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Halliburton NUS CORPORATION

452 Burbank Street
Broomfield, CO 80020

April 28, 1993

(303) 466-3573
FAX (303) 469-6354



Mr. Thomas D. Beckman
Contract Technical Representative
Solar Ponds Remediation Program
EG&G Rocky Flats, Inc.
Building 080
P. O. Box 464
Golden, Colorado 80402-0464

Subject: ROCKY FLATS PLANT SOLAR EVAPORATION PONDS STABILIZATION PROJECT
[WBS 235 TREATABILITY STUDIES - HALLIBURTON NUS ROCKY FLATS]
ADDITIONAL WORK FOR 207A/B & 207C/CLARIFIER TREATABILITY STUDIES
RF-HED-93-0271 [RESPONSE REQUESTED]

Dear Mr. Beckman:

Your letter 93-RF-3874 dated April 1, 1993 directed immediate testing of two (2) samples each of A/B Pond and C Pond/Clarifier Treatability Study cylinders.

The test results are attached with all specimens showing good strength and stability. This report will be incorporated in the next formal revision to the respective Treatability Studies.

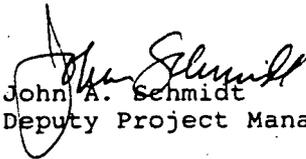
Also included for your review is our proposed addendum to the Treatability Study Work Plans which will govern follow on testing of specimens from the Treatability Studies.

Loading of these samples into a drum will commence May 3, 1993 and thus prompt approval of the addendum is requested.

Please contact me if you have any questions or comments.

Sincerely,

HALLIBURTON NUS CORPORATION


John A. Schmidt
Deputy Project Manager

JAS/jg

Enclosures: (ROCKY FLATS SOLAR POND PROJECT, RESULTS OF ADDITIONAL WORK FOR THE 207A/B AND 207C/CLARIFIER TREATABILITY STUDIES, REVISION 1 and ADDENDUM TO THE POND SLUDGE AND CLARIFIER SLUDGE TREATABILITY STUDY WORK PLAN DELIVERABLE (COMBINED) 231A, 231B, 231C, 231E; REVISION 1, DECEMBER, 1992)

cc: T. Bittner
S. Keith
T. Snare

A:\LTR\BECKMAN47
RF-HED-93-0271

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A Halliburton Company

ADMIN RECORD

A-DU04-000495

C-49-4-3-286
April 26, 1993
Page 2

The results from the Paint Filter Liquids Test and the DOT test are presented in Table 1-3. The results indicate that no free liquids were present and that the material is a solid in accordance with DOT standards. Therefore, all DOT criteria are met for these batches.

TABLE 1-1
SUMMARY OF BATCHES TESTED

Batch No.	Pond	Date Mixed	Date Analyzed	W/P Ratio	Cement/Flyash/ Lime Ratio	TCLP Analysis + UCS Tests ⁽¹⁾	PFLT and DOT Test ⁽²⁾
1 BC	207C/Clarifier	4/6/92	4/2/93	0.34	1/2/0.066		X
2 BC	207C/Clarifier	4/6/92	4/5/93	0.38	1/2/0.078	X	
4 BC	207C/Clarifier	4/6/92	4/5/93	0.46	1/2/0.067	X ⁽³⁾	
5 BC	207C/Clarifier	4/6/92	4/2/93	0.50	1/2/0.077		X
1 TC	207 A/B (Series)	4/9/92	4/2/93	0.34	1/2/0.060		X
2 TC	207 A/B (Series)	4/9/92	4/5/93	0.38	1/2/0.063	X	
4 TC	207 A/B (Series)	4/9/92	4/5/93	0.46	1/2/0.067	X	
5 TC	207 A/B (Series)	4/9/92	4/2/93	0.50	1/2/0.070		X

(1) As per:

TCLP Extraction - SW 1311
 Acid Digestion - SW 3050
 Metals Analysis by ICP - SW 6010: As, Ba, Cd, Cr, Pb, Ni, Se, Ag
 by CVAA - SW 7470: Hg
 UCS - D4219-83

(2) As per:

Paint Filter Liquids Test - SW 9095
 Standard Test Method for Determining Whether a Material is a Liquid or a Solid (DOT Test) - D4359-90

(3) Specimen was discovered broken inside of mold when opened. UCS testing not done.

TABLE 1-2

TCLP ANALYSIS (mg/L) AND UCS TESTS

Batch Date Mixed	2 BC 4/6/92	4 BC 4/6/92	2 TC 4/9/92	4 TC 4/9/92	Toxicity Characteristic Standard ⁽¹⁾	LDR Standard ⁽²⁾
Arsenic	<0.1	0.1	<0.1	<0.1	5.0	NS
Barium	0.36	0.34	0.85	0.62	100.0	NS
Cadmium	<0.005	<0.005	<0.005	<0.005	1.0	0.066
Chromium	0.27	0.23	0.16	0.08	5.0	5.2
Lead	<0.05	<0.05	<0.05	<0.05	5.0	0.51
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	0.2	NS
Nickel	<0.02	<0.02	0.02	0.03	NS	0.32
Selenium	<0.1	<0.1	<0.1	<0.1	1.0	NS
Silver	<0.01	<0.01	<0.01	<0.01	5.0	0.072
pH	9.9	9.9	9.2	9.3	NS	NS
Unconfined Compressive Strength Test	1167 psig	(3)	1001 psig	729 psig		

(1) TC Standard - Standards for metal analytes regulated by 40 CFR 261.24 for the characteristic of toxicity.

(2) LDR Standard - Standards for metal analytes regulated by 40 CFR 268 for F006, F007, and F009.

(3) Specimen was discovered broken inside of mold when opened. UCS testing not done.

NS - No Standard

TABLE 1-3

PAINT FILTER LIQUIDS TEST AND DOT TEST

Batch Date Mixed	1 BC 4/6/92	5 BC 4/6/92	1 TC 4/9/92	5 TC 4/9/92
Liquid/Solid Test	Solid	Solid	Solid	Solid
Paint Filter Liquids Test	Pass	Pass	Pass	Pass



INTERNAL CORRESPONDENCE

C-49-04-3-005

TO: JOHN SCHMIDT
DATE: APRIL 29, 1993

FROM: TOM SNARE *TCS*
COPIES: TED BITTNER
RICH NINESTEEL
PAUL FRANK

SUBJECT: ~~ADDENDUM TO THE POND SLUDGE AND~~
CLARIFIER SLUDGE TREATABILITY STUDY
WORK PLAN DELIVERABLE (COMBINED)
231A, 231B, 231C, 231E
REVISION 1, DECEMBER, 1992
FILE: 2K68

The following is an addendum to the combined pond sludge and clarifier sludge Treatability Study Work Plans. This additional testing plan shall be included as Appendix J.

The remaining specimens from batches within the operating envelope shown to produce a certifiable product in the treatability studies will be packaged and shipped to the RFP. The packaging will be conducive to on-site storage on the pads. These specimens will be stored on the pads, in similar climatic conditions expected for the storage of pond sludge halfcrates, to provide an indication of the long-term stability and integrity of the solidified waste forms. The specimens will be periodically sampled and returned to the NUS Pittsburgh Laboratory for testing. The analysis will include UCS, TCLP metals, Paint Filter Liquids Test (PFLT), Standard Method for Determining whether a Material is a Liquid or a Solid Test (DOT test), and NTS criteria testing. The testing and methodologies to be used are shown in Table 1-1. The organic analyses listed are as per 40 CFR 268 Appendix III excluding the Dioxins and Furans.

It is not possible to perform all tests on the same specimen as both the UCS and the DOT test are destructive, thus the volumes required for analysis exceeds the sample size. Therefore, the UCS and TCLP metals analysis will be done on the selected specimen and the DOT tests will be performed on a specimen from a similar batch within the processing range. A total of three specimens are required for the analyses. The analyses will be performed at a DQO Level III, which requires no data validation. The findings will be issued in a memo following examination of the results.

The analyses will be performed on three selected specimens for each processing train, for example: three specimens mixed from the 207A/B north, center, and south (combined) sludges and two specimens from the 207C and 207C/Clarifier (combined) material. All specimens designated for sampling and analysis are packaged in the same drum. Shown in Table 1-2 are the drum contents and sampling plan for the specimens.

TABLE 1-1

SUMMARY OF ANALYTICAL PROGRAM
SOLAR POND PROJECT
ROCKY FLATS PLANT, COLORADO

Analysis	Solids Method	Extract Method
CHEMICAL PARAMETERS		
Selected Volatiles ⁽¹⁾	SW 8240	---
Selected Semi-volatiles ⁽²⁾	SW 8270	---
Selected Pesticides ⁽³⁾	SW 8080	---
Selected Herbicides ⁽⁴⁾	SW 8150	---
Selected PCBs ⁽⁵⁾	SW 8080	---
TCLP Leach	SW 1311	---
Arsenic	---	SW 3050/6010
Barium	---	SW 3050/6010
Cadmium	---	SW 3050/6010
Chromium	---	SW 3050/6010
Lead	---	SW 3050/6010
Mercury	---	SW 7470
Nickel	---	SW 3050/6010
Selenium	---	SW 3050/6010
Silver	---	SW 3050/6010
Sulfide Reactivity	SW 9030	---
Amenable Cyanide	EPA 335.1	---
PHYSICAL PARAMETERS		
Ignitability	SW 1010	---
Unconfined Compressive Strength (UCS)	D4219-83	---
Standard test method for Determining Whether a Material is a Liquid or a Solid	D4359-90	---
Paint Filter Liquids Test	SW 9095	---
RADIOLOGICAL PARAMETERS		
Plutonium - 239/240	AC-MM-2 0972 ⁽⁶⁾ (Draft) Oak Ridge	---
Americium - 241	U.S. DOE/EH-0053, August 1987 ⁽⁷⁾ (Gamma Spec)	---
Uranium - 233	AC-MM-2 0972 ⁽⁶⁾ (Draft) Oak Ridge	---
Uranium - 235	AC-MM-2 0972 ⁽⁶⁾ (Draft) Oak Ridge	---
Uranium - 238	AC-MM-0972 ⁽⁶⁾ (Draft) Oak Ridge	---

TABLE 1-1
SUMMARY OF ANALYTICAL PROGRAM
SOLAR POND PROJECT
PAGE 2

(1) Volatiles

Bromodichloromethane
Bromomethane
Carbon Tetrachloride
Chlorobenzene
2-Chloro-1,3-butadiene
Chlorodibromomethane
Chloroethane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
3-Chloropropene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
Dibromomethane
Trans-1,4-Dichloro-2-butene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
Cis/Trans-1,2-Dichloroethene
1,2-Dichloropropane
Trans-1,3-Dichloropropene
cis-1,3-Dichloropropene
Iodomethane
Methylene chloride
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Tribromomethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichloromonofluoromethane
1,2,3-Trichloropropane
Vinyl chloride

(2) Semi-Volatiles

Bis(2-chloroethoxy)ethane
Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether
p-Chloroaniline
Chlorobenzilate
p-Chloro-m-cresol
2-Chloronaphthalene
2-Chlorophenol
3-Chloropropionitrile
m-Dichlorobenzene
o-Dichlorobenzene
p-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
2,6-Dichlorophenol
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Hexachloropropene
Hexachloropropene
4,4'-Methylenebis(2-chloroaniline)
Pentachlorobenzene
Pentachloroethane
Pentachloronitrobenzene
Pentachlorophenol
Pronamide
1,2,4,5-Tetrachlorobenzene
2,3,4,6-Tetrachlorophenol
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
Tris(2,3-dibromopropyl)phosphate

(3) Organochlorine Pesticides

Aldrin
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
Chlordane
DDD
DDE
DDT
Dieldrin
Endosulfan I
Endosulfan II
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Isodrin
Kepone
Methoxychlor
Toxaphene

(4) Phenoxyacetic Acid Herbicides

2,4-Dichlorophenoxyacetic acid
Silvex
2,4,5-T

(5) PCBs

Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

(6) Oak Ridge National Laboratory Analytical Chemistry Division, Method No. AC-MM-2-0972 (Draft).

(7) U.S. Department of Energy Survey Manual DOE/EH-0053, August 1987 Appendix D, Gamma Spectroscopy P.D. 518.

TABLE 1-2

DRUM INVENTORY AND SAMPLING PLAN

Description	Date Mixed	Batch No.	Inventory		Sampling Date
207 A/B (Series) Sludges @ 20% Solids	3/17/92	Batch #3	2 cylinders	1 Plastic Molds	NS
				1 Plastic Bag	NS
		Batch #5	4 cylinders	3 Plastic Molds	April 1994
				1 Plastic Bag	NS
207C Water	4/2/92	Batch 1A	1 cylinder	Plastic Bag	NS
		Batch 2A	1 cylinder	Plastic Molds	April 1994
		Batch 4A	1 cylinder	Plastic Molds	April 1994
		Batch 2B	1 cylinder	Plastic Molds	April 1994
207C A/B (Series) Sludges @ 20% Solids	3/18/92	Batch 6A	6 cylinders	5 Plastic Molds	April 1995 - 3 Plastic Molds
				1 Plastic Bag	NS
		Batch 7A	2 cylinders	2 Plastic Molds	NS
207C/Clarifier Material (Combined)	4/6/92	Batch 1AC	1 cylinder	Plastic Molds	April 1995
		Batch 2AC	1 cylinder	Plastic Molds	April 1995
		Batch 3AC	1 cylinder	Plastic Molds	April 1995
		Batch 4AC	1 cylinder	Plastic Bag	NS
		Batch 5AC	1 cylinder	Plastic Bag	NS
207 A/B (Series) Sludges @ 10% Solids	4/8/92	Batch 1TA	1 cylinder	Plastic Molds	April 1996
		Batch 2TA	1 cylinder	Plastic Molds	April 1996
		Batch 4TA	1 cylinder	Plastic Molds	April 1996
		Batch 5TA	1 cylinder	Plastic Molds	NS
207C 10% Solids	4/3/92	Batch 1B	1 cylinder	Plastic Molds	April 1996
		Batch 2B	1 cylinder	Plastic Molds	April 1996
		Batch 3B	2 cylinder	Plastic Molds	April 1996 - 1 Plastic Mold

TABLE 1-2
 DRUM INVENTORY AND SAMPLING PLAN
 PAGE 2

Description	Date Mixed	Batch No.	Inventory	Sampling Date
207 A/B (Series) Sludges @ 15% Solids	4/9/92	Batch 1TB	1 cylinder Plastic Molds	NS
		Batch 2TB	1 cylinder Plastic Molds	April 1997
		Batch 4TB	1 cylinder Plastic Molds	April 1997
		Batch 5TB	1 cylinder Plastic Molds	April 1997
207C 15% Solids	4/3/92	Batch 1A	1 cylinder Plastic Molds	April 1997
		Batch 3A	1 cylinder Plastic Molds	April 1997
207 A/B (Series) Sludges @ 25% Solids	4/9/92	Batch 1TD	1 cylinder Plastic Molds	April 1998
		Batch 2TD	1 cylinder Plastic Molds	April 1998
		Batch 4TD	1 cylinder Plastic Molds	April 1998
		Batch 5TD	1 cylinder Plastic Molds	NS
207C 5% Solids	4/3/92	Batch 1C	1 cylinder Plastic Molds	April 1998
		Batch 3C	1 cylinder Plastic Molds	April 1998
207C Water and Solids with Latex 2000 Additive	4/3/92	Batch 1D	1 cylinder Plastic Molds	April 1999
		Batch 2D	1 cylinder Plastic Molds	April 1999
		Batch 4D	1 cylinder Plastic Molds	April 1999
		Batch 5D	1 cylinder Plastic Molds	NS
207C Water and Superplasticizer	5/13/92	Batch 2B	5 cylinders Plastic Molds	April 1999 - 3 Plastic Molds
		Batch 3B	5 cylinders Plastic Molds	NS
207C Water with Latex 2000 Additive	4/2/92	Batch 2	1 cylinder Plastic Molds	April 2000
		Batch 3	1 cylinder Plastic Molds	April 2000
		Batch 4	1 cylinder Plastic Molds	April 2000
		Batch 5	1 cylinder Plastic Molds	NS

HILLBURN UNIONS
 TEL: 412-292-1404
 HP 25-93
 11:20 NO. 006 F. 00

TABLE 1-2
 DRUM INVENTORY AND SAMPLING PLAN
 PAGE 3

Description	Date Mixed	Batch No.	Inventory		Sampling Date
207C Water	6/6/92	Batch 1	1 cylinder	Plastic Molds	April 2000
		Batch 3	1 cylinder	Plastic Molds	April 2000
207C Water and Superplasticizer	5/13/92	Batch 2A	5 cylinders	Plastic Molds	NS
		Batch 3A	5 cylinders	Plastic Molds	April 2000 - 3 Plastic Molds
Control Cylinder - No Waste	6/1/92	Control	1 cylinder	Plastic Bag	NS

NS: No sampling scheduled.

HALLIBURTON NO. 1
 TEL: 412-291-1404
 11/29/93 11:29 AM 000 F.07