FINAL CLOSE-OUT REPORT

AUSTIN AVENUE RADIATION

SUPERFUND SITE

DELAWARE COUNTY, PENNSYLVANIA

EPA ID Number PAD987341716

Prepared by:

U.S. Environmental Protection Agency

Region III

Philadelphia, Pennsylvania

Final Close Out Report
Austin Avenue Radiation Site
Delaware County, Pennsylvania

I. INTRODUCTION

This Final Close Out Report documents that the U.S. Environmental Protection Agency (EPA) completed all response actions for the Austin Avenue Radiation site in accordance with Close Out Procedures for National Priorities Sites (OSWER Directive 9320.2-09A-P).

II. SUMMARY OF SITE CONDITIONS

Introduction:

The Austin Avenue Radiation Superfund Site (Site) is located on and near thirty-seven property parcels in Lansdowne Borough, Aldan Borough, East Lansdowne Borough, Darby Borough, and Upper Darby Township, Delaware County, Pennsylvania. These parcels are all within a two-mile radius of the former W. L. Cummings (Cummings) radium refining operation, which was located at the intersection of Austin and South Union Avenues in Lansdowne, PA. The area immediately surrounding the Site is a mixture of light industrial and residential areas. The combined 1990 population for the five municipalities that the Site encompasses was 110,729 people. The properties associated with the Site were radiologically contaminated with radium (Ra226) and thorium (Th230) contaminated tailings generated by Cummings' radium refining process which was in operation during the early 1900's. A professor from the University of Pennsylvania developed a crystallization process for refining radium at this facility and also set up his own business in his home basement at 105 E. Stratford Avenue, Lansdowne, PA.

In the late 1910's and early 1920's, masonry and building contractors used the sand-like tailings from the Cummings plant as aggregate for the following work activities: laying mortar between brick and stone masonry; pointing mortar on stone or brick masonry; applying stucco on building exteriors; applying plaster to building interiors; and laying concrete for sidewalks and basement slabs. The tailings were also used as fill under basement slabs, exterior perimeter foundation walls and other miscellaneous applications.

In 1963 the Pennsylvania Department of Health inspected the professor's house at 105 East Stratford Ave., Lansdowne, PA, and found high levels of radiation. In 1964 the U.S. Public Health Service and the Pennsylvania Department of Health, aided by the U.S. Air Force, attempted to decontaminate the house. In 1984, sampling and monitoring of the house by EPA and the PADER, (now the Pennsylvania Department of Environmental Protection (PADEP)), showed high residual radiation contamination levels. An extensive evaluation of the house was conducted by the U.S. Department of Energy's Argonne National Laboratory (ANL). In 1986 the EPA issued a Record of Decision (ROD) outlining a cleanup action for the Stratford Avenue

Site. The ROD called for the dismantlement and proper offsite disposal of the house and associated contaminated soils. In 1986 the location of the contaminated tailings became an issue as the government suspected that the tailings would contain residual radiation contamination but there were no records relating to the ultimate disposition of the tailings.

In May 1991 the PADER visited the former Cummings' property to monitor for radon. Radioactive contamination had previously been discovered in the back yard of 133 Austin Avenue, a property adjacent to the warehouse property. During this visit, radiation instruments further indicated the presence of significant levels of radioactive contamination at the site.

On June 7, 1991 PADER notified the EPA of its findings and requested assistance from the EPA. A joint PADER/EPA site assessment confirmed the presence of radiological contamination at 133 Austin Avenue at levels that warranted immediate action.

On June 19, 1991 a team of radiation specialists from the EPA's National Air and Radiation Environmental Laboratory (NAREL), Montgomery, Alabama, conducted an assessment using special radiation detecting equipment. The warehouse and the adjacent residential dwelling, 133 Austin Avenue, were found to be heavily contaminated with radioactive materials. In November and December of 1991, the EPA used a specially equipped radiation detection van and conducted a 12.5 square mile survey in Delaware County and a small portion of the adjacent City of Philadelphia. The EPA also conducted radiological surveys of the contaminated properties found during the survey. The testing indicated thirty-seven properties within a two-mile radius of the site of the former Cummings radium processing facility were contaminated with Ra226 and Th230.

On February 7, 1992 EPA proposed the Austin Avenue Radiation Site to the National Priorities List (NPL) (57FR4824) and finalized its NPL listing on October 14, 1992 (57FR47180).

Removal Actions:

The EPA conducted CERCLA Removal Actions pursuant to Section 104 of CERCLA, 42 U.S.C. §9604 at nineteen contaminated properties from June 12, 1991 through August 23, 1995 at a total cost of approximately $23.6 million. The removal actions included temporary relocation of residents of several contaminated properties, the complete dismantlement of the warehouse structure at South Union and Austin Avenues, dismantlement of the house at 133 Austin Avenue, and excavation of radiologically contaminated plaster, stucco, concrete and soils at the other properties.

The removal actions resulted in the complete cleanup at the nineteen properties. The temporarily relocated residents of those properties returned to their homes following the completion of the removal action at their properties. The property parcels and waste types and quantities are contained in Table 1.

Table 1: Removal Property Parcels and Total Quantities Removed

Lansdowne Borough: (1) 11 Greenwood Avenue (2) 129 Austin Avenue (3) 131 Austin Avenue (4) 133 Austin Avenue (5) 134 Austin Avenue (6) 30 South Union Avenue (7) 36 South Union Avenue (8) 126 Owen Avenue
Upper Darby Township: (9) 504 Harper Avenue
Aldan Borough: (10) 62 South Clifton Avenue
Yeadon: (11) Yeadon Park
East Lansdowne Borough: (12) 25 Beverly Avenue (13) 25 Lexington Avenue (14) 137 Lexington Avenue (15) 139 Lexington Avenue (16) 155 Lexington Avenue (17) 246 Melrose Avenue (18) 28 Lewis Avenue (19) 210 Lewis Avenue
Total Quantities Removed During Removal Action: Radioactive Materials: 10,474 cubic yards Asbestos Containing Material: 16 cubic yards Waste Fuel Oil: 370 gallons Non hazardous construction debris: 400 tons Hazardous Liquids: 600 gallons Non-Regulated Liquids: 100 gallons

Proposed Remedial Action Plans:

On July 1, 1993 the EPA issued a Proposed Remedial Action Plan (PRAP) describing five possible remedial action alternatives for twenty-two property parcels associated with Operable Unit one (OU1). The PRAP also designated EPA's preferred alternative for each of the properties. EPA opened a public comment period requesting comments. EPA received

numerous letters from citizens and public officials requesting EPA reconsider its preferred alternative for several properties. Based on these comments, EPA gathered additional information to develop and evaluate other remedial alternatives for the properties. On March 2, 1994 EPA issued a revised PRAP for the Site.

On July 7, 1996 EPA issued a PRAP describing the No Action alternative for site related groundwater, Operable Unit Two (OU2). The comment period was held from July 7, 1996 through September 5, 1996, and a public meeting was held on July 31, 1996. On September 27, 1996 EPA issued a 'No Remedial Action' ROD for site-related groundwater. The No Action was based on the fact that EPA's investigation of groundwater revealed no risks to human health or welfare or the environment.

ROD and Remedial Action OU1:

On June 27, 1994 EPA issued a ROD selecting a remedial action for the site-related properties. The ROD's estimated cost for the selected cleanup alternative ranged from $36,642,250 to $38,581,200. The selected cleanup had the following major elements:

1. The removal of the contaminated components from the residential structure located at 346 Owen Avenue, Upper Darby, Pennsylvania and the repair of the structure.

2. The removal of the contaminated structural components where practicable, or the complete dismantlement of residential structures on eighteen properties followed by either repair of the structures, replacement of the structures on those properties, or permanent relocation of the residents to an offsite location. The property owners would select (where practicable) structure replacement or offsite relocation after the issuance of the ROD. The United States would acquire title to each property where the residents had selected offsite relocation. At the end of the remedial action, title to each property would be transferred to the Commonwealth of Pennsylvania.

3. The dismantlement and reconstruction of a building addition at the 42 South Union Avenue property and the repair and reconstruction of a portion of the adjoining structure at 44 South Union Avenue.

4. The temporary relocation of property residents during contamination removal and structural restoration/replacement.

5. Removal and offsite disposal of radiation-contaminated soils to permitted facilities.

6. Offsite disposal of radioactive and demolition wastes to permitted facilities.

7. Backfilling and re-vegetation of remediated properties.

8. Replacement of a storage building that at one time was 135 Austin Avenue.

9. Provision of an offsite structure or equivalent to replace the building formerly located at 133 Austin Avenue. (The remedial action at this property was limited to permanent offsite relocation. This property was cleaned of radioactive materials by EPA as part of a Removal Action conducted at the Site. A three story house had occupied the lot prior to EPA's Removal Action. That house was completely dismantled and disposed of as part of the cleanup of the property.)

10. Provision of institutional controls in those instances where soils cannot be removed to a level where the property is available for unrestricted use and unlimited access.

Remedial Design OU1

On July 20, 1994 EPA approved the Remedial Design for the Site.

Remedial Construction Activities OU1:

In order to perform the remedial action outlined in the ROD, in was necessary to perform temporary and permanent residential relocations. The remedial action included dismantlement, excavation, sampling and analysis, proper disposal of contaminated materials, residential reconstruction, and excavation of the source area at the warehouse property. The residential relocations, remedial design and remedial action were federal lead actions performed through Interagency Agreements (IAGs) with the U.S. Army Corps of Engineers (USACE). The EPA and the Commonwealth of Pennsylvania entered into a Superfund State Contract on September 21, 1994. The USACE awarded the remedial action contract on July 28, 1995.

Residential Relocations:

The ROD specified affected homeowners would be given a choice between permanent offsite relocation in accordance with the Uniform Relocation Assistance and Real Property Acquisition Polices Act, 42 U.S.C. Chapter 61 (URA), or permanent relocation back to their property after it was remediated to cleanup levels, or to a newly reconstructed comparable residence. The newly constructed home would be constructed with modern methods and materials and would maintain the same "curbside appeal" of the previous structure. The newly constructed house would also meet modern building and local codes, the decent safe and sanitary standards of the URA and the homeowners would participate in the design process of their new homes.

The USACE Real Estate Division performed property acquisitions and temporary and permanent residential relocations for affected homeowners and tenants in accordance with the URA. Permanent relocations and title acquisitions were performed for the following properties: Darby Borough- 617 Pine Street, 619 Pine Street, 621 Pine Street, and 623 Pine Street; East Lansdowne Borough- 151 Lexington Avenue, and 34 Lewis Avenue; Lansdowne Borough- 133 Austin Avenue; and Upper Darby Township- 3723 Huey Avenue and 500 Harper Avenue. The USACE also permanently relocated tenants from the rental properties located at 216 Wayne Avenue and 44 South Union Avenue in Lansdowne Borough and 310 Shadeland in Avenue Upper Darby Township.

Table 2: Property Parcels and Remedial Action Selected and Total Quantities Removed

Lansdowne Borough: (1) 216 Wayne Avenue; Rebuild Selected (2) 218 Wayne Avenue; Rebuild Selected (3) 219 Wayne Avenue; Rebuild Selected (4) 237 North Lansdowne Avenue; Rebuild Selected (5) 6 East Plumstead Avenue; Rebuild Selected (6) 10 East Plumstead Avenue; Rebuild Selected (7) 16 East Plumstead Avenue; Rebuild Selected (8) 42/44 South Union Avenue; Rebuild Performed (9) 133 Austin Avenue; Permanent Relocation Performed (10) 36 S. Union Ave Former Cummings Facility Property (Warehouse Property), (Soils excavated only, structure not rebuilt)
Upper Darby Township: (11) 500 Harper Avenue; Permanent Relocation Selected (12) 346 Owen Avenue; Partial Rebuild Performed (13) 310 Shadeland Avenue; Rebuild Selected (14) 3723 Huey Avenue; Permanent Relocation Selected
Aldan Borough: (15) 64 South Clifton Avenue; Rebuild Selected
East Lansdowne Borough: (16) 34 Lewis Avenue; Permanent Relocation Selected (17) 211 Penn Boulevard; Rebuild Selected (18) 151 Lexington Avenue; Permanent Relocation Selected
Darby Borough: (19) 617 Pine Street; Permanent Relocation Selected (20) 619 Pine Street; Permanent Relocation Selected (21) 621 Pine Street; Permanent Relocation Selected (22) 623 Pine Street; Permanent Relocation Selected
Quantities Removed During Remedial Action: Radiologically Contaminated Material (RCM) Debris: 5951.44 tons RCM Soils (all properties except warehouse): 149,470.10 cubic feet RCM Soils (warehouse property): 1,620 cubic feet Asbestos Containing Material: 1620 cubic feet Non hazardous construction debris: 1910.18 tons

Homeowners selecting the reconstruction option were temporarily relocated for a one year period while remedial action and reconstruction activities were performed on their properties. The temporary relocations included the homeowners of: Lansdowne Borough- 237 North Lansdowne Avenue, 6, 10 and 16 East Plumstead Avenue, 216, 218 and 219 Wayne Avenue; East Lansdowne Borough- 211 Penn Boulevard; and Aldan Borough- 64 South Clifton Avenue. A summary of the remedial action selected for each property is contained in Table 2 (above).

Remedial Construction Activities

Remediation/Reconstruction OU1:

On July 28, 1995 the USACE Baltimore District awarded a contract for the remedial action and construction to Sevenson Environmental Services (SES) for $13,685,414. On September 5, 1995 the USACE, Baltimore District, issued a Notice to Proceed to begin the remedial action to SES. On September 15, 1995 the USACE, Kansas City District, issued a Delivery Order to a pre-placed contract to Envirocare of Utah, Incorporated for the disposal of the radiologically contaminated material (RCM), and on site construction began on October 25, 1995.

Remedial Actions Performed:

The remedial actions performed at the Site include the cleanup of radiologically contaminated wastes from residential properties and their reconstruction (where appropriate) and the excavation of contaminated soils from the warehouse property.

The remedial activities at the site included the following: 1) removal and proper disposal of RCM in soils and structural materials from the houses; 2) removal and proper disposal of asbestos containing materials (ACM) from the houses; 3) demolition, removal and proper disposal of the non-contaminated portions of the residential structure; 4) consolidation, packaging and shipment of RCM soil and debris to Envirocare, Clive, Utah for disposal and the packaging and shipment of ACM for proper disposal; 5) consolidation, packaging and shipment of non-RCM to a local landfill for disposal; 6) independent post-cleanup verification study for each property performed by Argonne National Laboratory (ANL); 7) reconstruction of the residential dwelling to the remedial design plans and specifications; 8) temporary and permanent residential relocations in accordance with the URA; and 9) excavation and proper disposal of the radiologically contaminated soils from the warehouse property.

The warehouse property is a non-residential property approximately120 feet by 110 feet in area, and is located at the corner of Union and Austin Avenues. The warehouse property was formerly occupied by the Cummings radium processing facility. The property is bordered to the east and south by South Union and Austin Avenues, respectively. The property is bordered on the north by the SEPTA regional rail tracks. Soil contamination at this property was not uniformly distributed and extended to a depth of approximately 25 feet at the SE corner of the lot. Soil excavation was necessary to depths up to18 feet adjacent to the railroad tracks. The contract originally required a system using interlocking sheet piles and driven H-Piles. After considering the potential impact to the community, the EPA had the USACE direct their

remedial action contractor to redesign the shoring system to minimize installation noise and vibrational energy.

The remedial action contractor performed soil excavation at the property by dividing the Site into halves. While excavators and radiation technicians worked one half of the Site removing contaminated soil, laborers and radiation technicians worked the other half of the Site loading, weighing, packaging, and preparing the bulk bags for transportation offsite for proper disposal.

The Site's Preliminary Close Out Report (PCOR) was signed on September 27, 1999 and the Remedial Action Report was signed on June 15, 2000. A Five Year Review was conducted and the report was signed on December 21, 2000.

The cleanup goals for OU1 are contained in Table 3.

Table 3: Remedial Action Cleanup Goals OU1

Residential Remove all soil in residential and potentially residential settings having site-related Ra226 contaminant concentrations in excess of 5.0 picocuries/gram (pCi/g) (in individual soil samples, including background activity concentration).
Non-Residential For properties that EPA determined were unlikely to become residential (i.e., streets, parks, railroad right-of-way, etc.), soils were removed to the 5 pCi/g level if those soils had Ra226 contamination exceeding 5 pCi/g (above background) in the top 5 centimeters (cm) and/or 15 pCi/g (above background) in soils below 15 cm averaged over 100 square meters.
Institutional Controls Institutional controls to restrict the future construction of residential dwellings and/or the depth of building footings and foundations will be implemented if EPA is unable to reduce contamination to the 5 pCi/g (above background) at the non-residential properties.

Community Involvement:

During the time period immediately following the completion of the remedial action through June 2000, complaints from the community regarding lawn care and snow removal on the non-rebuilt properties were raised to EPA. Through an Interagency Agreement with the USACE, EPA has addressed these issues. The USACE had a property maintenance contract with a local contractor for lawn maintenance and snow removal on the non-rebuilt properties. This contract has expired for all the non-rebuilt properties except for the 133 Austin Avenue property. The maintenance contract on the 133 Austin Avenue property will expire when the United States

successfully transfers the title.

A number of local municipalities showed interest in the direct title transfer of the non-rebuilt properties. The EPA and the Commonwealth of Pennsylvania worked with the local municipalities to resolve the issue of direct transfer. On September 28, 2000 the USACE sent three fully executed deeds to Upper Darby, Darby, and East Lansdowne Boroughs for recording in the land records. The title for the 133 Austin Avenue property is planned to be transferred to Lansdowne Borough in 2001. If Lansdowne Borough declines the transfer, the property will instead be transferred to the Commonwealth of Pennsylvania.

III. DEMONSTRATION QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) FROM CLEANUP ACTIVITIES

Activities at the Site were consistent with the ROD, RD and the RA statement of work issued to the contractor for design and construction. The RD included a Quality Assurance Project Plan (QAPP) incorporating all EPA quality assurance and quality control (QA/QC) procedures and protocols. EPA analytical methods were used as appropriate, for all validation and monitoring samples during the RA activities. Sampling followed EPA protocol Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods. The USACE's Project Close Out Report dated May 20, 1998 and the Argonne National Laboratory Post Verification Reports contain documentation of all sampling results.

The QA/QC program used throughout the RA was rigorous in conformance with the EPA standards. EPA determined that all analytical results were accurate to the degree needed to assure satisfactory execution of the RA and were consistent with the ROD and RD plans and specifications.

Cleanup Verification

Following remedial activities and acceptance by the USACE/EPA of the remedial action sampling and compliance report for each property, an independent verification survey was conducted by the U.S. Department of Energy's Argonne National Laboratory (ANL). The USACE contracted ANL to provide independent verification that the remedial action contractor decontaminated the individual properties to comply with the EPA cleanup criterion indicated in the ROD (reference Table 3), and that the property was suitable for unrestricted use. Table 4 contains mean activity concentration data for each of the properties associated with the remedial action and indicates the cleanup goals were achieved on all residential and potentially residential properties.

Table 4. Residential Properties: Post Cleanup Ra226 Soil Activity Concentration

Property Address	mean Ra 226 (pCi/g)
64 S. Clifton Ave., Aldan, PA	1.4
617/619 Pine Street Darby, PA	1.6
621/623 Pine Street Darby, PA	1.8
500 Harper Ave., Upper Darby, PA	1.8
3723 Huey Ave., Upper Darby, PA	1.9
310 Shadeland Ave., Upper Darby, PA	1.6
346 Owen Ave., Upper Darby, PA	1.5
34 Lewis Ave., E. Lansdowne, PA	2.0
211 Penn Blvd., E. Lansdowne, PA	1.7
151 Lexington Ave., E. Lansdowne, PA	2.1
6 East Plumstead Ave., Lansdowne, PA	1.8
10 East Plumstead Ave., Lansdowne, PA	1.7
16 East Plumstead Ave., Lansdowne, PA	1.7
216 Wayne Ave., Lansdowne, PA	1.9
218 Wayne Ave., Lansdowne, PA	2.0
219 Wayne Ave., Lansdowne, PA	1.9
237 N. Lansdowne Ave., Lansdowne, PA	2.0
42/44 S. Union Ave., Lansdowne, PA	2.0
36 S. Union Avenue, Lansdowne, PA (The warehouse property)	1.6
135 Austin Ave., Lansdowne, PA *	1.6
133 Austin Ave., Lansdowne, PA **	N/A

* Results for this property are contained in the Post Verification Sample Report for 36 S. Union Ave, Lansdowne.

**(*Note:* The Remedial Action addressed in the 1994 ROD specifically excluded 133 Austin Avenue from cleanup since EPA Region III's Removal Program had previously cleaned up the property in a removal action. The ROD only required residential relocation at the 133 Austin Avenue property.)

Inspections

The Site consisted of twenty-two individual properties. These properties were remediated and returned to their respective owners at varying times over a two and a half year period. A number of separate inspections were required on each property. In all cases, the Final Inspection was conducted separately at each property when the EPA and the USACE determined all work had been completed in accordance with the approved RD plans and specifications. The inspections were conducted during the period January 1997 through June 1999.

During the final inspections, the EPA, USACE, PADEP, and the contractor, along with the homeowner(s), visited each room on each floor in the individual houses, pointing out any defects and/or deficiencies in the workmanship. (The PADEP was unable to attend all final inspections). The tour of the interior was followed with a tour of the property to inspect the exterior finish and landscaping. All deficiencies, defects in workmanship, omissions from the drawings, etc., were identified and discussed with the contractor. The contractor was required to compile the deficient items into a "punch list". The punch list was then used by the contractor as a working list and by the Government as a record-keeping device to insure that all observed deficiencies were adequately addressed in a timely manner by the contractor. A 'Warranty of Construction Clause' included in the contract required the remedial action contractor to warrant all new home construction for one year after final acceptance. Since the final inspections were held on a property-by-property basis, individual warranties expired at various times.

Once the EPA and USACE determined that the punch list items had been sufficiently completed to allow the homeowner(s) to relocate back to their property, the homeowner(s) were notified by the USACE Real Estate Division and arrangements were made for the relocation.

The final inspection for the warehouse property was conducted in November 1997 with the EPA, USACE and their remedial action contractor in attendance. During this inspection, it was determined that the remedial action at the warehouse property had been successfully executed and that the remedy was constructed in accordance with the remedial design plans and specifications.

IV. MONITORING RESULTS

The cleanup criteria was achieved for all of the residential properties associated with the Site. On the warehouse property, site-related radiological contamination extended beyond the property line to Austin Avenue on the south and Union Avenue on the east. Sampling results taken from these areas indicate that they meet the established cleanup criterion of non-residential properties of 15 pCi/g below 15 cm, averaged over 100 square meters. The results of the ANL's post-cleanup verification at the warehouse property following the remedial action indicated the mean Ra226 activity concentration was 1.6 pCi/g. This is below the ROD's Ra226 activity concentration cleanup goals (Table 3).

During the remedial action, the USACE's remedial action contractor took continuous air monitoring samples, (detailed in the May 20, 1998 Project Closeout Report), and implemented

dust suppression measures to ensure radiologically contaminated materials did not become airborne. No air releases were documented.

V. SUMMARY OF OPERATION AND MAINTENANCE

No further response actions are determined to be necessary. All site-related contamination has been removed to levels protective of human health and the environment as described in the ROD. A 'Warranty of Construction Clause', included in the remediation contract, required the remedial action contractor to warranty all work performed for one year after the final acceptance by the USACE. Since the final inspections were held on a property-by-property basis, individual warranties expired at various times between February 1998 and February 1999. For those properties where a new home was not rebuilt, the contractor was required to maintain the appearance of the property (i.e., cutting grass) until the contract expired.

All reconstructed properties have been returned to their respective owners and are currently occupied residential structures. The upkeep and maintenance of the properties are the responsibility of the respective owners or title holders.

A number of local municipalities showed interest in direct title transfer of the non-rebuilt properties. The EPA and the Commonwealth of Pennsylvania worked with the local municipalities to resolve the issue of direct transfer. On September 28, 2000 the USACE sent three fully executed deeds to Upper Darby, Darby, and East Lansdowne Boroughs for recording in the land records. The title for the 133 Austin Avenue property will be transferred to the Commonwealth of Pennsylvania in 2001.

Institutional Controls

The OU1 ROD includes a provision for institutional controls (ICs) for instances where soils could not be removed to a level where the property is available for unrestricted use and unlimited access. The cleanup goals for the unrestricted and unlimited use were achieved for all residential properties. While it was verified that the public-use properties achieved their specified cleanup goals, EPA was concerned that their use may change in the future to become residential, and thus ICs would be required. (Public use areas include non-residential areas, and those areas unlikely to become residential. Examples of public use areas associated with this Site are: railroad right-of-ways, streets, the area underneath sidewalks, and parks.)

The Site's September 27, 1999 Preliminary Closeout Report (PCOR) indicated a possible need for ICs at the warehouse property and areas immediately adjacent (such as the railroad right-of-way and portions of roadways) because discrete sampling and survey equipment readings indicated Ra226 activity concentrations in excess of the non-residential cleanup goals specified in the ROD. During the time period since the signing of the PCOR and the Five Year Review, EPA continued to examine the issue related to these areas and the need for ICs. Review of the existing data identified an error in one data element presented by ANL in a post-cleanup verification report (13, 38). EPA corrected the error and performed a post-cleanup risk analysis Ra226 activity concentration calculations on the public-use areas (14,15,16,17).

The EPA was also able to clarify the language contained in the performance standard section of the ROD related to the assessment of ICs on the public-use properties (18), and issued a Non Significant Post-ROD change (19) discussing that the intent of the performance standard was not based on discrete sample results in the public use areas, but instead was based on 100 square meter area averaging.

When this issue was resolved and the re-calculation of public-use areas were performed, EPA determined ICs were not necessary on any of the public-use properties associated with the Site (see discussion below).

Austin Avenue and Union Avenue Digs

The 1994 ROD required ICs in public-use (non-residential) areas whenever Ra226 activity concentration exceeded 5 pCi/g (above background) averaged over 100 square meters. Portions of the South Union Avenue and Austin Avenue roadways were excavated during the remediation of the warehouse property in 1997. The Union Avenue dig was approximately 7 square meters, while the Austin Avenue dig was approximately 75 square meters. Both excavations were to an approximate depth of 1.83 meters (6 feet).

Calculations: Road-Way Areas

The Ra226 activity concentration 100 square meter area averaging calculations were performed for the excavated portions of Austin and Union Avenues. The data presented in the February 1998 ANL report: Post Cleanup Verification Report Austin Avenue Radiation Site, 36 South Union Avenue were utilized in these computations. The areas comprising the excavated portions of Austin and South Union Avenues were placed on an area grid consisting of blocks 10 feet x 10 feet and area averages were then taken over 100 square meters. The background areas were assumed to be 3 pCi/g (regional background), and data from the adjacent warehouse property was utilized as appropriate in comprising the grid. The depth of excavations in both areas ranged up to 6 feet over their respective areas. The roadway computations are provided in reference (14), and summarized in Table 5.

Railroad Right-of-Way

The soils contained within the limits of excavation at the warehouse property were cleaned up to the standards described previously in this report. The mean Ra226 activity concentration at the warehouse property is 1.6 pCi/g. The SEPTA railroad right-of-way was beyond the limits of excavation at the warehouse property and a portion of the right-of-way extends onto the warehouse property (36 South Union Ave), and 135 and 133 Austin Avenue properties.

During the remedial action excavation on the warehouse and 135 Austin Avenue properties, ANL took additional gamma readings along the northern excavation wall and thus into the railroad right-of-way. The data is presented in the February 1998 ANL report: Post Cleanup Verification Report Austin Avenue Radiation Site, 36 South Union Avenue (38). The gamma survey measurements were taken by inserting tubes horizontally into the side wall of the excavation at the warehouse. Tubes were placed approximately every 4 feet vertically from the

surface, with a distance of approximately 8 feet between columns of tubes. The tubes extended horizontally into the right-of-way approximately 4.5 feet. A radiation detector was placed in each tube, and four measurements were taken per tube at 0-,1-,3-, and 4.5-foot horizontal distances. An estimated Ra226 in pCi/g was computed from each of these readings. The tubes were removed from the wall of the excavation once sampling was complete.

The data is presented on pages 49 thru 74 of the report as estimated Ra226 activity concentrations. In regard to the railroad right-of-way, the data associated with the excavation's northern wall is of concern. The data associated with the excavation's northern wall was taken from Sections 1 thru 17 from a depth of 3 feet to a depth of 16 feet.

Calculations: Railroad Right-of-Way

EPA utilized a more conservative method than it previously used for the December 2000 Five Year Review to assess the need for ICs in the railroad right-of-way. Since the top 3 feet of soil was removed at the warehouse property up to the property boundary during the Removal Action, the soils placed there were clean fill and had Ra226 activity concentrations consistent with regional background. Area averaging based on a 100 square meter area was performed for depths of 3,8,12 and 16 feet. The computations for the railroad right-of-way are presented in reference (15), and the results are summarized in Table 5.

ICs at Public Use Properties - Conclusions:

The calculations indicate that both 'public-use' road way areas have Ra226 concentrations below 5 pCi/g (above background) when averaged over 100 square meters. ICs are not required on these areas. Additionally, the railroad right-of-way calculations indicate this area has Ra226 concentrations below 5 pCi/g (above background) when averaged over 100 square meters. ICs are not required on the public use areas.

Table 5. Ra 226 activity Concentrations in Public-Use Areas

Public-Use Area	**Radium Concentration in Subsurface Soils (pCi/g)***
RailRoad Right- of- Way	
Depth: 3 ft.	3.61
8 ft.	3.40
12 ft.	2.53
16 ft.	1.89
Austin Avenue Road Dig	4.15
Union Avenue Road Dig	3.87

*Concentrations in non-residential areas are averaged over 100 sq. meters

133 Austin Avenue Property:

The Remedial Action specified in the Site's 1994 ROD specifically excluded 133 Austin Avenue from cleanup because EPA Region III's Removal Program addressed the cleanup on this property in a removal action in 1993 (1). During the ANL's Post-Cleanup Verification survey at the adjacent warehouse property, they obtained a gamma reading sample on the 133 Austin Avenue property. This sample indicated a possible hotspot in an area associated with a former cesspool located in the backyard properties at133 and the former 135 Austin Avenue. The cesspool was located on the border between the two properties and was found during the EPA Removal Action performed in 1993 to have been filled in with tailings from the radium refining operation. It is located at a depth of nine feet next to the railroad tracks where any future digging is very unlikely (9). This property was certified clean by the Removal Program and indication of the discrete gamma reading does not change this finding for it did not account for the entire property. Furthermore, since the 1994 ROD only required residential relocation at the 133 Austin Avenue property, ICs will not be pursued for this property.

VI. SUMMARY OF REMEDIATION COSTS

Removal Actions:

Three removal actions were performed at the Site having a combined cost of $23,854,594. The removal actions took place from June 17, 1991 through November 2, 1995.

OU1:

The cost to implement the remedial action selected for OU1 was estimated in the1994 ROD to range between $36,642,500 and $38,581,200. The cost range occurred because affected residents were given an option to relocate or rebuild. USACE Real Estate Division specialists performed the property acquisitions and temporary and permanent residential relocations through Interagency Agreements totaling $1,823,478. The USACE awarded the construction contract for $13,685,414. The total costs for contract modifications due to construction requirements increased the cost an additional $402,051. An additional $3,224,054 was utilized for the radiation post-cleanup verification studies and sampling efforts performed by ANL and for USACE administrative costs. Total RA costs including contract modifications for the implementation of the remedial action at the Site is approximately $21,893,740 at the writing of this FCOR. The current estimated annual O&M costs is $0.

The remedial action cost for OU1 is approximately $14.7M to $16.7M less than the 1994 ROD estimate for the selected remedial action.

OU2

The capital and annual O&M costs for the No Action remedial action selected for OU2 are $0.

VII. PROTECTIVENESS

This Site meets all of the completion requirements as specified in OSWER Directive 9320.2-09-A-P, *Close Our Procedures for National Priorities List Sites*. The Site has achieved the ROD's cleanup objectives. Radiologically contaminated soils and structures have been removed, institutional controls are not required, and no action is required for site-related wastes in groundwater. EPA completed the Site's Five Year Review on December 21, 2000. In the Five Year Review, EPA determined that the remedy was protective of human health and the environment since all requirements of the ROD have been achieved.

VIII. FIVE-YEAR REVIEW

EPA will not conduct future Five Year Reviews of the Site. The purpose of a Five Year Review is to ensure that the remedial action remains protective of public health and the environment and is functioning as designed. The Five Year Review performed on December 21, 2000 indicated this finding. The review was conducted pursuant to CERCLA 121(c) and OSWER Directives 9355.7-02 (May 23, 1991), 9355.7-02A (July 26, 1994) and 9355.7-03A (December 21, 1995).

AUG 0 2 2001

Thomas C. Voltaggio
Acting Regional Administrator
U.S. EPA Region III

Date

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