DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

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January 20, 1994

Mr. David Adler
U.S. Department of Energy
Oak Ridge Operations
Technical Services Division
P.O. Box E
Oak Ridge, Tennessee 37831

Dear Mr. Adler:

Enclosed please find a copy of the January 20, 1994, Preliminary Public Health Assessment on the following site prepared by the Agency for Toxic Substances and Disease Registry.

ST. LOUIS AIRPORT
HAZELWOOD INTERIM STORAGE/FUTURA COATINGS COMPANY
ST. LOUIS, ST. LOUIS COUNTY, MISSOURI
CERCLIS NO. MOD980633176

If you have questions regarding the technical and scientific content of this document, please contact Sally Shaver, Chief, Federal Programs Branch, at (404) 639-6070.

Sincerely yours,

for Susan D. Lacher

Max M. Howie, Jr.
Chief, Records and Information
Management Branch
Division of Health Assessment
and Consultation

Enclosure

112680

PRELIMINARY Public Health Assessment for

ST. LOUIS AIRPORT
HAZELWOOD INTERIM STORAGE/FUTURA COATINGS COMPANY
ST. LOUIS, ST. LOUIS COUNTY, MISSOURI
CERCLIS NO. MOD980633176
JANUARY 20, 1994

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

PRELIMINARY PUBLIC HEALTH ASSESSMENT

ST. LOUIS AIRPORT

HAZELWOOD INTERIM STORAGE/FUTURA COATINGS COMPANY

ST. LOUIS, ST. LOUIS COUNTY, MISSOURI

CERCLIS NO. MOD980633176

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
DIVISION OF HEALTH ASSESSMENT AND CONSULTATION
ATLANTA, GEORGIA

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment 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.

Additional copies of this report are available from:
National Technical Information Service, Springfield, VA
(703) 487-4650

ATSDR and its Public Health Assessment

ATSDR is the Agency for Toxic Substances and Disease Registry, a federal public health agency. ATSDR is part of the Public Health Service in the U.S. Department of Health and Human Services. ATSDR is not a regulatory agency. Created by Superfund legislation in 1980, ATSDR's mission is to prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment.

The Superfund legislation directs ATSDR to undertake actions related to public health. One of these actions is to prepare public health assessments for all sites on or proposed for the Environmental Protection Agency's National Priorities List, including sites owned or operated by the federal government.

During ATSDR assessment process the author reviews available information on

- the levels (or concentrations) of the contaminants,
- how people are or might be exposed to the contaminants, and
- how exposure to the contaminants might affect people's health

to decide whether working or living nearby might affect peoples' health, and whether there are physical dangers to people, such as abandoned mine shafts, unsafe buildings, or other hazards.

Four types of information are used in an ATSDR assessment.

1) environmental data; information on the contaminants and how people could come in contact with them

2) demographic data; information on the ethnicity, socioeconomic status, age, and gender of people living around the site,

3) community health concerns; reports from the public about how the site affects their health or quality of life

4) health data; information on community-wide rates of illness, disease, and death compared with national and state rates

The sources of this information include the Environmental Protection Agency (EPA) and other federal agencies, state, and local environmental and health agencies, other institutions, organizations, or individuals, and people living around and working at the site and their representatives.

TABLE OF CONTENT

SUMMARY

The St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company, a National Priorities List site, is in St. Louis County, Missouri. The site, a U.S. Department of Energy (DOE) Formerly Utilized Sites Remedial Action Program (FUSRAP) activity, is near the St. Louis International Airport and the McDonnell Douglas Corporation. From 1946 to 1973, the site was used to store radioactive materials resulting from uranium processing. High levels of uranium, thorium, radium, and radon were detected in soil, groundwater, and air. The site is still being used to store radioactive materials. The Agency for Toxic Substances and Disease Registry considers the St. Louis Airport site to be an indeterminate public health hazard. Although there are emissions of radon and the presence of thorium in on-site air and off-site soils and the emission of radiation resulting from the presence of these materials is not currently considered a health hazard. At present conditions, the concentration of radon off-site is indistinguishable from background levels. However, in the past, these contaminants may have been present at levels of health concern.

Citizens have concerns regarding cases of cancer reportedly found among residents living near five hazardous waste sites. These citizens requested the Missouri Department of Health to investigate cancer occurrences in the area of the sites. The results of the health statistics review and cancer inquiry by the Missouri Department of Health appear in the Public Health Implication section. ATSDR's detailed response to comments and concerns received during the public comment period appear in the Appendix C.

ATSDR made the following recommendations in order to protect public health in areas surrounding the sites: 1) characterize groundwater, surface water, sediment, and soil for chemical contamination on and off site, 2) characterize off-site surface soil and air for radiological contaminants, 3) implement dust controls during remediation. The Health Activities Recommendation Panel recommended this site for follow-up health studies and for community health education follow up. The Public Health Actions section describes which actions have been taken and which actions are planned by ATSDR and other federal or state agencies. Included in these actions is that ATSDR will review additional off-site soil and groundwater data when available from DOE and the Missouri Department of Health will periodically conduct follow-up assessments of the cancer incidence in the Hazelwood, Latty Avenue areas of St. Louis.

BACKGROUND

A. Site Description and History

The St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company site is in St. Louis County, Missouri. The site, which is composed of three smaller storage areas, was combined by the U.S. Environmental Protection Agency (EPA) into the present National Priorities List (NPL) site. These areas were the St. Louis Airport Storage Site (SLAPS), the Hazelwood Interim Storage Site (HISS) and the Futura Coatings Company site (FUTURA) (Figure 1). The HISS and FUTURA areas share common facilities. These three facilities were grouped together because of similarities of contaminants; proximity to each other; contaminated haul roads, including portions of Hazelwood Avenue, Pershall Road, and McDonnell Boulevard, between the areas; and air release of radon-222 (Rn-222). The sites also show the possibility of similar threats to public health (Mitre, 1988). The areas are also listed on the Department of Energy (DOE) Formerly Utilized Sites Remedial Action Program (FUSRAP).

The SLAPS is the largest of the three areas, covering 21.7 acres, and is approximately 15 miles northwest of downtown St. Louis. To the south is Banshee Road and a Norfolk and Western Railroad line, to the west is Coldwater Creek, and to the north and east is McDonnell Boulevard. Next to the SLAPS is the St. Louis International Airport on the south. The Berkeley Khoury League Park is to the north, and the McDonnell Douglas Corporation is to the west and southwest. The SLAPS slopes to the west toward the creek, which is about 20 feet below the site and 500 feet above mean sea level (Figure 2).

The HISS and FUTURA areas, which cover about 11 acres, are approximately 0.5 mile from SLAPS and approximately 2 miles northeast of the St. Louis Airport control tower. They are bounded on the north by Latty Avenue; on the east by the city of Berkeley; on the south by Hazelwood, the Norfolk and Western Railroad, and a tributary of the Coldwater Creek; and on the west by Coldwater Creek (Figure 3). The associated off-site locations collectively known as the Latty Avenue Vicinity Properties. Businesses located along Latty Avenue are adjacent to the HIS and Futura sites are shown in Figure 4.

In 1946, the area was acquired by the Manhattan Engineering District of the U.S. Army and used to store uranium wastes generated by the Mallinckrodt operation in St. Louis. Wastes stored at these sites also included scrap metals, drums, covered piles, and unstabilized piles of waste generated during uranium-processing activities. At the SLAPS, the uranium-processing wastes were stored on open ground and once covered two-thirds of the area to an estimated height of 20 feet. In 1957, contaminated scrap metal and miscellaneous radioactive wastes were buried on the west portion of the SLAPS (USDOE, 1986a). In 1966, after the Continental Mining and Milling Company (CMM) purchased the property, the wastes were

In 1986, the roads leading to these areas were improved and during this action, additional contaminated soils were removed from the area. Also, boreholes were drilled at the SLAPS to define the nature and extent of the contamination (USDOE, 1986a,b).

The total amount of the wastes believed to have been stored at the SLAPS is 125,150 tons, of which 241 tons were believed to be uranium, either naturally occurring (U-nat) or uranium-238 (U-238). Of this amount, the wastes perhaps consisted of 106,500 tons of raffinate, 10,200 tons of leached or unleached barium sulfate, 4,000 tons of dolomite and magnesium fluoride, 3,500 tons of scrap metal, 600 tons of U-containing sand and other contaminated materials in 2,400 drums, and 350 tons of miscellaneous wastes (Mitre, 1988).

In late 1989, the Army Corps of Engineers (COE) requested that DOE survey an additional portion of Coldwater Creek. The information garnered from this survey was used in preparing the COE's Coldwater Creek flood control project.

B. Site Visit

The Agency for Toxic Substances and Disease Registry (ATSDR) conducted a site visit on February 5, 1990. Participating in this visit were an ATSDR health physicist, a representative from the State of Missouri Department of Health, representatives from DOE and its contractor, Bechtel National, Inc., and a representative from EPA. During the site visit, a tour of the NPL site and off-site environs was given as well as a historical perspective of the operations resulting in the formation of the SLAPS.

C. Demographics, Land Use, and Natural Resource Use

The SLAPS site is located approximately 10 miles northwest of downtown St. Louis in the suburban town of Hazelwood. Lambert Airport is immediately south of the site. The three areas comprising the NPL site are in a commercial and industrial area. The McDonnell Douglas Corporation is within 0.5 mile of the site and employs approximately 33,000 people. Runways from the St. Louis Airport terminate near the SLAPS boundary on the southwest edge of the site. The community closest to any one of the three areas is Hazelwood, Missouri, at a distance of less than 0.3 mile from HISS.

The six census tracts which lie within roughly 1 mile of the site had a total 1990 population of 26,657; this represents a decline of nearly 14 percent from the 1980 population of approximatcly 31,000. The tract containing the site had a population of 4,093 in 1990.

The 1990 population of the six tracts was 52.6 percent female and 47.4 percent male. The 1990 racial makeup of this area was 68 percent white, 31 percent black, and only 1 percent other races; however, the population of the tract containing the site was over 84 percent

designed to ensure that excess cancer reported to the Bureau of Smoking, Tobacco, and Cancer are reviewed systematically in the preliminary review phase and are presented to the Cancer Inquiry Committee. The committee can recommend either the study be discontinued or the inquiry be expanded into an investigation phase.

COMMUNITY HEALTH CONCERNS

This site has posed many concerns for the health and safety of the residents in St. Louis. In 1987, the ATSDR released a health consultation, but could not adequately address the site then because of limited data. In that same year, a private citizen's letter to the U.S. Senators and Representatives of the region expressed concerns about the high concentrations of radioactive materials detected in soils, sediments, and the Coldwater Creek environs.

In 1988, the St. Louis Board of Aldermen passed a resolution stating their reluctance "that a permanent radioactive waste site near the airport would be in the best interest to area citizens or the local environment." The Board additionally remained opposed to releasing the title from the city to DOE for the purposes of site expansion (Resolution 146) unless specific conditions were met. In 1990, the Board of Aldermen voted to offer 81 acres near the airport to the DOE (St. Louis Post-Dispatch, February 5, 1990).

Citizens in this area of Hazelwood requested the Missouri Department of Health to investigate these cancer occurrences in the area and at other FUSRAP sites in the St. Louis area. In 1988 a citizen requested a health study of persons living near five sites in St Louis area. In 1989 a concerned citizen contacted the Missouri Department of Health regarding several cases of cancer reportedly found among the residents in the homes closest to the HISS.

On April 29, 1991, ATSDR issued a news release announcing the availability of the health assessment for this site. The Public Comment Period, in which citizens could obtain and comment on the health assessment, ran from May 15 to June 13, 1991. The announcement, a newspaper article concerning the study, and comments received by ATSDR are given in Appendix B. Personal identifiers, except for governmental agencies or national interest groups, were deleted from the material in the appendix. The agency response to the comments are given in Appendix C.

Sediment

Sediment sampling at the SLAPS for total uranium, Th-230, and Ra-226 showed maximum concentrations of 1.7 pCi/g, 4.1 pCi/g, and bkg, respectively (Bechtel, 1989a) (Table 1). Sediment sampling at the HISS for total uranium, Th-230, and Ra-226 showed average concentrations of 1.7 pCi/g, 4.8 pCi/g, and 1.2 pCi/g, respectively (Table 2) (Bechtel, 1989b).

Air

Airborne contamination at these areas consists of both gamma radiation and Rn-222. The amount, or intensity, of gamma rays depends on the type of radioactive material at the site, its concentration and depth from the surface, and physical distribution in the soil. This intensity results in an exposure rate. Measurements of the gamma ray exposure rate were made with a pressurized ionization chamber. The Rn-222 concentration is dependent on the amount of Ra-226 present, since Rn-222 is the first decay product produced during decay of the Ra-226. Airborne measurements for Rn-222 were the average of 25 stations determined by alpha track detectors. The bkg station was 5 miles from the areas.

At the SLAPS, the gamma exposure rate has been measured at 9 to 261 x 10^{-6} roentgens per hour (R/hr, a roentgen is a unit of radiation exposure), with an average of 84 x 10^{-6} R/hr taken along the northern boundary (Bechtel, 1987c). In 1988, gamma radiation measurements showed a radiation exposure rate ranging from 17 to 2,229 x 10^{-3} R/yr above a bkg average of 73x10^{-3} R/yr (Bechtel, 1989a).

At the HISS area, the exposure rate was 13 to 55 x 10^{-6} R/hr, with an average of 24 x 10^{-6} R/hr. The exposure rate at the FUTURA site was 8 to 27 x 10^{-6} R/hr outside existing structures. The bkg in the St. Louis area was 8 x 10^{-6} R/hr. Gamma radiation readings at the site during 1988 ranged from 13 to 55 x 10^{-6} R/hr with an average exposure rate of 24 x 10^{-6} R/hr with the bkg in the St. Louis area of 8 x 10^{-6} R/hr.

Rn-222 measurements at the SLAPS site, including the bkg of 0.3 pCi/L, ranged from bkg to 6.8 pCi/L with a maximum average of 3.4 pCi/L. Results from the HISS ranged from bkg to 3.4 pCi/L with a maximum average of 1.8 pCi/L. Because gas emanation is dependent on atmospheric temperature and pressure, there were seasonal variations in the measurements. Ra-222 at the SLAPS for 1988 ranged from 0.3 to 4.6 pCi/L, including a bkg reading ranging from 0.3 to 0.6 pCi/L. Background sampling locations were located a minimum of 0.5 mile from the site. The average Rn-222 concentration at the site from 1984 to 1988 has ranged from 0.1 pCi/L to 3.6 pCi/L (Bechtel, 1989a). The DOE limit for FUSRAP sites is 3 pCi/L.

Ra-222 at the HISS for 1988 ranged from 0.3 to 2.4 pCi/L, including a bkg reading ranging from 0.3 to 1.0 pCi/L. Background sampling locations were located a minimum of 5 miles

Sediments and soils from Coldwater Creek were collected before 1989 by Bechtel. These samples were analyzed for the presence of radioactive materials. The results of sediment sampling show the presence of U-238 (4.8 pCi/g), Th-232 (1.5 pCi/g), Th-230 (110 pCi/g), and Ra-226 (3.1 pCi/g). Of these values, only Th-230 was above the DOE guidelines for FUSRAP locations. Surface soils from along the creek bank suggested the presence of U-238 (78 pCi/g), Th-232 (5 pCi/g), Th-230 (5,100 pCi/g), and Ra-226 (71 pCi/g) (Bechtel, 1990).

During 1989, the COE requested that additional soil plug samples be collected along the banks of Coldwater Creek. These samples were collected beginning at the termination point of the Bechtel study and proceeded for an additional 4.8 miles along the banks at 500 foot intervals. The top 6 inches of the soil plug were also analyzed for U-238, Th-232, Th-230, and Ra-226. The results of these sampling activities showed the maximum concentrations (above background) of U-238, Th-232, Th-230, and Ra-226 were 12.9 pCi/g, 4 pCi/g, 27.7 pCi/g, and 2.4 pCi/g, respectively. Of these levels, Th-230 exceeded the DOE clean-up levels. It has not been determined if the concentration of uranium in this survey exceeds guidelines since the guidelines are still being formulated for the St. Louis area (FUSRAP, 1989).

The results of soil sampling from over 60 properties located along the haul roads have been reviewed and summarized. The maximum levels detected and the corresponding depths are given in Table 4 (Bechtel, 1990). The contamination was mostly confined to a depth of a foot over the haul roads. Along Latty Avenue, however, in one area, the contamination was found as deep as 7 feet. The survey along McDonnell Boulevard suggested the contamination in one location was at least 15 feet deep and over 1300 feet in length. In one isolated area near the intersection of Eva Avenue and McDonnell Boulevard, the contamination was found to a depth of 5 feet. Along Hazelwood Avenue, the contamination was spread from the intersection of Frost Road to Pershall Road. Contamination along Pershall Road was found at an average depth of 3 feet, with an isolated area contaminated to a depth of 13 feet (Bechtel, 1990).

The results of sampling supplied from the Latty Properties were for near surface (12 inches above the surface), borehole readings for gamma-emitting contamination, and soil sampling for radionuclides. These data are shown in Table 3 (Bechtel, 1988).

Results of sampling from the Berkeley Khoury League Park recreational area indicated that the concentrations, in soils, of U-238 were 10 pCi/g; Th-230, 20 pCi/g; and Ra-226, 2 pCi/g.

Railroad

The ditches running along the boundary of the SLAPS were sampled by measurements in boreholes for the presence of gamma-emitting radioactive materials and soil samples. The major contaminant in these areas was Th-230, present at a maximum concentration of 15,000

PATHWAYS ANALYSES

A. Environmental Pathways (Fate and Transport)

The Coldwater Creek flows through or forms the boundary of the SLAPS areas. There is no known use of the creek for recreational purposes or as a water source near the site. The creek, 19 miles in length, originates about 3.5 miles south of SLAPS, flows for about 500 feet along the western boundary of the site, and then flows into the Missouri River about 15 miles northeast of the SLAPS area (FUSRAP, 1989). The river serves as the area's source of potable water, with the nearest water treatment facility on the Missouri River above the confluence of the creek with the river. The SLAPS was used without liners or a leachate collection system, and runoff has entered the creek. Surface water runoff ultimately flows into Coldwater Creek by direct overland flow or by drainage ditches into the creek that flows north-northeast into the Missouri River.

There are two groundwater systems at the SLAPS. The upper zone is composed of a wind deposit or an eolian layer and a lacustrine or lake deposit. The lower zone is composed of the lake deposit material only. Separating the upper and lower zone is a deposit of legislature silty clay (Dechtel, 1986). The underlying aquifer is alluvial and approximately 25 feet below the surface, is estimated to be 100 feet thick, and includes clay, silt, and gravel deposits. The depth to the water table ranges from 25 to 35 feet. The water from the system is saline, and wells produce low volumes of water. There is no known use of the aquifer within a 3-mile radius of the site.

Leaching from the soil to the groundwater has occurred. It is unknown if the groundwater, which is believed to flow toward Coldwater Creek, discharges into the creek.

The air pathway includes ionizing radiation, Rn-222, and the possible exposure from airborne dusts contaminated with radioactive substances or heavy metals. The ionizing radiation can easily penetrate air and nominal thickness materials with no or very little attenuation. Rn-222 is an inert, radioactive gas and migrates easily through air. The decay products of radon are particulate and can electrostatically attach to the dust particles.

There are no identified pathways for exposure from potentially contaminated biota. No commercial or private crops are grown in the area and no hunting or fishing is likely to occur in these areas.

B. Human Exposure Pathways

The surface water and groundwater near SLAPS are not used for water sources in the area, therefore, these pathways are not considered viable routes for exposure. Furthermore, the

PUBLIC HEALTH IMPLICATIONS

A. Toxicological and Radiological Evaluation

The evaluation of toxicological and radiological properties of contaminants and their effects on human health depends on a variety of factors. First, a person must be exposed to a chemical by coming in contact with it, and with certain types of radiation, by being in the vicinity. Second, the type and severity of adverse health effects resulting from an exposure to a contaminant depends on the concentration, the frequency and/or duration of exposure, the route of exposure, if the exposure was to a single contaminant or a mixture of contaminants and if there were multiple exposures.

For chemicals, the route of exposure can include breathing, drinking, eating, or dermal (skin) contact with a substance that contains the contaminant. In the case of ionizing radiation, the energy can pass through solid matter. A combination of contaminants can result in synergistic actions, where the simultaneous action of the separate compounds together, have a greater total effect than the sum of their individual effects.

The opposite is also a possibility whereby the combination of contaminants can act antagonistically, with one contaminant acting in opposition to or counteracting another contaminant. A third situation could result with the contaminants having no effect on each other.

Once an exposure has occurred, characteristics such as age, sex, race, socioeconomic status, genetics, lifestyle, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. All these factors and characteristics are considered when determining the health effects that may occur as a result of exposure to a contaminant.

The contaminants of concern at SLAPS are Rn-222 (radiological half-life of 3.8 days) and Th-230 (radiological half-life 75,400 years). Chemically, these contaminants pose no health threat. Because of the type of radiation these radionuclides emit--alpha particles and gamma rays--the greatest public health concern arises from inhalation or ingestion of the material.

Radon-222 (Rn-222):

Rn-222 measurements at the SLAPS site ranged from bkg to 6.8 pCi/L and at HISS, the Rn-222 ranged from bkg to 3.4 pCi/L. As previously stated, the DOE FUSRAP limit for Rn-222 emissions is 3 pCi/L. The EPA recommends that Rn-222 not exceed 4 pCi/L in residential areas. There were no reported measurements for off-site areas. However, the outdoor levels of Rn-222, although above average background levels are approximately equal to the concentration many homes across the nation.

used a value of 100 milligrams of soil ingested. The ATSDR used a value of 1 gram of soil being ingested which would account for the increase in the committed dose.

B. Health Outcome Data Evaluation

The National Academy of Sciences BIER V report estimates the risk of excess cancer mortalities related to these types of radiation exposure at 5 excess deaths per 1000 exposed population (NAS, 1990).

In response to the 1988 request at five hazardous waste sites in the St. Louis area, the MDOH conducted a health statistics review of mortality and incidence data by census tract and zip code. The mortality data were obtained from death certificates submitted to the State Center for Health Statistics. Incidence data were obtained from the MCR. In reviewing the mortality and incidence data MDOH had not discovered any excess of cancer.

Following a 1989 report of excess cancer adjacent to HISS, the MDOH, Bureau of Smoking, Tobacco, and Cancer opened an investigation by collecting information on the reported cancer cases and interviewing residents, relatives of cancer victims, and cancer victims to determine if any other cancer cases had occurred near the site. In February 1989, based on confirmation of cancer cases reported and knowledge of radioactive contamination at the waste sites in the area, the MDOH Cancer Inquiry Committee recommended expanding the inquiry.

The expanded inquiry included further interviews of residents and former residents, examination of medical records, and construction of chronology of deposition of radioactive materials, and chronologies of diagnosis dates and time residence of the cancer patients. Statistical tests used to evaluate the data were limited by incomplete information on the total number of residents who lived in the area during the last few decades, their ages, and how long they lived in the area, and by the small number of people and cancer cases on the street. Another problem in determining whether or not a cancer excess or a cancer cluster exist is the existence of several different kinds of cancer among the cases. A cancer cluster is used to describe a grouping of a number of cases of the same type of cancer that may be due to the same cause. Different types of cancer generally have different causes, it is usually unlikely that a grouping of different types of cancer would arise from the same cause. The MDOH was unable to confirm whether or not there is an excess number of cancers in the area and to determine the likelihood residence were exposed to types, quantities, and durations of radiation that would have induced the identified cancers.

Members of the Division of Health Studies, ATSDR, have met with MDOH and investigated these reports excess cancer. As a result of this investigation, ATSDR reviewed the MDOH health statistics review and cancer inquiry. ATSDR concluded that due to the lack of similarity with regard to site and histologic type, the reported cancer cases do not constitute a cancer cluster. In addition ATSDR concluded there is insufficient data to determine an increase incidence of cancer in the Hazelwood neighborhood or whether the identified cancers cases could be attributed to radiation exposure. Furthermore, the types of cancers in the

CONCLUSIONS

Based on the information reviewed, the ATSDR considers the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company NPL site to be an indeterminate public health hazard. Emission of Rn-222 into the air and the presence of Th-230 in off-site soils are considered the primary contaminants of concern for their presence could result in humans inhaling and ingesting these contaminants.

RECOMMENDATIONS

A. Recommendations and HARP Statement

Site Characterization Recommendations

1. Characterize groundwater, surface water, sediment, and soil for chemical (non-radiological) contamination on and off site.

2. Characterize off-site surface soil and air for radiological contaminants, in particular Th-230 in soil and Rn-222 in the air. Collect surface soil and air samples from roads used to transport contaminated material to and from these sites prior to remediation and from the baseball field.

Cease/Reduce Exposure Recommendations

1. Implement dust control measures during remediation to reduce the generation of airborne dust which would reduce the likelihood of internal deposition of radioactive material.

Health Activities and Recommendation Panel (HARP) Statement

The public health assessment for St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company was reviewed by the HARP on January 16, 1992. Based on the recommendations of the panel, it is proposed that the following statement be included in the public health assessment.

> The data and information developed in the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company public health assessment were evaluated by the ATSDR Health Activities and Recommendation Panel (HARP) for follow-up health

5. DOE conducted additional groundwater sampling at SLAPS, HISS, and vicinity properties. Samples were analyzed for radiological contaminants, volatile organic compounds, semi-volatile organic compounds, and metals.

Public Health Actions Planned

1. ATSDR, Division of Health Assessment and Consultation, will review the additional off-site soil and groundwater data collected by DOE and determined the public health implication.

2. The MDOH will periodically conduct follow-up assessments of cancer incidence in the area of the site.

PREPARER OF REPORT

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Division of Health Assessment and Consultation

ATSDR Regional Representative

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REFERENCES

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LIST OF TABLES

TABLE 1. ENVIRONMENTAL SAMPLING DATA AS REPORTED IN 1988 FOR THE ST. LOUIS AIRPORT STORAGE SITE[1]

Contaminant	Groundwater	Surface Water	Sediment	Soils[2]
Uranium	5,500 pCi/L	0.4 pCi/L	1.7 pCi/g	1,600 pCi/g[3]
Th-232	ND[4]	ND	ND	63
Th-230	50	background	4.1	2,600
Ra-226	1	background	background	5,600

1 - The Maximum contaminant level for these radionuclides in drinking water is 5 pCi/L for radium and 15 pCi/L for gross alpha activity except for uranium.
2 - The concentration of thorium and radium in soils should not exceed 5 pCi/g above background over the first 15 cm of depth and 15 pCi/g averaged over 15 cm at depths greater than 15 cm (40 CFR 192). There are no standards for the concentration of uranium in soils.
3 - Value is for Uranium-238
4 - No Data

TABLE 2. ENVIRONMENTAL SAMPLING DATA AS REPORTED IN 1988 FOR THE HAZELWOOD INTERIM STORAGE SITE[1]

Contaminant	Groundwater	Surface Water	Sediment	Soil[2]
Uranium	87 pCi/L	5 pCi/L	1.7 pCi/g	800 pCi/g[3]
Th-232	ND[4]	ND	ND	5
Th-230	64	0.9	4.8	750
Ra-226	3.7	0.3	1.2	700

1 - The Maximum contaminant level for these radionuclides in drinking water is 5 pCi/L for radium and 15 pCi/L for gross alpha activity except for uranium.
2 - The concentration of thorium and radium in soils should not exceed 5 pCi/g above background over the first 15 cm of depth and 15 pCi/g averaged over 15 cm at depths greater than 15 cm (40 CFR 192). There are no standards for the concentration of uranium in soils.
3 - Value is for Uranium-238
4 - No Data

LIST OF FIGURES

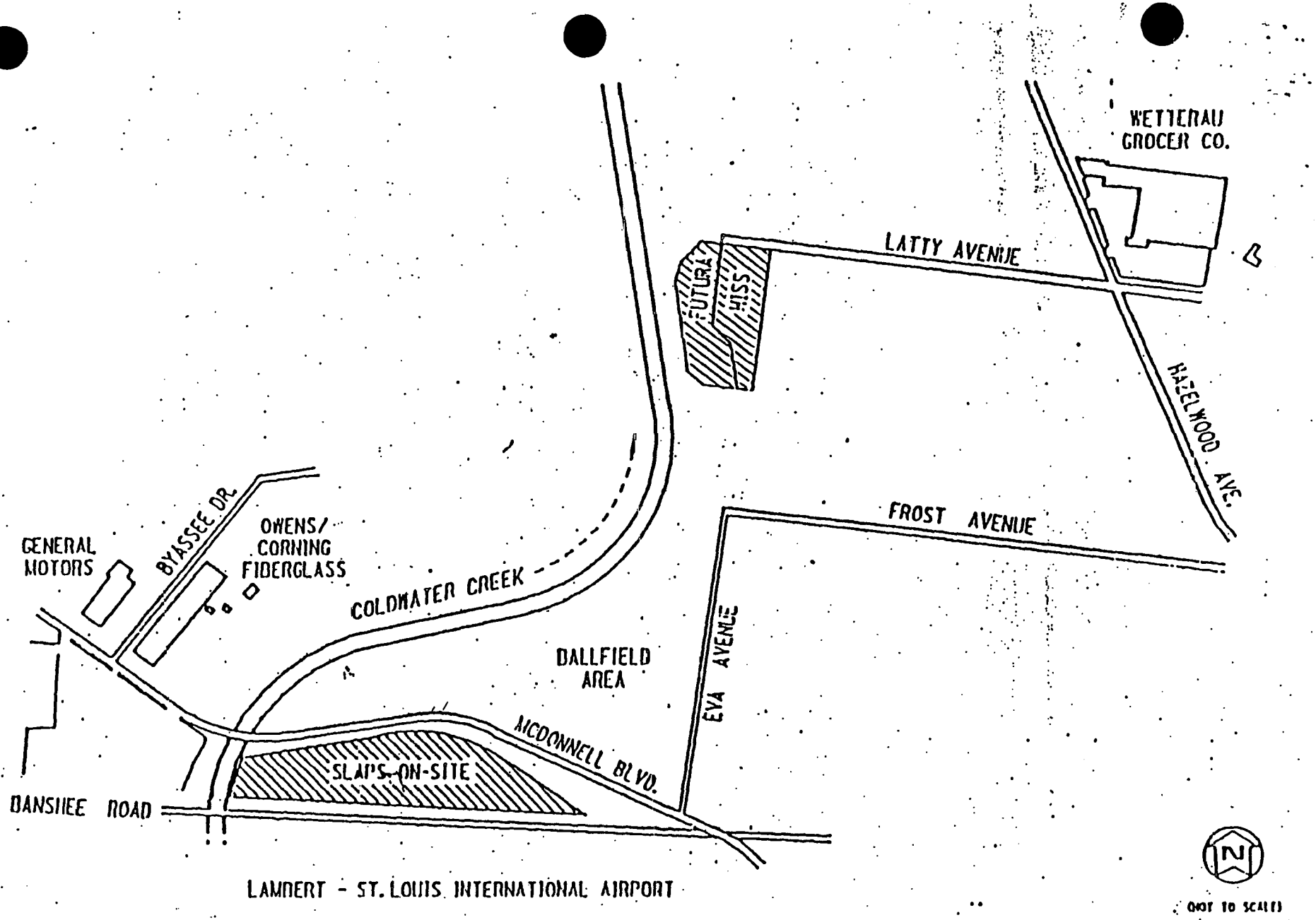

Figure 1. Location of the SLAP, HIS, and Futura sites

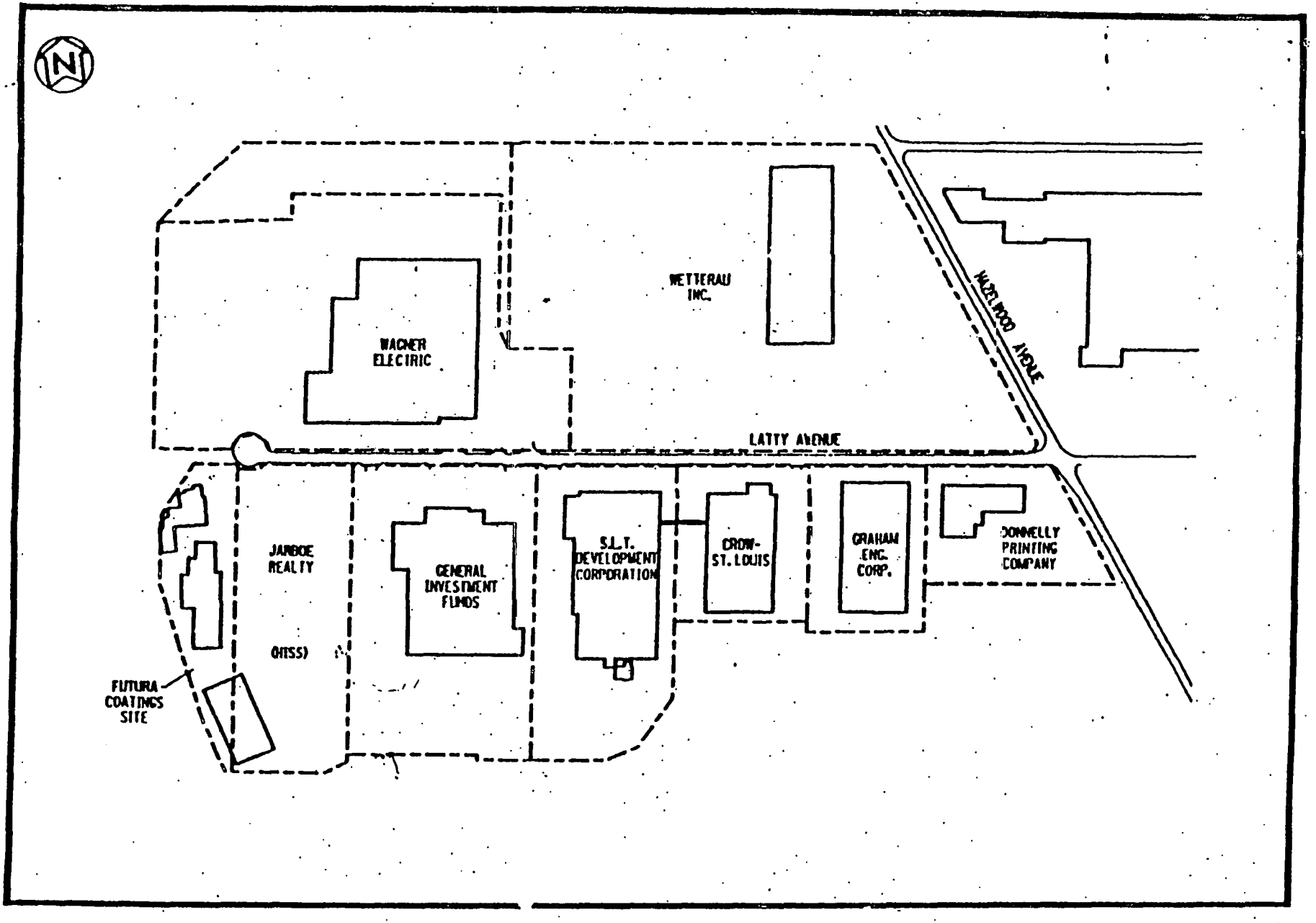

Figure 4. Location of the Latty Avenue vicinity properties

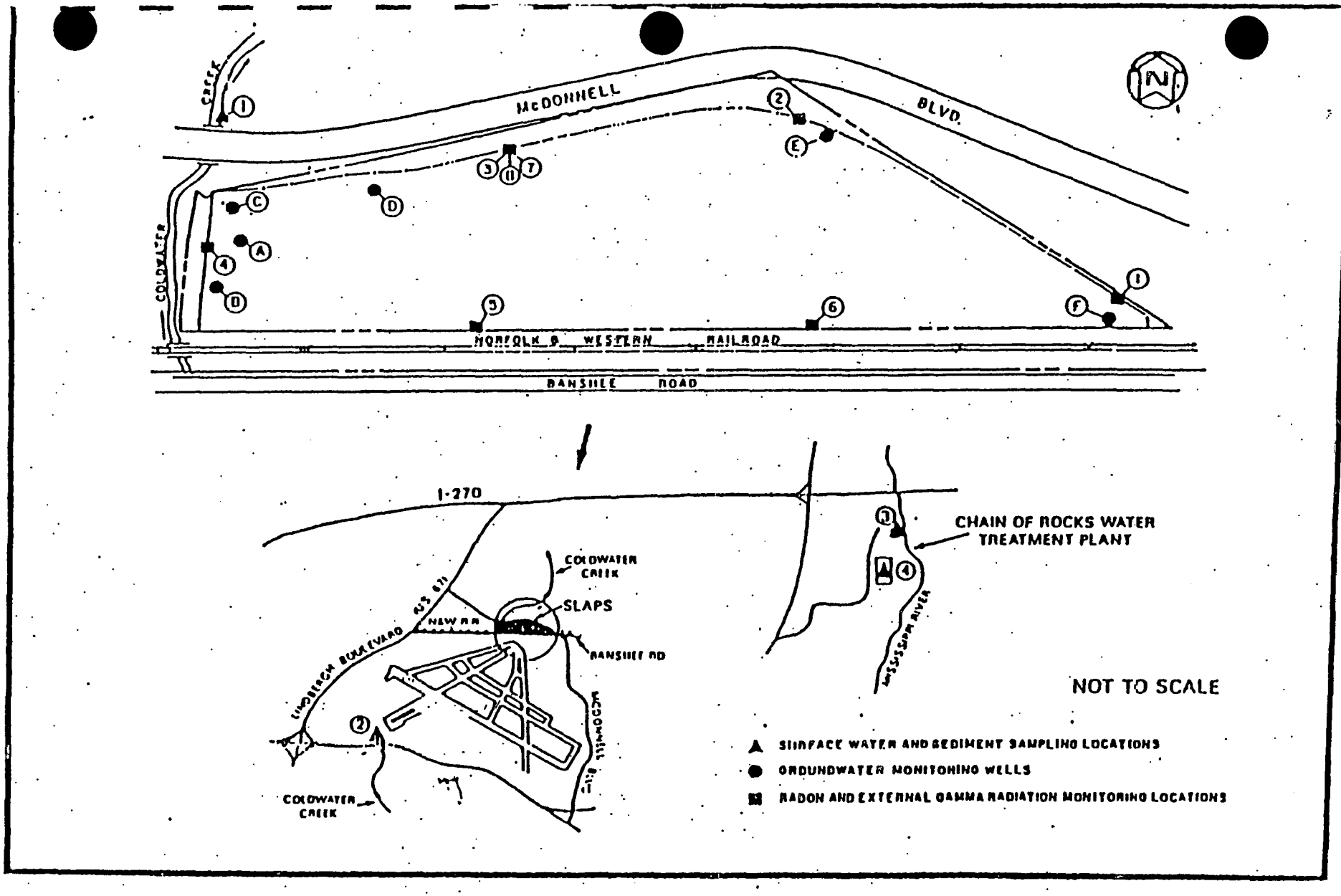

Figure 5. SLAPS environmental monitoring locations

APPENDIX A - DEPARTMENT OF ENERGY DOSE CALCULATIONS

Department of Energy
Oak Ridge Operations
P. O. Box E
Oak Ridge, Tennessee 37831

April 20, 1988

Mr. Larry Birkla, City Manager
City of Berkeley
6140 North Hanley Road
Berkeley, Missouri 63134

Dear Mr. Birkla:

RADIOLOGICAL STATUS OF RECREATION FIELDS

This letter is in response to your inquiry concerning the radiological s of recreation fields used by the City of Berkeley with regard to potenti health risks to persons playing on the fields.

The Department of Energy (DOE) has "standards" or guidelines for radioac contamination in soil that are adopted from Environmental Protection Ag (EPA) quidelines. If soil contamination exceeds these guidelines, reme action is considered. On a site specific basis, contamination levels a DOE guidelines are reviewed to determine if there is any practicable wa the contamination to reach the human environment in sufficient quantity represent a potential health hazard. If such a hazard exists then acti taken immediately. However, if it is determined that there are no sig health risks then site clean up is scheduled accordingly.

In October of 1986 samples were taken from the recreation fields in th extending about 300 feet north of McDonnell Douglas Boulevard. Analys these samples found that contamination exceeding DOE soil contaminatic guidelines was present. This is the same information that was provid and to the director of the Airport Authority in a letter dated March

Utilizing these data, a conservative hazard analysis was performed on recreation fields. This analysis made conservative assumptions on co which are not normally present, such as continuous high dust levels the radioactivity. Also, all of the contamination was found in gras areas which further reduces the risk of exposure to ball players by

Department of Energy
Oak Ridge Operations
P. O. Box E
Oak Ridge, Tennessee 37831

April 20, 1988

Mr. Larry Birkla, City Manager
City of Berkeley
6140 North Hanley Road
Berkeley, Missouri 63134

Dear Mr. Birkla:

RADIOLOGICAL STATUS OF RECREATION FIELDS

Please find enclosed a copy of the hazard assessment which was referenced in our letter of April 20, 1988. If there are any questions, please contact Mr. Andrew Avel at (615) 576-0844.

Sincerely,

Peter J. Gross, Director
Technical Services Division

Enclosure:
As stated

II. Estimates of the external dose equivalent from the soil at the SLAPS ballfields.

Assumptions:

1. It is assumed that the playing season is 18 weeks per year. This is the normal season length.

2. The player is at the ballfields for 8 hours per week. This gives the total number of hours at the playing field to be 144 hours per season.

3. Soil is assumed to have a density of 2 g/cm^3.

4. All of the contamination contained in the top 15 cm of soil is assumed to be an infinitely thin layer at the surface. Incorporated in this assumption is the fact that there is no contamination below 15 cm.

5. All short-lived daughters are assumed to be in secular equilibrium with their long-lived parent or be present at the relative abundance found naturally.

Method for estimating the external dose equivalent:

For this estimate it is assumed that all of the contamination in the 15 cm of the soil is located at the surface; this concentration will be called the effective contamination/cm^2. The effective contamination/cm^2 is given by:

effective contamination/cm^2 = (soil concentration of contaminant) x (soil density) x (15 cm)

The estimate of the external dose equivalent is then given by:

external dose equivalent = (effective contamination/cm^2) x (external dose rate conversion factor) x (time spent in contaminated area)

Table 2 gives the isotope, average soil concentration, external dose rate conversion factor, and the external dose equivalent for the isotopes presented the SLAPS ballfields. The total external dose equivalence from all isotopes is a 3.9 mrem.

III. Estimate of the external dose equivalent from immersion in a dust cloud at the SLAPS ballfields.

Table 1: Data for the calculations of the 50 yea equivalent

Isotope	Average Soil Concentration (PCi/g)	Committed Effective Dose Equivalent (mrem/uCi)	5 D (
U-238	10	1.0×10^{5} (Y)	8
Th-234	10	3.0×10^{1} (W)	2
Pa-234m	10	3.7×10^{-3} (W)	3
Pa-234	0.013	9.6 (Y)	1
U-234	10	1.1×10^{5} (Y)	9
Th-230	20	3.7×10^{5} (W)	6
Ra-226	2	8.5×10^{3} (W)	1
Rn-222	2	2.8×10^{-1} (-)	4
Po-218	2	3.1 (W)	5
Pb-214	2	1.5×10^{1} (W)	2
Bi-214	2	1.2×10^{1} (W)	2
Po-214	2	1.7×10^{-6} (W)	2
Pb-210	2	2.6×10^{3} (W)	4
Bi-210	2	2.0×10^{2} (W)	3
Po-210	2	1.0×10^{4} (D)	1
Th-232	2	4.1×10^{5} (W)	7
Ra-228	2	1.7×10^{3} (W)	2
Ac-228	2	4.4×10^{1} (Y)	7
Th-228	2	1.3×10^{5} (Y)	2
Ra-224	2	1.2×10^{3} (W)	2
Rn-220	2	2.6×10^{-1} (-)	4
Po-216	2	2.3×10^{-3} (Y)	4
Pb-212	2	2.3×10^{2} (W)	4
Bi-212	2	3.5×10^{1} (W)	6
Po-212	1.3	3.6×10^{-9} (W)	4
Tl-208	0.7	1.0×10^{-2} (W)	6

Table 3: Data for the calculations of the estimated external dose equivalence from the immersion in a dust cloud.

	Average Soil Concentration (pCi/g)	External Dose Rate Conversion Factor (mrem/yr per uCi/cm^3) (Immersion)	External Dose Equivalent (mrem)
U-238	10	4.6×10^{5}	3.8×10^{-10}
Th-234	10	3.4×10^{7}	2.8×10^{-8}
Pa-234	10	5.6×10^{7}	4.6×10^{-8}
Pa-234	0.013	9.60×10^{9}	1.0×10^{-8}
U-234	10	6.70×10^{5}	5.5×10^{-10}
Th-230	20	1.7×10^{6}	2.8×10^{-9}
Ra-226	2	3.7×10^{7}	6.1×10^{-9}
Rn-222	2	1.8×10^{6}	3.0×10^{-10}
Po-218	2	0.0	0.0
Pb-214	2	1.1×10^{9}	1.8×10^{-7}
Bi-214	2	7.7×10^{9}	1.3×10^{-6}
Po-214	2	4.1×10^{5}	6.8×10^{-11}
Pb-210	2	5.9×10^{6}	9.7×10^{-10}
Bi-210	2	0.0	0.0
Po-210	2	4.2×10^{4}	6.9×10^{-12}
Th-232	2	8.2×10^{5}	1.4×10^{-10}
Ra-228	2	2.3×10^{1}	3.8×10^{-15}
Ac-228	2	4.5×10^{9}	7.4×10^{-7}
Th-228	2	8.8×10^{6}	1.5×10^{-9}
Ra-224	2	4.6×10^{7}	7.6×10^{-9}
Rn-220	2	2.5×10^{6}	4.1×10^{-10}
Po-216	2	0.0	0.0
Pb-212	2	6.7×10^{8}	1.1×10^{-7}
Bi-212	2	9.0×10^{8}	1.5×10^{-7}
Po-212	1.3	0.0	0.0
Tl-208	0.7	1.9×10^{10}	1.1×10^{-6}

APPENDIX B - PUBLIC COMMENTS

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

NEWS RELEASE

For more information, contact:
Mike Greenwell
ATSDR Office of Policy and External Affairs
404/639-0727

For immediate release: April 29, 1991

ATSDR ANNOUNCES PUBLIC COMMENT PERIOD ON HEALTH ASSESSMENT

ATLANTA -- The Agency for Toxic Substances and Disease Registry (ATSDR), part of the U.S. Public Health Service, is investigating the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company National Priorities List site in St. Louis, Missouri, focusing on various potential sources of environmental contamination to determine their public health implications.

ATSDR is preparing a Health Assessment -- an evaluation of data and information on the release of hazardous substances into the environment -- on the site. Health Assessments are used to assess any current or future impact on public health, develop Health Advisories or other recommendations and identify studies or actions needed to evaluate and mitigate or prevent human health effects.

Health Assessments rely on three sources of information: environmental data, health outcome data and reports of community concerns. Environmental data detail the chemicals at a site and indicate their potential pathways to reach humans. Health

-more-

ST. LOUIS POST-DISPATCH
TUESDAY, MAY 14, 1991
5-STAR

Study Cites Hazards At Waste Area

By Christine Bertelson
Of the Post-Dispatch Staff

Radiation from nuclear waste stored near Lambert Field is a potential public health concern but not an immediate threat for people who live or work nearby, a federal report says.

The report is by the Agency for Toxic Substances and Disease Registry within the U.S. Public Health Service. The report says the potential health concerns are because of emissions of radon and the presence of thorium in the air and soil near three sites near the airport. Uranium waste from the nation's atomic energy program was dumped at the site between 1946 and 1966.

Because many people may have been exposed to contaminants in the area in the past, it says, follow-up health studies should be done.

The report says it found no evidence of a high incidence of cancer on Nyflot Avenue in Hazelwood, less than a half-mile from two of the sites under study. The agency had been asked to investigate reports of leukemia and other forms of cancer in that area.

The nine cancers found there were not the type normally associated with exposure to the kind of radiation present at the sites, the report says.

The report also recommends that:

- Air and dust samples be taken along roads used to carry contaminated material in and out of the storage sites.
- Steps be taken to reduce airborne dust during cleanup of the sites.
- Consideration be given to fencing off the former Berkeley Athletic Complex, closed by the city in 1988.

Berkeley Mayor Bill Miller said the report confirmed his city's long-held view that the radioactive material was a threat to public health, notwithstanding assurances to the contrary by the U.S. Department of Energy.

"This ... makes a liar out of the Department of Energy," Miller said. "The [department] told us years ago we could plant a garden, have animals out there, eat the dirt, ... and use the area as we saw fit. This confirms ...

Citizens seeking information on the public comment procedures should contact Regional Representatives for the area, Daniel Harper or David Parker, at 913/551-7692 or the Community Involvement Liaison, Lydia Ogden Askew, at 404/639-0610 (during the workday) or 404/330-9543 (24-hour message service).

News representatives seeking information about the Health Assessment, the public comment period or related issues should contact Mike Greenwell, ATSDR Office of Policy and External Affairs, 404/639-0727.

-30-

5 In order to determine the public health impact from playing baseball on contaminated fields, the adverse health effects from the 15 mrem radiation dose should be compared with the adverse health effects from 1) driving to a more distant baseball field; 2) a decline in general health if people stop playing baseball because it is inconvenient to play elsewhere.

6 Is this 15 mrem estimate intended to be a "conservative (worst case)" estimate? What are the 95% confidence intervals for this estimate? If 15 mrem is the "conservative" estimate, what is a more realistic (probabilistic) estimate of the risk?

7 Page 11, last paragraph: The statement is made that the ATSDR considers the St. Louis nuclear waste sites to be "a potential public health concern". What is the definition of "a potential health concern"? How does one differentiate a real public health concern from a potential health concern? How does the potential public health concern from St. Louis nuclear waste compare with other public health concerns (peri-natal mortality, obesity, smoking, excess alcohol ingestion, drug abuse, AIDS, etc)?

In summary, I thought the report does little to put the radiation doses from St. Louis' nuclear waste into a public health perspective. I would have liked to have seen some estimate of the number of person-sieverts that could be attributed to St. Louis' waste. The report should also include some estimate of the costs for preventing the adverse health effects from the radiation. A cost benefit analysis would help decision-makers determine how to best protect the public health. The resources to protect the public health are limited. Your report could help ensure that these resources are spend wisely.

I hope these comments have been helpful. Please feel free to call if you have any questions.

Sincerely,

(A)

June 10, 1991

To Agency for Toxic Substances and Disease Registry,

In response to the Preliminary Health Assessment of St. Louis city and county - cerclis number MOD 980633176 - May 10, 1991, I have these comments:

1. It is unfortunate this report had no new data. This report was compiled from a variety of old reports. The need for an epidemiology study is glaringly apparent. Mallinckrodt employees, Waste haulers, employees working on contaminated sites (Wetteraus, etc.), past and present residents near Latty Ave. (both sides of Hanley) and the offspring of all the people should be in the study. It has been shown that exposure to radiation can alter the males genes therefore causing genetic disorders, such as Downs Syndrome (note Wyflot case).

2. The report (page 4) sites no connection between the 9 Wyflot cancers because the cancers are types related to gamma radiation exposure and H.T.S.S. had only alpha emmissions. In the next paragraph (page 4) it states that significant amounts of U-238 and Radon

that is basically inhospitible to humans.

4. Also enclosed is an "Issue Analysis" from a graduate class - S I U - E. None of the students live near the contaminated areas. They are future business people. Cost effectiveness is a business students motto, yet even they acknowledge that the DOE storage site choices are not feasible. Maintenance and possible dangers of "break-up" make storage in the St. Louis area economically unsound.

Sincerely,

APPENDIX C - ATSDR RESPONSE TO PUBLIC COMMENTS

ATSDR received comments from eight sources concerning the St. Louis Airport, Hazelwood Interim Storage, Futura Coatings Company in St. Louis, Missouri. The comment period for this health assessment was published in the St. Louis Post-Dispatch and an article in the newspaper appeared on Tuesday, May 14, 1991. The comment period ran from May 15 to June 13, 1991. The responses were entered into a tracking system, photocopied, and distributed to the health assessment author. Where multiple comments from an individual were received, the comments were numbered. For Appendix B, all personal identifiers were removed from the comments received and placed in chronological order. The comments are addressed in chronological order as received.

May 30, 1991

1. The ATSDR Health Assessment for the St. Louis Airport, Hazelwood Interim Storage, Futura Coatings Company is written for several audiences, both technical and public. The technical audience includes the U.S. Environmental Protection Agency (EPA), other federal agencies involved with the site, state agencies, and the parties responsible for the site (owners or caretakers). In this respect the technical aspects of the assessment are a necessity. Because of the technical nature, ATSDR has attempted to structure certain sections of the health assessment to the public. These sections include the Summary, Human Exposure Pathways, and the Public Health Implications.

2. The determination of the size of a population that would be necessary to detect an increase in cancers is risk analysis. The National Academy of Science in their Biological Effects of Ionizing Radiation report (BEIR V) did publish risk factors for excess cancer mortalities for populations exposed to ionizing radiation. In a population of 100,000 males exposed over a lifetime to 100 mrem per year, the excess cancer mortality rate is estimated to be on the order of 520 excess deaths. For females under these same conditions, the excess death from cancer was estimated to be 600 individuals. However, there is much disagreement among radiation specialists as to the long term health effects of low doses of radiation. A statement of these studies has been included in the Public Health Implications section.

3. ATSDR believes that the commenter's remarks concerning radon stand on its own merit. A statement has been added in the Toxicological Implications section.

4. The dose calculations of ATSDR and DOE indicate the potential dose deposited directly to the bone surface after the internalization of radioactive materials. This dose is above and beyond that which might be received from the naturally occurring background radiation. ATSDR disagrees with the comment that "it is also considerably smaller than differences in radiation exposures due to the varying radon levels in a home." The National Council on Radiation Protection and Measurements (NCRP) in Report 78 state that the lung dose as a result of radon is low. However, the major lung damage is from the radon decay products. The NCRP estimates that the average dose to the lung bronchial epithelium for adults is 180 mrad per year and

with a site. This information is garnered from government and public documents and comments from citizens. The health assessment does not serve as an epidemiological study, but it can suggest that an epidemiological study be considered. This indeed has been stated in the Recommendations section of the health assessment as the site is being considered for follow-up health studies.

Although it is true that radiation can cause genetic disorders, radiation is not specific for male or female genes. In cases of Down's Syndrome where there is a breakage and realignment of human chromosome 21, the radiation doses resulting in chromosome breakage are orders of magnitude higher that those found at this site.

2. The majority of the radioactive materials found at this site are predominately alpha emitters with an emission of gamma radiation associated with the decay. Many of these resulting gamma ray emissions are very weak and are easily diminished in air. In cases of internalization of alpha emitters, the damage resulting from alpha radiation is twenty times more serious than damage resulting from gamma radiation. When alpha emitters, such as those found at this site, are internalized, they can result in bone cancers or lung cancer. In the case of radon exposure, it is not the radon that causes the most damage, but the alpha particles resulting from the decay of the radon progeny.

3. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

4. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 10, 1991 (b)

ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 12, 1991 (a)

An additional statement has been added to Part C. DEMOGRAPHICS, LAND USE, AND NATURAL RESOURCE USE indicating that some neighborhoods may use the creek for recreational purposes.

June 12, 1991 (b)

1. This comment has been addressed in the Summary section and the Background section of the health assessment.

2. Uranium-235 is found at the site; however, its concentration in the waste piles is low. Uranium-235 can be the main component in nuclear weapons or reactors and because of its value, is rarely disposed of as waste. The term enriched uranium refers to the

4. The health assessment stated that materials had been placed in a second pile. The initial reference (Bechtel, 1987a) stated that materials were stored in a supplementary pile at HISS. The health assessment has been corrected to reflect the commenter's concern.

5. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

6. The values in the health assessment were derived from Tables I1-I12 of Bechtel document. The values in those tables for each month were averaged over the 12-month period and the averages reported in the health assessment.

7. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

8. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

9. The health assessment has been corrected to reflect the commenter's concern.

10. The health assessment has been corrected to reflect the commenter's concern.

MISSOURI DEPARTMENT OF HEALTH

John Ashcroft
Governor

John R. Bagby, Ph.D.
Director

P.O. Box 570, Jefferson City, MO 65102 • 314-751-6400 • FAX 314-751-6010

June 13, 1991

Paul Charp
Health Physicist
ATSDR
Mailstop E32
1600 Clifton Road
Atlanta, GA 30333

Dear Mr. Charp:

The Missouri Department of Health wishes to comment on the ATSDR preliminary health assessment, released May 10, 1991, for the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company site (CIRCLIS No. MOD980633176) in St. Louis, Missouri.

The preliminary health assessment refers on page 4 to an inquiry conducted by the Missouri Department of Health at the request of a citizen. This inquiry examined a number of cancer cases found in residents of Nyflot Avenue, which is one block from the street that borders the Hazelwood Interim Storage Site. Because ATSDR's conclusions regarding the cancer cases on Nyflot Avenue appeared somewhat at variance with the conclusions of the Missouri Department of Health (DOH), DOH reexamined the literature and its own conclusions.

The results and conclusions of this reexamination are presented in the enclosed summary of the DOH inquiry. Our major conclusions are:

1) The possibility of an excess of cancer, particulary leukemia, should not be dismissed on the basis of lack of similarity between the cancers.

2) The possibility exists of an association between the cancers and the radiation found at the site. Contrary to ATSDR's statement on page 4, gamma radiation has been measured at the site. Several residents have reported visits to areas of potential gamma exposure, although re-creation of exposure is impossible.

We hope you will take this analysis into consideration when preparing your final health assessment of the area. We feel that the existence of the cancer cases on Nyflot Avenue lends further support to both your conclusion that the site is a potential public health concern and your recommendations outlined on page 12 of the health assessment.

SUMMARY STATEMENT

June 6, 1991

Inquiry No.: CI89-002

Location: St. Louis (Hazelwood; Nyflot Avenue)

Recieved: January 26, 1989

Initiator: Residents of Nyflot Avenue, parents of child with leukemia

Type(s) of cancer reported:

Initially, leukemia (ANLL/AML, ALL, HCL), colon and prostate cancer were reported. Later, cases of breast, lymphoma, melanoma, and thyroid cancer were found in addition to the types of cancer initially reported.

Suspected Cause(s):

Nearby radioactive waste sites

Associated regulatory issues (if any):

Regulation/clean-up of radioactive waste sites

Related inquiry (if any):

CI88-017

Summary of Inquiry:

[A more detailed summary of the activities up to November, 1989, related to this inquiry is given in the attached earlier summary, labelled "Summary A."]

In January, 1989, the parents of a child with leukemia reported four cases of leukemia associated with the four houses on Nyflot Avenue in closest proximity to the Hazelwood Interim Storage Site (HISS) on neighboring Latty Avenue, plus a fifth cancer case--a man with two separate primaries--at the far end of the same block.

Although a study of this area in response to an earlier inquiry (CI88-017) had not revealed an excess of cancer, residents of the area were contacted in response to the present inquiry. These contacts confirmed the five cases of cancer and revealed two additional cases. These findings, coupled with knowledge of radioactive contamination in the area (at two radioactive waste sites [SLAPS AND HISS] and along haul roads formerly used to transport radioactive materials), led the Cancer Inquiry Committee to recommend expanding the inquiry in February, 1989.

Another problem exists, however, with determining whether or not the present grouping represents an excess of cancer. This is the problem of comparing the number of cases with the number to be expected if the amount of cancer is similar to that experienced in other geographical areas. Many methods exist for making such a comparison, but all the methods have serious difficulties either due to lack of availability of necessary information (such as the number of people in the population at risk, i.e., the denominator used to determine the cancer rate), the small number of cases involved, or inadequacies of the statistical methods themselves. The committee decided that these difficulties preclude a meaningful analysis in this case, so the probability of such a cancer "cluster" occurring by chance is, as yet, unknown. However, because the total number of residents of this section of Nyflot over the past 30 years has been quite small, an elevated level of cancer incidence appears likely. Furthermore, to our knowledge, ATSDR has not analyzed available data and shown that a cluster does not exist. Given the level of public concern about this potential cluster, it is inappropriate to dismiss the possibility of a cluster as ATSDR has done.

Alpha emitters and gamma radiation

The ATSDR report found that the types of cancers on Nyflot Avenue are probably not due to the radioactive contamination in the area because the types of cancers are associated with exposure to gamma radiation and "not to alpha emitters found at this site". The statement implies that gamma radiation is not found at the site. However, the same ATSDR report (p. 5) states that gamma radiation above background levels has been measured at the site. Interviews with cancer cases and their families indicate that several cases may have been exposed to the gamma radiation during visits to the contaminated sites.

Tentative conclusions:

The number of cancers that have occurred in a small number of residents of Nyflot Avenue appears to be in excess of that expected, but it has not been possible to conduct statistical tests to confirm the accuracy of this impression. Most of the types/sites of cancers are highly to moderately sensitive to radiation induction, though the induction of melanoma and prostate cancer by radiation are questionable. The time of development of most of the cancers is consistent with an association with the radioactive waste materials, with the probable exception of the case of melanoma. Although an association between the specific cancers in the residents of Nyflot Avenue and the radioactive waste cannot be conclusively confirmed on the basis of this evidence, the evidence is consistent with the possibility of an association. Because of the potential for further exposures and possible consequent cancer induction, steps should be taken to reduce exposure to the radioactive materials and further follow-up studies should be conducted.

Recommendation(s) to committee:

Pursue assessments of health consequences of long-term exposures to the levels of radiation present in the area by requesting assistance from the Bureau of Radiological Health

Develop a protocol for the study of cancer incidence in residents of the neighboring street, Heather Lane

Committee decision(s):

Introduction:

The disposal and containment of radioactive wastes from industry is a major issue of vital concern to the health of citizens in the community. Disposal sites, haul roads, and groundwater contamination from radioactive wastes containing uranium and thorium pose serious health risks to St. Louisians. These wastes, the by-products of uranium processing for production of the nation's atomic weapons, have been stored in St. Louis since the late 1940's. Forty years later, the waste products have been moved from where they were originally produced. Some of these new locations lie within residential and commercial/industrial areas. The risks that these sites pose to occupants until recently has not been dealt with. A recent report stated that high levels of uranium, thorium, radium, and radon were detected in soil, groundwater, and air. The Agency for Toxic Substances and Disease Registry considers the St. Louis sites to be a potential health concern because of the emission of radon and the presence of thorium in on-site and off-site soils, and the emission of radiation resulting form the presence of these materials.

Study Purpose:

The objectives of this study are to identify alternatives and make recommendations that will be useful in reducing to acceptable levels the radioactivity at the uncontrolled hazardous waste sites near the Latty Avenue area.

Issue Environment and Health Concerns:

The radioactive materials at the Latty Avenue site consist of primarily wastes from uranium and thorium processing. These wastes contain residual quantities of these elements and their radioactive decay products, which have remained as contaminants in buildings, soil material, and stream channels after operations at the sites have ceased -- or have been dumped as waste in on-site or off-site disposal areas.

The radioisotopes of concern belong to the uranium 238 and thorium 230 decay series. Hazards to the general population could occur through several pathways, including:

1) inhalation of radon decay products, particularly where radon is concentrated in building structures;
2) inhalation of particulates or ingestion of materials containing radioisotopes of the two decay series;
3) ingestion of radionuclides via drinking water and food; and
4) external body exposure to gamma radiation.

Along the RR at Latty site high levels of Uranium were found at 309 pCi/g, Radium at 1100 pCi/g, and Thorium at 26,000 pCi/g. All at surface soils.

On Hazelwood Avenue, extremely contaminated soil samples show Thorium at 4810 pCi/g. On the west side of Hazelwood across from a perishable food storage warehouse, soil samples show a level of 3500 pCi/g of Thorium. A level 17,500 times above that which occurs in nature, and 700 times above that which is the Department of Energy's guidelines for clean.

Policy Issues:

Policy Issue #1: How can the haul roadways of Latty Avenue and adjacent ground areas be decontaminated?

Alternatives:

a) Removal of contaminated soil to off-site disposal areas for land encapsulation.

Local disposal by capping or vertical barriers.

b) Capping involves covering the contaminated site with a barrier sufficiently thick and impermeable to minimize the diffusion of radon gas and attenuate the gamma radiation associated with radionuclides.

c) Vertical Barriers are walls installed around the contaminated zone to help confine the material and any contaminated ground-water that might otherwise flow from the site.

Policy Issue #2: How can groundwater contamination be treated and removed?

Alternatives:

a) Ion Exchange: Uses synthetic resin material to exchange radion nuclide ions in the polluted water with ions in the resin material.

b) Pump it out and remove it.

c) Filtration: Removes solids by passing the fluid through a filtering system.

Policy Issue #3: What precautions should be taken at the Latty Avenue site upon completion of clean-up procedures?

Alternatives:

a) Surface seal the area (asphalt).

b) Land bank the area either temporarily or perpetually.

c) Let it revert to commercial land use.

alternatives #2 and #3, suggest that the radioactive waste be removed and then disposed of here in the St. Louis area. Due to the fact that this area has high instability because of potential earthquakes and floodplains, we believe that the permanent storage of nuclear waste is not safe.

With the removal of radioactive wastes, we assume that there will be a great reduction in the alpha and gamma rays which may cause serious health problems to those exposed.

Contamination of groundwater is much less likely to occur if waste is removed. Capping and vertical barriers only control certain migrational patterns of groundwater, allowing for potential contamination of groundwater. Capping does not control horizontal groundwater migration and vertical barriers do not control vertical migration.

Feasibility: First and foremost we would like to state that any method of nuclear waste removal and storage that is done haphazardly could cause severe health and environmental problems. Once again, alternative #4 seems to be the best method of dealing with potential future risks. Waste disposal in barriers or capping methods presents a future problem of radiation exposure due to the fact that containment material will need to be replaced. If alternative #4 is implemented efficiently and correctly, the possibilities of having an uncontaminated source of groundwater are better than with the other alternatives #2 and #3.

We agree in principle with alternative #1, however the feasibility of FUSRAP choosing ion exchange to clean the groundwater is not likely due to its high cost. The ion exchange method usually requires a pre-treatment filtration system which is very expensive. According to an EPA Superfund report, ion exchange was rated very high in effectiveness and reliability in decontamination of groundwater. However, alternative #4 recommends pumping the groundwater after the waste soil has been removed. We believe this method to more acceptable and less costly to FUSRAP.

$395/cubic meter

	COSTS		EFFECTIVENESS (HEALTH RELATED)			FEASIBILITY	
	TYPICAL COSTS	MAINTENANCE COSTS	REDUCTION OF WATER HAZARDS	REDUCTION OF SOIL HAZARD	REDUCTION OF AIR HAZARDS GAMMA & ALPHA RAYS	AVOID CREATION OF A WORSE HAZARD	IS TECHNOLOGY AVAILABLE TO PULL THIS OFF WILL FUSRAP USE THIS
1. REMOVE OFF-SITE ION EXCHANGE SURFACE SEAL	a) Removal of offsite $ 895/cubic meter b) Asume groundwater remediation is high priced in dollars c) High costs for asphalt Higher cost for ~~asphalt~~ concrete	Cost and maintenance for first year for for off-site $ .045/cubic met UMTRA Ion exchange offsite cleaner	Removal & land encapsulation is effective control for all migration but must find a suitable site	Removes source of radiation	We assume there will be a great reduction in Alpha & Gamma Rays with the removal of the contaminated soil.	If done haphazardly there could be severe problems	Less likely because ion-exchange is expensive & generally requires filtration as pretreatment. Potential problem with acceptance of states (i.e. CO) where waste would travel through
2. LOCAL DISPPOSAL BY CAPPING, FILTRATION, LAND BANK	a) For capping w/clay $ 200/cubic meter b) Assume groundwater remediation is high priced in dollars c) Land Bank has little to no public cost	$ .44/cubic meter for capping concrete Replacement of capping material will be needed within next 50 to 100 years because waste remains radioactive longer than capping materials life	Capping protects surface water but does not control horizontal groundwater migration Potential contamination due to flood & earthquake	Degree of radiation reduction is unknown and does not remove source of radiation Potential radiation leakage due to earthquake	Level of Alpha & Gamma Rays may not be reduced.	If done haphardly there could be severe problems Because of replacement need for capping material for radiation exposure will reoccur Groundwater pollution is not eliminated	Yes
3. VERTICAL BARRIERS, FILTRATION, COMMERCIAL LAND USE	a) Vertical barrier $ 377/sq. meter b) Assume groundwater remediation is high priced in dollars c) Little to no public cost	Replacement of capping material will be needed within next 50 to 100 years because waste remains radioactive longer than capping materials life	Vertical barriers controls horizontal groundwater migration but does not control vertical migration Potential contamination due to flood & earthquakes	May not reduce radiation and does not remove source of radiation Potential radiation leakage due to earthquake	Level of Alpha and Gamma Rays may not be reduced	If done haphazardly there could be severe problems Because of replacement need for capping material for radiation exposure will reoccur Groundwater pollution is not eliminated	Yes
4. REMOVE OFF SITE, GROUNDWATER PUMPING, LAND BANK	a) Removal to offsite is $ 895/cubic meter b) Assume groundwater remediation is high in dollars c) Land Bank has little to no public cost	Cost for off-site is .045/per cubic meter	Removal & land encapsulation is effective control for all migration but must find a suitable site	Removes source of radiation	We assume there will be a great reduction in Alpha & Gamma Rays with the removal of the contaminated soil.	If done haphazardly there could be severe problems	Potential problem with acceptance of states (i.e. CO) where wastes would travel through

6/12/91 (A)

Dear Ms Ogdon,

I mailed my comments on the Preliminary Health assessment for Old Waste Sites in St. Louis, Mo to Secretary Director J. Watkins by mistake instead of to you. He should have my letter

I would like to add comment to page 8 of the assessment to correct that <u>there is</u> recreation along Coldwater Creek as well

can see in the enclosed picture I am including.

Also, there are wells located near Coldwater Creek.

Thank you for considering my comments.

Sincerely,

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addressed in the Preliminary Health Assessment.

3. Volume: While virtually all the St. Louis haul routes that have been surveyed to date have been found to be contaminated, many of the potentially contaminated truck and rail routes have not yet been surveyed -- for instance, between the Downtown Mallinckrodt plant and the Airport, between the Downtown plant and the Weldon Spring Quarry in St. Charles County, and between Latty Avenue and West Lake Landfill in St. Louis County (in the Missouri River floodplain), where Latty wastes were illegally dumped in 1973. It seems to me that the long-lived uranium/thorium wastes which were dumped at West Lake should be exhumed and removed from St. Louis at the same time as the other St. Louis weapons wastes. (West Lake itself, as a hazardous waste site, was placed on the final EPA National Priorities List on August 30, 1990.)

4. Hazard: Comparing the contamination levels in the surface soil at our St. Louis sites with the DOE's cleanup guideline of 5 picocuries per gram also underscores the need for a cleanup: the Preliminary Health Assessment notes, for example, that a thorium-230 level of 4900 pCi/g was found along one of the haul routes (page 17) -- a level 980 times greater than the permissible DOE level and 24,500 times greater than the level found naturally in soil (0.2 pCi/g). According to the enclosed table from a June 1980 Health Physics article, originally published 25 years ago, thorium-230 and actinium-227, another widespread St. Louis contaminant, have been ranked with the most radiotoxic substances known.

All geohydrologic reports I have read on the Airport Site have agreed that the Site groundwater flows into Coldwater Creek. And that the creek in turn flows into the Missouri River upstream from the river's confluence with the Mississippi River, immediately upstream of the City of St. Louis's major drinking water intake. Furthermore, Coldwater Creek is enjoyed year-round by neighborhood residents, particularly children. Floodwaters from the creek often flow onto adjacent backyard food gardens.

The Department of Energy has estimated that some 3600 sites in our nation are contaminated with nuclear weapons wastes. I think the ATSDR Preliminary Health Assessment should encourage federal officials to give our St. Louis waste sites their deserved high cleanup priority.

Sincerely,

Enclosures

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri

U.S. Department of Energy