Citizens Advisory Board
Idaho National Engineering and Environmental Laboratory

Draft Engineering Evaluation and Cost Analysis for the CPP-603A Basin

The Idaho National Engineering and Environmental Laboratory (INEEL) Citizens Advisory Board (CAB) reviewed the Draft Engineering Evaluation and Cost Analysis (EE/CA) for the CPP-603A Basin. The status of the facility and the need for remedial action are well described and documented in the EE/CA.

Background:

Following review of the Draft EE/CA, the INEEL CAB's Cleanup and Closure of the Idaho Nuclear Technology and Engineering Center Committee submitted a list of questions for DOE review and response. The written responses to these questions (included as Attachment A) were provided in a timely and understandable fashion and provided the basis for a subsequent discussion between DOE and the committee on a conference call.

DOE then submitted to the Committee a clarification related to the definition of debris used in the Draft EE/CA. That document is included as Attachment B.

The two attachments are included because the only documentation available to the public at this time is the Draft EE/CA. Because we were asked to submit comments on that document, we want to help ensure that all parties see the information that was provided to us.

Recommendations:

After reviewing the additional documentation, the INEEL CAB seeks clarification regarding the differences between Alternatives 3, 4, and 5. Alternative 5 would include cleaning the walls, which we do not believe to be necessary. According to DOE's clarification (Attachment B), both Alternatives 3 and 4 would both include removal of the sludge, Small High-Activity Debris Object (SHADO)-1, and all Uranium^{235} contamination. It appears that neither would entail removal of the debris items contaminated with Cobalt^{60}.

The INEEL CAB understands that the closure of the CPP-603A basin is an Interim Removal Action. We believe that the selected Interim Removal Action should be consistent with possible Final Removal Actions. We understand that removal of the items contaminated with Cobalt^{60} would be difficult and expensive and would pose risk to the workers involved. However, we are concerned that grouting the debris items that are contaminated with Cobalt^{60} in place could preclude selection of a final removal action at some future date that would result in complete removal of the basin and its grout. Final end state decisions have not been made for the CPP-603A Basin. No decision should be made now that would eliminate consideration of a full range

of options during the more appropriate decision-making process that will determine the final end state.

Because we do not clearly understand what would occur under the various alternatives, we cannot select one alternative for recommendation.

The INEEL CAB recommends that DOE select the alternative that would result in removal from the basin of:

- **All sludge**
- **The SHADO-1**
- **All Uranium^{235} contamination**
- **All water.**

In addition, the INEEL CAB recommends that the alternative selected for this Interim Removal Action not prejudice the choice of end state. In the case of the residual cobalt, this requirement could be satisfied by (a) removal of all cobalt^{60}-contaminated objects, or (b) sequestration and localization of such objects so that they may be safely relocated and removed if the chosen end state so requires.

Finally, the INEEL CAB recommends that DOE conduct soil sampling around the failed drain line as soon as the removal action has been completed, rather than waiting until 2035.

INEEL CAB Questions Regarding the Engineering Evaluation/Cost Analysis for the CPP-603A Basin

1. The risk assessment [page 18] assumes that the grout will completely contain radioactive objects for 500 years. Is this a valid assumption? What data is being used to back this up?

    - The 500-yr integrity of the grout is consistent with the modeling assumptions used in the High Level Waste and Facility Disposition EIS. The risk assessment, using analytical data presented in the referenced Engineering Design Files (EDFs), for the CPP-603A basins provides a benchmark for the purposes of comparison. The risk assessment demonstrates that leaving ALL of the source term in the grouted basins would not result in an unacceptable risk. The proposed action removes the contamination in the sludge and water from the basin eliminating most of the contamination and entombs the remaining debris objects in grout 21-ft below the top of the grouted basins.

2. Table 1 [pages 10-11] provides an inventory of radioactive nuclides in the sludge and water at the present time and after 500 years of radioactive decay. What is the radioactive inventory 30 years in the future when the entire CPP-603A/B complex is planned to be demolished?

    - As discussed under No. 1 above, the majority of the radioactivity inventory will be removed from the basin when the sludge is removed, treated, and disposed to the ICDF landfill and the water is pumped to the ICDF evaporation ponds. The debris, contaminated primarily with Cobalt-60, with a 5.27-yr half-life, will have decayed to near background levels. The isotopes contributing to the contamination that has penetrated into the porous cement walls, floor, and scum line will be shielded by the grout used to displace the basin water.

3. Alternative 3 leaves in place 13 discrete objects [page 13] contaminated by Cobalt-60. What will be the level of radioactivity of these objects 30 years in the future when the entire CPP-603 A/B complex is planned to be demolished?

    - Please see the response to No. 9.

4. The cost analysis in Table 14 [page 48] presents a question. Option 3 is the least complex, Option 4 is more complex, and Option 5 is the most complex; this is reflected by the increasing costs for the Options. Why is the project management cost for Option 4 ($717K) is higher than for either of the other Options ($487K)?

    - The project management time period calculated for Option 4 is approximately 6-months long than Option 3 because of the additional time required to remove and manage the debris.

5. Alternatives 3 and 4 assume that contaminated water, sludge and debris will meet the acceptance criteria of the ICDF. Is this a good assumption? What data is available to back up this assumption? If the ICDF will not accept some or all of the waste products, what other alternatives are there?

- The basin water currently meets the ICDF waste acceptance criteria (WAC). If the character of the water changes as a result of removal activities in the basins, filtration and treatment capabilities will be provided in the transfer stream from CPP-603 to ICDF. The sludge dewatering, treatment, and packaging will be specifically designed and built to insure the ICDF WAC is met. The debris will not be deposed to the ICDF.

6. The EE/CA states [page 54] that the grouted basins are above the 100-year floodplain. However they are only 12 inches above the floodplain. What would happen if the grouted basins were exposed to a flood in the next 500 years?

    - Until spent fuel storage activities end in CPP-603 Complex, the grouted basins will remain within the CPP-603 building. At the end of the operational life of the building, a decision on the final end state of the CPP-603 Complex will be made. A flood prior to implementation of the final end state would only impact the basins for a short period of time and would not be expected to compromise the integrity of the grout.

7. What process was used to characterize the contents of the basin and how sure is DOE that the characterization is complete and accurate? Has the debris been fully characterized according to generally accepted scientific standards?

    - The process implemented to characterize the contents of the basins and the results are described in detail in Engineering Design Files (EDF) – 3535, EDF-3684, EDF-4235, and EDF-4271 available in the Administrative Record. All EDFs receive a thorough peer review for accuracy. These EDFs describe a process that included radiological scanning of the basin floor and sampling and analysis of the material found on the bottom of the basins.

8. What criteria and process will be used to determine whether debris should be left in place or removed?

    - The criteria used will be evaluation of the worker exposure to remove the debris and the environmental benefit derived from the exposure, in addition to an analysis of the cost to remove debris. The environmental benefit of removing the sludge is relatively small compared to the worker exposure and cost because of the short half-life (5.27-yr) of the primary contaminant, Co^{60}.

9. For the debris remaining in place, is there good evidence that the radioactivity remaining will decay essentially to background (in my trade, that's ten half-lives) before the grout begins to disintegrate ?

    - The primary radioactive constituents in the debris are described in EDF-4271 as cesium-137 (Cs^{137}) and cobalt-60 (Co^{60}). The Cs^{137} (approximately 16.29 Ci) is associated with SHADO 1 and will be removed and disposed off-site. The remaining contaminant is Co^{60} (approximately 1,282.98 Ci) and is found in the remaining discrete objects and debris that will be left in the basins. The Co^{60} has a radioactive half-life of 5.27 years and will decay to near background levels after ten half-lives. The final end state for the CPP-603 Complex will be determined at the end of fuel operations in the ISFS. The end state

identified may reflect removal of all remaining contamination from the CPP-603 Complex.

10. What proportion of the ICDF would the sludge from the CPP 603 basin fill? (What proportion of the radioactivity allowed would be filled by the contents as it includes Uranium 235?)

    - The estimated 0.03 Ci of U^{235} to be removed from the basins would consume an estimated 0.04% of the ICDF Landfill Waste Acceptance Criteria mass of 83 Ci U^{235}. The estimated 90 750-gal high integrity containers (HICs) (335 yd^3 total) generated by sludge treatment for disposal would consume approximately 0.07% of the total of 510,000 yd^3 ICDF capacity.

11. Has sand been considered instead of grout? If not, why not?

    - Sand has been considered and was not evaluated further because of its porosity. The function of the grout is to replace the volume of the water as it is pumped to ICDF. Sand would entrap water in the interstitial spaces between particles. Additionally, the extensive surface area of each of the sand particles would become contaminated by exposure to the water and add to the radiation fields being controlled.

12. What is planned for the water that will come out of the basin? Will it be filtered before being disposed in the ICDF?

    - Please see the response to No. 5.

13. Where did the Uranium 235 come from?

    - It is the result of nearly 50 years of underwater spent nuclear fuel storage, corrosion, and fuel cutting activities. The U^{235} in the CPP-603 Basins is not classified as High Level Waste and as a result, is not Waste Incidental to Reprocessing (WIR).

14. How will the decision to leave or remove debris fit with the overall strategy for putting the rest of the complex into an acceptable end state?

    - As described above, the debris will decay to a level that will not prohibit implementation of whatever end state is ultimately selected for the CPP-603 Complex.

Clarification of the term "Debris" as used in the CPP-603A Basin Engineering Evaluation and Cost Analysis

(This text was submitted to the CAB to provide additional information regarding the use of the term "debris" in the Draft EE/CA.)

The Citizens Advisory Board Committee asked for clarification of the term "debris," as used in the Engineering Evaluation and Cost Analysis (EE/CA) for the proposed CPP-603A Basin Non-time Critical Removal Action. The EE/CA uses the term "debris" to refer to both radioactive and non-radioactive particulate material in the basins. The terms "debris" and "debris object" are used in the document to refer to 14 discrete, highly radioactive objects sitting on the basin floor as well as a variety of non-radioactive hand tools, material inadvertently dropped in the basins over the years, and general rubbish that has fallen into the basins. This terminology has resulted in confusion regarding the amount of uranium-235 that will remain in the basins if each of the analyzed alternatives is selected. Much of the detailed information about the CPP-603 basins is currently found in Engineering Design Files that are referenced in the EE/CA and available in the Administrative Record. The following is a summary of information in those files.

If Alternative 1 – *No Action* is selected, approximately 13.983 kg of uranium-235 will remain in the basins. This is a conservative value calculated by adding the 3.8 kg of uranium-235 estimated to be in the larger particulate component in the sludge) , the 10.18 kg of uranium-235 estimated to be in the finer particulate in the basin sludge, and the 3 g of uranium-235 estimated to be in the small high-activity debris object (SHADO) called SHADO 1. The other objects called debris in the document are non-detect for uranium or non-radioactive rubbish.

If Alternative 2 – *Removal and Disposal of Water with Sludge and Debris Grouted in Place* is selected, approximately 13.98 kg of uranium-235 will remain. The sludge and debris would remain in the basin but the SHADO 1 debris object would be removed. This lowers the estimated remaining uranium-235 by 3 g.

If Alternative 3 – *Removal and Disposal of Water and Sludge with Grouting of Debris in Place* is selected, the uranium-235 identified in the three EDFs will be removed from the CPP-603A basins (The SHADO 1 debris object and the uranium-235 containing sludge and debris). The 13 discrete debris objects other than SHADO 1 will stay in the basin. The miscellaneous non-radioactive rubbish will remain in the basins. As stated above, these debris objects do not have detectable amounts of uranium-235. These objects are the non-radioactive material inadvertently dropped in the basins over the years and the stainless steel that was activated by being exposed to high levels of radiation in reactors. As a set, these objects contain approximately 1,283 Curies of cobalt-60. Cobalt-60 has a half-life of 5.27 years. CPP-603B spent nuclear fuel management operations are expected to continue until 2035. By that time, the radioactive cobalt will decay to near background levels. The short title given to this alternative is probably the cause of the terminology confusion.

If Alternative 4 – *Removal and Disposal of Water, Sludge and Debris with Basins Grouted in Place* is selected, no detectable uranium-235 should remain in the basin. As with Alternative 3, all uranium-235 containing sludge, debris and debris objects will be removed.

If Alternative 5 – *Water, Sludge, and Debris Removal and Disposal with Basin Interior Cleaning, Followed by Fixative and Shielding Installation* is selected, no uranium-235 should remain in the basin. The cleaning may remove some fraction of the contamination assumed to be embedded in the walls and floor but the ratio of near-surface contamination to deeply embedded contamination cannot be estimated with our current knowledge.

If Alternative 6 – *Water, Sludge, Debris, and Basin Floor and Wall Removal and Disposal* is selected no uranium-235 will remain.

As stated in the EE/CA, Alternatives 1, 2 and 6 will not be selected. Alternative 1 will not remove the risk of water release to the aquifer. Alternative 2 does not comply with state statutes. Alternative 6 is not possible, at this time. Complete removal of the basins cannot be accomplished until CPP-603B spent nuclear fuel management work is completed.

Alternatives 3, 4 and 5 do not differ with respect to final uranium-235 inventory. The sludge removal equipment will be designed to remove all sludge and uranium-235 containing debris in a manner that will protect workers from radiological exposure.