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West Valley Demonstration Project
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January 30, 2017

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Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
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SUBJECT: U.S. Department of Energy West Valley Demonstration Project (DOE-WVDP) Responses to the U.S. Nuclear Regulatory Commission (NRC) Comments on DOE-WVDP Vitrification Facility Decommissioning & Demolition Plan, WVDP-575, Rev. 3, dated July 6, 2016

REFERENCE: Letter (368973), M. R. Meyer to B. C. Bower, "U.S. Nuclear Regulatory Commission Comments on U.S. Department of Energy West Valley Demonstration Project Vitrification Facility Decommissioning & Demolition Plan, WVDP-575, Rev. 3, dated July 6, 2016 (Docket No. POOM-0032)," dated September 12, 2016.

Dear Mr. Meyer:

The DOE-WVDP is submitting responses to the NRC comments on the Vitrification Facility Decommissioning & Demolition Plan as submitted by the NRC with the above referenced letter. The attached table lists the NRC comments and provides responses with the information and explanation to address each comment.

Please contact Moira Maloney of my staff at (716) 942-4255 if you have any questions, need additional information, or if you would like to schedule a conference call to discuss the attached.

Sincerely,

Bryan C. Bower, Director
West Valley Demonstration Project

Enclosure: Comment and Response Table for the U.S. NRC Comments on the WVDP Vitrification Facility Decommissioning & Demolition Plan

cc: See Page 2

ZZZ:369807 – 450.4

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ZZZ:369807 – 450.4

U.S. NUCLEAR REGULATORY COMMISSION COMMENTS ON
WEST VALLEY DEMONSTRATION PROJECT
VITRIFICATION FACILITY DECOMMISSIONING & DEMOLITION PLAN, WVDP-575, REV.3

Comment Number	NRC Comment	WVDP Response
1)	Section 5.3, "Deactivation Activities Remaining": Provide the justification or rationale explaining why additional decontamination is not reasonable prior to disassembling/demolishing the structure. Also, discuss the criteria or rationale for fixing and leaving contaminated material/equipment in place for removal during demolition.	The criteria for fixing contamination and leaving contaminated materials/equipment in place for removal during demolition is an ALARA evaluation to determine if further decontamination efforts are justified in lieu of beginning demolition activities with fixatives applied. Additional decontamination is not reasonable if disassembly/demolition of the structure already meets prescribed limits for open air demolition, using the ALARA principles, including cost-benefit analysis of these programs (10 CFR 20.1003 and NUREG-1530). A New Section 6.4.1 on ALARA will be added to the document during the next revision—see Attachment 1. Removing the radiological materials with long reach equipment during demolition results in lower total personnel dose than would be realized if additional "hands on" deactivation or removal activities were to be performed. Air dispersion models, AERMOD and CAP-88, along with radionuclide source term estimates are used to estimate potential radiological dose to workers and the public, respectively, during demolition. This modeling is then supported by continuous monitoring during demolition to ensure all levels are within regulatory limits. To estimate the dose to the public, CAP-88 is used with air emissions calculated using the alternative methodology for radionuclide source term calculations as described in the January 25, 2016 letter from DOE-WVDP to the U.S. EPA. This methodology is referred to as the "Alternative Calculation" in the subsequent responses.
2)	Section 6.1, "General Decommissioning Approach and Technologies" and Section 6.4, "Radiation Protection and Radiological Controls": Describe the strategy or the guidelines that will be followed prior to beginning demolition (e.g., smearable levels are less than X, airborne contamination is less than Y, and direct measurement is less than Z, etc.) that ensure that the radiological controls for building demolition remain appropriate for the radiological conditions that are anticipated during building demolition.	The action levels at the perimeter of the site will be 0.02 DAC which is the maximum average concentration according to the AERMOD calculation and activity on the deposition mats of 20 dpm/100cm^2 alpha and 1000 dpm/100cm^2 beta-gamma. AERMOD modeling of residual contamination obtained from radiological surveys will be used to determine if contamination—including the demolition approaches used in a specific area (Cut, Shear, Break, Drop), fixative applications, and misting controls—will ensure that DAC objectives are met (0.02 DAC at the perimeter boundary). Air sampling, deposition monitoring and other job support surveys will be completed during demolition to verify estimated results.

Comment Number	NRC Comment	WVDP Response
3)	Section 6.1, "General Decommissioning Approach and Technologies" and Section 6.4, "Radiation Protection and Radiological Controls": Given the nature and progression of the work (use of water/suppressants to keep contamination down; eventually the cell will be open to the environment, possibly for a couple of months, and lay down areas will be open to the environment for further disassembly and staging of debris and waste), provide more detail with regard to the strategy on water use/runoff. *How will water used for dust suppression be managed during application to suppress dust and how will the volume of water be controlled to avoid potential impact to other systems (i.e., groundwater, spread of contamination within work zone and outside work zone, etc.)?*	Specific steps and sequencing are detailed in the Work Instruction Package (WIP) along with diagrams that identify safety and radiological considerations, precautions and notes. The approach for water collection, including water used for dust suppression, and management is described in an appendix to the WIP and is summarized below. Water control barriers shall be in place prior to and maintained during all phases of demolition. The lower portion of the Vitrification Facility (VF) cell and a berm set up around the demolition area will provide control and containment for dust suppression water and precipitation. The water will be tested in accordance with site procedures and transferred for treatment through the WVDP low-level waste treatment facility. Efforts will be made to minimize the volume of water by using misting techniques and a surfactant. Water will be dispositioned from the containment areas mentioned above before the areas become full. Storm drain inlets within the bermed area will be sealed to avoid potential impact to other systems (i.e., groundwater, spread of contamination within and outside the work zone).
4)	Section 6.1 "General Decommissioning Approach and Technologies" and Section 6.2 "Equipment to be Utilized and Available": a) How does the U.S. Department of Energy (DOE) support the assumption that the surfaces that are grouted will not be inadvertently disturbed during demolition? b) What portion of the inventory will be included in the source term calculations? Will DOE be transparent in assigning inventories in the source term calculations (e.g., including the total inventory present for the "material at risk" and using the "demolition ratio" to account for the portion of the inventory that will be impacted as a result of the demolition activity?) Note: terms "material at risk" and "demolition ratio" are found in DOE's "Methodology for Radionuclide Source Term Calculations for Air Emissions from Demolition Activities" dated January 2016.	a) Prior to placing grout in the VF cell; an engineering analysis was performed to determine the thickness of the 1,200 psi grout needed to avoid floor damage from dropped debris during demolition. The analysis determined the thickness of grout needed to protect the floor if the assumed heaviest piece of debris (steel crane rail support beam weighing 2,037 lbs) fell the 32 ft from its support above the floor. To provide an additional margin of protection, concrete demolition debris will be placed over the grouted floor surface prior to removing and lowering the piece of debris used in the calculation. b) The source term calculations are part of a transparent process and are documented in a calculation record, including material at risk (MAR), which is stored in the project's records system, subject to Government recordkeeping requirements. [It appears that where the comment refers to "demolition ratio" this should be "damage ratio" as used in the January 2016 paper on the Alternative Calculation.] All of the inventory present will be assigned to the MAR and the "Damage Ratio" (DR) in the calculations will be used to account for inventory that is impacted.

Comment Number	NRC Comment	WVDP Response
5)	Section 6.4, "Radiation Protection and Radiological Controls": a) Before actual building demolition work begins, provide the air dispersion model reports for review. This should include a description of the assumptions and rationale used to perform the modeling.	a) Calculation packages for AERMOD and the Alternative Calculation will be transmitted separately to the NRC.
	b) It is unclear how cut, shear, break, and drop demolition activities listed in Section 6.1, (and equipment listed in Section 6.2) compare to the list of activities described in "Methodology for Radionuclide Source Term Calculations for Air Emissions from Demolition Activities", and if all activities and all controls that will be employed are listed in the methodology document (e.g., how are emissions from drop demolition activities calculated?).	b) The activities described in Section 6.1 of the demolition plan are intended to give an overall description of aspects of the demolition process. The primary method used for drop operations in the January 2016 Alternative Calculation paper is from mechanical shearing. The Airborne Release Fraction (ARF) selected is 1E-03, which is based on dropping an object into a pile of powder. Langer (See section 4.4.3.3.2 of the DOE Handbook DOE-HDBK-3010-94) dropped large rocks onto various powders and measured ARFs for each type of powdered material. The highest value measured was 1E-03 (for Al_2O_3), which is the same ARF used in the Alternative Calculation. For the Hydraulic Hammer demolition method, which also might include a drop component, the estimated emissions also use an ARF of 1E-03, again, based on the Langer study of dropping large rocks into a pile of powder. In both cases, the drop operation was considered in developing the alternative calculation methods.
	c) Many factors (e.g., damage ratio, airborne release fraction, leak path factor) listed in "Methodology for Radionuclide Source Term Calculations for Air Emissions from Demolition Activities" appear to be based on professional judgement as experience and data are limited to determine parameters to use in the calculations. Therefore, it will be important to be transparent regarding what activities will be conducted and what information is available to support source term calculations for these activities, and to manage uncertainty associated with the calculations (e.g., through conservative assumptions when data is unavailable or very limited).	c) Comment noted. The source term calculations are part of a transparent process and are documented in a calculation record, including MAR, which is stored in the project's records system and will be transmitted separately to the NRC. Methods for the Alternative Calculation are based on experimental data as documented in the references. However, as part of the approval process with EPA, an emissions study will be conducted during demolition to validate the Alternative Calculation methods.
	d) *What is the strategy if a significant release or exposure is detected while doing the work? Include, how the overall significance would be determined and what actions would be expected to take place including the actions levels that would necessitate such action, and any additional plans that would be invoked, if necessary.*	d) Included in the work document is a radiological monitoring plan including action levels. Alerts will be established for Continuous Air Monitors (CAMs) to alert the workers before a stop work level is reached. At an alert, an evaluation of the ongoing work will take place to determine if the increase in activity was anticipated, and what actions, if any, are needed. Preset levels for alerts will be provided by the radiological controls department. The final WIP will present the Alerts, and actions to take in the event that Alerts are exceeded (including in the event of a significant release).
	e) *Clarify whether data received early on and/or throughout the demolition process will be used to validate parameter assumptions and preliminary calculations. Clarify whether there is a feedback mechanism to update worker and member of the public risk assessments and to inform radiation protection measures for future activities.*	e) The radiological data is analyzed each day and approval to proceed by the radiological controls department is required each morning based on the data. (This approval will be identified in the daily status log by the Radiological Controls Supervisor (RCS).) Any abnormality in the data will be analyzed and addressed the next morning with the work crews.

Comment Number	NRC Comment	WVDP Response
		As part of the approval process with EPA, an emissions study will be conducted during demolition to validate the Alternative Calculation methods for estimating dose to the public.
	f) On Page 33 of 66 of the Plan, it states, "Monitoring during demolition of the building includes air monitoring in the vicinity of the demolition actions for radiological releases to protect worker health and safety. This monitoring will also serve as an indication of potential airborne hazardous constituent releases. Should releases be detected above preset levels, work will be stopped and additional controls will be evaluated and implemented, as necessary. Ambient air monitoring stations located around the perimeter of the WVDP [West Valley Demonstration Project] will monitor for airborne radioactivity and confirm protection of the public." *What are the preset levels, and how are they calculated?*	f) The 0.02 DAC comes from federal regulations (10 CFR 835) that would trigger mandatory personnel monitoring (100 person-mrem/yr) and the contamination levels are the levels for a Contamination Area which the intent is to remain below in the area outside the 30m boundary. For the ambient air monitoring stations, compliance with the dose standard, and thereby protection of the public, is determined on a yearly basis by comparing potential (major) isotopic concentrations to those listed in the regulation (40CFR61,Appendix E, Table 2). Although at the WVDP, ambient air measurement data are examined routinely at multiple times (bench level, monthly, quarterly and annually) the timeliest formal examination of "exceptions" occurs as the sample data is entered into the WVDP's environmental database (the Environmental Laboratory Information Management System, the ELIMS). For quarterly isotopic data and monthly charcoal data, warning limits are based upon a result exceeding the WVDP contract required detection limit. Alarm limits are based on the quarterly result exceeding 5% of the NESHAP Concentration Level for Environmental Compliance. For biweekly alpha/beta data, warning and alarm limits are based on sample mean and standard deviation as derived from the network samples collected during the first quarter of operation. For biweekly sample flow, upper and lower warning limits are based on preset limits: Upper warning - total flow exceeding 1.3 times the biweekly target flow Lower warning - total flow below 0.8 times the biweekly target flow. Any value for alpha/beta, isotopic, or sample flow data entered that is outside of these ranges (warning or alarm) is captured on a LIMS Exception Report that is generated weekly.
	g) On page 36 of 66 of the Plan, it states "The WVDP [West Valley Demonstration Project] submitted a request for approval to EPA [Environmental Protection Agency] to utilize alternative methodology for radionuclide source-term calculations for air emissions from WVDP demolition activities as permitted by 40 CFR [Code of Federal Regulation] Part 61.96(b). This request was submitted in January 2016, and following EPA review and approval, calculations will be performed to	g) For the first part of the question, please see the first paragraph in the response to comment 5.f), above. The statement on page 36 was intended to communicate that meeting worker protection limits will also help protect the public, who are located farther away from active demolition. However, this is not what is relied upon to assure and document protection of the public.

Comment Number	NRC Comment	WVDP Response
	estimate radiological emissions and demonstrate compliance with rad-NESHAP [National Emissions Standards for Hazardous Air Pollutants] requirements. Results from these calculations will also be used to establish worker protection limits to maintain airborne concentrations below acceptable criteria at an established perimeter from the active demolition zone. Maintaining this worker protection limit will also be protective of the public." *What worker protection limits/constraints are being used (e.g., air concentrations, doses, etc.) and what are their bases?* *How do the worker limits/constraints assure that the public will be protected?*	The EPA has approved an alternative method for estimating emissions from the demolition activities as it relates to compliance with 40 CFR 61 Subpart H. The alternative method will be used to demonstrate that the emissions from demolition will result in a dose to the maximally exposed individual that would not exceed 0.1 mrem/yr. The maximum Federal Limit for an exposed public individual, which is protective of the public, as promulgated in 40 CFR 61 Subpart H is 10 mrem/yr. Therefore, a margin of 10,000% has been established based on using the alternative calculation method.
	h) On page 36 of 66 of the Plan, it states, "Radiological surveys will also be performed and documented following final preparations for demolition including final grout placement and fixative application to walls and other surfaces. Air dispersion modeling using these survey results will be performed to confirm and document that open air demolition of the VF [Vitrification Facility] can safely commence. These calculations and documentation will undergo internal review by CHBWV [CH2M Hill BWXT West Valley, LLC] and also by DOE-WVDP [Department of Energy-West Valley Demonstration Project]." *How will radiological survey data be used in air dispersion modeling and how will this information supplement or replace other preliminary source term calculations described in "Methodology for Radionuclide Source Term Calculations for Air Emissions from Demolition Activities"?*	h) A peer reviewed calculation (CALC-2016-036 VIT Demolition Readiness) identifies the "as is" activity and demolition readiness. This calculation has been provided to and reviewed by DOE-WVDP. The source term developed with the Alternative Calculation is a release source term (not an airborne concentration) and does not include any air dispersion. All of the radiological inventory estimated based on the surveys will be assigned to the Material At Risk (MAR), and the Damage Ratio (DR) in the calculations will be used to account for the inventory that is impacted. To calculate the air concentration, air dispersion calculations must be performed. Two dispersion models will be used. CAP-88 will be used to estimate dose to the public, as required by EPA and DOE regulations. EPA's AERMOD software will be used to estimate airborne concentrations which are then converted to DAC values for worker protection. AERMOD modeling of residual contamination obtained from radiological surveys will be used to determine if contamination that are encountered—including the demolition approaches used in a specific area (Cut, Shear, Break, Drop), fixative applications, and misting controls—will ensure that DAC objectives are met (0.02 DAC at the perimeter boundary). In addition, in the case of the Vitrification Facility demolition, AERMOD will also be used to estimate airborne concentrations at an ambient sampler that will be sited at the WVDP for use solely to establish the validity of the methods in the Alternative Calculation.

Comment Number	NRC Comment	WVDP Response
6)	General comment: *How will DOE address variability in meteorological conditions during demolition activities when evaluating potential worker and member of the public risk (and establishing necessary controls) through use of air dispersion modeling? DOE should provide example air dispersion model files (CAP-88 [Clean Air Act Assessment Package - 1988], and AERMOD) and results used in preliminary calculations. How will DOE use offsite air monitoring to validate models and demonstrate compliance with radiological criteria?*	The calculation to demonstrate demolition readiness for the Vitrification Facility (CALC-2016-036) includes the AERMOD data which uses 5 years of onsite meteorological data. A monitoring program will be in place to verify conditions are within expected parameters. Per the EPA approval of the Alternative Calculation, a sampler will be sited at the WVDP with a sole purpose of validating the alternative calculation methods. As samples are taken from this sampler, the onsite meteorological data will be processed for the time period that the sampler was operating during demolition. This meteorological data, along with an estimate of the source term over that period due to demolition, will be input into AERMOD and the results compared against the sampler data. Adjustments in demolition controls and with the Alternative Calculation method can be made based on this data. Note that this sampler will be located on site, near the demolition activities and is not an off-site sampler. It is expected that the off-site samplers will continue to read at or near background concentrations. Such low values would not provide statistically meaningful data as it related to the Alternative Calculation method for emissions. Therefore, there are no plans to try to correlate the off-site sampler data with the Alternative Calculation method validation.
7)	On page 8 of 66 of the Plan, it states: "The specific D&D [Decommissioning & Demolition] approaches, techniques, work sequencing and schedule are based on currently available information and planning and lessons learned from demolition of the WVDP 01-14 Building. Demolition of the 01-14 Building was conducted as a proof of concept for safe and compliant open air demolition of a radiological building." On page 20 of 66 of the Plan, it states: "Lessons learned from the 2013 demolition of the 01-14 Building at the WVDP, the Separations Process Research Unit (SPRU) D&D activities at Knolls Atomic Power Laboratory, and other DOE facilities will be factored into the planning for the VF demolition." Also, the NRC staff reviewed the summary of the 5 lessons learned found at https://opexshare.doe.gov/lesson.cfm/2014/7/30/4406/Open-Air-Demolition-of-Radiologically-Contaminated-Building-O1-14-at-the-West-Valley-Demonstration-Project. It is unclear what "lessons learned" were applied and how they were applied to the Plan.	The lessons learned (LL) from the specified projects are being incorporated into the Work Instruction Package (WIP) for demolition of the Vitrification Facility. Some of the LL include: • The WIP for demolition is a multi-phased work package developed to minimize the resources needed to develop several smaller work packages to allow the crew to better understand the entire project and what's coming next. • Specific steps and sequencing are detailed in the WIP along with building diagrams that identify safety and radiological considerations, precautions and notes. • Utilization of real time air monitors and reviews of daily radiological data to ensure results are within anticipated limits. • Careful consideration of dust suppression methods as well as the rate of application and wind speed and direction. • Emphasizing the use of stop work authority for any unplanned change in conditions. Additional LL, have also been implemented during facility deactivation such as: • Thorough characterization of the facility. • Utilization of personnel familiar with the facility and associated hazards. • Application of fixatives to control the spread of contamination. • Removal of smaller, contaminated items that would be difficult to remove with larger demolition equipment.

Comment Number	NRC Comment	WVDP Response
8)	Page 7 of 66 in the Plan it states, "In 2015, the U.S. Environmental Protection Agency (EPA) approved the use of "ambient environmental measurements" pursuant to 40 CFR 61.93(b)(5) for estimating off-site dose from airborne emissions and to demonstrate compliance with 10 CFR 61, Subpart H." *Comment: 10 CFR 61 should be 40 CFR 61.*	Comment noted. The correct citation will be used in the next revision.

ATTACHMENT 1

ALARA SECTION TO BE ADDED TO THE VITRIFICATION FACILITY DECOMMISSIONING & DEMOLITION PLAN

6.4.1 ALARA

As low as reasonably achievable (ALARA) is a philosophy of striving for excellence in the practice of health physics and is an important aspect of radiation-safety regulations. The National Council on Radiation Protection and Measurements has stated "ALARA is simply the continuation of good radiation-protection programs and practices which traditionally have been effective in keeping the average and individual exposures for monitored workers well below the limits" (NCRP 1993). The application of ALARA clearly includes the consideration of economic and social factors, and thus will inherently be different for different sources or facilities. From 10 CFR 20.1003:

> *ALARA means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.*

The 10 CFR 20.1103 standard for ALARA is similar to that in DOE-STD-1098-2008:

> *10 CFR 835 requires DOE activities to develop and implement plans and measures to maintain occupational radiation exposures as low as is reasonably achievable (ALARA) [see 10 CFR 835.101 and 835.1001]. As applied to occupational radiation exposure, the ALARA process does not require that exposures to radiological hazards be minimized without further consideration, but that such exposures be optimized, taking into account both the benefits arising out of the activity and the detriments arising from the resultant radiation exposures and the controls to be implemented.*

The ALARA concept is founded on the professional judgment of radiation-safety managers and personnel and is not, therefore, able to be used as a measure as to whether or not a particular radiation-safety program is adequate in comparison with other programs. Additionally, the ALARA concept does not provide a numerical limit below which the ALARA concept is achieved; ALARA makes every reasonable effort to maintain exposure as far below regulatory limits as possible.

Quantitative ALARA analyses include societal, technological, economic, and public policy considerations. In addition, these ALARA analyses consider NRC and DOE guidance for performing the following ALARA assessments:

- Identification of possible radiation protection systems, such as alternative operating methods or controls, that is reasonably achievable. The options range from the most rudimentary (base case) to the most technologically sophisticated systems.
- Quantification of exposures and doses to workers and the public in the vicinity of the work through air monitoring and dosimetry.
- Quantification of the economic factors, including the costs of purchasing, installing, operating, and maintaining the radiological equipment, and the potential health effects associated with the exposure of people and any other direct or indirect cost resulting from exposures to radiation during investigations and/or remediation.
- Identification and estimation of other health and non-health detriments and benefits, such as equipment loss and accidents.
- Evaluation of process alternatives using a quantitative cost-benefit analysis, when possible (NUREG-1530, 10 CFR 50 Appendix I, REG GUIDE 8.37).
- Implementation of the ALARA principles and monitoring of the results.

The following specific factors were used in performing a quantitative ALARA analysis:

- Dose to workers, the public, and the environment before and during work processes using AERMOD
- Residual dose to the local population (CAP-88 Modeling)
- Applicable alternative processes (treatments, operating methods, or controls) for site investigations or remediation
- Costs for each alternative evaluated compared to standards listed in NUREG-1530 and/or REG Guide 8.37
- Societal and environmental (positive and negative) impacts associated with alternatives