308 - - - Q200507140003
Scientific Notebook No. 696: Radionuclide Transport (RT) Key Technical Issues - Continuation of Scientific Notebook No. 653 (02/18/2005 through 06/06/2005)

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

696 - RT

CNWRA
CONTROLLED

COPY 696

Radionuclide Transport < SZ 20.06002.01.242
UZ 20.06002.01.232

Issued to Bradley Werling

210-522-6565

17 Feb 2005

INVESTIGATOR	SIGNATURE	INITIALS
Bradley Werling	Bradley Werling	BAW
Jon Brown	[illegible]	JB
Marla Roberts	Marla Roberts	MR

6-6-05 BW

This notebook contains work for Radionuclide Transport (RT) in both the saturated zone and unsaturated zone. RT is concerned with identification of key geochemical processes that may control radionuclide transport at Yucca Mountain. Radionuclide retardation is dependent on the hydrochemistry and mineralogy along the groundwater flow paths from the proposed repository. Typical activities associated with these investigations would include conducting laboratory batch sorption experiments, collecting field samples, and analyses of field samples.

Current experimental activities are focused on laboratory batch sorption experiments that incorporate materials (groundwater and sonic corings) from the Yucca Mountain region. The objective for a sorption experiment is to determine the sorption capability (Kd or sorption coefficient) for a particular radionuclide, solid material, and solution typically over a range of pH values. Tasks typically include the following:

- Preparation of reference solutions.
- Cation (Div 01), inorganic carbon (CNWRA) and pH analyses (CNWRA) of reference solutions.
- Preparation of experimental solutions
- Liquid Scintillation Analyses (CNWRA) of experimental solutions.

Further details of these tasks are recorded in initial and in-process entries.

This scientific notebook (SN) is a continuation of SN 653. That notebook concludes with the preparation of stock solutions that will be used to prepare NC-EWDP-19PB shallow string simulated groundwater.

18 FEB 2005 BAW

Preparation of 19PB shallow string simulated groundwater with calcium

Bradley Werling will prepare the simulated groundwater

Objective
To prepare simulated groundwater that can be used for sorption experiments. This is intended to provide an essentially endless supply of solution for sorption experiments that matches the groundwater of 19PB shallow string.

Proposed approach
The procedure will follow TOP-010 (Technical Operating Procedure for Preparing Simulated J-13 Water and its Modifications) with some modifications.

Equipment
2 L volumetric flask
500mL volumetric flask
20L LDPE carboy
Glass funnel
100mL beaker
Disposable pipet

Samples/Reagents
19PB stock solution A (653/197) BW 2-18-05
19PB stock solution B (653/196)
19PB stock solution D (653/199)
Type 1 water

Analyses
Cation and Anion analyses by SwRI Division 01.

Simulated groundwater will include Si from Soln D (653/199).

16 liters (via 2L volumetric flask) of type 1 water was added to the 20L carboy. 500 mL (vol flask w/ funnel) of stock soln A was collected. Taken to mark with disposable beaker + pipet. 500 mL transfered to 20L carboy. Similarly, 500 mL of stock soln B was added to carboy. Same process for stock solution D. The same 500 mL vol flask was used for all

18 FEB 2005 cont BAW

three transfers. This 500 mL flask was filled to mark with type 1 water and transfered to carboy (total 18L now). Carboy ~~swirl~~ BW 2-18-05 swirled by hand. Final 2 L added by vol flask (2L). Total volume 20L for a 40 fold dilution of each 500 mL stock solution. Labeled 19PB simulated water with Cr.

18 Feb 2005 cont

Creation of QA for anion and cation

A cation and anion QA was made to be sent out for analysis with simulated groundwater (696/2-3). 10 ml of Spex CertiPrep IC Instrument Check Standard 2 (Lot # 28-138AS, Cat ICMIX2-100) was transfered into a 1000 ml volumetric flask with ~~an~~ a volumetric pipett, and filled to the line with type 1 water to make Anion QA. 2-18-05 To make the cation QA, 10 ml of Instrument Calibration Standard 3 (lot # 12-71MS, Cat# CL-CAL-3) was transfered into a 1000 ml volumetric flask with a 10 ml volumetric pipet. 2-18-05

18 Feb 05 cont. [illegible]

Sample Identification

The three samples taken for Anion analysis were transfered into 125 ml (PP) containers. The three samples taken for cation analysis were transfered into 60 ml (PP) bottles. Samples labeled and ID ~~[illegible]~~ 2/18/05 [illegible] labled below.

Sample	Sample ID
Simulated Ground Water*	19PBS-C1
Simulated Ground Water*	19PBS-C2
QA Cation Standard (696/3)	19PBS-C3
Simulated Ground Water*	19PBS-A1
Simulated Ground Water*	19PBS-A2
QA Anion Standard (696/3)	19PBS-A3

* Simulated ground water from 696/2-3

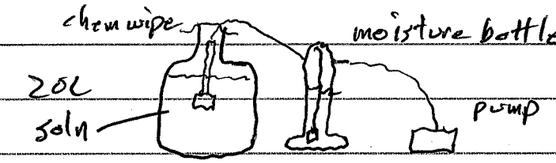
QA Cation and Anion samples taken on Feb. 18, 05
Simulated ground water samples taken on Feb. 21, 05
21 Feb 05 [illegible]
Concentration of QA standards recorded on 696/6.

2/21/05 [illegible]

21 Feb 2005 BAW

Aerated 19PB simulated ground water with Ca (696/3).

Inserted glass gas dispersion tube into 20L with "moisture bottle" between pump. Placed chem wipe over top of 20L soln.



Started aeration - 0930
Ended aeration - 1310

Sampling for Div01 Anion + Cation Analyses of 19PB simulated shallow string water w/ Calcium

Sample - 19PB simulated water w/ Ca (696/2-3)
Sample aliquot removed at 1335.
Approximately 400mL of water sample was poured into a 1000mL glass beaker. Aliquots poured into pp bottles (see 696/4).
6 total samples - 3 anion (2gw + 1QA) and
3 cation (2gw + 1QA)
Chain of Custodies on following pages (696/7-8)

21 Feb. 05 cont. JB

Cation - Anion QA sample concentration

The QA cation standard (696/3-4) labled 19PBS-C3 has a concentration of 10 mg/L of Fe, K, Ca, Na, Mg. The QA anion standard (696/3-4) labled 19PBS-A3 has the folowing concentrations 6 mg/L of HPO_4^{-2}, 4 mg/L of Br, NO_3^-, and SO_4^{-2}, 2 mg/L of Cl^-, and 1 mg/L of F^-.

2/21/05 JB

21 Feb. 05 cont. JB

SAMPLE LIST/CHAIN OF CUSTODY
Southwest Research Institute®
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client Purchase Order/Other ID: Site/Zone ID:

Shipper Name/Address: Bradley Working CNWRA - Div 20 Bldg 57

Client:

Requested Turnaround: ☐ 2 Weeks ☐ 3 Weeks ☒ Other: 4 weeks

SwRI Contact: Mike Richmann

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analyses Requested: Si, Ca, Mg, Na, K, Sr
19PBS-L1	2/21/05		L		–	✓
19PBS-C2					–	
19PBS-C3	✓		✓		–	✓

Preservation: a = HCl to pH <2; b = HNO_3 to pH <2; c = H_2SO_4 to pH <2; d = NaOH to pH >12; e = Cool (4°C±2°C); f = Other (specify): None

REMARKS: Nuclear Safety related use; appropriate QA procedures

PO - Based Hiring X 65765 Fax 5184

1.262.0600.01.242

Matrix Types: A – Air; B – Biota; D - Dust; E – Emission/Stack; L - Liquid; P – Product; Sd - Solid; S – Soil; SED – Sediment; T - Tissue; W - Water; WP - Wipe

Sample Types: D - Duplicate; ER – Equipment Rinsate; ES – Environmental Sample; FB – Field Blank; FD – Field Duplicate; MS – Matrix Spike; MSD – Matrix Spike Dup; TB – Trip Blank

Temp: 22.0°C Therm #: 27

Comments: 696/2-4

Relinquished by (Print/Signature)	Date	Time
X Scott Barton	2/21/05	2:45 pm

Received by (Print/Signature)	Date	Time

Relinquished by (Print/Signature)	Date	Time

Received by (Print/Signature)	Date	Time

Relinquished by (Print/Signature)	Date	Time

Received by (Print/Signature)	Date	Time

SwRI Project#:

Received by SwRI Lab: (Signature) Date 2/21/05 Time 1:45

Samples Disposed: Date Time

Samples Disposed by:

Page 1 of 1

Div 01 COC Form 01-01-001, Rev 8/02

21 Feb. 05 cont. BB

SAMPLE LIST/CHAIN OF CUSTODY
Southwest Research Institute®
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Client: Bradley Werling CNWRA - Div 20 Bldg. 57

Shipper Name/Address:

Site/Zone ID:

Client Purchase Order/Other ID:

Requested Turnaround: ☐ 2 Weeks ☐ 3 Weeks ☒ Other: 4 weeks

SwRI Contact: Mike Ringman

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Anions by IC except Phosphates	Phosphates by 365.3
19PBS-A1	2/21/05		W		—	x	x
19PBS-A2					—	x	x
19PBS-A3					—	x	x

Analyses Requested

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety related - use appropriate QA procedures

POC - Brad Werling x6565 Fax 31484

Matrix Types:
A - Air
B - Biota
D - Dust
E - Emission/Stack
L - Liquid
P - Product
Sd - Solid
S - Soil
SED - Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER - Equipment Rinsate
ES - Environmental Sample
FB - Field Blank
FD - Field Duplicate
MS - Matrix Spike
MSD - Matrix Spike Dup
TB - Trip Blank

Temp: 22.0°C
Therm #: 07
Comments: 696/a-4

		Date	Time
Relinquished by (Print/Signature)	x [signature]	2/21/05	2:45 pm
Received by (Print/Signature)	[signature]	2/21/05	
Relinquished by (Print/Signature)	[signature]		
Received by (Print/Signature)			
Relinquished by (Print/Signature)			
Received by (Print/Signature)			
Relinquished by (Print/Signature)			
Received by (Print/Signature)			
Relinquished by (Print/Signature)			
Received by (Print/Signature)			
Relinquished by (Print/Signature)			
Received by (Print/Signature)			

SwRI Project#: 11.20.06002.01.234

Received by SwRI Lab (Signature): [signature] 2-23-05

Date: 2/21/05 Time: 1445

Samples Disposed: Date: Time:

Samples Disposed by:

Page 1 of 1

Div 01 COC Form 01-01-001, Rev 8/02

22 FEB 05 BAW

Aeration of 19PB simulated ground water with Cg

Sample - 696-3
Procedure 696/5
Time started 0955
Time finished 1625

23 FEB 05 BAW

Aeration of 19PB simulated ground water with Cg

Sample - 696/3 Procedure 696/5
Time started - 1330 Time finished - 1705

2-22-05 BAW

23 FEB 2005 CONT BAW

Stock Solutions Preparation for 19PB Shallow String Simulated Water Without Calcium.

Objective: To prepare stock solutions used to make simulated water (without calcium) based on the NC-EWDP-19PB shallow string for use in sorption experiments.

Bradley Werling will prepare the stock solutions.

TOP-010 (Technical Operating Procedure for Preparing Simulated J-13 Water and its Modifications) will be used with some modifications. The amounts and types of compounds used to prepare the simulated water will reflect the composition of 19PB shallow water. The target concentrations for the 19PB shallow simulated water were based on the results of analyses performed on 19PB shallow water samples collected by CNWRA personnel. References for the sample results are as follows: 628/128, 628/197-198, 653/37-48, and 653/67-80. Table 1 contains the target chemical composition (limited to major constituents) of 19PB shallow string well water. Stock solutions are diluted 40 fold in order to prepare the simulated water. Based on a dilution factor of 40, the target chemical composition of the stock solutions are contained in Table 2. Three 1 liter stock solutions will be used to prepare the simulated water. Stock solution D has already been made (653/199) and contains only sodium silicate. Stock solution B has already been made (653/196) and contains potassium fluoride and sodium bicarbonate. Stock solution E will contain all of the remaining compounds. Table 3 contains the masses of each compound to be used for preparing the stock solutions. The masses of the compounds used to prepare the stock solutions will be recoreded and samples from the simulated 19PB water prepared from these stock solutions will be sent to Division 01 for anion and cation analyses in order to assess the actual concentration of species in solution.

TABLE 1: Target chemical composition of major constituents for NC-EWDP-19PB shallow string well water (no calcium)

Species	Shallow Target Conc mg/L
Magnesium	1.3
Potassium	3.6
Silicon	20
Sodium	52
Chloride	7
Fluoride	1.8
Nitrate	3
Sulfate	29
HCO3	143

23 FEB 05 CONT BAW

Table 2: Target chemical composition of stock solutions (based on a dilution factor of 40) for preparing 19PB shallow string simulated water without calcium

Species	Target Conc (mg/L) in stock solution
Magnesium	52
Potassium	144
Silicon	800
Sodium	2080
Chloride	280
Fluoride	72
Nitrate	120
Sulfate	1160
HCO3	5720

Table 3: Mass (g) of compounds used to make stock solutions for preparing 19PB shallow string simulated water without calcium.

Compound	19PB Shallow Mass (g) of compound for 1L of stock soln
NaHCO3	7.89694
KF*2H2O	0.28926
NaNO3	0.16148
Na2SO4*10H2O	3.86628
MgCL2*6H2O	0.40662
NaCl	0.46168
Na2SiO3*9H2O	4.8598

Preparation of Stock Solution E

Equipment

Mettler AE240 Balance SN 101237

1000 mL Beaker

23 FEB 2005 CONT BW

1000mL vol flask
Weigh boat
Glass funnel
Stir bar
Stir plate

Challenge of Balance (Target 20.0001g)
At start = 20.0002g
Afterwards = 20.0002g

Typer I water
NaCl - Fisher S271-500 lot 042966
$MgCl_2 \cdot 6H_2O$ - Fisher M33-500 lot 006854
$NaNO_3$ - Fisher S343-500 lot 035600
$Na_2SO_4 \cdot 10H_2O$ - Fisher S419-500 lot 044603

Masses used (g)
Sodium chloride = 0.4612
Magnessium chloride = 0.4088
Sodium nitrate = 0.1649
Sodium sulfate = 3.8865

Compounds individually added to tared weigh boats. Transferred to 1000mL beaker with 700mL of typeI water. Rinsed weigh boats with typeI water, rinsate added to ~~20~~ BW 23-11-05 1000mL beaker. Stirred on stir plate until

23 FEB 2005 CONT BW

everything dissolved (~10 min). Transferred into 1000mL vol flask. Beaker rinsed with rinsate added to vol flask. Diluted to mark with typeI water. Labeled 19PB Stock Soln E.

Preparation of 19PB Shallow String Simulated Groundwater Without Calcium

Bradley Werling will prepare the simulated groundwater

Objective
To prepare simulated groundwater that can be used for sorption experiments. This is intended to provide an essentially endless supply of solution for sorption experiments that matches the groundwater of 19PB shallow string (without calcium).

Proposed approach
The procedure will follow TOP-010 (Technical Operating Procedure for Preparing Simulated J-13 Water and its Modifications) with some modifications.

Equipment
2 L volumetric flask
1 L volumetric flask
500mL volumetric flask
20L LDPE carboy
Glass funnel
100mL beaker
Disposable pipet

Samples/Reagents
19PB stock solution E (696/11)
19PB stock solution B (653/196)
19PB stock solution D (653/199)
Type 1 water

Analyses
Cation and Anion analyses by SwRI Division 01.

8 Liters (2L vol flask) of typeI water was added to the 20L carboy. 250mL (vol flask - funnel - 100mL beaker + pipet to top off to mark)

23 FEB 2005 ~~CONT~~ BAW

of 19PB stock Soln B was transferred into carboy, similarly, 250mL of 19PB stock solution D was added. Same process for 19PB stock solution E. The same 250mL vol flask was used for all three transfers. This 250mL vol flask was filled to mark w/ typel water and transfered to carboy (total 9L now). Final 1L added via 1000mL vol flask. Total volume 10L for a forty fold dilution of each 250mL stock solution. Labeled 19PB simulated water without Ca.

24 FEB 2005 ~~CONT~~ BW 2-24-05 BAW

Aeration of 19PB simulated waters

Samples: 696/3 and 696/14
Procedure: 696/5
Time started: 0945
Time ended: left to run overnight.

24 FEB 05 BW

25 FEB 2005 BAW

Inorganic Carbon Analyses of simulated 19PB groundwaters

Objective: To characterize the simulated 19PB groundwaters that will be used for sorption experiments
Bradley Werling will perform the analyses

Equipment:
Tekmar Dohrmann Phoenix 8000 TOC analyzer (SN 00343010).
40mL amber glass vials
Reagents/Samples
Type I nanopure water
Inorganic Carbon calibration curve stds 631/49-51
Sodium Persulfate Solution 631/52
21% Phosphoric Acid Solution 631/52-3
Simulated 19PB shallow string with calcium 696/2 (+14)
Simulated 19PB shallow string without calcium 696/10 (+14)
Analyses performed on two simulated groundwater samples following instructions from the user manual. Samples transferred into 40mL amber glass vials with minimal headspace. IC standards removed from refridgerator and allowed to warmup before transfer to 40mL vials. The instrument method used was IC 20-200ppm (std default - not custom)

25 FEB 2005 CONT BAW

IC cal pts were 0, 1, 5, 10, 50, 100, and 200 ppm. Stds and samples run in triplicate (single vial). Blanks and cleaning procedures were run for six reps. A blank std was run after the samples and before a 10ppm std (cal check).

Sampling (Sample Collection) of simulated 19PB groundwaters for pH, cation, anion, and inorganic carbon analyses

Objective: to characterize the simulated 19PB groundwaters that will be used for the sorption experiments

Bradley Werling and Jon Brown performed sampling

Equipment:

- 40 mL amber glass vials
- 1000 mL beakers
- 60 mL pp bottles
- 125 mL pp bottles

Samples

- 19PB simulated water without Ca (696/14)
- 19PB simulated water with Ca (696/3+14)

Initial pH sampling for both samples

Initial IC sampling for both samples

Initial cation/anion sample for w/o CA

Reanalysis cation/anion sample for w/ CA.

25 FEB 2005 CONT BAW

Initial ~~and~~ BW 2-25-05 sampling 696/5-8. Re-sampled to provide QA style sample for comparison between results.

~~Aloquots~~ BW 2-25-05 Aliquots ~~proc.~~ BW 2-25-05 poured from carboy into 1000 mL ~~vol flask~~ BW 2-25-05 glass beaker. Individual samples were collected from 1000 mL glass beaker. pH samples were collected in 40 mL vial, IC samples were collected in 40 mL vial. Cation samples were collected in 60 mL pp bottle. Anion samples were collected in 125 mL pp bottle. IC samples immediately added to TOC sampling rack and analyzed (696/15+16). pH samples were immediately analyzed (696/18+19). Cation + Anion samples were labeled and stored in refridgerator for delivery to Div01 on Monday, 28 Feb. Below is legend for labling (C=cation, A=anion) 2 for w/o CA and 1 w/ CA

Sample	Sample ID
19PB simulated w/o CA	19PBS-C4
19PB simulated w/o CA	19PBS-C5
19PB simulated w CA	19PBS-C6
19PB simulated w/o CA	19PBS-A4
19PB simulated w/o CA	19PBS-A5
19PB simulated w CA	19PBS-A6

25 FEB 2005 CONT BAW

pH Analyses of simulated 19PB groundwaters

Objective: To characterize the simulated 19PB groundwaters that will be used for sorption experiments.

Bradley Werling will perform the analyses

Equipment
- Orion meter model 920A SN 039518
- Thermo Orion probe model 81-03 BN (36)
- 10 mL microbeakers
- Stir bars
- Stir plate

Reagents/Samples
- pH 7 buffer - Fisher SB108 lot#041088
- pH 9 buffer - Fisher SB114 lot# 035763
- pH 10 buffer - Fisher SB116 lot# 044060
- 19PB simulated water without Ca (696/16-17)
- 19PB simulated water with Ca (696/16-17)

Calibrated with pH 7 and 10 (Temp = 18°C)
- Setpts 7.02 and 10.07
- Slope = 99.3% (acceptable range 92-102% from p5 of Orion Ross pH Electrode instruction manual - 2003)

25 FEB 2005 CONT BAW

pH of 19PB simulated water without Ca = 8.82
pH of 19PB simulated water with Ca = 9.43
Challenge w pH 9 was 9.08.

For analyses, BW 2-25-05 ~~Samp~~ samples transferred into 10 mL microbeaker w/ stirbar and placed on stir plate.

27 FEB 2005 BAW

Results of Inorganic Carbon (IC) Analyses of 19PB simulated water - shallow string

Analyses documented on 696/15+16
Analyses from raw data is stored in PRN files. PRN files contain 39 columns of information. The legend for the contents of the 39 columns may be found on 696/20 Table 1. Sample IDs are found in column 8. Raw data area counts are found in column 30. The printout of the PRN file follows the legend in Table 1

2-27-05
~~2-25-05~~
BW 2-27-05
BW

27 FEB 05 CONT BAW

Table 1. Information contained in the PRN file

Information potentially subject to copyright protection was redacted from this location. The redacted material was a table (see above) from the reference information listed below.

Source: Tekmar Dohrmann Phoenix 8000 User Manual
7143 East Kemper Road, Cincinnati, Ohio
Document Part Number 14-7045-074 Rev C, 1998

27 FEB 05 CONT BAW

IC analyses of 19PB ~~[illegible]~~ BW 2-27-05 simulated groundwater shallow string PRN data file contents

1	2	3	4	5	6	7	8	9
~~v2.0	3	1	Done	0	2/25/2005 13:09	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:12	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:15	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:19	USER1	1 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:22	USER1	1 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:25	USER1	1 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:29	USER1	5 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:33	USER1	5 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:36	USER1	5 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:40	USER1	10 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:44	USER1	10 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:47	USER1	10 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:52	USER1	50 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 13:56	USER1	50 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:00	USER1	50 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:05	USER1	100 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:09	USER1	100 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:13	USER1	100 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:18	USER1	200 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:23	USER1	200 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	2/25/2005 14:27	USER1	200 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	10	1	Done	0	2/25/2005 14:30	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	2/25/2005 14:32	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	2/25/2005 14:35	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	2/25/2005 14:37	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	2/25/2005 14:39	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	2/25/2005 14:42	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	0	1	Done	0	2/25/2005 14:46	USER1	19PB w Ca	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 14:50	USER1	19PB w Ca	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 14:54	USER1	19PB w Ca	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 14:58	USER1	19PB wo Ca	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:02	USER1	19PB wo Ca	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:06	USER1	19PB wo Ca	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:09	USER1	IC 0 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:12	USER1	IC 0 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:15	USER1	IC 0 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:19	USER1	IC 10 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:23	USER1	IC 10 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	2/25/2005 15:27	USER1	IC 10 ppm	IC Range 20 - 200 ppm C

2-27-05 BW

27 FEB 05 CONT BW

IC analyses of 19PB simulated groundwater shallow string PRN data file contents

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
IC 20ppm up	2	2	3	1	2	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.39	5.385	63
IC 20ppm up	2	2	3	2	2	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.391	5.39	65
IC 20ppm up	2	2	3	3	2	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.457	5.451	65
IC 20ppm up	2	2	3	1	3	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.418	5.412	79
IC 20ppm up	2	2	3	2	3	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.454	5.453	78
IC 20ppm up	2	2	3	3	3	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.472	5.47	78
IC 20ppm up	2	2	3	1	4	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.458	5.452	95
IC 20ppm up	2	2	3	2	4	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.501	5.494	95
IC 20ppm up	2	2	3	3	4	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.52	5.513	95
IC 20ppm up	2	2	3	1	5	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.497	5.497	105
IC 20ppm up	2	2	3	2	5	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.517	5.509	104
IC 20ppm up	2	2	3	3	5	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.53	5.525	104
IC 20ppm up	2	2	3	1	6	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.497	5.494	129
IC 20ppm up	2	2	3	2	6	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.607	5.604	127
IC 20ppm up	2	2	3	3	6	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.654	5.653	127
IC 20ppm up	2	2	3	1	7	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.622	5.618	143
IC 20ppm up	2	2	3	2	7	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.815	5.812	140
IC 20ppm up	2	2	3	3	7	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.855	5.851	138
IC 20ppm up	2	2	3	1	8	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.812	5.81	166
IC 20ppm up	2	2	3	2	8	22505	0.5	0	0	5	0	0.5	0	10	0	1	5.075	6.072	159
IC 20ppm up	2	2	3	3	8	22505	0.5	0	0	5	0	0.5	0	10	0	1	5.125	6.123	158
IC 20ppm up	2	2	6	1	1001	22505	0	0	0	5	0	0.5	0	10	0	0.5	5.051	5.548	64
IC 20ppm up	2	2	6	2	1001	22505	0	0	0	5	0	0.5	0	10	0	0.5	4.692	5.188	68
IC 20ppm up	2	2	6	3	1001	22505	0	0	0	5	0	0.5	0	10	0	0.5	4.613	5.112	70
IC 20ppm up	2	2	6	4	1001	22505	0	0	0	5	0	0.5	0	10	0	0.5	4.596	5.094	70
IC 20ppm up	2	2	6	5	1001	22505	0	0	0	5	0	0.5	0	10	0	0.5	4.612	5.109	70
IC 20ppm up	2	2	6	6	1001	22505	0	0	0	5	0	0.5	0	10	0	0.5	4.625	5.125	70
IC 20ppm up	2	2	3	1	9	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.591	5.586	121
IC 20ppm up	2	2	3	2	9	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.652	5.647	120
IC 20ppm up	2	2	3	3	9	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.678	5.675	118
IC 20ppm up	2	2	3	1	10	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.662	5.658	123
IC 20ppm up	2	2	3	2	10	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.756	5.753	122
IC 20ppm up	2	2	3	3	10	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.748	5.747	122
IC 20ppm up	2	2	3	1	11	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.71	5.705	65
IC 20ppm up	2	2	3	2	11	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.613	5.609	67
IC 20ppm up	2	2	3	3	11	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.592	5.587	67
IC 20ppm up	2	2	3	1	12	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.555	5.552	104
IC 20ppm up	2	2	3	2	12	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.6	5.597	103
IC 20ppm up	2	2	3	3	12	22505	0.5	0	0	5	0	0.5	0	10	0	1	4.647	5.644	102

2-27-05 BAW

27 FEB 05 CONT BW

IC analyses of 19PB simulated groundwater shallow string PRN data file contents

30	31	32	33	34	35	36	37	38	39
66354	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251307
72055	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251310
71094	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251313
208289	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251317
197311	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251320
195932	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251323
723074	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251327
732178	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251330
746367	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251334
1419403	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251338
1418407	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251341
1439688	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251345
6831734	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251349
6934258	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251353
6949233	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251357
13935965	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251401
14296953	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251406
14139241	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251410
30045900	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251415
29976932	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251419
29871876	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251424
114921	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251429
74227	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251431
68555	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251433
69581	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251436
71263	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251438
74109	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	2251254	2251440
4117154	15.0425	30.0851	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251443
4129532	15.0886	30.1771	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251447
4118876	15.0489	30.0979	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251451
5118050	18.7642	37.5284	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251455
5185833	19.0162	38.0325	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251459
5157873	18.9123	37.8245	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251503
108235	0.136	0.2721	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251508
93740	0.0821	0.1643	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251510
93717	0.082	0.1641	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251513
1433620	5.0643	10.1285	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251517
1445727	5.1093	10.2185	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251521
1434127	5.0661	10.1323	71651	2.69E+05	6/24/2003 14:48	0.99993	129934	2251254	2251524

2-27-05 BAW

27 FEB 2005 CONT BAW

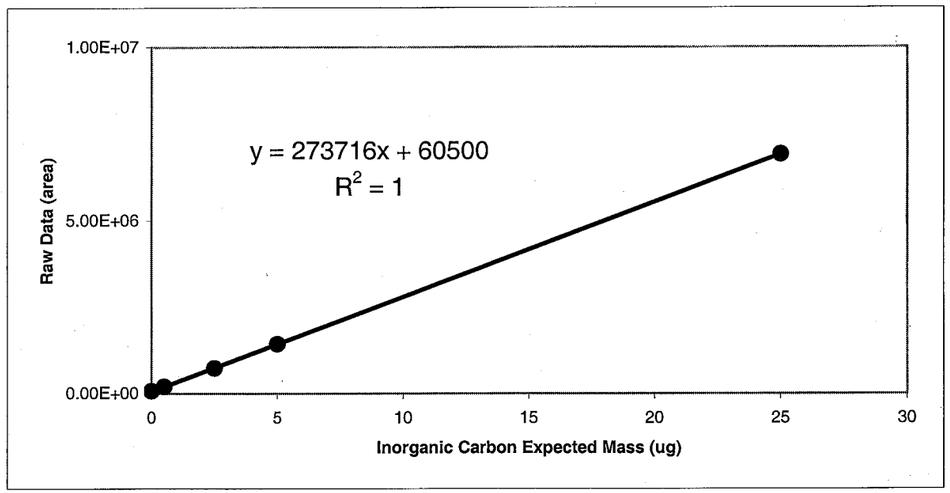
Inorganic Carbon (IC) Analysis
19PB Simulated Groundwater Shallow String
Method 20 ppm to 200 ppm IC (standard method)
Calibration Curve range 1 ppm to 200 ppm IC

IC Standard Data

IC Std (ppm)	IC expected mass (ug)	Raw Data rep 1	rep 2	rep 3	Raw Data Ave
0	0	66354	72055	71094	69834
1	0.5	208289	197311	195932	200511
5	2.5	723074	732178	746367	733873
10	5	1419403	1418407	1439688	1425833
50	25	6831734	6934258	6949233	6905075
100*	50	13935965	14296953	14139241	14124053
200*	100	30045900	29976932	29871876	29964903
Blank (last 3)	na	69581	71263	74109	71651

* 100 and 200 ppm not used since no sample ppm was greater than 50ppm

IC Calibration Curve



IC Sample Data

Sample ID	Raw Data rep 1	rep 2	rep 3	Raw Data Ave	mass # (ug) IC	conc (ppm)
19PB with calcium	4117154	4129532	4118876	4121854	14.83783922	29.7
19PB wo calcium	5118050	5185833	5157873	5153919	18.60840677	37.2
10 ppm IC std	1433620	1445727	1434127	1437825	5.031947956	10.1

\# Using calibration y intercept in calculation
* Calculated by dividing the mass by the volume of sample (0.5mL)

2-27-05 BAW

27 FEB 2005 CONT BAW

Six blank reps were run between the last cal curve pt (200 ppm IC) and the first sample analyses. The 0 ppm IC stds were analyzed between last sample and the 10 ppm IC calibration verification. The values of the blanks (~70,000) and the y-intercept (60,500) were similar. R^2 on curve was solid. Slope similar value to previous analyses (653/117 and 628/153). Calibration verification of 10 ppm IC came in at a solid 10.1 ppm.

28 FEB 05 BAW

Delivery of 19PB Simulated Water to Div01 for Anion + Cation Analyses

Sampling: 696/16-17
3 cation + 3 anion samples
QAs were reanalyses of 19PB with calcium.
~~to~~ BW 2-28-05
Chain of Custody on following pages.

2-28-05 BAW

26

28 FEB 05 CONT BAW

Shipper Name/Address: BRADLEY WERLING
CNWRA - DIV 20
BLD - 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute®
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Requested Turnaround:
☐ 2 Weeks
☐ 3 Weeks
☒ Other: 4 weeks

Client Purchase Order/Other ID:
Site/Zone ID:
SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Anions by IC except phosphate	Phosphate by 365.3 BW 2-7-05 365.3									
19PBS-A4	2-25-05		W		1	X	X									
19PBS-A5	↓		↓		↓	X	X									
19PBS-A6	↓		↓		↓	X	X									

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety Related - use appropriate QA procedures

POC. Brad Werling x6565 fax 5184

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
L - Liquid
P – Product
Sd - Solid
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 5.0°C
Therm #: 027

Comments:
696/1627 Rec'd Intact

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling	2-28-05	0930
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 1.20.06002.01.232
Received by SwRI Lab: (Signature)
Date: 2/28/05 Time: 0930
Samples Disposed: Date / Time
Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page 1 of 1

28 FEB 05 CONT BAW

Shipper Name/Address: BRADLEY WERLING
CNWRA - DIV 20
BLD 57

Client:

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute®
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Requested Turnaround:
☐ 2 Weeks
☐ 3 Weeks
☒ Other: 4 weeks

Client Purchase Order/Other ID:
Site/Zone ID:
SwRI Contact: Mike Dammann

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Si, Ca, Mg, Na, K, Sr										
19PBS-C4	2-25-05		W		1	X										
19PBS-C5	↓		↓		↓	X										
19PBS-C6	↓		↓		↓	X										

REMARKS
Preservation
a = HCl to pH <2
b = HNO_3 to pH <2
c = H_2SO_4 to pH <2
d = NaOH to pH >12
e = Cool (4°C±2°C)
f = Other (specify) none

Nuclear Safety Related - use appropriate QA procedures

POC - Brad Werling x6565 fax 5184

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
L - Liquid
P – Product
Sd - Solid
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 5.0°C
Therm #: 027

Comments:
696/2627 Rec'd Intact

Relinquished by (Print/Signature)	Date	Time
Brad Werling / Brad Werling	2-28-05	0930
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 1.20.06002.01.242
Received by SwRI Lab: (Signature)
Date: 2/28/05 Time: 0930
Samples Disposed: Date / Time
Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page 1 of 1

27

28 FEB 05 CONT BAW

Aeration of Simulated 19PB Waters

Two Samples have been bubbling since 24 Feb 2005 (696/14). pH results from 696/18-19 sampled on 25 Feb 2005 indicate that CO_2 equilibrium with air has not occurred. Aeration will be increased, pH's will be periodically taken until satisfied CO_2-air equilibrium has been reached. Inorganic carbon analyses (696/19-25) will be ~~reanalys.~~ BW 2-28-05 performed again at that point.

A second pump and moisture bottle and gas dispersion tube (696/5) was added to each simulated ~~carboy~~ BW 2-28-05 water carboy (see 696/14)

Aeration of groundwater sample

Sample: NC-EWDP-19PB-SHAL-0504-F4A-3
5-11-04 628/128 1 Liter HDPE
Preparation for use in sorption experiments - groundwater sample from Yucca Mtn was bubbled to equilibrate CO_2 levels. For setup, see 696/5. Started aeration at

4 MAR 05 BAW

Preparation of Nitric Acid Solutions for use in Sorption Experiments

- 4N stock solution HNO_3 Acid
  Conc HNO_3 (16N) - Fisher trace metal grade
  Fisher A509-212 lot # 1100040
  Type I water.

  Filled 100 mL vol flask about half full with Type I water. Added 25 mL (vol pipet) of conc acid. Filled to mark with type I water. Labeled 4N HNO_3 stock soln.

- 0.1N HNO_3 - for pH adjustment of exp. solns
  4N HNO_3 stock soln (696/29)
  Type I water

  Filled 1000 mL vol flask with about 750 mL of type I water. Added 25 mL (vol pipet) of 4N HNO_3. Filled to mark with type I water. Labeled 0.1 HNO_3

- 0.02N HNO_3 - for acid matrix for LSA analyses
  4N HNO_3 stock soln (696/29)
  Type I water

4 MAR 05 CONT BAW

Filled 1000 mL vol flask with about 750 mL of type I water. Added 5 mL (vol pipet) of 4 N HNO_3 stock soln. Filled to mark with type I water. Labeled 0.02 N HNO_3

Preparation of 0.1 N NaOH solution for pH adjustment of experimental solutions

Target conc 0.1 N NaOH
Sodium Hydroxide dilut-it analytical concentrate
0.1 N - Baker 4687-01 lot H33121
Type I water

Filled 1000 mL vol flask about half full with Type I water. Placed provided funnel on dilute-it ampoule. Inverted and cut bottom of ampoule with provided plastic knife. Placed ampoule in neck of vol flask, cut tap part of ampoule and let contents flow into vol flask. Rinsed ampoule and let rinsate flow into flask. Filled flask to mark with type I water. Labeled 0.1 N NaOH.

7 MAR 05 BAW

Experimental Procedure - Np sorption on alluvium and montmorillonite (separately) from drillhole NC-EWDP-19PB over a range of pHs.

Bradley Werling will be performing the experiment identified as AL series 4 (alluvium) and M series 2 (montmorillonite)

Objective: To investigate Np sorption on alluvium and montmorillonite (separately) using groundwater from drillhole NC-EWDP-19PB adjusted to create a pH range of 6.5 to 9

Conditions:
- $\sum$Np = 200 ppb
- equilibrium with lab CO_2(g); $pCO_2 = 10^{-3.42}$
- solution volume = 30 ml
- mass of solid = 0.1 g
- M/V (g/L) = 3.33

Samples
- NC-EWDP-19PB-SHAL-0504-FUA-~~2~~ 3 BW 3-7-05 (filtered, unacidified groundwater – SN 628/128)
- Alluvium sample NC-EWDP-19PB 406.3 – 407.5 ft depth interval (< 35 mesh size fraction) – SN 628/37-43
- Montmorillonite (SAZ*Na*<2*FD*Scr) 061/94 BW 4-27-05

Reagents
Np spike 46A (60 ppm ^{237}Np stock solution; pH of 5.85)
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 041088)
pH buffer 10 (Fisher SB 116 lot # 044060)
Ultima-Gold AB liquid scintillation cocktail (Packard 6013309 lot # 91-2111)
0.1 M HNO_3 (SN 696/29)
0.02 M HNO_3 (SN 696/29-30)
0.1 M NaOH (SN 696/30)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
New Brunswick Scientific Gyratory shaker model G33 (sn 290127990)
Fisher Marathon 21K centrifuge model D7209 (sn 15930025)
Mettler AE240 balance (sn ~~001439~~) BW 5-19-05 101237
Packard Tricard 3100TR Liquid Scintillation Analyzer model B2505 (sn 405314)

Supplies:
Eppendorf micropipetters and tips
BW 3-7-05 ~~Oxford~~ pipettes and tips
Repipettor for transfer of scintillation cocktail
Polycarbonate centrifuge tubes with caps (50 ml capacity)
7 ml scintillation vials
Weighing paper/boats
Plasticware and glassware as needed

7 MAR 05 BAW CONT

Basic Outline of Procedure

- Equilibrate groundwater sample with laboratory CO_2.
- Measure the pH of YM groundwater sample and take aliquots for inorganic carbon analyses.
- Add solids to experimental solutions.
- Add groundwater to experimental solutions.
- Add pH adjustment solutions to experimental solutions
- Add neptunium spike to experimental solutions.
- Run experiment for about 7 days with experimental solutions on gyratory shaker.
- Analyze aliquots of experimental solution for pH and neptunium concentration (LSA)

Equilibrium of samples

Initial Entry 696/31-32
Conducted for both NC-EWDP-19PB-SHAL-0504-FUA-~~2~~ 3
and the two simulated groundwaters BW 3-7-05
Aeration for sim. groundwaters since Feb 23, 2005 (696/14)
Aeration for groundwater sample since Feb 28, 2005 (696/28)

pH Measurement and collection of Inorganic Carbon Analyses samples

Initial Entry 696/31-32
sample NC-EWDP-19PB-SHAL-0504-FUA-3 (696-28)
Also analyzed 2 ~~simulat~~ BW 3-7-05 simulated waters
19PB simulated water without Ca and 19PB simulated water with CA. (696/14)

Objective: To characterize the solutions that will be used for sorption experiments

7 MAR 05 CONT BW

Bradley Werling will perform the analyses.

Additional Equipment: 40 mL amber glass vials BW 3-7-05
10 mL microbeakers
stir bars
stir plate

Calibrated with pH 7 and pH 10 (Temp = 18.5 °C)
Setpts 7.02 + 10.08
Slope = 99.4 (acceptable range 92-102% from p5 of Orion Ross pH Electrode instruction manual BW 3-7-05 2003)

Poured about 50 mL of sample into 250 mL glass beaker. Filled 40 mL vial (min headspace) and capped. Poured other aliquot into microbeaker with stir bar. Pt BW 3-7-05 Labled 19PB-shal on both 40 mL vial and 10 mL microbeaker. Repeated process for sim waters. Labeled 19PB-Ca and 19PB no Ca.

pH of 19PB = 8.49
pH of sim 19PB with CA = 8.58
pH of sim 19PB without CA = 8.65
challenge with pH 10 (target 10.08) = 10.09

Refrigerated IC samples ~ discarded pH samples

7 MAR 2005 CONT BAW

Addition of solids to experimental solutions
Alluvium series 4 Montmorillonite series 2 in
19PB-shal - groundwater

Initial entry 696/~~30-31~~ ~~BW 3-7-05~~ ~~30~~ 31-32
Labelled 11 polycarbonate tubes AL4-Np1 to 11 and
11 pc tubes M2-Np1 to 11.
Weighed and recorded mass of each tube (w/cap)
Added ~0.1g of alluvium/or montmorillonite (as appropriate)
directly ~~to weighing paper. Transferred solid to pc tube with~~
to pc tube ~~weigh paper found on top~~. Weighed pc tubes again.
BW 3-7-05

Sample ID	Mass (g) of empty pc tube	Mass (g) of pc tube + solid
AL4-Np1	22.4652	22.5638
AL4-Np2	22.1721	22.2700
AL4-Np3 BW 3-7-05	~~22.1759~~ 22.1157	22.2172
AL4-Np4	22.1568	22.2545
AL~~5~~4-Np5 BW 3-7-05	22.4718	22.5715
AL4-Np6	21.9951	22.0955
AL4-Np7	21.9221	22.0212
AL4-Np8	22.1827	22.2823
AL4-Np9	22.0213	22.1215
AL4-Np10	21.9193	22.0191
AL4-Np11	21.9887	22.0895

7 MAR 2005 CONT BAW

Sample ID	Mass (g) of empty pc tube	Mass (g) of pc tube with solid
M2-Np1	22.4861	22.5861
M2-Np2	22.1643	22.2647
M2-Np3	22.0183	22.1182
M2-Np4	22.1609	22.0607
M2-Np5	21.9840	22.0842
M2-Np6	21.9983	22.0980
M2-Np7	21.9658	22.0657
M2-Np8	21.9961	22.0959
M2-Np9	22.1848	22.2847
M2-Np10	22.1560	22.2563
M2-Np11	22.4638	22.5641

Addition of groundwater (19PB-shal) to Exp Solns-
Alluvium series 4 and Montmorillonite series 2

~~Initial~~ BW 3-7-05 Initial entry 696/31-32
About 30mL of NC-EWDP-19PB-shal-0504-FUA-3
was added to each pc tube using a 10mL pipet.
Mass of pc tube was recorded after solution
addition.
Challenge of Balance (target 20.0001g)
At start of day = 20.0002g
At end of day = 20.0003g

7 March 2005 CONT BAW

Sample ID	Mass (g) of pc tube after groundwater added.
AL4-Np1	53.2237
AL4-~~Np~~ 3-7-05 BAW Np2	52.7252
AL4-Np3	52.7391
AL4-Np4	52.7698
AL4-Np5	53.2861
AL4-Np6	52.5615
AL4-Np7	52.4686
AL4-Np8	52.8205
AL4-Np9	52.4965
AL4-Np10	52.3477
AL4-Np11	52.4708
M2-Np1	52.8996
M2-Np2	52.6643
M2-Np3	52.4026
M2-Np4	52.5868
M2-Np5	52.4271
M2-Np6	52.4181
M2-Np7	52.4362
M2-Np8	52.3809
M2-Np9	52.6170
M2-Np10	52.4811
M2-Np11	52.9783

7 March 2005 CONT BAW

Addition of pH adjustment solns to exp solns
Alur. Series 4 and Mont Series 2

Initial Entry 696/31-32
Adjust pH of exp soln (19PB-shal) by adding acid/base according to table1 below

TABLE 1
pH Adjustment Requirements for NC-EWDP-19PB-Shal-0504-FUA Water

Sample ID	Estimated pH	mL of 0.1M HNO3 needed for 30 mL	mL of 0.1M NaOH needed for 30 mL
X-Np1	6.5	0.663	
X-Np2	6.75	0.659	
X-Np3	7	0.650	
X-Np4	7.25	0.635	
X-Np5	7.5	0.609	
X-Np6	7.75	0.561	
X-Np7	8	0.475	
X-Np8	8.25	0.320	
X-Np9	8.5	0.035	
X-Np10	8.75		0.517
X-Np11	9		1.622

Assumptions:
1. Quantities based on EQ3NR calculations using 19PB water and chemsitry as measured
2. Water at equilibrium with lab CO2(g) = -3.42 (log fugacity)
3. Experimental solutions approximately 30 mL volume
4. Influence on pH by solid is ignored
5. GFW of NO3- = 62.0049, GFW of Na = 22.9898

Used adjustable eppendorfs 10-100µL and 100-1000µL.
Intended to create pH range from 6.5 to 9
Recorded mass after pH adjusting soln added (696/38)

3-7-05 BAW

7 MARCH 05 CONT BAW

SAMPLE ID	Mass (g) of pc tube after pH adjustment	Mass (g) of pc tube after Np spike
AL4-Np1	53.8747	53.9732
AL4-Np2	53.3726	53.4717
AL4-Np3	53.3776	53.4765
AL4-Np4	53.3936	53.4930
AL4-Np5	53.8823	53.9801
AL4-Np6	53.1104	53.2093
AL4-Np7	BW 3-7-05 ~~53.~~ 52.9339	53.0324
AL4-Np8	53.1294	53.2278
AL4-Np9	* data accidentally not recorded	52.6277
AL4-Np10	52.8603	52.9549
AL4-Np11	54.0743	54.1681
MZ-Np1	53.5578	53.6565
MZ-Np2	53.3166	53.4155
MZ Np3	53.0459	53.1452
MZ-Np4	53.2157	53.3145
MZ-Np5	53.0304	53.1292
MZ-Np6	52.9740	53.0729
MZ-Np7	52.9051	53.0022
MZ-Np8	52.6960	52.7937
MZ-Np9	52.6496	52.7475
MZ-Np10	52.9933	53.0921
MZ-Np11	54.5985	54.6984

7 Mar 05 CONT BAW

Addition of Neptunium Spike to Exp Solns Alur series 4 and Mont series 2

Initial Entry: 696/31-2
Np Spike 46A 556/84 to 696/38 solns
100 µL "set" pipetor
Recorded mass after Np spike (696/38)

Running of Alur series 4 and Mont Series 2 Experiment

Initial Entry: 696/31-2. Each pc tube vortexed ~30 secs
Placed racks on gyrator. (22 solns 696/38)
Caps loosed on all exp solns
Gyrator activated

3-8-05 BW

8 MAR 2005 BAW

Preparation of Sodium Persulfate Solution for Inorganic Carbon Analyses

Bradley Werling will perform this task

Objective
To prepare solution needed for inorganic carbon analyses

Reagents
Type 1 water (Barnstead/Thermolyne model D11901 SN 1190010979691)
Sodium Persulfate (Acros 20202 lot # B0104212)
Phosphoric acid (Fisher A242-4 lot # 001815)

Equipment
Mettler AE 240 balance (SN 101237)

Supplies
Weigh boat
10 mL and 250 mL graduated cylinders
Spatula
250mL pc bottle

Target Concentration: 10% persulfate and 5% phosphoric acid

Challenge of balance (target mass was 20.0001g)

At start of procedure: 20.0001g BW 3-8-05

At end of procedure: 20.0001g BW 3-8-05

Procedure: from Section 3.3 of Tekmar Dohrmann Phoenix 8000 User Manual
Document Part Number 14-7045-074, Rev C, 1998.

A weigh boat was tared on the balance. About 25g of sodium persulfate was carefully transferred to weigh boat and the mass was recorded.

Mass (g) of sodium persulfate used: 25.1291 BW 3-8-05

The sodium persulfate was transferred into a 250mL pc square bottle. 213mL (250mL) grad cylinder of type 1 water was added. Some of this water was used to rinse the weigh boat. The rinsate was added to the 250mL pc bottle. The solution was swirled by hand to dissolve the sodium persulfate. 9mL (10mL graduated cylinder) of phosphoric acid was added to the solution. The solution was labeled Sodium Persulfate Solution (with date, initials, and sn reference).

8 MAR 05 CONT BAW

Inorganic Carbon Analyses of NC-EWDP-19PB-Shal-0504-FUA-3 Groundwater and Simulated 19PB Shallow Groundwaters

Bradley Werling will perform this task

Objective
To characterize by inorganic carbon analyses solutions used in sorption experiments.

Samples
NC-EWDP-19PB-Shal-0503-FUA-3 – SN 696/32
19PB simulated water without Ca – SN 696/32
19PB simulated water with Ca – SN 696/32

Reagents
Type 1 water (Barnstead/Thermolyne model D11901 SN 1190010979691)
Sodium persulfate solution – SN 696/40
Phosphoric acid solution– SN 631/52-53
Inorganic carbon calibration standards – SN 631/49-51

Equipment
Tekmar Dohrmann Phoenix 8000 TOC Analyzer model 147045000 (SN 00343010)

Supplies
40mL amber glass vials

Conditions
Method - Inorganic carbon 20-200ppm standard method (not custom)
Calibration curve – from 1 to 200 ppm IC with 0ppm used

Procedure: followed Tekmar Dohrmann Phoenix 8000 User Manual
Document Part Number 14-7045-074, Rev C, 1998.

Calibration standards and samples removed from refrigerator and allowed to warm up before aliquots poured. Aliquots of calibration standards transferred into 40mL vials with minimal headspace. Fresh type 1 water used for 0ppm standards and reservoir bottle. Calibration points included 0, 1, 5, 10, 50, 100, and 200ppm IC. Standards and samples run in triplicate from single vials. Blanks and cleaning procedures were typically run for six repetitions. A blank was run after the samples and before a 10ppm std (cal check).

3-8-05 BW

8 Mar 05 CONT BAW

Running of Alluv 4 series + Mont 2 series Sorption Experiment

Experimental Solutions 696/39
Removed caps for about 1 hour (13:35 to 14:45) and left on activated gyrator
Tightly capped and vortexed for about 10 seconds.
Loosened caps and placed on activated gyrator.

9 March 05 BW

Running of Alluv. 4 series + Mont 2 series Sorption Experiment

Same procedures + methods used in treating Experimental soln's 696/39 as above (696/42).

10 Mar 2005 BAW

Results for Inorganic Carbon Analyses of NC-EWDP-19PB-Shal-0504-FUA-3 Groundwater and simulated 19PB GWs

The cal curve and samples were run. ~~The cal~~ BW 3-10-05 (696/41). An initial look indicated that the linearity of the cal curve was poor. The standards were taken from vol flasks that had already used

10 Mar 05 CONT BAW

Initial use 25 Feb 05 (696/15), second use on 8 Mar 05 (696/41). Vol flasks were of various sizes and had headspace. Decided to remake IC stds and redo analyses. The samples from 696/41 we put in the ~~frig~~ BW 3-10-05 refridgerator (w/ ~~pas~~ BW 3-10-05 parafilm) after analyses completed on 8 Mar 05. New stds were prepared (631/53-54). Aliquots were poured into 40mL amber glass ~~bottles~~ BW 3-10-05 vials on 9 Mar by Jon Brown. Two vials for each std except 10ppm which had four vials. The reanalyses will use the old samples (w/ head space) from 696/41 and fresh samples.

3-10-05
BW

10 Mar 05 CONT BW

Experimental Procedure – pH and Inorganic Carbon Sampling and pH Analyses of NC-EWDP-19PB-Shal-0504-FUA-3 and Simulated 19PB Groundwaters.

Bradley Werling will be performing this task

Objective: To characterize solutions that will be used in sorption experiments

Initial Entry 696/31-32

Samples NC-EWDP-19PB-SHAL-0504-FUA-3 (filtered, unacidified groundwater) - 628/128
19PB simulated water without Ca – 696/14
19PB simulated water with Ca – 696/14

Additional Supplies:
40mL amber glass vials
10mL microbeakers
Stir bars
Stir plate

Procedure

Poured about 50mL of sample into 250mL glass beaker. A 40mL vial was filled (minimum headspace) from the 250mL beaker and capped for use as the IC sample. Labeled 19PB. A 10mL microbeaker with stir bar was filled from the 250mL beaker for use as the pH sample. Also labeled 19PB. Process was repeated using new 250mL beakers for the two simulated waters. Labeled 19PB Ca and 19PB no Ca.

Used fresh pH buffers 7 and10 (60mL bottles with stir bars) and calibrated pH meter (using stir plate).

Temp (°C) 19.4°C

Setpoints 7.02 and 10.07

Slope 99.5% (accectable range 92-102% from page 5 of Orion Ross pH Elcetrode Instruction Manual, 2003)

Analyzed the three samples.

19PB 8.52 19PB Ca 8.54 19PB no CA 8.63

Challenged again with pH 10 (from calibration) 10.08
target temp pH 10.06

Temp, Setpts, slope, 3 pHs, Chal w/ comment entered 3-10-05 BW

10 MAR 2005 CONT BAW

Inorganic Carbon Reanalyses of NC-EWDP-19PB-Shal-0504-FUA-3 Groundwater and Simulated 19PB Shallow Groundwaters

Bradley Werling will perform this task

Objective
To characterize by inorganic carbon analyses solutions used in sorption experiments.

Samples 4 BW 3-22-05
NC-EWDP-19PB-Shal-0503-FUA-3 (old) – 696/32
NC-EWDP-19PB-Shal-0503-FUA-3 (new) – 696/44
19PB simulated water without Ca (old) – 696/32
19PB simulated water with Ca (old) – 696/32
19PB simulated water without Ca (new) – 696/44
19PB simulated water with Ca (new) – 696/44

Reagents
Type 1 water (Barnstead/Thermolyne model D11901 SN 1190010979691)
Sodium persulfate solution – SN 696/40
Phosphoric acid solution– SN 631/52-53
Inorganic carbon calibration standards – SN 631/53-54

Equipment
Tekmar Dohrmann Phoenix 8000 TOC Analyzer 147045000 (sn 00343010)

Supplies
40mL amber glass vials

Conditions
Method - Inorganic carbon 20-200ppm standard method (not custom)
Calibration curve – from 1 to 200 ppm IC with 0ppm used

Procedure: followed Tekmar Dohrmann Phoenix 8000 User Manual
Document Part Number 14-7045-074, Rev C, 1998.

Calibration standards and samples removed from refrigerator and allowed to warm up before aliquots poured. See 696/42-43 for background information on reanalyses. Old samples from 696/41 analyses of 696/32 samples. Due to limited volume, only one rep performed. New samples from 696/44 with three reps from single vial. Fresh type 1 water used for 0ppm standards and reservoir bottle. Calibration points included 0, 1, 5, 10, 50, 100, and 200ppm IC. Standards run in triplicate from single vials. Blanks and cleaning procedures were typically run for six repetitions. A blank was run after the samples and before a 10ppm std (cal check).

10 Mar 05 CONT BAW

Running of Aluv series 4 and Mont series 2 Sorption Experiment

See 696/42 for aeration + vortexing step
Aerated from 14:40 to 15:45

11 MAR 05 BW

Running of Aluv series 4 and Mont series 2 Sorption Experiment

See 696/42 for aeration + ~~ve~~ BW vortexing step 3-11-05
Aerated from 10:55 to 12:00.

16 MAR 05 BW

Running of Aluv series 4 and Mont series 2 Sorption Experiment

See 696/42 for aeration + vortexing step
Aerated from 15:15 to 17:25.

3-17-05 BW

17 MAR 05 CONT BAW

Running of Aluv series 4 and Mont series 2 Sorption Experiment

See 696/42 for aeration + vortexing step
Aerated from 13:15 to 14:50

- Copy made for QA

18 MAR 05 BAW

Experimental Procedure – Liquid Scintillation Analyses of NP with Aluv series 4 and Mont series 2 in 19PB Shal Groundwater over a pH range ~~of~~ BW 3-28-05

Bradley Werling will be performing this task

Objective: To determine the neptunium concentration in solutions and use in calculations for determining the sorption coefficient (Kd) under specified conditions

Initial Entry 696/31-32

Samples Alu~~m~~v series 4 and Mont series 2 – 696/47 BW 3-28-05

Procedure

LSA vials (size 7 mL) were labeled for experimental solutions, blank solution, and neptunium spikes solutions. Experimental solutions were analyzed in duplicate and labeled to identify the sorption solid phase and series, the radionuclide, the experimental solution number, and the a/b duplicate designator (example - AL4-Np1a and AL4-Np1b). A single groundwater blank solution was analyzed and labeled as 19PB with scientific notebook page reference. The neptunium spike was analyzed in duplicate and labeled Spike 46A-~~4~~ and 5. 6 BW 3-18-05

Each LSA vial (experimental solution, groundwater blank, and neptunium spike) had 0.5 mL (500µL eppendorf pipet) of 0.002 M HNO_3 added. The mass of all of the LSA vials with acid was recorded (See table 1 column 1).

18 MAR 05 CONT BAW
BW 3-18-05

The experimental solutions were centrifuged for about 5 minutes at 1400 RPM prior to aliquot transfer. The mass of the experimental solutions was recorded before removing the LSA aliquots (See table 2, column 1). The tubes containing the experimental solutions were placed in a tared 30mL glass beaker when being weighed.

For experimental solutions, 0.5 mL (500µL eppendorf pipet) of the experimental solution was transferred into the appropriate LSA vial. For the groundwater blank, 0.5 mL (500µL eppendorf pipet) of NC-EWDP-19PB-FUA-3 was added to the LSA vial. For the neptunium spike solutions, 0.1 mL (100µL eppendorf pipet) of the spike was added into each LSA vial. The mass of all of the LSA vials was recorded after the addition of the appropriate sample solution (See table 1 column 2).

All LSA vials had 5 mL (Repipet bottle top dispenser) of LSA cocktail added. The LSA vials were tightly capped and rigorously shaken by hand.

The pH of the experimental solutions was taken. Fresh pH buffers 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

A 10 mL aliquot (pipet with disposable 10 mL tip) of experimental solution was transferred into a 10 mL microbeaker with stir bar. A stir plate was used when measuring the pH of the experimental solutions. The pH was recorded (See table 2, column 2). pH meter challenged with pH 10 (from calibration). The solutions in the microbeakers were transferred back to into the original experimental solution.

Challenge of balance (Target 20.0001 g)
At start of day = 20.0001 g
At end of day = 20.0002 g

TABLE 1 - LSA Vial info.

ID	Mass(g) of vial + acid	Mass(g) of vial + acid + sample
19PB 696/47	7.8821	8.3748
Spike 46A-5	7.8529	7.9534
Spike 46A-~~5~~6	7.8889	7.9883

BW 3-18-05

18 MAR 05 CONT BAW

CONT TABLE 1 - LSA vial information

Mass(g) of vial + acid	Mass(g) of vial + acid + sample	ID
7.9610	8.4531	AL4-Np1a
7.9016	8.3879	AL4-Np1b
7.9092	8.3957	AL4-Np2a
7.8797	8.3722	AL4-Np2b
7.8857	8.3844	AL4-Np3a
7.9284	8.4152	AL4-Np3b
7.8836	8.3630	AL4-Np4a
7.7761	8.2731	AL4-Np4b
7.8804	8.3667	AL4-Np5a
7.9020	8.3897	AL4-Np5b
7.8791	8.3635	AL4-Np~~5a~~6 BW 3-18-05
7.9362	8.4220	AL4-Np6b
7.8617	8.3517	AL4-Np7a
7.9334	8.4174	AL4-Np7b
7.8933	8.3770	AL4-Np8a
7.8615	8.3479	AL4-Np8b
7.9201	8.4050	AL4-Np9a
7.9251	8.4122	AL4-Np9b
7.9363	8.4238	AL4-Np10a
7.9042	8.3933	AL4-Np10b
7.9164	8.4050	AL4-Np11a
7.9341	8.4259	AL4-Np11b

18 MAR 05 CONT BAW

TABLE 1 CONT - LSA vial info

ID	Mass (g) of vial + acid	Mass (g) of vial + acid + sample
M2-Np1a	7.8589	8.3542
M2-Np1b	7.8427	8.3386
M2-Np2a	7.9405	8.4280
M2-Np2b	7.8449	8.3287
M2-Np3a	7.9115	8.4028
M2-Np3b	7.9036	8.3930
M2-Np4a	7.9879	8.4661
M2-Np4b	7.8821	8.3669
M2-Np5a	7.8620	8.3491
M2-Np5b	7.9327	8.4163
M2-Np6a	7.8458	8.3327
M2-Np6b	7.8751	8.3534
M2-Np7a	7.8742	8.3594
M2-Np7b	7.8748	8.3625
M2-Np8a	7.8916	8.3806
M2-Np8b	7.8760	8.3766
M2-Np9a	7.9364	8.4245
M2-Np9b	7.8213	8.3083
M2-Np10a	7.8382	8.3247
M2-Np10b	7.8820	8.3655
M2-Np11a	7.9592	8.4370
M2-Np11b	7.9211	8.4031

18 MAR 05 CONT BAW

TABLE 2 - Experimental Solution info

ID	Mass (g) of Exp Soln tube before LSA Sampling	pH of exp solution
AL4-Np1	52.9647	7.75
AL4-Np2	52.4478	7.76
AL4-Np3	52.4432	7.81
AL4-Np4	52.4586	7.83
AL4-Np5	52.9287	7.95
AL4-Np6	52.2273	8.01
AL4-Np7	52.0229	8.16
AL4-Np8	52.2611	8.35
AL4-Np9	51.5315	8.55
AL4-Np10	52.0251	8.73
AL4-Np11	53.1061	9.15
M2-Np1	52.8391	7.70
M2-Np2	52.5499	7.52
M2-Np3	52.2568	7.53
M2-Np4	52.4917	7.67
M2-Np5	52.2123	7.64
M2-Np6	52.1815	7.68
M2-Np7	52.1814	7.92
M2-Np8	51.9150	8.15
M2-Np9	51.3960	8.55
M2-Np10	52.2198	9.00
M2-Np11	53.8549	9.67

18 MAR 05 CONT BAW

Temp = 20.0 °C
Setpts = 7.01, 10.06
Slope = 99.3
Challenge after analysis using Cal soln pH 10
Target = 10.06, Actual = 10.08

Used different lot # for Ultima Gold AB than listed in initial entry ~~EGC~~ BW 3-18-05 696/31-2. Used lot # 91-050201

pHs seemed off so uncapped experimental solutions and set in activated gyrator for the weekend. Will retest pHs on Monday.

21 MAR 05 BAW

Aluv Series 4 + Mont series 2 experimental solutions left uncapped over the weekend (696/52) for equilibration. Tested pH to determine this

3-21-05 BW

21 MAR 05 CONT BAW

Experimental Procedure – pH Analyses on Aluv Series 4 and Mont Series 2 Experimental Solutions.

Bradley Werling will be performing this task.

Objective: To determine the pH of the sorption experimental solutions at the completion of the sorption experiment.

Samples: Aluv Series 4 and Mont Series 2 Experimental Solutions- 696/51-52

Reagents:
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 041088)
pH buffer 10 (Fisher SB 116 lot # 044060)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
Stir Plate

Supplies:
Oxford pipettes and tips
Stir bar
10 mL microbeakers

Basic Outline of Procedure

The pH of the experimental solutions was taken. Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

3-21-05 BW

A 10 mL aliquot (pipet with disposable 10 mL tip) of experimental solution was transferred into a 10 mL microbeaker with stir bar. A stir plate was used when measuring the pH of the experimental solutions. The pH was recorded. pH meter challenged with pH ~~10~~ 7 (from calibration). The solutions in the microbeakers were transferred back to into the original experimental solution

Temp = 19.1 °C
Setpoints = 4.00, 7.02, 10.06
Slope = 99.1
pHs of exp solns on 696/54
Challenge at end of analyses = pH 7 from calibration
Target = 7.02, Actual = 7.04

21 MAR 05 CONT BAW

pHs of experimental solns - reanalyses (initial 696/51)

ID	pH of exp soln.
AL4-Np1	7.76
AL4-Np2	7.77
AL4-Np3	7.80
AL4-Np4	7.85
AL4-Np5	7.93
AL4-Np6	8.04
AL4-Np7	8.18
AL4-Np8	8.36
AL4-Np9	8.56
AL4-Np10	8.74
AL4-Np11	9.01
M2-Np1	7.74
M2-Np2	7.76
M2-Np3	7.79
M2-Np4	7.83
M2-Np5	7.89
M2-Np6	7.99
M2-Np7	8.19
M2-Np8	8.34
M2-Np9	8.58
M2-Np10	8.82
M2-Np11	9.25

21 Mar 05 CONT BAW

Determination of Acid spike for Alur 4 + Mont 2

Experimental Solutions equilibrated w/ air based on reanalyses of pHs (696/54). Needed to adjust acid spike levels (696/37). Alur 4 and Mont 2 experimental solutions Np1 to Np4 had more 0.02 M HNO_3 acid added.

0.02 N HNO_3 - 696/29-30
Exp Solns - 696/54
Eppendorf pipet + tips
AL4-Np4 and M2-Np4 had 25 µL acid added
AL4-Np3 and M2-Np3 had 50 µL acid added
AL4-Np2 and M2-Np2 had 75 µL acid added
AL4-Np1 and M2-Np1 had 100 µL acid added
Mass of exp soln recorded before and after spike

ID	Mass (g) before ~~ad~~ acid added (BWS 3-21-05)	Mass (g) after acid added
AL4-Np1	50.8990	50.9965
AL4-Np2	50.6912	50.7633
AL4-Np3	50.8306	50.8776
AL4-Np4	50.7850	50.8076
M2-Np1	51.3507	51.4477
M2-Np2	51.0024	51.0749
M2-Np3	~~51~~ 50.6555 (BWS 3-21-05)	50.7015
M2-Np4	51.2170	51.2401

21 MAR 05 CONT ~~CONT~~ BAW
BW 3-21-05

Mass challenge of balance (Target = 20.0001g)
At start = 20.0001g
At end = 20.0001g
Electronic Balance AE-240 Mettler SN 001439

— NC-EWDP-19PB-Shal-~~FA~~ FUA-3 soln generating since 28 Feb 2005 (696/28). Used for Alov 4 and Mont 2. Small quantity left, capped and returned to refrigerator. ~~BW 3-21-05~~

Aeration of groundwater sample

Sample NC-EWDP-19PB-Shal-FUA-4
5-11-04 628/128 1 Liter HDPE
Preparation of soln for sorption experiments. Ground water sample from Yucca Mtn was bubbled to equilibrate CO_2 levels w/ ambient. For setup, see 696/5.

Determination of acid spike for Alov 4 and Mont 2 - ~~continue~~ ~~BW 3-21-05~~ BW 3-21-05 Continued from 696/55+6

Exp. Solns vortexed for about 5 sec, uncapped, and placed on activated gyratory shaker.
Time = 16:30

21 MAR 05 CONT BAW

Inorganic Carbon Reanalyses of NC-EWDP-19PB-Shal-0504-FUA-3 Groundwater and Simulated 19PB Shallow Groundwaters

Bradley Werling will perform this task

Objective
To characterize by inorganic carbon analyses solutions used in sorption experiments.

Analyses documented on 10 Mar 2005 see 696/45

Initial Analyses of NC-EWDP-19PB IC sample 628/153
First Analyses (sim only)– 696/19 – Carboy solutions not equilibrated with ambient air
Second Analyses (sim and FUA-3) – 696/41-43 - Old IC standards used so curve was bad

Samples
NC-EWDP-19PB-Shal-0503-FUA-3 (old) – 696/32
NC-EWDP-19PB-Shal-0503-FUA-3 (new) – 696/44
19PB simulated water without Ca (old) – 696/32
19PB simulated water with Ca (old) – 696/32
19PB simulated water without Ca (new) – 696/44
19PB simulated water with Ca (new) – 696/44

Results
Analyses from raw data is stored in PRN files. PRN files contain 39 columns of information. The legend for the contents of the 39 columns is found on 696/20 Table 1. Sample Ids are found in column 8. Raw data area counts are found in column 30. The PRN file hardcopy is followed by a results page.

3-21-05
BAW

21 MAR 05 CONT BAW

PRN File for 10 Mar 05 IC Analyses

1	2	3	4	5	6	7	8	9
~~v2.0	3	1	Done	2	3/10/2005 12:44	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	2	3/10/2005 12:48	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	2	3/10/2005 12:51	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	2	3/10/2005 12:56	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 12:59	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:01	USER1	0 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:05	USER1	1 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:08	USER1	1 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:11	USER1	1 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:15	USER1	5 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:18	USER1	5 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:21	USER1	5 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:25	USER1	10 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:29	USER1	10 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:32	USER1	10 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:36	USER1	50 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:40	USER1	50 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:44	USER1	50 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:48	USER1	100 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:52	USER1	100 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 13:56	USER1	100 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 14:01	USER1	200 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 14:06	USER1	200 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	3	1	Done	0	3/10/2005 14:10	USER1	200 ppm IC	IC Range 20 - 200 ppm C
~~v2.0	10	1	Done	0	3/10/2005 14:13	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	3/10/2005 14:15	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	3/10/2005 14:18	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	3/10/2005 14:20	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	3/10/2005 14:22	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	10	1	Done	0	3/10/2005 14:24	USER1	Blank	Blank IC Ranges 3 4 & 5
~~v2.0	0	1	Done	0	3/10/2005 14:28	USER1	19PB old	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:32	USER1	19PB new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:36	USER1	19PB new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:40	USER1	19PB new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:44	USER1	19PB Ca old	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:48	USER1	19PB Ca new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:52	USER1	19PB Ca new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 14:55	USER1	19PB Ca new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:00	USER1	19PB wo Ca old	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:04	USER1	19PB wo Ca new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:08	USER1	19PB wo Ca new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:11	USER1	19PB wo Ca new	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:15	USER1	IC 0 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:18	USER1	IC 0 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:20	USER1	IC 0 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:24	USER1	IC 10 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:28	USER1	IC 10 ppm	IC Range 20 - 200 ppm C
~~v2.0	0	1	Done	0	3/10/2005 15:31	USER1	IC 10 ppm	IC Range 20 - 200 ppm C

21 MAR 2005 CONT BAW

10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
IC 20ppm up	2	2	3	1	1	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.779	6.743	120
IC 20ppm up	2	2	3	2	1	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.705	6.741	120
IC 20ppm up	2	2	3	3	1	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.725	6.702	120
IC 20ppm up	2	2	3	1	2	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.667	6.681	120
IC 20ppm up	2	2	3	2	2	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.695	7.69	56
IC 20ppm up	2	2	3	3	2	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.672	7.67	56
IC 20ppm up	2	2	3	1	3	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.631	7.624	69
IC 20ppm up	2	2	3	2	3	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.629	7.626	69
IC 20ppm up	2	2	3	3	3	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.603	7.6	69
IC 20ppm up	2	2	3	1	4	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.606	7.604	84
IC 20ppm up	2	2	3	2	4	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.561	7.558	85
IC 20ppm up	2	2	3	3	4	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.553	7.55	84
IC 20ppm up	2	2	3	1	5	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.5	7.492	93
IC 20ppm up	2	2	3	2	5	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.511	7.511	93
IC 20ppm up	2	2	3	3	5	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.511	7.511	92
IC 20ppm up	2	2	3	1	6	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.469	7.466	116
IC 20ppm up	2	2	3	2	6	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.655	7.653	113
IC 20ppm up	2	2	3	3	6	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.657	7.65	114
IC 20ppm up	2	2	3	1	7	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.545	7.543	131
IC 20ppm up	2	2	3	2	7	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.722	7.72	127
IC 20ppm up	2	2	3	3	7	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.715	7.711	127
IC 20ppm up	2	2	3	1	8	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.635	7.634	157
IC 20ppm up	2	2	3	2	8	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.787	7.787	153
IC 20ppm up	2	2	3	3	8	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.84	7.838	150
IC 20ppm up	2	2	6	1	1001	31005	0	0	0	5	0	0.5	0	10	0	0.5	6.707	7.202	61
IC 20ppm up	2	2	6	2	1001	31005	0	0	0	5	0	0.5	0	10	0	0.5	6.412	6.909	67
IC 20ppm up	2	2	6	3	1001	31005	0	0	0	5	0	0.5	0	10	0	0.5	6.375	6.873	65
IC 20ppm up	2	2	6	4	1001	31005	0	0	0	5	0	0.5	0	10	0	0.5	6.308	6.804	67
IC 20ppm up	2	2	6	5	1001	31005	0	0	0	5	0	0.5	0	10	0	0.5	6.312	6.809	66
IC 20ppm up	2	2	6	6	1001	31005	0	0	0	5	0	0.5	0	10	0	0.5	6.264	6.762	67
IC 20ppm up	2	2	1	1	9	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.236	7.23	108
IC 20ppm up	2	2	3	1	10	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.317	7.311	106
IC 20ppm up	2	2	3	2	10	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.33	7.322	106
IC 20ppm up	2	2	3	3	10	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.317	7.316	106
IC 20ppm up	2	2	1	1	11	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.266	7.261	109
IC 20ppm up	2	2	3	1	12	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.227	7.225	109
IC 20ppm up	2	2	3	2	12	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.282	7.28	108
IC 20ppm up	2	2	3	3	12	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.268	7.264	109
IC 20ppm up	2	2	1	1	13	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.226	7.224	111
IC 20ppm up	2	2	3	1	14	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.215	7.214	111
IC 20ppm up	2	2	3	2	14	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.209	7.205	111
IC 20ppm up	2	2	3	3	14	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.198	7.197	110
IC 20ppm up	2	2	3	1	15	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.173	7.166	62
IC 20ppm up	2	2	3	2	15	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.011	7.005	63
IC 20ppm up	2	2	3	3	15	31005	0.5	0	0	5	0	0.5	0	10	0	1	5.947	6.942	62
IC 20ppm up	2	2	3	1	16	31005	0.5	0	0	5	0	0.5	0	10	0	1	5.948	6.944	94
IC 20ppm up	2	2	3	2	16	31005	0.5	0	0	5	0	0.5	0	10	0	1	5.966	6.962	93
IC 20ppm up	2	2	3	3	16	31005	0.5	0	0	5	0	0.5	0	10	0	1	6.017	7.014	93

3-21-05 BW

21 ~~MAY~~ MAR 05 CONT BW

30	31	32	33	34	35	36	37	38	39
43122	0	0	216905	2.40E+05	2/16/1997 12:24	0.99993	129934	3101240	3101241
54939	0	0	216905	2.40E+05	2/16/1997 12:24	0.99993	129934	3101240	3101245
59142	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101249
66204	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101253
56151	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101257
58287	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101300
173878	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101303
180827	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101306
181147	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101309
681810	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101313
675523	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101316
676319	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101319
1349470	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101323
1345415	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101326
1352845	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101330
6539159	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101334
6658941	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101337
6609806	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101341
13285220	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101345
13382103	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101350
13405093	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101354
28710145	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101358
28518754	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101402
28536942	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101407
148024	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101412
96615	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101414
84073	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101416
84361	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101418
80263	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101421
82544	0	0	0	0.00E+00	1/1/1970 0:00	0.99993	129934	3101240	3101423
3779326	13.7464	27.4929	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101426
3814615	13.8777	27.7553	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101430
3796796	13.8114	27.6228	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101434
3851212	14.0137	28.0275	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101437
4391847	16.024	32.048	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101441
4411071	16.0955	32.191	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101446
4343829	15.8455	31.6909	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101449
4421132	16.1329	32.2658	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101453
5016013	18.3449	36.6897	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101457
5078600	18.5776	37.1552	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101501
4995504	18.2686	36.5372	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101505
5012327	18.3311	36.6623	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101509
120060	0.1401	0.2801	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101513
102647	0.0753	0.1507	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101516
97313	0.0555	0.111	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101519
1360441	4.7522	9.5044	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101522
1366669	4.7754	9.5508	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101526
1359152	4.7474	9.4949	82389	2.69E+05	6/24/2003 14:48	0.99993	129934	3101240	3101529

21 MAR 05 CONT BAW

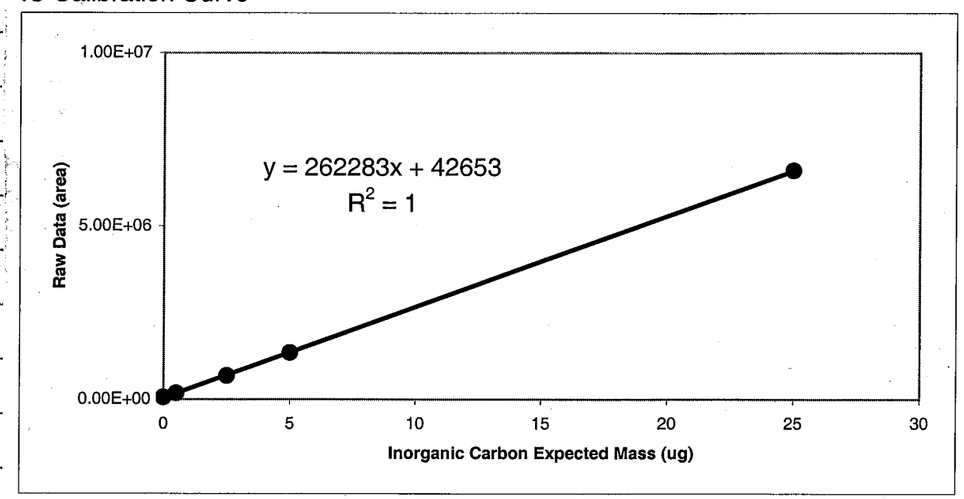
Inorganic Carbon (IC) Analysis
19PB Simulated Groundwater Shallow String and NC-EWDP-19PB-Shal-FUA-3
Method 20 ppm to 200 ppm IC (standard method)
Calibration Curve range 1 ppm to 200 ppm IC

IC Standard Data

IC Std (ppm)	IC expected mass (ug)	Raw Data rep 1	rep 2	rep 3	Raw Data Ave
0	0	66204	56151	58287	60214
1	0.5	173878	180827	181147	178617
5	2.5	681810	675523	676319	677884
10	5	1349470	1345415	1352845	1349243
50	25	6539159	6658941	6609806	6602635
100*	50	13285220	13382103	13405093	13357472
200*	100	28710145	28518754	28536942	28588614
Blank (last 3)	na	84361	80263	82544	82389

* 100 and 200 ppm not used since no sample ppm was greater than 50ppm

IC Calibration Curve



IC Sample Data

Sample ID	Raw Data rep 1	rep 2	rep 3	Raw Data Ave	mass # (ug) IC	conc (ppm)
19PB old	3779326	na	na	na	14.2	28.5
19PB new	3814615	3796796	3851212	3820874	14.4	28.8
19PB Ca old	4391847	na	na	na	16.6	33.2
19PB Ca new	4411071	4343829	4421132	4392011	16.6	33.2
19PB wo Ca old	5016013	na	na	na	19.0	37.9
19PB wo Ca new	5078600	4995504	5012327	5028810	19.0	38.0
10 ppm IC std	1360441	1366669	1359152	1362087	5.03	10.1

\# Using calibration y intercept in calculation
* Calculated by dividing the mass by the volume of sample (0.5mL)

~~21 MAR 05 CONT BAW~~ BW 3-21-05

22 Mar 05 BW

Experimental Procedure – pH Analyses on Aluv Series 4 and Mont Series 2 Experimental Solutions.

Bradley Werling will be performing this task.

Objective: To determine the pH of the sorption experimental solutions with additional pH adjustment solutions added (696/55-56).

Samples: Aluv Series 4 and Mont Series 2 Experimental Solutions- 696/55

Reagents:
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 041088)
pH buffer 10 (Fisher SB 116 lot # 044060)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
Stir Plate

Supplies:
Oxford pipettes and tips
Stir bar
10 mL microbeakers
Squirt bottle for water
Kimwipes

Basic Outline of Procedure

The pH of the experimental solutions was taken. Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

A 10 mL aliquot (pipet with disposable 10 mL tip) of experimental solution was transferred into a 10 mL microbeaker with stir bar. This aliquot was placed on a stir plate and then the stie plate was activated. The pH was recorded. pH meter challenged with one of the calibration standards. The solutions in the microbeakers were transferred back to into the original experimental solution.

Exp solns (uncapped) were placed back on the activated gyratory shaker. pHs will be reanalyzed to determine if stable.

22 Mar 05 CONT BAW

Temp 22.0°C
Setpoints 4.01, 7.01, 10.04
Slope = 99.2
Calibration challenge at end of analyses using pH 7
Target = 7.01 Actual = 6.99

ID	pH	ID	pH
AL4-Np1	7.66	M2-Np1	7.47
AL4-Np2	7.70	M2-Np2	7.54
AL4-Np3	7.75	M2-Np3	7.65
AL4-Np4	7.79	M2-Np4	7.70

Note M2 series solutions centrifuged (Fisher Marathon 21K model D7209 sn 15930025) for 5 minutes at 9300 rpm before pH aliquots removed.

Further determination of Acid Spike for Aluv series 4 and Mont series 2

Target range for sorption exp solns = pH of 6.5 to 9. ~~Added constant value (100 µL via eppendorf pipet) to all 8 exp solns (696/63) of 0.1 M HNO_3~~ BW 3-22-05
Noted that 0.02 M HNO_3 was used (696/55)
Will respike the solutions in a ~~sima~~ BW 3-22-05
similar manner using 0.1 M HNO_3 (696/29).
Spike amounts same as 696/55

22 Mar 05 CONT BAW

~~Electronic Balance Mettler AE240 (sn 001439)~~
~~Mass challenge (target = 20,000 g)~~
~~At start =~~ BW 3-22-05
~~At end =~~

After addition of pH adjustment acid soln, the exp soln were vortexed for about 10 seconds and placed back on the activated gyratory shaker (uncapped).

23 MAR 05 BAW

Creation of a composite 19PB alluvium sample

Bradley Werling will perform this task

Objective: To prepare a homogenized or mixed sample of alluvium from 19PB from several samples (depth intervals) for use in sorption experiments in order to try and measure the "average" alluvium and not just one sample.

Samples: Sonic core samples from 19PB below the water table (368.5 feet - Well Completion diagram - RID 6101 at www.nyecounty.com) or in the saturated zone

23 MAR 05 CONT BAW

Equipment
Mettler AE240 balance SN 001439
20g mass - ~~Tramner~~ Troemner sn 66388
BW 3-23-05

Supplies
Weigh boats
Spatula
Glass bottle

Procedure
10g aliquots of thirteen different NC-EWDP-19PB sonic core intervals were added to a glass bottle. The bottle was capped and thoroughly mixed by shaking by hand. 26 saturated zone intervals were available. Only half were used. The 13 used were randomly selected to cover the entire 373 to 633 feet of sonic core. The specific 13 samples used to create the composite sample is recorded on the following page. The aliquot was added to a tared weigh boat and the mass was recorded. All samples were NC-EWDP-19PB and <#35 mesh A so this was not included in the ID listed on the following page

23 MAR 2005 CONT BAW

ID	Date	Ref	Mass (g)
373.6-374.6	1-9-04	628/37-43	10.0721
387.2-388.9	1-12-04	628/37-43	10.0024
408.5-409.9	1-12-04	628/37-43	10.0642
418.4-419.6	2-10-04	628/55	10.0144
424.6-428.7	2-10-04	628/55	10.0111
441.2-442.9	2-11-04	628/55	10.0098
457.2-460.7	2-11-04	628/55	10.0042
470.5-474.3	2-11-04	628/55	10.0539
503.4-506.0	2-11-04	628/55	10.0373
547.6-549.6	2-11-04	628/55	10.0468
584.1-587.4	2-11-04	628/55	10.0297
595.2-596.2	2-11-04	628/55	10.0382
631.1-633.8	2-11-04	628/55	10.0253

Challange of Balance (Target = 20.0001 g)
At start = 20.0001 g
At end = 20.0001 g

Labeled NC-EWDP-19PB-0305-Sonic Core Composite. Date, initials, SN ref.
0305 ~~AW~~ BW 3-23-05 indicates month (03) and year (05) ~~of~~ BW 3-23-05 of date the composite sample was prepared.
Note composite from < #35 mesh

24 MAR 05 BAW

Experimental Procedure – pH Analyses on Aluv Series 4 and Mont Series 2 Experimental Solutions.

Bradley Werling will be performing this task.

Objective: To determine the pH of the sorption experimental solutions with additional pH adjustment solutions added (696/63-64).

Samples: Aluv Series 4 and Mont Series 2 Experimental Solutions- 696/63-64

Reagents:
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 041088)
pH buffer 10 (Fisher SB 116 lot # 044060)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
Stir Plate

Supplies:
Pipet and tips
Stir bar
10 mL microbeakers
Squirt bottle for water
Kimwipes

Basic Outline of Procedure

The pH of the experimental solutions was taken. Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

A 10 mL aliquot (pipet with disposable 10 mL tip) of experimental solution was transferred into a 10 mL microbeaker with stir bar. This aliquot was placed on a stir plate and then the stie plate was activated. The pH was recorded. pH meter challenged with one of the calibration standards. The solutions in the microbeakers were transferred back to into the original experimental solution.

Temp = 18.6°C
Setpoints 4.00, 7.02, 10.08
Slope 99.3
Calibration challange at the end of analyses using pH
Target = 7.03 Actual = 7.04

24 MAR 05 CONT BAW

ID	pH		ID	pH
AL4-Np1	BW 3-24-05 ~~6.75~~	6.51	M2-Np1	6.75
AL4-Np2	BW 3-24-05 ~~7.25~~	7.22	M2-Np2	7.25
AL4-Np3	BW 3-24-05 ~~7.54~~	7.57	M2-Np3	7.54
AL4-Np4	7.77		M2-Np4	7.75

3-28-2005 BAW

28 Mar 2005 BAW

Liquid Scintillation Analyses of Aluv Series 4 and Mont Series 2 Experimental Solutions

Bradley Werling will perform this task

Objective

To determine the amount of neptunium in the experimental solution at the end of the experiment.

Initial Entry 696/31-32

LSA sample preparation 696/47-48

Samples

Blank (one sample): 19PB 696/47 from 696/48
Neptunium spike (two samples) – Spike 46A–5 and Spike 46A–6 from 696/48
Aluvium series 4 (22 samples) and Montmorillonite series 2 (22 samples) experimental solutions 696/48-50

Results

Printout of LSA analyses following:

3/24/05 6:31:56 PM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 1

SNC Protocol

Calibration Information
Software Version IC: 2.11
Software Version EC: 1.31
Instrument Model: Tri-Carb 3100TR
Instrument Serial Number: 405314
3H Chi Square: 15.50 Date Processed: 3/24/05 6:31:54 PM
14C Chi Square: 25.71 Date Processed: 3/24/05 6:31:54 PM
3H E^2/B (1-18.6 keV): 278.83 Date Processed: 3/24/05 6:31:54 PM
14C E^2/B (4-156 keV): 534.49 Date Processed: 3/24/05 6:31:54 PM
3H Efficiency (0-18.6 keV): 65.16 Date Processed: 3/24/05 6:31:54 PM
14C Efficiency (0-156 keV): 96.18 Date Processed: 3/24/05 6:31:54 PM
IPA Background Date Processed: 3/24/05 6:31:54 PM
3H Background CPM (0-18.6 keV): 15.23 Date Processed: 3/24/05 6:31:54 PM
14C Background CPM (0-156 keV): 22.10 Date Processed: 3/24/05 6:31:54 PM
3H Calibration DPM: 285000
3H Reference Date: 10/29/99
14C Calibration DPM: 134100

3-28-05 BW

28 MAR 2005 CONT BAW

3/24/05 4:55:39 PM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 1

Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

Assay Definition-

Assay Description:

Assay Type: Alpha/Beta
Report Name: Np_Pa_Exp
Output Data Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB
Raw Results Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\20050321_1310.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\Np_Pa_AB.032
Assay File Name: C:\Packard\TriCarb\Assays\Pa_Np_Exp_AB.lsa

Count Conditions-

Nuclide: NP/PA
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Alpha/Beta Standards:
Low Energy: NP/PA
Count Time (min): 240.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

In Use Discriminator: 143

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
Beta A	0.0	400.0	1st Vial	0.00
Beta B	100.0	400.0	1st Vial	0.00
Alpha	100.0	400.0	1st Vial	2.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: n/a Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
Beta A				
Beta B				
Alpha				

IPA Block Data
Software Version IC: 2.11
Software Version EC: 1.31
Instrument Model: Tri-Carb 3100TR
Instrument Serial Number: 405314
3H Chi Square: 19.84 Date Processed: 3/21/05 1:10:05 PM
14C Chi Square: 15.93 Date Processed: 3/21/05 1:10:05 PM
3H E^2/B (1-18.6 keV): 278.62 Date Processed: 3/21/05 1:10:05 PM
14C E^2/B (4-156 keV): 541.10 Date Processed: 3/21/05 1:10:05 PM
3H Efficiency (0-18.6 keV): 65.10 Date Processed: 3/21/05 1:10:05 PM
14C Efficiency (0-156 keV): 96.62 Date Processed: 3/21/05 1:10:05 PM
IPA Background Date Processed: 3/21/05 1:10:05 PM

28 MAR 2005 CONT BAW

3/24/05 4:55:39 PM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 2

Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

3H Background CPM (0-18.6 keV): 15.13 Date Processed: 3/21/05 1:10:05 PM
14C Background CPM (0-156 keV): 22.22 Date Processed: 3/21/05 1:10:05 PM
3H Calibration DPM: 285000
3H Reference Date: 10/29/99
14C Calibration DPM: 134100

Cycle 1 Results

S#	Count Time	CPMA	A:2S%	CPMB	B:2S%	CPMa	alpha2S%	SIS	
MESSAGES									
1	240.00	20.13	2.88	3.31	7.10	0.40	20.31	163.2	19PB 696/47
B									
2	77.34	11.87	11.88	4.66	14.68	128.90	2.01	277.9	AL4Np 1a
3	77.12	14.56	10.04	5.25	13.46	129.26	2.01	274.3	1b
4	76.08	13.59	10.69	5.47	13.14	131.04	2.01	266.9	2a
5	75.45	13.51	10.78	5.80	12.65	132.16	2.01	294.0	2b
6	74.80	13.51	10.82	5.50	13.19	133.30	2.01	292.0	3a
7	76.97	14.73	9.95	5.51	13.00	129.52	2.01	274.8	3b
8	77.05	13.65	10.59	5.57	12.90	129.38	2.01	289.3	4a
9	74.53	15.31	9.77	6.58	11.63	133.84	2.01	289.4	4b
10	75.52	13.33	10.89	5.29	13.52	132.02	2.01	285.3	5a
11	78.75	14.64	9.90	5.87	12.30	126.59	2.01	285.7	5b
12	76.40	14.22	10.27	5.30	13.41	130.50	2.01	273.4	6a
13	77.15	13.40	10.75	5.08	13.78	129.23	2.01	267.5	6b
14	74.92	15.40	9.70	6.36	11.89	133.07	2.01	290.7	7a
15	77.30	16.96	8.85	7.31	10.63	128.96	2.01	296.7	7b
16	74.92	15.78	9.51	6.18	12.13	133.10	2.01	274.1	8a
17	75.31	16.05	9.36	6.49	11.69	132.38	2.01	279.7	8b
18	73.34	15.12	9.94	6.24	12.17	135.95	2.01	292.3	9a
19	74.77	15.99	9.42	6.63	11.56	133.34	2.01	297.2	9b
20	212.93	6.25	14.58	2.61	15.61	46.56	2.02	292.9	10a
21	216.69	7.42	12.38	2.97	13.91	45.74	2.03	291.7	10b
22	240.00	3.64	23.51	1.72	21.71	15.28	3.39	349.0	11a
23	240.00	3.80	22.57	1.74	21.43	14.66	3.46	325.0	11b
Missing vial 24.									
25	92.44	22.93	6.47	9.23	8.38	107.80	2.01	277.8	M2Np 1a
26	94.26	22.44	6.52	8.76	8.59	105.69	2.01	276.3	1b
27	92.18	21.88	6.72	8.73	8.70	108.08	2.01	278.7	2a
28	94.57	21.50	6.73	8.75	8.59	105.37	2.01	281.3	2b
29	91.01	22.35	6.64	9.02	8.57	109.47	2.01	275.8	3a
30	90.84	23.52	6.39	9.08	8.54	109.69	2.01	277.2	3b
31	96.55	23.26	6.28	9.14	8.27	103.18	2.01	280.3	4a
32	93.96	22.54	6.51	8.82	8.57	106.02	2.01	275.7	4b
33	91.78	23.80	6.30	9.00	8.54	108.65	2.01	271.1	5a
34	94.16	23.73	6.25	10.15	7.80	105.83	2.01	295.8	5b
35	94.24	20.18	7.09	8.62	8.69	105.72	2.01	292.6	6a
36	96.65	21.98	6.56	9.08	8.30	103.06	2.01	291.4	6b
37	92.77	24.37	6.16	9.35	8.29	107.40	2.01	273.1	7a
38	94.31	23.56	6.28	9.77	8.00	105.63	2.01	278.9	7b
39	91.69	23.92	6.28	10.08	7.93	108.67	2.01	290.4	8a
40	87.47	25.10	6.18	9.44	8.46	113.93	2.01	261.1	8b
41	82.32	25.23	6.32	10.05	8.35	121.07	2.01	278.0	9a
42	81.15	25.26	6.35	10.35	8.25	122.87	2.01	288.4	9b
43	78.99	33.57	5.21	13.31	7.11	126.21	2.01	280.5	10a
44	80.02	34.02	5.13	13.64	6.97	124.56	2.01	279.7	10b
45	80.85	33.45	5.17	12.97	7.15	123.31	2.01	270.0	11a
46	81.13	32.64	5.25	13.39	7.00	122.85	2.01	286.2	11b
Missing vial 47.									
48	1.16	6566.08	2.30	2413.07	3.78	8707.35	1.99	268.9	Spike 46A-5
49	1.15	6276.39	2.36	2229.74	3.95	8735.25	2.00	263.5	Spike 46A-6

30 MAR 05 BAW

Initial Entry - Np sorption on alluvium, consolidated alluvium, and montmorillonite (separately) with Simulated waters (with and without calcium) at a single pH. Identified as CAL series 1 and 2 (consolidated alluvium), AL series 5 and 6 (alluvium), and M series 3 and 4 (montmorillonite)

Bradley Werling will be performing this experiment

Objective: To investigate Np sorption on alluvium and montmorillonite (separately) using two types of simulated water (with and without calcium) based on the chemistry from water collected from the shallow string of drillhole NC-EWDP-19PB at a single pH.

Conditions:
- $\sum Np = 200$ ppb
- equilibrium with lab $CO_2(g)$; $pCO_2 = 10^{-3.42}$
- solution volume = 30 ml
- mass of solid = 0.1 g
- M/V (g/L) = 3.33

Samples
- 19PB Simulated water with Ca - 696/14 and 32
- 19PB Simulated water without Ca – 696/14 and 32
- Alluvium sample NC-EWDP-19PB 406.3 – 407.5 ft depth interval (< 35 mesh size fraction) – 628/37-43
- Consolidated alluvium sample (<35 mesh size fraction) NC-EWDP-19PB-0305-Sonic Core Composite - 696/64-66.
- Montmorillonite (SAZ*Na*<2*FD*Scr) 061/94 4-27-05 BW

Reagents
Np spike 46A (60 ppm ^{237}Np stock solution; pH of 5.85)
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 041088)
pH buffer 10 (Fisher SB 116 lot # 044060)
Ultima-Gold AB liquid scintillation cocktail (Packard 6013309 lot # 91-050201)
0.02 M HNO_3 (SN 696/29-30)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
New Brunswick Scientific Gyratory shaker model G33 (sn 290127990)
Fisher Marathon 21K centrifuge model D7209 (sn 15930025)
Mettler AE240 balance (sn ~~001439~~) BW 5-19-05 101237
Packard Tricard 3100TR Liquid Scintillation Analyzer model B2505 (sn 405314)
Stir Plate

Supplies:
Pipettes and tips
Repipettor for transfer of scintillation cocktail
Polycarbonate centrifuge tubes with caps (50 ml capacity)
7 ml scintillation vials
Weighing paper/boats
Plasticware and glassware as needed
Stir bars

30 MAR 05 CONT BAW

Basic Outline of Procedure
- Equilibrate simulated water sample with laboratory CO_2.
- Measure the pH of simulated water samples.
- Add solids to experimental solutions.
- Add simulated water to experimental solutions.
- Add neptunium spike to experimental solutions.
- Place experimental solutions on activated gyrator
- During the experiment, completely remove the experimental solution caps during the regular business hours. Loosely cap otherwise.
- Analyze aliquots of experimental solution for pH and neptunium concentration (LSA)

Equilibrium of Simulated Waters
Initial Entry: 696/72-73
Aeration of both simulated waters since Feb 23, 2005 - 696/14

Experimental Procedure – pH Analyses on simulated groundwaters used in sorption experiments for AL Series 5 and 6, CAL series 1 and 2, and Mont Series 3 and 4 Experimental Solutions.

Bradley Werling will be performing this task.

Objective: To determine the pH of the simulated waters used for the sorption experimental solutions.

Initial Entry 696/72-73

Basic Outline of Procedure

Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

About 300mL of each simulated water was poured into separate beakers. A 10 mL aliquot (pipet with disposable 10 mL tip) of simulated water was transferred into separate 10 mL microbeakers with stir bars. Each aliquot was placed on a stir plate and then the stir plate was activated. The pH was recorded. pH meter challenged with one of the calibration standards. The solutions in the microbeakers were discarded.

Temp = 18.9°C
Setpts = 4.00, 7.02, and 10.08
Slope = 99.3%

30 MAR 05 CONT BAW

19PB Simulated Water with Cq = 8.63
19PB Simulated Water without Cq = 8.68
pH 10 (target = 10.08) at 10.09

Challange of AE240 balance for work performed on 30 Mar 05

Target mass = 20.0001 g
Start of day =
End of day =

Addition of Solids to Experimental Solutions
Alluvium series 5+6, Mont series 3+4 and Consolidated Alluvium series 1+2

Alluvium series 5 (AL5), Montmorillonite series 3 (M3) and Consolidated Alluvium series 1 (CAL1) used 19PB simulated water with Cq.

Alluvium series 6 (AL6), Montmorillonite series 4, BW 3-30-05 (M4), and Consolidated Alluvium series 2 (CAL2) used 19PB simulated water without Cq.

Experiment run at single pH with 3 reps for each combination
Initial Entry 696/72-73

30 MAR 05 CONT BAW

SAMPLE ID	Mass (g) of empty pc tube	Mass (g) of tube + solid
~~AL4-N~~ BW 3-30-05		
AL5-Np1	22.4362	22.5343
AL5-Np2	22.1525	22.2498
AL5-Np3	21.9568	22.0565
AL6-Np1	22.1462	22.2459
AL6-Np2	21.9845	22.0829
AL6-Np3	22.4879	22.5878
M3-Np1	22.0120	22.1087
M3-Np2	22.1880	22.2852
M3-Np3	22.1676	22.2668
M4-Np1	22.0004	22.0987
M4-Np2	22.0294	22.1283
M4-Np3	22.0206	22.1196 2
CAL1-Np1	22.1698	22.2681 BW 3-30-05
~~CAL2-Np2~~ BW 3-30-05		
~~CAL3-Np3~~ BW 3-30-05		
CAL1-Np2	22.1720	22.2708
CAL1-Np3	21.9131	22.0111
CAL2-Np1	21.9757	22.0757
CAL2-Np2	22.1552	22.2544
CAL2-Np3	22.4506	22.5489

30 MAR 05 CONT BAW

Addition of simulated waters and Np Spike to Exp Solns Alluvium ~~AL4~~ BW 3-30-05 Series 5+6, Montmorillonite series 3+4, and Consolidated Alluvium series 1+2

Initial Entry 696/72-73
About 30 mL (10 mL pipet-disposible tip) of water was added to the appropriate pc tube (see legend 696/74)
Mass of pc tube recorded after solution addition (696/76-77)

SAMPLE ID	Mass(g) of pc tube after water added	Mass(g) of pc tube after Np spike
AL5-Np1	52.8818	52.9741
AL5-Np2	52.5176	52.6152
AL5-Np3	52.1166	52.2098
AL6-Np1	52.2169	52.3150
AL6-Np2	52.0498	52.1479
AL6-Np3	52.5934	52.6909
M3-Np1	52.1906	52.2872
M3-Np2	52.3382	52.4353
M3-Np3	52.3940	52.4915
M4-Np1	52.2052	52.3034
M4-Np2	52.2244	52.3215
M4-Np3	52.1819	52.2785

30 MAR 05 CONT BW

SAMPLE ID	Mass(g) of pc tube after water added	Mass(g) of pc tube after Np spike
CAL1-Np1	52.2866	52.3840
CAL1-Np2	52.2730	52.3706
CAL1-Np3	52.0168	52.1152
CAL2-Np1	52.0775	52.1750
CAL2-Np2	52.2591	52.3564
CAL2-Np3	52.6009	52.6968

~~CAL2~~ BW 3-30-05

Then Np Spike 46A (556/84) used. Quantity of 100 µL (single pt pipetor) of spike added to each exp soln and mass was recorded (696/76-77)

Running of Experiment for Alluvium Series 5+6, Montmorillonite Series 3+4, and Consolidated Alluvium Series 1+2

Initial Entry 696/72-73
Vortexed each exp soln for about 30 seconds
Exp solns loosely capped and placed on an activated gyratory shaker.

3-31-05 BW

31 MAR 05 BAW

Running of Experiment for Alluvium Series 5+6, Montmorillonite series 3+4, + Consolidated Alluvium Series 1+2

Initial entry: 696/72-73
Experimental solns (696/77) uncapped and placed on activated gyratory shaker at 09:00. At 16:30, exp solns tightly capped and each soln vortexed for about 10 seconds. Exp solns loosely capped and placed on gyratory shaker again.

1 April 05 BAW

Running of Experiment ~~at~~ BW 4-1-05 for Alluvium Series 5+6, Montmorillonite series 3+4, + Consolidated Alluvium Series 1+2

Initial Entry 696/72-73
Same procedure as 31 Mar 05 - 696/78
Uncapped 11:15
Loosely capped 19:25

4 Apr 05 BW

4 April 05 BAW

Running of Experiment for Alluvium Series 5+6, Montmorillonite series 3+4, + Consolidated Alluvium Series 1+2

Initial Entry 696/72-3
Same procedure as 31 Mar 05 - 696/78
Uncapped: 0900
Loosely capped: 1840

5 APRIL 05 BW

Running of Experiment ~~at~~ BW 4-5-05 for Alluvium Series 5+6, Montmorillonite series 3+4, + Consolidated Alluvium Series 1+2

Initial Entry 696/72-3
Same procedure as 31 Mar 05 - 696/78
Uncapped 0905
Loosely capped. 1805

4-6-05 BW

6 APRIL 05 BW

Running of Experiment for Alluvium Series 5+6, Montmorillonite series 3+4, and Consolidated Alluvium series 1+2

Initial Entry 696/72-3
Same procedure as 31 Mar 05 - 696/78
Uncapped at 0745
Loosely capped at

Experimental Procedure – Liquid Scintillation Analyses of NP with Aluv series 5 + 6, Mont series 3 + 4, and Consolidated Aluv series 1 + 2 in two type of simulated groundwater

Bradley Werling will be performing this task with Jon Brown BW 4-7-05

Objective: To determine the neptunium concentration in solutions and use in calculations for determining the sorption coefficient (Kd) under specified conditions

Initial Entry 696/72-73

Samples Alum series 5 + 6, Mont series 3 + 4, and Consolidated Aluv series 1 + 2 – 696/80

Procedure

LSA vials (size 7 mL) were labeled for experimental solutions, blank solutions, and neptunium spikes solutions. Experimental solutions were analyzed in duplicate and labeled to identify the sorption solid phase and series, the radionuclide, the experimental solution number, and the a/b duplicate designator (example - AL4-Np1a and AL4-Np1b). Two simulated water blank solutions were analyzed and labeled as w CA and w/o CA with scientific notebook page reference. The neptunium spike was analyzed in duplicate and labeled Spike 46~~A-6~~ and ~~7~~. BW 4-21-05
BW 4-21-05 7 8

Each LSA vial (experimental solution, ~~ground~~water blank, and neptunium spike) had 0.5 mL (500µL eppendorf pipet) of ~~0.002~~ 0.102 M HNO_3 added. The mass of all of the LSA vials with acid was recorded (See table 1 column 1). BW 4-6-05 4-6-05 BW BW 4-6-05

The experimental solutions were centrifuged for about 5 minutes at 9200RPM prior to aliquot transfer. The mass of the experimental solutions was recorded before removing the LSA aliquots (See table 2, column 1). The tubes containing the experimental solutions were placed in a tared 30mL glass beaker when being weighed.

6 April 05 CONT BAW

For experimental solutions, 0.5 mL (500µL eppendorf pipet) of the experimental solution was transferred into the appropriate LSA vial. For the simulated water blanks, 0.5 mL (500µL eppendorf pipet) of water was added to the LSA vial. For the neptunium spike solutions, 0.1 mL (100µL eppendorf pipet) of the spike was added into each LSA vial. The mass of all of the LSA vials was recorded after the addition of the appropriate sample solution (See table 1 column 2).

All LSA vials had 5 mL (Repipet bottle top dispenser) of LSA cocktail added. The LSA vials were tightly capped and rigorously shaken by hand.

The pH of the experimental solutions was taken. Fresh pH buffers of 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

A 10 mL aliquot (pipet with disposable 10 mL tip) of experimental solution was transferred into a 10 mL microbeaker with stir bar. A stir plate was used when measuring the pH of the experimental solutions. The pH was recorded (See table 2, column 2). pH meter challenged with pH 10 (from calibration). The solutions in the microbeakers were transferred back to into the original experimental solution.

Challange of Balance (Target 20.0001g)
At start of day = 20.0000g
At end of day = 20.0000g at 1058 on 4-7-05

Table 1 - LSA vial info

ID	Mass (g) of vial + acid	Mass (g) of vial + acid + sample
w CA	7.8860	8.3801
w/o CA	7.8670	8.3576
Spike 46A-7	~~7.8848~~ 4-6-05 7.9240	8.0234
Spike 46A-8	7.8299	7.9295
AL5-Np1a	7.8848	8.3799
AL5 Np1b	7.8355	8.3333

6 April 05 CONT BAW

Table 1 CONT - LSA info

ID	Mass(g) of acid + vial	Mass(g) of acid + vial + sample
AL5-Np2a	7.9500	8.4461
AL5-Np2b	7.8656	8.3633
AL5-Np3a	7.8266	8.3233
AL5-Np3b	7.8864	8.3842
AL6-Np1a	7.8878	8.3821
AL6-Np1b	7.9203	8.4168
AL6-Np2a	7.8496	8.3467
AL6-Np2b	7.8937	8.3927
AL6-Np3a	7.8688	8.3640
AL6-Np3b	7.9547	8.4530
M3-Np1a	7.9076	8.4040
M3-Np1b	7.8344	8.3309
M3-Np2a	7.9061	8.4036
M3-Np2b	7.8952	8.3924
M3-Np3a	7.9163	8.4131
M3-Np3b	7.8283	8.3271
M4-Np1a	7.9358	8.4331
M4-Np1b	7.9517	8.4495
M4-Np2a	7.9850	8.4811
M4-Np2b	7.8798	8.3774
M4-Np3a	7.8810	8.3773

6 April 05 CONT BAW

Table 1 CONT - LSA info

ID	Mass(g) of acid + vial	Mass(g) of acid + vial + sample
M4-Np3b	7.8732	8.3709
CAL1-Np1a	7.9026	8.3994
BW 4-6-05 ~~CAL2~~ CAL1-Np1b	7.9327	8.4311
BW 4-6-05 ~~CAL2~~ CAL1-Np2a	7.8553	8.3536
BW 4-6-05 ~~CAL2~~ CAL1-Np2b	7.8816	8.3800
CAL1-Np3a	7.9195	8.4169
CAL1-Np3b	7.8325	8.3292
CAL2-Np1a	7.8502	8.3488
CAL2-Np1b	7.8279	8.3243
CAL2-Np2a	7.8783	8.3753
CAL2-Np2b	7.9838	8.4815
CAL2-Np3a	7.8348	8.3305
CAL2-Np3b	7.9011	8.3990

pH Analyses recorded in Table 2

Temp 22.3 °C

Setpts 4.00, 7.01, 10.04

Slope 99.4

Challenge after analyses using Cal soln

Target = 7.01 Actual = 7.01

6 April 05 CONT BAW

Table 2 - Experimental Solution info

ID	Mass(g) of Exp Soln tube before LSA Sampling	pH of exp solution
AL5-Np1	~~51.7255~~ 52.4319 4-6-05	8.59
AL5-Np2	52.0000	8.63
AL5-Np3	51.5181	8.61
AL6-Np1	51.7253	8.68
AL6-Np2	51.5554	8.69
AL6-Np3	52.0319	8.68
M3-Np1	51.7255	8.62
M3-Np2	51.8776	8.60
M3-Np3	51.9069	8.61
M4-Np1	51.7585	8.66
M4-Np2	51.7524	8.66
M4-Np3	51.6747	8.65
CAL1-Np1	51.6318	8.61
CAL1-Np2	51.7416	8.62
CAL1-Np3	51.4731	8.62
CAL2-Np1	51.5293	8.67
CAL2-Np2	51.7133	8.66
CAL2-Np3	51.9578	8.67

5-24-05 BAW

11 April 05 JB

Initial Entry - Np sorption on consolidated alluvium and montmorillonite (separately) with Simulated waters (with and without calcium) over a pH range. Identified as CAL (consolidated alluvium) series 3 and 4 and M (montmorillonite) series 5 and 6 .

Jon Brown will be performing this experiment

Objective: To investigate Np sorption on alluvium and montmorillonite (separately) using two types of simulated water (with and without calcium) based on the chemistry from water collected from the shallow string of drillhole NC-EWDP-19PB over a range of pHs.

Conditions:
- $\sum$Np = 200 ppb
- equilibrium with lab CO_2(g); $pCO_2 = 10^{-3.42}$
- solution volume = 30 ml
- mass of solid = 0.1 g
- M/V (g/L) = 3.33

Samples
- 19PB Simulated water with Ca - 696/14 and 32
- 19PB Simulated water without Ca – 696/14 and 32
- Consolidated alluvium sample (<35 mesh size fraction) NC-EWDP-19PB-0305-Sonic Core Composite - 696/64-66.
- Montmorillonite (SAZ*Na*<2*FD*Scr) 061/94 4-27-05 BAW

Reagents
Np spike 46A (60 ppm ^{237}Np stock solution; pH of 5.85)
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 044065)
pH buffer 10 (Fisher SB 116 lot # 044060)
Ultima-Gold AB liquid scintillation cocktail (Packard 6013309 lot # 91-050201)
0.02 M HNO_3 (SN 696/29-30)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
New Brunswick Scientific Gyratory shaker model G33 (sn 290127990)
Fisher Marathon 21K centrifuge model D7209 (sn 15930025)
Mettler AE240 balance (sn ~~001439~~) BW 5-19-05 101237
Packard Tricard 3100TR Liquid Scintillation Analyzer model B2505 (sn 405314)
Stir Plate

Supplies:
Pipettes and tips
Repipettor for transfer of scintillation cocktail
Polycarbonate centrifuge tubes with caps (50 ml capacity)
7 ml scintillation vials
Weighing paper/boats
Plasticware and glassware as needed
Stir bars

11 April 05 cont. JB

Basic Outline of Procedure

- Equilibrate simulated water sample with laboratory CO_2.
- Measure the pH of simulated water samples.
- Add solids to experimental solutions.
- Add simulated water to experimental solutions.
- Add pH adjustment solutions to experimental solutions.
- Add neptunium spike to experimental solutions.
- Place experimental solutions on activated gyrator
- During the experiment, completely remove the experimental solution caps during the regular business hours. Loosely cap otherwise.
- Analyze aliquots of experimental solution for pH and neptunium concentration (LSA)

Equilibrium of Samples

Initial Entry 696/85-86
Conducted for the two simulated groundwaters
Aeration for simulated groundwater since Feb 23, 2005
(696/14)

~~pH measurement of simulated groundwater~~

~~Initial entry 696/85-86 4/11/05 JB~~
~~Objective: To determine pH of simulated waters~~
~~19PB simulated water without Ca and~~
~~19PB simulated water with Ca (696/14)~~

~~4/11/05 JB~~

11 April 05, cont. JB

Experimental Procedure – pH Analyses on simulated groundwaters used in sorption experiments for CAL series 3 and 4, and Mont Series 5 and 6 Experimental Solutions.

Jon Brown will be performing this task. + Brad Werling 4-11-05 BW

Objective: To determine the pH of the simulated waters used for the sorption experimental solutions.

Initial Entry 696/85-~~86~~ 86

Basic Outline of Procedure

Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

About 10 mL of each simulated water was poured into separate beakers. The 10 mL aliquot of simulated water was transferred into separate 10 mL microbeakers with stir bars. Each aliquot was placed on a stir plate and then the stir plate was activated. The pH was recorded. pH meter challenged with one of the calibration standards. The solutions in the microbeakers were discarded.

Calibrated with pH 4, pH 7, and pH 10
Temp. 20.4°C
Set points 4.00, 7.02, and 10.06
Slope = 98.9%

Poured about 750 mL of sample into a 1L glass beaker for each of the simulated waters (with and without Ca). A 10 mL aliquot was removed from each beaker with a Fisherbrand Finnpipett and transferred into disposable 10 mL plastic beakers with

11 April 05 cont. [illegible]

stir bars. These 10 mL samples were used to determine pH. The were placed on a stir plate and measured.

pH of simulated 19PB water with CA = 8.62
pH of simulated 19PB water without CA = 8.68

Challenge with pH 10 (target 10.06) = 10.08

Addition ~~10 g~~ 4/11/05 of solids to experimental solutions ~~Alluvium series~~ 4/11/05 Consolidated Alluvium series 3 and 4
Montmorillonite series 5 and 6

Initial entry 696/85-86.
Labeled 11 polycarbonate tubes (10 mL) M5-Np1 to 11 and 11 pc tubes M6-Np1 to 11.
Labeled 11 pc tubes CAL3-Np1 to 11 and 11 pc tubes CAL4-Np1 to 11.

Weighed and recorded mass of each tube (w/cap)
Added ~0.1 g of Montmorillonite or Consolidated Alluvium (as appropriate) directly into the PC tubes.
Then reweigh pc tubes with cap and sample
Weights recorded on 696/89

11 April 05 cont. [illegible]

Sample ID	Mass (g) of Empty pc tube	Mass (g) of pc tube with solid
M5-Np1	22.1398	22.2389
M5Np2	22.3919	22.4916
M5-Np3	22.5386	22.6377
M5-Np4	22.1676	22.2675
M5-Np5	22.2303	22.3304
M5-Np6	22.3652	22.4648
M5-Np7	22.3892	22.4890
M5-Np8	22.3297	22.4299
M5-Np9	22.3166	22.4169
M5-Np10	22.4866	22.5864
M5-Np11	22.0820	22.1817
M6-Np1	22.1176	22.2166
M6-Np2	22.3531	22.4527
M6-Np3	22.5419	22.6415
M6-Np4	22.1821	22.2828
M6-Np5	22.5518	22.6510
M6-Np6	22.2007	22.3012
M6-Np7	22.0539	22.1540
M6-Np8	~~22.0888~~ 4/11/05 22.3292	~~22.1289~~ 4/11/05 22.4289
M6-Np9	22.2248	22.3250
M6-Np10	22.0557	22.1551
M6-Np11	22.3718	22.4708

11 April 05 cont. BS

Sample ID	Mass(g) of Empty pc tube	Mass(g) of pc tube with solid
CAL3-Np1	22.3754	22.4764
CAL3-Np2	22.1270	22.2283
CAL3-Np3	22.5830	22.6813
CAL3-Np4	22.2401	22.3382
CAL3-Np5	22.2168	22.3179
CAL3-Np6	22.0493	22.1492
CAL3-Np7	22.4053	22.5051
CAL3-Np8	22.3487	22.4485
CAL3-Np9	22.1161	22.2145
CAL3-Np10	22.0475	22.1475
CAL3-Np11	22.4590	22.5575
CAL4-Np1	22.0936	22.1927
CAL4-Np2	22.1421	22.2427
CAL4-Np3	22.1468	22.2476
CAL4-Np4	21.9993	22.1002
CAL4-Np5	22.0074	22.1086
CAL4-Np6	22.1839	22.2829
CAL4-Np7	22.0111	22.1122
CAL4-Np8	22.0191	22.1202
CAL4-Np9	22.1370	22.2376
CAL4-Np10	21.8998	22.0010
CAL4-Np11	22.1288	22.2293

11 APRIL 05 CONT BAW

Challange of balance (Target = 20.0001g)
At start = 20.0003g
At end = 20.0002g

Addition of Simulated Water to Experimental Solutions CAL series 3+4 and Mont series 5+6

Initial Entry = 696/85-86
About 30mL (10mL pipet) of appropriate simulated water was added to the experimental solution pc tube. Mass was then recorded 696/91-93
19PB simulated water with Ca used for Mont series 5 and Cal series 3
19PB simulated water without Ca used for Mont series 6 and CAL series 4

Sample ID	Mass(g) of tube + solid + sim water
M5-Np1	52.2543
M5-Np2	52.5680
M5-Np3	52.7681
M5-Np4	52.3551
M5-Np5	52.3550
M5-Np6	52.6290
M5-Np7	52.6622
M5-Np8	52.6150
M5-Np9	52.4882

11 APRIL 05 CONT BAW

Sample ID	Mass (g) of tube + solid + sim water
M5-Np10	52.7585
M5-Np11	52.2927
M6-Np1	52.2046
M6-Np2	52.4409
M6-Np3	52.6237
M6-Np4	52.3364
M6-Np5	52.7500
M6-Np6	52.3296
M6-Np7	52.0447
M6-Np8	52.6793
M6-Np9	52.5028
M6-Np10	52.2326
M6-Np11	52.5077
CAL3-Np1	52.8296
CAL3-Np2	52.4928
CAL3-Np3	52.9061
CAL3-Np4	52.5954
CAL3-Np5	52.5480
CAL3-Np6	52.3905
CAL3-Np7	52.7606
CAL3-Np8	52.7080
CAL3-Np9	52.4032
CAL3-Np10	52.3776
CAL3-Np11	52.6593
CAL4-Np1	52.4775

11 APRIL 05 CONT BAW

SAMPLE ID	Mass (g) of tube + solid + sim water
CAL4-Np2	52.4266
CAL4-Np3	52.4996
CAL4-Np4	52.3612
CAL4-Np5	52.3501
CAL4-Np6	52.3130
CAL4-Np7	52.3335
CAL4-Np8	52.3478
CAL4-Np9	52.4457
CAL4-Np10	52.1938
CAL4-Np11	52.4499

12 April 05 BAW

Continuation of CAL series 3+4 and M series 5+6

Initial Entry 696/85-86

Reweighed exp solutions (tube/solid/sim water) 696/95-96

Addition of pH adjustment solns to exp solns CAL 3+4 and M series 5+6

Initial Entry 696/85-86

Adjusted pH by adding acid/base according to table on 696/94. Suffix Np1 to Np11 represents pH range of 6.5 to 9. Used adjustable eppendorfs 10-100 µL and 100-1000 µL. Recorded mass after pH adjusting soln added 696/94-96

12 APRIL 05 CONT BAW

pH adjustment volumes (see 696/93)

pH	Vol (uL) of 0.1M HNO3	Vol (uL) of 0.1M NaOH
6.5	795	na
6.75	783	na
7	770	na
7.25	750	na
7.5	710	na
7.75	665	na
8	561	na
8.25	420	na
8.5	36	na
8.75	na	517
9	na	1622

Assumptions
1. Quantities based on experimental testing (696/52-68)
2. Water at equilibrium with lab CO2(g) = -3.42 (log fugacity)
3. Experimental solutions approximately 30 mL volume
4. GFW of NO3- = 62.0049, GFW of NA = 22.9898

Challange of Balance (Target = 20.0001 g)
At start = 20.0002 g
At end = 20.0000 g

Addition of Neptunium Spike to Exp Solns
CAL series 4+5 and M series 5+6

Initial entry 696/85-86
Np Spike 46A 556/84 to 696/91-93 solns
100 µL "set" pipet
Recorded mass after Np spike 696/95-96

4-12-05 BW

12 APRIL 05 CONT BAW

SAMPLE ID ~~AA~~ BW 4-12-05	Mass (g) of tube + solid + sim H_2O	Mass (g) after pH adjustment	Mass (g) after Np Spike
M5-Np1	52.2503	53.0340	53.1322
M5-Np2	52.5639	53.3350	53.4320
M5-Np3	52.7647	53.5233	53.6213
M5-Np4	52.3515	53.0887	53.1869
M5-Np5	52.3515	53.0506	53.1483
M5-Np6	52.6254	53.2775	53.3761
M5-Np7	52.6587	53.2077	53.3026
M5-Np8	52.6107	53.0233	53.1197
M5-Np9	52.4850	52.5193	52.6172
M5-Np10	52.7552	53.2597	53.3581
M5-Np11	52.2896	53.8913	53.9896
M6-Np1	52.2014	52.9829	53.0800
M6-Np2	52.4365	53.2078	53.3055
M6-Np3	52.6204	53.3803	53.4782
M6-Np4	52.3332	53.0698	53.1675
M6-Np5	52.7462	53.4465	53.5444
M6-Np6	52.3260	52.9741	53.0716
M6-Np7	52.0416	52.5926	52.6901
M6-Np8	52.6740	53.0857	53.1833
M6-Np9	52.4983	52.5309	52.6270
M6-Np10	52.2280	52.7334	52.8310
M6-Np11	52.5039	54.1029	54.1990

12 APRIL 05 CONT BAW

SAMPLE ID	Mass (g) of tubes	Mass (g) after pH adjustment	Mass (g) after Np Spike
CAL3-Np1	solid + H_2O 52.8241	53.6054	53.7013
CAL3-Np2	52.4853	53.2530	53.3511
CAL3-Np3	52.9037	53.6582	53.7559
CAL3-Np4	52.5891	53.3182	53.4160
CAL3-Np5	52.5458	53.2406	53.3391
CAL3-Np6	52.3883	53.0405	53.1386
CAL3-Np7	52.7580	53.3028	53.4004
CAL3-Np8	52.7049	53.1110	53.2083
CAL3-Np9	52.3992	52.4303	52.5277
CAL3-Np10	52.3750	52.8755	52.9734
CAL3-Np11	52.6559	54.2556	54.3535
CAL4-Np1	52.4752	53.2519	53.3489
CAL4-Np2	52.4243	53.1924	53.2878
CAL4-Np3	52.4972	53.2552	53.3540
CAL4-Np4	52.3589	53.0931	53.1915
CAL4-Np5	52.3478	53.0447	53.1436
CAL4-Np6	52.3097	52.9602	53.0457
CAL4-Np7	52.3313	52.8823	52.9814
CAL4-Np8	52.3456	52.7551	52.8470
CAL4-Np9	52.4435	52.4777	52.5761
CAL4-Np10	52.1916	52.6958	52.7945
CAL4-Np11	52.4478	54.0483	54.1468

4-12-05 BAW

12 APRIL 05 CONT BAW

Running of CAL series 3+4 and M series 5+6 Experiment

Initial Entry 696/9 4-12-05 BAW 85-86
Each exp. soln vortexed for about 30 secs (696/95-96)
Placed on activated gyrator with loose caps

13 APRIL 05 BAW

Running of CAL series 3+4 and M series 5+6 Exp

Initial Entry 696/85-86
Exp Solns from 696/95-96
Followed procedure from 31 Mar 05 (696/78)
Uncapped: 0915
Loosely capped: 16:45

14 April 05 BAW

Running of CAL series 3+4 and M Series 5+6 Exp

Initial Entry 696/85-86
Exp Solns from 696/95-96
Same procedure as 31 Mar 05 (696/78)
Uncapped: 0900
Loosely capped: 17:10

4-15-05 BAW

15 APRIL 05 BAW

Running of the CAL series 3+4 and M series 5+6 Exp

Initial Entry 696/85-86
Same procedure as 31 Mar 05 on 696/78
Uncapped: 08:55
Loosely capped: 16:55

Liquid Scintillation Analyses Results for CAL series 1 + 2, M series 3 + 4, and AL series 5 + 6 Experimental Solutions

Bradley Werling will perform this task

Objective

To determine the amount of neptunium in the experimental solution at the end of the experiments.

Initial Entry 696/72-73

LSA sample preparation 696/80-83

Samples

Blank (two blanks prepared but only one used in analyses): w Ca 696/80
Neptunium spike (two samples) – Spike 46A–7 and Spike 46A–8
Six experiments derived from 3 different solids and 2 types of simulated waters. Alluvium series 5 (6 samples), Alluvium series 6 (6 samples), Montmorillonite series 3 (6 samples), Montmorillonite series 4 (6 samples), Consolidated Alluvium series 1 (6 samples) and Consolidated Alluvium series 2 (6 samples).

Results

Printout of LSA analyses following:

4-15-05 BW

15 APRIL 05 CONT BAW

```
4/10/05 3:07:31 PM          QuantaSmart (TM) - 1.31 - Serial# 405314          Page # 1
Protocol# 15 -- Pa_Np_Exp_AB.lsa                                              User: Bertetti


Assay Definition-

Assay Description:


Assay Type: Alpha/Beta
Report Name: Np Pa Exp
Output Data Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB
Raw Results Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\20050408 1251.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\Np_Pa_AB.033
Assay File Name: C:\Packard\TriCarb\Assays\Pa_Np_Exp_AB.lsa

Count Conditions-

Nuclide: NP/PA
   Quench Indicator: SIS
   External Std Terminator (sec): n/a
   Pre-Count Delay (min): 0.00
Alpha/Beta Standards:
   Low Energy: NP/PA
Count Time (min): 240.00
Count Mode: Normal
Assay Count Cycles: 1          Repeat Sample Count: 1
#Vials/Sample: 1               Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

In Use Discriminator: 143

Regions          LL       UL  Bkg Subtract  2Sigma % Terminator
Beta A          0.0    400.0      1st Vial                 0.00
Beta B        100.0    400.0      1st Vial                 0.00
Alpha         100.0    400.0      1st Vial                 2.00

Count Corrections-

Static Controller: On          Luminescence Correction: Off
Colored Samples: n/a           Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18    Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off
Regions    Half Life          Units      Reference Date      Reference Time
Beta A
Beta B
Alpha

IPA Block Data
Software Version IC: 2.11
Software Version EC: 1.31
Instrument Model: Tri-Carb 3100TR
Instrument Serial Number: 405314
3H Chi Square: 12.89     Date Processed: 4/8/05 12:51:43 PM
14C Chi Square: 17.68    Date Processed: 4/8/05 12:51:43 PM
3H E^2/B (1-18.6 keV): 273.02  Date Processed: 4/8/05 12:51:43 PM
14C E^2/B (4-156 keV): 505.15   Date Processed: 4/8/05 12:51:43 PM
3H Efficiency (0-18.6 keV): 65.23  Date Processed: 4/8/05 12:51:43 PM
14C Efficiency (0-156 keV): 96.39  Date Processed: 4/8/05 12:51:43 PM
IPA Background Date Processed: 4/8/05 12:51:43 PM
```

15 APRIL 05 CONT BAW

4/10/05 3:07:32 PM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 2

Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

3H Background CPM (0-18.6 keV): 15.62 Date Processed: 4/8/05 12:51:43 PM
14C Background CPM (0-156 keV): 22.80 Date Processed: 4/8/05 12:51:43 PM
3H Calibration DPM: 285000
3H Reference Date: 10/29/99
14C Calibration DPM: 134100

Cycle 1 Results

S#	Count Time	CPMA	A:2S%	CPMB	B:2S%	CPMa	alpha2S%	SIS	
MESSAGES									
1	240.00	20.16	2.88	3.27	7.13	0.39	20.74	162.7	w CA 696/80
B									
2	77.48	9.71	14.12	4.15	15.96	128.68	2.01	302.3	>AL5-Np1<b
3	78.46	8.17	16.32	3.59	17.70	127.07	2.01	326.3	
4	73.63	9.23	15.06	4.10	16.46	135.45	2.01	296.9	>AL5-Np2<b
5	73.65	10.07	13.97	3.62	18.09	135.40	2.01	267.4	
6	77.04	9.68	14.18	4.44	15.21	129.45	2.01	333.0	>AL5-Np3<b
7	74.97	9.43	14.68	4.07	16.40	133.01	2.01	290.9	
8	73.99	10.02	14.00	4.16	16.25	134.79	2.01	282.9	>AL6Np1<b
9	72.29	11.01	13.04	4.89	14.56	137.94	2.01	295.6	
10	71.90	11.12	12.96	5.03	14.29	138.72	2.01	308.9	>AL6Np2<b
11	71.92	11.60	12.50	4.75	14.91	138.66	2.01	289.8	
12	72.88	11.22	12.78	4.86	14.56	136.82	2.01	304.5	>AL6Np3<b
13	72.45	12.00	12.11	5.09	14.12	137.68	2.01	304.6	
Missing vial 14.									
15	81.81	17.48	8.44	7.38	10.28	121.86	2.01	291.1	>M3Np1<b
16	82.32	18.57	8.02	7.15	10.48	121.10	2.01	276.1	
17	81.07	19.12	7.89	7.64	10.08	122.98	2.01	268.4	>M3Np2<b
18	81.78	18.38	8.11	7.67	10.01	121.90	2.01	284.8	
19	80.62	18.79	8.02	7.76	10.00	123.65	2.01	282.9	>M3Np3<b
20	81.96	18.29	8.13	8.06	9.67	121.64	2.01	288.9	
21	79.58	19.79	7.74	8.21	9.68	125.28	2.01	290.9	>M4Np1<b
22	79.39	21.46	7.27	8.55	9.43	125.57	2.01	279.2	
23	80.65	19.98	7.64	8.10	9.72	123.62	2.01	287.3	>M4Np2<b
24	80.93	19.84	7.67	7.75	9.99	123.18	2.01	273.4	
25	80.97	21.41	7.22	8.68	9.25	123.14	2.01	286.2	>M4Np3<b
26	80.44	19.09	7.92	7.68	10.08	123.95	2.01	278.1	
Missing vial 27.									
28	72.91	12.70	11.51	5.21	13.83	136.81	2.01	289.7	>CAL1Np1<b
29	72.53	14.61	10.27	5.80	12.85	137.51	2.01	281.2	
30	72.87	14.86	10.11	5.86	12.72	136.84	2.01	279.9	>CAL1Np2<b
31	72.09	14.06	10.63	5.78	12.91	138.34	2.01	285.6	
32	72.40	14.86	10.14	5.99	12.56	137.75	2.01	282.9	>CAL1Np3<b
33	72.87	14.26	10.46	5.82	12.78	136.84	2.01	289.1	
34	71.49	15.48	9.86	6.84	11.52	139.49	2.01	307.8	>CAL2Np1<b
35	71.06	14.70	10.31	5.94	12.74	140.35	2.01	285.8	
36	71.76	16.69	9.26	6.41	12.03	138.98	2.01	279.0	>CAL2Np2<b
37	71.96	17.56	8.88	7.15	11.14	138.58	2.01	282.3	
38	73.76	16.08	9.43	6.91	11.28	135.20	2.01	301.1	>CAL2Np3<b
39	73.51	16.15	9.41	5.92	12.58	135.65	2.01	273.7	
Missing vial 40.									
41	1.14	7846.51	2.12	2663.39	3.63	8828.56	1.99	255.0	Np Spike 46A-7
42	1.16	5005.70	2.63	1794.14	4.39	8674.61	1.99	264.3	Np Spike 46A-8

4-15-05 BW

18 APRIL 05 BW

Running of CAL series 3+4, M series 5+6 Exp

Initial Entry 696/85-86
Same procedure as 31 Mar 05 on 696/78
Uncapped: 0900
Loosely capped: 1635

19 April 05 BAW

Running of CAL series 3+4, M series 5+6 Exp

Initial Entry 696/85-86
Same procedure as 31 Mar 05 on 696/78
Uncapped: 0800
Loosely capped: 16:40

Running of CAL series 3+4, M series 5+6 Exp

Initial Entry 696/85-86
Same procedure as 31 Mar 05 on 696/78
Uncapped: 0735
Loosely capped: 1640

4-21-05 BW

21 APRIL 05 BAW

Running of CAL series 3+4 and M series 5+6 Exp

Initial Entry: 696/85-86
Same procedure as 31 Mar 05 on 696/78
Uncapped at 0830
Loosely capped at 16:40

22 APRIL 05 BAW

Experimental Procedure – Liquid Scintillation Analyses of NP with Mont series 5 + 6, and Consolidated Aluv series 3 + 4 in two types of simulated groundwater

Bradley Werling will be performing this task + Paul Bertetti 4-22-05 BW

Objective: To determine the neptunium concentration in solutions and use in calculations for determining the sorption coefficient (Kd) under specified conditions

Initial Entry 696/85-86

Sample Info Four experiments based on two minerals (montmorillonite and consolidated alluvium) and two simulated waters (with and without calcium) based on 19PB shallow string

Procedure

LSA vials (size 7 mL) were labeled for experimental solutions, blank solution, and neptunium spikes solutions. Experimental solutions were analyzed in duplicate and labeled to identify the sorption solid phase and series, the radionuclide, the experimental solution number, and the a/b duplicate designator (example – CAL3-Np1a and CAL3-Np1b). One simulated water blank solution was analyzed and labeled as w CA with scientific notebook page reference. The neptunium spike was analyzed in duplicate and labeled Spike 46A-9 and 10.

Each LSA vial (experimental solution, water blank, and neptunium spikes) had 0.5 mL (500µL eppendorf pipet) of 0.02 M HNO_3 added. The mass of all of the LSA vials with acid was recorded (See table 1 column 1).

The experimental solutions were centrifuged for about 5 minutes at 9200 RPM prior to aliquot transfer. The mass of the experimental solutions was recorded before removing the LSA aliquots (See table 2, column 1). The tubes containing the experimental solutions were placed in a tared 30mL glass beaker when being weighed.

22 APRIL 05 CONT BAW

For experimental solutions, 0.5 mL (500µL eppendorf pipet) of the experimental solution was transferred into the appropriate LSA vial. For the simulated water blank, 0.5 mL (500µL eppendorf pipet) of water was added to the LSA vial. For the neptunium spike solutions, 0.1 mL (100µL eppendorf pipet) of the spike was added into each LSA vial. The mass of all of the LSA vials was recorded after the addition of the appropriate sample solution (See table 1 column 2).

The pH of the experimental solutions was taken. Fresh pH buffers of 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

A 10 mL aliquot (pipet with disposable 10 mL tip) of experimental solution was transferred into a 10 mL microbeaker with stir bar. A stir plate was used when measuring the pH of the experimental solutions. The pH was recorded (See table 2, column 2). pH meter challenged with pH 10 (from calibration). The solutions in the microbeakers were transferred back to into the original experimental solution.

All LSA vials had 5 mL (Repipet bottle top dispenser) of LSA cocktail added. The LSA vials were tightly capped and rigorously shaken by hand.

Challenge of Balance (Target 20.0001g)
At start of day = 20.0001
At end of day = 20.0001

Table 1 - LSA info

ID	Mass(g) of vial + acid	Mass(g) of vial + acid + sample
w CA 696/102	7.9591	8.4563
Spike 46A-9	7.8969	7.9984
Spike 46A-10	7.8705	7.9720
M5-Np1a	7.8750	8.3731
M5-Np1b	7.8820	8.3826

22 APRIL 05 CONT BAW

TABLE 1 - LSA info continued

ID ~~Np2a~~ BW 4-22-05 M5 ~~Np2b~~ BW 4-22-05	Mass(g) of vial + acid	Mass(g) of vial + ~~vial +~~ BW 4-22-05 acid + sample
M5-Np2a	7.9137	8.4099
M5-Np2b	7.8308	8.3297
M5-Np3a	7.8917	8.3863
M5-Np3b	7.9181	8.4141
M5-Np4a	7.9205	8.4163
M5-Np4b	7.8817	8.3789
M5-Np5a	7.9412	8.4350
M5-Np5b	7.9056	8.4020
M5-Np6a	7.8692	8.3646
M5-Np6b	7.8502	8.3472
M5-Np7a	7.9333	8.4277
M5-Np7b	7.8459	8.3430
M5-Np8a	7.8439	8.3410
M5-Np8b	7.9640	8.4618
M5-Np9a	7.8872	8.3844
M5-Np9b	7.8495	8.3464
M5-Np10a	7.9355	8.3834
M5-Np10b	7.9174	8.4160
M5-Np11a	7.9235	8.4188
M5-Np11b	7.8812	8.3783
M6-Np1a	7.9386	8.4349
M6-Np1b	7.9023	8.4019
M6-Np2a	7.8974	8.3920
M6-Np2b	7.9987	8.4988

22 APRIL 05 CONT BAW

TABLE 1 - LSA info continued

ID	Mass(g) of vial + acid	Mass(g) of vial + acid + sample
M6-Np3a	8.0248	8.5214
M6-Np3b	7.9662	8.4661
M6-Np4a	7.8593	8.3552
M6-Np4b	7.9149	8.4136
M6-Np5a	7.8984	8.3938
M6-Np5b	7.8474	8.3463
M6-Np6a	7.9223	8.4179
M6-Np6b	7.9236	8.4216
M6-Np7a	7.8342	8.3298
M6-Np7b	7.9184	8.4155
M6-Np8a	7.8311	8.3251
M6-Np8b	7.9705	8.4689
M6-Np9a	7.9751	8.4727
M6-Np9b	7.8982	8.3958
M6-Np10a	7.9905	8.4867
M6-Np10b	7.8978	8.3962
M6-Np11a	7.9796	8.4744
M6-Np11b	7.9557	8.4531
CAL3-Np1a	7.8524	8.3495
CAL3-Np1b	7.9305	8.4302
CAL3-Np2a	7.8887	8.3869
CAL3-Np2b	7.9209	8.4201
CAL3-Np3a	7.9208	8.4164
CAL3-Np3b	7.8904	8.3898

22 APRIL 05 CONT BAW

TABLE 1 - LSA info cont

ID	Mass (g) of vial + acid	Mass (g) of vial + acid + sample
CAL3-Np4a	7.9230	8.4216
CAL3-Np4b	7.8580	8.3571
CAL3-Np5a	7.8656	8.3607
CAL3-Np5b	7.9005	8.4003
CAL3-Np6a	7.8158	8.3129
CAL3-Np6b	7.9296	8.4291
CAL3-Np7a	7.9390	8.4359
CAL3-Np7b	7.8806	8.3786
CAL3-Np8a	7.8592	8.3554
CAL3-Np8b	7.9102	8.4078
CAL3-Np9a	7.9502	8.4460
CAL3-Np9b	7.9228	8.4216
CAL3-Np10a	7.8786	8.3760
CAL3-Np10b	7.9338	8.4327
CAL3-Np11a	7.8936	8.3967
CAL3-Np11b	7.8619	8.3599
CAL4-Np1a	7.8249	8.3200
CAL4-Np1b	7.9043	8.4028
CAL4-Np2a	7.9515	8.4455
CAL4-Np2b	7.9120	8.4088
CAL4-Np3a	7.9094	8.4042
CAL4-Np3b	7.8539	8.3485
CAL4-Np4a 4-BW 22 05	~~7.~~ 8.0241	8.5155
CAL4-Np4b	7.9327	8.4287

22 APRIL 05 CONT BAW

TABLE 1 - LSA info CONT

ID	Mass (g) of vial + acid	Mass (g) of vial + acid + sample
CAL4-Np5a	7.9420	8.4343
CAL4-Np5b	7.8802	8.3721
CAL4-Np6a	7.8907	8.3809
CAL4-Np6b	7.9619	8.4588
CAL4-Np7a	7.8971	8.3910
CAL4-Np7b	7.9029	8.3977
CAL4-Np8a	7.9087	8.4006
CAL4-Np8b	8.0348	8.5295
CAL4-Np9a	7.9301	8.4235
CAL4-Np9b	7.8758	8.3715
CAL4-Np10a	7.9655	8.4617
CAL4-Np10b	7.8457	8.3423
CAL4-Np11a	7.9399	8.4333
CAL4-Np11b	7.8578	8.3550

pH analyses recorded in Table 2

Temp = 19.8°C

Setpts = 4.00, 7.01, 10.07

Slope = 99.1%

Challange after analyses using Cal soln pH 7

Target = 7.02 Measured = 7.03

22 APRIL 05 CONT BAW

TABLE 2 - Experimental Soln info

ID	Mass(g) of exp soln tube before LSA sampling	pH of exp solution
M5-Np1	52.4109	7.42
M5-Np2	52.6169	7.52
M5-Np3	52.7490	7.56
M5-Np4	52.1770	7.67
M5-Np5	52.0904	7.77
M5-Np6	52.1964	7.97
M5-Np7	51.9627	8.01
M5-Np8	51.9152	8.34
M5-Np9	51.9646	8.65
M5-Np10	52.5523	9.06
M5-Np11	52.8760	9.37
M6-Np1	52.4597	7.84
M6-Np2	52.6723	7.85
M6-Np3	52.7993	7.88
M6-Np4	52.4128	7.92
M6-Np5	52.7497	8.07
M6-Np6	52.2149	8.12
M6-Np7	51.8503	8.18
M6-Np8	52.3483	8.38
M6-Np9	52.0130	8.73
M6-Np10	52.0849	9.21
M6-Np11	53.3753	9.49

22 APRIL 05 CONT BAW

TABLE 2 - EXPERIMENTAL SOLN INFO continued

ID	Mass(g) of exp soln tube before LSA sampling	pH of exp soln
CAL3-Np1	53.0522	7.75
CAL3-Np2	52.6657	7.80
CAL3-Np3	53.0793	7.84
CAL3-Np4	52.6491	7.92
CAL3-Np5	52.5443	8.00
CAL3-Np6	52.3065	8.11
CAL3-Np7	52.6205	8.26
CAL3-Np8	52.4138	8.42
CAL3-Np9	51.8925	8.67
CAL3-Np10	52.2690	8.89
CAL3-Np11	53.5647	9.33
CAL4-Np1	52.7160	8.05
CAL4-Np2	52.6015	8.09
CAL4-Np3	52.6664	8.12
CAL4-Np4	52.4988	8.17
CAL4-Np5	52.4173	8.25
CAL4-Np6	52.2853	8.29
CAL4-Np7	52.2774	8.39
CAL4-Np8	52.1007	8.50
CAL4-Np9	51.8998	8.71
CAL4-Np10	52.1189	8.88
CAL4-Np11	53.4294	9.38

22 APRIL 05 CONT BAW

Sampling of CAL4 3 exp solns for DIV01 Cation Analysis BW 4-22-05

Bradley Werling will perform this task

Objective: To characterize certain cation concentrations at the end of the experiment, particularly calcium.

Initial Entry: 696/85-86

Samples: Limit to consolidated alluvium in simulated 19PB shal with calcium (series CAL3 696/91)

Equipment + Supplies
- 100 mL pp beakers
- Filters - Whatman 6874-2504 lot 11026
  25mm dia, 0.45μm Pore size
- 30 mL syringe B-D 309650
- 30 mL pp bottles

Procedure

Exp solution poured into 100mL pp beaker. Soln withdrawn using syringe. Filter attached to syringe. Soln dispensed into labeled 30mL pp bottle. Labeled following this scheme

22 APRIL 05 CONT BAW

LEGEND FOR DIV01 Samples

CAL4-Np1 - CAL41
CAL4-Np2 - CAL42
CAL4-Np3 - CAL43
CAL4-Np4 - CAL44
CAL4-Np5 - CAL45
CAL4-Np6 - CAL46
CAL4 Np7 - CAL47
CAL4 Np8 - CAL48
CAL4 Np9 - CAL49
CAL4 Np10 - ~~CAL410~~ BW 4-22-05 CAL410
CAL4 Np11 - CAL411
3 BW 5-24-05

25 APRIL 05 BAW

Delivery of CAL series 3 samples to DIV01 for cation analysis

Initial Entry for Sorption experiment: 696/85-86
Samples limited to 11 CAL series 3 (no QA samples)
Sample collection 696/110-111
DIV01 labels CAL41 to 411.
Chain of Custody for DIV01 on following pages

25 April 05 BW

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute®
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Shipper Name/Address: BRAD WERLING CNWRA - DIV 20 Blg 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround: ☐ 2 Weeks ☐ 3 Weeks ☒ Other: 4 wks

SwRI Contact: Mike Daumann

Analyses Requested: Si, Ca, Mg, Na, K, Sr by ICP

REMARKS
Preservation
a = HCl to pH <2
~~b = HNO_3 to pH <2~~ BW 4-25-05
c = H_2SO_4 to pH <2
d = NaOH to pH >12
~~e = Cool (4°C±2°C)~~
f = Other (specify) NONE

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Si, Ca, Mg, Na, K, Sr by ICP										
CAL41	4-22-05		W		1	X										
CAL42																
CAL43																
CAL44																
CAL45																
CAL46																
CAL47																
CAL48																
CAL49																
CAL410																

INITIAL: Nuclear Safety related - Use appropriate QA procedures

POC - Brad Werling x6565 fax 5184

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
L - Liquid
P – Product
Sd - Solid
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 22.0°C Therm #: 027

Comments: RADIOACTIVE - max Np237 values 1.7×10^{-6} M or 2.8×10^{-4} µCi/mL
696/111

Relinquished by (Print/Signature)	Date	Time
Jon Brown / [signature]	4/25/05	4:30
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 1.20.06002.01.242

Received by SwRI Lab: (Signature) [signature]

Date: 04/25/05 Time: 16:30

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page 1 of 2

25 APRIL 05 CONT BAW

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute®
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Shipper Name/Address: BRAD WERLING CNWRA - DIV 20 Bld 57

Client:

Client Purchase Order/Other ID:

Site/Zone ID:

Requested Turnaround: ☐ 2 Weeks ☐ 3 Weeks ☒ Other: 4 wks

SwRI Contact: Mike Daumann

Analyses Requested: Si, Ca, Mg, Na, K, Sr, by ICP

REMARKS
Preservation
a = HCl to pH <2
~~b = HNO_3 to pH <2~~ BW 4-25-05
c = H_2SO_4 to pH <2
d = NaOH to pH >12
~~e = Cool (4°C±2°C)~~
f = Other (specify) none

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Si, Ca, Mg, Na, K, Sr, by ICP										
CAL411	4-22-05		W		1	X										

INITIAL: Nuclear Safety related - use appropriate QA procedures

POC - Brad Werling x6565 fax 5184

Matrix Types:
A – Air
B – Biota
D - Dust
E – Emission/Stack
L - Liquid
P – Product
Sd - Solid
S – Soil
SED – Sediment
T - Tissue
W - Water
WP - Wipe

Sample Types:
D - Duplicate
ER – Equipment Rinsate
ES – Environmental Sample
FB – Field Blank
FD – Field Duplicate
MS – Matrix Spike
MSD – Matrix Spike Dup
TB – Trip Blank

Temp: 22.0°C Therm #: 027

Comments: RADIOACTIVE: max Np237 values 1.7×10^{-6} M or 2.8×10^{-4} µCi/mL
696/111

Relinquished by (Print/Signature)	Date	Time
Jon Brown / [signature]	4/25/05	4:30
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 1.20.06002.01.242

Received by SwRI Lab: (Signature) [signature]

Date: 04/25/05 Time: 16:30

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

Page 2 of 2

25 APRIL 05 CONT BAW

25 APRIL 05 CONT BAW

Div 01 Results for anion analyses of 19PB shel string Simulated Ground water with calcium

Sample- 19PB simulated water with Ca 696/2-3
Two samples (duplicates) and 1 QA = 3 Total
QA creation = 696/3 QA conc. targets = 696/6
Sampling = 696/4
Chain of Custody 696/6+8
Note- sample of simulated water without Ca also created + ~~analyse~~ BW 4-25-05 analyzed. Samples also analyzed for cation. The complete data (both samples + both analyses) will be examined once available.
The following pages contain the div 01 results
Calculation of QA recoveries on 696/122

4-25-05 BW

25 APRIL 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: 19PBS-A1

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: 259407

Client: Division 20
Date Received: 02/21/05
Project No.: 06002.01.232
SRR: 27250
Task Order: 050222-4

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.05	0.1
Fluoride	1.47	0.1
Nitrate-N	0.614	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0545	0.01
Sulfate	28.2	1

25 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-A2

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259408

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.232

SRR: 27250

Task Order: 050222-4

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.07	0.1
Fluoride	1.47	0.1
Nitrate-N	0.598	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0702	0.01
Sulfate	28.6	1

25 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-A3

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259409

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.232

SRR: 27250

Task Order: 050222-4

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	4.11	0.1
Chloride	1.94	0.1
Fluoride	0.979	0.1
Nitrate-N	0.874	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	2.02	0.01
Sulfate	4.09	0.1

25 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
DUPLICATE SUMMARY

Sample ID
19PBS-A1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259407

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.232

SRR: 27250

Task Order: 050222-4

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Bromide	<0.1	<0.1	0.00%
Chloride	6.05	6.03	0.33%
Fluoride	1.47	1.47	0.00%
Nitrate-N	0.614	0.599	2.47%
Nitrite-N	<0.1	<0.1	0.00%
Phosphate-P	0.0545	0.0512	6.24%
Sulfate	28.2	28.2	0.00%

25 April 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID
19PBS-A1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259407

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.232

SRR: 27250

Task Order: 050222-4

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Bromide	<0.1	3.85	4.00	96.3%
Chloride	6.05	7.93	2.00	94.0%
Fluoride	1.47	2.37	1.00	90.0%
Nitrate-N	0.614	1.41	0.904	88.1%
Nitrite-N	<0.1	0.970	1.00	97.0%
Phosphate-P	0.0545	0.500	0.500	89.1%
Sulfate	28.2	67.8	40.0	99.0%

25 April 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.232

SRR: 27250

Task Order: 050222-4

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	421	400	105%
Chloride	207	200	104%
Fluoride	101	100	101%
Nitrate-N	90.3	90.4	99.9%
Nitrite-N	102	100	102%
Phosphate-P	8.78	8.81	99.7%
Sulfate	419	400	105%

NA- Not Applicable.

25 April 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID
PBW

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.232

SRR: 27250

Task Order: 050222-4

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.01	0.01
Sulfate	<0.1	0.1

NA- Not Applicable.

25 APRIL 05 CONT BAW

For Sample 19PBS-A3 (696/6+117)

Analyte	Target Conc (ppm)	Measured Conc (ppm)	Percent Difference
Bromide	4	4.11	2.75
Chloride	2	1.94	-3.00
Fluoride	1	0.979	-2.10
Nitrate-N*	0.904	0.874	-3.32
Phosphate - P #	1.94	2.02	4.12
Sulfate	4	4.09	2.25

* 4 ppm NO3 converts to 0.904 ppm NO3 as N
N = 14.0067 g/mol
NO3 = 62.0049 g/mol

# 6 ppm HPO4 converts to 1.94 ppm Phosphate as P
P = 30.97376 g/mol
HPO4 = 95.97926 g/mol

For CNWRA duplicate samples 19PBS-A1 and 19PBS-A2 696/115-116)

Analyte	19PBS-A1 conc (ppm)	19PBS-A2 conc (ppm)	Percent Difference
Bromide	<0.1	<0.1	na
Chloride	6.05	6.07	0.33
Fluoride	1.47	1.47	0.00
Nitrate-N*	0.614	0.598	-2.61
Nitrite -N	<0.1	<0.1	na
Phosphate - P #	0.0545	0.0702	28.81
Sulfate	28.2	28.6	1.42

Above are the calculations for QC sample recoveries. The top table is for the CNWRA blind sample. The bottom table is for a comparison of the CNWRA duplicate samples. Note the variation of the phosphate measurements of the CNWRA duplicate samples. QA BW 4-25-05

4-27-05 BW

27 APRIL 05 CONT BAW

Div 01 Anion Results for 19PB shallow string Simulated groundwater without calcium

Three samples were sent for analyses. Two samples (duplicates) were the simulated water w/o calcium and the ~~thir~~ BW 4-27-05 third was a reanalyses of a fresh aliquot of simulated water with calcium.

Samples: 19PB simulated water with Ca (QA type sample)
19PB simulated water without Ca
see 696/16-17
Results of initial 19PB sim water w/ Ca 696/114-122
Sampling + Legend 696/17
Chain of custody - 696/25 + 26
Samples also analyzed for cation. The complete data (both samples + both analyses) will be examined once available. The following pages contain the Div 01 results.

Calculation of QA recoveries on 696/131

4-27-05 BW

27 APRIL 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-A4

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259577

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	10.6	0.1
Fluoride	1.45	0.1
Nitrate-N	0.654	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0203	0.01
Sulfate	30.1	1

27 APRIL 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-A5

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259578

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	10.5	0.1
Fluoride	1.45	0.1
Nitrate-N	0.643	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0534	0.01
Sulfate	29.8	1

27 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-A6

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259579

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.08	0.1
Fluoride	1.43	0.1
Nitrate-N	0.595	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.0225	0.01
Sulfate	28.9	1

27 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
DUPLICATE SUMMARY

Sample ID
19PBS-A4

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259577

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Bromide	<0.1	<0.1	0.00%
Chloride	10.6	10.5	0.95%
Fluoride	1.45	1.40	3.51%
Nitrate-N	0.654	0.648	0.92%
Nitrite-N	<0.1	<0.1	0.00%
Phosphate-P	0.0203	0.0170	17.7%
Sulfate	30.1	29.9	0.67%

27 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID
19PBS-A4

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259577

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Bromide	<0.1	4.09	4.00	102%
Chloride	10.6	12.4	2.00	90.0%
Fluoride	1.45	2.38	1.00	93.0%
Nitrate-N	0.654	1.50	0.904	93.6%
Nitrite-N	<0.1	1.01	1.00	101%
Phosphate-P	0.0203	0.486	0.500	93.1%
Sulfate	30.1	69.8	40.0	99.3%

27 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	421	400	105%
Chloride	207	200	104%
Fluoride	101	100	101%
Nitrate-N	90.3	90.4	99.9%
Nitrite-N	102	100	102%
Phosphate-P	8.78	8.81	99.7%
Sulfate	419	400	105%

NA- Not Applicable.

27 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

Sample ID
PBW

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.232

SRR: 27271

Task Order: 050302-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.01	0.01
Sulfate	<0.1	0.1

NA- Not Applicable.

27 April 05 cont BAW

Comparison of average conc of initial analyses 19PBS-A1+2 (696/115+116) with the reanalyses 19PBS-A6 (696/126)

Analyte	Ave 19PBS-A1+2 conc (ppm)	19PBS-A6 conc (ppm)	Percent Difference
Bromide	<0.1	<0.1	na
Chloride	6.06	6.08	0.33
Fluoride	1.47	1.43	-2.72
Nitrate-N	0.606	0.595	-1.82
Nitrite -N	<0.1	<0.1	na
Phosphate - P	0.06	0.0225	-63.88
Sulfate	28.4	28.9	1.76

For CNWRA duplicate samples 19PBS-A4 and 19PBS-A5 (696/124+125)

Analyte	19PBS-A4 conc (ppm)	19PBS-A5 conc (ppm)	Percent Difference
Bromide	<0.1	<0.1	na
Chloride	10.6	10.5	-0.94
Fluoride	1.45	1.45	0.00
Nitrate-N	0.654	0.643	-1.68
Nitrite -N	<0.1	<0.1	na
Phosphate - P	0.0203	0.0534	163.05
Sulfate	30.1	29.8	-1.00

Above are the calculations for the QC samples for the 19PB simulated water without CA. The top table compares the initial analyses of the 19PB simulated water with CA with a "QC type" reanalyses of a fresh aliquot. The bottom table is for a comparison of the CNWRA duplicate samples. Note the variation of the phosphate measurement in both tables. Variation was also observed between the CNWRA duplicate samples in the initial analyses. (696/122)

29 APRIL 05 BAW

Div 01 Results for Cation analyses of 19PB shallow string Simulated Groundwater with calcium

Sample - 19PB simulated water with Cq 696/2-3
Two Samples (duplicates) and 1 QA = 3 total
QA creation = 696/3 QA conc targets 696/6
Sampling = 696/4 Legend 696/4
Chain of custody = 696/6-7
Note - sample of simulated water without Cq also created and analyzed. Samples also analyzed for anions. The complete data (both samples + both analyses) will be examined ~~one~~ BW 4-29-05 once available. The following pages contain the Div 01 results.

Calculation of QA values on 696/140

4-29-05 BAW

29 April 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-C1

Lab Name: Southwest Research Institute
Lab Code: SwRI
Matrix: Water
Lab System ID: 259410

Client: Division 20
Date Received: 02/21/05
Project No.: 06002.01.242
SRR: 27251
Task Order: 050222-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	12.1	0.250
Magnesium	1.20	0.250
Silicon	11.8	0.100
Potassium	3.48	1.25
Sodium	66.3	1.25
Strontium	<0.0250	0.0250

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-C2

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259411

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.242

SRR: 27251

Task Order: 050222-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	11.8	0.250
Magnesium	1.08	0.250
Silicon	11.8	0.100
Potassium	2.69	1.25
Sodium	64.9	1.25
Strontium	<0.0250	0.0250

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-C3

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259412

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.242

SRR: 27251

Task Order: 050222-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	9.27	0.250
Magnesium	8.93	0.250
Silicon	<0.100	0.100
Potassium	9.42	1.25
Sodium	10.2	1.25
Strontium	<0.0250	0.0250

29 APRIL 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
DUPLICATE SUMMARY

Sample ID
19PBS-C1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259410

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.242

SRR: 27251

Task Order: 050222-5

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Calcium	12.1	12.0	0.83%
Magnesium	1.20	1.07	11.5%
Silicon	11.8	11.9	0.84%
Potassium	3.48	2.48	33.6%
Sodium	66.3	65.2	1.67%
Strontium	<0.0250	<0.0250	0.00%

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID
19PBS-C2

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259411

Client: Division 20

Date Received: 02/21/05

Project No.: 06002.01.242

SRR: 27251

Task Order: 050222-5

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Calcium	11.8	111	100	99.2%
Magnesium	1.08	99.7	100	98.6%
Silicon	11.8	31.5	20.0	98.5%
Potassium	2.69	91.4	100	88.7%
Sodium	64.9	154	100	89.1%
Strontium	<0.0250	20.3	20.0	102%

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW - D18H1 / D26H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.242

SRR: 27251

Task Order: 050222-5

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Calcium	96.7	100.0	96.7%
Magnesium	96.4	100	96.4%
Silicon	19.6	20.0	98.0%
Potassium	89.2	100	89.2%
Sodium	89.8	100	89.8%
Strontium	19.6	20.0	98.0%

NA- Not Applicable.

29 APRIL 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID
PBW - D18H1 / D26H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.242

SRR: 27251

Task Order: 050222-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	<0.250	0.250
Magnesium	<0.250	0.250
Silicon	<0.100	0.100
Potassium	<1.25	1.25
Sodium	<1.25	1.25
Strontium	<0.0250	0.0250

NA- Not Applicable.

29 APRIL 05 CONT BAW

For Sample 19PBS-C3 (696/6+135)

Analyte	Target Conc (ppm)	Measured Conc (ppm)	Percent Difference
Calcium	10.0	9.27	-7.30
Magnesium	10.0	8.93	-10.70
Silicon	<0.100	<0.100	na
Potassium	10.0	9.42	-5.80
Sodium	10.0	10.2	2.00
Strontium	<0.0250	<0.0250	na

For CNWRA duplicate samples 19PBS-C1 and 19PBS-C2 (696/133-134)

Analyte	19PBS-C1 conc (ppm)	19PBS-C2 conc (ppm)	Percent Difference
Calcium	12.1	11.8	-2.48
Magnesium	1.2	1.08	-10.00
Silicon	11.8	11.8	0.00
Potassium	3.48	2.69	-22.70
Sodium	66.3	64.9	-2.11
Strontium	<0.0250	<0.0250	na

Above are the calculations for QC sample recoveries. The top table is for the CNWRA blind QA sample. The bottom table is for comparison of the CNWRA duplicate samples. Note potassium values on the bottom table. Potassium ~~is~~ BAW 4-29-05 frequently exhibits the greatest variation

4-29-05 BAW

29 APRIL 05 CONT BAW

Div 01 Cation Results for 19PB shallow string simulated groundwater without calcium

Three samples were sent for analyses. Two samples (duplicates) were the simulated water w/o calcium and the third was a reanalyses of a fresh aliquot of simulated water with calcium.

Samples: 19PB simulated water with Ca (QA type sample)
19PB simulated water without Ca
see 696/16-17
Results of initial 19PB sim water w/ Ca 696/132-140
Sampling + Legend 696/16-17
Chain of Custody - 696/25+27
Samples also analyzed for anions. The complete data (both samples + both analyses) will be examined one available. The following pages contain the Div 01 results.

Calculation of QA recoveries on 696/149

4-29-05 BAW

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-C4

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259580

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	<0.250	0.250
Magnesium	1.09	0.250
Silicon	11.9	0.100
Potassium	2.66	1.25
Sodium	82.1	1.25
Strontium	<0.0250	0.0250

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-C5

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259581

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	<0.250	0.250
Magnesium	1.09	0.250
Silicon	11.9	0.100
Potassium	2.19	1.25
Sodium	82.0	1.25
Strontium	<0.0250	0.0250

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
19PBS-C6

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259582

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	6.97	0.250
Magnesium	1.05	0.250
Silicon	11.8	0.100
Potassium	3.31	1.25
Sodium	65.4	1.25
Strontium	<0.0250	0.0250

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
DUPLICATE SUMMARY

Sample ID
19PBS-C4

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259580

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Calcium	<0.250	<0.250	0.00%
Magnesium	1.09	1.03	5.66%
Silicon	11.9	11.8	0.84%
Potassium	2.66	2.46	7.81%
Sodium	82.1	83.1	1.21%
Strontium	<0.0250	<0.0250	0.00%

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID
19PBS-C5

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 259581

Client: Division 20

Date Received: 02/28/05

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Calcium	<0.250	96.8	100	96.8%
Magnesium	1.09	97.4	100	96.3%
Silicon	11.9	31.5	20.0	98.0%
Potassium	2.19	90.6	100	88.4%
Sodium	82.0	169	100	87.0%
Strontium	<0.0250	21.4	20.0	107%

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW - D18H1 / D26H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Calcium	96.7	100.0	96.7%
Magnesium	96.4	100	96.4%
Silicon	19.6	20.0	98.0%
Potassium	89.2	100	89.2%
Sodium	89.8	100	89.8%
Strontium	19.6	20.0	98.0%

NA- Not Applicable.

29 APRIL 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

Sample ID
PBW - D18H1 / D26H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.242

SRR: 27272

Task Order: 050301-6

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	<0.250	0.250
Magnesium	<0.250	0.250
Silicon	<0.100	0.100
Potassium	<1.25	1.25
Sodium	<1.25	1.25
Strontium	<0.0250	0.0250

NA- Not Applicable.

29 APRIL 05 CONT BAW

Comparison of average conc of initial analyses 19PBS-C1+2 (696/133+134) with the reanalyses 19PBS-C6 (696/144)

Analyte	Ave 19PBS-C1+2 conc (ppm)	19PBS-C6 conc (ppm)	Percent Difference
Calcium	12.0	6.97	-41.67
Magnesium	1.14	1.05	-7.89
Silicon	11.8	11.8	0.00
Potassium	3.09	3.31	7.29
Sodium	65.6	65.4	na
Strontium	<0.0250	<0.0250	na

For CNWRA duplicate samples 19PBS-C4 and 19PBS-C5 (696/142+143)

Analyte	19PBS-C4 conc (ppm)	19PBS-C5 conc (ppm)	Percent Difference
Calcium	<0.250	<0.250	na
Magnesium	1.09	1.09	0.00
Silicon	11.9	11.9	0.00
Potassium	2.66	2.19	-17.67
Sodium	82.1	82.0	-0.12
Strontium	<0.0250	<0.0250	na

Above calculations for the QC samples for the 19PB simulated water without Ca. The top table compares the initial analyses of the 19PB simulated water with Ca with a "QC type" reanalyses of a fresh aliquot. Note the drop in the measured calcium level. The bottom table is for a comparison of the CNWRA duplicate samples. Note the variation of the potassium BW 4-29-05 ~~phosphate~~ measurement ~~in both~~ BW 4-29-05 Potassium frequently exhibits the greatest variation.

5-2-05 BW

2 MAY 2005 BW

Liquid Scintillation Analyses Results for CAL series 3 + 4 and M series 5 + 6 Experimental Solutions

Bradley Werling and Jon Brown will perform this task

Objective

To determine the amount of neptunium in the experimental solution at the end of the experiments.

Initial Entry 696/85-86

LSA sample preparation 696/102-107

Samples

Blank (one from simulated water with calcium): w Ca 696/102
Neptunium spike (two samples) – Spike 46A–9 and Spike 46A–10
Four experiments derived from 2 different solids (montmorillonite and consolidated alluvium) and 2 types of simulated waters (with and without calcium).
Montmorillonite series 5 (11 samples), Montmorillonite series 6 (11 samples), Consolidated Alluvium series 3 (11 samples) and Consolidated Alluvium series 4 (11 samples).

Results

Printout of LSA analyses following:

5-2-05 BW

2 MAY 05 CONT BAW

5/1/05 6:59:42 AM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 1
Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

Assay Definition-

Assay Description:

Assay Type: Alpha/Beta
Report Name: Np_Pa_Exp
Output Data Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB
Raw Results Path: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\20050425_1237.results
Comma-Delimited File Name: C:\Packard\Tricarb\Results\Bertetti\Pa_Np_Exp_AB\Np_Pa_AB.034
Assay File Name: C:\Packard\TriCarb\Assays\Pa_Np_Exp_AB.lsa

Count Conditions-

Nuclide: NP/PA
Quench Indicator: SIS
External Std Terminator (sec): n/a
Pre-Count Delay (min): 0.00
Alpha/Beta Standards:
Low Energy: NP/PA
Count Time (min): 240.00
Count Mode: Normal
Assay Count Cycles: 1 Repeat Sample Count: 1
#Vials/Sample: 1 Calculate % Reference: Off

Background Subtract: On - 1st Vial
Low CPM Threshold: Off
2 Sigma % Terminator: On - Any Region

In Use Discriminator: 143

Regions	LL	UL	Bkg Subtract	2Sigma % Terminator
Beta A	0.0	400.0	1st Vial	0.00
Beta B	100.0	400.0	1st Vial	0.00
Alpha	100.0	400.0	1st Vial	2.00

Count Corrections-

Static Controller: On Luminescence Correction: Off
Colored Samples: n/a Heterogeneity Monitor: n/a
Coincidence Time (nsec): 18 Delay Before Burst (nsec): 75

Half Life-

Half Life Correction: Off

Regions	Half Life	Units	Reference Date	Reference Time
Beta A				
Beta B				
Alpha				

IPA Block Data
Software Version IC: 2.11
Software Version EC: 1.31
Instrument Model: Tri-Carb 3100TR
Instrument Serial Number: 405314
3H Chi Square: 22.95 Date Processed: 4/25/05 12:37:29 PM
14C Chi Square: 12.13 Date Processed: 4/25/05 12:37:29 PM
3H E^2/B (1-18.6 keV): 280.43 Date Processed: 4/25/05 12:37:29 PM
14C E^2/B (4-156 keV): 538.50 Date Processed: 4/25/05 12:37:29 PM
3H Efficiency (0-18.6 keV): 65.01 Date Processed: 4/25/05 12:37:29 PM
14C Efficiency (0-156 keV): 96.38 Date Processed: 4/25/05 12:37:29 PM
IPA Background Date Processed: 4/25/05 12:37:29 PM

2 MAY 05 CONT BAW

5/1/05 6:59:43 AM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 2

Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

3H Background CPM (0-18.6 keV): 15.12 Date Processed: 4/25/05 12:37:29 PM
14C Background CPM (0-156 keV): 21.88 Date Processed: 4/25/05 12:37:29 PM
3H Calibration DPM: 285000
3H Reference Date: 10/29/99
14C Calibration DPM: 134100

Cycle 1 Results

	S#	Count Time	CPMA	A:2S%	CPMB	B:2S%	CPMa	alpha2S%	SIS
	MESSAGES								
WCA 696/021		240.00	20.44	2.86	3.42	6.98	0.33	22.65	168.2
	B								
M5-Npia	2	91.03	18.59	7.71	7.87	9.45	109.53	2.01	295.8
1b	3	88.93	21.87	6.85	8.12	9.35	112.13	2.01	259.0
2a	4	92.45	17.57	8.02	7.29	9.89	107.85	2.01	286.1
2b	5	93.10	18.31	7.74	7.66	9.53	107.09	2.01	290.3
3a	6	92.95	18.44	7.69	7.79	9.43	107.27	2.01	289.5
3b	7	91.30	19.70	7.35	7.36	9.88	109.20	2.01	264.9
4a	8	92.07	21.73	6.78	7.84	9.43	108.29	2.01	252.2
4b	9	91.15	21.32	6.91	9.22	8.48	109.38	2.01	296.1
5a	10	91.29	20.55	7.11	8.56	8.91	109.22	2.01	285.3
5b	11	92.86	21.04	6.93	8.83	8.66	107.36	2.01	287.6
6a	12	91.79	21.05	6.96	8.74	8.76	108.62	2.01	284.5
6b	13	92.53	21.48	6.83	8.55	8.87	107.75	2.01	277.1
7a	14	92.33	21.75	6.77	9.29	8.39	108.01	2.01	287.6
7b	15	92.78	21.79	6.75	8.92	8.61	107.46	2.01	283.1
8a	16	87.99	20.71	7.18	8.92	8.82	113.34	2.01	293.3
8b	17	88.01	20.93	7.12	9.03	8.74	113.30	2.01	290.9
9	18	81.38	21.96	7.09	9.01	9.07	122.57	2.01	287.5
9b	19	80.09	22.79	6.94	9.49	8.83	124.55	2.01	283.6
10a	20	86.58	30.76	5.35	12.19	7.24	115.18	2.01	273.8
10b	21	76.93	34.95	5.13	13.77	7.08	129.66	2.01	273.6
11a	22	76.84	34.64	5.17	13.94	7.03	129.82	2.01	275.3
11b	23	76.87	33.82	5.26	13.38	7.21	129.76	2.01	270.6
	Missing vial 24.								
M6-Npia	25	94.17	22.22	6.60	8.86	8.59	105.87	2.01	278.4
1b	26	92.74	22.19	6.65	8.88	8.64	107.52	2.01	270.5
2a	27	92.88	23.76	6.30	9.04	8.52	107.36	2.01	267.9
2b	28	91.09	23.61	6.39	9.28	8.45	109.46	2.01	269.4
3a	29	93.39	22.35	6.60	8.91	8.59	106.76	2.01	280.9
3b	30	91.22	22.56	6.61	9.61	8.25	109.32	2.01	299.7
4a	31	93.20	23.41	6.37	9.34	8.33	106.97	2.01	278.1
4b	32	92.74	25.09	6.05	9.55	8.23	107.52	2.01	270.8
5a	33	95.12	24.79	6.04	10.17	7.80	104.82	2.01	278.4
5b	34	92.63	25.75	5.94	10.07	7.94	107.64	2.01	280.3
6a	35	90.92	25.73	5.98	10.74	7.68	109.67	2.01	292.8
6b	36	92.36	26.11	5.88	10.79	7.60	107.96	2.01	282.6
7a	37	89.17	26.24	5.95	10.80	7.72	111.84	2.01	280.5
7b	38	90.10	25.69	6.02	10.78	7.69	110.67	2.01	283.7
8a	39	86.73	24.98	6.25	10.53	7.95	114.99	2.01	288.7
8b	40	87.22	27.96	5.72	11.14	7.65	114.35	2.01	270.8
9a	41	81.65	27.77	5.92	11.12	7.89	122.16	2.01	276.2
9b	42	81.08	30.01	5.61	11.47	7.76	123.01	2.01	264.2
10a	43	78.03	54.70	3.74	20.30	5.56	127.86	2.01	266.3
10b	44	76.85	56.63	3.68	20.54	5.56	129.84	2.01	258.8
11a	45	79.52	45.16	4.23	18.22	5.88	125.44	2.01	274.7
11b	46	78.25	44.06	4.33	17.07	6.16	127.47	2.01	269.5
	Missing vial 47.								
	Missing vial 48.								
	Missing vial 49.								
	Missing vial 50.								
	Missing vial 51.								
	Missing vial 52.								

2 MAY 05 CONT BW

5/1/05 6:59:43 AM QuantaSmart (TM) - 1.31 - Serial# 405314 Page # 3

Protocol# 15 - Pa_Np_Exp_AB.lsa User: Bertetti

	Missing vial 53.								
	Missing vial 54.								
CAL3-Npia	55	76.08	18.74	8.27	7.60	10.50	131.13	2.01	275.2
1b	56	77.71	19.61	7.90	8.40	9.71	128.36	2.01	293.9
2a	57	76.70	19.51	7.98	8.70	9.54	130.05	2.01	304.7
2b	58	77.09	19.87	7.85	8.73	9.50	129.39	2.01	299.6
3a	59	75.48	20.58	7.70	8.78	9.56	132.17	2.01	287.6
3b	60	75.34	21.04	7.58	8.92	9.46	132.42	2.01	297.3
4a	61	75.14	20.21	7.83	9.01	9.41	132.76	2.01	291.4
4b	62	74.56	22.16	7.31	9.52	9.11	133.82	2.01	290.3
5a	63	76.36	22.83	7.07	9.20	9.21	130.65	2.01	284.7
5b	64	75.66	23.09	7.04	8.99	9.40	131.85	2.01	274.1
6a	65	74.54	21.42	7.51	9.91	8.87	133.86	2.01	309.5
6b	66	75.20	21.14	7.56	8.80	9.56	132.65	2.01	288.3
7a	67	74.97	21.86	7.37	8.91	9.49	133.06	2.01	285.6
7b	68	75.48	21.57	7.43	9.08	9.34	132.21	2.01	289.6
8a	69	73.97	23.05	7.12	9.11	9.41	134.92	2.01	282.5
8b	70	73.22	22.92	7.18	9.69	9.08	136.28	2.01	287.2
9a	71	71.54	24.06	6.99	9.56	9.26	139.50	2.01	280.9
9b	72	70.17	23.67	7.14	9.46	9.41	142.20	2.01	281.7
10a	73	159.46	10.46	10.10	4.28	11.69	62.39	2.01	280.8
10b	74	158.61	11.58	9.25	4.86	10.61	62.72	2.01	283.5
11a	75	240.00	7.82	11.51	3.35	12.31	23.14	2.72	294.8
11b	76	240.00	8.43	10.75	3.55	11.72	22.75	2.75	287.1
	Missing vial 77.								
CAL4-Npia	78	78.69	24.08	6.70	9.63	8.82	126.78	2.01	281.8
1b	79	78.23	24.05	6.73	10.01	8.62	127.52	2.01	289.5
2a	80	79.17	23.29	6.86	9.80	8.69	126.01	2.01	285.8
2b	81	79.61	23.18	6.87	9.99	8.56	125.29	2.01	297.7
3a	82	76.53	23.57	6.89	10.37	8.50	130.36	2.01	298.8
3b	83	76.84	24.14	6.76	10.32	8.52	129.82	2.01	294.0
4a	84	76.71	26.21	6.35	10.93	8.21	130.05	2.01	290.5
4b	85	76.72	24.00	6.79	10.47	8.44	130.05	2.01	289.5
5a	86	76.71	24.81	6.62	10.35	8.51	130.04	2.01	290.4
5b	87	76.94	24.87	6.60	10.82	8.25	129.65	2.01	289.2
6a	88	87.75	22.12	6.83	9.08	8.72	113.64	2.01	290.8
6b	89	86.40	22.04	6.89	8.83	8.95	115.42	2.01	284.0
7a	90	75.73	25.48	6.53	11.50	8.00	131.75	2.01	297.7
7b	91	75.56	25.61	6.51	10.59	8.44	132.03	2.01	285.5
8a	92	79.56	24.84	6.51	10.23	8.43	125.37	2.01	275.7
8b	93	81.10	24.52	6.52	10.27	8.33	122.98	2.01	293.5
9a	94	70.69	25.65	6.69	10.55	8.73	141.15	2.01	287.1
9b	95	70.23	27.28	6.41	11.50	8.28	142.11	2.00	285.9
10a	96	80.00	25.42	6.38	10.99	8.03	124.68	2.01	296.0
10b	97	79.09	25.05	6.49	10.81	8.15	126.13	2.01	289.5
11a	98	184.60	15.26	6.92	6.27	8.24	53.86	2.02	285.2
11b	99	185.19	14.68	7.14	6.14	8.36	53.67	2.02	286.6
	Missing vial 100.								
Np spike 4CA-9	101	1.12	7205.46	2.23	2843.90	3.55	8946.10	2.00	281.3
Np spike 4CA-10	102	1.12	6659.03	2.32	2648.36	3.67	8979.14	1.99	283.0

5-2-05 BW

2 MAY 05 CONT BAW

CALIBRATION of Nanopure Diamond Analytical Ultrapure Water System

Water System: Barnstead model D11901 serial number 11900 10979691
Calibration module: Barnstead model E896X5 serial number 896020321720 with current cert performed by SwRI cal lab (asset #009582)

Performed calibration of sensing electronics on water system following instructions listed in the "Nanopure Diamond Analytical Ultrapure Water System Operation Manual Series 1190" (11/2/00) under the N.I.S.T. Calibration Module Section (page 29)

System responded with LED displaying "passed". Label placed on unit indicating date, status, and reference to this page.

5-4-05
BW

4 MAY 05 CONT BAW

Consolidation and Comparison of Results revealing the component concentrations of 19PB simulated waters

Two Samples: ~~Sim~~ BW 5-4-05
19PB simulated ground water with Ca- 696/2-3
19PB simulated ground water without Ca- 696/13-14
BW 5-4-05

Analyses
Gravimetric based on mass of compounds used to make solns.
Div ol cation: ICP
Div ol anion: IC for all except phosphate
phosphate by EPA 365.3 (colorimetric)

The information ~~of page~~ BW 5-4-05 on 696/156 relates to the target concentrations for the two waters
The information on 696/157 relates to the gravimetric concentrations for the two waters
The information of 696/158 combines the Div ol cation and anion analyses ~~to~~ BW 5-4-05 for both waters
The information on 696/159 provides the target, gravimetric, and div ol concentrations for both waters

TARGET Masses of compounds to use in stock solns for prep of simulated 19PB waters

4 MAY 05 CONT BAD

19PB Shallow without calcium

Compound	Mass (g) of compound for 1L of stock soln	MW of compound	mmoles of compound in 1L of stock solution	Na	Mg	Ca	K	HCO3	Si	Cl	SO4	NO3	F
				mmoles of ions in 1L of stock solution									
NaHCO3	7.8969	84.01	94.00	94.00	0	0	0	94.00	0	0	0	0	0
KF*2H2O	0.2893	76.12	3.800	0	0	0	3.800	0	0	0	0	0	3.800
NaNO3	0.1615	84.99	1.900	1.900	0	0	0	0	0	0	0	1.900	0
Na2SO4*10H2O	3.8663	322.19	12.00	24.00	0	0	0	0	0	0	12.00	0	0
MgCL2*6H2O	0.4066	203.31	2.000	0	2.000	0	0	0	0	4	0	0	0
NaCl	0.4617	58.44	7.900	7.900	0	0	0	0	0	7.900	0	0	0
Na2SiO3*9H2O	4.8598	284.20	17.10	34.20	0	0	0	0	17.10	0	0	0	0
			Stock Solution										
			TOTAL (mmol ions)	162	2	0	3.8	94	17.1	11.9	12	1.9	3.8001
			mass (g) per mole	22.99	24.305	40.08	39.1	61.02	28.09	35.45	96.062	62	18.998
			TOTAL (mass (mg) ions)	3724.3	48.61	0	149	5736	480.3	421.9	1152.7	117.8	72.195
			Conc (ppm) in Simulated water	93.1	1.22	0	3.71	143	12.0	10.5	28.8	2.95	1.80

19PB Shallow with calcium

Compound	Mass (g) of compound for 1L of stock soln	MW of compound	mmoles of compound in 1L of stock solution	Na	Mg	Ca	K	HCO3	Si	Cl	SO4	NO3	F
				mmoles of ions in 1L of stock solution									
NaHCO3	7.8969	84.01	94.00	94.00	0	0	0	94.00	0	0	0	0	0
KF*2H2O	0.2893	76.12	3.80	0	0	0	3.80	0	0	0	0	0	3.80
Ca(NO3)2*4H2O	0.2125	236.15	0.90	0	0	0.90	0	0	0	0	0	1.8	0
CaSO4*2H2O	1.9972	172.17	11.60	0	0	11.60	0	0	0	0	11.60	0	0
MgCL2*6H2O	0.4066	203.31	2.00	0	2.00	0	0	0	0	4	0	0	0
CaCl2*6H2O	0.3286	219.08	1.50	0	0	1.50	0	0	0	3	0	0	0
Na2SiO3*9H2O	4.8598	284.20	17.10	34.2	0	0	0	0	17.10	0	0	0	0
			Stock Solution										
			TOTAL (mmol ions)	128.2	2.00	14.00	3.80	94.00	17.10	7.00	11.60	1.80	3.80
			mass per mole	22.99	24.305	40.08	39.1	61.02	28.09	35.45	96.062	62	18.998
			TOTAL (mass (mg) ions)	2947.3	48.608	561.1	149	5736	480.3	248.2	1114.3	111.6	72.205
			Conc (ppm) in Simulated water	73.7	1.22	14.0	3.71	143	12.0	6.20	27.9	2.79	1.81

Simulated waters prepared by 40 fold dilution of stock solutions (653/193 and 696/10)
Source 653/194 and 696/11

ACTUAL Masses of compounds to use in stock solns for prep of simulated 19PB waters

4 MAY 05 CONT BAD

19PB Shallow without calcium

Compound	Mass (g) of compound for 1L of stock soln	MW of compound	mmoles of compound in 1L of stock solution	Na	Mg	Ca	K	HCO3	Si	Cl	SO4	NO3	F
				mmoles of ions in 1L of stock solution									
NaHCO3	7.8976	84.01	94.01	94.01	0	0	0	94.01	0	0	0	0	0
KF*2H2O	0.2991	76.12	3.929	0	0	0	3.929	0	0	0	0	0	3.929
NaNO3	0.1649	84.99	1.940	1.940	0	0	0	0	0	0	0	1.940	0
Na2SO4*10H2O	3.8865	322.19	12.06	24.13	0	0	0	0	0	0	12.06	0	0
MgCL2*6H2O	0.4088	203.31	2.011	0	2.011	0	0	0	0	4.021	0	0	0
NaCl	0.4612	58.44	7.892	7.892	0	0	0	0	0	7.892	0	0	0
Na2SiO3*9H2O	4.8615	284.20	17.11	34.21	0	0	0	0	17.11	0	0	0	0
			Stock Solution										
			TOTAL (mmol ions)	162.18	2.0107	0	3.93	94.01	17.11	11.91	12.063	1.94	3.9293
			mass (g) per mole	22.99	24.305	40.08	39.1	61.02	28.09	35.45	96.062	62	18.998
			TOTAL (mass (mg) ions)	3728.4	48.871	0	154	5736	480.4	422.4	1158.8	120.3	74.651
			Conc (ppm) in Simulated water	93.2	1.22	0	3.84	143	12.0	10.6	29.0	3.01	1.87

19PB Shallow with calcium

Compound	Mass (g) of compound for 1L of stock soln	MW of compound	mmoles of compound in 1L of stock solution	Na	Mg	Ca	K	HCO3	Si	Cl	SO4	NO3	F
				mmoles of ions in 1L of stock solution									
NaHCO3	7.8976	84.01	94.01	94.01	0	0	0	94.01	0	0	0	0	0
KF*2H2O	0.2991	76.12	3.93	0	0	0	3.93	0	0	0	0	0	3.93
Ca(NO3)2*4H2O	0.2120	236.15	0.90	0	0	0.90	0	0	0	0	0	1.795	0
CaSO4*2H2O	1.9991	172.17	11.61	0	0	11.61	0	0	0	0	11.61	0	0
MgCL2*6H2O	0.4096	203.31	2.01	0	2.01	0	0	0	0	4.029	0	0	0
CaCl2*6H2O	0.3287	219.08	1.50	0	0	1.50	0	0	0	3.001	0	0	0
Na2SiO3*9H2O	4.8615	284.20	17.11	34.212	0	0	0	0	17.11	0	0	0	0
			Stock Solution										
			TOTAL (mmol ions)	128.22	2.01	14.01	3.93	94.01	17.11	7.03	11.61	1.80	3.93
			mass per mole	22.99	24.305	40.08	39.1	61.02	28.09	35.45	96.062	62	18.998
			TOTAL (mass (mg) ions)	2947.7	48.966	561.5	154	5736	480.4	249.2	1115.4	111.3	74.651
			Conc (ppm) in Simulated water	73.7	1.22	14.0	3.84	143	12.0	6.23	27.9	2.78	1.87

Simulated waters prepared by 40 fold dilution of stock solutions (653/193 and 696/10)
Source 653/193-199 and 696/2-3 and 696/10-14

4 MAY 05 CONT BW

19PB simulated water with Ca

	19PBS-C1 conc (ppm)	19PBS-C2 conc (ppm)	Average conc (ppm)
Calcium	12.1	11.8	12.0
Magnesium	1.2	1.08	1.14
Silicon	11.8	11.8	11.8
Potassium	3.48	2.69	3.09
Sodium	66.3	64.9	65.6
Strontium	<0.0250	<0.0250	na
	19PBS-A1 conc (ppm)	19PBS-A2 conc (ppm)	Average conc (ppm)
Chloride	6.05	6.07	6.06
Fluoride	1.47	1.47	1.47
Nitrate-N*	0.614	0.598	0.606
Phosphate - P	0.0545	0.0702	0.0624
Sulfate	28.2	28.6	28.4

* 0.606 ppm nitrate -N converts to 2.68 ppm nitrate via N = 14.0067 g/mol and NO3 = 62.0049

19PB simulated water without Ca

	19PBS-C4 conc (ppm)	19PBS-C5 conc (ppm)	Average conc (ppm)
Calcium	<0.250	<0.250	na
Magnesium	1.09	1.09	1.09
Silicon	11.9	11.9	11.9
Potassium	2.66	2.19	2.43
Sodium	82.1	82	82.1
Strontium	<0.0250	<0.0250	na
	19PBS-A4 conc (ppm)	19PBS-A5 conc (ppm)	Average conc (ppm)
Chloride	10.6	10.5	10.6
Fluoride	1.45	1.45	1.45
Nitrate-N	0.654	0.643	0.649
Phosphate - P	0.0203	0.0534	0.0369
Sulfate	30.1	29.8	30.0

* 0.649 ppm nitrate -N converts to 2.87 ppm nitrate via N = 14.0067 g/mol and NO3 = 62.0049

LEGEND

Sample ID for Div 01 analyses	Sample Description	Analyses	Reference
19PBS-A1	19PB simulated water with Ca	anion	696/115
19PBS-A2	19PB simulated water with Ca - Duplicate	anion	696/116
19PBS-A4	19PB simulated water without Ca	anion	696/124
19PBS-A5	19PB simulated water without Ca - Duplicate	anion	696/125
19PBS-C1	19PB simulated water with Ca	cation	696/133
19PBS-C2	19PB simulated water with Ca - Duplicate	cation	696/134
19PBS-C4	19PB simulated water without Ca	cation	696/142
19PBS-C5	19PB simulated water without Ca - Duplicate	cation	696/143

4 MAY 05 CONT BW

19PB simulated water with Ca

	Target Conc (ppm)	Gravimetric Conc Concentration (ppm)	Div 01 Analyses Concentration (ppm)
Calcium	14.0	14.0	12.0
Magnesium	1.22	1.22	1.14
Potassium	3.71	3.84	3.09
Silicon	12.0	12.0	11.8
Sodium	73.7	73.7	65.6
Chloride	6.20	6.23	6.06
Fluoride	1.81	1.87	1.47
Nitrate	2.79	2.78	2.68
Sulfate	27.9	27.9	28.4
HCO3	143	143	na

19PB simulated water without Ca

	Target Conc (ppm)	Gravimetric Conc Concentration (ppm)	Div 01 Analyses Concentration (ppm)
Magnesium	1.22	1.22	1.09
Potassium	3.71	3.84	2.43
Silicon	12.0	12.0	11.9
Sodium	93.1	93.2	82.1
Chloride	10.5	10.6	10.6
Fluoride	1.80	1.87	1.45
Nitrate	2.95	3.01	2.87
Sulfate	28.8	29.0	30.0
HCO3	143	143	na

5-6-05 BW

6 MAY 2005 BAW

Results from Washington State University XRF, ICP-MS, and LOI Analyses of ~~NC-EWDP-5~~ BAW 5-6-05 NC-EWDP-19PB Sonic Core Samples

NC-EWDP-19PB Sonic Core Samples from 628/98-101
28 samples and 4 QAs
Legend 696/99-101
Purchase Order 476545P

- XRF and LOI results on 696/161-164
- ICP-MS results on 696/165-166
- Summary of previous and current XRF analysis with NIST certificate of analysis for QA samples on 696/167
  Source for previous analyses: 556/41
  Source for current analyses: 696/163
  Source for NIST values: NIST certificates of analyses.
- Procurement Plan calculations 696/168
  Source of data 696/167

Data Accepted 5-6-05 BAW
Per procurement plan, BAW 5-6-05 from PO 476545P,
Criteria - ±15% for majority of major components based on certified values and previous results from the same lab for the same standards.

6 MAY 2005 CONT BAW

Run 0204, Paul Bertetti, CNWRA, Southwest Research Institute

	BER628 XRF01	BER628 XRF02	BER628 XRF03	BER628 XRF04	BER628 XRF05	BER628 XRF06	BER628 XRF07	BER628 XRF08	BER628 XRF10	BER628 XRF11
Date	10-Jun-04	31-May-04	31-May-04	31-May-04	10-Jun-04	31-May-04	31-May-04	1-Jun-04	1-Jun-04	1-Jun-04
Depth	350.8	355.0	364.9	367.0	373.6	374.6	382.4	387.2	406.3	408.5
Interval	352.4	356.0	366.7	368.5	374.6	375.4	383.7	388.9	407.5	409.9
Unnormalized Major Elements (Weight %):										
SiO2	71.64	70.54	72.14	69.51	72.49	73.03	71.96	71.71	72.00	69.98
Al2O3	15.29	14.62	14.60	15.27	14.99	14.30	15.41	15.35	14.78	15.35
TiO2	0.42	0.48	0.44	0.61	0.32	0.32	0.36	0.41	0.43	0.58
FeO*	2.98	3.62	2.81	3.66	2.41	2.66	2.55	3.14	3.04	4.58
MnO	0.11	0.11	0.09	0.11	0.10	0.09	0.08	0.09	0.10	0.13
CaO	1.92	2.97	1.90	2.53	1.90	2.12	1.60	2.00	1.85	1.94
MgO	1.38	1.22	1.14	1.78	1.37	1.21	1.57	1.49	1.40	1.81
K2O	4.08	3.93	4.21	3.83	4.16	4.06	3.97	3.75	3.94	3.55
Na2O	2.85	3.03	3.20	3.26	3.05	2.77	2.22	2.45	2.65	2.35
P2O5	0.09	0.08	0.10	0.19	0.06	0.08	0.07	0.10	0.12	0.08
Total	100.75	100.61	100.63	100.74	100.85	100.64	99.80	100.49	100.29	100.35
LOI (%)	**5.81**	**5.59**	**4.16**	**4.78**	**6.20**	**5.41**	**7.65**	**6.58**	**5.54**	**7.24**
Normalized Major Elements (Weight %):										
SiO2	71.10	70.11	71.69	69.00	71.88	72.57	72.10	71.36	71.79	69.74
Al2O3	15.18	14.53	14.50	15.16	14.86	14.21	15.44	15.28	14.73	15.30
TiO2	0.418	0.481	0.438	0.602	0.319	0.318	0.362	0.411	0.428	0.574
FeO*	2.95	3.60	2.80	3.63	2.39	2.64	2.55	3.12	3.03	4.56
MnO	0.105	0.111	0.092	0.106	0.097	0.085	0.084	0.092	0.099	0.130
CaO	1.90	2.95	1.89	2.51	1.89	2.10	1.61	1.99	1.84	1.94
MgO	1.37	1.21	1.13	1.77	1.35	1.21	1.57	1.48	1.39	1.80
K2O	4.05	3.91	4.18	3.80	4.13	4.04	3.98	3.73	3.93	3.53
Na2O	2.83	3.01	3.18	3.24	3.02	2.75	2.22	2.44	2.64	2.34
P2O5	0.091	0.078	0.097	0.187	0.063	0.082	0.073	0.103	0.116	0.082
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Unnormalized Trace Elements (ppm):										
Ni	14	13	13	20	17	30	19	17	17	17
Cr	17	23	19	32	25	56	25	27	25	25
Sc	6	6	6	7	5	6	6	7	6	6
V	36	40	32	55	31	27	34	41	40	56
Ba	682	716	740	825	460	582	646	685	643	654
Rb	126	110	122	127	147	136	137	137	135	119
Sr	289	291	287	342	193	259	289	348	294	321
Zr	260	329	272	287	251	228	273	264	261	354
Y	31	30	27	31	33	29	31	29	30	30
Nb	24	25	23	25	25	23	24	22	24	25
Ga	21	20	19	21	21	17	22	21	20	21
Cu	17	21	18	21	14	26	20	19	30	34
Zn	84	97	78	85	87	80	79	84	85	124
Pb	25	35	26	26	27	30	29	26	25	27
La	66	79	64	60	54	56	60	73	67	82
Ce	131	160	120	120	120	110	135	138	124	151
Th	22	21	21	20	22	20	23	24	23	23

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.

6 MAY 2005 CONT BAW

Run 0204, Paul Bertetti, CNWRA, Southwest Research Institute

	BER628 XRF12	BER628 XRF13	BER628 XRF14	BER628 XRF15	BER628 XRF16	BER628 XRF17	BER628 XRF18	BER628 XRF19	BER628 XRF20	BER628 XRF21
Date	1-Jun-04	1-Jun-04	2-Jun-04	2-Jun-04	2-Jun-04	2-Jun-04	2-Jun-04	2-Jun-04	2-Jun-04	2-Jun-04
Depth	409.9	418.4	419.6	422.5	424.6	441.2	457.2	470.5	496.7	503.4
Interval	411.9	419.6	421.2	424.4	428.7	442.9	460.7	474.3	499.0	506.0
Unnormalized Major Elements (Weight %):										
SiO2	72.62	73.07	74.22	72.72	73.44	71.68	72.99	73.01	73.33	73.90
Al2O3	14.72	14.85	14.14	14.59	14.31	14.85	14.04	14.61	14.22	14.11
TiO2	0.41	0.34	0.31	0.40	0.35	0.46	0.40	0.37	0.39	0.33
FeO*	2.70	2.72	2.35	2.66	2.55	3.46	2.91	2.79	3.08	2.51
MnO	0.09	0.09	0.07	0.09	0.08	0.12	0.10	0.10	0.11	0.08
CaO	1.81	1.56	1.17	1.51	1.37	1.81	1.53	1.84	1.56	1.66
MgO	1.37	1.53	1.09	1.28	1.14	1.39	1.05	1.54	1.27	1.11
K2O	4.01	3.95	4.43	4.12	4.23	3.82	4.09	3.68	3.87	3.93
Na2O	2.72	2.25	2.58	2.68	2.61	2.62	2.74	2.16	2.13	2.32
P2O5	0.12	0.07	0.05	0.08	0.08	0.08	0.10	0.09	0.10	0.08
Total	100.56	100.44	100.41	100.13	100.16	100.30	99.95	100.20	100.06	100.02
LOI (%)	**5.36**	**6.62**	**4.76**	**5.21**	**4.94**	**5.99**	**4.73**	**7.14**	**6.37**	**5.97**
Normalized Major Elements (Weight %):										
SiO2	72.21	72.75	73.92	72.63	73.33	71.47	73.03	72.87	73.29	73.88
Al2O3	14.63	14.79	14.08	14.57	14.29	14.81	14.05	14.58	14.21	14.11
TiO2	0.411	0.342	0.309	0.401	0.345	0.460	0.399	0.368	0.391	0.325
FeO*	2.69	2.70	2.34	2.66	2.55	3.45	2.91	2.79	3.07	2.51
MnO	0.090	0.086	0.072	0.086	0.081	0.119	0.101	0.098	0.108	0.084
CaO	1.80	1.55	1.16	1.51	1.37	1.80	1.53	1.83	1.56	1.66
MgO	1.36	1.53	1.09	1.28	1.14	1.39	1.05	1.54	1.27	1.11
K2O	3.99	3.93	4.41	4.11	4.23	3.80	4.09	3.67	3.87	3.93
Na2O	2.70	2.24	2.57	2.68	2.61	2.61	2.74	2.16	2.13	2.32
P2O5	0.116	0.069	0.049	0.082	0.079	0.083	0.097	0.094	0.096	0.085
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Unnormalized Trace Elements (ppm):										
Ni	14	18	21	29	21	15	22	19	28	20
Cr	20	24	35	57	37	20	29	26	42	27
Sc	6	6	5	7	5	6	5	5	6	5
V	36	34	26	34	29	38	33	32	41	31
Ba	640	452	331	617	611	690	629	678	508	573
Rb	135	143	160	145	149	121	140	125	150	140
Sr	287	245	168	236	214	319	283	350	274	320
Zr	252	241	216	294	254	305	305	266	264	235
Y	29	29	28	29	30	30	32	30	30	28
Nb	24	23	24	23	24	24	24	24	23	22
Ga	21	21	22	23	21	21	18	21	20	19
Cu	19	28	34	33	24	23	27	26	34	38
Zn	75	86	85	79	76	99	89	86	92	81
Pb	26	28	25	29	25	29	28	27	25	27
La	54	59	56	62	66	70	70	57	64	54
Ce	113	119	109	117	116	143	130	129	125	117
Th	19	23	24	21	22	21	23	23	22	22

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.

6 MAY 2005 CONT BAW

Run 0204, Paul Bertetti, CNWRA, Southwest Research Institute

	BER628 XRF22	BER628 XRF23	BER628 XRF24	BER628 XRF25	BER628 XRF26	BER 62 8XRF27	BER628 XRF28	BER628 XRF29	BER628 XRF30	BER 62 8XRF31
Date	3-Jun-04	3-Jun-04	3-Jun-04	4-Jun-04	4-Jun-04	1-Jul-04	4-Jul-04	4-Jul-04	10-Jun-04	1-Jul-04
Depth	547.6	555.2	584.1	595.2	631.1	standard	standard	standard	standard	
Interval	549.6	557.8	587.4	596.2	633.8	NBS 70a	NBS 99a	NBS 278	RGM-1	
Unnormalized Major Elements (Weight %):										
SiO2	71.88	70.90	74.55	72.66	74.33	67.14	65.84	73.38	74.47	63.92
Al2O3	14.45	14.22	13.97	14.88	14.12	17.75	20.57	14.31	14.00	16.36
TiO2	0.43	0.52	0.31	0.39	0.27	0.01	0.01	0.24	0.27	0.65
FeO*	3.13	3.62	2.12	2.59	1.69	0.06	0.04	1.90	1.70	4.17
MnO	0.11	0.12	0.08	0.07	0.06	0.00	0.00	0.05	0.04	0.07
CaO	1.92	2.91	1.49	1.78	1.39	0.11	2.15	1.01	1.23	4.85
MgO	1.31	1.10	1.02	1.04	0.84	0.07	0.01	0.26	0.28	2.67
K2O	3.88	3.80	3.83	3.83	4.11	11.80	5.45	4.28	4.53	2.11
Na2O	2.62	2.75	2.69	2.80	2.77	2.41	6.22	4.82	4.19	4.20
P2O5	0.08	0.08	0.07	0.05	0.05	0.01	0.02	0.04	0.05	0.19
Total	99.81	100.02	100.13	100.11	99.62	99.35	100.32	100.29	100.76	99.18
LOI (%)	**5.78**	**5.91**	**5.14**	**5.25**	**4.72**	**0.40**	**0.26**	**0.76**	**1.11**	**0.93**
Normalized Major Elements (Weight %):										
SiO2	72.02	70.88	74.45	72.59	74.62	67.58	65.63	73.17	73.91	64.45
Al2O3	14.47	14.22	13.95	14.87	14.18	17.87	20.51	14.27	13.90	16.49
TiO2	0.433	0.522	0.311	0.385	0.268	0.009	0.010	0.240	0.265	0.653
FeO*	3.13	3.61	2.12	2.59	1.69	0.06	0.04	1.89	1.69	4.20
MnO	0.106	0.119	0.080	0.073	0.057	0.001	0.000	0.051	0.036	0.071
CaO	1.93	2.91	1.49	1.78	1.39	0.11	2.15	1.01	1.22	4.89
MgO	1.32	1.10	1.02	1.04	0.84	0.07	0.01	0.26	0.28	2.69
K2O	3.89	3.79	3.82	3.83	4.13	11.87	5.43	4.27	4.49	2.13
Na2O	2.63	2.75	2.69	2.80	2.78	2.43	6.20	4.81	4.16	4.24
P2O5	0.081	0.082	0.066	0.049	0.045	0.007	0.020	0.042	0.048	0.195
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Unnormalized Trace Elements (ppm):										
Ni	16	14	17	15	19	7	8	10	9	32
Cr	23	24	21	20	21	5	6	11	11	67
Sc	6	6	4	6	5	1	2	5	5	11
V	36	42	22	31	20	1	2	7	12	84
Ba	614	660	573	693	597	130	2516	909	835	594
Rb	141	133	142	147	153	538	106	129	151	41
Sr	250	256	209	288	227	69	456	65	107	692
Zr	300	371	246	277	236	14	18	279	214	178
Y	32	33	28	25	28	3	3	42	25	17
Nb	25	26	22	21	22	0	0	16	8	6
Ga	19	20	20	20	19	21	18	20	17	19
Cu	23	25	24	25	21	11	10	8	16	24
Zn	88	101	69	75	59	7	7	50	36	58
Pb	27	29	26	30	29	51	67	18	23	12
La	64	73	53	55	51	4	3	33	24	18
Ce	122	153	108	107	102	13	5	64	52	50
Th	23	24	21	19	20	0	0	12	14	6

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.

6 MAY 2005 CONT BAW

Run 0204, Paul Bertetti, CNWRA, Southwest Research Institute

	BER 62 8XRF32	BER628 XRF33	BER628 XRF02R	BER628 XRF02	BER628 XRF02R
Date	1-Jul-04	5-Jun-04	5-Jun-04	31-May-04	5-Jun-04
Depth Interval				355.0 356.0	355.0 356.0
Unnormalized Major Elements (Weight %):					
SiO2	63.86	89.92	70.23	70.54	70.23
Al2O3	16.31	5.57	14.62	14.62	14.53
TiO2	0.64	0.85	0.48	0.48	0.48
FeO*	4.23	0.92	3.71	3.62	3.71
MnO	0.07	0.00	0.11	0.11	0.11
CaO	4.79	0.43	2.94	2.97	2.94
MgO	2.68	0.23	1.19	1.22	1.19
K2O	2.09	0.75	3.90	3.93	3.90
Na2O	4.17	0.72	2.99	3.03	2.99
P2O5	0.20	0.10	0.08	0.08	0.08
Total	99.05	99.49	100.17	100.61	100.17
LOI (%)	**1.16**	**9.45**		**5.59**	
Normalized Major Elements (Weight %):					
SiO2	64.47	90.37	70.12	70.11	70.12
Al2O3	16.47	5.60	14.51	14.53	14.51
TiO2	0.648	0.857	0.481	0.481	0.481
FeO*	4.27	0.92	3.70	3.60	3.70
MnO	0.072	0.005	0.111	0.111	0.111
CaO	4.84	0.43	2.94	2.95	2.94
MgO	2.71	0.23	1.19	1.21	1.19
K2O	2.11	0.75	3.90	3.91	3.90
Na2O	4.21	0.72	2.99	3.01	2.99
P2O5	0.199	0.098	0.078	0.078	0.078
Total	100.00	100.00	100.00	100.00	100.00
Unnormalized Trace Elements (ppm):					
Ni	34	12	13	13	13
Cr	67	26	22	23	22
Sc	11	4	5	6	5
V	82	34	38	40	38
Ba	594	647	711	716	711
Rb	41	18	110	110	110
Sr	700	267	293	291	293
Zr	178	225	335	329	335
Y	16	7	31	30	31
Nb	5	8	24	25	24
Ga	20	9	20	20	20
Cu	26	21	19	21	19
Zn	58	17	95	97	95
Pb	10	19	37	35	37
La	20	12	84	79	84
Ce	45	19	159	160	159
Th	5	6	21	21	21

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"R" denotes a duplicate bead made from the same rock powder.

6 MAY 2005 CONT BAW

5/6/2005

Paul Bertetti- CNWRA, Southwest Research Institute

Sample ID	La ppm	Ce ppm	Pr ppm	Nd ppm	Sm ppm	Eu ppm	Gd ppm	Tb ppm	Dy ppm	Ho ppm	Er ppm	Tm ppm	Yb ppm	Lu ppm	Ba ppm
BER 628-XRF-01	63.25	118.27	11.40	38.70	7.21	1.03	5.67	0.87	5.14	1.02	2.75	0.41	2.60	0.40	636
BER 628-XRF-02	77.17	138.02	13.37	45.20	7.96	1.13	5.93	0.91	5.22	1.03	2.76	0.40	2.57	0.40	684
BER 628-XRF-03	66.63	124.33	11.85	40.49	7.37	1.13	5.66	0.88	5.03	1.00	2.68	0.41	2.59	0.41	709
BER 628-XRF-04	59.04	117.22	11.11	38.83	7.65	1.29	6.11	0.97	5.69	1.13	3.09	0.45	2.91	0.46	801
BER 628-XRF-05	53.33	107.83	10.04	34.50	7.02	0.83	5.82	0.93	5.59	1.10	3.01	0.46	2.93	0.46	439
BER 628-XRF-06	52.48	99.68	9.62	32.89	6.45	0.85	5.09	0.82	4.85	0.96	2.66	0.39	2.56	0.41	542
BER 628-XRF-07	62.31	122.84	10.92	37.25	6.83	0.97	5.49	0.84	4.94	0.98	2.73	0.42	2.72	0.44	576
BER 628-XRF-08	67.52	129.78	12.05	41.67	7.50	1.10	5.71	0.86	5.03	0.99	2.70	0.42	2.63	0.42	629
BER 628-XRF-10	65.87	124.34	11.81	40.11	7.34	1.02	5.72	0.89	5.20	1.04	2.80	0.43	2.82	0.44	586
BER 628-XRF-11	68.98	136.21	12.44	42.38	7.78	1.03	5.99	0.91	5.30	1.03	2.81	0.42	2.71	0.43	600
BER 628-XRF-12	54.51	103.31	9.95	34.53	6.61	0.98	5.23	0.84	4.95	0.97	2.68	0.40	2.61	0.41	587
BER 628-XRF-13	52.58	104.69	9.55	32.99	6.34	0.80	5.17	0.80	4.79	0.94	2.57	0.39	2.62	0.41	415
BER 628-XRF-14	53.10	101.16	9.63	32.60	6.28	0.69	4.93	0.81	4.77	0.96	2.62	0.40	2.64	0.42	304
BER 628-XRF-15	58.87	111.82	10.52	36.04	6.73	1.01	5.31	0.83	4.88	1.00	2.76	0.42	2.75	0.43	579
BER 628-XRF-16	61.64	112.78	10.98	37.42	7.03	0.97	5.47	0.87	5.10	1.02	2.75	0.42	2.70	0.43	561
BER 628-XRF-17	67.10	127.53	12.09	41.75	7.79	1.05	6.09	0.93	5.53	1.08	2.98	0.43	2.78	0.43	626
BER 628-XRF-18	62.62	114.25	11.27	38.89	7.33	0.96	5.78	0.90	5.31	1.05	2.87	0.42	2.72	0.44	581
BER 628-XRF-19	54.95	110.37	10.01	34.85	6.64	0.92	5.26	0.83	4.93	0.98	2.64	0.40	2.56	0.41	617
BER 628-XRF-20	55.41	108.03	10.15	34.93	6.56	0.84	5.18	0.81	4.81	0.95	2.71	0.41	2.66	0.42	462
BER 628-XRF-21	56.31	107.96	10.22	34.86	6.73	0.89	5.28	0.82	4.86	0.97	2.62	0.40	2.55	0.41	536
BER 628-XRF-22	65.49	123.08	11.73	40.42	7.71	1.04	5.98	0.94	5.63	1.09	2.95	0.45	2.82	0.45	590
BER 628-XRF-23	72.01	131.31	12.76	43.59	8.18	1.05	6.26	0.97	5.77	1.12	3.01	0.46	2.91	0.46	622
BER 628-XRF-24	51.37	100.18	9.19	31.57	6.31	0.86	5.09	0.80	4.84	0.96	2.66	0.40	2.59	0.41	546
BER 628-XRF-25	49.97	100.88	9.05	31.31	6.09	0.97	4.79	0.75	4.47	0.87	2.40	0.36	2.42	0.38	639
BER 628-XRF-26	46.75	91.16	8.27	28.35	5.47	0.75	4.32	0.70	4.26	0.84	2.39	0.37	2.42	0.40	556
BER 628-XRF-27	0.59	0.67	0.08	0.31	0.10	0.63	0.14	0.03	0.21	0.04	0.13	0.02	0.14	0.02	119
BER 628-XRF-28	2.73	4.03	0.47	1.90	0.55	0.85	0.52	0.07	0.34	0.05	0.13	0.02	0.10	0.01	2534
BER 628-XRF-29	31.19	59.12	6.56	25.25	6.06	0.83	5.85	1.05	6.92	1.45	4.24	0.67	4.42	0.72	908
BER 628-XRF-30	23.11	42.84	4.70	17.70	4.13	0.64	3.65	0.64	3.96	0.82	2.34	0.36	2.40	0.39	806
BER 628-XRF-06 ®fb	52.63	99.79	9.57	32.87	6.51	0.84	5.09	0.82	4.84	0.94	2.64	0.39	2.55	0.40	541
BER 628-XRF-22 ®	64.46	120.72	11.54	40.05	7.70	1.01	5.89	0.93	5.49	1.07	2.90	0.44	2.79	0.45	580
BER 628-XRF-25 ®	49.53	99.92	8.95	30.99	6.02	0.97	4.75	0.73	4.38	0.86	2.34	0.36	2.35	0.39	631

Analyses by ICP-MS

6 MAY 2005 CONT BAW

Paul Bertetti- CNWRA, Southwest Research Institute

5/6/2005

Sample ID	Th ppm	Nb ppm	Y ppm	Hf ppm	Ta ppm	U ppm	Pb ppm	Rb ppm	Cs ppm	Sr ppm	Sc ppm	Zr ppm
BER 628-XRF-01	21.87	23.18	28.22	6.71	1.62	2.63	25.10	115.8	7.80	264	5.7	234
BER 628-XRF-02	22.23	22.98	28.17	7.95	1.61	2.46	29.53	103.7	5.71	275	5.2	295
BER 628-XRF-03	21.42	23.45	27.55	7.37	1.57	2.86	24.89	116.5	5.54	277	5.9	268
BER 628-XRF-04	21.63	25.37	31.06	7.90	1.75	3.07	24.22	123.8	7.41	334	7.9	285
BER 628-XRF-05	23.78	25.48	31.52	7.21	1.70	3.29	25.37	138.5	7.85	186	5.5	237
BER 628-XRF-06	21.72	23.24	27.11	6.39	1.65	3.02	29.47	124.1	6.55	243	4.9	218
BER 628-XRF-07	21.75	22.53	28.10	6.84	1.54	2.86	24.39	121.2	13.25	253	6.1	245
BER 628-XRF-08	23.93	21.71	27.71	7.08	1.54	2.92	24.21	124.0	13.87	322	6.9	247
BER 628-XRF-10	23.12	23.14	28.87	7.20	1.59	2.95	23.73	122.0	10.98	273	6.2	255
BER 628-XRF-11	23.71	24.14	28.20	8.12	1.62	2.58	25.34	107.6	11.98	288	6.5	303
BER 628-XRF-12	21.39	22.41	27.19	6.69	1.62	3.09	24.09	122.5	9.49	265	6.1	233
BER 628-XRF-13	22.97	22.35	26.42	6.11	1.57	2.96	24.96	128.5	13.86	225	5.9	207
BER 628-XRF-14	25.09	23.06	26.83	6.09	1.59	3.46	24.32	146.8	11.85	157	5.5	202
BER 628-XRF-15	21.64	23.04	27.30	7.64	1.57	3.21	26.81	131.5	13.31	219	6.5	270
BER 628-XRF-16	22.08	22.70	28.12	6.76	1.59	3.38	25.54	135.0	12.75	196	5.6	240
BER 628-XRF-17	22.15	23.50	29.74	7.56	1.55	2.51	25.10	108.1	11.89	292	5.6	269
BER 628-XRF-18	22.44	23.01	29.25	7.70	1.58	3.16	24.49	124.1	11.45	256	5.3	278
BER 628-XRF-19	22.66	22.96	26.83	6.96	1.61	2.76	24.26	111.6	13.25	318	5.7	244
BER 628-XRF-20	20.69	22.24	28.21	6.76	1.44	2.97	23.34	137.9	15.19	251	6.4	241
BER 628-XRF-21	20.70	21.32	27.98	6.30	1.41	2.84	24.30	133.3	12.88	306	5.5	219
BER 628-XRF-22	22.49	25.55	31.14	8.02	1.67	2.77	24.93	131.6	14.61	236	6.2	299
BER 628-XRF-23	23.06	25.29	32.05	9.52	1.63	2.78	25.77	124.3	12.62	241	6.2	366
BER 628-XRF-24	20.72	21.10	27.79	6.42	1.38	2.85	23.45	133.4	10.44	195	4.7	224
BER 628-XRF-25	19.62	20.46	24.37	7.19	1.42	2.64	25.89	136.9	15.15	267	5.8	263
BER 628-XRF-26	19.84	20.68	24.69	6.22	1.40	2.85	26.04	137.6	9.89	204	4.3	215
BER 628-XRF-27	0.39	0.81	1.35	0.06	0.13	0.12	47.56	510.8	9.28	70	0.1	2
BER 628-XRF-28	0.50	0.33	1.72	0.32	0.02	0.20	65.10	104.3	0.44	448	0.2	8
BER 628-XRF-29	12.53	16.57	41.84	7.83	1.38	4.30	16.18	123.8	5.13	64	5.9	276
BER 628-XRF-30	14.50	8.60	23.40	5.88	0.96	5.17	23.56	141.4	9.62	101	5.2	205
BER 628-XRF-06 ®fb	21.60	23.10	26.98	6.44	1.60	3.00	28.56	122.4	6.49	242	4.8	220
BER 628-XRF-22 ®	22.39	24.96	30.02	7.97	1.63	2.78	24.62	125.0	14.34	225	5.9	290
BER 628-XRF-25 ®	19.61	20.01	23.60	7.26	1.41	2.65	25.75	131.1	14.90	256	5.6	255

6 MAY 2005 CONT BAW

	BER 502	BER Z8	BER 628 XRF27	NBS-70a certified values		BER 503	BER Z9	BER628 XRF28	NBS-99a certified values		BER 504	BER Z7	BER628 XRF29	NBS-278 certified values**		BER 505	BER628 XRF30	USGS RGM-1 recommended values		
	NBS-70a	NBS-70a	NBS-70a	NBS-70a		NBS-99a	NBS-99a	NBS-99a	NBS-99a		NBS-278	NBS-278		NBS-278		USGS-RGM1	USGS-RGM1	USGS-RGM1		
Date	12-Sep-00	22-Mar-02	1-Jul-04	15-Nov-90		12-Sep-00	22-Mar-02	4-Jul-04	15-Nov-90		12-Sep-00	22-Mar-02	4-Jul-04	27-Mar-92		12-Sep-00	10-Jun-04			
LOI (%)	0.44	0.56	0.40	0.40		0.24	0.35	0.26			0.70	0.84	0.76			1.07	1.11			LOI (%)
	Unnormalized Results (Weight %):																			
SiO2	67.74	67.51	67.14	67.1	± 0.1	65.44	64.66	65.84	65.2	± 0.1	73.20	72.22	73.38	73.05	± 0.13	73.93	74.47	73.4	± 0.53	SiO2
Al2O3	18.21	18.03	17.75	17.9	± 0.1	20.86	20.43	20.57	20.5	± 0.1	14.54	14.16	14.31	14.15	± 0.15	14.15	14.00	13.7	± 0.19	Al2O3
TiO2	0.000	0.000	0.01	0.01	± 0.01	0.001	0.003	0.01	0.007	± 0.001	0.238	0.237	0.24	0.245	± 0.007	0.267	0.27	0.27	± 0.02	TiO2
FeO	0.09	0.09	0.06	0.067	± 0.005	0.08	0.07	0.04	0.058	± 0.005	1.91	1.92	1.90	1.84	± 0.02	1.77	1.70	1.67	± 0.03	FeO
MnO	0.000	0.000	0.00			0.000	0.000	0.00			0.051	0.049	0.05	0.052	± 0.002	0.036	0.04	0.036	± 0.004	MnO
CaO	0.15	0.15	0.11	0.11	± 0.01	2.12	2.12	2.15	2.14	± 0.01	1.02	1.02	1.01	0.983	± 0.002	1.21	1.23	1.15	± 0.07	CaO
MgO	0.11	0.06	0.07			0.04	0.00	0.01	0.02	± 0.01	0.28	0.25	0.26	0.23		0.34	0.28	0.28	± 0.03	MgO
K2O	11.85	11.88	11.80	11.8	± 0.1	5.35	5.33	5.45	5.2	± 0.1	4.19	4.19	4.28	4.16	± 0.02	4.40	4.53	4.30	± 0.10	K2O
Na2O	2.49	2.56	2.41	2.55	± 0.05	6.19	6.16	6.22	6.2	± 0.1	4.82	4.78	4.82	4.84	± 0.05	4.18	4.19	4.07	± 0.15	Na2O
P2O5	0.005	0.004	0.01			0.018	0.018	0.02	0.02	± 0.01	0.040	0.040	0.04	0.036	± 0.003	0.046	0.05			P2O5
Total	100.65	100.29	99.35	99.537		100.09	98.79	100.32	99.345		100.29	98.87	100.29	99.586		100.32	100.76	98.876		Total
				uncertainty values for NBS standards are "expected" values - see certificates for details																
	Normalized Results (Weight %):																			
SiO2	67.30	67.32	67.58	67.4		65.38	65.45	65.63	65.6		72.99	73.05	73.17	73.35		73.69	73.91	74.2		SiO2
Al2O3	18.09	17.98	17.87	18.0		20.84	20.68	20.51	20.6		14.50	14.32	14.27	14.21		14.10	13.90	13.9		Al2O3
TiO2	0.000	0.000	0.01	0.01		0.001	0.003	0.010	0.007		0.237	0.240	0.240	0.246		0.266	0.265	0.27		TiO2
FeO*	0.09	0.09	0.06	0.067		0.07	0.07	0.04	0.058		1.91	1.94	1.89	1.85		1.76	1.69	1.69		FeO*
MnO	0.000	0.000	0.001			0.000	0.000	0.000			0.051	0.050	0.051	0.052		0.036	0.036	0.036		MnO
CaO	0.15	0.15	0.11	0.11		2.12	2.15	2.15	2.15		1.02	1.03	1.01	0.987		1.21	1.22	1.16		CaO
MgO	0.11	0.06	0.07			0.04	0.00	0.01	0.02		0.28	0.25	0.26	0.23		0.34	0.28	0.28		MgO
K2O	†11.77	†11.85	†11.87	11.85		5.34	5.40	5.43	5.2		4.18	4.24	4.27	4.18		4.39	4.49	4.35		K2O
Na2O	2.47	2.55	2.43	2.56		6.18	6.24	6.20	6.2		4.81	4.83	4.81	4.86		4.17	4.16	4.12		Na2O
P2O5	0.005	0.004	0.007			0.018	0.018	0.020	0.02		0.040	0.040	0.042	0.036		0.046	0.048			P2O5
	Trace Elements (ppm):																			
Ni	15	2	7			9	3	8			28	8	10	3.6	± 0.3	8	9			Ni
Cr	6	0	5			0	0	6			9	2	11	6.1		1	11	3.7		Cr
Sc	1	12	1			4	2	2			5	11	5	5.1		3	5	4.4	± 0.3	Sc
V	0	2	1			1	3	2			9	7	7			11	12	13	± 2	V
Ba	124	133	130	180	± 90	†2534	†2522	2516	2330	± 90	900	904	909	1140		826	835	810	± 46	Ba
Rb	†530	†526	538	550	± 90	110	108	106			131	128	129	127.5	± 0.3	153	151	150	± 8	Rb
Sr	66	68	69			443	441	456			65	66	65	63.5	± 0.1	106	107	110	± 10	Sr
Zr	5	6	14			15	15	18			276	274	279			212	214	220	± 20	Zr
Y	1	2	3			1	2	3			41	42	42			23	25	25		Y
Nb	1.1	1.2	0			0.2	0.4	0			16.3	17.2	16			8.3	8	8.9	± 0.6	Nb
Ga	21	18	21			16	15	18			17	18	20			15	17	15	± 2	Ga
Cu	7	6	11			7	8	10			6	5	8	5.9	± 0.2	12	16	12	± 1.4	Cu
Zn	1	1	7			5	4	7			48	45	50	55		32	36	32		Zn
Pb	46	49	51			65	65	67			17	15	18	16.4	± 0.2	22	23	24	± 3	Pb
La	7	7	4			0	13	3			28	41	33			25	24	24	± 1.1	La
Ce	16	13	13			0	0	5			62	48	64	62.2		49	52	47	± 4	Ce
Th	0	0	0			1	0	0			13	13	12	0.54	± 0.04	15	14	15	± 1.3	Th

Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
"†" denotes values >120% of our highest standard.

6 MAY 05 CONT BAW

	Current Analyses	Previous Analyses	Previous Analyses	NIST Certified Values	Percent Different		
	BER 628	BER	BER	NBS-70a			
	XRF27	502	Z8	certified values	BER 502	BER Z8	NBS-70a certified values
	NBS-70a	NBS-70a	NBS-70a	NBS-70a	NBS-70a	NBS-70a	NBS-70a
Date	1-Jul-04	12-Sep-00	22-Mar-02	15-Nov-90	12-Sep-00	22-Mar-02	15-Nov-90
SiO2	67.58	67.30	67.32	67.412	0.41	0.40	0.25
Al2O3	17.87	18.09	17.98	17.983	-1.23	-0.60	-0.63
TiO2	0.01	0.000	0.000	0.01	na	na	-10.4
FeO*	0.06	0.09	0.09	0.067	-39.1	-40.0	-17.3
CaO	0.11	0.15	0.15	0.111	-26.2	-26.5	-0.46
K2O	11.87	11.77	11.85	11.855	0.82	0.20	0.13
Na2O	2.43	2.47	2.55	2.562	-1.78	-4.81	-5.15
	BER628	BER	BER	NBS-99a			
	XRF28	503	Z9	certified values	BER 503	BER Z9	NBS-99a certified values
	NBS-99a	NBS-99a	NBS-99a	NBS-99a	NBS-99a	NBS-99a	NBS-99a
Date	4-Jul-04	12-Sep-00	22-Mar-02	15-Nov-90	12-Sep-00	22-Mar-02	15-Nov-90
SiO2	65.63	65.38	65.45	65.63	0.39	0.28	0.00
Al2O3	20.51	20.84	20.68	20.635	-1.61	-0.84	-0.63
TiO2	0.01	0.001	0.003	0.007	890	226	40.4
FeO*	0.04	0.07	0.07	0.058	-45.5	-43.9	-30.0
CaO	2.15	2.12	2.15	2.154	1.28	-0.03	-0.41
MgO	0.01	0.04	0.00	0.02	-63.0	na	-26.5
K2O	5.43	5.34	5.40	5.234	1.66	0.72	3.81
Na2O	6.20	6.18	6.24	6.241	0.25	-0.57	-0.66
P2O5	0.02	0.018	0.018	0.02	9.45	8.03	-2.23
	BER628	BER	BER	NBS-278			
	XRF29	504	Z7	certified values	BER 504	BER Z7	NBS-278 certified values
	NBS-278	NBS-278	NBS-278	NBS-278	NBS-278	NBS-278	NBS-278
Date	4-Jul-04	12-Sep-00	22-Mar-02	27-Mar-92	12-Sep-00	22-Mar-02	27-Mar-92
SiO2	73.17	72.99	73.05	73.354	0.25	0.17	-0.25
Al2O3	14.27	14.50	14.32	14.209	-1.60	-0.39	0.40
TiO2	0.24	0.237	0.240	0.246	1.14	0.13	-2.44
FeO*	1.89	1.91	1.94	1.848	-0.91	-2.83	2.29
MnO	0.05	0.051	0.050	0.052	0.01	2.61	-2.60
CaO	1.01	1.02	1.03	0.987	-0.80	-2.20	2.21
MgO	0.26	0.28	0.25	0.231	-8.56	0.96	10.5
K2O	4.27	4.18	4.24	4.177	2.18	0.73	2.19
Na2O	4.81	4.81	4.83	4.86	0.02	-0.58	-1.10
P2O5	0.04	0.040	0.040	0.036	5.49	4.00	16.4
	BER628	BER		USGS RGM-1	BER		USGS RGM-1
	XRF30	505	na	recommended values	505	na	recommended values
	USGS-RGM1	USGS-RGM1		USGS-RGM1	USGS-RGM1		USGS-RGM1
Date	10-Jun-04	12-Sep-00			12-Sep-00		
SiO2	73.91	73.69		74.234	0.30		-0.44
Al2O3	13.90	14.10		13.856	-1.48		0.29
TiO2	0.26	0.266		0.273	-0.46		-2.98
FeO*	1.69	1.76		1.689	-3.84		0.17
MnO	0.04	0.036		0.036	-0.26		-1.70
CaO	1.22	1.21		1.163	1.09		4.83
MgO	0.28	0.34		0.283	-17.2		-0.91
K2O	4.49	4.39		4.349	2.48		3.35
Na2O	4.16	4.17		4.116	-0.15		1.07

Normalized Results (Weight %):

5-16-05 BW

~~12 MAY 05~~ 12 May 05 BW

5-16-05 BW

13 May 05 [illegible]

Initial Entry - Np sorption on consolidated alluvium with Simulated waters (with and without calcium) over a pH range. Identified as CAL (consolidated alluvium) series 5 and 6.

Jon Brown, Bradley Werling, and Marla Roberts are the individuals initially assigned to work on this experiment

Objective: To investigate Np sorption on a consolidated alluvium sample using two types of simulated water (with and without calcium) based on the chemistry from water collected from the shallow string of drillhole NC-EWDP-19PB over a range of pHs.

Conditions:
- $\sum Np = 200$ ppb
- equilibrium with lab $CO_2(g)$; $pCO_2 = 10^{-3.42}$
- solution volume = 30 ml
- mass of solid = 0.1 g
- M/V (g/L) = 3.33

Samples
- 19PB Simulated water with Ca - 696/14 and 32
- 19PB Simulated water without Ca – 696/14 and 32
- Consolidated alluvium sample (<35 mesh size fraction) NC-EWDP-19PB-0305-Sonic Core Composite - 696/64-66.

Reagents
Neptunium Spike: #61A-1 (369/100) BW 6-3-05
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 044065)
pH buffer 10 (Fisher SB 116 lot # 044060)
Ultima-Gold AB liquid scintillation cocktail (Packard 6013309 lot # 91-050201)
0.02 M HNO_3 (SN 696/29-30)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
New Brunswick Scientific Gyratory shaker model G33 (sn 290127990)
Fisher Marathon 21K centrifuge model D7209 (sn 15930025)
Mettler AE240 balance ~~(sn 001439)~~ (SN 101037)
Packard Tricard 3100TR Liquid Scintillation Analyzer model B2505 (sn 405314)
Stir Plate

Supplies:
Pipettes and tips
Repipettor for transfer of scintillation cocktail
Polycarbonate centrifuge tubes with caps (50 ml capacity)
7 ml scintillation vials
Weighing paper/boats
Plasticware and glassware as needed
Stir bars

Basic Outline of Procedure
- Equilibrate simulated water sample with laboratory CO_2.

13 May 05 cont. [illegible]

- Measure the pH of simulated water samples.
- Add solids to experimental solutions.
- Add simulated water to experimental solutions.
- Add pH adjustment solutions to experimental solutions.
- Add neptunium spike to experimental solutions.
- Place experimental solutions on activated gyrator
- During the experiment, completely remove the experimental solution caps during the regular business hours. Loosely cap otherwise.
- Analyze aliquots of experimental solution for pH and neptunium concentration (LSA)

Equilibrium of Samples

Initial entry 696/~~84~~ 5/13/05 170-171
Conducted for the two simulated groundwaters
Aeration for simulated groundwater since
Feb 23, 2005 (696/14).

pH measurement of Simulated Water

Initial entry 696/170-171
The objective is to determine the pH of the simulated waters used for the sorption experimental solns.

Fresh pH buffers 4, 7, and 10 (60 ml bottles with stir bars) were used to calibrate pH meter (using stir plate). The temperature, calibration set points and slope were recorded. The acceptable range for the slope is 92-102%.

13 May 05 cont. JB

About 10 mL of each simulated water was poured into separate beakers. The 10 mL aliquots of simulated groundwater was transfered into separate 10 mL microbeakers with stir bars. Each aliquot was placed on an activated stir plate. The pH was recorded. The pH meter was chalaged with a standard. Then microbeakers of groundwater was discarded.

Calibrated with pH 4, 7, and 10
Temp: 19.8° C
Set points: 4.00, 7.02, 10.06
Slope: 98.6 %

pH of simulated 19PB water with CA = 8.71
pH of simulated 19PB water without CA = 8.73

Challenge with pH 7 (target 7.02) = 7.02

Addition of solids to experimental soln
Consolidated Alluvium series 5 and 6

Initial entry 696/170-171
Labeled 12 polycarbonated tubes (40mL)
CAL5-NP 1 to 12
Labeled 12 polycarbonate tubes CAL6Np1 to 12

13 May 05 cont. JB

Weighed and recorded mass of each tube with cap on the Mettler AE 240 balance (S/N ~~00~~ 1101237) Added ~ 0.1 g of Consolidated Alluvium ~~directly~~ into the PC tubes. Solid weighed on a pice of weighing paper then transfered into the PC tube with a funel made oute of a pice of weighing paper. Then the sample was reweighed with solid and caps. Weights recorded on 696/173-174

Sample ID	Mass (g) of Empty PC tube	Mass (g) of PC tube with solid
CAL5-Np-1	22.2538	22.3542
CAL5-Np-2	22.1308	22.2302
CAL5-Np-3	22.2900	22.3905
CAL5-Np-4	22.2836	22.3849
CAL5-Np-5	22.0138	22.1169
CAL5-Np-6	22.1246	22.2262
CAL5-Np-7	22.2478	22.3484
CAL5-Np-8	21.9302	22.0302
CAL5-Np-9	22.2680	22.3683
CAL5-Np-10	22.1835	22.2868
CAL5-Np-11	22.2690	22.3709
CAL5-Np-12	22.2365	22.3391

13 May 05 cont. [illegible]

Sample ID	Mass (g) of Empty pc tube	Mass (g) of pc tube with solid
CAL6-Np-1	22.2394	22.3419
CAL-6-Np-2	22.1726	22.2749
CAL6-Np-3	22.0752	22.1822
CAL6-Np-4	22.1041	22.2053
CAL6-Np-5	22.0651	22.1665
CAL6-Np-6	21.9811	~~22.2045~~ 5/13/05 [illegible] 22.0842
CAL6-Np-7	22.1025	22.2047
CAL6-Np-8	22.2403	22.3408
CAL6-Np-9	22.3023	22.4051
CAL6-Np-10	22.0648	22.1677
CAL6-Np-11	22.1091	22.2113
CAL6-Np-12	22.0862	22.1877

Final calibration chaleage (target 20.0001g) reading = 20.0002g

5-17-05

17 MAY 05 BAW

Shipping of NC-EWDP-22PC Samples (< #35 mesh aliquots) to Washington State University for XRD, LOI, and ICP-MS analyses

F BW 5-18-05

Initially assigned to task: Bradley Werling

Objective: To characterize alluvium in the Forty Mile Wash area of the Yucca Mountain region by XRF, LOI, and ICP-MS analyses of a particular grain size range (< mesh#35) from sonic core samples collected from NC-EWDP-22PC.

Samples: 62 total samples
59 were aliquots from NC-EWDP-22PC-0305-XXX,<#35 mesh samples where XXX represents the depth interval. 631/72-95 and 710/2-11. See synopsis for aliquot labeling info.
3 were QA samples from 710/14

Purchase Requisitions: PR # 05021884 for the XRF/LOI analyses
PR # 05022341 for the ICP-MS analyses

Synopsis:

These analyses were divided between two purchase requisitions (PRs). This should help streamline the payment process. Typically the XRF/LOI analyses are completed much earlier than the ICP-MS analyses. Using two purchase requisitions allows us to treat the XRF/LOI and ICP-MS analyses independently. Payment can be sent for PR # 05021884 when the XRF/LOI results are received instead of waiting until the all analyses to be received and paying for one PR. Although two PRs were generated, only one set of samples was sent.

Approximately 15g sample aliquots were removed from the NC-EWDP-22PC-0305-XXX,<#35 mesh samples where XXX represents the depth interval. The information relating the CNWRA sample IDS to the Washington State University (WSU) aliquot IDs was documented during the sieve analyses process (631/72-95 and 710/2-11). The WSU aliquot IDs were six characters long. All prefixes were "22" representing the well, NC-EWDP-22PC. All suffixes were "F" representing XRF analyses. The middle three characters were numbers derived form the depth interval. Approximately 10g of standard was used for each QA sample. Identification of the standard and the WSU label is found in 710/14. At WSU's request, a sample submittal form was included in the package with the samples. A copy of this form is included as a part of this entry. WSU is not on the ASL so a procurement plan was included as an attachment to each PR.

5-17-05

GeoAnalytical Laboratory XRF or ICP-MS Submittal Form

Name: **Paul Bertetti**
Address: **CNWRA, Southwest Research Institute**
6220 Culebra Road
San Antonio, TX 78238-5166
Phone: **(210) 522-5228** Fax: **(210) 522-5184**
Analysis Requested: **XRF, LOI, and ICP-MS**

	Sample No.	Rock Province	Rock Type	State	County	Latitude North	Longitude West
1	22-462-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.580
2	22-465-F	All are from	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
3	22-472-F	Southwestern	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
4	22-477-F	Nevada	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
5	22-480-F	Volcanic Field	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
6	22-487-F	within Southern	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
7	22-492-F	Basin and	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
8	22-498-F	Range Prov.	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
9	22-503-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
10	22-508-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
11	22-514-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
12	22-518-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
13	22-522-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
14	22-530-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
15	22-535-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
16	22-540-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
17	22-541-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
18	22-547-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
19	22-550-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
20	22-555-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
21	22-561-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
22	22-567-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.582
23	22-572-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
24	22-577-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
25	22-580-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
26	22-589-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
27	22-596-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
28	22-601-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
29	22-605-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581

17 MAY 05 CONT BAW

	Sample No.	Rock Province	Rock Type	State	County	Latitude North	Longitude West
30	22-610-F	All are from	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
31	22-614-F	Southwestern	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
32	22-619-F	Nevada	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
33	22-625-F	Volcanic Field	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
34	22-631-F	within Southern	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
35	22-636-F	Basin and	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
36	22-640-F	Range Prov.	alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
37	22-645-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
38	22-647-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
39	22-653-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
40	22-659-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
41	22-664-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
42	22-671-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
43	22-676-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
44	22-682-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
45	22-686-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
46	22-695-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.582
47	22-701-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
48	22-707-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
49	22-711-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
50	22-716-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
51	22-722-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
52	22-726-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
53	22-736-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
54	22-741-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
55	22-745-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
56	22-748-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
57	22-753-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
58	22-757-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
59	22-760-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581
60	22-764-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.579
61	22-769-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.580
62	22-773-F		alluvium	NV	Nye	36° 40' 15.712"	116° 25' 06.581

17 MAY 05 CONT BAW

18 MAY 05 BAW

Shipping of NC-EWDP-22PC Samples (< #35 mesh aliquots) to Core Lab for XRD Analyses

Initially assigned to task: Bradley Werling

Objective: To characterize alluvium in the Forty Mile Wash area of the Yucca Mountain region by XRD analyses of a particular grain size range (< mesh #35) from sonic core samples collected from NC-EWDP-22PC.

Samples: 62 total samples
59 were aliquots from NC-EWDP-22PC-0305-XXX,<#35 mesh samples where XXX represents the depth interval. 631/72-95 and 710/2-11. See synopsis for aliquot labeling info.
3 were QA samples from 710/112-13

Purchase Requisition: PR # 05022451

Synopsis:

Approximately 10g sample aliquots were removed from the NC-EWDP-22PC-0305-XXX,<#35 mesh samples where XXX represents the depth interval. The information relating the CNWRA sample IDS to the Core Lab aliquot IDs was documented during the sieve analyses process (631/72-95 and 710/2-11). The Core Lab aliquot IDs were six characters long. All prefixes were "22" representing the well, NC-EWDP-22PC. All suffixes were "D" representing XRD analyses. The middle three characters were numbers derived form the depth interval. Three QA samples were included. One was a pure mineral standard and the other two were created by mixing several minerals together. The identification, preparation, and labeling of the three QA standards is found in 710/12-13. Core Labs is not on the ASL so a procurement plan was included as an attachment to the PR.

19 May 05 MR

19 May 2005 MR

Surface Area Analysis of NC-EWDP-19PB-0305- Sonic Core Composite Sample

Task initially assigned to: Marla Roberts

Objectives: To determine the surface area of a consolidated alluvium sample used in sorption experiments by determining the surface area.

Sample: NC-EWDP-19PB-0305-Sonic Core Composite – 696/64-66
This composite sample was prepared from the < #35 mesh portions of 13 different samples collected from various depth intervals of the NC-EWDP-19PB sonic core. For details see 696/64-66. Please note that surface area analyses were also performed on the 13 samples used to prepare NC-EWDP-19PB-0305-Sonic Core Composite (631/4-17).

Equipment: Coulter Surface Area Analyzer Model SA 3100 serial number 46020
Mettler Electronic Balance Model AE240, Serial Number 101237

Reagents: NIST silicon nitride surface area standard 1899 (10 m^2/g)
Helium – Zero grade – 99.995%
Nitrogen – UHP grade – 99.999%
Liquid Nitrogen
DOW Corning high vacuum grease
Type I water

Supplies: Loading funnel
3cc to 9cc glass surface area sample tubes with glass inserts and tube caps
Weighing Paper
Spatulas

Procedure:

Prior to using the surface area analyzer, the O-rings were checked for integrity and replaced with new ones if brittle or cracked. The O-rings were lubricated with high vacuum grease.

The analysis of this single sample was conducted during the surface area analyses of 59 samples from NC-EWDP-22PC (see 710/18-19 for initial entry). Several times throughout the analyses of the NC-EWDP-22PC samples, the surface area analyzer was challenged with a standard of known surface area that was expected to have a surface area similar to the samples. The scientific notebook reference for one of these challenges will be documented for the consolidated sample analysis.

The mass of the empty glass sample tube with glass stirrer and cap was recorded. An appropriate amount (between 1.7 to 2.0 g) of the composite sample was added to a tared

19 May 05 MR cont.

weigh paper and the mass recorded. The aliquot was transferred into a glass sample tube with a loading funnel on top. The loading funnel was removed and replaced with a tube cap.

The following sample information was entered into the surface area analyzer data acquisition software prior to outgassing: sample ID, operator, and sample mass. The software limits to sample ID to six characters so another sample ID was created for the composite sample: 19COMP. The "19" represents the well: NC-EWDP-19PB and the "COMP" represents the fact that the sample is a composite.

The tube cap was removed and the sample was inserted into the surface area analyzer for outgassing under the following conditions: outgas temperature of 350°C and outgas time of 720 minutes. Once the outgas process was complete, the sample could be removed. The sample tube was promptly recapped and the "total mass" after outgassing is recorded. The sample mass after the outgassing process, referred to as the "outgas sample mass", was calculated by subtracting the mass of the empty sample tube with glass stirrer and cap from the "total mass".

The outgassed sample was uncapped and reloaded into the analyzer. The sample mass information in the data acquisition software was updated with the "outgas sample mass". Liquid nitrogen was added to the analyzer and the analysis automatically starts. At the completion of the analyses a hardcopy of the results was generated and placed in the scientific notebook.

After the analysis was complete, the sample aliquot was discarded. The sample glass tubes, inserts and caps were cleaned with type I water and oven dried.

19 May 05 MR

19 May 05 ~~05~~ 19 May 05 MR MR cont.

see initial entry 696/179-180

~~sample prefix: NC-EWDP-19PB-0305~~ 19 May 05 MR

Surface Area ~~Analysis~~ 19 May 05 MR Analyses of NC-EWDP-19PB-0305 Sonic Core Composite

Sample ID	Surface Area Analyses Sample ID	Mass(g) of tube, cap+insert	Aliquot Mass(g)
NCEWDP-19PB 0305 Sonic Core ~~Sample~~ 19 May 05 MR Composite	19COMP	29.4272	1.8712

- Sample container for NCEWDP19PB0305 Sonic Core composite was rolled gently prior to aliquot removal to avoid a grain size bias due settling within the container.

- This entry is prior to ~~the~~ 20 May 05 MR outgasing

23 May 05 MR

20 May 05 MR

see initial entry: 6916/179-180

Surface Area ~~Analyses~~ 20May05MR Analyses of
NC EWDP 19PB-0305 Sonic Core Composite

After outgassing

Sample ID	Surface Area Analyses Sample ID	Total Mass (g)	Outgass * Sample Mass (g)
NCEWDP19PB-0305-Sonic Core Composite	19COMP	31.1804	1.7532

* calculation

20 May 05 MR

20 May 05 MR cont.
Sample ID: NC-EWDP-19PB-0305 Sonic Core Composite
Surface Area Analyses: 19COMP
mass (g) before outgassing: 6916/181
mass (g) after outgassing: 6916/182

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	19COMP	Start Date	02/19/04
Customer	CNWRA	Start Time	05:02:36
Operator	MR	Elapsed Time	46 min
Sample Wt	1.7532 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	20.458 sq.m/g
Micropore Surface Area	8.051 sq.m/g
Micropore Volume	0.00346 ml/g
Correlation Coefficient	0.99954

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	19COMP	Start Date	02/19/04
Customer	CNWRA	Start Time	05:02:36
Operator	MR	Elapsed Time	46 min
Sample Wt	1.7532 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	20.458 sq.m/g
Total Surface Area	28.508 sq.m/g
Micropore Surface Area	8.051 sq.m/g
Micropore Volume	0.00346 ml/g
Film Thickness Range	0.35 to 0.50
Slope	13.2240
Intercept	2.23394
Correlation Coefficient	0.99954

Film Thickness (nm)	Vads (cc/g STP)
0.3522	6.863
0.3681	7.095
0.3804	7.268
0.3941	7.459
0.4085	7.652
0.4222	7.835
0.4356	8.007

20 May 05 MR cont.

0.4608	8.326
0.4871	8.649

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	19COMP	Start Date	02/19/04
Customer	CNWRA	Start Time	05:02:36
Operator	MR	Elapsed Time	46 min
Sample Wt	1.7532 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0177
Intercept	0.0027
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	749.03
0.0000	0.253	0.029	749.04
0.0001	0.506	0.059	749.03
0.0001	0.800	0.093	749.05
0.0002	1.126	0.185	749.07
0.0003	1.444	0.198	749.05
0.0004	1.776	0.272	749.08
0.0005	2.133	0.355	749.08
0.0007	2.504	0.532	749.07
0.0011	2.903	0.792	749.11
0.0021	3.523	1.600	749.09
0.0033	3.955	2.435	749.05
0.0049	4.405	3.652	749.07
0.0075	4.866	5.589	749.06
0.0106	5.204	7.971	749.02
0.0156	5.511	11.659	749.03
0.0224	5.782	16.761	749.03
0.0272	5.928	20.386	749.01
0.0327	6.067	24.462	748.98
0.0388	6.201	29.066	748.97
0.0452	6.326	33.889	748.94
0.0519	6.443	38.890	748.92
0.0564	6.519	42.232	748.90
0.0614	6.599	45.979	748.86
0.0705	6.729	52.762	748.89
0.0805	6.863	60.311	748.88
0.1003	7.095	75.141	748.87
0.1168	7.268	87.445	748.88
0.1360	7.459	101.818	748.84
0.1569	7.652	117.460	748.84
0.1776	7.835	132.953	748.82
0.1980	8.007	148.240	748.81
0.2373	8.326	177.675	748.81
0.2783	8.649	208.357	748.78
0.3175	8.960	237.761	748.77
0.3585	9.277	268.441	748.76
0.3997	9.598	299.257	748.76
0.4391	9.909	328.752	748.73

24 MAY 05 BAW

Div 01 Results for cation analyses of CAL Series 3 Post Experiment Experimental Solns.

Samples: 11 experimental solutions from CAL Series 3 ~~CAL 1 (1011) Np~~ BW 5-24-05 post experiment CAL3-Np 1to11. The sampling (696/110-111) initially incorrectly labeled them as CAL series 4. Corrections were made in the notebook except for the Div01 labels. They were left as "4"s. Physically verified that the sampled tubes were series 3.

No QA samples.

Chain of Custody: 696/111-113

Initial entry for sorption experiment 696/85-86

Analyses of 19PB simulated water with Ca on 696/132-140. This was the water used to make CAL Series 3 (696/91).

Further notes - CAL Series 3 water had calcium but CAL series 4 water did not have calcium 696/91

pH spiking adjustment volumes on 696/94

5-24-05 BW

24 MAY 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
CAL41

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262217

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.29	0.250
Magnesium	0.859	0.250
Silicon	12.6	0.125
Potassium	4.84	1
Sodium	77.2	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
CAL42

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262218

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.68	0.250
Magnesium	0.888	0.250
Silicon	12.7	0.125
Potassium	4.14	1
Sodium	77.9	1
Strontium	<0.0250	0.0250

24 MAY 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
CAL43

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262219

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.44	0.250
Magnesium	0.848	0.250
Silicon	12.5	0.125
Potassium	4.92	1
Sodium	78.5	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID
CAL44

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262220

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.45	0.250
Magnesium	0.903	0.250
Silicon	12.7	0.125
Potassium	4.13	1
Sodium	78.4	1
Strontium	<0.0250	0.0250

24 MAY 05 CONT BW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL45

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262221

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.13	0.250
Magnesium	0.836	0.250
Silicon	12.6	0.125
Potassium	3.96	1
Sodium	78.5	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL46

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262222

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.46	0.250
Magnesium	0.878	0.250
Silicon	12.8	0.125
Potassium	4.35	1
Sodium	78.0	1
Strontium	<0.0250	0.0250

24 MAY 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL47

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262223

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.28	0.250
Magnesium	0.829	0.250
Silicon	12.8	0.125
Potassium	6.21	1
Sodium	79.0	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL48

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262224

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	7.22	0.250
Magnesium	0.837	0.250
Silicon	12.8	0.125
Potassium	4.20	1
Sodium	79.8	1
Strontium	<0.0250	0.0250

24 MAY 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL49

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262225

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	6.53	0.250
Magnesium	0.758	0.250
Silicon	12.8	0.125
Potassium	4.48	1
Sodium	79.4	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL410

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262226

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	2.65	0.250
Magnesium	0.487	0.250
Silicon	13.7	0.125
Potassium	4.77	1
Sodium	109	1
Strontium	<0.0250	0.0250

24 MAY 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
SAMPLE ANALYSIS DATA SHEET

Sample ID: CAL411

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262227

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	1.24	0.250
Magnesium	1.11	0.250
Silicon	25.4	0.125
Potassium	4.57	1
Sodium	172	1
Strontium	<0.0250	0.0250

SOUTHWEST RESEARCH INSTITUTE
MATRIX SPIKE SUMMARY

Sample ID: CAL42

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262218S

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Original Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Calcium	7.68	99.9	100	92.2%
Magnesium	0.888	93.1	100	92.2%
Silicon	12.7	31.5	20.0	94.0%
Potassium	4.14	95.6	100	91.5%
Sodium	77.9	169	100	91.1%
Strontium	<0.0250	19.6	20.0	98.0%

24 MAY 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
DUPLICATE SUMMARY

Sample ID
CAL41

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: 262217D

Client: Division 20

Date Received: 04/25/05

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Original Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Calcium	7.29	7.28	0.00%
Magnesium	0.859	0.837	2.59%
Silicon	12.6	12.6	0.00%
Potassium	4.84	4.75	1.88%
Sodium	77.2	76.6	0.78%
Strontium	<0.0250	<0.0250	0.00%

SOUTHWEST RESEARCH INSTITUTE
LABORATORY CONTROL SAMPLE

Sample ID
LCSW - E15H1 / E16H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Calcium	93.5	100	93.5%
Magnesium	93.1	100	93.1%
Silicon	18.7	20.0	93.5%
Potassium	89.8	100	89.8%
Sodium	89.6	100	89.6%
Strontium	19.2	20.0	96.0%

NA- Not Applicable.

24 MAY 05 CONT BAW

SOUTHWEST RESEARCH INSTITUTE
BLANK SUMMARY

Sample ID
PBW - E15H1 / E16H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Water

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.242

SRR: 27509

Task Order: 050426-3

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Calcium	<0.250	0.250
Magnesium	<0.250	0.250
Silicon	<0.125	0.125
Potassium	<1.00	1
Sodium	<1.00	1
Strontium	<0.0250	0.0250

NA- Not Applicable.

6-3-05 BW

3 JUNE 05 BAW

Initial Entry – Preparation of Simulated Water (Based on NC-EWDP-19PB Shallow string chemistry) Stock Solutions with Neptunium Spike Added.

Personnel initially assigned task: Paul Bertetti and Bradley Werling

Objective: To create stock solutions for use in sorption experiments that already have the neptunium added. The usual procedure in previous sorption experiments is a two step process where a solution is added to each experimental tube and then the neptunium spike is directly added to the individual tube. This new stock solution is intended to provide a uniform amount of neptunium in each experimental tube.

Samples
- 19PB Simulated water with Ca - 696/14 and 32
- 19PB Simulated water without Ca – 696/14 and 32

Reagents
Neptunium Spike # 61A (369/095)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment: Mettler PR5002 Electronic balance - sn 1122142733

Supplies:
2 liter polycarbonate bottles
5 mL Wheaton pipet and tips
1000 mL glass beakers
Disposable pipet

Procedure:

A labeled 2000 mL polycarbonate (pc) bottle (without cap) was tared on the electronic balance. Approximately 5 grams of the neptunium spike was transferred to the 2000 mL pc bottle using a Wheaton pipet. The mass was recorded. The next step was to add the appropriate simulated water to reach a total solution mass of about 2000 grams. The simulated water was initially transferred from the large carboy into a 1000 mL beaker. The simulated water was poured into the 2000 mL pc bottle from the 1000 mL beaker. This process was repeated until the target solution mass was reached. A disposable pipet was used to add the final portions to the 2000 mL pc bottle. The mass of the solution was recorded and the pc bottle was capped.

This process was repeated for the second stock solution. The Np-237 concentration in Spike # 61A was calculated at 99.9 ppm so the resulting stock solution should have a Np-237 of about 250 ppb.

The stock solution created from 19PB Simulated water with Ca was labeled 19PB Sim-1. The stock solution created from 19PB Simulated water without Ca was labeled 19PB Sim No Ca -1

Sample ID	Mass (g) of Np Spike	Soln Total Mass (g)
19PB Sim-1	4.97	2000.05
19PB Sim No Ca-1	5.01	2000.19

6 JUNE 05

Preparation of Nitric Acid Solution for use in Sorption Experiments

- 0.4 N HNO_3 for pH adjustment of exp solns
  4 N HNO_3 stock soln (696/29)
  Type 1 water

Filled ~~1000~~ 500 mL vol flask with about ~~750~~ 250 mL of type 1 water. Added ~~100~~ 50 mL (vol pipet) of 4 N HNO_3. Filled to mark with type 1 water. BW 6-6-05

Labeled 0.4 ~~HNO_3~~ N HNO_3 BW 6-6-05

6-6-05 BW

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6-6-05
BW

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6-6-05
BAW

6 JUNE 05 CONT BAW

pH Analyses of Neptunium Spiked Simulated Water Stock Solutions for use in Experimental Solutions.

Bradley Werling will be performing this task.

Objective: To determine the pH of the neptunium spiked simulated water stock solutions to be used in sorption experiments.

Samples
19PB Sim-1 (696/194)
19PB Sim No Ca – 1 (696/194)

Reagents
pH buffer 4 (Fisher SB98 lot # 041614)
pH buffer 7 (Fisher SB108 lot # 044065)
pH buffer 10 (Fisher SB 116 lot # 044060)
Type 1 water (Barnstead/Thermolyne model D11901 sn1190010979691)

Equipment:
Orion meter 920A (sn 039518)
Thermo Orion combination electrode 8103BN (ID 3G)
Stir Plate

Supplies:
Pipet and tips
Stir bar
10 mL microbeakers
Squirt bottle for water
Kimwipes

Basic Outline of Procedure

Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter. (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

A 10 mL aliquots (pipet with disposable 10 mL tip) of neptunium spiked simulated waters were transferred into a 10 mL microbeakers with stir bars. Each aliquot was placed on a stir plate and then the stir plate was activated. The pH was recorded. pH meter challenged with one of the calibration standards. The pH and solution ID were recorded. The solutions in the microbeakers were not transferred back to into the original experimental solution.

Temp: 21.1°C Cal Setpts = 4.01, 7.01, 10.05
Slope: 99.1

SAMPLE ID	pH
19PB Sim-1	8.09
19PB Sim NoCa-1	~~8.17~~ 8.17 (6 Jun 05 MR)
pH 7	7.03

6 JUNE 05 CONT BAW

pH Analyses of Simulated Waters for use in CAL Series 5 and 6 Experimental Solutions.

Bradley Werling will be performing this task. + Malla Roberts 6-6-05 BAW

Objective: To determine the pH of the simulated waters to be used in sorption experiments.

Initial Entry: 696/170-171

Additional Reagents: pH buffer 7 (Fisher SB108 lot # 041088) Note: different lot # from 696/170-171 initial entry

Additional Supplies:
10 mL microbeakers
Squirt bottle for water
Kimwipes

Basic Outline of Procedure

Fresh pH buffers 4, 7 and 10 (60mL bottles with stir bars) were used to calibrate the pH meter. (using stir plate). The temperature, calibration setpoints and slope were recorded. The acceptable range for the slope is 92-102% from page 5 of Orion Ross pH Electrode Instruction Manual, 2003.

About a 10 mL aliquot of the simulated water was poured out of the carboy into a small glass beaker. This aliquot was transferred into a 10 mL microbeaker with stir bar. This sampling step was repeated for the second simulated water. Each aliquot was placed on a stir plate and then the stir plate was activated. The pH was recorded. pH meter challenged with one of the calibration standards. The pH and solution ID were recorded. The solutions in the microbeakers were not transferred back to into the original experimental solution.

Temp 21.3°C
Cal Setpts 4.01, 7.01, 10.05
Slope 99.2

Sample ID	pH
19PB Simulated water with Ca	8.68
19PB Simulated water without Ca	8.68
pH 7	7.02

6 JUNE 2005 CONT BAW
END OF SCIENTIFIC NOTEBOOK
ENTRIE CONTINUED IN SN 711

I have reviewed this scientific notebook and find it in agreement with QAP-001. There is sufficient information regarding methods used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

E. C. Pearcy
7/6/2005