Environmental Defense Institute

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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**
http://deq.idaho.gov/news-archives/waste-cssf-inl-hw-partial-permit-renewal-comment-032817/

Submitted by
Chuck Broscious and David B. McCoy
on behalf of the Environmental Defense Institute
May 9, 2017 [Rev. S]

Reports used as the basis for these comments include:

1. Before the Director of the Idaho Department of Environmental Quality, in the matter of the hazardous waste treatment order granting limited and storage partial review of permit docket no 10hw-0109 permit for units at INEEL bldgs. CPP 659/1659 IDAPA 58.05.013 [40 CFR§124.19] David B. McCoy **(**Petitioner) Appellant Brief, January 11, 2002. http://environmental-defense-institute.org/publications/MackayDam2002.pdf

2. EDI 3/14/17 letter to Governor Otter, et.al. RE: Mackay Dam a Preventable Disaster, with attachments. http://environmental-defense-institute.org/publications/MackayDam2017.pdf

3. EDI Comments Subject: 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), 7/11/16, by Tami Thatcher. http://environmental-defense-institute.org/publications/EDICalcineComments.pdf

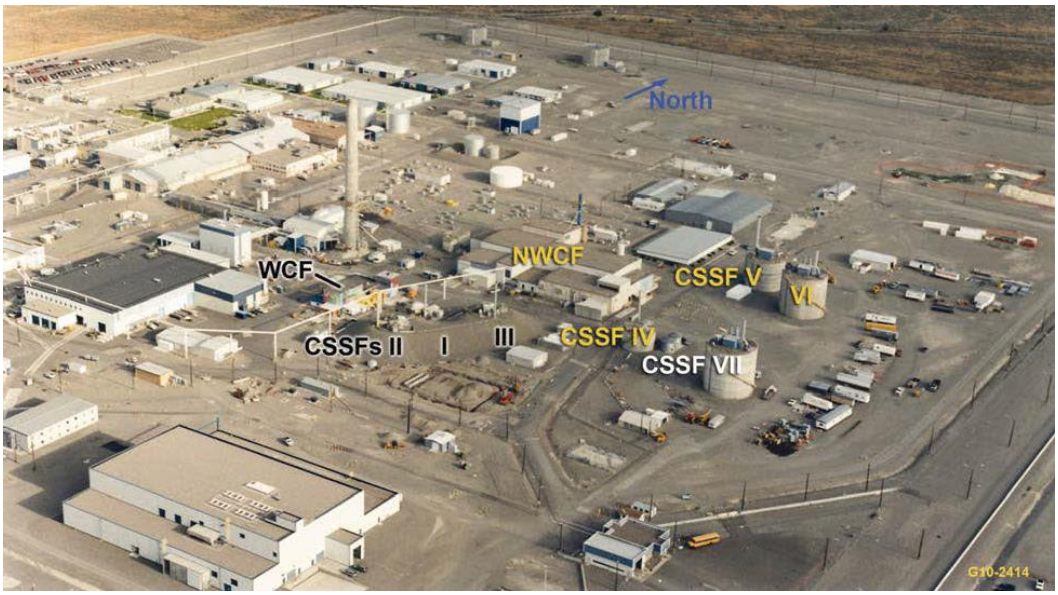

Figure 1. Aerial Photograph Showing the Waste Calcining Facility (WCF), the New Waste Calcining Facility (NWCF) now closed, and the Calcined Solids Storage Facilities (CSSFs) at the Idaho National Laboratory. DOE photo.

"*The Department of Environmental Quality (DEQ) received a renewal application for the HWMA/RCRA Storage Permit for the Calcined Solids Storage Facility (CSSF) at the Idaho Nuclear Technology & Engineering Center (INTEC) on the INL, EPA ID# ID4890008952, on May 12, 2016. This application contained updated information on storage of hazardous waste at this facility. DEQ is now proposing to approve a draft Permit in accordance with IDAPA 58.01.05.013 [40 CFR § 124.6(d)l] .*"

Summary

IDEQ fails 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 Calcine Storage 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 Fails to Demand DOE Initiate Calcine Retrieval Technology

Calcine waste is High-Level Waste by the definition given in DOE Order 435.1:

DOE O 435.1 RADIOACTIVE WASTE MANAGEMENT [1] states:

SECTION 1 – HIGH-LEVEL WASTE REQUIREMENTS DEFINITION OF HIGH-LEVEL WASTE

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.)

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

IDEQ must force DOE (via the Consent Order) to start calcine extraction - starting with the oldest Bins that AoA [2] claims may be problematic and to prevent DOE from permanently grouting in place in violation of RCRA and NWPA. The retrieval process must be done regardless of the treatment chosen. Why wait?

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***.**

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.

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

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

EPA/IDEQ must require DOE to follow through with 2002 Idaho High-level Waste & Facilities Disposition FEIS, [3] 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] [4] 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." [5] [Emphasis added]

What Happened to the State of Idaho's Preferred Direct Vitrification 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 "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 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

[3] Idaho High-level Waste & Facilities Disposition Final Environmental Impact Statement, September 2002, DOE/EIS-0287F. Hereinafter called HLW FEIS.
[4] See Background History discussion below for how DOE used the Federal Circuit Court of Appeals to delay a decision on HLW.
[5] HLWFEIS, Section B.9.3.3.1

removal of all existing processing equipment, while retaining the structure." [6]

DOE's primary focus on "separations treatment" is to maximize waste portion that they think can be buried at INL/R-HDF [7] 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. [8]

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 [9] "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. [10] 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. [11] 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. [12] Also IDEQ must force DOE (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

[6] 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.

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

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

[9] 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.

[10] 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.

[11] 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.

[12] 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.

permanently grouting in place in violation of RCRA and NWPA land disposal restrictions of HLW. [13]

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." [14]

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. [15] This chemical and radioactive contamination has migrated in the underlying Snake River Aquifer all the way to the Magic Valley along the Snake River. [16] 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. [17]

Table 4: 1995 INTEC (ICPP) Perched Water Well Sample Data [18]

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

[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)

[13] 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

[14] 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)]

[15] 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

[16] 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

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

[18] 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."

Table 5: 2002 INTEC Perched Ground Water Sample Data [19]

Contaminate	Concentration	Regulatory Std. (MCL) [20]
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
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 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." [21] [Emphasis in original]

IDEQ Fails to Demand DOE Initiate Calcine Retrieval Technology

Calcine waste is High-Level Waste by the definition given in DOE Order 435.1:

DOE O 435.1 RADIOACTIVE WASTE MANAGEMENT [22] states:

SECTION 1 – HIGH-LEVEL WASTE REQUIREMENTS DEFINITION OF HIGH-LEVEL WASTE

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.)

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

[19] DOE/EIS-0287, Idaho HLW & FD EIS, page 4-52, 4-53 and 4-57.
[20] 40 CFR 140 and 141
[21] 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
[22] **http://energy.gov/sites/prod/files/2013/06/f1/O-435-1_ssm-01.pdf** Page 3

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." [23]

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. [24] 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. [25]

"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." [26]

"*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." [27] 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

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[23] 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

[24] 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.

[25] 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/

[26] 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.

[27] AoA, pg. 22.

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." [28]

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. [29]

"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." [30]

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."*

"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."*** [31] [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 complicitus with.

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[28] AoA pg. 24

[29] *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*

[30] AoA, Pg. 27

[31] AoA, Pg. 4

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." [32]

"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." [33]

"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. [34]

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

[32] PNNL-13483, pg.1-1 &2.
[33] AoA, Pg. 5
[34] AoA, pg. 17

"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." [35]

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***

[35] 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."* [36] [Emphasis added]

Not 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."** [37] [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." [38]

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**

[36] AoA, Pg. 1
[37] AoA, Pg. 7
[38] AoA, pg.27

temperatures) of all the processing options.

"6. [Deep bore hole] DBH disposal is technically feasible, **but represents much more 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." [39]
[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.

HLW 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." [40]

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. [41]

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.

LCF = latent cancer fatality; MEI = maximally exposed individual; NIW = noninvolved worker; OSP = offsite population;

[39] AoA, pg. 22

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

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

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.

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 the 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* (DOE/EIS - 0203F, Volume 1, Appendix B). A copy of this document has already been provided to DEQ." [42] 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. [43] 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

[42] 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)]

[43] 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.

radioactive liquid over the aquifer or calcine waste over the aquifer and above ground. [44] 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.[45] 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.[46]

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** 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." [47]

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[44] 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.

[45] 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

[46] 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.

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

This 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 publically 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. [48]

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

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*.

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 1983 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." 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." [49] 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." [50] 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.

[49] INL CSSF HWMA/RCRA Permit Reapplication Attachment 1 - Section B, Facility Description Volume 22 –INTEC May 2016, pg. iii.
[50] Hydrostatic and Hydrodynamic Forces on the INTEC CSSF During a 100-yr Flood, EDF File 3996, pg. 1.

"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." [51]

"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." [52] [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 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." [53]

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

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

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

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
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) [54]

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

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

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
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). [A] 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-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).

Manual counting of above Total Table C.7-3 [55] 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 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." [56]

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. CSSF–Total, useable and filled CSSF volumes.

CSSF	Total ($ft.^3$)	Usable ($ft.^3$)	Filled ($ft.^3$)	% 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

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. [57]

[55] 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.

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

[57] 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 Winmills tentative ruling (stayed) on DOE Order 435.1 reclassification of Hanford HLW is instructive.

U.S District Court Judge Winmill tentatively 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 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. [58]

This huge volume of liquid (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

[58] HWMA/RCRA Part B Permit Reapplicatication 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

actively sought authority from EPA to administer RCRA. [59]

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.** [60] 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] (OSP), and [latent cancer fatality] 3.0 LCF." [61] 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, [62] and Nuclear Waste Policy Act of 1982 (NWPA) to name only the lead legislative Acts.

As result there have been no less than 21 [63] 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. See attached list of INL EISs. To date, there has been very limited accomplished except a lot of reports, talk, promises and court battles. Now comes DOE with yet another request to kick the can further down the perviable 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

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[59] 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.

[60] 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.

[61] 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.

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

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

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. [64] 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**. [65] This Calcine Permit extension is only the most recent example to DOE's "MO." [66]

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 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." [67]

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. [68]

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

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

[66] 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.

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

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

Again, the Navy tried again 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.

Conclusion

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 in the INTEC HLW Tank Farm. These tanks are over 54 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] [69]

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.

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

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." [70]

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

Respectfully Submitted,

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Attachments Included Below

1. Koslow (1986) Figure 6, Flood Routing Analysis for a Failure of Mackay Dam, EGG-EP-7184, DE86 013458, June 1986, pg. 22.

2. Koslow (1986) Figure 7, Flood Routing Analysis for a Failure of Mackay Dam, EGG-EP-7184, DE86 013458, June 1986, pg. 23.

3. **INL Environmental Impact Statement List**

DOE/EA-1148; Draft Environmental Assessment, Electrometallurgical Treatment Research and Demonstration Project in the Fuel Conditioning Facility at Argonne National Laboratory-West, U.S. Department of Energy, Office of Nuclear Energy, Science and Technology , January 29, 1996

DOE/EA-0831; Environmental Assessment, High-Level Waste Tank Farm Replacement Project for the Idaho Chemical Processing Plant at the INEL, June 1993, US Department of Energy Idaho Operations

EA; Environmental Assessment of the Proposed Adoption and Implementation of a US Policy on Receipt and Reprocessing of Spent Research Reactor Fuel, US Department of Energy, February 1991

Environmental Progress(a); A Report from the USDOE Office of Environmental Restoration and Waste Management, July 1991 DOE/EM-0014P; and July 1993

Environmental Progress(b); A Report from the USDOE Office of Environmental Management, Winter 1996, Vol. 5 Number 1

DOE/EM-0319: Linking Legacies, January 1997, Connecting the Cold War Nuclear Weapons Production Process to their Environmental Consequences, US Department of Energy, Office of Environmental Management

DOE/EH-0072; Environmental Survey Report, INEL, USDOE, September 1988,p.2-8

DOE/EH-0415; Plutonium Working Group Report on Environmental , Safety and Health Vulnerabilities Associated with the Department's Plutonium Storage, Volumes I & II, November 1994

DOE/EH/OEV-22-P; Environment, Safety, and Health Needs of the US Department of Energy, September 1988

DOE/EIS-0144D ; Draft Environmental Impact Statement for the Sitting, Construction Operation of New Production Reactor Capacity, April 1991, DOE/EIS-0144D

DOE/EIS-0203-D; Department of Energy Programmatic Spent Nuclear Fuel Management and INEL Environmental Restoration and Waste Management Draft Environmental Impact statement June 1994.

DOE/EH-0520; Office of Nuclear and Facility Safety, Safety Notice, Office of Operating Experience Analysis and Feedback, U.S. Department of Energy, Washington DC, April 1996

DOE/EH-0525; Highly Enriched Uranium Working Group Report on Environmental, Safety and Health Vulnerabilities Associated with the Department's Storage of Highly Enriched Uranium, Volume II: Number 5, INEL Working Group and Site Assessment Team Reports, US Department of Energy, December 1996

DOE/EIS-0203F; Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement, April 1995, Office of Environmental Management, Idaho Operations Office

DOE/EIS-0218F: Final Environmental Impact Statement, Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, Volume 1, February 1996

DOE/EIS-0310; Final Programmatic Environmental Impact Statement of Accomplishing Experimental Civilian Nuclear Energy Research & Development and Isotopic Production Mission in U.S. Including Role of Fast Flux Test Reactor.

DOE/EIS-0453F; Final Environmental Impact Statement for Recapitalization of Infrastructure Supporting Naval Spent Nuclear Fuel Handling, October 2016

DOE/1994; Plan of Action To Resolve Spent Nuclear Fuel Vulnerabilities, Phase I, February 1994, U.S. Department of Energy. Also, Plan of Action To Resolve Spent Nuclear Fuel Vulnerabilities, Phase II, April 1994, U.S. Department of Energy. Also, Plan of Action To Resolve Spent Nuclear Fuel Vulnerabilities, Phase III, October 1994, U.S. Department of Energy.

ERDA-1536; Waste Management Operations, INEL Final Environmental Impact Statement, US Energy Research & Development Administration, September 1977

ERDA-1552; Final Environmental Impact Statement, Safety Research Experiment Facilities, INEL, September 1977, US Energy Research & Development Administration

FFA/CO(a); US Environmental Protection Agency, Region 10, State of Idaho, Department of Health and Welfare, and the US Department of Energy, Federal Facility Agreement and Consent Order, Administrative Docket No. 1088-06-29-120, July 22, 1991

FFA/CO(b); Response to Comments on the INEL Federal Facility Agreement and Consent Order, by Idaho Dept. Health and Welfare US Environmental Protection Agency, US Dept. Energy, Dec.6,1991

Attachments (only available on EDI website)

http://environmental-defense-institute.org/publications/

1. Calcine Bin Set Photos: Part A Permit Application for the INTEC Volume 22 WMA/RCRA CSSF Part B Permit Reapplication May 2016.

2. INTEC/ATRC Probable Maximum Flood, Figure 19, Water depth for the 1,902 cms flow rate at the INL Diversion Dam. This flow is approximately equal to the probable maximum flood flow of Koslow and Van Haaften (1986). Figure adapted from Ostenaa and O'Connell (2005).

3. Before the Director of the Idaho Department of Environmental Quality, in the matter of the hazardous waste treatment order granting limited and storage partial review of permit docket no 10hw-0109 permit for units at INEEL bldgs. CPP 659/1659 IDAPA 58.05.013 [40 CFR§124.19] David B. McCoy,) Petitioner) Appellant Brief, January 11, 2002. http://environmental-defense-institute.org/publications/MackayDam2002.pdf

4. EDI 3/14/17 letter to Governor Otter RE: *Mackay Dam a Preventable Disaster*, with attachments. http://environmental-defense-institute.org/publications/MackayDam2017.pdf
Click for IDWR inspection photos:
Top view of the dam; Outlet of dam;
Toe of dam view of outlet pipe; Inlet tower cracks and rock cliff;
Leakage inside the pipe tunnel; Spauling inside the pipe tunnel;
Offset of spillway panels; IDWR Mackay dam inspection reports cited.

5. EDI Comments Subject: 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), 7/11/16, by Tami Thatcher.
http://environmental-defense-institute.org/publications/EDICalcineComments.pdf

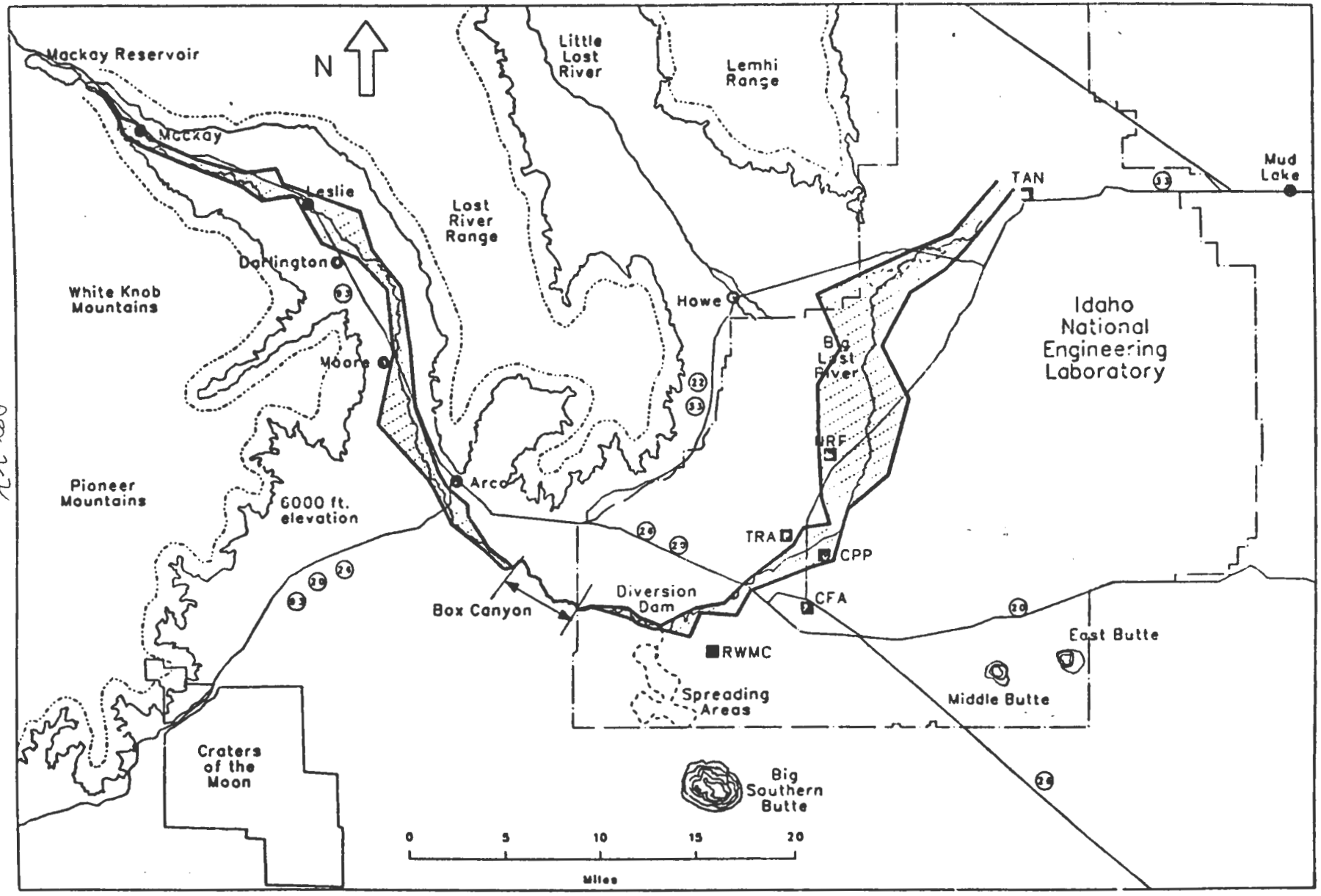

Figure 6. Inundation map for the 100-year flood piping failure.

Flood Routing Analysis for a Failure of Mackay Dam
EGG-EP-7184, DE86 013458, June 1986, pg 22

TABLE 7. RESULTS OF PMF-INDUCED OVERTOPPING FAILURE of Mackey Dam

Location (Approximate Elevation, ft msl)	Streambed Elevation (ft msl)	Peak Water Surface Elevation (ft msl)	Peak Flood Flow (cfs)	Peak Water Velocity (ft/sec)	Time of Wave Arrival (hr)
Mackay Dam (6076)	5997	6078	306,700	8.5	0.0
Arco (5310-5410)	5309	5319	147,720	5.6	6.7
INEL Diversion (5065)	5043	5073	71,850	1.0	10.0
CFA (4928-4940)	4935	4942	67,830	3.4	12.8
TRA (4920-4925)	4919	4924	67,170	2.8	13.2
CPP (4914-4930)	4911	4917	66,830	2.7	13.5
NRF (4845-4850)	4846	4851	61,620	1.9	16.4
TAN/LOFT (4780-4795)	4778	4786	34,810	1.1	34.5

Total Flow to INEL Diversion Area: 27,460 ac-ft

Total Reservoir Release: 142,330 ac-ft

Flood Routing Analysis for a Failure of Mackay Dam, K. N. Koslow, et.al.,June 1986, EG&G,Inc., EGG-EP-7184.