0042880

Battelle
Pacific Northwest Laboratories

Project No. D7T31

Internal Distribution

Date September 21, 1995

To Mike Schlender

From Joe Perez

Subject Management of Condensate in 324 Tank Pit Tanks

CM Andersen
WC Buchmiller
CJ Freeman
DA Lamar
LJ Sealock
RL Tidwell
File/LB

Condensates collected in the 324 building tank pit tanks (TK 16 and TK 20) are handled as test solutions and reused to the extent possible for secondary testing or as makeup solutions for subsequent vitrification experiments. Condensates have been concentrated using our thermosyphon evaporator which is part of our vitrification process recycle system. All of the systems are hardpiped together including the tank pit tanks. The following synopsis summarizes the "fate" of our condensates since that time.

- Pilot-Scale Ceramic Melter test 23: Condensate generated in June 1988 was combined with transfer line flushes and tank heel rinses and concentrated. The composition of the condensate is shown in the attached Table 10.12 from the test report. The concentrate was stored as feed test material and used during the high-temperature melter (HTM) acceptance test run in March 1995. The attached spreadsheet identifies the different test materials that were combined for the HTM test. The column identified as Tank-13 is the composite of the blended test materials that were concentrated and saved.
- Liquid-Fed Ceramic Melter test 8: Condensate generated in April and May of 1993 was combined with transfer line flushes and tank heel rinses and concentrated. The resultant feed test material was stored in the 3718G warehouse behind the 324 building and used during the high-temperature melter (HTM) acceptance test run in March 1995. The composition of the condensate was nonhazardous as shown in the attached Table 4.7.
- Small-Scale High-Temperature Melter tests SSHTM-1, -2, -3, & -4: Condensates generated in June through October 1994 were utilized to test the prototype HWVP condensate treatment system located in EDL-102 of the 324 building. This is basically a filtration system to separate fine particulate from the soluble species. The bottoms containing the solids from the test were disposed of as waste (see attached disposal request form). The liquid fraction has been analyzed to be non-hazardous and was discharged to the 300 area treated effluent disposal facility. The attached analysis sheet (sample TK-14) shows the composition of this material.
- Recently generated condensate from the 1831 project, treatability test of aluminum pot liners, is being prepared for concentration in our thermosyphon evaporator. This is expected to occur in late September and early October. The concentrated material will be disposed of as waste.

- Condensates generated from the recently completed SSHTM test 5 are being used to test the efficiency of the plant protoypic feed preparation tank to concentrate plant recycle streams to determine the maximum extent that they can be concentrated. Once testing is completed the concentrated solution will be disposed of as waste. This is projected to occur in October or November depending on staff assignment priorities .

PNL-7142
UC-721

Hanford Waste Vitrification Program Pilot-Scale Ceramic Melter Test 23

February 1990

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

Battelle

PNL-7142

TABLE 10.12. Composition of SBS Solution

Element	Wt% Total	Wt% PPT	Wt% Supernate	Total, mg/L	Feed Average, g/L	Melter DF
Al	2.03	3.44	1.79	32	6.79	338
Ba	0.11	0.74	0.00	2	0.48	446
B	4.83	1.10	5.45	77	16.5	314
Ca	0.33	1.77	0.10	5	3.26	979
Ce	0.42	2.91	0.00	7	0.57	138
Cr	0.21	0.95	0.08	3	0.49	227
Cs[a]	0.00	0.00	0.00	12	0.8	77
Cu	0.18	0.58	0.11	3	0.63	346
F	20.69	0.00	24.14	330	1.2	46
Fe	5.77	33.77	1.10	92	24.6	431
K	0.19	0.00	0.22	3	NA	NA
La	0.95	6.63	0.00	15	5.57	595
Li	0.25	0.46	0.22	4	8.81	3054
Mg	0.50	2.90	0.10	8	2.6	519
Mn	0.15	0.52	0.08	2	0.58	400
Mo	0.43	2.27	0.12	7	1.09	234
Na	7.68	18.00	5.95	122	41.7	500
Nd	0.68	4.79	0.00	11	2.65	392
Ni	0.61	3.19	0.18	10	2.34	374
P	0.14	0.00	0.17	2	0.4	247
SO4	10.66	0.00	12.44	170	0.99	8
Si	2.67	9.44	1.54	43	129	4868
Sr	0.10	0.62	0.02	2	0.47	453
Ti	0.13	0.80	0.02	2	0.01	8
Zn	0.47	0.84	0.41	8	2.02	428
Zr	3.64	4.26	3.53	58	14.4	400
Cl	11.48	0.00	13.39	183	0.54	4
				1606	305.5	275

(a) Analyses did not include this compound.

where C_1 = steady state concentration

t = time

f = overflow rate

C_f = overflow concentration

V = volume of SBS.

Consequently, it appears that the sampling of the SBS for insoluble matter was not representative of bulk average conditions within the tank. However, the suspended SBS solids concentrations in the samples collected were much higher (2X) than off-gas effluent sampling results would predict. Since SBS

TRANSMITTED TO RECORD CENTER

PHTD-K963

QA Plan WTC-006
Task 1.2.2.04.15
File Cat. T7.5
Page ____ of ____

HWVP Pilot-Scale Vitrification System Campaign - LFCM-8 Summary Report

Revision 0

J. M. Perez
L. D. Whitney
W. C. Buchmiller
J. T. Daume
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July 1994

Prepared for
the U.S. Department of Energy
under contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

Table 4.7. SBS Condensate Sample Cation Analyses By ICP-AES (Micrograms/liter)

Sample No.: No	7	19	33	46	60	74	87	102	115	130	141	154	175	185	198	211	225	237
Run Day :	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Ag	-0.01	-0.01	-0.01	-0.01	0.09	0.03	0.27	0.09	0.06	0.08	0.42	0.94	-0.05	0.22	0.16	0.21	0.44	0.50
Al	3.57	9.55	14.57	17.06	22.16	26.86	39.37	39.83	41.01	45.75	48.28	55.50	50.56	47.48	43.46	37.35	36.91	41.78
B	41.24	110.74	191.92	241.2	331.8	435.60	664.20	722.40	755.00	856.30	907.10	1018.00	821.00	728.60	660.20	601.50	592.40	655.80
Ba	0.24	0.47	0.38	0.45	0.62	0.65	0.79	0.59	0.56	0.54	0.58	0.66	0.51	0.67	0.67	0.60	0.63	0.72
Bi	-0.12	-0.12	-0.12	0.15	0.17	0.26	0.38	0.37	-0.6	-0.6	-0.6	0.66	0.66	-0.6	-0.6	-0.6	-0.6	-0.6
Ca	35.22	40.66	40.92	36.9	37.52	37.32	45.48	39.83	37.00	37.27	36.18	38.25	44.08	35.20	27.79	21.40	18.56	17.41
Cd	1.62	5.81	10.93	15.05	21.72	30.30	51.65	58.80	62.61	70.16	73.25	80.89	66.44	60.66	55.96	50.53	48.44	54.79
Ce	0.11	0.81	1.60	2.04	2.81	3.64	5.58	5.74	6.07	6.71	7.14	8.04	7.43	6.89	6.22	5.39	5.06	5.78
Co	-0.02	-0.02	0.03	0.04	0.06	0.08	0.14	0.16	0.17	0.19	0.23	0.28	0.37	0.31	0.27	0.22	0.19	0.22
Cr	0.55	1.11	1.83	2.32	3.36	4.56	8.13	9.54	11.17	13.89	16.40	20.67	35.39	28.42	22.55	18.40	16.32	16.50
Cu	0.16	0.47	0.77	0.93	1.23	1.58	2.43	2.52	2.60	2.88	3.01	3.35	3.19	3.03	2.80	2.48	2.39	2.66
Dy	-0.01	-0.01	0.03	0.04	0.06	0.08	0.13	0.13	0.14	0.15	0.17	0.20	0.18	0.17	0.14	0.11	0.10	0.13
Eu	-0.01	0.01	0.03	0.03	0.05	0.06	0.09	0.10	0.10	0.11	0.12	0.14	0.13	0.12	0.11	0.09	0.09	0.10
Fe	0.49	3.20	14.48	22.18	34.3	46.92	86.70	92.88	101.20	121.30	139.60	180.00	225.60	195.70	167.60	138.50	132.20	147.20
La	0.46	1.54	2.52	3.09	4.07	5.07	7.48	7.55	7.72	8.53	8.80	9.81	8.61	8.00	7.38	6.42	6.11	6.81
Li	4.12	12.40	20.44	26.22	36.42	47.76	71.16	74.70	77.36	86.99	90.22	101.40	90.26	85.72	80.82	73.52	72.36	81.72
Mg	8.70	10.14	10.28	9.31	9.60	9.69	11.99	10.69	10.08	10.30	10.33	11.09	14.77	12.03	9.65	7.54	6.54	6.69
Mn	0.30	0.86	1.61	2.21	3.25	4.51	7.79	8.31	8.88	10.20	11.10	13.31	13.72	12.12	10.76	9.31	8.90	10.14
Mo	0.65	0.50	1.46	1.91	2.60	3.53	5.75	6.32	6.34	7.19	7.83	9.31	7.65	6.26	5.17	4.19	4.10	4.72
Na	98.78	139.18	166.78	173.62	205.8	240.00	338.52	333.66	336.10	360.80	373.80	412.40	344.40	309.30	273.20	236.20	220.50	246.30
Nd	1.21	4.97	8.75	11.08	15.05	19.36	29.38	30.21	31.34	35.01	36.39	40.79	36.56	34.55	32.44	28.42	27.25	30.63
Ni	0.32	0.81	1.58	2.24	3.44	4.86	9.13	10.38	11.73	14.45	17.11	23.50	39.60	32.10	25.82	21.05	19.13	20.04
P	11.04	10.48	6.71	6.39	6.51	7.20	12.21	10.27	12.49	12.08	15.96	17.19	14.37	12.03	12.48	10.35	10.16	10.38
Pb	-0.16	0.26	0.92	1.47	2.33	3.27	5.46	5.66	6.05	6.64	7.12	8.01	6.26	6.02	5.63	5.06	4.91	5.60
S	18.52	38.52	71.14	88.76	122.16	170.92	285.12	322.26	334.50	373.30	388.30	422.40	324.90	276.10	237.50	205.00	186.00	201.40
Si	22.86	57.44	95.86	113.14	134.18	151.92	186.36	185.46	184.40	190.60	200.20	212.10	144.30	145.70	146.50	137.70	139.90	158.70
Sn	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.48	-0.48	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8
Sr	0.24	0.40	0.52	0.58	0.71	0.86	1.25	1.25	1.27	1.40	1.43	1.58	1.45	1.35	1.25	1.08	1.03	1.14
Te	-0.12	0.17	0.39	0.54	0.89	1.36	2.94	3.50	3.42	3.82	4.51	5.90	3.89	3.36	2.93	2.52	2.72	3.26
Ti	-0.01	0.02	0.10	0.15	0.21	0.29	0.45	0.47	0.46	0.52	0.58	0.73	0.58	0.44	0.33	0.21	0.24	0.33
V	-0.02	-0.02	-0.02	-0.02	-0.02	0.02	-0.06	-0.06	-0.1	-0.1	-0.1	0.13	0.20	0.15	0.10	-0.1	-0.1	-0.1
Y	0.03	0.13	0.22	0.28	0.37	0.48	0.72	0.74	0.77	0.85	0.88	0.99	0.87	0.82	0.76	0.67	0.64	0.72
Zn	0.90	1.66	2.24	2.49	2.95	3.42	4.91	4.83	4.92	5.15	5.29	5.78	5.11	4.65	4.24	3.60	3.46	3.63
Zr	0.80	6.84	18.64	25.00	34.76	48.18	77.04	82.98	86.52	98.48	103.7	118.60	103.00	92.94	84.16	71.01	67.33	78.51
Totals =	252.18	459.25	687.66	806.86	1041.3	1319.6	1763	2072.2	2147	2281.64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Shakedown testing feed makeup formula:

RWCT Simulant: 2000 gallons at 207.8 g/L
Frit Slurry Testing Material: 376.8 gallons at 643.1 g/L (917.3 kg frit)
Tank 13: 8200 liters (2167 gallons) at 86 g/L
Thermosyphon bottoms: 150 gallons
Old HWVP feed (blue drums): 1481 gallons (20 drums)

Oxide	RWCT Simulant kg	376.82 Frit Slurry Testing kg	Tank 13 kg	Thermo Bottoms kg	HWVP drums kg	Shim Chem kg	Total Feed kg	Total Feed wt%
Ag2O			0.01				0.01	0.00
Al2O3	22.66		28.85		17.14		68.65	1.78
B2O3	140.92	123.83	57.95	6.90	92.25		421.85	10.91
BaO			0.87		0.42		1.28	0.03
BeO			0.00				0.00	0.00
Bi2O3			0.00				0.00	0.00
CaO	11.96	9.17	7.81	0.02	2.78		31.74	0.82
CdO	20.32		4.05		6.17		30.54	0.79
Ce2O3			2.44		0.45		2.89	0.07
Cl	0.17	0.15	0.00				0.31	0.01
Co2O3			0.12				0.12	0.00
Cr2O3			2.10		0.56		2.66	0.07
CuO			0.75		0.48		1.23	0.03
Dy2O3			0.05				0.05	0.00
Eu2O3			0.00				0.00	0.00
Fe2O3	5.79		90.47		49.64		145.89	3.77
K2O	4.33		2.35		16.68		23.36	0.60
La2O3			2.68		1.26		3.94	0.10
Li2O	51.77	45.86	20.33	4.99	41.46		164.42	4.25
MgO	12.51	9.17	4.12		1.41		27.21	0.70
MnO	4.41		7.94		4.47		16.81	0.43
MoO3			1.50		0.96		2.46	0.06
Na2O	327.41	82.56	76.22	8.13	51.45		545.77	14.11
Nd2O3			6.43		6.08		12.52	0.32
NiO			6.18	0.12	4.03		10.33	0.27
P2O5	18.36		10.67		2.11		31.13	0.80
PbO			0.74		1.49		2.23	0.06
SO3	0.32	0.28	5.83	0.77	1.64		8.84	0.23
SiO2	958.31	643.94	328.28	0.15	313.37		2244.05	58.02
SnO2			0.00		0.28		0.28	0.01
SrO			0.54		0.25		0.79	0.02
TeO2			0.00		0.25		0.25	0.01
TiO2	0.78		1.97		1.53		4.28	0.11
VO2			0.00				0.00	0.00
Y2O3			0.20		0.15		0.35	0.01
ZnO			1.98	0.01	1.38		3.37	0.09
ZrO2			31.35		24.52		55.87	1.44
Others		2.29					2.29	0.06
	1580.03	917.26	704.79	21.07	644.64		3867.80	100.00

Battelle
Pacific Northwest Laboratories

#3034

CHEMICAL DISPOSAL/RECYCLE REQUEST

Send Completed Form To:

Nonradioactive Materials:
K. A. Poston, 376-3752
P7-68

95-104
Radioactive Materials:
M. W. McCoy, 376-1483
P7-68

lo 8/9/95

K27682

This material was generated by:
☒ 1830
☐ 1831 Programs

Generator Logbook Number

Requested by	Telephone No.	Address	Organization Code	Date
Buchmeller	6-4291	324/231	D7T31	7/5/91

Location of Waste: 3718 G

DETAILED MATERIAL DESCRIPTION (CONTINUE ON BACK OF FORM)

Item No.	Number of Containers (a)	Container Size	Material Quantity (KG)	Container Type	Material Description or Trade Name (b)	Chemical Component (b)	Weight % (c)	(S) Solid (L) Liquid (G) Gas	Hazards (d)	Status (e)	Isotope and Quantity (RMW Only)
1-1	3	55 gal	567	poly	Hydropulse			L	heavy	F	
1-2					Filter bottoms				metals		
1-3											
2	1	55 gal	57	poly	"			"	"	PF	
					Ph = 6.5						

(a) Indicate how many containers of each size are being offered for disposal or recycle.

(b) If the waste is a mixture, list the components and their approximate percentages. Please provide any information on trade name, manufacturer or unusual chemicals that will assist in disposal analysis.

(c) Trace amounts of metals, cyanide, sulfide, PCBs, and phenolics should be specified. Components must add up to 100% including water, earth or other components.

(d) Hazards
C = corrosive
E = explosive
H = heavy metal
R = reactive
EP = EP toxic
O = oxidizer
F = flammable
X = biohazard/carcinogen
T = toxic

(e) Status (state all that apply)
F = full
MT = empty (<1 in.)
Rx = reacted
N = new (unused)
T = treated
PF = partially full
TR = triple-rinsed (empty drums)
O = old (expired)
S = spill material
R = recyclable condition, i.e., unopened, opened but in excellent condition, quality assured.

A-1200-367 (12/88)

ANALYTICAL REQUEST FORM
ANALYTICAL AND PROCESS SUPPORT LABORATORY
To be Filled by Customer

1.0 Customer's Name DAVID LAMAR WP Number K27682

2.0 Date Submitted 5-22-95 Date Required 5-25-95

3.0 Customer's Sample Identifications TK-14

4.0 Project Description if Available

5.0 Impact Level [ ] Level I [ ] Level II [✓] Level III

6.0 Analysis Requested IC, ICP, pH = 4.88

7.0 Does the Sample Contain Radioisotopes? [ ] Yes [✓] No
If yes, radioisotopes and approximate activities

QP Representative approval required for the first ARF in a series for internal work. Approval not required for external work.

By: _____ Date _____
QP Representative

To be Filled by APSL

1.0 Laboratory Log-in Number (LN) 1740-95

2.0 Received by [signature] Date 5/24/95

3.0 Sample Damage? [ ] Yes [ ] No If yes, brief description of damage
and Customer Notified by _____ Date _____

4.0 Final Report Prepared by and Date M Gong 5/31/95

5.0 Final Report Reviewed by and Date

6.0 Final Report Issued by and Date M Gong 5/31/95

Results must be signed and dated by the analyst and reviewer, identifying the measuring and test equipment and the procedure used.

ION CHROMATOGRAPHY
Analytical and Process Support Laboratory

Lab No	1740		
Customer	D.LAMAR		
Customers's ID	TK-14		
Water Leach DF	1		
Sample DF	50		

Analysis	IC values (ug/mL)	Supernatant Reported values ug/mL		IC values (ug/mL)	Supernatant Reported values ug/mL		IC values (ug/mL)	Supernatant Reported values ug/mL
Fluoride	0.893	4.47E+01	F		0.00E+00	F		0.00E+00
Chloride	8.744	4.37E+02	Cl		0.00E+00	Cl		0.00E+00
Nitrite		0.00E+00	NO2		0.00E+00	NO2		0.00E+00
Nitrate	60.655	3.03E+03	NO3		0.00E+00	NO3		0.00E+00
Phosphate		0.00E+00	PO4		0.00E+00	PO4		0.00E+00
Sulfate	5.193	2.60E+02	SO4		0.00E+00	SO4		0.00E+00
Oxalate	2.024	1.01E+02	(COOH)2		0.00E+00	(COOH)2		0.00E+00
Formate		0.00E+00	(HCOO)		0.00E+00	(HCOO)		0.00E+00

Lab No			
Customer			
Customers's ID			
Water Leach dilution	g/mL	g/mL	g/mL
Second dilution			

Analysis	IC values (ug/mL)	Supernatant Reported values ug/mL		IC values (ug/mL)	Supernatant Reported values ug/mL		IC values (ug/mL)	Supernatant Reported values ug/mL
Fluoride		0.00E+00	F		0.00E+00	F		0.00E+00
Chloride		0.00E+00	Cl		0.00E+00	Cl		0.00E+00
Nitrite		0.00E+00	NO2		0.00E+00	NO2		0.00E+00
Nitrate		0.00E+00	NO3		0.00E+00	NO3		0.00E+00
Phosphate		0.00E+00	PO4		0.00E+00	PO4		0.00E+00
Sulfate		0.00E+00	SO4		0.00E+00	SO4		0.00E+00
Oxalate		0.00E+00	(COOH)2		0.00E+00	(COOH)2		0.00E+00
Formate		0.00E+00	(HCOO)		0.00E+00	(HCOO)		0.00E+00

Dionex Model 300DX M&TE Nunber WD00284

Analyst Signature and Date

Reviewed by and Date M. Gong 5/31/95

Comments

Estimated detection limit for F ion is 0.5 ug/mL. Estimated detection limit for NO3 is 1.0 ug/mL.

Estimated chloride ion detection limit is 0.5 ug/mL. Estimated dection limit for POis 1.0 ug/mL.

Estimated detection limit for NO2 ion is 1.0 ug/mL. Estimated detection limit for SO4 is 1ug/mL.

Estimated detection limit for nitrate ion is 1.0 ug/mL. Estimated detection limit for (COO)2 is 1.0 ug/mL.

Estimated detection limit for (CHOO) is 1.0 ug/mL.

ICP ANALYSIS ON ACIDIFIED SAMPLES

Element Concentration in the Sample

1.0 The ICP/AES analysis are performed by the Analytical Process and Separation Laboratory (APSL) using the method APSL-14. The instrument used is a Thermo Jarrell-Ash Model 61E Spectrometer located in room 146 in 324 Building.

2.0	Customer	D.LAMAR			Date File No	293	
3.0	Laboratory Log No.	1740	0	0	0	0	0
4.0	Customer's Sample ID	TK-14	0	0	0	0	0
5.0	Sample Weight	2.0095	0	0	0	0	0
		0	0	0	0	0	0
6.0	Acid Used	HNO3/HCL	0	0	0	0	0
7.0	Dilution Factor	50					

8.0 ICP Analysis

A portion of the sample is digested in the acids specified in 6.0. The digested sample is diluted to volume and analyzed by ICP. Some of the values reported below are negative. Concentrations below the estimated detection limit of the instrument are tabulated as negative values. The "Element Concentration in the Sample" are ICP values corrected for the dilutions performed by the laboratory.

Element	Detection Limit	Element Conc in Sample mg/g	Element Conc in Sample mg/g	Element Conc in Sample mg/g	Element Conc in Sample mg/g	Element Conc in Sample mg/g	Element Conc in Sample mg/g
Ag	0.005	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Al	0.03	0.02	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
B	0.01	0.16	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Ba	0.003	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Be	0.003	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Bi	0.06	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Ca	0.01	0.03	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Cd	0.006	0.03	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Ce	0.04	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Co	0.01	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Cr	0.02	0.01	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Cu	0.006	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Dy	0.006	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Eu	0.004	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Fe	0.005	0.07	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
K	0.3	0.13	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
La	0.01	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Li	0.005	0.03	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Mg	0.06	0.01	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Mn	0.003	0.01	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Mo	0.01	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Na	0.05	1.05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Nd	0.02	0.07	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Ni	0.02	0.02	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
P	0.08	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Pb	0.08	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
S	0.08	0.08	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Si	0.01	0.03	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Sn	0.08	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Sr	0.003	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Te	0.06	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Ti	0.003	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
V	0.01	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Y	0.003	0.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Zn	0.01	0.01	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Zr	0.01	0.04	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
	Total →	1.80	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

9.0 Comment

10.0 Calculated by and date

10.0 Approved by and date

Cations	Wt %	
Silver	0.003	
Aluminum	0.033	
Boron	0.03	
Barium	0.001	
Bismuth	0.003	
Calcium	0.024	
Cadmium	0.024	
Cerium	0.001	
Chrome	0.01	
Copper	0.002	
Iron	0.082	
~~Potassium~~	~~0.041~~	
~~Lanthanum~~	~~0.002~~	
Potassium	0.041	
Lanthanum	0.002	
Lithium	0.006	
Magnesium	0.005	
Manganese	0.003	
Molybdenum	0.006	
Sodium	0.156	
Neodymium	0.01	
Nickel	0.005	
Phosphorus	0.005	
Lead	0.001	
Sulfur	0.021	
Silicon	0.021	
Tellurium	0.002	
Zinc	0.005	
Zirconium	0.012	
Water	99.4[illegible]	99.443
Anions	Wt %	
Fluoride	0.003	
Chloride	0.078	
Nitrate	0.285	
Sulfate	0.055	

99.0650
.9350

.94

486

A001