



## Memorandum

**To:** Bradley Clawson, Hanford Special Exposure Cohort (SEC) Working Group Chair

**From:** Charles Nelson, DCAS Health Physicist

**Subject:** Information Requested during the April 2020 Working Group Meeting

**Date:** May 21, 2020

### Introduction

At a meeting of the Hanford Working Group on April 14, 2020, NIOSH was asked to provide additional information regarding its evaluation of Hanford Matrix Issue Number 7, as documented in the Board Review System. Matrix Issue Number 7 pertains to potential sources of uranium-233 intakes by Hanford prime contractor employees during 1984 through 1990, and the adequacy of Hanford's internal monitoring practices for uranium-233 in the event such sources existed.

The purpose of the April 14 Working Group meeting was to discuss the information presented in the white paper titled "Assessment of Certain Special Exposure Cohort-Related Issues for the Hanford Site." which was provided to the Working Group on January 7, 2020. It presented the results from NIOSH's assessment of several Special Exposure Cohort (SEC)-related issues for the Hanford site, based on the extensive site research actions accomplished since the approval of SEC petition SEC-00201 in 2012.

For Matrix Issue Number 7 (uranium-233), the determination presented in the white paper was "With respect to intake potential, no indications of any sources or usage of U-233 from 1984 through 1990 have been identified to date."

In its review of the NIOSH determination for Hanford SEC Issue Number 7, the Advisory Board contractor agreed NIOSH had performed a broad review of pertinent records. However, it found the response given in the white paper to be general with respect to two potential sources of uranium-233 intakes it had previously identified. Specifically, the Board contractor asked if NIOSH had addressed the possibility of intakes of purified uranium-233 associated with the following.

1. Scrap solutions of uranium-233 in the Plutonium Finishing Plant (PFP).
2. Possible use in experimental work within the 300 Area.

This memorandum provides additional information regarding these two potential sources of uranium-233 intakes by Hanford prime contractor employees during calendar year 1984 through calendar year 1990.

### **Uranium-233 scrap solutions within the PFP**

In its April 2013 update to the Working Group, the Board contractor stated that during an onsite records review the week of March 18, 2013, a document was identified that indicated a scrap solution of uranium-233 was being stored at the PFP as of 1991. The material was being stored awaiting disposition from DOE [SRDB Ref. ID: 178508 page 5].

Given its remote location and physical security infrastructure, the storage vaults at the PFP were used to store numerous items containing accountable materials for other organizations, within Hanford and elsewhere. Those items were not associated with PFP's operations. They were merely stored at the PFP for safeguards and security purposes. The uranium-233 scrap solution identified in the April 2013 memo from the Board contractor is an example of these types of items.

The site research actions accomplished at Hanford from 2012 forward included the physical review of large volumes of material control and accountability records. Records for the Hanford 200 Area, which included the PFP and its associated facilities, comprised a significant portion of these documents. Storage of items containing uranium-233 in the PFP vaults was noted during these reviews, but in no case was any routine transfer observed that would indicate operational use. The uranium-233 inventories for the material balance areas associated with the PFP were found to be static. Also, most of the uranium-233-containing items were mixtures of materials.

During an interview with a former manager of the PFP in June 2017, the individual was specifically asked about the operational use of uranium-233 in the PFP complex. The individual stated there were no routine operations involving uranium-233 at PFP. However, they did hold uranium-233 in their materials inventory in solution and oxide forms [SRDB Ref. ID: 168556 page 4]. This was consistent with what was observed in the material control and accountability records.

In another interview with a former material control and accountability officer for the 200 Area, the individual stated he or she did not recall any uranium-233 at Hanford during 1984 through 1990 other than items stored in the vaults at the PFP [SRDB Ref. ID: 168557 page 4].

In summary, the reviews of material control and accountability data and interviews with cognizant staff led to a consistent determination that there was no use of uranium-233 within the PFP complex (or elsewhere within the 200 Area) during 1984 through 1990. The vaults at the PFP were used to store items containing uranium-233 for safeguards and security purposes, but these were static inventories that did not pose any intake potential to workers. The uranium-233 scrap solution noted during the March 2013 site visit is an example of such items.

### **Possible experimental use of uranium-233 in 300 Area**

In its April 2013 update to the Working Group, the Board contractor stated that experimental work with U-233 was being conducted within the 308 Building as of 1982, but no documentation had been found indicating processing or research with uranium-233 during 1984 through 1990 [SRDB Ref. ID: 178508 page 6].

The statement regarding the use of uranium-233 in experimental work within the 308 Building originated from a historical review of that facility published in 1982. Specifically, it stated PNL performed research into radiation effects on ceramic materials in specific laboratories (Rooms 208, 212, and 220) located on the second floor. The document identified plutonium-239, uranium-235, uranium-233, americium-241, and curium-244 as radionuclides involved in these studies [SRDB Ref. ID: 105859 page 10].

An inspection performed by the Uranium Process Licensing Section of the U.S. Nuclear Regulatory Commission (NRC) in November of 1979 identified Rooms 208 and 212 of the 308 Building as being used by “Battelle” (PNL) for waste disposal studies involving ceramic materials. The inspection report also noted that PNL used X-ray diffraction equipment belonging to Westinghouse in Building 308 Room 220. The NRC did not identify any other rooms or labs within the 308 Building as being used by PNL. The inspection report stated no experiments were in progress (in Rooms 208 and 212) at the time of their visit, which was November 26, 1979 [SRDB Ref. ID: 101635 page 3]. A PNL Radiation Work Procedure (RWP) from October 1983 also identifies Building 308 Rooms 208, 212, and 220 as being associated with Ceramics Research, and Ceramics and Polymers Development [SRDB Ref. ID: 174223 page 129].

Several RWPs were noted that addressed the irradiation of solid samples by the PNL Ceramics Research group using external sources [see SRDB Ref. IDs 174222 page 36, 174223 page 131, or 174224 page 109]. It appears, therefore, that the radiation effects research mentioned in the 1982 history document for the 308 Building was performed using sealed sources that were external to the ceramic materials of interest. It also appears this was bench-scale research and not a large program.

Reviews of material accountability records from 1984 through 1990 did not identify any operations involving uranium-233 within the 300 Area (or elsewhere) at Hanford. In a June 2017 interview with PNL radiation staff, the individuals stated they had no recollection of any work involving uranium-233 [SRDB Ref. ID: 168555 page 4].

As discussed in the white paper, operations in the 308 Building were performed in gloveboxes in what was described as a well-controlled environment that included daily surveys and various types of air monitoring. It seems unlikely that a radiological incident would have gone unrecognized; especially given that 308 Building was considered an alpha facility. Procedures were in place for responding to incidents, including sending individuals for in-vivo bioassay, as needed.

Workers in the 308 Building received routine bioassays including whole-body and chest counting. The presence of transuranic materials in the 308 Building would have meant a rigorous internal monitoring and workplace surveillance program. Appropriate bioassay measures (both in vivo and in vitro) were available in the event of an incident involving uranium-233, and any otherwise, unknown intake would have been apparent in the routine chest count.

To summarize, it appears the 1982 reference to uranium-233 usage in the 308 Building was referring to work involving sealed sources and not dispersible forms of radioactive materials. Site research, including personnel interviews and reviews of material control and accountability records, did not identify any operational use of uranium-233 within the Hanford 300 Area during 1984 through 1990.