MEETING MINUTES for Revision of RPP-9937		
Date of Meeting: 6/26/2013	Location: Ecology/Room 3A	
Preparer: A.G. Miskho, WRPS	Time: 2:00 – 4:00	
Attendees: Jim Alzheimer, Ecology Jared Mathey, Ecology Jeff Lyon, Ecology Nancy Uziemblo, Ecology	Joe Caggiano, Ecology Jeremy Johnson, ORP Lori Huffman, ORP David Houghton, WRPS Tony Miskho, WRPS	Jeff Luke, WRPS Jeff Voogd, WRPS John Guberski, WRPS John Conner, WRPS

Minutes:

Meeting minutes:

Miskho stated the minutes from the last meeting were reviewed and comments were received. The minutes from 6/12/2013 were approved by Ecology and ORP at the meeting. The process for the minutes will be to approve minutes from the previous meeting at the next meeting. Miskho will get the minutes out the next day and participants will have an opportunity for review. Minutes approved by Ecology and ORP in the RPP-9937 meetings will be entered into the monthly PM. See decision below on management of meeting minutes.

Action item Discussion (See list at the end of the minutes for a description of the action):
2013-06-12-1: OPEN: list is still in development.

2013-06-12-2: OPEN. Miskho provided a copy of the TPA Action Plan Section 3.0 which describes how waste management units are classified as either "TSD" or "past practice" and recommended that we continue to use the term since it is a TPA term. Alzheimer stated we got here in this discussion because of the scope discussion on RPP-9937. Discussion occurred on the previous classification of unit classification, and historical unit classifications. Decision to keep action open pending outcome of action 2013-06-12-1.

2013-06-12-3: OPEN. Miskho provided Link to M-023-26 report in an email dated 6/26/2013. Discuss report at next meeting.

2013-06-12-4: **(CLOSED 6/26/2013)**. Voogd reported that the report has been broken down into sections. Draft sections will be provided for review to WRPS/ORP and then provide to Ecology for review on a bi-weekly basis. July 10th would be the first time Ecology would see a section, and there would be 5 packages as follows:

Introduction (Purpose and Scope)/Single Shell Tank/Description of SST System to be Monitored
Discuss with Ecology: July 10th

Monitoring Methods/Monitoring Frequency/Related Programs
Discuss with Ecology: July 24th

Data Evaluation Process/Reporting
Discuss with Ecology: August 7th

Response Actions/Change Control
Discuss with Ecology: August 21st

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References/Appendices

5.2.3
5.3.4
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Discuss with Ecology: August 27th

Consolidated Draft in September

ORP/WRPS would hand the section over at the meeting, talk through them, have Ecology look at the sections outside of the meeting, and work on the sections through September. Alzheimer asked if the sections would be provided before the meeting so Ecology could review. Voogd responded we could work on that after the first section is provided, but the first one will be provided at the next meeting since we have the ex-tank monitoring subject to address.

2013-06-12-5: **(CLOSED 6/26/2013)**: TPA Change notice (TPA-CN-576) was signed and entered in Administrative Record) Ecology. Miskho thanked all the participants to get the package approved.

DIL discussion

Houghton handed out the file prepared by Alzheimer with comments added (Attachment) and asked what the course of action should be.

Alzheimer stated that he prepared a graph and was not sure where the porosity numbers came from and was important if we are using volume criteria for a limit (i.e., 50K gallons).

Alzheimer's had additional questions separate from the file that was commented on that was shared in a separate email previously to the meeting:
Does Hanlon (HNF-EP-0182) get updated? Houghton answered: It does not get updated for DIL.

Should DIL in Hanlon be updated? Johnson answered: This raises a good discussion from the field visit. It was a good idea in the past, but it may not make sense now. We would like to propose a standardized frequency for monitoring instead of one based on the volume in the tank. Caggiano replied that the volume of the tank may not be that meaningful. Miskho asked whether Ecology was OK with removing the dependency of the monitoring frequency to the liquid volume. Uziemblo replied that if equipment and volume determined an outcome, then it could be important.

What is a weight factor? Conner replied it is a raw number that needs to be corrected with specific gravity based on the pressure sensed in the dip tube.

What is a dip tube? Conner replied two bubblers and gave an example of an old calculation.

Alzheimer stated DIL has been addressed to his satisfaction.

How far are the dip tubes away from the salt well screen? Houghton responded they can be as far as a ½ tank away.

Is it possible to get new dip tube data? Houghton responded not easily achievable since some equipment has been removed from the tanks.

Alzheimer said we may want to talk about neutron probe data and that ORP/WRPS is doing a pretty good job. He would like to take the time to go through the comments provided on this paper.

Miskho asked about clarification of monitoring frequency and whether the volume of the tank will still be a factor in determining frequency.

Uziemblo thought that the waste type would determine the type of monitoring equipment. She will prepare her own table and come to her own conclusions about how the tank should be monitored with what equipment. An example of a tank containing 68K gallon supernatant was provided for discussion.

Johnson indicated OPR/WRPS may propose a monitoring frequency methodology less complex than what is currently in RPP-9937.

Houghton responded if the monitoring frequency is based on a factor that cannot be calculated very well, basing the frequency on that type of factor would not be the best way to structure. WRPS is looking at the 20 level increasing tanks, and the 20 decreasing level tanks and looking at integrating functions to do a better.

Alzheimer stated if there is a tank out there that has a fair amount of liquid, we should ask ourselves whether we should pump that tank. WRPS is taking ENRAF readings more frequent than RPP-9937 requires. Once in a while the LOW data is not collected.

Uziemblo asked if there was another presentation at a higher level.

Houghton talked about the level of detail was maybe too great for some in the April Ecology briefing.

Guberski added that the offer to provide the presentation again has been made in the past.

Johnson said that before getting into the data interpretation section, we could talk about the information again. See 2 new actions below for delivering the information.

Alzheimer thought that maybe taking 3 different types of tanks and going through the 3 scenarios would be helpful.

Mathey asked about the agenda for the next meeting.

Actions:
2013-06-12-1: ORP: **(OPEN)** Come with a list of tanks beyond the 100 and 200 series tanks that should be within the scope of -9937 for discussion.
2013-06-12-2: ORP: **(OPEN)** is there a better way to describe what is excluded from -9937 than using the term "past practice."
2013-06-12-3: **(OPEN)** Ecology and ORP: Look at history of M-023-25 for the basis of the one-time inspection.
2013-06-12-4: **(CLOSED 6/26/2013)** ORP: Provide a draft schedule for -9937 sections.
2013-06-12-5: **(CLOSED 6/26/2013** Ecology: Conform the TPA change notice is OK with the office.
2016-06-26-1: ORP to set up a more detailed briefing on neutron probe data analysis of to-be-selected tanks prior to discussing data interpretation.
2016-06-26-2: ORP provide a repeat presentation to Ecology/HAB Single Shell Tank Liquid Monitoring from April.

Decisions made:
Process for meeting minutes (see above)

Next Meeting:
Every two week, Wednesday afternoon 2-4pm (Next July 10th)
Agenda: Meeting minutes, Action items, Ext tank monitoring.

Attachment:

Alzheimer DIL Writeup with WRPS/ORP comments discussed at meeting.

"Look at Drainable Interstitial Liquid Calculations

The Interim Stabilization program was implemented to reduce the risks of leaks from the SSTs. It is liquid part of the waste that is the primary concern for a leak in the liner of an SST. Past releases to the environment from the SST system have included leaks that were not just the liquid part. However, the type of new leaks expected in the SSTs is corrosion breaches of the carbon steel liners. With less drainable liquids in the tanks, less hazardous material can drain to the environment. The criteria established for the Interim Stabilization program were 1) less than 5000 gallons of supernatant, 2) less than 50,000 gallons of drainable interstitial liquids, and 3) pumping was to continue until the rate dropped below 0.05 gallons per minute. Currently, all but six SSTs meet criteria 1) and 2). These are the six tanks currently listed in RPP-9937 Rev. 3 as requiring Leak Detection Monitoring. Some SSTs were administratively Interim Stabilized due to changes in the calculations used to determine the drainable interstitial liquid volumes or failure of the pumping system before criteria 3) was met. Some SSTs were declared Interim Stabilized because past leaks had drained essentially all of the drainable liquids from the tank.

During our activities related to trying to understand the cause of the recent six tanks of heightened concern, questions have been raised about how much drainable liquids are actually present in the TRU like waste in tanks such as T-111. While this tank is listed as having 38,000 gallons of drainable liquids, this seems unlikely. Samples of waste from T-111 and a few tanks with similar waste show the sludge to contain at least 85 weight percent water as an integral part of the waste. The weight percent water values were determined by heated drying of samples after any free liquids had drained away. The surface level and interstitial liquid levels for T-111 and TY-105 are moving in unison. This is not consistent with the concept of a drainable liquid. The drop in the interstitial liquid level due to a draining of liquid from pores in the sludge and salt cake would be at a faster rate than the drop in the rate of the free surface. This implies that we might actually be tracking the water "trapped" in the sludge and actually have very little drainable liquids in some SSTs.

WRPS COMMENT

An important distinction is that the porosity used in the calculations of drainable liquid is 'drainable porosity', an empirically calculated value that may different than the true porosity. The true porosity will be higher, perhaps much higher, but empirical evidence from saltwell pumping shows that not all liquid will drain.

T-111 has a low SpG and high water content with a drainable porosity of 10.5%, calculated from the change in saltwell dip-tube level vs. volume pumped. The calculation is documented in HNF-SD-RE-TI-178 'interim stabilization letters for the SSTs'. The DIL value reported in RPP-5556 for T-111 is based on this calculated value rather than an average value. As noted later in this paper, the TY-105 drainable porosity estimate is even lower (6% in HNF-SD-RE-TI-178).

To better understand the concept of drainable interstitial liquids, I looked in RPP-5556, "Updated Drainable Liquid Volume Estimates for 119 Single-Shell Tanks Declared Stabilized"; authored by Jim Field, dated February 8, 2000. This describes the methods used to determine the drainable liquid volumes in tanks. Many factors are considered. These include the type of waste in a specific tank and the monitoring data that was available, including changes in levels during pumping activities. Parameters considered include waste type (sludge, salt cake, or a combination), measured liquid levels, drainable porosity estimates, and capillary height. Measured liquid levels were of two types. Some tanks had a LOW to measure the Interstitial Liquid Level. Some tanks had dip tube data. Dip tube data was collected in the jet pumping process and is a measure of the free liquid surface in the jet pump salt well. The LOW data is collected using a neutron probe and detects the hydrogen in the water. For sludge and to a less degree salt cake, water is held in the waste above a drainable liquid level due to hydrostatic forces. The height of the capillary region varies based on the waste, with particle size being a primary determining factor. Sludges tend to have higher capillary heights than salt cake. The best guess, conservative capillary height is 24 inches for sludge and 6 inches for salt cake. In Jim Field's report, tank specific porosities were used based on calculations using jet pumping data when available. The porosities used ranged from 0.08 (TY-101) to 0.42 (BY-112) for salt cake and 0.07 (TY-105) to 0.27 (C-110). When pumping or other supplemental data was not available, 0.25 was used for salt cake and 0.15 was used for sludge porosities.

WRPS COMMENT

RPP-5556 (2000) is a good reference however, the methodology for pumpable liquid calculations was reevaluated and updated in HNF-2978 Rev 4 (2002) and Rev 5 (2003). It is noted that for the calculation of drainable interstitial liquid the changes are not significant. Drainable porosities were updated to 24% saltcake and 17% sludge. DIL = interstitial liquid – capillary liquid.

I made estimates of the drainable interstitial liquids for the 75 tanks that have active LOW readings. My calculations were similar to those used by Jim Field but different and probably less detailed. I collected the most recent LOW reading from the TWINS database for each of the 75 SSTs with LOWs. These reading are in feet so I multiplied them by 12 to get inches. The 100 series SSTs have a volume of 2750 gallons per inch of waste depth, except for the region of the dished bottom. Some SSTs do not have dished bottoms. I subtracted the dish depth and the capillary height from the LOW reading to get the height of the cylindrical part of the waste that has drainable liquid. I added the dish volume to get the total volume of waste with drainable liquid. This volume was then multiplied by the porosity to get a drainable liquid volume. To get porosity and capillary height estimates, I used the sludge and salt cake volumes for individual tanks from Hanlon. I used a simple approximation where the porosity was equal to 0.15 times the fraction of the waste that is listed as sludge plus 0.25 times the fraction of the waste that is listed as salt cake. The same method was used to obtain a capillary height estimate. Capillary heights of 6 inches for salt cake and 24 inches for sludge were used.

WRPS COMMENT

This methodology for overall volume and consideration of capillary height is accurate. The estimates have used the volume calculations/dimensions as described in RPP-7625, *Guidelines for Updating Best-Basis Inventory*. That is, 2750 gal per inch for the 100 series SSTs. 100-series SSTs with a dished bottom have a 12-inch dish with a volume of 12,500 gal except SX Farm, which has a 14.9-inch dish with a dish volume of 18,500 gal. The 200 series tanks have a 6-inch dish with a volume of 590 gal and 196 gal/inch in the cylindrical portion.

Figure 1 below shows a comparison of my calculated drainable liquid volumes compared to those listed in Hanlon. For some tanks, I predict lower drainable liquid volumes. However, for many tanks I predict higher drainable liquid volumes and many of these volumes are in excess of the 50,000 gallon interim stabilization criteria.

WRPS COMMENT drainable

Hanlon (HNF-EP-182) interstitial liquid estimates are not actively managed / updated and show historical estimates more than 10 years old. This data most likely came from several sources, including HNF-SD-RE-TI-178, RPP-5556 and HNF-2978 where the methodology for calculating DIL may not be consistent. HNF-SD-RE-TI-178 in particular includes 'stabilization letters' over several decades where the methodology (specifically the capillary height assumed) changed over the years. Assumptions should be noted in each of the individual stabilization letters.

Figure 2 shows the same calculations except that all waste was treated as sludge with a porosity of 0.15 and a capillary height of 24 inches. For this case, only one SST was above the 50,000 gallon limit though it is not one of those currently reported as over 50,000 gallons.

Figure 3 shows the calculations treating all tanks as salt cake with a porosity of 0.25 and a capillary height of 6 inches. Results are fairly similar to the first case with waste averaged properties. This is expected since over 77% of the waste is listed as salt cake.

I do not believe my results indicate that the drainable liquid amounts are actually being under reported. I think the results more reflect a need to better understand the drainable liquid situation and make a good discussion in RPP-9937 or/and elsewhere.

One obvious reason question my results has to do with a couple of the tanks we have been most interested in lately. These are T-111 and TY-105. Both of these are almost TRU waste and likely have little drainable liquids based on observations of the Enraf and LOW data and the fact that TY-105 had the lowest measured porosity in Jim Field's report (0.07).

One area that I want to understand better is how the neutron probe data is interpreted to determine the interstitial liquid level. I suspect that we may be doing a conservative estimate of the interface. We may be declaring the water trapped in the sludge and that is not drainable in the drainable liquid calculations. In Jim Field's report, the drainable liquid level was based not on the LOW data bur rather on the dip tube measurements which should be a more reliable measure of the drainable liquid height. If dip tube measurements are no longer being done, perhaps we should make dip tube measurements for some tanks such as T-111, TY-105, and tanks with suspected high ILL from the LOW data.

WRPS COMMENT

The relation between the LOW (ILL) and dip tube is the capillary. Capillary heights were re-evaluated in HNF-2978 Rev 4/Rev 5 however no changes were made to the methodology (retained the same capillary heights as used in RPP-5556). HNF-2978 notes that the sludge capillary may be conservative. The HNF-2978 methodology was evaluated by independent review (Chuck Stewart PNNL) and his review is referenced in Rev. 4

Dip tube measurements are not easily achievable. The saltwell pumping equipment has not been maintained and necessary components may be missing, broken, or inoperable. The screens and tubes have most probably become salted up and/or plugged. The LOW readings are considered the best estimates of the current ILLs.

I am also interested in understanding how the drainable liquid amounts listed in Hanlon are calculated and how often these are updated. Some of the differences between the Hanlon values and mine may be due to ongoing intrusion changing the actual amount of liquids in the tanks.

WRPS COMMENT

As discussed above, Hanlon estimates are historical data and have not been updated in a number of years.

Documents that support the BBI are routinely updated, including the Auto-Tank Characterization Reports. These will typically have an estimate for drainable porosity and possibly the interstitial liquid volume based on drainable porosity, but not the drainable interstitial liquid volume.

As for retained gas (mentioned in the PowerPoint), the BBI will only have estimates of retained gas for tanks where retained gas core samples were taken. This is a small fraction of the tanks (the tanks reported in PNNL-13000). Since historically retained gas was not accounted for in the drainable porosity estimates, it probably should not be accounted for in updated estimates for consistency.

It may also be that the Drainable Liquid Volumes listed in Hanlon are based on a more detailed data and calculations.

References:

Field, Jim; 2000, Updated Drainable Interstitial Liquid Volume Estimates for 119 Single-Shell Tanks Declared Stabilized, RPP-5556, Rev. 0

Waste Tank Summary Report for Month Ending January 31, 2013 , HNF-EP-0182, Rev. 298 (The Hanlon report)

Hill, Julian, et al; 1999, An Assessment of the Uncertainty in the Waste Volume of the Hanford Site Single-Shell and Double-Shell Tanks, WM' 99 Conference (used for dish bottom depths and volumes)

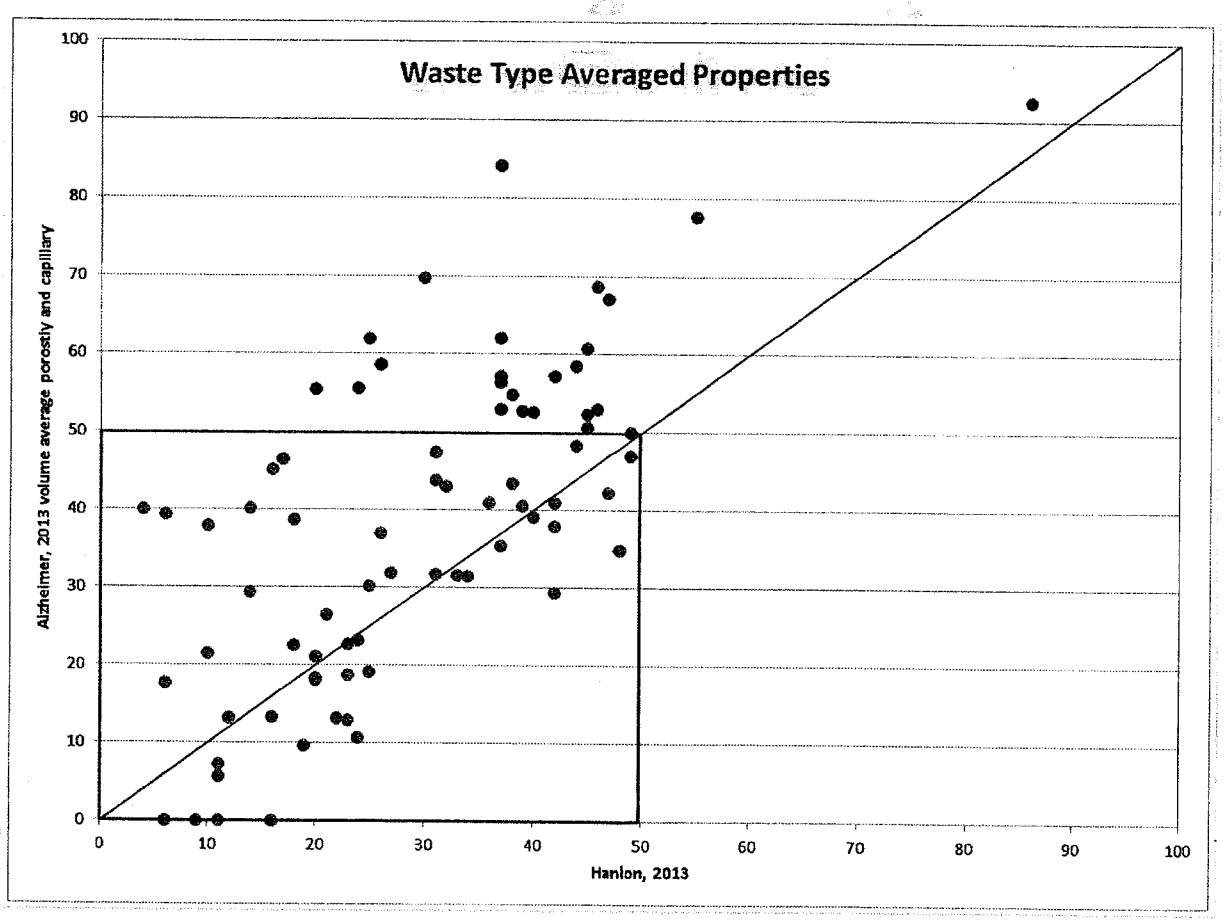

Figure 1 Drainable Liquid Estimates using averaged properties

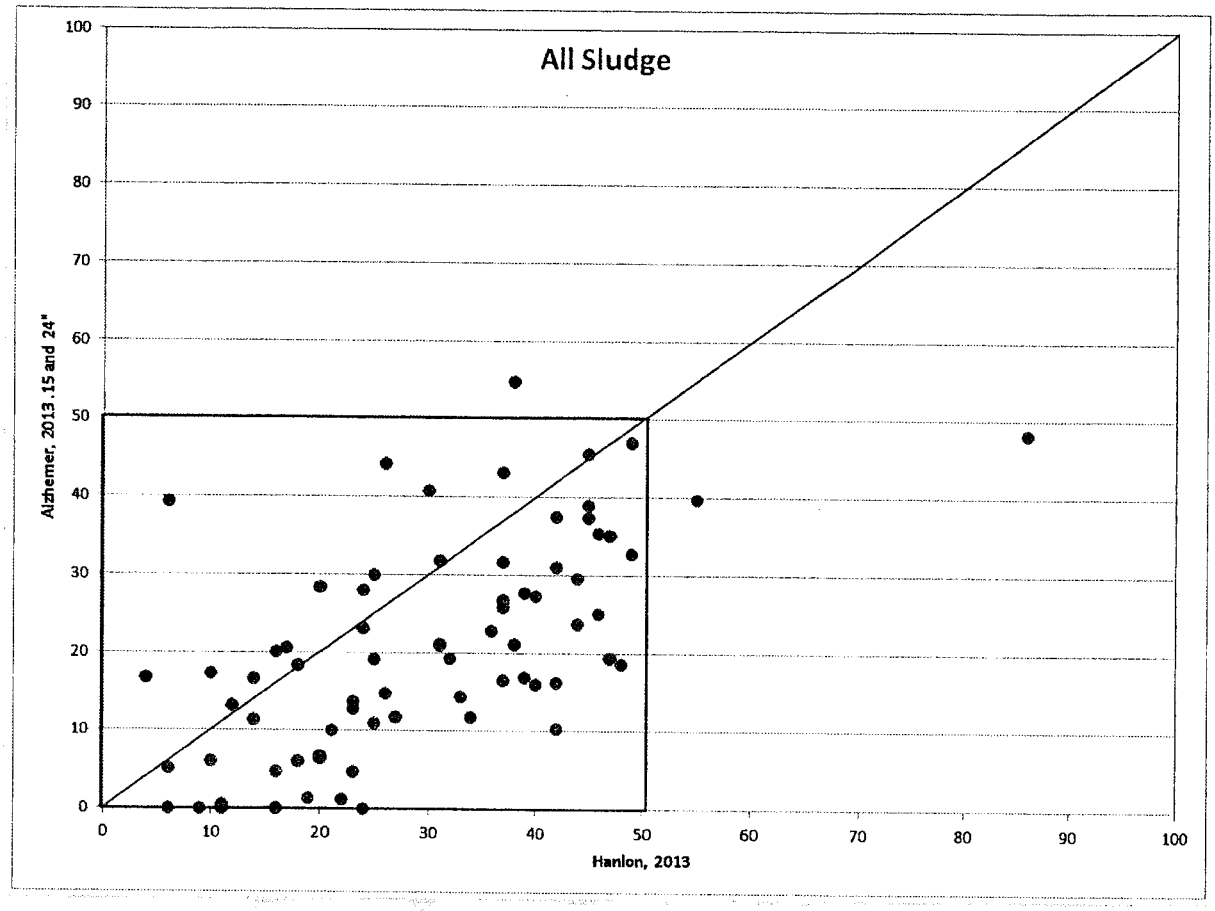

Figure 2 Drainable Liquid Estimates using nominal sludge properties

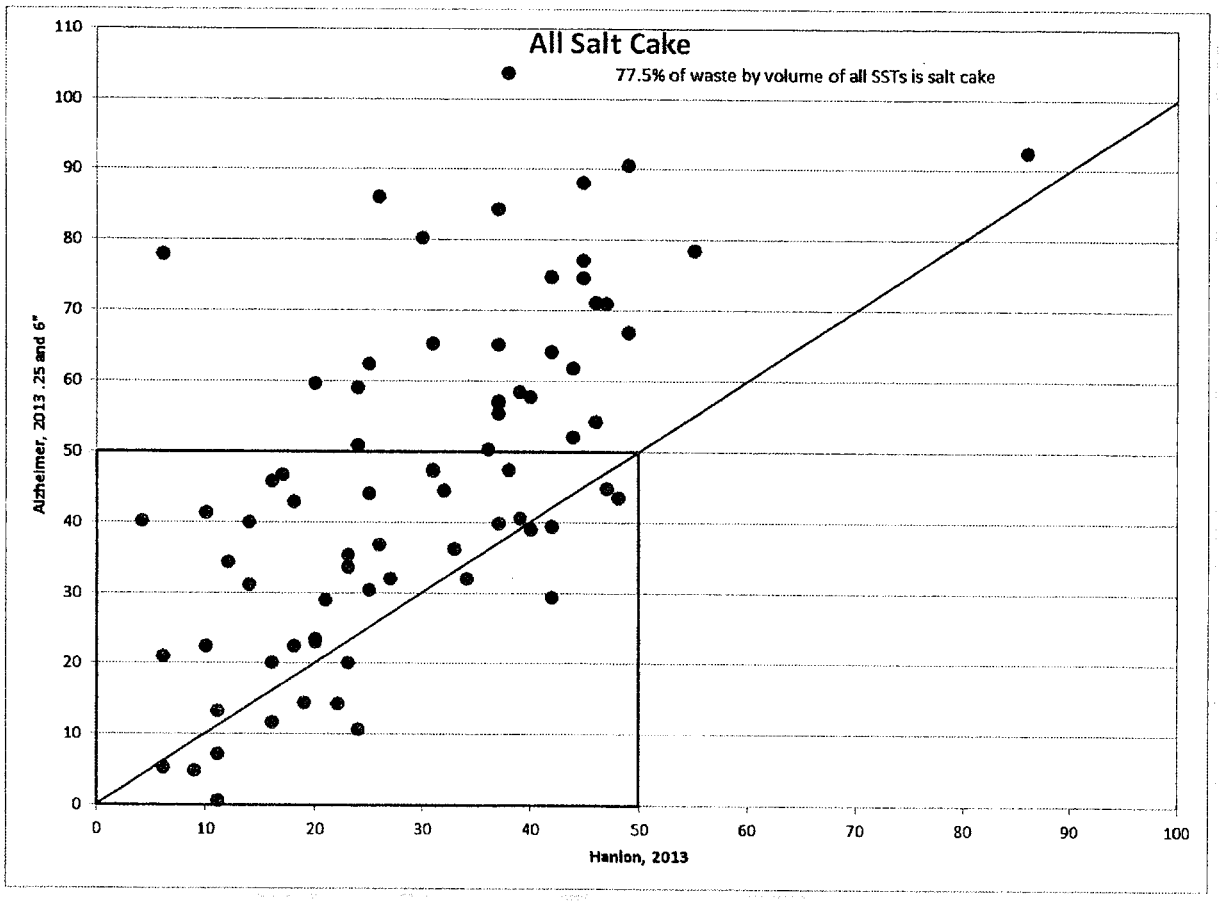

Figure 3 Drainable Liquid Estimates using nominal salt cake properties