JUN 16 1995
Sta. #3 58

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT No. 611736

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
PUREX/UO3 Field Deactivation	PUREX/UO3 System Deactivation Engineering	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
KP	D.W. Nelson	N/A

8. Originator Remarks:
TBP/NPH, PUREX Organic Solution, PUREX Deactivation, End Point Criteria, TPA Milestone Number M-80-00-T03 211-A Tank Farm, TK-40, TSD, RCRA
PUREX/UO3 Deactivation Project Management Plan
Thermal Destruction, Commerce Business Daily (CBD)

9. Equip./Component No.: N/A

10. System/Bldg./Facility: Organic/211-A/PUREX

11. Receiver Remarks:

12. Major Assm. Dwg. No.: N/A

13. Permit/Permit Application No.: N/A

14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-AP-037	N/A	0	Alternatives For The Disposition Of PUREX Organic Solution	N/A	1	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng.: D.W. Nelson D W Nelson 7/16/95 S6-18	Cog. Mgr.: D.G. Harlow 7/16/95 S6-19	1	1
			Central Files L8-04	3	
			O.S.T.I. (2) A3-36	3	

18. D W Nelson 7/16/95
Signature of EDT Originator
Date

19.
Authorized Representative for Receiving Organization
Date 6/16/95

20.
Cognizant Manager
Date 6/16/95

21. DOE APPROVAL (if required)
Ctrl. No.
[ ] Approved
[ ] Approved w/comments
[ ] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097^GMACPATH~GEF1000^G

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

RELEASE AUTHORIZATION

Document Number:	WHC-SD-WM-AP-037, REV 0
Document Title:	Alternatives For The Disposition of PUREX Organic Solution
Release Date:	6/16/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz — June 16, 1995

SUPPORTING DOCUMENT

1. Total Pages 18

2. Title

Alternatives For The Disposition Of PUREX Organic Solution

3. Number

WHC-SD-WM-AP-037

4. Rev No.

0

5. Key Words

TBP/NPH, PUREX Organic Solution,
PUREX Deactivation, End Point Criteria
Tri-Party Agreement Milestone Number M-80-00-T03
211-A Tank Farm, TK-40
PUREX/UO_3 Deactivation Project Management Plan
Thermal Destruction, Commerce Business Daily (CBD)
TSD, RCRA

6. Author

Name: D.W. Nelson

D W Nelson 7/16/95
Signature

Organization/Charge Code 17710/KP4C2

7. Abstract

This Supporting Document submits options and recommendations for final management of Tank 40 Plutonium-Uranium Extraction (PUREX) Plant organic solution per Tri-Party Agreement Milestone Number M-80-00-T03.

The Westinghouse Hanford Company (WHC) is deactivating the PUREX Plant for the U.S. Department of Energy (DOE). One of the key elements of this Deactivation is the disposition of approximately 81,300 liters (~21,500 gallons) of slightly radioactively contaminated organic solution to reduce the risk to the environment, reduce the cost of long-term storage, and assure regulatory compliance.

An announcement in the Commerce Business Daily (CBD) on October 14, 1994 has resulted in the submission of proposals from two facilities capable of receiving and thermally destroying the solution. Total decomposition by thermal destruction is the recommended option for the disposition of the PUREX organic solution and WHC is evaluating the proposals from the two facilities.

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

APPROVED FOR PUBLIC RELEASE

DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

9. Impact Level N/A

10. RELEASE STAMP

OFFICIAL RELEASE 50
BY WHC
DATE JUN 16 1995
Sta #3

ALTERNATIVES FOR THE DISPOSITION OF PUREX ORGANIC SOLUTION

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This Supporting Document submits options and recommendations for final management of Tank 40 Plutonium-Uranium Extraction (PUREX) Plant organic solution per Tri-Party Agreement Milestone Number M-80-00-T03.

The Westinghouse Hanford Company (WHC) is deactivating the PUREX Plant for the U.S. Department of Energy (DOE) at the Hanford Site near Richland, Washington. Deactivation activities will result in placing PUREX in an environmentally safe and stable condition for long-term surveillance and maintenance. Upon the completion of Deactivation, the annual funding requirements will be reduced from the current $34M per year to less than $2M per year.

One of the key elements of this Deactivation is the disposition of approximately 81,300 liters (~21,500 gallons) of slightly radioactively contaminated organic solution to reduce the risk to the environment, reduce the cost of long-term storage, and assure regulatory compliance.

Upon receiving formal direction from the DOE in December of 1992 to deactivate the PUREX Facility, the G and R cell slightly radioactively contaminated organic solution was consolidated in TK-40 within the 211-A Tank Farm of the PUREX compound to facilitate G Cell, R Cell, and canyon fire system deactivation activities. There is currently no near-term beneficial use identified for the PUREX organic solution within the DOE Complex. Therefore, WHC has considered eight disposition alternatives.

Three key criteria are established to evaluate each organic disposition option. Each are deemed to be equally important so no relative "weighting" is necessary or required. The first criterion is the total cost required to implement the option: including the disposition of the solution and all costs associated with ensuring public safety, preservation of the environment and compliance with all applicable laws and regulations. The second is related to the solution's final state; where total destruction is preferred as it completes the solution's life-cycle. The third criterion deals with the compatibility of the option with the *PUREX/UO_3 Deactivation Project Management Plan* (Reference C) and scheduled completion dates, including any uncertainties related to unresolved regulatory issues.

The preferred disposition option for the PUREX organic solution is the thermal destruction at a state and federal licensed and permitted off-site disposal facility at a cost of less than $1,000,000.

2.0 BACKGROUND

The PUREX Plant in the Hanford 200 East Area is one of the largest nuclear fuels reprocessing plants in the world. It was designed to recover plutonium and uranium from reactor fuel for the national defense program, research reactor development, and safety programs.

PUREX construction began in 1953. Completed in 1955, operations began in 1956. In 1972 the plant was shut down and placed in standby status, until it was restarted in November 1983. The PUREX Plant was then placed in Cold Standby in 1990.

In December 1992, DOE directed the PUREX Plant be deactivated because it was no longer needed to support the nation's weapons-grade plutonium production. The scope of the PUREX Deactivation Project involves many activities necessary to place the PUREX Plant in an environmentally safe and stable state for long-term surveillance and maintenance. The full range of required activities, described in detail in *PUREX/UO_3 Deactivation Project Management Plan* (Reference C), are estimated to take approximately 4 years at a total project cost of $185M. The current surveillance and maintenance costs are approximately $34M per year, or $100K per day.

Organic solutions were used at the Hanford Site's PUREX Plant as an extractant in the solvent extraction portion of the PUREX process. The term "organic" is used extensively throughout this document and pertains to a liquid mixture of Normal Paraffin Hydrocarbons (NPH), straight-chained hydrocarbons ranging from decane to tetradecane, and Tri-n-Butyl Phosphate (TBP) in a nominal volume ratio of 77% and 23%, respectively. During processing campaigns, the organic solution degraded and was periodically "washed" to remove impurities and enhanced with fresh organic solution for use in the solvent extraction process. During the final operating campaign shutdown activities, extra care was taken to wash the organic solution to extremely low activity/impurity levels. The contents of the Organic Cycle processing tanks G5 and R7 (within the PUREX canyon) were subsequently transferred and consolidated in TK-40 within the 211-A Tank Farm of the PUREX compound to facilitate G Cell, R Cell, and canyon fire system deactivation activities.

The current PUREX organic inventory is considered a waste and is designated a Low Specific Activity (LSA) material for transportation purposes. The LSA category applied to the material is based upon the evenly distributed and very low levels of radioactive

constituents in the solution. In approximately 81,300 liters (~21,500 gallons) of organic solution, conservative estimates based upon samples taken in 1993 indicate the total quantity of plutonium (Pu) in the solution to be less than 0.05 grams (.00011 pounds). The total quantity of uranium (U) is also conservatively estimated to be less than 0.41 grams (.00090 pounds).

The need to disposition the organic solution is based upon risk reduction, regulatory compliance and the reduction or elimination of the cost of long-term storage. Although non-radioactive organic solutions have been introduced into several operating DOE facilities in the past, no current or near-term use for the slightly radiologically contaminated solution could be identified. Continued storage of the material in the current configuration does not meet the objectives of deactivation and could possibly result in a release of the solution to the environment in the unlikely event of a containment failure. Also, continued long-term storage in the current storage configuration at the PUREX Plant is not in full compliance with applicable *Resource Conservation and Recovery Act of 1976* requirements, as implemented by the State of Washington Department of Ecology (Ecology) pursuant to 40 Code of Federal Regulations (CFR) parts 260-271, 49 CFR 171-179, and Washington Administrative Code (WAC) 173-303 (Reference F).

At the time of the December, 1992, DOE PUREX Plant deactivation directive, there was an inventory of bulk chemicals at PUREX in various stages of use that became available for disposition. Since that time, DOE has dispositioned most of those materials in a manner consistent with good waste minimization practices, including the *Pollution Prevention Act of 1990*, State of Washington requirements (i.e., WAC 173-303), and DOE Orders and policies (e.g., DOE Order 5400.1, *General Environmental Protection Program*; and DOE Order 5820.2A, *Radioactive Waste Management*). Compliance with the laws and orders requires waste minimization programs and practices, a pollution prevention awareness program, and annual waste reduction reports and goals. Examples of ongoing waste minimization efforts at the PUREX Plant have resulted in the sale or exchange of nearly 2 million pounds of excess chemicals (Reference C).

The organic solution is a Washington State-only dangerous waste due to the TBP fraction being greater than 10 wt%. However the TBP, and therefore the solution, is not recognized as a hazardous waste by Federal Environmental Protection Agency (EPA) and Resource Conservation and Recovery Act (RCRA) mandates. Washington State regulation WAC 173.303.141 allows the PUREX organic solution to be offered to a Treatment, Storage, or Disposal (TSD) facility "if the TSD facility...has a permit issued by the United

States EPA under 40 CFR Part 270, or...Part 271." Should the receiver not hold a permit as stated, the generator is required to have "on file a letter or copy of a letter signed by the regulatory authority in the receiving state that the receiving facility may accept the waste." States which enforce only EPA/RCRA regulations and do not consider Washington's characterization of the PUREX organic solution as a mixed waste provide a viable organic disposition alternative. This position has been discussed with Ecology and has included consultations with the States of Washington, Oregon and Idaho, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and other stakeholders.

A potential beneficial use for the solution was identified at the New Waste Calcining Facility (NWCF), located at the Idaho Chemical Processing Plant (ICPP) at the Idaho National Engineering Laboratory (INEL). NWCF and PUREX personnel and management initiated discussions to transfer the solution for use as a fuel substitute in the NWCF low level waste fluidized bed calcination process. Differing policies and program plans between the State and Regulatory agencies of Idaho and Washington surfaced concerning the designation of the solution, under State of Washington regulations as a Washington State-only dangerous waste, based upon the TBP content. These regulatory uncertainties, in conjunction with an undefined NWCF operational schedule, ultimately prevented the transfer of the organic solution to the NWCF.

With no other beneficial use for the organic solution identified within the DOE, private sector interest was solicited through two separate Commerce Business Daily (CBD) announcements, a daily publication having 20,000 to 30,000 subscribers. The first announcement in December 1993 yielded an Expression of Interest from Diversified Scientific Services, Incorporated (DSSI), a subsidiary of RUST Remedial Services. DSSI proposed the solution be transported to their Facility near Oak Ridge, Tennessee, where it would be thermally destroyed. A purchase Order was initiated to identify the scope and pricing data. However, WHC chose to cancel the procurement based upon DSSI proposal inadequacies cited in Reference D.

The second CBD announcement on October 14, 1994 has resulted in the submission of proposals from two facilities capable of receiving and thermally destroying the solution. Total decomposition by thermal destruction is the recommended option for the disposition of the PUREX organic solution and WHC is evaluating the proposals from the two facilities. Section 3.1 provides the details of the two proposals.

3.0 ORGANIC DISPOSITION ALTERNATIVES

This section addresses the disposition of the inventory of the PUREX Plant organic solution plus the final system flush, which translates to 81,300 liters (~21,500 gallons) of organic solution plus a residual heel flush.

Three key criteria are established to evaluate each organic solution disposition option. Each are deemed to be equally important so no relative "weighting" is necessary or required. The first criterion is the total cost required to implement the option: including the disposition of the solution and all costs associated with ensuring public safety, preservation of the environment and compliance with all applicable laws and regulations. The second is related to the solution's final state; where total destruction is preferred as it completes the solution's life-cycle. The third criterion deals with the compatibility of the option with the *PUREX/UO_3 Deactivation Project Management Plan* and schedules (Reference C), including any uncertainties related to unresolved regulatory issues. Section 5.0, Table 1 summarizes each criterion for all eight disposition options.

A thorough analysis was completed to document a Categorical Exclusion would be sufficient for the disposition of the organic solution. This Categorical Exclusion has been drafted, approved and issued (Reference E). No additional National Environmental Policy Act (NEPA) review is required prior to the disposition of the solution.

Section 3.1 through 3.8 discuss and evaluate the eight disposition options:

3.1 OPTION #1 - THERMAL DESTRUCTION OF PUREX ORGANIC SOLUTION: RECOMMENDED OPTION

After failing to finalize the first CBD bid, a second CBD announcement on October 14, 1994, resulted in the submission of two proposals from two facilities capable of receiving and thermally destroying the organic solution: DSSI and Scientific Ecology Group (SEG). Located near Oak Ridge, Tennessee, DSSI operates a state and federal licensed and permitted off-site disposal Mixed Waste (MW) incinerator. Also located near Oak Ridge, Tennessee, SEG operates a Low Level Waste (LLW) incinerator which utilizes supplemental propane burners to aid the thermal destruction of the waste. DSSI, having completed their compliance test burns in August 1993, has a permit to treat, store, or dispose of Mixed Waste and has incinerated their backlog material. SEG is not a licensed and permitted TSD Facility for MW and therefore is licensed to incinerate Low Level Waste only. However,

SEG petitioned and was granted permission from the state of Tennessee to accept and thermally destroy the solution. No other private enterprise, nationally or internationally, expressed any interest in disposing of the solution. WHC has received best and final offers and is evaluating the proposals from both DSSI and SEG.

The shipments of PUREX Plant organic solution will be categorized as LSA, fissile exempt, per U.S. Department of Transportation (DOT) specifications. To qualify as LSA, a shipping container must have a uniform dose rate of 200 millirem per hour, or less, at contact. Dose rates are expected not to exceed 1 millirem per hour at contact. To qualify as fissile exempt, an individual shipment must contain not more than 7.5 kilograms (16.5 pounds) of fissile radionuclides in 15,120 liters (4,000 gallons). A shipping container of the PUREX Plant organic solution will have less than .066 grams (1.5×10^{-4} pounds) of fissile radionuclides (Reference B). Therefore, shipments will be substantially below the DOT's LSA, fissile exempt shipping category requirements.

In Summary, the preferred PUREX organic solution disposition option is the thermal destruction of the waste at one of two Tennessee locations at a cost of less than $1,000,000. Sample analyses indicate that the solution is within the thermal destruction feed specifications of both nuclear waste incinerators. WHC has requested and received best and final offers and is evaluating the proposals from both DSSI and SEG.

3.1.1 First Criterion (Cost): Competitive at <$1.0M.

3.1.2 Second Criterion (Final State): Excellent. Total decomposition by thermal destruction.

3.1.3 Third Criterion (Schedule): Compatible with the *PUREX/UO_3 Deactivation Project Management Plan* and schedules.

3.2 OPTION #2 - PUREX ORGANIC SOLUTION USED AS ALTERNATE FUEL FOR INEL'S NEW WASTE CALCINING FACILITY (NWCF)

As mentioned previously, a beneficial use for the PUREX organic was found at the New Waste Calcining Facility (NWCF), located at the Idaho Chemical Processing Plant (ICPP) at the Idaho Engineering Laboratory (INEL). NWCF and PUREX personnel and management initiated discussions to transfer the solution for use as a fuel substitute in the NWCF low level waste fluidized bed calcination process. Differing policies and program plans between the State and Regulatory agencies of Idaho and Washington surfaced due to the designation of the solution, under State of Washington regulations, as a Washington State-only dangerous waste, based upon the TBP content. These regulatory uncertainties, in

conjunction with an undefined NWCF operational schedule, ultimately prevented the transfer of the organic solution to the NWCF.

3.2.1 First Criterion (Cost): Extremely competitive at ~$20K. Transportation costs only.

3.2.2 Second Criterion (Final State): Excellent. Total decomposition by thermal destruction.

3.2.3 Third Criterion (Schedule): Undetermined. Regulatory issues remain unresolved.

3.3 OPTION #3 - PUREX ORGANIC SOLUTION USED FOR INTENDED PURPOSE IN SOLVENT EXTRACTION AT SAVANNAH RIVER SITE (SRS)

Nuclear fuels processing operations similar to the Hanford Site's PUREX process have been conducted in the past at the SRS. The SRS facilities, although not having received a Deactivation order, are presently in Standby. The DOE has determined that expedited action is required to stabilize plutonium solutions currently stored at the SRS and a NEPA review has been completed for the stabilization. Alternatives for the plutonium stabilization include startup of facilities requiring organic solution. A Record of Decision was issued in February 1995 approving the processing of the plutonium solution. However, SRS personnel indicate they have an adequate inventory of organic to sustain future operating campaigns.

3.3.1 First Criterion (Cost): Extremely competitive at ~$100K. Transportation costs only.

3.3.2 Second Criterion (Final State): Unfavorable. Interim use only. Solution life-cycle not completed.

3.3.3 Third Criterion (Schedule): Compatible with the *PUREX/UO_3 Deactivation Project Management Plan* and schedules. However, SRS has no need to supplement their organic inventory with PUREX organic.

3.4 OPTION #4 - NO ACTION - LEAVE AT PUREX

Under the "No-Action" Alternative, the organic solution would remain in TK-40 within the 211-A Tank Farm of the PUREX compound for surveillance awaiting future disposition. This alternative does not address the actual disposition of the solution. The "No-Action" alternative would continue to present the potential hazards associated with the storage of large quantities of radioactive, aqueous organic solutions. The existing tanks and

retention basins in the 211-A area are approximately 40 years old and may fail during a significant seismic event. The solution is categorized as a Washington State-only mixed waste, subject to RCRA treatment, storage, and disposal requirements. The 211-A Facility in its current configuration is not a RCRA-compliant facility per WAC-173-303-640. To become RCRA-compliant, TK-40 and its dike area may likely require structural integrity assessments to certify both the tank and the secondary containment, a part B Permit for continued storage, as well as the need to treat and dispose of any solutions generated by structural testing, with all the associated environmental impacts and costs. Previous tank integrity assessments conducted at the PUREX Facility have cost between $300K and $500K while the estimated cost to draft, approve and issue a Part B Permit is approximately $1.5M. Additionally, the PUREX Deactivation Project would be adversely impacted due to the need to install and maintain new fire suppression capabilities and a RCRA-compliant continuous surveillance liquid level monitoring system.

Finally, the ultimate goal of deactivation of the PUREX Plant could not be achieved while organic solution is stored in a tank within the 211-A Tank Farm. The PUREX Deactivation End Point Criteria (Reference A) requires the removal of major source terms (radioactive and dangerous materials) and physical isolation to mitigate potential contamination migration to the environment. The logistics and physical capabilities to allow the removal of the solution in the future (external transfer routes, electrical power, and equipment remaining in service) are not consistent with the goals of the PUREX Deactivation Project. Continued storage of the solution in TK-40 delays the final disposition and creates institutional conflicts such as regulatory compliance issues, additional Project work scope for remote system surveillance, and is inconsistent with *PUREX/UO_3 Deactivation Project Management Plan*, baseline schedules, and national policy.

3.4.1 First Criterion (Cost): Not competitive at ~$2.0M

3.4.2 Second Criterion (Final State): Unfavorable. Interim storage only. Solution life-cycle not completed.

3.4.3 Third Criterion (Schedule): Incompatible with the existing *PUREX/UO_3 Deactivation Project Management Plan and schedules*. Additional Project scope would be required.

3.5 OPTION #5 - TRANSFER PUREX ORGANIC SOLUTION TO EXISTING OR NEW HANFORD FACILITY FOR INDEFINITE STORAGE IN THE LIQUID FORM

Alternate Hanford Site storage options for the organic solution also were considered including upgrading an existing tank or Tank Farm to achieve regulatory compliance as well as the constructing of a new storage facility. This alternative would address the environmental, safety and regulatory compliance concerns associated with the current storage facility.

A modification to the "No-Action" Alternative would be to transfer the solution to an appropriate, available onsite storage facility outside the PUREX Plant compound. The current 211-A storage tanks are not RCRA-compliant. Therefore, although transferring the solution to another storage location would eliminate the impacts to PUREX Plant deactivation, the aforementioned risks and regulatory compliance issues associated with onsite storage of large volumes of organic solution would remain. Implementation of this alternative would not address the potential hazards associated with indefinite storage of the solution nor would it complete the organic solution life-cycle. Further, an upgraded or new facility would cost at least $200K, excluding permitting activities necessary to address the storage of a dangerous waste (estimated at $1.5M). Also, the additional future cost associated with disposing of the material would be substantial and would depend upon the treatment method selected at that time.

3.5.1 First Criterion (Cost): Not competitive at < $1.7M.

3.5.2 Second Criterion (Final State): Unfavorable. Interim storage only. Solution life-cycle not completed.

3.5.3 Third Criterion (Schedule): Undetermined compatibility with the existing *PUREX/UO_3 Deactivation Project Management Plan* and schedules.

3.6 OPTION #6 - SOLIDIFY PUREX ORGANIC SOLUTION AND TRANSFER TO EXISTING OR NEW HANFORD FACILITY FOR INDEFINITE STORAGE IN THE SOLID FORM

Solidification/stabilization pilot studies using non-radiologically contaminated organic solution have yielded significant increases in waste volume. Based on ideal density, compaction and stability variables in the final form, preliminary testing has yielded an optimum stabilization ratio (final solid waste volume/initial liquid waste volume) of approximately 13. If the solidified organic is classified as LLW at the 1995 disposal cost of ~$36 per cubic foot, the cost of stabilization/disposal would be approximately $1.3M. If

the solidified organic is determined to be MW at the 1995 disposal cost of ~$120 per cubic foot, the cost of solidifying the ~21,500 gallons of PUREX organic would increase by more than three times. The cost is greater still if a fifty-five gallon drum is the required waste container (1995 average cost of $1106 per drum). These costs do not include the additional expenditure of approximately $1.5M for drafting, approving and issuing a Part B Permit for the treatment of the solution as waste.

3.6.1 First Criterion (Cost): Not competitive at ~$2.8M (assuming the final waste matrix is designated LLW).

3.6.2 Second Criterion (Final State): Favorable. Although not thermally destroyed, the material would be in a stabilized waste matrix.

3.6.3 Third Criterion (Schedule): Incompatible with the existing *PUREX/UO_3 Deactivation Project Management Plan* and schedules. Additional Project scope would be required.

3.7 OPTION #7 - SOLIDIFY PUREX ORGANIC SOLUTION AND TRANSFER OFF-SITE TO EXISTING OR NEW FACILITY FOR INDEFINITE STORAGE IN THE SOLID FORM

WHC has investigated the solid mixed waste disposal option at ENVIROCARE in Clive, Utah. It is not obvious at this time that ENVIROCARE is permitted to perform the solidification/stabilization treatment operation. Therefore, assuming the generator (PUREX) would perform the treatment activities, the additional budget and time expenditures associated with the generation of a Part B Permit for the treatment of the PUREX organic solution waste would not align with the *PUREX/UO_3 Deactivation Project Management Plan* baseline schedules. The ENVIROCARE Site, once at full capacity, will pay for Site surveillance from a Trust Fund set up by ENVIROCARE. ENVIROCARE assumes a simple "caretaker" responsibility and assumes no responsibility for the stability of the waste.

ENVIROCARE appears to assume this treatment method would make the material non-hazardous. Preliminary laboratory testing (Reference B) does not support this assumption. Validation would require further laboratory testing.

This option appears to employ the use of a polymer to stabilize the material. As stated in Section 3.6, Option #6, preliminary testing has yielded an optimum dilution ratio (final solid waste volume/initial liquid waste volume) of approximately 13. The ~21,500 gallons would fill nearly 400 fifty-five gallon drums. At a 13:1 ratio, the increase in volume would result in ~5200 fifty-five gallon drums of stabilized material. Using the 1995 cost

per volume data stated in Section 3.6 and assuming the final waste matrix is categorized as LLW, the solidified organic stabilization/disposal cost would be ~$1.7M. Again, the stabilization/disposal cost increases by a factor of three if the final waste matrix is designated as MW. These costs do not include the additional expenditure of approximately $1.5M for drafting, approving and issuing a Part B Permit for the treatment of the solution as waste.

3.7.1 First Criterion (Cost): Not competitive at ~3.2M (assuming the final waste matrix is designated LLW).

3.7.2 Second Criterion (Final State): Favorable. Although not thermally destroyed, the material would be in a stabilized waste matrix.

3.7.3 Third Criterion (Schedule): Incompatible with the existing *PUREX/UO_3 Deactivation Project Management Plan* and schedules. Additional Project scope would be required.

3.8 OPTION #8 - TRANSFER PUREX ORGANIC SOLUTION TO NEW HANFORD FACILITY FOR THERMAL DESTRUCTION

Consideration was given to the procurement, permitting and operation of a Hanford Site MW incinerator. The consolidation of organic solutions from different DOE locations was investigated. However, no current or near-term consolidation options for organic solutions could be identified. DOE recently initiated a project which will consider the management and disposition of similar types of material, including organic solutions, at the various DOE sites. This initiative will not yield results to support the near-term PUREX Plant Deactivation baseline schedule. There appears to be no benefit to postponing implementation of an acceptable disposition alternative (OPTION 3.1). Selection and permitting of one site to store, treat, and dispose of all DOE organic solution is outside the scope of the *PUREX/UO_3 Deactivation Project Management Plan* and baseline schedules but should be considered in the future for the inevitable disposition of additional Hanford Site waste and organic solutions.

3.8.1 First Criterion (Cost): Not competitive at >$3.0M

3.8.2 Second Criterion (Final State): Excellent. Total decomposition by thermal destruction.

3.8.3 Third Criterion (Schedule): Incompatible with the existing *PUREX/UO_3 Deactivation Project Management Plan* and schedules. Additional Project scope would be required.

4.0 CONCLUSION

PUREX System Deactivation Engineering has concluded a study on the disposition alternatives for the radiologically contaminated PUREX organic solution. The recommended option is the thermal destruction of the solution at Diversified Scientific Services, Incorporated (DSSI) or Scientific Ecology Group (SEG) at a cost of less than $1,000,000. WHC has received best and final offers and is evaluating the proposals from DSSI and SEG.

5.0 TABLES AND FIGURES

Table 1: PUREX NPH/TBP - Summary Of Disposition Alternatives
Table 2: PUREX NPH/TBP Solvent Characterization

TABLE 1: PUREX NPH/TBP - Summary Of Disposition Alternatives

DISPOSITION ALTERNATIVE NUMBER	EVALUATION CRITERIA		
	CRITERION #1 (COST)	CRITERION #2 (FINAL STATE)	CRITERION #3 (SCHEDULE)
OPTION #1	<$1.0M	Excellent	Compatible
OPTION #2	~$20K	Excellent	Undetermined
OPTION #3	~$100K	Unfavorable	Compatible
OPTION #4	~$2.0M	Unfavorable	Incompatible
OPTION #5	<$1.7M	Unfavorable	Undetermined
OPTION #6	~$2.8M	Favorable	Incompatible
OPTION #7	~$3.2M	Favorable	Incompatible
OPTION #8	>$3.0M	Excellent	Incompatible

TABLE 2: PUREX NPH/TBP Organic Solvent Characterization

A complete X-Ray Fluorescence (XRF) characterization is presented below from analyses conducted at Hanford Laboratories in October 1990. The complete results of that analysis is contained in WHC-SD-CP-ES-142, Revision 0, "Disposal of Contaminated PUREX Organic Solvent."

ELEMENT	TANK G5 (ppm)	TANK R7 (ppm)
Aluminum (Al)	BDL*	BDL
Antimony (Sb)	BDL	BDL
Arsenic (As)	BDL	BDL
Barium (Ba)	BDL	BDL
Bromine (Br)	BDL	0.30 (0.11)**
Cadmium (Cd)	BDL	BDL
Calcium (Ca)	14.5 (2.6)	6.0 (2.3)
Cerium (Ce)	BDL	BDL
Cesium Cs)	BDL	BDL
Chlorine (Cl)	BDL	BDL
Chromium (Cr)	BDL	BDL
Cobalt (Co)	BDL	BDL
Copper (Cu)	2.29 (0.39)	2.87 (0.43)
Gallium (Ga)	BDL	BDL
Iodine (I)	4.6 (2.1)	BDL
Iron (Fe)	18.3 (1.6)	30.7 (2.2)
Lanthanum (La)	BDL	BDL
Lead (Pb)	BDL	BDL
Manganese (Mn)	BDL	BDL
Mercury (Hg)	BDL	BDL
Molybdenum (Mo)	BDL	BDL
Nickel (Ni)	BDL	BDL
Niobium (Nb)	BDL	BDL
Palladium (Pd)	BDL	BDL
Phosphorous (P)	5.49 (0.28)	5.21 (0.26)
Potassium (K)	7.4 (3.3)	BDL
Rhodium (Rh)	BDL	BDL
Ruthenium (Ru)	BDL	BDL
Selenium (Se)	BDL	BDL
Silicon (Si)	6980 (420)	5430 (330)
Silver (Ag)	BDL	BDL
Strontium (Sr)	BDL	BDL
Sulfur (S)	BDL	BDL
Thallium (Tl)	BDL	BDL
Thorium (Th)	BDL	BDL
Tin (Sn)	BDL	BDL
Titanium (Ti)	BDL	BDL
Uranium (U)	BDL	1.53 (0.48)
Vanadium (V)	BDL	BDL
Yttrium (Y)	BDL	BDL
Zinc (Zn)	0.94 (0.28)	0.47 (0.23)
Zirconium (Zr)	BDL	BDL

* BDL = below detection level. See WHC-SD-CP-ES-142, Revision 0.

** The values in parentheses indicate the error range over which the concentration is valid as plus or minus the value in parentheses. All values were compared to the same reference standard

Most of the following total activity resulted from RuRh-106, which has a half-life of approximately one year. TK-40 calculated values are listed below.

TANK	TOTAL ACTIVITY	TOTAL ALPHA
TK-40	16.57 nanocuries/gram 1.0056 curies total	.0145 nanocuries/gram .0009 curies total

6.0 REFERENCES

(A) WHC-SD-WM-TPP-053, "PUREX Deactivation End Point Criteria," Revision 0, dated February 24, 1995.

(B) WHC-SD-CP-ES-142, "Disposal of Contaminated PUREX Organic Solvent," Revision 0, dated September 27, 1991.

(C) *PUREX/UO_3 Deactivation Project Management Plan*, WHC-SP-1011, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

(D) Internal Memo, R. C. Roal to L. M. Rowley, et al., "Vendor Procurement For the PUREX Contaminated Organic Solvent," dated July 26, 1993.

(E) "Categorical Exclusion For Disposal of Tri-N-Butylphosphate From The Plutonium-Uranium Extraction Facility, 200 East Area, Hanford Site, Richland Washington."

(F) WAC 173-303, 1990, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.