This document was too large to scan as a whole document, therefore it required breaking into smaller sections.

Document number: SD-WM-DP-054

Section 1 **of** 7

Title: Grout Product Test for Tank 241AP102, 5day & 90day Runs (Ansi Section)

Date: 1-14-94 **Revision:** A000

Originator: A.P. Hammitt, RA St. Denis T.L. Welsh
Co: WHC

Recipient:
Co:

References: EDT-140726

THIS PAGE INTENTIONALLY
LEFT BLANK.

S

JAN 14 1994
55 STA 6

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 140726

2. To: (Receiving Organization) DISTRIBUTION	3. From: (Originating Organization) PROGRAM SUPPORT	4. Related EDT No.: 140712
5. Proj./Prog./Dept./Div.: ANSI 102-AP/WASTE MANAGEMENT/PS/PAL	6. Cog. Engr.: A. P. Hammitt, R. A. St. Denis, T. L. Welsh	7. Purchase Order No.: NA
8. Originator Remarks: This document is being released into the Supporting Document System for retrievability purposes.		9. Equip./Component No.: NA
		10. System/Bldg./Facility: /222-S/PAL
11. Receiver Remarks: For Release		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date: 12/16/93

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-DP-054	NA	0	GROUT PRODUCT TEST FOR TANK 241-AP-102 (ANSI SECTION)	3Q	2	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
2	1	Cog.Eng. A. P. Hammitt	A P Hammitt	1-12-94	T6-50						
2	1	Cog. Eng. R. A. St. Denis	for R St Denis	1-12-94	T6-06						
2	1	Cog. Eng. T. L. Welsh	T L Welsh	1-12-94	T6-07						
2	1	Cog. Mgr. J. Kristofzski		1-12-94	T6-06						
2	1	QA J. C. Langford	J C Langford	1-12-94	S1-52						
		Safety									
		Env.									

18. R. Webb — Signature of EDT Originator — Date	19. Authorized Representative for Receiving Organization — Date	20. J. Kristofzski — Cognizant/Project Engineer's Manager — Date 1-12-94	21. DOE APPROVAL (if required) Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-1 (07/91)

THIS PAGE INTENTIONALLY
LEFT BLANK.

JAN 14 1994

Date Received: 1/12/94

INFORMATION RELEASE REQUEST

Reference: WHC-CM-3-4

Complete for all Types of Release

Purpose

[] Speech or Presentation
- [] Full Paper
- [] Summary
- [] Abstract
- [] Visual Aid

(Check only one suffix)

[] Speakers Bureau
[] Poster Session
[] Videotape

[] Reference
[X] Technical Report
[] Thesis or Dissertation
[] Manual
[] Brochure/Flier
[] Software/Database
[] Controlled Document
[] Other

ID Number (include revision, volume, etc.): WHC-SD-WM-DP-054, REV. 0

List attachments: EDT-140726

Date Release Required: 12/16/93

Title: GROUT PRODUCT TEST FOR TANK 241-AP-102 (ANSI SECTION)

Unclassified Category: UC-

Impact Level: 3Q

New or novel (patentable) subject matter? [X] No [] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[] No [] Yes Disclosure No(s).

Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions?
[X] No [] Yes (Identify)

Copyrights? [X] No [] Yes
If "Yes", has written permission been granted?
[] No [] Yes (Attach Permission)

Trademarks?
[X] No [] Yes (Identify)

Complete for Speech or Presentation

Title of Conference or Meeting: NA

Group or Society Sponsoring: NA

Date(s) of Conference or Meeting: NA

City/State: NA

Will proceedings be published? [] Yes [X] No
Will material be handed out? [] Yes [X] No

Title of Journal: NA

CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval: Name (printed)	Signature	Date
Classification/Unclassified Controlled Nuclear Information	[]	[X]			
Patent - General Counsel	[X]	[]	CGC Nguyen 5/4/93		
Legal - General Counsel	[X]	[]	CGC Nguyen 5/4/93		
Applied Technology/Export Controlled Information or International Program	[]	[X]			
WHC Program/Project	[X]	[]	D. M. Nguyen		1-2-94
Communications	[]	[X]			
RL Program/Project	[]	[X]			
Publication Services	[X]	[X]	J. R. Dunphy		1-13-94
Other Program/Project	[]	[X]			

Information conforms to all applicable requirements. The above information is certified to be correct.

	Yes	No
References Available to Intended Audience	[X]	[]
Transmit to DOE-HQ/Office of Scientific and Technical Information	[]	[X]

Author/Requestor (Printed/Signature) — Date

A. P. Hammitt — 1-2-94
R. A. St. Denis — 1/12/94
T. L. Welsh — 1-12-94

Intended Audience

[X] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) — Date

J. Kristofzski — 1/12/94

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

APPROVED FOR RELEASE — OFFICIAL DOCUMENT — Date

Date Cancelled | Date Disapproved

THIS PAGE INTENTIONALLY
LEFT BLANK.

S

SUPPORTING DOCUMENT

1. Total Pages 1058

2. Title

GROUT PRODUCT TEST FOR TANK 241-AP-102, 5-DAY & 90-DAY RUNS (ANSI SECTION)

3. Number

WHC-SD-WM-DP-054

4. Rev No.

0

5. Key Words

TANK 102AP, GROUT PRODUCT, ANSI

APPROVED FOR PUBLIC RELEASE

6. Author

Name: A. P. Hammitt

Signature

Name: R. A. St. Denis

for Kurt A. Gasch 1/12/94

Signature

Name: T. L. Welsh

TL Welsh 1-12-94

Signature

Organization/Charge Code J124J0/J120H

7. Abstract

NA

8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed.

PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA.

DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

9. Impact Level 3Q

10. RELEASE STAMP

OFFICIAL RELEASE BY WHC

DATE JAN 14 1994

55 Sta. 6

THIS PAGE INTENTIONALLY
LEFT BLANK.

Westinghouse
Hanford Company
P.O. Box 1970 Richland, WA 99352

DEC 1993
RECEIVED
SDLA

PROJECT: GROUT PRODUCT TEST FOR TANK 241-AP-102 (ANSI REPORT)

DATE PRINTED: December 16, 1993

54-7800-075
Hanford Operations and Engineering Contractor for the US Department of Energy

THIS PAGE INTENTIONALLY
LEFT BLANK.

TABLE OF CONTENTS

Narrative 1
Tables 8
Grout Logbook 31
Calculations 36
Correspondence 57
Sample Data Summary 61

5-DAY - PHYSICAL TEST ANALYSES 67

pH Analysis G597 through G602 68
pH Analysis G606 through G610 74
pH Analysis G614 through G618 80
pH Analysis G622 through G626 86
pH Analysis G630 through G634 92
pH Analysis G637 through G642 98

5-DAY - METALS ANALYSES 104

Acid Digestion G733 105
Acid Digestion G728 Through G735 109

Inductively Coupled Plasma Spectrographic G728-G729,G731-G735 . . . 117
Inductively Coupled Plasma Spectrographic G677 through G685 . . . 137

5- DAY - ANION ANALYSES 163

Ion Chromatography G597 through G602 164
Ion Chromatography G606 through G610, G618 181
Ion Chromatography G614 through G617 202
Ion Chromatography G622 through G626 217
Ion Chromatography G630 through G634 238
Ion Chromatography G637 through G642 261

5-DAY - ALPHA ANALYSES 287

Americium 241 G597 through G602 288
Americium 241 G606 through G610 330
Americium 241 G614 through G618 367
Americium 241 G614, G617 404
Americium 241 G622 through G626 426
Americium 241 G630 through G634 463
Americium 241 G630 through G634 500
Americium 241 G637 through G642 537

THIS PAGE INTENTIONALLY
LEFT BLANK.

5-DAY - BETA ANALYSES 579

Technetium 99 G597 through G602 580
Technetium 99 G606 through G610 592
Technetium 99 G614 through G618 603
Technetium 99 G622 through G626 614
Technetium 99 G630 through G634 625
Technetium 99 G637 through G642 636

5-DAY - OTHER ANALYSES 648

Total Organic Carbon G597 through G602 649
Total Organic Carbon G606 through G610 663
Total Organic Carbon G614 through G618 676
Total Organic Carbon G622 through G626 689
Total Organic Carbon G630 through G634 702
Total Organic Carbon G637 through G642 715

90-DAY - PHYSICAL TEST ANALYSES 729

pH Analysis G698 through G701 730
pH Analysis G720 through G623 735
pH Analysis G747 through G750 740

90-DAY - ANION ANALYSES 745

Ion Chromatography G698 through G701 746
Ion Chromatography G720 through G723 762
Ion Chromatography G747 through G750 781

90-DAY - ALPHA ANALYSES 797

Americium 241 G698 through G701 798
Americium 241 G718 through G723 830
Americium 241 G745 through G749 862
Americium 241 G747 through G750 884

90-DAY - BETA ANALYSES 916

Technetium 99 G698 through G701 917
Technetium 99 G718 through G723 927
Technetium 99 G747 through G750 937

90-DAY - OTHER ANALYSES 947

Total Organic Carbon G698 through G701 948
Total Organic Carbon G720 through G723 960
Total Organic Carbon G747 through G750 971

This report consists of pages 1 through 981.

THIS PAGE INTENTIONALLY
LEFT BLANK.

Employee payroll numbers have been eliminated from this data package to protect the privacy of WHC employees. The elimination of these numbers in no way compromises the integrity of the raw data or information contained herein.

K. K. Giamberardini 10-13-93

K. K. Giamberardini, Manager
Laboratory Data Management

Date

THIS PAGE INTENTIONALLY
LEFT BLANK.

NARRATIVE

THIS PAGE INTENTIONALLY
LEFT BLANK.

Westinghouse
Hanford Company

P.O. Box 1970 Richland, WA 99352

CASE NARRATIVE

Grout Product Tests
for
Tank 241-AP-102

INTRODUCTION

On 4/28/93 grout feed Tank 241-AP-102 (102-AP) was sampled for a full characterization under the protocol listed in Hanford Grout Disposal Program-Campaign 102 Feed Characterization and Test Plan, WHC-SD-WM-TP-136, and Technical Project Plan for The 222-S Laboratory in Support of The Grout Treatment Facility Sampling and Characterization Plans for Tanks 105-AP, 106-AP, and 102-AP, WHC-SD-WM-TPP-008.

The results of the inorganic and radiochemical constituents are reported in WHC-SD-WM-DP-046, Revision 0. The organic analyses were performed by PNL. The grout treatment tests specified in the test plan were performed by the Process Chemistry Laboratory (PCL) and 222-S Analytical Operations (222-S). This data package reports the results of the grout product tests.

RHEOLOGY

Since the waste in 102-AP was determined to be homogeneous (the mean concentrations at each location could not be distinguished from each other), a composite solution was prepared using equal volumes of each of the 15 samples (field duplicates were not included). The dry blend, which was mixed with 102-AP waste, consisted of three components (Type II Portland cement (21%), attapulgite clay (11%), and class F fly ash (68%)).

Grout was prepared by blending seventy-five mL of the composite (102-AP waste) with 75.5 grams (g) of the dry blend (8.4 pounds per gallon) for two minutes using a separatory funnel mixer in the hot cell. The relative weight percent of each dry blend component and the mix time were recorded by PCL in laboratory notebook WHC-N-583. Two additional grout specimens were prepared using water for the liquid.

Several grout mixtures were prepared and the density, using the procedure specified in the test plan, was determined for each grout mixture. The viscosity, critical flow rate, and frictional pressure drop for each grout mixture were determined using procedure LA-519-174. The 10 minute gel strength for each grout mixture was determined using procedure LA-519-175. The drainable liquid for each grout mixture was determined using procedure LA-519-176. A Brookfield standard oil with a value of 95 centipoise was used as the standard for the viscometer. The standard results varied between 86.5 and 96.5 centipoise.

Results of the rheology tests are reported in laboratory notebook WHC-N-583 and listed in Table 1.

54-7800-075

Hanford Operations and Engineering Contractor for the US Department of Energy

The summary statistics for the rheology properties are as follows.

- The mean density for the seven grout mixtures made using 102-AP waste is 13.23 pounds per gallon (lb/gal) with a standard deviation of 0.16 lb/gal. The mean density for the water grout mixtures is 11.34 lb/gal with a standard deviation of 0.35 lb/gal.

- The mean viscosity for the seven grout mixtures made using 102-AP waste is 28.3 centipoise (cP) with a standard deviation of 5.0 cP. The mean viscosity for the water grout mixtures is 9.8 cP with a standard deviation of 1.1 cP.

- The mean critical flow rate for the seven grout mixtures made using 102-AP waste is 31.4 gallons per minute (gpm) with a standard deviation of 4.4 gpm. The upper limit of a one-sided 95% confidence interval for the mean is 34.6 gpm. One of the criteria for processing (Riebling and Fadeff, 1991) is that the critical flow rate be $\leq$ 60 gpm. This grout product has a mean critical flow rate well below this limit. The mean critical flow rate for the water grout mixtures is 19.4 gpm with a standard deviation of 2.0 gpm.

- The mean frictional pressure drop for the seven grout mixtures made using 102-AP waste is 2.49 pounds force per square inch (psi) with a standard deviation of 0.73 psi. The upper limit of a one-sided 95% confidence interval for the mean is 3.02 psi. One of the criteria for processing (Riebling and Fadeff, 1991) is that the frictional pressure drop be $\leq$ 14 psi. This grout product has a mean frictional pressure drop value well below this limit. The mean frictional pressure drop for the water grout mixtures is 0.82 psi with a standard deviation of 0.20 psi.

- The mean 10-minute gel strength for the seven grout mixtures made using 102-AP waste is 13.2 pounds force per one hundred square feet ($lb_f/100\ ft^2$) with a standard deviation of 0.2 $lb_f/100\ ft^2$. The upper limit of a one-sided 95% confidence interval for the mean is 13.4 $lb_f/100\ ft^2$. One of the criteria for processing (Riebling and Fadeff,1991) is that the 10-minute gel strength be $\leq$ 100 $lb_f/100\ ft^2$. This grout product has a mean 10-minute gel strength value well below this limit. The mean 10-minute gel strength for the water grout mixtures is 13.4 $lb_f/100\ ft^2$ with a standard deviation of 0.2 $lb_f/100\ ft^2$.

After the rheology measurements were obtained the grout specimens were placed in a programmable oven and cured to a maximum temperature of 65 °C. The curing oven was programmed to simulate the adiabatic temperature rise specified in the test plan. The quantity of drainable liquid was to be estimated after one day of curing and after 15 days of curing by single visual observations. Since it was not possible to get into the curing oven in the hot cell, these observations were not performed. After the grout specimens were cured for 28 days, the specimens were removed from their container and the quantity of drainable liquid determined. No drainable liquid was observed in any of the grout specimens and therefore no drainable liquid samples were sent to 222-S Laboratory for analysis.

PULSE VELOCITY AND COMPRESSIVE STRENGTH

Pulse velocity measurements were obtained on five grout specimens (made with 102-AP waste) using procedure LA-519-181. The pulse velocity readings varied from 2176 to 2477 meter per second (m/s). The pulse velocity readings for the water grout specimens were 978 and 1102 m/s. The pulse velocity mesurements are listed in Table 2.

The compressive strength instrument was calibrated using a calibrated load cell and the calibration equation was calculated and reported in laboratory notebook WHC-N-583. Compressive strength measurements were then obtained for five grout specimens (the same specimens used for the pulse velocity measurements). These measurements are recorded in the laboratory notebook and are listed in Table 2.

The mean compressive strength is 1064 psi with a standard deviation of 521 psi. The lower limit of a one-sided 95% confidence interval for the mean is 568 psi. The NRC guideline for compressive strength is $\geq$ 60 psi (NRC, 1991) with a recommendation of $\geq$ 500 psi (NRC, 1993). This grout product has a mean greater and the associated lower limit of a one-sided 95% confidence interval for the mean greater than this criteria.

The compressive strength measurement for one of the water grout specimens was 359 psi. The second specimen cracked prior to the compressive strength measurement. It is postulated that the water grout specimens have lower compressive strength than those of the 102-AP waste grout specimens because there is more H_2O per gallon of water then H_2O per gallon of waste.

Toxicity Characteristics Leach Procedure (TCLP)

After the compressive strength measurements were completed, five grout specimens (made with 102-AP waste) and one grout specimen (made with water) were prepared for the TCLP tests through particle size reduction according to procedure LA-544-131. The analysis of 102-AP waste (see Table 3) showed Cr as the only hazardous metal that exists in concentration (630 mg/L) exceeding 20 times the TCLP limit (5 milligram per liter [mg/L]). The concentrations of the other metals (As, Ba, Cd, Pb, Hg, Se, and Ag) were lower than 20 times the corresponding limits. Thus, according to recent guideline from EPA (EPA, 1993), only Cr in the TCLP leachate samples was required to be analyzed.

The Cr was analyzed using the ICP procedure LA-505-151. The TCLP leachate samples were analyzed twice. The first measurement used a modification to the TCLP procedure where the spike was added after the preservation. The second measurement followed the TCLP procedure where the spike was added before the preservation.

Seven samples were submitted to 222-S laboratory for Cr analysis, one was an acid blank, one was from a grout mixture using water, and five were from grout mixtures using 102-AP waste. For the Cr analysis, both the beginning and ending laboratory measurement control system (LMCS) standards were within the control limits. The spike recovery for the sample with the spike added after the preservation was 90.4%, which is within limits. The spike recovery for the sample with the spike added before the preservation was 100.9%, which is within limits. The data are listed in Table 4.

The mean TCLP Cr value (spike added after the preservation) for the samples associated with 102-AP waste was 9.70E-02 mg/L with a standard deviation of

9.92E-03 mg/L. The upper limit of a 95% confidence interval for the mean is 1.06E-01 mg/L. The criteria (EPA, 1989) for Cr is 5 mg/L. Thus, the grout TCLP leachate Cr concentration is below the limit.

The maximum TCLP Cr value (spike added before the preservation) observed for the samples associated with 102-AP waste was 1.4E-01 mg/L. The maximum value for the TCLP leachate Cr concentration is below the limit.

The TCLP Cr value for the sample associated with the water grout specimen is < 1.1E-01 mg/L. The spike recovery for this sample was 88.9%. The Cr value for the acid blank was 5.70E-02 mg/L.

ANSI 16.1 LEACHATE TEST

Four grout specimens (one made with water and three made with waste) were prepared for ANSI 16.1 leach testing (NRC, 1991b). The results of the 90-day ANSI leach indices are presented in this document.

The ANSI samples were submitted to 222-S laboratory for analysis of NO_2^-, NO_3^-, ^{241}Am, ^{99}Tc, TOC, and pH. The ANSI samples were not analyzed for ^{129}I because it was not detected in the 102-AP waste samples. The ANSI sample numbers are listed in Table 5. The IC analyses were performed using procedure LA-533-105, Rev. C-0. Americium-241 analysis is performed using procedures LA-503-156, Rev. D-0 and LA-508-051, Rev. A-3. Technetium-99 analyses were performed using procedure LA-438-101, Rev. D-1. The TOC analyses were performed using procedure LA-344-105, Rev. B-2. The pH analyses were performed using procedure LA-212-102, Rev. C-5. The analytical results from the ANSI samples are listed in Tables 6, 7, 8, 9, 10, and 11.

The laboratory values (except for pH) were put into a spreadsheet which calculated the leach index. For those samples where the analytical result was given as a "less than" value, the "less than" value itself was used in the spreadsheet. Therefore, the actual leach index is expected to be greater than the value obtained from the spreadsheet calculations.

The NO_2^- leach indices for the three grout specimens made with the 102-AP waste are 8.0, 8.1, and 7.6 (see Tables 12, 13, and 14). The mean leach index is 7.90 with a standard deviation of 0.26 (RSD = 3.3%). The lower limit of a one-sided 95% CI for the mean is 7.45. The criterion (Riebling and Fadeff, 1991) is 6.0. Thus, the NO_2^- grout leachate value is above the limit.

The NO_3^- leach indices for the three grout specimens made with the 102-AP waste are 8.4, 8.5, and 8.0 (see Tables 15, 16, and 17). The mean leach index is 8.30 with a standard deviation of 0.26 (RSD = 3.1%). The lower limit of a one-sided 95% CI for the mean is 7.85. The criterion (Riebling and Fadeff, 1991) is 6.0. Thus, the NO_3^- grout leachate value is above the limit.

Since "less than" analytical results existed for the leachate samples, the ^{99}Tc leach index is a "greater than" value. The leach indices for the three grout specimens made with the 102-AP waste are > 7.3, 8.2, and > 7.2 (see Tables 18, 19, 20). Summary statistics were not calculated due to the "greater than" values.

Since "less than" analytical results (detection limits) existed for the ^{241}Am leachate samples, the leach index is a "greater than" value. The leach indices for the three specimens made with the 102-AP waste are > 5.3, > 5.7,

and > 5.7 (see Tables 21, 22, and 23). Summary statistics were not calculated due to the "greater than" values. Since all but one analytical result were below the detection limit, the three leach indices may not be meaningful because the actual leach index for ^{241}Am may be much higher.

Since "less than" analytical results existed for the TOC leachate samples, the leach index is a "greater than" value. The leach indices for the three specimens made with the 102-AP waste are > 7.7, > 7.8, and > 7.7 (see Tables 24, 25, and 26). Summary statistics were not calculated due to the "greater than" values.

A. P. Hammitt — 12-16-93
A. P. Hammitt
Advanced Scientist

R. A. St Denis — 12-16-93
R. A. St. Denis
Senior Scientist

T. L. Welsh — 12-16-93
T. L. Welsh
Senior Statistician

Duchsherer, M. J., 1993, *222-S Analytical Laboratory , Grout - (Feed Tank) 102AP*, WHC-SD-WM-DP-046, Revision 0, Westinghouse Hanford Company, Richland, Washington.

EPA, 1989, *Identification and Listing of Hazardous Waste*, Title 40, Code of Federal Regulations, Part 261, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1993, *Application of the Toxic Characteristic Leach Procedure Extraction for Metals to Hanford Grouts*, M. Gearheard to J.D. Bauer, U. S. Environmental Protection Agency, Washington, D.C.

Hendrickson, D.W., Welsh, T.L., and Nguyen, D.M., 1993, *Hanford Grout Disposal Program Campaign 102 Characterization and Test Plan*, WHC-SD-WM-TP-136, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

NRC, 1991a, *Licensing Requirements for Land Disposal of Radioactive Waste*, Title 10, Code of Federal Regulations, Part 61, U.S. Nuclear Regulatory Commission, Washington, D.C.

NRC, 1991b, *Technical Position on Waste Form*, Revision 1, NRC Report, Low-Level Waste Management Branch, Division of Low-Level Waste Management And Decommissioning, U.S. Nuclear Regulatory Commission, Washington, D.C., (NUREG/OP-0101).

Riebling, E.F. and Fadeff, J. G., 1991, *Grout Formulation Standard Criteria Document*, WHC-SD-WM-CSD-003, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

TABLES

THIS PAGE INTENTIONALLY
LEFT BLANK.

Table 1. 102-AP Rheology Results.

Grout sample	Density (lb/gal)	Viscosity (cP)	Critical flow rate (gpm)	Frictional pressure drop (psi)	10 Minute gel strength ($lb_f/100\ ft^2$)
Water - 1	11.09	9.053	17.957	0.679	NA
Water - 2	11.59	10.581	20.825	0.955	13.53
102AP - 1	13.03	24.696	30.378	2.284	13.36
102AP - 2	13.14	30.112	34.272	2.931	13.43
102AP - 3	13.28	32.395	34.453	2.994	12.96
102AP - 4	13.13	35.398	38.238	3.646	12.82
102AP - 5	13.43	NA	NA	NA	NA
102AP - Gas1	13.25	23.759	26.679	1.791	13.34
102AP - Gas2	13.11	22.835	26.605	1.632	NA
102AP - Gas3	13.50	27.636	28.989	2.155	13.29
Summary statistics for the 102-AP grout samples					
N	8	7	7	7	6
mean	13.23	28.262	31.373	2.490	13.20
standard deviation	0.16	4.992	4.406	0.726	0.248
UL-95% CI mean	13.34	31.928	34.609	3.023	13.404
criterion	None	None	$\leq$ 60	$\leq$ 14	$\leq$ 100

Table 2. 102-AP Compressive Strength/Pulse Velocity Results.

Grout sample	Compressive strength (psi)		Pulse velocity (m/s)
102-AP - 1	1887		2304
102-AP - 2	753		2176
102-AP - 3	953		2457
102-AP - 4	1196		2477
102-AP - 5	533		2387
Water - 1	NA		978
Water - 2	359		1102
Summary statistics for the 102-AP grout samples			
N	5	required criterion ≥ 60 psi	
mean	1064.4 psi	recommended criterion ≥ 500 psi	
standard deviation	521.0 psi		
LL 95% CI - mean	567.6 psi		

Table 3. Concentration of Hazardous Metals in 102-AP Waste.

Analyte	Concentration limits	Required quantitation limits	Mean of the sample results () = number of observations
As	5 mg/L	0.5 mg/L	< 0.25 mg/L (3)
Ba	100 mg/L	10 mg/L	0.284 mg/L (13)
Cd	1 mg/L	0.1 mg/L	1.47 mg/L (15)
Cr	5 mg/L	0.5 mg/L	6.302 E2 mg/L (15)
Pb	5 mg/L	0.5 mg/L	< 1.55 mg/L (15)
Hg	0.2 mg/L	0.02 mg/L	< 0.01 mg/L (4)
Se	1 mg/L	0.1 mg/L	0.367 mg/L (9)
Ag	5 mg/L	0.5 mg/L	< 0.125 mg/L (15)

Table 4. 102-AP Grout TCLP Cr Leachate Results.

TCLP Cr results				
Sample numbers			Cr result (μg/mL or mg/L)	
Type	AP	BP	Spike added after preservation	Spike added before preservation
(Reagent)	G679	G734	5.70E-02	< 1.1E-01
(Water Grout)	G680	G735	2.32E-01	1.48E-01
(102AP Grout)	G681	G728	9.50E-02 *	8.29E-02 * < 1.1E-01
(102AP Grout)	G682	G729	1.03E-01	< 1.1E-01
(102AP Grout)	G683	G731	1.10E-01	< 1.1E-01
(102AP Grout)	G684	G732	8.40E-02	1.4E-01
(102AP Grout)	G685	G733	9.30E-02	< 1.1E-01
Summary statistics (102AP grout samples)				
N mean standard deviation UL 95% CI - mean			5 9.70E-02 9.92E-03 1.06E-01	Maximum concentration is 1.4E-01

AP: Spike added after the preservation.
BP: Spike added before the preservation.
*: Spike was added to this sample.

Table 5. 102-AP Grout ANSI Sample Numbers.

Sample numbers				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0 (Wash)	G597	G608	G622	G633
1 (2 Hours)	G598	G609	G623	G634
2 (7 Hours)	G599	G610	G624	G637
3 (24 Hours)	G600	G614	G625	G638
4 (48 Hours)	G601	G615	G626	G639
5 (72 Hours)	G602	G616	G630	G640
6 (96 Hours)	G606	G617	G631	G641
7 (120 Hours)	G607	G618	G632	G642
8 (456 Hours)	G747	G748	G749	G750
9 (1128 Hours)	G698	G699	G700	G701
10 (2160 Hours)	G720	G721	G722	G723

Table 6. 102-AP Grout ANSI pH Results.

pH				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0	1.07E+01	9.44E+00	8.49E+00	8.15E+00
1	1.06E+01	9.87E+00	9.94E+00	1.05E+01
2	1.04E+01	9.81E+00	9.82E+00	9.75E+00
3	1.08E+01	1.00E+01	9.45E+00	9.99E+00
4	1.08E+01	1.02E+01	1.01E+01	1.02E+01
5	1.06E+01	1.01E+01	1.03E+01	1.01E+01
6	1.04E+01	1.01E+01	1.02E+01	1.01E+01
7	1.04E+01	1.00E+01	1.01E+01	1.00E+01
8	1.14E+01	1.11E+01	1.11E+01	1.11E+01
9	9.93E+00 9.37E+00	9.44E+00 9.91E+00	1.10E+01 1.09E+01	1.10E+01 1.10E+01
10	1.12E+01	1.11E+01	1.11E+01	1.11E+01

Table 7. 102-AP Grout ANSI NO_2^- Results.

NO_2^- (µg/mL)				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0	< 1	7.91E+00	6.74E+00	1.57E+01
1	< 1	3.64E+01	4.51E+01	5.74E+01
2	< 1	2.29E+01	2.78E+01	4.36E+01
3	< 1	4.27E+01	5.24E+01	8.27E+01
4	< 1	3.79E+01	4.91E+01	7.42E+01
5	< 1	2.88E+01	3.67E+01	5.43E+01
6	< 1	2.46E+01	3.16E+01	4.70E+01
7	< 1	2.10E+01	2.75E+01	3.93E+01
8	< 1	2.03E+02	2.43E+02	3.35E+02
9	< 1	1.99E+02	2.00E+02	2.45E+02
10	< 1	1.56E+02	1.41E+02	1.50E+02

Table 8. 102-AP Grout ANSI NO_3^- Results.

NO_3^- (µg/mL)				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0	< 1	1.07E+01	9.03E+00	2.25E+01
1	< 1	4.69E+01	5.73E+01	7.37E+01
2	< 1	3.01E+01	3.63E+01	5.47E+01
3	< 1	5.42E+01	6.56E+01	1.03E+02
4	< 1	4.86E+01	6.18E+01	9.12E+01
5	< 1	3.70E+01	4.70E+01	6.83E+01
6	< 1	3.19E+01	4.11E+01	5.94E+01
7	< 1	2.76E+01	3.64E+01	5.00E+01
8	< 1	2.66E+02	3.17E+02	4.54E+02
9	< 1	2.63E+02	2.69E+02	3.43E+02
10	< 1	2.12E+02	1.92E+02	2.14E+02

Table 9. 102-AP Grout ANSI ^{99}Tc Results.

^{99}Tc ($\mu Ci/mL$)				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0	< 1.47E-05	2.23E-05	3.20E-05	3.40E-05
1	< 1.45E-05	7.64E-05	9.40E-05	1.22E-04
2	< 1.45E-05	4.16E-05	5.27E-05	< 2.80E-04
3	< 1.45E-05	4.70E-04	9.07E-05	4.50E-04
4	< 1.46E-05	5.69E-04	8.55E-05	3.31E-04
5	< 1.53E-05	< 3.00E-04	7.48E-05	< 2.84E-04
6	< 9.26E-06	3.32E-04	7.22E-05	< 2.79E-04
7	< 9.56E-06	3.60E-04	5.85E-05	< 2.84E-04
8	< 1.06E-05	3.73E-04	4.12E-04	6.08E-04
9	< 8.14E-06	3.94E-04	3.79E-04	4.64E-04
10	< 7.07E-06	3.16E-04	2.84E-04	3.11E-04

Table 10. 102-AP ANSI ^{241}Am Results.

^{241}Am ($\mu Ci/mL$)				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0	< 6.37E-06	< 6.37E-06	< 6.37E-06	< 1.27E-05
1	< 6.37E-06	< 6.37E-06	< 6.37E-06	< 1.27E-05
2	< 6.37E-06	< 6.37E-06	< 6.37E-06	< 6.37E-06
3	< 6.37E-06	< 1.27E-05	< 6.37E-06	< 6.37E-06
4	< 6.37E-06	< 1.27E-05	< 6.37E-06	< 6.37E-06
5	< 6.37E-06	< 1.27E-05	< 1.27E-05	< 6.37E-06
6	< 6.37E-06	< 1.27E-05	< 1.27E-05	7.64E-06
7	< 6.37E-06	< 1.27E-05	< 1.27E-05	< 6.37E-06
8	< 3.40E-05	< 3.40E-05	5.48E-05	< 3.40E-05
9	< 1.27E-05	< 1.27E-05	< 1.27E-05	< 1.27E-05
10	< 1.27E-05	< 1.27E-05	< 1.27E-05	< 1.27E-05

Table 11. 102-AP Grout ANSI TOC Results.

TOC (μg/mL)				
Time period	Water grout sample	102AP grout sample 1	102AP grout sample 2	102AP grout sample 3
0	4.07E+01	1.20E+01	< 5.50E+00	7.70E+00
1	6.33E+01	7.70E+00	< 5.50E+00	9.40E+00
2	2.81E+01	7.70E+00	< 5.50E+00	< 5.50E+00
3	5.50E+00	< 5.50E+00	< 5.50E+00	< 5.50E+00
4	< 5.50E+00	< 5.50E+00	< 5.50E+00	< 5.50E+00
5	5.50E+00	< 5.50E+00	1.60E+01	< 5.50E+00
6	1.90E+01	< 5.50E+00	8.20E+00	< 5.50E+00
7	1.40E+01	< 5.50E+00	5.50E+00	< 5.50E+00
8	< 5.00E+00	7.10E+00	9.30E+00	1.50E+01
9	< 5.50E+00	< 5.50E+00	7.70E+00	1.10E+01
10	< 5.50E+00	< 5.50E+00	7.15E+00	8.8 E+00

Table 12. NO_2^- Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # B102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

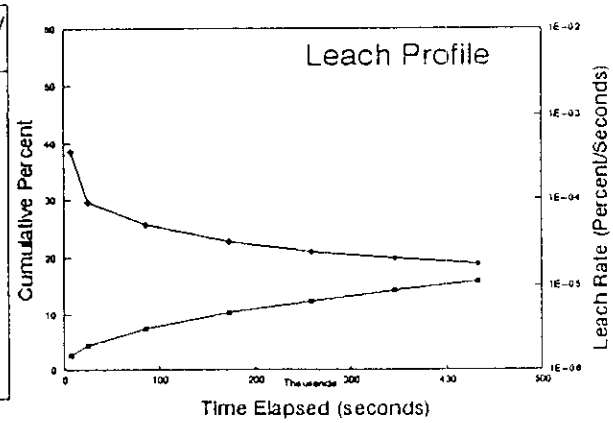
Analyte Concentration	35800	µg/ml	Specimen Surface Area (cm2)	49.65287
Volume Solution Used	75	ml	Specimen Volume (cm3)	26.42079
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	496.5287
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	6.752E+05
Analyte Conc. in Grout	16222.83	µg/g	Analyte [Species]	NO2-
Mass of Specimen	41.65	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	4	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	3.64E+01	2.677	2.677	3.72E-04
2	18000	25200	14835	2.29E+01	1.684	4.361	9.36E-05
3	61200	86400	51231	4.27E+01	3.140	7.501	5.13E-05
4	86400	172800	125894	3.79E+01	2.787	10.288	3.23E-05
5	86400	259200	213818	2.88E+01	2.118	12.406	2.45E-05
6	86400	345600	300849	2.46E+01	1.809	14.215	2.09E-05
7	86400	432000	387596	2.10E+01	1.544	15.759	1.79E-05
8	1209600	1641600	939462	2.03E+02	14.928	30.688	1.23E-05
9	2419200	4060800	2716550	1.99E+02	14.634	45.322	6.05E-06
10	3715200	7776000	5768861	1.56E+02	11.472	56.794	3.09E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	2.213E-08	7.7	7.7
18000	1.155E-08	7.9	7.8
61200	1.200E-08	7.9	7.8
86400	1.165E-08	7.9	7.9
86400	1.143E-08	7.9	7.9
86400	1.173E-08	7.9	7.9
86400	1.101E-08	8.0	7.9
1209600	1.273E-08	7.9	7.9
2419200	8.842E-09	8.1	7.9
3715200	4.893E-09	8.3	8.0



Hey Hammitt

Table 13. NO_2^- Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # C102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

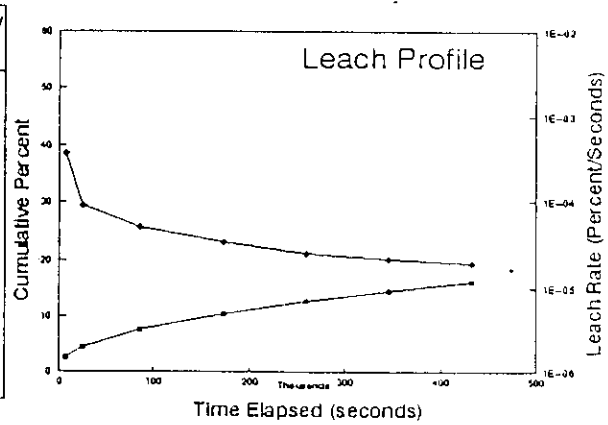
Analyte Concentration	35800	µg/ml	Specimen Surface Area (cm2)	40.54225
Volume Solution Used	75	ml	Specimen Volume (cm3)	19.8156
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	405.4225
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	6.752E+05
Analyte Conc. in Grout	16222.83	µg/g	Analyte [Species]	NO2-
Mass of Specimen	31.83	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	4.51E+01	2.706	2.706	3.76E-04
2	18000	25200	14835	2.78E+01	1.669	4.375	9.27E-05
3	61200	86400	51231	5.24E+01	3.146	7.521	5.14E-05
4	86400	172800	125894	4.91E+01	2.948	10.470	3.41E-05
5	86400	259200	213818	3.67E+01	2.204	12.673	2.55E-05
6	86400	345600	300849	3.16E+01	1.897	14.571	2.20E-05
7	86400	432000	387596	2.75E+01	1.651	16.222	1.91E-05
8	1209600	1641600	939462	2.43E+02	14.591	30.813	1.21E-05
9	2419200	4060800	2716550	2.00E+02	12.009	42.822	4.96E-06
10	3715200	7776000	5768861	1.41E+02	8.466	51.288	2.28E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	1.908E-08	7.7	7.7
18000	9.575E-09	8.0	7.9
61200	1.016E-08	8.0	7.9
86400	1.100E-08	8.0	7.9
86400	1.044E-08	8.0	7.9
86400	1.089E-08	8.0	7.9
86400	1.062E-08	8.0	7.9
1209600	1.026E-08	8.0	7.9
2419200	5.024E-09	8.3	8.0
3715200	2.248E-09	8.6	8.1



Hey Hammitt

Table 14. NO_2^- Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # D102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

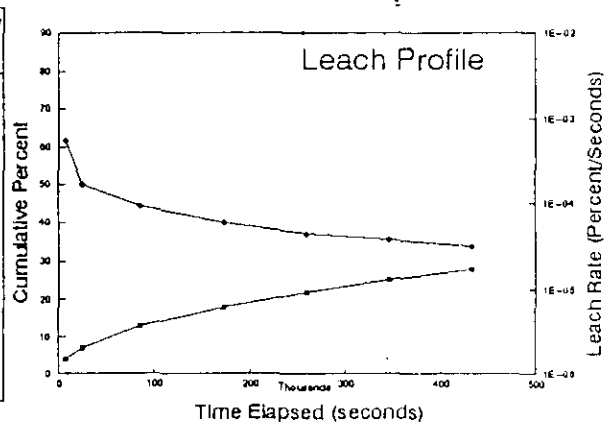
Analyte Concentration	35800	µg/ml	Specimen Surface Area (cm2)	46.91969
Volume Solution Used	75	ml	Specimen Volume (cm3)	24.43923
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	469.1969
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	6.752E+05
Analyte Conc. in Grout	16222.83	µg/g	Analyte [Species]	NO2-
Mass of Specimen	39.58	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3.7	cm		

Incremental Functions:

Leachate Sample	Time (seconds) Duration	Elapsed	Mean	Analytical Result	Percent Leached Incremental	Cumulative	Leaching Rate
1	7200	7200	1800	5.74E+01	3.989	3.989	5.54E-04
2	18000	25200	14835	4.36E+01	3.030	7.019	1.68E-04
3	61200	86400	51231	8.27E+01	5.747	12.765	9.39E-05
4	86400	172800	125894	7.42E+01	5.156	17.922	5.97E-05
5	86400	259200	213818	5.43E+01	3.773	21.695	4.37E-05
6	86400	345600	300849	4.70E+01	3.266	24.961	3.78E-05
7	86400	432000	387596	3.93E+01	2.731	27.692	3.16E-05
8	1209600	1641600	939462	3.35E+02	23.279	50.971	1.92E-05
9	2419200	4060800	2716550	2.45E+02	17.025	67.997	7.04E-06
10	3715200	7776000	5768861	1.50E+02	10.424	78.420	2.81E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	4.709E-08	7.3	7.3
18000	3.582E-08	7.4	7.4
61200	3.850E-08	7.4	7.4
86400	3.822E-08	7.4	7.4
86400	3.476E-08	7.5	7.4
86400	3.664E-08	7.4	7.4
86400	3.301E-08	7.5	7.4
1209600	2.966E-08	7.5	7.4
2419200	1.147E-08	7.9	7.5
3715200	3.871E-09	8.4	7.6



Hey Hammitt

Table 15. NO_3^- Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # B102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

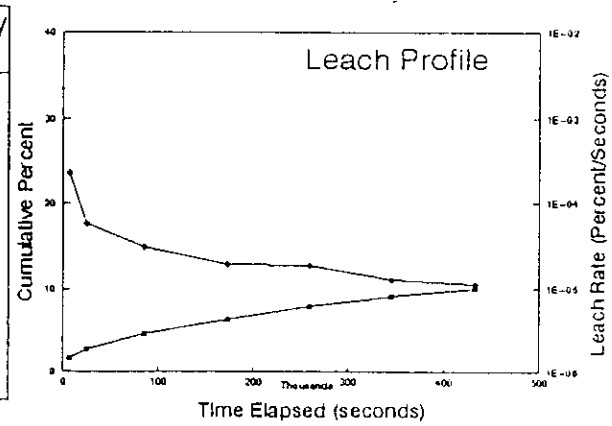
Analyte Concentration	75800	µg/ml	Specimen Surface Area (cm2)	49.65287
Volume Solution Used	75	ml	Specimen Volume (cm3)	26.42079
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	496.5287
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	1.430E+06
Analyte Conc. in Grout	34348.9	µg/g	Analyte [Species]	NO3-
Mass of Specimen	41.65	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	4	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	4.69E+01	1.629	1.629	2.26E-04
2	18000	25200	14835	3.01E+01	1.045	2.674	5.81E-05
3	61200	86400	51231	5.42E+01	1.882	4.557	3.08E-05
4	86400	172800	125894	4.86E+01	1.688	6.245	1.95E-05
5	86400	259200	213818	4.70E+01	1.632	7.877	1.89E-05
6	86400	345600	300849	3.19E+01	1.108	8.985	1.28E-05
7	86400	432000	387596	2.76E+01	0.959	9.944	1.11E-05
8	1209600	1641600	939462	2.66E+02	9.239	19.182	7.64E-06
9	2419200	4060800	2716550	2.63E+02	9.135	28.317	3.78E-06
10	3715200	7776000	5768861	2.12E+02	7.363	35.680	1.98E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	8.195E-09	8.1	8.1
18000	4.451E-09	8.4	8.2
61200	4.312E-09	8.4	8.3
86400	4.274E-09	8.4	8.3
86400	6.789E-09	8.2	8.3
86400	4.401E-09	8.4	8.3
86400	4.244E-09	8.4	8.3
1209600	4.875E-09	8.3	8.3
2419200	3.445E-09	8.5	8.3
3715200	2.016E-09	8.7	8.4



Hey Hammitt

Table 16. NO_3^- Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # C102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

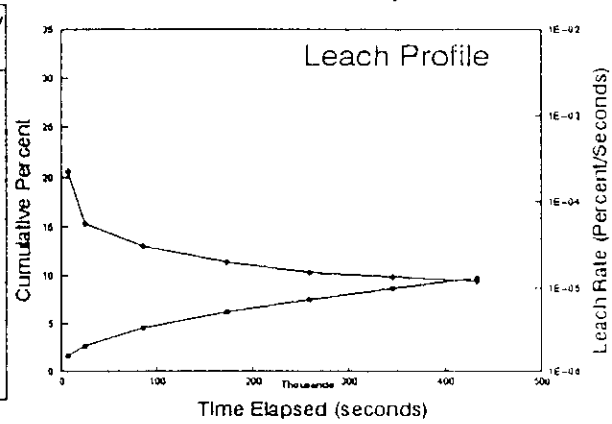
Analyte Concentration	75800	µg/ml	Specimen Surface Area (cm2)	40.54225
Volume Solution Used	75	ml	Specimen Volume (cm3)	19.8156
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	405.4225
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	1.430E+06
Analyte Conc. in Grout	34348.9	µg/g	Analyte [Species]	NO3-
Mass of Specimen	31.83	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	5.73E+01	1.625	1.625	2.26E-04
2	18000	25200	14835	3.63E+01	1.029	2.654	5.72E-05
3	61200	86400	51231	6.56E+01	1.860	4.515	3.04E-05
4	86400	172800	125894	6.18E+01	1.753	6.267	2.03E-05
5	86400	259200	213818	4.70E+01	1.333	7.600	1.54E-05
6	86400	345600	300849	4.11E+01	1.166	8.766	1.35E-05
7	86400	432000	387596	3.64E+01	1.032	9.798	1.19E-05
8	1209600	1641600	939462	3.17E+02	8.990	18.788	7.43E-06
9	2419200	4060800	2716550	2.69E+02	7.629	26.417	3.15E-06
10	3715200	7776000	5768861	1.92E+02	5.445	31.861	1.47E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	6.881E-09	8.2	8.2
18000	3.642E-09	8.4	8.3
61200	3.553E-09	8.4	8.4
86400	3.888E-09	8.4	8.4
86400	3.819E-09	8.4	8.4
86400	4.109E-09	8.4	8.4
86400	4.152E-09	8.4	8.4
1209600	3.894E-09	8.4	8.4
2419200	2.027E-09	8.7	8.4
3715200	9.300E-10	9.0	8.5



Hey Hammitt

Table 17. NO_3^- Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # D102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

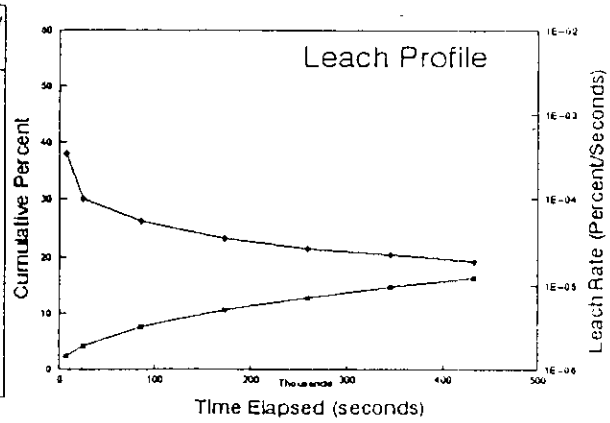
Analyte Concentration	75800	µg/ml	Specimen Surface Area (cm2)	46.91969
Volume Solution Used	75	ml	Specimen Volume (cm3)	24.43923
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	469.1969
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	1.430E+06
Analyte Conc. in Grout	34348.9	µg/g	Analyte [Species]	NO3-
Mass of Specimen	39.58	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3.7	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	7.37E+01	2.419	2.419	3.36E-04
2	18000	25200	14835	5.47E+01	1.795	4.214	9.97E-05
3	61200	86400	51231	1.03E+02	3.380	7.595	5.52E-05
4	86400	172800	125894	9.12E+01	2.993	10.588	3.46E-05
5	86400	259200	213818	6.83E+01	2.242	12.829	2.59E-05
6	86400	345600	300849	5.94E+01	1.950	14.779	2.26E-05
7	86400	432000	387596	5.00E+01	1.641	16.420	1.90E-05
8	1209600	1641600	939462	4.54E+02	14.900	31.320	1.23E-05
9	2419200	4060800	2716550	3.43E+02	11.257	42.578	4.65E-06
10	3715200	7776000	5768861	2.14E+02	7.024	49.601	1.89E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	1.732E-08	7.8	7.8
18000	1.258E-08	7.9	7.8
61200	1.332E-08	7.9	7.8
86400	1.288E-08	7.9	7.9
86400	1.227E-08	7.9	7.9
86400	1.306E-08	7.9	7.9
86400	1.192E-08	7.9	7.9
1209600	1.215E-08	7.9	7.9
2419200	5.014E-09	8.3	7.9
3715200	1.757E-09	8.8	8.0



Hey Hammitt

Table 18. ^{99}Tc Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # B102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

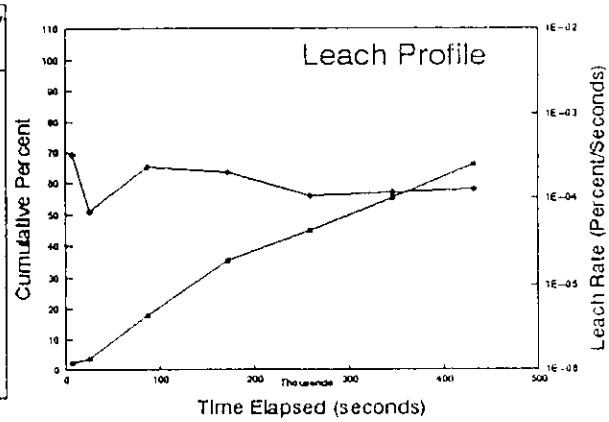
Analyte Concentration	0.0856	µCi/ml	Specimen Surface Area (cm2)	49.65287
Volume Solution Used	75	ml	Specimen Volume (cm3)	26.42079
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	496.5287
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	1.614E+00
Analyte Conc. in Grout	0.03879	µg/g	Analyte [Species]	Tc99
Mass of Specimen	41.65	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	4	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	7.64E-05	2.350	2.350	3.26E-04
2	18000	25200	14835	4.16E-05	1.279	3.629	7.11E-05
3	61200	86400	51231	4.70E-04	14.455	18.084	2.36E-04
4	86400	172800	125894	5.69E-04	17.500	35.584	2.03E-04
5	86400	259200	213818	3.00E-04	9.227	44.811	1.07E-04
6	86400	345600	300849	3.32E-04	10.211	55.022	1.18E-04
7	86400	432000	387596	3.60E-04	11.072	66.094	1.28E-04
8	1209600	1641600	939462	3.73E-04	11.472	77.566	9.48E-06
9	2419200	4060800	2716550	3.94E-04	12.118	89.683	5.01E-06
10	3715200	7776000	5768861	3.16E-04	9.719	99.402	2.62E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	1.705E-08	7.8	7.8
18000	6.667E-09	8.2	8.0
61200	2.542E-07	6.6	7.5
86400	4.594E-07	6.3	7.2
86400	2.169E-07	6.7	7.1
86400	3.738E-07	6.4	7.0
86400	5.662E-07	6.2	6.9
1209600	7.517E-09	8.1	7.0
2419200	6.063E-09	8.2	7.2
3715200	3.512E-09	8.5	7.3



Hey Hammitt

Table 19. ^{99}Tc Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # C102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

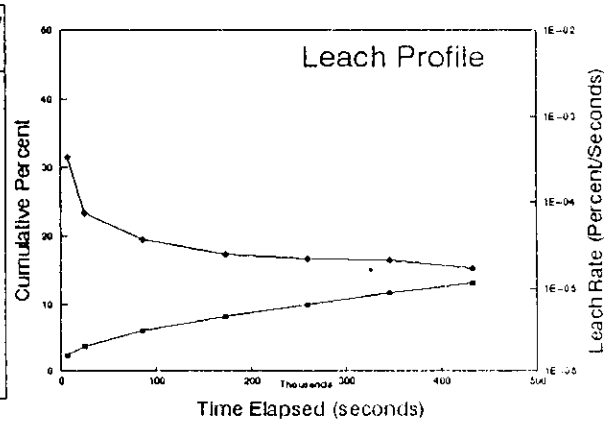
Analyte Concentration	0.0856	µCi/ml	Specimen Surface Area (cm2)	40.54225
Volume Solution Used	75	ml	Specimen Volume (cm3)	19.8156
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	405.4225
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	1.614E+00
Analyte Conc. in Grout	0.03879	µg/g	Analyte [Species]	Tc99
Mass of Specimen	31.83	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	9.40E-05	2.361	2.361	3.28E-04
2	18000	25200	14835	5.27E-05	1.323	3.684	7.35E-05
3	61200	86400	51231	9.07E-05	2.278	5.962	3.72E-05
4	86400	172800	125894	8.55E-05	2.147	8.109	2.49E-05
5	86400	259200	213818	7.48E-05	1.878	9.987	2.17E-05
6	86400	345600	300849	7.22E-05	1.813	11.800	2.10E-05
7	86400	432000	387596	5.85E-05	1.469	13.269	1.70E-05
8	1209600	1641600	939462	4.12E-04	10.346	23.616	8.55E-06
9	2419200	4060800	2716550	3.79E-04	9.518	33.133	3.93E-06
10	3715200	7776000	5768861	2.84E-04	7.132	40.265	1.92E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	1.452E-08	7.8	7.8
18000	6.019E-09	8.2	8.0
61200	5.326E-09	8.3	8.1
86400	5.835E-09	8.2	8.1
86400	7.585E-09	8.1	8.1
86400	9.943E-09	8.0	8.1
86400	8.410E-09	8.1	8.1
1209600	5.158E-09	8.3	8.1
2419200	3.156E-09	8.5	8.2
3715200	1.595E-09	8.8	8.2



Hey Hammitt

Table 20. ^{99}Tc Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # D102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

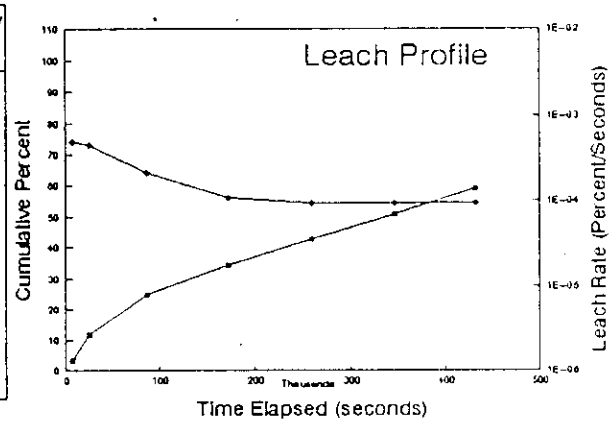
Analyte Concentration	0.0856	µCi/ml	Specimen Surface Area (cm2)	46.91969
Volume Solution Used	75	ml	Specimen Volume (cm3)	24.43923
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	469.1969
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	1.614E+00
Analyte Conc. in Grout	0.03879	µg/g	Analyte [Species]	Tc99
Mass of Specimen	39.58	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3.7	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	1.22E-04	3.546	3.546	4.92E-04
2	18000	25200	14835	2.80E-04	8.138	11.683	4.52E-04
3	61200	86400	51231	4.50E-04	13.078	24.761	2.14E-04
4	86400	172800	125894	3.31E-04	9.620	34.381	1.11E-04
5	86400	259200	213818	2.84E-04	8.254	42.635	9.55E-05
6	86400	345600	300849	2.79E-04	8.108	50.743	9.38E-05
7	86400	432000	387596	2.84E-04	8.254	58.997	9.55E-05
8	1209600	1641600	939462	6.08E-04	17.670	76.667	1.46E-05
9	2419200	4060800	2716550	4.64E-04	13.485	90.152	5.57E-06
10	3715200	7776000	5768861	3.11E-04	9.038	99.191	2.43E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	3.721E-08	7.4	7.4
18000	2.584E-07	6.6	7.0
61200	1.994E-07	6.7	6.9
86400	1.330E-07	6.9	6.9
86400	1.663E-07	6.8	6.9
86400	2.258E-07	6.6	6.8
86400	3.015E-07	6.5	6.8
1209600	1.709E-08	7.8	6.9
2419200	7.194E-09	8.1	7.0
3715200	2.910E-09	8.5	7.2



Hey Hammitt

Table 21. ^{241}Am Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # B102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

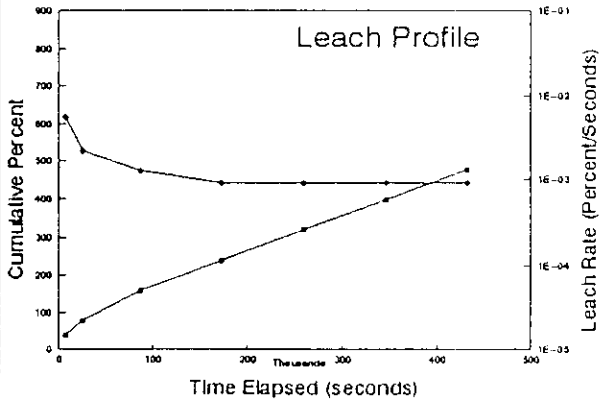
Analyte Concentration	0.00042	µCi/ml	Specimen Surface Area (cm2)	49.65287
Volume Solution Used	75	ml	Specimen Volume (cm3)	26.42079
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	496.5287
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	7.921E-03
Analyte Conc. in Grout	0.00019	µg/g	Analyte [Species]	Am241
Mass of Specimen	41.65	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	4	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	6.37E-06	39.929	39.929	5.55E-03
2	18000	25200	14835	6.37E-06	39.929	79.858	2.22E-03
3	61200	86400	51231	1.27E-05	79.607	159.465	1.30E-03
4	86400	172800	125894	1.27E-05	79.607	239.073	9.21E-04
5	86400	259200	213818	1.27E-05	79.607	318.680	9.21E-04
6	86400	345600	300849	1.27E-05	79.607	398.287	9.21E-04
7	86400	432000	387596	1.27E-05	79.607	477.895	9.21E-04
8	1209600	1641600	939462	3.40E-05	213.122	691.017	1.76E-04
9	2419200	4060800	2716550	1.27E-05	79.607	770.624	3.29E-05
10	3715200	7776000	5768861	1.27E-05	79.607	850.232	2.14E-05

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	4.924E-06	5.3	5.3
18000	6.493E-06	5.2	5.2
61200	7.711E-06	5.1	5.2
86400	9.507E-06	5.0	5.2
86400	1.615E-05	4.8	5.1
86400	2.272E-05	4.6	5.0
86400	2.927E-05	4.5	4.9
1209600	2.594E-06	5.6	5.0
2419200	2.617E-07	6.6	5.2
3715200	2.356E-07	6.6	5.3



Hey Hammitt

Table 22. ^{241}Am Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # C102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

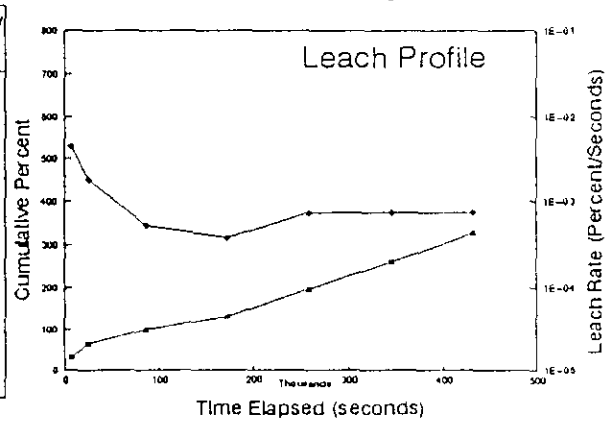
Analyte Concentration	0.00042	µCi/ml	Specimen Surface Area (cm2)	40.54225
Volume Solution Used	75	ml	Specimen Volume (cm3)	19.8156
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	405.4225
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	7.921E-03
Analyte Conc. in Grout	0.00019	µg/g	Analyte [Species]	Am241
Mass of Specimen	31.83	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3	cm		

Incremental Functions:

Leachate Sample	Time (seconds) Duration	Elapsed	Mean	Analytical Result	Percent Leached Incremental	Cumulative	Leaching Rate
1	7200	7200	1800	6.37E-06	32.603	32.603	4.53E-03
2	18000	25200	14835	6.37E-06	32.603	65.205	1.81E-03
3	61200	86400	51231	6.37E-06	32.603	97.808	5.33E-04
4	86400	172800	125894	6.37E-06	32.603	130.410	3.77E-04
5	86400	259200	213818	1.27E-05	65.000	195.411	7.52E-04
6	86400	345600	300849	1.27E-05	65.000	260.411	7.52E-04
7	86400	432000	387596	1.27E-05	65.000	325.412	7.52E-04
8	1209600	1641600	939462	5.48E-05	280.475	605.886	2.32E-04
9	2419200	4060800	2716550	1.27E-05	65.000	670.887	2.69E-05
10	3715200	7776000	5768861	1.27E-05	65.000	735.887	1.75E-05

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	2.770E-06	5.6	5.6
18000	3.653E-06	5.4	5.5
61200	1.091E-06	6.0	5.7
86400	1.345E-06	5.9	5.7
86400	9.082E-06	5.0	5.6
86400	1.278E-05	4.9	5.5
86400	1.646E-05	4.8	5.4
1209600	3.791E-06	5.4	5.4
2419200	1.472E-07	6.8	5.5
3715200	1.325E-07	6.9	5.7



Hey Hammitt

Table 23. ^{241}Am Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # D102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

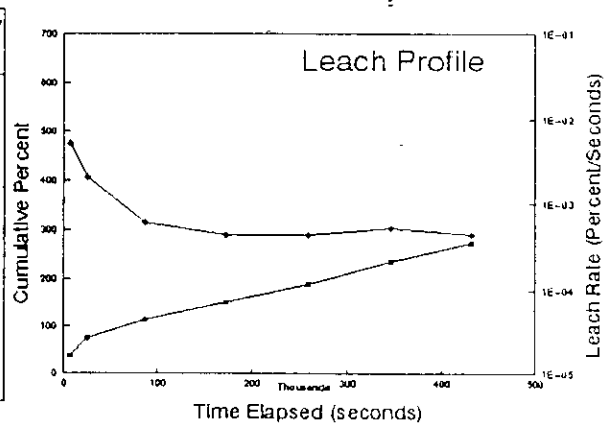
Analyte Concentration	0.00042	µCi/ml	Specimen Surface Area (cm2)	46.91969
Volume Solution Used	75	ml	Specimen Volume (cm3)	24.43923
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	469.1969
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	7.921E-03
Analyte Conc. in Grout	0.00019	µg/g	Analyte [Species]	Am241
Mass of Specimen	39.58	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3.7	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	6.4E-06	37.731	37.731	5.24E-03
2	18000	25200	14835	6.4E-06	37.731	75.462	2.10E-03
3	61200	86400	51231	6.4E-06	37.731	113.193	6.17E-04
4	86400	172800	125894	6.4E-06	37.731	150.924	4.37E-04
5	86400	259200	213818	6.4E-06	37.731	188.656	4.37E-04
6	86400	345600	300849	7.6E-06	45.254	233.909	5.24E-04
7	86400	432000	387596	6.4E-06	37.731	271.640	4.37E-04
8	1209600	1641600	939462	3.4E-05	201.391	473.031	1.66E-04
9	2419200	4060800	2716550	1.3E-05	75.225	548.256	3.11E-05
10	3715200	7776000	5768861	1.3E-05	75.225	623.481	2.02E-05

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	4.213E-06	5.4	5.4
18000	5.556E-06	5.3	5.3
61200	1.660E-06	5.8	5.5
86400	2.046E-06	5.7	5.5
86400	3.476E-06	5.5	5.5
86400	7.035E-06	5.2	5.5
86400	6.300E-06	5.2	5.4
1209600	2.220E-06	5.7	5.4
2419200	2.239E-07	6.6	5.6
3715200	2.016E-07	6.7	5.7



Hey Hammitt

Table 24. TOC Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # B102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

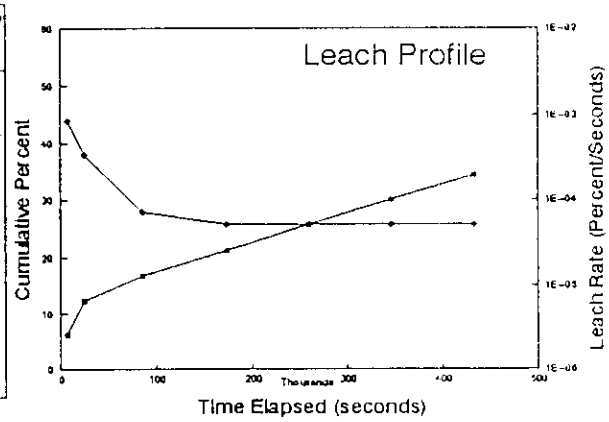
Analyte Concentration	3280	µg/ml	Specimen Surface Area (cm2)	49.65287
Volume Solution Used	75	ml	Specimen Volume (cm3)	26.42079
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	496.5287
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	6.186E+04
Analyte Conc. in Grout	1486.337	µg/g	Analyte [Species]	TOC
Mass of Specimen	41.65	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	4	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	7.70E+00	6.180	6.180	8.58E-04
2	18000	25200	14835	7.70E+00	6.180	12.361	3.43E-04
3	61200	86400	51231	5.50E+00	4.415	16.775	7.21E-05
4	86400	172800	125894	5.50E+00	4.415	21.190	5.11E-05
5	86400	259200	213818	5.50E+00	4.415	25.604	5.11E-05
6	86400	345600	300849	5.50E+00	4.415	30.019	5.11E-05
7	86400	432000	387596	5.50E+00	4.415	34.434	5.11E-05
8	1209600	1641600	939462	7.10E+00	5.699	40.132	4.71E-06
9	2419200	4060800	2716550	5.50E+00	4.415	44.547	1.82E-06
10	3715200	7776000	5768861	5.50E+00	4.415	48.961	1.19E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	1.180E-07	6.9	6.9
18000	1.556E-07	6.8	6.9
61200	2.371E-08	7.6	7.1
86400	2.924E-08	7.5	7.2
86400	4.965E-08	7.3	7.2
86400	6.986E-08	7.2	7.2
86400	9.001E-08	7.0	7.2
1209600	1.855E-09	8.7	7.4
2419200	8.046E-10	9.1	7.6
3715200	7.245E-10	9.1	7.7



Hey Hammitt

Table 25. TOC Leach Index.

December 14, 1993
Process Chemistry Laboratory

Sample # C102

Measurement of the Leachability of Solidified Low-Level Radioactive Wastes by a Short-term Test Procedure (ANSI/ANS-16.1-1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

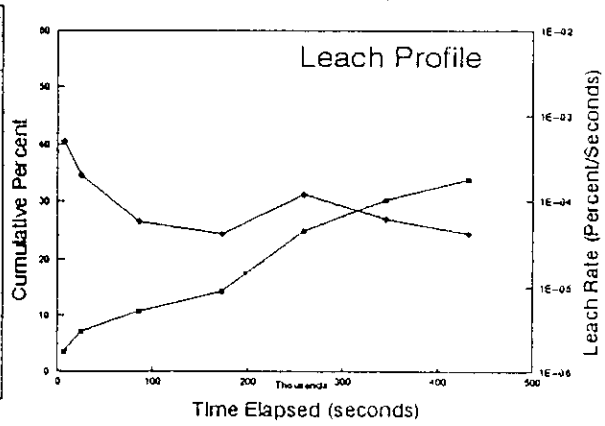
Analyte Concentration	3280	µg/ml	Specimen Surface Area (cm2)	40.54225
Volume Solution Used	75	ml	Specimen Volume (cm3)	19.8156
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	405.4225
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	6.186E+04
Analyte Conc. in Grout	1486.337	µg/g	Analyte [Species]	TOC
Mass of Specimen	31.83	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	5.5E+00	3.605	3.605	5.01E-04
2	18000	25200	14835	5.5E+00	3.605	7.209	2.00E-04
3	61200	86400	51231	5.5E+00	3.605	10.814	5.89E-05
4	86400	172800	125894	5.5E+00	3.605	14.418	4.17E-05
5	86400	259200	213818	1.6E+01	10.486	24.904	1.21E-04
6	86400	345600	300849	8.2E+00	5.374	30.278	6.22E-05
7	86400	432000	387596	5.5E+00	3.605	33.883	4.17E-05
8	1209600	1641600	939462	9.3E+00	6.095	39.978	5.04E-06
9	2419200	4060800	2716550	7.7E+00	5.046	45.024	2.09E-06
10	3715200	7776000	5768861	7.2E+00	4.686	49.710	1.26E-06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	3.386E-08	7.5	7.5
18000	4.465E-08	7.4	7.4
61200	1.334E-08	7.9	7.6
86400	1.644E-08	7.8	7.6
86400	2.364E-07	6.6	7.4
86400	8.735E-08	7.1	7.4
86400	5.063E-08	7.3	7.4
1209600	1.790E-09	8.7	7.5
2419200	8.871E-10	9.1	7.7
3715200	6.888E-10	9.2	7.8



Hey Hammitt

Table 26. TOC Leach Index.

December 14, 1993 WHC-SD-WM-DP-054 REV 0 Sample # D102
Process Chemistry Laboratory

Measurement of the Leachability of Solidified Low–Level Radioactive Wastes by a Short–term Test Procedure (ANSI/ANS–16.1–1986)

This spreadsheet is used to perform the Leachability Index for a system of ten samples of leachate according to the ANS method above.

System Parameters:

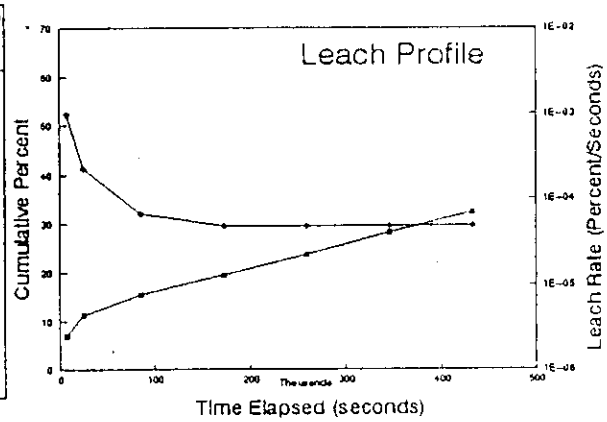
Analyte Concentration	3280	µg/ml	Specimen Surface Area (cm2)	46.91969
Volume Solution Used	75	ml	Specimen Volume (cm3)	24.43923
Density of Solution	1.2001	g/ml	Leachant Volume (ml)	469.1969
Mass of Dry Blend	75.5	g	Total Amount Analyte in Specimen	6.186E+04
Analyte Conc. in Grout	1486.337	µg/g	Analyte [Species]	TOC
Mass of Specimen	39.58	g	ß (dimensional constant)	1
Specimen Diameter	2.9	cm		
Specimen Height	3.7	cm		

Incremental Functions:

Leachate Sample	Time (seconds)			Analytical Result	Percent Leached		Leaching Rate
	Duration	Elapsed	Mean		Incremental	Cumulative	
1	7200	7200	1800	9.40E+00	7.130	7.130	9.90E−04
2	18000	25200	14835	5.50E+00	4.172	11.301	2.32E−04
3	61200	86400	51231	5.50E+00	4.172	15.473	6.82E−05
4	86400	172800	125894	5.50E+00	4.172	19.644	4.83E−05
5	86400	259200	213818	5.50E+00	4.172	23.816	4.83E−05
6	86400	345600	300849	5.50E+00	4.172	27.987	4.83E−05
7	86400	432000	387596	5.50E+00	4.172	32.159	4.83E−05
8	1209600	1641600	939462	1.50E+01	11.377	43.536	9.41E−06
9	2419200	4060800	2716550	1.10E+01	8.343	51.879	3.45E−06
10	3715200	7776000	5768861	8.80E+00	6.674	58.554	1.80E−06

Characteristicand General Functions:

Leach Duration	Effective Diffusivity	Log (ß/D)	Leachability Index
7200	1.504E−07	6.8	6.8
18000	6.791E−08	7.2	7.0
61200	2.029E−08	7.7	7.2
86400	2.501E−08	7.6	7.3
86400	4.248E−08	7.4	7.3
86400	5.978E−08	7.2	7.3
86400	7.701E−08	7.1	7.3
1209600	7.084E−09	8.1	7.4
2419200	2.754E−09	8.6	7.5
3715200	1.587E−09	8.8	7.7



Hey Hammitt

GROUT LOGBOOK

THIS PAGE INTENTIONALLY
LEFT BLANK.

6-16-93 10 2AP Grout

Weighed 350 gms of attapulgite clay 2040 gms of Fly Ash FA, 630 gms of Type III Cement @ mo 9AM mixed in a Blender for 1 hour 222.5.

Weighed 10 cylinders of 75.5 g Fly Blend for Hot Cell
Calibration of 22 ml Vial

Balance that WTS in Cell
Scale — 100.11 g
50.005 g

wt of Bottle + H_2O	39.0369
wt of Bottle cap	17.5082
	21.5287

Density of Water Grout

wt of Bottle + Grout	42.6880
wt of Bottle	14.0843
	28.6037

1.328 Spg 11.09 #/gal

Second H_2O Grout (Water grout)

wt of Bottle + H_2O Grout	44.2054
wt of Bottle	14.3104
	~~29.8950~~
	29.8950

1.389 Spg 11.557

1st 10 2AP 75 ml 10 2AP 75.5 gms of Dry Blend

wt of Bottle + 10 2 Grout	47.89
tare of Bottle No LID	14.2637
	33.63

Spg = 1.562 13.03 #/gal

2nd 10 2AP 75 ml 10 2AP 75.5 gms Dry Blend

wt of Bottle + 10 2 Grout	48.08
Tare of Bottle	14.17
	33.91

Spg = 1.575 13.14 #/gal

3rd 10 2AP 75 ml 10 2AP 75.5 gms Dry Blend
Run mid point 100 rpm oil Recalibrated INST.

wt of Bottle + 10 2 Grout	48.49
Tare of Bottle	14.20
	34.29

Spg 1.593 13.28

A. R. Hammitt 6-16-93

BEST AVAILABLE COPY

6/16/93 102 AF hot leaf Cpl 6/30/93
4th run same as prior 3

Bottle + Grout 48.13 Wt of # Contam
Tare on Bottle 14.25
33.88 Sgg 1.574 13.13 #/gal

5th run same as Prior 4
Bottle + Grout 48.75
Tare of Bottle 14.21 after 67.19 = Sgg 1.610 Wt of # Contam
34.66/21.53 13.43 #/gal

The start of the number 5 run the power was shut off the Viscometer and the Viscometer would not restart Waited until the next morning after number three the Viscometer started properly.

Wt of # Contam

Wt of #4

Grout

Bottle -
Brk. H_2O -
V

Grout #
-

BEST AVAILABLE COPY

C. P. Hammett 6/16/93

6/30/93 102AP Gas analysis wt of Cans again

wt of #1 container 3328 − 2959 = 369 gms

Vol check tare 1597 + water − 1301 = 296 gms

wt of #2 container 3310 − 2959 = 351 gms

all containers filled within ½" of top with grout

wt of #3 container 3328 − 2967 = 361 gms

BEST AVAILABLE COPY

wt of #4 3325 − 2966 = 359 gms

Density of Grout solutions

Standards wt 100.013
50.0055

Bottle − 14.0134
Bottle H_2O − 34.9332 gm 6/29/93
20.9198 6/29/93
= 9.7.93 gm

Grout #1 47.2287
− 14.0134
33.2133 gm = 1.588
20.9198
13.25 #/gal

Grout #2 47.2355
− 14.0134 gm 6/29/93
14.3637
32.8718
20.9192 = 1.5715
13.11 #/gal

6/30/93

6/30/93 Gas Analysis Pg 2 [illegible] 7-1-9

Grout 3

Tare ~~[illegible]~~ 48.1880
14.3379
33.8501 ~ 1.6181 = 1350 ft/gal
~~20.9199~~ [illegible] 9-7-93
20.9199

SAMPLES TAKEN OUT AND PUT IN ROOM 1B IN OVEN
AT 19:00 AT 40° FOR 1HR
AT 20:00 Turned to 45° FOR 1½ HR
AT 21:30 Turned TO 50°

1. Temp
2. AT 1
7-6-93
1 [illegible]
28

BEST AVAILABLE COPY

[illegible] 6/30/93

[illegible]

CALCULATIONS

THIS PAGE INTENTIONALLY
LEFT BLANK.

Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: 100 cps oil

Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93

Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	0.00	Constant		-2.67	0.00
Fly Ash	0.00	Std Err of Y Est		0.00	
Attapulgite Clay	0.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.99		
		Std Err of Coef.	0.01		

WASTE SOLUTION I.D.: Brookfield 100 cps oil

Mix Ratio 0.00 lbs/gal

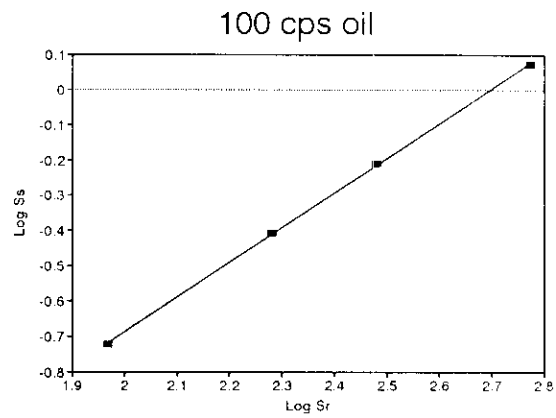
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	592.80	2.773	60.450	1.185	0.07
33.00	5.65	339	301.10	2.479	31.430	0.616	-0.21
27.00	3.61	217	190.60	2.280	19.970	0.391	-0.41
18.00	1.84	111	93.04	1.969	9.668	0.189	-0.72

INPUT VALUES:

K'	=	0.002147	L =	100.00
n'	=	0.990	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		=	0.00	

ANSWERS:

Viscosity	=	*96.634*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: 100cps1 | Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93 | Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	0.00	Constant		-2.66	0.00
Fly Ash	0.00	Std Err of Y Est		0.00	
Attapulgite Clay	0.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.99		
		Std Err of Coef.	0.01		

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 0.00 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	690.00	2.839	70.630	1.384	0.14
33.00	5.65	339	300.40	2.478	31.440	0.616	-0.21
27.00	3.61	217	190.20	2.279	19.980	0.392	-0.41
18.00	1.84	111	92.78	1.967	9.695	0.190	-0.72

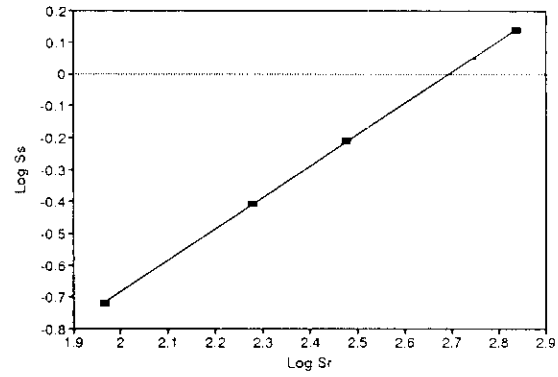
INPUT VALUES:

K'	=	0.002163	L =	100.00
n'	=	0.989	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		=	0.00	

ANSWERS:

Viscosity	=	*96.977*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*

100cps1



f/g

Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: Wtgr1

Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93

Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:	
Cement	21.00	Constant	-2.56 0.00
Fly Ash	68.00	Std Err of Y Est	0.00
Attapulgite Clay	11.00	R Squared	1.00
Indian Red Clay	0.00	No. of Observations	4.00
Calcium Carbonate	0.00	Degrees of Freedom	2.00
Blast Furnace Slag	0.00	X Coefficient(s)	0.57
Total	100.00	Std Err of Coef.	0.00

WASTE SOLUTION I.D.: Water

Mix Ratio 8.40 lbs/gal

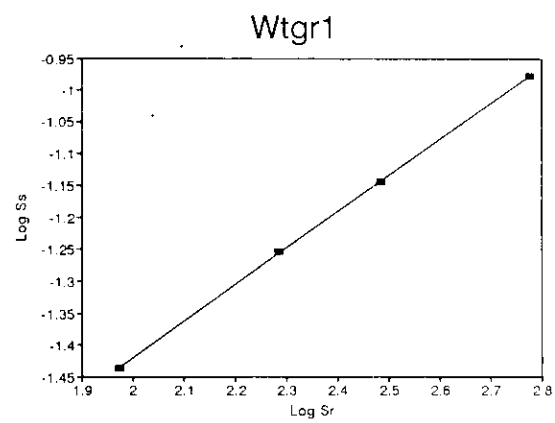
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.60	2.776	5.384	0.106	-0.98
33.00	5.65	339	304.60	2.484	3.664	0.072	-1.14
27.00	3.61	217	192.70	2.285	2.844	0.056	-1.25
18.00	1.84	111	93.76	1.972	1.870	0.037	-1.44

INPUT VALUES:

K'	=	0.002763	L =	100.00
n'	=	0.570	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	11.09	#/Gal	
10 Min Gel Strength		12.45	0.00	

ANSWERS:

Viscosity	=	*9.053*	*cps*
Velocity	=	*1.951*	*ft/sec*
Velocity	=	*17.957*	*gal/min*
Pressure Drop	=	*0.679*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: Wtgrt2

Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93

Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	21.00	Constant		-2.31	0.00
Fly Ash	68.00	Std Err of Y Est		0.00	
Attapulgite Clay	11.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.50		
Total	100.00	Std Err of Coef.	0.01		

WASTE SOLUTION I.D.: Water

Mix Ratio 8.40 lbs/gal

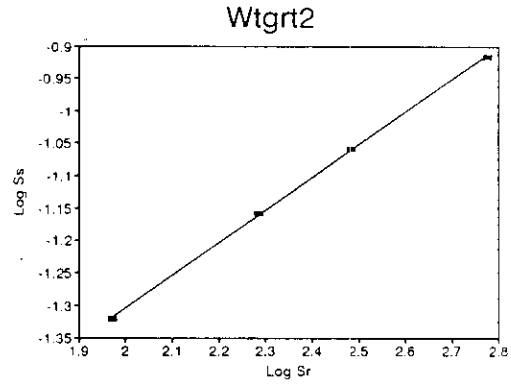
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.60	2.776	6.203	0.122	-0.92
33.00	5.65	339	304.50	2.484	4.455	0.087	-1.06
27.00	3.61	217	192.70	2.285	3.548	0.070	-1.16
18.00	1.84	111	93.87	1.973	2.439	0.048	-1.32

INPUT VALUES:

K'	=	0.004871	L =	100.00
n'	=	0.504	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	11.59	#/Gal	
10 Min Gel Strength		12.70		

ANSWERS:

Viscosity	=	*10.581*	*cps*
Velocity	=	*2.262*	*ft/sec*
Velocity	=	*20.825*	*gal/min*
Pressure Drop	=	*0.955*	*psi*
10 Min Gel Strength	=	*13.53*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #:	102ap1	Sample Point:	4 points
		VISCOMETER:	Bohlin
Date:	6-16-93	Analyst:	APH

FORMULATION #

Dry Solids	Wt %	Regression Output:		
Cement	21.00	Constant	-2.34	0.00
Fly Ash	68.00	Std Err of Y Est	0.00	
Attapulgite Clay	11.00	R Squared	1.00	
Indian Red Clay	0.00	No. of Observations	4.00	
Calcium Carbonate	0.00	Degrees of Freedom	2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.65	
Total	100.00	Std Err of Coef.	0.00	

WASTE SOLUTION I.D.: Actual 102 ap Solution

Mix Ratio 8.40 lbs/gal

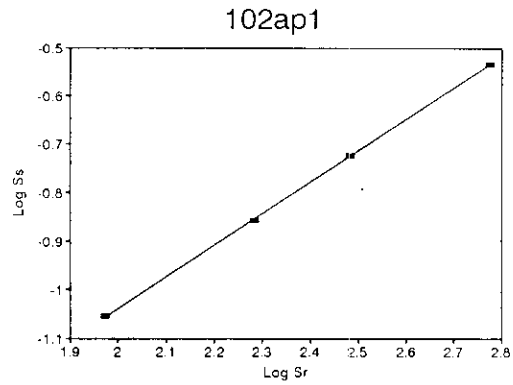
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.50	2.776	14.910	0.292	-0.53
33.00	5.65	339	304.70	2.484	9.626	0.189	-0.72
27.00	3.61	217	192.90	2.285	7.096	0.139	-0.86
18.00	1.84	111	94.01	1.973	4.495	0.088	-1.06

INPUT VALUES:

K'	=	0.004593	L =	100.00
n'	=	0.649	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.03	#/Gal	
10 Min Gel Strength		12.54		

ANSWERS:

g	=	*24.696*	*cps*
Velocity	=	*3.300*	*ft/sec*
Velocity	=	*30.378*	*gal/min*
Pressure Drop	=	*2.284*	*psi*
10 Min Gel Strength	=	*13.36*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: ap1022

Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93

Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	21.00	Constant		-2.32	0.00
Fly Ash	68.00	Std Err of Y Est		0.01	
Attapulgite Clay	11.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.68		
Total	100.00	Std Err of Coef.	0.01		

WASTE SOLUTION I.D.: Actual 102 ap Solution

Mix Ratio 8.40 lbs/gal

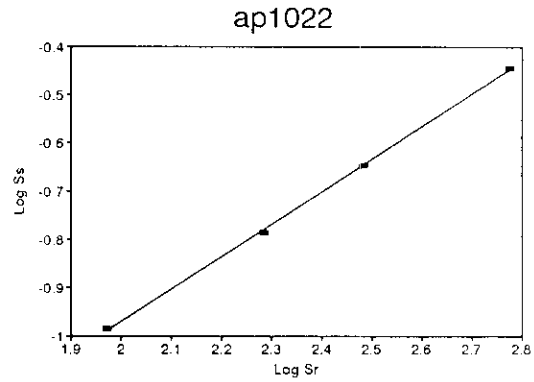
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.60	2.776	18.370	0.360	-0.44
33.00	5.65	339	304.70	2.484	11.530	0.226	-0.65
27.00	3.61	217	192.90	2.285	8.355	0.164	-0.79
18.00	1.84	111	93.95	1.973	5.276	0.103	-0.99

INPUT VALUES:

K'	=	0.004749	L =	100.00
n'	=	0.676	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.14	#/Gal	
10 Min Gel Strength		12.61		

ANSWERS:

Viscosity	=	*30.112*	*cps*
Velocity	=	*3.723*	*ft/sec*
Velocity	=	*34.272*	*gal/min*
Pressure Drop	=	*2.931*	*psi*
10 Min Gel Strength	=	*13.43*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: AP1023 | Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93 | Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	21.00	Constant		-2.44	0.00
Fly Ash	68.00	Std Err of Y Est		0.03	
Attapulgite Clay	11.00	R Squared		0.99	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.73		
Total	100.00	Std Err of Coef.	0.05		

WASTE SOLUTION I.D.: Actual 102 ap Solution

Mix Ratio 8.40 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.60	2.776	20.730	0.406	-0.39
33.00	5.65	339	303.60	2.482	11.430	0.224	-0.65
27.00	3.61	217	191.90	2.283	8.340	0.163	-0.79
18.00	1.84	111	93.37	1.970	5.304	0.104	-0.98

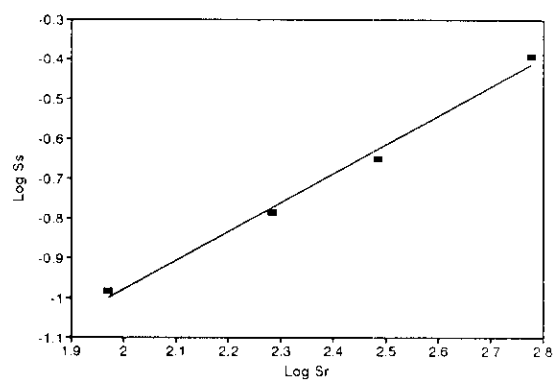
INPUT VALUES:

K'	=	0.003632	L =	100.00
n'	=	0.731	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.28	#/Gal	
10 Min Gel Strength		12.17		

ANSWERS:

Viscosity	=	*32.395*	*cps*
Velocity	=	*3.743*	*ft/sec*
Velocity	=	*34.453*	*gal/min*
Pressure Drop	=	*2.994*	*psi*
10 Min Gel Strength	=	*12.96*	*lb/100 sq ft*

AP1023



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: ap1024 | Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93 | Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	21.00	Constant		-2.31	0.00
Fly Ash	68.00	Std Err of Y Est		0.03	
Attapulgite Clay	11.00	R Squared		0.99	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.70		
Total	100.00	Std Err of Coef.	0.04		

WASTE SOLUTION I.D.: Actual 102 ap Solution

Mix Ratio 8.40 lbs/gal

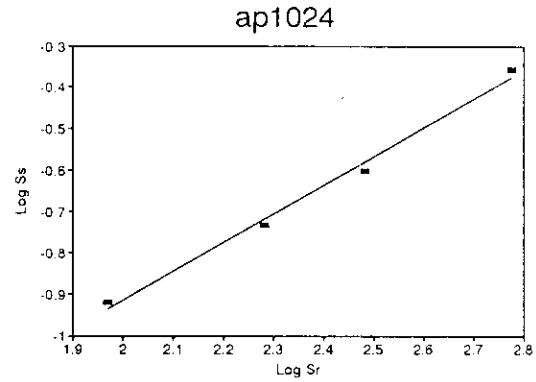
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.60	2.776	22.450	0.440	-0.36
33.00	5.65	339	303.30	2.482	12.790	0.251	-0.60
27.00	3.61	217	191.80	2.283	9.422	0.185	-0.73
18.00	1.84	111	93.18	1.969	6.138	0.120	-0.92

INPUT VALUES:

K'	=	0.004952	L =	100.00
n'	=	0.695	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.13	#/Gal	
10 Min Gel Strength		12.04		

ANSWERS:

Viscosity	=	*35.398*	*cps*
Velocity	=	*4.154*	*ft/sec*
Velocity	=	*38.238*	*gal/min*
Pressure Drop	=	*3.646*	*psi*
10 Min Gel Strength	=	*12.82*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: ap1025 | Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93 | Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	21.00	Constant		-2.04	0.01
Fly Ash	68.00	Std Err of Y Est		0.02	
Attapulgite Clay	11.00	R Squared		0.99	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.65		
Total	100.00	Std Err of Coef.	0.04		

WASTE SOLUTION I.D.: Actual 102 ap Solution

Mix Ratio 8.40 lbs/gal

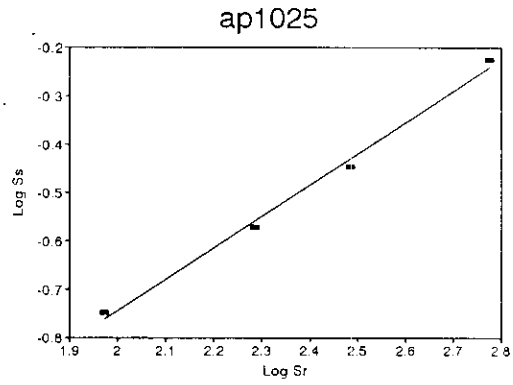
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.60	2.776	30.370	0.595	-0.23
33.00	5.65	339	305.40	2.485	18.260	0.358	-0.45
27.00	3.61	217	193.20	2.286	13.690	0.268	-0.57
18.00	1.84	111	93.84	1.972	9.120	0.179	-0.75

INPUT VALUES:

K'	=	0.009141	L =	100.00
n'	=	0.648	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.43	#/Gal	
10 Min Gel Strength		12.48		

ANSWERS:

Viscosity	=	*48.622*	*cps*
Velocity	=	*5.333*	*ft/sec*
Velocity	=	*49.093*	*gal/min*
Pressure Drop	=	*6.147*	*psi*
10 Min Gel Strength	=	*13.29*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #:	mdpt100	Sample Point:	4 points
		VISCOMETER:	Bohlin
Date:	6-16-93	Analyst:	APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	0.00	Constant		-2.59	0.00
Fly Ash	0.00	Std Err of Y Est		0.01	
Attapulgite Clay	0.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.94		
Total	0.00	Std Err of Coef.	0.02		

WASTE SOLUTION I.D.: Brookfield 100 cps oil

Mix Ratio 0.00 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	600.20	2.778	54.120	1.061	0.03
33.00	5.65	339	307.10	2.487	29.720	0.583	-0.23
27.00	3.61	217	194.80	2.290	19.300	0.378	-0.42
18.00	1.84	.111	96.27	1.983	9.644	0.189	-0.72

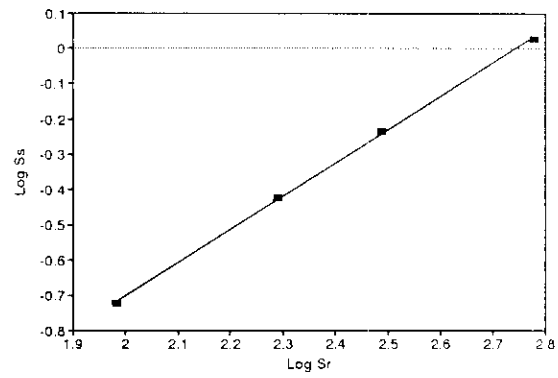
INPUT VALUES:

K'	=	0.002584	L =	100.00
n'	=	0.943	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		0.00		

ANSWERS:

Viscosity	=	*86.775*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*

mdpt100



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: mdpt1001 | Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-16-93 | Analyst: APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	0.00	Constant		-2.59	0.00
Fly Ash	0.00	Std Err of Y Est		0.01	
Attapulgite Clay	0.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.94		
Total	0.00	Std Err of Coef.	0.02		

WASTE SOLUTION I.D.: Brookfield 100 cps oil

Mix Ratio 0.00 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	600.90	2.779	54.000	1.058	0.02
33.00	5.65	339	307.30	2.488	29.610	0.580	-0.24
27.00	3.61	217	195.00	2.290	19.240	0.377	-0.42
18.00	1.84	111	96.51	1.985	9.610	0.188	-0.73

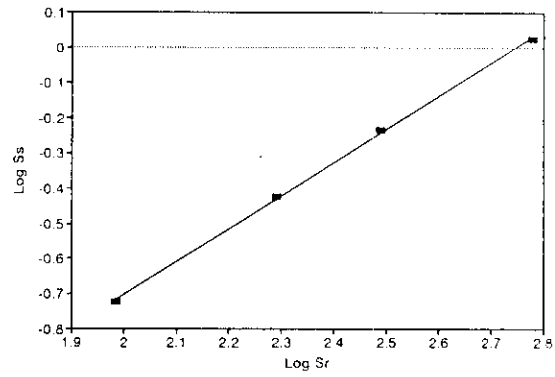
INPUT VALUES:

K'	=	0.002554	L =	100.00
n'	=	0.944	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		0.00		

ANSWERS:

Viscosity	=	*86.476*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*

mdpt1001



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #:	lspt100	Sample Point:	4 points
		VISCOMETER:	Bohlin
Date:	6-17-93	Analyst:	APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	0.00	Constant		-2.71	0.00
Fly Ash	0.00	Std Err of Y Est		0.00	
Attapulgite Clay	0.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.99		
Total	0.00	Std Err of Coef.	0.00		

WASTE SOLUTION I.D.: Brookfield 100 cps oil

Mix Ratio 0.00 lbs/gal

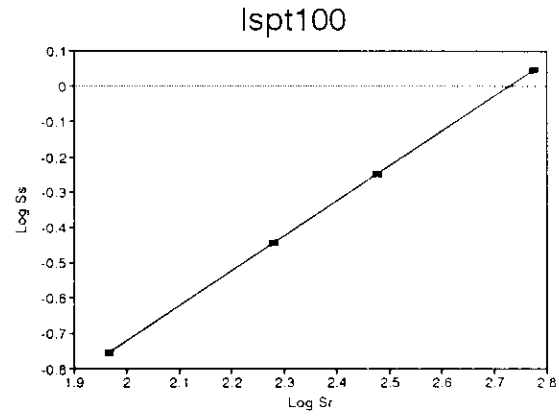
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	594.90	2.774	56.800	1.113	0.05
33.00	5.65	339	300.00	2.477	28.740	0.563	-0.25
27.00	3.61	217	190.00	2.279	18.320	0.359	-0.44
18.00	1.84	111	92.63	1.967	8.975	0.176	-0.75

INPUT VALUES:

K'	=	0.001971	L =	100.00
n'	=	0.992	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		0.00		

ANSWERS:

Viscosity	=	*89.657*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV 0

Sample #:	lspt1001	Sample Point:	4 points
		VISCOMETER:	Bohlin
Date:	6-17-93	Analyst:	APH

FORMULATION #

Dry Solids	Wt %	Regression Output:			
Cement	0.00	Constant		-2.73	0.00
Fly Ash	0.00	Std Err of Y Est		0.00	
Attapulgite Clay	0.00	R Squared		1.00	
Indian Red Clay	0.00	No. of Observations		4.00	
Calcium Carbonate	0.00	Degrees of Freedom		2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	1.00		
Total	0.00	Std Err of Coef.	0.00		

WASTE SOLUTION I.D.: Brookfield 100 cps oil

Mix Ratio 0.00 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	594.50	2.774	56.510	1.108	0.04
33.00	5.65	339	301.10	2.479	28.640	0.561	-0.25
27.00	3.61	217	190.20	2.279	18.160	0.356	-0.45
18.00	1.84	111	92.91	1.968	8.786	0.172	-0.76

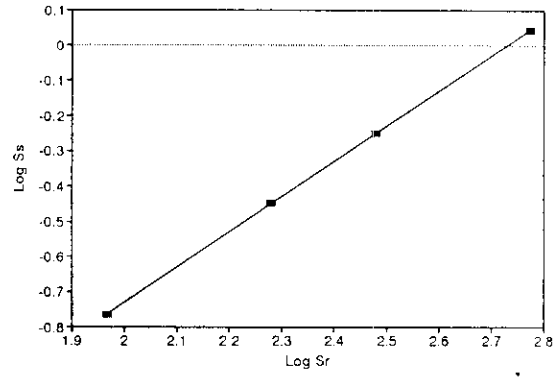
INPUT VALUES:

K'	=	0.001841	L =	100.00
n'	=	1.002	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		0.00		

ANSWERS:

Viscosity	=	*89.353*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*

lspt1001



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: 100cpsStart

Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-29-93

Analyst: APH

FORMULATION #

Dry Solids	Wt %
Cement	0.00
Fly Ash	0.00
Attapulgite Clay	0.00
Indian Red Clay	0.00
Calcium Carbonate	0.00
Blast Furnace Slag	0.00

Regression Output:

Constant	-2.65	0.00
Std Err of Y Est	0.00	
R Squared	1.00	
No. of Observations	4.00	
Degrees of Freedom	2.00	
X Coefficient(s)	0.98	
Std Err of Coef.	0.00	

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 0.00 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.50	2.776	61.260	1.201	0.08
33.00	5.65	339	300.50	2.478	31.200	0.612	-0.21
27.00	3.61	217	190.90	2.281	19.980	0.392	-0.41
18.00	1.84	111	93.34	1.970	9.869	0.193	-0.71

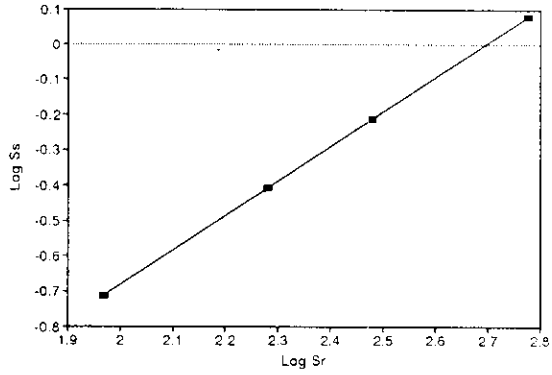
INPUT VALUES:

K'	=	0.002236	L =	100.00
n'	=	0.983	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		=	0.00	

ANSWERS:

Viscosity	=	*96.532*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*

100cpsStart



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #: 100cpsStart #2

Sample Point: 4 points

VISCOMETER: Bohlin

Date: 6-29-93

Analyst: APH

FORMULATION #

Dry Solids	Wt %
Cement	0.00
Fly Ash	0.00
Attapulgite Clay	0.00
Indian Red Clay	0.00
Calcium Carbonate	0.00
Blast Furnace Slag	0.00

Regression Output:

Constant	-2.64	0.00
Std Err of Y Est	0.00	
R Squared	1.00	
No. of Observations	4.00	
Degrees of Freedom	2.00	
X Coefficient(s)	0.98	
Std Err of Coef.	0.00	

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 0.00 lbs/gal

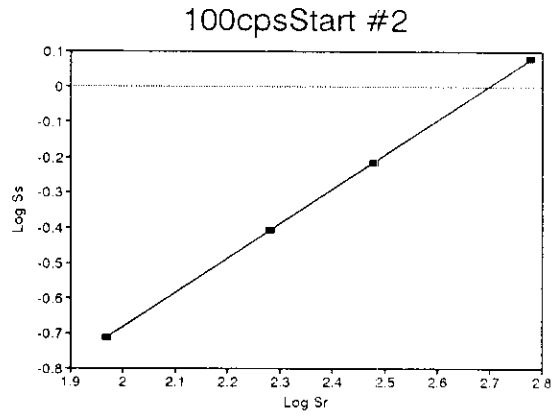
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.90	2.777	61.280	1.201	0.08
33.00	5.65	339	300.60	2.478	31.090	0.609	-0.22
27.00	3.61	217	190.90	2.281	20.000	0.392	-0.41
18.00	1.84	111	93.22	1.970	9.899	0.194	-0.71

INPUT VALUES:

K'	=	0.002274	L =	100.00
n'	=	0.980	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		=	0.00	

ANSWERS:

Viscosity	=	*96.339*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #:	102AP Gas	Sample Point:	4 points
	Analysis #1	VISCOMETER:	Bohlin
Date:	6-29-93	Analyst:	APH

FORMULATION #

	Wt %
Dry Solids	
Cement	21.00
Fly Ash	68.00
Attapulgite Clay	11.00
Indian Red Clay	0.00
Calcium Carbonate	0.00
Blast Furnace Slag	0.00

Regression Output:

Constant	-2.61	0.00
Std Err of Y Est	0.02	
R Squared	1.00	
No. of Observations	4.00	
Degrees of Freedom	2.00	
X Coefficient(s)	0.74	
Std Err of Coef.	0.03	

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 8.40 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.50	2.776	14.930	0.293	-0.53
33.00	5.65	339	304.40	2.483	8.525	0.167	-0.78
27.00	3.61	217	192.70	2.285	6.156	0.121	-0.92
18.00	1.84	111	93.88	1.973	3.751	0.074	-1.13

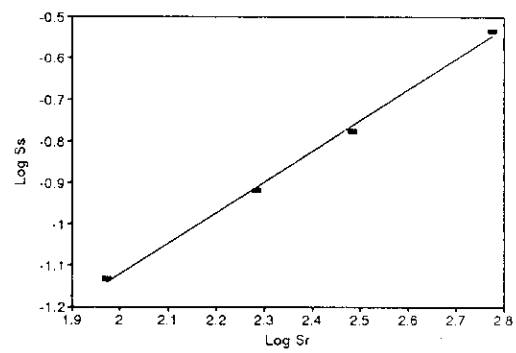
INPUT VALUES:

K'	=	0.002452	L =	100.00
n'	=	0.744	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.25	#/Gal	
10 Min Gel Strength		12.53	0.00	

ANSWERS:

Viscosity	=	*23.759*	*cps*
Velocity	=	*2.898*	*ft/sec*
Velocity	=	*26.679*	*gal/min*
Pressure Drop	=	*1.791*	*psi*
10 Min Gel Strength	=	*13.34*	*lb/100 sq ft*

102AP Gas



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

Sample #: 102AP Gas
Analysis #2

Sample Point: 4 points
VISCOMETER: Bohlin

Date: 6-29-93

Analyst: APH

FORMULATION #

	Wt %
Dry Solids	
Cement	21.00
Fly Ash	68.00
Attapulgite Clay	11.00
Indian Red Clay	0.00
Calcium Carbonate	0.00
Blast Furnace Slag	0.00

Regression Output:

Constant	-2.67	0.00
Std Err of Y Est	0.01	
R Squared	1.00	
No. of Observations	4.00	
Degrees of Freedom	2.00	
X Coefficient(s)	0.76	
Std Err of Coef.	0.03	

WASTE SOLUTION I.D.: Brookfield
Mix Ratio 8.40 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	595.90	2.775	14.320	0.281	-0.55
33.00	5.65	339	304.50	2.484	8.206	0.161	-0.79
27.00	3.61	217	192.80	2.285	5.764	0.113	-0.95
18.00	1.84	111	94.05	1.973	3.514	0.069	-1.16

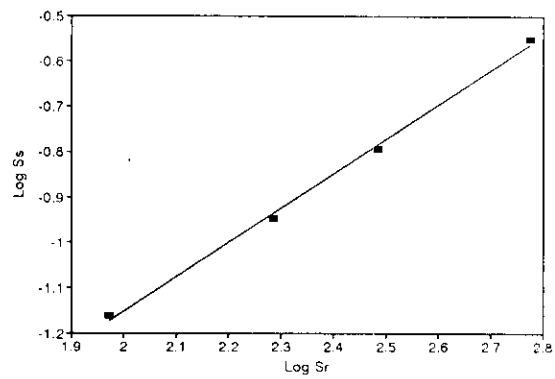
INPUT VALUES:

K'	=	0.002117	L =	100.00
n'	=	0.761	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.11	#/Gal	
10 Min Gel Strength		0.00	0.00	

ANSWERS:

Viscosity	=	*22.835*	*cps*
Velocity	=	*2.782*	*ft/sec*
Velocity	=	*25.605*	*gal/min*
Pressure Drop	=	*1.632*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*

102AP Gas



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #:	102AP Gas Analysis #3	Sample Point:	4 points
		VISCOMETER:	Bohlin
Date:	6-29-93	Analyst:	APH

FORMULATION #

	Wt %
Dry Solids	
Cement	21.00
Fly Ash	68.00
Attapulgite Clay	11.00
Indian Red Clay	0.00
Calcium Carbonate	0.00
Blast Furnace Slag	0.00

Regression Output:

Constant	-2.61	0.00
Std Err of Y Est	0.02	
R Squared	1.00	
No. of Observations	4.00	
Degrees of Freedom	2.00	
X Coefficient(s)	0.77	
Std Err of Coef.	0.03	

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 8.40 lbs/gal

Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.50	2.776	17.530	0.344	-0.46
33.00	5.65	339	304.60	2.484	9.761	0.191	-0.72
27.00	3.61	217	192.70	2.285	6.943	0.136	-0.87
18.00	1.84	111	93.82	1.972	4.215	0.083	-1.08

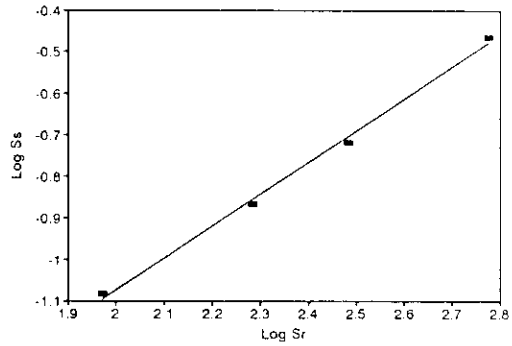
INPUT VALUES:

K'	=	0.002459	L =	100.00
n'	=	0.768	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	13.50	#/Gal	
10 Min Gel Strength		12.48	0.00	

ANSWERS:

Viscosity	=	*27.638*	*cps*
Velocity	=	*3.149*	*ft/sec*
Velocity	=	*28.989*	*gal/min*
Pressure Drop	=	*2.155*	*psi*
10 Min Gel Strength	=	*13.29*	*lb/100 sq ft*

102AP Gas



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

Sample #: 100cps1 After Analysis

Date: 6-29-93

Sample Point: 4 points

VISCOMETER: Bohlin

Analyst: APH

FORMULATION #

	Wt %
Dry Solids	
Cement	0.00
Fly Ash	0.00
Attapulgite Clay	0.00
Indian Red Clay	0.00
Calcium Carbonate	0.00
Blast Furnace Slag	0.00

Regression Output:

Constant	-2.68	0.00
Std Err of Y Est	0.00	
R Squared	1.00	
No. of Observations	4.00	
Degrees of Freedom	2.00	
X Coefficient(s)	0.99	
Std Err of Coef.	0.00	

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 0.00 lbs/gal

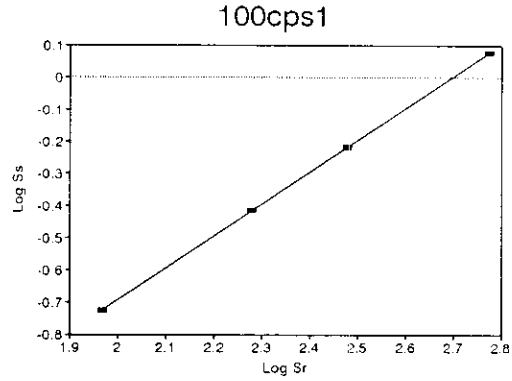
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	597.10	2.776	60.940	1.194	0.08
33.00	5.65	339	300.30	2.478	30.840	0.604	-0.22
27.00	3.61	217	190.30	2.279	19.660	0.385	-0.41
18.00	1.84	111	93.06	1.969	9.617	0.188	-0.72

INPUT VALUES:

K'	=	0.002095	L =	100.00
n'	=	0.993	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		=	0.00	

ANSWERS:

Viscosity	=	*96.000*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*



Viscosity and Critical Flow Rate Calculations

For Freshly Prepared Grout Mixes

WHC-SD-WM-DP-054 REV O

Sample #:	100cps1	Sample Point:	4 points
	After Analysis	VISCOMETER:	Bohlin
Date:	6-29-93	Analyst:	APH

FORMULATION #

Dry Solids	Wt %	Regression Output:		
Cement	0.00	Constant	-2.66	0.00
Fly Ash	0.00	Std Err of Y Est	0.00	
Attapulgite Clay	0.00	R Squared	1.00	
Indian Red Clay	0.00	No. of Observations	4.00	
Calcium Carbonate	0.00	Degrees of Freedom	2.00	
Blast Furnace Slag	0.00	X Coefficient(s)	0.99	
		Std Err of Coef.	0.00	

WASTE SOLUTION I.D.: Brookfield

Mix Ratio 0.00 lbs/gal

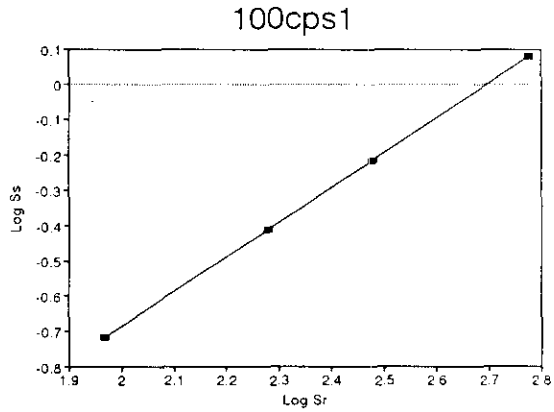
Sp	Hz	N (RPM)	Sr (Sec-1)	Log	Ss(pa)	Ss(lb/ft2)	Log
42.00	11.07	664	596.90	2.776	61.360	1.203	0.08
33.00	5.65	339	300.30	2.478	31.070	0.609	-0.22
27.00	3.61	217	190.30	2.279	19.780	0.388	-0.41
18.00	1.84	111	93.07	1.969	9.785	0.192	-0.72

INPUT VALUES:

K'	=	0.002173	L =	100.00
n'	=	0.988	Fanning =	0.01
Shear Rate	=	511.00		
Density	=	0.00	#/Gal	
10 Min Gel Strength		=	0.00	

ANSWERS:

Viscosity	=	*96.547*	*cps*
Velocity	=	*ERR*	*ft/sec*
Velocity	=	*ERR*	*gal/min*
Pressure Drop	=	*ERR*	*psi*
10 Min Gel Strength	=	*0.00*	*lb/100 sq ft*



CORRESPONDENCE

THIS PAGE INTENTIONALLY
LEFT BLANK.

Pulse Velocity 8/16/93 1024P Hot Cell

The procedure used for pulse velocity is LA-519-181, A0

The samples were taken from the hot cell in 2 plastic bags, and the pulse velocity was taken through the 2 plastic bags.

The steel was tested with no plastic bag with a reading of 26.0 and then the steel was covered with 2 plastic 8-18-93 bags of the same size as the sample and reading was taken again 26.0

Data on samples follows:

Sample #	diameter	length	wt	Reading	Result
1	1.32	2.73	96.06	30.1	2304
2	1.32	2.81	99.16	32.8	2176
3	1.32	2.67	95.57	27.6	2457
4	1.32	2.79	95.75	28.6	2477
5	1.32	2.97	107.81	31.6	2387

Water Grout

1	1.32	2.45	73.65	63.6	978
2	1.32	2.76	79.97	63.6	1102

BEST AVAILABLE COPY

8-16-93 Compression Strength gjh
Procedure used LA-519-179
Calibration of Compressive Strength tester

WHC-SD-WM-DP-054 REV 0

0 Load Cell #	Calibrated 2 Load Cell #			
301.5	513.0	y constant	219.4	
379.0	594.5			
443.5	664.0	X	.983	
669.5	882.0			
756.5	961.0	load	Corrected CS	CS PSI
847.5	1047.5	2404.5	2583	1887
976.5	1172.5	825.5	1030	753
1033.0	1228.0	1104.5	1305	953
1147.5	1346.0	1442.0	1636	1196
1342.5	1542.5	520	730	533
1576.5	1772.5		Ave	1064 ± 5
1636.0	1830.5	Wt Grout		
		277	491	359

Diameter of Samples/inches	Length inches	Vol ml	Weight gms	Density
1.32	2.73	61.2	96.06	1.57
1.32	2.81	63.01	99.16	1.57
1.32	2.67	59.87	95.51	1.60
1.32	2.79	62.57	95.75	1.53
1.32	2.97	66.60	107.81	1.62

Water Grout

1.32	2.45	54.94	73.65	1.34
1.32	2.76	61.89	79.97	1.29

Area of Samples for CS. 1.37 sq inches

BEST AVAILABLE COPY

C. R. Hamrick 8/16/02

BEST AVAILABLE COPY

THIS PAGE INTENTIONALLY
LEFT BLANK.

SAMPLE DATA SUMMARY

THIS PAGE INTENTIONALLY
LEFT BLANK.

pH

RESULTS		QC RESULTS		QC ID INFO.	
ID:	SAMPLE	BEGIN STD % REC	BLANK	BEGIN STD ID:	BLANK I.D.
G698	9.37	100.20	NA	G696	NA
G699	9.91	100.20	NA	G696	NA
G700	10.92	100.20	NA	G696	NA
G701	11.02	100.20	NA	G696	NA
G720	11.17	101.00	NA	G718	NA
G721	11.09	101.00	NA	G718	NA
G722	11.05	101.00	NA	G718	NA
G723	11.14	101.00	NA	G718	NA
G747	11.44	100.10	5.50	G745	G746
G748	11.12	100.10	5.50	G745	G746
G749	11.11	100.10	5.50	G745	G746
G750	11.11	100.10	5.50	G745	G746

ION CHROMATOGRAPHY

RESULTS			QC RESULTS		QC ID INFO.	
ID	ANALYTE	SAMPLE	BEG STD	**BLANK**	**BEG STD**	**BLANK**
		ug/ml	% REC	ug/ml	ID:	I.D.
G698	NO2	<1.0E+00	95.86	<1.0E+00	G696	G697
G699	NO2	1.99E+02	95.86	<1.0E+00	G696	G697
G700	NO2	2.00E+02	95.86	<1.0E+00	G696	G697
G701	NO2	2.45E+02	95.86	<1.0E+00	G696	G697
G720	NO2	<1.0E+00	95.86	<1.0E+00	G718	G719
G721	NO2	1.56E+02	95.86	<1.0E+00	G718	G719
G722	NO2	1.41E+02	95.86	<1.0E+00	G718	G719
G723	NO2	1.50E+02	95.86	<1.0E+00	G718	G719
G747	NO2	<1.0E+00	98.66	<1.0E+00	G745	G746
G748	NO2	2.03E+02	98.66	<1.0E+00	G745	G746
G749	NO2	2.43E+02	98.66	<1.0E+00	G745	G746
G750	NO2	3.35E+02	98.66	<1.0E+00	G745	G746
G698	NO3	<1.0E+00	98.27	<1.0	G696	G697
G699	NO3	2.63E+02	98.27	<1.0	G696	G697
G700	NO3	2.69E+02	98.27	<1.0	G696	G697
G701	NO3	3.43E+02	98.27	<1.0	G696	G697
G720	NO3	<1.0E+00	97.93	<1.0	G718	G719
G721	NO3	2.13E+02	97.93	<1.0	G718	G719
G722	NO3	1.93E+02	97.93	<1.0	G718	G719
G723	NO3	2.15E+02	97.93	<1.0	G718	G719
G747	NO3	<1.0E+00	98.96	<1.0	G745	G746
G748	NO3	2.66E+02	98.96	<1.0	G745	G746
G749	NO3	3.17E+02	98.96	<1.0	G745	G746
G750	NO3	4.54E+02	98.96	<1.0	G745	G746

Am-241

RESULTS		QC RESULTS		QC ID INFO	
ID:	SAMPLE uci/ml	BEGIN STD % REC	BLANK uci/ml	BEGIN STD ID:	BLANK I.D.
G698	<1.27E-05	100.00	<1.27E-05	G696	G697
G699	<1.27E-05	100.00	<1.27E-05	G696	G697
G700	<1.27E-05	100.00	<1.27E-05	G696	G697
G701	<1.27E-05	100.00	<1.27E-05	G696	G697
G720	<1.27E-05	108.20	<1.27E-05	G178	G719
G721	<1.27E-05	108.20	<1.27E-05	G178	G719
G722	<1.27E-05	108.20	<1.27E-05	G178	G719
G723	<1.27E-05	108.20	<1.27E-05	G178	G719
G747	<3.40E-05	122.80	<3.40E-05	G754	G746
G748	<3.40E-05	97.40	<3.40E-05	G754	G746
G749	5.48E-05	97.40	<3.40E-05	G754	G746
G750	<3.40E-05	122.80	<3.40E-05	G754	G746

Tc-99

RESULTS ID:	SAMPLE	QC RESULTS: BEGIN STD	BLANK	QC ID INFO. BEG STD	BLANK
	uCi/ml	% REC	uCi/ml	ID:	I.D.
G698	<8.14E-06	95.90	<8.38E-06	G696	G697
G699	3.94E-04	95.90	<8.38E-06	G696	G697
G700	3.79E-04	95.90	<8.38E-06	G696	G697
G701	4.64E-04	95.90	<8.38E-06	G696	G697
G720	<7.07E-06	89.60	1.47E-05	G718	G719
G721	3.16E-04	89.60	1.47E-05	G718	G719
G722	2.84E-04	89.60	1.47E-05	G718	G719
G723	3.11E-04	89.60	1.47E-05	G718	G719
G747	<1.06E-05	103.10	8.78E-06	G745	G746
G748	3.73E-04	103.10	8.78E-06	G745	G746
G749	4.12E-04	103.10	8.78E-06	G745	G746
G750	6.08E-04	103.10	8.78E-06	G745	G746

TOC

RESULTS		QC RESULTS		QC ID INFO	
ID:	SAMPLE ugC/mL	BEGIN STD % REC	BLANK ugC/mL	BEGIN STD ID:	BLANK I.D.
G698	<5.50E+00	95.00	<5.50E+00	G696	G697
G699	<5.50E+00	95.00	<5.50E+00	G696	G697
G700	7.70E+00	95.00	<5.50E+00	G696	G697
G701	1.10E+01	95.00	<5.50E+00	G696	G697
G720	<5.50E+00	96.00	<5.50E+00	G718	G719
G721	<5.50E+00	96.00	<5.50E+00	G718	G719
G722	7.15E+00	96.00	<5.50E+00	G718	G719
G723	8.80E+00	96.00	<5.50E+00	G718	G719
G747	<5.50E00	94.60	<5.50E+00	G745	G746
G748	7.10E+00	94.60	<5.50E+00	G745	G746
G749	9.30E+00	94.60	<5.50E+00	G745	G746
G750	1.50E+01	94.60	<5.50E+00	G745	G746

THIS PAGE INTENTIONALLY
LEFT BLANK.

5-DAY - PHYSICAL TEST ANALYSES

THIS PAGE INTENTIONALLY
LEFT BLANK.

WESTINGHOUSE HANFORD COMPANY

Batch 1370

WHC-SD-WM-DP-054 REV 0

222-S LABORATORY

ANALYTICAL BATCH

102-5DA4

Lab Segment Serial No. G597, G598, G599, G600, G601, G602	Customer ID: A-0, A-1, A-2, A-3, A-4, A-5
Analysis: pH	Sample Prep: Direct

Instrument: SN 246354 Beckman 40	Procedure/ Rev: LA-212-102 C-5
Technologist: E. C.	Date: 8-6-93
Starting Time: ~~13:20~~ 8-9-93 13:20	Temperature 79° F
Ending Time: 13:45	Chemist: J. Lachut

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	G595-5513	11		
2	Blank	G596-5613	12		
3	Sample	G597-5713	13		
4	Sample	G598-5713	14		
5	Sample	G599-5713	15		
6	Sample	G600-5713	16		
7	Sample	G601-5713	17		
8	Sample	G602-5713	18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS NBS pH-1	24N16-C (3ml)			
LMCS pH-1°	18M6-C (3ml)			

A-6000-881 (03/92)

QA 4

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA 212-102/6-5 ANALYTE: pH ANALYSIS START DATE: 8-1-13

PREPARED BY: Rob Schroeder DATE PREPARED: 8-12-93

PROJECT: 102 ASCE UNITS: NONE SAMPLE PREP: Direct / Digest wt.=

SPL PT.	SERIAL No.	RESULT #1	RESULT #2	DIFF.	AVERAGE	RPD%	%REC	DET LIM
STD	G595	10.01					100.1	
BLK	G596	~~6.75~~ RWS 8-12-93 6.71						
A-0	G597	10.69						
A-1	G598	10.55						
A-2	G599	10.40						
A-3	G600	10.78						
A-4	G601	10.75						
A-5	G602	10.62						

☒ NO SPECIAL PROBLEMS / METHOD VARIATIONS IN THIS BATCH

NARRATIVE-LIST SPECIFIC PROBLEMS / VARIATIONS FOR THIS BATCH:

RW Schroeder
8-12-93

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 595.-5513	102 5 DAY	7-22-93	14:26	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	STD

Remarks Calculations Results

S350 PH MAT.
STD# 18N16-2
STD VAL 10.00
S353 NBSPH1
STD# 24N16-2
STD VAL 4.00

RESULT 10.01 RWS 8-9-93
%REC ~~100.1~~ 100.1
RESULT 4.00
%REC 100.0

E.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	13:45	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 596.-5613	102 5 DAY	7-22-93	14:28	26

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	BLK

Remarks Calculations Results

REAGENT BLANK

~~9.95~~ RWS 8-10-93

6.71

Blank O.K. RWS

E.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	13.45	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 597.-5713	102 5 DAY	7-22-93	14:29	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-0

Remarks Calculations Results

8-23-93

10.69

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	13:45	8-9-93 RWSchroeder

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 598.-5713	102 5 DAY	7-22-93	14:30	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-1

Remarks Calculations Results

10.55

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	13:45	8-9-93 RWSchroeder

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 599.-5713	102 5 DAY	7-22-93	14:30	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-2

Remarks, Calculations, Results

10.40

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	13:45	RW Schroeder	

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 600.-5713	102 5 DAY	7-22-93	14:31	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-3

Remarks, Calculations, Results

10.78

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	13:45	RW Schroeder	

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 601.-5713	102 5 DAY	7-22-93	14:31	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-4

Remarks, Calculations Results

10.75

E C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	13:45	8-9-93 RW Schroeder	

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 602.-5713	102 5 DAY	7-22-93	14:32	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-5

Remarks Calculations Results

10.62

E C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	13:45	8-9-93 RW Schroeder	

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

WESTINGHOUSE HANFORD COMPANY Batch 1364

222-S LABORATORY

ANALYTICAL BATCH 102-5-DAY

Lab Segment Serial No. G606, G607, G608, G609, G610	Customer ID: A-6, A-7, B-0, B-1, B2
Analysis: pH	Sample Prep: Direct

Instrument: 246354	Procedure/ Rev: LA 212-102 C-5
Technologist: E. Contreras	Date: 8-6-93
Starting Time: 13:00	Temperature >9°F
Ending Time: 13:12	Chemist: V. Lachut

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	G604-5513	11		
2	Blank	G605-5613	12		
3	Sample	G606-5713	13		
4	Sample	G607-5713	14		
5	Sample	G608-5713	15		
6	Sample	G609-5713	16		
7	Sample	G610-5713	17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS MDSPH,1 E.C. 8-6-93	24 N16-C (3ml)			
~~LMCS~~	~~pH-1°~~ (3ml)			
LMCS pH-1°	18 N16-C (3ml)			

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA 212-102/C-5 ANALYTE: pH ANALYSIS START DATE: 8-6-93

PREPARED BY: Rob Schroeder DATE PREPARED: 8-12-93

PROJECT: 102 ASCI UNITS: None SAMPLE PREP: Direct / Digest wt.=

SPL PT.	SERIAL No.	RESULT #1	RESULT #2	DIFF.	AVERAGE	RPD%	%REC	DET LIM
STD	G604	10.01					100.1	
BIK	G605	6.73						
A-6	G606	10.39						
A-7	G607	10.40						
B-0	G608	9.44						
B-1	G609	9.87						
B-2	G610	9.81						

[X] NO SPECIAL PROBLEMS / METHOD VARIATIONS IN THIS BATCH

NARRATIVE-LIST SPECIFIC PROBLEMS / VARIATIONS FOR THIS BATCH:

RW Schroeder
8-12-93

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 604.-5513	102 5 DAY	7-22-93	14:33	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	STD

Remarks, Calculations, Results

S350 PH MAT.
STD# ~~10.00~~ 18N16-C RESULT 10.01
STD VAL 10.00 %REC 100.1
S353 NBSPH1
STD# 24N16-2 RESULT 4.00
STD VAL 4.00 %REC 100.0

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	13:12	RW Schroeder	

54-6800-261 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 605.-5613	102 5 DAY	7-22-93	14:33	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	BLK

Remarks, Calculations, Results

REAGENT BLANK

~~9.95~~ RWS 8-10-93

6.73

Blank O.K. RWS

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	13.12	RW Schroeder	

54-6800-261 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 606.-5713	102 5 DAY	7-22-93	14:34	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-6

Remarks, Calculations, Results

10.39

E. C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	13:12	8-9-93 RW Schroeder	8/18

54-6806-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 607.-5713	102 5 DAY	7-22-93	14:35	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	A-7

Remarks, Calculations, Results

10.40

E. C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	13:12	8-9-93 RW Schroeder	8/18

54-6806-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 608.-5713	102 5 DAY	7-22-93	14:35	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-0

Remarks, Calculations, Results

9.44

E. C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	13:12	RW Schroeder 8-9-93

54-680C-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 609.-5713	102 5 DAY	7-22-93	14:35	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-1

Remarks, Calculations, Results

9.87

E. C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	13:12	RW Schroeder 8-9-93

54-680C-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 610.-5713	102 5 DAY	7-22-93	14:36	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-2

Remarks, Calculations, Results

9.81

E C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	13:12	RW Schroeder 8-9-93	

54-6800-261 (R-10/85)

BEST AVAILABLE COPY

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1369

102-5-DAY

G614

Lab Segment Serial No. ~~G614~~, G615, G616, G617, G618 (RWS 8-9-93)	Customer ID: B-3, B-4, B-5, B-6, B-7
Analysis: pH	Sample Prep: Direct

Instrument: 246354	Procedure/ Rev: LA-212-102 C-5
Technologist: E.C.	Date: 8-6-93
Starting Time: 13:50	Temperature 79° F
Ending Time: 14:15	Chemist: J. Lachut

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	G612-5513	11		
2	Blank	G613-5613	12		
3	Sample	G614-5713	13		
4	Sample	G615-5713	14		
5	Sample	G616-5713	15		
6	Sample	G617-5713	16		
7	Sample	G618-5713	17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS NBS pH 1	24N16-C (3ml)			
LMCS pH-1°	18N16-C (3ml)			

A-6000-881 (03/92)

OA

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA212-102/C-5 ANALYTE: pH ANALYSIS START DATE: 8-6-93

PREPARED BY: Rob Schroeder DATE PREPARED: 8-12-93

PROJECT: 102 AGCI UNITS: NONE SAMPLE PREP: Direct / Digest wt.=

SPL PT.	SERIAL No.	RESULT #1	RESULT #2	DIFF.	AVERAGE	RPD%	%REC	DET LIM
STD	G612	10.01					100.1	
BLK	G613	6.68						
B-3	G614	10.04						
B-4	G615	10.18						
B-5	G616	10.13						
B-6	G617	10.09						
B-7	G618	10.00						

[X] NO SPECIAL PROBLEMS / METHOD VARIATIONS IN THIS BATCH

NARRATIVE-LIST SPECIFIC PROBLEMS / VARIATIONS FOR THIS BATCH:

RW Schroeder
8-12-93

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 612.-5513	102 5 DAY	7-22-93	14:36	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	STD

Remarks, Calculations, Results

S350 PH MAT.
STD# 18N16-C RESULT 10.01
STD VAL 10.00 %REC 100.1
S353 NBSPH1
STD# 24N16-C RESULT 4.00
STD VAL 4.00 %REC 100.0

E.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
6C270				
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93 ~~8-16-93~~ RWS 8-10-93	14.15	8-9-93 RW Schroeder	

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 613.-5613	102 5 DAY	7-22-93	14:37	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	BLK

Remarks, Calculations, Results

REAGENT BLANK

~~9.95~~ RWS 8-10-93

6.68

Blank O.K. RWS

E.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93 ~~8-16-93~~ RWS 8-10-93	14:15	8-9-95 RW Schroeder	

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 614.-5713	102 5 DAY	7-22-93	14:38	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-3

Remarks, Calculations, Results

10.04

E.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93 ~~8-16-93~~	14:15	8-9-93 RW Schroeder	

RWS 8-10-95

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 615.-5713	102 5 DAY	7-22-93	14:40	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-4

Remarks, Calculations, Results

10-18

E.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
~~8-6-93~~ 8-6-93	14:15	8-9-93 RW Schroeder	

8-6-93

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 616.-5713	102 5 DAY	7-22-93	14:40	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-5

Remarks, Calculations, Results

10.13

EC

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	14:15	RW Schroeder 8-9-93

54-6800061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 617.-5713	102 5 DAY	7-22-93	14:41	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-6

Remarks, Calculations, Results

10.09

EC

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	14:15	RW Schroeder 8-9-93

54-6800061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 618.-5713	102 5 DAY	7-22-93	14:41	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	B-7

Remarks, Calculations Results

10.00

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	14:15	RW Schmeddy 8-9-93	8/18

54-6800-061 (4-10-83)

BEST AVAILABLE COPY

WHC-SD-WM-DP-054 REV 0

WESTINGHOUSE HANFORD COMPANY

222-S LABORATORY

ANALYTICAL BATCH

Batch 1389

102 SDAK

Lab Segment Serial No. 6622, 6623, 6624, 6625, 6626	Customer ID: C-0, C-1, C-2, C-3, C-4
Analysis: pH	Sample Prep: Direct

Instrument: 246354	Procedure/ Rev: LA-212-102/C-5
Technologist: E. Contreras	Date: 8-6-93
Starting Time: 10:45	Temperature: ~~79°F~~ 79°F
Ending Time: 11:00	Chemist: J. Lachut

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	6620-5513	11		
2	Blank	6621-5613	12		
3	Sample	6622-5713	13		
4	Sample	6623-5713	14		
5	Sample	6624-5713	15		
6	Sample	6625-5713	16		
7	Sample	6626-5713	17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS ND SPH-1	24N16-C (3ml)			
LMCS pH-1°	18N16-C (3ml)			

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA 212-102 / C-5 ANALYTE: pH ANALYSIS START DATE: 8-6-93

PREPARED BY: Rob Schroeder DATE PREPARED: 8-12-93

PROJECT: 102 ASU UNITS: NONE SAMPLE PREP: Direct / Digest wt.=

SPL PT.	SERIAL No.	RESULT #1	RESULT #2	DIFF.	AVERAGE	RPD%	%REC	DET LIM
Std	G620	10.01					100.1	
BLK	G621	6.76						
C-0	G622	8.49						
C-1	G623	9.94						
C-2	G624	9.82						
C-3	G625	9.45						
C-4	~~G10~~ G626 8-12-93	10.08						

[X] NO SPECIAL PROBLEMS / METHOD VARIATIONS IN THIS BATCH

NARRATIVE-LIST SPECIFIC PROBLEMS / VARIATIONS FOR THIS BATCH:

RW Schroeder
8-12-93

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 620.-5513	102 5 DAY	7-22-93	14:54	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	STD

Remarks, Calculations, Results

S350 PH MAT.
STD# 18N16-C RESULT 10.01
STD VAL 10.00 %REC 100.1
S353 NBSPH1
STD# 24N16-C RESULT 4.00
STD VAL 4.00 %REC 100.0

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	11:00	8-9-93 RW Schroeder

S4-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 621.-5613	102 5 DAY	7-22-93	14:56	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	BLK

Remarks, Calculations, Results

REAGENT BLANK

~~9.95~~ RWS 8-10-93

6.76 Blank O.K. RWS

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	11:00	8-9-93 RW Schroeder

S4-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 622.-5713	102 5 DAY	7-22-93	14:58	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	C-0

Remarks Calculations Results

8.49

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	11:00	RW Schroeder	8/18

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 623.-5713	102 5 DAY	7-22-93	15: 3	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	C-1

Remarks Calculations Results

9.94

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	11:00	RW Schroeder	8/18

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 624.-5713	102 5 DAY	7-22-93	15: 3	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	C-2

Remarks, Calculations, Results

9.82

EC

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	11:00	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 625.-5713	102 5 DAY	7-22-93	15: 6	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	C-3

Remarks, Calculations, Results

9.45

EC

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	11:00	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 626.-5713	102 5 DAY	7-22-93	15: 7	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	C-4

Remarks, Calculations, Results

10.08

E. C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-6-93	11:00	RW Schroeder 8-9-93	

BEST AVAILABLE COPY

WESTINGHOUSE HANFORD COMPANY

Batch 1384

222-S LABORATORY

ANALYTICAL BATCH

102-5DAY

Lab Segment Serial No. G630, G631, G632, G633, G634	Customer ID: C-5, C-6, C-7, D-0, D-1
Analysis: pH	Sample Prep: Direct

Instrument: 246354	Procedure/ Rev: LA 212-102/C-5
Technologist: E. [illegible]	Date: 8-12-93
Starting Time: 10:30	Temperature 73°
Ending Time: 11:00	Chemist: R. Schroeder

Comments:

	Description	Lab ID		Description	Lab ID
1	LMCS	G628-5513	11		
2	Blank	G629-5613	12		
3	Sample	G630-5713	13		
4	Sample	G631-5713	14		
5	Sample	G632-5713	15		
6	Sample	G633-5713	16		
7	Sample	G634-5713	17		
8			18		
9			19		
10			20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS pH-1°	NBS (3ml)			

A-6000-881 (03/92)

QA

WHC-SD-WM-DP-054 REV 0

ANALYTICAL BATCH SUMMARY SHEET

METHOD: ANALYTE: ANALYSIS START DATE:

PREPARED BY: Rob Schroeder DATE PREPARED:

PROJECT: UNITS: SAMPLE PREP: Direct / Digest wt.=

SPL PT.	SERIAL No.	RESULT #1	RESULT #2	DIFF.	AVERAGE	RPD%	%REC	DET LIM
STD	[illegible]	[illegible]				[illegible]		
[illegible]	[illegible]	[illegible]						
[illegible]	[illegible]	[illegible]						
[illegible]	[illegible]	[illegible]						
[illegible]	[illegible]	[illegible]						
[illegible]	[illegible]	[illegible]						
[illegible]	[illegible]	[illegible]						

☐ NO SPECIAL PROBLEMS / METHOD VARIATIONS IN HIS BATCH

NARRATIVE-LIST SPECIFIC PROBLEMS / VARIATIONS FOR THIS BATCH:

[illegible]
8-12-93

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 628.-5513	102 5 DAY	7-22-93	15: 8	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
? ~3 mL	STD

Remarks, Calculations, Results:

S350 PH MAT.
STD# (PH-10) 18N16-c RESULT 10.01
STD VAL 10.00 %REC 100.1
S353 NBSPH1
STD# RESULT
STD VAL %REC

S.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	11:00	8-12-93 RW Schroeder

54-6800-001 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 629.-5613	102 5 DAY	7-22-93	15:10	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	BLK

Remarks, Calculations, Results:

REAGENT BLANK

6.73

S.C.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	11:00	8-12-93 RW Schroeder

54-6800-001 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 630.-5713	102 5 DAY	7-22-93	15:12	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
? ~3 mL	C-5

Remarks, Calculations, Results

10.26

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	11:00	RW Schroeder 8-12-93

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 631.-5713	102 5 DAY	7-22-93	15:12	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
? ~3mL	C-6

Remarks, Calculations, Results

10.23

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	11:00	RW Schroeder 8-12-93

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 632.-5713	102 5 DAY	7-22-93	15:13	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
? ~3 mL	C-7

Remarks Calculations Results

10.14

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-12-93	11:00	8-12-93 RW Schroeder	8/10

54-6800-261 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 633.-5713	102 5 DAY	7-22-93	15:13	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
? ~3 mL	D-0

Remarks Calculations Results

8.15

E. C

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr	
8-12-93	11:00	8-12-93 RW Schroeder	8/10

54-6800-261 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 634.-5713	102 5 DAY	7-22-93	15:14	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
? ~3 mL	D-1

Remarks, Calculations, Results

10.50

EC

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-12-93	11:00	Ron Schroeder 8-12-93

SCANDOC (R-10-93)

BEST AVAILABLE COPY

WHC-SD-WM-DP-054 REV 0

WESTINGHOUSE HANFORD COMPANY

Batch 1379

222-S LABORATORY

ANALYTICAL BATCH

102-S-DAY

Lab Segment Serial No. GJH 8-23-93 G637, G638, G639, G640, G641, G642	Customer ID: D-2, D-3, D-4, D-5, D-6, D-7
Analysis: PH	Sample Prep: Direct

Instrument: N246354	Procedure/ Rev: LA 212-102 C-5
Technologist: E.C. 8-6-93	Date: 6-6-93 93 GJH 8-23-93
Starting Time: ~~13:~~ 14:20	Temperature 79° F
Ending Time: 15:00	Chemist: J. Lachut

Comments:

	Description	Lab ID
1	LMCS	G635-5513
2	Blank	G636-5613
3	Sample	G637-5713
4	Sample	G638-5713
5	Sample	G639-5713
6	Sample	G640-5713
7	Sample	G641-5713
8	Sample	G642-5713
9		
10		

	Description	Lab ID
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Standard Type	Primary Book No. and Aliquot Vol.	Second Book No. and Aliquot Vol.	Third Book No. and Aliquot Vol.	Final Vol. of Standard
LMCS NBS PH 7	24 N16-C (3ml)			
LMCS PH 10	18 N16-C (3ml)			

A-6000-881 (03/92)

ANALYTICAL BATCH SUMMARY SHEET

METHOD: LA 212-102/C-5 ANALYTE: pH ANALYSIS START DATE: 8-6-93

PREPARED BY: Rob Schroeder DATE PREPARED: 8-12-93

PROJECT: 102 ASCI UNITS: NONE SAMPLE PREP: Direct / Digest wt.=

SPL PT.	SERIAL No.	RESULT #1	RESULT #2	DIFF.	AVERAGE	RPD%	%REC	DET LIM
STD	G635	10.01					100.1	
BLK	G636	6.76						
D-2	G637	9.75						
D-3	G638	9.99						
D-4	G639	10.17						
D-5	G640	10.09						
D-6	G641	10.13						
D-7	G642	10.00						

[X] NO SPECIAL PROBLEMS / METHOD VARIATIONS IN THIS BATCH

NARRATIVE-LIST SPECIFIC PROBLEMS / VARIATIONS FOR THIS BATCH:

RW Schroeder
8-12-93

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 635.-5513	102 5 DAY	7-22-93	15:16	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	STD

Remarks, Calculations, Results

S350 PH MAT.
STD# 8M16-C RESULT 10.01
STD VAL 10.00 %REC 100.1
S353 NBSPH1
STD# 24M16-C RESULT 4.00
STD VAL 4.00 %REC 100.0

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	15:00	RW Schroeder	

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 636.-5613	102 5 DAY	7-22-93	15:18	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	BLK

Remarks, Calculations, Results

REAGENT BLANK

~~9.95~~ RWS 8-10-93

6.76 Blank O.K. RWS

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	15:00	RW Schroeder	

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 637.-5713	102 5 DAY	7-22-93	15:20	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	D-2

Remarks, Calculations, Results

9.75

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	15:00	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 638.-5713	102 5 DAY	7-22-93	15:21	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	D-3

Remarks Calculations Results

9.99

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	15:00	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 639.-5713	102 5 DAY	7-22-93	15:22	23

Determination	Method-Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	D-4

Remarks, Calculations Results

10.17

E.C.D.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	15:00	RWSchroeder	8/19

54-6800-061 (R 10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 640.-5713	102 5 DAY	7-22-93	15:24	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	D-5

Remarks Calculations Results

10.09

E.C.D.

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr 8-9-93	
8-6-93	15:00	RWSchroeder	8/19

54-6800-061 (R 10-83)

BEST AVAILABLE COPY

pH ANALYSIS - UNDIGESTED SAMPLE

Serial No	Sample Point	Date	Time Issued	Priority
G 641.-5713	102 5 DAY	7-22-93	15:25	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	D-6

Remarks, Calculations, Results

10.13

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	15:00	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

Serial No	Sample Point	Date	Time Issued	Priority
G 642.-5713	102 5 DAY	7-22-93	15:25	23

Determination	Method Standard	Result Units	Charge Code	Reruns
pH	LA-212-102	NONE	D44B3	0

Sample Size	Customer ID
?	D-7

Remarks, Calculations, Results

10.00

Analyst - 1	Analyst - 2	Analyst - 3	Analyst - 4	Analyst - 5
Hrs	Hrs	Hrs	Hrs	Hrs

Date	Time Completed	Lab Unit Mgr
8-6-93	15:00	8-9-93 RW Schroeder

54-6800-061 (R-10-83)

BEST AVAILABLE COPY