

**U.S. NUCLEAR REGULATORY COMMISSION**  
**DOCKET NO. 30-10716**  
**ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED**  
**TO THE ISSUANCE OF A LICENSE AMENDMENT TO BYPRODUCT MATERIALS LICENSE**  
**NO. 24-16273-01, FOR THE SIGMA-ALDRICH COMPANY**  
**ST. LOUIS, MISSOURI**

1. Introduction

The U.S. Nuclear Regulatory Commission (NRC) is considering approval of two requests from Sigma-Aldrich Company (Sigma) amending NRC Materials License No. 24-16273-01 by letters dated August 22, 2019 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML19273A163) to revise the Decommissioning Plan (DP) and April 27, 2020 (ADAMS Accession No. ML20120A544) and October 19, 2020 (ADAMS Accession No. ML20294A191) to terminate the license. If the revised DP is approved, Sigma would be allowed to perform direct dose assessment of the residual radioactivity in addition to using derived concentration guideline levels (DCGLs) to demonstrate compliance with the radiological criteria for unrestricted use in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20.1402 and license termination of the Fort Mims Site in Maryland Heights, Missouri. The license currently states, in part, that the licensee shall conduct its program in accordance with the Sigma-Aldrich Fort Mims Facility, Maryland Heights, DP dated October 22, 2008 (ADAMS Accession No. ML083010187). A Notice of Availability of an Environmental Assessment (EA) and the Finding of No Significant Impact was published for NRC's approval of the DP in the *Federal Register* on April 28, 2009 (2009 DP approval EA). The NRC approved the DP on May 12, 2009 (ADAMS Accession No. ML091330309). In the DP, Sigma stated that they would rely on the screening values in Appendix H of NRC's "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria" (NUREG-1757), Vol. 2, Rev.1 to demonstrate that the site meets the release criteria for unrestricted use specified in 10 CFR 20.1402, "Radiological criteria for unrestricted use." The NRC has prepared this document in support of the proposed action in accordance with the requirement of 10 CFR Part 51.

The NRC staff is reviewing the license amendment requests (to revise the DP and terminate the license) concurrently. If the revised DP is approved and Sigma is authorized to use dose assessments in addition to DCGLs, the license can be terminated based on the existing site characterization data referenced in the April 27, 2020 submittal and without additional soil or groundwater remediation. Approval of the second amendment request (to terminate the license) would result in the site being considered acceptable for unrestricted use.

In response to Sigma's requests, the NRC published notice of the requests in the *Federal Register* on December 21, 2020 (85 FR 83109) with an opportunity to provide comments, request a hearing, and to petition for leave to intervene. The NRC received no comments, request for hearing, or petition for leave to intervene.

## 2. Site Description

The Sigma Fort Mims Site is located at 11542 Fort Mims Drive, Maryland Heights, Missouri. The site consists of a three-acre parcel of, formerly-developed and now unused, land that was previously used for the radiolabeling of chemicals with carbon-14 (C-14) and tritium (H-3). The site is located within the Lakeside Crossing Industrial Park, which is zoned for industrial and commercial use (ADAMS Accession No. ML19273A160). Residential use of the Sigma site in the near future is considered unlikely due to local zoning restrictions and current and expected future land use. The former building facility was constructed in the late 1960s and expanded in 1981. The effluent discharge points were an exhaust stack and a septic tank, which was located beneath the former building facility. The use of the septic system ceased in 1981.

The former building facility structures, foundation, and septic system were decontaminated, decommissioned, and removed from the site in 2010. In 2014, the asphalt parking lot was removed. The site currently consists of areas of grass and moderate vegetation. The groundwater at the site ranges from 5 to 6 meters (15 to 20 feet) below ground surface based on groundwater monitoring data. Both C-14 and H-3 were detected in the groundwater with maximum observed concentrations of 24 becquerel/liter (647 picocuries/liter) for C-14 and 500 becquerel/liter (13,500 picocuries/liter) for H-3. For comparison, the U.S. Environmental Protection Agency (EPA) has established a Maximum Contaminant Level of 4 millirem/year for beta particle and photon radioactivity from manmade radionuclides in drinking water. The EPA-established concentrations would be 2,000 picocuries/liter for C-14 and 20,000 picocuries/liter for H-3. Based on the currently available information, it appears that the groundwater could be suitable for domestic use. However, because there is a public water supply for Maryland Heights that is drawn from the surface waters of the Missouri and Merrimac Rivers, the NRC assumes that the public drinking water supply would be the likely source of water in the future and not the groundwater.

As discussed in the Phase 4 Sampling and Analysis Plan dated February 26, 2015 (ADAMS Accession No. ML15147A565), the site operational history stated that there are different potential sources of soils contamination onsite:

- Soil deposition from exhaust stack emissions to the west of the former Fort Mims Building
- Deposition from exhaust stack emissions on the roof from which rain runoff drained to the south and southwest corner of the Fort Mims Building
- Septic disposal of contaminants under the foundation of the former building, which was in use until 1981 (ADAMS Accession No. ML091330309)

## 3. Proposed Action

The proposed action is approval of two requests for license amendment. First, Sigma requested the option to perform direct dose assessment of residual radioactivity in addition to using DCGLs to demonstrate compliance with the radiological criteria for unrestricted use in 10 CFR 20.1402 at the Fort Mims Site in Maryland Heights, Missouri. The NRC guidance in NUREG-1757, Volume 2, Revision 1, allows for the use of either the DCGL or dose assessment approach in demonstrating compliance with the license termination criteria.

Second, Sigma also requested license termination based on the site-specific dose assessment in the revised DP and the site characterization data referenced in the letter dated April 27, 2020. Because, according to the licensee, the revised DP and site characterization data indicate that the site meets the radiological criteria for unrestricted use in 10 CFR 20.1402 and therefore, the license could be terminated without additional site characterization or soil remediation.

To support this proposed action, the NRC staff developed a Safety Evaluation Report (SER) (ADAMS Accession No. ML21116A234) for the licensee's dose assessment and supporting assumptions. The NRC staff concluded in the SER that the licensee has shown that the site soils and groundwater meet NRC regulations and that the site, therefore, could be released for unrestricted use.

#### 4. Need for the Proposed Action

Sigma was originally approved to use screening DCGL values to demonstrate that the entire site meets the radiological criteria for unrestricted use specified in 10 CFR 20.1402. DCGLs are intended to be conservative because they are designed to apply generically across a range of sites. However, during site characterization, Sigma identified areas of contamination exceeding the screening DCGL values. Instead of remediating the contaminated soil to less than the screening DCGL values, Sigma requested the use of a dose assessment approach in addition to DCGLs to demonstrate that the site meets the NRC criteria for unrestricted release. The NRC's proposed approval of Sigma's use of the dose assessment and DCGL approach instead of the DCGL screening values for the site would allow Sigma to use site-specific information in a more realistic manner. A license amendment is required for Sigma to change their approach from screening DCGLs to the use a dose assessment approach in combination with DCGLs.

In addition to the request for use of the dose assessment approach in combination with DCGLs, Sigma also requested license termination, as they have ceased principal activities at the Fort Mims Site. The NRC needs to fulfill its responsibilities under the Atomic Energy Act by making a decision on the proposed license termination request in a manner that would allow unrestricted use of the site while protecting public health and safety and the environment.

#### 5. Alternative to the Proposed Action

The alternative to the proposed action is the no-action alternative, denial of the requested license amendment. Without the requested license amendment, Sigma would need to use the DCGL screening values approved in the 2008 DP to demonstrate compliance with 10 CFR 20.1402 in order to terminate their license. That would require Sigma to remediate soil with concentrations exceeding the screening DCGL values and recharacterize the soils to verify that the soils meet the screening DCGL values.

#### 6. Environmental Impacts of the Proposed Action

The Fort Mims Site is located within the Lakeside Crossing Industrial Park, which is zoned for industrial and commercial use. The proposed action would authorize Sigma to adopt a dose assessment approach for certain areas of the site to demonstrate compliance with the radiological criteria for unrestricted use in 10 CFR 20.1402 and to terminate their license. Sigma would use the dose assessment approach in combination with DCGLs to evaluate the entire site. The dose assessment approach would result in a higher allowed level of residual radioactivity in certain areas of the site in comparison to the previously-approved approach of

using screening DCGL values. The use of screening DCGL values would require remediation of contaminated soils that are present in the areas described in Section 2 of this EA. That residual contamination affects the soil and groundwater resources at the Fort Mims Site. However, as explained below, the radiological and nonradiological impacts from this residual contamination would not be significant and the site would meet the NRC's requirements for unrestricted use.

In the SER for the Fort Mims Site (ADAMS Accession No. ML21116A234), NRC staff evaluated the dose impacts from the C-14 and H-3 contamination to potential future receptors. The staff reviewed the revised DP, in which Sigma evaluated an industrial worker as the likely scenario for the Fort Mims Site. Sigma also evaluated a suburban resident scenario, which is plausible but less likely because the parcel is currently zoned for commercial and industrial use, which is the expected future use for the land as well. In the industrial worker scenario, the hypothetical worker is at the site for 8 hours per day, does not consume food grown or well water from the site, leaves the site after work, and does not work on weekends. In the second scenario, the hypothetical suburban resident is at the site for 24 hours per day and has a vegetable garden but does not consume water from an onsite well because of the availability of a public water system. The maximum total radiological dose is projected to be 0.0002 millisievert/year (0.02 millirem/year) for the most likely scenario of industrial worker from exposure to site soils. The projected dose to the less likely, but plausible, scenario of suburban resident from exposure to site soils and food from the garden is 0.038 millisievert/year (3.8 mrem/year). If groundwater from an onsite well were consumed at the Fort Mims Site, the dose would be approximately 0.019 millisievert/year (1.9 millirem/year) based on: (1) the maximum observed groundwater concentrations of C-14 and H-3 in the groundwater and (2) an ingestion rate of 1.4 liter/day (0.37 gal/day). All of these potential doses are significantly less than the NRC's unrestricted use criterion in 10 CFR 20.1402 of 0.25 millisievert/year (25 millirem/year).

Based on its review, the NRC staff determined that the radiological environmental impacts from the proposed action for the facility are bounded by the "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities" (NUREG-1496). Because of the localized nature of the impacts, the NRC staff does not expect any cumulative effects from the proposed action, when considered in combination with previously-approved actions at the site and other past, present, or reasonably foreseeable actions. The total dose from the residual radioactivity at the site will continue to be less than the 0.25 mSv/y (25 mrem/y) criterion.

## 7. Environmental Impacts of the Alternative to the Proposed Action

The only alternative to the proposed action is the no-action alternative, denial of the license amendment requests. If Sigma is not authorized to use the dose assessment approach to demonstrate compliance with 10 CFR 20.1402, then Sigma would have to remove the residual radioactivity (by excavating soils) to reach levels that are below the previously-approved DCGL values in order to terminate their license. Approximately 860 m<sup>3</sup> (1,100 yd<sup>3</sup>) of soils would need to be excavated. Although the residual levels of radioactivity in the soils are well below the NRC's criterion for unrestricted release of the site, the excavation and removal of this material would create a potential for radiological environmental impacts. Radiological environmental impacts that could result from such remediation activities include inhalation and ingestion hazards to workers and the public. As described in the NUREG-1496 and NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs," the excavation and removal of soil would also impact air quality (dust from excavation), increase noise (earthmoving equipment), and affect transportation.

These impacts would not be significant but, taken together, the potential nonradiological and radiological impacts of the no-action alternative would be greater than the radiological and nonradiological impacts of leaving the soil in place.

#### 8. Agencies and Persons Consulted

The NRC staff consulted with the Missouri Department of Natural Resources regarding the environmental impact of the proposed action. By letter dated August 10, 2021 (ADAMS Accession No. ML21258A322), the State of Missouri provided several comments, and the NRC responded by letter to those comments (ADAMS Accession No. ML21277A027). There were no changes made to this EA as a result of the comments from the State of Missouri. As described in the NRC's 2009 DP approval EA (ADAMS Accession No. ML091180638), NRC staff also previously consulted with the Missouri Department of Conservation, Wildlife Division, Endangered Species, on March 5, 2009, (ADAMS Accession No. ML090640890) as required by Section 7 of the Endangered Species Act. The purpose of the call was to ensure that the licensing action is "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the habitat of such species." The Missouri Wildlife Division staff indicated that, based on their review and knowledge of current documents relating to possible endangered species, the decommissioning and release of the Sigma building located in Maryland Heights, Missouri would not affect any endangered species. NRC staff have determined that the current proposed action of allowing dose modeling and license termination would not affect listed species or critical habitat, because there would be no additional disturbance of the site. Therefore, no additional consultation is required under Section 7 of the Endangered Species Act.

As described in the NRC's 2009 DP approval EA (ADAMS Accession No. ML091180638), NRC staff previously consulted with the Missouri Department of Natural Resources, as required by Section 106 of the National Historic Preservation Act. By letter dated March 19, 2009 (ADAMS Accession No. ML090860375) from the Department of Natural Resource's State Historic Preservation Office, Director, and Deputy State Historic Preservation Officer, the State indicated that "[w]e have reviewed the information provided concerning the above referenced project. Based on this review we concur that the Sigma Aldrich Chemical Company is not eligible for inclusion in the National Register of Historic Places. In our opinion, the property has been extensively disturbed, and there is little potential for the occurrence of archaeological sites. We concur that there will be no historic properties affected and we have no objection to the initiation of project activities." NRC staff have determined that the current proposed action of allowing dose modeling and license termination is not the type of activity that has potential to cause effects on historic properties, because there will be no additional disturbance of the site. Therefore, no additional consultation is required under Section 106 of the National Historic Preservation Act.

#### 9. Conclusion

Per NRC guidance in NUREG 1757, Volume 2, the use of dose assessment in combination with DCGLs is an acceptable approach for demonstrating compliance with 10 CFR 20.1402. NRC staff also determined in its SER that the site meets the unrestricted use criterion in 10 CFR 20.1402 and that the license can be terminated.

The NRC staff has prepared this EA in support of the proposed action to amend NRC Materials License No. 24-16273-01 in accordance with requirements of 10 CFR 51. On the basis of this EA and per NRC's National Environmental Policy Act guidance for materials sites in NUREG-1748, NRC has concluded that there would be no significant environmental impacts and approval of the license amendment would not warrant the preparation of an Environmental Impact Statement. Accordingly, it has been determined that a Finding of No Significant Impact is appropriate.

#### 10. Preparer

This EA was prepared by George Alexander, Risk Analyst, Division of Decommissioning, Uranium Recovery, and Waste Programs.

#### 11. Sources Used

Missouri Department of Natural Resources, Letter from State Historic Preservation Officer Re: Sigma Aldrich, ADAMS Accession No. ML090860375, March 19, 2009.

Missouri Department of Natural Resources, Comments on Draft EA for Sigma-Aldrich Fort Mims Site, ADAMS Accession No. ML21258A322, August 10, 2021.

Sigma-Aldrich Company, Letter from Sigma Aldrich, RE: Decommissioning Plan, ADAMS Accession No. ML083010187, September 21, 2010.

Sigma-Aldrich Company, Phase 4 Sampling and Analysis Plan, ADAMS Accession No. ML15147A565, February 26, 2015.

Sigma-Aldrich Company, Revised Decommissioning Plan for the Fort Mims Site, ADAMS Accession No. ML19273A160, June 27, 2019.

Sigma-Aldrich Company, Transmittal Email – Revised Decommissioning Plan for the Fort Mims Site, ADAMS Accession No. ML19273A163, August 22, 2019.

Sigma-Aldrich Company, Request for License Termination for the Fort Mims Site, ADAMS Accession No. ML20120A544, April 27, 2020.

Sigma-Aldrich Company, Revised Decommissioning Plan: NRC Form 313, ADAMS Accession No. ML20294A191, October 19, 2020.

U.S. Nuclear Regulatory Commission, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities" NUREG-1496, ADAMS Accession No. ML20149G542, July 31, 1997.

U.S. Nuclear Regulatory Commission, NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs, ADAMS Accession No. ML032540811, August 31, 2003.

U.S. Nuclear Regulatory Commission, Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria" NUREG-1757, Vol. 2, Rev.1, ADAMS Accession No. ML063000252, October 31, 2006.

U.S. Nuclear Regulatory Commission, Consultation with State of Missouri Department of Conservation, Regarding Endangered Species, ADAMS Accession No. ML090640890, March 5, 2009.

U.S. Nuclear Regulatory Commission, Federal Register Notice – Environmental Assessment for Sigma-Aldrich Company’s Decommissioning Plan License Amendment, ADAMS Accession No. ML091180638, April 28, 2009.

U.S. Nuclear Regulatory Commission, NRC Approval of Sigma-Aldrich Company’s Fort Mims Facility Decommissioning Plan, ADAMS Accession No. ML091330309, May 12, 2009.

U.S. Nuclear Regulatory Commission, Safety Evaluation Report for Revised Decommissioning Plan and License Termination for the Sigma-Aldrich Fort Mims Site, ADAMS Accession No. ML21116A234

U.S. Nuclear Regulatory Commission, NRC Response to Missouri Department of Natural Resources Comments on Sigma-Aldrich Draft Environmental Assessment, ADAMS Accession No. ML21277A027, October 12, 2021.