



Department of Energy
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MEMORANDUM FOR DOUG S. SHOOP
MANAGER
RICHLAND OPERATIONS OFFICE

FROM: THOMAS R. STAKER
DIRECTOR
OFFICE OF ENVIRONMENT, SAFETY AND
HEALTH ASSESSMENTS

A handwritten signature in blue ink, appearing to read "T. Staker", written over the name and title of the sender.

SUBJECT: *Results of the Office of Enterprise Assessments Concurrent Assessment of Recovery Activities at the Plutonium Finishing Plant at the Hanford Site for the Time Period between February 2018 and April 2018*

INTRODUCTION AND BACKGROUND

Between December 14 and December 18, 2017, unexpected contamination was detected by the operating contractor outside of the posted Contamination Area (CA) boundaries at the Plutonium Finishing Plant (PFP) demolition zone, including around the PFP offices and on multiple vehicles located outside the radiological boundaries. The consequences of this event included personnel exposure and the potential for radiological contamination leaving the Hanford Site. At the request of the U.S. Department of Energy (DOE) Under Secretary for Science and Office of Environmental Management (EM), the DOE Office of Environment, Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an independent concurrent assessment, from February through April 2018, of the implementation of the CH2M HILL Plateau Remediation Company (CHPRC¹) Radiological Controls Program and the site stabilization efforts at PFP. EA also concurrently reviewed the Jacobs Engineering Group, Inc. (Jacobs) independent assessment of the CHPRC Radiological Controls Program. EA worked closely with EM and the Richland Operations Office (RL) during this assessment.

EA assessed the implementation of the CHPRC Radiological Controls Program using the Criteria Review and Approach Document 45-35, Rev. 1, *Occupational Radiation Protection Program Inspection Criteria, Approach, and Lines of Inquiry*, December 4,

¹ CH2M HILL Plateau Remediation Company is a wholly-owned subsidiary of CH2M HILL Constructors, which is a wholly-owned subsidiary of CH2M HILL Limited, which is a wholly-owned subsidiary of Jacobs Group, Inc.

2012, focusing on work planning, exposure, contamination control, surveys, monitoring, posting, access, and materials controls. EA's assessment was based on a sample of key work packages, procedures, manuals, analyses, policies, and supporting documentation related to the programmatic revisions to the radiological controls being implemented at PFP in response to the December 2017 PFP event.

ACTIVITIES AND RESULTS

I. Review of the Programmatic Implementation of the CHPRC Radiological Controls Program as Related to Ongoing Site Stabilization Efforts

EA conducted, documented, and shared its weekly observations in Field Notes with EM and RL. CHPRC opened several Condition Reporting and Resolution System items to document the identified concerns and establish corrective actions. CHPRC and RL were open, responsive, and receptive to EA's observations.

EA identified a number of concerns about CHPRC's radiological control practices, the most significant of which are listed below:

- (1) CHPRC did not have an appropriate technical basis to justify that the Ludlum 2360 ratemeter/scaler (field counting equipment) being used to evaluate most routine radiological surveillance contamination surveys (smears) at a 67% confidence level was capable of detecting removable contamination at the required regulatory limit of 20 disintegrations per minute (dpm)/100 cm² alpha. Reliable detection of contamination at this low level normally requires the use of benchtop counting equipment with consistent counting geometry and a count time that results in calculation of a Minimum Detectable Activity of at least 20 dpm/100cm². CHPRC has a procedure for smear, lapel, and air sample counting that meets these requirements and is consistent with American National Standards Institute/Health Physics Society N13.49-2001, *Performance and Documentation of Radiological Surveys*, an industry consensus standard adopted by the Health Physics Society and referenced in DOE Guide 441.1-1C, *Radiation Protection Programs Guide for Use with 10 CFR 835*. However, this procedure was not used for most surveys that EA observed or reviewed, in favor of field counting practices using the Ludlum 2360 procedure that was not supported by a technical basis demonstrating the ability to detect removable contamination at the required regulatory sensitivity of 20 dpm/100 cm² alpha contamination. CHPRC retained a qualified health physics contractor to respond to this concern at the time EA raised it. Although CHPRC believed that its practices were sufficient to demonstrate compliance with regulatory limits, there was general agreement between EA and CHPRC that CHPRC did not sufficiently define its technical basis in this area. CHPRC developed corrective action plans to benchmark other DOE sites to evaluate alignment of its counting practices with those used in the DOE complex, increase counting times in the field,

and develop an appropriate technical basis. At the time of the assessment, these actions were currently still in progress.

- (2) There were several examples of poor quality and inadequate specificity of radiological work permits (RWPs) and radiological controls. Most PFP radiological work was governed by several extremely broad RWPs that allowed multiple radiological conditions and tasks without proper specificity of expected radiological conditions and controls for discrete tasks. Inadequate RWPs were also identified as a finding in the *Assessment Report for the Independent Assessment of the CH2M HILL Plateau Remediation Company (CHPRC) Radiological Control Program*, discussed in Section III of this memorandum, below.
- (3) Task descriptions did not always sufficiently describe the expectations for Radiation Control Technician survey and monitoring practices. Information needed for proper completion of the tasks was not always provided, including taking appropriate background measurements, evaluation of potential radon interference, proper techniques for collecting transferability samples, and methods for ensuring sample integrity. EA identified deficiencies in radiological survey performance, including excessive scan rates and greater distances from the surface than required by procedure. In some cases, survey sample collection methodology for removable alpha contamination precleaned the surface before sample collection (i.e., placing the technical smear in the middle of a large area maslin cloth). Moreover, EA observed work being performed near several outdoor High Contamination Area/Airborne Radioactivity Area boundaries that did not have boundary air samplers running as necessary to verify airborne concentrations at the boundary (as required per workplace air monitoring procedures).
- (4) There were various examples of inadequate radiological posting and labeling, including several deviations from area posting requirements specified in the site Radiological Control Manual for fixed contamination areas, and improper use of radioactive material area postings to identify items with potential internal contamination that should have been labeled. EA also identified some gaps in radiological boundary demarcation, including roped-off areas that were either incomplete or had conflicting access and/or conflicting posted requirements.

Toward the end of the concurrent assessment, EA did note improvement in CHPRC's survey practices, radiological postings, and RWPs.

II. Review of PFP Site Stabilization

EA reviewed objective evidence provided by CHPRC intended to support completion of the 15 stabilization actions documented in the PFP Demolition Area Stabilization list (developed by RL) as critical in achieving stability after the December 2017 PFP event. The following stabilization actions are summarized (see Appendix 1 for more detailed results of EA's assessment of the stabilization actions):

- **Actions #1 through #6, #11, #13, and #14:** EA determined these actions to be adequate and complete.
- **Action #7:** EA could not adequately assess Biological vector control because controls were not fully implemented during EA’s concurrent review timeframe.
- **Action #8:** At the time of this assessment, the Radiological Buffer Area expansion was not complete and, therefore, not assessed, but will be reviewed during a future assessment.
- **Action #9:** The personnel contamination monitors at the PFP site were not installed and set up and, therefore, not assessed, but will be reviewed during a future assessment.
- **Action #10:** EA determined that the determination of background conditions was not adequately completed. Although comprehensive radiological surveys and legacy contamination searches have been accomplished, they were subject to the same accuracy limitations associated with Concern (1) listed in Section I, above.
- **Action #12:** EA did not review the survey records because they were handled and controlled by CHPRC’s processes as Personal Identifiable Information. EA has requested redacted copies of the home survey records from CHPRC through RL and will review them as they become available.
- **Action #15:** EA is still reviewing PFP corrective actions and will continue to track the Condition Reporting and Resolution System items that correspond to the actions taken by CHPRC to address EA’s observations and issues.

III. Review of the Assessment Report for the Jacobs Independent Assessment of the CHPRC Radiological Controls Program

EA conducted a review of the Jacobs independent assessment report that was written in response to the events culminating in the December 2017 PFP event. EA held discussions with Jacobs team members about the Phase 1 objectives to prevent additional radiological events at other CHPRC projects or ongoing operations and the detailed “vertical slice” through the PFP Radiological Controls Program. The Jacobs report concluded that the CHPRC Radiological Controls Program was adequate, with the exception of certain elements of program implementation.

The Jacobs Phase 1 review was based solely on interviews and did not include any work observations in the field at other CHPRC projects. Given this approach for the independent review process, which lacked field performance observations, the Jacobs assertion of the adequacy of CHPRC’s Radiological

Controls Program at other projects may not be valid. It is noted that CHPRC is in the process of conducting a more thorough 10 CFR 835 assessment with RL oversight to further assess the validity of the Jacobs review.

CONCLUSIONS

Overall, CHPRC was responsive to the safety concerns revealed by the December 2017 PFP contamination event and those identified by EA during this assessment. CHPRC has taken some immediate corrective actions, although effectiveness cannot be determined at such an early phase in the recovery process. Improvements were made to the Radiological Controls Program (as indicated by radiological controls technician survey practices at PFP and other CHPRC projects at Hanford) and to site stability regarding contamination control (as evidenced by the surveys that indicated no additional measured spread of contamination outside the CA after high wind events). The Jacobs independent review was narrow in scope due to the lack of work observations across the site, which may impact the validity of some of its conclusions. However, CHPRC is conducting a more thorough 10 CFR 835 assessment with RL oversight to further assess the validity of the Jacobs review.

As CHPRC prepares to restart the demolition process for the PFP structure and remaining debris, EA plans to conduct independent assessments concurrently with EM and RL as conditions warrant.

If you have questions or concerns about EA's assessment of the CHPRC Radiological Controls Program for the PFP at the Hanford Site, please contact me, at (301) 903-5392, or your staff may contact C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments, at (301) 903-9894, or the assessment team leader, Gregory M. Schoenebeck, at (301) 903-9713.

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EA Assessment of the Status of RL-Defined Actions Needed to Complete Stabilization

	Stabilization Action	EA Assessment
1	Fixative and soil have been applied to the Plutonium Reclamation Facility stub walls and rubble piles at an amount where spread of contamination is very unlikely.	Adequate implementation. Additional fixative is application (stabilization action 4) continues on a routine basis. EA witnessed several applications of soil and fixative during its weekly onsite visits, which began in early February 2018. As noted in published PFP recovery updates, soil and fixative application began in late December 2017.
2	Fixative and soil have been applied to 234Z-5Z building, debris pile(s), and the surrounding contaminated or potentially contaminated areas at amounts where spread of contamination is very unlikely.	Adequate implementation. Additional fixative application (stabilization action 4) continues on a routine basis. EA witnessed several applications of soil and fixative during its weekly onsite visits. As noted in published PFP recovery updates, soil and fixative application began in late December 2017.
3	Fixative has been applied to contaminated (and potentially contaminated) mobile offices and surrounding areas at amounts where spread of contamination is very unlikely.	Adequate implementation. Additional fixative application (stabilization action 4) continues on a routine basis. EA witnessed application of fixative to mobile trailers during one of its weekly onsite visits.
4	For stabilization actions 1-3 above, processes are in place to monitor soil and fixative amounts and apply additional soil and/or fixative when necessary to continue to ensure that spread of contamination is very unlikely.	Adequate implementation. EA's observations during weekly onsite visits and PFP recovery updates indicate that routine fixative maintenance applications were ongoing.

EA Assessment of the Status of RL-Defined Actions Needed to Complete Stabilization

	Stabilization Action	EA Assessment
5	Radiological monitoring processes and equipment are in place which, at a minimum, monitor daily for the spread of contamination.	Adequate implementation and ongoing effort, however many samples were evaluated with field counting techniques, which are subject to the accuracy limitations associated with Concern (1) listed in Section I of this memo. During weekly onsite visits, EA observed several iterations of daily radiological surveys including “cookie sheet” and trailer surveys to monitor for the potential spread of contamination. EA also observed several iterations of other variable frequency (weekly) surveys of radiological boundaries. These routine surveys are governed by formal survey task description documents and implementing procedures.
6	Radiological processes are in place which specify actions to be taken during and after high wind events.	Adequate instructions and implementation; ongoing effort, however many samples were evaluated with field counting techniques, which are subject to the accuracy limitations associated with Concern (1) listed in Section I of this memo.. On January 25, 2018, PFP Operations published Standard Operating Instruction 18-004-SOI-Rev 1, <i>Contingency Plans for High Winds</i> , which defines high winds and addresses monitoring for high winds, notifying personnel of high wind conditions, and response actions to be taken, including personnel exit and access restrictions as well as conduct of the Z-VAR009 survey task description. During weekly onsite visits, EA has tracked the implementation of response to several high wind events, including performance and documentation of VAR009 surveys to detect any windblown spread of contamination.
7	Processes have been established and implemented to minimize the potential spread of contamination from biological vectors.	EA could not fully assess the adequacy of the biological vector plan developed to address this stabilization action because its scope falls beyond the concurrent review of PFP activities. Much of this area falls within the purview of a different contractor Mission Support Alliance, LLC, under the site wide environmental protection program and governed by other DOE orders. EA did review the objective evidence provided by the site and concluded that although some effort went into the biological vector plan developed by Mission Support Alliance, LLC and CHPRC, there was not enough information (e.g., program goals, evaluation of different control sets that could be used to keep wildlife away from areas of concern, contamination action levels) to assess the plan’s adequacy

EA Assessment of the Status of RL-Defined Actions Needed to Complete Stabilization

	Stabilization Action	EA Assessment
8	A new, significantly larger radiological buffer area has been formally established.	Action was not complete at the time of this assessment and was not assessed at this time. EA will continue to review and assess objective evidence. EA will review the newly established radiological buffer area during onsite activities at PFP at a later time.
9	Processes (e.g., use of personnel contamination monitors) have been developed and implemented for the new radiological buffer area that minimizes the potential for spread of contamination.	Action was not complete and not assessed at this time. EA will continue to review and assess objective evidence. EA will assess the use of personnel contamination monitors in the field during onsite activities at PFP at a later time.
10	Comprehensive radiological surveys and legacy contamination searches have been completed to establish background conditions prior to expanding the Contamination Area/High Contamination Area	EA reviewed the objective evidence and found that comprehensive radiological surveys and legacy contamination searches have been accomplished. However, the ability of these surveys/searches to establish background conditions for removable contamination may be insufficient due to the lack of performance of transferability surveys capable of detecting greater than 20 dpm/100 cm ² . The survey plan did not require transferability surveys unless alpha contamination was detected by a static count, which was only capable of detecting total contamination of 500 dpm or more beneath the probe. However, alpha background levels should be close to 0, and a contamination area is defined at greater than 20 dpm/100 cm ² removable. Therefore, the data collected for this stabilization action does not address the potential for removable contamination in excess of 20 dpm on a swatch and below 500 dpm total. (See Concern (1), listed in Section I of this memo.)
11	Evaluate radiological monitoring data from November through December 2017 to understand the December 2017 spread of contamination.	Adequate implementation. EA's review of the objective evidence and found that CHPRC appropriately evaluated radiological monitoring data from November through December 2017 to better understand the December 2017 spread of contamination. The data demonstrates that stabilization efforts (fixative application, etc.) following the event were effective in trapping contaminants and establishing defenses against erosion and Aeolian transport.

EA Assessment of the Status of RL-Defined Actions Needed to Complete Stabilization

	Stabilization Action	EA Assessment
12	All current (as of February 13, 2018) requests for home radiological surveys, including DOE and U.S. Department of Health oversight, have been completed.	<p>EA did not review survey records because they contained personal identifiable information, limiting EA's ability to obtain and review these survey records due to the time needed to implement redaction and release protocols. The home surveys were a due diligence effort offered by CHPRC to any employee to have the opportunity of investigative home surveys following the December 2017 PFP contamination spread. RL's radiological controls subject matter expert was present during the home survey process and debriefed EA on the surveys, scope and conduct, which EA found to be acceptable. PFP's published stabilization updates reported that as of December 20, 2017, seven originally-requested home surveys were complete, with no contamination found. On February 6, 2018, an additional requested survey of a PFP employee's home was completed, with no contamination found.</p> <p>EA has requested redacted copies of the home survey records and will review them as they become available.</p>
13	All current (as of February 13, 2018) requests for personal vehicle radiological surveys, including DOE and U.S. Department of Health oversight, have been completed and vehicles returned to owners.	<p>Adequate implementation and level of effort. An initial verification survey of the seven vehicles immediately by the RBA was performed by CHPRC Radiation Control Technicians. By protocol, a verification survey is considered a good practice, "go, no-go" survey to determine if the presence of contamination exists. Due to the potential of known contamination at the PFP site (and to the cars), these results were evaluated between RL and CHPRC and it was determined that the surveys were not adequate (i.e., <95% confidence level). Subsequently, CHPRC offered additional surveys of which four car owners accepted with their cars being surveyed at the 95% confidence level. EA was able to review one complete record set and found the survey results were comprehensive and adequate, including the use of appropriate bench counting techniques designed to detect any contamination above the DOE removable contamination limit of 20 dpm/100 cm².</p>

EA Assessment of the Status of RL-Defined Actions Needed to Complete Stabilization

	Stabilization Action	EA Assessment
14	All current (as of February 13, 2018) requests for radiological bioassays have been completed and results provided to individual workers.	Adequate implementation. PFP's published stabilization updates indicate that as of March 22, 2018, all bioassays requested as a result of the December 2017 PFP event were complete and that the results were communicated properly. 281 bioassays were requested, 270 of which were negative. Eleven bioassays were positive, all of which with a verified 50-year committed dose of less than 10 millirem.
15	All documented corrective actions from internal (CHPRC) and external (Jacobs) reviews and/or compensatory measures are in place for identified deficiencies in the PFP Radiological protection program.	Not assessed at this time. EA will continue to review and assess objective evidence and samples of corrective action implementation during onsite activities at PFP in July and August 2018.