

Long-Term Surveillance and Maintenance Plan for the Painesville, Ohio, Site

September 2016



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

This page intentionally left blank

Contents

Abbreviations	ii
1.0 Site Conditions	1
1.1 FUSRAP Background	1
1.2 Operations	1
1.3 Contaminants	2
2.0 Remedial Actions	5
2.1 Cleanup Criteria	5
2.2 Remedial Actions	5
2.3 Release Survey	7
2.4 Independent Verification	7
2.5 Use Restrictions	7
2.6 Assessment of Risk	8
2.7 Certification and Regulator Concurrence	9
2.8 Agreements and Permits	9
3.0 Long Term Surveillance and Maintenance Requirements	11
3.1 Institutional Controls	11
3.2 Desktop Audit	11
3.3 Site Fact Sheets	11
3.4 Site Inspections	11
3.5 Monitoring	11
3.6 Field Operations	12
3.7 Regulatory Interfaces	12
4.0 References	13

Figures

Figure 1. Location of the Painesville Site and Surrounding Features	2
Figure 2. Aerial photograph of the Diamond Magnesium Company production facility, prior to scrap metal containing FUSRAP-eligible constituents being shipped to the Painesville site	3
Figure 3. Gravel backfill in Remediation Area “C” along eastern boundary of the site, adjacent to Hardy Industrial Technologies. Painesville, Ohio, Site, May 2013.	3
Figure 4. View southeast to Building 400 (south), across Remediation Areas “A” and “G” and to Hardy Industrial Technologies to the east from top of adjacent landfill northeast of site. Painesville, Ohio, Site, May 2013.	4
Figure 5. Monitoring well MW-39, adjacent to the former 90-day storage area located in the northern portion of the site. Painesville, Ohio, Site, May 2013.	4
Figure 6. Contaminated Areas Remediated in 2007–2008 and 2010–2011	6
Figure 7. Contaminated Areas A and H and the Boundary of Adjacent Landfill	8

Table

Table 1. Painesville Site Constituents of Concern and Soil Remediation Goals	5
--	---

Abbreviations

AEC	U.S. Atomic Energy Commission
ANL	Argonne National Laboratories
AOCs	areas of concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	constituents of concern
DCGL	Derived Concentration Guideline Level
DOE	U.S. Department of Energy
EE/CA	Engineering Evaluation/Cost Analysis
FUSRAP	Formerly Utilized Sites Remedial Action Program
LM	Office of Legacy Management
LTS&M	long-term surveillance and maintenance
MED	Manhattan Engineer District
mrem/yr	millirems per year
pCi/g	picocuries per gram
Ra	radium
RESRAD	RESidual RADiation
RI/FS	Remedial Investigation/Feasibility Study
SU	survey unit
Th	thorium
U	uranium
USACE	U.S. Army Corps of Engineers

1.0 Site Conditions

1.1 FUSRAP Background

The Manhattan Engineer District (MED) and the U.S. Atomic Energy Commission (AEC) are predecessor agencies of the U.S. Department of Energy (DOE) and were responsible for developing nuclear technology beginning in the early 1940s in support of World War II Manhattan Project efforts. The Formerly Utilized Sites Remedial Action Program (FUSRAP) was established in 1974 to remediate sites where radioactive contamination remained from MED and AEC operations.

A site may be designated for cleanup under FUSRAP if:

- The site was involved in MED or early AEC activities, and;
- Residual radioactive contamination likely remains from these activities at levels that pose a risk to human health or the environment or exceed applicable standards, and;
- The federal government is liable for remediation of the contamination.
- Congress may also designate sites for remediation.

In 1992, after two site evaluations by the Oak Ridge National Laboratory, DOE designated the Painesville, Ohio, Site as a FUSRAP site for further evaluation and remedial action. The DOE Office of Environmental Management was responsible for the Painesville site from 1992 to 1997. In 1997, Congress assigned responsibility for additional characterization, remediation, and verification of FUSRAP sites to the U.S. Army Corps of Engineers (USACE). A Memorandum of Understanding between DOE and USACE established that, once remediation was complete, FUSRAP sites would transfer back to DOE for long-term stewardship responsibilities. In December 2003 DOE established the Office of Legacy Management (LM). LM is the responsible party for long-term stewardship of remediated FUSRAP sites.

1.2 Operations

The Painesville site (formerly the Diamond Magnesium site) is located at 720 Fairport Nursery Road, Painesville, Lake County, Ohio, about 22 miles northeast of Cleveland (Figure 1).

From mid-1942 to late 1953, Diamond Magnesium Company operated a magnesium production facility with no known history of processing or producing radioactive materials at their Painesville site.

Between late 1951 and mid-1953, approximately 1,650 tons of scrap metal from the Lake Ontario Storage Area, now the Niagara Falls Storage Area, was shipped to Diamond Magnesium Company and was either used to scrub chlorine gas or stored on the ground with no cover. The source of the scrap metal sent to Painesville was drums used to ship and store residues from the processing of pitchblende ores. These drums, which contained observable residues of pitchblende ores, were part of the scrap metal shipped to the Painesville site). The scrap metal that was stored on the ground was moved around the site on skids or sleds, pulled by a tractor.



Figure 1. Location of the Painesville Site and Surrounding Features such as Hardy Industrial Technologies and adjacent privately owned landfills

All of the aboveground structures on the site (buildings, storage tanks, and railroad spurs) except for a vacant office building (formerly called Building 400) used by Uniroyal Chemical Company have been demolished (Figure 2). The concrete foundations of many of the buildings still remain. Remediated areas may be backfilled with gravel (Figure 3), other remediated areas are backfilled with soil (Figure 4). There are also privately owned groundwater monitoring wells still present (Figure 5).

1.3 Contaminants

The constituents of concern (COCs) were radium-226 (Ra-226), thorium-230 (Th-230), thorium-232 (Th-232), and uranium (U) isotopes (U-234, U-235 and U-238), as well as their decay products. Contamination was limited to surface and subsurface soils. Surface water and groundwater were determined to be not contaminated.

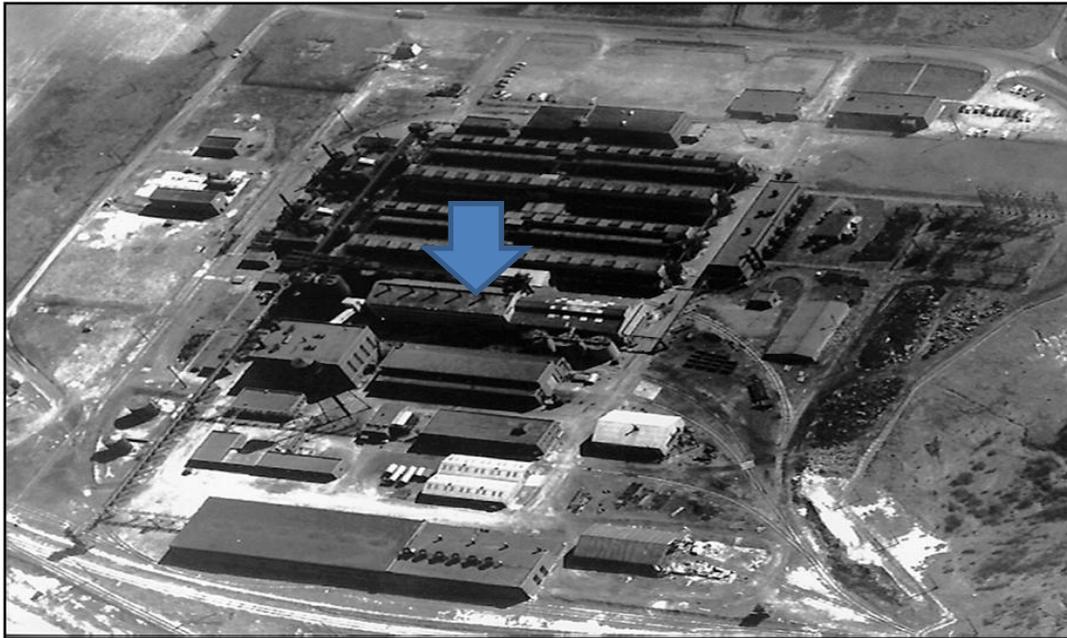


Figure 2. Aerial photograph of the Diamond Magnesium Company production facility, prior to scrap metal containing FUSRAP-eligible constituents being shipped to the Painesville site. The scrap metal arrived by rail at the northwest corner of the property (bottom right). Painesville, Ohio, Site, circa 1950.



Figure 3. Gravel backfill in Remediation Area "C" along eastern boundary of the site, adjacent to Hardy Industrial Technologies. Painesville, Ohio, Site, May 2013.



Figure 4. View from top of adjacent landfill northeast of site looking southeast to Building 400, across Remediation Areas “A” and “G” and to Hardy Industrial Technologies to the east. Painesville, Ohio, Site, May 2013.



Figure 5. Monitoring well MW-39, adjacent to the former 90-day storage area located in the northern portion of the site. Painesville, Ohio, Site, May 2013.

2.0 Remedial Actions

2.1 Cleanup Criteria

The Painesville site was remediated to cleanup criteria outlined in the Painesville ROD for Ra-226, Th-230, Th-232, and total U. The Ohio Administrative Code 3701:1-38-22(B) also states that a facility is considered to be acceptable for unrestricted use if the residual radioactivity exceeding background results in a total effective dose equivalent that does not exceed 25 millirems per year (mrem/yr). Soil cleanup was based on the 25 mrem/year goals, the Derived Concentration Guideline Levels (DCGLs) for the construction worker scenario, are provided in Table 1.

Table 1. Painesville Site Constituents of Concern and Soil Remediation Goals

Constituent of Concern	Average Site Background Concentrations (pCi/g)	Construction Worker Scenario DCGL _w (pCi/g)	Construction Worker Scenario DCGL _{emc} (pCi/g)
Ra-226	0.95	9	12
Th-230	1.45	23	34
Th-232	1.07	6	8
Total U	2.72	482	810

Notes:

DCGL = Derived concentrations guideline level; used as the remediation goal for comparison with soil sampling data

DCGL_w = DCGL wide-area average; derived based on a contaminated area of 10,000 square meters

DCGL_{emc} = DCGL elevated measurement comparison; derived based on a contaminated area of 100 square meters

pCi/g = picocuries per gram

2.2 Remedial Actions

In 1991, the Oak River National Laboratory performed a radiological survey at the site and identified widespread contamination in the surface and subsurface soils exceeding DOE guidelines for unlimited use and restricted exposure. The site was designated for remediation under FUSRAP in September 1992, but it was assigned a low priority because the contaminants were outside, where there was little or no work activity and little chance for exposure. In 1997, USACE was assigned responsibility for FUSRAP remediation. In 1996, Bechtel National Inc., Science Applications International Corporation, and Argonne National Laboratories (ANL), under contract to DOE, performed a detailed investigation of the Painesville site. The results of this study were documented in a Characterization Report for the Painesville Site. That report was used to support USACE's preparation of an Engineering Evaluation/Cost Analysis (for the remediation of the Painesville site. In the EE/CA, USACE recommended excavation and offsite disposal for the impacted soil on the Painesville site.

Before remedial action began, USACE performed a Remedial Investigation/Feasibility Study (RI/FS) for the Painesville site in 2003 and a Feasibility Study Addendum in 2005. In an effort to refine their remedial approach and to define the nature and extent of the contaminants, USACE prepared two additional documents: a Proposed Plan for the Painesville Site (July 2005) and a Pre-Remediation Sampling Report (March 2006). A Record of Decision (USACE 2006) outlining USACE's plans for the remediation of the site was submitted in April 2006, detailing

USACE's intent to excavate the impacted soil and have it transported to a licensed facility for disposal.

USACE conducted three soil excavation and disposal events at the facility. The first was a non-time-critical removal action in 1998 in which impacted soil was excavated and transported by rail to the Energy Solutions disposal facility in Clive, Utah. Approximately 1,326 cubic yards of soil was excavated and transported off the site for disposal. The excavation was performed from September to November 1998. Excavation activities were suspended in November 1998 because winter was approaching and because the extent of contamination was found to be greater than expected.

According to the Final RI/FS Report of 2003, at that time the Painesville FUSRAP site was approximately 52 acres in size and included Area I and the landfills, which is currently under investigation by Uniroyal Chemical Company for chemical contamination. The figure below illustrates areas of remediation in yellow; whereas the blue depicts area of concern (landfills, labeled I and Building 400, labeled E) not remediated on the original 52 acres (see Figure 6).



Figure 6. Contaminated Areas Remediated in 2007–2008 and 2010–2011

In 2005, the site boundary was re-delineated to align with the property line of the former Diamond Magnesium Company, which brought in contaminated scrap metals from AEC inventories for use in the magnesium production, resulting in the radiological contamination at the site. The new boundary encompasses a total area of about 30 acres and was the focus of subsequent remediation-related activities. Area I and the landfill are outside the re-delineated Painesville boundary, and fall outside the scope of LM stewardship mission.

In April 2007, after submittal of the ROD, USACE began a second remediation excavation effort. While performing the investigations leading up to the submittal of the ROD, USACE identified eight areas of concern (AOCs) onsite where impacted soils exceeded the cleanup criteria. During the second remediation effort, 15,268 tons of impacted soil were excavated from the eight AOCs and transported to US Ecology Idaho's Grand View facility for disposal. Excavation activities were suspended in April 2008. Confirmatory sampling confirmed that the remediation met the cleanup goal for four of the eight AOCs identified onsite and an impacted rubble pile, but impacted soil still remained in four of the AOCs. In 2009, USACE performed additional sampling to further define the volume of impacted soil remaining onsite, prior to performing additional excavation.

The third excavation event occurred from April 2010 to August 2011, when USACE excavated soil from the remaining four AOCs (see Figure 6 and Figure 7). For this event, soil that met the size criteria was fed into a mechanical segregation system that radiologically surveyed the soil and segregated out the soil that met the ROD cleanup criteria from the soil that did not meet the criteria. The soil that met or was below the cleanup criteria was returned and placed as backfill for the excavated areas. The soil that did not meet the cleanup goals was sent offsite for disposal. During this remediation, 47,950 tons of soil were excavated and sent through the segregation system. Of that total, 46,932 tons of soil met the cleanup criteria and were returned as backfill, and the remaining soil was sent offsite for disposal. A total of 1,854 tons of soil not meeting the cleanup criteria along with contaminated debris were sent to US Ecology Idaho's Grand View facility for disposal.

2.3 Release Survey

Following the final remediation, a post-remediation report survey showed that the remaining radiological contaminants were below the levels required to meet the 25 mrem/yr dose specified in the applicable or relevant and appropriate requirements in the ROD.

2.4 Independent Verification

As documented in the *Site Closeout Report for the Painesville Report, Painesville Ohio* (USACE 2013), ANL performed an independent review of the site gamma walkover data, as well as all final status survey data.

2.5 Use Restrictions

Post-remedial action survey results indicate that the radiological condition of the site is in compliance with the standards established in the ROD.



Figure 7. Contaminated Areas A and H and the Boundary of Adjacent Landfill

2.6 Assessment of Risk

The scope of long-term stewardship at any radiologically contaminated site that has undergone remediation is based on the amount, if any, of residual contamination that remains at the site once remediation is complete. During the transition of a site to LM, DOE performs an independent “due diligence” analysis of residual contamination in order to identify all necessary long-term surveillance and maintenance activities that will be required to ensure long-term protection of human health and the environment. For the transition of the Painesville site, ANL performed an independent evaluation of the remediation conducted at the site. The source documents include the CERCLA decision documents and the USACE Site Closure Report. In the Site Closure Report, USACE stated that site conditions were protective for “unlimited use and unrestricted exposure.” However, no specific definition was provided in the report.

USACE performed a post-remediation final status survey/dose assessment for the Painesville site to establish residual concentrations for the four radionuclides of concern that remained in soil. For this assessment, the post-remediation radiological dose assessment consisted of defining a sitewide source term of the residual contamination in soil of the four COCs: Ra-226, Th-230,

Th-232, and total U. The average Th-230, Th-232, and total U activity concentrations were below background levels. Only Ra-226 had an average COC activity concentration above background level. USACE used the RESRAD computer model to estimate radiation doses and cancer risks from residual radioactive materials in soil. The model was used to estimate the post-remediation radiological dose assessment for a construction worker scenario, an urban resident scenario, and a subsistence farmer scenario. After remediation, the maximum dose to a construction worker was estimated to be above average background at 1.2 mrem/yr. For the urban resident, the estimated maximum dose was 2.2 mrem/yr, and for the subsistence farmer, it was 7.4 mrem/yr. All those estimated maximum doses were well below the most restrictive dose limit of 25 mrem/yr established as the cleanup criteria in the Painesville ROD.

ANL performed a review to identify residual contamination and the extent of radiation dose and risk associated with the residual contamination. ANL performed an independent assessment of the final status survey data and concluded that the remediation achieved the goals of the ROD for the construction, industrial worker, and urban resident (except for two of the Multi-Agency Radiation Survey and Site Investigation Manual survey units (SUs), 5 and 27).

Based on the results of the RESRAD (RESidual RADiation) computer model, residual concentrations were estimated to be protective (at the 10^{-4} risk level) for a construction worker and an industrial worker in all SUs. Therefore, as long as the site maintains its current use designation as industrial land use, it meets the ROD criteria.

USACE performed one round of groundwater sampling in spring of 2001 using the eight pre-existing wells. These wells were analyzed for Ra-226, isotopic thorium, and isotopic uranium. USACE determined the groundwater was not impacted and was protected from migration of radionuclides by the nature and thickness of the soils at the site based on the modeling results.

2.7 Certification and Regulator Concurrence

None

2.8 Agreements and Permits

A new site access agreement was obtained between the current property owner, Chemtura Corporation and LM.

This page intentionally left blank

3.0 Long Term Surveillance and Maintenance Requirements

3.1 Institutional Controls

DOE Policy 454.1, *Use of Institutional Controls* (DOE Policy), applies the term “institutional controls” (ICs) to include legal instruments (e.g., land use restrictions), physical or engineering controls (e.g., fences and signs), and methods of providing information to people (interpretive displays) that help minimize the risk of human exposure to contaminants and maintain the remedies at a site. The Policy utilizes this broader application of the term ICs in order to encompass the diverse nature of institutional controls and measures used throughout DOE in a consistent yet flexible policy framework integrated into an overall site-wide program. There are no regulatory enforceable institutional controls required by the Record of Decision (ROD) at the Painesville site. However, LM elects to implement several protective measures as listed in Section 3.2 through 3.5.

3.2 Desktop Audit

The desktop audit is applicable to the Painesville site. For sites that were released for unrestricted use and may contain supplemental limits areas, DOE will conduct annual data verification to ensure land usage is consistent with the site certification land use per the remedy and to determine if a site visit is necessary. The Painesville site has been an industrial site for over 60 years and is expected to remain so. As part of the protective measures at the site, LM will verify that the land use at the site remains industrial.

3.3 Site Fact Sheets

The LM public site fact sheet and the LM website will be maintained and updated as required by changes in site conditions. The LM site fact sheet can be found at www.LM.DOE.gov.

3.4 Site Inspections

To assure unencumbered access to the site, there is an access agreement in place between LM and the property owner, Chemtura Corporation for the purpose of conducting inspections and maintenance as necessary. An initial site inspection was conducted in April 2016, within 6 months of site transfer from USACE to LM. Future site visits are not required, but may occur when necessary.

3.5 Monitoring

There are no monitoring requirements at the Painesville site. As long as the site maintains its current use designation as industrial land use, it meets the ROD criteria. Therefore, no monitoring is required at the Painesville site. However, LM may elect to establish a groundwater benchmark as a protective measure given the adjacent landfills. Sampling would occur using existing groundwater monitoring wells located on the site within the first five years of transfer (prior to FY2022).

3.6 Field Operations

There are no field operations required at the Painesville site.

3.7 Regulatory Interfaces

No regulatory interfaces are required at the Painesville site.

4.0 References

USACE (U.S. Army Corp of Engineers), 2006. *Final Record of Decision, Authorized under the Formerly Utilized Sites Remedial Action Program, Painesville Site, Painesville, Ohio*, Final, April.

USACE (U.S. Army Corp of Engineers), 2013. *Site Closeout Report for the Painesville Report, Painesville Ohio*, January.

This page intentionally left blank