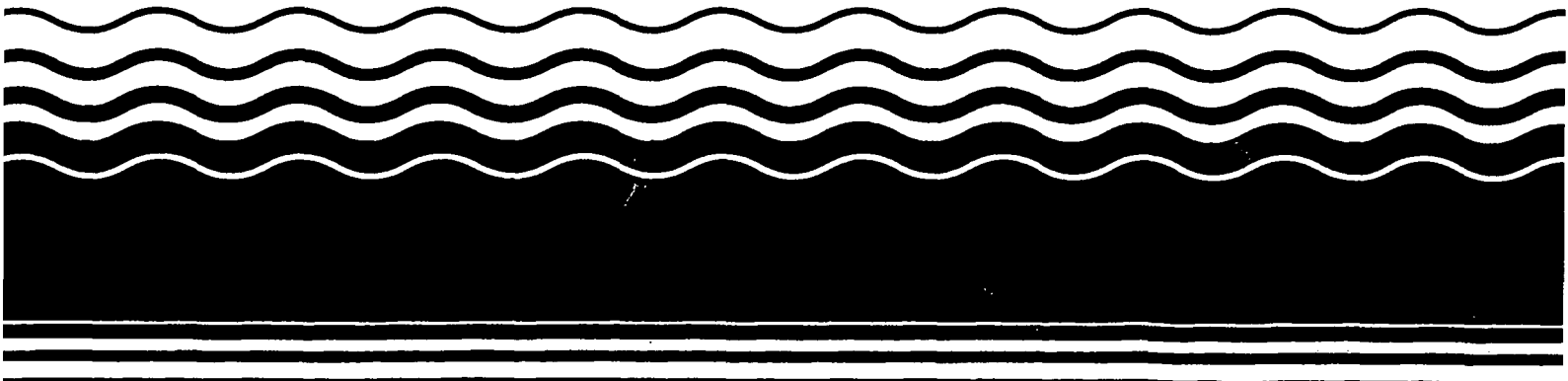


**PB95-963807  
EPA/ROD/R02-95/253  
October 1995**

**EPA Superfund  
Record of Decision:**

**U.S. Radium Corporation  
Operable Unit 2, Essex County, NJ  
8/29/1995**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION II

DATE: AUG 25 1995

SUBJECT: Record of Decision for the U.S. Radium Corporation Site

FROM: Kathleen C. Callahan, Director  
Emergency and Remedial Response Division

TO: Jeanne M. Fox  
Regional Administrator

Attached for your approval is the Record of Decision (ROD) for the U.S. Radium Corporation site. The site is located in Essex County, New Jersey.

The selected remedial action represents the second of two planned operable units for the site. The ROD for the first operable unit, signed September 21, 1993, selected an action to address all of the residential properties and most of the commercial properties in the Vicinity and Satellite Properties study areas. This second action will address the High and Alden Streets study area (the former U.S. Radium processing plant) and the remaining commercial properties not addressed in the first operable unit. Ground water is not addressed in either this or the earlier decision document. If an action is needed for the ground water, it will be addressed in a future decision document.

Under the remedy outlined in the attached ROD, radium-contaminated material will be excavated from the affected properties and transported for off-site disposal. The remedy will require approximately two years to fully implement at an estimated cost of \$22 million.

The results of the remedial investigation and feasibility study and the Proposed Plan for this action were released to the public on May 22, 1995. The public comment period ended on June 21, 1995. In addition, a public meeting was held on June 1, 1995. The comments received from local residents and officials on the proposed remedial action did not necessitate a modification of the proposed remedy.

The ROD was developed by the U.S. Environmental Protection Agency and has been reviewed by the New Jersey Department of Environmental Protection, and the appropriate offices within Region II and Headquarters. Their input and comments are reflected in this document.

If you have any questions concerning this ROD, I will be happy to discuss them at your convenience.

Attachment

## DECLARATION STATEMENT

### RECORD OF DECISION

U.S. Radium Corporation

#### Site Name and Location

U.S. Radium Corporation, Essex County, New Jersey

#### Statement of Basis and Purpose

This decision document presents the selected remedial action for the former radium processing plant and four commercial properties that comprise the second operable unit of the U.S. Radium Corporation site. The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the administrative record for the site.

The State of New Jersey concurs with the selected remedy.

#### Assessment of the Site

Actual or threatened releases of hazardous substances from the U.S. Radium Corporation site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare or the environment.

#### Description of the Remedy

The remedy described in this document represents the second operable unit for the U.S. Radium Corporation site. It addresses the principal threats to human health and the environment associated with the properties that make up the former U.S. Radium Corporation ore-processing plant, as well as four nonadjacent commercial properties, and is the final remedial action for those properties.

A previous Record of Decision, signed on September 21, 1993, selected a remedy for contaminated residential properties and the remaining commercial properties that comprise the U.S. Radium site. Ground water has not been addressed in either this or the earlier Record of Decision. If an action is needed for the ground water, it will be addressed in a future decision document.

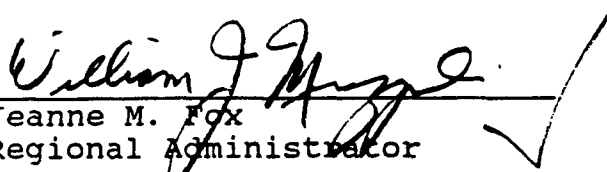
The major components of the selected remedy for the second operable unit include:

- Excavation/removal of the radium-contaminated material above remedial action objectives from the designated properties;
- Off-site disposal of the radium-contaminated material; and
- Appropriate environmental monitoring to ensure the effectiveness of the remedy.

#### Declarations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element.

Because this remedy will not result in hazardous substances remaining on the addressed properties above levels that allow for unlimited use and unrestricted exposure, a five-year review of this action will not be required.

  
\_\_\_\_\_  
Jeanne M. Fox  
Regional Administrator

8/29/95  
\_\_\_\_\_  
Date



*State of New Jersey*

Christine Todd Whitman  
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.  
Commissioner

AUG 11 1995

Ms. Jean M. Fox, Regional Administrator  
USEPA - Region II  
290 Broadway  
New York, NY 10007-1866

Dear Ms. Fox:

Subject: US Radium Corporation Second Operable Unit  
Concurrence Letter

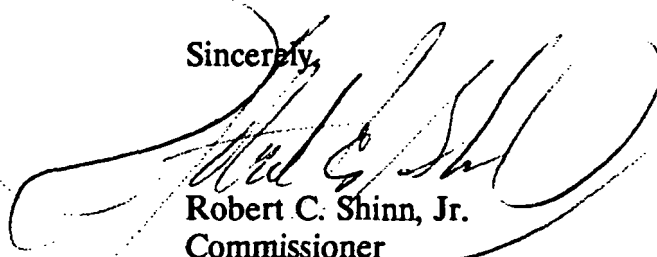
The Department has reviewed the draft final Record of Decision (ROD) for the subject site and concurs with the following remedy for the second operable unit.

- . Excavation/removal of the radium-contaminated material above remedial action objectives from the designated properties;
- . Offsite disposal of the radium-contaminated material; and
- . Appropriate environmental monitoring to ensure the effectiveness of the remedy.

As previously stated in the attached letter dated May 22, 1995 the Department concurs with the selected remedy; however, the Department does not support the exclusion of S-1070 (Industrial Site Recovery Act, P.L. 1993, c.139) as State ARARs (applicable, or relevant and appropriate requirements) for this site.

Thanking you for the opportunity to comment and participate in the Superfund process.

Sincerely,

  
Robert C. Shinn, Jr.  
Commissioner

Attachment  
AS/lmj



State of New Jersey

Department of Environmental Protection

Christine Todd Whitman  
Governor

Robert C. Shinn, Jr.  
Commissioner

MAY 22 1995

Ms. Katherine Callahan  
USEPA - Region II  
290 Broadway  
New York, NY 10007-1866

Dear Ms. Callahan:

SUBJECT: US Radium Corporation Superfund Site Second Operable Unit  
Proposed Plan

The Department has reviewed the Proposed Plan of the second operable unit for the U.S. Radium Corporation site and is in agreement with the proposed remedy. However, the Department does not support the exclusion of S-1070 (Industrial Site Recovery Act, P.L. 1993, c.139) as State "ARARs" (applicable, or relevant and appropriate requirements) for this site. The Department has decided to support the preferred alternative. In view of the fact that the selected remedy, excavation and off-site disposal, would achieve the Department's objective of cleanup to background, since the first two feet thickness of soil would not contain above background, and that any residually contaminated material remaining on the remediated properties would not be greater than two feet in thickness.

Thank you for the opportunity to participate in the superfund process.

Sincerely,

Richard J. Cimello  
Assistant Commissioner

AS:jb

## **DECISION SUMMARY**

### **U.S. Radium Corporation Site**

#### **Second Operable Unit High and Alden Streets Properties and Related Properties**

##### **SITE NAME, LOCATION AND DESCRIPTION**

The U.S. Radium Corporation site consists of three study areas located in several communities of Essex County in northeastern New Jersey about 12 miles west of New York City. The study areas are referred to as the High and Alden Streets Properties, the Vicinity Properties and the Satellite Properties.

The High and Alden Streets Properties study area covers approximately two acres in the City of Orange. The Vicinity Properties study area covers approximately 25 acres and includes about 330 properties in Orange and in the Town of West Orange. The Satellite Properties study area includes approximately 50 noncontiguous single properties or small clusters of properties located primarily in Orange, with a few properties in the municipalities of East Orange and South Orange. Figures 1, 2 and 3 show the locations of the study areas.

The High and Alden Streets Properties and Vicinity Properties study areas are located in a well-established, urban residential neighborhood with single- and multi-family homes, interspersed with commercial and light-industrial establishments. The Satellite Properties are located in both commercial and residential areas of Essex County.

Wigwam Brook, which originates in the Watchung Mountains, passes through the Vicinity Properties study area and along side the High and Alden Streets Properties study area. Ground water resources within the study areas are an unconsolidated, glacial-overburden aquifer, and the deeper, fractured-bedrock aquifer of the underlying Brunswick Formation. The majority of the drinking water supplies for the towns within the study areas are drawn from surface reservoirs in northern New Jersey, although some deep bedrock aquifer wells located nearby the study areas are used for water supply.

Soil and other material at certain properties within the study areas are contaminated to varying degrees with radioactive waste materials suspected to have originated from radium processing or utilization by the former U.S. Radium Corporation.

##### **SITE HISTORY AND ENFORCEMENT ACTIVITIES**

The U.S. Radium Corporation, formerly known as the Radium Luminous Materials Corporation, operated a facility at the High and Alden Streets Properties study area from 1915 through 1926.

U.S. Radium also operated facilities at various Satellite Properties in the early 1900s. A primary activity at the High and Alden Streets Properties was the extraction and purification of radium from carnotite ore. Because each ton of ore produced only a few milligrams of radium, large volumes of ore were required. Large quantities of process wastes, or "tailings", were generated which contained radioactive elements at elevated levels. The tailings were temporarily discarded on unused areas of the facility and ultimately disposed of off site.

In addition to the production and sale of radium itself, the U.S. Radium Corporation also manufactured a radium-based luminous paint. At one time, the company employed over 100 workers to paint instruments and watch dials with this luminous paint. Reports indicate that dial painting took place at the High and Alden Streets Properties and at several Satellite Properties.

U.S. Radium Corporation discontinued radium processing operations in 1926, while continuing its dial painting business. U.S. Radium subsequently sold its properties at High and Alden Streets in the 1940s. No subsequent occupants of the properties are known to have processed or used radium.

In 1979, the U.S. Environmental Protection Agency (EPA) and the New Jersey Department of Environmental Protection (NJDEP) initiated a program to identify and investigate locations within New Jersey where radium processing activities had taken place. The former U.S. Radium Corporation facility was included in this program. In May 1981, EPA conducted an aerial gamma radiation survey covering approximately 12 square miles centered on the High and Alden Streets Properties. This aerial survey located about 25 acres around the High and Alden Streets Properties where elevated readings of gamma radiation were detected. This 25-acre area corresponds to the approximate limits of the Vicinity Properties study area. This same survey identified areas of elevated gamma radiation in the nearby communities of Montclair, West Orange and Glen Ridge; the affected properties in these areas comprise two other Superfund sites, the Montclair/West Orange Radium site and the Glen Ridge Radium site (the "MWG sites").

In 1982, the site was proposed for inclusion on the National Priorities List (NPL) of Superfund sites. The site was placed on the NPL in September 1983.

Ground level surveys conducted in the early 1980s showed elevated gamma radiation and radon gas in most of the buildings on the High and Alden Streets Properties. In 1984, NJDEP performed preliminary field investigations of 31 properties near the facility. While these studies found elevated levels of gamma radiation at some properties, NJDEP found only small pockets of



radium-contaminated soil, and detected no elevated radon gas levels.

Working from U.S. Radium Corporation documents and other historical records, EPA and NJDEP initially identified 22 Satellite Properties. Initial investigations of some of the Satellite Properties in 1983 and 1986 indicated elevated levels of gamma radiation, with a few instances of elevated radon gas in basements. Additional Satellite Properties have been identified through investigations of properties adjacent to the first 22 Satellite Properties, in some cases resulting in small clusters of properties with similar conditions.

In July 1983, EPA notified five companies and one individual that they had been identified as potentially responsible parties (PRPs) for the site. EPA requested a response outlining the activities that the PRPs would be willing to undertake. One PRP, Safety Light Corporation, a corporate successor to the U.S. Radium Corporation, responded that it was willing to perform response activities at the site.

In 1983, EPA and Safety Light Corporation commenced the first of several unsuccessful efforts to negotiate an agreement whereby Safety Light would undertake response activities at the site, under EPA supervision. The last of these efforts ended in December 1988 when Safety Light declined to perform any work, other than a removal action to replace the inadequate security fence around the High and Alden Streets Properties. Safety Light began the fence construction in 1989; however, EPA completed the work because of problems which arose during the removal action. No PRPs have agreed to perform any additional work.

EPA initiated a remedial investigation and feasibility study (RI/FS) in October 1989 to determine the nature and extent of contamination at the U.S. Radium site. While preliminary field investigations did not reveal extensive radiological contamination beyond the limits of the High and Alden Streets study area, EPA elected to perform a comprehensive investigation of what would become about 330 Vicinity and 50 Satellite Properties concurrent with its studies of the High and Alden Streets Properties.

EPA's investigations of the Vicinity and Satellite properties involved a separate field investigation of several hundred mostly residential, private properties. By October 1992, over 160 investigations had been performed, and 63 radium-contaminated properties had been identified.

As part of a second removal action begun in 1991, EPA installed radon mitigation systems and gamma radiation shielding at four properties where elevated radiation levels were detected early in the RI.

As with many Superfund sites, the problems at the U.S. Radium Corporation site are complex. Consequently, EPA has organized the site into separate phases or operable units. In October 1992, with the investigations of the former plant site still ongoing, EPA elected to organize the Vicinity and Satellite Properties study areas into a first operable unit (OU1), and to propose a remedy for radium-contaminated properties within those study areas. With about 160 investigations completed, it was clear that performing studies on the remaining 220 properties would not assist EPA in better understanding the problem, and would unnecessarily delay the process of proposing a remedy.

A Proposed Plan for OU1 of the U.S. Radium Corporation site was released for public comment in April 1993, along with a first RI/FS report, which documented the nature and extent of contamination at the Vicinity and Satellite Properties and provided a detailed evaluation of remedial alternatives.

After consideration of public comments, which were generally supportive of EPA's preferred alternative, EPA issued a Record of Decision (ROD) for the site, signed on September 21, 1993, which documented the selected remedy for OU1. The remedy for the OU1 properties involves excavation and off-site disposal of the radium-contaminated material.

Regarding the OU1 selected remedy, the remedial design associated with the first group of OU1 properties is currently being prepared. It is anticipated that remedial construction activities at these properties will begin in early 1996. Property investigations have continued since the 1993 ROD; over 300 property investigations have now been completed. As a result, the number of properties included in OU1 has risen to about 75.

#### **HIGHLIGHTS OF COMMUNITY PARTICIPATION**

A Community Relations Plan was developed to ensure the public opportunities for involvement in site-related decisions. In addition, the Community Relations Plan was used by EPA to determine, based on community interviews, activities to ensure public involvement and to provide opportunities for the community to learn about the site.

EPA held a public meeting, conducted a series of public availability sessions and distributed a fact sheet in February 1991 to explain the RI/FS to the public and to report on the progress being made at the site. EPA held additional public availability sessions in June and November 1992, during the RI, when the results from field investigations of Vicinity and Satellite Properties were distributed to the respective property owners, so that each individual property owner would have an opportunity to discuss the findings with EPA.

For the second operable unit (OU2), the subject of this document, a second RI/FS report was released to the public in May 1995. A Proposed Plan identifying EPA's preferred remedial alternative was released on May 22, 1995. These documents were made available to the public at the information repositories at the Orange Public Library, located on Main Street in Orange, New Jersey, and at the West Orange Public Library located on Mount Pleasant Avenue in West Orange, New Jersey. In addition, the Proposed Plan was mailed to property owners of affected properties, and a "Superfund Update" for the site was mailed to certain property owners and residents in the three study areas. A copy of the administrative record file is located at the Orange Public Library and in the EPA Superfund Records Center in Region II, 290 Broadway, New York, New York. The notice of availability of the Proposed Plan and administrative record was published in The Star-Ledger (Essex County Edition) on May 22, 1995 and in The Orange Transcript on May 25, 1995. The public comment period relating to these documents was held from May 22, 1995 to June 21, 1995.

On June 1, 1995, EPA held a public meeting at the Orange City Hall Council Chambers, to present the findings of the RI/FS and the Proposed Plan, and to respond to questions and comments from area residents and other attendees. Responses to the comments received during the public comment period are included in the Responsiveness Summary, which is part of this ROD.

This decision document presents the selected remedial action for OU2 of the U.S. Radium Corporation site, chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The selection of the remedy for this site is based on the administrative record.

#### **SCOPE AND ROLE OF OPERABLE UNIT**

As described above, the first operable unit (OU1) included all the residential properties in the Satellite and Vicinity Properties study areas where radium-contaminated material was detected. OU1 also included all but four of the nonresidential properties in the Vicinity and Satellite Properties study areas.

The second operable unit (OU2) includes all properties within the High and Alden Streets study area, including the former processing plant and several adjacent properties. OU2 also includes the four nonresidential, nonadjacent properties not addressed in OU1. Two of these four nonadjacent OU2 properties appear to have been watch dial painting facilities; a third was a U.S. Radium-operated laboratory. The fourth property appears to have been an experimental thorium handling operation.

## **SUMMARY OF SITE CHARACTERISTICS**

The OU2 RI/FS report presents the results of field investigations conducted at the High and Alden Streets Properties study area and the four nonresidential, nonadjacent properties that are included in OU2. The OU2 RI/FS report also discusses investigations of Wigwam Brook and ground water; however, the results of EPA's ground water investigation are inconclusive, and further evaluation will be undertaken.

Radionuclides, primarily of the uranium decay chain, are the principal contaminants of concern resulting from releases at the U.S. Radium site. These nuclides include isotopes of radium, thorium, uranium, lead and others. Radium-contaminated material resulting from radium processing and utilization at the High and Alden Streets Properties was apparently discarded on various Vicinity and Satellite Properties. Hence, the primary radionuclide of concern is radium-226. As a result of the radioactive decay of radium-226 in the soil, elevated indoor concentrations of radon gas and radon decay products are exhibited in most of the buildings associated with OU2. All OU2 properties exhibit elevated levels of indoor and/or outdoor gamma radiation.

Table 1 summarizes the common units of measure for radionuclides that are discussed below. The concentration of radium-226 measured at the properties investigated ranges from "background" levels of approximately 1 picoCurie per gram (pCi/g) of soil up to several thousand pCi/g.

As stated above, radium-226 radioactively decays into radon gas. Because radium is found naturally in most soils, radon gas is typically found in most buildings, and, in fact, radon gas was detected at each of the properties where radon tests were performed. Typical indoor radon gas levels, measuring about 1 picoCurie per liter (pCi/l) of air, were detected at unaffected properties. Levels in excess of 4 pCi/l are considered elevated, and some affected properties had radon gas values as high as 20 pCi/l. The background radon-222 level of 1 pCi/l within the study areas corresponds to approximately 0.005 Working Level (WL), whereas 20 pCi/l of radon-222 corresponds to approximately 0.1 WL. Additionally, both indoor and outdoor gamma radiation levels, reported in units of microRoentgens per hour ( $\mu$ R/hr), have been measured at many of the study area properties. Background gamma radiation is approximately 8.3  $\mu$ R/hr within the study areas.

### **Soil and Construction Material Investigations**

Properties included in OU2 were surveyed for radioactive materials to define the limits of contamination. Radiological investigations included the collection of radon gas samples from inside buildings, and interior/exterior surveying of each

property to identify areas of elevated gamma radiation. Wherever elevated gamma radiation readings were detected, additional samples were collected to characterize the extent of contaminants present.

Because of the long and varied history of industrial use at the High and Alden Streets Properties study area, additional field investigations were performed to augment the studies described above. Surface and subsurface soil samples were collected and analyzed for selected radionuclides and nonradiological, chemical analyses for metals, volatile organic compounds (VOCs), semi-volatile organic compounds, pesticides and polychlorinated biphenyls (PCBs).

The following is a summary of the RI findings.

#### High and Alden Streets Properties

- Soil contaminated with radium and other radionuclides is found on a substantial portion of the High and Alden Streets Properties study area. Radiological contamination is present in some locations to a depth of 15 feet. An estimated 18,000 cubic yards of soil have elevated radium concentrations. In addition, approximately 110 cubic yards of structural material are similarly contaminated.
- Gamma radiation exposure rates associated with contaminated soils range from background (8.3  $\mu\text{R/hr}$ ) to 700  $\mu\text{R/hr}$ . All buildings on the High and Alden Streets Properties contain elevated levels of radon gas, with levels ranging from 12.7 pCi/l to 110 pCi/l. Elevated concentrations of both fixed and removable building surface contamination are detected in some of the older on-site structures.
- Soil samples collected and analyzed for chemical (non-radiological) contaminants indicate the presence of low levels of metals and semi-volatiles in soils at the High and Alden Streets Properties. Chemical soil contamination is sporadic.

#### Four Nonadjacent OU2 Properties

- Studies of the four nonadjacent OU2 properties indicated the presence of elevated levels of radiological contamination. Three properties contain elevated levels of radium, found in both soil and structural materials, resulting in elevated gamma radiation levels. Elevated radon levels, along with elevated levels of both fixed and removable building surface contamination, were detected at one property.

The fourth property is the only investigated property contaminated with thorium-232. Approximately 400 cubic yards of contaminated soil and 40 cubic yards of contaminated structural material were found at these four properties.

#### **Wigwam Brook and Ground Water Investigations**

Surface water and stream sediments were collected from Wigwam Brook and analyzed for radiological and chemical contaminants. Four ground water monitoring wells were installed at the High and Alden Streets Properties study area. In addition to these four wells, EPA also sampled four preexisting wells (one municipal supply well, one commercial production well and two monitoring wells) for radionuclides and chemical contaminants. The findings of the RI are summarized below.

- No elevated radiological contamination was found in surface water or sediment samples from Wigwam Brook.
- No chemical contamination attributable to the site was found in surface water or sediment samples from Wigwam Brook.
- Elevated uranium concentrations were detected in EPA's monitoring wells 1S and 3, and an elevated radium concentration was detected in EPA monitoring well 1S. No other ground water sampling locations had elevated levels of radionuclides.
- VOCs, including tetrachloroethylene (PCE), trichloroethylene (TCE) and 1,2-dichloroethylene (1,2-DCE), were detected in EPA monitoring wells above federal or state Maximum Contaminant Levels (MCLs) for drinking water.
- VOCs were also detected in the municipal and non-potable, private wells sampled over an area covering about one square mile around the site. No definite pattern of VOC contamination was evident, nor could a defined plume of ground water contamination be identified. (Municipal drinking water supply wells in the area have treatment systems to remove VOCs; there are no known private drinking water wells located near the site.) It is unclear at this time whether any portion of the VOC contamination found is related to the site.

Because EPA monitoring wells are contaminated with site-related as well as potentially unrelated contaminants, and information is currently not available to determine the extent to which site-related contaminants may be migrating into the ground water, EPA will further evaluate the nature and extent of ground water

contamination. Notwithstanding this further evaluation, site activities do not appear to be adversely impacting Wigwam Brook. In addition, local municipal water supply wells are not contaminated with radionuclides.

The study areas are situated in well-established urban or suburban communities, where extensive development and reworking of soils has taken place. Thus, no wetlands remain at or in close proximity to the study areas.

#### **SUMMARY OF SITE RISKS**

During the OU2 RI/FS, EPA performed a baseline risk assessment of exposure to contaminants associated with the U.S. Radium Corporation site. This baseline risk assessment estimates the human health risk which could result from the contamination at the site if no remedial action were taken.

To evaluate human health risks, a four-step process is used for assessing site-related risks for a reasonable maximum exposure scenario. These steps are: Hazard Identification - identified the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration; Exposure Assessment - estimated the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated soil) by which humans are potentially exposed; Toxicity Assessment - determined the types of adverse health effects associated with exposures to site contaminants, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and Risk Characterization - summarized and combined outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk) assessment of site-related risks.

For risk assessment purposes, individual contaminants are typically separated into two categories of health hazard depending on whether they exhibit carcinogenic or noncarcinogenic effects. Radionuclides (e.g., radium, thorium, radon, radon decay products) are known carcinogens. Nonradiological, "chemical" contaminants (e.g., polycyclic aromatic hydrocarbons [PAHs], barium, vanadium, cadmium and lead) may exhibit both carcinogenic and noncarcinogenic health effects.

Current federal guidelines for acceptable exposures are an individual lifetime excess carcinogenic risk in the range of  $10^{-4}$  to  $10^{-6}$ , representing an increased probability of one in ten thousand to one in one million that an individual could develop cancer resulting from exposure to site-related contaminants, and a maximum Hazard Index (which reflects noncarcinogenic effects for a human receptor) equal to 1.0. (A Hazard Index greater than 1.0 indicates a potential for noncarcinogenic health effects.)

It must be noted that the risk posed by naturally occurring background radiation appears high when compared to the potential risk posed by nonradiological carcinogens. During the RI, natural background radiation was measured and used to estimate the risk of cancer to the general public. The risk of cancer to the public was estimated to be  $2 \times 10^{-3}$ , representing a probability of two in one thousand that an individual could develop cancer resulting from exposure to natural background radiation. The excess risk to individuals at contaminated properties has been evaluated with respect to this background risk.

To evaluate human health risk, several exposure pathways were selected for detailed evaluation under current land-use conditions. In addition, potential future land-use conditions were considered for the High and Alden Streets Properties.

All of the current land-use conditions involved the potential exposure of workers or occupants of commercial properties, and trespassers on unused properties. Because most of the properties surrounding the High and Alden Streets Properties are residential, conversion from commercial to residential use was considered to be a reasonable future scenario for the High and Alden Streets Properties, resulting in potential exposures to residents. The exposure pathways were similar for current and future land-use situations: inhalation of radon decay products; exposure to external gamma radiation emanating from radium-contaminated material; ingestion of radionuclides in soil; and inhalation of radium-contaminated particulates. In addition, a future residential land-use condition resulted in several added exposure pathways for on-site residents: ingestion of radionuclides, cadmium and vanadium, either from inadvertent ingestion of soil or in locally grown produce.

In all current and future land-use situations, inhalation exposure to radon decay products is consistently the major contributor to the total cancer risk that may be incurred by individuals at contaminated properties. Exposure to gamma radiation also provides a significant component of the overall radiogenic cancer risk. Ingestion of radionuclides is several orders of magnitude lower in risk than that of the inhalation and gamma exposure pathways. Inhalation exposure to particulate radium is an insignificant contributor to the total risk.

For current land-use conditions at the four nonadjacent OU2 properties, the estimated excess lifetime cancer risk ranged up to  $5 \times 10^{-3}$  (five in one thousand). For the High and Alden Streets Properties, the estimated excess lifetime risks under current and future land-use scenarios were  $1 \times 10^{-2}$  (one in one hundred) and  $2 \times 10^{-1}$  (two in ten), respectively.



Tables 2 through 10 provide a summary of the excess lifetime cancer risk estimates associated with exposure to radionuclides for unremediated OU2 properties.

Exposure to chemical (nonradiological) contaminants under future land-use conditions contributed a marginally elevated Hazard Index and cancer risk at the High and Alden Streets Properties study area. Table 11 summarizes the risks posed by chemical contaminants under various current and future use scenarios. The major contributors to the risk are cadmium and vanadium; however, these risks are trivial compared to those resulting from radionuclide exposure.

Unusually high concentrations of naturally occurring radon have not been associated with the communities where OU2 properties are located. Exposure to elevated levels of gamma radiation, and the pathways for the inhalation and ingestion of radium, pose risks not typically encountered in areas of naturally occurring radon. The close proximity of the radium-contaminated soil to the ground surface or radiological contamination in building construction material at contaminated properties is the main reason for these additional risks.

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental sampling and analysis;
- environmental parameter measurement;
- fate and transport modeling;
- exposure parameter estimation; and
- toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of contaminants in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Environmental sample-analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the radionuclides of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the contaminants of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a

mixture of contaminants. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the Risk Assessment provides upper-bound estimates of the risks to populations that may be exposed to radionuclides, and is highly unlikely to underestimate actual risks related exposure.

More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the Risk Assessment Report.

An evaluation of ecological risk was not conducted as part of OU2. It was determined that, because of the urban setting associated with the contaminated areas, the likelihood of contact of contaminants with ecological receptors was minimal. For example, Wigwam Brook serves primarily as a stormwater drainage culvert in this area. The one possible exception would be receptors down stream of Wigwam Brook; however, because of the length of time since the original deposition of material and the lack of any current releases from the High and Alden Streets Properties study area into the brook, the likelihood of exposure is considered minimal.

Actual or threatened releases of hazardous substances from the U.S. Radium Corporation site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

#### **REMEDIAL ACTION OBJECTIVES**

The following remedial action objectives have been established for this operable unit of the U.S. Radium Corporation site:

- Reduce exposure to radon gas levels in excess of 4 pCi/l and radon decay products in excess of 0.02 WL.
- Reduce exposure to gamma radiation emitted from radium-contaminated material resulting from site sources with radium concentrations in excess of 5 pCi/g; employing As Low As Reasonably Achievable (ALARA) principles.
- Prevent ingestion of and general contact with radium-contaminated material resulting from site sources with radium concentrations in excess of 5 pCi/g, employing ALARA principles.

These remedial action objectives are similar to those selected for the Montclair/West Orange and Glen Ridge Radium sites (MWG sites) and for OU1 of this site and would, at minimum, achieve the cleanup criteria in 40 CFR 192, the federal regulations

governing the cleanup of uranium mill tailings from inactive uranium processing sites. EPA has determined that the 5 pCi/g standard found in 40 CFR 192 is relevant and appropriate for cleanup at the U.S. Radium site, when combined with ALARA principles.

EPA's implementation of the remedy at the MWG sites has revealed some of the limitations of 40 CFR 192: a strict implementation of the regulation would not result in a cleanup that would satisfy the more protective requirements of CERCLA. Therefore, EPA has relied upon ALARA principles at the MWG sites during implementation of the response action. Applying ALARA principles means taking additional measures during remedial action, beyond those required to meet a specified cleanup goal, to assure protectiveness. In achieving the remedial action objectives for OU2, EPA will rely on the ALARA principles used at the MWG sites during implementation of the response action. Applying the 5 pCi/g standard with ALARA principles at the MWG sites has resulted in exposure levels that are lower than the levels that would result from using the 5 pCi/g standard alone. An ALARA approach is being used at the MWG sites because of the long-lived nature of radionuclides, the difficulty in eliminating routes of exposure, limitations of the analytical equipment to detect radionuclides, and site-specific factors which may make it necessary to remove material at levels below 5 pCi/g to achieve adequate public health protection.

Certain structures and above-ground debris at the affected properties are contaminated with radium. The selected remedy is expected to satisfy Nuclear Regulatory Commission guidelines for surface contamination or, as appropriate, the remedial action objectives employing ALARA principles to help ensure protectiveness.

EPA's experience at the MWG sites has shown that the remedial action objectives noted above can be achieved and, by incorporating ALARA principles, generally result in no elevated radon or gamma radiation levels at the surface. Therefore, by using similar remedial action objectives, the U.S. Radium site would pose no unacceptable risk for residential uses after cleanup, and would result in a cleanup that is protective under CERCLA.

Vanadium and cadmium at levels that exceed background for those metals were detected in some samples collected at the High and Alden Streets Properties study area; the levels pose some marginal risk in several future-use scenarios. Risk-based remediation goals of 517 milligrams per kilogram (mg/kg) for vanadium and 10 mg/kg for cadmium were derived in the RI report. The areas of radionuclide-soil contamination appear to be contiguous with the areas of vanadium/cadmium contamination. The remedial alternatives considered below take into account the

metals contamination, in that the limited options available for mitigating the radium-contaminated soil would also adequately address the metals contamination at the levels detected.

#### **DESCRIPTION OF REMEDIAL ALTERNATIVES**

CERCLA requires that each selected site remedy be protective of human health and the environment, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility or volume of the hazardous substances.

Only a limited number of options are available for the remediation of radioactively contaminated sites. No treatment technologies are known that will eliminate radioactivity. (The total amount of radioactivity cannot be altered or destroyed, as is often possible with chemical contaminants.) Thus, the remedial alternatives described below focus on methods of satisfying the remedial action objectives by limiting contact with radium-contaminated material.

The FS evaluated in detail four alternatives for addressing the contamination associated with the U.S. Radium Corporation site. The estimated capital cost, operation and maintenance (O&M) costs, and net present worth cost of each alternative discussed below are provided for comparison. The time to implement a remedial alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate with the responsible parties, procure contracts for design and construction, or conduct O&M at the site. A brief description of each alternative follows.

#### **Alternative 1: No Action**

Estimated Capital Cost:	\$ 0
Estimated Annual O&M Costs:	\$ 0
Estimated Present Worth:	\$ 0
Estimated Implementation Timeframe:	none

A No Action alternative is evaluated for every Superfund site to establish a baseline for comparison with remedial alternatives. Under this alternative, no further action would be taken to reduce exposure to radioactive materials at these properties. The temporary radon mitigation system already installed at one OU2 property during the 1991 removal action would remain in place, but there would be no provision for operation and maintenance. No additional measures would be taken to reduce exposures at properties that are not presently being addressed. Even with a long projected life for the radon mitigation system, it is assumed that it would eventually fail and that indoor

concentrations of radon and radon decay products would return to the pre-mitigation conditions.

Because hazardous substances would remain at the OU2 properties above acceptable levels, five-year reviews would be required.

#### **Alternative 2: Engineering and Institutional Controls**

Estimated Capital Cost:	\$12,716,000
Estimated Annual O&M Costs:	\$ 107,000
Estimated Present Worth:	\$13,740,000
Estimated Implementation Timeframe:	3 years

This alternative involves the implementation of one or more of the following engineering controls, as determined to be necessary, in areas where contamination has been identified and measures have yet to be taken:

- Installation of systems to reduce indoor concentrations of radon and radon decay products;
- Installation of indoor gamma radiation shielding;
- Installation of outdoor gamma radiation shielding where necessary; and
- In some cases, installation of fencing to restrict property access.

During implementation of this action, temporary relocation of some businesses may be required. Institutional controls (e.g., municipal or health ordinances, land-use restrictions) would also be necessary to ensure the effectiveness of the engineering controls.

O&M would also be necessary to assure the continued protectiveness of the engineering controls. Because radium, which persists for thousands of years, would not be removed from the properties, the need for O&M would continue for many years; however, for cost-estimating purposes, O&M costs for maintaining the radon mitigation systems and gamma radiation shielding have been assumed for a period of 30 years. Because hazardous substances would remain at the OU2 properties above acceptable levels, five-year reviews of the remedy would be required. This alternative would take approximately three years to implement.

### **Alternative 3: On-site Containment**

Estimated Capital Cost:	\$ 10,771,000
Estimated Annual O&M Costs:	\$ 128,000
Estimated Present Worth:	\$ 11,990,000
Estimated Implementation Timeframe:	2 years

Under this alternative, radium-contaminated buildings at the High and Alden Streets Properties and one nonadjacent OU2 property would be dismantled. The dismantled building debris would be sent to an appropriate off-site disposal facility. Soil from the four nonadjacent OU2 properties would be excavated and replaced with clean fill. The excavated material from these four properties would be brought to the High and Alden Streets Properties study area for long-term containment. A containment facility would be constructed by installing a cap and slurry wall around the radium-contaminated soil at the High and Alden Streets Properties study area.

During implementation of this action, temporary or permanent relocation of businesses would be required at some properties. Chemical (nonradiological) soil contamination found at the High and Alden Streets Properties would also be contained under the cap. Engineering and institutional controls similar to those described under Alternative 2 would be required for the High and Alden Streets Properties; however, the four nonadjacent OU2 properties would be available for unrestricted use. Because hazardous substances would remain at the High and Alden Streets Properties study area, five-year reviews of the remedy would be required to assure the continued effectiveness of the remedy. This alternative would take approximately two years to implement.

### **Alternative 4: Excavation and Off-site Disposal**

Estimated Capital Cost:	\$ 22,030,000
Estimated Annual O&M Costs:	\$ 0
Estimated Present Worth:	\$ 22,030,000
Estimated Implementation Timeframe:	2 years

Under this alternative, radium-contaminated material would be excavated or otherwise removed from contaminated properties, and replaced with clean fill or otherwise restored. It is estimated that approximately 18,400 cubic yards of soil and 150 cubic yards of construction material are contaminated with radionuclides. Contaminated material would be transported for final disposal at an appropriate, off-site facility.

Based on experience at this site and the MWG sites, material contaminated above background levels would not remain within the first two feet of a remediated property. In addition, based on data available for the site and EPA's experience, residually

contaminated material remaining on remediated properties would not be greater than two feet in thickness.

During implementation of this action, relocation of businesses would be required at some properties. In addition, demolition of certain OU2 property buildings may be required because of the unique contaminant distributions at those properties. Excavation and off-site disposal of radium-contaminated soil from the High and Alden Streets Properties would also remove nonradiological, chemical contamination found in the soil. Because this alternative would not result in elevated levels of radionuclides remaining on any property, a five-year review of the effectiveness of the remedy would not be required. This alternative would take approximately two years to implement.

#### **SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES**

In accordance with the NCP, a detailed analysis of each remedial alternative was performed with respect to each of the nine evaluation criteria. This section discusses and compares the performance of the remedial alternatives under consideration against these criteria. These criteria were developed to address the requirements of Section 121 of CERCLA to ensure that all important considerations are factored into remedy selection decisions. All selected remedies must at least satisfy the Threshold Criteria. The selected remedy should provide the best trade-offs among the Primary Balancing Criteria. The Modifying Criteria are evaluated following the public comment period.

##### **Threshold Criteria**

1. Overall protection of human health and the environment considers whether or not a remedial alternative provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
2. Compliance with ARARs addresses whether or not a remedial alternative meets all of the applicable or relevant and appropriate requirements (ARARs) of federal and state environmental statutes and requirements, or provides grounds for invoking a waiver.

##### **Primary Balancing Criteria**

3. Long-term effectiveness and permanence refers to the ability of a remedial alternative to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage

the risk posed by treatment residuals and/or untreated wastes.

4. Reduction of toxicity, mobility, or volume through treatment addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of hazardous substances as a principal element.
5. Short-term effectiveness considers the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.
6. Implementability refers to the technical and administrative feasibility of a remedial alternative, including the availability of materials and services needed to implement the alternative.
7. Cost includes the estimated capital and O&M costs, and the present-worth costs.

#### **Modifying Criteria**

8. State acceptance indicates whether, based on its review of the RI/FS and the Proposed Plan, the State supports, opposes, and/or has identified any reservations with the preferred alternative.
9. Community acceptance refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS report. Responses to public comments are addressed in the Responsiveness Summary section of this Record of Decision.

#### **Comparisons**

A comparative analysis of the remedial alternatives based upon the evaluation criteria noted above follows.

#### **Protection of Human Health and the Environment**

Alternative 1 (No Action) is not protective of human health and the environment because the risks associated with contaminated OU2 properties would persist for the foreseeable future. Under Alternative 1, radon and radon decay product levels would be reduced in only the one building which currently has a mitigation system. However, as the temporary mitigation system fails, indoor concentrations of radon and radon decay products would return to pre-mitigation conditions. Under Alternative 1, the security fence currently in place around the abandoned portion of



the former plant site would not be maintained. There would be no reduction in gamma radiation exposure indoors or outdoors, and no reduction in the threat of direct contact with radium-contaminated material.

Alternatives 2 (Engineering and Institutional Controls) and 3 (On-site Containment) reduce the possibility of exposure to contaminated material and, therefore, reduce human health risks associated with the site. However, with either alternative, the radium-contaminated material would remain on certain properties.

Alternative 4 (Excavation and Off-site Disposal) is fully protective of human health and the environment because it removes the contamination from the site. As a result, Alternative 4 allows unrestricted future use of contaminated properties.

#### Compliance with Applicable or Relevant and Appropriate Requirements

No requirements have been determined to be applicable to the remediation of the OU2 properties. However, as discussed earlier, portions of the federal regulations governing the cleanup of uranium mill tailings from inactive uranium processing sites, 40 CFR 192, have been determined to be relevant and appropriate.

Health- or risk-based standards include an annual average exposure guideline of no more than 4 pCi/l of air for radon, which corresponds to an approximate annual average exposure of 0.02 WL for radon decay products. Additionally, the standards for the cleanup of radium-contaminated material require that the concentration of radium-226, averaged over an area of 100 square meters (120 square yards) of surface soil, be no greater than 5 pCi/g. For this site, the 5 pCi/g cleanup standard also applies to subsurface soils.

Alternative 1 does not satisfy any of the human health standards. Alternatives 2 and 3 satisfy human health standards by reducing exposures to radiation in excess of natural background levels; however, continued O&M is required to assure continued attainment of these standards. Alternative 4 satisfies human health standards by removing the source of exposures to radiation in excess of natural background levels. Alternatives 2, 3 and 4 would satisfy the threshold requirements of overall protection of human health and the environment with regard to chemical (nonradiological) contaminants.

Because Alternative 1, No Action, does not meet the threshold requirements of overall protection of human health and the environment or compliance with ARARs, it will not be considered further in the evaluation of alternatives.

### Long-Term Effectiveness and Permanence

Alternative 2 provides little long-term effectiveness or permanence, since it relies on the use of engineering and institutional controls at radium-contaminated properties. Alternative 3 provides a slightly more effective long-term solution; however, it would be difficult to maintain a facility containing radioactive wastes with long half-lives (about 1,622 years for Radium-226) in a densely populated area. Alternative 3 would allow for unrestricted future use of the four nonadjacent OU2 properties, but not the High and Alden Streets Properties. Alternative 4 is fully effective in the community for the long term, would allow for unrestricted use of all the OU2 properties, and is considered a final remedial solution.

### Reduction of Toxicity, Mobility, or Volume through Treatment

As radioactivity is an intrinsic property of the nuclides in the contaminated material, its toxicity cannot be altered by treatment. Mobility and/or volume may be addressed by treatment, but as toxicity is not altered, such treatment does not provide a sufficient reduction in health risk or environmental threat. No treatment technology is currently available that can effectively reduce the toxicity, mobility or volume of the radioactive contamination to the site-specific cleanup criteria specified given the soil matrix found at the OU2 properties. Therefore, none of the remedial alternatives that were considered satisfy this evaluation factor. Although none of the alternatives considered use treatment as a principal element, Alternatives 3 and 4 provide some reduction in the mobility of radiologically contaminated material, through placement in a secure containment facility.

### Short-Term Effectiveness

Alternatives 2, 3 and 4 provide effective short-term protection, and become effective as they are implemented at individual properties. Any adverse short-term impacts during implementation (such as the creation of dust) can be controlled through the use of measures such as dust suppression techniques.

Alternative 2 involves less intrusive activities and poses less of a threat to workers and the surrounding community during implementation than Alternatives 3 or 4. Alternatives 3 and 4 require a comparable period of time to implement, two years. However, Alternatives 2, 3 and 4 involve intrusive activities, including, in some cases, temporary or permanent relocation of businesses. Alternatives 3 and 4 have a greater potential adverse impact in the short term because of the removal of radium-contaminated material, including the excavation of soil. Engineering controls would be required to minimize the impacts of these alternatives.

### Implementability

The indoor remedial activities associated with Alternative 2 are generally straightforward to implement and have been successfully implemented at other sites. Extensive outdoor gamma radiation shielding techniques have not been attempted or fully demonstrated and, therefore, may create some difficulties. Property owners along with state, county and municipal authorities would need to be involved in the process of implementing the necessary institutional controls for Alternatives 2 and 3.

Alternatives 3 and 4 involve the use of standard construction practices. Implementation would be expected to be straightforward and, in the case of Alternative 4, has been successfully performed at the Montclair/West Orange and Glen Ridge Radium sites.

The continued availability of an off-site disposal facility is required for implementation of Alternative 4.

### Cost

Alternative 2 includes construction costs of \$12.7 million to implement remedial measures at OU2 properties, and an annual O&M cost of \$107,000 for all properties for an assumed period of 30 years. This results in an estimated present worth cost of \$13.7 million for the alternative. Alternative 3 has an estimated present worth cost of \$12 million, with \$128,000 in annual O&M costs assumed for a period of 30 years. Alternative 4 involves construction costs of \$22 million, but no O&M costs.

### State Acceptance

The State of New Jersey concurs with the remedial actions called for by the selected remedy.

### Community Acceptance

The community response to EPA's Proposed Plan was supportive. There is a consensus of support for the proposal in that it calls for full remediation of the properties where radium-contaminated material is discovered.

Alternative 4 has received consistent community support, as it is a final remedy which complies with ARARs. Even though short-term disruption to the community during implementation of Alternative 4 would be the highest of the active remedial alternatives, the public fully supports this alternative.

Alternatives 1, 2 and 3 have received little or no community support.

## SELECTED REMEDY

The following describes the remedial action plan which EPA is selecting to implement at the OU2 properties. EPA selects Alternative 4, as presented in the Proposed Plan.

The selected remedial action will achieve the remedial action objectives at affected OU2 properties, (i.e., reduce exposure to gamma radiation resulting from material with radium concentrations in excess of 5 pCi/g, reduce exposure to radon decay products in excess of 0.02 WL, and prevent ingestion of and general contact with material with radium concentrations in excess of 5 pCi/g). Radium-contaminated soil found on affected properties in excess of 5 pCi/g will be excavated consistent with 40 CFR 192, Subpart B. The remedy will attain a risk level similar to risk levels associated with exposure to natural background radiation. Based on sampling efforts to date, EPA estimates that approximately 18,400 cubic yards of contaminated soil will be excavated from these properties. Other nonsoil contamination, estimated to total approximately 150 cubic yards, will also be removed. All of the radium-contaminated material will be disposed of at a licensed, off-site facility. Areas that have been excavated will be restored with clean fill.

Concentrations of vanadium and cadmium are present at this site in excess of the risk-based remediation goals for those metals (517 mg/kg for vanadium, 10 mg/kg for cadmium). However, the areas where nonradiological contaminants have been found generally coincide with areas of radionuclide contamination. Therefore, the selected remedy will provide for excavation and disposal of these contaminants as well.

During implementation of this action, some businesses may need to relocate.

Though it is unlikely, should circumstances arise which prevent the continuation of off-site disposal (e.g., loss of the disposal facility), excavation activities will cease. At that point, the OU2 properties will receive appropriate engineering controls designed to protect human health and the environment to the maximum extent practicable.

The selected remedy will be a final remedy for the OU2 properties addressed in the second operable unit. As stated earlier, because elevated levels of radon decay products could be present after completion of the remedy as a result of naturally occurring sources, it may be necessary for some property owners to maintain radon mitigation systems after implementation of the action.

A Stage 2 Cultural Resources Survey is currently being performed as part of the second operable unit studies. It has been determined that mitigation actions under the National Historic

Preservation Act (NHPA) may be necessary as a result of the remedial action selected here. The nature and extent of those mitigation activities will be assessed as part of the Cultural Resources Survey. The selected remedy will be performed in compliance with the requirements of the NHPA.

#### **STATUTORY DETERMINATIONS**

Superfund remedy selection is based on CERCLA and the regulations contained in the NCP. Under its legal authorities, EPA's primary responsibility in selecting remedies at Superfund sites is to undertake actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under federal and state environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of the hazardous wastes, as their principal element. The following sections discuss how the selected remedy meets these statutory requirements for the second operable unit of the U.S. Radium Corporation site.

#### **Protection of Human Health and the Environment**

For the OU2 properties, this remedy fully protects human health and the environment. It is estimated that no radium-contaminated soil above the cleanup standards will remain on the affected properties. In addition, based on experience at this site and the Montclair/West Orange and Glen Ridge Radium sites, material contaminated above background levels would not remain within the first two feet of a remediated property. In addition, based on data available for the site and EPA's experience, residually contaminated material remaining on remediated properties would not be greater than two feet in thickness. The remedy will attain a risk level similar to risk levels associated with exposure to natural background radiation. Implementation of this remedy will eliminate additional risks attributable to exposures to indoor or outdoor gamma radiation, indoor radon gas or radon decay products, inhalation and/or ingestion of contaminated soil, and ingestion of contaminated vegetables grown in contaminated soil.

This remedy will comply with the ARARs for exposure to indoor gamma radiation and the inhalation of radon gas or radon decay products, and attainment of soil cleanup standards.

There are few short-term risks associated with the implementation of this remedy. Where excavation occurs, dust suppression measures can reduce the risk of inhalation of radium-contaminated dust. In addition, no adverse cross-media impacts are expected from the remedy.

#### **Attainment of ARARs**

As presented earlier, the primary ARARs for this site are contained in 40 CFR 192, Subpart B. This regulation deals with the cleanup of inactive uranium processing facilities. EPA has determined that while these standards are not legally applicable, they are relevant and appropriate to the situation at the U.S. Radium Corporation site.

When implemented, the cleanup of the affected properties within the study areas will comply with all public health and soil cleanup ARARs.

#### **Cost Effectiveness**

The selected remedy is cost-effective because it provides the highest degree of overall effectiveness relative to its cost. The remedy provides for complete protection of public health and the environment at the affected properties. It has been examined closely to ensure that it is the least costly means of achieving the required level of protection.

#### **Utilization of Permanent Solutions and Alternate Treatment or Resource Recovery Technologies to the Maximum Extent Practicable**

EPA and the State of New Jersey have determined that the selected remedy represents the maximum extent to which permanent solutions and currently available treatment technologies can be utilized in a cost-effective manner for this phase of the remedial action at the U.S. Radium Corporation site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA and the State of New Jersey have determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence, short-term effectiveness, implementability, and cost, and considering the statutory preference for treatment as a principal element and State and community acceptance.

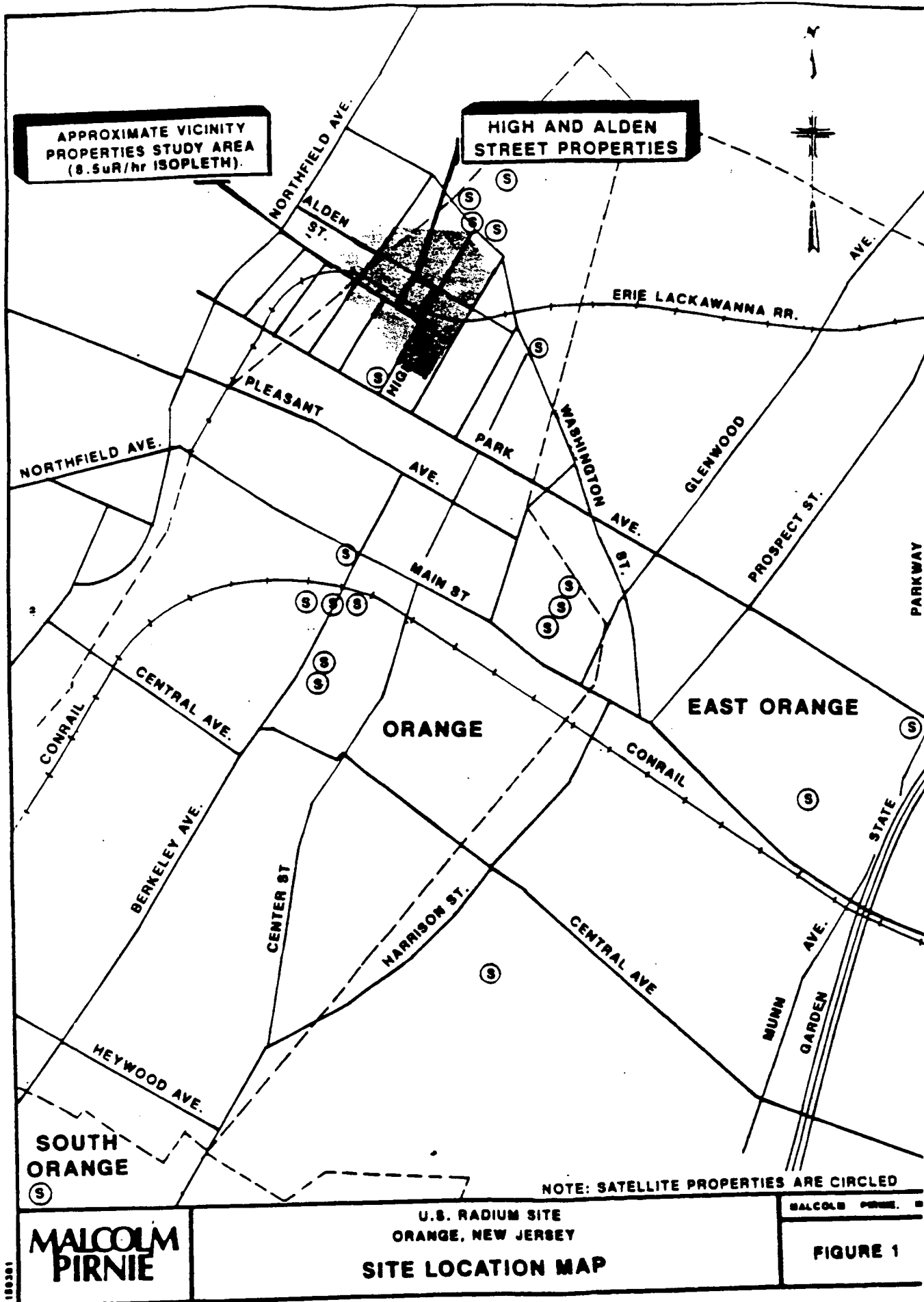
#### **Preference for Treatment as a Principal Element**

The principal threat at the site is the generation of excess concentrations of radon gas and radon decay products indoors, which are subsequently inhaled by the occupants of structures on OU2 properties. In addition, there are threats from exposure to excess levels of indoor and/or outdoor gamma radiation, ingestion and/or inhalation of radium-contaminated soil, and ingestion of

vegetables grown in contaminated soil. Because there is no treatment available that destroys the radioactive source of these threats, the selected remedy does not satisfy the statutory preference for treatment as the principal element. The remedy does reduce the exposure to all excess indoor concentrations of radon and radon decay products. It also provides for complete remediation at the affected properties, thereby reducing the exposure risk from all pathways.

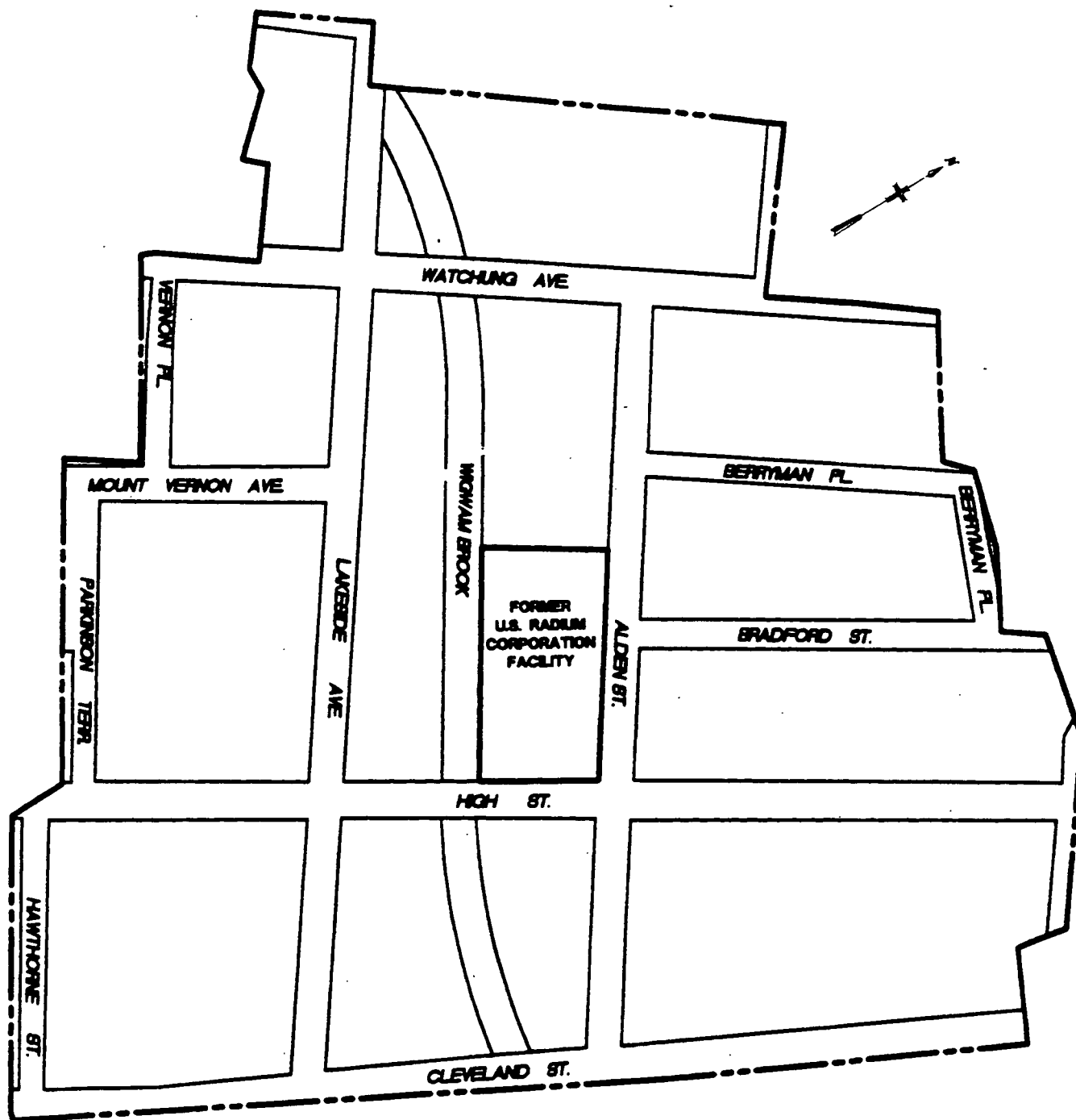
#### **DOCUMENTATION OF SIGNIFICANT CHANGES**

There are no significant changes from the preferred alternative presented in the Proposed Plan.



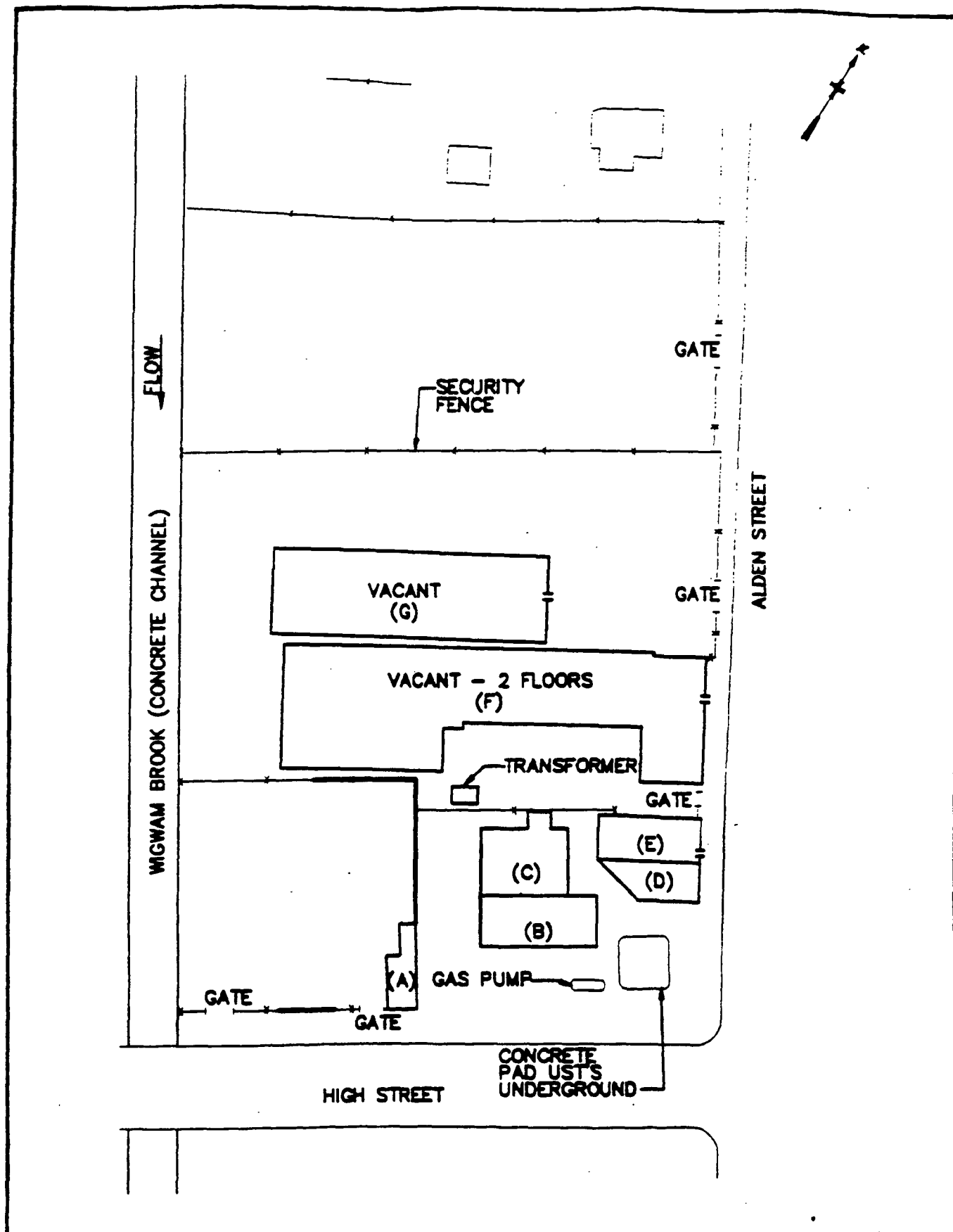


**U.S. RADIUM CORPORATION SITE  
Vicinity Properties Study Area**



Note: The Satellite Properties study area includes discrete properties located in several communities, and cannot be similarly represented.

FIGURE 2



07/30/97

**MALCOLM  
PIRNIE**

EPA US RADIUM SITE  
FIELD INVESTIGATIONS

**SITE PLAN SHOWING EXISTING BUILDINGS**

MALCOLM PIRNIE, INC.

**FIGURE 3**

TABLE 1  
RADIATION UNITS  
US RADIUM SITE

Parameter	Historical		International	
	Unit	Abbrev.	Unit	Abbrev.
Quantity	Curie	Ci	Becquerel	Bq
Radionuclide Concentration in Soil or other Solid Material	picoCurie per gram of Solid	pCi/g	Becquerel per kilogram	Bq/kg
Radionuclide Concentration in Water	picoCurie per liter of Water	pCi/L	---	---
Radon gas conc.	picoCurie per liter of Air	pCi/L	Becquerel per cu. meter	Bq/m <sup>3</sup>
Radon progeny conc.	Working Level	WL	---	---
Exposure rate	micro-Roentgen per hour	uR/h	---	---
Dose	Radiation Absorbed Dose	rad	Gray	Gy
Dose equivalent	Radiation Equivalent Man	rem	Sievert	Sv

TABLE 2  
HAZARD ASSESSMENT  
U.S. RADIUM SITE

RADIONUCLIDE	MEDIUM	RANGE OF DETECTED CONCENTRATION (pCi/g)	USEPA CORRECTIVE ACTION LEVEL (pCi/g)	USEPA WEIGHT OF EVIDENCE CLASSIFICATION FOR CARCINOGENICITY
Radium-226	Soil; Structural Materials	<1 - 3300	5 <sup>a</sup>	A
Uranium-238	Soil	<1 - 220	5 <sup>a</sup>	A
Thorium-230	Soil	<1 - 2300	5 <sup>a</sup>	A
Lead-210	Soil	Not Measured	NA	A
Thorium-232	Soil	<1 - 159	5 <sup>a</sup>	A
Radon-222	Air	<1 - 110 <sup>b</sup>	4 <sup>c</sup>	A

<sup>a</sup> 40 CFR Part 192

<sup>b</sup> Radon-222 measured in pCi/L

<sup>c</sup> EPA 1992a

TABLE 3

## SUMMARY OF COMPLETE EXPOSURE PATHWAYS

## U.S. RADIUM SITE

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
Residents; Occupants <sup>1,2</sup>	External gamma radiation emanating from soil and/or structural materials.	Yes	Contamination is in occupied and potentially occupied areas.
Residents; Occupants <sup>1</sup>	Inhalation of radon decay products.	Yes	Major contributor to radiation dose at some occupied and potentially occupied properties.
Residents	Inhalation of radioactive particulates.	Yes	Contamination is in potentially occupied areas.
Occupants <sup>1</sup>	Inhalation of radioactive particulates.	No	Contamination is in inaccessible areas.
Residents	Ingestion of radionuclides in soil.	Yes	Contamination is in potentially occupied areas.
Occupants <sup>1</sup>	Ingestion of radionuclides in soil.	No	Contamination is in inaccessible areas.
Residents	Ingestion of radionuclides in locally grown produce.	Yes	Produce is grown at several Vicinity Properties and may be grown in potentially occupied areas.

<sup>1</sup>Commercial properties<sup>2</sup>Trespasser is also considered an occupant

TABLE 4

**EXPOSURE CONDITIONS - COMMERCIAL AND TRESPASSER SCENARIOS  
US RADIUM SITE**

PROPERTY	SCENARIO	Exposure Point Gamma Radiation Exposure Rate ( $\mu$ R/h)	Exposure Point Indoor Radon Concentration (pCi/L)
SATELLITE 1	Commercial	8	<1.7
SATELLITE 2	Commercial	12	<1.7
SATELLITE 3	Commercial	80	4.3
VICINITY 1	Commercial	10	<1.7
High and Alden Streets	Current commercial	22	11.0
	Redeveloped commercial	44	24.4
	Trespasser	89	18.6
Background	--	8	1.7

TABLE 5

**EXPOSURE CONDITIONS:  
HIGH AND ALDEN STREETS PROPERTIES - FUTURE RESIDENTIAL SCENARIO  
US RADIUM SITE**

EXPOSURE POINT VALUES	BACKGROUND	HIGH AND ALDEN STREETS PROPERTIES
SOIL (pCi/g): Ra-226 Pb-210 U-234, 238 Th-230	1 1 1.8 1	456 456 10 182
PRODUCE (pCi/g): Ra-226 Pb-210 U-234, 238 Th-230	0.02 0.01 0.0036 0.0005	9.1 4.6 0.02 0.09
INHALATION:  Gaseous (pCi/L): Rn-222  Particulate (pCi/cu.m): Ra-226 Pb-210 U-234, 238 Th-230	1.7   1E-04 1E-04 1.8E-04 1E-04	25.3   4.6E-02 4.6E-02 1.0E-03 1.8E-02

TABLE 6  
SUMMARY OF LIFETIME GAMMA RADIATION DOSE AND RADON INTAKE  
FOR COMMERCIAL AND TRESPASSER SCENARIOS  
US RADIUM SITE

PATHWAY	Background	PROPERTY						
		SATELLITE 1	SATELLITE 2	SATELLITE 3	VICINITY 1	High and Alden Streets		
						Current Commercial	Redeveloped Commercial	Trespasser*
EXTERNAL GAMMA RADIATION DOSE (rad)	0.35	0.35	0.52	3.5	0.44	1.0	1.9	0.023
RADON-222 INHALATION (pCi)	2.1E+08	<2.1E+08	<2.1E+08	5.4E+08	<2.1E+08	1.4E+09	3.1E+09	4.6E+06

\* Trespasser intake is based on a one year exposure period and may be compared to background values of 2.1E-03 rad external gamma dose and 4.3E+05 pCi Rn-222 intake via inhalation.



**TABLE 7**

**LIFETIME RADIONUCLIDE INTAKE FOR HIGH AND ALDEN STREETS  
PROPERTIES - FUTURE RESIDENTIAL SCENARIO  
US RADIUM SITE**

<b>Exposure Pathway</b>	<b>Background</b>	<b>High and Alden Streets Properties</b>
<b>INGESTION (pCi)</b>		
Ra-226		
Soil	1.3E+03	5.7E+05
Produce	2.6E+04	1.2E+07
Pb-210		
Soil	1.3E+03	5.7E+05
Produce	1.3E+04	5.8E+06
U-234, 238		
Soil	2.3E+03	1.3E+04
Produce	4.6E+03	2.6E+04
Th-230		
Soil	1.3E+03	2.3E+05
Produce	6.4E+02	1.2E+05
<b>INHALATION (pCi)</b>		
Rn-222	2.7E+08	4.0E+09
Ra-226	5.3	2.4E+03
Pb-210	5.3	2.4E+03
U-234, 238	9.5	5.3E+01
Th-230	5.3	9.6E+02

TABLE 8

**SUMMARY OF EXCESS LIFETIME CANCER RISK ESTIMATE - COMMERCIAL SCENARIOS  
US RADIUM SITE**

PATHWAY	Background	PROPERTY					
		SATELLITE 1	SATELLITE 2	SATELLITE 3	VICINITY 1	High and Alden Streets Current Commercial	Redeveloped Commercial
EXTERNAL GAMMA RADIATION	2.2E-04	2.2E-04	3.2E-04	2.2E-03	2.7E-04	5.9E-04	1.2E-03
INHALATION	1.6E-03	1.6E-03	1.6E-03	4.2E-03	1.6E-03	1.1E-02	2.4E-02
TOTAL RISK	1.9E-03	1.9E-03	2.0E-03	6.4E-03	1.9E-03	1.1E-02	2.5E-02
TOTAL EXCESS LIFETIME RISK *	--	0E+00	1.1E-04	4.5E-03	5.4E-05	9.3E-03	2.3E-02

\* Total excess lifetime risk = Total Risk - Risk from unavoidable natural background radiation.

TABLE 9		
SUMMARY OF EXCESS ANNUAL RISK ESTIMATES - TRESPASSER SCENARIO US RADIUM SITE		
PATHWAY	Background	Trespasser
EXTERNAL GAMMA RADIATION	1.3E-06	1.4E-05
INHALATION	3.3E-06	3.6E-05
ANNUAL RISK	4.6E-06	5.0E-05
TOTAL EXCESS ANNUAL RISK *	--	4.6E-05

\* Total excess annual risk = Annual Risk - Risk from unavoidable natural background radiation.

TABLE 10 SUMMARY OF EXCESS LIFETIME CANCER RISK ESTIMATES FOR HIGH AND ALDEN STREETS PROPERTIES - FUTURE RESIDENTIAL SCENARIO US RADIUM SITE		
PATHWAY	Background	Resident
EXTERNAL GAMMA RADIATION	1.4E-04	6.3E-02
INGESTION Soil Produce	1.1E-06 1.2E-05	4.5E-04 5.3E-03
INHALATION Radon Particulate	2.1E-03 9.3E-07	3.1E-02 4.9E-05
TOTAL RISK	2.2E-03	1.0E-01
TOTAL EXCESS LIFETIME RISK *	--	9.8E-02

\* Total excess lifetime risk = Total Risk - Risk from unavoidable natural background radiation.

TABLE 11

**SUMMARY OF HAZARD INDICES AND CANCER RISKS  
U.S. RADIUM SITE**

<b>EXPOSURE POPULATION AND PATHWAY</b>	<b>HAZARD INDEX</b>	<b>CANCER RISK</b>
<b>CURRENT SCENARIO</b>		
<b>COMMERCIAL WORKER</b>		
Inadvertent ingestion of surface soils	5E-01	4E-05
Dermal contact with surface soils	3E-01	N/A
Inhalation of volatilized chemicals from surface soils	N/A	4E-10
Inhalation of particulate matter	1E-04	8E-09
<b>TOTAL PATHWAY HAZARD INDEX/CANCER RISK:</b>	<b>8E-01</b>	<b>4E-05</b>
<b>TRESPASSER</b>		
Inadvertent ingestion of surface soils	6E-02	2E-07
Dermal contact with surface soils	3E-02	N/A
Inhalation of volatilized chemicals from surface soils	N/A	2E-12
Inhalation of particulate matter	2E-05	5E-11
<b>TOTAL PATHWAY HAZARD INDEX/CANCER RISK:</b>	<b>1E-01</b>	<b>2E-07</b>
<b>FUTURE SCENARIO</b>		
<b>RESIDENT ADULT</b>		
Inadvertent ingestion of soils	6E-01	3E-05
Dermal contact with soils	3E-01	N/A
Inhalation of volatilized chemicals from soils	3E-04	5E-09
Inhalation of particulate matter	5E-04	4E-09
Ingestion of homegrown produce	9E-01	3E-04
<b>TOTAL PATHWAY HAZARD INDEX/CANCER RISK:</b>	<b>2E+00</b>	<b>3E-04</b>
<b>RESIDENT CHILD</b>		
Inadvertent ingestion of soils	5E+00	5E-05
Dermal contact with soils	6E-01	N/A
Inhalation of volatilized chemicals from soils	1E-03	5E-09
Inhalation of particulate matter	3E-03	4E-09
Ingestion of homegrown produce	2E+00	1E-04
<b>TOTAL PATHWAY HAZARD INDEX/CANCER RISK:</b>	<b>8E+00</b>	<b>2E-04</b>
<b>COMMERCIAL WORKER</b>		
Inadvertent ingestion of soils	4E-01	1E-05
Dermal contact with soils	2E-01	N/A
Inhalation of volatilized chemicals from soils	6E-05	9E-10
Inhalation of particulate matter	1E-04	7E-10
<b>TOTAL PATHWAY HAZARD INDEX/CANCER RISK:</b>	<b>6E-01</b>	<b>1E-05</b>

N/A - Not Applicable

**RESPONSIVENESS SUMMARY  
FOR THE  
U.S. RADIUM CORPORATION SITE  
ESSEX COUNTY, NEW JERSEY**

**SECOND OPERABLE UNIT**

**I. INTRODUCTION**

This Responsiveness Summary provides a summary of public comments and concerns regarding the remedial investigation and feasibility study (RI/FS) report and the Proposed Plan for the U.S. Radium Corporation Superfund site. It also provides the U.S. Environmental Protection Agency's (EPA's) responses to those comments. EPA has selected a remedy for the second operable unit (OU2) of the U.S. Radium Corporation site after reviewing and considering all public comments received during the public comment period. OU2 includes the High and Alden Streets Properties study areas and four other commercial properties.

A previous Record of Decision (ROD), signed September 21, 1993, selected a remedy for contaminated residential properties and the remaining commercial properties that comprise the U.S. Radium site. These properties are referred to as the first operable unit (OU1).

EPA held a public comment period from May 22, 1995 through June 21, 1995 to provide interested parties with the opportunity to comment on the OU2 RI/FS report and the Proposed Plan. In addition, EPA held a public information meeting to discuss the remedial alternatives described in the RI/FS report and to present EPA's preferred remedy for cleaning up the site. The meeting was held on June 1, 1995 at the Orange City Hall Council Chambers located at 29 North Day Street, Orange, New Jersey.

In general, the community responded positively to EPA's Proposed Plan. Residents recognized the importance of remediating the contamination at the U.S. Radium Corporation site.

The next section of this Responsiveness Summary provides a comprehensive summary of major questions, comments, concerns, and responses, by summarizing oral comments raised at the public meeting, written comments submitted during the public comment period, and EPA's responses.

The last section of this Responsiveness Summary includes appendices which document public participation in the remedy selection process for this site. There are four appendices attached to this Responsiveness Summary. They are as follows.

**Appendix A** contains the Proposed Plan that was distributed to the public for review and comment.

**Appendix B** contains public notices which appeared in The Orange Transcript and The Star-Ledger.

**Appendix C** contains the public meeting transcript.

**Appendix D** contains the index to the administrative record for the site.

## **II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS, AND RESPONSES**

### **ORAL COMMENTS RECEIVED DURING THE PUBLIC MEETING**

This section summarizes oral comments raised at the public meeting and EPA's responses. Most of the individuals at the public meeting were homeowners or residents of properties included in OU1; thus, it is not surprising that most of the comments were directed toward EPA's ongoing work to clean up affected OU1 properties. What follows is a brief discussion of the types of questions and concerns raised about OU1, followed by a response to the questions directed at EPA's OU2 Proposed Plan.

#### **First Operable Unit**

Because of the complexity of the U.S. Radium site, with its many affected properties located in several municipalities, a number of questions were directed at trying to understand which properties were included in OU1 and which in OU2. All the residential properties have been included in OU1, along with most of the commercial properties. OU2 contains only commercial properties. The OU2 properties also have in common the fact that the U.S. Radium Corporation appears to have directly operated facilities on each, whereas none of the OU1 properties appear to have been used directly by the company.

Other questions were directed at real estate issues, EPA's cleanup schedule and general health concerns. Written responses to these types of questions appear in the Responsiveness Summary for the OU1 ROD, which is available at the Orange and West Orange Public Libraries, or from EPA.

## **Second Operable Unit**

**Comment:** One interested citizen asked about the extent of EPA's community relations efforts since the start of EPA's RI/FS.

**Response:** Since the start of the RI/FS in 1990, EPA has tried to provide as much information as possible to the community, and to be responsive to community concerns about the site. Public meetings were held in January 1991, May 1993 and June 1995. Ten public availability sessions were also held, on various dates, where property owners were provided an opportunity to talk individually with EPA about their property or the project in general. In addition, Superfund Updates providing project status information were periodically distributed to hundreds of property owners, residents and interested parties in the study area. Most recently, the Proposed Plan and a Superfund Update were distributed to interested parties. Notices of the availability of these documents and of the public meeting were placed in The Orange Transcript and The Star-Ledger. Contact was also made with property owners during the property surveys. Over the past four years, EPA has contacted over 350 property owners individually to request access for property investigations. These community relations efforts will continue throughout the remedial design and remedial action.

**Comment:** One concerned citizen asked whether anyone could be held liable for future health problems resulting from exposure to site contaminants, and what those health problems might be.

**Response:** Several successor corporations to the U.S. Radium Corporation have been identified as potentially responsible parties for the site; however, determining whether any party could be held liable for future health problems is beyond the scope of EPA's authority.

Studies have shown that long-term exposure to even low levels of radiation increases the incidence of cancer in a population. However, it is important to recognize that risk estimates are statistical probabilities of the likelihood of a given event (e.g., an incidence of cancer resulting from exposure to site contaminants) taking place within a population in the future. The translation of these risk estimates to practical, real-world circumstances is difficult, and depends substantially on what individuals perceive as an acceptable risk for themselves and their families.

The primary health threat posed by radium-contaminated material from the U.S. Radium site is exposure to elevated levels of radon gas and radon decay products. The dominant health concern posed by the inhalation of radon decay products is an increased risk of getting lung cancer. Gamma radiation emitted by the radium-contaminated material is also a contributing factor.



**Comment:** One interested citizen asked why EPA hadn't identified the specific addresses for the four nonadjacent properties in its description of OU2.

**Response:** Information about the four properties is available in the administrative record for the site and, specifically, in the RI/FS report. To provide property owners with some degree of privacy, EPA tries to avoid publicly discussing specific property addresses when possible.

**WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD**

EPA received no written comments during the public comment period.

**U.S. Radium Corporation Site  
Responsiveness Summary  
Second Operable Unit**

**Appendix A:**      Proposed Plan dated May 22, 1995



## U.S. Radium Corporation Site

Second Operable Unit  
High And Alden Streets Properties  
And Related Properties

Essex County, New Jersey

EPA

Region 2

May 22, 1995

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### **PURPOSE OF PROPOSED PLAN**

This Proposed Plan describes the remedial alternatives considered for a discrete group of properties associated with the U.S. Radium Corporation Superfund site, and identifies the preferred remedial alternative with the rationale for this preference. The properties include (1) the former radium processing facility at the corner of High and Alden Streets and several adjacent properties, and (2) four nonadjacent, nonresidential properties. The U.S. Environmental Protection Agency (EPA) developed this Proposed Plan with support from the New Jersey Department of Environmental Protection (NJDEP). EPA is issuing the Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act (CERCLA), and Section 300.430(f) of the National Oil and Hazardous Substances Pollution Contingency Plan. EPA is simultaneously issuing a remedial investigation and feasibility study (RI/FS) report, which describes the nature and extent of contamination and the remedial alternatives summarized here. The RI/FS report should be consulted for a more detailed description of all the alternatives.

EPA has placed the RI/FS report at two information repositories: the Orange Public Library, located at 348 East Main Street in Orange, New Jersey; and the West Orange Public Library located at 46 Mount Pleasant Avenue in West Orange, New Jersey. Additional documentation regarding the proposed remedy is available in the administrative record for the site. Copies of the administrative record, as assembled to date, are located at the Orange Public Library and at EPA's offices at 290 Broadway, New York, New York.

The remedy described in this Proposed Plan is the preferred remedy for the site. Changes to the preferred remedy, or a change from the preferred remedy to another remedy, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. Because EPA may select a remedy other than the preferred remedy, EPA is soliciting public comment on all of the alternatives considered in the detailed analysis of the RI/FS. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments.

### **COMMUNITY ROLE IN SELECTION PROCESS**

EPA and NJDEP rely on public input to ensure that the remedy selected for each Superfund site is fully understood by the public and that the agencies have considered the concerns of the local community, as well as to ensure that the selected remedy provides an effective solution.

This Proposed Plan and the RI/FS report are being made available to the public during the public comment period. Written comments on the Proposed Plan or the RI/FS report will be welcomed through June 21, 1995, and, if received by that date, will be considered in a Record of Decision (ROD) which will formally document the selected remedy. All written comments should be addressed to:

Mr. John Prince, Remedial Project Manager  
New Jersey Superfund Branch I  
U.S. Environmental Protection Agency - Region II  
290 Broadway  
New York, New York 10007-1866

The final remedy selected will be documented in a ROD only after consideration of all comments on

any of the remedial alternatives addressed in the Proposed Plan and RI/FS report. A public meeting has been scheduled for June 1, 1995, at 7:00 p.m. at the Orange City Hall Council Chambers, located at 29 North Day Street in Orange, to present both the findings of the RI/FS report and the Proposed Plan.

#### **MARK YOUR CALENDAR:**

**May 22, 1995 through June 21, 1995**

Public Comment Period - written and oral comments solicited on RI/FS report and this Proposed Plan

**June 1, 1995**

Public meeting at the Orange City Hall Council Chambers, 29 North Day Street, at 7:00 pm.

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Copies of the RI/FS report, Proposed Plan, and supporting documentation are available at the following locations:

Orange Public Library  
348 Main Street

West Orange Public Library  
46 Mount Pleasant Avenue

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#### **DESCRIPTION OF STUDY AREAS**

The U.S. Radium Corporation site comprises radium-contaminated properties within three study areas, located primarily in the City of Orange, Essex County, New Jersey. EPA refers to the three study areas as the "High and Alden Streets Properties", the "Vicinity Properties" and the "Satellite Properties". The three study areas are described below:

##### **High and Alden Streets Properties**

These properties are the location of the former U.S. Radium Corporation radium-processing facility, which operated from approximately 1915 to 1926, and several adjacent properties

contaminated as a result of activities at the processing facility. The study area occupies approximately two acres at the southwest corner of High and Alden Streets in Orange. Wigwam Brook runs in a concrete channel along the south side of the study area.

##### **Vicinity Properties**

These are properties in the vicinity of the High and Alden Streets Properties, some of which contain radium-contaminated material. This study area includes over 300 properties on about 25 acres in Orange and West Orange.

##### **Satellite Properties**

These properties include noncontiguous residential and commercial properties at which radium-containing materials may have been handled or disposed of, in addition to former residences of employees of the U.S. Radium Corporation. This group includes about 50 properties located mostly in Orange, with a few properties in the municipalities of East Orange and South Orange.

#### **DESCRIPTION OF OPERABLE UNITS**

As with many Superfund sites, the problems at the U.S. Radium Corporation site are complex. As a result, EPA has organized the site into separate phases or operable units. This Proposed Plan addresses the second operable unit (OU2) for this site.

The first operable unit (OU1) included all the residential properties in the Satellite and Vicinity Properties study areas where radium-contaminated material was detected. OU1 also included all but four of the nonresidential properties in the Vicinity and Satellite Properties study areas.

The second operable unit (OU2) includes the all of the High and Alden Streets study area, including the former processing plant and several adjacent properties. OU2 also includes the four non-residential, nonadjacent properties not addressed in OU1. Two of these four nonadjacent OU2 properties appear to have been dial painting facilities; a third was a U.S. Radium-operated laboratory. The fourth property appears to have been an experimental thorium handling operation.

## **SITE BACKGROUND**

The U.S. Radium Corporation, formerly known as the Radium Luminous Materials Corporation, operated a facility at High and Alden Streets in Orange from 1915 through 1926. Its primary activity at this location was the extraction and purification of radium from carnotite ore. Each ton of ore produced only 5 to 7 milligrams of radium; thus, large volumes of ore were required. Large quantities of process wastes, or "tailings", were generated, containing radioactive elements at elevated levels. The tailings were temporarily discarded on unused areas of the facility and ultimately disposed of off the site.

In addition to the production and sale of radium itself, the U.S. Radium Corporation also manufactured a radium-based luminous paint. At one time, the company employed over 100 workers to paint instruments and watch dials with this luminous paint. Reports indicate that dial painting took place at the High and Alden Streets Properties and at several Satellite Properties.

U.S. Radium Corporation discontinued radium processing operations in 1926, while continuing its dial painting business. U.S. Radium subsequently sold its properties at High and Alden Streets in the 1940s. No subsequent occupants of the properties are known to have processed or used radium.

EPA and NJDEP began investigating former radium processing facilities, including the High and Alden Streets facility, in the early 1980s. The investigations of U.S. Radium lead to the identification of several large areas in the nearby communities of Montclair, West Orange and Glen Ridge where radium-contaminated soil had been deposited; the affected properties in these areas comprise two other Superfund sites, the Montclair/West Orange Radium site and the Glen Ridge Radium site (MWG sites).

In 1982, the U.S. Radium site was proposed for inclusion on the National Priorities List (NPL) of Superfund sites. The site was placed on the NPL in September 1983.

In July 1983, EPA notified five companies and one individual that they had been identified as potentially responsible parties (PRPs) for the site. EPA requested a response outlining the activities that the PRPs would be willing to undertake. One PRP,

Safety Light Corporation, a corporate successor to U.S. Radium, responded that it was willing to perform response activities at the site.

In 1983, EPA and Safety Light Corporation commenced the first of several unsuccessful efforts to negotiate an agreement whereby Safety Light would undertake response activities at the site, under EPA supervision. The last of these efforts ended in December 1988 when Safety Light declined to perform any work, other than to replace the inadequate security fence around the High and Alden Streets Properties. Safety Light began the fence construction in 1989; however, EPA completed the work because of problems with health and safety procedures. The PRPs have not agreed to perform any additional work.

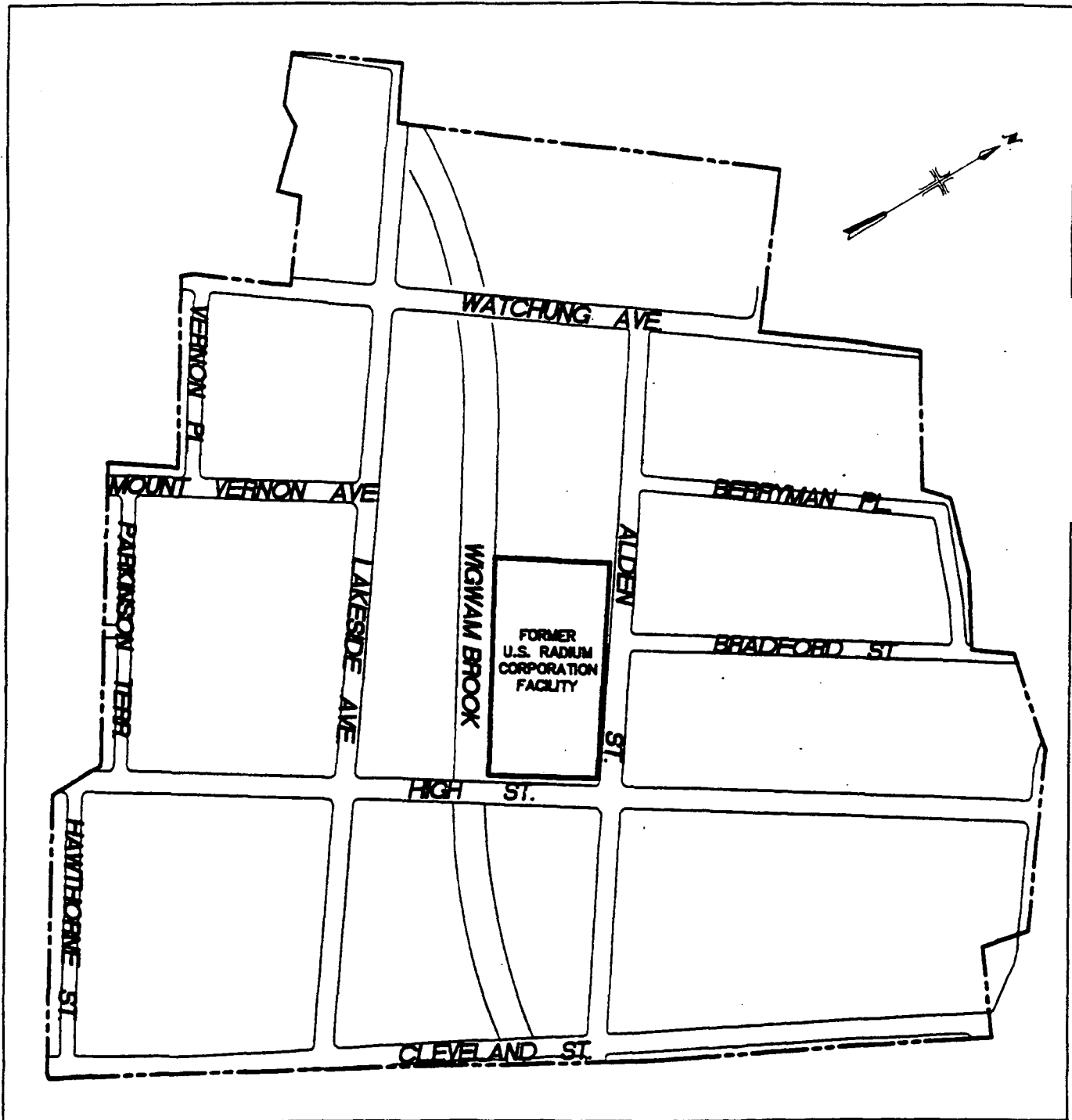
The chronology of EPA and NJDEP site investigations and activities have been described in two RI/FS reports, available at the information repositories identified on page 2 of this Proposed Plan, or from EPA. The information repositories also include reports describing two removal actions performed at site properties: the 1989 fence replacement described above; and in 1991, the installation of radon mitigation systems and gamma shielding at four OU1 properties and a radon mitigation system in one OU2 property.

For further information on the selected remedy for the OU1 properties, please refer to a first Record of Decision (ROD) for the site, signed on September 21, 1993, also available at the information repositories or from EPA. The selected remedy for the OU1 properties involves excavation and off-site disposal of the radium-contaminated material.

Regarding the OU1 selected remedy, the remedial design associated with the first group of OU1 properties is currently being prepared. It is anticipated that remedial construction activities at these properties will begin in 1995. Further information on the OU1 remedy is available from EPA.

For further background information about the site, please refer to the documents mentioned here and available at the information repositories.

**U.S. RADIUM CORPORATION SITE**  
***Vicinity Properties Study Area***



*Note: The Satellite Properties study area includes discrete properties located in several communities, and cannot be similarly represented.*

## **THE NATURE OF RADIONUCLIDES**

A radionuclide is an element that spontaneously changes, or "decays" into another element through natural processes. Radionuclides are present in trace amounts in all rocks and soils, and consist primarily of elements of the uranium-238 and thorium-232 decay series. When radionuclides decay, they emit energy in the form of radiation. The decaying radionuclide is often called the "parent", and the radionuclide that is produced is referred to as the "decay product". A quantity of radioactive material is measured by its rate of decay, expressed by the unit Curie (Ci), which is equal to  $2.22 \times 10^{12}$  (2.22 trillion) disintegrating atoms per minute. A more convenient unit for expressing environmental radioactivity is the picroCurie (pCi), which is equal to  $1 \times 10^{-12}$  (one trillionth) Ci.

Radium-226 is a naturally occurring, radioactive, metallic element formed from the decay of uranium. Radium, in turn, decays, with the formation of radon gas. Radon gas is colorless, odorless, radioactive and inert; therefore, it can move easily through soil to the ground surface or into houses. Within a matter of days, the radon gas itself decays into a series of radioactive decay products. While radon gas in the outdoor air dissipates quickly, inside a house, the concentration of radon decay products in the indoor air can build up over time. Adverse health affects have been shown to result from the exposure to the energy released by these various decays, referred to collectively as "ionizing radiation".

EPA has developed health guidelines for limiting exposure to ionizing radiation from radium and other sources. In order to further ensure protectiveness, those health guidelines can be supplemented by selecting response actions which reduce exposures resulting from ionizing radiation to levels that are As Low As Reasonably Achievable (ALARA) taking into consideration technical, economic and social factors.

EPA recommends that indoor radon concentrations should not exceed 4 picroCuries/liter of air (pCi/l). In 40 CFR 192, "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials From Inactive Uranium Processing Sites", EPA promulgated standards for limiting exposure to radon decay products, gamma radiation, and radium. While this regulation is not applicable to this site because it is not an inactive uranium processing site,

EPA promulgated standards for, parts of 40 CFR 192 are considered relevant and appropriate. The relevant portions include the limiting of exposure to: (1) radon decay products to levels less than 0.02 Working Levels (WL) (exposure to 4 pCi/l of air for radon corresponds to an approximate annual average exposure of 0.02 WL for radon decay products); (2) gamma radiation to 20 micro-Roentgens/hour ( $\mu\text{R/hr}$ ) above the background rate; and (3) radium concentration to 5 picroCuries/gram (pCi/g) above background averaged over 100 square meters (120 square yards) of surface soil. As noted in the initial ROD for the site, the 40 CFR 192 standard of 15 pCi/g in sub-surface soil (below 15 centimeters) is not considered relevant and appropriate for this site; the 5 pCi/g standard is considered relevant and appropriate for both surface and subsurface soil.

The U.S. Nuclear Regulatory Commission (NRC) has set guidelines for decontamination of building surfaces and equipment prior to their release for unrestricted use from facilities that process radioactive materials. The limits for radium contained within these guidelines are To-Be-Considered guidelines with regard to this site and, therefore, provide a set of criteria to determine which structures and above-ground debris pose an unacceptable risk of radiation exposure.

## **REMEDIAL INVESTIGATION SUMMARY**

In 1990, EPA initiated an RI to characterize the nature and extent of contamination at the High and Alden Streets, Vicinity and Satellite Properties study areas. Field studies for all study areas began in August 1991. In April 1993, EPA released the OU1 RI/FS report, presenting the results of field investigations conducted at Vicinity and Satellite Properties. The OU2 RI/FS report released concurrently with this Proposed Plan presents the results of field investigations conducted at the High and Alden Streets Properties study area and four non-residential, nonadjacent properties not included in OU1. The OU2 RI/FS report also discusses investigation of ground water to date; however, the results of EPA's ground water investigation are inconclusive, and further evaluation will be undertaken.

### **Soil and Construction Material Investigations**

Properties included in OU2 were surveyed for radioactive materials to define the limits of

contamination. Radiological investigations included the collection of radon gas samples from inside buildings, and interior/exterior surveying of each property to identify areas of elevated gamma radiation. Wherever elevated gamma radiation readings were detected, additional samples were collected to characterize the extent of contaminants present.

Because of the long and varied history of industrial use at the High and Alden Streets Properties study area, additional field investigations were performed to augment the studies described above. Surface and subsurface soil samples were collected and analyzed for selected radionuclides and nonradiological, chemical analyses for metals, volatile organic compounds (VOCs), semi-volatile organic compounds, pesticides and polychlorinated biphenyls (PCBs).

The following is a summary of the RI findings.

#### High and Alden Streets Properties

- Soil contaminated with radium and other radionuclides is found on a substantial portion of the High and Alden Streets Properties study area. Radiological contamination is present in some locations to a depth of 15 feet. An estimated 18,000 cubic yards of soil have elevated radium concentrations. In addition, approximately 110 cubic yards of structural material are similarly contaminated.
- Gamma radiation exposure rates associated with contaminated soils range from background (less than 10  $\mu\text{R/hr}$ ) to 700  $\mu\text{R/hr}$ . All buildings on the High and Alden Streets Properties contain elevated levels of radon gas, with levels ranging from 12.7 pCi/l to 110 pCi/l. Elevated concentrations of both fixed and removable building surface contamination are detected in some of the older on-site structures.
- Soil samples collected and analyzed for chemical (non-radiological) contaminants indicate the presence of low levels of some contaminants (metals and semi-volatiles) in soils at the High and Alden Streets

Properties. Chemical soil contamination is sporadic.

#### Four Nonadjacent OU2 Properties

- Studies of the four nonadjacent OU2 properties indicated the presence of elevated levels of radiological contamination. Three properties contain elevated levels of radium, found in both soil and structural materials, resulting in elevated gamma radiation levels. Elevated radon levels, along with elevated levels of both fixed and removable building surface contamination, were detected at one property. The fourth property is the only property investigated as part of the site contaminated with thorium-232 (Th-232). Approximately 400 cubic yards of contaminated soil and 40 cubic yards of contaminated structural material were found at these four properties.

#### Wigwam Brook and Ground Water Investigations

Surface water and stream sediments were collected from Wigwam Brook and analyzed for radiological and chemical contaminants. Four ground water monitoring wells were installed at the High and Alden Streets Properties study area. These four wells and four existing wells (one municipal supply well, one commercial production well and two private monitoring wells) were sampled and analyzed for radionuclides and chemical contaminants. The findings of the RI are summarized below.

- No elevated radiological contamination was found in surface water or sediment samples from Wigwam Brook.
- No chemical contamination attributable to the site was found in surface water or sediment samples from Wigwam Brook.
- Elevated uranium concentrations were detected in EPA's monitoring wells 1S and 3, and an elevated radium concentration was detected in EPA monitoring well 1S. No other ground water sampling locations had elevated levels of radionuclides.
- VOCs, including tetrachloroethylene (PCE), trichloro-ethylene (TCE) and 1,2-



dichloroethylene (1,2-DCE), were detected in EPA monitoring wells above federal or state Maximum Contaminant Levels (MCLs) for drinking water.

- VOCs were also detected in the municipal and non-potable, private wells sampled over an area covering about one square mile around the site. No definite pattern of VOC contamination was evident, nor could a defined plume of ground water contamination be identified. (Municipal drinking water supply wells in the area have treatment systems to remove VOCs; there are no known private drinking water wells located near the site.)

Because EPA monitoring wells are contaminated with site-related and potentially unrelated contaminants, and information is currently not available to determine the extent to which site-related contaminants may be migrating into the ground water, EPA will further investigate the nature and extent of ground water contamination. In summary, site activities do not appear to be adversely impacting Wigwam Brook. Local municipal water supply wells are not contaminated with radionuclides.

### **SUMMARY OF SITE RISKS**

During the OU2 RI/FS, EPA performed a baseline risk assessment of exposure to contaminants at the U.S. Radium Corporation site. This baseline risk assessment estimates the human health risk which could result from the contamination at the site if no remedial action were taken.

To evaluate human health risks, a four-step process was used for assessing site-related risks for a reasonable maximum exposure scenario. These steps are: Hazard Identification - identified the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration; Exposure Assessment - estimated the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated soil) by which humans are potentially exposed; Toxicity Assessment - determined the types of adverse health effects associated with exposures to site contaminants, and the relationship between magnitude of exposure (dose) and severity of adverse

effects (response); and Risk Characterization - summarized and combined outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk) assessment of site-related risks.

For risk assessment purposes, individual contaminants are typically separated into two categories of health hazard depending on whether they exhibit carcinogenic or noncarcinogenic effects. Radionuclides (e.g., radium, thorium, radon, radon decay products) are known carcinogens. Nonradiological, "chemical" contaminants (e.g., polycyclic aromatic hydrocarbons [PAHs], barium, vanadium, cadmium and lead) may exhibit both carcinogenic and noncarcinogenic health effects.

Current federal guidelines for acceptable exposures are an individual lifetime excess carcinogenic risk in the range of  $10^{-4}$  to  $10^{-6}$ , representing an increased probability of one in ten thousand to one in one million that an individual could develop cancer resulting from exposure to site-related contaminants, and a maximum health Hazard Index (which reflects noncarcinogenic effects for a human receptor) equal to 1.0. (A Hazard Index greater than 1.0 indicates a potential for noncarcinogenic health effects.) It must be noted, however, that the risk posed by naturally occurring background radiation appears high when compared to the potential risk posed by nonradiological carcinogens. During the RI, natural background radiation was measured and used to estimate the risk of cancer to the general public. The risk of cancer to the public was estimated to be  $2 \times 10^{-3}$ , representing a probability of two in one thousand that an individual could develop cancer resulting from exposure to natural background radiation. The excess risk to individuals at contaminated properties has been evaluated with respect to this background risk.

To evaluate human health risk, several exposure pathways were selected for detailed evaluation under current land-use conditions. In addition, potential future land-use conditions were considered for the High and Alden Streets Properties.

All of the current land-use conditions involved the potential exposure of workers or occupants of commercial properties, and trespassers on unused properties. Conversion from commercial to residential use was considered as a future scenario for the High and Alden Streets Properties, resulting

in potential exposures to residents. The exposure pathways were similar for current and future land-use situations: inhalation of radon decay products; exposure to external gamma radiation emanating from radium-contaminated material; ingestion of radionuclides in soil; and inhalation of radium-contaminated particulates. In addition, a future residential land-use condition resulted in several added exposure pathways for on-site residents: ingestion of radionuclides, cadmium and vanadium, either from inadvertent ingestion of soil or in locally grown produce.

In all current and future land-use situations, inhalation exposure to radon decay products is consistently the major contributor to the total cancer risk that may be incurred by individuals at contaminated properties. Exposure to gamma radiation also provides a significant component of the overall radiogenic cancer risk. Ingestion of radium, cadmium and vanadium is several orders of magnitude lower in risk than that of the other two pathways. Inhalation exposure to particulate radium is an insignificant contributor to the total risk.

For the four nonadjacent OU2 properties, the estimated excess lifetime cancer risk ranged up to  $5 \times 10^{-3}$  (five in one thousand). For the High and Alden Streets Properties, the estimated excess lifetime risks under current and future land-use conditions were  $1 \times 10^{-2}$  (one in one hundred) and  $2 \times 10^{-1}$  (two in ten), respectively.

Exposure to chemical (nonradiological) contaminants under future land-use conditions contributed a marginally elevated Hazard Index and cancer risk at the High and Alden Streets Properties study area; however, these risks are trivial relative to those resulting from radionuclide exposure.

Unusually high concentrations of naturally occurring radon have not been associated with the communities where OU2 properties are located. Exposure to elevated levels of gamma radiation, and the pathways for the inhalation and ingestion of radium, pose risks not typically encountered in areas of naturally occurring radon. The close proximity of the radium-contaminated soil to the ground surface or radiological contamination in building construction material at contaminated properties is the main reason for these additional risks.

An evaluation of ecological risk was not conducted as part of OU2. It was determined in OU1 that, because of the urban setting associated with the contaminated areas, the likelihood of contact of contaminants with ecological receptors was minimal. For example, Wigwam Brook serves primarily as a stormwater drainage culvert in this area. The one possible exception would be receptors down stream of Wigwam Brook; however, because of the length of time since the original deposition of material and the lack of any current releases from the High and Alden Streets Properties study area into the brook, the likelihood of exposure is considered minimal.

Actual or threatened releases of hazardous substances from this site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

#### ***SCOPE AND ROLE OF ACTION FOR OU2 PROPERTIES***

As described above, this Proposed Plan addresses the second operable unit for the site and identifies the preferred remedy for the High and Alden Streets Properties study area and four nonadjacent properties not addressed in the first operable unit.

#### **Remedial Action Objectives**

EPA proposes the following remedial action objectives for this second operable unit of the U.S. Radium Corporation site:

- Reduce exposure to radon gas levels in excess of 4 pCi/l and radon decay products in excess of 0.02 WL.
- Reduce exposure to gamma radiation emitted from radium-contaminated material resulting from site sources with radium concentrations in excess of 5 pCi/g, employing ALARA principles.
- Prevent ingestion of and general contact with radium-contaminated material resulting from site sources with radium concentrations in excess of 5 pCi/g, employing ALARA principles.

These remedial action objectives are similar to those selected for the Montclair/West Orange and Glen Ridge Radium (MWG) sites and for OU1 of this site and would, at minimum, achieve the cleanup criteria in 40 CFR 192. Region II has determined that the 5 pCi/g standard found in 40 CFR 192 is relevant and appropriate for cleanup at the U.S. Radium site.

In achieving the remedial action objectives for OU2, EPA would rely on the ALARA principles used at the MWG sites during implementation of the response action. Applying ALARA principles means taking additional measures during remedial action, beyond those required to meet a specified cleanup goal, to assure protectiveness. Applying the 5 pCi/g standard with ALARA principles at the MWG sites has resulted in exposure levels that are lower than the levels that would result from using the 5 pCi/g standard alone. An ALARA approach is being used at the MWG sites because of the long-lived nature of radionuclides, the difficulty in eliminating routes of exposure, limitations of the analytical equipment to detect radionuclides, and site-specific factors which may make it necessary to remove material at levels below 5 pCi/g to achieve adequate public health protection.

Certain structures and above-ground debris at the affected properties are contaminated with radium. Any remedial alternative considered for these properties would be expected to satisfy the NCR guidelines for surface contamination or, as appropriate, the remedial action objectives employing ALARA principles to help ensure protectiveness.

EPA's experience at the MWG sites has shown that the remedial action objectives noted above can be achieved and, by incorporating ALARA principles, result in no elevated radon or gamma radiation levels at the surface. Therefore, by using similar remedial action objectives, the U.S. Radium site would pose no unacceptable risk for residential uses after cleanup, and would result in a cleanup that is protective under CERCLA.

Vanadium and cadmium were detected in some samples collected at the High and Alden Streets Properties study area at levels that exceed background for those metals; the levels pose some marginal risk in several future-use scenarios. The areas of radionuclide-soil contamination appear to be contiguous with the areas of vanadium/cadmium contamination. The remedial alternatives considered

below take into account the metals contamination, in that the limited options available for mitigating the radium-contaminated soil would also adequately address the metals contamination at the levels detected.

### **FEASIBILITY STUDY**

The information obtained from the RI was used to conduct the FS. The FS report provides a detailed evaluation of various options, referred to as remedial alternatives, to address the site.

### **Summary of Remedial Alternatives**

CERCLA requires that each selected site remedy be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (ARARs), utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and be cost-effective. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of hazardous substances.

#### Alternative 1: No Action

Estimated Capital Cost:	\$ 0
Estimated Annual Operation & Maintenance (O&M) Costs:	\$ 0
Estimated Present Worth:	\$ 0
Estimated Implementation Timeframe:	none

A No Action alternative is evaluated for every Superfund site to establish a baseline for comparison with remedial alternatives. Under this alternative, no further action would be taken to reduce exposure to radioactive materials at these properties. The temporary radon mitigation system already installed at one OU2 property during the 1991 removal action would remain in place, but there would be no provision for operation and maintenance. No additional measures would be taken to reduce exposures at properties that are not presently being addressed. Even with a long projected life for the radon mitigation system, it is assumed that it would eventually fail and that indoor concentrations of radon and radon decay products would return to the pre-mitigation conditions.

Because hazardous substances would remain at the OU2 properties above acceptable levels, five-year reviews would be required.

#### Alternative 2: Institutional and Engineering Controls

Estimated Capital Cost:	\$12,716,000
Estimated Annual O&M Costs:	\$ 107,000
Estimated Present Worth:	\$13,740,000
Estimated Implementation Timeframe:	3 years

This alternative involves the implementation of one or more of the following engineering controls, as determined to be necessary, in areas where contamination has been identified and measures have yet to be taken:

- Installation of systems to reduce indoor concentrations of radon and radon decay products;
- Installation of indoor gamma radiation shielding;
- Outdoor gamma radiation shielding where necessary; and
- In some cases, installation of fencing to restrict property access.

During implementation of this action, temporary relocation of some businesses may be required. Institutional controls (e.g., municipal or health ordinances, land-use restrictions) would also be necessary to ensure the effectiveness of the engineering controls.

Operation and maintenance of the action would also be necessary, to assure the continued protectiveness of the engineering controls. Because radium, which persists for thousands of years, would not be removed from the properties, the need for O&M would continue for many years; however, for cost-estimating purposes, O&M costs for maintaining the radon mitigation systems and gamma radiation shielding have been assumed for a period of 30 years. Because hazardous substances would remain at the OU2 properties above acceptable levels, five-year reviews of the remedy would be required. This alternative would take approximately three years to implement.

#### Alternative 3: On-site Containment

Estimated Capital Cost:	\$ 10,771,000
Estimated Annual O&M Costs:	\$ 128,000
Estimated Present Worth:	\$ 11,990,000
Estimated Implementation Timeframe:	2 years

Under this alternative, radium-contaminated buildings at the High and Alden Streets Properties and one nonadjacent OU2 property would be dismantled. The dismantled building debris would be sent to an appropriate off-site disposal facility. Soil from the four nonadjacent OU2 properties would be excavated and replaced with clean fill. The excavated material from these four properties would be brought to the High and Alden Streets Properties study area for long-term containment. A containment facility would be constructed by installing a cap and slurry wall over the radium-contaminated soil at the High and Alden Streets Properties study area.

During implementation of this action, temporary or permanent relocation of businesses would be required at some properties. Chemical (nonradiological) soil contamination found at the High and Alden Streets Properties would also be enclosed under a cap. Engineering and institutional controls similar to those described under Alternative 2 would be required for the High and Alden Streets Properties; however, the four nonadjacent OU2 properties would be available for unrestricted use. Because hazardous substances would remain at the High and Alden Streets Properties study area above acceptable levels, five-year reviews of the remedy would be required to assure the continued effectiveness of the remedy. This alternative would take approximately two years to implement.

#### Alternative 4: Excavation and Off-site Disposal

Estimated Capital Cost:	\$ 22,030,000
Estimated Annual O&M Costs:	\$ 0
Estimated Present Worth:	\$ 22,030,000
Estimated Implementation Timeframe:	2 years

Under this alternative, radium-contaminated material would be excavated or otherwise removed from contaminated properties, and replaced with clean fill or otherwise restored. It is estimated that approximately 18,400 cubic yards of soil and 150 cubic yards of construction material are contaminated with radionuclides. Contaminated

material would be transported for final disposal at an appropriate, off-site facility.

Based on experience at this site and the MWG sites, material contaminated above background levels would not remain within the first two feet of a remediated property. In addition, based on data available for the site and EPA's experience, residually contaminated material remaining on remediated properties would not be greater than two feet in thickness.

During implementation of this action, relocation of businesses would be required at some properties. In addition, demolition of certain OU2 property buildings may be required because of the unique contaminant distributions at those properties. Excavation and off-site disposal of radium-contaminated soil from the High and Alden Streets Properties would also remove nonradiological, chemical contamination found in the soil. Because this alternative would not result in elevated levels of radionuclides remaining on any property, a five-year review of the effectiveness of the remedy would not be required. This alternative would take approximately two years to implement.

### ***EVALUATION OF ALTERNATIVES***

During the detailed evaluation of alternatives, each alternative is assessed against nine evaluation criteria. The nine criteria are described below.

#### **Overall Protection of Human Health and the Environment**

This criterion addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

#### **Compliance with Applicable or Relevant and Appropriate Requirements of Federal or State of New Jersey Regulations**

This criterion addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statutes and/or provide grounds for invoking a waiver.

#### **Long-Term Effectiveness and Permanence**

This criterion refers to the ability of the remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

#### **Reduction of Toxicity, Mobility and Volume Through Treatment**

This criterion addresses the anticipated performance of the treatment technologies that a remedy may employ.

#### **Short-Term Effectiveness**

This criterion involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

#### **Implementability**

This criterion examines the technical and administrative feasibility of a remedy, including availability of materials and services needed to implement a particular option.

#### **Cost**

This criterion includes capital operation and maintenance costs, and net present worth.

#### **State Acceptance**

This criterion indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative at the present time.

#### **Community Acceptance**

This criterion will be addressed in the Record of Decision following a review of the public comments received on the RI/FS reports and the Proposed Plan.

The remedial alternatives are evaluated utilizing the above criteria. A discussion of these evaluations is presented below.

## **PREFERRED ALTERNATIVE**

The preferred alternative for the remediation of the U.S. Radium Corporation site OU2 properties is Alternative 4, Excavation and Off-site Disposal. A comparison of the remediation alternatives follows.

### **Overall Protection of Human Health and the Environment**

Alternative 1, No Action, is not protective of human health and the environment because the risks associated with contaminated properties would persist for the foreseeable future. Alternatives 2 and 3 reduce the possibility of exposure to contaminated material and, therefore, reduce human health risks associated with the site.

Alternative 4 is protective of human health and the environment because it removes contamination from the site.

### **Compliance with ARARs**

No requirements have been determined to be applicable to the remediation of the OU2 properties. However, as discussed earlier, portions of the federal regulations governing the cleanup of uranium mill tailings from inactive uranium processing sites, 40 CFR 192, have been determined to be relevant and appropriate.

Health- or risk-based standards include an annual average exposure guideline of no more than 4 pCi/l of air for radon, which corresponds to an approximate annual average exposure of 0.02 WL for radon decay products. Additionally, the standards for the cleanup of radium-contaminated material require that the concentration of radium-226, averaged over an area of 100 square meters (120 square yards) of surface soil, be no greater than 5 pCi/g. For this site, the 5 pCi/g cleanup standard also applies to subsurface soils.

Alternative 1 does not satisfy any of the human health standards. Alternatives 2 and 3 satisfy human health standards by reducing exposures to radiation in excess of natural background levels; however, continued operation and maintenance are required to assure continued attainment of these standards. Alternative 4 satisfies human health standards by removing the source of exposures to radiation in excess of natural background levels.

Alternatives 2, 3 and 4 would satisfy the threshold requirements of overall protection of human health and the environment with regard to chemical (nonradiological) contaminants.

Because Alternative 1, No Action, does not meet the threshold requirements of overall protection of human health and the environment or compliance with ARARs, it will not be considered further in the evaluation of alternatives.

### **Long-Term Effectiveness And Permanence**

Alternative 2 provides essentially no long-term effectiveness or permanence. Alternative 3 provides a marginally more effective long-term solution. It would be difficult, however, to maintain a waste disposal facility containing radioactive wastes with long half-lives (about 1,600 years for Ra-226) in a densely populated area. Alternative 3 would allow for unrestricted future use of the four nonadjacent OU2 properties, but not the High and Alden Streets Properties. Alternative 4 is fully effective in the community for the long term, would allow for unrestricted use of all the OU2 properties, and is considered a final remedial solution.

### **Reduction of Toxicity, Mobility and Volume Through Treatment**

No treatment technology is known today that can effectively reduce the toxicity, mobility or volume of the radioactive contamination to the site-specific cleanup criteria specified given the soil matrix found at the OU2 properties. The total amount of radioactivity cannot be altered or destroyed, as is often possible with chemical contaminants. Therefore, none of the remedial alternatives considered fully satisfy this evaluation criterion.

### **Short-Term Effectiveness**

Alternatives 2, 3 and 4 provide effective short-term protection, and become effective as they are implemented at individual properties. Any adverse short-term impacts during implementation (such as the creation of dust) can be controlled through the use of measures such as dust suppression techniques.

Alternative 2 involves less intrusive activities and poses less of a threat to workers and the surrounding community than Alternative 3 or 4. Alternatives 3 and 4 require a comparable period of time to

implement, two years. However, Alternatives 2, 3 and 4 involve intrusive activities, including, in some cases, temporary or permanent relocation of businesses. Alternatives 3 and 4 have a greater potential adverse impact in the short term because of the removal of radium-contaminated material, including the excavation of soil. Engineering controls would be required to minimize the impacts of these alternatives.

#### **Implementability**

The indoor remedial activities associated with Alternative 2 are generally straightforward to implement and have been successfully implemented at other sites. Extensive outdoor gamma radiation shielding techniques have not been attempted or fully demonstrated and, therefore, may create some difficulties. State, County and Municipal authorities would need to be involved in the process of implementing the necessary institutional controls for Alternatives 2 and 3.

Alternatives 3 and 4 involve the use of standard construction practices. Implementation would be expected to be straightforward and, in the case of Alternative 4, has been successfully performed at the MWG sites.

The continued availability of an off-site disposal facility is required for implementation of Alternative 4.

#### **Cost**

Alternative 2 includes construction costs of \$12.7 million to implement remedial measures at OU2 properties, and an annual O&M cost of \$107,000 for all properties for an assumed period of 30 years. This results in an estimated present worth cost of \$13.7 million for the alternative. Alternative 3 has an estimated present worth cost of \$12 million, with \$128,000 in annual O&M costs assumed for a period of 30 years. Alternative 4 involves construction costs of \$22 million, but no O&M costs.

#### **State Acceptance**

The State of New Jersey supports the preferred alternative.

#### **Community Acceptance**

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for the site.

#### **SUMMARY OF PREFERRED ALTERNATIVE**

Based on the information available to evaluate the remedial alternatives against the nine criteria, EPA has concluded that the preferred solution for OU2 properties at the U.S. Radium Corporation site is Alternative 4, excavation of the radium-contaminated soil and restoration of the affected properties with clean fill, removal of radium-contaminated concrete and other construction material and restoration to the extent required, and disposal of all excavated or removed radium-contaminated materials at a licensed, off-site disposal facility. The alternative would also remediate the elevated concentrations of vanadium and cadmium found at the High and Alden Streets Properties study area.

Based on current information, Alternative 4 appears to provide the best balance of trade-offs among the alternatives with respect to the nine criteria. The preferred alternative is protective of human health and the environment, complies with ARARs, and is cost-effective. This action would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

**U.S. Radium Corporation Site  
Responsiveness Summary  
Second Operable Unit**

**Appendix B:      Public Notices**





*This Superfund Update provides the latest information on the United States Environmental Protection Agency's (EPA's) field activities to residents and local officials living and working in the vicinity of the U.S. Radium Corporation Superfund site. The Update focuses on two activities:*

- *progress on the first operable unit (OU1) selected remedy, involving about 75 residential and commercial properties; and*
- *the Proposed Plan for remedial action for the second operable unit (OU2), which includes the former U.S. Radium plant site at High and Alden Streets, and four other, non-adjacent properties.*

#### **PROGRESS ON THE FIRST OPERABLE UNIT (OU1) PROPERTIES**

##### **OU1 Selected Remedy**

A Record of Decision (ROD) for the first operable unit (OU1) properties was signed on September 21, 1993. The ROD details the selected remedy for the OU1 properties, which will involve excavation of the radium-contaminated material at each property, with off-site disposal of the excavated material. After the radium-contaminated material has been removed, confirmatory testing will be performed and the property will be restored as necessary.

##### **OU1 Remedial Design - Phase I**

The remedial design associated with the first group of OU1 properties is currently being prepared. It will involve approximately 18 residential properties, located throughout the U.S. Radium study area. It is anticipated that remedial construction activities at these Phase I properties will begin in late 1995.

##### **Ongoing OU1 Property Surveys**

Approximately 380 properties will be investigated as part of OU1, with over 300 property surveys completed thus far. The remaining 80 or so properties are either awaiting a property survey or EPA has yet to obtain access to the property. Difficulty in obtaining access has led to delays in

completing this aspect of the site investigation. EPA continues to try to gain access to these remaining homes to complete this stage of the process.

Of the 300 property surveys performed to date, about 75 properties have been found to contain radium-contaminated material requiring remedial action. The first 18 properties are included in Phase I. In June 1995, EPA will initiate remedial design surveys on the next group of properties, which will become Phase II.

#### **SECOND OPERABLE UNIT (OU2) PROPOSED PLAN**

Concurrent with the release of this Superfund Update, EPA is releasing a Proposed Plan for the second operable unit (OU2) of the U.S. Radium Corporation site, with support from the New Jersey Department of Environmental Protection. OU2 includes the properties that once made up the U.S. Radium Corporation radium-ore processing plant along High and Alden Streets in Orange. OU2 also includes four U.S. Radium-operated commercial properties that are not adjacent to the original High and Alden Streets plant, called the "non-adjacent OU2 properties".

The OU2 Proposed Plan describes the remedial alternatives considered for the OU2 properties, and identifies EPA's preferred remedy. EPA conducted a remedial investigation and feasibility study (RI/FS)

for OU2 to define the extent of contamination at the OU2 properties, and develop and evaluate measures to protect public health. The alternatives considered in the Proposed Plan consist of the following:

- No Action
- Institutional and Engineering Controls
- On-site Containment
- Excavation and Off-site Disposal

#### **The Proposed Plan**

EPA's preferred alternative for OU2 is Alternative 4, Excavation and Off-site Disposal. The Proposed Plan details the rationale for EPA's preference of Alternative 4. As part of its public participation responsibilities under Superfund, EPA is soliciting comment on the Proposed Plan and the RI/FS report. Written comments should be sent to:

John Prince  
Remedial Project Manager  
New Jersey Superfund Branch I  
U.S. Environmental Protection Agency  
290 Broadway  
New York, New York 10007-1866

The final remedy will be documented in a ROD after consideration of comments on the Proposed Plan and RI/FS report. Comments will be accepted through June 21, 1995. Also, a public meeting has been scheduled for June 1, 1995, at 7:00 p.m. at the Orange City Hall Council Chambers, located at 29 North Day Street in Orange, to present the findings of the RI/FS report and the Proposed Plan.

#### **For Further Information**

If you would like more information about the U.S. Radium Corporation site, EPA has placed important site documents at the following locations:

Orange Public Library  
348 Main Street  
Orange, New Jersey

West Orange Public Library  
46 Mount Pleasant Avenue  
West Orange, New Jersey

If you have any questions about the site or your property, please contact EPA at (201) 676-3331. If you hear a recorded message, please leave your name, address and telephone number, and an EPA representative will get back to you shortly. If you would like to speak to EPA's project manager directly, please call John Prince at (212) 637-4382.

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Dates to remember:

**MARK YOUR CALENDAR**

**May 22, 1995 through June 21, 1995**

Public comment period on RI/FS report, Proposed Plan, and remedies considered

**June 1, 1995**

Public meeting at the Orange City Hall Council Chambers, 29 North Day Street at 7:00 pm.

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United States  
Environmental Protection Agency  
Region 2: NJ, NY, PR, VI  
290 Broadway  
New York, New York 10007-1866

# NEWS

95(44) Rich Cahill (212) 637-3665

FOR RELEASE: Tuesday, May 23, 1995

**EPA TO HOLD PUBLIC MEETING IN ORANGE ON CLEAN-UP PLAN FOR U.S.  
RADIUM SUPERFUND SITE IN ESSEX COUNTY, NEW JERSEY**

NEW YORK, N.Y. -- The U.S. Environmental Protection Agency (EPA) is holding a public meeting in the City of Orange, New Jersey on June 1st to discuss its plan to clean up radium-contaminated materials at the U.S. Radium Corporation Superfund site at High and Alden Streets. The plan also calls for the cleanup of similar materials at four commercial properties in the area. The contaminated material would be disposed of at a licensed, out-of-state disposal facility under the plan. The radium-contaminated materials at the site, which covers about 2 acres, originated from radium processing and utilization by the former U.S. Radium Corporation from 1917 to 1926.

The meeting on Thursday, June 1st will start at 7 P.M. in the Council Chambers of the City of Orange Municipal Building. Copies of the plan and other site-related documents are available for public review at the Orange Public Library and the West Orange Public Library. The public comment period on EPA's plan started on May 22nd and ends on June 21st. Written comments on the plan should be addressed to John Prince, Remedial Project Manager, USEPA, Emergency and Remedial Response Division, 19th Floor, 290 Broadway, New York, New York 10007-1866.

- more -

In September 1993, EPA selected a cleanup plan that will remove soil that contains radium-226 and other radioactive materials from about 120 scattered residential and commercial properties located primarily in the City of Orange, with the rest in South, East and West Orange, Essex County, New Jersey. The contaminated material will be disposed of at a licensed, out-of-state disposal facility. This action will be carried out over the next four years at a cost of \$14.1 million.

People may suffer adverse health effects from long-term exposure to gamma radiation and inhalation of radioactive dust particles, or inadvertent ingestion of radioactive particles.

Past actions by EPA resulted in the restriction of public access to hot spots, thereby making the site safer while the investigations leading to the selection of cleanup methods for the site were underway. Interim measures were also taken to reduce the levels of radon at other residential and commercial properties, which further minimized potential radiation exposures.

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F1F

**PUBLIC MEETING  
PROPOSED PLAN TO BE DISCUSSED FOR  
U.S. Radium Corporation Superfund Site, Operable Unit 2  
Orange, New Jersey**

The United States Environmental Protection Agency (EPA) will hold an informational public meeting on Thursday, June 1, 1995, at 7:00 pm, in the Orange City Hall Council Chambers, located at 29 North Day Street in Orange, New Jersey. EPA will discuss the findings of a recently completed remedial investigation and feasibility study and announce the proposed remedy for the cleanup of the former U.S. Radium Corporation plant site on Alden Street near the corner of High Street, and four other non-adjacent but related commercial properties located in Orange. These properties comprise Operable Unit 2 of the U.S. Radium Corporation Superfund site.

The study evaluated four alternatives for addressing radium-contaminated soil and structural materials (e.g., concrete, wood, gravel, etc.). These are:

- 1) No Action;
- 2) Engineering and Institutional Controls;
- 3) On-site Containment; and
- 4) Excavation and Off-site disposal.

EPA's proposed remedial alternative is Alternative 4, under which radium-contaminated material would be removed and transported off site for disposal. All of these alternatives are discussed in the Proposed Plan for Operable Unit 2.

Before selecting a final remedy, EPA will consider written and oral comments on the proposed alternative, as well as the other alternatives that were considered. Comments must be received on or before June 21, 1995. The final decision document will include a summary of public comments and EPA responses.

The remedial investigation and feasibility study report, Proposed Plan, and other site-related documents have been placed in the information repositories listed below:

Orange Public Library  
348 Main Street  
Orange, New Jersey

West Orange Library  
48 Mount Pleasant Avenue  
West Orange, New Jersey

Written comments on the proposed alternative, as well as any other alternatives considered, should be sent to:

John Prince, Remedial Project Manager  
U.S. Environmental Protection Agency  
290 Broadway  
New York, New York 10007-1868

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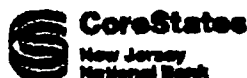
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Every region reported a decline in reported crime: 5 percent in the Northeast, 2 percent in the South, and 1 percent in the Midwest and in the West. Violent crime declined in all regions and property crime showed a reduction in all but the West, where it remained at the 1993 level.

Among cities, the largest decline in overall reported crime was 6 percent in those with more than 1 million residents. All others showed smaller declines except cities of 10,000 to 24,999, where reported crime remained level.

In suburbs, overall crime showed no change; it increased by 1 percent in rural areas.

In New Jersey, serious crime dropped a little less than 3 percent in Elizabeth and Newark, remained about the same in Jersey City but dropped almost 12 percent in Paterson.

The FBI's total of seven major crimes reported to law enforcement nationwide declined 2 percent in 1993 and 3 percent in 1992.

Violent crime—murder, rape, robbery and aggravated assault—was unchanged in 1993 from the 1992 figures. Property crime declined 2 percent in 1993 and 4 percent in 1992.

"We're now in the hall before the crime storm," Fox said. As the children of baby boomers age, "by the year 2005, we will have 23 percent more teenagers than now."

The problem is confined to boys with guns. The homicide rate among teenage girls has not risen.

"Since 1984, the number of teenagers committing murder with a gun has quadrupled. The number of teen-

## Public Meeting

### Proposed Plan to be Discussed for

### U.S. Radium Corporation Superfund Site, Operable Unit 2 Orange, New Jersey

The United States Environmental Protection Agency (EPA) will hold an informational public meeting on Thursday, June 1, 1995, at 7:00 pm, in the Orange City Hall Council Chambers, located at 29 North Day Street in Orange, New Jersey. EPA will discuss the findings of a recently completed remedial investigation and feasibility study and announce the proposed remedy for the cleanup of the former U.S. Radium Corporation plant site on Alden Street near the corner of High Street, and four other non-adjacent but related commercial properties located in Orange. These properties comprise Operable Unit 2 of the U.S. Radium Corporation Superfund site.

The study evaluated four alternatives for addressing radium-contaminated soil and structural materials (e.g., concrete, wood, gravel, etc.). These are:

- 1) No Action;
- 2) Engineering and Institutional Controls;
- 3) On-site Containment; and
- 4) Excavation and Off-site Disposal.

EPA's proposed remedial alternative is Alternative 4, under which radium-contaminated material would be removed and transported off site to disposal. All of these alternatives are discussed in the Proposed Plan to Operable Unit 2.

Before selecting a final remedy, EPA will consider written and oral comments on the proposed alternative, as well as the other alternatives that were considered. Comments must be received on or before June 21, 1995. The final decision document will include a summary of public comments and EPA responses.

The remedial investigation and feasibility study report, Proposed Plan, and other site-related documents have been placed in the informational repositories listed below:

Orange Public Library  
348 Main Street  
Orange, New Jersey

West Orange Library  
46 Mount Pleasant Avenue  
West Orange, New Jersey

Written comments on the proposed alternative, as well as any of alternatives considered, should be sent to:

John Prince, Remedial Project Manager  
U.S. Environmental Protection Agency  
290 Broadway  
New York, New York 10007-1866

THE STAR-LEDGER, 5/22/95

**U.S. Radium Corporation Site  
Responsiveness Summary  
Second Operable Unit**

**Appendix C:      Public Meeting Transcript**

U.S. ENVIRONMENTAL PROTECTION AGENCY  
NEW JERSEY SUPERFUND BRANCH I

IN THE MATTER OF: : PUBLIC HEARING  
EPA SUPERFUND :  
U.S. RADIUM CORPORATION SITE :  
ESSEX COUNTY, NEW JERSEY :  
- - - - -

June 1, 1995  
Council Chambers  
City Hall  
29 N. Day Street  
Orange, New Jersey  
Commencing at 7:07 p.m.

P R E S E N T:

JOHN PRINCE  
EPA REMEDIAL PROJECT MANAGER

PAT SEPPI  
EPA COMMUNITY RELATIONS COORDINATOR

ROBERT MC KNIGHT  
EPA SECTION CHIEF

ALAN FELLMAN, Ph D  
MALCOLM PIRNIE, INC.

ROBERT KERBEL  
MALCOLM PIRNIE, INC.

THOMAS J. MORRISON III  
BUSINESS ADMINISTRATOR, CITY OF ORANGE

ROBERTS, WALSH & ASSOCIATES  
Certified Shorthand Reporters  
425 Eagle Rock Avenue  
Roseland, New Jersey 07068  
201-228-9280



1                   TRANSCRIPT of proceedings taken by  
2                   and before JOANNE M. OPPERMANN, a Notary Public and  
3                   Certified Shorthand Reporter of the State of New  
4                   Jersey, at City Hall, 29 N. Day Street, Orange, New  
5                   Jersey, on June 1, 1995, commencing at 7:07 p.m.

6                   - - - - -

7                   MR. MORRISON: I'm Thomas Morrison, your  
8                   Business Administrator, City of Orange. This is the  
9                   next in a series of EPA Public Hearings on the  
10                  North Ward and surrounding ward radon situations in  
11                  people's homes.

12                 Many of you have come to other  
13                 meetings-- I wouldn't say many, there may be a  
14                 few-- and there have been a lot of people that the  
15                 federal government has contacted in this last year,  
16                 year and a half, period of time, to try and resolve  
17                 the situations that we have that revolve around a  
18                 radon plant in the North Ward.

19                 I certainly want to thank the EPA for  
20                 these series of meetings and their efforts in  
21                 cleaning up a problem that has existed for a long  
22                 time, 40, 50 years, and at least 10 to 15 years of  
23                 abandonment of some properties that would be  
24                 important to us on Alden Street.

25                 So, they are certainly going to go

1 through a presentation this evening. They will tell  
2 you who to be in contact with, but at any point in  
3 time, if we as a city can be helpful in this  
4 inner-relationship, we would be happy to, and I  
5 certainly will give you cards later on as to how to  
6 contact me here in City Hall.

7 Without further adieu, I'd like to  
8 bring forth those from EPA who are kind enough to  
9 be here this evening and give their presentation.

10 MS. SEPPI: My name is Pat Seppi and I'm  
11 with the U.S. Environmental Protection Agency and I  
12 want to thank you for coming out to this meeting  
13 this evening. I know it's a nice night outside. I'm  
14 sure you would rather be home.

15 The purpose of this meeting tonight is  
16 twofold. We want to tell you about the cleanup plan  
17 that EPA has come up with for the U.S. Radium site  
18 that's located here in Orange, and, secondly, we  
19 want to open the floor to questions and answers  
20 when we're done. Hopefully, we'll have the answers  
21 to your questions. If not, we'll get them for you  
22 and get back to you at a later date.

23 I wanted to introduce the other people  
24 that are here this evening. From EPA, John Prince,  
25 who is the project manager for EPA; and Bob Mc

1 Knight who is also section chief for EPA; also we  
2 have two gentlemen from Malcolm, Pirnie, Bob Kerbel  
3 who is the manager, actually, of all the in-field  
4 investigations that are going on right now, and  
5 Alan Fellman who is an expert in health physics.  
6 If anybody has any questions related to risks, as  
7 far as radium-contaminated soil is concerned, Alan  
8 will be here to answer your questions.

9 So, we do have a brief presentation.  
10 John has assured me it's only about 10 or 15  
11 minutes. Then, as I said, we'll open up the meeting  
12 to questions and answers.

13 There is a sign-in sheet up front. If  
14 you would be so kind as to sign it, I would  
15 appreciate it. We have a mailing list. If you are  
16 not on the mailing list, this will assure that you  
17 do get on it.

18 Secondly, you will notice that this is  
19 being recorded by a stenographer. So when we get to  
20 the question and answer portion, if you would state  
21 your name before you ask your question, because we  
22 want to have a record of these comments this  
23 evening.

24 Part of the Proposed Plan is a comment  
25 period. Tonight we'll be taking oral comments from

1 anyone who has questions. If anyone has a written  
2 question that may come up, or a question that may  
3 come up that you want to write to us after this  
4 meeting, come up to me afterwards. If you don't  
5 know the address, I'll give that to you. That  
6 comment period ends June 21st. There is about three  
7 more weeks to get your written comments in.

8 The Proposed Plan itself is in your  
9 library if anyone would like to go and read it. The  
10 Proposed Plan, which some of you may have gotten in  
11 the mail or some of you may have gotten a Superfund  
12 Update-- the Proposed Plan sort of summarizes EPA's  
13 alternatives for cleaning up the U.S. Radium  
14 Corporation site. There is a few different  
15 alternatives in there and then the final  
16 alternative that the EPA has chosen as their  
17 preferred one.

18 What happens after this, we take all  
19 the comments into consideration, we go back and  
20 write the final decision document that's called a  
21 "Record of Decision."

22 That's all I have to say. I'd like to  
23 turn this over to John Prince for his presentation.

24 (Whereupon, there is an off-the-record  
25 discussion.)

1 MR. PRINCE: Thank you.

2 To some of you, this presentation might  
3 sound quite familiar because in May of 1993 we were  
4 here, making a very similar presentation about the  
5 U.S. Radium site and about making a proposal for  
6 cleaning up a portion of the site.

7 The result of that proposal was that  
8 EPA signed what's called a "Record of Decision," in  
9 September of 1993, for those properties, and EPA is  
10 now proceeding with implementing that remedy at  
11 those properties.

12 This meeting, and the proposal that is  
13 the subject of this meeting, is about a different  
14 group of properties also associated with the U.S.  
15 Radium Corporation site.

16 The first group of properties we call  
17 "Operable Unit 1." It's sort of our shorthand for  
18 that group of properties. This group of properties  
19 we call "Operable Unit 2" (indicating), and I'm  
20 going to describe the site in general terms and  
21 then I'll explain what's in Operable Unit 1 and  
22 what's in Operable Unit 2.

23 This is a map (indicating.) You all  
24 have-- if you grabbed the handout, you have a copy  
25 of this map also.

1                   So, if you look at High and Alden  
2 Streets here in Orange, you'll notice at the center  
3 is a former U.S. Radium Corporation- operated  
4 facility. It's about two acres on Alden Street near  
5 the corner of High Street. That's the first study  
6 area and we call that the "High and Alden Street  
7 Study Area."

8                   Surrounding that is the "Vicinity  
9 Properties Study Area" because it's in the vicinity  
10 of the original plant. It involves about 330  
11 residential and commercial properties. Some of  
12 those properties have been identified to contain  
13 some of the material from the U.S. Radium site.

14                  And then there is a third study area,  
15 which is called the "Satellite Properties," and it  
16 is not depicted on the map because it's located  
17 further away. It totals about 50 properties. They  
18 are single properties and then small clusters,  
19 small groups of properties. They were identified by  
20 going back and looking at some of the U.S. Radium  
21 corporate records and identifying where some of the  
22 off-site operations of the corporation took place  
23 and where some of the residences of some of the  
24 executives of the U.S. Radium Corporation were.

25                  So, those are the three study areas,

1 the Plant Site, the Vicinity Properties and then  
2 the Satellite Properties.

3 The first operable unit includes about  
4 75 residential and commercial properties away from  
5 the original plant site. So, of these many, many  
6 properties, we have done studies and identified  
7 about 75 so far, that have some level of this  
8 material that will require action to satisfy our  
9 selected remedy, and we're in the design stage of  
10 that work. We expect that first excavations on the  
11 first properties will take place early next year,  
12 the spring of 1996. So, there will be several  
13 groups, but the first group of about 18 we expect  
14 to be getting to early next year.

15 So, the second operable unit, the  
16 subject of this evening's meeting, really includes  
17 what's left, which is the Plant Site and then four  
18 other properties, four commercial properties that  
19 were also places where U.S. Radium worked, places  
20 where they were actually doing their various  
21 activities.

22 Let me get to describing those  
23 activities.

24 U.S. Radium started work at this plant  
25 in about 1915, 1916. The business was bringing an

1 ore, which was high in radium content, to this  
2 facility, extracting the radium, and then they used  
3 that product for various purposes.

4 The ore, after it had been processed,  
5 still contained some radium, and that material was  
6 deposited, some on the property, some away from the  
7 property, and the resulting disposition we see at  
8 some of these Vicinity Properties that are  
9 associated with the first operable unit.

10 We also believe that they are  
11 associated with the Montclair, West Orange and Glen  
12 Ridge radium sites. We believe that most of the  
13 radium material from this plant actually created  
14 those properties.

15 I should tell you a little bit about  
16 radium itself. Radium is a rare radioactive metal  
17 which, like all radioactive substances, goes  
18 through a process of radioactive decay, releasing a  
19 certain amount of energy and forming actually  
20 another element. In the case of radium it decays  
21 in forms of radon gas.

22 Radium is naturally occurring; it's  
23 found in soil, it's found throughout the surface of  
24 the earth, and it's found in certain ores to a  
25 greater degree, like the ore that U.S. Radium was



1 processing at this plant. Radon is also naturally  
2 occurring, and it tends to be present at higher  
3 concentrations when one has higher concentrations  
4 of radon.

5           There are health effects that are  
6 associated with exposure to radionuclides like  
7 radium and radon, and those health effects are  
8 generally put into two categories, acute health  
9 effects and long-term or chronic health effects.  
10 Acute health defects would be associated with  
11 generally short-term exposures to very high levels  
12 of radiation, and radiation sickness is the result  
13 of those acute health effects.

14           In all of the studies we have done at  
15 the U.S. Radium sites, we haven't seen any levels  
16 that would result in acute health effects. There  
17 are levels of material at the plant site that,  
18 under certain circumstances, could present a  
19 long-term health effect, which would result from  
20 long-term exposure to even low levels of  
21 radionuclides.

22           One thing I do need to mention is that  
23 radionuclides are part of the crust of the earth  
24 and natural radiation is sort of something that we  
25 live with and there is a certain sort of a natural

1 background radiation that's associated with living  
2 on this planet. The levels associated with this  
3 plant site are elevated above that natural  
4 background level, and exposure to, say, a worker at  
5 that plant site, who worked there over a number of  
6 years, could result in an increased risk of cancer.

7 Another example would be exposure to  
8 radon gas and radon decay products over a long  
9 period of time, resulting in an increased risk of  
10 lung cancer.

11 I'll talk a little bit about the plant  
12 site itself and what we have found.

13 We investigated all the properties that  
14 are associated with this second operable unit. The  
15 main problems that we found-- this figure is also  
16 in your handout-- the main problems that we found  
17 are associated with the soils and associated with  
18 some of the older buildings that remain on this  
19 facility.

20 What this map represents, this is High  
21 Street and Alden Street, and these darker areas  
22 represent deeper levels of contamination  
23 (indicating.) So, this sort of is a quantification  
24 of the extent of contamination.

25 We also found elevated levels of radon

1 in the buildings located on this facility, and, as  
2 I say, some of the older portions of the buildings  
3 that were there, at the time U.S. Radium was  
4 operating, have some building surface contaminants  
5 as a result.

6 The four commercial properties that are  
7 away from this facility are-- it's mainly building  
8 surface contamination as a result of activities  
9 that were going on at the plant site at that time--  
10 at those various facilities at the time, rather.

11 We also found some low-level chemical  
12 contamination, nonradiological contamination, at  
13 this facility, and it may be related to U.S. Radium  
14 activities and it may be related to some activities  
15 that took place after U.S. Radium sold the  
16 property. But the primary concern-- EPA's primary  
17 concern are these levels of radium contamination.

18 We also took some samples in Wigwam  
19 Brook, which runs alongside of the site here  
20 (indicating), and did not find any problems  
21 associated with Wigwam Brook.

22 We installed some monitoring wells to  
23 examine the groundwater immediately below the site,  
24 to try and assess whether there is a possibility  
25 that groundwater might be affected from the site.

1           While we did get some information, we  
2       really don't have a complete handle on the extent  
3       of what might be a problem. There were some low  
4       levels of groundwater contaminants. Some of them  
5       may be associated with the site, but there is some  
6       additional studies that need to take place and  
7       that's not actually part of the proposal in the  
8       Proposed Plan.

9           EPA has been doing some sampling,  
10      periodically, of the drinking water supplies in  
11      this area, just as an extra check to make sure that  
12      there isn't any effect from the site that might be  
13      getting to the municipal supplies, and we have not  
14      found any problems. The municipalities do a very  
15      good job of testing and treating the water to make  
16      sure that it's safe to drink.

17           That's a real quick summary of the  
18      investigations that we have done. I'm now going to  
19      describe the alternatives that we considered in  
20      considering how to address this second operable  
21      unit, and I'll say that I'm going to go through  
22      these very quickly. There is a lot of additional  
23      information that is sort of the backup for  
24      describing these alternatives, and it's available,  
25      and we can explain after the meeting how you can

1 find additional information if you are interested  
2 in it, and then these alternatives are described  
3 also in greater detail in the Proposed Plan itself.

4 So, there are four alternatives that we  
5 came up with. One thing you need to know, as  
6 regards to radionuclide contamination, is that  
7 there is no way to destroy it and there is no way  
8 to reduce the level of radioactivity. It's  
9 impervious to that sort of treatment.

10 So, what we're left with is figuring  
11 out ways that you can separate people from the  
12 material so that they don't come in contact with  
13 it.

14 So, these are the four alternatives  
15 that were considered: "No Action"; "Engineering  
16 Controls and Institutional Controls" is the second  
17 alternative; Alternative 3 is "On-site  
18 Containment"; and Alternative 4 is "Excavation and  
19 Off-site Disposal."

20 Alternative 1, "No Action," EPA is  
21 obliged to consider no action as a baseline so that  
22 we can compare active options and have some  
23 baseline: Well, if there were no action taken,  
24 what would be the effect?

25 Alternative 2, "Engineering and

1 Institutional Controls," involve a number of  
2 different things. For example, shielding of  
3 material, that's in the ground or below a  
4 structure, with either lead or concrete or soil;  
5 fencings could be an institutional control, just  
6 preventing people from getting access to an area;  
7 radon mitigation systems, because radon tends to  
8 concentrate inside structures, so that you can  
9 prevent or minimize exposure to radon.

10 Alternative 3, "On-site Containment,"  
11 would involve bringing material from the four  
12 commercial properties not at this plant, to the  
13 High and Alden Street facility, probably bringing  
14 it down and then building a cap over the top of  
15 this two-acre property and fencing it, then  
16 providing some security. That would be the extent  
17 of the action.

18 Then the fourth alternative, which is  
19 "Excavation and Off-site Disposal," is actually  
20 EPA's preferred alternative and I'll describe that  
21 in a little more detail.

22 EPA expects it will cost approximately  
23 \$22 million to implement that action, "Excavation  
24 and Off-site Disposal," and that it will take  
25 approximately-- it would take approximately two

1 years. It would involve digging up material,  
2 contaminated material, transporting it off-site to  
3 a landfill licensed to dispose of that material  
4 appropriately, confirmatory testing in the  
5 excavation area to assure that we have gotten all  
6 the material out, and then filling the hole back  
7 in, and restoration would follow. Again that's  
8 EPA's preferred option.

9 That is pretty much the end of our  
10 presentation. Again I'll remind you that there is a  
11 public comments period that's open until June 21st.  
12 Written comments will be accepted on the Proposed  
13 Plan until then. Before EPA takes an action, we'll  
14 consider those comments and there have been cases  
15 where comments have been submitted that have  
16 resulted in EPA changing remedies, changing  
17 proposals. So we take those comments very  
18 seriously.

19 I guess that's about it. I'm going to  
20 reintroduce the people who will probably be  
21 responding to questions along with myself; Bob Mc  
22 Knight with EPA, Pat Seppi with EPA, and then Bob  
23 Kerbel, who's really responsible for our  
24 investigations, and Dr. Alan Fellman whose  
25 background is in health physics and has a lot of

1 experience with the effects of radiation.

2 Please state your name and if it's a  
3 complicated name, we may ask you to spell it.  
4 That's about it.

5 Are there any questions?

6 MS. CATALFAMO: Orange, New Jersey.

7 That diagram, does that refer to  
8 Watchung Avenue at all?

9 MR. PRINCE: Watchung is-- let me put up  
10 this one because it may make a little bit more  
11 sense.

12 (Pause.)

13 This is Watchung here (indicating) and  
14 that other figure is a blowup of--

15 MS. CATALFAMO: We're right behind Alden  
16 Street.

17 MR. PRINCE: You're up near this corner  
18 (indicating)?

19 MS. CATALFAMO: Yes, we're in more where  
20 Spanky's is.

21 MR. PRINCE: That's right on the corner,  
22 right. The facility is actually at the corner of  
23 High and Alden Streets. It's about two acres.

24 DR. FELLMAN: Point out what the back  
25 figure is showing.



1 MR. PRINCE: Yes, it's this right here  
2 (indicating.)

3 MS. CATALFAMO: I'm talking about the  
4 other diagram you have there.

5 MR. PRINCE: This is a blowup of this  
6 area right here (indicating.)

7 MS. CATALFAMO: Okay. That's what I  
8 wanted to know.

9 Also, I think you're wrong about the  
10 date of the first meeting. I don't think it was in  
11 '93. I think it was before that. It was before  
12 because, I remember, when we came to the first  
13 meeting, you told us that it would be in a few  
14 years, the cleanup, in '95, and here it is '95 and  
15 nothing has been done.

16 MR. PRINCE: EPA's studies of all of  
17 these properties-- we have done over 300 properties  
18 investigations so far-- began in 1991. We had some  
19 meetings back in 1991 to tell people who we were  
20 going to be in the community and the sort of work  
21 that we were going to be doing.

22 MS. CATALFAMO: You said within a  
23 four-year period this would have been resolved.

24 MS. JANICE CHAM: Orange, New Jersey.  
25 I would like to know a little bit about

1 Operable Unit 2 because you're not talking about  
2 that and I think that I'm in that area and that  
3 area is from Alden to probably Washington.

4 MR. PRINCE: This is Washington over  
5 here (indicating), that's actually Operable Unit 1.

6 MS. CHAM: You don't have it depicted on  
7 either one of those-- on that blowup really. I'd  
8 like to know why.

9 MR. PRINCE: I may not have been clear.  
10 There is two separates pieces. For the first piece,  
11 which is Operable Unit 1 and includes a number of  
12 residential properties in this area, not the plant,  
13 we have already selected a remedy, we already have  
14 the design process going on, and those properties--  
15 the work on those properties, which will involve  
16 excavation, off-site disposal of that material,  
17 excavation of the property, are in the process, and  
18 the first group of those properties is what we  
19 expect to actually start working on, the  
20 construction work, next spring. That group is  
21 actually 18 properties.

22 MS. CHAM: That includes this area that  
23 I'm talking about?

24 MR. PRINCE: It includes particular  
25 properties in that area.

1 MS. DENICE JONES: Orange, New Jersey.

2 I live right in back of the radiation  
3 plant. I want to know, who is going to be held  
4 responsible for long-term or acute health problems  
5 of my family and for how long in the future is this  
6 person or whatever going to be responsible?

7 DR. FELLMAN: I think the first part of  
8 the question is, who's responsible? The responsible  
9 party is the U.S. Radium Corporation who ceased  
10 activities here in 1926.

11 So, unfortunately there is no person  
12 responsible who you can interact with in 1995. A  
13 lot of the Superfund problems are inactive sites.  
14 The person or company that is responsible for  
15 creating the hazardous condition is no longer with  
16 us and in many cases such as this one, it's been 70  
17 or so years since they have been here.

18 As far as health effects, what we're  
19 talking about, as John touched on, is an increased  
20 risk of cancer when one is exposed to a carcinogen.  
21 It would be similar to the risk to a cigarette  
22 smoker, in that, number one, not everyone who  
23 smokes cigarettes gets cancer or any other  
24 tobacco-related illness. The more one smokes, the  
25 greater the risk. Then again you may have a

1 three-pack smoker who lives to be a hundred and  
2 never gets cancer.

3 It's not something that you can point a  
4 finger at and say, if this individual is exposed to  
5 this amount of radiation for this period, then we  
6 can say with any degree of certainty that there is  
7 going to be a radiation-caused cancer down the  
8 road, 10, 20, 30 years later, for that individual.

9 All we can say is, in a broad sense,  
10 looking at a population, as opposed to an  
11 individual, that if a group of people are exposed  
12 to elevated levels of radiation for a long period  
13 of time, then in that group we may expect to see a  
14 greater number of cancers than we would have had  
15 they not been exposed to radiation.

16 Just like in a group of cigarette  
17 smokers, over a long period of time we would expect  
18 to see greater numbers of tobacco-related illness,  
19 such as lung cancer and heart disease, than we  
20 would have had that group not been exposed to that  
21 hazardous agent.

22 So, having said that, what we're left  
23 with here is levels of radiation that are elevated  
24 above background, natural background. We know what  
25 natural background levels are and we see definite

1 increases when we are studying over the U.S. Radium  
2 waste piles.

3 On the other hand, the fact that these  
4 elevated levels exist does not necessarily mean  
5 that the people who are either living near them, as  
6 you are, or working in and around them, as we have  
7 for the past several years, are not getting such an  
8 enormous radiation exposure that we're necessarily  
9 going to see any health effects.

10 What this is all about is being  
11 prudent. It's about an increased risk, albeit a  
12 small risk. You are still talking risk estimates  
13 that would predict a handful of cases to thousands  
14 of people.

15 So, certainly no real certainty that  
16 there would be any cancers caused by this, but a  
17 possibility based on our knowledge of how radiation  
18 works and what the carcinogenic-- the magnitude of  
19 the carcinogenic effects based on studies of people  
20 like the survivors from Japan who were exposed to  
21 radiation when the atomic bomb went off, and other  
22 groups that have been studied over the years.

23 So, again it's more of a low risk, but  
24 it's a-- we know it's there, we know this is a  
25 carcinogen, and so the prudent thing to do is to

1 find it and remove it.

2 MS. JONES: With all due respect, that's  
3 not an acceptable answer to me. I appreciate the  
4 information that you're offering. The reason it's  
5 not acceptable to me, in your line of work you  
6 choose to do your line of work.

7 DR. FELLMAN: That's true.

8 MS. JONES: If a person chooses to smoke  
9 cigarettes, that's their choice.

10 DR. FELLMAN: That's true.

11 MS. JONES: I have little ones at home,  
12 two and four, and this is not my choice or their  
13 choice.

14 DR. FELLMAN: I was addressing the risk.  
15 I wasn't addressing why you are incurring that risk  
16 compared to a smoker who chooses to incur it or  
17 myself who chooses to work in this field.

18 So, I didn't mean to equate it from  
19 that sense. I'm just talking about the biological  
20 risk. I probably don't have the answer that's going  
21 to satisfy you because, as you say, you have not  
22 chosen that risk.

23 MS. JONES: I'm very upset and angry  
24 about this situation because this is not my choice.  
25 It was not a choice of mine. I had no awareness of

1     what I was moving into and I have my family  
2     smack-dab in the middle of something that was not  
3     my choice.

4                     If I had been informed of the situation  
5     beforehand, someone had given me the choice, I  
6     would not have moved there. I feel very angry  
7     because the choice was taken away from me. My  
8     family-- I feel horrible that my family is in this  
9     situation. I have very small children and I just  
10    feel that someone has to be responsible for that.  
11    I'm not saying that you are, but someone has to be  
12    responsible. Someone should have informed me before  
13    I moved to where I'm living.

14                    DR. FELLMAN: I take it you're a tenant.

15                    MS. JONES: I'm a tenant. Someone should  
16    have informed me, before I moved to this area right  
17    smack in the backyard of this, of what the  
18    situation was.

19                    This is where my anger comes in: I'm  
20    the last person in the world who would have put  
21    myself in that situation. I've always been very  
22    careful with my family and their health. I'm not  
23    blaming anyone here. But I have to vent how I feel.

24                    DR. FELLMAN: Understood.

25                    MR. PRINCE: Other questions, please?

1 MR. CAREY GAGE, Orange, New Jersey.

2 What properties exactly are in Operable  
3 Unit 2? You have the plan site and you said four or  
4 five--

5 MR. PRINCE: Four other properties.

6 MR. GAGE: What are the addresses?

7 MR. PRINCE: I have the addresses with  
8 me and actually I didn't have your telephone number  
9 so I couldn't call you back. I can provide you the  
10 information that you requested.

11 The reason we don't generally make  
12 public the addresses that are associated with  
13 particular properties is that, while the  
14 information is public information, because the EPA,  
15 the government, is paying for this work and  
16 therefore it's the work of the people and it's  
17 public information, we try and keep a level of  
18 privacy to the degree that we can.

19 So, we don't talk about individual  
20 properties, we don't refer to so and so's house. We  
21 just try and have that level of separation.

22 So, I know the information you would  
23 like and I have it. I can provide it for you.

24 MS. CHAM: What's going to happen to the  
25 people who have to have on-site excavation, or



1     whatever, and the people around them? Are you  
2     telling those neighbors-- I mean should they not  
3     know about this? If it's one individual house, what  
4     about the people around them? They should not know  
5     about it?

6             MR. PRINCE: Well, we'll need to speak  
7     to them, depending on the level of work that has to  
8     take place at their particular property.

9             This is a question about the first  
10    operable unit again. It's generally a question  
11    about one or a group of these residences that is  
12    not the subject of this particular meeting, but  
13    that doesn't mean it's not a legitimate question.

14            In general we're finding that we don't  
15    find clusters of properties. We are often finding  
16    just one property out here somewhere (indicating),  
17    where this material, sometime back in the '20s, was  
18    brought. We don't know how. It's clearly material  
19    that is associated with this plant, but how it got  
20    there, we don't know.

21            Be that as it may, it's part of the  
22    cleanup work. We speak with the individual  
23    homeowner. In some cases, depending on the extent  
24    of the contamination, and more the type of work  
25    that has to take place, we do need to relocate

1 certain homeowners, which is also part of the  
2 restoration program.

3 It's paid for through the cleanup work  
4 and, depending on the nature of the work, we may be  
5 working in front of that house or around that  
6 particular house for several days, several weeks,  
7 possibly-- generally several weeks. And, in that  
8 case, obviously we need to make everyone in the  
9 area understand why we're in and what we're doing  
10 and contact them and explain our concerns.

11 MR. MORRISON: You have said you have  
12 gone house-to-house and anybody who lets you, you  
13 went in and examined for radon.

14 MR. PRINCE: Radium, yes.

15 MR. MORRISON: Radium. People who  
16 wouldn't let you in, you could not examine,  
17 correct?

18 MR. PRINCE: That is true.

19 MR. MORRISON: So, anybody who is there,  
20 you would have contacted.

21 MR. PRINCE: Right.

22 MR. MORRISON: So, if someone has a  
23 particular problem, you've already contacted the  
24 neighbors in the ways that you can already.

25 MR. PRINCE: Well, we don't stop there.

1 MR. MORRISON: At least you are going  
2 through that initial situation.

3 MR. PRINCE: Sure. You actually bring up  
4 a point that is worth my mentioning. There are 330  
5 properties here and then there are about 50  
6 properties that are sort of scattered about. That's  
7 380 properties. We have been to 300 or so, a little  
8 more than 300 or so of those. There are about 80  
9 that, for one reason or another, we haven't been to  
10 yet. In some case it's because people have said,  
11 no, no, we can't be bothered.

12 DR. FELLMAN: In most cases. There are  
13 some properties that are abandoned and we can't  
14 find the owner. In general it's because people  
15 don't understand or we maybe haven't done our job  
16 of communicating what we're doing yet.

17 So, that work is ongoing. We're still  
18 trying to get into those remaining 80 homes to find  
19 out, well, is there a problem? The good news is, if  
20 we do find something for these 380 properties, not  
21 associated with this plant and not those four  
22 commercial properties, we have a remedy at home for  
23 that so we can start that work relatively quickly.

24 MS. SEPPI: Any other questions? If  
25 anyone has a question about their own property, if

1 they would prefer to stay after to talk to us more,  
2 that's fine and we would be glad to stay and answer  
3 your questions.

4 If that's all the questions for now,  
5 thank you very much for coming. If anyone didn't  
6 get the handout, there are some up here.

7 Thank you.

8 (Whereupon, the hearing is concluded at  
9 7:47 p.m.)

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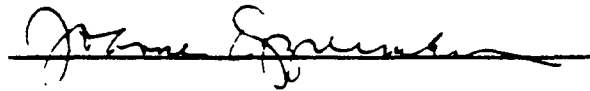
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C E R T I F I C A T E

I, JOANNE M. OPPERMANN, a Certified  
Shorthand Reporter and Notary Public of the  
State of New Jersey, do hereby state that the  
foregoing is a true and accurate transcript of  
my stenographic notes of the within  
proceedings, to the best of my ability.



JOANNE M. OPPERMANN

LICENSE NO. X1435

**U.S. Radium Corporation Site  
Responsiveness Summary  
Second Operable Unit**

**Appendix D:      Administrative Record Index**

**U.S. RADIUM CORPORATION SITE  
OPERABLE UNIT TWO  
ADMINISTRATIVE RECORD FILE  
INDEX OF DOCUMENTS**

**1.0 SITE IDENTIFICATION**

**1.5 Previous Operable Unit Information**

- P. 100001 - Memo to administrative record file, from Mr. John  
100028 Prince, Remedial Project Manager, U.S. EPA, Region  
II, re: Incorporation by reference of documents  
that are included in the administrative record for  
the first operable unit (OU1) of the site and are  
also part of the OU2 administrative record, May  
12, 1995. (Attached: OU2 Administrative Record  
Documents (In OU1 Administrative Record), Index  
Chronological Order, U.S. Radium Corporation  
Documents, October 18, 1993.)

**3.0 REMEDIAL INVESTIGATION**

**3.4 Remedial Investigation Reports**

- P. 300001 - Report: Draft Final Remedial  
300361 Investigation/Feasibility Study Report, Volume I.  
Operable Unit Two, U.S. Radium Corporation,  
prepared by Malcolm Pirnie Inc., prepared for U.S.  
EPA, May 1995.
- P. 300362 - Report: Draft Final Remedial  
300455 Investigation/Feasibility Study Report, Volume II.  
Appendices, Operable Unit Two, U.S. Radium  
Corporation, prepared by Malcolm Pirnie Inc.,  
prepared for U.S. EPA, May 1995.
- P. 300456 - "Abstract of Offers - Construction, Montclair/West  
300463 Orange & Glen Ridge Radium Sites, Property  
Remediation & Restoration; Phase IIA, Essex  
County, New Jersey", prepared by Ms. Susan Meites,  
Bid Opening Officer, U.S. EPA, September 14, 1992.

## **6.0 STATE COORDINATION**

### **6.2 State Certification of Applicable or Relevant and Appropriate Requirements**

- P. 600001 - Memo to administrative record file, from Mr. John  
600025 Prince, Remedial Project Manager, U.S. EPA, Region  
II, re: U.S. Radium Corporation Superfund Site -  
Second Operable Unit - Administrative Record  
Confidential Document, May 12, 1995. (Attached:  
"Objective: To Establish Statewide Cleanup  
Standards for Radioactive Materials Consistent  
with the Direction in S-1070 and the Radiation  
Protection Act", prepared by the Bureau of  
Environmental Radiation, undated. Note: This  
document is CONFIDENTIAL. It is located in the  
U.S. EPA Superfund Records Center, 18th floor, 290  
Broadway, New York, New York, 10007-1866.)

## **10.0 PUBLIC PARTICIPATION**

### **10.6 Fact Sheets and Press Releases**

- P. 1000001 - "A Citizen's Guide to Radon (Second Edition), The  
1000016 Guide to Protecting Yourself and Your Family from  
Radon", prepared by U.S. EPA, U.S. Department of  
Health and Human Services, and Centers for Disease  
Control, May 1992.



## ROD FACT SHEET

### SITE

Name : U.S. Radium Corporation  
Location/State : Essex County, New Jersey  
EPA Region : II  
HRS Score (date): 37.79 (8/12/83)  
Site ID # : NJD980654172

### ROD

Date Signed: August 29, 1995  
Remedy: Excavation and off-site disposal of  
radium-contaminated material  
Operable Unit Number: OU-2  
Capital Cost: \$ 22 Million in 1995 dollars  
Construction Completion: Two years  
O & M: None  
Present Worth: \$ 22 Million

### LEAD

Remedial/EPA  
Primary contact: John Prince (212)-637-4382  
Secondary contact: Robert McKnight (212)-637-4378  
Main PRP: Safety Light Corporation  
PRP Contact: N/A

### WASTE

Type: Radium and other radionuclides  
Medium: Soil, miscellaneous  
Origin: Radium-ore tailings  
Est. quantity: 18,000 cu.yd.