

**FINAL MEETING SUMMARY**

**HANFORD ADVISORY BOARD  
TANK WASTE COMMITTEE  
January 15, 2004  
Richland, Washington**

**Topics in this Meeting Summary**

Welcome and Introductions ..... 1  
Transuranic (TRU) Waste Supplement Analysis..... 1  
Iron (FeP) Phosphate Glass..... 3  
Update on Technical Development Work at the Waste Treatment Plant (WTP) ..... 5  
Tank Waste Environmental Impact Statement Update (EIS) ..... 6  
Tank C-106 Closure Demonstration ..... 6  
M-45 Update ..... 8  
Supplemental Technologies Update ..... 9  
Handouts ..... 10  
Attendees..... 11

*This is only a summary of issues and actions in this meeting. It may not represent the fullness of ideas discussed or opinions given, and should not be used as a substitute for actual public involvement or public comment on any particular topic unless specifically identified as such.*

**Welcome and Introductions**

Committee chair Doug Huston opened the meeting and reviewed the agenda.

Howard Gnann, Department of Energy-Office of River Protection (DOE-ORP), introduced himself. Howard is the new Deputy Designated Federal Official to the Hanford Advisory Board (Board). He provided summary DOE-ORP baseline information for the tank farms to the committee and offered to have a discussion on this material at a later time. The baseline is currently being prepared for Department of Energy – Headquarters (DOE-HQ) review.

Doug thanked CH2MHill Hanford Group (CHG) for providing lunch for the committee.

The October meeting summary was adopted.

**Transuranic (TRU) Waste Supplement Analysis**

Rob Yasek, DOE-ORP, provided a status report of the project. DOE-ORP is continuing to work with DOE-HQ and the Carlsbad field office on a variety of issues. Rob clarified that they are talking about a “supplement” analysis first; that is, do they need to prepare a supplement to the Environmental Impact Statement to cover the new plans for this waste? A Supplemental Analysis (SA) is a document that comes after that first analysis; Rob

anticipates moving forward with an SA in the near future. TRU waste processing capabilities are now being developed and the project team is working with the Washington State Department of Ecology (Ecology) to obtain a Part B permit. Every effort is being made to get the paperwork in order as quickly as possible so the work can move forward.

Rob announced that the Hanford team has been invited to participate in a technical exchange in New Mexico in March on the subject of TRU acceptance criteria. Two knowledge packages are currently under review in that state and he is confident that the logjam with New Mexico will be broken.

### **Regulator Perspectives**

Suzanne Dahl, Ecology, stated that Ecology is waiting to see how the high-level/TRU issue is resolved. For some tanks the path is clearer than for others. Ecology wants to ensure there is a clear pathway out of the state for the waste. The role that other entities play in the proper disposal of the waste is recognized and the state would like to offer its help in this. The permit is conditional upon this issue coming to a clear resolution.

### **Committee Discussion**

- Public comment will be taken on the analysis after the material is reviewed by DOE-HQ. Roy Schepens, DOE-ORP Manager, has been to DOE-HQ three times in three months to work on this. He added that all parties agree the first eight tanks contain TRU waste. It is now imperative to work out the acceptance issues with New Mexico.
- Wade Riggsbee asked how the TRU will be treated and if a mobile unit will be used for treatment. Rob replied that a dewatering process and a mobile unit will be used. John Swailes, DOE-ORP, added there are systems being designed for this process. Wade clarified he is concerned over the size of the package. John explained that the equipment comes in three semi trailers and is then put together on site. He added that there will be extensive training of the workforce. Howard noted it will be a \$15 million investment in equipment but this is a large savings over the cost of sending the material to the Waste Treatment Plant (WTP).
- Leon Swenson asked for clarification that eight tanks have been classified as containing TRU. Roy confirmed this and added it is possible three others will be classified as such. Leon asked if additional process records have been found for those tanks. Roy stated these are a step closer to high-level waste so additional scrutiny is needed
- Sandra Lilligren asked how many tanks are being considered for TRU classification. John stated every tank will be investigated; this is upwards of 21 tanks and some of these will require extensive work. Currently the focus is on the contact-handled (CH) waste because the Waste Isolation Pilot Plant (WIPP) cannot accept remote-handled (RH) waste.

- Richard Smith asked when the first box will be produced and if there is a place to store it. Rob stated the first box is scheduled for October. The box will be stored as part of the Part B permit at the Central Waste Complex (CWC). John Kristofzski, CHG, added that the CH waste is scheduled for shipment to WIPP in June 2005. It is a matter of sending all the necessary paperwork to WIPP and retrieving the material.
- A committee member asked how the mobile units will be funded given that the DOE-ORP budget is decreasing. Howard clarified that the DOE-ORP budget does not begin to decrease until after the vitrification plant starts operating.
- Bob Parks asked if the proposed Initiative 247 will affect these plans. John explained that the initiative affects new trenches and will not affect this project.
- Paige Knight asked if the project needs a health permit. Rob stated they will have to get an air permit from the Washington State Department of Health (WDOH). Everything is being done to ensure the process runs smoothly.
- Al Boldt asked if the Nuclear Regulatory Commission (NRC) is invited to the March meeting in New Mexico. John did not know but hopes they will be involved. Al added that there should be an opportunity for public input on the analysis.

### **Iron (FeP) Phosphate Glass**

At the request of Al Boldt, Bill Hamel, DOE-ORP, prepared a review of the Iron Phosphate Preliminary Assessment for the committee. DOE-ORP has committed to completing this assessment and to determining what the challenges of using this type of glass in the WTP would be. Pacific Northwest National Laboratory (PNNL) is helping DOE-ORP with this assessment. The review paper is currently being prepared.

Initial observations regarding the performance of this product are based on lab-scale melts. These melts have indicated that the durability of FeP glass is similar to that of Borosilicate (BSi) glasses. The crystallinity of FeP is higher than BSi, which is indicative of a different physical separation; however, the waste loading benefit is ~10-15% higher than BSi.

The interest in FeP glass stems from the use of Aluminum Phosphate (Na-Al-P) glasses in a Russian waste management program. These glasses are different from FeP glasses. The behavior of the Russian glass is more similar to that of the BSi glass. Because only limited testing has been completed on FeP glass, refractory corrosion issues are not completely understood. Current tests show that the electrode corrosion on metal electrodes is higher with FeP glass than with BSi glasses. This would require a design change for the WTP melters. FeP is about 6 to 10 times less viscous than BSi and therefore higher melt rates may be expected.

Rob discussed details of several issues and uncertainties with FeP glasses.

- Low-Activity Waste (LAW) testing of FeP glass has been limited to lab-scale crucible tests.

- FeP glass is more corrosive and less viscous compared to BSi glasses
- There is waste loading improvement only for Sulfur (SO<sub>3</sub>) concentrations greater than ~1.2wt%
- Technology will not allow completion of the entire LAW Mission in the WTP by 2028

Rob acknowledged that several conclusions can be drawn from this assessment; however, DOE-ORP will focus on improving the capability of the current baseline LAW vitrification facility. Supplemental treatment is the preferred approach for adding LAW treatment capability and DOE-ORP will not support the investigation of alternative LAW waste forms for WTP in the near term.

### *Committee Discussion*

- Al provided another view of the benefits of FeP glass. He commented that the difference between the Russian glass and the glass being discussed today is when the process was brought to this country the name was changed. However, the formulations are very similar. He presented a table that compares the traits and capabilities of BSi and FeP.
- A committee member noted that the performance of BSi glass is unknown due to the sodium issue. Bill replied that data from melt runs show preliminary positive results and these results can be improved and he believed this data is light years ahead of where the data is for FeP glass.
- Several committee members asked if more information will be coming on FeP glass. Bill replied these were only the preliminary results of an upcoming technical evaluation, which will be available in February. Al will review it and report to the committee. Howard offered to let Al look at a draft of the report prior to its finalization.
- Paige noted that BSi glass has its own issues. Bill explained that every glass has a sulfate limit. The test melts do not demonstrate how well the glass will go through the melter. Paige stated that FeP glass is worth additional funding as one of the supplemental technologies.
- Pam noted that it could cost \$100 million to flesh out this technology. She asserted that, for the same amount, a third LAW melter could be purchased and installed in the WTP. Pam expressed belief that, at this point, the money is better spent on something other than another new technology.
- A committee member asked why the crystal structure of the glass is important. Bill explained that the structure is indicative of how the glass may perform in a performance assessment. The more crystals a glass has, the less certain the performance. In pure glass there is not crystal structure, which is why it is the best

waste form. The key points to look at are how do the crystals perform and what the interface is.

- Paige asked how Bill could be a fair reviewer of the process, since he seems to have a bias toward BSi glass. Bill stated that based on his experience with BSi glass, he does have a bias; however, he tries to review everything with an open mind. BSi glass provides a great benchmark that can be pushed up.
- John Swailes commented that when he first talked with Al last year he was very excited about the possibilities of FeP glass. However, over the last seven months he has slowly become more neutral towards it because of the large level of investment needed. This investment tends to offset the potential benefits of FeP, since similar benefits can be achieved for less cost. On a purely technical basis, there is a lot of promise; however, this promise is not fully documented in a way that would support an investment in an industrial facility.

### **Update on Technical Development Work at the Waste Treatment Plant (WTP)**

John Eschenberg, DOE-ORP, reported on the two key technical risks at the WTP: the pulse jet mixers (PJM) and the Cesium Ion Exchange Resin and System Design.

#### *Pulse Jet Mixers*

PJMs are used to mix waste in 40 holding/processing tanks. Waste is mixed to ensure homogeneity in the tank and to prevent solids from settling. The risk is that PJMs are not proven for mixing non-Newtonian fluids. For this to work, 4 to 5 times the planned Bechtel National Inc. (BNI) air volume is needed. Further testing will be completed to finalize the hydrogen (H<sub>2</sub>) release rates.

The PJM Optimization Program is pursuing three options:

- Sparging
- Recirculation Pumps
- Converting to an acid flowsheet for melter feed

The cost and schedule impacts and worker health issues of these options are being evaluated. They are hoping to complete the downselect by February 27, 2004 and finalize design parameters by March 2004.

#### *Cesium Ion Exchange and Resin Design*

Ion exchange resins are used in the pre-treatment facility to remove cesium. The resin design is new and unproven. There is a high pressure differential from top to bottom and unproven cycle performance. Of greatest concern is that there is a single supplier/manufacturer of the resin and the supplier owns the intellectual property. To date, half-scale tests have validated 22 cycles with no adverse column effects. Hydrogen buildup concerns have also slowed the finalization of design. Alternative resin form results are encouraging but not proven.

### **Regulator Perspectives**

Suzanne noted going to an acid flow sheet presumably would produce other secondary waste issues that will have to be resolved.

### **Committee Discussion**

- Pam asked about the configuration of black box cells; the tanks are tightly placed, so how would they be expanded? John replied they could put more pulse jet mixers in the cell, but changing pipe size at this point affects other parts of the system.
- Al asked if there is a separate off-gas ventilation system in the black cells. John replied that the air will be processed and filtered. It will not feed back into the black cell.
- Leon asked how long there has been work occurring on these problems. John stated the project has been publicized since March 2003 and these have been issues the entire time.

### **Tank Waste Environmental Impact Statement Update (EIS)**

Mary Beth Burandt, DOE-ORP, provided an update on the Tank Closure Environmental Impact Statement (EIS). The draft was delivered to DOE-HQ last Friday. The team will be going to DOE-HQ to talk through the issues with the draft. On the current schedule, the EIS would be published sometime in March and there will be a 45-day comment period.

### **Tank C-106 Closure Demonstration**

Delmar Noyes, DOE-ORP, discussed the progress with C-106 retrieval. C-106 is a 530,000 gallon single shell tank (SST) located in the C-Farm in the 200 East area of Hanford. The tank stores mixed wastes that resulted from reactor fuel reprocessing and waste separation. The majority of the high-heat waste was removed in a previous large-scale sluicing campaign in 1998-1999. C-106 is one of 7 tanks identified in the Tri-Party Agreement (TPA) for a demonstration of retrieval technologies. The current retrieval efforts began in August 2003.

Significant progress has been made to date with this retrieval. The limits of the technologies used in this demonstration (Oxalic Acid and Modified Sluicing) have been reached. The tank waste residuals are approaching 360 cubic meters and this has been corroborated by visual evidence. A total of 6 acid batch additions and 4 sluicing campaigns were completed as of 12/31/03. As of the sixth acid batch addition, no further waste dissolution was evidenced. Minimal waste solids were removed during the fourth campaign. Displacement measurements and video mapping were used to verify the final volume of tank waste residuals. Sampling and analysis of the tank waste residuals was completed to support the risk assessment and initial evaluations of other available

technologies for retrieval indicate insignificant risk reduction potential from any further retrieval. The demonstration project is now at the stage to evaluate the cost versus risk reduction components of the project.

### **Regulator Perspectives**

Suzanne commented the first thing to do now is define what the limits of technology are and see if those were reached. The question that needs to be answered is at what point to the limits of technology provide diminishing returns: if the limits of technology have been reached, the 360 cubic meter law is not enforced. If, however, the tank is below the 360 cubic meter level and retrieval is at the limit of what is technically feasible, then the tank can go into the closure process.

### **Committee Discussion**

- Paige asked what the team has learned about the sluicing process. Delmar stated the sluicing was done this time with a lower volume nozzle than had been used in the past. The new nozzle is a high-pressure nozzle that can move the material but does so at a lower volume. Process controls were used to monitor what was put in and taken out of the tank.
- Pam asked if they had predicted a crawler would be needed. Moses Jarayssi, CHG, stated they didn't anticipate this. Engineers are evaluating other technologies to determine how much volume can be handled and how well. Pam asked if the levels left in the tank are significantly below what is required by the TPA. Moses stated the levels are very near. If there were a viable technology to move the levels lower, it would be considered.
- A committee member asked if the water is recycled or if it becomes waste. Moses replied it becomes waste. One thing that is being watched carefully is the impacts to the waste feed. This is a filtration and pre-treatment issue.
- Paige asked how much this retrieval project has cost. Moses stated that to this point the cost is about \$27 million plus \$3 million for closure activities. Because this is the first tank, the costs were higher but many lessons have been learned. Suzanne added the original retrieval effort for this tank cost around \$80 million.
- Sandra asked what the motivation is to go lower than 360 cubic meters. Moses replied that the TPA requires the level be down to what is technically feasible. John added that the project team is working through this to satisfy themselves they that they are doing everything possible. It is important to determine what potential impact the remaining material in the tank may have on the environment. For some tanks, leaving 1% in place may not be desirable while for other tanks it may not be possible to get any more out.
- Wade asked if there is a clean closure step. Moses stated this has been examined from an engineering standpoint and has been shown to be technically feasible. Suzanne stated that until the Tank Closure EIS is released, the Record of Decision

(ROD) is decided, and challenges addressed, an irreversible closure action cannot be taken.

- Sandra asked if the C-106 Closure Plan covers retrieval and stabilization only. Delmar replied that is the case. Part of the permit conditions address what the interim closure status will be. Suzanne stated the closure plan is the document that makes the next set of decisions.
- Doug asked if the Closure Plan will be released soon. Suzanne stated that the comment period for the plan is scheduled to start in early February and end in mid-March, although the plan may not be ready by early February. If the timing does not fit the Board's schedule, the comment period will be extended to allow for Board comment.

### **M-45 Update**

Delmar explained that M-45 is the TPA milestone series for the closure of SSTs. The purpose of the renegotiation of this milestone was for DOE to commit to SST retrieval in the near term by using double shell tank (DST) space. These efforts will create more space and reduce environmental and human health risks.

Commitments for each phase of the work were developed to ensure the momentum continues. The intent was to make the process easier to understand and more comprehensive. The process started with the first seven tanks to help answer the question of how closure is best reached. Commitments were also made to look at leak detection, waste retrieval technology, and the selection process for SST systems.

The parties are continuing to work in a positive and productive manner to reach a sound agreement. The goal is to reach an agreed-upon process description and definition. The process will ensure that what is done today is consistent with longer-term actions. Negotiations are to be completed in February.

### **Regulator Perspectives**

Roger Stanley, Ecology, stated that the negotiations have been going very well. One thing that has changed: originally, a schedule was to be developed out to 2015; now it won't be set that far. This is because there are too many unknowns to set an effective long-term schedule. More definitive schedules will continue to be developed over time. The team expects to establish a template for the tank waste closure retrieval process. The milestones will change so that there are no longer 4 or 5 milestones for each tank in this process. The proposals discussed to date come fairly close to the DOE-ORP baseline of closing 26 tanks by 2006. The state will not agree to milestones that force rapid closure in a short period of time.

### **Committee Discussion**

- Wade asked what it means to close 26 tanks by 2006. Delmar stated these would be closed consistent with the TPA approach. They would be closed in the same manner as tank C-106; this would not be closure at the Resource Conservation and Recovery Act (RCRA) level. Removing the waste from those tanks by 2006 would be a major step forward and will require a major effort. Roger Stanley added that this process is starting with C Farm in order to learn how to work more intelligently in a waste management area.
- Pam acknowledged that this is a logical explanation. However, there is still the issue that the CHG contract requires the closure of a specific number of tanks in an unreasonable amount of time. Delmar stated the goal is to get as far as possible in terms of the 40 tanks. The commitment is that this will be done in a safe and compliant manner.
- Several committee members commented they are worried about the site's credibility in Washington D.C. They do not want the site to be seen as a failure if 40 tanks are not closed in the specified timeframe. Delmar replied that he believes six of the tanks can be easily retrieved this year. If the momentum continues forward, it should be possible to achieve the goal.

### **Supplemental Technologies Update**

Billie Mauss, DOE-ORP, announced that the project received National Environmental Protection Act (NEPA) coverage on 12/18/2003. Additionally, the research and development permit was signed by the state on 12/17/2003.

Based on the two proposals received from the vendors, a decision was made to move forward into the demonstration phase of the project. Bulk vitrification was chosen for the demonstration phase because the steam-reforming product was not entirely validated. The risk performance for steam reforming product was equal to bulk vitrification with the exception of one technetium-99 spike. While there were some initial issues with bulk vitrification, these have been addressed. A full-scale melting has been done and the results were smooth glass. In this process, any residuals continue to be incorporated during the feeding process. Two more tests will be completed before an engineering scale test at the 325 building begins with a full mass balance.

### **Regulator Perspectives**

Suzanne commented the TPA will require a report that presents a path forward in January 2005. This report will provide the information gathered for the original 28 technologies and will also look at ways to improve the vitrification facility as well as the possibility of a second-generation LAW vitrification building. The intent is to make the vitrification facility as competitive with the other options as possible. As information is available it will be shared with the public. It is important that the public have voice in what the rest of treatment looks like.

### **Committee Discussion**

- Leon asked if solid refractory is more expensive. Billie replied it is about 25% more expensive.
- Paige commented it is difficult for the committee to comment on issues that seem to have already been decided. Keith replied it is not a foregone conclusion that one of these options will be chosen. Briant Charboneau, DOE-RL, clarified all this does is say the technology will be taken through a demonstration project before full funding is committed.
- Paige asked what the backup plan is. Suzanne responded that if the supplemental technologies are not adequate, the second LAW vitrification plant must be built.
- Doug stated this process has bothered him because the decisions appear to be more economic than technical. Since this will be the method used to treat the bulk of the waste, it is imperative that it be the best solution, not just the cheapest.
- Keith Smith urged the committee to stay vigilant in insisting on the minimum requirement that these alternative technologies perform at least as well as vitrification. Doug concurred that that is the ultimate criteria.

### **Handouts**

- Tank Waste Committee Meeting Agenda, January 15, 2004
  - C-106 Retrieval Progress, Delmar Noyes DOE-ORP, January 15, 2004
  - Preliminary Assessment of Iron Phosphate Glass, Brian Hamel DOE-ORP, January 15, 2004
  - Iron Phosphate ILAW Glass, Al Boldt, January 15, 2004
  - Waste Treatment and Immobilization Plant, John Eschenberg DOE-ORP, January 15, 2004
  - Tank Farm Baseline, DOE-ORP, January 15, 2004
  - SL644 Resin (picture), DOE-ORP, January 15, 2004
  - Small Scale PJM Tank (picture), DOE-ORP, January 15, 2004
  - Bulk Vitrification Tests (picture), DOE-ORP, January 15, 2004
-

## Attendees

### **HAB Members and Alternates**

Al Boldt	Jeff Luke	Keith Smith
Pam Brown-Larsen	Todd Martin	John Stanfill
Doug Huston	Bob Parks	Leon Swenson
Paige Knight	Wade Riggsbee	
Sandra Lilligren	Richard Smith	

### **Others**

John Britton, DOE-ORP	Suzanne Dahl, Ecology	Alan Page, CEES
Mary Beth Burandt, DOE-ORP	Roger Stanley, Ecology	Dru Butler, CH2MHill
John Eschenberg, DOE-ORP	Jean Vanni, Ecology	Bryan Kidder, CH2MHill
Howard Gnann, DOE-ORP		John Kristofzski, CH2MHill
Bill Hamel, DOE-ORP		Richard Raymond, CH2MHill
Erik Olds, DOE-ORP		Rico Cruz, CTUIR-ESTP
John Swailes, DOE-ORP		Liana Herron, EnviroIssues
Robert Yasek, DOE-ORP		Lynn Lefkoff, EnviroIssues
		Kristie Baptise, NPT-ERWM
		Gabriel Bohnee, NPT-ERWM
		Anthony Smith, NPT-ERWM
		Kim Ballinger, Nuvotec
		Sharon Braswell, Nuvotec
		Regina Lundgren, Supporting Hanford Communities
		Annette Cary, TC-Herald
		John Lindsey, Washington Group International