

Public Health Assessment

Palos Forest Preserve – Argonne Site A

Cook County, Illinois

107th and Archer Avenue

December 20, 2002

Prepared and Issued by the
Illinois Department of Public Health

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Summary

Palos Forest Preserve – Argonne Site A does not pose a public health hazard because contaminated soil and sediments have been removed. Past human exposure to contaminants by site visitors was likely infrequent and would have resulted in a negligible exposure.

Site A is at the former location of ANL and its predecessor, the University of Chicago Metallurgical Laboratory. Site A is a 19-acre area that had experimental laboratories and two nuclear reactors.

Beginning in the late 1940s, the facilities at Site A were closed and operations were gradually moved to the present location of Argonne National Laboratory in DuPage County. By 1956, all buildings and equipment at Site A had been decontaminated and demolished; however, the decontamination likely did not meet current standards. In 1956, the containment vessel of the CP-3 reactor, along with pipes, valves, and building debris from the CP-2 and CP-3 reactors, were buried on the site in a 40-foot deep pit.

During its years of operation, worker exposure at Site A probably occurred; however, reconstruction of these exposures is not possible.

In 1995, the U.S. Department of Energy removed contaminated surface soil from Site A, so exposure is no longer occurring. Before remediation, the exposure to radioactive contaminants at Site A was unlikely, and trespassing probably was infrequent. The remediation work removed surface contamination from the site, and gamma radiation levels now are no higher than normal background levels. Future exposure would require the excavation of deep contaminants, which is unlikely.

Nearby residents are concerned about elevated cancer rates because of radioactive contamination at Site A. Several epidemiologic studies have not found elevated cancer rates in people living near Site A.

Purpose and Health Issues

The Illinois Department of Public Health (IDPH) has received calls from concerned residents near Palos Forest Preserve – Argonne Site A. Residents are concerned about increased cancer risks because of radioactive contamination at Site A, the former location of ANL. Monitoring activities at Site A are the responsibility of the U.S. Department of Energy (DOE).

Background and Statement of Issues

Site A (Figures 1 and 2) is in the Palos Forest Preserve and is part of the former location of ANL and its predecessor, the University of Chicago Metallurgical Laboratory. The Palos Forest Preserve covers about 67,000 acres (1)(2)(3). Site A is a 19-acre area that had experimental laboratories and two nuclear reactors, CP-2 and CP-3. The past and present owner of this land is the Cook County Forest Preserve District (CCFPD).

Site A was part of the World War II Manhattan Engineering District Project, which made the first atomic bomb. Site A operated from 1943 to 1954, and research programs included:

- C reactor control, operation, and physics studies,
- C fission product separations,
- C plutonium-239 production and separation from irradiated fuel,
- C radionuclide metabolism in laboratory animals,
- C studies of radiation protection and shielding, and
- C tritium recovery from irradiated lithium.

Two early nuclear reactors, operated on the site. The CP-2 reactor used the ambient air for cooling through natural ventilation. The CP-3 reactor used heavy water for cooling. Both reactors used cadmium and lead for shielding (2)(3).

When the Manhattan Engineering District Project ended, the Chicago Metallurgical Laboratory removed the reactor fuel and heavy water and sent them to the Oak Ridge National Laboratory in Tennessee. Beginning in the late 1940s, ANL closed the facilities at Site A and gradually moved operations to ANL's present location. Between 1943 and 1949, the Chicago Metallurgical Laboratory buried radioactive wastes and contaminated laboratory equipment generated at Site A in Plot M (3).

In 1956, the concrete containment vessel of the CP-3 reactor was filled with concrete and it, along with pipes, valves, and building debris from the CP-2 and CP-3 reactors, was buried in a 40-foot deep pit (1)(2). This is known as the bioshield burial area. By 1956, all buildings and equipment at Site A had been decontaminated and demolished. In October 1996 at Site A, DOE completed the removal of surface soil contaminated with radionuclides and heavy metals (4).

Areas of Operation for Site A

In 1995, DOE identified several contaminated areas at Site A (Figure 3). Below is a description of each of these areas.

Laboratories K and L and Lead Foundry

Laboratory K was a liquid sodium research facility, and Laboratory L separated and refined plutonium. The Lead Foundry melted and formed lead into radiation shielding. The foundations and slabs of these demolished structures had building rubble on and around them (2).

Septic System

The septic system included drain lines, the septic tank, the septic tank drain field, and drainage ditches leading to the septic tank drain field. Two septic systems existed on the site, but we do not know if Site A used them at the same time. The septic systems also received laboratory wastes (2).

Underground Storage Tanks

The site contained three underground storage tanks, including 5,000-gallon and 1,000-gallon gasoline tanks, and a 5,000-gallon diesel fuel tank. During the site characterization process, all three tanks were removed according to Illinois regulations (2).

Suspect Areas 3 and 4

DOE suspected contamination in Areas 3 and 4 because of past waste disposal. In 1990, the Illinois Department of Nuclear Safety found a piece of natural uranium metal in Suspect Area 4. Further investigation found more radioactive contamination (2).

Suspect Areas 5, 5A and 6

DOE also suspected contamination in Areas 5, 5A and 6 because of past waste disposal. These areas contained the powerhouse, dog kennels, and a small guard house. Investigators found small objects with radioactive contamination. Coke slag and cinder mounds also were found (2).

Other areas not mentioned above include:

- C a buried leach drain system north of Building D,
- C a rubble and debris slope south of the garage,
- C seven former storage buildings in the northwestern corner of the site,
- C areas with elevated radioactivity southeast of the garage and south of the site trailers, and
- C an area around a small concrete slab suspected to have been used for an incinerator.

The site contains several on-site drainage channels, a fire pond, and septic tanks. A slough is southeast of Site A. Three sludge piles containing dry waste from a local waste water treatment facility were found on the site. The material was brought to the site for use as fill dirt and fertilizer.

Demographics

According to 2000 U.S. Bureau of the Census data, about 500 people live within 1 mile of Site A and Plot M. Figure 4 shows the demographic profile of this area.

Site Visits

IDPH staff conducted site visits of Site A on March 6, 1997, August 29, 1997, and May 20, 1999. A trail leads from the Red Gate Woods Picnic Area, past several monitoring wells, and over the center of Plot M. After crossing Plot M, the trail leads to a paved trail that is the original roadway access to Site A. Site A is about a 15-minute walk from the Red Gate Woods Picnic Area.

On March 6, 1997, a park trail followed the perimeter fence of Site A and connected with another park trail. A chain-linked fence was present, but it did not adequately prevent trespassing. At the time of the 1997 site visits, the entry gate was open. A sign read that visitors must register at the office, which was in a trailer near the gate. Many signs along the perimeter fence read “No Trespassing; Environmental Study Area.” On the western part of the site, grass covered Suspect Areas 3 and 4 and trees covered Suspect Area 6. IDPH staff did not observe building rubble in the area with Laboratories K and L and the Lead Foundry, although brush and trees limited the view.

Horsecollar Slough is northeast of Site A, and the septic drain field on Site A was marshy. On the northern side of Site A, IDPH staff did not observe any building rubble in the garage area near the bioshield burial area. Grass and some small trees covered much of this area. The locations of three former garages could be seen because of rectangular areas with bare ground. A plastic tub about 20 feet across was observed in the staging area. It contained pieces of rusty scrap sheet metal, metal pipes, and ceramic tiles. Large plastic bags with unknown contents were next to the tub. A filled dumpster had similar plastic bags. The staging area also had two other large, closed waste containers.

On August 29, 1997, the staging area at Site A contained piled wooden pallets, but the other items were gone. The Fire Pond was the only water body observed on Site A. It did not extend beyond the site fence.

On May 20, 1999, the site fence was gone, having been removed by CCFPD. No items were in the staging area, and the trailer was gone. IDPH staff observed a mountain biker and evidence of horseback riding. A stone marker at the bioshield burial area stated that the first nuclear reactor and the first heavy water moderated reactor operated at that location. The marker also said that the two reactors were buried at that location. A trail continued east past the bioshield burial area, but it branched and became faint within about 400 feet. The staging area, Suspect Area 3, and the Guard House area had some bare soil. Grass covered former bare ground in the garage area.

IDPH noted many monitoring wells, but no public wells at Site A. IDPH staff did not note any other changes at Site A.

Discussion

Chemicals of Interest

The chemicals of interest at this site are radionuclides. IDPH compared the maximum level of each contaminant detected during environmental sampling with appropriate screening comparison values, when available, to select chemicals of interest for further evaluation for carcinogenic and non-carcinogenic health endpoints. Chemicals that exceeded comparison values and those for which no comparison values exist were selected for further evaluation. A detailed discussion of each of the comparison values used is found in Attachment 1.

The comparison values are used only to screen for contaminants that should be evaluated further. Though some of those chemicals might exist at levels greater than comparison values, the contaminants can only affect persons who are exposed and only if the exposure results in high enough doses for adverse effects to occur. 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 development of adverse health effects.

Exposure Analysis

A hazardous chemical can affect people only if they contact it through an exposure pathway at a sufficient level to cause a toxic effect. The five components of an exposure pathway are (1) a source of exposure; (2) an environmental transport medium; (3) a point of exposure; (4) a route of exposure; and (5) an exposed population. An exposure pathway is complete if all its components are present and exposure occurred in the past, is occurring, or will occur in the future. An exposure pathway is potential if parts of a pathway are absent, data are insufficient to decide whether it is complete, or exposure may occur at some time (past, present, future). An exposure pathway is incomplete if part of it is not present and will never exist.

Completed Exposure Pathways

Gamma Radiation

Everyone is exposed to background levels of alpha, beta, and gamma radiation, which originate from naturally-occurring radionuclides in the environment. People are also exposed to radiation through human-generated sources, mainly medical in nature. People who receive repeated x-rays or radiation therapy are exposed to higher levels of radiation than most people. In addition, smokers expose their lungs to radiation levels up to 56 times background because tobacco plants accumulate naturally-occurring polonium 210, which is then present in the smoke (5).

Exposure to alpha or beta radiation requires ingestion, inhalation, or skin contact with a radionuclide. In contrast, gamma radiation can travel easily through the air. Gamma radiation spreads in all directions from a source. The dose depends on time, distance, and shielding. It can pass through a large amount of low-density material without losing much energy; however, it can lose much of its energy in thin layers of high-density material (6). Exposure to gamma radiation, as well as the dose from gamma radiation, decreases as the distance from a source increases.

During its years of operation, worker exposure to radionuclides at Site A probably occurred. Due to a lack of past monitoring data, reconstruction of these exposures is not possible.

The past exposure of park visitors probably was negligible. DOE estimated the risk of a current Site A visitor, assuming the person visits the site thirty times per year for 2.5 hours per visit (7). They estimated that exposure at Site A would cause no increased risk of cancer. This exposure scenario included all exposure pathways.

Contaminated surface soil at Site A has been removed, reducing the gamma radiation level to background levels (8). DOE did not find elevated gamma radiation levels at the bioshield burial area, where subsurface contamination remains (2). The contamination is covered with clean fill material (8).

Potential Exposure Pathways

Air

Although past exposure to park visitors from airborne dust was possible, most of Site A is well-vegetated, reducing dust production. Furthermore, park visitors probably visited only occasionally, likely resulting in negligible exposure. The levels of airborne contaminants at Site A are unknown; however, the removal of surface soil contamination should have eliminated any airborne contamination.

Biota

DOE measured the concentrations of radionuclides in the bone, muscle (meat), and liver of two deer on the site and two deer off the site as background samples (2). The perimeter fence had confined two of the deer to Site A. The levels of chemicals and radionuclides were similar in the meat and liver of the on-site and off-site deer. This showed that the deer were not exposed to elevated levels of radionuclides at Site A. The removal of contaminated surface soil should eliminate biota becoming contaminated at Site A.

DOE sampled fish from Saganashkee Slough, south of Site A. They did not find chemicals or radionuclides in these fish at levels that would be expected to cause adverse health effects (2).

Groundwater

No one consumes groundwater at Site A. The well at Site A (labeled 5195 in Figure 2) was the well that served the Site A facility during its years of operation. ANL sealed this well during the 1970s (1). DOE stated that no drinking water wells exist at Site A (7). Because of largely impermeable clay, the migration of contaminants beyond the boundaries of Site A is unlikely (2)(7).

Sediments

Past exposure of park visitors to contaminated sediments was occasional and negligible. DOE sampled sediments of Sanagashkee Slough, south of Site A. No chemicals were found at levels that exceeded comparison values (2). DOE has removed contaminated sediments, eliminating this potential exposure pathway on Site A.

Soil

The past exposure of park visitors to contaminated surface soil was negligible. DOE removed contaminated surface soil from Site A, so exposure is no longer occurring.

Surface Water

No one consumes on-site surface water. Skin contact with on-site surface water probably would be occasional, resulting in negligible exposure.

Community Health Concerns

On September 17, 1991, a public meeting was held to discuss the contamination at Site A and Plot M. At the meeting, the citizens group, Kingery East Citizen's Advisory Committee, voiced their health concerns. These concerns included:

- C the contamination of plants, soil, rivers, and sewers,
- C the presence of americium, neptunium, plutonium, and uranium in groundwater,
- C contamination in Red Gate Woods outside Site A and Plot M,
- C increased rates of cancer (especially leukemia from strontium 90 and ovarian cancer) and,
- C learning disabilities from exposure to contaminants.

On February 21, 1997, the group also expressed concern about contamination in unnamed ponds at Site A that extend beyond the site fence.

Response to Community Concerns for Site A

The presence of contaminants alone does not mean that they pose a threat to public health. For health effects to occur, exposure must be at high enough levels for a sufficient period. At Site A,

because of the low levels of contaminants and the infrequent opportunity for exposure, people should not experience adverse health effects.

Contaminated surface soil and sediments have been removed from the site. Future exposure would require deep (to 40 feet) excavation of the bioshield burial area. This is unlikely to occur because of the location of the site.

Exposure of on-site workers may have occurred in the past, but because monitoring data are unavailable, IDPH cannot evaluate any past health risks. The removal of the contaminated surface soil should prevent any future exposure to airborne contaminants.

Health professionals cannot distinguish chemically or radiologically induced cancers from cancers that occur spontaneously. Other risk factors such as occupational, medical, lifestyle, heredity, and environmental factors are usually unknown. Researchers use state cancer registry data to compute population-based rates of cancer to evaluate whether the rate of cancer is elevated in a specific area. They then compare the rate of cancer in an exposed, or possibly exposed, population to the expected cancer rate in a similar, unexposed population.

The IDPH Division of Epidemiologic Studies has conducted five cancer incidence data reviews (by zip code) of people living in different areas near ANL, Site A, and Plot M. Those were Bolingbrook and Lemont (8), Clarendon Hills (9), Darien and Westmont (10), Willow Springs (11), and Woodridge (12). These cancer incidence data reviews found no evidence of increased cancer rates in communities around ANL, Site A, and Plot M.

ANL examined the cancer incidence of Site A workers and found no increased incidence of cancer. However, the small number of people exposed made detecting any increased cancer rates difficult (1).

Public Comment Period

This public health assessment was made available for public comment from October 20 to December 6, 2002. No public comments were received.

Child Health Initiative

IDPH recognizes that children can be especially sensitive to exposure to some contaminants and to physical hazards at hazardous waste sites. For that reason, IDPH always considers children when evaluating possible human exposures. Children may have been exposed in the past if they visited the park, but the exposure dose children might have received should not have been high enough for a long enough period to have caused any adverse health effects. Contaminated surface soil and sediments have been removed so no future exposure should occur.

Conclusions

Site A does not pose a public health hazard because contaminated soil and sediments have been removed. Past human exposure to contaminants by site visitors was likely infrequent and would have resulted in a negligible exposure. The remediation removed surface contamination from the site, and gamma radiation levels now are no higher than background levels. Future exposure would require the excavation of deep contaminants, which is unlikely.

Recommendations and Public Health Action Plan

Although no further recommendations or follow-up health actions are indicated, IDPH will continue to provide information to concerned area residents about public health issues associated with Site A.

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Figures and Attachment

Comparison Values Used in Screening Contaminants for Further Evaluation

Environmental Media Evaluation Guides (EMEGs) are developed for chemicals based on their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are not action levels but are comparison values. They are developed without consideration for carcinogenic effects, chemical interactions, multiple route exposure, or exposure through other environmental media. They 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. They are developed without consideration for carcinogenic effects, chemical interactions, multiple route exposure, or exposure through other environmental media. They are very conservative concentration values designed to protect sensitive members of the population.

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations based on a probability of one excess cancer in a million persons exposed to a chemical over a lifetime.

Maximum Contaminant Levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of occurrence of adverse health effects from use of 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. They represent the concentrations of chemicals in drinking water that are not expected to cause any adverse, non-carcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations based on a probability of one excess cancer in a million persons exposed over a lifetime. These are very conservative values designed to protect sensitive members of the population.

Action Levels are established by the U.S. Environmental Protection Agency (USEPA). An action level is the concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow. For lead or copper it is the level which, if exceeded in more than 10% of the homes tested, triggers treatment.