

**Draft Waste Incidental to Reprocessing
Evaluation for Vitrified Low Activity Waste
Disposed onsite at Hanford (at the IDF)**

Comments by Marco Kaltofen, PhD., PE (civil, MA) on
behalf of Hanford Challenge & NRDC, 11/2020

Bumper sticker version of comments:

**The public radiation exposure targets
are attainable for this project if
cumulative risks, uncharacterized
waste streams and onsite intrusions
are limited.**

**Draft Waste Incidental to Reprocessing
Evaluation for Vitrified Low Activity Waste**

Marco Kaltofen, PhD., PE (civil, MA) 11/2020

The three criteria for determining that waste is incidental to reprocessing:

1. Key radionuclides must be removed to the maximum practical extent.
2. Managed to meet safety requirements comparable to objectives set out in 10 CFR 61 Subpart C;
3. The waste must be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55.

The project (disposing of WIR in the IDF), could fail to meet the three criteria due to:

Cumulative risks: There are other sources of radiation exposure from this same site that, along with the Draft WIR Proposal, can **drive total public risk to unacceptable levels.**

Currently uncharacterized waste streams to the IDF should be **prohibited or fully characterized** prior to project approval.

Early onsite intrusions likely result in unacceptable doses to both the intruders onsite, **and to the public offsite.**

Sources of uncertainty : Thing we don't know

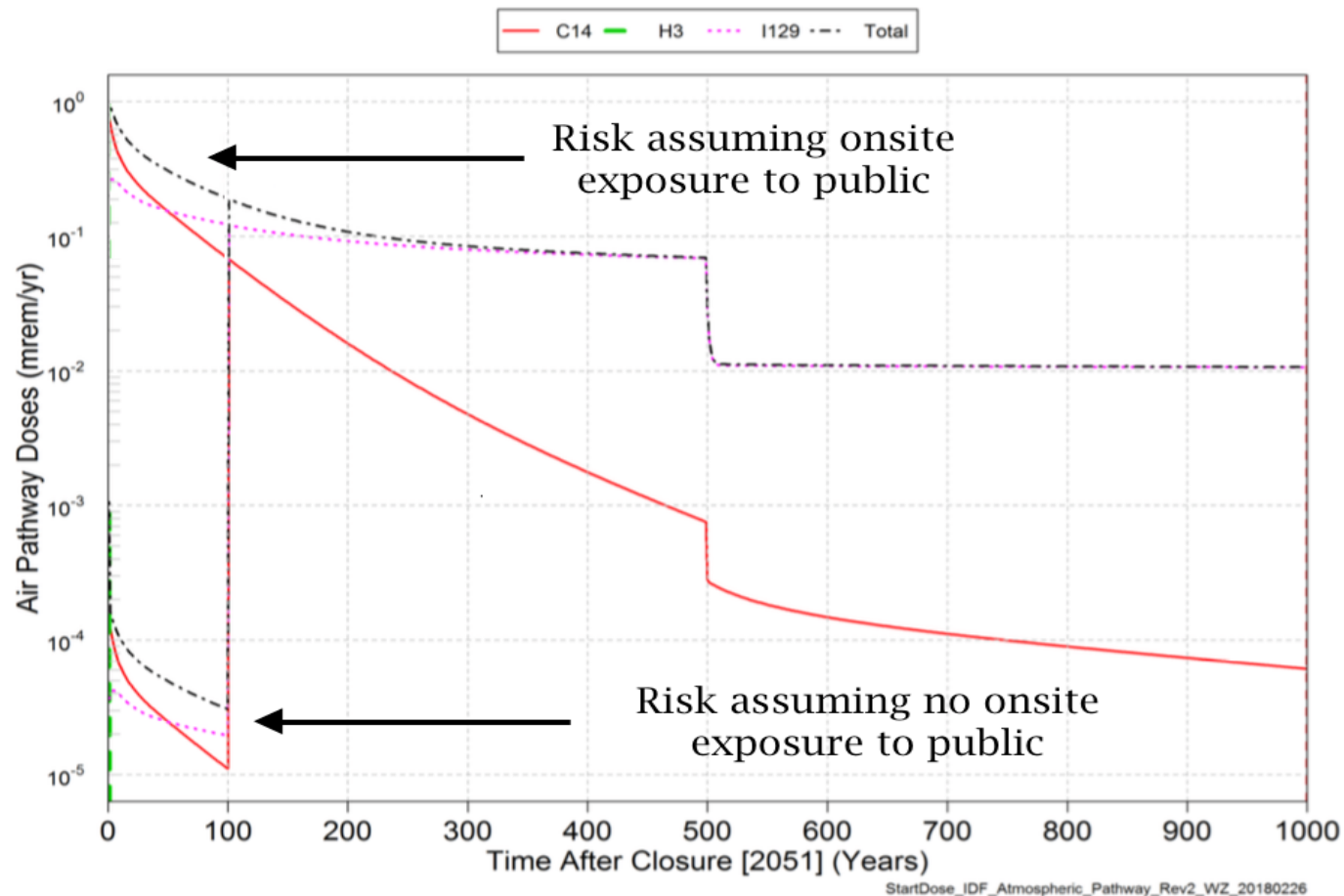
- a) The chemistry of leaking vitrified waste in the vadose zone
- b) The entire cumulative dose to members of the public offsite
- c) Isotopes in the uncharacterized 10% of IDF waste
- d) How to safeguard institutional controls for closure + 100 years
- e) Offsite public doses from early onsite intrusion

Institutional controls are supported by weak evidence and require engineered controls against intrusions.

Critical path to failure: Intrusions must limit doses to less than 500 mrem (short term) to intruders, but doses must simultaneously stay below 25 mrem (all pathways) or 10 mrem (air pathway) to members of the public.

Onsite intrusion in the first 100 years after IDF closure is the most like source of project failure (ref. 2019 IDF PA).

Figure 1-2. Atmospheric Pathway Dose During the 1,000-Year Compliance Period.



Recommendations

This project can meet the three acceptance criteria outlined in the Draft WIR, but only if critical uncertainties in the analysis are addressed. These are:

(R1) Public radiation exposure allowances must be prorated.

(R2) Prohibit uncharacterized waste streams.

(R3) The proposed project fails if public access to the IDF is not prevented for closure plus 100 years (or more).

Recommendation one

(R1) The public radiation exposure allowances should be prorated for this proposed project and reevaluated, as other projects already exert some measured or expected exposure to public receptors.

Recommendation one

The analyses of IDF performance compared to standards (Radon flux of $\text{pCi/m}^2/\text{s}$, all pathways 25 mrem/yr., air pathway 10 mrem/yr., intrusion 500 mrem, 100 mrem/yr. – acute, chronic) should include the contributions from other Hanford radiation sources to the same theoretical receptor.

Given that other sources already expose the same target population to net activity, the allowable limits must be reduced accordingly. All parallel exposures must be considered, and the remaining allowable dose should be apportioned to the IDF.

It is not acceptable under federal law (10 CFR 8.2) to yield the full maximum exposure limit to a single source if other net sources exist in parallel.

Recommendation two

(R2) Compliance with the three statutory criteria can't be assured without first prohibiting future waste streams outside the current proposal, and fully characterizing all remaining waste streams prior to project approval.

Again, the three criteria are: (1) High level wastes in Hanford's tank farms must be pretreated to remove key radionuclides, (2) vitrified, (3) disposed of onsite in the IDF following 10 CFR 61 Subpart C.

Recommendation three

(R3) The proposed project fails to meet the three criteria if public access to the IDF is not prevented for closure plus 100 years (or more).

The evidence provided for success of institutional controls against such intrusion failure is far short of what is required. The Project should not proceed without added engineering controls against early site intrusion at the IDF.

Recommendation three

The critical assumption is that no human activity will degrade the IDF barrier before closure + 100 years. This is conditional on three further assumptions relating to continued funding, site controls, and environmental policies and criteria that are subject to political alteration.

DOE should not rely on institutional controls to safeguard the integrity of the surface barrier. Instead, DOE should follow the example at Weldon Springs and build a robust engineered barrier that does not rely on guards, fences, or the institutional memory of a society that may or may not have moved on.

Early inadvertent intrusion due to changes in what are all political decisions, results in early failure and significantly increased maximum public doses from all pathways (air, groundwater and intrusion).

Draft Waste Incidental to Reprocessing Evaluation for Vitrified Low Activity Waste

Marco Kaltofen, PhD., PE (civil, MA) 11/2020



Recommendation three

Example of Engineering controls against onsite intrusion:

Weldon Springs, MO

Armored near-surface burial protects against intrusion and against exposure to onsite users in the first 100 years post-closure.

**Draft Waste Incidental to Reprocessing
Evaluation for Vitrified Low Activity Waste**

Marco Kaltofen, PhD., PE (civil, MA) 11/2020



Recommendation three

**Engineering controls
make this Missouri
nuclear waste disposal
site less sensitive to
failure from onsite
intrusion.**

Recommendation three

The evidentiary basis for institutional controls is weak and is conditional on three assumptions that have already been challenged in the existing administration:

- A) Continued funding of existing groundwater monitoring and remediation programs.

- B) Continued funding of existing site controls

- C) Maintenance of environmental policies and criteria for the next 132 years (32 years to IDF closure + 100 years) even though these are subject to political alteration.

Summary of Recommendations

(R1) The **public radiation exposure allowances should be prorated** for this proposed project and reevaluated, as other projects already exert some measured or expected exposure to public receptors.

(R2) Compliance with the statutory criteria to be met before any VLAW can be separated from the existing high level wastes in Hanford's tank farms, pretreated to remove key radionuclides, vitrified, then disposed of onsite in the IDF; can't be assured without first prohibiting future waste streams outside the current proposal, and **fully characterizing all remaining waste streams** prior to project approval.

(R3) The proposed project fails to meet the three criteria if public access to the IDF is not prevented for closure plus 100 years (or more). The evidence provided for success of institutional controls against such intrusion failure is far short of what is required. The Project should not proceed without **added engineering controls against early site intrusion** at the IDF.