Health Consultation

AMERICAN CYANAMID-CYTEC INDUSTRIES

JOLIET, WILL COUNTY, ILLINOIS

EPA FACILITY ID: ILD000675264

OCTOBER 16, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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Prepared By:

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

Purpose

Beginning in January 2001, the Illinois Environmental Protection Agency (Illinois EPA) provided environmental data for the American Cyanamid-Cytek Industries site and requested that the Illinois Department of Public Health (IDPH) interpret the data. This health consultation summarizes site activities and evaluates private well data and other environmental data for the site.

Background and Statement of Issues

The American Cyanamid-Cytek Industries site at 1306 McKinley Avenue in Joliet, Will County, Illinois, is about 60 acres in size (Figure 1). The property is bounded by McKinley Avenue and a residential neighborhood to the west, Sugar Run Creek to the north, the Illinois Central Railroad line and the inactive National Quarry (owned by Vulcan Materials Company) to the east, and Zurich Road and an active quarry to the south. A ditch originates from water pumped from the active rock quarry south of the site. The ditch runs roughly northwest through the middle of the site and discharges into Sugar Run Creek. Sugar Run Creek flows to the northwest and discharges into the Des Plaines River (IEPA 2001). A fence and four locked gates restrict access to the site.

In 1921, the Superior Chemical Company constructed a facility on this property for the production of dry alum and baking powder. The food industry, paper industry, and wastewater treatment plants used these products. Alum is composed of aluminum ammonium sulfate, aluminum potassium sulfate, and aluminum sulfate. Baking powders vary in composition, but all include a carbonate and a weak acid. A typical baking powder composition is sodium bicarbonate, tartaric acid or monobasic calcium phosphate, and cornstarch. Some baking powder includes ammonium carbonate and potassium bitartrate.

American Cyanamid bought the Superior Chemical Company plant in 1931, and they continued making dry alum in various grades, including ammonia alum, potash alum, and iron free alum. The plant also produced hydrochloric and sulfuric acids. In 1953, regular production of liquid alum began, and in 1955, sulfuric acid production increased to 150 tons per day. Sulfuric acid production ended in 1980. The number of employees at the plant decreased over time, from nearly 300 in the late 1940s, to 36 in 1980, to five in 1990. The alum production facility is no longer operating (Hallinger 2005, IEPA 2001).

Site facilities include one manufacturing building, two aluminum ore silos, and an office building with showers. Starting in 1966, the plant used impoundments to recycle wash water from alum production. Waste silica settled in the five impoundments, which cover most of the southern half of the site. Impoundment 1 is filled and covered with vegetation, including trees. The other four impoundments have been filled with alum, mud, and clay, capped with two feet of clay, and vegetated (IEPA 2001).

In 1995, Cytec Industries began voluntary investigation and remediation activities at the site under the Illinois EPA Site Remediation Program. In that year, the Cytek contractor, Basland, Bouck, and Lee, Inc. (BBL) sampled private wells near the facility. In 1996, wells with more

than 400 parts per million (ppm) of sulfates were abandoned. Cytek Industries had a water main installed, and homes with affected private wells were supplied with municipal water from the City of Joliet. In 1998, BBL performed additional private well sampling (Hallinger 2005).

In 1999, Cytek Industries graded the on-site impoundments to improve storm water runoff. This was to decrease the infiltration of precipitation into the impoundments and reduce the leaching of contaminants into groundwater. Cytek also installed monitoring wells at this time (Hallinger 2005).

In 2000 and 2001, BBL installed and sampled more monitoring wells. They also sealed additional private wells and extended municipal water to affected homes, based on previous sampling data. In 2003, they began a 5-year monitoring program of the site, which included annual sampling of monitoring wells and private wells in the area. As of late 2005, 20 private wells had been sealed (Hallinger 2005).

Over the years of facility operation, Illinois EPA responded to many complaints concerning air releases from the sulfuric acid plant and leachate releases or overflows from some of the impoundments. Illinois EPA inspections confirmed several of these releases (IEPA 2001).

Hydrogeology

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). At the site, glacial till overlies dolomite bedrock. The glacial till is clayey, with thin local deposits of clay, silt, and sand. The glacial till ranges from three feet thick in the northern part of the site to about 40 feet thick in the southern part of the site.

The base of impoundment one is on dolomite bedrock, while the other impoundments are on glacial till (IEPA 2001). The upper 15 to 30 feet of the dolomite bedrock is fractured, providing conduits for groundwater to move. Private wells in the area draw water from the dolomite bedrock. The flow of site groundwater is affected by residential wells to the west and pumping from rock quarries, so the direction of groundwater flow is difficult to establish (IEPA 2001).

Demographics

The nearest home is about 50 feet west of the site. Using U.S. Bureau of the Census data, Illinois EPA (2001) estimated that about 800 people live within 1 mile of the site. In 2001, Illinois EPA reported 13 private wells within 0.25 miles of the site, 58 private wells between 0.25 miles and 0.5 miles of the site, and 154 private wells between 0.5 miles and 1 mile of the site. All Joliet municipal wells are more than 1 mile from the site (IEPA 2001).

Site Visit

On February 23, 2006, IDPH staff conducted a site visit. Although Hallinger (2005) reported that the alum production facility was no longer operating, the main gate of the facility was open, and

a car, a pickup truck, and two 18-wheel tanker trucks were present, indicating some activity at the site. All the vehicles appeared to be in good condition.

In general, the site was well vegetated. No odors were present near the site, and no visible smoke was present on the site. Although the site had a perimeter chain-link fence topped with barbed wire, the entire fence was not intact. Along the southwestern side of the site, one gate had a gap of about 18 inches. Just north of that gate, the barbed wire was missing from one section of fence, and the chain-link fence had been rolled back to make an opening about two feet across. Homes were within 100 yards of these openings. IDPH notified Illinois EPA about the gaps in the site fence.

To the west, most homes were small, and several of these homes had private wells in their front yards. Singleton Park is across the street from the site and near the main site entrance on McKinley Street. It has a playground, a picnic shelter, and a basketball court. The playground has wood chips, the basketball court is paved, and grass covers the rest of the ground surface. A church is south of Singleton Park and is directly across McKinley Street from the main site entrance.

An active rock quarry is immediately south of the site. A few permanent homes and a small group of mobile homes are southwest of the site. More homes also are east of the southern boundary of the site. An abandoned rock quarry at least 80-feet deep, with water at the bottom, is immediately north of these homes and west of the site. A gas station is on the eastern side of Illinois Route 53, and more homes are east of Illinois Route 53. To the north, the land is mostly undeveloped, though there are several commercial properties.

Discussion

Chemicals of Interest

IDPH compared the maximum level of each chemical detected during environmental sampling with appropriate screening comparison values. This was to select chemicals for further evaluation for both carcinogenic and non-carcinogenic health effects. Chemicals that exceeded comparison values or ones without a comparison value were selected for further evaluation. A description of each comparison value used is found in Attachment 1.

Comparison values do not represent thresholds of toxicity. Although some of these chemicals may exist at levels greater than comparison values, they can affect someone only when exposed to sufficient doses. The amount of the chemical, the duration and route of exposure, and the health status of exposed individuals are important factors in determining the potential for adverse health effects.

Groundwater

Although BBL has sampled private wells near the site since 1995, the samples were analyzed only for sulfates and parameters such as pH (Hallinger 2005). Elevated sulfate levels may impart

a disagreeable taste, but are not a health hazard (USEPA 2005). Consequently, this document does not evaluate the data from those sampling events.

On May 7, 2001, Illinois EPA sampled the water from four private wells near the site. These samples were analyzed for inorganic chemicals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and pesticides. Analysis detected no SVOCs, pesticides or PCBs. Sodium was the only chemical of interest (Table 1).

On May 8 and 9, 2001, Illinois EPA sampled the water from seven monitoring wells on and around the site. These samples were analyzed for inorganic chemicals, VOCs, SVOCs, PCBs, and pesticides. Analysis detected no PCBs, but many inorganic and organic chemicals exceeded comparison values (Table 2).

Sediments

On May 7-10, 2001, Illinois EPA collected six sediment samples from an on-site drainage ditch and Sugar Run Creek. These samples were analyzed for inorganic chemicals, VOCs, SVOCs, pesticides and PCBs. Analysis found no PCBs, but several inorganic and organic chemicals exceeded comparison values (Tables 3 and 4).

Soil

On May 7-10, 2001, Illinois EPA took soil samples, one from an off-site park and 20 from on-site locations; however, only three of the on-site samples were surface samples from one foot of depth or less. Because exposure is most likely from surface soil, this document evaluated potential exposure only for samples taken from one foot of depth or less. The samples were analyzed for inorganic chemicals, VOCs, SVOCs, pesticides and PCBs. In surface soil one foot of depth or less, no inorganic chemicals exceeded state or regional background levels, but several organic chemicals were identified as chemicals of interest (Table 5).

Exposure Pathways and Public Health Implications

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

- a source of exposure,
- an environmental transport medium,
- a route of exposure,
- a receptor population, and
- a point of exposure.

A pathway is complete if all its components are present and 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

The levels of any site-related contaminants likely were higher in the past, when wastewater was discharged into the unlined on-site impoundments. Capping of the impoundments to reduce the infiltration of precipitation should have decreased the leaching of contaminants into groundwater. However, groundwater monitoring to date is insufficient to establish any trends.

No one is drinking groundwater from monitoring wells, so only chemicals in private wells are a potential present or past (for sealed and abandoned wells) health hazard.

In private wells, sodium was found at elevated levels. Considering that some on-site monitoring wells had much higher concentrations, the site may have contributed to increased sodium in the area groundwater. However, other 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). Consequently, the sodium in private wells near the site may or may not be site-related.

Since sampling in 2001, many of the individuals with private wells have connected to a public water supply. Therefore, these residents would no longer be exposed to elevated sodium levels.

Sediments

Exposure of a trespasser or on-site worker to sediments would probably be occasional, resulting in negligible exposure. Because the levels of contaminants are low in the sediments, exposure is not likely to cause adverse health effects.

Soil

People may be exposed to contaminants in surface soil by inhalation (dust), incidental ingestion, or skin contact. Exposure is more likely in areas with bare soil. Vegetation or pavement minimizes exposure to contaminated soil. The site is well vegetated, which would minimize exposure. One impoundment has some bare soil, but it is in an unused part of the site. Gaps in the perimeter fence suggest that trespassing might be relatively frequent. Teenagers are the most likely trespassers.

To estimate exposure to chemicals in soil, IDPH assumed that a child or adult at the off-site park would be exposed 4 days per week, 20 weeks per year. We used a daily soil ingestion rate of 200 milligrams per day for a child and 100 milligrams per day for an adult. For children, we assumed exposure for 10 years and for adults we assumed exposure for 30 years. For a trespasser, IDPH assumed that they would be exposed 2 days per week, for 20 weeks per year, for 8 years. For an on-site worker, IDPH assumed exposure 5 days per week, 50 weeks per year, for 40 years.

Based on these exposure scenarios, no adverse health effects or increased cancer risk would be expected from exposure to chemicals of interest detected in surface soil at or near the site (Table 6).

Surface Water

No one consumes surface water near the site. Exposure of a trespasser or on-site worker to contaminants in surface water probably would be occasional at most, resulting in negligible exposure. Exposures to contaminants in surface water are not likely to cause adverse health effects.

Toxicological Evaluation

Sodium

All four sampled private wells had elevated sodium levels. 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). Near the site, a person drinking 2 liters of water per day from the residential well with the highest level of sodium would consume 75.4 mg/d from this water. The sodium intake from drinking water would be considerably less than the amount of sodium in a typical or even a low-sodium diet.

Child Health Considerations

The Illinois Department of Public Health recognizes that children are especially susceptible to some contaminants. The only contaminant of interest detected in private wells was sodium and elevated sodium levels are unlikely to affect the health of children.

Conclusions

Historically the American Cyanamid-Cytec Industries site had many complaints concerning air releases from the sulfuric acid plant and leachate releases or overflows from some of the impoundments. Illinois EPA inspections confirmed several of these releases (IEPA 2001). We cannot reconstruct past exposures to determine whether the site may have presented a public health hazard in the past.

Currently, the American Cyanamid-Cytec Industries site 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. Levels of chemicals in on site soil are not at levels that would be expected to cause adverse health effects. Exposure to chemicals in private wells and on- and off-site surface soil would not pose a health hazard. Exposure to contaminated sediments or surface water probably would be occasional, resulting in negligible exposure.

Public Health Action Plan

IDPH will evaluate any additional data that may be forthcoming for the site and will make appropriate health-based interpretations and recommendations.

Preparer of Report

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Table 1. Chemicals of interest in groundwater from private wells near the site (IEPA 2001).

Chemical	Well A, Northwest of Site (in ppb)	Well B, Northwest of Site (in ppb)	Well C, Northeast of Site (in ppb)	Well D, West of Site (in ppb)	Comparison Value (in ppb)	Source of Comparison Value
Sodium	31,900	37,700	37,400	31,400-31,700	20,000	DWEL

ppb = parts per billion.
DWEL = drinking water evaluation level

Table 2. Chemicals of interest in groundwater from on-site and off-site monitoring wells (IEPA 2001).

Chemical	Concentration (in ppb)	Comparison Value (in ppb)	Source of Comparison Value
Inorganic Chemicals			
Arsenic	N.D.-48.9	10	MCL
Barium	12.5-2,170	700	RMEG
Beryllium	N.D.-52.4	20	EMEG
Cadmium	N.D.-53.4	2	EMEG
Chromium	N.D.-219	100	MCL
Cobalt	N.D.-508	100	iEMEG
Lead	N.D.-17.6	15	AL
Manganese	N.D.-2,760	500	RMEG
Nickel	N.D.-541	100	LTHA
Silver	N.D.-53.2	50	RMEG
Sodium	21,000-209,000	20,000	DWEL
Vanadium	N.D.-535	30	iEMEG
Volatile Organic Compounds			
2-Chlorophenol	N.D.-50	40	LTHA
Semi-Volatile Organic Compounds			
4-Chloro-3-methylphenol	N.D.-65	--	--
4, 4'-DDT	N.D.-1.2	0.1; 5	CREG; iEMEG
2,4-Dinitrotoluene	N.D.-38	20	EMEG
bis(2-Ethylhexyl) phthalate	N.D.-13	3; 600	CREG; EMEG
N-Nitroso-di-n-propylamine	N.D.-46	0.005	CREG
Pentachlorophenol	N.D.-100	0.3; 10	CREG; EMEG
Pesticides			
Aldrin	N.D.-0.51	0.002; 0.3	CREG; iEMEG
Dieldrin	N.D.-1.3	0.002; 0.5	CREG; EMEG
Endosulfan sulfate	N.D.-0.071	--	--
Heptachlor	N.D.-0.57	0.008; 5	CREG; RMEG
Heptachlor epoxide	N.D.-0.012	0.004; 0.1	CREG; RMEG
Lindane	N.D.-0.49	0.1	iEMEG

N.D. = not detected
-- = data not available
ppb = parts per billion
MCL = maximum contaminant level
RMEG = reference dose media evaluation guide
EMEG = environmental media evaluation guide
iEMEG = intermediate environmental media evaluation guide
AL = action level
CREG = cancer risk evaluation guide

Table 3. Inorganic chemicals of interest in sediments (IEPA 2001).

Chemical	On-site Ditch (ppm)	Upstream Sugar Run Creek (ppm)	Downstream Sugar Run Creek (ppm)	Comparison Value (ppm)	Source of Comparison Value	Illinois Background (ppm)	Eastern U.S. Background (ppm)
Antimony	6.2-115	15.1	7.7-14.9	20	RMEG	0.18-8.6	N.D.-8.8
Beryllium	0.28-13	0.64	0.5-1.1	100	EMEG	N.D.-9.9	N.D.-7
Cadmium	0.24-12.8	N.D.	N.D.-1.4	10	EMEG	N.D.-8.2	--

N.D. = not detected
-- = data not available
ppm = parts per million
RMEG = reference dose media evaluation guide
EMEG = environmental media evaluation guide

Table 4. Organic chemicals of interest in sediments (IEPA 2001)

Chemical	On-site Ditch (in ppm)	Upstream Sugar Run Creek (in ppm)	Downstream Sugar Run Creek (in ppm)	Comparison Value (in ppm)	Source of Comparison Value
Semi-volatile Organic Compounds					
Benzo(a)anthracene	N.D.	0.920	0.120	--	--
Benzo(b)fluoranthene	N.D.-0.094	0.750	0.140	--	--
Benzo(k)fluoranthene	N.D.	0.620	0.100	--	--
Benzo(g,h,i)perylene	N.D.	0.180	N.D.	--	--
Benzo(a)pyrene	N.D.	0.690	0.120	0.1	CREG
Carbazole	N.D.	0.049	N.D.	--	--
4-Chloro-3-methylphenol	N.D.-1.6	N.D.	N.D.	--	--
Chrysene	N.D.-0.098	0.950	0.150	--	--
Dibenzo(a,h)anthracene	N.D.	0.160	N.D.	--	--
Indeno(1,2,3-c,d)pyrene	N.D.	0.300	0.076	--	--
4-Methylphenol	N.D.	N.D.	N.D.-16	--	--
n-Nitroso-di-n-propylamine	N.D.-1.5	N.D.	N.D.	0.1	CREG
4-Nitrophenol	N.D.-2.4	N.D.	N.D.	--	--
Phenanthrene	N.D.-0.080	0.390	0.130	--	--
Pesticides					
Endrin aldehyde	N.D.-0.0014	N.D.	N.D.	--	--

N.D. = not detected.
-- = data not available.
ppm = parts per million.
CREG = cancer risk evaluation guide
EMEG = environmental media evaluation guide

Table 5. Chemicals of interest in on-site and off-site surface soil (IEPA 2001).

Chemical	Off-site Park (in ppm)	On-site (in ppm)	Comparison Value (in ppm)	Source of Comparison Value
Polycyclic Aromatic hydrocarbons (PAHs)				
Benzo(a)anthracene	0.140	N.D.-0.048	--	--
Benzo(b)fluoranthene	0.230	N.D.-0.076	--	--
Benzo(k)fluoranthene	0.190	N.D.-0.079	--	--
Benzo(a)pyrene	0.110	N.D.-0.082	0.1	CREG
Chrysene	0.140	N.D.-0.075	--	--
Indeno(1,2,3-c,d)pyrene	0.091	N.D.-0.072	--	--
Phenanthrene	0.160	N.D.-0.072	--	--
Total PAHs as Benzo(a)pyrene	**0.169**	**0.110**	**0.1**	CREG
Other Semi-volatile Organic Compounds				
Polychlorinated biphenyls (PCBs)	N.D.	0.084-0.960	0.4; 1	CREG; EMEG

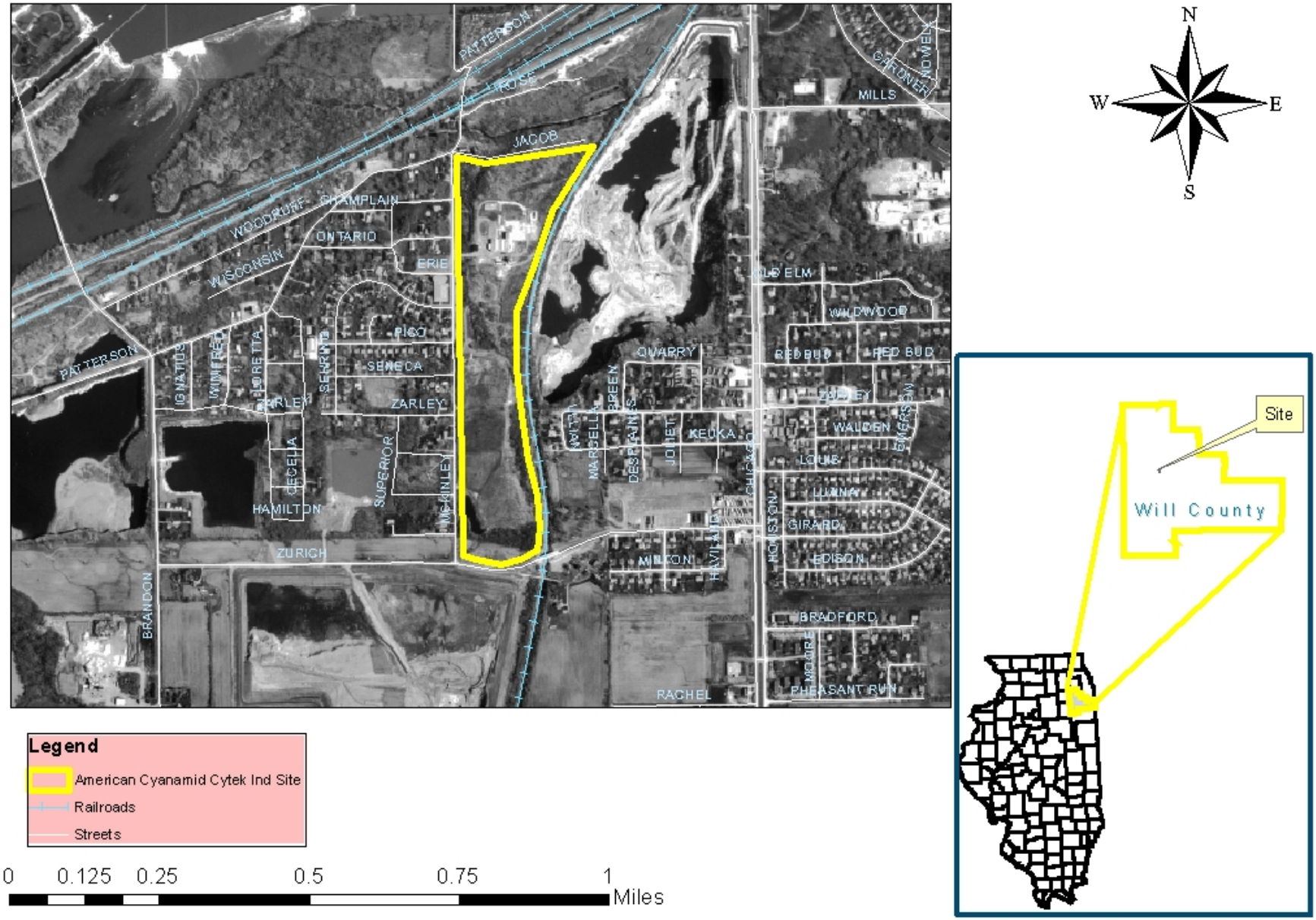
N.D. = not detected
-- = data not available
ppm = parts per million
CREG = cancer risk evaluation guide
EMEG = environmental media evaluation guide

Table 6. Public Health Implications of On-site and Off-site Soil Exposure

Exposure Scenario	**Estimated Daily Dose** (in mg/kg-day)	**Minimal Risk Level** (in mg/kg-day)	**Hazard Index** (if < 1, not a hazard)	**Estimated Dose Over Lifetime** (in mg/kg-day)	**Estimated Cancer Risk** (if < 1E-5, no increased risk)
Child in Park exposed to PAHs in soil	7E-7	NA	NA	1E-7	7E-7
Adult in Park exposed to PAHs in soil	5E-8	NA	NA	2E-8	1E-7
Trespasser exposed to PAHs in on-site soil	5E-8	NA	NA	5E-9	4E-8
Trespasser exposed to PCBs in on-site soil	4E-7	2E-5	0.02	5E-8	1E-7
Worker exposed to PAHs in on-site soil	1E-7	NA	NA	6E-8	4E-7
Worker exposed to PCBs in on-site soil	9E-7	2E-5	0.045	5E-7	1E-6

mg/kg-day = milligrams of chemical per kilogram of body weight per day
PAHs = polycyclic aromatic hydrocarbons as benzo(a)pyrene
PCBs = polychlorinated biphenyls
NA = not available; if minimal risk level not available, hazard index is not able to be determined

Figure 1. American Cyanamid/Cytek Industries Site Location Map



Attachment 1

Comparison Values Used In Screening Contaminants For Further Evaluation

Environmental media evaluation guides (EMEGs) are developed for chemicals on the basis of their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not action levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Maximum contaminant levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime health advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.

Certification

This American Cyanamid-Cytec Industries 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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