

**LMS/WEL/50502**

# **Technical Basis Document for Weldon Spring Site Asphalt Radiological Determination**

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## Abbreviations

AEC	U.S. Atomic Energy Commission
ANSI	American National Standards Institute
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
cm <sup>2</sup>	square centimeters
CSR	<i>Code of State Regulations</i>
DOE	U.S. Department of Energy
dpm	disintegrations per minute
EPA	U.S. Environmental Protection Agency
HPS	Health Physics Society
LM	Office of Legacy Management
LTS&M	long-term surveillance and maintenance
pCi/g	picocuries per gram
RAP	reclaimed asphalt pavement
ROD	Record of Decision
SWRAU	Sitewide Ready for Anticipated Use
TBD	technical basis document
TNT	trinitrotoluene
WSSRAP	Weldon Spring Site Remedial Action Project

## 1.0 Introduction

Active remedial activities at the Weldon Spring Site concluded in 2001 with the completion of the site's disposal cell, a 41-acre engineered structure designed to contain the site's waste resulting from the cleanup. The *Post-Remediation Risk Assessment for the Chemical Plant Operable Unit, Weldon Spring Site, St. Charles, Missouri* (DOE 2002) found that the cleanup of the Chemical Plant and its vicinity properties was within the acceptable risk range for recreational land use.

Over the years, the site has removed asphalt material from various parking lot areas and walkways to make way for new site infrastructure and vertical structures (e.g., the new Weldon Spring Site Interpretive Center built in 2021) and new parking lot areas. Decommissioned asphalt has been kept onsite and stored as construction debris, in accordance with the June 2015 *Position Paper: Status of Parking Lot Asphalt at the Weldon Spring, Missouri, Site* (DOE 2015) (2015 position paper). The practice of not releasing decommissioned asphalt from the site was based on past conservative best management practices and not having definitive U.S. Department of Energy (DOE) residual volumetric activity concentration release and clearance guidelines or limits. This document and its conclusion regarding the stored asphalt supersedes the 2015 position paper, given current and appropriate volumetric radioactivity concentration release values established and implemented within DOE.

In 2023, DOE released volumetric radioactivity concentration guidelines, identified in DOE Standard DOE-STD-1241-2023, *Implementing Release and Clearance of Property Requirements*. DOE total residual volumetric activity guideline limits, which provide release and clearance criteria for allowable total residual volumetric activity in picocuries per gram (pCi/g), are identified in Table 2 of the DOE standard. The preapproved volumetric authorized limits in Table 2 are applicable to personal property, including various debris materials (e.g., removed soil, rubble, sludge, wood, tanks, scrap metal, concrete, asphalt, wiring, doors, and windows), and allow for disposal, recycling, or reuse of the debris material. The volumetric activity guidelines were established under procedures in DOE Order 458.1 Chg 5 (Admin Chg), *Radiation Protection of the Public and the Environment* (Section 4.k.[6][f]2), with the issuance of the memorandum titled *Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements* (March 16, 2021) by the chief Environment, Health, Safety, and Security officer (DOE 2021b). DOE Order 458.1 Chg 5 (Admin Chg) provides for the use of preapproved authorized limits, instead of developing site-specific authorized limits. The Table 2 volumetric activity guidelines are based upon screening levels published in the national consensus standard, American National Standards Institute (ANSI)/Health Physics Society (HPS) N13.12-2013, *Surface and Volume Radioactivity Standards for Clearance*. An Operating Experience Level 3 document was issued by the director of the Office of Environmental Protection and ES&H Reporting titled *OE-3:2021-01, Implementation of Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements* (March 2021), which provides useful information related to implementing clearance of personal property (DOE 2021a). The DOE standard states: "Although Table 2 values are conservative and may be too restrictive or inappropriate for certain radionuclides in certain situations, sites may continue to seek site-specific Authorized Limits using site-specific values."

Using the 2023 DOE total residual volumetric activity guidelines identified in the DOE standard, past historic asphalt radiological laboratory data results, and external subject matter expert evaluations, a technical evaluation was performed to determine whether or not asphalt at the site is or has been radiologically impacted (i.e., whether the radioactivity associated with the asphalt is above the DOE standard Table 2 concentration isotopic guideline limits for the radiologic contaminants of concern and whether the asphalt can be released from the site for unrestricted use (e.g., disposal or recycling).

## 1.1 Purpose

The purpose of this technical basis document (TBD) is to describe the technical evaluation performed to determine if asphalt at the site is or has been radiologically impacted (i.e., if radioactivity associated with the asphalt is above the DOE standard Table 2 release and clearance of volumetric radioactivity of personal property's guideline limit for the contaminants of concern) and whether the asphalt can be released from the site for unrestricted use (e.g., recycling or disposal). Asphalt with radioactivity above the DOE standard Table 2 guideline limit for contaminants of concern will be considered radiologically impacted (volumetrically contaminated) and deemed not releasable from the site for unrestricted use.

## 1.2 Scope

The scope of this TBD deals specifically with asphalt material that is currently on the site. It includes both in-place (in-use) asphalt (e.g., asphalt used for parking lot and walkway surfaces) and asphalt that has been decommissioned and is stored at the site (Figure 1, Figure 2, and Figure 3). The contaminants of concern at the site have been identified as elemental uranium (a combination of uranium-234, uranium-235, and uranium-238 isotopes), radium-226, radium-228, thorium-230, and thorium-232.



*Figure 1. Decommissioned Asphalt Stored at the Weldon Spring Site, Photo 1*



*Figure 2. Decommissioned Asphalt Stored at the Weldon Spring Site, Photo 2*



*Figure 3. Closeup of Decommissioned Asphalt Stored at the Weldon Spring Site, Photo 3*

## 2.0 Site and Cleanup History

### 2.1 Site Operations History

In 1941, the U.S. government acquired 17,232 acres of rural land in St. Charles County, Missouri, to establish the Weldon Spring Ordnance Works. In the process, the towns of Hamburg, Howell, and Toonerville, Missouri, and 576 citizens of the area were displaced. From 1941 to 1945, the U.S. Army manufactured trinitrotoluene (TNT) and dinitrotoluene at the Ordnance Works site. Four TNT production lines were situated on what was to be the Chemical Plant. These operations resulted in nitroaromatic contamination of soil, sediments, groundwater, and some offsite springs ("offsite," in this document, refers to those adjacent or nearby properties not within the physical boundaries of the Weldon Spring Chemical Plant and Quarry; this definition of "offsite" deviates from the definition in the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]).

Following a considerable amount of explosives decontamination of the facility by the U.S. Army, 205 acres of the former Ordnance Works property were transferred to the U.S. Atomic Energy Commission (AEC) in 1956 for the construction of the Weldon Spring Uranium Feed Materials Plant, now referred to as the Weldon Spring Chemical Plant. An additional 14.88 acres were transferred to AEC in 1964. The plant converted processed uranium ore concentrates to pure uranium trioxide, intermediate compounds, and uranium metal. A small amount of thorium was also processed. Wastes generated during these operations were stored in four raffinate pits on the Chemical Plant property. Uranium-processing operations resulted in the radiological contamination of the similar locations previously contaminated by former U.S. Army operations.

The Quarry was mined for limestone aggregate used in the construction of the Ordnance Works. The U.S. Army also used the Quarry for burning wastes from explosives manufacturing and disposal of TNT-contaminated rubble during Ordnance Works operations. These activities resulted in the nitroaromatic contamination of the soil and groundwater at the Quarry. In 1960, the U.S. Army transferred the Quarry to AEC, which used it from 1963 to 1969 as a disposal area for uranium and thorium residues (both drummed and uncontained) from the Chemical Plant.

Uranium-processing operations ceased in 1966, and on December 31, 1967, AEC returned the facility to the U.S. Army for use as a defoliant-production plant. In preparation for the defoliant-production process, the U.S. Army removed equipment and materials from some of the buildings and disposed of them principally in Raffinate Pit No. 4. The defoliant project was canceled before any defoliant was manufactured, and the U.S. Army transferred 50.65 acres of land encompassing the raffinate pits back to AEC while retaining the Chemical Plant. AEC, and subsequently DOE, managed the site, including the U.S. Army-owned Chemical Plant, under caretaker status from 1968 through 1985. Caretaker activities included site security oversight, fence maintenance, grass cutting, and other incidental maintenance. In 1984, the U.S. Army repaired several of the buildings at the Chemical Plant; decontaminated some of the floors, walls, and ceilings; and isolated some equipment. In 1985, the U.S. Army transferred full custody of the Chemical Plant to DOE.

## 2.2 Cleanup History

In 1984, at the direction of the U.S. Office of Management and Budget, the U.S. Army transferred custody of the Chemical Plant to DOE, and DOE assumed responsibility for the cleanup of the site. DOE designated the site a major project called the Weldon Spring Site Remedial Action Project (WSSRAP). A project office was established at the site in 1986. The U.S. Environmental Protection Agency (EPA) placed the Quarry and Chemical Plant areas on the National Priorities List in 1987 and 1989, respectively. The site was remediated by DOE under CERCLA. DOE began the decontamination and dismantling of buildings in 1988 and completed that work in fall 1994. The project also involved disposal of material from the raffinate pits, the Quarry, and the vicinity properties (including water, sludge, abandoned waste materials, and structural materials). To dispose of contaminated material in a manner that met the requirements of the CERCLA remedy, DOE constructed a 41-acre disposal cell in the area formerly occupied by Chemical Plant production buildings. The cell provides long-term containment and management of waste materials from the Weldon Spring Site. DOE completed construction of the cell cap in October 2001.

The site reached construction completion under CERCLA on August 22, 2005. The site also received the EPA Superfund Sitewide Ready for Anticipated Use (SWRAU) designation from EPA in a letter dated March 20, 2013. The SWRAU performance measure reports sites as ready for reuse when the entire construction completed National Priority List site meets the following requirements:

- All cleanup goals in the Records of Decision (RODs) or other remedy decision documents have been achieved for media that may affect current and reasonably anticipated future land uses of the site, so that there are no unacceptable risks
- All institutional or other controls required in the RODs or other remedy decision documents have been put in place

After a review of all relevant site documents, including site RODs, the Long-Term Surveillance and Maintenance Plan, Five-Year Review reports, annual inspections and monitoring data, and institutional control documentation, EPA determined that DOE had achieved the SWRAU performance measure for all DOE-owned land at the site. This included the Chemical Plant and Quarry, which totaled approximately 229 acres. The SWRAU measure was recorded as completed in the EPA Comprehensive Environmental Response, Compensation, and Liability Information System database on February 13, 2013.

## 3.0 Technical Basis

The 2015 position paper was written based on pre-2015 Missouri regulations, as found in Missouri's historic Title 10 *Code of State Regulations* Section 80-3.010(3)(A)2.B (10 CSR 80-3.010[3][A]2.B). As such, the 2015 position paper's conclusion stated: "In conclusion, the referenced material reports radiological contamination in the parking lot asphalt above background, but below ALARA levels. Based on these results the parking lot asphalt may be kept onsite, either in-place or reused. If the asphalt were to be shipped off-site for disposal it must go to a landfill that accepts radiologically contaminated waste" (DOE 2015).

While the current Missouri CSR still prohibits most hazardous wastes from being disposed of in Missouri landfills, including certain types of radioactive material (i.e., Missouri's 10 CSR 80-3.010[2][A]12–15), recent DOE regulations have provided guidance for identifying and providing volumetric radioactivity concentration release and clearance values. In 2023, DOE released volumetric radioactivity concentration values, identified in DOE Standard DOE-STD-1241-2023, *Implementing Release and Clearance of Property Requirements*. DOE total residual volumetric activity values, which provide release and clearance criteria for allowable total residual volumetric activity in units of picocuries per gram, are identified in Table 2 of the DOE standard. The preapproved volumetric authorized limits in Table 2 are applicable to personal property, including various debris materials (e.g., removed soil, rubble, sludge, wood, tanks, scrap metal, concrete, asphalt, wiring, doors, and windows), and allow for disposal, recycling, or reuse of the debris material. The volumetric activity guidelines were established under procedures in DOE Order 458.1 Chg 5 (Admin Chg) (Section 4.k.[6][f]2) with the issuance of the memorandum titled *Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements* (March 16, 2021) by the chief Environment, Health, Safety, and Security officer (DOE 2021b). DOE Order 458.1 Chg 5 (Admin Chg) provides for the use of preapproved authorized limits, instead of developing site-specific authorized limits. The Table 2 volumetric activity guidelines are based upon screening levels published in the national consensus standard, ANSI/HPS N13.12-2013. An Operating Experience Level 3 document was issued by the director of the Office of Environmental Protection and ES&H Reporting titled *OE-3:2021-01, Implementation of Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements* (March 2021), which provides guidance on implementing clearance of personal property (DOE 2021a).

In addition to the 2015 position paper, the documents listed below were also reviewed and evaluated as part of this TBD:

- Memorandum by Rodney Bauman, dated September 6, 2000, about the disposition of WSSRAP asphalt (MK 2000)
- *Characterization Results for Surplus Asphalt*, dated November 2001 (DOE 2001a)
- Letter from DOE to EPA, dated November 26, 2001, about *Characterization Results for Surplus Asphalt* (DOE 2001b)
- Missouri's 10 CSR 80-3.010(3)(A)2.B (historic) and 10 CSR 80-3.010(2)(B)2.B (current)
- Letter from the Missouri Department of Natural Resources to DOE, dated September 21, 2001, about the disposal of postremediation wastes (MDNR 2001)
- Letter from Mary Picel, Argonne National Laboratory, to DOE, dated April 25, 2001 (ANL 2001)

## 4.0 Current Site Radiological Regulations

Regulations identified to be applicable to and implemented at a site (those specifically dealing with radioactivity and its release) have changed over the years, and the regulatory agencies responsible for those regulations have made changes to their regulations. Additionally, DOE has updated some of its DOE orders (specifically DOE Order 458.1 Chg 4 [LtdChg]) and recently

(March 2023) provided DOE sites with the new DOE Standard DOE-STD-1241-2023. This DOE standard, along with DOE Order 458.1 Chg 5 (Admin Chg), identifies what is needed for a DOE site to meet specific regulatory requirements (particularly, those requirements identified in DOE Order 458.1 Chg 5 [Admin Chg]) before the release and clearance of property associated with the site.

In addition to DOE Order 458.1 Chg 5 (Admin Chg) and DOE Standard DOE-STD-1241-2023, the regulations listed below were reviewed and evaluated as part of this TBD:

- *Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements* (March 16, 2021) (DOE 2021b)
- *OE-3:2021-01, Implementation of Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements* (March 2021) (DOE 2021a)
- 10 CSR 80-3.010, “Design and Operation”

## 5.0 Asphalt Radiological Data Evaluation and Determination

Site historical information combined with DOE Standard DOE-STD-1241-2023, *Implementing Release and Clearance of Property Requirements*, provide current and specific guidance that supersedes the information the 2015 position paper was based on. This information includes both surface and volumetric contamination limits:

1. Surface contamination guidelines meeting the guidance of DOE Order 458.1 Chg 5 (Admin Chg), Section 4.k.(6)(f)1.b are provided in Table 2 of the *LMS Radiological Control Manual* (DOE 2025). Surface contamination guidelines are consistent with those originally provided in DOE Order 5400.5 Chg 2, *Radiation Protection of the Public and the Environment*. DOE currently uses the surface contamination limits identified in Table 2 of the *Radiological Control Manual* for releases of personal property to uncontrolled areas.
2. Volumetric radioactivity guidelines meeting the guidance of DOE Order 458.1 Chg 5 (Admin Chg), obtained from certain portions of ANSI/HPS N13.12-2013, have been identified and approved by the Office of Environment, Health, Safety, and Security as the preapproved authorized limits for release and clearance of volumetric radioactivity of personal property. DOE currently uses the volumetric radioactivity concentration values identified in Table 2 of the DOE standard for releases of personal property to uncontrolled areas.

While the actual activity of surface contamination (i.e., some value in disintegrations per minute per 100 square centimeters [dpm/100 cm<sup>2</sup>]) is not presented in the 2015 position paper, the paper does state that: “Surveys performed prior to placement of new asphalt (i.e., for the remediation project) showed low levels of surface contamination on the old asphalt. Due to the placement of additional layers of asphalt and uncertainties in the status of the original pavement, all respective asphalt must be retained on-site because of low-level volumetric contamination concerns” (DOE 2015). Low levels of surface contamination that are “paved over” are no longer considered surface contaminated (they are now volumetric in nature) and do not generate a volumetric contamination hazard. For example, if an area of 100 cm<sup>2</sup> had a surface contamination level of

2000 dpm (2000 dpm/100 cm<sup>2</sup> is 2 times the loose surface contamination level for DOE sites) and was paved over, then the volumetric radioactivity would be 0.8 pCi/g (assuming that only 1 inch of asphalt was placed on top of the 1-inch-thick initial asphalt layer area, and the assumed density of asphalt is 2.24 grams per cubic centimeter [Aqua-Calc 2025]). In reality, multiple inches of asphalt are usually placed when asphaltting driveways or parking lots (initially or when adding another layer). Adding several more inches of thickness of asphalt to the calculation performed above would simply lower the volumetric activity of the asphalt (more mass with the same surface activity).

Radiological release limits (for both surface contamination and volumetric radioactivity) are not to be compared against background levels of radioactivity (which occurred often in the 2015 position paper). Instead, both Title 10 *Code of Federal Regulations* Section 835 (10 CFR 835), “Occupational Radiation Protection,” and DOE Order 458.1 Chg 5 (Admin Chg), *Radiation Protection of the Public and the Environment*, regulations (implemented at the Weldon Spring Site) require that background radioactivity be ignored or removed from radiological measurements that are performed on DOE Office of Legacy Management (LM) sites.

From the 2015 position paper and its five attachments that dealt with possible asphalt radioactivity impact, the evaluation team gleaned volumetric laboratory analytical results in units of picocuries per gram for the contaminants of concern and asphalt background radioactivity (see Attachment 2 of the 2015 position paper, “Characterization Results for Surplus Asphalt, dated November 2001”). Table 1 identifies contaminants of concern, the sample radioactivity concentration ranges, their mean radioactivity concentrations (obtained from the more than 70 asphalt samples that were collected and analyzed in October and November 2000), asphalt background radioactivity concentrations, and the release and clearance volumetric limits for the isotopes.

*Table 1. Asphalt Isotope Radioactivity Concentration and Limits*

Isotope	Sample Activity Concentration Range (pCi/g)	Mean Sample Activity Concentration (pCi/g)	Asphalt Background Activity Concentration (pCi/g)	Limits for Release and Clearance of Volumetric Radioactivity of Personal Property (pCi/g)
Uranium-238 (natural uranium)	< DL to 1.37	0.52	0.52	3 <sup>a</sup>
Radium-226	< DL to 0.765	0.42	0.20	3
Radium-228	< DL to 1.34	0.35	0.15	3
Thorium-228	NA	0.21	0.13	3
Thorium-230	0.24–2.29	1.08	1.20	3
Thorium-232	< DL to 2.12	0.25	0.17	3

**Note:**

<sup>a</sup> Lowered from the Group 2 to the Group 1 radionuclide limit (i.e., 3 pCi/g) due to possible but unknown uranium progeny ingrowth.

**Abbreviations:**

DL = laboratory instrument analytical detection limit

NA = not available

In Attachment 2 of the 2015 position paper, it was identified that three sets of quality control samples (duplicates and matrix spikes) were obtained during the sampling effort and that equipment blank samples were also taken and analyzed. These quality control samples help ensure that laboratory analytical sample results are sound and have a level of quality that makes the asphalt sample results appropriate for making radiological release decisions.

When comparing the asphalt sample contaminants of concern mean activity concentration results to the current DOE limits for release and clearance of volumetric radioactivity of personal property for the concentrations of concern (Table 1), it is clear that asphalt radioactivity concentrations do not exceed the personal property volumetric release and clearance limit. Because routine investigation and maintenance operations at the site have not involved intrusive work activities or work with significant amounts of uranium mill tailings material since 2001 (2001 is when active site remedial activities were concluded), it should also be concluded that asphalt placed at the site between 2001 and the present day is also not radiologically impacted from site activities or operations.

Additionally, the “CERCLA Off-Site Rule” under 40 CFR 300.440 does not apply to the disposition of the asphalt. The CERCLA Off-Site Rule states, “This section applies to any remedial or removal action involving the off-site transfer of any hazardous substance, pollutant, or contaminant as defined under CERCLA sections 101 (14) and (33) (“CERCLA waste”) that is conducted by EPA, States, private parties, or other Federal agencies, that is Fund-financed and/or is taken pursuant to any CERCLA authority, including cleanups at Federal facilities under section 120 of CERCLA, and cleanups under section 311 of the Clean Water Act (except for cleanup of petroleum exempt under CERCLA). Applicability extends to those actions taken jointly under CERCLA and another authority.” Disposition or recycling of the parking lot asphalt is not considered a remedial or removal action under CERCLA.

## **6.0 Beneficial Reuse of Decommissioned Asphalt**

In Missouri, asphalt pavement recycling has been conducted in some form since 1915. Today, reclaimed asphalt pavement (RAP) is utilized in the production of asphalt mixtures for applications ranging from driveways to airport runways. Asphalt pavement is one of the most recycled products in the United States with over 82 million tons of RAP being used in new asphalt mixtures in 2018. Utilization of RAP provides for favorable economic (lower mixture cost), environmental (less energy consumption and greenhouse gas emissions), and societal (extension of available natural resources) impacts.

LM’s beneficial reuse refers to the productive use of an LM-managed site that no longer has a DOE mission after remediation by LM or other entities, while being protective of human health and the environment. Reuse activities maintain protective use of lands and remedies, including revitalization of real property and disposal of land. Two main elements of reuse are:

1. Protectiveness (activities are compatible with long-term maintenance and ensure protection of public health and the environment).
2. Environmentally sound activities that retain good stewardship of natural resources.

LM's goal to sustainably manage and optimize the use of land and assets supports DOE's overall asset reuse program. The intent is to place DOE legacy sites and property in the most beneficial use that is consistent with LM's mission. DOE has a growing number of aging facilities and sites no longer required for mission activities. Those sites form the basis of LM's real property asset portfolio. The objectives are to:

1. Dispose of surplus property held by the federal government.
2. Maintain efficient use of government real property assets.
3. Reduce the total square footage of domestic office and warehouse inventory.

To support LM's long-term surveillance and maintenance (LTS&M) mission and long-term stewardship of DOE assets, LM's real property asset inventory will grow as sites are transitioned. Thus, LM's transition approach includes initial assessments of the most effective uses or reuses of these properties that support LTS&M activities, while still protecting human health and the environment. Once a site becomes part of LM's inventory, LM continues to make assessments on a periodic basis, as LTS&M activities progress and closure plans and strategies are implemented.

## **7.0 Asphalt Radiological Impact Conclusion**

A review and comparison of historic asphalt radiological laboratory data results against current DOE regulations confirms that the volumetric radioactivity for the contaminants of concern for the asphalt at the Weldon Spring Site is significantly less than the preapproved concentration guideline limits for unrestricted release of volumetric material.

Given the technical evaluation information presented above, it is appropriate to conclude with a high level of confidence (that level of confidence associated with the quality and quantity of data collected to support proper decision making, as identified in the *Multi-Agency Radiation Survey and Site Investigation Manual [MARSSIM]*, NUREG-1575 [NRC 2000]) that the site's asphalt (both in-use and stored) volumetric activity is significantly less than the personal property volumetric release and clearance concentration limit as identified in DOE Standard DOE-STD-1241-2023. Because the site's asphalt is released or cleared by the current updated DOE Standard DOE-STD-1241-2023, the material is no longer identified as radioactive material by DOE as stated in the 2015 position paper. Therefore, it is concluded that asphalt debris resulting from activities at the Weldon Spring Site can be dispositioned within the state of Missouri as solid nonhazardous waste in accordance with applicable Missouri Department of Natural Resources rules for solid waste.

## 8.0 References

10 CFR 835. U.S. Department of Energy, “Occupational Radiation Protection,” *Code of Federal Regulations*.

40 CFR 300.440. U.S. Environmental Protection Agency, “Procedures for Planning and Implementing Off-Site Response Actions,” *Code of Federal Regulations*.

10 CSR 80-3.010. “Design and Operation,” *Code of State Regulations*.

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DOE (U.S. Department of Energy), 2002. *Post-Remediation Risk Assessment for the Chemical Plant Operable Unit, Weldon Spring Site, St. Charles, Missouri*, Rev. 1, DOE/OR/21548-910, Oak Ridge Operations Office, March.

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DOE (U.S. Department of Energy), 2021a. *OE-3:2021-01, Implementation of Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements*, Office of Environmental Protection and ES&H Reporting, March.

DOE (U.S. Department of Energy), 2021b. *Pre-Approved Authorized Limits for Release and Clearance of Volumetric Radioactivity of Personal Property at DOE Field Elements*, memorandum by Chief Environment, Health, Safety, and Security Officer, March 16.

DOE (U.S. Department of Energy), 2025. *Radiological Control Manual*, LMS/POL/S04322-8.1, Office of Legacy Management, November.

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DOE Order 5400.5 Chg 2, *Radiation Protection of the Public and the Environment*, U.S. Department of Energy, archived February 11, 2011.

DOE Standard DOE-STD-1241-2023, *Implementing Release and Clearance of Property Requirements*, U.S. Department of Energy, March 1, 2023.

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MK (Morrison-Knudsen), 2000. *Disposition of WSSRAP Asphalt*, memorandum by R. Bauman, September 6.

NRC (U.S. Nuclear Regulatory Commission), 2000. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, NUREG-1575, Rev. 1, August.