U.S. Government Accountability Office

HANFORD CLEANUP: DOE's Plans to Grout and Dispose of Millions of Gallons of Tank Waste

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Q&A Report to Congressional Committees
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Accessible Version

Why This Matters

The Hanford Site in Washington State is home to one of the largest and most expensive environmental cleanup projects in the world. After decades of research and production of weapons-grade nuclear materials at Hanford ceased in the late 1980s, the Department of Energy (DOE) began its mission to clean up hazardous and radioactive waste created as a byproduct of producing nuclear weapons. In a 2025 report on the lifecycle costs for the Hanford Site, DOE estimated that completing cleanup of the entire 586 square mile site would cost between $364 billion and $589 billion, with active cleanup through 2086.

DOE's mission at the Hanford Site includes addressing approximately 55 million gallons of hazardous and radioactive waste stored in 177 large underground storage tanks. This waste must be retrieved and treated—or immobilized—before disposal, according to legal requirements and agreements made with federal and state environmental regulators. Under these agreements, DOE has historically been required to treat all of Hanford's tank waste by vitrifying it (i.e., immobilizing it in glass).

In January 2025, DOE, the U.S. Environmental Protection Agency (EPA), and Washington State finalized a Holistic Agreement under which DOE would grout (i.e., immobilize in a concrete-like mixture) a portion of the waste from 22 tanks and dispose of it as low-level radioactive waste at facilities off the Hanford Site. DOE has not determined where this waste will be grouted before disposal.

We have previously reported that grouting, rather than vitrifying, portions of Hanford's tank waste that are low in radioactivity—referred to as low-activity waste (LAW)—could accelerate DOE's cleanup mission and save billions of dollars.

Senate Report 119-39 includes a provision for GAO to assess DOE's available options for grouting Hanford LAW. This report provides information on DOE's options for grouting, transporting, and disposing of a subset of Hanford LAW and key factors for DOE's consideration in pursuing identified options.

Key Takeaways

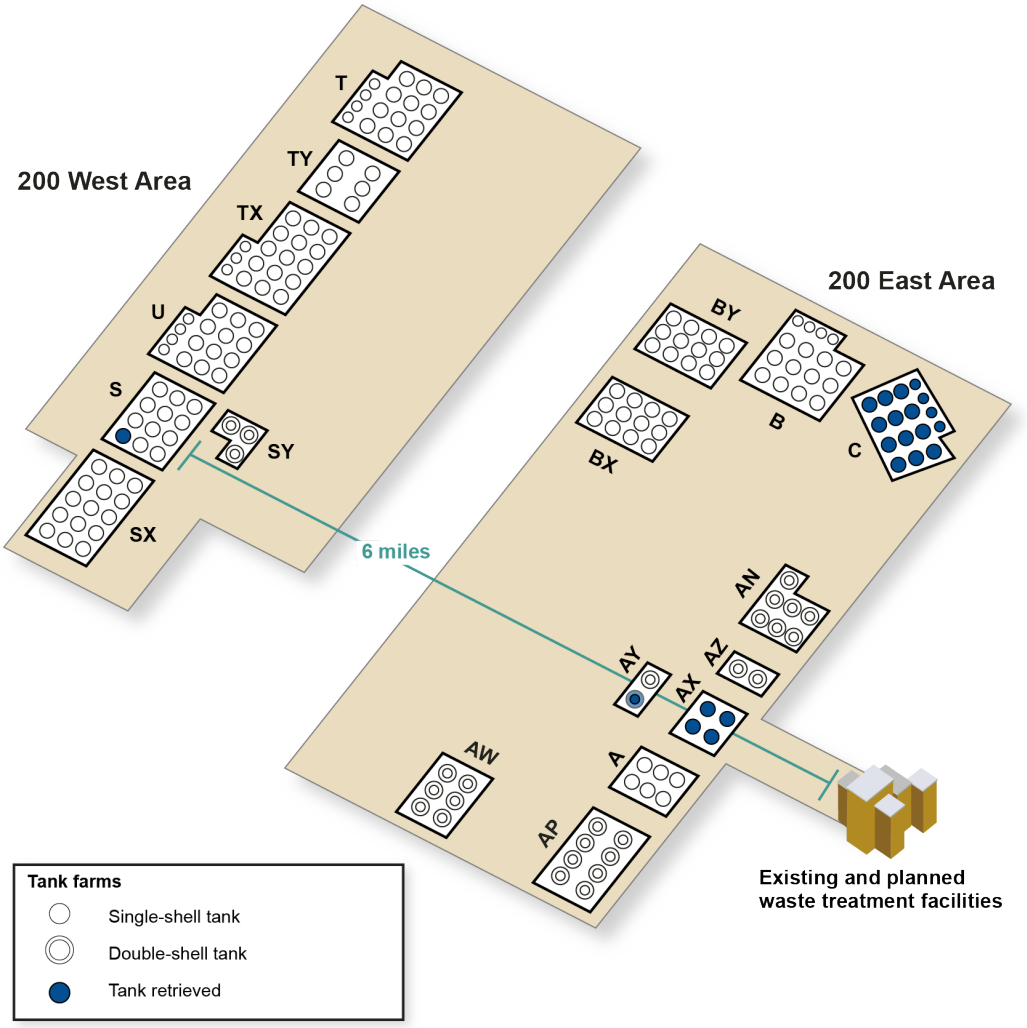
- DOE is pursuing options to grout about 24 million gallons of LAW (including liquid added during the retrieval and pretreatment process) from 22 tanks in Hanford's 200 West Area and dispose of this waste offsite by 2040, as outlined in the 2025 Holistic Agreement. Grouting LAW can accelerate cleanup at the site and save billions of dollars when compared to vitrifying it.

- DOE is also exploring opportunities to continue grouting Hanford LAW beyond the initial 22 tanks. Officials stated that doing so could help the agency to address existing gaps in Hanford's treatment capability and accelerate cleanup operations at the site.
- DOE's options for grouting Hanford LAW include designing and constructing a new grouting facility onsite at Hanford or transporting liquid waste to existing grouting facilities for treatment and permanent disposal. In determining a path forward, DOE must consider a range of factors, including cost and schedule, associated risks, and permanent disposal options. DOE must also consider whether to transport the waste in liquid or grouted form by truck or rail.
- Grouting 24 million gallons of LAW could reasonably cost between $480 million to $1.1 billion, or $20 to $45 per gallon of waste. Officials and industry representatives emphasized that this estimate does not capture additional costs, such as transportation, disposal, and the need to address potential organic materials that were added during waste extraction operations and remain in a portion of the waste.
- DOE officials estimated that shipping pretreated LAW in liquid form via truck to available treatment and disposal facilities would cost about $0.50 to $1.50 per gallon. Accordingly, the total costs to transport 24 million gallons via truck could range from about $12 million to $36 million. Further, DOE officials we interviewed estimated that these costs would likely double to about $24 million to $72 million for shipping solid, grouted waste.

What is DOE's tank waste cleanup mission at Hanford?

DOE is responsible for cleaning up approximately 55 million gallons of waste containing about 128 million curies of radioactivity at the Hanford Site.[1] This waste is stored in 177 underground tanks clustered into groupings referred to as tank farms.[2] The tank farms are divided into the 200 East Area and the 200 West Area (see fig. 1).

Figure 1: Map of Tank Farms at the Department of Energy's Hanford Site, as of April 2026



Source: GAO analysis of Department of Energy data and documents. | GAO-26-108878

Notes: Single-shell tanks have a single carbon steel liner containment system and double-shell tanks have a double carbon steel liner containment system. The Department of Energy has declared that it has completed waste retrieval from certain tanks.

Over time, the tank waste has settled into three main layers:

- **Supernate**, or the top layer, consists of liquid with dissolved salts and other soluble waste and generally sits above denser layers.
- **Saltcake**, or the middle layer, consists of soluble components—such as sodium salts—that crystallize or solidify out of the waste solution to form a moist sand-like material.
- **Sludge**, or the bottom layer, consists of denser, insoluble components that form a thick substance with the consistency of peanut butter.

Cleaning up this waste generally includes retrieving it from the underground storage tanks, separating it into high-activity and low-activity waste streams, treating the waste according to its characteristics, and disposing of the waste in an appropriate disposal facility. Prior to treatment, the LAW in the tanks will undergo a pretreatment process to remove 99 percent of two radionuclides from the waste—cesium and strontium—thereby reducing the waste's radioactivity level.

As a matter of policy, DOE manages Hanford's tank waste as "high-level radioactive waste" as defined by federal law unless and until it is classified as another waste type.[3] As noted above, LAW is DOE's term for the primarily liquid

portion of this tank waste, including the supernate and dissolved saltcake, with low levels of radioactivity.[4]

In 2025, DOE began the process of vitrifying a portion of the site's LAW in the Direct-Feed Low-Activity Waste Facility and, in 2026, began disposing of it onsite at the Integrated Disposal Facility. As we reported in December 2021, however, this facility is only designed to treat about 60 percent of Hanford's LAW and DOE had not yet determined how it will treat the remaining 40 percent of the LAW.[5] As of April 2026, DOE was considering options for grouting this waste and transporting it out of state for final disposal. In the future, DOE plans to vitrify the high-activity portion of Hanford's waste.

Additionally, according to DOE documentation, the process of vitrifying 1 gallon of waste produces 1 to 3 gallons of secondary waste that may require additional treatment, including grouting. As a result, DOE officials told us they must plan accordingly to address this added volume and ensure adequate capacity to grout this secondary waste.

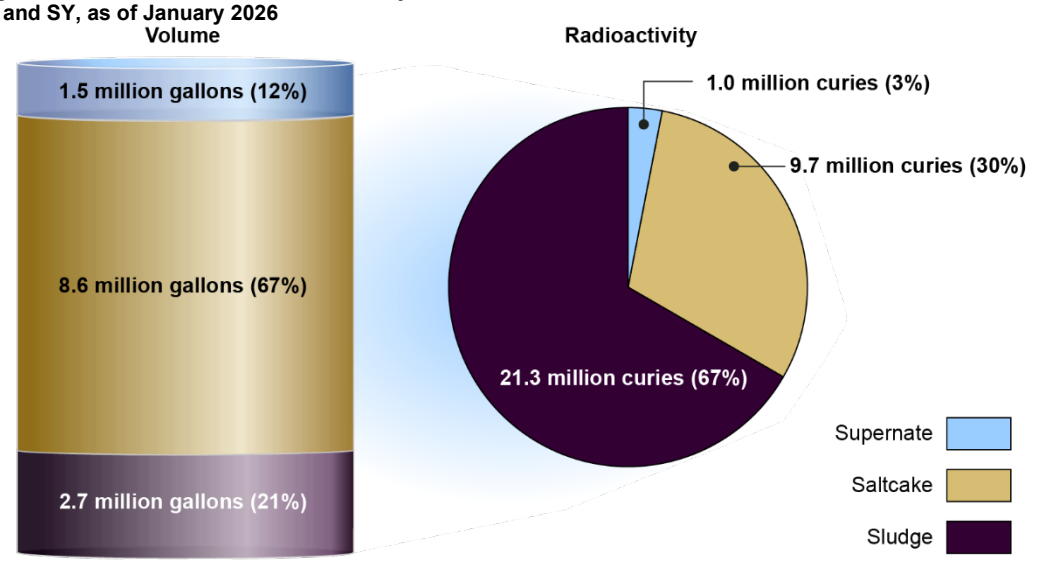
What is the 2025 Holistic Agreement?

In January 2025, DOE and its regulators—EPA and the Washington State Department of Ecology—finalized a Holistic Agreement that included a set of sweeping changes to the approach for cleaning up tank waste at the Hanford Site.[6] This agreement followed confidential, mediated negotiations that started in 2020 and were aimed at developing a holistic and realistic approach for retrieving and treating Hanford's tank waste.

The agreement includes a new cleanup milestone under which DOE is to complete retrieval of the waste from 22 single-shell tanks in tank farms S, SX, and U in Hanford's 200 West Area by 2040.[7] The agreement further specifies that DOE will grout the LAW portion of this tank waste and dispose of it offsite.[8]

In total, tank farms S, SX, U, and SY constitute 46 underground storage tanks each containing different volumes of waste and levels of radioactivity. This includes 43 single-shell tanks—one of which has been retrieved—and three double-shell tanks (tank farm SY), which will temporarily store waste from the single-shell tanks during retrieval operations (see fig. 2).

Figure 2: Overall Volume and Radioactivity of Hanford Tank Waste in 200 West Area Tank Farms S, SX, U, and SY, as of January 2026



Source: GAO analysis of Department of Energy information. | GAO-26-108878

Notes: Curies measure the level of radioactive decay and emission for a radiological source. Data include volumes and radioactivity of tank waste in the three double-shell tanks located in tank farm SY. The Department of Energy will use these tanks to temporarily store waste from the single-shell tanks in farms S, SX, and U during retrieval operations. The figure presents radioactivity levels prior to pretreatment—a process that will remove additional radioactivity from the supernate and saltcake before treatment and disposal.

The Holistic Agreement also specified that no grouted tank waste will be disposed of within the borders of the Hanford Site and that DOE's inventory of grouted tank waste stored onsite awaiting shipment for offsite disposal should not exceed the amount that DOE could reasonably ship over a 3-month period. In December 2025, DOE, EPA, and Washington State agreed to extend DOE's deadline for selecting a pathway to grout, transport, and dispose of this waste from December 31, 2025, to July 1, 2026.

In December 2025, DOE's tank waste contractor at the Hanford Site issued a solicitation to prospective subcontractors to submit proposals for grouting and disposing of an estimated 24 million gallons of LAW from the site.[9] The solicitation requested proposals for grouting the tank waste, including by designing and constructing a new onsite grouting facility or by shipping liquid waste to be grouted offsite. According to the solicitation, companies bidding on the contract must be capable of accepting liquid waste on an intermittent basis. For instance, a selected contractor must be prepared to receive 60,000 to 100,000 gallons of waste during certain weeks and zero waste during other weeks. As of April 2026, DOE was evaluating submitted proposals and plans to award one or more contracts later in 2026.

How will DOE select the 22 tanks and what are the likely characteristics of their waste?

DOE officials told us they had not yet selected the specific 22 single-shell tanks that will be retrieved per the Holistic Agreement to allow for necessary flexibility during the retrieval, grouting, and offsite disposal of the waste. To select which tanks to retrieve, DOE officials said they would consider factors including the radioactivity levels in the tank, the volumes and consistency of the waste, and whether the tank is known or suspected to be leaking. For example, according to Hanford's Waste Tank Summary Report, as of January 31, 2026, 12 of the 43 single-shell tanks in tank farms S, SX, and U are assumed to be leaking. Further, DOE officials explained they would not select all 22 tanks at once but would instead identify groups of tanks for retrieval and treatment and complete this process before continuing to the next group of tanks.

According to DOE data, the total volume of waste DOE will need to retrieve from any combination of 22 single-shell tanks in the S, SX, and U tank farms for grouting ranges from roughly 4.7 million to 11.1 million gallons.[10] However, this volume will increase as additional materials are added to the waste stream during retrieval and treatment activities. Table 1 provides an overview of radioactivity levels, in curies, associated with retrieving and grouting waste from 22 single-shell tanks with the most or least radioactivity.

Table 1: Radioactivity Levels Associated with Retrieving and Grouting Waste from 22 Single-Shell Tanks with the Most or Least Radioactivity in the Hanford Site's 200 West Area

In millions of curies

	All tank waste (sludge, saltcake, and supernate)	Liquid waste only (saltcake and supernate)	Liquid waste following pretreatment (removal of key radionuclides)[a]
Tanks with the most radioactivity	28.2	10.2	5.2
Tanks with the least radioactivity	7.3	4.6	2.3

Source: GAO analysis of the Department of Energy's Best Basis Inventory database. | GAO-26-108878

Notes: There are 43 total single-shell tanks in the S, SX, and U tank farms. Since DOE has declared that waste retrieval from one of these tanks—S-112—has been completed, there are 42 single-shell tanks that DOE will consider for selection to treat the low-activity waste with grout. Data includes volumes and radioactivity of tank waste in three double-shell tanks located in tank farm SY. DOE will use these tanks to temporarily store waste retrieved from the single-shell tanks in farms S, SX, and U.

[a]Prior to treatment, the low-activity waste in the tanks will undergo a pretreatment process to remove approximately 99 percent of two radionuclides from the waste—cesium and strontium—thereby reducing the waste's radioactivity level.

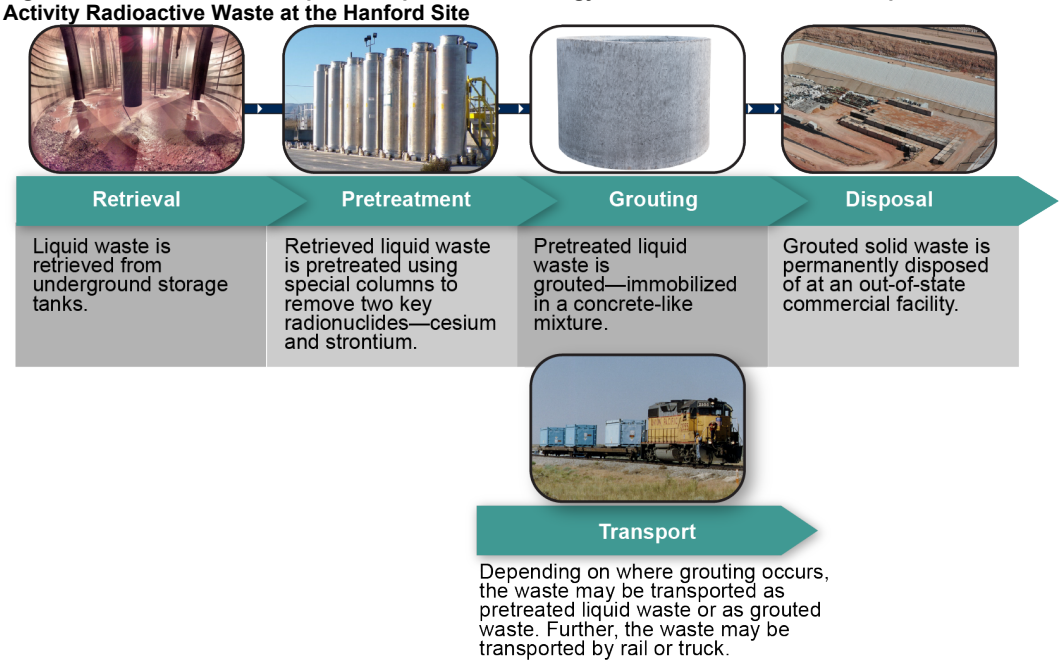
According to DOE officials, portions of the LAW from the 22 tanks yet to be selected are expected to meet radionuclide concentration limits for Class A, B, and C nuclear waste specified by the Nuclear Regulatory Commission.[11] In addition to radioactive constituents, industry representatives told us that a portion of the LAW from the 22 tanks will likely contain organic (i.e., carbon-containing) constituents, which could increase the price of treatment. This is because certain chemicals, such as solvents and several organic compounds, were added during various waste extraction operations used to recover selected radioactive constituents (uranium, cesium, and strontium) for reuse.

In general, such organics and nitrates—another hazardous contaminant of concern—could prevent grout from setting, thereby reducing the grout's effectiveness. To address this, organics and nitrates will need to be destroyed using one of two processes—chemical treatment or a thermal, high-heat procedure—prior to grouting. Estimates from industry representatives we interviewed varied on the percentage of LAW in the 22 tanks that may require organic treatment, ranging from an estimated 5 percent to up to 33 percent.

What will DOE's process be to treat LAW from the 22 tanks?

DOE will generally follow five process steps in treating and disposing of LAW once the 22 tanks are selected (see fig. 3).

Figure 3: General Process Steps the Department of Energy Will Follow to Grout and Dispose of Low-Activity Radioactive Waste at the Hanford Site



Sources: GAO analysis of Department of Energy information; Department of Energy (retrieval/pretreatment/transport); mdbildes/stock.adobe.com (grouting); Waste Control Specialists (disposal). | GAO-26-108878

Note: A portion of the tank waste may require additional treatment processes to address organic constituents in the waste.

As described above, DOE will pretreat the liquid LAW to reduce the radioactivity, then grout the remaining liquid waste and vitrify the remaining sludge—which contains the highest levels of radioactivity—in a facility currently in design and construction.

In 2025, DOE demonstrated its ability to successfully retrieve, pretreat, transport, grout, and dispose of Hanford LAW through its Test Bed Initiative project. Specifically, DOE shipped approximately 2,000 gallons of pretreated liquid LAW from the Hanford Site to commercial facilities in Utah and Texas via truck for grouting and permanent disposal (see fig. 4).

Figure 4: A Shipment of Liquid Low-Activity Waste in a Double-Walled Steel Container is Prepared at the Hanford Site, May 2025

Source: Department of Energy. | GAO-26-108878

What options exist for grouting and disposing of Hanford LAW?

DOE has several options regarding where to grout LAW from the 200 West Area that will be retrieved and pretreated at the Hanford Site. In selecting one or more options, DOE must consider a range of factors, including the cost and schedule associated with each option, the need for new facilities versus the use of existing ones, the availability of disposal facilities, and more. For instance, DOE officials estimated that designing, permitting, constructing a new facility onsite at Hanford, and beginning the grouting process will likely take 2–4 years to complete. In contrast, both DOE officials and industry representatives we interviewed told us that offsite commercial grouting and disposal capacity currently exists and that DOE could therefore begin grouting and disposing of Hanford LAW immediately.

For disposal, DOE is currently only considering disposing of grouted LAW at two commercial facilities—EnergySolutions in Clive, Utah and Waste Control Specialists in Andrews County, Texas. We have previously reported that two federal facilities likely also have the technical capability to dispose of grouted LAW but that DOE faces regulatory constraints and other challenges to disposing of the waste at these two facilities.[12]

Table 2 provides examples of DOE's options for grouting and disposing of Hanford LAW and related factors for its consideration.

Table 2: Examples of the Department of Energy's (DOE) Options for Grouting Portions of the Low-Activity Waste (LAW) at the Hanford Site and Related Factors for DOE's Consideration

Grout location	Grout facility	Summary	Factors for DOE's consideration
On-site commercial facility at the Hanford Site	To be constructed onsite grouting facilities	New facilities would be designed and constructed to grout liquid tank waste. DOE would then transport the grouted waste to one of the two commercial disposal sites able to accept this waste.	**Cost:** DOE will need to consider the cost associated with a commercial entity developing, permitting, and constructing a new grouting facility onsite at Hanford. A 2023 Savannah River National Laboratory report estimated that developing and constructing an onsite grout facility may cost between $5 billion and $8.2 billion.[a] DOE may also need to consider whether a commercial entity will be willing to take the financial risk of building such a facility. For example, industry representatives we interviewed told us that unless a large enough volume of waste is guaranteed for treatment at the facility, the commercial entity cannot ensure that its capital investment will be recovered. **Schedule:** DOE will need to consider the schedule implications associated with constructing a new facility. DOE officials we interviewed estimated that it would take about 2-4 years to finish construction of such a facility and begin the grouting process. These officials expressed confidence in the agency's ability to complete retrieval of the waste by 2040. **Treatment**: DOE will need to consider treatment approaches for grouting waste onsite. For example, DOE may consider the construction of a new large grouting facility or an alternative option, such as a modular approach of mixing pretreated liquid waste with cementitious materials in transport-ready containers, as outlined by industry representatives we interviewed. **Disposal:** Since grouted LAW cannot be disposed of onsite at Hanford, DOE will need to consider other disposal options. EnergySolutions in Clive, Utah and Waste Control Specialists in Andrews County, Texas are the only options DOE is considering for disposing of grouted Hanford LAW. EnergySolutions is licensed to permanently dispose of Class A waste while Waste Control Specialists is licensed to permanently dispose of Class A, B, and C wastes.[b] **Transportation**: By grouting LAW onsite at Hanford, DOE would not have to ship liquid waste offsite to treatment facilities, which certain stakeholders have expressed concerns about. DOE will need to transport grouted waste to one of the two disposal facilities—approximately 690 miles to EnergySolutions in Utah or 1,600 miles to Waste Control Specialists in Texas. In addition, the Hanford Site is not located directly on a rail spur; therefore, DOE will need to transport grouted waste by truck, or by truck to a rail line for disposal in Utah or Texas.
Near-site commercial facilities in Washington State	Commercial grouting facilities in Washington State near the Hanford Site	DOE would transport pretreated liquid waste to a facility in Washington State and then transport grouted waste for permanent disposal.	**Cost and Schedule:** DOE will need to consider the cost and schedule associated with transporting liquid LAW to a nearby grouting facility and contracting with this facility to complete treatment and disposal. **Treatment:** DOE will need to consider facilities' ability to treat different classes of waste with varying radioactivity as well as wastes with organic constituents.[b] **Capacity:** DOE will need to consider facilities' capacity to accept and treat pretreated liquid waste. For instance, DOE may need to rely on more than one facility to ensure sufficient capacity to treat the required volume of waste, or facilities may need to expand their capacity. **Disposal**: Since grouted LAW cannot be disposed of onsite at Hanford, DOE will need to consider other disposal options. Energy Solutions in Clive, Utah and Waste Control Specialists in Andrews County, Texas are the only options DOE is considering for disposing of grouted Hanford LAW. **Transportation:** DOE will need to ship pretreated LAW in liquid form to the nearby grouting site. Once grouted, the waste will need to be transported by truck or rail to the permanent disposal facility in Utah or Texas.

Out-of-state commercial facilities	Commercial grouting facilities outside of Washington State	DOE would transport pretreated liquid waste to commercial grouting facilities outside of Washington State. The grouted waste would then be disposed of at a disposal facility.	**Cost and Schedule:** DOE will need to consider the cost and schedule associated with transporting liquid LAW to an out-of-state grouting facility and contracting with the facility to complete treatment and disposal. **Treatment:** DOE will need to consider facilities' ability to treat different classes of waste with varying radioactivity as well as wastes with organic constituents.[b] **Capacity**: DOE will need to consider facilities' capacity to accept and treat pretreated liquid waste. For instance, DOE may need to rely on more than one facility to ensure sufficient capacity to treat the required volume of waste, or facilities may need to expand their capacity. **Disposal**: EnergySolutions and Waste Control Specialists are the only options DOE is considering for disposing of grouted Hanford LAW. **Transportation**: DOE will need to ship pretreated LAW in liquid form to the out-of-state grouting site. Once grouted, the waste will need to be transported by truck or rail to the permanent disposal facility in Utah or Texas. Since EnergySolutions and Waste Control Specialists both contain grout treatment facilities, these facilities could both grout the LAW and dispose of it onsite, which would limit the need for further transportation of the grouted waste.

Source: GAO analysis of prior GAO reports, DOE documentation, statements from DOE officials and selected industry representatives, and other associated information. | GAO-26-108878

Notes: This table does not aim to present a complete or comprehensive list of DOE's options for grouting portions of LAW at the Hanford Site. Instead, the table presents illustrative examples of DOE's options and associated factors for DOE's consideration based on our prior work, relevant documentation, interviews with DOE officials and selected industry representatives, and other associated information. Additional options not presented in the table may also exist for grouting portions of Hanford's LAW.

[a]Savannah River National Laboratory, *Follow-on Report of Analysis of Approaches to Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation*, SRNL-STI-2023-00007, Volume I, Revision 0 (January 2023).

[b]According to DOE officials, portions of the LAW that DOE is planning to grout are expected to meet the radionuclide concentration limits for Class A, B, and C nuclear waste specified by the Nuclear Regulatory Commission. The Nuclear Regulatory Commission specifies certain radionuclide concentration limits for Class A, B, and C low-level radioactive waste for disposal in licensed commercial facilities. 10 C.F.R. § 61.55. Class A is the least hazardous and Class C is the most hazardous. In addition, a portion of the Hanford LAW likely contains organic (i.e., carbon-containing) constituents that must be destroyed prior to grouting, according to industry representatives.

What is the estimated cost to grout Hanford LAW?

The total cost to grout 24 million gallons of LAW—the estimated amount identified in the contract solicitation—could range from about $480 million to $1.1 billion based on an estimated cost of $20 to $45 per gallon of liquid treated cited in a 2023 report by the Savannah River National Laboratory.[13]

DOE officials and industry representatives we interviewed agreed that this cost range is generally accurate in capturing the baseline costs associated with grouting a single gallon of pretreated liquid waste. However, they cautioned this range included only the grouting process and did not reflect key additional costs, such as waste transportation and disposal costs. Further, DOE officials and industry representatives added that the need to treat a certain portion of Hanford LAW containing organic constituents (estimated to be present in less than 5 percent to up to 33 percent of the waste) would also increase treatment costs. For instance, DOE officials stated that the need for such treatment could nearly triple the baseline estimate cited above. Last, industry representatives told us that the price per gallon can change based on the total volume of waste a given company is responsible for treating.

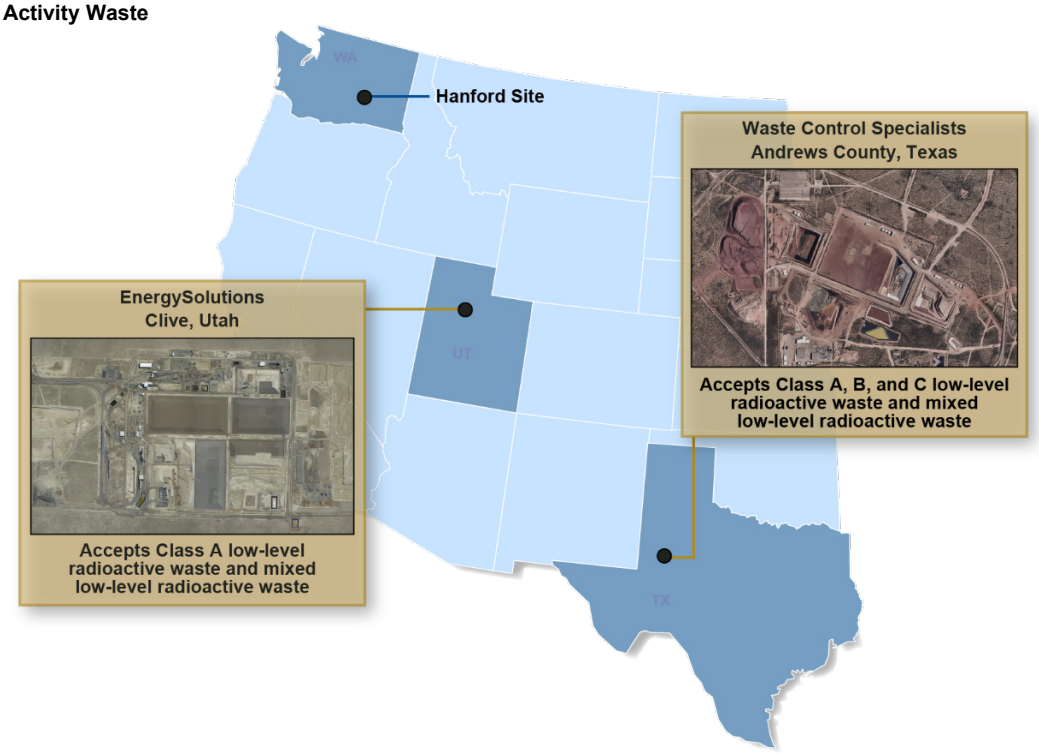
As of April 2026, DOE and its contractor were in the process of evaluating contract proposals for grouting and disposing of Hanford LAW, including proposed costs of converting one gallon of Hanford LAW into grout.

What options exist for transporting LAW?

DOE must consider two sets of options when determining how to transport LAW to the two commercial disposal facilities in the United States—the waste form

and the shipping method. Figure 5 identifies the location of the two commercial facilities in the United States able to accept grouted Hanford LAW for disposal.

Figure 5: Location of Two Commercial Disposal Facilities Able to Accept Hanford's Grouted Low-Activity Waste



Sources: EnergySolutions and Waste Control Specialists (photos); Map Resources (basemap). | GAO-26-108878

Waste form. DOE must decide whether to (1) transport the LAW in a liquid form—to be grouted upon arrival at the treatment and disposal facility—or (2) grout the waste at or near the Hanford Site and transport the waste in a solid form as grout.

DOE officials we interviewed estimated that shipping pretreated LAW in liquid form via truck to either treatment and disposal facility would cost about $0.50 to $1.50 per gallon. Accordingly, the total costs to transport 24 million gallons—the amount estimated in the contract solicitation—via truck could range from $12 million to $36 million. Further, DOE officials we interviewed estimated that these costs would likely double to about $24 million to $72 million for shipping solid, grouted waste. The officials explained that this increase in cost is due to the increase in volume that occurs during the grouting process, as many more shipments would be required to transport the waste to the disposal facilities.

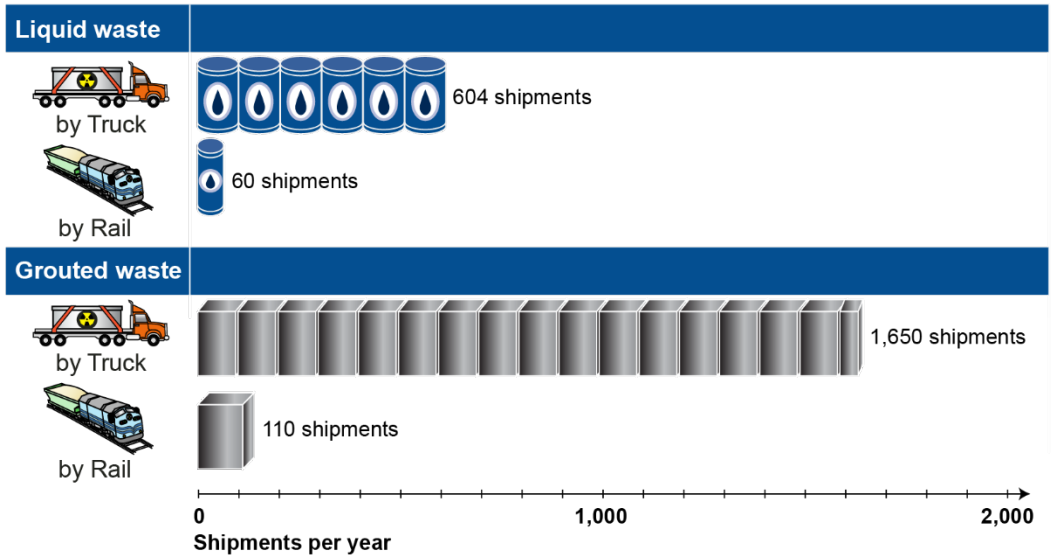
Shipping method. DOE must decide whether to ship the liquid or grouted LAW by truck or rail. According to DOE documentation, both disposal sites accept waste via truck and rail (see fig. 6).

Figure 6: Transportation of Department of Energy Radioactive Waste Via U.S. Department of Transportation-Compliant Tanker Truck and Rail Car

Source: Department of Energy. | GAO-26-108878

In an October 2025 analysis, DOE assessed options for transporting both liquid and solid waste from the Hanford Site to offsite commercial disposal facilities via both truck and rail. Figure 7 describes the number of shipments required annually for each mode of transport to retrieve tank waste from 22 tanks and ship it offsite by 2040.

Figure 7: Department of Energy (DOE) Analysis of Annual Shipments Required for Liquid and Solid Wastes by Truck and Rail



Source: GAO analysis of Department of Energy documentation. | GAO-26-108878

Notes: DOE's analysis identifies the number of shipments required annually to remove waste from 22 tanks at the Hanford Site from Washington State by 2040 for each individual mode of transport and form of waste. DOE's analysis does not consider options for choosing more than one mode of transport or waste form. Further, according to DOE's analysis, each rail shipment includes five rail cars each carrying two 5,000-gallon tanks of liquid waste or three disposal containers holding 13.1 cubic-yards each of grouted waste. Moreover, each truck shipment includes one 5,000-gallon tank for liquid waste or one disposal container holding 13.1 cubic-yards of grouted waste. In addition, DOE's analysis evaluates the number of shipments required to transport 32 million gallons of Hanford low-activity waste (LAW) offsite by 2040. While DOE currently estimates retrieving and transporting 24 million gallons of Hanford LAW, this analysis uses 32 million gallons to ensure that potential impacts of shipping large volumes of waste are addressed.

DOE officials told us that certain stakeholders—including from the state of Oregon as well as certain Tribes—have expressed safety concerns about the transport of liquid low-level radioactive waste through their jurisdictions. DOE officials and industry representatives we interviewed emphasized that shipping radioactive material, including in liquid form, by truck and rail are both extremely safe and that DOE and others have extensive experience in shipping such materials across the country.

For example, according to DOE documentation, in fiscal year 2022, DOE transported more than 3,800 hazardous materials shipments for more than 7.5 million miles without a single recordable transportation accident.[14] Further, according to the Savannah River National Laboratory's 2023 report, about 3 million radioactive materials packages are shipped in the U.S. annually by highway, rail, air, and water. In addition, one industry representative we interviewed stated that a perception problem exists as local communities and the public are sometimes afraid of low-level radioactive waste—which is relatively safe when properly controlled—but are simultaneously unaware that other dangerous chemicals—such as vinyl chloride—regularly pass safely through their towns.[15]

Industry representatives we interviewed told us that shipping material via rail was statistically safer than shipping by truck and also represented a more efficient, cost-effective pathway given the large volume of Hanford tank waste expected to be transported. These representatives also stated that compared to trucks, rail shipments would carry more waste per load, thereby requiring many fewer shipments and miles traveled, while also keeping long-distance shipments away from public highways.

What additional factors must DOE consider in pursuing grout for Hanford LAW?

DOE must consider certain additional factors in pursuing options to grout Hanford LAW, including potential legal and regulatory issues and opportunities to grout LAW beyond the 22 tanks that will be retrieved per the Holistic Agreement.

Legal and regulatory issues

- **Clarifying DOE's authority to manage this waste as low-level radioactive waste.** As noted above, DOE currently manages all Hanford tank waste as if it is "high-level radioactive waste," which is defined by federal law and subject to specific requirements. For example, under EPA regulations also adopted by Washington State, radioactive high-level wastes must be vitrified prior to land disposal.[16] DOE's ability to grout portions of the tank waste and dispose of it in a near surface facility is contingent, in part, on its ability to manage LAW as something other than high-level radioactive waste.[17] We have previously found that legislation clarifying DOE's authority to do so could help DOE reduce risks posed by leaking tanks, expedite treatment, and save billions of dollars.[18] As such, we have recommended that Congress consider clarifying DOE's authority to determine whether portions of Hanford's waste can be (1) managed as a waste type other than high-level radioactive waste and (2) disposed of outside of Washington State.
- **Clarifying the treatment standard for LAW.** We have previously reported that even if DOE is able to classify and manage Hanford's LAW as low-level radioactive waste, it may encounter legal challenges under the Resource Conservation and Recovery Act of 1976, as amended (RCRA), if it tries to use methods other than vitrification to treat the waste and prepare it for disposal. RCRA regulations govern hazardous waste from generation to disposal. Under RCRA's land disposal requirements—which are implemented by the Washington State Department of Ecology—when hazardous waste with specific characteristics is mixed with radioactive high-level wastes generated during the reprocessing of fuel rods, this waste—called mixed high-level radioactive waste—is required to be vitrified before disposal. Conversely, RCRA regulations do not require low-level radioactive waste with these hazardous characteristics—called mixed low-level radioactive waste—to be vitrified. Instead, mixed low-level radioactive waste can generally be treated with less expensive methods like grout.

However, in cases where DOE determines that mixed waste that DOE has previously managed as high-level radioactive waste can instead be managed as another waste type, such as low-level radioactive waste, there is disagreement between DOE and certain regulators as to whether the associated RCRA treatment standards also change, or whether (1) the original treatment standard (e.g., vitrification) must still be met or (2) a variance from the vitrification treatment standard must be obtained. In 2021, we found that this disagreement could lead to litigation, which could add several years to DOE's ability to treat certain waste at Hanford.[19]

Opportunities to grout additional Hanford LAW

DOE officials told us they are focused on retrieving and grouting LAW from the 22 tanks in the West Area by 2040, as outlined in the Holistic Agreement. However, DOE documentation states, and agency officials confirmed, that it would be reasonable to continue grouting operations on the LAW in additional tanks following completion of these first 22 tanks. As a result, the officials said they are exploring potential opportunities to grout additional LAW and accelerate mission completion at the Hanford Site.

In planning such operations, DOE officials said they must holistically consider the costs, schedules, and risks present across the entire site—not just in the West Area. Specifically, the officials told us that a gap currently exists between the total amount of waste DOE must treat at Hanford and the site's current and planned capability to treat it. For instance, while DOE has begun vitrifying a portion of LAW in the Direct-Feed Low-Activity Waste Facility in the East Area, the agency has not yet determined how it will treat the remaining LAW not destined for vitrification—a portion that represents tens of millions of gallons of waste.

In addition, as noted above, the process of vitrifying 1 gallon of LAW generates 1 to 3 gallons of secondary waste, some of which may also be grouted, according to DOE documentation. However, one industry expert we interviewed stated that vitrifying 1 gallon of LAW could generate significantly more than 3 gallons of secondary waste that DOE would need to treat and dispose of. DOE officials explained that any plans to continue grouting waste must therefore also address the treatment and disposal of this additional waste stream.

Moreover, DOE initially planned to treat this secondary waste locally and then dispose of it onsite at Hanford. However, according to DOE documentation from February 2026, DOE plans to transport this grouted waste out of Washington State for disposal at one of the two commercial disposal facilities. DOE officials told us this change provided an opportunity to increase efficiency by avoiding the need to vitrify a portion of the secondary waste. The officials added that shipping, grouting, and disposing of this portion of secondary waste would cost approximately $74 per gallon.

Agency Comments

We provided a draft of this report to DOE for review and comment. DOE provided technical comments, which we incorporated as appropriate.

How GAO Did This Study

We reviewed and assessed DOE documentation and data, other relevant information, and our prior work on DOE's cleanup mission at the Hanford Site more generally and its options for treating and disposing of liquid tank waste in its 200 West Area specifically.[20] We reviewed relevant legal agreements, including the 2025 Holistic Agreement among DOE, Washington State, and EPA, to fully understand all aspects of the agreement for DOE to retrieve, pretreat, treat, and dispose of LAW from 22 underground storage tanks in the Hanford Site's S, SX,

and U tank farms. We also reviewed the Hanford tank waste contractor's December 2025 contract solicitation and DOE's October 2025 environmental assessment to understand the details of DOE's plans to grout the waste. In addition, we reviewed the 2023 Savannah River National Laboratory's report on grouting waste for cost estimates and relevant factors affecting DOE's decision to grout this waste.

We analyzed DOE data on the composition of tank waste contained in the 46 total tanks from the Best Basis Inventory, DOE's publicly available database containing inventory estimates for chemical and radioactive components in Hanford's tanks. We analyzed these data to identify the volume of waste and the level of radioactivity across each tank and in total. We assessed the reliability of these data by drawing on our prior work analyzing these data and the data systems that house them, interviewing DOE officials about their data management practices, reviewing relevant documentation, and manually checking for errors or inconsistencies. We determined that the data were sufficiently reliable for our purposes of describing the volumes and radioactivity levels of the Hanford storage tanks.

We assessed our prior work, DOE documentation, and published reports from external sources as well as interviewed DOE officials and industry representatives to identify DOE's options for both grouting Hanford tank waste and transporting this waste to disposal facilities offsite. We analyzed this documentation and relevant interviews to identify factors DOE must consider in choosing one or more options to address this waste.

We conducted this performance audit from January 2026 to May 2026 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

List of Addressees

The Honorable Roger F. Wicker
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable John Kennedy
Chair
The Honorable Patty Murray
Ranking Member
Subcommittee on Energy and Water Development
Committee on Appropriations
United States Senate

The Honorable Mike Rogers
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Chuck Fleischmann
Chairman

The Honorable Marcy Kaptur
Ranking Member
Subcommittee on Energy and Water Development, and Related Agencies
Committee on Appropriations
House of Representatives

We are sending copies of this report to the appropriate congressional committees, the Secretary of Energy, and other interested parties. In addition, the report will be available at no charge on the GAO website at https://www.gao.gov.

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Endnotes

[1]Radioactivity is measured in curies (Ci) and picocuries (pCi). One pCi = 0.000000000001 Ci. The natural radium-226 level of surface water is approximately 0.5 pCi/L. In its System Plan 10 for the Hanford Site, DOE uses 119 million curies as the total radioactivity in the 177 tanks. For the purposes of this report, we use 128 million curies, which reflects the total radioactivity for the 177 tanks from the Best Basis Inventory, as of April 2026. The Best Basis Inventory is DOE's publicly available database containing inventory estimates for chemical and radionuclide components in Hanford's tanks.

[2]According to DOE documentation, waste has been retrieved from 22 of these tanks as of February 2026.

[3]High-level radioactive waste is defined in the Nuclear Waste Policy Act of 1982, as amended, as "(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the [Nuclear Regulatory] Commission, consistent with existing law, determines by rule requires permanent isolation." Nuclear Waste Policy Act of 1982, Pub. L. No. 97-425, § 2(12), 96 Stat. 2201 (1983) (codified at 42 U.S.C. § 10101(12)). Further, the Atomic Energy Act of 1954, as amended, provides that "high-level radioactive waste" has the meaning given to that term in the Nuclear Waste Policy Act of 1982, as amended. 42 U.S.C. § 2014(ee).

[4]LAW is primarily the liquid portion of the tank waste that remains after as much radioactive material as is technically and economically practical has been removed. DOE uses the term LAW to mean the waste that, when solidified and properly classified as low-level radioactive waste, may be disposed of as low-level radioactive waste in a near-surface facility.

[5]GAO, *Nuclear Waste Disposal: Actions Needed to Enable DOE Decision That Could Save Tens of Billions of Dollars*, GAO-22-104365 (Washington, D.C.: Dec. 9, 2021).

[6]The Holistic Agreement included three parts: (1) changes to the Consent Decree of 2010, as amended; (2) changes to the Hanford Federal Facility Agreement and Consent Order of 1989 (or Tri-Party Agreement), as amended; and (3) a settlement agreement among DOE, EPA, and Washington State Department of Ecology that addresses parts of the cleanup approach at Hanford.

The Tri-Party Agreement (among DOE, EPA, and the Washington State Department of Ecology) and Consent Decree (between DOE and the Washington State Department of Ecology) are legally enforceable instruments that govern aspects of the cleanup at Hanford and set certain milestones for cleanup activities.

[7]This and the other cleanup milestones discussed herein are included in the latest version of the Tri-Party Agreement, which has been updated since the Holistic Agreement was finalized in January 2025. DOE officials noted that it may seek to grout the waste from two additional tanks—for a total of 24 tanks. For the purposes of this report, we consistently refer to 22 tanks, as outlined in the Holistic Agreement and latest version of the Tri-Party Agreement.

[8]The high-activity portion of the Hanford tank waste—primarily included in the sludge—is planned for vitrification onsite at Hanford.

[9]Specifically, the solicitation includes an estimated quantity of 24 million gallons, a minimum quantity of 1,200 gallons, and a maximum quantity of 50 million gallons.

[10]These figures include sludge, but do not include tank S-112 as DOE has declared that waste retrieval from this tank has been completed. They also include waste contained within three double-shell tanks in the SY tank farm. Specifically, waste from the three double-shell tanks will be retrieved to provide tank space for waste retrievals from the 22 single-shell tanks.

[11]The Nuclear Regulatory Commission specifies certain radionuclide concentration limits for Class A, B, and C low-level radioactive waste for disposal in licensed commercial facilities. 10 C.F.R. § 61.55. DOE does not use the Nuclear Regulatory Commission classification system for waste disposed of at DOE facilities, but it instead relies on site-specific performance assessments and waste acceptance criteria. Nonetheless, DOE does dispose of low-level radioactive waste at commercial facilities subject to the Nuclear Regulatory Commission classification system; therefore, the classifications can be relevant for DOE operations.

[12]GAO-22-104365. In contrast, state regulators in Utah and Texas told us that if grouted LAW meets a facility's established waste acceptance criteria, it would be accepted and could be disposed of at EnergySolutions or Waste Control Specialists.

[13]Savannah River National Laboratory, *Follow-on Report of Analysis of Approaches to Supplemental Treatment of Low-Activity Waste at the Hanford Nuclear Reservation*, SRNL-STI-2023-00007, Volume I, Revision 0 (January 2023).

[14]When shipping radioactive materials, DOE generally follows requirements and standards established by the Department of Transportation and the Nuclear Regulatory Commission, as well as DOE's internal order on the transportation of materials. DOE, *Hazardous Materials Packaging and Transportation Safety*, Order 460.1D, Chg. 1 (Washington D.C.: June 10, 2022).

[15]According to the Environmental Protection Agency, vinyl chloride is a hazardous chemical and known human carcinogen used to make plastic for pipes, insulating materials, and consumer goods.

[16]The referenced regulations apply specifically to radioactive high-level wastes generated during the reprocessing of fuel rods that exhibit specified hazardous waste characteristics. See 40 C.F.R. § 268.40. Treatment of these wastes must meet the "HLVIT" treatment standard, which requires vitrification of high-level mixed radioactive wastes in units in compliance with all applicable radioactive protection requirements under control of the Nuclear Regulatory Commission. 40 C.F.R. §§ 268.40, 268.42(a); Wash. Admin. Code 173-303-140(2)(a).

[17]DOE has three processes—known as waste classification tools—it can use to determine that certain waste can be treated and disposed of as low-level radioactive waste or transuranic waste, rather than high-level radioactive waste. In March 2026, we reported on DOE's use of these tools and their shortcomings, which have hindered DOE's cleanup progress. GAO, *Nuclear Waste Cleanup: Clarifying Definition of High-Level Radioactive Waste Could Help DOE Save Tens of Billions of Dollars*, GAO-26-108018 (Washington, D.C.: Mar. 25, 2026).

[18]GAO-22-104365.

[19]GAO-22-104365. In May 2024, EPA granted DOE a treatment variance under RCRA that authorized DOE to grout—rather than vitrify—2,000 gallons of low-activity tank waste from Hanford for offsite disposal as a part of the second phase of DOE's demonstration project to treat a specific volume of tank waste with grout and dispose of it off-site. *Department of Energy Hanford Mixed Radioactive Waste Land Disposal Restrictions Variance*, 89 Fed. Reg. 35008 (May 1, 2024). However, this variance did not resolve disagreements about how RCRA's treatment requirements will apply to other portions of Hanford's tank waste—such as the LAW from the tanks in the 200 West Area—that DOE has historically managed as HLW.

[20]GAO, *Nuclear Waste: Opportunities Exist to Reduce Risks and Costs by Evaluating Different Waste Treatment Approaches at Hanford*, GAO-17-306 (Washington, D.C.: May 3, 2017); and *Nuclear Waste Disposal: Actions Needed to Enable DOE Decision That Could Save Tens of Billions of Dollars*, GAO-22-104365 (Washington, D.C.: Dec. 9, 2021).