SRS WATCH

Savannah River Site Watch

July 15, 2026

Comment by Tom Clements, Director, Savannah River Site Watch (www.srswatch.org) - Plaintiff in the PEIS Lawsuit - on the Draft Plutonium Pit PEIS (DOE/EIS-0573), based on the *Science & Global Security* Journal Article:

Consequence Analysis of Major Fires at Plutonium Pit Production Facilities,
by Raven Witherspoon, Svitlana Lavrenciuc & Sébastien Philippe; in *Science & Global Security* (affiliated with Princeton University's Program on Science & Global Security), July 10, 2026; DOI: 10.1080/08929882.2026.2690796.
(at: https://www.tandfonline.com/doi/full/10.1080/08929882.2026.2690796)

Abstract of the article: "As the United states reestablishes large-scale plutonium pit production, federal agencies have published environmental impact studies estimating radiological consequences from major facility fires in New Mexico and south Carolina. these analyses predict average latent cancer fatalities in the single digits but do not evaluate total cancers or remediation costs from land contamination. Using atmospheric transport and dispersion modeling, this study independently estimates downwind plutonium deposition and inhalation, cancer risk, and land contamination across meteorological conditions for different source terms. For assumptions consistent with current federal analyses, a 1-kilogram respirable release could produce up to 21 latent cancer fatalities, with total cancers three times higher. tens of square kilometers of land could require billions of dollars in soil remediation, while contamination in residential areas could require evacuation. larger releases involving different fire conditions and smaller particle sizes could cause over 1,000 fatalities, suggesting current assessments may underestimate accident consequences."

The journal article cited above is submitted for the PEIS record as part of this comment.

<u>Questions arising from the Science & Global Security Journal article cited above, with extracts from the article, followed by relevant questions and issues posed that must be addressed in the final PEIS:</u>

"The radiotoxicity of plutonium and the pyrophoric character of several of its forms make fires a central risk throughout the pit production process." (page 2)

(See United States Department of Energy, “DOE Handbook: Primer on Spontaneous Heating and Pyrophoricity” (DOE-HDBK-1081-2014, Washington, 2014, at: https://www.energy.gov/ehss/articles/doe-hdbk-1081-2014)

<u>Question 1:</u> How will the final PEIS assess the likelihood and consequences of major plutonium fires, including fires involving pyrophoric plutonium and loss of containment? Please address this in the PEIS.

“Environmental impact statements for Los Alamos (2008) and the Savannah River Site (2020) conclude that major fires resulting in complete loss of containment would lead to only a small number of latent cancer fatalities from inhalation of plutonium oxide particles on average. They do not, however, include projection of total cancers or analysis of land contamination and associated remediation costs.” (page 2)

<u>Question 2:</u> Why does the draft PEIS not evaluate land contamination resulting from a major facility plutonium fire with loss of containment? Please address this in the PEIS.

<u>Question 3:</u> Does DOE estimate the total number of radiation induced cancers resulting from major accident scenarios, in addition to latent cancer fatalities? If not, why was this analysis omitted? Please address this in the PEIS.

“This study presents a consequence analysis of potential major plutonium fires at Los Alamos National Laboratory and the Savannah River Site. The National Oceanic and Atmospheric Administration’s Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model, a modern atmospheric transport code, is used to estimate dispersion and deposition of plutonium oxide released during a fire.10 The Nuclear Regulatory Commission describes this model as state of the art, and the DOE incorporated it into its accident consequence system in 2022. (page 3)

(See United States Nuclear Regulatory Commission, “Recent Major Updates for the NRC’s Accident Consequence Code System (MACCS)” (2022). www.nrc.gov/docs/ML2214/ML22145A493.pdf; United States Department of Energy, Sandia National Laboratory, D. J. Clayton, N. E. Bixler, and K. L. Compton, “HYSPLIT/MACCS Atmospheric Dispersion Model Technical Documentation and Benchmark Analysis” (SAND2022-5515, 2022).)

<u>Question 4:</u> Does the draft PEIS use HYSPLIT or another state-of-the-art atmospheric transport and dispersion model to evaluate accident consequences? If not, what methodology is used, and why? Please address this in the PEIS.

"Major fires could also contaminate hundreds of square kilometers of land, including tens of square kilometers where remediation would be required at substantial cost. In extreme cases, contamination may be too severe or widespread for remediation to be feasible." (page 3)

<u>Question 5:</u> Please estimate the minimum, average, and maximum downwind areas requiring remediation following a major plutonium fire with loss of containment. Please also identify the conditions under which residential areas would require evacuation or relocation. Please address this in the PEIS.

"Initial calculations in this study assume a one-kilogram source term, consistent with the range of source terms for large fires presented in the 2008 Los Alamos environmental impact statement (0.67 to 1.28 kilogram) and the 2020 Savannah River Site statement (0.5 to 1.01 kilogram)" (page 5)

(See United States Department of Energy, "Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina," vol. 2, Appendix B, B-25).

<u>Question 6:</u> Please confirm the plutonium source terms assumed for each major accident scenario evaluated in the draft PEIS and explain the technical basis for those assumptions. Please address this in the PEIS.

"Because environmental impact statements restrict their analyses to a 50-mile radius around each facility, this analysis compared latent cancer fatalities computed over the full 14 × 14° domain to those captured within that radius. For Los Alamos, the 50-mile domain includes 89% of average fatalities and 78% of median fatalities across the full simulation set. For the Savannah River Site, it includes only 50% of average fatalities

and 27% of median fatalities. In both cases, however, the 50-mile radius captures 99.9% of the fatalities associated with the single worst meteorological outcome." (page 6)

<u>Question 7:</u> Why does the draft PEIS limit its consequence analysis to a 50-mile radius? Please justify the 50-mile limit. Please quantify the health and environmental impacts occurring beyond this 50-mile boundary and explain why they were excluded from the analysis.

"Additionally, this work examines the effect of particle size on deposition and cancer fatalities. The findings are consistent with the expectation that, under identical meteorological conditions, smaller particles travel farther from the release site, producing lower deposition in the immediate vicinity and greater radiological exposure to downwind populations. They are also associated with higher cancer risk (see Appendix A for details). The initial 5-micron analysis is extended by simulating the same 1 kg source term using a lognormal distribution of particles sizes with activity median aerodynamic diameter (AMAD) of 0.88 micron (~1-micron) and a geometric standard deviation of 0.39. Simulations using this particle size distribution result in substantially higher latent cancer fatalities than the 5-micron case. At the Savannah River Site, average fatalities increase from 3 to 40, and the highest con sequence simulation produces roughly 330 fatalities." (page 6)

<u>Question 8:</u> Does the draft PEIS evaluate the effects of different plutonium particle size distributions on atmospheric transport, deposition, and public health consequences? If not, why not? Please address this in the PEIS.

"In addition to latent cancer fatalities, this study considers total cancers from plutonium inhalation. For the 5-micron AED simulations, inhalation of plutonium from a Los Alamos fire could result in 0 to 63 cancers, with a mean of 5. For the Savannah River Site, results show 0 to 64 cancers, with a mean of 8. For the 0.88-micron AMAD distribution, Los Alamos could see between 0 and 638 cancers (mean 30) and SRS could see between 0 and 1000 cancers (mean 122)." (page 6)

Note that AED means "aerodynamic equivalent diameter" and AMAD means "activity median aerodynamic diameter."

<u>Question 9:</u> Please provide the minimum, median, average, and maximum estimated numbers of excess cancers associated with each major accident scenario, including the effects of different plutonium particle size distributions.

"The environmental impact statements for pit production at Los Alamos and the Savannah River Site do not include estimates of land contamination or remediation costs. At the former Rocky Flats plant, the 10-year cleanup concluded in 2005 and cost ten billion dollars, or 16.27 billion dollars in fiscal year 2025 dollars, according to the United States Government Accountability Office. The portion of the site that required remediation through soil mixing or removal, known as the Central Operable Unit, covered 5.29 square kilo meters of the 25.5 square kilometer facility. This corresponds to an approximate remediation cost of three billion dollars per square kilometer." (p 7)

<u>Question 10:</u> Why does the draft PEIS not estimate remediation costs associated with land contamination following a major plutonium fire? Please provide the basis for excluding these costs. Please address this in the PEIS.

"These simulations show that areas exceeding 18,500 Bq/m2 often include residential zones. For instance, deposition levels in some areas of Los Alamos Township could exceed 600,000 Bq/m2, and populated areas around the Savannah River Site could approach and in rare cases exceed 100,000 Bq/m2. Contamination of this magnitude could require evacuation of local communities and temporary shutdown of lab facilities. Remediating large tracts of land may also prove untenable as the scope of soil mixing and removal could exceed previous radiological cleanup efforts at Rocky Flats and other DOE sites. Cost estimates likewise do not include additional expenses associated with remediating residential properties or compensating affected residents." (p 8)

<u>Question 11</u>: Please estimate the extent of land contamination, the associated remediation costs, and the potential costs of evacuation and compensation for affected residents following a major plutonium fire with loss of containment.

"The Savannah River Site environmental impact statement cites Handbook 3010 values directly and assumes that most of the plutonium at the facility is in metal form. While the 2008 Los Alamos statement does not explicitly list ARF × RF parameters for its

major fire scenarios, other fire related accident analyses in the document are consistent with the same 1994 recommendations.
However, a series of reports on historical public exposure from Rocky Flats prepared for the Colorado Department of Health examined a wider set of ARF × RF values for different oxidation states and fire conditions of metallic plutonium, including those in Handbook-3010.Footnote[33] DOE environmental impact statements cite Handbook-3010 in assuming an ARF × RF value of 2.5×10^{-4} for plutonium metal. However, sources cited in Voillequé et al.'s reconstruction of the 1957 Rocky Flats fire source term posit that four oxidation states of metallic plutonium have different ARF × RF values, including two higher coefficients for burning under dynamic (5×10^{-4}) and vigorous (1×10^{-3}) fire conditions. The DOE also assumes an ARF × RF value of 2×10^{-3} for plutonium burning in aqueous solutions, while Voillequé et al. use 6×10^{-2} as value.Footnote[34] Table 2 compares ARF × RF values from different studies."
(pages 11-12)

"The current study assesses different combinations of ARF × RF values listed in Table 2 and varying proportions of plutonium across oxidation states, finding that source terms could be 2–5 times as large for the MAR values listed in environmental impact statements. In the bounding scenario – all plutonium metal burning in the "vigorous" oxidation category – source terms could reach 5.1 kg and 4.3 kg for LANL and SRS, respectively." (p 13)

Question 12: Why does the draft PEIS not evaluate the broader range of credible plutonium fire conditions identified in the scientific literature, including dynamic and vigorous oxidation of plutonium metal, that could produce source terms two to five times larger than those currently assumed? Please address this in the PEIS.

Conclusion: "Accounting for smaller particles and a broader range of fire conditions, estimated latent cancer fatalities could be up to two orders of magnitude higher than current federal evaluations. These findings suggest that existing assessments may underestimate the consequences of major plutonium fires and warrant further analysis." (page 14)

Question 13: In light of the findings reported in *Science & Global Security*, will DOE in the final PEIS update its accident consequence analysis for Los Alamos National Laboratory and the Savannah River Site to include:

- **latent cancer fatalities and total cancers,**
- **contamination above 18,500 Bq/m² and 1,000 Bq/m²,**

- **minimum, median, average, and maximum consequences across meteorological conditions, and**
- **mapping of contamination affecting residential neighborhoods, schools, parks, and other public spaces?**

And, from the *Final Environmental Impact Statement for Plutonium Pit Production at the Savannah River Site in South Carolina* (SRS Pit Production EIS) (DOE/EIS-0541), 2020, I note the analysis in the 2020 EIS about a major fire with loss of containment. It is the bounding scenario evaluated by DOE in the LANL and SRS EIS.

"The building ventilation system would include high-efficiency particulate air (HEPA) filters and would be designed to maintain confinement, thus precluding the spread of airborne radioactive particulates or hazardous chemicals within the facility or to the outside environment. Both intake and exhaust air would be filtered, and exhaust gases would be monitored for radioactivity." In the draft PEIS of 2026, the air from the pit plant would go only through a sand filter. Question: Why was HEPA filtration eliminated for the SRPPF in the draft PEIS?

"Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage."

Re the Charleston seismic zone the 2020 EIS says: "With nearly three centuries of available seismic data, the Charleston and Summerville, South Carolina areas remain the most seismically active region affecting SRS. However, levels of earthquake activity within this region are usually low, with magnitudes generally less than or equal to 3.0 on the Richter scale. The Charleston earthquake of 1886 (estimated Richter scale magnitude of 6.8) is the most damaging earthquake known to have occurred in the southeastern United States and one of the largest historic shocks in eastern North America. At SRS, this earthquake had an estimated Richter scale magnitude ranging from 6.5 to 7.5."

Question/Request 14: Please provide in the final PEIS an updated seismic analysis of the K-Area Plutonium Metal Preparation (K-Area PuMP) facility, including the potential for loss of confinement of plutonium from gloveboxes and the K-Reactor building during a magnitude 6.5 to 7.5 earthquake.

(K-Area PuMP information based on based on DNFSB weekly report, May 29, 2026: https://www.dnfsb.gov/sites/default/files/2026-06/Savannah%20River%20Week%20Ending%20May%2029%202026.pdf)

Please publish this comment and the submitted plutonium-fire journal article in a publicly available appendix to the final Plutonium Pit PEIS. Thank you - SRS Watch, Columbia, South Carolina, www.srswatch.org.

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Appendix A: Journal article *Consequence Analysis of Major Fires at Plutonium Pit Production Facilities,* submitted along with this comment.

Appendix B: New York Times on plutonium fire-risk journal article, July 10, 2026:

https://www.nytimes.com/2026/07/10/climate/nuclear-bomb-energy-department-lab.html

By Alicia Inez Guzmán

U.S. Underestimates Peril if Los Alamos Were to Leak Plutonium, Study Says

An accident at the lab that produces America's nuclear bomb cores could lead to more fatalities than previously estimated by the federal government, according to new research.

The Energy Department has underestimated the potential deadly consequences should plutonium escape the Los Alamos National Laboratory in New Mexico, which produces bomb cores for America's nuclear weapons, a study published today by independent scientists found.

The chances of a leak are considered minuscule. But one is possible, especially following a natural disaster like an earthquake. Plutonium could escape from protective work stations inside a building called Plutonium Facility 4, or PF-4, and ignite. Then, if one or more of the building's safety systems fail, radioactive plutonium particles could enter the outside air and spread through the surrounding communities in a plume of smoke.

The Energy Department, which manages the country's nuclear weapons production, had previously concluded that a so-called loss of containment at the lab could spread about one kilogram of plutonium, a radioactive metal, leading to nine cancer deaths on average in the surrounding area. But modeling in the new study, published in Science and Global Security, showed the potential for much worse: Hundreds of people who inhale or ingest particles from a leak could eventually die from cancer, the researchers said.

And in the most serious possibility modeled in the study — if more than one kilogram of plutonium escaped — the town of Los Alamos could become unlivable and radioactive particles could spread across state lines. As many as 3,200 people could eventually get cancer, the researchers estimated, leading to about 1,000 deaths. The remediation of land could run up to an estimated $150 billion.

“In the worst case, it would be devastating for Los Alamos and New Mexico,” said Sébastien Philippe, an assistant professor of nuclear engineering and engineering physics at the University of Wisconsin-Madison, who led the study. “We find that it could be 10 to 100 times worse” than the government’s estimates, he added.

The peer-reviewed study is the first to independently evaluate the department’s assessment of a potential leak. The journal Science and Global Security is affiliated with Princeton University, where Dr. Philippe is also a visiting researcher. The study was funded by the Andrew Carnegie Foundation and the Ploughshares Fund, both of which underwrite arms control and nonproliferation research.

The study arrives amid a threat of a global nuclear arms race. China, North Korea and Russia are upgrading or expanding their arsenals. And Iran, at war with the United States and Israel, has a stockpile of enriched uranium. The United States is ramping up its own bomb core production at Los Alamos, where the country’s only active plutonium-handling facility is running round-the-clock operations as part of a $1.7 trillion effort to modernize the nation’s weapons.

The country already has thousands of bomb cores — each about the size of a grapefruit — made during the Cold War, but the new ones are intended to arm next-generation land-based missiles and submarines. Just one would produce a blast far more powerful than the one at Hiroshima. And while Congress required the production of at least 30 bomb cores per year by 2030, Los Alamos could be called upon to produce up to 80 per year.

The lab sits on a fault system, and the federal government has identified the most consequential risk to be an earthquake that knocks over one of PF-4’s thousands of glove boxes, oxygen-free enclosures where workers handle radioactive materials.

Plutonium particles pose little harm if they are not inhaled, similar to radiation from an X-ray. But when inhaled or ingested, those particles can cause damage over years or decades, even altering DNA. Children are the most vulnerable because their cells are still forming.

In a statement, a spokesperson for the National Nuclear Security Administration, an agency within the Energy Department, wrote that PF-4 “has robust safety programs and systems in place to ensure multiple and redundant layers of protection for our workers, the environment and the public.” The statement continued: “The facility is one of the safest places in the country to be in the event of a natural disaster.”

In 2008, the department publicly released a loss-of-containment scenario written by a government contractor. It concluded that if all of the plutonium estimated to be in the handling facility were engulfed in flames, just over one kilogram would escape outside in a form that could be inhaled, and an average of nine people would eventually die of cancer related to exposure.

For the new study, the researchers reverse-engineered the government’s methodology, and replicated a similar fatality average. But then, they recalculated the risks of a leak with additional context and under different assumptions.

Using wind and precipitation data from every hour of every day of 2022, the researchers modeled 8,760 scenarios of a plutonium leak, tracing the possible trajectory of particles. In some circumstances, the data shows that particles would have traveled as far north as Central Colorado and as far south as Southern New Mexico.

Thomas B. Cochran, a former senior scientist at the Natural Resources Defense Council and former adviser to the Energy Department, who was not involved in the study, said the research seemed to offer a “thorough analysis of the issue.”

And the scientists chose the best modeling software for the analysis, said Steven Hanna, an expert in meteorology and atmospheric physics who was also not involved with the study. But, he added, they did not account for statistical uncertainty as exhaustively as is possible.

For estimates in its own assessment, the government had used an Energy Department handbook that relied on data from the 1960s through the 1980s, information that predated findings about other containment breaches, the study said.

For example, from 1951 to 1989, hundreds of fires occurred at the Rocky Flats Plant, a federal nuclear facility near Denver that produced bomb cores during the Cold War. A major fire there in 1957 released a large amount of plutonium particles, according to research published after the plant shuttered in the 1990s.

Soil analysis from Rocky Flats show that the size of those particles were roughly one-fifth the size of the particles considered in the government's analysis. Smaller particles can disperse farther, the researchers said, increasing the area contaminated and the number of people exposed. They can also remain in the lungs longer, increasing the risk of cell damage.

In one scenario modeled by the researchers, approximating a lab breach on an October night in 2022, shifting wind patterns could have moved smaller particles across several towns, tribal reservations, Santa Fe and parts of Albuquerque. Up to 210 people could have eventually died from cancer, they estimated.

Things get even more dire should more plutonium escape. Using other data from Rocky Flats, the researchers determined that just over five kilograms of plutonium — quadruple government estimates — could escape Los Alamos. On that October night, as many as 3,200 people could have developed cancer, leading to about 1,000 deaths, not including lab workers or emergency medical workers, the study said.

The researchers also examined the Savannah River Site in Aiken, S.C., which is expected to begin plutonium-pit production in the mid 2030s. The Energy Department estimated in 2020 that a breach there would lead to an average of two long-term cancer fatalities. But the scientists identified a night in May 2022 when wind could have carried the particles northwest beyond a buffer zone and into Georgia, possibly leading to as many as 330 cancer-related deaths.

The plutonium-handling facility was built almost 50 years ago for nuclear research, not production. Now, it is replacing aging infrastructure that has disrupted work at times and spread contamination, a New York Times investigation found last year.

The lab performs its own internal safety analysis, which is not made public. Workers are installing a new fire suppression system, which Rocky Flats didn't have. And some, but not all, of the glove boxes at Los Alamos have been made earthquake resistant as part of the renovation.

But one component will not be fully replaced: the ventilation system.

For decades, the Defense Nuclear Facilities Safety Board, a federal watchdog, has recommended the facility upgrade the system so that, in the case of a catastrophe, it could capture tiny plutonium particles before they leak into the environment.

In 2022, the Energy Department said the upgrade was too expensive.