Health Consultation

LINCOLN LIMITED LANDFILL

FORD HEIGHTS, COOK COUNTY, ILLINOIS

SEPTEMBER 30, 2006

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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HEALTH CONSULTATION

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Prepared By:

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Purpose

On January 12, 2005, the Illinois Environmental Protection Agency (IEPA) requested that the Illinois Department of Public Health (IDPH) assist in sampling private and semi-private wells near the Lincoln Limited Landfill for possible site-related chemicals. In June 2006, IEPA requested that IDPH review their environmental investigation report for the site, which included soil sampling data, groundwater sampling data, and asbestos analysis. This health consultation summarizes the site information and our findings, conclusions, and recommendations.

Background and Statement of Issues

The Lincoln Limited Landfill is a non-permitted landfill east of Illinois Route 394 and north of U.S. Route 30 (Figures 1 and 2) in southern Cook County, Illinois. The land immediately to the east, north, and west of the landfill is farmland. South of the landfill is the Clark Garden Center.

In October 2002, IEPA first cited the Lincoln Limited Landfill for waste disposal violations. The landfill lacked a state permit to accept general waste and piled waste above grade. The owner of the landfill refused to comply with IEPA demands, so in November 2003, the case was referred to the Illinois Attorney General (Illinois Government News Network 2005a).

Despite the ongoing legal action, the landfill continued accepting wastes. Between October 2002 and August 2004, the landfill grew from about 370,000 cubic yards to about 2.2 million cubic yards, and its height grew from 47 feet to 80 feet (IEPA 2006).

On January 10, 2005, IEPA and the Illinois State Police sealed the Lincoln Limited Landfill, stopping its operations (Illinois Government News Network 2005b). Subsequently, a federal judge overturned the seal order (White 2005), and the landfill resumed operations.

On January 19, 2005, IDPH staff sampled six wells south, southeast, east and northeast of the site (Figure 3 and Table 1). All but well S-4 were analyzed for inorganic chemicals, volatile organic chemicals (VOCs), semi-volatile organic chemicals (SVOCs) and pesticides. Well S-4 was not analyzed for SVOCs.

IEPA investigated the site in November 2005. They excavated 22 test pits and collected soil samples that were analyzed for VOCs, SVOCs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and metals. IEPA also installed 12 temporary wells to assess groundwater on the site. The water samples also were analyzed for VOCs, SVOCs, PAHs, PCBs, pesticides, and metals. IEPA also sampled material from an area known as the “former sand pit” for asbestos (IEPA 2006).

Demographics

The Lincoln Limited Landfill is in a rural area. Homes to the west of Illinois Route 394 are served by a public water supply. IDPH conducted a site visit on January 19, 2005. The land immediately south, east, and north of the landfill is farmland. Scattered homes and businesses with wells are along U.S. Route 30 and Torrence Avenue. These wells are south, southeast, east, and northeast of the landfill. Homes south of U.S. Route 30 and homes east of Torrence Avenue are served by a public water supply. North of Well S-5 (Figure 3), homes and businesses on Torrence Avenue are served by a public water supply. On January 19, 2005, the landfill was active, and several dump trucks were dumping material on the landfill. No odors were detected during the site visit.

Discussion

Chemicals of Interest

IDPH compared the maximum level of each contaminant detected during environmental sampling with appropriate screening comparison values. This was to select contaminants for further evaluation for both carcinogenic and non-carcinogenic health effects. Chemicals that exceeded comparison values were selected for further evaluation. An explanation of each of the comparison values is found in Attachment 1.

IDPH used the comparison values to screen for contaminants that warranted further evaluation. These comparison values do not represent thresholds of toxicity. Although some of these chemicals may exist at levels greater than comparison values, the contaminants can only affect someone exposed to sufficient doses. The amount of the contaminant, the duration and route of exposure, and the health status of exposed individuals are important factors in determining the potential for adverse health effects.

Off-Site Groundwater

On January 19, 2005, IDPH staff sampled six wells south, southeast, east, and northeast of the Lincoln Limited Landfill (Figure 3 and Table 1). Analysis by the IEPA Laboratory found no organic compounds. Of the inorganic chemicals, only sodium exceeded its comparison value, in three wells (Table 2).

On-Site Groundwater

IDPH reviewed the results of the analyses of 12 groundwater samples collected from monitoring wells at the site in November 2005. The chemicals of interest include bis-2-ethylhexylphthalate, arsenic, lead, manganese, and vanadium (Table 4). Iron was also elevated, but these are aesthetic parameters and are not considered toxic at these levels.

On-Site Soil

IDPH reviewed the results of the analyses of 53 soil samples collected at various depths on the site in November 2005. PAHs, lead, and asbestos are the chemicals of interest in on-site soil. Sample X-102 had the greatest level of PAHs, 42.7 mg/kg of benzo(a)pyrene (BaP) equivalents. Sample X-122 had the greatest level of lead at 1,200 mg/kg. These chemicals were detected from 2 to 9 feet below the ground surface.

A sample collected in November 2005 from the surface of the former sand pit area in the southeast portion of the site was analyzed for asbestos. The laboratory reported this material to be 20% chrysotile asbestos, making the material asbestos-containing material (ACM).

Exposure Pathways

A chemical can affect people only if they contact it through an exposure pathway at a sufficient level to cause a toxic effect. This requires:

- A source of exposure,
- An environmental transport medium,
- A route of exposure
- A point of exposure, and
- A receptor population.

A pathway is complete if all its components are present and human exposure of people occurred in the past, is occurring, or will occur in the future. If (1) parts of a pathway are absent, (2) data are insufficient to decide whether it is complete, or (3) exposure may occur at some time (past, present, future), then it is a potential pathway. If a part of a pathway is not present and will never exist, the pathway is incomplete and can be eliminated from further consideration.

Groundwater

Water from precipitation can dissolve contaminants in soil, percolate downward, and contaminate groundwater. The geology of a site controls the flow of groundwater. Sand and gravel enhances the movement of groundwater, but clay inhibits this movement (Christensen et al. 1994). The direction of groundwater flow at the Lincoln Limited Landfill is unknown.

Contaminants found in on-site groundwater have not been detected in off-site wells. No one is currently exposed to the contaminants in on-site groundwater. Several chemicals of interest in on-site groundwater exceed drinking water standards and may pose a hazard if contamination migrates off the site.

Sampling results indicated elevated sodium levels in three of six private wells near the site. This contamination, however, may not be from the site. Common sources of sodium in groundwater include road salt and water softeners. Also, water softeners release considerable amounts of sodium to septic systems, which can cause elevated sodium concentrations in groundwater

(Panno et al. 2000). Of the three wells having elevated sodium levels, only one reported using a water softener.

Poor well construction and poor well maintenance also can contribute to groundwater contamination. An improperly sealed well can be a conduit for contamination. IDPH found well construction problems with four of the six sampled wells (Table 3). In particular, Well S-1 was in a depression in a parking lot, and its well casing extended only one inch above the bottom of the depression. Water in the electrical conduit of the well showed that water had overflowed into the well casing. It is probable that salt runoff from the parking lot also had overflowed the top of the well casing, contaminating that well with sodium. The Illinois Water Well Construction Code requires well casings to extend at least eight inches above the ground surface, and to have the cap tightly sealed. The Illinois Pump Installation Code requires that if a well has a buried seal, the seal will be replaced with a pitless well adaptor or the casing be extended eight inches above the surface, as required by the Illinois Water Well Construction Code. IDPH sent letters recommending corrective action to the users of the affected wells. Because of the seriousness of the problems with Well S-1, IDPH required that within 30 days after receipt of the letter, they have a licensed well contractor raise the casing 8 inches above grade and install a water tight seal on the well.

Soil

Trespassers on the Lincoln Limited Landfill site may be exposed to contaminants in on-site soil and wastes by dermal contact. If dust is stirred up, particles could be inhaled or ingested. Lead and PAHs are the chemicals of interest in on-site soil. BaP is one of the most potent PAHs and probably one of the most studied. Little is known about many of the other PAHs. USEPA has developed toxicity equivalency factors (TEFs) for many of the PAHs on the basis of their toxicity relative to BaP. These TEFs can be used to estimate the potential for adverse human health effects from exposure to mixtures of PAHs. IDPH converted the PAH results to BaP equivalents for evaluation of potential cancer risk.

For trespassers, IDPH assumed that middle school aged children (40 kg) to adults (70 kg) would come onto the site 50 days per year for 7 years of their lifetime. IDPH assumed that trespassers would incidentally ingest 150 milligrams of soil daily from hiking and digging activities, and would be exposed to the maximum level of contaminants detected in the soil. This exposure scenario is likely very conservative, because the soil data evaluated was collected from depth in test pits. We assumed the highest level of contamination detected was at the surface where trespassers would contact it.

On the basis of the above exposure scenario, trespassers exposed to PAHs would have no apparent increased risk of cancer. In this scenario, no non-cancer adverse health effects would be expected from exposure to PAHs and lead.

Exposure to asbestos containing material on the surface of the site via inhalation may pose an increased risk of cancer to trespassers who frequent that area of the site. The breakdown of friable asbestos containing material can release fibers into the air. Asbestos fibers do not

evaporate into air, but are carried by wind. Small diameter fibers and particles may remain suspended in the air for long periods and may be carried long distances by wind or water. Larger diameter fibers and particles tend to settle more quickly. Asbestos fibers are not able to move through soil.

Public Health Implications

Asbestos

Asbestos exposure by inhalation mainly affects the lungs and the membrane that surrounds the lungs. Breathing lower levels of asbestos may result in changes called plaques in the pleural membranes. These plaques sometimes can occur in people living in areas with high levels of asbestos in air. Effects on breathing from pleural plaques alone are not usually serious, but higher exposure can lead to a thickening of the pleural membrane that may restrict breathing.

Breathing asbestos can increase the risk of lung cancer and mesothelioma, a cancer of the thin lining surrounding the lung (pleural membrane) or abdominal cavity (the peritoneum). Cancer from asbestos does not develop immediately, but shows up after a number of years.

Sodium

Sodium has long been a major dietary factor affecting the risk of high blood pressure. Many studies have shown that reducing sodium intake can reduce blood pressure. The U.S. Food and Drug Administration (FDA) and National Research Council both recommend that people limit their sodium intake to 2,400 milligrams per day (mg/d). Low sodium diets can range from 1,000 mg/d to 3,000 mg/d. The typical American consumes between 4,000 mg/d and 6,000 mg/d (USEPA 2005, FDA 1995). A person drinking 2 liters of water per day from the well with the highest sodium concentration would consume 740 mg/d from this water.

Child Health Considerations

IDPH recognizes that children are especially sensitive to some contaminants. Given the same contaminant concentrations, children likely receive greater exposure than adults. This is because children play in soil, wash their hands less frequently than adults, and commonly exhibit hand-mouth behavior. Children also have a smaller body size, meaning that they receive a greater dose from the same amount of absorbed contaminant.

The site is far enough from homes that trespassing by small children is unlikely. Older children trespassing on the site would not be expected to experience adverse health effects.

Conclusions

The site currently poses no apparent public health hazard. Limited data do not suggest that people near the site are being exposed to site-related contaminants at levels that would cause adverse health effects. Asbestos containing material on a portion of the site has the potential to release fibers into the air that could be carried by wind on the site. Sodium detected in three wells may pose a public health hazard to people on a sodium-restricted diet; however, this sodium may not be site-related. Although possible air or soil contamination is unknown, on-site exposure probably is infrequent and likely would result in negligible exposure. Should groundwater contamination migrate from the site, area private wells could be affected.

Recommendations

IDPH recommends that IEPA:

- ensure proper disposal of asbestos containing material to reduce the potential for human exposure to asbestos fibers, and
- ensure that monitoring wells be installed around the site to detect groundwater contamination migration. These monitoring wells and private wells should be sampled regularly.

Public Health Action Plan

IDPH sent letters to home and business owners interpreting their well sampling results.

For the wells with construction deficiencies, IDPH recommended or required corrective actions.

IDPH will review any additional information that becomes available for the site.

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Certification

This Lincoln Limited Landfill public health consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

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

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Attachment 1

Comparison Values Used In Screening Contaminants for Further Evaluation

Comparison values (CVs) are the calculated levels of a chemical in air, water, food, or soil that is unlikely to cause adverse health effects in exposed people. CVs are used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

There are three different types of comparison values, environmental media evaluation guides (EMEGs), reference dose media evaluation guides (RMEGs), and cancer risk evaluation guides (CREGs). These values are used to screen chemicals and determine those that need to be evaluated further.

Environmental media evaluation guides (EMEGs) are derived from minimal risk levels presented in ATSDR Toxicological Profiles. Standard exposure assumptions for children and adults (body weights; ingestion rates for water, soil and air; and frequency and duration of exposure) are used. Individual EMEGs do not consider cancer, chemical interactions or multiple routes of exposure. They do help to identify specific chemicals needing further evaluation.

Reference dose media evaluation guides (RMEGs) are derived from the oral RfDs developed by USEPA using standard exposure assumptions for children and adults (body weights; ingestion rates for water, soil and air; and frequency/duration of exposure). Like EMEGs, RMEGs do not consider carcinogenic effects, chemical interactions, or multiple exposures.

Cancer risk evaluation guides (CREGs) represent levels of environmental chemicals that may pose a $1x10^{-6}$ (one in a million) excess cancer risk. They are derived using cancer slope factors published by USEPA.

Table 1. Wells sampled by IDPH on January 19, 2005. Well locations are in Figure 3.

Well	Details
S-1	Serves business (garden center), has water softener, not currently used for drinking water.
S-2	Serves business (installs tanks).
S-3	Serves business (hotel).
S-4	Serves business (gasoline station), not currently used for drinking water.
S-5	Serves home and business (auto body repair)
S-6	Serves home.

Table 2. Concentrations of sodium in private wells near the site, January 19, 2005. Well locations are in Figure 3.

Well	Sodium Concentration (ppb)	Comparison Value (ppb)	Source of Comparison Value
S-1	370,000	20,000	DWEL
S-4	22,000	20,000	DWEL
S-5	28,000	20,000	DWEL

ppb = Parts per billion.
DWEL = Drinking Water Equivalent Level

Table 3. Construction problems found with wells near the site. Well locations are in Figure 3.

Well (letters correspond with wells above)	Problems with Well
S-1	Well in depression in parking lot, casing only 1 inch above grade of bottom of depression, cap loose and lacked bolts, standing water in electrical conduit.
S-2	Well casing extended 5 inches above grade, cap missing bolts.
S-4	Well casing extended 5 inches above grade, dumpster and trash (including oil container) next to well, wiring not in electrical conduit.
S-5	Buried well seal.

Table 4. Chemicals of Interest in On-Site Groundwater

Chemical	Maximum Level Detected in µg/L	Well Location	Comparison Value in µg/L	Source of Comparison Value
Bis-2-ethylhexylphthalate	69	G105	6	MCL
Arsenic	51	G101	10	MCL
Iron	120,000	G101	1,000	IDPH (aesthetic)
Lead	82	G101	15	USEPA Action Level
Manganese	4,600	G101	300	LTHA
Vanadium	120	G101	30	Child EMEG

MCL – maximum contaminant level
IDPH – Illinois Department of Public Health guideline for taste
USEPA – action level established by the U.S. Environmental Protection Agency for lead in drinking water
LTHA – lifetime health advisory
EMEG – environmental media evaluation guide for children established by the Agency for Toxic Substances and Disease Registry

Figure 1. Lincoln Limited Landfill Site Location Map

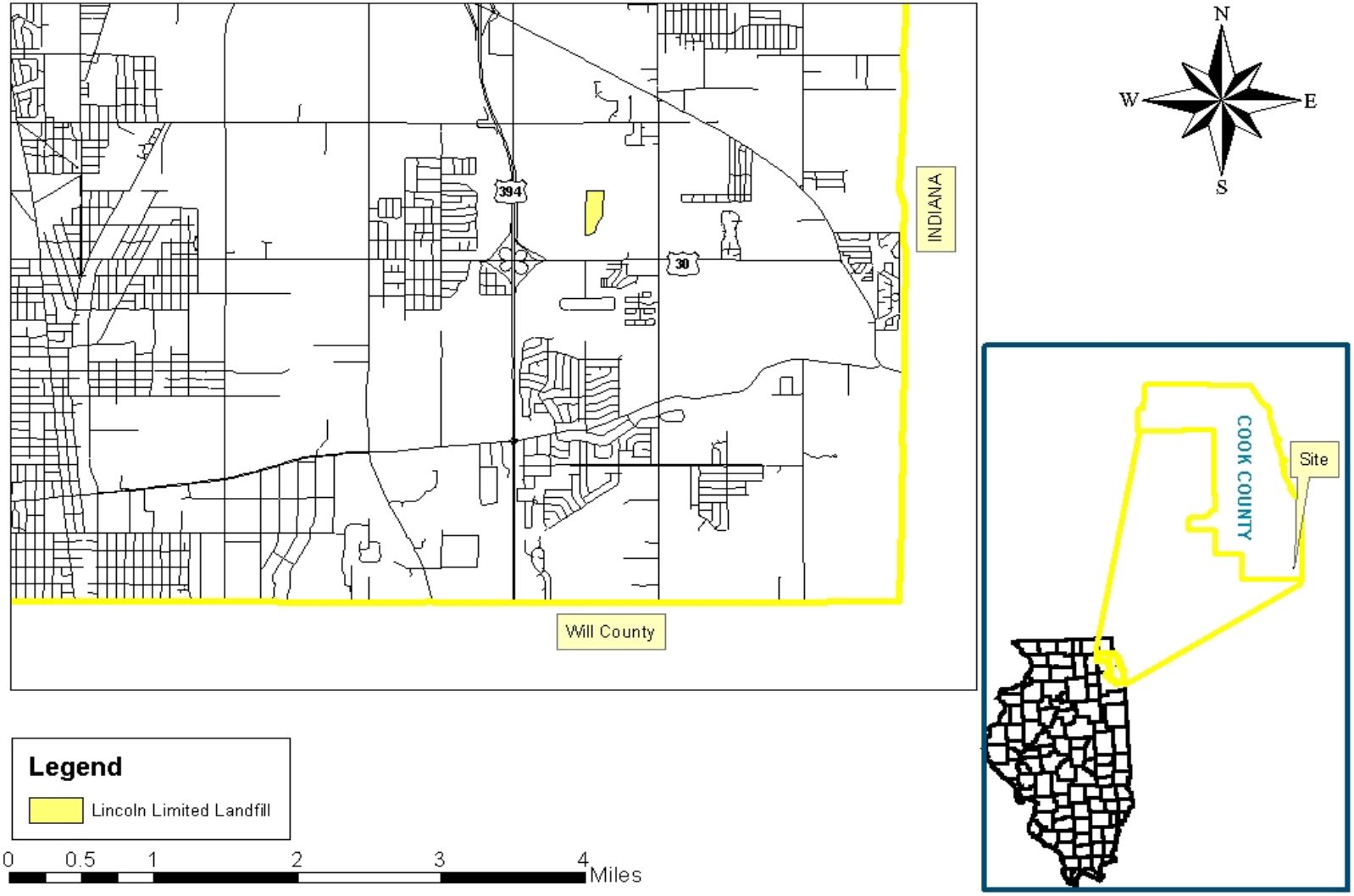

Figure 2. Lincoln Limited Landfill (Cobb 2005b).

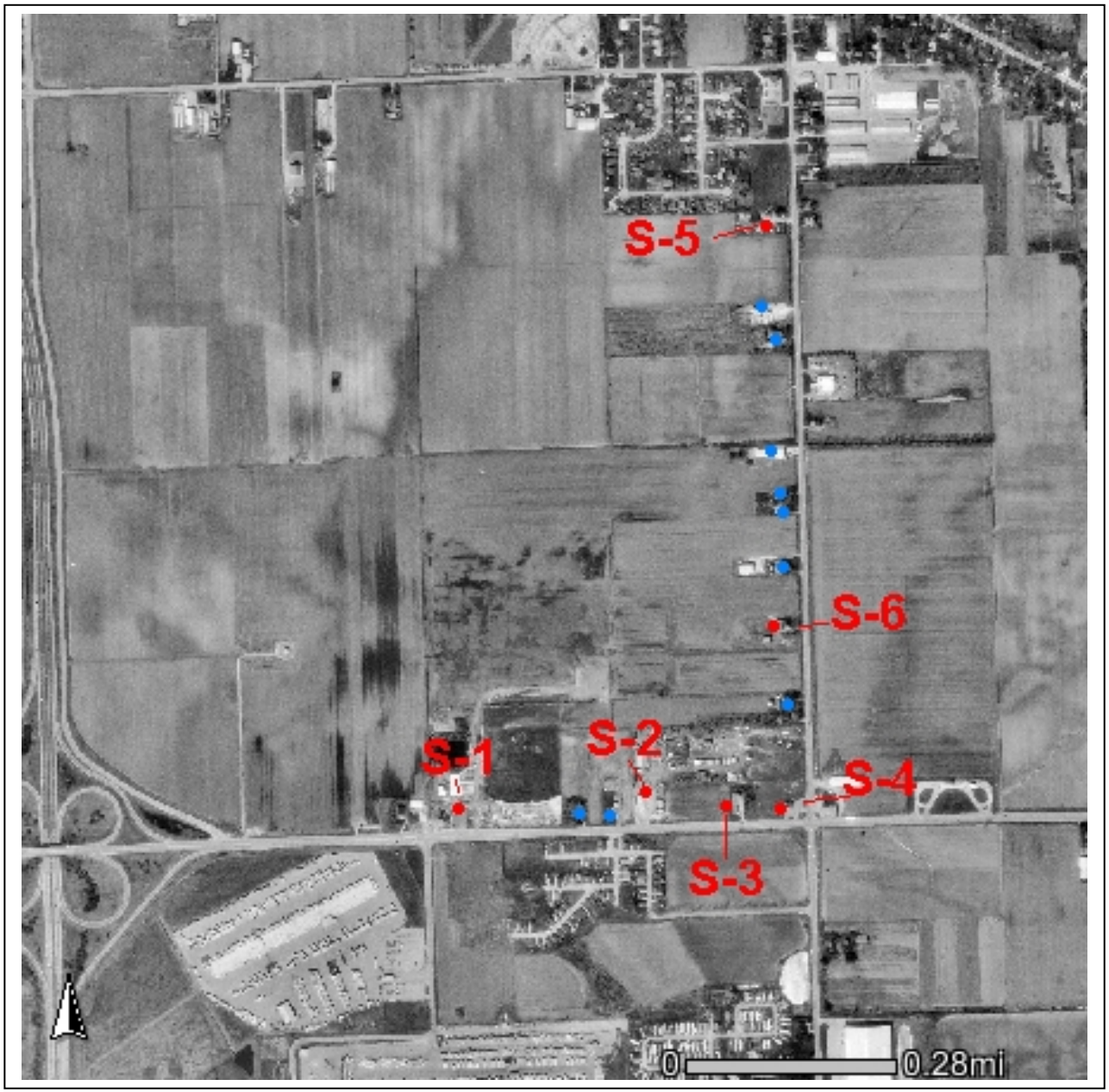

Figure 3. Wells sampled near the Lincoln Limited Landfill (Cobb 2005a).