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JASON ASSOC. IF
HLW & FD

EIS PROJECT - ADFF
Control # DC-55

4002

Citizens Advisory Board

Idaho National Engineering and Environmental Laboratory



00-CAB-030
April 7, 2000

Thomas L. Wichmann
U.S. Department of Energy
Idaho Field Office
850 Energy Drive, MS 1108
Idaho Falls, ID 83401

Dear Mr. Wichmann:

Chair:
Charles M. Rice

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Stanley Hobson

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Note: The Site-Specific Advisory Board for the Idaho National Engineering and Environmental Laboratory (INEEL), also known as the INEEL Citizens Advisory Board (CAB), is a local advisory committee chartered under the Department of Energy's (DOE) Environmental Management SSAB Federal Advisory Committee Act Charter.

The INEEL CAB reviewed the Idaho High-Level Waste (HLW) and Facilities Disposition Draft Environmental Impact Statement (EIS). We appreciate the U.S. Department of Energy's (DOE) willingness to extend the public comment period to allow the opportunity for the CAB to review the document and develop this consensus recommendation. *55-1 IX.C(2)*

To support preparation of this recommendation, our HLW Committee spent extensive time and effort meeting with the preparers of the EIS and reviewing the Draft EIS. In addition to the Draft EIS, we reviewed other relevant documents, including: 1) the "Cost Analysis of Alternatives for the Idaho High-level Waste and Facilities Disposition Environmental Impact Statement" (DOE/ID 10702, January 2000), 2) the National Research Council's (NRC) document titled "Alternative High-Level Waste Treatments at the Idaho National Engineering and Environmental Laboratory," and 3) "Options for Determining Equivalent MTHM for DOE High-Level Waste" (INEEL/EXT-99-00317 Revision 1, April 1999). Each contributed to our understanding of the Draft EIS.

We commend DOE on its careful preparation of a thorough and well presented document. We have several comments and recommendations for consideration in preparing the Final EIS and the related Record of Decision. Those comments and recommendations are contained in the enclosed recommendation, INEEL CAB Recommendation #73, which was reached through consensus at our March 2000 meeting. *55-2 IX.A(2)*

We await your response to this recommendation and receipt of the Final Environmental Impact Statement.

Sincerely,

Stanley Hobson, Interim Chair
INEEL CAB

cc: Beverly Cook, DOE-ID
Carolyn Huntoon, DOE-HQ

Martha Crosland, DOE-HQ
Fred Butterfield, DOE-HQ
Governor Dirk Kempthorne
Larry Craig, U.S. Senate
Mike Crapo, U.S. Senate
Mike Simpson, U.S. House of Representatives
Helen Chenoweth, U.S. House of Representatives
Robert Geddes, President Pro-Tem, Idaho Senate
Laird Noh, Chair, Idaho Senate Resources and Environment Committee
Bruce Newcomb, Speaker, Idaho House of Representatives
Golden C. Linford, Chair, Idaho House Resources and Conservation Committee
Jack Barraclough, Chair, Idaho House Environmental Affairs Committee
Gerald Bowman, DOE-ID
Kathleen Trever, State of Idaho INEEL Oversight
Wayne Pierre, U.S. Environmental Protection Agency Region X
John Sackett, Argonne National Laboratory - West



Citizens Advisory Board
Idaho National Engineering and Environmental Laboratory

Idaho High-Level Waste and Facilities Disposition
Draft Environmental Impact Statement

The Idaho National Engineering and Environmental Laboratory (INEEL) Citizens Advisory Board (CAB) reviewed the Idaho High-Level Waste (HLW) and Facilities Disposition Draft Environmental Impact Statement (EIS). We appreciate the Department of Energy's willingness to extend the public comment period to allow the opportunity for the CAB to review the document and develop this consensus recommendation.

55-3
IX.C(2)

To support preparation of this recommendation, our HLW Committee spent extensive time and effort meeting with the preparers of the EIS and reviewing the Draft EIS. In addition to the Draft EIS, we received numerous presentations and reviewed other relevant documents, including: 1) the "Cost Analysis of Alternatives for the Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement" (DOE/ID 10702, January 2000), 2) the National Research Council's (NRC) document titled "Alternative High-Level Waste Treatments at the Idaho National Engineering and Environmental Laboratory," and 3) "Options for Determining Equivalent MTHM for DOE High-Level Waste" (INEEL/EXT-99-00317 Revision 1, April 1999). Each contributed to our understanding of the Draft EIS.

55-4
IX.A(2) We commend DOE on its careful preparation of a thorough document. We have several comments and recommendations for consideration in preparing the Final EIS and the related Record of Decision.

55-5
IX.A(2) The document presents some of the most technical and complicated information reviewed by the INEEL CAB since its inception. The EIS documents, although highly commendable, is nonetheless lacking. Documents written to comply with the National Environmental Policy Act (NEPA) must be understandable for the general public. DOE made a valiant effort in this EIS, but there remains room for improvement. The INEEL CAB recommends DOE intensify its efforts to make the EIS as understandable as possible.

ALTERNATIVES CONSIDERED IN THE DRAFT EIS

In order to prepare an EIS that complies with NEPA and can withstand challenges to its adequacy, DOE should evaluate all reasonable alternatives. There appear to be alternatives not evaluated in the Draft EIS that might be considered reasonable, however. The INEEL CAB recommends analysis of the following additional alternatives in the Final EIS, or a full explanation of the reasons why they were excluded from further consideration:

- 55-6
III.D.2.C(5) In recognition of the challenges associated with shipment of HLW to an offsite vitrification plant, the INEEL CAB suggests evaluation of moving an existing vitrification plant to the INEEL.
- 55-7
III.D.4(5) Because of the challenges associated with retrieving the HLW calcine from the bins, the INEEL CAB suggests evaluation of an alternative that would entomb the calcine in situ. We recognize the

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requirements in the Idaho Settlement Agreement to make all HLW road ready to leave the state by 2035 and we understand entombment would in all likelihood make eventual shipment out of Idaho technically impossible.

55-8
III.D.4(2) Likewise, the INEEL CAB suggests evaluation of an alternative involving solidification and subsequent entombment of the sodium bearing waste in the tanks. We recognize the requirements in the Idaho Settlement Agreement to make all HLW road ready to leave the state by 2035 and we understand entombment would in all likelihood make eventual shipment out of Idaho technically impossible.

55-9
VII.D(3) While we recognize there may be alternatives the decision-maker will not consider politically feasible, we encourage DOE to use this document to support consideration of all alternatives that are reasonable from a technical standpoint.

55-10
VII.D(3) We understand one of the primary reasons for developing this EIS at this point in time was to provide better information on which to base renegotiations of the Idaho Settlement Agreement. On that basis, alternatives not in compliance with the Idaho Settlement Agreement should still be considered, if found to be reasonable.

55-11
II.E(2) In addition, we note specific details that should be included in the description of any alternative involving treatment of INEEL's calcine at a proposed vitrification plant to be located at Hanford. The Hanford Advisory Board made three recommendations of relevance to this alternative on prior occasions. All appear reasonable to the INEEL CAB. These include:

- 55-44
II.E(4) 1. Offsite waste shipped to any treatment facility at Hanford should not be shipped until the waste can be treated to avoid the necessity for storage capacity at Hanford.
- 2. Similarly, offsite waste shipped to any treatment facility at Hanford should be returned (to the site it was shipped from) to avoid the necessity for storage capacity at Hanford.
- 3. All costs associated with shipment of INEEL's waste to and from and treatment at Hanford should be borne by the INEEL so as not to impose additional costs on the Hanford cleanup program.

We note that the Hanford Advisory Board does not expect to consider a consensus recommendation on this EIS at this time and has taken no position on the acceptability of the alternative involving Hanford facilities. We nonetheless believe accommodation of the principles behind their prior recommendations could be accommodated in the implementation of the Hanford alternative, should it be selected by DOE. The INEEL CAB recommends DOE incorporate these principles into the "Hanford Alternative" as described and evaluated in this EIS.

THE INEEL BUDGET AND THE COSTS OF THE ALTERNATIVES

We note only one of the alternatives evaluated in the EIS would entail expenditures within the historical budget for the INEEL's HLW program. According to the cost assessment for the various alternatives, all of the other alternatives would run between \$20 and \$25 million dollars more per year than the budget for the INEEL HLW program in recent years. We further note that only one of the alternatives would comply fully with the Idaho Settlement Agreement; all others would fail to meet at least one of the provisions in the Agreement. Notably, the one alternative that is manageable within historic program

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funding falls the shortest of meeting the terms in the Idaho Settlement Agreement. And the one that would allow compliance would be one of the more costly alternatives to implement.

55-12 X (i) [We assume implementation of any of the more costly alternatives would require DOE to do one of two things: provide a significantly higher level of funding to the INEEL or make significant cuts elsewhere in the INEEL budget. It was our understanding the budget authorization for the INEEL in recent years has been barely enough to stay in compliance with all legally binding environmental regulations. In recent years, the proportion of DOE's total budget that has been allocated to the INEEL has remained constant, and we conclude that the political pressures surrounding DOE's budgeting process prevent large transfers of funds among DOE sites. These observations lead to three conclusions:

- First, additional funding for the INEEL is highly improbable.
- Second, funding the INEEL HLW program to support compliance with the Settlement Agreement will pose a risk to the site's ability to remain in compliance with other environmental regulations.
- Third, selection and implementation of any of the higher cost alternatives could force DOE-ID to fall out of compliance with other environmental regulations.]

55-13 X (2) [The INEEL CAB understands DOE does not address costs in documents written to comply with NEPA. We believe, however, that avoiding any discussion of costs in the Draft EIS leaves readers with the impression that additional funding can be found; it also makes all of the alternatives appear to be equally implementable from a cost perspective.]

55-14 X (i) [The INEEL CAB would like to know what environmental impacts would result from noncompliance resulting from insufficient funding under each alternative evaluated in the EIS. We note DOE prefers to evaluate only those impacts which would necessarily and directly result from implementation of each alternative in NEPA documents. We recognize any environmental impacts associated with noncompliance under any other program (i.e., other than the HLW program) would not be caused directly by the HLW program. As such, we acknowledge our concern may be considered "off scope." We nonetheless believe that environmental impacts resulting from diverted funding caused by implementation of an alternative must be evaluated to support a fully informed decision making process.

The INEEL CAB therefore recommends DOE develop a mechanism to inform the decision-maker and the public regarding the compliance issues arising under each alternative if implemented under a flat budget to support comparison with impacts under a fully funded budget. We cannot believe the decision-maker will ignore this information during the decision process, regardless of the requirements under NEPA. The public similarly requires such information to support informed review of this EIS. Precluding provision of this information to the public jeopardizes the adequacy of public participation conducted to support this EIS. At least three approaches would achieve our objective.

First, DOE could elect to include add a discussion of the budget requirements of each alternative in its description of the how each alternative would be implemented. Having presented this information, DOE could then include discussion of the impacts of implementation of each alternative under two possible budget scenarios (a flat budget scenario and a fully funded scenario) in the discussion of impacts. If implementation of any alternative would result in non-compliance with any legally binding environmental regulation, then the discussion of impacts associated with implementation of that alternative would presumably include environmental impacts resulting from noncompliance. If the environmental impacts of both budget scenarios were presented for each alternative evaluated, it would

allow the public and the decision-maker to evaluate all of the environmental impacts of all of the alternatives under two budgetary possibilities.

If DOE concludes the first approach is not appropriate under NEPA, we suggest a second alternative. DOE could evaluate the impacts of noncompliance in its discussion of cumulative impacts. As we understand it, the cumulative impacts section is supposed to address the impacts which would occur under each alternative within the context of other likely changes affecting the existing conditions as described. This strategy appears less appropriate, although it would better meet our expectations. It would result in providing a clearer picture of what the site would look like after implementation of decisions than is presently the case, however.

If DOE concludes our first two suggestions are inappropriate for a document written to evaluate only the HLW program at INEEL, we offer a third suggestion. We understand DOE-ID will reevaluate the final site-wide EIS for the INEEL (which supported a 1995 Record of Decision) later this year in accordance with department policy to review site wide EISs every five years. That reevaluation could be conducted in a manner that would allow comparisons of the risks posed by all radioactive and hazardous materials in the INEEL and prioritization of potential and ongoing projects in accordance with those risks. If choices are to be made about which legally binding requirements the INEEL will comply with (and which the site will not comply with), the INEEL CAB believes such a determination should be made in an open and publicly defensible manner.]

55-15 VII.A (6) [Obtaining additional funding authorization of this magnitude (\$20-25 million) would likely require intense public scrutiny and congressional review. DOE would require a thorough understanding of pending environmental impacts to defend such a greatly increased budget request. DOE can prepare the decision-maker and the public for participation in these possible debates by providing more complete information. Neither the public nor Congress can be expected to support or defend DOE's budget requests without an adequate understanding of the impacts associated with continuing funding at historical levels. The INEEL CAB recommends DOE make every effort to ensure the decision-maker and the public fully understand the tradeoffs between costs and environmental impacts that permeate the decisions the Draft EIS was written to support.]

A PATH FORWARD FOR INEEL'S HLW

Based on the analysis presented in the Draft EIS, the INEEL CAB makes the following recommendations for a path forward for managing the HLW at the INEEL in a responsible manner:

55-16 111.C (4) 1. [The INEEL CAB recommends DOE-ID cease operations at the New Waste Calcining Facility. DOE-ID has had difficulty restarting the facility and getting it to operate reliably. In light of the uncertainties of operations at the higher temperatures needed to adequately treat sodium bearing waste, we question whether the facility would support DOE's objectives.] [The costs associated with attempting to upgrade the facility to meet the MACT rules simply do not appear justified.] In addition, [it appears obtaining a permit for the facility would be extremely difficult.] 55-18 111.C (4)

55-19 V (5) 2. [The INEEL CAB recommends DOE-ID undertake efforts to adequately characterize the calcine in the bin sets and the sodium bearing waste in the tanks as soon as possible

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to support decision making related to subsequent treatment of the calcine and the sodium bearing waste.

- 55-20 3. [The INEEL CAB recommends DOE-ID pursue expedient development of a reliable method or methods for retrieving calcine. We believe the sooner this effort begins the better chance DOE will have of optimizing the success of the effort.]
III.D.1(4)
- 55-21 4. [The INEEL CAB recommends DOE-ID pursue a rigorous evaluation of alternative methods for solidifying the sodium bearing waste, including those evaluated by the National Research Council, and select the most appropriate treatment method in an expedient manner. This liquid poses risks to human health and the environment in the present form and therefore should be stabilized as soon as possible.]
III.A.(1)
- 55-22 5. [The INEEL CAB recommends that following solidification, the sodium bearing waste should be stored at the INEEL in casks. It should not be mixed with any HLW in order to ensure the maximum number of options for its ultimate disposal.]
III.A.(1)
- 55-23 6. [The INEEL CAB recommends DOE-ID pursue no additional treatment of the sodium bearing waste other than solidification until the ultimate disposal location has been identified.]
III.A.(1)
- 55-24 7. [The INEEL CAB recommends DOE-ID close all of the tanks in the tank farm as they are emptied, focusing first on the pillar and panel tanks.] DOE should use demonstrated technologies for removal of the heels and then fill the tanks and containment structures with grout.
VII.D.(4)
- 55-25 IV.C.(1)
- 55-26 8. [The INEEL CAB looks forward to continued involvement in decision making as DOE develops plans for tank closure and calcine disposition.]
VII.A.(6)
- 55-27 9. [The INEEL CAB recommends DOE-ID continue to conduct research and development efforts on alternatives that might be used to prepare the calcine for disposal, including direct cementation and, possibly, entombment of the bin sets.] We have concluded none of the technologies currently being evaluated is sufficiently mature to support selection at this time and the waste acceptance criteria that will apply at the proposed geologic repository are not yet finalized. [The calcine does not appear to pose any risks at this time. Expenditure of funds on its treatment at this time is not justified.] 55-30 III.B.(2)
- 55-31 10. [The INEEL CAB recommends DOE pursue with vigor the resolution of the issues that could preclude receipt of INEEL's HLW at the proposed geologic repository. DOE should adopt a method for calculating equivalent metric tons of heavy metal in the HLW based on the relative hazard compared with commercial spent nuclear fuel, such as levels of radioactivity or radiotoxicity to allow greater quantities of HLW to be disposed in the repository.] DOE, perhaps with the help of Congress, must devise a strategy that will allow acceptance of hazardous materials in the repository for final disposal. [Waste acceptance criteria must be developed to allow disposal of all of the INEEL HLW in the repository without jeopardy to human health and safety or the environment.] Finally, [schedules must be

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55-34 adjusted to ensure that all INEEL HLW can be treated and prepared for shipment in time to
III.F.2(4) beat the likely closure date for the proposed geologic repository.]

PHASED DECISION MAKING AND PUBLIC INVOLVEMENT

55-35 [It does not appear DOE will be able to make all of the decisions this EIS was written to support in the near future. Too little is known at this time to make that possible or prudent. For example, this EIS evaluates the possibility of treating INEEL's calcine at a proposed vitrification plant at Hanford, which has not even been given final approval, much less constructed and brought on line. It seems premature to consider this possibility even if the Hanford vitrification plant were operational until the best way to retrieve the calcine from the bins has been determined. It simply is not prudent to consider some number of specific decisions at this time. The INEEL CAB recommends DOE develop phased decisions regarding the INEEL's HLW. We further recommend that later decisions occur only after relevant information becomes available, following implementation of the earlier decisions.] The INEEL CAB has attempted to suggest an approach to appropriate phasing for decisions in earlier sections of this recommendation.
VI.(1)

55-36 [Public interest in and concerns regarding the various decisions supported by this EIS will remain. Because NEPA requires public participation in federal decisions that may have significant environmental impacts, the INEEL CAB recommends DOE conduct public involvement activities to support each phase of its decision making. Public outreach activities will be a critical component, as the public will require access to emerging information to support a meaningful role in later phases in the decision making.]
VII.A.(6)

We understand the Hanford Advisory Board has determined it will not consider the possibility of treating INEEL's calcine at the proposed vitrification plant at Hanford until such time as that proposed facility becomes a reality. [The INEEL CAB recommends including stakeholders from all potentially affected sites in public participation efforts during all later phases of decision making.] The INEEL CAB stands ready to assist in these efforts in any way deemed appropriate.
55-37 VII.A.(6)

SELECTION OF A PREFERRED ALTERNATIVE

55-38 We recognize that all of the alternatives presented in the Draft EIS, including those that do not meet the Idaho Settlement Agreement milestones, must be included in the EIS. [We commend DOE in that most of the alternatives (with the exception of the No Action alternative and the Continued Current Operations alternative) will meet the target date for treatment of the calcine and making it road ready to leave in support of being able to ship out of Idaho by 2035.] [The INEEL CAB strongly recommends DOE select a preferred alternative in the final EIS that will meet the basic intent of the Idaho Settlement Agreement to 1) remove and process all of the sodium bearing waste from the tanks as soon as practicable and 2) treat the sodium bearing waste and the calcine so that it will be ready for shipment out of Idaho by 2035.]
VII.D.(6)

55-39 [In particular, the INEEL CAB does not concur with the NRC's recommendation that "The need for immediate action and a rush to select a long term treatment option [for calcine] appear unwarranted . . ." While the NRC committee was aware of the Idaho Settlement Agreement, its recommendation appears to ignore the milestone that requires completion of calcine treatment to make it "road-ready" for shipment offsite by 2035.] [The INEEL CAB is concerned that any delays or funding cuts that would impede the

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development of calcine treatment would result in a de-facto decision to leave the calcine in place. Even if there is time before a calcine treatment process decision can be made, funding is necessary immediately to provide the technical information necessary to support that decision. **Therefore, the INEEL CAB recommends that the preferred alternative in the final EIS and ROD must support continuation of activities to identify the path forward for treating the calcine on a schedule to meet the Idaho Settlement Agreement milestone, including critical waste characterization and processing research activities. Based on DOE funding cycles and the duration of time required to fully develop an appropriate technology, the INEEL CAB recommends DOE provide sufficient funding to ensure timely progress with respect to treatment of INEEL's calcine.**

USE OF BEST ENGINEERING ESTIMATES, ALONG WITH WORST-CASE "BOUNDING" SCENARIOS, IN NEPA DOCUMENTATION

55-42
VIII.A(2)

The Draft EIS considers the impacts of worst-case scenarios to estimate "bounding" cases. These bounding cases are based on worst-case probabilities for doses to the public along with maximum possible waste quantities. While this approach may be effective to support scientific and legal review, it can have a serious negative impact on public perception. For example, the reported worst case emissions for the proposed Advanced Mixed Waste Treatment Project (AMWTP) are much higher than the actual emissions are expected to be with a result of causing excessive fear among individuals who consider themselves to be "downwinders." We note that the conservative approach is standard for environmental documentation prepared to satisfy NEPA, and agree that it is necessary to support an adequate and conservative evaluation of the impacts of a proposed new action. The INEEL CAB recommends DOE consider the possibility of modifying the existing approach to include an evaluation of impacts under a "best engineering judgment" case, in addition to that based on a bounding case. This approach would allow the public to better understand the risks and consequences of each alternative. For the purposes of this EIS, which has proceeded to date based on worst-case scenarios, the INEEL CAB recommends that such the final EIS include best engineering estimates of impacts as well, if possible.

CALCINE AND SODIUM-BEARING WASTE QUANTITIES AND COMPOSITION

55-43
V(5)

Because the EIS evaluates the impacts of a range of alternatives for treating INEEL's HLW, the composition of the waste is an integral part of the EIS. We note that Chapter 5.2.13 describes the wastes generated under each alternative using general waste categories such as industrial, hazardous, low-level waste, mixed low-level waste, and HLW. We are unable to find a description of the waste composition and quantities of calcine and sodium-bearing waste requiring treatment, however, although we assume that information provides the basis for estimation of impacts.

The INEEL CAB recently reviewed the Draft EIS for the proposed geologic repository, and commended DOE for providing a detailed description of the compositions and quantities of all HLW and spent nuclear fuel. In fact, the information presented in that EIS appeared to be much more detailed than in previous DOE publications. The INEEL CAB recommends that the INEEL HLW EIS include known information on existing calcine and sodium-bearing liquid waste compositions and quantities in a technical appendix in the Final EIS even though additional characterizations are needed. We would expect to be able to compare that information with what was reported in the proposed geologic repository EIS. It will be difficult to conclude that the numbers are the same in the absence of evidence to that effect.



HLW & FD EIS PROJECT - (AR)/PF
Control # DC-56
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101



April 3, 2000

Reply To
Attn Of: ECO-088

Ref: 00-007-DOE

T.L. Wichmann
U.S. Department of Energy
Idaho Operations Office
850 Energy Drive, MS 1108
Idaho Falls, ID 83401-1563
Attn: Idaho HLW & FD EIS

Dear Mr. Wichmann:

We have reviewed the draft Environmental Impact Statement (EIS) for the proposed Idaho High-Level Waste and Facilities Disposition in accordance with our responsibilities under the National Environmental Policy Act and §309 of the Clean Air Act. The draft EIS analyzes the potential environmental consequences of managing two waste types at the Idaho National Engineering and Environmental Laboratory (INEEL), namely, High-Level Waste (HLW) in a calcine form and liquid mixed transuranic waste. The draft EIS also analyzes the disposition of existing and proposed HLW facilities after their missions have been completed. The draft EIS does not identify a preferred alternative.

Include circled text as prefix to each of the first 3 comments

56-1
IV.D(1)
56-21
V(5)
56-22
III.F.4(2)

Based on our review, we have rated the supplemental draft EIS, EC-2 (Environmental Concerns - Insufficient Information). Our concerns stem from the uncertainties (due to a lack of analysis and documentation in the EIS) that (1) grout containing the Low-Level Waste (LLW) would prevent contamination of the aquifer for 500 years, (2) that waste stream products could be reclassified as LLW, thus allowing DOE to pursue separations alternatives, and (3) that facilities exist for handling and storing LLW. We also identify important components missing from the cost report. This rating and a summary of our comments will be published in the Federal Register.

Modeling Transport of Contaminants to the Aquifer from Grouted Low-Level Waste (LLW)

56-2
VIII.C(4)

The analysis of transport of contaminants leached from Low-Level Waste (LLW) Class A and Class C grout placed in the tanks and calcined bins assumes that the grout has a 500 year lifetime over which leaching of contaminants does not occur. However, there is no evidence that the grout will in fact achieve the 500 year design lifetime. If the grout fails before 500 years, I-129 leaching from the grout could arrive at the aquifer at a time coinciding with the peak concentrations of I-129 from the abandoned INTEC injection well. This situation could result in an exceedance of the I-129 MCL in the aquifer and potential risks to human health. The EIS should provide modeling results predicting the impact to water quality in the aquifer if the grout and containing structures fail in shorter periods of time, such as 100, 200, 300, and 400 years.