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Department of Energy  
Richland Operations Office  
P.O. Box 550  
Richland, Washington 99352

05-AMCP-0187

MAR 15 2005

Mr. Nicholas Ceto, Program Manager  
Office of Environmental Cleanup  
Hanford Project Office  
U.S. Environmental Protection Agency  
712 Swift Boulevard, Suite 5  
Richland, Washington 99352

Mr. Michael A. Wilson  
Nuclear Waste Program  
State of Washington  
Department of Ecology  
3100 Port of Benton Boulevard  
Richland, Washington 99352

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MAR 22 2005  
EDMC

Addressees:

#### STATUS OF TRITIUM TREATMENT TECHNOLOGY DEVELOPMENTS

The purpose of this letter is to transmit the tritium treatment technology status letter report to the State of Washington Department of Ecology by March 31, 2005. The attached report provides an update on the development of tritium treatment technology that would be pertinent to the cleanup and management of tritiated waste water and tritium contaminated groundwater at the Hanford Site.

Tri-Party Agreement Milestone M-026-07 requires the submittal of a formal evaluation of the development status of tritium treatment technology every five years. In accordance with the Tri-Party Agreement Milestone M-026-07, the next formal tritium technology evaluation report is due on March 31, 2009. Each year that a formal report is not due, a status letter report is to be submitted to the regulators to keep them abreast of any tritium treatment technology developments. This letter is the first status letter report submittal.

If you have questions, please contact me, or your staff may contact Matthew S. McCormick, Assistant Manager for the Central Plateau, on (509) 373-9971.

Sincerely,

  
Keith A. Klein  
Manager

AMCP:RDH

Attachment

cc: See Page 2

Addressees  
05-AMCP-0187

-2-

MAR 15 2005

cc w/attach:

G. Bohnee, NPA

L. D. Crass, FHI

L. J. Cusack, Ecology

D. L. Flyckt, FHI

R. H. Gurske, FHI

S. Harris, CTUIR

J. S. Hertzal, FHI

D. A. Isom, Admin Record, H6-08

F. D. Jamison, Ecology

R. Jim, YN

T. Martin, HAB

E. J. Murphy-Fitch, FHI

K. Niles, ODOE

R. F. Stanley, Ecology

Fluor Hanford  
P.O. Box 1000  
Richland, Washington 99352

**FLUOR**

FEB 15 2005

FH-0304975A R2  
Contract Number DE-AC06-96RL13200

Mr. Keith A. Klein, Manager  
U.S. Department of Energy A7-50  
Richland Operations Office  
Post Office Box 550  
Richland, Washington 99352

Dear Mr. Klein:

**STATUS OF TRITIUM TREATMENT TECHNOLOGY DEVELOPMENTS**

Reference: Letter, R. G. Gallagher, FH, to K. A. Klein, RL, "Completion Notification of Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-026-07A 2004, Evaluation of Tritium Removal and Mitigation Technologies for Wastewater Treatment," FH-0304975A R1, dated February 25, 2004.

In support of PHMC Sections C.3.7.1, "Maintain Safe and Compliance 200 Area Effluent Treatment Facility Operations," and H.4, "Tri-Party Agreement," the purpose of this letter is to request RL to transmit this tritium treatment technology status letter report to the State of Washington, Department of Ecology (Ecology) by March 31, 2005.

This status letter report provides an update on the development of tritium treatment technology that would be pertinent to the cleanup and management of tritiated waste water (e.g., the 242-A Evaporator, process condensate, liquid effluent) and tritium contaminated groundwater at the Hanford Site.

Tri-Party Agreement (TPA) milestone M-026-07 requires the submittal of a formal evaluation of the development status of tritium treatment technology every five years. The first formal tritium technology evaluation report submitted under this milestone was provided to RL in February 2004, completing contract deliverable CD0244 (reference), and transmitted by RL to Ecology in March 2004. Other tritium technology evaluation reports, identified below, were previously submitted as required by TPA milestone M-026-05, which was replaced by milestone M-026-07.

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FEB 16 2005

**DOE-RL/RLCC**

Mr. Keith A. Klein

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FH-0304975A R2

Contract Number DE-AC06-96RL13200

In accordance with TPA milestone M-026-07, the next formal tritium technology evaluation report is due on March 31, 2009. Each year that a formal report is not due, a status letter report is to be submitted to the regulators to keep them abreast of any tritium treatment technology developments. This letter is the first status letter report submittal.

The tritium technology evaluation reports that have been developed to date are listed below:

- *Tritiated Wastewater Treatment and Disposal Evaluation for 1994*, DOE/RL-94-77
- *Tritiated Wastewater Treatment and Disposal Evaluation for 1995*, DOE/RL-95-68
- *1997 Evaluation of Tritium Removal and Mitigation Technologies for Hanford Site Wastewaters*, DOE/RL-97-54
- *1999 Evaluation of Tritium Removal and Mitigation Technologies for Wastewater Treatment*, DOE/RL-99-42
- *2001 Evaluation of Tritium Removal and Mitigation Technologies for Wastewater Treatment*, DOE/RL-2001-33
- *2004 Evaluation of Tritium Removal and Mitigation Technologies for Wastewater Treatment*, DOE/RL-2004-11.

The above reports each evaluated the applicability of tritium removal technologies to Hanford Site groundwater and wastewater applications. Technologies were evaluated for applicability to large wastewater volumes with relatively low levels of tritium (less than  $1.0E-05$  Ci/L) as seen in Hanford wastewaters and groundwater. Technology applicability to smaller wastewater volumes with higher levels of tritium (greater than  $1.0E-05$  Ci/L) was also identified.

The Table (below) summarizes the technologies discussed in each report, indicates technology maturity, and defines technology applicability. This Table was previously transmitted to Ecology and has been updated to include the 2004 tritium report.

The majority of tritium removal technology development work has been conducted with wastewaters containing tritium at levels higher than expected in the Hanford wastewaters or observed in Hanford groundwater. However, as can be seen on the Table, there are several fairly developed technologies (designated with a D) that are also designated as being applicable to wastewaters having less than  $1.0E-05$  Ci/L of tritium:

- Soil column discharge
- Barrier formation
- Pumping and recharging
- Phytoremediation
- Evaporation.

Both soil column discharge and barrier formation concepts have been implemented via use of the State-approved land disposal structure for treated effluent disposal. Other technologies, pumping/recharging, phytoremediation, and evaporation, even though applicable to low levels of tritium, cannot reasonably be applied on the scale required to address Hanford groundwater tritium contamination.

None of the other technologies identified to date are currently viable for treating the large volumes of Hanford wastewater and groundwater having relatively low concentrations of tritium. Many of the developed technologies depend on an energy-intensive phase transfer process (e.g., changing a liquid to a gas) or pretreatment of the tritiated water to remove dissolved solids and would not be cost-effective to implement.

The emerging tritium removal technologies that do not depend on a phase transfer or dissolved solid removal have been slow to mature due to funding limitations, inadequacies defined during field demonstration, and the lack of commercial demand for tritium removal technologies applicable to tritium levels less than 1.0E-05 Ci/L.

The tritium technology reports developed to date have concluded that tritium removal technologies are not economically viable for the large volumes of Hanford wastewaters and groundwater with relatively low tritium concentrations (less than 1.0E-05 Ci/L). A review of literature produced since the issuance of the March 2004 report did not identify any information that would change this conclusion.

Technology	Year Report Prepared					
	1994	1995	1997	1999	2001	2004
Distillation	D, h		D, h	D, h	D, h	D, h
Gaseous diffusion	D, h					
Laser isotope separation	T, h	T, h	T, h			
Electrolysis	D, h	D, h	D, h			
Combined electrolysis and catalytic exchange (CECE)	D, h	D, h T, l				
Combined electrolysis catalytic exchange with vapor phase catalytic exchange					D, h	
Membrane separation process	T, l	T, l	T, l			
Cryogenic distillation	D, h	D, h	D, h	D, h	D, h	
Bithermal catalytic exchange		D, h T, l		D, h T, l	D, h T, l	D, h T, l
Isotopic exchange, air sparge		T, l				
Finely divided nickel catalyst		O				
Separation by Metanetix Inc.		O				

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Substituted naphthalene		O				
Crown Ether Complexes		O				
Girdler-sulfide Process			D, h	D, h	D, h	D, h
Liquid phase catalytic exchange with solid oxide electrolyte			D, h	D, h	D, h	
Liquid phase catalytic exchange with high-temperature steam electrolysis (Hot Elly)			D, h			
Sulfur resin ion exchange			O			
Metal hydride exchange			T, h			
Soil column discharge	D, l, h		D, l, h	D, l, h	D, l, h	D, l, h
Barrier formation			O	D, l, h	D, l, h	D, l, h
Air sparging			T, l			
Dual-temperature liquid-phase catalytic exchange				D, h		
Tritium resin separation process				T, l	T, l	T, l
Kinetic-isotope effect for concentrating tritium				T, l	T, l	
Pumping and recharging				D, l	D, l	D, l
Phytoremediation					D, l	D, l
Evaporation						D, l

Maturity:

D = Demonstrated or developed technology that has been successfully applied in the field

T = Testing or theoretical stage of development

O = Observation indicates a potential process needing funding to continue

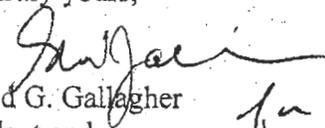
Applicability:

l = Technology is applicable to larger wastewater volumes having lower levels of tritium (less than 1.0E-05 Ci/L)

h = Technology is applicable to smaller wastewater volumes having higher levels of tritium (greater than 1.0E-05 Ci/L)

Technical questions should be directed to D. L. Flyckt at 372-3142; contractual questions should be directed to L. J. Hunter at 376-6986.

Very truly yours,

  
Ronald G. Gallagher  
President and  
Chief Executive Officer

sah:ajb

RL - B. L. Charboneau  
M. S. French  
R. D. Hildebrand  
E. D. MacAlister  
M. S. McCormick

O. C. Robertson  
L. D. Romine  
J. F. Schwier  
S. A. Sieracki