NIOSH Responses to SC&A Review of the Idaho National Laboratory Burial Ground 1952-1970 (SEC00219)

Mitch Findley

ORAU Team Senior Health Physicist

INL/ANL-W Work Group Meeting

July 16, 2020

Overview

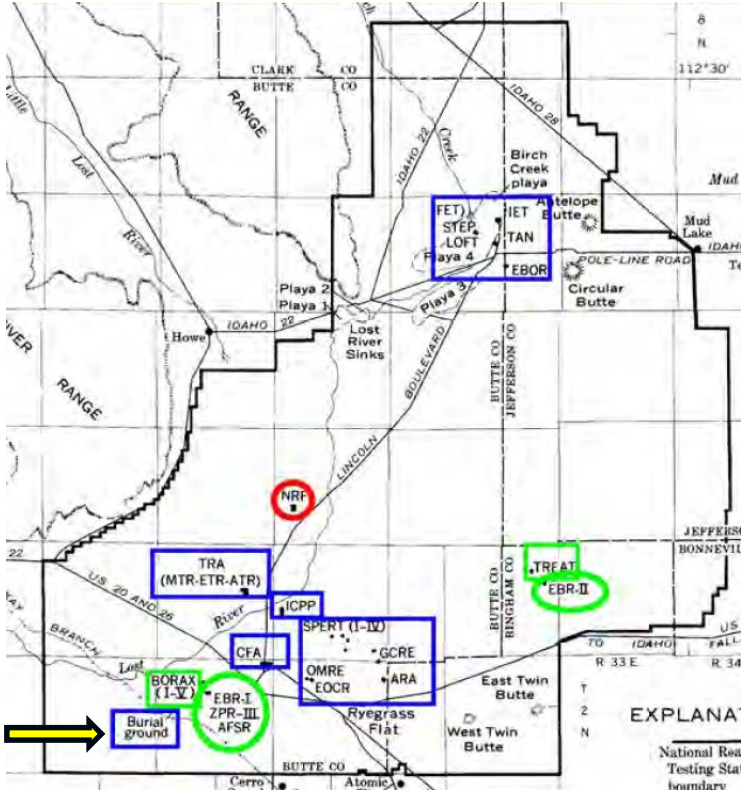
I. Review of the INL Burial Ground 1952-1970

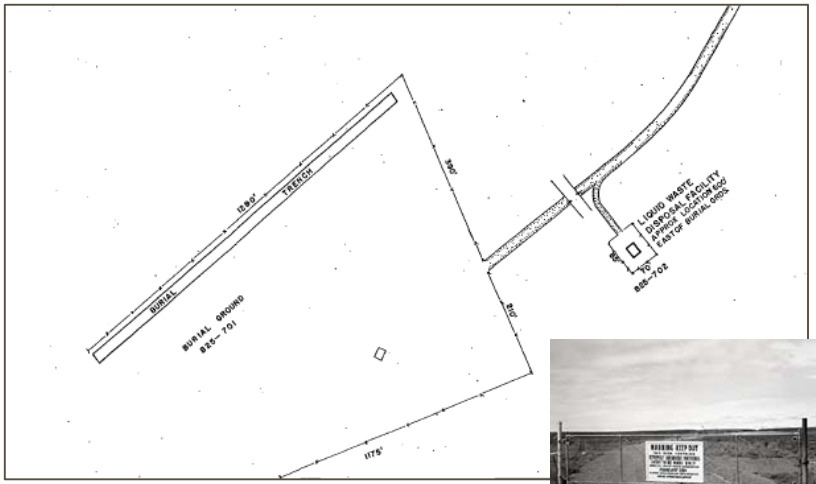
II. Review of the SEC-00219 Evaluation Report Conclusion on the INL Burial Ground
   - Radiological operations: July 3, 1952 through December 31, 1970

III. NIOSH Responses to the SC&A Review of the INL Burial Ground 1952-1970

I. Review of the INL Burial Ground 1952-1970

INL Burial Ground





1955 (photo insert 1961)

1970

Important Events at INL Burial Ground During 1952-1970

- July 3, 1952: First waste trench opened for disposal of INL MFP waste
- April 22, 1954: First shipment of TRU waste from Rocky Flats Plant
  - From November 1963 through late 1969 waste was dumped not stacked
- May 1960 – August 1963: Designated burial site for other AEC sites and non-AEC waste generators
- February 1962: “Chinook” flood event
- January 1969: Second flood event

Important Events at INL Burial Ground During 1952-1970 cont'd

- November 1969: First waste retrieval for specific RFP waste drum
- March 1970: AEC policy requiring solid TRU waste to be segregated from non-TRU waste resulting in construction of TSA-1 pad
- November 1970: First waste stored on TSA-1 pad

SRDB Ref ID 151677, p. 5

II. Review of the SEC-00219 Conclusion on the INL Burial Ground 1952-1970

SEC-00219 Petition for Idaho National Laboratory

- 83.13 (Form B) Petition received July 8, 2014
  - (F.1) Basis: *No personal knowledge of internal monitoring for plutonium, neptunium or fission products. For 1949-1970.*

- Petition qualified for review on September 16, 2014
  - Class under Review: *All employees who worked in any area of the Idaho National Laboratory from January 1, 1949 through December 31, 1970.*

External Monitoring

- All workers in INL's radiological areas, including the Burial Ground, were monitored for external radiation exposure. Dosimeters were required for entry into any fenced area at INL.

- DOE provides worker dosimeter data to NIOSH for dose reconstructions, the external doses for monitored workers can be reconstructed using the guidance in ORAUT-TKBS-0007-6, Rev. 3, *Idaho National Laboratory and Argonne National Laboratory-West - Occupational External Dose*

Internal Monitoring

- NIOSH will assess missed Sr-90 and/or Cs-137 intakes in accordance with ORAUT-OTIB-0054 and ORAUT-OTIB-0060.

- The potential intakes of other radionuclides when mixed fission products were present (as indicated by data in personnel records) can be estimated on a case-by-case basis using the approach described in ORAUT-TKBS-0007-5 Rev. 3, *Idaho National Laboratory and Argonne National Laboratory-West - Occupational Internal Dose.*

Conclusions

Table 7-15: Feasibility Summary for the Burial Ground (1952-1970)

Exposure Source	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
Mixed Fission Products	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	C	C	C	C
Actinides with MFP Present	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	C	C	C	C
Neptunium without MPF Present	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Plutonium without MFP Present	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Uranium without MFP Present	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Other Radionuclides	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	C	C	C	C
External Photon and Electron	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
External Neutron	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

F = Dose reconstructions are feasible.
C = Dose reconstructions are feasible but a mixed fission product co-worker model is needed.
R = Reserved for further evaluation.

SRDB Ref ID 166679, p. 233

III. NIOSH Responses to the SC&A Review of the INL Burial Ground 1952-1970

SEC00219 ER Position #1

The Burial Ground's internal dose monitoring program was based on a strict contamination control program with entry and exit monitoring. With the exception of Rocky Flats waste, mixed fission products were considered the controlling radionuclides. When workplace indicators indicated that an intake may have occurred, "special" (non-routine) bioassay would be requested by the area Health Physics staff. (SEC00219 ER Rev. 2, p. 232)

Position #1: Broken Out Into Three Separate Preliminary Findings by SC&A

- Position 1(a): The Burial Ground's internal dose monitoring program was based on a strict contamination control program with entry and exit monitoring.

- Position 1(b): With the exception of Rocky Flats waste, mixed fission products were considered the controlling radionuclides.

- Position 1(c): When workplace indicators indicated that an intake may have occurred, "special" (non-routine) bioassay would be requested by the area Health Physics staff.

Preliminary Finding 1(a)

- The Burial Ground's internal dose monitoring program was based on a strict contamination control program with entry and exit monitoring.

SC&A: It is questionable whether a "strict" contamination control program existed at the Burial Ground, given the weight of evidence indicating a haphazard and inconsistent approach to limiting contamination when dumping TRU-containing waste drums, inadequate health physics monitoring instrumentation, and little evidence of contamination-driven bioassay.

Preliminary Finding 1(a) Response – Not Haphazard (slide 1 of 3)

- NIOSH Response

Attached are the pertinent sections of the new contract between Phillips Petroleum Company and IDO for operation of certain site facilities. Included in these facilities is the NRTS Burial Ground. You will note that no distinction is made between our responsibility for this facility and others which we have operated for some time.

Because of this addition, it is necessary that we proceed immediately to control the Burial Ground as if (and we do) we had full responsibility for its proper operation and the safety of personnel working therein. Standard practices should be prepared and collected in a manual. Control of access will be a necessity. Complete records of all material dumped in the Burial Ground will need to be maintained whether the dumping is done by Phillips or other site contractors. I can only assume that we will be responsible to maintain complete records and make monthly reports to IDO based on these records.

I suggest you consult with the IDO personnel who have in the past maintained control of the Burial Ground and determine what records they have maintained and what reports they are going to require so that we can be sure we are able to meet whatever demands they place upon us. Among other responsibilities, I foresee that we will be required to foresee needs for excavation and backfill. Weather problems will have to be considered and thus six to eight months foresight will need to be maintained.

October 17, 1961 Memo on Burial Ground Operation Expectations (SRDB Ref ID 138196, p. 103)

Preliminary Finding 1(a) Response (slide 2 of 3)

NIOSH Response

- Monitoring practices at other INL facilities and an evaluation of the Burial Ground in the 1970s demonstrated that radiological monitoring was based on the exposure potential of workers.
- Safe work permits, shipping records, multiple radiation/contamination surveys used.
- Documentation indicates even small quantities of contamination were not tolerated.
- NIOSH has procedures on waste burial from as early as 1955.

Preliminary Finding 1(a) Response (slide 3 of 3)

NIOSH Response

- Health Physicist in charge of radiological control and operation of Burial Ground.
- Logically, an operation that was entrusted to an organization specializing in radiological controls would make a priority of a strict contamination control program; otherwise, the operation of the Burial Ground would be adversely affected by radiation and contamination problems. There are no data to suggest that this was the case at the Burial Ground between 1952 and 1970.

Preliminary Finding 1(a) Response cont'd

NIOSH Response

- Small number of special bioassay supports position that contamination control was strict and effective.
- Burial Ground workers are difficult to identify as it was not a true "facility" due to limited use, few workers, and no buildings.
- Determined during 83.14 determination review of Burial Ground that waste drums had poly liners even if drum tops came off.

1969 Waste Drum Dumping
(SRDB Ref ID 142133, p. 7)

Preliminary Finding 1(b)

- With the exception of Rocky Flats waste, mixed fission products were considered the controlling radionuclides.

SC&A: It is not clear whether a suitable source term can be derived for what radionuclides workers may have been exposed to during specific waste shipments, and whether such exposures can be bounded by existing NIOSH methods that may rely on assumed radioactive constituency inventories for multiple shipments over longer periods of time.

Preliminary Finding 1(b) Response

NIOSH Response

- Waste shipments were surveyed by the originating site with subsequent “receipt” surveys at CFA prior to shipment to the Burial Ground.
- Radiological data was available from information on the required forms for each waste disposal.
- If non-routine radiological conditions arose, INL would perform special monitoring to determine 1. the radionuclides involved and would 2. request special bioassay, if deemed necessary.
- Co-exposure models being developed for INL.

Preliminary Finding 1(b) Response cont'd

NIOSH Response

- NIOSH proposes to use the bioassay data from the 18 workers who participated in the exhumation work in the 1970s to provide a bounding estimate for actinide internal doses to Burial Ground workers during the burial period (1952–1970).

- The 18 workers were full-time workers at the Burial Ground performing the most hazardous radiological work ever attempted up to that point in the facility's history.

Preliminary Finding 1(c)

- When workplace indicators indicated that an intake may have occurred, “special” (non-routine) bioassay would be requested by the area Health Physics staff.

SC&A: While special or event-driven bioassays may have been the practice at INL at the time, there is no evidence (i.e., actual results traceable to exposure at the Burial Ground) that this practice was implemented at the Burial Ground, despite repeated instances where potential contamination was released during dumping operations. The infrequent use and unreliability of available alpha monitoring instruments and apparent lack of a suitable smear-counting capability at the Burial Ground, at least in the period immediately before 1972, would have removed or severely impaired “workplace indicators” for indicating a potential intake and the need for a “special” bioassay.

Preliminary Finding 1(c) Response

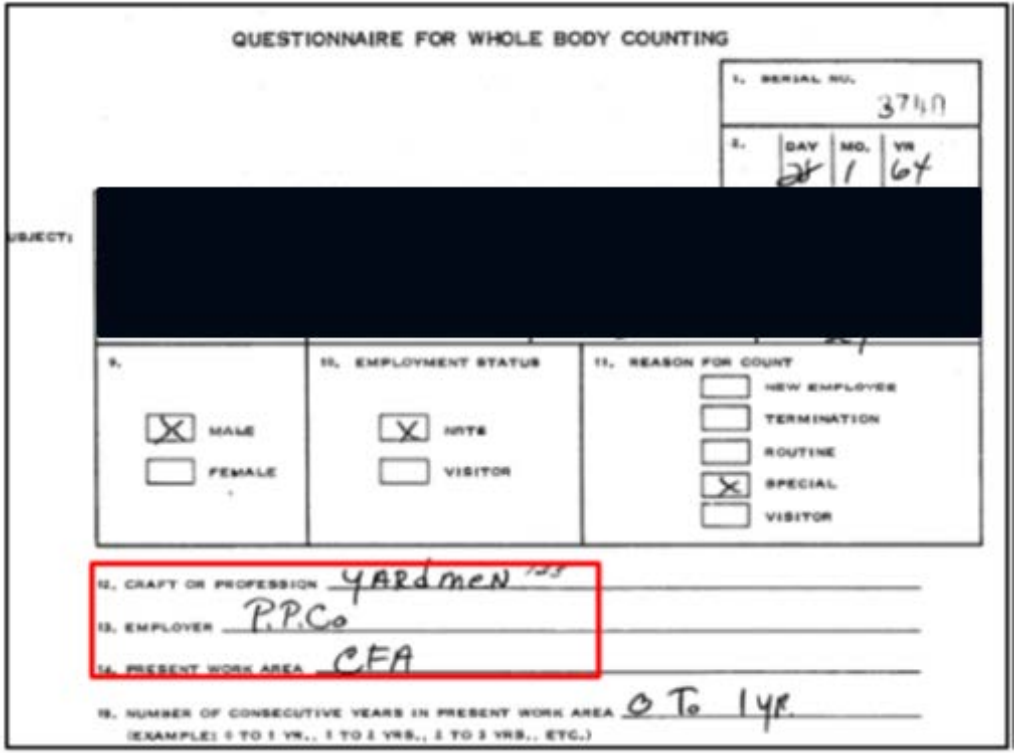
NIOSH Response

- Because the Burial Ground prior to the mid-1970s was not considered an area, but was operated by workers primarily from CFA, the ability to definitively tie a special bioassay with the Burial Ground is difficult. However, names of Burial Ground workers were compiled during review of HP logs, SWPs, and other documentation.
- Little evidence of contamination events at the Burial Ground in the available CFA HP monthly reports. NIOSH has 58% of monthly reports for 1952-1970 time period.
- If contamination events had been commonplace due to mass dumping, it is highly unlikely that the practice would have persisted over an almost 7-year period and special bioassay would have been commonplace.

Preliminary Finding 1(c) Response cont'd

NIOSH Response

- Special bioassay for known Burial Ground occupations titles like "yardmen" and "laborer" are available.
- Multiple examples provided in response paper.
- Isotopic identification of contaminant performed at Health Services Laboratory (later RESL) in CFA.


QUESTIONNAIRE FOR WHOLE BODY COUNTING

1. SERIAL NO. 3740

2. DAY 24 MO. 1 YR. 64

SUBJECT: [redacted]

9. [X] MALE [ ] FEMALE

10. EMPLOYMENT STATUS [X] MITE [ ] VISITOR

11. REASON FOR COUNT [ ] NEW EMPLOYEE [ ] TERMINATION [ ] ROUTINE [X] SPECIAL [ ] VISITOR

12. CRAFT OR PROFESSION YARDMEN

13. EMPLOYER P.P.Co

14. PRESENT WORK AREA CFA

15. NUMBER OF CONSECUTIVE YEARS IN PRESENT WORK AREA 0 To 14yr

(EXAMPLE: 6 TO 1 YR., 1 TO 2 YRS., 2 TO 3 YRS., ETC.)

Questionnaire for special whole body count Indicating "yardmen" and CFA

Preliminary Finding 2

- NIOSH has determined that internal exposures at the Burial Ground were directly related to the materials being disposed of in the grounds. Up to the point in time that drum retrieval commenced in 1969, exposure potential was virtually all from mixed fission products in the INL waste being buried, and plutonium for the Rocky Flats Plant waste that was received for disposal. Internal monitoring data are available for the workers who supported the waste disposal activities and drum retrieval activity in 1969. (SEC00219 ER Rev 2, p. 5)

SC&A: While internal exposures at the Burial Ground were relatable to the material being disposed of, it is not demonstrable that potential dose can apportioned to MFP and plutonium given the source term uncertainties cited earlier coupled with issues surrounding the application of ORAUT-OTIB-0054 and ORAU-OTIB-0060 using indicator radionuclides such as Sr-90 and Cs-137.

Preliminary Finding 2 Response

NIOSH Response

- NIOSH proposes to use the bioassay data from the 18 workers that participated in the exhumation work in the 1970s. These workers were identified during the 83.14 determination performed after the SEC00219 ER. This bioassay data provides a bounding estimate for internal actinide doses to potential Burial Ground workers during the burial period (1952–1970).
- ORAUT-OTIB-0060 allows for the application of co-exposure data. A series of co-exposure models are being developed that can be applied to the Burial Ground 1952–1970.
- A response to SC&A concern over use of Cs-137 and Sr-90 as indicator radionuclides has yet to be developed.

Preliminary Finding 3

- The radiological monitoring program at the Burial Ground included the presence of a health physicist, safe work permits for all waste disposals, personnel surveys upon completion of work, air monitoring, and decontamination of vehicles at CPP if they were found to be contaminated…. This defense-in-depth approach was adequate to ensure that unmonitored intakes of plutonium did not occur [NIOSH, 2017a, PDF p. 236].

SC&A: Given this checkered radiological program history recounted above and in preceding sections, a programmatic basis alone is not sufficient to claim Burial Ground historic practices would have precluded any unmonitored plutonium uptake in the early years up to 1970. A "defense-in-depth" approach to radiological control was not evident at the Burial Ground.

Preliminary Finding 3 and Response

Other concerns stated by SC&A:

- AEC's concern over the conflicted role of health physicists at the Burial Ground.
- Lack of management support for the Burial Ground.
- Funding needed for contamination detection equipment.

NIOSH Response

- Most of these concerns listed above were due to changes which occurred at the Burial Ground in the 1969-1970 time period.

Preliminary Finding 3 Response

NIOSH Response

- There is no evidence to support the notion that the Burial Ground was reorganized due to poor radiological controls. Reorganization of the Burial Ground began in 1969 due to the following reasons:
  - The facility was transitioning away from simple low-risk burials to above-ground TRU storage, waste retrievals, and increased operations.
  - May 1969 RFP fire resulted in a dramatic increase in waste shipments Ground.
  - Another major flood affecting the Burial Ground occurred in 1969.
  - National Environmental Policy Act of 1969.
  - AEC wanted to develop long-range policies, standards, and criteria for management of AEC waste.

Preliminary Finding 3 Response cont'd

NIOSH Response

- The SC&A conclusion that the Burial Ground was "considered a low priority by INL management" is simply not substantiated for the 1952–1970 time period.
- Burial operations were low-risk activities compared to other site activities and later waste retrieval activities.
- Evaluation of the 1970s when waste retrieval operations expanded demonstrated a sliding scale of radiological control based on exposure risk.

SC&A Preliminary Conclusion

The NIOSH ER concludes that worker exposures at the Burial Ground can be dose reconstructed for 1952–1970 on the basis of stringent contamination controls, a radiation control program for plutonium exemplifying a "defense-in-depth" approach, and available internal dose data for known radioactive waste source terms that lend themselves to standard dose reconstruction methods (e.g., ORAUT-OTIB-0054 [ORAUT 2014a] *and ORAUT-OTIB-0060* [ORAUT 2014b]*). SC&A finds all of these basic tenets fall short given a review of available SRDB documentation and an extensive series of former worker interviews.*

SC&A Preliminary Conclusion Response

NIOSH Response

- Review of all the available CFA monthly reports, available CFA HP logbooks, and available CFA HP log sheets did not show contamination events to be common at the Burial Ground.
- The characterization of a facility that was not given proper management attention and was fundamentally flawed in the monitoring of workers is not borne out by the available records.
- Most Burial Ground interviewees were favorable about radiological control practices and health physics monitoring at the Burial Ground.
- Several interviewees during 83.14 determination indicated the Burial Ground was actually a preferred area to work at INL.

NIOSH Dose Reconstruction Conclusions (slide 1 of 3)

- The additional research performed on the 1952–1970 time period at the Burial Ground and a review of the personnel monitoring practices in the 1970s found the following occupations commonly associated with Burial Ground work.

  - Laborer or Yardman
  - Driver or Truck Driver or Teamster
  - Equipment Operator
  - Heavy Equipment Operator
  - Health Physicist or Health Physics Technician or HP

NIOSH Dose Reconstruction Conclusions (slide 2 of 3)

- No routine bioassay program at the Burial Ground (later RWMC) until 1978. Special bioassay was prescribed as deemed necessary by Health Physics. Any bioassay data available for a claim will be used for dose reconstruction.

- Burial Ground workers from the 1952–1970 period would have dose contributions from MFPs using applicable co-exposure models being developed for INL workers and OTIB-0054 to determine the isotopic contributions.

NIOSH Dose Reconstruction Conclusions (slide 3 of 3)

- For actinide dose reconstruction, NIOSH proposes to use the bioassay data from the 18 workers that participated in the exhumation work in the 1970s to provide a bounding estimate for internal actinide doses to identified Burial Ground workers during 1952-1970.

- Revision to ORAUT-TKBS-0007-5, Rev. 3, *Idaho National Laboratory and Argonne National Laboratory-West - Occupational Internal Dose* technical basis document [ORAUT 2010b] will be made during the next revision to incorporate these changes.