Concerns with Hanford Solid Waste EIS

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DOE Evaluation Standards vs. Benchmark MCLs

The DOE HSW EIS is stated to be evaluated against an internal DOE Order 5400.5 "*Radiation Protection of the Public and Environment*" (instead of the regulatory limits).

The DOE HSW EIS evaluation benchmark for groundwater is 4 mrem per yr, whole body dose.

DOE Order 5400.5 states it is DOE policy to provide an equivalent level of protection corresponding to 40 CFR 141.16 (HSW EIS pg 6.14). 40 CFR 141.16 states drinking water shall not produce an annual dose equivalent to the total body or any <u>internal organ</u> greater than 4 millirem/yr.

The Benchmark MCLs (Maximum Contaminant Levels) are EPA regulatory limits (40 CFR Part 141) for toxicity or 4 mrem per year, whole body or internal organ dose, for radionuclides.

Comparison of Tc-99 and I-129 values derived from information on pg 5.291 of the HSW EIS:

<u>DOE HSW EIS Standards and EPA Regulatory Limits for Groundwater</u>

	Tc-99	I-129
DOE HSW EIS pCi/L for 4 mrem/yr whole body dose	3760	20
EPA MCL, pCi/L	900	1

Summation of Individual Disposal Actions – Composite Analysis

The HSW EIS presents a case for the Integrated Disposal Facility (IDF) preferred alternative meeting all evaluation standards.

The IDF preferred alternative presents MCL sum of fractions equal to 60 percent and a total groundwater drinking dose of 0.4 mrem/yr (10 percent of the DOE evaluation standard).

Individual disposal actions, when summed with other site contributors, exceeds EPA MCL limits.

> **Table 5.14, pg. 5.84 shows total Tc-99 and I-129 groundwater concentrations from solid wastes buried prior to 2008 (not including the IDF) at 100 meters down gradient from the disposal boundary. Table 5.14 shows 9.9 and 6.2 for the sums of MCL fractions for 200 East Area and 200 West Area, respectively. The calculated whole body doses are 2.6 and 1.6 mrem/yr for 200 East and 200 West areas, respectively.**
>
> **Section 5.14.3 Groundwater Pathway, pgs 5.289-5.191, discusses groundwater concentrations at 1-km from the disposal site obtained from the "Composite Analysis". The discussion presents Tc-99 and I-129 concentrations that result in 2.7 for the sum of MCL fractions and a whole body dose of 2.1 mrem/yr.**

Maximum groundwater concentrations at the boundary of the Columbia River are buried in Appendix G (Figure G.47, pg. G.218). Whole body doses presented in the body of the report are calculated after dilution by the Columbia River.

I-129 Inventory

I-129 Inventory, Curies					
	Reactor Production	Tanks	ILAW	Secondary Wastes	HLW
2001 ILAW PA	101	101	22[a]	79	-
2003 IDF Risk Assessment	101	101	22	7-9	79[b]
2002 Reactor Calculations	75[c]	45 (?)	-	-	-
2004 HSW EIS (?)	101 (?)	71-101 (?)	22	5	44-74 (?)

A - based on assumption of 25 percent of ILAW melter feed captured in glass, no reference or technical basis, *Tank Waste Remediation System Operational Utilization Plan*, HNF-SD-WM-SP-012, Rev 1, May 1999

B – values do not sum to 101 Ci.

C – HSW EIS page L.14.

Prior to 2001, it was assumed that the bulk of I-129 was volatilized by the melter and reported to secondary wastes.

Higher temperature melters (bulk vitrification) have greater volatilization of I-129, Tc-99, and other semi volatiles with lower retention in the glass.

System Mass Balance Modeling

Prediction of radionuclide and chemical pathways and ultimate disposal waste forms and locations is a product of a system mass balance for the total tank waste inventory to mission completion.

DOE and contractor communications to date have indicated that individual projects are being designed and built for a limited portion of the waste, a limited portion of the total tank waste treatment mission.

The designs of separate operations of the total system include transfer of secondary waste streams back into the system fabric.

Not all participants in the total system are aware of decisions to return waste streams that would affect integration of the total system and completion of mission (beyond the initial design basis).

The split of I-129 was set by an assumption of “black box” split in the HTWOS model. The assignment of a HTWOS split requires a detailed calculation of internal plant recycles and volatility factors in a separate vitrification facility flowsheet model using the ASPEN code.

The path of Tc-99 and I-129 will follow sulfate that is volatilized by melters. Modeling of sulfate in the system in necessary to understand where the Tc-99 and I-129 will go and be disposed of.

If sulfate is disposed of in a grouted waste form (not vitrified), significant quantities of Tc-99 and I-129 will also be disposed of in a grouted waste form and not vitrified with significant increases in groundwater concentrations of Tc-99 and I-129.

In March 2004, DOE made a commitment to the HAB tank waste committee to provide a system mass balance.

Secondary Waste Form Performance Assumptions

The HSW EIS assumes a cement waste form for secondary wastes.

The cement waste form assumes a diffusion coefficient of 1×10^{-11} and 1×10^{-12} cm^2 s^{-1} for Tc-99 and I-129, respectively. For some radionuclides (for which no specific values were available), the diffusion coefficient was fixed at a reasonable conservatively high default value (5×10^{-8} cm^2 s^{-1}). Page G.18, HSW EIS.

The tank waste treatment system will produce a secondary waste from the Effluent Treatment Facility. The secondary waste is a soluble salt concentrate produced by reverse osmosis treatment of waste water, scrubber solutions, and process condensates.

A cemented salt waste may produce a waste form similar to the high salt grout form produced by direct grouting of ILAW.

The 2003 ILAW PA (DOE/ORP-2000-19, Rev. 3, pg. 30) indicated that "cast stone" (grout) waste form was approximately four times poorer performing than a "cemented" secondary waste form (predominately I-129).

Non-conservative Analysis

The specific IDF location has a factor of four difference in groundwater impact. The preferred location near PUREX has a high groundwater velocity resulting in dilution greater than other locations. Table 5.15, pg. 5.86, HSW EIS.

The specific IDF location has an impact at the 100 m point of compliance. There may not be much performance difference at the 1-km line or the Columbia River.

The inventory of I-129 and Tc-99 in grouted secondary waste may be a factor of 5 to 10 times higher than the assumed values (even including the potential reduced reactor production basis).

The grouted secondary waste form may perform a factor of four poorer than the assumed high performance cement waste form.

The total impact on ground water may be up to 4 x (5 to 10) x 4 or a total of 80 to 160 times worst than the presented values.

Potential increases of 10 to 100 times the impact and compared to DOE Order 5400.5 required 4 mrem/yr organ dose (40 CFR 141.16, a factor of 20 lower comparison value for I-129 than used in the HSW EIS) may result in non-compliance.

There is no facility for grouting the ETF secondary waste nor is there a proposed project to design and build a secondary waste grouting facility.