



**OFFICE OF INSPECTOR GENERAL**

U.S. Department of Energy

# AUDIT REPORT

DOE-OIG-20-55

September 2020

## **RESPIRATORY EQUIPMENT MAINTENANCE AT THE HANFORD SITE**



**Department of Energy**  
Washington, DC 20585

September 16, 2020

MEMORANDUM FOR THE MANAGER, HANFORD SITE

A handwritten signature in black ink, appearing to read "John E. McCoy II".

FROM: John E. McCoy II  
Deputy Assistant Inspector General  
for Audits  
Office of Inspector General

SUBJECT: INFORMATION: Audit Report on "Respiratory Equipment  
Maintenance at the Hanford Site"

BACKGROUND

The Department of Energy's Hanford Site (Hanford), located in Washington State, was one of the sites selected for the Manhattan Project to produce plutonium for the U.S. nuclear arsenal. The weapon production processes left solid and liquid wastes that pose a risk to the environment. Since 1987, Hanford's mission has been to clean up the site following the decades of weapon production activities. There are two Department Offices at Hanford that oversee the cleanup efforts. The first, the Office of River Protection, is responsible for retrieving and treating the Hanford's tank waste and for closing the Tank Farms. The Office of River Protection contracted with Washington River Protection Solutions, LLC (WRPS) to manage, retrieve, and treat radioactive and hazardous tank waste; and with Bechtel National, Inc. (Bechtel) to design and build the Waste Treatment and Immobilization Plant. The second Department Office, the Richland Operations Office, is responsible for programs that are necessary to ensure the safety of the Hanford cleanup and site infrastructure needs. The Richland Operations Office contracted with CH2M HILL Plateau Remediation Company (CHPRC) to perform environmental cleanup of the Central Plateau at Hanford. CHPRC is responsible for waste retrieval, demolition of facilities, and closure of the Plutonium Finishing Plant.

These Hanford cleanup projects require contractors to work in a variety of hazardous work environments that can include radioactive materials and industrial and chemical hazards. As a result, Hanford contractors are required to use respiratory protection equipment to protect from the health and safety consequences of these work activities. The Occupational Safety and Health Administration (OSHA) standards contained in 29 CFR 1910.134, *Respiratory Protection*, require employers to develop and implement a written respiratory protection program with mandatory worksite-specific procedures and elements for required respirator use. To meet this requirement, a committee made up of Hanford prime contractors developed the Hanford Site Respiratory Protection Program (HSRPP) and Respirator Maintenance and Care Instructions,

which identify the frequency that contractors are required to perform maintenance on the various types of respiratory protection equipment. We initiated this audit to determine whether Hanford contractors were adequately maintaining respiratory protection equipment to protect workers from exposure to hazardous materials. This report is one in a series at select Environmental Management sites.

## RESULTS OF AUDIT

We found that Hanford contractors CHPRC and WRPS did not always maintain respiratory protection equipment in accordance with requirements. Although we did not specifically identify that unmaintained equipment was issued by either contractor, neither contractor had documented compensating controls in place to ensure that equipment which had not received proper maintenance was not issued to end users, increasing the possibility that end users might be issued the unmaintained respiratory equipment. Using unmaintained respirators increases the risk that workers will inhale dangerous substances because the respirator may not function properly.

Our review also identified that Bechtel's occupational medical provider had not always fully completed required medical evaluations to determine workers' abilities to safely use respirators. These evaluations are essential to ensure that a worker is medically qualified to accept the physiological burdens that a respirator may cause when in use. This occurred because Bechtel did not always provide oversight to its occupational medical provider as closely as necessary to ensure medical evaluations were completed as required.

### **Respirators Were Found Outside Hanford Program Required Maintenance Due Dates**

Hanford contractors CHPRC and WRPS did not always maintain respiratory protection equipment in accordance with requirements. Using unmaintained respirators increases the risk that workers will be exposed to dangerous substances because the unmaintained respirator may not function properly. Many of the hazards that Hanford contractors are potentially exposed to may cause cancer, lung impairment, or other occupational diseases. If even a single respirator is improperly maintained, this has the potential to increase the risk that the worker could be exposed to hazards such as beryllium, vapors, or chemical wastes. Therefore, it is essential that workers' respirators fit properly and are maintained in a clean and serviceable condition.

To reduce the risks that respirators would not function, CHPRC and WRPS are required to perform maintenance of respirator equipment that includes inspections of the respirator battery packs, blowers, and tubes that connect the blower to the respirator. In addition, flow tests are conducted to ensure that workers are getting adequate air flow. Other respirator maintenance activities can include calibration, visual inspection, functional test, and regulator adjustment.

### **CH2M HILL Plateau Remediation Company**

CHPRC did not always maintain respiratory protection equipment in accordance with the HSRPP and Respirator Maintenance and Care Instructions. CHPRC is a prime contractor with the Department's Richland Operations Office. Specifically, CHPRC workers used respirators

called OptimAir Mask-Mounted Powered Air Purifying Respirators (PAPR), which required a 90-day maintenance interval, and OptimAir TL PAPRs, which required a 180-day maintenance interval. Many of CHPRC's PAPRs were used at the Plutonium Finishing Plant to protect against plutonium and americium hazards. Our review of 21 of CHPRC's PAPR maintenance records identified that 17 of the PAPRs (81 percent) were not maintained within those 90-day and 180-day maintenance intervals. The average timeframe for not meeting the maintenance requirements for both PAPR types was 63 days late. However, we also identified some PAPRs that were over 180 days late. For example, for one PAPR, the maintenance due date was July 20, 2017, but the date it went for maintenance was January 24, 2018, over 188 days late.

The database used to manage the issuance of the PAPRs showed that those PAPRs past their maintenance lifecycle were all "available for use." However, the "available for use" designation did not actually mean that the PAPR was ready or available for use by an end user. Instead, the "available for use" designation meant that the PAPR was available to be moved to another status.<sup>1</sup> Since some PAPRs past their requirement maintenance date were held at issue stations, sometimes in the same physical location as maintained equipment, while awaiting transfer to maintenance or storage, having a PAPR with a status of "available for use" in the database when the actual PAPR had not been maintained increased the possibility that a worker may inadvertently use one of these respirators in need of maintenance. In response to our audit findings, CHPRC was in the process of updating their system to add another designation of "in inventory" to help prevent confusion. They planned to complete this action by September 2020. In addition, during our site visit, issue stations demonstrated how they could check a PAPR "out for service" and then back to "available for use," allowing them to issue the PAPR. It should be noted that CHPRC does require that both the issuer and the user check the maintenance sticker on the equipment prior to use. CHPRC believed that the maintenance sticker placed on maintained PAPRs was a sufficient secondary control. However, while such controls can help to mitigate the use of unmaintained respiratory equipment, the controls are heavily reliant on the workers performing those checks correctly. As a result, in response to our audit findings, CHPRC was in the process of adding a maintenance due date change log in the system to ensure that all changes to the maintenance due dates were appropriate and auditable, and that not as much reliance was placed on the manual compensating control. They planned to complete this action by June 2020. Although we did not specifically identify that unmaintained equipment was issued, having strong, documented internal controls and properly maintained respiratory protection equipment decreases the likelihood of equipment failures in the field.

### **Washington River Protection Solutions, LLC**

WRPS did not always maintain respiratory protection equipment, although those we identified with outdated maintenance were all in the maintenance shed and unavailable to be issued. WRPS is a prime contractor with the Department's Office of River Protection. Specifically, WRPS required the use of Self-Contained Breathing Apparatus respirators for the majority of the

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<sup>1</sup> There are eight status indicators: (1) "In Use"—equipment is issued to a user; (2) "No Longer in Use"—equipment has been removed from usability; (3) "Available for Use"—equipment is available to be moved to another status; (4) "Out for Service"—equipment is in for maintenance; (5) "Out for Laundry"—equipment is in for cleaning; (6) "Out for IH"—equipment is being checked because something was noted; (7) "Out for RadCon"—equipment is pending clearance from radiological zone; and (8) "Out for Air"—specific to certain equipment used by another contractor.

tank waste operations that work with chemical vapor hazards. Our review of eight of the Self-Contained Breathing Apparatus maintenance records identified that all eight were maintained within established maintenance intervals.

However, WRPS also allowed for the use of 3M Breathe Easy and OptimAir TL PAPRs for work activities outside the Tank Farm fence line. Our review of 20 of WRPS's PAPR equipment maintenance records found that 10 of the PAPRs (50 percent) were not maintained within the required maintenance intervals. On average, maintenance for the 3M Breathe Easy PAPRs was performed 99 days after the required maintenance due date. In fact, we identified that some of the PAPRs were over 180 days late in receiving required maintenance. For example, one PAPR was due for maintenance on June 25, 2017, but maintenance was not completed until February 12, 2018, or 232 days late.

WRPS officials were able to provide documentation showing that the PAPRs we tested were actually in the maintenance shed and unavailable to be issued during the time they were out of compliance with required maintenance intervals. However, WRPS's industrial hygiene database did not always clearly tag PAPRs out of compliance with required maintenance as out of service. After our audit brought this to the attention of WRPS management, action was taken to ensure that their respirator database provided more clarity to ensure that all PAPRs taken out of service for maintenance were tagged as out of service in the industrial hygiene database as of November 2018.

In addition, WRPS had a mitigating control in place that required workers to check respiratory protection equipment before entering a work area. Further, per WRPS, all respiratory equipment, whether used or not, is picked up from the issue stations weekly and taken to maintenance for a check before being returned to the issue station. While these are good compensating controls, there was no documented requirement for compensating controls. As a result, there was no assurance that these practices would continue.

## OTHER MATTERS

### **Respiratory Equipment Medical Evaluations Were Not Always Fully Completed**

Bechtel's occupational medical provider did not always fully complete required medical evaluations to determine the workers' abilities to use respirators. Without proper documentation of medical evaluations, Bechtel could not provide assurance that a worker was medically qualified to accept the physiological burdens that a respirator may cause when in use. Specifically, Bechtel workers who use respirators are placed in environments with hazardous materials. Due to the burden a respirator can cause to a worker, it is essential that the workers are medically qualified to ensure that ailments such as seizures, claustrophobia, asthma, and chronic bronchitis are evaluated to ensure the safety of the worker.

To ensure workers who use respirators are kept safe, Bechtel was contractually obligated to follow OSHA standards that required workers to be medically evaluated, fit tested, trained in the respiratory hazards they could potentially be exposed to, and trained in the proper use of equipment. The OSHA standards also require employers to retain written information regarding

the medical evaluations and fit testing. Bechtel's construction of the Waste Treatment and Immobilization Plant consists of airborne contaminants such as silica dust and metal fumes from activities that involve welding and working with concrete. Respirators in use for these work activities included PAPRs, dust masks, and air-purifying respirators.<sup>2</sup>

Our review of 18 medical evaluations identified that 14 (78 percent) were not completed as required. Specifically, we reviewed each medical evaluation form to determine, among other things, whether the mandatory questions<sup>3</sup> were completed and the respirator qualification information<sup>4</sup> was complete. We found that 5 (36 percent) of the 14 did not have both the mandatory questions and respirator qualification information complete. In addition, 2 (14 percent) of the 14 did not have the mandatory questions complete, but the respirator qualification information was completed. Finally, 7 (50 percent) of the 14 had the mandatory questions completed but did not have the respirator qualification information.

### **Inadequate Oversight of Respiratory Medical Evaluations**

This occurred because Bechtel's safety and health oversight group did not always provide oversight to its occupational medical provider as closely as necessary to ensure that medical evaluations were completed as contractually required. Specifically, Bechtel's respiratory protection assessments relied on observations and discussions to determine whether the occupational medical provider was compliant with OSHA requirements. However, Bechtel did not always review or validate the medical evaluations during its respiratory protection assessments. In response to our audit, Bechtel issued a condition report and took actions to have the occupational medical provider mentor staff to ensure that medical files were reviewed and updated prior to issuing qualifications.

### **RECOMMENDATIONS**

As a result of the findings and weaknesses we identified in this report, we recommend that the Manager, Hanford Site ensures that:

1. CHPRC establishes procedures to store unmaintained or used respiratory equipment separately from fully maintained equipment;
2. WRPS formally documents the process for when and how equipment is moved between issue stations and maintenance; and
3. Bechtel verifies that medical evaluation forms are fully completed and/or updated as appropriate.

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<sup>2</sup> Air-purifying respirators are negative pressure respirators that depend on the user to breathe through a filter to purify the air.

<sup>3</sup> The mandatory questions were OSHA required information that asked potential users what type(s) of respirators would be used and whether the potential user had difficulty wearing respirators in the past.

<sup>4</sup> The respirator qualification information detailed the specific types of respirators the individual was qualified to use (e.g., PAPR, Self-Contained Breathing Apparatus, supplied air, half-face or full-face negative pressure respirators).

## MANAGEMENT RESPONSE

Management concurred with the report's recommendations and indicated that corrective actions are planned to address the issues identified in the report. In addition, management provided separate technical comments.

## AUDITOR COMMENTS

We reviewed management's technical comments and updated the report to address these technical comments related to their concerns, where appropriate, to enhance the clarity of the report. Management's comments and planned corrective actions are responsive to our recommendations.

Management's comments are included in Attachment 3.

Attachment

cc: Deputy Secretary of Energy  
Chief of Staff  
Under Secretary for Science  
Associate Under Secretary for Environment, Health, Safety and Security, AU-1  
Principal Deputy Assistant Secretary for Environmental Management, EM-1

## **OBJECTIVE, SCOPE, AND METHODOLOGY**

### OBJECTIVE

We initiated this audit to determine whether Hanford Site was adequately maintaining respiratory protection equipment to protect workers from exposure to hazardous materials. This report is one in a series of reports on our audit results for multiple Environmental Management sites.

### SCOPE

We conducted this audit between June 2018 and October 2019 at the Hanford Site near Richland, Washington. We focused on respiratory protective equipment maintenance, training, and qualifications between calendar years 2015 and 2018. This audit was conducted under Office of Inspector General project number A18AL037.

### METHODOLOGY

To accomplish our audit objective, we:

- Reviewed applicable policies, procedures, laws, and regulations pertaining to respiratory protective equipment.
- Reviewed reports issued by the Office of Inspector General, Government Accountability Office, and other entities, such as external audit firms.
- Interviewed key personnel from the Department of Energy's Office of River Protection and Richland Operations Offices, and contractor personnel from Washington River Protection Solutions, LLC (WRPS), Bechtel National, Inc. (Bechtel), CH2M HILL Plateau Remediation Company (CHPRC), and Mission Support Alliance.
- Assessed WRPS, Bechtel, CHPRC, and Mission Support Alliance contractors' processes to ensure protection of its workers from respiratory hazards.
- Conducted a review of respiratory equipment maintenance activities, inventory tracking systems for equipment issuances, and user training and qualifications, for compliance with laws, regulations, policies, and procedures. As part of our review, we:
  - Selected 63 respiratory protection equipment items—Self-Contained Breathing Apparatus and Powered Air Purifying Respirators—from several CHPRC and WRPS locations. This was not a statistical sample, and we are not using the results to project to the universe. We went to multiple locations with the contractors and judgmentally selected respiratory protection equipment items from what was at the locations. We selected more Powered Air Purifying Respirators based on the frequency of the maintenance (90-180 days) vs. the Self-Contained Breathing Apparatus, which have a maintenance frequency of every 2

years for the industrial Self-Contained Breathing Apparatus. Our selection of 63 respiratory equipment items was used as a basis to check against the maintenance information of the equipment.

- Reviewed Bechtel's subcontractor's medical evaluation forms for 18 workers to see if they had been completed by the requirements. This too was not a statistical sample, and we are not projecting the results to the universe. The workers were judgmentally selected from the equipment issuance logs between September 25, 2018, and October 18, 2018. During our audit, Bechtel revised its Respiratory Protection Procedure and fully implemented the procedure on September 25, 2018.

We conducted this performance audit 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 objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective. Accordingly, we assessed significant internal controls and compliance with laws and regulations necessary to satisfy the audit objective. In particular, we assessed the implementation of the *GPR Modernization Act of 2010* and found that the Department had established performance measures related to worker safety and health. Because our review was limited, it would not necessarily have disclosed all internal control deficiencies that may have existed at the time of this audit. We conducted a reliability assessment of computer-processed data relevant to our audit objective by comparing the data to source documents. We deemed the data to be sufficiently reliable for our purposes.

An exit conference was held with management officials on August 25, 2020.

## PRIOR REPORT

Special Report on [Department of Energy's Actions to Address Worker Concerns Regarding Vapor Exposures at the Hanford Tank Farms](#) (OIG-SR-17-01, November 2016). The report disclosed that 7 of 52 workers interviewed indicated that they had concerns with reporting, communicating, reprisal, or fear of retaliation related to potential vapor exposures. While a number of actions were underway to address the risks posed by vapors, such as evaluating technologies in the Tank Farms, the Office of Inspector General found that improvements in communication are needed to inform workers about the status of actions and to ameliorate continuing fear of retaliation on the part of some workers. In addition, although not directly related to respiratory maintenance, the report also stated that a labor union president had some concerns about a few management officials on the Hanford Site who may react negatively to workers who want to voluntarily upgrade to full self-contained breathing apparatus gear in the Tank Farms. However, the union president did not volunteer specific information regarding the union's concerns with specific management officials. Management concurred with the Office of Inspector General recommendations and was committed to: (1) taking steps to strengthen the tracking and closure of vapor issues using the Washington River Protection Solutions, LLC's Problem Evaluation Request system; (2) working with Washington River Protection Solutions, LLC to summarize prior and ongoing engineering control evaluation reports and to share these with the workforce and the public; and (3) continuing to develop and sustain a strong safety culture by using the Chemical Vapors Solution Team and numerous mechanisms for workers to raise safety concerns.

## MANAGEMENT COMMENTS



**Department of Energy**  
**Hanford Site**  
 Richland Operations Office | Office of River Protection

August 13, 2020

HCS:DMS/20-MGR-0014

MEMORANDUM FOR JOHN E. MCCOY II, DEPUTY INSPECTOR  
 GENERAL FOR AUDITS AND INSPECTIONS  
 IG-301.2

FROM: BRIAN T. VANCE  
 MANAGER

Digitally signed by Brian T. Vance  
 DN: cn=Brian T. Vance, o=Office of  
 River Protection, ou=Department of  
 Energy,  
 email=brian.t.vance@orp.doe.gov,  
 c=US  
 Date: 2020.08.13 17:31:09 -07'00'

SUBJECT: MANAGEMENT RESPONSE TO THE OFFICE OF INSPECTOR  
 GENERAL DRAFT AUDIT REPORT ON "RESPIRATORY  
 EQUIPMENT MAINTENANCE AT THE HANFORD SITE"

The U.S. Department of Energy (DOE), Office of Environmental Management appreciates the opportunity to review and comment on the subject Office of Inspector General (OIG) draft report, "Respiratory Equipment Maintenance at the Hanford Site." The Hanford Respiratory Equipment Maintenance Program has a long history of providing properly maintained respiratory equipment to users. The DOE Office of River Protection (ORP) and Richland Operations Office (RL) has reviewed the information in the draft report and has initiated actions to further strengthen the respiratory equipment program at the Hanford Site. ORP and RL concur with the OIG's recommendations.

The OIG has incorporated clarifying information requested by Hanford into the draft report. Furthermore, Hanford has provided and discussed with OIG, the numerous programmatic controls and compensating measures which have been implemented into procedures, training, and work practices to ensure respiratory equipment is appropriately maintained prior to use.

The draft report states that respiratory equipment was not maintained in accordance with scheduled intervals, but does not provide supporting details to support this conclusion. Specifically, for Washington River Protection Solutions, LLC, only excess respiratory equipment in storage has been allowed to lapse; and for CH2M HILL Plateau Remediation Company, the Respiratory Protection Equipment Tracking System does not allow equipment with expired maintenance to be issued for use. In instances of excess equipment held in storage for future deployment and not immediately needed for operations, Hanford asserts that it is not cost effective to maintain unused respiratory equipment. The report also discusses a potential exposure risk to workers. Hanford is requesting that OIG include full context to this statement to ensure the reader understands that unmaintained respiratory equipment had not been issued and did not result in worker exposure. Programmatic controls are institutionalized in the form of training for users, issuers, and maintenance technicians; software tracking mechanisms; and medical clearances for users. These controls are built on a framework of procedures that regulate all steps of maintenance, preparation, issuance, and use of respiratory equipment. For respirators that are drawn from storage, this

John E. McCoy II  
20-MGR-0014

-2-

August 13, 2020

framework serves a compensatory function by ensuring that equipment with lapsed maintenance is brought current prior to assembly and issuance for use. Hanford notes that the audit did not find evidence indicating that an unmaintained respirator had been issued to an end user.

The Attachment details the specific actions being taken that will address your recommendations. If you have any questions, please contact me, or your staff may contact Glyn Trenchard, Assistant Manager, Technical and Regulatory Support, Office of River Protection, on (509) 373-4016, or Brian Stickney, Assistant Manager for Safety and Environment, Richland Operations Office, on (509) 376-9079.

Attachment:  
Management Response

cc w/attach:  
S. T. Bush, IG-301.1  
L. J. Jackson, EM-5.112  
L. A. Jessup, EM-5.112  
K. A. Ott, EM-3

## Attachment

Management Response  
 OIG Draft Audit Report  
*Respiratory Equipment Maintenance At The Hanford Site*

**Recommendation 1:**

“CHPRC establish procedures to store unmaintained or used respiratory equipment separately from fully maintained equipment.”

**Management Response (DOE concurs):**

RL concurs with this recommendation and has taken actions to further enhance the Hanford Site Respiratory Protection Program. For example, the OIG draft report states CHPRC did not always maintain respiratory protection equipment (RPE) in accordance with the Hanford Site Respiratory Protection Program and respiratory maintenance and care instructions. As part of its worker safety and health programs process improvement, CHPRC implemented RPETS for RPE in June 2015. In addition, the site-wide respiratory protection maintenance procedure was revised in 2019 to allow a respirator designated as “out of service” to be exempt from the maintenance schedule until returned to service. Numerous compensating controls have been implemented to ensure that respiratory units that are past maintenance deadlines are not issued to employees until the maintenance has been completed.

The draft report further states that unmaintained RPE increases the risk that workers could be exposed to dangerous substances because the unmaintained respirators may not function properly. Programmatic controls have been institutionalized in the form of employee training and built on a framework of procedures that regulate all steps of maintenance, preparation, issuance, and use of respiratory equipment. CHPRC has committed to taking a program enhancement action to ensure that this recommendation is fully addressed by December 31, 2020.

**Recommendation 2:**

“WRPS formally documents the process for when and how equipment is moved between issue stations and maintenance.”

**Management Response (DOE concurs):**

ORP concurs with this recommendation. Programmatic controls currently exist that have been institutionalized in the form of training for users and are built on a framework of procedures that regulate all steps of maintenance, preparation, issuance, and use of respiratory equipment. WRPS continues to incorporate additional compensating controls to ensure that respirators taken out of service, or placed in storage, are clearly identified as “out of service” in the contractor’s industrial hygiene database. WRPS has committed to taking action to ensure that this recommendation is fully addressed by December 31, 2020.

**Recommendation 3:**

Attachment

Management Response  
OIG Draft Audit Report  
*Respiratory Equipment Maintenance At The Hanford Site*

“Bechtel verifies that medical evaluation forms are fully completed and/or updated as appropriate.”

**Management Response (DOE concurs):**

ORP concurs with this recommendation and Bechtel National, Inc. (BNI) has taken corrective actions in 2019 to ensure medical evaluation questionnaires were complete and/or updated as appropriate. Furthermore, in March 2020, BNI conducted a surveillance with a 10 percent sample of medical evaluation questionnaires to verify corrective actions remain effective. In addition, BNI has a broader Occupational Medicine Self-Assessment planned for fiscal year 2020, focusing on respiratory protection medical records, and is committed to incorporating additional controls (where applicable) to fully address this recommendation by December 31, 2020.

## **FEEDBACK**

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Office of Inspector General (IG-12)  
Department of Energy  
Washington, DC 20585

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