure in animals or humans include the liver, the testes, the immune system, the nervous system, and the blood.

Mercury is a highly toxic, silver-white, liquid metal which is slightly volatile at room temperature. Mercury is capable of being readily absorbed by the body from the inhalation of its fumes. There are inorganic and organic forms of mercury with every known form of mercury compound being potentially dangerous. Mercury is readily absorbed via the respiratory tract (elemental mercury vapor, mercury compound dusts), the intact skin, and the gastrointestinal (G.I.) tract, although incidental swallowing of metallic mercury may sometimes occur without harm. However, spilled and heated elemental mercury is particularly hazardous. Acute mercury poisoning has violent corrosive effects on the skin and mucous membranes. Severe nausea, vomiting, abdominal pain, bloody diarrhea, kidney damage, and death may follow usually within 10 days. In chronic mercury poisoning, there is noticeable inflammation of mouth and gums, kidney damage, loosening of teeth, muscle tremors, personality changes, depression, irritability, and nervousness. Mercury poisoning can cause permanent brain damage.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

This site is of potential health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in Section C (Human Exposure Pathways) above, human exposure to asbestos, chromium and other heavy metals may occur/ be occurring/ have occurred via inhalation of airborne particulates, ingestion of groundwater, and soil ingestion.

Contamination at the Asbestos Disposal Sites has been shown to exist in the soil, sediment, surface and groundwater. Surface water is contaminated with cadmium, chromium, and lead. Surface water usage by residential, commercial, or industrial establishments is not known. A high level of lead (1,480 mg/kg) was found in one sediment sample adjacent to a roadway and was speculated to have resulted from road runoff. Other sediment samples did not reveal significant lead contamination. Some on-site groundwater samples were also heavily contaminated with metals. However, the private wells that were sampled did not indicate any significant contamination by metals or asbestos except for one private well with chromium contamination. On-site soils are contaminated with mercury, cadmium, lead, silver, beryllium and antimony. Currently, air data do not indicate significant contamination by asbestos. However, fugitive dust generation and ingestion of contaminated soil are expected to be important routes of human exposure to asbestos, since the contaminated areas of the sites are open. Asbestos surface soil data and ambient air data during dry, windy periods are needed before the public health implication of the asbestos contamination can be fully evaluated.

Recommendations:

1. Because of the large number of private wells existing in the vicinity of these sites, further geological and hydrogeological investigations is recommended. Information on faults, documentation of wells within a half mile of the sites with respect to depth, construction, and location is needed to adequately assess site impacts on the groundwater users. We were not able to determine from Fred C. Hart Associates, Inc. (1987) if the private wells that were sampled were upgradient or downgradient from the sites. Any future samples for groundwater metals determination should not be filtered so as to obtain total metals concentrations rather than dissolved metals concentrations. Total metals concentrations are more relevant to private well users since the water is ingested without filtering.

2. Surface soil sampling for asbestos levels should be conducted for all sites. Without this data, the levels and routes for potential human exposure to asbestos by ingestion and fugitive dust generation would be difficult to evaluate.

3. Because of the levels of lead in the sediments and also lead, cadmium and chromium in the surface waters, a fish bioassay should be performed to determine if metals bioaccumulation has occurred. Information on the degree of fishing in the vicinity of the sites is needed to determine the extent and level of population exposure.

4. Ambient air monitoring for asbestos around the perimeter of the sites is recommended during dry, windy periods to assess the airborne asbestos impact on downgradient populations.

5. Resampling of private well Number 2 is recommended. Sample analyses should reflect total, dissolved, and hexavalent chromium. If total chromium is still in the range of 310 ug/l, the well owner should be advised to treat the well water or seek an alternative source.

6. A surface water use survey should be performed within one mile of the sites to identify any user or potential users of surface water for ingestion purposes.

7. Institutional controls should be implemented to prevent installation and use of drinking water wells in the contaminated portion of the aquifer(s).

8. Further information is needed on any game animals, consumable wild plants, crops and livestock that may be potentially contaminated by contaminated surface soil, surface water and groundwater and whether the food is locally consumed or marketed for consumption elsewhere.

In accordance with CERCLA as amended by SARA, the Asbestos Disposal Sites have been evaluated for appropriate follow-up with respect to health effects studies. Since human exposure to on-site and off-site contaminants may have occurred in the past and may still be occurring, this site is being considered for follow-up health studies. After consultation with Regional EPA staff and State and local health and environmental officials, the Epidemiology and Medicine Branch, Office of Health Assessment, ATSDR, will determine if follow-up public health actions or studies are appropriate for this site.

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REFERENCES

1. Fred C. Hart Associates, Inc., DRAFT REMEDIAL INVESTIGATION REPORT, ASBESTOS DISPOSAL SITES, MORRIS COUNTY, NEW JERSEY, National Gypsum Company, (May 29, 1987).

2. Sittig, M., HANDBOOK OF TOXIC AND HAZARDOUS CHEMICALS AND CARCINOGENS, 2nd edition, Park Ridge, NJ, Noyes publications, (1985).

APPENDICES

1. FIGURE 1- MILLINGTON SITE
2. FIGURE 2- GREAT SWAMP SITE, NEW VERNON ROAD SITE, WHITE BRIDGE ROAD SITE
3. TABLE 2- SURFACE WATER CONTAMINATION
4. TABLE 3- SEDIMENT CONTAMINATION

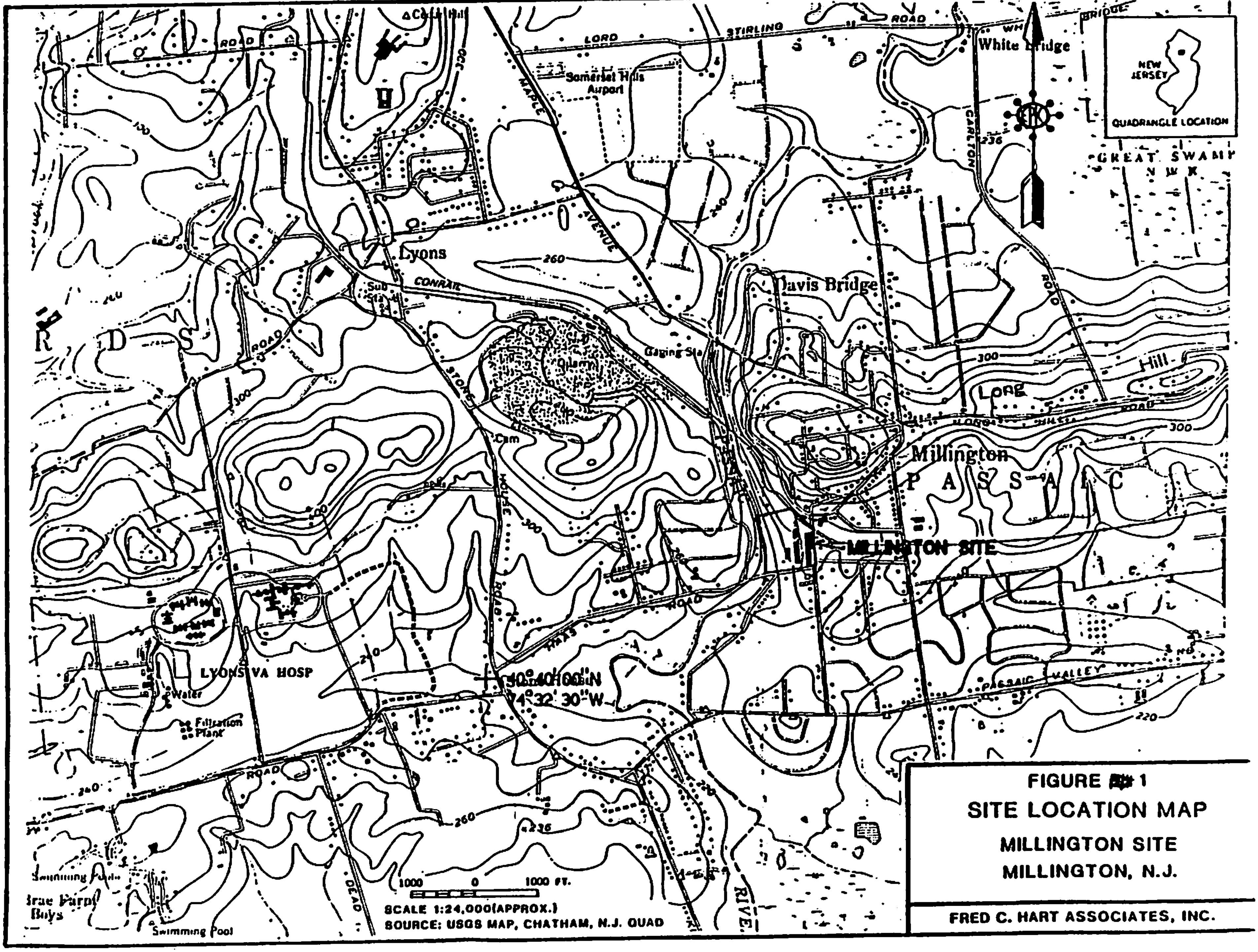

FIGURE 1
SITE LOCATION MAP
MILLINGTON SITE
MILLINGTON, N.J.

FRED C. HART ASSOCIATES, INC.

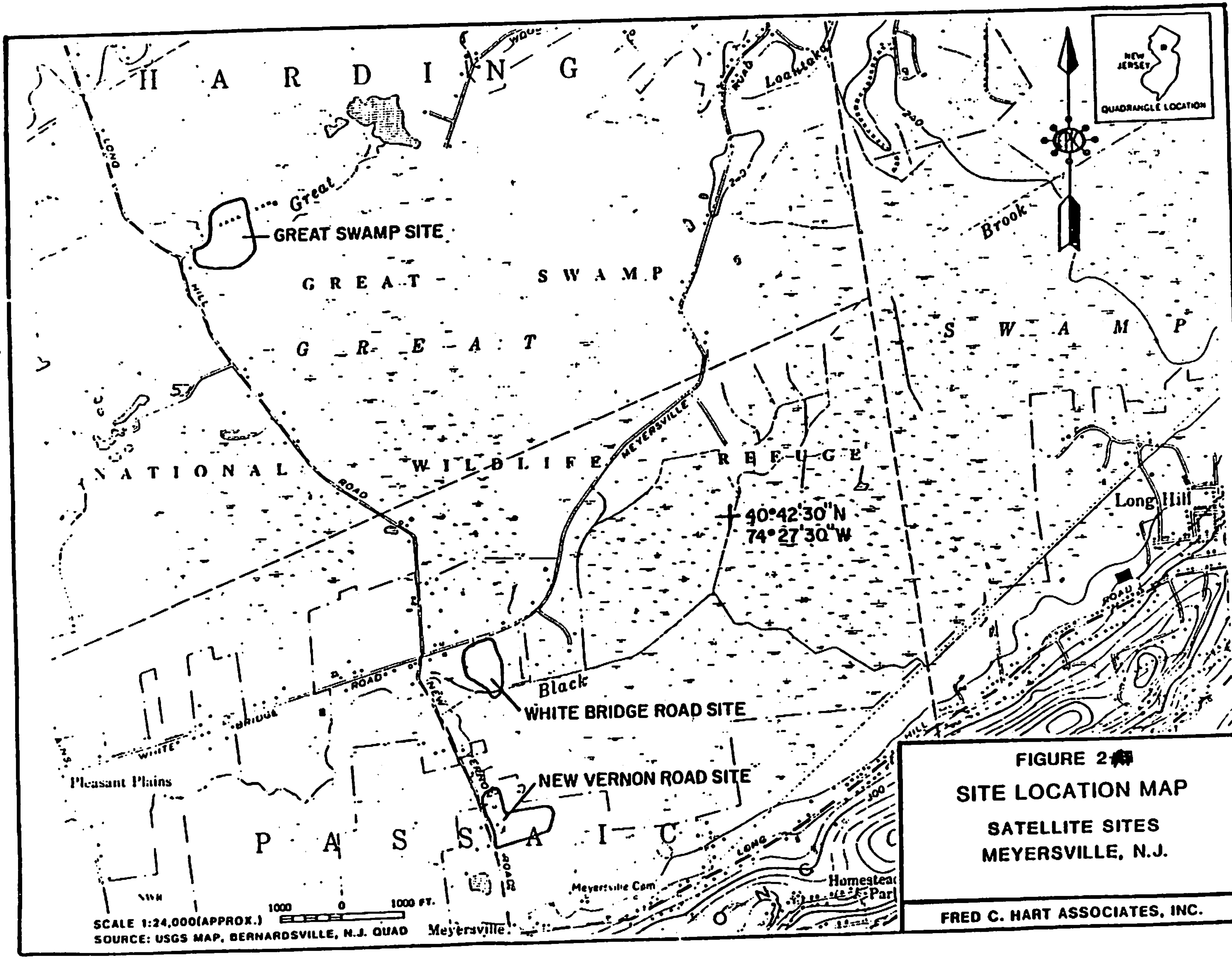

FIGURE 2

SITE LOCATION MAP

SATELLITE SITES
MEYERSVILLE, N.J.

FRED C. HART ASSOCIATES, INC.

TABLE 2

SURFACE WATER CONTAMINATION

Contaminant	Concentration ug/l max.
Cadmium	563
Chromium	163
Lead	570

TABLE 3

SEDIMENT CONTAMINATION

Contaminant	Concentration mg/kg max.
Lead	1,480
Naphthalene	24
Acenaphthene	6
Fluorene	10
Phenanthrene	53
Anthracene	9.5
Fluoranthene	52
Pyrene	62
Chrysene	24
Benzo(a)anthracene	24
Benzo(b)fluoranthene	31
Benzo(a)pyrene	18
Benzo(g,h,i)perylene	11
Ideno(1,2,3,c,d)pyrene	8.3