

November 9, 1992



Mr. Edward M. Lee, Jr.  
Program Manager  
Solar Ponds Remediation Program  
EG&G Rocky Flats, Inc.  
Building 080  
P. O. Box 464  
Golden, Colorado 80402-0464

Subject: Rocky Flats Plant Solar Evaporation Ponds Stabilization Project  
[WBS 431 PONDSLUDGE PROCESS TRAIN - DESIGN CRITERIA - HALLIBURTON  
NUS ROCKY FLATS] USE OF PLASTICIZER FOR PONDSLUDGE PROCESSING -  
REVISION 2 - RF-HED-92-0780

Dear Mr. Lee:

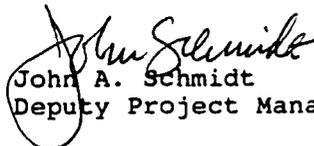
On September 2, 1992 HALLIBURTON NUS transmitted to Mr. Don Ferrier (RF-HED-92-0557) two HNUS Pittsburgh Lab reports on the use of a Halliburton plasticizer. Our correspondence recommended use of plasticizer in both process trains. We still await a reply to this letter.

Enclosed for your review is REVISION 2 to one of the reports which provides updated information. This information will be included in the next revision to our Pondsludge Treatability Study deliverables.

If you have any questions, please let me know.

Sincerely,

HALLIBURTON NUS ENVIRONMENTAL  
CORPORATION

  
John A. Schmidt  
Deputy Project Manager

JAS/jg

Enclosure

cc: S. Heiman  
J. Kohli  
R. Ninesteel  
R. Rodrigue  
J. Zak

A:\LTR\LEE36  
RF-HED-92-0780

A-DU04-000454



TO: TED BITTNER  
OCTOBER 7, 1992 - PAGE TWO

The pozzolan materials and the dry superplasticizer additive were mixed together before addition to the sludge. The pozzolanic blend was then added to the sludge and wet mixed for 5 minutes in the Hobart mixer.

Table 2-1 lists the materials used to prepare the pozzolan/superplasticizer batches.

TABLE 2-1  
SAMPLE PREPARATION  
POND 207 A/B CSS TREATABILITY STUDY  
WITH SUPERPLASTICIZER ADDITIVE  
ROCKY FLATS PLANT, COLORADO

Batch No.	207 A/B Material	W/P Ratio	Cement	Flyash	Lime	S.P. Additive
1E	2,000 g	0.42	1270 g	2540 g	82.5 g	3.899 g <sup>(1)</sup>
2E	2,000 g	0.42	1270 g	2540 g	82.5 g	11.68 g <sup>(2)</sup>

(1) Superplasticizer added at 0.1% of pozzolans.

(2) Superplasticizer added at 0.3% of pozzolans.

Once the mixing was completed the material was removed and used to fill eight plastic cylinders, one paint can, and one simulated half-crate for observation and analysis as described in Table 2-2. The cylinders were capped, wax-sealed, then placed in a warm water accelerated cure bath for 48 hours. The paint can and model half-crate were allowed to standard cure. Packing of the cylinders was conducted as per standard procedures and packing of the paint can was as per ASTM Test Method D4359-84. For this experiment a scale model of a half-crate was built to the dimension of 1" = 1'. The purpose of the scale model was to determine if freshly mixed stabilized material could be self-leveled using vibration. Vibrators were simulated by gently tapping the model half-crate on the table top. Loading the cement into the half-crates was simulated by gently dropping scoops of stabilized material into the

TO: TED BITTNER  
 OCTOBER 7, 1992 - PAGE THREE

center of the model half-crate. The half-crate was observed to determine physical property changes, and penetrometer readings were taken to determine setting strength. The penetrometer could be used with a boot, increasing the applied surface area by a factor of 16 for soft material, or used without the boot for harder material.

A video tape of this experiment to record the physical properties of the material, was taken and a copy was sent to Mr. Bittner.

TABLE 2-2  
 SUMMARY OF TESTING  
 POND 207 A/B CSS TREATABILITY STUDY  
 WITH SUPERPLASTICIZER ADDITIVE  
 ROCKY FLATS PLANT, COLORADO

Analysis	Method	Cure	No. Samples Required
Unconfined Compressive Strength (UCS)	ASTM D4219-83	48 Hr. Accelerated	1
TCLP-RCRA Metals and Nickel <sup>(1)</sup>	SW 3010/6010	48 Hr. Accelerated	1
Standard Test Methods for Wetting and Drying Compacted Soil-Cement Mixtures (Wet/Dry) and UCS on cylinder following test.	ASTM D559-82 and D4219-83 <sup>(2)</sup>	48 Hr. Accelerated	2
Standard Test Methods for Freezing and Thawing Compacted Soil-Cement Mixtures (Freeze/Thaw) and UCS on cylinder following test.	ASTM D560-82 and D4219-83 <sup>(2)</sup>	48 Hr. Accelerated	2
Paint Filter Liquids Test	SW 9095	48 Hr. Accelerated	1
Standard Test Methods for Determining Whether a Material is a Liquid or a Solid (Liquid/Solids Test)	ASTM D4359-84	Standard	1
Vibration Test with Model Half-Crate	Visual Observation	Standard	---

(1) TCLP METALS

Arsenic	Mercury
Barium	Selenium
Cadmium	Silver
Chromium	
Lead	

(2) Unconfined compressive strength testing was conducted after the durability testing to enable evaluation of the reduction of strength due to the severe conditions of the durability tests.

### 3.0 OBSERVATIONS

The initial A/B sludge cake material at 20% total solids was fluid and sloppy. When the pozzolan blend was first added, it appeared very dry, but after mixing for two to three minutes, it became softer and similar to smooth icing. The 0.3% S.P. mixture was easier to work with and seemed slightly more fluid than the 0.1% S.P. mix.

After mixing the 207 A/B and pozzolan with S.P. material for approximately 5 minutes, the material was placed in the simulated half-crate and tapped on the table to simulate vibration. The stabilizer material had a very low slump close to zero, but the tapping caused the material to level and fill the corners of the simulated half-crate. With sufficient tapping and several bounces, as the video tape shows, the material leveled out and conformed to the shape of the half-crate.

It was observed that as soon as the material self-leveled with vibration it could be turned completely upside down with no loss of material. Filling the cylinders for analysis took approximately 3 minutes and the tapping of the simulated half-crate took approximately 5 minutes. Therefore, curing observations listed in Table 3-1 started approximately 8 minutes after mixing stopped.

Table 3-1 lists the observations for the curing of the model half-crate pour.

TABLE 3-1  
OBSERVATIONS FOR SIMULATED HALF-CRATE POUR  
207 A/B PLUS SUPERPLASTICIZER  
ROCKY FLATS PLANT, COLORADO

Curing Time	Batch 1E 0.1% S.P.	Batch 2E 0.3% S.P.
Initial	Dry mix, similar to cake icing. Smooth; stiff, but soft.	Similar to Batch 1E but not quite as stiff and easier to work with.
5 Min.	Stiff enough to turn on side and upside down. Too soft for penetrometer reading.	Could turn on side with only very slight slump. Could also turn upside down.
10 Min.	Still soft, getting stiffer.	Getting stiff, but still too soft for penetrometer reading.

TO: TED BITTNER  
 OCTOBER 7, 1992 - PAGE FIVE

TABLE 3-1  
 OBSERVATIONS FOR SIMULATED HALF-CRATE POUR  
 207 A/B PLUS SUPERPLASTICIZER  
 ROCKY FLATS PLANT, COLORADO  
 PAGE TWO

Curing Time	Batch 1E 0.1% S.P.	Batch 2E 0.3% S.P.
15 Min.	ND	0.25 with boot (0.22 psi).
20 Min.	Getting stiffer, did not try penetrometer.	ND
25 Min.	ND	0.75 with boot (0.65 psi).
30 Min.	2.1 with boot (1.82 psi).	1.25 with boot (1.08 psi).
40 Min.	ND	2.5 with boot (2.17 psi).
50 Min.	Maxed out penetrometer with boot on (4.13 psi). <sup>(1)</sup> Reading not taken without boot.	4.5 with boot (3.9 psi).
60 Min.	Without boot - 0.9 (12.5 psi). Similar to stiff clay, could push hard to mold.	Without boot - 1.8 (25 psi).
1 Hr. 40 Min.	Max. penetrometer without boot (66 psi). <sup>(2)</sup>	Max. without boot (66 psi). <sup>(2)</sup>

ND - No observation made or penetrometer reading taken.

- (1) Maximum penetrometer reading with boot 0.3 tons/ft<sup>2</sup> or 4.13 psi.
- (2) Maximum penetrometer reading without boot 4.75 tons/ft<sup>2</sup> or 66 psi.

#### 4.0 RESULTS

##### 4.1 UCS

Unconfined compressive strength (UCS) provides an estimate at the products strength and allows the formulation to be compared with other formulations.

The 48-hr. accelerated cure UCS results are provided in Table 4-1.

TO: TED BITTNER  
 OCTOBER 7, 1992 - PAGE SIX

TABLE 4-1

207 A/B WITH SUPERPLASTICIZER ADDITIVE  
 48-HR ACCELERATED CURE  
 UNCONFINED COMPRESSIVE STRENGTH  
 ROCKY FLATS PLANT, COLORADO

Batch No.	% S.P.	UCS	Observations
1E	0.1%	>637 psi <sup>(1)</sup>	The sample seemed well cured and looked good.
2E	0.3%	221 psi	The sample was not fully cured in the center.

(1) The maximum applicable pressure for the UCS is 2000 ft-lb or 637 psi.

Similar 207 A/B mixes without superplasticizer additive achieved UCS values of >637 psi. The addition of 0.1% S.P. shows no detectable loss in strength, while the addition of 0.3% S.P. showed a loss in strength, but still achieved an acceptable reading of 221 psi. However, the observation that the center of the cylinder was not fully cured indicates that the 0.3% would require a longer curing period to become fully cured.

4.2 FREE LIQUID TESTS

The Paint Filter Liquids Test and the Liquid/Solids Test are required to determine if the final product can be shipped as a solid and to verify that there are no free liquids present. The results from the tests conducted on 48-hour accelerated cure samples are provided in Table 4-2.

TABLE 4-2

207 A/B WITH SUPERPLASTICIZER ADDITIVE  
 FREE LIQUID TEST CRITERIA  
 ROCKY FLATS PLANT, COLORADO

Batch No.	Paint Filter Liquid Test <sup>(1)</sup>		Liquid/Solids Test <sup>(2)</sup>	
	Pass	Fail	Pass	Fail
1E	X		X	
2E	X		X	

(1) Paint Filter Liquids Test - SW846, Method 9095.

(2) Standard Test Method for determining whether a material is a liquid or a solid - ASTM D4359-84.

TO: TED BITTNER  
 OCTOBER 7, 1992 - PAGE SEVEN

Both batches passed the required Free Liquids Tests, therefore, are considered to be solids with no free liquid.

#### 4.3 TCLP - METALS

The results of the 48 hour accelerated cure TCLP-metals analysis is provided in Table 4-3. Review of the TCLP results indicates that all leachate concentrations for both batches are below the criteria for the RCRA characteristic of toxicity (40 CFR 261.24) and the criteria for the RCRA Land Disposal Restrictions (40 CFR 268.41).

TABLE 4-3  
 207 A/B WITH SUPERPLASTICIZER ADDITIONAL  
 48-HR ACCELERATED CURE  
 TCLP (UG/L)  
 ROCKY FLATS PLANT, COLORADO

Analyte	Batch #1E	Batch #2E	TC Standard <sup>(1)</sup>	LDR Standard <sup>(2)</sup>
Aluminum	1080	1120	NS	NS
Arsenic	<80.0	<80.0	5,000	NS
Barium	7,580	17,800	100,000	NS
Cadmium	<5.0	<5.0	1,000	66
Calcium	1.94 x 10 <sup>6</sup>	2.20 x 10 <sup>6</sup>	NS	NS
Chromium	36.0	58.0	5,000	5,200
Iron	<20.0	<20.0	NS	NS
Lead	<30.0	<30.0	5,000	510
Magnesium	167	121	NS	NS
Mercury	<0.20	<0.20	200	NS
Nickel	<20.0	<20.0	NS	320
Selenium	<70.0J	<70.0J	1,000	NS
Silver	<5.0	<5.0	5,000	72
pH	11.6	12.0	NS	NS

J - Estimated Value  
 NS - No Standard

- (1) TC Standard - Standards for metal compounds regulated by 40 CFR 261.24 for the characteristic of toxicity.  
 (2) LDR Standard - Standards for metal compounds regulated by 40 CFR 268 for F006, F007, and F009.

TO: TED BITTNER  
 OCTOBER 7, 1992 - PAGE EIGHT

4.4 DURABILITY

Both batches passed the wet/dry durability testing with no detectable loss in strength. The initial 48 hr. accelerated cure UCS for Batch 2E, the higher S.P. dosage batch, only achieve 221 psi because the center of the sample was not fully cured. After the durability testing, the sample was fully cured and achieved greater than 637 psi.

The freeze/thaw durability test results show one failure. The scratched sample with the higher S.P. dosage failed in Cycle No. 4. All other samples passed the durability testing with no detectable loss in strength.

The results of the wet/dry and freeze/thaw durability testing are provided in Tables 4-4 and 4-5, respectfully.

TABLE 4-4  
 DURABILITY ANALYSIS - WET/DRY  
 POND 207 A/B WITH SUPERPLASTICIZER ADDITIVE  
 ROCKY FLATS PLANT, COLORADO

Batch	UP Ratio	% S.P.	Wet/Dry				
			Initial	Final			
			UCS (psi)	Control % Wt Loss	Scratched % Wt. Loss	Control UCS (psi)	Scratched UCS (psi)
1E	0.42	0.1%	>637	10.9%	10.7%	>637	>637
2E	0.42	0.3%	221	12.7%	14.3%	>637	>637

TABLE 4-5  
 DURABILITY ANALYSIS - FREEZE/THAW  
 POND 207 A/B WITH SUPERPLASTICIZER ADDITIVE  
 ROCKY FLATS PLANT, COLORADO

Batch	UP Ratio	% S.P.	Freeze/Thaw				
			Initial	Final			
			UCS (psi)	Control % Wt Loss	Scratched % Wt. Loss	Control UCS (psi)	Scratched UCS (psi)
1E	0.42	0.1%	>637	-0.2% <sup>(1)</sup>	-0.1% <sup>(1)</sup>	>637	>637
2E	0.42	0.3%	221	-4.2% <sup>(1)</sup>	Failed in Cycle #4	>637	NA

(1) Negative sign indicates the sample gained weight in durability analyses.  
 NA Not Analyzed

TO: TED BITTNER  
OCTOBER 7, 1992 - PAGE NINE

## 5.0 DISCUSSION

The addition of superplasticizer to the 207 A/B CSS formulation mixture at the dosages tested increased the fluidity. The dosage of superplasticizer was sufficient to enable a simulated half-crate to be filled with simulated vibration. The addition of superplasticizer had no adverse affects on the ability of the stabilized waste to pass the NTS acceptance criteria.

The TCLP results indicate that the formulations developed with the superplasticizer will meet the LDR criteria. It is noted that the same formulations without the superplasticizer also had no problem passing the LDR standards.

The results of the paint filter liquids test and the liquid/solids test indicate that the formulations tested will pass all Department of Transportation (DOT) requirements.

The UCS data indicates there is no long-term detrimental effects on the strength of the solidified product from the addition of the superplasticizer. The superplasticizer dosage of 0.3% retards the curing rate of the CSS formulation which causes an initial lower strength due to incomplete curing. The longer curing periods, greater than 24-days, show no strength differences between formulation with or without the S.P. additive.

The addition of superplasticizer had no affect on the performance of the waste in the wet/dry durability test. The results showed minimum weight loss and no detectable loss in strength at both dosage tested. The freeze/thaw durability testing had a failure at the higher 0.3% S.P. dosage and all others passed with no determined loss of strength.

RS/pam



C-49-9-2-83  
Mr. Rich Ninesteel  
September 10, 1992  
Page Two

Laboratory Control Sample Results

The Percent Recovery (%R) for silver exceeded the 120% upper control limit. However, no actions were taken for silver because only nondetects were reported for this analyte.

Overall Assessment

The data are accepted for use as qualified. Nondetect sample results for selenium are estimated due to negative blank contamination. No other problems were encountered.

ROCKY FLATS  
CASE NO. TCLP17, SDG PKG17

TABLE 1 - RECOMMENDATION SUMMARY

---

Aluminum	Magnesium	
Antimony	Manganese	
Arsenic	Mercury	
Barium	Nickel	
Beryllium	Potassium	
Cadmium	Selenium	J <sup>1</sup>
Calcium	Silver	
Chromium	Sodium	
Cobalt	Thallium	
Copper	Vanadium	
Iron	Zinc	
Lead	Boron	

---

If the field is left blank, the qualifier is A, accept all data.

J<sup>1</sup> - Estimate "UJ" nondetects sample results due to negative blank contamination.

INORGANIC ANALYSES DATA SHEET

1E207

Lab Name: HALLIBURTON\_NUS \_\_\_\_\_ Contract: \_\_\_\_\_  
 Lab Code: HNUS \_\_\_\_\_ Case No.: TCL17 SAS No.: \_\_\_\_\_ SDG No.: PKG17\_  
 Matrix (soil/water): WATER Lab Sample ID: P209237  
 Level (low/med): LOW \_\_\_\_\_ Date Received: 08/20/92  
 % Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L\_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1080			P
7440-36-0	Antimony				NR
7440-38-2	Arsenic	80.0	U		P
7440-39-3	Barium	7580			P
7440-41-7	Beryllium				NR
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	1940000			P
7440-47-3	Chromium	36.0			P
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron	20.0	U		P
7439-92-1	Lead	30.0	U		P
7439-95-4	Magnesium	167	B		P
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	20.0	U		P
7440-09-7	Potassium				NR
7782-49-2	Selenium	70.0	U		P
7440-22-4	Silver	5.0	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

UJ

Color Before: \_\_\_\_\_ Clarity Before: \_\_\_\_\_ Texture: \_\_\_\_\_  
 Color After: \_\_\_\_\_ Clarity After: \_\_\_\_\_ Artifacts: \_\_\_\_\_

Comments:

1E207 LAB / TCLP LEACH



INORGANIC CASE COMMENTS - METALS

ROCKY FLATS

CASE: TCLP17 SDG: PKG17

- 1 Samples in this data package were analyzed by protocols that are specific to the Rocky Flats project , although CLP reporting forms were used.
- 2 A diskette showing Form I values only is included with this data package.
- 3 The complete Rocky Flats sample identification appears in the comments section on Form Is.

Under the columns labeled "C", "Q", and "M", enter result qualifiers as identified below. If additional qualifiers are used, their explicit definitions must be included on the Cover Page in the Comments section.

FORM I-IN includes fields for three types of result qualifiers. These qualifiers must be completed as follows:

- o C (Concentration) qualifier -- Enter "B" if the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected, a "U" must be entered.
- o Q qualifier -- Specified entries and their meanings are as follows:
  - E - The reported value is estimated because of the presence of interference. An explanatory note must be included under Comments on the Cover Page (if the problem applies to all samples) or on the specific FORM I-IN (if it is an isolated problem).
  - M - Duplicate injection precision not met.
  - N - Spiked sample recovery not within control limits.
  - S - The reported value was determined by the Method of Standard Additions (MSA).
  - W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance. (See Exhibit E.)
  - \* - Duplicate analysis not within control limits.
  - + - Correlation coefficient for the MSA is less than 0.995.

Entering "S", "W", or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

- o M (Method) qualifier -- Enter:
  - "P" for ICP
  - "A" for Flame AA
  - "F" for Furnace AA
  - "CV" for Manual Cold Vapor AA
  - "AV" for Automated Cold Vapor AA
  - "AS" for Semi-Automated Spectrophotometric
  - "C" for Manual Spectrophotometric
  - "T" for Titrimetric
  - "NR" if the analyte is not required to be analyzed.

A brief physical description of the sample, both before and after digestion, must be reported in the fields for color (before and after), clarity (before and after), texture and artifacts. For water samples, report color and clarity. For soil samples, report color, texture and artifacts.





ICP INTERFERENCE CHECK SAMPLE

Lab Name: HALLIBURTON\_NUS \_\_\_\_\_ Contract: \_\_\_\_\_  
 Lab Code: HNUS \_\_\_\_\_ Case No.: TCL17 SAS No: \_\_\_\_\_ SDG No.: PKG17\_ \_\_\_\_\_  
 ICP ID Number: ARL3560 \_\_\_\_\_ ICS Source: SPEX \_\_\_\_\_

Concentration Units: ug/L

Analyte	True		Initial Found			Final Found		
	Sol. A	Sol. AB	Sol. A	Sol. AB	%R	Sol. A	Sol. AB	%R
Aluminum	500000	500000	479258	479188.0	95.8	483048	482084.0	96.4
Antimony								
Arsenic								
Barium	0	500	2	490.0	98.0	4	501.0	100.2
Beryllium								
Cadmium	0	1000	(-1)	902.0	90.2	(-1)	935.0	93.5
Calcium	500000	500000	479282	478964.0	95.8	492951	492569.0	98.5
Chromium	0	500	-12	462.0	92.4	-4	497.0	99.4
Cobalt								
Copper								
Iron	200000	200000	182843	182863.0	91.4	189011	188560.0	94.3
Lead	0	1000	-22	873.0	87.3	-36	901.0	90.1
Magnesium	500000	500000	455623	455361.0	91.1	455185	453635.0	90.7
Manganese								
Mercury								
Nickel	0	1000	-17	910.0	91.0	-12	934.0	93.4
Potassium								
Selenium								
Silver	0	1000	-1	955.0	95.5	-1	975.0	97.5
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

N A



ICP SERIAL DILUTION

1E207L

Lab Name: HALLIBURTON\_NUS

Contract: \_\_\_\_\_

Lab Code: HNUS

Case No.: TCL17

SAS No.: \_\_\_\_\_

SDG No.: PKG17

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum	1077.00		1108.00		2.9		P
Antimony							P
Arsenic	80.00	U	320.00	U			P
Barium	7577.00		7952.00		4.9		P
Beryllium							P
Cadmium	5.00	U	20.00	U			P
Calcium	484634.00		498180.00		2.8		P
Chromium	36.00		56.00		(55.6)		P
Cobalt							
Copper							P
Iron	20.00	U	80.00	U			P
Lead	30.00	U	120.00	U			P
Magnesium	167.00	B	156.00	B	6.6		P
Manganese							
Mercury							P
Nickel	20.00	U	80.00	U			P
Potassium							P
Selenium	70.00	U	280.00	U			P
Silver	5.00	U	20.00	U			P
Sodium							
Thallium							
Vanadium							
Zinc							
Cyanide							

N.A.

ICP SERIAL DILUTION

2E207L

Lab Name: HALLIBURTON\_NUS

Contract: \_\_\_\_\_

Lab Code: HNUS

Case No.: TCL17

SAS No.: \_\_\_\_\_

SDG No.: FKG17

Matrix (soil/water): WATER

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum	1118.00		1168.00		4.5		P
Antimony							P
Arsenic	80.00	U	820.00	U			P
Barium	17841.00		18572.00		4.1		P
Beryllium							
Cadmium	5.00	U	20.00	U			P
Calcium	551063.00		575976.00		4.5		P
Chromium	58.00		60.00		3.4		P
Cobalt							
Copper							
Iron	20.00	U	80.00	U			P
Lead	30.00	U	120.00	U			P
Magnesium	121.00	B	80.00	B	33.9		P N.A.
Manganese							
Mercury							
Nickel	20.00	U	80.00	U			P
Potassium							
Selenium	70.00	U	280.00	U			P
Silver	5.00	U	20.00	U			P
Sodium							
Thallium							
Vanadium							
Zinc							
Cyanide							