Health Assessment for

FLORENCE LAND RECONTOURING LANDFILL

FLORENCE, MANSFIELD, AND SPRINGFIELD TOWNSHIPS, NEW JERSEY

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

SUMMARY

The Florence Land Recontouring Landfill is a National Priorities List site in the townships of Florence, Mansfield, and Springfield, in Burlington County, New Jersey. The site is a land parcel of approximately 60 acres on Cedar Lane Extension, between the New Jersey Turnpike and I-295. The landfill occupies about one-half of the total area and two leachate lagoons and a pond is on the other section.

From 1973 until 1981, the landfill was operated as a solid waste disposal facility. It collected municipal wastes as well as industrial wastes and may have received more than 95 tons of hazardous wastes. As part of the final closure of the landfill, a clay cap was placed over the landfill and a leachate collection system installed. The hazardous wastes that have been detected on-site were primarily heavy metals and volatile organic compounds (VOC's) including vinyl chloride. Off-site, there was evidence of subsurface soil contamination with heavy metals and surface water contamination with phenolic compounds. The on-site shallow groundwater also was contaminated with compounds from the landfill. Air sampling indicated there were detectable concentrations of VOC's only at the vents to the landfill cap, (i.e., at the manholes of the leachate collection system and the monitoring wells). There were no detectable concentrations at the landfill perimeter; however, there were the typical nuisance odors that emanate from all landfills, which were detected by olfaction. Nearby residential wells were sampled, but the water quality did not appear to be affected by the landfill contaminants.

The Record of Decision (ROD) addresses the public health concerns as well as the nuisance odor problem. This site is not of public health concern at this time because of the absence of human exposure to hazardous substances.

BACKGROUND

A. SITE DESCRIPTION

The 29-acre landfill is situated approximately 1 mile south of Interchange 52 on New Jersey Interstate 295 in a mixed agricultural and residential area of 3 townships: Florence, Springfield, and Mansfield. The landfill is bordered by single-family residences along Cedar Lane Extension, farmland, and Assiscunk Creek.

The landfill, which began operation in November 1973, was permitted to accept sanitary and industrial wastes including septage and sewage sludge. The permit for industrial wastes did not include chemical wastes. In 1975 the New Jersey Department of Environmental Protection discovered chemical waste disposal had occurred at the landfill. Subsequent administrative problems ultimately led to a Consent Order issued by the New Jersey Superior Court in January 1979. The Consent Order elements included: (1) listing the permitted and prohibited wastes, (2) a sampling and analysis program, and (3) designing, installing and maintaining a leachate collection system.

The landfill area was closed in September 1982. A clay cover was placed on the landfill during closure. It was reported that this cover had been severely eroded exposing municipal wastes in some areas. The leachate collection was installed and upon extraction from the collection system, the leachate was placed into two lagoons constructed on another section of the property. These leachate lagoons were surrounded by a 5-foot high fence with three strands of barbed wire around the top. Carbon adsorption filters were placed on top of six leachate collection system manholes to collect the VOC's and nuisance odors. The Remedial Investigation (RI) reported that these filters were not totally effective. The landfill is not fenced; however, there is a gate that was installed at the entrance to the site. This gate is 8 feet high and 20 feet wide with an attached fence that extends approximately 30 feet on either side. While the gate, which remains locked, may prevent vehicular traffic from entering by the site entrance road, it does not prevent access by off-road vehicles or other trespassers.

B. SITE VISIT

ATSDR has not conducted a site visit at this time.

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

A. ON-SITE CONTAMINATION

The leachate collected in the manholes is pumped from the manholes to the leachate lagoons. It is later transported to the Willingsboro Wastewater Treatment Plant for disposal. The contaminants detected in the leachate were: VOC's such as methylene chloride, 1,1,2-trichloroethane, and 1,2-dichloroethane, and polynuclear aromatic hydrocarbons.

Air sampling was conducted around the site and at landfill monitoring wells and manholes. The results indicated that some contamination was present at the manholes, although the components were not identified. The analytical results from the periphery air sampling indicated no contamination was detected by the sampling methods employed.

The shallow groundwater at the site was contaminated with a variety of VOC's and base/neutral compounds. The following Table of Contaminants lists the compounds of concern.

TABLE OF CONTAMINANTS

Compound	Shallow Groundwater	Deep Groundwater	Soil
methylene chloride	114	44	940
vinyl chloride	75	ND	NI
trans-1,2-dichloro-ethylene	61	ND	184
trichloroethylene	10	ND	423
tetrachloroethylene	11	ND	2,030
antimony	NI	NI	760
arsenic	1,600	15	68
chromium	450	20	152
lead	1,200	20	45

Soil metal concentration units are mg/kg, groundwater units are ug/l
ND None Detected
NI No Information available

There were detectable concentrations of other contaminants such as phthalates; however, the low concentrations reported are not likely to be of health concern.

The surface water on-site had detectable quantities of methylene chloride and phenolic compounds. The concentrations detected are not of health concern.

There were soil samples taken in the wastefill and around the wastefill areas. The results of soils analyses within the wastefill area yielded the same contaminants as the groundwater: methylene chloride, tetrachloroethylene, and trichloroethylene. The concentrations were generally 1 to 2 orders of magnitude higher than their respective groundwater concentrations. Toluene was also found in concentrations exceeding 7,500 ug/kg. The higher metal concentrations were confined to the wastefill area. Generally, the metal concentrations are typical of concentrations found in wastewater sludges from sewage treatment and other municipal-type landfills.

One soil sample had a high concentration of Aroclor 1242, approximately 2,200 mg/kg. Aroclor 1242 is a trade name for a commercial mixture of several polychlorinated biphenyl congeners. This was the only sample within the wastefill of the landfill to indicate the presence of PCB's.

B. OFF-SITE CONTAMINATION

The RI sampled 20 domestic wells in the area in December 1985. Results indicated that 11 wells were contaminated with methylene chloride; however, the laboratory blanks also contained methylene chloride at roughly the same concentration. The contaminants may have been introduced in the laboratory. In any event, the concentrations detected are not considered to be of health concern.

Aroclor 1242 was also detected in one near-surface soil sample (0-2 feet) at a concentration of 1.8 mg/kg.

Surface water and sediments were taken in Assiscunk Creek upstream of the landfill and just at the eastern edge where the stream exits the site. The quality of water entering and leaving the site was generally the same. While the conventional parameters (chloride, sulfate, specific conductance, etc.) results were similar, there were detectable quantities of pentachlorophenol (9 ug/l), phenol (16 ug/l), and methylene chloride (20 ug/l) in the downstream samples. The sediment samples taken from Assiscunk Creek (upstream and downstream) indicated there was no significant increase in contamination from the landfill.

C. PHYSICAL HAZARDS

There were no structures on-site that were reported as physical hazards. The pond, erosion drainage ditches, and exposed refuse may present a physical hazard to those trespassing on-site.

DEMOGRAPHICS OF POPULATION NEAR SITE

The 1980 census revealed the populations in each of the 3 townships to be between 2,500 and 9,000. The total population within a 3-mile radius of the site was estimated to be 4,500. In the immediate area of the landfill there are far fewer residents. The most densely populated area near the site was on Cedar Lane extension, west of the site boundary. There were single family homes scattered through the agricultural farmland north of the site. There were some small commercial enterprises further away. There has been a proposal for the construction of a large landfill that will encompass the current site. This proposed landfill, currently called the Burlington County Solid Waste Management Facilities, will occupy approximately 600 acres to the north, south, and west of the landfill. The land use east of the site would remain unchanged (wooded and farmland).

EVALUATION

A. SITE CHARACTERIZATION

1. Environmental Media

The landfill and surrounding area were adequately sampled. No further information is required at this time.

2. Land Use and Demographics

No further information is required at this time; however, future rezoning and/or land use changes may require institutional controls to be invoked.

3. Quality Assurance and Quality Control

It was assumed that the analytical data has been reviewed by the EPA and has met their acceptability criteria. The conclusions in this Health Assessment were based on the information received. The accuracy of these conclusions is determined by the completeness and reliability of that information.

B. ENVIRONMENTAL PATHWAYS

The migration of site contaminants can occur through groundwater transport. Other transport mechanisms may be through horizontal migration of landfill gases, surface water, and sediment. Seeps of landfill leachate could carry contaminants into drainage ditches or Assiscunk Creek. Also, the discharge of groundwater into Assiscunk Creek can introduce the contaminants into the sediments and/or surface water. The ROD addresses these concerns by proposing the installation of slurry walls surrounding the site, the construction of a synthetic membrane and clay cap, interception of the groundwater upgradient of the site, and a new leachate collection and management system. By management of the incoming groundwater, the amount of landfill leachate can be reduced. The installation of the slurry walls should significantly reduce the amount of groundwater flowing into the landfill. The groundwater flow can be reduced further by its interception and diversion away from and around the landfill by way of the upgradient groundwater interception system. The synthetic membrane and clay cap will reduce the amount of water infiltrating the landfill through precipitation and surface water run-off thereby reducing the generation of leachate. The leachate collection system was designed to collect the generated leachate and for its removal and proper disposal.

Assiscunk Creek has been used for irrigation and recreational purposes and could transport contaminants off-site and into foodchains. However, the RI analytical results on concentrations of contaminants in the surface water and sediments did not indicate the landfill was affecting the water quality.

Some surface water run-off was ponded in an area on-site. The analytical results indicated this water was not contaminated. However, it can act as a point where surface water may infiltrate the cap and increase the amount of leachate.

The air monitoring data indicated contamination from VOC's around the vents to the landfill cap but no contamination was detected at site peripheries. The ROD proposed the installation and maintenance of a gas collection system which should eliminate the nuisance odor problem, as well as any VOC's present.

The surface soils were not contaminated except for areas where the landfill cap had eroded and exposed the underlying refuse.

C. HUMAN EXPOSURE PATHWAYS

The groundwater on-site has been contaminated with VOC's and some metals. The residences in the area using the groundwater for domestic purposes, (bathing, drinking, cooking, etc.) have the potential for exposure should the contaminants migrate from the landfill into their wells. The RI reported that 20 residential wells were tested for the contaminants and that 11 had detectable quantities of methylene chloride. The concentrations detected were similar to the concentrations found in the blank samples. The conventional parameters (sulfate, chloride, specific conductivity, etc.) indicated there was no difference between the residential samples and background samples; therefore, it is concluded the methylene chloride was probably a laboratory-introduced contaminant.

Exposure through dermal contact appears minimal since the contamination is below the landfill cap. The surface water and sediment results indicated that they were not affected by the landfill and that exposure or contact with either would be of minimal concern. Concern is warranted for the remedial workers, especially during activities which disturbs the landfill cap. These activities may include the installation of the slurry walls or the leachate collection system, and also during the removal of leachate from the collection system.

Inhalation of VOC's is of concern for the remedial workers during activities on-site, especially when installing the gas collection system, the leachate collection system, or when the landfill cap is disturbed.

Food chain pathways were not investigated in the RI; however, it would appear that bio-accumulation of contaminants by plants or animals would be minimal because of the lack of contamination of the surface soil, water and sediment.

PUBLIC HEALTH IMPLICATIONS

The contaminants of greatest concern found in the groundwater and soils were tetrachloroethylene (PCE), trichloroethylene (TCE), and vinyl chloride. Generally, this class of compounds can cause liver and kidney

damage, subtle neurobehavioral effects, sensitization for cardiovascular disease, and frank central nervous system (CNS) effects. The metal concentrations found in the subsurface soils and especially the groundwater also pose a public health concern.

The vinyl chloride found in the groundwater at the site is thought to be produced from the bio-degradation of TCE and PCE. The concentrations of vinyl chloride that were detected in the on-site groundwater were above the regulatory standards for drinking water, i.e., EPA's Maximum Contaminant Level. Vinyl chloride is a known human carcinogen causing angiosarcomas of the liver in workers exposed to high concentrations (Wagoner, 1983). Other target organ cancers linked to vinyl chloride exposure are liver, lung, and brain cancers (Wagoner, 1983). The population at risk would primarily be the remedial workers during installation of the leachate collection system, etc. Persons having preexisting liver, kidney, cardiac, neurological, and pulmonary diseases are particularly at risk.

Tetrachloroethylene is readily absorbed into the system through inhalation and ingestion, but dermal absorption is considered poor. The main target organs are the liver and kidneys. There are also CNS effects associated with ingestion and inhalation exposures although the concentrations typical for those effects are several orders of magnitude higher than the concentrations found in the groundwater and soils in the landfill. PCE was present in the groundwater at average concentrations of approximately 11 ug/l. This concentration is several orders of magnitude below those likely to cause acute health effects. However, chronic low level exposure to PCE at present concentrations may result in adverse health effects to users of the untreated water. Several studies have revealed that PCE is carcinogenic in laboratory animals and consequently, it has been given a Group B2 rating (Probable Human Carcinogen) by the EPA.

TCE has not been found to be carcinogenic in humans. However, TCE has been indicated in some studies as a carcinogen in laboratory animals; consequently, it has been designated as a potential human carcinogen. TCE was present in the groundwater at concentrations of approximately 10 ug/l. This concentration is several orders of magnitude below that likely to result in acute health effects. However, the exposure to TCE in the untreated groundwater from the landfill may cause adverse health effects with long-term exposure.

Methylene chloride is a VOC common to hazardous wastes sites. It is readily absorbed into the system through inhalation and ingestion. Case studies indicate that methylene chloride is an animal carcinogen. It has not been proven to be a human carcinogen; therefore, it has been classified by EPA as a probable human carcinogen. Chronic exposure studies indicate methylene chloride may cause mild liver toxicity, although little quantitative information presently exists. Dermal contact with the concentrations detected on-site may cause mild skin irritations.

As with the other VOC's, trans-1,2-dichloroethylene (DCE) may exert its health effects in water via oral, inhalation, and dermal contact. The majority of acute and chronic health effects reported have occurred in occupational settings. In the presence of other VOC's there may be synergistic effects that manifest as headaches, lethargy, and general malaise. Existing evidence from animal studies suggests that DCE is a possible human carcinogen, and it has been given a Group C rating.

Acute arsenic poisoning may result in nausea, vomiting, diarrhea, anemia, and cardiac dysfunction in high risk populations. Trivalent arsenic is rapidly absorbed across the stomach and intestines into the bloodstream, and subsequently can readily lead to systemic injury. Renal damage may result in hematuria, glycosuria, and necrosis. Another clinical manifestation, resulting from chronic oral exposure to arsenic, is liver disease and liver cancer. The induction of portal hypertension and cirrhosis of the liver may result from chronic arsenic exposure. Peripheral neuropathy and other neurological dysfunctions are also common after acute and chronic arsenic exposure and may lead to hearing loss and mental retardation in children. Systemic effects can be observed in humans with oral doses of 30-300 ug/kg/day. Skin lesions may also arise (30-200 ug/kg/day) with chronic oral exposures. These skin abnormalities may include hyperpigmentation and hyperkeratosis on the palms and soles of the skin, and epidemiological studies reveal some evidence for a dose-dependent relationship between arsenic concentrations and skin cancers. Arsenic may act as a contact allergen leading to local inflammation. Dermal exposure to arsenic at this site would be of particular concern to remedial workers. No precise dose estimates are currently available; however, dermal contact may lead from mild to severe dermatitis of the skin. Additional sampling of this medium is presently in progress.

Chromium has been detected in the soils and groundwater of the landfill. Chromium exists primarily in two oxidation states, trivalent and hexavalent. While trace quantities of trivalent chromium are essential for carbohydrate metabolism, hexavalent chromium is a human carcinogen by the inhalation exposure route. The concentrations present may cause, through ingestion, effects such as acute renal tubular necrosis. Also, dermatitis and allergic skin reactions can occur with dermal exposure.

Lead is present in the groundwater on-site at concentrations well above the primary drinking water regulations. Adverse health effects have been observed at concentrations below this standard and estimated long-term exposures to lead at concentrations present in the groundwater are of public health concern. Exposure to lead may produce several effects. It may inhibit hemoglobin synthesis and decrease red blood cell survival, cause peripheral nerve dysfunction, and increase blood pressure. There are several sub-populations that are particularly susceptible to lead toxicity. These sub-populations include reproductive age women (because of developing fetuses), children, and individuals with hepatic or renal disorders.

Most of the available information on antimony exposures and toxicity comes from the industrial settings. There may be acute effects from exposures to the trivalent and pentavalent chlorides of antimony which manifest as rhinitis and/or acute pulmonary edema. Chronic exposures by the inhalation route may result in rhinitis, pharyngitis, and tracheitis and exposures by dermal contact may cause skin lesions.

CONCLUSIONS

This site is of potential public 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. Although the above discussions of the site contaminants indicate that adverse health effects may be realized through chronic exposure to any or all of the contaminants, there was no indication of any exposures having occurred or currently occurring. The ROD, with its proposed remediation activities, adequately addresses (and appears to eliminate) the potential for any future exposure to site contaminants.

The remedial workers and those who trespass on the landfill are of particular concern. The workers may be exposed to the contaminants through dermal contact with the soils and groundwater, inhalation of the VOC's and the other gases typically produced in landfills by biological degradation of refuse that have violated the integrity of the cap, and the ingestion of the soils or groundwater.

The recommendations are as follows:

1. Provide proper safety training and protective equipment to remedial workers.

2. Restrict access to the contaminated areas.

3. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended, the Florence Land Recontouring 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 contaminants is occurring or has occurred in the past, this site is not being considered for follow-up health studies at this time. However, if data becomes available suggesting that human exposure to significant levels of hazardous substances is currently occurring of has occurred in the past, ATSDR will reevaluate this site for any indicated follow-up.

PREPARER OF REPORT

Max M. Howie, Jr.
Environmental Health Specialist
Health Sciences Branch

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