Immobilization Technology Section
Savannah River Technology Center
Westinghouse Savannah River Company

WSRC-TR-2002-00491
Rev. 0

October 15, 2002

FRIT DEVELOPMENT FOR SLUDGE BATCH 3

D.K. Peeler
T.B. Edwards

Westinghouse Savannah River Company
Savannah River Technology Center
Aiken, South Carolina

Westinghouse Savannah River Company
Savannah River Technology Center
Aiken, SC 29808

SAFETY • RESPONSIBILITY • SECURITY
SRS
SAVANNAH RIVER SITE

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY UNDER CONTRACT NO. DE-AC09-96SR18500

FRIT DEVELOPMENT FOR SLUDGE BATCH 3

D.K. Peeler
T.B. Edwards

Westinghouse Savannah River Company
Savannah River Technology Center
Aiken, South Carolina

This report was prepared by Westinghouse Savannah River Company (WSRC) for the United States Department of Energy under Contract No. DE-AC09-96SR18500 and is an account of work performed under that contract.

Task Title: Sludge Batch 3 Variability Study with Simulants	ITS Task Number: NA	TTR Number: HLW/DWPF/TTR-02-00027, Rev. 0	TTR Date: 7/11/02
Task Lead: D.K. Peeler	Signature:	Organization: ITS	Date: 12/4/02
Co-author: T.B. Edwards	Signature:	Organization: SCS	Date: 12/5/02
Technical Reviewer: A.D. Cozzi	Signature:	Organization: ITS	Date: 12/5/02
Technical Reviewer: H.H. Elder	Signature:	Organization: HLW PE	Date: 12/5/02
Technical Reviewer: C.C. Herman	Signature:	Organization: ITS	Date:
Technical Reviewer: C.M. Jantzen	Signature:	Organization: ITS	Date: 12/6/02
Level 3 Manager: E.W. Holtzscheiter	Signature:	Organization: ITS	Date: 12/5/02
Level 4 Manager: S.L. Marra	Signature:	Organization: ITS	Date: 12/5/02
Level 3 Manager: R.C. Tuckfield	Signature:	Organization: SCS	Date: 12/5/02
DWPF Process Engineering, Manager: J.E. Occhipinti	Signature:	Organization: DWPF PE	Date: 12/18/02
HLW Process Engineering, Manager: R.E. Edwards	Signature:	Organization: HLW PE	Date: 12/18/02

Executive Summary

Several key criteria or aspects will provide the technical basis for selecting a frit for SB3. These include:

- Maximizing the projected Product Composition Control System (PCCS) operational window size over the anticipated SB3 composition region
- Providing a frit that is robust or insensitive to anticipated sludge composition variation
- Improving or maintaining high waste loadings (WLs)
- Improving or maintaining high melt rates
- Providing a "frittable" additive or frit composition

Given the five key criteria can be competing, the basis for not only developing but ultimately selecting a frit for SB3 is complex. The selection process should not be made based on a single criterion but a collection of criteria that provide insight into the economics of processing SB3. A balanced approach should be utilized in both the development and selection.

A unique, but technically sound methodology was developed and implemented for this study to guide frit development activities. The methodology utilized was a sequential, iterative process capable of discerning the effects of frit composition on the projected PCCS operational windows and robustness to sludge variation. Comparisons among the frits were conducted using objective metrics that were developed to aid in this decision making process.

The model-based assessments indicate that judicious selection of the frit can yield processable and durable products at attractive waste loadings for all washing scenarios. The results provide support for the concept of developing specific frits for specific sludges to optimize PCCS operational windows and waste throughput. Given this, an aggressive washing strategy may not be required to assure processability or product quality as long as alternative frits are considered (assuming there are no other glass- or process-related restrictions such as anion solubility, H_2 generation, redox control, or rheological control issues). Again, the assessments are based solely on PCCS model predictions and do not include assessments of melt rate or frittability that are part of the integrated testing methodology. The integrated strategy should lower the risk of introducing a feed into DWPF that although on paper is very attractive (in terms of waste loading) results in a very difficult feed to process (in terms of melt rate). In fact, this strategy should provide the basis for developing a decision matrix in which optimum waste throughput could be targeted.

This page intentionally left blank.

Acronyms

ASTM	American Society for Testing and Materials
ΔG_p	preliminary glass dissolution estimator based on free energy of hydration (in kcal/mol)
CPC	Chemical Process Cell
DOE	U.S. Department of Energy
DWPF	Defense Waste Processing Facility
EV	extreme vertice
HLW	high-level waste
HLW PE	High Level Waste Process Engineering
MAR	Measurement Acceptability Region
MST	monosodium titanate
NL[B]	normalized boron release
PAR	Property Acceptability Region
PCCS	Product Composition Control System
PCT	Product Consistency Test
PHA	precipitate hydrolysis aqueous
REDOX	reduction/oxidation
SB	sludge batch
SME	Slurry Mix Evaporator
SRS	Savannah River Site
SRTC	Savannah River Technology Center
T_L	liquidus temperature
THERMO™	Thermodynamic Hydration Energy Reaction Model
TTR	technical task request

$\eta_{1150°C}$	melt viscosity at 1150°C
WAPS	Waste Acceptance Product Specifications
WL	waste loading
WQR	Waste Qualification Report
WSRC	Westinghouse Savannah River Company

Contents

List of Figures

This page intentionally left blank.

List of Tables

This page intentionally left blank.

1.0 Introduction

Approximately 130M L of sludge/supernate high-level radioactive waste (HLW) is currently stored in underground carbon steel tanks at the Savannah River Site (SRS) in Aiken, South Carolina. The Defense Waste Processing Facility (DWPF) began immobilizing these wastes in borosilicate glass in 1996. Currently, the radioactive glass is being produced as a "sludge-only" composition by combining washed high-level sludge with glass frit and melting. The glass is poured into stainless steel canisters that will eventually be disposed of in a permanent geological repository.

Currently, DWPF is processing Sludge Batch 2 (SB2) and is planning to start processing Sludge Batch 3 (SB3) in the spring of 2004 (WSRC 2001).[1] A sludge batch is defined as a single tank of sludge slurry or a combination of sludge slurries from different tanks that has or will be qualified for eventual transfer to DWPF. Sludge Batch 3 will be primarily Tank 7 sludge mixed with the heel of Sludge Batch1B (SB1B), contributions from Tanks 18 and 19, and an H-Canyon slurry containing precipitated Pu with Gd (Jilani 2002). The sludge from Tank 7 is expected to contain several components that are considered atypical of DWPF sludge to date including higher levels of noble metals than previously processed sludge batches (Peeler et al. 2002a). Other atypical components that may be present in this sludge batch include sand, coal, Am/Cm precipitate (Patel 2002), sodium oxalate, and zeolite (Jantzen et al. 2002a). Based on the process history for Tank 7, it is estimated that significant quantities of sand/coal (~7723 kg) and sodium oxalate (~300,000 kg) have been added to this tank (Goslen 1984; Fowler 1980).

The quantities of sand, coal, and sodium oxalate may impact several processing parameters at the DWPF. High Level Waste Process Engineering (HLW PE) has issued a Task Technical Request (TTR) requesting the Savannah River Technology Center (SRTC) to address these processing impacts (Rios-Armstrong 2002a). Fellinger (2002) provided a list of the various tasks that are currently being addressed prior to DWPF's accepting SB3. Studies have been and are being performed by SRTC to assess the effects of sand, coal, sodium oxalate, the Pu/Gd stream, and the higher levels of noble metals on various SB3 issues [Herman et al. (2002a); Peeler et al. (2002a), Bronikowski et al. (2002), Jantzen (2002b)].

One of the tasks identified by Fellinger (2002) involved an evaluation of potential frits for SB3. Rios-Armstrong (2002b) issued a more specific TTR to address the frit development activity as well as a subsequent variability study. The focus of this report is solely on the frit development activity, as the results of the variability study will be documented in a separate report.

Several key criteria or aspects will provide the technical basis for selecting a frit for SB3. These include:

- Maximizing the Product Composition Control System (PCCS) projected operational window size over the anticipated SB3 composition region
- Providing a frit that is robust or insensitive to anticipated sludge composition variation
- Improving or maintaining high waste loadings (WLs)

[1] Although the current HLW System Plan (WSRC 2001) projects the initiation of SB3 processing in the spring of 2004, plans to expedite processing of SB3 are currently being assessed. If proven feasible, processing of SB3 could begin as soon as the spring/summer of 2003.

- Improving or maintaining high melt rates
- Providing a "frittable" additive or frit composition[2]

The issues listed above will be used to guide the SB3 frit development task in an effort to improve current DWPF baseline operations in terms of ease of processing, waste loading[3] and/or melt rate. The ability to maximize the size of the DWPF PCCS operational window provides flexibility in targeting waste loadings to meet processing goals. This is strictly an ease-of-processing goal targeted to provide as large of a compositional operating window and as much flexibility as possible.

Another key criterion defining a viable frit for SB3 is the ability of the frit to be tolerant of compositional variation in the incoming waste stream. That is, providing a frit that is robust or insensitive to relatively large variations in sludge composition (yields a relatively large processing window when accounting for composition variation) is a major advantage. A "robust" frit will reduce uncertainties or questions associated with how the frit will respond to SB3 once the qualification sample is obtained and compared to what is being used as the nominal or targeted composition in current testing. That is, a viable frit should not only be able to process the nominal SB3 composition being used but should also be able to process (i.e., be robust to) realistic variations of that composition while still maintaining adequate processing and product characteristics. The degree of tolerance can be measured by the ability to produce acceptable glasses as one transitions from the nominal sludge case to compositions representing larger and larger variation about the nominal.

Although the issue of waste loading is essentially built into the criterion of providing large operational windows, a short discussion of this important topic is still warranted. One method of supporting site and U.S. Department of Energy (DOE) goals of accelerated cleanup is to improve waste loading. For DWPF, a new liquidus temperature (T_L) model has been developed and is pending implementation. This model has been shown to yield higher waste loadings for projected sludge batches (Brown et al. 2001). The waste loading projections provided by Brown et al. (2001) were based on Frit 165, Frit 200, and Frit 320. Frit 165 was developed to be a "generic" sludge-only frit (Soper et al. 1983), while Frit 200 was developed to be a "generic" coupled operations (sludge-only plus high alkali from precipitate hydrolysis aqueous (PHA)) (Jantzen 1988) frit. Frit 320 was developed specifically to improve melt rate for SB2 (Peeler et al. 2001a). Although these frits may be viable in terms of processing SB3, none were specifically developed for this sludge batch and, hence, may not be "optimal" for the projected SB3 composition. Therefore, if the strategy is embraced of developing a frit for a specific sludge batch in an effort to improve waste loadings (and potentially melt rate), one may be able to take advantage of the specific sludge components and adjust the frit composition accordingly in the manner that Frit 200 was developed to accommodate PHA. This strategy may allow for the development of frits that provide not only a large PCCS processing window but simultaneously provide relatively high waste loadings. Therefore, in the assessments that follow, not only is the size of the PCCS projected processing window (the interval of viable waste loadings) provided for each frit of interest, but the ability of the frit to shift the PCCS operational window to higher waste loading is also assessed. For example, two unique frits may both yield a 10% waste loading range with one frit providing the acceptable window over a 31 – 40 % waste loading interval, while the other allows processing over a 41- 50% waste loading interval. Depending upon other processing

[2] The term of "frittable" refers to the ability to produce a prefabricated frit (glass) from the proposed glass additives.
[3] Waste loading (WL) in this report is simply calculated as the HLW oxide fraction of the final glass.

characteristics (e.g., melt rate), the higher waste loading interval may be more beneficial in terms of maximizing waste throughput and meeting the goals of accelerated clean-up.

As previously mentioned, although targeting higher waste loadings is a primary objective, other processing constraints are also important. Another critical constraint being assessed in this task is melt rate. Since DWPF is concerned with the amount of waste throughput to meet accelerated mission plans, providing a frit that allows relatively high waste loadings but does not melt rapidly may not be acceptable. On the other hand, selecting a frit that does not yield a comparatively high waste loading but provides a higher melt rate may be beneficial in terms of waste throughput. The balance between melt rate and waste loading must be carefully considered. The concept of this balance was recently evaluated in the assessment of the impact of higher waste loading on melt rate for Frit 320 combined with SB2 (Lorier and McGrier 2002). However, the notion that reduced melt rates at higher waste loading is unacceptable should be tempered with an evaluation of the total waste throughput. More specifically, during an assessment of the impacts of waste loading on melt rate, decisions on frit selection or targeted waste loading should not be made solely on the relative melt rate. The decision needs to consider the total sludge throughput per unit time. Currently, no models exist that can be used a priori to gain insight into the melt rate of various systems. Therefore, this assessment will be made solely by using a testing methodology that was shown to be effective for SB2 (Stone and Josephs 2001).

The last criterion listed above is the desire to have a "frittable" frit (i.e., the targeted frit composition will produce a glass that can be manufactured by a vendor) which stems from waste acceptance issues. Use of a prefabricated frit instead of batch chemicals stems primarily from waste acceptance issues. Currently, DWPF uses a frit that is ultimately blended with the sludge. Samples of this blend are taken from the Slurry Mix Evaporator (SME), the compositions determined, and properties are predicted from the measured composition to assure that they are within the processing window. Given the feed is acceptable in terms of various property predictions, the feed is transferred to the melter, converted to glass, and poured into canisters. This feed-forward process control strategy has been very effective in terms of assuring processability and product quality. Hence, frittability is an important criterion.

Given the five key criteria can be competing, the basis for not only developing but ultimately selecting a frit for SB3 is complex. The selection process should not be made based on a single criterion but on a collection of criteria that provide insight into the ease of processing SB3 while still making an acceptable glass. A balanced approach should be utilized in both the development and selection. Another factor that could play a significant role in the selection of a frit is the availability of an existing frit versus any procurement and manufacturing costs for an alternative frit given frit fabrication requires a significant lead time.

The focus of this report is on frit development activities conducted solely on the basis of predictions generated by DWPF's PCCS glass property-composition models. More will be said about these models in the following sections, but for now it is enough to know that model predictions, and model predictions alone, were used to guide the development of the candidate frits discussed below and to select, from these candidates, those frits that were judged worthy of additional consideration. This was a sequential, iterative process that may be summarized as follows: candidate frits were identified for and compared across nominal sludge compositions (i.e., where each such composition is considered as a "best guess" view of SB3 sludge for a potential washing scenario). Two different sets of sludge compositions (an initial and a final) were used to represent potential nominal SB3 compositions. The initial set of compositions was available early in the study and served as the basis for much of the preliminary development

efforts. The preliminary frits that were the most promising at this stage were carried over to a stage of investigation that introduced variation around the nominal SB3 compositions. This approach was used to provide an idea of the robustness or tolerance of a candidate frit to anticipated compositional variation (i.e., the ability of the frit to produce an acceptable product for variations in the sludge based upon model predictions). Comparisons among the frits were conducted using objective metrics, described below, that were developed to aid in this decision making process. This two-staged (an assessment using only nominal compositions and then an assessment with variation introduced) approach was then conducted for the second (or final) set of SB3 compositions. The information resulting from these efforts will hopefully serve as part of the technical basis for the frit selection decision. Assessments of frittability and melt rate will complete this picture and these topics are to be covered in subsequent reports.

Objectives for this task are specified in Section 2.0. In Section 3.0, the strategy or approach for developing and assessing new or existing frits is discussed. In Section 4.0, the property acceptance criteria are established that will be used to classify properties predicted from models as acceptable or unacceptable as projected operation windows are defined. Various SB3 compositions (linear washing and decant composition projections) are summarized in Section 5.0 from which assessments will be founded. Section 6.0 summarizes the Nominal and Variation Stage assessments for the five linear washing scenarios. Section 7.0 provides a detailed discussion on the eleven decant compositions in terms of the Nominal and Variation Stage assessments. Section 8.0 provides insight into the use of various liquidus temperature acceptance criteria and its impact on projected operational windows. Section 9.0 provides a summary of these assessments. Recommendations and a path forward are presented in Section 10.0.

2.0 Objective

The objective of this task is to provide DWPF with technical information from which a business decision can be made in terms of the frit selection for SB3. Several key criteria or aspects will provide the basis for this decision:

- Maximize the PCCS projected operational window size over the anticipated SB3 composition region
- Provide a frit that is robust or insensitive to anticipated sludge composition variation
- Improve or maintain high waste loadings
- Improve or maintain high melt rates
- Provide a "frittable" frit composition

The selection process should not be made based on a single criterion but rather on a collection of criteria that provide insight into both the economics and processability of SB3.

The focus of this report is solely on the frit development activities associated with maximizing the projected PCCS operational windows and providing a frit that is robust to anticipated sludge variation. Assessments of frittability and melt rate are to be covered in subsequent reports.

This work has been prepared to address technical issues discussed in Technical Task Request HLW/DWPF/TTR-01-00027, Rev. 0 (Rios-Armstrong 2002b) and in accordance with the Task Technical and Quality Assurance Plan (Herman, Peeler, and Edwards 2002).

This page intentionally left blank.

3.0 The Strategy or Approach Supporting the Paper Study

Two stages were used to assess various frit/sludge combinations: the Nominal Stage and the Variation Stage. The Nominal Stage utilized a nominal SB3 composition representing a potential washing scenario as outlined in Figure 3-1. In general, candidate frit compositions were assessed with respect to their ability to provide a relatively large operational window based solely on a specific nominal composition – no sludge variation was accounted for in this phase. Assessments were made using predictions from models currently implemented in DWPF over the waste loading interval of interest (25 – 60 wt%). The property predictions assessed included those for liquidus temperature (T_L), viscosity (η), durability (normalized boron release – NL[B]), and homogeneity. Assessments were also conducted for the constraints associated with the sum of alkali and/or Al_2O_3 concentrations (Edwards and Brown 1998; Peeler et al. 2000; Peeler et al. 2001b; Peeler et al. 2002b; Herman et al. 2002b).[4] The associated constraints for these properties were assessed at the Property Acceptability Region (PAR) limits (Brown and Postles 1996) – these limits are defined in the next section. Use of the PAR, instead of the more restrictive Measurement Acceptability Region (MAR) was thought to provide a consistent, easily computed metric which could be used to compare, efficiently and effectively, the relatively large set of candidate frits. Although the PAR was used as the basis for the comparisons, an assessment using the MAR was performed on select frit/sludge combinations to assure that projected operational windows were not dramatically affected (see Section 8.0).

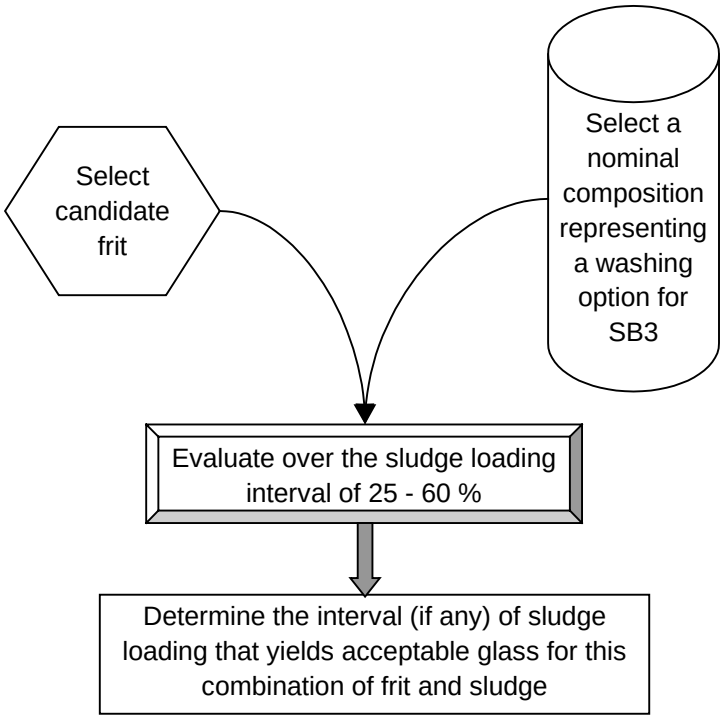

Figure 3-1. Evaluation Strategy Utilized in the Nominal Stage Assessment of SB3 Sludge Compositions.

[4] Given the projected high Na_2O and Al_2O_3 concentrations in SB3, the potential of the projected glass compositions to form nepheline was also assessed using a model provided by Li et al. (1997 and 1998). Although assessed, the predictions did not limit the projected operational windows.

The use of a nominal SB3 composition is consistent with the approach used by Elder (2002) as initial assessments were made using existing frits (320 and 202). It is recognized that the Nominal Stage assessments do not account for anticipated compositional variation. Therefore, an increased risk would result with respect to processability or product quality if a decision were based solely on this assessment without accounting for compositional variation. For example, consider the case if the Tank 7-qualification sample did not "match" the nominal composition anticipated for this tank. The obvious question would be: "For the frit selected, is there a processing window for this sludge?". The intent or focus of the Variation Stage assessment was to gain insight into the robustness of candidate frits with respect to compositional variation.

Figure 3-2 provides an overview of the Variation Stage assessment. Again, the major difference between the two stages is the fact that the Variation Stage builds into its assessment an anticipated variation of ±10% around the nominal composition.

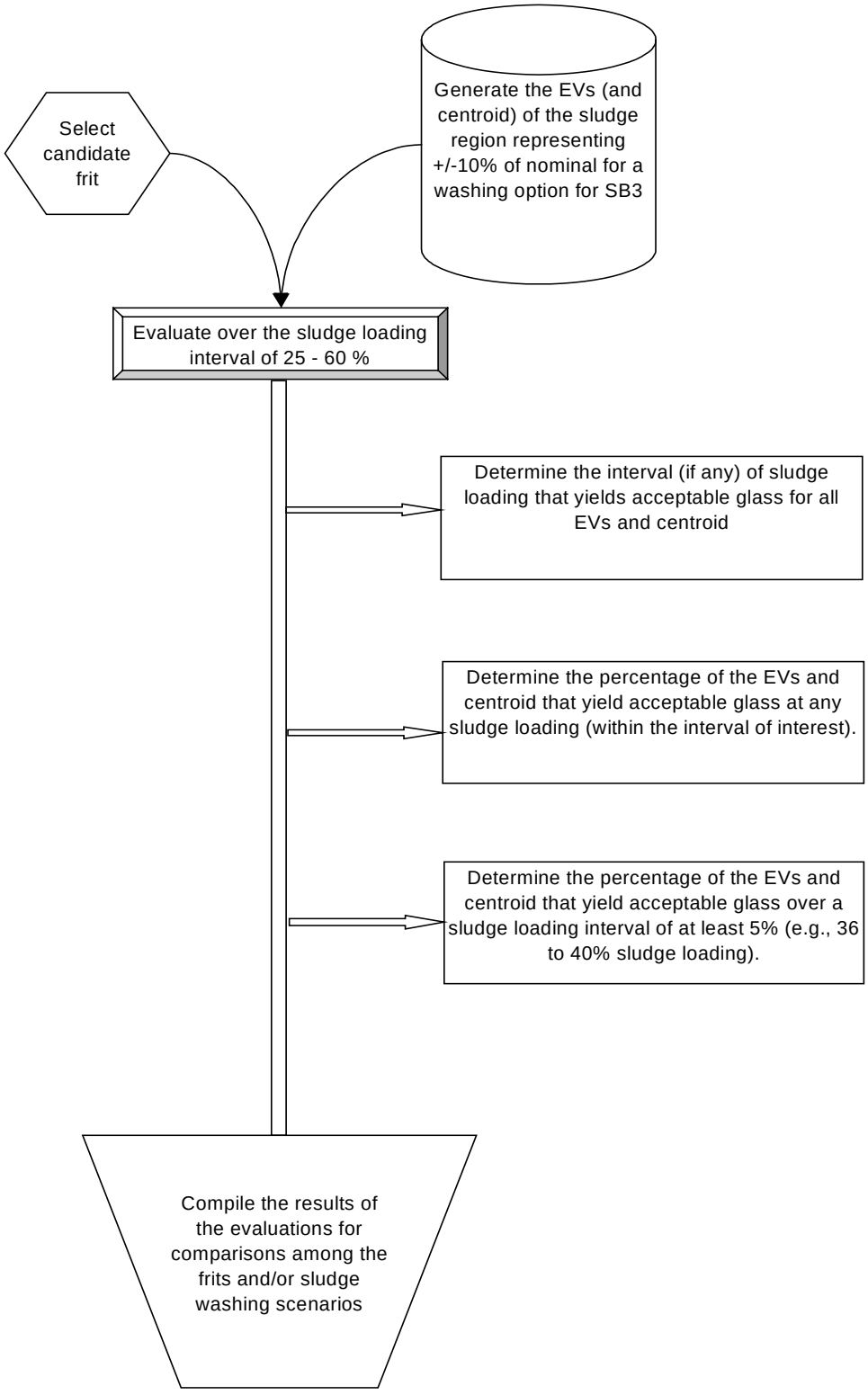

Figure 3-2. Evaluation Strategy Utilized in the Variation Stage Assessment of SB3 Sludge Compositions.

The ±10% variation used to define a sludge compositional region was determined by grouping the components of SB3 into two categories: major and minor oxides. The minors were considered collectively as an "Others" component of the sludge. For a selected, nominal SB3 composition (one representing a potential washing scenario), the concentration of each of the major oxides was multiplied by 0.90 and 1.10 to determine an interval of possible values for its concentration. The concentrations of the minor components were summed, and this sum was multiplied by 0.90 and 1.10 to determine an interval of possible values for "Others" with the relative proportions of the minors within the "Others" being determined by their nominal concentrations. (See Section 5.0 for details.) A mixture of the major components and the "Others" (i.e., a composition where the sum of these concentrations adds to 1) with each component's concentration being within its interval of possible values is a feasible composition of the sludge region providing this representation of SB3. Obviously, there are an infinite number of such feasible compositions in such a sludge region.

Statistical mixture experimental design methods were used to obtain an initial and manageable set of such feasible compositions for each sludge region. These methods include algorithms that can be used to determine the extreme vertices (the bounding compositions) of a sludge region, such as that defined in the preceding paragraph. These algorithms are available in many statistical software packages. One such package in JMP Version 4.0.5 [SAS 2000] was used to generate the extreme vertices (EVs) for mixture regions of interest for this study.[5] An additional composition, the centroid, was computed for each set of EVs generated during this study. The centroid of a sludge region is determined by averaging all of the EVs for that sludge region and this composition was included along with the EVs in the assessments described below.

Once the EVs were determined for the sludge region developed around each nominal SB3 composition being considered, assessments were made using models currently implemented in DWPF over the waste loading interval of interest (25 – 60 wt%) – see Section 4.0 for a more detailed discussion of the models and PAR limits. To obtain insight into the robustness of candidate frits to this sludge variation, three metrics were developed (as shown in Figure 3-2). These three metrics also provide a way to make meaningful comparisons among the candidate frits for each sludge compositional region of interest. The first metric was simply the waste loading interval over which all of the EVs and the centroid SB3 sludge compositions were deemed acceptable based on the established acceptance criteria. The larger the projected operational window for this metric, the more robust the frit is to anticipated compositional variation. A 0% result for this metric indicates that there is no waste loading interval over which all of the EVs and centroid are predicted to be processable.

The second metric defines the percentage of the EVs and centroid that yield an acceptable glass at some waste loading of interest. That is, this metric provides the percentage of EVs and the centroid that could be processed at some waste loading over the 25 – 60% interval. A high percentage for this metric provides a fair and standard comparison between frits and is an indicator to the robustness or insensitivity of the frit to composition variations in sludge. For example, a 100% for this metric would indicate that all of the EVs generated (accounting for the ±10% variation) and the centroid could be processable at some waste loading within the interval

[5] The extreme vertices (EVs) for a particular sludge view are the "corner points" of the region determined by applying the ± 10% variation about the nominal composition for that sludge view. The corresponding centroid for the sludge view is simply the arithmetic average of these EVs.

from 25 to 60%. A 50% result on this metric would indicate that only 50% of the EVs would yield acceptable glass at some waste loading between 25 – 60%.

The third metric builds upon the second and serves as a measure of the percentage of the EVs and centroid that yield an acceptable glass over a minimum waste loading range of 5% within the 25 – 60% window being evaluated. Again, the higher percentage calculated for this metric indicates that the specific frit composition is relatively robust to potential sludge composition variations. More specifically, a 100% for this metric would indicate that all of the EVs and centroid would be processable over a (minimum) 5% waste loading interval. In the assessments that follow, if this metric yields an indicator of 100%, efforts will be made to identify the minimum waste loading interval over which the EVs and centroid would be processable.

Additional metrics could be developed but the authors feel that the three being utilized provide an adequate indication of the projected operational windows and robustness of each candidate frit for the waste streams of interest. These metrics should not be used as the sole basis for the frit selection process, but should be factored into the decision making process along with assessments of frittability and melt rate. The authors feel that the strategy being utilized for the development of the SB3 frit is not only technically defensible, but that it also provides a methodology that could be used for similar frit development activities in the future.

As previously mentioned, the assessments and comparisons documented here are based solely on model predictions; no experimental work was performed in support of these assessments. The assessments are also a function of the underlying assumptions made with respect to the impacts of sludge washing on the ultimate composition of SB3. It should also be noted that an additional underlying assumption is being made with respect to the projected operational windows by the use of centroid and EV compositions. The assumption is that the property predictions for a sludge region of interest are bounded by the predictions generated from the EVs and that compositions lying between the EVs (i.e., such as the centroid) would yield property predictions that are acceptable if those from the EVs were acceptable. This assumption is valid when the property behavior is expected to be linear over the compositional region of interest. This assumption adds minimum risk to the projected operational windows with the highest concern being predictions of T_L from the highly non-linear T_L model (Brown et al. 2001).

This page intentionally left blank.

4.0 Property Acceptability Region (PAR) Limits Used for Assessments

The assessments discussed in this report are based solely on property predictions generated by glass-property models. Property measurements were not performed (experimentally) as part of this study. DWPF uses the PCCS to determine the acceptability of each batch of SME feed before processing in the melter. Acceptability is determined by the PCCS by imposing several constraints on the SME content composition. The PCCS constraints relate process or product properties, which take into account modeling, analytic, and measurement uncertainties. The uncertainties are accounted for in two steps. The first is the uncertainty due to the property model, which when accounted for provides the Property Acceptability Region (PAR). The second, and more restrictive, is the uncertainty due to sampling and analytical (grouped under the heading of measurement). This uncertainty is accounted for, when necessary, in addition to the property uncertainty, and the resulting region defines the Measurement Acceptability Region (MAR). The baseline document guiding the use of these models is "SME Acceptability Determination for DWPF Process Control" by Brown and Postles (1996).

The property predictions assessed in this study included durability (Product Consistency Test [PCT] [ASTM 1998] response in terms of ΔG_P), viscosity at 1150°C ($\eta_{1150°C}$), T_L (new model), homogeneity, and Al_2O_3 and alkali concentrations. Jantzen et al. (1995) and Brown et al. (2001) provide a more detailed discussion on the development of these models. To establish or project operational windows for sludge/frit scenarios of interest, the predicted properties must be assessed relative to established acceptance criteria. Acceptable predicted properties for this assessment are based on satisfying their respective PAR limit values (see Table 4-1)—not the more restrictive MAR limits. Because the PAR limit for the new T_L model is compositionally dependent (Brown et al. 2001), the PAR limit was conservatively set at 1010ºC to allow for a quick assessment. In fact, Brown et al. (2001) have demonstrated that the PAR limits for the new model will not be this restrictive (in terms of limiting the projected compositional operating window) for various glass-forming systems. Therefore, in the assessment discussions that follow, if the new T_L model limits the projected operational window, one must remember the use of this conservatively set PAR limit. More specifically, failing this constraint (as currently defined) does not necessarily mean that it would be an unacceptable glass given the conservative 1010ºC PAR limit.

Predictions of homogeneity were calculated and the constraint was imposed in terms of limiting projected operational windows. More specifically, a glass that failed the homogeneity constraint at the PAR but passed all other criteria was deemed unacceptable. This decision is based on the fact that the technical basis to replace the homogeneity constraint with the Al_2O_3 and sum of alkali constraints is currently being developed. Although the results from previous studies (Edwards and Brown 1998; Peeler et al. 2000; Peeler et al. 2001b; Peeler et al. 2002b) indicate that replacing the homogeneity constraint with the Al_2O_3 and sum of alkali constraints does not compromise product quality and provides more flexibility for DWPF operations, Herman et al. (2002b) are performing the final task to address this issue. In that study, the technical basis for unconditional elimination or replacement of the homogeneity constraint via application of the Al_2O_3 and sum or alkali constraints is being assessed over a bounding compositional region. Given the results and/or conclusions were not available at the time this assessment was initiated, continued use of the homogeneity constraint to limit the projected operational window was warranted.

Table 4-1. PAR Limits for Various Properties

Property	PAR Limit
T_L (new)	< 1010°C
ΔG_P (durability)	> -12.7178 kcal/mol
$\eta_{1150°C}$ (melt viscosity)	21.5–105.4 Poise
Homogeneity	> 210.92
Al_2O_3	≥ 3.0 wt% (in glass)[6]
Σalkali[7]	< 19.3 wt% (in glass)

[6] The Al_2O_3 and Σalkali limits were developed by Edwards and Brown (1998) to allow the homogeneity constraint to be relaxed from the MAR to the PAR. An alternative criterion would be a minimum Al_2O_3 content of 4 wt% with no constraint on the sum of alkali over the composition region evaluated.

[7] Alkalis included in this sum are Na_2O, Li_2O, Cs_2O, and K_2O.

5.0 Basis for SB3 Compositional Scenarios

Two primary inputs are required to assess the projected operational windows, the waste loading intervals, and the robustness: sludge or waste stream composition(s) and frit composition(s). Given the focus of this study is to develop frit compositions for SB3, defining the nominal SB3 waste stream(s) and representing its (their) variation are required inputs. For a given waste stream composition, one can select candidate frit compositions, and ultimately assess or define glass compositional regions or operating windows based on established acceptance criteria (see Section 4.0).

Prior to receiving information from HLW PE with respect to the projected sludge compositions as a function of washing or decants, an initial phase (Phase 1) of frit assessments was made using projections of SB3 sludge compositions based on an assumed washing scenario. Existing or newly-developed candidate frits were then assessed against these initial SB3 compositions following the strategy of Section 3.0 and the criteria of Section 4.0. Once the final (more definitive) washing or decant information for this study was received from HLW PE, a second assessment (Phase 2) was made for the frits that appeared to be promising from the initial projections given that differences did exist between the initial and final compositions. The results from these two phases of study are presented in Sections 6.0 and 7.0, respectively.

5.1 SB3 Compositions for Nominal Stage Assessments

Table 5-1 summarizes the nominal SB3 sludge composition (in oxide wt%) and masses (in kg) on an oxide basis as reported by Peeler et al. (2002a). This nominal SB3 composition includes the Tank 51 heel, Tank 7 sludge (including sand and the Tank 18 and Tank 19 sludge transfers), and Am/Cm and Pu/Gd additions and is based on a weighted average of the individual sludge masses either reported or calculated. The potential zeolite contribution from Tank 19 is not included. It was also assumed that the individual streams were evenly distributed or uniformly blended, resulting in a "constant" feed to the melter (once frit additions are made). More specifically, the nominal SB3 sludge compositions represented by Peeler et al. (2002a) assumed that none of the individual waste streams or sludges comprising SB3 constituted a "spike" in the composition during processing of a limited portion of SB3. That is, each of the individual streams is assumed to be well blended into SB3. The nominal SB3 compositions (and thus the assessments based upon them) do not account for any variation in the blending of the waste streams comprising SB3.

The nominal SB3 composition provided in Table 5-1 does not account for the sodium oxalate ($Na_2C_2O_4$) that could be present in Tank 7 as reported by Goslen (1984) and Fowler (1980). The total mass of sodium oxalate added to Tank 7 was estimated to be as high as 660,000 lbs (or 299,640 kgs). Studies are being performed by SRTC to assess the effects of sodium oxalate on different SB3 issues [Herman et al. (2002a); Bronikowski et al. (2002), Jantzen (2002b)]. One of the critical issues being addressed is the degree of washing that is required to meet specific operational constraints (e.g., H_2 generation and flammability), processing constraints (e.g., redox control), or product constraints (e.g., durability). Although not accounted for by Peeler et al (2002a), it is the intent of this assessment to address a series or suite of washing options that ultimately affect the amount of sodium transferred to the melter.

It also should be noted that the nominal composition does not account for the potential introduction of a monosodium titanate (MST) stream. Based on the HLW System Plan (WSRC 2001) it is anticipated that a limited volume of MST will be blended into SB3. However, given

the current uncertainties of if, when, and/or how (e.g., blended over the entire SB3 campaign or spiked into a limited portion of the SB3 campaign) that stream would be blended with SB3; its contribution was not accounted for in the initial assessment (Phase 1). Although not accounting for this stream does add some technical risk to the projected operational windows in the initial assessment, its impact should be minimal. The latter statement being based on the fact that the volume of MST is anticipated to be relatively low (~1200 kg/yr[8]; compared to the 366,886 kg of SB3 without the contribution of sodium oxalate). In addition, risks should be minimal for most of the cases considered in this report given the majority of the projected operational windows are either durability or viscosity limited (given the relatively high sodium concentration in the final glass). In these cases, and assuming the major impact of the MST (assumed to be primarily TiO_2) would be to increase T_L, the upper waste loading limits should not be impacted. It would only be in cases where the upper (or lower) waste loading interval is T_L limited, that the introduction of MST would be expected to cause changes to the projected operational windows. This latter statement assumes the single-component solubility limit for TiO_2 is not exceeded at the higher waste loadings. The impact of TiO_2 on glass properties is being assessed by Herman et al. (2002b), and the SB3 variability study will also assess this potential impact.

[8] Based on personal communication with Mark Drumm (7/15/02), the current material balance information indicates that the MST plant would send approximately 18,000 L of solution at 15 wt% MST to the DWPF each year. Assuming a 0.4 g/L solution and a full time operations, this would translate into approximately 2700 lbs of MST per year coming into DWPF.

Table 5-1. Nominal SB3 Composition (in wt%, calcine oxide basis)
(same as Case #4 as reported by Peeler et al. 2002a)

Oxide	SB3 baseline with Pu/Gd and Am/Cm Without $Na_2C_2O_4$
Ag	6.85E-04
Al_2O_3	18.102
AmO_2	4.28E-03
BaO	0.25
CaO	3.60
CdO	1.18E-05
Ce_2O_3	0.355
Cm_2O_3	6.47E-04
Cr_2O_3	0.374
CuO	0.198
Eu_2O_3	4.68E-05
Fe_2O_3	40.270
Gd_2O_3	0.051
K_2O	0.431
La_2O_3	0.206
Li_2O	2.94E-03
MgO	0.189
MnO	7.177
MoO_3	2.17E-04
Na_2O	10.629
Nd_2O_3	0.682
NiO	1.611
PbO	0.302
Pd	0.037
Pr_2O_3	0.186
PuO_2	0.052
RuO_2	0.278
Rh	0.078
SiO_2	3.343
Sm_2O_3	0.10
ThO_2	0.143
TiO_2	1.04E-04
U_3O_8	10.188
ZnO	0.411
ZrO_2	0.743
Total	100.00
Mass (in kg)	366886.24

Note: Anions/halides not reported.

5.2 Initial Projections of SB3 Composition as a Function of Washing

At the time this task was initiated, uncertainties associated with the actual quantity of $Na_2C_2O_4$ in Tank 7 and the fraction that would ultimately be transferred to SB3 given the various washing scenarios being considered were being addressed. From a glass formulation perspective and resulting properties, the unknown quantity of Na_2O resulting from the $Na_2C_2O_4$ will have a major impact on the overall sludge composition and ultimately the frit development efforts. That is, frit formulation efforts will have to account or compensate for the varying Na_2O concentrations that could be present in the sludge and ultimately the glass as different washing schemes are considered. As one transitions from a 100% washed case to a 0% (or minimal) washed case, the assumption is that the amount of Na_2O in sludge will increase. It has been further assumed in the Phase 1 assessment (due to the inaccessibility of sludge washing calculations) that washing only reduces the amount of Na_2O contributed from the oxalate source which is soluble with no impact on other components associated with SB3 (as listed in Table 5-1). The result of this assumption is essentially a dilution effect of the nominal SB3 composition with varying amounts of Na_2O as the different washing percentages are reviewed. For example, consider a 50% washed sludge case. The 299,640 kg of $Na_2C_2O_4$ would be reduced to ~149,820 kg (50% of the projected total) ultimately yielding an additional ~34,600 kg of Na_2O which would be blended with the 366,886.24 kg of nominal SB3. Given this assumption, the 100% washed case ultimately yields the nominal SB3 composition provided by Peeler et al. (2002a) (referred to as Case #4 in that report). The 0% washed case should be bounding given that in this assessment, all of the sodium oxalate would be transferred to the melter feed when in fact, a minimal amount of washing that will remove some Na_2O and other soluble species is expected prior to transferring SB3 to DWPF.

Table 5-2 provides a summary of the $Na_2C_2O_4$ and Na_2O contributions (in kg) for the various washing schemes used in the Phase 1 assessment. It is recognized that the assumption that washing does not impact other components of the sludge may be partially unfounded; however, incorporating sludge variation (see Section 5.3) around the nominal sludge(s) to develop frits should bound this assumption.

Table 5-2. Estimated $Na_2C_2O_4$ and Na_2O Masses as a Function of Washing

Washing	$Na_2C_2O_4$ (kgs)	Na_2O (kgs)
0%	299,640	138,584
25%	224,730	103,938
50%	149,820	69,292
75%	74,910	34,646
100%	0	0

Given the uncertainties associated with the degree of washing that will be required to meet processing constraints (including solubility limits of anions), safety issues with respect to hydrogen generation, melter flammability, and product quality issues, several washing scenarios are being considered in the Phase 1 assessment. Note that the potential impacts of coal and oxalate on reduction/oxidation (REDOX) control is not being specifically addressed as part of this study – see Jantzen (2002b). Issues regarding anion solubility limits were also not addressed in this assessment. It is recognized that the concentration of sulfate, nitrate, and nitrite will increase as one considers a less washed sludge, which may ultimately limit or dictate the degree of washing targeted. Prior to finalizing or selecting a particular frit/sludge washing flowsheet, an evaluation of the anion solubility limits should be addressed. In the assessment of melt rate, one

must account for the nitrite and nitrate levels as these may have a significant impact on melt rate. However, the nitrite and nitrate levels will vary with the processing performed in the Chemical Process Cell (CPC) and the associated SB3 flowsheet. In any case, the flowsheet should result in a product that meets the nitrite destruction levels (i.e., all products should be less than 1000 mg/l nitrite), but will have different nitrate and formate concentrations depending on the processing strategy selected.

Table 5-3 summarizes the nominal SB3 compositions for the washing scenarios (using the underlying assumptions discussed above). Those oxides shown as bold are considered to be major components as the projected concentration of these oxides is thought to be > 0.5 wt% in glass over the waste loading range of interest (25 – 60 wt%). Those oxides not bolded were classified as minor (i.e., anticipated as not having a significant impact on predicted properties at the concentrations expected in the glass). This is consistent with Plodinec et al. (1995) who indicated that trace components (elements whose oxides are present in the glass at concentrations less than 0.5 wt%) do not have a significant impact on glass durability. The "Others" component, shown in Table 5-3, is a total of all minor components in the sludge. For example, consider the 0%, nominal washed case that indicates a 3.69 wt% "Others" group. This indicates that the minor components account for 3.69 wt% of the sludge (calcined, oxide basis). The wt% shown by each minor component represents the percentage of that component in "Others". Therefore, the percentage of each minor component in the sludge can be obtained simply by multiplying the percentage of "Others" by the amount of "Others" in the sludge. Consider Cr_2O_3 and the 0% nominal washed case. The nominal SB3 sludge (0% washed) contains 3.69% of "Others" (minor components) of which Cr_2O_3 is 7.37%. Therefore, the Cr_2O_3 content in the sludge would be 0.272 wt%.

Based on the underlying assumptions previously discussed, the major impact of washing on the projected nominal compositions is related strictly to Na_2O concentrations. Concentrations of Na_2O in the nominal SB3 sludges range from 10.63 wt% to 35.13 wt% in the 100% washed case (no sodium oxalate transferred) to the 0% washed case (complete transfer of the sodium oxalate), respectively. The contribution of other alkali (Li_2O, K_2O, and Cs_2O) to the various sludge projections is minimal with respect to Na_2O (although their contributions will be considered). With respect to frit development activities, the wide range of Na_2O will make it extremely difficult (or impossible) to develop a single frit that is tolerant or insensitive to this large variation. (It would be ideal to develop a single frit that would yield acceptable glasses for all washing schemes over the waste loading interval of interest – assuming no adverse impacts of other processing issues such as melt rate are encountered.) Given this large variation, adjustments in the alkali content of the frit are expected as the contribution of alkali from the waste is accounted for. More specifically, as sludge washing is increased, the alkali concentration in sludge decreases, therefore, it is anticipated that the alkali content in the frit will increase (perhaps making the targeted frit composition more "frittable" – a key criteria for frit selection as discussed in Section 1.0).

5.3 Accounting for Anticipated Sludge Variation

Minimum and maximum values for each of the major components and "Others" group are also shown in Table 5-3. These intervals are based on ±10% variation around the components in an effort to capture potential sludge variation that may be observed during processing of SB3 and form the basis for the Variation Stage assessments. Although the official SB3 qualification sample has not been obtained, historical differences between projections in WCSystems and

actual sample analysis have typically been within ±10% for the major oxides of interest. In some instances, the analytical results of the qualification sample have indicated differences larger than expected when compared to WCSystems. However, it is felt that the use of the ±10% is on average a good approximation to the expected variation within a sludge batch. This does not indicate that any one of the nominal compositions will actually align itself (compositionally) with the SB3 qualification sample.

As with the nominal sludge compositions, the most interesting issue associated with the addition of the ±10% variation is the resulting Na_2O intervals. For the 0% washed case and a +10% variation, the Na_2O concentration is approximately 38.65%. For the 100% washed case and a -10% variation (on the nominal), the Na_2O concentration is approximately 9.57% (in sludge). Again, this large range in potential Na_2O concentrations will obviously impact the frit development strategy as a balance between the alkali contribution from the sludge and frit is maintained.

Stone and Josephs (2001) and Lambert et al. (2001) indicated that melt rate was directly related to total alkali concentration (melt rate increased as total alkali increased) for the SB2-based glasses. Given this observation and the fact that the SB3 sludge could potentially provide a high % of Na_2O (considering an underwashed sludge), one option for the glass formulation strategy is to take advantage of the relatively high alkali concentration in the sludge to improve melt rate as was done during the development of Frit 200 to accommodate the high alkali PHA stream (Jantzen 1988). In doing so, the approach must balance the desire to improve melt rate with the requirements to assure both processability (with respect to viscosity and liquidus temperature) and product performance (durability). To accomplish this, compositional adjustments to the frit will be required. Focusing solely on the desire to enhance melt rate could result in the DWPF making a poor-quality product faster (ignoring the use of PCCS). It is expected however that projections of the operating window may become durability or viscosity (i.e., challenge the lower limit) limited as glass formulation efforts try to balance the desire to increase melt rate and/or waste loading (both affecting waste throughput) with the desire to minimize the number of washes required. Developing a system which is durability limited (e.g., having predictions of elemental releases that limit the upper waste loading range) would be appropriate. That could indicate that enhanced melt rates may be realized without compromising product quality given the conservatism in the model predictions. Transferring from a liquidus temperature limited system to a durability limited system may have advantages in terms of meeting the goals or objectives of the accelerated clean-up mission.

Table 5-3. Nominal Compositions of SB3 as a Function of Washing Scenario and Minimum and Maximum Values Assuming a ±10% Variation (mass fractions).

	0% Washed			25% Washed			50% Washed			75% Washed			100% Washed		
	Nominal	**Min**	**Max**	**Nominal**	**Min**	**Max**	**Nominal**	**Min**	**Max**	**Nominal**	**Min**	**Max**	**Nominal**	**Min**	**Max**
Ag_2O	0.0001	-	-	0.0001	-	-	0.0001	-	-	0.0001	-	-	0.0001	-	-
Al_2O_3	**0.1314**	**0.1183**	**0.1445**	**0.1411**	**0.1270**	**0.1552**	**0.1523**	**0.1370**	**0.1675**	**0.1654**	**0.1489**	**0.1819**	**0.1810**	**0.1629**	**0.1991**
AmO_2	0.0008	-	-	0.0008	-	-	0.0008	-	-	0.0008	-	-	0.0008	-	-
BaO	0.0493	-	-	0.0493	-	-	0.0493	-	-	0.0493	-	-	0.0493	-	-
CaO	**0.0261**	**0.0235**	**0.0287**	**0.0280**	**0.0252**	**0.0309**	**0.0303**	**0.0272**	**0.0333**	**0.0329**	**0.0296**	**0.0362**	**0.0360**	**0.0324**	**0.0396**
Ce_2O_3	0.0699	-	-	0.0699	-	-	0.0699	-	-	0.0699	-	-	0.0699	-	-
Cm_2O_3	0.0001	-	-	0.0001	-	-	0.0001	-	-	0.0001	-	-	0.0001	-	-
Cr_2O_3	0.0737	-	-	0.0737	-	-	0.0737	-	-	0.0737	-	-	0.0737	-	-
CuO	0.0390	-	-	0.0390	-	-	0.0390	-	-	0.0390	-	-	0.0390	-	-
Eu_2O_3	0.0009	-	-	0.0009	-	-	0.0009	-	-	0.0009	-	-	0.0009	-	-
Fe_2O_3	**0.2923**	**0.2631**	**0.3215**	**0.3138**	**0.2824**	**0.3452**	**0.3387**	**0.3049**	**0.3726**	**0.3680**	**0.3312**	**0.4048**	**0.4027**	**0.3624**	**0.4430**
Gd_2O_3	0.0100	-	-	0.0100	-	-	0.0100	-	-	0.0100	-	-	0.0100	-	-
K_2O	0.0848	-	-	0.0848	-	-	0.0848	-	-	0.0848	-	-	0.0848	-	-
La_2O_3	0.0405	-	-	0.0405	-	-	0.0405	-	-	0.0405	-	-	0.0405	-	-
Li_2O	0.0006	-	-	0.0006	-	-	0.0006	-	-	0.0006	-	-	0.0006	-	-
MgO	0.0371	-	-	0.0371	-	-	0.0371	-	-	0.0371	-	-	0.0371	-	-
MnO	**0.0521**	**0.0469**	**0.0573**	**0.0559**	**0.0503**	**0.0615**	**0.0604**	**0.0543**	**0.0664**	**0.0656**	**0.0590**	**0.0721**	**0.0718**	**0.0646**	**0.0789**
Na_2O	**0.3513**	**0.3162**	**0.3865**	**0.3036**	**0.2732**	**0.3339**	**0.2483**	**0.2234**	**0.2731**	**0.1834**	**0.1651**	**0.2017**	**0.1063**	**0.0957**	**0.1169**
Nb_2O_3	0.0000	-	-	0.0000	-	-	0.0000	-	-	0.0000	-	-	0.0000	-	-
Nd_2O_3	0.1342	-	-	0.1342	-	-	0.1342	-	-	0.1342	-	-	0.1342	-	-
NiO	**0.0117**	**0.0105**	**0.0129**	**0.0126**	**0.0113**	**0.0138**	**0.0136**	**0.0122**	**0.0149**	**0.0147**	**0.0132**	**0.0162**	**0.0161**	**0.0145**	**0.0177**
P_2O_5	0.0000	-	-	0.0000	-	-	0.0000	-	-	0.0000	-	-	0.0000	-	-
PbO	0.0595	-	-	0.0595	-	-	0.0595	-	-	0.0595	-	-	0.0595	-	-
PdO	0.0072	-	-	0.0072	-	-	0.0072	-	-	0.0072	-	-	0.0072	-	-
Pr_2O_3	0.0367	-	-	0.0367	-	-	0.0367	-	-	0.0367	-	-	0.0367	-	-
PuO_2	0.0103	-	-	0.0103	-	-	0.0103	-	-	0.0103	-	-	0.0103	-	-
RhO_2	0.0153	-	-	0.0153	-	-	0.0153	-	-	0.0153	-	-	0.0153	-	-
RuO_2	0.0547	-	-	0.0547	-	-	0.0547	-	-	0.0547	-	-	0.0547	-	-
SiO_2	**0.0243**	**0.0218**	**0.0267**	**0.0261**	**0.0234**	**0.0287**	**0.0281**	**0.0253**	**0.0309**	**0.0305**	**0.0275**	**0.0336**	**0.0334**	**0.0301**	**0.0368**
Sm_2O_3	0.0197	-	-	0.0197	-	-	0.0197	-	-	0.0197	-	-	0.0197	-	-
ThO_2	0.0282	-	-	0.0282	-	-	0.0282	-	-	0.0282	-	-	0.0282	-	-
TiO_2	0.0000	-	-	0.0000	-	-	0.0000	-	-	0.0000	-	-	0.0000	-	-
U_3O_8	**0.0739**	**0.0666**	**0.0813**	**0.0794**	**0.0715**	**0.0873**	**0.0857**	**0.0771**	**0.0943**	**0.0931**	**0.0838**	**0.1024**	**0.1019**	**0.0917**	**0.1121**
ZnO	0.0809	-	-	0.0809	-	-	0.0809	-	-	0.0809	-	-	0.0809	-	-
ZrO_2	0.1463	-	-	0.1463	-	-	0.1463	-	-	0.1463	-	-	0.1463	-	-
Others	**0.0369**	**0.0332**	**0.0406**	**0.0396**	**0.0356**	**0.0435**	**0.0427**	**0.0385**	**0.0470**	**0.0464**	**0.0418**	**0.0511**	**0.0508**	**0.0457**	**0.0559**
Sum	1.0000			1.0000			1.0000			1.0000			1.0000		

5.4 SB3 Composition as a Function of Decant

As previously stated, assessments were initially performed using the linear washing schemes prior to receiving projected sludge compositions as a function of washing (or decant) from HLW PE. Elder provided the compositional estimates of SB3 as a function of decant.[9] The elemental concentrations provided by Elder were converted to an oxide basis (by multiplying by the appropriate gravimetric factor) and these data are presented in Table 5-4. These nominal compositions form the basis for the final phase assessments (Phase 2) as described in Section 7.0.

General observations of composition as a function of washing indicate that the Na_2O concentrations decrease with increased washing (or decant). Initially, the Na_2O concentration decreases relatively quickly with the differences becoming smaller as the decant number increases. All other components trend in the opposite direction – increased concentration as the decant number increases. Although this trend was expected, the Na_2O concentration for the minimum washed sludge (Decant #5) is lower than that associated with the nominal 0% washed case (see Table 5-3), 31.205 versus 35.13 wt%, respectively. This difference is based on the assumptions made in the initial compositional projections given no washing models were available at the time. Given this difference, frits developed for the 0% washed case may be alkali-deficient for the Decant #5 stream resulting in a smaller projected operational window or lower melt rate. This required alternative frits to be developed to compensate for the Na_2O difference.

It should also be noted that the compositional projections provided by Elder for the Phase 2 assessment include significant quantities of TiO_2 ranging from 2.154% to 2.627% in Decant #5 to Decant #15, respectively. TiO_2 will be considered a major oxide when these sludges are evaluated – the impact of TiO_2 will be accounted for in the various Phase 2 predictions. This is another difference between the two assessments (Phase 1 vs. Phase 2) given the potential impact of the MST stream was not accounted for in the initial phase assessment.

To account for impact of sludge variation on projected operational windows, select frits were evaluated in terms of their ability to process ±10% variation around each major oxide associated with two decants. This formed the Phase 2 Variation Stage of the paper study assessments. More specifically, ±10% variation around the Decant #7 was selected to assess the robustness of frits developed for the lower washed sludges. Frits developed for the higher washed sludges were assessed against a ±10% variation around the Decant #12. This strategy was used given the ±10% variation around Decant #7 captured the value of each major oxide associated with the nominal sludge compositions for Decant #5 through Decant #9.

[9] Personal communication with H.H. Elder via email dated 7/30/02. Appendix A provides the data transmitted in the personal communication (elemental wt%, calcine basis).

Table 5-4. Projected SB3 Compositions as a Function of Decant (oxide basis, wt%).

Oxide	Decant #5	Decant #6	Decant #7	Decant #8	Decant #9	Decant #10	Decant #11	Decant #12	Decant #13	Decant #14	Decant #15
Al_2O_3	13.844	14.348	14.777	15.139	15.467	15.743	16.006	16.253	16.458	16.669	16.886
B_2O_3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.192	0.198	0.204	0.209	0.214	0.218	0.221	0.225	0.228	0.231	0.234
CaO	2.755	2.855	2.940	3.012	3.077	3.132	3.185	3.234	3.274	3.316	3.360
Ce_2O_3	0.267	0.277	0.285	0.292	0.298	0.304	0.309	0.313	0.317	0.321	0.326
Cr_2O_3	0.283	0.293	0.302	0.310	0.316	0.322	0.327	0.332	0.337	0.341	0.345
Cs_2O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CuO	0.152	0.157	0.162	0.166	0.169	0.172	0.175	0.178	0.180	0.183	0.185
Fe_2O_3	30.784	31.905	32.858	33.664	34.392	35.007	35.591	36.141	36.596	37.065	37.549
K_2O	0.329	0.341	0.352	0.360	0.368	0.375	0.381	0.387	0.392	0.397	0.402
La_2O_3	0.176	0.182	0.187	0.192	0.196	0.200	0.203	0.206	0.209	0.211	0.214
Li_2O	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MgO	0.144	0.150	0.154	0.158	0.161	0.164	0.167	0.169	0.172	0.174	0.176
MnO	5.491	5.690	5.860	6.004	6.134	6.244	6.348	6.446	6.527	6.611	6.697
MoO_3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na_2O	31.205	28.701	26.571	24.770	23.142	21.770	20.464	19.235	18.219	17.170	16.089
Nb_2O_3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NiO	1.231	1.276	1.314	1.346	1.375	1.400	1.423	1.445	1.463	1.482	1.501
PbO	0.230	0.238	0.245	0.251	0.257	0.261	0.265	0.270	0.273	0.276	0.280
SiO_2	1.603	1.661	1.711	1.753	1.791	1.823	1.853	1.882	1.906	1.930	1.955
ThO_2	0.110	0.114	0.117	0.120	0.122	0.125	0.127	0.129	0.130	0.132	0.134
TiO_2	2.154	2.232	2.299	2.356	2.407	2.450	2.490	2.529	2.561	2.594	2.627
U_3O_8	7.792	8.075	8.316	8.520	8.705	8.860	9.008	9.147	9.262	9.381	9.504
Y_2O_3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZnO	0.315	0.326	0.336	0.344	0.351	0.358	0.364	0.369	0.374	0.379	0.384
ZrO_2	0.568	0.589	0.607	0.622	0.635	0.646	0.657	0.667	0.676	0.684	0.693
sum	99.624	99.610	99.598	99.588	99.579	99.572	99.565	99.558	99.553	99.547	99.541

This page intentionally left blank.

6.0 Assessment of Linear Washing Scenarios (Phase 1): Nominal and Variation Stages

Using the available PCCS process/product models, various frits will be assessed as a function of SB3 washing. Evaluating the predicted impacts and projected operating windows for candidate frits will provide one of the primary criteria that should be used in the SB3 frit selection process. It is not the intent of this study to recommend a frit to DWPF for SB3—only to provide insight into the selection process. In this section, Phase 1 assessments based on the nominal SB3 linear washing scenarios are discussed using the strategy as defined for the Nominal Stage and for the Variation Stage.

6.1 Nominal Stage Assessment

Elder (2002) has performed calculations similar to those being utilized in the Nominal Stage of this study to determine that Frit 202 and Frit 320 are viable candidates for SB3 given a specific number of washes and decants.[10] Frit 202 was developed by Jantzen et al. (1988) as a "generic" coupled operations frit – one that could be used for several combinations of sludge and sodium rich PHA waste streams. Frit 320 was developed specifically for improving melt rate for SB2 (Peeler et al. 2001a) – a sludge-only flowsheet. Although neither frit was developed specifically for SB3, the calculations performed by Elder (2002) indicate that Frit 202 and Frit 320 are viable candidates for SB3 when considering different washing/decant options. This is consistent with the assessments performed by Peeler et al. (2002a) for Frit 320 and SB3 (although sodium oxalate was not accounted for). Given their viability and classification as "baseline" frits to this point, assessments using both frits will be made over all washing cases being considered.

Although the Nominal Stage analysis (based solely on nominal compositions) should provide a comparative or confirmatory analysis to the operational windows projected by Elder (2002), slight differences in the acceptance criteria, acceptable limits (PAR vs. MAR), and SB3 compositions may yield slight differences. It is anticipated that the incorporation of the ±10% sludge variation in the Variation Stage will provide more insight into robustness and will bound Elder's calculations. Table 6-1 summarizes the current "baseline" and alternative candidate frit compositions used in the initial phase assessments (refer to Table 5-3 for the sludge compositions). The Nominal Stage assessment results are shown in Table 6-2.

[10] Frit 202 is more refractory (less total alkali) and is therefore capable of handling a less washed sludge that would contain more Na_2O. The use of Frit 320 with an underwashed sludge has a higher potential to produce an unacceptable product (limited based on predictions of durability) given the high alkali content in the frit which was the basis for increasing melt rate for SB2.

Table 6-1. Nominal Compositions of Candidate Frits (in wt% on an oxide basis).

	Frit 202	Frit 320	Frit 400	Frit 401	Frit 402	Frit 403	Frit 404	Frit 405	Frit 406	Frit 407	Frit 408	Frit 409	Frit 410	Frit 411	Frit 412	Frit 413	Frit 414	Frit 415	Frit 416	Frit 417	Frit 418	Frit 419
Al_2O_3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-
B_2O_3	8	8	20	30	12	15	12	20	15	8	8	8	8	8	8	9	8	10	8	8	8	8
Li_2O	7	8	-	-	-	3	3	5	5	-	2	4	5	5	5	5	6	5	8	8	8	8
Na_2O	6	12	-	-	-	-	-	-	-	6	6	6	5	12	12	15	14	15	11	11	8	15
SiO_2	77	72	80	70	88	82	85	75	80	86	84	82	82	74	75	71	72	70	72	73	76	69
MgO	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table 6-2. Summary of Nominal Stage Assessments for Candidate SB3 Frits (waste loading ranges are in wt% on a calcined, oxide basis).

Results Presented are from a Waste Loading Interval of 25% to 60%		Frit 202	Frit 320	Frit 400	Frit 401	Frit 402	Frit 403	Frit 404	Frit 405	Frit 406	Frit 407	Frit 408	Frit 409	Frit 410	Frit 411	Frit 412	Frit 413	Frit 414	Frit 415	Frit 416	Frit 417	Frit 418	Frit 419
0% washed	WL (nominal)	None	None	40-53	32-46	46-57	37-52	40-53	32-44	32-48													
25% washed	WL (nominal)	31-40	None						30-47	34-51	45-55	40-55	34-51	33-51									
50% washed	WL (nominal)	29-45	None												26-45	28-43							
75% washed	WL (nominal)	29-35	26-41														26-45	26-45	26-43	25-44			
100% washed	WL (nominal)	None	25-37																	25-36	25-36	25-34	25-40

Projected operating windows (i.e., waste-loading ranges) for the five washing scenarios are presented in Table 6-2 for each candidate frit composition over the waste loading interval of interest (25 – 60 wt%). In the following sections, various frit/sludge combinations are discussed in terms of the projected operational window and the property prediction limiting the lower and upper waste loadings. Initially, an in-depth discussion linking the details provided in Appendix B to the summary table (Table 6-2) is provided to demonstrate how the summary table was developed. This discussion will provide insight into the comparison of the predicted properties to the acceptance criteria and the influence they have on establishing or defining the projected operational windows. Given the understanding of how the summary table was developed and knowing the extensive number of combinations that result when coupling the candidate frits with the different washing scenarios, detailed discussion of other frit/sludge systems will be brief and select. Given the classification of Frit 202 and Frit 320 as "baseline" frits to this point, both will be discussed to some degree for each washing scenario considered. Although a particular frit is not specifically discussed in the text, one should not rule out its potential use. Again, the discussions are intended to provide insight into how the summary table (Table 6-2) was developed and what information can be extracted and carried forward to the frit selection process. It must be recognized that the assessments and projected operational windows are based solely on model predictions – no experimental work was performed.

Detailed information regarding the predicted properties for the nominal compositions when coupled with each candidate frit is provided in Appendix B (linear washing scenarios). The columns identified as "Type" summarizes the specific sludge being evaluated with the second column ("Frit ID") identifying the frit. The third column "Satisfies PAR" represents the comparison of the predicted properties versus the PAR limits as shown in Table 4-1. The last two columns specify the minimum and maximum WLs over which the specific sludge/frit combination possess the characteristics described by the "Satisfies PAR" nomenclature.

6.1.1 0% Washed Case

For example, consider the 0% washed, SB3 nominal sludge case and Frit 202 (i.e., Table 6-3 is an excerpt of this specific information from Appendix B). For Row #1 (which represents a waste loading range between 25 – 28% – see last two columns), the "Satisfies PAR" nomenclature indicates "Durable; Visc.; Not Homog; New T_L; Al_2O_3; and Alkali." This nomenclature indicates that the nominal sludge/Frit 202 combinations over the WL range of 25 – 28% satisfies the PAR limits (based on predictions using target compositions) for durability, viscosity, the new liquidus temperature model (New T_L), the Al_2O_3 lower limit, and the sum of alkali upper limit (Alkali). However, this glass challenges the homogeneity constraint (as noted by "Not Homog") at the PAR. That is, it fails to meet the homogeneity PAR acceptance value of 210.92 (as noted in Table 4-1) and thus is predicted to produce inhomogeneous glasses over this WL range. Based on the acceptance criteria established in Section 4.0, this particular sludge/frit combination would be restricted from DWPF processing based solely on the homogeneity constraint over the waste loading range of 25 – 28%.

Table 6-3. Nominal Stage Assessment for the 0% Washed Nominal Sludge with Frit 202 over the Waste Loading Range of 25 – 60%.

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
SB3 Nominal for Washing @ 0%	202	Durable; Visc; Not Homog; New TL; Al2O3; alkali	25	28
SB3 Nominal for Washing @ 0%	202	Durable; Visc; Not Homog; New TL; Al2O3; Not alkali	29	30
SB3 Nominal for Washing @ 0%	202	Not Durable; Visc; Not Homog; New TL; Al2O3; alkali	31	33
SB3 Nominal for Washing @ 0%	202	Not Durable; Visc; Homog; New TL; Al2O3; alkali	34	41
SB3 Nominal for Washing @ 0%	202	Not Durable; Not L Visc; Homog; New TL; Al2O3; alkali	42	60

Continuing the discussion of the Frit 202, 0% washed SB3 combination, as waste loadings are increased to 29 and 30%, not only is the homogeneity constraint failed (at the PAR) but the sum of alkali criterion is exceeded as well. It should be noted that in this case, the Al_2O_3 concentration is less than 4 wt% with the sum of alkali content exceeding 19.3%. If however, the Al_2O_3 concentration is ≥ 4.0 wt%, there is no sum of alkali limit (over the compositional range tested), which is the case for waste loadings of 31% and higher for this system. Based on the predicted property assessments, glasses in the 29 – 30% waste loading range are unacceptable and thus not processable. At WLs of 31% and higher, predictions of durability indicate unacceptable glasses may be produced even though the Al_2O_3 concentration is > 4.0% (otherwise the "Not Alkali" nomenclature would be shown). The low viscosity limit is exceeded (as indicated by the "Not L Visc") at waste loadings between 42 – 60%.

Based on the assessment of the various property predictions, the SB3 nominal 0% washed sludge when coupled with Frit 202 does not yield an acceptable processing window. Table 6-2 summarizes this assessment by the use of "none" indicating that there is not a projected operating window for Frit 202/0% washed SB3 nominal sludge combinations over the 25 – 60 wt% WL range based on the acceptance criteria established (see Table 4-1).

Using the information in Appendix B, a projected operational window for the Frit 320/0% SB3 nominal sludge also does not exist. The primary criterion that eliminates this specific frit/sludge combination is the prediction of durability. With the 0% washed sludge containing approximately 35% Na_2O and Frit 320 being a high alkali based frit (alkali added to improve melt rate for SB2 [Peeler et al. 2001a]), combining these two inputs over the waste loading range of interest would produce extremely high alkali based glasses – thus predictions of an unacceptable durability or PCT response are expected.

Given the two "baseline" frits yield no processing window, alternative frits were developed for the 0% washed nominal SB3 sludge. It should be noted that neither Frit 202 nor Frit 320 was developed for this specific waste stream so their application may not be warranted. Alternative frits that were developed include: Frits 400, 401, 402, 403, 404, 405, and 406.[11] As previously mentioned, a detailed discussion on each of the systems is not warranted but the reader is referred to Appendix B for details of each system.

Based on the summary shown in Table 6-2, relatively large operational windows exist for all of the alternative frits when coupled with the nominal 0% washed SB3 composition. Frits 400, 401, and 402 are two component frits (with different SiO_2/B_2O_3 ratios) which are depleted of alkali and, thus, are compensating for the high alkali content of the 0% washed sludge. Projected operational windows for Frit 400, 401, and 402 are 40 – 53%, 32 – 46%, and 46 – 57% WL, respectively. Although relatively large operational windows exist for these three frits, other factors need to be considered in the frit selection process – melt rate and frittability. Based solely on composition, the primary issue with these alkali-depleted frits will be the desire to have a "frittable" frit. If proven to be unfrittable, their use may be eliminated especially if an additive composition that is frittable yields a similar acceptable WL interval (assuming melt rates are similar).

[11] During the frit development process, an alphanumeric nomenclature or system was used to identify specific frit compositions. These alphanumeric identifiers have been converted to a numerical series (the 400 series). Appendix C provides the conversion chart.

To increase the likelihood of being able to produce a frit from additives, alkali additions to frits 403, 404, 405, and 406 were made. Given the high concentration of Na_2O in the sludge, Li_2O was used as the frit additive at relatively low concentrations. The low concentrations primarily being driven by issues associated with predictions of durability.

All of the alternative frits developed for the nominal 0% washed case appear to be primary candidates. This latter statement being based solely on their respective, relatively large operating windows and the fact that the frits do contain alkali (Li_2O) resulting in a higher potential to meet the frittability constraint. The upper waste loadings projected for Frits 403, 404, 405, and 406 are 52, 53, 44, and 48 wt%, respectively. Higher waste loadings are limited by predictions of durability and/or viscosity (challenging the low viscosity limit) which suggest that the frits being developed are taking advantage of the high alkali concentrations of the waste. More specifically, targeting higher waste loadings for the 0% washed nominal sludge yields glasses that are enriched in alkali promoting the formation of a less durable glass and/or driving viscosities below the acceptable lower limit. Not only does this suggest that the frits are taking advantage of the high alkali in the sludge, but also that the property limiting upper waste loadings can be shifted from being a T_L-limited system to a viscosity and/or durability limited system based on predictive models. It should be noted that for the alternative frits developed for the 0% washed case, all systems are either durability or low viscosity limited on the upper waste loading side.

The extremely high upper waste loading limit (57%) predicted by Frit 402 is very attractive. However, as described in Section 6.2, its response to compositional variation is less than adequate which detracts from it being classified as a primary frit candidate.

Again, numerous comparisons could be discussed. The details from which the summary table was developed is presented in Appendix B so that the reader can assess or make specific comparisons of interest.

6.1.2 25% Washed Case

As discussed in Section 5.0, as the degree of washing is increased, the Na_2O concentration in the linear washed sludge decreases. Therefore, frit development activities compensated by adjusting the alkali concentration and type as well as their ratios in perspective frits. The Nominal Stage strategy was used to assess the response of the projected operational window using model predictions to these compositional changes. Based on rudimentary glass science knowledge, enhancing the alkali concentration in the frit improves the likelihood of being able to manufacture a prefabricated frit from the proposed additives and potentially improves melt rate (based on the observations by Stone et al. [2001] and Lambert et al. [2001]).

Given the classification as “baseline” frits, projected operational windows for Frit 202 and Frit 320 will be discussed initially. In this section, general observations are made based on the detailed information provided in Appendix B. The reader is referred to this appendix to obtain more details or to make specific comparisons of interest.

As was the case for the 0% washed sludge, use of Frit 320 is prohibited with the 25% washed nominal sludge over the entire WL range of interest due to durability predictions.[12] The more refractory (less alkali) Frit 202 does produce an operational window with the nominal 25%

[12] Use of “prohibited” in this report refers to the inability to utilize a specific frit over the entire 25 – 60% WL range of interest based solely on model predictions.

washed sludge from 31 – 40 wt%. Although the frit is more refractory, predictions of durability limit access to waste loadings of 41% or greater.

Alternative frits developed for the 25% washed case include: 407, 408, 409, and 410. All of these frits yield relatively large operational windows based on model predictions with upper WL limits in the low- to mid-50% range. Although developed for the 0% washed case, Frits 405 and 406 provide operational windows for the 25% washed nominal sludge case. The ability of a single frit composition to provide operational windows for a range of sludge compositions is advantageous and demonstrates a degree of operational flexibility. It should be noted that the Nominal Stage assessment is based solely on nominal compositions with the Variation Stage specifically designed to provide insight into the robustness of each frit to possible compositional variation.

6.1.3 50% Washed Case

Continued washing of the sludge results in lower alkali concentrations that require compensation via frit development or formulation activities in order to maintain a high degree of operational flexibility. The 50% nominal washed sludge contains approximately 25% total alkali. Coupling this nominal sludge with Frit 202 provides an operating window from 29 – 45 wt% with higher waste loadings being limited by T_L predictions – not durability or viscosity. Use of Frit 202 may be advantageous not only from a WL perspective, but given the current availability of the frit, fabrication cost may be eliminated (assuming the quantity of frit existing would be sufficient to process SB3) or at least minimized (assuming a limited quantity would be required from a vendor). The classification of Frit 202 as a primary candidate based solely on availability assumes all other factors (such as robustness, operational window size, and melt rate) are equal. If proven to meet or provide acceptable responses to the Variation Stage and melt rate, a cost benefit analysis should be performed (including adjustments for total waste throughput) to assess the advantages and (potential) disadvantages of this frit.

Use of Frit 320 is still prohibited from a durability perspective with this nominal sludge – excessive alkali driving predictions of unacceptability. As the degree of washing increases, the alkali concentration in the sludge should decrease to a level in which Frit 320 could be utilized.

Based on the Frit 202 system being T_L limited, compositional adjustments to drive the system toward being durability limited were attempted – primarily via increasing alkali concentration. The results were Frits 411 and 412. Appendix B confirms that the Frit 411 and Frit 412 based glasses are either durability and/or low viscosity limited at the higher WLs. Based on model predictions, there is no advantage of either Frit 411 or 412 in terms of the maximum waste loading that could be potentially achieved relative to Frit 202. In fact, use of Frit 412 reduces the maximum WL by 2%. However, the enhanced alkali concentrations may promote faster melt rates that could manifest into higher waste throughput. Lorier et al. (2002) demonstrated for a Frit 320 based system that optimum waste throughput was not achieved at the highest possible waste loading. Therefore, consideration of melt rate for these two frits (relative to Frit 202) is warranted during the frit selection process. It should also be noted that the lower waste loading limits for Frit 411 and Frit 412 are extended due to less restrictive challenges to the homogeneity constraint. This may provide more operational flexibility to DWPF although higher waste loadings are desired or preferred, in general.

6.1.4 75% Washed Case

Given the overall reduction of alkali in the 75% washed sludge, Frit 320 provides its first operational window for this series of nominal sludge compositions. The WL range allowed extends from a low of 26% to a high of 41%. Waste loadings of 42% or greater, are limited by the low viscosity criterion – not durability.

Coupling Frit 202 with the 75% washed nominal sludge composition also provides an operational window (29 – 35%). Relative to the 25% and 50% washed cases with Frit 202, the window became narrower or more restricted indicating that the use of Frit 202 may be more advantageous for these lesser washed sludges. (Frit 202 provided no operational window for the 0% washed case). High viscosity predictions limit access to WLs less than 29%; while predictions of T_L prohibit waste loadings greater than 35% for the 75% washed case.

Compositional adjustments to provide more operational flexibility to DWPF for this specific sludge are shown through Frits 413, 414, 415, and 416. All of these frits yield essentially the same projected operational windows with respect to each other. Lower WLs are on the order of 25 – 26%; with upper WLs ranging from 43 – 45%. When compared to Frit 320 and Frit 202, the upper WL limits achievable are higher with the alternative frit compositions developed by up to 4% and 10%, respectively.

One interesting comparison is the operational windows provided by Frit 320 compared to those for Frit 416. Frit 416 is based on a very minor compositional change to Frit 320. More specifically, 1% of the Na_2O was removed and added as Al_2O_3. This slight change provided access to both lower and higher WLs for this specific sludge. As previously discussed, the Frit 320 based system failed the low viscosity limit at WLs of 42% and higher. The 1% Al_2O_3 increased the predicted viscosity in a manner to shift the upper WL limit from 41% to 44% prior to becoming both viscosity and T_L limited at 45%. Implications of becoming T_L limited at 45% are that additional shifts of Al_2O_3 for Na_2O may not be effective in extending the upper WL limit – although other compositional adjustments are possible.

6.1.5 100% Washed Case

As previously mentioned, the 100% washed case represents a sludge composition with no Na_2O contribution from sodium oxalate rendering this sludge to be relatively alkali deficient. Use of Frit 202 is prohibited (over the WL range of interest) with the 100% washed nominal sludge case with high viscosity and/or T_L limiting both lower and upper WLs.

Coupling the 100% washed sludge with Frit 320 does provide an operational window (25 – 37%) with the system becoming T_L limited at higher waste loadings. This is consistent with the findings of Peeler et al. (2002a), which assessed the addition of Am/Cm and Pu/Gd on SB3 (without sodium oxalate).

Alternative frits were developed (Frits 417, 418, and 419) to extend the upper waste loading levels and potentially improve melt rate by increasing the alkali content in the frit to compensate for the low content of alkali in the sludge. This effort was semi-successful with respect to the model-based projections of the operational window given that Frit 419 was the only alternative frit to allow for higher waste loadings (based on use of the PAR criteria) when compared to the Frit 320 based system. The enhanced alkali concentration in Frit 419 may also promote higher melt rates that could manifest into higher waste throughput. Based on the observations by Stone

et al. (2001) and Lambert et al. (2001) the lower total alkali concentrations in Frits 417 and 418 may yield slower melt rates than either Frit 320 or Frit 419. Coupling the projected slower melt rate with lower upper WLs provided a basis for not considering these two frits as primary candidates.

6.2 Variation Stage Assessment (Phase 1): Linear Washing Scenarios

As mentioned in Section 6.1, the Nominal Stage assessments are based on nominal SB3 compositions and do not account for anticipated compositional variation. Therefore, an increased risk would result with respect to processability or product quality if a decision were based solely on this assessment without accounting for compositional variation. For example, consider the case if the Tank 7 qualification sample did not "match" the nominal composition used (from Table 5-3). The obvious question would be: "For the frit selected, is there a processing window for this sludge?" The intent or focus of this stage was to gain insight into the robustness of candidate frits with respect to compositional variation.

The Phase 1 Variation Stage was based primarily on EVs determined for each SB3 linear washing scenario accounting for a ±10% variation around the major oxide. Assessments were made using models currently implemented in DWPF over the WL interval of interest (25 – 60 wt%). Table 6-4 summarizes the results of the Phase 1 Variation Stage assessment in terms of the three metrics (defined in Section 3.0) for each frit/sludge combination. Also shown in Table 6-4, are the results of the Phase 1 Nominal Stage assessment for completeness. It must be recognized that the assessments and projected operational windows are based solely on model predictions – no experimental work was performed.

Detailed information regarding the predicted properties for the EV-based sludge compositions (for each washing scenario) when coupled with each candidate frit is provided in Appendix D. The column identified as "Sludge Loading (%)" summarizes the specific waste loading of interest. It should be noted that there are typically more than one row for each sludge loading given the predicted properties for all EVs will vary dramatically. The second column in Appendix D ("Satisfies PAR") represents the comparison of the predicted property versus the PAR limits as shown in Table 4-1. In this column, properties deemed unacceptable with respect to the PAR acceptance limits are preceded by "Not". The last column ("# of EVs") summarizes the number of EVs whose common property predictions are classified by the "Satisfies PAR" column.

Again, numerous comparisons could be discussed. Detailed information is presented in Appendix D and summarized in Table 6-4 so specific comparisons of interest can be made. Highlighted below are some general comments regarding the Variation Stage assessments for both existing and alternative frits. The discussion primarily focuses on high level comparisons for a specific washing scenario but when applicable comparisons may be made with respect to a frit's ability to tolerate multiple washing scenarios.

Table 6-4. Summary of the Nominal and Variation Stage Assessments for Candidate SB3 Frits and the Linear Washing Scenarios.

Results Presented are from a Waste Loading Interval of 25% to 60%		Frit 202	Frit 320	Frit 400	Frit 401	Frit 402	Frit 403	Frit 404	Frit 405	Frit 406	Frit 407	Frit 408	Frit 409	Frit 410	Frit 411	Frit 412	Frit 413	Frit 414	Frit 415	Frit 416	Frit 417	Frit 418	Frit 419
0%	WL (nominal)	None	None	40-53	32-46	46-57	37-52	40-53	32-44	32-48													
	WL all EVs (+/- 10%)	None		None	None	None	40-45	43-46	37-39	37-41													
	%EVs at Some WL	40.0		89.2	100.0	67.9	100.0	100.0	100.0	100.0													
	WL of 5% or greater	33.2		66.8	100.0	61.8	100.0	100.0	86.4	100.0													
	Minimum WL Range	-		-	5	-	9	7	-	5													
25%	WL (nominal)	31-40	None						30-47	34-51	45-55	40-55	34-51	33-51									
	WL all EVs (+/- 10%)	None							34-37	37-38	34-37	None	37-42	36-42									
	%EVs at Some WL	80.7							100.0	100.0	100.0	43.0	100.0	100.0									
	WL of 5% or greater	59.1							100.0	95.9	100.0	38.3	100.0	100.0									
	Minimum WL Range	-							9	-	9	-	9	9									
50%	WL (nominal)	29-45	None												26-45	28-43							
	WL all EVs (+/- 10%)	33-38													None	None							
	%EVs at Some WL	100.0													97.6	81.5							
	WL of 5% or greater	100.0													86.2	66.4							
	Minimum WL Range	12													-	-							
75%	WL (nominal)	29-35	26-41														26-45	26-45	26-43	25-44			
	WL all EVs (+/- 10%)	None	None														None	None	None	27-39			
	%EVs at Some WL	100.0	97.2														89.8	96.0	82.5	100.0			
	WL of 5% or greater	79.9	96.0														86.3	93.6	80.6	100.0			
	Minimum WL Range	-	-														-	-	-	15			
100%	WL (nominal)	None	25-37																	25-36	25-36	25-34	25-40
	WL all EVs (+/- 10%)		26-35																	25-33	26-34	28-31	28-36
	%EVs at Some WL		100.0																	100.0	100.0	100.0	100.0
	WL of 5% or greater		100.0																	100.0	100.0	100.0	100.0
	Minimum WL Range		11																	9	10	6	11

6.2.1 0% Washing Case

A detailed discussion for the Frit 202-based EVs is provided below to demonstrate how the information in Appendix D can be translated to provide insight into the robustness of each frit to anticipated sludge variation. More specifically, this detailed discussion will outline or guide the definition of the three metrics for the Frit 202 / sludge combination and translate how these promote or support the frit selection process. Again, Table 6-4 summarizes the information of all frit / sludge combinations.

Consider the 0% washed EV-based sludges / Frit 202 information in Appendix D at the lower waste loading of interest – 25%. Four rows are shown at 25% WL with all four indicating that the glasses produced by this combination are predicted to be inhomogeneous (at the PAR) and thus would not be processable. A high percentage of the 455 EVs also fail either the Al_2O_3 and/or the sum of alkali constraints. Therefore at 25% WL, there are no EV-based sludges that would be processable with Frit 202.

As waste loadings are increased, durability limitations as well as homogeneity, Al_2O_3 and sum of alkali restrictions eliminate the potential to process at 26% WL. A review of each WL will indicate that there is no WL interval in which all EVs can be processed based on model predictions and the use of the PAR acceptance criteria. This is reflected in Table 6-4 by the "none" shown for the first metric. An effective method to identify potential WLs or WL ranges in which all 455 EVs can be processed is to scan the "# of EVs" column for 455 then evaluate the "Satisfies PAR" column to assure that all predicted properties are acceptable ("Not" should be absent from that row). For example, consider WLs of 45% and higher (as shown in Appendix D). The "# of EVs" column contains 455 which indicates that all 455 EV-based glasses (with Frit 202) fall into the same category. Unfortunately, a review of the "Satisfies PAR" indicates that these EV-based glasses are predicted to fail both the durability and viscosity PAR criteria. This again results in the "none" entry for the first metric in Table 6-4 for this system indicating that there is no WL interval in which all EVs can be processed based on model predictions and the use of the PAR acceptance criteria.

Also provided in Appendix D is a summary table for each frit / sludge combination being evaluated. The columns shown in this table are "WL Range", "# of EVs and Centroid" and "% of total". This summary table helps to define the second and third metrics for the Variation Stage assessments. The "WL Range" column indicates a waste loading interval (i.e., "0" indicates no interval, "1" indicates a 1% WL interval, etc……) but does not specify the particular interval. The "# of EVs and Centroid" column indicates the number of EVs (out of the 455) that are processable within the corresponding WL interval. The third column provides the percentage of the 455 EVs. Consider the "WL Range" of "0" for the 0% washed, Frit 202 EV-based glasses. The summary indicates that 273 of the 455 EVs (or 60%) are not processable at any waste loading over the WL range of 25 – 60 wt%. The converse of this is that approximately 40% of the EVs are processable at some waste loading – the second metric as shown in Table 6-4. Again the second metric defines the percentage of the EVs and centroid that yield an acceptable glass at some waste loading of interest. The higher the percentage the more robust the frit composition is to compositional variation of the sludge. For example, a 100% for this metric would indicate that all of the EVs generated (accounting for the ±10% variation) and the centroid could be processable at some waste loading in the interval from 25 – 60%.

The third metric is also determined from the information provided in the summary tables shown in Appendix D for each system. This metric builds upon the second and serves a measure of the

percentage of the EVs and centroid that yield an acceptable glass over a minimum waste loading range of 5% within the 25 – 60% window being evaluated. For the Frit 202, 0% washed EV-based system, 304 of the 455 EVs (or ~66.8%) either have no operational windows or operational windows with a width of no more than 4% (perhaps not the same 4% across all the EVs). Conversely, 33.2% of the 455 EVs have operational windows greater than 4% – the second metric as shown in Table 6-4.

To summarize the Variation Stage assessment for the Frit 202, 0% washed sludge case, there is no WL interval in which all of the EVs could be processed, although 40% of the EVs could be processed at some WL. Only 33.2% of the EVs have operational windows of at least 5%. These metrics, coupled with the fact that the Nominal Stage assessment based on the nominal waste 0% washed sludge did not possess an operational window, suggests that Frit 202 may not be a primary candidate for this specific sludge envelope.

The same non-ideal results are shown for Frit 320, where the high alkali content of both the sludge and the frit produce durability limited systems. Therefore, if a 0% washed sludge is realized (i.e., no or limited washing of the sludge), the use of Frit 202 or Frit 320 will be prohibited based on model predictions.

Alternative frits (Frit 400, 401, 402, 403, 404, 405, and 406) were developed during the Nominal Stage assessment and given model predictions are readily available, an assessment of the response to compositional variation was performed for each. Frits 400, 401, and 402 provide less than ideal results with respect to the three metrics. However, Frits 403, 404, 405, and 406 indicate the ability to tolerate the projected compositional variation very well. That is, all 455 EVs can be processed over some waste loading interval within the 25 – 60% range. As shown in Table 6-4, the 2nd and 3rd metrics for these four frit-based systems support the fact that these frits are extremely robust to the projected compositional variation – 100% shown for all systems. For example, consider Frits 403 and 404 in which the projected operational windows over which all of the EVs could be processed are 40 – 45% and 43 – 46%, respectively. The minimum WL range over which all of the EVs can be processed is 9% and 7%, respectively. The Variation Stage assessment for these frits indicate an extremely high tolerance to this specific waste stream and the compositional envelope produced when considering the ±10% variation. These results make Frit 403 and 404 strong candidates for consideration as the frit selection process continues – given a target sludge composition within the compositional range evaluated. Assessments of melt rate and frittability have not been taken into account in this latter statement.

6.2.2 25% Washed Case

Similar trends are observed with the Frit 202/25% washed sludge case as were observed with the 0% washed sludge (see Table 6-4). Although the Nominal Stage assessment indicated a 31 – 40% WL range over which glasses would be acceptable, accounting for compositional variation results in a less than perfect system. To summarize the Variation Stage assessment for the Frit 202, 25% washed sludge case, there is no WL interval in which all of the EVs could be processed although ~81% of the EVs could be processed at some WL. Only 59.1% of the EVs have operational windows of at least 5%. These metrics, coupled with the fact that the Nominal Stage assessment based on the nominal waste 25% washed sludge did not possess an operational window, suggests that Frit 202 may not be a primary candidate for this specific waste stream or envelope. Frit 320 continues to be durability limited, which restricts its use as a possible candidate for the 25% washed sludge.

The Variation Stage assessment also includes alternative frits (Frits 407, 408, 409, 410, 405, and 406)[13] developed during the Phase 1 assessment for the 25% nominal sludge. Frits 405, 407, 409 and 410 show a high tolerance for compositional variation with relatively large processing windows projected for all 465 EVs. Relatively high minimum WL ranges of 9% are projected for each EV when coupled with each frit. Although the projected operational window for the nominal 25% sludge / Frit 408 system (Nominal Stage) was 40 – 55%, its response to the EVs was less attractive relative to other frits. Therefore, although the high waste loadings appear attractive, consideration of its ability to handle compositional variation should be factored into the frit selection process.

Although not specifically developed for the 25% washed case, Frits 405 and 406 show flexibility in being highly tolerant to the compositional variation associated with the 0% washed case but also the 25% washed case as well. Projected WL ranges over which all 465 EVs could be processed are 34 – 37% and 37 – 38% for Frit 405 and 406, respectively. Assessment of the other metrics suggest that Frit 405 is more tolerant with 100% of the EVs having a minimum WL range of 9%; whereas only 95.9% of the EVs have a minimum WL range of 5% for Frit 406.

6.2.3 50% Washed Case

When the 50% washed sludge is considered, the use of Frit 202 is very attractive. The Nominal Stage assessment provided an operational window of 29 – 45%. The Variation Stage assessment indicates that all of the EVs can be processed over a WL range of 33 – 38% with 100% of the EVs having a minimum WL interval of 5%. In fact, the minimum WL interval for all of the EVs is 12% – a very positive statement about the potential use of Frit 202 within this compositional envelope. Frit 320 continues to provide no operational window due to predictions of durability or low viscosity.

Given the positive assessments of Frit 202, only two alternative frits (Frit 411 and 412) were developed during the Phase 1 Nominal Stage assessment – both rendering essentially the same WL ranges based on the nominal sludge composition. The results of the Variation Stage assessment indicate that both frits are less tolerant to compositional variation relative to Frit 202. This latter statement is supported by the lack of a projected operational window over which all EVs could be processed. Based on an assessment of subsequent metrics, a more detailed analysis suggests that Frit 411 is slightly more robust to compositional variation than Frit 412.

It is known that Frit 202 is frittable, so unless Frit 202 has an adverse impact on melt rate or total waste throughput, the development of subsequent frits for this specific sludge should not be pursued. This is aided by the fact that Frit 202 is currently in stock at DWPF which may eliminate (assuming the quantity of frit existing would be sufficient to process SB3) or at least minimize (assuming a limited quantity would be required from a vendor) manufacturing costs. However, if Frit 411 shows a marked improvement in melt rate relative to Frit 202 (given the higher total alkali content in the frit – see Table 6-1), further consideration should be made prior to eliminating it during the frit selection process.

6.2.4 75% Washed Case

As the Na_2O concentration continues to decrease, a transition in candidate frits can be observed in terms of the Phase 1 Variation Stage metrics. Although Frit 320 does not provide a WL range

[13] Although Frits 405 and 406 were not specifically developed for the 25% washed case, given the positive Nominal and Variation Stage assessments for the 0% washed case, they were included in this assessment.

over which all of the EVs can be processed, ~97% of the EVs could be processed at some WL and 96% of all the EVs have a minimum WL range of 5%. This transition was also observed in the Nominal Stage assessment where the use of Frit 320 provided a 26 – 41% WL interval based on the nominal 75% washed sludge composition. Although not ideal in its response to the applied compositional variation, the depletion of alkali in the sludge makes Frit 320 a potential candidate for this compositional region.

Similar to the Frit 320 assessment, the Frit 202 Phase 1 Variation Stage assessment projects no window of opportunity over which all of the EVs could be processed. Although 100% of the 423 EVs could be processed at some waste loading, only ~80% have a minimum WL range of 5%. Although less than perfect, these results should not eliminate Frit 202 as a possible candidate for this particular waste stream or compositional envelope.

Of the four alternative frits (413, 414, 415, and 416) developed during the Nominal Stage, the results of the Variation Stage assessments are somewhat negative for three (413, 414, and 415). The most interesting observation is the response of Frit 416 (a modified formulation of Frit 320 in which 1% of the Na_2O was added as Al_2O_3). Although the compositional modification appears to be negligible, its impact on predicted properties, which define the projected operational window, is rather high. As mentioned above, there was no WL or WL range over which all 423 EVs could be processed with Frit 320. The slight compositional modification of Frit 416 results in a 27 – 39% WL range over which all of the EVs could be processed. This result indicates a high tolerance of Frit 416 to the applied compositional variation of ±10%. Evaluation of the third metric provides additional insight into the robustness of Frit 416. A minimum WL range of 15% is predicted for each of the 423 EVs – a very strong statement in terms of flexibility.

6.2.5 100% Washed Case

The need for a less refractory frit becomes more evident in the Phase 1 Variation Stage assessment for this specific waste stream and compositional region. Based on model predictions, Frit 202 is not a candidate for the 100% washed nominal sludge; therefore, a Variation Stage assessment was not performed.

As discussed in the previous section (Nominal Stage assessment), coupling the 100% washed nominal sludge with Frit 320 does provide an operational window (25 – 37%) with the system becoming T_L limited at higher waste loadings. This is consistent with the findings of Peeler et al. (2002a), which assessed the impact of the addition of Am/Cm and Pu/Gd on SB3. The results of the Variation Stage assessment indicate that Frit 320 is robust to compositional variation, as all 365 EVs can be processed over a WL interval of 26 – 35%. Adding to this case, the results indicate that all 365 EVs have a minimum WL range of 11%.

The Variation Stage assessments of the alternative frits (416, 417, 418, and 419) indicate a response very similar to that of Frit 320. The WL ranges over which all 365 EVs can be processed are roughly the same for all four frits. Given Frit 320 has been “fritted” in support of SB2 operations in DWPF, and assuming the alternative frits (416, 417, 418, and 419) can be fritted, the frit selection process may be solely a function of melt rate. Although the availability of Frit 320 (assuming that not all is used during SB2 processing) may have some benefit in terms of a cost-benefit analysis.

7.0 Assessment of Decant Information (Phase 2): Nominal and Variation Stages

As previously stated, assessments were initially performed using the linear washing schemes prior to receiving projected sludge compositions as a function of washing (or decant) from HLW PE. Elder provided the compositional estimates of SB3 as a function of decant which formed the basis for the Phase 2 assessments.[14] The elemental concentrations provided by Elder were converted to an oxide basis (by multiplying by the appropriate gravimetric factor) and these data were presented in Table 5-4.

Using the available PCCS process/product models, various frits will be assessed as a function of SB3 washing. Given frits were developed and assessed for the linear washing scenarios, primary candidates from that assessment will be assessed against the decant information. Compositional adjustments will be made as necessary to account for the differences between the two sets of sludge compositions. Table 7-1 provides a summary of the frit compositions used in the Phase 2 Nominal and Variation Stage assessments for the decant information. As stated earlier, it is not the intent of this study to recommend a frit to DWPF for SB3—only to provide insight into the frit selection process.

In this section, assessments using the nominal SB3 decant information provided by Elder are discussed using both the Nominal and Variation Stage strategies. The Nominal Stage assessment was performed on all 11 decant streams (Decant #5 – Decant #15). However, generation of 11 sets of EVs and performing a full Variation Stage assessment of each frit for each EV set over a WL range of 25 – 60% would have been a time consuming and tedious process. A different approach was taken to define the EVs used in the Variation Stage assessment. Although an alternative EV approach was taken, the Variation Stage strategy outlined in Section 3.0 did not change.

[14] Personal communication with H.H. Elder via email dated 7/30/02. Appendix A provides the data transmitted in the personal communication (elemental wt%, calcine basis).

Table 7-1. Summary of Frit Compositions (in wt% oxides) Used in the Nominal and Variation Stages of the Decant (or Phase 2) Assessments

Oxide	Frit 406	Frit 405	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202	Frit 411	Frit 412	Frit 416	Frit 320
Al_2O_3	-	-	-	-	1	1	-	-	-	1	-	1	-
B_2O_3	15	20	8	8	8	10	8	10	8	8	8	8	8
Li_2O	5	5	4	5	5	5	8	8	7	5	5	8	8
MgO	-	-	-	-	-	-	-	-	2	-	-	-	-
Na_2O	-	-	6	5	7	7	3	3	6	12	12	11	12
SiO_2	80	75	82	82	79	77	81	79	77	74	75	72	72
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

7.1 Nominal Stage Assessment: Decant Information (Phase 2)

Projected operating windows (for the Nominal Stage assessment) for the fifteen decant scenarios are presented in Table 7-2 for each candidate frit composition over the waste loading range of interest (25 – 60 wt%). Initially, an in-depth discussion linking the details provided in Appendix E to the summary table (Table 7-2) is provided to demonstrate how the summary table was developed. This discussion will provide insight into the comparisons of the predicted properties to the acceptance criteria and the influence they have on establishing or defining the projected operational windows. Given the understanding of how the summary table was developed and knowing the extensive number of combinations that result when coupling the candidate frits with the different decant scenarios, detailed discussions of other frit/sludge combinations will be brief, high level, and select. The primary focus will be on Decant #5 and Decant #9 given those have been established as focal points for both melt rate assessments and flow sheet development activities by the SB3 technical team. Emphasis will be given to Frit 202 and Frit 320 given their consideration as "baseline" frits to this point. Alternative frits will be discussed to demonstrate the ability of frit development efforts to compensate for compositional changes based on the degree of washing. Although a particular frit may not be specifically discussed in the following section, one should not rule out its potential use. Again, the discussions are intended to provide insight into the how the summary table (Table 7-2) was developed and what information can be extracted and carried forward to the frit selection process. It must be recognized that the assessments and projected operational windows are based solely on model predictions – no experimental work was performed.

Detailed information regarding the predicted properties for the nominal decant compositions when coupled with each candidate frit is provided in Appendix E. The column identified as "Type" summarizes the specific decant being evaluated with the second column ("Frit ID") identifying the frit. The third column "Satisfies PAR" represents the comparison of the predicted properties versus the PAR limits as shown in Table 4-1. The last two columns specify the minimum and maximum waste loadings over which the specific sludge/frit combination possesses the characteristics described by the "Satisfies PAR" nomenclature.

For example, consider Frit 202 coupled with the nominal Decant #5. Based on the information presented in Table 7-3 (information extracted from Appendix E), the WL interval over which the nominal Decant #5 composition could be processed is 33 – 39 wt%. Lower WLs (≤ 32 wt%) are restricted by the homogeneity constraint (predictions indicate that this glass would be inhomogeneous – "Not Homog"). Durability predictions ("Not Durable") prohibit WLs of 40% or higher.

Table 7-2. Summary of Projected Operational Windows for the Phase 2 Nominal Stage Assessment of the Decant Compositions

		Frit 406	Frit 405	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202	Frit 411	Frit 412	Frit 416	Frit 320
Decant #5	WL (nominal)	33 - 51	31 - 46	33 - 50	32 – 50	30 – 45	30 – 44	31 – 46	31 – 44	33 - 39	none	none	none	none
	lower limit	high visc	Homog	hi visc	hi visc	Homog	Homog	Homog	Homog	homog	PCT	PCT	PCT	PCT
	upper limit	low visc	low visc	PCT	PCT/lo visc	PCT	PCT	Lo visc	lo visc	PCT	PCT	PCT	PCT	PCT
Decant #6	WL (nominal)	35 - 48	30 – 47	35 - 53	34 – 52	30 – 49	29 – 48	30 – 48	30 – 46	32 - 45	29	none	None	none
	lower limit	hi visc	Homog	hi visc	hi visc	Hi visc	Homog	Homog	Homog	Homog	Homog	Homog	PCT	PCT
	upper limit	TL	TL	lo visc	lo visc	Lo visc	lo visc	lo visc	lo visc	low visc	PCT	PCT	PCT	PCT
Decant #7	WL (nominal)	36 - 42	30 – 41	37 - 52	35 – 52	31 - 51	28 – 49	29 – 50	29 – 48	31 – 47	28 - 38	29 - 35	None	none
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	Homog	Homog	Homog	Homog	Homog/PCT	PCT	PCT
	upper limit	TL	TL	TL	TL	Lo visc	lo visc	lo visc	lo visc	low visc	PCT	PCT	PCT	PCT
Decant #8	WL (nominal)	38	31 – 37	38 - 47	36 - 47	32 - 49	29 – 49	29 – 48	29 – 48	30 – 47	27 - 45	29 - 45	none	none
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	hi visc	Homog	Homog	Homog	Homog	homog	PCT
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc	Lo visc	PCT	PCT
Decant #9	WL (nominal)	none	32 – 34	39 - 44	38 - 44	33 - 46	30 – 45	30 – 45	28 – 45	29 – 44	26 - 46	28 - 46	26 - 38	none
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	hi visc	Homog	Homog	Homog	Homog	homog	PCT
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc	Lo visc	lo visc	PCT
Decant #10	WL (nominal)	none	None	40 - 42	39 - 41	35 - 43	31 – 43	31 – 43	28 – 42	29 – 41	26 - 48	28 - 48	26 - 40	none
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	hi visc	Homog	Homog	Homog	Homog	homog	PCT
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc	Lo visc	lo visc	lo visc
Decant #11	WL (nominal)	none	none	none	none	36 - 41	33 – 41	32 – 40	28 – 40	28 – 39	26 - 47	27 - 48	26 - 41	27 - 38
	lower limit	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	Homog	Homog	Homog	homog	Homog
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc	lo visc
Decant #12	WL (nominal)	none	none	none	none	37 - 39	34 – 39	33 – 39	30 – 38	28 – 37	25 - 45	27 - 46	25 - 42	27 - 40
	lower limit	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	hi visc	-	Homog	-	Homog
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc	lo visc
Decant #13	WL (nominal)	none	none	none	none	38	35 – 38	34 – 37	30 – 37	28 – 36	25 - 43	26 - 44	25 - 43	26 - 41
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	hi visc	hi visc	hi visc		Homog	-	Homog
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc	lo visc
Decant #14	WL (nominal)	none	none	none	none	None	36	35 – 36	31 – 36	29 - 35	25 - 42	26 - 43	25 - 44	26 - 42
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	hi visc	hi visc	hi visc	-	Homog	-	Homog
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc/TL	lo visc
Decant #15	WL (nominal)	none	none	none	none	None	None	None	33 – 34	30 - 33	25 - 41	26 - 41	25 - 42	26 - 43
	lower limit	hi visc	hi visc	hi visc	hi visc	Hi visc	hi visc	hi visc	hi visc	hi visc	-	homog	-	homog
	upper limit	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	TL	lo visc

Table 7-3. Nominal Stage Assessment for Decant #5 and Frit 202 over the Waste Loading Range of 25 – 60%

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #5	202	Durable; Visc; Not Homog; New TL; Al2O3; alkali	25	32
Decant #5	202	Durable; Visc; Homog; New TL; Al2O3; alkali	33	39
Decant #5	202	Not Durable; Visc; Homog; New TL; Al2O3; alkali	40	43
Decant #5	202	Not Durable; Not L Visc; Homog; New TL; Al2O3; alkali	44	60

Table 7-2 provides a summary of the acceptable operational windows for each decant/frit combination based on model predictions. Three rows of information are supplied in Table 7-2. The first row is the WL interval over which both process and product performance criteria are acceptable. The second and third rows provide the criterion that restricts access to lower and upper waste loadings respectively. Those frit/decant combinations that provide an operational window (albeit a single WL for select combinations) are shaded in gray. In general, the operational windows of interest shift from left to right (in terms of candidate frit compositions) as one proceeds from Decant #5 to Decant #15 (or the degree of washing increases). As was observed with the linear washing assessments (see Section 6.1), this shift can be attributed to the variable Na_2O sludge concentration and the compensation taken in terms of frit development efforts. In general, as one proceeds from left to right in Table 7-2, the frits become less refractory (more alkali-rich) to account for the depletion of alkali in the more advanced washed sludges (higher decant numbers). For those frit/decant combinations in which model predictions do not project an operational window, the limiting acceptance criteria are also provided for both the upper and lower WLs.

As previously stated, the primary focus will be on Decant #5 and Decant #9 given those have been established as focal points for both melt rate assessments and flow sheet development activities by the SB3 technical team. Emphasis will also be given to Frit 202 and Frit 320 given their consideration as "baseline" frits to this point. Alternative frits will be discussed to demonstrate the ability of frit development efforts to compensate for compositional changes based on the degree of washing. Although a particular frit may not be specifically discussed in the following section, one should not rule out its potential use.

7.1.1 Decant #5

As shown in Table 7-2, projected operational windows exist for several frits. In general, predictions of either homogeneity or high viscosity define the lower WLs for each system. The upper WL limits are defined by predictions of either low viscosity or durability. As with the less washed sludges in the linear washing assessments, challenges to durability and/or low viscosity provide some indication that the frit development effort is taking advantage of the high alkali content of Decant #5. It should be noted that predictions of T_L do not limit any of the Decant #5-based systems.

As previously discussed, an acceptable WL interval of 33 – 39% is projected for the Frit 202/Decant #5 system with the lower and upper WLs being homogeneity and durability limited, respectively. Minor compositional adjustments to Frit 202 were made initially to provide insight into the potential to improve the upper waste loading limit. Given the Frit 202 system was durability limited at WLs exceeding 39%, 1% of the total alkali content was removed and replaced with Al_2O_3 to form Frit 420. Not only was the 1% alkali removed but also the ratio of Na_2O/Li_2O was adjusted. This compositional adjustment resulted in a projected operational window of 30 – 45% – not only improving the upper WL limit but the lower WL limit as well providing an overall larger window for processing. This larger operational window would provide DWPF with more flexibility in terms of operational control. Although a larger operational window exists for Frit 420, the system is still limited by predictions of homogeneity and PCT for the lower and upper WLs, respectively.

A second compositional adjustment was made to Frit 202 and/or Frit 420 to address a potentially non-technical issue. If a frit containing 8 wt% B_2O_3 (such as Frit 202, Frit 420, or Frit 320) is utilized, at WLs of ~38 wt%, the total B_2O_3 content in the glass approaches 5 wt%. If restricted

to borosilicate glass by the Waste Acceptance Product Specification (WAPS) (Plodinec et al. 1995) and the current ASTM definition of a borosilicate glass is taken literally, WLs exceeding ~38% would yield a glass composition containing less than 5% B_2O_3 (not accounting for measurement uncertainties). This could potentially (and unnecessarily) restrict the acceptable WL range and limit DWPF operational flexibility. With the potential implication of restricting higher waste loadings, this becomes a more significant issue.

With Frit 202 and Frit 420 providing upper WLs of 39 and 45% respectively, application of the "borosilicate" definition may impose unnecessary limitations on the upper WL that could be achieved. Frit 421 was developed to address this potential issue. The B_2O_3 content in Frit 421 is 10% which would require WL in excess of 50% to reduce the B_2O_3 content in glass to less than 5% (ignoring measurement uncertainties). The results of the Phase 2 Nominal Stage assessment with Frit 421 and Decant #5 indicate that the increased B_2O_3 content (at the expense of SiO_2) does have a slight negative impact on the upper WL limit (reduced from 45% with Frit 420 to 44% with Frit 421). However, at the upper WL of 44%, the B_2O_3 concentration in glass would be ~5.6% meeting the ATSM definition (ignoring measurement uncertainties). These results indicate that slight modifications to Frit 202 can be made to improve the upper waste loadings (based on model predictions) and to address the definition of a "borosilicate" glass (if needed). Melt rate assessments may differentiate or play a significant role in the frit selection process if one of these three frits is considered (assuming the modified compositions can be fritted).

Frits 422 and 423 were developed given the potential uncertainties or implications of having a system being durability limited at the upper WL. Although the authors feel that having a durability limited system is of minimal concern given the conservatism built into the ΔG_P acceptance criteria, compositional adjustments to the frit can be made to shift the Decant #5-based system to be low viscosity limited (e.g., viscosity predictions at the upper WL exceed the low viscosity limit as defined in Table 7-2). A minor reduction in the total alkali content (relative to Frit 202) and a change in the alkali ratio were the primary bases for Frit 422. Frit 423 also addressed the potential "borosilicate" issue given the upper WL with Frit 422 (with 8% B_2O_3) greatly exceed the ~38% level. As with the Frit 202 modifications, large operational windows are projected for Frits 422 and 423 with upper WLs of 46 and 44%, respectively. Like the observations in the Frit 202-based modifications, there appears to be a slight negative impact on the upper WL limit as one increases the B_2O_3 concentration (at the expense of SiO_2) in frit.

Results of the Phase 1 assessments with the linear washed nominal sludge compositions and EVs (see Section 6.0) indicated that Frits 405 and 406 were relatively robust to both the 0% and 25% washed cases. Given this high degree of flexibility for these frits and the fact that the Decant #5 composition lies between these two washed sludges (for the major oxides), the large projected operational windows for Decant #5 are not surprising. Frit 405 and 406 yield upper WL limits of 46 and 51% respectively. Given their high B_2O_3 concentrations, the non-technical issue of producing a borosilicate glass is not challenged with either frit over the acceptable WL range. Assessments of melt rate or frittability are needed to further evaluate their potential application to SB3 during the frit selection process.

Frits 409 and 410 were developed with the intent that Frit 202 may contain slightly too much alkali for this particular decant. More specifically, given Frit 202 was developed as a "generic" coupled operations frit (with coupled operations providing a higher alkali content than the current sludge-only flowsheet), frit development efforts were undertaken to investigate the potential to reduce the total alkali content of Frit 202 to enhance the upper waste loading limit while maintaining a frittable frit with high melt rates. Based on model predictions, Frits 409 and 410 do

improve the upper WL limit achievable (both indicating 50% WL) relative to Frit 202 (upper WL limit of 39%). Upper WLs for Frit 409 and 410 are both 50% with each system being durability limited at higher WLs. This indicates that the high alkali content of the sludge can be compensated for via frit development efforts to improve operational flexibility for DWPF. These results give support for the concept of developing specific frits for specific sludges to optimize operational windows. However, imposition of the "borosilicate" definition, would have a significant impact on the WL ranges of interest – eliminating WLs of 38% or greater from consideration.

It should be reiterated that although Frit 202 was developed for the "generic" coupled operations flowsheet, model predictions (as summarized in Table 7-2) indicate that its use is feasible for this specific (and nominal) decant. The fact that larger operational windows can be developed by targeting a specific waste stream should be expected. It should also be noted that the Phase 2 Nominal Stage assessment indicates that Frit 202 provides an operational window for each decant sludge composition listed (one of four frits demonstrating this flexibility; the others being Frits 421, 422, and 423). This observation demonstrates the robustness of these frits to handle a wide range of targeted decants recognizing that these are nominal compositions that do not account for compositional variation. The Variation Stage assessment will provide further insight.

Frit 320 should also be mentioned given its classification as a "baseline" frit by Elder. For Decant #5, model predictions do not provide an operational window for Frit 320. Predictions of durability limit all potential waste loadings of interest. Frits 411, 412, and 416 also fall into this category for Decant #5 – durability limited based on model predictions. Given Frit 320 was developed to improve melt rate for SB2, its generic application to other sludge batches should be made with caution. From the summary information presented in Table 7-2, Frit 320 only becomes a possible candidate once Decant #11 and more advanced washed sludges are obtained.

7.1.2 Decant #9

General observations for the Decant #9 Phase 2 Nominal Stage assessment indicate that the Na_2O concentration in the nominal waste stream is being reduced to the point that a frit change may be required. Although there are frits that can obviously tolerate the compositional range presented by the two nominal streams of interest, alternative frits (Frits 411, 412, and 416 which are not feasible with Decant #5) become possible candidates for this more washed sludge. All of the Decant #9/alternative frit (Frits 411, 412, and 416) combinations have projected operational windows with upper WLs ranging between 38 – 46%. It should also be noted that the glass formulation strategy of shifting the WL-limiting property to be non-T_L based was successful for these glasses. In all cases, the upper WL is limited by predictions of low viscosity reinforcing the concept of the need for frit composition compensations as a function of washing. For the other Decant #9 based systems, the upper WL is T_L limited as a result of coupling the alkali-depleted sludge with an alkali-depleted frit.

The use of Frit 320 is still prohibited by predictions of durability. Select frits that were candidates for Decant #5 are either prohibited (Frit 406) or provide extremely small operational windows (Frit 405 with a 32 – 34% WL interval) even for this nominal stream.

Use of Frit 202 provides a projected operational window of 29 – 44%. Although this WL interval is very attractive it should be tempered with the potential issue of the borosilicate glass definition. That is, given only 8% B_2O_3 in the frit, WLs would be restricted to < 38% to produce a glass with

≥ 5% B_2O_3. Frit 421 (with 10% B_2O_3) not only addresses this issue but shifts the acceptable WL interval to 30 – 45%.

In general, the typical WL interval projected for the Decant #9 nominal composition is ~30 – 45% irrespective of frit compositions (a few exceptions exist). Therefore, the frit selection process may hinge upon other key criteria such as melt rate and/or frittability. Availability (in the case of Frit 202) may also play a role. However, prior to making a decision based solely on the Phase 2 Nominal Stage assessments, the response or tolerance to anticipated sludge variation should be considered.

7.2 Variation Stage Assessment: Decant Information (Phase 2)

In the previous section, projected operational windows were developed for various frit compositions based on the nominal decant information provided by Elder. Assessment of the projected operational windows accounting for compositional variation will reduce the risk of selecting a frit that will be intolerant of this anticipated change.

The Phase 1 Variation Stage assessment (see Section 6.2) for the linear washed sludges was based primarily on EVs determined for each nominal washing scenarios with a ±10% variation around each major oxide. Assessments were made using the PCCS models currently implemented in DWPF over the WL interval of interest (25 – 60 wt%). Considering the large number of nominal decants provided, generation of 11 sets of EVs, and performing a full assessment of each frit/EV set over a WL range of 25 – 60% would be a time consuming and tedious process. Therefore a slightly different approach was taken in terms of defining EVs for this assessment.

In the early stages of the SB3 integrated flowsheet development, no obvious technical issues were identified that could be used to eliminate a particular decant or range of decants.[15] Therefore, glass formulation efforts were undertaken to maintain a bounding approach in an attempt to provide as much information as possible for the frit selection process given the unknowns associated with the targeted decant or washing strategy. To gain insight into the tolerance of each frit composition to potential sludge variation, two sets of EVs were generated. Upper and lower bounds (using ±10% for each major oxide) were established for Decants #7 and Decant #12 (see Table 7-4). These two decants were selected given the upper and lower ranges for each bounded two distinct (but overlapping) nominal decant ranges. The EVs associated with Decant #7 bound the nominal Decant #5 and nominal Decant #11 compositions. The EVs associated with Decant #12 bound the nominal Decant #7 and Decant #15 compositions. Although Decant #5 or Decant #9 were not specifically evaluated , use of the respective set of overlapping EVs will provide insight into the ability of each frit to handle compositional variation.[16] It should be noted that the Na_2O values between the two different sets of EVs do not overlap.

[15] The decision to assess the EVs associated with Decants #7 and Decant #12 were made prior to the SB3 team focusing the melt rate and flow sheet development efforts on Decant #5 and Decant #9. Given that, this report will focus primarily on the Variation Stage assessment for Decant #7's EVs.

[16] In Sections 7.2.3 and 7.2.4, a Phase 2 Variation Stage assessment is performed focused solely on Decants #5 and #9, respectively.

Table 7-4. Minimum and Maximum Values for Decants #7 and #12 Used to Define EVs (wt% oxides).

Oxide	Decant #7			Decant #12		
	Min	Nominal	Max	Min	Nominal	Max
Al_2O_3	13.299	14.777	16.255	14.628	16.253	17.879
B_2O_3	0.000	0.000	0.000	0.000	0.000	0.000
BaO	0.184	0.204	0.225	0.202	0.225	0.247
CaO	2.646	2.940	3.234	2.910	3.234	3.557
Ce_2O_3	0.256	0.285	0.313	0.282	0.313	0.345
Cr_2O_3	0.272	0.302	0.332	0.299	0.332	0.366
Cs_2O	0.000	0.000	0.000	0.000	0.000	0.000
CuO	0.146	0.162	0.178	0.160	0.178	0.196
Fe_2O_3	29.572	32.858	36.144	32.527	36.141	39.755
K_2O	0.316	0.352	0.387	0.348	0.387	0.425
La_2O_3	0.169	0.187	0.206	0.185	0.206	0.227
Li_2O	0.000	0.000	0.000	0.000	0.000	0.000
MgO	0.139	0.154	0.169	0.152	0.169	0.186
MnO	5.274	5.860	6.446	5.801	6.446	7.091
MoO_3	0.000	0.000	0.000	0.000	0.000	0.000
Na_2O	23.914	26.571	29.228	17.311	19.235	21.158
Nb_2O_3	0.000	0.000	0.000	0.000	0.000	0.000
NiO	1.183	1.314	1.445	1.301	1.445	1.590
PbO	0.221	0.245	0.270	0.243	0.270	0.297
SiO_2	1.540	1.711	1.882	1.694	1.882	2.070
ThO_2	0.105	0.117	0.129	0.116	0.129	0.141
TiO_2	2.069	2.299	2.529	2.276	2.529	2.782
U_3O_8	7.485	8.316	9.148	8.233	9.147	10.062
Y_2O_3	0.000	0.000	0.000	0.000	0.000	0.000
ZnO	0.302	0.336	0.369	0.332	0.369	0.406
ZrO_2	0.546	0.607	0.667	0.601	0.667	0.734

Although EVs were not considered for each specific decant, the Variation Stage strategy utilized was consistent with that defined in Section 3.0 and outlined in Figure 3-2. The three metrics defined above were developed to gain insight into the robustness of candidate frits to sludge variation.

Detailed information regarding the predicted properties for the Decant #7 EV-based sludge compositions when coupled with select candidate frits is provided in Appendix F. The column identified as "Sludge Loading (%)" summarizes the specific waste loading of interest. It should be noted that there are typically more than one row for each sludge loading given the predicted properties for all EVs will vary dramatically. The second column in Appendix F ("Satisfies PAR") represents the comparison of the predicted properties versus the PAR limits as shown in Table 4-1. In this column, properties deemed unacceptable with respect to the PAR acceptance limits are preceded by "Not". For example, "Not Homog" indicates that glasses fail the homogeneity PAR criteria. The last column ("# of EVs") summarizes the number of EVs whose common property predictions are classified by the "Satisfies PAR" column.

A detailed discussion for the Frit 202-based EVs is provided below to demonstrate how the information in Appendix F can be translated to provide insight into the robustness of each frit to anticipated sludge variation. More specifically, this detailed discussion will outline the process used to define the three metrics and translate how these results impact the frit selection process.

Consider Table 7-5 (extracted from Appendix F) for the summary of the Variation Stage assessment for Frit 202 and the Decant #7 EVs. At WLs of 25 – 26%, all 915 EVs are unacceptable due to predictions of the resulting glasses being inhomogeneous. At 27% WL, 22 of the 915 EVs are acceptable with the remaining 893 being classified as inhomogeneous. Predictions of homogeneity continue to restrict processing of select EVs through WLs of ≤ 34%.

Between 35 and 40% WL, all 915 EVs are acceptable and could be processed based on a comparison of the predicted properties and the PAR acceptance criteria established in Section 4.0. A review of each WL indicates that the projected operational window for this Frit 202-based system is between 35 – 40%. At 41% WL, predictions of T_L ("Not T_L") limit 4 of the 915 EVs from being processed. Durability predictions begin to restrict the acceptability of select glasses at 43%. Predictions of low viscosity and T_L become limiting factors at 44%.

An effective method to identify potential WLs or WL intervals in which all 915 EVs may be processed is to scan the "# of EVs" column for 915 then evaluate the "Satisfies PAR" column to assure that all predicted properties are acceptable ("Not" should be absent from that row).

Also provided below the detailed assessment in Appendix F is a summary table for each system being evaluated. This summary table has been extracted from the appendix for the Frit 200 based system (see Table 7-6). The columns shown in this table are "WL Range", "# of EVs and Centroid" and "% of total". This summary table helps to define the second and third metrics for the Variation Stage assessments. The "WL Range" columns indicates a waste loading range (i.e., "0" indicates no interval, "1" indicates a 1% WL interval, etc…) but does not specify the particular interval. The "# of EVs and Centroid" column indicates the number of EVs (out of the 915) that are processable within the corresponding WL interval. The third column provides the percentage of the 915 EVs. Consider the "WL Range" column for the Decant #7 EVs and Frit 202. The initial value for "WL Range" is "8". The fact that a "0" is not shown confirms the fact that all of the 915 EVs could be processed at some WL. In fact, each EV has a minimum waste loading range of 8% within the 25 – 60% window being evaluated.

To summarize the Variation Stage assessment for the Frit 202, Decant #7 EVs, a WL range of 35 – 40% is available over which all 915 EVs can be processed. All 915 of the EVs can be processed at some waste loading of interest with the minimum WL range being 8 wt%. These results suggest that Frit 202 is extremely robust to the compositional variation presented by the EVs associated with Decant #7. Given that the minimums and maximums used to define the EVs encompass the nominal Decant #5 through the nominal Decant #12 compositions, Frit 202 is a candidate for this compositional envelope (based solely on the model assessments).

Table 7-5. Variation Stage Results for Decant #7 with Frit 202

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	915
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	915
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	22
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	893
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	124
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	791
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	282
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	633
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	470
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	445
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	531
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	384
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	777
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	138
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	857
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	58
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	897
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	18
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	911
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	864
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	51
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	739
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	139
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	37
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	7
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	569
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	250
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	89
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	35
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	392
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	350
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	85
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	53
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	36
46	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	4
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	292
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	396
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	160
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	27
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	165
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	42
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	71
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	380
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	257
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	127
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	200
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	26
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	242
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	320
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	76
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	287

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	169
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	380
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	54
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	422
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	42
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	397
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	39
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	470
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	406
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	23
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	475
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	416
52	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	5
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	482
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	423
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	5
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	475
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	405
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	34
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	467
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	354
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	94
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	458
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	305
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	152
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	448
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	199
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	268
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	439
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	139
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	337
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	431
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	65
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	419
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	422
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	30
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	463

Table 7-6. Summary of the Frit 202 Decant #7 Variation Stage Assessment

WL Range	# of EVs and Centroid	% of Total
8	12	1.31
9	24	2.62
10	16	1.75
11	26	2.84
12	39	4.26
13	47	5.14
14	163	17.81
15	318	34.75
16	178	19.45
17	76	8.31
18	16	1.75

7.2.1 Decant #7 EV Assessment

Table 7-7 summarizes the results of the Variation Stage assessment in terms of the three metrics for the various decant EVs/frit combinations. Also shown in Table 7-7 are the results of the Phase 2 Nominal Stage assessment for completeness for the two decants being considered. It must be recognized that the assessments and projected operational windows are based solely on model predictions – no experimental work was performed.

In this section, some general observations are reported based on the summary information presented in Table 7-7. As discussed in detail above, Frit 202 should be considered a candidate frit for the compositional region covered by the EVs representing Decant #7. All of the EVs can be processed over a 35 – 40% WL range. All 915 of the EVs can be processed at some waste loading of interest with the minimum WL range being 8%. These results suggest that Frit 202 is extremely robust to the compositional variation presented by the EVs associated with Decant #7.

The modifications made to Frit 202 (e.g., Frit 420 and Frit 421) also demonstrate a high degree of flexibility to process the Decant #7 EVs. Use of both Frit 420 and Frit 421 extended not only the upper WL range (relative to Frit 202) but the lower WL as well. Model predictions indicate that Frit 421 has the largest window of the three with all of the EVs being processable over a WL range of 32 – 42%. Although low WLs may not be of interest, having a larger operating window may prove advantageous. For Frit 420 and Frit 421, the minimum WL interval over which all of the EVs could be processed is 10 and 13%, respectively. Use of Frit 421 could address the non-technical issue of producing a borosilicate glass given its relatively high concentration of B_2O_3.

Frits 422 and 423 also demonstrate a high tolerance for the compositional envelope encompassed by the Decant #7 EVs. The projected WL interval for the Frit 422 system is 33 – 42%. The Frit 423 based system yields a WL interval of 33 – 41% over which all of the EVs can be processed. The minimum WL interval for each EV for both systems is 14%.

Although Frits 409 and 410 provide operational windows for this set of EVs, the window sizes are less attractive. Frit 410 provides a WL interval of 38 – 41% over which all of the EVs could be processed while only a 40 – 41% window exists for the Frit 409-based EVs. Frit 410 may provide a slight advantage relative to Frit 409 given that 100% of the EVs have a minimum WL range of 5%. The Frit 409-based assessment indicates that ~97% of the EVs have a minimum operating window of 5%.

Although a WL range existed for Frits 405 and 406 when the nominal Decant #7 waste stream was considered (see Table 7-2), when one accounts for the compositional variation, the metrics indicate that these frits are less attractive as compared to other frits. More specifically, the three metrics provide an indication that use of either Frit 405 or Frit 406 would be less tolerant to compositional variation relative to other frits. For both systems, there is no WL range over which all of the EVs could be processed (as indicated by the “none” in Table 7-7). Approximately 58% of the EVs could be processed at some WL using Frit 406 while nearly all of the EVs (99.7%) could be processed at some WL with Frit 405. The percentage of EVs with a minimum WL range of 5% is less than 70% for both frits. Based on these results, the use of Frits 405 or 406 for this compositional region should be considered a low probability (all other factors being equal such as melt rate).

Table 7-7. Summary of Frit Compositions (in wt% oxides) Used in the Phase 2 Nominal and Variation Stage Decant #7 Assessment.

Oxide	Frit 406	Frit 405	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202
Al_2O_3	-	-	-	-	1	1	-	-	-
B_2O_3	15	20	8	8	8	10	8	10	8
Li_2O	5	5	4	5	5	5	8	8	7
MgO	-	-	-	-	-	-	-	-	2
Na_2O	-	-	6	5	7	7	3	3	6
SiO_2	80	75	82	82	79	77	81	79	77
Total	100	100	100	100	100	100	100	100	100

Decant #7		Frit 406	Frit 405	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202
Nominal	WL (nominal)	36 – 42	30 – 41	37 – 52	35 – 52	31 – 51	28 – 49	29 – 50	29 – 48	31 – 47
Variation	WL all EVs	None	None	40 – 41	38 – 41	34 – 42	32 – 42	33 – 42	33 – 41	35 – 40
	% EVs at some WL	57.7%	99.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	WL of 5% or greater	50.3%	67.8%	96.8%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Minimum WL range	-	-	-	5%	10%	13%	14%	14%	8%

7.2.2 Decant #12 EV Assessment

Table 7-8 summarizes the results of the Phase 2 Variation Stage assessment for the Decant #12 EVs. Values for the three metrics are provided for each frit/sludge combination of interest. Also shown in Table 7-8 are the results of the Decant #12 Phase 2 Nominal Stage assessment for completeness. It must be recognized that the assessments and projected operational windows are based solely on model predictions – no experimental work was performed.

Detailed information regarding the predicted properties for the Decant #12 EV-based sludge compositions when coupled with each candidate frit is provided in Appendix G. The column identified as "Sludge Loading (%)" summarizes the specific waste loading of interest. It should be noted that there are typically more than one row for each sludge loading given the predicted properties for all 849 EVs will vary dramatically. The second column in Appendix G ("Satisfies PAR") represents the comparison of the predicted property versus the PAR limits as shown in Table 4-1. In this column, properties deemed unacceptable with respect to the PAR acceptance limits are preceded by "Not". The last column ("# of EVs") summarizes the number of EVs whose common property predictions are classified by the "Satisfies PAR" column. An effective method to identify potential WLs or WL intervals in which all 849 EVs can be processed is to scan the "# of EVs" column for 849 then evaluate the "Satisfies PAR" column to assure that all predicted properties are acceptable ("Not" should be absent from that row).

The WL interval over which all 849 EVs can be processed with Frit 202 is relatively small (31 – 32%). Metric #2 indicates that all of the EVs can be processed at some WL with 90.6% of the EVs having a minimum WL range of 5% (metric #3). The frits based on slight modifications to Frit 202 (Frit 420 and Frit 421) have very similar responses to the applied compositional variation. There is no WL or WL interval over which all the EVs could be processed. The assessment indicates that 57.6% and 85.6% of the EVs could be processed at some WL with 35.5% and 51.8% having a minimum 5% WL range for Frit 420 and Frit 421, respectively. The less than perfect response of these three frits to the compositional variation indicates that these may not be primary candidates for this particular compositional envelope. The EVs defining this region include relatively low alkali concentrations which when coupled with more refractory frits tend to challenge the predicted T_L and/or high viscosity acceptance criteria – see Appendix G.

Assessment of Frits 422 and 423 provide similar trends with the Frit 202-based systems (Frits 202, 420, and 421). No WL or WL interval exists over which all 849 EVs can be processed with Frit 422. With Frit 423, although no interval is observed, all EVs could be processed at 33% WL – an extremely narrow operational window. Metrics #2 and #3 suggest that Frit 423 is slightly more flexible given that 100.0% of the EVs are processable at some WL and 82.8% have a minimal WL range of 5%. This compares to the corresponding metric responses for Frit 422 of 85.4% and 52.2%. With the only difference between the two frits being a 2% B_2O_3 for SiO_2 adjustment, this suggests that the increased B_2O_3 concentration provides a slightly more flexible system.

When the more alkali-rich frits (Frit 411, 412, and 416) are considered, the operational windows become much more favorable and the overall robustness of the frits to compositional variation increases. Consider Frits 411, 412, and 416 in which the WL intervals over which all 849 EVs could be processed are 28 – 39%, 30 – 40%, and 28 – 38%, respectively. The third metric suggests that the minimum WL range for each EV is extremely high: 15%, 15%, and 12% for Frits 411, 412, and 416, respectively. The results of the Phase 2 Variation Stage assessment

indicate that if a higher washed sludge is targeted, Frit 411, 412, and 416 should be primary candidates during the frit selection process (based solely on the paper study assessments).

An interesting comparison is the results of the Variation Stage assessment between Frit 320 and Frit 416. As discussed in an earlier section, Frit 416 was developed in response to the overwhelmingly negative response of Frit 320 to the predicted durability for several of the linear washing scenarios. The strategy for Frit 416 was to increase predicted durability by slightly lowering the total alkali content and adding Al_2O_3. Although a minor adjustment was made (1% reduction in Na_2O content added as Al_2O_3) the impact on the projected operational windows was significant. For Frit 320 and Decant #12, there is no window over which all 849 EVs can be processed. A review of the information provided in Appendix G indicates that durability predictions are the primary limitations over the 25 – 60% WL interval. Frit 416 provides a 28-38% WL interval over which all EVs could be processed with 100% of the EVs having a minimum WL range of 12%. This is a significant improvement in the ability of the frit to handle the applied compositional variation with a minor change in frit composition.

Since the original decision was made to focus the Phase 2 Variation Stage assessment around Decants #5 and #12, the SB3 Technical team more recently decided to narrow the focus to span the range bounded by Decant #5 through Decant #9. The latter decision was made based on the lack of identifying any significant technical issues during the initial stages of the SB3 flowsheet development activities. Washing the sludge less does have advantages in terms of significant time and labor savings in the pretreatment/retrieval operation. A reduced washing campaign should also result in less water being sent to the evaporators. Conversely, targeting a more washed sludge should reduce the total number of canisters produced by some incremental amount and may minimize components that have potentially negative impacts to either WL or processability (such as SO_4). A cost-benefit analysis should be performed to fully understand the advantages and disadvantages of selecting a targeted washing scenario. Even though the SB3 team did not have access to a detailed cost-benefit analysis, they elected to narrow the decant/washing focus to span a range covered by Decant #5 through Decant #9. Given this decision, the Variation Stage assessments for Decant #7 (Section 7.2.1) and the linear washing cases of 0%, 25% and perhaps 50% (see Section 6.2) are extremely valuable in terms of identifying potential frits to carry forward in the melt rate and frittability assessment leading into the frit selection process. This latter statement does not suggest that the other assessments (both the nominal and variation stages) are not valuable.

Given this decision and recognizing that the Variation Stage was not assessed for Decants #5 or #9 specifically, the frit development team decided to perform these assessments. Table 7-9 summarizes the results of the Variation Stage assessment for the Decant #5 EVs. Table 7-10 summarizes the results of the Variation Stage assessment for the Decant #9 EVs. Values for the three metrics are provided for each frit/sludge combination of interest. Also shown in their respective tables are the results of the Phase 2 Nominal Stage assessments for completeness. It must be recognized that the assessments and projected operational windows are based solely on model predictions – no experimental work was performed.

Table 7-8. Summary of Frit Compositions (in wt% oxides) Used in the Phase 2 Nominal and Variation Stage Decant #12 Assessment

Oxide	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202	Frit 411	Frit 412	Frit 416	Frit 320
Al_2O_3	1	1	-	-	-	1	-	1	-
B_2O_3	8	10	8	10	8	8	8	8	8
Li_2O	5	5	8	8	7	5	5	8	8
MgO	-	-	-	-	2	-	-	-	-
Na_2O	7	7	3	3	6	12	12	11	12
SiO_2	79	77	81	79	77	74	75	72	72
Total	100	100	100	100	100	100	100	100	100

Decant #12		Frit 420	Frit 421	Frit 422	Frit 423	Frit 202	Frit 411	Frit 412	Frit 416	Frit 320
Nominal	WL (nominal)	37 – 39	34 – 39	33 – 39	30 – 38	28 – 37	25 – 45	27 – 46	25 – 42	27 – 40
Variation	WL all EVs	None	None	None	33	31 – 32	28 – 39	30 – 40	28 – 38	None
	% EVs at some WL	57.6%	85.6%	85.4%	100.0%	100.0%	100.0%	100.0%	100.0%	88.1%
	WL of 5% or greater	35.5%	51.8%	52.2%	82.8%	90.6%	100.0%	100.0%	100.0%	85.5%
	Minimum WL range	-	-	-	-	-	15%	15%	12%	-

7.2.3 Phase 2 Variation Stage: Decant #5

Detailed information regarding the predicted properties for the Decant #5 EV-based sludge compositions when coupled with each candidate frit is provided in Appendix H. The column identified as "Sludge Loading (%)" summarizes the specific waste loading of interest. It should be noted that there are typically more than one row for each sludge loading given the predicted properties for all 927 EVs will vary dramatically. The second column in Appendix H ("Satisfies PAR") represents the comparison of the predicted property versus the PAR limits as shown in Table 4-1. In this column, properties deemed unacceptable with respect to the PAR acceptance limits are preceded by "Not". The last column ("# of EVs") summarizes the number of EVs whose common property predictions are classified by the "Satisfies PAR" column. An effective method to identify potential WLs or WL intervals in which all 927 EVs can be processed is to scan the "# of EVs" column for 927 then evaluate the "Satisfies PAR" column to assure that all predicted properties are acceptable ("Not" should be absent from that row).

Given the high alkali concentration associated with the nominal Decant #5, when a ±10% variation is considered, it is anticipated that the extremely high alkali-based frits (such as Frit 320, 416, 411, and 412) will not have projected operational windows over which all 927 EVs will be processed. In fact, when the EVs associated with Decant #7 were assessed, these frits did not yield operational windows. Therefore, they were excluded from this assessment.

As the frit compositions become more refractory (moving from right to left in Table 7-9), the tolerance to the applied compositional variation should increase. In fact, a cursory review of the projected windows associated with the Phase 2 Variation Stage for Decant #5 assessment support this latter statement.

No WL or WL interval exists over which all 927 EVs can be processed with Frit 202. A more detailed review of the second and third metrics indicates that only 70% of the EVs can be processed at some WL with ~52% of those having a minimum 5% window. The results for Frits 422, 423, 420, and 421 are somewhat more positive but still less than perfect (when compared to other frits in Table 7-9). The WL ranges over which all the EVs could be processed for these frits is roughly a 2 – 4% window (all being in the mid-to-high 30's). Subsequent metrics indicate a less than perfect response to the compositional variation applied.

The Phase 2 Variation Stage Decant #5 assessment for Frits 406, 405, 409, and 410 are very similar and provide feedback into the effect of the compensations required to handle the high concentration and variation of alkali in the sludge. The 927 Decant #5 EVs could be processed by either of these frits over a relatively large WL interval. Waste loading intervals of 36 – 40%, 36 – 39%, 36 – 41%, and 36 – 41%, respectively, are projected indicating a relatively high degree of robustness for these frits. The second and third metrics are also very similar yielding 100% values which indicate that all 927 EVs could be processed at some WL with each having a minimum WL range of 5%. In fact, the minimum WL ranges are 6% or 9% depending upon the frit.

Assessments of melt rate and/or frittability may play a significant role in determining the primary frit for Decant #5 and its resulting compositional envelope.

Table 7-9. Summary of Frit Compositions (in wt% oxides) Used in the Phase 2 Nominal and Variation Stage Decant #5 Assessment

Oxide	Frit 406	Frit 405	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202
Al_2O_3	-	-	-	-	1	1	-	-	-
B_2O_3	15	20	8	8	8	10	8	10	8
Li_2O	5	5	4	5	5	5	8	8	7
MgO	-	-	-	-	-	-	-	-	2
Na_2O	-	-	6	5	7	7	3	3	6
SiO_2	80	75	82	82	79	77	81	79	77
Total	100	100	100	100	100	100	100	100	100

Decant #5		Frit 406	Frit 405	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202
Nominal	WL (nominal)	33 – 51	31 – 46	33 – 50	32 – 50	30 – 45	30 – 44	31 – 46	31 – 44	33 – 39
Variation	WL all EVs	36 – 40	36 – 39	36 – 41	36 – 41	34 – 36	34 – 35	36 – 39	36 – 37	None
	% EVs at some WL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100%	70.0%
	WL of 5% or greater	100.0%	100.0%	100.0%	100.0%	92.1%	87.8%	95.7%	90.2%	51.6%
	Minimum WL range	6%	9%	6%	6%	-	-	-	-	-

7.2.4 Phase 2 Variation Stage: Decant #9

Detailed information regarding the predicted properties for the Decant #9 EV-based sludge compositions when coupled with each candidate frit is provided in Appendix I. The column identified as "Sludge Loading (%)" summarizes the specific waste loading of interest. It should be noted that there are typically more than one row for each sludge loading given the predicted properties for all 889 EVs will vary dramatically. The second column in Appendix I ("Satisfies PAR") represents the comparison of the predicted property versus the PAR limits as shown in Table 4-1. In this column, properties deemed unacceptable with respect to the PAR acceptance limits are preceded by "Not". The last column ("# of EVs") summarizes the number of EVs whose common property predictions are classified by the "Satisfies PAR" column. An effective method to identify potential WLs or WL intervals in which all 889 EVs can be processed is to scan the "# of EVs" column for 889 then evaluate the "Satisfies PAR" column to assure that all predicted properties are acceptable ("Not" should be absent from that row). Table 7-10 summarizes the Phase 2 Variation Stage assessments for Decant #9 (the Nominal Stage assessments are also shown for completeness).

Frit 202 should be considered a candidate frit for the compositional region covered by the Decant #9 EVs. All of the Decant #9 EVs can be processed over a WL range of 33 – 36% with the minimum WL range being 9% for each EV. These results suggest that Frit 202 is extremely robust to the compositional variation presented by the EVs associated with Decant #9.

The modifications made to Frit 202 (e.g., Frit 420 and Frit 421) also demonstrate flexibility to process the Decant #9 EVs with WL projections of 37 – 38% and 34 – 37%, respectively. The second and third metrics indicate that Frit 421 may have a slight advantage over Frit 420. Although not as attractive as other frits, their use should be considered in further assessments involving melt rate and frittability.

The "higher" (Frits 412, 416, and 320) and "lower" (Frits 409 and 410) alkali containing frits are less attractive given their response to the Phase 2 Variation Stage assessments. Although the Nominal Stage assessments indicate relatively large operating windows (exception of Frit 320 in which there was no window), only Frit 412 possesses a WL range over which all the EVs could be processed.

The assessment of Frits 422 and 423 (intermediate alkali containing frits) indicates both respond extremely well to the applied compositional variation. The projected WL ranges over which all the EVs could be processed are 33 – 37% and 32 – 37%, respectively. With a minimum WL interval of 6% and 10%, Frits 422 and 423 should be considered primary candidates within this compositional region. Assessments of melt rate and/or frittability may play a significant role for this compositional region during the frit selection process.

Table 7-10. Summary of Frit Compositions (in wt% oxides) Used in the Phase 2 Nominal and Variation Stage Decant #9 Assessment

Oxide	Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202	Frit 412	Frit 416	Frit 320
Al_2O_3	-	-	1	1	-	-	-	-	1	-
B_2O_3	8	8	8	10	8	10	8	8	8	8
Li_2O	4	5	5	5	8	8	7	5	8	8
MgO	-	-	-	-	-	-	2	-	-	-
Na_2O	6	5	7	7	3	3	6	12	11	12
SiO_2	82	82	79	77	81	79	77	75	72	72
Total	100	100	100	100	100	100	100	100	100	100

Decant #9		Frit 409	Frit 410	Frit 420	Frit 421	Frit 422	Frit 423	Frit 202	Frit 412	Frit 416	Frit 320
Nominal	WL (nominal)	39 – 44	38 – 44	33 – 46	30 – 45	30 – 45	28 – 45	29 – 44	28 – 46	26 - 38	None
Variation	WL all EVs	None	None	37 – 38	34 – 37	33 – 37	32 – 37	33 – 36	32 – 35	None	None
	% EVs at some WL	66.1%	76.4%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	58.5%	31.1%
	WL of 5% or greater	50.0%	53.4%	94.4%	100.0%	100.0%	100.0%	100.0%	99.9%	54.0%	28.8%
	Minimum WL range	-	-	-	6%	6%	10%	9%	-	-	-

8.0 MAR vs. PAR: Impact on Projected Waste Loading Intervals

Since the development of the new T_L model (Brown et al. 2001), recent assessments (Peeler et al. 2000; Peeler et al. 2001b; Peeler et al. 2002a) for DWPF have used the PAR criteria to assess the impact of secondary waste streams or various frit compositions on select glass properties – not the "more restrictive" MAR criteria. In these studies, use of the PAR criteria has allowed an efficient, "one-to-one" comparison in an effort to assess the impact of frit compositional changes or the addition of secondary waste streams on properties such as viscosity, homogeneity, durability, and liquidus temperature (which ultimately dictate projected operating windows). As mentioned in Section 3.0, this same strategy was utilized in this report.

One may question the impact using this "conservative" T_L limit has on the actual windows that DWPF may anticipate (given the implementation of the product control system at the MAR). More specifically, "Is the use of the 1010°C truly conservative?" With respect to the SB3 frit development effort, the authors wanted to assure that the relatively large operational windows provided in the preceding sections are not reduced to an unmanageable level in terms of minimizing DWPF flexibility to the point of inoperability.

Another potential issue resulting from the use of this conservative limit is the influence it may have on actual melter processing. More specifically, could the use of this conservative limit have a negative impact on subsequent assessments of processing glass within the melter (i.e., melt behavior or melt rate)? This issue is addressed in detail in Section 10.0 (Path Forward).

In this section, the impacts of implementing or using this "conservative constraint" on the projected operational windows are discussed in detail. Also discussed is the impact (or lack thereof) on this conservative constraint on the methodology being used not only for this specific assessment but future assessments that may be performed.

Appendix J provides an assessment of the projected operational windows for Decant #5 and Decant #9 using various frits based on the MAR criteria. The column identified as Frit/Decant indicates the specific frit/sludge combination being evaluated. The "% WL" column provides the WL. The next five columns labeled as "Durability", "T_L", "Visc", "Frit", and Homog", respectively, represent the MAR determination (in terms of pass or fail) for durability, liquidus temperature, viscosity, low/high frit, and homogeneity, respectively. A "blank" entry in a specific cell under these columns indicates that the predicted property satisfies the MAR. For "durability", "T_L", and "homog", a "NO" in the respective cell indicates that the predicted property fails the MAR and that particular frit/sludge combination is not acceptable at that WL. For "visc" and "Frit", if "high" or "low" are shown, this is an indication that the predicted property fails the MAR and on which side (high or low).

Table 8-1 provides a summary of the projected operational windows for various frit/decant compositions expressed in terms of a waste loading range (based on a calcined oxide wt% basis) based on the use of both the PAR and MAR criteria. Also listed in the PAR column is the property that limits the particular frit/sludge combination from higher waste loadings.

Table 8-1. Projected Waste Loading Ranges for Various Frit/Decant Combinations Using both the PAR and MAR Acceptance Criteria

Decant #5	PAR	MAR
Frit 202	33 – 39 (PCT)	33 – 37
Frit 420	30 – 45 (PCT)	30 – 43
Frit 421	30 – 41 (PCT/lo visc)	30 – 41
Frit 409	33 – 50 (PCT)	34 – 48
Frit 410	32 – 50 (PCT)	33 – 48
Frit 422	31 – 46 (lo visc)	31 – 45
Frit 423	31 – 44 (lo visc)	31 – 43
Decant #9		
Frit 202	29 – 44 (T_L)	29 – 45
Frit 420	33 – 46 (T_L)	35 – 47
Frit 421	30 – 45 (T_L)	32 – 47
Frit 411	26 – 45 (T_L)	26 – 45
Frit 422	30 – 45 (T_L)	31 – 46
Frit 423	28 – 45 (T_L)	28 – 46

This table provides insight into the use of this "conservative" T_L PAR limit on the actual windows that DWPF may anticipate (given the implementation of the product control system at the MAR). With respect to the SB3 frit development effort, the authors want to assure that operational window for the recommended frit is not reduced to an unmanageable level in terms of minimizing DWPF flexibility to the point of inoperability once the MAR criteria are applied.

A review of the "upper waste loading limiting properties" indicates that predictions of durability and/or low viscosity limit access to higher waste loadings for the specific frit shown in Table 8-1 when coupled with Decant #5. This is primarily a result of glass formulation efforts taking advantage of the high Na_2O content in this particular sludge (less washing) in an effort to increase waste loadings as well as targeting enhanced melt rates given the historical knowledge that increased alkali concentrations improve melt rate.

A review of the Decant #9 based systems, indicates that all of these systems are T_L limited in terms of access to higher waste loadings. From previous DWPF process experience, T_L has been the primary property that has limited access to higher waste loadings.

With respect to the impact of using the "less conservative" PAR criteria to assess projected operational windows, a review of projected waste loading range difference between the PAR and MAR is in order. Consider Decant #5 when coupled with Frit 202. Using the PAR criteria, the projected waste loading interval is 33 – 39% with PCT (or predictions of durability) limiting access to higher waste loadings. When the MAR criteria are used, the WL interval is 33 – 37%; a 2% reduction in the upper WL limit achievable based on predictions of durability.

In general, use of the MAR criteria typically reduces the upper waste loading limit that can be obtained for the Decant #5 based systems. This is not surprising given the addition of measurement uncertainty to the PAR predictions to the PCT and viscosity models leading to a

more conservative operating window. The use of the "conservative 1010°C PAR limit" does not come into play for these systems.

For a direct assessment of the "conservative" 1010°C PAR criteria, one must evaluate T_L limited systems (e.g., all of the Decant #9-based systems). In each of these systems, the upper waste loading limit for the PAR is lower than that allowed by the MAR – indicating that the use of the 1010°C T_L PAR limit is conservative with respect to the upper waste loadings achievable. This is consistent with that reported by Brown et al. (2001). More specifically, consider the Decant #9/Frit 202 system. Use of the PAR criteria established a projected waste loading interval of 29 – 44%; while the projected waste loading interval using the MAR criteria is 29 – 45% (a 1% increase in the projected, achievable waste loading).

Based on the information reviewed since the development of the new T_L model, the use of the 1010°C PAR limit does appear to be "conservative" with respect to upper waste loading projections for systems that are T_L limited. It appears that its use has not specifically misrepresented (overestimated) potential waste loadings of interest (assuming T_L limited systems) and has effectively supported a methodology to evaluate the impact of various frit or sludge compositional changes on projected operational windows. It should be noted that waste loading projections are based on model predictions of viscosity, durability, homogeneity, and liquidus temperature as they compare to property acceptance criteria. The WL projections are not influenced by assessments of melt rate or cold cap behavior.

This page intentionally left blank.

9.0 Summary

Current planning strategies project that DWPF should start processing SB3 in the spring of 2004 (WSRC 2001). Sludge Batch 3 will be primarily Tank 7 sludge mixed with the heel of Sludge Batch 1B (SB1B), contributions from Tanks 18 and 19, and an H-Canyon slurry containing precipitated Pu with Gd (Jilani 2002). The sludge from Tank 7 is expected to contain several components that are considered atypical of DWPF sludge to date including higher levels of noble metals than previously processed sludge batches (Peeler et al. 2002a). Other atypical components that may be present in this sludge batch include sand, coal, Am/Cm precipitate (Patel 2002), sodium oxalate, and zeolite (Jantzen et al. 2002a). Based on the process history for Tank 7, it is estimated that significant quantities of sand/coal (~7723 kg) and sodium oxalate (~300,000 kg) have been added to this tank (Goslen 1984; Fowler 1980).

A series of tasks have been identified and are currently being addressed prior to accepting SB3 into DWPF (Fellinger 2002). One of the tasks identified involved an evaluation of potential frits for SB3, which is the sole focus of this report.

Several key criteria or aspects will provide the technical basis for selecting a frit for SB3. These include:

- Maximizing the PCCS projected operational window size over the anticipated SB3 composition region
- Providing a frit that is robust or insensitive to anticipated sludge composition variation
- Improving or maintaining high waste loadings (WLs)
- Improving or maintaining high melt rates
- Providing a “frittable” additive or frit composition

The issues listed above have been used to guide the SB3 frit development task in an effort to improve current DWPF baseline operations in terms of ease of processing, waste loading, and/or melt rate. The ability to maximize the size of the DWPF operational window provides flexibility in targeting waste loadings to meet processing goals in support of the accelerated clean-up mission.

The focus of this report is on frit development activities conducted solely on the basis of predictions generated by DWPF’s glass property-composition models as they apply to determining projected operational windows and assessing the robustness of a frit to compositional variation. Technical issues and results associated with melt rate and frittability are not discussed in this report but are critical inputs into the frit selection process. It is not the intent of this study to recommend a frit to DWPF for SB3 – only to provide insight into the selection process.

A unique, but technically sound methodology was developed and implemented for this study to guide frit development activities. The methodology utilized was a sequential, iterative process that may be summarized as follows: Candidate frits were identified for and compared across nominal sludge compositions (i.e., where each such composition is considered as a “best guess” view of SB3 sludge for a potential washing scenario). Two different sets of sludge compositions (an initial and a final) were used to represent potential nominal SB3 compositions. The initial set

of compositions was available early in the study and served as the basis for much of the preliminary development efforts. The preliminary frits that were the most promising at this stage were carried over to a stage of investigation that introduced variation around the nominal SB3 compositions. This approach was used to provide an assessment of the robustness or tolerance of a candidate frit to anticipated compositional variation (i.e., the ability of the frit to produce an acceptable product for variations in the sludge based upon model predictions). Comparisons among the frits were conducted using objective metrics, described below, that were developed to aid in this decision making process. This two-staged (an assessment using only nominal compositions and then an assessment with variation introduced) approach was then conducted for the second (or final) set of SB3 compositions. It should be noted that this portion of the overall frit development strategy was based solely on model predictions.

At the time this task was initiated, uncertainties associated with the actual quantity of $Na_2C_2O_4$ in Tank 7 and the fraction that would ultimately be transferred to SB3 given the various washing scenarios being considered were being addressed. From a glass formulation perspective and resulting properties, the unknown quantity of Na_2O resulting from the $Na_2C_2O_4$ will have a major impact on the overall sludge composition and ultimately the frit development efforts. That is, frit formulation efforts will have to account for or compensate for the varying Na_2O concentrations that could be present in the sludge and ultimately the glass as different washing schemes are considered. Concentrations of Na_2O in the nominal SB3 sludges ranged from 10.63 wt% to 35.13 wt%. With respect to frit development activities, the wide range of Na_2O concentration made it extremely difficult to develop a single frit that is tolerant or insensitive to this large variation. (It would be ideal to develop a single frit that would yield acceptable glasses for all washing schemes over the waste loading interval of interest – assuming no adverse impacts of other processing issues such as melt rate are encountered.) Therefore, frit development activities compensated by adjusting the alkali concentration and type as well as their ratios in perspective frits. More specifically, as sludge washing is increased, the alkali concentration in sludge decreases, therefore, resulting in a shift to a higher alkali containing frit.

Based on model predictions, the Nominal and Variation Stage assessments of both existing and alternative (or newly developed) frits indicate that judicious selection of the frit can yield processable and durable products at attractive waste loadings for all washing scenarios that demonstrate a high degree of tolerance for compositional variation. Given this, an aggressive washing strategy may not be required to assure processability or product quality as long as alternative frits are considered (assuming there are not significant technical issues such as anion solubility, H_2 generation, redox control, or rheological control). Again, the assessments are based solely on model predictions and do not include assessments of melt rate or frittability.

Numerous comparisons could be made based on the information generated in this study. General observations or results are bulletized below. It should be noted that the observations cited below are based solely on the results of the paper study assessment and do not account for melt rate or frittability. The reader is referred to the detail discussions within the main body of the report for more detailed assessments.

General observations from this study:

- Compositional frit adjustments can be made to compensate for various waste stream compositions resulting from the washing strategy pursued. More specifically, frits can be developed to provide relatively large operational windows with a high degree of compositional robustness over the entire compositional region evaluated.

- It would be ideal to develop a single frit that would yield acceptable glasses for all washing schemes (including compositional variation) over the waste loading interval of interest – assuming no adverse impacts of other processing issues such as melt rate are encountered. This would be an ideal situation from the perspective of balancing frit development requirements with selecting a washing strategy to pursue. That is, minimal insight would be required from the glass formulation team and the integrated flowsheet would be solely driven by the washing strategy. Although conceptually enticing, this may result in a "non-optimized" system. The use of a single frit over such a large compositional region could result in a wide response in melt rate potentially leading to lower waste throughput for DWPF. This concept gives support for developing specific frits for specific sludges to optimize operational windows and waste throughput (e.g., Frit 320 for SB2).
- The ability to compositionally compensate for the degree of washing via frit development efforts provides an incentive to further evaluate the potential to integrate a "low washed sludge" into the overall flowsheet. Washing the sludge less does have advantages in terms of significant time, labor, and ultimately funding reductions in the pretreatment/retrieval operation. A reduced washing campaign should also result in less water being sent to the evaporators. Assuming the source of alkali is not of concern, the enhanced alkali concentration in the under washed sludge could also improve melt rate (or at a minimum maintain melt rate relative to other sludge compositions). Conversely, targeting higher washed sludge should reduce the total number of canisters produced by some incremental amount and may minimize components that have potentially negative impacts to either WL or processability (such as SO_4). A cost-benefit analysis should be performed to fully understand the advantages and disadvantages of selecting a targeted washing scenario.
- Frit 202 is a viable frit candidate for specific washing scenarios. For the "mid-ranged" washing scenarios (e.g., 50% linear washing case, Decant #7, or Decant #9), Frit 202 provides large operational windows and is extremely tolerant to compositional variation. This is consistent with Elder's conclusions and his classification of Frit 202 as a "baseline" frit. However, use of Frit 202 with the extreme (in terms of washing strategy) sludge compositions typically results in small (sometimes non-existent) projected operational windows. If a window does exist, the tolerance to compositional variation is low. Use of Frit 202 may be advantageous not only from a WL perspective, but given the current availability of the frit, fabrication cost may be eliminated (assuming the quantity of frit existing would be sufficient to process SB3) or at least minimized (assuming a limited quantity would be required from a vendor). The classification of Frit 202 as a primary candidate based solely on availability assumes all other factors (such as robustness, operational window size, and melt rate) are equal. If proven to meet or provide acceptable responses to the Variation Stage and melt rate, a cost benefit analysis should be performed (including adjustments for total waste throughput) to assess the advantages and (potential) disadvantages of this frit.
- Frit 320 is a viable frit for the more advanced washed sludges (e.g., 75% linear washing case, Decant #12 and above). The relatively high alkali concentrations in the frit are off-set by the lower Na_2O concentration as the degree of washing increases resulting in operational flexibility for DWPF. Combining Frit 320 with less washed sludges is typically prohibited by predictions of durability (a direct result of the high alkali concentrations of both the sludge and frit). Again, availability of Frit 320 (assuming it is not consumed during SB2 processing) may be advantageous from a cost-benefit analysis.
- To provide compositional operating regions for each washing scenario, alternative frits were developed primarily based on alkali compensation with respect to the sludge. As with Frits 202 and 320, the alternative frits are best suited over a limited compositional region. The alternative frits do provide large operational windows and demonstrate a high degree of robustness to anticipated compositional variation.

- The concept of developing alternative frits for specific sludges (in an attempt to maximize throughput and/or operational flexibility) was observed numerous times during these assessments. One of the more interesting observations was the comparative responses of Frit 320 and Frit 416 (a modified formulation of Frit 320 in which 1% of the Na_2O was added as Al_2O_3) for the 75% washed sludge. Although the compositional modification appears to be negligible, its impact on predicted properties, which define the projected operational window, is rather high. No WL or WL range exists over which all 423 EVs could be processed with Frit 320. The slight compositional modification of Frit 416 results in a 27 – 39% WL range over which all of the EVs could be processed. This result indicates a high tolerance of Frit 416 to the applied compositional variation of ±10%. Evaluation of the third metric provides additional insight into the robustness of Frit 416. A minimum WL range of 15% is predicted for each of the 423 EVs – a very strong statement in terms of flexibility. Assuming no significant changes in melt rate are observed, the slight compositional adjustment provides operational flexibility to DWPF that is not available with existing frits.
- Historically, most of the previous sludge batches processed through DWPF have been T_L limited (in terms of the maximum waste loading achievable). An interesting outcome in this assessment was the fact that frit development efforts could take advantage of the high alkali content of the sludge driving or forcing the low washed sludges to be durability limited. This may be beneficial from a waste loading and melt rate perspective.
- The use of the less conservative PAR criteria seems to be a viable and effective method to guide frit development activities. It appears that its use has not specifically misrepresented (overestimated) potential waste loadings of interest (assuming T_L limited systems) and has effectively supported a methodology to evaluate the impact of various frit or sludge compositional changes on projected operational windows.

As previously mentioned, key criteria or aspects that will provide the technical basis for selecting a frit for SB3 include: (1) maximizing the projected operational window size (i.e., the waste loading interval) over the anticipated SB3 composition region, (2) providing a frit that is robust or insensitive to anticipated sludge composition variation, (3) improving or maintaining high waste loadings (WLs), (4) improving or maintaining high melt rates, and (5) providing a "frittable" additive or frit composition. Given the five key criteria can be competing, the basis for not only developing but ultimately selecting a frit for SB3 is complex. The selection process should not be made based on a single criterion but a collection of criteria that provide insight into the economics of processing SB3. A balanced approach should be utilized in both the development and selection. The selection may be solely a business decision assuming no technical showstoppers are identified. Another factor that could play a significant role in the selection of a frit is the availability of an existing frit versus any procurement and manufacturing costs for an alternative frit. The bottom line is that all the available information should be used to perform a cost / benefit analysis that could serve as input to the frit selection process.

An integrated methodology has been developed and is being utilized (and is in place for SB3) to develop frits for specific sludge batches. The methodology should include assessments of (a) projected operational windows using current model predictions, (b) melt rate, and (c) frittability. This integrated strategy would lower the risk of introducing a feed into DWPF that although on paper is very attractive (in terms of waste loading) results in a very difficult feed to process (in terms of melt rate). In fact, this strategy should provide the basis for developing a decision matrix in which optimum waste throughput could be targeted.

10.0 Path Forward

As previously mentioned, five key criteria or aspects will provide the technical basis for selecting a frit for SB3. These include:

- Maximizing the projected operational window size (i.e., the waste loading interval) over the anticipated SB3 composition region
- Providing a frit that is robust or insensitive to anticipated sludge composition variation
- Improving or maintaining high waste loadings (WLs)
- Improving or maintaining high melt rates
- Providing a "frittable" additive or frit composition

The current report addresses the first three items from a prediction standpoint – no experimental assessments were made to confirm predictions. The overall strategy has not discounted the importance of the remaining two criteria: melt rate and frittability. Parallel activities (outlined in Herman, Peeler and Edwards 2002) are on-going to assess these criteria which will form a significant portion of the frit selection process. These two criteria are discussed below.

10.1 Melt Rate

One method of supporting site and U.S. DOE goals of accelerated cleanup is to improve waste loading. For DWPF, a new T_L model has been developed and implemented which has proven to yield higher waste loadings for projected sludge batches (Brown et al. 2001). As previously mentioned, although targeting higher waste loadings is a primary objective, other processing constraints are also important. In the assessments discussed in this report, waste loading projections were not influenced by assessments of melt rate or cold cap behavior given there is currently no model to perform such an evaluation that is sensitive enough to discern between the glass compositions of interest (much less a 1% change in waste loading). That is, the projected operational windows are defined independent of melt rate projections from a model perspective. As discussed in Section 1.0, a major objective of the SB3 glass formulation team was to provide operational flexibility to DWPF via large operational windows while maintaining both high WL and an acceptable melt rate. Therefore, although no models were available to assess melt rate as a function of frit composition, compositional adjustments were based on the general trends observed during the development of Frit 320 for SB2 (Peeler et al. 2001a). More specifically, the alkali concentration in the frit was directly related to melt rate.

The balance between melt rate and waste loading should be carefully considered. Although every effort was made to indirectly develop frit compositions in terms of melt rate, the concern is that targeting the maximum WL allowed by model predictions may not necessarily lead to optimum melt rate or waste throughput. In fact, Lorier and McGrier (2002), have shown that for the Frit 320 based system, increased waste loading can have a negative impact on melt rate above some critical value. The concept that reduced melt rates at higher waste loading is unacceptable should be tempered with an evaluation of the total waste throughput. More specifically, during an assessment of the impacts of waste loading on melt rate, decisions on frit selection or targeted waste loading should not be made solely on the relative melt rate. The decision should consider the total sludge throughput per unit time. Note that currently there are no models that can be used a priori to gain insight into the melt rate of various systems. This assessment will be made solely

by using a testing methodology that has been shown to be effective for SB2 (Stone and Josephs 2001).

Therefore, as frit development efforts proceed for SB3 (or for future sludge batches), an assessment of melt rate must be included in the development of the integrated flowsheet to account for this disconnect. Assessments not only associated with projected operational windows (currently based on model predictions) but the impact on melt rate or melt behavior must be addressed (experimentally). In support of the accelerated clean up mission, the primary focus should be on determining the parameters that define optimal waste throughput (or work off) which may be a compromise between waste loading and melt rate.

Integration of melt rate assessments for select frit/sludge combinations is part of the SB3 flowsheet development program. The assessment of melt rate will be one of three major criteria used in the frit selection process – the other two being operational flexibility and frittability. The results of the melt rate and frittability assessments are not covered in this report. However, the strategy being used in the melt rate assessment to address the potential impact of the "conservative 1010°C" PAR constraint for T_L with respect to melt rate or melt behavior in DWPF is briefly discussed below.

The model-based assessments provide valuable information with respect to how the projected operational windows respond to compositional variation around a nominal sludge composition for various frits. This information will form one of the three key inputs to the frit selection process. The final decision of selecting a frit will not be based solely on the projected operational sizes or robustness of a frit – melt rate or cold cap behavior being critical as well. One question that should be asked and addressed is: "Does it really matter that model predictions allow extremely high waste loadings if the DWPF melter processing is hindered or inefficient due to an erratic cold cap behavior or extremely slow melt rate?" To address this issue, the SB3 frit development team has integrated an assessment of melt rate for candidate frit compositions into its program in an effort to provide not only relatively high WLs but to maximize waste throughput via a balance between melt rate and WL. An ideal scenario would be that maximum waste throughput is attained at the maximum waste loading.

As discussed in Sections 6.0 – 7.0, both existing and newly developed frits were assessed in terms of their projected operational windows for various washing scenarios. The results provide insight into the compositional adjustments needed to compensate for the various levels or degrees of washing. The Variation Stage assessments provide valuable insight into the robustness or flexibility of each frit to handle compositional sludge variation. The Nominal and Variation Stage assessments allowed candidate frit compositions to be screened with respect to their potential application to SB3. For example, a frit that did not provide an operational window (for a specific sludge composition or compositional region) should not be carried forward in further assessments (melt rate and/or frittability) given the models would ultimately not allow DWPF to process.

Given the decision of the SB3 team to focus primarily on the compositional region bounded by Decants #5 and #9, plans for melt rate assessments have been developed based on these two nominal waste streams. An initial frit down selection occurred based on model assessments (i.e., those frits that indicated relatively large processing windows and had a positive response on the ability to handle compositional variation as a function of various washing scenarios). The results of both Nominal and Variation Stage assessments associated with Decants #5, #7, and #9 will play an integral role in this down selection process.

To directly compare the effect of frit composition on melt rate, the task team identified the need to maintain a constant acid addition strategy (at least within a particular washing scenario) as well as to select "common" waste loadings for each frit/sludge system. The constant acid addition strategy is intended to eliminate (or at least minimize) any overwhelming impacts of the acid addition strategy on melt rate so a relative measure of the effect of frit composition on melt rate can be obtained. More specifically, given the focus of this effort is on differentiating the effect of frit composition on melt rate, the team did not want the acid addition strategy (which is currently under development for SB3) to suppress this assessment.

The use of "constant waste loadings" should provide a sound technical basis for two assessments. The first being a direct comparison of melt rate between frit-based systems at a constant waste loading. The second major assessment will be the impact of waste loading changes on melt rate within a specific system. The latter providing insight into the total waste throughput curve for a particular frit/sludge system. Based on the MAR information provided in Section 8.1, the SB3 melt rate team elected to use WLs of 30, 35, and 40% in the initial melt rate assessments. It is recognized that electing to use a "common" waste loading range provides some disadvantages and adds some risk. One disadvantage is the fact that the WL intervals for the various frit/sludge systems are not consistent so use of a common waste loading interval forces one to select non-bounding (below and above) the lower and upper WL limits as defined by model predictions. This could lead to an assessment of melt rate in a compositional region that would not be allowed in DWPF based on model predictions or not provide full coverage at the upper WLs limits of interest. For example, consider the two Frit 202 based systems. When coupled with Decant #5, the projected operational window based on MAR predictions is 33 – 37%. Both the 30% and 40% WL melt rate tests may be questionable given they lead to unacceptable products based on some criteria. However, the WL interval to be used bounds the anticipated processing region from which the effect of WL on melt rate can be viewed. The use of 30% and 40% for the Frit 202/Decant #9 melt rate tests are non-bounding tests (MAR predictions allow for a 29 – 45% window). Although not bounding, assessment of melt rate can be made over a majority of the WL interval to provide insight into the total waste throughput curve. Given the use of constant WLs, comparisons of melt rate can be made between the two sludge cases providing input into the targeted washing strategy.

Although potentially not bounding or unacceptable, the melt rate information obtained can be used as a guide to understand the impacts of WL on melt rate and should provide the template for this relationship from which melt rate interpolations could be made (albeit with some risk).

It should also be noted that the initial set of screening tests will be based on the dry fed melt rate furnace which also induces some risks, although minimal, based on recent data linking the dry fed system to slurry fed melters. This initial screening based on dry fed testing will be factored into the frit selection process from which a minimum number of primary frit candidates would be defined. Upon identification of the primary frit candidates, more detailed melt rate testing should be performed which could include dry feed tests at intermediate WLs to fill out the melt rate versus waste loading curve, slurry feed melt rate tests as a function of WL, and/or mini-melter tests.

10.2 Frittability

The last criteria to discuss is the desire to have a "frittable" frit (i.e., the targeted frit composition will produce a glass that can be manufactured by a vendor) which stems from waste acceptance issues. Currently, DWPF uses a frit that is ultimately blended with the sludge. Samples of this blend are taken from the Slurry Mix Evaporator (SME), the compositions determined, and properties are predicted from the measured composition which are verified to be within the processing window. Given the feed is acceptable in terms of various property predictions, the feed is transferred to the melter, converted to glass, and poured into canisters. This feed-forward process control strategy has been very effective in terms of assuring processability and product quality. The use of a prefabricated frit has alleviated or minimized issues associated with mixing, sampling, and homogenizing the contents of the SME, which serves as the basis for the process control strategy. It is therefore desirable to provide a "frittable" frit for DWPF. Although desirable, this criterion was not used as a strict constraint during the frit selection process in order not to limit the alternative processing situations/cases submitted for DWPF review.

In order to assess this criterion, two approaches have been taken. The first approach was to assume an upper frit melt temperature of 1450°C and experimentally determine if the targeted compositions could be melted at this temperature. This assessment is being performed on the laboratory scale and is an on-going task at the time this report was written. It was recognized that this approach had risks associated which included: (1) laboratory scale tests being solely used as a measure of a vendor's ability to implement or produce tonnage quantities and (2) not only is there a need to define an upper temperature limit but also an associated viscosity-temperature relationship. The former is being addressed by a request (albeit informal) for a vendor to review a list of primary frit candidate compositions to determine the potential for the vendor to utilize an existing melter technology to cost effectively produce the frits. The second issue is being addressed within SRTC as the viscosity versus temperature relationships for select candidate frit compositions is being formally measured. Again, this information alone will not be used to make the final frit selection but will form a valuable portion to be used during the frit selection process.

11.0 References

ASTM 1998. **Standard Test Methods for Determining Chemical Durability of Nuclear Waste Glasses: The Product Consistency Test (PCT),** ASTM C-1285-98, 1998.

Bronikowski, MG, MC Thompson, FR Graham, TL Fellinger, WR Wilmarth, and DT Hobbs, 2002. *Technical Task and Quality Assurance Plan for Assessing Downstream Effects of Plutonium/Gadolinium in Sludge Washing and SRAT*, WSRC-RP-2002-00178 Westinghouse Savannah River Company.

Brown, KG, and RL Postles. 1996. *SME Acceptability Determination for DWPF Process Control*, WSRC-TR-95-0364, Revision 3, Westinghouse Savannah River Company, Aiken, South Carolina, 1996.

Brown KG, CM Jantzen, and G Ritzhaupt. 2001. *Relating Liquidus Temperature to Composition for Defense Waste Processing Facility (DWPF) Process Control,* WSRC-TR-2001-00520, Westinghouse Savannah River Company, Aiken, South Carolina.

Edwards TB, and KG Brown. 1998. *Evaluating the Glasses Batched for the Tank 42 Variability Study (U)*, SRT-SCS-98-017, Revision 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Elder, HH. 2002. *Impact of Processing Americium and Curium in ESP, DWPF, and Saltstone, Savannah River Site, High Level Waste Process Engineering Position Paper,* HLW-SDT-2001-00244, Rev. 1.

Fellinger, TL. 2002. *Sludge Batch 3 – Overall Program View (U),* WSRC-RP-2002-00353, Westinghouse Savannah River Company, Aiken, South Carolina.

Fowler, JR. 1980. "Estimate of Maximum Amount of Reducing Agents and Sand in the SRP Waste for DWPF TDS", Don't Say It Write Memo, September 9, 1980.

Goslen, AQ. 1984. "Estimated Sodium Oxalate in the Tank Farm", March 22, 1984.

Herman, CC, TL Fellinger, NE Bibler, and DC Koopman. 2002a. *Scoping SRAT Runs with Simulated Sludge Batch 3,* SRT-GPD-2002-00044, Westinghouse Savannah River Company, Aiken, South Carolina.

Herman, CC, KG Brown, DK Peeler, and TB Edwards. 2002b. Selecting Glass Compositions for Phase 2 of the Reduction of Constraints Study, WSRC-RP-2002-00236, Revision 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Herman, CC, DK Peeler, and TB Edwards. 2002. Task Technical and QA Plan: Sludge Batch 3 Variability Studies with Simulants, WSRC-RP-2002-00386, Westinghouse Savannah River Company, Aiken, South Carolina.

Jantzen, CM. 1988. *Glass Composition and Frit Formulation Developed for DWPF,* DPST-88-952, E.I. du Pont de Nemours and Company, Savannah River Laboratory, Aiken, South Carolina.

Jantzen, CM, JB Pickett, KG Brown, TB Edwards, and DC Beam. 1995. *Process/Product Models for the Defense Waste Processing Facility (DWPF): Part I. Predicting Glass Durability from Composition Using a Thermodynamic Hydration Energy Reaction Model (THERMO) (U)*, WSRC-TR-93-672, Rev. 1, Volume 1, Westinghouse Savannah River Company, Aiken, South Carolina.

Jantzen, CM, RF Swingle, and FG Smith. 2002a. *Impact of Tank 19F Zeolite Mound on DWPF Vitrification of Sludge Batch 3*, WSRC-TR-2002-00288, Rev. 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Jantzen, CM. 2002b. *REDOX Studies and Modeling for DWPF Sludge Batch 3*, WSRC-RP-2002-00341, Westinghouse Savannah River Company, Aiken, South Carolina.

Jilani, I. 2002. *Evaluation of Impact of HLW of Using Gadolinium as a Neutron Poison for Plutonium*, Technical Task Request, NMMD-HTS-2002-010, Westinghouse Savannah River Company, Aiken, South Carolina.

Lambert, DP, TH Lorier, DK Peeler, and ME Stone. 2001. *Melt Rate Improvement for DWPF MB3: Summary and Recommendations*, WSRC-TR-2001-00148, Westinghouse Savannah River Company, Aiken, South Carolina.

Li, H, JD Vienna, PR Hrma, DE Smith, and MJ Schweiger. 1997. "Nepheline Precipitation in High-Level Waste Glasses: Compositional Effects and Impact on the Waste Form Acceptability." In *Scientific Basis for Nuclear Waste Management XX*, Vol. 465, pp. 261-268. Materials Research Society, Pittsburgh, Pennsylvania.

Li, H, B Jones, P Hrma, and JD Vienna. 1998. "Compositional Effects on Liquidus Temperature of Hanford Simulated High-Level Waste Glasses Precipitating Nepheline ($NaAlSiO_4$)," *Ceram. Trans.* 87, pp 279-288, American Ceramic Society, Westerville, Ohio.

Lorier, TH and PL McGrier. 2002. Melt Rate Improvement for the DWPF: Higher Waste Loading Testing, WSRC-TR-2002-00344, Westinghouse Savannah River Company, Aiken, South Carolina.

Patel, PM. 2002. *Evaluation of Impacts of Sludge Containing "Americium/Curium" on H_2 Generation and Glass Quality*, Technical Assistance Request, HLW/DWPF-TAR-02-0007, Westinghouse Savannah River Company, Aiken, South Carolina.

Peeler DK, TB Edwards, KG Brown, RJ Workman, and IA Reamer. 2000. *Reduction of Constraints: Applicability of the Homogeneity Constraint for Macrobatch 3 (U)*, WSRC-TR-2000-00358, Revision 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Peeler, DK, TH Lorier, DF Bickford, DC Witt, TB Edwards, KG Brown, IA Reamer, RJ Workman, JD Vienna. 2001a. *Melt Rate Improvement for DWPF MB3: Frit Development and Model Assessment*, WSRC-TR-2001-00131, Revision 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Peeler DK, KG Brown, and TB Edwards. 2001b. *Reduction of Constraints: Technical Status report on the Applicability of the Homogeneity Constraint for Sludge-Only Processing*, WSRC-TR-2001-00538, Revision 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Peeler, DK, NE, Bibler, and TB Edwards. 2002a. *An Assessment of the Impacts of Adding Am/Cm and Pu/Gd Waste Streams to Sludge Batch 3 (SB3) on DWPF H_2 Generation Rates and Glass Properties*, WSRC-TR-2002-00145, Westinghouse Savannah River Company, Aiken, South Carolina.

Peeler DK, KG Brown, TB Edwards, DR Best, RJ Workman, and IA Reamer. 2002b. *Reduction of Constraints: Phase 1 Experimental Assessment of Centroid-Based Sludge-Only Glasses*, WSRC-TR-2002-00120, Revision 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Plodinec MJ, KG Brown, SL Marra, CM Jantzen, and TB Edwards. 1995. "Technical Bases for the DWPF Glass Product Control Program", In: *Waste Qualification Report (WQR)*, WSRC-IM-91-116-5, Revision 1, Volume 5, Aiken, South Carolina.

Rios-Armstrong, MA. 2002a. Technical Task Request, *Sludge Batch 3 Carbon Content Analysis*, TTR-HLW/DWPF/TTR-02-0017, 4/25/2002.

Rios-Armstrong, MA., 2002b. *Sludge Batch 3 Variability Studies with Simulants*, HLW/DWPF/TTR-02-0027.

SAS Institute, Inc., JMP® Statistics and Graphics Guide: JMP Version 4, SAS Institute, Inc, Cary, North Carolina, 2000.

Soper, PD, DD Walker, MJ Plodinec, GJ Roberts and LF Lightner. 1983. "Optimization of Glass Composition for the Vitrification of Nuclear Waste at the Savannah River Plant," *Ceram. Bull.* Volume 62, No. 9, pp. 1013–1018.

Stone, ME and JE Josephs. 2001. *Melt Rate Improvements for DWPF MB3: Melt Rate Furnace Testing*, WSRC-TR-2001-00146, Rev. 0, Westinghouse Savannah River Company, Aiken, South Carolina.

Westinghouse Savannah River Company (WSRC). 2001. *Savannah River Site High Level Waste System Plan (HLW)*, HLW-2001-00040, Revision 13, Aiken, South Carolina.

This page intentionally left blank.

Appendix A

Nominal Decant Compositions
(Personal Communication with H.H. Elder)

Elemental wt. %	Decant #5	Decant #6	Decant #7	Decant #8	Decant #9	Decant #10	Decant #11	Decant #12	Decant #13	Decant #14	Decant #15
Al	7.33	7.59	7.82	8.01	8.18	8.33	8.47	8.60	8.71	8.82	8.93
B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ba	0.17	0.18	0.18	0.19	0.19	0.19	0.20	0.20	0.20	0.21	0.21
Ca	1.97	2.04	2.10	2.15	2.20	2.24	2.28	2.31	2.34	2.37	2.40
Ce	0.23	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.28
Cr	0.19	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.23	0.24
Cs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cu	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.15	0.15
Fe	21.53	22.31	22.98	23.54	24.05	24.48	24.89	25.27	25.59	25.92	26.26
K	0.27	0.28	0.29	0.30	0.31	0.31	0.32	0.32	0.33	0.33	0.33
La	0.15	0.16	0.16	0.16	0.17	0.17	0.17	0.18	0.18	0.18	0.18
Li	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mg	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11
Mn	4.25	4.41	4.54	4.65	4.75	4.84	4.92	4.99	5.06	5.12	5.19
Mo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Na	23.15	21.29	19.71	18.38	17.17	16.15	15.18	14.27	13.52	12.74	11.94
Nb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ni	0.97	1.00	1.03	1.06	1.08	1.10	1.12	1.14	1.15	1.16	1.18
Pb	0.21	0.22	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.26
Si	0.75	0.78	0.80	0.82	0.84	0.85	0.87	0.88	0.89	0.90	0.91
Th	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12
Ti	1.29	1.34	1.38	1.41	1.44	1.47	1.49	1.52	1.54	1.55	1.58
U	6.61	6.85	7.05	7.23	7.38	7.51	7.64	7.76	7.86	7.96	8.06
Y	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zn	0.25	0.26	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.30	0.31
Zr	0.44	0.45	0.46	0.48	0.49	0.49	0.50	0.51	0.52	0.52	0.53

This page intentionally left blank.

Appendix B

Summary of the Projected Operational Windows for the Nominal Washing Cases

SB3 Nominal Washing Compositions with Selected Frits

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
SB3 Nominal for Washing @ 0%	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
SB3 Nominal for Washing @ 0%	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	29	30
SB3 Nominal for Washing @ 0%	202	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	31	33
SB3 Nominal for Washing @ 0%	202	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34	41
SB3 Nominal for Washing @ 0%	202	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	42	60
SB3 Nominal for Washing @ 0%	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	28
SB3 Nominal for Washing @ 0%	320	Not Durable; Not L Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	29	30
SB3 Nominal for Washing @ 0%	320	Not Durable; Not L Visc; ; Not Homog; New TL ; Al2O3 ; alkali	31	31
SB3 Nominal for Washing @ 0%	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32	60
SB3 Nominal for Washing @ 0%	A	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	31
SB3 Nominal for Washing @ 0%	A	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	32	39
SB3 Nominal for Washing @ 0%	A	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40	53
SB3 Nominal for Washing @ 0%	A	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	54	54
SB3 Nominal for Washing @ 0%	A	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	55	60
SB3 Nominal for Washing @ 0%	B	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
SB3 Nominal for Washing @ 0%	B	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	31	31
SB3 Nominal for Washing @ 0%	B	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	46
SB3 Nominal for Washing @ 0%	B	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	50
SB3 Nominal for Washing @ 0%	B	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	51	60
SB3 Nominal for Washing @ 0%	C	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	31
SB3 Nominal for Washing @ 0%	C	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	32	36
SB3 Nominal for Washing @ 0%	C	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	37	52
SB3 Nominal for Washing @ 0%	C	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	53	60
SB3 Nominal for Washing @ 0%	D	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	31
SB3 Nominal for Washing @ 0%	D	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	32	39
SB3 Nominal for Washing @ 0%	D	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40	53
SB3 Nominal for Washing @ 0%	D	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	54	54
SB3 Nominal for Washing @ 0%	D	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	55	60
SB3 Nominal for Washing @ 0%	E	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	31
SB3 Nominal for Washing @ 0%	E	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	32	45
SB3 Nominal for Washing @ 0%	E	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	46	57
SB3 Nominal for Washing @ 0%	E	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	58	58
SB3 Nominal for Washing @ 0%	E	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	59	60
SB3 Nominal for Washing @ 0%	O	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	31
SB3 Nominal for Washing @ 0%	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	44
SB3 Nominal for Washing @ 0%	O	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	45	46

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
SB3 Nominal for Washing @ 0%	O	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	60
SB3 Nominal for Washing @ 0%	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
SB3 Nominal for Washing @ 0%	P	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	31	31
SB3 Nominal for Washing @ 0%	P	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	48
SB3 Nominal for Washing @ 0%	P	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	60
SB3 Nominal for Washing @ 25%	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
SB3 Nominal for Washing @ 25%	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	40
SB3 Nominal for Washing @ 25%	202	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	41	44
SB3 Nominal for Washing @ 25%	202	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	45	60
SB3 Nominal for Washing @ 25%	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	28
SB3 Nominal for Washing @ 25%	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	29	29
SB3 Nominal for Washing @ 25%	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	31
SB3 Nominal for Washing @ 25%	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32	60
SB3 Nominal for Washing @ 25%	F	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
SB3 Nominal for Washing @ 25%	F	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	39
SB3 Nominal for Washing @ 25%	F	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40	55
SB3 Nominal for Washing @ 25%	F	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	56	56
SB3 Nominal for Washing @ 25%	F	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	57	58
SB3 Nominal for Washing @ 25%	F	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
SB3 Nominal for Washing @ 25%	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
SB3 Nominal for Washing @ 25%	O	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	29
SB3 Nominal for Washing @ 25%	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	47
SB3 Nominal for Washing @ 25%	O	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48	50
SB3 Nominal for Washing @ 25%	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	57
SB3 Nominal for Washing @ 25%	O	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
SB3 Nominal for Washing @ 25%	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
SB3 Nominal for Washing @ 25%	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	33
SB3 Nominal for Washing @ 25%	P	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34	51
SB3 Nominal for Washing @ 25%	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	52
SB3 Nominal for Washing @ 25%	P	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	59
SB3 Nominal for Washing @ 25%	P	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
SB3 Nominal for Washing @ 25%	Q	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
SB3 Nominal for Washing @ 25%	Q	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	44
SB3 Nominal for Washing @ 25%	Q	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	45	55
SB3 Nominal for Washing @ 25%	Q	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	58
SB3 Nominal for Washing @ 25%	Q	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
SB3 Nominal for Washing @ 25%	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
SB3 Nominal for Washing @ 25%	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	33
SB3 Nominal for Washing @ 25%	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34	51
SB3 Nominal for Washing @ 25%	S	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	52	52
SB3 Nominal for Washing @ 25%	S	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	53	60
SB3 Nominal for Washing @ 25%	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
SB3 Nominal for Washing @ 25%	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	32
SB3 Nominal for Washing @ 25%	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	51
SB3 Nominal for Washing @ 25%	T	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	52	60
SB3 Nominal for Washing @ 50%	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
SB3 Nominal for Washing @ 50%	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	45
SB3 Nominal for Washing @ 50%	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	49
SB3 Nominal for Washing @ 50%	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	60
SB3 Nominal for Washing @ 50%	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	26
SB3 Nominal for Washing @ 50%	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	27	27
SB3 Nominal for Washing @ 50%	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	35
SB3 Nominal for Washing @ 50%	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	36	56
SB3 Nominal for Washing @ 50%	320	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60
SB3 Nominal for Washing @ 50%	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
SB3 Nominal for Washing @ 50%	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	45
SB3 Nominal for Washing @ 50%	G	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	46	46
SB3 Nominal for Washing @ 50%	G	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	53
SB3 Nominal for Washing @ 50%	G	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
SB3 Nominal for Washing @ 50%	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
SB3 Nominal for Washing @ 50%	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	43
SB3 Nominal for Washing @ 50%	I	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	44	46
SB3 Nominal for Washing @ 50%	I	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	54
SB3 Nominal for Washing @ 50%	I	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
SB3 Nominal for Washing @ 75%		Not Durable; Not H Visc; ; Not Homog; Not New TL; Not Al2O3; alkali	26	26
SB3 Nominal for Washing @ 75%	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
SB3 Nominal for Washing @ 75%	202	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	28
SB3 Nominal for Washing @ 75%	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	35
SB3 Nominal for Washing @ 75%	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	55
SB3 Nominal for Washing @ 75%	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
SB3 Nominal for Washing @ 75%	320	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
SB3 Nominal for Washing @ 75%	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	41
SB3 Nominal for Washing @ 75%	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	42	46
SB3 Nominal for Washing @ 75%	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	60
SB3 Nominal for Washing @ 75%	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	44
SB3 Nominal for Washing @ 75%	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	60
SB3 Nominal for Washing @ 75%	H	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
SB3 Nominal for Washing @ 75%	H	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	45
SB3 Nominal for Washing @ 75%	H	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	46	46
SB3 Nominal for Washing @ 75%	H	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	60
SB3 Nominal for Washing @ 75%	K	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
SB3 Nominal for Washing @ 75%	K	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	45
SB3 Nominal for Washing @ 75%	K	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	46	46
SB3 Nominal for Washing @ 75%	K	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	60

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
SB3 Nominal for Washing @ 75%	L	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
SB3 Nominal for Washing @ 75%	L	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	43
SB3 Nominal for Washing @ 75%	L	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44	46
SB3 Nominal for Washing @ 75%	L	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	60
SB3 Nominal for Washing @ 100%	202	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	27
SB3 Nominal for Washing @ 100%	202	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	28	37
SB3 Nominal for Washing @ 100%	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	60
SB3 Nominal for Washing @ 100%	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	37
SB3 Nominal for Washing @ 100%	320	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	52
SB3 Nominal for Washing @ 100%	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
SB3 Nominal for Washing @ 100%	M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	36
SB3 Nominal for Washing @ 100%	M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	55
SB3 Nominal for Washing @ 100%	M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
SB3 Nominal for Washing @ 100%	N	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	34
SB3 Nominal for Washing @ 100%	N	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35	60
SB3 Nominal for Washing @ 100%	R	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	40
SB3 Nominal for Washing @ 100%	R	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	41	42
SB3 Nominal for Washing @ 100%	R	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	60
SB3 Nominal for Washing @ 100%	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	36
SB3 Nominal for Washing @ 100%	320-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	55
SB3 Nominal for Washing @ 100%	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60

This page intentionally left blank.

Appendix C

Conversion Table of Frits Nomenclatures

Numeric	Alphanumeric
400	A
401	B
402	E
403	C
404	D
405	O
406	P
407	Q
408	F
409	S
410	T
411	G
412	I
413	H
414	K
415	L
416	320-M
417	M
418	N
419	R
420	202-M
421	202-M2
422	U
423	U2

Appendix D

Phase 1 Assessment of Linear Washing Scenarios

Paper Study Results for 0% Washing with Frit 202 (# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	63
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	207
25	Durable; Visc; Not Homog; New TL ; Not Al2O3; Not alkali	104
25	Durable; Visc; Not Homog; New TL ; Not Al2O3; alkali	81
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	88
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	264
26	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	103
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	58
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	245
27	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	152
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	4
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	275
28	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	152
28	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	24
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	15
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	246
29	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	147
29	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	47
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	61
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	30
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	154
30	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	140
30	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	70
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	119
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	38
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	68
31	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	137
31	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	93
32	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	23
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	158
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	13
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	15
32	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	18
32	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	121
32	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	107
33	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	31
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	165
33	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	31
33	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	115
33	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	113
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	182
34	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	59
34	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	214
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	171
35	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	149
35	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	135
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	154
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	202
36	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	99
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	140
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	272
37	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	112
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	343
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	52
39	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	8
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	395

Sludge Loading (%)	Satisfies PAR	# of EVs
40	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	135
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	320
41	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	198
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	257
42	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	260
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	195
43	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	317
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	138
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	433
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	22
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455

WL Range	# of EVs and Centroid	% of Total
0	273	60
1	10	2.1978022
2	4	0.87912088
3	7	1.53846154
4	10	2.1978022
5	10	2.1978022
6	14	3.07692308
7	18	3.95604396
8	37	8.13186813
9	41	9.01098901
10	31	6.81318681

Paper Study Results for 0% Washing with Frit 320 (# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; Not alkali	270
25	Not Durable; Visc; Not Homo; New TL ; Not Al2O3; Not alkali	185
26	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; Not alkali	455
27	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	58
27	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; Not alkali	397
28	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	164
28	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	16
28	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; Not alkali	106
28	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; alkali	169
29	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	197
29	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	53
29	Not Durable; Visc; Homo; New TL ; Al2O3 ; Not alkali	2
29	Not Durable; Visc; Homo; New TL ; Al2O3 ; alkali	81
29	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; Not alkali	56
29	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; alkali	66
30	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; Not alkali	11
30	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	4
30	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	216
30	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	85
30	Not Durable; Visc; Homo; New TL ; Al2O3 ; Not alkali	7
30	Not Durable; Visc; Homo; New TL ; Al2O3 ; alkali	113
30	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; Not alkali	3
30	Not Durable; Visc; Not Homo; New TL ; Al2O3 ; alkali	16
31	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; Not alkali	80
31	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	127
31	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	137
31	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	97
31	Not Durable; Visc; Homo; New TL ; Al2O3 ; alkali	14
32	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; Not alkali	81
32	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	147
32	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	121
32	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	106
33	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; Not alkali	82
33	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	198
33	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; Not alkali	109
33	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	66
34	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	336
34	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	119
35	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	372
35	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	83
36	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	434
36	Not Durable; Not L Visc; Not Homo; New TL ; Al2O3 ; alkali	21
37	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
38	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
39	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
40	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
41	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
42	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
43	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
44	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
45	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
46	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
47	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
48	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
49	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
51	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
52	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
53	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
54	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
55	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
56	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
57	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
58	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
59	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455
60	Not Durable; Not L Visc; Homo; New TL ; Al2O3 ; alkali	455

Paper Study Results for 0% Washing with Frit A (400)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	270
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali	185
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	83
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	372
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	135
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	320
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	221
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	234
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	228
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	227
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	280
33	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	175
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	336
34	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	119
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	372
35	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	83
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	434
36	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
37	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	455
38	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	350
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	105
39	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	273
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	182
40	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	210
40	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	242
41	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	135
41	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	18
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	302
42	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	33
42	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	379
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	383
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	72
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	349
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	106
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	319
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	136
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	300
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	155
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	288
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	167
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	240
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	174
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	41
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	145
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	178
49	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	132
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	119
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	182
50	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	154
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	97
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	184
51	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	174

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	77
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	102
52	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	86
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	11
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	50
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	192
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	166
53	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	28
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	14
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	11
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	185
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	191
54	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	19
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	38
55	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	3
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	162
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	227
55	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	99
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	102
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	243
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
57	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	193
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	2
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	246
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	13
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	184
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	247
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	24
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	173
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	243
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	39
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	166
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	240
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49

WL Range	# of EVs and Centroid	% of Total
0	49	10.7692308
1	28	6.15384615
2	30	6.59340659
3	33	7.25274725
4	11	2.41758242
5	13	2.85714286
6	7	1.53846154
7	2	0.43956044
8	3	0.65934066
9	5	1.0989011
10	69	15.1648352
11	94	20.6593407
12	41	9.01098901
13	28	6.15384615
14	40	8.79120879
15	2	0.43956044

Paper Study Results for 0% Washing with Frit B (401)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	270
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali	185
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	447
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	8
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	83
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	224
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	148
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	127
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	105
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	8
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	215
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	161
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	8
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	60
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	226
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	60
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	168
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	227
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	280
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	175
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	336
34	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	119
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	372
35	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	83
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	434
36	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	452
37	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	436
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	19
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	406
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	49
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	376
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	79
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	343
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	112
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	316
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	139
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	295
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	160
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	5
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	261
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	169
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	20
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	151
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	174
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	117
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	83
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	180
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	151
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	72
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29

Sludge Loading (%)	Satisfies PAR	# of EVs
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	176
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	172
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	77
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	42
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	4
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	145
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	187
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	64
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	142
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	48
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	201
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	195
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	216
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	23
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	200
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	232
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	9
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	201
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	245
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	195
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	247
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	186
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	247
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	22
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	175
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	247
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	33
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	167
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	241
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	148
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	240
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	67
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	134
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	240
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	81
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	85
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	236
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	134
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	25
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	234
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	196

WL Range	# of EVs and Centroid	% of Total
5	9	1.97802198
6	17	3.73626374
7	36	7.91208791
8	63	13.8461538
9	78	17.1428571
10	60	13.1868132
11	35	7.69230769
12	19	4.17582418
13	40	8.79120879
14	34	7.47252747
15	32	7.03296703
16	28	6.15384615
17	4	0.87912088

Paper Study Results for 0% Washing with Frit E (402)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	270
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali	185
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	83
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	372
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	135
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	320
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	221
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	234
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	228
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	227
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	280
33	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	175
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	336
34	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	119
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	372
35	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	83
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	434
36	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
37	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	455
38	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	455
39	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	455
40	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	455
41	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	455
42	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	454
42	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
43	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	440
43	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	15
44	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	315
44	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	30
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	110
45	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	209
45	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	62
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	184
46	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	113
46	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	100
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	242
47	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	41
47	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	113
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	291
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
48	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	6
48	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	55
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	299
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	95
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	295
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	160
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	284
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	171
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	209
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	175
51	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	71
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	134
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	181

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	140
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	106
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	183
53	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	166
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	89
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	188
54	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	178
55	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	72
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
55	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	193
56	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	51
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	197
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	11
56	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	196
57	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	200
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	137
57	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	85
58	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	8
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	5
58	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	7
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	197
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	186
58	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	52
59	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	27
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	173
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	223
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	7
59	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	22
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	133
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	245
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
60	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2

WL Range	# of EVs and Centroid	% of Total
0	146	32.0879121
1	13	2.85714286
2	8	1.75824176
3	5	1.0989011
4	2	0.43956044
5	5	1.0989011
6	5	1.0989011
7	99	21.7582418
8	81	17.8021978
9	31	6.81318681
10	26	5.71428571
11	6	1.31868132
12	11	2.41758242
13	17	3.73626374

Paper Study Results for 0% Washing with Frit C (403)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	270
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali	185
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	83
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	372
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	135
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	320
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	221
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	234
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	228
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	227
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	280
33	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	175
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	336
34	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	119
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	328
35	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	10
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	44
35	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	73
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	264
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	170
36	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
37	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	198
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	257
38	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	139
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	316
39	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	20
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	435
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	346
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	109
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	307
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	148
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	280
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	5
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	170
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	258
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	14
49	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	183
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	228
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	29
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	24
50	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	174
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	178
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	62
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	143
51	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	69
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	23
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	126
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	79

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	184
52	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	43
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	40
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	54
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	119
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	225
53	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	17
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	23
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	13
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	116
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	253
54	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	139
55	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	3
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	13
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	267
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	10
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	166
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	279
57	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	167
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	281
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	151
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	280
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	24
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	137
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	274
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	44
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	98
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	273
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	84

WL Range	# of EVs and Centroid	% of Total
9	24	5.27472527
10	69	15.1648352
11	74	16.2637363
12	77	16.9230769
13	44	9.67032967
14	54	11.8681319
15	35	7.69230769
16	78	17.1428571

Paper Study Results for 0% Washing with Frit D (404)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	270
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali	185
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	83
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	372
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	135
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	320
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	221
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	234
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	228
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	227
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	280
33	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	175
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	336
34	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	119
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	372
35	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	83
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	434
36	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
37	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	437
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	18
38	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	308
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	147
39	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	242
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	213
40	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	184
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	271
41	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	115
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	340
42	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	5
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	450
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	361
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	94
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	311
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	144
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	276
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
49	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	169
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	257
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
50	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	181
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	215
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44
51	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	196
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	174
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	71
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	28
52	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	182
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	132
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	97
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	150

Sludge Loading (%)	Satisfies PAR	# of EVs
53	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	74
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	18
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	72
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	125
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	193
54	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	47
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32
55	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	144
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	236
55	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	17
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	33
56	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	4
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	120
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	264
56	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	11
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	155
57	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	277
58	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	168
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	280
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	151
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	280
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	24
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	138
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	273
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	44

WL Range	# of EVs and Centroid	% of Total
7	10	2.1978022
8	5	1.0989011
9	115	25.2747253
10	93	20.4395604
11	62	13.6263736
12	48	10.5494505
13	30	6.59340659
14	18	3.95604396
15	71	15.6043956
16	3	0.65934066

Paper Study Results for 0% Washing with Frit O (405)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	179
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali; No Neph	27
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	91
25	Durable; Visc; ; Not Homog; New TL ; Not Al2O3; alkali; No Neph	158
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	130
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	325
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	3
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	452
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	455
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	83
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	372
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	135
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	320
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	221
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	234
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	228
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	227
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	280
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	175
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	336
34	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	119
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	372
35	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	83
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	434
36	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali; No Neph	21
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	455
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	455
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	455
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	375
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	80
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	312
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	143
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	288
42	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	8
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	159
43	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	2
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	273
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	131
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	49
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	22
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	238
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	173
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	22
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	53
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	192
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	203
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	7
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	90
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	141
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	224
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	186
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	29
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	240
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	202
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	70
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	183

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	190
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	221
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	44
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	2
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	176
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	230
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	47
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	112
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	53
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	5
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	254
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	31
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	135
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	4
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	14
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	286
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; No Neph	16
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	115
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	25
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	315
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	55
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	58
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	338
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	4
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	16
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	37
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	360
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	42
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	342
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	113
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	318
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	137
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	308
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	147
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	295
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	160
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali; Neph Likely	289
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali; Neph Likely	166

WL Range	# of EVs and Centroid	% of Total
3	18	3.95604396
4	44	9.67032967
5	38	8.35164835
6	21	4.61538462
7	18	3.95604396
8	10	2.1978022
9	21	4.61538462
10	16	3.51648352
11	18	3.95604396
12	19	4.17582418
13	23	5.05494505
14	36	7.91208791
15	29	6.37362637
16	7	1.53846154
17	43	9.45054945
18	92	20.2197802
19	2	0.43956044

Paper Study Results for 0% Washing with Frit P (406)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	270
25	Durable; Not H Visc; ; Not Homog; New TL ; Not Al2O3; alkali	185
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	455
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	83
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	318
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	54
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	131
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	146
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	4
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	174
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	174
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	34
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	47
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	200
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	140
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	2
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	88
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	225
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	19
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	261
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	175
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	336
34	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	119
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	372
35	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	83
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	434
36	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	412
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	43
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	321
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	134
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	296
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	159
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	280
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	175
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	265
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	188
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	250
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	116
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	88
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	15
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	221
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	172
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	47
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	39
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	182
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	205
49	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	59

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	148
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	242
50	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	134
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	61
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	260
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	174
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	272
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	159
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	14
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	282
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	138
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	28
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	289
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	84
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	62
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	309
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	54
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	74
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	322
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	5
57	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	72
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	334
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	43
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	16
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	317
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	122
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	305
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	150
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	291
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	164

WL Range	# of EVs and Centroid	% of Total
5	13	2.85714286
6	28	6.15384615
7	48	10.5494505
8	28	6.15384615
9	17	3.73626374
10	15	3.2967033
11	12	2.63736264
12	20	4.3956044
13	16	3.51648352
14	16	3.51648352
15	10	2.1978022
16	5	1.0989011
17	14	3.07692308
18	162	35.6043956
19	51	11.2087912

Paper Study Results for 25% Washing with Frit 202

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	47
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	418
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	95
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	370
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	194
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	271
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	233
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	90
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	142
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	300
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	165
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	368
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	38
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
33	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	53
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	351
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	59
34	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	55
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	327
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	125
35	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	13
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	280
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	185
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	270
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	195
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	260
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	205
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	252
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	213
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	243
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	222
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	232
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	233
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	222
42	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	9
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	234
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	215
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	96
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	154
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	206
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	181
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	77
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	14
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	186
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	233
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	76
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	117
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	263
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	9
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	129
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	58
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	277
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1

Sludge Loading (%)	Satisfies PAR	# of EVs
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	169
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	5
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	288
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	121
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	21
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	323
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	79
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	335
50	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	38
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	84
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	333
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	97
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	326
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	79
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	294
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	92
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	277
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	130
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	37
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	264
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	164
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	256
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	203
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	250
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	215
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	244
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	221
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	239
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	226
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	236
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	229

WL Range	# of EVs and Centroid	% of Total
0	90	19.3548387
1	23	4.94623656
2	18	3.87096774
3	18	3.87096774
4	41	8.8172043
5	10	2.15053763
6	9	1.93548387
7	11	2.3655914
8	7	1.50537634
9	4	0.86021505
10	3	0.64516129
11	3	0.64516129
12	7	1.50537634
13	6	1.29032258
14	11	2.3655914
15	44	9.46236559
16	36	7.74193548
17	14	3.01075269
18	44	9.46236559
19	54	11.6129032

WL Range	# of EVs and Centroid	% of Total
20	12	2.58064516

Paper Study Results for 25% Washing with Frit 320

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	465
26	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	280
26	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	185
27	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	3
27	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	52
27	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	258
27	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	152
28	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	26
28	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	89
28	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	216
28	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	134
29	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	3
29	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	110
29	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	114
29	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	108
29	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	130
30	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; Not alkali	6
30	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	87
30	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; alkali	2
30	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	102
30	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	133
30	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	6
30	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	129
31	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; Not alkali	41
31	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	43
31	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	74
31	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; alkali	37
31	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	73
31	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	177
31	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	20
32	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	185
32	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; alkali	75
32	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	205
33	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	319
33	Not Durable; Not L Visc; ; Not Homo; New TL ; Al2O3 ; alkali	43
33	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	103
34	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	443
34	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	22
35	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
36	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
37	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
38	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
39	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
40	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
41	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
42	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
43	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
44	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
45	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
46	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
47	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
48	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
49	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
50	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
51	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
52	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
53	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465

Sludge Loading (%)	Satisfies PAR	# of EVs
54	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
55	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
56	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
57	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
58	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
59	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	465
60	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	457
60	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	8

Paper Study Results for 25% Washing with Frit F (408)

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	55
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	410
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	115
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	350
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	224
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	224
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	333
31	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	131
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	363
32	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	27
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	75
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	328
33	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	94
33	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	43
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	307
34	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	158
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	270
35	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	195
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	257
36	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	208
37	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	250
37	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	215
38	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	243
38	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	222
39	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	238
39	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	227
40	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	236
40	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	229
41	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	233
41	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	232
42	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	229
42	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	236
43	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	228
43	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	237
44	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	227
44	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	238
45	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	222
45	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	243
46	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	216
46	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	248
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
47	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	153
47	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	250
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	61
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
48	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	80
48	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	243
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	130
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	12
49	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	12
49	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	222
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	192
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	148
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	197
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	120
51	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	88
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	191
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	186
52	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	180
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	274
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	170
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	295
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	150
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	315
55	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	129
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	336
56	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	109
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	356
57	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	95
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	370
58	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	72
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	393
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
59	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	401
59	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	15
59	Not Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
60	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	27
60	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	354
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	34
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
60	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2
60	Not Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	6

WL Range	# of EVs and Centroid	% of Total
0	265	56.9892473
1	5	1.07526882
2	3	0.64516129
3	9	1.93548387
4	5	1.07526882
5	14	3.01075269
6	25	5.37634409
7	12	2.58064516
8	14	3.01075269
9	16	3.44086022
10	28	6.02150538
11	21	4.51612903
12	34	7.31182796
13	14	3.01075269

Paper Study Results for 25% Washing with Frit O (405)

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	463
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	2
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	362
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	103
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	55
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	192
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	218
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	106
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	45
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	9
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	305
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	58
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	5
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	166
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	236
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	2
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	239
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	224
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	334
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	131
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	390
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	75
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	422
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	43
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	462
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	448
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	411
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	54
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	360
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	105
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	311
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	154
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	286
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	179
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	269
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	196
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	253
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	206
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	90
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	162
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	213
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	168
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	77
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	214
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	178
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	27
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	143

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	105
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	12
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	124
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	81
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	112
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	165
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	65
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	122
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	88
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	226
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	7
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	144
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	236
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	185
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	31
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	239
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	195
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	20
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	240
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	205
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	8
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	244
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	212
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	242
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	213
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	233
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	213
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	19
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	224
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	205
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	215
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	201
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	207
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	194
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	64

WL Range	# of EVs and Centroid	% of Total
9	7	1.50537634
10	22	4.7311828
11	43	9.24731183
12	88	18.9247312
13	63	13.5483871
14	55	11.827957
15	44	9.46236559
16	41	8.8172043
17	59	12.688172
18	31	6.66666667
19	12	2.58064516

Paper Study Results for 25% Washing with Frit P (406)

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	55
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	410
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	115
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	350
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	224
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	224
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	332
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	131
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	352
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	21
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	54
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	277
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	145
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	43
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	207
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	258
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	109
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	356
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	438
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	462
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	445
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	20
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	409
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	56
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	352
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	113
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	306
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	159
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	282
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	183
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	266
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	199
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	257
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	208
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	251
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	214
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	245
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	220
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	237
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	226
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	60
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	176
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	229
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	70
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	104
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	220

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	61
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	81
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	37
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	196
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	111
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	81
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	95
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	14
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	141
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	134
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	148
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	91
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	179
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	225
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	16
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	192
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	19
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	245
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	201
57	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	248
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	207
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
58	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	244
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	210
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	237
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	205
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	23
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	226
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	200
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	39

WL Range	# of EVs and Centroid	% of Total
3	3	0.64516129
4	16	3.44086022
5	34	7.31182796
6	45	9.67741935
7	38	8.17204301
8	27	5.80645161
9	18	3.87096774
10	11	2.3655914
11	5	1.07526882
12	9	1.93548387
13	5	1.07526882
14	6	1.29032258
15	3	0.64516129
16	17	3.65591398
17	50	10.7526882
18	115	24.7311828
19	63	13.5483871

Paper Study Results for 25% Washing with Frit Q (407)

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	463
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	2
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	362
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	103
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	55
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	192
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	218
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	106
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	45
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	9
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	305
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	58
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	5
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	166
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	236
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	2
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	239
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	224
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	334
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	131
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	390
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	75
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	422
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	43
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	462
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	448
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	411
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	54
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	360
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	105
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	311
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	154
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	286
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	179
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	269
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	196
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	253
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	206
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	90
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	162
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	213
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	168
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	77
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	214
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	178
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	27
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	143

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	105
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	12
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	124
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	81
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	112
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	165
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	65
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	122
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	88
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	226
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	7
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	144
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	236
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	185
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	31
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	239
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	195
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	20
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	240
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	205
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	8
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	244
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	212
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	242
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	213
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	233
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	213
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	19
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	224
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	205
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	215
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	201
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	207
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	194
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	64

WL Range	# of EVs and Centroid	% of Total
9	7	1.50537634
10	22	4.7311828
11	43	9.24731183
12	88	18.9247312
13	63	13.5483871
14	55	11.827957
15	44	9.46236559
16	41	8.8172043
17	59	12.688172
18	31	6.66666667
19	12	2.58064516

Paper Study Results for 25% Washing with Frit S (409)

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	55
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	410
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	115
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	350
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	224
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	224
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	333
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	131
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	352
32	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	50
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	279
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	143
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	43
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	210
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	255
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	112
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	353
36	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	435
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	415
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	50
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	368
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	97
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	337
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	128
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	296
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	169
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	276
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	189
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	266
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	199
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	250
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	8
49	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	207
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	208
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	31
50	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	184
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	5
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	156
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	79
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	112
51	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	113
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	21
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	83

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	125
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	189
52	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	47
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	7
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	19
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	162
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	221
53	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	23
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	25
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	83
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	104
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	246
54	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	10
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	163
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	255
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	197
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	255
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	193
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	251
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	21
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	187
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	245
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	33
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	175
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	239
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	139
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	236
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	90

WL Range	# of EVs and Centroid	% of Total
9	36	7.74193548
10	13	2.79569892
11	32	6.88172043
12	46	9.89247312
13	63	13.5483871
14	53	11.3978495
15	51	10.9677419
16	41	8.8172043
17	38	8.17204301
18	44	9.46236559
19	48	10.3225806

Paper Study Results for 25% Washing with Frit T (410)

(# of EVs = 465)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	465
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	55
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	410
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	115
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	350
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	224
29	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	241
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	237
30	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	208
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	4
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	16
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	308
31	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	36
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	95
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	241
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	149
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	75
33	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	150
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	272
33	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	43
34	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	68
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	397
35	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	5
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	460
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	465
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	428
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	37
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	374
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	91
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	339
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	126
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	308
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	157
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	278
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	187
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	269
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	196
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	251
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	8
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	15
49	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	191
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	204
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	97
50	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	118
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	20
51	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	131
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	90
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	169

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	55
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
52	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	64
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	125
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	207
52	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	45
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60
53	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	111
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	235
53	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	8
54	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	25
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	142
54	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	47
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	250
55	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	9
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	195
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	255
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
56	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	198
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	252
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	12
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	193
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	250
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	22
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	187
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	244
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	177
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	239
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	140
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	236
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	89

WL Range	# of EVs and Centroid	% of Total
9	30	6.4516129
10	16	3.44086022
11	24	5.16129032
12	23	4.94623656
13	22	4.7311828
14	41	8.8172043
15	59	12.688172
16	57	12.2580645
17	45	9.67741935
18	41	8.8172043
19	54	11.6129032
20	53	11.3978495

Paper Study Results for 50% Washing with Frit 202

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	56
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	399
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	5
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	17
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	433
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	65
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	390
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	195
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	260
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	248
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	207
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	351
30	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	104
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	414
31	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	41
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	442
32	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	13
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	455
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	447
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	8
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	413
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	342
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	113
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	278
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	177
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	247
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	208
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	235
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	220
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	231
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	224
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	219
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	229
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	53
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	168
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	231
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	63
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	15
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	136
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	225
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	16
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	117
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	50
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	213
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	39
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	118
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	161
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	3
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	118

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	55
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	82
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	216
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	81
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	65
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	30
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	290
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	41
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	58
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
53	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	331
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	71
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	317
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	17
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	121
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	293
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	156
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	267
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	188
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	259
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	196
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	255
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	200
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	252
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	203
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	248
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	207

WL Range	# of EVs and Centroid	% of Total
12	19	4.17582418
13	81	17.8021978
14	73	16.043956
15	57	12.5274725
16	46	10.1098901
17	39	8.57142857
18	40	8.79120879
19	48	10.5494505
20	50	10.989011
21	2	0.43956044

Paper Study Results for 50% Washing with Frit 320

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	N Rows
25	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	3
25	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	22
25	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	247
25	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	183
26	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	28
26	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	53
26	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	205
26	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	169
27	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	124
27	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	83
27	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	89
27	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	159
28	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	139
28	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	124
28	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	59
28	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	133
29	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; Not alkali	151
29	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	231
29	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; Not alkali	36
29	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	37
30	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	426
30	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	29
31	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	452
31	Not Durable; Visc; ; Not Homo; New TL ; Al2O3 ; alkali	3
32	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	455
33	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	25
33	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	430
34	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	81
34	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	374
35	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	135
35	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	320
36	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	315
36	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	140
37	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	371
37	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	84
38	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	409
38	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	46
39	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	449
39	Not Durable; Visc; ; Homo; New TL ; Al2O3 ; alkali	6
40	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
41	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
42	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
43	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
44	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
45	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
46	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
47	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	455
48	Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	1
48	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	454
49	Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	5
49	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	450
50	Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	7
50	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	446
50	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	2
51	Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	3
51	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	5
51	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	425

Sludge Loading (%)	Satisfies PAR	N Rows
51	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	22
52	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	9
52	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	364
52	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	82
53	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	10
53	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	294
53	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	151
54	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	10
54	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	251
54	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	194
55	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	10
55	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	240
55	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	205
56	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	10
56	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	232
56	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	213
57	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	11
57	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	227
57	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	217
58	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	12
58	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	223
58	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	220
59	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	13
59	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	216
59	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	226
60	Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	14
60	Not Durable; Not L Visc; ; Homo; New TL ; Al2O3 ; alkali	206
60	Not Durable; Not L Visc; ; Homo; Not New TL; Al2O3 ; alkali	235

Paper Study Results for 50% Washing with Frit G (411)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	180
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	275
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	240
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	215
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	342
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	113
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	418
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	37
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	442
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	13
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	430
30	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	410
31	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	45
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	386
32	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	69
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	90
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	347
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	108
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	317
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	138
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	291
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	164
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	265
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	190
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	259
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	196
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	254
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	201
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	250
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	205
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	247
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	208
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	243
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	212
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	239
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	14
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	202
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	233
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	61
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	158
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	17
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	216
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	91
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	131
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	37
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	194
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	192
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	131
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	83
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	213
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	16
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	109

Sludge Loading (%)	Satisfies PAR	# of EVs
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	41
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	23
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	229
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	3
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	57
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	133
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	16
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	15
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	234
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	22
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	193
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	237
50	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	213
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	237
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	2
52	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	212
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	233
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	210
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	230
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	15
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	208
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	224
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	23
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	207
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	221
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	27
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	205
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	215
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	35
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	202
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	201
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	201
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	166
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	88
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	200
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	117
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	138
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	198
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	70
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	187

WL Range	# of EVs and Centroid	% of Total
0	11	2.41758242
1	11	2.41758242
2	12	2.63736264
3	11	2.41758242
4	18	3.95604396
5	17	3.73626374
6	11	2.41758242
7	25	5.49450549
8	26	5.71428571
9	28	6.15384615
10	17	3.73626374

WL Range	# of EVs and Centroid	% of Total
11	10	2.1978022
12	6	1.31868132
13	2	0.43956044
14	6	1.31868132
15	3	0.65934066
16	2	0.43956044
17	2	0.43956044
18	3	0.65934066
19	6	1.31868132
20	20	4.3956044
21	48	10.5494505
22	84	18.4615385
23	44	9.67032967
24	26	5.71428571
25	6	1.31868132

Paper Study Results for 50% Washing with Frit I (412)

(# of EVs = 455)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	98
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	332
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	81
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	89
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	285
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	2
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	205
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	68
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	169
27	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	11
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	18
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	245
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	24
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	129
28	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	35
28	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	26
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	341
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	5
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	24
29	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	15
29	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	31
29	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	13
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	369
30	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	57
30	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	29
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	351
31	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	101
31	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	3
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	321
32	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	134
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	293
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	162
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	267
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	188
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	259
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	196
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	255
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	200
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	250
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	205
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	247
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	208
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	243
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	212
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	239
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	216
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	236
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	219
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	233
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	222
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	231
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	12
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	212
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	224
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	61

Sludge Loading (%)	Satisfies PAR	# of EVs
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	169
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	11
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	212
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	93
45	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	139
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	29
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	191
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	197
46	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	127
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	89
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	218
47	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	20
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	141
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
48	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	55
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	8
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	235
48	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	5
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	110
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	71
49	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	5
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	242
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	57
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	151
50	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	245
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	16
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	192
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	244
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	206
52	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	240
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	205
53	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	234
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	16
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	202
54	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	229
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	24
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	201
55	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	224
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	30
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	200
56	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	221
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	198
57	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	211
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	46
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	196
58	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	194
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	65
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	194
59	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	157
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	104
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
60	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	100
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	165

WL Range	# of EVs and Centroid	% of Total
0	84	18.4615385
1	13	2.85714286
2	9	1.97802198
3	30	6.59340659
4	17	3.73626374
5	28	6.15384615
6	11	2.41758242
7	9	1.97802198
8	4	0.87912088
9	4	0.87912088
10	6	1.31868132
11	2	0.43956044
12	3	0.65934066
13	1	0.21978022
14	4	0.87912088
15	2	0.43956044
16	4	0.87912088
17	3	0.65934066
18	7	1.53846154
19	30	6.59340659
20	80	17.5824176
21	18	3.95604396
22	28	6.15384615
23	49	10.7692308
24	9	1.97802198

Paper Study Results for 75% Washing with Frit 202

(# of EVs = 423)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	52
25	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	369
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	2
26	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	176
26	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	197
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	11
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	39
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	212
27	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	129
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	42
28	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	213
28	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	12
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	170
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28
29	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	87
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	328
29	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	8
30	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	69
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	354
31	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	33
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	390
32	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	407
32	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	12
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	318
33	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	105
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	235
34	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	188
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	213
35	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	210
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	206
36	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	217
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	177
37	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	246
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	104
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	319
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	393
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	421
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	8
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	415
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	376
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	76
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	347

Sludge Loading (%)	Satisfies PAR	# of EVs
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	126
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	297
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	229
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	194
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	337
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	86
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	351
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	72
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	380
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	410
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	13

WL Range	# of EVs and Centroid	% of Total
1	9	2.12765957
2	38	8.98345154
3	23	5.43735225
4	15	3.54609929
5	65	15.3664303
6	52	12.2931442
7	12	2.83687943
8	21	4.96453901
9	57	13.4751773
10	80	18.9125296
11	43	10.1654846
12	8	1.89125296

Paper Study Results for 75% Washing with Frit 320

(# of EVs = 423)

SLUDGE LOADING (%)	SATISFIES PAR	# OF EVS
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	32
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	167
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	18
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	160
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	40
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	6
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	40
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	225
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	10
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	106
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	10
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	26
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	6
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	373
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	8
27	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	22
27	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	20
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	389
28	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	1
28	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30
28	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	3
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	391
29	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	391
30	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	394
31	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	396
32	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	398
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	403
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	20
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	405
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	18
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	405
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	18
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	406
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	17
38	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	402
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	15
39	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	368
39	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	10
40	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	69
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	345
40	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	2
41	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	117
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	297
41	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	9
42	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	225
42	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	189
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
42	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7

SLUDGE LOADING (%)	SATISFIES PAR	# OF EVS
43	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	305
43	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	26
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	72
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	14
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	255
44	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	94
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	217
45	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	160
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	7
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	208
46	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	198
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	12
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	201
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	217
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	176
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	243
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	103
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	316
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	35
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	384
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
50	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	418
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	422
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	422
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423

WL Range	# of EVs and Centroid	% of Total
0	12	2.83687943
1	4	0.94562648
2	1	0.23640662
5	6	1.41843972
6	3	0.70921986
7	2	0.47281324
8	3	0.70921986
10	1	0.23640662
11	13	3.07328605
12	23	5.43735225
13	14	3.30969267

WL Range	# of EVs and Centroid	% of Total
14	17	4.01891253
15	10	2.36406619
16	124	29.3144208
17	105	24.822695
18	33	7.80141844
19	37	8.74704492
20	14	3.30969267
21	1	0.23640662

Paper Study Results for 75% Washing with Frit 320-M (416)

(# of EVs = 423)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	371
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	52
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	411
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	12
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	423
40	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	422
41	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	26
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	378
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	19
42	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	65
42	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	252
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	105
43	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	74
43	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	11
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	163
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	175
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	83
44	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	106
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	132
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	102
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	151
45	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	142
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	57
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	73
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	181
46	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	161
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	10
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	71
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	127
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	235
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	60
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	45
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	350
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	28
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	8
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	409
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423

Sludge Loading (%)	Satisfies PAR	# of EVs
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423

WL Range	# of EVs and Centroid	% of Total
15	3	0.70921986
16	59	13.9479905
17	122	28.8416076
18	85	20.0945626
19	39	9.21985816
20	60	14.1843972
21	49	11.5839243
22	5	1.1820331
23	1	0.23640662

Paper Study Results for 75% Washing with Frit H (413)

(# of EVs = 423)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	24
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	166
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	60
25	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	8
25	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	58
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	106
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	22
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	205
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	36
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	28
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	20
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	36
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	76
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	281
27	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	114
27	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	290
28	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	129
28	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	299
29	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	124
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	312
30	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	111
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	324
31	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	99
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	332
32	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	91
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	345
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	78
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	348
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	75
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	352
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	71
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	354
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	69
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	363
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	60
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	58
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	369
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	54
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	374
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	49
41	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	373
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	46
42	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	24
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	357
42	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	12
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30
43	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	39
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	308
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	9
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47
44	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	7

Sludge Loading (%)	Satisfies PAR	# of EVs
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	211
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	118
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	34
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	6
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	65
45	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	111
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	129
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	85
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	145
46	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	143
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	37
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	66
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	166
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	150
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	9
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	66
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	152
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	187
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	54
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	29
48	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	88
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	286
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	22
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	24
49	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	24
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	369
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	13
50	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	14
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	397
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	24
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	405
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	18
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	405
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	18
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	405
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	18
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	406
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	408
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	15
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	410
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	13
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	414
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	414
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	416
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	7

WL Range	# of EVs and Centroid	% of Total
0	43	10.1654846
1	2	0.47281324
2	3	0.70921986
3	7	1.65484634
4	3	0.70921986
5	6	1.41843972
6	4	0.94562648
7	4	0.94562648
8	2	0.47281324
9	3	0.70921986
10	1	0.23640662
11	2	0.47281324
12	2	0.47281324
13	9	2.12765957
14	6	1.41843972
15	17	4.01891253
16	20	4.72813239
17	21	4.96453901
18	46	10.8747045
19	131	30.9692671
20	80	18.9125296
21	11	2.60047281

Paper Study Results for 75% Washing with Frit K (414)

(# of EVs = 423)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	28
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	167
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	2
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	153
25	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	4
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	56
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	13
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	30
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	225
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	99
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	20
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	36
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	13
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	360
27	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	3
27	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35
27	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
28	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	54
28	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	373
29	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	50
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	376
30	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	47
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	380
31	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	43
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	381
32	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	42
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	384
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	39
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	391
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	391
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	391
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	394
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	396
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	398
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	403
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	20
41	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	402
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	18
42	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	373
42	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	16
43	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	58
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	314
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	12
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	5
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	65
44	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	6

Sludge Loading (%)	Satisfies PAR	# of EVs
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	217
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	118
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	16
44	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	83
45	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	110
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	132
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	85
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	13
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	153
46	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	143
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	51
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	66
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	10
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	188
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	150
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	10
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	66
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	9
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	174
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	186
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	55
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	8
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	105
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	288
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	23
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	7
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	34
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	381
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	4
50	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	2
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	417
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	419
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	419
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	419
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	419
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	419
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	4
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	420
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	421
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	2
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	422
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	423

WL Range	# of EVs and Centroid	% of Total
0	17	4.01891253
2	4	0.94562648
3	5	1.1820331
4	1	0.23640662
5	3	0.70921986
6	1	0.23640662
8	3	0.70921986

WL Range	# of EVs and Centroid	% of Total
9	5	1.1820331
10	1	0.23640662
11	3	0.70921986
12	3	0.70921986
13	5	1.1820331
14	8	1.89125296
15	15	3.54609929
16	10	2.36406619
17	14	3.30969267
18	41	9.69267139
19	158	37.3522459
20	108	25.5319149
21	18	4.25531915

Paper Study Results for 75% Washing with Frit L (415)

(# of EVs = 423)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	22
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	159
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	38
25	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	10
25	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	8
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	58
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	128
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	21
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	190
26	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	11
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; Not alkali	29
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	36
26	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	101
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	224
27	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	171
27	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	230
28	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	189
28	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	235
29	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	188
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	245
30	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	178
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	255
31	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	168
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	270
32	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	153
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	286
33	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	137
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	294
34	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	129
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	300
35	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	123
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	313
36	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	110
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	324
37	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	99
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	332
38	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	91
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	344
39	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	79
40	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	6
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	341
40	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	14
40	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	62
41	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	13
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	337
41	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48
41	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25
42	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	28
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	324
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
42	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	56
42	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	14
43	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	105
43	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	16
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	216

Sludge Loading (%)	Satisfies PAR	# of EVs
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	23
43	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	56
43	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	7
44	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	137
44	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	89
44	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	93
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44
44	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	60
45	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	147
45	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	137
45	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	21
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	60
45	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	58
46	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	154
46	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	154
46	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	8
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	57
46	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	50
47	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	155
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	188
47	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	31
47	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48
48	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	136
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	236
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	6
48	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44
48	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
49	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	75
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	306
49	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	32
49	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
50	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	22
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	359
50	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	13
50	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	29
51	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	385
51	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	1
51	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	36
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	391
52	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	32
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	391
53	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	32
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	391
54	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	32
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	394
55	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	29
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	396
56	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	27
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	396
57	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	27
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	401
58	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	22
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	405
59	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	18
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	405
60	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	18

WL Range	# of EVs and Centroid	% of Total
0	74	17.4940898
1	4	0.94562648
2	1	0.23640662
3	1	0.23640662
4	2	0.47281324
5	9	2.12765957
6	3	0.70921986
7	12	2.83687943
8	8	1.89125296
9	12	2.83687943
10	10	2.36406619
11	7	1.65484634
12	20	4.72813239
13	13	3.07328605
14	17	4.01891253
15	17	4.01891253
16	6	1.41843972
17	6	1.41843972
18	114	26.9503546
19	65	15.3664303
20	20	4.72813239
21	2	0.47281324

Paper Study Results for 100% Washing with Frit 320

(# of EVs = 365)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	361
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	340
36	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	25
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	236
37	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	129
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	169
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	196
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	89
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	276
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	16
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	349
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	5
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	360
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	22
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	343
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	315
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	103
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	262
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	152
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	213
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	174
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	191
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	185
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	180
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	199
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	166
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	221
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	144
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	265
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	100
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	311
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	54
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	330
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	348
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	358
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	7

WL Range	# of EVs and Centroid	% of Total
11	25	6.84931507
12	104	28.4931507
13	67	18.3561644
14	84	23.0136986
15	69	18.9041096
16	16	4.38356164

Paper Study Results for 100% Washing with Frit M (417)

(# of EVs = 365)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	361
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	348
35	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	247
36	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	118
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	175
37	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	100
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	265
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	18
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	347
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	9
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	356
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	34
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	331
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	305
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	122
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	243
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	160
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	205
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	178
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	187
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	175
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	208
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	157
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	234
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	131
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	291
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	74
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	318
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	47

WL Range	# of EVs and Centroid	% of Total
10	17	4.65753425
11	101	27.6712329
12	72	19.7260274
13	79	21.6438356
14	78	21.369863
15	18	4.93150685

Paper Study Results for 100% Washing with Frit 320-M (416)

(# of EVs = 365)

Sludge Loading (%)	Satisfies PAR	N Rows
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	360
34	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	5
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	281
35	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	84
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	194
36	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	171
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	130
37	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	235
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	39
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	326
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	10
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	355
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	35
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	330
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	61
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	304
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	132
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	233
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	162
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	203
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	178
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	187
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	190
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	175
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	209
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	156
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	245
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	120
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	301
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	64
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	322
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43

WL Range	# of EVs and Centroid	% of Total
9	5	1.36986301
10	79	21.6438356
11	87	23.8356164
12	64	17.5342466
13	91	24.9315068
14	39	10.6849315

Paper Study Results for 100% Washing with Frit N (418)

(# of EVs = 365)

Sludge Loading (%)	Satisfies PAR	N Rows
25	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	44
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	317
25	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
26	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	15
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	350
27	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	3
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	362
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	363
32	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	2
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	278
33	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	87
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	192
34	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	173
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	122
35	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	243
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28
36	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	337
37	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
52	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
53	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
54	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
55	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	3
56	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	362
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	19
57	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	346
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	48
58	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	317
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	100
59	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	265
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	151
60	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	214

WL Range	# of EVs and Centroid	% of Total
6	1	0.2739726
7	16	4.38356164
8	100	27.3972603
9	68	18.630137
10	65	17.8082192
11	88	24.109589
12	27	7.39726027

Paper Study Results for 100% Washing with Frit R (419)

(# of EVs = 365)

Sludge Loading (%)	Satisfies PAR	N Rows
25	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	286
25	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	75
25	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	4
26	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	326
26	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	39
27	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	349
27	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	16
28	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
29	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
30	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
31	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
32	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
33	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
34	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
35	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
36	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	365
37	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	3
37	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	362
38	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	19
38	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	344
38	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	2
39	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47
39	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
39	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	236
39	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	81
40	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	59
40	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	42
40	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	140
40	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	124
41	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41
41	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	111
41	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	92
41	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	121
42	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	13
42	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	161
42	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30
42	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	161
43	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	186
43	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	1
43	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	178
44	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	200
44	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	165
45	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	222
45	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	143
46	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	266
46	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	99
47	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	312
47	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	53
48	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	330
48	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35
49	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	348
49	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	17
50	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	357
50	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	8
51	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	364
51	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	1
52	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
53	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365

Sludge Loading (%)	Satisfies PAR	N Rows
54	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
55	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
56	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
57	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
58	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
59	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365
60	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	365

WL Range	# of EVs and Centroid	% of Total
11	6	1.64383562
12	29	7.94520548
13	29	7.94520548
14	90	24.6575342
15	78	21.369863
16	49	13.4246575
17	66	18.0821918
18	18	4.93150685

Appendix E

Nominal Stage Assessment for Various Decants

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #5	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	32
Decant #5	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	39
Decant #5	202	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40	43
Decant #5	202	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44	60
Decant #5	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #5	202-M	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	29
Decant #5	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	45
Decant #5	202-M	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	46	48
Decant #5	202-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	60
Decant #5	202-M2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #5	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	44
Decant #5	202-M2	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	45	46
Decant #5	202-M2	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	60
Decant #5	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	28
Decant #5	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	29	30
Decant #5	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	31	60
Decant #5	320-M	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #5	320-M	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	32
Decant #5	320-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33	60
Decant #5	G	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #5	G	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	40
Decant #5	G	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41	60
Decant #5	I	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	28
Decant #5	I	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	29	30
Decant #5	I	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	40
Decant #5	I	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41	60
Decant #5	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #5	O	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	27	30
Decant #5	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	46
Decant #5	O	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	55
Decant #5	O	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	56	58
Decant #5	O	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #5	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
Decant #5	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	31	32
Decant #5	P	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	51
Decant #5	P	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	52	58
Decant #5	P	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	59	59
Decant #5	P	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #5	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
Decant #5	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	31	32
Decant #5	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	50
Decant #5	S	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	51	51
Decant #5	S	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	52	60
Decant #5	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
Decant #5	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	31	31
Decant #5	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	50
Decant #5	T	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	51	60
Decant #5	U	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
Decant #5	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	46
Decant #5	U	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	48
Decant #5	U	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	60
Decant #5	U2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
Decant #5	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	44
Decant #5	U2	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	45	47
Decant #5	U2	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48	60
Decant #6	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	31
Decant #6	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	45
Decant #6	202	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	46	47
Decant #6	202	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48	58
Decant #6	202	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #6	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #6	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	29
Decant #6	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	49
Decant #6	202-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	50	53
Decant #6	202-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	54	60
Decant #6	202-M2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #6	202-M2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	27	28
Decant #6	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	48
Decant #6	202-M2	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	52
Decant #6	202-M2	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	53	59
Decant #6	202-M2	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #6	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	27
Decant #6	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	29
Decant #6	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	32
Decant #6	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	33	60
Decant #6	320-M	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #6	320-M	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	34
Decant #6	320-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	35	60
Decant #6	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #6	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	29
Decant #6	G	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	42
Decant #6	G	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	43	60
Decant #6	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	27
Decant #6	I	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	29
Decant #6	I	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	42
Decant #6	I	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	43	60
Decant #6	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #6	O	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	29	29
Decant #6	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	47
Decant #6	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	48
Decant #6	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	60
Decant #6	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #6	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	34
Decant #6	P	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35	48
Decant #6	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	52
Decant #6	P	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
Decant #6	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #6	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	34
Decant #6	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35	53
Decant #6	S	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	54	58
Decant #6	S	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #6	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #6	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	30	33
Decant #6	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34	52
Decant #6	T	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	53	58
Decant #6	T	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #6	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #6	U	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	26	29
Decant #6	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	48
Decant #6	U	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	56
Decant #6	U	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	57	59
Decant #6	U	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #6	U2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #6	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	46
Decant #6	U2	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	55
Decant #6	U2	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	56	59
Decant #6	U2	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #7	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	30
Decant #7	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	47
Decant #7	202	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	48	51
Decant #7	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	57
Decant #7	202	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #7	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #7	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	30
Decant #7	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	51
Decant #7	202-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	52	53
Decant #7	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #7	202-M2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #7	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	49
Decant #7	202-M2	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	50	53
Decant #7	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #7	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	27
Decant #7	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	28
Decant #7	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	33
Decant #7	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	34	60
Decant #7	320-M	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #7	320-M	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	36
Decant #7	320-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	37	60
Decant #7	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #7	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	38
Decant #7	G	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	39	43
Decant #7	G	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44	59
Decant #7	G	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #7	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	27
Decant #7	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	28
Decant #7	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	35
Decant #7	I	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36	44
Decant #7	I	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	45	60
Decant #7	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #7	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	29
Decant #7	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	41
Decant #7	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	50
Decant #7	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	60
Decant #7	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #7	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	35
Decant #7	P	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36	42
Decant #7	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	54
Decant #7	P	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #7	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #7	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	36
Decant #7	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	37	52
Decant #7	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	54
Decant #7	S	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #7	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #7	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	34
Decant #7	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35	52
Decant #7	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	54
Decant #7	T	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #7	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #7	U	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	28	28
Decant #7	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	50
Decant #7	U	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	51	53
Decant #7	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #7	U2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #7	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	48
Decant #7	U2	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	52
Decant #7	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
Decant #8	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	29
Decant #8	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	47
Decant #8	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	48
Decant #8	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	60
Decant #8	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #8	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	31
Decant #8	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	49

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #8	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	53
Decant #8	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #8	202-M2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #8	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	28
Decant #8	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	49
Decant #8	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	51
Decant #8	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #8	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	26
Decant #8	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	27	28
Decant #8	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	35
Decant #8	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	36	58
Decant #8	320	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #8	320-M	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #8	320-M	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27	37
Decant #8	320-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	38	57
Decant #8	320-M	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #8	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #8	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27	45
Decant #8	G	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	46	51
Decant #8	G	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	52	55
Decant #8	G	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #8	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	45
Decant #8	I	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	46	48
Decant #8	I	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	56
Decant #8	I	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60
Decant #8	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	30
Decant #8	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	37
Decant #8	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	51
Decant #8	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #8	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	37
Decant #8	P	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38	38
Decant #8	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	56
Decant #8	P	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60
Decant #8	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	37
Decant #8	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38	47
Decant #8	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	56
Decant #8	S	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60
Decant #8	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	29	35
Decant #8	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36	47
Decant #8	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	55
Decant #8	T	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #8	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	48
Decant #8	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	51
Decant #8	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #8	U2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #8	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	48
Decant #8	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	49
Decant #8	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	60
Decant #9	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	28
Decant #9	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	44
Decant #9	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	50
Decant #9	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	60
Decant #9	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #9	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	32
Decant #9	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	46
Decant #9	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	54

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #9	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #9	202-M2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #9	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	29
Decant #9	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	45
Decant #9	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	52
Decant #9	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
Decant #9	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	25
Decant #9	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	26	27
Decant #9	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	36
Decant #9	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	37	55
Decant #9	320	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #9	320-M	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #9	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	38
Decant #9	320-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	39	48
Decant #9	320-M	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	53
Decant #9	320-M	Not Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #9	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #9	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	46
Decant #9	G	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	51
Decant #9	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #9	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #9	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	46
Decant #9	I	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	47	52
Decant #9	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
Decant #9	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #9	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	31
Decant #9	O	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	34
Decant #9	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35	53
Decant #9	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #9	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #9	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	35
Decant #9	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	38
Decant #9	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	57
Decant #9	P	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #9	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #9	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	38
Decant #9	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	39	44
Decant #9	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	57
Decant #9	S	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #9	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #9	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	37
Decant #9	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38	44
Decant #9	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	57
Decant #9	T	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #9	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #9	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	29
Decant #9	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	45
Decant #9	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	53
Decant #9	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #9	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #9	U2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	26	27
Decant #9	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	45
Decant #9	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	51
Decant #9	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #10	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #10	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	26	28
Decant #10	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	41
Decant #10	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	51
Decant #10	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #10	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #10	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	34
Decant #10	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35	43

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #10	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	55
Decant #10	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #10	202-M2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #10	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	30
Decant #10	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	43
Decant #10	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	54
Decant #10	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #10	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; Not alkali	25	25
Decant #10	320	Not Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	26	27
Decant #10	320	Not Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	37
Decant #10	320	Not Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	38	48
Decant #10	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	53
Decant #10	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #10	320-M	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #10	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	40
Decant #10	320-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41	51
Decant #10	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #10	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #10	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	48
Decant #10	G	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	49
Decant #10	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	60
Decant #10	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #10	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	48
Decant #10	I	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	49	50
Decant #10	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	60
Decant #10	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #10	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	32
Decant #10	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	33	54
Decant #10	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #10	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #10	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	33
Decant #10	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	34	39
Decant #10	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	58
Decant #10	P	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #10	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #10	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	39
Decant #10	S	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	40	42
Decant #10	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	59
Decant #10	S	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #10	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #10	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	38
Decant #10	T	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	39	41
Decant #10	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	58
Decant #10	T	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #10	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #10	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	28	30
Decant #10	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	43
Decant #10	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	54
Decant #10	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #10	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #10	U2	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	27	27
Decant #10	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	42
Decant #10	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	52
Decant #10	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
Decant #11	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	202	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	27	27
Decant #11	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	39
Decant #11	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	52
Decant #11	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	53	60
Decant #11	202-M	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #11	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	35
Decant #11	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36	41

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #11	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	57
Decant #11	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #11	202-M2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #11	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	32
Decant #11	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	41
Decant #11	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	55
Decant #11	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #11	320	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27	38
Decant #11	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	39	50
Decant #11	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	60
Decant #11	320-M	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #11	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	41
Decant #11	320-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	42	49
Decant #11	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	60
Decant #11	G	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #11	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	47
Decant #11	G	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	49
Decant #11	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	60
Decant #11	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27	48
Decant #11	I	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	49
Decant #11	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	50	60
Decant #11	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	30
Decant #11	O	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	31	34
Decant #11	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35	55
Decant #11	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #11	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	31
Decant #11	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	32	41
Decant #11	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	60
Decant #11	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	39
Decant #11	S	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	41
Decant #11	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	60
Decant #11	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	39
Decant #11	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	59
Decant #11	T	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #11	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	31
Decant #11	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	32	40
Decant #11	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	41	55
Decant #11	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #11	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #11	U2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	27
Decant #11	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	40
Decant #11	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	41	54
Decant #11	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #12	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #12	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	37
Decant #12	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	54
Decant #12	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #12	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	36
Decant #12	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	37	39
Decant #12	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	58
Decant #12	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #12	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	33
Decant #12	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34	39
Decant #12	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	56
Decant #12	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #12	320	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27	40
Decant #12	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	41	48
Decant #12	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	49	60
Decant #12	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	42
Decant #12	320-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	43	47
Decant #12	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	60
Decant #12	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	45
Decant #12	G	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	50
Decant #12	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	60
Decant #12	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	27	46
Decant #12	I	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	50
Decant #12	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	51	60
Decant #12	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	28
Decant #12	O	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	29	35
Decant #12	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	57
Decant #12	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #12	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	29
Decant #12	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	30	42
Decant #12	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	60
Decant #12	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	38
Decant #12	S	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	42
Decant #12	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	60
Decant #12	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	38
Decant #12	T	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	40
Decant #12	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	41	60
Decant #12	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	32
Decant #12	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	39
Decant #12	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	57
Decant #12	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #12	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #12	U2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	29
Decant #12	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	38
Decant #12	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	55
Decant #12	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #13	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	27
Decant #13	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	28	36
Decant #13	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	55
Decant #13	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	56	60
Decant #13	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	37
Decant #13	202-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	38	38
Decant #13	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	59
Decant #13	202-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #13	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	34
Decant #13	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35	38
Decant #13	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	57
Decant #13	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #13	320	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	41
Decant #13	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	42	47
Decant #13	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	48	60
Decant #13	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	43
Decant #13	320-M	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44	45
Decant #13	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	60
Decant #13	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	43
Decant #13	G	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	51

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #13	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #13	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	44
Decant #13	I	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	51
Decant #13	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	52	60
Decant #13	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	27
Decant #13	O	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	28	36
Decant #13	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	58
Decant #13	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #13	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	28
Decant #13	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	29	43
Decant #13	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	60
Decant #13	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	36
Decant #13	S	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	43
Decant #13	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	60
Decant #13	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	36
Decant #13	T	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	41
Decant #13	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	60
Decant #13	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	33
Decant #13	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	34	37
Decant #13	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	58
Decant #13	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #13	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #13	U2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	29
Decant #13	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	37
Decant #13	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	56
Decant #13	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60
Decant #14	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #14	202	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	28
Decant #14	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	29	35
Decant #14	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	56
Decant #14	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	57	60
Decant #14	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	36
Decant #14	202-M	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	38
Decant #14	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	60
Decant #14	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	35
Decant #14	202-M2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	36	36
Decant #14	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	58
Decant #14	202-M2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60
Decant #14	320	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	42
Decant #14	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	43	46
Decant #14	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	60
Decant #14	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	44
Decant #14	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	60
Decant #14	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	42
Decant #14	G	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	53
Decant #14	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #14	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	43
Decant #14	I	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	44	53
Decant #14	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	54	60
Decant #14	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	O	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	26
Decant #14	O	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	27	37
Decant #14	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	38	59
Decant #14	O	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #14	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	27
Decant #14	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	28	44
Decant #14	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	60
Decant #14	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	35
Decant #14	S	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	44
Decant #14	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	60
Decant #14	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	35
Decant #14	T	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	42
Decant #14	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	60
Decant #14	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	34
Decant #14	U	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	35	36
Decant #14	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	59
Decant #14	U	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	60	60
Decant #14	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #14	U2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	30
Decant #14	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	31	36
Decant #14	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	57
Decant #14	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #15	202	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	26
Decant #15	202	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	27	29
Decant #15	202	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	30	33
Decant #15	202	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	34	57
Decant #15	202	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	58	60
Decant #15	202-M	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	35
Decant #15	202-M	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	39
Decant #15	202-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	40	60
Decant #15	202-M2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	25	35
Decant #15	202-M2	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	36
Decant #15	202-M2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	37	60
Decant #15	320	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	320	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	43
Decant #15	320	Durable; Not L Visc; ; Homog; New TL ; Al2O3 ; alkali	44	44
Decant #15	320	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	60
Decant #15	320-M	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	42
Decant #15	320-M	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	43	46
Decant #15	320-M	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	47	60
Decant #15	G	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	25	41
Decant #15	G	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	54
Decant #15	G	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #15	I	Durable; Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	I	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	26	41
Decant #15	I	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	42	54
Decant #15	I	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	55	60
Decant #15	O	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	O	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	26	38
Decant #15	O	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	39	60
Decant #15	P	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	P	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	26
Decant #15	P	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	27	45
Decant #15	P	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	60
Decant #15	S	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	S	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	34
Decant #15	S	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	35	45
Decant #15	S	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	46	60
Decant #15	T	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	T	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	34
Decant #15	T	Durable; Not H Visc; ; Homog; Not New TL; Al2O3 ; alkali	35	44
Decant #15	T	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	45	60

Type	Frit ID	Satisfies PAR	Min(Sludge Loading (%))	Max(Sludge Loading (%))
Decant #15	U	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	U	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	35
Decant #15	U	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	36	60
Decant #15	U2	Durable; Not H Visc; ; Not Homog; New TL ; Al2O3 ; alkali	25	25
Decant #15	U2	Durable; Not H Visc; ; Homog; New TL ; Al2O3 ; alkali	26	32
Decant #15	U2	Durable; Visc; ; Homog; New TL ; Al2O3 ; alkali	33	34
Decant #15	U2	Durable; Visc; ; Homog; Not New TL; Al2O3 ; alkali	35	58
Decant #15	U2	Durable; Not L Visc; ; Homog; Not New TL; Al2O3 ; alkali	59	60

Appendix F

Phase 2 Variation Stage Assessment for Decant #7

Paper Study Results for 7 Decants with Frit 202

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	915
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	915
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	22
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	893
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	124
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	791
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	282
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	633
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	470
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	445
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	531
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	384
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	777
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	138
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	857
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	58
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	897
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	18
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	911
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	864
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	51
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	739
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	139
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	37
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	7
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	569
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	250
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	89
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	35
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	392
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	350
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	85
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	53
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	36
46	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	4
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	292
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	396
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	160
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	27
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	165
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	42
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	71
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	380
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	257
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	127
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	200
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	26
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	242
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	320
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	76
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	287

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	169
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	380
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	54
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	422
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	42
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	397
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	39
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	470
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	406
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	23
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	475
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	416
52	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	5
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	482
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	423
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	5
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	475
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	405
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	34
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	467
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	354
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	94
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	458
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	305
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	152
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	448
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	199
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	268
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	439
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	139
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	337
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	431
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	65
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	419
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	422
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	30
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	463

WL Range	# of EVs and Centroid	% of Total
8	12	1.31147541
9	24	2.62295082
10	16	1.74863388
11	26	2.84153005
12	39	4.26229508
13	47	5.13661202
14	163	17.8142077
15	318	34.7540984
16	178	19.4535519
17	76	8.30601093
18	16	1.74863388

Paper Study Results for 7 Decants with Frit 202M (420)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	108
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	807
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	250
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	665
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	458
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	457
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	506
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	381
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	25
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	3
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	686
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	71
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	91
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	67
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	562
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	295
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	58
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	282
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	623
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	10
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	168
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	747
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	23
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	892
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	911
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	866
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	49
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	762
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	153
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	633
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	282
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	550
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	365
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	505
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	410
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	72
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	384
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	431
49	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	28
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	85
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	11
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	305
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	437
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	68
50	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	9
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	117
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	59
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	214

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	399
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	126
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	234
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	142
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	41
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	323
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	175
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	199
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	272
53	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	200
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	238
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	137
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	396
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	81
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	301
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	52
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	485
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	374
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	22
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	498
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	381
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	14
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	504
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	344
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	61
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	499
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	286
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	130
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	488
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	184
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	243
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	478
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	121
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	316

WL Range	# of EVs and Centroid	% of Total
10	4	0.43715847
11	32	3.49726776
12	65	7.10382514
13	88	9.61748634
14	80	8.7431694
15	54	5.90163934
16	43	4.69945355
17	36	3.93442623
18	37	4.04371585
19	46	5.0273224
20	91	9.94535519
21	279	30.4918033
22	60	6.55737705

Paper Study Results for 7 Decants with Frit 202-M2 (421)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	108
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	802
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	5
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	241
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	533
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	9
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	132
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	387
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	228
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	71
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	229
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	256
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	32
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	275
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	352
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	159
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	618
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	138
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	17
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	840
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	58
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	905
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	10
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	906
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	9
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	846
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	69
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	727
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	188
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	597
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	318
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	47
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	484
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	373
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	11
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	103
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	338
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	416
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	50
48	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	7
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	130
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	28
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	246
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	406
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	105
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	255

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	88
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	51
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	362
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	159
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	233
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	251
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	15
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	209
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	207
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	171
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	365
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	102
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	277
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	91
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	461
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	12
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	351
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	47
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	479
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	389
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	24
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	491
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	396
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	4
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	8
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	496
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	389
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	22
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	492
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	336
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	86
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	483
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	276
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	156
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	473
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	165
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	277
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	462
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	113
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	340

WL Range	# of EVs and Centroid	% of Total
13	2	0.21857923
14	43	4.69945355
15	93	10.1639344
16	82	8.96174863
17	100	10.9289617
18	133	14.5355191
19	98	10.7103825
20	47	5.13661202
21	221	24.1530055
22	87	9.50819672
23	9	0.98360656

Paper Study Results for 7 Decants with Frit O (405)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	915
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	61
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	854
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	148
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	738
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	29
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	335
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	420
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	22
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	138
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	391
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	137
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	100
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	287
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	245
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	27
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	351
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	292
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	137
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	678
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	100
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	13
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	846
32	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	10
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	46
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	829
33	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	86
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	685
34	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	230
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	562
35	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	353
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	508
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	407
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	484
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	431
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	467
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	448
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	456
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	459
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	449
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	466
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	443
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	472
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	438
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	477
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	425
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	490
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	400
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	515
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	342
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	573
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	283
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	632
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	4
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	175
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	736
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	22
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	89

Sludge Loading (%)	Satisfies PAR	# of EVs
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	95
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	709
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	31
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	155
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	13
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	716
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	18
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	438
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	459
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	622
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	287
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	732
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	182
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	861
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	54
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	885
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	30
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	831
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	84

WL Range	# of EVs and Centroid	% of Total
0	3	0.32786885
1	37	4.04371585
2	104	11.3661202
3	80	8.7431694
4	71	7.75956284
5	66	7.21311475
6	31	3.38797814
7	18	1.96721311
8	19	2.07650273
9	15	1.63934426
10	17	1.8579235
11	9	0.98360656
12	17	1.8579235
13	16	1.74863388
14	46	5.0273224
15	74	8.08743169
16	136	14.863388
17	88	9.61748634
18	46	5.0273224
19	22	2.40437158

Paper Study Results for 7 Decants with Frit P (406)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	915
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	61
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	854
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	148
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	767
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	357
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	558
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	491
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	424
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	596
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	319
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	815
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	100
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	869
32	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	46
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	897
33	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	14
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	4
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	689
34	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	102
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	124
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	457
35	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	243
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	215
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	83
36	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	343
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	471
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	18
37	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	18
37	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	214
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	486
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	197
38	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	99
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	482
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	334
39	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	7
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	465
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	443
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	455
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	460
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	449
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	466
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	443
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	472
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	438
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	477
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	424
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	491
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	398
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	517
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	339
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	576
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	278
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	637
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	169
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	746
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	116
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	799

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	42
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	873
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	18
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	897
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	79
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	830
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	166
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	749
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	338
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	577
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	580
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	335
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	715
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	200
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	841
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	74
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	913
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	2
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	915

WL Range	# of EVs and Centroid	% of Total
0	387	42.295082
1	20	2.18579235
2	14	1.53005464
3	18	1.96721311
4	16	1.74863388
5	12	1.31147541
6	11	1.20218579
7	12	1.31147541
8	12	1.31147541
9	17	1.8579235
10	45	4.91803279
11	37	4.04371585
12	93	10.1639344
13	54	5.90163934
14	71	7.75956284
15	44	4.80874317
16	28	3.06010929
17	14	1.53005464
18	8	0.87431694
19	2	0.21857923

Paper Study Results for 7 Decants with Frit S (409)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	915
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	61
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	854
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	148
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	767
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	357
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	558
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	491
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	424
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	596
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	319
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	815
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	100
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	869
32	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	46
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	913
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	797
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	118
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	706
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	209
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	433
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	482
37	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	237
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	678
38	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	105
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	810
39	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	9
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	906
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	903
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	12
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	827
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	88
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	699
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	216
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	578
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	337
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	522
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	393
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	495
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	420
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	478
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	437
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	461
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	454
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	454
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	461
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	446
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	469
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	34
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	406
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	475
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	127
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	14
53	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	304
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	470

Sludge Loading (%)	Satisfies PAR	# of EVs
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	143
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	55
54	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	228
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	444
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	45
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	277
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	123
55	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	14
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	407
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	94
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	192
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	345
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	234
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	132
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	12
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	107
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	511
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	107
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	136
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	54
58	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	29
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	605
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	15
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	125
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	141
59	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	7
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	568
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	89
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	251
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	529
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	31
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	355

WL Range	# of EVs and Centroid	% of Total
4	29	3.16939891
5	91	9.94535519
6	86	9.3989071
7	72	7.86885246
8	65	7.10382514
9	34	3.71584699
10	18	1.96721311
11	19	2.07650273
12	13	1.42076503
13	18	1.96721311
14	17	1.8579235
15	11	1.20218579
16	11	1.20218579
17	13	1.42076503
18	88	9.61748634
19	330	36.0655738

Paper Study Results for 7 Decants with Frit T (410)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	915
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	61
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	854
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	148
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	767
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	357
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	558
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	491
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	424
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	596
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	319
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	815
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	100
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	828
32	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	46
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	41
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	755
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	160
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	596
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	319
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	300
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	615
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	182
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	733
37	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	44
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	871
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	896
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	19
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	816
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	99
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	683
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	232
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	571
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	344
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	518
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	397
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	493
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	422
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	475
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	440
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	459
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	456
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	453
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	462
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	12
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	433
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	470
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	118
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	8
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	321
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	468
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	165
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	42
53	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	265

Sludge Loading (%)	Satisfies PAR	# of EVs
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	443
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	341
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	93
54	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	35
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	409
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	37
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	292
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	273
55	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	259
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	88
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	189
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	433
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	157
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	125
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	11
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	96
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	601
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	33
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	130
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	55
58	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	29
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	632
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	118
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	136
59	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	5
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	587
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	69
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	254
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	534
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	29
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	352

WL Range	# of EVs and Centroid	% of Total
5	14	1.53005464
6	75	8.19672131
7	92	10.0546448
8	59	6.44808743
9	53	5.79234973
10	65	7.10382514
11	35	3.82513661
12	11	1.20218579
13	16	1.74863388
14	20	2.18579235
15	14	1.53005464
16	14	1.53005464
17	12	1.31147541
18	11	1.20218579
19	264	28.852459
20	160	17.4863388

Paper Study Results for 7 Decants with Frit U (422)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	851
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	64
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	61
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	669
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	185
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	148
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	288
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	479
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	182
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	41
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	175
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	517
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	77
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	414
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	424
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	596
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	319
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	815
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	100
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	869
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	46
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	896
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	19
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	817
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	98
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	691
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	224
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	582
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	333
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	520
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	393
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	104
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	391
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	420
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	173
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	10
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	304
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	428
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	355
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	67
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	106
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	387
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	417
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	204
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	33
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	258
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	3

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	392
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	286
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	183
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	51
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	339
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	416
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	59
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	101
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	277
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	484
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	154
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	210
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	500
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	204
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	121
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	521
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	264
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	9
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	28
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	538
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	292
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	57
58	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	3
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	524
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	240
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	148
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	515
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	155
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	245
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	504
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	86
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	325

WL Range	# of EVs and Centroid	% of Total
14	29	3.16939891
15	88	9.61748634
16	152	16.6120219
17	155	16.9398907
18	112	12.2404372
19	138	15.0819672
20	137	14.9726776
21	97	10.6010929
22	7	0.76502732

Paper Study Results for 7 Decants with Frit U2 (423)

(# of EVs = 915)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	186
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	729
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	24
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	61
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	830
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	148
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	767
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	357
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	558
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	491
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	424
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	596
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	319
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	815
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	100
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	869
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	46
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	915
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	911
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	870
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	45
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	783
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	132
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	669
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	245
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	93
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	475
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	347
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	176
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	340
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	399
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	352
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	32
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	140
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	391
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	437
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	175
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	36
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	267
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	430
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	269
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	7
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	187
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	22
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	380
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	396
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	68
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	71

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	329
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	469
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	1
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	116
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	268
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	476
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	171
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	199
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	485
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	231
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	120
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	503
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	289
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	31
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	514
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	334
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	36
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	516
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	299
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	94
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	511
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	203
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	201
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	500
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	142
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	273
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	490
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	64
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	361

WL Range	# of EVs and Centroid	% of Total
14	50	5.46448087
15	64	6.99453552
16	132	14.4262295
17	242	26.4480874
18	229	25.0273224
19	165	18.0327869
20	33	3.60655738

This page intentionally left blank.

Appendix G

Phase 2 Variation Stage Assessment for Decant #12

Paper Study Results for 12 Decants with Frit 202

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	16
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	709
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	124
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	92
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	576
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	171
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	142
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	250
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	262
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	195
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	129
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	26
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	400
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	294
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	101
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	2
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	611
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	135
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	20
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	805
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	24
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	804
33	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	45
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	592
34	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	257
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	450
35	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	399
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	414
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	435
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	401
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	448
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	361
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	488
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	238
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	611
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	88
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	761
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	11
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	838
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	5
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	844
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	82
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	767
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	157
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	692
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	192
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	657

Sludge Loading (%)	Satisfies PAR	# of EVs
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	447
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	402
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	678
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	171
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	717
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	132
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	779
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	70
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	839
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	10
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

WL Range	# of EVs and Centroid	% of Total
3	11	1.29564193
4	69	8.12720848
5	67	7.89163722
6	35	4.12249706
7	148	17.4322733
8	86	10.1295642
9	63	7.4204947
10	146	17.196702
11	154	18.138987
12	64	7.53828033
13	6	0.70671378

Paper Study Results for 12 Decants with Frit 202-M (420)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	509
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	340
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	694
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	155
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	825
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	24
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	834
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	15
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	726
34	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	1
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	122
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	589
35	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	87
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	173
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	322
36	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	162
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	237
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	128
37	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	45
37	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	140
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	391
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	273
38	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	15
38	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	127
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	397
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	310
39	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	1
39	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	80
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	399
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	369
40	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	13
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	360
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	476
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	226
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	623
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	76
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	773
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	5
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	844
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	42
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	807
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	138

Sludge Loading (%)	Satisfies PAR	# of EVs
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	711
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	178
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	671
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	372
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	477
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	660
59	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	189
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	705
60	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	144

WL Range	# of EVs and Centroid	% of Total
0	360	42.4028269
1	51	6.00706714
2	24	2.82685512
3	28	3.29799764
4	85	10.0117786
5	109	12.8386337
6	73	8.598351
7	66	7.77385159
8	44	5.18256773
9	9	1.06007067

Paper Study Results for 12 Decants with Frit 202-M2 (421)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	509
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	340
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	694
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	155
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	825
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	24
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	849
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	828
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	21
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	715
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	134
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	668
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	181
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	425
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	424
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	167
34	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	1
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	677
34	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	100
35	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	28
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	628
35	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	93
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	26
36	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	24
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	498
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	301
37	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	2
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	426
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	421
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	409
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	440
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	395
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	454
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	336
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	513
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	200
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	649
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	58
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	791
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	4
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	845
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	26
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	823
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	125
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	724
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	170
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	679

Sludge Loading (%)	Satisfies PAR	# of EVs
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	280
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	569
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	577
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	272
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	697
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	152
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	740
59	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	109
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	815
60	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	34

WL Range	# of EVs and Centroid	% of Total
0	122	14.3698469
1	45	5.30035336
2	79	9.30506478
3	115	13.5453475
4	48	5.65371025
5	28	3.29799764
6	29	3.41578327
7	82	9.65842167
8	116	13.6631331
9	73	8.598351
10	62	7.30270907
11	42	4.94699647
12	8	0.94228504

Paper Study Results for 12 Decants with Frit 320

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	47
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	87
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	240
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	280
25	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	131
25	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	64
26	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	244
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	170
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	26
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	235
26	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	18
26	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	108
26	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	48
27	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	250
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	254
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	182
27	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	51
27	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
27	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	72
27	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	38
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	679
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	22
28	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	92
28	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	56
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	706
29	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	131
29	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	12
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	712
30	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	137
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	716
31	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	133
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	722
32	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	127
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	729
33	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	120
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	734
34	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	115
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	738
35	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	111
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	744
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	105
37	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	41
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	709
37	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	24
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	75
38	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	72
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	682
38	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	80
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	15
39	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	111
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	647
39	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	78
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	13
40	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	353
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	408
40	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	88
41	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	592
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	171

Sludge Loading (%)	Satisfies PAR	# of EVs
41	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	86
42	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	635
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	131
42	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	83
43	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	694
43	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	8
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	66
43	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	81
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	673
44	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	85
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	81
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	493
45	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	278
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	78
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	374
46	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	401
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	74
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	345
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	433
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	71
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	334
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	445
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	70
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	308
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	474
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	67
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	204
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	579
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	57
50	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	9
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	73
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	713
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	39
51	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	24
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	8
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	779
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	12
52	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	50
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	788
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	60
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	791
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	58
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	792
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	57
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	793
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	56
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	793
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	56
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	794
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	55
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	795
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	54
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	795
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	54

WL Range	# of EVs and Centroid	% of Total
0	101	11.8963486
1	1	0.11778563
2	6	0.70671378

WL Range	# of EVs and Centroid	% of Total
3	7	0.82449941
4	8	0.94228504
5	4	0.47114252
6	6	0.70671378
7	6	0.70671378
8	4	0.47114252
9	14	1.64899882
10	20	2.3557126
11	39	4.59363958
12	183	21.5547703
13	210	24.7349823
14	58	6.83156655
15	24	2.82685512
16	20	2.3557126
17	42	4.94699647
18	92	10.836278
19	4	0.47114252

Paper Study Results for 12 Decants with Frit 320-M (416)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	509
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	340
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	694
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	155
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	825
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	24
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
39	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	23
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	826
40	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	125
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	724
41	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	170
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	678
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	1
42	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	287
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	518
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	44
43	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	459
43	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	130
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	160
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	100
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	432
44	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	267
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	32
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	118
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	412
45	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	330
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	101
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	406
46	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	409
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	34
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	385
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	463
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	1
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	307
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	542
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	174
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	675
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	52
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	797
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	847
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

Sludge Loading (%)	Satisfies PAR	# of EVs
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

WL Range	# of EVs and Centroid	% of Total
12	2	0.23557126
13	30	3.5335689
14	87	10.2473498
15	39	4.59363958
16	71	8.36277974
17	273	32.155477
18	287	33.8044759
19	49	5.77149588
20	11	1.29564193

Paper Study Results for 12 Decants with Frit G (411)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	509
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	340
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	694
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	155
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	825
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	24
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	829
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	20
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	688
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	161
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	488
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	361
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	424
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	425
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	409
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	440
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	392
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	457
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	332
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	517
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	16
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	200
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	633
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	4
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	104
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	56
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	685
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	164
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	681
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	204
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	645
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	492
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	357
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	692
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	157
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	724
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	125
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	795
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	54
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	844
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	5
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

Sludge Loading (%)	Satisfies PAR	# of EVs
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

WL Range	# of EVs and Centroid	% of Total
15	20	2.3557126
16	150	17.6678445
17	194	22.8504122
18	66	7.77385159
19	29	3.41578327
20	73	8.598351
21	161	18.9634865
22	129	15.1943463
23	27	3.18021201

Paper Study Results for 12 Decants with Frit I (412)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	134
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	715
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	432
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	417
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	557
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	292
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	771
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	78
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	837
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	12
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	813
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	36
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	661
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	188
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	468
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	381
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	421
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	428
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	407
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	442
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	388
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	461
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	4
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	9
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	305
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	531
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	19
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	83
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	153
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	594
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	13
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	151
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	35
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	650
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	198
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	1
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	649
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	486
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	363
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	689
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	160
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	723
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	126
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	791
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	58
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	842

Sludge Loading (%)	Satisfies PAR	# of EVs
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	7
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

WL Range	# of EVs and Centroid	% of Total
15	9	1.06007067
16	151	17.7856302
17	211	24.852768
18	60	7.06713781
19	85	10.0117786
20	149	17.5500589
21	139	16.3722026
22	45	5.30035336

Paper Study Results for 12 Decants with Frit U (422)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	134
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	715
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	432
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	417
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	557
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	292
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	771
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	78
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	837
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	12
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	775
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	74
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	687
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	162
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	638
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	211
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	266
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	583
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	136
34	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	11
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	687
34	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	15
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	64
35	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	28
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	600
35	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	157
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	9
36	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	8
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	461
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	371
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	417
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	432
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	406
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	443
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	382
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	467
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	286
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	563
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	137
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	712
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	42
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	807
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	1
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	848
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	848
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	66
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	783
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	149

Sludge Loading (%)	Satisfies PAR	# of EVs
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	700
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	184
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	665
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	420
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	429
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	673
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	176
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	712
59	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	137
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	774
60	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	75

WL Range	# of EVs and Centroid	% of Total
0	124	14.6054181
1	37	4.35806832
2	89	10.4829211
3	116	13.6631331
4	40	4.71142521
5	26	3.06242638
6	39	4.59363958
7	81	9.54063604
8	90	10.6007067
9	75	8.83392226
10	67	7.89163722
11	50	5.88928151
12	15	1.76678445

Paper Study Results for 12 Decants with Frit U2 (423)

(# of EVs = 849)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	134
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	715
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	419
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	416
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	13
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	1
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	483
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	233
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	74
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	59
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	621
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	46
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	150
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	32
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	392
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	445
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	12
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	157
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	692
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	111
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	738
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	25
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	824
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	849
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	807
34	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	42
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	594
35	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	255
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	452
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	397
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	414
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	435
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	403
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	446
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	368
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	481
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	250
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	599
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	96
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	753
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	14
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	835
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	849
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	848
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	57
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	792
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	146
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	703
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	181
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	668

Sludge Loading (%)	Satisfies PAR	# of EVs
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	395
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	454
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	667
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	182
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	707
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	142
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	764
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	85
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	830
59	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	19
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	849

WL Range	# of EVs and Centroid	% of Total
2	7	0.82449941
3	76	8.95170789
4	63	7.4204947
5	30	3.5335689
6	144	16.9611307
7	75	8.83392226
8	26	3.06242638
9	26	3.06242638
10	70	8.24499411
11	124	14.6054181
12	99	11.6607774
13	74	8.71613663
14	31	3.65135453
15	4	0.47114252

Appendix H

Phase 2 Variation Stage Assessment for Decant #5

Paper Study Results for 5 Decants with Frit 202

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	72
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	855
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	216
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	185
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	526
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	334
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	173
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	420
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	464
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	71
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	282
32	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	93
32	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	17
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	509
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	196
33	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	18
33	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	204
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	606
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	24
34	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	97
34	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	200
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	545
35	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	262
35	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	120
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	522
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	333
36	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	72
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	501
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	419
37	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	7
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	479
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	448
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	458
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	469
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	438
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	489
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	419
41	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	20
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	488
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	404
42	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	185
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	338
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	389
43	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	417
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	121
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	16
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	357
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	512
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	42
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	90
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	268
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	563
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	275

Sludge Loading (%)	Satisfies PAR	# of EVs
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	73
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	579
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	309
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	618
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	286
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	641
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	273
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	654
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	227
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	14
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	686
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	152
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	33
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	739
51	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	46
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	75
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	768
52	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	38
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	5
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	46
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	728
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	148
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	2
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	662
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	263
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	617
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	310
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	578
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	349
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	560
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	367
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	546
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	381
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	529
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	398
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	514
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	413

WL Range	# of EVs and Centroid	% of Total
0	278	29.9892125
1	80	8.62998921
2	54	5.82524272
3	23	2.4811219
4	14	1.51024811
5	10	1.07874865
6	3	0.3236246
7	4	0.43149946
8	12	1.29449838
9	18	1.94174757
10	19	2.04962244
11	16	1.72599784
12	25	2.69687163
13	82	8.84573894
14	16	1.72599784
15	33	3.55987055
16	144	15.5339806
17	96	10.3559871

Paper Study Results for 5 Decants with Frit 202-M (420)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	53
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	742
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	132
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	204
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	307
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	416
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	272
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	107
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	66
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	482
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	213
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	1
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	252
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	461
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	5
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	538
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	384
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	719
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	208
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	823
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	859
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	68
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	897
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	30
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	780
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	147
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	693
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	234
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	595
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	332
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	540
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	387
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	520
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	407
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	500
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	427
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	479
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	448
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	459
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	467
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	438
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	115
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	374
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	419
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	277
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	230
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	32
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	373
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	457
48	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	65
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	94

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	297
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	519
49	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	17
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	178
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	198
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	551
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	352
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	565
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	335
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	14
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	578
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	281
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	40
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	606
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	167
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	122
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	638
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	83
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	193
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	645
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	6
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	25
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	225
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	620
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	57
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	194
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	592
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	140
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	129
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	567
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	231
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	66
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	552
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	309
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	539
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	385

WL Range	# of EVs and Centroid	% of Total
3	24	2.58899676
4	49	5.28586839
5	22	2.37324703
6	48	5.17799353
7	51	5.50161812
8	32	3.45199569
9	65	7.01186624
10	81	8.73786408
11	39	4.20711974
12	21	2.26537217
13	17	1.83387271
14	8	0.86299892
15	4	0.43149946
16	4	0.43149946
17	13	1.40237325
18	18	1.94174757
19	35	3.77562028
20	107	11.5426106
21	284	30.6364617
22	5	0.53937433

Paper Study Results for 5 Decants with Frit 202-M2 (421)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	402
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	525
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	49
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	190
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	4
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	684
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	11
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	204
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	712
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	338
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	589
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	465
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	462
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	543
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	384
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	719
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	208
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	823
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	859
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	68
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	829
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	98
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	731
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	196
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	660
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	267
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	550
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	377
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	530
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	397
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	510
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	417
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	489
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	438
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	467
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	460
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	447
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	89
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	391
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	429
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	244
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	254
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	30
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	381
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	440
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	76
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	64
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	333
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	506
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	24
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	163
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	220
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	543
48	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	1
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	346

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	22
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	559
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	355
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	572
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	345
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	582
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	279
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	17
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	631
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	235
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	47
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	645
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	135
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	131
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	656
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	5
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	38
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	185
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	668
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	36
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	3
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	159
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	633
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	132
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	99
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	586
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	242
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	23
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	563
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	341
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	549
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	378
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	534
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	393

WL Range	# of EVs and Centroid	% of Total
2	62	6.68824164
3	24	2.58899676
4	27	2.91262136
5	56	6.04099245
6	43	4.6386192
7	47	5.07011866
8	67	7.22761597
9	71	7.65911543
10	26	2.80474649
11	19	2.04962244
12	13	1.40237325
13	5	0.53937433
14	3	0.3236246
15	8	0.86299892
16	15	1.61812298
17	36	3.88349515
18	60	6.47249191
19	55	5.93311758
20	37	3.99137001
21	74	7.98274002
22	179	19.3096009

Paper Study Results for 5 Decants with Frit O (405)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	810
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	117
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	514
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	413
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	378
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	549
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	110
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	101
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	18
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	698
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	2
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	232
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	693
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	425
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	502
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	469
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	458
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	570
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	357
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	753
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	174
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	823
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	884
35	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	912
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	15
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	886
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	41
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	795
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	132
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	696
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	231
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	15
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	621
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	291
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	177
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	406
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	344
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	373
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	188
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	366
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	428
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	22
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	52
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	357
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	68
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	354
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	119
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	9
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	276
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	169
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	277
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	322

Sludge Loading (%)	Satisfies PAR	# of EVs
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	88
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	240
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	160
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	423
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	1
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	343
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	105
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	434
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	388
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	74
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	446
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	407
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	48
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	452
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	427
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	23
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	456
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	447
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	453
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	460
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	8
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	438
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	461
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	28
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	420
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	458
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	49
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	405
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	453
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	69
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	390
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	450
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	87
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	374
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	444
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	109

WL Range	# of EVs and Centroid	% of Total
9	38	4.09924488
10	47	5.07011866
11	68	7.33549083
12	112	12.0819849
13	182	19.6332255
14	202	21.7907228
15	146	15.7497303
16	88	9.49298813
17	41	4.42286947
18	3	0.3236246

Paper Study Results for 5 Decants with Frit P (406)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	128
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	799
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	232
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	695
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	425
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	502
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	466
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	352
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	106
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	490
32	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	133
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	80
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	224
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	403
33	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	6
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	350
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	168
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	272
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	551
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	55
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	829
35	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	911
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	16
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	883
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	44
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	791
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	136
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	691
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	236
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	633
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	294
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	583
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	344
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	559
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	368
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	544
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	381
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	123
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	395
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	396
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
49	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	7
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	156
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	4
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	229
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	409

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	129
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	216
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	55
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	63
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	370
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	223
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	188
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	141
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	16
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	293
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	289
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	101
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	257
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	189
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	380
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	74
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	447
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	7
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	399
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	50
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	458
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	419
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	25
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	462
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	440
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	461
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	5
58	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	445
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	456
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	25
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	427
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	453
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	47
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	410
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	449
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	68

WL Range	# of EVs and Centroid	% of Total
6	17	1.83387271
7	36	3.88349515
8	89	9.600863
9	86	9.2772384
10	59	6.36461704
11	29	3.12837109
12	27	2.91262136
13	32	3.45199569
14	67	7.22761597
15	78	8.41423948
16	74	7.98274002
17	60	6.47249191
18	242	26.1057174
19	31	3.34412082

Paper Study Results for 5 Decants with Frit S (409)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	128
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	799
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	232
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	695
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	425
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	502
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	466
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	356
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	102
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	495
32	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	137
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	75
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	220
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	408
33	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	6
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	345
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	168
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	277
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	546
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	63
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	821
35	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	826
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	101
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	731
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	196
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	665
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	262
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	555
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	372
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	534
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	393
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	513
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	414
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	493
48	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	434
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	472
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	75
49	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	380
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	7
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	446
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	225
50	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	249
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	43
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	364
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	26
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	410

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	84
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	70
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	266
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	80
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	483
52	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	28
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	149
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	18
53	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	102
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	132
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	524
53	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	117
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	233
54	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	22
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	14
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	541
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	69
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	302
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	556
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	15
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	343
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	566
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	346
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	560
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	20
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	307
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	547
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	73
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	284
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	531
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	112
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	267
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	514
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	146

WL Range	# of EVs and Centroid	% of Total
6	40	4.31499461
7	44	4.74649407
8	24	2.58899676
9	52	5.60949299
10	42	4.53074434
11	51	5.50161812
12	110	11.8662352
13	35	3.77562028
14	33	3.55987055
15	21	2.26537217
16	39	4.20711974
17	66	7.1197411
18	176	18.9859763
19	194	20.9277238

Paper Study Results for 5 Decants with Frit T (410)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	927
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	128
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	799
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	232
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	687
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	8
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	415
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	322
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	180
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	398
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	88
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	71
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	370
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	345
32	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	26
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	225
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	331
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	209
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	544
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	174
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	8
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	815
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	884
35	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	845
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	82
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	745
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	182
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	673
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	254
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	567
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	360
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	536
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	391
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	516
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	411
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	496
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	37
48	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	394
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	8
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	468
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	191
49	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	260
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	48
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	408
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	380
50	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	91
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	82

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	328
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	26
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	452
51	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	39
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	156
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	164
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	96
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	502
52	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	200
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	140
53	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	43
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	21
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	523
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	132
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	257
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	538
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	67
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	306
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	554
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	14
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	346
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	564
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	347
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	558
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	21
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	310
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	546
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	71
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	284
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	529
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	114
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	272
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	513
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	142

WL Range	# of EVs and Centroid	% of Total
6	36	3.88349515
7	41	4.42286947
8	29	3.12837109
9	43	4.6386192
10	48	5.17799353
11	43	4.6386192
12	63	6.7961165
13	69	7.4433657
14	34	3.66774542
15	26	2.80474649
16	18	1.94174757
17	34	3.66774542
18	67	7.22761597
19	286	30.8522114
20	90	9.70873786

Paper Study Results for 5 Decants with Frit U (422)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	331
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	596
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	94
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	833
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	128
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	799
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	232
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	695
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	425
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	502
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	469
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	458
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	570
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	357
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	753
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	174
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	823
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	884
35	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	823
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	104
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	719
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	208
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	658
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	269
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	550
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	377
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	530
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	12
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	385
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	505
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	168
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	248
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	46
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	445
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	318
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	118
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	98
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	372
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	417
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	40
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	169
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	282
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	469
48	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	7
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	319
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	113
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	495
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	414
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	1
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	512

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	399
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	528
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	357
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	27
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	543
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	269
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	99
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	559
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	198
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	158
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	571
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	102
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	243
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	582
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	24
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	281
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	601
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	21
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	4
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	280
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	579
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	64
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	266
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	562
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	99
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	227
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	547
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	153
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	162
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	532
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	233

WL Range	# of EVs and Centroid	% of Total
4	40	4.31499461
5	44	4.74649407
6	27	2.91262136
7	54	5.82524272
8	43	4.6386192
9	47	5.07011866
10	59	6.36461704
11	72	7.76699029
12	29	3.12837109
13	22	2.37324703
14	17	1.83387271
15	11	1.18662352
16	57	6.14886731
17	65	7.01186624
18	59	6.36461704
19	16	1.72599784
20	93	10.0323625
21	143	15.4261057
22	29	3.12837109

Paper Study Results for 5 Decants with Frit U2 (423)

(# of EVs = 927)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	927
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	128
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	799
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	232
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	695
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	425
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	502
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	469
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	458
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	570
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	357
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	753
33	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	174
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	823
34	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	104
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	884
35	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	43
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	927
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	909
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	18
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	792
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	135
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	695
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	232
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	618
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	309
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	544
42	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	4
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	379
43	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	3
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	521
43	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	135
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	268
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	42
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	460
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	264
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	161
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	97
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	385
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	408
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	37
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	170
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	293
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	460
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	4
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	302
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	139
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	486
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	419
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	4
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	504
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	408
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	519
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	393
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	534

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	370
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	9
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	548
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	331
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	33
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	563
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	241
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	111
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	575
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	148
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	182
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	597
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	46
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	245
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	617
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	19
56	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	13
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	267
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	605
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	42
57	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	254
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	577
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	95
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	202
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	559
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	166
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	142
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	545
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	240
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	72
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	528
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	327

WL Range	# of EVs and Centroid	% of Total
2	7	0.75512406
3	46	4.9622438
4	38	4.09924488
5	35	3.77562028
6	56	6.04099245
7	33	3.55987055
8	59	6.36461704
9	71	7.65911543
10	49	5.28586839
11	31	3.34412082
12	22	2.37324703
13	12	1.29449838
14	55	5.93311758
15	71	7.65911543
16	55	5.93311758
17	21	2.26537217
18	88	9.49298813
19	126	13.592233
20	52	5.60949299

This page intentionally left blank.

Appendix I

Phase 2 Variation Stage Assessment for Decant #9

Paper Study Results for 9 Decants with Frit 202

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	185
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	704
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	84
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	30
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	775
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	1
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	106
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	782
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	336
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	553
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	491
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	398
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	636
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	253
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	825
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	64
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	877
32	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	12
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	859
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	30
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	740
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	149
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	586
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	303
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	491
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	398
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	461
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	428
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	444
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	445
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	435
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	454
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	426
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	463
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	403
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	486
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	323
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	566
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	4
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	28
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	226
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	631
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	31
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	107
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	73
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	678
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	18
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	166
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	695
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	375
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	508

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	675
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	214
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	750
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	139
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	830
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	59
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	887
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	2
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	879
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	10
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	853
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	36
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	830
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	59

WL Range	# of EVs and Centroid	% of Total
9	16	1.79977503
10	120	13.4983127
11	171	19.2350956
12	101	11.3610799
13	28	3.1496063
14	29	3.26209224
15	58	6.52418448
16	108	12.1484814
17	141	15.8605174
18	91	10.2362205
19	26	2.92463442

Paper Study Results for 9 Decants with Frit 202-M (420)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	295
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	594
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	483
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	406
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	607
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	282
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	825
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	64
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	877
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	12
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	879
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	758
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	131
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	697
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	192
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	333
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	556
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	186
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	703
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	102
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	787
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	13
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	876
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	861
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	28
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	721
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	168
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	564
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	325
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	481
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	408
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	454
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	435
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	442
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	447
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	433
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	456
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	426
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	463
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	402
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	487
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	316
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	573
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	226
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	663
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	90
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	799
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	5
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	19
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	865
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	101
52	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	786
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	161
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	728

Sludge Loading (%)	Satisfies PAR	# of EVs
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	257
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	632
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	631
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	258
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	719
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	170
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	797
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	92
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	877
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	12
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889

WL Range	# of EVs and Centroid	% of Total
3	4	0.44994376
4	46	5.17435321
5	97	10.9111361
6	58	6.52418448
7	90	10.1237345
8	73	8.21147357
9	33	3.712036
10	17	1.91226097
11	23	2.5871766
12	15	1.68728909
13	17	1.91226097
14	23	2.5871766
15	59	6.63667042
16	50	5.62429696
17	118	13.2733408
18	93	10.4611924
19	48	5.39932508
20	18	2.02474691
21	7	0.78740157

Paper Study Results for 9 Decants with Frit 202-M2 (421)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	295
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	594
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	483
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	406
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	602
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	282
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	5
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	717
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	43
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	108
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	21
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	694
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	1
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	183
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	11
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	299
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	590
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	176
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	713
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	85
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	804
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	4
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	885
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	888
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	1
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	841
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	48
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	693
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	196
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	543
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	346
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	473
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	416
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	451
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	438
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	439
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	450
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	432
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	457
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	424
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	465
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	389
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	500
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	295
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	594
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	1
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	169
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	719
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	3
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	76
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	75
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	735
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	149

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	8
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	726
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	225
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	662
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	602
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	287
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	705
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	184
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	781
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	108
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	867
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	22
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889

WL Range	# of EVs and Centroid	% of Total
6	5	0.5624297
7	55	6.18672666
8	91	10.2362205
9	60	6.74915636
10	74	8.32395951
11	83	9.33633296
12	34	3.82452193
13	20	2.24971879
14	24	2.69966254
15	15	1.68728909
16	15	1.68728909
17	25	2.81214848
18	64	7.19910011
19	94	10.5736783
20	90	10.1237345
21	88	9.89876265
22	48	5.39932508
23	4	0.44994376

Paper Study Results for 9 Decants with Frit 320

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	38
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	126
25	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	409
25	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	278
26	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	9
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	112
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	19
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	70
26	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	11
26	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	374
26	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	294
27	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	17
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	170
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	26
27	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	181
27	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
27	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	183
27	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	302
28	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	9
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	214
28	Not Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	250
28	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	42
28	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	98
28	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	276
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	229
29	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	451
29	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	209
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	240
30	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	597
30	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	52
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	250
31	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	635
31	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	256
32	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	633
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	264
33	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
33	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	624
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	267
34	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	97
34	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	525
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	268
35	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	164
35	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	457
36	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	276
36	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	278
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	334
37	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	91
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	196
37	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	563
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	39
38	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	148
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	145
38	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	586
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	10
39	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	236

Sludge Loading (%)	Satisfies PAR	# of EVs
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	64
39	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	589
40	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	304
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
40	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	583
41	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	311
41	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	578
42	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	318
42	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	571
43	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	329
43	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	560
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	338
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	551
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	341
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	548
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	344
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	545
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	347
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	542
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	325
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	25
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	539
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	250
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	104
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	535
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	125
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	234
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	524
50	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	6
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	32
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	329
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	497
51	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	31
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	362
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	470
52	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	57
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	364
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	451
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	74
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	367
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	438
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	84
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	368
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	430
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	91
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	370
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	411
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	108
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	371
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	366
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	152
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	374
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	266
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	249
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	375
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	124
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	390
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	375
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	37
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	477

WL Range	# of EVs and Centroid	% of Total
0	613	68.9538808
1	8	0.89988751
2	1	0.11248594
3	3	0.33745782
4	8	0.89988751
5	6	0.67491564
6	9	1.01237345
7	12	1.34983127
8	15	1.68728909
9	15	1.68728909
10	7	0.78740157
11	10	1.12485939
12	61	6.86164229
13	89	10.0112486
14	32	3.59955006

Paper Study Results for 9 Decants with Frit 320-M (416)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	295
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	299
25	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	295
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	460
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	95
26	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	23
26	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	311
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	470
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	48
27	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	137
27	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	234
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	505
28	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	320
28	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	64
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	492
29	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	385
29	Not Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	12
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	487
30	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	402
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	483
31	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	406
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	479
32	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	410
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	474
33	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	415
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	471
34	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	418
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	467
35	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	422
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	464
36	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	53
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	372
37	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	18
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	442
37	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	133
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	296
38	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	57
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	400
38	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	162
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	270
39	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	206
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	248
39	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	390
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	45
40	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	281
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	169
40	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	425
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	14
41	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	345
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	103
41	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	441
42	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	426
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	20
42	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	443
43	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	444
43	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	445
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	441
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	448

Sludge Loading (%)	Satisfies PAR	# of EVs
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	439
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	450
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	427
46	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	10
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	452
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	357
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	77
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	455
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	213
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	220
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	456
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	76
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	354
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	459
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	16
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	412
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	457
50	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	4
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	3
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	424
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	449
51	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	13
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	1
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	424
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	438
52	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	26
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	423
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	431
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	35
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	422
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	421
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	46
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	422
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	383
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	84
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	419
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	290
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	180
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	418
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	147
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	324
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	417
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	77
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	395
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	416
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	14
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	459
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	414
60	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	473

WL Range	# of EVs and Centroid	% of Total
0	369	41.5073116
1	17	1.91226097
2	10	1.12485939
3	9	1.01237345
4	4	0.44994376
5	4	0.44994376
6	4	0.44994376
7	2	0.22497188
8	4	0.44994376

WL Range	# of EVs and Centroid	% of Total
9	2	0.22497188
10	4	0.44994376
11	2	0.22497188
12	41	4.61192351
13	112	12.5984252
14	84	9.4488189
15	59	6.63667042
16	84	9.4488189
17	78	8.77390326

Paper Study Results for 9 Decants with Frit I (412)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	851
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	132
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	74
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	683
27	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	2
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	376
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	129
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	382
28	Durable; Visc; Homog; New TL ; Al2O3 ; Not alkali	30
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	485
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; Not alkali	98
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	276
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	680
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	209
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	837
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	52
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	885
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	877
36	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	12
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	851
37	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	38
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	826
38	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	63
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	802
39	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	87
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	778
40	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	111
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	754
41	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	135
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	731
42	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	158
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	699
43	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	190
44	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	659
44	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	50
44	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	178
45	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	21
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	603
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	8
45	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	126
45	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	131
46	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	58
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	474
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	69
46	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	143
46	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	145
47	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	175
47	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	23
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	183
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	188
47	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	291

Sludge Loading (%)	Satisfies PAR	# of EVs
47	Not Durable; Visc; Homog; New TL ; Al2O3 ; alkali	29
48	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	162
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	183
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	34
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	164
48	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	346
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	97
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	295
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	118
49	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	373
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	69
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	394
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	42
50	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	384
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	44
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	449
51	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	396
52	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	30
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	458
52	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	401
53	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	22
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	464
53	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	400
53	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	3
54	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	6
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	475
54	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	381
54	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	27
55	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	476
55	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	293
55	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	118
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	474
56	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	151
56	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	264
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	471
57	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	77
57	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	341
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	467
58	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	15
58	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	407
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	464
59	Not Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
59	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	423
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	461
60	Not Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	428

WL Range	# of EVs and Centroid	% of Total
4	1	0.11248594
5	10	1.12485939
6	18	2.02474691
7	13	1.46231721
8	15	1.68728909
9	26	2.92463442
10	21	2.36220472
11	20	2.24971879
12	20	2.24971879
13	18	2.02474691
14	41	4.61192351
15	42	4.72440945

WL Range	# of EVs and Centroid	% of Total
16	22	2.47469066
17	52	5.84926884
18	67	7.53655793
19	143	16.0854893
20	209	23.5095613
21	110	12.3734533
22	41	4.61192351

Paper Study Results for 9 Decants with Frit O (405)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	851
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	132
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	757
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	378
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	511
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	503
28	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	12
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	374
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	515
29	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	152
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	209
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	13
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	391
30	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	329
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	32
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	117
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	20
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	294
31	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	395
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	174
31	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	22
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	53
32	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	245
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	394
32	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	197
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	17
33	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	159
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	421
33	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	292
34	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	91
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	430
34	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	368
35	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	8
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	415
35	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	466
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	357
36	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	532
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	241
37	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	648
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	95
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	794
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	20
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	869
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	887
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	22
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	867

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	129
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	760
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	174
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	715
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	310
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	579
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	663
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	226
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	734
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	155
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	821
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	68
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	885
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	4
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889

WL Range	# of EVs and Centroid	% of Total
0	423	47.5815523
1	25	2.81214848
2	16	1.79977503
3	19	2.13723285
4	32	3.59955006
5	77	8.66141732
6	122	13.7232846
7	104	11.6985377
8	52	5.84926884
9	14	1.57480315
10	5	0.5624297

Paper Study Results for 9 Decants with Frit S (409)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	851
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	132
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	757
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	378
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	511
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	515
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	374
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	680
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	209
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	837
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	52
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	885
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	889
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	889
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	889
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	889
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	832
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	57
37	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	733
37	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	4
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	152
38	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	598
38	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	65
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	226
39	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	114
39	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	165
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	536
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	74
40	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	27
40	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	149
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	482
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	231
41	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	1
41	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	95
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	467
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	326
42	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	13
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	446
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	430
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	437
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	452
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	429
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	460
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	417
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	472
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	372
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	517
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	271
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	618
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	123
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	766
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	60
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	829
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	8
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	881
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	66
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	823
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	152
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	737
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	220
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	669
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	591
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	298
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	705
59	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	184
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	781
60	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	108

WL Range	# of EVs and Centroid	% of Total
0	301	33.8582677
1	82	9.22384702
2	19	2.13723285
3	20	2.24971879
4	23	2.5871766
5	18	2.02474691
6	15	1.68728909
7	27	3.03712036
8	66	7.42407199
9	106	11.9235096
10	62	6.97412823
11	87	9.78627672
12	40	4.49943757
13	19	2.13723285
14	4	0.44994376

Paper Study Results for 9 Decants with Frit T (410)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	851
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	132
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	757
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	378
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	511
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	515
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	374
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	680
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	209
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	837
30	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	52
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	885
31	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	889
33	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	889
34	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	881
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	8
35	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	768
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	121
36	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	713
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	176
37	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	527
37	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	8
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	354
38	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	143
38	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	64
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	651
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	31
39	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	47
39	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	79
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	566
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	197
40	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	6
40	Durable; Not H Visc; Homog; Not New TL; Al2O3 ; alkali	35
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	493
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	355
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	465
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	424
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	445
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	444
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	436
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	453
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	428
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	461
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	412
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	477
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	363
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	526
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	257
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	632
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	116
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	773
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	39
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	850
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	6
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	883
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889

Sludge Loading (%)	Satisfies PAR	# of EVs
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	889
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	38
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	851
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	140
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	749
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	193
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	696
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	441
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	448
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	686
58	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	203
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	758
59	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	131
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	847
60	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	42

WL Range	# of EVs and Centroid	% of Total
0	210	23.6220472
1	98	11.023622
2	63	7.08661417
3	26	2.92463442
4	17	1.91226097
5	24	2.69966254
6	16	1.79977503
7	20	2.24971879
8	18	2.02474691
9	43	4.83689539
10	116	13.048369
11	81	9.11136108
12	62	6.97412823
13	56	6.2992126
14	30	3.37457818
15	8	0.89988751
16	1	0.11248594

Paper Study Results for 9 Decants with Frit U (422)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	851
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	132
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	757
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	375
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	464
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	3
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	47
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	457
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	276
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	58
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	98
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	506
29	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	113
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	174
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	96
30	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	224
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	613
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	52
31	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	133
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	752
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	33
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	856
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	877
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	12
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	791
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	98
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	634
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	255
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	514
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	375
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	466
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	423
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	446
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	443
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	438
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	451
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	430
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	459
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	414
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	475
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	368
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	521
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	267
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	622
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	125
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	764
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	19
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	57
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	813
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	2
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	122

Sludge Loading (%)	Satisfies PAR	# of EVs
51	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	8
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	757
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	174
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	715
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	304
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	585
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	660
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	229
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	733
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	156
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	820
56	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	69
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	884
57	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	5
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889

WL Range	# of EVs and Centroid	% of Total
6	5	0.5624297
7	50	5.62429696
8	94	10.5736783
9	54	6.07424072
10	89	10.0112486
11	73	8.21147357
12	33	3.712036
13	23	2.5871766
14	17	1.91226097
15	21	2.36220472
16	17	1.91226097
17	24	2.69966254
18	94	10.5736783
19	151	16.9853768
20	93	10.4611924
21	46	5.17435321
22	5	0.5624297

Paper Study Results for 9 Decants with Frit U2 (423)

(# of EVs = 889)

Sludge Loading (%)	Satisfies PAR	# of EVs
25	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	38
25	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	677
25	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	174
26	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	130
26	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	214
26	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	2
26	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	543
27	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	133
27	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	43
27	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	245
27	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	468
28	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	79
28	Durable; Not H Visc; Not Homog; New TL ; Al2O3 ; alkali	1
28	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	436
28	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	373
29	Durable; Not H Visc; Homog; New TL ; Al2O3 ; alkali	1
29	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	679
29	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	209
30	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	837
30	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	52
31	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	885
31	Durable; Visc; Not Homog; New TL ; Al2O3 ; alkali	4
32	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
33	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
34	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
35	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
36	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
37	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	889
38	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	864
38	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	25
39	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	746
39	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	143
40	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	588
40	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	301
41	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	492
41	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	397
42	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	461
42	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	428
43	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	444
43	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	445
44	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	435
44	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	454
45	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	428
45	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	461
46	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	406
46	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	483
47	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	336
47	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	553
48	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	12
48	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	246
48	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	631
49	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	22
49	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	96
49	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	87
49	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	684
50	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	16
50	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	154
50	Durable; Visc; Homog; New TL ; Al2O3 ; alkali	16

Sludge Loading (%)	Satisfies PAR	# of EVs
50	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	703
51	Durable; Not L Visc; Homog; New TL ; Al2O3 ; alkali	7
51	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	276
51	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	606
52	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	649
52	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	240
53	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	728
53	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	161
54	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	807
54	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	82
55	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	881
55	Durable; Visc; Homog; Not New TL; Al2O3 ; alkali	8
56	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
57	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
58	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
59	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889
60	Durable; Not L Visc; Homog; Not New TL; Al2O3 ; alkali	889

WL Range	# of EVs and Centroid	% of Total
10	34	3.82452193
11	92	10.3487064
12	116	13.048369
13	111	12.4859393
14	52	5.84926884
15	29	3.26209224
16	26	2.92463442
17	39	4.38695163
18	81	9.11136108
19	143	16.0854893
20	123	13.8357705
21	43	4.83689539

Appendix J

MAR Calculations for Various Frit/Decant Combinations

Frit/Decant	% WL	Durability	TL	Visc	Frit	Homog	Al_2O_3	alkali	T_L	Visc	ΔG_P	Homog
202-Decant #5	25				High	NO	3.46	17.61	750.1	81.02	-10.646	198.96
202-Decant #5	26					NO	3.60	17.79	760.4	76.74	-10.788	200.63
202-Decant #5	27					NO	3.74	17.98	770.1	72.58	-10.929	202.31
202-Decant #5	28					NO	3.88	18.16	779.6	68.53	-11.071	203.98
202-Decant #5	29					NO	4.01	18.35	788.9	64.62	-11.212	205.65
202-Decant #5	30					NO	4.15	18.53	797.8	60.82	-11.354	207.33
202-Decant #5	31					NO	4.29	18.72	806.5	57.15	-11.496	209.00
202-Decant #5	32					NO	4.43	18.90	814.9	53.61	-11.637	210.67
202-Decant #5	33						4.57	19.09	823.0	50.20	-11.779	212.34
202-Decant #5	34						4.71	19.27	830.9	46.91	-11.921	214.02
202-Decant #5	35						4.85	19.45	838.6	43.75	-12.062	215.69
202-Decant #5	36						4.98	19.64	846.1	40.71	-12.204	217.36
202-Decant #5	37						5.12	19.82	853.4	37.80	-12.345	219.03
202-Decant #5	38	NO					5.26	20.01	860.5	35.02	-12.487	220.71
202-Decant #5	39	NO					5.40	20.19	867.3	32.37	-12.629	222.38
202-Decant #5	40	NO					5.54	20.38	874.1	29.84	-12.770	224.05
202-Decant #5	41	NO					5.68	20.56	880.6	27.43	-12.912	225.73
202-Decant #5	42	NO					5.81	20.75	886.9	25.15	-13.053	227.40
202-Decant #5	43	NO		Low			5.95	20.93	893.1	22.99	-13.195	229.07
202-Decant #5	44	NO		Low			6.09	21.11	899.2	20.96	-13.336	230.74
202-Decant #5	45	NO		Low			6.23	21.30	905.1	19.04	-13.478	232.42
202-Decant #5	46	NO		Low			6.37	21.48	910.8	17.23	-13.620	234.09
202-Decant #5	47	NO		Low			6.51	21.67	916.5	15.54	-13.761	235.76
202-Decant #5	48	NO		Low			6.65	21.85	921.9	13.97	-13.903	237.44
202-Decant #5	49	NO		Low			6.78	22.04	927.3	12.50	-14.045	239.11
202-Decant #5	50	NO		Low			6.92	22.22	932.5	11.14	-14.186	240.78
202-Decant #5	51	NO		Low			7.06	22.41	937.6	9.88	-14.328	242.45
202-Decant #5	52	NO		Low			7.20	22.59	942.6	8.73	-14.469	244.13
202-Decant #5	53	NO		Low			7.34	22.77	947.5	7.67	-14.611	245.80
202-Decant #5	54	NO		Low			7.48	22.96	952.3	6.70	-14.753	247.47
202-Decant #5	55	NO		Low			7.61	23.14	956.9	5.82	-14.894	249.14

202-Decant #5	56	NO		Low			7.75	23.33	961.5	5.02	-15.036	250.82
202-Decant #5	57	NO		Low			7.89	23.51	965.9	4.31	-15.177	252.49
202-Decant #5	58	NO		Low			8.03	23.70	970.3	3.67	-15.319	254.16
202-Decant #5	59	NO		Low			8.17	23.88	974.6	3.11	-15.461	255.83
202-Decant #5	60	NO		Low			8.31	24.06	978.8	2.60	-15.602	257.51
202-M-Decant #5	25			High	High	NO	4.21	16.86	731.6	121.22	-9.459	204.40
202-M-Decant #5	26			High	High	NO	4.34	17.05	742.3	114.94	-9.616	206.00
202-M-Decant #5	27			High		NO	4.47	17.25	752.6	108.85	-9.774	207.60
202-M-Decant #5	28			High		NO	4.60	17.44	762.6	102.92	-9.931	209.20
202-M-Decant #5	29					NO	4.72	17.64	772.3	97.16	-10.089	210.80
202-M-Decant #5	30						4.85	17.83	781.6	91.58	-10.246	212.40
202-M-Decant #5	31						4.98	18.03	790.7	86.18	-10.403	214.00
202-M-Decant #5	32						5.11	18.22	799.5	80.95	-10.561	215.60
202-M-Decant #5	33						5.24	18.42	808.1	75.91	-10.718	217.20
202-M-Decant #5	34						5.37	18.61	816.4	71.04	-10.876	218.80
202-M-Decant #5	35						5.50	18.80	824.5	66.35	-11.033	220.40
202-M-Decant #5	36						5.62	19.00	832.3	61.85	-11.191	222.00
202-M-Decant #5	37						5.75	19.19	840.0	57.53	-11.348	223.60
202-M-Decant #5	38						5.88	19.39	847.4	53.39	-11.505	225.20
202-M-Decant #5	39						6.01	19.58	854.6	49.43	-11.663	226.80
202-M-Decant #5	40						6.14	19.78	861.7	45.65	-11.820	228.40
202-M-Decant #5	41						6.27	19.97	868.5	42.05	-11.978	230.00
202-M-Decant #5	42						6.39	20.17	875.1	38.63	-12.135	231.60
202-M-Decant #5	43						6.52	20.36	881.7	35.38	-12.293	233.20
202-M-Decant #5	44	NO					6.65	20.55	888.0	32.31	-12.450	234.80
202-M-Decant #5	45	NO					6.78	20.75	894.2	29.41	-12.608	236.41
202-M-Decant #5	46	NO					6.91	20.94	900.2	26.68	-12.765	238.00
202-M-Decant #5	47	NO		Low			7.04	21.14	906.1	24.12	-12.922	239.61
202-M-Decant #5	48	NO		Low			7.17	21.33	911.9	21.73	-13.080	241.21
202-M-Decant #5	49	NO		Low			7.29	21.53	917.5	19.49	-13.237	242.80
202-M-Decant #5	50	NO		Low			7.42	21.72	923.0	17.41	-13.395	244.41
202-M-Decant #5	51	NO		Low			7.55	21.92	928.4	15.49	-13.552	246.01
202-M-Decant #5	52	NO		Low			7.68	22.11	933.6	13.71	-13.709	247.61
202-M-Decant #5	53	NO		Low			7.81	22.30	938.7	12.08	-13.867	249.21

202-M-Decant #5	54	NO		Low			7.94	22.50	943.8	10.59	-14.024	250.81
202-M-Decant #5	55	NO		Low			8.06	22.69	948.7	9.22	-14.182	252.41
202-M-Decant #5	56	NO		Low			8.19	22.89	953.5	7.99	-14.339	254.01
202-M-Decant #5	57	NO		Low			8.32	23.08	958.2	6.88	-14.497	255.61
202-M-Decant #5	58	NO		Low			8.45	23.28	962.8	5.88	-14.654	257.21
202-M-Decant #5	59	NO		Low			8.58	23.47	967.3	4.99	-14.811	258.81
202-M-Decant #5	60	NO		Low			8.71	23.66	971.7	4.20	-14.969	260.41
202-M2-Decant #5	25			High	High	NO	4.21	16.86	733.4	104.37	-9.785	204.40
202-M2-Decant #5	26				High	NO	4.34	17.05	744.2	98.84	-9.938	206.00
202-M2-Decant #5	27					NO	4.47	17.25	754.4	93.47	-10.091	207.60
202-M2-Decant #5	28					NO	4.60	17.44	764.4	88.26	-10.244	209.20
202-M2-Decant #5	29					NO	4.72	17.64	774.0	83.20	-10.397	210.80
202-M2-Decant #5	30						4.85	17.83	783.4	78.31	-10.550	212.40
202-M2-Decant #5	31						4.98	18.03	792.5	73.58	-10.703	214.00
202-M2-Decant #5	32						5.11	18.22	801.3	69.01	-10.856	215.60
202-M2-Decant #5	33						5.24	18.42	809.8	64.61	-11.009	217.20
202-M2-Decant #5	34						5.37	18.61	818.0	60.37	-11.162	218.80
202-M2-Decant #5	35						5.50	18.80	826.1	56.29	-11.316	220.40
202-M2-Decant #5	36						5.62	19.00	834.0	52.38	-11.469	222.00
202-M2-Decant #5	37						5.75	19.19	841.6	48.64	-11.622	223.60
202-M2-Decant #5	38						5.88	19.39	848.9	45.05	-11.775	225.20
202-M2-Decant #5	39						6.01	19.58	856.1	41.63	-11.928	226.80
202-M2-Decant #5	40						6.14	19.78	863.2	38.37	-12.081	228.40
202-M2-Decant #5	41						6.27	19.97	869.9	35.27	-12.234	230.00
202-M2-Decant #5	42	NO					6.39	20.17	876.6	32.34	-12.387	231.60
202-M2-Decant #5	43	NO					6.52	20.36	883.1	29.56	-12.540	233.20
202-M2-Decant #5	44	NO					6.65	20.55	889.4	26.93	-12.693	234.80
202-M2-Decant #5	45	NO					6.78	20.75	895.6	24.46	-12.846	236.41
202-M2-Decant #5	46	NO		Low			6.91	20.94	901.6	22.14	-12.999	238.00
202-M2-Decant #5	47	NO		Low			7.04	21.14	907.4	19.96	-13.153	239.61
202-M2-Decant #5	48	NO		Low			7.17	21.33	913.2	17.94	-13.306	241.21
202-M2-Decant #5	49	NO		Low			7.29	21.53	918.8	16.05	-13.459	242.80
202-M2-Decant #5	50	NO		Low			7.42	21.72	924.2	14.30	-13.612	244.41
202-M2-Decant #5	51	NO		Low			7.55	21.92	929.6	12.68	-13.765	246.01

202-M2-Decant #5	52	NO		Low			7.68	22.11	934.8	11.20	-13.918	247.61
202-M2-Decant #5	53	NO		Low			7.81	22.30	939.9	9.83	-14.071	249.21
202-M2-Decant #5	54	NO		Low			7.94	22.50	944.9	8.59	-14.224	250.80
202-M2-Decant #5	55	NO		Low			8.06	22.69	949.7	7.46	-14.377	252.41
202-M2-Decant #5	56	NO		Low			8.19	22.89	954.6	6.44	-14.530	254.01
202-M2-Decant #5	57	NO		Low			8.32	23.08	959.2	5.52	-14.683	255.61
202-M2-Decant #5	58	NO		Low			8.45	23.28	963.8	4.70	-14.836	257.21
202-M2-Decant #5	59	NO		Low			8.58	23.47	968.3	3.98	-14.990	258.81
202-M2-Decant #5	60	NO		Low			8.71	23.66	972.7	3.34	-15.143	260.41
S-Decant #5	25			High	High	NO	3.46	15.36	735.3	164.40	-8.338	201.37
S-Decant #5	26			High	High	NO	3.60	15.57	746.5	156.18	-8.511	203.01
S-Decant #5	27			High	High	NO	3.74	15.79	757.2	148.17	-8.683	204.65
S-Decant #5	28			High		NO	3.88	16.00	767.6	140.37	-8.856	206.29
S-Decant #5	29			High		NO	4.01	16.22	777.6	132.78	-9.028	207.93
S-Decant #5	30			High		NO	4.15	16.43	787.3	125.41	-9.200	209.57
S-Decant #5	31			High			4.29	16.65	796.6	118.25	-9.373	211.21
S-Decant #5	32			High			4.43	16.86	805.7	111.32	-9.545	212.85
S-Decant #5	33			High			4.57	17.08	814.4	104.61	-9.717	214.49
S-Decant #5	34						4.71	17.29	822.8	98.13	-9.890	216.13
S-Decant #5	35						4.85	17.50	831.1	91.87	-10.062	217.77
S-Decant #5	36						4.98	17.72	839.1	85.84	-10.235	219.41
S-Decant #5	37						5.12	17.93	846.8	80.04	-10.407	221.05
S-Decant #5	38						5.26	18.15	854.3	74.46	-10.579	222.69
S-Decant #5	39						5.40	18.36	861.5	69.12	-10.752	224.34
S-Decant #5	40						5.54	18.58	868.7	64.01	-10.924	225.98
S-Decant #5	41						5.68	18.79	875.5	59.12	-11.096	227.62
S-Decant #5	42						5.81	19.01	882.2	54.47	-11.269	229.26
S-Decant #5	43						5.95	19.22	888.7	50.04	-11.441	230.90
S-Decant #5	44						6.09	19.43	895.0	45.83	-11.614	232.54
S-Decant #5	45						6.23	19.65	901.2	41.86	-11.786	234.18
S-Decant #5	46						6.37	19.86	907.2	38.10	-11.958	235.82
S-Decant #5	47						6.51	20.08	913.1	34.56	-12.131	237.46
S-Decant #5	48						6.65	20.29	918.8	31.24	-12.303	239.10
S-Decant #5	49	NO					6.78	20.51	924.3	28.13	-12.475	240.74

S-Decant #5	50	NO					6.92	20.72	929.7	25.22	-12.648	242.38
S-Decant #5	51	NO		Low			7.06	20.94	935.0	22.52	-12.820	244.03
S-Decant #5	52	NO		Low			7.20	21.15	940.2	20.02	-12.992	245.67
S-Decant #5	53	NO		Low			7.34	21.36	945.2	17.71	-13.165	247.31
S-Decant #5	54	NO		Low			7.48	21.58	950.2	15.59	-13.337	248.94
S-Decant #5	55	NO		Low			7.61	21.79	954.9	13.65	-13.510	250.59
S-Decant #5	56	NO		Low			7.75	22.01	959.7	11.88	-13.682	252.23
S-Decant #5	57	NO		Low			7.89	22.22	964.2	10.27	-13.854	253.87
S-Decant #5	58	NO		Low			8.03	22.44	968.7	8.83	-14.027	255.51
S-Decant #5	59	NO		Low			8.17	22.65	973.1	7.53	-14.199	257.15
S-Decant #5	60	NO		Low			8.31	22.86	977.4	6.38	-14.371	258.79
T-Decant #5	25			High	High	NO	3.46	15.36	735.7	150.39	-8.299	201.37
T-Decant #5	26			High	High	NO	3.60	15.57	747.0	142.86	-8.472	203.01
T-Decant #5	27			High	High	NO	3.74	15.79	757.7	135.54	-8.645	204.65
T-Decant #5	28			High		NO	3.88	16.00	768.1	128.41	-8.818	206.29
T-Decant #5	29			High		NO	4.01	16.22	778.1	121.47	-8.991	207.93
T-Decant #5	30			High		NO	4.15	16.43	787.8	114.73	-9.164	209.57
T-Decant #5	31			High			4.29	16.65	797.1	108.19	-9.337	211.21
T-Decant #5	32			High			4.43	16.86	806.2	101.85	-9.510	212.85
T-Decant #5	33						4.57	17.08	814.9	95.72	-9.683	214.49
T-Decant #5	34						4.71	17.29	823.4	89.79	-9.855	216.13
T-Decant #5	35						4.85	17.50	831.7	84.06	-10.028	217.77
T-Decant #5	36						4.98	17.72	839.6	78.55	-10.201	219.41
T-Decant #5	37						5.12	17.93	847.4	73.24	-10.374	221.05
T-Decant #5	38						5.26	18.15	854.9	68.15	-10.547	222.69
T-Decant #5	39						5.40	18.36	862.1	63.26	-10.720	224.34
T-Decant #5	40						5.54	18.58	869.2	58.58	-10.893	225.98
T-Decant #5	41						5.68	18.79	876.0	54.11	-11.066	227.62
T-Decant #5	42						5.81	19.01	882.7	49.85	-11.238	229.26
T-Decant #5	43						5.95	19.22	889.2	45.80	-11.412	230.90
T-Decant #5	44						6.09	19.43	895.6	41.96	-11.584	232.54
T-Decant #5	45						6.23	19.65	901.7	38.32	-11.757	234.18
T-Decant #5	46						6.37	19.86	907.7	34.88	-11.930	235.82
T-Decant #5	47						6.51	20.08	913.6	31.64	-12.103	237.46

T-Decant #5	48						6.65	20.29	919.3	28.60	-12.276	239.10
T-Decant #5	49	NO					6.78	20.51	924.8	25.75	-12.449	240.74
T-Decant #5	50	NO		Low			6.92	20.72	930.2	23.10	-12.622	242.38
T-Decant #5	51	NO		Low			7.06	20.94	935.5	20.63	-12.795	244.03
T-Decant #5	52	NO		Low			7.20	21.15	940.7	18.34	-12.967	245.67
T-Decant #5	53	NO		Low			7.34	21.36	945.7	16.22	-13.140	247.31
T-Decant #5	54	NO		Low			7.48	21.58	950.7	14.28	-13.313	248.94
T-Decant #5	55	NO		Low			7.61	21.79	955.4	12.50	-13.486	250.59
T-Decant #5	56	NO		Low			7.75	22.01	960.2	10.88	-13.659	252.23
T-Decant #5	57	NO		Low			7.89	22.22	964.7	9.41	-13.832	253.87
T-Decant #5	58	NO		Low			8.03	22.44	969.2	8.09	-14.005	255.51
T-Decant #5	59	NO		Low			8.17	22.65	973.6	6.90	-14.178	257.15
T-Decant #5	60	NO		Low			8.31	22.86	977.9	5.85	-14.351	258.79
U-Decant #5	25			High	High	NO	3.46	16.11	723.3	102.24	-8.876	201.37
U-Decant #5	26				High	NO	3.60	16.31	734.8	97.07	-9.041	203.01
U-Decant #5	27				High	NO	3.74	16.52	745.7	92.06	-9.206	204.65
U-Decant #5	28					NO	3.88	16.72	756.4	87.17	-9.371	206.29
U-Decant #5	29					NO	4.01	16.93	766.6	82.41	-9.536	207.93
U-Decant #5	30					NO	4.15	17.13	776.5	77.79	-9.702	209.57
U-Decant #5	31						4.29	17.34	786.1	73.32	-9.867	211.21
U-Decant #5	32						4.43	17.54	795.4	68.98	-10.032	212.85
U-Decant #5	33						4.57	17.75	804.4	64.79	-10.197	214.49
U-Decant #5	34						4.71	17.95	813.1	60.74	-10.362	216.13
U-Decant #5	35						4.85	18.15	821.6	56.83	-10.528	217.77
U-Decant #5	36						4.98	18.36	829.8	53.07	-10.693	219.42
U-Decant #5	37						5.12	18.56	837.8	49.45	-10.858	221.05
U-Decant #5	38						5.26	18.77	845.5	45.98	-11.023	222.69
U-Decant #5	39						5.40	18.97	853.0	42.65	-11.189	224.34
U-Decant #5	40						5.54	19.18	860.4	39.47	-11.354	225.98
U-Decant #5	41						5.68	19.38	867.4	36.43	-11.519	227.62
U-Decant #5	42						5.81	19.59	874.3	33.54	-11.684	229.26
U-Decant #5	43						5.95	19.79	881.0	30.79	-11.849	230.90
U-Decant #5	44						6.09	19.99	887.6	28.18	-12.014	232.54
U-Decant #5	45						6.23	20.20	894.0	25.71	-12.180	234.18

U-Decant #5	46			Low			6.37	20.40	900.2	23.39	-12.345	235.82
U-Decant #5	47	NO		Low			6.51	20.61	906.2	21.20	-12.510	237.46
U-Decant #5	48	NO		Low			6.65	20.81	912.2	19.14	-12.675	239.10
U-Decant #5	49	NO		Low			6.78	21.02	917.9	17.22	-12.841	240.74
U-Decant #5	50	NO		Low			6.92	21.22	923.5	15.43	-13.006	242.38
U-Decant #5	51	NO		Low			7.06	21.43	929.0	13.76	-13.171	244.03
U-Decant #5	52	NO		Low			7.20	21.63	934.4	12.22	-13.336	245.67
U-Decant #5	53	NO		Low			7.34	21.83	939.5	10.80	-13.501	247.31
U-Decant #5	54	NO		Low			7.48	22.04	944.7	9.50	-13.666	248.94
U-Decant #5	55	NO		Low			7.61	22.24	949.6	8.30	-13.832	250.59
U-Decant #5	56	NO		Low			7.75	22.45	954.6	7.22	-13.997	252.23
U-Decant #5	57	NO		Low			7.89	22.65	959.3	6.23	-14.162	253.87
U-Decant #5	58	NO		Low			8.03	22.86	963.9	5.35	-14.327	255.51
U-Decant #5	59	NO		Low			8.17	23.06	968.5	4.56	-14.493	257.15
U-Decant #5	60	NO		Low			8.31	23.26	973.0	3.86	-14.658	258.79
U2-Decant #5	25				High	NO	3.46	16.11	725.1	87.98	-9.201	201.37
U2-Decant #5	26				High	NO	3.60	16.31	736.5	83.44	-9.362	203.01
U2-Decant #5	27				High	NO	3.74	16.52	747.5	79.02	-9.523	204.65
U2-Decant #5	28					NO	3.88	16.72	758.1	74.73	-9.684	206.29
U2-Decant #5	29					NO	4.01	16.93	768.3	70.56	-9.845	207.93
U2-Decant #5	30					NO	4.15	17.13	778.2	66.51	-10.006	209.57
U2-Decant #5	31						4.29	17.34	787.8	62.59	-10.167	211.21
U2-Decant #5	32						4.43	17.54	797.1	58.81	-10.327	212.85
U2-Decant #5	33						4.57	17.75	806.0	55.15	-10.488	214.49
U2-Decant #5	34						4.71	17.95	814.7	51.62	-10.649	216.13
U2-Decant #5	35						4.85	18.15	823.2	48.23	-10.810	217.77
U2-Decant #5	36						4.98	18.36	831.4	44.96	-10.971	219.42
U2-Decant #5	37						5.12	18.56	839.3	41.82	-11.132	221.05
U2-Decant #5	38						5.26	18.77	847.0	38.82	-11.293	222.69
U2-Decant #5	39						5.40	18.97	854.5	35.95	-11.454	224.34
U2-Decant #5	40						5.54	19.18	861.8	33.20	-11.614	225.98
U2-Decant #5	41						5.68	19.38	868.8	30.59	-11.775	227.62
U2-Decant #5	42						5.81	19.59	875.7	28.10	-11.936	229.26
U2-Decant #5	43						5.95	19.79	882.4	25.75	-12.097	230.90

U2-Decant #5	44			Low			6.09	19.99	889.0	23.52	-12.258	232.54
U2-Decant #5	45	NO		Low			6.23	20.20	895.3	21.41	-12.419	234.18
U2-Decant #5	46	NO		Low			6.37	20.40	901.5	19.43	-12.579	235.82
U2-Decant #5	47	NO		Low			6.51	20.61	907.5	17.57	-12.740	237.46
U2-Decant #5	48	NO		Low			6.65	20.81	913.4	15.83	-12.901	239.10
U2-Decant #5	49	NO		Low			6.78	21.02	919.1	14.20	-13.062	240.74
U2-Decant #5	50	NO		Low			6.92	21.22	924.7	12.69	-13.223	242.38
U2-Decant #5	51	NO		Low			7.06	21.43	930.2	11.29	-13.384	244.03
U2-Decant #5	52	NO		Low			7.20	21.63	935.5	10.00	-13.545	245.67
U2-Decant #5	53	NO		Low			7.34	21.83	940.7	8.81	-13.706	247.31
U2-Decant #5	54	NO		Low			7.48	22.04	945.8	7.72	-13.866	248.94
U2-Decant #5	55	NO		Low			7.61	22.24	950.7	6.73	-14.027	250.59
U2-Decant #5	56	NO		Low			7.75	22.45	955.6	5.83	-14.188	252.23
U2-Decant #5	57	NO		Low			7.89	22.65	960.3	5.02	-14.349	253.87
U2-Decant #5	58	NO		Low			8.03	22.86	964.9	4.30	-14.510	255.51
U2-Decant #5	59	NO		Low			8.17	23.06	969.5	3.65	-14.671	257.15
U2-Decant #5	60	NO		Low			8.31	23.26	973.9	3.07	-14.832	258.79
202-Decant #9	25			High		NO	3.87	15.60	827.0	101.68	-8.759	203.77
202-Decant #9	26					NO	4.02	15.71	839.3	97.48	-8.826	205.63
202-Decant #9	27					NO	4.18	15.81	851.1	93.36	-8.892	207.50
202-Decant #9	28					NO	4.33	15.91	862.6	89.30	-8.958	209.36
202-Decant #9	29						4.49	16.02	873.8	85.32	-9.024	211.23
202-Decant #9	30						4.64	16.12	884.6	81.41	-9.090	213.09
202-Decant #9	31						4.79	16.23	895.1	77.58	-9.156	214.96
202-Decant #9	32						4.95	16.33	905.3	73.83	-9.222	216.82
202-Decant #9	33						5.10	16.43	915.3	70.16	-9.288	218.69
202-Decant #9	34						5.26	16.54	925.0	66.57	-9.355	220.55
202-Decant #9	35						5.41	16.64	934.4	63.07	-9.421	222.42
202-Decant #9	36						5.57	16.75	943.5	59.66	-9.487	224.28
202-Decant #9	37						5.72	16.85	952.4	56.33	-9.553	226.15
202-Decant #9	38						5.88	16.95	961.1	53.10	-9.619	228.02
202-Decant #9	39						6.03	17.06	969.5	49.95	-9.685	229.88
202-Decant #9	40						6.19	17.16	977.8	46.90	-9.751	231.74
202-Decant #9	41						6.34	17.27	985.8	43.95	-9.818	233.61

202-Decant #9	42						6.50	17.37	993.7	41.09	-9.884	235.47
202-Decant #9	43						6.65	17.47	1001.3	38.34	-9.950	237.34
202-Decant #9	44						6.81	17.58	1008.7	35.68	-10.016	239.20
202-Decant #9	45						6.96	17.68	1016.1	33.12	-10.082	241.07
202-Decant #9	46		NO				7.11	17.79	1023.1	30.67	-10.148	242.93
202-Decant #9	47		NO				7.27	17.89	1030.1	28.32	-10.214	244.80
202-Decant #9	48		NO				7.42	18.00	1036.9	26.07	-10.281	246.67
202-Decant #9	49		NO	Low			7.58	18.10	1043.5	23.93	-10.346	248.53
202-Decant #9	50		NO	Low			7.73	18.20	1050.0	21.89	-10.413	250.39
202-Decant #9	51		NO	Low			7.89	18.31	1056.3	19.96	-10.479	252.26
202-Decant #9	52		NO	Low			8.04	18.41	1062.5	18.13	-10.545	254.13
202-Decant #9	53		NO	Low			8.20	18.52	1068.6	16.40	-10.611	255.99
202-Decant #9	54		NO	Low			8.35	18.62	1074.5	14.78	-10.677	257.86
202-Decant #9	55		NO	Low			8.51	18.72	1080.3	13.26	-10.743	259.72
202-Decant #9	56		NO	Low			8.66	18.83	1086.0	11.84	-10.810	261.58
202-Decant #9	57		NO	Low			8.82	18.93	1091.5	10.52	-10.876	263.45
202-Decant #9	58		NO	Low			8.97	19.04	1097.0	9.29	-10.942	265.32
202-Decant #9	59		NO	Low			9.13	19.14	1102.4	8.17	-11.008	267.18
202-Decant #9	60		NO	Low			9.28	19.24	1107.6	7.13	-11.074	269.04
202-M-Decant #9	25			High		NO	4.62	14.85	805.7	151.21	-7.572	209.21
202-M-Decant #9	26			High			4.76	14.97	818.4	145.10	-7.654	211.00
202-M-Decant #9	27			High			4.91	15.08	830.7	139.08	-7.736	212.79
202-M-Decant #9	28			High			5.05	15.19	842.6	133.17	-7.818	214.58
202-M-Decant #9	29			High			5.20	15.31	854.2	127.35	-7.900	216.38
202-M-Decant #9	30			High			5.34	15.42	865.4	121.65	-7.982	218.17
202-M-Decant #9	31			High			5.48	15.54	876.3	116.03	-8.064	219.96
202-M-Decant #9	32			High			5.63	15.65	886.9	110.54	-8.146	221.75
202-M-Decant #9	33			High			5.77	15.76	897.2	105.16	-8.228	223.55
202-M-Decant #9	34			High			5.92	15.88	907.3	99.89	-8.310	225.34
202-M-Decant #9	35						6.06	15.99	917.0	94.74	-8.392	227.13
202-M-Decant #9	36						6.21	16.11	926.5	89.73	-8.474	228.93
202-M-Decant #9	37						6.35	16.22	935.8	84.82	-8.556	230.72
202-M-Decant #9	38						6.50	16.33	944.8	80.05	-8.638	232.51
202-M-Decant #9	39						6.64	16.45	953.6	75.41	-8.720	234.30

202-M-Decant #9	40						6.79	16.56	962.2	70.90	-8.801	236.09
202-M-Decant #9	41						6.93	16.68	970.5	66.52	-8.884	237.89
202-M-Decant #9	42						7.08	16.79	978.7	62.29	-8.966	239.68
202-M-Decant #9	43						7.22	16.90	986.6	58.19	-9.048	241.47
202-M-Decant #9	44						7.37	17.02	994.4	54.25	-9.129	243.26
202-M-Decant #9	45						7.51	17.13	1002.0	50.44	-9.211	245.06
202-M-Decant #9	46						7.65	17.25	1009.4	46.77	-9.293	246.85
202-M-Decant #9	47						7.80	17.36	1016.6	43.26	-9.375	248.64
202-M-Decant #9	48		NO				7.94	17.47	1023.7	39.89	-9.457	250.44
202-M-Decant #9	49		NO				8.09	17.59	1030.7	36.68	-9.539	252.23
202-M-Decant #9	50		NO				8.23	17.70	1037.5	33.62	-9.621	254.02
202-M-Decant #9	51		NO				8.38	17.82	1044.1	30.71	-9.703	255.81
202-M-Decant #9	52		NO				8.52	17.93	1050.6	27.94	-9.785	257.61
202-M-Decant #9	53		NO				8.67	18.05	1056.9	25.34	-9.867	259.40
202-M-Decant #9	54		NO	Low			8.81	18.16	1063.2	22.88	-9.949	261.19
202-M-Decant #9	55		NO	Low			8.96	18.27	1069.3	20.57	-10.031	262.98
202-M-Decant #9	56		NO	Low			9.10	18.39	1075.2	18.41	-10.113	264.78
202-M-Decant #9	57		NO	Low			9.25	18.50	1081.1	16.39	-10.195	266.57
202-M-Decant #9	58		NO	Low			9.39	18.62	1086.8	14.52	-10.277	268.36
202-M-Decant #9	59		NO	Low			9.54	18.73	1092.4	12.79	-10.359	270.15
202-M-Decant #9	60		NO	Low			9.68	18.84	1097.9	11.20	-10.441	271.95
202-M2-Decant #9	25			High		NO	4.62	14.85	808.0	130.95	-7.898	209.21
202-M2-Decant #9	26			High			4.76	14.97	820.7	125.54	-7.976	211.00
202-M2-Decant #9	27			High			4.91	15.08	832.9	120.21	-8.053	212.79
202-M2-Decant #9	28			High			5.05	15.19	844.9	114.97	-8.131	214.58
202-M2-Decant #9	29			High			5.20	15.31	856.4	109.84	-8.209	216.38
202-M2-Decant #9	30			High			5.34	15.42	867.6	104.80	-8.286	218.17
202-M2-Decant #9	31			High			5.48	15.54	878.5	99.85	-8.364	219.96
202-M2-Decant #9	32						5.63	15.65	889.1	95.01	-8.441	221.76
202-M2-Decant #9	33						5.77	15.76	899.4	90.28	-8.519	223.55
202-M2-Decant #9	34						5.92	15.88	909.4	85.65	-8.597	225.34
202-M2-Decant #9	35						6.06	15.99	919.1	81.13	-8.674	227.13
202-M2-Decant #9	36						6.21	16.11	928.5	76.73	-8.752	228.93
202-M2-Decant #9	37						6.35	16.22	937.8	72.44	-8.829	230.72

202-M2-Decant #9	38						6.50	16.33	946.8	68.27	-8.907	232.51
202-M2-Decant #9	39						6.64	16.45	955.5	64.22	-8.985	234.30
202-M2-Decant #9	40						6.79	16.56	964.1	60.29	-9.062	236.09
202-M2-Decant #9	41						6.93	16.68	972.4	56.48	-9.140	237.89
202-M2-Decant #9	42						7.08	16.79	980.5	52.81	-9.218	239.68
202-M2-Decant #9	43						7.22	16.90	988.4	49.25	-9.295	241.47
202-M2-Decant #9	44						7.37	17.02	996.2	45.83	-9.373	243.26
202-M2-Decant #9	45						7.51	17.13	1003.8	42.54	-9.450	245.06
202-M2-Decant #9	46						7.65	17.25	1011.1	39.38	-9.528	246.85
202-M2-Decant #9	47						7.80	17.36	1018.3	36.36	-9.606	248.64
202-M2-Decant #9	48		NO				7.94	17.47	1025.4	33.46	-9.683	250.44
202-M2-Decant #9	49		NO				8.09	17.59	1032.3	30.71	-9.761	252.23
202-M2-Decant #9	50		NO				8.23	17.70	1039.1	28.09	-9.838	254.02
202-M2-Decant #9	51		NO				8.38	17.82	1045.7	25.60	-9.916	255.81
202-M2-Decant #9	52		NO	Low			8.52	17.93	1052.1	23.24	-9.994	257.61
202-M2-Decant #9	53		NO	Low			8.67	18.05	1058.4	21.03	-10.071	259.40
202-M2-Decant #9	54		NO	Low			8.81	18.16	1064.6	18.94	-10.149	261.19
202-M2-Decant #9	55		NO	Low			8.96	18.27	1070.7	16.99	-10.227	262.98
202-M2-Decant #9	56		NO	Low			9.10	18.39	1076.6	15.16	-10.304	264.78
202-M2-Decant #9	57		NO	Low			9.25	18.50	1082.4	13.47	-10.382	266.57
202-M2-Decant #9	58		NO	Low			9.39	18.62	1088.1	11.90	-10.459	268.36
202-M2-Decant #9	59		NO	Low			9.54	18.73	1093.7	10.45	-10.537	270.15
202-M2-Decant #9	60		NO	Low			9.68	18.84	1099.2	9.12	-10.615	271.95
G-Decant #9	25					NO	4.62	18.60	745.2	80.63	-11.037	209.21
G-Decant #9	26						4.76	18.67	758.3	77.18	-11.073	211.00
G-Decant #9	27						4.91	18.73	771.0	73.80	-11.109	212.79
G-Decant #9	28						5.05	18.79	783.4	70.47	-11.144	214.58
G-Decant #9	29						5.20	18.86	795.5	67.21	-11.180	216.38
G-Decant #9	30						5.34	18.92	807.3	64.03	-11.216	218.17
G-Decant #9	31						5.48	18.99	818.8	60.90	-11.252	219.96
G-Decant #9	32						5.63	19.05	830.1	57.85	-11.287	221.75
G-Decant #9	33						5.77	19.11	841.1	54.87	-11.323	223.55
G-Decant #9	34						5.92	19.18	851.8	51.96	-11.359	225.34
G-Decant #9	35						6.06	19.24	862.3	49.12	-11.395	227.13

G-Decant #9	36						6.21	19.31	872.5	46.37	-11.430	228.93
G-Decant #9	37						6.35	19.37	882.6	43.69	-11.466	230.72
G-Decant #9	38						6.50	19.43	892.4	41.09	-11.502	232.51
G-Decant #9	39						6.64	19.50	902.0	38.57	-11.538	234.30
G-Decant #9	40						6.79	19.56	911.4	36.13	-11.574	236.09
G-Decant #9	41						6.93	19.63	920.5	33.77	-11.609	237.89
G-Decant #9	42						7.08	19.69	929.5	31.50	-11.645	239.68
G-Decant #9	43						7.22	19.75	938.3	29.31	-11.681	241.47
G-Decant #9	44						7.37	19.82	947.0	27.21	-11.717	243.26
G-Decant #9	45						7.51	19.88	955.5	25.19	-11.752	245.06
G-Decant #9	46			Low			7.65	19.95	963.8	23.26	-11.788	246.85
G-Decant #9	47			Low			7.80	20.01	971.9	21.41	-11.824	248.64
G-Decant #9	48			Low			7.94	20.07	979.9	19.65	-11.860	250.44
G-Decant #9	49			Low			8.09	20.14	987.7	17.98	-11.895	252.23
G-Decant #9	50			Low			8.23	20.20	995.4	16.40	-11.931	254.02
G-Decant #9	51			Low			8.38	20.27	1002.9	14.90	-11.967	255.81
G-Decant #9	52			Low			8.52	20.33	1010.3	13.48	-12.003	257.61
G-Decant #9	53			Low			8.67	20.40	1017.6	12.16	-12.038	259.40
G-Decant #9	54		NO	Low			8.81	20.46	1024.7	10.91	-12.074	261.19
G-Decant #9	55		NO	Low			8.96	20.52	1031.7	9.75	-12.110	262.98
G-Decant #9	56		NO	Low			9.10	20.59	1038.6	8.67	-12.146	264.78
G-Decant #9	57		NO	Low			9.25	20.65	1045.3	7.67	-12.181	266.57
G-Decant #9	58		NO	Low			9.39	20.72	1052.0	6.75	-12.217	268.36
G-Decant #9	59		NO	Low			9.54	20.78	1058.5	5.90	-12.253	270.15
G-Decant #9	60		NO	Low			9.68	20.84	1064.9	5.13	-12.289	271.95
U-Decant #9	25			High		NO	3.87	14.10	801.9	126.86	-6.989	206.17
U-Decant #9	26			High		NO	4.02	14.23	815.4	121.86	-7.079	208.01
U-Decant #9	27			High		NO	4.18	14.35	828.4	116.94	-7.168	209.84
U-Decant #9	28			High			4.33	14.47	841.0	112.09	-7.258	211.67
U-Decant #9	29			High			4.49	14.60	853.2	107.33	-7.348	213.51
U-Decant #9	30			High			4.64	14.72	865.0	102.63	-7.438	215.34
U-Decant #9	31						4.79	14.85	876.4	98.02	-7.528	217.17
U-Decant #9	32						4.95	14.97	887.5	93.50	-7.617	219.00
U-Decant #9	33						5.10	15.09	898.3	89.07	-7.707	220.84

U-Decant #9	34						5.26	15.22	908.7	84.72	-7.797	222.67
U-Decant #9	35						5.41	15.34	918.8	80.46	-7.886	224.50
U-Decant #9	36						5.57	15.47	928.7	76.30	-7.976	226.34
U-Decant #9	37						5.72	15.59	938.3	72.24	-8.066	228.17
U-Decant #9	38						5.88	15.71	947.6	68.28	-8.155	230.00
U-Decant #9	39						6.03	15.84	956.6	64.42	-8.245	231.83
U-Decant #9	40						6.19	15.96	965.5	60.66	-8.335	233.67
U-Decant #9	41						6.34	16.09	974.0	57.02	-8.425	235.50
U-Decant #9	42						6.50	16.21	982.4	53.48	-8.514	237.33
U-Decant #9	43						6.65	16.33	990.5	50.05	-8.604	239.17
U-Decant #9	44						6.81	16.46	998.5	46.73	-8.694	241.00
U-Decant #9	45						6.96	16.58	1006.2	43.54	-8.784	242.83
U-Decant #9	46						7.11	16.71	1013.7	40.45	-8.873	244.67
U-Decant #9	47		NO				7.27	16.83	1021.1	37.49	-8.963	246.50
U-Decant #9	48		NO				7.42	16.95	1028.3	34.64	-9.053	248.33
U-Decant #9	49		NO				7.58	17.08	1035.3	31.92	-9.143	250.17
U-Decant #9	50		NO				7.73	17.20	1042.2	29.32	-9.232	252.00
U-Decant #9	51		NO				7.89	17.33	1048.8	26.84	-9.322	253.83
U-Decant #9	52		NO	Low			8.04	17.45	1055.3	24.49	-9.412	255.67
U-Decant #9	53		NO	Low			8.20	17.58	1061.8	22.26	-9.502	257.50
U-Decant #9	54		NO	Low			8.35	17.70	1068.0	20.15	-9.591	259.33
U-Decant #9	55		NO	Low			8.51	17.82	1074.1	18.16	-9.681	261.16
U-Decant #9	56		NO	Low			8.66	17.95	1080.1	16.30	-9.771	263.00
U-Decant #9	57		NO	Low			8.82	18.07	1085.9	14.56	-9.860	264.83
U-Decant #9	58		NO	Low			8.97	18.20	1091.6	12.94	-9.950	266.66
U-Decant #9	59		NO	Low			9.13	18.32	1097.2	11.43	-10.040	268.49
U-Decant #9	60		NO	Low			9.28	18.44	1102.7	10.05	-10.130	270.33
U2-Decant #9	25			High		NO	3.87	14.10	804.1	109.77	-7.315	206.17
U2-Decant #9	26			High		NO	4.02	14.23	817.6	105.35	-7.400	208.01
U2-Decant #9	27			High		NO	4.18	14.35	830.6	101.00	-7.486	209.84
U2-Decant #9	28						4.33	14.47	843.2	96.72	-7.571	211.67
U2-Decant #9	29						4.49	14.60	855.4	92.51	-7.656	213.51
U2-Decant #9	30						4.64	14.72	867.1	88.37	-7.742	215.34
U2-Decant #9	31						4.79	14.85	878.5	84.31	-7.827	217.17

U2-Decant #9	32						4.95	14.97	889.6	80.33	-7.912	219.00
U2-Decant #9	33						5.10	15.09	900.3	76.43	-7.998	220.84
U2-Decant #9	34						5.26	15.22	910.8	72.62	-8.083	222.67
U2-Decant #9	35						5.41	15.34	920.9	68.89	-8.169	224.50
U2-Decant #9	36						5.57	15.47	930.7	65.24	-8.254	226.34
U2-Decant #9	37						5.72	15.59	940.2	61.69	-8.340	228.17
U2-Decant #9	38						5.88	15.71	949.5	58.23	-8.425	230.00
U2-Decant #9	39						6.03	15.84	958.5	54.87	-8.510	231.84
U2-Decant #9	40						6.19	15.96	967.4	51.59	-8.596	233.67
U2-Decant #9	41						6.34	16.09	975.9	48.42	-8.681	235.50
U2-Decant #9	42						6.50	16.21	984.2	45.35	-8.766	237.33
U2-Decant #9	43						6.65	16.33	992.3	42.38	-8.852	239.17
U2-Decant #9	44						6.81	16.46	1000.2	39.51	-8.937	241.00
U2-Decant #9	45						6.96	16.58	1008.0	36.74	-9.022	242.83
U2-Decant #9	46						7.11	16.71	1015.4	34.08	-9.108	244.67
U2-Decant #9	47		NO				7.27	16.83	1022.8	31.53	-9.193	246.50
U2-Decant #9	48		NO				7.42	16.95	1029.9	29.08	-9.279	248.33
U2-Decant #9	49		NO				7.58	17.08	1036.9	26.75	-9.364	250.17
U2-Decant #9	50		NO	Low			7.73	17.20	1043.8	24.52	-9.450	252.00
U2-Decant #9	51		NO	Low			7.89	17.33	1050.4	22.40	-9.535	253.83
U2-Decant #9	52		NO	Low			8.04	17.45	1056.9	20.40	-9.620	255.67
U2-Decant #9	53		NO	Low			8.20	17.58	1063.2	18.50	-9.706	257.50
U2-Decant #9	54		NO	Low			8.35	17.70	1069.5	16.71	-9.791	259.33
U2-Decant #9	55		NO	Low			8.51	17.82	1075.5	15.03	-9.877	261.16
U2-Decant #9	56		NO	Low			8.66	17.95	1081.4	13.45	-9.962	263.00
U2-Decant #9	57		NO	Low			8.82	18.07	1087.2	11.98	-10.047	264.83
U2-Decant #9	58		NO	Low			8.97	18.20	1092.9	10.62	-10.133	266.66
U2-Decant #9	59		NO	Low			9.13	18.32	1098.5	9.36	-10.218	268.49
U2-Decant #9	60		NO	Low			9.28	18.44	1103.9	8.20	-10.304	270.33