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7. Abstract

This SD documents the preliminary work performed during the effort to better understand the magnitude and nature of transuranic (TRU) and/or complexed wastes contained in the 200 West Area single shell tanks (SSTs). This preliminary work identified which of the SST interstitial liquids in question had adequate characterizations and performed a limited compatibility assessment based upon those characterizations. This allowed a determination of the TRU activity in the liquid and the waste type which describes the liquid. The waste type, complexed or non-complexed, was determined by a calculated total organic carbon (TOC) concentration when the waste containing the measured TOC value is evaporated to the composition of double-shell slurry feed (DSSF). DSSF was defined as the concentration at which aluminum bearing solids begin to precipitate (the sodium aluminate boundary), or when the OH^- concentration reached 8.0 M as determined by the PREDICT evaporator simulation program. Two sets of results are presented. The first set identified only those tanks with adequate characterization data, and listed the remaining tanks as unknowns. These results have the higher level of confidence. The second result set used engineering judgement to estimate applicable characterization data where none existed. This allowed a tentative classification to be made for all but one of the tanks considered unknowns from the first result set. These results may have utility if decisions must be made in the absence additional, improved waste characterizations. This information was used in developing the follow-on laboratory testing to more precisely define the magnitude and specifics of the compatibility problems.

8. RELEASE STAMP

CONTENTS

LIST OF TABLES

LIST OF TERMS

CC	complexed concentrate
DCRT	double contained receiver tank
DSS	double-shell slurry
DSSF	double-shell slurry feed
gm	gram
HEDTA	N-hydroxyethyl-ethylenediaminetriacetic acid
kgal	one thousand gallons
M	molar
mmHg	millimeters mercury
nCi	nanocuries
pH	negative base 10 log of the hydogen ion concentration
SpG	specific gravity
SST	single-shell tank
TOC	total organic carbon
TPA	Tri-Party Agreement
TRU	transuranic
TWRS	Tank Waste Remediation System
WVRF	waste volume reduction factor

1.0 SUMMARY

This study performed the first in a series of waste compatibility assessments with respect to organic and transuranic (TRU) concentration in the 200 West Area salt well wastes. These considerations are of importance to interim stabilization activities due to the tank farm facility configuration and to the established interim stabilization schedules. A preliminary screening of the 26 single shell tanks (SSTs) still remaining to be interim stabilized in the 200 West Area was performed. The interstitial liquids contained in these tanks were analyzed to determine their TRU activity and classification according to total organic carbon (TOC) concentration. Two sets of criteria were used in determining the results. The first criteria set was the most restrictive in that it required characterization data adequate for the needs of the calculational method used. Such characterizations were all subsequent to 1989. In this case, conclusions were reached on only 18 of the 26 tanks since the remaining eight did not possess adequate characterizations and could not be sampled via normal grab sampling methods due to tank configuration or waste consistency. Of the 18 tanks successfully screened, 13 were identified as non-complexed, four were identified as complexed, and one identified as both complexed and TRU. The second criteria set allowed engineering judgement to estimate results using the aged and incomplete characterization data available for the eight unidentified waste liquids from the first criteria set. This method yielded estimated results for seven of the eight unidentified tanks. The second criteria set showed 18 tank liquids to be non-complexed, six to be complexed, and, as before, one tank liquid to be complexed and TRU. This document outlines these screening methods and discusses follow-on activities and possible implications for interim stabilization activities.

2.0 INTRODUCTION

The Tri-Party Agreement calls for the stabilization of all SSTs by September 30, 2000. With the current WHC interpretation of DOE Order 5820.2A as it applies to tank farm operations, the 200 West Area SSTs present a number of difficulties for achieving this milestone. There is only one useable double-shell tank (DST) in the 200 West Area which can receive salt well liquids. This tank (102-SY) contains sludge with high TRU content. It is suspected that the salt well liquids remaining to be pumped in the 200 West Area are described as both non-complexed as well as complexed wastes. Varying levels of TRU contamination are also suspected in the wastes.

Current grab sample analysis data coupled with the current WHC interpretation of DOE Order 5820.2A indicates that significant and involved waste management decisions will be required in the near term to maintain hopes of meeting committed milestones for the interim stabilization of Hanford SSTs by September 30, 2000. 26 SSTs in the 200 West Area were evaluated in this study to refine the understanding of the implications of current Tank Farm waste management practices. Of these 26 SSTs, nine remain unsampled due to unforseen difficulties which occurred during the sampling events. Of the 18 currently sampled tanks, three classes of wastes types were identified. Of the tentatively identified salt well wastes in these tanks, 13 were non-complexed, four were complexed, and one was both complexed and TRU. Current WHC waste management practice calls for keeping these three waste types segregated from one another. A complete evaluation of the compatibility of the three waste types with the heel in the DST used for staging the waste for cross-site transfers (102-SY) could not be accomplished in this study. However, the four complexed waste tanks indicate the potential for incompatibility with tank 102-SY, justifying the need for further study of these wastes.

The problem with the different classifications (complexed vs non-complexed; TRU or not TRU) is that numerous incompatibilities may exist between the salt well wastes themselves, and between the salt well wastes and the sludge in the DST receiver tank (102-SY). The latter concern arises from the possibility of complexants in the salt well wastes mobilizing the TRU present in the sludge of tank 102-SY. Even if all the salt well wastes can be shown as compatible with the sludge in tank 102-SY, incompatibilities between different salt well liquids may still cause difficulties with the SST stabilization schedule. This is due to the projected volume of liquids to be pumped (~4 million gallons) as well as the projected pumping times required (approaching 2 yrs for some SST's). Since only one type of waste can be accumulated in a double contained receiver tank (DCRT) and the receiver tank 102-SY at any one time, pumping two types of wastes will require a coordinated and sequenced stabilization plan such that sufficient time is allotted to pump all the tanks by 9/30/2000 yet maintain segregation of the wastes types passing through the DCRT's and tank 102-SY.

3.0 DISCUSSION

3.1 STATEMENT OF THE INTERIM STABILIZATION PROBLEM

Problems interfering with the smooth performance of interim stabilization activities in the 200 West Area are numerous. At once, the size of the task is an obvious problem. There are 26 SSTs containing no less than 4 million gallons of highly saturated pumpable waste liquids. The pumping times estimated for at least some of the tanks is on the order of up to two years. The current overall Tri-Party Agreement (TPA) milestone date for interim stabilization is September 30, 2000. Multiple compatibility problems may exist between the liquid wastes in the 26 SST's to be pumped, and between these wastes and the wastes in tank 102-SY. Finally, a problem is presented by the fact that all the wastes must currently pass through tank 102-SY in order to be transferred cross-site to the 200 East Area DST's. If any waste segregation issues must be adhered to, tank 102-SY will be tied-up in receiving different waste types in batches. When maximum tank pumping times are considered, sequential accumulation of different waste types in tank 102-SY, if such accumulation will be allowed at all, may require changes to interim milestones and in worst cases, may not be achievable at all. Reynolds (WHC 1995g) contains additional information on the subject.

3.1.1 SST Liquid Volumes, Pumping Duration, Schedules

The current interim stabilization schedule for achieving the associated milestone was devised based on a grouping of tanks with equivalent watch list designations. The schedule relies on two major assumptions for salt well wastes in the 200 West Area:

1. All of the salt well wastes can be routed through tank 102-SY.

2. Salt well wastes from a large number of tanks can be commingled.

Due to the schedule constraints and the tank farm geometry, the following facts are evident:

1. Most of the applicable SSTs in 200 West Area have on the order of 100 - 200 kgal of pumpable liquids remaining and it is estimated that pumping periods of two years or longer may be required to interim stabilize any given tank.

2. The current pathway for the salt well wastes to be pumped to 200 East Area is through tank 102-SY. If waste compatibility considerations result in the need to maintain segregation of different waste types, even under ideal conditions, two or even three sequential periods of up to two years or so in length may be required.

As an example, all of the non-complexed tanks could begin pumping first. Ideally, in about two years, the non-complexed SSTs could be interim stabilized. Next, the complexed waste tanks (if segregation is deemed necessary for them yet they can be mixed with tank 102-SY) could begin pumping and ideally, in two years, the complexed waste tanks could be interim stabilized. Finally, the complexed & TRU tank (currently identified as comprising tank U-106 only) could repeat the same process. Assuming it takes two years to interim stabilize tank U-106, the total elapsed time is about six years minimum, which will fail the current milestone criteria.

3.1.2 Issues with TRU and/or Complexed Waste

It is generally accepted that complexed waste is more difficult, and therefore more costly, to deal with in the DST system when compared with non-complexed waste. The current interpretation of DOE Order 5820.2A (WHC 1995a, 1995b) indicates that waste which is TRU will be more expensive to prepare for ultimate disposal than waste which is not. The interpretation is that generation of additional TRU waste is not allowed, and if a waste transfer operation indicates the risk of such an occurrence, a technical evaluation must be performed to verify that TRU segregation is not jeopardized. The risk of violating TRU segregation is largely indicated by the total organic carbon (TOC) content of the interstitial liquids in the SST's. If organic complexants comprise a portion of the TOC content in tank waste, it is likely that the complexants will be largely solubilized in the aqueous phase of the wastes (WHC 1995c). This indicates that liquids which have significant TOC concentrations pose a risk of TRU mobilization when combined with solids of high TRU activity, as would occur if such SST wastes were transferred to tank 102-SY.

Complicating matters is the term "complexed" waste, which does not necessarily mean the waste can mobilize TRU elements. The term "complexed" refers to those waste types which exhibit specific behaviors upon volume reduction. This term means that the waste cannot be subject to the same amount of volume reduction as non-complexed waste without incurring undesired or even untenable slurry properties. Historically, non-complexed wastes have been reduced in volume to a concentration known as double-shell slurry (DSS), which represents a near maximum dewatering of the salt wastes while still retaining fluid-like properties. DSS waste is produced from the evaporation of double-shell slurry feed (described later) past the aluminate solubility boundary. This waste is high in aluminates, highly viscous, gelatinous and does not normally separate into solids and supernate layers (WHC 1989).

DSS produced in the past is typically considered to have a specific gravity (SpG) of around 1.5. Although creation of DSS is now disallowed due to its gas retention behavior, this degree of concentration is possible with non-complexed wastes because as salt crystals nucleate during volume reduction, the individual crystals can grow freely until the end point upon further volume reduction. Because the crystals which form can grow without hinderance, the liquid which remains maintains a relatively non-viscous behavior up until the allowable concentration limits (i.e., DSS, where so many solids have formed that little effective settling occurs).

The problem attributed to complexed wastes is that they contain materials which inhibit the sort of crystal formation which occurs for non-complexed waste. In complexed wastes, the these materials interact with a nucleated salt crystal to largely prevent its continued growth. When this occurs during the volume reduction process, the complexed waste is immediately driven to supersaturation. Since the supersaturation cannot be relieved by continued crystal growth, formation of many more nucleation sites rapidly occurs throughout the entire volume of the waste. Since the nucleation sites are so numerous and closely spaced, they experience unknown interactions either between themselves or the solution itself. This interaction essentially results in highly viscous substance described typically as a gel which usually cannot be pumped. In addition, this gel formation occurs at a volume reduction which is significantly less than that achievable during DSS formation.

Tank Farms has defined a quantitative measure which indicates when a waste may be considered complexed. As stated earlier, this measure, which comprised the large part of the compatibility assessment documented herein, is defined as the concentration of TOC in a waste if it were evaporated to double-shell slurry feed (DSSF) composition. DSSF is defined as either the concentration at which aluminum compounds begin to precipitate in the waste (WHC 1989, RHO 1985), a concentration of 8 M hydroxide (RHO 1985), or concentration to a slurry with 30% more volume than DSS waste (WHC 1989). If the TOC concentration of the waste is > 10 g/L at the DSSF composition, the waste is indicated to be complexed (WHC 1995a, 1995b).

When complexed waste itself is evaporated to the maximum extent, it is known by the term complexed concentrate (CC). CC is defined as the waste which results from evaporating dilute complexed waste to the point of solids formation (WHC 1989). It has been found that the viscosity of complexed waste increases very rapidly when solids are allowed to form (WHC 1989). The materials attributed to this adverse behavior upon volume reduction of complexed wastes are thought to be certain organic compounds, but this statement is only supposition at present. The definition of CC waste implies that if a complexed waste is limited in volume reduction such that no solubility limits are exceeded, solids formation and the attendant high viscosity problems will be avoided.

Review of 242-A Evaporator Post-Run Documents (RHO 1984; RHO 1982; RHO 1981) regarding campaigns which produced CC waste support the implication of the CC waste definition. In these campaigns, the complexed feed wastes were evaporated to a concentration just short of where solids precipitation was experimentally determined to occur. This was indicated by supporting boil-down testing of the feed wastes. The resulting CC wastes had specific gravities and constituent concentrations similar to those of the interstitial liquids contained in the 200 West Area SST's. The CC wastes produced reported specific gravities in the range of 1.25 - 1.40, hydroxide molarities of about

0.5 to 2.0, nitrate molarities of about 2.0 to 4.0, nitrite molarities around 1.0, aluminate & carbonate molarities of about 0.5, phosphate and sulfate molarities of about 0.05 molar, and TOC concentrations up to 30 g/L.

The disadvantage of complexed waste is that its achievable waste volume reduction factor (WVRF) is almost always less than that achievable with non-complexed waste (WHC 1995a). The WVRF is a fractional value expressed as a percentage. It is defined as 100(1-Vc/Vd) where Vc is the volume of the waste before concentration and Vd is the volume after concentration (WHC 1989). However, with the current evaporator operating criteria, the limiting SpG of wastes concentrated by the evaporator is 1.35. This limit was established to protect against the production of wastes which may retain significant amounts of gas. If a waste entering the DST system already has a SpG of 1.35 or higher, the distinction between complexed and non-complexed wastes becomes less clear.

3.1.3 Facility and Geometry Problems

The DST configuration in the 200 West Area is the pinch point of the interim stabilization activities. Waste pumped from the SSTs in question, and the DCRTs which service them, must currently pass through tank 102-SY. Previous planning counted on there being no restrictions on mixing wastes from the SSTs in 102-SY. If wastes must be segregated from one another, simultaneous pumping of those wastes may not be possible with the current tank configuration. Possible solutions to this scenario could be a waiver to or reinterpretation of DOE Order 5820.2A, a milestone schedule renegotiation, or an infrastructure upgrade. Additionally, if the SST wastes are deemed incompatible with wastes in tank SY-102, possible solutions will be restricted to a waiver of DOE Order 5820.2A, an infrastructure upgrade, or 102-SY solids retrieval.

Currently, tank 102-SY has a 25 HP flex and float pump which is used to transfer its contents cross-site. The pump impeller is located 210" above the tank bottom, but the floating pump suction can draw liquid from any level so long as the pump remains primed. Therefore, it is necessary to accumulate a volume of liquid at least to the 210" level to be able to establish prime and start the pump. Once started, the pump must not be stopped, or lose prime, until the desired liquid level is reached. If the pump stops, or prime is lost, before the desired liquid level is reached, the tank must be refilled to at least the 210" level to ensure prime before starting it again. Although the flex and float pump is capable of pumping liquid down to the sludge level, the currently specified lower liquid level pumping limit is 130". This level, based on historical pumping records, is a conservative limit intended to minimize the possibility of agitating and entraining any TRU solids in the pump suction. The solids-liquid interface in 102-SY is thought to be somewhere around the 50" level. The 130" pumping lower limit (~225 kgal liquid assuming the tank contains 133 kgal or ~50" of sludge) and the 210" pump start limit (~440 kgal liquid assuming the tank contains 133 kgal or ~50" of sludge) indicate that some cross-contamination of waste types may be unavoidable in the tank.

An ideal result would be that all of the non-complexed wastes in the SST's have been removed and transferred to tank 102-SY, and that the liquid level is above 210". Assume that the next liquid waste type to be pumped out of the SST's was complexed waste, and the total anticipated volume of this waste was in excess of 440 kgal. In this case, the current non-complexed liquid waste in tank 102-SY could be pumped down to the minimum level, potentially down to the sludge level. Then the complexed wastes could start accumulating in 102-SY with no, or minimized, cross-contamination of any remaining non-complexed wastes. Once 102-SY had received all the complexed wastes (and was above the 210" level) the complexed wastes could be completely pumped out. This sequence could maintain segregation of non-complexed and complexed waste as it is routed through 102-SY (neglecting TRU content or generation problems).

If the result was not so ideal (e.g., the liquid could not be pumped down to the sludge level, or there was not enough of one type of waste to fill the tank to the 210" level) some adverse cross contamination could occur. If any volume of the liquid waste types (complexed or complexed & TRU) exist in 200 West Area in volumes <440 kgal, some amount of cross contamination will be unavoidable in tank 102-SY, unless water could be used to raise the tank level to >210" in order to cross site a particular waste type. Any inadvertent blending of complexed with non-complexed waste is believed to indicate a resultant volume reduction penalty. In the case of TRU waste, this situation would constitute generation of additional of TRU waste volume in violation of DOE Order 5820.2A direction. An outcome of this is the tenet that dilution is not allowed as a method to reclassify a waste type.

3.2 PROCEDURE

The first step in defining the solution to these stabilization problems was determined to be finding the most up to date characterization of the pumpable liquids remaining in the SSTs still requiring interim stabilization. The requirement specified for this effort was that the grab sample analysis of the salt well liquid must have been subsequent to calendar year 1989. Data of this vintage has greater utility in permitting activities. Additionally, such analyses must contain no glaring inconsistencies and must provide sufficient characterization data to perform the characterization screening. Fortunately, the chronological requirements placed on the data satisfied largely satisfied the data requirements needed in this study.

DOE Order 5820.2A provides the accepted definition of TRU waste as waste containing > 100 nanocuries per gram (nCi/gm) activity from TRU elements (atomic number > 92 and half life > 20 years). in this analysis, TRU activity in the salt well liquid was defined as the combined activity contributed by two analyses: $^{239/240}Pu$ and ^{241}Am. If the activity represented by adding these two analysis was $\geq$100 nanocuries/gram waste liquid, the salt well waste is considered TRU waste.

Pretreatment and disposal activities may create TRU concerns beyond the definition of DOE Order 5820.2A. The Tank Waste Remediation System (TWRS) Process Flowsheet (WHC, 1995e) provides the current assumption that low level glass will be constrained to a sodium oxide loading of 0.25 gram per gram of glass. With this performance assumption, it is calculated that in order to produce glass with a TRU activity below 100 nCi/gm, that the TRU activity in the pretreated waste liquids cannot exceed 540 nCi per gram of sodium. Since the sodium concentration and specific gravity of the interstitial liquid wastes is known, the flowsheet limit can be compared to the limit per the DOE order to see which is most restrictive.

The screening method used to estimate whether the waste needed further testing to distinguish its complexed/non-complexed behavior was based upon the PREDICT (WHC, 1985) evaporator simulation program running to produce DSSF product with pressure controlled at 60 mmHg and receiver tank temperature specified at 37°C. PREDICT simulates concentrating the waste to the specified endpoint composition as would occur during evaporator operation. PREDICT defines DSSF as the concentration at which aluminum solids begin to precipitate (known as the aluminate boundary), or when the caustic concentration reaches 8 M. At the concentration endpoint, PREDICT reports the final concentrations of the chemical constituent in the final slurry composition and the resultant WVRF achieved for that run. PREDICT requires the following constituent concentrations to operate: molarity of hydroxide, aluminum, nitrate, nitrite, carbonate, phosphate, sulfate, fluoride, and the grams/liter TOC.

The quantity of interest in this application is the TOC concentration at the DSSF endpoint. If this value is ≥10 grams/liter TOC, the waste exhibits an indicator that it may be complexed. There is debate as to whether a PREDICT analysis indicating ≥10 grams/liter TOC at the DSSF composition is sufficient justification to reclassify a waste as complexed when it was historically considered non-complexed. Less questioned, however, is the use of the PREDICT result as an indication that further testing of the waste is justified.

No attempt at performing a mass or charge balance was made in collating the data required to use PREDICT. The results used in the program were derived from the results listed in the grab sample laboratory analysis report or the respective Tank Characterization Reports. Where available, averaged data was used. If no data were available for a particular analyte, a concentration of zero was used. Fortunately for such cases, a zero concentration represented both a rare occurrence and a not unreasonable result since it involved a phosphate, sulfate, or fluoride concentration.

It is widely debated how to best handle incomplete or inconsistent sample data in compatibility analyses. Various options are available, including those more technically elegant and detailed than the simple method applied here. However, simplicity and traceability are always lost when more sophisticated characterization models are applied. The logic of applying more complicated methods to a preliminary screening could also be questioned. The sample data used in this study revealed that reasonable laboratory analytical results were available for almost all of the required analytes in almost all of the 200 West Area SSTs with grab sample analyses subsequent to 1989.

Additional data of interest collected was the SpG of the salt well liquids, the estimated volumes of pumpable salt well liquids remaining in the tanks, and the sodium concentrations of the salt well liquids. As of this writing, eight of the subject SST's remain without post 1989 liquid characterization data. Despite recent sampling attempts to support resolution of 200 West Area SST complexed/TRU waste classification, solidified salts in the tank prevented obtaining liquid samples. A few of these eight tanks have enough pre-1989 characterization data to make estimates of their TOC and TRU concentrations (e.g., a TOC value > 10 g/l would indicate the waste is complexed as a TRU value > 100 nCi/gm would indicate the waste is TRU).

3.3 RESULTS

The results of this preliminary waste compatibility assessment for TRU waste per the DOE Order and complexed waste issues are shown in Table 1. Table 1 also summarizes the findings in two ways. The first method treats any tank that does not have characterization data more recent than 1989 as an unknown. This method identified 18 tanks and left 8 tanks as unknowns. The second method considers all available data and draws upon engineering judgement to assign waste classifications based upon reported TOC concentrations and/or TRU activities. This method identified 25 tanks while leaving only one unknown.

Table 2 shows a comparison of TRU activity limits based on:

1) The DOE Order 5820.2A definition.
2) An analysis of the waste sodium concentrations and the corresponding TRU activity limit for the low-level waste glass form.

It can be seen that the results of Table 2 vary by tank as to which of the criteria form the more restrictive limit. Tank U-106 is the only tank whose TRU activity exceeds both of these limits.

Results Neglecting Characterization Data Prior to 1989:

This interpretation of the results applies more rigorous criteria to assigning classifications to the waste types. this criteria leaves eight tanks unidentified.

Interstitial liquids which indicated no complexed waste/TRU waste related compatibility problems for commingling with each other and with the heel in tank SY-102:

S-101, S-102, S-103, S-106, S-107, S-108, S-109, S-110
T-104
U-107, U-108, U-111

Interstitial liquids which were indicated as complexed, requiring further testing to establish actual TRU complexing capability as well as the boil down based confirmation of the preliminary screening designation as complexed waste:

U-102, U-103, U-105, U-109

Interstitial liquids which were indicated as being both complexed as well as containing enough complexants to form a TRU waste, justifying additional testing to verify the results:

U-106

Tanks which require additional sampling to permit performance of a waste compatibility screening assessment for complexed waste/TRU waste issues:

S-111, S-112
SX-101, SX-102, SX-103, SX-104, SX-105, SX-106
T-110

Of the 16 tanks successfully analyzed in S, T, and U Farms, their historical waste classification indicates that their contents are non-complexed, listed as either non-complexed waste directly, or, as in the case of S-102, S-103, U-107, and U-111, listed as containing DSSF. In this respect, this waste compatibility screening of salt well liquids agrees with the historical waste classifications for tanks:

S-101, S-102, S-103, S-106, S-107, S-108, S-109, S-110
T-104
U-107, U-108, U-111

This screening indicated a contradictory classification for the liquid wastes contained in tanks U-102, U-103, U-105, U-106, U-109 which were indicated to be complexed when the historical classification indicates non-complexed waste. The major finding of this screening indicates that the salt well liquids of these tanks warrant further investigation.

Results Using All Available Characterization Data And Engineering Judgement:

If a call needed to be made immediately as to the classification of the interstitial liquids in question, enough limited characterization data exists to make a call on seven of the eight tanks which could not be classified by the criteria used above. This engineering judgement can be made by analysis of all historical data available on TRU activity and/or TOC content.

Interstitial liquids which indicated no complexed waste/TRU waste related compatibility problems for commingling with each other and with the heel in tank SY-102:

S-101, S-102, S-103, S-106, S-107, S-108, S-109, S-110, S-111
SX-101, SX-103, SX-104, SX-105
T-104, T-110
U-107, U-108, U-111

Interstitial liquids which were indicated as complexed, requiring further testing to establish actual TRU complexing capability as well as the boil down based confirmation of the preliminary screening designation as complexed waste:

SX-102, SX-106
U-102, U-103, U-105, U-109

Interstitial liquids which were indicated as being both complexed as well as containing enough complexants to form a TRU waste, justifying additional testing to verify the results:

U-106

Tanks which require additional sampling to permit performance of a waste compatibility screening assessment for complexed waste/TRU waste issues:

S-112

(this tank was so classified because no characterization data on TOC content or TRU activity could be found).

Of the applicable tanks in S, T, and U Farms, their historical waste classification indicates that their contents are non-complexed, listed as either non-complexed waste directly, or, as in the case of S-102, S-103, SX-102, SX-104, SX-105, U-107, and U-111, listed as containing DSSF. In this respect, this waste compatibility screening of salt well liquids agrees with the historical waste classifications for tanks:

S-101, S-102, S-103, S-106, S-107, S-108, S-109, S-110, S-111
SX-102, SX-103, SX-104, SX-105, SX-106
T-104, T-110
U-107, U-108, U-111

The historical classification of SX-101 indicates it contains dilute complexed waste.

This screening indicated a contradictory classification for the liquid wastes contained in tank SX-101 which was indicated as non-complexed when it was thought to be complexed, and in tanks U-102, U-103, U-105, U-106, U-109 which were indicated to be complexed when they were thought to be non-complexed. Additionally, no waste type could be defined for the interstitial liquid in tank S-112. The major finding of this screening indicates that the salt well liquids of tanks S-112, SX-101, U-102, U-103, U-105, U-106, and U-109 warrant further investigation.

3.4 FOLLOW-ON ACTIVITIES

The following discusses the activities needed to complete the evaluation of the complexed/TRU waste issues for the 200 West Area interim stabilization efforts. Table 3 illustrates the problem requiring solution. This table shows the currently scheduled interim stabilization start and stop dates. Superimposed for comparison are the results of the preliminary waste compatibility screening for the complexed waste/TRU waste issues. Any tank listed with a font other than plain italics indicates a problem for the interim stabilization effort. Regardless of what the final waste compatibility findings are, desired results can be simply summarized. The first will be to finish the waste compatibility grab sampling which will eliminate the bold type. All of the tanks will then be indicated in some sort of italics. It will be desired to move the non-complexed (plain italics) tanks up in the schedule and to push back the complexed (underlined italics) and TRU (shadowed italics) wastes. Finally, the goal will include establishing the interim stabilization milestones by waste type instead of watch list classification. One fortunate finding was that the first batch of tanks scheduled to start pumping (TPA M-41-09) were all screened as non-complexed waste which indicates that there should be no problem with routing these wastes through tank 102-SY.

3.4.1 Continued Testing

Mixing and boil down studies are specified for the U-Farm tanks to primarily verify the complexed, or complexed and TRU screening. Some additional testing is specified to better estimate actual WVRFs that can be expected. The initial follow-on tests are specified for U-Farm for a number of reasons. The S-Farm tanks which were successfully screened were all found to be non-complexed waste. No further waste compatibility testing is required to confirm a non-complexed screening result, particularly when this finding is in agreement with historical waste classifications for the tanks. This was a fortuitous finding since the eight S-Farm tanks which were successfully screened include the entire first batch West Area tanks scheduled to start pumping (Dec. '95 - TPA Milestone M-41-09). Next in line to start pumping (Jul. '96 - TPA Milestone M-41-11) are the U-Farm Tanks. The subject U-Farm tanks were successfully screened in their entirety. Additionally, sufficient archived samples from each subject U-Farm tank are available in the 222-S lab to support additional testing activities. The combination of schedule, problem indicators, and sample availability made follow-on testing of the U-Farm wastes the obvious first choice.

A brief review of the waste compatibility screening results shows that, of those tanks evaluated, only the U-Farm tanks exhibited problems with complexed waste and concentrations of transuranium elements high enough to qualify as TRU waste. The next questions to be answered deal with what other actions might be warranted. The Tank Farm Waste Compatibility Program (WHC, 1995a, 1995b) provides guidance for additional testing that can be done. The initial screening indicated that tanks U-102, U-103, U-105, U-106, and U-109 contain complexed interstitial liquids, and in addition, the liquid of tank U-106 is also indicated as TRU waste. The goal of any additional waste compatibility work or testing is to verify that the screening assessment is correct and to determine the best estimate of the impact to the DST system when that waste is transferred into it. This also implies that the waste compatibility issues may indicate a conflict with the currently scheduled SST interim stabilization activities. The testing which hopes to answer the concerns of complexed and TRU waste issues are mixing and boil down studies.

In the mixing study, samples of liquid and solid wastes are combined and commingled as defined by specified contact times and degree of mix agitation. The goal is to see if the liquid waste contains any material that possesses the ability to solubilize (also known as mobilize or complex) transuranium elements contained in the solid waste. When the liquid waste is subjected to before and after measurements for $^{239/240}$Pu and ^{241}Am, a quantitative measure of the liquid's complexing capability is obtained. If the test reveals that a liquid waste experiences an increase in TRU concentration to $\geq$100 nCi/gm during the course of the mixing study, then that waste has the potential to create TRU waste if it is commingled with sludge containing a high enough inventory and concentration of transuranium elements. In this case, the inventory and corresponding concentration of TRU elements in the sludge must be such as to maintain a concentration gradient against a liquid containing 100 nCi/gm TRU. The concern for a complexing waste which commingles with the sludge in tank 102-SY is the extreme concentration of transuranium elements contained in the sludge. Testing has revealed that 102-SY solids contains $^{239/240}$Pu and ^{241}Am in concentrations two orders of magnitude higher than that required by the definition of TRU waste (WHC 1995d).

Another method by which additional TRU waste could be generated is by solids precipitation in tank 102-SY. In this case, the solids would precipitate out of the liquid wastes moving through tank 102-SY and settle on top of the current solids in the tank. Regardless of the TRU activity of any newly precipitated solids, since there is no available method to remove any such solids, the act of solids precipitation in tank 102-SY amounts to the generation of additional TRU waste. Technically, this situation is a violation of DOE Order 5820.2A. The mixing studies will note and try to objectively measure any such phenomena which could be construed as equivalent to the generation of additional solids in tank 102-SY.

While the calculation of the TOC concentration of a waste at the DSSF endpoint is described as an indicator of a complexed waste per the Waste Compatibility Program, only the boil down test can be used to declare that a waste actually is complexed. Boil down tests form the second part of the follow-on waste compatibility testing specified here. The boil down tests simply evaporate a sample of liquid waste with a heating and vacuum apparatus, and the behavior of the concentrate or resulting slurry is noted. Interpretation of the boil down results will probably be a subjective process. The boil down endpoint is specified when the boil down sample forms a slurry with 50% by volume solids or when the boil down sample becomes intractable. Intractable is defined here as the rapid formation of non-settling solids throughout the mixture (a rapidly formed slurry), a slurry that gels as opposed to settles, or a noticeably large and rapid viscosity increase in the boil down sample. Intractable behavior is not expected unless the boil down sample is known to be complexed waste. The boil down results can roughly be interpreted by whether or not the sample becomes intractable, although the final interpretation will be subject to engineering judgement. As an example, if the waste sample becomes intractable during the boil down, the waste could be considered complexed. If the slurry does not become intractable during the procedure, the waste could be considered non-complexed.

Traditional wisdom has held that a waste which is TRU should also be complexed. However, studies have shown that certain organic complexes, such as N-hydroxyethyl-ethylenediaminetriacetic acid (HEDTA), citrate, and glycolate, can solubilize >100 nCi/gm TRU (as ^{241}Am) at concentrations significantly less than 10 g TOC/liter equivalent (WHC 1983). Additionally, carbonates are attributed with TRU complexing characteristics at pH levels of 10 or lower. While the U-Farm tank salt well liquids with the higher TRU concentrations also have the higher TOC concentrations, there also appears to be a correlation with the TIC (carbonate) concentrations.

A final consideration is that the boil down studies should better refine the estimated WVRFs that can be expected from the interstitial liquid wastes originating in the 200 West Area SSTs (WHC 1995f).

3.4.2 Tank U-106 Findings and Considerations

There is some belief that the preliminary screening results for tank U-106 are viable because the tank held CC waste as the feed tank for the 242-S evaporator during the B-Plant Cs/Sr removal campaigns (WHC 1990). If this is the case, then this tank will present a segregation problem between its salt well wastes and all the other salt well wastes currently identified in the 200 West Area SSTs. At least two segregated batches will have to be routed through tank 102-SY with the corresponding time impact and the issue of TRU contamination of any inadvertent volumes remaining in 102-SY as a result of the facility geometry. The projected volume of interstitial liquid in tank U-106 is insufficient to form a transferrable quantity in tank 102-SY and an additional volume of liquid will become TRU contaminated if tank U-106 waste is sent through 102-SY.

The follow-on testing will either confirm or discount the tentative complexed and TRU classification of this tank. This testing will also determine the balance of the other waste types and thus provide a more firm definition of the real problems. As an example, if other complexed wastes are found to represent a TRU mobilization risk, an argument could be made to lump those wastes with tank U-106 waste if such wastes are to be transferred through tank 102-SY. In such a case, the total volume of waste may be enough to minimize the required cross-contamination needed to form a sufficient volume for pumping out of tank 102-SY. At any rate, unless the existence of the TRU waste in tank U-106 can be discounted, moving this waste out of West Area without a compatibility violation will require either an infrastructure upgrade, schedule relief, or a waiver to/reinterpretation of DOE 5820.2A.

3.4.3 SX-101 to -106, S-111, S-112, T-110 Sample Recovery Actions

The following actions are specified as the plan to recover the SST stabilization milestones with the inability to obtain a grab sample from the tank. Obviously, a full assessment of the problem cannot be obtained until these tanks are sampled. Once the sampling is completed, a realistic estimate will be two months for the lab to perform the grab sample analysis. With the grab sample analysis in hand, the actual waste compatibility screening for complexed waste and TRU waste issues will take only a short period of time.

Current planning for recovering from the sampling schedule delay involves use of a high pressure, low volume water lance, similar to the lances used for thermocouple tree installation, to bore a hole through the salt crust. A 45 day waiting period will then be provided to allow for diffusion of any concentration gradients that resulted from the water injection. Possible other provisions will include use of a lithium bromide doping or spiking to quantitatively determine the amount of diffusion or mixing that has taken place at the sampling point. Upon completion of the 45 day period, a grab sample will be taken for waste compatibility assessment. This method will be planned for obtaining grab samples from any additional tank in which solidified salts deny access to the interstitial liquid.

Table 1. Results of TRU and Complexed Waste Screening

28 200 West Area SSTs Requiring Interim Stabilization as of 10/1/95

Results from Grab Sampling Analysis and Predict Simulation

Tanks with adequate screening data are shown in bold, unless noted.
Results from tanks not shown in bold are tentative.
"?" indicates an unknown.

Tank	gallons (1)	SpG	OH- (M)	Al (M)	NO3- (M)	NO2- (M)	CO3- (M)	PO4- (M)	SO4- (M)	F- (M)	TOC (gm/L)	TRU (nCi/gm)	Analyses Dates	TOC @ DSSF (gm/L) P=60mmHg, 37C	Classification	WVRF @ DSSF P=60mmHg, 37C	WVR terminated at
S-101	1.09E+05	1.32E+00	2.47E+00	9.11E-01	4.50E+00	3.06E+00	4.22E-01	4.17E-02	6.36E-02	8.60E-03	2.96E+00	1.57E-01	1992	4.40E+00	NCPLX	3.30E-01	aluminate boundary
S-102	2.82E+05	1.32E+00	2.51E+00	1.40E+00	3.07E+00	2.19E+00	3.36E-01	3.64E-02	0.00E+00	1.33E-02	3.74E+00	3.35E-01	1995	4.70E+00	NCPLX	2.00E-01	aluminate boundary
S-103	1.02E+05	1.47E+00	2.23E+00	1.05E+00	3.78E+00	5.06E+00	2.44E-01	4.36E-02	4.29E-02	8.60E-03	6.24E+00	8.39E-01	1992	8.50E+00	NCPLX	2.70E-01	aluminate boundary
S-106	1.68E+05	1.41E+00	3.04E+00	1.12E+00	3.50E+00	1.96E+00	3.73E-01	2.26E-02	5.60E-02	8.60E-03	1.50E+00	2.82E-01	1992	2.00E+00	NCPLX	2.40E-01	aluminate boundary
S-107	7.90E+04	1.32E+00	2.10E+00	5.13E-01	2.97E+00	2.41E+00	3.41E-01	2.15E-02	3.93E-02	8.61E-03	2.12E+00	6.79E-01	1992	4.90E+00	NCPLX	5.50E-01	aluminate boundary
S-108	1.05E+05	1.40E+00	2.20E+00	7.63E-01	4.47E+00	1.56E+00	6.02E-01	3.92E-02	1.02E-01	8.61E-03	1.31E+00	1.30E-01	1992	2.40E+00	NCPLX	4.30E-01	aluminate boundary
S-109	1.19E+05	1.42E+00	2.45E+00	8.69E-01	3.79E+00	1.60E+00	4.30E-01	2.29E-02	5.96E-02	8.61E-03	1.18E+00	2.14E-01	1992	1.90E+00	NCPLX	3.90E-01	aluminate boundary
S-110	1.03E+05	1.39E+00	2.37E+00	1.00E+00	2.22E+00	1.03E+00	4.80E-01	2.61E-02	6.26E-02	1.48E-02	2.27E+00	2.50E-01	1995	3.70E+00	NCPLX	3.90E-01	aluminate boundary
S-111 (2)	1.34E+05	1.42E+00	?	?	1.00E+01	1.65E+00	?	9.30E-02	?	?	?	1.90E-01	1980; 1974	?	NCPLX	?	?
S-112 (2)	1.07E+05	1.50E+00	?	?	2.50E+00	2.02E+00	?	?	?	?	?	?	1974	?	?	?	?

Tank	kgal (1)	SpG	OH- (M)	Al (M)	NO3- (M)	NO2- (M)	CO3- (M)	PO4- (M)	SO4- (M)	F- (M)	TOC (gm/L)	TRU (nCi/gm)	Analyses Dates	TOC @ DSSF (gm/L) P=60mmHg, 37C	Classification	WVRF @ DSSF P=60mmHg, 37C	WVR terminated at
SX-101 (3)	4.70E+04	1.11E+00	1.60E-01	4.60E-02	1.45E+00	1.10E-01	1.00E-04	5.60E-02	7.30E-02	6.70E-02	3.20E-01	99999900	1990	8.80E+00	NCPLX	9.30E-01	aluminate boundary
SX-102 (2)	2.46E+05	1.56E+00	?	?	3.26E+00	2.23E+00	?	8.10E-02	?	?	1.27E+01	9.42E-02	1980;1975; 197	?	CPLX	?	?
SX-103 (2)	2.87E+05	1.38E+00	?	?	5.59E+00	?	?	?	?	?	?	9.90E-02	1975	?	NCPLX	?	?
SX-104 (2)	1.95E+05	1.50E+00	?	?	6.60E+00	2.50E+00	?	1.00E-01	?	?	6.00E+00	3.30E+00	1988	?	NCPLX	?	?
SX-105 (2)	3.33E+05	1.34E+00	?	?	3.71E+00	4.43E-01	?	2.11E-03	?	?	?	2.84E-01	1974	?	NCPLX	?	?
SX-106 (2)	3.01E+05	1.45E+00	?	?	2.94E+00	2.00E-02	?	4.00E-02	?	?	6.16E+01	2.90E+00	1978;1977;1974	?	CPLX	?	?

Tank	kgal (1)	SpG	OH- (M)	Al (M)	NO3- (M)	NO2- (M)	CO3- (M)	PO4- (M)	SO4- (M)	F- (M)	TOC (gm/L)	TRU (nCi/gm)	Analyses Dates	TOC @ DSSF (gm/L) P=60mmHg, 37C	Classification	WVRF @ DSSF P=60mmHg, 37C	WVR terminated at
T-104	6.50E+04	1.13E+00	3.69E+00	1.17E-01	1.58E+00	1.30E-01	0.00E+00	2.60E-01	4.44E-02	2.47E-01	5.40E-01	3.17E+00	1994	1.20E+00	NCPLX	5.40E-01	8M caustic
T-110 (2)	4.50E+04	1.08E+00	?	?	9.14E-01	6.41E-03	?	2.79E-01	?	?	?	1.85E-01	1975; 1974	?	NCPLX	?	?

Tank	kgal (1)	SpG	OH- (M)	Al (M)	NO3- (M)	NO2- (M)	CO3- (M)	PO4- (M)	SO4- (M)	F- (M)	TOC (gm/L)	TRU (nCi/gm)	Analyses Dates	TOC @ DSSF (gm/L) P=60mmHg, 37C	Classification	WVRF @ DSSF P=60mmHg, 37C	WVR terminated at
U-102	1.59E+05	1.38E+00	1.02E+00	6.20E-01	1.59E+00	1.81E+00	5.48E-01	4.85E-02	6.56E-02	0.00E+00	1.00E+01	1.63E+01	1994	2.00E+01	CPLX	6.10E-01	aluminate boundary
U-103	2.21E+05	1.39E+00	2.71E+00	1.04E+00	3.94E+00	2.44E+00	4.13E-01	3.19E-02	4.81E-02	7.53E-02	1.54E+01	2.57E+01	1995	2.10E+01	CPLX	2.80E-01	aluminate boundary
U-105	2.00E+05	1.35E+00	1.31E+00	6.67E-01	2.84E+00	1.82E+00	6.90E-01	4.27E-02	8.60E-02	9.71E-02	1.97E+01	6.86E+01	1995	4.70E+01	CPLX	5.60E-01	aluminate boundary
U-106	7.80E+04	1.34E+00	4.29E-01	5.54E-01	3.38E+00	1.92E+00	7.30E-01	5.82E-02	8.86E-02	1.20E-01	3.80E+01	1.84E+02	1994	1.30E+02	CPLX & TRU	6.60E-01	aluminate boundary
U-107	1.58E+05	1.40E+00	1.77E+00	7.82E-01	3.23E+00	1.86E+00	6.25E-01	2.61E-02	6.76E-02	1.46E-02	4.80E+00	8.09E-01	1995	9.80E+00	NCPLX	5.00E-01	aluminate boundary
U-108	2.27E+05	1.39E+00	2.89E+00	1.49E+00	2.81E+00	2.52E+00	2.68E-01	1.22E-02	4.79E-02	6.59E-02	7.44E+00	1.79E+00	1995	8.70E+00	NCPLX	1.40E-01	aluminate boundary
U-109	2.10E+05	1.37E+00	2.85E+00	1.06E+00	2.39E+00	2.10E+00	2.86E-01	2.49E-02	3.01E-02	1.51E-02	8.02E+00	2.80E+00	1995	1.10E+01	CPLX	2.90E-01	aluminate boundary
U-111	1.36E+05	1.37E+00	2.25E+00	1.41E+00	2.70E+00	2.49E+00	3.16E-01	4.00E-02	4.64E-02	4.64E-02	6.15E+00	4.89E+00	1994	8.00E+00	NCPLX	2.30E-01	aluminate boundary

Summary of findings based on disregarding characterization data prior to 1989.

NCPLX		CPLX & TRU		CPLX		Unknown	
13 tanks (4)		1 tank		4 tanks		8 tanks (2)	
1.69E+06	gallons	7.80E+04	gallons	7.90E+05	gallons	1.65E+06	gallons

Summary of findings based on considering all available characterization data and using engineering judgement.

NCPLX		CPLX & TRU		CPLX		Unknown	
18 tanks (2), (4)		1 tank		8 tanks (2)		1 tank (2)	
2.48E+06	gallons	7.80E+04	gallons	1.34E+06	gallons	1.07E+05	gallons

(1) Based on 61% saltcake porosity / 16% sludge porosity from WHC-SD-W236A-ES-012, Rev. 0-A.
(2) Classification based on pre-1989 analysis data. Results from these tanks are considered tentative, and classifications made from them are based on best engineering judgement using reported TOC and/or TRU values.
(3) The reported TRU activity is assumed to be in error since analysis indicates > 100 nCi/gm TRU are present in NCPLX liquid, and because the reported TRU activity is so unrealistically high. Am and Pu were reported in Ci/L when most likely it was meant as uCi/L. This interstitial liquid is considered a NCPLX liquid in this waste compatibility screening.
(4) Includes tank SX-101. See note (3).

Table 2. Additional Analysis of TRU Limits

26 200 West Area SSTs Requiring Interim Stabilization as of 10/1/95

Comparison of Various TRU Activity Limits with Actual TRU Activity.

Tanks with adequate screening data are shown in bold, unless noted.
Results from tanks not shown in bold are tentative.
"?" indicates an unknown

Tank	kgal (1)	SpG	TRU (nCi/gm)	Na+ (M)	Na+ (gm/L)	TRU Limit (a) (nCi/L)	TRU Limit (b) (nCi/L)	Actual TRU Loading (nCi/L)
S-101	**1.09E+02**	**1.32E+00**	**1.57E-01**	**9.70E+00**	**2.23E+02**	**1.32E+05**	**1.20E+05**	**2.06E+02**
S-102	**2.82E+02**	**1.32E+00**	**3.35E-01**	**1.10E+01**	**2.53E+02**	**1.32E+05**	**1.37E+05**	**4.41E+02**
S-103	**1.02E+02**	**1.47E+00**	**8.39E-01**	**1.10E+01**	**2.53E+02**	**1.47E+05**	**1.37E+05**	**1.24E+03**
S-106	**1.68E+02**	**1.41E+00**	**2.82E-01**	**9.30E+00**	**2.14E+02**	**1.41E+05**	**1.16E+05**	**3.98E+02**
S-107	**7.90E+01**	**1.32E+00**	**6.79E-01**	**7.30E+00**	**1.68E+02**	**1.32E+05**	**9.07E+04**	**8.95E+02**
S-108	**1.05E+02**	**1.40E+00**	**1.30E-01**	**6.40E+00**	**1.47E+02**	**1.40E+05**	**7.95E+04**	**1.82E+02**
S-109	**1.19E+02**	**1.42E+00**	**2.14E-01**	**5.80E+00**	**1.33E+02**	**1.42E+05**	**7.20E+04**	**3.04E+02**
S-110	**1.03E+02**	**1.39E+00**	**2.50E-01**	**2.40E+00**	**5.52E+01**	**1.39E+05**	**2.98E+04**	**3.46E+02**
S-111 (2)	1.34E+02	1.42E+00	1.91E-01	2.20E+01	5.11E+02	1.42E+05	2.76E+05	2.71E+02
S-112 (2)	1.07E+02	1.50E+00	?	1.10E+01	2.62E+02	1.50E+05	?	?

Tank	kgal (1)	SpG	TRU (nCi/gm)	Na+ (M)	Na+ (gm/L)	TRU Limit (a) (nCi/L)	TRU Limit (b) (nCi/L)	Actual TRU Loading (nCi/L)
SX-101 (3)	**4.70E+01**	**1.11E+00**	**9.90E+04**	**2.10E+00**	**4.83E+01**	**1.11E+05**	**2.61E+04**	**1.10E+08**
SX-102 (2)	2.45E+02	1.56E+00	9.42E-02	1.03E+01	1.34E+02	1.56E+05	7.22E+04	1.47E+02
SX-103 (2)	2.87E+02	1.38E+00	9.90E-02	8.00E+00	1.84E+02	1.38E+05	9.96E+04	1.37E+02
SX-104 (2)	1.95E+02	1.50E+00	3.30E+00	1.60E+01	3.57E+02	1.50E+05	1.93E+05	4.95E+03
SX-105 (2)	3.33E+02	1.34E+00	2.04E-01	7.20E+00	1.66E+02	1.34E+05	8.97E+04	2.73E+02
SX-106 (2)	3.01E+02	1.45E+00	2.90E+00	1.00E+01	1.87E+02	1.45E+05	1.01E+05	4.21E+03

Tank	kgal (1)	SpG	TRU (nCi/gm)	Na+ (M)	Na+ (gm/L)	TRU Limit (a) (nCi/L)	TRU Limit (b) (nCi/L)	Actual TRU Loading (nCi/L)
T-104	**5.50E+01**	**1.13E+00**	**3.17E+00**	**2.40E+00**	**5.52E+01**	**1.13E+05**	**2.98E+04**	**3.58E+03**
T-110 (2)	4.50E+01	1.08E+00	1.85E-01	1.90E+00	3.58E+01	1.08E+05	1.93E+04	2.01E+02

Tank	kgal (1)	SpG	TRU (nCi/gm)	Na+ (M)	Na+ (gm/L)	TRU Limit (a) (nCi/L)	TRU Limit (b) (nCi/L)	Actual TRU Loading (nCi/L)
U-102	**1.59E+02**	**1.36E+00**	**1.63E+01**	**9.60E+00**	**2.21E+02**	**1.36E+05**	**1.19E+05**	**2.21E+04**
U-103	**2.21E+02**	**1.39E+00**	**2.57E+01**	**1.20E+01**	**2.76E+02**	**1.39E+05**	**1.49E+05**	**3.56E+04**
U-105	**2.00E+02**	**1.35E+00**	**6.96E+01**	**9.30E+00**	**2.14E+02**	**1.35E+05**	**1.16E+05**	**9.40E+04**
U-106	**7.80E+01**	**1.34E+00**	**1.84E+02**	**1.20E+01**	**2.76E+02**	**1.34E+05**	**1.49E+05**	**2.46E+05**
U-107	**1.58E+02**	**1.40E+00**	**8.09E-01**	**5.10E+00**	**1.17E+02**	**1.40E+05**	**6.33E+04**	**1.13E+03**
U-108	**2.27E+02**	**1.39E+00**	**1.79E+00**	**1.30E+01**	**2.99E+02**	**1.39E+05**	**1.61E+05**	**2.49E+03**
U-109	**2.10E+02**	**1.37E+00**	**2.60E+00**	**9.40E+00**	**2.16E+02**	**1.37E+05**	**1.17E+05**	**3.55E+03**
U-111	**1.35E+02**	**1.37E+00**	**4.89E+00**	**1.00E+01**	**2.30E+02**	**1.37E+05**	**1.24E+05**	**6.72E+03**

(a) Allowable TRU loading in waste liquid based on DOE 5820.2A limit of 100 nCi/gm TRU activity
(b) Allowable TRU loading in waste liquid based on TWRS Process Flowsheet (WHC-SD-WM-TI-613) limit of (540 nCi TRU activity/gram sodium) for the low-level waste glass form.

(1) Based on 61% saltcake porosity / 16% sludge porosity from WHC-SD-W236A-ES-012, Rev. 0-A.
(2) Classification based on pre-1989 analysis data. Results from these tanks are considered tentative, and classifications made from them are based on best engineering judgement using reported TOC and/or TRU values.
(3) The reported TRU activity is assumed to be in error since analysis indicates > 100 nCi/gm TRU are present in NCPLX liquid, and because the reported TRU activity is so unrealistically high. Am and Pu were reported in Ci/L when most likely it was meant as uCi/L. This interstitial liquid is considered a NCPLX liquid in this waste compatibility screening.

Table 3. Current 200 West Area Interim Stabilization Planning

Start 31 Jan 96 End 30 Apr 97 (TPA M-41-09):

S-101, S-103, S-106, S-107, S-108, S-109, S-110

Start 31 Aug 96 End 30 Apr 97 (TPA M-41-08):

U-102

Start 31 Aug 96 End 30 Sep 97 (TPA M-41-11):

U-103, U-105, U-108, U-109

Start 31 Aug 96 End 31 Jan 98 (TPA M-41-13):

*U-106**, *U-107, U-111*

Start 30 Jun 97 End 30 Nov 99 (TPA M-41-14):

S-111, S-112, SX-101, SX-102, SX-103, SX-104, SX-105

Start 30 Jun 97 End 31 Mar 99 (TPA M-41-15):

S-102, **SX-106**

Start 31 Mar 98 End 31 Aug 98 (TPA M-41-16):

T-104

Start 30 Apr 98 End 31 Jul 98 (TPA M-41-17):

T-110

Italics indicate those tanks which were successfully screened for TRU/complexed waste compatibility considerations. Of these tanks:

- if no additional indicators are present, the tank salt well liquid satisfied the screening criteria for non-complexed waste.

- if the tank is underlined, its salt well liquid satisfied the screening criteria for complexed waste.

- if the tank is marked by an asterisk (*), its salt well liquid was determined to satisfy requirements for TRU waste.

Tanks shown in **bold** still require liquid sampling for waste compatibility assessment.

4.0 CONCLUSIONS

Of the 26 200 West Area SSTs requiring interim stabilization:

13 tank salt well liquids were screened as non-complexed waste
8 tank salt well liquids could not be sampled
4 tank salt well liquids were screened as complexed waste
1 tank salt well liquid was screened as complexed <u>and</u> TRU waste

If an engineering judgement was required on the eight unsampled tanks, seven of them could be further classified based on less restrictive criteria.

This study formed the basis for specifying follow-on testing, primarily for the wastes identified as complexed. The follow-on testing consists of a variety of mixing and boil down studies to be performed by the 222-S Laboratory Process Chemistry and Statistics group. This testing has three main objectives:

1) Via mixing studies, determine if the complexed wastes can solubilize enough TRU elements to pose a danger of forming additional TRU waste if transferred to tank 102-SY.

2) Via boil down studies, determine if the wastes exhibit the behavioral definition of complexed waste. If so, try to identify which tank wastes are contributing the complexed waste behavior.

3) Via boil down studies, determine an expected WVRF from all the waste types.

These follow-on mixing and boil down studies, when compared to the range of solution options currently proffered for the interim stabilization effort, exhibit significant benefit in terms of cost reduction and synergistic effects on downstream activities. For minimal cost, the outcome of the testing may demonstrate, for those potential issues which feature major all-around impacts to tank farm operations, that those issues will not apply to the situation.

An example of this can be easily explained. If the mixing studies show that the complexed wastes lack significant concentrations of complexing agents, then there is nothing in DOE Order 5820.2A which precludes the mixing of complexed waste with non-complexed waste. Additionally, if the boil down studies on those same complexed wastes indicate that they do not exhibit complexed waste behavior upon volume reduction, any further cost-driven discriminators arguing against waste blending will vanish. In this case, the only concern is maintaining segregation of wastes which are already designated as TRU waste.

5.0 RECOMMENDATIONS

The findings for the 200 West Area SST's requiring interim stabilization, although preliminary and incomplete, still present important information for interim stabilization activities.

Case 1 - Interstitial liquids which are permissible to pump to tank SY-102:

S-101, S-102, S-103, S-106, S-107, S-108, S-109, S-110
T-104

This recommendation means that the interstitial liquids in these tanks met the criteria which indicates that they do not possess any complexed waste or TRU concentrations which prevent their transfer to and commingling in tank SY-102.

Case 2 - Interstitial liquids which need further testing:

U-102, U-103, U-105, U-106, U-109
U-107, U-108, U-111

This recommendation means that the interstitial liquids in these tanks were judged to fall under two categories. Tanks on the first line were indicated to possess potential waste compatibility problems either from mixing with wastes of Case 1, or from mixing with one another, or from mixing with the wastes in tank SY-102. These tanks met the screening criteria of TRU and/or complexed waste. Technically, the tanks on the second line met the criteria of Case 1, but engineering judgement included them in Case 2 because their TOC values were so close to the limit defining complexed waste and because so many of the other U-Farm tanks were indicated as being complexed.

Case 3 - Interstitial liquids which need to be sampled and a subsequent waste compatibility screening evaluation performed:

S-111, S-112
SX-101, SX-102, SX-103, SX-104, SX-105, SX-106
T-110

This recommendation means that the interstitial liquids in these tanks didn't possess an up-to-date characterization, and/or didn't have the proper analytes identified to support a subsequent waste compatibility screening evaluation. In the case of tank SX-101, the reported characterization was highly suspect and this tank should be either resampled or the existing characterization should be reevaluated.

Further recommendations are for Case 2 issues to be investigated as soon as possible with additional laboratory testing as outlined in this document. Case 3 issues must be resolved as soon as possible, preferably by implementing an identified sampling strategy, and obtaining liquid samples from these tanks.

6.0 REFERENCES

Allison, J. M., 1985, *Computer Prediction of Evaporator Operations*, SD-WM-ADP-004, Rev. 1, Rockwell Hanford Operations, Richland, Washington.

Anderson, J. D., 1990, *A History of the 200 Area Tank Farms*, WHC-MR-0132, Westinghouse Hanford Company, Richland, Washington.

Barney, G. S., 1995c, *The Solubilities of Significant Organic Compounds in HLW Tank Supernate Solutions*, WHC-SA-2565-FP, Westinghouse Hanford Company, Richland, Washington.

Delegard, C. H., 1995d, *Chemistry of Proposed Calcination/Dissolution of Hanford Site Tank Waste*, WHC-EP-0832, Westinghouse Hanford Company, Richland, Washington.

Delegard, C. H. and S. A. Gallager, 1983, *Effects of Hanford High-Level Waste Components on the Solubility of Cobalt, Strontium, Neptunium, Plutonium and Americium*, RHO-RE-ST-3 P, Rockwell Hanford Operations, Richland, Washington.

Fowler, K. D., 1995a, *Tank Farm Waste Compatibility Program*, WHC-SD-WM-OCD-015, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Fowler, K. D., 1995b, *Data Quality Objectives for the Waste Compatibility Program*, WHC-SD-WM-DQO-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Orme, R. M., 1995e, *TWRS Process Flowsheet*, WHC-SD-WM-TI-613, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Pontius, N. L., 1984, *242-A Evaporator/Crystallizer FY'84 Campaign Run 84-4 Post Run Document*, SD-WM-PE-017, Rev. 0, Rockwell Hanford Operations, Richland, Washington.

Reynolds, D. A. , 1995g, *Waste Segregation Analysis for Salt Well Pumping in the 200 W Area--Task 3.4*, WHC-SD-W236A-ES-015, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Sederburg, J. P., 1995f, *Waste Volume Reduction Factors for Potential 242-A Evaporator Feed*, WHC-SD-WM-TI-690, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Strode, J. N., D. C. Riley, R. L. Shaver, T. L. Cruzen, 1989, *Waste Generation and Processing Rates with Waste Volume Reduction Factors - 1988*, SD-WM-TI-309, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Teats, M. C., 1982, *Dilute Complexed Waste Concentration, 242-A Evaporator-Crystallizer, Campaign 80-9, August 13th to August 30th, 1980*, SD-WM-PE-005, Rev. 0, Rockwell Hanford Operations, Richland, Washington.

Teats, M. C., 1981, *Dilute Complexed Waste Concentration, 242-A Evaporator-Crystallizer, Campaign 80-6, April 10th to April 27th, 1980*, RHO-CD-80-1045 6, Rockwell Hanford Operations, Richland, Washington.

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