Section IV. INL Cleanup Plans

A. How Clean is Clean

Conscientious environmental restoration of the INL site where massive quantities of radioactive and chemical wastes have been recklessly dumped will not occur unless clear quantitative environmental standards are established. "How clean is clean." The Environmental Protection Agency's (EPA) last promulgated ruling on maximum concentrations limits (MCL)for radionuclides in drinking water was issued in the Federal Register (28404) July 9, 1976. The agency also issued National Interim Primary Drinking Water Regulations (EPA-570/9-76-003) that went into effect in June 24,1977. EPA tried to promulgate new standards for high level and Transuranic radioactive wastes in 1985 that offered inadequate protection of human health. These standards were challenged by the Natural Resources Defense Council and were overturned by the First District Court of Appeals in 1987. See Section IV.A.1 for details.

In 1991, EPA announced National Primary Drinking Water Regulations; Radionuclides; Proposed Rule, published in the Federal Register, July 18, 1991. As of this writing, EPA has yet to promulgate these new standards. The table below titled EPA Drinking Water Standards- Current and Proposed compares the two standards. EPA has issued grossly less stringent standards promulgated shown in Appendix E. See Section IX Appendix E for a complete listing of both the current rules and current Primary Drinking Water Standards (again grossly inadequate).

EPA Drinking Water Standards - Current and Proposed [EPA-570/9-76-003] [FR-7/18/91-Part-II]

Nuclide	Symbol	EPA 1976 Standard pCi/L	EPA Proposed Standard pCi/L
Beryllium-7	Be	6,000	43,500
Carbon-14	C	2,000	3,200
Sodium-22	Na	400	466
Phosphorus-32	P	30	641
Sulfur-35	S	500	12,900
Chlorine-36	Cl	700	1,850
Calcium-45	Ca	10	1,730
Calcium-47	Ca	80	846
Scandium-46	Sc	1,000	863
Scandium-47	Sc	300	2,440
Scandium-48	Sc	80	766
Vanadium-48	V	90	644
Chromium-51	Cr	6,000	38,400
Manganese-52	Mn	90	733
Manganese-54	Mn	300	2,010
Iron-55	Fe	2,000	9,250
Iron-59	Fe	200	844
Cobalt-57	Co	1,000	4,870
Cobalt-58	Co	9,000	1,590
Cobalt-60	Co	100	218.00

Nickel-59	Ni	300	27,000
Nickel-63	Ni	50	9,910
Zink-65	Zn	300	396
Germanium-71	Ge	6,000	436,000
Arsenic-73	As	1,000	7,850
Arsenic-74	As	100	1,410
Arsenic-76	As	60	1,060
Arsenic-77	As	200	4,330
Selenium-75	Se	900	574
Bromine-82	Br	100	3,150
Rubidium-86	Rb	600	485
Rubidium-87	Rb	300	501
Strontium-85	Sr	21,000	2,830
Strontium-89	Sr	20	599
Strontium-90	**Sr**	**8**	**42**
Yttrium-90	Y	60	510
Yttrium-91	Y	90	576
Zirconium-93	Zr	2,000	5,090
Zirconium-95	Zr	200	1,460
Niobium-93	Nb	1,000	10,500
Niobium-95	Nb	300	1,250
Molybdenum-99	Mo	600	1,830
Technetium-96	Tc	300	2,050
Technetium-97m	Tc	1,000	4,450
Technetium-97	Tc	6,000	32,500
Technetium-99	Tc	900	3,790
Ruthenium-97	Ru	1,000	7,960
Ruthenium-103	Ru	200	1,810
Ruthenium-106	Ru	30	203
Ruthenium-105	Ru	300	3,720
Palladium-103	Pd	900	6,940
Palladium-109	Pd	300	2,120
Silver-105	Ag	300	2,700
Silver-110	Ag	90	512
Silver-111	Ag	100	1,080
Cadmium-109	Cd	600	227
Cadmium-115m	Cd	90	339

Cadmium-115	Cd	90	958
Indium-115	In	300	35.1
Tin-113	Sn	300	1,740
Tin-125	Sn	60	446
Antimony-122	Sb	90	810
Antimony-124	Sb	60	563
Antimony-125	Sb	300	1,940
Tellurium-125m	Te	600	1,490
Tellurium-127m	Te	200	663
Tellurium-127	Te	900	7,920
Tellurium-129m	Te	90	524
Tellurium-129	Te	2,000	27,200
Tellurium-131m	Te	200	971
Tellurium-132	Te	90	580
Iodine-126	I	3	81
Iodine-129	I	1	21
Iodine-131	I	3	108
Cesium-131	Cs	20,000	22,800
Cesium-134	Cs	20,000	81.3
Cesium-135	Cs	900	794
Cesium-137	**Cs**	**200**	**119**
Barium-131	Ba	600	2,950
Barium-140	Ba	90	582
Lanthanum-140	La	60	652
Cerium-141	Ce	300	1,890
Cerium-143	Ce	100	1,210
Praseodymium-143	Pr	100	1,170
Promethium-149	Pm	100	1,380
Samarium-151	Sm	1,000	14,100
Samarium-153	Sm	200	1,830
Emporium-152	Eu	60	814.00
Emporium-154	Eu	200	573.00
Emporium-155	Eu	600	3,590.00
Gadolinium-153	Gd	600	4,680
Terbium-160	Tb	100	815
Dysprosium-166	Dy	100	830
Holmium-166	Ho	90	981

Erbium-169	Er	300	3,640
Thulium-170	Tm	100	1,030
Thulium-171	Tm	1,000	12,700
Ytterbium-175	Yb	300	3,110
Lutetium-177	Lu	300	2,550
Hafnium-181	Hf	200	1,170
Tantalum-182	Ta	100	842
Wolfram-181	W	1,000	19,000
Wolfram-185	W	300	3,440
Rhenium-183	Re	2,000	5,400
Rhenium-186	Re	300	1,880
Rhenium-187	Re	9,000	520,000
Osmium-185	Os	200	2,460
Osmium-191	Os	600	2,380
Osmium-193	Os	200	1,690
Iridium-190	Ir	600	1,010
Iridium-192	Ir	100	957
Platinum-191	Pt	300	3,810
Platinum-193m	Pt	3,000	3,020
Platinum-193	Pt	3,000	46,100
Platinum-197	Pt	300	3,400
Gold-196	Au	600	3,660
Gold-198	Au	100	1,310
Thallium-204	Ti	300	1,680
Lead-203	Pb	1,000	5,060
Bismuth-206	Bi	100	656
Bismuth-207	Bi	200	1,010
Radium-226/228	Ra	5	15.7
Protactinium-233	Pa	300	1,510
Gross Alpha		15	15
Tritium		**20,000**	**60,900.00**

EPA's current Primary Drinking Water Standards maximum contaminate level (MCL) have been reduced to only six listed below in Table A. 40 CFR §141.66 Maximum Contaminant Levels for radionuclides states the following:

"(2) Except for the radionuclides listed in table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liter per day drinking water intake using the 168 hour data list in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in

Water for Occupational Exposure," NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce. *http://www.archives.gov/federal register/code of federal regulations/ibr locations.htm*

EDI's online attempt to access the above link found it nonfunctional or "Page Not Found" and a hours of search Dept. of Commerce for National Bureau of Standards Handbook 69 found nothing.

"l. **If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.**

"Table A—Average Annual Concentrations Assumed To Produce: a Total Body or Organ Dose of 4 mrem/yr maximum contaminate level (MCL) Regulated Contaminants (Radionuclides Rule 66 FR 76708 December 7, 2000 Vol. 65, No. 236)

1. Radionuclide	Critical organ	pCi per liter ug/L
2. Tritium	Total body	20,000 pCi/l
3. Strontium-90	Bone Marrow	8 pCi/l
4. Combined Radium-226 and 228		5 pCi/l
5. Gross Alpha particle activity (excluding radon and uranium)		15 pCi/l
6. Beta particle and photon radioactivity		30 µg/L
Beta/photon emitters* 4 mrem/yr		4 mrem/yr
7. Uranium		30 µg/L

"(e) ***MCL for uranium***. The maximum contaminant level for uranium is **30 µg/L**

"(b) ***MCL for combined radium-226 and -228***. The maximum contaminant level for combined radium-226 and radium-228 is **5 pCi/L**. The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

"(c) ***MCL for gross alpha particle activity (excluding radon and uranium).*** The maximum contaminant level for gross alpha particle activity (including radium-226 but excluding radon and uranium) is **15 pCi/L.**

"(d) ***MCL for beta particle and photon radioactivity.*** (1) The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year (mrem/year).

"(e) *MCL for uranium.* The maximum contaminant level for uranium is **30 µg/L**

"(2) **Except for the radionuclides listed in table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents** must be calculated on the basis of 2 liter per day drinking water intake using the 168 hour data list in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure," [1]

The current and proposed comparative table shows the obvious trend to raise the allowable limits of radionuclides in drinking water. Clearly, this an effort to change the standards to accommodate increases of radiation from DOE operations and commercial nuclear power plants. The 1976 regulations are based on whole body or critical organ dose limit of 4 mrem/year. Whereas the proposed 1991 regulations are based only on whole body effective dose equivalent of 4 mrem/yr without critical organ dose limit. Thus, any nuclides that were limited by their dose (4 mrem being the limit) to a critical organ (e.g. Sr-90 to bone) are now limited by that same (4 mrem) dose, but calculated on the effective whole-body equivalent basis, thus the allowable uptake of these nuclides go up. EPA rationale has been severely challenged to the extent that seven years later the agency has not promulgated the rule to avoid the anticipated litigation. This is an attempt by EPA to legitimize federally generated contaminates

[1] Title 40 CFR Part 141: Protection of Environment]
PART 141—NATIONAL PRIMARY DRINKING WATER REGULATIONS

dumped by a sister federal agency - DOE, that is the primary radioactive polluter. EPA's rule-making is in direct contradiction to the independent research which document the risks to exposure to low-level radiation, and the need to lower the allowable radioactive contaminates in the environment. And once again, it will be the public interest groups that must generate the resources to challenge these rules in court in order to protect the public health.

A Congressional Office of Technology Assessment report states that: "The existing Federal guidance for protection of the public against radiation is outdated, and the development of new guidance is uncertain." ... "It is uncertain when and whether EPA would revise their standards to reflect: 1.) recent findings by the National Research Council's Committee on Biological Effects of Ionizing Radiation (BEIR V report) that the risks of low-level ionizing radiation are two to three times more serious than it previously anticipated and 2.) the draft recommendation by the International Commission on Radiological Protection that the current radiation limit for workers be reduced by 60 percent." [OTA @ 41]

The Nuclear Regulatory Commission's definition of transuranic waste was also changed from 10 nano curies per gram to 100 nano curies per gram, which effectively wrote off large quantities of waste that must go to permanent repositories as opposed to going to low-level landfill dumps like the RWMC burial ground at INL.

The federal government continues to violate its obligation to clean up its environmental disasters by setting standards that will minimize cleanup costs - not maximize restoration. Risk minimization dictates that the establishment of environmental standards be guided by considerations of health effects on current and future residents. DOE must assume that currently sparsely populated areas will not remain so. Declaring large areas of land as "nuclear sacrifice zones" into perpetuity is unacceptable - if not grossly unconscionable.

The National Academy of Sciences (NAS) offered standards in "A Study of the Isolation System for Geologic Disposal of Radioactive Wastes." This study used risk-based approach for standards setting. The NAS panel recommended that there be a limit on the dose to the maximally exposed individual at <u>any</u> future time from wastes buried in a repository. The NSA's risk-based approach is the most sensible and scientifically supportable approach to standards. However, the 10 millirem limit NSA recommended is far too high. Recent epidemiological studies are revealing that exposures at that level can cause serious health effects. [IEER(c)] The May 1997 NRC standards are set at 25 millirem for unrestricted access and 500 millirem for restricted access. EPA advises for a 15 millirem/year limit for lifetime exposure that again based on independent studies is too high.

Congressional action on the Resource Conservation Recovery Act (RCRA) which is up for reauthorization, will have far reaching impact on INL cleanup. Currently, RCRA excludes radionuclides, in their pure form, from regulation based on Atomic Energy Act. However, if radionuclides are mixed with other RCRA listed hazardous materials, then the laws apply. DOE has for decades, hidden behind this exemption. Hopefully, Congress, now having to appropriate (between 2003 and 2020) ($10,995,412,000) to cleanup DOE's INL mess, will finally recognize that federal agencies must be held to the same standard as corporate America. Continuing the RCRA exemption will surely continue the past abuses and exacerbate the cleanup process. See table INL Cleanup Costs below.

The public must be involved and able to fully participate in developing clean-up standards. This issue must be specifically addressed and ample opportunity for public comment. The question of "How Clean is Clean" is a question that the public, not government agencies, must decide. Therefore, Congressional hearings are needed not only to address standards, but also the fundamental structural issues concerning the funding of cleanup programs under a permanent trust fund that would not be subject to annual Congressional and Administrative raids.

INL 2003 -2020 Cleanup Costs [2]

FY-Year	Including NRF/Regulatory Support $	Excluding NRF	Source
2003		484,709,000	FY-05 P.34
2004	567,310,000		FY-05 P.34
2005		534,600,000	FY-05 P.34
2006		538,083,000	FY-07 P.144
2007		519,604,000	FY-07 P.144
2008		522,838,000	FY-07 P.144
2009		489,239,000	FY-07 P.144
2010		469,168,000	FY-07 P.144
2011		412,000,000	FY-14 P.59
2012		389,800,000	FY-14 P.59
2013		355,766,000	FY-15 P.29
2014		393,593,000	FY-16 P.127
2015		404,929,000	FY-17 P. 121
2016		401,919,000	FY-17 P. 121
2017		370,088,000	FY-17 P. 121
2018	595,198,000		FY-20 P. 29
2019	638,805,000		FY-20 P. 29
2020	553,225,000		FY-20 P. 29
Totals	2,354,538,000	8,640,874,000	
Total 2003-2020		10,995,412,000	

As is true with "all-things-government," regulation is only as good as the political will of those in power to protect the general public's interest. The current struggle between federal agencies to generate nuclear site cleanup standards is a high stakes game because of the hundreds of billions of dollars required for cleanup and decommissioning. A strict standard that protects the public health will cost more than a lax standard that only protects the polluter. As the first commercial nuclear power plants end their design life and the utilities move toward decommissioning, the Nuclear Regulatory Commission (NRC) is determining "how clean is clean." Michael Mariette, Director of the Washington, DC based Nuclear Information and Research Service (NIRS) reported May 23, 1997 in his "Radiation Crisis Alert" the following:

> "The Nuclear Regulatory Commission's (NRC) FINAL Rulemaking in a process that began as ERORR (Enhanced Rulemaking on Residual Radioactivity-- and before that BRC) has a three part deal -- 25 millirem/year for unrestricted, and 100 or 500 millirem/year for 'restricted' license termination at nuclear sites. This new rule currently applies to civilian sites under NRC or state agreement agencies, (thousands of sites in the US) and may be applied to DOE sites, if prospective external regulation of DOE by NRC is approved. NRC's rule provides no special protection for groundwater, and indeed assumes that if public water supplies are available, that water contamination does not have to be factored as an exposure pathway, in some cases creating permanent sacrifice of water

[2] Department of Energy FY (for each year + PG.#) Congressional Budget Request Environmental Management, Volume 5 and;
DOE FY 2014 Congressional Budget Request Environmental Management, DOE/CF-0088, Volume 5 and;
Department of Energy FY 2015 Congressional Budget Request, DOE/CF-0100, Volume 5 and;
Department of Energy FY 2016 Congressional Budget Request DOE/CF-0111 Volume 5 and;
Environmental Management Department of Energy FY 2017 Congressional Budget Request DOE/CF-0123, Volume 5 and;
DOE FY 2020 Congressional Budget Page 28 of 129

resources."

"To qualify a site for unrestricted use, licensees must 'clean' contamination of the site to a level 'As Low as Reasonably Achievable' (ALARA) below a 25 mrem/yr dose to the average member of the 'critical group.' The 25 mrem/yr dose is in addition to the NRC's estimated background dose of 300 mrem/yr which, by itself, results (according to NRC) in a little more than one fatal cancer per hundred people. Unrestricted use includes farming, homes, day care centers and other uses--i.e. anything. Both dose and critical group are based on many assumptions made by NRC that may not represent actual radiation exposure that will result from activities on any given site. Again, using NRC calculations, the 25 mrem/yr incremental dose above background, over a lifetime will result in 1 fatal cancer for every 1144 people exposed. Not only are there thousands of sites, but much of the radiation will persist for decades, centuries, millennia. It is not possible to calculate the cumulative death toll."

"A dose of 25 mrem/yr for unrestricted sites is clearly inadequate to protect public health and safety even by EPA standards. EPA drafted a clean-up rule that would have limited the site dose to 15 mrem/year and would have enforced the Safe Drinking Water Act limit of 4 mrem/yr on ground water. EPA has tabled the rule for now after DOE announced it did not want this rule. EPA could still issue the rule, and has made a rare display of standing tough, by suggesting to NRC that EPA would declare sites released under the NRC rule to be Superfund sites, requiring a more stringent clean-up."

"NRC proposes even laxer standards for "restricted" sites. Although "restricted" sites will have higher contamination levels, NRC claims these sites can still be used for certain activities, as long as licensees "guarantee" no one at these sites receives more than a 25 mrem/yr dose. Exemptions may be granted by NRC, on licensee request based on factors such as prohibitive cleanup costs, and arguments that further clean-up may cause greater harm than the residual dose. The rule allows contamination levels that will cause doses of 100 mrem/year and as high as a 500 mrem/yr to those who use the site, if restrictions fail. The NRC claims exceptions will only be made in 'unusual circumstances,' such as perceived loss of institutional control of the contaminated site, sites that have contaminated soil, or SDMP sites. Since many site operations have resulted in contaminated soil, and SDMP (Site Decommissioning Management Plan) is composed of the current major nuclear license terminations, NRC's definition of 'unusual circumstances' verges on criminal."

"Licensee proof of compliance with the regulations required by the rule is not stringent and NRC has left many loopholes by using non-specific language and definitions. It appears that almost any site contaminated with radionuclides could apply for cleanup standards at the 500 mrem/yr level and be considered as long as it was 'restricted' use. 'Restricted' use could mean simply fencing in the area or planting obstructing bushes. This is clearly unacceptable since 500 mrem/yr over 'background' translates into a citizen cancer fatality of approximately 1 in every 57 people exposed to this radiation dose for a lifetime. Those are NRC numbers for the rate of cancer. Independent analysts have made findings that the rate could in fact be 10 times higher. Further, other health impacts that NRC's rule ignores altogether include non-fatal cancer, infertility, genetic and birth defects and lowered immunity. The rule does not account for Hot Spots, which could allow certain individuals to get a double dose of radiation (or more), while others receive none. Since the projected radiation doses are averaged, this effectively assumes the dose is spread evenly among all individuals in the critical group, while in reality, those receiving the largest doses (and the higher risk), are effectively ignored and unprotected."

"This devastating departure from the NRC's mandate to protect the public health and safety is one more piece in a long history of placing industry economic interests ahead of citizen health and citizen's economic interests, not to mention all the other species that are affected, and in affect us indirectly. This process of deregulation of radiation has been ongoing at NRC, but in 1986 the agency formalized it as a policy called "Below Regulatory Concern" or BRC. Citizens across the country did a phenomenal organizing effort, including passage of over a dozen state laws prohibiting deregulation and in 1992, Congress directed NRC to revoke the BRC Policy."

"In 1993, in the wake of this industry defeat, NRC put together the ERORR (Enhanced Rulemaking on Residual Radioactivity) process and citizens from across the country attended "stakeholder" meetings. Again and again we told NRC that in order to release the polluter from liability; it is their job to require that the site be returned to naturally occurring levels of background radiation. Indeed, the NRC draft rule of August 22, 1994 was more stringent than this final rule. The proposed rule did not mention a 500 mrem/year dose cap, only a 100 mrem/yr cap, and the level of 15 mrem/yr was given for unrestricted sites. The final rule also drops mandatory Site Specific Advisory Boards (SSABs). There are other forms of public in-put in decommissioning, but the implication is clear: NRC does not wish to create any more opportunities for public participation." [NIRS]

EPA's standards for nuclear waste sites by Tami Thatcher [3]

The Environmental Protection Agency (EPA) environmental standards for the disposal of spent nuclear fuel, high-level and transuranic radioactive wastes (40 CFR 191) but specifically limits EPA's consideration of public comment on these proposed standards. Questions on the adequacy of the proposed standards include:

a. Are there reasons for adopting a different regulatory time frame for the individual and ground-water protection requirements than the 10,000-year period of analysis associated with the containment requirements in 191.13? EDI believes that a regulatory time frame of at least 100,000 years is appropriate and necessary. The Transuranic wastes to be regulated, for instance at the Waste Isolation Pilot Plant (WIPP), remain hazardous for longer than 240,000 years. The 10,000-year time frame proposed in the standards is an arbitrary time frame that cannot be justified given the hazard of these wastes and the length of time they remain hazardous. A 100,000-year time frame would allow for the degeneration of a significant proportion of these wastes, thus reducing the danger of radioactivity to the public after the control period.

b. Should the Agency adopt non-degradation requirements for especially valuable ground water? If so, what types of ground water warrant this extra level of protection?

EDI believes that all ground water warrants a no-degradation protection requirement. Particularly in the West where surface water is scarce, ground water is frequently used, even today, for human and livestock drinking water and irrigation. When considering 10,000 to 100,000 year time frames and given the projected exponential growth predicted for future populations, it will be important to protect all ground water from endangerment. In addition, because it is difficult to predict future hydrologic flows over the period of time contemplated for this standard, there is a possibility that water not currently classified as Class I that is an "underground source of drinking water could, in the future, be used for human consumption.

Strict limits will discourage siting nuclear disposal facilities near ground water that people depend on for personal use. Stringent requirements also will limit the cost of future remediation of this ground water that is limited in quantity and necessary for human survival. Not only have ground water remediation techniques thus far not been 100% successful in reversing contamination, but these processes are also expensive. Current technology relies on two processes: containment and extraction. Containment involves expensive engineered barriers, and extraction is an equally costly process of pumping, treating, and reinjecting water into the water table. By requiring a no-degradation standard for irreplaceable ground water today, EPA can save future dollars, preserve our valuable natural resource, and prevent the future need for bulky and expensive remediation programs.

c. Is it reasonable for the Agency to adopt a standard (15-millirem) that allows a slightly higher level of risk when the dose is being received through all exposure pathways, e.g., direct exposure, food ingestion, water ingestion, and inhalation and all environmental media, e.g., air and water, than when regulating doses received through a single environmental medium, e.g., a 10-millirem committed- effective-dose (CED) per year standard for air emissions (40 CFR Part 61). EDI believes that the CED limit for nuclear waste disposal facilities should be much lower than 15-millirem per year. As early as 1983 in A Study of the Isolation System for Geologic Disposal of Radioactive Wastes, the National Academy of Sciences (NAS) recommended a "lifetime radiation-dose commitment to the maximally exposed individual at any future time" to be "10-4 sieverts per year (Sv/yr)," which is equivalent to a CED limit of 10-millirem. [BRWM]

In 1990 the NAS Board on Radiation Effects Research [BRWM] Commission on Life Sciences Committee on the Biological Effects of Ionizing Radiation (BEIR) published Health Effects of Exposure to Low Levels of Ionizing Radiation BEIR V. The BEIR V committee concluded: "The cancer risk estimates derived with the preferred models used in this report are about 3 times larger for solid cancers (relative risk projection) and about 4 times larger for leukemia than the risk estimates presented in the BEIR III report." The BEIR III report was published in 1980. (National Academy Press, 1990, page 6)

Because the most recent research into the biological effects of ionizing radiation indicates a greater risk to the public than was previously thought, EDI believes that EPA standards minimally must limit the CED to the 1983 NAS's recommendation of 10-millirem per year. The direction of the current research, however, argues for an even more conservative limit.

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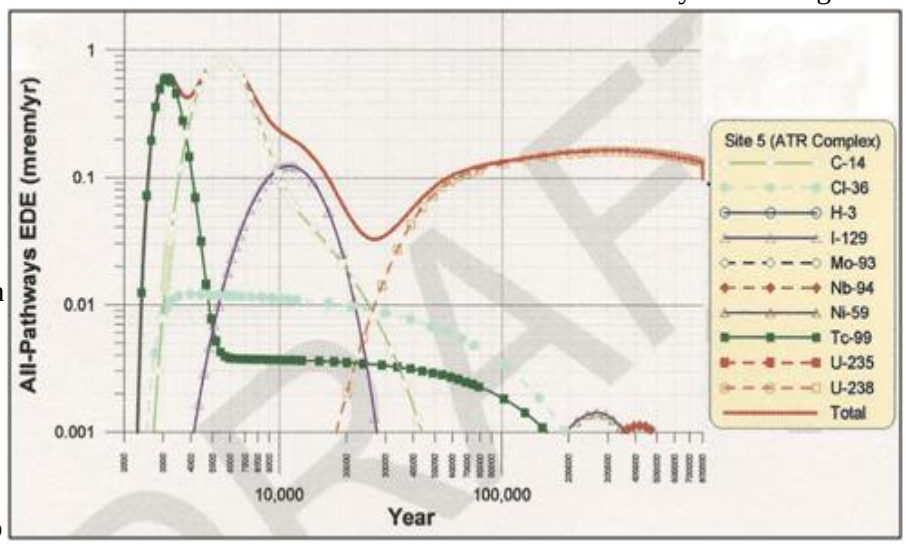
[3] Margret Carde also contributed to developing these criteria.

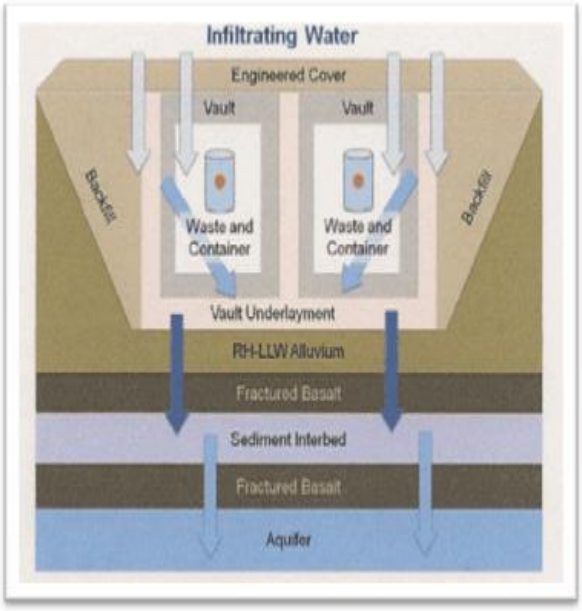
d. Does the public have comments on how, if at all, implementation of Subpart C, in lieu of direct compliance with the SDWA regulations, to the extent that statute applies for a particular disposal system, if at all, would not be equivalent to direct application of the SDWA. EPA standards must not take away a state's right to permit underground injection wells under the Safe Drinking Water Act (SDWA 1421(b) (3) (C). EPA's Federal Register publication (58 Fed. Reg. 7931) states that "compliance with the new Subpart C will provide an equivalent level of protection as would compliance with SDWA regulations. Thus ... compliance with Subpart C will constitute compliance with the SDWA to the extent -- if at all -- such compliance would otherwise be required for a particular disposal system." EDI believes that this section of the standard must be eliminated so that each state's right to regulate Underground Injection Controls (UICs) within its boundaries is preserved. A state's right under SDWA to permit underground injection wells must not be preempted by this standard. Procedures for issuing UIC permits are different from those of Subpart C, so compliance with Subpart C is not "equivalent" to a UIC permit.



Tami Thatcher's report *More Buried Waste in INL's Future? o*n EDI website*:*

"Radiological waste burial practices at INL are not protective of the environment and will continue to contaminant Idaho's sole source Snake River Plain Aquifer. Waste buried at the Radioactive Waste Management Complex includes large quantities of the radioactive material in spent fuel (enriched and depleted uranium and fission products); actually, it contains discarded spent fuel from experiments, accidents and other processing.

"DOE's proposed new replacement of RWMC, the Replacement Remote-Handled Low-Level Waste Facility is a permanent disposal facility that will leach radionuclides into the ground and aquifer for thousands of years. The concrete vaults have holes in the bottom to prevent water buildup. The metal canisters are expected to corrode and release the contaminants.



"The timeframe for leaching contaminants is hundreds of thousands of years. The analysis ignores inevitable variations in precipitation and flooding in order to produce the appearance of a steady trickle of contaminants, not exceeding regulatory thresholds.

"In addition to continued radioactive waste burial at INL's Radioactive Waste Management Complex and the proposed new Replacement Remote-Handled Low-Level Waste disposal facility, the INL remains short-listed for DOE's Greater-Than-Class-C repository. This waste includes DOE GTCC waste and the commercial nuclear industry waste DOE will become the owner of. This waste placed in the ground, whether or not in metal cans, permanently.

"DOE can finalize its Greater-Than-Class-C Low-Level Waste environmental impact statement (EIS)

now that public comment was taken. DOE's draft EIS for GTCC waste assessed various locations around the country including INL. DOE can now finalize its report and select along with Congress who will take the country's long-lived waste from commercial reactors, DOE operations, and other waste generators. See more at DOE's GTCC EIS

"Interestingly, DOE's draft EIS had conservatisms that made INL's contaminant migration and subsequent dose relatively high. But more recent INL contaminant migration studies have produced estimates of slower contaminant migration and radiation dose, see INL's assessment of its Replacement RH-LLW facility. Hanford already has so many long-lived contaminants, it appears not viable. So, INL cannot be ruled out as a place for this waste.

"Other waste facilities at INL are called temporary where highly radioactive waste is placed in cans in the ground, awaiting a plan to retrieve the waste after finding a permanent home for the waste. Buried cans are located at INL's INTEC (formerly for fuel reprocessing) and the Materials and Fuels Complex, formerly Argonne National Laboratory-West (MFC) at its Radioactive Scrap and Waste Facility." [4]

The Environmental Protection Agency (EPA) arbitrarily limits the scope of public comment

EDI believes that EPA must consider public comment on all parts of 40 CFR 191. In 1987, the 1st Circuit Court remanded the entire 1985 EPA nuclear waste disposal standards, not just the specifically cited subsections that concerned individual and ground water protection requirements. Subsequent to the 1987 court ruling, EPA reviewed all aspects of the 1985 standards, producing four drafts of the standards which were never published in the Federal Register. These drafts clearly show that EPA has its own concerns with other parts of the 1985 standards.

In October, 1992, Congress passed Public Law (PL) 102-579 that directs EPA to "issue ... final disposal regulations." Section 8 of the law reinstates "the disposal regulations issued by the Administrator on September 19, 1985, and contained in Subpart B of part 191 of title 40 Code of Federal Regulations" and excepts " (A) the 3 aspects of sections 191.15 and 191.16 of such regulations that were the subject of the remand ordered in Natural Resources Defense Council, Inc. v. United States Environmental Protection Agency, 824 F.2d 1258 (1st Cir. 1987); and (B)the characterization, licensing, construction, operation, or closure of any site required to be characterized under section 113(a) of Public Law 97-425." Thus, PL 102-579 intended the reinstatement of EPA's 1985 nuclear waste disposal standard (with the above exceptions) to be a temporary measure until EPA issued a new standard. EPA's promulgation of only revised sections of its 1985 standard does not address the mandate of PL 102-579, which expressly directs EPA to "issue ... final disposal regulations." EPA's limited promulgation not only fails to satisfy PL 102-579, but it denies the public right to comment on the whole, final standard.

EPA granted the Idaho Department of Environmental Quality (IDEQ) enforcement authority to administer EPA's Hazardous Waste laws. [5] This arrangement allows a captured inadequately funded state agency to set INL cleanup criteria and issue inadequate permits for INL operations. In the DOE/EPA/ IDEQ Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site it states:

"Review of the various [applicable or relevant and appropriate requirement] ARARs and to-be-considered criteria identified in the [Record of Decision] RODs showed that ROD requirements do not affect remedy protectiveness. The one ARAR that was used in several RODs as a remediation goal was the Safe Drinking Water Act MCLs (State of Idaho Groundwater Quality Standards) (IDAPA 58.01.11), and this review determined that MCLs have not changed for the COCs identified in RODs evaluated in this FYR. For other remediation goals, such as soil cleanup levels and performance-based goals (e.g., for engineered barriers), RODs relied primarily on calculated site-specific risk-based values rather than ARAR-derived values. This review found no changes to ARARs or to-be-considered criteria that affect remedy protectiveness for this FYR." [6]

Response to EPA's inadequate nuclear waste disposal standards

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[4] http://environmental-defense-institute.org/cleanup.html

[5] 40 CFR Part 271[EPA–R10–RCRA–2011–0973; FRL–9684–6] Idaho: Final Authorization of State Hazardous Waste Management Program; Revision

[6] Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site— Fiscal Years 2010–2014, *1.4.2.2 Conclusion*, Pg. 1-15, December 2015 DOE/ID-11513, Revision 0

a. EPA must revise the standards and require states with enforcement authority to isolate the alpha-emitting TRU radionuclides with the same degree of effectiveness as for high-level waste. EPA has stated its intention that the radioactivity from either high-level or TRU wastes would be "isolated with about the same degree of effectiveness ... so that about the same fraction of TRU radionuclides would be retained for either high-level or TRU-wastes (Numark, Presentation to BRWM, 9/24/92)." Reissuing the 1985 standard without revising the TRU-waste unit ignores EPA's own stated concerns. EDI recommends that EPA revise its TRU-waste unit to be between 3 and 11 million curies in accordance with the conclusions and the recommendations of the Environmental Evaluation Group (EEG). [7]

b. EPA must revise the standards' assurance requirements to prohibit waste disposal in areas with large deposits of valuable natural resources. EPA and DOE are in agreement that future human intrusion is probably inevitable at the WIPP site because of the presence of valuable natural resources. The proposed standard does not, but should, give clear guidelines for acceptable limits to human intrusion from petroleum drilling, innocent intrusions or intrusions from exploration for solid mineral deposits or salt bed storage areas. EPA's language, "Such places [with valuable water or other natural resources] shall not be used for disposal of the wastes covered by this part unless the favorable characteristics of such places compensate for their greater likelihood of being disturbed in the future," does not insist on a scientific limit either to the frequency of future intrusion or to the releases allowed by that intrusion. Rather, EPA's language allows this requirement to be ignored for political or policy considerations.

c. EPA disposal standards should include performance standards for engineered barriers such as TRU-waste containers, backfill, plugs and seals at repositories which are not licensed by the Nuclear Regulatory Commission (NRC). PL 102-579 (Section 8(g) directs DOE to "use both engineered and natural barriers, and waste form modifications, at WIPP to isolate Transuranic waste after disposal to the extent necessary to comply with the final disposal regulations." Thus Congress directed EPA to set guidelines in its disposal standards for engineered barriers. Indeed, the EPA 1985 standard explicitly recommends that "[D]isposal systems shall use different types of barriers to isolate the wastes from the accessible environment. Both engineered and natural barriers shall be included." However, disposal facilities not regulated by NRC do not have the benefit of NRC guidelines for these engineered barriers. Therefore, EPA must provide specific performance standards to be met for engineered barriers at non-NRC regulated disposal facilities.

d. EPA must review all public comment on all of the proposed standard, rewriting all sections which need to be strengthened. EPA should then issue these rewritten standards, ask for additional public comment, and review the public comment. Then and only then should EPA attempt to publish final standards

Section IV. B. DOE Changed the Definition of High-level Waste to Avoid Cleanup Obligations

DOE's Idaho National Laboratory (INL) formerly National Reactor Testing Station is where the U.S. chose to build/test/operate over 52 reactors since its creation in 1949 by the Atomic Energy Commission. INL has extensive inventories of high-level waste (HLW) along with the remains of those 52 reactors and the full range of HLW mixed hazardous radioactive waste produced by them and from the reprocessing of used (irradiated) spent nuclear fuel (SNF) from military and commercial reactors.

EDI's discussions cover the eight INL facilities that handle HLW, transuranic (TRU), and greater-than-class C low-level (GTCC) and what DOE euphemistically calls "greater-than-class-C-like" waste because once DOE implemented Order 435.1, that's how they "managed" previously classified HLW. We discuss how DOE's policies resulted in mismanagement of these wastes and irrevocably [8] contaminating Idaho. Between 1949 and 1995 there were few-if any restraints on DOE HLW waste management – they simply dug pits and trenches and dumped it all in – reactors, spent nuclear fuel (SNF) [9], chemicals from SNF reprocessing. This represents an

[7] Environmental Evaluation Group (EEG) report by James Channell, February 5, 1992, and the September 1992 presentation by Neil J. Numark, Associate, and S. Cohen & Associates.

[8] Once hazardous/radioactive waste migrates into the underlying aquifer, it's virtually impossible to cleanup.

[9] SNF (90.282 metric tons) dumped were typically damaged from reactor meltdowns or otherwise not usable for reprocessing. Radioactive Waste Management Information System Database (P61SH090, and P61SH070, Run Date 10/24/89) [RWMIS]

existential environmental threat to all Idahoans due to the contaminate air and migration into our sole source Snake River Aquifer.

EDI's focus is on all of these waste categories (HLW, TRU, and GTCC) wastes because DOE's continuing policy to unilaterally change the definition of HLW results in this (most lethal) waste being reclassified as TRU and GTCC at INL. Specifically, DOE illegally [10] changed the formerly HLW 900,000 gal. sodium-bearing waste (SBW) generated from reprocessing spent nuclear fuel (SNF) to "waste incidental to reprocessing" (WIR) mixed hazardous TRU [11] and changed formerly HLW calcine to TRU [12] so it can be dumped at Waste Isolation Piolet Project (WIPP) in New Mexico. In keeping with the NWPA, NM Department of Environmental Quality has blocked bringing waste derived from reprocessing SNF (like calcine/SBW) to WIPP. [13]

To implement this new HLW reclassification policy, DOE is relying on Public Law 108–375—Oct. 28, 2004 Section 3116 that states:

"SEC. 3116. DEFENSE SITE ACCELERATION COMPLETION.

"(a) IN GENERAL.—Notwithstanding the provisions of the Nuclear Waste Policy Act of 1982, the requirements of section 202 of the Energy Reorganization Act of 1974, and other laws that define classes of radioactive waste, with respect to material stored at a Department of Energy site at which activities are regulated by a covered State pursuant to approved closure plans or permits issued by the State, the term ''high-level radioactive waste'' does not include radioactive waste resulting from the reprocessing of spent nuclear fuel that the Secretary of Energy (in this section referred to as the ''Secretary''), in consultation with the Nuclear Regulatory Commission (in this section referred to as the ''Commission''), determines—

a. "does not require permanent isolation in a deep geologic repository for spent fuel or high-level radioactive waste;
b. has had highly radioactive radionuclides removed to the maximum extent practical; and

(3)(A) does not exceed concentration limits for Class C low-level waste as set out in section 61.55 of title 10 Code of Federal Regulations, and will be disposed of—

(i) in compliance with the performance objectives set out in subpart C of part 61 of title 10, Code of Federal Regulations; and

(ii) pursuant to a State-approved closure plan or State- issued permit, authority for the approval or issuance of which is conferred on the State outside of this section; or

(B) exceeds concentration limits for Class C low-level waste 10, Code of Federal Regulations, but will be disposed of—

(i) in compliance with the performance objectives set out in subpart C of part 61 of Federal Regulations;

(ii) pursuant to a title 10, Code State-approved closure plan or State- issued permit, authority for the approval or issuance of which is conferred on the State outside of this section; and

(iii) pursuant to plans developed by the Secretary in consultation with the Commission."

DOE claims INL Idaho Nuclear Technology and Engineering Center (INTEC) tank "sodium-bearing" wastes are:

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[10] B.Lynn Winmill, Chief Judge U.S. District Court for Idaho, July 2, 2003, Memorandum Decision in NRDC v. DOE, Civ. No. 01-0413-S-BLM, discussed more below.

[11] Notice of Preferred Sodium Bearing Waste Treatment Technology, Federal Register /Vol. 70, No. 148 /Wednesday, August 3, 2005 /Notices, DEPARTMENT OF ENERGY Office of Environmental Management.

[12] Comments On U.S Department of Energy Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (DOE/EIS-0375-D) February 2011, Submitted by Chuck Broscious, May 12, 2011.

[13] Review of U.S. Department of Energy Final Environmental Assessment Replacement Capacity for Disposal Remote Handled Low-Level Waste Generated at Idaho National Laboratory December 2011 DOE/FEA-1793, [13] Submitted by Chuck Broscious on behalf of Environmental Defense Institute 3/30/17 [Rev12]. Also see EDI special report Unwarranted *Confidence in DOE's Low-Level Waste Facility Performance Assessment The INL Replacement Remote-Handled Low-Level Waste Facility Will Contaminate Our Aquifer for Thousands of Years.* by Tami Thatcher http://www.environmental-defense-institute.org/publications/rhllwFINALwithFigs4.pdf

"WASTE DOES NOT REQUIRE PERMANENT ISOLATION IN A DEEP GEOLOGIC REPOSITORY FOR SPENT FUEL OR HIGH-LEVEL RADIOACTIVE WASTE

"Section 3116(a) of the National Defense Authorization Act (NDAA) provides in pertinent part:

"[T]he term "high-level radioactive waste" does not include radioactive waste resulting from the reprocessing of spent nuclear fuel that the Secretary of Energy …, in consultation with the Nuclear Regulatory Commission …, determines—

"(1) does not require permanent isolation in a deep geologic repository for spent fuel or high-level radioactive waste.

"Under Section 3116(a), certain wastes from reprocessing are not "high-level radioactive waste" if the Secretary, in consultation with the NRC, determines that certain criteria are met. Section 3116(a) sets out two specific criteria in Clauses (2) and (3). Clause (2) requires the DOE to remove highly radioactive radionuclides to the maximum extent practical. Clause (3) generally mirrors the criteria that the NRC has established for determining whether waste qualifies for land disposal as LLW (see 10 CFR 61.55 and 61.58). This clause provides that disposal of the waste must meet the NRC performance objectives of 10 CFR 61, Subpart C, and that the waste must not exceed the concentration levels for Class C waste in 10 CFR 61.55 or the Secretary must consult with NRC concerning DOE's disposal plans." [14]

EDI documents in this comment/report how DOE is violating Nuclear Waste Policy Act (NWPA), PL 108–375 Section 3116, and 1995 Settlement Agreement, [15] subsequent Agreements with the State of Idaho [16] and other related environmental statutes at INL. DOE is clearly having a waste constipation problem that leaves the WIPP dump option their solution; as opposed to legally disposing HLW in a deep geological repository designed and permitted for HLW. The Waste Isolation Pilot Project (WIPP) Permit, issued by the New Mexico Environment Department, has the following provision:

"Section 2.3.3.8. Excluded Waste:

TRU mixed waste that has ever been managed as high-level waste and waste from tanks specified in Permit Attachment C are not acceptable at WIPP unless specifically approved through a Class 3 permit modification."

Permit Attachment C lists all of the tanks at Hanford, INL, and SRS.

Class 3 permit modifications include public hearing and judicial review,

What Idahoans legitimately fear is the waste staying in Idaho in near-surface dumps. These comments discuss these issues in detail because they are already occurring.

Section 3116 states: "Notwithstanding the provisions of the Nuclear Waste Policy Act of 1982" Congress acknowledges the ongoing validity of the Act. EDI poses the following questions with respect to DOE reclassification of high-level waste (HLW) that deserve consideration due to the significant violation of established governing statute but more importantly the resulting environmental health and safety consequences on Idahoans.

1. Is DOE exceeding its authority and violating the NWPA?

Judge B.Lynn Winmill, Chief Judge U.S. District Court for Idaho, July 2, 2003 states yes:

"While DOE has the authority to 'fill any gap left…by Congress,'…it does not have the authority 'to adopt a policy that directly conflicts with its governing statute.'…

DOE's Order 435.1 directly conflicts with the NWPA's definition of HLW. NWPA's definition pays no

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[14] Basis for Section 3116 Determination for the Idaho Nuclear Technology and Engineering Center Tank Farm Facility, November 2006, Revision 0, Pg. 45, DOE/NE-ID-11226

[15] 1995 Settlement Agreement, The State of Idaho, through the Attorney General, and Governor Philip E. Batt in his official capacity; the Department of Energy, through the General Counsel and Assistant Secretary for Environmental Management; and the Department of the Navy, through the General Counsel and Director, Naval Nuclear Propulsion Program, hereby agree on this 16th day of October, 1995, to the following terms and conditions to fully resolve all issues in the actions Public Service Co. of Colorado v. Batt, No. CV 91-0035-S-EJL (D. Id.) and United States v. Batt, No.CV-91-0065-S-EJL (D. Id.), Pgs. 2&3. Hereinafter, 1995 Settlement Agreement.

[16] See below: SECTION III. Radioactive Waste Management Complex (RWMC) for details on revisions to the 1995 Settlement Agreement.

heed to techical or economic constraints in waste treatmet. Moreover, NWPA does not delegate to DOE the authority to estblish 'alternative requirements for solid waste.' Because Congress has spoken to that subject "that is the end of this matter,' leaving no room for 'alternative requirements'" [17] [[Pg. 12]

2. **Does NWPA permit DOE to permanently intern HLW including tank sediments "heels" at INL**?
Again Judge Winmill states:

"In this case, Congress defined HLW in NWPA as 'highly radioactive material resulting from the reprocessing of spent nuclear fuel.' Congress then used the word 'including' to signal that what followed were examples designed to illustrate the definition just given. The two examples designated to illustrate the definition just given. The two examples are (1) 'liquid waste produced directly in reprocessing'; and (2) 'solid material derived from such liquid waste that contains fission products in sufficient concentrations.'" [Pg.10]

"These two examples neatly cover the manner in which the waste separates in the tanks over time. As discussed above, the solids sink to the bottom, forming a sludge, leaving the liquids on top. This physical separations is analogous to the NWPA's definitional separation: The liquid and solids are treated differently by the Act. While NWPA allows DOE to treat the solids to remove fission product, thereby permitting reclassification of the waste, NWPA does not offer the option of reclassification for liquid waste produced directly in reprocessing." [Pg.10]

"NWPA's definition of HLW considers the source of the waste and, in the case of solids derived from liquid waste, its hazard. It is undisputed that the waste stored at Hanford, INEEL, and Savannah River is highly radioactive and the result of reprocessing. No solids are yet been extracted from the liquid waste at those sites and treated to reduce fission products. Thus, the waste at issue in this case falls within NWPA's definition of HLW." [18] [Pg.11]

3. **Does Idaho allow DOE to leave HLW (including calcine) permanently at INL?**
The Settlement Agreement/Consent Order between Idaho and DOE states NO:

"E. Treatment and Transfer of Existing Wastes at INEL: 1. Treatment Commitment. DOE agrees to treat spent fuel, high-level waste, and transuranic wastes in Idaho requiring treatment so as to permit ultimate disposal outside the State of Idaho." [19] [Settlement Agreement, Pg. 5]

4. **DOE does NOT have the authority to consolidate HLW irradiated fuel because it is illegal and not allowed under federal law until there is a permanent repository operating.** [20]

Robert Alvarez's 6/9/12 report "D.C. Court of Appeals Overturns NRC's Waste Confidence Decision" states:

"The discussion on the risks of spent nuclear fuel (SNF) in commercial nuclear power facilities also applies to Department of Energy (DOE) SNF storage pools at the Idaho National Laboratory and other DOE sites where "re-racking" of SNF to conserve space has increased the risk of a major accident in Advanced Test Reactor SNF canal and INTEC CPP-666. DOE states: "This underwater storage facility (in Building 666) contains spent fuel from nuclear reactors. Almost all of the fuel stored here is from nuclear submarines and nuclear surface ships of the U.S. Navy. "There are 4 main storage pools (one is not visible in this photo). The individual fuel storage vaults can just be seen in the foreground. To the left and rear are transfer channels for moving the spent fuel in and out of the pools. This facility is the newest and most modern at INL. "This facility was designed to store spent fuel *temporarily* until the fuel rods could be reprocessed to extract residual uranium. The uranium was then reused for weapons programs.

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[17] B.Lynn Winmill, Chief Judge U.S. District Court for Idaho, July 2, 2003, Memorandum Decision in NRDC v. DOE, Civ. No. 01-0413-S-BLM, pg. 12.

[18] B.Lynn Winmill, Chief Judge U.S. District Court for Idaho, July 2, 2003, Memorandum Decision in NRDC v. DOE, Civ. No. 01-0413-S-BLM, pg. 11.
Also see Settlement Agreement/Consent Order that states: "3. DOE shall treat all high-level waste currently at INEL so that it is ready to be moved out of Idaho for disposal by a target date of 2035." Pg.3

[19] 1995 Settlement Agreement, Pg.5. Section III Radioactive Waste Management Complex below discusses the subsequent revisions to the 1995 Agreement all of which acknowledge the ongoing validity of the 1995 Agreement.

[20] Environmental Defense Institute's comment submittal on the Consent-based Approach for Siting Storage for the nation's Nuclear Waste, July 31, 2016. http://www.environmental-defense- institute.org/publications/EDIXConsentFinal.pdf

When reprocessing was halted in 1992, this facility became a de facto *permanent* storage facility. Spent fuel continues to come in from the Navy, but nothing leaves because there is no place for it to go. As a consequence, this pool is now filled to its design capacity and additional fuel vaults are being 'over-stacked'."

The Department of Energy's two repository approach announced in 2015 are rarely mentioned but it designates one repository for commercial spent nuclear fuel and another for DOE spent fuel and high-level waste. 21 DOE's consent-based approach for a new HLW repository has disappeared. 22

This year, the administration proposed funding to attempt to revive Yucca Mountain, but a senate bill put forth in July 2018 left out this funding. [23] Idaho should be paying attention to whether or not Yucca Mountain, even if attempts to revive it survive, would actually accept spent fuel and high-level waste from INL since current inventory of commercial (that gets priority over DOE) SNF will nearly fill it today.

5. Can DOE be challenged in court on its HLW reclassifying policy?

US Federal District Court for District of Idaho ordered 3/6/06 states yes:

"The National Resources Defense Council (NRDC) has filed a brief describing various actions of the Department of Energy (DOE). However, none of those actions are final as required by the Ninth Circuit in this case. If they become final, the NRDC retains the right to challenge them in a new lawsuit. However, this lawsuit is governed by the Ninth Circuit's decision that directed this Court to dismiss this action." [24]

6. Can DOE be challenged in the Ninth Circuit Court on its HLW policy?

Judge B. Lynn Minmill, Chief Judge, US District Court, August 9, 2002 states:

"This case was transferred to this Court by the Ninth Circuit. *See NRDC v. Abraham, 244 F.3d 742 (9th Cir. 2001)*. In its opinion, the Circuit found that it lacked original or exclusive jurisdiction under 42 U.S.C. ss 10139 to entertain Plaintiffs' claims because the decision by the DOE in promulgating Order 435.1 was not made pursuant to the Nuclear Waste Policy Act 42 U.S.C. ss 10101 et seq. See is.at 747. However the Ninth Circuit expressly noted that issues relating to standing, ripeness, and the merits of the Plaintiff's claims must be decided by this Court. *See id.*" [pg2]

"Moreover, delaying review of Order 435.1 until the DOE makes a site specific decision conformance with the Order may cause substantial harm. Tank closures, once undertaken, aren't readily altered and future judicial review may therefore be foreclosed until it is too late. [5]

Foot note 5 "The Court notes that council for Plaintiffs suggested during oral arguments that the closure of two tanks at SRS occurred under circumstances in which they were unable to bring a timely action to obtain judicial review of that decision." [pg.7]

"The Court need not wait until a threatening injury comes to fruition before undertaking judicial review. This is particularly true where the DOE Order has the force of law and requires immediate compliance by DOE facilities as well as DOE contractors. In such a case, a justiciable controversy exists that is ripe for

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[21] U.S. Nuclear Waste Technical Review Board, Management of U.S. Department of Energy Spent Nuclear Fuel, Report to the United States Congress and the Secretary of Energy, December 2017. "**Nuclear Waste Policy Act** The federal statute enacted in 1982 that establishes both the Federal Government's responsibility to provide a place for the permanent disposal of high-level radioactive waste and spent nuclear fuel, and the nuclear power generators' responsibility to bear the costs of permanently disposing of commercial spent nuclear fuel. Amendments to the Act in 1987 limited the Federal Government's site characterization activities to a possible geologic repository at Yucca Mountain, Nevada. The Act provides for extensive state, tribal, and public participation in the planning and development of permanent repositories." [Pg.180] "Finding: DOE's aging management programs are not fully implemented. Some DOE SNF storage facilities lack aging management programs to facilitate retrieving stored SNF and packaging it into multi-purpose canisters needed to transport it to either a centralized interim storage facility or a permanent repository." [Pg.7&8]

[22] EDI's 2016 comments on the consent-based siting of permanent and interim spent nuclear fuel storage and disposal facilities. http://www.environmental-defense-institute.org/publications/EDIXConsentFinal.pdf

[23] Brief overview of issues on H.R. 3053 on Donna Gilmore's website: https://sanonofresafety.org/

[24] US Federal District Court for District of Idaho in NRDC v. DOE, Case 1:01-cv-00413-BLW, Document 125 Filed 03/06/2006, Page 2 of 2

review, because the Court can 'firmly predict' the result that would occur through the application of Order 435.1. ('One does not have to await the consummation of threatened injury to obtain preventive relief. If the injury s certainly impending, that is enough.')" [pg.8]

"In short, the Court concludes that there is a clear indication of the hardship that plaintiffs and the intervenors will suffer if review is delayed, there is no indication that undertaking judicial review at this jucture would interfere with subsequent agency action, and the Court perceives no benefit which would be obtained by allowing further factual development of the issues involved. Under such circumstaces, the Court concludes that Order 435.1 and its mandate that all DOE contractors and entities comply with its provisions, are ripe for jucicial review." [pg.8]

"Conclusion: Therefore, pursuant to its review authority under 5 U.S.C. ss 704 & 706, the Court will deny the Defendants' [DOE] Motion to Dismiss. However, indenying the Defendants' motion the Court makes no ruling as to the merits of Plaintiffs' [NRDC] claims." [25] [Pg.14] Judge B. Lynn Minmill, Chief Judge, US District Court, August 9, 2002, pages noted.

In 2005 when DOE announced its "Notice of Preferred Sodium Bearing Waste Treatment Technology" it stated:

"The Final EIS contains an evaluation of reasonable alternatives for the management of mixed transuranic waste/sodium bearing waste (SBW)…

"The Final EIS refers to SBW as mixed transuranic waste/SBW. However, a determination that SBW is transuranic waste has not been made."

"In the Final EIS DOE did not identify a preferred treatment technology for SBW from among the several technology options evaluated." [emphasis added]

"SBW is a liquid mixed radioactive waste (contains hazardous and radioactive constituents) produced primarily from INTEC decontamination and cleanup activities. SBW also includes approximately one percent (by volume) commingled 1st cycle reprocessing waste, approximately two percent 2nd cycle reprocessing waste, and approximately four percent 3rd cycle reprocessing waste. SBW contains large quantities of sodium and potassium nitrates; however, the radionuclide concentrations for liquid SBW are generally ten to 1,000 times less than for liquid HLW."

"In 1992, DOE entered into a Notice of Noncompliance Consent Order with the State of Idaho Department of Environmental Quality and the Environmental Protection Agency that requires DOE to cease use of the tanks in which the SBW is stored by December 31, 2012.

"In 1995, DOE and the State of Idaho entered into a settlement agreement that resolved litigation and that established dates for the treatment of approximately 900,000 gallons of liquid SBW stored at INTEC." [26]

It is crucial to note in the above DOE Notice it states: "SBW is a liquid mixed radioactive waste (contains hazardous and radioactive constituents) produced primarily from INTEC decontamination and cleanup activities. SBW also includes approximately one percent (by volume) commingled 1st cycle reprocessing waste, approximately two percent 2nd cycle reprocessing waste, and approximately four percent 3rd cycle reprocessing waste." The State of Idaho got suckered into believing DOE estimates on the % of raffinate in the SBW and would follow through with its promises to ship the treated SBW to WIPP and disregarded the Nuclear Waste Policy Act's definition of HLW. Again Judge Winmill states:

"In this case, Congress defined HLW in NWPA as 'highly radioactive material resulting from the reprocessing of spent nuclear fuel.' Congress then used the word 'including' to signal that what followed were examples designed to illustrate the definition just given. The two examples designated to illustrate

[25] Judge B. Lynn Minmill, Chief Judge, US District Court, August 9, 2002

[26] Notice of Preferred Sodium Bearing Waste Treatment Technology, Federal Register /Vol. 70, No. 148 /Wednesday, August 3, 2005 /Notices, DEPARTMENT OF ENERGY Office of Environmental Management

the definition just given. The two examples are (1) 'liquid waste produced directly in reprocessing'; and (2) 'solid material derived from such liquid waste that contains fission products in sufficient concentrations.'"

"These two examples neatly cover the manner in which the waste separates in the tanks over time. As discussed above, the solids sink to the bottom, forming a sludge, leaving the liquids on top. This physical separations is analogous to the NWPA's definitional separation: The liquid and solids are treated differently by the Act. While NWPA allows DOE to treat the solids to remove fission product, thereby permitting reclassification of the waste, NWPA does not offer the option of reclassification for liquid waste produced directly in reprocessing." [Pg.10]

"NWPA's definition of HLW considers the source of the waste and, in the case of solids derived from liquid waste, its hazard. It is undisputed that the waste stored at Hanford, INEEL, and Savannah River is highly radioactive and the result of reprocessing. No solids are yet been extracted from the liquid waste at those sites and treated to reduce fission products. Thus, the waste at issue in this case falls within NWPA's definition of HLW." [27] [Pg.11]

The State of Idaho again got fooled by DOE because WIPP's Waste Acceptance Criteria (WAC) specifically prohibits any waste derived from HLW [28] which by DOE's own definition is: "SBW also includes approximately one percent (by volume) commingled 1st cycle reprocessing waste, approximately two percent 2nd cycle reprocessing waste, and approximately four percent 3rd cycle reprocessing waste." DOE can call it whatever it wants, but it is still HLW by Congressional NWPA statute.

7. Is NEPA and/or CERCLA working as intended to address DOE's waste mismanagement and environmental degradation?

Ultimately DOE continues to abuse the National Environmental Policy Act (NEPA) process by routinely and repeatedly ignoring comments, no matter how reasoned, and no matter how supported by science and facts. NEPA needs to require DOE and other agencies to directly answer with technical justification each question asked or challenge made. When they cannot, they must resolve the underlying issue.

The whole risk assessment and public process is irreparably broken. The risk assessment process is subject to fiddling and fudging in myriad ways. As a result, the agencies can bury their desires in a warped process to get any outcome they desire. It is not in any way an honest process. And it isn't a process that gets to truth. Thus, reclassifying HLW to lesser waste category of waste has significant environmental consequences since DOE is able to leave it in INL shallow dumps rather than shipping to the requisite (under the NWPA) HLW geologic repository. DOE claims CERCLA is not a requirement for implementing current policy:

"Section 3116 is not dependent on the independent process under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq. 1980) and does not provide a basis for any new authority, responsibility, or obligation for DOE or any other entity with respect to the CERCLA process or otherwise affect the CERCLA process. Decisions regarding past releases of contaminants and the impacts of contaminated soils associated with the [Tank Farm Facility]TFF will be addressed under the CERCLA process as specified in the Federal Facility Agreement and Consent Order among DOE, the State of Idaho, and the U.S. Environmental Protection Agency (EPA) (State of Idaho et al. 1991)." [29] [pg.3] [emphasis added]

DOE/INL's HLW INTEC tank closure plan using the new DOE Order 435.1 policy further compromised the CERCLA cleanup process by changing one word from – "maximum extent *technically to economically* practical." This seemingly minor change made a significant difference in the requirement to utilize the best

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[27] B.Lynn Winmill, Chief Judge U.S. District Court for Idaho, July 2, 2003, Memorandum Decision in NRDC v. DOE, Civ. No. 01-0413-S-BLM, pg. 11.
Also see Settlement Agreement/Consent Order that states: "3. DOE shall treat all high-level waste currently at INEL so that it is ready to be moved out of Idaho for disposal by a target date of 2035." Pg.3

[28] New Mexico WIPP Permit "Section 2.3.3.8. Excluded Waste: TRU mixed waste that has ever been managed as high-level waste and waste from tanks specified in Permit Attachment C are not acceptable at WIPP unless specifically approved through a Class 3 permit modification." Permit Attachment C lists all of the tanks at Hanford, INL, and SRS.

[29] DOE/NE-ID-11226, Pg.3.

technology available to clean the HLW tanks to a less expensive economical solution. The implications of leaving the tank solids (heals) [30] are incalculable. DOE considers it too expensive to remove - this most deadly waste – left permanently over the aquifer for millennia (the half-life of the tank radionuclides).

> "While prior NRC and DOE requirements for waste determinations called for removal "to the maximum extent *technically* and *economically* practical," Section 3116 omits these adverbs, thereby suggesting that a broad range of considerations, including but not limited to technical and economic practicalities, may appropriately be taken into account in determining the extent of removal that is practical." [31] [emphasis added]

8. Is DOE going to reclassify calcine HLW at INL's Integrated Waste Treatment Unit as MTRU?

Calcine and the Integral Waste Treatment Unit (IWTU) slated to treat calcine will produce Steam Reform Product (1,078.00 cm). [32] DOE will again unilaterally reclassified it as mixed hazardous transuranic (MTRU) waste waiting disposal at WIPP. [33] DOE's plan to extract calcine from bin-sets "only to the extent practicable" and then grout the remainder in the tanks again violates the NWPA. Calcine and the IWTU waste products are derived from HLW. Again Idaho got fooled by DOE because WIPP's Waste Acceptance Criteria (WAC) specifically prohibits any waste derived from HLW. DOE knows full well this waste will remain in Idaho if (for no other reason) there is no HLW geologic repository to send it to. The IWTU operability remains so uncertain as to have no schedule. EDI discusses this and DOE's missed Settlement Agreement milestones in detail below. DOE continues to miss 1995 Settlement Agreement to prepare calcine for "road-ready" transport out of Idaho.

9. What is DOE's plan for formerly HLW reprocessing liquid waste in INL tanks?

DOE renamed this ~900,000 gal. (3,222.14 cm) [34] tank waste as "sodium-bearing waste" (SBW); also called "waste incidental to reprocessing" (WIR) as the first step in reclassifying it as a MTRU for treatment at the IWTU and disposal at WIPP. "The DOE is evaluating the disposition path for SBW at this time. Until such time as the regulatory approvals are obtained and a determination is made, the DOE will manage the waste for appropriate storage at the INL Site." [35] Again, this is a violation NWPA that defines HLW (in addition to SNF) as: "(1) liquid waste produced directly in reprocessing; and (2) solid material derived from such liquid waste that contains fission products in sufficient concentrations." See Section IV.C.

10. Are there HLW disposal options?

The mythical disposal option for HWL is deep geological repository at Yucca Mt. in Nevada. The big question is "will it ever open"? Nevada says NO! [36] WIPP, currently prohibits waste that has been HLW or "waste incidental to reprocessing, thanks to New Mexico's understandable resistance. The document DOE gave the Idaho Citizens Advisory Board, written by the Energy Community Alliance says that DOE wants to reclass the calcine and the treated sodium bearing waste as TRU and ship it to WIPP in violation of WIPP's Permit. Idahoans predict – given DOE history at INL – the new Remote-Handled Waste Disposal Facility will get the HLW. See Section 6 below for details.

Congress refuses to address an alternative for HLW geological repository at Yucca Mt. and the state of Nevada –to date- justifiably refuses to accept the flawed Yucca Mt. EIS.

11. Undisclosed and ongoing HLW reprocessing of waste disposal at INL threaten Snake River Aquifer.

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[30] "Tank heel" means the liquid/solid level remaining in each tank after lowering the level to the greatest extent possible by using existing transfer equipment, such as steam jets. See SECTION 3 below for more information on how much of the tank heels and the curie contents are left in the tanks.

[31] Basis for Section 3116 Determination for the Idaho Nuclear Technology and Engineering Center Tank Farm Facility, November 2006, Revision 0, Pg. 48.DOE/NE-ID-11226

[32] Idaho National Laboratory Site Treatment Plan, November 2016, INL-STP Rev. 36A, Pg. 4-10. Hereinafter called INL STP 2016, Pg. 4-10.

[33] WIPP's waste acceptance code (WAC) prohibits any waste derived from reprocessing SNF.

[34] INL-STP Rev. 36A, Pg. 4-10.

[35] INL-Site Treatment Plan Rev. 36A, Pg. 4-10.

[36] Gary Martin / Las Vegas Review-Journal Nevada officials brace for new attempt to revive Yucca Mountain October 31, 2018. "Former Sen. Harry Reid, Gov. Brian Sandoval and the current state congressional delegation have effectively blocked development of Yucca Mountain since it was designated by Congress in 1987 as the sole site for permanent nuclear waste disposal."

Tami Thatcher reports Past Waste Water Practices at INL Included Dumping Thorium and Uranium into the Aquifer:

> "The acceptance of direct dumping of thorium and uranium related material following [HLW SNF] separations or examinations processes at the Department of Energy's Hanford facility gives important insight into the dumping practices at Idaho's Department of Energy site, now called the Idaho National Laboratory. There were many U-233 programs at the Idaho site at the Naval Reactors Facility, Test Reactor Area (now the ATR Complex), MFC (now the Materials and Fuels Complex), and the Radioactive Waste Management Complex.
>
> "In fact, the thorium and uranium in the Snake River Plain aquifer found by various US Geological Survey reports is not naturally occurring but is there because of radioactive waste disposal into the aquifer by the Department of Energy. [37] For an idea of the radioactive and chemical waste resulting from one DOE facility at the Idaho National Laboratory, see this CERCLA cleanup report and others at the administrative record. [38]
>
> "The high levels of gross alpha from uranium and thorium radioactive wastes, along with hexavalent chromium, have long reached Idaho's Magic Valley. The state's drinking water monitoring program has done what is can to pretend this isn't from INL. Experts attending the INL Citizens Advisory Board continue to claim that only a few molecules of contamination can be found south of the INL. This frequently repeated falsehood along with inadequate state oversight ignores the elevated cancers in counties downgradient from the Idaho National Laboratory that are probably because of the chemical and radioactive contaminants in the aquifer from the INL.
>
> "One of the contaminants particular to U-233 production that does not occur otherwise in reactors is the production of contaminant europium-152. While highly enriched U-235 reactor produce europium-154, they do not produce Eu-152." [39]

Section IV. C. Idaho Nuclear Technology Environmental Complex and Calcined of High-Level Waste [40] [41]

Idaho Nuclear Environmental Complex (INTEC) (formerly called Chemical Processing Plant or is the largest

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[37] LeRoy L. Knobel et al., US Geological Survey, "Chemical Constituents in the Dissolved and Suspended Fractions of Ground Water From Selected Sites, Idaho National Engineering Laboratory and Vicinity, Idaho, 1989," Report 92-51, March 1992. See Table 19 for USGS well 14 contamination including thorium-232 decay products lead-212 and radium-228. They were mystified by the variations in monitored contaminant levels in the same well. But the variations likely resulted from the stratified contamination levels and variation in mixing the stratified levels during well sampling. http://pubs.er.usgs.gov/usgspubs/ofr/ofr925

[38] See INL CERCLA Cleanup Administrative Record at https://ar.icp.doe.gov and See one report for an idea of contaminants in Department of Energy Idaho Operations Office, "Final Removal Action Report for CPP-601, CPP-602, CPP-627, CPP-630, and CPP-640," DOE/ID-11453, February 2012. See Table 3, p. 19 and 20. *https://ar.icp.doe.gov/images/pdf/201202/20120228007688RU.pdf*

[39] Tami Thatcher, Department of Energy Past Waste Water Practices at INL Included Dumping Thorium and Uranium into the Aquifer: They Keep Pretending It's There Naturally, EDI Newsletter December 2016

[40] David B. McCoy, Preliminary Comments on Calcined Solids Storage Facility Draft Hazardous Waste Management Act Resource Conservation and Recovery Act Storage Facility Partial Permit Renewal for the Idaho Nuclear Technology & Engineering Center on the Idaho National Laboratory To Idaho Department of Environmental Quality Waste and Remediation Division RE: Draft Hazardous Waste Management Act/Resource Conservation and Recovery Act Storage Facility Partial Permit Renewal for the Calcined Solids Storage Facility at the Idaho Nuclear Technology & Engineering Center on the Idaho National Laboratory, EPA ID# ID4890008952 Submitted by Chuck Broscious and David B. McCoy on behalf of the Environmental Defense Institute May 9, 2017 [Rev. S] http://www.environmental-defense-institute.org/publications/EDI-CSSF-Permit-S.pdf

[41] Tami Thatcher, Public Comment for inclusion in the public record on US Department of Energy (DOE) Application to renew the Calcined Solids Storage Facility Mixed Hazardous Waste Permit (EPA ID No. ID4890008952) (Docket No. 10HW-1604) July 11, 2016. http://www.environmental-defense-institute.org/publications/EDICalcineComments.pdf

of the INL's high-level waste (HLW) storage and treatment facilities. [42] Leading in the INTEC HLW storage and treatment is the Calcined Solids Storage Facility **(**CSSF), the Integral Waste Treatment Unit (IWTU) and the INTEC HLW Tank Farm Facility (TFF).

Idaho Department of Environmental Quality (IDEQ) and EPA (primary regulatory authorities with jurisdiction over INL) fail to offer the public "in one concise document" what the RCRA permit is required to cover and more importantly what is missing in the Permit. IDEQ must reject the 10-year extension of DOE's Calcined Solids Storage Facility **(**CSSF) Permit and replace it with an annual storage permit based on correcting the following regulatory non-compliance and Settlement Agreement/Consent Order requirements:

1. IDEQ/EPA fail to demand DOE initiate Calcine Retrieval Technology Calcine waste is high-level Waste (HLW) by the definition given in NWPA and DOE Order 435.1 states in section 1: [43]

"High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel. High-level waste includes:

* liquid waste produced directly in reprocessing;
* any solid material derived from such liquid waste that contains fission products;
* and other highly radioactive material that requires permanent isolation."

(Emphasis provided.)

INL's calcite (calcine) waste is clearly high level waste as defined by statute. It is nothing more than solidified SNF reprocessing first cycle raffinate - HLW by definition. DOE may add names to it like SBW. That does not change its character nor does it make it something else. DOE lacks regulatory authority to do that. Idaho Department of Environmental Quality (IDEQ) must force DOE (via the NWPA and Consent Order) to start calcine extraction - starting with the oldest Bins that AoA [44] claims may be problematic and to prevent DOE from permanently grouting calcine in place in violation of RCRA and NWPA. The retrieval process must be done regardless of the treatment chosen. Why wait? DOE wants to reclassify calcine as greater-than-class-c (GTCC) waste not HLW in order to save money on cleanup.

2. IDEQ has the duty under RCRA, 42 USC § 6901 (b) to avoid risk from the following:

"[T]he placement of inadequate controls on hazardous waste management [that] will result in substantial risks to human health and the environment;

"[I]f hazardous waste management is improperly performed in the first instance, corrective action is likely to be expensive, complex, and time consuming;

"[C]ertain classes of land disposal facilities are not capable of assuring long-term containment of certain hazardous wastes, and to avoid substantial risk to human health and the environment, reliance on land disposal should be minimized or eliminated, and land disposal, particularly landfill and surface impoundment, should be the least favored method for managing hazardous wastes."

These unaddressed hazards include:

a. Inadequate flood analysis;
b. Inadequate seismic qualifications;
c. Inadequate accident dose evaluation;
d. Inadequate contaminate migration in soil and aquifer;
e. Inadequate emergency/remediation response in the event of the above a, b, c, and d hazards;
f. Non-existent Current Calcine Bin Set Safety Analysis.

3. The DOE documents presented to IDEQ for RCRA floodplain review present misleading, incomplete, inconsistent facts and conclusions, and fail to comply with the state and/or federal requirements for information to be supplied under the Resource Conservation and Recovery Act (RCRA), the National Environmental Policy Act of 1969 (NEPA) and floodplain/ Wetlands Environmental Review Requirements of 10 CFR 1022 *et seq***.**

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[42] Materials and Fuels Complex also has a spent nuclear fuel reprocessing (pyroprocessing), discussed in Section IV. J below.

[43] **http://energy.gov/sites/prod/files/2013/06/f1/O-435-1_ssm-01.pdf** Page 3

[44] U.S. DOE-EM Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory Volume 1- Summary Report. Hereinafter AoA.

The permit must be **rejected** until DOE/INL first addresses the immediate potential flood hazard and incorporates sufficient measures to protect the INTEC and other INL facilities as required by Idaho Code §39-4409(5). Specifically, corrective action is required prior to permit approval - as stated in IDEQ's Fact Sheet.

"Corrective Action Determination: Idaho Code §39-4409(5) requires, in accordance with IDAPA 58.01.05.008 [40 CFR § 264.l0l (a)], the owner/operator of a hazardous waste facility to institute corrective action as necessary to protect human health and the environment for all releases of hazardous wastes and hazardous constituents from any solid waste management unit at the facility, regardless of the time at which the waste was placed in the unit."

4. Historical Background

DOE/INL is a major generator of high-level (HLW) radioactive waste since its inception in 1949. DOE and its predecessor have never been willing to appropriately deal with this waste unless forced by Federal Court Order. This background is crucial in understanding this Permit. We discuss this long history of blocking every effort to force waste remediation below in the RWMC Section.

Waste Stream ID	Waste Stream Name	Current Storage Volume (m^3)	5-Year Generation (m^3)
ID-TEC-173	Sodium-Bearing Waste	3,222.14	0.00
ID-TEC-174	High-Level Waste Calcine Solids	4,386.00	0.00
ID-TEC-176	IWTU Steam Reform Product	0.00	1,078.00
	Total	**7,608.14**	**1,078.00**

Table 4-3. Waste Calcine and Sodium-Bearing Waste (SBW). [45]

DOE's Permit Extension for INL Seven Calcined Solids Storage Facilities

EPA/IDEQ must require DOE to follow through with 2002 Idaho High-level Waste & Facilities Disposition FEIS, [46] the 1995 Settlement Agreement Consent Order and its own State of Idaho's Preferred Alternative that States in Pertinent Part:

> "The State of Idaho's Preferred Alternative for waste processing is the Direct Vitrification Alternative described in HLW EIS Section 3.1.6. This alternative includes vitrification of mixed transuranic waste/SBW [formerly called HLW] [47] and vitrification of the HLW calcine with or without separations. Under the option to vitrify the mixed transuranic waste/SBW and calcine without separations, the mixed transuranic waste/SBW would be retrieved from the INTEC Tank Farm and vitrified. Calcine would be retrieved from the bin sets and vitrified. In both cases, the vitrified product would be stored at INTEC pending disposal in a geologic repository.
>
> "The option to vitrify the mixed transuranic waste/SBW and vitrify the HLW fraction after calcine separations would be selected **if separations were shown to be technically and economically practical.** Mixed transuranic waste/SBW would be retrieved from the INTEC Tank Farm and vitrified.
>
> "In addition, under the Direct Vitrification Alternative, newly generated liquid waste could be vitrified in the same facility as the mixed transuranic waste/SBW, or DOE could construct a separate treatment facility for newly generated liquid waste." [48] [Emphasis added]

What Happened to the State of Idaho's Preferred Direct Verification Waste Processing?

The State of Idaho has allowed DOE to stall implementing "the Direct Vitrification Alternative" for over 40 years (based on the 1977 EIS that preferred direct vitrification) by allowing DOE to attempt to deploy various

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[45] Idaho National Laboratory Site Treatment Plan, November 2016, INL-STP Rev. 36A.

[46] Idaho High-level Waste & Facilities Disposition Final Environmental Impact Statement, September 2002, DOE/EIS-0287F. Hereinafter called HLW FEIS.

[47] See Background History discussion below for how DOE used the Federal Circuit Court of Appeals to delay a decision on HLW.

[48] HLWFEIS, Section B.9.3.3.1

"separations/steam-reforming treatment" (~17 years) now under construction at the INTEC/Integrated Waste Treatment Unit (IWTU). The "separations" approach to treatment is designed to **maximize** the portion of the waste that can be dumped in the new Remote-Handled Disposal Facility (R-HDF) located between INTRC and the Advanced Reactor Complex and **minimize** the portion that must go to a deep geologic repository.

This IWTU process has failed (after numerous attempts) to perform thus far for the 900,000 gallons of formerly liquid high-level waste (LHLW) now illegally reclassified to a less stringent TRU/Sodium-Bearing liquid waste in the INTEC HLW Tank Farm or treating the Calcine. We discuss this legality issue later. DOE falsely claims calcine treatment is contingent on IWTU as a stalling technique to avoid calcine treatment.

DOE's Stalling on Direct Vitrification Using IWTU as Pre-treatment is not Supported by its Own Analysis.

> "The ability to re-use existing facilities (i.e., IWTU) will be limited (i.e., cost-prohibitive) for more complex processing technologies (i.e., high temperature and/or high pressure) that involve several steps, especially those that require complete decontamination, dismantlement, and removal of all existing processing equipment, while retaining the structure." [49]

DOE's primary focus on "separations treatment" is to maximize waste portion that they think can be buried at INL/R-HDF [50] and reduce more costly volume of waste that will go to a future deep geologic repository out of Idaho required in the original Settlement Agreement. This unnecessarily complicates the treatment process that as we see at both INL and Hanford –do not work and adds to the over-all cost of the project and more delays. [51]

DOE routinely makes one key mistake in treatment design. They emphasize and focus incessantly on maximizing waste loading in the treated waste logs (i.e., cram as much waste into each log that it compromises its long-term durability. They do this to **minimize** the volume of waste logs and the ultimate disposal cost. They do that to the point of stupidity. If they cut the waste loading, the glass easily maintains consistency and properties. They simply focus on the wrong constraint. As a result they actually **maximize** not minimize the costs (that is good for DOE contractors on cost+ treatment agreement. They make the systems more complex and prone to failure as a result.

DOE's Hanford [52] "separations pre-treatment" of its HLLW is a decade's long boondoggle at huge taxpayer expense that is being repeated at INL. The whole "separations treatment" approach has always been about cost cutting and reducing DOE HLW waste repository constipation crisis caused by its own incompetence to do the job correctly the first time. [53] Instead of admitting going down the wrong treatment path and moving quickly to implement piolet plant scale "Direct Vitrification," "proof-of-process" projects DOE has wasted billions of scarce EM dollars on bogus separations treatment plants that don't work. Now DOE is trying to use these self-imposed delays/cost over-runs to use illegal grout-in-place "in-situ entombment" as a cheap solution. [54] DOE is making the same argument for INL HLW that is discussed below.

In EDI's view IDEQ must reject the Calcine Storage Permit and replace it with an annual Storage permit based on progress on development of a "Direct Vitrification" piolet plant scale and calcine retrieval development.

Idaho must incorporate "lessons-learned" so as not to repeat Hanford full scale rush on unproven designs. Some credible vitrification studies have already been done but rejected by DOE. [55] Also IDEQ must force DOE

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[49] U.S. DOE-EM Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory Volume 1- Summary Report, Pg. 27. Hereinafter AoA.

[50] INL/R-HDF is the Remote-Handled Waste Disposal Facility under construction near INTEC also in a flood zone.

[51] http://agportal-s3bucket.s3.amazonaws.com/uploadedfiles/Another/News/Press_Releases/Hanford-Timeline-V4.pdf

[52] HANFORD FEDERAL FACILITY Richland Operations Office,) AGREEMENT AND CONSENT ORDER Richland, Washington) (EPA Docket Number: 1089-03-04-120 Respondent) Ecology Docket Number: 89-54.

[53] United States Government Accountability Office, HANFORD CLEANUP Condition of Tanks May Further Limit DOE's Ability to Respond to Leaks and Intrusions, November 2014 GAO-15-40, Report to the Honorable Ron Wyden, U.S. Senate.

[54] Opportunities Exist to Reduce Risks and Costs by Evaluating Different Waste Treatment Approaches at Hanford DOE Executive Branch GAO-17-306: Published: May 3, 2017. Publicly Released: May 3, 2017.

[55] See: Formulation Efforts for Direct Vitrification of INEEL Blend Calcine Waste Simulate: Fiscal Year 2000, J. V. Crum et.al., Pacific Northwest National Laboratory, Savannah River Technology Center, March 2001, PNNL-13483.

(via the Consent Order) to start calcine extraction - starting with oldest Bins that the Analysis of Alternatives (AoA) study claim may be problematic and prevent DOE permanently grouting in place in violation of RCRA and NWPA land disposal restrictions of HLW. [56]

The INTEC Calcine HLW and SBW tanks have never been RCRA compliant, are >54 years old (long past design life) and therefore fail to meet land-disposal restriction in RCRA. DOE must get a variance from IDEQ for continuing Calcine storage. The law states in part:

> "In accordance with 40 CFR 264.193(g), a variance may be obtained from the secondary containment requirements if it can be demonstrated that the alternative design and operating practices, together with location characteristics, will prevent the migration of any hazardous waste or hazardous constituents into the ground water or surface water at least as effectively as secondary containment during the active life of the tank system." [57]

The Calcine Bin Sets fail on all of the 40 CFR 264.193(g), criteria for a variance for the land-disposal "grout-in-place" "in-situ entombment" restriction in RCRA. In fact, the soil and groundwater under INTEC is seriously contaminated after decades of leaks, spills, and waste mismanagement. [58] This chemical and radioactive contamination has migrated in the underlying Snake River Aquifer all the way to the Magic Valley along the Snake River. [59] A typical example of ~ 14 sample Tank Farm (**near Calcine Bins**) locations in Table B-B-1, A-65 summery of years 1954 through 2003 resulted in a total of 1,623.8 cm of recharge through the Tank Farm to the aquifer below. [60]

Table 4: 1995 INTEC (ICPP) Perched Water Well Sample Data [61]

ICPP Well No.		Gross Alpha	Gross Beta	Strontium-90
CPP-55-06	[A]	7,290	191,000	65,600
MW-2 4,	[A]	700	925,000	516,000
MW-5	[A]	520	211,000	110,000
MW-020	[B]	--	---	25,800
MW-010	[B]	-	--	320,000
MW-15	[B]	--	--	17,200

Notes for above table:

[A] [INEEL-95/0056@2-162] [INEEL-95/0056 @ 5-25]

[B] DOE/ID-10660, pg. 5-67, 5-68

All unites in pico curies/liter (pCi/L)

Table 5: 2002 INTEC Perched Ground Water Sample Data [62]

Contaminate	Concentration	Regulatory Std. (MCL) [63]
Gross Alpha	1,100.00	15
Gross Beta	590,000.00	4 millirem/yr.
Tritium	40,400.00	20,000.00
Strontium-90	136,000.00	8.00

[56] U.S. DOE-EM Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory Volume 1- Summary Report, Pg. 22. Hereinafter AOA

[57] Calcine Permit at D-2f(3)(a)(ii) Proposed Alternate Design and Operation of the Containment System [IDAPA 58.01.05.012 and 58.01.05.008; 40 CFR 270.16(h) and 264.193(g)(1)(ii)]

[58] See EDI's Review of INTEC Tank Farm, Calciner and Groundwater CERCLA Cleanup Plan and Tank Farm Closure Plan, 7/14/16. http://environmental-defense-institute.org/publications/CERCLA.INTEC.pdf

[59] Tritium at 800 pCi/L in the Snake River Plain Aquifer in the Magic Valley at Kimama: Why This Matters by Tami Thatcher, Updated January 5, 2017 http://environmental-defense-institute.org/publications/kimamareport.pdf

[60] DOE/NE-ID-11227, Appendix B.

[61] INEL-95/0056; Waste Area Group 3 Comprehensive Remedial Investigation/Feasibility Study Work Plan (final) Volume 1, August 1995, Lockheed Idaho Technologies Co.; also Chapter 5 OU 3-14 "Nature and Extent of Soil Contamination."

[62] DOE/EIS-0287, Idaho HLW & FD EIS, page 4-52, 4-53 and 4-57.

[63] 40 CFR 140 and 141

Plutonium-238	0.0501	7.02
Americium-241	0.0374	6.34
Iodine-129	0.650	1.00
Technetium-99	476.00	3,790.00
Uranium-233/234	15.30	13.80
Uranium-235/236 0	0.142	13.80

Table 5 References: Units are pCi/L

* Beta particle/photon radioactivity shall not produce annual dose equivalent to the total body or internal organ greater than 4 mrem per year. If the dominate (gross) beta is strontium-90, the MCL of 8 pCi/L can be used.

The point of including this groundwater contamination is that decisions on the Calcine Bin Storage Permit the will permit residual post-closure calcine left in the bins must consider the fact that INTEC is already seriously contaminated - so any new waste mismanagement, leaks, spills are cumulative and therefore must be included in the Permit extension.

In the words of former ID Governor Andrus: "The issues [ID] Governor Batt and I are focused on are bigger and far more important: ***what ultimately happens to the significant quantities of nuclear waste already in Idaho, what is DOE's plan to honor commitments already made, and what happens if we agree to take on even more waste?*** DOE and IDEQ owe all of us a real discussion about these questions, followed by real answers." [64] [Emphasis in original]

IDEQ/EPA Fail to Demand DOE Initiate Calcine Retrieval Technology Calcine waste is High-Level Waste by the definition given in DOE Order 435.1 [65] Calcine Retrieval Technology is Difficult and must not be Delayed any Further

"To date, six [calcined solids storage facilities] CSSFs are being used to store the calcine. Each CSSF design is different in that each CSSF includes a range of three to seven composite bin and sub-bins. In addition to the design differences, each bin includes the following internal obstructions that may hinder the retrieval process: multiple thermos-wells, wall stiffeners, braces, and corrosion coupons. The calcine compositions in these CSSFs vary, depending on feed composition to the calcine. Therefore, the calcine types are layered in the binsets; thus, the compositions defined by CSSF are reported as composite composition." [66]

Here in Idaho we're stuck with DOE's continued obfuscation and stalling on what to do with INL's Calcine HLW despite Court rulings. DOE already is getting away with what amounts to shallow burial for HLW that requires permanent isolation in a deep geological repository. [67] DOE has developed no plan to show that grouted waste tanks are retrievable. After many decades and legal challenges, the only path forward DOE offers is – in-action via continuing studies (see attached list of EAs and EISs) hoping for a cheap remedy and continuing to "store" HLW that is de-facto disposal. So far DOE and the Navy have succeeded- saving billions at the expense of future generations of Idahoans and our collective environment, health and safety. [68]

"Currently, a preferred disposal option for DOE HLW has not been identified, and other options are being evaluated. Thus, the assumptions regarding disposal costs and drivers to reduce the waste form volume, may no longer be valid. Consequently, the uncertainty of the disposition path, and related final waste form requirements, resulted in an additional variable that had to be accounted for during the [Analysis of Alternatives] AoA." [69]

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[64] Letter from Cecil D. Andrus, Governor of Idaho (1971-1977 and 1987-1995 and U.S. Secretary of the Interior under President Jimmy Carter from 1977 to 1981), letter dated October 13, 2015

[65] **http://energy.gov/sites/prod/files/2013/06/f1/O-435-1_ssm-01.pdf** Page 3

[66] Formulation Efforts for Direct Vitrification of INEEL Blend Calcine Waste Simulate: Fiscal Year 2000, J. V. Crum, J. D. Vienna, Pacific Northwest National Laboratory Savannah River Technology Center, Aiken, SC 29808, March 2001, PNNL-13483, Summary. http://www.pnl.gov/main/publications/external/technical_reports/PNNL-13483.pdf

[67] The INTEC HLW tank sediments "heals" were grouted in-place. See Nuclear Regulatory Commission 10 CFR Part 61 regulation excluding any near-surface TRU HLW or TRU LLW disposal.

[68] See EDI's website for numerous reports that document the ongoing migration of INTEC contamination from INL's miss-management of "stored" liquid and solid HLW waste into Snake River Aquifer. http://environmental-defense-institute.org/

[69] U.S. DOE-EM Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory Volume 1- Summary Report, Pg. 1. Hereinafter AOA.

"*Retrieval is required for all feasible options considered and is not a discriminator for this AoA. Retrieval of calcine represents a significant technical and engineering challenge."* [70] *As the Independent Analysis of Alternatives for Disposition of the Idaho Calcined Recommendations state:*

"a. The Calcine Disposition Project should be divided into two subprojects: a) Calcine Retrieval, and b) Calcine Processing. The project near-term priorities should focus on calcine retrieval activities, and limited technology maturation to better inform future processing decisions.

"b. A final decision regarding the processing technology should be deferred until the disposal path is better defined, as well as its expected regulatory framework, and resulting waste form performance requirements.

"c. An independent AoA should be conducted for the retrieval system. It should consider impacts of the as-retrieved calcine feed to downstream unit process steps, and how to optimally manage and subsequently condition these materials such that an acceptable feed is provided (particle size, physical uniformity, blending/chemical uniformity, etc.).

"d. Efforts should be accelerated on development and testing of the most effective retrieval technologies and systems. Significant progress can be made in advance of processing and disposal to address key retrieval risks and uncertainties.

"e. The Calcine Retrieval Subproject should consider the concept of a full-scale radioactive demonstration of the retrieval and transport system, to include retrieval from CSSF #1 to CSSF #6. This would potentially allow for RCRA closure of CSSF #1, which is considered the most suspect CSSF from a structural integrity perspective due to its concentric tube bin configuration.

"f. Additional sampling of actual calcine should be considered, especially during retrieval demonstration efforts, to support development of processing options." [71]

All of the above essential calcine retrieval processes have been known for four decades and yet to be implemented by DOE and the Navy thus adding unnecessary delays. Additionally, there are crucial determinations of the actual condition of the calcine and how it will affect retrieval. Specifically, due to numerous INTEC flooding events, water could have infiltrated into the calcine requiring additional retrieval alternatives beyond the assumption of pneumatic vacuum extraction. Thus delays unnecessarily add risk of more flood water infiltrating the Calcine Bins. This flooding risk also must eliminate DOE s cost-cutting "In Situ Entombment" alternative offed by DOE. [72]

"Interim decay storage (i.e., 100 years or less) of the calcine prior to retrieval and processing, while reducing the overall level of radioactivity, does not appear to provide any benefits related to reduction of [material at risk] MAR and/or hazard class of the facility, and will likely result in the same number of Safety Class systems for the future processing facility. Additionally, it may lead to increased difficulties in retrieval due to continued compaction and potential agglomeration of the calcined solids within the binsets." [73]

The DOE's own Independent Alternative Analysis Report states: "Key challenges related to [Calcine] retrieval includes the following:

- *"The size and number of access risers available for retrieval operations varies by bin. Additionally, the configuration of each binset requiring retrieval is different.*
- *"Clumping/caking of the calcine is expected, but is assumed to be a manageable problem. An exception would be extreme caking, resulting, for example, from large amounts of water entering a bin or sintered bonding due to the temperature and pressure environment over time.*
- *"The actual characteristics of the as-retrieved calcine will be uncertain due to differing chemical and physical properties, coupled with commingling during emplacement and retrieval."*

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[70] AoA, pg. 22.

[71] AoA pg. 24

[72] *In-Place Entombment/Disposal U.S. DOE-EM Independent Analysis of Alternatives for Disposition of the Idaho Calcined High-Level Waste Inventory Volume 1- Summary Report, pg.12*

[73] AoA, Pg. 27

> *"The access challenges can likely be resolved through equipment development and testing. The retrieval activities also provide an opportunity to better understand the physical and chemical characteristics of retrieved calcine. This is important in the context of processing and waste form requirements.* ***Until a disposal path is defined, and the related waste form/processing requirements determined, development of the most effective retrieval technology/system could proceed independently since it is a common need to virtually all processing options."*** [74] [Emphasis added]

The Calcine is a HLW by NWPA definition and Settlement Agreement Court Order and must be road-ready for deep-geologic disposal out of Idaho. There is no dispute here except in DOE's obfuscation to follow Court Order that EPA and IDEQ are equally complicit with.

The Case for Direct Vitrification

"The U.S. Environmental Protection Agency (EPA) has identified vitrification, the process of converting waste into a glass, as the best demonstrated available technology (BDAT) for immobilizing wastes generated during the reprocessing of nuclear fuel. The Batt Settlement Agreement between the State of Idaho, the U.S. Department of Energy (DOE), and the Navy states that all HLW calcine must be treated and considered road ready for repository storage by 2035. New technologies are necessary to successfully design a waste-treatment facility that will meet these INEEL regulatory milestones. Two requirements are to develop (1) glass formulations and (2) integrated vitrification flowsheets that will successfully immobilize INEEL HLWs. The definitions of these glass formulations and integrated flowsheets have been initiated by a cooperative testing program between INEEL, Savannah River Technology Center (SRTC), and Pacific Northwest National Laboratory (PNNL). One of the environmental impact statement (EIS) options being considered as the treatment process for immobilizing INEEL HLW is early vitrification, which includes direct vitrification (bypass pretreatment of waste) of INEEL calcine. This report documents the Fiscal Year 2000 (FY00) activities for developing glass forms to demonstrate the direct vitrification of INEEL Blend pilot plant calcine." [75]

Vitrification: In the context of radioactive waste immobilization, vitrification is the process by which glass forming chemicals (GFCs) or glass frit are combined with waste material and introduced into a vessel, either as a dry powder or slurry, which is heated in the vessel to an appropriate temperature such that a glass, glass-ceramic, or other glass-like product is formed. Several technologies can perform this process, and the efficacy of a specific technology depends on the application.

> *"Two primary categories of vitrification technologies have been investigated and/or implemented for radioactive waste immobilization: 1) melters that use energized electrodes within the melt pool as the heat-generating energy source, often referred to as Joule-heated ceramic-lined melters (JHCMs); and 2) inductively heated melters that use an energized external coil to produce an electromagnetic field, which in turn provides the heat-generating energy source (e.g., cold crucible induction melters [CCIMs]). Multiple variants exist within each of these two broad categories, including in-can batch and continuous processes. These were all considered during the AoA. However, the two most promising includes the conventional JHCM and CCIM, which were considered during the detailed analysis."* [76]
>
> *"For the vitrification option, this resulted in selection of the CCIM due to its greater flexibility in waste form chemistry, operational temperatures, and potentially improved waste loadings. For the low-temperature stabilization option, the [chemically bonded phosphate ceramics] CBPC variant was selected due to its potential for much higher waste loadings, as compared to a saltstone-like grout waste form, and thus lower final waste form volume. Additionally, the final waste form is more robust, in general. The combined results of the two screening steps are depicted in Figure 2*. [77]

Direct Vitrification is the most developed technology and meets all interim surface storage (like SNF currently

[74] AoA, Pg. 4
[75] PNNL-13483, pg.1-1 &2.
[76] AoA, Pg. 5
[77] AoA, pg. 17

in use) as well as deep geologic disposal waste acceptance criteria (WAC). DOE keeps stalling on doing the right thing hoping for regulatory relief from a more "flexible" Congress and Executive Branch.

> "Vitrification systems, regardless of the specific technology, are assumed to be more readily maintained than the [DOE preferred] HIP process due to operational experience within the DOE as well as internationally for these technologies. HIPing has never been deployed for remote, large-scale, radioactive ceramic production." [78]

Direct Vitrification also offers compliance with NWPA and the best treatment, interim storage and disposal solution for the 900,000 gal. highly mixed hazardous TRU radioactive sodium bearing waste SBW and related tank heels. Again, this avoids more tragic "in situ entombment" already used in the INTEC tank farm and the Hanford debacles.

Analysis of Alternatives (AoA) Operability Assumptions for Vitrification

"1. Start-up/Shutdown of low temperature stabilization processes is assumed to require the greatest operator interface due to the need to flush the systems, recycle water, etc.

"2. JHCMs are not amenable to thermal cycling due to refractory cracking concerns, while cold wall induction heating systems (e.g., CCIM, In-can melting) do not have this limitation. This makes start-up/shutdown for JHCMs more problematic, but procedures are well-established from West Valley and DWPF experiences.

"3. For a given processing option, disposal options that have less restrictive waste form requirements, will offer a higher confidence in meeting target production rates. This is primarily driven by the limited ability to perform reliable in-process sampling and analysis of the calcine solids. This will result in a greater likelihood that the waste loadings will have to be reduced to ensure an acceptable final waste form.

"4. Vitrification systems, regardless of the specific technology, are assumed to be more readily maintained than the HIP process due to operational experience within the DOE as well as internationally for these technologies. HIPing has never been deployed for remote, large-scale, radioactive ceramic production.

"5. Waste loadings, and thus final waste volume, for offsite treatment options represent significant risk due to uncertainty as to how the calcine feed would be processed (i.e., blended with existing HLW, processed separately after water/chemicals added to make it compatible with the existing system, fed directly as powder after significant facility modification, etc.)."

Why DOE's Preferred HIPing Treatment Alternative Fails

"The current [Calcine Disposition Project] CDP proposed path forward is to pneumatically retrieve the calcine from the CSSFs and transfer it to the Idaho Waste Treatment Unit (IWTU) for processing. There it will be blended with additives and processed in a hot isostatic pressing (HIPing) system to immobilize the material. The HIPing process was identified as the preferred calcine treatment technology by DOE through the National Environmental Policy Act process, and documented in the resulting High-Level Waste (HLW) Environmental Impact Statement (EIS) Amended Record of Decision (ROD), issued December 2009. As envisioned, the HIPing process will produce a glass-ceramic waste form deemed suitable for disposition of HLW in a geologic repository, ***although the waste form has not been qualified yet for this specific application.***

"The current baseline to immobilize the calcine via HIPing is technically immature, with significant challenges to overcome, which may represent unacceptable project risk. An important factor in the original selection of HIPing was its ability to provide the lowest volume of final waste, while producing a robust waste form.

"Currently, a preferred disposal option for DOE HLW has not been identified, and other options are being evaluated. ***Thus, the assumptions regarding disposal costs and drivers to reduce the waste form***

[78] AoA, pg. 28

***volume, may no longer be valid**. Consequently, the uncertainty of the disposition path, and related final waste form requirements, resulted in an additional variable that had to be accounted for during the AoA."* [79] [Emphasis added]

Note above highlights, DOE's obsession on costs and related volume reduction rather than long term waste forms that will survive the toxic life of the HLW and legal requirements of the NWPA deep geologic repository.

"**In general, while producing a very robust waste form, due to the combined pressure and temperature levels, HIPing is assumed to represent the greatest safety risk of all the processing options considered during the AoA."** [80] [Emphasis added][pg.7]

Analysis of Alternatives (AoA) Safety Assumptions for HIPing DOE Preferred Treatment

"1. High temperature and high pressure processes (e.g., HIPing) represent the greatest safety risk.

"2. Low temperature stabilization processes (e.g., MgPO4) represent the lowest safety risk.

"3. Disposition strategies that require more frequent transportation or multiple transportation steps represent greater risk. This will be driven by final waste form volume and treatment location (i.e., offsite treatment).

"4. Processes that produce more robust waste forms represent lower risk during transportation than those that produce less robust waste forms (e.g., direct HIP versus direct packaging).

"5. Offsite processing options represent an increased safety risk because this disposition strategy will require two shipments: from Idaho to the treatment facility and from the treatment facility to the disposal facility.

"6. Introduction of dispersible powders into the operating vitrification plants, which are designed to manage wet slurries only, will introduce new hazards that may significantly impact existing DSAs.

"7. Achieving acceptable levels (i.e., ALARA principles) of contamination and radiation to allow personnel entry into the IWTU cells for installation of new equipment will likely be cost prohibitive and is not feasible." [81]

AoAs "Alternative Analysis Conclusions:

"1. Selection of the most appropriate processing technology is highly dependent on the disposal path, and the associated waste form performance requirements. A fully informed final decision regarding processing of the calcine cannot be made until the disposal path is known along with the associated regulatory framework.

"2. In general, salt bed formation disposal of DOE-only HLW appears to provide the most flexible and cost-effective disposal path, regardless of processing technology.

"3. Package for direct disposal offers the best alternative for all disposal scenarios, when the baseline criteria weightings are used. ***However, if regulatory or stakeholder concerns have a greater influence, the process options that produce more robust waste forms are preferred.***

"4. [Cold crucible induction melter] CCIM vitrification provides the best processing option if a robust waste form is preferred.

"**5. The current baseline of HIPing appears to represent the least preferable processing technology for all disposal options based on the assumptions and supporting criteria.* ***HIPing represents the highest operational safety risk (e.g., high pressures and temperatures) of all the processing options.

"6. [Deep bore hole] DBH disposal is technically feasible, ***but represents much more***

[79] AoA, Pg. 1
[80] AoA, Pg. 7
[81] AoA, pg.27

> ***uncertainty related to the regulatory framework and overall waste form requirements that will be established****. Additionally, the DBH configuration does not appear to be cost effective for calcine disposal due to the volume of waste. Calculation estimate that approximately 80 boreholes would be required.*
>
> *"7. Package for Direct Disposal is the lowest cost and most technically mature option."* [82]
> *[Emphasis added]*

The above AoAs (Alternative Analysis) conclusions show how DOE's policy makers are constantly revealing how their arbitrary regulatory interpretation and disposal site short-cuts are deliberately slowing the treatment decision. I.e., DOE tried to convince North Dakota on accepting deep bore hole for HLW and were immediately rebuffed. When DOE says above:

> *"However, **if regulatory** or stakeholder concerns have a **greater influence**, the process options that produce more robust waste forms are preferred," their utter disregard for the law, regulations, states, environmental groups, and Tribes legitimate environmental concerns, is made clear. DOE's primary driver above all is cost savings – not long-term environmental stewardship. [Emphasis added] Idahoans cannot allow this policy to compromise our future sole source aquifer*."

High-Level Waste EIS Accident Analysis Tank-Bin Sets

> "CPP-729 Bin set 1; Maximum plausible accident is: Rupture or break in the calcine transfer lines during Calcine Retrieval and Transport operations. Bounding operations accident is: An external event results in: An external event results in 0.50 rem (MEI), 34 rem (NIW), 5,900 rem (OSP), and 3.0 LCF." [83]

The accident doses for all 7 Calcine Bin Sets are the same. The same HLW EIS Table C.4-7. Facility disposition accidents summary for CPP-713 Vault for Tanks VS-WM-187, 188,189, and 190 for Bounding Operations accident, External event results in 0.34 rem (MEI), 23 rem (NIW), 3,500 rem (OSPP, and 1.8 LCF. See comparison table below.

Where LCF = latent cancer fatality; MEI = maximally exposed individual; NIW = noninvolved worker; OSP = offsite population. [84]

Comparison of SBW Tank Vault and Calcine Bin accident doses

CPP-713 vaults for SBW tanks (VES-WM-187, 188, 189, and 190)	**Calcine Bin Set # 1**
An external event results in 0.34 rem (MEI), 23 rem (NIW), 3,500 rem (OSP), and 1.8 LCF.	An external event results in 0.50 rem (MEI), 34 rem (NIW), 5,900 rem (OSP), and 3.0 LCF.

Notes for above Table: LCF = latent cancer fatality; MEI = maximally exposed individual; NIW = noninvolved worker; OSP = offsite population;

MEI of 0.5 is maximally exposed individual --- this is defined usually at the fence or boundary of a facility and the individual is there for plume passage. Shine and inhalation are calculated. Later ingestion of crops or contaminated water is **not** included in the MEI. Remember the windblown calcine and contaminated water does not stop at the facility boundary. IDEQ needs to understand the calcine material that can be dispersed in terms of radionuclide and curie amounts, the characteristics of the material - the calcine is a very soluble powder-like material that will be extremely difficult or impossible to remediate. These doses don't tell the whole story. These analyses do not look at crop losses, unusable land, continued contamination that blows in the wind or migrates in the aquifer.

NIW (noninvolved worker) dose of 34 rem is bad; a very serious exposure with potential for serious health effects, but DOE would conclude that it wouldn't be lethal. Not to worry. The EPA maximum contaminate limit (MCL) for radionuclides is based 4 mrem/year public exposure, or 0.004 rem.

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[82] AoA, pg. 22

[83] DOE/EIS-0287 Table C.4-7. Facility disposition accidents summary, Pg. C.4-55 &56

[84] DOE/EIS-0287 Table C.4-7, Pg. C.4-55

LCF is latent cancer fatality. This is based on industry cancer risk rates for the calculated exposure. Most people are assumed to evacuate so the doses are low. There is no apparent to show/examine the details of this particular analysis. The actual cancer risk is higher if newer cancer rates are used. The LCF also neglects the other health harms of increased heart disease, genetic effects, etc.

OSP is offsite population dose of 5,900 rem is also a serious dose to the general population that must be made public so they can make informed decisions about INL operations.

The above dose table shows that dose from accidental release from only Calcine Bin Set #1 is significantly higher than 4 highly radioactive sodium-bearing waste tanks which like the Calcine Bins use ridiculous, "Materials at risk is low levels of radioactive and hazardous materials."
The 34 rem NIW is a very serious dose to other workers, but DOE would conclude that it wouldn't be lethal. Is this potential exposure fact communicated to those workers?

Informative as this above dose data is, it's based on bogus assumptions such as: The Calcine in Bin Sets "materials at risk is low levels of radioactive and hazardous materials." The tables below listing all the hazardous chemicals and the radionuclides show just how dangerous this material is. These doses don't tell the whole story. These analyses do not look at crop losses, unusable land, continued contamination that blows in the wind (remember calcine is in fine granular form) what DOE calls "contaminate mobility" or (as a soluble) that will easily migrate in the aquifer.

The "external event accident" that they chose looks very unlikely -- implausible. So DOE chose the worst consequences, made the probability look very small without acknowledging that the Calcine Bins were built ~ 1963 (54 years) without adequate seismic consideration. The probability of a very serious event is probably much higher than they made it look which is not apparently stated. The types of initiating events that the calcine bins are vulnerable to and the fact that these initiating events are not remote possibilities, but could be 1 in 150 year events depending on the particular analysis of flooding depth and likelihood and seismic hazard curve and bin set fragility.

Where is the Calcine Bin Set Safety Analysis?

INTEC like other INL facilities has probably conducted safety analysis bordering on the ridiculous to try to minimize the appearance of a safety problem. These are reasons why DOE won't let the public see their Documented Safety Analysis --- they probably don't want to release it and expose how inadequate the safety analysis is. Without the DOE's documented safety analysis and supporting documents, it just isn't realistic to evaluate the hazard issues. The DOE has never included aquifer contamination migration is safety analysis and tends to exaggerate the length of time to reach community wells once in the aquifer.

Flood Hazard Analysis is Required by RCRA

IDEQ fails to offer the public "in one concise document" what the permit covers. In EDI's view, the subject permit must be rejected until DOE/INL first addresses the potential flood hazard and incorporates sufficient measures to protect the INTEC (Calcine Bin Sets) and other INL facilities as required by Idaho Code §39-4409(5).

Specifically, corrective action is required prior to permit approval - as stated in DEQ's Fact Sheet:

> "Corrective Action Determination: Idaho Code §39-4409(5) requires, in accordance with IDAPA 58.01.05.008 [40 CFR § 264.l0l (a)], the owner/operator of a hazardous waste facility to institute corrective action as necessary to protect human health and the environment for all releases of hazardous wastes and hazardous constituents from any solid waste management unit at the facility, regardless of the time at which the waste was placed in the unit."

The Calcine Permit incorrectly claims that "The hydrology conditions at the INL are addressed in the *DOE Programmatic Spent Nuclear Fuel Management and INEEL Environmental Restoration and Waste Management Programs Final Environmental Impact Statement.* [85] A copy of this document has already been provided to

[85] DOE/EIS - 0203F, Volume 1, Appendix B.

DEQ." [86] Hydrogeology is discussed but RCRA **disallows** disposal in a flood zone. DOE cherry-picked what it wanted to use from the Koslow report and deliberately chose NOT to use the results of higher flood PMF-Induced Overtopping Mackay Dam failure. [87] We discuss this issue below.

Flood Issues Not Fully Analyzed in the Calcine Storage Permit

DOE habitually ignores flood issues in all its documentation including this Calcine Storage Permit. There are IMMEDIATE flood hazards that not only affect ALL INL facilities but specifically the vulnerabilities of its HLW inventories and the Calcine Bin Sets as previously noted in the above retrievably discussion. DOE offers no emergency INTEC flood plan. I.e., what response plan will handle a flood that "floats" the calcine bins and severs the riser pipes?

Significant flooding from the Mackay Dam has already been identified in HLW FEIS as a risk to various nuclear facilities at INL/INTEC, such as the INTEC tank farm where liquid radioactive waste is stored. And of great concern, flooding of underground high-level waste tanks at INTEC may cause release of radioactive material by shearing piping and cause extensive release of radioactive liquid over the aquifer or calcine waste over the aquifer and above ground. [88]

The Calcine Storage Permit should be denied on this issue alone.

Previous analyses of INL's flood hazard posed by a probable maximum flood (PMF) generated by high seasonal runoff coupled by overtopping/failure of Mackay Dam clearly document an immediate hazard not only for downstream residents but also INL facilities. The capacity of various improvements to the INL Diversion Dam designed to shunt flood water away from INL facilities are also in question in addition to questions about long-term institutional maintenance.

The US Geological Survey (USGS) released a 1998 report that modeled the **median** 100-year flow rates in the Big Lost River (that flows by the ICPP now called INTEC) downstream of the INL Diversion Dam (6,220 cf/s). The USGS report cross section number 22 at the ICPP puts the median flood elevation at 4,912 feet.[89] Again, this is only the mean flow rate (as opposed to the maximum rate of 11,600 cf/s) of just a 100-year flood, and **not** including any additional cascading events like the failure of Mackey Dam.

The USGS flood map (see attached maps) show the northern half of the INTEC under water. The USGS flood map shows the INTEC elevation of 4,917 feet and the USGS predicted elevation of 4,912 feet through the middle of the ICPP. The USGS study also employed current modeling technics and plotted 37 separate cross sections on the INL site. The INTEC as a whole is about as flat as a table top with only a couple feet change in elevation north to south.[90]

The crucial point here is that even the slightest variation in a Big Lost River flood would put the INTEC Calcine Bins underwater assuming the bins were on the surface – which they are not since they are partially buried. Proportionally less variation in floods would inundate the INTEC the deeper the bins are buried below the surrounding terrain.

Given the significance of flooding issues on all INL facilities and the risk flooding poses for the **continued**

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[86] Calcine Permit at D-2f(3)(a)(iii) Hydrogeologic Setting of the Facility [IDAPA 58.01.05.012 and 58.01.05.008; 40 CFR 270.16(h) and 264.193(g)(1)(iii)]

[87] Engineering Design File, Hydrostatic and Hydrodynamic Forces on the INTEC CSSF During a 100-year Flood, ID-EDF-33996, 10/31/03, pg.2. "The binsets have been identified as Safety Significant per PC-2 per SAR-104 [8] and SAR-106 [9]." "However, the performance category is not used in this analysis since the design basis flood event and scope of the analysis are governed by RCRA regulations." But it was not accurately done.

[88] The HLW/EIS [pg. 4-54] states that "... in the event of a design basis flood with sufficient magnitude and duration, it may be possible that one or more buried [high-level] 300,000 gallon waste tanks could float." Another potential effect could be the failure of high-level waste calcine bin sets. Shearing of service lines and the release of radioactive liquids is another potential hazard in addition to lack of access to tanks needed to receive flood waters pumped from inundated waste facilities.

[89] Preliminary Water-Surface Elevations and Boundary of the 100 Year Peak Flow in the Big Lost River at the Idaho National Engineering and Environmental Laboratory, Idaho, US Geological Survey, Water-Resources Investigations Report 98-4065, DOE/ID-22148

[90] Topographic Map of Block 21, National Reactor Testing Station (now called INL) showing works and structures, U.S. Atomic Energy Commission, Idaho Operations Office, shows three feet change in elevation between the north and south end of the ICPP.

migration of hazardous and radioactive contaminates into the underlying Snake River Plain Aquifer, IDEQ must require that a new independent three dimensional flood study using current modeling methods be conducted as a permit extension requirement.

DOE's Calcine Storage Permit acknowledges "The design basis flood is a 100-year flood coincident with a Mackey Dam failure. The flood water elevation for the postulated flood is 4916 ft. and the flood water depth at INTEC is approximately 4 ft." [91]

This calcine report notes the bottom of Bin Set 3 (CPP-746) at 4865 ft. above sea level which means it will be ~50.5 ft. underwater in a probable maximum flood (PMF).

Idaho Department of Water Resources (IDWR) clearly warns that Mackey Dam could have a problem this year. However, the following issues remain uncorrected.

1.) What IS the Emergency Plan other than the people for contact? Why is it not publicly available even using a Public Records Request?

2.) Were corrections from prior years' inspections made? What was done?

3.) Also it seems like more than one inspection might be necessary given the potential for over topping and the fact Mackay Dam is "high risk".

4. There's an issue as to whether Mackey Dam owners can dump the necessary amount of water to be protective. Where's the analysis for that?

5. IDWR 3/14/17 letter to Big Lost River Irrigation District, RE: Mackey Dam 2017 snow water equivalent that states in pertinent part:

"The purpose for this letter is to encourage you to release as much water as possible from the Mackay Reservoir without flooding downstream properties. ***The reason for my concern is that the runoff forecast volume of 350,000 acre-feet (NRCS-30%) is more than seven times the entire capacity of the reservoir, and the current rate of release(± 400 cfs) is too small to prevent the emergency overflow spillway from discharging uncontrollably to pass all of this expected runoff****. This year, the near record volume of water that presently exists in the snowpack may combine later with unseasonably warm temperatures to create near record maximum flow through the spillway."*

"As you are aware, the maximum spillway capacity is approximately 4,370 cfs measured at the top of the concrete training wall. Exceeding this rate of flow may result in severe erosion of adjacent fill materials. Consequently, the sooner you are able to controllably release the maximum quantity of water from the reservoir, the more likely you will be able to reduce peak discharges through the spillway; I am aware that you intend to increase releases from the outlet as soon as the Big Lost River channel downstream from the dam is clear of ice and other potential obstructions."

Despite this clear warning, there is no indication that Mackey Dam owners will act; or even if they did belatedly respond, that the capacity of either the outlet gates (400 cf/s) could lower the reservoir enough to keep the emergency spillway from overflowing in the potential flood.

The State of Idaho has experience ignoring disasters waiting to happen. In 1976, the earthen Teton Dam began eroding due to a leak at its base, then burst, resulting in 11 deaths and over a billion dollars in property damage. Teton Dam, built during the same era and of similar design, was only 125 miles away from Mackay Dam. News reports at the time mentioned that the Teton Dam owners were warned but refused to release water because their agriculture needs required the water later in the summer.

The State of Idaho only has authority to take control of dams in an emergency condition. EDI has written letters to Governor Otter and Attorney General Wasden about the Mackey Dam RE: "Preventable Disaster" however there has been on response. EDI even requested a copy of the Emergency Plan from IDWR required of the dam owners, and were improperly denied. [92]

The DOE documents presented to IDEQ for RCRA floodplain review present misleading, incomplete, inconsistent facts and conclusions, and fail to comply with the state and/or federal requirements for

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[91] Engineering Design File, Hydrostatic and Hydrodynamic Forces at INTEC CCSF During a 100-Yeat Flood, [ID-EDF-3996, 10/31/03, pg. 1]

[92] John Falk, PE, Idaho Department of Water Resources, Email to Broscious, 3/2/17

information to be supplied under the Resource Conservation and Recovery Act (RCRA), the National Environmental Policy Act of 1969 (NEPA) and Floodplain/Wetlands Environmental Review Requirements of 10 CFR 1022 *et seq*.

The Calcine Storage Permit offers no apparent actions for protection to be taken in the eventuality of a flood. DOE/INL and IDEQ have been cognizant of this problem for decades, and should have decades ago dealt with the problem. Rejection of this permit as presented is an opportunity for IDEQ to correct this imminent hazard that threatens Idaho's sole source aquifer, public health and safety, and the environment when the calcine leaches out during a flood.

IDEQ must consider what additional terms and conditions that should be taken for the flood dangers posed by Mackay Dam, up to and including eminent domain proceedings, relevant to the omnibus provision of RCRA since this is a RCRA Permit proceeding. Section 3005(c) (3) of RCRA (codified at 40 CFR 270.32(b) (2)) requires that each hazardous waste facility permit contain the terms and conditions necessary to protect human health and the environment. This provision is commonly referred to as the "omnibus authority" or "omnibus provision." It is the means by which additional site-specific permit conditions may be incorporated into RCRA permits should such conditions be necessary to protect human health and the environment.

Incomplete Calcine Storage Permit Information

1. Permit calls for removal of calcine and closure but there is no apparent time-line or explanation of how the calcine will be removed and what DOE plans to do with the calcine removed from the bins. Why the decades-long delay?
2. There appears to be a distinction between calcine bin sets in terms of land disposal restrictions that suggests different disposition for different bin sets; (i.e., calcine generated from SNF reprocessing and calcine produced from "sodium-bearing waste"). What are DOE's plans?
3. Is any of this removed calcine destined for the Remote-Handled Waste Disposal Facility and/or WIPP? If so, no clear waste acceptance criteria (WAC) is offered for these facilities and if the calcine meets their WAC.
4. Previously, INTEC calcine was classified as high-level mixed waste. The permit has no apparent statement on this calcine radioactive waste class, direct vitrification treatment requirement, or restrictions to disposal in a deep geologic repository per NWPA requirements.
5. The permit section on flooding only analyzes a 100-year PMF which is grossly inadequate.
6. There are no apparent plans on what to do when the INTEC is flooded, and what affect compromised Calcine Bin leached contents will have on the retrieval, the aquifer and the human environment.
7. The closure plan has no apparent explanation for how the contents of the earlier bin sets (without retrieval piping) will be extracted. Will they be grouted in place like DOE did the high-level waste tanks creating an illegal HLW shallow disposal in violation of Nuclear Regulatory Commission 10 CFR Part 61 regulation, NWPA, RCRA and CERCLA any near-surface disposal?
8. What chemical reaction will flood water contact have on calcine, and treatment?
9. What impact will wet calcine have on retrieval during closure?
10. Why hasn't DOE/INL started transferring calcine from the problematic Bin Sets 1, 2, and 3 to the other Bin Sets with unused capacity? See table below.
11. The Settlement Agreement Consent Order has had little impact on forcing DOE to implement treatment of the huge Liquid HLW and HLW Calcine inventory. Why?
12. DOE provides no Calcine Bin Set Safety Analysis.

DOE <u>1983</u> Calcine Treatment Preferred Alternative is not implemented

> *"The Decision Management Team's recommended Preferred Alternative for calcine was to retrieve the calcine presently stored in the six bin sets at INTEC, vitrify it, and place it in a form to enable compliance with the current legal and regulatory requirement to have **HLW** road ready by a target date*

> *of December 31, 2035. Concurrent with the program to design, construct, and operate the vitrification facility for mixed transuranic waste/ SBW, DOE would initiate a program to characterize the calcine, and develop methods to construct and install the necessary equipment to retrieve calcine from the bin sets. DOE would focus technology development on the preferred calcine treatment technology of vitrification, and the feasibility and merits of performing calcine separations as well as refine cost and engineering design." [emphasis added]* [DOE/EIS-0287, Pg. B-2]

The above **1983** Calcine vitrification plan is the most realistic because it appropriately links both the INTEC HLW tank waste and the Calcine and provided estimates of HLW volumes to be generated through **2015**. Subsequently, the DOE Idaho Operations Office completed the study (DOE 1983) in 1983. That was >34 years ago and DOE is no closer today to offering a solution. What does it take for DOE to move - another law suit and Court Order?

The Permit states: "The [INTEC] area is relatively flat and receives little rainfall. However, poor drainage patterns can produce localized flooding during periods of rapid snowmelt and/or heavy rainfall." [93] So DOE/INL is relying in this permit on questionably reliable; a.) flood information; b.) reliance on INL Diversion Dam to shunt floods away from INL; and institutional control adequate to maintain the Diversion Dam for the hundreds of thousands of years the Calcine will be toxic.

The Engineering Design File used in the Permit acknowledges: "The floodwater elevation for the postulated flood is 4,916 ft. and the flood water depth at INTEC is approximately 4 ft." [94] Also stated is the elevation of Bin Set # 1 is 4,867. That means the Bin Set # 1 will be ~56 ft. below the flood water which will add significant hydrologic pressure on the non-water tight concrete casing with the potential of floating the bins, severing connecting coolant piping and exposing workers to unshielded radiation. [Pg.3 and 4]

The Permit states: "Since a 100-year flood with a Mackay Dam failure is the maximum credible flood associated with a 100-year peak flow in the Big Lost River (exceeding RCRA requirements for a design basis flood event), load factors for floodwater forces and soil pressure were set equal to one.

> "A structural evaluation of the bin set vaults was used to check whether the vault walls are able to withstand hydrostatic and hydrodynamic forces resulting from the postulated 100-year flood. The concrete walls of bin sets 1 to 7 meet the structural requirements given in ACI-318 [4]. The structural capacity of the walls ensures that washout of hazardous waste from these bin sets will be prevented." [95]
>
> "The only pathway for floodwater infiltration into a bin set vault is at pipe penetrations, which are sealed and watertight.
>
> "The floodwater elevation for the postulated 100-year flood coincident with a Mackay Dam failure is 4916 ft. in reference to NGVD29 (Koslow and Van Haaften, [2]). Since the elevation at grade level is approximately 4912 ft., the floodwater depth is 4 ft.
>
> "The wave height of shallow water waves generated by a 60 mph wind with a water depth equal to 4 ft. is approximately 2 ft. from crest to trough (Fig. 10-16 in Brater and King [3]). The maximum water level during the postulated 100-year flood is 4917 ft. (still water level + 1/2 wave height).
>
> "WCF Bin Sets 1 -3 were built from 1959 to 1969 and NWCF Bin Sets 4-7 were built from 1976 to 1985." [96] [Pg. 3]

Despite the above false assurances that the Calcine Bin Sets will structurally not collapse in the postulated flood, there is no apparent detailed analysis of whether floodwater will infiltrate the concrete enclosure and float the tanks inside and sever the piping. This is important given the age stated as: "WCF Bin Sets 1-3 were built from 1959 to 1969 and NWCF Bin Sets 4-7 were built from 1976 to 1985." There is no apparent confirmation of

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[93] INL CSSF HWMA/RCRA Permit Reapplication Attachment 1 - Section B, Facility Description Volume 22 –INTEC May 2016, pg. iii.

[94] Hydrostatic and Hydrodynamic Forces on the INTEC CSSF During a 100-yr Flood, EDF File 3996, pg. 1.

[95] ENGINEERING DESIGN FILE, Hydrostatic and Hydrodynamic Forces on the INTEC CSSF During a 100-Year Flood, EDF No. 3996, pg. 5.

[96] ENGINEERING DESIGN FILE, Hydrostatic and Hydrodynamic Forces on the INTEC CSSF During a 100-Year Flood, EDF No. 3996, and pg. 3.

how reliable this old "water-tight" sealant data is given its age. **There is no analysis for how regional earthquakes have affected Calcine Bin Sets piping and seals over time.**

"Although the Calcined Solids Storage Facility (CSSF) bins are not currently receiving any waste, this permit reapplication allows for the continued use of Bin Sets 1, 2, 3, 4, and 5 for storage and Bin Sets 6 and 7 for storage and to receive future waste transfers.

"From December 1963 to June 2000, the calciners at the INTEC were used to convert approximately 7,920,000 gal of liquid mixed waste into approximately 155,600 ft3 of granular calcine solids. In the calciner processes liquid wastes were injected into a high-temperature (400 to 600o C) air fluidized bed of granular solids. The liquid portion of the waste evaporated and the solids adhered to the granular material-producing calcine. Exhibit D-1 provides a diagram of the typical calciner process flow.

"Calcined solids were pneumatically transferred from the calciner facilities to the CSSF via air transport lines. In the CSSF, the solids are stored in stainless-steel bins located in underground or partially underground concrete vaults to isolate them from the environment. Exhibit D-2 provides the calcine solids flow path from the Waste Calcining Facility (WCF) to the CSSF. Exhibit D-3 provides the calcine solids flow paths from the New Waste Calcining Facility (NWCF) to the CSSF." [97]

IDEQ has the duty under RCRA, 42 USC § 6901 (b) to avoid risking from the following:

"[T]he placement of inadequate controls on hazardous waste management will result in substantial risks to human health and the environment;

"[I]if hazardous waste management is improperly performed in the first instance, corrective action is likely to be expensive, complex, and time consuming;

"[C]certain classes of land disposal facilities are not capable of assuring long-term containment of certain hazardous wastes, and to avoid substantial risk to human health and the environment, reliance on land disposal should be minimized or eliminated, and land disposal, particularly landfill and surface impoundment, should be the least favored method for managing hazardous wastes."

To that purpose, IDEQ must immediately enforce and implement the DOE/INL Settlement Agreement Consent Order to put the Calcine into "road-ready" containers for ultimate disposal in a geologic repository. Additionally, the first step must be to transfer the Calcine from the problematic Bin Sets 1 and 2 into the empty Bin Set #7 and not continue stalling on the four decades long failure to operate the Integral Waste Treatment Facility.

Calcine Storage Facility Inventory [Part A Permit Application Vol.22, pg. 3a]

Bin Set No.	**Inventory** in cubic meters	**Capacity** in gallons/ cubic meters
Bin Set No 1	235	62,086
Bin Set No 2	895	236,459
Bin Set No 3	1,133	299,388
Bin Set No 4	502	132,628
Bin Set No 5	1,025	270,805
Bin Set No 6	1,563	412,944
Bin Set No 7	1,784	471,322

[97] INL CSSF HWMA/RCRA Permit Reapplication Attachment 1 - Section B, Facility Description Volume 22 –INTEC May 2016, pg. 1

Total	5,353	7,137 cm 1,885,595 gallons

Table 1. Summary of High-Level Waste Calcination and Storage at the Idaho National Laboratory (Staiger and Swenson, 2011) [98]

Calcined Waste Production Facility	Operating	Volume of Liquid HLW	Volume of Calcined Waste	Storage Facilities
Waste Calcine Facility	1963–1981	4,091,000 gal (15,490,000 L)	77,300 ft^3 (2,190 m^3)	CSSFs I, II, III
New Waste Calcine Facility	1982–2000	3,642,000 gal (13,790,000 L)	78,000 ft^3 (2,210 m^3)	CSSFs IV, V, VI

Table C.7-2. Bin set total chemical inventory (fission and activation species decayed to 2016).[a] Idaho HLW & FD EIS, DOE/EIS-0287.

Constituent	Total mass (kg)	Constituent	Total mass (kg)
Actinium	1.2×10^{-6}	Molybdenum	2.9×10^{4}
Aluminum	9.7×10^{5}	Neodymium	1.4×10^{3}
Americium	4.4	Neptunium	46
Antimony	10	Nickel	2.6×10^{3}
Arsenic	3.7	Niobium	2.6
Astatine	8.5×10^{-20}	Palladium	110
Barium	770	Plutonium	1.3×10^{3}
Beryllium	3.6	Polonium	2.8×10^{-9}
Bismuth	2.7×10^{-9}	Potassium	2.8×10^{4}
Boron	4.0×10^{4}	Praseodymium	380
Bromine	29	Promethium	5.7×10^{-3}
Cadmium	4.7×10^{4}	Protactinium	2.4×10^{-3}
Calcium	1.1×10^{6}	Radium	2.7×10^{-5}
Californium	1.0×10^{-12}	Rhodium	140
Cerium	850	Rubidium	170
Cesium	740	Ruthenium	1.9×10^{3}
Chlorine	4.5×10^{3}	Samarium	280
Chromium	8.8×10^{3}	Selenium	51
Cobalt	1.6	Silver	8.3
Curium	3.6×10^{-3}	Sodium	1.3×10^{5}
Dysprosium	3.3	Strontium	2.6×10^{3}
Erbium	1.8	Technetium	280
Europium	20	Tellurium	140
Fluorine	8.4×10^{5}	Terbium	0.94
Francium	3.1×10^{-14}	Thallium	0.36

[98] U.S. NUCLEAR WASTE TECHNICAL REVIEW BOARD CALCINED HIGH-LEVEL RADIOACTIVE WASTE

Gadolinium	15	Thorium	6.1
Gallium	14	Thulium	0.14
Germanium	1.2	Tin	43
Holmium	1.1	Uranium	1.7×10^{4}
Indium	4.0	Ytterbium	1.8
Iodine	1.4×10^{3}	Yttrium	260
Iron	2.2×10^{4}	Zinc	71
Lanthanum	440	Zirconium	5.6×10^{5}
Lead	360	NO_3	2.5×10^{5}
Lithium	18	PO_4	2.4×10^{4}
Manganese	1.2×10^{3}	SO_4	5.3×10^{4}
Mercury	1.2×10^{4}		

Why is there is no definition for "chemical inventory (fission and activation species)"

Table C.7-3. Bin set total inventory of radionuclides (decayed to 2016). Idaho HLW & FD EIS

Constituent	Total activity (Ci)	Constituent	Total activity (Ci)	Constituent	Total activity (Ci)
H-3	15	Sm-148	9.0×10^{-9}	Th-227	0.085
Be-10	0.033	Sm-149	2.9×10^{-9}	Th-228	1.6
C-14	0.038	Sm-151	4.5×10^{5}	Th-229	1.4×10^{-4}
Co-60	1.5×10^{3}	Eu-150	5.3×10^{-3}	Th-230	1.4
Ni-63	6.8×10^{4}	Eu-152	430	Th-232	5.0
Se-79	9.9×10^{4}	Gd-152	5.3×10^{-10}	Th-234	2.3×10^{-7}
Rb-87	9.1×10^{-3}	Eu-154	2.9×10^{4}	Pa-231	5.0
Sr-90	7.9×10^{6}	Eu-155	3.9×10^{3}	Pa-233	0.11
Y-90	7.9×10^{6}	Ho-166m	0.014	Pa-234	690
Zr-93	680	Tm-171	1.1×10^{-9}	U-232	5.0
Nb-93m	630	Tl-207	0.085	U-233	6.3×10^{-3}
Nb-94	270	Tl-208	0.16	U-235	1.6
Tc-98	7.3×10^{-4}	Tl-209	1.9×10^{-6}	U-236	0.057
Tc-99	4.6×10^{3}	Pb-209	1.4×10^{-4}	U-237	130
Rh-102	9.1×10^{-3}	Pb-210	0.013	U-238	3.2
Ru-106	4.4×10^{-3}	Pb-211	0.085	U-240	11
Rh-106	0.029	Pb-212	1.6	Np-235	1.5
Pd-107	9.1	Pb-214	0.027	Np-237	3.1
Ag-108	1.1×10^{-5}	Bi-210m	5.2×10^{-17}	Np-238	1.6×10^{-7}
Ag-108m	1.3×10^{-4}	Bi-210	0.013	Np-239	5.1×10^{-17}
Ag-109m	3.8×10^{-17}	Bi-211	0.085	Np-240m	470
Cd-109	3.8×10^{-17}	Bi-212	1.6	Pu-236	0.017
Cd-113m	1.6×10^{3}	Bi-213	1.4×10^{-4}	Pu-238	50
In-115	2.7×10^{-8}	Bi-214	0.027	Pu-239	1.6×10^{-7}
Sn-121m	68	Po-210	0.013	Pu-240	0.027
Te-123	1.3×10^{-10}	Po-211	1.7×10^{-4}	Pu-241	1.1×10^{5}
Sb-125	130	Po-212	0.29	Pu-242	4.8×10^{4}
Te-125m	38	Po-213	1.4×10^{-4}	Pu-243	2.0×10^{3}
Sn-126	310	Po-214	0.027		4.8×10^{4}
Sb-126	43	Po-215	0.085		130
Sb-126m	310	Po-216	1.6		1.1×10^{-13}

I-129	1.6	Po-218	0.027	Pu-244	1.6×10^{-7}
Cs-134	67	At-217	1.4×10^{-4}	Am-241	1.2×10^{4}
Cs-135	360	Rn-219	0.085	Am-242m	6.1
Cs-137	8.8×10^{6}	Rn-220	1.6	Am-242	5.8
Ba-137m	8.5×10^{6}	Rn-222	0.027	Am-243	50
La-138	6.8×10^{-8}	Fr-221	1.4×10^{-4}	Cm-242	4.8
Ce-142	9.4×10^{-3}	Fr-223	0.018	Cm-243	5.0
Ce-144	8.6×10^{-5}	Ra-223	0.085	Cm-244	250
Pr-144	1.4×10^{-3}	Ra-224	1.6	Cm-245	0.071
Pr-144m	1.7×10^{-5}	Ra-225	1.4×10^{-4}	Cm-246	4.6×10^{-3}
Nd-144	4.6×10^{-7}	Ra-226	0.027	Cm-247	5.2×10^{-9}
Pm-146	2.3	Ra-228	2.3×10^{-7}	Cm-248	5.5×10^{-9}
Pm-147	5.3×10^{3}	Ac-225	1.4×10^{-4}	Cf-249	4.0×10^{-9}
Sm-146	8.6×10^{-5}	Ac-227	0.085	Cf-250	1.7×10^{-9}
Sm-147	3.0×10^{-3}	Ac-228	2.3×10^{-7}	Cf-251	6.3×10^{-11}

a. Source for above table: Valentine (2000).

Manual counting of above Total Table C.7-3 [99] Bin set total inventory of radionuclides (decayed to 2016) only counting >2 Ci = **33,987,941 Ci.** This represents an important factor requisite for appropriate evaluation of the subject Permit.

Why is this crucial information NOT in the IDEQs Fact Sheet or in the Calciner Permit but is found in the Idaho High-level Waste Management EIS? Is it because the public would be shocked to know how lethal the calcine actually is and treatment delays are very risky for Idaho?

"Radionuclides that contribute the majority of the activity for wastes managed in the [Calcined Solids Storage Facility] CSSF include Sr-90, Y-90, Ba-137m, and Cs-137. Activity of typical calcine is approximately 10 mCi/g. The exposure rates associated with the calcine routinely exceed 10 rem/h on a 15-mL sample and can pose a potentially serious hazard to workers at the INL, if appropriate protective measures such as time, distance, and shielding are not applied." [100]

In short, this Calcine is deadly and thus must receive appropriate priority to vitrify it into a waste form that can be temporarily stored like the current SNF in "road-ready" canisters for transport out of Idaho to a deep geologic repository.

Table 2. Calcined Solids Storage Facility **(**CSSF)–Total, useable and filled CSSF volumes.

CSSF	Total ($ft.^3$)	Usable	Filled	% Full
1	8,300	8,000	7,800	96
2	31,600	30,000	30,000	100
3	40,000	39,900	39,500	99
4	17,700	17,200	17,100	100
5	36,200	35,600	35,600	100
6	55,200	53,200	25,600	48
7	63,000	63,000	0	0

[99] Table C.7-4. Calculated radionuclide activities for SBW (curies per liter) decayed to 2016 can be found at Idaho High-Level Waste & Final EIS, D0E/EIS-0287 Appendix C. 7, pg. C.7-4.

[100] INL CSSF HWMA/RCRA Part B Permit Reapplication Attachment 2 - Section C, Waste Characteristics Volume 22 May 2016.

Why is this data not in the Calcine Storage Permit to remind everyone how radioactively/ chemically hazardous it is?

The below Table C.7-4. Calculated radionuclide activities for SBW (curies per liter) decayed to 2016 can be found at Idaho High-Level Waste & Final EIS, D0E/EIS-0287 Appendix C. 7, pg. C.7-4. Table C.4-7 is crucial information because it will end up as calcine yet it's NOT in the Permit! Idaho High-level Waste EIS calculated facility disposition summary Table C.4-7 showed a comparison of CPP-713 vaults for sodium-bearing waste tanks with Calcine Bin Set #1. [101]

[101] Table C.7-4. Calculated radionuclide activities for SBW (curies per liter) decayed to 2016 can be found at Idaho High-Level Waste & Final EIS, D0E/EIS-0287 Appendix C. 7, pg. C.7-4.

Table C.7-4. Calculated radionuclides activities for SBW (curies per liter) decayed to 2016.[a]

Radionuclide		Radionuclide		Radionuclide	
Hydrogen-3	1.2×10^{-4}	Samarium-147	2.9×10^{-11}	Thorium-227	8.1×10^{-10}
Beryllium-10	3.1×10^{-10}	Samarium-148	8.5×10^{-17}	Thorium-228	1.5×10^{-8}
Carbon-14	3.6×10^{-10}	Samarium-149	2.8×10^{-17}	Thorium-229	1.3×10^{-12}
Cobalt-60	8.1×10^{-6}	Europium-150	5.0×10^{-11}	Thorium-230	1.3×10^{-8}
Nickel-63	6.0×10^{-4}	Samarium-151	4.2×10^{-3}	Thorium-231	4.7×10^{-8}
Selenium -9	2.2×10^{-5}	Europium-152	4.0×10^{-6}	Thorium-232	1.9×10^{-15}
Rubidium-87	8.6×10^{-11}	Gadolinium-152	5.0×10^{-18}	Thorium-234	4.1×10^{-8}
Strontium-90	0.15	Gadolinium-153	3.1×10^{-31}	Protactinium-231	1.1×10^{-9}
Yttrium-90	0.15	Europium-154	5.5×10^{-5}	Protactinium-233	6.4×10^{-6}
Zirconium-93	6.5×10^{-6}	Europium-155	5.4×10^{-5}	Protactinium-234m	4.1×10^{-8}
Niobium-93m	6.0×10^{-6}	Holmium-166m	1.3×10^{-10}	Protactinium-234	5.3×10^{-11}
Niobium-94	1.2×10^{-4}	Thulium-171	1.0×10^{-17}	Uranium-232	1.5×10^{-8}
Technetium-98	6.9×10^{-12}	Thallium-207	8.1×10^{-10}	Uranium-233	5.4×10^{-10}
Technetium-99	1.7×10^{-4}	Thallium-208	1.5×10^{-9}	Uranium-234	1.8×10^{-6}
Rhodium-102	8.7×10^{-11}	Thallium-209	1.8×10^{-14}	Uranium-235	2.2×10^{-8}
Ruthenium-106	2.6×10^{-10}	Lead-209	1.3×10^{-12}	Uranium-236	7.4×10^{-8}
Rhodium-106	2.6×10^{-10}	Lead-210	1.2×10^{-10}	Uranium-237	1.4×10^{-8}
Palladium-107	8.6×10^{-8}	Lead-211	8.1×10^{-10}	Uranium-238	2.0×10^{-8}
Silver-108	1.1×10^{-13}	Lead-212	1.5×10^{-8}	Uranium-240	1.5×10^{-15}
Silver-108m	1.2×10^{-12}	Lead-214	2.5×10^{-10}	Neptunium-235	4.8×10^{-25}
Silver-109m	3.6×10^{-25}	Bismuth-210m	4.9×10^{-25}	Neptunium-237	2.0×10^{-6}
Cadmium-109	3.6×10^{-25}	Bismuth-210	1.2×10^{-10}	Neptunium-238	1.6×10^{-10}
Silver-110	6.2×10^{-31}	Bismuth-211	8.1×10^{-10}	Neptunium-239	4.8×10^{-7}
Silver-110m	4.8×10^{-29}	Bismuth-212	1.5×10^{-8}	Neptunium-240m	1.5×10^{-15}
Cadmium-113m	1.5×10^{-5}	Bismuth-213	1.3×10^{-12}	Plutonium-236	2.5×10^{-10}
Indium-115	2.5×10^{-16}	Bismuth-214	2.5×10^{-10}	Plutonium-238	7.1×10^{-4}
Tin-119m	1.9×10^{-29}	Polonium-210	1.2×10^{-10}	Plutonium-239	1.6×10^{-4}
Tin-121m	6.4×10^{-7}	Polonium-211	1.6×10^{-12}	Plutonium-240	2.3×10^{-5}
Tellurium-123	1.2×10^{-18}	Polonium-212	2.7×10^{-9}	Plutonium-241	5.8×10^{-4}
Antimony-125	6.0×10^{-6}	Polonium-213	1.3×10^{-12}	Plutonium-242	4.7×10^{-8}
Tellurium-125m	3.6×10^{-7}	Polonium-214	2.5×10^{-10}	Plutonium-243	1.0×10^{-21}
Tin-126	2.9×10^{-6}	Polonium-215	8.1×10^{-10}	Plutonium-244	1.5×10^{-15}
Antimony-126	4.0×10^{-7}	Polonium-216	1.5×10^{-8}	Americium-241	7.4×10^{-5}
Antimony-126m	2.9×10^{-6}	Polonium-218	2.5×10^{-10}	Americium-242m	5.7×10^{-8}
Iodine-129	1.3×10^{-7}	Astatine-217	1.3×10^{-12}	Americium-242	5.5×10^{-8}
Cesium-134	1.9×10^{-6}	Radon-219	8.1×10^{-10}	Americium-243	4.8×10^{-7}
Cesium-135	3.4×10^{-6}	Radon-220	1.5×10^{-8}	Curium-242	4.5×10^{-8}
Cesium-137	0.084	Radon-222	2.5×10^{-10}	Curium-243	4.7×10^{-8}
Barium-137m	0.081	Francium-221	1.3×10^{-12}	Curium-244	2.4×10^{-6}
Lanthanum-138	6.5×10^{-16}	Francium-223	1.7×10^{-10}	Curium-245	5.9×10^{-10}
Cerium-142	8.9×10^{-11}	Radium-223	8.1×10^{-10}	Curium-246	3.6×10^{-2}
Cerium-144	1.2×10^{-11}	Radium-224	1.5×10^{-8}	Curium-247	4.9×10^{-17}
Praseodymium-144	1.3×10^{-11}	Radium-225	1.3×10^{-12}	Curium-248	5.2×10^{-17}
Praseodymium-144m	1.6×10^{-13}	Radium-226	2.5×10^{-10}	Californium-249	3.8×10^{-17}
Neodymium-144	4.3×10^{-15}	Radium-228	2.1×10^{-15}	Californium-250	1.6×10^{-17}
Promethium-146	2.2×10^{-8}	Actinium-225	1.3×10^{-12}	Californium-251	5.9×10^{-19}
Samarium-146	8.1×10^{-13}	Actinium-227	8.1×10^{-10}	Californium-252	7.7×10^{-30}
Promethium-147	4.9×10^{-5}	Actinium-228	2.1×10^{-15}		

a. Source: Valentine (2000).

Are Calcine and Treatment Bi-products High-level Waste (HLW)?

1) The calcine waste is by definition HLW. See definition above in DOE O 435.1 section. DOE cannot take the "high level waste components" out of it. HLW is NOT the high activity portion, i.e., Cs-137 as DOE staff seems to want to believe. HLW is defined in NWPA based on what it came from. Separations are a useless exercise in search of cheap remedies**.** Judge Winmill tentative ruling (stayed) on DOE Order 435.1 reclassification of Hanford HLW is instructive.

U.S District Court Judge Winmill concluded that the separations process at Hanford matches what is described in statute. The liquid waste that DOE calls low activity waste (in 1995 - when they tried and failed to call it low level waste) is high level waste. Accordingly, it must go to deep repository. DOE still plans to try to reclassify it under Order 435.1 as LLW and bury it at Hanford/INL in the near surface. With the Trump administration in charge they might well succeed so IDEQ must get pro-active.

2) The legislative history of the atomic energy and nuclear waste policy acts makes it clear that the reason for deep disposal is the long half-life of the waste. That is the technetium, iodine and actinides. DOE thinks these are low hazard. They are exactly wrong.

3) The calcine can NOT be safely stored for 300-500 years to allow the cesium 137 and Strontium-90 to decay away and take the bulk of the heat with them because**,** as discussed earlier in the AoA discussion**,** the Calcine composition due to compaction, water infiltration**,** and future flooding**,** it may be too late for extraction. Just what DOE is hoping for – so it can be grouted in place and/or the policy makers will not be around to answer for their actions.

IDEQ should not allow the accomplishment of what clearly constitutes illegal disposal of HLW under NRC 10 CFR part 61.

Background History is a Huge Factor in Understanding this Permit

DOE/INL is a major generator of high-level (HLW) radioactive waste since its inception in 1949. DOE and its predecessor have never been willing to appropriately deal with this waste unless forced by Federal Court Order. From December 1963 to June 2000, Calciners at the INTEC were used to convert approximately 7,920,000 gal of liquid mixed hazardous (HLW) into approximately 155,600 ft3 of granular calcine solids. [102]

This huge volume of liquid high-level waste (LHLW) was the product from chemical/acid reprocessing of irradiated reactor fuel for the production of highly enriched uranium/plutonium for nuclear bombs and other military applications. Eleven underground tanks were used to store this highly toxic/radioactive waste in INTEC Tank Farm that also – like the Calciner Bins never could be RCRA compliant as hazardous waste storage units. The Calcine Bins cannot meet RCRA compliance as any hazardous materials waste storage unit much less used for some 54 years for some of the most deadly man-made toxic material; thanks to complicity of State regulators who actively sought authority from EPA to administer RCRA. [103]

As previously noted, the 7 Calcine Bin Sets total mixed HLW inventory of radionuclides (decayed to 2016) only counting >2 Ci = ~ **33,987,941 Ci.** [104] See the above Table C.7-3. Bin set total inventory of chemicals and radionuclides below. This is evidence enough of the calcine lethality and critical role regulations play in protecting the public.

"Radiation exposure at Calcine Bin Set #1 from an external event (i.e., earthquake) results in 0.50 rem [minimally exposed individual] (MEI), 34 rem; [noninvolved worker] (NIW), 5,900 rem; [offsite population]

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[102] HWMA/RCRA Part B Permit Re-application for the Idaho National Laboratory Volume 22 - Calcine Solids Storage Facility (CSSF) EPA ID NO. ID4890008952, Revision O - May 2016- Book 1 office Idaho Cleanup Project, Pg.1.Hereinafter Calcine Permit

[103] Federal Register Volume 77, Number 40 (2/29/12),Proposed Rules],[Pages 12228-12231] [http://www.gpo.gov/] [FR Doc No: 2012-3916]
ENVIRONMENTAL PROTECTION AGENCY, 40 CFR Part 271,[EPA-R10-RCRA-2011-0973; FRL-9633-8]Idaho: Proposed Authorization of State Hazardous Waste Management, Program; Revision, ACTION: Proposed rule, 40 CFR Part 271, [EPA-R10-RCRA-2011-0973; FRL-9633-8], Idaho: Proposed Authorization of State Hazardous Waste Management Program; Revision.

[104] Idaho HLW & FD EIS Table C.7-3. Bin set total inventory of radionuclides (decayed to 2016), pg. C.7-3, D0E/EIS-0287 Appendix C.7, pg. C.7-4. Hereinafter D0E/EIS-0287.

(OSP), and [latent cancer fatality] 3.0 LCF." [105] In other words, it's deadly radioactive! Now DOE wants to extend its Calcine Storage Permit for another 10 years for a total of ~64 years; long past their design life. Given this history, it's a good bet that another extension will be requested in 2027. This delay is an avoidable risk imposed on Idahoans.

The Laws Intended to Force Action on the Legacy of Federal Government's Resistance to Deal with its Waste Generation

The U.S. Congress passed numerous laws starting in the 1970s in an attempt to force federal agencies to be accountable for their actions that include National Environmental Policy Act (NEPA), Federal Facilities Compliance Act (FFACO), Federal Facilities Agreement and Consent Order (FFA/CO), CERCLA, RCRA, [106] and Nuclear Waste Policy Act of 1982 (NWPA) to name only the lead legislative Acts.

As result there have been no less than 21 [107] Environmental Impact Statements or Environmental Assessments directly related to INL's nuclear waste programs that all promised to address the mixed/radioactive waste treatment and resulting contamination remediation. To date, there has been very limited accomplished except a lot of reports, talk, promises and court battles. Now comes DOE with yet another policy to kick the can further down the previable road by requesting that Idaho extend this Calcine high-level waste (HLW) permit another decade.

In addition to the above Congressional legislation specifically designed to reign-in the federal government we see one of the better local examples of push-back on DOE and its predecessors. His name is former ID Governor Cecil Andrus; who initially filed suit in 1991 against DOE and later supported by both Governor Phil Batt and Governor Dirk Kempthorne into the Ninth Circuit Court of Appeals that ultimately produced the Settlement Agreement Consent Order in 1995. It took three successive Idaho Governors to see this process through based in part on what they read in the first INL EIS in 1977. [108] It's a shocking read about the highly secretive INL and more candid than the current variety of EISs.

Our recent Idaho Governors saw how the federal governments' (Congress and DOE) promises are hollow. The issue being; when does perpetual storage become "de-facto" dumping? The result is that Idaho is de-facto nuclear waste dump and Idahoans future is compromised. Andrus had the political will to – as he said – send the biggest – meanest looking State Troopers out to block a spent nuclear fuel (SNF) shipment from Public Services Colorado reactor from crossing the border. Governor Andrus continues his efforts by filing a suit against DOE for denying FOIA documents on its SNF shipment plans at INL which is a significant testament to his long held view of DOE **actual policy is to leave nuclear waste in Idaho**. [109] This Calcine Permit extension is only the most recent example to DOE's "MO." [110]

ID Attorney General Alan Lance was forced in 2002 to go back to Court to force DOE to comply with all the terms of the 1995 Settlement Agreement. Lances' office asked the U.S. District Court to issue an order declaring that the 1995 agreement includes nuclear waste buried at INL. Lance stated:

> *"The agreement requires the federal government to remove all INL transuranic waste no later than 2018 and all SNF by 2035. Although the court-enforceable agreement clearly states that all transuranic waste must be removed, the DOE has taken the position that buried waste is not covered by the agreement. This is extremely important because DOE maintains that the agreement does not require removal of an estimated 30,000 cubic meters of buried transuranic waste. Regrettably, the department is*

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[105] DOE/EIS-0287 Table C.4-7. Facility disposition accidents summary, Pg. C.4-55. "Calcine Bin Set #1 Bounding operations accident; An external event results in 0.50 rem (MEI), 34 rem (NIW), 5,900 rem (OSP), and 3.0 LCF. MEI = maximally exposed individual; NIW = noninvolved worker; OSP = offsite population." The exposure rate is the same for all 7 Bin Sets.

[106] Comprehensive Environmental Response, Compensation, and Liability Act, 1999.

[107] See attached list of EIS/EA related to DOE's INL.

[108] ERDA-1536; Waste Management Operations, INEL Final Environmental Impact Statement, US Energy Research & Development Administration, September 1977 and
ERDA-1552; Final Environmental Impact Statement, Safety Research Experiment Facilities, INEL, September, 1977, US Energy Research & Development Administration.

[109] Case 1:15-cv-00453-BLW Document 24 Filed 08/08/16

[110] Another example is EDI's Notice of Intent to Sue Over DOE's Failure to Comply with the Resource Recovery and Conservation Act, 42 U.S.C. § 6901 et seq. and the Clean Air Act in operation of the New Waste Calcining Facility at the Idaho National Engineering Laboratory, April 11, 2000. EDI's legal action prompted the IDEQ to force DOE to close the NWCF.

> *unwilling to accept that the agreement means what it says. Since the day Governor Batt and I signed the agreement the State of Idaho has been clear and consistent in stating that the agreement will be vigorously enforced."* [111]

What the previous ID Governors realized was – once nuclear waste is allowed in it's nearly impossible to get it out regardless what the federal government pledges to do in court. They lie because there's no accountability. The long history of litigation attests to the fact that the federal government is playing a long game of "catch me if you can," because no judge will put us in jail.

Since the US Nuclear Navy's Naval Reactors Facility is a major contributor to INL's nuclear HLW waste problem, they are also battling Idaho's Settlement Agreement in Court because it restricts shipment of the Navy's reactor spent nuclear fuel (SNF). The Navy even fought and lost Idaho's demand for an EIS on the impact on Idaho's environment, health and safety. [112] Again, the Navy tried to violate a court enforceable agreement that they and DOE originally signed. The bottom line is the federal agencies don't care about the law or Idahoans; they just need a place to cheaply dump their nuclear waste.

Current Idaho Attorney General Laurence Wasden is doing his part by rejecting DOE's requests to send more SNF to INL in violation of the Settlement Agreement. Credible – even heroic – as these actions are, they still have only stalled the process of protecting Idahoans. Decade after decade, the federal government lies, obfuscates accountability.

Listening to the 2/6/17 audio recordings of Idaho House Energy Committee grilling Deputy Attorney General Kathleen Trever on why AG Wasden is denying DOE request for more SNF waste shipments, is tragic to hear the collective ignorance demonstrated by legislators on this crucial issue. DOE is the largest single employer in Idaho with huge economic influence. This discussion is crucial within the context of this Calcine Storage Permit extension because it demonstrates repetition of all the above history of nuclear waste generation and lack of resolution.

In EDI's view**,** IDEQ must reject the Calcine Storage Permit and replace it with an annual storage permit based on progress in development of; 1.) retrieval technology; 2.) "Direct Vitrification" piolet plant scale so as not to repeat Hanford full scale rush on unproven designs. Also IDEQ must force DOE (via the Consent Order) to start calcine extraction - starting with the oldest Bins that AoA claims may be problematic and to prevent DOE from permanently grouting in place in violation of FFCA, CERCLA, RCRA and NWPA. The retrieval process must be done regardless of the treatment chosen. Why wait? Since Bin Set 7 (the newest of the 7) is empty it can be used to develop retrieval systems by transferring calcine from the Bin Set 1 (the oldest and most vulnerable) to Bin Set 7.

The State of Idaho has allowed DOE to stall implementing "the Direct Vitrification Alternative" for over 50 years (based on 1977 EIS) despite near continuous legal challenges by allowing DOE to attempt to deploy various "separations/steam-reforming treatment" at the Integrated Waste Treatment Unit (IWTU). This failed to process the current 900,000 gallons of TRU/Sodium-Bearing liquid waste [113] in the INTEC HLW Tank Farm. These tanks are over 64 years old, single-walled, with leaking concrete vaults. **"**The high infiltration rate predicted by the simulations is consistent with the need to pump the tank vault sumps. Approximately 0.5 cm/year recharge across the entire tank farm area (total area including tanks and surrounding area) is removed from the sumps even though the vaults have concrete roofs." [emphasis added] [114]

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[111] State of Idaho Office of Attorney General Alan G. Lance, press release, 4/18/02.

[112] Civil No. 91-0035-S-HLR (Lead case) Civil No. 91-0054-S-HLR, Order Modifying Order of June 28, 1993.

[113] SBW is a liquid mixed radioactive waste (contains hazardous and radioactive constituents) produced primarily from INTEC decontamination and cleanup activities. SBW also includes approximately one percent (by volume) commingled 1st cycle reprocessing waste, approximately two percent 2nd cycle reprocessing waste, and approximately four percent 3rd cycle reprocessing waste. SBW contains large quantities of sodium and potassium nitrates; however, the radionuclide concentrations for liquid SBW are generally ten to 1,000 times less than for liquid HLW. [Notice of Preferred Sodium Bearing Waste Treatment Technology, Federal Register /Vol. 70, No. 148 /Wednesday, August 3, 2005 /Notices, DEPARTMENT OF ENERGY Office of Environmental Management]. Notice of Preferred Sodium Bearing Waste Treatment Technology, Federal Register /Vol. 70, No. 148 /Wednesday, August 3, 2005 /Notices, DEPARTMENT OF ENERGY Office of Environmental Management

[114] DOE/NE-ID-11227, Appendix B.

DOE steadfastly claims the tanks do not leak; however no credible data is provided distinguishing surface infiltration into the tank vaults from leaks. Regardless, the presence of water in the tank vaults should disqualify leaving the tank sludge/heals in place as a RCRA hazardous waste landfill as planned. It's long past time to implement Idaho's direct vitrification preferred option.

IDEQ is obligated to provide the public "in one concise document" on what the Calcine Storage Permit covers and avoid the public/environmental hazard that the delay in Calcine treatment presents for road-ready transport out of Idaho. Also, the permit must be **rejected** until DOE/INL first addresses the immediate potential flood hazard and incorporate sufficient measures to protect the INTEC and other INL facilities as required by Idaho Code §39-4409(5). Specifically, corrective action is required prior to permit approval - as stated in DEQ's Fact Sheet.

> "Corrective Action Determination: Idaho Code §39-4409(5) requires, in accordance with IDAPA 58.01.05.008 [40 CFR § 264.l0l (a)], the owner/operator of a hazardous waste facility to institute corrective action as necessary to protect human health and the environment for all releases of hazardous wastes and hazardous constituents from any solid waste management unit at the facility, regardless of the time at which the waste was placed in the unit."

The imminent threat of Mackey Dam failure on INL, INTEC, Calcine Bins and any persons' living downstream is real. It seems that the only alternative to obtaining the Mackey Dam Emergency Plan is litigation. IDEQ has a duty to prevent what would be a major catastrophe for the public and INL personnel who are being deliberately kept in the dark about this imminent hazard presumably for purely political reasons. Even if the state required daily inspections during the flood season, knowing what the emergency plans are - there would be some warning system necessary for evacuation of downstream residents and INL nuclear facility operators.

EDI agrees with former ID Governor Andrus when he stated:

> "As you know, I have happily spent many years of my life serving Idaho and her citizens. As your 4-term governor elect, one of my proudest achievements was opposing efforts by the federal Department of Energy to use Idaho as a dumpsite for nuclear waste – laying the groundwork for my successor and friend, Governor Phil Batt, to negotiate the historic 1995 Batt Agreement." [115]

Section IV. C.1 INTEC Remediation Waste Area Group 2

The INTEC (INTEC is interchangeable to ICPP) mission since 1952 has been reprocessing spent reactor (SNF) fuel to extract fissile material (primarily uranium) for military programs. Spills, leaks, and releases over the years resulted in significant contamination of the surface soils and underlying groundwater. INTEC releases 979,486,072 gal/year in system leaks to flush contaminates to aquifer. [DOE/ID-10660,pg. 5-4] Additionally, CPP- 02 released 3,698,408 gal./yr. [DOE/ID-1066002, pg. 5-16] A Remedial Investigation/ Feasibility Study Final Work Plan [INL-95/0056, referenced below as A] for the ICPP was completed in August 1995. The three-party INTEC cleanup Record of Decision was released in 1999 [DOE/ID-10660, Section 5, referenced below as B] was issued. The following table shows surface soil sample excerpts from these studies.

[115] October 13, 2015 Letter from Cecil D. Andrus, former Governor of Idaho.

INTEC CPP Cleanup Site	Contaminate	Concentration pCi/g
CPP-15 Solvent Burner [B] Tank Farm Soil Steam Flush [A]	Am-241 Cs-137 Eu-154 Sr-90 Pu-238 Pu-239-240 Pu-241 U-235	16,600 102,000,000 565,000 56,800,000 276,000 12,600 106,000 9,000
CPP-89 Soil Storage Area [A]	Cs-137 Sr-90	7,730 10,800
CPP-26	Cs-137 Sr-90	11,000 4,900
CPP-34 Soil Storage Area [A]	Cs-137 Sr-90	2,000 6,000
CPP-34 Soil Storage Area [A]	Cs-137 Sr-90	2,000 6,000
CPP-79 Tank Farm Valve Box A-2 12 meters/40 feet below surface Total Tank Farm contaminated soils [A Pg. 5-4]	Sr-90 Cs-137 Am-241 Pu-238 Pu-239	5,410,000 33,700,000 16,600 276,000 89,900
CPP-04/05 Soil around CPP-603 Settling Tank [A]	Cs-134 Cs-137 Ce-144 Co-60 Eu-152 Eu-154 Eu-155	1,450 26,500 2,390 2,390 35,000 35,000 7,600
CPP-19 CPP-603 to CPP-604 Line Leak [A]	Cs-137 Co-60 Eu-152 Eu-154 Eu-155 Sr-90	408,000 21,600 87,600 53,500 9,620 125,000

* The Radiological Release Criteria for Cesium-137 is 10 pCi/gram. [EG&G-WM-8804] INL-95/0056 pg. 2-115

The ICPP Remedial Investigation/Feasibility Study lists 100 chemical/radiological release sites. Of the 100 release sites, 13 are related to the tank farm. The estimate of radioactivity in decayed values in the surface soils within the ICPP compound is 50,000 curies plus 22,200 curies released to the aquifer. [EMSSAB @ 5] Contaminates migrating from the ICPP are found in the following perched water sample data.

Total Tank Farm contaminated soil originally was (111,835 cm) or (146,275 cu. ft.) but later investigations designated as “additional soils” is (84,606 cu m) or (110,660 cu yds) down to 40 ft.. [INTEC-RI/FS, 1998, pg.5-4]

ICPP Well Sample Data

ICPP Well	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Strontium-90 (pCi/l)
CPP-55-06	7,290	191,000	65,600
MW-2	4,700	925,000	516,000
MW-5	520	211,000	110,000

[INL-95/0056@2-162] EPA Maximum Concentration Limit (MCL) for gross alpha is 15 pCi/l; for gross beta 8 pCi/l; for Strontium-90 MCL is 8 pCi/l. [INL-95/0056 @ 5-25]

For more than forty years this INTEC facility processed spent reactor fuel to reclaim enriched uranium for nuclear military programs. The legacy of these operations remains in the form of massive soil and groundwater contamination as well as stored high-level radioactive waste. Soil samples show radioactive contamination 10 million times higher than regulatory standards.

The most hazardous waste is the two million gallons of high-level liquid left in 11 underground tanks. This waste is the ultimate witch's brew of acids, solvents, and radioactive materials. Radiation emanating from these tanks is so intense that a lethal dose could be received just by standing beside a tank. Most of this liquid waste, as well as the tanks holding it, date back to the early 1950s. The design life of the tanks was 20-30 years. Dozens of tank service line leaks have contaminated the soil and groundwater. The Congressional General Accounting Office identified INL's tanks along with Hanford's tanks as having a significant explosive hazard due to gases that are generated in the tanks.

ICPP also stores the majority of the reactor spent fuel at INL. All but one of these storage facilities are recognized as having significant vulnerabilities. For instance, the CPP-603 water pool that keeps fuel elements under 20 feet of water to provide a radiation shield, is leaking more than a hundred gallons of contaminated water into the ground every day. Corrosion caused fuel support systems to fail, allowing the whole assemblies to fall to the bottom of the pool. This could cause a criticality or uncontrolled nuclear reaction to occur.

Trying to develop a cleanup plan for the ICPP while ongoing operations continue to contaminate the site is ludicrous. For example, millions of gallons of radioactive waste water every day are still being dumped in old unlined percolation ponds for "disposal". This waste water drives radioactive and chemical contaminates down to the Snake River Aquifer. Publicly, DOE claims it has no plans to restart ICPP fuel processing. Yet a 1/17/96 ID Division of Environmental Quality ICPP permit notice says that the ICPP "assigned objectives included .... recovery of highly enriched uranium from fuel elements discharged from Naval Nuclear Propulsion Reactors, Research and Test Reactors (foreign and domestic) as well as from other unique fuels that cannot be processed elsewhere." [DEQ@2]

One of the most discouraging policies currently being used by DOE to minimize cleanup expenditures is to assume that the federal government will maintain "institutional control" over the site and thereby restrict public access. Now DOE can claim that there is a minimal hazard because unauthorized persons cannot get near the pollution. Hundreds or thousands of years must pass before the radioactivity will burn off, yet DOE is confident that fences and guards can be maintained.

The Nuclear Regulatory Commission, which controls commercial nuclear facilities, assumes that "institutional control" cannot be assumed, and therefore requires deep geologic disposal to insure no one would be injured. Unfortunately, even these commercial standards are now under attack by vested interests wanting to cut disposal costs.

Congressional cuts to DOE cleanup requirements contrast to increased spending on military nuclear weapons and non-nuclear programs. According to the Center for Defense Information, Congress appropriated $27 billion for nuclear war in 1995 alone. Between 1940 and 1995 the U.S. spent an estimated $3.5 trillion to prepare for nuclear war.

High-level Tank Farm Remediation

Since the beginning of the nuclear age, the unsolved problem of what to do with the radioactive waste has haunted the alchemists. The veil of secrecy let the problems go unnoticed thereby allowing the federal government to delay facing the inevitable waste problem. Only recently has the truth started to emerge and the

awesome extent of the contamination problem revealed. The Department of Energy (DOE) is now obliged to comply with a number of Federal Court Orders and signed agreements with the State of Idaho and the Environmental Protection Agency. One of the many compliance areas is the treatment and disposition of its high-level liquid and solid radioactive waste at the Idaho Chemical Processing Plant (ICPP). This is the plant where the irradiated reactor fuel was dissolved and uranium, barium and other isotopes were extracted for the military. (See Section I(E)(3)).

Faced with legal deadlines, DOE is now generating plans on how to meet these court-ordered requirements. In October of 1996 DOE released a document called "Regulatory Analysis and Proposed Path Forward for the INEL High-level Waste Program." [DOE-ID-10544] This plan lays out in detail what the Department's intentions are for high-level waste disposition. From an environmental advocate's perspective, this plan is a shocking rerun of the terminated Hanford tank waste grouting program. This canceled program involved mixing Hanford's high-level liquid wastes in their tank farm with cement (grout) and dumping it back into the ground.

There are three main categories of radioactive waste, high-level, transuranic, and low-level. Under each of these main waste categories there are numerous subgroups. Different federal regulations apply to the disposal of different waste categories. Because of this regulatory framework, considerable emphasis is given to properly assigning the right category or class to a given waste. Unfortunately, the regulations are not as explicit in defining waste categories as one would hope.

The Nuclear Regulatory Commission defines high-level waste by the process that created it, as opposed to specific characteristics. High-level is, (1) irradiated reactor fuel, (2) the waste generated by the processing of irradiated reactor fuel, (3) the solids into which the liquid wastes were converted.

Another wild card in this process is the regulation on the characteristics of treated wastes. Each high-level repository must have what is called a waste acceptance criterion. This means all waste shipped to that repository must meet certain standards to ensure the contamination will not migrate and compromise the dump. Since DOE does not have a high-level dump yet there are no waste acceptance criteria. The Yucca Mt. Nevada site is still under evaluation. Currently, the collective wisdom is that waste vitrified into a glass form will meet any repository criteria.

Despite the uncertainty of not having high-level waste acceptance criteria, DOE must move forward in selecting treatment technologies and start building the treatment plants. Court ordered compliance agreements with enforceable deadlines are the current drivers. Had DOE followed through with its 1977 INEL Environmental Impact Statement commitments to vitrify the high-level wastes into a glass form, the Department would not be in its current bind. DOE's Record of Decision on its 1995 INEL Environmental Impact Statement (EIS) states that: "The technology selected [for high-level waste] is radionuclide partitioning for radioactive liquid and calcine waste treatment, grout for immobilizing the resulting low activity waste stream, and glass (vitrification) for immobilizing the resulting high-activity waste stream." [ROD(1995)] The EIS further acknowledges that:

"The removal of the final approximately 5,000 to 20,000 gallons of high-level liquid waste (that is, the heel) from the five tanks proposed for replacement (VES-WM-182 through WM-186) would be an existing normal Tank Farm Project."..."Since no materials were found that were completely compatible with the tank heels, and the mechanisms required to ensure mixing would be more complicated than simple removal. Also, one cannot ensure that the grout would prevent migration of hazardous elements (that is heavy metals) into the environment." [DOE/EIS-0203-F Vol.2 Part B C-4.3.1-3]

A similar high-level waste treatment program at the Hanford Nuclear Reservation in Washington State generated so much public opposition that DOE was forced to cancel the project. [HEAL(a)] The question of waste classification played a crucial role in ending the Hanford grouting program. DOE tried in 1990 to delist much of its high-level liquid waste saying it was not really high-level and therefore could be mixed with cement (grout) and dumped back into the ground in concrete cribs. The Oregon and Washington State regulator's position is that the tank farm waste is high-level and therefore, regardless of what DOE's separations treatment is, it must be managed and disposed as high-level wastes. [Dunning]

DOE is trying to pull the same high-level - low-level nonsense at INL apparently thinking Idahoans are not aware of the Hanford escapade. The radionuclide partitioning technology is a process of separating out the

transuranic elements (heavier than uranium) from the rest of the waste and calling it "high-activity." This "high-activity" waste would then be vitrified (made into glass) and eventually shipped to a geologic repository. The "low-activity" waste (everything else) would be mixed with cement and dumped back into the high-level tanks at the ICPP or into the ground at the INL Radioactive Waste Management Complex. The driver to this treatment approach is money. DOE says the separations approach is cheaper because the volume shipped to a geologic repository is small and the volume dumped back into the ground is large. The National Academy of Sciences' analysis of the comparative costs between vitrification and extensive separations suggests that direct vitrification is the least expensive. [NAS(1996)] The Department also thinks that it can ship the small volume of high activity waste to another site to be vitrified, thereby avoiding building a plant at INL. Since DOE is building a vitrification plant at Hanford, the Department likely will ship INL's high-activity waste there for treatment and avoid spending the $3 billion on vitrification plant in Idaho. If DOE follows through with this plan to ship to Hanford, Dirk Dunning of the Oregon Department of Energy says his state's jurisdiction over Hanford and transportation will kick in.

Another driver is waste repository capacity. Even if DOE can open Yucca Mt., its design capacity is not sufficient to hold the accumulated volume of commercial power reactor waste plus the military high-level waste (HLW). INL's radioactive waste is considered military because it was generated in support of the nuclear weapons programs. DOE now acknowledges that ". no [INL] HLW will be sent to the first repository by 2035. The second repository will take 30 years to license and open." [DOE-ID-10544@2]

Because of this waste constipation, DOE is looking for every excuse to reduce the volume of high-level waste requiring repository space. To complicate the problem further, DOE is not looking for another repository site that will be needed even if Yucca Mt. opens.

The show stopper of the Hanford grouting program occurred when the States of Washington and Oregon and the Yakima Indian Nation filed a petition with the Nuclear Regulatory Commission (NRC) for a rule making on the classification of the Hanford tank wastes. [Petition] DOE backed down when the grouting (mixing with Portland cement) of the tank wastes did not meet the disposal requirements for high-level waste in the NRC regulations. The NRC did subsequently release a vaguely worded discussion paper in an attempt to answer the Petitioner's request. [Fed.Reg.]

Hanford now is planning to vitrify both the high and low activity parts of its high-level wastes. The low-activity parts are to be stored on-site in a retrievable form. Thomas Tebbs with the Washington Department of Ecology believes this is a step in the right direction but is a waste of resources to separate the high and low wastes; it would be best to vitrify the whole volume together in one operation.

DOE's cleanup shortcuts at INL make it clear that the culture within the Department has not changed. Shortcuts taken over the last four decades are the reason we now see cleanup cost pushing $29 billion [BEMR(c)] to partially remediate the site under Superfund. Every year, every decade that passes, the costs only escalate. The worst part of delaying environmental restoration is that the pollution migrates away from the source every day. The further contaminates migrate the more unlikely any corrective action can be taken.

DOE's INL high-level waste (HLW) planning document perpetuates this shell game by stating: "The sodium-bearing and other mixed liquid wastes stored in the ICPP Tank Farm should not be classified and managed as HLW." [IDO-14362, IDO-14295, IDO-1414307, IDO-14300, IDO-14567] This sodium-bearing waste constitutes about three-quarters of the total high-level volume (~ 1.9 million gallons) in the ICPP tank farm. The Environmental Defense Institute's review of the quarterly report of the ICPP's former operator, Phillips Petroleum Co., shows clearly the chemicals used to dissolve the reactor fuel rods were sodium nitrate and sodium hydroxide. Wastes generated in the fuel dissolution process went to the tank farm. There is no question that this waste meets the Nuclear Regulatory Commission definition of high-level waste.

INL is unique from Hanford and other DOE sites because it used a calcining treatment process that converts most of the high-level liquid waste into a granular form stored in seven large underground silos at the ICPP. The Calciner is a incinerator that burns off the liquid portion and mixes the residual ash with granular calcine material so it can be pneumatically easily handled. Unfortunately, the sodium-bearing waste is not readily calcined unless it is diluted with aluminum nitrate. DOE put off calcining the sodium-bearing waste until it was faced with court-ordered deadlines.

The sodium-bearing waste volume in the ICPP tank farm is about 1,648,400 gallons.[DOE-ID-10544@6]

DOE's recent attempt to reclassify or delist this high-level waste is illegal because it meets the Nuclear Regulatory Commission definition that includes the waste generated by reprocessing spent reactor fuel and the concentrated wastes from subsequent extraction cycles, or equivalent.

Between 1954 and 1963 the Idaho Chemical Processing Plant (ICPP) dissolved two-day cooled Materials Test Reactor (MTR) fuel. This fuel reprocessing program was known collectively as the RaLa runs, INL's equivalent to Hanford's Green Runs. Over this period, more than 113 separate process campaigns were run for the separation of barium-140 delivered to the Oak Ridge National Laboratory and Los Alamos for military programs. The RaLa campaigns used unique chemical separation processes from other ICPP nitric, sulfuric, or hydrofluoric acid uranium extraction campaigns. "This [RaLa] process involved the dissolution of MTR assemblies in a sodium hydroxide-sodium nitrate solution leaving a precipitate of sodium diuranate and fission products." [IDO-14445@14] Early Atomic Energy Commission documents leave no doubt that the sodium-bearing high-level waste in the ICPP tank farm is the result of spent nuclear fuel reprocessing and therefore appropriately designated as high-level. Admittedly, a certain amount of the sodium-bearing waste is from decontamination flushes. However, it is still a product of irradiated reactor fuel reprocessing containing all the characteristics of HLW. DOE's own characterization of the sodium-bearing waste acknowledges that it exceeds the low-level Class C definition because of its high alpha emitter constituents. [DOE-ID-10544@8] Uranium and plutonium are alpha emitters.

Even more troubling is DOE's attempt to use "cementitous [grouting] solidification for treatment" of this high-level waste. The discredited Hanford experience [Hanford] where hundreds of millions of dollars were wasted on a high-level waste grouting program appears to be conveniently forgotten at DOE Idaho Operations Office. Internal DOE Hanford contractor reports revealed that the physical integrity of the grout would not last long. When radionuclides decay, they give off heat and radiation.

"Under the expected disposal conditions...the grout will remain at elevated temperatures for many years. The high temperatures expected during the first few decades after disposal will increase the driving force for water vapor transport away from the grout; the loss of water may result in cracking ... as the grout cools... (it) may draw moisture back into the grout mass. The uptake of moisture may have detrimental impacts on the behavior of the grout." [HEAL(b)]

Additionally, DOE's attempt to reclassify the sodium-bearing waste may be a violation of the State Agreement with DOE that orders the Department to calcine all the waste in the ICPP tank farm. The order states that: "DOE shall commence calcination of sodium-bearing liquid high-level wastes by June 1, 2001. DOE shall complete calcination of sodium-bearing liquid high-level wastes by December 31, 2012." [Batt(a)] Even if DOE fulfills its commitment to calcine the sodium-bearing wastes the issue remains about the classification of the partitioned "low-activity" part that DOE wants to mix with concrete and dump back into the old waste tanks. All the calcine (~3,800 cubic meters) is slated for the same chemical separations process to divide the "high-activity" from the "low-activity" parts.

Another very troubling part of DOE's plan is to leave the high-level tank farm sediments (heels) in the tanks. "The ICPP Tank Farm heels will not be removed and the Tank Farm will be closed under RCRA [Resource Conservation Recovery Act]." [DOE-ID-10544@3] DOE thinks that: "The closed Tank Farm would probably meet the subtitle D landfill standards for industrial waste." [DOE-ID-10544@13] Subtitle D is a municipal garbage dump classification. It is obvious to the most pedestrian observer that garbage and radioactive waste are different. This literally translates into INL becoming a permanent high-level waste dump site.

The tank heels can be removed by conventional dredging techniques or use the Hanford Tank Sluicer Mechanism. DOE believes: "However, it is not practical to remove all of the heels from the INL tanks, decontaminate the equipment, and remove all surrounding soils due to technological, economic, and health and safety factors involved." [DOE-ID-10544@20]

The Environmental Defense Institute (EDI) believes that the best approach is directly to vitrify the whole volume of the sodium-bearing liquid and the calcine high-level wastes without any partitioning or separation of "high-activity and low-activity" wastes. Sediments and all tank heels must be included in the waste to be vitrified. The State of Idaho must fully review the failed Hanford grout program before committing to a similar project at INL.

A reasonable person may ask, "doesn't EPA Region 10 cover both Hanford and INL?" Why are these

regulators, who are involved in all the decisions with both sites, not communicating with the Idaho State regulators? Are there no "lessons learned" at the EPA? Part of this problem revolves around the different regulatory authorities that are applied. The INL Tank Farm falls under the jurisdiction of the Resource Conservation Recovery Act (RCRA) the regulation of which Idaho has primacy. EPA granted Idaho this authority, however, EPA maintains review authority if the State does not appropriately enforce the regulation. So for the time being, EPA is sitting on the sidelines with respect to the INL Tank Farm wastes.

Another reason the Environmental Defense Institute disagrees with DOE's separating the high activity and low activity parts is the chemistry. Part of the problem is the complexity of the chemistry involved in separating or partitioning radionuclides from each other in this high-level witch's brew. INL scientists recently completed the first stage of a multi-year project called Efficient Separations and Processing Program that preprocesses high-level waste and is funded at a half million per year through DOE's Office of Science and Technology. This project reportedly "separates highly radioactive elements from waste, reducing the volume of high-activity waste that must be disposed of at a repository." [STAR] This separations/ partitioning process is also called Transuranic Extraction (TRUEX). Despite the proliferation implications of this program, the grouted residual from this solvent extraction process is destined for low-level burial; or the preferred option is dumping it on top of the waste tank heels. A Science Program Symposium in Richland, Washington on June 26, 1996 sponsored by DOE showed that the Department is still struggling with the basic science of chemical separation and the applied technology is still in the hypothetical stage. This means that millions of additional R&D dollars will be required to test the technology.

The INL Pit 9 waste treatment plant could not get the chemical separations/ partitioning to work. DOE was forced recently to announce a two-year delay while the chemists and engineers go back to the drawing board. This Pit-9 reburial of the residuals of chemical separations approach does not enjoy public acceptance for many reasons. First, the classification of low-level waste has no connection with environmental, health and safety hazards. [IEER(c)@89] It is merely a catchall category for all waste not classified as high-level or transuranic. Secondly, the public demands that the entire volume of the waste be processed directly into a stable vitrified form so that the inevitable interim on-site storage does not continue the migration of contaminates into the environment. Remember, DOE thinks maybe a second repository will be available in forty years. The Final Report from the Hanford Tank Waste Task Force got it right by recommending:

"The high cost and uncertainty of high-tech pretreatment and R&D threatens funding for higher performance low-level waste form, vitrification, and cleanup."..."Put wastes in an environmentally safe form, using retrievable waste forms when potential hazards from the waste may require future retrieval and when retrievability does not cause inordinate delays in getting on with cleanup."..."Let the ultimate best form for the waste drive decisions, not the size nor timing of a national repository."..."Accept the fact that interim storage, at least, of the waste in an environmentally-safe form will occur for some time at Hanford. Select a waste form that will ensure safe interim storage of this waste." [Hanford@11]

Another reason why waste must not remain at the ICPP is the risk of flooding. A 1996 DOE Environmental Assessment (EA) for TAN Pool Stabilization noted that the maximum probable flood is considered conservative as the last flood (12,000 years ago) with the magnitude of 35,000 cubic feet per second.[DOE/EA-1050 @B-4] This flood would easily overflow the diversion dam capacity of 9,300 cubic feet per second. The EA predicted that the ICPP would be two feet under water during such a flood. However since the ICPP is 130 feet lower in elevation than the Big Lost River Channel, it is likely to be under more than two feet of water. [IDO-22056@8]

In summary, the repeated mantra "get on with cleanup" in the Hanford Waste Tank Task Force is repeated in public interest group reports. [HEAL(c)] DOE is wasting precious resources by refusing to recognize the public's demand for real solutions to the radioactive waste problem. DOE must "get on with cleanup" and apply research and development (R&D) to technologies that will put all radioactive waste into a stable vitrified form for on-site storage for the near-term because there are no guarantees on any repositories coming on line soon. Additionally, the DOE is remiss in not investing in the essential R&D on emissions control that will be key to health and safety issues in all waste processing.

Vitrification processing cannot be avoided in stabilizing and preparing the waste to meet future repository acceptance criteria. To ensure that the nuclear legacy mortgage is paid, the Department must make its case to

Congress for specific funding for INL Waste Immobilization Vitrification Plant. Idaho State and Environmental Protection Agency regulators must aggressively challenge DOE's attempt to reclassify formerly high-level waste as low-level and learn from the Hanford debacle.

Section IV.C.1.a **INL's Calcine Waste** by Tami Thatcher

The 1995 Idaho Settlement Agreement [116] requires packaging of the calcine in order to ship it and requires shipping the calcine to an as of yet unidentified repository by 2035. IDEQ needs to plan for the contingency that the DOE is tardy, and must address seismic weakness of the calcine storage, rather than allow the lack of a repository for the calcine high level waste to become an excuse to delay repackaging of the calcine to a road-ready condition. [117]

The LINE Commission 2013 report [118] makes the strong push for Idaho to put repackaging of the calcine behind reactor research funding for the INL. The LINE Commission report fails to represent the interests of Idahoans and does not disclose how continued calcine storage leaves Idaho vulnerable to accidents including severe Natural Phenomena Hazards events that can cause release of the calcine. The serious hazard posed by calcine waste storage is not discussed in any meaningful way but is instead waived away in LINE presentations and is not presented in IDEQ distributed literature concerning the calcine. The presumed low risk is not backed up by any meaningful disclosure of an adequate risk analysis. Idahoans must examine the facts.

While it is significant that the 4,400 cubic meters of calcine granular solids is not currently leaching into the aquifer, numerous buried waste sites at INL have leaked and are leaking and the INL's INTEC liquid high-level waste (HLLW) tank farm and other INTEC locations have leaked radionuclide and chemical contamination into soil and the Snake River Plain aquifer. It is important to recognize the extraordinary high quantity of calcine high-level waste generated from reprocessing SNF producing 7,733,000 gal. (29,280,000 L) of HLLW. [119] That is essentially an enormous amount of spent nuclear fuel minus the uranium-235 and volatiles. The hazard posed by the 30 million curies [120] of highly soluble and readily dispersible form of the calcine material must be respected. The **basic inability to mitigate a release from a calcine bin set must be recognized and emphasized** along with recognition of the inevitable far-reaching devastating **long-term environmental consequences that cannot be remediated** should a serious breach of one or calcine bin sets occur.

While the calcine bin sets are not in the dire shape of leaking tanks at Hanford, LINE Commission speakers should not placate Idahoans with comparisons of Idaho's waste problems to the already horrible and continuing to deteriorate state of environmental devastation at Hanford's DOE waste site that will never be remediated. Calcine blowing in the wind, with its powdered laundry detergent granularity, would be difficult or impossible to remediate.

IDEQ must require the DOE to put the calcine into a less vulnerable condition and must do so with more urgency, not less, because of the lack of a designated repository for the high-level calcine waste.

The DOE emphasizes that the bulk of the calcine radioactivity will decay away in a few hundred years; there

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[116] See more about Idaho's Settlement Agreement at https://www.deq.idaho.gov/inl-oversight/oversight-agreements/1995-settlement-agreement.aspx

[117] EDI filed a Notice of Intent to Sue DOE Sue 4/11/2000 Over DOE's Failure to Comply with the Resource Recovery and Conservation Act, 42 U.S.C. § 6901 et seq. and the Clean Air Act in operation of the New Waste Calcining Facility at the Idaho National Engineering Laboratory. DOE subsequently closed the NWCF.

[118] See the Leadership in Nuclear Energy Commission reports and the 2013 report at LINE Exec Summary: http://gov.idaho.gov/mediacenter/press/pr2015/pdf/LINE%20Exec%20Summary.pdf The LINE commission report narrative downplays the hazards posed and the lack of a designated repository for permanent disposal of calcine, arguing instead for the State of Idaho to ignore the calcine, delay repackaging and forget about the 1995 Idaho Settlement Agreement. Specifically, the 2013 LINE report states: "Thus, the state should be open to alternative approaches for the calcine; this could include the possibility of keeping the calcine in its current, safe storage configuration so long as any change in plans brought commensurate value to the state of Idaho, such as redirecting the funds saved to other INL [research] projects."

[119] U.S. NUCLEAR WASTE TECHNICAL REVIEW BOARD CALCINED HIGH-LEVEL RADIOACTIVE WASTE. See attached report.

[120] Ibid. Based on the value given in Carter *et al.* (2013, Table F-1), decay corrected to January 1, 2017. As with all government reports there is a significant discrepancy between this 30 million curie and DOE's report of 33.1 million curies likely due to how decay factors are applied.

are 33.1 million curies (assuming decay to 2016). The strontium-90 and cesium-137 do make up the bulk of the radioactivity, driving shielding needs and do pose a huge environmental hazard if released now. But often ignored in presentations to the public is the toxicity over millennia from other radioisotopes in the calcine, should they be allowed to migrate to the aquifer. If calcine were allowed to leach into soil from the vaults containing the bin sets, the calcine will leach into the aquifer. There would, realistically, be no cleaning up the contamination. Once in the aquifer, the contamination flows downstream to communities, even if the contamination lies deeper in the aquifer than is typically monitored or acknowledged.[121]

It is instructive to compare the quantities and radioisotopes of stored calcine to the waste buried at the Radioactive Waste Management Complex that will not be exhumed. [122] [123] Leaving aside the Sr-90 and Cs-137, the analysis of the buried waste migration at RWMC to the aquifer show that the dominant long-lived and mobile radioisotopes contributing the most to radiation dose come primarily from drinking water come from carbon-14, chlorine-36, iodine-129, technetium-99, neptunium-237, uranium, plutonium and americium-241.

The full inventory of calcine chemical and radionuclides are provided at the end of this letter in two tables from DOE/EIS-0287. [124] A comparison of radionuclide inventories for RWMC, the replacement for RWMC (the Remote-Handled Low-Level Waste Facility), [125] and calcine stored at INL are provided in Table 1 to highlight important radionuclides.

Table 1. Calcine bin set total radionuclide inventory comparison to the waste that will remain buried at RWMC and to the replacement for RWMC.

[121] Geophysical Logs and Water-Quality Data Collected for Boreholes Kimama-1A and -1B, and a Kimama Water Supply Well near Kimama, Southern Idaho By Brian V. Twining and Roy C. Bartholomay, 2011 Prepared in cooperation with the U.S. Department of Energy (DOE//ID 22215) Data Series 622. http://pubs.usgs.gov/ds/622/pdf/ds622.pdf Herein are presented deep aquifer contamination consistent with historical Idaho National Laboratory waste water releases, yet there is no stated recognition of that fact.

[122] U.S. Department of Energy, 2007. Performance Assessment for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11243. Idaho National Laboratory, Idaho Falls, ID and U.S. Department of Energy, 2008. Composite Analysis for the RWMC Active Low-Level Waste Disposal Facility at the Idaho National Laboratory Site. DOE/NE-ID-11244. Idaho National Laboratory, Idaho Falls, ID. (https://www.inl.gov/about-inl/general-information/research-library/ Search the DOE-ID Public Reading Room for the reports.

[123] See that the publically available administrative record for RWMC cleanup does not contain the assessment of radionuclide migration and radioactive doses after 10,000 years. The pre-10,000 year contaminant migration is artificially suppressed for the first 10,000 years and then rapidly escalates and stays elevated for hundreds of thousands of years. See the Administrative Record at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documents for documents associated with this cleanup action, including "Record of Decision" documents and EPA mandated Five-year Reviews at http://ar.inel.gov or http://ar.icp.doe.gov

[124] Idaho High-Level Waste and Facilities Disposition Final Environmental Impact Statement, DOE/EIS-0287, September 2002. http://energy.gov/nepa/downloads/eis-0287-final-environmental-impact-statement

[125] US Department of Energy, "Environmental Assessment for the Replacement Capability for Disposal of Remote-Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site," Final, DOE/EA-1793, December 2011. http://energy.gov/sites/prod/files/EA-1793-FEA-2011.pdf

Radionuclide (half life)	Calcine Inventory (curies)	Buried (existing) RWMC Inventory (curies)	Buried (future) Replacement RH-LLW Inventory (curies)
Carbon-14 (5730 year)	0.038	731	432
Chlorine-36 (301,000 year)	0	1.66	260
Iodine-129 (17,000,000 year)	**1.6**	0.188	0.133
Technetium-99 (213,000 year)	**4600**	42.3	16.7
Neptunium-237 (2,144,000 year)	**470**	0.141	0.003
Uranium-232 (68.9 year)	1.6	10.6	0.00036
Uranium-233 (159,000 year) Product bred from U-235 and thorium, also decay of Np-237	0.057	2.12	0.0001
Uranium-234 (245,500 year) Pu-238 decay product	**130**	63.9	0.0012
Uranium-235 (703,800,000 year)	**3.2**	4.92	0.005
Uranium-236 (23,400,000 year) Pu-240 decay product	**11**	1.45	0.0001
Uranium-237 (0.0185 year to Np-237)	**1.5**	-	-
Uranium-238 (4,470,000,000 year)	3.1	148	16.2
Thorium-228 (1.92 year to radium-224) Natural thorium decay and Pu-240 decay product	1.6	10.5	-
Americium-241 (423 y decays to Np-237)	12,000	215,000	0.38
Plutonium-238 (87.7 year)	**110,000**	2080	-
Plutonum-239 (24,000 year)	**48,000**	64,100	-

Notes for above Table 1

* Calcine inventory from DOE/EIS-0287; RWMC buried waste inventory from DOE/NE-ID-11243/11244 (figures cited may not be the latest estimates); replacement remote-handled facility INL-EXT-11-23102.

****Bold** highlighting of calcine inventory indicates a similar or larger inventory than the buried RWMC waste. The RWMC buried waste is estimated by the DOE to yield 100 mrem/yr doses in drinking water for millennia unless a perfect soil cap limits the estimated doses to be 30 mrem/yr. Importantly, the inevitable spikes in contamination due to flooding have not been accounted for despite RWMC flooding

in 1963 and 1969. The dose estimates are not conservative. The assumed dilution factors are not consistent with past INL aquifer contamination migration. Calcine migration Kd coeffients may be different than used for RWMC and may worsen the effect of calcine in the soil.

Table 2. Perspective on the quantity of radionuclides in the stored calcine.

Radionuclide (half life)	Inventory (curie)	Maximum Contaminant Level	Dilution volume (Liter) [b]	Number of Aquifers to Dilute
Sr-90/Y-90 (Sr-90 29.1 year)	15,800,000	8 pCi/L	1.975E+18 1,975,000,000 billion	809
Cs-137/Ba-137m (30.2 year)	17,300,000	160 pCi/L	1.081E+17 108,000,000 billion	44
C-14 (5,730 yr)	0.038	2000 pCi/L	1.90E+7 0.019 billion	<<1
Cl-36 (301,000 yr)	0	700 pCi/L	0	0
I-129 (17,000,000 yr)	1.6	1 pCi/L	1.6E+12 1600 billion	<<1
Tc-99 (2213,000 yr)	4600	900 pCi/L	5.11E+12 5110 billion	0.002
Np-237 (2,144,000 yr)	470	15 pCi/L[a]	3.13E+13 31,300 billion	0.0128
U-234 (245,500 yr)	130	15 pCi/L[a]	8.67E+12 8,670 billion	0.00355
Am-241 (432 yr to Np-237)	12,000	15 pCi/L[a]	8.0E+14 800,000 billion	0.378
Plutonium-238 (87.7 year)	110,000	15 pCi/L[a]	7.3E+15 7,300,000 billion	3
Plutonum-239 (24,000 year)	48,000	15 pCi/L[a]	3.2E15 3,200,000 billion	1.3

Table 2 Notes:

a. The unit of 1 picoCurie/liter is 1.E-12 curie/liter. The limit is 15 pCi/L for total alpha (40 CFR 141). For uranium, total natural uranium limit of 30 microgram/liter for all combined uranium isotopes.

b. Aquifer volume of 2.44E+15 liters is assumed.

c. The dilution volume ignores soil adsorption and migration delay timing; it is provided to give some perspective on the amount of waste involved. It ignores that fact that the entire aquifer is not going to be involved with dilution, although waste in the aquifer can fan out and involve a considerable portion of the aquifer downstream.

Table 2 above provides some additional perspective on the large inventory of radioactive material in the calcine bin sets. It would require 1,975,000,000 billion liters of water (or over 800 Snake River Plain aquifers) to dilute the strontium-90/y-90 in calcine storage to federal drinking water standards. It would require 7,300,000 billion liters of water (or over 3 Snake River Plain aquifers) to dilute the Pu-238 stored in the calcine to federal drinking water standards. It should also be pointed out that these figures are presented as though only a single contaminant were present. In reality, the health detriment of the combination of all contaminants in the drinking water must be considered. This is a point often overlooked by the Idaho Department of Environmental Quality as IDEQ surveys the contamination in the aquifer, dismissing any result below federal drinking water standards which have, for tritium and hexavalent chromium been found to not be protective of human health, especially when consumed over a lifetime. [126] The graph of the migration of the buried waste at RWMC that will remain at

[126] See www.environmental-defense-institute.org for discussion of more stringent tritium and hexavalent chromium regulations and public health goals that the current EPA federal drinking water standards.

RWMC buried in soil is shown below in Figure 1. The contamination migration is not realistically modeled by the DOE nor is it conservatively modeled. Flooding and fast paths of contaminant migration are ignored. [127] The ingestion doses will undoubtedly exceed the 30 to 100 mrem/yr radiation doses shown, intermittently at least.

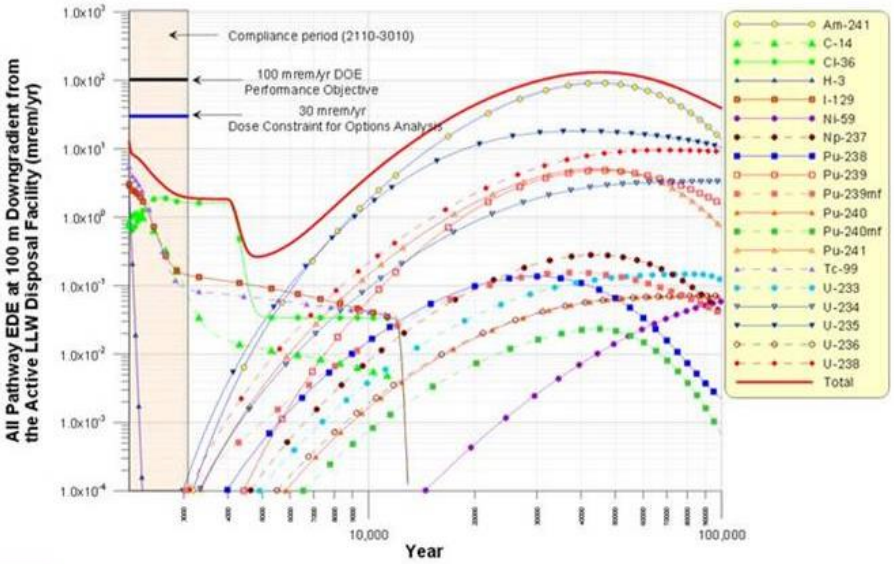


Figure 4-2. All-pathways effective dose equivalent 100 m downgradient from the Radioactive Waste Management Complex boundary from year 2110 to year 100,000 with cover infiltration rate equal to 1 cm/year.

Figure 1. All-pathways radiation dose for the Radioactive Waste Management Complex from DOE/NE-ID-11243 and DOE/NE-ID-11244. Americium-241, uranium-235, uranium-238, and plutonium-239 are top contributors to ingestion dose after 10,000 years. Beware, however, that contamination migration by the DOE appears to be modeled with a bias toward delaying the release timing to be after 10,000 years. The EPA ignores post-10,000 contamination in its INL CERLCA cleanup.

Despite the overly optimistic statements made about the grouting below portions of the RWMC and untrue statements presented in LINE presentations about the short half life of the material, the buried radioactive waste that is not being exhumed from the RWMC will continue to contaminate the Snake River Plain aquifer, essentially forever. EPA cleanup standards are discussed in relation to INL CERCLA cleanup but are rarely met and will not be met over the long term, after 10,000 years, beneath the RWMC.

A revealing history of calcine storage seismic evaluation is presented in 2003 report INEEL/EXT-02-1548. [128] It is a "kick the can down the road" approach to seismic evaluation typical of high hazard INL nuclear facilities. There are seven bin sets, each designed and constructed differently; see figure at end of this letter from INEEL/EXT-02-1548. Each bin set for containing calcine is inside a concrete vault that is usually at least partially above ground. Initially, both the bin set and the vault were to be seismically evaluated for bin set 1.

Bin set 1, designed and built first, was found in 1989, upon visual inspection by EQE Engineering to be extremely seismically fragile. The INL then focuses on evaluation of the concrete vault which consultants conclude would "not collapse" in a severe seismic event. Yet unsaid is that structural failure of bin set 1 would be expected and the concrete vault would be cracked. Importantly, the calcine in bin set 1 would not be confined following a small seismic event.

It is evident that as early as 1989, it was recognized that the importance of confining the calcine merited applying stringent seismic design criteria similar to a nuclear reactor, more stringent than the Performance

[127] Johnson TM et al., *Geology*, "Groundwater "fast paths" in the Snake River Plain aquifer: Radiogenic isotope ratios as natural groundwater tracers," v. 28; no. 10; p. 871-874, October 2000.

[128] Department of Energy Idaho Operations Office, INEEL/EXT-02-01548, "Structural Integrity Program for the Calcined Solids Storage Facilities at the Idaho Nuclear Technology and Engineering Center," May 2003. Find it at https://inldigitallibrary.inl.gov

Category 2 later adopted to argue that the calcine bin set 1 vault is satisfactory. Performance Category 2 seismic design criteria should never have been argued to be sufficient for the seismic performance requirement for INL calcine bin sets.

A 1994 report [129] explains that "Currently, Bin Set 1 is being evaluated to determine the seismic qualification of the bins and vault. Based on this study, retrieval of calcine from Bin Set 1 and transporting it to Bin Set 6 could be required." This is stated despite the inspection in 1989 that by visual inspection would have shown bin set 1 to be seismically fragile.

For the other calcine bin sets, the argument then shifts to more stringent seismic design criteria having been specified in safety analysis documents, but these safety analysis documents are unavailable to the public and cannot be reviewed as the basis for adequacy of the other calcine bin sets or vaults. At least it was recognized that the calcine storage facilities for bin sets 2 through 7 needed to meet seismic design criteria more stringent than PC-2. The fact that more stringent seismic design criteria were adopted for calcine storage facilities 2 through 7 is positive; **yet not all INL designed tank systems were actually adequately designed despite having adopted more stringent criteria**. Subsequent detailed design and installation should have been reviewed by qualified nuclear industry seismic structural engineering experts yet no evidence of seismic expert review of each bin set is evident except for bin set 1 which is obviously found to be seismically weak.

The charade continues to this day concerning the seismically weak calcine bin set 1 (both bin set and also the vault). The ability of the vault to withstand a PC-2 seismic event does not alleviate the problem that bin set 1 is expected to not withstand even a small and likely PC-2 seismic event and the spilled calcine in the concrete vault will not be confined by the vault. It should be obvious why the hand waving occurs during LINE Commission meetings rather than facts about the seismic vulnerability of the calcine bin sets, in particular, bin set 1.

Design standards for pre-1990 tank structures constructed at the INL have typically been found to be seismically inadequate. Despite pressure to find otherwise, it appears highly questionable whether the early calcine bin sets would be capable of withstanding any anticipated or likely seismic event. Given the extremely large inventory of hazardous material, the release of which cannot be remediated, it would be much more appropriate for the interests of protecting Idaho to require a higher level of seismic capability to withstand a more serious seismic event.

Structural consensus codes and standards have changed substantially since the bin sets were originally commissioned, especially for calcine bin sets and vaults 1 through 3. An unbiased assessment of the calcine bin sets is likely to conclude that one seismic event centered near the INTEC site that approaches the magnitude of historical seismic events in the area, will likely result in spilling highly radioactive calcine across the Idaho desert, which can then be dispersed to populated areas via prevailing winds. The IDEQ needs to recognize the serious seismic vulnerability of the calcine storage at the INL and must refuse to accept inadequately supported seismic analyses that do not use evaluation to standards commensurate with the long-term environmental hazard posed to the environment by a release of the calcine.

IDEQ must require expedited repackaging of the calcine stored at the INL even if shipment of the calcine is not expected to occur in time to meet the 2035 shipment milestone stipulated in the Idaho Settlement Agreement. [130]

[129] Department of Energy Idaho Operations Office, WINCO-1192, "ICPP Tank Farm System Analysis," January 1994. Find it at https://inldigitallibrary.inl.gov

[130] U.S. NUCLEAR WASTE TECHNICAL REVIEW BOARD CALCINED HIGH-LEVEL RADIOACTIVE WASTE http://www.nwtrb.gov/facts/Calcined_HLW.pdf

Appendix C.7 - New Information -

Table C.7-2. Bin set total chemical inventory (fission and activation species decayed to 2016).[a]

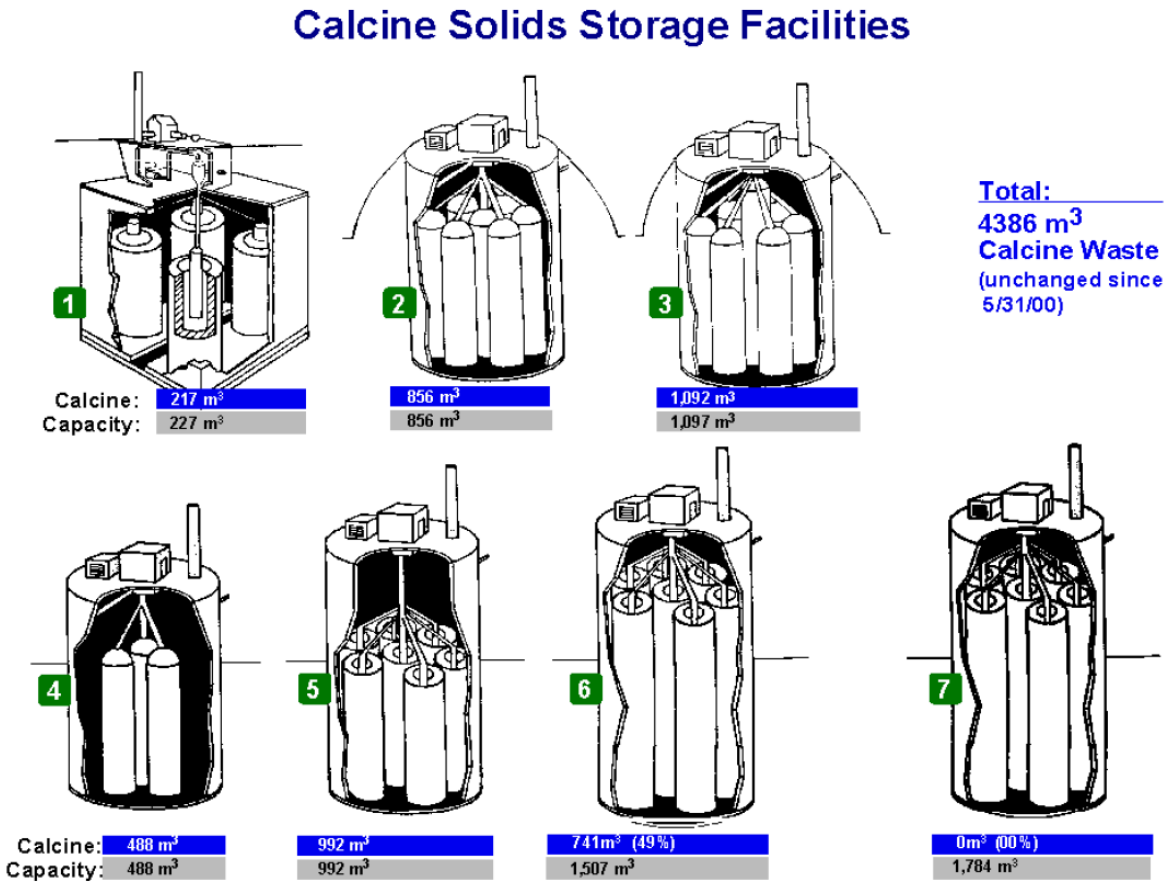
Constituent	Total mass (kg)	Constituent	Total mass (kg)
Actinium	1.2×10^{-6}	Molybdenum	2.9×10^{4}
Aluminum	9.7×10^{5}	Neodymium	1.4×10^{3}
Americium	4.4	Neptunium	46
Antimony	10	Nickel	2.6×10^{3}
Arsenic	3.7	Niobium	2.6
Astatine	8.5×10^{-20}	Palladium	110
Barium	770	Plutonium	1.3×10^{3}
Beryllium	3.6	Polonium	2.8×10^{-9}
Bismuth	2.7×10^{-9}	Potassium	2.8×10^{4}
Boron	4.0×10^{4}	Praseodymium	380
Bromine	29	Promethium	5.7×10^{-3}
Cadmium	4.7×10^{4}	Protoactinium	2.4×10^{-3}
Calcium	1.1×10^{6}	Radium	2.7×10^{-5}
Californium	1.0×10^{-12}	Rhodium	140
Cerium	850	Rubidium	170
Cesium	740	Ruthenium	1.9×10^{3}
Chlorine	4.5×10^{3}	Samarium	280
Chromium	8.8×10^{3}	Selenium	51
Cobalt	1.6	Silver	8.3
Curium	3.6×10^{-3}	Sodium	1.3×10^{5}
Dysprosium	3.3	Strontium	2.6×10^{3}
Erbium	1.8	Technetium	280
Europium	20	Tellurium	140
Fluorine	8.4×10^{5}	Terbium	0.94
Francium	3.1×10^{-14}	Thallium	0.36
Gadolinium	15	Thorium	6.1
Gallium	14	Thulium	0.14
Germanium	1.2	Tin	43
Holmium	1.1	Uranium	1.7×10^{4}
Indium	4.0	Ytterbium	1.8
Iodine	1.4×10^{3}	Yttrium	260
Iron	2.2×10^{4}	Zinc	71
Lanthanum	440	Zirconium	5.6×10^{5}
Lead	360	NO_3	2.5×10^{5}
Lithium	18	PO_4	2.4×10^{4}
Manganese	1.2×10^{3}	SO_4	5.3×10^{4}
Mercury	1.2×10^{4}		

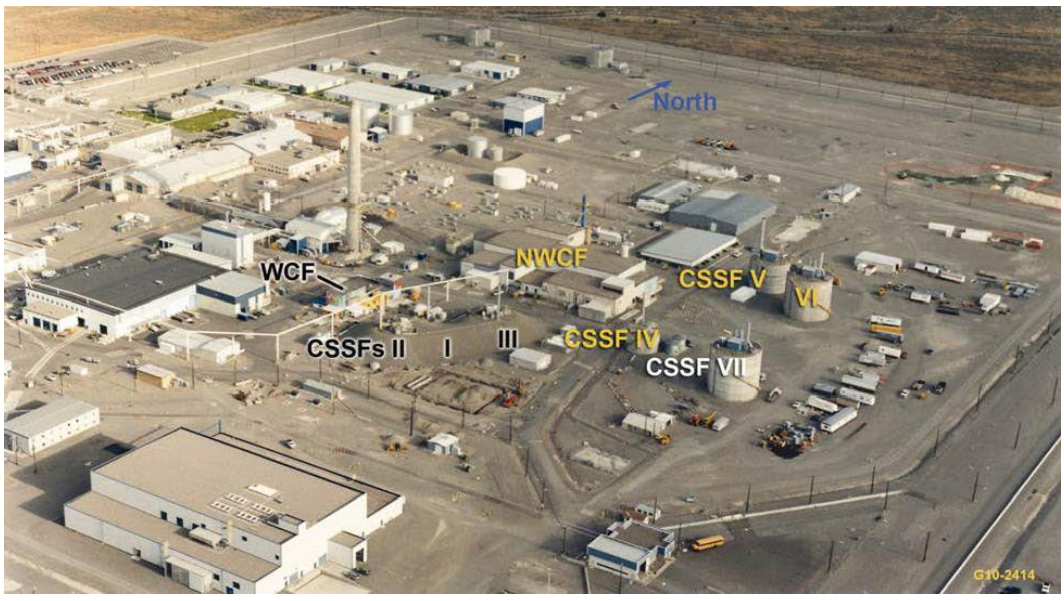
a. Source : Valentine (2000).

Table C.7-3. Bin set total inventory of radionuclides (decayed to 2016).[a]

Constituent	Total activity (Ci)	Constituent	Total activity (Ci)	Constituent	Total activity (Ci)
H-3	15	Sm-148	9.0×10^{-9}	Th-227	0.085
Be-10	0.033	Sm-149	2.9×10^{-9}	Th-228	1.6
C-14	0.038	Sm-151	4.5×10^{5}	Th-229	1.4×10^{-4}
Co-60	1.5×10^{3}	Eu-150	5.3×10^{-3}	Th-230	1.4
Ni-63	6.8×10^{4}	Eu-152	430	Th-231	5.0
Se-79	9.9×10^{4}	Gd-152	5.3×10^{-10}	Th-232	2.3×10^{-7}
Rb-87	9.1×10^{-3}	Eu-154	2.9×10^{4}	Th-234	5.0
Sr-90	7.9×10^{6}	Eu-155	3.9×10^{3}	Pa-231	0.11
Y-90	7.9×10^{6}	Ho-166m	0.014	Pa-233	690
Zr-93	680	Tm-171	1.1×10^{-9}	Pa-234m	5.0
Nb-93m	630	Tl-207	0.085	Pa-234	6.3×10^{-3}
Nb-94	270	Tl-208	0.16	U-232	1.6
Tc-98	7.3×10^{-4}	Tl-209	1.9×10^{-6}	U-233	0.057
Tc-99	4.6×10^{3}	Pb-209	1.4×10^{-4}	U-234	130
Rh-102	9.1×10^{-3}	Pb-210	0.013	U-235	3.2
Ru-106	4.4×10^{-3}	Pb-211	0.085	U-236	11
Rh-106	0.029	Pb-212	1.6	U-237	1.5
Pd-107	9.1	Pb-214	0.027	U-238	3.1
Ag-108	1.1×10^{-5}	Bi-210m	5.2×10^{-17}	U-240	1.6×10^{-7}
Ag-108m	1.3×10^{-4}	Bi-210	0.013	Np-235	5.1×10^{-17}
Ag-109m	3.8×10^{-17}	Bi-211	0.085	Np-237	470
Cd-109	3.8×10^{-17}	Bi-212	1.6	Np-238	0.017
Cd-113m	1.6×10^{3}	Bi-213	1.4×10^{-4}	Np-239	50
In-115	2.7×10^{-8}	Bi-214	0.027	Np-240m	1.6×10^{-7}
Sn-121m	68	Po-210	0.013	Pu-236	0.027
Te-123	1.3×10^{-10}	Po-211	1.7×10^{-4}	Pu-238	1.1×10^{5}
Sb-125	130	Po-212	0.29	Pu-239	4.8×10^{4}
Te-125m	38	Po-213	1.4×10^{-4}	Pu-240	2.0×10^{3}
Sn-126	310	Po-214	0.027	Pu-241	4.8×10^{4}
Sb-126	43	Po-215	0.085	Pu-242	130
Sb-126m	310	Po-216	1.6	Pu-243	1.1×10^{-13}
I-129	1.6	Po-218	0.027	Pu-244	1.6×10^{-7}
Cs-134	67	At-217	1.4×10^{-4}	Am-241	1.2×10^{4}
Cs-135	360	Rn-219	0.085	Am-242m	6.1
Cs-137	8.8×10^{6}	Rn-220	1.6	Am-242	5.8
Ba-137m	8.5×10^{6}	Rn-222	0.027	Am-243	50
La-138	6.8×10^{-8}	Fr-221	1.4×10^{-4}	Cm-242	4.8
Ce-142	9.4×10^{-3}	Fr-223	0.018	Cm-243	5.0
Ce-144	8.6×10^{-5}	Ra-223	0.085	Cm-244	250
Pr-144	1.4×10^{-3}	Ra-224	1.6	Cm-245	0.071
Pr-144m	1.7×10^{-5}	Ra-225	1.4×10^{-4}	Cm-246	4.6×10^{-3}
Nd-144	4.6×10^{-7}	Ra-226	0.027	Cm-247	5.2×10^{-9}
Pm-146	2.3	Ra-228	2.3×10^{-7}	Cm-248	5.5×10^{-9}
Pm-147	5.3×10^{3}	Ac-225	1.4×10^{-4}	Cf-249	4.0×10^{-9}
Sm-146	8.6×10^{-5}	Ac-227	0.085	Cf-250	1.7×10^{-9}
Sm-147	3.0×10^{-3}	Ac-228	2.3×10^{-7}	Cf-251	6.3×10^{-11}

a. Source : Valentine (2000).


Calcine Solids Storage Facilities
1
2
3
Calcine: 217 m³
Capacity: 227 m³
856 m³
856 m³
1,092 m³
1,097 m³
Total:
4386 m³
Calcine Waste
(unchanged since
5/31/00)
4
5
6
7
Calcine: 488 m³
Capacity: 488 m³
992 m³
992 m³
741m³ (49%)
1,507 m³
0m³ (00%)
1,784 m³


North
WCF
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CSSF VII
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Section IV.D. Advanced Test Reactor Complex Cleanup

The Advanced Test Reactor Complex (ATRC) (formerly the Test Reactor Area (TRA) or the Reactor Technology Center (RTC); (these names are interchangeable) is one of the major high-level waste sites - in on-site radioactive solid waste (spent nuclear fuel) and percolation pond disposal sites relative to curie content. DOE summary data between 1952 and 1983 cite 5 million Ci of solid waste disposed. [EGG-WM-10903 @6-25][ID-10054-81] ATRC supports the Advanced Test Reactor, Advanced Reactor Critical Facility Reactors, Hot Cell Facility, Nuclear Physics Research Program, Advanced Reactivity Measurement Facility, and Coupled Fast Reactivity Measurement Facility Reactors.

Previously, the now (closed) D&D Engineering Test Reactor, Materials Test Reactor were located at the ATRC. The reactors used chromium (VI) in the coolant and discharged between (1952-72) 55,353 lbs. of Cr (VI). [Analytica ID-12782-1 @4-26] Accidental chemical spills have also contributed to site contamination. For instance, recent disclosures by the Oil Chemical and Atomic Workers Union revealed a 680 gallon sulfuric acid spill. The union cited nine other worker health and safety violations at the Advanced Test Reactor.

The ATRC has fifty-one Solid Waste Management Units. These include leaching ponds, underground tanks, rubble piles, cooling towers, waste injection wells, French drains, and assorted spills where hazardous and mixed radioactive/hazardous wastes exist. These waste sites have been in continuous use for over 40 years and have created ground water contamination under the ATRC. The culture of secrecy and non-accountability made it possible to willfully allow problems to go unsolved. For instance, the ATRC's reactor fuel cooling canal at the Materials Test Reactor had a severe leak that was not drained and repaired until a decade after it was discovered. This leak allowed large quantities of contaminated coolant water to escape to the soil below the ATRC, and initially was not identified in the Cleanup Plan as a contamination source. The largest contributor to groundwater contamination under the ATRC was the radioactive waste injection well that was not closed until 1984. Discontinuing the use of injection wells due to pressure from the State increased volumes of contamination in the leach ponds proportionally.

Advanced Test Reactor Complex (ATRC) Groundwater Liquid Waste Volumes Disposed

Disposal Site	Period Used	Total Discharge (gal)
Warm Waste Pond	1952 - 1996	5.35×10^9
Cold Waste Pond	1982- 1996	2.13×10^9
Chemical Waste Pond	1962 - 1996	726×10^8
Sanitary Waste Pond	1952- present	310×10^6
Injection Well -05	1964-1982	3.89×10^9
Injection Well - USGS-53	1960-1964	2.2×10^8
Totals		8.45×10^{10} or 84.5 billion gallons

[ATRC Record of Decision [ROD] (a) pg. 5]

ATRC (formerly called TRA) also leads (volume and activity) the list of INL facility areas for radioactive liquid waste discharges - 84.5 billion gallons between 1952 and 1990. ATRC [ROD @5] Between 1952 and 1981 ATRC released 50,840 Ci to the soil or 83% of total INL liquid discharges. This figure does not include short-lived radioactivity with less than 2-3 day half-life. [Ibid. @14] Idaho State University monitoring found ATRC highest in tritium concentrations. ATRC injection well No.53 received waste containing 31,131 lbs. of hexavalent chromium between 1964-1982. In the same time period, ATRC injection well No.05 got 55,353 lb. of Cr (VI). The size of the contamination plume under ATRC is larger than DOE acknowledges. Well No. 65 south of [and beyond acknowledged plume] ATRC had the highest results ranging from 43, 5000 to 48,200 pico curies per liter. [IDEQ Oversight (a) pg.21]

The State challenges DOE's characterization of the size of the perched water contamination plumes because of the location and depth of the monitoring wells. The State's "review strongly suggests that wells along the north and northeast margin of the network are too deep to intercept or represent water levels in the perched

water zone."... "That is, the perched water zone may extend farther to the north and northeast than previously recognized" by DOE. [Oversight (a)@31] The volume of the perched water plume is estimated at 4.3 billion gallons. This plume is connected to the Big Lost River flood zone. Hydrology studies during flooding of the Big Lost River and ATRC monitoring well static levels revealed that recharge to the ATRC groundwater occurred at a rate of 30 - 35 feet per day. [EGG-WM-10002 @ 3-109] At this transmissivity rate, contaminates could move nearly 2 ½ miles per year. Other monitoring data supports these findings. "Chromium-51 was detected in monitoring well USGS-56 at a concentration of 0.33 pCi/mL [330 pCi/L]. Well USGS-56 is located in close proximity to the [ATRC] Retention Basin where concentrations of up to 2,540 pCi/mL [2,540,000 pCi/L] of chromium-51 have been detected in the shallow perched zone wells. Thus, detection of chromium-51 is not considered unusual in USGS-56; however, this indicates rapid transport time from the shallow zone to the deep zone in this area." [EGG-WM-10002 @ 4-129]

Selected ATRC Perched Water Chemical Sample Data
[TRA, ROD, 12/92@13& Analytica ID-12782-1][40 CFR Sec. 141.61]

Chemical	Concentration ug/L	EPA Standard ug/L
Arsenic	42.8	50
Barium	10,300.0	2
Beryllium	136.0	1
Cadmium	177.0	0.005
Chromium	4,480.0	0.1
Copper	1,930.0	1,000
Iron	546,000.0	300
Lead	4,260.0	50
Manganese	92,000.0	50
Mercury	394.0	2
Sulfate	4,880,000.0	250,000
Zinc	10,700.9	5,000
Aluminum	430,000.0	?
Xylene	31,000.0	10
Magnesium	400,000.0	?

* The Asterisk (*) on the below ATRC perched water sample data table indicates EPA's new proposed Drinking Water standards (40 CFR Part 141 and 142).

Advanced Test Reactor Complex Area Perched Ground Water Sample Data

Nuclide	Concentration pCi/L	EPA 1976 Standard pCi/L	Number Times over EPA Std.
Cobalt-58	601	1,590.0*	0
Cobalt-60	12,200,000	100.00	122,000.0
Zinc-65	105,000	300.00	350.0
Cesium-134	62,400	8.13*	7,675.0
Cesium-137	21,000,000	119.0*	176,470.0

Europium-152	108,000	60.00	1,800.0
Europium-154	130,000	200.00	650.0
Europium-155	20,400	600.00	34.0
Americium-241	16,700	6.34	2,634.0
Manganese-54	336	300.00	0
Chromium-51	2,540,000	6,000.00	423.0
Scandium-46	4,140	863.0*	4.7
Iron-59	2,600	200.00	13.0
Zirconium-95	11,500	200.00	57.0
Niobium-95	12,000	300.00	40.0
Ruthenium-103	3,970	200.00	19.8
Rhodium-106	4,980	30.00	166.0
Silver-108	14,400	90.00	160.0
Antimony-124	150	60.00	2.5
Cerium-141	6,140	300.00	20.4
Ytterbium-175	3,500	300.00	11.6
Hafnium-181	136,000	200.00	680.0
Tantalum-182	3,180	100.00	31.8
Lead-203	1,680	1,000.00	1.6
Plutonium-239	12	15.00	0
Uranium-234	520	13.9*	37.0
Strontium-90	18,000	8.00	2,250.0
Tritium	3,940,000	20,000.00	197.0

[Administrative Record, TRA Summary Tables of Chemical and Radiological Analysis, Appendix G-484 and 485, Analytica-ID-12782-1 @ D-615 to D-632] [EPA-570/9-76-003] *[FR-7/18/91 Proposed MCL] Expressed in Pico Curies per liter (pCi/L)

These new proposed nuclide limits in drinking water, which EPA attempted to promulgate in 1991, are substantially higher than the 1976 limits. For instance, tritium MCL will be increased from 20,000 to 60,900 pCi/l. It should be noted that the federal government is the largest polluter of radionuclides so it is in their interest to raise the limits on their own waste sites. EPA attempted to raise the allowable limits in 1985, but the courts found that they were not protective of human health, and EPA was forced to withdraw the standard. As of this writing, the 1976 rule is still the only enforceable regulation.

The decision by the Agencies (DOE, ID, EPA) to do nothing on interim actions on the ATRC perched water is an affront to common sense and demonstrates blatant disregard for Idaho's most valuable resource - groundwater. Contaminated water in the perched zones must be pumped and treated to minimize further migration into the rest of the aquifer. The federal government must never again be allowed to foul our waters and just walk away. Monies currently being channeled into nuclear materials production would more than adequately fund environmental restoration such as pump and treat. It is unconscionable for Idaho & EPA to approve such a position. The Environmental Defense Institute recommends this pump and treat immediate action because as the Congressional Office of Technology Assessments states:

> "Contaminates may also form or absorb onto colloidal particles, which allows them to move with, or faster than the average groundwater flow. Flow can result from an apparently unrelated force, such as the flow of water and contaminates due to a thermal or electrical gradient instead of the expected hydraulic gradient. Chemical reactions and biotransformation may occur, possibly changing the toxicity or mobility of contaminates. Some contaminates dissolve and move with the water; some are in the gas phase; others are non-aqueous phase liquids; some are more dense than water and may move in a direction different from groundwater; others may be less dense than water and float on top of it." [OTA (a) @ 38]

Advanced Test Reactor Complex Warm Waste Pond

A major contaminated area at Advanced Test Reactor Complex (formerly called TRA) is the Warm Waste Pond which has three separate cells dug in 1952, 1957, and 1964 respectively. These are unlined percolation pits where contaminated waste water was dumped and allowed to absorb into the ground. Even though EPA determined that this percolation pond was in violation of federal law, DOE continued to use it up until 1995 when it was capped.

The "low levels of radioactivity" the DOE describes as going to the Warm Waste Pond are actually not so low. Three separate contractors sampled pond sediments. One found cesium-137 and cobalt-60 in concentrations of 55,750 and 50,292 pCi/g respectively. [EGG-ER-10610 @ 3-3][EGG-WM-10000@11] The second sample tests showed Cs-137 and CO-60 in concentrations of 110,000 and 100,000 pCi/g respectively in sediment fines. [NRT 910521-N/C @ 2-5] The third treatability samples showed Co-60 and Cs-137 at 50,292 and 113,497 pCi/g. [EGG-WM-10000 @11] Currently, "The service waste activity is allowed to average no more than three times drinking water tolerance in any isotope with the exception of very short-lived ones like Iodine-131." [IDO-14532 @ 49]

Continued use of the Warm Waste Pond up until 1995 clearly demonstrates DOE's misguided priorities and total disregard for environmental degradation. DOE continued to add radioactive contaminates to a site that has been identified for cleanup for over fifteen years. The continued use of the pond insures that water will continue leaching previous contaminates further down into the aquifer. Moreover the Environmental Protection Agency (EPA) and the State of Idaho are remiss in their respective enforcement responsibilities for not closing down the Test Reactor Area ponds. According to the ATRC Warm Waste Pond Hazardous Conditions and Incidents Report, "After November 1980 it was in violation of RCRA since we had no interim status." [TRA Hazardous] EPA and the State have full justification to declare these ponds RCRA hazardous mixed waste sites as the following paragraph illustrates.

"EPA is authorized [under RCRA] to issue a corrective action order, which can suspend or revoke the authority to operate an interim status Treatment/Storage/Disposal facility or to seek appropriate relief (including an injunction) from a US District Court." [OTA (a) @ 28]

"Over the past 5 years, DOE has gradually been required to acknowledge that cleanup of the Nuclear Weapons Complex [including INL] is subject to regulation by EPA (or the States) to the extent that hazardous materials are involved or a site is placed on the Superfund's National Priority List (NPL). Until 1984, DOE claimed that it was exempted from regulation under hazardous waste laws such as RCRA because of its Atomic Energy Act authority relating to national security and sovereign immunity from State regulation. A 1984 Tennessee Federal court decision rejected this claim and ordered DOE to comply with all RCRA provisions." [OTA (a) @ 34] Congressional passage of the Federal Facility Compliance in 1992 further clarified the law removing sovereign immunity as a federal defense against compliance with environmental laws.

ATRC (formerly TRA) Warm Waste percolation pond received (5.35×10^9) 5.35 billion gallons between 1952 and 1992 at a rate of 40 gallon/minute. [TRA ROD@5] The high volumes of water were due to the once through cooling for the reactors that were then diluted before discharge. This also accounts for the high chromium contamination in the groundwater because chromium was used to retard corrosion in the reactor cooling systems. Between 1961 and 1985 a total of 32,660 curies were released to the pond. [TRA Hazardous] Warm Waste Pond sediments at the two foot level contained 75.1 pCi/g of Plutonium-235-240. [Analytica ID-12782-1 @ 4-33] ATRC pond algae registered 100 mR/hr. Ducks (usually 25 at anyone time) using the pond registered the following radionuclide concentrations. [ERDA-1536 @ III-75-76]

A DOE Occurrence Report [131] stated that "Contaminated Soil Outside Warm Waste Evaporation Pond at the ATR Complex. "On May 12, 2016, the Advanced Test Reactor (ATR) Control Room Supervisor received a report from the Radiological Control Manager that contaminated soil was discovered outside of the contamination area north of the ATR evaporation ponds. Pre-work surveys were being performed in preparation for the ATR Complex Warm Waste Evaporation Pond liner replacement project. A radiological buffer area had been established to support surveys of the area surrounding the evaporation pond contamination area. A normally unoccupied area was surveyed and contamination was found in the soil. Further surveys off of the pond berm elevation, and downwind of the pond, found contamination levels to be as high as 250,000 disintegrations per minute /100 centimeters squared. Following the discovery, the area was posted as a soil contamination area. Surveys of the road around the evaporation pond were conducted and no contamination was found. Management was notified."

ATRC Duck Tissue Using Evaporation Pond Samples

Nuclide	Concentration	Nuclide	Concentration
Cesium-137	890 pCi/g	Cerium-141	390 pCi/g
Cobalt-60	540 pCi/g	Iodine-131	18 pCi/g
Zinc	1,100 pCi/g	Cesium-134	38 pCi/g

[ERDA-1536 @ III-75-76]

DOE calculated in 1977 that an individual eating a duck would receive 20 mRem to the thyroid and 25 mRem (milli-rem) whole body exposure. [ERDA-1536 @ III-75-76] In a later 1988 study of ATRC waterfowl, "Three thousand one hundred forty-one individuals representing 22 species of waterfowl were observed on the ATRC ponds from January 1974 through 1978." "If each of the 3,141 waterfowl had transuranic concentrations equal to the averages in the experimental waterfowl, 1,300 nCi of transuranic [including plutonium-238/239/240] would have been removed during this period or an annual average of 305 nCi" and "... if one of the bone samples that was approximately 100 times the other samples was excluded from the average." Additionally, "...if the 3,141 individuals in the wild [duck] population had similar [Sr-90] activity, a total of 292 uCi of Sr-90 would have been exported in the 51-month period or an annual average of 68.7 uCi." The dose to a person eating a duck from the Sr-90 alone would be whole-body 12 mrem and thyroid 7 mrem. "The mean dose rate to experimental ducks on the ATRC ponds was 69 mRad from Sr-90 and transuranic nuclides in body tissues."... "Water fowl at the TRA ponds potentially export greater quantities of transuranic from this area than do other species of wildlife. The maximum yearly export of transuranic radionuclides by small mammals and coyotes at the ATRC was 35 pCi (Haliford) and 70 nCi (Arthur and Markham)." [Markham @ 522] Pacific Northwest Laboratory studies on internal exposure of dogs found that there was no minimum amount of plutonium that did not cause death. [Parks] State radiation standard limit is 4 mRem/yr for beta emitters. Safe limits for cesium-137 are 10 pCi/g. [EG&G-WM-8804] Chromium released to ATRC ponds was 500 ppb. The chromium standard at the time was .05 ppb or 10,000 times over regulatory standards. [ERDA-1536 @III-79]

Advanced Test Reactor Complex (ATRC) Summary of Site Risks

DOE remediation plan's listing of contaminants fails to list Iodine-129 and Plutonium-238, 239, and 240 which were found in ATRC leach pond plankton in concentration ranges (CRs) from 40,000 to 400,000. Distribution coefficients for Pu isotopes in sediments ranged from 13,000 to 150,000. [DOE/ID-12111 @39] Due to I-129's 17-million year half-life, and Plutonium's 24 thousand-year half-life, these isotopes are considered permanent contaminates.

DOE's plan also fails to quantify the range of contamination in ATRC perched water in its Community Relations Plan mailings. EDI concurs with the State's criticism of DOE for using only the MEAN (average)

[131] NE-ID--BEA-ATR-2016-0014 FINAL

concentration levels. By only offering the mean, DOE dilutes the data and offers a lower average number as opposed to offering the highest concentration number which best characterizes the risk. Readers of the plan deserve more information than they "exceed federal safe drinking water standards" or a footnote stating a standard of 4 mRem/yr. The proposed EPA standard for Cesium-137 (not stated in the plan) is 119 pCi/L.

There is no justification for DOE to eliminate from consideration in the plan, radioactive isotopes that had half-lives of more than five years. [TRA Plan @ A-6] This also holds true for the non-inclusion of Cesium (half-life of 30 yrs) in the exposure assessment. The current cesium levels of 21 million pCi/L mean that by the year 2023, the concentration levels will be 10.5 million pCi/L. In other wards it will take 540 years before the cesium will decay to below proposed EPA drinking water standard of 119 pCi/L.

ATRC lies immediately (less than 2 miles) up gradient to the Big Lost River. Considerable uncertainty exists as to contaminate transport time within the aquifer due to the existence of lava tubes etc. in a very non-homogenous geology of the Snake River Plain Aquifer. Moreover, DOE's contention that "there is no current use of the perched water or contaminated Snake River Aquifer in the vicinity of TRA" and the decision to consider the potential use of the area for only a 125 years period, is unjustified and unacceptable.

A six member ground water study team commissioned by EG&G, an INL contractor, was canceled after its preliminary results showed that contamination "could move from INL to the Magic Valley within months." [Aley, 1980] Their findings revealed the presence of lava tubes which move water rapidly through the aquifer and exit at Thousand Springs on the Snake River. Under normal conditions the entire volume of the Big Lost River literally disappears into the porous Snake River Plain. This is a very graphic example of the porosity of the ground under the INL. Also see Section I (F) on aquifer contamination.

ATRC Risk Assessment

Human health risk information appears not to consider the combined cancer risks for non-radionuclide and radionuclide from inhalation. Since the radionuclide component already "approaches the upper National Contingency Plan (NCP) limit"[TRA Plan @3], the combined risks (synergistic effect) may push it over the limit.

"The carcinogenic risks due to the external exposure to radionuclides were found to be significantly above the recommended NCP target risk range."[TRA Plan] This statement, as with other vague un-quantified statements, deserves specific numbers attached to it due to their obvious significance. EPA's standards are nearly two decades old and do not reflect current knowledge about the health risks to exposure to low levels of radiation. Therefore, the conservative 1 chance in a million in getting cancer must be used, not the 1 in 10,000 industrial standard.

Human health risks assessments additionally do not consider migratory water fowl using the ATRC waste ponds. I-129 and other gamma-emitting nuclide in tissues of ducks from the Test Reactor Area (ATRC) leaching ponds have been known by INL at least since 1981. [Health Physics 40: 173-181, 1981] DOE acknowledges I-129 concentration AVERAGES of .3 pCi/gm. [TRA ROD (b)@35]

According to the Office of Technology Assessment (OTA), INL has not attempted extensive ecological site characterization. "Although selected studies have been done on effects with potential relevance to the cleanup, there appears to be no systematic attempt to inform the cleanup process through ecological studies at INL. The routine monitoring program there, is designed primarily to determine radionuclide pathways to human receptors and includes very little biological monitoring. Routine contaminant-level monitoring in animals is limited to game animals obtained from road kills." [OTA (a) @ 205]

Since the soil ingestion assessment for "cesium approached the upper limit of the recommended NCP target risk range" [TRA Plan @ 3] DOE must specify which "worst-case conditions" were used. Since, "It could take over 400 years for the cesium to naturally decay to an acceptable level," then cesium must be given appropriate consideration. [TRA Plan @ 7]

DOE's statement that any wastes generated or isolated during remediation activities "will be properly disposed of" is not only inadequate; it is based on credibility that DOE no longer can claim. Therefore, a full discussion must describe the required "cradle to grave" waste process. "DOE's current decisions lack credibility because of past failures by DOE and its predecessor agencies to deal effectively with environmental contamination and to make full public disclosure regarding the contamination and its impacts." [OTA (a) @ S-14]

The fact that DOE has known for decades that it was contaminating the environment and deliberately avoided compliance with environmental law, warrants challenges to its credibility. According to the Office of Technology Assessment of INL, "Characterization work is proceeding at a slow pace and is probably limited by

funding. Investigation and testing of more conventional stabilization and containment techniques could be pursued more aggressively." [OTA (a) @ 34] Below are examples of DOE Occurrence Reports related to the ATR.

1995 Aug. 24; The Advanced Test Reactor Emergency Fire Water Injection System would be rendered inoperable during a design basis earthquake. The purpose of the injection system is to pump water into the reactor core to prevent irradiated fuel elements from being uncovered in the event of a loss-of-coolant accident or a complete loss of coolant flow during an earthquake.

2007 Oct. 29: At the Advanced Test Reactor, "dampers" are used to prevent the release of radioactive material from the facility in the event of an incident. Several years ago, backup dampers were upgraded to provide the same kind of protection as primary dampers. While both the backup and primary dampers would close in the event of a release at ATR, current safety documentation only requires that one or the other is in service during reactor operations. This is inconsistent with a higher-level safety requirement, and is under review. (NE-ID-BEA-ATR-2007-0023).

Oct. 29: As part of an ongoing evaluation process to ensure that safety documentation at the Advanced Test Reactor is consistent, three issues were identified. These deal with how much pressure the reactor confinement system can withstand; an improper evaluation of the heating, ventilation and air conditioning system performance during a radiation release; and improper evaluation of the effect of negative air pressure on the confinement system. Both the ATR contractor and DOE have evaluated these issues and found there is no impact to the safe operation of ATR. An evaluation of the issues and how to correct them is ongoing. (NE-ID-BEA-ATR-2007-0022).

2010, June 15: A need for further safety analysis was determined at the Advanced Test Reactor. As part of ongoing review of the safety documentation at the reactor, it was determined the existing analysis does not look at what would happen in the unlikely event that all five experiment loops in the reactor **failed during an earthquake.** The preliminary analysis showed that this accident is already enveloped by other accidents in the unlikely category and it does not have any effect on safe reactor operation (NE-ID—BEA-ATR-2010-0009).

Advanced Test Reactor Complex Warm Waste Pond Interim Action Record of Decision

The December 1991 ATRC Warm Waste Pond Record of Decision (ROD) is deficient. The ROD did not include the immediate secession of use of the ATRC leach ponds. EDI supports immediate secession of use of the leach ponds in combination with pumping contaminated perched water to a water treatment system for removal of ALL contaminates. EDI supported the physical separation and vitrification of pond sediment contaminates. These separated wastes must be safely stored in a monitored, retrievable form after vitrification. However, the remedy criteria for removal of sediments of 690 pCi/gm must be equal to or less than the State radiation exposure standard of 4 mRem/yr. Tragically, even the ROD plan to implement chemical extraction was revoked by a March 1993 notice of "Explanation of Significant Difference for the Warm Waste Pond Sediments Record of Decision." Treatability tests found that:

"The goal of reducing cesium activity to less than 690 pCi/gm activity for the treated sediment returned to the pond would result in a dramatic increase in the amount of treatment residuals that could not be returned to the pond cells, resulting in the need for long term storage, as no disposal location had been identified. This increase in the amount of sediments requiring long-term storage would, therefore, result in a decrease in the short-term effectiveness of this physical/ chemical treatment remedy. This increased storage would significantly elevate the project costs above the original estimates in the Proposed Plan. Further, the effectiveness of acid extraction was marginally achievable only under extremely rigorous (i.e., boiling acid and long retention times) conditions bringing into question the implement ability of the project" [TRA ROD(c)]

In plain English, what this decision means is this. DOE is once again walking away from a cleanup site because they do not want to store the waste generated, and they do not want to pay the additional costs to cleanup the site to safe standards. The Significant Difference Notice also states that the State and EPA have agreed to a

contingency plan to exhume contaminated sediments in one of three cells within the Warm Waste Pond and dump it in the other two cells. Then DOE plans to cover all the cells with soil - not an impermeable cap - just soil. "...The soil cover is to be placed over the Warm Waste Pond to reduce the radiation field and mitigate the potential for blowing dust. The need for an infiltration barrier is not demonstrated and therefore, no cap is needed to meet this objective." [INL Reporter 3/93 @4]

EG&G's 1993 treatability study of the Warm Waste Pond sediments showed extremely effective extraction results for Co-60 that ran as high as 9,270,000 pCi/L and Cesium-137 residuals that ran as high as 27,000,000 pCi/L. [EGG-ER-10616 @4-51] Of course there will be increased storage costs involved with these extracted wastes due to the extreme radioactivity that by definition will require similar management that highly radioactive spent reactor fuel requires. That is, theoretically, the whole idea of cleanup - safe isolation of contaminates from the environment. DOE's final solution supported by the State and EPA was, "transfer of contaminated sediment from the 1964 [Warm Waste Pond] cell and consolidation into the 1952 cell. Contaminated soil from the following INL sites was also dumped into the 1957 cell; 788 cubic yards (603 cm) from MFC containing Cs-137 @ 800 pCi/g; 1,178 cubic yards (901cm) from BORAX ditch containing Cs-137 @ 95.4 pCi/g; 1,279 cubic yards (978 cm) from EBR-I containing Cs-137 @ 364 pCi/g; 1,947 cubic yards (1,489 cm) from TRA-NSA containing Sr-90 @ 7,755, Eu-152 @ 913, Am-241 @ 684, Cs-137 @ 404, Eu-154 @ 146, Co-60 @ 74 pCi/g; 2,737 cubic yards (2,093 cm) from TAN Area B containing Cs-137 @ 75, Sr-90 @ 160 pCi/g; 2,208 cubic yards (1,88 cm) from TAN Technical Support Facility containing Cs-137 @ 39, Sr-90 @ 405 pCi/g. Contaminate soil from the ICPP was also dumped at the Warm Waste Pond. These percolation pond cells were then to be backfilled with six inches of soil to grade level. [DOE/ID-10531 @3-23] A reasonable observer would conclude that DOE has created another shallow radioactive dump site and nothing has been cleaned up.

If one accepts the agency's contention that the original plan to treat the sediments in a chemical extraction process is not feasible, then EDI proposes that the sediments must be exhumed and interned in a monitored retrievable storage (MRS) facility until the mixed waste treatment is operational. The worst contaminates in the top three feet would thereby be isolated from the environment. At some future time when vitrification treatment technology is developed to handle the waste then the MRS can be opened up and the material removed for treatment. After the sediments are removed from the pond, a membrane could be laid to delineate contaminate zones from backfill should the need arise to exhume additional sediments. An impermeable cap must then be placed on top of the backfilled pond to eliminate infiltration of precipitation that could leach additional contaminates into the aquifer. Unfortunately, none of this was done.

None of the agencies dispute that the Warm Waste Pond posed a significant threat to health and safety, and they recognized the need to initiate an interim remedial action to mitigate the threat. The agency's action consolidating the sediments in one or two cells of the pond clearly did not isolate the threatening contaminates from the environment, and therefore is not acceptable. Moreover, now the volume of the waste is tripled due to commingling of backfill and cap soils over the contaminated sediments making later cleanup actions unlikely.

At Hanford, DOE was forced by the regulators to construct the Environmental Restoration Disposal Facility (ERDF) that is a fully compliant RCRA Subtitle C Hazardous waste and NRC compliant low-level waste dump. The ERDF has a double liner, leach monitoring and collection wells, and an impermeable cap. This approach would work for INL if an on-site location can be found that is not above the Snake River Plain Aquifer.

ATRC Compliance with Applicable or Relevant and Appropriate Requirements (ARAR's)

Both the State and EPA have clearly turned a blind eye to enforcing ARAR's when they agreed to go along with DOE's refusal to cleanup the Warm Waste Pond. In this case the term enforcement agency is an oxymoron. Corporate America should be justifiably outraged at the double standard exercised by enforcement agencies. DOE acknowledges Cesium-137 concentrations of 110,000 pCi/gm in the sediments. [NRT-91052-NC@2-5] The standard for Cesium-137 is 10 pCi/gm. [EG&G-WM-8804] That represents 11,000 times over the standard that is established to protect human health and the environment. If DOE is allowed to walk away from this contaminated site like they did with the ATRC perched water which contained Cesium-137 in excess of 176,470 times the standard, what will get cleaned up? What legacies do these actions leave for future generations 540 years from now when the cesium has decayed to "safe" levels?

EDI challenges the Plan's statement that, "The sediment is not hazardous waste as described in RCRA, based upon tests conducted in 1990." [TRA Plan @ 7] Clearly, the sediment is a hazardous mixed waste as defined by

court challenges to DOE's obfuscation of RCRA definitions. The agencies contend that even though there are RCRA listed contaminates DOE's tests show that they do not leach and therefore RCRA does not apply. No independent tests have been conducted to confirm DOE's claim to non-leachability. This begs the question as to how these contaminates got into the perched water zones in such high concentrations if it did not leach through the soil. DOE continues to circumvent RCRA requirements that specifically specify safe handling, treatment, disposal, and waste site closure standards. For instance, the Warm Waste Pond plan would not even pass EPA's Subtitle D municipal garbage landfill standards.

The ATRC pilot study goals state: "minimize or eliminate any characteristic which makes the [warm waste pond] waste RCRA hazardous, including treatment if necessary." [TRA ROD@30] This is indisputable evidence that there are RCRA classified constituents in the pond, and DOE's goal is to avoid RCRA requirements. RCRA closure requirements are further circumvented by not providing a non-permeable cap on top of the pond after extraction operations. This is important to keep precipitation from leaching residual contaminates still suspended in the sub-soils.

The Plan brazenly proclaims - without protest from the State nor EPA - that, "the new lined evaporation pond must be operational before significant cleanup can begin on cells currently in use." This statement clearly and unequivocally identifies EPA and the State with complicity with DOE's highest priority being continued operation - not protection of human health and the environment.

The Congressional Office of Technology Assessment found that, “Doe’s various priority systems have certain fundamental flaws and have yet to prove themselves useful in decision-making. The priority scheme used in the Five-Year Plan groups activities into four very broad categories. Most DOE activities fall into some portion of the first two categories primarily, ongoing activities ..."... "Yet, at present, the greatest uncertainty concerns the variables that should be given highest priority in these systems - reducing health and environmental risks." [OTA(a) @ 62-63]

The priority system developed by DOE's Office of Waste Operations provides the categories in descending order of importance for action and funding. In category number one, DOE puts "maintains ongoing activities." [DOE(b)] Again, DOE's priority system reflects the same misguided emphasis on continuing "operation" and "maintaining on-going activities" in priority number 1 over its legal obligations to comply with environmental regulations in priority number 3. INL's current crisis can be attributed to its historic failure to emphasize environmental compliance.

Other ATRC also called TRA Contamination Areas

Test Reactor Area had four separate groups of underground hot waste tanks (TRA-15, TRA-16, TRA-19, and TRA-603/605). TRA-15 has four tanks contained in two concrete basins that occupy about 624 square feet (58 square meters). Leaks in tanks 1 and 2 plus waste piping leaks resulted in extensive soil contamination that included the following pCi/g concentrations: alpha @ 40; beta @ 6,640; Sr-90 @ 2.280; U-234 @ 2,000. [DOE/ID-10531 @3-10] One of the tanks was removed in the 1960's after it leaked extensively.

TRA-16 is an underground hot waste storage tank. The contents of the tank were found to be ignitable waste contaminated with low levels of radionuclides, primarily uranium isotopes. The tank was emptied and excavated in 1993 and dumped at the RWMC.

TRA-19 has four Materials Test Reactor (MTR) underground rad tanks that had service line leaks including a significant incident in August 1985 that caused extensive soil contamination. Soil samples for gamma contamination (Co-60, Cs-134, Cs-137, and Eu-154) ran as high as 1,3000,000 pCi/g. [DOE/ID-10531 @3-14] TRA-603/605 tank was used for all the warm waste from the MTR

ATRC-04; “Warm Waste Retention Basin is composed of one large rectangular underground concrete structure divided into two cells by a common concrete wall and holds 720,000 gallons (2,725,200 L). The basin received waste in route to the Warm Waste Pond, and was designed to delay passage of reactor system flush water to allow sufficient time for radionuclides with half-lives of less than a few hours to decay.” “It is known that the Basin has been leaking since the 1970's. There have been a number of documented releases from the Retention Basin in the past, including pipeline leakage and leakage from the Basin at a estimated rate of 86,000 gallons (325,526 L) per day. Contamination from the Basin enters the perched water zone beneath TRA.” [DOE/ID-10531 @3-24] The Basin was not removed from service until August of 1993 despite the known leaks. Soil contamination around the Basin in pCi/g include: Cs-137 @ 9,150; Co-60 @ 1,320; Sr-90 @ 416: Pu-238 @ 5.08;

Pu-230-240 @ 3.79. [DOE/ID-10531 @3-25] "Well USGS-56 is located in close proximity to the retention basin where concentrations of up to 2,540 pCi/mL (2,540,000 pCi/L) of chromium-51 have been detected in the shallow perched zone wells. Thus, detection of chromium-51 is not considered unusual in USGS-56; however, this indicates rapid transport time from the shallow zone to the deep zone in this area." [EGG-WM-10002 @ 4-129] It must be noted that chromium contamination is what forced EPA to designate INL a Super Fund Site and put it on the National Priorities List. Other contaminates in the deep perched zone are Co-60 at 800 pCi/L; Sr-90 at 180 pCi/L; and U-234 at 14.2 pCi/L. [Ibid @ 4-115/4-116/4-129]

The Materials Test Reactor Canal (OU-2-8/ TRA-37) is located in the basement of the MTR. "The canal installed in 1952 leaked significant quantities of water contaminated with radionuclides for approximately eight years." [INL-94-0026 @a-8]

Advanced Test Reactor Complex (ATRC) Cleanup Cost

EPA's comments on the costs challenge DOE's estimates. "Several of the most significant costs are not adequately backed up by the cost summary and calculations." EPA lists twelve items as inflated, unsupported, or not needed. [EPA(b)]

DOE contractors that knowingly violate the law and create the polluted sites requiring Superfund cleanup are now being paid to cleanup their own mess. Former Congressman Mike Synar (D-OH) has stated that these contractors are "being paid at a profit to pollute."... "In any other Superfund situation, a private firm would be penalized for its pollution - by footing the bill itself for the cleanup." [Environmental Magazine 3/93 @42] The cost of actual cleanup is only part of the pork offered these polluters. Costs for remedial investigations, sampling programs, pilot studies, and community involvement put additional millions of dollars into DOE contractor profits.

Congressional Office of Technology Assessment (OTA) recommended that Congress "authorize an institution other than DOE to regulate those aspects of radioactive waste management activities not subject to DOE authority, and over which no other agency has authority, in order to enhance the credibility and effectiveness of those programs." "By limiting DOE self-regulation and providing appropriate independent regulation of radioactive waste management at the [DOE] Weapons Complex, Congress could provide a credible and effective mechanism for addressing the issues, problems, and prospective solutions related to the safe treatment, storage, and disposal of existing and future radioactive waste." [OTA(a) @141-142]

Radiological Release to Advanced Test Reactor Complex Evaporation Ponds by Tami Thatcher [132]

"An unspecified amount of what would be remote-handled waste was flushed to the open air radioactive warm waste evaporation pond outside the fence at the Idaho National Laboratory's Advanced Test Reactor Complex and discovered last year. There is no description of how long this had been going on when the radioactive material was finally noticed. The evaporation pond was not designed or intended to handle the radioactive material. There is no description of the total amount and what radionuclides were flushed. There is no description of the size of the area outside the pond that was contaminated. And there is no description of how many years would need to elapse before the radionuclides would not require institutional control.

"Anything and everything had been flushed to the retention basin and percolation ponds at the ATR Complex from its operating reactors, spent fuel pools and hot cell and laboratory operations commencing in 1952. From the percolation ponds, radionuclides migrated into the soil and groundwater below. The contamination was the most extensive in perched water above the aquifer. The long-touted improvement to use a lined evaporation pond beginning in 1993 instead of percolation ponds was described by the state, by the CERCLA cleanup and by the US Geological Survey to exemplify cleaner operations at the INL. They just failed to mention that while the lined evaporation pond did not push contaminants already in the soil and perched water into the aquifer, the retention basin where waste water was routed on the way to the evap pond that had been used for the earlier percolation ponds still had substantial leakage. In addition, other piping and fuel storage pool leakage had contributed substantially to soil and perched water contamination at the ATR Complex. Deep and shallow injection wells were also used at the facility. Lawn irrigation continues to accelerate contaminant migration.

"Despite discovering extensive americium-241 contamination in the perched water investigated as part of

[132] Tami Thatcher, Environmental Defense Institute newsletter article *Radiological Release to ATR Complex Evap Pond* August 2017. http://www.environmental-defense-institute.org/publications/News.17.August.pdf

CERCLA cleanup in the 1990s at the ATR Complex, [133] the Department of Energy, state and federal Environmental Protection Agencies put their heads in the sand and ignored the transuranic contamination at the ATR Complex. It was not until 2015 that a soil investigation was conducted that torpedoed the Department of Energy's earlier statements that the ATR Complex would be allowed unrestricted use by 2095. [134]

" In the tardy 2015 investigation of soils at the ATR Complex, several long-lived radionuclides were found in the soil where the retention basin was located prior to demolition. [135] The soil contamination was 17 times higher for americium-241 than would allow unrestricted use, see Table 1 Below. This means it would take 17 half-lives for natural decay to lower the soil concentration sufficiently to reach the unrestricted use exposure level of 187 picoCurie/gram soil. The half-life of americium-241 is 430 years — but it decays to neptunium-239 which has a half-life of 2.1 million years. There are several other decay progeny before becoming non-radioactive. In other words, it will take longer than forever to reach unrestricted use levels.

"Plutonium-239 levels were also found above unrestricted use concentrations in soil analyzed in 215 and would take forever to decay to unrestricted use levels.

"Subsequent to early mid 1990s CERCLA investigations, the US Geological Survey monitoring and reporting specifically of shallow and deep perched water inexplicably omitted monitoring of americium or an alpha radionuclides in the shallow perched water at the ATR Complex. [136]

"Eventually, the contaminants in the soil and shallow perched water will migrate downward into the aquifer. Because DOE has wanted to promote the idea that all the significant radiological contamination would naturally decay away within 100 years, the DOE, INL contractors, the state, and the EPA have all actively avoided mentioning the long-lived radionuclide contamination. The cesium-137 and cobalt-60 radioactivity and others will decay away within 400 years. But the long-lived plutonium-239 and americium-241 contamination at ATRC in the soil will never decay to unrestricted use concentrations (see Table 1 below).

"At INL's INTEC facility, asphalt covers are installed to reduce the driving of known contamination into the aquifer. At INL's ATR Complex, no such action has been taken. At INTEC, a lined disposal facility called the Idaho CERCLA Disposal Facility is used for disposing of CERLCA wastes. At the ATR Complex, resins are left underground in buried piping and no one gets excited if the radioactively laden resins are flushed to the open air evaporation pond undetected possibly for years.

"DOE-ID Operational Summaries are posted online, albeit currently nearly one year late. [137] The final public Occurrence Reports can be found in a database in the Department of Energy's Dashboard. [138]

26002, Rev. 1., prepared July 2015. This NSI states that the retention basin cannot be released for unrestricted use by 2095. Nor can it be released for unrestricted use in 2310 as a 2011 DOE 5-yr review indicated. The document incorrectly states that institutional controls will require 24,100 years to elapse.

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133 Lewis, S.M, et al., EG&G Idaho, "Remedial Investigation (RI) Report for the TRA Perched Water System OU 2- 12," EGG-WM-10002, June 1992. https://ar.icp.doe.gov/ This and draft CERCLA evaluation documents in the early 1990s found perched water levels of Americium-241 at the Test Reactor Area of 2110 picoCuries/liter, far exceeding 15 pCi/L that relates to alpha emitters.

134 See. https://ar.icp.doe.gov/ See WAG 2 Operable Unit 2-13. Various documents beginning around 1997 discuss continuing institutional controls "for at least 100 years." There are public relations brochures saying natural radioactive decay would eliminate the health risk within 1000 years. And proposed actions would make no other actions required after 100 years. See NSI-260002 and other recent documents that have revised these previous statements.

135 Federal Facility Agreement and Consent Order (FFA/CO) New Site Identification (NSI), "TRA-04; TRA-712 Warm Waste Retention Basin System (TRA-712 and tRA-612)," Site Code: TRA-04, Document Number: NSI-26002.

136 Linda C. Davis, US Geological Survey "An Update of the Distribution of Selected Radiochemical and Chemical Constituents in Perched Ground Water, Idaho National Laboratory, Idaho, Emphasis 1999-2001. The is NO Americium monitoring at the Test Reactor Area now called the ATR Complex. There is not even gross alpha monitoring in the perched water found to have exceeded the MCL for americium in CERCLA studies conducted just a few years before this report was written although it was not released until 2006.

137 DOE-ID Operations Summaries, http://www.id.doe.gov/NEWS/OperationsSummarys.htm retrieved May 25, 2017, with no report of events since August 2016.

138 Department of Energy Final Public Occurrence Reports as of May 2017. See https://energy.gov/ehss/policy-guidance-reports/dashboards

But they have forgotten that americium-241 decays to neptunium-237 and so have underestimated to time for americium-241 to decay to levels not requiring institutional controls by a few million years.

"Table 1. Past retention basin soil sample results compared to concentrations allowing unrestricted use and an estimate of potential resin radioactivity concentrations.

Radionuclide (Half Life)	2015 Retention Basin soil samples (pCi/g)	CERCLA Unrestricted Access level (pCi/g)	Years Until Unrestricted Use	Note
Americium-241 (432.2 y)	3210	187	**1,772	These estimated years indicated in the NSI is incorrect because of the continuing decay progeny, notably Np-237. Potential resin concentration is 7000 pCi/g.
Neptunium-237 (2.1 million y)	(would increase over time due to Am-241 decay)	13		Np-237 contamination concentrations are restrictive than Am-241.
Plutonium-239 (24,065 y)	520	259	24,100	Potential resin concentration is 6000 pCi/g.
Plutonium-238 (87.7 y)	671	297	103	Pu-238 would decay to acceptable levels after one half life. Potential resin concentration is 5000 pCi/g.
Cesium-137 (30.2 year)	45000	6	388	Cs-137 would decay to acceptable levels after 13 half lifes. Potential resin concentration is 2 million pCi/g.
Europium-152 (13 y)	9950	4.16	146	Potential resin concentration is 7500 pCi/g.

Cobalt-60 (5 y)	124,000	3.61	79	Potential resin concentration is 5 million pCi/g.

From Table 1 of NSI-26002. units pCi/g are picocurie/gram. Potential resin concentrations are based on INL/EXT-06-11601 and assume 1 gram per cubic centimeter when conversion from Ci/m^3 was needed. The actual resin radioactivity concentrations released and reported in 2016 may be less.

"The Department of Energy Idaho Operations Summary for the event phrased the May 12 Occurrence report mildly: "Contaminated soil was discovered outside of a contamination area near the Advanced Test Reactor (ATR) evaporation ponds. Pre-work surveys were being performed in preparation for the ATR Complex Warm Waste Evaporation Pond liner replacement project. A radiological buffer area had been established to support surveys of the area surrounding the evaporation pond contamination area. A normally unoccupied area was surveyed and contamination was found in the soil. Following the discovery, the area was posted as a soil contamination area. Surveys of the road around the evaporation pond were conducted and no additional contamination was found."

"However, the full Occurrence Report (OR) stated **that soil contamination levels were as high as 250,000 disintegrations per minute per 100 square centimeters near the pond.** The contractor admitted that radionuclides were being sent to the open-air pond that the pond was not designed for. And the OR stated that snow fence was erected to limit the spread of radioactivity among other actions.[139]

"**This is not the first time radioactively laden resins, intended to capture radionuclides and clean up the waste water, have escaped the resin beds.** Resin beads were found near an underground piping leak in waste water lines headed for the evap pond. [140] Radiation monitors that should have detected the elevated radiation levels in the waste water going to the pond were either kept off or were otherwise ineffective in detecting the elevated radiation levels in the waste water. The damaged pipe and resins inside it were then left in the ground.

"But in the 2016 OR, it was admitted that the resins escaped to the open air evaporation pond and resulted in contaminating the pond and soil near the pond. The reality is that resins may have been sent to the pond since the evap pond was installed in 1993. The degree to which the release may have increased in recent years or months is not described.

"When resins were previously found as described in DOE/NE-ID-11139 in the 2001, federal cleanup CERCLA Track 1 documentation was prepared. But apparently this has not occurred for the 2016 OR despite the radioactivity involved being above ground rather than occurring underground where a pipe was leaking.

"The evap pond installed in 1993 was to accept only warm waste water that had been filtered through resin cleanup systems and the main radionuclide to be released was to be tritium. Based on DOE/NE-ID-11139, the normally accepted levels of radioactivity released to the evap pond are not trivial and the tritium released to the evaporation pond is in concentrations far exceeding drinking water standards, over 9 million picocuries/liter. [31] But the Battelle Energy Alliance does not estimate its releases of tritium from the ATR Complex to the skies. This requires others to make rough estimates when creating air emissions reports for the INL.

"Instead of just sending filtered waste water to the evap pond, the resin beads laden with the radionuclides that they are supposed to be removing from the waste water have been sent to the evap pond potentially greatly increasing the radioactivity. The levels of radioactive concentrations for a few of the many dozens of radionuclides they may contain are provided in Table 2 based on INL/EXT-06-11601.

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139 Department of Energy Occurrence Report NE-ID—BEA-ATR-2016-0014. "Contaminated Soil Outside Warm Waste Evaporation Pond at the ATR Complex." a copy made available on our website www.environmental- defense-institute.org/publications/ATR-2016-0014.htm

140 DOE/NE-ID-11139, "Track 1 Decision Documentation Package for TRA-605 Warm Waste Line," January 2005. http://ar.inel.gov/images/pdf/200503/2005030300231KAH.pdf

"Table 2. Maximum resin concentrations for a few selected radionuclides based on INL/EXT-06- 11601.

Radionuclide (Half Life)	Potential Used Resin Concentration (pCi/g)	CERCLA Unrestricted access level (pCi/g)	Average (mean) soil background levels at INL (pCi/g) [a]	Note
Americium-241 (432.2 y)	7000	187	0.005	Am-241 decays to Np-237.
Neptunium-237 (2.1 million y)	(would increase over time due to Am-241 decay)	13	not compiled	Np-237 contamination concentrations are restrictive than Am- 241.
Plutonium-239 (24,065 y)	6000	259	0.024	
Plutonium-238 (87.7 y)	5000	297	0.0014	Ci/m3 coverted to Ci/g assuming 1 g per cubic centimeter.
Cesium-137 (30.2 year)	2,000,000	6	0.44	
Europium-152 (13 y)	7500	4.16	not compiled	
Cobalt-60 (5 y)	5,000,000	3.61	not compiled	

Units pCi/g are picocurie/gram. Potential resin concentrations are based on INL/EXT-06-11601 and assume 1 gram per cubic centimeter when conversion from Ci/m^3 was needed. The actual resin radioactivity concentrations released and reported in 2016 may be less. Note a: Soil background concentrations based on S. M. Rood et al., Idaho National Engineering Laboratory, "Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory," INEL-94-0250, August 1996. Table 23.

"The 2006 INL report (INL/EXT-06-11601) characterized potential ATR resins from experiment loops and the main primary coolant system in order to investigate waste disposal options. [141] The ATR resins require remote handling and are too radioactive to be accepted by most commercial low-level radioactive waste disposal facilities. Basically, Texas will only accept the federal waste if DOE agrees to take possession of the dump. [142] There are federal disposal facilities in Washington and Nevada but those states don't want to accept the waste. The resins likely include cesium-137, strontium-90, and may include long-lived radionuclides significant for migration to the aquifer including americium-241, neptunium-239, plutonium-239, iodine-129, technetium-99 and others.

"For that reason, these radioactive resins with long-lived radioisotopes are shallowly buried over the Snake River Plain aquifer at the Radioactive Waste Management Complex and soon to be buried over the aquifer at the Remote-handled Low-level Waste facility outside the fence at the ATR Complex. And for now, some unknown quantity of the radionuclides from the resins have apparently been flushed to the open air evaporation pond and may be blowing in the wind. Don't worry. The DOE occurrence report says they put up snow fence to reduce the blowing.

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141 Timothy Carlson et al., Idaho National Laboratory for the Department of Energy Office of Nuclear Energy, "Low- level Waste Disposal Alternative Analysis Report," INL/EXT-06-11601 rev. 1, September 2006. Table B-2-4. https://inldigitallibrary.inl.gov/sites/sti/sti/3661678.pdf

142 INL/EXT-06-11601 rev. 1, p. 3-2, from 2006 states that "Texas has a state law that requires DOE to take possession of the site after closure, if a 'federal waste' site is opened. DOE has not made a policy decision to accept future liability for the site after closure."

"In addition to the radiological contamination posed by the release of used resins to the evap pond that can have a long term environmental effect, workers conducting work near the pond at any time since the release may have received both external and internal exposures. The alpha and beta radioactivity would not be measured by a workers radiation badge although the badge, if worn outside the fence, would detect increased gamma radiation. The inhaled radionuclides would be undetected. Subsequent illness compensation claims may never factor in their possible unrecorded inhalation internal radiation doses.

The INL Battelle Energy Alliance public affairs folks, quite predictably, refused to answer any questions about their significant radiological release, including whether or not the release was intentional. And so far, there is no indication that the Idaho Department of Environmental Quality has done anything but facilitate INL's radiological release coverup." [143]

Section IV.E. Test Area North Cleanup Plans

Ground Water Contamination at TAN

The self-serving language in DOE's Test Area North (TAN) Fact Sheets persists as with all previous publications on INL. A consistent effort to minimalize the risks and hazards is pervasive. "The DOE believes the current risk of exposure to groundwater contaminants is minimal. At this time, only contaminated wells are located within a few miles of the TAN and all the drinking water at the facility is treated before use, so no human health exposures exist." [TAN Fact @ 3] EDI considers this an incredulous statement when DOE later states that: "none of the [treatment] alternatives [in the interim actions] would meet drinking water standards for the groundwater under TAN." [TAN Plan @ 8] Either the TAN potable water is not safe; or, DOE can treat the ground water for TAN production facilities but not for the cleanup of the TAN ground water contaminated by TAN facilities.

DOE's solicitous statement that the plume has only migrated a few miles challenges any public confidence that it is capable of objective characterization of its own mess. The following list of contaminates was not on DOE's Community Relations Plan (CRP) Fact Sheets: [TAN Fact]

List of Contaminates of Concern in the TAN Ground Water 1987-1998

Contaminate	Concentration	Drinking Water Standard
TCE	35,000 ug/L	5.0 ug/L
PCE	170 ug/L	5.0 ug/L
DCE	9,300 ug/L	5.0 ug/L
Strontium-90	1,930 Ci/L	8.0 pCi/L
Tritium	43,200 pCi/L	20,000.0 pCi/L
Cesium-137	7,500 pCi/L	119.0 pCi/L
Plutonium-238	1.22 pCi/L	7.02 pCi/L
Plutonium-239-240	5.0 pCi/L	62.0 pCi/L
Cobalt-60	890 pCi/L	100.0 pCi/L
Uranium-234	17 pCi/L	13.9 pCi/L
Europium-154	6.62 pCi/L	200.0 pCi/L
Americium-241	23.6 pCi/L	6.34 pCi/L

[TAN ROD @ 17][EGG-10802][EGG-10643]

Of particular concern is the high tritium contamination at TAN and the public and worker risks from

[143] Tami Thatcher, Environmental Defense Institute newsletter article *Radiological Release to ATR Complex Evap Pond* August 2017. http://www.environmental-defense-institute.org/publications/News.17.August.pdf

tritium exposure. For instance, huge tritium releases from INL facilities have been largely ignored despite the known risks. A cursory review of the literature by EDI reveled a significant body of research challenging DOE and the nuclear industry's public contentions that tritium is of little public health concern. Two studies by DOE's Battelle NW Labs in 1972 and 1982 found that rainbow trout exposed to tritium only 0.4 rad above background levels resulted in permanent immune suppression in all the fish.[Strand] Numerous other studies on animals have proven significant genetic damage and other biological dysfunction as a result of tritium exposure. Also see references on tritium studies.

Maximum contaminant in TAN TSF-05 injection well sludge
[OU 1-07B TAN groundwater RI/FS work plan, Appendix B and G]

Substance	Concentration	EPA Standard
1,1 trichloroethylene	24 ug/gm	7 ug/L
methylene chloride	290 ug/l	?
trans-1,2-dichloroethylene	410 ug/gm	5 ug/gm
Trichloroethylene	30,000 ug/gm	5 ug/gm
Tetrachloroethylene	2,800 ug/gm	5 ug/gm
2-butanone(methyl ethylketone)	180 ug/gm	?
Barium	326 ug/gm	1,000 ug/gm
Lead	180 ug/gm	50 ug/gm
Chromium	91 ug/gm	50 ug/gm
Mercury	101 ug/gm	2 ug/gm
Gross Beta	4,900,000 pCi/l	8 pCi/l
Gross Alpha	6,000 pCi/l	15 pCi/l
cobalt-60	812 pCi/gm	
cesium-137	2,340 pCi/gm	
emporium-154	6.62 pCi/gm	
americium-241	23.6 pCi/l	6.34 pCi/l
Tritium	1,000,000 pCi/l	20,000 pCi/l
plutonium-241	123.6 pCi/l	62.6 pCi/l
plutonium-239	12.2 pCi/gm	

[TAN Sludge] [TAN ROD @18][EGG-ER-10643][INL-95/0056@5-25]

Groundwater Pump and Treat Action at Test Area North (TAN)

DOE only identifies trichloroethylene, tetrachloroethylene, lead and strontium as contaminates at TAN. [TAN Fact @ 3] The State INL Oversight list additionally identifies cesium, cobalt, plutonium, americium and tritium also have been detected at high activity levels in the [TAN] injection well. [Oversight(b)] Though the State's list which is more complete, neither agency is telling the whole story in their public literature. The State cites migration of tritium and strontium-90 (Sr-90) in the ground water. [Oversight (b) @ 29] Sr-90 levels of 10 pCi/L in TAN-1 well, 12 pCi/L in TAN-2 well, and 27 pCi/L in APN-9 are also acknowledged by the State. [Ibid] The maximum Sr-90 contaminate level for drinking water standard is 8 pCi/L. DOE has an obligation to state the data presented in the previous tables in their fact-sheets, and the other agencies clearly are remiss by not ensuring that appropriate data reaches the public. Additionally, Test Area North 616 Tank area, trench soil has readings of 54,120 pico curies/gram in the soil which indicates additional contaminate sources than currently acknowledged.

[RE-P-80-090, p.6]

DOE's contention that the contaminate plume has not migrated more than 1/4 mile [TAN Plan @ 4] is in direct contradiction to its own fact-sheet stating contaminated wells located within a few miles of TAN [TAN Fact@ 3] and the State's report. [Oversight(b)@ 29] Additionally, DOE's claim that "trichloroethylene plume is not expected to reach existing supply or drinking water wells in areas outside of TAN for over 100 years" [TAN Fact@ 4] is currently being challenged. Knowledgeable hydrologists not related to DOE argue with justification that the aquifer is not homogenous and indeed, the existence of lava tubes can provide for speedy dispersion of contaminates. Even if the public were to accept the questionable 100-year migration time, the identified TAN contaminates have a half-life of thousands of years, a fact which dominates the discussion. This claim also contrasts to DOE's recent admission that Iodine-129 migrated eight miles south of the site and that "Our computer modeling has predicted for years that these contaminates would be detected off-site." [AP 2/13/93]

The groundwater pump and treat action will discharge partially treated water into the old leach pit. Any continued use of the existing TAN percolation pond (leach pit) - whether divided or not - is unacceptable. DOE's contention that "contaminates already in the pond would not be pushed deeper into the soil by water coming from the interim action" [TAN Plan @ 6] is totally unfounded. Sample data of the percolation pond show gross alpha at 53 pCi/g, and gross beta at 28 pCi/g. [TAN--5171 @ 17] EDI proposes that a new fully- lined evaporation pond, meeting Subtitle C requirements, must be built some distance from the present one to receive the processed TAN ground water. Even if the new lined pond had some minimal leakage, the water would not be flushing subsurface contamination downward as would be the case in the existing TAN percolation pond.

DOE acknowledges that: "The treatment facility built under these alternatives would be expected to remove a minimum of 90% of the contaminates in the groundwater before the treated water is discharged to the TAN disposal pond." And that: "none of the [treatment] alternatives [in the interim actions] would meet drinking water standards for the groundwater under TAN." [TAN Plan @ 8] The June 9, 1994 Moscow hearing presentation by EG&G project spokespersons acknowledged that the treated water discharged to the percolation pond contains greater than 300 pCi/l strontium-90. [Also see TAN ROD] This violates the Clean Water Act, Idaho Hazardous Waste Management Act and therefore does not meet the Applicable or Relevant and Appropriate Requirements (ARAR) rule. Discharging Sr-90 three hundred times the EPA's maximum concentration level of 8 pCi/l so that it can migrate back into the aquifer is unconscionable.

Environmental Defense Institute (EDI) suggests that technologies do exist to treat the groundwater to drinking water standards. No public acceptance should be expected for reintroducing contaminates back into the aquifer because DOE does not want to spend the money on appropriate resin filter technologies. If the agencies proceed with the identified treatment processes, the bottom line is: do not use the existing TAN percolation pond. Therefore, the "treated" groundwater must be categorized as a hazardous waste; and the new EDI proposed lined evaporation pond must be permitted by the State as a RCRA waste site. Because EDI raised this issue of re-dumping contaminated water, the agencies agreed to conduct more extensive treatability studies using commercially available resin filter columns. Despite success with these studies it is uncertain whether DOE will agree to pay the additional costs for the resins and appropriately dispose of the filters.

DOE's claim is unfounded that; "The only acceptable disposal option for this mixed waste [filter] carbon would be complete destruction in a special incinerator that also could capture the radionuclides." [TAN Plan @ 10] DOE previously used the Waste Experimental Reduction Facility for decades before EDI filed a Notice of Intent to Sue forcing the closure. See Section I.G for details on INL radioactive waste incinerators. EDI supports the Hanford approach recently negotiated with the State of Washington, EPA, and the stakeholders. The technology chosen is vitrification of all low-level, mixed, and high-level (except for spent fuel) into a stable glass/ceramic form. This approach will meet RCRA requirements and also put the waste in a stable form that can be safely stored until a permanent repository is developed. An important issue yet to be resolved is DOE's insistence on pre-treatment which the stakeholders justifiably consider a waste of money.

Additionally, delisting TAN waste treatment residuals from the hazardous waste classification subject to RCRA Subtitle C hazardous waste disposal and closure requirements; and classifying the waste in the same category (Subtitle D) as municipal garbage, is illegal. This arbitrary switch in waste classification by the stroke of DOE's pen must not go unchallenged by the State or EPA. Little public confidence exists for EPA's Best Demonstrated Available Technology (BDAT) requirements. For a detailed discussion on these inadequate and

controversial regulations see the Natural Resources Defense Council's comments on "Land Disposal Restrictions for Newly Listed Wastes and Contaminated Debris." "Although EPA acknowledges that technology is available, has been demonstrated and meets all of the relevant standards for NWW constituents, the agency improperly based its BDAT determination on less effective incineration and solvent extraction technologies." Moreover, "incineration technologies often cause an irreconcilable conflict due to the need to operate at a high enough combustion temperatures to destroy organic wastes without also volatilizing the radionuclide constituents." [NRDC(c), 2/24/92 @ 4]

Another monumental problem faced at INL is the strangle hold contractors have on the site. What cleanup money does finally make it to Idaho, is eaten up by these site contractors who charge excessive overhead for doing the work. Cleanup contracts at other DOE sites allow only 30% overhead charges, and consequently get three times the work accomplished. DOE Headquarters is now attempting to reign in these excesses by awarding the INL Maintenance and Operations contract to Lockheed Martin, however recent Inspector General Audit suggests that little has changed. See Section I(K).

Comprehensive TAN Cleanup Plan

DOE's Proposed Comprehensive Plan for Waste Area Group 1 (Test Area North TAN) dated February 1998 fails to provide remedial solutions that meet Applicable or Relevant and Appropriate Requirements (ARAR). The Plan offers no substantive information about the maximum contamination levels related to individual Operational Units (OU). Consequently, the general public is effectively denied essential information upon which to make their own determination of whether the preferred alternatives were appropriate.

The Plan claims to be "the comprehensive" CERCLA investigation into TAN. This is not a "comprehensive" Plan because the ANP Cask Storage Pad, the Area 10 HTRE Reactor Vessel Burial Site, and the TAN Pool have been excluded. The disposition of the contaminated Tan Pool water into unlined pits and the dumping of the "hardware" and "reactor fuel support structures "in the Pool as low-level waste is particularly egregious. [DOE/EA-1050@ 17&a-4] If the hardware and fuel element parts were properly classified as greater than class C low-level waste (GCC), DOE would legally be blocked from dumping it at the RWMC although that never stopped the Department from dumping GCC there in the past.

The apparent absence of lessons learned between the Hanford Environmental Restoration (ER) process and the INL ER process is regrettable and a serious threat to Idaho. DOE is taking advantage of its position as the single largest employer in Idaho to float ER actions at INL that the Department was not allowed to do at Hanford because public and regulatory pressure blocked shortcuts. Specifically, at Hanford DOE was required to build the Environmental Restoration Disposal Facility (ERDF) which is a fully compliant Resource Conservation Recovery Act (RCRA)/ Nuclear Regulatory Commission (NRC) mixed hazardous/radioactive dump with double liner, leachate collection and monitoring wells and an impermeable cap. ERDF was completed in the Spring of 1996 at the farthest location on Hanford away from the Columbia River and will receive contaminated soil and decontamination/decommissioning (D&D) waste. At INL, DOE refuses to build such a repository because the Department is not being pressured by the state and EPA regulators to comply with the law. The need for the INL equivalent to the ERDF is discussed in the INL Environmental Impact Statement and the INL Site Treatment Plan but DOE has yet to initiate construction because the regulators are allowing short cut ER proposals to go through. DOE's own "off-aquifer siting analysis identified two areas off the Snake River Plain Aquifer (Spent Fuel Storage at the INEL Yet off the Aquifer). [DOE/EA-1050@B-5] Another option would be for DOE to purchase additional adjacent land at the northwest of the site for an ERDF type dump off the aquifer.

The contamination the TAN Plan addresses is mixed hazardous / radioactive low-level waste (MLLW) and is listed in DOE's own Site Treatment Plan (STP) which the Department was required to generate to comply with the Federal Facilities Compliance Act. This MLLW designation is supported by the TAN Remedial Investigation/Feasibility Study (RI/FS) sample data that clearly shows Resource Conservation Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) extraction analysis results exceeding the regulatory limit in 40 CFR ss 261.23. Therefore RCRA Land Disposal Restrictions (LDR) in 40 Code of Federal Regulations (CFR) Parts 148 and Parts 268 for MLLW and Nuclear Regulatory Commission 10 CFR-Subpart D ss 61.50 must be applied. Unfortunately, the State of Idaho Division of Environmental Quality (DEQ) and the Environmental Protection Agency as regulators refuse to force DOE to comply with the legal requirements of the most basic of environmental laws. The Plan proposes disposal of this MLLW in a manner that would not even

comply with municipal garbage landfill requirements let alone the more stringent MLLW regulations. For those TAN hazardous waste release sites, the LDR's in 40 CFR 148 & 268 still apply.

Adding to the list of lessons NOT learned we must add dumping radioactive and chemical waste in unlined shallow pits and trenches over top of the regions sole source Snake River Plain Aquifer. This misguided dumping practice at the INL Radioactive Waste Management Complex Subsurface Disposal Area has resulted in extensive contamination of the aquifer. The proposed TAN Plan intends to repeat this dumping practice despite undeniable examples of failure of this approach. DOE has already gotten away with this illegal dumping in the Test Reactor Area Warm Waste Pond Environmental Restoration project completed in 1997. The Department proposes to repeat this type of dumping at the Naval Reactor Facility, Argonne-West and again at Test Area North. Still another lesson NOT learned at INL is the public and regulators rejection of grouting of MLLW and shallow land burial at Hanford. DOE proposes grouting the TAN tank wastes and leaving it in place in the existing waste tank. Grouting did not meet treatment and disposal requirements of MLLW at Hanford or INL. The State of Idaho simply will not force INL to comply with the relevant laws.

Below Table A lists the Operable Units (contaminate release sites) and the proposed decisions remedial actions or no actions. Table B lists the Operable Units and selected sampling data and the source of the data. This information is the result of weeks of review of the voluminous Administrative Record. The Environmental Defense Institute believes that this information is essential to making an informed decision as to whether DOE preferred alternative is appropriate and therefore should have been included in the Plan that was mailed out to the general public.

DOE has never in any of its INL Environmental Restoration Record of Decisions (ROD) been forced by the regulators to specify what institutional control constitutes. Only through that legally binding document can DOE be held liable for specific actions. For instance, 100 years of institutional control (the amount DOE has committed to) could be interpreted as retaining ownership and annual flybys to monitor the site. In view of the toxicity of the waste being hazardous for hundreds of thousands of years, this is a crucial issue. The length of time the waste will pose a risk to any intruder must determine the duration of institutional control and barriers adequate to keep intruders out must be maintained for the duration. Monitoring must include soil and ground water sampling to ensure the waste is not migrating. A trust fund must also be established so that if the federal government again decides to ignore the law, that state or local government will have the resources to do the job.

Table A and B Ignored sites: ANP Cask Storage Pad Area 10 Reactor Vessel Burial Site
TAN Pool contaminated soil

Table B

TAN Site	Contaminate	Concentration	Reference *
ANP Cask Storage Pad	Gross Alpha	330 pCi/g	(a) Table A-5-5
	Gross Beta	25,600 pCi/g	"
	Cs-137	30,400 pCi/g	
TSF-3 Burn Pit	Lead	2,830 mg/kg (a)	(a) Table A-2-3
TSF-06 Contaminated Soil	Cs-137 Mercury Gross Beta	30,400 80,500 mg/kg 1,880 pCi/g	(a)4-24 (a) Table A-5-6 (a) Table A-5-7
TSF-07 TAN Disposal Pond	Aluminum	25,400 mg/kg	(a)4-29
	Barium	9,740 mg/kg	(b) 4-110
	Mercury	4,040 mg/kg	"
	Sulfide	4,270 mg/kg	"

	Cobalt-60	87.7 pCi/g	“
	Cesium-137	135 pCi/g	“
	Cesium-137	135 pCi/g	“
Drainage Pool TSF-10	Aluminum	30,400 mg/kg	(a)4-26
TSF-09/18 V-1 Tank Liquid	Cobalt-60	101,000 pCi/l	(a) Table A-6-10
	Cs-134	16,900 pCi/l	(a) Table A-6-10
	Cs-137	12,500,000 pCi/l	(a) Table A-6-10
	Europium-152	83,800 pCi/l	(a) Table A-6-10
	Europium-154	93,800 pCi/l	(a) Table A-6-10
	Plutonium-238	7,010 pCi/l	(a) Table A-6-10
	Plutonium-239	3,220 pCi/l	(a) Table A-6-10
	Gross Beta	16,100,000 pCi/l	(c) 59
	Gross Gamma	24,300,000 pCi/l	(c)59
TSF-09/18 (continued)	Gross Alpha	19,800 pCi/l	(c) 59
	Tritium	11,800,000 pCi/l	(a) Table A-6-10
	Total Strontium	1,840,000 pCi/l	(a) Table A-6-10
	Lead	842 ug/l	(a) Table A-6-10
	Tetrachloroethene	1,800,000 ug/kg	(a) Table A-6-11
	Trichloroethene Tetrachloroethene Vinyl Chloride	All three chemicals/metals Exceed TCLP	(c) 8 through 12
Tank V-2	Gross Beta	6,340,000 pCi/l	(c) 59
	Gross Gamma	38,500,000 pCi/l	(c)59
	Gross Alpha	84.9 pCi/l	(c) 59
Tank V-2 (continued)	Trichloroethene Tetrachloroethene Cadmium Vinyl Chloride	All four chemicals/metals Exceed TCLP	(c) 8 through 12
V-3 Tank	Uranium-233/234	13,300 pCi/l	(b) A-83
	Strontium-90	12,300,000 pCi/l	“
	Cobalt-60	14,800 pCi/l	“
	Cesium-137	4,230,000 pCi/l	“
	Ruthenium-103	13,600 pCi/l	“
	Tritium	6,090,000 pCi/l	“

	Nickel-63	205,000 pCi/l	“
	Gross Beta	28,300,000 pCi/l	(c) 59
	Gross Gamma	2,230,000 pCi/l	(c) 59
	Trichloroethene Tetrachloroethene Vinyl Chloride	All three chemicals/metals Exceed TCLP	(c) 8 through 12
V-1, 2, 3 & 9 Tanks	STP lists waste as	MLLW	
V-9 Tank	Americium-241	40,200 pCi/l	(b) A-91
	Plutonium-238	170,000 pCi/l	(b) A-91
	Plutonium-239/240	45,300 pCi/l	(b) A-91
	Uranium-233	12,400 pCi/l	(b) A-91
	Uranium-234	211,000 pCi/l	(b) A-91
	Uranium-235	6,900 pCi/l	(b) A-91
	Uranium-236	3,260 pCi/l	(b) A-91
	Uranium-238	972 pCi/l	(b) A-91
	Cesium-137	6,370,000 pC/g	(b) A-91
	Tritium	353,000,000 pCi/l	(b) A-91
	Total Strontium	250,000,000 pCi/l	(b) A-91
	37 hazardous chemicals/metals		(b) 10-44
PMA-2M TSF-26 V-13 Tank	Cobalt-60	45,900,000 pCi/l	(c) 31
	Europium-154	93,000,000 pCi/l	(C)31
	Cesium-137	2,900,000,000 pCi/l	(c) 31
	Strontium-90	2,850,000,000 pCi/l	(c) 31
	Cesium-134	18,100,000 pCi/l	(c) 31
PMA-2M TSF-26 V-14 Tank	Cobalt-60	191,000,000 pCi/l	(c) 31
	Cesium-134	2,000,000 pCi/l	(C) 31
	Cesium-137	9,420,000,000 pCi/l	(c) 31
	Europium-154	17,200,000 pCi/l	(c) 31
	Strontium-90	9,260,000,000 pCi/l	(c) 31
	32 hazardous chemicals/metals		(b) 10-28
V Tank soil	STP lists as MLLW	54,120 pCi/g	RE-P-80-090 @6
V-13 & V-14 Tanks	STP lists liquid/sludge	MLLW	STP @ 6-3

IET Valve Pit TSF-21	Cs-137	602,000 pCi/l	(a)Table A-9-2
	Lead	9,350 ug/l	(a) Table A-9-2
	Trichloroethene	22,000 ug/l	"
Loft-02 Disposal Pond	Aluminum	23,900 mg/kg	(b) 7-43
	Manganese	1,080 mg/kg	"
	gross alpha	8,400 pCi/kg 8.4 pCi/g	"
	gross beta	6,500 pCi/kg 6.5 pCi/g	"
WRRTF-01 Burn Pit	Xylene	6,600 ug/kg	(a) Table A-3-3
	Acetone	4,200 ug/kg	(a) Table A-3-5
	Naphthalene	7,800 ug/kg	(a) Table A-3-5
	2-methylnapthalene	10,300 ug/kg	(a) Table A-3-5
	Lead	2,350 ug/kg	(a) Table A-3-6
Diesel Fuel Tank WRRTF-13	TPH	35,700 mg/kg	(b) 4-140

*See Reference Section for the following table references: (a) DOE-ID-10527; (b) DOE-ID-10557; (c) TAN(d)

TAN SNAPTRAN Tests by Tami Thatcher

Tami Thatcher writes; "There were three SNAPTRAN tests at INL in the 1960s all conducted at TAN. The INL was given three SNAPTRAN reactors to play with. These were designed as an experimental reactor to launch into space. A SNAPTRAN reactor was actually launched in 1965. It operated just 43 days before an electrical failure caused it (to be shut down?) (Google wiki SNAPTRAN)

"These were U-235 cores, 15.6 in. long by 8.8 inches in diameter. (Contrast this to ATR's 4 ft. long, 4 ft. diameter core?) These were thermal power of 30 kW contrast to the Advanced Test Reactor is 250 MW thermal but usually operated at only about 100 MW thermal.

But what matters is the total amount of fissionable material in the core, not the rate at which it was designed to produce power. These had beryllium reflectors and were sodium-potassium Nak cooled.

" One of the three did not dismantle or disassemble the reactor core so there's no plume of it mentioned in the ERDA-1536 document or INEL HDE. But apparently it did go critical, become radioactive, and I found somewhere it said "it was only slightly damaged." I can't find where I read that. The thing is that all three would have also been a worker exposure source for TAN workers in the 1960s. And John Horan's report of external radiation exposures in the 1990s, he claims he thinks it was an error that so many workers got over 5 rem but then on closer examination can't find an error. He was in charge of safety in the 60s, including keeping tabs on worker radiation doses. So his claimed surprise at the high recorded doses is "incredible." So one issue is the worker exposure from the SNAPTRAN tests which NIOSH tries to approach from looking at the INEL HDE created for offsite dose evaluation.

"J. R. Horan, "Occupational Radiation Exposure History of the Idaho Field Office Operations at INEL," EGG-CS-11143, October 1993. [144] [145] Thatcher wrote:

> "Following one SNAPTRAN test, the plume was tracked 21 miles by plane. Subsequent monitoring in Monteview, a farming community near TAN at the near end of the INL included cow's milk and alfalfa concluded that the release wasn't above allowable standards but never told residents. The DOE's 1966 report [1] concluded that the release was 20 percent of the total inventory, but it doesn't say what the total inventory was. The INEL Historical Dose Evaluation listed the release on January 11, 1966 as 2000 curies but the DOE's waste document said 600,000 curies. [2] They proceed to say "The SNAPTRAN-2 Reactor Dolly was dismantled and the reactor structure and components were removed to the burial ground. Forty-seven truck-loads of contaminated soil were removed from around the IET area to the CFA burial ground." If you understand how DOE is really not that particular about soil contamination, you know that the soil had to be hotter than hell. Around the BORAX I reactor debris from intentionally blowing it up, later, a few rocks were scattered over the top of it. Decade's later CERCLA reviews found unacceptably high soil contamination problems at TAN where the SNAPTRAN and initial engine tests took place, among others. Coincidentally, the US Geological Survey stopped well water monitoring for the entire north end of the INL from NRF to TAN after 1963 for about a decade." [146]

"The discrepancy between the 2000 curies and the 600,000 curies is said to be because the 2000 curies is the long-lived curies that blew offsite. They are saying that the short-lived curies stayed on-site. And p. A-64 SNAPTRAN, they say released 75 percent of the noble gases, 70 percent of the iodine, 45 percent of the tellurium, 4 percent of the "solids" this being alpha emitters like uranium and plutonium that they would not have monitored for, likely, and only 21 percent of the fission product inventory." Yes, a large fraction of the curies are short-lived. But the longer lived fission product inventory – how reliable is the 21 percent estimate? How reliable is the solid's 4 percent estimate? Well, these questions take more research and are harder to answer, especially without the environmental monitoring data.

ERDA-1536 p. II-248 says "only slight ground contamination" plume followed 21 miles but no iodine, only noble gases. 10 mrem 6 miles at boundary of INL. If the ground contamination was only "slight" then why the multiple truckloads of soil hauled away? And excessive soil contamination found years later?

4/1/1964 SNAPTRAN-3 Underwater, but steam ejected. 45 MW-sec of nuclear fission. Said to be a fireball. Prompt critical. "Blew up."

1/11/1966 SNAPTRAN-2 54 MW-sec of nuclear fission. Open air test, so no chance of iodine scrubbing from water. But DOE says "once again, the total integrated rad exposure at the nearest boundary was less than 10 mrem."

"So I think there is an issue about what was actually released by the two destructive SNAPTRAN tests. There's the mystery milk in SE Idaho in the 1965 and 1966 documented in Table E-5 of the INEL HDE. [147]

"There is an unsigned press release that is part of the DOE's Human Radiation Experiments collection dated July 20, 1965 of a destructive SNAPTRAN test. Why was this press release part of the Human Radiation Experiments collection, since acknowledged tests were not on this date? [148]

"There is reporting of fuel processing at the "chem. plant" for two SNAPTRAN tests, but we know there were three. This report below has Table V that lists all the fuel processed at ICPP.

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[144] http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/26/050/26050117.pdf#search=%22doe%2Fid-12119%22

[145] ERDA-1536; Waste Management Operations, INEL Final Environmental Impact Statement, US Energy Research & Development Administration, September 1977. p. II-249.

[146] EDI's website here: http://www.environmental-defense-institute.org/publications/TopTenINLR2.pdf

[147] US Department of Energy Idaho Operations Office, "Idaho National Engineering Laboratory Historical Dose Evaluation," DOE-ID-12119, August 1991. See Table E-5 on p. E-36 for mystery milk and see Table C-21 for the public annual dose summary. Volumes 1 and 2 can be found at https://www.iaea.org/inis/inis-collection/index.html

[148] See the Department of Energy Human Radiation Experiments documents collection (of the small subset publically accessible) including J. R. Horan, "Annual Progress Report 1963, Idaho Operations Office of the US Atomic Energy Commission," 1964, and INEL-HRE-TO70228 and the SNAPTRAN collection at http://www4vip.inl.gov/library/searchreadingroom2.shtml

"In addition to MTR fuel, Hanford fuel, "Zirconium" which is naval propulsion fuel I think, it lists Borax, EBR-I, EBR-II, ATR, ETR, Borax IV, SL-1 scrap, SL-1 (fuel not in the reactor at the time of the accident, I suppose) SPERT, SNAPTRAN 2/10A-3 core debris, SNAPTRAN 2/10-2, and many others. [149]

"But nothing about the where-abouts of SNAPTRAN 2/10-1, which operated in the 1964 to 1966 timeframe but was supposedly only slightly damaged but radioactive. It makes sense for them to have reprocessed it. In an interesting but unreliable book "Atomic Accidents" by James Mahaffey, he says he could not find any record of the whereabouts of the 2/10-1 reactor. But it is not impossible for them to have shipped it in a shielded cask to another NASA research facility. But unless that facility had a hot cell or spent fuel pool, its seems very unlikely. Confirming its whereabouts would be somewhat helpful but may not help know the extent of understatement of worker and public exposures.

" There was an ans.org dinner meeting presentation about SNAP 10A by Schmidt. He says "test shutdown at 10,000 hours in 1966." Was he talking about SNAPTRAN 10A-1, the reactor not blown to smithereens?

Susan Stacey's "Proving the Principle" describes the fact the Idaho tested three SNAP reactors. So there are multiple issues:

- "There's the likely underestimation of the amount of fission products actually released from the two SNAPTRAN destructive tests that exposed the public. I say this because of the mystery milk high iodine levels in Idaho Falls in 1965 and 1966 and because of the likely underestimation of the fraction of inventory released from the fuel by the tests. The 2000 curie vs 600,000 curies is explained by DOE's using only the long-lived fission products they say blew offsite. But the assumed release fractions are subject to question.
- "The worker external as well as internal exposures, especially alpha and beta exposures were likely to have not been adequately monitored and likely not well represented by NIOSH feeble attempts to argue, as they have in person in Idaho Falls, that all radioactivity was timed to blow offsite, so that workers were not exposed.
- "The amount of soil contamination that had to be trucked away for disposal points to the mess and overall monitoring problems. I say this because later CERCLA investigations required hauling more contaminated soil away from TAN. Where was the soil trucked to? DOE's 1960s report says to a CFA landfill. But was it actually trucked to CFA or to RWMC? Some later soil cleanup was hauled to TRA. The soil mess points to lousy overall monitoring especially in those early years which is a public and a worker issue.
- "Where did the third SNAPTRAN reactor (INL had three of these reactors to play with), where did it end up? My conjecture is that at least one of the destructive tests resulted in no core to reprocess. So it is only conjecture on my part to wonder if the missing SNAPTRAN-10A-1 was actually reprocessed even though the official records say that -2 and -3 were reprocessed."

Section IV.F. Radioactive Waste Management Complex Cleanup Plan

Site Description

The Radioactive Waste Management Complex (RWMC) is the largest of the numerous INL radioactive waste burial grounds. This site's first trench was opened on July 8, 1952 for on-site mixed fission product waste, but soon started accepting waste from around the country. "During the 1950's, the rate of radioactive waste generated by private industry [Atomic Energy Commission] AEC licensees was increasing. Since no commercially operated burial ground existed for these wastes, most of the licensees used commercial sea disposal

[149] INEEL Site Report on the Production and Use of Recycled Uranium, L.C. Lewis, D.C. Barg C.L. Bendixsen J.P. Henscheid D.R. Wenzel B.L. Denning, INEEL/EXT-2000-00959, September 2000 http://www.osti.gov/scitech/servlets/purl/768760

services provided by seven firms that disposed of packaged solid waste in AEC approved areas off the US Coast." "In late 1959, the AEC decided that land burial had definite advantages, particularly economic, over sea disposal." [PR-W-79-038 @27]

Between 1946 and 1970, the AEC supervised the disposal of about 107,000 drums of low-level radioactive wastes at sites off the Atlantic and Pacific coasts, according to the history of the commission and a report by Daniel P. Finn for the Senate Intelligence Committee. Ocean dumping of low-level radioactive wastes by the USA ended about 1970 with the passage of the Marine Protection, Research and Sanctuaries Act, referred to as the ocean dumping act.

The RWMC is divided into primarily two areas, the Subsurface Disposal Area (SDA), and the Transuranic Storage Area (TSA). The SDA was expanded from the original 13 acres to its current 96.8 acres, and as of 1992 contained 20 pits, an acid pit, 58 trenches, and after 1977 more than 20 rows of soil "vaults" for small volume highly radioactive waste requiring remote handling and shielding. Soil vault is a euphemism for a plain old hole in the ground. Prior to 1977, remote handled waste was dumped in pits and trenches with other waste. The MFC Hot Fuel Examination Facility, ICPP, and the Navy's ECF remote handled hot waste is buried here in these 600+ holes. [INEL-94/0241] A thermal analysis of MFC waste notes 1,150 soil vaults at the SDA and container temperatures of 392 degrees (F). [RE-A-80-062 @2] See Section I(E) Navy waste characterization. A 1992 plot plan [RWMC # 416511] shows the 20 rows of soil vaults between the pits and trenches. Additionally, a more recent large concrete lined soil vault array has been added to the SW corner of Pit 20.

The SDA also contains the Transuranic Disposal Area (TDA) that originally was designed for two large pads (A & B) where the waste was stacked and later covered with ground to act as shielding, however only Pad A was used. Current DOE documentation acknowledges Pad-A with dimensions of 73.2 x 102.1 meters (240 x 335 feet) by 5.6 to 6.1 meters (20 feet) high and with a total volume of 10,200 cubic meters. [Pad-A ROD] However, if these dimensions are multiplied (minus soil cover) the volume would be 45,514 cubic meters. The discrepancy may in part be due to the Pad being somewhat larger than the waste stack but not likely to be four times larger. This volume discrepancy is not just an academic question but an important issue related to characterizing the actual volume of mixed alpha low-level waste dumped at this site.

The Transuranic Storage Area (TSA) covers 57.5 acres, and is divided into four areas. TSA Pad-1 opened in 1970 and has Cells 1 through 9, TSA-R Pad immediately south of Pad-1 has 3 cells. These two above ground pads are covered with plastic wood and soil. Pad-1 and Pad-R measure 150 x 1,100 x 15 feet. Pad-2 measures about 150 x 730 x 15 feet high. A containment building is currently being built over both pads for the planned exhumation of the waste. Pad-2 opened in 1975 contains an Air Support Building that stores barrels of TRU waste and has 3 earth covered cells behind it. TSA Pad 3 has the SWEEP building that assesses the contents of incoming waste barrels, and has another large air support storage building attached to it on the east. The fourth TSA section is the Intermediate Level Transuranic Storage Facility (ILTSF) that is divided up into two pads (Pads 1 & 2). The ILTSF contained 57 "concrete lined soil vaults" in 1979 and is used for remote handled waste in excess of 4,500 R/h three feet from the container surface.

Responding to warnings by the US Geologic Survey, the National Academy of Sciences Committee on Geologic Aspects of Radioactive Waste Disposal visited (June-July 1960) both Hanford and National Reactor Testing Station (NRTS) (now called INL) and submitted a report to the Atomic Energy Commission in which they stated:

"The protection afforded by aridity can lead to overconfidence: at both sites it seemed to be assumed that no water from surface precipitation percolates downward to the water table, whereas there appears to be as yet no conclusive evidence that this is the case, especially during periods of low evapotranspiration and heavier-than-average precipitation, as when winter snows are melted. At the NRTS pipes were laid underground without ordinary safeguards against corrosion on the assumption that the pipes would not corrode in the dry soil, but they did. At NRTS plutonium wastes (plutonium half-life 24,000 years) are given shallow burial in ordinary steel (not stainless) drums on the same assumption. Corrosion of the drums and ultimate leakage is inevitable .... The movement of fluids through the vadose (aeration) zone and the consequent movement of the radioisotopes are not sufficiently understood to ensure safety."[IDO-22056 @ 3]

Five years later (1965) the National Academy of Sciences revisited NRTS and concluded that "1.) considerations of long-range safety are in some instances subordinated to regard for economy or operation, and

2.) that some disposal practices are conditioned on over-confidence in the capacity of the local environment to contain vast quantities of radionuclides for indefinite periods without danger to the biosphere."[IDO-22056 @ 3]

These scientific observations by the National Academy of Sciences were made over forty five years ago and were ignored by the Atomic Energy Commission, Energy Research Development Agency (ERDA), and finally by DOE. Even in 1960, the scientists recognized what the consequences would be and offered specific criticism for subordinating safety to economic expediency. No claim to ignorance can be made by the federal agencies. This is outright gross negligence on the part of the federal government.

The cleanup proposal for the Radioactive Waste Management Complex (RWMC) unfortunately is characteristic of DOE's shell game with its nuclear waste. Observers also call DOE's process "radioactive relocation" - scoffing at the term "cleanup". Despite the fact that the RWMC is a Superfund cleanup site due to contamination from previous radioactive dumping, INL continues to bury radioactive waste at RWMC. The waste is dumped in unlined pits that would not even pass municipal garbage landfill regulations under Subtitle D. Neither the State nor EPA has demanded permitting of the RWMC under the Resource Conservation Recovery Act (RCRA). DOE claims that RCRA does not apply because radioactive waste is not covered by the law. Court decisions in 1987 over-threw that argument whenever radioactive and hazardous chemical wastes are mixed (mixed waste). The RWMC has mixed waste and therefore must be held in compliance with RCRA. EPA's inability to promulgate radioactive waste disposal standards has further exacerbated the enforcement problem. The Nuclear Regulatory Commission and DOE have effectively kept previous administration pressures on EPA to shelve the standards.

DOE's public literature (fact sheets) on cleanup actions inaccurately identifies only Rocky Flats transuranic (TRU) as the only off-site waste dumped at the Radioactive Waste Management Complex (RWMC). [RWMC Fact @ 2] Also on page 3 the fact sheet states that " The Subsurface Disposal Area which is dedicated to permanent disposal of low-level waste generated at the INL", [RWMC Fact @ 3] is not supported by the literature. A 1976 USGS document that has an RWMC plot plan of the location of the pits and trenches notes that "Trench 55 is still available for high-level waste." [IDO-22056 @9]

"In May 1960, the INL was designated as one of two national burial grounds for disposal of waste from any ERDA [predecessor of DOE] source. Consequently, a great deal of beta-gamma contaminated waste was received from various experimental operations around the country, and was buried together with the transuranic waste from Rocky Flats. This waste material included: reactor shielding weighing 16,329 Kg (36,000 lbs) from Kelly Air Force base, San Antonio, Texas, contaminated with Co-60; an aluminum heat exchanger 8.2 meters long and 1.5 meters in diameter weighing 20,000 lbs from Nuclear Engineering Company, Pleasanton, CA, contaminated with radionuclides of Co, Fe, and Al; drums containing old compasses, metascopes[sic], switchboards, electron tubes, contaminated with Ra-226, Po-210, Sr-90, Co-60 from US Army Chemical Center, Dugway, UT; drums containing animal carcasses from US Nuclear Co., Burbank, CA; concrete blocks 1.5 x 1.5 x 2 meters contaminated with mixed fission products from Lawrence Livermore, CA." [WMP 77-3 @ 8-9]

Also US Nuclear Corp., General Atomics Corp., dumped at INL. [WMP 77-3 @ 14] In later years, DOE facilities at Mound, Battelle-Columbus, Argonne-east, and Bettis also dumped at INL. "Soon general 'low-level' and 'high-level' wastes were buried here. High level wastes in shielded containers continued to be buried there at least until 1957. Some readings were as high as 12,000 rads per hour. 'Low-level' waste was buried in everything from cardboard boxes to steel drums and wooden crates. [Deadly Defense @ 50] Attempts were made to bury the most radioactive materials at the bottom of the trenches "to reduce the radiation level at the top of the trench to <25 R/hr. " [IDO-12085 @4]

Reactors and/or cores from the on-site Aircraft Nuclear Propulsion, SNAPTRAN, SL-1, Low-Power Reactor (ML-1), Portable Medium Nuclear Power Plant (PM-2A), and LOFT tests were also buried at the RWMC. Spent reactor fuel from the INL Aircraft Nuclear Propulsion (ANP) and other projects went to the burial grounds. "Information about the disposal of the insert material is uncertain based on discussions with personnel previously employed with the ANP Program. A check with personnel at ICPP indicated that no records available at ICPP existed to show that ceramic fuels had been received or were being stored at ICPP. In addition, the only fuel to be processed at ICPP, other than metallic fuel, was the graphite ROVER (nuclear rocket propulsion program) fuel. To date, no ceramic fuel has been processed at ICPP."[EGG-WM-10903 @2-14 & 2-21] Basically, there were three options, reprocess, storage, or dumping. If the spent reactor fuel was neither reprocessed or stored, then it

was likely dumped at the RWMC.

Modifications to the EBR-II reactor at MFC in 1981 generated considerable radioactive waste that was buried at the RWMC. The large waste items included the old reactor vessel (16 tons), large reactor rotating plug (65 tons), and small reactor rotating plug (50 tons). The reactor-vessel cover contained about 270,000 curies of cobalt-60. This activity level results from activation of Stellite sleeves required for rod-drive shafts and gripper mechanisms. The reactor-vessel cover is filled with 263 individual graphite-filled cans. [ERDA-1552 @IV-16]

Considerable confusion exists in the public and DOE literature regarding waste classifications. The public cannot be faulted by combining all highly radioactive waste in the high-level category, as opposed to the arbitrary DOE definition of high-level being reactor fuel and fuel process waste. The term Transuranic is a relatively new term which earlier was called mixed fission products (MFP). High-level, Transuranic (TRU), and low-level are the currently used technical classifications.

Additionally, the public is not served by the DOE's deficient and inaccurate public literature that characterizes the waste at the RWMC. No mention is made of radionuclides in the aquifer, only "organic compounds are present in groundwater monitoring wells at RWMC." [RWMC Fact@ 3] DOE's internal documents reviewed by independent analysis show that, "Core sampling into the 88 acre [RWMC] burial ground site has disclosed plutonium contamination 110 feet and 230 feet below the Waste Management Complex. Floods in 1962 and 1969 are believed to have caused the plutonium migration. Another possible cause is transport by organic chemicals. One test well emitted organic gas levels 30 times safe worker exposure limit and had to be sealed." [Deadly Defense @ 51] More recent water sample data show radionuclides at a depth of 580 feet below the RWMC. [IDO-22056] Disposal trenches average about 6 feet wide, 12 feet deep and 900 feet long. Pits are large deep rectangular holes dug down to basalt, filled with waste and then covered over with soil.

Subsurface Disposal Area Pits and Trenches

Pit / Trench Number	Waste Type	Year Used	Number of drums	Number of Cartons/Boxes
Trenches 1-16	Non-TRU	1954-57	?	?
Trenches 17,19, 20, 26, 32, 34, 39, 45, 47-49, 51, 52, 55, and 56	TRU	1958-74	?	?
Trenches 18, 21-25, 27-31, 33, 35-38, 40,44, 46, 50, 53, 54, 57, and 58	Non-TRU			
Pit 1	Non-TRU	1957-61	7,551	2,526
Pit 2	TRU	1959-63	22,435	2,367
Pit 3	TRU	1961-63	5,511	100
Pit 4	TRU	1963-67	31,411	2,368
Pit 5	TRU	1965-66	18,486	1,350
Pit 6	TRU	1967-68	14,396	3,423
Pit 7	MFP	1966-68	?	?
Pit 8	MFP	1967-67	?	?
Pit 9	TRU	1968-69	3,921	2,029
Pit 10	TRU	1968-71	26,645	2,849
Pit 11 (later emptied)	TRU	1970-70	13,542	90
Pit 12 (part emptied)	TRU	1970-72	4,838	26
Pit 13 through 15	TRU	1971-	?	?
Pit 16	Non-TRU			

20 Rows Soil Vaults >600 w/2 drums each hole	>Class-C LLW shielding /remote handling		1,200	SW corner Pit-20 array concrete vaults >Class-C LLW
Pad - A	Mixed Alpha LLW	1972-78	18,232	2,020
Acid Pit	Rad/chemical Liquids	1954-61	?	160,000 gallons

Acronyms:
[WMP-77-3 @2][IDO-22056 @9][Oversight(c), 1/6/96][INEL-94/0241][EGG-WM-10903@2-7]
MPF = Mixed Fission Products; TRU = Transuranic Waste (elements heavier than uranium >100 nCi/g);
Alpha Low-level = >10 nCi/g but <100 nCi/g TRU

Sub-soil sampling of the SDA burial ground showed Americium-241 at 66,000 pCi/gm, Plutonium-239 at 1,600,000 pCi/gm of soil, Cesium-137 at 2 pCi/gm, and Krypton-40 at 16 pCi/gm. [RE-P-81-016@2] Radiation being given off at 3 feet above Pit 13 and trench 55 were as high as 200 mR/ hr.[Tree-1013@8] SDA perimeter monitoring also at 3 foot height reached 7,261 mR/hr in 1975. [Ibid @ 11]

"High radiation level waste that would cause excess personnel exposure was handled and disposed by using special transfer vehicles and containers. A long tongue trailer, pulled behind a pickup truck, was used to haul material contained in 2x2x3 foot boxes or in 30 gal garbage cans. A shielded cask and a lead open-top box container were used to shield high-level waste."... "At least until 1957, no upper limit had been set on the level of radiation that could be handled; units of up to 12,000 R/hr were disposed." [PR-W-79-038 @19]

Limits of up to 400 grams of U-235, or 267 grams of Pu-239 that could be disposed in the same container were exceeded. [PR-W-79-038 @30] Two fires in Trench 42 occurred on September 8 and 9, 1966, and were caused by alkali metals being mixed with low-level waste. This was coupled with a 34% increase in "hot" waste in the trench. [Ibid] A third fire occurred on June 1, 1970 when sunlight on an exposed drum of uranium turnings ignited. The fire spread to other drums and "attempts failed to extinguish the fire in the waste stack." [Ibid @44] The fire was finally contained by a bulldozer operator who covered the stack with ground.

Pad-A within the SDA was the first attempt to comply with new regulations that required segregation of Mixed TRU waste from low-level. This crude storage approach consisted of a thin above ground asphalt pad (240 x 335 feet) upon which waste drums and boxes were stacked and later covered with soil to provide radiation shielding. Pad-A received over 87,500 kg of Uranium-234, 235, and 238 along with 4,600,000 kg of evaporator nitrates that the Code of Federal Regulations classifies as an ignitable oxide contaminated with plutonium, americium, thorium, uranium, and potassium-40. [Pad-A ROD@10]

EPA and State regulators went along with DOE on a no-action (no cleanup) Record of Decision even though the risk assessment showed Pad-A would be contaminating ground water in excess of drinking water standards within 100 years. [EGG-WM-9967 @ 7-2] Corrosion /disintegration of waste containers with the resulting release of contaminates and the long term erosion (wind and rain) of the 3-4 feet of cover soil from the top of the 25-30 foot Pad-A mound does not appear to be considered. EG&G's Remedial Investigation Feasibility Study for Pad A found that erosion rates of 36 inches per hundred years can be expected. [EGG-WM-9967 @ 7-2] This means that the Pad-A waste will be exposed in a hundred years.

Understanding the extent of the waste problem at INL is necessary for putting any remedial cleanup actions into context. Additionally, the nature and radioactive content of these wastes must be understood in order to quantify the risks these wastes pose. Early waste burial practices were particularly egregious. The issue of contaminated soil, estimated at 60,000 cm under-burden and an additional 112,000 cm overburden, at the burial ground is very serious because environmental restoration efforts must include this contamination because it too will leach into the aquifer below if not removed with the waste. [IEER(g)@85] Soil samples five feet below Pit 2 in the Subsurface Disposal Area contained the following concentrations: [TREE-1171 @29]

RWMC Pit 2 Sub-surface Soil Samples [TREE-1171 @29]

Nuclide	Concentration	
Strontium-90	41.0	pCi/gram
Plutonium-238	220.0	pCi/gram
Plutonium-239/240	11,000.0	pCi/gram
Cesium-137	10.9	pCi/gram
Americium-241	1,550.0	pCi/gram

See Section I Part E Onsite Waste Hazard for summaries of disposed and stored waste. Samples were taken of deer mice tissues that had access through burrowing to the waste in the SDA. "Much of the activity [on the mice] in this one set of samples was associated with the hides and GI tracts, total concentrations of 2,026 and 415 pCi/g respectively while the lungs and remainder of the carcasses had total concentrations of 86 and 145 pCi/g respectively."[IDO-12085 @ 9] This sample data brings up numerous questions as to the extent these animals were consumed up the food chain by other predators which in turn may have been consumed by humans. "Harvester ants (Pogonomyrmex salinus) are complicating waste disposal efforts by doing what ants do best: digging below and moving dirt above."... "The rigorous digging of the ants disturbs radioactive contaminates and paves vertical tunnels that can channel water into disposal areas." [Programs and People @ 10] Six-month exposures measured at the RWMC perimeter from November 1973 to November 1984 found 16,800 mrem at station 33. [EGG-2386 @ 35]

At a 11/2/92 briefing, Idaho Division of Environmental Quality representative Dean Nygard emphatically denied that radionuclides had migrated lower than the 150 foot level below the SDA. Again, this position by the State is not supported by the literature. Cesium-137, Plutonium-238,-239,-240 were all found at the 240 foot interbeds. [IDO-22056@74] Forty-one % of the samples from the 240 foot inter-beds contained radionuclides. [Ibid.@87] Other literature confirmation of plutonium at 240 feet includes: "Radionuclides (including Pu-238.-239.-240, Am-241, Cs-137, and Sr-90) have been detected in soils and in sedimentary inter-beds to a depth of 240 feet beneath the RWMC, (Hodge et al, 1989)." "Positive values for Pu-238,-239,-240 were detected in samples obtained from the 240 foot interbed in bore hole DO2."[DOE/ID-10183@134-145][DOE/ID/12082(88) @14-16]

Radionuclides are also confirmed in the aquifer under the RWMC. [EG&G-WTD-9438@25] USGS water sampling data at the 600 foot levels, expressed in pico curies per liter (pCi/l) show:

Groundwater Sampling Data at 600 Feet Under RWMC

Nuclide	Concentration pCi/L	Drinking Water Std. pCi/L
Tritium	10,000.00	20,000.00
Cobalt-57	48.00	1,000.00
Cobalt-60	100.00	100.00
Cesium-137	400.00	119.00
Plutonium-238	9.00	7.02
Plutonium-239-240	0.14	62.10
Americium-241	15.00	6.34
Strontium-90	10.00	8.00

[IDO-22056 @66] * The drinking water standard for gross alpha (total of all alpha emitters) is 15 pCi/l.

USGS report titled Hydrology of the Solid Waste Burial Ground as Related to the Potential Migration of Radionuclides Idaho National Engineering Laboratory, describes in detail the monitoring well drilling methodology. USGS hydrologists that drilled the wells went to considerable lengths to ensure surface or near-surface contamination did not compromise their 600 foot deep well samples listed in the table above. Analysis of the circumstances of the RWMC generated the following principal evidence supporting migration of radionuclides to the aquifer below.

> "Sufficient water has come in contact with buried waste to cause initial leaching and mobilization. Sufficient quantities of wastes have been available for leaching to account for observed subsurface radionuclide concentrations. The lithologic column beneath the burial ground has sufficient permeability and appears to be at field moisture capacity; this would allow infiltrated water to have migrated downward. Sufficient water has percolated downward through the burial ground to have reached depths were significant concentrations of radionuclides were found. Most of the higher subsurface radionuclide concentrations tended to lie beneath the oldest buried waste or beneath the areas through which the most water has percolated. A greater percentage of samples analyzed from the 110 foot sedimentary layer contained waste isotopes than from the 240 foot or deeper layers in the six interior wells. Samples from wells 93 and 96 indicate greater concentrations of nuclides in the 110 layer than in the 240 foot layer. Many of the observed subsurface concentrations of radionuclides were greater than could be attributed to artificial sample contamination from any known ground-surface or other overlying sources." [IDO-22056@83]

DOE's own sampling of the USGS 600 foot wells at the RWMC between 1987 and 1997 show americium-241 contamination at levels shown in the following table. Americium-241 is a decay product (daughter) of plutonium-241. The maximum concentration level allowed in drinking water is 6.34 pCi/l. Though the DOE sample concentration levels for Am-241 are lower than those of USGS, the data contradicts DOE public statements for the past several decades that actinides (isotopes heavier than uranium) had migrated to the aquifer which is 580 feet below the RWMC.

Americium-241 at 600 foot level at RWMC

Well Number	Date of Sample	Concentration (pC/l)
88	1992	0.40 +/- 0.02
89	1990	0.04 +/- 0.02
90	1988	0.06 +/- 0.03
90	1991	0.40 +/- 0.02
117	1987	0.06 +/- 0.03
119	1991	0.06 +/- 0.03
M-1F	1997	1.03 +/- 0.27
M-10-S	1993	0.3 +/- 0.1
M-3F	1997	0.045 +/- 0.017

[Hain(a)]

Radioactivity of Waste Dumped at the Radioactive Waste Management Complex Subsurface Disposal Area 1952-2003

Major Generator	1952-1983	1984-1993	1994-2003	Total 1952-2003
TAN	**63,000**	**2,200**	**?**	**65,200**
ATRC/TRA	**460,000**	**320,000**	**2,800,000**	**3,580,000**
INTEC/ICPP	**690,000**	**670**	**160**	**690,830**
NRF	**4,200,000**	**970,000**	**140,000**	**5,310,000**
MFC/ANLW	**1,100,000**	**150,000**	**810,000**	**2,060,000**
Rocky Flats Plant				
Non-plutonium	**57,000**	**-?-**	**- ?-**	**57,000**
Plutonium * (all species)	**576,967**			**576,967**
Other	**55,000**	**3,200**	**510**	**58,710**
Total	**7,261,967**	**1,446,070**	**3,750,670**	**12,458,700**

Notes for above table: [EGG-WM-10903 @ 6-25] [INEL-95/0310 (Formerly EGG-WM-10903) Rev.1; Volume 1 to 3; August 1995]
[* Plutonium totals are significantly understated because EDI only added rollup entries > 9 curies in the total]

ATRC/TRA/RTC; Advanced Test Reactor Complex/Test Reactor Area/ Reactor Technology Center
ICPP/INTEC; Idaho Chemical Processing Plant, aka Idaho Nuclear Technology & Engineering Center
NRF; Naval Reactors Facility
MFC/ANLW; Materials &Fuels Complex /Argonne National Laboratory – West
RFP/RFO; Rocky Flats Plant
Other; On-site D&D Environmental Cleanup and Non-Idaho National Laboratory Generators

The above summary of radioactive content of waste dumped is considered understated. The Environmental Defense Institute analysis of the curie content of Navy shipments to the burial ground, for instance, adds up to 8,140,668 curies. However, the above DOE data using annual summaries attributes the Navy to only 4.2 million curies or only half as much. DOE admits that the annual summaries are understated. [EGG-WM-10903 @ 6-26] EDI's analysis of the Rocky Flats plutonium (all species) dumped at the RWMC during the years 1952 – 1983 has a curie content of 576,967 Ci, and is also understated because only individual listings of >9 curies were counted. [INEL-95/0310 (Formerly EGG-WM-10903) Rev.1; Volume 3; August 1995]

Section IV.F.2 Flooding Issues at the RWMC

US Geological Survey (USGS) hydrologist Barraclough estimates that 100 acre-feet (32,492,910 gallons) of direct precipitation landed on the RWMC between 1952 and 1970. Additionally, due to the low depression of the RWMC local run off has entered the burial ground adding to direct surface water introduction. The 1962 flood which inundated the SDA allowed 30 acre feet (10,000,000 gallons) into the SDA. The 1969 flood put 20 acre feet (6.4 million gallons) into the SDA. [IDO-22056@46] It is no wonder radionuclides are found in the Snake River Aquifer. "Adams and Fowler measured solubility's of plutonium in tap water and found a range of 46,000 to 130,000 pCi/l."... "These findings are also consistent with Hagan and Miners (1970)." [Ibid.@70] According to DOE sponsored studies, the presence of gamma radiation increases the permeability/leach-ability of contaminates in basalt by ten-fold. [EG&G-J-02083] Water samples taken in the flooded SDA pits during the 1969 flood contained 13,000 pCi/l gross beta and 2,700 pCi/l gross alpha. [IDO-22056@69-70] This data verifies the solubility of radionuclides and the water sample data from the deep monitoring wells verify the mobility of these contaminates. Additionally, USGS soil samples under Pit 10 showed plutonium at 400,000 pCi/g and under Pit 2 the Pu was at 320,000 pCi/g which confirms contaminate mobility.[IDO-22056@77]

Flooding of the RWMC and its Subsurface Disposal Area (SDA) from the Big Lost River has occurred at

least three times (1962, 1969, and 1982) since 1950. In 1962, Trenches 24 and 25 plus Pits 2 and 3 were flooded. In 1969, Trenches 48 and 49 plus Pits 8, 9, and 10 were flooded. In 1982, Trenches 42 and 49 plus Pit 16 were flooded. [EG&G-WM-10090@3] According to topographical map (INC-B-15368) of the burial ground area and a part of the Big Lost River ponding areas, the burial ground lies 40 feet below the Big Lost River 2 miles north. [IDO-22056@8] A flood-control diversion dam was been built to mitigate flooding. A USGS 1976 "Analysis of historical stream-flow information indicate that floods in the Big Lost River would overtop the flood-control diversion dam about once in every 55 years on average; if the culverts in the dam are completely plugged, overtopping of the dam would occur about once every 16 years." [IDO-22052@iii] The 1982 flooding of the SDA was in fact caused by plugging of the culverts. [EG&G-WM-10090] Since the RWMC is the lowest point in the region, there is nowhere else for the water to go. Currently, sump pumps are required to remove water out of the RWMC due to its lack of drainage. [IDO-22056 @10] This drainage problem begs the question of long-term institutional control to prevent flooding after DOE is gone.

In 1984, the Big Lost River Diversion Dam height was raised several feet to prevent additional flooding of the RWMC and other INL facilities. These improvements are expected to divert a maximum of 9,300 cubic feet per second flow of the Big Lost River with the accuracy limits of the computational procedures in the order of plus or minus 10-15%. The theoretical capacity then could be as low as 7,905 (9,300 - 15%) cubic feet per second. "A sustained flow at or above this [9,300] discharge could damage or destroy the dike". [DOE/ID-22071 @ 24] According to Larry Mann, former USGS Supervisory Hydrologist, "There is a USGS publication that is undergoing technical review which will update the 100-year flood for the Big Lost River and provide an estimate for the 500-year flood. Peak flows for the 100 and 500-year floods are estimated to be 7,260 and 9,680 cubic feet per second, respectively". [Mann 12/12/95]

Winter of 1996-97 brought record (188%) snow pack that feeds the Big Lost River coupled with record high Spring temperatures that again raise the flooding risks. Brandon Lommis, Idaho Falls Post Register reporter, found that in addition to the RWMC flooding hazard, the ICPP high-level waste tanks are also at risk. Lommis reports that, "Mike Bennett, INL's water resources coordinator, said 'it would be foolish not to have some concerns,' and that dike failure could allow water to seep into the underground storage tanks under a chemical processing plant and possibly contaminate the Snake River Plain Aquifer, according to a recent study. INL officials this year asked the Army Corps of Engineers to help inspect the dam and dikes before the water peaks. Bennett said dirt graders and trucks are standing by to shore up any unexpected weak spots." [Post Register 5/7/97] The May 20, 1997 LMICO Star noted that:

"Under normal conditions, the diversion dam is adequate to control water flow. The dam is weakest above the diversion gate, and may need reinforcement if water flows become heavier than anticipated (flood waters could flow over the diversion dam and back into the Big Lost river bed). Dixon has identified a source of rip rap (large rocks) and gravel for reinforcement. Along with the rip rap and gravel, 9,000 sandbags are strategically stockpiled to expedite any reinforcement that becomes necessary. The sandbags include 4,000 in existing inventory with another 5,000 bags ordered and available if needed." [Star (d)]

Geologic investigations are needed on the ground up stream of the INL diversion dam to see if there is evidence of flooding and related heights/volumes. This type of information may minimize the uncertainty of long-term maximum flood projections (i.e.. validate flow-rate assumptions). The life expectancy evaluations are also needed of the Big Lost River diversion dam and related channels, dams etc., after the 100 year institutional control and maintenance of the flood control infrastructure ends. Absent maintenance, could debris collect and block the interconnecting channels to the spreading areas facilitating the failure of the dams, and thus flood the RWMC? The USGS believes this is a credible scenario in their 1976 report:

> "It would appear that a rare major flood of the [Big Lost] river could over-flow into the burial ground basin through the narrow wind-gaps in the basalt. Although this has not occurred in the INL history, evidence indicates it has occurred in the past 2,000 years and possibly within the past 200 years." "At regional scale, horizontal hydraulic conductivities of the Snake River Plain Aquifer generally range from 100 to 10,000 feet per day as determined from well pumping tests or flow net analysis. The high number is among the highest for any know aquifer."... "Although vertical hydraulic conductivity is generally much less than horizontal conductivity in basalt, significant vertical conductivity does exist, primarily through vertical fractures. This is demonstrated by the fact that surface water from the Big Lost River infiltrates from the channel and the INEL diversion area and produces measurable recharge to the aquifer. In addition, waste water recharged to the Test Reactor Area (TRA) disposal ponds eventually reaches the Snake River Aquifer, 450 feet below. There is no reason

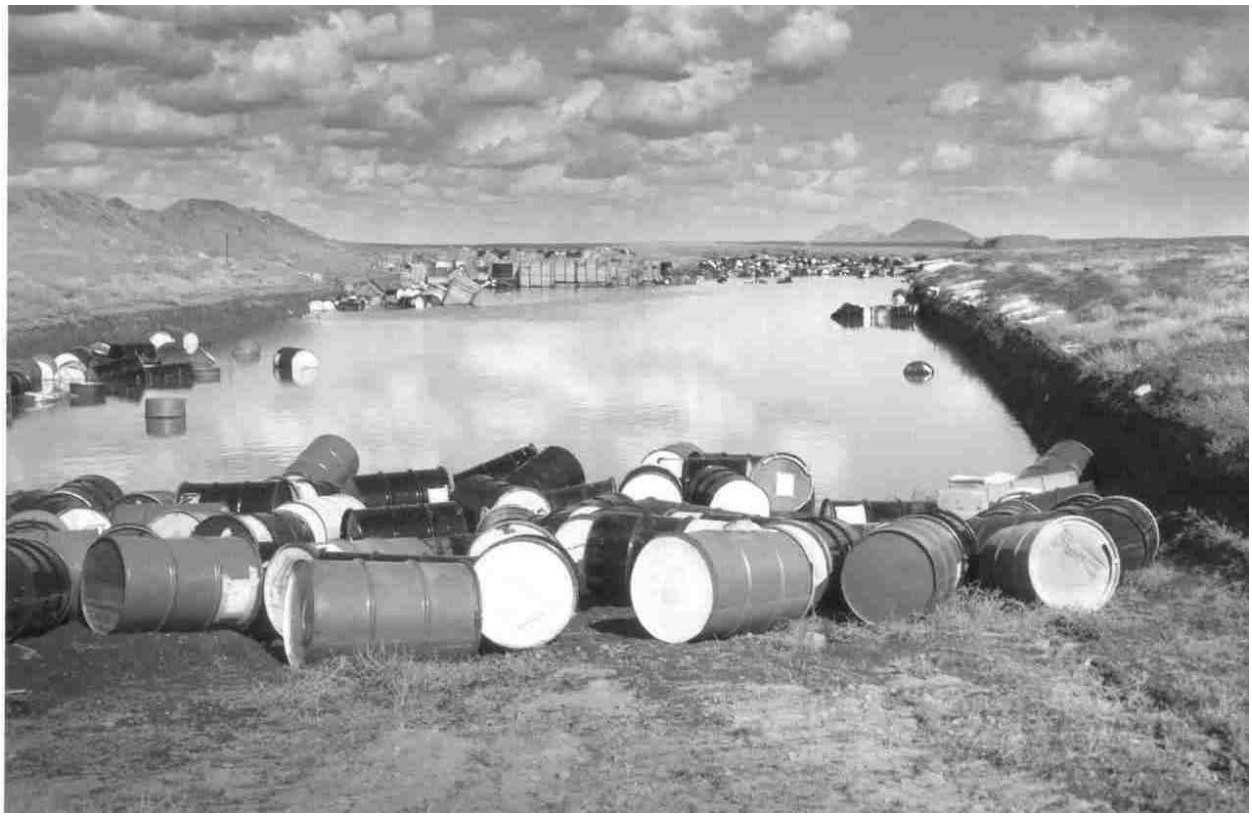
to believe that basalt beneath the burial ground have significantly less hydraulic conductivity than those beneath TRA or the diversion area." "Specified field tests...at Test Area North vicinity of the INL indicated an average horizontal permeability of about 55 feet per day and vertical permeability of about 15 feet per day." [IDO-22056@48]

A hypothesis is needed of Mackey Dam being overtopped and failing due to floods of not much greater recurrence interval than that of the maximum floods considered in the literature. The results of a failure of Mackey Dam have not been investigated in this paper. The INL EIS acknowledges that Mackey Dam "was built without seismic design criteria" and "additionally, it is not clear how resistant the dam structure is to seismic events" and the fact that "a fault segment runs within 6 kilometers of the Mackay Dam" [DEIS @ B-17] is significant. One need only recall the catastrophic failure of the Teton Dam a few years ago northeast of Idaho Falls. The Teton Dam, also constructed by the Army Corps of Engineers, failed because of inadequate design and construction. A 1996 DOE Environmental Assessment (EA) for TAN Pool Stabilization noted that the maximum probable flood is considered conservative as the last flood (12,000 years ago) with the magnitude of 35,000 cubic feet per second.[DOE/EA-1050 @B-4] This flood would easily overflow the diversion dam capacity of 9,300 cubic feet per second.

USGS Photo of RWMC
Area North-East of Big South Butte

USGS report titled Hydrology of the Solid Waste Burial Ground as Related to the Potential Migration of Radionuclides Idaho National Engineering Laboratory, describes in detail the monitoring well drilling methodology. USGS hydrologists that drilled the wells went to considerable lengths to ensure surface or near-surface contamination did not compromise their 600 foot deep well samples listed in the table above. Analysis of the circumstances of the RWMC generated the following principal evidence supporting migration of radionuclides to the aquifer below.

"Sufficient water has come in contact with buried waste to cause initial leaching and mobilization. Sufficient quantities of wastes have been available for leaching to account for observed subsurface radionuclide concentrations. The lithologic column beneath the burial ground has sufficient permeability and appears to be at field moisture capacity; this would allow infiltrated water to have migrated downward. Sufficient water has percolated downward through the burial ground to have reached depths were significant concentrations of radionuclides were found. Most of the higher subsurface radionuclide concentrations tended to lie beneath the oldest buried waste or beneath the areas through which the most water has percolated. A greater percentage of samples analyzed from the 110 foot sedimentary layer contained waste isotopes than from the 240 foot or deeper layers in the six interior wells. Samples from wells 93 and 96 indicate greater concentrations of nuclides in the 110 layer than in the 240 foot layer. Many of the observed subsurface concentrations of radionuclides were greater than could be attributed to artificial sample contamination from any known ground-surface or other overlying sources." [150]



[150] IDO-22056@83; Also see Phase I RWMC Remedial Action for OU-7-13/14 Targeted Waste DOE/ID-11396.

Taken in January 1969, this photo of SDA Pit 9 shows material that "surfaced" when the area was flooded. (69-881) Some of the waste in Pit 9 was retrieved in 2004.

Geologic investigations are needed on the ground up stream of the INL diversion dam to see if there is evidence of historical flooding and related heights/volumes. This type of information may minimize the uncertainty of long-term maximum flood projections (i.e. validate flow-rate assumptions). The life expectancy evaluations are also needed of the Big Lost River diversion dam and related channels, dams etc., after the 100 year institutional control and maintenance of the flood control infrastructure ends. Absent maintenance, debris could collect and block the interconnecting channels to the spreading areas facilitating the failure of the dams, and thus flood the RWMC. The USGS believes this is a credible scenario in their 1976 report.

"It would appear that a rare major flood of the [Big Lost] river could over-flow into the burial ground basin through the narrow wind-gaps in the basalt. Although this has not occurred in the INL history, evidence

indicates it has occurred in the past 2,000 years and possibly within the past 200 years." "At regional scale, horizontal hydraulic conductivities of the Snake River Plain Aquifer generally range from 100 to 10,000 feet per day as determined from well pumping tests or flow net analysis. The high number is among the highest for any know aquifer." "Although vertical hydraulic conductivity is generally much less than horizontal conductivity in basalt, significant vertical conductivity does exist, primarily through vertical fractures. This is demonstrated by the fact that surface water from the Big Lost River infiltrates from the channel and the INL diversion area and produces measurable recharge to the aquifer. In addition, waste water recharged to the Test Reactor Area (TRA) disposal ponds eventually reaches the Snake River Aquifer, 450 feet below. There is no reason to believe that basalt beneath the burial ground have significantly less hydraulic conductivity than those beneath TRA or the diversion area." "Specified field tests...at Test Area North vicinity of the INL indicated an average horizontal permeability of about 55 feet per day and vertical permeability of about 15 feet per day." [IDO-22056@48]

A hypothesis is needed of the upstream Mackey Dam being overtopped and failing due to floods of not much greater recurrence interval than that of the maximum floods considered in the literature. The results of a failure of Mackey Dam have not been investigated in this paper. The INL EIS acknowledges that Mackey Dam "was built without seismic design criteria" and "additionally, it is not clear how resistant the dam structure is to seismic events" and the fact that "a fault segment runs within 6 kilometers of the Mackay Dam" [DEIS @ B-17] is significant.

One need only recall the catastrophic failure of the Idaho Teton Dam a few years ago northeast of Idaho Falls. The Teton Dam, also constructed by the Army Corps of Engineers, failed because of inadequate design and construction.

A 1996 DOE Environmental Assessment (EA) for TAN Pool Stabilization noted that the maximum probable flood is considered conservative as the last flood (12,000 years ago) with the magnitude of 35,000 cubic feet per second. [DOE/EA-1050 @B-4] This flood would easily overflow the INL diversion dam capacity of 9,300 cubic feet per second.

DOE's risk evaluation assumes non-conservative precipitation rates when calculating the leachate factors through the reinterred waste into Pit 9. "Heavy rainfall and melting snow within burial ground have also introduced water into the trenches and pits, especially where the soil cover has slumped or cracked." [IDO-22056@8]

"Between 1950 to 1963 the yearly precipitation at INL varied from 5.25 to 14.4 inches." "Between 1950 and 1965 the greatest daily precipitation rate was 1.73 inches in June 1954." "The greatest monthly precipitation rate was 4.4 inches in May 1957." [Ibid.@45] This means that considerably more water can, and has, aided the migration of contaminates than DOE is saying.

Additional Flooding Issues at RWMC

Since the radioactive waste will be extremely hazardous for tens of thousands of years and flooding will flush contaminates down into the aquifer, a conservative risk assessment would model the upper 95-percent confidence limits for the estimated Big Lost River 100-year peak flow of 11,600 cubic feet/second (cf/s). USGS has proposed this additional research to DOE, but the Department thus far is not willing to provide the funding. A USGS hydrologist notes, "The flow of 11,600 cfs represents the upper 95 percent confidence limit flow for the estimated 100-year peak flow (Kjelstrom and Berenbrock, 1996, p6). Future modeling needs are to model the area with this flow. We've expressed this to the INL and also have expressed that the WSPRO model used has limitations and that an application of more stringent models (two dimensional) is needed to refine and better delineate the extent of possible flooding of the Big Lost River." [6]

[6] Charles E. Berenbrock, U.S. Geological Survey Hydrologist, March 25, 1999 email to Chuck Broscious

USGS estimates the mean 500-year Big Lost River flood rates at 9,680 cf/s (34% greater flow rate than the mean 100 year flood).[7] This 500-year flood would inundate the ICPP and surrounding area. These potential hazards must be taken into consideration when making hazardous mixed radioactive waste decisions in these vulnerable areas because of the long-term consequences and the potential for additional aquifer contamination.

Cascading events should also be considered. This is known as a worst case scenario where one event triggers another event. For instance a 500-Year flood plus failure of Mackay Dam (built in 1917) resulting in estimated flows of 9,700 + 54,000 cubic feet per second respectively would be an example of a cascading event. Failure of Mackey Dam is non-speculative in view of the 1976 failure of the Teton Dam of similar construction and the fact that Mackey Dam lies within 11 miles of a major earthquake fault line that produced the 1983 Borah Peak 7.3 magnitude quake. An internal 1986 DOE report that analyzed the impact of Mackey Dam failure scenarios notes that, "Mackay Dam was not built to confirm to seismic or hydrologic design criteria," and "the dam has experienced significant under seepage since its construction." [8] This EG&G study acknowledged that the ICPP, Navel Reactors Facility, and the Test Area North (LOFT) facilities would be flooded with at least four feet of water moving at three feet per second.

USGS did not consider cascading events but noted previous studies showing that failure of Mackay Dam alone would result in 6 feet of water at the INL Radioactive Waste Management Complex (RWMC). Other studies recognized by USGS note that, "Rathburn (1989, 1991) estimated that the depth of water at the RWMC, resulting from a paleo-flood [early] of 2
to 4 million cf/s in the Big Lost River in Box Canyon and overflow areas, was 50-60 feet." "If Mackey Dam failed, Niccum estimated that peak flow at the ICPP would be at 30,000 cfs." [9] Comparing these flow rates with the USGS estimate 100-year mean flow of 6,220 cfs that would flood the north end of the ICPP with four feet of water, and a Mackey Dam failure becomes a real disaster potential with respect to the existing underground waste at the ICPP.

DOE is relying extensively on the Big Lost River Diversion Dam (located at the western INL boundary) to shunt major flood waters away from INL facilities. The last comprehensive analysis of this diversion dike system (below the diversion dam) was conducted by USGS in 1986 in a report titled *Capacity of the Diversion Channel below the Flood Control Dam on the Big Lost River at the INL*. In this study USGS estimated a mean flow rate of 9,300 cf/s, 7,200 of which went into the diversion channel and "2,100 cf/s will pass through two low swells west of the main channel for a combined maximum diversion capacity of 9,300 cf/s." "A sustained flow at or above 9,300 cf/s could damage or destroy the dike banks by erosion.

Overflow will first top the containment dike at cross section 1, located near the downstream control structure on the diversion dam." [10] This USGS study did not analyze the construction of the diversion dikes but they would likely fail as did the upstream diversion dam, built at the same time that the Army Corps of Engineers found deficient. "On the basis of a structural analysis of the INL diversion dam (U.S. Army Corps of Engineers, written comments, 1997), the dam was assumed incapable of retaining high flows. The Corps indicated that the diversion dam could fail if flows were to exceed 6,000 cf/s. Possible failure mechanisms are: (1) erosion of the upstream face of the dam that results from high-flow velocities and loss of slope protections (rip-rap), (2) overtopping of the diversion dam by flows exceeding the capacity of the diversion channel and culverts, (3) piping and breaching of the diversion dam because of seepage around the culverts, and (4) instability of the dam and its foundation because of seepage."[11]

Failure of the diversion dam and/or the diversion channel dikes would directly impact the Radioactive Waste Management Complex (RWMC) burial grounds. A 1976 USGS report notes, "The burial ground is within

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[7] Estimated 100 Year Peak Flows and Flow Volumes in the Big Lost River and Birch Creek at the Idaho National Engineering Laboratory, U.S. Geological Survey, Water Resources Investigations Report 96-4163, page 11 shows flow rates for 5-year, 10-year, 100-year, and 500-year floods

[8] Flood Routing Analysis for a Failure of Mackey Dam, K. Koslow, D. Van Hafften, prepared by EG&G Idaho for U.S. Department of Energy, June 1986, EGG-EP-7184, page 15.

[9] USGS 98-4065, page 6

[10] Capacity of the Diversion Channel Below the Flood Control Dam on the Big Lost River at the Idaho National Engineering Laboratory, US. Geological Survey Water Resources Investigations Report 86-4204, C. M. Bennet, page 1 and 25

[11] USGS 98-4065, page 9

2 miles (3.2 km) of the Big Lost River and the surface is approximately 40 feet (12 m) **lower than the present river channel**. Sediments in the burial ground contain grains and pebbles of limestone and quartzite, suggesting that in recent geologic past, flood waters of the Big Lost River flowed through the burial ground basin. Two eroded notches or 'wind-gaps' in the basalt ridge bordering the west of the burial ground also suggest past Big Lost River floods." "A large diversion system on the Big Lost River was constructed by the AEC to control flood waters by diverting water into ponding Areas A, B, C, and D. The nearest of these, Area B is less than a mile [south] from and about 30 feet (9m) **higher** in elevation than the burial ground." [12]

USGS *Arco Hills SE* and *Big Southern Butte* quadrangle topographic maps clearly show the RWMC flooding vulnerability as do other USGS reports that note, "If [diversion] dike 2 [at ponding Area B] fails, large flows will drain directly toward the solid radioactive waste burial grounds." [13] These vulnerabilities must be taken into consideration when DOE attempts to leave the buried transuranic waste at the RWMC and not exhume and relocate it to a safe permanent repository.

Building dams around the proposed INL CERCLA Disposal Facility (ICDF) as was done at the RWMC is not an acceptable flood protection answer because lateral water migration
will go under the dams and local precipitation will be held - thus exacerbating the leachate conditions. The liner of the ICDF will not be capable of maintaining integrity with the increased hydraulic pressure during a flood because they are only capable of blocking what minimal surface water may leak past the cap and infiltrate the waste. There are good legitimate reasons why dumps (even municipal garbage dumps) are not allowed by statute in flood zones. Dams by definition are only functional if there is regular maintenance which cannot be assumed once DOE ends institutional control of INL in a hundred years. Dumping the waste on top of the ground and mounding the cover over it will result in the cap eroding over the long-term which again is unacceptable.

Nuclear Regulatory Commission restrictions prohibiting citing radioactive waste disposal dumps on 100 year flood plains must be observed. [NRC 10 CFR ss 61.50] The reason for these restrictions is because the flood water will leach the contaminates out of the waste and flush the pollution more rapidly into the aquifer. Since these wastes will remain toxic for tens of thousands of years, they must be disposed of responsibly in a safe permanent repository.

The legal requirements of the process are spelled out in the National Environmental Policy Act that requires Environmental Impact Statements and public hearings. Only un-containerized wastes that can be compacted during placement should be allowed so as to minimize subsidence caused by container decomposition. Biodegradable, VOC, collapsible, soluble, TRU, or Greater than Class C Low-level, and Alpha-low-level waste must also be excluded from the RWMC dump and sent off-site.

USGS reports identified factors favoring downward waste migration. "In order for waste isotopes to be carried downward by water, four basic requirements are needed: 1.) availability of water, 2.) contact of the water with the waste, 3.) solubility or suspend ability of the waste in water, 4.) permeability in the geologic media to allow water flow downward." [15] This USGS report describes in detail how all four conditions are met at INL including the solubility factor where they note "Hagan and Miner (1970) leached five different categories of solid waste from Rocky Flats [the main source of plutonium in the RWMC] with ground water from the INL and Rocky Flats and measured the plutonium concentrations and pH of the leachate. They found the highest Pu-239 concentration in leachates from the acidic-graphite wastes, 62,000 to 80,000 ug/l plutonium or (3.8×10^9 to 4.9×10^9 pCi/L)." [Ibid]

The most reliable indicators of contaminate migration are onsite sampling data. Cesium-137, plutonium-238,-239,-240 were all found at the 240 foot inter-beds under the RWMC. [IDO-22056@74] Forty-one % of the samples from the 240 foot inter-beds contained radionuclides. [Ibid.@87] Other literature confirmation of plutonium at 240 feet includes: "Radionuclides (including Pu-238.-239.-240, Am-241, Cs-137, and Sr-90) have been detected in soils and in sedimentary inter-beds to a depth of 240 feet beneath the RWMC, (Hodge et al, 1989)." "Positive values for Pu-238,-239,-240 were detected in samples obtained from the 240 foot interbed in

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[12] Hydrology of the Solid Waste Burial Ground, as Related to the Potential Migration of Radionuclides, Idaho National Engineering Laboratory, U.S. Geological Survey, Open File Report 76-471, J. Barraclough, August 1976, page 8

[15] USGS 76-471 page 68-69

bore hole DO2."[DOE/ID-10183@134-145][DOE/ID/12082(88) @14-16] Radionuclides are also confirmed in the aquifer under the RWMC. [EG&G-WTD-9438@25]

A 1993 USGS report titled *Speciation of Plutonium and Americium in Ground Waters from the Radioactive Waste Management Complex* notes: "The solubility of plutonium, when added in the low-oxidation-state form [Pu (III) and (VI)], did not exceed 50 percent (of the amount added) in any of the waters from wells that penetrate the Snake River Plain Aquifer." "In water from well 92, however, which is completed in a perched aquifer at a much shallower depth than the water table, 83 percent of the Pu (III) and (VI) remained in solution 30 days after it was added." "In experiments using the high oxidation states Pu (V) and (VI), virtually all the added plutonium remained in solution in the water from all wells, and remained in the relatively soluble high oxidation states." "The results indicate that although low-oxidation-state plutonium is generally insoluble in water [50%] from the Snake River Plain Aquifer, it is more soluble in water from the perched aquifer and could, in time, are leached from the waste and ultimately reach the Snake River Plain Aquifer." The report goes on to note that the reason for the increased solubility of plutonium in the perched water is due to the 222,000 gallons of hazardous wastes including acids and solvents were also dumped in the RWMC.[16] The solubility of actinides and there mobility is a big issue with the ICPP high-level waste tanks contaminated soils because this resulted from raffinate (nuclear fuel processing waste) leaks which transuranic are already dissolved in an acid/solvent solution and therefore highly mobile. Flooding of the ICPP would therefore result in extensive migration of contaminates to the underlying aquifer.

Most of the [solid] wastes at INL were dumped at the RWMC in cardboard boxes [IDO-14532,p.25] and pose such a significant threat to workers during excavation that DOE considers it "impracticable" to clean up. "Burial of high level waste [at INL] continued until 1957 with no upper limit for the level of radiation. Items of up to 12,000 rems per hour were buried [at INL]."[Deadly Defense@50] Standard operating practice throughout INL's history was to cut off the metal ends of all spent nuclear reactor fuel that was shipped to the site or generated at the site. These highly radioactive fuel element parts were then sent to the RWMC for burial as "low-level" waste.

DOE's early public documents acknowledge that there are at least 800 pounds of plutonium dispersed throughout the buried waste at the Radioactive Waste Management Complex (RWMC). [DOE\ID-10253(FY91),@33] Other independent analysts cite "nearly 1000 pounds of plutonium, more than 200 tons of uranium, and 90,000 gallons of contaminated organic solvents were dumped into shallow trenches at the RWMC. [Facing Reality @ 6]

N.S. Nokkentved cites 431,700 pounds (216 tons) of uranium including 250 pounds of U-235, and 808 pounds of plutonium including 757 pounds of Pu-235, and 33 pounds of americium. [Times News, 7/29/89] More recent DOE revelations acknowledge 3,208 pounds (1,455 kg) of plutonium were dumped at the RWMC or enough for over 70 Nagasaki-type bombs. [ER-BWP-82] The reason for these varying numbers is because plutonium inventories have been secret, and early numbers were based on DOE's misinformation.

[16] Speciation of Plutonium and Americium in Ground Waters from the Radioactive Waste Management Complex, Idaho National Engineering Laboratory, Idaho, U.S. Geological Survey, Water Resources Investigations Report 93-4035, J. Cleveland, A. Mullin, 1993, page 1.

Chemical Contaminates in the Dissolved and Suspended Fractions of Ground Water from Selected Sites, Idaho National Engineering Laboratory and Vicinity, Idaho 1989, U.S. Geological Survey, Open File Report 92-51, pg. 33, shows organic solvents under RWMC

Plutonium in Groundwater at the NTS: Observations at ER-20-5, J.L.Thompson, A.B. Kersting, D. Finnegan, Chemical Technology Division, Los Alamos National Laboratory, Isotope Sciences Division Lawrence Livermore National Laboratory, December 1997 that shows extensive plutonium migration at the Nevada Test Site .

Selected Rocky Flats Waste Dumped at the Subsurface Disposal Area, 1954-1972

Radionuclide	Lower Bound Estimate	Upper Bound Estimate
Plutonium (all species)	1,102 kilo grams	1,455 kilo grams
Americium-241	44 kilo grams	58 kilo grams
Uranium-235	386 kilo grams	603 kilograms

[ER-BWP-82 @A-4]

RWMC Pit 9 Remedial Action

The EPA, State of Idaho and DOE released a Pit-9 cleanup Record of Decision in October 1993. Remediation of Pit-9 using alternative 4 would consist of exhuming the waste to include the following steps: (a) physical separation, (b) treatment, and © stabilization. The preferred alternative 4 remedial action presented in the "Revised Proposed Plan for a Cleanup of Pit 9 at the Radioactive Waste Management Complex" (RWMC) represents a flawed decision making process. A review of the available literature suggests that implementation of the preferred alternative 4 would not be protective of human health and the environment. Moreover, aspects of alternative 4 may be illegal under National Environmental Policy Act (NEPA) and Resource Conservation Recovery Act (RCRA).

DOE's statement that: "Because it is possible that some of the storage containers in Pit 9 have breached, the potential exists for subsurface soils to be contaminated with both radioactive and nonradioactive materials" is not supported by the literature. It is not just possible but a fact that contaminates have migrated. Additionally, DOE's Plan states: "The Pit 9 Interim Action will be used to expedite site cleanup and to potentially halt possible contamination of the vadose zone and groundwater." Plutonium has been found at 110 and 230 feet under RWMC and organic have contaminated the vadose zone. False and inaccurate statements like the above cited quotes challenge the very credibility of the document and indeed the whole cleanup process. Clearly, DOE, is not being honest with the public.

The Environmental Defense Institute (EDI) supports exhuming the buried waste from INL's Radioactive Waste Management Complex Pit 9 and the development and testing of waste treatment technologies at INL. Specifically, EDI endorses the Hanford approach, mandated by the State of Washington. Hanford is moving ahead with construction of a vitrification facility for all classes of waste except spent nuclear fuel which requires no treatment. Excavation and verification and storage actions are therefore supported. Waste treatment technologies are still in the developmental stage. As an interim action to mitigate additional contaminate migration from the buried waste, excavation is immediately necessary. The original treatment technology agreed to by the State of Washington, EPA, and DOE is to build a pre-treatment chemical separations process and one verification facility to stabilize low-level, mixed, TRU, and high-level waste into a glass/ceramic medium. Nitrification is the best approach and should be adopted at INL; however, the chemical pre-treatment is not supported. DOE's proposed Pit 9 technology is geared to listed RCRA organic contaminates and fails to provide a stable waste form for all contaminates. The goal is to get all waste forms into a stable medium as directly as possible.

The Pit-9 waste chemical separations (nitric acid leaching) process is now challenged by the State and EPA regulators as unworkable. Lockheed Martin finally in May 1996 admitted that the redesigned chemical treatment system did not work, and proposed replacing it with a physical soil separation process- abandoning the chemical leaching system. [IEER(g)@140] Even DOE has locked horns with its contractor. “The retrieval and treatment of the waste was originally estimated to cost $50 million in the 1993 Record of Decision; Lockheed Martin Advanced Environmental Systems, the contractor for the Pit-9 project, has estimated its costs through June 30, 1997 to be 57 million. This increase has occurred without retrieval and treatment system design having even been finalized, never mind built, tested and completed. Major components that have been designed or built are not in compliance with the terms of the contract. In March 1997, the contractor indicated that its final costs would be over $400 million.” [IEER(g)@132] The public expects and the regulators must advocate for the entire waste volumes to be directly vitrified into a stable form that can be safely stored onsite until a permanent

repository is permitted. To their credit the regulators have levied $940,000 in fines against DOE for missing Pit-9 cleanup milestones.

The Pit 9 issues of reburial of the residuals of chemical separations approach does not enjoy public acceptance for many reasons. First, the classification of low-level waste has no connection with environmental, health and safety hazards; [IEER(c)] it is merely a catchall category for all waste not classified as high-level or transuranic. Secondly, the public demands that the entire volume waste be processed directly into a stable form so that the inevitable interim storage does not continue the migration of contaminates into the environment. Finally, the Final Report Hanford Tank Waste Task Force got it right by recommending:

"The high cost and uncertainty of high-tech pretreatment and R&D threaten funding for higher performance low-level waste form, vitrification, and cleanup." "Put wastes in an environmentally- safe form, using retrievable waste forms when potential hazards from the waste may require future retrieval and when irretrievability does not cause inordinate delays in getting on with cleanup." "Let the ultimate best form for the waste drive decisions, not the size nor timing of a national repository." "Accept the fact that interim storage, at least, of the waste in an environmentally-safe form will occur for some time at Hanford. Select a waste form that will ensure safe interim storage of this waste." [Hanford]

The mantra repeated over and over again "get on with cleanup" in the Hanford Waste Tank Task Force is repeated in public interest group reports. [HEAL] DOE is wasting precious resources by refusing to recognize the public's demand for solutions to the radioactive waste problem. DOE must "get on with cleanup" and apply R&D to technologies that will put the whole volume of waste into a stable form for on-site storage for the near-term because there are no guarantees on any repositories coming on line soon. Additionally, the DOE is remiss in not investing in the essential R&D on emission control that will be key to health and safety in all waste processing that cannot be avoided in stabilizing and preparing for the waste acceptance criteria for the future repositories.

Under no circumstances would EDI support reinternment of processed waste back into Pit 9. Pit 9 simply must not be considered independent of the collective impacts of the site-wide environmental restoration and waste management activities. The final disposal of all processed wastes must be in a fully permitted and compliant RCRA/NRC radioactive waste site. The Agency for Toxic Substances and Disease Registry, a federal public health agency found that:

"The [Pit-9] clean-up level for Transuranic wastes of <10 nCi/g will not be protective of public health for a future agriculture or commercial use scenario." "The planned clean-up level for transuranic waste is 10 nCi/g. When compared to the proposed Annual Limits on Intake for Americium-241 by ingestion (40 nCi), an ingestion of only 4 grams of contaminated soil would exceed the proposed Annual Limit on Intake. Similarly, an inhalation of only 0.30 grams of contaminated soil within a one year period would exceed the proposed Annual Limits on Intake for Americium-241 by inhalation (0.25 nCi). In either an industrial or agricultural use scenario, the Annual Limits on Intake for Americium-241 by ingestion and inhalation would probably be exceeded." [ATSDR @ 10-11]

Former Governor Andrus, because of his long history of justified concerns over the mismanagement of INL's radioactive wastes, insisted that the State be the lead enforcement agency on the cleanup of the RWMC. Unfortunately, the ID Division of Environmental Quality and the INL Oversight Program have not provided a credible enforcement and oversight role in the process. EDI encourages current Governor Batt to reevaluate the positions his agencies have taken on INL cleanup.

Continued public pressure for the enforcement of environmental laws will be essential in coming years. Reauthorization of the Resource Conservation Recovery Act with stricter compliance standards that must also include radionuclides as a regulated hazardous material will also be key to environmental protection. The Clinton Administration, unfortunately, is not moving toward a new national environmental legislative priority.

A review of the DOE documents for Pit 9 reveals extremely disturbing assumptions made by J.J. King [EG&G-ERP-BWP-64] to determine the radiological inventory subsequently used in the risk evaluation. King acknowledges Rocky Flats radionuclide information on shipments to INL in 1968 contained the following:

Radionuclide	Quantity (grams)	Radionuclide	Quantity (grams)
U-238	33,373,000.00	U-235	1,210.00
Pu-238	4.18	Pu-239	43,543.44
Pu-240	2,720.83	Pu-241	210.11
Pu-242	7.44	Am-241	1,778.00

The above listed nuclides were contained in 345,377 cubic feet of waste shipped from Rocky Flats to INL in 1968. This represents an activity concentration of possibly 31,216 Curies. J.J. King cites Rhodes' determination that of the total 345,377 cubic feet shipped in 1968, 67,352 cubic feet (containing 203 g of Pu-239) went to Pit 10 and 102,103 cubic feet went to Pit 9. [EG&G-ERP-BWP-64] No accounting by King is offered as to what happened to the remaining 157,922 cubic feet of Rocky Flats waste shipped to INL during 1968. Generally, only one trench was open and received waste at any given time. In those early years, no attempt was made to segregate categories of waste. [EG&G-WTD-9438@23] It simply all was dumped in whatever trench or pit happened to be open at the time.

Another assumption King made in determining the radiological inventory was to assume that the Pu-239 was "distributed uniformly throughout the waste volume not associated with Pu-239 identified in Pit 10". [EG&G-ERP-BWP-64] There is no credible basis for these assumptions. The numbers King ended with are many orders of magnitude below the possible inventories available for deposition in Pit 9. Moreover, the use of Kings numbers in the risk evaluation are not conservative and greatly understates the probable hazard.

These issues of radionuclide inventory are extremely germane to determining the appropriate remediation for Pit 9. If DOE's presentation of inventories is extremely understated, and the Alternative 4 chemical separation design target for radionuclide removal is not met, a lot of radioactive waste could be returned to Pit 9. DOE's design treatment standards for "wastes and/or materials in Pit 9 containing [greater than] >10 nanocuries per gram transuranic would be treated to reduce the volume by >90% prior to returning to the Pit." [Plan@11] The returned 10% could still potentially have considerable radioactivity in the processed waste since no upper bounds are stated for this "stabilized" material.

The plan also calls for exhumed waste or soils that contain 10 nanocuries or less will be returned directly to Pit 9. This 10 nano-curie criteria is a DOE internally generated directive that has not been legally established as protective of the environment. No quality assurance mechanisms are offered to ensure that non-contaminated material is not mixed with contaminated waste to reach the 10 nanocurie/ gram criteria. The plan's criteria for residuals returned to Pit 9 uses industrial (1 in 10,000) carcinogenic risk performance criteria. Due to the long half-life of the radioactive contaminates and the probable inability to maintain institutional control over the sight, the residential performance criteria (1 in 1,000,000) should be used.

Another area of uncertainty is the radionuclide inventory of on-site waste in Pit 9. DOE acknowledges in the mailing that some Aircraft Nuclear Propulsion (ANP) wastes are in Pit 9. When asked at the Nov. 2 briefing if this may include ANP reactors, DOE emphatically denied that any ANP reactors were buried at INL yet the literature specifically acknowledges that jet engines are buried at the RWMC Subsurface Disposal Area (SDA). [EG&G-WM-10090@12] One of the ANP series involved three reactor assemblies that were constructed at INL for the ANP program. "These three assemblies were designated HTRE No. 1, HTRE No. 2, and HTRE No. 3." [DOE/ID-12119@A-87] Though two ANP nuclear jet engine shells are on display at the ERB-I, the disposition of all of the other engines and reactor cores for these engines were to the RWMC. See Section I.C for HTRE details.

The HTRE-2 and 3 were disassembled in the IET hot shop where the highly radioactive plug shield and core assembly were removed and shipped intact to the RWMC. Radiation levels (300 R/h) were too high to allow further disassembly of the reactor vessel and its shielding. Then the reactor vessels were moved back out to the IET test pad where the 200 ton HTRE-2 (with dollies) and the 90 ton HTRE-3 (w/o dollies) were jacked up off the rail tracks and a special 350 ton transporter was moved under for shipment to the RWMC. Bridges between the IET and the RWMC had to be blocked up to take the heavy transporter, and special ramps made into the trench where they were buried. [PR-W-79-001 @4-3] 106,000 pounds of radioactive mercury used in a tank for shielding around the HTRE-3 as well as considerable volumes of related radioactive parts were dumped at the RWMC.

Other reactor components including shielding weighing 36,000 pounds from Kelly Air Force Base, and a reactor heat exchanger 27 x 5 feet from Nuclear Engineering that were buried in Pit 2 in 1960 also may be part of the ANP program tests. The Hallam Nuclear Power Reactor from Lincoln Nebraska was also buried at the RWMC. [PG-WM-58-008 @2-3] Three SPERT experimental reactors tested at INL [ERDA-1536,@II-244] as where two SNAPTRAN reactors and, two Modular Cavity reactors from the ANP program were also dumped at the RWMC.

At the Pit 9 hearing in Moscow, (11/10/92) the State representative maintained his position that there was no radioactive contamination below the 150 foot level below the RWMC. One can only conclude that the State Division of Environmental Quality is grossly ill-informed. DOE's mailing only offers one waste volume number (110,000) cubic feet from Rocky Flats in Pit 9. [Plan@3] Why is the total volume to be exhumed not stated? DOE's Pit 9 estimated volumes are: [EG&G-WTD-9438@5]

Waste containers	150,690	cubic feet
Contaminated Soil	191,726	"
Total Volume	342,416	"

DOE's risk evaluation not stated in the public mailing states that the air pathway (respirable) exceeds the risk specific concentration for Am-241 and Pu-239 for both residential and occupational exposure. External pathway also exceeds risk specific concentrations for Am-241, Pu-239 and Cs-137 for both residential and occupational exposure. Soil ingestion exceeds residential exposure. [EG&G-WM-10090@10-11] This risk evaluation is based on understated (non-conservative) radionuclide inventories previously discussed. The risk evaluation also assumes 100-year institutional control over the site which is exceedingly presumptuous. Even if this control could be insured, the unlucky resident who tries to build a house with a basement over top of Pit 9, would be digging right into the buried wastes that will be toxic for 24,000 years. A future rancher who sinks a well through the burial ground also would be at extreme risk.

Another problem that the risk evaluation assumes is an underlying layer of soil to assist in filtering contaminates that may migrate. The underlying basalt at Pit 9 comes within 7.7 feet of the surface. [EG&G-ERP-BWP-67@6] "Some trenches and pits were excavated down to the basalt while others only have a thin layer of soil over the basalt. Therefore some older (pre 1970) buried waste has no soil between it and underlying basalt." [IDO-22056@8]

DOE's risk evaluation assumes non-conservative precipitation rates when calculating the leachate factors through the reinterred waste into Pit 9. "Heavy rainfall and melting snow within burial ground have also introduced water into the trenches and pits, especially where the soil cover has slumped or cracked." [IDO-22056@8] "Between 1950 to 1963 the yearly precipitation at INL varied from 5.25 to 14.4 inches." ... "Between 1950 and 1965 the greatest daily precipitation rate was 1.73 inches in June 1954." "The greatest monthly precipitation rate was 4.4 inches in May 1957." [Ibid.@45] This means that considerably more water can, and has, aided the migration of contaminates than DOE is acknowledging. According to a RWMC worker currently employed at the Pit 9 project, 18 tons of pyrophoric zirconium cuttings (also see IDO-14532 @50) and a reactor emitting one billion rads make the remediation process extremely dangerous.

The selected waste treatment processes and the criteria for material returned to the burial pits must receive the full EIS evaluation within the context of existing site-wide contamination and anticipated site-wide "processed" waste returned to the ground. It is conceivable that existing contamination below Pit 9 poses sufficient risk that would preclude adding additional risk from reburial of partially treated waste.

DOE has legally binding Environmental Restoration milestones that must be meet under the Federal Facility Agreement and Consent Order (FFACO). If the Department fails to meet a milestone the State of Idaho or the Environmental Protection Agency (EPA) can impose sizable fines on DOE or the contractor. Due to radical Congressional cuts in DOE's cleanup funding the Department was forced to turn to large contractors who could attract Wall Street's financial backing to provide the funding to build the waste treatment plants required by the FFACO. The sales pitch was that private industry could get the job done better, faster, and cheaper. Privatization is touted by its proponents as the wave of the future and fixed priced contracts would put an end to the proverbial cost overruns. Well, this simplistic approach is fine if the government wants to buy one thousand F-18 fighter planes. There are few uncertainties that the contractors face because of decades of experience

manufacturing similar planes. The same cannot be said about cleaning up the Pit-9 radioactive waste dump at INL because no one knows for certain what is actually in the dump and the intensity of the radiation fields that may be encountered. This is the first time the government or anyone else has attempted cleaning up a highly radioactive dump site.

To further confound an already complicated situation, the DOE still has no permanent repositories for its nuclear waste. Even if the transuranic Waste Isolation Pilot Plant (WIPP) dump in New Mexico and the high-level waste dump at Yucca Mt. Nevada open, their capacity cannot handle the current volume in inventory. So there is this policy crunch to reduce the waste volume destined for the repositories. DOE puts unrealistic demands on its cleanup contractors to reduce waste volume and generate new treatment technologies that currently do not exist. The chemists are still struggling with the basic science and are not even close to developing an applied technology.

DOE gave the Pit-9 fixed price contract to Lockheed Martin Advanced Energy Systems for $179 million. Lockheed's cleanup record has been documented in a Public Broadcasting System program that featured the company's radioactive cleanup fiasco on Johnston Atoll in the Pacific. The technology was unable to meet criteria for discharge even after multiple recycling through the process. In a rerun, Lockheed Martin Pit-9 treatment technology failed forcing the contractor to delay facility construction for several years. This delay also resulted in a $750,000 fine imposed on Lockheed Martin by the State for missing a FFACO milestone. The fine was later negotiated in March 1997 where DOE/ID will pay $100,000 to EPA's Superfund account, submit new deadlines for the projects and provide $870,000 for additional environmental projects in Idaho. Now Lockheed Martin wants to double the original $179 million contract. The total cost to the government for Pit-9 including management and waste storage is estimated at $264 million; but the delays and change in technology are expected to double the price. Tom Brokow's NBC Nightly News (5/22/97) reported that Lockheed Martin is now asking DOE to raise the original $179 million "fixed" Pit-9 contract to $337 million.

Privatization is now seen by observers as something different than the faster, better, and cheaper alternative its proponents would like us to believe. Bill Weida, an economics professor at Colorado Collage and researcher for Economists Allied for Arms Reduction recently released a report on Privatization in DOE Cleanup Operations. This is a thorough analysis of the problem. Copies of the report are available by writing Bill Weida, c/o Department of Economics, Colorado College, Colorado Springs, CO 80903. The following is an excerpt from Weida's executive summary:

> "Privatized nuclear cleanup operations will handle some of the world's most hazardous materials. Such high risk operations have many economic implications--most of them unfavorable. Because of this, and because of the general nature of nuclear waste cleanup, it is obvious that the cleanup of nuclear waste is a classic public good and that it is not an appropriate candidate for privatization. This fact has already been adequately demonstrated Department of Energy (DOE) cleanup privatization has only been possible when DOE assumed a majority of the risk in privatized operations. In fact, DOE has assumed so much risk in its current privatization contracts that there is no longer sufficient incentive for contractors to perform in an economically efficient manner. When these problems are added to the high capital costs created both by the use of private borrowers and by the appropriation of federal funds to the reserve account mandated by the Government Accounting Office (GAO), there remains no economic rationale for DOE privatization. Even DOE admits that privatization is fundamentally a budgeting ploy that trades short-term capital expenditures for delayed, and potentially higher, long-term reimbursements to a private contractor."
>
> "DOE's privatization initiative could also be a very expensive experiment for those who live around sites where nuclear waste is stored or generated. As currently implemented, DOE privatization appears to be an attempt at union busting. If DOE cannot guarantee that members of the current local work force will be employed by privatized cleanup operations, the economic penalty levied on the regions that surround DOE sites will be substantial and the costs of privatization would need to be recalculated to include these negative economic impacts. Further, past experience with DOE contractors, and with the DOE itself, has shown that safety and health problems at DOE sites are only corrected when active citizen oversight is exercised. Privatization, as implemented by the DOE at the Portsmouth and Paducah gaseous diffusion plants, has been used to thwart citizen oversight by allowing the privatized operators to claim that most information about their operations is proprietary in nature and not subject to citizen oversight. At cleanup sites like Hanford and the INL, DOE has also limited public access to documents based on "procurement sensitive" document status. DOE's chosen successor as regulator of privatized operations, the Nuclear Regulatory Commission (NRC), has actively abetted this policy. These are the same short-sighted

> approaches to site management that created many of the nuclear problems now facing DOE and they have the potential to significantly increase the costs of cleanup now facing the US." [Weida]

Another nuclear waste treatment plant called the Advanced Mixed Waste Treatment Project (AMWTP) was estimated by DOE in 1994 to cost $300 million. In January 1997, DOE awarded the AMWTF project, one of the largest privatization projects worth $1.18 billion, to British Nuclear Fuels Limited (BNFL) to treat mixed and transuranic waste at the INL. The team includes BNFL as the prime contractor with subcontracts with BNFL Engineering, CTS Duratek, Manufacturing Sciences, Morrison Knudsen, and Science Applications International. In the contract, BNFL has committed to treating at least 65,000 cm of waste at the INL, with the option to treat up to an additional 120,000 cm of waste generated by future INL cleanup and decontamination efforts, as well as some waste generated at other DOE sites. [Star 1/14/97] The AMWTP is another example of DOE's violation of the National Environmental Policy Act (NEPA) that requires the government to conduct an Environmental Impact Statement (EIS) of all major projects prior to commitment of resources. DOE did conduct a 1995 INL site wide EIS but only committed seven pages discussing the AMWTP which at that time was called the Idaho Waste Processing Facility. In those seven pages only the most cursory descriptions of the planned mixed transuranic treatment plant are offered. There is little characterization of waste throughput, emission control systems, or anticipated radioactive and chemical releases to the environment. [DOE/EIS-0203F@C-4.4.3-1] If BNFL wanted to build a municipal garbage incinerator in Boise, they could not get away with a seven page plan let alone a mixed transuranic waste incinerator. Only after public interest organizations filed a law suit did DOE agree to comply with the legal requirements of NEPA. Even more incredible is the fact that the AMWTP is to be built only few hundred feet from the Pit-9 treatment facility. An analysis of DOE's cleanup mess by the Institute for Energy and Environmental Research (IEER) found that duplication of comparable waste processing plants makes no sense.

"One of the remarkable indicators of a lack of coordination and disarray in DOE's Environmental Management program is its failure to coordinate extraction and treatment of buried waste in Pit-9 with the Advanced Mixed Waste Treatment Project [AMTWP] that is supposed to treat the 'retrievably stored' TRU waste at the Idaho Lab; treatment of the 'retrievably stored' wastes is estimated to cost $880 million dollars. The buried and stored wastes contain similar kinds of wastes and it is likely that a large percentage will require similar treatment technologies. Whether or not they are stored under a few feet of dirt is relevant only to extraction and not to treatment technologies. Yet DOE is proceeding with the Advanced Mixed Waste Treatment Facility as a privatized project without yet having absorbed the issues of the pit-9 failure." "Perhaps the only success of the Pit-9 has been the development of remote retrieval technologies that can reduce risk to workers from radionuclides, chemicals, and explosives. However, even this success has a major flaw in that Lockheed Martin AES did not build a double confined structure as required by the Record of Decision and as described in Lockheed Martin AES' own Best and Final Offer." [IEER(g)@145-146]

Privatization of waste treatment plants has produced an accountability barrier that state and EPA regulators find intolerable. Kathleen Trever, manager of the State of Idaho's INL Oversight program testified at a 1997 Congressional hearing stating: "The nature of Pit-9 subcontract allowed DOE subcontractor Lockheed Martin Advanced Environmental Systems (LMAES) to make design changes without consulting with the [regulatory] agencies, thus preventing the agencies from identifying and resolving concerns in a timely manner. In addition, EPA and Idaho were not even officially informed of the extent of cost overruns and schedule delays until October 1996, months after project deadlines had already been missed." [IEER(g)@146-147] As of this writing, LMAES's Pit-9 project is completely shut down because of contract disputes with DOE. LMAES contends that "subsequent inventories indicate that types and quantities of other radioactive and hazardous contents in Pit-9 are far greater than originally thought. Technology used on the project has been proven in laboratory testing, but never used before on a large scale to treat the types of materials now believed to be present in INL's Pit-9." [Star;7/15/97] [151]

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[151] Chuck Broscious, Report: Review of the Mixed Hazardous Radioactive CERCLA Waste Cleanup Policy at the Radioactive Waste Management Complex Subsurface Disposal Area Department of Energy's Idaho National Laboratory, by Chuck Broscious, July 2018 and click here for Attachment http://www.environmental-defense-institute.org/publications/RWMCCERCLA4.pdf

Tami Thatcher's "Idaho To Miss Important Idaho Settlement Agreement Milestones" reports:

> "The currently missed milestones are the slowed pace of shipments of transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico, which resumed a year ago, and the failure to get the Integrated Waste Treatment Unit (IWTU) treating liquid radioactive waste it was supposed to have completed in 2012. [152] DOE is paying fines to the state for not emptying the waste tanks and calcine treatment is delayed by continued problems at the IWTU.
>
> "Even with the progress of shipping of above-ground stored transuranic waste and some buried transuranic waste, the "cleanup" will still leave plenty of transuranic waste over Idaho's aquifer. The americium-241 buried at the RWMC not being exhumed would require six Snake River Plain aquifers to dilute to drinking water standards." [153]

Section IV. G. Power Burst Facility (PBF) Cleanup

The PBF (located at Auxiliary Reactor Area) cleanup Plan considers only two alternatives, no action, and hot spot removal. [PBF Plan] Consequently, there is no credible comparative analysis when the only other option is no action - to which no one subscribes. EDI requests a third alternative be evaluated. That option would involve exhuming all contaminated material on top of the PBF evaporation pond Hypalon liner with the stipulation that if contamination exists below the liner due to its failure, then all contaminated materials be exhumed.

The basis for this third alternative request rests on three factors. First, spot removal will inevitably compromise the liner, thereby providing migration route to the other contamination in the pond. Secondly, the concentration levels in the whole pond are more than high enough to warrant complete removal. Thirdly, simple efficiency would dictate considerable cost savings with one comprehensive operation as opposed to numerous operational set-ups and tear-downs.

Considerable discrepancy exists between information offered to the public in the "Dear Citizen" publication and DOE contractor documents. For instance, the "Dear Citizen" cites: "The highest concentrations of cesium-137 (325 pCi/g) were at the pond inlet"[PBF Plan; whereas DOE internal document (EG&G-WM-8804) cites: "Specific concentrations ranged from a high of 830 pCi/g for a surface sediment sample collected adjacent to the drip pan to a low of 15.2 pCi/g collected diagonally across the pond from the drip pan. Radiological Release Criteria specify a limit of 10 pCi/g for release of soils contaminated by cesium-137." [EG&G-WM-8804@ 5]

The "Dear Citizen" also does not offer important background on SPERT reactor tests. DOE internal documents have revealed that the 1954 SPERT-I reactor excursion released 240,000 curies of radiation including 500 curies of radioactive Iodine. The SPERT-II excursion in 1963 released 530 curies of radiation. SPERT-III released 1,900 curies. [ERDA-1536 @ II-244][IDO-12119@79]

Considerable public concern exists with this type of interim Plan. Specifically, if DOE is allowed to do only a spot removal to mitigate only the highest contaminate spot(s), there will more than likely be a later claim that the contaminate levels remaining do not warrant additional remedial action. The public may well be lulled into believing that the site was fully cleaned up during the earlier action. Public skepticism is further bolstered that this is not an interim but a permanent action by INL's statement that, "Both options [A&B] are permanent solutions and will reduce the risk for environmental and human exposure to the contaminants currently present in the pond." [PBF Plan @ 7] INL officials stated at a public briefing in Moscow 5/7/92 that once the hot-spots are

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[152] Bryan Clark, *The Idaho Falls Post Register*, "IWTU might begin this year – DOE gives progress report to LINE Commission," February 1, 2018. The Post Register reported that as of last June, the IWTU was more than $200 million over budget. The DOE faces daily fines while it's not in operation because of missing the 2012 milestones and subsequently missed renegotiated schedules for hazardous waste tanks regulated by the State of Idaho.

[153] Tami Thatcher, Idaho To Miss Important Idaho Settlement Agreement Milestones Environmental Defense Institute, News on Environmental Health and Safety Issues June 2018, Volume 29, Number 6.
Also: Public Comment Submittal to the Idaho Department of Environmental Quality for Class 2 Permit Modification Request and Request for Temporary Authorization for the Idaho Nuclear Technology and Engineering Center and Radioactive Waste Management Complex Located on the INL, by Tami Thatcher, November 2019
http://environmental-defense-institute.org/publications/CommentARP7PMR.pdf

removed, "the remaining concentrations of Chromium and Cesium will pose no risk." Again, these statements are not supported by data.

Public confidence levels in EPA, the lead agency on nine of the ten INL Waste Area Groups, are extremely low. This is particularly true after former President Bush's directive to all regulatory agencies to cease all new enforcement initiatives. As previously stated, OMB followed that up with a 1% cut to EPA's DOE/DOD oversight budget. Cuts in EPA budgets have continued into the Clinton administration which caused EPA to cut their Office of Federal Facility Enforcement. Moreover, the State has not protested these budget cuts to its enforcement partner in the INL cleanup process.

"EPA's FY 1993 budget requests identified 'Federal Facilities Enforcement' as a 'Material Weakness' requiring 'Corrective Actions'. According to EPA, 'the Agency does not have sufficient resources to perform an adequate level of oversight of other agencies' environmental compliance and restoration plans and activities.' Moreover, the Agency noted that '[t]he sheer magnitude, impact, and political realities of the [DOD] base closures program could easily consume the entire Federal Facilities resources base during this period.' [NRDC(f) 3/30/92] [Citing EPA, FMFY!, Attachment D@1]

"Oversight costs are typically estimated at approximately 2 to 4% of the costs of the cleanup. Hence, based on FY 1993 DOD and DOE environmental restoration and waste management budget of more than $7.3 billion, the budget for oversight of the Energy Departments' environmental restoration activities should be $150 to 300 million. Unfortunately, the EPA Federal Facilities Oversight Budget for FY93 is only $46.4 million - just 0.63 % of the DOE/DOD waste cleanup budgets. Moreover, while the DOE and DOD waste cleanup budgets increased from FY92 to FY93 by 26 and 44 percent, respectively, the EPA oversight budget declined by one percent." [NRDC (f)] "EPA is routinely reimbursed by private parties for the cost of overseeing the cleanup of commercial waste sites. During negotiations over some Interagency Agreements, the DOE has agreed to provide oversight funding to EPA and States. Unfortunately, the Office of Management and Budget (OMB) has opposed the transfer of DOE funds to EPA to cover oversight expenses." [NRDC(f) 3/30/92]

Public confidence is also extremely low with the State's enforcement role. In a recent meeting with the commenter, IDEQ's Dean Nygard stated that the State had adequate funding to fulfill its regulatory obligations. Indeed, he took issue with the Governor Andrus' attorney Jonathan Carter's testimony to the Senate Commerce and Labor Committee that characterized State funding as inadequate. In response to Mr. Nygard, EDI showed him numerous falsifications in INL primary cleanup documentation that the State had not challenged. These falsifications are prima facie evidence that either the State does not have the resources to enforce; or it has the resources but is simply rubber stamping INL proposals. State oversight requires between 2 to 4% of INL's $428,313,000 ER/WM. At 2%, the State should be getting $8,566,000. In 1992 the State only got $3,500,600 from DOE for oversight of INL. Clearly, this is inadequate funding.

PBF Applicable or Relevant and Appropriate Requirements (ARAR)

The Plan does not cite RCRA hazardous waste, corrective action, or closure requirements in the listed ARARs. The INL Federal Facility Agreement and Consent Order (FFA) exempts INL only "... from the procedural requirements to obtain federal, state, or local permits, when such response action is selected and carried out in compliance with Section 121 of CERCLA, 42 USC 9621. Nonetheless, these actions shall satisfy, to the extent authorized by law, all the applicable or relevant and appropriate federal and state standards, requirements, criteria, or limitations that would have been included in any such permit. Accordingly, when USDOE proposes that a response action be conducted entirely on the INL Site which, in the absence of Section 121(e)(10) of CERCLA and the NCP, which, would require a federal or state permit, USDOE shall include in the appropriate documents submitted to the Lead and Support Agencies: (a) Identification of each permit which would otherwise be required; (b) Identification of the standards, requirements, criteria, or limitations which would have had to have been met to obtain each permit; and Explanation of how the response action proposed will meet the standards, requirements, criteria, or limitations of this Part." [FFA/CO @ 18]

Additionally, the Plan does not certify that exhumed contaminated materials from the PBF evaporation pond will be deposed at a RCRA permitted site which is in full and complete compliance with RCRA standards. Engineering study summaries by EG&G on using contaminated soil in a grout and injecting this grout into existing partially filled plywood waste containers are not supported by the studies testing results. Considerable air voids, lack of structural integrity, and extensive cracking was documented throughout the tests that were

conducted at Oak Ridge National Laboratory. Additionally, the study stated that unless the outside as well as the inside of the containers were grouted the subsidence problem would not be mitigated.

Clearly, the use of old or even new plywood boxes in addition to a relatively unstable grout will result in yet another cleanup of the same waste some years hence. To rebury these wastes in wood boxes again over the aquifer is ridiculous. The misguided culture in DOE for the past four decades has regrettably not changed. Those previous waste management practices are today's cleanups. Clearly, today's waste management practices are sure to be tomorrow's cleanups as well, unless the DOE is brought under enforcement actions by the State.

The PBF evaporation pond is not a permitted RCRA land disposal site nor is it listed as an Idaho Hazardous Waste Management Act site. The big question is why? Why is the State not imposing federal and State enforcement regulations and closure requirements on this hazardous waste dump? The State claims that the PBF is not a permitted facility, because it is not does not generate wastes characteristically covered under RCRA. Yet there are clearly mixed hazardous chemical/radionuclide wastes that are covered under RCRA. Additionally, the State is not doing any split sampling of contaminates in the pond that means that they are taking DOE's word on the constituents and their concentrations. The Environmental Defense Institute (EDI) supports the construction of concrete surface bunkers similar to those used for munitions storage. This approach will accommodate regular monitoring of the contents of the facilities as well as ready retrieval for final shipping to the permanent repository. Current underground dumping in unlined pits or pads is a continuation of the failed waste management policies of the past, and therefore must end. Construction of vitrification waste treatment facilities is the best hope for putting these wastes into a stable form for interim storage until a permanent disposal site is built.

Section IV. H. Central Facilities Area

Motor Pool Percolation Pond

Agency plans to cleanup the Central Facilities (CFA) Motor Pool Pond fail to accurately acknowledge the source of, nor the quantities of significant radioactive contamination in the pond. DOE's plan states only that: "On several occasions, vehicles and equipment with small amounts of radioactive contamination were decontaminated at the station." In fact, washing vehicles is standard operating procedure to reduce the spread of on-site contamination picked up by vehicles - especially during the multitude of accidents the site experienced.

Internal DOE documents show concentrations of 8.41 pCi/l of cesium-137; americium-241 and plutonium-238 at 9.46 pCi/l; and plutonium-239 at 4.29 pCi/l that are not adequately accounted for in their public literature. Sampling data showed cadmium and lead concentrations were 25 times higher than background tolerance levels. Chromium levels were 3 times higher than background. [EGG-WM-9973 @4-1]

For those who are willing to read the administrative record, INL contractor (EG&G) documentation says that: "long-lived fission products such as cesium-137, cobalt-60, and strontium-90 may have been added to the waste stream during decontamination of vehicles." [EGG-WM-9973@13] Also potassium-40 concentrations of 8.73, lead-212, and radium-226 are not acknowledged. [EG&G 8792@36] Tritium contamination under CFA ranges as high as 24,800 pCi/l which means additional contamination loading from motor pool must not be allowed. [90 Oversight (a)] DOE's proposed plan also does not accurately state the volatile organic ranges. Oak Ridge Survey sampling found 2-butanone at 190 ug/kg; trichloroethane at 25 ug/kg; toluene at 23 ug/kg; methylene chloride at 460 ug/kg; acetone at 85 ug/kg; tetachloroethlene at 76 ug/kg; and 4-methyl 2-pentanone at greater than 8,300 ug/kg. [EGG-WM-9973.@4-6&11] EG&G sampling found organic such as bis (2 ethylhexyl) phthalate at 4,000 ug/kg. [EG&G-WM-9973 @1-7] The federal Primary Drinking Water Standards for most of these organic is 5 ug/L.

Over INL's history, many accidents and intentional releases made transport of contaminates off the site of significant concern. Washing all vehicles has always been standard operating procedure. Therefore, it is not surprising that those contaminates ended up in the Motor Pool Pond. Clearly, the instillation of motorized washing equipment made the process faster. The CFA Laundry washes 10 mrad/hr of contaminated clothing. [ERDA-1536 @II-161] Risk calculations for worker exposure only allow for inhalation at 5% and direct contact at 1%. This is grossly understated due to the close proximity of the pond to CFA. Both State and EPA review of the Plan challenge DOE statements that EPA risk assessment methodology guidance was followed and point out that heavy metals such as silver and selenium were not acknowledged. Additionally, EPA challenges DOE's

dismissal of the soil to groundwater pathway for contaminates migration. EPA also challenges the use of average values that is inconsistent with EPA guidance requiring use of a 95% upper level confidence limit. Cesium is also not included in Exposure Assessment nor was alpha and beta emitters even tested for at the waste pit. [IDEQ]

The agency decision of "No Action" is not supportable, non-compliant with ARAR's, and therefore, unacceptable. The PCB aroclor-1260, in concentrations of 1,470 ug/kg, alone, would dictate enforceable remedial action of exhuming contaminates to prevent further migration to the aquifer.

Section IV. I. Auxiliary Reactor Area

Auxiliary Reactor Area II - Stationary Low-Power Reactor 1

Background on SL-1

The U.S. Department of Defense wanted the Atomic Energy Commission (AEC) to develop a simple reactor for military to generate electricity at remote military locations such as the Arctic or Antarctic. In the late 1950s, the Navy had dominance over reactor development for submarines and with Admiral Rickover's leadership, the Navy had applied stringent design/safety/operating policies for reactors.

In the case of the Stationary Low-Power Reactor Number One (SL-1), the Atomic Energy Commission assigned the development and design to the Argonne National Laboratory. The design and proposed operation of the SL-1, built at the National Reactor Testing Station (NRST), now the Idaho National Laboratory, was built and operational in 1958. The SL-1 design was reviewed in 1958 by the AEC's Division of Licensing and Regulation and also by the Advisory Committee on Reactor Safeguards. Argonne's initial role included design and initial operation of the SL-1, and then the AEC hired Combustion Engineering, Inc. on February 5, 1959 as its contractor to operate and also modify the SL-1 reactor. Combustion Engineering had a cost-plus-fixed-fee contract with the AEC to operate the SL-1 reactor and conduct research and development at CEI's office in Windsor, Connecticut. This contract was administered by the Idaho Operations Office of the AEC. Combustion Engineering had about nine personnel in Idaho assigned to the SL-1. [154]

The reactor served both as an experimental prototype and as a training facility for military personnel. Located at the INL's Auxiliary Reactor Area, SL-1 was a small compact Army nuclear power plant having only 3 megawatt thermal (MWt) and using highly enriched fuel, 93 percent enriched in uranium-235.

The SL-1 reactor had no containment. The reactor building consisted of a grain silo/like building around the reactor vessel; and gravel filled the space between the exterior silo and the reactor vessel that provided some radiation shielding. Access to the top of the reactor was up exterior stairs connected to an operations building connected to the silo building.

The SL-1 accident occurred on January 3, 1961, while the reactor was shut down and while a control rod drives was being reassembled. Withdrawal of a single control rod during shutdown inserted enough reactivity for a super-prompt-critical power excursion and subsequent steam explosion accident. On this bitterly cold afternoon of January 3, three Army technicians arrived at the facility for the four to midnight shift. The SL-1 reactor had been shut down for routine maintenance, and the task of the three Army crewmen that evening was to complete certain preparations for nuclear startup. There were only these three crewmen working at the SL-1 facility that night. During the process of attaching control rods to drive motors, one of the men apparently raised the central control rod too far.

In addition to many problems at the SL-1, there was an extensive history of control rod sticking, during rod drop tests and also when raising the control rods. When manually lifting the 80-lb rod assembly while shutdown and trying to free it, the rod may have suddenly become unstuck and withdrawn enough to cause the accident. The No. 9 control rod was later found to be bound in its shroud at the 20-inch withdrawal position. It would later be shown that the control rod could manually be lifted far enough and fast enough to cause the supercritical prompt power excursion in the reactor core. In a fraction of a second the power reached a magnitude of an estimated 19,000 MWt and vaporized part of the core. [IDO-19311] The water in the core region was vaporized, creating a

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[154] Joint Committee on Atomic Energy, SL-1 Accident Atomic Energy Commission Investigation Board Report, U.S. Government Printing Office, Washington, 1961.

devastating steam explosion. The remaining water in the reactor vessel was hurled upward at high velocity, striking the underside of the reactor's pressure lid and lifting the whole nine-ton vessel upward 9-ft, shearing cooling pipes in the process.

The author interviewed Owen Gailar (now 93) by phone in July 2019. Gailar worked at Combustion Engineering Physics Division located in Windsor, CT where he was in charge of the Reactor Statics. The Combustion Engineering (CE) Windsor Engineering Division had control of the SL-1 modifications and operations. But the CE Windsor Reactor Statics Group that Gailar worked in had no part in the original SL-1 design and no control over ongoing SL-1 operations.

Gailar said he would "often get 'unofficial calls' from the CE SL-1 Physics Group reporting on loss of boron, critical rod positions and sticking control rods. In this capacity I could 'cross the aisle' and recommend to friends and supervisors in the Engineering Division that the SL-1 be shut down. They in turn did NOT push for SL-1 shutdown! 'You geeks worry about everything, nothing is going to happen,' was the response of mid-level supervisor in the Engineering Department. The supervisor was right…for a few months. Then four people [three SL-1 crewmen and a few years later a nurse that responded to the emergency who also received a high and unmonitored radiation exposure] were killed… and if not for bureaucratic money grabbing, a fifth [a night shift CEI supervisor requested but denied by the AEC] would have been killed in the first nuclear power related accident in the United States."

According to Owen Gailar's written comments to Broscious in 2019, There were significant problems with aluminum clad rods swelling and sticking produced a risk in controlling the reactor and implementing a controlled shutdown. Gailar and another person at Combustion Engineering at the Windsor office recommended the shut down of the SL-1 reactor, but they had no control over SL-1 operations. The part of Combustion Engineering that had control of the SL-1 wanted to continue reactor operations.

Combustion Engineering management wanted to continue operations and disregarded its CE Windsor Reactor Statics Group's warnings. These physicists became extremely concerned after they heard that the Army operators were conducting "bumping experiments" or "burp tests" to see how much "steam bubbles" were generated during shutdowns to evaluate the reactor's stability. These "bumping experiments" tests were dangerous because they were triggering the automatic scram system thus relying on the nuclear instrumentation and requiring the rapid insertion of control rods in a reactor with sticking control rods to limit the overpower condition.

Also, the Reactor Statics Group was concerned when they heard that Combustion Engineering/Army reactor operators were instructed to use a sledge hammer to drive the rods into the core. To no avail. Then later when operators tried to remove the rods, they could not manually lift the rods out because they had been hammered into place. The operators ask the Army for a jack to lift the rods out far enough (13") to reach the motorized rod lift; but were refused because "it might damage the reactor."

The Army SL-1 operators were concerned enough that "they wanted the night supervisor present but were turned down because there were no funds for a night supervisor." The AEC refused to provide funding for the additional staffing.

Other reactor facilities require monitoring control room instrumentation whenever fuel is in the reactor and during reactor core loading or unloading operations. With only three crewmen working at the SL-1 and no operator monitoring the control room instrumentation, there wasn't even anyone alive to call in the emergency. It was the activation of a fire alarm due to steam that activated the emergency response the night of the SL-1 accident.

As documented in the "SL-1 Accident Atomic Energy Commission Investigation Board Report" the Army provided no meaningful technical or safety oversight of the SL-1 reactor. The SL-1 reactor had been approved for operation at 3 MW thermal, but the AEC and Combustion Engineering were operating the reactor at higher power levels without licensing evaluation or approval. According to this board report, there was a lack of safety appraisals, lack of clear roles and responsibilities for safety, and "a number of deficiencies related to the SL-1 reactor." The board report stated: "…it is the judgement of the Board that, before the incident occurred, the condition of the reactor core and the reactor control system had deteriorated to such an extent that a prudent operator [the AEC and its contractor Combustion Engineering] would not have allowed operation of the reactor to continue without a thorough analysis and review, and subsequent appropriate corrective action, with respect to the possible consequences or hazards resulting from known deficiencies."

The AEC and Combustion Engineering would downplay the importance of control rod sticking because the problem of control rod sticking was far worse in late December 1960 after the high-power testing, above the approved 3 MWt, of the reactor.

Two crewmen died immediately and the third died about two hours after the accident. One of the men remained impaled on the ceiling by a piece of control rod rammed through his groin. "It all happened in a second or so." [155]

Twenty-two emergency responders, including the nurse, were acknowledged to have received external radiation exposures between 3 and 27 rem. The cancer deaths of these emergency responders several years after the SL-1 accident has been noted in several books about the accident. About 1200 workers participated in SL-1 cleanup.

According to Norton, "It [SL-1] was a terrible accident, made even more grisly because the intensely radioactive fission products scattered inside the building by the accident hampered the work of recovering the bodies. Staying in the building for mere seconds resulted in a year's allowable dose of radiation for rescue workers. And it took six days to remove the body that was impaled on the ceiling by use of a remotely operated crane and a closed-circuit television. The bodies were so badly contaminated, the heads and hands of the victims had to be severed and buried with other radioactive wastes at the Radioactive Waste Management Complex." [Norton] The Oil Chemical and Atomic Workers Union protested vigorously that the government refused to provide a proper Christian burial for the workers.

The SL-1 reactor accident would cause the radiation exposure of emergency responders including firemen, the nurse, health physics personnel, and then cleanup workers. The AEC acknowledged exposures of 0.1-0.5 roentgens [rem] to nearly 100 personnel are probably underestimated. Over 12 emergency responders received exposure greater than 10 roentgens [rem]. [IDO-19301@138] The maximum acknowledged radiation field was 1,000 R/hr. (Rad per hour) ERDA-1536, p.II-243], but this may understate the radiation fields especially the night of the accident. The exposed reactor was still emitting 22,000 R/hr. five months after the accident. Readings above the reactor one month after the accident were stated as 410 R/hr. [IDO-19301, p.109]

The AEC stated that 1,128 Ci including 80 Curies of radioactive Iodine were also released during the SL-1 accident. [ERDA-1536, p.II-243] [DOE/ID-12119@A-53] and this is likely to underestimate that actual radiological release. A temperature inversion kept the radiation plume close to the ground and at 25 miles the radioactive iodine levels were 10 times above background. At 100 miles the radiation levels were above background.

The author interviewed the widow of James Dennis who was a member of the SL-1 **in-**voluntary Army demolition crew brought in to dismantle the reactor after the accident. Dennis died of a rare blood cancer called Waldenstrom's micro globulin anemia, which his medical documents confirm, was caused by exposure to 50 rem/hr. for nine hours and ten minutes at the SL-1 site. [Dennis ,p.10] Dennis' documents further challenge the government's acknowledged exposure of whole body - 2135 mrem, and skin - 3845 mrem [Dennis citing AEC/SL-1, CAB] as grossly understated. Dr. Charles Miller M.C., hematologist / oncologist, chief of Medical Services at Letterman Army Medical Center and Dennis' internal physician, supports the allegation that Dennis' cancer was caused by exposure to radiation. [Dennis, p.17] The government refused to grant Dennis any compensation for his radiation exposure injuries that caused his early death. John Horan, an INL health physics technician, was an expert witness brought in by the Atomic Energy Commission to refute Dennis' claims to radiation induced injuries. Dennis is only one of thousands of individuals who are victims of the health effects of radiation exposure caused by radioactive releases from DOE facilities.

Tami Thatcher's has written extensive published reviews of the available declassified reports on the SL-1 nuclear reactor accident. [156]

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[155] Norton; "Supercritical", Boyd Norton, Manager of SPERT Reactor tests during 1960s, Audubon Magazine May 1980, p. 89-105]

[156] Tami Thatcher, Environmental Defense Institute, The SL-1 Accident Consequences, September 2019. http://environmental-defense-institute.org/publications/SL-1Consequences.pdf

Tami Thatcher, Environmental Defense Institute, The Truth about the SL-1 Accident – Understanding the Reactor Excursion and Safety Problems at SL-1, Updated September 2019. http://environmental-defense-institute.org/publications/SL-1Accident.pdf

Tami Thatcher, Environmental Defense Institute, A Brief History of Radiation Exposures to Idaho National

"The Stationary Low-Power Reactor 1 (SL-1) was a small [3 megawatt] nuclear power plant designed for the military to generate electric power and heat for remote arctic installations [defense early warning - DEW line]. The reactor was operated from August 1958 until January 3, 1961 as a test, demonstration, and training facility. On the evening of January 3, 1961, the SL-1 reactor accidentally achieved a prompt critical nuclear reaction [melt-down] that resulted in a steam explosion that destroyed the reactor. The accident resulted in the deaths of the three operators on duty. The reactor vessel and building were severely damaged and highly contaminated, and a massive cleanup operation ensued to dismantle and dispose of the reactor and building." [SL-1 Plan] Also see Guide section I(B) on INL accident history.

"A burial ground was constructed approximately 1,600 feet northeast of the original site of the reactor. This was done to minimize radiation exposure to the public and site workers that would have resulted from transport of contaminated debris from SL-1 to the Radioactive Waste Management Complex (RWMC) over 16 miles of public highway. Original cleanup of the site took about 18 months. The entire reactor building and contaminated materials from nearby buildings were disposed in the burial ground. The majority of contaminated materials consisted of soils and gravel that were contaminated during cleanup operations." [SL-1 Plan] Reactor core minus the remaining fuel not blown out during the explosion were sent to the RWMC for shallow burial in the Subsurface Disposal Area. "The SL-1 Burial ground consists of three excavations, in which a total volume of 99,000 cubic feet of contaminated material was disposed. The excavations were dug as close to basalt as the equipment used would allow, and range from 8 to 14 feet in depth." ... "During a survey of surface soil in June 1994, hot spots areas of higher radioactivity were found within the burial ground, with activities ranging from 0.1 to 50 mR/hr." [SL-1 Plan] Surface soil samples showed Cs-137 at 1,854.8 p/Ci/g and Sr-90 at 2,806 p/Ci/g. [INL-95/0027 @6-15] Other soil samples at SL-1 burial ground showed cesium-137 at 70,000 and Sr-90 at 27,000 pCi/g. [IT Corp]

"The initial [SL-1] core loading consisted of 14,007.5 grams of uranium-235, and 1022 grams of uranium-238". SL-1 heavy metal and fission product full core isotopic inventory was 221,507.13 curies. [EGG, 3/22/94] It is assumed that approximately 7 percent of the initial fuel load or 15,505.499 curies are buried at the SL-1 site. As a result of the explosion, this fuel is dispersed among reactor and building debris and contaminated soil primarily in the form of fission byproducts cesium-137 and strontium-90. The total exposure risk to a future resident in thirty years of getting cancer is 5 in 10 chances; or a 50/50 chance. "The risk due to cesium-137 falls below the EPA one in 10,000 [industrial] threshold in about 400 years". [INL Facts(b)] This high risk means that if institutional control cannot be ensured for over 400 years, then people or animals coming in contact with the waste will face serious hazards. EPA's one in 10,000 threshold is an industrial standard; the residential standard is one in a million. Despite this hazard, DOE, the State, and EPA concluded that the SL-1 burial ground environmental restoration was only to consist of adding a thin earth and rock cap. For a compelling documentary of the SL-1 accident see Beacher Films, 6810 Chabet Rd, Oakland, CA 94618.

Laboratory Workers, Updated January 5, 2016. http://www.environmental-defense-institute.org/publications/TopTenINLR2.pdf

Tami Thatcher, Environmental Defense Institute January 2015 Newsletter article, America's only Nuclear Reactor Operator Deaths. http://www.environmental-defense-institute.org/publications/News.15.Jan.Final.pdf

Tami Thatcher, Environmental Defense Institute April 2018 Newsletter article, "An Editorial About the 1961 SL-1Accident History in Response to a February Guest Editorial in the Post Register." http://environmental-defense-institute.org/publications/News.18.April.pdf

Tami Thatcher's Understanding the Reactor Excursion and Safety Problems at SL-1 Jan 3, 2015 - On the night of January 3, 1961, the SL-1 nuclear reactor, a prototype for a military installation to be used in remote Arctic locations, exploded ...[PDF] http://www.environmental-defense-institute.org/publications/SL-1Article%20Rev5.pdf

Tami Thatcher, A Brief History of Radiation Exposures to Idaho National Laboratory Workers, January 5, 2016 Update. http://www.environmental-defense-institute.org/publications/TopTenINLR2.pdf

2.**No Cleanup of ARA-1 Chemical Percolation Pond**

Once again, DOE generates a "No Action" proposal without any substantive information to support the decision. The Auxiliary Reactor Area (ARA) Chemical Evaporation Pond is actually an unlined percolation waste pit for chemicals and radionuclides. Sampling did not include beta-emitting radionuclides. Alpha and gamma isotopes are listed without any quantitative contaminate values and drinking water standards upon which a reader could reasonably make an informed decision on the merits of the Agency decision.

This chemical percolation pit is located at ARA Area I, which is the site of the infamous SL-1 reactor explosion that spewed 1,100 Ci out and killed three operators (see next section on SL-1). The ARA has a long and sordid reactor destruct experimental history including Power Burst Reactor, Gas-Cooled Reactor Experiment, Mobil Power Plant #1, SPERT Reactors 1&2, Fast Spectrum Refractory Metals Reactor, Hot Critical Experiment, Fast Transient Reactor, and related support facilities.

In the Plan narrative, DOE commits nearly all discussion to trivializing the problem and offering little or no substantive information. The ARA facilities have extensively contaminated the ground in the area. DOE expects the public to accept background samples collected 100 feet from the pond. Given ARA released 361,632 curies over its history, this choice for background sampling is ludicrous. Adding insult to injury, DOE characterizes these background readings as "naturally occurring."

The ARA lies immediately up gradient of the Big Lost River. As previously cited, a six member ground water study team commissioned by EG&G, an INL contractor, was canceled after its preliminary results showed that contamination "could move from INL to the Magic Valley within months." [Aley, 1980] Their findings revealed the presence of lava tubes that move water rapidly through the aquifer and exit at Thousand Springs on the Snake River.

Other DOE studies of aquifer contamination plume movement from ICPP to CFA between 1953 to 1958 document a seven foot/day or one-half mile/yr. Contaminate travel time from surface disposal to the aquifer is approximately 4-6 weeks or 10 feet/day. [ERDA-5316@II-120&III-81] The fact is that the aquifer is not a homogenous geologic structure, but rather a very heterogeneous mix of different strata. Therefore no generalized characterization about water movement within the aquifer is valid. The entire volume of the Big Lost River literally disappears into the porous Snake River Plain. The Administrative Record lists the following contaminates in the ARA chemical "pond".

ARA Chemical Waste Pond Contaminates

Contaminate	Concentration	Contaminate	Concentration
Cesium-137*	297.00 pCi/gram	Barium	293.00 mg/kg
Cesium-134	11.40 pCi/gram	Methyl Chloride	26.00 ug/gram
Strontium-90	297.00 pCi/gram	Uranium-234	1.60 pCi/gram
Cobalt-60	8.14 pCi/gram	Gross Alpha	285.00 pCi/gram
Plutonium-239	2.60 pCi/gram		

* The Radiological Release Criteria for Cesium-137 is 10 pCi/gram. [EG&G-WM-8804]
[EGG-WM-10001@4-16 to 4-20][EGG-2612(90)][ARA Rod]

Section IV. J. BORAX-1 Remediation

"The [Boiling Water Reactor Experiment Number 1] BORAX-1 reactor was a small experimental reactor used in the summer months of 1953 and 1954 for testing boiling water reactor technology. In 1954, the design mission of BORAX-1 was completed, and the decision was made to make one final test, which resulted in the intentional destruction of the reactor. The destruction of the reactor contaminated approximately 84,000 square feet of the surrounding terrain. Immediately following the final test of the BORAX-1 reactor, much of the radioactive debris including some fuel residue, was collected and buried on site in the reactor shield tank." "However the cleanup did not sufficiently reduce the radioactivity at the site; therefore, the 84,000 square foot contaminated area

was covered with approximately 6 inches of gravel to reduce radiation levels at the ground surface."..."Buried materials at the site consist of unrecovered uranium fuel residue, irradiated metal scrap, and contaminated soil and debris. Part of the waste was buried in the bottom half of the shield tank; the top half of the tank was collapsed into the bottom and the void space was filled with debris." [SL-Plan]

"After 25 years, exposure rates as high as 45 R/hr were measured above the gravel covering of the BORAX-1 site."..."Radiation surveys around anthills on the gravel covering detected radioactive fuel fragments which were presumably transported to the surface by ants."..."Vegetation sampling indicated that mean cesium-137 concentrations in rabbit brush from the former reactor site was statistically greater than the control area samples."..."Uranium-235 was detected in two surface soil samples 100 to 140 meters to the southeast of the former reactor in concentrations about 3 times greater than background." [Dickson] Forty seven ant hills were observed in the BORAX-1 gravel area and a survey of the hills showed radiation counts ranging from 2,000 and 15,000 counts per minute. Sixteen grams of U-235 fragments were found on the surface after the explosion.[Dickson] Recent surface soil samples show Cs-137 at 7,334 pCi/g and U-235 at 144 pCi/g. [INL-95/0027 @6-15] Other soil sample data showed Cs-137 at 67,000 and Sr-90 at 27,000 pCi/g. [IT Corp]

Only 12% of the BORAX-1 reactor fuel was recovered leaving the remaining 88% released to the surrounding area. The reactor core consisted of 30 uranium aluminum alloy assemblies containing a total of 4.2 kg of 90% enriched U-235. The reactor tank had 3,4000 gallons of waste during operation. [Dickson] According to DOE's internal documents BORAX-1 fuel remaining at the reactor site burial ground contained 22,800,000 curies. This number is significantly understated because, "The total value includes total activity at the dates indicated while individually radionuclide entries include activity only if the curie value was greater than 0 after 40 years of decay". [ERD-93-002] Also not included in the remaining soil contamination is 714 curies released to the atmosphere. Atomic Energy Commission video footage of the intentional BORAX-1 explosion can be seen in the movie Dark Circles.

DOE, State of Idaho, and EPA concluded that the BORAX-1 site could be covered over with an additional thin layer of soil and rock as the final environmental remediation action despite the extreme hazard the site presents to future generations. The deterministic exposure risk of contracting cancer by a future resident in thirty years is 3 in 100. EPA's standard for residential exposure is one in a million. This is an example of a nuclear sacrifice zone.

Section IV. K. Naval Reactor Facility Cleanup Plan

The Environmental Defense Institute (EDI) comments on the Department of Energy (DOE) Final Environmental Impact Statement DOE/EIS-0453-F, submitted previously for the record, are available on EDI's website. [157] EDI's comments have more background contamination and radioactive waste information needed to fully understand all the environmental impacts. EDI's comments on NRF CERCLA review is also available. [158] Tami Thatcher's DOE comments on DEIS that cover other crucial issues are available. [159] The comments below focus on the final FEIS issues that were not covered and therefore make it deficient for the following reasons:

* The FEIS fails to comply with all National Environmental Policy Act (NEPA) requirements;
* The FEIS fails to fully evaluate keeping the existing Expanded Core Facility (ECF) spent (used) nuclear fuel (SNF) cooling pool in operation for "over 33 years" as an integral part of NRF operation;
* The FEIS incorrectly says NNPP will not generate high-level-waste, greater-than-class waste or transuranic waste;
* The FEIS failed to adequately assess the ECF's seismic vulnerabilities.

"The Naval Nuclear Propulsion Program (NNPP), also known as the Naval Reactors Program, is a joint United States (U.S.) Navy and Department of Energy (DOE) organization with responsibility for all matters pertaining to

[157] http://www.environmental-defense-institute.org/publications/EDINRFcomments.pdf
2 http://www.environmental-defense-institute.org/publications/NNPP-Report7A.pdf
[159] http://environmental-defense-institute.org/publications/CommentsECF.pdf

naval nuclear propulsion from design through disposal (cradle-to-grave)." [FEIS pg. Vol. I Abstract]

The Naval Reactors Facility (NRF) located on DOE's Idaho National Laboratory (INL) is the waste end of the used reactor fuel (spent nuclear fuel or SNF) from the NNPP's nuclear fleet. DOE's role is designated to manage the Navy's waste.

EDI finds this EIS a clever effort to slip in major expansion of the Navy's SNF waste management without acknowledging 50+ years of massive radioactive contamination at INL by claiming previous NRF environmental studies. [160] DOE/NAVY claim these CERCLA reports are beyond the scope of this EIS. The Navy's previous radioactive contamination will remain for manila putting Idahoans at risk. This is an unconscionable and avoidable assault on Idaho's most valuable Snake River Aquifer that we depend on.

1. **NEPA Requirements Violated**

A. The FEIS fails to comply with all NEPA requirements.

The FEIS correctly states: "NEPA, Sec. 1502.1 Purpose Environmental Impact Statement. The primary purpose of an environmental impact statement is to serve as an action-forcing device to insure that the policies and goals defined in the Act are infused into the ongoing programs and actions of the Federal Government. **It shall provide full and fair discussion of significant environmental impacts and shall inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment… Statements shall be concise, clear, and to the point, and shall be supported by evidence that the agency has made the necessary environmental analyses. An environmental impact statement is more than a disclosure document.** It shall be used by Federal officials **in conjunction with other relevant material** to plan actions and make decisions." [161] [emphasis added]

FEIS states: "Per NEPA requirements (10 C.F.R. § 1021 and 40 C.F.R. § 1500–1508), consideration must be given to whether actions performed under the alternatives could result in a violation of any federal, state, or local law or requirements, or require a federal permit, license, or other entitlements. Federal environmental laws that affect environmental protection, health, safety, and compliance were considered in the EIS scope development. In addition, environmental requirements that have been delegated to the state of Idaho and local requirements were considered to ensure compliance." [FEIS pg. 1-13]

The Yale Law Journal Review notes: "To comply with existing law and achieve NEPA's normative goals, agencies should expand EIS discussions of how applicable regulatory regimes will shape project impacts. Impact discussions are not 'full and fair' without this information because they fail to allow the public and other agencies to comment on—and more importantly, to challenge—this crucial aspect of project planning. Such an approach would further NEPA's aim to '[r]igorously explore and objectively evaluate' the full scope of project impacts that 'significantly affect the quality of the human environment.'" [162]

Due to public and Federal court pressure, DOE has in the recent past conducted numerous "Programmatic" EISs that comprehensively analyze all relevant aspects of a project's environmental impact. [163] DOE/NNPP must be pressured to fulfill NEPA requirements by reissuing this FEIS as a comprehensive "Programmatic EIS."

The DOE/Navy is trying to avoid NEPA requirements to provide a comprehensive environmental impact statement of the proposed actions. Failure to provide NRF past-present-future waste characterization/disposition means the DEIS/FEIS are deficient. Absent this crucial waste data,

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[160] Remedial Investigation/Feasibility Study (RI/FS) studies required by CERCLA to characterize the nature and extent of contamination because of past releases of hazardous and radioactive substances to the environment, to assess risks to human health and the environment from potential exposure to contaminates, and to evaluate cleanup actions.

[161] Authority: NEPA, the Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. 4371 et seq.), sec. 309 of the Clean Air Act, as amended (42 U.S.C. 7609), and E.O. 11514 (Mar. 5, 1970, as amended by E.O. 11991, May 24, 1977). Source: 43 FR 55994, Nov. 29, 1978, unless otherwise noted.

[162] *A 'Full and Fair' Discussion of Environmental Impacts in NEPA EISs: The Case for Addressing the Impact of Substantive Regulatory Regimes*, Sarah Langberg, foot notes 178 & 179 citing 40 C.F.R. § 1502.14(a) (2014). U.S.C. § 4332(C) (2012). http://www.yalelawjournal.org/note/nepa-eiss-and-substantive-regulatory-regimes.

[163] See, Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the U.S. Including the Role of the Fast Flux Test Facility, DOE/EIS-0310, December 2000.

Commenters' must rely on previous reports to ascertain how these operations effect the environment. [164] The public cannot rely on this document to provide the information needed to make an informed decision.

2. DOE/Navy fails to issue a Comprehensive Programmatic EIS

A. The FEIS inadequately evaluates keeping the Expanded Core Facility (ECF) in operation; for "over 33 years" as an integral part of NNPP operation.

FEIS states: "**Overhaul Alternative time period. The first 33 years of the 45 years (i.e., the [ECF] refurbishment period), refurbishment and operations activities would be conducted in parallel.**" [Pg. S-8] [emphasis added]

"[T]he NNPP will continue to operate ECF during new facility construction, during a transition period, and **after the new facility is operational for examination work**. **To keep the ECF infrastructure in safe working order during these time periods, some limited upgrades and refurbishments may be necessary. Details are not currently available regarding which specific actions will be taken; therefore, they are not explicitly analyzed as part of the New Facility Alternative.**" [165] [emphasis added]

The above FEIS statement: "Details are not currently available regarding which specific actions will be taken." **This documents the fundamental inadequacy of the FEIS.** DOE/Navy cannot legitimately claim compliance with NEPA when the most degraded part of this operation is not fully evaluated in explicit detail. More troubling is the Environmental Protection Agency (EPA) and Idaho Department of Environmental Quality's defining silence as regulators. This is a crucial issue given that the public's environmental defenders are politically compromised on enforcement of laws they have authority over.

The FEIS correctly states: "Per NEPA requirements (10 C.F.R. § 1021 and 40 C.F.R. § 1500–1508), consideration must be given to whether actions performed under the alternatives could result in a violation of any federal, state, or local law or requirements, or require a federal permit, license, or other entitlements. Federal environmental laws that affect environmental protection, health, safety, and compliance were considered in the EIS scope development." [FEIS Pg. 1-13]

Yes, environmental laws were considered but never acknowledged to be violated. In addition the FEIS fails to include soil and ground water contamination from ECF leaks and discharges that **do** violate environmental laws. [166] These issues will be discussed later.

3**. ECF Degraded Condition**

DOE/NRF's statements confirm the degraded condition of the ECF. Again documents the fundamental inadequacy of the FEIS to exclude specific actions required to mitigate continued significant ECF leaks. "Not a matter of urgency" discloses the Navy's previous decades of disregard for environmental degradation.

"Major portions of the ECF infrastructure have been in service for over 50 years. **The ECF water pools have never undergone a complete refurbishment and have not been upgraded to current seismic standards. Although water pool surfaces are covered with a fiberglass or epoxy coating, the water pool does not have a liner, creating the potential for water infiltration into the reinforced concrete structure and the potential for corrosion damage of the reinforcing bar within the structure. The capability to detect and collect small leaks, a common feature in modern water pools, is not present for the ECF water pool. Consequently, while the replacement or overhaul of the current water pool is not a matter of urgency that must be done in a very short period, it is something that needs to be planned and started soon."** [FEIS Pg. S-6][emphasis added]

A. ECF Leaks ?

"**Alternative methods would be to discharge the water from leak testing the pools (up to 18,927,000 liters**

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[164] See EDI's NRF CERCLA comments and for more detailed information on NRF's waste characterization not provided in this EIS. http://www.environmental-defense-institute.org/publications/NNPP-Report7A.pdf

[165] Final Environmental Impact Statement for the Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling, October 2016, DOE/EIS-0453-F, Pg. S-9, herein after referred to as FEIS.

[166] See EDI's NNPP Report that offers a Review of NRF CERCLA issues not addressed in this EIS. And Final NRF Comprehensive Feasibility Study Waste Group 8 Naval reactor Facility. And "Supplement to Evaluation of Naval Reactors Facility Radioactive Waste Disposed of at the Radioactive Waste Management Complex from 1953 to 1999", J. Giles et.al., April 2005, ICP/EXT-05-00833, pg. 18.

(5 million gallons)) to the sewage lagoons or to the [Industrial Waste Ditch] IWD during the last year of construction. This discharge would occur over a short period of time (about 6 days) but is not expected to exceed the infiltration capacity or the maximum flow distance (2.9 kilometers (1.8 miles)) previously recorded for the IWD. **The permitted annual discharge rate for the IWD of 113,600,000 liters (30,000,000 gallons) would not be exceeded. Section 4.4.3 reflects this potential discharge of water for pool leak testing."** [FEIS Pg. 1-21]

Table 4.4-5: Discharge to the IWD for the Construction Period of the New Facility Alternative [FEIS Pg. 4-44]

Source	Volume[1]	
	liters per year	gallons per year
Construction Period Increase **(leak test water)**	18,927,000	5,000,000
NRF Baseline [including ECF] [2]	43,190,000	11,410,000
Total[3]	62,117,000	16,410,000
Wastewater Reuse Permit Discharge Limit[4]	113,600,000	30,000,000
Percent Increase Over the NRF Baseline[5]	**43.8**	
Percent of Discharge Limit[6]	**54.7**	

[1]Numbers have been rounded; therefore, unit conversions are not exact.

[2]Total volume of discharge to the IWD from all NRF sources **(including ECF) for 2009.**

[3]Total of Construction Period Increase and NRF Baseline.

[4]Based on the Industrial Reuse Permit Renewal Application for the Naval Reactors Facility pending approval, dated January 26, 2012.

[5]Percent increase from construction period over the NRF Baseline.

[6]Percentage of total discharges for NRF (62,115,000 liters) compared to the wastewater reuse permit discharge limit.

The NRF Industrial Waste Ditch (IWD) is just that; an open ditch where huge volumes of radioactive liquid process waste from the ECF is allowed to sink down into the aquifer below flushing previous contaminates down further into groundwater. DOE/Navy claims "CERCLA remedial action plan are outside the scope of this EIS" and thereby attempts to censure NRF groundwater and soil reports showing significant contamination above EPA/MCL limits. This FEIS facilitates continued contamination of Idaho's most precious resource that thousands of INL workers and all Idahoans rely on for drinking and crop irrigation.

Again, leak testing (in the above 4.4-5 table) is not defined, however the reader is left to assume that this represents the volume of water that continues to leak into concrete structure surrounding the ECF and that must be pumped out and discharged to the Industrial Waste Ditch (IWD) or other unlined percolation ponds at the NRF. These radioactive waste discharges eventually migrate to the aquifer and the Snake River via Thousand Springs near Hagerman, ID.

The above ECF "water tight" is not possible with planned epoxy/fiberglass coatings as previous use demonstrates, but only with the NRC required stainless liner which is not planned. FEIS fails to characterize/quantify what the above waste discharges will be and how these additional discharges will add to existing NRF soil/groundwater contamination described in CERCLA RI/FS. [167]

FEIS states: "The ECF water pool does not leak 16,000 gallons per day as alleged by the [EDI] commenter, and there is no known leak to the environment." "Appendix F, Section F.5.4.12 states that additions to the water pool are about 150 gallons of water per day to compensate for evaporation. The 150 gallons per day of make-up water is consistent with expected losses due to evaporation based on the surface area of the pool and facility humidity levels." [FEIS Pg. G-102]

[167] Remedial Investigation/Feasibility Study (RI/FS) studies required by CERCLA to characterize the nature and extent of contamination because of past releases of hazardous and radioactive substances to the environment, to assess risks to human health and the environment from potential exposure to contaminates, and to evaluate cleanup actions.

The above statement is misleading at best. The Navy's own earlier CERCLA report states: "The ECF water level is monitored frequently and recorded in water level logs. Water is routinely added to the pits to compensate for evaporation loss. **For the past four years, the average water loss has been 3500 gallons per month.** To determine if any leakage has occurred, the actual water loss per month is compared to theoretical and experimental evaporation data. **Between December 8, 1991 and February 6, 1992, significantly more water was added to the water pits than anticipated. The detailed investigation of this event identified that an unexplained water loss of 62,500 gallons occurred between December 8, 1991 and February 21, 1992.** A leak from one water pit was the expected cause of the water loss." [168]

The above documented ECF 62,500 gal.30 day leak = 2,083 gal. /day. Obviously, the DOE/Navy is not offering true or credible information in this FEIS. The above cited document was obtained through an EDI FOIA request and not radially available to public. Clearly, this is why the DOE/Navy does not include NRF CERCLA data in this FEIS. [169]

ECF leaks and discharges to the Industrial Waste Ditch (IWD) are not fully evaluated in the FEIS especially when ECF projects will be heavily regulated under substantive environmental law regimes such as the Clean Air Act (CAA) [170] or Clean Water Act (CWA). [171]

5**. The FEIS fails to include the Advanced Test Reactor as an integral part of NNPP operation**

Currently, the Advanced Test Reactor at INL that tests NRF fuel is a crucial part of NRF operations and itself produces SNF. This sleight of hand that the ATR is not an integral part of the NNPP/NRF is ridiculous and challenges the credibility of this FEIS.

The FEIS fails to include Idaho Nuclear Technology and Environmental Center (INTEC) as an integral part of NNPP operation

"In addition to DOE owned fuel INL/INTEC CPP-666 stores spent fuel from the Naval Reactors Program." [172] "The Idaho [CPP-666] inventory includes SNF from the Naval Nuclear Propulsion Program (i.e., submarines and aircraft carriers), which is different from commercial SNF in many ways, including enrichment level and design. From about 1952 to 1992 this Navy SNF was reprocessed in Idaho to extract high-enriched uranium for use in driver fuel rods at weapons material production reactors elsewhere." [173]

Chemical reprocessing at INL/INTEC generated millions of gallons of high-level waste – 900,000 gallons of which remains in underground tanks today. Leaks from this INTEC high-level waste tank farm and aquifer waste injection wells continue to contaminate the soil and groundwater. [174]

The FEIS states: "The Naval Nuclear Propulsion Program (NNPP), also known as the Naval Reactors Program, is a joint United States (U.S.) Navy and Department of Energy (DOE) organization with responsibility for **all matters pertaining to naval nuclear propulsion from design through disposal (cradle-to-grave).**" [FEIS pg. Vol. I Abstract] [emphasis added]

Incomplete Environmental Impacts

The FEIS fails to include previous environmental contamination identified in CERCLA investigations in cumulative environmental impact;

DOE/Navy use a classical bait and switch ostensibly initially appearing to follow the legal requirements of NEPA, while later buried in the FEIS claim's the NRF has no obligation to include the full waste stream disposition and environmental contamination resulting from NRF/ECF operations. What is critical in any EIS is to review all

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[168] Final NRF Comprehensive Feasibility Study Report Waste Area group 8 Naval Reactors Facility, Idaho Falls Idaho, Pittsburgh Naval Reactors Office, and pg. 5-1.

[169] FEIS, Pg. G-102

[170] Clean Air Act (CAA)[10] Yale citing 42 U.S.C. ss 7401q(2012)

[171] Clean Water Act (CWA) Yale citing 33 U.S.C. ss 1251-1387 [11]

[172] Energy and Environment, Storage of DOE SNF at the Idaho National Laboratory, U.S. DOE.

[173] U.S. Spent Nuclear Fuel Storage, James Warner, Section Research Manager, Pg. 27, Citing T. Cochran, et.al., Nuclear Weapons Databook, Vol. II, May 24, 2012, Congressional Research Service, 7-5700, R42513, www.crs.gov

[174] Engineering Design File, Groundwater Pathway Risk Assessment for CPP-601, CPP-602, CPP-627, and CPP-640 Fuel Reprocessing Complex Non-Time-Critical Removal Action**,** Document ID: EDF-10195, Revision ID: 1, Effective Date: 02/08/12.

environmental the impacts of any subject operation. That literally means the past, present and anticipated impacts as NEPA requires. By ignoring history, we are bound to repeat it.

FEIS states: "Comments on the NRF Waste Area Group 8 CERCLA remedial action plan are outside the scope of this EIS." [175] [FEIS Pg.G-104]

Again, it is essential to review previous CERCLA analysis to get an accurate assessment of what current and future operations will be since the basic operations have not changed. Moreover, new waste discharges MUST be added to previous contamination to fully assess environmental impacts. An earlier NRF Environmental Report states: "Overall, less than an estimated 1500 curies of radioactivity have been released to the atmosphere during the period of 1953 through 1991, with the majority of the releases occurring in the 1950s. During the past 10 years, releases have been less than 10 curies per year…. In Addition to the annual releases, a single release occurred in 1955 during the performance of an engineering test to obtain information on the effects of boiling conditions in naval reactors. … A conservative estimate of the amount of radioactivity released from the site was 870 curies. [176]

Review of the historical deep well sampling data at NRF does not support the Navy's conclusion of no impact. NRF CERCLA report shows Table III Deep Well Sample Results for Wells # 1, # 2, and # 3 at 60, 69, and 44 pico curies per liter respectively for gross beta. [177] The federal drinking water standard for gross beta is 8 pico curies per liter. This deep well sample data confirm that contaminates in fact migrate, contrary to the Navy's claims that contaminates are bound up in the soil.

Vegetation at NRF CERCLA Unit 8-08-14 radioactivity (pCi/gm) Sampling Results (Pre-1971) Sample # 68-1 was 144,522; Sample 6-82 was 687,447 pCi/gm. [178] DOE/NRF understandability is blocking this shocking data. Like a used house salesman showing a prospective buyer a fancy color brochure that does not show the failing foundation, leaking heating oil tank and water leaks, DOE fits perfectly by vehemently objecting to independent environmental review.

The FEIS Inadequately Characterize Groundwater Contamination

FEIS states: "Groundwater monitoring has generally shown long-term trends of decreasing concentrations for radionuclides, and **current concentrations are near or below EPA MCLs for drinking water and the sites where there is historic contamination are not used as sources for drinking water**." [Pg. G-99][emphasis added]

The above statement "**current concentrations are "near" EPA MCLs for drinking water and the sites where there is historic contamination are not used as sources for drinking water" completely disregards NRF staff, visitors and thousands of INL workers at other facilities who drink water drawn from facility wells.** What about adjacent Atomic City residents? What kind of credibility can the public put on the Navy's assurance that groundwater is "NEAR" regulatory EPA MCL limits? None! Every INL/NRF potable water source should have a notice DO NOT USE FOR DRINKING.

The FEIS states: "During the construction period of the New Facility Alternative, there would be **small impacts on the amount of water seeping into the perched water zone at the IWD outfall**." [4-44][emphasis added] "The increased water discharge volume at Location 3/4 or Location 6 during the transition period could result in **additional seepage of water to the perched water zone located beneath the IWD outfall. When the areal extent of this perched water zone was greatest, annual discharge volume to the IWD was 650,000,000 liters (172,000,000 gallons) and was not regulated by a permit**. [FEIS Pg. 5-40]

To characterize waste discharges as having "small impacts" to the ground water is ridiculous. Why? Because these huge contaminated waste water discharges will flush existing waste into the aquifer. Nuclear Regulatory Commission (NRC) would otherwise require leak-proof stainless steel liner in all commercial spent nuclear fuel

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[175] Proposed Plan Waste Area Group 8, and Removal Actions Considered for Naval Reactors Facility Idaho National Laboratory, issued by DOE, EPA, and Idaho Department of Environmental Quality.

[176] Naval Reactors Facility Environmental Summary Report NRF-EC-1046, Pg.18. And Naval Reactors Facility Environmental Summary Report NRF-EC-1007, Calendar Year 1991, Pg. 18.

[177] NRF October 1995 Remedial Investigation / Feasibility Study (RI/FS) Appendix K.

[178] Final NRF Comprehensive Feasibility Study Waste Group 8 Naval Reactor Facility Appendix H, October 1995, Pg. H6-13, Table H6—5.

(SNF) storage pools because leaks contaminate the groundwater. Epoxy/fiberglass coatings are not allowed at NRC regulated SNF facilities because they leak and the pool cannot be accurately leak tested. Moreover, applying more epoxy to acknowledged failing concrete pool walls adds to the absurdity. Below EDI discusses ECF significant leaks and what DOE/Navy euphemistically calls "Leak Testing" that is apparently when they measure the amount of ongoing ECF leaks into this pool substructure. Leaks to the soil cannot be measured except by water required to maintain pool water volume.

The FEIS states: "Water pool refurbishment would include correcting deteriorating conditions. These actions would be necessary to ensure that the water pools support long-term use by, to the extent practicable, **bringing the water pools up to current design and construction standards.** [Pg. S-8]

The "current design and construction standards" DOE/NRF refers to above are not the standards NRC requires of all regulated SNF storage pools. DOE/NRF makes no apparent reference what standards are being applied to this ECF. There is no intent to replace the degraded/leaking ECF SNF water storage pool. What will NRF do with the 400 SNF assemblies in the ECF while "The water pools [are] drained, decontaminated, and emptied of some equipment" with degraded pool gate seals? We discuss this major issue below in seismic vulnerabilities.

No Discharge of Radioactive Liquid?

The FEIS states: "Liquid LLW: Refurbishment Period: There would be **no impact from liquid** LLW since waste generation volumes would not change. Post-Refurbishment Operational Period: There would be **no impact from liquid LLW** since waste generation volumes would not change." [Pg. S-69] [emphasis added]

"Groundwater: There would be **negligible impacts to groundwater** under the No Action Alternative and the refurbishment period of Overhaul Alternative from radiological constituents **if** preventive and corrective maintenance is not sufficient to prevent a **minor** water pool leak. There could be **small impacts to groundwater** during the transition period and new facility operational period under the New Facility Alternative from potential increases in non-hazardous salts in wastewater discharge." [Pg. S-73] [emphasis added]

No reasonable person can read these repeated statements of "no impact" "negligible impacts to groundwater" knowing the huge leak volumes in question and knowing this operation has been doing this for 50 years, without cringing. Again, the Navy intends to keep this leaking ECF in operation for decades. The FEIS offers no accurate characterization of the ECF water discharged/leaked. See below NRF CERCLA report EDI gained through FOIA that documents this crucial data.

The FEIS states: "Radiological Effluent: There would be **no impact from radiological effluent since none** would be discharged to surface water or the Snake River Plain Aquifer (SRPA). "NRF does **not discharge radiological liquid effluent to the environment**." [FEIS Pg.S-16] [emphasis added]

However FEIS states: "Radiological Liquid Effluent Parameters for NRF [Industrial Waste Ditch] IWD maximum discharge for Co-60, Cs-137, Sr-90, and tritium (H3) at 20, 20, 1.9 and 0.7 pCi/l respectively. "Actual minimums and maximums over 5-yr. **or** 2 yr. period are reported." [FEIS Pg. 3-32] [179]

These two above FEIS statements are contradictory and challenge the veracity of the document. Additionally, why 5 yr. **OR** 2yr. periods recorded? Is there data in 5-yr. monitoring data showing higher numbers that DOE/Navy is withholding like 10 yr. monitoring data? See below CERCLA data showing significant radioactive contamination intentionally excluded.

The above FEIS table 4.4-5 showing tens of millions of gallons of water used for direct contact cooling of extremely radioactive used reactor fuel (SNF) and dumped in the open IWD ditch, belies DOE/NRF's statement: "**NRF does not discharge radiological liquid effluent to the environment." The coolant water is radioactive and hazardous due to corrosive activated material on extremely radioactive used fuel surfaces and must be treated as such.**

NRF CERCLA reports prove FEIS false by showing S1W Leaching Bed Area Radioactivity Soil Sampling for Cs-137 at 310,000 pCi/g; Co-60 at 1,300,000 pCi/g. [180] The NRF Retention Basin where highly radioactive process waste water is sent to allow short-lived isotopes to decay before discharging it to IWD showed sludge

[179] FEIS Pg. 3-32

[180] Final NRF Comprehensive Feasibility Study Report Waste Area group 8 Naval Reactors Facility, Idaho Falls Idaho, Pittsburgh Naval Reactors Office, Appendix I, October 1995, Table 1-3a, Pg. I-59.

samples of Cs-137 at 192,700 pCi/gm; [181] Strontium-90 at 5,118 pCi/gm. NRF Vegetation sampling results at location 68-1 and 68-2 at 144,522 and 687,447 pCi/gm respectively. [182]

These FEIS statements of "no impact" are categorically false. Absence of recent CERCLA Remedial Investigations/Feasibility (RIFS) showing significant environmental contamination documents how this FEIS attempts to ignore fundamental NEPA policy. For instance, NRF CERCLA Unit 8-08-12 sample results show chromium at 2,090 mg/kg (MCL = 50 mg/kg); Cesium-137 at 149,759 pCi/gm (risk-based soil level = 0.003). [183]

Below Table H6-6 lists the radioactive isotopes found in the ECF process water Leaching Bed sediments. This CERCLA data contradicts FEIS statement: "NRF does not discharge radiological liquid effluent to the environment." These sample results show extremely high radioactive mud that will eventually percolate into the aquifer.

1971 Samples NRF Leaching Bed Mud [184]

Table H6-6- Unit 8-08-14 Radioactivity (pc/gm) Sample Results (pre-1971)

Sample Number	Soil				
	Cs-137	Cs-134	Co-60	Hf-181	Sb-124
1	310,000	42,000	450,000	4,900	190,000
2	190,000	42,000	42,000	6,200	37,000
3	210,000	7,600	1,300,000	8,700	43,000
4	80,000	14,000	640,000	9,100	ND
5	95,000	20,000	1,000,000	15,000	55,000
6	140,000	42,000	1,000,000	19,000	ND
7	150,000	40,000	1,100,000	20,000	ND
8	140,000	31,000	440,000	8,200	33,000

Source: NRF-RI/FS Table H6-6 Pg. H-6-14

NRF CERCLA report continues: "The release of 62,500 gallons is a conservative maximum estimate. Based on the results of periodic NRF Chemistry analyses of the low level of radio nuclides present in ECF water pool water, the estimated quantities of radionuclides released are as follows: 5.2 x 10-2 curies of tritium, 9.7 x 10-6 curies of carbon-14, 7.1 x 10-6 curies of manganese-54, 1.9 x 10-5 curies of cobalt-58, 4 x 10-4 curies of cobalt-60, 6.6 x 10-5 curies of nickel-63, 1.2 x 10-6 curies of strontium-90, 1.2 x 10-6 curies of yttrium, and 1.1 x 10-5 curies of cesium-137. Thus, a total of 5.25 X 10-2 curies of radioactivity were estimated to have been released. The estimate is considered to be conservative, because previous leaks from the water pit into observation rooms within the ECF building rarely indicated the presence of radioactive contamination. The release occurred about 30 feet below ground surface." [185] [5-1]

[181] Ibid. Appendix H, Table H8-4, Unit 8-08-17, Pg. H8-8.
[182] Ibid. Appendix H, Table H8-5, Pg. H8-9.
[183] Ibid. Appendix H, Table H4-13, Unit 8-08-12, Pg. H4-22.
[184] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Prepared for the U.S. DOE Pittsburgh Naval Reactors Office, Pg.H-6-14.
[185] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-2

"Tritium is the only radionuclide expected to migrate with the water. The COPCs as identified in the Work Plan (WEC, 1995) were tritium, carbon-14, cobalt-60, manganese-54, nickel-63, strontium-90 and cesium-137.

Table 2-1 OU 8-08 COCs and Risk-based Soil Concentrations

COC	Exposure Route	Risk-based Soil Concentration[1] (pci/gm unless specified)	Max. Soil Concentration (pci/gm unless specified) Detected at OU 8-08
Lead	Direct Contact	400 ppm[2]	1,140 ppm
Americium-241	External Exposure	895	20
	Ingestion of Soil	283	–
	Food Crop Ingestion	301	–
Cesium-137	External Exposure	16.7	7,323
	Ingestion of Soil	24,860	–
	Food Crop Ingestion	164	–
Neptunium-237	Food Crop Ingestion	19.8	0.79
Nickel-63	Food Crop Ingestion	15,846	730
Plutonium-238	Ingestion of Soil	590	20
	Food Crop Ingestion	1,153	–
Plutonium-244	External Exposure	3.3	0.24
Strontium-90	Ingestion of Soil	15,418	750
	Food Crop Ingestion	45.6	–
Uranium-235	External Exposure	13.2	0.18

(1) Concentration which corresponds to a 1 x 10^{-4} carcinogenic risk.
(2) EPA recommended cleanup level (EPA, 1994)

The concentration terms for each radionuclide are given in Table 5-1 below. [186] [Pg. 5-2]

[186] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-2.

Table 5-1 COPCs and Concentration Terms for Unit 8-08-79

Constituent	Estimated Amount Released (Curies)	Concentration (pci/l) of pit water (1992)	Concentration Term (pci/l) - Decay-Corrected to 1996
Carbon-14	9.7×10^{-6}	41	41
Cesium-137	1.1×10^{-5}	46.5	42.3
Cobalt-60	4×10^{-4}	1691	930
Manganese-54	7.1×10^{-6}	30	0.8
Nickel-63	6.6×10^{-5}	279	270
Strontium-90	1.2×10^{-6}	5.1	4.6
Tritium	5.2×10^{-2}	219791	170761

Summary of NRF Drinking Water Radioactivity Results [187]

Table 4 Well Number	Gross Alpha (based on Am-241) pCi/l	Gross Beta (Based on 137-Cs pCi/l)
#1 Maximum	5.0	2.0
#2 Maximum	3.0	2.0
#3 Maximum	1.0	3.0
#4 Maximum	1.5	2.0
EPA MCL	15	8

EPA MCL for Drinking Water for Gross Alpha radioactivity is 15 pCi/L; Gross Beta MCL is 8 pCi/L

The below table 2-1 is found in a NRF CERCLA report and documents soil contamination. [188]

Maximum	Gross Alpha (based on Th-230) pCi/l	Gross Beta (Based on Sr-90 pCi/l)
Up Gradient	3.0	3.1
System	5.3	3.7
On site	3.1	3.9
Down Gradient	4.1	5.1
EPA MCL	15	8

NRF CERCLA report: "5.5.2 Risk Characterization: Table 5-2 summarizes the risks associated with Unit 8-08-79. The carcinogenic risk for the 30 year future residential scenario is with cesium-137 being the risk driver through the groundwater ingestion pathway. The carcinogenic risk factor the 100 year future residential scenario is 7E-6 with cesium-137 and nickel-63 being the risk drivers through the groundwater ingestion pathway." [189]

"The specific activities of the water released are known, the volume of water can be accurately calculated, and a conservative assumption is made that the specific activity of the water released remains the same until it reached

[187] Naval Reactors Facility, Environmental Monitoring Report, Calendar Year 1991, NRFRC-EC-1007, Table 4, Pg. 21.

[188] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Prepared for the U.S. DOE Pittsburgh Naval Reactors Office, Pg. 7.

[189] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-3.

the aquifer." [190]

Table 5-2 Summary of Risks Associated with Unit 8-08-79, Water Pit Release
Residential Groundwater Ingestion

	Concentration (pci/l)	30 Year Rad. Risk	100 Year Rad. Risk
Carbon-14	41	9E-07	9E-07
Cesium-137	42.3	1E-05	3E-06
Cobalt-60	930	7E-06	7E-10
Tritium	170761	5E-05	9E-07
Manganese-54	0.8	1E-18	3E-43
Nickel-63	270	3E-06	2E-06
Strontium-90	4.6	3E-06	5E-07
Total Risk		8E-05	8E-06

Source: Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-4

NRF CERCLA report: "The release is estimated to have occurred approximately 30 feet below ground surface. The COPCs were identified as carbon-14, cesium-137, cobalt-60, manganese-54, nickel-63, strontium-90, and tritium." [191]

Why are these earlier NRF CERCLA reports important? The basic NRF operations are expanding but there is no commitment to stop contamination to the environment or even be honest about it. By reviewing previous CERCLA reports, we get clearer picture of what the current/future will do to Idaho's environment.

FEIS fails to include Worker Exposures

NRF non-military employees are excluded from EEOICPA coverage with a faulty rationale and this egregious exclusion must be removed.

DEIS states: The Energy Employees Occupational Illness Compensation Program Act (EEOICPA) is outside the scope of this EIS. [DEIS Pg. G-117]

"The historically high allowable doses at NRF, the variety and complexity of operations at NRF, the problems of adequately monitoring internal dose and transient conditions, and the evolving science of radiation health and epidemiology of radiation workers showing elevated cancer risks at annual doses less than 2 rem per year point to the unsupportable rationale for excluding NRF workers from compensation. Although it would in many cases be decades late, and the compensation will never compensate for the early deaths of fine people, this exclusion must be removed. **By any measure of fairness and honest assessment, the exclusion of NRF workers from**

[190] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-3.
[191] Final NRF Comprehensive Feasibility Study Report Waste Area Group 8 Naval Reactors Facility, Pg. 5-4

EEOICPA act compensation must be removed." [192]

Incomplete Waste Disposition

FEIS Fails to Include NEPA Requirements of Cumulative Radioactive Waste Disposition.

"Comments on the history of disposal at the RWMC are outside the scope of this EIS." [FEIS Pg. G-99] Despite the above statutory statements the FEIS states: "Historic disposal at the RWMC including the subsurface disposal area of the RWMC were previously evaluated and addressed through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process which included opportunities for public comment.

The FEIS fails to acknowledge the NRF's waste stream to INL burial landfill that would not qualify as a municipal dump under EPA Subtitle D regulations. Since the NRF/ECF basic operations will increase but not change the process and the nature of waste generation, inclusion of waste is crucial. Thus, it is essential to review previous years to get an accurate assessment of what current and future operations will be. The DOE/NRF makes their position clear as the above statement shows – waste deposition is absolutely not part of this EIS thus violating basin NEPA rules.

EDI is obliged to offer the Summary of Naval Reactors Facility best-estimate radionuclide inventories in waste sent to the INL RWMC Subsurface Disposal Area from 1953 through 1999. When added the total curie content is 952,986.86. [193]

NRF plans to ship its highly radioactive remote handled waste to R-H LLW Facility yet FEIS claims: **"Comments on the location of the new Remote-Handled Low-Level Radioactive Waste disposal facility at the INL are outside the scope of this EIS."** [FEIS Pg. G-99]

DOE/Navy use a classical bait and switch ostensibly initially appearing to follow the legal requirements of NEPA, while later buried in the FEIS claim's the NRF has no obligation to include the full waste stream disposition and environmental contamination resulting from NRF/ECF operations. What is critical in any EIS is to review all environmental the impacts of any subject operation. That literally means the past, present and anticipated impacts as NEPA requires. By ignoring history, we are bound to repeat it.

FEIS says NNPP will not generate high-level-waste (HLW)

"High-Level Radioactive Waste: NRF **does not currently generate any high-level radioactive waste.** Transuranic Waste: NRF does **not currently generate any transuranic waste** from naval spent nuclear fuel handling operations." [Pg. S-19] [emphasis added]

Clearly NRF does not consider irradiated spent nuclear fuel (SNF) produced by NNPP as high-level waste as it is classified in statutes. In the recent past, the NRF had 5 propulsion prototype reactors several are defueled but operable. [194] Currently, the Advanced Test Reactor at INL that tests NRF fuel is a crucial part of NRF operations and itself produces SNF. This sleight of hand that the ATR is not an integral part of the NNPP/NRF is ridiculous and challenges the credibility of this FEIS. See EDI comments on Draft EIS

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192 Tami Thatcher http://environmental-defense-institute.org/publications/CommentsECF.pdf Pg. 1. Citing:

[2] Naval Nuclear Propulsion Program, Office of Naval Reactors, "Occupational Radiation Exposure from Naval Reactors' Exposure from Naval Reactors' Department of Energy Facilities," Report NT-113, Mary 2011. http://nnsa.energy.gov/sites/default/files/nnsa/02-12-multiplefiles/NT-11-3%20FINAL.pdf

[3] Kohnlein,W, PhD., and Nussbaum, R. H., Ph.D., "False Alarm or Public Health Hazard?: Chronic Low-Dose External Radiation Exposure, Medicine & Global Survival, January 1998, Vol. 5, No. 1. http://www.ippnw.org/pdf/mgs/5-1-kohnlein-nussbaum.pdf

[4] "An Epidemiology Study of Mortality and Radiation-Related Risk of Cancer Among Workers at the Idaho National Engineering and Environmental Laboratory, a U.S. Department of Energy Facility, January 2005. http://www.cdc.gov/niosh/docs/2005-131/pdfs/2005-131.pdf and http://www.cdc.gov/niosh/oerp/ineel.htm and Savannah River Site Mortality Study, 2007. http://www.cdc.gov/niosh/oerp/savannah-mortality/

193 "Supplement to Evaluation of Naval Reactors Facility Radioactive Waste Disposed of at the Radioactive Waste Management Complex from 1953 to 1999", J. Giles. et.al, April 2005, ICP/EXT-05-00833, table 5 pg. 18.

194 NRF Reactors: Large Ship Reactor A, Large Ship Reactor B, Natural Circulation Reactor, Submarine Thermal Reactor, High-Temperature Propulsion Reactor.

for listing of NRF transuranic waste and GTCC waste dumped at RWMC. [195]

"In addition to DOE owned fuel INL/INTEC CPP-666 stores spent fuel from the Naval Reactors Program." [196] "The Idaho [CPP-666] inventory includes SNF from the Naval Nuclear Propulsion Program (i.e., submarines and aircraft carriers), which is different from commercial SNF in many ways, including enrichment level and design. From about 1952 to 1992 this Navy SNF was reprocessed in Idaho to extract high-enriched uranium for use in driver fuel rods at weapons material production reactors elsewhere." [197]

Chemical reprocessing at INL/INTEC generated millions of gallons of high-level waste – 900,000 gallons of which remains in underground tanks today. Leaks from this INTEC high-level waste tank farm and aquifer waste injection wells continue to contaminate the soil and groundwater. [198]

The FEIS states: "The Naval Nuclear Propulsion Program (NNPP), also known as the Naval Reactors Program, is a joint United States (U.S.) Navy and Department of Energy (DOE) organization with responsibility for **all matters pertaining to naval nuclear propulsion from design through disposal (cradle-to-grave)."** [FEIS pg. Vol. I Abstract] [emphasis added]

The FEIS inaccurately characterizes transuranic waste

EDI comments on the DEIS (Page 18): "Navy Waste Characterization Partial listing of isotopes found in Navy waste dumped at INL" table shows clearly how Navy waste dumped in the RWMC burial grounds contains Transuranic waste. [199] One of the reasons for this is the lack of precision in cutting off the structural parts of the fuel element in preparation for reprocessing or storage. Destructive tests of fuel assemblies additionally add to the fissile content of the waste stream. In recent DOE documents characterizing the Navy waste streams going to the RWMC they acknowledge presence of, "Irradiated fuel element end boxes that were cut off of the fuel plates in the hot cells. The end boxes may contain some fuel, but **generally** only activation products". [200] [emphasis added] Independent characterization of this waste must be made before more is dumped at the RWMC.

EDI's comments (Page 19) on DEIS table "Spent Reactor Fuel Dumped at INL's RWMC Subsurface Disposal Area Burial Grounds 1952 to 1980 [RWMIS] [201] shows:

Naval Reactors Facility (NRF)	27,707,700 Mass in grams or 27,707.7 kilograms

NRF Environmental Report states: "During 1991, approximately 776 cubic meters of solid radioactive waste containing 102, 706 curies of radioactivity were shipped to RWMC disposal facilities." [202]

DOE/NRF legitimately cannot deny its own waste data by claiming it is "beyond the scope of this FEIS. A legitimate assessment of any operation (absent FEIS disclosure or current publically available data) is to look at past waste streams. The above preliminary numbers, compiled by the Environmental Defense Institute, are drawn from Freedom of Information Act from DOE's Radioactive Waste Management Information System Database (P61SH090, and P61SH070, Run Date 10/24/89) and represent about 57 shipments specifically identified as "irradiated fuel". Not included in the above listing are even more numerous shipments called "un-irradiated fuel", "fuel rods", "control rods", and other reactor fuel not identified specifically as "irradiated". The curie content of these shipments identified as "fuel rods" (>7,000 curies) suggests that they are also irradiated reactor fuel. The

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[195] http://www.environmental-defense-institute.org/publications/NNPP-Report7A.pdf Page 17 through 18

[196] Energy and Environment, Storage of DOE SNF at the Idaho National Laboratory, U.S. DOE.

[197] U.S. Spent Nuclear Fuel Storage, James Warner, Section Research Manager, Pg. 27, Citing T. Cochran, et.al., Nuclear Weapons Databook, Vol. II, May 24, 2012, Congressional Research Service, 7-5700, R42513, www.crs.gov

[198] Engineering Design File, Groundwater Pathway Risk Assessment for CPP-601, CPP-602, CPP-627, and CPP-640 Fuel Reprocessing Complex Non-Time-Critical Removal Action, Document ID: EDF-10195, Revision ID: 1, Effective Date: 02/08/12.

[199] Transuranic (TRU) waste is "radioactive waste that is not classified as high-level radioactive waste contains more than 100 nanocuries (3700 Becquerel's) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

[200] EG&G-WM-10903; A Comprehensive Inventory of Radiological and Non Radiological Contaminates in Waste Buried In the Subsurface Disposal Area of the INEL RWMC During the Years 1952-1983,June 1994, Lockheed, Pg. 2-30.

[201] Radioactive Waste Management Information Data Base Solid Master Data Base (P61SH090), List for 1954 to 1970, Run Date 3/29/89, pages 517, 518, 519 and 520 (RWMIS).

[202] Naval Reactors Facility, Environmental Monitoring Report, Calendar Year 1991, NRFRC-EC-1007, Pg. 37.

above listing also does not include 7 shipments of "irradiated fuel" during the same period to the RWMC Transuranic Storage Area amounting to 621.549 kilograms, and which also were not included in the Spent Nuclear Fuel EIS.

DOE/NAVY gets to call waste whatever they want – HLW should equal either SNF or chemically separated material from reactor fuel reprocessing. But the activated metals and the bits of SNF on the chopped off end caps of the fuel/ECF canal trash --- these are going to a "low level radiation waste facility --- specifically, RWMC and the remote handled LLW facility at INL that has no permit to accept HLW. They don't even like to admit when its greater-than-class C material, let alone that it should be considered HLW.

Proper comprehensive evaluation – required by NEPA- looks at all cumulative environmental impacts – past, present and future. DOE/NRF cannot legally exclude complete characterization of its entire waste stream.

The FEIS inaccurately characterizes greater-than-class C waste;

FEIS states: "Solid Low-Level Radioactive Waste (LLW): Operations at ECF result in generation of solid LLW primarily consisting of filters, resin, contaminated components, pieces of insulation, rags, sheet plastic, paper, and filter paper and towels resulting from radiochemistry and radiation monitoring operations. The annual average of LLW waste generated at NRF is 740 cubic meters (960 cubic yards) from routine activities and 1200 cubic meters (1600 cubic yards) from decontamination and decommissioning (D&D) activities. There are 38 shipments of LLW from NRF annually." [pg. S-20]

No complete characterization (isotope content/activity rate) of this highly radioactive remote handled waste is offered in this FEIS. Again a violation of NEPA.

EDI's comments on DEIS (Page 8) notes; "Since this NRF reactor core waste going to the RWMC burial grounds contains long-lived radioactive isotopes due to many years of exposure in the reactor core, it should be classified as high-level waste and treated according to Nuclear Regulatory Commission (NRC) disposal standards. At the very least this waste must be put in NRC Greater than Class C (GTCC) waste category. NRC disposal criteria require that "waste that will not decay to levels which present an acceptable hazard to an intruder within 100 years is designated as Class C waste." [10 CFR 61.7] Class C waste, must, for this reason, be disposed at a greater depth than other classes, or, if that is not possible, under an intruder barrier with an effective life of 500 years. "At the end of the 500 year period," according to NRC regulations, "remaining radioactivity will be at a level that does not pose an unacceptable hazard to an intruder or public health and safety." [Ibid.] The adequacy of the EPA, NRC, IDEQ regulations is discussed more fully in the waste dumping in this paper, for instance there is considerable debate over these **regulators non-enforcement that allows greater than class-C waste to be dumped in shallow land burial at INL in a flood zone.**

FEIS states: "Mixed Low-Level Radioactive Waste (MLLW) and TSCA MLLW: NRF generates a **small** amount of MLLW and TSCA MLLW, primarily from D&D activities at ECF. The annual average of MLLW and TSCA MLLW generated at NRF is 20 cubic meters (26 cubic yards). There are 12 shipments of MLLW (including TSCA MLLW) from NRF annually." [Pg.S-20]

The above DOE/NRF statement is a grossly inadequate and inaccurate waste characterization that does not meet NEPA requirements.

Incomplete Seismic Vulnerabilities

The EIS failed to adequately assess the ECF's seismic vulnerabilities.

The FEIS states: "**The ECF water pools have never undergone a complete refurbishment and have not been upgraded to current seismic standards."** [Pg. S-6]

Despite this statement, NRF intends to continued use of the ECF for decades and does not specify exactly what modifications will be made and what independent seismic assessment will be made to demonstrate compliance.

FEIS states: "Seismic Hazards Refurbishment Period: There would be **moderate** impacts from seismic hazards until refurbishment activities are complete. Activities during the refurbishment period would improve the building's ability to withstand vibratory ground motions from seismic activity. Post-Refurbishment Operational Period: There would be small impacts from seismic hazards since the refurbishment actions would improve the building's ability to withstand vibratory ground motions from seismic activity." [Pg. S-33]

FEIS states: "Seismic Hazards: Differences in impacts from seismic hazards from the alternatives are related to the ability to withstand vibratory ground motions under each alternative. Since there would be no additional refurbishment or upgrades to ECF for the No Action Alternative, the facility and supporting infrastructure **would**

continue to degrade for a period of 45 years. During the refurbishment period of the Overhaul Alternative, **to the extent practicable,** infrastructure and equipment would be refurbished or designed to the appropriate natural phenomena hazard category to withstand vibratory ground motions.

"During the **construction and transition periods** of the New Facility Alternative, **there may be upgrades or refurbishments to ECF,** to ensure operations continue in a safe and environmentally responsible manner**.** [Pg.S-72]

What do the above statements: "to the extent **practicable**" and "there **may be** upgrades or refurbishments to ECF" mean? Obviously, this is slippery non-committal language that has no business in this FEIS and must raise RED flags to EPA/IDEQ regulators.

The above FEIS statement contradicts the fact that NRF intends to continue ECF operations for over 3 additional decades. Additionally, the FEIS fails to offer requisite detail on what exactly these ECF "upgrades" will be.

"During the **refurbishment period** of the Overhaul Alternative**, to the extent practicable**, infrastructure and equipment would be refurbished or designed to the appropriate natural phenomena hazard category to withstand vibratory ground motions."

Again, what do the above statements: "to the extent **practicable**" and "there **may be** upgrades or refurbishments to ECF" mean? Obviously, this is slippery non-committal language that has no business in this FEIS and must raise RED flags to regulators. Repeating a false statement over and over does not make it true.

FEIS states: "During the construction and transition periods of the New Facility Alternative, there may be upgrades or refurbishments to ECF, to ensure operations continue in a safe and environmentally responsible manner. During the transition and new facility operational periods, the structures, systems, and components in the new facility would be designed to the **appropriate natural phenomena hazard category to withstand vibratory ground motions."** [FEIS Pg. S-72]

Only careful reading reveals that only the NEW Facility portion covered in this EIS will be built to "appropriate natural phenomena hazard category to withstand vibratory ground motions" cleverly giving the impression that the ECF is included.

Seismic Vulnerability of Storing Highly Enriched SNF in ECF

The FEIS states: "Naval nuclear fuel is highly enriched (approximately 93 weight percent to 97 weight percent) in the isotope uranium-235 (235U). As a result of the high initial uranium enrichment, very small amounts of transuranic radionuclides are generated by end of life when compared to commercial spent nuclear fuel." [Pg.1-3]

This Navy high burnup SNF ECF is the most hazardous material in the world requiring deep geological disposal for hundreds of thousands of years due to the long-lived radio-isotopes produced in nuclear reactors. The current ECF inventory of ~400 assemblies constitutes a significant unregulated hazard in the event of accidental loss of canal coolant water.

"Since the 1990's, U.S. reactor operators are permitted by the U.S. Nuclear Regulatory Commission (NRC) to effectively double the amount of time nuclear fuel can be irradiated in a reactor, by approving an increase in the percentage of uranium-235, the key fissionable material that generates energy. In doing so, NRC has bowed to the wishes of nuclear reactor operators, motivated more by economics than spent nuclear fuel storage and disposal. Known as increased "burnup" this practice is described in terms of the amount of electricity in gigawatts (GW) produced per day with a ton of uranium." [203]

"Given these uncertainties the U.S. Department of Energy (DOE) and the NRC have provided general estimates of the radionuclide content of spent nuclear fuel based on current and previous burnup assumptions. According to DOE the estimated average long-lived radioactivity for a typical PWR and BWR assembly having lower burnup at the time of geological disposal are 88,173.69 curies and 30,181.63 curies respectively. 29 For current burnups the NRC estimates that the post discharge radioactive inventory of spent fuel for a typical PWR and BWR

[203] Robert Alvarez, Memorandum: High Burnup Spent Power Reactor Fuel, : December 17, 2013, citing : Foot Note 29: U.S. Department of Energy, Final Environmental Impact Statement, for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, 2002, Appendix A, Tables A-7, A-8, A-9, A-10, (PWR/ Burn up = 41,200 MWd/MTHM, enrichment = 3.75 percent, decay time = 23 years. BWR/ Burn up = 36,600 MWd/MTHM, enrichment = 3.03 percent, decay time = 23 years.)

assemblies are 270,348.26 curies and 127,056.67 curies respectively.[204] **Approximately 40 percent of the total estimated radioactivity for lower and high burnup is Cs-137**." [205] [emphasis added]

The FEIS ECF accident source terms do not list Cs-137.[206] This represents another significant deficiency in this FEIS. The Navy uses zirconium clad fuel that adds to storage hazards.

"Zirconium cladding of spent fuel is chemically very reactive in the presence of uncontrolled decay heat. According to the National Research Council of the National Academy of Sciences the buildup of decay heat in spent fuel in the presence of air and steam: " is strongly exothermic – that is, the reaction releases large quantities of heat, which can further raise cladding temperatures… if a supply of oxygen and or steam is available to sustain the reactions.. The result could be a runaway oxidation – referred to as *a zirconium cladding fire* – that proceeds as a burn front (e.g., as seen in a forest fire or fireworks sparkler)...As fuel rod temperatures increase, the gas pressure inside the fuel rod increases and eventually can cause the cladding to balloon out and rupture.[original emphasis]" [207]

The FEIS states: "Naval spent nuclear fuel consists of solid metal and metallic components that are nonflammable, highly corrosion-resistant, and neither pyrophoric, explosive, combustible, chemically reactive, nor subject to gas generation by chemical reaction or off-gassing. Naval spent nuclear fuel is primarily from pressurized water reactors (PWRs)." [FEIS Pg. 1-3]

Seismic Vulnerabilities of ECF Degraded Concrete Basin

There are some crucial unknowns the FEIS failed to assess.

1. Is the ECF basin concrete already to degraded to allow continued operation?
2. What radiation cumulative level has the ECF basin been exposed to now and in 10 years? 10 x E 10 rad? More? Less?
3. Will the fuel in the ECF (or some fraction of fuel) melt/burn if water is removed and the fuel is uncovered?
4. Will the concrete or structural materials above the ECF actually fail if temperatures rise because of fuel heat up? Interesting that it has not been brought up as an issue before, but perhaps that is because the fuel melting temperature of fresher fuel assured fuel melt before such structural damage.

Defense Nuclear Facility Safety Board conducted a review of the newer INL/INTEC CPP-666 SNF Basin concrete foundation. This review is relevant because the Navy's ECF "refurbishment" will entail draining portions of the basin so epoxy leak-proofing can be applied potentially putting similar stresses on the ECF concrete foundation.

"The [Fuel Storage Area] FSA Pool Structures is a passive design feature of the FAST facility. **Additional calculations performed to increase the allowable floor loading to support the FSA Reracking Project indicated that the original design objective to allow an empty pool to be adjacent to a water filled pool resulted in <u>overstresses</u> during the [Design Basis Earthquake] DBE."** [208] [DFNSB Pg. A-4]

FEIS fails to fully analyze the ECF refurbishing part that includes empting sections so epoxy leak prevention remediation can proceed. Calculations of shifting ECF SNF on the degraded concrete basin foundations ability to withstand the "overstress" concurrently with a DBE are absent.

Radiation degradation of concrete ECF SNF basin

It is highly likely that the ECF concrete walls have received an aggregate gamma ray dosage far in excess of that necessary to severely degrade the concrete, thus increasing seismic vulnerabilities. Maintaining ECF water levels

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[204] Alvarez citing: U.S. Nuclear Regulatory Commission, Characteristics for the Representative Commercial Spent Fuel Assembly for Pre-closure Normal Operations, May 2007, Table 16, p.44-45. http://pbadupws.nrc.gov/docs/ML0907/ML090770390.pdf

[205] Robert Alvarez, Memorandum: High Burnup Spent Power Reactor Fuel, : December 17, 2013, Pg. 5

[206] FEIS Pg. F-35

[207] Robert Alvarez, Memorandum: High Burnup Spent Power Reactor Fuel, December 17, 2013, pg. 8.

[208] DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Assessment Report, Pg. A-4.

should a significant seismic event (earthquake) occur are problematic. The FEIS fails to fully analyze these fundamental issues in the Hypothetical Accident 4.13.2.2.

For continuously wetted concrete (no stainless steel liner) an aggregate dose of 10 x E10 rad (10 x E8 gray) is the limit. For dry concrete the limit is not known. The few pieces of data available from the X10 reactor in Oak Ridge, Tennessee and the Temelin reactor in the Czech Republic suggest that the allowable dose to avoid structural degradation and failure is 500 to 2,000 times lower than for wetted concrete (i.e., 5 x 10E6 rad).

The catastrophe hazard from an ECF basin drain down event is more than extreme. Such an event must be prevented at any cost. Once a drain down begins it cannot be stopped. Once the fuel is exposed no human or robotic response is possible - of any kind. A current example is Japan's Fukushima reactor/SNF storage disaster.

The accident will then proceed to its ultimate termination independent of human intervention. Temperatures inside the ECF structure will likely rise to levels sufficient to cause the concrete to fail and the building to crumble in on itself. The human exclusion zone for direct radiation exposure will likely be 1-2 km in all directions. No access will be possible in this zone for decades. Once fuel fails and radioactive atmospheric releases that zone will be pushed farther out (likely much farther out). Access to respond to the event may not be possible in or through that zone for centuries.

FEIS must provide independent engineering assessments of ECF basin concrete. Alternatively, using civilian fuel (since Navy fuel details are classified) as a surrogate; what is the concrete heat profile and rad profile of used civilian fuel? How far is it from the walls and floors of the basin? Then do some estimates of shielding and you have estimates of dose. Doing that correctly requires details about the fuel, and a complex set of radiation calculations that have a lot in common with optics problems. Gamma rays are light after all. The fuel is opaque to it, as are the water and concrete. Some of it is absorbed and heats the fuel, water and concrete. Several different interactions occur that shift the energy spectrum and generate secondary radiation. The most accurate way to assess all of this is to actually measure it.

What the ECF review will likely find is the surface of the concrete probably exceeded 10 x E10 rad after 10-20 years. It is likely now that the concrete 6-10 inches in has exceeded that same dose. The concrete 'paste' likely has little to no strength in 6-10 inches from the surface.

The temperature issue is different. So long as there is some cooling and the fuel is over 20 years old, there is not much heat to remove. If the basin water is lost, during an earthquake or severe leak, the rad field can be extreme. That prevents human entry. Lacking human entry the systems fail. When ventilation is lost heat then builds up having only convective and radiative cooling to keep things under control. [209] With limited ventilation, the temperatures inside the structure will rise substantially. If newer fuel is present, this could get out of hand quite quickly creating a second barrier (after the lethal rad fields) to human entry. The potential then is that following a basin drain down that uncovers the fuel that the accident progresses of its own accord to complete loss of control of the basin and failure of the fuel. It is likely that no recovery will ever be possible at that point. The accident proceeds to final completion (whatever that is) entirely outside of human ability to influence it.

The concrete dose serves to heat the concrete failing it prematurely. This is well known. And it served to hide the insidious damage to the concrete, as that is waived away as being all thermal damage, and then assessing that the concrete in the basin hasn't seen high heat, so it will not fail. For instance, the rad dose damage gets ignored. There are also an equally large but still handful of data points for dry concrete exposed to radiation. That data was thrown out in developing the standards for what radiation dose concrete can withstand. The data was discarded on the presumption that the early weakening was attributable to heat. The experience at Temelin and X-10 show that to be wrong. The concrete wasn't heated.

At a microscopic scale, absorbed radiation heats the concrete at nearly the atomic level. The heat damage is then limited to a small volume. But continue doing this over 50 years in a large SNF ECF basin and the problem becomes a stochastic one of adding up all of the random little damages into one large failure. This can lead to a large uncontrollable leak and extended loss-of-coolant.

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[209] A DNFSB review of the newer INL/INTEC CPP-666 Fuel Storage Area (FAST) water basin found "[T]he Confinement Ventilation System is degrading due to facility aging. This degradation could result in future operational downtime, radiological contamination and personnel exposure." DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Assessment Report, Executive Summary.

Yet another way to consider it is that the radiation serves to boil out the water from the cement paste that forms the backbone of concrete. When the concrete is moist there is water immediately available to cool the local heating and/or to replace the lost water. When the concrete is dry (< about 11% water) these effects are not enough and waters of hydration are lost from the paste to migrate out of the concrete. The paste then chemically changes and falls apart as damage accumulates.

One of the papers on this considered two different dose rates and times to accumulate the same aggregate dose or different doses. What they observed was very interesting. The time until the concrete was weakened remained the same despite the differing dose rates. In other words, the effect seemed to be caused by some critical radiation insult and then the passage of time. This is hugely concerning as it brings into question the entire safety basis and the possibility that the damage is essentially done in the first few days. It then just takes time for the basin concrete to fail. The FEIS acknowledges ECF basin concrete degradation.

Congress' Role

Exemptions from Environmental Laws

Consequent to over a half century of Congressional exemptions to the NNPP from nuclear operations and waste management, the largest contamination of the human environment has resulted.

The 1985 Low Level Waste amendments require DOE to take ownership of a NRC licensee of GTCC waste. But as DOE manages its own LLW it is not required to classify it according to the laws for NRC licensed facilities. DOE does not have to classify its waste as A, B, C or Greater-Than-Class C except when it wants to send this waste to a another state or NRC-licensed facility. Below are exemptions to the Low-level waste law for NRC licensees like commercial power reactors.

TITLE 42 United States Code Annotated 6.427.§ 28.021c

" Disposal of low level radioactive waste; (a) State responsibilities, (1) Each State shall be responsible for providing, either by itself or in cooperation with other States, for the disposal of (A) low-level radioactive waste generated within the State (other than by the Federal government) that consists of or contains class A, B, or C radioactive waste as defined by section 61.55 of title 10, Code of Federal Regulations, as in effect on January 26, 1983;(B)low-level radioactive waste described in subparagraph (A) that is generated by the Federal Government **except** such waste that is (i) owned or generated by the Department of Energy; (ii) owned or generated by the United States Navy as a result of the decommissioning of vessels of the United States result of the decommissioning of vessels of the United States Navy; or (iii) owned or generated as a result of any research, development, testing, or production of any atomic weapons…." [210]

Exemptions from Regulatory Oversight

In the early 1990s Clinton Administration, Congress established the Defense Facility Nuclear Safety Board (DFNSB) to conduct safety assessments of DOE operations. Congress however did not grant the Board with enforcement authority similar to NRC.

Defense Facility Nuclear Safety Board enabling legislation states in pertinent part:

"SEC. 318. DEFINITION. [42 USC 2286g] "As used in this chapter, the term 'Department of Energy defense nuclear facility' means any of the following:

"(1) A production facility or utilization facility (as defined in section 11 of this Act) that is under the control or jurisdiction of the Secretary of Energy and that is operated for national security purposes, **but the term does not include__**

"(A) any facility or activity covered by Executive Order No. 12344, dated February 1, 1982, pertaining to the Naval nuclear propulsion program;"

The bottom line is NNPP is unregulated by any federal agency – even the Nuclear Regulatory Commission charged with regulating commercial nuclear operations or Defense Nuclear Facility Safety Board charged with monitoring DOE nuclear facilities.

Attorney Mark Sullivan representing EDI petitioned the Defense Nuclear Facility Safety Board (DFNSB) to conduct a safety analysis of DOE's 60 year old Advanced Test Reactor at the INL. DFNSB chairman Winokur's reply states: "It is the Board's understanding that currently the primary defense-related mission of ATR is

[210] 42 United States Code Annotated 6.427. § 28.021c.

research and testing of components in support of naval nuclear propulsion program. **Navy nuclear propulsion activities are excluded from the Board's jurisdiction by 42 U.S.C. ss 2286g(1)(A)."** [211]

EDI's *Unacceptable Risk at INL's Advanced Test Reactor* details significant safety problems that neither DOE, the Navy or DFNSB are willing to address. As a fundimental part (as stated above) the ATR must be included in this FEIS but it is not!

NRF CERCLA Cleanup Conclusion

EDI's comments are by no means a complete analysis of this lengthy 3 Volume document because the NRF operations are classified and there are no regulatory agency reports on it.
For instance, the NNPP SNF coolant time, fuel cladding needed to properly determine ECF basin loss-of-coolant source terms are classified.

This DOE/NRF/NNPP FEIS is deficient and EPA and IDEQ are complicitious if they do not also reject its findings that contain innumerable fundamental false statements. This EIS should be detailing how NRF is going to completely replace the ECF basin as a SNF wet storage facility. Many casual EIS readers mistakenly assumed ECF replacement. Instead, DOE/Navy intends to keep this high-hazard heavily degraded ECF operating for 3-4 decades far beyond its design life that has already expired. The Navy is only willing to spend money to expand capacity for new large ship reactor SNF assemblies.

The DNFSB noted, in Recommendation 2000-2, (now 14 years back) that "[I]t was concerned with the fact that many of the DOE's nuclear facilities were constructed years ago and are approaching end-of-life. The DNFSB expressed concern that some degradation of reliability and operability of systems designed to ensure safety can reasonably be expected and recommended specific actions to assess system condition and apply system expertise in managing the configuration of vital safety systems." [212] Lacking enforcement authority, DNFSB can only advise.

EDI finds this EIS a clever effort to slip in a deliberately narrow major expansion of the Navy's SNF waste management without acknowledging 50+ years of massive radioactive contamination at INL by claiming previous NRF environmental studies. DOE/NAVY claim these CERCLA reports are beyond the scope of this EIS. The Navy's previous radioactive contamination will remain for manila putting Idahoans at risk. This is an unconscionable and avoidable assault on Idaho's most valuable Snake River Aquifer that we depend on.

Congress bears the most responsibility for NRF's unregulated willful contamination of Idaho's environment via nuclear waste mismanagement and exposure to catastrophic accidents by granting exemptions to these rogue agencies compliance with the same regulations imposed on commercial nuclear operations.

Even when federal (EPA) and state (IDEQ) regulators can enforce NEPA regulations, or mixed-hazardous RCRA regulations, Clean Water Act regulations, they remain largely silent. We the public are left with little alternative than the Courts for redress. Even this process is blocked by the courts. [213] FOIA requests when approved are largely redacted and Appeals to DOE's office of Hearings and Appeals are denied. [214]

It is unconscionable that 3-4 additional decades of continued operation of the ECF represents a significant unregulated hazard of the most deadly radioactive material in the world and that high-level waste ultimately must be interred in a deep geologic repository yet to be established by Congress.

The apparent absence of lessons learned between the Hanford Environmental Restoration (ER) process and the INL ER process is regrettable and a serious threat to Idaho. DOE is taking advantage of its position as the single largest employer in Idaho to float ER actions at INL that it was not allowed to do at Hanford because public and regulatory pressure blocked shortcuts. Specifically, at Hanford DOE was required to build the Environmental Restoration Disposal Facility (ERDF) which is a fully compliant Resource Conservation Recovery Act (RCRA)/ Nuclear Regulatory Commission (NRC) mixed hazardous/radioactive dump with double liner, leachate collection

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[211] DNFSB Chair, Peter Winokur letter to Mark Sullivan, 9/23/10. Also see EDI's Unacceptable Risk at INL's Advanced Test Reactor.

[212] DNFSB Recommendation 2000-2 INEEL Priority Facility Phase I Safety Class, Ventilation and Fire Protection Systems Assessment Report, Pg.1.

[213] KYNF and EDI filed a complaint in U.S. Federal Court asking for DOE to conduct an EIS on the Advanced Test Reactor, but the judge ruled in favor of DOE. See U.S District Court for Wyoming (06-CV-205-WFD).

[214] KYNF and EDI filed a FOIA 6/23/2010 that was denied. It was appealed 9/30/2010 (10-032) (OM-PA-10-063) resulting only a few documents released with most redacted. Second appeal 2/28/13 (TFC-009) (OM-PA-13-012) denied.

and monitoring wells and an impermeable cap. ERDF was completed in the Spring of 1996 at the farthest location on Hanford away from the Columbia River and will receive contaminated soil and decontamination/decommissioning (D&D) waste. At INL, DOE refuses to build such a repository because the Department is not being pressured by the state and EPA regulators to comply with the law. DOE's own "off-aquifer siting analysis identified two areas off the Snake River Plain Aquifer (Spent Fuel Storage at the INEL Yet off the Aquifer). [DOE/EA-1050@B-5] Another option would be for DOE to purchase additional adjacent land at the northwest of the site for an ERDF type dump off the aquifer in Clark County.

The Plan (January 1998 publication) assumes that the DOE and the Naval Reactor Facility (NRF) enjoy credibility in the public's eye. This is an invalid assumption. These agencies have broken the law and are being forced via a Federal Facility Agreement and Consent Order to correct their illegal activities. As illegal polluters, no credibility can be assumed and therefore full and complete disclosure is demanded in all Plan publications. The Plan does not provide the reader with full disclosure or provide the essential information the reader needs in order to evaluate the appropriateness of the preferred remedial alternative. For instance, maximum contaminate levels for all contaminates of concern must be stated for each Operational Unit as well as the effective standard for that contaminate so that the reader can make up their own mind whether the cleanup actions or no actions are appropriate. Stating conclusions without providing definitive data to support the finding assumes credibility that the agencies do not have.

Another major assumption that is extensively evoked in the Plan is 100 years of DOE monitoring and institutional control of the contaminated sites. In real life, when entities brake the law, and are required to do major corrective actions in the future, they are generally required to establish a trust fund so that if they again decide to disregard their legal requirements, or are no longer in existence, the funding will be there for the state or local government to do the job. The state of Idaho should therefore, require DOE to establish a monitoring/institutional control trust fund to cover those costs at INL. An example of where this issue is important is the current designation that NRF is not in the Big Lost River (one mile away) 100 year flood plain. This current designation is due to Big Lost River dams that divert flood waters south into spreading areas. These dams and their related water channels require regular maintenance in order to provide that flood protection to NRF and other INL facilities. Spring 1997 runoff nearly topped the dams. Prior to construction of the diversion dam, NRF was in the Big Lost River 100 year flood plain. [RI/FS@5] Nuclear Regulatory Commission (NRC) radioactive waste disposal requirements state, "waste disposal shall not take place in a 100 year flood plain." [10 CFR ss 61.50] Institutional control must include diversion dam and water channel maintenance as well as monitoring and fencing of waste sites. The NRF Plan proposes consolidation of contaminated soil into one of the leach pits. The cesium alone will take over 420 years to decay to acceptable risk levels, or considerably longer than the planned 100 year institutional control.

The Environmental Protection Agency (EPA) and the Idaho Division of Environmental Quality (DEQ) also incorrectly assume credibility with the public. The presence of their logos on the Plan, their review of the document, and their endorsement of the preferred alternative make these agencies complicities in the Plan's inadequacies and flaws as well as a history of INL "cleanup" Plans that were more cover-up than cleanup.

The Plan states: "The Comprehensive RI/FS Waste Area Group 8 represents the last extensive Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) investigation for the Naval Reactors Facility." This Plan is not "comprehensive" because it excludes the Retention Basin (one of the most contaminated waste sites at NRF) from the CERCLA cleanup process. The Retention Basin (OU-8-08-17) is a large concrete tank that temporarily holds liquid radioactive and chemical wastes (presumably to allow short-lived isotopes to burn off) prior to discharge to the various leach pits. The Plan fails to state that the sludge in the basin contains cesium-137 at 192,700 pico curies per gram (pCi/g)(risk-based action level is 16.7 pCi/g) and Cobalt-60 at 20,410 pCi/g. [RI/FS@H8-8] A long history of Basin leaks assures significant soil contamination under the basin and therefore must be included in the Comprehensive Plan.

The Plan's exclusion of the NRF Expanded Core Facility (ECF) leaks additionally demonstrates the incompleteness of the so called "comprehensive" Plan. The ECF, built in 1958, does not meet current spent reactor fuel storage standards that require stainless steel liner, leak containment, and leak detection systems. The ECF should be shutdown for exactly the same reasons the Idaho Chemical Processing Plant (CPP-603) Underwater Fuel Storage Facility was shutdown - it was an unacceptable hazard and did not meet current

standards. ECF has been leaking significantly >62,500 gallons of radioactive water over the past decade and the soil contamination around and underneath the basins must be included in the CERCLA cleanup process. [RI/FS@5-1] The Plan offers no soil sampling data to substantiate exclusion of the ECF from CERCLA action. A theoretical risk analysis assumed only one leak which does not reflect the actual ECF history and that is why the sampling data is essential.

The Plan's exclusion of the Sewage Lagoon (NRF-23) from its so called "comprehensive" CERCLA cleanup, again, demonstrates the incompleteness of the Plan. Contaminate levels of arsenic, mercury, and cesium-137 would normally require remedial action. In fact, the Track 1 investigations recommended inclusion of the lagoons into the comprehensive RI/FS primarily due to radionuclides and the risk assessment results showed increased cancer rate of 1 in 10,000 from exposure to the site. [Plan@25] The Plan offers no data to substantiate the "risk management decision" to exclude the lagoons. NRF intends to continue to use these unlined leach pits despite the fact that every gallon of waste water that flows into the pit, leaches more of the contaminates toward the aquifer below. NRF should be required to close the Sewage Lagoons, clean them up, and build new lined ponds that meet current regulations.

The preferred alternative 3 that DOE, the State, and EPA want the public to accept cannot be justifiably called a cleanup plan. A shell cover-up game, yes, but not a cleanup plan. Alternative 3 is a rerun of the misguided actions at the INL Test Reactor Area Warm Waste Pond. The NRF Plan calls for the consolidation of the contaminated soil from numerous sites into the bottom of one of the old leach pits (S1W Leach Pit), then cap it with rocks and gravel. It's quick, dirty and comparatively cheap; and that's why DOE likes it. With a slight of hand DOE wants to create a dump without calling it a dump because if they called it a dump then they would have to comply with hazardous and radioactive disposal regulations. If it looks like a duck, walks like a duck, and quacks like a duck then it is a duck. The very moment contaminated soil is moved from one site to another, a dump is created, and therefore the regulations apply regardless what DOE wants to call it.

The Plan offers inaccurate data to support the preferred alternative. The Plan states that the maximum soil concentration at all of the 8-08 Operable Units for cesium-137 is 7,323 pCi/g. [Plan@14] Appendix H of the RI/FS however credits the S1W Leach Pit with a maximum detected cesium-137 concentration of 149,759 pCi/g "decay corrected to obtain equivalent 1995 results." [RI/FS@H4-22] This contaminate concentration discrepancy is significant because the undisclosed higher amount qualifies under NRC radioactive waste Class B criteria in 10 CFR ss 61.55 and the "technical requirements for land disposal facilities" in ss 61.50. The preferred alternative does not meet NRC requirements. Actually, DOE's preferred alternative does not even meet municipal garbage landfill requirements under RCRA Subtitle D which require liner, leachate monitoring wells, impermeable cap, and location restrictions over sole source aquifers. The NRF Plan contains none of these essential features. This Plan effectively shifts the risks, hazards, and ultimate cleanup costs to future generations. The high levels of hazardous materials in the NRF waste qualify it as a mixed hazardous and radioactive waste under the 1992 Federal Facility Compliance and RCRA Land Disposal Restrictions. Hazardous contaminates in the soil include chromium at 2,090 mg/kg, lead at 1,140 mg/kg and mercury at 56.1 mg/kg. EPA's interim lead soil cleanup level is 400 mg/kg. The Plan offers no Toxic Concentration Leach Procedure (TCLP) data to support exclusion of this hazardous waste from regulatory disposal compliance. The transuranic contaminates (americium-241 and plutonium-238) at 20 pCi/g have half-lives of 432 and 87 years respectively guarantee the waste will be hazardous for a long time. Under the circumstances, it is difficult to see how the Plan's preferred alternative can claim to meet all the "Applicable or Relevant and Appropriate Requirements" (ARAR).

The INL Oversight Program's Kathleen Trever claims that the SIW data set containing the 149,759 pCi/g cesium-137 was not considered reliable by DOE and therefore it was not used in the Risk Assessment. When asked about this data-set discrepancy, EPA's Wayne Pierre said that DOE could not arbitrarily ignore data-set unless they had more than 10 data-sets, and then they could choose the most reliable 10 sets. Since DOE only had three data-sets, Pierre thought it unacceptable to rely completely on the 1991 and 1992 samples. It is possible that the earlier sampling grid identified hot spots that the later sampling grids could be planned to avoid.

1971 sampling data buried in the RI/FS show long-term waste mismanagement at the S1W Leach Pit with cesium-137 at 310,000 pCi/g, cesium-134 at 42,00 pCi/g, hafnium-181 at 20,000 pCi/g, and cobalt-60 at 1,300,000 pCi/g. [RI/FS@I-59] Algae (accessible to ducks using the pond) sampling show 667,447 pCi/g. [RI/FS@ pg H6-13] By comparison, the risk based soil concentration for cesium-137 applied to this Plan is 16.7 pCi/g. These

high contamination levels were due primarily to once through reactor cooling water dumped in the leach pits which was discontinued by 1980. No explanation is offered why the remediation goal applied to Waste Area Group 3 of 0.02 pCi/g for cesium-137 was changed.

Alternative 4, Complete Excavation and "Off-site Disposal" is equally unacceptable because "Off-site" is defined as hauling the contaminated soil from NRF to another INL leach pit consolidation site at the Idaho Chemical Processing Plant, Test Reactor Area, or the Radioactive Waste Management Complex, none of which would qualify even as a garbage dump. Interestingly, DOE calls these "INL soil repositories." Therefore, alternative 4 also does not meet legal requirements in the ARAR's.

The cumulative risk assumptions that determine the exposures to future 100 year residential and occupational scenarios are not conservative (most protective of human health) and not supportable. The Plan states: "The ingestion of soil, the ingestion of food crop, and direct contact with soil through the dermal pathway is not included in the cumulative assessment because these involve exposures routes that are not likely to occur at more than one release site at a time." [Plan@11] A possible future scenario of a pasture over the leach pit, a well over the Retention Basin, and dermal exposure from digging around the ECF is reasonable. Therefore, all these pathways must be considered to be cumulative. The risk assessment must also be recalculated using the above cited maximum cesium-137 contaminate level of 149,759 pCi/g which will produce radically different results from the 7,323 pCi/g used by DOE as the maximum contaminate level at NRF.

NRF and DOE representatives stated at a public meeting in Moscow that the groundwater and aquifer are not at risk because contaminates are absorbed by the soil column. Review of the historical deep well sampling data at NRF does not support the Navy's conclusion. The NRF October 1995 Remedial Investigation / Feasibility Study (RI/FS) Appendix K shows Table III Deep Well Sample Results for Wells # 1, # 2, and # 3 at 60, 69, and 44 pico curies per liter respectively for gross beta. The federal drinking water standard for gross beta is 8 pico curies per liter. This deep well sample data confirm that the contaminates do migrate, contrary to the Navy's claims.

The Plan's "remediation goals" that set risk-based soil concentrations for contaminates of concern (cleanup goals) fail to include inhalation as an exposure pathway. This exclusion represents a major flaw in the Plan. Inhalation is the most biologically hazardous for alpha emitting contaminates of concern listed as americium-241, neptunium-237, plutonium-238, plutonium-244, and uranium-235, yet inhalation is not considered for these isotopes, nor for lead. The wide difference between ingestion of beta/gamma contaminated soil also appears out of balance. For instance, cleanup goals for cesium-137 external exposure is set at 16.7 pico curies per gram (pCi/g) while ingestion of soil is set at 24,860 pCi/g. Additionally, the beta emitter strontium-90 is not considered for external or inhalation exposure but is considered for soil ingestion at 15,416 pCi/g and food crop ingestion at 45 pCi/g.

An integral factor in the Plan's establishing a "remediation goal" is the maximum concentration of contaminates of concern. The Plan acknowledges (pg 14) that the maximum cesium-137 soil contamination detected at the NRF is 7,323 pCi/g which generated a risk based cleanup goal of 16.7 pCi/g. Again, as previously discussed, this must be recalculated using the above cited maximum detected cesium-137 at 149,759 pCi/g "decay corrected to obtain equivalent 1995 results." This significant discrepancy begs the question as to the quality of regulatory review the State and EPA are bringing to the process and whether the "remediation goals" are supportable.

Section IV. L. Materials and Fuels Complex (MFC)

(formerly Argonne National Laboratory – West (ANL-W))_

The Materials and Fuels Complex (MFC) formerly called Argonne National Laboratory-West (ANL-W) below these site names are inter-changeable has a solid high-level waste site called the Radioactive Scrap and Waste Facility (RSWF) that is seldom acknowledged. It has 12-foot-deep steel walled underground repositories (27 rows on 12 ft centers and 40 rows on 6 ft. centers for a total of 1200). According to DOE, the existence of severely corroded storage wells coupled with the lack of a monitoring program for soil contamination was identified as a vulnerability. RSWF had as of 1981, 81 cubic meters containing 9,823,000 Ci of radioactive materials, including 40.73 grams of plutonium. [ID-10054-81@19] Responding to pressure, ANL-W upgraded

1,016 of the RSWF vaults in 1995 and plan on upgrading another 350 in the next three years.[RSWF] Even the new upgrades do not meet regulatory requirements for spent fuel storage because the contents cannot be inspected due to the welded cap on the top of the vault. However, the regulators granted ANL-W a variance.

MFC radioactive airborne releases for the 1952-81 period were 44,580 Ci. [ID-10054-81@19] The 1977 radioactive content of MFC's annual waste generation sent to the RSWF or RWMC is 1,300,126 curies. [ERDA-1552 @V-23] DOE claims that MFC dumped 1.1 million curies at the RWMC between 1952 and 1983. [EG&G-WM-10903] MFC's Zero Power Physics Reactor fuel is releasing fission product because the uranium has oxidized and hydrided on approximately 25% of the plates, causing stainless steel cladding to bulge. In a few isolated cases, the cladding is breached. A total of 83,276 spent fuel elements/assemblies are stored at MFC. [DOE Spent Fuel Working Group Report, p.25]

ERB-II Leach Pit Sediment Sampling Data

Detected Radiochemical	Maximum Detected Value (pCi/g)
Yttrium-90	2,247
Americium-241	0.65
Cobalt-60	196
Cesium-134	1.8
Cesium-137	29,110
Uranium-234	35.64
Uranium-235	2.18
Uranium-238	3.54
Neptunium-237	329
Strontium-90	2,247
Iodine-129	124

[ANL-5277]

The DOE/MFC Plan suffers from the same misguided approach to environmental restoration that the DOE has applied at other INL sites. The apparent absence of lessons learned between the Hanford Environmental Restoration (ER) process and the INL ER process is regrettable and a serious threat to Idaho. DOE is taking advantage of its position as the single largest employer in Idaho to float ER actions at INL that it was not allowed to do at Hanford because public and regulatory pressure blocked shortcuts. Specifically, at Hanford DOE was required to build the Environmental Restoration Disposal Facility (ERDF) which is a fully compliant Resource Conservation Recovery Act (RCRA)/ Nuclear Regulatory Commission (NRC) mixed hazardous/radioactive dump with double liner, leachate collection and monitoring wells and an impermeable cap. ERDF was completed in the Spring of 1996 at the farthest location on Hanford away from the Columbia River and will receive contaminated soil and decontamination/decommissioning (D&D) waste. At INL, DOE refuses to build such a repository because the Department is not being pressured by the state and EPA regulators to comply with the law.

This must not be called a “comprehensive” plan because it does not include ANL-W-W’s underground high-level waste site (Radioactive Scrap and Waste Facility) which as of 1981 has 81 cubic meters of waste containing 9,823,000 curies of radioactive materials including 40.73 grams of plutonium.[ID-10054-81@19] DOE must not continue to postpone treatment and disposition of this waste.

The polluters continue their criminal arrogance by thumbing their nose at the law and continuing to use leach pits that currently pose unacceptable hazards to environmental health and safety. Specifically, ANL-W intends to continue to use the contaminated Industrial Waste Pond (ANL-01) and the Sewage Lagoons (ANL-04) and the State and EPA regulators are silent. Continued waste water discharge perpetuates the leaching of contaminates into the soil column and eventually to the aquifer below. The Plan acknowledges that: “Human health risks from cesium-137 will be at acceptable levels within 130 years due to radiological decay.” [Plan@14] Yet in the next paragraph, the plan states: “Institutional controls are assumed to remain in effect for at least 100 years.” What about the remaining thirty years. Once the CERCLA process is wound up in a few years, there are uncertainties that DOE or any other federal agency is going to fulfill its questionably enforceable commitment to provide monitoring and institutional control to ensure no people gain access to the waste sites. Again, a trust fund

is warranted and a requirement under the NRC 10 CFR ss 61.63 "Financial Assurances for Institutional Controls."

MFC's Plan, like the NRF deficient Plan, is to consolidate all the contaminated soil into the Industrial Waste Pit, and again, it does not meet Applicable or Relevant and Appropriate Requirements (ARAR's). The Plan offers no maximum contaminate levels of the waste planned for the Pit. This lack of full disclosure by the polluter and the regulators is unacceptable. The drawing offered in the Plan [Plan@15] of the Industrial Pit does not vaguely resemble the near 20 foot deep localized depression that the pit is in. The Plan drawing shows a flat terrain with the leach pit being the only depression. This is a major discrepancy. Continued pooling of surrounding precipitation runoff into the pit (covered or not) will provide water to leach contaminates toward the aquifer. Moreover, the cap does not include an impermeable seal to keep precipitation out. The Waste Pit currently receives drainage from a considerable area to the southeast in addition to storm water from the MFC site. A major flaw in the Plan is not providing drainage diversion away from the pit regardless of the alternative chosen. The fact that chromium, mercury, selenium, and zinc are in the pit sediments qualifies the waste as a mixed hazardous/radioactive and it must be disposed pursuant to RCRA land disposal restrictions.

The Plan states at page 8 that: "contaminates to the ground water show only arsenic and chromium exceeded the risk based screening levels." The MFC RI/FS well (M-13) 1993 sample data shows strontium-90 at 1,330 pCi/L at 642 feet. [RI/FS,Vol.III App. H pg. 3] EPA maximum concentration level for strontium-90 in drinking water is 8 pCi/L. The Plan does not acknowledge this strontium migration or propose remedies that will correct the problem.

Alternative 5 (phytoremediation) that would use plants, over five growing seasons, to absorb the contaminates in the leach pit, is so ludicrous in an arid environment that it does not deserve rebuttal. There are issues of plant density to prevent wind erosion (contaminate dispersion). What is ANL going to do after annual harvest and between growing seasons to prevent wind erosion? Bench scale tests in ANL's greenhouse will only reflect efficiencies in an artificial climate controlled environment, not the real desert thing.

The Sanitary Waste Lift Station (ANL-31) is listed as a no action site presumably because ANL wants to continue to use the pumps. The Plan offers no data to substantiate this no action decision. The Track 2 Investigation shows maximum concentrations of sludge collected from the Lift Station as follows: cesium-137 at 9,380 pCi/g, strontium-90 at 2,470 pCi/g, uranium at 4.8 pCi/g, neptunium-237 at 13 pCi/g, and cobalt-60 at 16.3 pCi/g.[Vol. III Track 2 App.-H pg.4] This contamination suggests that this Lift Station was inappropriately excluded from the cleanup. May 1995 Track 2 reflect continued high gross alpha and gross beta in the pump water and sludge. [Vol. III Appendix - E]

The EBR-II Leach Pit (ANL-08) underwent an interim "cleanup" action in 1993 when only "the majority of the sludge was removed "and the pit was backfilled. The Plan fails to acknowledge that the remaining sludge had the following pCi/g concentrations: cesium-137 at 29,110, iodine-129 at 124, neptunium-237 at 329, strontium-90 at 2,247, yttrium-90 at 2,247. [RI/FS Vol.II pg.59-60] Inadequate interim actions end up being permanent because of the additional volume of contaminated soil used as backfill is now part of the problem.

The public has demanded for many years that DOE treat its radioactive waste into a stable vitrified form so that it can be stored onsite until a safe permanent repository can be established. At the very legal minimum, all contaminated soil should be shipped off the INL site to a licensed and permitted RCRA hazardous/radioactive disposal site. A compromise would be if there is an area on the INL site that is not over the Snake River Plain Aquifer, use it to build a licensed and permitted RCRA hazardous/radioactive disposal site for INL low-level wastes only.

The MFC Plan makes it very clear that DOE and the regulators refuse to learn from past mistakes. So far three of the six U.S. commercial radioactive waste dumps are now closed and undergoing CERCLA cleanup. The Institute for Energy and Environmental Research's book High-Level Dollars Low-Level Sense notes the following about these dumps:

"At each of the three sites (located at West Valley, New York; Maxey Flats, Kentucky; Sheffield, Illinois), water has leaked into the burial trenches and in some cases caused extensive movement of radionuclides into the surrounding environment. Rather than being maintenance-free stabilized landfills, as was intended, these sites have ended up requiring active maintenance and remedial activities within ten years of closure. The problems at Maxey Flats which was first opened in 1962, provide an instructive example. A 1974 report by the state of Kentucky found that radioactive materials, including plutonium had moved hundreds of feet from where

they had be buried. Although the operator of the site, U.S. Ecology had claimed that significant subsurface migration of plutonium was not possible, a 1975 report by the EPA found plutonium in core drilling samples, monitoring wells, and drainage streams. The EPA report noted that although Maxey Flats had been 'expected to retain the buried plutonium for its hazardous lifetime 'the plutonium had actually migrated from the site in less than ten years." [IEER(c)@69]

Even the fact that INL Subsurface Disposal Area (SDA) at the Radioactive Waste Management Complex is a CERCLA cleanup site seems to have been forgotten. Shallow burial of radioactive waste resulted in contaminate migration hundreds of feet below the SDA. See Section IV(D) Radioactive Waste Management Complex. DOE's continued use of Envirocare in Utah is unacceptable because it is being sued for permit violations by the Natural Resources Defense Council for RCRA non-compliance. According to Edwin Lyman:

> "The Idaho National Laboratory (INL) has 26 metric tons of sodium-bonded spent nuclear fuel left over from operating the Experimental Breeder Reactor II. It contains metallic sodium, which reacts violently with both air and water. DOE argues that the fuel can't be put in a geologic repository unless the sodium is removed. INL chose to remove the sodium through pyroprocessing, a technology that poses a proliferation threat because it can separate nuclear bomb ingredients out of spent fuel. Despite opposition from the Alliance, UCS, and other environmental and peace groups, INL started pyroprocessing in 2000. As a waste management effort, it has been a disaster right from the start." [215]

Section IV. M. Remote-Handled Low-Level Waste Disposal Facility (RHWDF)

The DOE's short-cut Environmental Assessment (EA) and attached Finding of No Significant Impact of the Remote-Handled Low-Level Waste Disposal Facility (RHWDF) is a violation of the National Environmental Policy Act (NEPA) that – if appropriately applied - would require a full Environmental Impact Statement (EIS) given the major potential environmental, health and safety impact of this proposal. Moreover, given DOE/INL gross mismanagement of existing nuclear waste disposal at the Idaho National Laboratory (INL) over six decades – resulting in extensive contamination of the underlying Snake River Aquifer, the public has no confidence that this new remote handled low-level landfill dump will not further impact their health and safety. [216] Thus, at the minimum, a full scale EIS must be conducted.

"DOE classifies some of the LL W generated at the INL as remote-handled LL W because its potential radiation dose is high enough to require additional protection of workers using distance and shielding. Remote-handled wastes are those with radiation levels exceeding **200 millirem** per hour at the surface of a container, and includes debris, used materials (i.e., gloves, tools, hardware, and other activated metal components), ion-exchange resins, and filters." [217]

The EA states: "The scope of the proposed action only addresses the need for **final disposal location** of remote-handled LLW waste generated by various operations at various facilities on the INL Site. The environmental impacts from operating facilities at the INL Site that will or may generate remote-handled LLW in the future are out of the scope of this EA." [218] [Emphasis added] The public is justifiably angry that DOE and the Navy is building yet another permanent nuclear waste dump over the sole-source aquifer that these agencies mismanagement – over 6 decades - have extensively contaminated.

Specific Deficiencies of this Environmental Assessment (EA)

* No detailed waste characterization (including curie content) of known waste streams slated for dump internment;

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215 Edwin Lyman, on August 11, 2017, the Los Angeles Times revealed that, without significant reform, the Department of Energy (DOE) will miss its 2035 deadline for getting all its spent fuel out of Idaho. The LA Times article is based on a report by Edwin Lyman of the Union of Concerned Scientists (UCS), a longtime Alliance ally. DOE documents he got through the Freedom of Information Act show DOE is knowingly making the situation even worse while leaving the public and the State of Idaho in the dark.

216 See EDI Snake River Plain Aquifer Report available at, www.environmental-defense-institute.org

217 EA-1793, pg. 1

218 EA-1793, pg. A-9.

1. Naval Reactor Facility (Naval Nuclear Propulsion Program) ;
2. Advanced Test Reactor;
3. Materials and Fuels Complex (MFC) (formally Argonne National Lab – West) to include the restart of the Transient Reactor Test Facility;
4. Idaho Nuclear Engineering and Technology Complex (INTEC) formerly called Idaho Chemical Processing Plant (ICCP);
5. Other specific INL operations to include RWMC non-compliant WIPP/ICDF waste;
6. Other Non-INL waste shipped to INL (past/future);

* No cumulative radioactive/curie content of annual/final estimate waste to be dumped;
* Inadequate flood plain documentation;
  The proposed candidate dump(s) are above the Snake River Plain Aquifer and right beside to the Big Lost River;
* No disclosure of Greater than Class-C Low-level waste slated for the dump. According to Nuclear Regulatory Commission regulations, GTCC waste is prohibited from shallow landfill dumps and must be interred in a deep geologic repository; [219]
* No disclosure of credible onsite interim "road-ready" storage currently operating;
* No cumulative doses from all INL operations to the aquifer – the public has a right-to-know how much this new dump will add to existing INL contamination to the aquifer and general environment;
* No discussion of "Consent Order" compliance that all high-level , transuranic and alpha-emitting waste is to be shipped out of state for permanent disposal. [220]

The Environmental Protection Agency and the Idaho Department of Environmental Quality are complacent in this six decade long mismanagement of INL waste disposal because they failed to exercise their regulatory/legal oversight. These regulatory agencies with jurisdiction must demand a full EIS of the INL new dump and make their comments available to the public. Neither the Environmental Protection Agency, Nuclear Regulatory Commission, nor the Idaho Department of Environmental Quality bothered to even comment on the Greater-than-Class-C (GTCC) Waste EIS despite DOE's disclosed intent to construct a new GTCC and Transuranic waste dump at INL. Where is the "due-diligence?"

The EA states: "No other federal or state agencies were formally consulted during preparation of this Environmental Assessment." [221] DOE's Notice of Intent states: "In addition, DOE proposes to include DOE LLW and **transuranic waste** having characteristics similar to GTCC LLW and which may not have an identified path to disposal (herein referred to as GTCC-like waste) in the scope of this EIS." [emphasis added] [222]

DOE fails to disclose if this new dump is permanent. "At the end of the operational life [50 years] of the disposal facility, an engineered cover would be placed over the disposal vaults." [223] This sounds permanent by any reading.

The EA states: "Before DOE authorizes disposal of LLW under DOE Order 435.1, it must be demonstrated that the disposal facility will do the following:

"Before sited, designed, operated, maintained, and closed such that the total all-pathways exposure to the public is less than 25 mrem/year effective dose equivalent (EDE) from the facility and to less than 30 mrem/yr EDE for all potential sources of radionuclides.

"Limit the radionuclide concentrations for near surface disposal so that the potential exposure received by an inadvertent intruder (more than 100 years post-closure) would be limited to **100 mrem/year for acute**

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[219] Title 10 Code of Federal Regulations (CFR) Subsections 72.3 and 61.55

[220] U.S. District Court for the District of Idaho, Settlement Agreement and Consent Order, Cv. No. 91-0035-S-EJL and 91-0054-S-EJL, 8/17/95; and Agreement to Implement U.S. District Court Order Dated 5/25/06, signed 7/1/08.

[221] EA-1793 pg. 6-1

[222] Federal Register / Vol. 72, No. 140, DOE Notice of Intent, 7/23/07.

[223] EA-1793, pg. 2-5

exposure and 500 mrem total EDE for chronic exposure." [Emphasis added] [224]

"Dose to representative members of the public shall not exceed **25 mrem** (0.25 mSv) in a year total EDE from all exposure pathways, excluding the dose from radon and its progeny in air. Dose to representative members of the public via the air pathway shall not exceed **10 mrem** (0.10 mSv) in a year total EDE, excluding the dose from radon and its progeny." [225]

No mention in the EA that every 500 years, non-sorbing radionucides, which dominate the dose, by the way, are estimated to increase by a factor of 3.

The EA also states: "The Idaho Ground Water Quality Rule (IDAPA 58.01.11) establishes minimum requirements for protection of groundwater quality through standards and an aquifer categorization process. Primary constituent standards are based on protection of human health, and secondary constituent standards are generally based on aesthetic qualities. The primary constituent standards for radionuclides incorporate standards set by EPA (40 CFR 141.66). These limits are typically specified as a maximum contaminant level (MCL). MCLs found in 40 CFR 141 include values for beta-gamma-emitting radionuclides and alpha-emitting radionuclides. The MCL for beta-gamma-emitting radionuclides is the concentration that, assuming an ingestion rate of about one-half gallon of water per day for 365 days per year, the dose equivalent to the whole body or critical organ does not exceed **4.0 mrem/year**. Other specific limits include a maximum gross alpha activity of 15 pCi/L (excluding radon and uranium isotopes), a maximum combined Ra-226 and Ra-228 concentration of 5 pCi/L, a maximum uranium mass concentration of 30 µg/L, and maximum H-3 and Sr-90 concentrations of 20,000 pCi/L and 8 pCi/L, respectively." [Emphasis added] [226]

DOE fails to disclose all INL contaminate contributions to the underlying Snake River Plain Aquifer. The EA only discloses some contributors and ignores Radioactive Waste Management Complex (RWMC). The EA states: "Assessing the cumulative impacts to groundwater requires consideration of other sources of contaminants that either exist in the aquifer currently or will enter the aquifer in the future. Locations of the sources include upgradient [sic] contaminants that could migrate through the aquifer volume potentially impacted by the remote-handled LLW disposal facility, nearby sources that could overlap the impacted region and those sources downgradient [sic] that might be affected by the remote-handled LLW disposal facility. The potential for cumulative impacts to groundwater were analyzed for each candidate onsite location (INL 2011a)." [227]

Based on Environmental Defense Institute's Freedom of Information requests limited information, the below document previous waste streams at INL. Clearly, DOE/INL is failing to disclose detailed characterization (including radiation/curie content) of the nuclear waste slated for the new dump.

The EA states: "DOE is planning to develop capabilities to support nuclear research, development, and testing at the INL Site and at facilities located in Idaho Falls (DOE-ID 2011). At the INL site, the restart of the Transient Reactor Test Facility is being considered for testing fuel behavior over a brief interval of time. Potential new capabilities include an analytical laboratory for post-irradiation examination and facilities for conducting laboratory-and engineering-scale testing of aqueous separations and materials disposition. These projects are in the initial planning phases and insufficient data exists to support evaluation of whether they could have a cumulative effect on a remote-handled LLW disposal facility. As these projects progress, their potential for cumulative effects will be considered as part of project planning." [EA pg. 4-15] This waste stream must be characterized – if only estimated.

For instance, this EA does not disclose Materials and Fuels Complex (MFC's) underground transuranic/GTCC waste site Radioactive Scrap and Waste Facility (RSWF) which – according to previous DOE documents has 81 cubic meters of waste containing 9,823,000 curies of radioactive materials including 40.73 grams of plutonium. [228] The RSWF consists of a large array of vertical carbon steel pipes that contain the waste. The EA states: "In addition, DOE is continuing to remove and process for disposition remote-handled waste that was placed in

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[224] EA-1793, pg. 2-1
[225] EA-1793, pg.5-1
[226] EA-1793, pg. 4-2
[227] EA-1793, pg. 4-13
[228] See DOE/INL document # ID-10054-81, page 19

storage at the Radioactive Waste and Scrap Facility at MFC between 1965 and 2007 (DOE 2009)." [229]

DOE fails to disclose the current RSWF inventory/characterization slated for the new dump. Also the MFC's pyrophoric EBR-II sodium coolant post-treatment residual waste is not disclosed.

INTEC's Integrated Waste Treatment Unit (IWTU) incinerator - currently operating to treat 900,000 gallons of high-level liquid waste remaining in the Tank Farm – post treatment waste destination is not disclosed. [230]

DOE fails to fully characterize Advanced Test Reactor (ATR) waste slated for the dump.
The EA states: "At the ATR Complex, change-out of reactor core components generates remote-handled activated-metal approximately every 8 years. These components are stored in water-filled canals to allow radioactivity to decay." [231] This designated waste includes irradiated reactor fuel and irradiated experimental fuel units and "reactor core components."

"INL also provides infrastructure and research, development, and testing for other federal tenants and sponsors. Remote-handled LLW could be generated over the next 50 years from other INL support facilities and operations as part of ongoing activities (such as spent nuclear fuel management) or from potential new missions." [232]

"The alternative of interim storage involved storage of remote-handled LLW at either the generator facilities or another acceptable, safe location until disposal capability is available. The generator facilities have very limited storage capacity available and there are no plans to expand interim storage capability. No other facilities exist or are planned onsite that could accommodate the remote-handled LLW for interim storage. Even if storage were available, implementation of an alternative for storage instead of disposal does not provide for permanent disposal of remote-handled LLW generated at the INL site beyond 2017." [233]

The EA states: "The alternative of storage for decay considered storage of remote-handled LLW for sufficient time to enable its radioactive source term to decay to levels that would make it acceptable for disposal as contact-handled LLW. Storage for over 80 years would be required to provide time for the remote-handled LLW isotopes to decay to contact-handled LLW. Storage facilities do not exist to support this alternative. Even if storage were available, disposal capability for 80 to 130 years in the future is uncertain. In addition, an alternative for storage instead of disposal does not provide for permanent disposal of remote-handled LLW generated at the INL site beyond 2017." [234]

The above EA statements are grossly miss-leading because it fails to acknowledge existing onsite temporary "road-ready" storage of highly radioactive waste. The INL INTEC has for many years managed (Independent Spent Fuel Storage Instillation) – under NRC permit – heavily shielded dry casks filled with waste as interim-storage pending final geologic disposal facility availability.

"The Naval Nuclear Propulsion Program is a joint Navy and DOE organization responsible for all matters pertaining to U.S. nuclear-powered submarines and aircraft carriers. At the INL site, NRF supports the Naval Nuclear Propulsion Program by receiving, examining, and processing spent fuel assemblies as part of preparations for final disposition. Naval spent nuclear fuel is shipped by rail in shielded shipping containers from naval shipyards to NRF, where it is removed from the shipping containers and placed in water pools for examination. The assemblies are then prepared for dry storage prior to shipment for final disposition. The process for preparing spent fuel assemblies involves removing non-fuel structural components (activated metals), which are remote-handled LLW that require disposal. Filtration of water in the NRF pools as part of ongoing maintenance also generates spent ion-exchange resins that are remote-handled LLW." [235]

Naval Reactors FY 2013 Congressional Budget allocates $35,493,000 for the Remote-Handled Waste Disposal Project. [236] Since the Navy is the primary funder of this dump, it's a credible assumption that Navy waste will

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[229] EA-1793 pg. 2-2
[230] Idaho Cleanup Project Progress Report 2009, CH2M-WG.
[231] EA-1793 pg.2-1
[232] EA-1793 pg. 2-2
[233] EA-1793 pg. 2-4
[234] DOE/EA-1793, page 2-5
[235] EA-1793 pg.2-2
[236] Naval Reactors FY 2013 Congressional Budget, Total Estimated Cost, pg. 489.

dominate the volume interned. The Navy's $70,895,000 expansion of the NRF Expanded Core Facility to accommodate significant additions to its Nuclear Navy Propulsion fleet additionally indicates corresponding increased waste flow to the new INL dump. [237]

"Outyear [sic] funding [2013] supports Naval Reactors' core mission of providing proper maintenance and safety oversight, and addressing emergent operational issues and technology obsolescence for 103 reactor plants. This includes 71 submarines, 11 aircraft carriers, and four research and development and training platforms (including the land-based prototypes)." [238] Even this near-term level (103 reactors) of decommissioning will generate significant quantities of highly radioactive remote-handled waste destined for the new INL dump. Therefore, it is crucial for the Navy to disclose full characterization of waste planned for internment in the new dump. [See pg. 17 below for past NRF waste dumped at INL]

"FY 2013, FY 2014 and FY 2015 includes an allocation to Naval Reactors from the Department of Defense's (DoD) Research, Development, Testing and Evaluation (RDT&E) account entitled "NNSA PROGRI-'M SUPPORT". The amounts included for Naval Reactors from this DoD account are FY 2013 $5.8 million; FY 2014, $2.0 million; and FY 2015, $0.9 million." [239]

Additionally, the Naval Reactor Facility (NRF) continues to use its dry cask storage for highly radioactive waste and thus is obliged to continue storing (not dump) its own waste until a permanent geologic repository is permitted. See below attached NRF pictures that document the Navy's existing extensive capacity to generate "road-ready" nuclear waste for interim storage. There is no credible/legitimate reason these and/or comparable interim storage facilities cannot be used for all INL nuclear remote-handled low-level waste.

DOE's Notice of Intent states: "The Low-level Radioactive Waste Policy Act Amendments of 1985 specifies that the GTCC low-level waste covered under section 3(b)(1)(D) is to be disposed of in a facility licensed and determined to be adequate by the [Nuclear Regulatory Commission] NRC." "NRC regulations at 10 CFR 61.55(a)(2)(iv) define GTCC LLW as that waste which would require disposal in a geologic repository as defined in 10 CFR Part 60 or 63." [240]

The DOE/INL EA apparently offers no confirmation of NRC "determination" or disclosure of "adequate" compliance of siting criteria of the new INL dump.

DOE's EA postulates that the new dump: "Be sited, designed, operated, maintained, and closed [once filled] such that the total all-pathways exposure to the public is less than 25 mrem/year effective dose equivalent (EDE) from the facility and to less than 30 mrem/yr EDE for all potential sources of radionuclides. [And] Limit the radionuclide concentrations for near surface disposal so that the potential exposure received by an inadvertent intruder (more than 100 years post-closure) would be limited to **100 mrem/year for acute exposure and 500 mrem total [effective dose equivalent] EDE for chronic exposure.**" [emphasis added] [241]

See INL flooding issues in Section IV.F for more details on the flooding problems with the Remote-Handled Radioactive Waste Facilities that are completely ignored by DOE.

See EDI's complete detailed comments at:

EDI Comments on DOE New Remote-Handled Radioactive ...
www.environmental-defense-institute.org › publications

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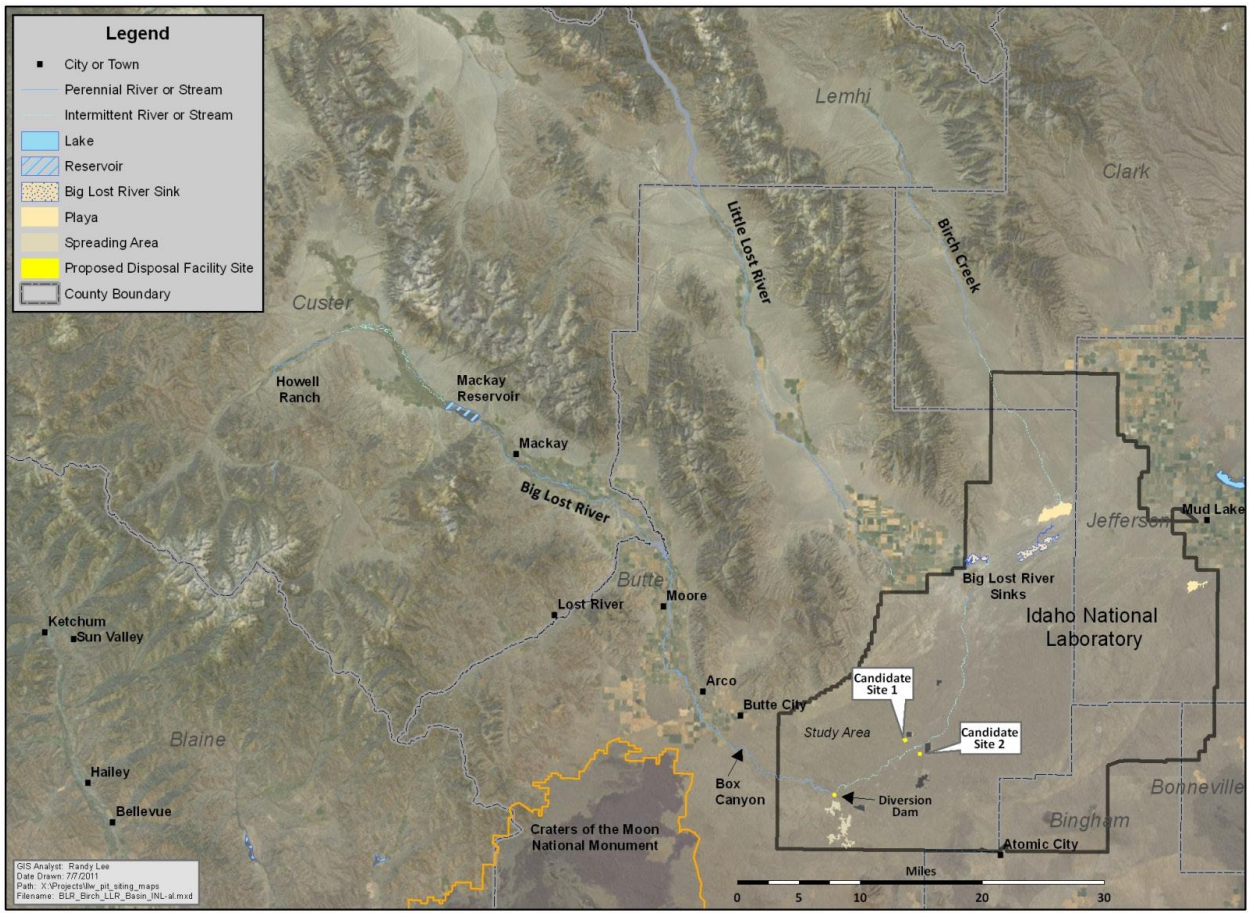
[237] Ibid.; Also see; Notice of Intent, To Prepare an Environmental Impact Statement for the Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling and Examination at the Idaho National Laboratory

[238] Naval Reactors, Overview, Appropriations Summary by Program, FY-2013 Congressional Budget, pg.480.

[239] Ibid.

[240] Federal Register / Vol. 72, No. 40135, DOE Notice of Intent, 7/23/07.

[241] DOE/EA-1793, page 2-1



Remote-Handled Waste Disposal Facility top 2 candidate sites.
Also see Attached INL/EXT-10-18191 pg.1 Figure 1

Section IV. O. Environmental Management Sight Specific Advisory Board

In May 1994, DOE/ID convened the first meeting of the Environmental Management Sight Specific Advisory Board - INL EMSSAB also called Citizens Advisory Board (CAB). Fifteen individuals were chosen to serve on the Board by a selection panel. Since the first meeting the Board has met semi-monthly. The structure that DOE headquarters chose to meet the requirements of the Federal Advisory Committee Act was a single large board composed of all members of each of the eight DOE sites that have advisory boards. The individual DOE sites would convene subcommittee meetings.

The dominate SSAB-INL composition of current or former site workers, and economic development interests is not balanced. This strategy ensured that environmental interests would be marginalized not only numerically but also through a perverse interpretation of the "consensus process". For over a year, the SSAB refused to put INL CERCLA (Superfund cleanup) issues on the agenda. This precisely mirrors INL site manager John Wilcynski's priorities presented numerous times to the SSAB. Wilcynski encouraged the SSAB to focus on the big picture and become advocates for new nuclear missions for the INL and not get "bogged down" in the multitude of Environmental Restoration (ER) projects.

Admittedly, the SSAB did eventually and grudgingly allow an ER Issue Committee to be formed - Brett Hayball, Shoshone-Bannock Tribal then representative and this Guide's author were co-chairs of this committee. However, this ER committee was shortly and summarily dissolved by the SSAB. New Waste Area Group issue committees were organized, but they are now dominated by individuals who are loath to allow substantive discussions concerning the details of specific INL remediation actions.

Environmental stakeholders are left with no other recourse than to pursue other venues within the CERCLA/Federal Facility Agreement mandates where INL environmental restoration actions can be fully discussed with the principal agencies. The departure of environmentalists from the SSAB in no way is an indication of a reduced interest in INL cleanup. Indeed, it represents a renewed commitment to the issues and a vigorous demonstration that environmental issues require full consideration by the policy makers. The SSAB effectively marginalized these environmental stakeholder interests yet claimed to accurately represent the diversity of Idahoans. Nothing could be further from the truth. The dominate SSAB opinion is to encourage DOE to build fences around contaminated sites and walk away from the problem. Continued participation on the SSAB by environmentally active individuals and organizations only lends unwarranted credibility to a failed process. [242]

It is instructive to see that the two DOE site boards experiencing environmental flight are the two remaining production sites - INL and Savannah River. Expansion of their respective nuclear production missions remains the priority today as it did sixty-years ago. Environmental restoration is perceived by the SSAB's as damaging to future INL nuclear missions because it exposes the extent of past and present environmental contamination caused by mismanagement of the most toxic substances known to humankind. This is a tragic legacy to thrust on future generations - not only the health and safety hazards, but also the $29 billion cleanup legacy mortgage costs that are now due. If at some future date current INL site director chooses to redirect the SSAB toward substantive involvement in environmental restoration projects, then EDI will be ready and willing to participate on the board.

Thatcher is a former nuclear safety analyst at INL and is now a nuclear safety consultant comments: [243]

"A presentation was given to the ICP Citizens Advisory Board by Bret Leslie about the findings and recommendations of the US Nuclear Waste Technical Review Board. The presentation can be unzipped and downloaded from the ICP CAB website for their April 19 meeting in Fort Hall.[244]

"It is important information that is more complete and candid than has been presented by the Department of Energy regarding Idaho's spent nuclear fuel challenges and may be of interest to the LINE commission.

"As you know, the Idaho Settlement Agreement stipulated the "Establishment of INEL as DOE Spent Fuel Lead Laboratory" and this entailed research, development and testing of treatment, shipment and disposal technologies of all DOE spent fuel. Basically, this was defunded around 2008 and the consequences of DOE's lapse are now more evident. In a nutshell:

"The presentation by the USNWTRB pointed out that a nuclear fuel packaging facility is needed in order to comply with the Idaho Settlement Agreement to have the fuel shipped out of Idaho by 2035. It also pointed out that estimates that it would take 15 years to package the fuel for shipping would need to start in 2 years. But the Department of Energy has not even decided whether to build a new facility or use an existing facility to repackage the fuel.

"Some highlights of the deficiencies identified include:

* The degradation of fuels stored is not being managed for degradation of the fuel and this may complicate future packaging, storage, transportation and disposal of the fuel;
* The Department of Energy has stopped developing the DOE standardized canister to store, transport, and dispose of nuclear fuel;
* More analysis on fuel drying and on hydrogen generation from corrosion products is needed
* The fate high-level waste streams of the sodium-bonded driver fuel at the Materials and Fuels Complex at the Idaho National Laboratory is uncertain and may not meet waste acceptance requirements for a disposal repository.

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[242] Chuck Broscious was a member of DOE's INL Environmental Management Sight Specific Advisory Board - INL Subcommittee and the CDC's INEL subcommittee for about six years when I resigned from both because it became clear that I was giving credence to a bogus process because CDC/DOE were putting committee members on the boards who were INL boosters and did not want to damage INL's public image.

[243] Tami Thatcher**,** For more information on sourcing for this guest column in PostRegister.com.

[244] Idaho Cleanup Project Citizens Advisory Board (formerly the Idaho National Laboratory Citizens Advisory Board) meeting schedules and presentations at https://energy.gov/em/icpcab/idaho-cleanup-project-citizens-advisory-board-icp-cab
See presentations for the April 19, 2018 meeting at Fort Hall, Idaho.

* The DOE's spent nuclear fuel will be stored decades longer than expected, and DOE SNF is typically more degraded than commercial SNF. SNF degradation may complicated storage, transportation and disposal.
* While DOE has been making important progress, for years now the DOE has focused on what it has already accomplished. The tune has been to assert that everything is on track."

"It concerns me that the most important future ISA milestones are apparently going to be missed, perhaps by decades or more. Even in the optimistic scenario that a repository for spent nuclear fuel is obtained, the waste at the INL will likely be stored in Idaho for decades, writes Tami Thatcher. [245]

"The state of Idaho has ignored the Department of Energy's lack of focus on meeting future milestones in the Idaho Settlement Agreement. Idaho now stands assured of missing every major settlement agreement milestone in the future involving removal of spent nuclear fuel (SNF) and high-level waste (HLW) from the state.

"The currently missed milestones are the slowed pace of shipments of transuranic waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico that resumed a year ago, and the failure to get the Integrated Waste Treatment Unit (IWTU) treating liquid radioactive waste it was supposed to have completed in 2012. DOE is paying fines to the state for not emptying the waste tanks and calcine treatment is delayed by continuing problems at the IWTU.

"Even with the progress of shipping of above-ground stored transuranic waste and some buried transuranic waste, the "cleanup" will still leave plenty of transuranic waste over Idaho's aquifer. The americium-241 buried at the RWMC not being exhumed would require six Snake River Plain aquifers to dilute to drinking water standards.

"Largely because of the failure to treat liquid waste with the IWTU, the shipping of non-naval spent nuclear fuel to the Idaho National Laboratory was suspended, including research quantities of commercial nuclear power reactor SNF.

"The environmental impact statements regarding DOE's SNF and HLW at INL, including the research quantities of SNF, all rely on the illusive Yucca Mountain repository for disposal. Even a Republican dominated congress is unable to revive the illusion of progress toward obtaining a license to construct the repository.

"The geology of Yucca Mountain does not prevent corrosion of the SNF or its containers and does not prevent the migration of radionuclides into nearby watersheds. Arguments that migration of the contaminants from the repository will be acceptably low hinge on the assumed protection of 11,500 5-ton titanium drip shields to be robotically installed after the waste is in place.

"In the optimistic scenario that a repository is obtained, the spent nuclear fuel and high-level waste at the INL will likely be stored in Idaho decades longer than expected and certainly beyond the milestone dates. The only thing certain is the hubris of nuclear boosters who will try to dismiss the problem of dealing with the nuclear wastes which remains unsolved despite decades of trying and billions of dollars spent.

"The settlement agreement date of January 1, 2035 to have the SNF shipped out of Idaho would require SNF repackaging to begin by 2020, but the DOE has not even decided whether to build a new facility or if it can use an existing one.

"According to a presentation at the Idaho Cleanup Project Citizens Advisory Board meeting held in April, the DOE has not completed the SNF fuel canister design, has not fully implemented fuel aging management programs for the SNF already at INL, is not addressing waste acceptance requirements affecting disposal of certain SNF/HLW and is not conducting the necessary research concerning degradation related to disposal.

"The DOE is simultaneously pretending that a repository will be operating soon and using the lack of a repository is an excuse not to make progress on the repackaging facilities that are essential for the removal of SNF and HLW from Idaho.

"And although the Settlement Agreement doesn't prevent new reactors such as the NuScale reactor from creating more SNF, this new commercial SNF would be at the back of the line should a repository open. Ask NuScale who will pay for extended storage decades after closure and the subsequent repackaging of the SNF it creates." [246]

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[245] Tami Thatcher, Guest column: Missed clean up milestones (title is the Post Register's) Posted: May 19, 2018 1:43 a.m.

[246] Tami Thatcher and Chuck Broscious Comment for Class 2 Permit Modification Request (PMR) Including a Request for a Temporary Authorization for Proposed Modifications to the Hazardous Waste Management Act (HWMA)/Resource Conservation and Recovery

Regulated Contaminants (Radionuclides Rule 66 FR 76708 December 7, 2000 Vol. 65, No. 236)

Regulated Radionuclide	MCL	MCL Goal
Beta/photon emitters*	4 mrem/yr	0
Gross alpha particle	15 pCi/L	0
Combined radium- 226/228	5 pCi/L	0
Uranium	30 µg/L	0

*A total of 168 individual beta particle and photon emitters may be used to calculate compliance with the MCL.

"Monitoring Requirements: Gross Alpha, Combined Radium-226/228, and Uranium (1)
Beta Particle and Photon Radioactivity (1);
(1) All samples must be collected at each entry point to the distribution system.
Vulnerable CWSs (2) must sample for:
• Gross beta: quarterly samples. • Tritium and Strontium-90: annual samples
(2) The rule also contains requirements for CWSs using waters contaminated by effluents from nuclear facilities.

"A system with an entry point result above the MCL must return to quarterly sampling until 4 consecutive quarterly samples are below the MCL. If gross beta particle activity minus the naturally occurring potassium-40 activity exceeds 50 pCi/L, the system must:
• Speciate as required by the State.
• Sample at the initial monitoring frequency.
4 consecutive quarterly samples. Systems with MCL violations must continue to take quarterly samples until 4 consecutive samples are at or below the MCL.

"Grandfathering of Data
When allowed by the State, data collected between June, 2000 and December 8, 2003 may be used to satisfy the initial monitoring requirements if samples have been collected from:
• Each entry point to the distribution system (EPTDS).
• The distribution system, provided the system has a single EPTDS.
• The distribution system, provided the State makes a written justification explaining why the sample is representative of all EPTDS."

[Source: Radionuclides Rule: A Quick Reference Guide, EPA 816-F-01-003, June 2001]