LMS/FUSRAP/S07566
Rev. 1

Long-Term Surveillance and Maintenance Requirements for Remediated FUSRAP Sites

This document supersedes DOE−LM/GJ1242–2006,
Long-Term Surveillance and Maintenance Needs Assessment for the 25 DOE FUSRAP Sites (S01649), December 2006

March 2012

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Executive Summary

Purpose

This document summarizes radiological conditions at sites remediated under the Formerly Utilized Sites Remedial Action Program (FUSRAP) and transferred to the U.S. Department of Energy (DOE) for long-term surveillance and maintenance (LTS&M). Source document citations are presented. Most of these sites meet criteria for unrestricted use; a few require some use restrictions.

This document serves as the LTS&M Plan for the FUSRAP sites that can be released for unrestricted use, based on the final radiological conditions. For these sites, LTS&M requirements will consist of preserving site records and responding to stakeholder inquiries. DOE may conduct occasional checks of land use to maintain awareness of site activities.

This document also identifies some sites that will require use restrictions. For those sites, DOE may develop a site-specific LTS&M plan that establishes a program of post-closure care that maintains protectiveness; this document summarizes post-closure care requirements.

FUSRAP Background

The Manhattan Engineer District (MED) and the U.S. Atomic Energy Commission (AEC), which are DOE predecessor agencies, conducted nuclear weapons and technology development beginning in the early 1940s. MED and AEC contracted with private and public enterprises to perform the development work. When specific activities were completed, contractor sites were decontaminated to existing standards and released.

AEC initiated FUSRAP in 1974 to address concerns about the potential for residual radioactive contamination at contractor sites. There are two main criteria for including a site in FUSRAP: (1) radioactive contamination remains at a site from MED- or AEC-related activities, and (2) the site is not being addressed by another program.

DOE identified 46 sites that were eligible for remediation under FUSRAP out of the approximately 600 sites that were evaluated. Many of the sites had been remediated at the time MED or AEC activities ceased, but more stringent standards were since instituted for radiological protection, which caused AEC and then DOE to reevaluate the sites for radiological contamination.

In 1997, the U.S. Congress assigned responsibility for characterization, remediation, and verification of FUSRAP sites to the U.S. Army Corps of Engineers (USACE). By that time, DOE had completed remediation of 25 sites, which are referred to as the "Completed Sites" in the 1999 Memorandum of Understanding between DOE and USACE. Since 1997, seven additional sites were added to the program and USACE completed remediation at five of those sites and transitioned those five sites to DOE for long-term surveillance and maintenance, making a total of 30 DOE FUSRAP sites.[1] USACE is remediating 23 additional sites, so DOE may ultimately be responsible for 53 FUSRAP sites.

[1] In this document, Units 1 and 2 of the Tonawanda North, NY, Site are treated as a single site because USACE certified them together. These were previously addressed as two separate sites referred to as Ashland Oil #1 and Ashland Oil #2. Consequently, there are 29 chapters in this report for the 30 FUSRAP sites assigned to DOE.

Responsibility for the 25 Completed Sites resided with the DOE Office of Environmental Management (EM) until December 2003, when DOE established the Office of Legacy Management (LM) and transferred responsibility for completed FUSRAP sites to that organization. The first version of this assessment, *Long-Term Surveillance and Maintenance Needs Assessment for the 25 DOE FUSRAP Sites*, was released in 2006. Its purpose was to determine the radiological release status of the 25 Completed Sites and identify LTS&M requirements for the sites. The primary data source was the Considered Sites Database (CSD), which LM acquired from EM in 2004. LM also acquired a collection of eligibility determination records and other site information that EM maintained at DOE Headquarters.

Since then, LM has acquired additional FUSRAP records, including remediation records from the DOE Oak Ridge, Tennessee, office and assessment and verification records from the Oak Ridge Associated Universities office in Oak Ridge, Tennessee. These newly acquired records enabled DOE to fill some of the documentation gaps noted in the 2006 report.

Maintaining Protectiveness

Most FUSRAP sites were remediated to a condition that allows unrestricted use and unlimited exposure. For unrestricted use and unlimited exposure, the cleanup criterion for sites remediated by DOE was a Total Effective Dose Equivalent of 100 millirems per year (mrem/yr) for a residential or subsistence farming exposure scenario. Sites remediated by USACE after 1997 typically used 25 mrem/yr as the release criterion. In both cases, through application of the As Low As Reasonably Achievable process, final dose rates were typically far less than the DOE criterion of 100 mrem/yr.

Generic limits were applied for radium and thorium in soil, and site-specific limits were derived for other radionuclides. As shown in the site chapters that follow, cleanup criteria were often contained in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. or in the *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*. Authorized limits in both documents are the same. Chapter IV of DOE Order 5400.5 is presented in Attachment 1 and the complete order is available at http://www.lm.doe.gov/LM_Program/Regulatory_Drivers.aspx. Surface activity and radionuclide concentrations in soil presented in the following site chapters can be compared to these limits. If different guidelines and limits were derived for a site, those limits are presented in the site-specific chapters.

At some sites, DOE applied supplemental limits to occurrences of radiological contamination that exceeded the generic limits and were left in place. These occurrences do not pose an unacceptable risk if the land use that was in place at the time of certification continues. DOE has initiated a program of periodic site surveillance to track land use and confirm that the exposure assumptions at the time of certification remain valid (see "Notes on the March 2012 Revision" below).

DOE must maintain protectiveness for as long as residual contaminants may pose a potential risk. The major contaminant at many FUSRAP sites is natural uranium (i.e., uranium in natural isotopic abundances, having been neither enriched nor depleted in uranium-235) that was previously refined at other locations where daughter products were removed. Other FUSRAP

sites were involved in storage of or the actual processing of uranium ore, so uranium daughter products may be present in the waste stream and the natural uranium may have been removed. In all cases where supplemental limits were applied, because of the long half lives of uranium and its daughter products, DOE assumes that LTS&M requirements will remain in effect in perpetuity or until site conditions change. Future land use will change at some of the FUSRAP sites. Often, if current land use is industrial and conditions would not be acceptable for residential or another land use, the need for a use restriction is implied. Currently, formal use restrictions managed by DOE have been imposed on two FUSRAP sites (New Brunswick and Wayne, New Jersey).

Summary of Findings

DOE conducted a systematic assessment of risk, based on final radiological conditions documented in the reports available on the CSD. The output from this process was recommendations to further evaluate conditions at certain sites to determine if land use restrictions or other institutional controls are needed. Controls could be required to maintain protectiveness or to manage hazardous materials for disposal. The recommendations from the risk screening are included in this report (see "Notes on the March 2011 Revision" below).

In assessing potential site risk, DOE paid particular attention to land-use assumptions and exposure scenarios used for certifying that a given site can be released for unrestricted use. Some sites were remediated to a condition that poses no unacceptable health risks to a hypothetical subsistence farmer or resident with a home garden. This level of protectiveness is not confirmed for all sites, and DOE will impose surveillance requirements at sites where some land uses should be restricted. DOE will determine whether use restrictions are needed for a particular site if conditions change.

The documentation posted on the CSD demonstrates that most of the 30 DOE FUSRAP sites carry no restrictions on use and have no LTS&M requirements beyond records management and stakeholder support. For these sites, DOE site visits are discretionary and conducted as a best management practice to monitor land use. At the sites where supplemental limits were applied, periodic surveillance has been implemented to ensure that land use changes will not result in disturbance of residual radiological contamination in supplemental limits areas.

For several sites, the information points to conditions allowing unrestricted use but documentation is not complete. For example: (1) Certification Dockets for several sites (e.g., Fairfield, Ohio [also known as Associate Aircraft] and Chicago South [also known as the University of Chicago]) are in draft form; (2) some Certification Dockets do not include the *Federal Register* Certification Notification; and (3) the Remedial Action Report is not posted for some sites, or researchers could not access all the documentation.

One of the outcomes of this assessment is a list of issues and follow-on activities. Missing or inaccessible data and documents should be obtained. Recently acquired field data and project files that were received as this report was being released may help confirm final radiological conditions where conclusive documentation had not been available previously.

Site conditions are summarized in Table ES-1.

Locating FUSRAP Records

DOE has been working to document the contents and location of records collections containing documentation needed to manage completed FUSRAP sites. Needed information includes historical documentation of operations conducted by MED and AEC that resulted in contamination, which is needed to evaluate site eligibility and contaminant profiles. Remedial action records are needed to document post-remediation radiological conditions and to assess health risk. Guidance for locating FUSRAP documentation is presented in *FUSRAP Historical Records: Collections, Contents, Access, Custody, and Finding Aids*, which is updated as new information becomes available.

Additional FUSRAP records have been acquired since this document was first released in 2006. FUSRAP records are maintained by the DOE Office of Legacy Management at the Morgantown, West Virginia, Business Center. Other records may be contained in historical MED and AEC collections at various National Archives and Federal Records Center locations.

Most of the reports and correspondence cited in the following chapters has been linked to the Certification Dockets that DOE prepared for the 25 Completed Sites. These are posted to the Considered Sites Database at http://www.lm.doe.gov/Considered_Sites/. Records for FUSRAP sites remediated by USACE remain in USACE custody at the Federal Records Center in Lexana, Kansas. DOE has index materials for the USACE records and USACE will provide access to these records.

Notes on the March 2011 Revision

This document supersedes the *Long-Term Surveillance and Maintenance Needs Assessment for the 25 DOE FUSRAP Sites* published in 2006. This revised document incorporates additional knowledge about the sites that has been gained since 2006, including information resulting from the following activities:

- DOE acquired additional information that has been incorporated into descriptions of physical and radiological conditions.
- DOE incorporated results from a screening-level risk assessment into this document.
- Site visits provided a basis for establishing baseline land use conditions. Several of the industrial facilities that were remediated under FUSRAP have been demolished and redeveloped, and DOE reviewed final radiological conditions to confirm that no unacceptable risk would result from changed land use.
- DOE added citations for eligibility determination and designation decisions.

Notes on the March 2012 Revision

This document was revised to add additional material to further define FUSRAP LTS&M activities and implement the risk assessment results.

DOE released most of the completed sites for unrestricted use. However, supplemental limits were applied to inaccessible contamination at nine sites. These occurrences of residual contamination were determined to pose no unacceptable health or environmental risk as long as the physical configuration of the residual radioactive contamination is not disturbed.

In the March 2011 revision, DOE added Table ES-1, which identifies sites with supplemental limits. Institutional controls may be applicable at those sites where the contamination is buried and excavation should not occur without DOE oversight to manage contaminated materials that might be encountered. At other sites, supplemental limits were applied to structures. At these locations, DOE must determine if demolition would result in unacceptable risk or if debris must be managed as radioactive waste.

DOE will conduct periodic site visits (ranging from once per year to once every 5 years; see Table ES-1) to sites where were DOE applied supplemental limits to ensure they remain protective. The specific objectives of these visits are to do the following:

- Ensure that land use has not changed from the assumed land use that was the basis for determining that residual contamination in supplemental limits areas pose no unacceptable risk
- Ensure that supplemental limits occurrences have not been disturbed
- Mitigate the risk of uncontrolled recycling, disposal, or dispersal of contaminated material

DOE also will contact owners and tenants of the supplemental limits sites to ensure those parties (1) remain aware of the residual contamination and (2) will contact DOE if redevelopment or demolition is planned so DOE can properly manage the residual contamination.

For those sites that were released for unrestricted use and that do *not* contain supplemental limits areas, DOE will conduct periodic site visits as a best management practice when staff are in the region for other business. The visit frequency for these sites will be approximately every 5 years. Many of the sites are clustered in discrete areas: western Ohio; Buffalo, New York; central New Jersey; southern New York; and the New England coast. Sites in a cluster will be visited on the same trip. These visits are discretionary and are not listed as requirements in the site chapters.

DOE is evaluating the supplemental limits sites to determine where formal institutional controls are needed. If the evaluations indicate that no institutional controls are needed (based on current and anticipated site uses) and that disposal restrictions do not apply, DOE may modify the visit frequency to match the frequency for sites without supplemental limits.

Table ES-1 was revised to incorporate the site visit frequency and rationale for conducting those visits. Aerial photographs of the DOE FUSRAP sites are posted on the LM website at http://www.lm.doe.gov/default.aspx?id=866.

The remainder of this document consists of a chapter for each FUSRAP site assigned to DOE for LTS&M. Within each chapter is site-specific information describing the following:

- Historical activities and associated contamination
- Documentation of site eligibility
- Determination of release criteria and cleanup limits
- Description of remedial action
- Final radiological conditions and residual risk
- LTS&M requirements

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Table ES–1. Summary of LTS&M Requirements for DOE FUSRAP Sites

Site Name	DOE LTS&M Requirements	Institutional Controls	Supplemental Limits[a]	Institutional Controls	Site Visit Frequency	Last Year Visited	Comments
Acid/Pueblo Canyon, New Mexico, Site	Records management and stakeholder support	See comments	No	Not imposed under FUSRAP	None	2006	Site managed by Los Alamos National Laboratory under an Order of Consent, no further FUSRAP involvement
Adrian, Michigan, Site	Records management and stakeholder support; owner contact and site visit every 2 years. Potential institutional controls monitoring.	None	Yes	DOE will determine if demolition debris requires disposal as regulated waste	2 years (may revise based on IC)	2010	Uranium contamination left in below-grade drains and utility chases
Albany, Oregon, Site	Records management and stakeholder support	None	Yes	None	Not necessary - government tenant	Not visited	Site is owned by the DOE Department of Fossil Energy, thorium-232 in subfloor drains and soil, DOE determined that demolition debris will contain less than the authorized limit for thorium-232 and no disposal restrictions will apply
Aliquippa, Pennsylvania, Site	Records management and stakeholder support; owner contact and site visit every 2 years. Potential land use monitoring.	No	Yes	DOE will determine if demolition debris requires disposal as regulated waste	2 years, may revise per result of determination if debris is regulated	2010	Uranium left on building structures; building used for warehouse
Bayo Canyon, New Mexico, Site	Records management and stakeholder support	See comments	No	Not imposed under FUSRAP	None	2006	Strontium-90 contamination left in place within a 1.5-acre area, site managed by Los Alamos National Laboratory under an Order of Consent, no further FUSRAP involvement
Berkeley, California, Site	Records management and stakeholder support	None	No	Not imposed under FUSRAP	Not necessary - State operates site under RAM license	Not visited	Health physics monitoring performed by the University of California under their State radioactive materials license, DOE will remediate contamination before terminating contract with university
Beverly, Massachusetts, Site	Records management and stakeholder support	None	Yes, see comments	None	5 years	2010	Supplemental limits were applied to surface contamination fixed on concrete slabs; rubblized demolition debris did not exceed volumetric limits; no disposal restrictions on remaining foundation materials
Buffalo, New York, Site	Records management and stakeholder support	None	No	None	5 years	2009	
Chicago North, Illinois, Site	Records management and stakeholder support	None	No	None	5 years	2006	National Guard armory
Chicago South, Illinois, Site	Records management and stakeholder support; potential monitoring of contaminated sewers for disturbance	None	No	DOE will determine if demolition debris from the sewers requires management as regulated waste	5 years	2006	University of Chicago campus, DOE found contamination in sewers serving the affected buildings and indicated that documentation should be entered into the University's permanent record, supplemental limits were not formally applied
Chupadera Mesa, New Mexico, Site	Records management and stakeholder support	None	No	None	Not necessary	Not visited	No further action taken under FUSRAP based on radionuclide levels that pose no unacceptable risk
Columbus East, Ohio, Site	Records management and stakeholder support	None	No	None	5 years	2010	Redevelopment planned
Fairfield, Ohio, Site	Records management and stakeholder support	None	Yes, see comments	None	5 years	2010	Maximum uranium concentration exceeds authorized limits beneath a concrete slab, average concentration is 6.1 pCi/g
Granite City, Illinois, Site	Records management and stakeholder support	None	No	None	5 years	2011	

Table ES-1 (continued). Summary of LTS&M Requirements for DOE FUSRAP Sites

Site Name	DOE LTS&M Requirements	Institutional Controls	Supplemental Limits[a]	Institutional Controls	Site Visit Frequency	Last Year Visited	Comments
Hamilton, Ohio, Site	Records management and stakeholder support	None	No	None	5 years	2010	
Indian Orchard, Massachusetts, Site	Records management and stakeholder support	None	Yes, see comments	None	5 years	2008	Supplemental limits addressed uranium on building surfaces, buildings have since been demolished
Jersey City, New Jersey, Site	Records management and stakeholder support	None	No	None	5 years	2007	Site redeveloped for commercial and residential use
Madison, Illinois, Site	Records management and stakeholder support; land use monitoring and owner contact every 2 years.	None	Yes, see comments	None	2 years	2011	Alternate limit applied to uranium in hard-to-reach areas beneath roof, dose to worker near these areas would be 8.3 mrem/yr, risk for residential use not assessed
Middlesex North, New Jersey, Site	Records management and stakeholder support for portion of site remediated by DOE, TBD based on implementation of remedy for additional contamination	TBD	TBD	TBD	TBD	2011	Elevated radium detected at south end of property, USACE is determining if contamination is eligible for remediation under FUSRAP
New Brunswick, New Jersey, Site	Records management and stakeholder support; biennial inspection and protectiveness certification	Excavation restriction in area containing arsenic in soil that exceeds State standards	No	Deed Notice implemented in accordance with New Jersey regulations	2 years	2011	New Jersey Department of Environmental Protection (NJDEP) issued no further action determination for entire site (includes portion of public right-of-way), DOE-owned property sold to private party in 2009
New York, New York, Site	Records management and stakeholder support	None	No	None	5 years	Not visited	
Niagara Falls Vicinity Properties, New York, Site	Records management and stakeholder support	None	Yes, see comments	None	1 year	2011	Supplemental limits applied to radium-226 exceeding authorized limits in unexcavated portion of Central Drainage Ditch, no unacceptable risk under reasonable exposure scenario or if sediment used as fill beneath a residence, USACE will complete remediation of three properties, DOE will determine if additional remediation is required on vicinity property H'
Oak Ridge, Tennessee, Warehouses Site	Records management and stakeholder support	None	No	None	5 years	2010	
Oxford, Ohio, Site	Records management and stakeholder support	None	No	None	5 years	2010	
Seymour, Connecticut, Site	Records management and stakeholder support; owner contact and site visit every 2 years. Potential institutional controls monitoring.	None	Yes	DOE will determine if disposal restrictions needed for uranium contamination left in drains	2 years (may revise based on IC)	2010	Supplemental limits applied to uranium fixed to drains that are beneath the remaining building
Springdale, Pennsylvania, Site	Records management and stakeholder support	None	No	None	5 years	2010	
Toledo, Ohio, Site	Records management and stakeholder support	None	No	None	5 years	2010	Includes one vicinity property, a residence
Tonawanda North, New York, Site, Units 1 and 2	Records management and stakeholder support	None	No	None	5 years	2010	Dose to urban farmer would be less than 25 mrem/years, adjacent to closed municipal waste landfill
Wayne, New Jersey, Site	Records management and stakeholder support; monitor institutional control	Groundwater	No	Deed restriction on groundwater use	2 years	2010	Site listed on National Priorities List, DOE will remove groundwater use restriction when delisted, USACE completed remediation of off-site contamination in public rights-of-way in 2010

[a] Visits to sites where supplemental limits were NOT applied are discretionary and are not listed as a requirement in the site chapters.
Key: IC = institutional control; mrem/yr = millirems per year; pCi/g = picocuries per gram, RAM = radioactive materials; TBD = to be determined

1.0 Acid/Pueblo Canyon, New Mexico, Site

1.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Acid/Pueblo Canyon, New Mexico, Site are as follows:

- Managing site records for Formerly Utilized Sites Remedial Action Program (FUSRAP) activities
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use.

The Acid/Pueblo Canyon site is associated with Los Alamos National Laboratory. Effective March 1, 2005, Los Alamos National Laboratory, the New Mexico Environment Department (NMED), and DOE entered into an Order of Consent to address the potential release of contamination from the laboratory facility. The Order of Consent establishes requirements and a timetable for environmental cleanup. The DOE Office of Environmental Management (EM) funds the work necessary to meet Order of Consent requirements. The National Nuclear Security Administration (NNSA) is responsible for managing and performing the work. The Order of Consent was revised on June 18, 2008, and can be found at http://www.lanl.gov/environment/compliance/consent_order.shtml.

Because EM, NNSA, and NMED have assumed responsibility for any further remedial action, monitoring, and post-closure care at the Acid/Pueblo Canyon site, no further action is required under FUSRAP.

1.1.1 Site Conditions

DOE Office of Legacy Management personnel visited the site in September 2006. The site consists of a narrow, flat-bottomed canyon (Pueblo Canyon) and side canyon (Acid Canyon), with development on the canyon rims. The canyon floor is forested and contains an ephemeral water course with sandy sediment deposits and rock outcroppings. This area is open to public recreation and the canyon floor is used for walking and bicycling. During the site visit in 2006, recent storms had eroded the road and it was impassable near the upstream end of the canyon.

Pueblo Canyon, NM, looking upstream, September 2006

1.2 Background and Supporting Information

1.2.1 Location
Canyons in Pajarito Plateau Region, Los Alamos, NM.

1.2.2 Ownership
Los Alamos County, NM.

1.2.3 Operations
Liquid radioactive waste from Los Alamos National Laboratory acid sewer line was processed and discharged, 1943−1964.

1.2.4 Contaminants
Tritium, strontium-90, cesium-137, uranium, americium-241, and plutonium-239 in soil.

1.2.5 FUSRAP Eligibility Determination
DOE (U.S. Department of Energy), 1982. Letter, R.W. Davies, DOE, to F. Coffman, DOE, "Designation of Acid and Pueblo Canyons Site, Los Alamos, New Mexico," February 8.

1.2.6 Cleanup Criteria
DOE (U.S. Department of Energy), 1979. *Interim Soil Limits for D&D Projects*, LA-UR-79-1865-Rev., written by J.W. Healy, J.C. Rogers, and C.L. Wienke. (pre-FUSRAP standards)

1.2.7 Remedial Action

1966, 1967, 1982. Removal of soil, rock, and debris from waste treatment plant.

1.2.8 Release Survey

DOE (U.S. Department of Energy), 1983. *Radiological Survey Following Decontamination Activities Near the TA-45 Site*, LA-983 I-MS, July.

DOE (U.S. Department of Energy), 1984. *Final Report on the Remedial Action at the Acid/Pueblo Canyon Site, Los Alamos, New Mexico*, DOE/OR/20722-l5, October.

1.2.9 Independent Verification

None. Los Alamos National Laboratory conducted a post-remedial action survey but an independent verification of final radiological conditions was not performed.

1.2.10 Use Restrictions

Not applicable under FUSRAP. Restrictions may be imposed under the Order of Consent.

1.2.11 Institutional Controls and Enforcement

Not applicable under FUSRAP.

1.2.12 Monitoring and Site Inspections

Not required under FUSRAP.

1.2.13 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1984. "Notice of Certification," August. (Published in the *Federal Register* on October 29, 1984 [49 FR 43493].)

Incorporated County of Los Alamos, 1982. Letter, N.G. Seeley, Incorporated County of Los Alamos, to H.E. Valencia, DOE, "Formerly Utilized Sites Remedial Action Program (FUSRAP) Acid/ Pueblo Canyon and Bayo Canyon," July 28.

1.2.14 Agreements and Permits

None.

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2.0 Adrian, Michigan, Site

2.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Adrian, Michigan, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries
- Potential institutional controls monitoring for disposal of contamination in supplemental limits area
- Site visit and owner contact every 2 years to ensure that the supplemental limits area has not been disturbed

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Supplemental limits were applied to residual radioactive material left in the interior oil collection system discharge manholes, piping, and pipe chase. Following remediation, the U.S. Department of Energy (DOE) certified that any residual contamination remaining onsite falls within current guidelines for use without radiological restrictions, and assured that reasonably foreseeable future use of the property will result in no radiological exposure above current guidelines established to protect members of the general public and site occupants. Currently, there are no institutional controls, permits, or agreements in effect at the site. DOE will determine if waste materials will require management and permitted disposal if disturbed.

2.1.1 Site Conditions

After remediation, all accessible residual radioactive material above the current guidelines was removed, the underground sumps and manholes were backfilled with flowable concrete or controlled low-strength material, and all associated piping was plugged or filled. Dose to plant or renovation workers will not exceed 2.5 millirems per year. Radionuclide concentrations in the remediated exterior soil area were 1.8 picocuries per gram (pCi/g) for uranium-238, 0.90 pCi/g for radium-226, and 0.50 pCi/g for thorium-230.

Residential use was determined to be an implausible future land use; therefore, dose modeling for that land use was not performed.

DOE personnel most recently visited the site in July 2010 to determine if the land use had changed. Signage indicated that the plant was now a manufacturing facility for Inteva Products. The site is in an area used predominantly for mixed residential and commercial purposes. No apparent change to the plant or the surrounding area had occurred since the previous visit in 2007.

Manhole at the Adrian, MI, site before remedial action, December 1974 (DOE Digital Archive)

Adrian, MI, remediated area, July 1995 (DOE Digital Archive)

Adrian, MI, site, July 2010

2.2 Background and Supporting Information

2.2.1 Alternative Names
General Motors Site, Bridgeport Brass Site.

2.2.2 Location
1450 East Beecher Street, Adrian, MI.

2.2.3 Ownership
Private.

2.2.4 Operations
Extrusion of uranium metal to produce slugs that would be irradiated in production reactors at Hanford, WA, and Savannah River, SC, during the 1950s.

2.2.5 Contaminants
Uranium metal, including natural uranium and uranium metal depleted in or as much as 2.1 percent enriched in uranium-235.

2.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
DOE (U.S. Department of Energy), 1985. Letter from W.R. Voigt, Jr., DOE, to J. LaGrone, DOE, "Designation of Sites for Remedial Action - ...Bridgeport Brass, Adrian, MI...," BNI CCN 054358, December 17.

2.2.7 Cleanup Criteria

DOE Order 5400.5, *Radiation Protection of the Public and the Environment,* February 1990.

Site-specific standard for total uranium in soil: 35 pCi/g

DOE (U.S. Department of Energy), 1995. Telephone conference record, J. Kopotic, DOE, to A. Williams, DOE, "GM Site Specific Soil Criteria," March 6.

Site-specific standard for total uranium in oil, water, or liquid waste: 300 picocuries per liter

MDNR (Michigan Department of Natural Resources) 1995. Letter from D. Minaar, MDNR, to J. Kopotic, DOE, "Comments on the Proposal for Management of Waste Oil Preparatory to Remediation of Uranium Contamination," February 17.

Supplemental limits were applied to residual radioactive material left in the oil collection system discharge manholes, piping, and pipe chase:

DOE (U.S. Department of Energy), 1996. *Hazard Assessment for the General Motors Site*, DOE/OR/21950-1017, June.

2.2.8 Remedial Action

Remediated contaminated oil, scale, and sludge in the interior building pipe chase and oil collection system (sumps, traps, manholes, and drains). Fixed residual uranium left in place within portions of the oil collection system discharge manholes, piping, and pipe chase. Unused portions of the piping system containing residual uranium were filled with concrete. Friable asbestos-containing material was removed from cables within electrical duct banks. An exterior soil area was remediated. Remediation completed July 1995.

2.2.9 Release Survey

DOE (U.S. Department of Energy), 1997. *Post-Remedial Action Report for the Remedial Action at the General Motors Site, Adrian, Michigan*, DOE/OR/21949-397, March.

2.2.10 Independent Verification

DOE (U.S. Department of Energy), 2002. *Independent Radiological Verification Survey Results for the Remedial Action Performed at the Former Bridgeport Brass Company Facility, Adrian, Michigan*, ORNL/RASA-96/7, prepared by Oak Ridge National Laboratory, August.

2.2.11 Use Restrictions

Unrestricted (assumes continued industrial land use).

2.2.12 Institutional Controls and Enforcement

Not applicable per the site certification and backup documentation. However, DOE will determine if disturbance of the supplemental limits areas requires DOE notification and permitted disposal of debris.

2.2.13 Monitoring and Site Inspections

Regular owner contact, potential monitoring of supplemental limits areas.

2.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1996. "Notice of Certification." (Published in the *Federal Register* on January 29, 1997 [62 FR 4273].)

2.2.15 Agreements and Permits

None.

3.0 Albany, Oregon, Site

3.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Albany, Oregon, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance
- Site visits to determine if supplemental limits areas have been disturbed

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the properties for unrestricted use. Supplemental limits were applied to thorium-232 contamination remaining in drains and soil beneath certain buildings. There are no institutional controls, permits, or agreements in effect at the site. Demolition debris will not require disposal as regulated waste.

3.1.1 Site Conditions

After remediation, radium-226 concentrations ranged from 0.4 to 1.1 picocuries per gram (pCi/g), thorium-232 concentrations ranged from 0.5 to 3.3 pCi/g, and uranium-238 concentrations ranged from less than 2 to 11.6 pCi/g. Maximum dose rates were modeled to be 7 millirems per year (mrem/yr) for a worker in the building and 4 mrem/yr for a decontamination and decommissioning worker. In the case of demolition, thorium-232 concentrations in demolition debris would be 5 pCi/g or less. Gamma exposure rates ranged from 4 to 16 microroentgens per hour (μR/hr); background is 9 μR/hr.

DOE Office of Legacy Management (LM) personnel have not visited the Albany, Oregon, site. The site is owned and administered by the DOE Office of Fossil Energy. In December 2006, in support of the sale of the south portion of the property, LM confirmed that site documentation demonstrated the property could be released for unrestricted use.

3.2 Background and Supporting Information

3.2.1 Alternative Name

Albany Research Center Site.

3.2.2 Location

1450 Queen Ave. SW, Albany, OR.

3.2.3 Ownership

DOE Office of Fossil Energy.

3.2.4 Operations

Metallurgical research for U.S. Atomic Energy Commission and U.S. Energy Research and Development Administration between 1948 and 1978.

3.2.5 Contaminants

Natural uranium and thorium, some commingled with polychlorinated biphenyls.

3.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination

U.S. Department of Energy (DOE), 1983. Memorandum from F.E. Coffman, DOE, to J. LaGrone, DOE, "Designation of the Bureau of Mines Site at Albany, Oregon, for Remedial Action Under the Formerly Utilized Sites Remedial Action Program," June 14.

3.2.7 Cleanup Criteria

DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

DOE Order 5400.5, *Radiation Protection of the Public and the Environment,* February 1990.

Uranium was in secular equilibrium with daughters; therefore, a derived uranium standard for soil was not developed. Uranium surface contamination limits were applied in areas where secular equilibrium wasn't apparent. In other areas, thorium surface contamination limits were applied.

DOE (U.S. Department of Energy), 1991. Letter, S.D. Liedle, Bechtel National, Inc., to D.G. Adler, DOE, "Cleanup Criteria for the Albany Research Center," May 8.

Supplemental limits were applied to limited occurrences of fixed beta surface activity remaining on the surface of drains, subfloor pipes, and soils, and on certain processing equipment:

> DOE (U.S. Department of Energy), 1990. Memorandum from J.W. Wagoner II, DOE, to L.K. Price, DOE, "Approval of Supplemental Limits at the Albany Research Center," September 12.

3.2.8 Remedial Action

Historical remediation was performed at various times from 1948 to 1978.

Under FUSRAP, DOE performed remediation from July 1987 to January 1988 (Phase I) and from August 1990 to April 1991 (Phase II). Contaminated soil and building surfaces were remediated.

3.2.9 Release Surveys

DOE (U.S. Department of Energy), 1989. *Post Remedial Action Report for the Albany Research Center*, DOE/OR/20722-207, April. (Remediated building surfaces, equipment, and soil.)

DOE (U.S. Department of Energy), 1992. *Post Remedial Action Report for Phase II Work Conducted During 1990−1991 at the Albany Research Center*, DOE/OR/20722-302, May 1. (Primarily building surfaces that were previously unassessed.)

Scrubbing and sanding at Building 31, Albany, OR, site (DOE Digital Archive)

Radiological survey support work at the Albany, OR, site, December 31, 1991 (DOE Digital Archive)

3.2.10 Independent Verification

DOE (U.S. Department of Energy), 1989. *Verification of Remedial Actions, Albany Research Center, Albany, Oregon,* ORAU89/1-29, prepared by Oak Ridge Associated Universities, October.

DOE (U.S. Department of Energy), 1993.*Verification Survey of the Phase II Actions, Albany Research Center, Albany, Oregon*, ORISE 93/D-20, prepared by Oak Ridge Institute for Science and Education, April.

3.2.11 Use Restrictions

Unrestricted. DOE determined that there would be no disposal restrictions on drains, pipes, and soil beneath Buildings 4, 17, 28, 29, 30, and 31 that contain residual thorium-232 in excess of generic release criteria.

DOE (U.S. Department of Energy), 1990. Memorandum from J.W. Wagoner II, DOE, to L.K. Price, DOE, "Approval of Supplemental Limits at Albany Research Center," September 11.

3.2.12 Institutional Controls and Enforcement

Not applicable.

3.2.13 Monitoring and Site Inspections

Not required.

3.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1992. "Certification of the Radiological Condition of the Albany Research Center in Albany, OR," December. (Published in the *Federal Register* on February 23, 1993 [58 FR 11041].)

3.2.15 Agreements and Permits

None.

4.0 Aliquippa, Pennsylvania, Site

4.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Aliquippa, Pennsylvania, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries
- Site visit and owner contact every 2 years to ensure that supplemental limits areas have not been disturbed

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. Supplemental limits were applied to uranium contamination remaining in roof panel laps and fixed to roof support structures and three interior concrete pedestals. There are no institutional controls, permits, or agreements in effect at the site. DOE will determine if demolition debris will require disposal as regulated waste.

4.1.1 Site Conditions

After remediation, the maximum dose to an indoor worker would be at essentially background levels. The gamma exposure rate would be 11.4 microroentgens per hour (μR/hr) and background is 10.1 μR/hr. Beta-gamma activities as high as 27,572 disintegrations per minute per 100 centimeters squared remain on three concrete pedestals. Inaccessible contamination on the roof structure was not characterized. The dose to a decontamination and decommissioning worker from the residual contamination would be 15 millirems per year, considering all exposure pathways.

The hazard assessment assumed debris from demolition would be disposed of at a licensed facility.

DOE Office of Legacy Management personnel most recently visited the site in September 2010. The portion of the building used for U.S. Atomic Energy Commission (AEC) work is used as warehouse space and is in good condition. The roof trusses do not appear to have been disturbed since remediation was conducted. Portions of the floor that were remediated and restored are discernable as patched areas. A compressor building (referred to as Building 8 in site documentation) adjacent to the rear of the main building (referred to as Building 3) has been demolished and the foundation remains with subgrade portions of the structure filled with rubble. Two monitor wells were found and were decommissioned in 2007.

Front of remediated building in which AEC work occurred, Aliquippa, PA, site, September 2005

Rear of remediated building, compressor building foundation in front of building left of the open door; well in foreground was later abandoned, Aliquippa, PA, site, September 2005

Building interior, Aliquippa, PA, site, September 2005

Roof system where supplemental limits were applied, Aliquippa, PA, site, September 2005

4.2 Background and Supporting Information

4.2.1 Alternative Names
Aliquippa Forge Site, Universal Cyclops Site, Vulcan Crucible Site.

4.2.2 Location
100 First Street, West Aliquippa, PA.

4.2.3 Ownership
Precision Kidd Steel Company.

4.2.4 Operations
Uranium metal forming (heating and rolling rods) for AEC in 1948 and 1949.

4.2.5 Contaminants
Natural uranium metal.

4.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
DOE (U.S. Department of Energy), 1983. Memorandum from F.E. Coffman, DOE, to J. LaGrone, DOE, "Designation of Universal Cyclops, Inc., Titusville Plant, Aliquippa, Pennsylvania, for Remedial Action under the Formerly Utilized Sites Remedial Action Program (FUSRAP)," August 5.

4.2.7 Cleanup Criteria
DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

Site-specific uranium-in-soil standard: 100 picocuries per gram

DOE (U.S. Department of Energy), 1992. *Derivation of Uranium Residual Radioactive Material Guidelines for the Aliquippa Forge Site,* ANL/EAIS/RP-77575, prepared by Argonne National Laboratory, September.

Supplemental limits were applied to beta-gamma surface activities remaining on roof and support structures that exceeded authorized limits:

DOE (U.S. Department of Energy), 1995. *Hazard Assessment for Radioactive Contamination at the Aliquippa Forge Site, Aliquippa, Pennsylvania*, prepared by Bechtel National, Inc., January.

4.2.8 Remedial Action
1950, 1988, 1993, 1994. Remediated building surfaces, equipment, and soil.

4.2.9 Release Survey
DOE (U.S. Department of Energy), 1996. *Post Remedial Action Report for the Aliquippa Forge Site*, DOE/OR/21949-384, May.

4.2.10 Independent Verification

DOE (U.S. Department of Energy), 1995. *Verification Survey of Buildings 3 and 8, Aliquippa Forge Site, West Aliquippa, Pennsylvania*, prepared by Oak Ridge Associated Universities, July.

4.2.11 Use Restrictions

Unrestricted.

4.2.12 Institutional Controls and Enforcement

No institutional controls have been implemented but DOE is determining if the land records should be annotated to require DOE notification of demolition of the structures to which supplemental limits were applied.

4.2.13 Monitoring and Site Inspections

DOE will determine if land use monitoring is required.

4.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1996. "Certification of the Radiological Condition of the Aliquippa Forge Site in Aliquippa, Pennsylvania, 1995," June. (Published in the *Federal Register* on October 30, 1996 [61 FR 55981].)

4.2.15 Agreements and Permits

None.

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5.0 Bayo Canyon, New Mexico, Site

5.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Bayo Canyon, New Mexico, Site are as follows:

- Managing site records for Formerly Utilized Sites Remedial Action Program (FUSRAP) activities
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

The U.S. Atomic Energy Commission remediated contaminated areas from 1960 to 1963. A radiological survey performed in 1976 and supplemental surveys indicated that additional contamination remained in disposal pits and remediation might be required. The U.S. Department of Energy (DOE) implemented additional remedial action under FUSRAP in 1982 to prevent disturbance of contaminated subsurface debris and soil that remains within a 1.5-acre area. DOE erected six permanent monuments to demarcate the contaminated area and restrict the use of this land by prohibiting excavation until the year 2142, at which time the existing contamination will have undergone sufficient radioactive decay to allow the release of the affected area for unrestricted use.

Institutional controls (consisting of restrictive covenants that prevent excavation of contaminated subsurface soil) were prepared but not filed in public land records. There are no permits or agreements in effect at the site.

The Acid/Pueblo Canyon site is associated with Los Alamos National Laboratory. Effective March 1, 2005, Los Alamos National Laboratory, the New Mexico Environment Department (NMED), and DOE entered into an Order of Consent to address the potential release of contamination from the laboratory facility. The Order of Consent establishes requirements and a timetable for environmental cleanup. The DOE Office of Environmental Management (EM) funds the work necessary to meet Order of Consent requirements. The National Nuclear Security Administration (NNSA) is responsible for managing and performing the work. The Order of Consent was revised on June 18, 2008, and can be found at http://www.lanl.gov/environment/compliance/consent_order.shtml.

Because EM, NNSA, and NMED have assumed responsibility for any further remedial action, monitoring, and post-closure care at the Bayo Canyon site, no further action is required under FUSRAP.

5.1.1 Site Conditions

Strontium-90 was left in place 8 to 40 feet beneath ground surface. No surface contamination has been identified.

DOE Office of Legacy Management personnel visited the site in September 2006. The site consists of a 1.5-acre area delineated by six survey markers. One of the survey marker caps was missing. Because Los Alamos National Laboratory has assumed responsibility for site management, no repairs will be made under FUSRAP. Furthermore, the information that follows describes only the work conducted under FUSRAP, and Los Alamos National Laboratory may conduct additional remedial action at the Bayo Canyon site.

Bayo Canyon restricted area monument, September 2006

5.2 Background and Supporting Information

5.2.1 Location

Canyons in Pajarito Plateau Region, Los Alamos, NM.

5.2.2 Ownership

Los Alamos County, NM. A portion of the 1.5-acre site is in Santa Fe County, NM; ownership has not been confirmed.

5.2.3 Operations

Los Alamos National Laboratory activities (conventional explosives testing using radioactive materials; waste from radiochemistry operations) between 1943 and 1961.

5.2.4 Contaminants

Strontium-90, lanthanum-140, and uranium (natural and depleted).

5.2.5 FUSRAP Eligibility Determination

DOE (U.S. Department of Energy), 1980. Memorandum from T.G. Frangos, DOE, to S. Meyers, DOE, "Notification of Need for Some Form of Remedial Action in Bayo Canyon, Los Alamos, New Mexico, February 7.

5.2.6 Cleanup Criteria

DOE (U.S. Department of Energy), 1979. *Interim Soil Limits for D&D Projects*, LA-UR-79-1865-Rev., written by J.W. Healy, J.C. Rogers, and C.L. Wienke. (pre-FUSRAP standards)

Strontium-90 in soil: 100 picocuries per gram

DOE (U.S. Department of Energy), 1983. *Radiologic Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program*, ORO-831, March.

5.2.7 Remedial Action

Remediation of structures, infrastructure, and soil performed between 1960 and 1963. Contaminated debris was buried within the 1.5-acre FUSRAP site. Monuments marking remaining subsurface contamination and restricting excavation were erected in 1982. Strontium-90 contamination remains in subsurface soil.

5.2.8 Release Survey

August 1982 (placement of monuments completed).
DOE (U.S. Department of Energy), 2003. *Final Report on Remedial Action at the Bayo Canyon Site, Los Alamos, New Mexico*, Document Number 2143, prepared by Bechtel National, Inc., August.

5.2.9 Independent Verification

None. Los Alamos National Laboratory conducted a post-remedial action survey but an independent verification of final radiological conditions was not performed.

5.2.10 Use Restrictions

DOE will not impose the excavation restriction within 1.5-acre site under FUSRAP because the site is managed by Los Alamos National Laboratory under the Order of Consent.

5.2.11 Institutional Controls and Enforcement

Not applicable under FUSRAP.

5.2.12 Monitoring and Site Inspections

Not required under FUSRAP.

5.2.13 Certification and Regulator Concurrence

Aerospace Corporation, 1983. Letter, M.A. Jennison, Aerospace Corporation, to A. Whitman, DOE, "Draft Certification Docket: Bayo Canyon Site, Los Alamos, New Mexico, December 7. (Conveys draft Certification Docket, undated, which includes the draft Statement of Certification.)

No executed DOE certification statement or *Federal Register* Notice of Certification found in project files.

New Mexico State Environmental Improvement Division (EID) concurred that contamination was not a hazard if "kept at depth."

EID (New Mexico State Environmental Improvement Division), 1979, December. (Letter not found in project files.)

5.2.14 Agreements and Permits

Restrictive covenant addressing excavation restrictions was specified as a part of the remedy but not recorded in public land records.

6.0 Berkeley, California, Site

6.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Berkeley, California, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The State of California monitors radiological conditions at the site in accordance with their radioactive materials license

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Surface contamination remains in Gilman Hall at the University of California and has been covered, shielded, or fixed to reduce exposure and risk to acceptable levels. Radiological controls are provided by the University of California in accordance with its California State General License 1333-62. The U.S. Department of Energy (DOE) is responsible for remediating the remaining contamination in accordance with appropriate standards prior to terminating its contract with the university (the contract is primarily for the Lawrence Berkeley Laboratory). Other than the General License, there are no supplemental limits, institutional controls, other permits, or agreements in effect at the site.

6.1.1 Site Conditions

After remediation, contamination was either removed or shielded so that no radioactivity above background levels was detected. Because of regulatory oversight of license requirements imposed upon the owner, DOE personnel have not visited the site.

6.2 Background and Supporting Information

6.2.1 Alternative Names

University of California, Gilman Hall Site.

6.2.2 Location

Gilman Hall, University of California, Berkeley, CA.

6.2.3 Ownership

State of California.

6.2.4 Operations

Research on production and chemical properties of plutonium in support of Manhattan Engineer District and U.S. Atomic Energy Commission beginning in the 1940s.

6.2.5 Contaminants
Uranium, plutonium-239/240, cesium-137, and americium-241.

6.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1979. Letter, T.G. Frangos, DOE, to S. Meyers, DOE, "Notification of Need for Some Form of Remedial Action - A Portion of Gilman Hall," November 7.

6.2.7 Cleanup Criteria
Residual contamination was remediated to conditions that were acceptable under the University of California's radioactive materials license.

DOE (U.S. Department of Energy), undated draft. Memorandum from J.E. Baublitz, DOE, to E.F. Coffman, DOE, "Recommendation for Certification of Current Restricted Use and Termination of the Gilman Hall Site, University of California, Berkeley, California, from the Formerly Utilized Sites Remedial Action Program."

6.2.8 Remedial Action
Removal and replacement of contaminated walls, lab bench, baseboards, and sills; cover (shield) or seal contaminated floor. Remediation conducted from 1981 to 1983.

6.2.9 Release Survey
University of California, Berkeley, 1983. *Radiological Survey and Remedial Actions, Gilman Hall, University of California, Berkeley*, under cover of a letter from J. Gates, University of California, to J.T. Davis, DOE, May 6.

DOE (U.S. Department of Energy), 1983. Letter from J.T. Davis, DOE, to J. Baublitz, DOE, "Completion of Decontamination of Gilman Hall, University of California at Berkeley," July 25.

6.2.10 Independent Verification
Not performed.

6.2.11 Use Restrictions
Use is restricted by the controls of the University of California's State General License 1333-62.

6.2.12 Institutional Controls and Enforcement
Draft certification statement states that the University of California will manage residual contamination.

6.2.13 Monitoring and Site Inspections
Conducted by the University of California's health physics group in accordance with State General License 1333-62.

6.2.14 Certification and Regulator Concurrence
DOE certification March 26 (?), 1985 (date partially illegible), documentation of publication in the *Federal Register* not found in project files.

6.2.15 Agreements and Permits

University of California's State General License 1333-62 controls acceptable use of the site. The University of California accepted responsibility for managing the remaining contamination. The contract between the University of California and DOE stipulates that DOE will restore all areas to conditions that existed before activities were conducted by DOE and its predecessor agencies.

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7.0 Beverly, Massachusetts, Site

7.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Beverly, Massachusetts, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. DOE applied supplemental limits to fixed beta-gamma surface contamination on concrete that exceeded the cleanup criteria. Upon demolition, the contamination in the rubblized material was less than volumetric (e.g., soil) limits and the debris was disposed of. The remaining concrete can be disposed of without restrictions. There are no institutional controls, permits, or agreements in effect at the site.

7.1.1 Site Conditions

After remediation, radionuclide concentrations were less than authorized limits: radium-226 and thorium-232 concentrations were less than 2 picocuries per gram (pCi/g) and uranium-238 concentrations were less than 50 pCi/g. Gamma exposure rates were less than 15 microroentgens per hour (μR/hr) and most were less than 10 μR/hr. The concrete slabs to which supplemental limits were applied met volumetric standards upon demolition.

DOE personnel visited the site in August 2010. Foundation structures remain on the property, which is otherwise vacant with overgrown vegetation. Fencing has not been maintained and access is unimpeded. Local residents say the site is used for fishing and by homeless people. Nearby residents also indicate the site is designated for redevelopment as townhomes.

Beverly, MA, site looking west from railroad bridge, August 2010

Beverly, MA, site looking south, August 2010

7.2 Background and Supporting Information

7.2.1 Alternative Names
Ventron Corporation Site, Metal Hydrides Site.

7.2.2 Location
Congress Street, Beverly, MA.

7.2.3 Ownership
Private.

7.2.4 Operations
From 1942 to 1948, uranium-processing operations were conducted to convert uranium oxide to uranium metal powder for the Manhattan Engineer District (MED). Other operations included the recovery of uranium from scrap and turnings resulting from the fabrication of uranium slugs. Note: Thorium operations that were not related to the MED, involving the purification of thorium compounds, were conducted at the site after MED operations ceased.

7.2.5 Contaminants
Natural uranium metal. Note: Thorium-232 and radium-226 contamination was present as a result of thorium purification operations (not related to the MED) that were conducted privately after MED operations ceased.

7.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1985. Memorandum from W. Voigt, DOE, to J. LaGrone, DOE, "Designation of Sites for Remedial Action - Metal Hydrides, Beverly, MA; Bridgeport Brass, Adrian, MI, and Seymour, CT; and National Guard Armory, Chicago, IL," December 17.

7.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

Site-specific standard for total uranium: 100 pCi/g
Site-specific standard for uranium-238: 50 pCi/g

DOE (U.S. Department of Energy), 1993. Letter from A. Williams, DOE, to L. Price, DOE, "Uranium Guidelines for Ventron Site, Beverly, MA," CCN 108174, September 1.

Argonne National Laboratory performed a risk analysis using the resident subsistence farmer as a most conservative scenario and concluded that the site-specific criteria for total uranium of 100 pCi/g is equivalent to an annual exposure of 36 millirems per year (mrem/yr), which is less than the 100 mrem/yr DOE dose guideline.

Site documents indicate that 40 percent of the slab area was removed to access soil contamination. Any remaining slabs can safely be removed and disposed of as unregulated material when the property is redeveloped.

DOE (U.S. Department of Energy), 1997. Memorandum from A. Johnson, DOE, to W. Seay, DOE, "Ratification, Confirmation, and Changes to Supplemental Standards for Residual Radioactive Material at the Ventron Site, Beverly, Massachusetts," CCN 127-GOAGAM-00007, September 29.

7.2.8 Remedial Action

Remediated tidal flats area, exterior soil, and interior surface contamination, both government- and non-government-related, to levels below guidelines established for the site in two phases: September 1995 (harbor area) and from May1996 to March 1997 (remainder of the site).

7.2.9 Release Survey

DOE (U.S. Department of Energy), 2003. *Post-Remedial Action Report for the Remedial Action at the Ventron Site, Beverly, Massachusetts*, Document No. 2144, prepared by Bechtel National, Inc., March.

7.2.10 Independent Verification

DOE (U.S. Department of Energy), 2003. *Verification Survey of the Ventron Site, Beverly, Massachusetts*, ORISE 03-0321, prepared by the Oak Ridge Institute for Science and Education, March.

7.2.11 Use Restrictions

Unrestricted.

7.2.12 Institutional Controls and Enforcement

Not applicable.

7.2.13 Monitoring and Site Inspections

Not required.

7.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 2003. "Certification of the Radiological Condition of the Ventron Site in Beverly, MA," October. (Published in the *Federal Register* on October 21, 2003 [68 FR 60097].)

MDPH (Massachusetts Department of Public Health), 1996. Letter from T. O'Connell, MDPH, to J. Koptic, DOE, "Approval of Remediation Approach," CNN 143840, June 21.

7.2.15 Agreements and Permits

None.

8.0 Buffalo, New York, Site

8.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Buffalo, New York, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance.

Following remediation, the U.S. Army Corps of Engineers (USACE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no institutional controls, permits, or agreements in effect at the site.

8.1.1 Site Conditions

After remediation, USACE modeled risk to future site occupants. Under the most restrictive future land use, a residential farmer would receive a maximum total effective dose equivalent (TEDE) of 1.7 millirems per year (mrem/yr). An industrial worker would receive a maximum TEDE of 0.14 mrem/yr.

U.S. Department of Energy (DOE) personnel most recently visited the site in September 2009 to familiarize staff with final conditions and establish a land use baseline. The site is operated by Niagara Cold Drawn Steel. Land use is mixed residential, commercial, and industrial, and does not appear to be changing.

Buffalo, NY, site, September 2009

8.2 Background and Supporting Information

8.2.1 Alternative Name
Bliss and Laughlin Steel Site.

8.2.2 Location
110 Hopkins Street, Buffalo, NY.

8.2.3 Ownership
Private.

8.2.4 Operations
Machining and straightening uranium metal rods.

8.2.5 Contaminants
Natural uranium metal.

8.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from A. Williams, DOE, to file, "Authority Determination—Former Bliss & Laughlin Steel Company Site, Buffalo, New York," July 27.

DOE (U.S. Department of Energy), 1992. Memorandum from R. Whitfield, DOE, to Manager, Oak Ridge Field Office, " Authorization for Remedial Action at the Former Bliss and Laughlin Steel Company Site, Buffalo, New York," October 8.

8.2.7 Cleanup Criteria
Release Criterion: Total effective dose equivalent: 25 mrem/year (Title 10 *Code of Federal Regulations* Part 20 Subpart E)

Site-specific derived concentration guideline for surface contamination: 5,000 disintegrations per minute per 100 centimeters squared.

USACE (U.S. Army Corps of Engineers), 1998. *Record of Decision for the Bliss and Laughlin Site*, December.

Site-specific derived concentration guideline for uranium in soil: 100 picocuries per gram

USACE (U.S. Army Corps of Engineers), 1998. Technical Memorandum, "Cleanup Goals for Soil at the Former Bliss and Laughlin Facility."

8.2.8 Remedial Action
Remediation of the Buffalo Site occurred from December 1998 to March 1999. Trusses were remediated by scraping and wiping, and then removing the residual dust with a high-efficiency vacuum. Scabbling (a process that breaks up and removes the surface of concrete) and jackhammers were used to remove surface contamination from the floor and from the concrete over the trench west of the Special Finishing Area. The second trench and a pit area contained uranium metal shavings and debris, which were removed manually. The concrete pad covering this trench was jackhammered, and the trench walls and floors were scabbled, jackhammered, and sand-blasted.

8.2.9 Release Survey

USACE (U.S. Army Corps of Engineers), 1999. *Final Status Survey Report for the Bliss and Laughlin Site, Buffalo, New York,* prepared by Dames and Moore, June 10. [Attached to USACE (U.S. Army Corps of Engineers), 1999. *Closure Report, Decontamination of the Former Bliss and Laughlin Facility, Buffalo, New York,* September 30.]

8.2.10 Use Restrictions

None.

USACE (U.S. Army Corps of Engineers), 2002. *Post-Remedial Radiological Dose and Risk Assessment for the Bliss and Laughlin Site, Buffalo, New York*, LTSM012583*,* March 5.

8.2.11 Institutional Controls and Enforcement

Not applicable.

8.2.12 Monitoring and Site Inspections

Not required.

8.2.13 Certification and Regulator Concurrence

USACE (U.S. Army Corps of Engineers), 1999. *Declaration of Remedial Action Completion and Issuance of Closure Report,* September 30. [Attached to USACE (U.S. Army Corps of Engineers), 1999. *Closure Report, Decontamination of the Former Bliss and Laughlin Facility, Buffalo, New York,* September 30.]

NYSDEC (New York State Department of Environmental Conservation), 2000. Letter, P.J. Merges, NYSDEC, to C. Marranca, USACE, "Closure Report: Decontamination of the Former Bliss and Laughlin Facility, Niagara Cold Steel, Buffalo, New York (September 13, 1999)," January 7. (Conveys State concurrence in cleanup of trenches.)

Regulator concurrence of remediation of building structures not found in project files.

8.2.14 Agreements and Permits

None.

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9.0 Chicago North, Illinois, Site

9.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Chicago North, Illinois, Site include:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

9.1.1 Site Conditions

After remediation, surface and soil contamination levels were less than authorized limits. The maximum uranium-238 level was 13.4 picocuries per gram (pCi/g). Gamma exposure rates were approximately 11 microroentgens per hour. Surface contamination levels were less than 990 disintegrations per minute per 100 centimeters squared (dpm/100 cm^2) for alpha radiation. Beta radiation levels ranged as high as 8,000 dpm/100 cm^2 but did not exceed the average or maximum limits. Removable contamination levels were less than authorized limits.

DOE personnel conducted a drive-by visit in April 2006 to collect baseline information on land use and development trends. The Chicago North site remains an active National Guard armory. The site is in an area used for government and public purposes, with the University of Chicago located east of the National Guard facility.

Removing sludge and placing in drums at National Guard Armory, Chicago North, IL, site, September 1987 (DOE Digital Archive)

Scabbling concrete at National Guard Armory, Chicago North, IL, site, September 1987 (DOE Digital Archive)

Chicago North, IL, site, April 2006

9.2 Background and Supporting Information

9.2.1 Alternative Name
National Guard Armory.

9.2.2 Location
East 52nd Street and Cottage Grove Ave., Chicago, IL.

9.2.3 Ownership
State of Illinois.

9.2.4 Operations
1942−1951, storage and processing of uranium metal; central procurement and shipping location for the Manhattan Engineer District Metallurgical Laboratory.

9.2.5 Contaminants
Natural uranium metal and dry uranium oxide.

9.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1985. Memorandum from W.R. Voigt, Jr., DOE, to J. LaGrone, DOE, "Designation of Sites for Remedial Action - Metal Hydrides, Beverly, MA; Bridgeport Brass, Adrian, MI and Seymour, CT; National Guard Armory, Chicago, IL," December 17.

9.2.7 Cleanup Criteria

DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

Site-specific standard, uranium-238 in soil: 150 pCi/g (assumes natural isotopic abundances)

DOE (U.S. Department of Energy), 1987. *Derivation of a Uranium Residual Radioactivity Guideline for the National Guard Armory in Chicago, IL*, prepared by Argonne National Laboratory, May.

9.2.8 Remedial Action

Initial surveys in 1977 and 1978. Removed contamination from building surfaces, catch basins (sludge), and soil. Remediation completed 1987.

9.2.9 Release Survey

DOE (U.S. Department of Energy), 1988. *Post-Remedial Action Report for the National Guard Armory, Chicago, IL*, Rev. 1, DOE/OR/20722-184, December.

9.2.10 Independent Verification

DOE (U.S. Department of Energy), 1988. *Verification of Remedial Action, Illinois National Guard Armory, Chicago, IL*, ORAU 88/A-20, prepared by Oak Ridge Associated Universities, February.

9.2.11 Use Restrictions

Unrestricted.

9.2.12 Institutional Controls and Enforcement

Not applicable.

9.2.13 Monitoring and Site Inspections

Not required.

9.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1989. *Statement of Certification: National Guard Armory in Chicago, Illinois*, February 17. (Published in the *Federal Register* on February 17, 1989, published notice not in project files.)

9.2.15 Agreements and Permits

None.

10.0 Chicago South, Illinois, Site

10.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Chicago South, Illinois, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries
- Potential monitoring for sewer disturbance

The following ***are not required*** at the site:

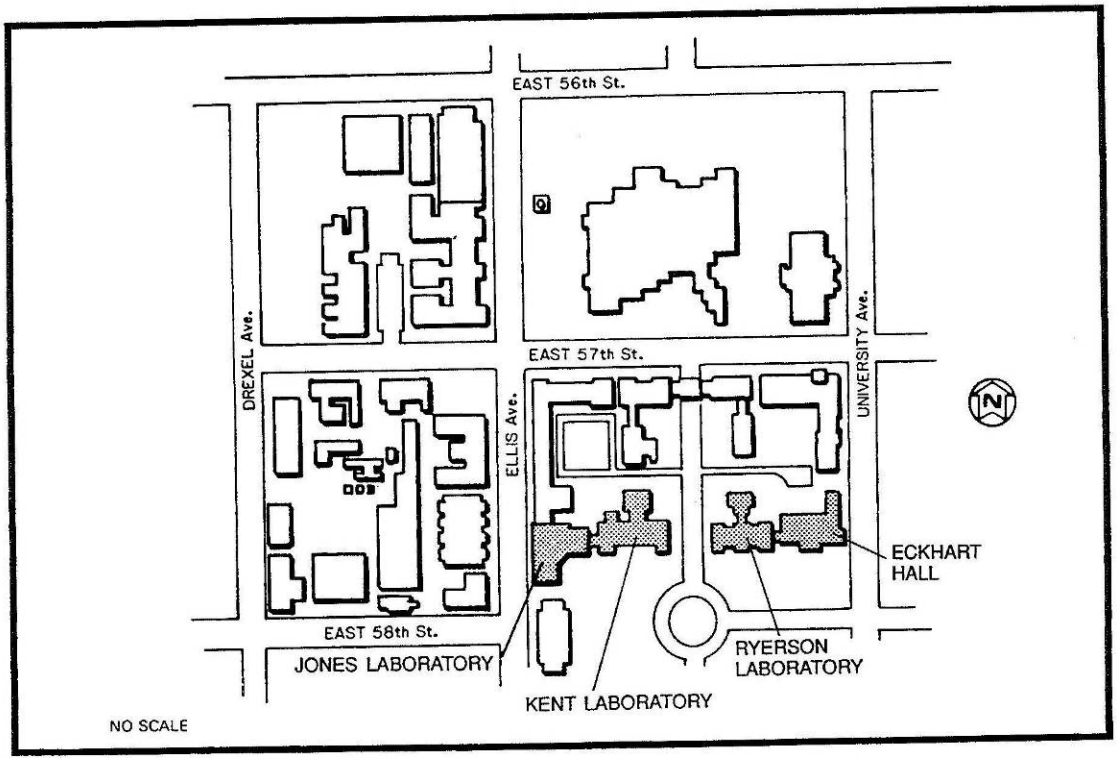
- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site. DOE will determine if demolition debris from contaminated sewers will require disposal as regulated waste.

10.1.1 Site Conditions

Site has been released for unrestricted use. The 171-acre site comprises the Ryerson Physical Laboratory, Kent Chemical Laboratory, G.H. Jones Chemical Laboratory, and Eckhart Hall. Other buildings associated with this site were removed.

Sewers associated with Ryerson Physical Laboratory, Eckhart Hall, Kent Chemical Laboratory, and G.H. Jones Chemical Laboratory were found to be contaminated but were not remediated due to inaccessibility. DOE will confirm this information is included in University records.



Map showing affected areas at the Chicago South, IL, site (University of Chicago)

10.2 Background and Supporting Information

10.2.1 Alternative Name
University of Chicago Site.

10.2.2 Location
Ellis Ave and East 58th Street, Chicago, IL.

10.2.3 Ownership
Private.

10.2.4 Operations
Production and purification of plutonium; metals toxicology; research and development for creation and operation of Chicago Pile-1 and Manhattan Engineer District/U.S. Atomic Energy Commission activities. Research occurred from 1942 to 1952. Work occurred in the New Chemistry Laboratory and Annex, West Stands, Ryerson Physical Laboratory, Eckhart Hall, Kent Chemical Laboratory, G.H. Jones Chemical Laboratory, and Ricketts Laboratory.

10.2.5 Contaminants
Natural uranium and daughters, thorium-232 and daughters, fission products, and plutonium-239.

DOE (U.S. Department of Energy), 1984. *Formerly Utilized MED/AEC Sites Remedial Action Program, Report of the Decontamination of Jones Chemical Laboratory, Ryerson Physical Laboratory, and Eckhart Hall, the University Of Chicago, Chicago, Illinois*, ANL-OHS/HP-84-108, prepared by Argonne National Laboratory, August.

10.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination

DOE (U.S. Department of Energy), 1983. Memorandum from F. Coffman, DOE, to J. LaGrone, DOE, "Designation of the University of Chicago Sites for Remedial Action under the Formerly Utilized MED/AEC Sites Remedial Action Program (FUSRAP)," May 20.

10.2.7 Cleanup Criteria

DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

Site-specific guideline for uranium in soil: 150 picocuries per gram

DOE (U.S. Department of Energy), 1987. *Derivation of Uranium Residual Radioactivity Guidelines for the National Guard Armory in Chicago, Illinois,* prepared by Argonne National Laboratory, May.

10.2.8 Remedial Action

1982, 1983, and 1987. Remediated building surfaces and sewer lines. New Chemistry Laboratory and Annex, West Stands, and Ricketts Laboratory have been torn down. Argonne National Laboratory performed removal and decontamination of walls, floors, ceilings, roofing tiles, and ductwork in the Ryerson Physical Laboratory, Eckhart Hall, and G.H. Jones Chemical Laboratory. University of Chicago decontaminated Kent Chemical Laboratory. Bechtel National, Inc., cleaned the ductwork in the G.H. Jones Chemical Laboratory.

10.2.9 Release Survey

December 1983, August 1984, and January 1989

DOE (U.S. Department of Energy), 1983. *Post-Remedial Action Radiological Survey of Kent Chemical Laboratory, the University of Chicago, Chicago, Illinois*, ANL-OHS/HP-83-107, prepared by Argonne National Laboratory, December.

DOE (U.S. Department of Energy), 1989. *Verification of Remedial Action on Ventilation Systems, Jones Chemical Laboratory, University of Chicago, Chicago, Illinois*, ORAU 89/A-42, prepared by Oak Ridge Associated Universities, January.

DOE (U.S. Department of Energy), 1989. *Post-Remedial Action Report for the George Herbert Jones Chemical Laboratory at the University of Chicago Site, Chicago, Illinois*, DOE/OR/20722-205, prepared by Bechtel National, Inc., January.

10.2.10 Independent Verification

DOE (U.S. Department of Energy), 1988. Letter from S.D. Liedle, Bechtel National, Inc., to J.F. Wing, DOE, "Verification of Remedial Action at the University of Chicago," BNI CCN 050544, January 21.

DOE (U.S. Department of Energy), 1989. *Verification of Remedial Action on Ventilation Systems, Jones Chemical Laboratory, University of Chicago, Illinois*, prepared by Oak Ridge Associated Universities, January.

DOE (U.S. Department of Energy), 1989. Letter from M.R. Landis, DOE, to A. Wallo, DOE, "Verification Activities at University of Chicago," June 14.

10.2.11 Use Restrictions

Unrestricted.

10.2.12 Institutional Controls and Enforcement

Project records state that sewer contamination should be documented in University records. Documentation in project files does not confirm this was done.

DOE (U.S. Department of Energy), 1983. Letter, J.E. Baublitx, DOE, to E.L. Keller, DOE, "University of Chicago Remedial Action Plan, " August 17.

10.2.13 Monitoring and Site Inspections

Not required.

10.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1990. *Statement of Certification, University of Chicago, Chicago, Illinois*, April 20. (Record of publication in the *Federal Register* not in project files.)

10.2.15 Agreements and Permits

None.

11.0 Chupadera Mesa, New Mexico, Site

11.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Chupadera Mesa, New Mexico, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

In 1986, the U.S. Department of Energy (DOE) determined that no further action was required for the Chupadera Mesa Site under the Formerly Utilized Sites Remedial Action Program (FUSRAP) on the basis of radiological data that indicated guidelines for contaminant concentrations were not exceeded. The site was released for "uncontrolled use." There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

11.1.1 Site Conditions

Concentrations of radiological contamination at the Chupadera Mesa site do not exceed applicable cleanup criteria. The Total Effective Dose Equivalent under a residential farming scenario was calculated to be 13 millirems per year (mrem/yr).

11.2 Background and Supporting Information

11.2.1 Location

Twenty-eight miles northeast of the Trinity atomic bomb test site, at White Sands Missile Range, NM (referred to as "Area 21"). This site is within the downwind fallout zone of the Trinity Test (the first atomic weapon test) conducted on July 16, 1945.

11.2.2 Ownership

Private and public.

11.2.3 Operations

None. Open range, used primarily for ranching (cattle grazing).

11.2.4 Contaminants

Longer-lived radionuclides from fallout—primarily cesium-137, strontium-90, plutonium-239, cobalt-60, and europium-155.

11.2.5 FUSRAP Eligibility Determination

Based on radiological conditions, DOE determined that no further action was required for the Chupadera Mesa site.

U.S. Department of Energy, (DOE), 1996. Letter; from E. DeLaney, DOE, to C. Garcia, DOE, "Elimination of the Chupadera Mesa and Los Alamos County Industrial Waste Line Sites from Further Consideration for FUSRAP Inclusion," April 22.

11.2.6 Cleanup Criteria

When DOE evaluated the risk from the residual radioactive contamination at the Chupadera Mesa site, the DOE Total Effective Dose Equivalent limit was 500 mrem/yr.

DOE (U.S. Department of Energy), 1985. *Chupadera Mesa and Near-By Areas, Summary Review to Support the DOE Designation/Elimination Decision*, November 1985.

11.2.7 Remedial Action

No action—radiological data collected by Los Alamos National Laboratory indicates DOE guidelines for remedial action were not exceeded.

DOE (U.S. Department of Energy), 1996. Letter from E. DeLaney, DOE, to C. Garcia, DOE, "Elimination of the Chupadera Mesa and Los Alamos County Industrial Waste Line Sites from Further Consideration for FUSRAP Inclusion," April 22.

11.2.8 Release Survey

DOE (U.S. Department of Energy), 1985. *Radiological Survey and Evaluation of the Fallout Area from the Trinity Test,* LA-10256-MS, prepared by Los Alamos National Laboratory, June.

11.2.9 Independent Verification

Not applicable.

11.2.10 Use Restrictions

None.

DOE (U.S. Department of Energy), 1985. *Radiological Survey and Evaluation of the Fallout Area from the Trinity Test*, LA-10256-MS, June. (Report was used to exclude the site from further consideration by FUSRAP, stating, "Comparison of the estimated inhalation and ingestion doses with the DOE and EPA guidance indicates there is no cause for concern for individuals living full time in the uncontrolled areas of the fallout zone.")

11.2.11 Institutional Controls and Enforcement

Not applicable.

11.2.12 Monitoring and Site Inspections

Not required.

11.2.13 Certification and Regulator Concurrence

Not applicable; DOE determined that no further action was required for the Chupadera Mesa site.

DOE (U.S. Department of Energy), 1996. Letter from E. DeLaney, DOE, to C. Garcia, DOE, "Elimination of the Chupadera Mesa and Los Alamos County Industrial Waste Line Sites from Further Consideration for FUSRAP Inclusion," April 22.

11.2.14 Agreements and Permits

None.

12.0 Columbus East, Ohio, Site

12.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Columbus East, Ohio, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

12.1.1 Site Conditions

After remediation, radionuclide concentrations in soil were less than 30 picocuries per gram (pCi/g) of uranium-238, less than 2.3 pCi/g of radium-226, and less than 2.2 pCi/g of thorium-232. Average surface activities meet the guidelines and spotty contamination remained in scattered areas imbedded in concrete and metal.

DOE personnel most recently visited the site in June 2010. The former B&T Metals building is derelict. News reports indicate the area is slated for redevelopment.

Columbus East site (B&T Metals), January 1995; most contamination was in the right (northwest) corner of the building (DOE Digital Archive)

Former B&T Metals Building, June 2006

12.2 Background and Supporting Information

12.2.1 Alternative Name
B&T Metals Site.

12.2.2 Location
425 West Town Street, Columbus, OH.

12.2.3 Ownership
Private.

12.2.4 Operations
Uranium metal forming (heating and extruding rods) for the Manhattan Engineer District through a contract with E.I. DuPont de Nemours and Co., Inc., in 1943.

12.2.5 Contaminants
Natural uranium metal.

12.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from W. Williams, DOE, to file, "Authority Determination—B&T Metals in Columbus, Ohio," CCN 096627, February 21.

DOE (U.S. Department of Energy), 1992. Memorandum from J.W. Wagoner, DOE, to L. Price, DOE, "Authorization for Remedial Action at B&T Metals in Columbus, Ohio," CCN 095792, September 25.

12.2.7 Cleanup Criteria
DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Change 2, January 1993.

Site-specific standard for total uranium in soil: 35 pCi/g

DOE (U.S. Department of Energy), 1996. Letter from C. Yu, DOE, to A. Williams (DOE), "BTM-Derivation of Guidelines for Uranium Residual Radioactive Material in Soil," CCN 140147, prepared by Argonne National Laboratory, March 14.

12.2.8 Remedial Action
1943, 1996. Remediated building surfaces and equipment, drains, soil, and manholes in nearby streets. Completed June 1996.

12.2.9 Release Survey
DOE (U.S. Department of Energy), 1996. *Post-Remedial Action Report for the B&T Metals Site, Columbus, Ohio*, DOE/OR/21949-406, prepared by Bechtel National, Inc., October.

12.2.10 Independent Verification

DOE (U.S. Department of Energy), 1997. *Results of the Independent Radiological Survey at B&T Metals, 425 West Town Street, Columbus, Ohio*, CO001V, prepared by Oak Ridge National Laboratory, June.

12.2.11 Use Restrictions

Unrestricted.

12.2.12 Institutional Controls and Enforcement

Not applicable.

12.2.13 Monitoring and Site Inspections

Not required.

12.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 2001. "Notice of Certification," May. (Published in the *Federal Register* on June 26, 2001 [66 FR 33954].)

12.2.15 Agreements and Permits

None.

13.0 Fairfield, Ohio, Site

13.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Fairfield, Ohio, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Contamination was removed from the shop area and from several small exterior areas of this light industrial property. Following remediation, the U.S. Department of Energy (DOE) certified that residual contamination remaining onsite will not result in radiological exposure above current guidelines established to protect members of the general public or site occupants.

Supplemental limits were applied to residual uranium-238 that was left in place in soil beneath a concrete slab of a bay built in 1994 on the east end of the original building.

13.1.1 Site Conditions

The supplemental limits area contains elevated uranium-238 in a soil area of 167 meters squared beneath an addition built on the east end of the building in 1994. The contamination is adjacent to a roll-up door in the adjoining wall of the original building. Uranium-238 concentrations ranged as high as 134 picocuries per gram (pCi/g), which exceeded the site-specific uranium limit. The average uranium-238 concentration was 6.1 pCi/g. The total effective dose equivalent is 4.2 millirems per year (mrem/yr) for an industrial worker and 17.4 mrem/yr for a residential farmer. This dose rate was compared to a proposed dose limit of 25 mrem/yr. There is no unacceptable risk from the soil containing the elevated uranium-238. Therefore, there are no institutional controls, permits, or agreements in effect at the site.

DOE personnel most recently visited the site in July, 2010. The site is operated by Force Control as a machine and fabrication shop and includes office space. An addition was built in 1992 on the west end of the original building facing the highway, and another addition was built on the east end of the original building in 1994. The site is unchanged from its configuration at the time remedial action occurred, and inspectors noted nothing that would diminish protectiveness.

Interior remediation at the Fairfield, OH, site, December 1994 (DOE Digital Archive)

West end of the Fairfield, OH, site, June 2006

13.2 Background and Supporting Information

13.2.1 Alternative Name
Associate Aircraft Tool and Manufacturing Company Site.

13.2.2 Location
3660 Dixie Highway, Fairfield, OH.

13.2.3 Ownership
Private.

13.2.4 Operations
Uranium metal fabrication (machining) for National Lead Company of Ohio, a prime contractor for the U.S. Atomic Energy Commission, in 1956.

13.2.5 Contaminants
Natural uranium metal.

13.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1993. Memorandum from I. Wagoner, DOE, to L. Price, DOE, "Authorization for Remedial Action at the Former Associate Aircraft Site in Fairfield, Ohio," BNI CCN 103598, April 15.

13.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

Site-specific uranium-238 in soil limit: 35 pCi/g

DOE (U.S. Department of Energy), 1995. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Uranium Guidelines for the Associate Aircraft Site, Fairfield, Ohio," BM CCN 126469, February 10.

Supplemental limits were applied to residual uranium-238 in soil left in place beneath a concrete floor slab:

DOE (U.S. Department of Energy), 1995. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "AAS (Associate Aircraft Site) - Hazard Assessment for Radioactive Contamination," BNI CCN 130903, June 5.

13.2.8 Remedial Action
1956, 1994, 1995. Remediated building surfaces and equipment, drains, and soil.

13.2.9 Release Survey
DOE (U.S. Department of Energy), 1996. *Post Remedial Action Report for the Associate Aircraft Site, Fairfield, OH*, DOE/OR/21949-343, prepared by Bechtel National, Inc., July.

13.2.10 Independent Verification
DOE (U.S. Department of Energy), 1996. *Results of the Independent Verification Survey at the Former Associate Aircraft Tool and Manufacturing Company Site, Fairfield, Ohio*, ORNL/RASA-95/15, prepared by Oak Ridge National Laboratory, May.

13.2.11 Use Restrictions
Unrestricted.

13.2.12 Institutional Controls and Enforcement
Not applicable.

13.2.13 Monitoring and Site Inspections
Not required.

13.2.14 Certification and Regulator Concurrence
DOE (U.S. Department of Energy), 1996. "Notice of Certification," September. (Published in the *Federal Register* on September 16, 1996, [61 FR 48667].)

DOE (U.S. Department of Energy), 1995. Letter from D. Adler (DOE) to G. Mitchell (Ohio Environmental Protection Agency), "AAS (Associate Aircraft Site) - Hazard Assessment for Residual Contamination" BNI CCN 132318, July 18.

13.2.15 Agreements and Permits
None.

14.0 Granite City, Illinois, Site

14.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Granite City, Illinois, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

14.1.1 Site Conditions

After remediation, surface contamination levels were less than the authorized limits in DOE Order 5400.5. No soil contamination was remediated. Gamma exposure rates ranged from 8.2 to 9.0 microroentgens per hour (μR/hr); background is 7.4 μR/hr.

The Betatron (industrial x-ray) building had not been used since before remediation was conducted. DOE personnel visited the site in 2006 to obtain baseline information on land use. The property is a former steel manufacturing facility that is mostly derelict. In preparation for a site visit in 2011, DOE staff found that public-domain aerial imagery shows the Betatron building has been removed (http://www.lm.doe.gov/Granite_City/Sites.aspx). The prevailing land use remains industrial with commercial and residential use nearby.

Betatron building at the Granite City, IL, site before remediation was conducted, 1991 (DOE Digital Archive)

2011 Aerial photo of the Granite City, Illinois, site showing the Betatron building removed

14.2 Background and Supporting Information

14.2.1 Alternative Name
Granite City Steel Site.

14.2.2 Location
1417 State Street, Granite City, IL.

14.2.3 Ownership
Private.

14.2.4 Operations
From 1958 to 1966, natural uranium ingots were x-rayed at the site for the U.S. Atomic Energy Commission (AEC), using government-owned Betatron (magnetic induction electron accelerator) machines to detect metallurgical flaws on an as-required basis.

14.2.5 Contaminants
Natural uranium metal.

14.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from J.W. Wagoner, DOE, to L. Price DOE, "Designation for Remedial Action at the Granite City Steel Site," BNI CCN 095802, September 25.

DOE (U.S. Department of Energy), 1992. Letter from R.P. Whitfield, DOE, to J. LaGrone, DOE, "Authorization for Remedial Action at Granite City Steel Site, Granite City, Illinois," October 8.

14.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Change 2, January 1993.

14.2.8 Remedial Action
Remediated discrete localized spots of contamination in the Betatron building interior surfaces and equipment. No exterior contamination associated with AEC operations was found. Remediation completed June 1993

14.2.9 Release Survey
DOE (U.S. Department of Energy), 1993. *Post-Remedial Action Report for the Granite City Site,* DOE/OR/21949-371, September.

14.2.10 Independent Verification
DOE (U.S. Department of Energy), 1994, *Results of Independent Radiological Verification Survey at the Old Betatron Building, Granite City, Illinois*, ORNL/RASA-94/2, prepared by Oak Ridge National Laboratory, July.

14.2.11 Use Restrictions
Unrestricted.

14.2.12 Institutional Controls and Enforcement
Not applicable.

14.2.13 Monitoring and Site Inspections
Not required.

14.2.14 Certification and Regulator Concurrence
DOE (U.S. Department of Energy), 1994. "Notice of Certification." (Published in the *Federal Register* on June 14, 1994 [59 FR 30573].)

14.2.15 Agreements and Permits
None.

15.0 Hamilton, Ohio, Site

15.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Hamilton, Ohio, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

15.1.1 Site Conditions

After remediation, alpha and beta surface activities were less than the release criteria for surface contamination. Gamma exposure rates were at background levels. No exterior contamination was found.

DOE personnel visited the site most recently in July 2010 to assess land use. The area still has light industrial use but recent commercial development has occurred on adjacent property and residential use is nearby.

The Hamilton, OH, site after remediation, February 1995 (DOE Digital Archive)

The Hamilton, OH, site in June 2006, showing third floor where FUSRAP remediation occurred

15.2 Background and Supporting Information

15.2.1 Alternative Name
Herring-Hall-Marvin Safe Company Site.

15.2.2 Location
1550 Grand Boulevard, Hamilton, OH.

15.2.3 Ownership
Private.

15.2.4 Operations
Fabrication and machining of natural uranium metal slugs from rolled stock under subcontract to prime Manhattan Engineer District contractors University of Chicago in 1943 and E.I. DuPont de Nemours and Co., Inc., in 1951.

15.2.5 Contaminants
Natural uranium metal.

15.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
DOE (U.S. Department of Energy), 1994. Memorandum from W.A. Williams, DOE, to file, "Authority Determination - Former Herring-Hall-Marvin Safe Co., Hamilton, Ohio," BNI CCN 114465, March 8.

DOE (U.S. Department of Energy), 1994. Memorandum from R.P. Whitfield, DOE, to J. LaGrone, DOE, "Authorization for Remedial Action at the Former Herring-Hall-Marvin Safe Co., Hamilton, Ohio," BNI CCN 115803, April 20.

15.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

15.2.8 Remedial Action
Remediation of third-floor wall and floor surfaces and drains. Remedial action completed March 1995.

15.2.9 Release Survey
DOE (U.S. Department of Energy), 1996. *Post-Remedial Action Report for the Herring-Hall-Marvin Safe Company Site, Hamilton, Ohio*, DOE/OR/21949-391, prepared by Bechtel National, Inc., February.

15.2.10 Independent Verification
DOE (U.S. Department of Energy), 1995. *Results of Radiological Verification Survey at the Former Herring-Hall-Marvin Safe Company, 1550 Grand Boulevard, Hamilton Ohio*, ORNL/RASA-95/14, prepared by Oak Ridge National Laboratory, November.

15.2.11 Use Restrictions
Unrestricted.

15.2.12 Institutional Controls and Enforcement
Not applicable.

15.2.13 Monitoring and Site Inspections
Not required.

15.2.14 Certification and Regulator Concurrence
DOE (U.S. Department of Energy), 1996. "Notice of Certification." (Published in the *Federal Register* on December 3, 1996 [61 FR 64072].)

15.2.15 Agreements and Permits
None.

16.0 Indian Orchard, Massachusetts, Site

16.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Indian Orchard, Massachusetts, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. Supplemental limits were applied for residual uranium remaining embedded on some building surfaces. A follow-up radiological survey conducted in 2003 concluded that the property continued to meet the criteria for unrestricted use. There are no institutional controls, permits, or agreements in effect at the site.

16.1.1 Site Conditions

After remediation, radium-226 and thorium-230 concentrations in soil were less than 1 picocurie per gram (pCi/g), and the maximum uranium-238 concentration was 14 pCi/g. The buildings have since been demolished.

DOE personnel visited the Indian Orchard site in August 2008. The site was being redeveloped, and no above-ground structures remain.

Indian Orchard, MA, site, August 2008

16.2 Background and Supporting Information

16.2.1 Alternative Names
Chapman Valve Site, Chapman Valve Manufacturing Company Site.

16.2.2 Location
203 Hampshire Street, Indian Orchard, MA.

16.2.3 Ownership
Private.

16.2.4 Operations
Machined extruded uranium rods (and possibly conducted rolling operations on uranium metal) for the Brookhaven Laboratory in 1948.

16.2.5 Contaminants
Natural uranium metal.

16.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from W.A. Williams, DOE-HQ, to file, "Authority Determination - Former Chapman Valve Manufacturing Company Facility, Indian Orchard, Massachusetts," CCN 098808, December 15.

DOE (U.S. Department of Energy), 1992. Memorandum from James W. Wagoner II, DOE, to L. Price, DOE, "Authorization for Remedial Action at the Chapman Valve Manufacturing Company Facility, Indian Orchard, Massachusetts," CCN 098808, December 15. (Attachment: "Designation Summary for Chapman Valve Manufacturing, Indian Orchard, Massachusetts.")

16.2.7 Cleanup Criteria

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Change 2, January 1993.

No site-specific uranium guideline determined; typical total uranium in soil guideline of 50 to 100 pCi/g and uranium-238 guideline of 35 to 50 pCi/g were used for comparison.

Supplemental limits: 15,000 disintegrations per minute per 100 centimeters squared for alpha or beta-gamma activity averaged over individual roof trusses, portions of the roof, interior walls, and wood block flooring

DOE (U.S. Department of Energy), 1995. Letter from J.W. Wagoner to L. Price, July 27.

DOE (U.S. Department of Energy), 1995. *Technical Study for Remedial Action*, May 25.

DOE (U.S. Department of Energy), 1995. *Hazard Assessment*, calculation No. 133-CV-001, December 18. (The hazard assessment was conducted for worst-case scenarios, i.e., demolition and reuse of building materials.)

DOE (U.S. Department of Energy), 1995. Memorandum from J.W. Wagoner, DOE, to L. Price, DOE, "Supplemental Limits for Residual Uranium at the Chapman Valve Site, Indian Orchard, Massachusetts," CCN 132753, July 27.

DOE (U.S. Department of Energy), 1996. Memorandum from A.S. Johnson, DOE, to L. Price, DOE, "Supplemental Limits for Residual Uranium at the Chapman Valve Site," CCN 144918, July 31. (Attachment: DOE (U.S. Department of Energy), 1996. *Chapman Valve Site - Draft Technical Memorandum Post Remedial Action Report*," CCN 143419, prepared by Bechtel National, Inc., June 20.)

16.2.8 Remedial Action

Remediated interior building surfaces, including floors, walls, and overhead beams. No subsurface soil contamination found beneath the concrete base slab except beneath a concrete ramp just inside the west equipment door. Contamination found in floor drain lines. Completed September 1995.

Residual uranium remained embedded in the asphaltic roof materials, wooden roof planks, wood block flooring and one location on the upper north wall; building subsequently demolished after 1996, concrete slab remains.

DOE (U.S. Department of Energy), 2003. Letter from Murray, DOE, to T. McDaniel, U.S. Army Corps of Engineers, July 16.

16.2.9 Release Survey

DOE (U.S. Department of Energy), 1996. *Post Remedial Action Report for the Chapman Valve Site, Indian Orchard, Massachusetts*, DOE/OR/21949-408, prepared by Bechtel National, Inc., November.

16.2.10 Independent Verification

DOE (U.S. Department of Energy), 1997. *Results of Independent Radiological Verification Survey at the Former Chapman Valve Manufacturing Company Site*, ORNL/RASA-95/17, prepared by Oak Ridge National Laboratory, May.

16.2.11 Use Restrictions

Unrestricted.

16.2.12 Institutional Controls and Enforcement

Not applicable.

16.2.13 Monitoring and Site Inspections

Not required.

16.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 2004. "Notice of Certification." (Published in the *Federal Register* on January 20, 2004 [69 FR 2908].)

MDEP (Massachusetts Department of Environmental Protection), 1995. Letter from A. Weinberg, MDEP, to A. Pantaleoni, Crane Co., "Concurrence with DOE Remedial Action Plan," CCN 131136, June 15.

MDOH (Massachusetts Department of Health), 1995. Letter from T.F. O'Connell, MDOH, to J. Kopotic, DOE-FSRD, "Concurrence with DOE Remedial Action Plan," CCN 131136, June 14.

16.2.15 Agreements and Permits

None.

17.0 Jersey City, New Jersey, Site

17.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Jersey City, New Jersey, Site include:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

17.1.1 Site Conditions

After remediation, concentrations of radium-226 and uranium-238 did not exceed release criteria.

DOE personnel visited the site in October 2007. A shopping center has been constructed on the eastern portion of the property, facing the highway. On the western portion of the property, facing Newark Bay, townhomes have been built.

Jersey City, NJ, site in October 2007 showing the location where underground oil tank was to be removed; (records indicated this area was unaffected by FUSRAP contamination)

17.2 Background and Supporting Information

17.2.1 Alternative Name
Kellex/Pierpont Site.

17.2.2 Location
New Jersey Route 440 and Kellogg Street, Jersey City, NJ.

17.2.3 Ownership
Private (multiple owners).

17.2.4 Operations
Research and development for the Manhattan Engineer District and the U.S. Atomic Energy Commission, 1943−1953: gaseous diffusion process for uranium enrichment using uranium hexafluoride and solvent extraction process for uranium recovery from ores.

17.2.5 Contaminants
Uranium, radium-226, thorium-232.

17.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
Preliminary surveys began in 1976. This site was one of 73 sites known to have been involved in Manhattan Engineer District or early U.S. Atomic Energy Commission research and development activities and included in an initial survey program conducted between 1974 and 1978. A formal eligibility determination has not been located in project files.

NJDEP (New Jersey Department of Environmental Protection), 1979, Letter, G.J. Tyler, NJEDEP, to W.E. Mott, DOE, February 6.

17.2.7 Cleanup Criteria

Radium-226 and thorium-232 in soil: 5 picocuries per gram (pCi/g)

NJDEP (New Jersey Department of Environmental Protection), 1979. Letter from G.J. Tyler, NJDEP, to W.E. Mott, DOE, May 29.

NJDEP (New Jersey Department of Environmental Protection), 1979. Letter from G.J. Tyler, NJDEP, to W.E. Mott, DOE, September 19.

Site-specific standard for uranium-238 in soil: 40 pCi/g

DOE (U.S. Department of Energy), 1980. *Decontamination Criteria for the Former Kellex Site (Pierpont Property) Remedial Action, Jersey City, New Jersey,* June.

DOE (U.S. Department of Energy), 1980. Letter from T.G. Frangos, DOE, to G.J. Tyler, NJDEP, "Proposed Uranium Criteria," July 14; (contains rationale for limiting uranium to 40 pCi/gram of soil averaged over 400 meters squared).

NJDEP (New Jersey Department of Environmental Protection), 1980. Letter from J. Stanton, NJDEP, to W.E. Mott, DOE, "Agreement on Decontamination Criteria for the Pierport Property, Former Kellex Site," August 22, 1980, (requests radium criterion and external gamma criterion remain at previous levels and approves 40 pCi/gram of uranium in the soil).

17.2.8 Remedial Action

Initial cleanup in 1961. Removed contaminated soil and debris in 1979 and 1983.

17.2.9 Release Survey

DOE (U.S. Department of Energy), 1979. *Post-Decontamination Radiological Survey of a Portion of the Former Kellex Laboratory Site, Jersey City, New Jersey*, August.

DOE (U.S. Department of Energy), 1982. *Radiological Survey of the Former Kellex Research Facility, Jersey City, New Jersey*, DOE/EV-0005/29, prepared by Oak Ridge National Laboratory, February.

17.2.10 Independent Verification

DOE (U.S. Department of Energy), 1983. *Results of the Post Remediation Survey of Areas 4 through 10 of the Former Kellex Site, Jersey City, New Jersey*, DOE/EV-0005/29 (Supplement), February.

17.2.11 Use Restrictions

Unrestricted.

17.2.12 Institutional Controls and Enforcement

Not applicable.

17.2.13 Monitoring and Site Inspections

Not required.

17.2.14 Certification and Regulator Concurrence

NJDEP (New Jersey Department of Environmental Protection), 1983. Letter from S.G. Kuhrtz, NJDEP, to A.J. Whitman, DOE, "Data Review and Concurrence with Remedial Action Criteria," May 23.

DOE (U.S. Department of Energy), 1983. "Statement of Certification: The Former Kellex Laboratory Site, Jersey City, New Jersey," September 13. (Published on October 4, 1983 in the *Federal Register* [48 FR 45281)].

17.2.15 Agreements and Permits

None.

18.0 Madison, Illinois, Site

18.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Madison, Illinois, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries
- Site visit and owner contact every 2 years as a best management practice to ensure that alternate limits area has not been disturbed

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Following remediation, the U.S. Army Corps of Engineers (USACE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no institutional controls, permits, or agreements in effect at the site.

18.1.1 Site Conditions

After remediation, the maximum value in each survey unit met cleanup criteria. The maximum surface activity overall was 2,720 disintegrations per minute per 100 centimeters squared (dpm/100 cm^2), and the maximum uranium concentration in dust remaining in hard to reach areas (on interior window ledges and structural members at the roof level) was 112 picocuries per gram (pCi/g). The average dose for the maximum exposed individual is 8.3 millirems per year for a utility worker working in the existing structure. The dose under a residential land use scenario was not evaluated.

U.S. Department of Energy (DOE) personnel conducted a drive-by visit of the site in 2011 to assess land use and redevelopment trends. The property is in an industrial area. The structure is in use. No evidence of changing land use was noted in the area.

18.2 Background and Supporting Information

18.2.1 Alternative Names

Spectrulite Corporation Site, Dow Chemical Company Site.

18.2.2 Location

Intersection of College and Weaver Streets, Madison, IL.

18.2.3 Ownership

Private.

18.2.4 Operations

During the late 1950s and early 1960s, the Dow Metal Products Division of Dow Chemical Company machined and shaped uranium metal and straightened uranium rods for the

U.S. Atomic Energy Commission. This work was conducted under subcontract to the Uranium Division of the Mallinckrodt Chemical Works.

18.2.5 Contaminants

Natural uranium.

18.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination

DOE (U.S. Department of Energy), 1992. Memorandum from R. Whitfield, DOE, to Manager, Oak Ridge Field Office, "Authorization for Remedial Action at the Former Dow Chemical Company Site in Madison, Illinois," October 8.

DOE (U.S. Department of Energy), 1992. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Authorization for Remedial Action at the Former Dow Chemical Company Facility in Madison, Illinois," September 25.

18.2.7 Cleanup Criteria

Release criterion, Total Effective Dose Equivalent: 25 mrem/year

Title 10 *Code of Federal Regulations* Part 20, Subpart E. (Note that only industrial uses were modeled in deriving the cleanup criteria.)

Derived Concentration Guideline, surface contamination: 6,000 dpm/100 cm^2

Derived Concentration Guideline, volumetric contamination, total uranium: 20 pCi/g

Alternate Limit, volumetric contamination, total uranium: 300 pCi/g for uranium in difficult to access surfaces such as above window ledges at the upper portions of the structure.

USACE (U.S. Army Corps of Engineers), 2000. *Proposed Plan for the Madison Site, Madison, Illinois,* January.

18.2.8 Remedial Action

In June 2000, USACE remediated the Madison Site over a 12-day period. Remediation included vacuuming, scraping, and sweeping approximately 60,000 pounds of dust and debris from overhead surfaces, including window ledges, utility conduits, trusses, and cross-member beams.

18.2.9 Release Survey

USACE (U.S. Army Corps of Engineers), 2000. *Post-Remedial Action Report for the Madison FUSRAP Site, Madison, Illinois,* September.

18.2.10 Use Restrictions

None, assuming continuing industrial use. If the building is demolished, there would be no use restrictions under any exposure scenario. However, if the existing building is converted to another use, risk to occupants should be assessed.

18.2.11 Institutional Controls and Enforcement

Not applicable.

18.2.12 Monitoring and Site Inspections

Owner contact and land use monitoring every 2 years.

18.2.13 Certification and Regulator Concurrence

USACE (U.S. Army Corps of Engineers), 2001. "Declaration of Remedial Action Completion and Issuance of Closure Report," September 14 [appended to USACE (U.S. Army Corps of Engineers), 2001. *Closeout Report for the Formerly Utilized Sites Remedial Action Program (FUSRAP) - Madison Site*, September].

IDNS (Illinois Department of Nuclear Safety), 2000. Letter from G. McCandless, IDNS, to S. Cotner, USACE, "Review [of] Draft Post Remedial Action Report for the Madison FUSRAP Site," October 6.

18.2.14 Agreements and Permits

None.

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19.0 Middlesex North, New Jersey, Site

19.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Middlesex North, New Jersey, Site include:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation of the five acre area where uranium ore residues were disposed of, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

19.1.1 Site Conditions

After remediation, radionuclide concentrations ranged from 0.1 to 43.2 picocuries per gram (pCi/g) for radium-226. Of the 4,800 samples collected and analyzed, results for 32 samples exceeded the subsurface limit for radium-226 of 15 pCi/g but the average radium concentration was less than the standard when averaged over 100 meters squared. The arithmetic mean of the radium-226 results was 1.9 pCi/g. Thorium-232 concentrations ranged from 0.1 to 32.0 pCi/g with an arithmetic mean of 1.6 pCi/g; thorium-232 concentrations also met the standard for concentrations averaged over a 100 meters squared area. Uranium-238 concentrations ranged from 0.3 to 37.6 pCi/g, with an arithmetic mean of 6.5 pCi/g. Gamma exposure rates on the restored surface were at background levels.

In 2008, the New Jersey Department of Environmental Protection provided DOE the results of a radiological survey conducted in 2001 by the Borough of Middlesex, the property owner. Above-background gamma exposure rates were detected at the south end of the property. Records indicated that no anomalies were found on this portion of the property during a DOE aerial survey, but no other radiological data were found. Therefore, DOE commissioned a radiological survey of the entire property that comprises the former Middlesex Municipal Landfill.

DOE identified above-background concentrations of radium-226 and uranium-238 inside the south property boundary along Pershing Avenue. DOE referred the property to the U.S. Army Corps of Engineers (USACE), which will conduct a preliminary assessment to determine if the contamination is eligible for remediation under the Formerly Utilized Sites Remedial Action Program (FUSRAP). If USACE finds the contamination is eligible, the site will revert to "active" status under the sole control of USACE, and USACE will remediate the portions of the site containing the additional contamination.

Middlesex North, NJ, site looking south, 2005

19.2 Background and Supporting Information

19.2.1 Alternative Name
Middlesex Municipal Landfill Site.

19.2.2 Location
Bounded by Mountain Ave., Monroe St., Pershing Ave., and Bound Brook, within the Borough of Middlesex, NJ.

19.2.3 Ownership
Parcel 1: Middlesex Presbyterian Church, 1190 Mountain Ave. (Block 219, Lot 1).
Parcel 2: Borough of Middlesex, Mountain Ave. (Block 219, Lot 2).

19.2.4 Operations
Disposal of soil contaminated with pitchblende (high-grade uranium ore) by activities at Middlesex Sampling Plant; soil was from site grading and construction of ore storage pads in 1948.

19.2.5 Contaminants
Low-level residual source material: radium-226, thorium, and natural uranium.

19.2.6 FUSRAP Eligibility Determination
DOE (U.S. Department of Energy), 1980. Memorandum from S. Greenleigh, DOE, to B. Snyder, DOE, "Legal Opinion - Authority to Decontaminate the Middlesex Municipal Landfill Site, Middlesex, New Jersey," May 30.

19.2.7 Cleanup Criteria

DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

Screening guideline for uranium in soil: 75 pCi/g

DOE (U.S. Department of Energy), 1984. *Action Description Memorandum, Proposed 1984 Remedial Actions at Middlesex, New Jersey*, prepared by Argonne National Laboratory, April 27.

19.2.8 Remedial Action

Removed contaminated soil from the 1948 disposal activity. Remediation completed in 1986.

19.2.9 Release Survey

DOE (U.S. Department of Energy), 1987. *Post-Remedial Action Report for the Middlesex Municipal Landfill, Middlesex, NJ*, DOE/OR/20722-135, February.

19.2.10 Independent Verification

DOE (U.S. Department of Energy), 1987. *Verification of Remedial Action, Middlesex Municipal Landfill, Middlesex, NJ*, prepared by Oak Ridge Associated Universities, September.

19.2.11 Use Restrictions

Unrestricted.

19.2.12 Institutional Controls and Enforcement

Not applicable.

19.2.13 Monitoring and Site Inspections

Not required.

19.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1989. *Statement of Certification: Property Forming Part of the Middlesex Municipal Landfill* (Parcel 1), April 7.

DOE (U.S. Department of Energy), 1989. *Statement of Certification: Property Forming Part of the Middlesex Municipal Landfill* (Parcel 2), April 7.

DOE (U.S. Department of Energy), 1989. "Certification of the Radiological Condition of Middlesex Municipal Landfill in Middlesex, NJ," April 21. (Published in the *Federal Register*, May 8, 1989 [54 FR 19603].)

19.2.15 Agreements and Permits

None.

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20.0 New Brunswick, New Jersey, Site

20.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the New Brunswick, New Jersey, Site are as follows:

- Annual site inspection to ensure restricted area is not disturbed, with submittal of protectiveness certification to the New Jersey Department of Environmental Protection (NJDEP) every other year
- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards. There are no supplemental limits in effect at the site. An institutional control was placed on the property to prevent excavation into soil containing elevated levels of arsenic in the northeast portion of the site.

20.1.1 Site Conditions

After remediation, radionuclide concentrations in soil or activities on the remaining pavements and slabs did not exceed authorized limits. No structures remain at the site. Soil used to backfill excavations was found to contain arsenic at levels exceeding State standards and DOE imposed an institutional control to prevent disturbance. Samples indicating elevated radionuclide concentrations were collected in 1982 from a storm drain drop inlet and a sanitary sewer manhole. DOE sampled these locations and could not find contamination above background levels. The site was sold to a non-DOE owner on October 29, 2009.

DOE personnel visit the site at least once every two years to confirm that the restricted area containing the soil with arsenic has not been disturbed. The most recent visit was in August 2011. The site is in a light industrial and commercial district and remains zoned for industrial use. Redevelopment had not begun and the restricted area has not been disturbed.

New Brunswick, NJ, site, August 2010

20.2 Background and Supporting Information

20.2.1 Alternative Names
New Brunswick Site, New Brunswick Laboratory, New Brunswick ERDA Site.

20.2.2 Location
986 Jersey Avenue, New Brunswick, NJ.

20.2.3 Ownership
Private.

20.2.4 Operations
Operated as a general nuclear chemistry laboratory performing radiochemical analyses from 1948 to 1977 for the government's (Manhattan Engineer District, U.S. Atomic Energy Commission, U.S. Energy Research and Development Administration, and DOE) nuclear power and weapons programs.

20.2.5 Contaminants
Uranium and thorium ores, high-purity plutonium, americium-241, and enriched uranium.

20.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
DOE (U.S. Department of Energy), 1990. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Addition of Sites to FUSRAP," August 2.

20.2.7 Cleanup Criteria

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

Site-specific standard for total uranium: 100 picocuries per gram

DOE (U.S. Department of Energy), 1995. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Uranium Guideline for the New Brunswick Site, New Brunswick, New Jersey," December 19.

DOE (U.S. Department of Energy), 1996. *Derivation of Guidelines for Uranium Residual Radioactive Material in Soil at the New Brunswick Site, Middlesex County, New Jersey*, ANL/EAD/TM-54, prepared by Argonne National Laboratory, February.

20.2.8 Remedial Action

Prior to site transfer to FUSRAP, the site was partially remediated in two phases between 1978 and 1983. Phase I consisted of removing contaminated accessible plumbing, equipment, and portions of floors, walls, and ceilings. Phase II included the removal of all above ground structures, including contaminated concrete foundations and on-site drain lines and radioactively-contaminated soil on the front two-thirds of the property. In 1996, under FUSRAP, additional contaminated soil was remediated from a location along the south fence line and from within a railroad spur that had been backfilled with soil contaminated with pitchblende uranium ore received from the Middlesex Municipal Landfill.

At the request of NJDEP, DOE conducted additional groundwater sampling and demonstrated that groundwater quality does not exceed applicable standards. NJDEP also requested additional radiological data on a drop inlet and drain lines entering a sanitary sewer in the public right-of-way at the property frontage. DOE completed the radiological survey of these structures in 2009 and found no indication of above-background radioactivity.

20.2.9 Release Survey

Completed in November 1996:

DOE (U.S. Department of Energy), 1997. *Post Remedial Action Report for the Remedial Action at the New Brunswick Laboratory Site, New Brunswick, New Jersey*, DOE/OR/21949-411, July.

DOE (U.S. Department of Energy), 1997. *Technical Memorandum – Post-Remedial Action Groundwater Quality Summary for the New Brunswick Site*, No. 144-97-013, Rev. 0, prepared by Bechtel National, Inc., September.

Follow-on Investigations:

USACE (U.S. Army Corps of Engineers), 2006. *Remedial Investigation Technical Memorandum for Soils and Groundwater, New Brunswick ERDA Site, New Brunswick, New Jersey*, August.

DOE (U.S. Department of Energy), 2009. *New Brunswick, New Jersey, Site, Sanitary Sewer Investigation (Manhole 26) Report*, LMS/NBL/S05387, June.

20.2.10 Independent Verification

DOE (U.S. Department of Energy), 2001. *Verification Survey of the New Brunswick Laboratory Site, New Brunswick, New Jersey*, ORISE 01-0987, prepared by Oak Ridge Institute for Science and Education, July.

20.2.11 Use Restrictions

Excavation is restricted in the northeast portion of the site. This restriction is addressed by a Deed Notice (see following section).

20.2.12 Institutional Controls and Enforcement

DOE implemented a Deed Notice in accordance with NJDEP regulations in Section 7.26E of the New Jersey Administrative Code. The Deed Notice restricts excavation through the clean soil layer and into soil containing elevated levels of arsenic. At least once every 2 years, DOE submits a certification of protectiveness as required by State regulations. Enforcement authority rests with the State of New Jersey.

20.2.13 Monitoring and Site Inspections

An inspection at least once every 2 years in support of a certification of protectiveness.

20.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 2001. "Notice of Certification," September 6. (Published in the *Federal Register* on September 21, 2001, [66 FR 48863].)

NJDEP (New Jersey Department of Environmental Protection), 2008. Letter from D. Gaffigan, NJDEP, to A Roos, USACE, "Conditional No Further Action Letter and Covenant Not to Sue with Requirements for Biennial Certification," October 14.

NJDEP (New Jersey Department of Environmental Protection), 2011. Letter from D. Gaffigan, NJDEP, to A Roos, USACE, "No Further Action Letter, Remedial Action Type: Unrestricted Use for Areas of Concern (Manhole 26 and Site-Wide Ground Water), ERDA New Brunswick Laboratory," March 21.

20.2.15 Agreements and Permits

None.

21.0 New York, New York, Site

21.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the New York, New York, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

21.1.1 Site Conditions

After remediation, no removable contamination was found exceeding guidelines in any building. Of 1,200 beta-gamma direct measurements collected after remediation, 20 exceeded the guideline for fixed surface activity but were less than the maximum allowable activity and average activities were less than the guideline. The maximum removable alpha activity was 45 disintegrations per second per 100 centimeters squared; and the maximum removable beta activity was 54 dpm/cm^2. Gamma exposure rates ranged from 10 to 14 microroentgens per hour. No exterior contamination was found.

21.2 Background and Supporting Information

21.2.1 Alternative Name

Baker & Williams Warehouses Site.

21.2.2 Location

513−519, 521−527, and 529−535 W. 20th Street, New York, NY.

Baker and Williams Warehouses, 1990 (DOE Digital Archive)

21.2.3 Ownership
Private.

21.2.4 Operations
Short-term storage of uranium concentrates for the Manhattan Engineer District produced in Port Hope, Canada, from African uranium ores during the early 1940s.

21.2.5 Contaminants
Processed natural uranium; uranium ores, and oxides (orange and yellow sodium uranate, sodium uranyl carbonate, black uranium oxide).

21.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
DOE (U.S. Department of Energy), 1990. Letter from J. Fiore, DOE, to L. Price, DOE, "Authorization for Remedial Action at the Former Baker and Williams Warehouses on West 20th Street in New York, New York, under FUSRAP," BNI CCN 070264, August 1.

DOE (U.S. Department of Energy), 1990. Letter from W. Seay, DOE, to F. Bradley, New York State Department of Labor, "Designation of the Former Baker and Williams Warehouses into DOE's Formerly Utilized Sites Remedial Action Program," BNI CCN 071634, September 27.

21.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

21.2.8 Remedial Action
Remediated areas of fixed contamination on interior surfaces (floors primarily, some lower walls) at two of the three warehouse buildings, Buildings 521−527 and Buildings 513−519, in 1991 and 1993, respectively. No contamination exceeding guidelines was found in Buildings 529−535.

21.2.9 Release Survey
DOE (U.S. Department of Energy), 1992. *Post-Remedial Action Report for Buildings 521-527, Baker & Williams Warehouses Site, New York, New York*, DOE/OR/21949-301, February.

DOE (U.S. Department of Energy), 1994. *Post-Remedial Action Report for Buildings 513-519, Baker & Williams Site, New York, New York*, DOE/OR/21949-381, May.

21.2.10 Independent Verification
DOE (U.S. Department of Energy), 1992. *Verification Survey of the Baker & Williams Warehouses - Buildings 521–527, New York, New York*, ORISE 92/E-041, May.

DOE (U.S. Department of Energy), 1994. *Verification Survey of the Baker & Williams Warehouses - Buildings 513-519, New York, New York*, June.

21.2.11 Use Restrictions
Unrestricted.

21.2.12 Institutional Controls and Enforcement
Not applicable.

21.2.13 Monitoring and Site Inspections
Not required.

21.2.14 Certification and Regulator Concurrence
DOE (U.S. Department of Energy), 1995. "Notice of Certification." (Published in the *Federal Register* on October 16, 1995 [60 FR 53588].)

DOE (U.S. Department of Energy), 1993. Letter from R. Kirk, DOE, to W.J. Condon, New York State Department of Health, "Baker and Williams Warehouses Site - Completion of Cleanup Activities," BNI CCN 103137, April 20.

DOE (U.S. Department of Energy), 1993. Letter from R. Kirk, DOE, to R. Kulikowski, New York City Department of Health, "Baker and Williams Warehouses Site - Completion of Cleanup Activities," BNI CCN 103137, April 20.

DOE (U.S. Department of Energy), 1993. Letter from R. Kirk, DOE, to R. Aldrich, New York State Department of Labor, "Baker and Williams Warehouses Site - Completion of Cleanup Activities," BNI CCN 103137, April 20.

DOE (U.S. Department of Energy), 1993. Letter from R. Kirk, DOE, to P. Merges, New York State Department of Environmental Conservation, "Baker and Williams Warehouses Site - Completion of Cleanup Activities," BNI CCN 103137, April 20.

21.2.15 Agreements and Permits

None.

22.0 Niagara Falls Vicinity Properties, New York, Site

22.1 LTS&M Requirements

Long-term surveillance and maintenance requirements (LTS&M) for the Niagara Falls Vicinity Properties (VPs), New York, Site include:

- Managing site records
- Responding to stakeholder inquiries
- Annual site visit as a best management practice to remain apprised of stakeholder concerns

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. Supplemental limits were applied to the downstream end of the Central Drainage Ditch. DOE did not implement institutional controls, permits, or agreements at the site. The New York State Department of Health maintains use restrictions on some of the VPs.

22.1.1 Site Conditions

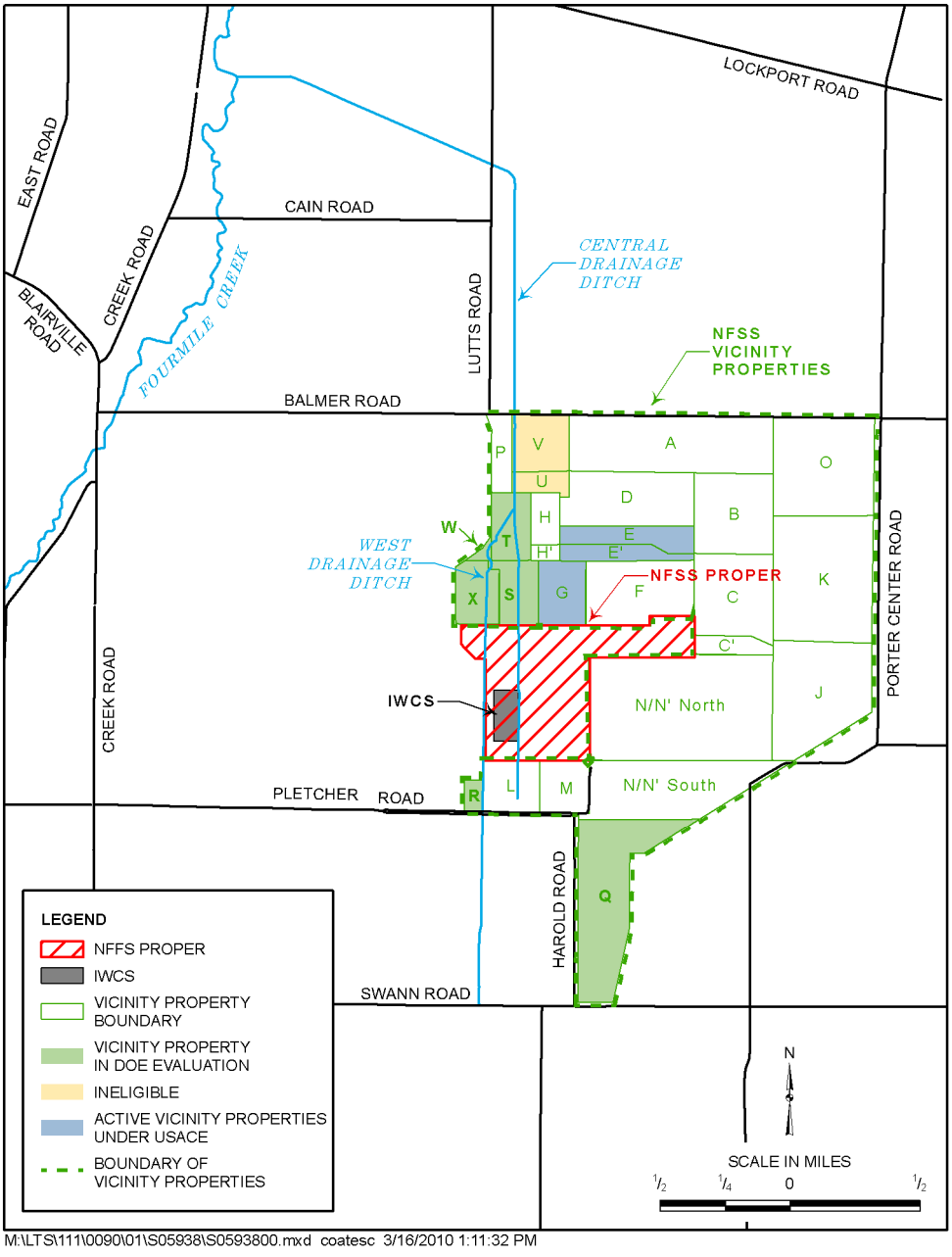
After remediation, radionuclide concentrations did not exceed authorized limits except where supplemental limits were applied to residual radium-226 in soil in the Central Drainage Ditch. The residual radium-226 concentrations in the ditch do not pose unacceptable risk to residents on the basis of dose modeling that assumed the soil would be removed from the ditch and used as fill material for a residential foundation. The modeling assumed the radium-226 concentrations would be diluted to one fourth of the original concentration though the handling. The modeling concluded that radium-226 concentrations as high as 20 picocuries per gram (pCi/g) would not result in unacceptable risk under this residential use scenario. The maximum radium-226 concentration in the unexcavated portion of the ditch where supplemental limits were applied was 11.5 pCi/g.

Of the more than 1,750 post-remediation soil samples collected from the remediated portion of the Central Drainage Ditch, 101 exceeded the average radium-226 concentration limit for soil. Average remediated ditch concentrations were approximately 1.2 pCi/g above background. Seven areas exceeded the 5 pCi/g but were averaged over the 100 meter squared to less than 15 pCi/g. Under a reasonable exposure scenario, DOE determined that the annual dose would be less than 10 millirems per year and released these areas for unrestricted use.

Much of the area comprising the vicinity properties is occupied by a municipal waste landfill and a hazardous waste landfill; access is restricted to these properties. After remedial action was completed, radium-226 was identified on vicinity property H' at concentrations exceeding the cleanup limits and DOE is determining the response.

DOE personnel most recently visited the site in December 2009. Several derelict buildings remain at the former wastewater treatment plant. The Central Drainage Ditch was heavily

vegetated with still water in the bottom of the ditch. Fences prevent access to the landfills. Other portions of the vicinity properties are occupied by municipal or commercial interests. No residential use is occurring on the vicinity properties.



Vicinity property designations at the Niagara Falls Storage Site, NY

Abandoned wastewater treatment plant on Niagara Falls Vicinity Properties site, VP-X, December 2009 (USACE uses the drums to store purge water while awaiting analytical results)

22.2 Background and Supporting Information

22.2.1 Alternative Name
Niagara Falls Storage Site Vicinity Properties Site.

22.2.2 Location
Various parcels subdivided from the former Lake Ontario Ordnance Works, Lewiston, New York.

22.2.3 Ownership
Private and local government (multiple owners).

22.2.4 Operations
Storage of uranium ore processing residues, uranium metal, and radioactive waste began in 1944 under the Manhattan Engineer District. Waste from the Knolls Atomic Power Laboratory and the University of Rochester was disposed of at the site in the early 1950s; this contained mixed fission products. Storage and shipment of radioactive ores and uranium and thorium metal goods occurred from 1944 to at least 1951. The VPs were declared excess and sold after 1971; 21 of 26 VPs were contaminated. Slag containing naturally occurring radioactive material was used in construction of the former Lake Ontario Ordnance Works, of which this site was a part.

22.2.5 Contaminants
Natural uranium, radium, and thorium in soil and sediments. Mixed fission products (predominantly cesium-137, with detectable but sporadic strontium-90 and plutonium-239).

22.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination

DOE (U.S. Department of Energy), 1983. Letter, G.P. Turi, DOE, to E.L. Keller, DOE, "Designation of Niagara Falls Storage Site Off-Site Properties H', L, M, Q, and N/N' South," June 29.

DOE (U.S. Department of Energy), 1983. Memorandum, J.E. Baublitz, DOE, to L.F. Campbell, DOE, "Designation of NFSS Vicinity Property - Areas Along Pletcher Road," November 2.

DOE (U.S. Department of Energy), 1984. Memorandum, J.E. Baublitz, DOE, to E.L. Keller, DOE, "Designation of Niagara Falls Storage Site Vicinity Properties," June 8.

DOE (U.S. Department of Energy), 1985. Letter, W.R. Voigt, DOE, to J. La Grone, DOE, "Designation of Three NFSS Vicinity Properties," December 9.

22.2.7 Cleanup Criteria

DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites,* Rev. 1, July.

Site-specific limits for total uranium and cesium-137: 90 pCi/g and 33 pCi/g, respectively

DOE (U.S. Department of Energy), 1988. Memorandum, P.J. Gross, DOE, to J.J. Fiore, DOE, "NFSS Residual Radioactive Material Guidelines," BNI CCN 055358, August 30.

Supplemental limits for Central Drainage Ditch (20 pCi/g radium-226).

DOE (U.S. Department of Energy), 1986. *Development of a Supplemental Residual Contamination Guideline for the NFSS Central Drainage Ditch*, December.

22.2.8 Remedial Action

From 1953 to 1959, debris and contaminated soil was consolidated to allow transfer of ownership of portions of site. DOE remediated 23 of the 26 vicinity properties eligible for remediation under FUSRAP in 1983 and 1984 to FUSRAP authorized limits. The Central Drainage Ditch was also remediated to FUSRAP authorized limits except were supplemental limits were applied along the Central Drainage Ditch from 500 feet west of Lutts Road to the confluence with Fourmile Creek.

DOE did not complete remediation on three properties because the properties were in use and portions of the properties were inaccessible: USACE will complete remediation and certification of these properties.

22.2.9 Release Survey

DOE (U.S. Department of Energy), 1986. *Post-Remedial Action Report for the Niagara Falls Storage Site Vicinity Properties - 1983 and 1984*, DOE/OR/20722-84, prepared by Bechtel National, Inc., December.

DOE (U.S. Department of Energy), 1989. *Post-Remedial Action Report for the Niagara Falls Storage Site Vicinity Properties - 1985 and 1986*, DOE/OR/20722-133, prepared by Bechtel National, Inc., January.

22.2.10 Independent Verification

DOE (U.S. Department of Energy), 1989. *Verification of 1983 and 1984 Remedial Actions, Niagara Falls Storage Site Vicinity Properties, Lewiston, New York*, ORAU 89/J-178, prepared by Oak Ridge Associated Universities, December.

DOE (U.S. Department of Energy), 1990. *Verification of 1985 and 1986 Remedial Actions, Niagara Falls Storage Site Vicinity Properties, Lewiston, New York*, prepared by Oak Ridge Associated Universities, July.

22.2.11 Use Restrictions

The New York State Department of Health imposed use restrictions in 1972, before the last episode of remediation occurred. These are still in effect.

22.2.12 Institutional Controls and Enforcement

DOE has no requirements for enforcing institutional controls or use restrictions at the Niagara Falls Vicinity Properties Site. State regulators oversee the landfill operations and the New York State Department of Health maintains use restrictions on some of the VPs.

22.2.13 Monitoring and Site Inspections

Not required.

22.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1991. "Statement of Certification: Remedial Action at the Niagara Falls Storage Site Vicinity Properties Associated with the Former MED/AEC Operations" February 26. (Published in the *Federal Register* on October 25, 1991 [56 FR 55292].)

22.2.15 Agreements and Permits

None.

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23.0 Oak Ridge, Tennessee, Warehouses Site

23.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Oak Ridge, Tennessee, Warehouses Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

23.1.1 Site Conditions

After remediation, concentrations of radium-226 and thorium-230 were less than 2 picocuries per gram (pCi/g). Uranium-238 concentrations were less than the site-specific guideline of 35 pCi/g; most results were less than 20 pCi/g. Gamma exposure rates were within the range of background. The dose rate to a residential farmer from a uranium-238 concentration of 35 pCi/g was modeled to be around 15 millirems per year. Lead and polychlorinated biphenyl (PCB) contamination was remediated to less than 100 milligrams per kilogram (mg/kg) and 25 mg/kg, respectively, which are less than the approved limits.

DOE FUSRAP personnel visited this site in April 2011. Most of the parcels associated with the site have been redeveloped for commercial and light industrial use.

Oak Ridge Warehouses site before remediation, January 1990 (DOE Digital Archive)

Oak Ridge Warehouses site after remediation, December 1992 (DOE Digital Archive)

Oak Ridge Warehouses site, April 2011

23.2 Background and Supporting Information

23.2.1 Alternative Name
Elza Gate Site.

23.2.2 Location
Melton Lake Industrial Park, Meco Lane, Oak Ridge, TN.

23.2.3 Ownership
Private.

23.2.4 Operations
Storage site for high-grade African uranium ore (pitchblende) and ore-processing residues for the Manhattan Engineer District in the early 1940s.

23.2.5 Contaminants
High-grade uranium ore (pitchblende), uranium oxide residues, slag, and tailings. Note: PCBs and lead contamination were present from post-DOE private plating operations.

23.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination
DOE (U.S. Department of Energy), 1988. Memorandum from J. Fiore, DOE, to P. Gross, DOE, "Authorization for Remedial Action at the Melton Lake Industrial Park; Former Elza Gate Area Warehouses," Oak Ridge, Tennessee, November 30.

23.2.7 Cleanup Criteria

DOE (U.S. Department of Energy), 1985. *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites*, Rev. 1, July.

Site-specific standard for uranium-238 in soil: 35 pCi/g

DOE (U.S. Department of Energy), 1991. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Uranium Cleanup Guidelines for the Elza Gate, Tennessee, FUSRAP Site," February 6.

Site-specific standard for lead in soil: 1,000 mg/kg

EPA (U.S. Environmental Protection Agency), 1989. *Interim Guidance on Establishing Lead Cleanup Levels at Superfund Sites*, OSWER 9355.4-02.

Site-specific standard for PCBs: 50 mg/kg

EPA (U.S. Environmental Protection Agency), 1990. *Guidance on Remedial Action for Superfund Sites with PCB Contamination*, EPA/540/G-90/007.

23.2.8 Remedial Action

Remediated surface contamination on concrete slabs and surface and subsurface soil contamination (radionuclides to 2.1 meters deep, nonradionuclides to 0.3 meter deep). Minor amounts of asbestos-contaminated soil and an asbestos-wrapped pipe were also remediated. Remediation completed in 1991.

23.2.9 Release Survey

DOE (U.S. Department of Energy), 1992. *Post-Remedial Action Report for the Elza Gate Site, Oak Ridge, Tennessee*, DOE/OR/21949-352, prepared by Bechtel National, Inc., October.

23.2.10 Independent Verification

DOE (U.S. Department of Energy), 1992. *Verification Survey of the Elza Gate Site*, ORISE 92/L-30, prepared by Oak Ridge Institute for Science and Education, December.

23.2.11 Use Restrictions

Unrestricted.

23.2.12 Institutional Controls and Enforcement

Not applicable.

23.2.13 Monitoring and Site Inspections

Not required.

23.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1993. Memorandum from R. Whitfield, DOE, "Federal Register Notice for Certification of Remediation at Oak Ridge, Tennessee," November 1. (Published in the *Federal Register* on November 5, 1993, [58 FR 59020].)

DOE (U.S. Department of Energy), 1991. Letter from D.G. Adler, DOE, to E. Lemming, Tennessee Department of Health and Environment, "Planned Cleanup Levels for the Elza Gate Site," BNI CCN 91-103, February 25.

23.2.15 Agreements and Permits

None.

24.0 Oxford, Ohio, Site

24.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Oxford, Ohio, Site and its associated vicinity properties are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site and vicinity properties complied with applicable cleanup criteria and standards and released the properties for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

24.1.1 Site Conditions

After remediation, radium-226 and thorium-232 concentrations were less than 2.2 picocuries per gram (pCi/g). Uranium-238 concentrations ranged as high as 73 pCi/g, exceeding the site-specific guideline, but the average concentrations over 100 meters squared areas met the guideline. Final dose rates are 11 millirems per year (mrem/yr) for residential farming use and 4 mrem/yr for residential use.

DOE Office of Legacy Management personnel most recently visited the site in June 2010. Area land use is mixed residential and commercial. The former machine shop and office building was demolished and the site is vacant land with native vegetation encroaching on the remediated portion of the site. Documentation demonstrates that site conditions are suitable for unrestricted use.

24.2 Background and Supporting Information

24.2.1 Alternative Names

Alba Craft Laboratory Site, Alba Craft Site.

24.2.2 Location

10-14 West Rose Ave., Oxford, OH
(project also included nearby vicinity properties).

24.2.3 Ownership

Private.

The Alba Craft Laboratory building before remediation (DOE Digital Archive)

Demolition of the Alba Craft Laboratory building, October 1994 (DOE Digital Archive)

Vacant land with duplex on right side of photograph, Oxford, OH, site, June 2006

West Rose Avenue looking west toward remediated site, duplex on right with vacant land beyond, Oxford, OH, site, June 2006

24.2.4 Operations
Uranium metal machining for National Lead Company of Ohio, a U.S. Atomic Energy Commission prime contractor, 1952 to 1957.

24.2.5 Contaminants
Natural uranium metal.

24.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from J.W. Wagoner II, DOE, to L. Price, DOE, "Authorization for Remedial Action at Alba Craft Laboratory in Oxford, Ohio," September 25.

DOE (U.S. Department of Energy), 1993. Memorandum from W.A. Williams, DOE, to L. Price, DOE, "Designation of 525 South Main Street, Oxford, Ohio," October 18. (vicinity property)

DOE (U.S. Department of Energy), 1994. Memorandum from W.A. Williams, DOE, to L. Price, DOE, "Designation of Vicinity Properties in Oxford, Ohio," June 3.

24.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

Site-specific total uranium-in-soil standard: 35 pCi/g

DOE (U.S. Department of Energy), 1994. *Derivation of Uranium Residual Radioactive Material Guidelines for the Former Alba Craft Laboratory Site, Oxford, Ohio*, ANL/EAD/TM-9, prepared by Argonne National Laboratory, January.

DOE (U.S. Department of Energy), 1994. Memorandum from W.A. Williams, DOE, to L. Price, DOE, "Uranium Guidelines for the Alba Craft Site, Oxford, Ohio," July 15.

24.2.8 Remedial Action
Alba Craft Laboratory property, 1957, 1994, and 1995: remediated surfaces, equipment, and soils, and demolished building.

Vicinity properties, 1995: remediated building surfaces, soil, and sewer line.

24.2.9 Release Survey
DOE (U.S. Department of Energy), 1995. *Post Remedial Action Report for the Former Alba Craft Laboratory and Vicinity Properties*, DOE/OR/21949-387, August.

24.2.10 Independent Verification
DOE (U.S. Department of Energy), 1996. *Results of the Independent Radiological Verification Survey of the Remedial Action Performed at the Former Alba Craft Laboratory Site, Oxford, OH*, ORNL/TM-12968, prepared by Oak Ridge National Laboratory, April.

DOE (U.S. Department of Energy), 1996. *Results of the Independent Radiological Verification Survey of the Remedial Action Performed at 525 S. Main Street, Oxford, Ohio (OX0002)*, ORNL/RASA-95/2, prepared by Oak Ridge National Laboratory, April.

24.2.11 Use Restrictions
None.

24.2.12 Institutional Controls and Enforcement
Not applicable.

24.2.13 Monitoring and Site Inspections
Not required.

24.2.14 Certification and Regulator Concurrence
DOE (U.S. Department of Energy), 1996. "Certification of the Radiological Condition of the Alba Craft Site in Oxford, Ohio," March 31. (Published in the *Federal Register* on November 26, 1996 [61 FR 60097].)

Ohio Environmental Protection Agency (EPA) and Ohio Department of Health, 1995. Letter from G.E. Mitchell, Ohio EPA, and R.H. Vandegrift, Ohio Department of Health, to J.C. Collard, Oxford City Manager, "Ohio EPA and Ohio Department of Health Report on Alba Craft Cleanup," BNI CCN 128361, March 31.

24.2.15 Agreements and Permits
None.

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25.0 Seymour, Connecticut, Site

25.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Seymour, Connecticut, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries
- Site visit and owner contact every 2 years to ensure that supplemental limits area has not been disturbed

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. DOE applied supplemental limits to a drain system that was not remediated. There are no institutional controls, permits, or agreements in effect at the site. DOE will determine if demolition debris from the drain system will require disposal as regulated waste.

25.1.1 Site Conditions

After remediation, radium-226 and thorium-232 concentrations were less than 2 picocuries per gram (pCi/g). The uranium-238 concentration in exterior soil was 7 pCi/g. The maximum gamma exposure rate was 5.8 microroentgens per hour (μR/hr) above background. Surface activities were less than authorized limits for alpha and beta-gamma activity. Supplemental limits were applied to contaminated drains and manholes that were grouted to contain residual uranium contamination; the maximum gamma exposure rate for a decontamination and demolition worker would be 0.5 μR/hr. Uranium concentrations were estimated to be as high as approximately 2,700 pCi/g. DOE will determine if waste management oversight is required for the supplemental limits material.

DOE personnel most recently visited the site in August 2010. The affected building is vacant but in good condition. The remainder of the former Seymour Specialty Wire facility has been demolished and redeveloped as commercial structures and municipal offices.

Seymour, CT, site, August 2010

25.2 Background and Supporting Information

25.2.1 Alternative Names
Seymour Specialty Wire Site, Bridgeport Brass Site.

25.2.2 Location
15 Franklin St., Seymour, CT.

25.2.3 Ownership
Private.

25.2.4 Operations
Cold-forming of uranium metal, with related storage and laboratory operations, from 1962 to 1964.

25.2.5 Contaminants
Natural uranium metal.

25.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1985. Memorandum from W. Voigt, DOE, to J. LaGrone, DOE, "Designation of Sites for Remedial Action - Metal Hydrides, Beverly, MA; Bridgeport Brass, Adrian, MI, and Seymour, CT; and National Guard Armory, Chicago, IL," December 17.

25.2.7 Cleanup Criteria

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

A site-specific limit for uranium in soil was not developed because contaminated soil was not expected to be encountered. Typical uranium-238 limits are 35 to 50 pCi/g.

DOE applied supplemental limits for uranium-238 in a drain system.

DOE (U.S. Department of Energy), 1993. Memorandum, from J. Wagoner to L. Price, "Hazard Assessment for the Radioactive Contamination at the Seymour Site, Seymour, Connecticut," August 10.

DOE (U.S. Department of Energy), 1994. *Hazard Assessment for Radioactive Contamination at the Seymour Site, Revision 2, Seymour, Connecticut*, Oak Ridge, TN, prepared by Bechtel National, Inc., August.

25.2.8 Remedial Action

Remediated contamination on building surfaces in the Rufert Building (primarily floors, floor drains, expansion joints, walls, and overhead surfaces [ducts, fans, and light fixtures]). Two small exterior soil areas were excavated and backfilled. Supplemental limits were applied to three manholes and the connecting piping because the contamination was fixed and extremely resistant to decontamination efforts. The hazard assessment concluded that leaving the residual contamination in place would not pose unacceptable potential or future exposure risk. Remediation was completed in March 1993.

25.2.9 Release Survey

DOE (U.S. Department of Energy), 1994. *Post Remedial Action Report for the Removal Action at the Seymour Specialty Wire Site, Seymour, Connecticut*, DOE/OR/21949-370, prepared by Bechtel National, Inc., January.

25.2.10 Independent Verification

DOE (U.S. Department of Energy), 1993. *Results of the Independent Radiological Verification Survey at the Former Bridgeport Brass Company Facility, Seymour, Connecticut*, ORNL/TM-12390, prepared by Oak Ridge National Laboratory, March.

25.2.11 Use Restrictions

Unrestricted.

25.2.12 Institutional Controls and Enforcement

Not applicable, DOE will determine if institutional controls are needed.

25.2.13 Monitoring and Site Inspections

Site visit and owner contact every 2 years to ensure that supplemental limits area has not been disturbed.

25.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1996. "Certification of the Radiological Condition of the Seymour Specialty Wire Site, Seymour, Connecticut, 1992–1993," January 19. (Published in the *Federal Register*, January 24, 1995 [60 FR 4612].)

25.2.15 Agreements and Permits

None.

26.0 Springdale, Pennsylvania, Site

26.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Springdale, Pennsylvania, Site are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup and decontamination criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

26.1.1 Site Conditions

After remediation, gamma exposure rates ranged from 8.6 to 12.2 microroentgens per hour (μR/hr). Alpha and beta-gamma surface activities were less than guidelines for fixed and removable contamination. Several individual soil samples exceeded the site-specific uranium concentration guideline but average concentrations were met and maximum concentrations satisfied hot-spot limits.

DOE personnel most recently visited the site in April 2010. Because the site met criteria for unrestricted use, the purpose of the visit was to determine if land use had changed on the property or in the site vicinity. The exterior physical configuration of the site has not changed since remediation was completed and the surrounding area remains predominantly residential.

Remediation of C.H. Schnorr building interior, Springdale, PA, site, September 1994 (DOE Digital Archive)

Springdale, PA, site, September 2005

26.2 Background and Supporting Information

26.2.1 Alternative Name
C. H. Schnorr Site, C. H. Schnoor Site (a persistent misspelling in project records), Conviber Site.

26.2.2 Location
644 Garfield Street, Springdale, PA.

26.2.3 Ownership
Private.

26.2.4 Operations
Uranium metal fabrication services in support of the Manhattan Engineer District (MED) during the mid-1940s. Machined extruded uranium for the Hanford Pile Project, and machined uranium slugs for MED contractors the University of Chicago and, later, E.I. DuPont de Nemours and Co., Inc.

26.2.5 Contaminants
Natural uranium metal.

26.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from J. Wagoner, DOE, to L Price, DOE, "Authorization for Remedial Action at Schnoor Site in Springdale, Pennsylvania," BNI CCN 095788, September 25.

26.2.7 Cleanup Criteria
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Change 2, January 1993.

Site-specific standard for total uranium in soil: 100 picocuries per gram

DOE (U.S. Department of Energy), 1994. Memorandum from J.W. Wagoner, DOE, to L. Price, DOE, "Uranium Guidelines for the Schnoor Site, Springdale, Pennsylvania," BNI CCN 119900, August 25.

26.2.8 Remedial Action
Remediated interior building concrete surfaces and sub-concrete soil contamination in the belt-cutting, belt-fabrication, and loading dock rooms. No exterior contamination found; completed September 1994.

26.2.9 Release Survey
DOE (U.S. Department of Energy), 1995. *Post-Remedial Action Report for the C.H. Schnoor Site, Springdale, Pennsylvania,* DOE/OR/21949-386, September.

26.2.10 Independent Verification
DOE (U.S. Department of Energy), 1995. *Results of Independent Radiological Verification Survey at the Former C.H. Schnoor & Company Site*, ORNL/RASA-95-1, prepared by Oak Ridge National Laboratory, September.

26.2.11 Use Restrictions
Unrestricted.

26.2.12 Institutional Controls and Enforcement
Not applicable.

26.2.13 Monitoring and Site Inspections
Not required.

26.2.14 Certification and Regulator Concurrence

DOE (U.S. Department of Energy), 1996. Memorandum, from J. Owendoff, DOE, to R. Rosen, DOE, "Federal Register Notices for Certification of the Radiological Condition of the C. H. Schnoor Site," September 6. (Published in the *Federal Register* on September 11, 1996 [61 FR 48135].)

26.2.15 Agreements and Permits
None.

27.0 Toledo, Ohio, Site

27.1 LTS&M Requirements

Long-term surveillance and maintenance requirements for the Toledo, Ohio, Site and its associated vicinity property are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance

Following remediation, the U.S. Department of Energy (DOE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no supplemental limits, institutional controls, permits, or agreements in effect at the site.

27.1.1 Site Conditions

During assessment of the Toledo site, DOE learned that contaminated soil had been transported to a residence in Ottawa Lake, MI, and used as fill. The Ottawa Lake property was addressed as a vicinity property (VP) of the Toledo site.

After remediation at the Toledo site, the maximum total uranium concentration in soil was less than the authorized limit. Maximum beta-gamma and alpha surface activities were less than the authorized limits and most measurements were at background levels. Gamma exposure rates also were less than the authorized limit in exterior areas

After remediation at the Ottawa Lake VP site, the maximum total uranium concentration in soil was less than the authorized limit. The maximum gamma exposure rate was at background levels.

DOE personnel visited the Toledo site most recently in July 2010 to assess land use changes. The property is used for light industrial purposes and established residential areas are across the street. No development pressures were evident in the area. DOE has not visited the Ottawa Lake VP.

Toledo, OH, site, June 2006

27.2 Background and Supporting Information

27.2.1 Alternative Name
Baker Brothers Site.

27.2.2 Location
2551−2555 Harleau Place and 1000 Post Street, Toledo, OH
(includes VP at 4400 Piehl Road, Ottawa Lake, MI).

27.2.3 Ownership
Private.

27.2.4 Operations
Fabricated and machined uranium metal slugs from uranium metal during the early and mid-1940s.

27.2.5 Contaminants
Natural uranium metal.

27.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
DOE (U.S. Department of Energy), 1992. Memorandum from A. Williams, DOE, to L. Price, DOE, "Designation Summary for Baker Brothers, Incorporated, Toledo, Ohio," BNI CCN 095790, June 12.

DOE (U.S. Department of Energy), 1992. Memorandum from J.W. Wagoner, DOE, to L. Price, DOE, "Designation of Ottawa Lake, Michigan, Vicinity Property," BNI CCN 097162, November 17.

DOE (U.S. Department of Energy), 1992. Memorandum from R.P. Whitfield, DOE, to Oak Ridge Field Office, "Authorization for Remedial Action at the Former Baker Brothers, Inc., Site, Toledo, Ohio," BNI CCN 095789, October 8.

27.2.7 Cleanup Criteria

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, February 1990.

Site-specific uranium-in-soil standard: 35 pCi/g for total uranium

DOE (U.S. Department of Energy), 1994. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Uranium Guidelines for the Ottawa Lake, Michigan, Vicinity Property," November 24.

DOE (U.S. Department of Energy), 1994. *Derivation of Uranium Residual Radioactive Material Guidelines for the 4400 Piehl Road Site, Ottawa Lake, Michigan*, ANUEAD/TM-33, prepared by Argonne National Laboratory, December.

DOE (U.S. Department of Energy), 1995. *Derivation of Guidelines for Uranium Residual Radioactive Material in Soil at the Former Baker Brothers, Inc., Site, Toledo, Ohio*, prepared by Argonne National Laboratory, BCI CNN 128122, March.

DOE (U.S. Department of Energy), 1995. Memorandum from J. Wagoner, DOE, to L. Price, DOE, "Uranium Guidelines for the Baker Brothers Site, Toledo, Ohio," BNI CCN 132244, July 10.

27.2.8 Remedial Action

Toledo, OH, Site: remediated interior building surfaces and exterior soil and concrete, completed September 1995.

Ottawa Lake, MI, VP: remediated exterior fill material, completed January 1995.

27.2.9 Release Surveys

DOE (U.S. Department of Energy), 1997. *Post-Remedial Action Report for the Former Baker Brothers, Inc. Site, Toledo, Ohio*, DOE/OR/21949-402, February.

DOE (U.S. Department of Energy), 1996. *Post-Remedial Action Report for the Baker Brothers Vicinity Property in Ottawa Lake, Michigan*, DOE/OR/21949-392, July.

27.2.10 Independent Verification

DOE (U.S. Department of Energy), 1996. *Verification Survey of the Former Baker Brothers, Inc., Toledo, Ohio*, prepared by Oak Ridge Institute for Science and Education, December.

DOE (U.S. Department of Energy) 1996, *Results of the Independent Radiological Verification Survey at 4400 Piehl Road, Ottawa Lake, MI*, ORNL/RASA-95/16, prepared by Oak Ridge National Laboratory, April.

27.2.11 Use Restrictions
Unrestricted.

27.2.12 Institutional Controls and Enforcement
Not applicable.

27.2.13 Monitoring and Site Inspections
Not required.

27.2.14 Certification and Regulator Concurrence
DOE (U.S. Department of Energy), 2001. "Notice of Certification." (Published in the *Federal Register* on August 24, 2001 [66 FR 5019].)

MDPH (Michigan Department of Public Health), 1995. Letter from V. Anthony, MDPH, to T. Grumbly, DOE, "Appreciation for Ottawa Lake Remedial Action," BNl CCN 126464, February 3.

27.2.15 Agreements and Permits
None.

28.0 Tonawanda North, New York, Site, Units 1 and 2

28.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Tonawanda North, New York, Site, Units 1 and 2, are as follows:

- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site surveillance or inspection
- Site physical property maintenance.

Following remediation, the U.S. Army Corps of Engineers (USACE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. There are no institutional controls, permits, or agreements in effect at the site.

28.1.1 Site Conditions

After remediation, uranium-238, thorium-230, and radium-226 concentrations were less than the derived concentration guidelines or typical limits. Dose to a resident with a home garden would be 7.1 millirems per year (mrem/yr).

Map of the Tonawanda North, NY, site (USACE)

Tonawanda North, NY, Site, Unit 1 with Seaway Area D at the foot of the Seaway municipal waste disposal site, 2006

Tonawanda North, NY, Site, Unit 2, Rattlesnake Creek, with Seaway Area C at the north end of the municipal waste disposal site in the background, 2009

U.S. Department of Energy (DOE) personnel most recently visited the site in September 2009 while in the Buffalo area. Vegetation has established in remediated areas. Commercial development is occurring east of the Rattlesnake Creek area.

28.2 Background and Supporting Information

28.2.1 Alternative Names

Ashland Oil #1 Site, Ashland Oil #2 Site, Haist Property.

28.2.2 Location

State Highway 266, east of Interstate Highway 190.

28.2.3 Ownership

Private.

28.2.4 Operations

From 1944 to 1946, uranium-ore processing wastes were transported from the Linde site to a 10-acre area known then as the Haist property, now called Tonawanda North, Unit 1 (Ashland Oil #1 site). These materials consisted of about 8,000 tons of low-grade uranium ore processing residues. In 1960, the property was transferred to Ashland Oil for use in the company's oil refinery activities. Soil removed during construction contained radioactive residues, and the Ashland Oil Company transported the contaminated materials to the Seaway Landfill (Seaway Area C) and Ashland Oil #2 sites for disposal. Contamination on the Ashland Oil #1 site spilled over onto the Seaway Landfill in Seaway Area D.

28.2.5 Contaminants

Uranium ore processing residues containing thorium-230 and radium-226.

28.2.6 Formerly Utilized Sites Remedial Action Program (FUSRAP) Eligibility Determination

DOE (U.S. Department of Energy), 1984. Memorandum from W. Voigt, DOE, to J. LaGrone, DOE, "Authorization for Remedial Action at the Seaway Industrial Park and Ashland Oil Co. (1) Sites at Tonawanda, NY, and Mallinckrodt Chemical Co., St. Louis, MO," October 29.

DOE (U.S. Department of Energy), 1984. Memorandum, F. Coffman, DOE, to J. LaGrone, DOE, "Authorization for Remedial Action of the Ashland 2 Site, Tonawanda, New York," June 22.

28.2.7 Cleanup Criteria

Release criterion: 25 mrem/yr

Title 10 *Code of Federal Regulations* Part 20.1402, "Radiological criteria for unrestricted use."

Site-specific derived concentration guideline for thorium-230 in soil: 40 picocuries per gram

If this concentration is met, the dose limit will be met also. The Record of Decision recognizes the radionuclide concentration standards in 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

USACE (U.S. Army Corps of Engineers), 1998. *Record of Decision for the Ashland 1 (including Seaway Area D) and Ashland 2 Sites*, April.

Site-specific guidelines for Rattlesnake Creek range from 4.3 to 16 pCi/g for radium-226, 12 to 46 pCi/g for thorium-230, and 350 to 2,000 pCi/g for uranium-238, varying with the size of the remediated area.

USACE (U.S. Army Corps of Engineers), 2004. *Explanation of Significant Differences for the Rattlesnake Creek Portion of the Ashland Sites*, September 20.

28.2.8 Remedial Action

USACE remediated the Tonawanda North Site, Unit 1, (including Seaway Area D) and the Tonawanda North Site, Unit 2, (including Rattlesnake Creek). Contaminated soil was excavated and shipped offsite for disposal or reprocessed as alternate uranium ore feed material. Remediation of the Tonawanda North Site, Unit 1, was completed in 2002, the Tonawanda North Site, Unit 2, was completed in 1999, and Rattlesnake Creek was completed in 2005. Remediation of the Tonawanda North Site, Unit 1, included remediation of Seaway Area D. USACE will remediate Seaway Area C (Tonawanda North Site, Unit 3) in a separate action.

28.2.9 Release Survey

USACE (U.S. Army Corps of Engineers), 1999. *Project Construction Report, FUSRAP Ashland 1 Site (including Seaway Area C) Remedial Action, Tonawanda, New York.*

USACE (U.S. Army Corps of Engineers), 1999. *Project Construction Report, FUSRAP Ashland 2 Phase Remedial Action, Tonawanda, New York.*

USACE (U.S. Army Corps of Engineers), 2006. *Project Construction Report for the Rattlesnake Creek FUSRAP Site, Tonawanda, New York*.

28.2.10 Use Restrictions

None for urban residential use (i.e., residential use where produce from a home garden is consumed). Because of the adjacent above-grade landfill on the adjacent Seaway property, agricultural use is not plausible.

28.2.11 Institutional Controls and Enforcement

Not applicable.

28.2.12 Monitoring and Site Inspections

Not required.

28.2.13 Certification and Regulator Concurrence

USACE (U.S. Army Corps of Engineers), 2006. *Site Closeout Report for the Ashland 1 (Including Seaway Area D), Ashland 2 and Rattlesnake Creek FUSRAP Sites*, October. [Includes the *Declaration of Response Action Completion & Issuance of the Site Closure Report for Ashland I (including Seaway Area D), Ashland 2, and Rattlesnake Creek,* USACE, signed October 31, 2006. This report includes regulator letters of concurrence].

28.2.14 Agreements and Permits

None.

29.0 Wayne, New Jersey, Site

29.1 LTS&M Requirements

Long-term surveillance and maintenance (LTS&M) requirements for the Wayne, New Jersey, Site are as follows:

- Surveillance for groundwater use restriction every 2 years
- Managing site records
- Responding to stakeholder inquiries

The following ***are not required*** at the site:

- Environmental monitoring, onsite or offsite
- Site physical property maintenance

Following remediation, the U.S. Army Corps of Engineers (USACE) certified that the site complied with applicable cleanup criteria and standards and released the property for unrestricted use. Groundwater use restrictions remain in effect at the site until the site has been delisted from the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA).

29.1.1 Site Conditions

The U.S. Department of Energy (DOE) remediated 28 vicinity properties to the approved cleanup criteria. In 1997, Congress assigned Formerly Utilized Sites Remedial Action Program (FUSRAP) remediation responsibility to USACE. USACE completed remediation of the site and conducted additional remediation at two vicinity properties. All contaminated material was shipped to a permanent offsite disposal facility.

USACE transferred responsibility for the site to DOE in 2006. DOE transferred the real property to Wayne Township through the National Parks Service Land to Parks Program in 2006. In 2010, USACE remediated contaminated soils where Sheffield Brook flows through culverts beneath Black Oak Ridge Road and Pompton Plains Crossroad. EPA is the lead agency for delisting the site from the National Priorities List.

Transfer occurred before regulator concurrence was obtained that site groundwater poses no risk to human health or the environment. Until the site is delisted, DOE will continue to impose a groundwater use restriction on the site.

Wayne, NJ, site, August 2006

29.2 Background and Supporting Information

29.2.1 Alternative Names
Wayne Interim Storage Site; Rare Earths, Inc., Site; W.R. Grace and Co. Site.

29.2.2 Location
868 Black Oak Ridge Road.

29.2.3 Ownership
Private.

29.2.4 Operations
Production of crude thorium hydroxide and rare earth elements from monazite sands. Waste materials were stored onsite in pits. DOE acquired the property for interim storage of vicinity property remediation waste.

29.2.5 Contaminants
Thorium-230 is the principal contaminant. Radium-226, natural uranium, and other rare earth elements are present.

29.2.6 Formerly Utilized Sites Remedial Action Program Eligibility Determination
Not applicable, added to FUSRAP through Congressional action.
Energy and Water Appropriations Act of FY 1984 (Conference Report), June 28, 1983

29.2.7 Cleanup Criteria

Release criterion:

Maximum total effective dose equivalent is 25 millirems per year

Title 10 *Code of Federal Regulations* Part 20.1402, "Radiological criteria for unrestricted use."

Radionuclide limits in soil:

Title 40 *Code of Federal Regulations* Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

Site-specific derived concentration guidelines:

Total uranium in soil: 100 pCi/g

USACE (U.S. Army Corps of Engineers), 2000. *Record of Decision for the Wayne Interim, Storage Site, Wayne, New Jersey*, April 27.

29.2.8 Remedial Action

1985 to 1987: DOE remediated vicinity properties and stored waste on top of former waste pits.
1997 to 1998: Vicinity property waste shipped offsite for disposal.
2000: Waste pit contamination removed, remediated, and shipped offsite for disposal. Additional remediation accomplished at two vicinity properties.
2010: USACE remediated residual radioactive contamination in public rights-of-way that was associated with Sheffield Brook culverts.

USACE conducted a groundwater monitoring program between 2002 and 2006.

29.2.9 Release Survey

DOE (U.S. Department of Energy), 1989. *Post-Remedial Action Report for the Wayne Site - 1985 And 1987, Wayne, New Jersey*, DOE/OR/20722-88, March.

USACE (U.S. Army Corps of Engineers), 2003. *Preliminary Close-Out Report*. (Signed by EPA on September 16, 2003.)

29.2.10 Independent Verification

EPA Region II completed a pre-final inspection in September 2003 and verified that remedial action was completed at the Wayne Site and vicinity properties. NPL delisting is pending.

29.2.11 Use Restrictions

DOE imposed a groundwater use restriction as a best management practice. DOE will rescind the restriction when the site is delisted from the NPL. The site currently meets the criteria for unrestricted use.

29.2.12 Institutional Controls and Enforcement

DOE imposed a groundwater use restriction as a best management practice. DOE will rescind the restriction when the site is delisted from the NPL.

29.2.13 Monitoring and Site Inspections

Not required.

29.2.14 Certification and Regulator Concurrence

The Wayne site was initially remediated to pre-FUSRAP criteria and a notice of cleanup certification published in the *Federal Register* on October 29, 1984.

DOE performed remediation of vicinity properties

> DOE (U.S. Department of Energy), 1995. "Certification of the Radiological Condition of the Wayne Site Vicinity Properties in Wayne, NJ." (Published in the *Federal Register* on September 26, 1995.)

USACE performed additional remediation under the 2000 Record of Decision (ROD) and the 2003 ROD Explanation of Significant Difference.

USACE (U.S. Army Corps of Engineers), 2003. *Preliminary Close-Out Report.* (Signed by EPA on September 16, 2003.)

New Jersey Department of Environmental Protection, 2004. Letter from D. Gaffigan, New Jersey Department of Environmental Protection, to A. Roos, USACE, "Final Post Remedial Action Report, May 2004, Wayne Interim Storage Site, Wayne Township, Passiac County," October 25.

EPA (U.S. Environmental Protection Agency), 2004. Letter from A. Carpenter, EPA, to A. Roos, USACE, "W.R. Grace/Wayne Interim Storage Site – Final Post Remedial Action Report," September 7.

29.2.15 Agreements and Permits

The Wayne site was listed by EPA on the NPL in 1984 as W.R. Grace and Co./Wayne Interim Storage Site, CERCLIS ID # NJ 189193980. In September 1990, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), DOE and EPA entered into a Federal Facility Agreement (FFA) that established the cleanup responsibilities for each agency. USACE remains the lead agency until closeout and transfer to DOE. Groundwater use restrictions may be removed once the site is removed from the NPL by EPA.

Attachment 1

DOE Order 5400.5, Chapter IV

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CHAPTER IV

RESIDUAL RADIOACTIVE MATERIAL

1. PURPOSE. This chapter presents radiological protection requirements and guidelines for cleanup of residual radioactive material and management of the resulting wastes and residues and release of property. These requirements and guidelines are applicable at the time the property is released. Property subject to these criteria includes, but is not limited to sites identified by the Formerly Utilized Sites Remedial Action Program (FUSRAP) and the Surplus Facilities Management Program (SFMP). The topics covered are basic dose limits, guidelines and authorized limits for allowable levels of residual radioactive material, and control of the radioactive wastes and residues. This chapter does not apply to uranium mill tailings or to properties covered by mandatory legal requirements.

2. IMPLEMENTATION. DOE elements shall develop plans and protocols for the implementation of this guidance. FUSRAP sites shall be identified, characterized, and designated, as such, for remedial action and certified for release. Information on applications of the guidelines and requirements presented herein, including procedures for deriving specific property guidelines for allowable levels of residual radioactive material from basic dose limits, is contained in DOE/CH 8901, "A Manual for Implementing Residual Radioactive Material Guidelines, A Supplement to the U.S. Department of Energy Guidelines for Residual Radioactive Material at FUSRAP and SFMP Sites," June 1989.

   a. Residual Radioactive Material This chapter provides guidance on radiation protection of the public and the environment from:

      (1) Residual concentrations of radionuclides in soil (for these purposes, soil is defined as unconsolidated earth material, including rubble and debris that might be present in earth material);

      (2) Concentrations of airborne radon decay products;

      (3) External gamma radiation,

      (4) Surface contamination; and

      (5) Radionuclide concentrations in air or water resultlng from or associated with any of the above.

b. Basic Dose Limit. The basic dose limit for doses resulting from exposures to residual radioactive material is a prescribed standard from which limits for quantities that can be monitored and controlled are derived; it is specified in terms of the effective dose equivalent as defined in this Order. The basic dose limits are used for deriving guidelines for residual concentrations of radionuclides in soil. Guidelines for residual concentrations of thorium and radium in soil, concentrations of airborne radon decay products, allowable indoor external gamma radiation levels, and residual surface contamination concentrations are based on existing radiological protection standards (40 CFR Part 192; NRC Regulatory Guide 1.86 and subsequent NRC guidance on residual radioactive material). Derived guidelines or limits based on the basic dose limits for those quantities are used only when the guidelines provided in the existing standards are shown to be inappropriate.

c. Guideline. A guideline for residual radioactive material is a level of radioactive material that is acceptable for use of property without restrictions due to residual radioactive material. Guidelines for residual radioactive material presented herein are of two kinds, generic and specific. The basis for the guidelines is generally a presumed worst-case plausible-use scenario for the property.

(1) Generic guidelines, independent of the property, are taken from existing radiation protection standards. Generic guideline values are presented in this chapter.

(2) Specific property guidelines are derived from basic dose limits using specific property models and data. Procedures and data for deriving specific property guideline values are given by DOE/CH 8901.

d. Authorized Limit. An authorized limit is a level of residual radio active material that shall not be exceeded if the remedial action is to be considered completed and the property is to be released without restrictions on use due to residual radioactive material.

(1) The authorized limits for a property will include:

(a) Limits for each radionuclide or group of radionuclides, as appropriate, associated with residual radioactive material in soil or in surface contaminatlon of structures and equipment .

(b) Limits for each radionuclide or group of radionuclides, as appropriate, in air or water; and

(c) Where appropriate, a limit on external gamma radiation resulting from the residual material.

(2) Under normal circumstances expected at most properties, authorized limits for residual radioactive material are set equal to, or below guideline values. Exceptional conditions for which authorized limits~ might differ from guideline values are specified in paragraphs IV-5 and IV-7.

(3) A property may be released without restrictions if residual radioactive material does not exceed the authorized limits or approved supplemental limits, as defined in paragraph IV.7a, at the time remedial action is completed. DOE actions in regard to restrictions and controls on use of the property shall be governed by provisions in paragraph IV. 7b. The applicable controls and restrictions are specified in paragraph IV.6 and IV.7.c.

e. ALARA Applications. The monitoring, cleanup, and control of residual radioactive material are subject to the ALARA policy of this Order Applications of ALARA policy shall be documented and filed as a permanent record.

3. BASIC DOSE LIMITS.

a. Defining and Determining Dose Limits. The basic public dose limits for exposure to residual radioactive material, in addition to natural occurring "background" exposures, are 100 mrem (1 mSv) effective dose equivalent in a year, as specified in paragraph II.1a.

b. Unusual Circumstances. If, under unusual circumstances, it is impracticable to meet the basic limit based on realistic exposure scenarios, the respective project and/or program office may, pursuant to paragraph II.1a(4), request from EH-1 for a specific authorization for a temporary dose limit higher than 100 mrem (1 mSv), but not greater than 500 mrem (5mSv), in a year. Such unusual circumstances may include temporary conditions at a properly scheduled for remedial action or following the remedial action. The ALARA process shall apply to the selection of temporary dose limits.

4. GUIDELINES FOR RESIDUAL RADIOACTIVE MATERIAL.

a. Residual Radionuclides in Soil. Generic guidelines for thorium and radium are specified below. Guidelines for residual concentrations of other radionuclides shall be derived from the basic dose limits by means of an environmental pathway analysis using specific property data where available. Procedures for these derivations are given in DOE/CH-8901. Residual concentrations of radioactive material in soil are defined as those in excess of background concentrations averaged over an area of 100 m^2.

(1) Hot Spots. If the average concentration in any surface or below-surface area less than or equal to 25 , exceeds the limit or guideline by a factor of (lOO/A) , [where A is the area (in square meters) of the region in which concentrations are elevated], limits for "hot-spots" shall also be developed and applied. Procedures for calculating these hot-spot limits, which depend on the extent of the elevated local concentrations, are given in DOE/CH-8901. In addition, reasonable efforts shall be made to remove any source of radionuclide that exceeds 30 times the appropriate limit for soil, irrespective of the average concentration in the soil.

(2) Generic Guidelines. The generic guidelines for residual concentrations of Ra-226, Ra228, Th-230, and Th-232 are:

(a) 5 pCi/g, averaged over the first 15 cm of soil below the surface; and

(b) 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface.

(3) Ingrowth and Mixtures. These guidelines take into account ingrowth of Ra-226 from Th-230 and of Ra-228 from Th-232, and assume secular equilibrium. If both Th-230 and Ra-226 or both Th-232 and Ra-228 are present and not in secular equilibrium, the appropriate guideline is applied as a limit for the radionuclide with the higher concentration. If other mixtures of radionuclide occur, the concentrations of individual radionuclides shall be reduced so that either the dose for the mixtures will not exceed the basic dose limit or the sum of the ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1. Explicit formulas for calculating residual concentration guidelines for mixtures are given in DOE/CH-8901.

b. Airborne Radon Decay Products. Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property that are intended for release without restriction; structures that will be demolished or buried are excluded. The applicable generic guideline (40 CFR Part 192) is: In any occupied or habitable building, the objective of remedial action shall be, and a reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. [A working level (WL) is any combination of short lived radon decay products in 1 L of air that will

result in the ultimate emission of 1.3 x 10^5 MeV of potential alpha energy.] In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Remedial actions by DOE are not required in order to comply with this guideline when there is reason able assurance that residual radioactive material is not the source of the radon concentration.

c. External Gamma Radiation. The average level of gamma radiation inside a building or habitable structure on a site to be released without restrictions shall not exceed the background level by more than 20 μR\h and shall comply with the basic dose limit when an "appropriate-use" scenario is considered. This requirement shall not necessarily apply to structures scheduled for demolition or to buried foundations. External gamma radiation levels or open lands shall also comply with the basic limit and the ALARA process, considering appropriate-use scenarios for the area.

d. Surface Contamination. The generic surface contamination guidelines provided in Figure IV-1 are applicable to existing structures and equipment. These guidelines are generally consistent with standards of the NRC (NRC 1982) and functionally equivalent to Section 4, "Decon-tamination for Release for Unrestricted Use," of Regulatory Guide 1.86, but apply to nonreactor facilities. These limits apply to both interior equipment and building components that are potentially salvageable or recoverable scrap. If a building is demolished, the guidelines in paragraph IV.6a are applicable to the resulting con-tamination in the ground,

e. Residual Radionuclides in Air and Water. Residual concentrations of radionuclides in air and water shall be controlled to the required levels shown in paragraph II.1a and as required by other applicable Federal and/or State laws.

AUTHORIZED LIMITS FOR RESIDUAL RADIOACTIVE MATERIAL.

a. Establishment of Authorized Limits. The authorized limits for each property shall be set equal to the generic or derived guidelines unless it can be established, on the basis of specific property data (including health, safety, practical, programmatic and socioeconomic considerations), that the guidelines are not appropriate for use at the specific property. The authorized limits shall be established to (1) provide that, at a minimum, the basic dose limits of in paragraph IV.3, will not be exceeded under the "worst case" or "plausible-use" scenarios, consistent with the procedures and guidance provided in DOE/CH-8901, or (2) be consistent with applicable generic guidelines. The authorized limits shall be consistent with limits and guidelines established by other applicable Federal and State laws. The authorized limits are developed through the project offices in the field and are approved by the Headquarters Program Office.

Figure IV-1
Surface Contamination Guidelines

Radionuclides[2]	Allowable Total Residual Surface Contamination (dpm/100 cm²)[1] Average[3,4]	Maximum[4,5]	Removable[4,6]
Transuranics, I-125, I-129, Ra-226, Ac-227, Ra-228, Th-228, Th-230, Pa-231.	RESERVED	RESERVED	RESERVED
Th-Natural, Sr-90, I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232.	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay product, alpha emitters.	5,000	15,000	1,000
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.[2]	5,000	15,000	1,000

1/ As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

2/ Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

3/ Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

4/ The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

5/ The maximum contamination level applies to an area of not more than 100 cm2.

6/ The amount of removable material per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

7/ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

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b. Application of Authorized Limits. Remedial action shall not be considered complete until the residual radioactive material levels comply with the authorized limits, except as authorized pursuant to paragraph IV.7 for special situations where the supplemental limits and exceptions should be considered and it is demonstrated that it is not appropriate to decontaminate the area to the authorized limit or guideline value.

6. CONTROL OF RESIDUAL RADIOACTIVE MATERIAL. Residual radioactive material above the guidelines shall be managed in accordance with Chapter II and the following requirements.

a. Operational and Control Requirements. The operational and control requirements specified in the following Orders shall apply to interim storage, interim management, and long-term management.

(1) DOE 5000.3B, Occurrence Reporting and Processing of Operations Information

(2) DOE 5440.1E, National Environmental Policy Act Compliance Program

(3) DOE 5480.4, Environmental Protection, Safety, and Health Protection Standards

(4) DOE 5482.1B, Environmental, Safety, and Health Appraisal Program

(5) DOE 5483.1A, Occupational Safety and Health Program for DOE Employees at Government-Owned, Contractor-Operated Facilities

(6) DOE 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements

(7) DOE 5820.2A, Radioactive Waste Management.

Vertical line denotes change.

b. Interim Storage.

(1) Control and stabilization features shall be designed to provide, to the extent reasonably achievable, an effective life of 50 years with a minimum life of at least 25 years.

(2) Controls shall be designed such that Rn-222 concentrations in the atmosphere above facility surfaces or openings in addition to background levels, will not exceed:

(a) 100 pCi/L at any given point;

(b) An annual average concentration of 30 pCi/L over the facility site; and

(c) An annual average concentration of 3 pCi/L at or above any location outside the facility site.

(d) Flux rates from the storage of radon producing wastes shall not exceed 20 pCi/sq.m-sec , as required by 40 CFR Part 61.

(3) Controls shall be designed such that concentrations of radionuclides in the groundwater and quantities of residual radioactive material will not exceed applicable Federal or State standards.

(4) Access to a property and use of onsite material contaminated by residual radioactive material should be controlled through appropriate administrative and physical controls such as those described in 40 CFR Part 192. These control features should be designed to provide, to the extent reasonable, an effective life of at least 25 years.

c. Interim Management.

(1) A property may be maintained under an interim management arrangement when the residual radioactive material exceeds guideline values if the residual radioactive material is in inaccessible locations and would be unreasonably costly to remove, provided that administrative controls are established by the responsible authority (Federal, State, or local) to protect members of the public and that such controls are approved by the appropriate Program Secretarial Officer.

(2) The administrative controls include but are not limited to periodic monitoring as appropriate; appropriate shielding; physical barriers to prevent access; and appropriate radiological safety measures during maintenance, renovation, demolition, or other activities that might disturb the residual radioactive material or cause it to migrate.

Vertical line denotes change.

(3) The owner of the property should be responsible for implementing the administrative controls and the cognizant Federal, State, or local authorities should be responsible for enforcing them.

d. Long-Term Management.

(1) Uranium, Thorium, and Their Decay Products.

(a) Control and stabilization features shall be designed to provide, to the extent reasonably achievable, an effective life of 1,000 years with a minimum life of at least 2OO years.

(b) Control and stabilization features shall be designed to limit Rn-222 emanation to the atmosphere from the wastes to less than an annual average release rate of 20 pCi/m²/s and prevent increases in the annual average Rn-222 concentration at or above any location outside the boundary of the contaminated area by more than 0.5 pCi/L. Field verification of emanation rates shall be in accordance with the requirements of 40 CFR Part 61.

(c) Before any potentially biodegradable contaminated wastes are placed in a long-term management facility, such wastes shall be properly conditioned so that the generation and escape of biogenic gases will not cause the requirement in paragraph IV.6d(1)(b) to be exceeded and that biodegradation within the facility will not result in premature structural failure in violation of the requirements in paragraph IV.6d(1)(a).

(d) Ground water shall be protected in accordance with legally applicable Federal and State standards.

(e) Access to a property and use of onsite material contaminated by residual radioactive material should be controlled through appropriate administrative and physical controls such as those described in 40 CFR Part 192. These controls should be designed to be effective to the extent reasonable for at least 200 years.

(2) Other Radionuclides. Long-term management of other radionuclides shall be in accordance with Chapters II, III, and IV of DOE 5820.2A, as applicable.

7. SUPPLEMENTAL LIMITS AND EXCEPTIONS. If special specific property circumstances indicate that the guidelines or authorized limits established for a given property are not appropriate for any portion of that property, then the DOE Field Office Manager may request, through the Program Office, that supplemental limits or an exception be applied. The responsible DOE Field Office Manager shall document the decision that the subject guidelines or authorized limits are not appropriate and that the alternative action selected will provide adequate protection, giving due consideration

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to health and safety, the environment, costs, and public policy considerations. The DOE Field Office Manager shall obtain approval for specific supplemental limits or exceptions from Headquarters as specified in paragraph IV.5, and shall provide to the Headquarters Program Office those materials required by Headquarters for the justification as specified in this paragraph and in the FUSRAP and SFMP protocols and subsequent guidance documents. The DOE Field Office Manager shall also be responsible for coordination with the State and local government regarding the limits or exceptions and associated restrictions as appropriate. In the case of exceptions, the DOE Field Office Manager shall be responsible for coordinating with the State and/or local governments to ensure the adequacy of restrictions or conditions of release and that mechanisms are in place for their enforcement.

a. Supplemental Limits. Any supplemental limits shall achieve the basic dose limits set forth in Chapter II of this Order for both current and potential unrestricted uses of a property. Supplemental limits may be applied to any portion of a property if, on the basis of a specific property analysis, it is demonstrated that

(1) Certain aspects of the property were not considered in the development of the established authorized limits for that property; and

(2) As a result of these certain aspects, the established limits either do not provide adequate protection or are unnecessarily restrictive and costly.

b. Exceptions to the authorized limits defined for a property may be applied to any portion of the property when it is established that the authorized limits cannot reasonably be achieved and that restrictions on use of the property are necessary. It shall be demonstrated that the exception is justified and that the restrictions will protect members of the public within the basic dose limits of this Order and will comply with the requirements for control of residual radioactive material as set forth in paragraph IV.6.

c. Justification for Supplemental Limits and Exceptions. The need for supplemental limits and exceptions shall be documented by the DOE Field Office on a case-by-case basis using specific property data. Every reasonable effort should be made to minimize the use of supplemental limits and exceptions. Examples of specific situations that warrant DOE use of supplemental standards and exceptions are:

(1) Where remedial action would pose a clear and present risk of injury to workers or members of the public, notwithstanding reasonable measures to avoid or reduce risk.

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(2) Where remedial action, even after all reasonable mitigative measures have been taken, would produce environmental harm that is clearly excessive compared to the health benefits to persons living on or near affected properties, now or in the future. A clear excess of environmental harm is harm that is long-term, manifest, and grossly disproportionate to health benefits that may reasonably be anticipated.

(3) Where it is determined that the scenarios or assumptions used to establish the authorized limits do not apply to the property or portion of the property identified, or where more appropriate scenarios or assumptions indicate that other limits are applicable or appropriate for protection of the public and the environment.

(4) Where the cost of remedial action for contaminated soil is unreasonably high relative to long-term benefits and where the residual material does not pose a clear present or future risk after taking necessary control measure. The likelihood that buildings will be erected or that people will spend long periods of time at such a property should be considered in evaluating this risk. Remedial action will generally not be necessary where only minor quantities of residual radioactive material are involved or where residual radioactive material occurs in an inaccessible location at which specific property factors limit its hazard and from which it is difficult or costly to remove. Examples include residual radioactive material under hard-surfaced public roads and sidewalks, around public sewer lines, or in fence-post foundations. A specific property analysis shall be provided to establish that the residual radioactive material would not cause an individual to receive a radiation dose in excess of the basic dose limits stated in paragraph IV.3, and a statement specifying the level of residual radioactive material shall be provided to the appropriate State and/or local agencies for appropriate action, e.g., for inclusion in local land records.

(5) Where there is no feasible remedial action.

8. SOURCES.

a. Basic Dose Limits. Dosimetry model and dose limits are defined in Chapter II of this Order.

b. Generic Guidelines for Residual Radioactive Material. Residual concentrations of radium and thorium in soil are defined in 40 CFR Part 192. Airborne radon decay products are also defined in 40 CFR Part 192, as are guidelines for external gamma radiation. The surface contamination definition is adapted from NRC (1982).

c. Control of Radioactive Wastes and Residues. Interim storage is guided by this Order and DOE 5820.2A. Long-term management is guided by this Order, 40 CFR Part 192, and DOE 5820.2A.