

2. To: (Receiving Organization) Data Assessment and Interpretation	3. From: (Originating Organization) NHC Process Chemistry	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: TWRS Privatization	6. Design Authority/ Design Agent/Cog. Engr.: J. C. Person	7. Purchase Order No.: NA
8. Originator Remarks: Approval/Release of the attached Test Plan is requested.		9. Equip./Component No.: NA
		10. System/Bldg./Facility: 222-S Laboratory
11. Receiver Remarks: 11A. Design Baseline Document? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date:

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	HNF-2909		0	Test Plan for Tank 241-AW-101 Solubility Screening Tests	NA-JCP	2	1	

16. KEY					
Approval Designator (F)	Reason for Transmittal (G)			Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval	4. Review	5. Post-Review	1. Approved	4. Reviewed no/comment
	2. Release	6. Dist. (Receipt Acknow. Required)		2. Approved w/comment	5. Reviewed w/comment
	3. Information			3. Disapproved w/comment	6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)											
(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Authority									
		Design Agent									
1	1	Cog. Eng. J. C. Person	<i>J. C. Person</i>	7-21-98	T6-07						
1	1	Cog. Mgr. J. R. Jewett	<i>J. R. Jewett</i>	8/1/98	T6-07						
		QA									
		Safety									
1	1	Env. G. J. Warwick	<i>G. J. Warwick</i>	8/4/98	T6-12						
1	1	B. C. Simpson	<i>B. C. Simpson</i>	8/4/98	T2-12						

18. J. C. Person <i>J. C. Person</i> Signature of EDT Originator	7-21-98 Date	19. B. C. Simpson <i>B. C. Simpson</i> Authorized Representative for Receiving Organization	8/1/98 Date	20. J. R. Jewett <i>J. R. Jewett</i> Design Authority Cognizant Manager	8/1/98 Date	21. DOE APPROVAL (if required) Ctrl. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
--	-----------------	--	----------------	--	----------------	---

Test Plan for Tank 241-AW-101 Solubility Screening Tests

J. C. Person

Numatec Hanford Corporation, Richland, WA 99352
U. S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 620351 UC: 2070
Org Code: 8C510 Charge Code: MD621
B&R Code: EW 3120074 Total Pages: 19

Key Words: 241, AW, 101, 241-AW-101, Solubility, Privatization, Sludge

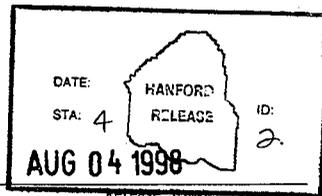
Abstract: Tank 241-AW-101 (101-AW) has been identified as one of the early tanks to be for retrieved for low level waste pretreatment and immobilization. Retrieval of the tank waste may require dilution. This test is to determine the effects of dilution on the mass of solids and their composition. This test plan gives test instructions, example data sheets, a waste compatibility review, and a waste stream fact sheet.

TRADEMARK DISCLAIMER. 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.

Printed in the United States of America. To obtain copies of this document, contact: Document Control Services, P.O. Box 950, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

Kara J. Gross
Release Approval

8/4/98
Date



Approved for Public Release

CONTENTS

1.0	INTRODUCTION	1
2.0	BACKGROUND	1
3.0	DESCRIPTION OF TEST	1
3.1	Tank Composite Sample Preparation Overview	1
3.2	Composite Preparation Job Steps	2
3.3	Solubility Screening Test Overview	5
3.4	Solubility Screening Test Job Steps	5
4.0	DATA INTERPRETATION	8
4.1	Chemical Data	8
4.2	Quality Assurance	8
5.0	SAFETY	9
6.0	WASTE HANDLING	9
7.0	SCHEDULE AND DELIVERABLES	9
8.0	REFERENCES	10

APPENDICES

A:	EXAMPLE DATA SHEETS	A-1
B:	WASTE COMPATIBILITY REVIEW	B-1
C:	WASTE STREAM FACT SHEET	C-1

TABLES

Table 1.	Grab Samples Available for the Test	2
----------	---	---

LIST OF TERMS

101-AW	Tank 241-AW-101
AT	total alpha
DQO	data quality objective
G	gravity
g	gram
gal	gallon
GEA	gamma energy analysis
IC	ion chromatography
ICP	inductively-coupled plasma spectroscopy
L	liter
mL	milliliter
NHC	Numatec Hanford Corporation
PCB	polychlorinated biphenyl
PLM	polarized light microscopy
PNNL	Pacific Northwest National Laboratory
QA	quality assurance
TIC	total inorganic carbon (C present as CO_3^{2-})
TSAP	tank sampling and analysis plan
TOC	total organic carbon
vol%	volume percent
wt%	weight percent

1.0 INTRODUCTION

Tank 241-AW-101 (101-AW) has been identified as one of the early tanks to be for retrieved for low level waste pretreatment and immobilization. Retrieval of the tank waste may require dilution. This test is to determine the effects of dilution on the mass of solids and their composition. This test plan gives test instructions, example data sheets, a waste compatibility review, and a waste stream fact sheet. This test plan is similar to tests on tanks 241-AN-102 (Person 1998a) and 241-AN-107 (Person 1998b).

The 101-AW tests will be done with composites of liquid and solids from grab samples that were taken in 1998 (Benar 1998). Future revisions of the Tank Sampling and Analysis Plan (Benar 1998) may change the details of the work performed under this test plan.

2.0 BACKGROUND

As of November 30, 1997, tank AW-101 contained a total waste volume of 4258 kL (1125 kgal), consisting of 3,100 kL (819 kgal) of supernatant liquid, and 1158 kL (306 kgal) of sludge with 114 kL (30 kgal) of drainable interstitial liquid (Hanlon 1998). This waste volume is equivalent to 10.4 meters (409 inches) of waste as measured from the centerline of the tank. An alternative estimate was derived by Herting (1998) from the core sample results (Benar 1997) and the Best Basis Inventory (Jones 1997). That estimates the total waste volume to be 4000 kL (1100 kgal), consisting of 260 kL (70 kgal) of crust, 2800 kL (740 kgal) of supernatant liquid, and 1100 kL (290 kgal) of settled solids.

Sodium oxalate has a solubility that is very dependent on ionic strength; it is unlikely to dissolve very much at the dilution ratios used for these tests. The solubilities of some of the sodium salts are known to be very temperature-dependent. The solubility screening test will be done only at ambient temperature. Therefore, temperature is likely to be a key factor not explored in the solubility screening tests.

Given that the average waste is at 38 °C (Brevick et al. 1997) and the tests described below are conducted at hotcell ambient temperature (20 to 30 °C), the solids seen in the "supernate" layer samples may in fact be in solution at tank temperatures.

3.0 DESCRIPTION OF TEST

3.1 Tank Composite Sample Preparation Overview

All of the dilution/dissolution tests will use a solids/liquid composite sample to be prepared from samples currently in the laboratory. Sample preparation and all of the testing will be done in hotcells at the 222-S Laboratory. The grab samples shown in Table 1 are available for use in this study (except for material needed to prepare the archived samples

described later). It is currently planned that the activities described in this test plan (except for analysis) will be performed in 11A5 hotcell of 222-S Laboratory. Other portions of the 11A hotcells may be used, as needed or as space is available.

Table 1. Grab Samples Available for the Test

Sample #	Sample Type	Sample Depth Below Top of Riser 022 (in.)	Vol% Solids	Estimated Solids Volume (mL) ¹	Estimated Liquid Volume (mL) ¹
1AW-98					
-1	Crust	268	100	125	0
-2	Crust	268	100	125	0
-3	Supernate	325	21	26	99
-4	Supernate	325	32	40	86
-5	Supernate	420	17	21	104
-6	Supernate	420	17	18	93
-7	Supernate	515	14	17	108
-8	Supernate	515	27	34	91
-9	Sludge	630	36	45	80
-10	Sludge	654	44	55	70
		Overall Totals		507 mL est. solids	730 mL liquids not in settled solids
		Available material for solubility screening		394 mL est. solids	545 mL estimate

¹Assumes that a full jar contains 125 mL.

The sample descriptions by 222-S Laboratory personnel are summarized here. The crust samples are dark brown solids. The supernate samples (1AW-98-3 through 8) have a cloudy, yellow liquid and gray/brown solids that settled on cooling. Sample 1AW-98-8 had a significant amount of lighter gray flocculent solids. No solids were indicated on the sampling data sheet for any of the supernate samples. The upper sludge sample has an opaque yellow/brown liquid and dark brown solids. The lower sludge sample has a cloudy yellow liquid and gray/brown solids. No organic layer was observed in any of the samples.

3.2 Composite Preparation Job Steps

- 3.2.1. Weigh and record (example data sheets shown in Appendix A) the masses of the available sample jars.
- 3.2.2. Record the height of the material in the sample jars (this height corresponds to 100% settled solids). Record the height of the

settled solids in the jar. Record the hotcell ambient temperature. If the jar has greater than about 5 vol% settled solids perform the following settling test (step 3.2.3) in their original containers (wide mouth 125 mL jars).

- 3.2.3. Mix the sample jars two or three times (at one-hr intervals), then let sample jars sit undisturbed. Record the height of the settled solids at a few times during the shift (e.g., at 1, 2, and 5 hrs) and during the next day (e.g., early in shift and after 3 or 4 hrs), letting it settle for at least 24 hrs.
- 3.2.3a. If the liquid is too turbid to determine the top of the solids, allow the material to settle for another 24 hrs (longer, if continued turbid).
- 3.2.4. Archive a subsample of at least 20 mL from each of the samples. The subsample can either be collected at this point (using step 3.2.4a), or it can be prepared after the solids/liquid separation (using step 3.2.6a).
 - 3.2.4a. Shake the jar to suspend the settled solids. Subsample so as to transfer solids and liquid in the same proportions as the original. If the solids tend to settle, the following method is suggested to subsample while mixing. Weigh a stir bar. Unscrew the cap from the sample jar, add the stir bar, and place the jar on a magnetic stirrer. Stir the waste in the jar until it appears to be homogeneous. WHILE THE WASTE IS BEING STIRRED, transfer desired volume (20 mL) of waste into archive vial. One method of transfer is to use a 60 mL syringe modified with an attachment to extend into the jar. Record weights of parent jar and archive vial after subsampling.
- 3.2.5. Separate the solids and liquid for each sample where visual inspection indicates that there is more than about 0.5 wt% solids (the DQO [Wiemers, section 7.5.3] states that the solubility tests will only contain waste in which the solids to liquid ratio is greater than 0.5 wet wt% solids). If the sample has less solids, then perform the items in the rest of this step. Decant the liquid; measure the volume of the liquid removed (e.g., with a graduated cylinder). Transfer the liquid into a clean (tared) jar, labeled with sample # plus the suffix "-L". Record the new weights of the liquid jar and of the original jar. Go directly to step 3.2.5c.
 - 3.2.5a. Decant most of the liquid (possibly by using a modified syringe) from the settled solids for each sample jar; measure the volume of the liquid removed (e.g., with a graduated cylinder). Transfer the liquid into a clean (tared) jar, labeled with sample # plus the suffix "-L". Record the new weights of the liquid jar and of the original jar. Leave enough liquid to transfer the solids.

- 3.2.5b. Gather the solids from the sample jar into a tared 50 mL centrifuge cone that is labelled with the sample #. Centrifuge the cone, decanting the liquids into the liquid sample jar (see step 3.2.5a). If necessary to collect solids from different cones, use a minimum of supernate from that sample (collected in step 3.2.5a) to slurry the solids into one cone and recentrifuge that cone, decanting the liquid into the liquid sample jar. Weigh the cone before and after adding the additional supernate.

Note on Centrifugation:

Cones will be centrifuged at approximately 2000 rpm (300 G force) for 30 minutes. Volumes of centrifuged solids will be recorded. Sharp, complete solids/liquid separation may not be achieved. This is acceptable as this test simulates tank behavior, where complete separation is unlikely to be achieved. Supernatant liquid will be decanted into liquid sample jars, and the cones will be re-weighed.

- 3.2.5c. Weigh and record all masses of jars and cones (and cone volumes); calculate net masses and volumes of the solids and liquid from each sample jar on the data sheets to determine the weight percent (wt%) and volume percent (vol%) centrifuged solids (include the liquid decanted from the settled solids in the calculation). Mix the solids and the liquid separately.
- 3.2.6. Archive a subsample of at least 20 mL from any sample where no archive was prepared using step 3.2.4a.
- 3.2.6a. Mix the solids from the sample, then add enough solids to the tared archive vial so that the archive sample will contain approximately the same wt% of solids as the original sample. Then add the proportionate amount of liquid (mix liquid before sampling) and mix.
- 3.2.7. Make up a composite of the centrifuged solids. Homogenize the solids. The composite is prepared by combining representative fractions of the solids from each level. Prepare the composite so that the mass fraction of solids in the composite from any sample is equal to the ratio of the mass of centrifuged solids from that sample to the total mass of centrifuged solids from all samples.
- 3.2.8. Prepare a liquid composite. Homogenize the liquid. The composite is based on mass of each sample's liquid compared to the sum of the liquid for all samples (the same way as for the solids in step 3.2.7).

- 3.2.8a. When the volume is greater than 450 mL, use the large "privatization" homogenizers for the liquid composite collection/mixing.
 - 3.2.8b. The liquid composite(s) will be divided into tall 500 mL sample jars for ease in handling with hotcell manipulators.
 - 3.2.9. Submit 6 vials containing liquid composite subsamples (there are 3 subsamples, each consisting of approximately 40 mL divided between 2 vials for different tests) for the analyses in Table 3 of the Tank Sampling and Analysis Plan (TSAP) (Benar 1998), which is derived from the second column of Table 7.1 of the DQO (Wiemers 1997). Each of the 3 subsamples will be analyzed in duplicate. The analyses include measuring the wt% solids (gravimetric).
 - 3.2.10. Submit 3 solid composite subsamples (6 to 8 g each) for the analyses found in Table 2 of the TSAP (Benar 1998), which is derived from the first column of Table 7.1 of the DQO (Wiemers 1997). Both fusion and acid digests should be performed (by request of Wiemers et al.). Each digest should have all the "digest" analyses done. The analyses need not be done in duplicate. The analyses include measuring the wt% solids (gravimetric).
 - 3.2.11. Archive at least 50 mL of liquid composite; record the bottle so reserved.
 - 3.2.12. Archive at least 20 mL of solid composite; record the bottle so reserved.
 - 3.2.13. Archive any material not to be used for the solubility screening tests; record the bottle identifiers in the test notebook.
- 3.3 Solubility Screening Test Overview

The experiment listed below will indicate the effects of dilution for waste material from the level with the highest solids/liquid ratio. Dissolving the soluble solids in this material will require the largest amount of diluent (provided that the Ksp values are sufficiently independent of the ionic strength). Additional chemical analyses of the solids may be requested by the chemist in consultation with the Tank Coordinator (B. Simpson).

3.4 Solubility Screening Test Job Steps

- 3.4.1. Tare and label ("IAW-98-Test #") five tall jars of the appropriate size (e.g., 125 to 500 mL). Consider the following when choosing the size. The jar size should be around 1.3 to 2.5 times as large as the volume after the dilution in step 3.4.2, in order to accommodate shaking the diluted material. The volume of solids/liquid composite before dilution can be estimated from the mass of the composites available after preparing archive samples and the samples for analysis; the estimate also depends on the desired solids/liquid mass ratio and the composite density.

Notes on Sample Transfer Technique

Per Wiemers (1997) Section 7.3, any rinsing of containers for the purpose of sample transfer should be done using a minimum amount of separated liquid (weigh the container before and after adding the separated liquid).

- 3.4.2. Add solid composite and liquid composite by mass to the jars in the same solids/liquid mass ratio as the maximum ratio found for the levels sampled. The ratio for each level is the average of the ratios calculated from the wt% centrifuged solids for all samples from that sampling depth. For the undiluted cones, use a smaller mass of solid composite (e.g., 20 g). For the dilution tests use a larger amount of solid composite (e.g., 80 g).
 - 3.4.2a. Test 1: 100 parts (by mass) solids/liquid composite, plus 25 parts (by mass) diluent (inhibited water).
 - 3.4.2b. Test 2: 100 parts (by mass) solids/liquid composite, plus 75 parts (by mass) diluent (inhibited water).
 - 3.4.2c. Test 3: 100 parts (by mass) solids/liquid composite, plus 100 parts diluent (inhibited water).
 - 3.4.2d. Test 4: 100 parts (by mass) solids/liquid composite with no dilution.
 - 3.4.2e. Test 5: 100 parts (by mass) solids/liquid composite with no dilution.
 - 3.4.2f. Inhibited water is 0.01 M NaOH and 0.01 M NaNO₂ (sodium nitrite).
- 3.4.3. Mix for 24 hrs.
 - 3.4.3a. Shake vigorously every hour during normal working hours. Since the compositing will take some amount of time, it is expected that the shaking will begin on one day with several shakings and end 24 hours later after some additional shakes during working hours.
- 3.4.4. Settle for a minimum of 72 hrs.
 - 3.4.4a. Record hotcell ambient temperature at several times during solubility screening. Record observations of solids properties and gelation.
 - 3.4.4b. Measure the amounts of settled solids (vol%) at several times during the period (e.g., at 1, 2, 4, 20, 24, 28, 48, and 72 hrs).

Note to steps 3.4.3 and 3.4.4:

The times have been changed from the original version of the DQO (Wiemers 1997) by agreement with the customer for operational and settling test experience reasons.

- 3.4.5. Separate the solids and liquids.
 - 3.4.5a. Decant most of the liquid fraction from each test; measure the volume of the liquid removed. Transfer the liquid into a clean (tared) jar labeled "IAW-98-Test #-L". Leave enough liquid to transfer the solids.
 - 3.4.5b. Gather the solids from the test jar into a tared centrifuge cone that is labelled "IAW-98-Test #" (use suffix "-B" if a second cone is needed). Centrifuge the cone, decanting the liquids into the liquid fraction jar (see step 3.4.5a). If necessary to collect solids from different cones, use a minimum of supernate from that sample (collected in step 3.4.5a) to slurry the solids into one cone and recentrifuge that cone, decanting the liquid into the liquid jar. Weigh the cone before and after any supernate addition.
 - 3.4.5c. Measure and record the volumes and masses of the solids and liquids.
- 3.4.6. Submit an aliquot of solids (mix well first) of each test for analyses in Table 2 of the TSAP (Benar 1998), which is derived from the first column of Table 7.1 of the DQO (Wiemers 1997). The analyses include measuring the wt% solids (gravimetric). If there is only a small amount of solids after any dilution test (e.g., less than 1 g), do step 3.4.8 in place of this step.
- 3.4.7. Submit an aliquot of the separated liquids (mix well first) from each test for the analyses in Table 2 of the TSAP (Benar 1998), which is derived from the first column of Table 7.1 of the DQO (Wiemers 1997).
- 3.4.8. At the discretion of the chemist in charge, in consultation with the customer (B. Simpson), other tests may be performed. This can help identify the solids, especially if the amount of solids remaining is insufficient for the full suite of tests. Possible other tests are X-Ray Diffractometry, Polarized Light Microscopy (PLM), and Scanning Electron Microscopy/Energy Dispersive Spectroscopy.

4.0 DATA INTERPRETATION

4.1 Chemical Data

Chemical analyses of centrifuged liquid and solid phases will be used to develop knowledge of the chemical properties of the solid phase. With analyses of both phases, it will be possible to calculate the contribution of the interstitial liquid to the centrifuged solids and to provide a composition of the true solid phase. Knowledge of which solid phases are present as a function of dilution ratio should provide the information needed to explain the physical (solubility) data.

As a first approximation, the assumption will be made that all of the water in the centrifuged solids can be attributed to interstitial liquid. If the calculations and/or PLM results suggest that the true solid phase contains some salts that are highly hydrated [e.g. $\text{Na}_7\text{F}(\text{PO}_4)_2 \cdot 19\text{H}_2\text{O}$], then an iterative calculation may be required to distribute the water in the centrifuged solids between the true solid phase and the interstitial liquid phase.

The list of analytes from the ICP that will be reported will be longer than those requested (per "opportunistic" analysis memo [Kristofski 1996]), and include the "less-than" elements. This will allow the full set of the Privatization envelope specifications (analyte:sodium mole ratios) to be evaluated.

4.2 Quality Assurance

Based on the requirements in "Review and Approval of Documents", HNF-PRO-233, this test plan is assigned Approval Designator E. Approval signatures are required from the author, immediate manager, Environmental Compliance reviewer, and the customer.

Analyses that do not meet the QA requirements of the DQO (Section 7.6 of the DQO [Wiemers 1997]) will either be rerun or reported as not meeting the requirements in the final report. Analytical QA will meet the requirements of the 222-S Lab QA plan (Markel 1998) as modified by the DQO [Wiemers 1997] and the TSAP (Benar 1998).

All compositing and solubility screening tests will follow the "Process Chemistry & Statistics Quality Assurance Plan", WHC-SD-CP-QAPP-018, Rev. 0 (Meznarich 1996). The instructions will be recorded in a controlled laboratory notebook before work begins; observations and data will be recorded as the work is done. Example data sheets are shown in Appendix A. Minor changes to the work (as determined by the chemist in charge) will be noted in the laboratory notebook and in the test report. Substantive changes to the work will be reviewed by the author, immediate manager, and the customer at a minimum. Changes that need to be reviewed by Radiological Control or Environmental Compliance or other entities will have those additional reviews before the changes are implemented.

5.0 SAFETY

All of the safety requirements that apply to this test plan are described in "Development of Instrumentation, Methods and Performance of Process Testing", Hanford Analytical Services Laboratory Operating Procedure LO-140-100.

6.0 WASTE HANDLING

Three waste streams are expected to be generated from this test program. Stream #1 is the waste resulting from analysis of samples. Each waste generated from these routine analyses will be handled in accordance with the instructions in the procedures for the respective analyses.

Stream #2 is the used and left-over tank waste material. This material, expected to be less than 1 kg, will be discarded to the 219-S Building tanks via a hotcell drain, per procedure LO-100-107, "Cubicle Housekeeping, Waste Disposal, and Management". This disposal will only be completed after 101-AW material is found to be below regulatory concern for PCBs.

Stream #3 is the solid hotcell waste consisting of used centrifuge cones, used sample vials, used plastic syringes, etc. After the 101-AW material is found to be below regulatory concern for PCBs, this waste will be rinsed with water, loaded into waste cans, removed from the hotcell, and disposed of according to LO-100-151, "Segregate and Manage Solid Laboratory Wastes".

If the 101-AW material is above regulatory concern for PCBs, all waste streams will be managed and disposed of according to LO-100-114, "Management of Polychlorinated Biphenyl (PCB) at the 222-S Laboratory Complex".

Other than the waste streams described here, there will be no accumulating of hazardous waste. The Waste Compatibility Review is attached as Appendix B. The Waste Stream Fact Sheet (listing the components of the diluent added to the waste) is attached as Appendix C.

7.0 SCHEDULE AND DELIVERABLES

This test plan should be issued by August 4, 1998. Laboratory work should begin by August 20, 1998.

A complete report of the test results will be issued by Process Chemistry in the form of an internal memo to 222-S Laboratory. Informal interim status reports will be given to the customer (via cc:mail or teleconference) at the customer's request. An electronic version of the report and associated data spreadsheets will be provided to the customer. The 222-S Laboratory will issue a Format IV report (per the TSAP, Benar 1998) that will include Process Chemistry's report.

8.0 REFERENCES

- Brevick, C. H., Stroup, J. L., and Funk, J. W. (1997), *Historical Tank Content Estimate for the Southeast Quadrant of the Hanford 200 Areas*, HNF-SD-WM-ER-350, Rev. 1, Fluor Daniel Northwest Inc., Richland, Washington.
- Benar, C. J. (1998), *Tank Characterization Report for Double-Shell Tank 241-AW-101*, WHC-SD-WM-ER-545, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- Benar, C. J. (1998), *Tank 241-AW-101 Privatization Grab Sampling and Analysis Plan*, HNF-2379, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.
- Benar, C. J. (1997), *Tank 241-AW-101, Cores 132 and 139 Analytical Results the Final report*, WHC-SD-WM-DP-192, Rev. 1, Rust Federal Services of Hanford Inc., Richland, Washington.
- Hanlon, B. M. (1997), *Waste Tank Summary Report for Month Ending September 30, 1997*, HNF-EP-0182-114, Lockheed Martin Hanford Corporation, Richland, Washington.
- Herting, D. L. (1998), *Test Plan for Tank 241-AW-101 Dilution Studies*, HNF-2239, Rev. 0, Numatec Hanford Corporation, Richland, Washington.
- Jones, T. E., R. T. Winward, and M. J. Kupfer (1997), *Tank Characterization Report for Double-Shell Tank 241-AW-101*, WHC-SD-WM-ER-470, Rev. 0A, Appendix H, Lockheed Martin Hanford Corporation, Richland, Washington.
- Kristofski, J. G. (1996), *Directions for Opportunistic Analyses*, memo 75310-96-168 to J. H. Baldwin, et. al., September 11, 1996, Westinghouse Hanford Company, Richland, Washington
- Markel, L. P. (1998), *222-S Laboratory Quality Assurance Plan*, HNF-SD-CP-QAPP-016, Rev. 3, Rust Federal Services Hanford Inc., Richland, Washington.
- Meznarich, H. K. (1996), *Process Chemistry & Statistics Quality Assurance Plan*, WHC-SD-CP-QAPP-018, Rev. 0, Westinghouse Hanford Company, Richland, Washington.
- Person, J. C. (1998a), *Test Plan for Tank 241-AW-102 Solubility Screening Tests*, HNF-2516, Rev. 1, Numatec Hanford Corporation, Richland, Washington.
- Person, J. C. (1998b), *Test Plan for Tank 241-AW-107 Solubility Screening Tests*, HNF-2910, Rev. 0, Numatec Hanford Corporation, Richland, Washington.
- Wiemers, K. D. (1998), *Low Activity Waste Feed Data Quality Objectives*, WIT-98-010, Pacific Northwest National Laboratory, Richland, Washington.

APPENDIX A: EXAMPLE DATA SHEETS

Solids/Liquid Separation

Date: _____

Sample # 1AW-98: _____	Different Columns for Values at Different Times				
Gross wt, original sample jar, g	Check wt (20.00/500.0 g), g:				
Tare wt, original jar, g					
Net sample wt, g					
Date/Time					
Temperature, °C					
Total sample height, cm					
Settled solids height, cm					
Settled solids vol%					
Wt after decant liquid, sample jar, g					
Wt liquid removed, sample jar, g					
Wt residue (and tare error), g					
Volume liq decanted to grad cyl _____ mL	Add to grd cyl	Add to Lcomp	Mass of liq	SpG =	
Wt graduated cyl + liquid, g					
Empty wt, grad cyl, g (after _____, after dump, tare)					
Wt liq, g (added to cyl, added to lcomp jar, mass of liq)					
Solids cone _____					
Gross wt, g					
Tare wt, g					
Wt of solids/liquid in cone, g					
Total volume in cone, mL					
Cone wt after c-liquid decant, g					
Wt of c-liquid, g					
Wt of centrifuged solids, g					
Volume of centrifuged solids, mL					
Density of centrifuged solids, g/mL					
Volume, c-liquid decanted, mL					
Density of centrifuged liquid, g/mL					
Total volume liquid, mL					
Total wt liquid, g					
Density of total liquid, g/mL					
Solids/liquid ratio					
Wt% centrifuged solids					
Vol% centrifuged solids					

Solubility Screening Test: Prepare Mixture, Dilute, Settle. Date:

Prepare mixture using desired solids/liquid ratio (SLR= _____)					
IAW-98-	Test 1	Test 2	Test 3	Test 4	Test 5
Solid+jar, g					
Tare, g					
Solid, g					
Solid/SLR					
Desire wt, g					
Actual wt, g					
Liquid, g					
Liq+solid, g					
Solid/liq					
Dilute with 0.01 M NaOH + 0.01 M NaNO2					
Dil. factor	0.25	0.75	1.00	0.	0.
Desire liq,g					
Desire wt, g					
Dil+liq+sol					
Diluent, g					
Dil. factor					
Mix for 24 hrs. Note shake times, also a few settled solids ht + total ht. Time: Temp°C: Test 1: Test 2: Test 3: Test 4: Test 5: Settle for 72 hrs, note settled solids ht (SSH) + total ht (TH)					
Date/Time/°C	SSH/TH,#1	SSH/TH,#2	SSH/TH,#3	SSH/TH,#4	SSH/TH,#5

Solubility Screening Test: Solid/Liquid Properties.

Date:

Properties of solids after dilution.					
1AW-98-	Test 1	Test 2	Test 3	Test 4	Test 5
Wt liq + sol + jar, g					
Tare test jar, g					
Wt liq + sol, g					
Wt test jar + resid, g					
Vol%, set sol					
Cone Label					
Liq vol cone, mL					
Wt liq + cone, g					
Tare cone, g					
Wt liq in cone, g					
SpG liq in cone					
Empty cone liquid into "-L" jar, weigh. Decant any additional liquid to "-L" jar -- end with liquid + solids in cone.					
Wt liq + -L jar, g					
Tare wt -L jar, g					
Wt liq + decant liq, g					
Wt decant liq, g					
Vol decant liq, mL					
Vol liq + sol (cone), mL					
Wt liq + sol + cone, g					
Wt solids + cone, g					
Wt c-liq, g					
Wt c-sol, g					
Vol c-sol, mL					
Vol c-liq, mL					
SpG c-liq (final cone)					
SpG c-sol					
Tot vol, liq + sol, mL					
Total wt, g					
Tot vol liq					
Tot wt liq, g					
Tot liq SpG					
Solids/liq					
Wt% c-sol					
Vol% c-sol					

APPENDIX B: WASTE COMPATIBILITY REVIEW**COMPATIBILITY REVIEW**

PROCEDURE NUMBER: HNF-2909, Rev. 0 (Tank 101-AW Solubility Screening Tests)

CHEMICALS OF CONCERN IN WASTE STREAM**MAXIMUM CONCENTRATION**

NaOH (sodium hydroxide)

0.007 M

NaNO₂ (sodium nitrite)

0.007 M

COMPATIBILITY HAZARDS, INCLUDING SPECIAL STORAGE REQUIREMENTS, POSSIBLE REACTIONS, AND RESULTS OF MIXING INCOMPATIBLE WASTE STREAMS

None, as NaOH and NaNO₂ are present within the waste at concentrations much greater than the concentrations added (tank 101-AW liquid waste contains about 5.3 M NaOH and 2.2 M NaNO₂).

RECOMMENDED WASTE STREAMS

See section 6.0 of Test Plan. Procedure LO-100-107 is followed for waste disposal and management of waste stream #2 (used and left-over tank waste material) in the hotcell. Procedure LO-100-151 is followed for waste disposal and management of waste stream #3 (solid waste, such as used centrifuge cones, etc.) in the hotcell.

CONTAINER MATERIAL

glass or plastic

REFERENCE DOCUMENTS USED IN COMPATIBILITY STUDY

none required

J. C. Person

Technical Authority



7/21/98

Date

J. R. Jewett

Reviewer



7/29/98

Date

APPENDIX C: WASTE STREAM FACT SHEET

222-S LABORATORY
DEVELOPMENTAL METHOD WASTE STREAM FACT SHEET

CONSTITUENTS OF WASTE GENERATED	CAS NUMBER	APPROXIMATE WEIGHT %
NaOH (sodium hydroxide)	1310-73-2	0.02
NaNO ₂ (sodium nitrite)	7632-00-0	0.04
Waste Codes: F001-F005	Waste Class: DW	
Disposal: Cubicle Hotcell Drains	Waste Container: None	
<p>Comments:</p> <p>Tank Farm listed waste must include F001-F005 waste codes.</p> <p>No Waste Stream Label required. Waste generated from this test plan will be disposed down cubicle hotcell drains, after material is found to be below regulatory concern for PCBs.</p>		
<p>Intended Use:</p> <p>Solubility screening tests of tank waste.</p>		
Approvals - print name, sign, and date		
<p>Authorized By J. C. Person</p>	<p><i>J.C. Person</i> 8/3/98</p>	
<p>Environmental Compliance Officer (or delegate) G. J. Warwick</p>	<p><i>G.J. Warwick for G.J. Warwick</i> 8/4/98</p>	

Procedure No.	Developmental Method No.	Waste Stream Type	Waste Stream No.	Page No.
L0-140-100	DM13	Aqueous	2	1

DISTRIBUTION SHEET

To Distribution	From J. C. Person	Page 1 of 1
		Date July 29, 1998
Project Title/Work Order Test Plan for Tank 241-AW-101 Solubility Screening Tests		EDT No. 620351
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
J. Y. Bourges	T6-07				
K. G. Carothers	R2-11				
P. J. Certa	H5-61				
R. A. Esch	T6-12				
K. M. Hall	R2-12				
D. L. Herting	T6-07				
V. L. Hunter	K7-97				
J. R. Jewett	T6-07				
R. A. Kirkbride	H5-27				
J. L. Kovach	K6-51				
J. C. Person (5)	T6-07				
C. M. Seidel	T6-14				
B. C. Simpson	R2-12				
M. J. Truex	K2-10				
K. D. Wiemers	A0-21				