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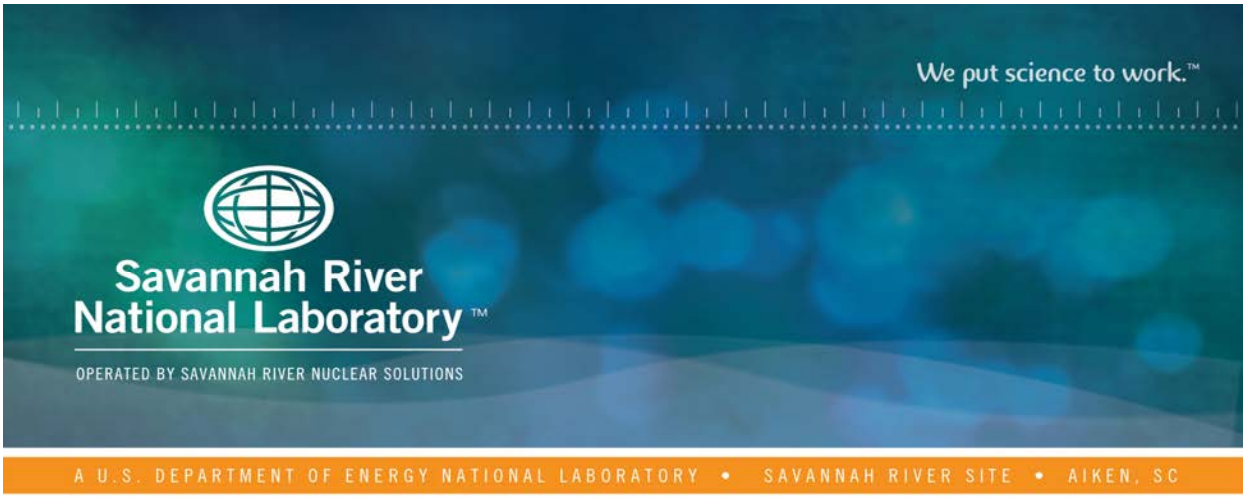

Chemical Composition Analysis and Product Consistency Tests to Support Enhanced Hanford Waste Glass Models: Results for the August and October 2014 LAW Glasses

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July 2015

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EXECUTIVE SUMMARY

In this report, the Savannah River National Laboratory provides chemical analyses and Product Consistency Test (PCT) results for several simulated low activity waste (LAW) glasses (designated as the August and October 2014 LAW glasses) fabricated by the Pacific Northwest National Laboratory. The results of these analyses will be used as part of efforts to revise or extend the validation regions of the current Hanford Waste Treatment and Immobilization Plant glass property models to cover a broader span of waste compositions.

The measured chemical composition data are reported and compared with the targeted values for each component for each glass. There was an issue with P and Zr measurements for four of the study glasses due to the formation of a precipitate containing these elements during the analytical sample preparation. This issue was corrected by omitting HCl from the sample preparation method for these glasses. All of the measured sums of oxides for the study glasses fall within the interval of 96 to 101 wt %. Comparisons of the targeted and measured chemical compositions showed that the measured values for the glasses met the targeted concentrations within 10% for those components present at more than 5 wt %.

The PCT results were normalized to both the targeted and measured compositions of the study glasses. Five of the study glasses have normalized concentration values for boron and sodium (NC_B and NC_{Na}) that are higher than the WTP contract limit of 4.0 g/L for both the quenched and canister centerline cooled (CCC) heat treatments. These glasses are EWG-LAW-New-IL-42295, EWG-LAW-New-OL-17130, EWG-LAW-New-IL-5255, EWG-LAW-New-OL-14844, and EWG-LAW-New-OL-90780. These results can be combined with additional characterization, including X-ray diffraction, to help determine the cause of the higher releases.

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LIST OF ABBREVIATIONS

ar	As Received
ARM	Approved Reference Material
BDL	Below Detection Limit
CCC	Canister Centerline Cooled
DOE	U.S. Department of Energy
EA	Environmental Assessment benchmark glass
EDS	Energy Dispersive Spectroscopy
HLW	High Level Waste
IC	Ion Chromatography
ICP-AES	Inductively Coupled Plasma – Atomic Emission Spectroscopy
JHCM	Joule-Heated Ceramic Melter
KH	Potassium hydroxide digestion
LAW	Low Activity Waste
LM	Lithium Metaborate/tetraborate fusion
LRM	Low-level Reference Material
NC_i	Normalized Concentration of element *i*
ORP	Office of River Protection
PCT	Product Consistency Test
PF	Peroxide Fusion
PNNL	Pacific Northwest National Laboratory
ppm	Parts Per Million
RSD	Relative Standard Deviation
SEM	Scanning Electron Microscopy
SRNL	Savannah River National Laboratory
TTQAP	Task Technical and Quality Assurance Plan
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.0 Introduction

The U.S. Department of Energy (DOE) Office of River Protection (ORP) has requested that the Savannah River National Laboratory (SRNL) provide expert evaluation and experimental work in support of the River Protection Project vitrification technology development. DOE is building the Hanford Tank Waste Treatment and Immobilization Plant (WTP) at the Hanford Site in Washington to remediate 55 million gallons of radioactive waste that is temporarily stored in 177 underground tanks. The low-activity waste (LAW) fraction will be partitioned from the high-level waste (HLW). Both the LAW and HLW will then be vitrified into borosilicate glass using Joule-heated ceramic melters (JHCM).

Efforts are being made to increase the loading of Hanford tank wastes in the glass while conforming to processing requirements and product quality regulations. DOE-ORP has requested that SRNL support the advancement of glass formulations and process control strategies in key technical areas, as defined in the Task Technical and Quality Assurance Plan (TTQAP).[1] One of these areas is enhancing waste glass composition/property models and broadening the compositional regions over which those models are applicable.

In this report, SRNL provides chemical analyses and Product Consistency Test (PCT) results for select simulated LAW glasses (designated as the August and October 2014 LAW glasses) fabricated by Pacific Northwest National Laboratory (PNNL).[2] The results of these analyses will be used to revise or extend the validation regions of the current WTP glass property models or to develop new models to cover a broader span of waste compositions.

2.0 Experimental Procedure

2.1 Glasses Selected for Study

PNNL provided 25 LAW glasses for this set of analyses. The identifiers for these glasses are given in Table 2-1. For the August 2014 LAW glasses, two versions of a study glass were provided: a rapidly cooled (quenched) version, and a canister centerline cooled (CCC) version, which was heat treated by PNNL to simulate slow cooling at the center of a WTP glass canister. The quenched glasses were used for chemical analyses. Both the quenched and CCC versions of the glasses were used for the PCTs. For the October 2014 LAW glasses, only the quenched versions had been received from PNNL at the time of this report. PCT results for the CCC versions of these glasses will be reported at a later date.

Table 2-1. PNNL Identifiers for Glasses Characterized in this Study

Glass ID		Glass ID
EWG-LAW-New-OL-17130		EWG-LAW-New-OL-90780
EWG-LAW-New-OL-100210		EWG-LAW-New-OL-122817
EWG-LAW-New-IL-456		EWG-LAW-New-IL-94020
EWG-LAW-New-IL-42295		EWG-LAW-New-IL-103151
EWG-LAW-New-IL-87749		EWG-LAW-New-IL-1721
EWG-LAW-Centroid 1		EWG-LAW-New-IL-5253
EWG-LAW-Centroid 2		EWG-LAW-New-IL-5255
LAW-ORP-LD1 (1)		EWG-LAW-New-IL-70316
EWG-LAW-New-OL-8445		EWG-LAW-New-IL-93907
EWG-LAW-New-OL-14844		EWG-LAW-New-IL-151542
EWG-LAW-New-OL-15493		EWG-LAW-New-IL-166697
EWG-LAW-New-OL-57284		EWG-LAW-New-IL-166731
EWG-LAW-New-OL-62380		

In the sections that follow, the methods used for measuring chemical composition and PCT performance are described and reviews of the resulting data are provided. Detailed data from these analyses are included as appendices.

2.2 Compositional Analysis

Chemical analysis was performed under the auspices of an analytical plan[3] on a representative sample from the quenched version of each of the study glasses to allow for comparisons with the targeted compositions. Three preparation techniques, including sodium peroxide fusion (PF), lithium metaborate/tetraborate fusion (LM), and potassium hydroxide digestion (KH) were used to prepare the glass samples, in duplicate, for analysis. Each of the duplicate samples was analyzed twice for each element of interest by Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES) or ion chromatography (IC), for a total of four measurements per element. Glass standards were also intermittently measured to assess the performance of the ICP-AES and IC instruments over the course of these analyses. Specifically, several samples of the low-level reference material (LRM)[4] were included as part of the analytical plan. The preparation and measurement methods used for each of the reported glass components are listed in Table 2-2.

Table 2-2. Preparation and Measurement Methods Used in Reporting the Concentrations of Each of the Components of the Study Glasses

Analyte	Preparation Method	Measurement Method
Al	PF	ICP-AES
B	PF	ICP-AES
Ca	LM	ICP-AES
Cl	KH	IC
Cr	LM	ICP-AES
F	KH	IC
Fe	LM	ICP-AES
K	LM	ICP-AES
Li	PF	ICP-AES
Mg	LM	ICP-AES
Na	LM	ICP-AES
P	LM [a]	ICP-AES
Si	PF	ICP-AES
Sn	LM	ICP-AES
S	LM	ICP-AES
V	LM	ICP-AES
Zn	LM	ICP-AES
Zr	LM [a]	ICP-AES

2.3 Product Consistency Test

The PCT Method-A was performed on each of the quenched and CCC versions of the August 2014 glasses and the quenched versions of the October 2014 glasses to assess chemical durability.[5] Also included in the experimental test matrix was the Environmental Assessment (EA) benchmark glass,[6] the Approved Reference Material (ARM) glass,[7] and blanks from the sample cleaning batch.[b] Samples were ground, washed, and prepared according to the standard procedure.[5] Fifteen milliliters of Type-I ASTM water (as defined in the procedure) were added to 1.5 g of glass in stainless steel vessels. The vessels were closed, sealed, and placed in an oven at 90 ± 2 °C where the samples were maintained at temperature for 7 days. Once cooled, the resulting solutions were sampled (filtered and acidified), then labeled and analyzed by ICP-AES under the auspices of two analytical plans.[8,9] Samples of a multi-element, standard solution were also included in the analytical plans as a check on the accuracy of the ICP-AES instrument used for these measurements. Normalized concentrations were calculated based on both the targeted (provided by PNNL) and measured compositions using the average of the common logarithms of the leachate concentrations.

2.4 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in Savannah River Site Manual E7, Procedure 2.60. SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011, Rev. 2.

[a] The LM method was modified for P and Zr measurements for some of the study glasses, as will be discussed in Section 3.0.

[b] The EA glass was included in the PCT for reference but will not be discussed further in this report. WTP contractual requirements dictate the required performance of Hanford LAW glass rather than a comparison to the EA glass.

3.0 Results and Discussion

3.1 Review and Evaluation of Chemical Composition Measurements

Table A-1 and Table A-2 in Appendix A provide the elemental concentration measurements in wt % for the study glasses that were prepared by the LM method. Table A-3 in Appendix A provides the elemental concentration measurements in wt % from these glasses as prepared by the PF method. Table A-4 in Appendix A provides the elemental concentration measurements in wt % from these glasses as prepared by the KH method. Elemental measurements for samples of the LRM standard glass are also provided in the tables of Appendix A. These unprocessed data are provided as appendices to this report so that the values are readily available should they be of interest for future reviews.

A preliminary review with PNNL of the measured composition data identified unusually low measured values for phosphorous (P) and zirconium (Zr) for four of the study glasses: EWG-LAW-New-IL-166697, EWG-LAW-New-IL-166731, EWG-LAW-New-IL-151542, and EWG-LAW-New-IL-1721. The preparation and measurement of these glasses was reviewed to determine potential sources of the discrepancies.

The concentrations of P and Zr in these glasses were first evaluated using alternate methods. Zr was analyzed using the PF preparations with ICP-AES and the measured values were significantly higher than those measured after the LM preparation. P was evaluated as PO_4 using the KH preparation and IC. Results showed an increase in the measured P concentration relative to that measured with the LM preparation. Although the measured values remained below the targets with these methods, the results suggested a digestion error with the LM technique and not a glass batching error.

For the LM digestion, a dilute 4% HNO_3 solution and 2 ml of concentrated HCl are typically used to digest the glass monolith that forms in the fusion. PNNL suggested that precipitation of zirconyl phosphate may have occurred during the LM preparation. Literature showed that zirconyl phosphate is soluble in sulfuric acid. Therefore, the glasses were digested again using LM with a 4% HNO_3 solution, the addition of H_2SO_4, and the omission of HCl. Analyses of these solutions by ICP-AES showed a significant improvement with results near or at the targeted values for P and Zr for all digestions. Additional LM digestions were performed with various combinations of acids, with the results showing that measured P and Zr values were low when HCl was used in the preparation, and that H_2SO_4 assists in the solubility of P and Zr in the presence of HCl.

Based on this outcome, the four glasses in question were reanalyzed using the LM method with only a 4% HNO_3 solution. Analyses were performed in duplicate with two calibrations and the two digestions analyzed per calibration to yield four values for P and Zr for each of the four glasses. Analyses of the four glasses without HCl in the LM digestions resulted in all glasses meeting the targeted values for P and Zr. It is suspected that precipitation was occurring when HCl was used, perhaps as a function of time for these solutions.

A select group of other glasses from this study was analyzed using LM without HCl and the results were poor, with visible solids remaining in many of the solutions. This response was therefore unique to these four glasses, each of which targeted 1.01 wt % P_2O_5 and 1.5 wt % ZrO_2. It is not clear why this combination of P_2O_5 and ZrO_2 (concentrations of each being in the mid-range for this study) resulted in a unique response to the LM dissolution method and required special treatment.

The data resulting from the modified LM measurements of the four LAW glasses described above are given in Table A-5 in Appendix A. Data for the glasses listed in Table A-5 are substituted for the original P and Zr measurements of those glasses throughout this report, and these measurements are treated as an additional analytical block (Block 4) in the discussions that follow. Again, the unprocessed data in Table A-1 through Table A-5 of Appendix A are provided so that the values are readily available should they be of interest for future reviews.

In the sections that follow, the analytical sequences of the measurements are explored, the measurements of the LRM standard glass are investigated, the measurements for each glass are reviewed, the average chemical composition for each glass is determined, and comparisons are made between the measurements and the targeted compositions for the glasses. JMP™ Pro Version 11.2.1 (SAS Institute, Inc.)[10] was used to support these analyses.

3.1.1 Treatment of Detection Limits

The elemental concentrations in Table A-1 through Table A-5 of Appendix A were converted to oxide concentrations by multiplying the values for each element by the gravimetric factor for the corresponding oxide. During the process of converting to oxide concentrations, an elemental concentration that was reported to be below the detection limit of the analytical process used was set to the detection limit as the oxide concentration was determined for the purposes of review and calculating a sum of oxides for each glass. Those oxides with measured concentrations that were below the associated detection limit will be denoted with a less than symbol (<) as the measured compositions are reported.

3.1.2 Measurements in Analytical Sequence

Exhibit A-1 in Appendix A provides plots of the wt % measurements generated for each sample by oxide and analytical block. The plots are in analytical sequence within each calibration block with different symbols and colors being used to represent each of the study and standard glasses. These plots include all of the measurement data from Table A-1 through Table A-5 in Appendix A, with each plotted point identified by its Lab ID. Plotting the data in this format provides an opportunity to identify gross trends in performance of the analytical instruments within and among calibration blocks. A review of these plots did not identify any gross patterns or trends in the analytical process over the course of these measurements.

3.1.3 Composition Measurements by Glass Identifier

Exhibit A-2 in Appendix A provides plots of the oxide concentration measurements by the PNNL Glass ID (including the LRM reference glass) by Lab ID grouped by targeted concentration. Different symbols and colors are used to represent the different glasses. These plots show the individual measurements across the duplicates of each preparation method and the two instrument calibrations for each glass. Plotting the data in this format provides an opportunity to review the values for each individual glass as a function of the duplicate preparations and duplicate measurements. A review of the plots presented in these exhibits reveals the repeatability of the four individual values for each oxide for each glass and leads to the following observations:

- There is scatter among the B_2O_3 measurements for some of the study glasses.
- There is scatter seen in some of the Cl and F measurements, including one low F measurement for one of the LRM samples.
- There are some differences among the calibration blocks for the Na_2O measurements.
- There is scatter among the SiO_2 measurements for some of the study glasses.

None of the observations noted above were considered to indicate an error in preparation or measurement that had to be addressed in treatment of the data. Therefore, the entire set of measurement data was used in determining representative, measured compositions for the study glasses.

3.1.4 Results for the LRM Standard

Exhibit A-3 in Appendix A provides a comparison of the LRM results to their acceptability limits utilized by SRNL.[11] The review is in the form of a plot of the measurements arranged by preparation method and element, framed by upper and lower acceptability limits for the concentration of the element in question. The results show that all of the measurements for the elements present in the LRM standard glass were within the acceptability limits utilized by SRNL in conducting instrument and procedure assessments during the execution of these analyses.

3.1.5 Measured versus Targeted Compositions

From the discussion of Section 3.1.3, all of the measurements for each oxide for each glass (i.e., all of the measurements in Appendix A, Table A-1 through Table A-5), were averaged to determine a representative chemical composition for each glass. A sum of oxides was also computed for each glass based upon the averaged, measured values. Exhibit A-4 in Appendix A provides plots showing the result for each glass for each oxide to allow PNNL to draw comparisons between the measured and targeted values. For example, note that some measured B_2O_3, Cl, F, and SO_3 concentrations are somewhat below the targeted values for some of the study glasses. This may be due to volatility during fabrication of the glasses.

Table A-6 in Appendix A provides a summary of the average compositions as well as the targeted compositions and some associated differences and relative differences. All of the measured sums of oxides for the study glasses fall within the interval of 96 to 101 wt %, indicating recovery of all components. Entries in Table A-6 show the relative differences between the measured values and the targeted values for the oxides with targeted values above 5 wt %. The relative differences are shaded if they are 10% or more.[a]

3.2 Review and Evaluation of PCT Measurements

Table B-1 in Appendix B provides the elemental leachate concentration measurements, in two sets (August and October), for the solution samples generated by the PCTs for the study glasses and standards. The values for these measurements are given in the table as-received ("ar") from the laboratory analyses and after adjustments for dilutions. The "ar" measurements for the study glasses, blanks, and the ARM glass were multiplied by 1.6667 to determine the values in parts per million (ppm) and the "ar" measurements for EA were multiplied by 16.6667 to determine the values in ppm. A dilution error was made during the preparation of one of the PCT leachates for the quenched version of glass EWG-LAW-New-IL-456. The row corresponding to this leachate in Table B-1 is shaded. This measurement is omitted from the results presented in the following sections.

Based on the masses of the PCT vessels before and after the 7-day procedures, there were no samples that had water-loss issues. The ratio of leachant volume to the mass of ground glass was confirmed to be correct for each vessel. The measured concentrations of B, Li, Na, and Si in the leachates from the ARM glasses were compared to the control charts to demonstrate proper performance of the PCTs.[7] Two of the triplicate B values from the August 2014 set of PCTs and one of the triplicate B values from the October 2014 set of PCTs fell outside the limits of the

[a] These criteria were selected arbitrarily for the purpose of highlighting differences from targeted concentrations that may be of practical concern.

control chart, while all of the measured Li, Na, and Si concentrations in the ARM glass leachates fell within the limits of the control charts. The expectation is that an error in the performance of a PCT would result in a consistent divergence of the concentrations of the analytes of the ARM glass away from the limits of the control charts. Since there were no consistent issues with the ARM values for either of the two PCTs, the tests were considered to have been performed properly and no bias correction was performed.[a] The measured pH values for each of the PCT leachates are provided in Table B-2 and Table B-3 in Appendix B for reference.

In the sections that follow, the analytical sequences of the measurements are explored, the measurements for each glass are reviewed, the measurements of the multi-element solution standard are investigated, the normalized concentrations for each glass are determined, and comparisons are made between the PCTs for the two heat treatments of each glass (when available). JMP Pro Version 11.2.1 (SAS Institute, Inc.)[10] was used to support these analyses.

3.2.1 Treatment of Detection Limits

Some of the as-received measurements (Table B-1 in Appendix B) were below the detection limit of 1 ppm prior to correction for dilution. These measurements (indicated by a "<" symbol in Table B-1) were replaced by their detection limits in subsequent analyses for the purposes of review and calculating normalized concentration values. Those elements with measured concentrations that were below the associated detection limit will be denoted with a less than symbol (<) as the normalized concentration values are reported.

3.2.2 Results for the Samples of the Multi-Element Solution Standard

Table 3-1 provides a review of the measurements of the solution standard samples that were included in the analytical blocks for the PCT analyses. For each analytical block, the mean, standard deviation, and percent relative standard deviation (%RSD) are determined for each element present in the standard. Following the guidance in ASTM C 1285, there were two primary evaluations conducted for these summary statistics: the mean value for each analytical block was found to be less than 10% from the reference value (i.e., a percent relative bias less than 10%) for the element in question, and the %RSD was less than 10% for the element in question. The results in Table 3-1 satisfy these criteria, and thus, there are no significant issues with the analytical outcomes for the measurements of the PCT solutions.

[a] Data are provided in Appendix B to support bias correction per ASTM C 1285, Section 25.2 if desired.

Table 3-1. Results from Samples of the Multi-Element Solution Standard

Set	Aug	Aug	Aug	Oct	Oct	Oct	Reference
Block	1	2	3	1	2	3	values (ppm)
Mean (B (ppm))	21.2	21.1	20.5	19.8	20.4	21.0	20
Mean (Li (ppm))	9.6	9.5	9.7	10.0	9.9	10.0	10
Mean (Na (ppm))	79.9	78.7	82.0	84.5	83.3	82.3	81
Mean (Si (ppm))	49.3	48.7	49.2	50.3	49.6	49.6	50
% relative bias B	6.2%	5.5%	2.3%	-0.8%	2.2%	5.2%	
% relative bias Li	-3.7%	-5.5%	-3.1%	-0.5%	-1.0%	0.3%	<10% per
% relative bias Na	-1.3%	-2.8%	1.2%	4.4%	2.8%	1.6%	ASTM C 1285
% relative bias Si	-1.4%	-2.6%	-1.6%	0.7%	-0.9%	-0.9%	
Std Dev (B (ppm))	0.351	0.557	1.172	1.155	0.666	0.808	
Std Dev (Li (ppm))	0.297	0.026	0.075	0.134	0.217	0.061	
Std Dev (Na (ppm))	2.836	0.839	1.825	1.274	2.066	1.000	
Std Dev (Si (ppm))	1.100	0.300	0.557	1.102	1.137	0.666	
%RSD (B (ppm))	1.65%	2.64%	5.73%	5.82%	3.26%	3.84%	
%RSD (Li (ppm))	3.08%	0.28%	0.77%	1.35%	2.19%	0.61%	<10% per
%RSD (Na (ppm))	3.55%	1.07%	2.23%	1.51%	2.48%	1.22%	ASTM C 1285
%RSD (Si (ppm))	2.23%	0.62%	1.13%	2.19%	2.29%	1.34%	

3.2.3 Measurements in Analytical Sequence

Exhibit B-1 in Appendix B provides plots of the common logarithms of the leachate concentrations (ppm) in analytical sequence by analytical block by analytical set. Each of the two analytical sets corresponds to an oven run that was used to conduct the PCT measurements needed to support the study of the August and October 2014 LAW glasses. Heat treatment is indicated by a suffix to the glass identifiers in these plots. Plotting the data in this format provides an opportunity to identify gross trends in performance of the analytical instrument within and among calibration blocks. No issues were observed in these plots.

3.2.4 Measurements by Glass Identifier

Exhibit B-2 in Appendix B provides plots of the leachate concentrations for both the quenched and CCC versions (when available) of each of the study glasses and for the standards for each analytical set. Heat treatment is indicated by a suffix to the glass identifiers in these plots. These plots are in common logarithms of the ppm values and allow for the assessment of the repeatability of the measurements and any differences between the quenched and CCC version of a given glass when available. For some of the glasses, minor scatter among the triplicate values of some analytes is observed. In addition, there are differences in the PCT responses between the quenched and CCC versions of some of the study glasses.

3.2.5 Normalization of the PCT Results

The PCT data were normalized using both the targeted and measured compositions of the glasses to obtain grams-per-liter (g/L) concentrations of each element of interest in each leachate. The common logarithm of the normalized concentration (NC_i) for each element (i) of interest was determined as described in ASTM C 1285 and used for comparison.[a]

3.2.6 Effects of Heat Treatments

Exhibit B-3 in Appendix B provides plots of the normalized PCT responses for each of the study glasses with the heat treatment of each glass indicated, as well as for the responses of the ARM and EA glasses. The results are grouped by compositional view. Heat treatment is indicated by a suffix to the glass identifiers in these plots. Note that an indicator is provided as part of these plots to show results involving below detection limit (bdl) values.

The plots of Exhibit B-3 provide a graphical comparison between the PCT responses for the heat treatments of each study glass where more than one heat treatment was available. Table 3-2 provides a listing of the normalized PCT responses. In reading this table, note that bdl values are indicated and that results are omitted for those elements with targeted concentrations of zero for a given glass composition.

A review of the PCT results shows that five of the study glasses have normalized concentration values for boron and sodium (NC_B and NC_{Na}) for both the quenched and CCC heat treatments that are higher than the WTP contract[b] limit of 4.0 g/L.[c] These glasses are:

- EWG-LAW-New-IL-42295
- EWG-LAW-New-OL-17130
- EWG-LAW-New-IL-5255
- EWG-LAW-New-OL-14844
- EWG-LAW-New-OL-90780

Glass EWG-LAW-New-OL-17130 also has a NC_{Si} value for both the quenched and CCC heat treatments that is greater than 4.0 g/L. Note that the NC_i values for glass EWG-LAW-New-IL-42295 are higher for the quenched version of the glass than for the CCC version. Additional characterization, such as X-ray diffraction analysis to identify possible crystalline phases, would be beneficial for further interpretation of the PCT results. One could also examine the glasses for amorphous phase separation using transmission electron microscopy or test for the potential of amorphous phase separation using a model.[12]

[a] Note that the waste forms in this study were assumed to be of similar density, the PCT-A reference volume of leachant to sample mass ratio was used, and the 100 to 200 mesh reference particle size was used. Thus, no adjustment for the density of the glasses was made in normalizing the PCT results. Data provided in the appendices of this report allow for the calculation of normalized elemental mass loss (NL_i) if glass densities are measured at a later date.
[b] WTP Contract, U.S. DOE Contract Number DE-AC27-01RV14136, Section C, Specification 2.2.2.17.2.
[c] A glass density of 2.67 g/cm^3 was assumed in converting the WTP contract limit of 2.0 g/m^2 to 4.0 g/L.

Table 3-2. Normalized PCT Results

Set	Glass ID	Heat Treatment	Compositional View	NC_B (g/L)	NC_{Li} (g/L)	NC_{Na} (g/L)	NC_{Si} (g/L)
Aug	ARM	ref	ref	0.618	0.612	0.528	0.293
Aug	EWG-LAW-New-IL-42295	ccc	measured	15.291	12.157	10.067	1.978
Aug	EWG-LAW-New-IL-42295	ccc	targeted	15.011	11.647	10.267	2.003
Aug	EWG-LAW-New-IL-42295	quenched	measured	19.815	15.333	12.938	2.303
Aug	EWG-LAW-New-IL-42295	quenched	targeted	19.453	14.690	13.195	2.331
Aug	EWG-LAW-New-IL-456	ccc	measured	0.556	0.785	0.764	0.241
Aug	EWG-LAW-New-IL-456	ccc	targeted	0.554	0.759	0.767	0.245
Aug	EWG-LAW-New-IL-456	quenched	measured	0.502	0.828	0.898	0.264
Aug	EWG-LAW-New-IL-456	quenched	targeted	0.500	0.801	0.902	0.268
Aug	EWG-LAW-New-IL-87749	ccc	measured	1.327	1.509	1.439	0.385
Aug	EWG-LAW-New-IL-87749	ccc	targeted	1.287	1.425	1.456	0.384
Aug	EWG-LAW-New-IL-87749	quenched	measured	0.471	0.756	0.973	0.238
Aug	EWG-LAW-New-IL-87749	quenched	targeted	0.457	0.714	0.984	0.238
Aug	EWG-LAW-New-OL-100210	ccc	measured	1.868	-	2.481	1.166
Aug	EWG-LAW-New-OL-100210	ccc	targeted	1.789	-	2.617	1.156
Aug	EWG-LAW-New-OL-100210	quenched	measured	2.156	-	2.672	1.281
Aug	EWG-LAW-New-OL-100210	quenched	targeted	2.066	-	2.819	1.269
Aug	EWG-LAW-New-OL-17130	ccc	measured	23.582	19.459	18.143	4.842
Aug	EWG-LAW-New-OL-17130	ccc	targeted	22.407	18.391	17.676	4.794
Aug	EWG-LAW-New-OL-17130	quenched	measured	23.964	19.634	17.376	4.908
Aug	EWG-LAW-New-OL-17130	quenched	targeted	22.769	18.557	16.928	4.859
Oct	ARM	ref	ref	0.427	0.576	0.507	0.284
Oct	EWG-LAW-Centroid 1	quenched	targeted	0.803	0.691	1.048	0.320
Oct	EWG-LAW-Centroid 1	quenched	measured	0.828	0.739	1.021	0.322
Oct	EWG-LAW-Centroid 2	quenched	targeted	0.796	0.673	1.054	0.316
Oct	EWG-LAW-Centroid 2	quenched	measured	0.820	0.712	1.009	0.312
Oct	EWG-LAW-New-IL-103151	quenched	targeted	2.109	1.295	2.025	0.788
Oct	EWG-LAW-New-IL-103151	quenched	measured	2.276	1.428	1.955	0.816
Oct	EWG-LAW-New-IL-151542	quenched	targeted	0.634	0.791	0.950	0.286
Oct	EWG-LAW-New-IL-151542	quenched	measured	0.677	0.869	0.903	0.287

Table 3-2. Normalized PCT Results (continued)

Set	Glass ID	Heat Treatment	Compositional View	NC_B (g/L)	NC_{Li} (g/L)	NC_{Na} (g/L)	NC_{Si} (g/L)
Oct	EWG-LAW-New-IL-166697	quenched	targeted	0.799	0.608	0.895	0.359
Oct	EWG-LAW-New-IL-166697	quenched	measured	0.834	0.643	0.877	0.352
Oct	EWG-LAW-New-IL-166731	quenched	targeted	0.812	0.661	1.004	0.364
Oct	EWG-LAW-New-IL-166731	quenched	measured	0.840	0.708	0.976	0.359
Oct	EWG-LAW-New-IL-1721	quenched	targeted	2.552	2.290	2.181	0.670
Oct	EWG-LAW-New-IL-1721	quenched	measured	2.578	2.371	2.142	0.661
Oct	EWG-LAW-New-IL-5253	quenched	targeted	1.600	1.483	1.450	0.423
Oct	EWG-LAW-New-IL-5253	quenched	measured	1.689	1.573	1.484	0.423
Oct	EWG-LAW-New-IL-5255	quenched	targeted	13.194	10.867	10.239	1.536
Oct	EWG-LAW-New-IL-5255	quenched	measured	13.865	11.700	10.558	1.543
Oct	EWG-LAW-New-IL-70316	quenched	targeted	0.626	0.914	1.347	0.343
Oct	EWG-LAW-New-IL-70316	quenched	measured	0.653	0.979	1.364	0.345
Oct	EWG-LAW-New-IL-93907	quenched	targeted	0.427	0.454	0.520	0.253
Oct	EWG-LAW-New-IL-93907	quenched	measured	0.464	0.495	0.541	0.259
Oct	EWG-LAW-New-IL-94020	quenched	targeted	0.497	0.564	0.668	0.276
Oct	EWG-LAW-New-IL-94020	quenched	measured	0.520	0.603	0.655	0.282
Oct	EWG-LAW-New-OL-122817	quenched	targeted	0.293	-	1.075	0.234
Oct	EWG-LAW-New-OL-122817	quenched	measured	0.295	-	1.037	0.239
Oct	EWG-LAW-New-OL-14844	quenched	targeted	7.610	7.743	7.373	1.247
Oct	EWG-LAW-New-OL-14844	quenched	measured	8.143	8.277	7.266	1.208
Oct	EWG-LAW-New-OL-15493	quenched	targeted	0.952	-	3.233	0.609
Oct	EWG-LAW-New-OL-15493	quenched	measured	0.962	-	3.114	0.609
Oct	EWG-LAW-New-OL-57284	quenched	targeted	1.707	-	1.555	0.419
Oct	EWG-LAW-New-OL-57284	quenched	measured	1.756	-	1.549	0.420
Oct	EWG-LAW-New-OL-62380	quenched	targeted	0.329	-	0.501	0.120
Oct	EWG-LAW-New-OL-62380	quenched	measured	0.359	-	0.509	0.120
Oct	EWG-LAW-New-OL-8445	quenched	targeted	0.530	0.656	0.638	0.093
Oct	EWG-LAW-New-OL-8445	quenched	measured	0.537	0.692	0.663	0.091
Oct	EWG-LAW-New-OL-90780	quenched	targeted	4.838	4.150	2.929	0.564
Oct	EWG-LAW-New-OL-90780	quenched	measured	4.987	4.307	2.949	0.560
Oct	LAW-ORP-LD1	quenched	targeted	0.933	-	1.192	0.274
Oct	LAW-ORP-LD1	quenched	measured	0.975	-	1.211	0.275

4.0 Summary

In this report, SRNL provides chemical analyses and PCT results for several simulated LAW glasses (designated as the August and October 2014 LAW glasses) fabricated by PNNL. The results of these analyses will be used as part of efforts to revise or extend the validation regions of the current WTP glass property models (or develop new models) to cover a broader span of waste compositions.

The measured chemical composition data are reported and compared with the targeted values for each component for each glass. There was an issue with P and Zr measurements for four of the study glasses due to the formation of a precipitate containing these elements during the analytical sample preparation. This issue was corrected by omitting HCl from the sample preparation method for these glasses.

All of the measured sums of oxides for the study glasses fall within the interval of 96 to 101 wt %. Comparisons of the targeted and measured chemical compositions showed that the measured values for the glasses met the targeted concentrations within 10% for those components present at more than 5 wt %.

The PCT results were normalized to both the targeted and measured compositions of the study glasses. Five of the study glasses have normalized concentration values for boron and sodium (NC_B and NC_{Na}) that are higher than the WTP contract limit of 4.0 g/L for both the quenched and CCC heat treatments. These glasses are EWG-LAW-New-IL-42295, EWG-LAW-New-OL-17130, EWG-LAW-New-IL-5255, EWG-LAW-New-OL-14844, and EWG-LAW-New-OL-90780. These results can be combined with additional characterization, including X-ray diffraction, to determine the cause of the higher releases.

5.0 References

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Appendix A Tables and Exhibits Supporting the Chemical Composition Measurements

Table A-1. LM Measurements of the LAW Study Glasses – Part 1

ID	Block	Sub-Blk	Sequence	Lab ID	Ca (wt%)	Cr (wt%)	Fe (wt%)	K (wt%)	Mg (wt%)	Na (wt%)
LRM	1	1	1	LRMLM111	0.394	0.142	1.04	1.31	<0.100	15.9
EWG-LAW-Centroid 1	1	1	2	T05LM11	3.88	0.101	0.720	0.372	0.861	14.7
EWG-LAW-New-OL-122817	1	1	3	T13LM11	8.50	0.217	1.06	1.33	<0.100	14.4
EWG-LAW-New-OL-57284	1	1	4	T12LM11	2.09	0.218	<0.100	1.35	<0.100	10.7
EWG-LAW-New-OL-100210	1	1	5	T04LM21	1.32	0.222	<0.100	<0.100	1.88	20.8
EWG-LAW-New-OL-122817	1	1	6	T13LM21	8.31	0.224	1.09	1.37	<0.100	14.9
EWG-LAW-New-IL-42295	1	1	7	T22LM21	1.96	<0.100	0.915	0.197	1.36	13.5
EWG-LAW-New-OL-100210	1	1	8	T04LM11	1.37	0.218	<0.100	<0.100	1.86	20.8
EWG-LAW-New-IL-103151	1	1	9	T06LM21	2.01	<0.100	0.884	0.902	1.34	18.0
LRM	1	1	10	LRMLM112	0.396	0.140	1.02	1.28	<0.100	15.8
EWG-LAW-New-IL-456	1	1	11	T24LM21	6.39	<0.100	0.887	0.191	1.34	11.7
EWG-LAW-New-IL-42295	1	1	12	T22LM11	1.97	<0.100	0.895	0.189	1.34	13.5
EWG-LAW-New-IL-151542	1	1	13	T07LM21	6.26	0.143	0.866	0.180	1.33	13.5
EWG-LAW-Centroid 2	1	1	14	T20LM21	3.80	0.103	0.731	0.399	0.858	15.1
EWG-LAW-New-OL-57284	1	1	15	T12LM21	2.05	0.224	<0.100	1.38	<0.100	10.9
EWG-LAW-New-IL-103151	1	1	16	T06LM11	1.99	<0.100	0.917	0.923	1.38	18.1
EWG-LAW-New-IL-151542	1	1	17	T07LM11	6.22	0.151	0.915	0.192	1.40	14.0
EWG-LAW-Centroid 1	1	1	18	T05LM21	3.78	0.100	0.713	0.391	0.856	15.3
EWG-LAW-Centroid 2	1	1	19	T20LM11	3.73	0.101	0.752	0.382	0.851	15.7
EWG-LAW-New-IL-456	1	1	20	T24LM11	6.06	<0.100	0.906	0.196	1.37	11.9
LRM	1	1	21	LRMLM113	0.388	0.143	1.05	1.31	<0.100	16.1
LRM	1	2	1	LRMLM121	0.367	0.134	0.988	1.22	<0.100	15.5
EWG-LAW-Centroid 1	1	2	2	T05LM12	3.80	<0.100	0.673	0.342	0.809	13.9
EWG-LAW-New-OL-57284	1	2	3	T12LM12	2.08	0.209	<0.100	1.27	<0.100	9.93
EWG-LAW-New-IL-151542	1	2	4	T07LM22	6.23	0.150	0.914	0.192	1.39	13.5
EWG-LAW-New-IL-103151	1	2	5	T06LM12	1.98	<0.100	0.907	0.911	1.37	16.5
EWG-LAW-Centroid 1	1	2	6	T05LM22	3.81	0.100	0.721	0.394	0.865	14.0
EWG-LAW-Centroid 2	1	2	7	T20LM22	3.81	0.101	0.724	0.393	0.850	13.7
EWG-LAW-New-IL-103151	1	2	8	T06LM22	1.94	<0.100	0.899	0.910	1.36	16.5
EWG-LAW-New-OL-100210	1	2	9	T04LM12	1.30	0.225	<0.100	<0.100	1.91	19.5
LRM	1	2	10	LRMLM122	0.357	0.142	1.04	1.29	<0.100	15.6
EWG-LAW-New-IL-42295	1	2	11	T22LM12	1.98	<0.100	0.898	0.189	1.35	13.0
EWG-LAW-Centroid 2	1	2	12	T20LM12	3.86	0.099	0.746	0.378	0.843	14.4
EWG-LAW-New-OL-100210	1	2	13	T04LM22	1.35	0.217	<0.100	<0.100	1.86	20.3
EWG-LAW-New-IL-151542	1	2	14	T07LM12	6.39	0.145	0.885	0.183	1.36	13.2
EWG-LAW-New-OL-122817	1	2	15	T13LM12	8.71	0.214	1.05	1.29	<0.100	13.9
EWG-LAW-New-IL-456	1	2	16	T24LM12	6.35	<0.100	0.884	0.185	1.34	10.8
EWG-LAW-New-OL-122817	1	2	17	T13LM22	8.72	0.214	1.04	1.28	<0.100	14.0
EWG-LAW-New-IL-42295	1	2	18	T22LM22	1.92	<0.100	0.869	0.182	1.30	12.9

Table A-1. LM Measurements of the LAW Study Glasses – Part 1 (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Ca (wt%)	Cr (wt%)	Fe (wt%)	K (wt%)	Mg (wt%)	Na (wt%)
EWG-LAW-New-IL-456	1	2	19	T24LM22	6.22	<0.100	0.899	0.124	1.37	10.3
EWG-LAW-New-OL-57284	1	2	20	T12LM22	2.07	0.222	<0.100	1.381	<0.100	10.2
LRM	1	2	21	LRMLM123	0.394	0.144	1.06	1.33	<0.100	15.5
LRM	2	1	1	LRMLM211	0.353	0.134	0.965	1.20	<0.100	15.8
EWG-LAW-New-OL-90780	2	1	2	T18LM21	<0.100	0.204	<0.100	1.33	1.77	11.8
EWG-LAW-New-IL-87749	2	1	3	T10LM21	6.50	<0.100	0.835	0.842	0.277	13.7
EWG-LAW-New-IL-166731	2	1	4	T03LM21	2.06	0.141	0.362	0.177	1.30	14.3
EWG-LAW-New-OL-14844	2	1	5	T01LM11	8.97	0.201	<0.100	1.13	1.74	11.8
EWG-LAW-New-IL-94020	2	1	6	T11LM11	2.60	<0.100	0.835	0.180	1.26	11.6
EWG-LAW-New-IL-166731	2	1	7	T03LM11	1.99	0.138	0.352	0.171	1.26	14.0
EWG-LAW-New-IL-1721	2	1	8	T19LM11	1.99	0.138	0.810	0.814	0.281	12.5
EWG-LAW-New-IL-166697	2	1	9	T02LM11	1.97	0.134	0.799	0.805	0.282	13.1
LRM	2	1	10	LRMLM212	0.374	0.127	0.915	1.12	<0.100	15.6
EWG-LAW-New-OL-15493	2	1	11	T15LM11	8.83	<0.100	<0.100	1.25	1.76	19.8
EWG-LAW-New-IL-1721	2	1	12	T19LM21	2.00	0.145	0.857	0.862	0.297	12.5
EWG-LAW-New-IL-94020	2	1	13	T11LM21	2.58	<0.100	0.856	0.184	1.30	11.4
EWG-LAW-New-OL-14844	2	1	14	T01LM21	8.83	0.208	<0.100	1.17	1.79	11.6
EWG-LAW-New-OL-90780	2	1	15	T18LM11	<0.100	0.207	<0.100	1.28	1.78	11.5
EWG-LAW-New-IL-87749	2	1	16	T10LM11	6.25	<0.100	0.817	0.826	0.270	12.9
EWG-LAW-New-OL-15493	2	1	17	T15LM21	8.41	<0.100	<0.100	1.22	1.75	19.5
EWG-LAW-New-IL-166697	2	1	18	T02LM21	1.89	0.141	0.857	0.847	0.300	13.7
LRM	2	1	19	LRMLM213	0.355	0.136	0.983	1.21	<0.100	15.8
LRM	2	2	1	LRMLM221	0.366	0.141	1.00	1.22	<0.100	16.3
EWG-LAW-New-IL-87749	2	2	2	T10LM22	6.31	<0.100	0.858	0.868	0.280	13.4
EWG-LAW-New-OL-14844	2	2	3	T01LM12	8.72	0.213	<0.100	1.14	1.78	11.7
EWG-LAW-New-OL-14844	2	2	4	T01LM22	8.67	0.216	<0.100	1.15	1.80	11.6
EWG-LAW-New-IL-166697	2	2	5	T02LM12	1.93	0.150	0.866	0.845	0.301	13.2
EWG-LAW-New-IL-1721	2	2	6	T19LM22	1.97	0.153	0.875	0.867	0.299	12.4
EWG-LAW-New-IL-94020	2	2	7	T11LM12	2.47	<0.100	0.885	0.184	1.31	11.1
EWG-LAW-New-IL-166697	2	2	8	T02LM22	1.89	0.151	0.882	0.850	0.305	13.0
EWG-LAW-New-IL-166731	2	2	9	T03LM12	1.94	0.154	0.380	0.177	1.34	13.5
LRM	2	2	10	LRMLM222	0.352	0.146	1.01	1.19	<0.100	15.6
EWG-LAW-New-OL-90780	2	2	11	T18LM22	<0.100	0.226	<0.100	1.33	1.83	11.3
EWG-LAW-New-OL-90780	2	2	12	T18LM12	<0.100	0.228	<0.100	1.31	1.84	11.1
EWG-LAW-New-IL-166731	2	2	13	T03LM22	1.89	0.157	0.387	0.180	1.36	13.2
EWG-LAW-New-IL-87749	2	2	14	T10LM12	5.94	<0.100	0.876	0.858	0.286	12.5
EWG-LAW-New-IL-1721	2	2	15	T19LM12	1.95	0.160	0.901	0.840	0.307	12.3
EWG-LAW-New-IL-94020	2	2	16	T11LM22	2.51	<0.100	0.904	0.183	1.35	11.3
EWG-LAW-New-OL-15493	2	2	17	T15LM12	8.65	<0.100	<0.100	1.26	1.83	19.9

Table A-1. LM Measurements of the LAW Study Glasses – Part 1 (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Ca (wt%)	Cr (wt%)	Fe (wt%)	K (wt%)	Mg (wt%)	Na (wt%)
EWG-LAW-New-OL-15493	2	2	18	T15LM22	8.42	<0.100	<0.100	1.24	1.84	19.4
LRM	2	2	19	LRMLM223	0.365	0.152	1.04	1.21	<0.100	16.3
LRM	3	1	1	LRMLM311	0.382	0.140	1.01	1.27	<0.100	15.9
EWG-LAW-New-IL-93907	3	1	2	T17LM21	1.89	<0.100	0.863	0.902	0.285	11.0
EWG-LAW-New-OL-17130	3	1	3	T21LM21	1.10	0.219	1.05	<0.100	<0.100	12.0
EWG-LAW-New-IL-70316	3	1	4	T14LM11	6.04	<0.100	0.876	0.890	1.34	14.6
EWG-LAW-New-IL-5253	3	1	5	T08LM21	1.88	<0.100	0.893	0.194	1.36	10.8
EWG-LAW-New-OL-62380	3	1	6	T16LM11	8.45	<0.100	1.04	1.25	<0.100	10.3
EWG-LAW-New-IL-5255	3	1	7	T09LM21	1.82	<0.100	0.865	0.190	1.33	12.6
EWG-LAW-New-OL-62380	3	1	8	T16LM21	8.51	<0.100	1.05	1.24	<0.100	10.2
EWG-LAW-New-IL-93907	3	1	9	T17LM11	1.87	<0.100	0.881	0.887	0.291	10.7
LRM	3	1	10	LRMLM312	0.363	0.140	1.01	1.25	<0.100	15.6
LAW-ORP-LD1 (1)	3	1	11	T23LM21	5.41	0.343	0.704	0.155	0.562	15.5
EWG-LAW-New-IL-70316	3	1	12	T14LM21	6.06	<0.100	0.894	0.896	1.37	14.7
EWG-LAW-New-OL-8445	3	1	13	T25LM21	8.38	0.216	<0.100	1.30	1.83	7.11
LAW-ORP-LD1 (1)	3	1	14	T23LM11	5.35	0.343	0.702	0.157	0.558	15.2
EWG-LAW-New-IL-5253	3	1	15	T08LM11	1.86	<0.100	0.875	0.189	1.34	10.7
EWG-LAW-New-IL-5255	3	1	16	T09LM11	1.88	<0.100	0.865	0.186	1.33	12.9
EWG-LAW-New-OL-8445	3	1	17	T25LM11	8.38	0.225	<0.100	1.33	1.80	6.99
EWG-LAW-New-OL-17130	3	1	18	T21LM11	1.09	0.223	1.08	<0.100	<0.100	11.6
LRM	3	1	19	LRMLM313	0.352	0.143	1.03	1.28	<0.100	15.7
LRM	3	2	1	LRMLM321	0.385	0.138	1.01	1.17	<0.100	16.2
EWG-LAW-New-IL-5253	3	2	2	T08LM22	1.99	<0.100	0.871	0.192	1.34	11.2
EWG-LAW-New-IL-5255	3	2	3	T09LM22	2.01	<0.100	0.872	0.196	1.33	13.4
EWG-LAW-New-OL-62380	3	2	4	T16LM22	8.60	<0.100	1.06	1.23	<0.100	10.2
EWG-LAW-New-IL-5255	3	2	5	T09LM12	1.94	<0.100	0.855	0.190	1.32	12.9
LAW-ORP-LD1 (1)	3	2	6	T23LM12	5.49	0.335	0.676	0.157	0.545	15.4
EWG-LAW-New-OL-8445	3	2	7	T25LM12	8.45	0.225	<0.100	1.31	1.77	7.13
EWG-LAW-New-OL-17130	3	2	8	T21LM22	1.18	0.222	1.04	<0.100	<0.100	12.1
LAW-ORP-LD1 (1)	3	2	9	T23LM22	5.43	0.340	0.688	0.155	0.552	15.2
LRM	3	2	10	LRMLM322	0.411	0.144	0.998	1.22	<0.100	16.0
EWG-LAW-New-OL-8445	3	2	11	T25LM22	8.33	0.216	<0.100	1.24	1.78	7.32
EWG-LAW-New-IL-70316	3	2	12	T14LM12	6.27	<0.100	0.844	0.842	1.30	14.9
EWG-LAW-New-IL-5253	3	2	13	T08LM12	1.95	<0.100	0.840	0.186	1.29	10.8
EWG-LAW-New-OL-62380	3	2	14	T16LM12	8.60	<0.100	1.00	1.18	<0.100	10.2
EWG-LAW-New-IL-70316	3	2	15	T14LM22	6.34	<0.100	0.854	0.847	1.31	15.1
EWG-LAW-New-IL-93907	3	2	16	T17LM12	1.91	<0.100	0.862	0.854	0.289	10.7
EWG-LAW-New-IL-93907	3	2	17	T17LM22	1.91	<0.100	0.855	0.879	0.287	10.8
EWG-LAW-New-OL-17130	3	2	18	T21LM12	1.17	0.218	1.03	<0.100	<0.100	12.0
LRM	3	2	19	LRMLM323	0.439	0.142	0.987	1.20	<0.100	16.0

Table A-2. LM Measurements of the LAW Study Glasses – Part 2

ID	Block	Sub-Blk	Sequence	Lab ID	P (wt%)	S (wt%)	Sn (wt%)	V (wt%)	Zn (wt%)	Zr (wt%)
LRM	1	1	1	LRMLM111	0.209	<0.100	<0.100	<0.100	<0.100	0.691
EWG-LAW-Centroid 1	1	1	2	T05LM11	0.277	0.241	1.66	1.16	2.37	2.22
EWG-LAW-New-OL-122817	1	1	3	T13LM11	0.649	0.510	2.45	2.23	0.810	<0.100
EWG-LAW-New-OL-57284	1	1	4	T12LM11	0.598	<0.100	<0.100	2.25	3.80	3.64
EWG-LAW-New-OL-100210	1	1	5	T04LM21	0.663	0.380	2.65	<0.100	3.82	<0.100
EWG-LAW-New-OL-122817	1	1	6	T13LM21	0.663	0.529	2.50	2.27	0.86	<0.100
EWG-LAW-New-IL-42295	1	1	7	T22LM21	0.156	0.165	0.811	1.66	1.63	3.50
EWG-LAW-New-OL-100210	1	1	8	T04LM11	0.647	0.371	2.60	<0.100	3.81	<0.100
EWG-LAW-New-IL-103151	1	1	9	T06LM21	0.156	0.476	2.01	1.67	3.04	1.09
LRM	1	1	10	LRMLM112	0.203	<0.100	<0.100	<0.100	<0.100	0.681
EWG-LAW-New-IL-456	1	1	11	T24LM21	0.145	0.159	2.77	1.64	1.60	1.06
EWG-LAW-New-IL-42295	1	1	12	T22LM11	0.160	0.160	0.796	1.64	1.59	3.45
EWG-LAW-New-IL-151542	1	1	13	T07LM21	0.151	0.407	2.60	1.63	1.58	0.515
EWG-LAW-Centroid 2	1	1	14	T20LM21	0.289	0.291	1.67	1.17	2.43	2.24
EWG-LAW-New-OL-57284	1	1	15	T12LM21	0.635	<0.100	<0.100	2.28	3.90	3.79
EWG-LAW-New-IL-103151	1	1	16	T06LM11	0.163	0.501	2.09	1.71	3.16	1.12
EWG-LAW-New-IL-151542	1	1	17	T07LM11	0.161	0.442	2.74	1.72	1.67	0.543
EWG-LAW-Centroid 1	1	1	18	T05LM21	0.279	0.239	1.65	1.15	2.36	2.20
EWG-LAW-Centroid 2	1	1	19	T20LM11	0.280	0.277	1.64	1.16	2.38	2.23
EWG-LAW-New-IL-456	1	1	20	T24LM11	0.151	0.162	2.83	1.68	1.63	1.09
LRM	1	1	21	LRMLM113	0.211	<0.100	<0.100	<0.100	<0.100	0.696
LRM	1	2	1	LRMLM121	0.196	<0.100	<0.100	<0.100	<0.100	0.652
EWG-LAW-Centroid 1	1	2	2	T05LM12	0.256	0.223	1.55	1.09	2.28	2.07
EWG-LAW-New-OL-57284	1	2	3	T12LM12	0.571	<0.100	<0.100	2.15	3.66	3.48
EWG-LAW-New-IL-151542	1	2	4	T07LM22	0.160	0.439	2.72	1.71	1.65	0.540
EWG-LAW-New-IL-103151	1	2	5	T06LM12	0.159	0.492	2.06	1.70	3.12	1.11
EWG-LAW-Centroid 1	1	2	6	T05LM22	0.282	0.244	1.66	1.16	2.38	2.22
EWG-LAW-Centroid 2	1	2	7	T20LM22	0.288	0.290	1.64	1.15	2.40	2.21
EWG-LAW-New-IL-103151	1	2	8	T06LM22	0.161	0.492	2.04	1.69	3.12	1.10
EWG-LAW-New-OL-100210	1	2	9	T04LM12	0.676	0.390	2.68	<0.100	3.94	<0.100
LRM	1	2	10	LRMLM122	0.210	<0.100	<0.100	<0.100	<0.100	0.684
EWG-LAW-New-IL-42295	1	2	11	T22LM12	0.158	0.161	0.793	1.65	1.61	3.45
EWG-LAW-Centroid 2	1	2	12	T20LM12	0.276	0.279	1.61	1.14	2.36	2.21
EWG-LAW-New-OL-100210	1	2	13	T04LM22	0.647	0.374	2.59	<0.100	3.80	<0.100
EWG-LAW-New-IL-151542	1	2	14	T07LM12	0.149	0.421	2.63	1.66	1.60	0.515
EWG-LAW-New-OL-122817	1	2	15	T13LM12	0.641	0.509	2.39	2.20	0.821	<0.100
EWG-LAW-New-IL-456	1	2	16	T24LM12	0.145	0.158	2.74	1.63	1.61	1.05
EWG-LAW-New-OL-122817	1	2	17	T13LM22	0.633	0.505	2.37	2.17	0.835	<0.100
EWG-LAW-New-IL-42295	1	2	18	T22LM22	0.148	0.151	0.760	1.58	1.55	3.30

Table A-2. LM Measurements of the LAW Study Glasses – Part 2 (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	P (wt%)	S (wt%)	Sn (wt%)	V (wt%)	Zn (wt%)	Zr (wt%)
EWG-LAW-New-IL-456	1	2	19	T24LM22	0.155	0.134	2.63	1.65	1.63	1.05
EWG-LAW-New-OL-57284	1	2	20	T12LM22	0.628	<0.100	<0.100	2.28	3.85	3.78
LRM	1	2	21	LRMLM123	0.214	<0.100	<0.100	<0.100	<0.100	0.701
LRM	2	1	1	LRMLM211	0.192	<0.100	<0.100	<0.100	<0.100	0.642
EWG-LAW-New-OL-90780	2	1	2	T18LM21	0.611	0.481	2.24	2.10	0.782	<0.100
EWG-LAW-New-IL-87749	2	1	3	T10LM21	0.146	0.157	2.02	1.57	1.53	1.04
EWG-LAW-New-IL-166731	2	1	4	T03LM21	0.166	0.387	2.30	1.59	2.90	0.535
EWG-LAW-New-OL-14844	2	1	5	T01LM11	0.560	<0.100	0.00	2.07	3.54	4.35
EWG-LAW-New-IL-94020	2	1	6	T11LM11	0.147	0.297	2.58	0.265	2.85	1.03
EWG-LAW-New-IL-166731	2	1	7	T03LM11	0.131	0.377	2.23	1.54	2.87	0.446
EWG-LAW-New-IL-1721	2	1	8	T19LM11	0.183	0.414	2.41	1.52	1.45	0.569
EWG-LAW-New-IL-166697	2	1	9	T02LM11	0.250	0.403	2.48	1.50	2.75	0.762
LRM	2	1	10	LRMLM212	0.183	<0.100	<0.100	<0.100	<0.100	0.608
EWG-LAW-New-OL-15493	2	1	11	T15LM11	<0.100	<0.100	2.27	2.09	0.774	<0.100
EWG-LAW-New-IL-1721	2	1	12	T19LM21	0.182	0.436	2.55	1.60	1.54	0.570
EWG-LAW-New-IL-94020	2	1	13	T11LM21	0.150	0.306	2.66	0.27	2.95	1.05
EWG-LAW-New-OL-14844	2	1	14	T01LM21	0.591	<0.100	<0.100	2.13	3.61	4.45
EWG-LAW-New-OL-90780	2	1	15	T18LM11	0.619	0.491	2.26	2.11	0.775	<0.100
EWG-LAW-New-IL-87749	2	1	16	T10LM11	0.140	0.155	1.97	1.53	1.50	1.00
EWG-LAW-New-OL-15493	2	1	17	T15LM21	<0.100	<0.100	2.24	2.07	0.767	<0.100
EWG-LAW-New-IL-166697	2	1	18	T02LM21	0.174	0.436	2.50	1.61	2.99	0.54
LRM	2	1	19	LRMLM213	0.198	<0.100	<0.100	<0.100	<0.100	0.65
LRM	2	2	1	LRMLM221	0.203	<0.100	<0.100	<0.100	<0.100	0.638
EWG-LAW-New-IL-87749	2	2	2	T10LM22	0.155	0.162	2.07	1.60	1.58	1.04
EWG-LAW-New-OL-14844	2	2	3	T01LM12	0.597	0.054	<0.100	2.15	3.66	4.41
EWG-LAW-New-OL-14844	2	2	4	T01LM22	0.610	0.057	<0.100	2.18	3.69	4.46
EWG-LAW-New-IL-166697	2	2	5	T02LM12	0.228	0.454	2.70	1.63	3.01	0.700
EWG-LAW-New-IL-1721	2	2	6	T19LM22	0.157	0.459	2.56	1.64	1.61	0.491
EWG-LAW-New-IL-94020	2	2	7	T11LM12	0.165	0.327	2.73	0.28	3.04	1.06
EWG-LAW-New-IL-166697	2	2	8	T02LM22	0.162	0.465	2.56	1.68	3.10	0.483
EWG-LAW-New-IL-166731	2	2	9	T03LM12	0.116	0.421	2.36	1.67	3.09	0.391
LRM	2	2	10	LRMLM222	0.214	<0.100	<0.100	<0.100	<0.100	0.641
EWG-LAW-New-OL-90780	2	2	11	T18LM22	0.686	0.539	2.38	2.23	0.84	<0.100
EWG-LAW-New-OL-90780	2	2	12	T18LM12	0.687	0.541	2.39	2.23	0.84	<0.100
EWG-LAW-New-IL-166731	2	2	13	T03LM22	0.143	0.437	2.39	1.70	3.17	0.442
EWG-LAW-New-IL-87749	2	2	14	T10LM12	0.161	0.178	2.11	1.66	1.65	1.04
EWG-LAW-New-IL-1721	2	2	15	T19LM12	0.180	0.484	2.63	1.70	1.69	0.530
EWG-LAW-New-IL-94020	2	2	16	T11LM22	0.170	0.341	2.79	0.29	3.19	1.06
EWG-LAW-New-OL-15493	2	2	17	T15LM12	<0.100	<0.100	2.38	2.24	0.854	<0.100

Table A-2. LM Measurements of the LAW Study Glasses – Part 2 (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	P (wt%)	S (wt%)	Sn (wt%)	V (wt%)	Zn (wt%)	Zr (wt%)
EWG-LAW-New-OL-15493	2	2	18	T15LM22	<0.100	<0.100	2.40	2.26	0.850	<0.100
LRM	2	2	19	LRMLM223	0.223	0.104	<0.100	<0.100	<0.100	0.645
LRM	3	1	1	LRMLM311	0.201	<0.100	<0.100	<0.100	<0.100	0.655
EWG-LAW-New-IL-93907	3	1	2	T17LM21	0.146	0.360	2.71	0.277	1.58	1.05
EWG-LAW-New-OL-17130	3	1	3	T21LM21	0.651	<0.100	2.38	2.21	0.814	<0.100
EWG-LAW-New-IL-70316	3	1	4	T14LM11	0.148	0.499	2.77	1.65	1.57	1.06
EWG-LAW-New-IL-5253	3	1	5	T08LM21	0.164	0.392	2.79	1.67	3.06	3.28
EWG-LAW-New-OL-62380	3	1	6	T16LM11	0.150	<0.100	3.52	1.44	3.66	4.57
EWG-LAW-New-IL-5255	3	1	7	T09LM21	0.159	0.466	2.71	1.63	2.96	3.22
EWG-LAW-New-OL-62380	3	1	8	T16LM21	0.151	<0.100	3.50	1.45	3.65	4.61
EWG-LAW-New-IL-93907	3	1	9	T17LM11	0.150	0.372	2.74	0.28	1.59	1.09
LRM	3	1	10	LRMLM312	0.199	<0.100	<0.100	<0.100	<0.100	0.65
LAW-ORP-LD1 (1)	3	1	11	T23LM21	0.126	0.407	<0.100	0.56	2.32	2.17
EWG-LAW-New-IL-70316	3	1	12	T14LM21	0.154	0.516	2.83	1.67	1.64	1.09
EWG-LAW-New-OL-8445	3	1	13	T25LM21	0.642	<0.100	<0.100	<0.100	0.822	4.65
LAW-ORP-LD1 (1)	3	1	14	T23LM11	0.121	0.403	<0.100	0.56	2.33	2.15
EWG-LAW-New-IL-5253	3	1	15	T08LM11	0.160	0.386	2.72	1.64	3.01	3.22
EWG-LAW-New-IL-5255	3	1	16	T09LM11	0.156	0.468	2.70	1.62	3.00	3.19
EWG-LAW-New-OL-8445	3	1	17	T25LM11	0.614	<0.100	<0.100	<0.100	0.804	4.56
EWG-LAW-New-OL-17130	3	1	18	T21LM11	0.679	<0.100	2.40	2.25	0.830	<0.100
LRM	3	1	19	LRMLM313	0.208	<0.100	<0.100	<0.100	<0.100	0.658
LRM	3	2	1	LRMLM321	0.214	<0.100	<0.100	<0.100	<0.100	0.674
EWG-LAW-New-IL-5253	3	2	2	T08LM22	0.164	0.382	2.70	1.62	2.97	3.21
EWG-LAW-New-IL-5255	3	2	3	T09LM22	0.165	0.475	2.74	1.63	3.01	3.23
EWG-LAW-New-OL-62380	3	2	4	T16LM22	0.158	<0.100	3.53	1.45	3.68	4.60
EWG-LAW-New-IL-5255	3	2	5	T09LM12	0.161	0.461	2.69	1.61	2.93	3.20
LAW-ORP-LD1 (1)	3	2	6	T23LM12	0.120	0.385	<0.100	0.543	2.26	2.11
EWG-LAW-New-OL-8445	3	2	7	T25LM12	0.597	<0.100	<0.100	<0.100	0.81	4.50
EWG-LAW-New-OL-17130	3	2	8	T21LM22	0.647	<0.100	2.36	2.20	0.81	<0.100
LAW-ORP-LD1 (1)	3	2	9	T23LM22	0.127	0.395	<0.100	0.551	2.27	2.14
LRM	3	2	10	LRMLM322	0.206	<0.100	<0.100	<0.100	<0.100	0.652
EWG-LAW-New-OL-8445	3	2	11	T25LM22	0.620	<0.100	<0.100	<0.100	0.814	4.51
EWG-LAW-New-IL-70316	3	2	12	T14LM12	0.149	0.478	2.64	1.58	1.57	1.04
EWG-LAW-New-IL-5253	3	2	13	T08LM12	0.159	0.365	2.61	1.58	2.93	3.12
EWG-LAW-New-OL-62380	3	2	14	T16LM12	0.151	<0.100	3.35	1.39	3.53	4.43
EWG-LAW-New-IL-70316	3	2	15	T14LM22	0.152	0.487	2.68	1.61	1.57	1.06
EWG-LAW-New-IL-93907	3	2	16	T17LM12	0.154	0.363	2.66	0.278	1.56	1.05
EWG-LAW-New-IL-93907	3	2	17	T17LM22	0.153	0.367	2.65	0.276	1.55	1.04
EWG-LAW-New-OL-17130	3	2	18	T21LM12	0.648	<0.100	2.30	2.14	0.782	<0.100
LRM	3	2	19	LRMLM323	0.204	<0.100	<0.100	<0.100	<0.100	0.633

Table A-3. PF Measurements of the LAW Study Glasses

ID	Block	Sub-Blk	Sequence	Lab ID	Al (wt %)	B (wt %)	Li (wt %)	Si (wt %)
LRM	1	1	1	LRMPF111	5.07	2.45	0.107	25.4
EWG-LAW-New-IL-456	1	1	2	T24PF11	3.31	2.48	1.56	20.3
EWG-LAW-New-IL-166697	1	1	3	T02PF11	5.81	3.15	1.57	17.2
EWG-LAW-New-OL-122817	1	1	4	T13PF21	1.90	1.86	<0.100	20.3
EWG-LAW-New-IL-1721	1	1	5	T19PF11	3.35	3.67	1.58	20.4
EWG-LAW-New-OL-15493	1	1	6	T15PF21	1.87	1.84	<0.100	18.2
EWG-LAW-New-IL-166697	1	1	7	T02PF21	5.93	3.20	1.58	17.8
EWG-LAW-New-IL-42295	1	1	8	T22PF11	3.42	3.72	1.60	20.7
EWG-LAW-New-OL-15493	1	1	9	T15PF11	1.94	1.93	<0.100	19.0
LRM	1	1	10	LRMPF112	5.15	2.41	0.10771	26.1
EWG-LAW-New-IL-456	1	1	11	T24PF21	3.33	2.52	1.59	20.6
EWG-LAW-New-OL-57284	1	1	12	T12PF11	1.96	4.37	<0.100	22.7
EWG-LAW-New-OL-122817	1	1	13	T13PF11	1.89	1.88	<0.100	20.4
EWG-LAW-New-IL-1721	1	1	14	T19PF21	3.36	3.66	1.58	20.9
EWG-LAW-New-IL-42295	1	1	15	T22PF21	3.38	3.70	1.59	20.6
EWG-LAW-New-OL-8445	1	1	16	T25PF11	6.54	4.31	0.901	16.5
EWG-LAW-New-OL-8445	1	1	17	T25PF21	6.40	4.19	0.893	15.9
LAW-ORP-LD1 (1)	1	1	18	T23PF21	5.21	3.59	<0.100	17.6
LAW-ORP-LD1 (1)	1	1	19	T23PF11	5.21	3.61	<0.100	17.2
EWG-LAW-New-OL-57284	1	1	20	T12PF21	1.91	4.16	<0.100	22.1
LRM	1	1	21	LRMPF113	5.22	2.48	0.106	26.5
LRM	1	2	1	LRMPF121	5.01	2.42	0.103	25.0
EWG-LAW-New-OL-122817	1	2	2	T13PF22	1.88	1.86	<0.100	20.2
EWG-LAW-New-OL-8445	1	2	3	T25PF12	6.43	4.25	0.877	16.1
EWG-LAW-New-OL-15493	1	2	4	T15PF12	1.88	1.84	<0.100	18.3
EWG-LAW-New-OL-8445	1	2	5	T25PF22	6.30	4.11	0.870	16.3
LAW-ORP-LD1 (1)	1	2	6	T23PF12	5.15	3.50	<0.100	17.0
LAW-ORP-LD1 (1)	1	2	7	T23PF22	5.21	3.61	<0.100	17.5
EWG-LAW-New-IL-166697	1	2	8	T02PF12	5.58	2.95	1.52	17.6
EWG-LAW-New-IL-42295	1	2	9	T22PF22	3.15	3.35	1.49	19.0
LRM	1	2	10	LRMPF122	5.02	2.34	0.101	25.1
EWG-LAW-New-OL-57284	1	2	11	T12PF22	1.85	4.01	<0.100	21.2
EWG-LAW-New-IL-166697	1	2	12	T02PF22	5.49	2.86	1.48	17.6
EWG-LAW-New-IL-456	1	2	13	T24PF22	3.33	2.47	1.58	20.6
EWG-LAW-New-OL-15493	1	2	14	T15PF22	1.86	1.77	<0.100	17.9
EWG-LAW-New-IL-1721	1	2	15	T19PF22	3.34	3.59	1.57	20.6
EWG-LAW-New-OL-122817	1	2	16	T13PF12	1.85	1.80	<0.100	19.9
EWG-LAW-New-IL-1721	1	2	17	T19PF12	3.29	3.53	1.55	20.1
EWG-LAW-New-IL-456	1	2	18	T24PF12	3.30	2.43	1.56	20.4

Table A-3. PF Measurements of the LAW Study Glasses (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Al (wt %)	B (wt %)	Li (wt %)	Si (wt %)
EWG-LAW-New-IL-42295	1	2	19	T22PF12	3.31	3.56	1.55	20.0
EWG-LAW-New-OL-57284	1	2	20	T12PF12	1.88	4.07	<0.100	21.7
LRM	1	2	21	LRMPF123	5.08	2.35	0.102	25.5
LRM	2	1	1	LRMPF211	5.09	2.41	<0.100	25.4
EWG-LAW-New-OL-90780	2	1	2	T18PF11	7.14	4.18	2.21	16.1
EWG-LAW-New-IL-70316	2	1	3	T14PF11	3.24	2.37	0.418	17.9
EWG-LAW-Centroid 1	2	1	4	T05PF11	4.50	2.91	0.832	18.3
EWG-LAW-New-IL-94020	2	1	5	T11PF21	5.78	2.34	1.49	19.8
EWG-LAW-New-IL-5255	2	1	6	T09PF11	3.15	3.36	1.46	17.0
EWG-LAW-New-IL-103151	2	1	7	T06PF11	3.12	2.25	0.400	18.5
EWG-LAW-Centroid 2	2	1	8	T20PF21	4.43	2.79	0.829	18.2
EWG-LAW-New-IL-103151	2	1	9	T06PF21	3.13	2.26	0.396	18.6
LRM	2	1	10	LRMPF212	5.12	2.36	<0.100	25.6
EWG-LAW-New-IL-87749	2	1	11	T10PF21	6.02	2.48	1.54	17.8
EWG-LAW-New-IL-5255	2	1	12	T09PF21	3.32	3.60	1.54	17.5
EWG-LAW-Centroid 2	2	1	13	T20PF11	4.72	3.09	0.872	18.9
EWG-LAW-New-IL-70316	2	1	14	T14PF21	3.17	2.30	0.410	17.6
EWG-LAW-New-IL-87749	2	1	15	T10PF11	5.87	2.34	1.52	17.3
EWG-LAW-New-OL-90780	2	1	16	T18PF21	7.15	4.09	2.23	16.1
EWG-LAW-Centroid 1	2	1	17	T05PF21	4.56	2.96	0.851	18.2
EWG-LAW-New-IL-94020	2	1	18	T11PF11	5.84	2.35	1.51	19.4
LRM	2	1	19	LRMPF213	5.04	2.31	<0.100	25.4
LRM	2	2	1	LRMPF221	5.07	2.47	0.105	25.3
EWG-LAW-New-IL-5255	2	2	2	T09PF22	3.21	3.45	1.51	16.8
EWG-LAW-New-IL-87749	2	2	3	T10PF12	5.82	2.41	1.53	17.3
EWG-LAW-Centroid 1	2	2	4	T05PF22	4.63	3.08	0.884	18.6
EWG-LAW-Centroid 2	2	2	5	T20PF22	4.74	3.12	0.902	18.9
EWG-LAW-New-IL-94020	2	2	6	T11PF22	6.01	2.48	1.56	20.6
EWG-LAW-New-IL-87749	2	2	7	T10PF22	5.91	2.41	1.55	17.4
EWG-LAW-Centroid 2	2	2	8	T20PF12	4.78	3.06	0.913	18.9
EWG-LAW-Centroid 1	2	2	9	T05PF12	4.78	3.10	0.905	18.4
LRM	2	2	10	LRMPF222	5.20	2.43	0.104	26.0
EWG-LAW-New-IL-70316	2	2	11	T14PF22	3.29	2.44	0.454	18.2
EWG-LAW-New-IL-70316	2	2	12	T14PF12	3.30	2.42	0.452	18.3
EWG-LAW-New-IL-103151	2	2	13	T06PF12	3.27	2.36	0.453	19.3
EWG-LAW-New-OL-90780	2	2	14	T18PF12	7.11	4.09	2.23	15.9
EWG-LAW-New-OL-90780	2	2	15	T18PF22	7.31	4.21	2.28	16.5
EWG-LAW-New-IL-5255	2	2	16	T09PF12	3.27	3.48	1.53	17.1
EWG-LAW-New-IL-103151	2	2	17	T06PF22	3.21	2.34	0.436	19.1
EWG-LAW-New-IL-94020	2	2	18	T11PF12	5.78	2.34	1.52	19.2

Table A-3. PF Measurements of the LAW Study Glasses (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Al (wt %)	B (wt %)	Li (wt %)	Si (wt %)
LRM	2	2	19	LRMPF223	4.98	2.27	0.103	24.8
LRM	3	1	1	LRMPF311	5.02	2.46	<0.100	25.2
EWG-LAW-New-IL-166731	3	1	2	T03PF11	5.92	2.77	1.52	17.3
EWG-LAW-New-OL-62380	3	1	3	T16PF11	1.84	3.89	<0.100	15.5
EWG-LAW-New-OL-100210	3	1	4	T04PF21	1.83	1.72	<0.100	21.6
EWG-LAW-New-IL-93907	3	1	5	T17PF21	5.78	3.36	1.50	19.7
EWG-LAW-New-OL-17130	3	1	6	T21PF11	1.85	4.03	2.21	21.7
EWG-LAW-New-OL-62380	3	1	7	T16PF21	1.81	3.80	<0.100	16.0
EWG-LAW-New-OL-14844	3	1	8	T01PF11	1.85	1.79	2.16	16.7
EWG-LAW-New-IL-93907	3	1	9	T17PF11	5.73	3.32	1.49	19.8
LRM	3	1	10	LRMPF312	4.84	2.18	<0.100	25.5
EWG-LAW-New-IL-166731	3	1	11	T03PF21	5.90	2.81	1.53	17.3
EWG-LAW-New-IL-5253	3	1	12	T08PF21	3.31	3.54	1.55	18.9
EWG-LAW-New-IL-5253	3	1	13	T08PF11	3.28	3.48	1.55	18.7
EWG-LAW-New-OL-14844	3	1	14	T01PF21	1.86	1.78	2.20	16.5
EWG-LAW-New-OL-100210	3	1	15	T04PF11	1.86	1.75	<0.100	21.7
EWG-LAW-New-IL-151542	3	1	16	T07PF21	3.25	2.86	0.426	18.3
EWG-LAW-New-IL-151542	3	1	17	T07PF11	3.24	2.88	0.430	18.2
EWG-LAW-New-OL-17130	3	1	18	T21PF21	1.86	4.05	2.21	21.9
LRM	3	1	19	LRMPF313	4.93	2.32	<0.100	25.8
LRM	3	2	1	LRMPF321	4.94	2.34	<0.100	24.8
EWG-LAW-New-IL-151542	3	2	2	T07PF12	3.13	2.83	0.421	18.7
EWG-LAW-New-IL-166731	3	2	3	T03PF12	5.73	2.72	1.49	17.4
EWG-LAW-New-IL-93907	3	2	4	T17PF22	5.78	3.52	1.51	19.7
EWG-LAW-New-IL-166731	3	2	5	T03PF22	6.00	2.88	1.53	17.6
EWG-LAW-New-IL-5253	3	2	6	T08PF12	3.29	3.53	1.53	18.8
EWG-LAW-New-OL-100210	3	2	7	T04PF12	1.89	1.84	<0.100	22.1
EWG-LAW-New-OL-14844	3	2	8	T01PF22	1.87	1.79	2.19	16.1
EWG-LAW-New-OL-17130	3	2	9	T21PF12	1.86	4.12	2.21	21.8
LRM	3	2	10	LRMPF322	4.96	2.35	<0.100	26.0
EWG-LAW-New-OL-62380	3	2	11	T16PF12	1.88	4.02	<0.100	16.0
EWG-LAW-New-OL-100210	3	2	12	T04PF22	1.87	1.83	<0.100	21.7
EWG-LAW-New-OL-62380	3	2	13	T16PF22	1.85	3.94	<0.100	16.1
EWG-LAW-New-OL-17130	3	2	14	T21PF22	1.82	4.03	2.15	21.6
EWG-LAW-New-OL-14844	3	2	15	T01PF12	1.84	1.78	2.14	16.3
EWG-LAW-New-IL-151542	3	2	16	T07PF22	3.14	2.76	0.416	18.3
EWG-LAW-New-IL-93907	3	2	17	T17PF12	5.73	3.23	1.46	19.8
EWG-LAW-New-IL-5253	3	2	18	T08PF22	3.19	3.28	1.50	18.0
LRM	3	2	19	LRMPF323	4.96	2.26	<0.100	24.9

Table A-4. KH Measurements of the LAW Study Glasses

ID	Block	Sub-Blk	Sequence	Lab ID	Cl (wt %)	F (wt %)
LRM	1	1	1	LRMKH111	<0.010	0.851
EWG-LAW-New-IL-93907	1	1	2	T17KH11	0.061	0.126
EWG-LAW-New-OL-15493	1	1	3	T15KH11	0.023	0.050
LAW-ORP-LD1 (1)	1	1	4	T23KH11	0.175	0.117
EWG-LAW-Centroid 1	1	1	5	T05KH11	0.103	0.232
EWG-LAW-New-OL-8445	1	1	6	T25KH21	0.284	0.495
EWG-LAW-New-OL-57284	1	1	7	T12KH11	0.335	0.485
EWG-LAW-Centroid 1	1	1	8	T05KH21	0.103	0.230
LRM	1	1	9	LRMKH112	<0.010	0.816
LAW-ORP-LD1 (1)	1	1	10	T23KH21	0.154	0.104
EWG-LAW-New-OL-17130	1	1	11	T21KH11	0.291	0.436
EWG-LAW-New-OL-17130	1	1	12	T21KH21	0.327	0.459
EWG-LAW-New-IL-166697	1	1	13	T02KH21	0.181	0.363
EWG-LAW-New-OL-8445	1	1	14	T25KH11	0.286	0.499
EWG-LAW-New-IL-166697	1	1	15	T02KH11	0.171	0.340
EWG-LAW-New-IL-93907	1	1	16	T17KH21	0.061	0.123
EWG-LAW-New-OL-57284	1	1	17	T12KH21	0.343	0.494
EWG-LAW-New-IL-103151	1	1	18	T06KH11	0.075	0.136
EWG-LAW-New-IL-103151	1	1	19	T06KH21	0.067	0.123
EWG-LAW-New-OL-15493	1	1	20	T15KH21	0.023	0.057
LRM	1	1	21	LRMKH113	<0.010	0.081
LRM	1	2	1	LRMKH121	<0.010	0.861
EWG-LAW-New-OL-57284	1	2	2	T12KH22	0.351	0.507
EWG-LAW-New-OL-57284	1	2	3	T12KH12	0.350	0.503
EWG-LAW-New-OL-17130	1	2	4	T21KH22	0.351	0.521
LAW-ORP-LD1 (1)	1	2	5	T23KH22	0.182	0.122
EWG-LAW-New-OL-17130	1	2	6	T21KH12	0.352	0.522
EWG-LAW-New-IL-103151	1	2	7	T06KH22	0.082	0.147
EWG-LAW-New-IL-166697	1	2	8	T02KH12	0.191	0.372
LRM	1	2	9	LRMKH122	<0.010	0.836
EWG-LAW-New-OL-15493	1	2	10	T15KH12	0.026	0.058
EWG-LAW-Centroid 1	1	2	11	T05KH22	0.109	0.238
EWG-LAW-New-IL-93907	1	2	12	T17KH12	0.065	0.130
EWG-LAW-Centroid 1	1	2	13	T05KH12	0.108	0.237
EWG-LAW-New-IL-166697	1	2	14	T02KH22	0.186	0.368
EWG-LAW-New-OL-8445	1	2	15	T25KH12	0.304	0.524
EWG-LAW-New-OL-8445	1	2	16	T25KH22	0.299	0.513
EWG-LAW-New-IL-103151	1	2	17	T06KH12	0.080	0.144
EWG-LAW-New-IL-93907	1	2	18	T17KH22	0.065	0.129
EWG-LAW-New-OL-15493	1	2	19	T15KH22	0.026	0.057
LAW-ORP-LD1 (1)	1	2	20	T23KH12	0.185	0.122
LRM	1	2	21	LRMKH123	<0.010	0.833
LRM	2	1	1	LRMKH211	<0.010	0.842
EWG-LAW-New-OL-14844	2	1	2	T01KH21	0.101	0.321
EWG-LAW-New-IL-5253	2	1	3	T08KH21	0.061	0.134
EWG-LAW-New-IL-151542	2	1	4	T07KH21	0.163	0.328
EWG-LAW-New-IL-5255	2	1	5	T09KH21	0.064	0.130
EWG-LAW-New-IL-94020	2	1	6	T11KH21	0.052	0.127
EWG-LAW-New-IL-151542	2	1	7	T07KH11	0.168	0.336
EWG-LAW-New-IL-5253	2	1	8	T08KH11	0.060	0.129
LRM	2	1	9	LRMKH212	<0.010	0.841
EWG-LAW-New-OL-62380	2	1	10	T16KH11	0.034	0.099
EWG-LAW-New-IL-42295	2	1	11	T22KH11	0.077	0.133
EWG-LAW-New-IL-94020	2	1	12	T11KH11	0.052	0.129
EWG-LAW-New-OL-90780	2	1	13	T18KH11	0.245	0.524
EWG-LAW-New-IL-42295	2	1	14	T22KH21	0.078	0.135
EWG-LAW-New-OL-62380	2	1	15	T16KH21	0.033	0.101
EWG-LAW-New-IL-5255	2	1	16	T09KH11	0.066	0.133
EWG-LAW-New-OL-14844	2	1	17	T01KH11	0.174	0.497
EWG-LAW-New-OL-90780	2	1	18	T18KH21	0.256	0.547
LRM	2	1	19	LRMKH213	<0.010	0.771

Table A-4. KH Measurements of the LAW Study Glasses (continued)

ID	Block	Sub-Blk	Sequence	Lab ID	Cl (wt %)	F (wt %)
LRM	2	2	1	LRMKH221	<0.010	0.855
EWG-LAW-New-OL-62380	2	2	2	T16KH22	0.035	0.107
EWG-LAW-New-OL-90780	2	2	3	T18KH22	0.235	0.491
EWG-LAW-New-OL-62380	2	2	4	T16KH12	0.034	0.103
EWG-LAW-New-IL-42295	2	2	5	T22KH12	0.079	0.135
EWG-LAW-New-IL-151542	2	2	6	T07KH12	0.170	0.340
EWG-LAW-New-OL-90780	2	2	7	T18KH12	0.253	0.539
EWG-LAW-New-OL-14844	2	2	8	T01KH22	0.104	0.324
LRM	2	2	9	LRMKH222	<0.010	0.830
EWG-LAW-New-IL-5255	2	2	10	T09KH22	0.074	0.145
EWG-LAW-New-IL-42295	2	2	11	T22KH22	0.080	0.138
EWG-LAW-New-IL-151542	2	2	12	T07KH22	0.169	0.337
EWG-LAW-New-IL-94020	2	2	13	T11KH12	0.053	0.131
EWG-LAW-New-IL-94020	2	2	14	T11KH22	0.054	0.131
EWG-LAW-New-IL-5253	2	2	15	T08KH12	0.064	0.134
EWG-LAW-New-IL-5253	2	2	16	T08KH22	0.063	0.138
EWG-LAW-New-OL-14844	2	2	17	T01KH12	0.175	0.526
EWG-LAW-New-IL-5255	2	2	18	T09KH12	0.067	0.135
LRM	2	2	19	LRMKH223	<0.010	0.845
LRM	3	1	1	LRMKH311	<0.010	0.744
EWG-LAW-New-IL-456	3	1	2	T24KH11	0.078	0.132
EWG-LAW-New-OL-122817	3	1	3	T13KH11	0.273	0.469
EWG-LAW-Centroid 2	3	1	4	T20KH21	0.141	0.247
EWG-LAW-Centroid 2	3	1	5	T20KH11	0.128	0.226
EWG-LAW-New-OL-100210	3	1	6	T04KH21	0.315	0.519
EWG-LAW-New-IL-166731	3	1	7	T03KH21	0.139	0.319
EWG-LAW-New-IL-87749	3	1	8	T10KH11	0.069	0.122
LRM	3	1	9	LRMKH312	<0.010	0.824
EWG-LAW-New-IL-1721	3	1	10	T19KH21	0.199	0.348
EWG-LAW-New-IL-166731	3	1	11	T03KH11	0.151	0.314
EWG-LAW-New-IL-70316	3	1	12	T14KH11	0.061	0.126
EWG-LAW-New-IL-70316	3	1	13	T14KH21	0.062	0.126
EWG-LAW-New-IL-87749	3	1	14	T10KH21	0.074	0.130
EWG-LAW-New-OL-100210	3	1	15	T04KH11	0.354	0.581
EWG-LAW-New-OL-122817	3	1	16	T13KH21	0.269	0.459
EWG-LAW-New-IL-456	3	1	17	T24KH21	0.067	0.120
EWG-LAW-New-IL-1721	3	1	18	T19KH11	0.201	0.375
LRM	3	1	19	LRMKH313	<0.010	0.824
LRM	3	2	1	LRMKH321	<0.010	0.832
EWG-LAW-New-OL-122817	3	2	2	T13KH12	0.272	0.475
EWG-LAW-New-IL-456	3	2	3	T24KH12	0.078	0.133
EWG-LAW-New-OL-100210	3	2	4	T04KH12	0.358	0.591
EWG-LAW-New-IL-70316	3	2	5	T14KH22	0.062	0.128
EWG-LAW-New-IL-87749	3	2	6	T10KH22	0.074	0.134
EWG-LAW-New-IL-70316	3	2	7	T14KH12	0.062	0.128
EWG-LAW-New-IL-166731	3	2	8	T03KH22	0.157	0.363
LRM	3	2	9	LRMKH322	<0.010	0.844
EWG-LAW-Centroid 2	3	2	10	T20KH12	0.145	0.259
EWG-LAW-Centroid 2	3	2	11	T20KH22	0.145	0.258
EWG-LAW-New-IL-1721	3	2	12	T19KH12	0.199	0.354
EWG-LAW-New-IL-87749	3	2	13	T10KH12	0.073	0.134
EWG-LAW-New-IL-456	3	2	14	T24KH22	0.075	0.132
EWG-LAW-New-IL-1721	3	2	15	T19KH22	0.200	0.354
EWG-LAW-New-OL-122817	3	2	16	T13KH22	0.275	0.470
EWG-LAW-New-OL-100210	3	2	17	T04KH22	0.360	0.594
EWG-LAW-New-IL-166731	3	2	18	T03KH12	0.155	0.351
LRM	3	2	19	LRMKH323	<0.010	0.839

Table A-5. Modified LM Measurements of Select LAW Study Glasses

Glass ID	Sample ID	P (wt %)	Zr (wt %)
LRM	LRM	0.222	0.706
LRM	LRM	0.227	0.73
EWG-LAW-New-IL-166697	T02LM11	0.458	1.13
EWG-LAW-New-IL-166697	T02LM12	0.437	1.12
EWG-LAW-New-IL-166697	T02LM21	0.456	1.16
EWG-LAW-New-IL-166697	T02LM22	0.444	1.13
EWG-LAW-New-IL-166731	T03LM11	0.458	1.13
EWG-LAW-New-IL-166731	T03LM12	0.47	1.13
EWG-LAW-New-IL-166731	T03LM21	0.448	1.17
EWG-LAW-New-IL-166731	T03LM22	0.447	1.17
EWG-LAW-New-IL-151542	T07LM11	0.458	1.12
EWG-LAW-New-IL-151542	T07LM12	0.441	1.13
EWG-LAW-New-IL-151542	T07LM21	0.443	1.18
EWG-LAW-New-IL-151542	T07LM22	0.447	1.17
EWG-LAW-New-IL-1721	T19LM11	0.43	1.13
EWG-LAW-New-IL-1721	T19LM12	0.447	1.15
EWG-LAW-New-IL-1721	T19LM21	0.454	1.15
EWG-LAW-New-IL-1721	T19LM22	0.448	1.13

Table A-6. Comparison of Measured and Targeted Glass Compositions

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-Centroid 1	Al_2O_3		8.725	9.000	-0.2750	-3.1%
EWG-LAW-Centroid 1	B_2O_3		9.700	10.000	-0.3000	-3.0%
EWG-LAW-Centroid 1	CaO		5.341	5.500	-0.1590	-2.9%
EWG-LAW-Centroid 1	Cl		0.106	0.210	-0.1040	
EWG-LAW-Centroid 1	Cr_2O_3	<	0.147	0.140	0.0070	
EWG-LAW-Centroid 1	F		0.234	0.320	-0.0860	
EWG-LAW-Centroid 1	Fe_2O_3		1.010	1.000	0.0100	
EWG-LAW-Centroid 1	K_2O		0.451	0.400	0.0510	
EWG-LAW-Centroid 1	Li_2O		1.869	2.000	-0.1310	
EWG-LAW-Centroid 1	MgO		1.406	1.500	-0.0940	
EWG-LAW-Centroid 1	Na_2O		19.512	19.000	0.5120	2.7%
EWG-LAW-Centroid 1	P_2O_5		0.627	0.680	-0.0530	
EWG-LAW-Centroid 1	SiO_2		39.310	39.550	-0.2400	-0.6%
EWG-LAW-Centroid 1	SnO_2		2.069	2.000	0.0690	
EWG-LAW-Centroid 1	SO_3		0.591	0.700	-0.1090	
EWG-LAW-Centroid 1	V_2O_5		2.035	2.000	0.0350	
EWG-LAW-Centroid 1	ZnO		2.922	3.000	-0.0780	
EWG-LAW-Centroid 1	ZrO_2		2.941	3.000	-0.0590	
EWG-LAW-Centroid 1	Sum		98.997	100.000	-1.0030	-1.0%
EWG-LAW-Centroid 2	Al_2O_3		8.819	9.000	-0.1810	-2.0%
EWG-LAW-Centroid 2	B_2O_3		9.708	10.000	-0.2920	-2.9%
EWG-LAW-Centroid 2	CaO		5.317	5.500	-0.1830	-3.3%
EWG-LAW-Centroid 2	Cl		0.140	0.210	-0.0700	
EWG-LAW-Centroid 2	Cr_2O_3		0.148	0.140	0.0080	
EWG-LAW-Centroid 2	F		0.248	0.320	-0.0720	
EWG-LAW-Centroid 2	Fe_2O_3		1.055	1.000	0.0550	
EWG-LAW-Centroid 2	K_2O		0.467	0.400	0.0670	
EWG-LAW-Centroid 2	Li_2O		1.892	2.000	-0.1080	
EWG-LAW-Centroid 2	MgO		1.410	1.500	-0.0900	
EWG-LAW-Centroid 2	Na_2O		19.849	19.000	0.8490	4.5%
EWG-LAW-Centroid 2	P_2O_5		0.649	0.680	-0.0310	
EWG-LAW-Centroid 2	SiO_2		40.058	39.550	0.5080	1.3%
EWG-LAW-Centroid 2	SnO_2		2.082	2.000	0.0820	
EWG-LAW-Centroid 2	SO_3		0.710	0.700	0.0100	
EWG-LAW-Centroid 2	V_2O_5		2.062	2.000	0.0620	
EWG-LAW-Centroid 2	ZnO		2.978	3.000	-0.0220	
EWG-LAW-Centroid 2	ZrO_2		3.002	3.000	0.0020	
EWG-LAW-Centroid 2	Sum		100.596	100.000	0.5960	0.6%
EWG-LAW-New-IL-103151	Al_2O_3		6.013	6.250	-0.2370	-3.8%
EWG-LAW-New-IL-103151	B_2O_3		7.414	8.000	-0.5860	-7.3%
EWG-LAW-New-IL-103151	CaO		2.770	2.750	0.0200	
EWG-LAW-New-IL-103151	Cl		0.076	0.120	-0.0440	
EWG-LAW-New-IL-103151	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-103151	F		0.138	0.180	-0.0420	
EWG-LAW-New-IL-103151	Fe_2O_3		1.289	1.250	0.0390	
EWG-LAW-New-IL-103151	K_2O		1.098	1.000	0.0980	
EWG-LAW-New-IL-103151	Li_2O		0.907	1.000	-0.0930	
EWG-LAW-New-IL-103151	MgO		2.259	2.500	-0.2410	
EWG-LAW-New-IL-103151	Na_2O		23.287	22.490	0.7970	3.5%
EWG-LAW-New-IL-103151	P_2O_5		0.366	0.380	-0.0140	
EWG-LAW-New-IL-103151	SiO_2		40.379	41.840	-1.4610	-3.5%
EWG-LAW-New-IL-103151	SnO_2		2.603	2.500	0.1030	
EWG-LAW-New-IL-103151	SO_3		1.224	1.170	0.0540	
EWG-LAW-New-IL-103151	V_2O_5		3.021	3.000	0.0210	
EWG-LAW-New-IL-103151	ZnO		3.871	4.000	-0.1290	
EWG-LAW-New-IL-103151	ZrO_2		1.493	1.500	-0.0070	
EWG-LAW-New-IL-103151	Sum		98.355	100.010	-1.6550	-1.7%
EWG-LAW-New-IL-151542	Al_2O_3		6.028	6.250	-0.2220	-3.6%
EWG-LAW-New-IL-151542	B_2O_3		9.120	9.740	-0.6200	-6.4%

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-IL-151542	CaO		8.780	9.000	-0.2200	-2.4%
EWG-LAW-New-IL-151542	Cl		0.168	0.310	-0.1420	
EWG-LAW-New-IL-151542	Cr_2O_3		0.215	0.210	0.0050	
EWG-LAW-New-IL-151542	F		0.335	0.470	-0.1350	
EWG-LAW-New-IL-151542	Fe_2O_3		1.280	1.250	0.0300	
EWG-LAW-New-IL-151542	K_2O		0.225	0.200	0.0250	
EWG-LAW-New-IL-151542	Li_2O		0.911	1.000	-0.0890	
EWG-LAW-New-IL-151542	MgO		2.272	2.500	-0.2280	
EWG-LAW-New-IL-151542	Na_2O		18.265	17.370	0.8950	5.2%
EWG-LAW-New-IL-151542	P_2O_5		1.025	1.010	0.0150	
EWG-LAW-New-IL-151542	SiO_2		39.310	39.390	-0.0800	-0.2%
EWG-LAW-New-IL-151542	SnO_2		3.393	3.500	-0.1070	
EWG-LAW-New-IL-151542	SO_3		1.067	1.300	-0.2330	
EWG-LAW-New-IL-151542	V_2O_5		2.999	3.000	-0.0010	
EWG-LAW-New-IL-151542	ZnO		2.023	2.000	0.0230	
EWG-LAW-New-IL-151542	ZrO_2		1.553	1.500	0.0530	
EWG-LAW-New-IL-151542	Sum		98.968	100.000	-1.0320	-1.0%
EWG-LAW-New-IL-166697	Al_2O_3		10.775	11.250	-0.4750	-4.2%
EWG-LAW-New-IL-166697	B_2O_3		9.788	10.220	-0.4320	-4.2%
EWG-LAW-New-IL-166697	CaO		2.686	2.750	-0.0640	
EWG-LAW-New-IL-166697	Cl		0.182	0.310	-0.1280	
EWG-LAW-New-IL-166697	Cr_2O_3		0.210	0.210	0.0000	
EWG-LAW-New-IL-166697	F		0.361	0.470	-0.1090	
EWG-LAW-New-IL-166697	Fe_2O_3		1.217	1.250	-0.0330	
EWG-LAW-New-IL-166697	K_2O		1.008	1.000	0.0080	
EWG-LAW-New-IL-166697	Li_2O		3.310	3.500	-0.1900	
EWG-LAW-New-IL-166697	MgO		0.493	0.500	-0.0070	
EWG-LAW-New-IL-166697	Na_2O		17.861	17.490	0.3710	2.1%
EWG-LAW-New-IL-166697	P_2O_5		1.028	1.010	0.0180	
EWG-LAW-New-IL-166697	SiO_2		37.545	36.750	0.7950	2.2%
EWG-LAW-New-IL-166697	SnO_2		3.250	3.500	-0.2500	
EWG-LAW-New-IL-166697	SO_3		1.097	1.290	-0.1930	
EWG-LAW-New-IL-166697	V_2O_5		2.865	3.000	-0.1350	
EWG-LAW-New-IL-166697	ZnO		3.688	4.000	-0.3120	
EWG-LAW-New-IL-166697	ZrO_2		1.533	1.500	0.0330	
EWG-LAW-New-IL-166697	Sum		98.898	100.000	-1.1020	-1.1%
EWG-LAW-New-IL-166731	Al_2O_3		11.124	11.500	-0.3760	-3.3%
EWG-LAW-New-IL-166731	B_2O_3		9.000	9.310	-0.3100	-3.3%
EWG-LAW-New-IL-166731	CaO		2.756	2.750	0.0060	
EWG-LAW-New-IL-166731	Cl		0.151	0.310	-0.1590	
EWG-LAW-New-IL-166731	Cr_2O_3		0.216	0.210	0.0060	
EWG-LAW-New-IL-166731	F		0.337	0.470	-0.1330	
EWG-LAW-New-IL-166731	Fe_2O_3		0.529	0.500	0.0290	
EWG-LAW-New-IL-166731	K_2O		0.212	0.200	0.0120	
EWG-LAW-New-IL-166731	Li_2O		3.267	3.500	-0.2330	
EWG-LAW-New-IL-166731	MgO		2.181	2.500	-0.3190	
EWG-LAW-New-IL-166731	Na_2O		18.535	18.020	0.5150	2.9%
EWG-LAW-New-IL-166731	P_2O_5		1.044	1.010	0.0340	
EWG-LAW-New-IL-166731	SiO_2		37.224	36.750	0.4740	1.3%
EWG-LAW-New-IL-166731	SnO_2		2.945	3.200	-0.2550	
EWG-LAW-New-IL-166731	SO_3		1.012	1.270	-0.2580	
EWG-LAW-New-IL-166731	V_2O_5		2.901	3.000	-0.0990	
EWG-LAW-New-IL-166731	ZnO		3.744	4.000	-0.2560	
EWG-LAW-New-IL-166731	ZrO_2		1.553	1.500	0.0530	
EWG-LAW-New-IL-166731	Sum		98.732	100.000	-1.2680	-1.3%
EWG-LAW-New-IL-1721	Al_2O_3		6.301	6.250	0.0510	0.8%
EWG-LAW-New-IL-1721	B_2O_3		11.632	11.750	-0.1180	-1.0%
EWG-LAW-New-IL-1721	CaO		2.767	2.750	0.0170	
EWG-LAW-New-IL-1721	Cl		0.200	0.310	-0.1100	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-IL-1721	Cr_2O_3		0.218	0.210	0.0080	
EWG-LAW-New-IL-1721	F		0.358	0.470	-0.1120	
EWG-LAW-New-IL-1721	Fe_2O_3		1.231	1.250	-0.0190	
EWG-LAW-New-IL-1721	K_2O		1.019	1.000	0.0190	
EWG-LAW-New-IL-1721	Li_2O		3.380	3.500	-0.1200	
EWG-LAW-New-IL-1721	MgO		0.491	0.500	-0.0090	
EWG-LAW-New-IL-1721	Na_2O		16.749	16.450	0.2990	1.8%
EWG-LAW-New-IL-1721	P_2O_5		1.019	1.010	0.0090	
EWG-LAW-New-IL-1721	SiO_2		43.856	43.250	0.6060	1.4%
EWG-LAW-New-IL-1721	SnO_2		3.222	3.500	-0.2780	
EWG-LAW-New-IL-1721	SO_3		1.119	1.300	-0.1810	
EWG-LAW-New-IL-1721	V_2O_5		2.883	3.000	-0.1170	
EWG-LAW-New-IL-1721	ZnO		1.957	2.000	-0.0430	
EWG-LAW-New-IL-1721	ZrO_2		1.540	1.500	0.0400	
EWG-LAW-New-IL-1721	Sum		99.941	100.000	-0.0590	-0.1%
EWG-LAW-New-IL-42295	Al_2O_3		6.264	6.250	0.0140	0.2%
EWG-LAW-New-IL-42295	B_2O_3		11.535	11.750	-0.2150	-1.8%
EWG-LAW-New-IL-42295	CaO		2.739	2.750	-0.0110	
EWG-LAW-New-IL-42295	Cl		0.079	0.120	-0.0410	
EWG-LAW-New-IL-42295	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-42295	F		0.135	0.180	-0.0450	
EWG-LAW-New-IL-42295	Fe_2O_3		1.279	1.250	0.0290	
EWG-LAW-New-IL-42295	K_2O		0.228	0.200	0.0280	
EWG-LAW-New-IL-42295	Li_2O		3.353	3.500	-0.1470	
EWG-LAW-New-IL-42295	MgO		2.218	2.500	-0.2820	
EWG-LAW-New-IL-42295	Na_2O		17.827	17.480	0.3470	2.0%
EWG-LAW-New-IL-42295	P_2O_5		0.356	0.380	-0.0240	
EWG-LAW-New-IL-42295	SiO_2		42.946	42.420	0.5260	1.2%
EWG-LAW-New-IL-42295	SnO_2		1.003	1.000	0.0030	
EWG-LAW-New-IL-42295	SO_3		0.398	0.400	-0.0020	
EWG-LAW-New-IL-42295	V_2O_5		2.914	3.000	-0.0860	
EWG-LAW-New-IL-42295	ZnO		1.985	2.000	-0.0150	
EWG-LAW-New-IL-42295	ZrO_2		4.626	4.750	-0.1240	
EWG-LAW-New-IL-42295	Sum		100.032	100.010	0.0220	0.0%
EWG-LAW-New-IL-456	Al_2O_3		6.268	6.250	0.0180	0.3%
EWG-LAW-New-IL-456	B_2O_3		7.969	8.000	-0.0310	-0.4%
EWG-LAW-New-IL-456	CaO		8.752	9.000	-0.2480	-2.8%
EWG-LAW-New-IL-456	Cl		0.075	0.120	-0.0450	
EWG-LAW-New-IL-456	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-456	F		0.129	0.180	-0.0510	
EWG-LAW-New-IL-456	Fe_2O_3		1.278	1.250	0.0280	
EWG-LAW-New-IL-456	K_2O		0.210	0.200	0.0100	
EWG-LAW-New-IL-456	Li_2O		3.385	3.500	-0.1150	
EWG-LAW-New-IL-456	MgO		2.247	2.500	-0.2530	
EWG-LAW-New-IL-456	Na_2O		15.064	15.000	0.0640	0.4%
EWG-LAW-New-IL-456	P_2O_5		0.341	0.380	-0.0390	
EWG-LAW-New-IL-456	SiO_2		43.802	43.150	0.6520	1.5%
EWG-LAW-New-IL-456	SnO_2		3.482	3.500	-0.0180	
EWG-LAW-New-IL-456	SO_3		0.383	0.400	-0.0170	
EWG-LAW-New-IL-456	V_2O_5		2.946	3.000	-0.0540	
EWG-LAW-New-IL-456	ZnO		2.013	2.000	0.0130	
EWG-LAW-New-IL-456	ZrO_2		1.435	1.500	-0.0650	
EWG-LAW-New-IL-456	Sum		99.926	100.010	-0.0840	-0.1%
EWG-LAW-New-IL-5253	Al_2O_3		6.174	6.250	-0.0760	-1.2%
EWG-LAW-New-IL-5253	B_2O_3		11.133	11.750	-0.6170	-5.3%
EWG-LAW-New-IL-5253	CaO		2.686	2.750	-0.0640	
EWG-LAW-New-IL-5253	Cl		0.062	0.120	-0.0580	
EWG-LAW-New-IL-5253	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-5253	F		0.134	0.180	-0.0460	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-IL-5253	Fe_2O_3		1.243	1.250	-0.0070	
EWG-LAW-New-IL-5253	K_2O		0.229	0.200	0.0290	
EWG-LAW-New-IL-5253	Li_2O		3.299	3.500	-0.2010	
EWG-LAW-New-IL-5253	MgO		2.210	2.500	-0.2900	
EWG-LAW-New-IL-5253	Na_2O		14.660	15.000	-0.3400	-2.3%
EWG-LAW-New-IL-5253	P_2O_5		0.371	0.380	-0.0090	
EWG-LAW-New-IL-5253	SiO_2		39.791	39.750	0.0410	0.1%
EWG-LAW-New-IL-5253	SnO_2		3.434	3.500	-0.0660	
EWG-LAW-New-IL-5253	SO_3		0.952	1.300	-0.3480	
EWG-LAW-New-IL-5253	V_2O_5		2.905	3.000	-0.0950	
EWG-LAW-New-IL-5253	ZnO		3.725	4.000	-0.2750	
EWG-LAW-New-IL-5253	ZrO_2		4.333	4.500	-0.1670	
EWG-LAW-New-IL-5253	Sum		97.487	100.010	-2.5230	-2.5%
EWG-LAW-New-IL-5255	Al_2O_3		6.117	6.250	-0.1330	-2.1%
EWG-LAW-New-IL-5255	B_2O_3		11.181	11.750	-0.5690	-4.8%
EWG-LAW-New-IL-5255	CaO		2.676	2.750	-0.0740	
EWG-LAW-New-IL-5255	Cl		0.068	0.120	-0.0520	
EWG-LAW-New-IL-5255	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-5255	F		0.136	0.180	-0.0440	
EWG-LAW-New-IL-5255	Fe_2O_3		1.236	1.250	-0.0140	
EWG-LAW-New-IL-5255	K_2O		0.229	0.200	0.0290	
EWG-LAW-New-IL-5255	Li_2O		3.251	3.500	-0.2490	
EWG-LAW-New-IL-5255	MgO		2.201	2.500	-0.2990	
EWG-LAW-New-IL-5255	Na_2O		17.457	18.000	-0.5430	-3.0%
EWG-LAW-New-IL-5255	P_2O_5		0.367	0.380	-0.0130	
EWG-LAW-New-IL-5255	SiO_2		36.582	36.750	-0.1680	-0.5%
EWG-LAW-New-IL-5255	SnO_2		3.441	3.500	-0.0590	
EWG-LAW-New-IL-5255	SO_3		1.167	1.300	-0.1330	
EWG-LAW-New-IL-5255	V_2O_5		2.896	3.000	-0.1040	
EWG-LAW-New-IL-5255	ZnO		3.703	4.000	-0.2970	
EWG-LAW-New-IL-5255	ZrO_2		4.336	4.500	-0.1640	
EWG-LAW-New-IL-5255	Sum		97.191	100.010	-2.8190	-2.8%
EWG-LAW-New-IL-70316	Al_2O_3		6.141	6.250	-0.1090	-1.7%
EWG-LAW-New-IL-70316	B_2O_3		7.671	8.000	-0.3290	-4.1%
EWG-LAW-New-IL-70316	CaO		8.644	9.000	-0.3560	-4.0%
EWG-LAW-New-IL-70316	Cl		0.062	0.120	-0.0580	
EWG-LAW-New-IL-70316	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-70316	F		0.127	0.180	-0.0530	
EWG-LAW-New-IL-70316	Fe_2O_3		1.240	1.250	-0.0100	
EWG-LAW-New-IL-70316	K_2O		1.046	1.000	0.0460	
EWG-LAW-New-IL-70316	Li_2O		0.933	1.000	-0.0670	
EWG-LAW-New-IL-70316	MgO		2.206	2.500	-0.2940	
EWG-LAW-New-IL-70316	Na_2O		19.984	20.230	-0.2460	-1.2%
EWG-LAW-New-IL-70316	P_2O_5		0.345	0.380	-0.0350	
EWG-LAW-New-IL-70316	SiO_2		38.507	38.720	-0.2130	-0.6%
EWG-LAW-New-IL-70316	SnO_2		3.466	3.500	-0.0340	
EWG-LAW-New-IL-70316	SO_3		1.236	1.300	-0.0640	
EWG-LAW-New-IL-70316	V_2O_5		2.905	3.000	-0.0950	
EWG-LAW-New-IL-70316	ZnO		1.976	2.000	-0.0240	
EWG-LAW-New-IL-70316	ZrO_2		1.435	1.500	-0.0650	
EWG-LAW-New-IL-70316	Sum		98.071	100.010	-1.9390	-1.9%
EWG-LAW-New-IL-87749	Al_2O_3		11.157	11.500	-0.3430	-3.0%
EWG-LAW-New-IL-87749	B_2O_3		7.760	8.000	-0.2400	-3.0%
EWG-LAW-New-IL-87749	CaO		8.745	9.000	-0.2550	-2.8%
EWG-LAW-New-IL-87749	Cl		0.073	0.120	-0.0470	
EWG-LAW-New-IL-87749	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-87749	F		0.130	0.180	-0.0500	
EWG-LAW-New-IL-87749	Fe_2O_3		1.210	1.250	-0.0400	
EWG-LAW-New-IL-87749	K_2O		1.022	1.000	0.0220	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-IL-87749	Li_2O		3.305	3.500	-0.1950	
EWG-LAW-New-IL-87749	MgO		0.461	0.500	-0.0390	
EWG-LAW-New-IL-87749	Na_2O		17.693	17.490	0.2030	1.2%
EWG-LAW-New-IL-87749	P_2O_5		0.345	0.380	-0.0350	
EWG-LAW-New-IL-87749	SiO_2		37.331	37.410	-0.0790	-0.2%
EWG-LAW-New-IL-87749	SnO_2		2.593	2.700	-0.1070	
EWG-LAW-New-IL-87749	SO_3		0.407	0.400	0.0070	
EWG-LAW-New-IL-87749	V_2O_5		2.838	3.000	-0.1620	
EWG-LAW-New-IL-87749	ZnO		1.948	2.000	-0.0520	
EWG-LAW-New-IL-87749	ZrO_2		1.391	1.500	-0.1090	
EWG-LAW-New-IL-87749	Sum		98.556	100.010	-1.4540	-1.5%
EWG-LAW-New-IL-93907	Al_2O_3		10.874	11.500	-0.6260	-5.4%
EWG-LAW-New-IL-93907	B_2O_3		10.811	11.750	-0.9390	-8.0%
EWG-LAW-New-IL-93907	CaO		2.651	2.750	-0.0990	
EWG-LAW-New-IL-93907	Cl		0.063	0.120	-0.0570	
EWG-LAW-New-IL-93907	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-93907	F		0.127	0.180	-0.0530	
EWG-LAW-New-IL-93907	Fe_2O_3		1.237	1.250	-0.0130	
EWG-LAW-New-IL-93907	K_2O		1.061	1.000	0.0610	
EWG-LAW-New-IL-93907	Li_2O		3.208	3.500	-0.2920	
EWG-LAW-New-IL-93907	MgO		0.478	0.500	-0.0220	
EWG-LAW-New-IL-93907	Na_2O		14.558	15.120	-0.5620	-3.7%
EWG-LAW-New-IL-93907	P_2O_5		0.345	0.380	-0.0350	
EWG-LAW-New-IL-93907	SiO_2		42.251	43.250	-0.9990	-2.3%
EWG-LAW-New-IL-93907	SnO_2		3.415	3.500	-0.0850	
EWG-LAW-New-IL-93907	SO_3		0.913	1.130	-0.2170	
EWG-LAW-New-IL-93907	V_2O_5		0.496	0.500	-0.0040	
EWG-LAW-New-IL-93907	ZnO		1.954	2.000	-0.0460	
EWG-LAW-New-IL-93907	ZrO_2		1.428	1.500	-0.0720	
EWG-LAW-New-IL-93907	Sum		96.017	100.010	-3.9930	-4.0%
EWG-LAW-New-IL-94020	Al_2O_3		11.058	11.500	-0.4420	-3.8%
EWG-LAW-New-IL-94020	B_2O_3		7.655	8.000	-0.3450	-4.3%
EWG-LAW-New-IL-94020	CaO		3.554	3.530	0.0240	
EWG-LAW-New-IL-94020	Cl		0.053	0.120	-0.0670	
EWG-LAW-New-IL-94020	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-IL-94020	F		0.130	0.180	-0.0500	
EWG-LAW-New-IL-94020	Fe_2O_3		1.244	1.250	-0.0060	
EWG-LAW-New-IL-94020	K_2O		0.220	0.200	0.0200	
EWG-LAW-New-IL-94020	Li_2O		3.272	3.500	-0.2280	
EWG-LAW-New-IL-94020	MgO		2.164	2.500	-0.3360	
EWG-LAW-New-IL-94020	Na_2O		15.300	15.000	0.3000	2.0%
EWG-LAW-New-IL-94020	P_2O_5		0.362	0.380	-0.0180	
EWG-LAW-New-IL-94020	SiO_2		42.251	43.250	-0.9990	-2.3%
EWG-LAW-New-IL-94020	SnO_2		3.415	3.500	-0.0850	
EWG-LAW-New-IL-94020	SO_3		0.793	1.020	-0.2270	
EWG-LAW-New-IL-94020	V_2O_5		0.493	0.500	-0.0070	
EWG-LAW-New-IL-94020	ZnO		3.744	4.000	-0.2560	
EWG-LAW-New-IL-94020	ZrO_2		1.418	1.500	-0.0820	
EWG-LAW-New-IL-94020	Sum		97.273	100.010	-2.7370	-2.7%
EWG-LAW-New-OL-100210	Al_2O_3		3.519	3.500	0.0190	
EWG-LAW-New-OL-100210	B_2O_3		5.748	6.000	-0.2520	-4.2%
EWG-LAW-New-OL-100210	CaO		1.868	1.890	-0.0220	
EWG-LAW-New-OL-100210	Cl		0.347	0.470	-0.1230	
EWG-LAW-New-OL-100210	Cr_2O_3		0.322	0.310	0.0120	
EWG-LAW-New-OL-100210	F		0.571	0.710	-0.1390	
EWG-LAW-New-OL-100210	Fe_2O_3	<	0.143	0.000	0.1430	
EWG-LAW-New-OL-100210	K_2O	<	0.120	0.000	0.1200	
EWG-LAW-New-OL-100210	Li_2O	<	0.215	0.000	0.2150	
EWG-LAW-New-OL-100210	MgO		3.113	3.500	-0.3870	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-OL-100210	Na_2O		27.432	26.000	1.4320	5.5%
EWG-LAW-New-OL-100210	P_2O_5		1.508	1.510	-0.0020	
EWG-LAW-New-OL-100210	SiO_2		46.583	47.000	-0.4170	-0.9%
EWG-LAW-New-OL-100210	SnO_2		3.339	3.200	0.1390	
EWG-LAW-New-OL-100210	SO_3		0.946	0.910	0.0360	
EWG-LAW-New-OL-100210	V_2O_5	<	0.179	0.000	0.1790	
EWG-LAW-New-OL-100210	ZnO		4.783	5.000	-0.2170	-4.3%
EWG-LAW-New-OL-100210	ZrO_2	<	0.135	0.000	0.1350	
EWG-LAW-New-OL-100210	Sum		100.872	100.000	0.8720	0.9%
EWG-LAW-New-OL-122817	Al_2O_3		3.552	3.500	0.0520	
EWG-LAW-New-OL-122817	B_2O_3		5.957	6.000	-0.0430	-0.7%
EWG-LAW-New-OL-122817	CaO		11.977	12.240	-0.2630	-2.1%
EWG-LAW-New-OL-122817	Cl		0.272	0.470	-0.1980	
EWG-LAW-New-OL-122817	Cr_2O_3		0.318	0.310	0.0080	
EWG-LAW-New-OL-122817	F		0.468	0.710	-0.2420	
EWG-LAW-New-OL-122817	Fe_2O_3		1.515	1.500	0.0150	
EWG-LAW-New-OL-122817	K_2O		1.587	1.500	0.0870	
EWG-LAW-New-OL-122817	Li_2O	<	0.215	0.000	0.2150	
EWG-LAW-New-OL-122817	MgO	<	0.166	0.000	0.1660	
EWG-LAW-New-OL-122817	Na_2O		19.276	18.600	0.6760	3.6%
EWG-LAW-New-OL-122817	P_2O_5		1.481	1.510	-0.0290	
EWG-LAW-New-OL-122817	SiO_2		43.214	44.170	-0.9560	-2.2%
EWG-LAW-New-OL-122817	SnO_2		3.082	3.000	0.0820	
EWG-LAW-New-OL-122817	SO_3		1.282	1.490	-0.2080	
EWG-LAW-New-OL-122817	V_2O_5		3.959	4.000	-0.0410	
EWG-LAW-New-OL-122817	ZnO		1.035	1.000	0.0350	
EWG-LAW-New-OL-122817	ZrO_2	<	0.135	0.000	0.1350	
EWG-LAW-New-OL-122817	Sum		99.492	100.000	-0.5080	-0.5%
EWG-LAW-New-OL-14844	Al_2O_3		3.505	3.500	0.0050	
EWG-LAW-New-OL-14844	B_2O_3		5.748	6.150	-0.4020	-6.5%
EWG-LAW-New-OL-14844	CaO		12.309	12.240	0.0690	0.6%
EWG-LAW-New-OL-14844	Cl		0.139	0.470	-0.3310	
EWG-LAW-New-OL-14844	Cr_2O_3		0.306	0.310	-0.0040	
EWG-LAW-New-OL-14844	F		0.417	0.710	-0.2930	
EWG-LAW-New-OL-14844	Fe_2O_3	<	0.143	0.000	0.1430	
EWG-LAW-New-OL-14844	K_2O		1.382	1.500	-0.1180	
EWG-LAW-New-OL-14844	Li_2O		4.677	5.000	-0.3230	-6.5%
EWG-LAW-New-OL-14844	MgO		2.948	3.500	-0.5520	
EWG-LAW-New-OL-14844	Na_2O		15.738	15.510	0.2280	1.5%
EWG-LAW-New-OL-14844	P_2O_5		1.351	1.510	-0.1590	
EWG-LAW-New-OL-14844	SiO_2		35.085	34.000	1.0850	3.2%
EWG-LAW-New-OL-14844	SnO_2	<	0.095	0.000	0.0950	
EWG-LAW-New-OL-14844	SO_3	<	0.194	0.100	0.0940	
EWG-LAW-New-OL-14844	V_2O_5		3.807	4.000	-0.1930	
EWG-LAW-New-OL-14844	ZnO		4.512	5.000	-0.4880	-9.8%
EWG-LAW-New-OL-14844	ZrO_2		5.967	6.500	-0.5330	-8.2%
EWG-LAW-New-OL-14844	Sum		98.323	100.000	-1.6770	-1.7%
EWG-LAW-New-OL-15493	Al_2O_3		3.566	3.500	0.0660	
EWG-LAW-New-OL-15493	B_2O_3		5.941	6.000	-0.0590	-1.0%
EWG-LAW-New-OL-15493	CaO		12.002	12.240	-0.2380	-1.9%
EWG-LAW-New-OL-15493	Cl		0.025	0.060	-0.0350	
EWG-LAW-New-OL-15493	Cr_2O_3	<	0.146	0.040	0.1060	
EWG-LAW-New-OL-15493	F		0.056	0.090	-0.0340	
EWG-LAW-New-OL-15493	Fe_2O_3	<	0.143	0.000	0.1430	
EWG-LAW-New-OL-15493	K_2O		1.497	1.500	-0.0030	
EWG-LAW-New-OL-15493	Li_2O	<	0.215	0.000	0.2150	
EWG-LAW-New-OL-15493	MgO		2.977	3.500	-0.5230	
EWG-LAW-New-OL-15493	Na_2O		26.488	25.510	0.9780	3.8%
EWG-LAW-New-OL-15493	P_2O_5	<	0.229	0.200	0.0290	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-OL-15493	SiO_2		39.256	39.250	0.0060	0.0%
EWG-LAW-New-OL-15493	SnO_2		2.949	3.000	-0.0510	
EWG-LAW-New-OL-15493	SO_3	<	0.250	0.100	0.1500	
EWG-LAW-New-OL-15493	V_2O_5		3.865	4.000	-0.1350	
EWG-LAW-New-OL-15493	ZnO		1.010	1.000	0.0100	
EWG-LAW-New-OL-15493	ZrO_2	<	0.135	0.000	0.1350	
EWG-LAW-New-OL-15493	Sum		100.748	99.990	0.7580	0.8%
EWG-LAW-New-OL-17130	Al_2O_3		3.491	3.500	-0.0090	
EWG-LAW-New-OL-17130	B_2O_3		13.065	13.750	-0.6850	-5.0%
EWG-LAW-New-OL-17130	CaO		1.588	1.650	-0.0620	
EWG-LAW-New-OL-17130	Cl		0.330	0.470	-0.1400	
EWG-LAW-New-OL-17130	Cr_2O_3		0.322	0.310	0.0120	
EWG-LAW-New-OL-17130	F		0.485	0.710	-0.2250	
EWG-LAW-New-OL-17130	Fe_2O_3		1.501	1.500	0.0010	
EWG-LAW-New-OL-17130	K_2O	<	0.120	0.000	0.1200	
EWG-LAW-New-OL-17130	Li_2O		4.726	5.000	-0.2740	-5.5%
EWG-LAW-New-OL-17130	MgO	<	0.166	0.000	0.1660	
EWG-LAW-New-OL-17130	Na_2O		16.075	16.500	-0.4250	-2.6%
EWG-LAW-New-OL-17130	P_2O_5		1.504	1.510	-0.0060	
EWG-LAW-New-OL-17130	SiO_2		46.530	47.000	-0.4700	-1.0%
EWG-LAW-New-OL-17130	SnO_2		2.996	3.000	-0.0040	
EWG-LAW-New-OL-17130	SO_3	<	0.250	0.100	0.1500	
EWG-LAW-New-OL-17130	V_2O_5		3.927	4.000	-0.0730	
EWG-LAW-New-OL-17130	ZnO		1.007	1.000	0.0070	
EWG-LAW-New-OL-17130	ZrO_2	<	0.135	0.000	0.1350	
EWG-LAW-New-OL-17130	Sum		98.218	100.000	-1.7820	-1.8%
EWG-LAW-New-OL-57284	Al_2O_3		3.590	3.500	0.0900	
EWG-LAW-New-OL-57284	B_2O_3		13.371	13.750	-0.3790	-2.8%
EWG-LAW-New-OL-57284	CaO		2.900	2.980	-0.0800	
EWG-LAW-New-OL-57284	Cl		0.345	0.470	-0.1250	
EWG-LAW-New-OL-57284	Cr_2O_3		0.319	0.310	0.0090	
EWG-LAW-New-OL-57284	F		0.497	0.710	-0.2130	
EWG-LAW-New-OL-57284	Fe_2O_3	<	0.143	0.000	0.1430	
EWG-LAW-New-OL-57284	K_2O		1.620	1.500	0.1200	
EWG-LAW-New-OL-57284	Li_2O	<	0.215	0.000	0.2150	
EWG-LAW-New-OL-57284	MgO	<	0.166	0.000	0.1660	
EWG-LAW-New-OL-57284	Na_2O		14.063	14.010	0.0530	0.4%
EWG-LAW-New-OL-57284	P_2O_5		1.393	1.510	-0.1170	
EWG-LAW-New-OL-57284	SiO_2		46.904	47.000	-0.0960	-0.2%
EWG-LAW-New-OL-57284	SnO_2	<	0.127	0.000	0.1270	
EWG-LAW-New-OL-57284	SO_3	<	0.250	0.100	0.1500	
EWG-LAW-New-OL-57284	V_2O_5		3.999	4.000	-0.0010	
EWG-LAW-New-OL-57284	ZnO		4.733	5.000	-0.2670	-5.3%
EWG-LAW-New-OL-57284	ZrO_2		4.961	5.160	-0.1990	-3.9%
EWG-LAW-New-OL-57284	Sum		99.596	100.000	-0.4040	-0.4%
EWG-LAW-New-OL-62380	Al_2O_3		3.486	3.500	-0.0140	
EWG-LAW-New-OL-62380	B_2O_3		12.598	13.750	-1.1520	-8.4%
EWG-LAW-New-OL-62380	CaO		11.949	12.240	-0.2910	-2.4%
EWG-LAW-New-OL-62380	Cl		0.034	0.110	-0.0760	
EWG-LAW-New-OL-62380	Cr_2O_3	<	0.146	0.080	0.0660	
EWG-LAW-New-OL-62380	F		0.103	0.170	-0.0670	
EWG-LAW-New-OL-62380	Fe_2O_3		1.483	1.500	-0.0170	
EWG-LAW-New-OL-62380	K_2O		1.476	1.500	-0.0240	
EWG-LAW-New-OL-62380	Li_2O	<	0.215	0.000	0.2150	
EWG-LAW-New-OL-62380	MgO	<	0.166	0.000	0.1660	
EWG-LAW-New-OL-62380	Na_2O		13.783	14.010	-0.2270	-1.6%
EWG-LAW-New-OL-62380	P_2O_5		0.349	0.370	-0.0210	
EWG-LAW-New-OL-62380	SiO_2		34.015	34.000	0.0150	0.0%
EWG-LAW-New-OL-62380	SnO_2		4.412	4.500	-0.0880	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
EWG-LAW-New-OL-62380	SO_3	<	0.250	0.100	0.1500	
EWG-LAW-New-OL-62380	V_2O_5		2.557	2.660	-0.1030	
EWG-LAW-New-OL-62380	ZnO		4.519	5.000	-0.4810	-9.6%
EWG-LAW-New-OL-62380	ZrO_2		6.150	6.500	-0.3500	-5.4%
EWG-LAW-New-OL-62380	Sum		97.690	99.990	-2.3000	-2.3%
EWG-LAW-New-OL-8445	Al_2O_3		12.126	12.410	-0.2840	-2.3%
EWG-LAW-New-OL-8445	B_2O_3		13.572	13.750	-0.1780	-1.3%
EWG-LAW-New-OL-8445	CaO		11.732	12.240	-0.5080	-4.2%
EWG-LAW-New-OL-8445	Cl		0.293	0.470	-0.1770	
EWG-LAW-New-OL-8445	Cr_2O_3		0.322	0.310	0.0120	
EWG-LAW-New-OL-8445	F		0.508	0.710	-0.2020	
EWG-LAW-New-OL-8445	Fe_2O_3	<	0.143	0.000	0.1430	
EWG-LAW-New-OL-8445	K_2O		1.560	1.500	0.0600	
EWG-LAW-New-OL-8445	Li_2O		1.906	2.010	-0.1040	
EWG-LAW-New-OL-8445	MgO		2.977	3.500	-0.5230	
EWG-LAW-New-OL-8445	Na_2O		9.621	10.000	-0.3790	-3.8%
EWG-LAW-New-OL-8445	P_2O_5		1.417	1.510	-0.0930	
EWG-LAW-New-OL-8445	SiO_2		34.657	34.000	0.6570	1.9%
EWG-LAW-New-OL-8445	SnO_2	<	0.127	0.000	0.1270	
EWG-LAW-New-OL-8445	SO_3	<	0.250	0.100	0.1500	
EWG-LAW-New-OL-8445	V_2O_5	<	0.179	0.000	0.1790	
EWG-LAW-New-OL-8445	ZnO		1.011	1.000	0.0110	
EWG-LAW-New-OL-8445	ZrO_2		6.153	6.500	-0.3470	-5.3%
EWG-LAW-New-OL-8445	Sum		98.553	100.010	-1.4570	-1.5%
EWG-LAW-New-OL-90780	Al_2O_3		13.562	13.850	-0.2880	-2.1%
EWG-LAW-New-OL-90780	B_2O_3		13.338	13.750	-0.4120	-3.0%
EWG-LAW-New-OL-90780	CaO	<	0.140	0.000	0.1400	
EWG-LAW-New-OL-90780	Cl		0.247	0.470	-0.2230	
EWG-LAW-New-OL-90780	Cr_2O_3		0.316	0.310	0.0060	
EWG-LAW-New-OL-90780	F		0.525	0.710	-0.1850	
EWG-LAW-New-OL-90780	Fe_2O_3	<	0.143	0.000	0.1430	
EWG-LAW-New-OL-90780	K_2O		1.581	1.500	0.0810	
EWG-LAW-New-OL-90780	Li_2O		4.817	5.000	-0.1830	-3.7%
EWG-LAW-New-OL-90780	MgO		2.993	3.500	-0.5070	
EWG-LAW-New-OL-90780	Na_2O		15.401	15.510	-0.1090	-0.7%
EWG-LAW-New-OL-90780	P_2O_5		1.491	1.510	-0.0190	
EWG-LAW-New-OL-90780	SiO_2		34.550	34.250	0.3000	0.9%
EWG-LAW-New-OL-90780	SnO_2		2.942	3.000	-0.0580	
EWG-LAW-New-OL-90780	SO_3		1.281	1.640	-0.3590	
EWG-LAW-New-OL-90780	V_2O_5		3.869	4.000	-0.1310	
EWG-LAW-New-OL-90780	ZnO		1.007	1.000	0.0070	
EWG-LAW-New-OL-90780	ZrO_2	<	0.135	0.000	0.1350	
EWG-LAW-New-OL-90780	Sum		98.340	100.000	-1.6600	-1.7%
LAW-ORP-LD1 (1)	Al_2O_3		9.816	10.150	-0.3340	-3.3%
LAW-ORP-LD1 (1)	B_2O_3		11.519	12.040	-0.5210	-4.3%
LAW-ORP-LD1 (1)	CaO		7.584	8.010	-0.4260	-5.3%
LAW-ORP-LD1 (1)	Cl		0.174	0.330	-0.1560	
LAW-ORP-LD1 (1)	Cr_2O_3		0.497	0.500	-0.0030	
LAW-ORP-LD1 (1)	F		0.116	0.170	-0.0540	
LAW-ORP-LD1 (1)	Fe_2O_3		0.990	1.000	-0.0100	
LAW-ORP-LD1 (1)	K_2O		0.188	0.160	0.0280	
LAW-ORP-LD1 (1)	Li_2O	<	0.215	0.000	0.2150	
LAW-ORP-LD1 (1)	MgO		0.919	1.000	-0.0810	
LAW-ORP-LD1 (1)	Na_2O		20.658	20.980	-0.3220	-1.5%
LAW-ORP-LD1 (1)	P_2O_5		0.283	0.290	-0.0070	
LAW-ORP-LD1 (1)	SiO_2		37.063	37.140	-0.0770	-0.2%
LAW-ORP-LD1 (1)	SnO_2	<	0.127	0.000	0.1270	
LAW-ORP-LD1 (1)	SO_3		0.993	1.060	-0.0670	
LAW-ORP-LD1 (1)	V_2O_5		0.988	1.000	-0.0120	

Table A-6. Comparison of Measured and Targeted Glass Compositions (continued)

Glass ID	Oxide	BDL (<)	Measured (wt %)	Targeted (wt %)	Difference of Measured versus Targeted	% Difference of Measured versus Targeted
LAW-ORP-LD1 (1)	ZnO		2.857	3.000	-0.1430	
LAW-ORP-LD1 (1)	ZrO_2		2.894	3.000	-0.1060	
LAW-ORP-LD1 (1)	Sum		97.882	99.830	-1.9480	-2.0%
LRM	Al_2O_3		9.521	9.510	0.0110	0.1%
LRM	B_2O_3		7.622	7.850	-0.2280	-2.9%
LRM	CaO		0.528	0.540	-0.0120	
LRM	Cl	<	0.010	0.000	0.0100	
LRM	Cr_2O_3		0.205	0.190	0.0150	
LRM	F		0.787	0.860	-0.0730	
LRM	Fe_2O_3		1.442	1.380	0.0620	
LRM	K_2O		1.491	1.480	0.0110	
LRM	Li_2O	<	0.220	0.110	0.1100	
LRM	MgO	<	0.166	0.100	0.0660	
LRM	Na_2O		21.358	20.030	1.3280	6.6%
LRM	P_2O_5		0.469	0.540	-0.0710	
LRM	SiO_2		54.469	54.200	0.2690	0.5%
LRM	SnO_2	<	0.127	0.000	0.1270	
LRM	SO_3	<	0.250	0.300	-0.0500	
LRM	V_2O_5	<	0.179		0.1790	
LRM	ZnO	<	0.124	0.000	0.1240	
LRM	ZrO_2		0.889	0.930	-0.0410	
LRM	Sum		99.859	98.020	1.8390	1.9%

Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence

Analyte=Al2O3 (wt%), Prep Method=PF, Block=1
Variability Chart for Measured (wt%)

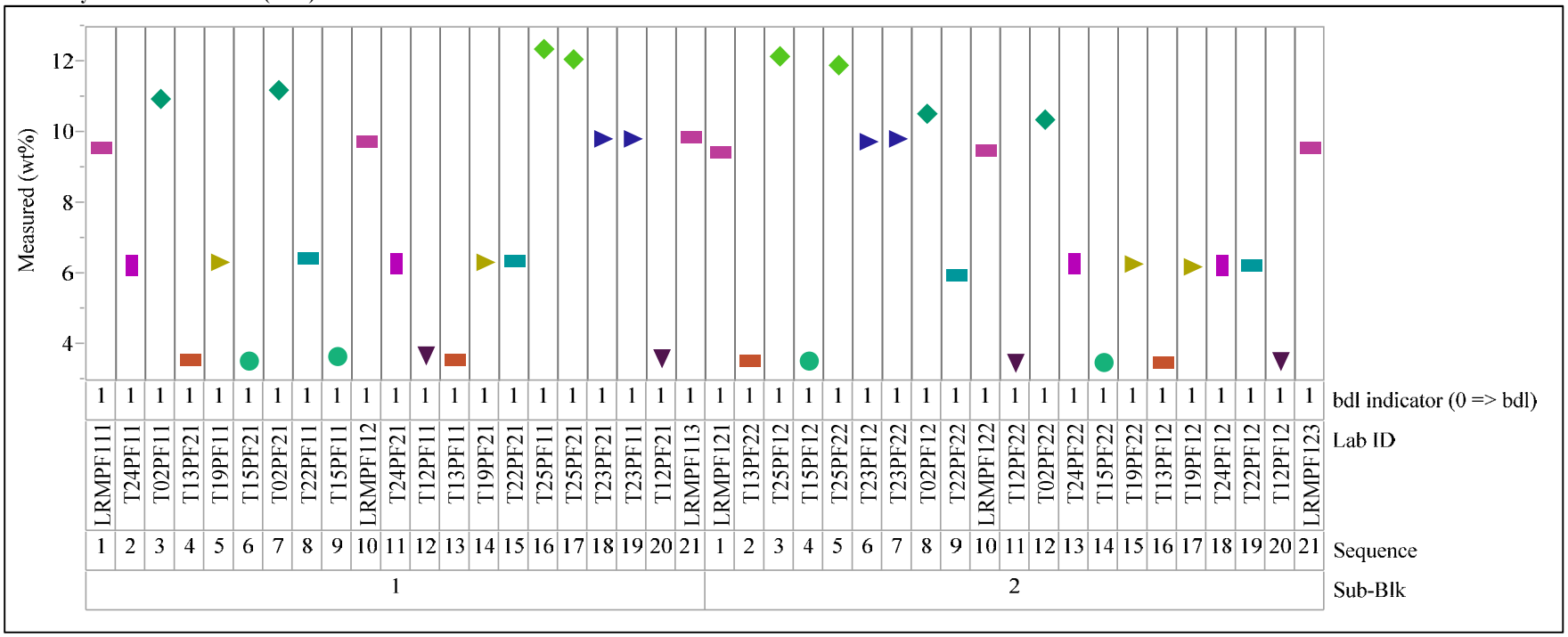


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

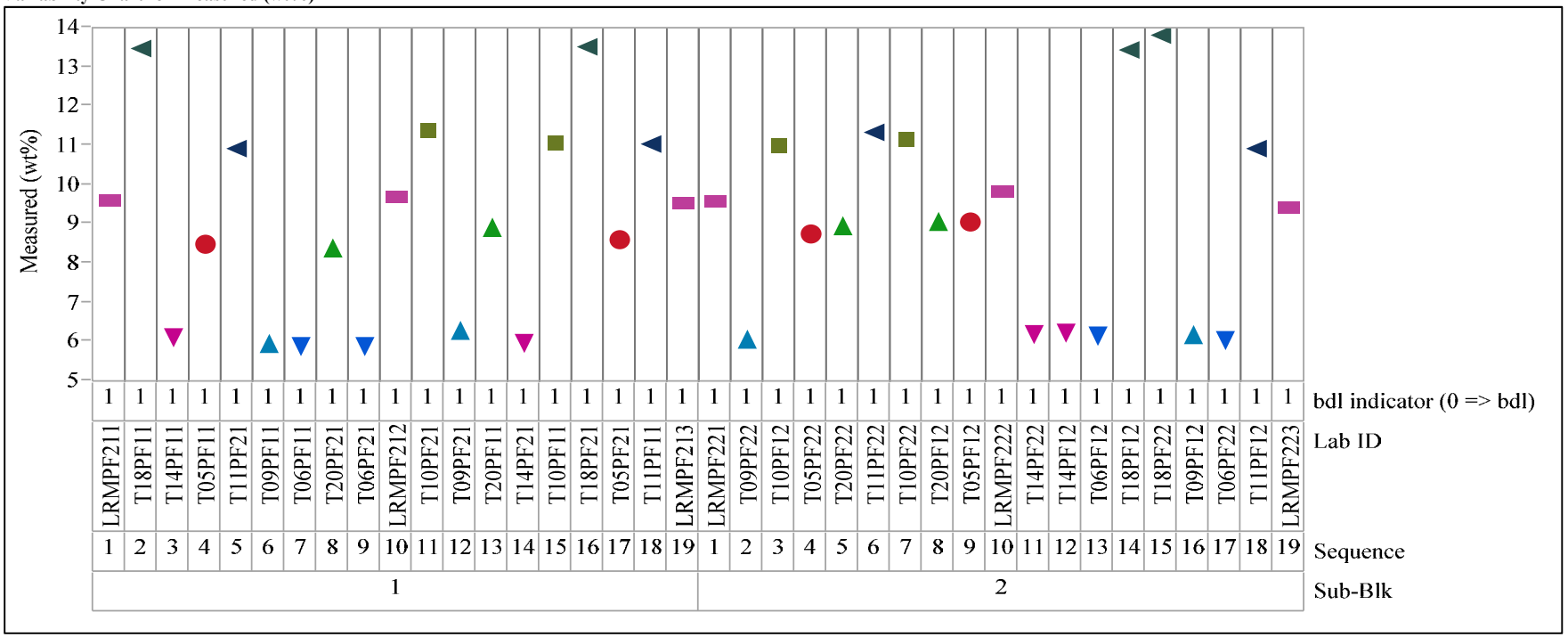


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Al2O3 (wt%), Prep Method=PF, Block=3
Variability Chart for Measured (wt%)

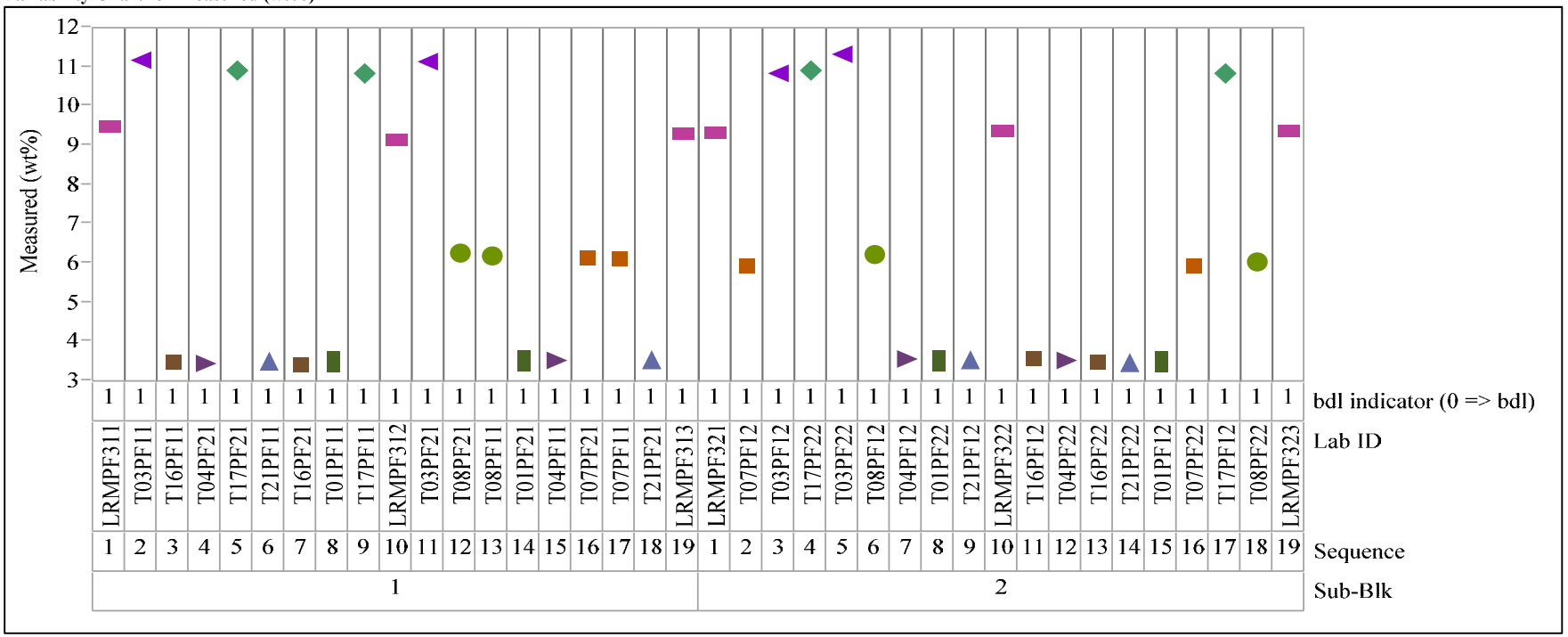


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=B2O3 (wt%), Prep Method=PF, Block=1
Variability Chart for Measured (wt%)

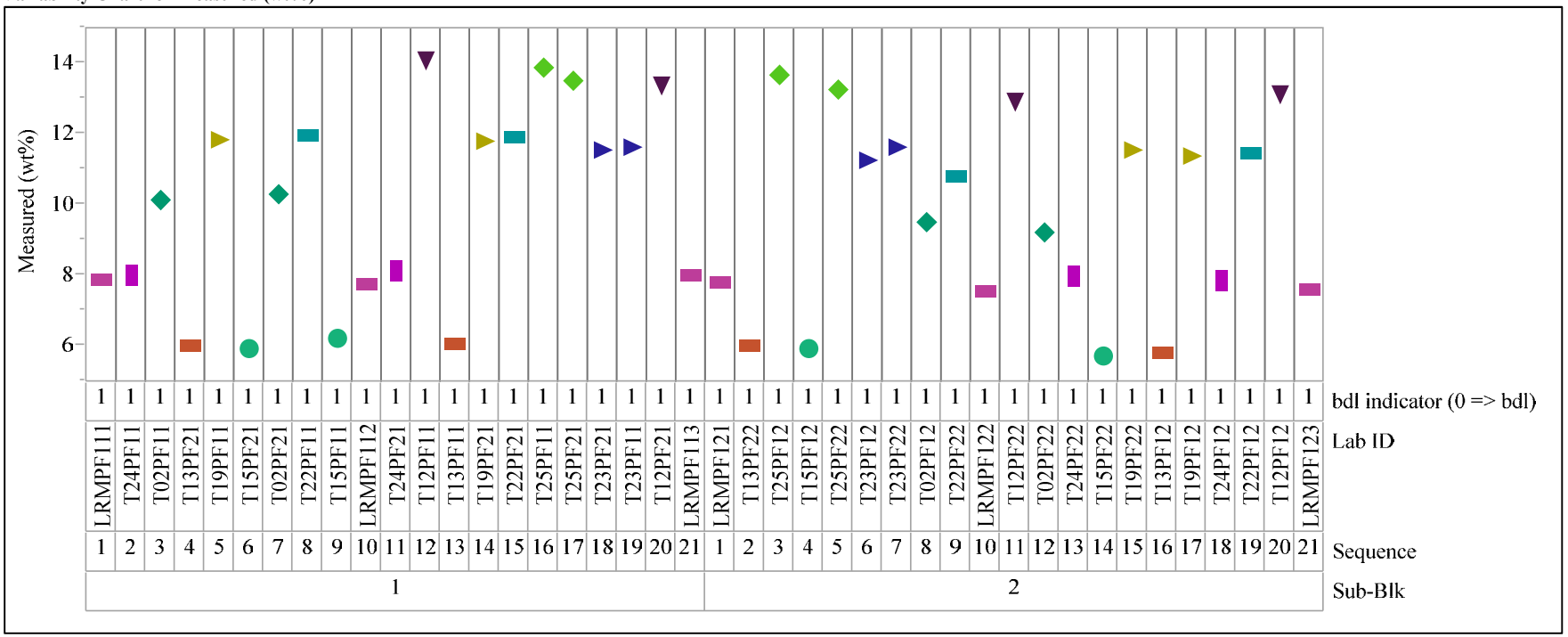


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

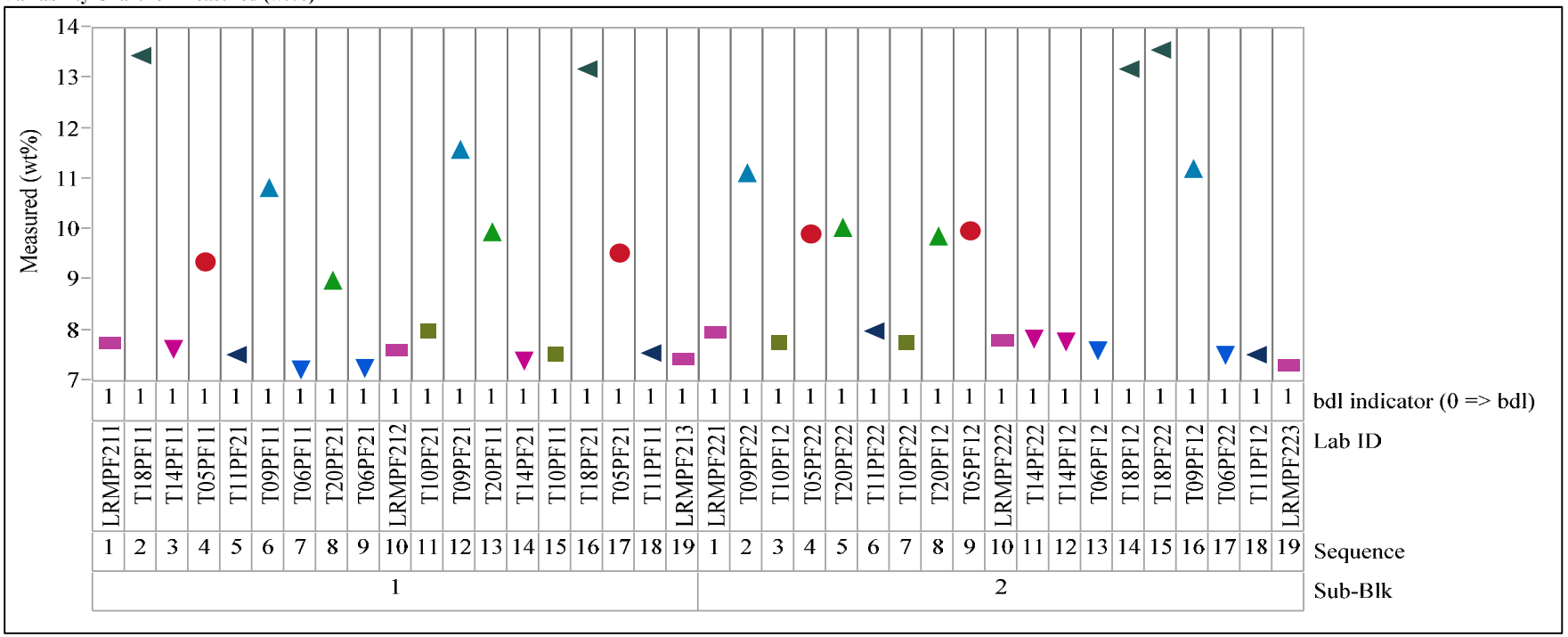


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=B2O3 (wt%), Prep Method=PF, Block=3
Variability Chart for Measured (wt%)

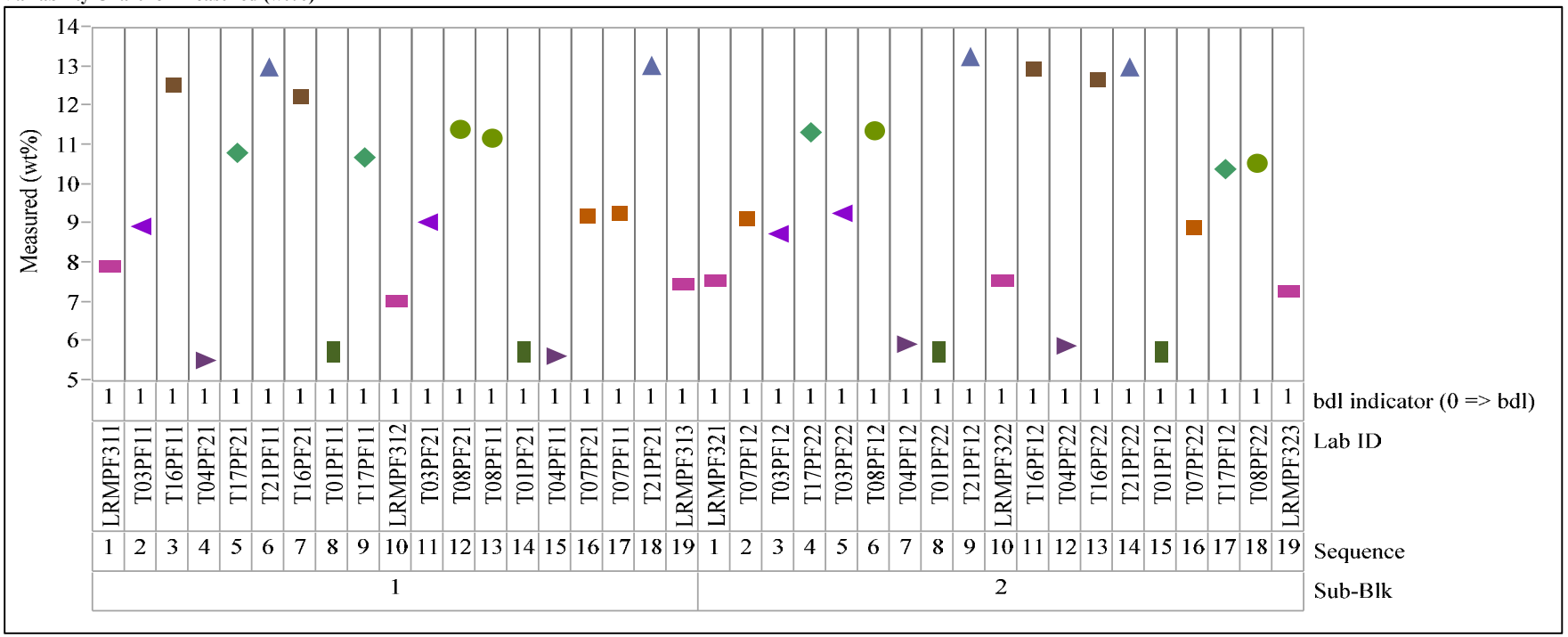


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=CaO (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

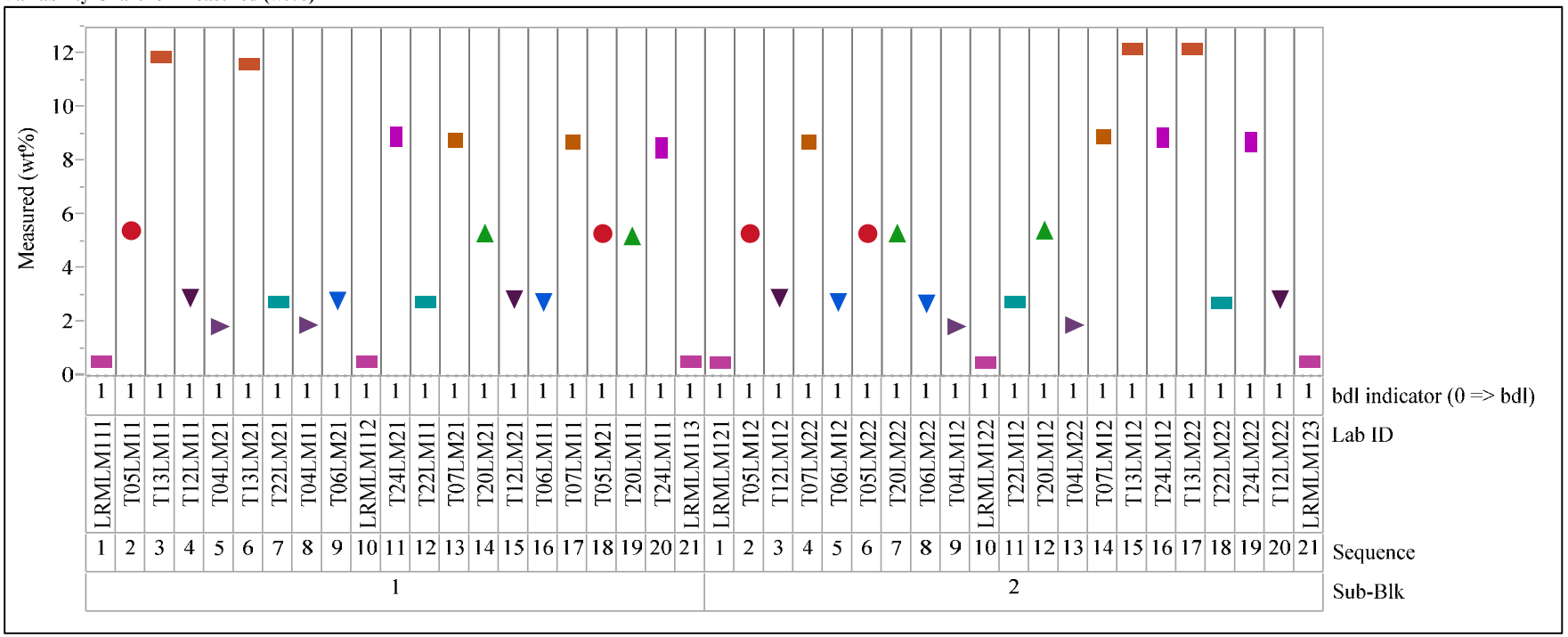


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=CaO (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

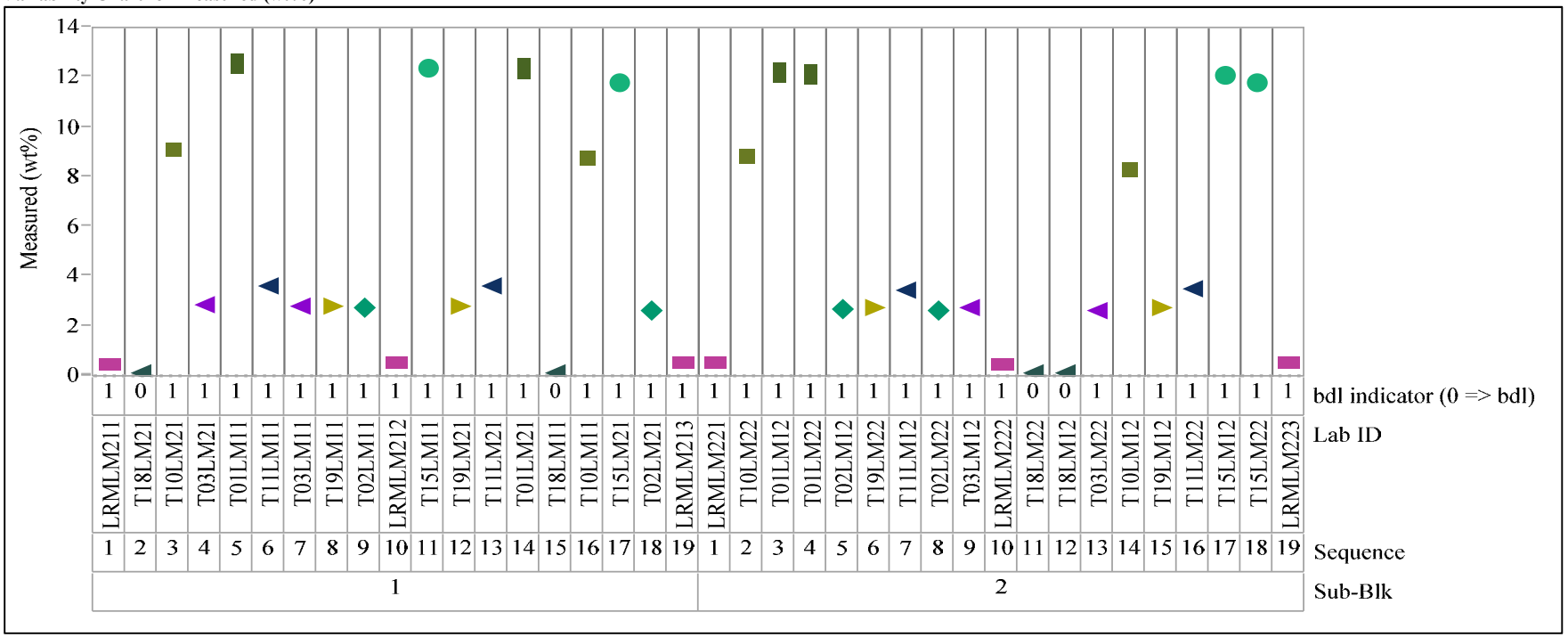


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=CaO (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

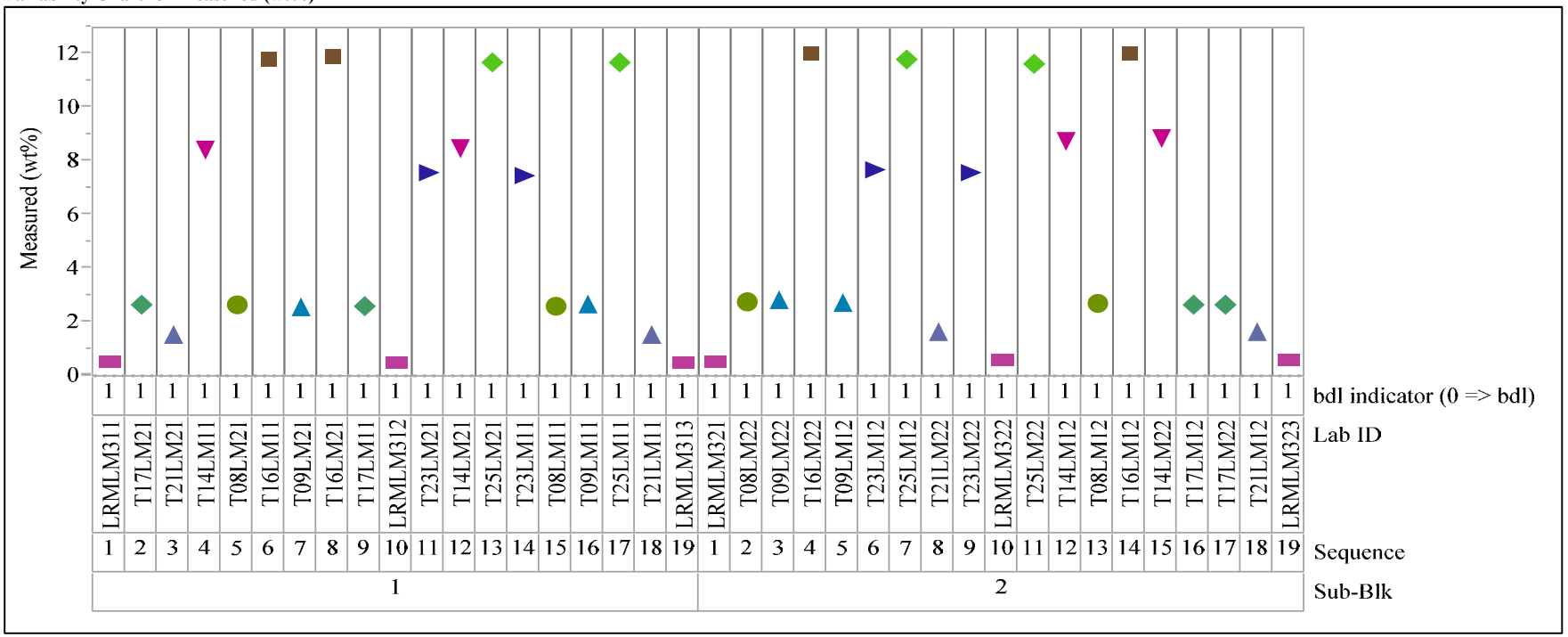


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

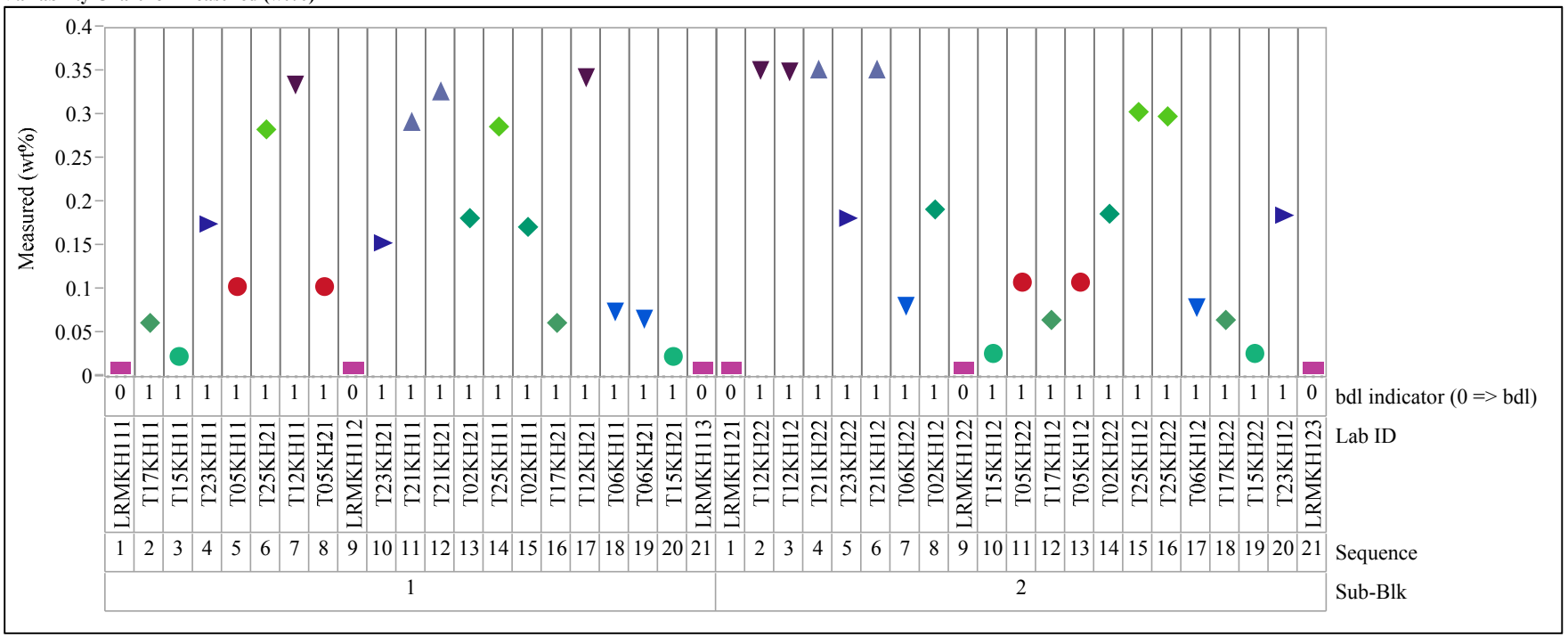


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Cl (wt%), Prep Method=KH, Block=2
Variability Chart for Measured (wt%)

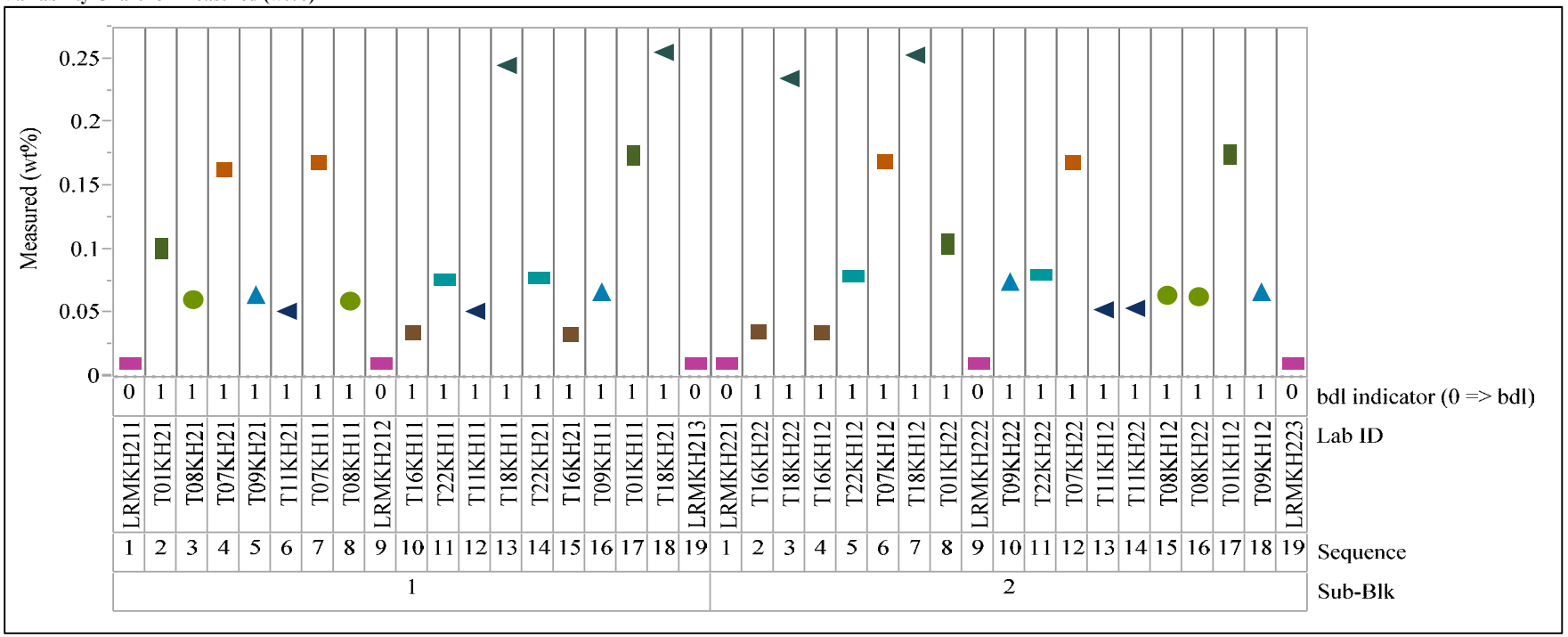


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Cl (wt%), Prep Method=KH, Block=3
Variability Chart for Measured (wt%)

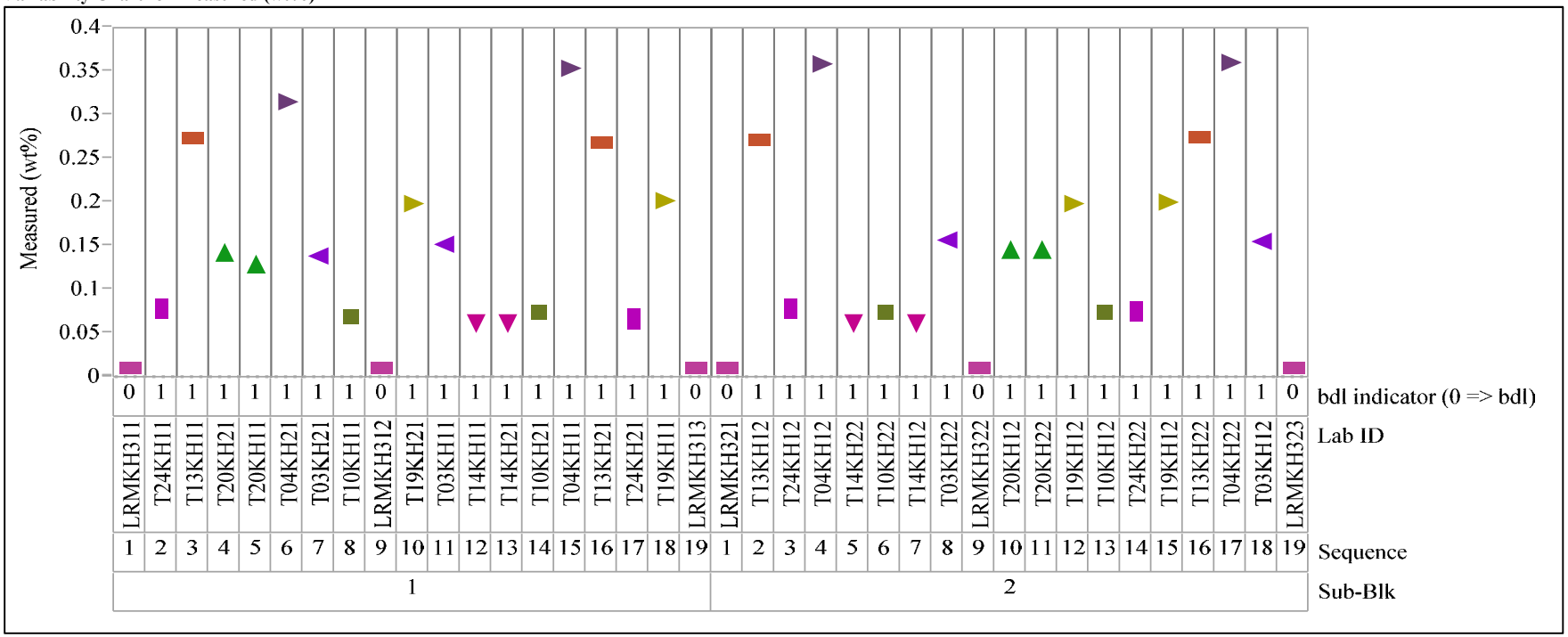


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Cr2O3 (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

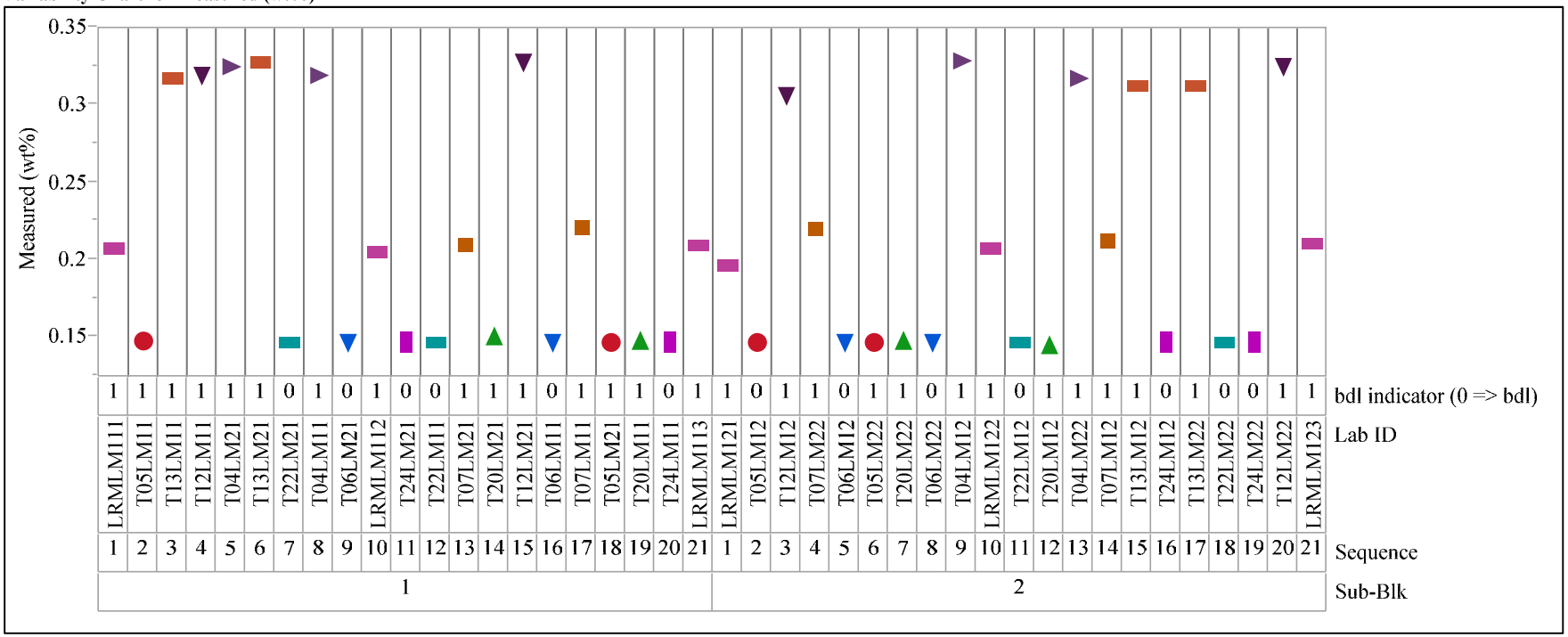


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Cr2O3 (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

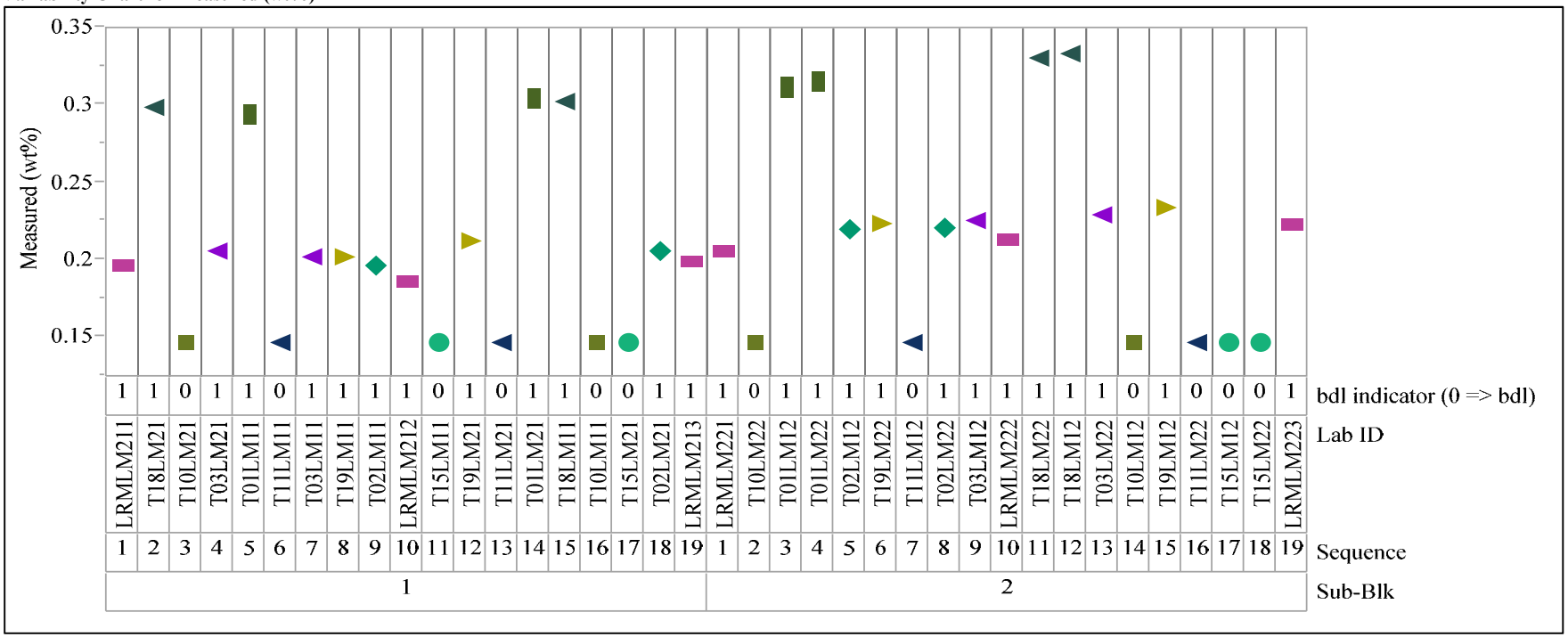


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

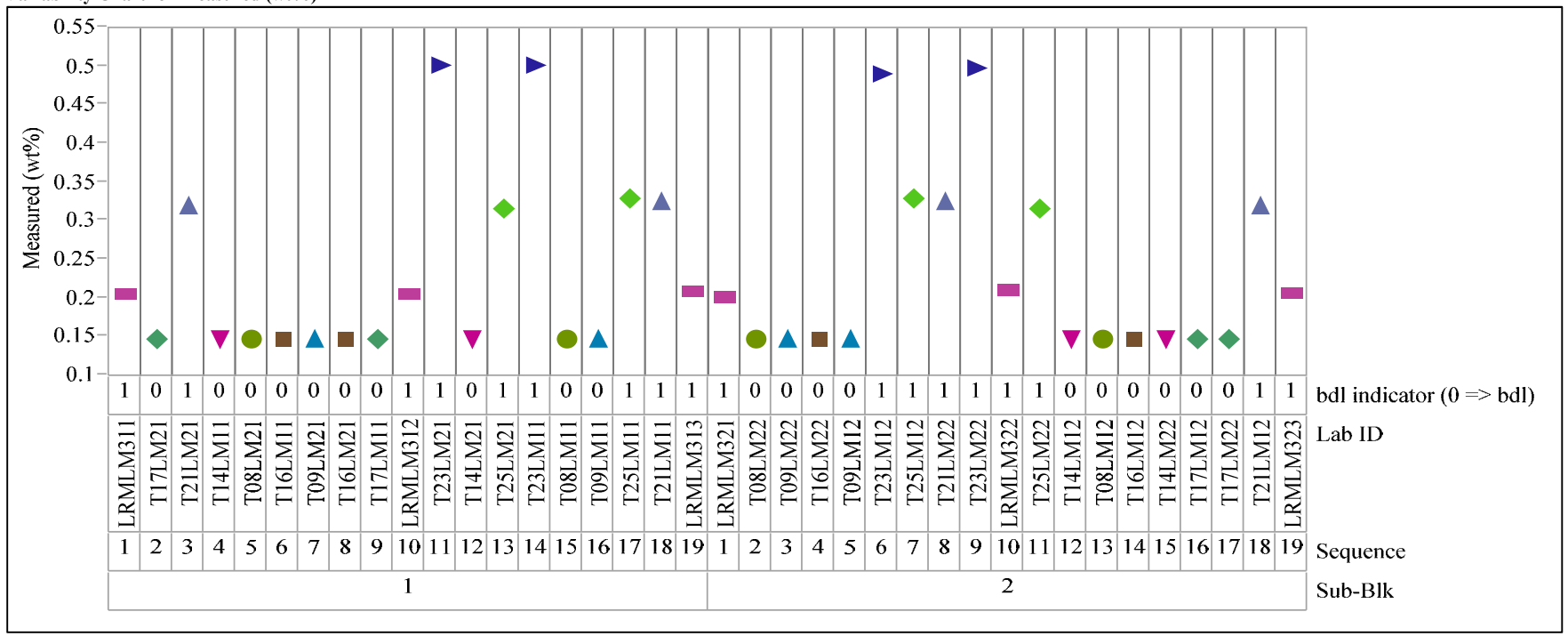


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=F (wt%), Prep Method=KH, Block=1
Variability Chart for Measured (wt%)

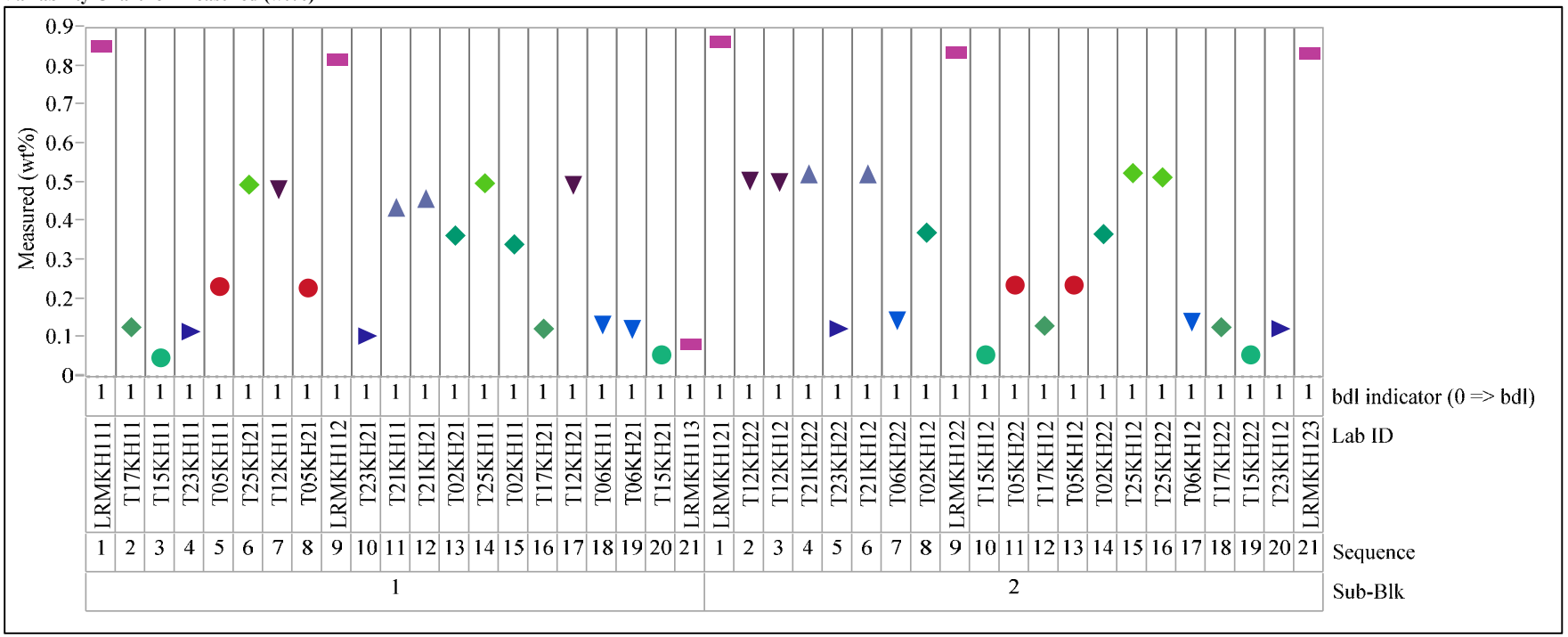


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=F (wt%), Prep Method=KH, Block=2
Variability Chart for Measured (wt%)

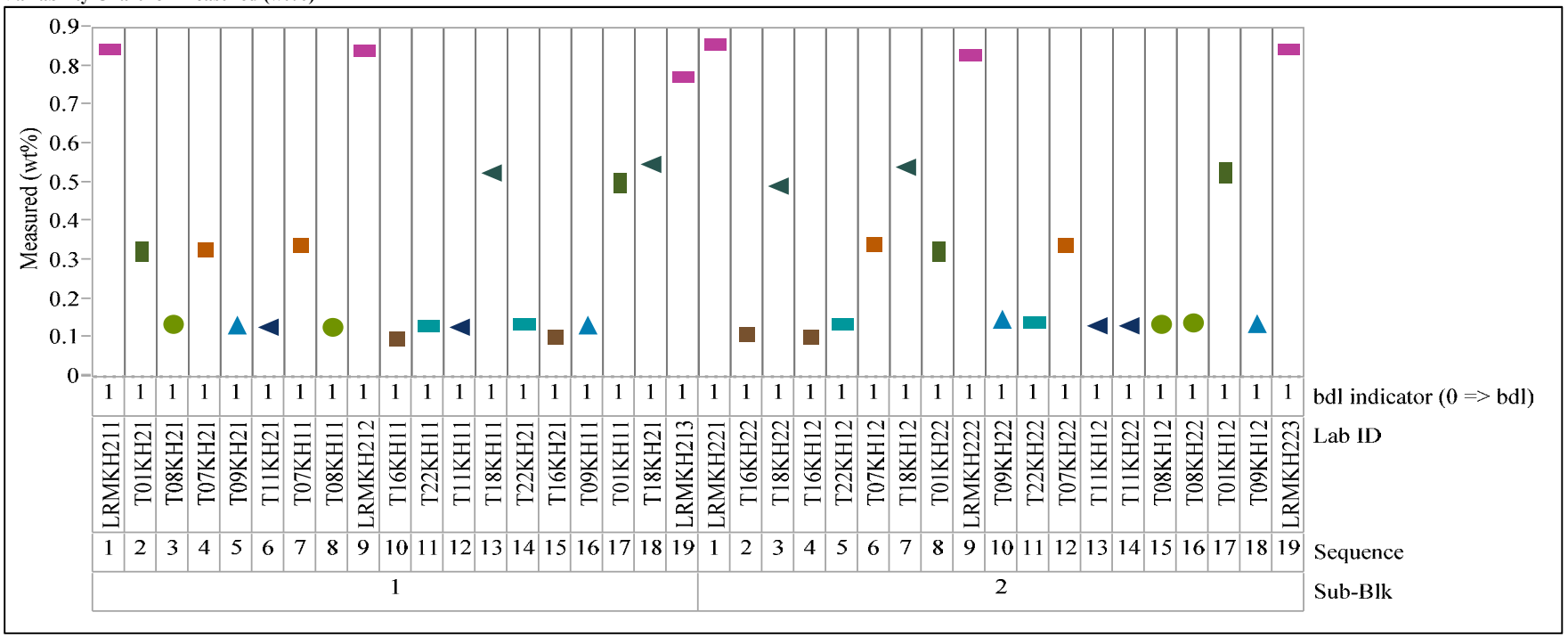


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=F (wt%), Prep Method=KH, Block=3
Variability Chart for Measured (wt%)

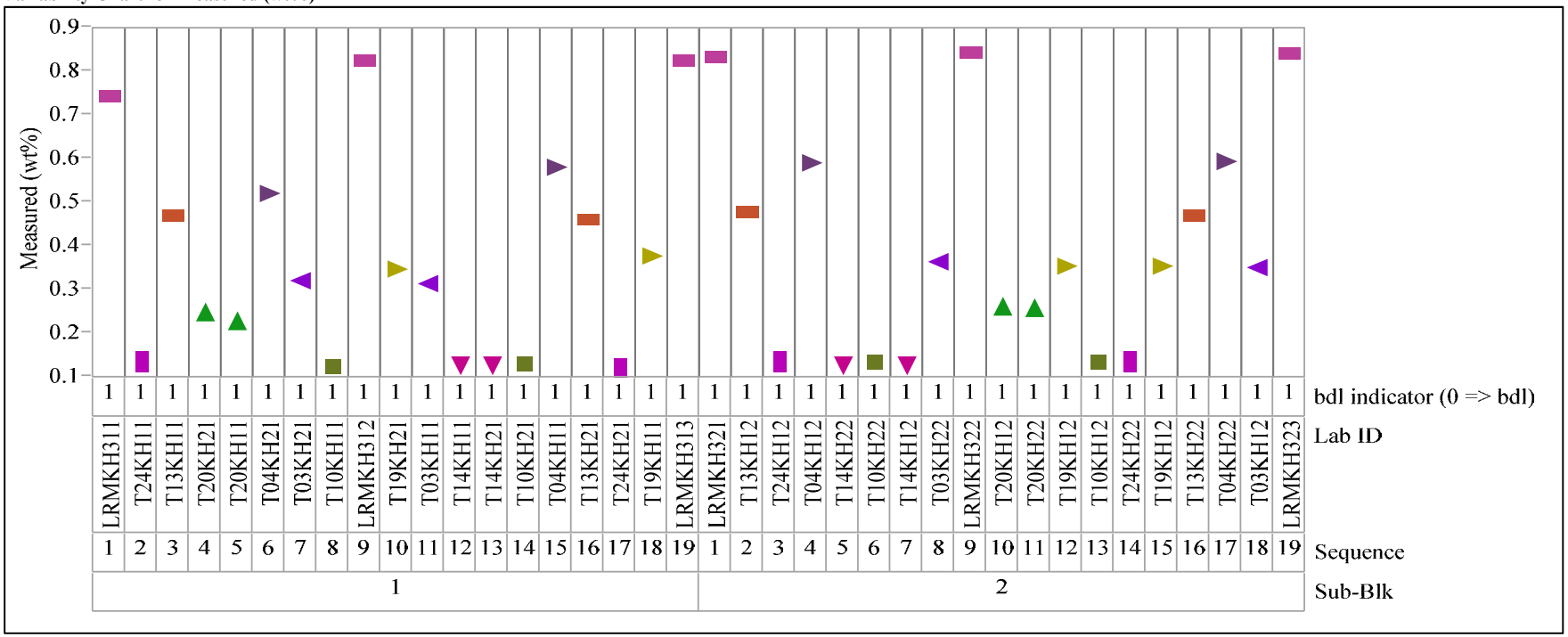


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Fe2O3 (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

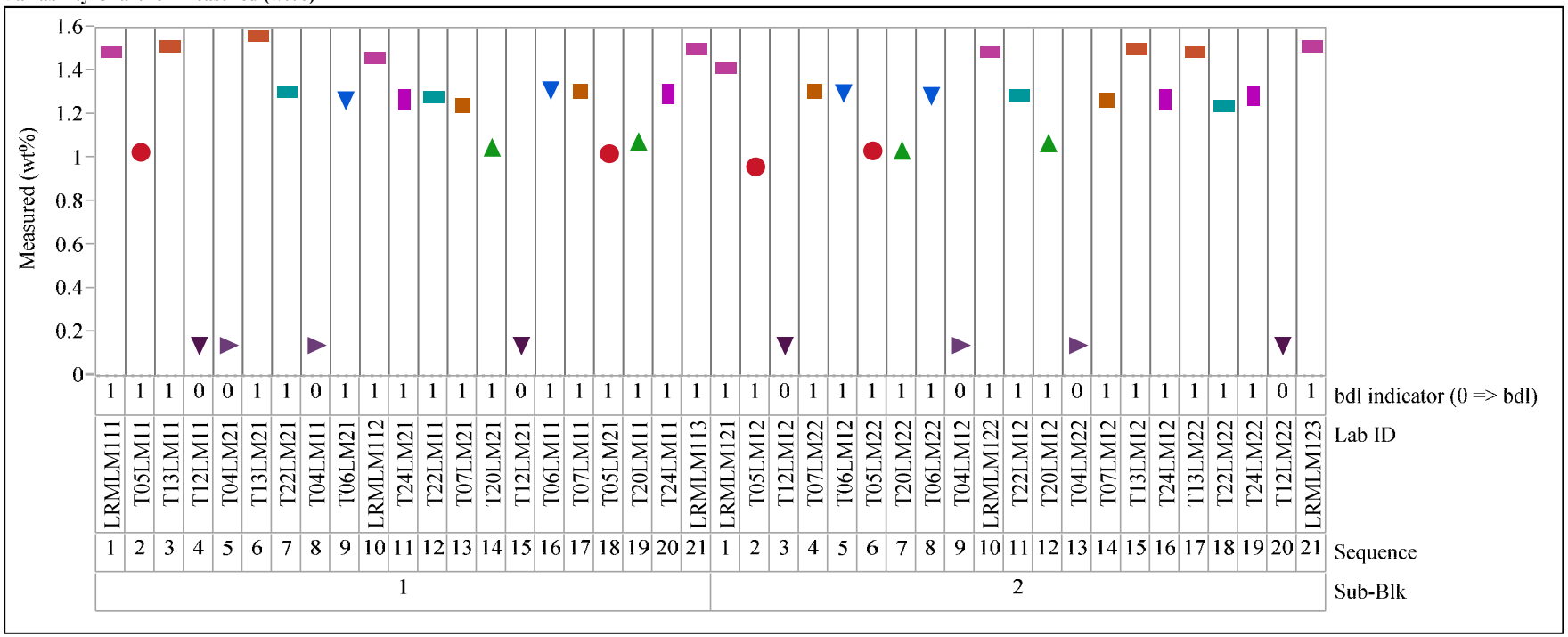


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Fe2O3 (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

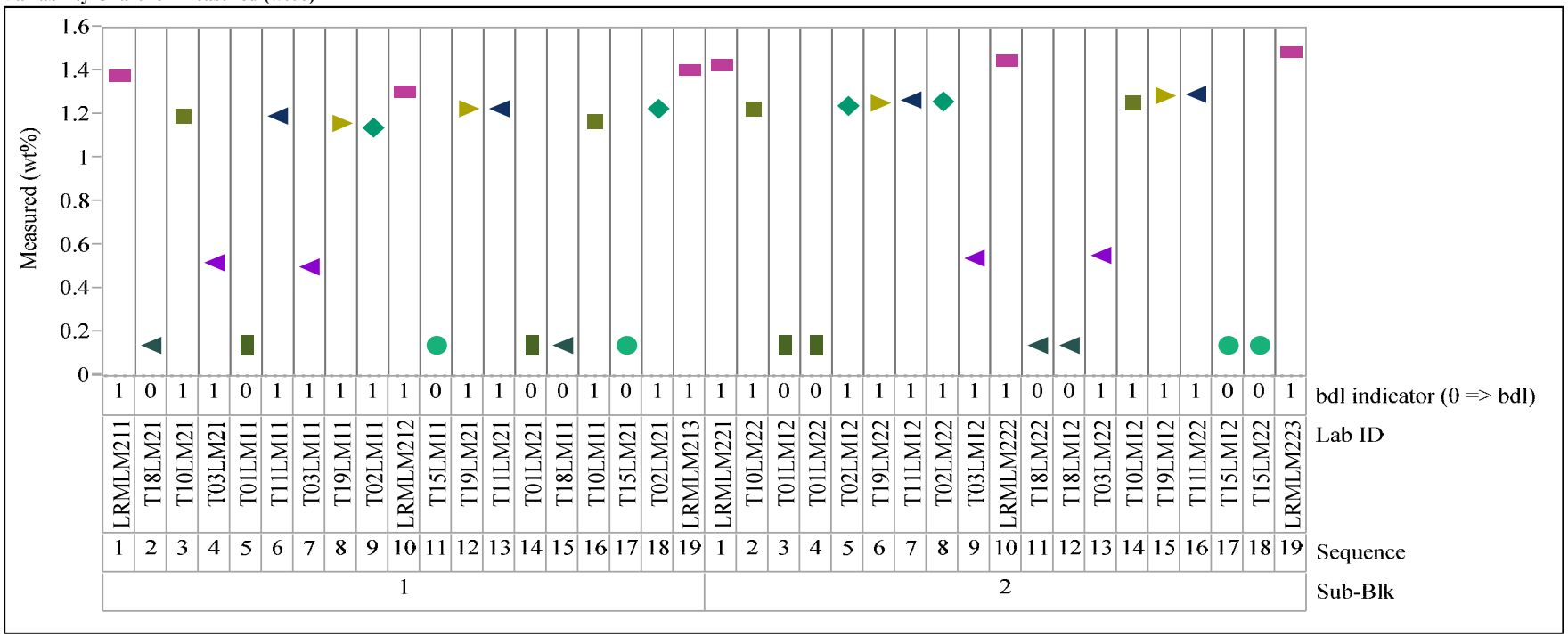


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Fe2O3 (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

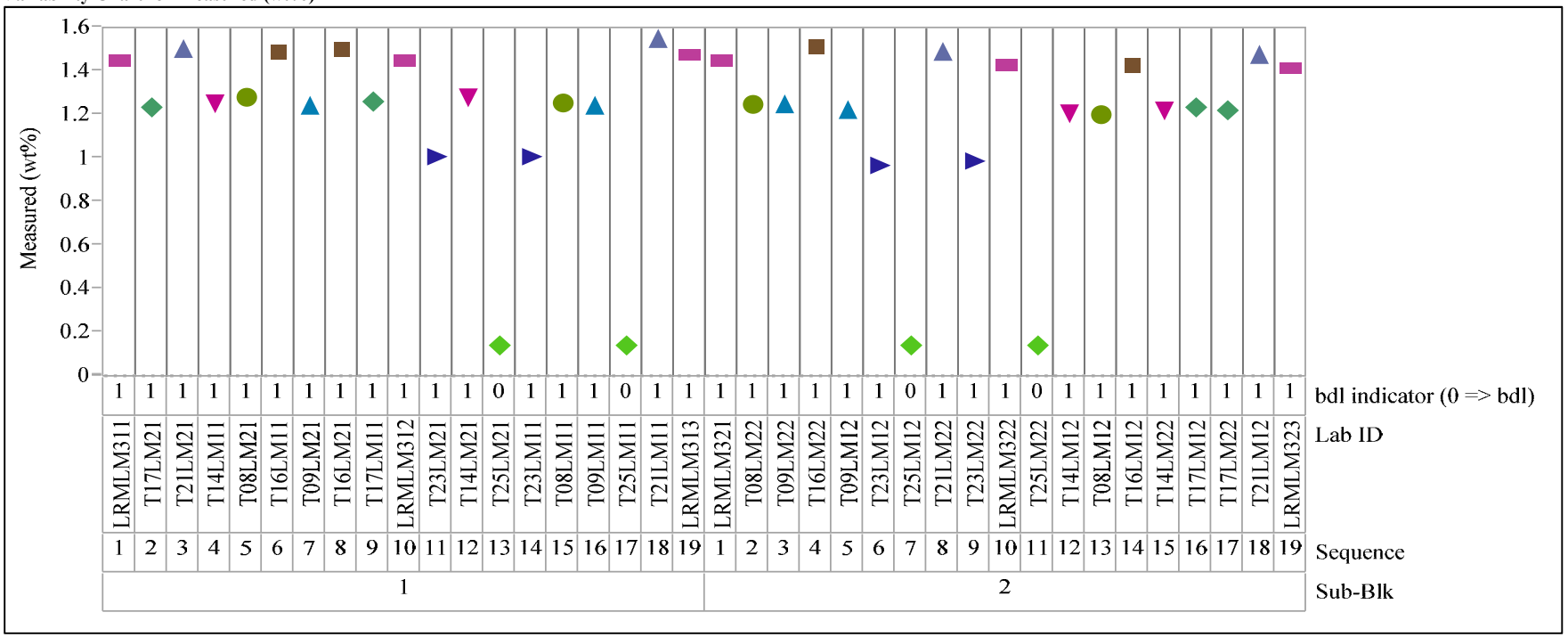


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=K2O (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

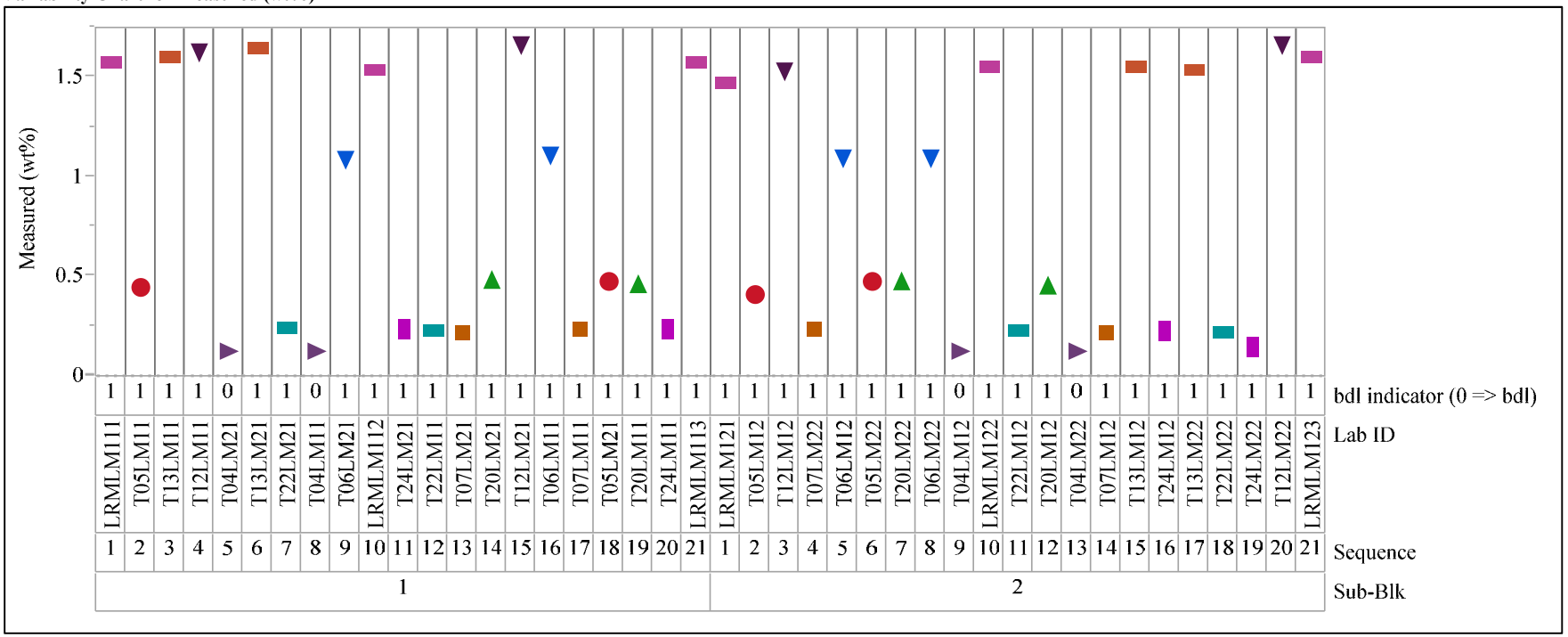


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=K2O (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

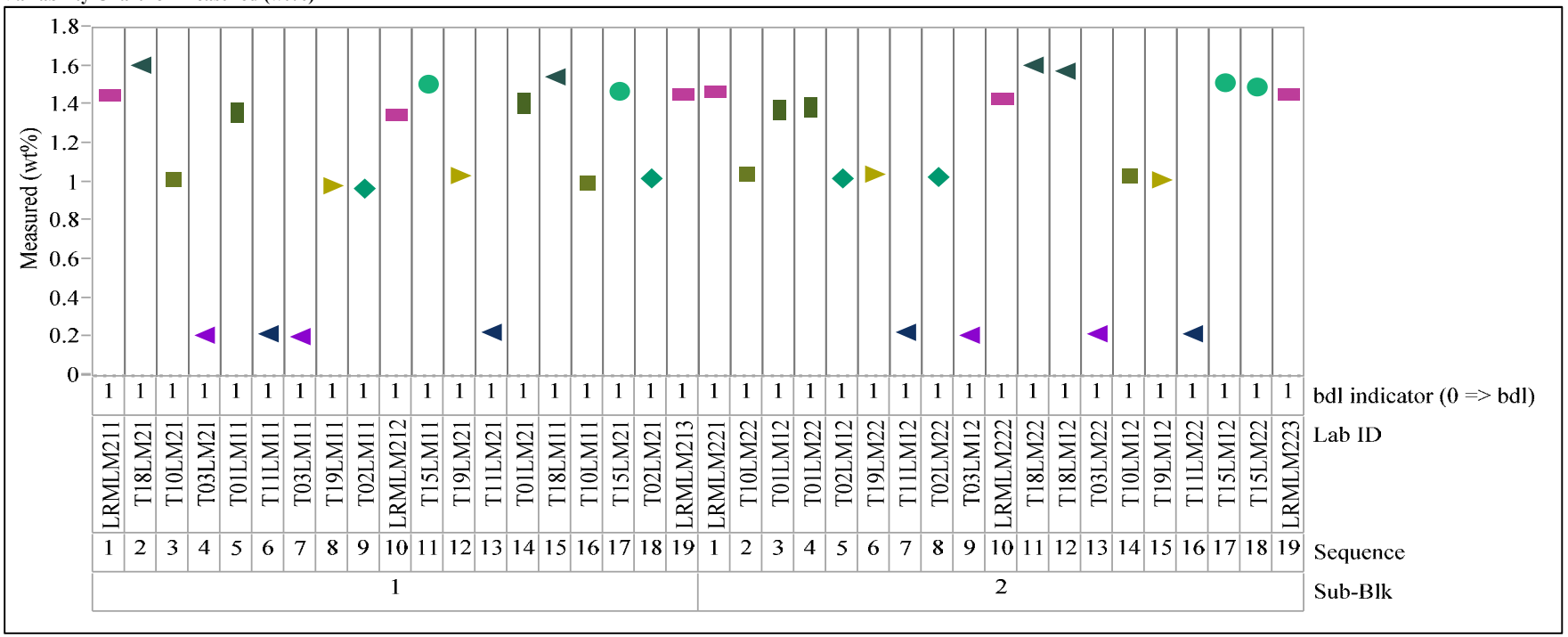


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=K2O (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

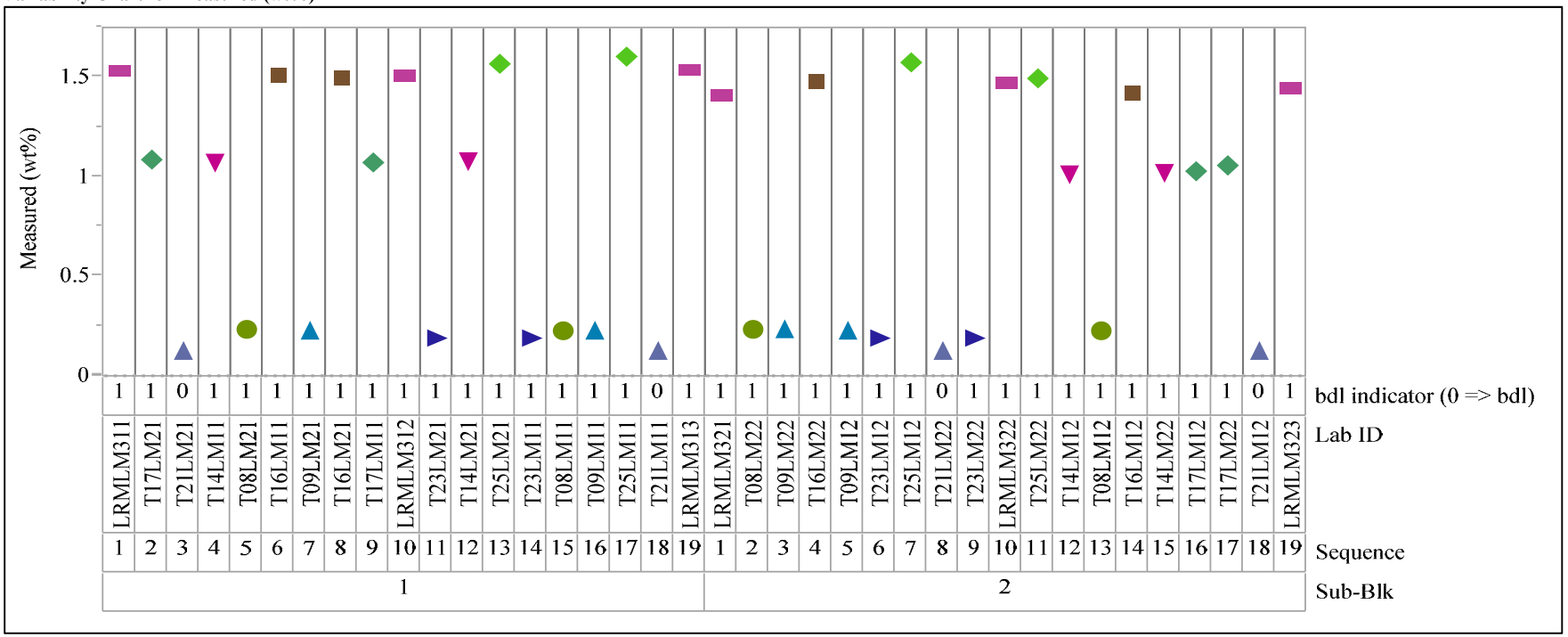


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Li2O (wt%), Prep Method=PF, Block=1
Variability Chart for Measured (wt%)

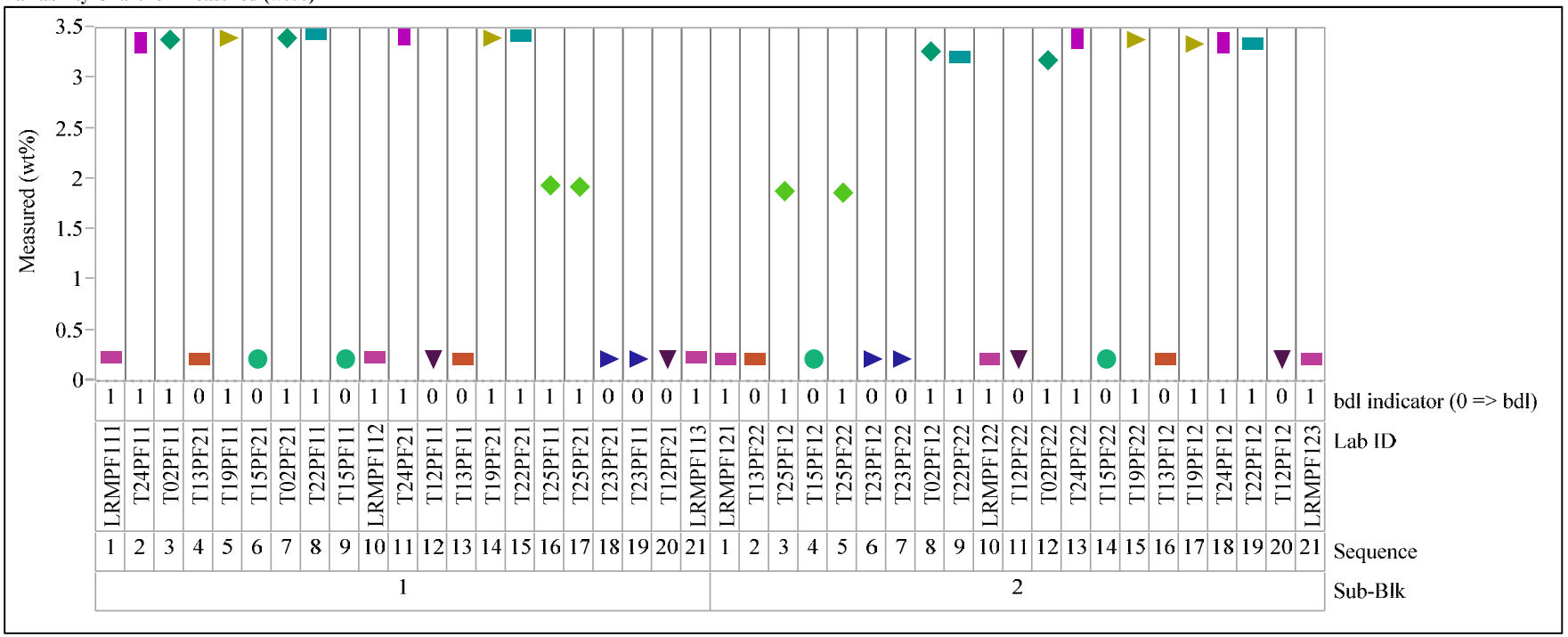


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Li2O (wt%), Prep Method=PF, Block=2
Variability Chart for Measured (wt%)

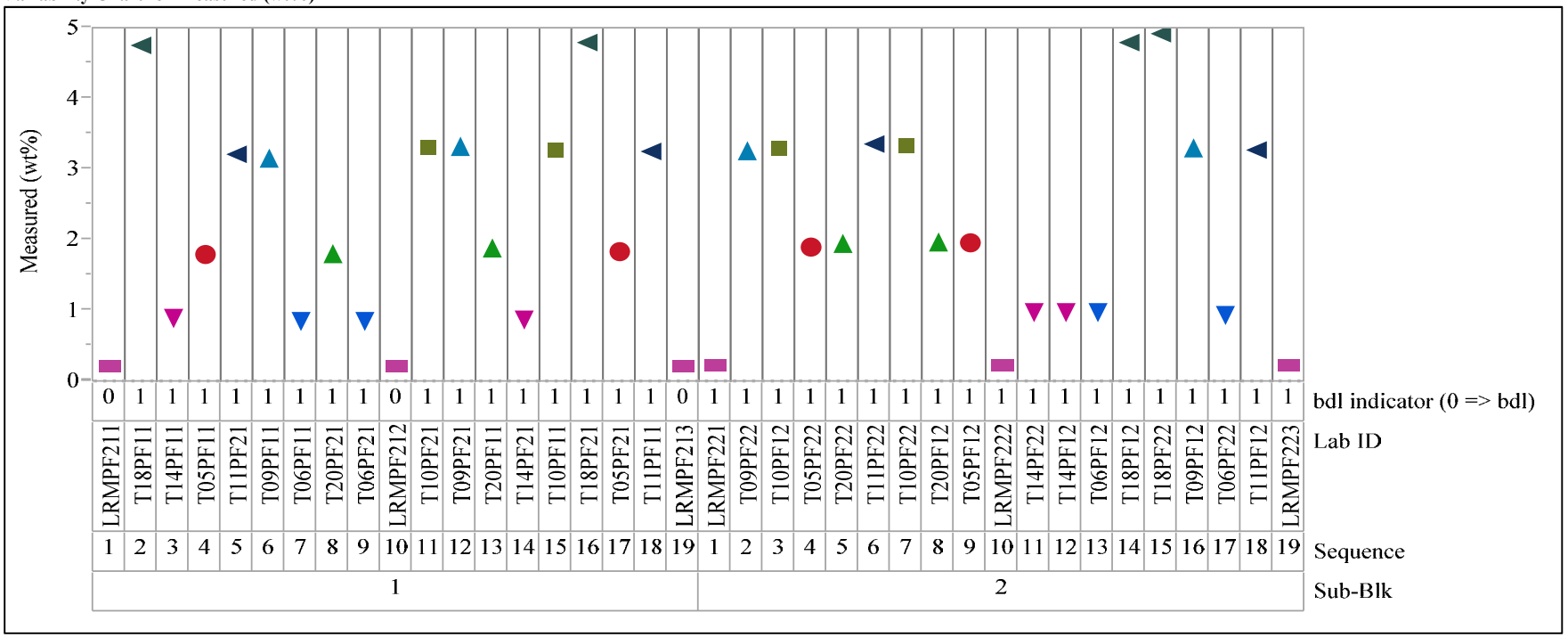


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Li2O (wt%), Prep Method=PF, Block=3
Variability Chart for Measured (wt%)

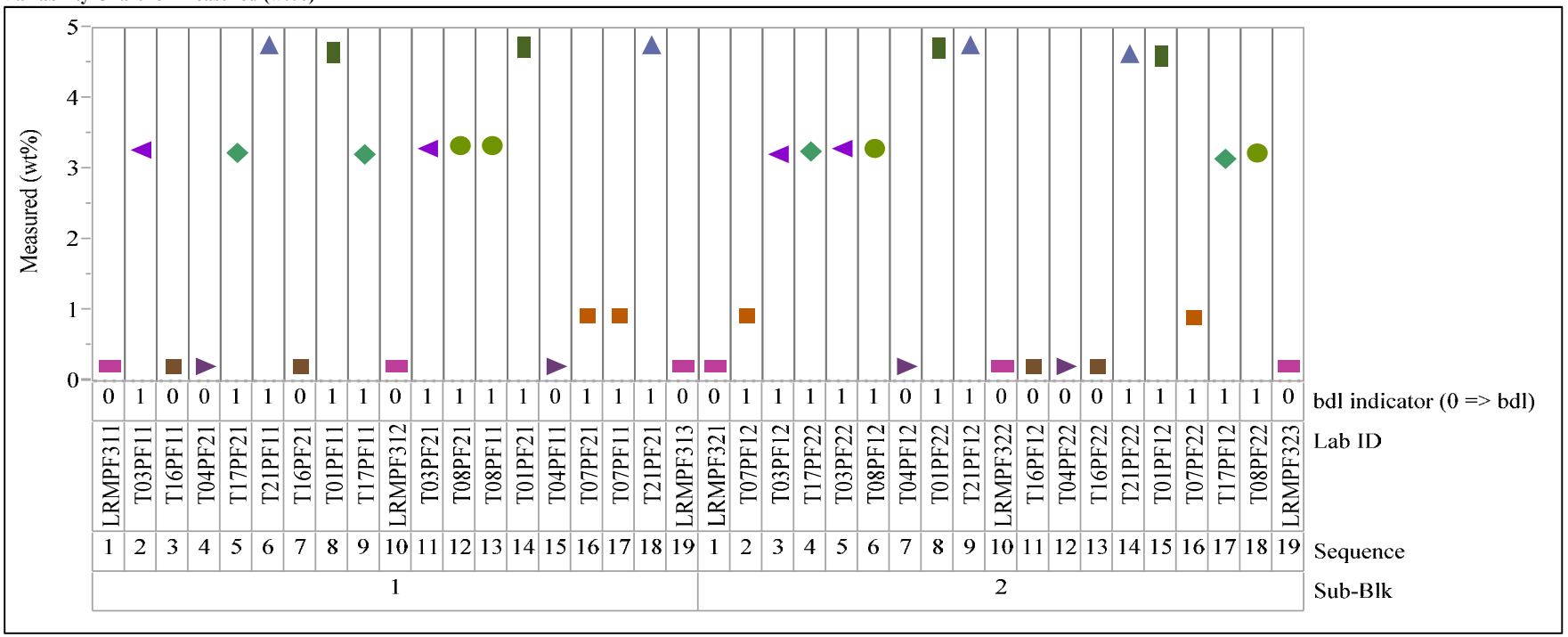


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=MgO (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

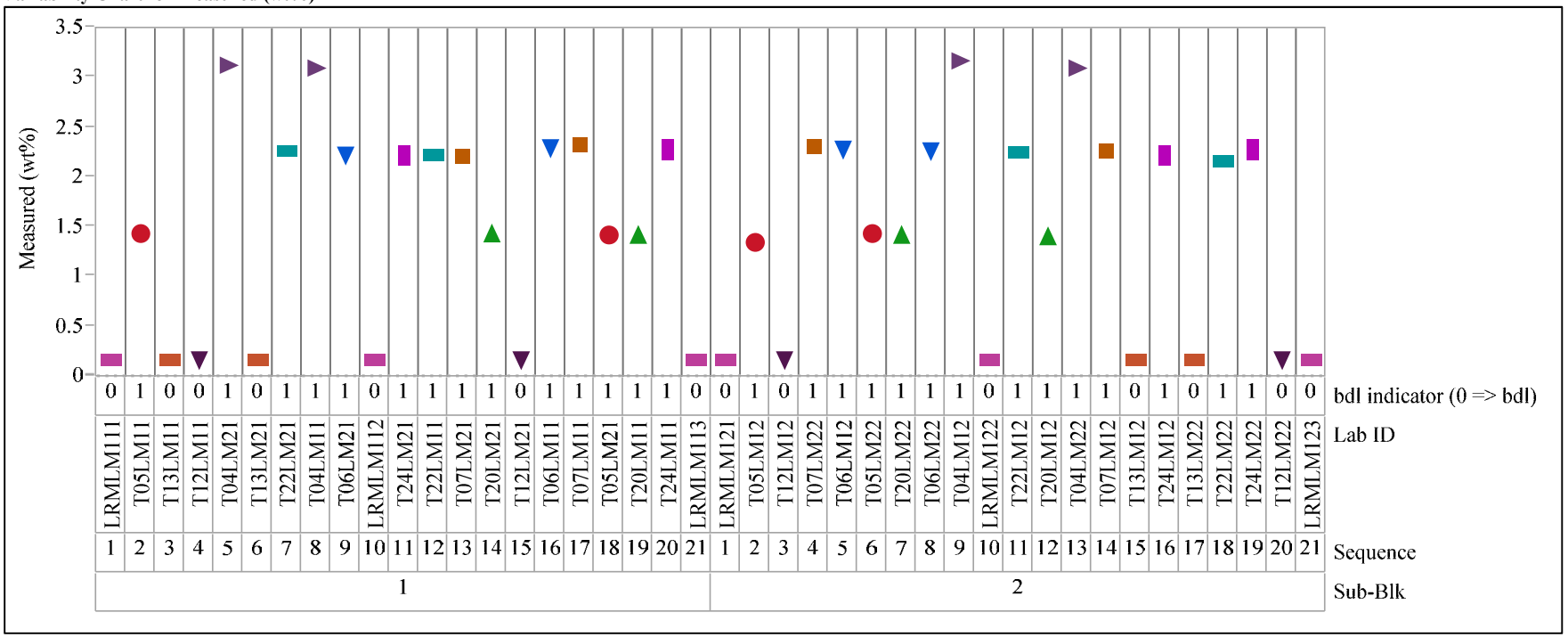


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=MgO (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

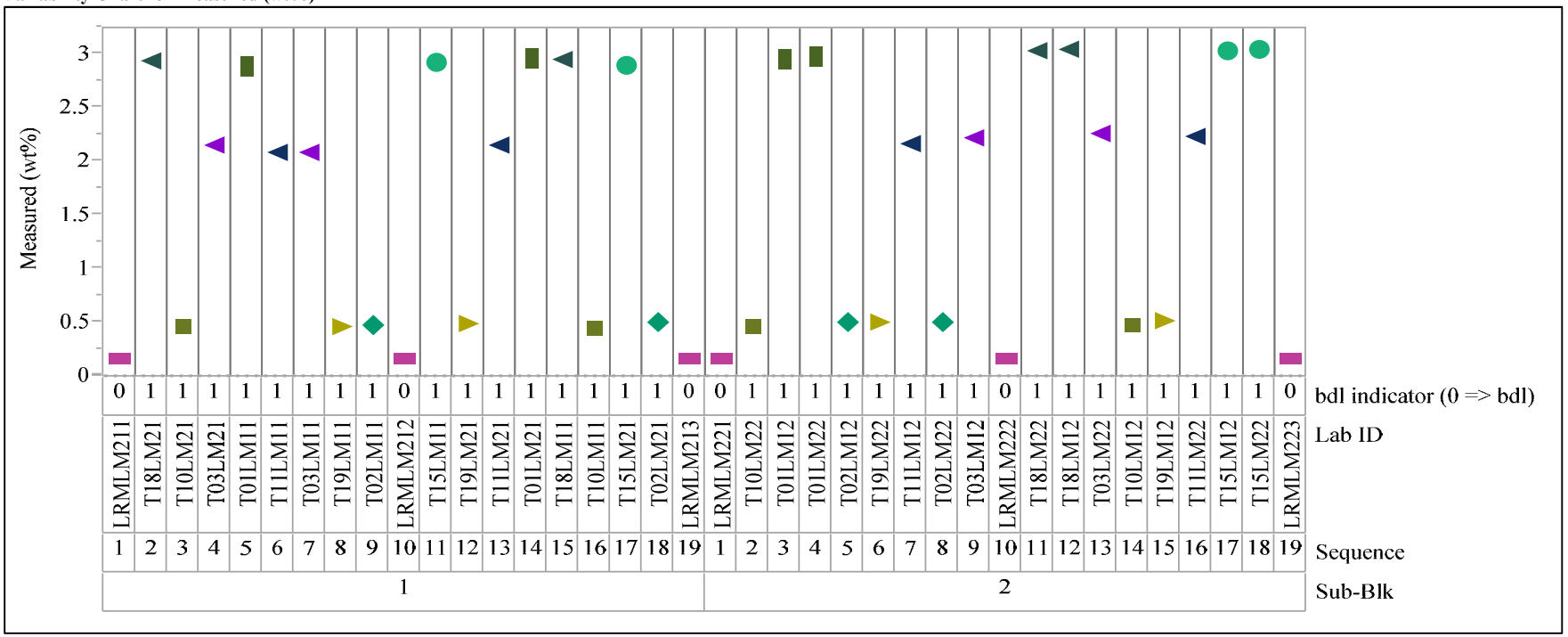


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=MgO (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

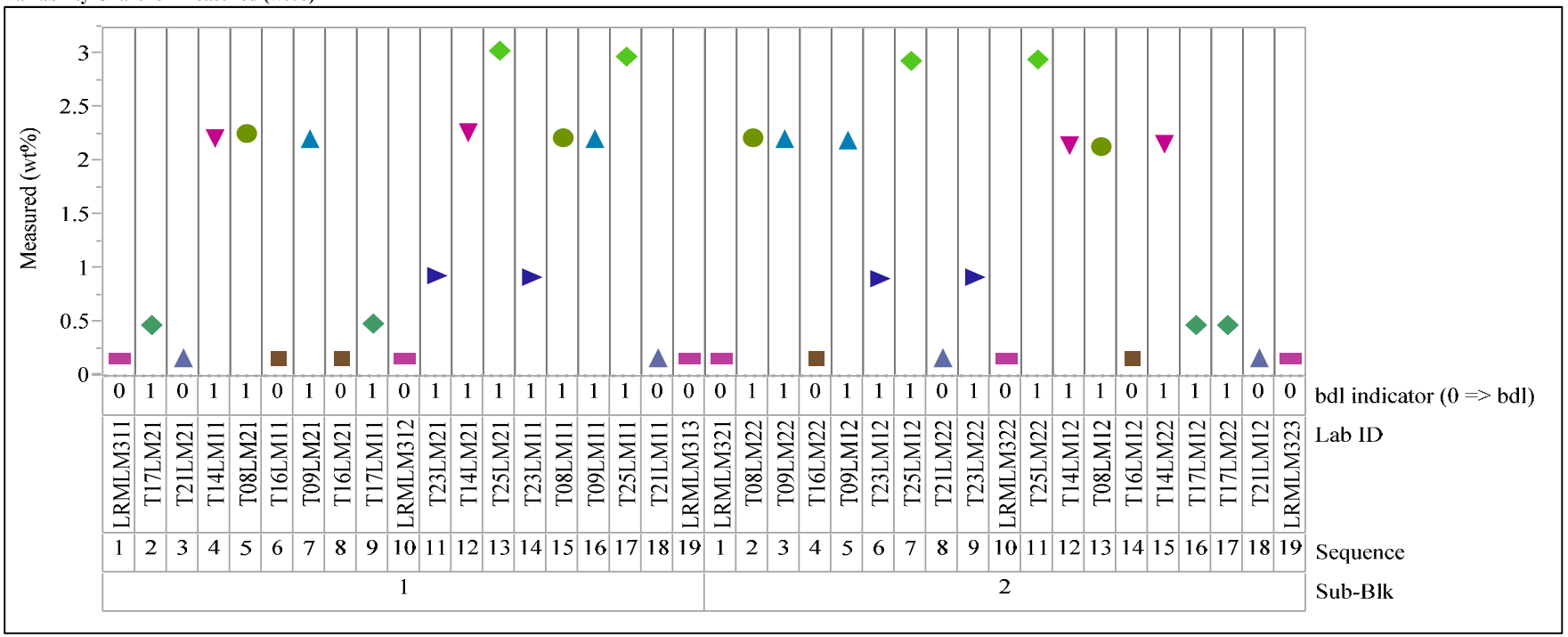


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Na2O (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

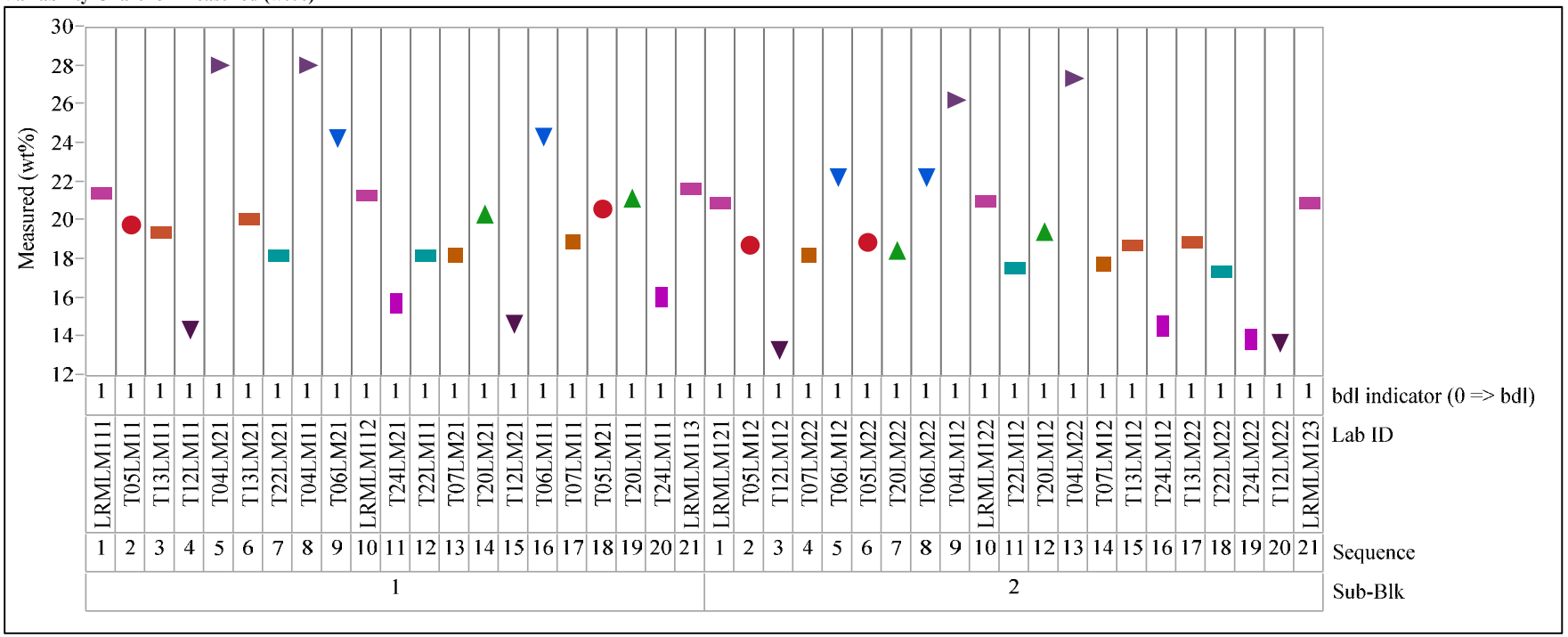


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Na2O (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

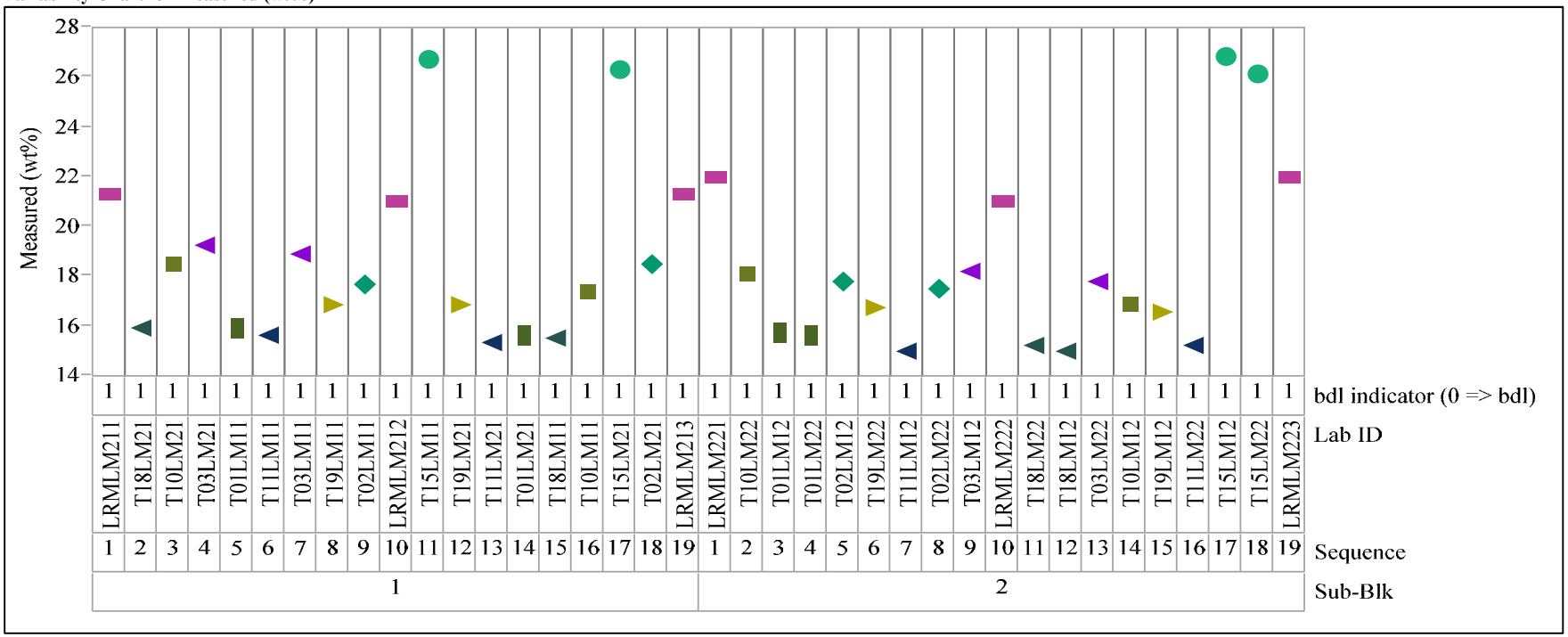


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=Na2O (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

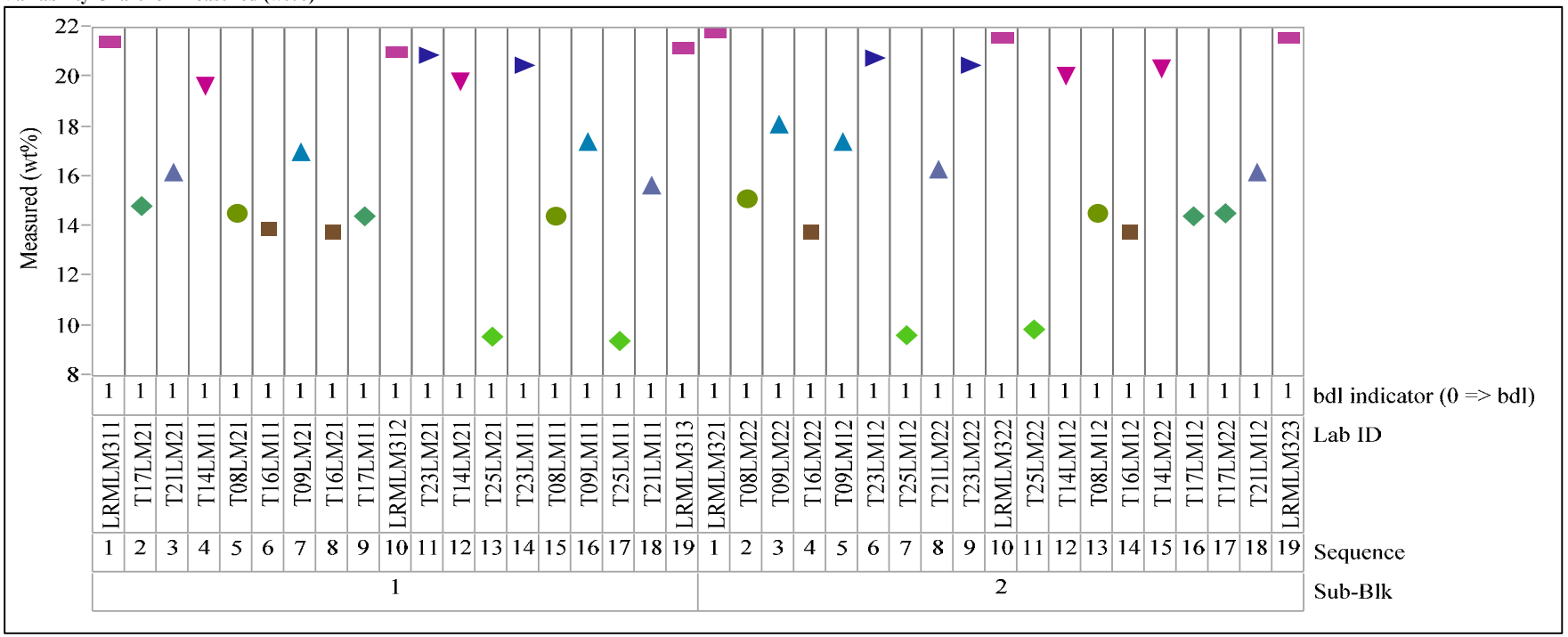


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=P2O5 (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

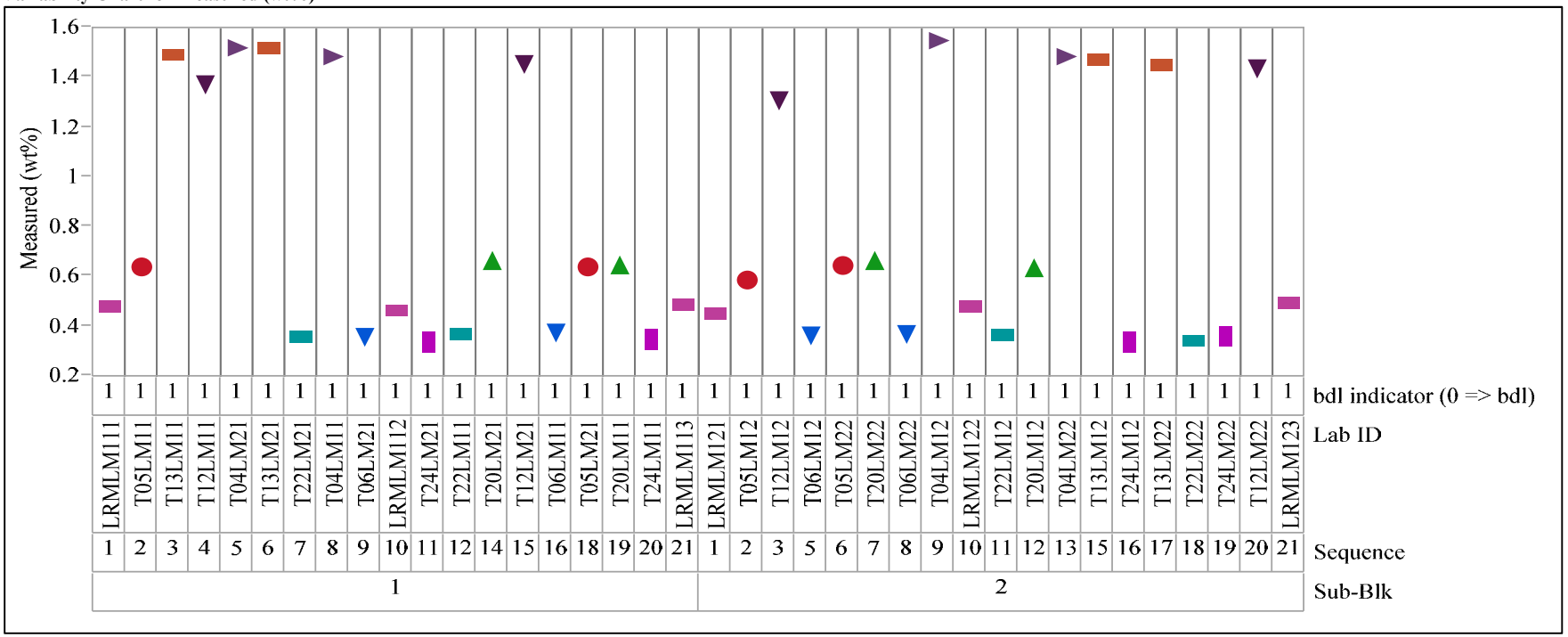


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=P2O5 (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

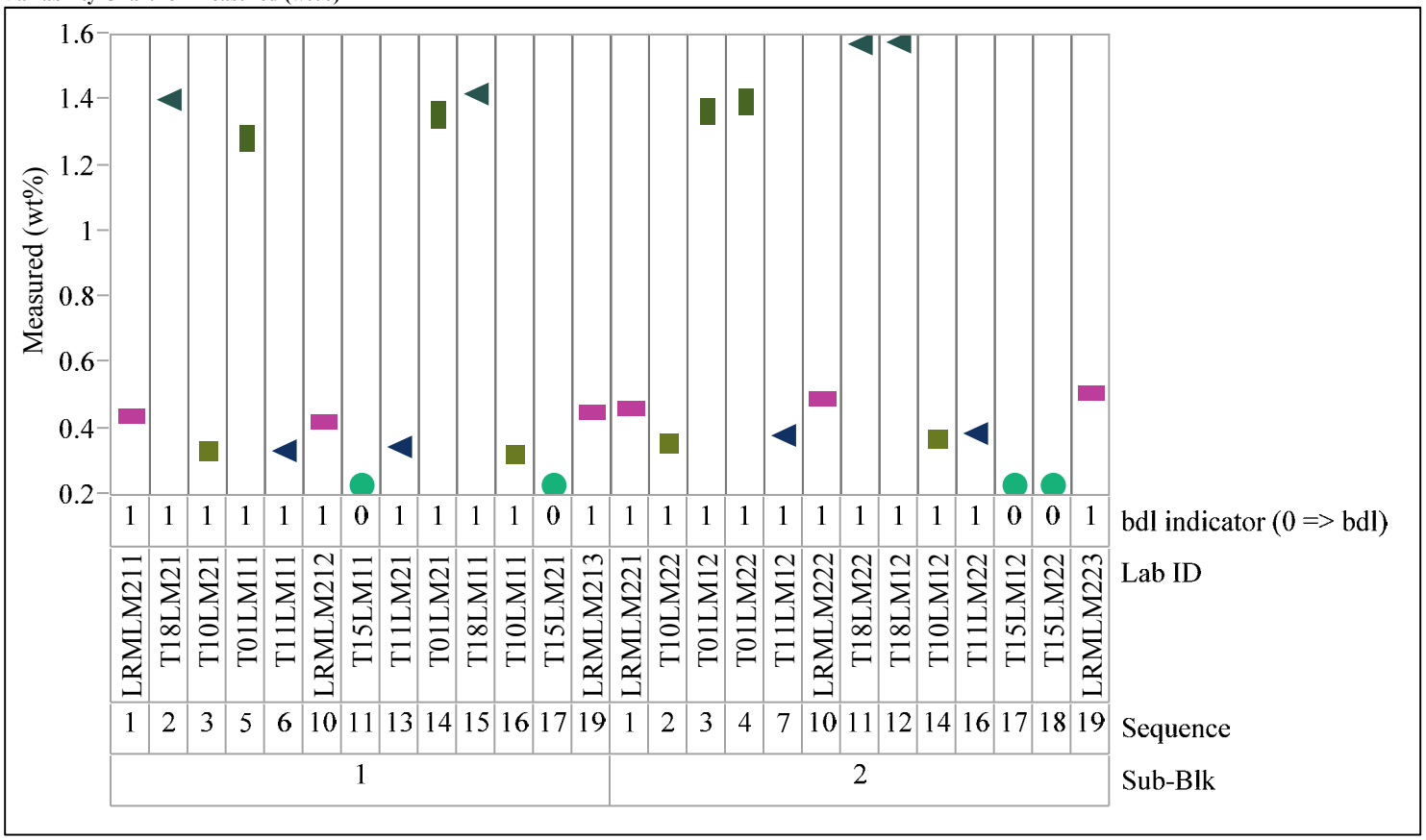


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=P2O5 (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

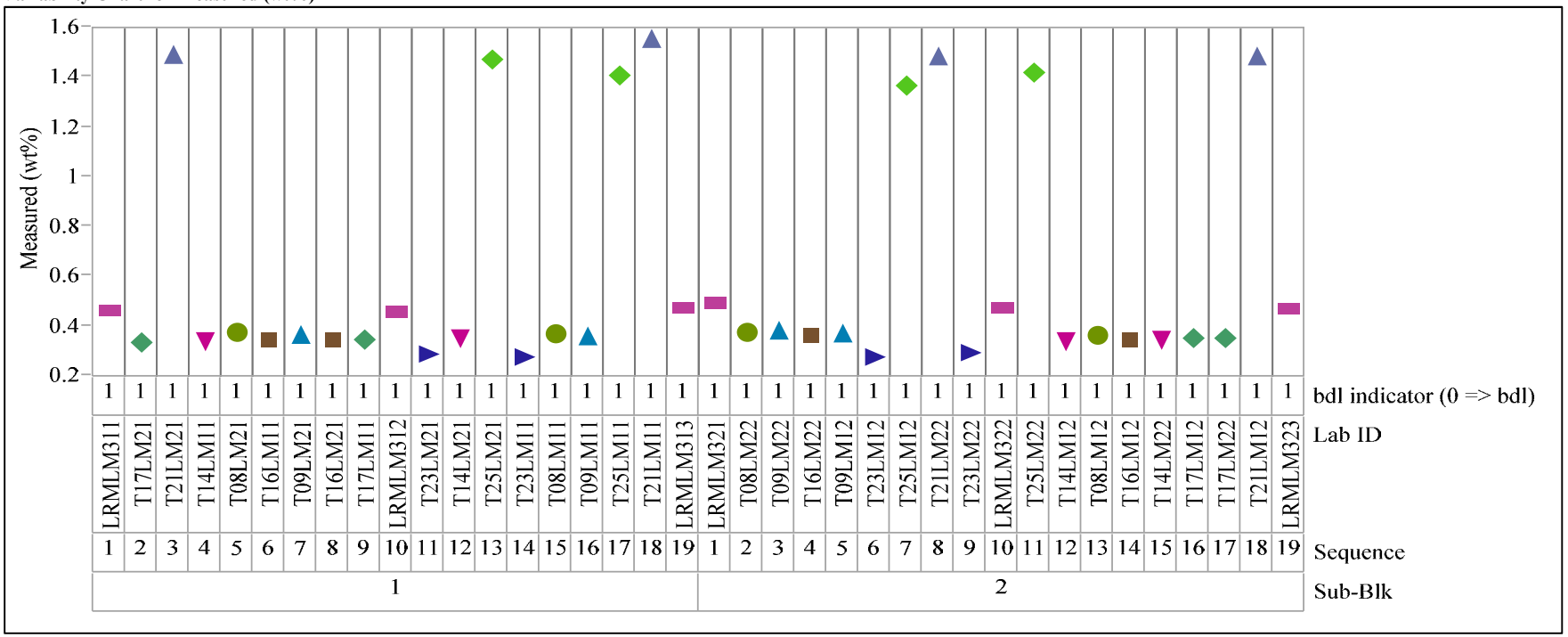


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

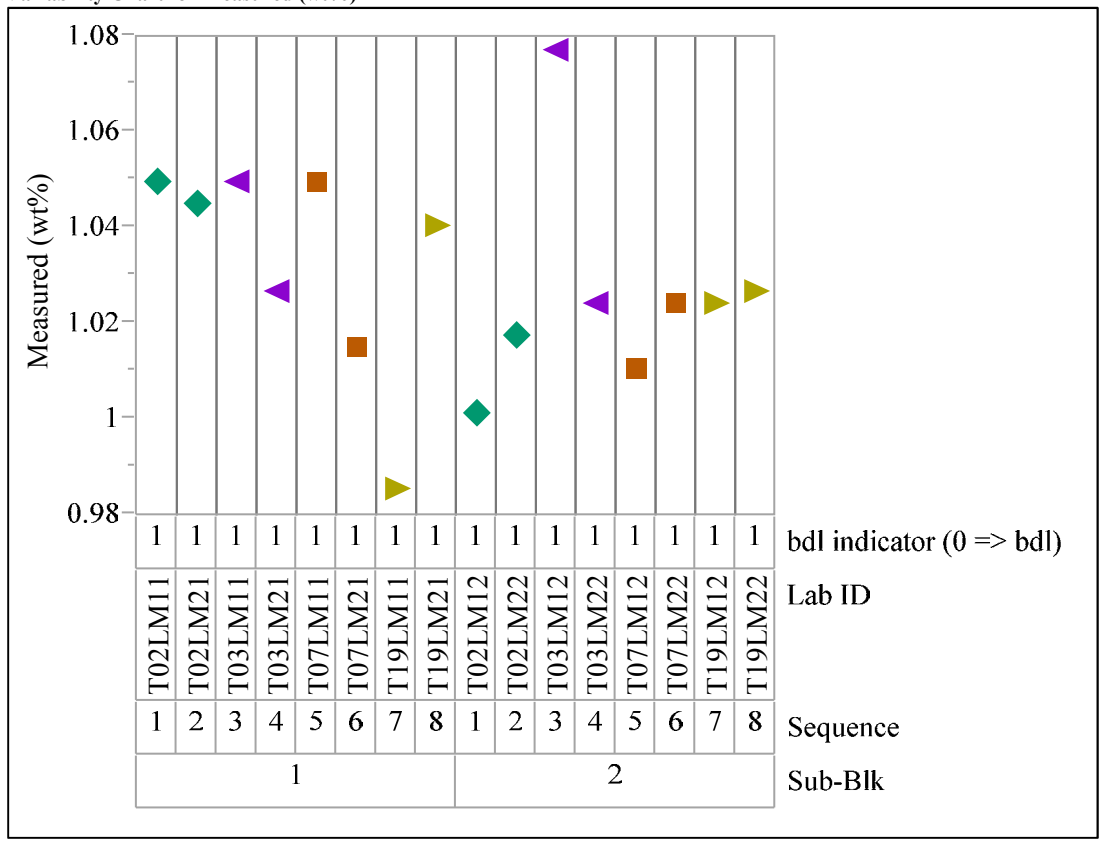


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=SiO2 (wt%), Prep Method=PF, Block=1
Variability Chart for Measured (wt%)

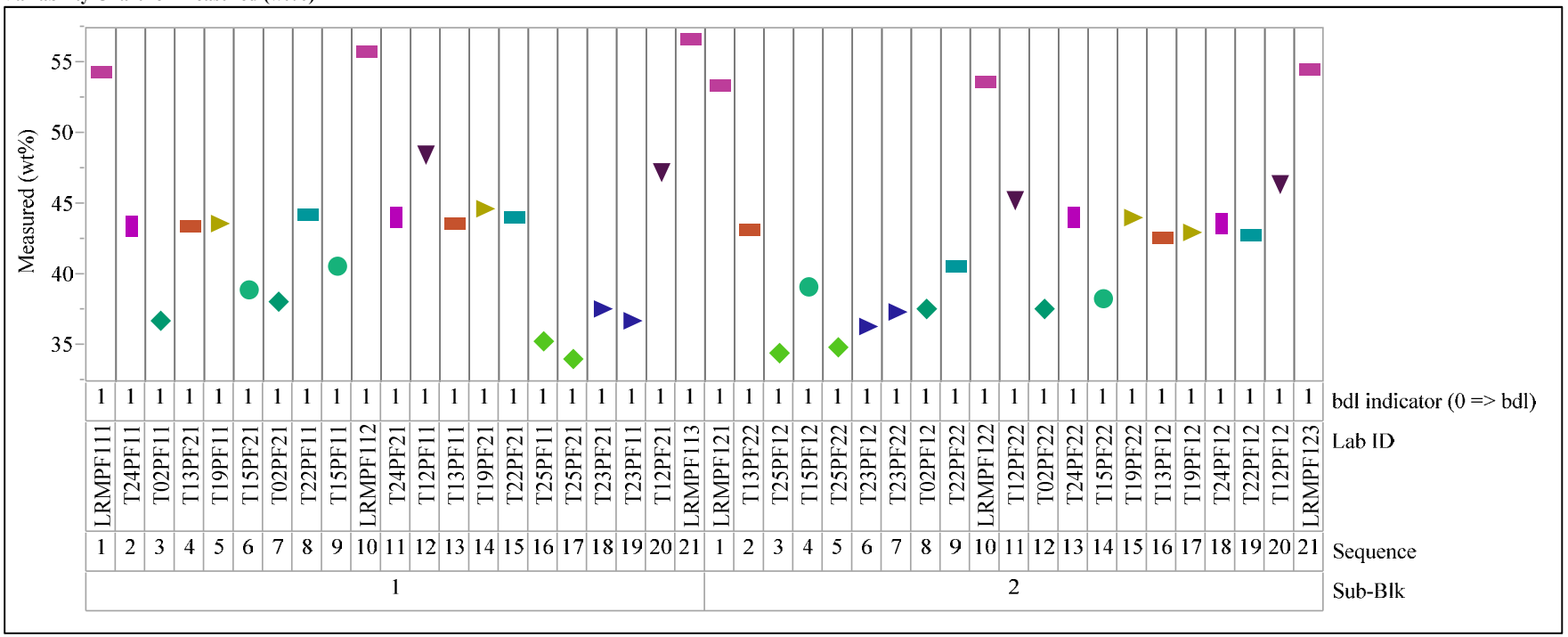


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=SiO2 (wt%), Prep Method=PF, Block=2
Variability Chart for Measured (wt%)

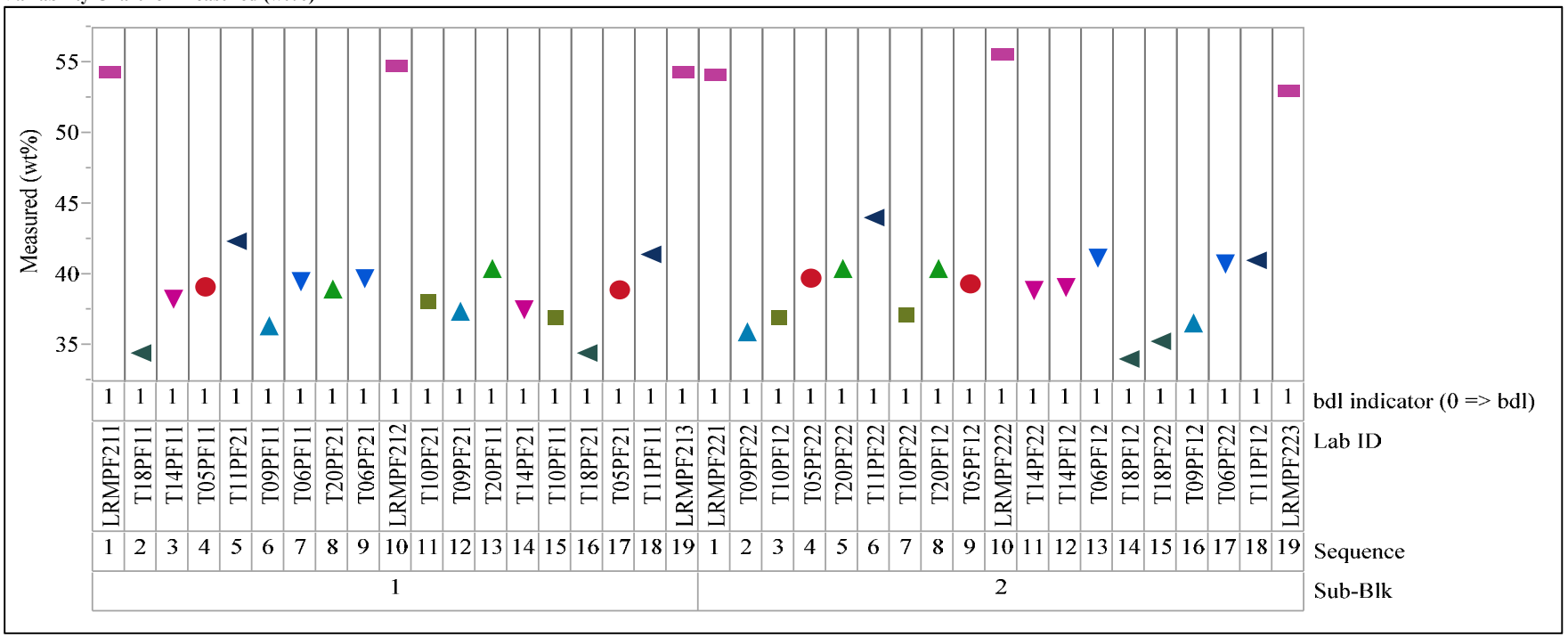


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=SiO2 (wt%), Prep Method=PF, Block=3
Variability Chart for Measured (wt%)

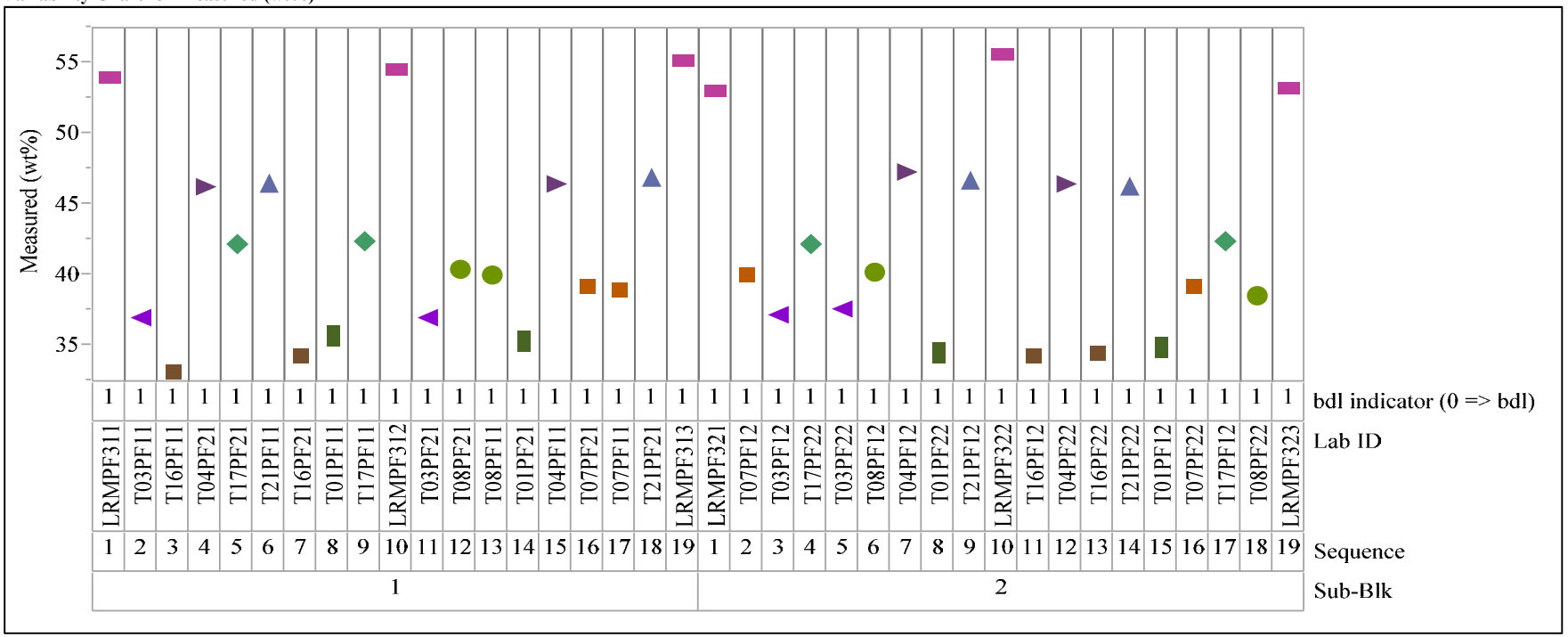


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=SnO2 (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

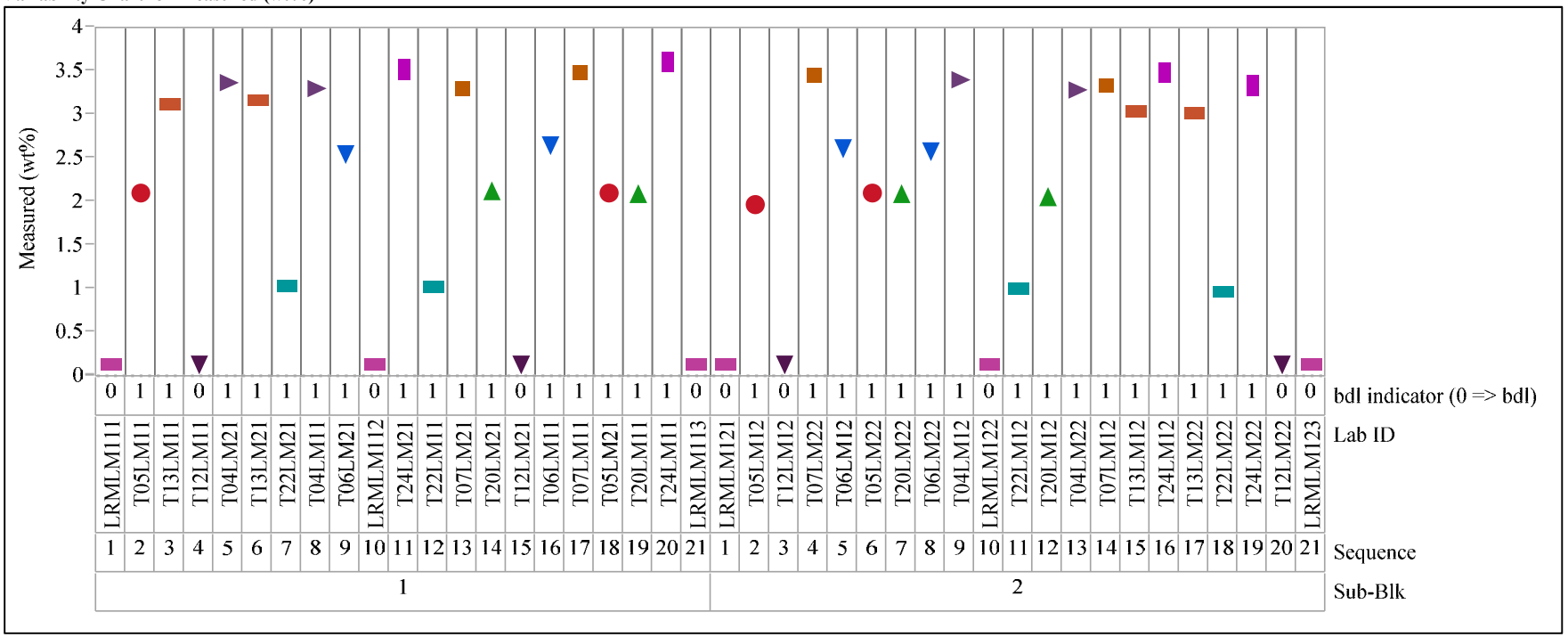


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

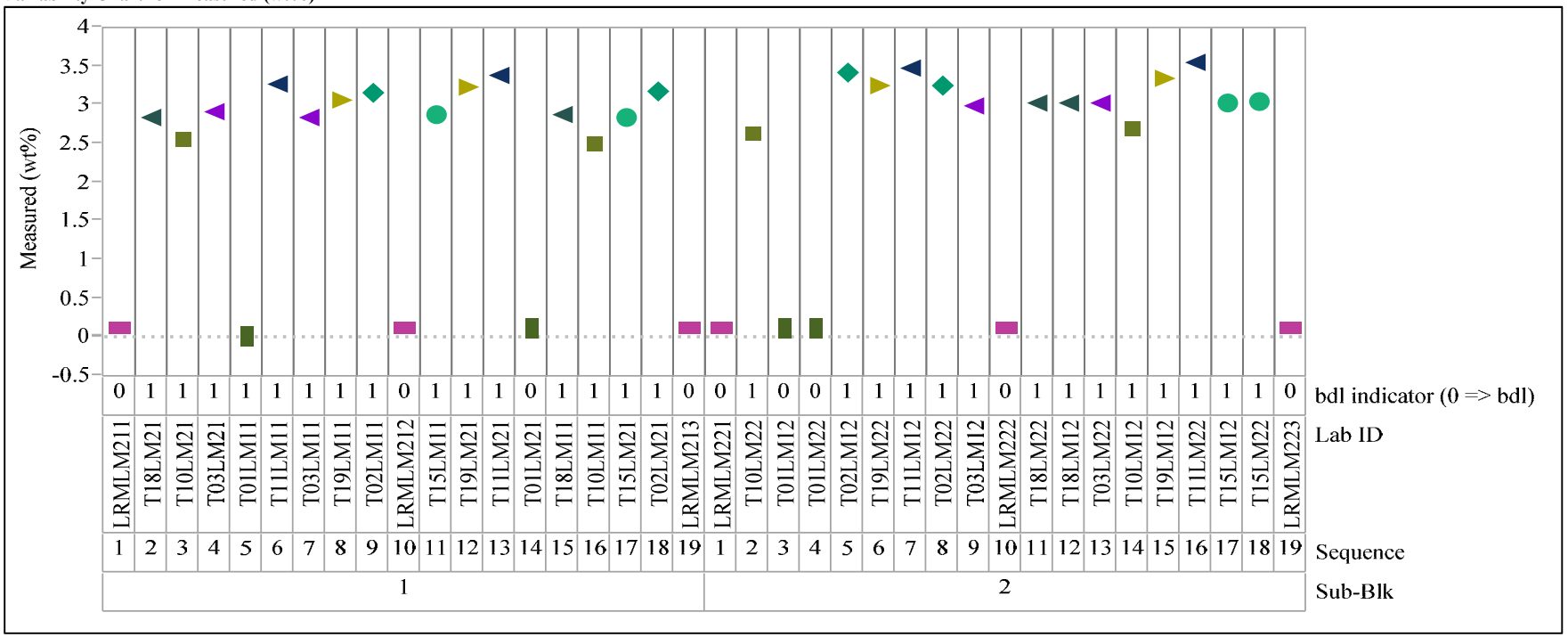


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=SnO2 (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

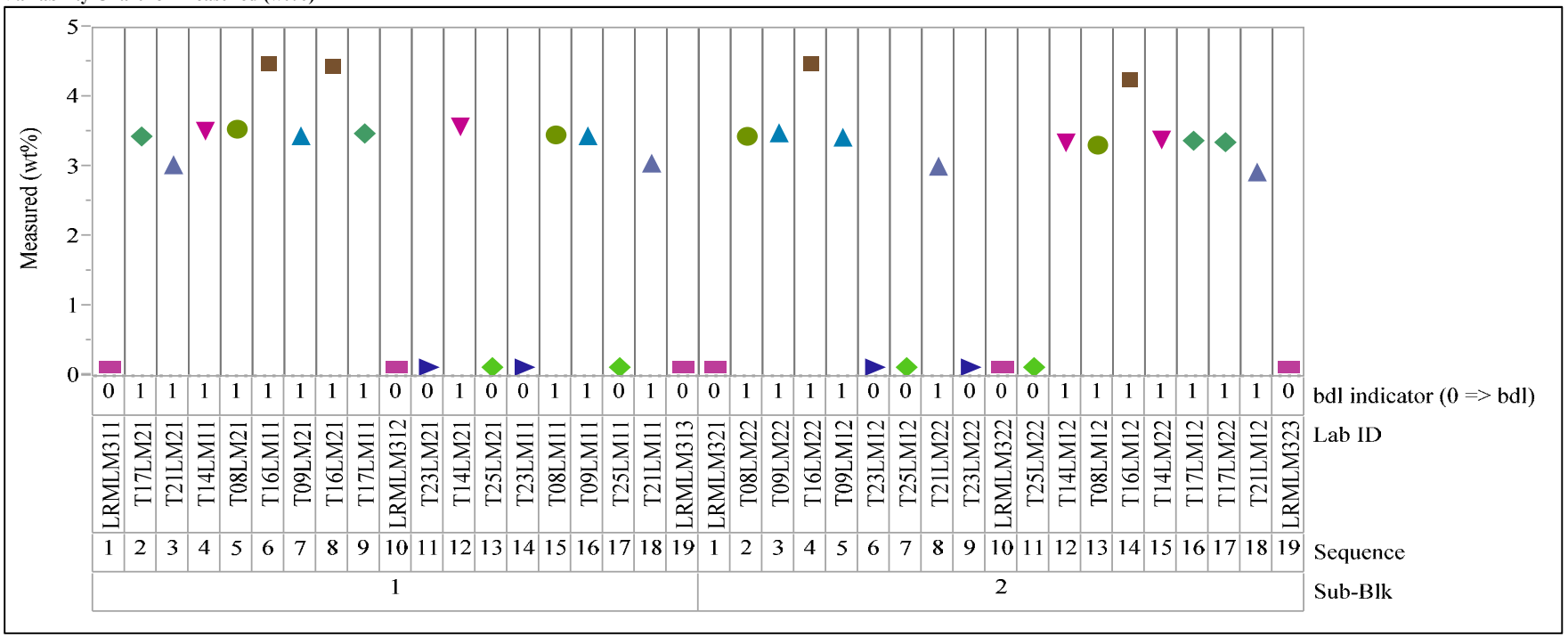


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

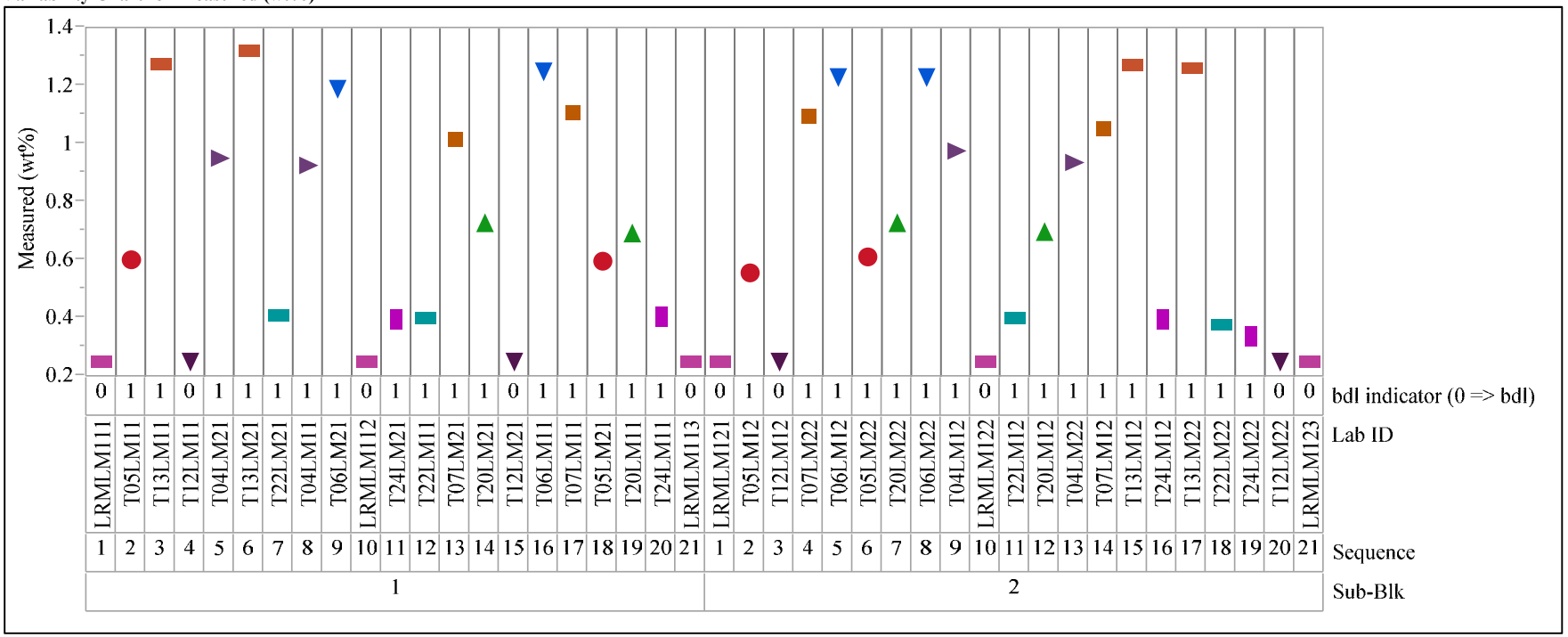


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

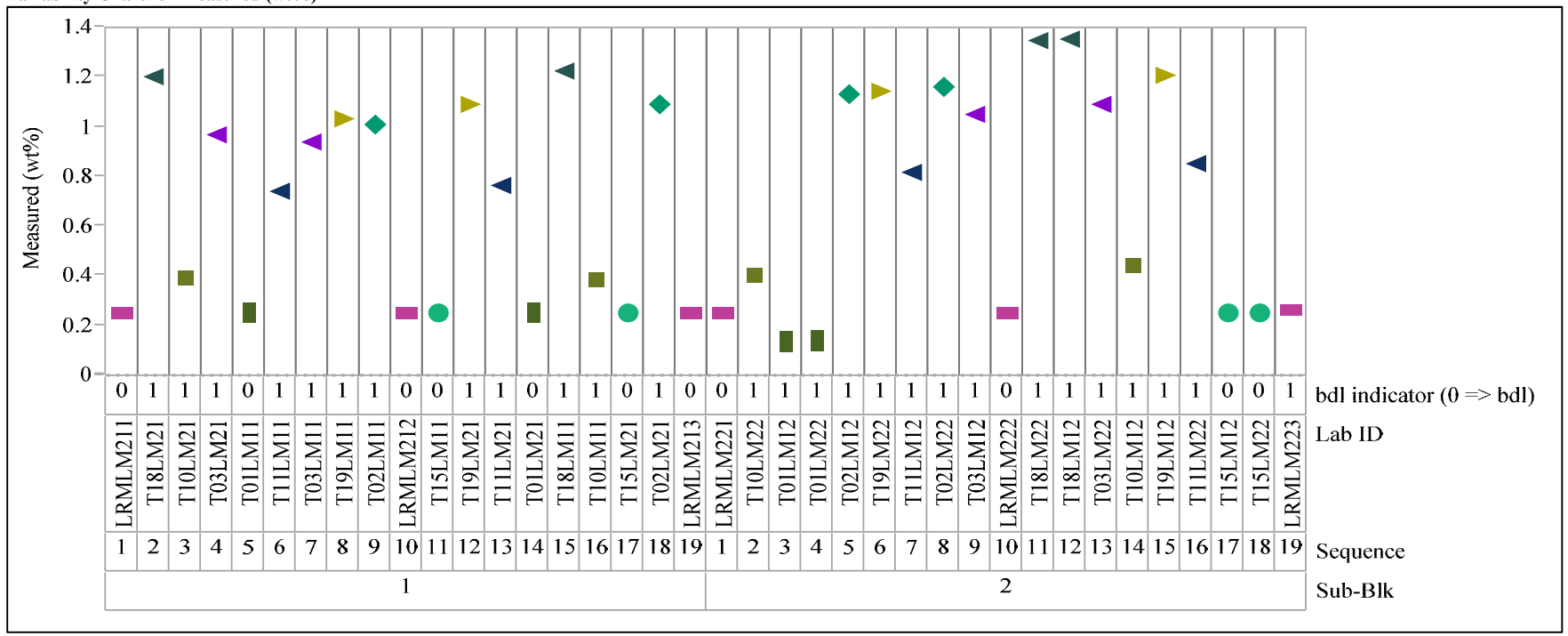


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=SO3 (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

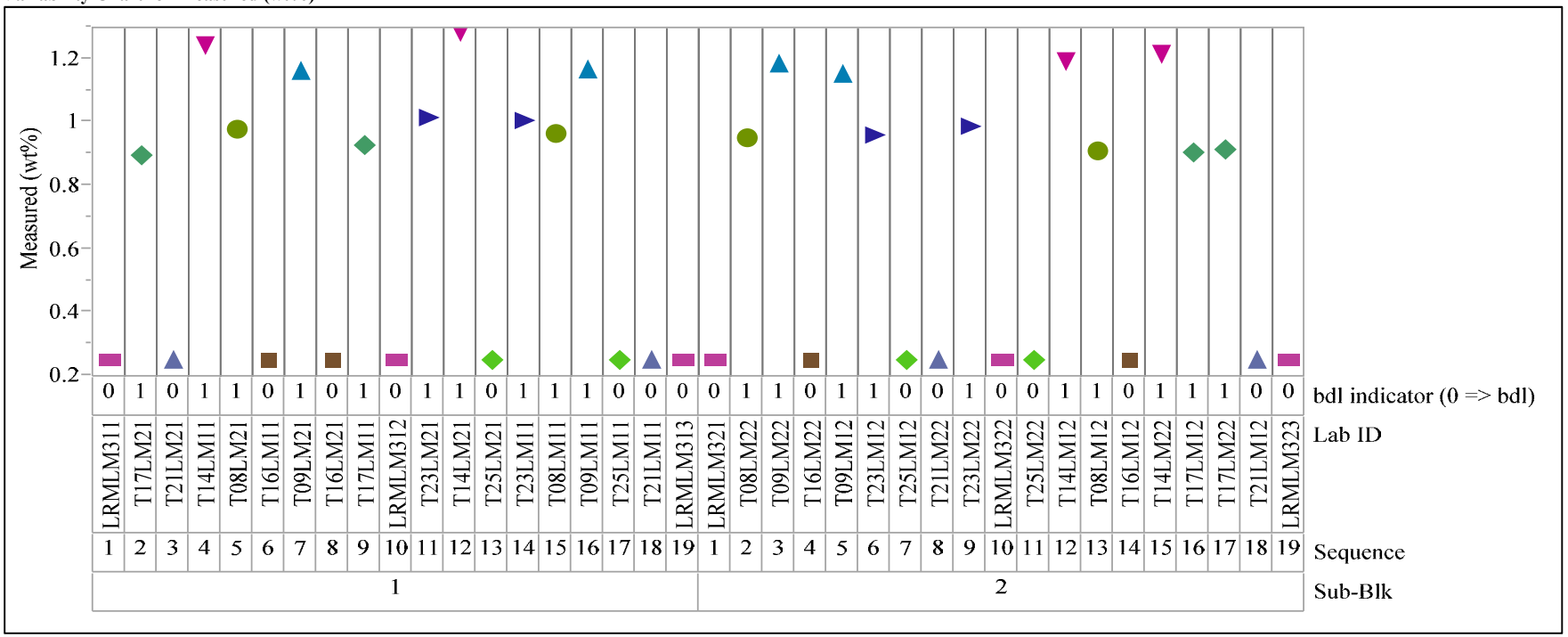


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=V2O5 (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

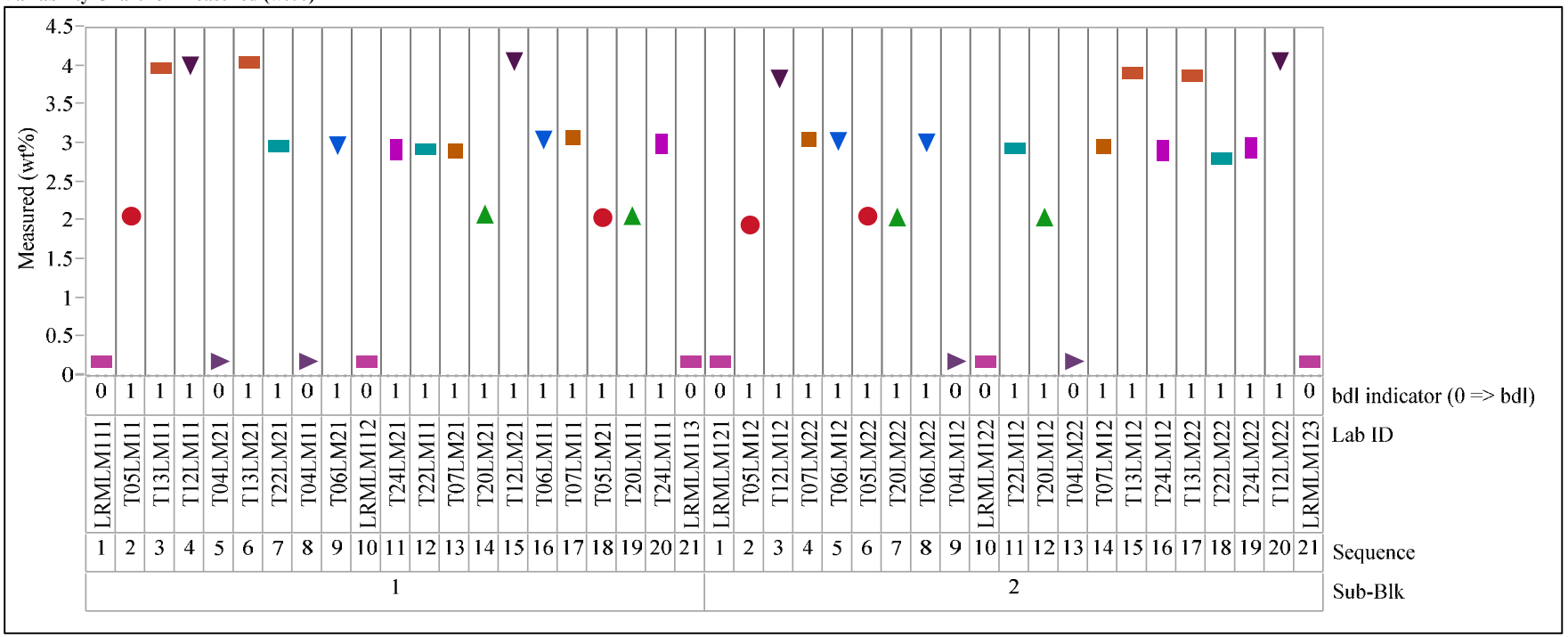


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=V2O5 (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

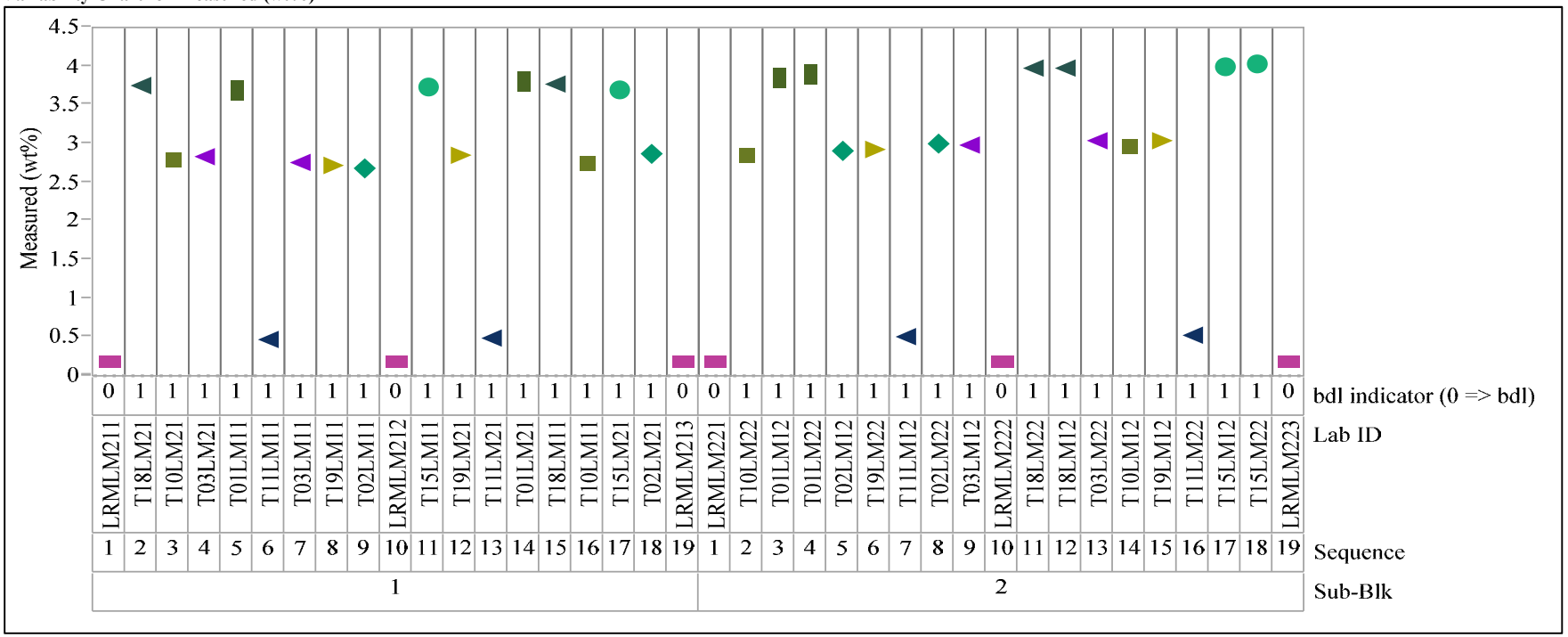


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

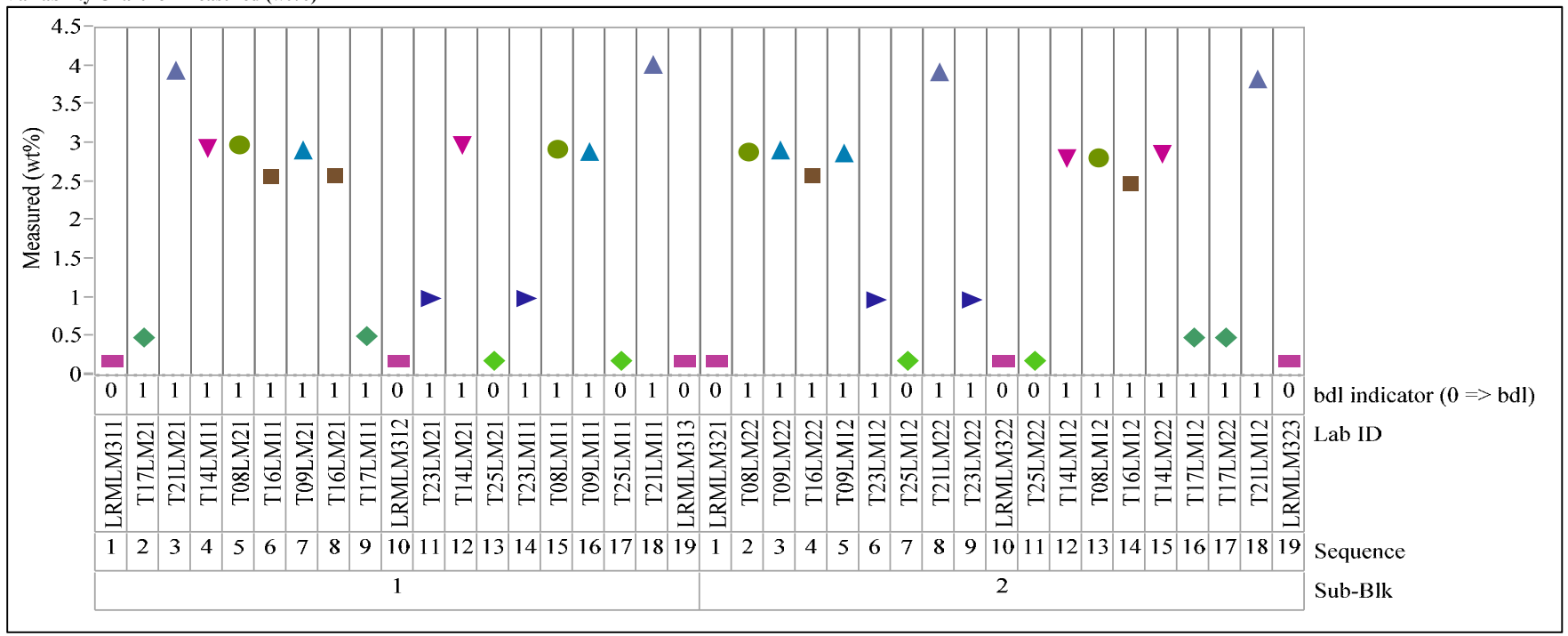


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=ZnO (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

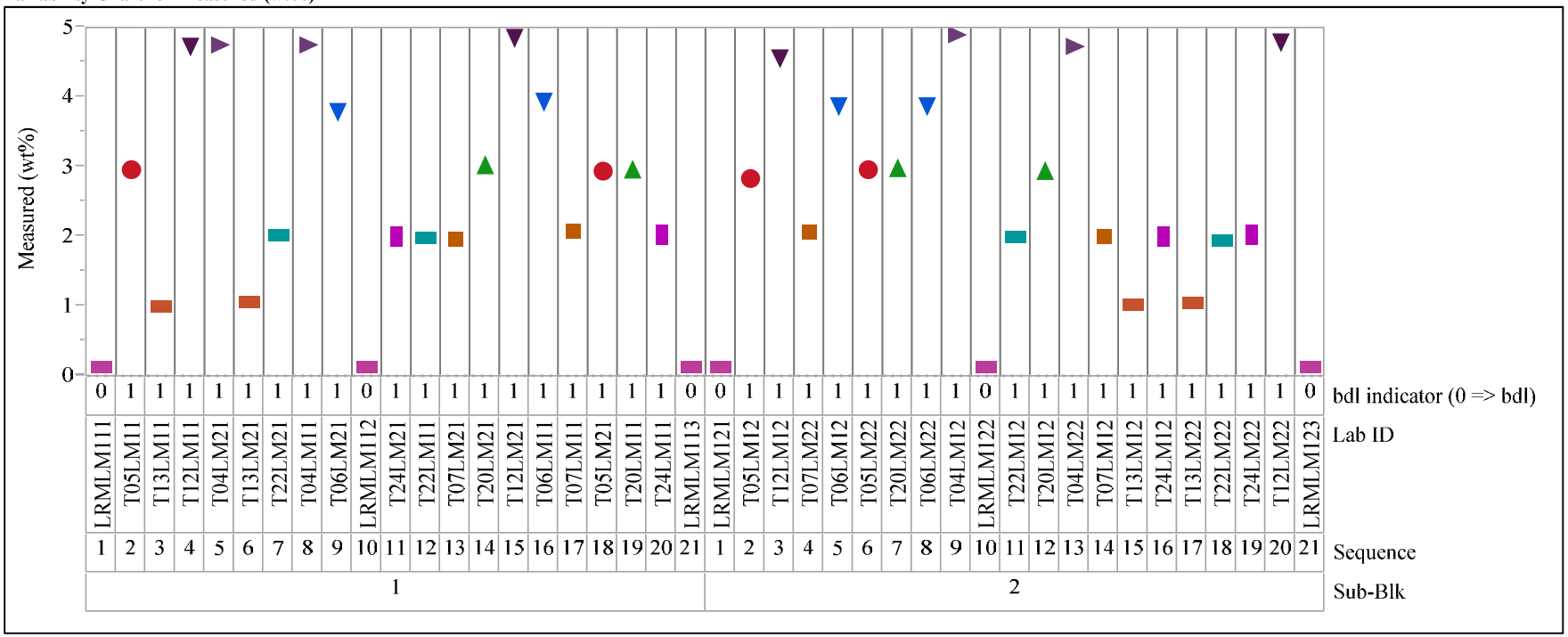


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=ZnO (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

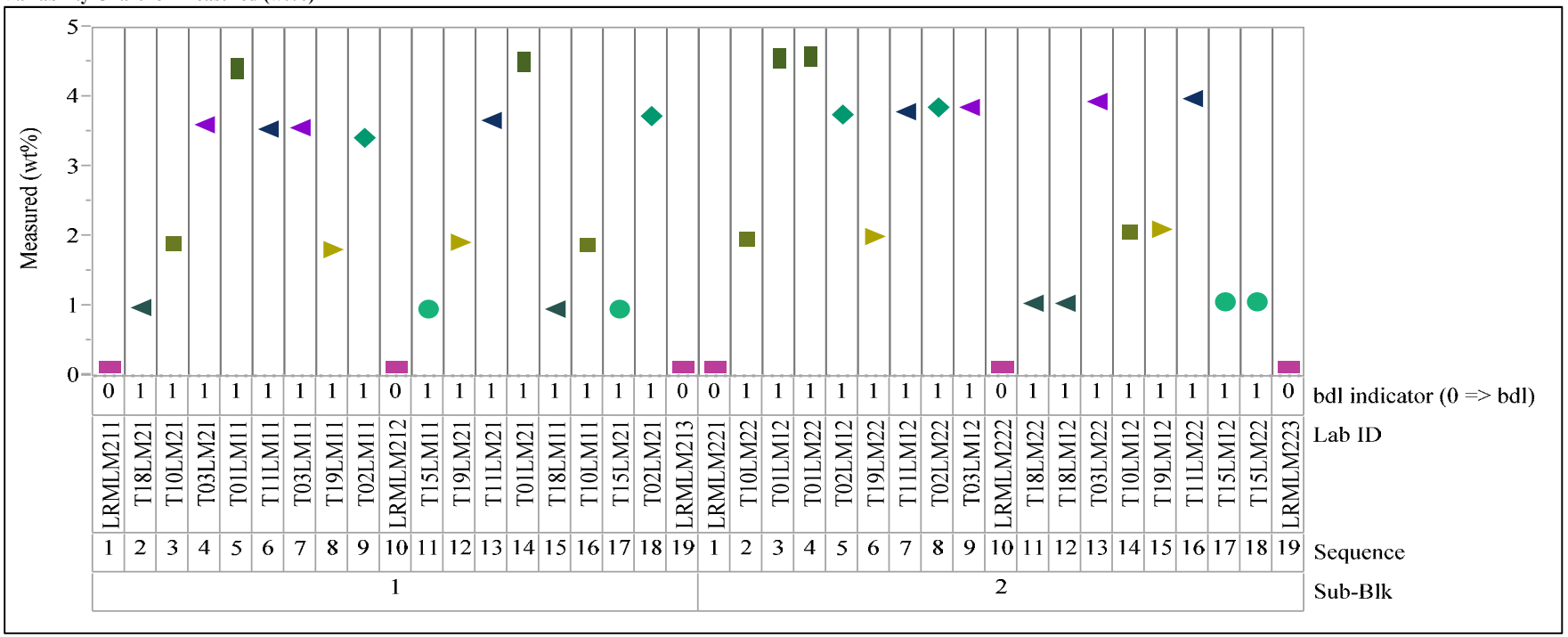


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=ZnO (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

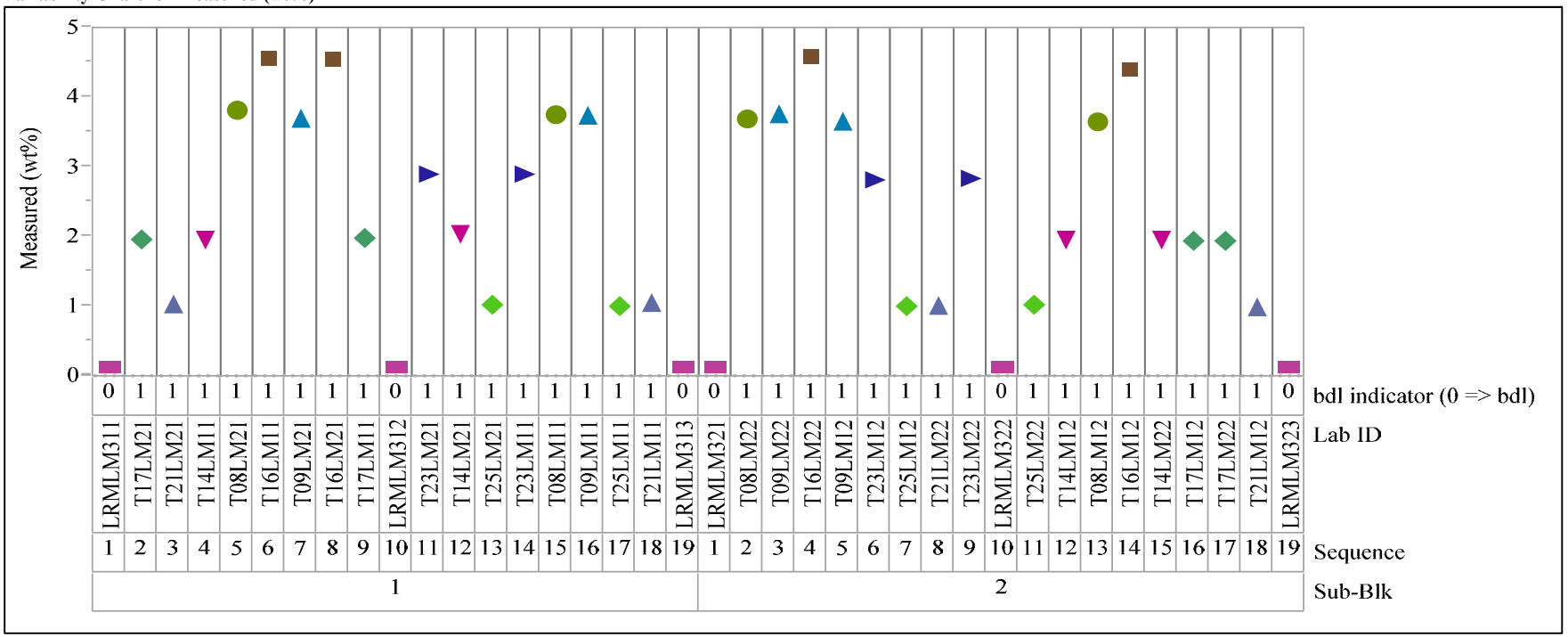


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=ZrO2 (wt%), Prep Method=LM, Block=1
Variability Chart for Measured (wt%)

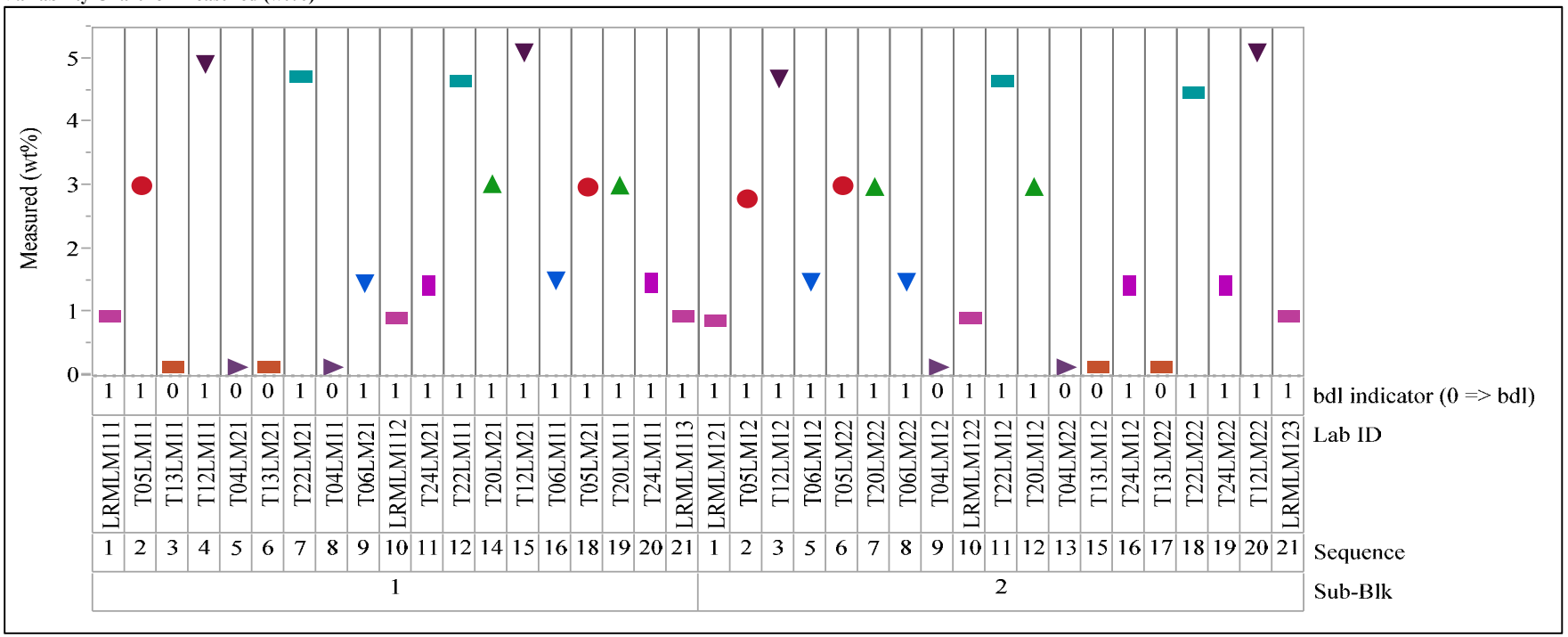


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=ZrO2 (wt%), Prep Method=LM, Block=2
Variability Chart for Measured (wt%)

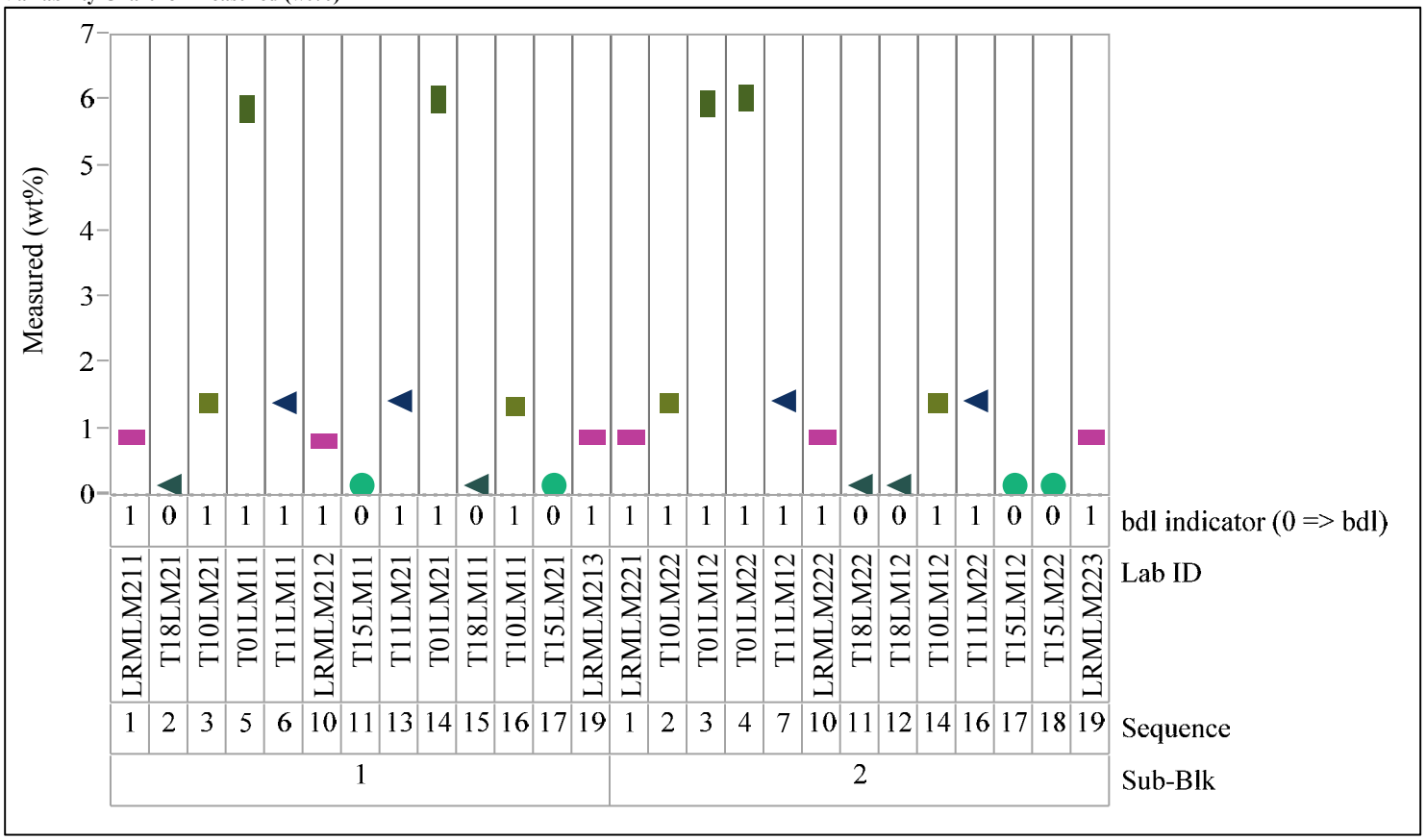


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

Analyte=ZrO2 (wt%), Prep Method=LM, Block=3
Variability Chart for Measured (wt%)

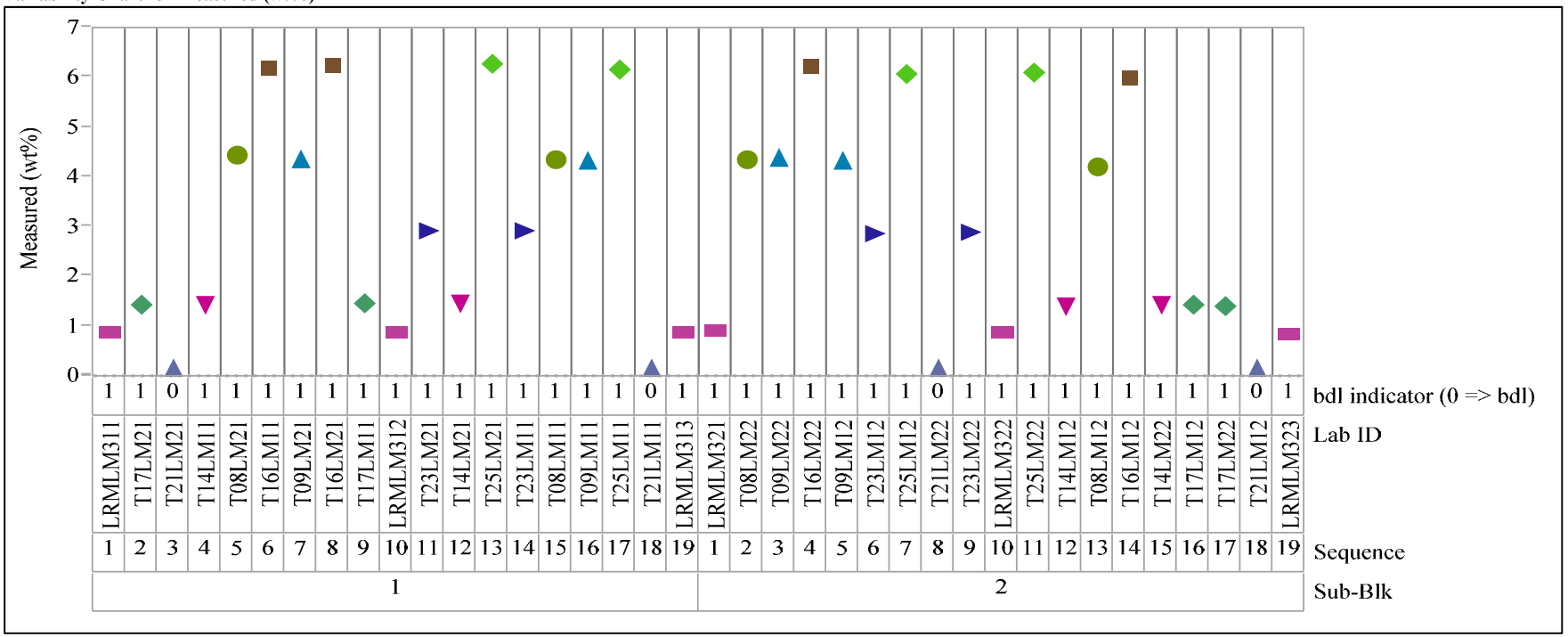


Exhibit A-1. Plots of Oxide Measurements in Analytical Sequence (continued)

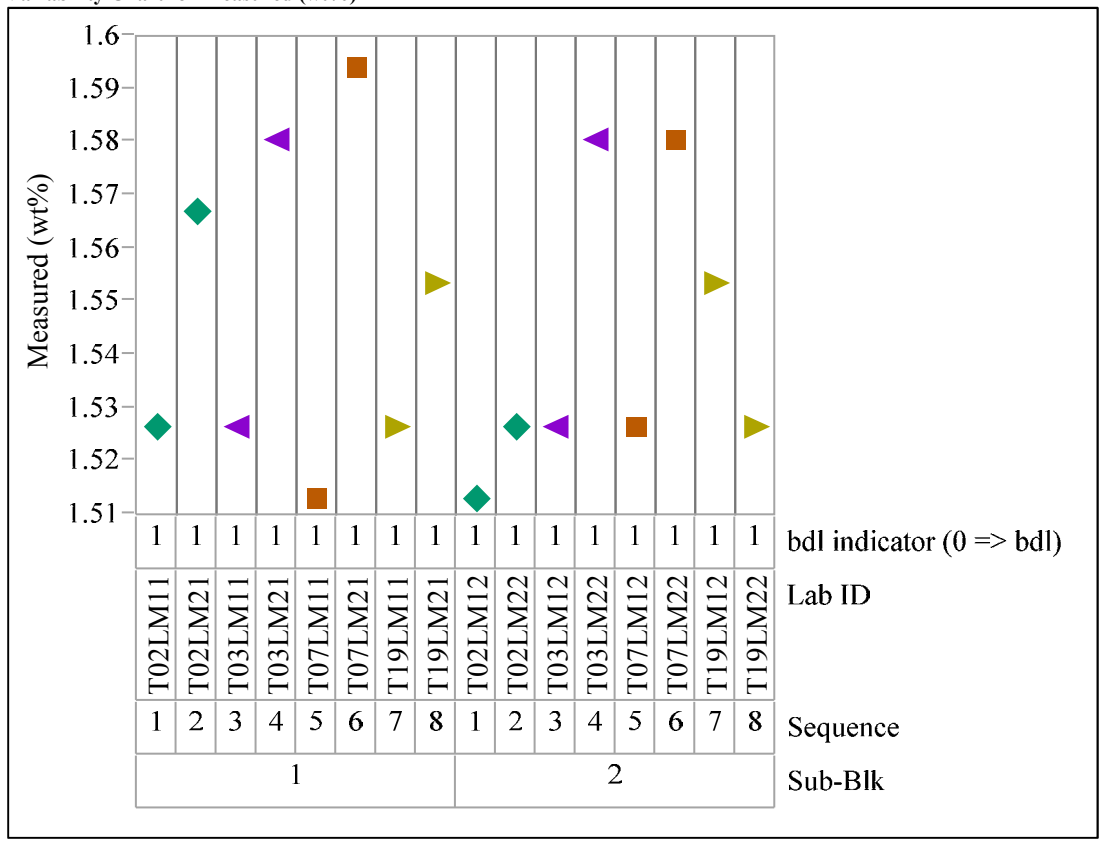


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations

Analyte=Al2O3 (wt%), Prep Method=PF
Variability Chart for Measured (wt%)

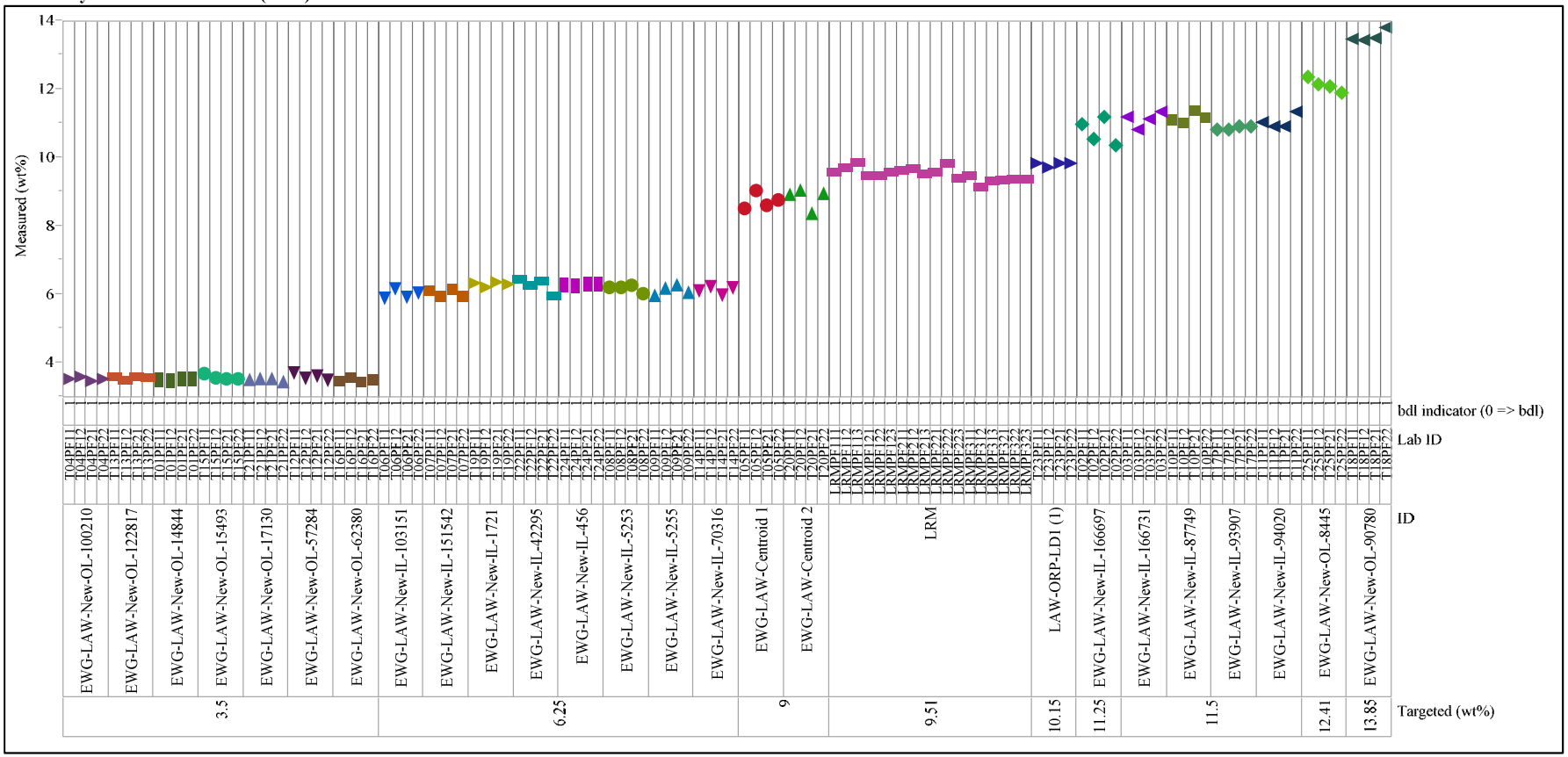


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=B2O3 (wt%), Prep Method=PF
Variability Chart for Measured (wt%)

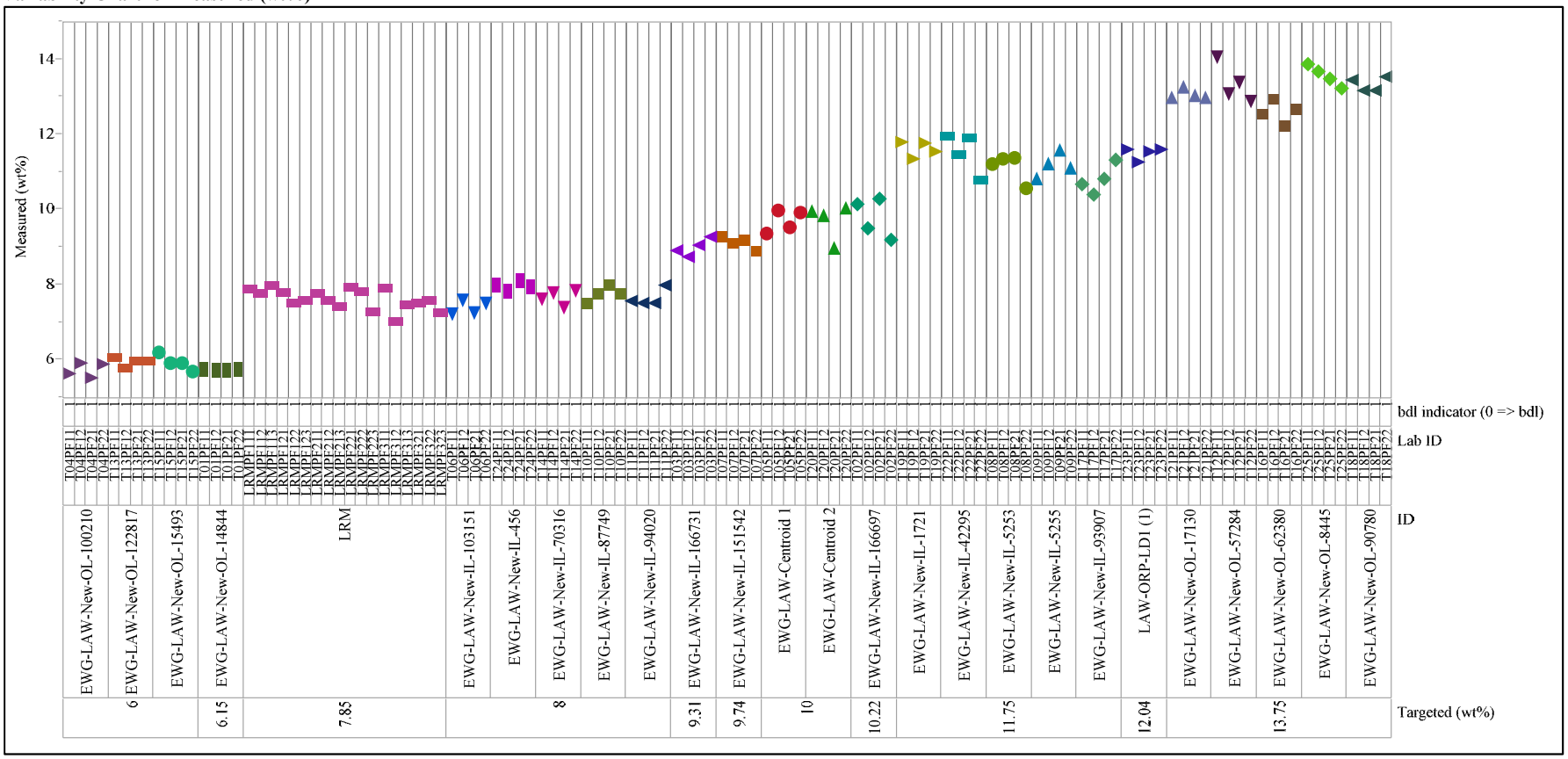


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=CaO (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

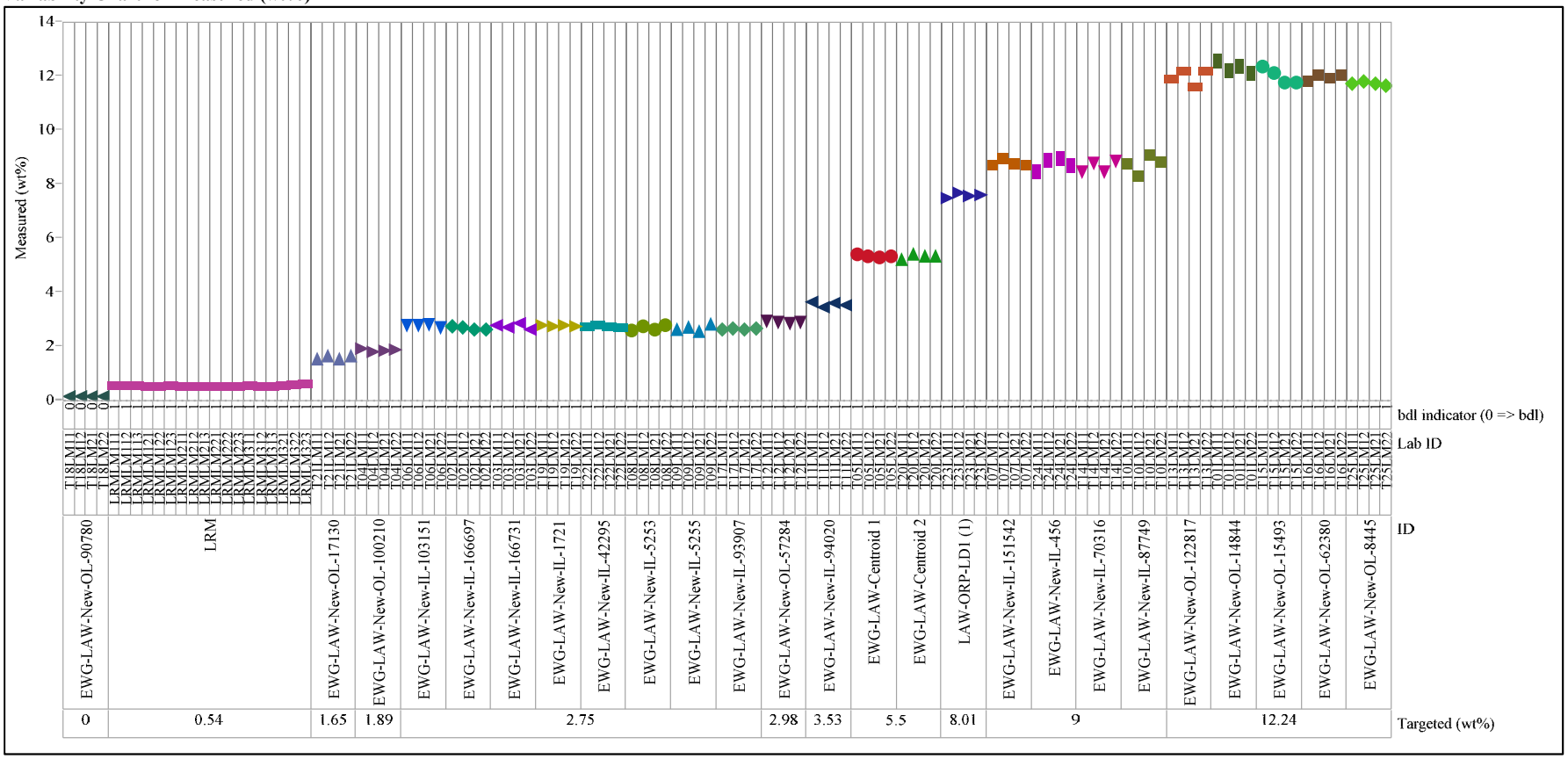


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=Cl (wt%), Prep Method=KH
Variability Chart for Measured (wt%)

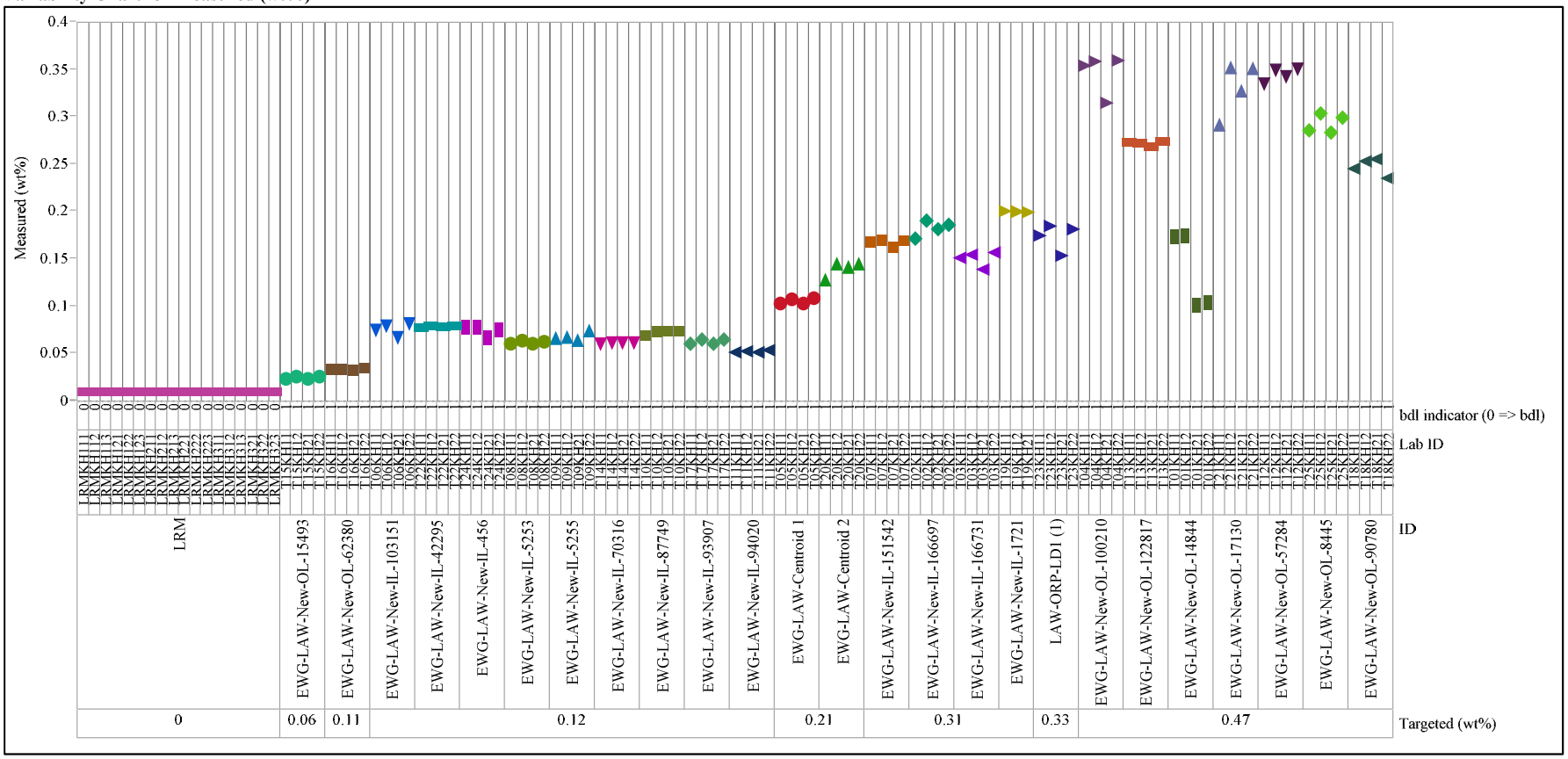


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=Cr2O3 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

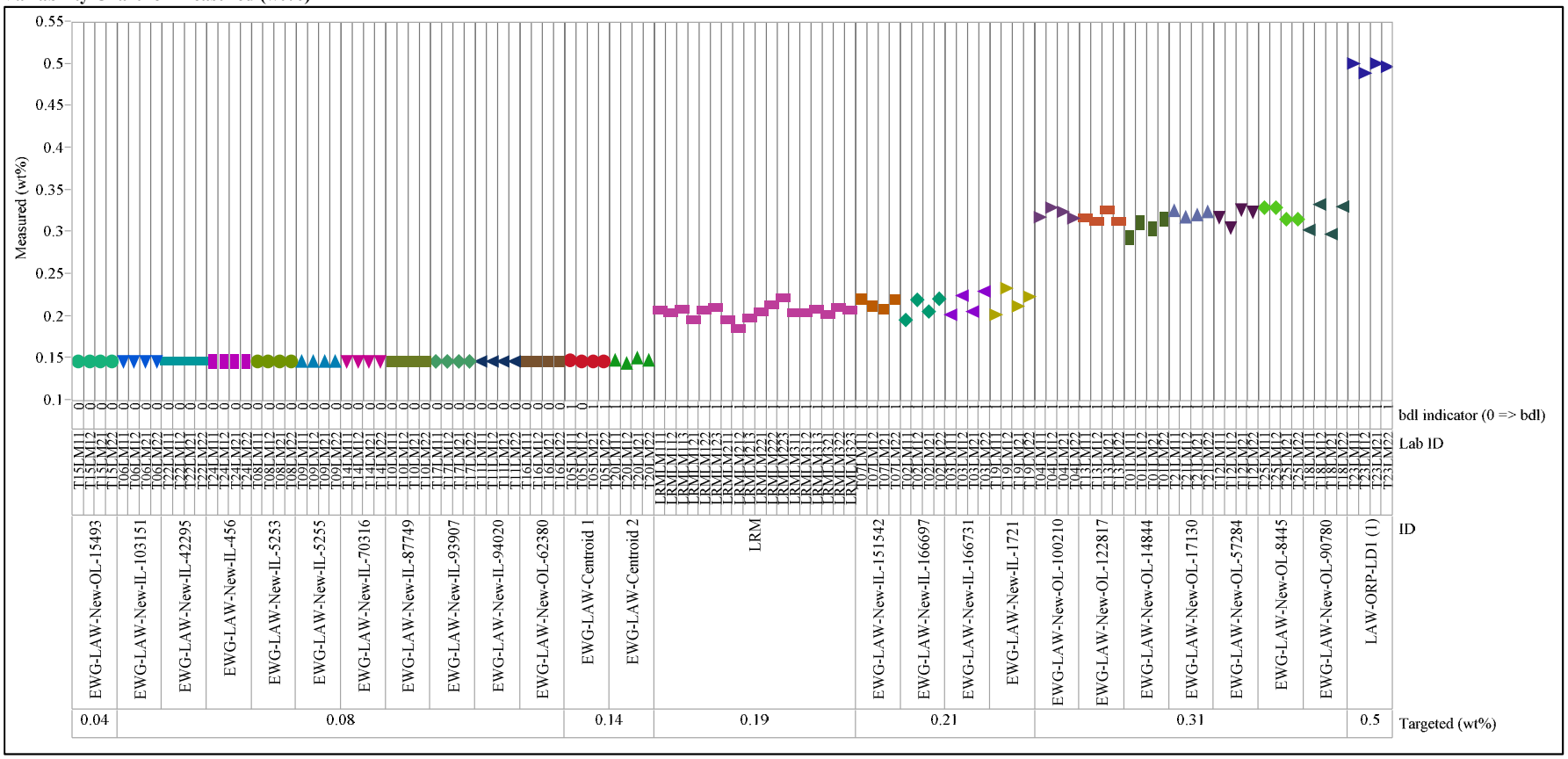


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=F (wt%), Prep Method=KH
Variability Chart for Measured (wt%)

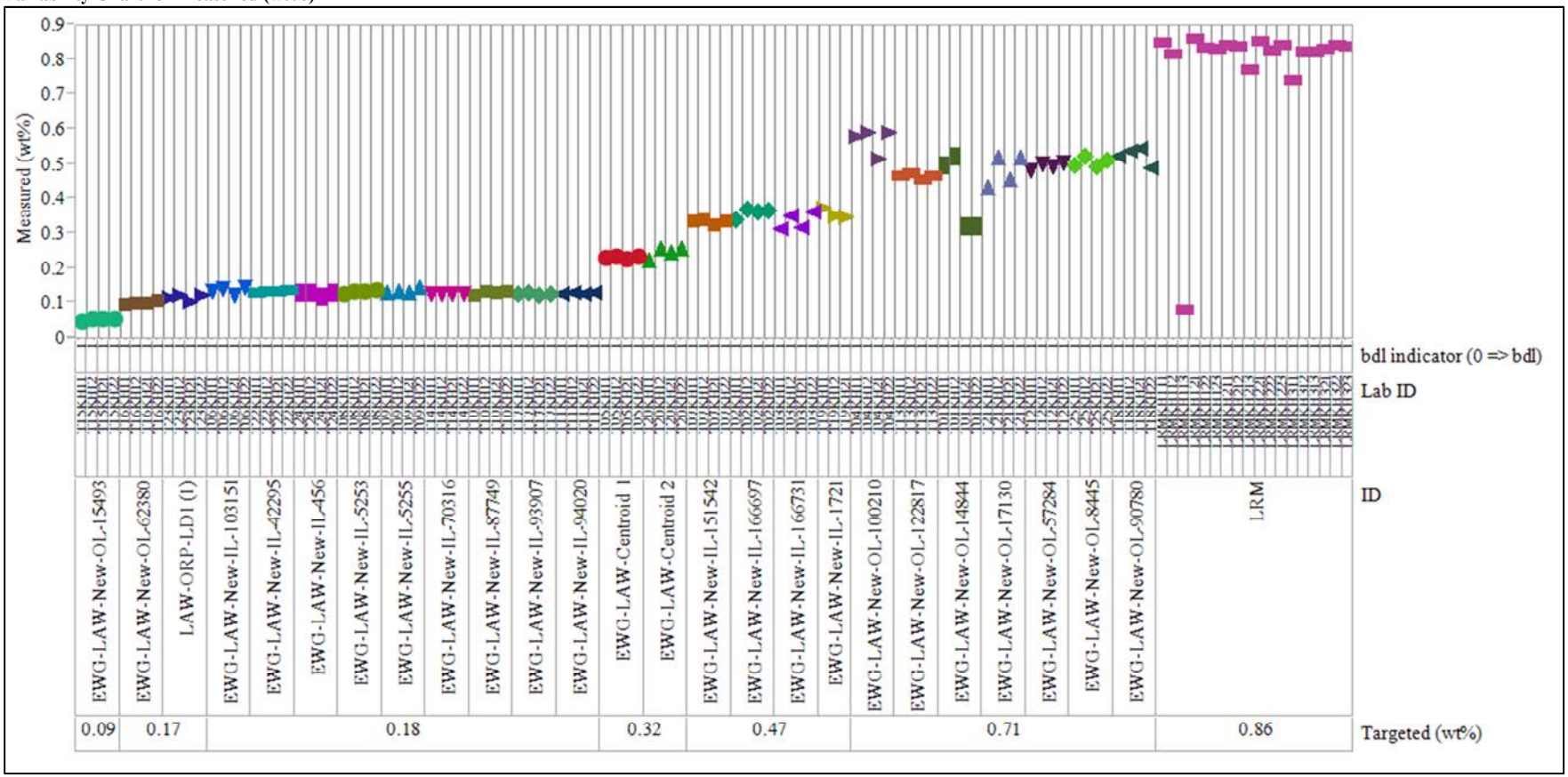


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=Fe2O3 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

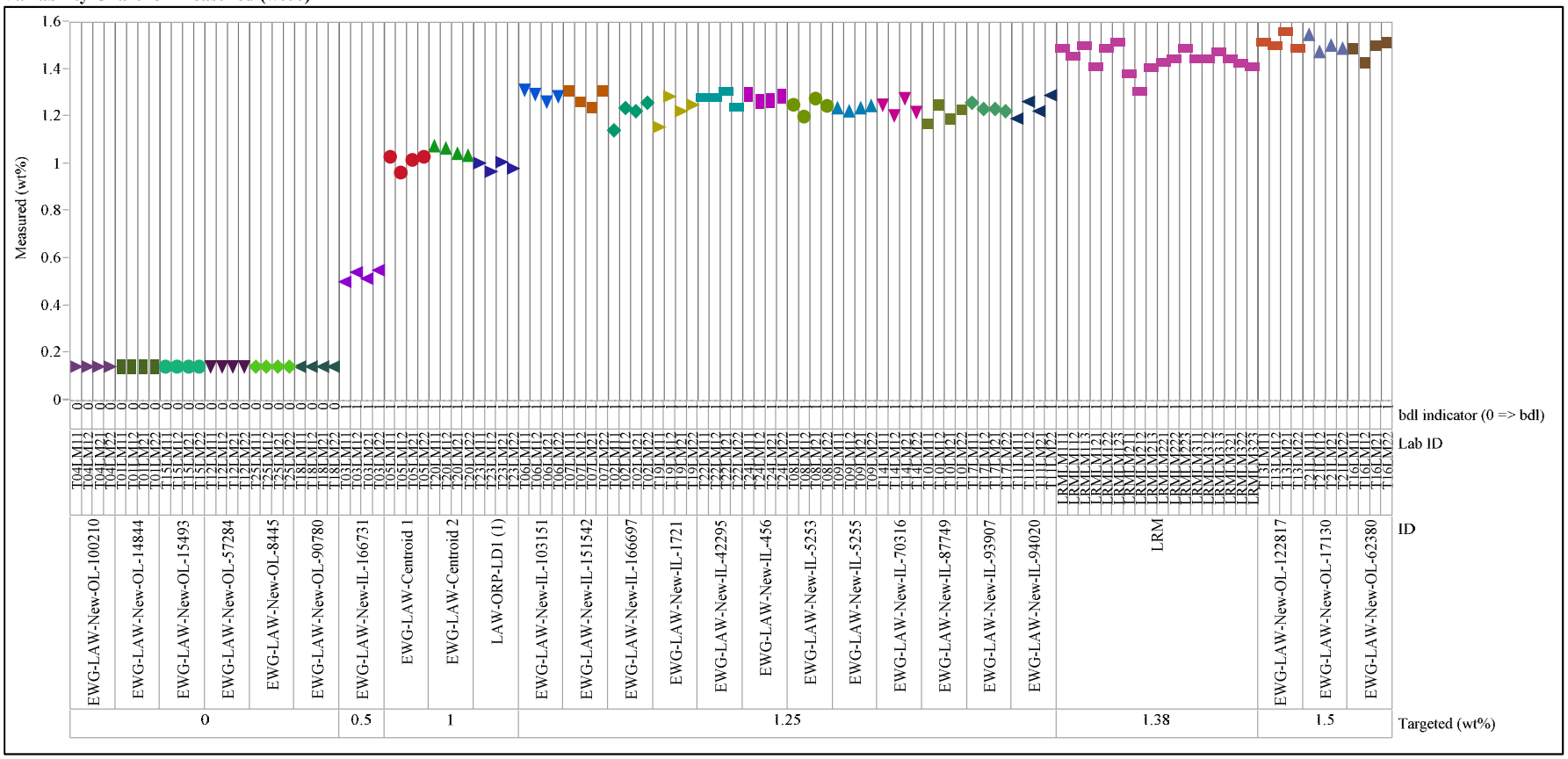


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=K2O (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

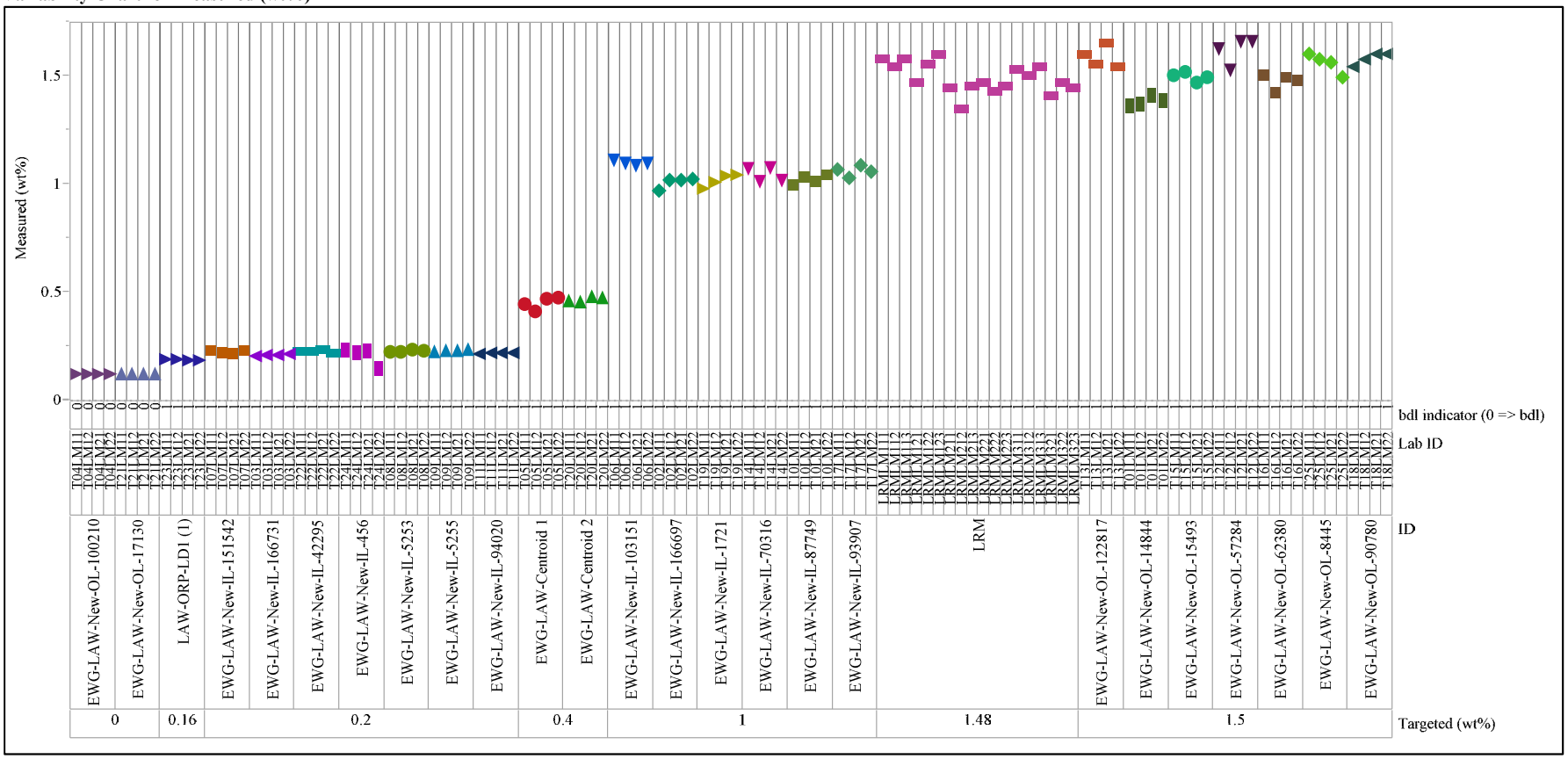


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=Li2O (wt%), Prep Method=PF
Variability Chart for Measured (wt%)

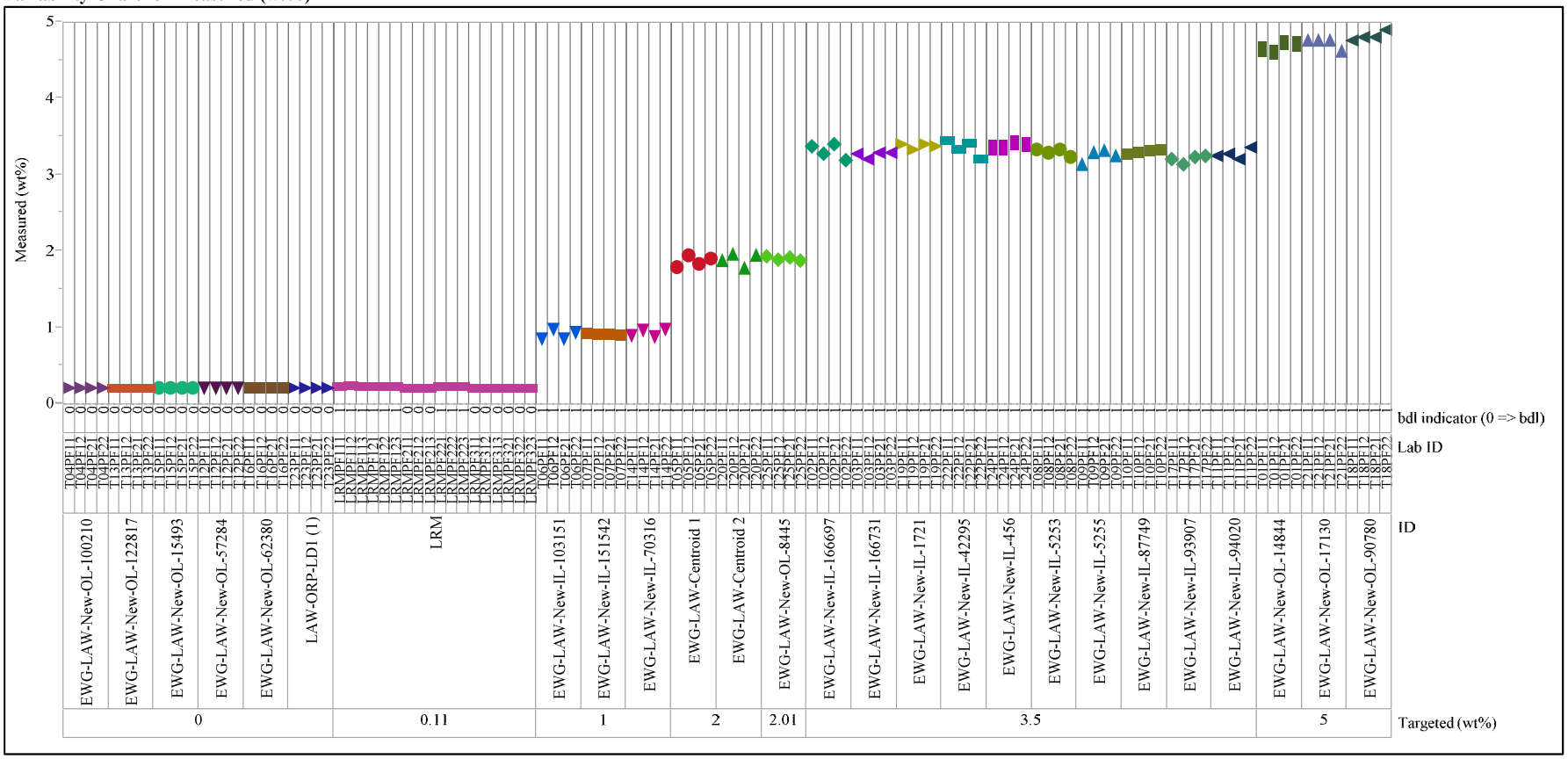


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=MgO (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

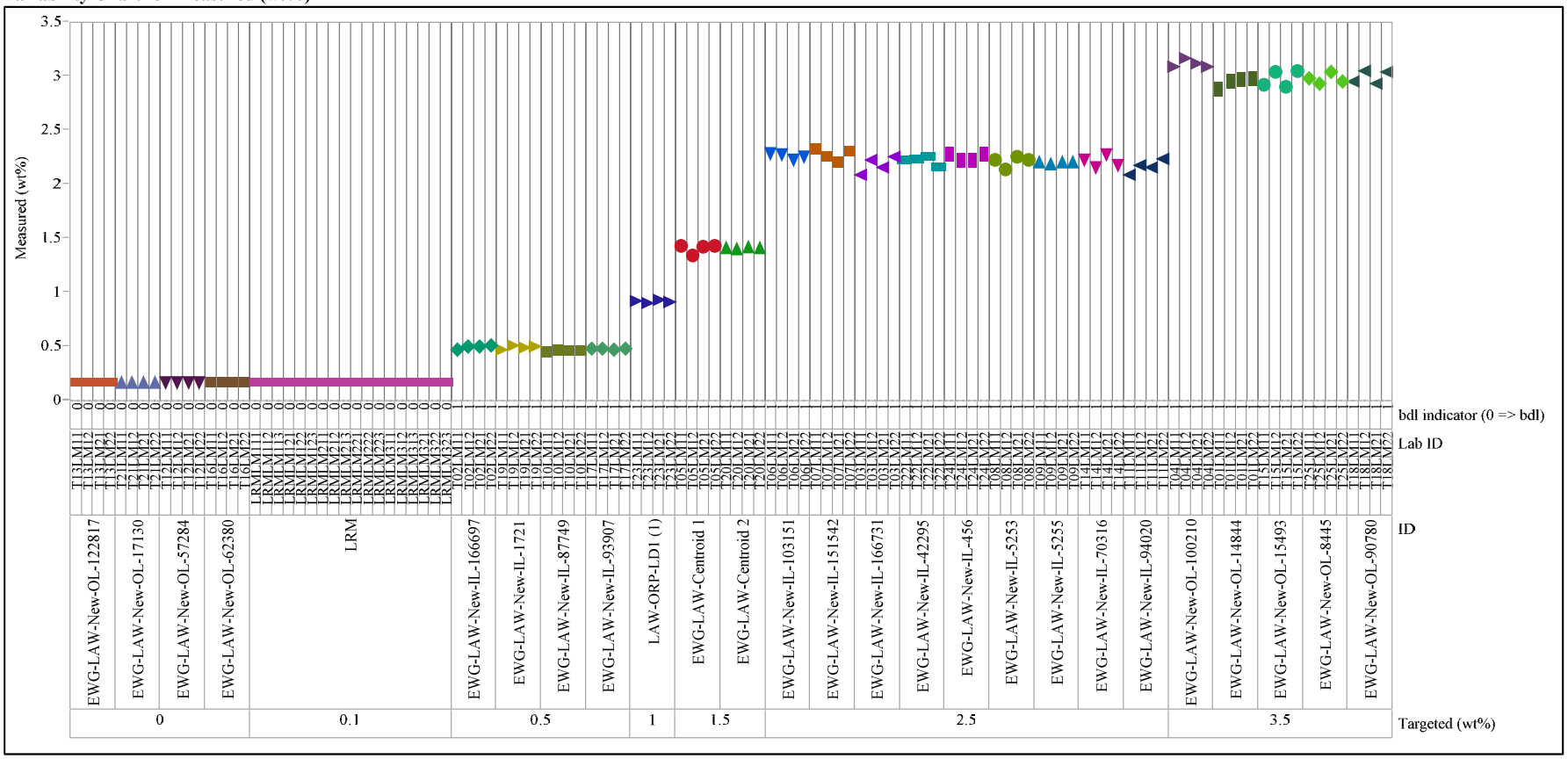


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=Na2O (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

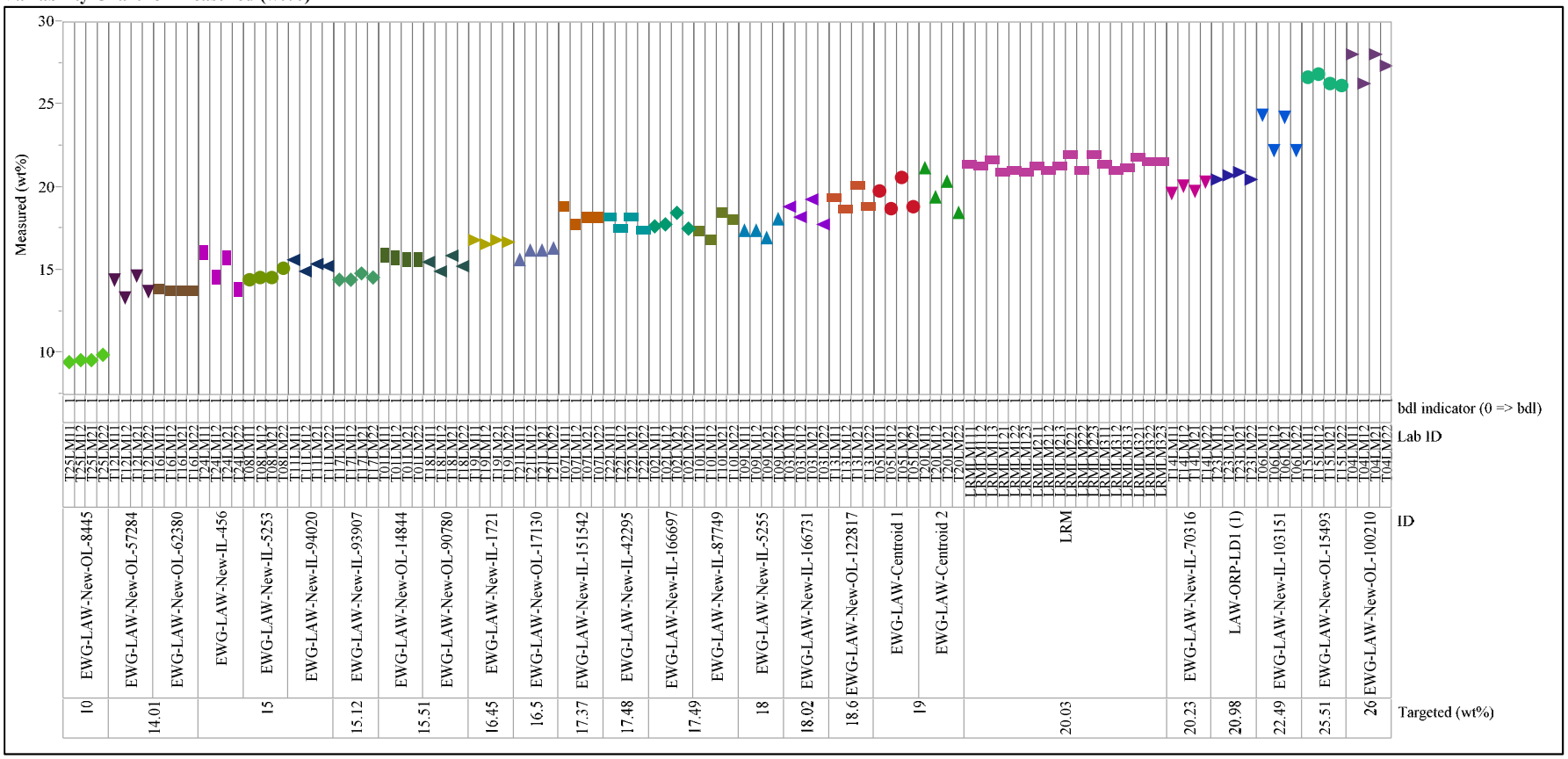


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=P2O5 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

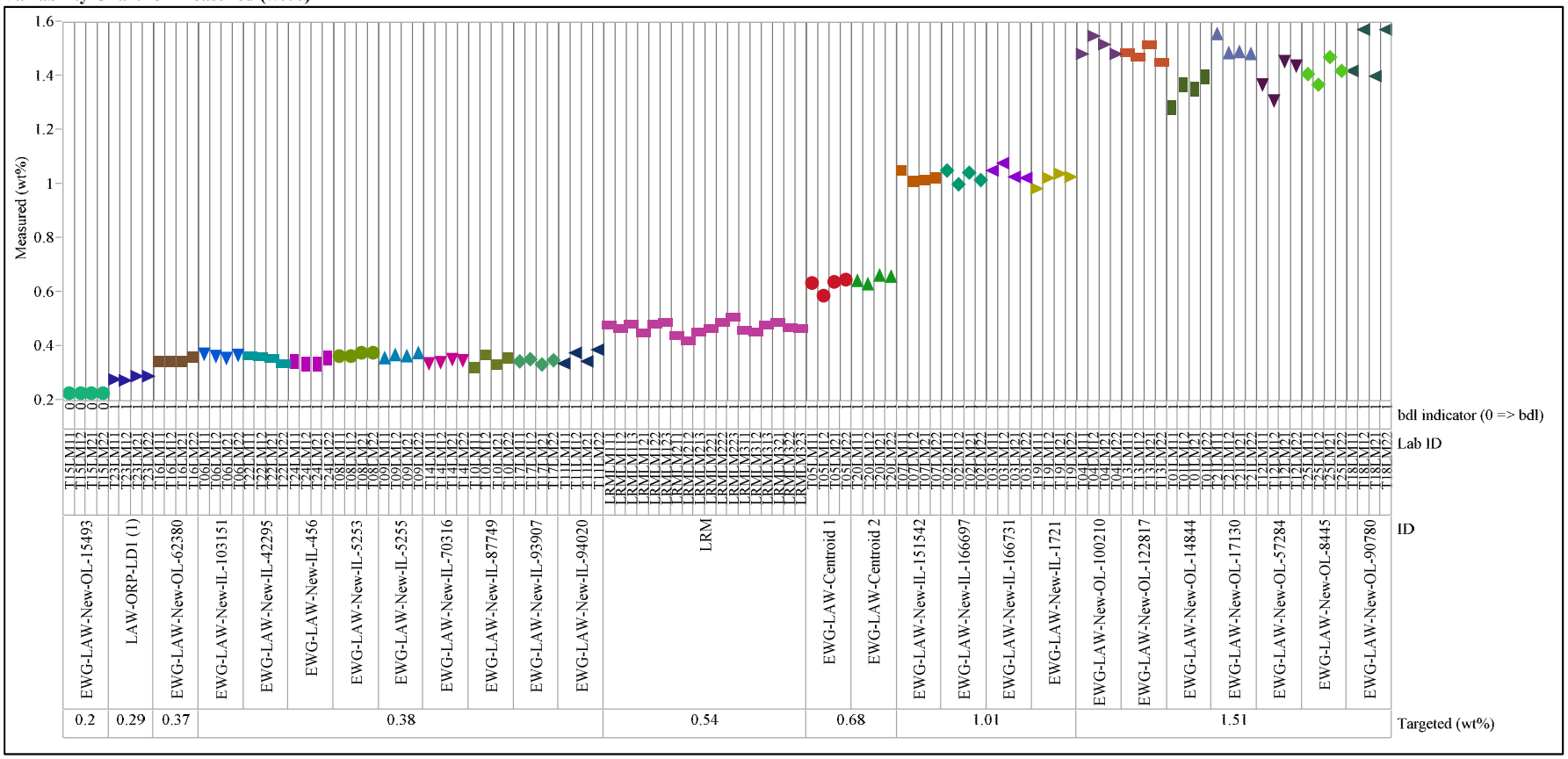


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=SiO2 (wt%), Prep Method=PF
Variability Chart for Measured (wt%)

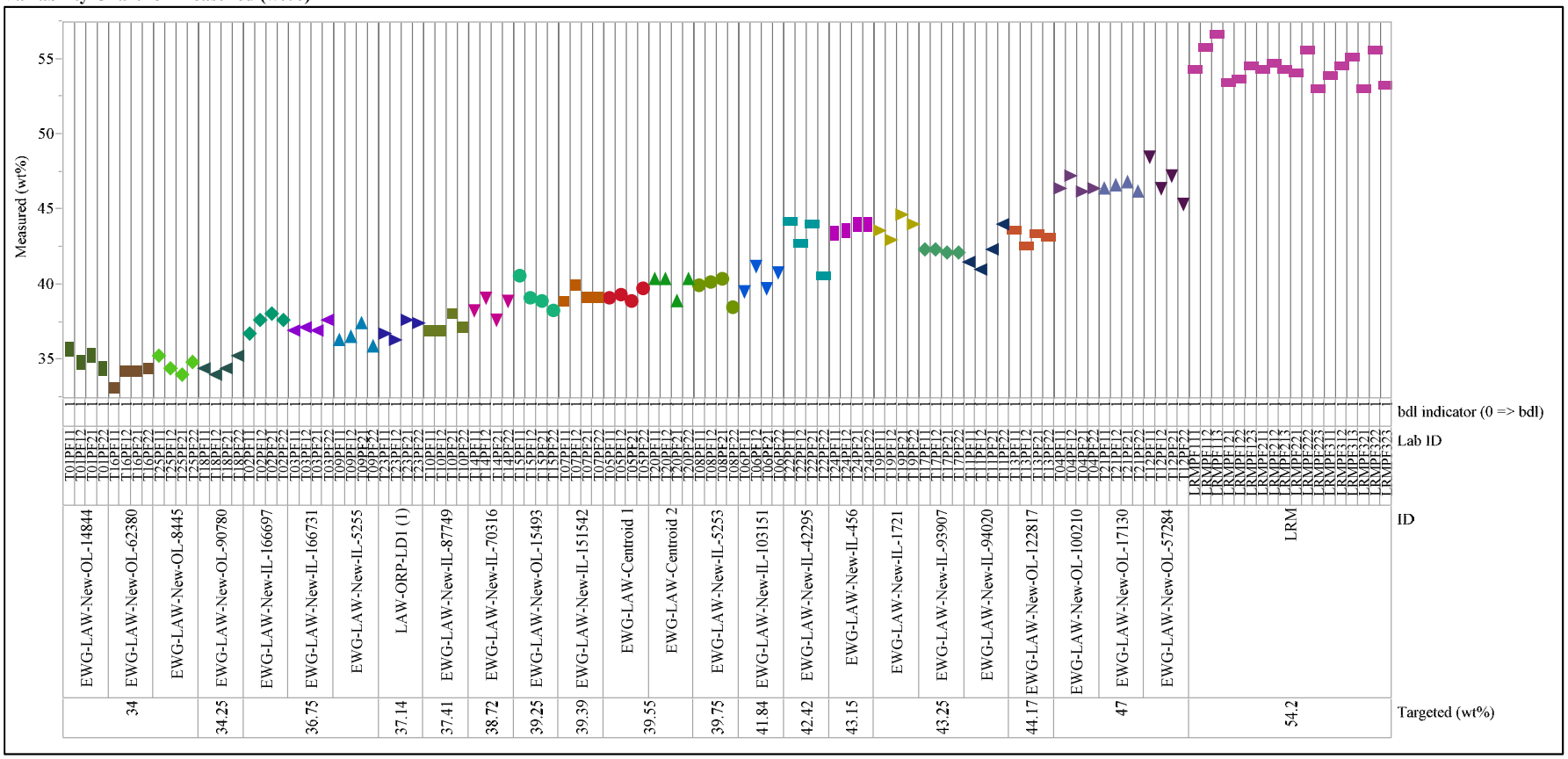


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=SnO2 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

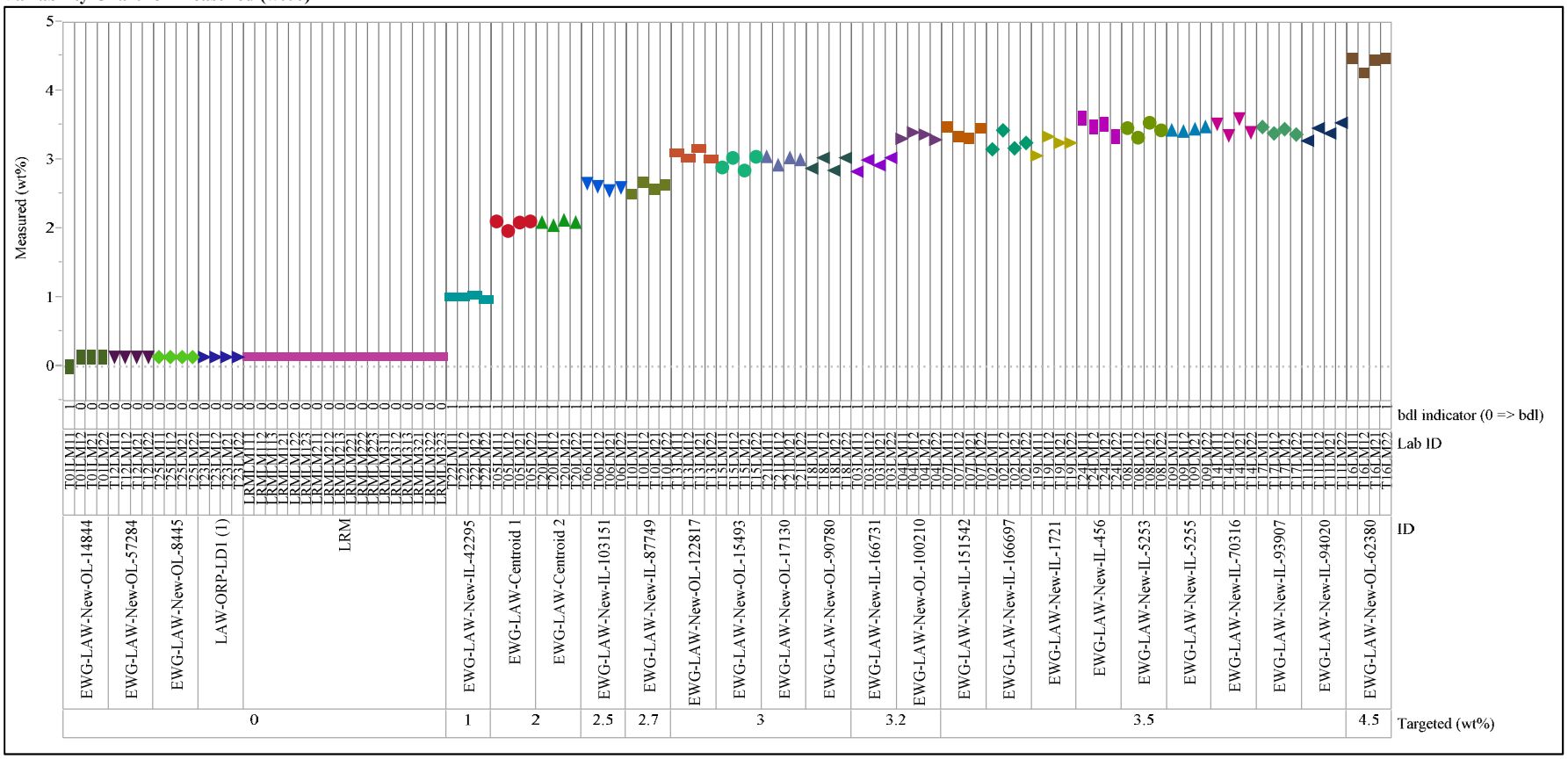


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=SO3 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

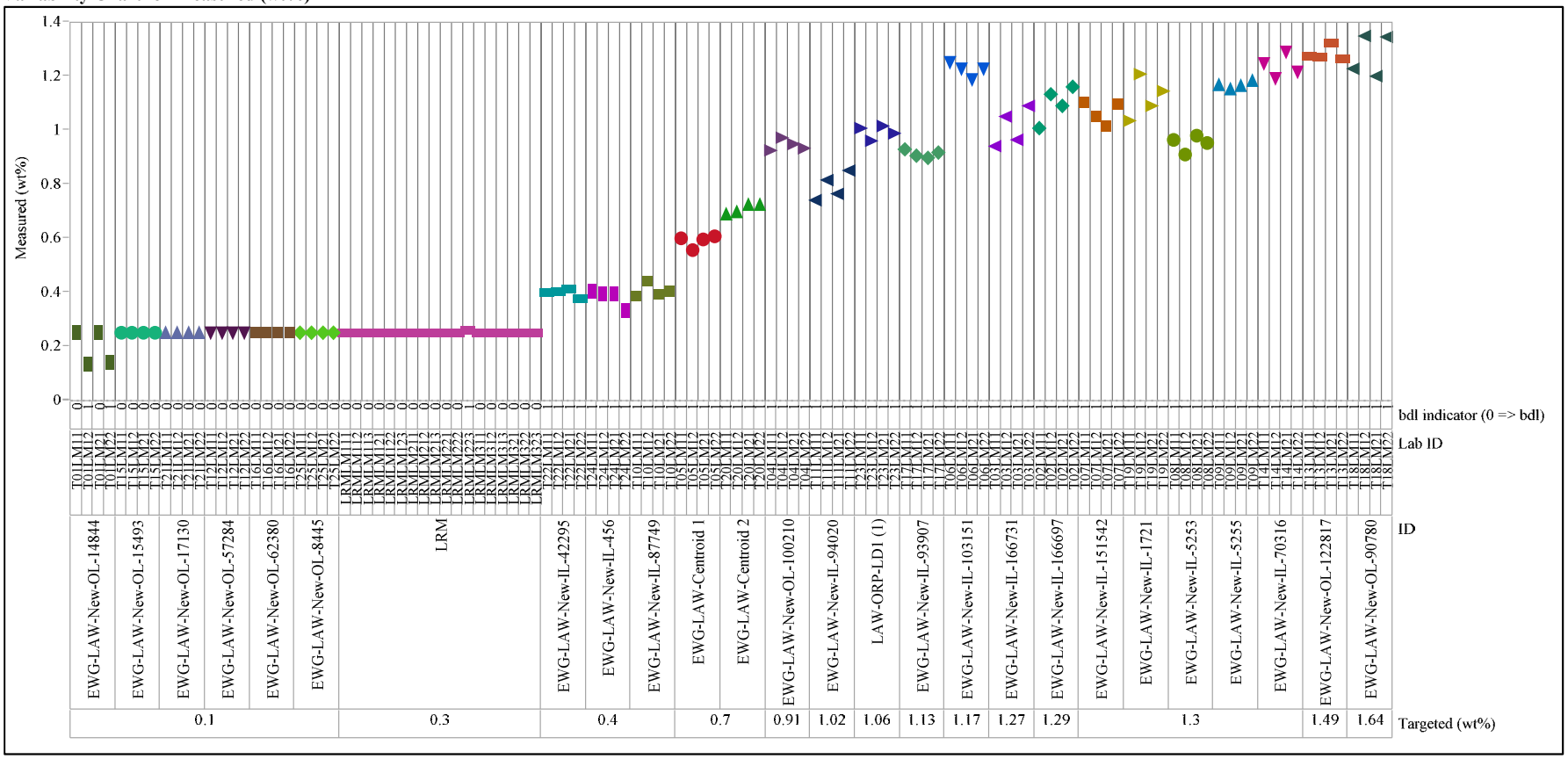


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=V2O5 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

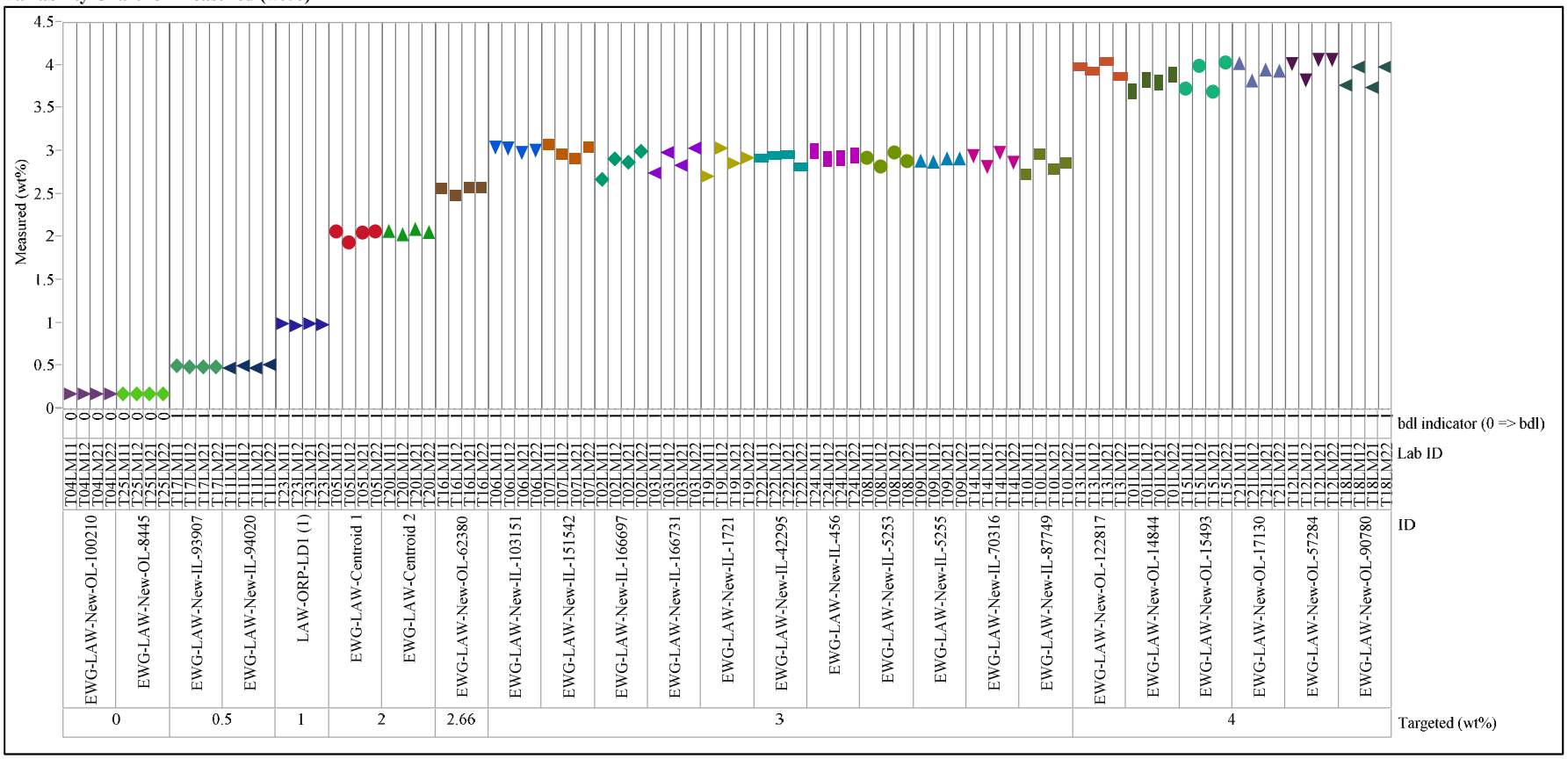


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=ZnO (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

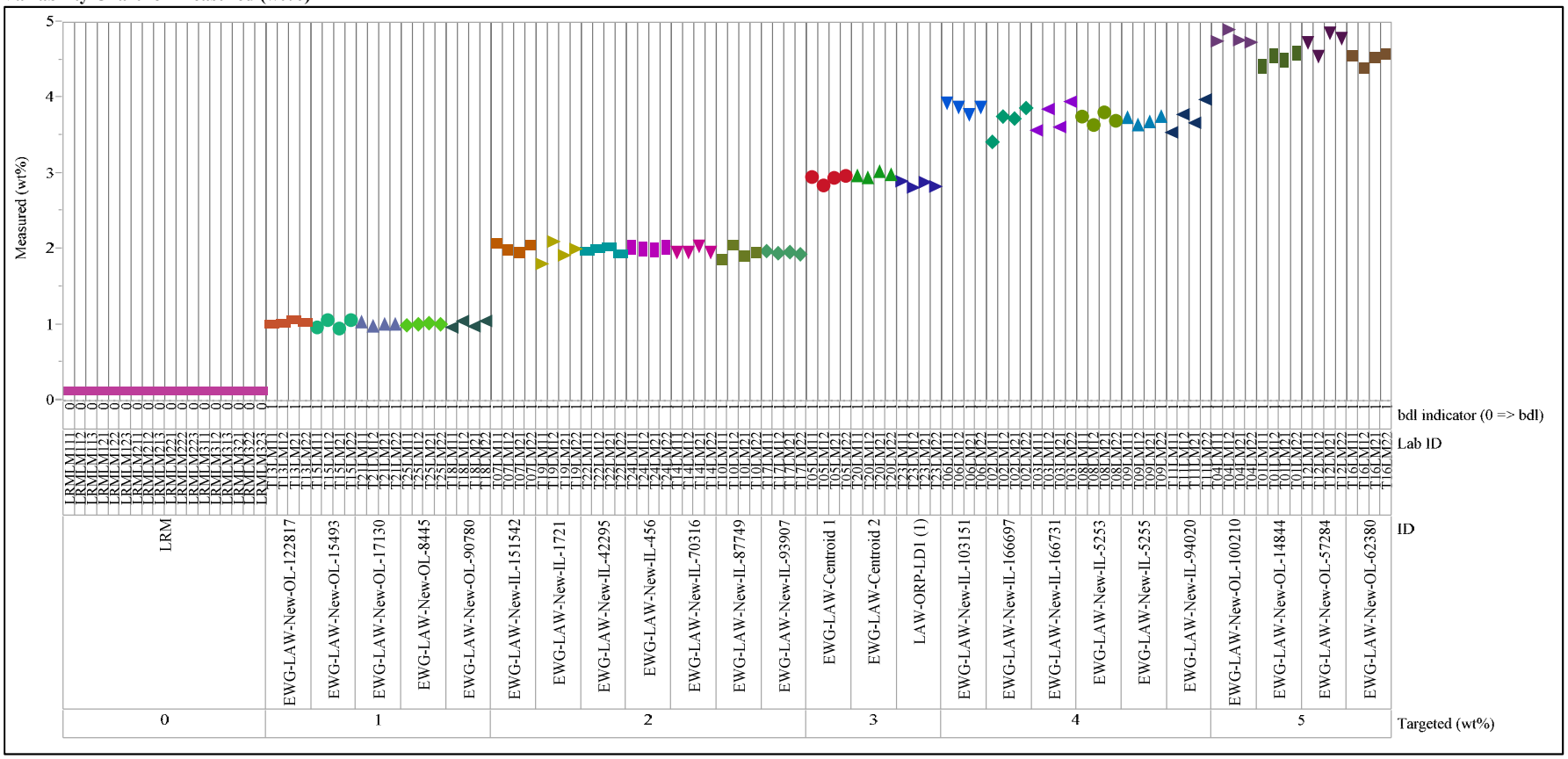


Exhibit A-2. Plots of Oxide Measurements by Glass Identifier Grouped by Targeted Concentrations (continued)

Analyte=ZrO2 (wt%), Prep Method=LM
Variability Chart for Measured (wt%)

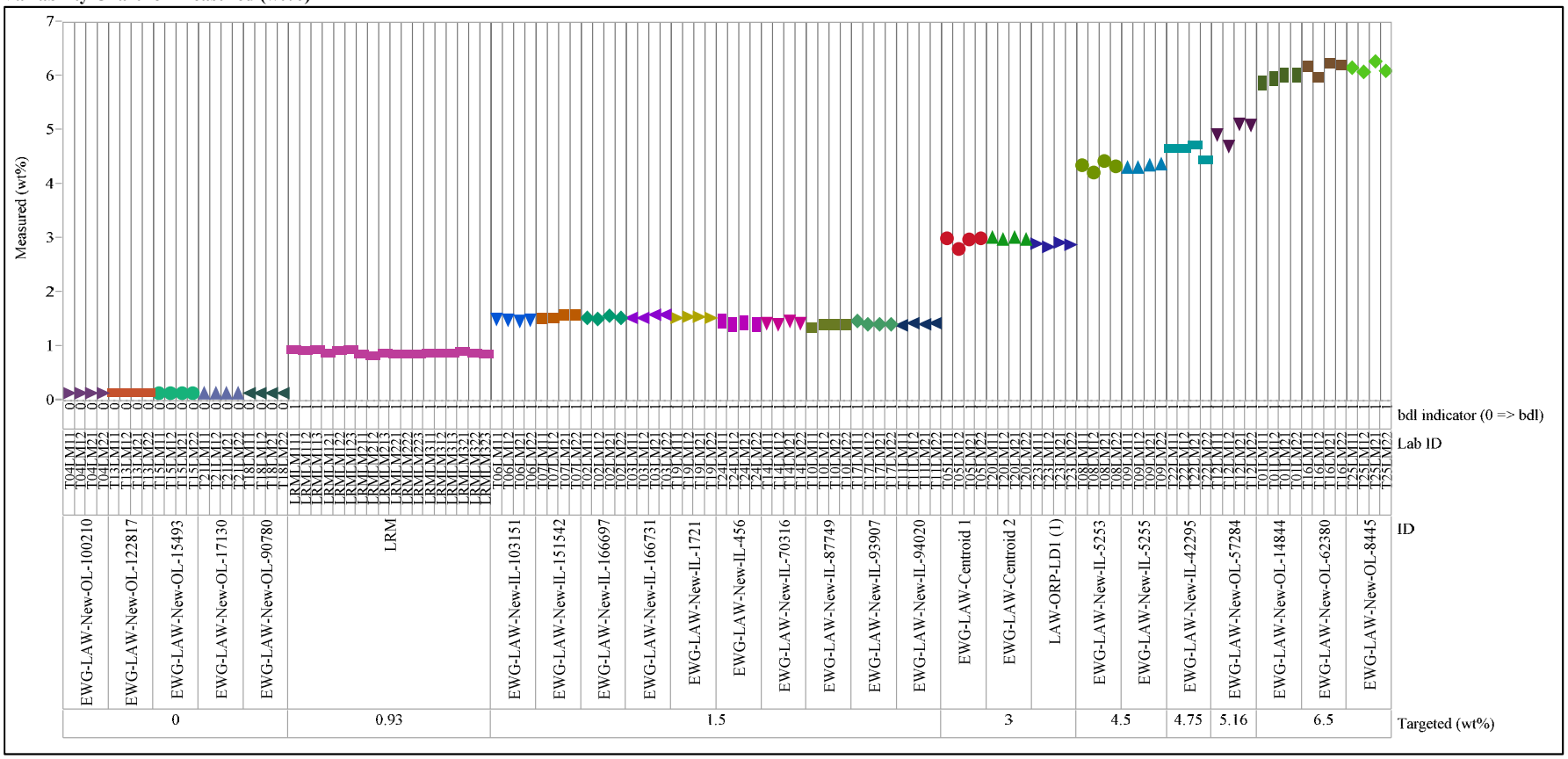


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass

Overlay Plot ID=LRM, Oxide=Al (wt%), Prep Method=PF

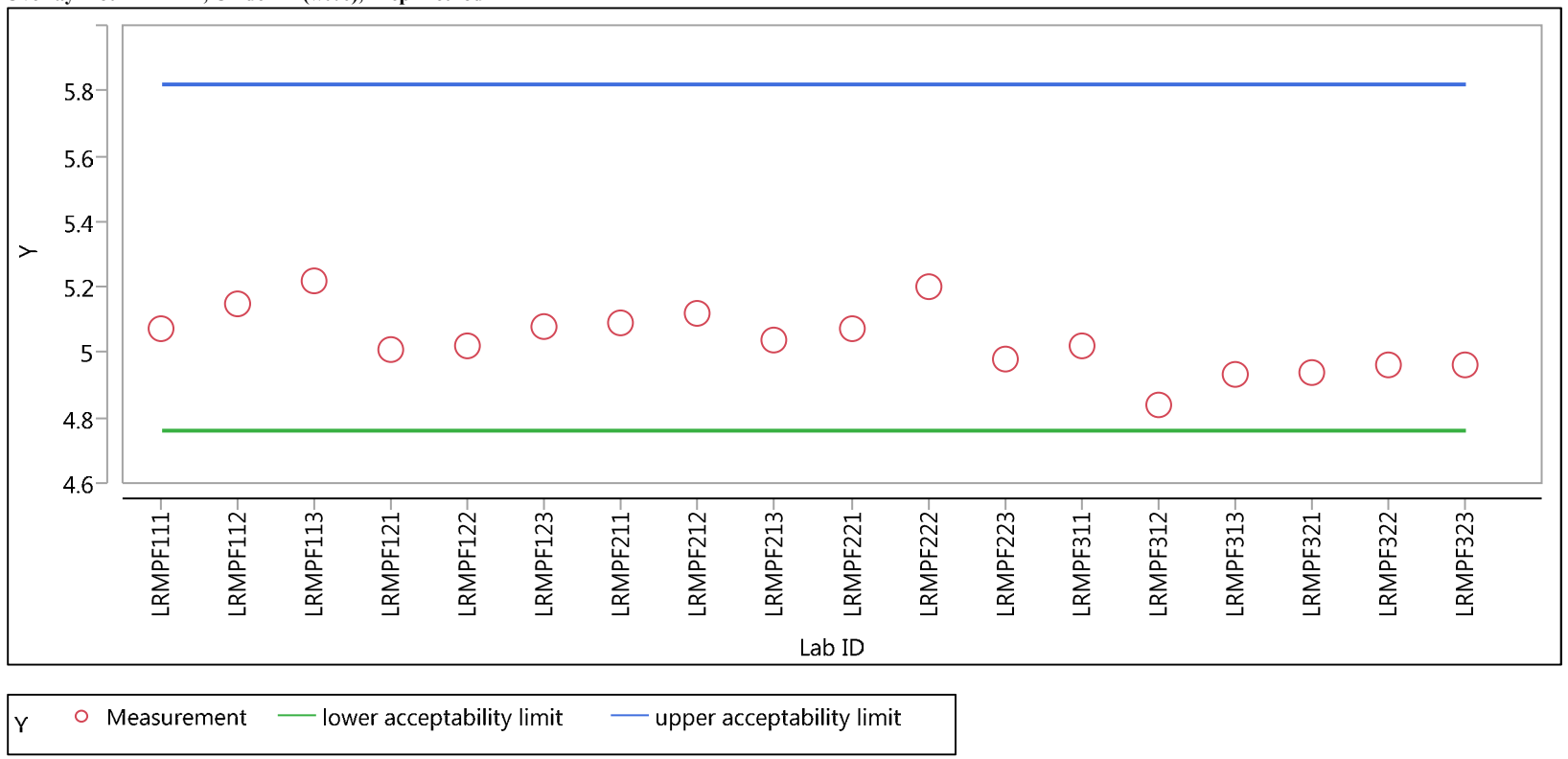


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass (continued)

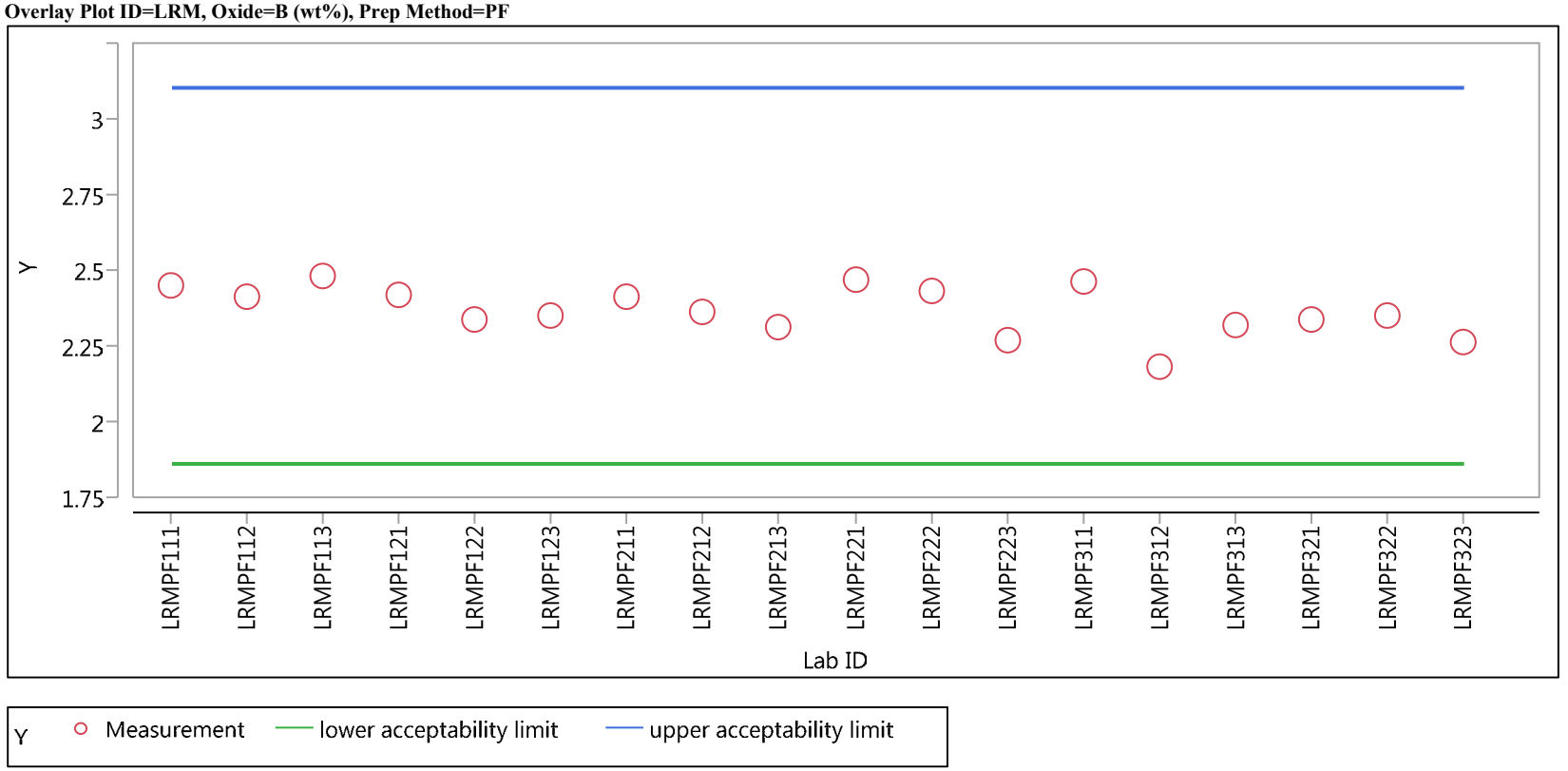


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass (continued)

Overlay Plot ID=LRM, Oxide=Fe (wt%), Prep Method=LM

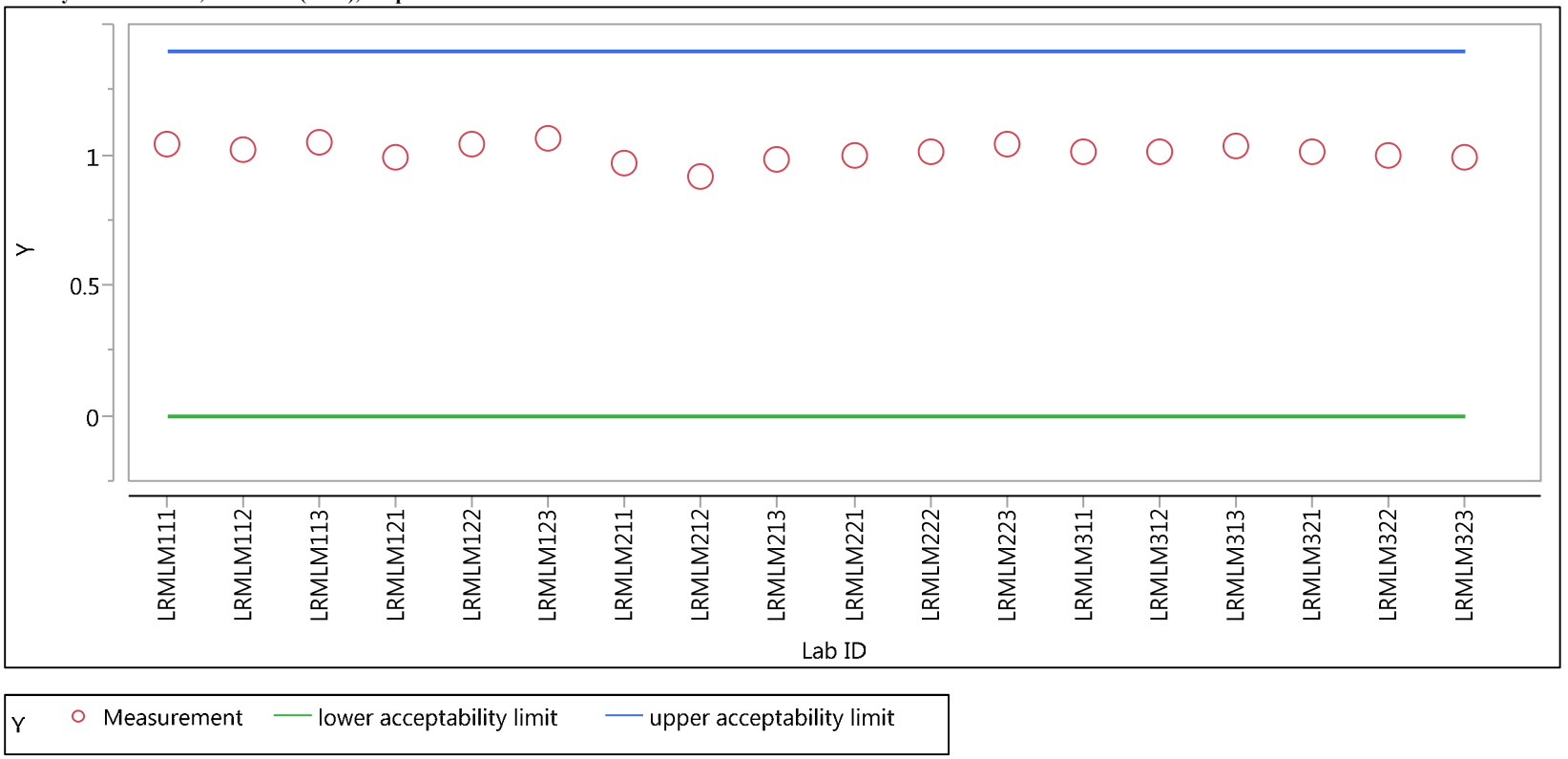


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass (continued)

Overlay Plot ID=LRM, Oxide=K (wt%), Prep Method=LM

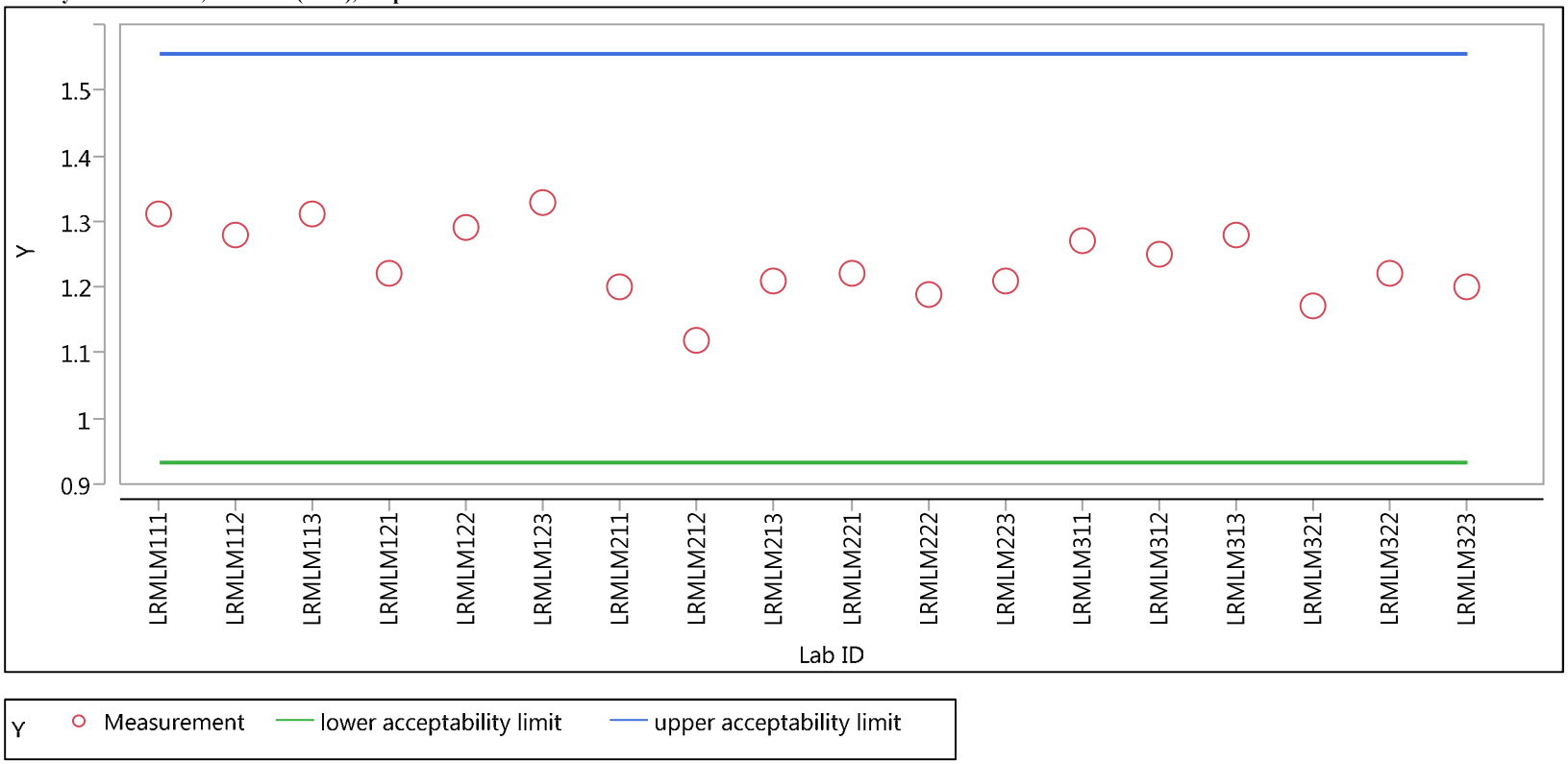


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass (continued)

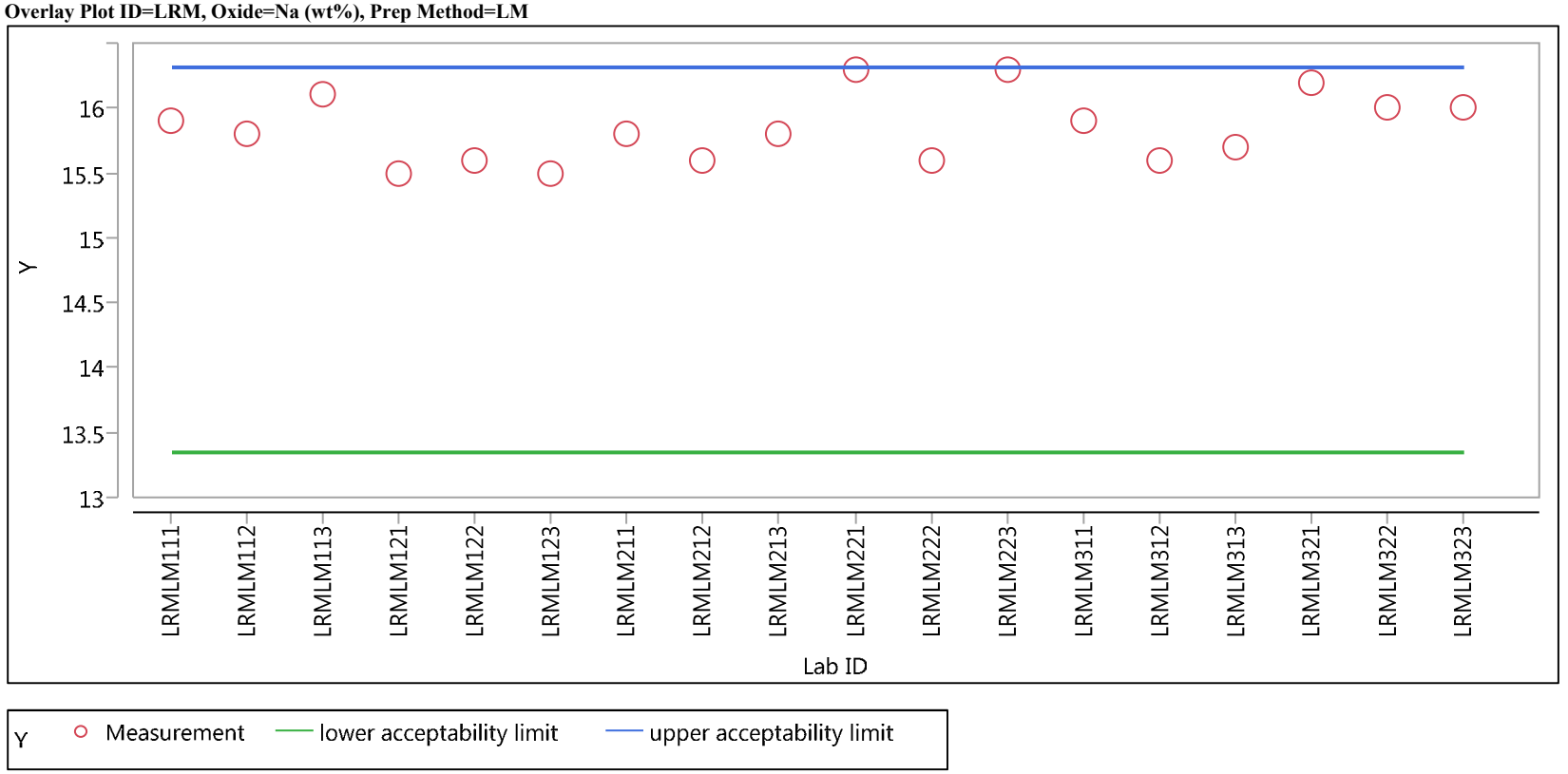


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass (continued)

Overlay Plot ID=LRM, Oxide=Si (wt%), Prep Method=PF

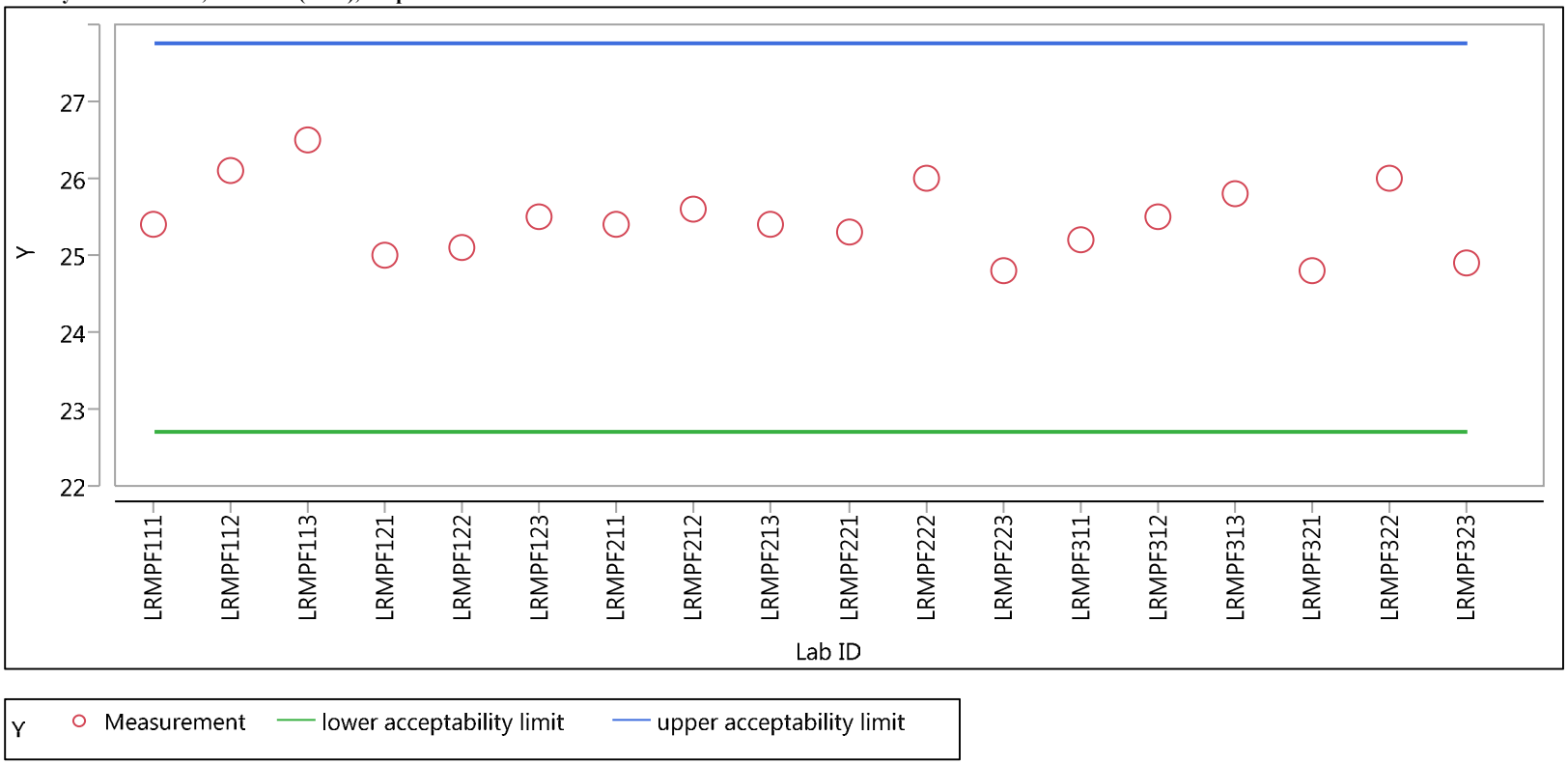


Exhibit A-3. Acceptability Evaluation for Measurements of the LRM Standard Glass (continued)

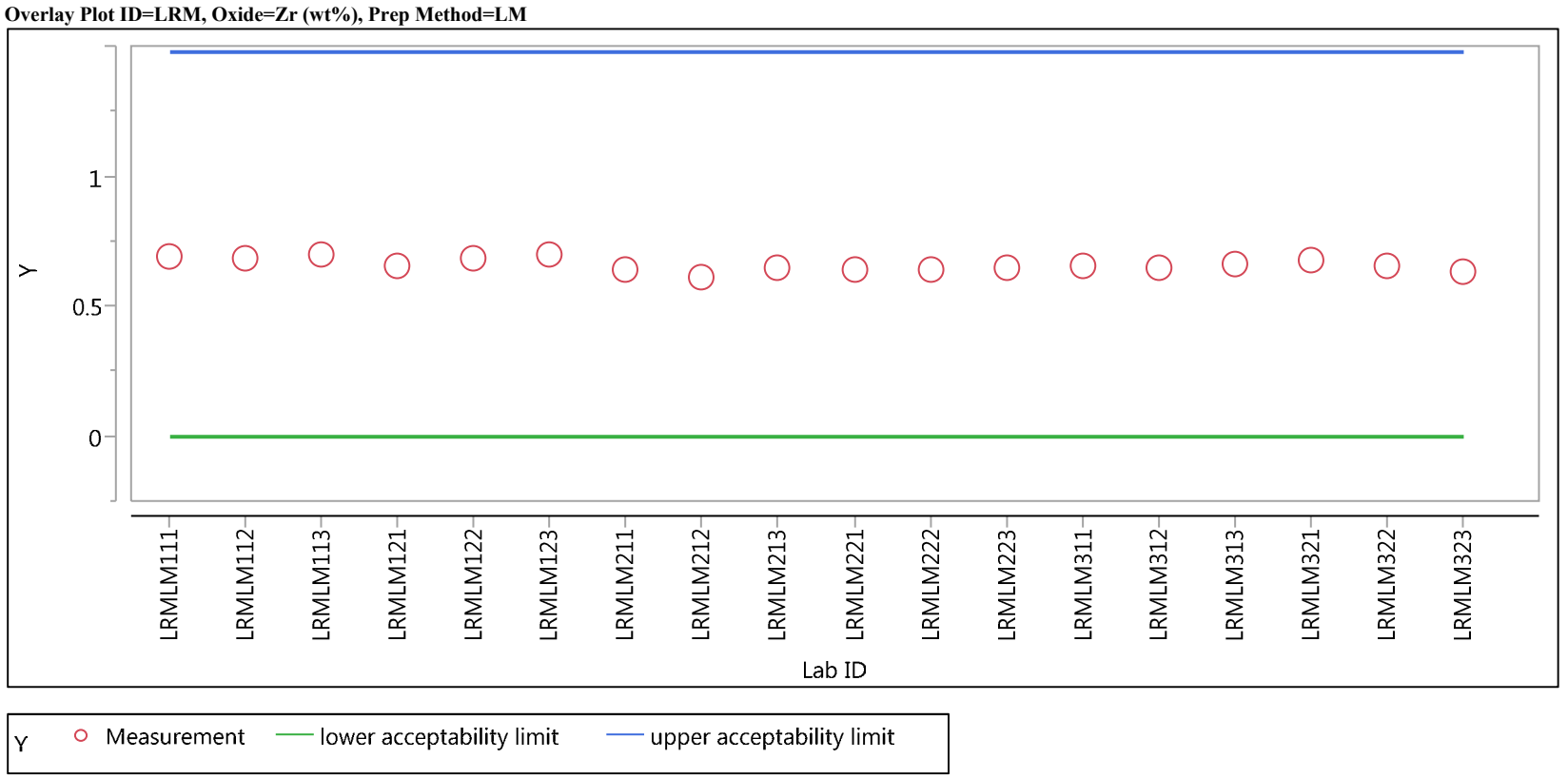


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide

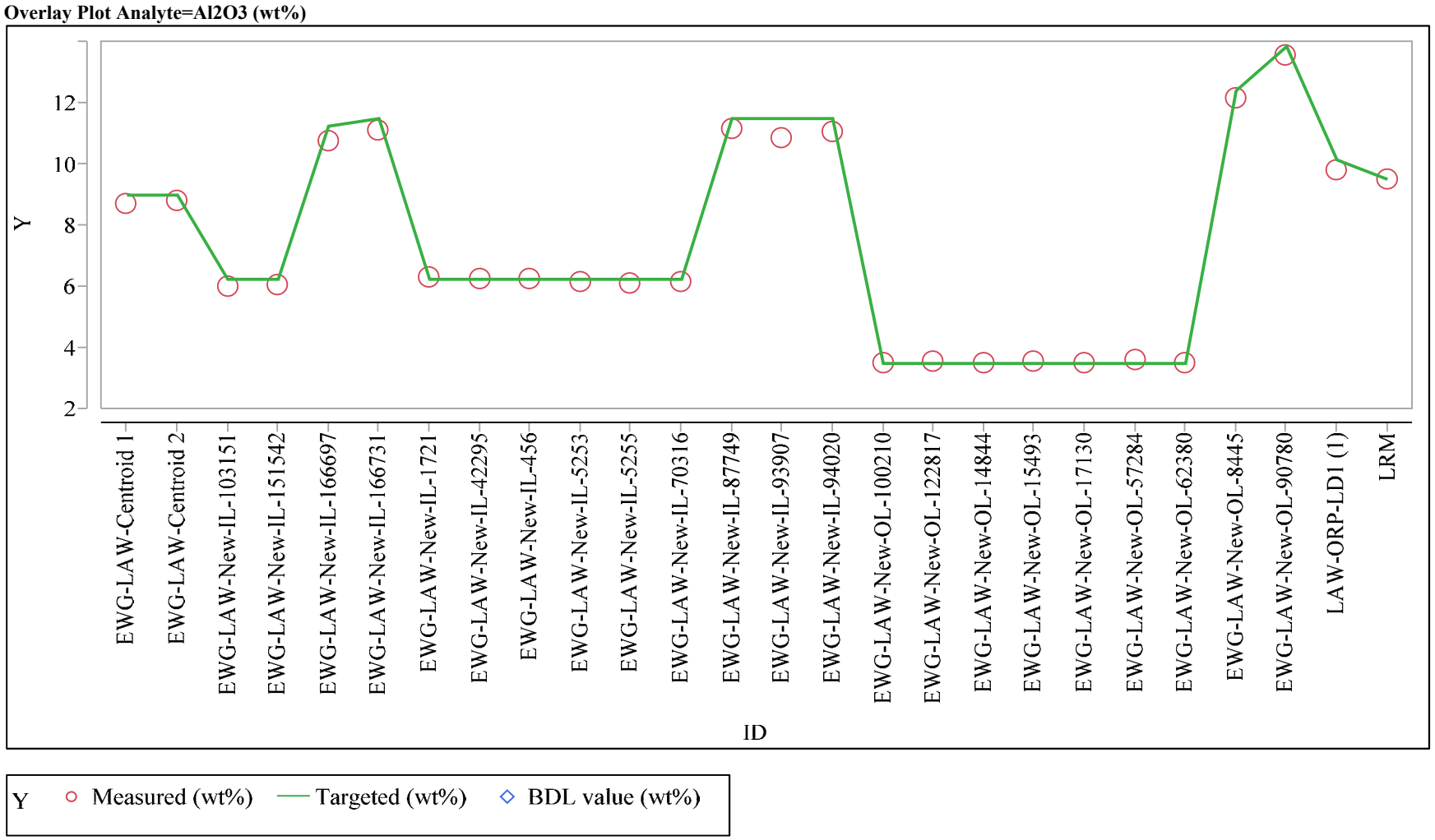


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

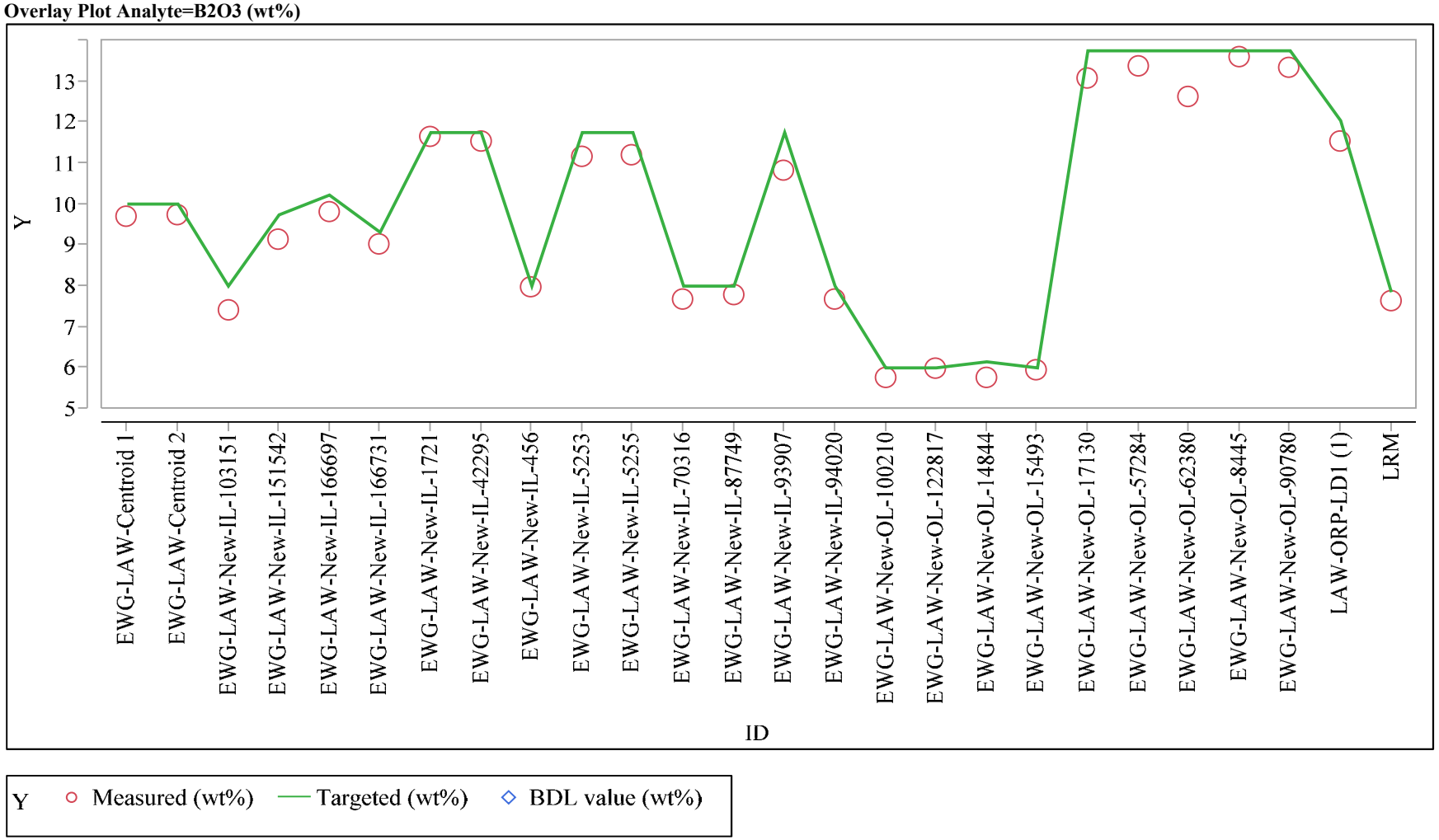


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

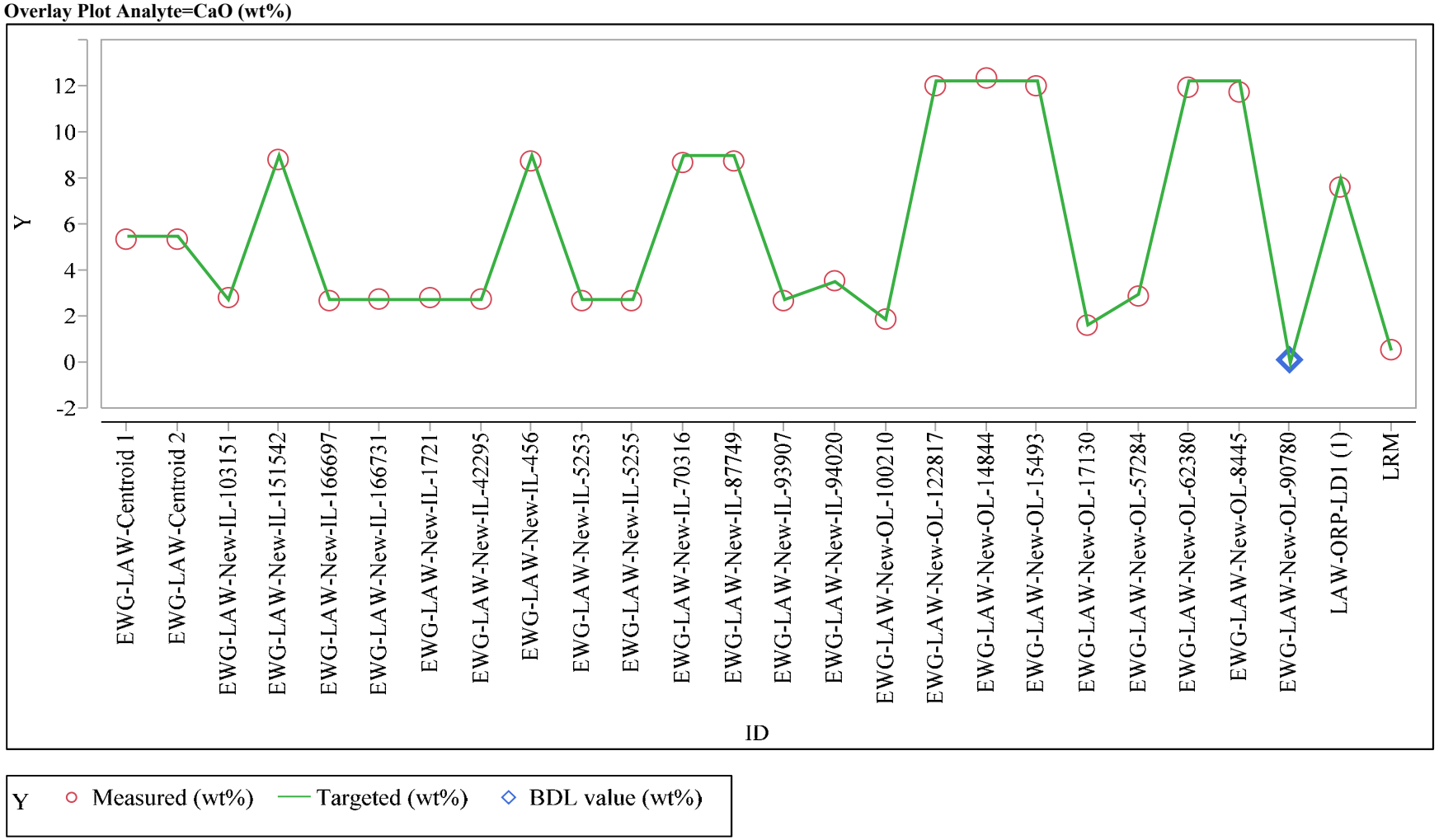


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

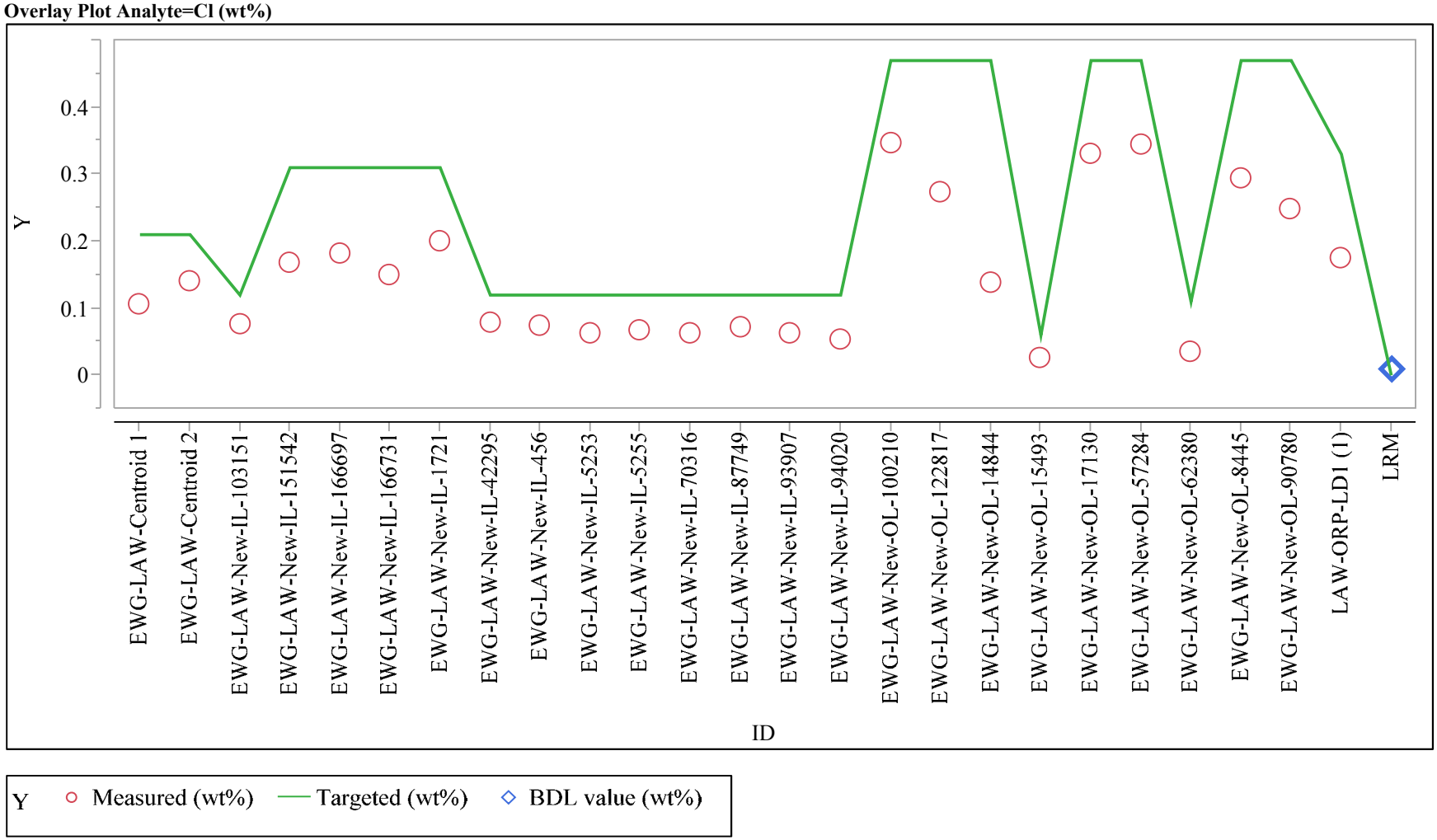


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

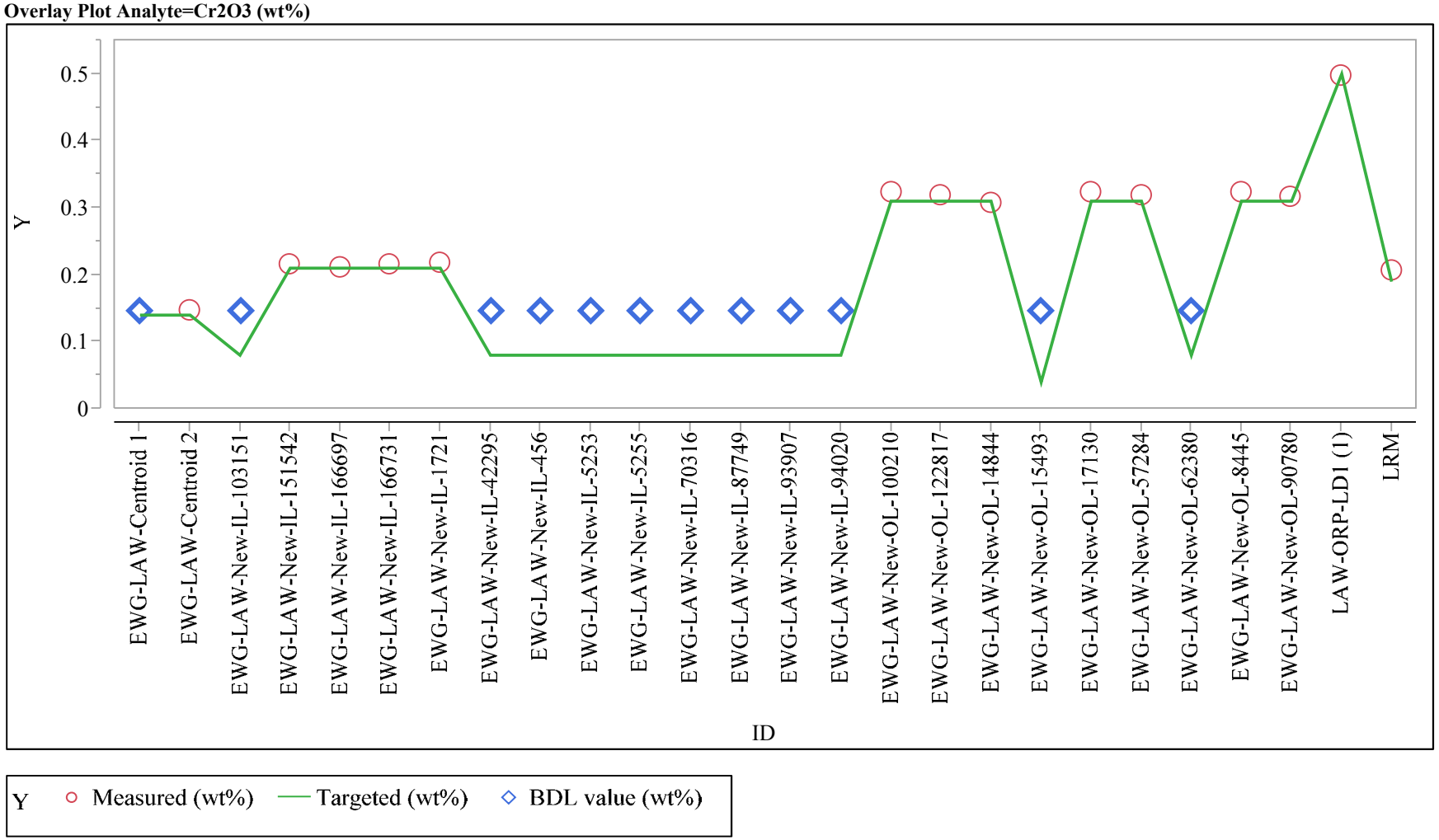


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Analyte=F (wt%)

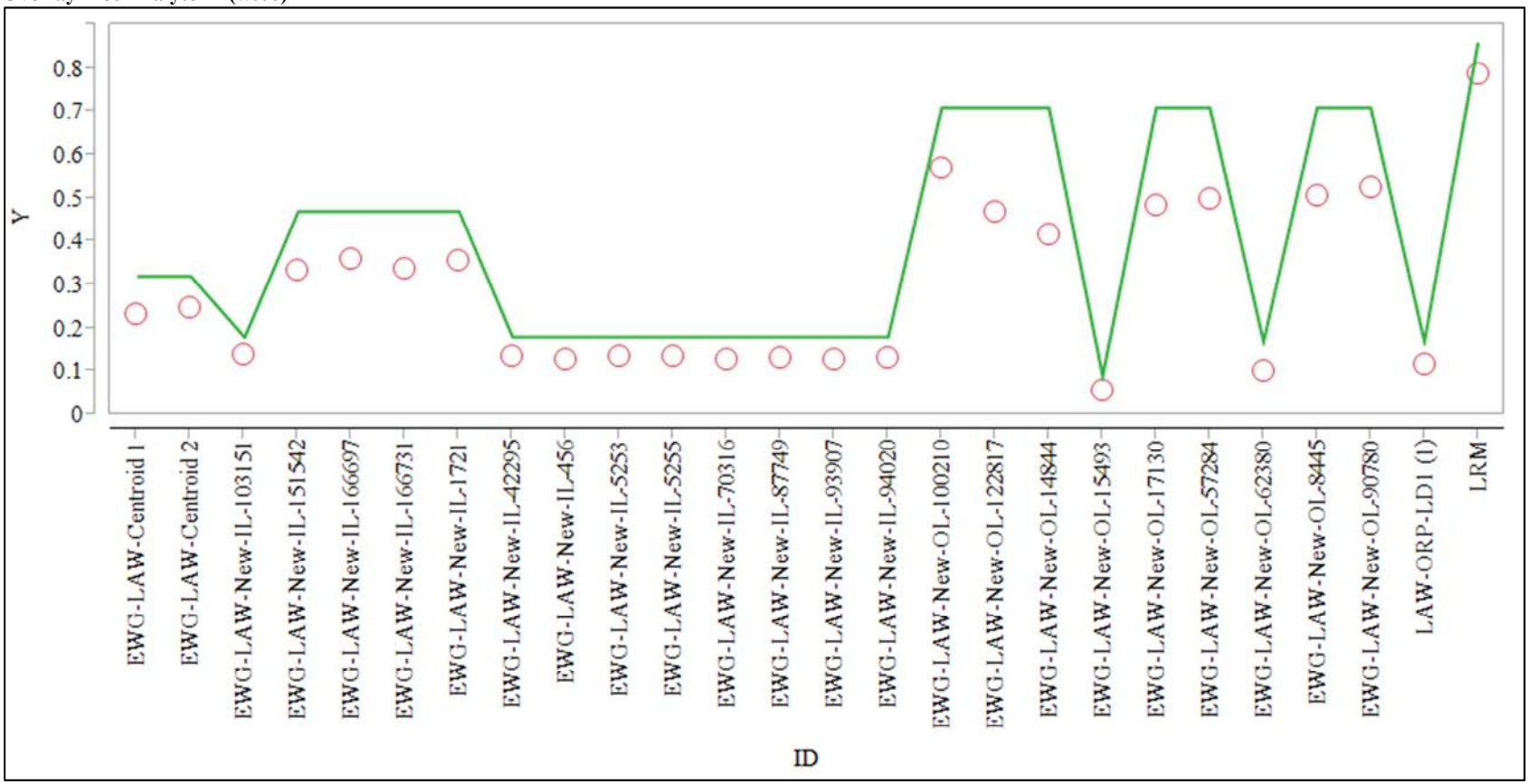


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

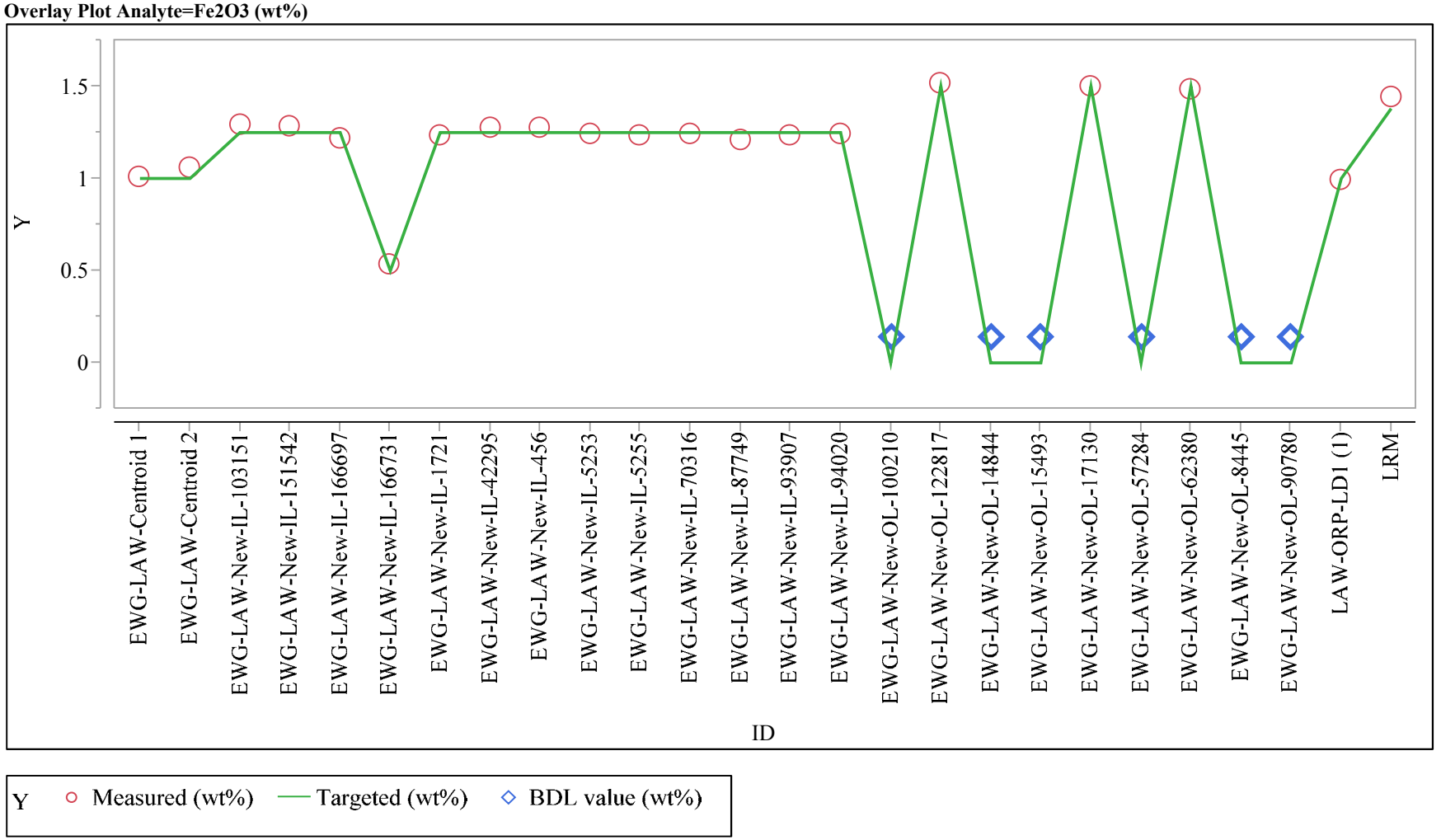


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

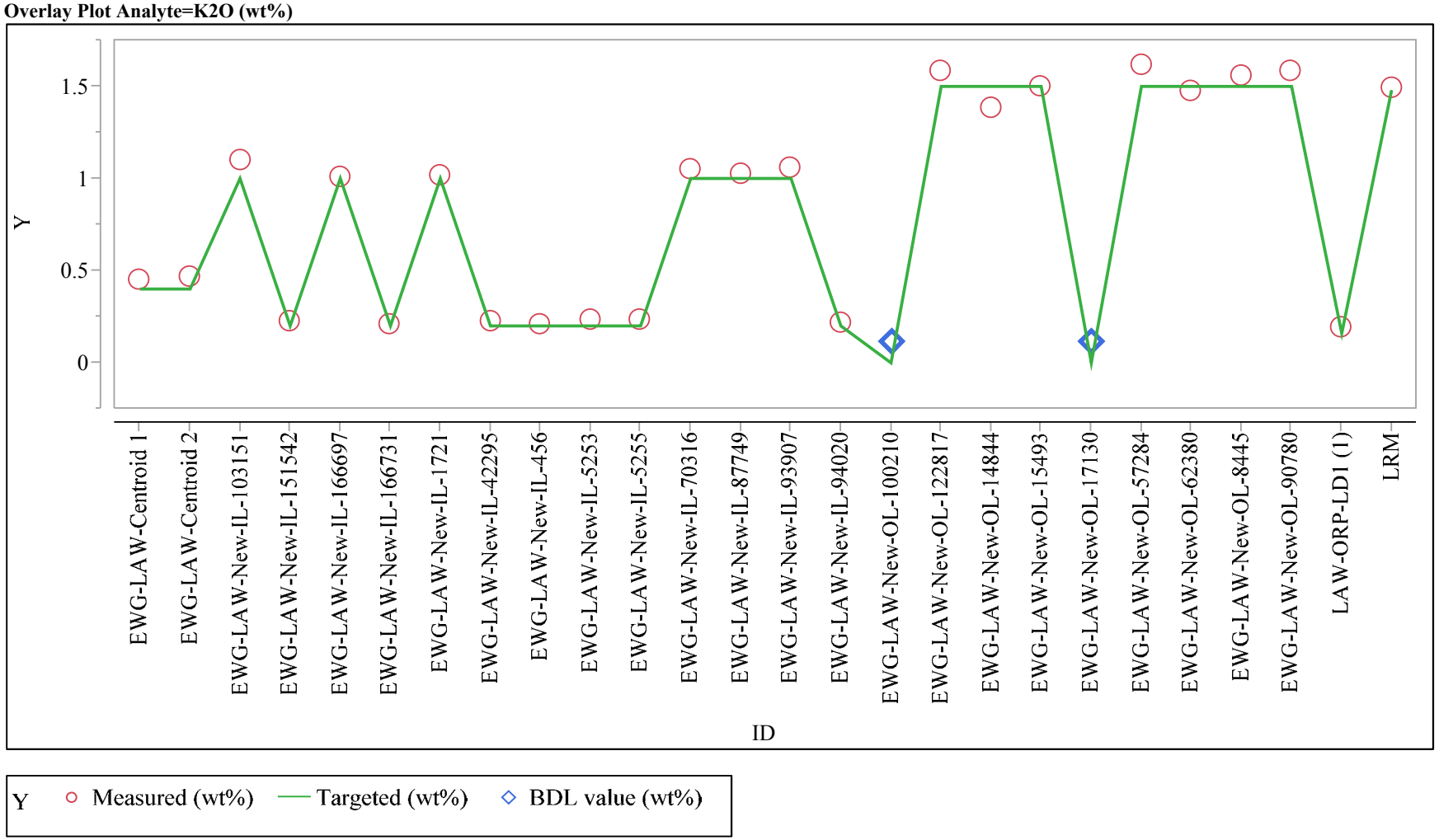


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

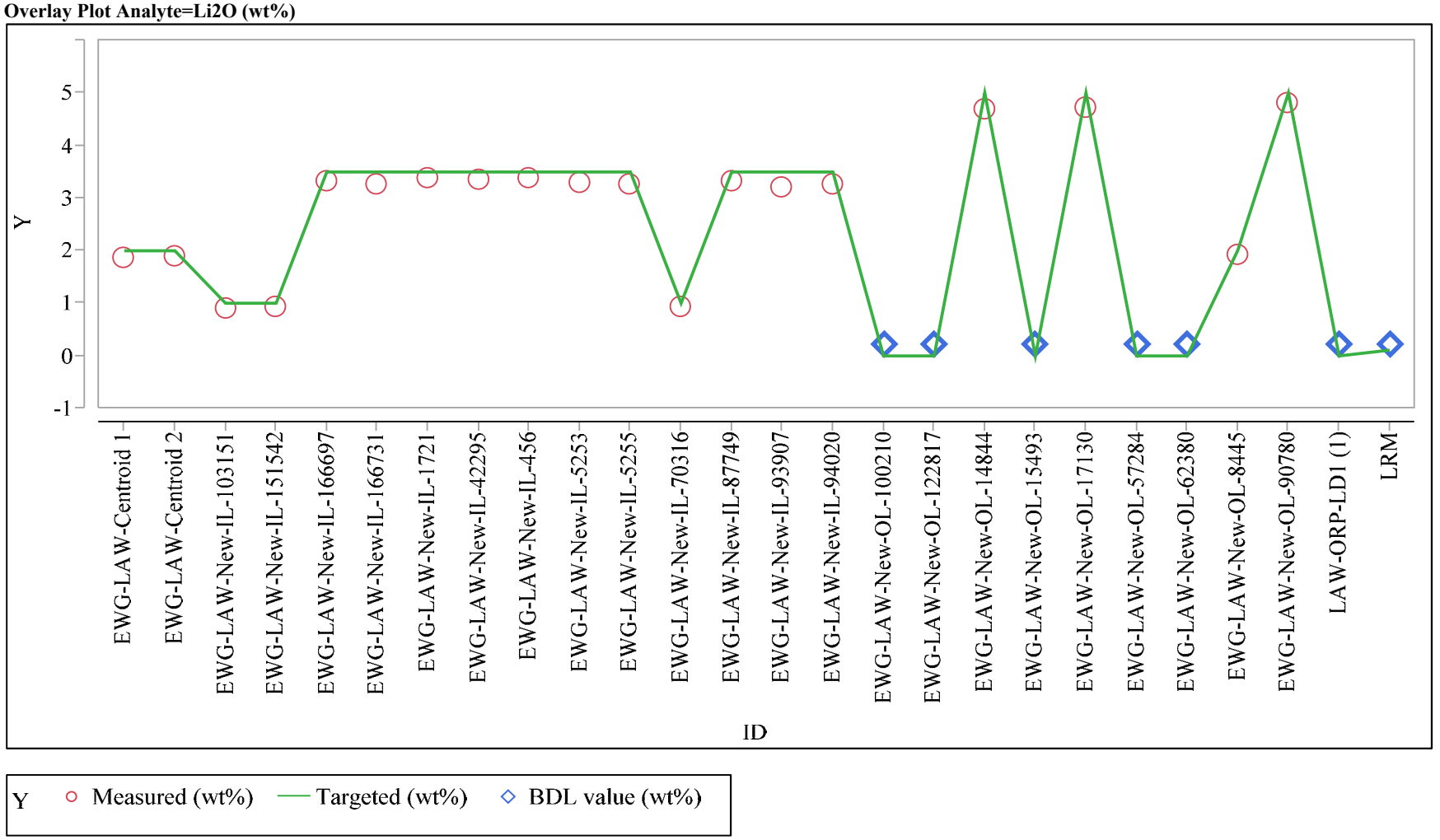


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

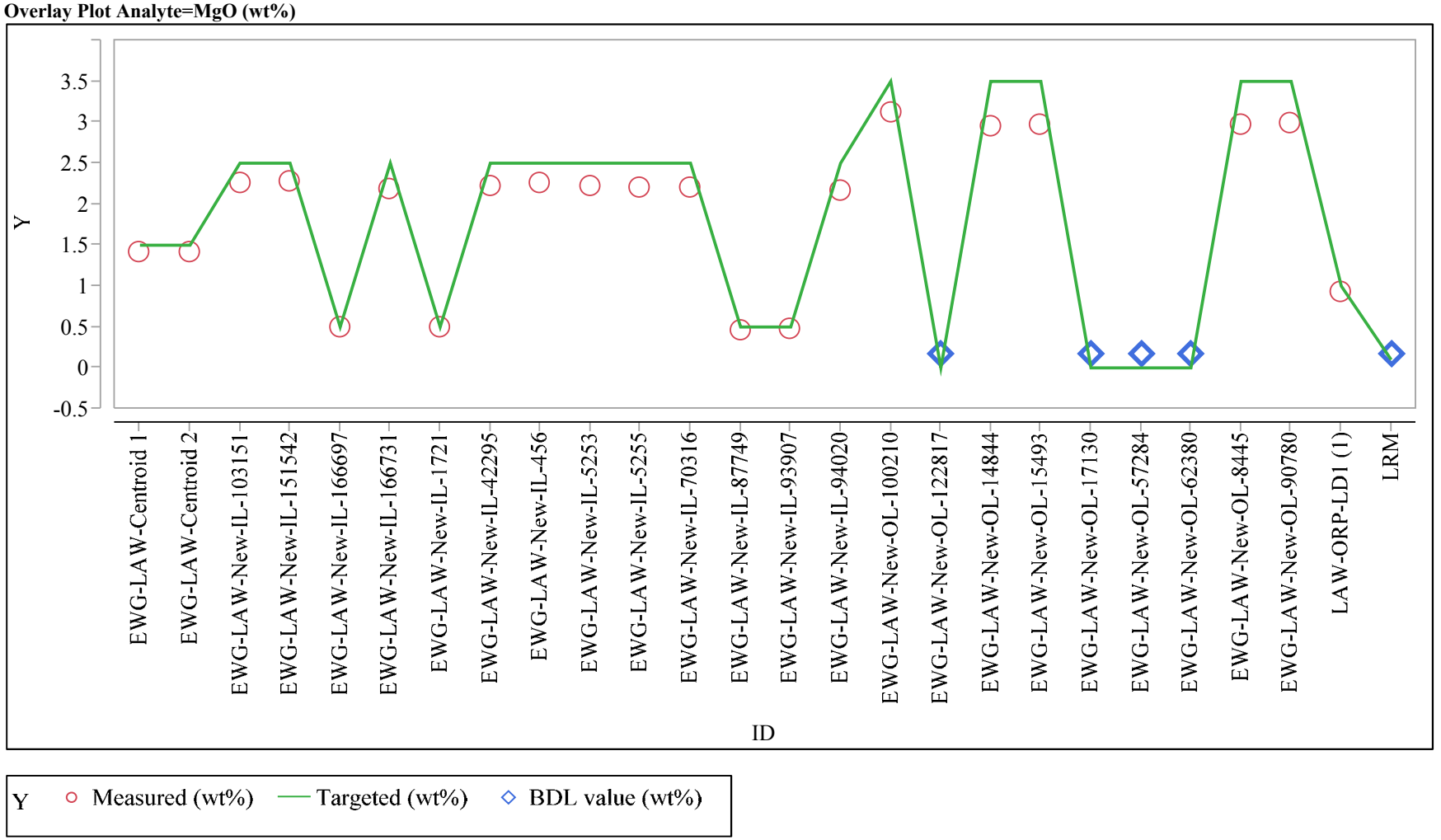


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

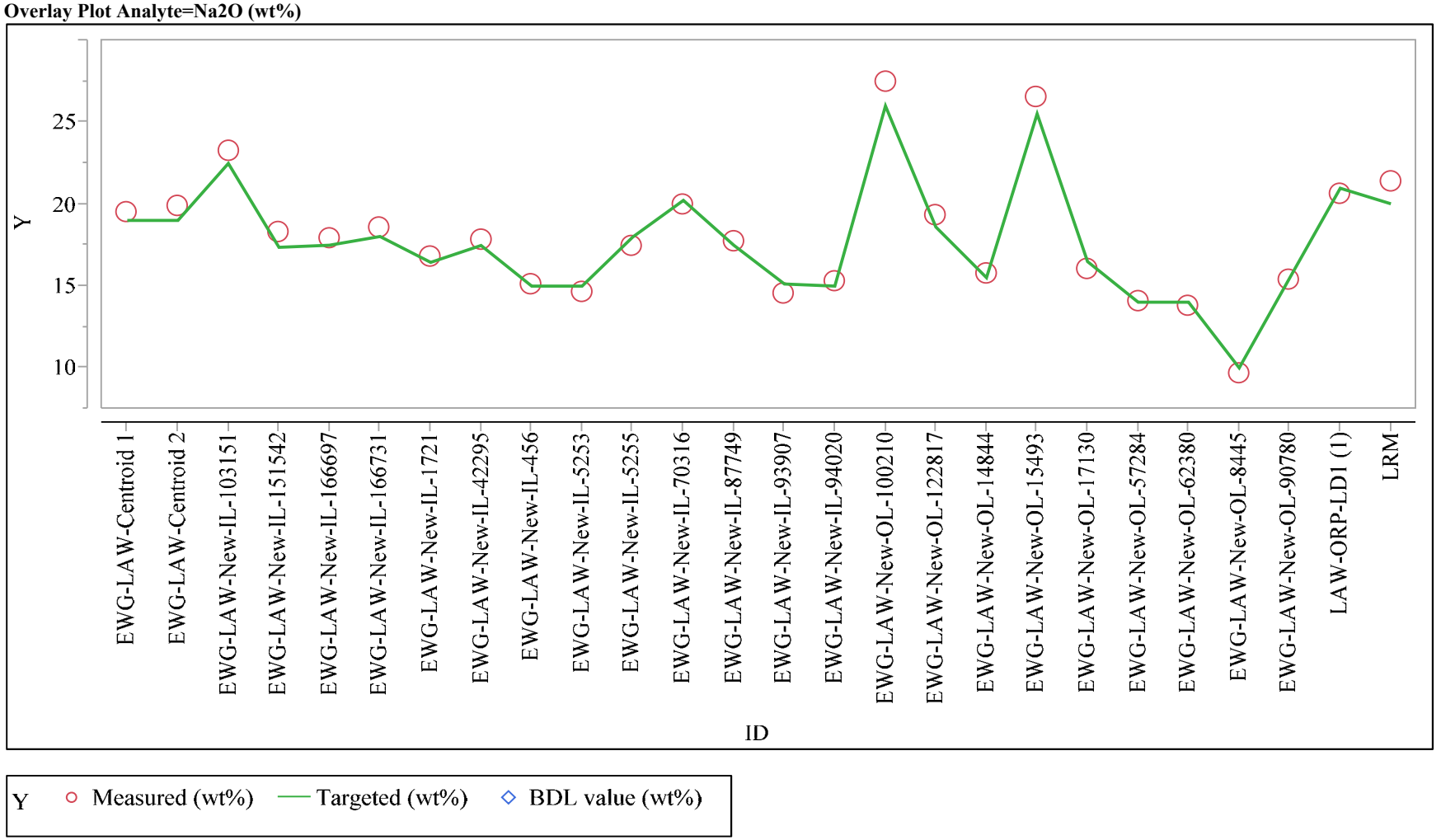


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

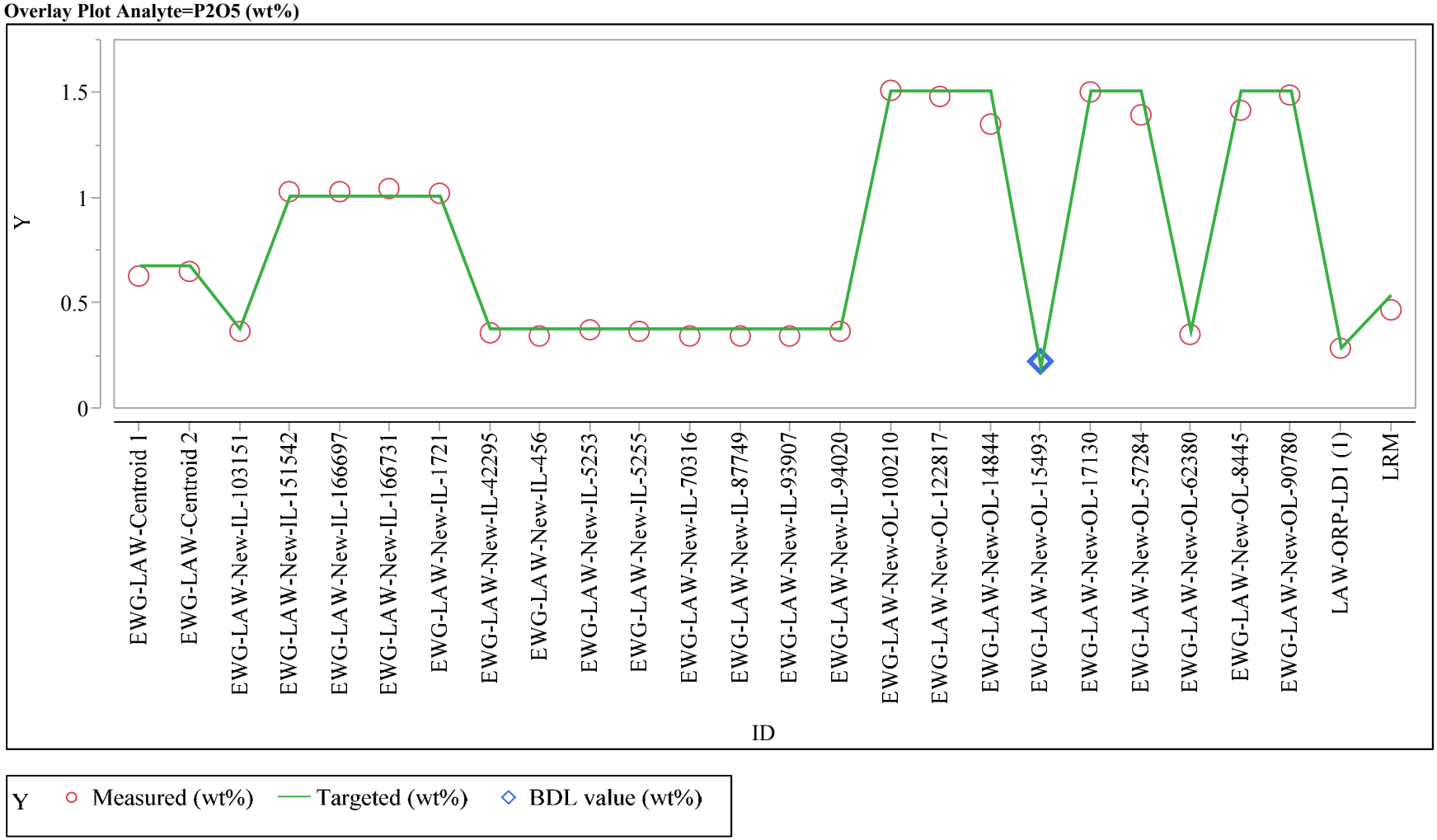


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

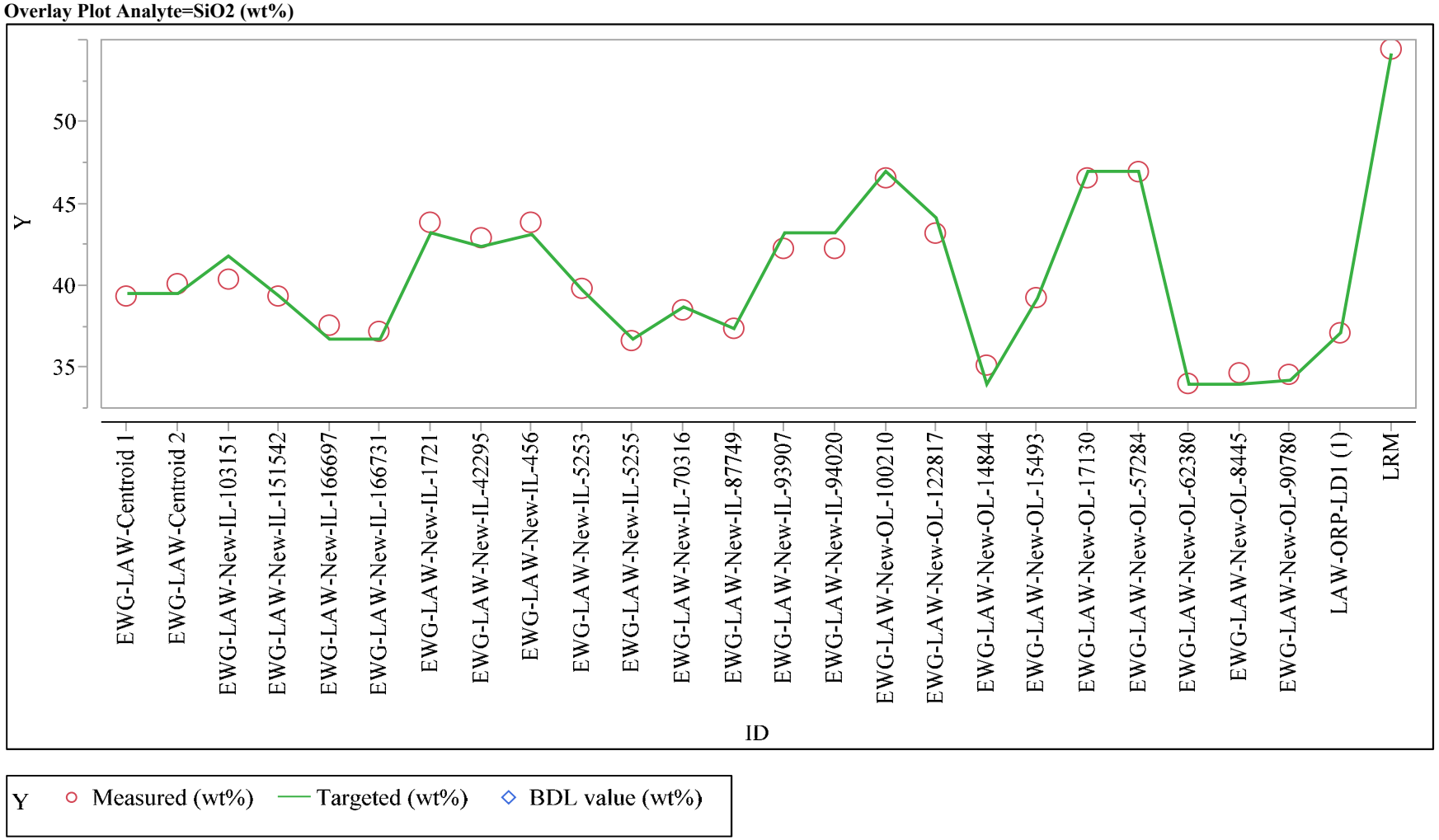


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

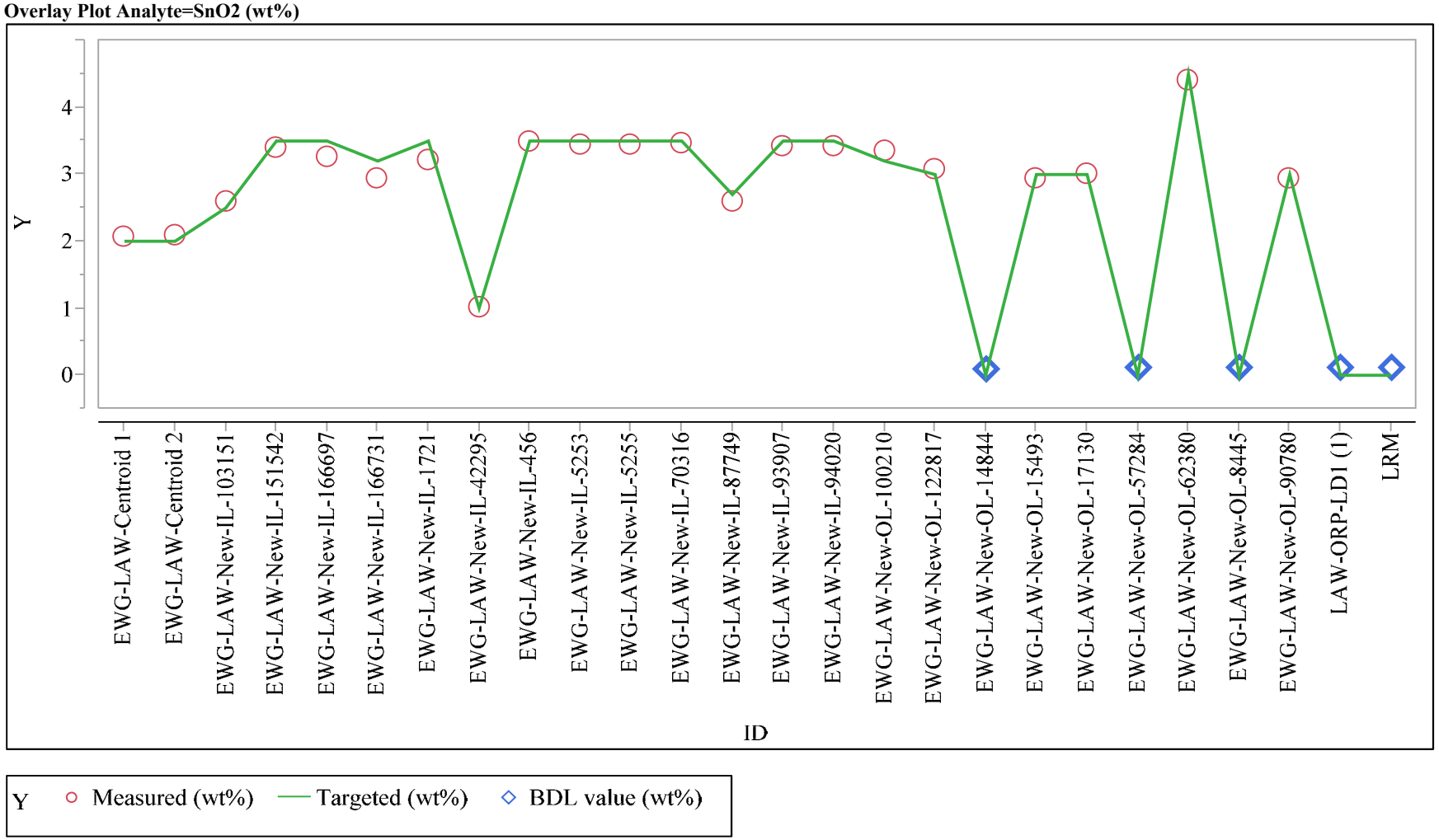


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

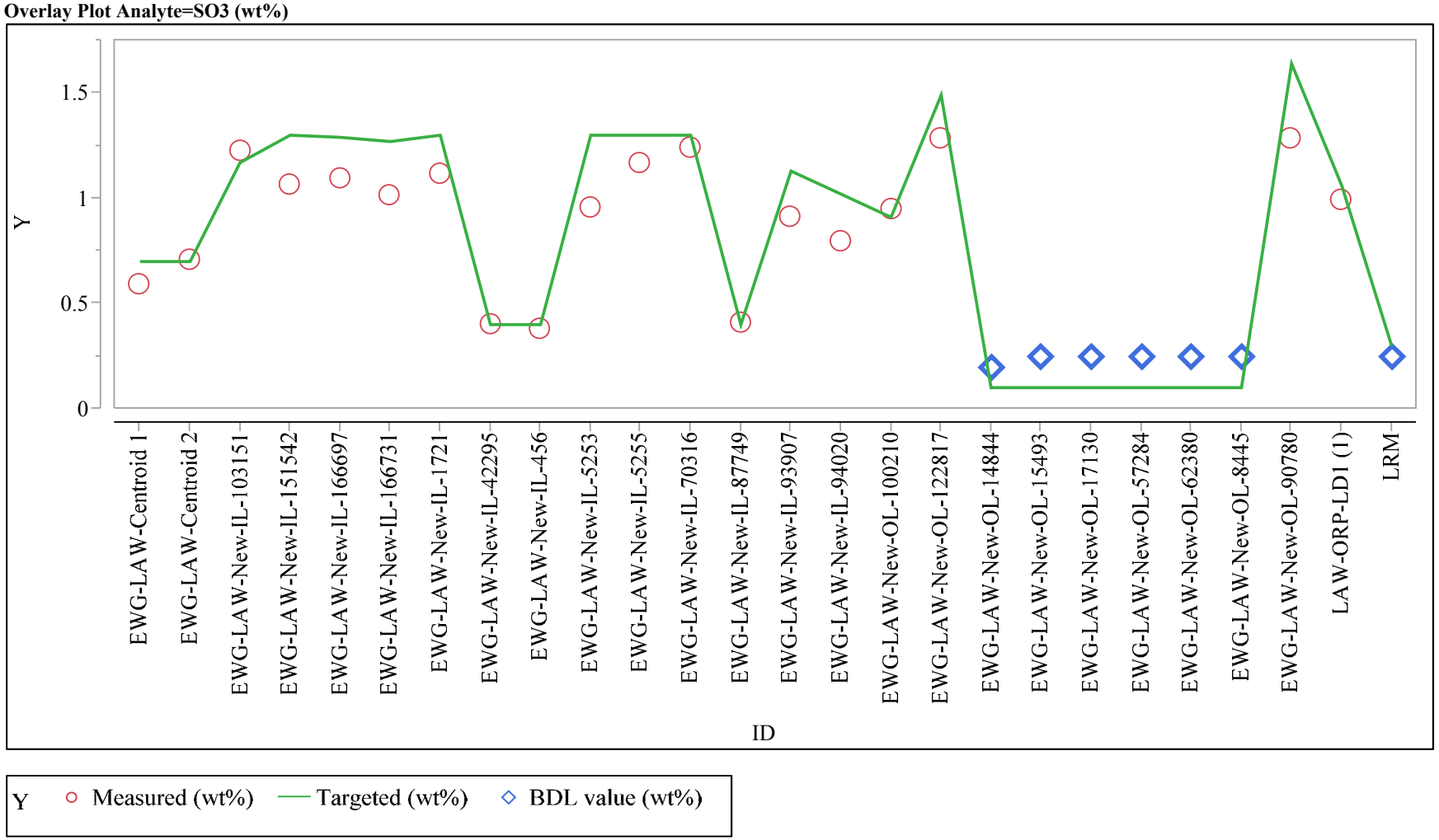


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

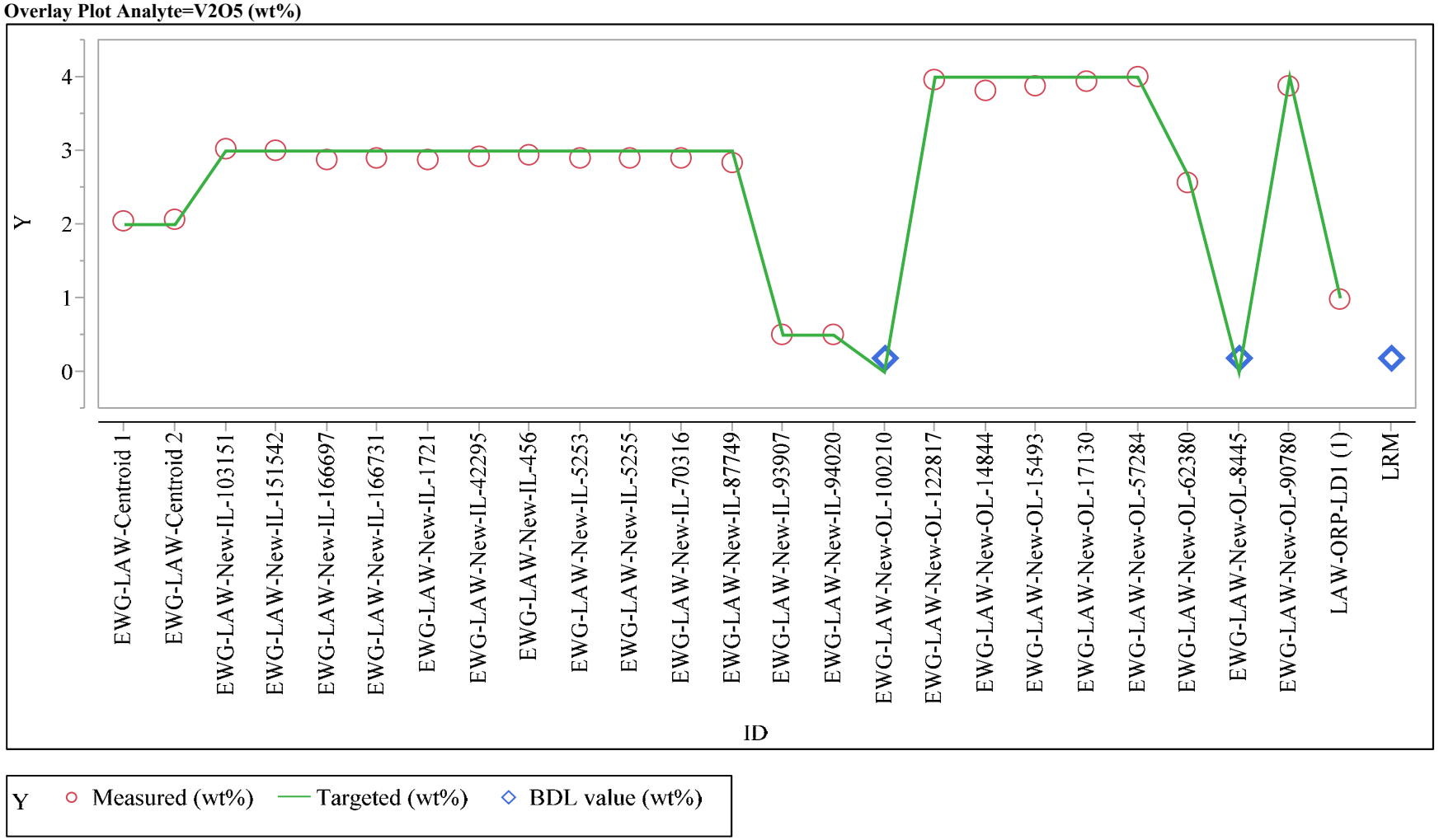


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

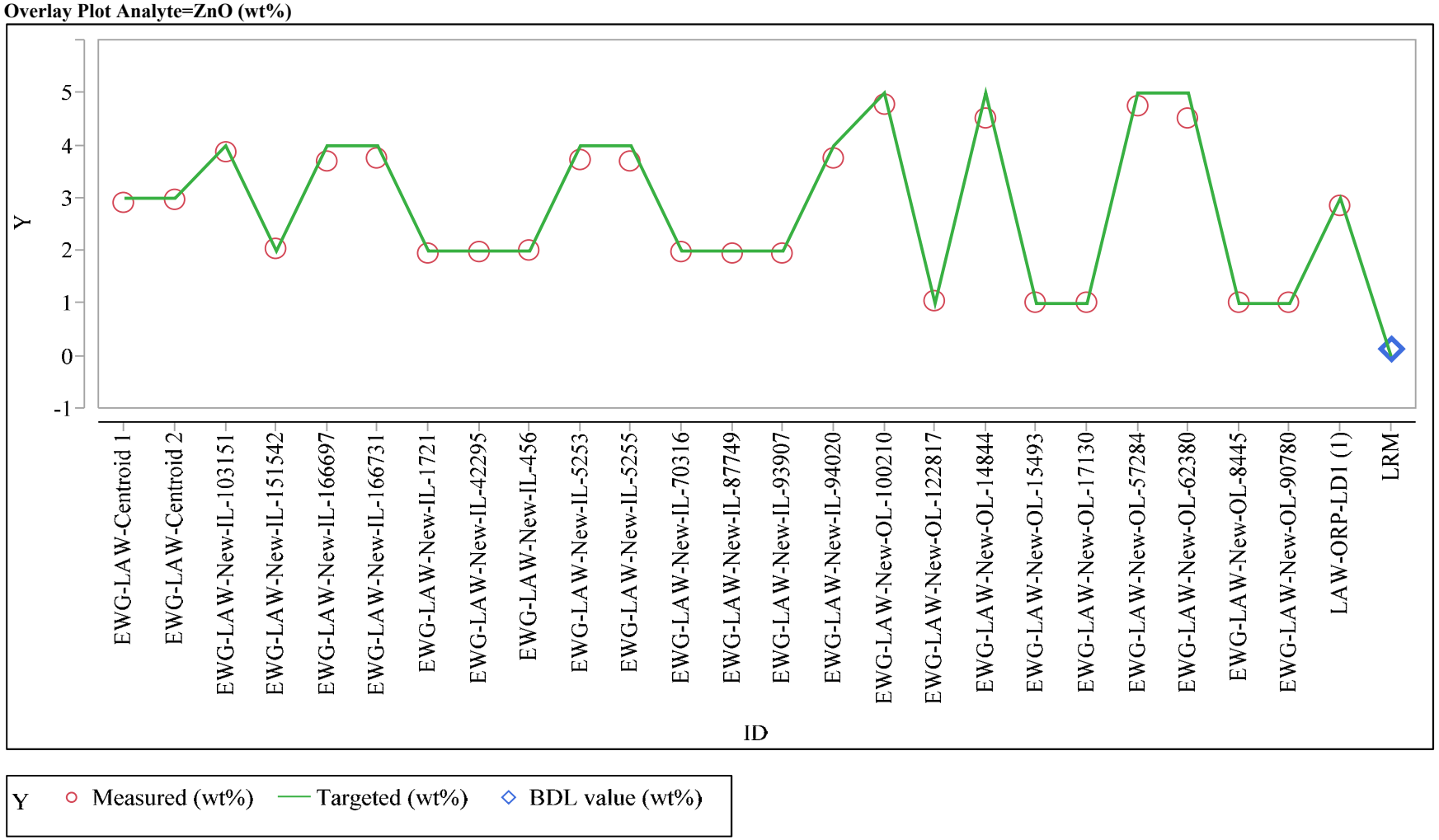


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

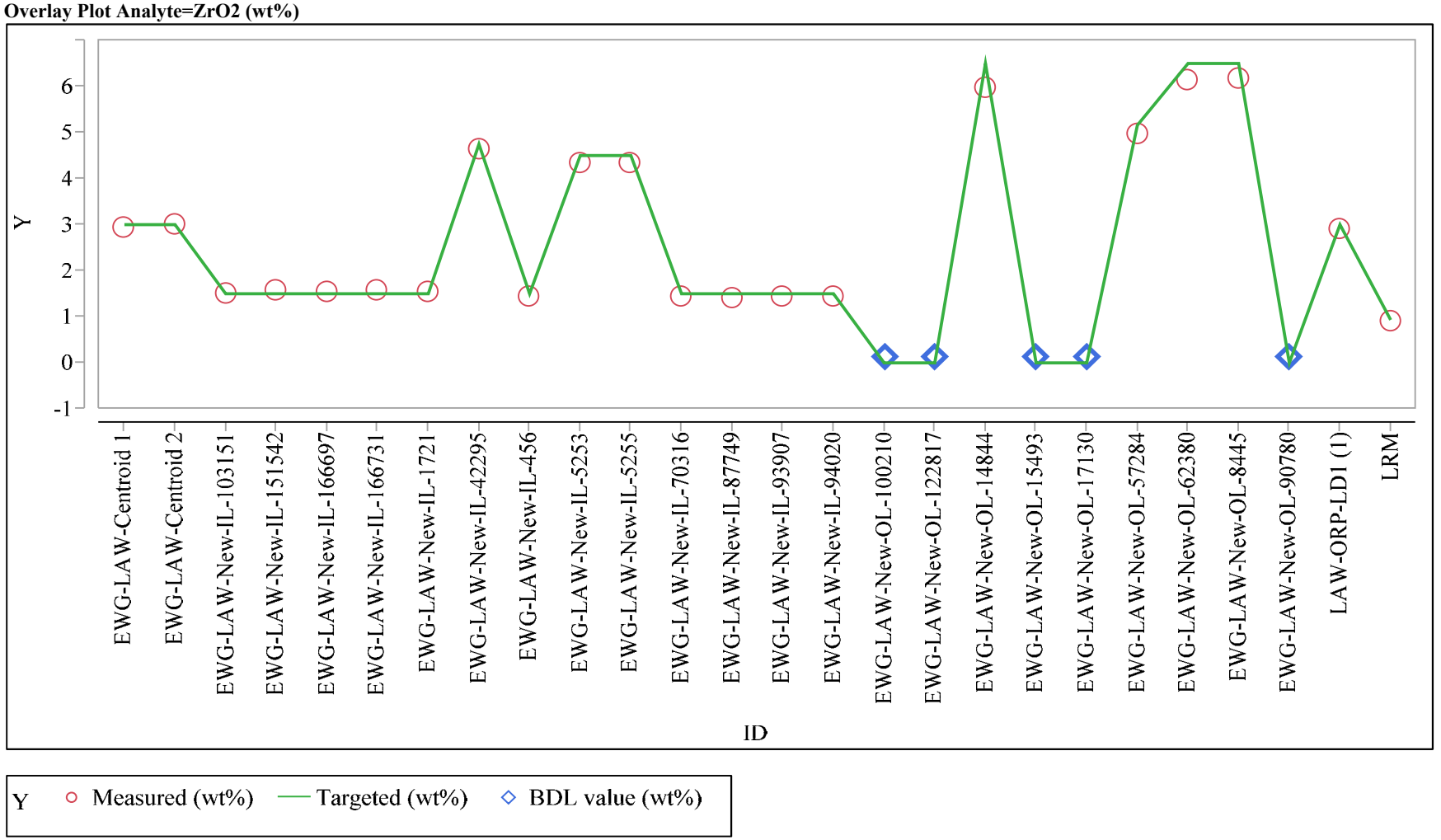
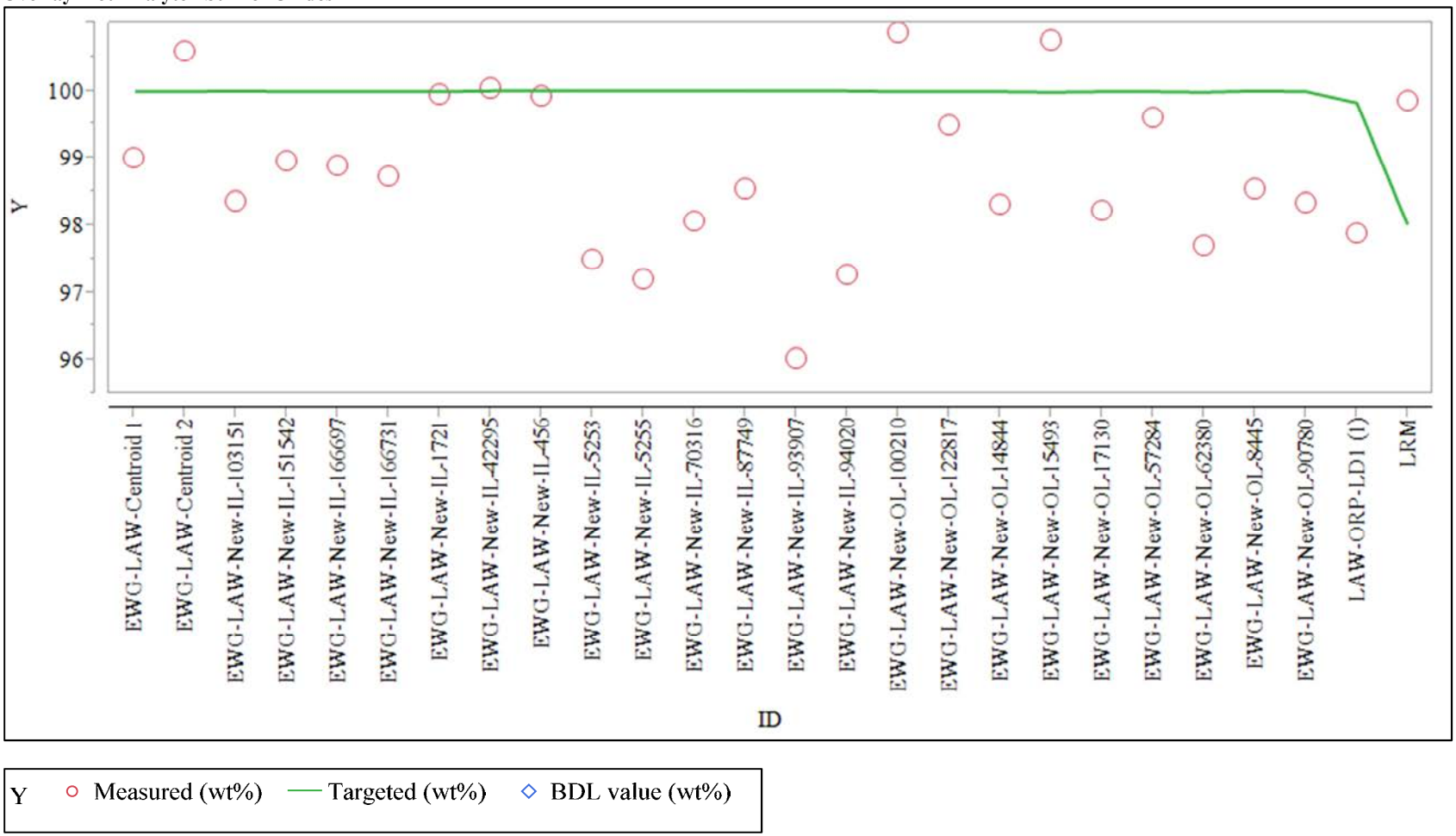


Exhibit A-4. Measured versus Targeted Concentrations by Glass ID by Oxide (continued)

Overlay Plot Analyte= Sum of Oxides



Appendix B Tables and Exhibits Supporting the PCT Results

Table B-1. PCT Measurements for LAW Study Glasses (ar – as received)

Set	Glass ID with Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Aug	Soln Std	1	1	std-1-1	20.9	9.91	81.1	50.4	20.9	9.91	81.1	50.4
Aug	EWG-LAW-New-OL-100210-CCC	1	2	M20	19.6	<1.00	298	155	32.667	<1.667	496.677	258.339
Aug	EWG-LAW-New-OL-17130-CCC	1	3	M01	580	257	1140	638	966.686	428.342	1900.038	1063.355
Aug	EWG-LAW-New-OL-17130-Q	1	4	M33	597	264	1220	650	995.02	440.009	2033.374	1083.355
Aug	EWG-LAW-New-IL-87749-CCC	1	5	M23	21.5	13.9	113	41.6	35.834	23.167	188.337	69.335
Aug	blank	1	6	M03	2.58	<1.00	3.53	1.16	4.3	<1.667	5.883	1.933
Aug	EWG-LAW-New-IL-42295-Q	1	7	M13	429	139	1020	277	715.014	231.671	1700.034	461.676
Aug	ARM-1	1	8	M32	14.1	8.4	21.7	37.9	23.5	14	36.167	63.168
Aug	Soln Std	1	9	std-1-2	21.6	9.67	82	49.3	21.6	9.67	82	49.3
Aug	EWG-LAW-New-IL-87749-Q	1	10	M19	7.83	6.96	76.4	25.1	13.05	11.6	127.336	41.834
Aug	EWG-LAW-New-IL-42295-CCC	1	11	M27	329	110	789	240	548.344	183.337	1315.026	400.008
Aug	EWG-LAW-New-IL-456-Q	1	12	M37	1.26	<1.00	7.8	4.2	2.1	<1.667	13	7
Aug	EWG-LAW-New-OL-100210-Q	1	13	M15	23.6	<1.00	330	170	39.334	<1.667	550.011	283.339
Aug	EA	1	14	M10	22.1	6.96	55.7	36.5	368.334	116	928.335	608.335
Aug	EWG-LAW-New-IL-456-CCC	1	15	M09	8.96	7.68	53.1	30.8	14.934	12.8	88.502	51.334
Aug	Soln Std	1	16	std-1-3	21.2	9.32	76.7	48.2	21.2	9.32	76.7	48.2
Aug	Soln Std	2	1	std-2-1	20.6	9.43	78.2	48.7	20.6	9.43	78.2	48.7
Aug	EWG-LAW-New-IL-456-Q	2	2	M26	7.06	7.65	59	32	11.767	12.75	98.335	53.334
Aug	EWG-LAW-New-OL-17130-Q	2	3	M35	558	249	1260	620	930.019	415.008	2100.042	1033.354
Aug	EWG-LAW-New-IL-87749-CCC	2	4	M02	19	13.7	112	39.3	31.667	22.834	186.67	65.501
Aug	EA	2	5	M24	20.4	6.63	55	34.6	340.001	110.5	916.669	576.668
Aug	EWG-LAW-New-IL-42295-CCC	2	6	M04	311	112	769	232	518.344	186.67	1281.692	386.674
Aug	EWG-LAW-New-IL-456-CCC	2	7	M25	8.53	7.26	50.3	29.1	14.217	12.1	83.835	48.501
Aug	EWG-LAW-New-OL-100210-Q	2	8	M34	22.4	<1.00	332	169	37.334	<1.667	553.344	281.672
Aug	Soln Std	2	9	std-2-2	21	9.48	79.7	49	21	9.48	79.7	49
Aug	EWG-LAW-New-IL-42295-Q	2	10	M05	415	148	1020	276	691.681	246.672	1700.034	460.009
Aug	ARM-1	2	11	M06	14.1	9.03	24	38.9	23.5	15.05	40.001	64.835
Aug	EWG-LAW-New-OL-17130-CCC	2	12	M07	591	263	1640	642	985.02	438.342	2733.388	1070.021
Aug	EWG-LAW-New-OL-100210-CCC	2	13	M08	18.9	<1.00	297	150	31.501	<1.667	495.01	250.005
Aug	EWG-LAW-New-IL-87749-Q	2	14	M14	7.7	7.02	77.9	25.3	12.834	11.7	129.836	42.168
Aug	Soln Std	2	15	std-2-3	21.7	9.44	78.3	48.4	21.7	9.44	78.3	48.4
Aug	Soln Std	3	1	std-3-1	21.8	9.6	79.9	49.8	21.8	9.6	79.9	49.8
Aug	EWG-LAW-New-IL-456-Q	3	2	M11	7.88	7.98	61.5	32.9	13.134	13.3	102.502	54.834
Aug	blank	3	3	M28	<1.00	<1.00	<1.00	<1.00	<1.667	<1.667	<1.667	<1.667
Aug	EA	3	4	M38	24	7.96	70.5	40.7	400.001	132.667	1175.002	678.335
Aug	EWG-LAW-New-IL-87749-Q	3	5	M21	5.24	6.9	75.5	24.4	8.734	11.5	125.836	40.667
Aug	EWG-LAW-New-IL-42295-CCC	3	6	M31	347	119	840	243	578.345	198.337	1400.028	405.008
Aug	EWG-LAW-New-OL-17130-CCC	3	7	M16	552	249	1170	616	920.018	415.008	1950.039	1026.687
Aug	EWG-LAW-New-IL-42295-Q	3	8	M17	434	143	1040	279	723.348	238.338	1733.368	465.009

*Shaded row indicates that a dilution error was made during the PCT for the highlighted vessel. This measurement was omitted from calculation.

Table B-1. PCT Measurements for LAW Study Glasses (ar – as received) (continued)

Set	Glass ID with Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Aug	Soln Std	3	9	std-3-2	20	9.73	82.9	48.7	20	9.73	82.9	48.7
Aug	EWG-LAW-New-OL-100210-CCC	3	10	M12	21.6	<1.00	314	152	36.001	<1.667	523.344	253.338
Aug	EWG-LAW-New-IL-456-CCC	3	11	M36	7.38	7.29	50.3	29	12.3	12.15	83.835	48.334
Aug	EWG-LAW-New-OL-100210-Q	3	12	M18	23.3	<1.00	317	163	38.834	<1.667	528.344	271.672
Aug	EWG-LAW-New-IL-87749-CCC	3	13	M30	17.3	14.1	115	40	28.834	23.5	191.671	66.668
Aug	ARM-1	3	14	M29	11.1	8.59	22.5	37.8	18.5	14.317	37.501	63.001
Aug	EWG-LAW-New-OL-17130-Q	3	15	M22	596	263	1250	652	993.353	438.342	2083.375	1086.688
Aug	Soln Std	3	16	std-3-3	19.6	9.73	83.2	49.1	19.6	9.73	83.2	49.1
Oct	Soln Std	1	1	std-1-1	20.5	9.89	83.9	50.4	20.5	9.89	83.9	50.4
Oct	EWG-LAW-New-OL-62380-Q	1	2	N42	7.04	<1.00	31.3	11.3	11.734	<1.667	52.168	18.834
Oct	EWG-LAW-New-IL-166731-Q	1	3	N11	12.2	6.3	80.3	37.3	20.334	10.5	133.836	62.168
Oct	EWG-LAW-New-IL-93907-Q	1	4	N49	7.54	4.41	36.2	30.9	12.567	7.35	60.335	51.501
Oct	EWG-LAW-New-IL-1721-Q	1	5	N09	51.9	21.5	170	78	86.502	35.834	283.339	130.003
Oct	EWG-LAW-New-IL-103151-Q	1	6	N14	29.9	3.53	203	93.7	49.834	5.883	338.34	156.17
Oct	EWG-LAW-New-IL-94020-Q	1	7	N05	5.96	5.28	44.1	32.7	9.934	8.8	73.501	54.501
Oct	EWG-LAW-Centroid 1-Q	1	8	N59	13.5	3.7	88.8	35.4	22.5	6.167	148.003	59.001
Oct	EWG-LAW-New-OL-122817-Q	1	9	N65	1.8	<1.00	90	29.2	3	<1.667	150.003	48.668
Oct	blank	1	10	N08	<1.00	<1.00	<1.00	<1.00	<1.667	<1.667	<1.667	<1.667
Oct	EA	1	11	N63	20	7.79	65.3	40.9	333.334	129.834	1088.336	681.668
Oct	LAW-ORP-LD1-1-Q	1	12	N52	19.1	<1.00	113	29.2	31.834	<1.667	188.337	48.668
Oct	EWG-LAW-Centroid 2-Q	1	13	N43	12.3	3.61	88.3	34.9	20.5	6.017	147.17	58.168
Oct	Soln Std	1	14	std-1-2	18.5	10.1	86	51.4	18.5	10.1	86	51.4
Oct	EWG-LAW-New-IL-70316-Q	1	15	N31	6.61	2.38	122	36.5	11.017	3.967	203.337	60.835
Oct	EWG-LAW-New-OL-57284-Q	1	16	N67	40.8	<1.00	95	55.9	68.001	<1.667	158.337	93.169
Oct	EWG-LAW-New-IL-5253-Q	1	17	N27	32.9	14.5	97.9	47.8	54.834	24.167	163.17	79.668
Oct	EWG-LAW-New-IL-151542-Q	1	18	N58	10.5	2.11	75.9	32.8	17.5	3.517	126.503	54.668
Oct	EWG-LAW-New-OL-8445-Q	1	19	N30	11	3.51	28.4	8.73	18.334	5.85	47.334	14.55
Oct	ARM-1	1	20	N61	6.94	8.21	22.2	37.2	11.567	13.684	37.001	62.001
Oct	EWG-LAW-New-OL-90780-Q	1	21	N01	127	60.4	196	56.7	211.671	100.669	326.673	94.502
Oct	EWG-LAW-New-IL-5255-Q	1	22	N60	279	105	817	157	465.009	175.004	1361.694	261.672
Oct	EWG-LAW-New-IL-166697-Q	1	23	N07	14.4	6.02	72.6	37.5	24	10.034	121.002	62.501
Oct	EWG-LAW-New-OL-14844-Q	1	24	N17	92	114	514	117	153.336	190.004	856.684	195.004
Oct	EWG-LAW-New-OL-15493-Q	1	25	N51	9.11	<1.00	375	70.7	15.184	<1.667	625.013	117.836
Oct	Soln Std	1	26	std-1-3	20.5	9.85	83.7	49.2	20.5	9.85	83.7	49.2
Oct	Soln Std	2	1	std-2-1	20.1	9.67	81.1	48.3	20.1	9.67	81.1	48.3
Oct	LAW-ORP-LD1-1-Q	2	2	N12	21.7	<1.00	111	28	36.167	<1.667	185.004	46.668
Oct	EWG-LAW-New-OL-90780-Q	2	3	N56	126	58.1	197	54.6	210.004	96.835	328.34	91.002
Oct	EWG-LAW-New-IL-1721-Q	2	4	N36	54.1	21.5	147	78.1	90.168	35.834	245.005	130.169
Oct	EWG-LAW-New-IL-166697-Q	2	5	N46	15.4	5.77	68.5	35.4	25.667	9.617	114.169	59.001

Table B-1. PCT Measurements for LAW Study Glasses (ar – as received) (continued)

Set	Glass ID with Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Oct	EWG-LAW-New-OL-14844-Q	2	6	N24	87.8	108	509	126	146.336	180.004	848.35	210.004
Oct	EA	2	7	N34	19.7	6.46	54	33.6	328.334	107.667	900.002	560.001
Oct	EWG-LAW-New-IL-93907-Q	2	8	N48	10.4	4.28	34.5	30.5	17.334	7.133	57.501	50.834
Oct	EWG-LAW-New-OL-122817-Q	2	9	N50	4.09	<1.00	89.6	28.9	6.817	<1.667	149.336	48.168
Oct	EWG-LAW-Centroid 2-Q	2	10	N41	15.9	3.67	89.4	34.9	26.501	6.117	149.003	58.168
Oct	EWG-LAW-New-IL-5255-Q	2	11	N68	288	106	818	157	480.01	176.67	1363.361	261.672
Oct	EWG-LAW-New-IL-5253-Q	2	12	N23	38	14.9	101	48.1	63.335	24.834	168.337	80.168
Oct	EWG-LAW-New-IL-103151-Q	2	13	N44	32.5	3.54	202	91.6	54.168	5.9	336.673	152.67
Oct	Soln Std	2	14	std-2-2	21.2	10.1	85.2	50.5	21.2	10.1	85.2	50.5
Oct	EWG-LAW-New-OL-8445-Q	2	15	N37	16.6	3.91	30.9	9.24	27.667	6.517	51.501	15.4
Oct	EWG-LAW-New-IL-70316-Q	2	16	N02	11	2.49	122	37.8	18.334	4.15	203.337	63.001
Oct	EWG-LAW-Centroid 1-Q	2	17	N66	16.1	3.83	89.1	36	26.834	6.383	148.503	60.001
Oct	EWG-LAW-New-IL-166731-Q	2	18	N54	14.9	6.4	80.5	37.4	24.834	10.667	134.169	62.335
Oct	EWG-LAW-New-OL-15493-Q	2	19	N55	9.4	<1.00	350	58.6	15.667	<1.667	583.345	97.669
Oct	EWG-LAW-New-IL-151542-Q	2	20	N32	11.7	2.11	72.5	30.7	19.5	3.517	120.836	51.168
Oct	EWG-LAW-New-IL-94020-Q	2	21	N18	8.08	5.57	46	34.4	13.467	9.284	76.668	57.334
Oct	EWG-LAW-New-OL-57284-Q	2	22	N20	46.3	<1.00	100	55.8	77.168	<1.667	166.67	93.002
Oct	EWG-LAW-New-OL-62380-Q	2	23	N03	9.39	<1.00	32	11.6	15.65	<1.667	53.334	19.334
Oct	ARM-1	2	24	N19	10.5	8.09	21.8	36.2	17.5	13.484	36.334	60.335
Oct	Soln Std	2	25	std-2-3	20	9.94	83.6	49.9	20	9.94	83.6	49.9
Oct	Soln Std	3	1	std-3-1	21.9	10.1	83.3	50.3	21.9	10.1	83.3	50.3
Oct	EWG-LAW-New-OL-122817-Q	3	2	N21	4.79	<1.00	87.4	28.7	7.983	<1.667	145.67	47.834
Oct	EWG-LAW-New-IL-94020-Q	3	3	N57	8.47	5.66	43.8	33.2	14.117	9.434	73.001	55.334
Oct	EWG-LAW-Centroid 1-Q	3	4	N47	15.4	4.03	88	35.1	25.667	6.717	146.67	58.501
Oct	EWG-LAW-New-IL-166731-Q	3	5	N62	15.4	6.65	80.7	37.7	25.667	11.084	134.503	62.835
Oct	EWG-LAW-Centroid 2-Q	3	6	N64	16.7	3.99	89.8	35.5	27.834	6.65	149.67	59.168
Oct	LAW-ORP-LD1-1-Q	3	7	N06	22.1	<1.00	110	28.5	36.834	<1.667	183.337	47.501
Oct	blank	3	8	N45	<1.00	<1.00	<1.00	<1.00	<1.667	<1.667	<1.667	<1.667
Oct	EWG-LAW-New-OL-62380-Q	3	9	N39	9.07	<1.00	30.4	11.5	15.117	<1.667	50.668	19.167
Oct	EWG-LAW-New-IL-93907-Q	3	10	N28	10.4	4.6	34.4	30.7	17.334	7.667	57.334	51.168
Oct	EWG-LAW-New-IL-151542-Q	3	11	N38	12.4	2.41	72	31.3	20.667	4.017	120.002	52.168
Oct	EWG-LAW-New-OL-90780-Q	3	12	N16	119	55.1	214	51.5	198.337	91.835	356.674	85.835
Oct	EWG-LAW-New-OL-57284-Q	3	13	N33	44.3	<1.00	96	54	73.835	<1.667	160.003	90.002
Oct	Soln Std	3	14	std-3-2	20.3	10	82.3	49	20.3	10	82.3	49
Oct	EWG-LAW-New-OL-15493-Q	3	15	N10	14.1	<1.00	377	72.8	23.5	<1.667	628.346	121.336
Oct	EWG-LAW-New-IL-5253-Q	3	16	N40	34.4	14	91.8	45.6	57.334	23.334	153.003	76.002
Oct	EWG-LAW-New-OL-8445-Q	3	17	N35	13.7	3.62	26.1	8.6	22.834	6.033	43.501	14.334
Oct	EWG-LAW-New-IL-70316-Q	3	18	N04	11.2	2.79	120	37.5	18.667	4.65	200.004	62.501
Oct	ARM-1	3	19	N29	10	8.17	21.5	37.9	16.667	13.617	35.834	63.168

Table B-1. PCT Measurements for LAW Study Glasses (ar – as received) (continued)

Set	Glass ID with Heat Treatment	Block	Seq	Lab ID	B ar	Li ar	Na ar	Si ar	B (ppm)	Li (ppm)	Na (ppm)	Si (ppm)
Oct	EA	3	20	N53	22.2	8.19	65.5	43	370.001	136.5	1091.669	716.668
Oct	EWG-LAW-New-IL-5255-Q	3	21	N13	300	107	826	161	500.01	178.337	1376.694	268.339
Oct	EWG-LAW-New-IL-103151-Q	3	22	N26	32	3.76	203	92	53.334	6.267	338.34	153.336
Oct	EWG-LAW-New-IL-166697-Q	3	23	N22	15.9	6.01	68.1	38.2	26.501	10.017	113.502	63.668
Oct	EWG-LAW-New-OL-14844-Q	3	24	N15	82.1	102	504	114	136.836	170.003	840.017	190.004
Oct	EWG-LAW-New-IL-1721-Q	3	25	N25	62.1	24.1	163	88.1	103.502	40.167	271.672	146.836
Oct	Soln Std	3	26	std-3-3	20.9	9.99	81.3	49.4	20.9	9.99	81.3	49.4

Table B-2. PCT Leachate pH Values for the August 2014 LAW Glasses

Identifier	pH		Identifier	pH
ARM-1-1	10.16		EWG-LAW-New-IL-87749-ccc-1	11.58
ARM-1-2	10.25		EWG-LAW-New-IL-87749-ccc-2	11.50
ARM-1-3	10.22		EWG-LAW-New-IL-87749-ccc-3	11.49
Blank-1	6.64		EWG-LAW-New-IL-87749-Q-1	11.37
Blank-2	6.67		EWG-LAW-New-IL-87749-Q-2	11.31
EA-1	11.70		EWG-LAW-New-IL-87749-Q-3	11.39
EA-2	11.63		EWG-LAW-New-OL-100210-ccc-1	11.73
EA-3	11.87		EWG-LAW-New-OL-100210-ccc-2	11.68
EWG-LAW-New-IL-42295-ccc-1	11.96		EWG-LAW-New-OL-100210-ccc-3	11.62
EWG-LAW-New-IL-42295-ccc-2	11.88		EWG-LAW-New-OL-100210-Q-1	11.88
EWG-LAW-New-IL-42295-ccc-3	11.82		EWG-LAW-New-OL-100210-Q-2	11.80
EWG-LAW-New-IL-42295-Q-1	12.15		EWG-LAW-New-OL-100210-Q-3	11.76
EWG-LAW-New-IL-42295-Q-2	11.90		EWG-LAW-New-OL-17130-ccc-1	11.16
EWG-LAW-New-IL-42295-Q-3	11.93		EWG-LAW-New-OL-17130-ccc-2	11.08
EWG-LAW-New-IL-456-ccc-1	11.39		EWG-LAW-New-OL-17130-ccc-3	11.05
EWG-LAW-New-IL-456-ccc-2	11.27		EWG-LAW-New-OL-17130-Q-1	11.30
EWG-LAW-New-IL-456-ccc-3	11.27		EWG-LAW-New-OL-17130-Q-2	11.22
EWG-LAW-New-IL-456-Q-1	11.32		EWG-LAW-New-OL-17130-Q-3	11.18
EWG-LAW-New-IL-456-Q-2	11.36			
EWG-LAW-New-IL-456-Q-3	11.26			

Table B-3. PCT Leachate pH Values for the October 2014 LAW Glasses

Identifier	pH	Identifier	pH	Identifier	pH
ARM-1-1	10.36	EWG-LAW-New-IL-166731-1	11.16	EWG-LAW-New-OL-14844-1	12.32
ARM-1-2	10.36	EWG-LAW-New-IL-166731-2	11.16	EWG-LAW-New-OL-14844-2	12.30
ARM-1-3	10.38	EWG-LAW-New-IL-166731-3	11.14	EWG-LAW-New-OL-14844-3	12.31
Blank-1	6.86	EWG-LAW-New-IL-1721-1	11.09	EWG-LAW-New-OL-15493-1	12.23
Blank-2	6.32	EWG-LAW-New-IL-1721-2	11.01	EWG-LAW-New-OL-15493-2	12.19
EA-1	11.68	EWG-LAW-New-IL-1721-3	11.01	EWG-LAW-New-OL-15493-3	12.20
EA-2	11.73	EWG-LAW-New-IL-5253-1	10.90	EWG-LAW-New-OL-57284-1	9.38
EA-3	11.73	EWG-LAW-New-IL-5253-2	10.87	EWG-LAW-New-OL-57284-2	9.38
EWG-LAW-Centroid 1-1	11.26	EWG-LAW-New-IL-5253-3	10.86	EWG-LAW-New-OL-57284-3	9.36
EWG-LAW-Centroid 1-2	11.26	EWG-LAW-New-IL-5255-1	12.01	EWG-LAW-New-OL-62380-1	10.76
EWG-LAW-Centroid 1-3	11.24	EWG-LAW-New-IL-5255-2	12.01	EWG-LAW-New-OL-62380-2	10.77
EWG-LAW-Centroid 2-1	11.35	EWG-LAW-New-IL-5255-3	12.00	EWG-LAW-New-OL-62380-3	10.77
EWG-LAW-Centroid 2-2	11.30	EWG-LAW-New-IL-70316-1	11.47	EWG-LAW-New-OL-8445-1	10.68
EWG-LAW-Centroid 2-3	11.31	EWG-LAW-New-IL-70316-2	11.52	EWG-LAW-New-OL-8445-2	10.68
EWG-LAW-New-IL-103151-1	11.54	EWG-LAW-New-IL-70316-3	11.51	EWG-LAW-New-OL-8445-3	10.72
EWG-LAW-New-IL-103151-2	11.56	EWG-LAW-New-IL-93907-1	10.62	EWG-LAW-New-OL-90780-1	11.27
EWG-LAW-New-IL-103151-3	11.56	EWG-LAW-New-IL-93907-2	10.62	EWG-LAW-New-OL-90780-2	11.28
EWG-LAW-New-IL-151542-1	11.15	EWG-LAW-New-IL-93907-3	10.61	EWG-LAW-New-OL-90780-3	11.28
EWG-LAW-New-IL-151542-2	11.11	EWG-LAW-New-IL-94020-1	11.02	LAW-ORP-LD1 (1)-1	11.31
EWG-LAW-New-IL-151542-3	11.11	EWG-LAW-New-IL-94020-2	10.99	LAW-ORP-LD1 (1)-2	11.32
EWG-LAW-New-IL-166697-1	11.06	EWG-LAW-New-IL-94020-3	10.96	LAW-ORP-LD1 (1)-3	11.31
EWG-LAW-New-IL-166697-2	11.05	EWG-LAW-New-OL-122817-1	11.54		
EWG-LAW-New-IL-166697-3	10.99	EWG-LAW-New-OL-122817-2	11.53		
		EWG-LAW-New-OL-122817-3	11.55		

Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set

Set=Aug, Analyte=B
Variability Chart for log (ppm)

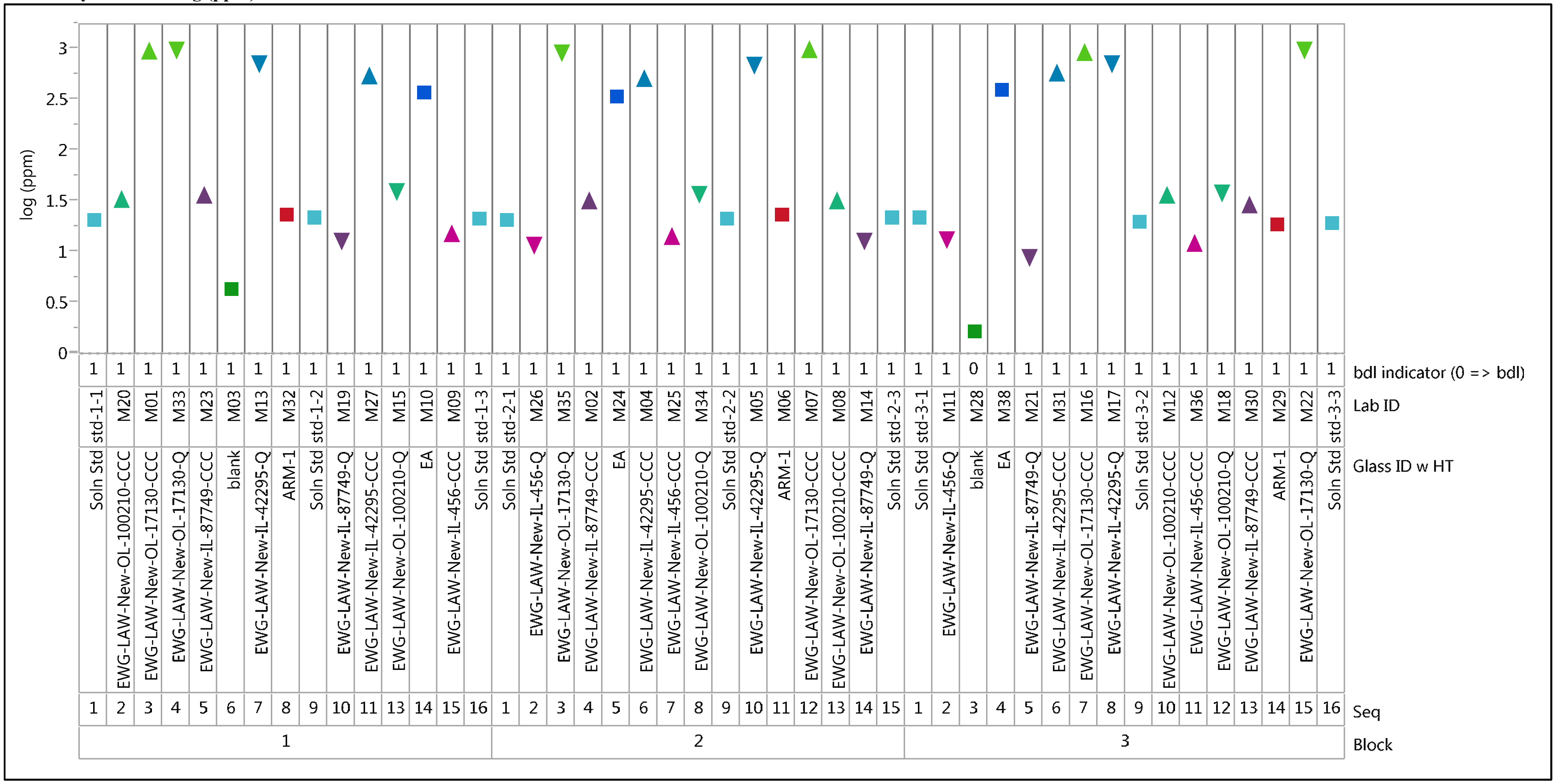


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Aug, Analyte=Li
Variability Chart for log (ppm)

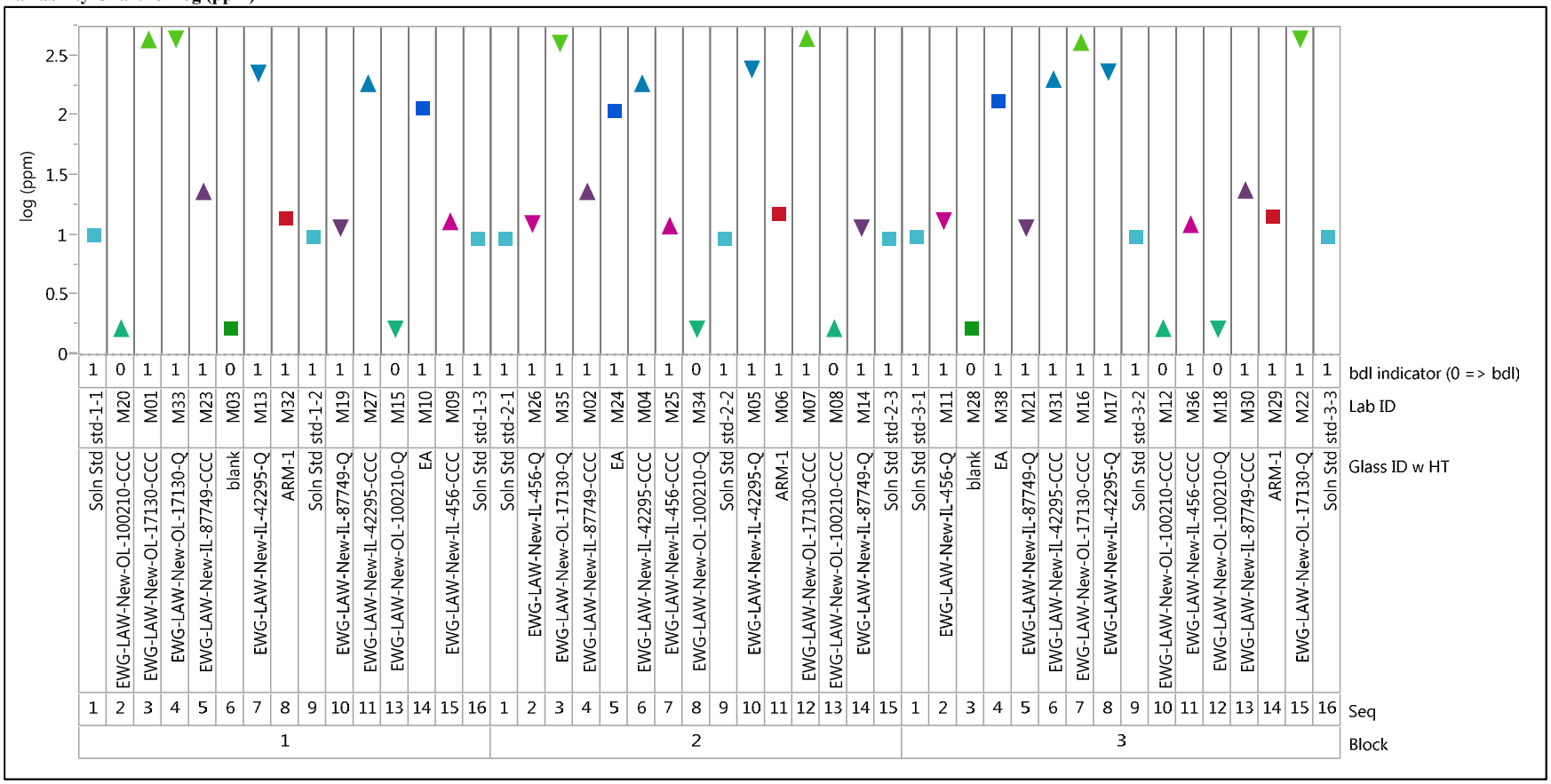


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Aug, Analyte=Na
Variability Chart for log (ppm)

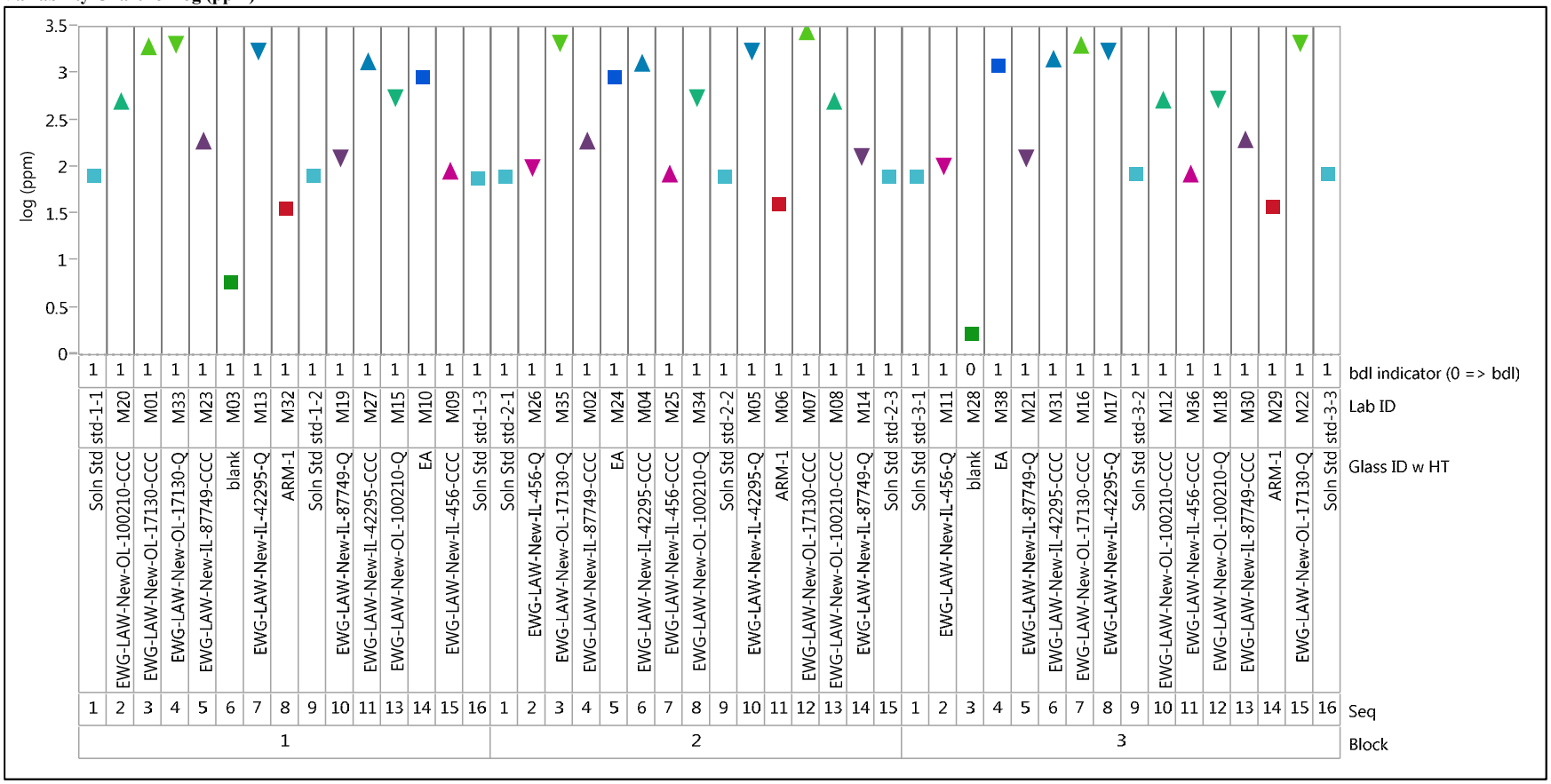


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Aug, Analyte=Si
Variability Chart for log (ppm)

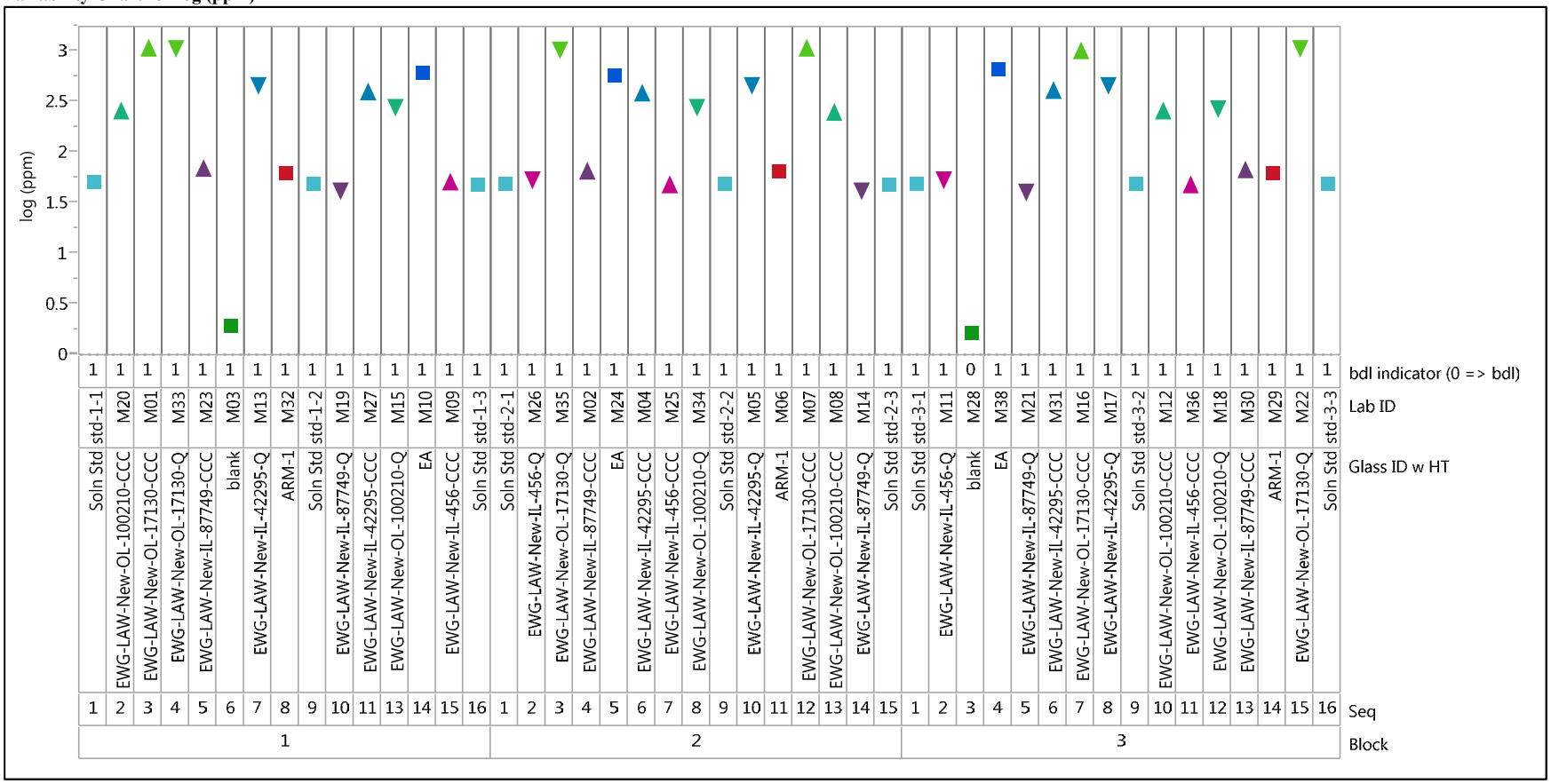


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Oct, Analyte=B
Variability Chart for log (ppm)

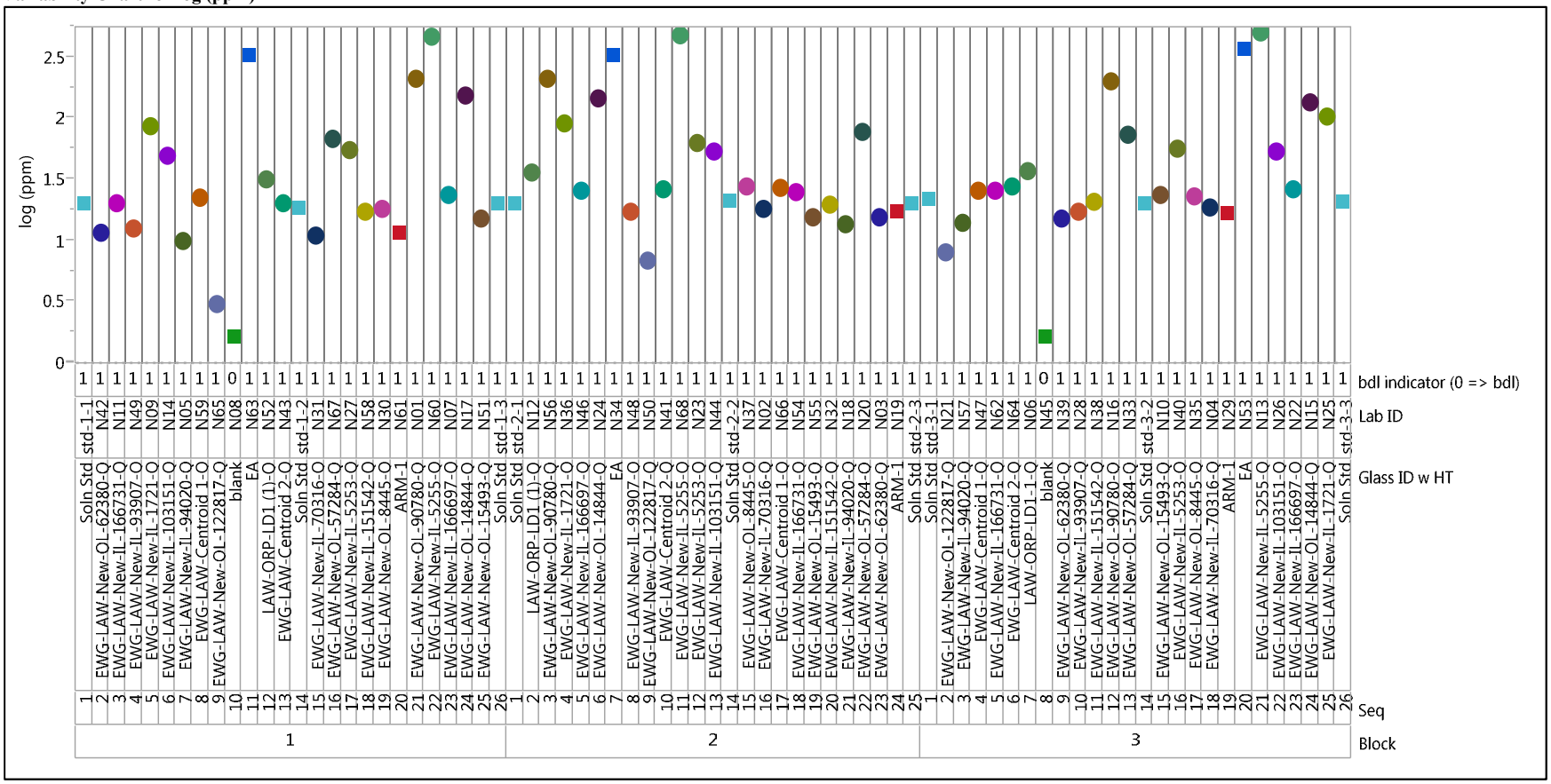


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Oct, Analyte=Li
Variability Chart for log (ppm)

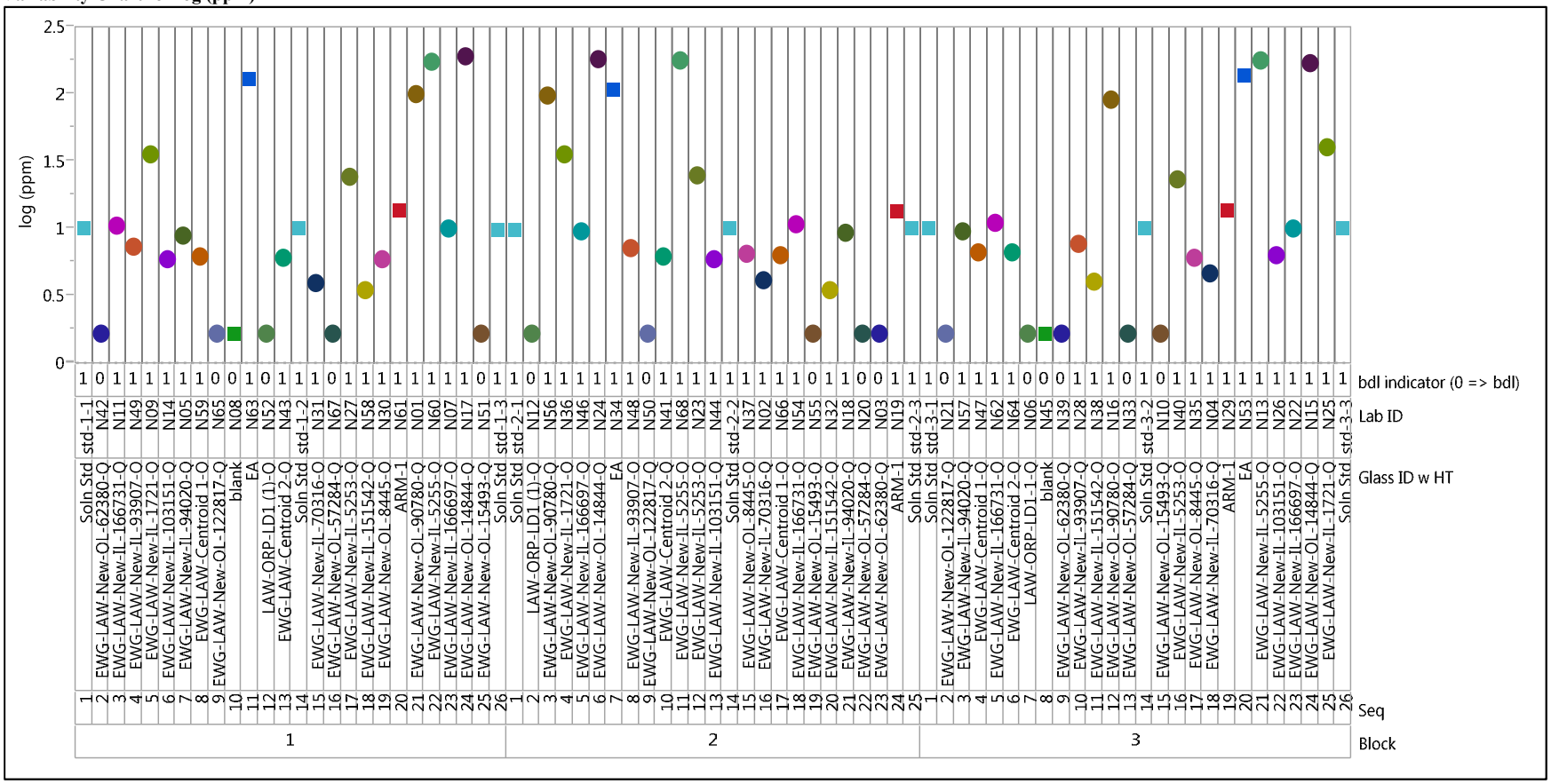


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Oct, Analyte=Na
Variability Chart for log (ppm)

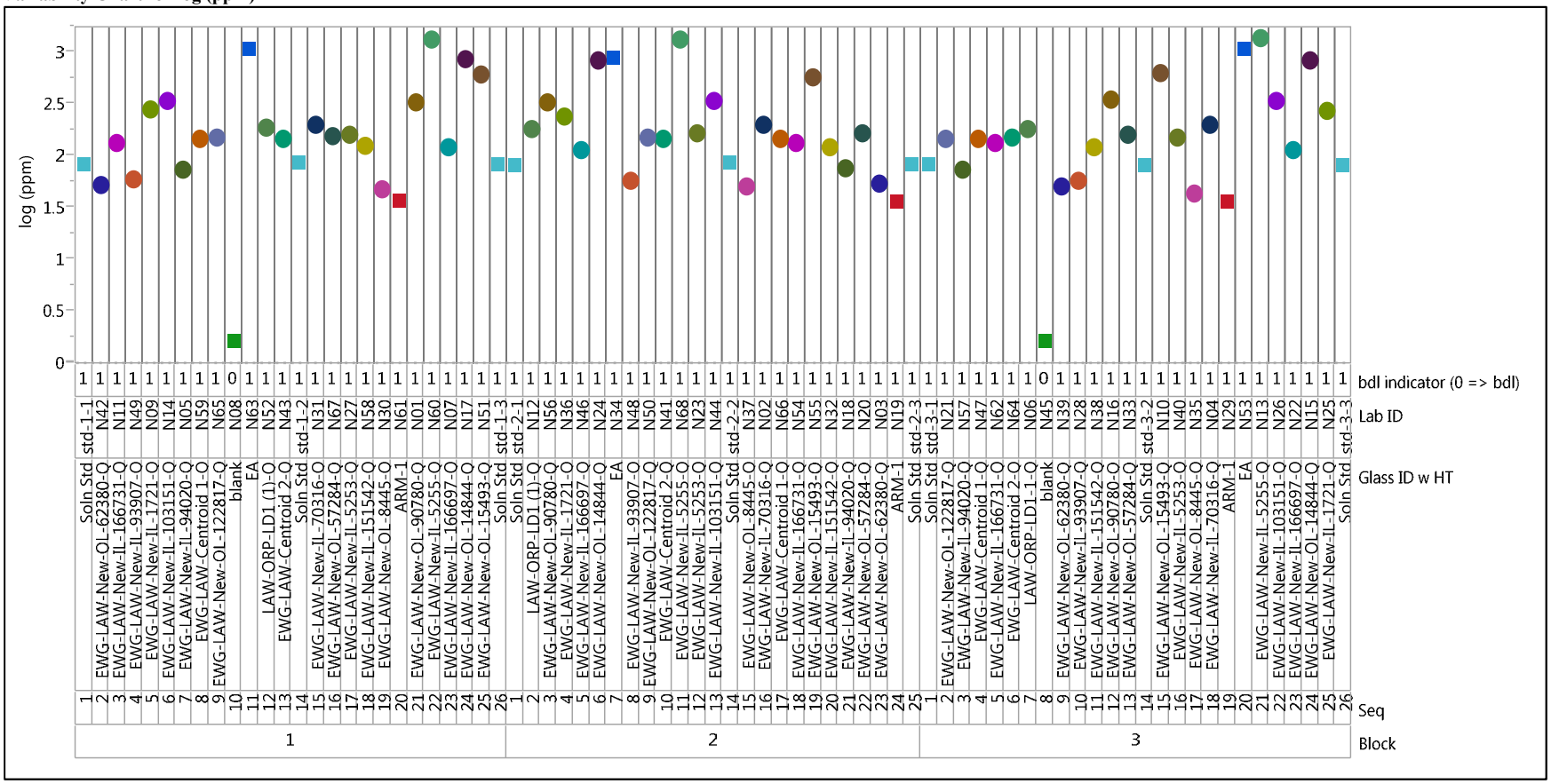


Exhibit B-1. PCT Measurements in Analytical Sequence by Analytical Set (continued)

Set=Oct, Analyte=Si
Variability Chart for log (ppm)

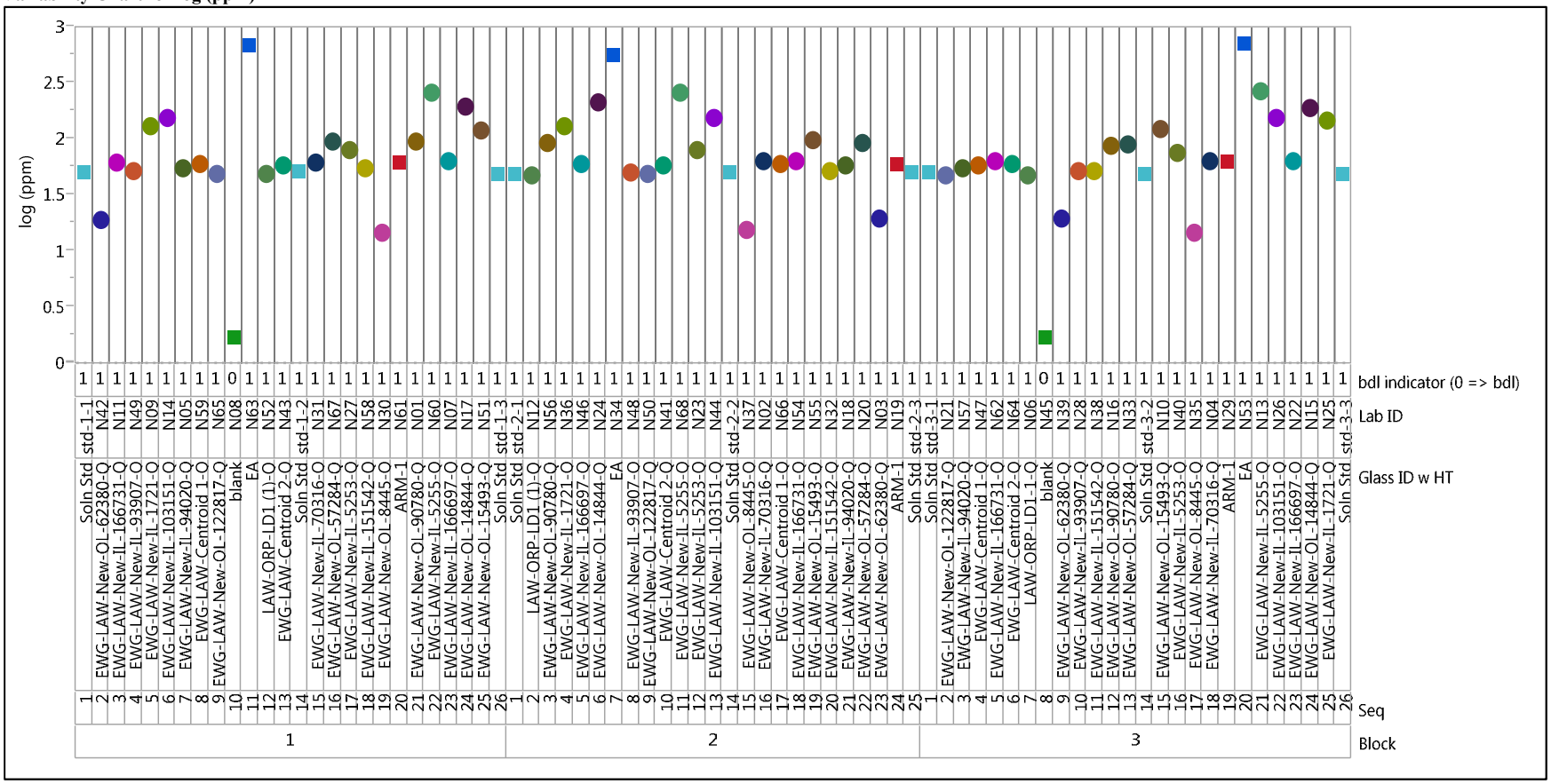


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses

Set=Aug, Analyte=B
Variability Chart for log (ppm)

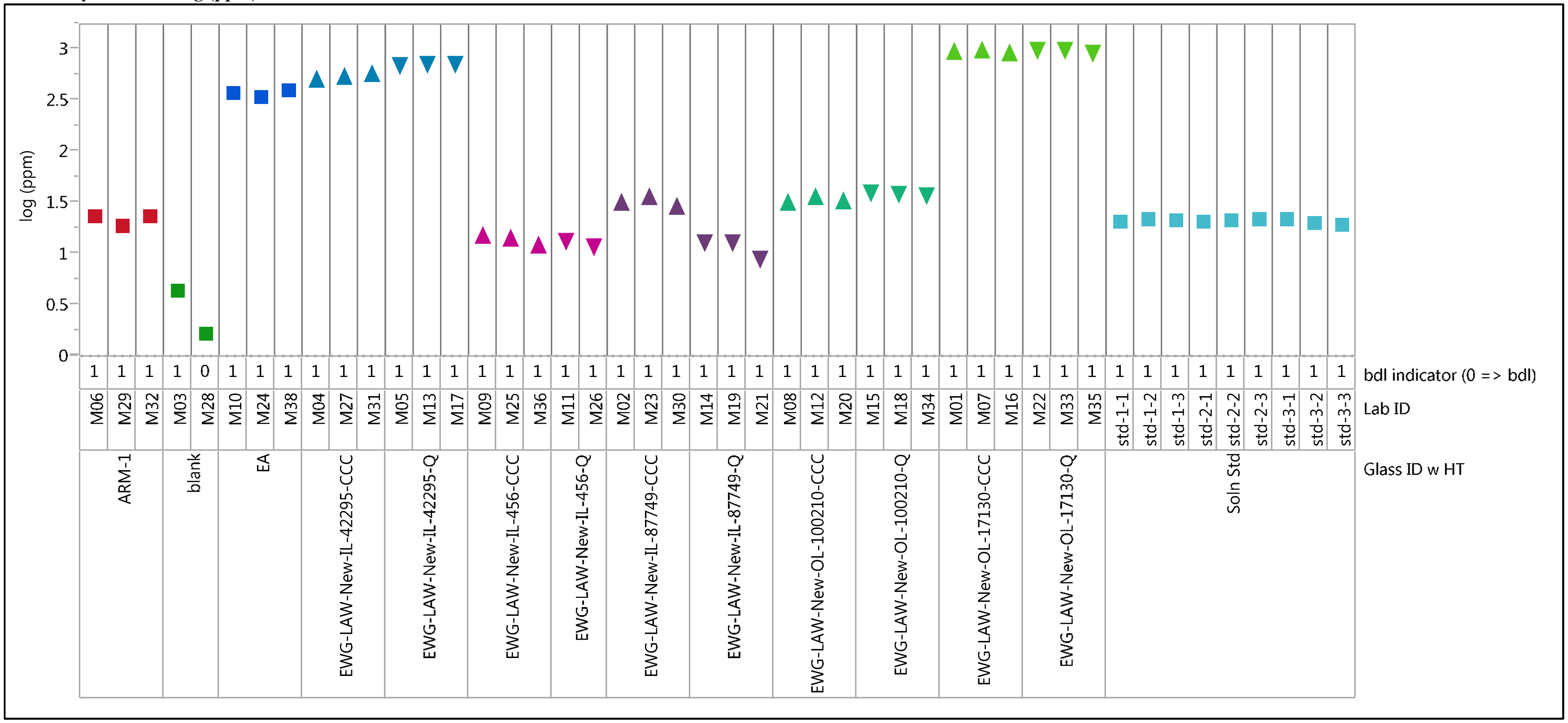


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Aug, Analyte=Li
Variability Chart for log (ppm)

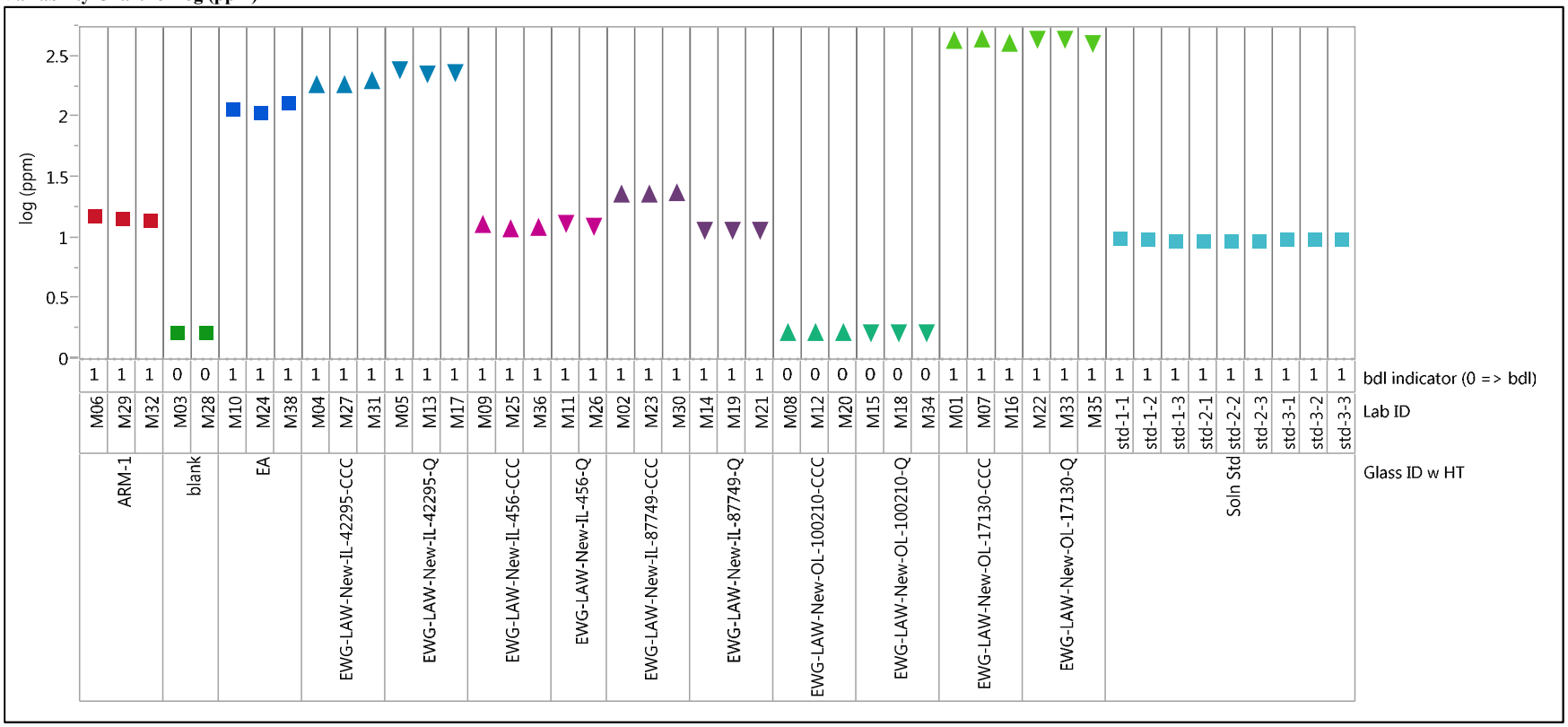


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Aug, Analyte=Na
Variability Chart for log (ppm)

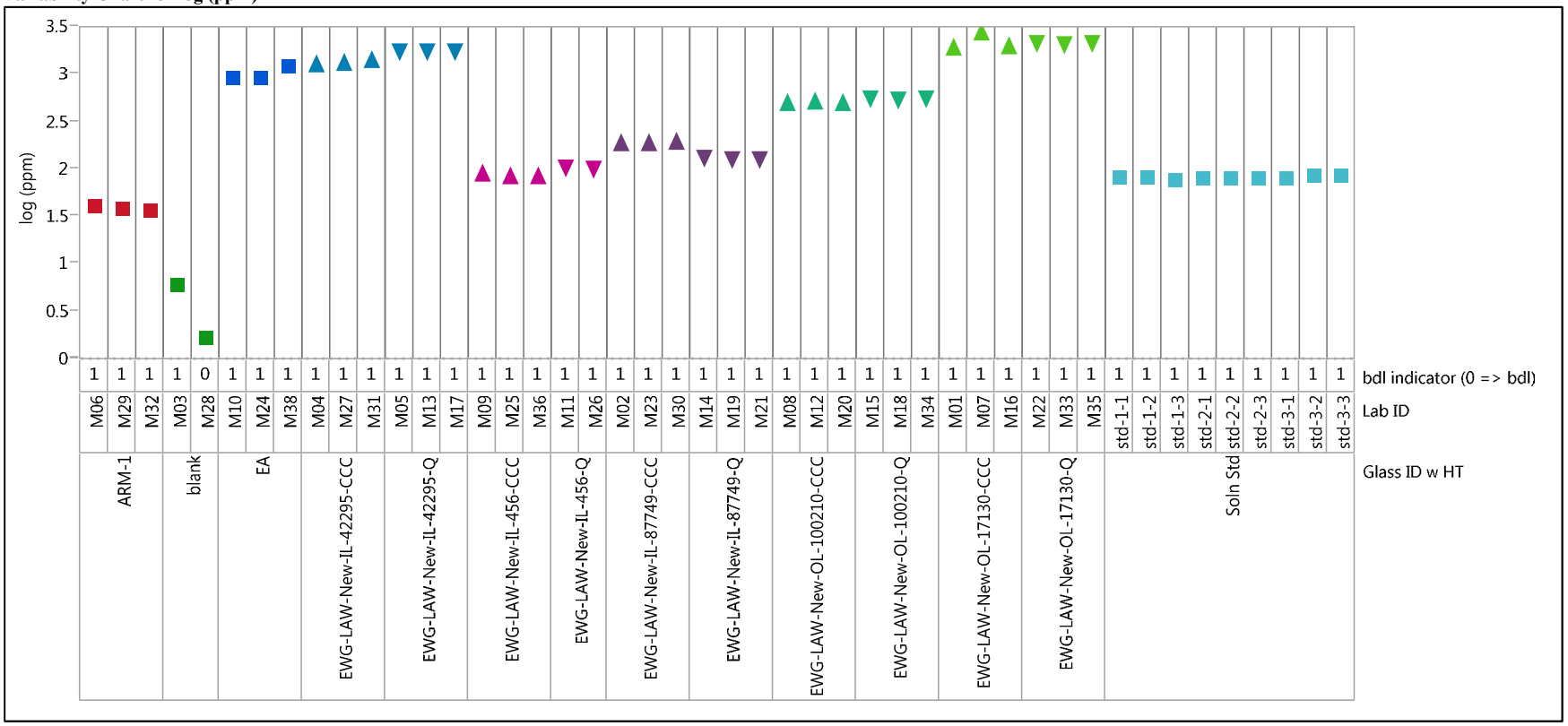


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Aug, Analyte=Si
Variability Chart for log (ppm)

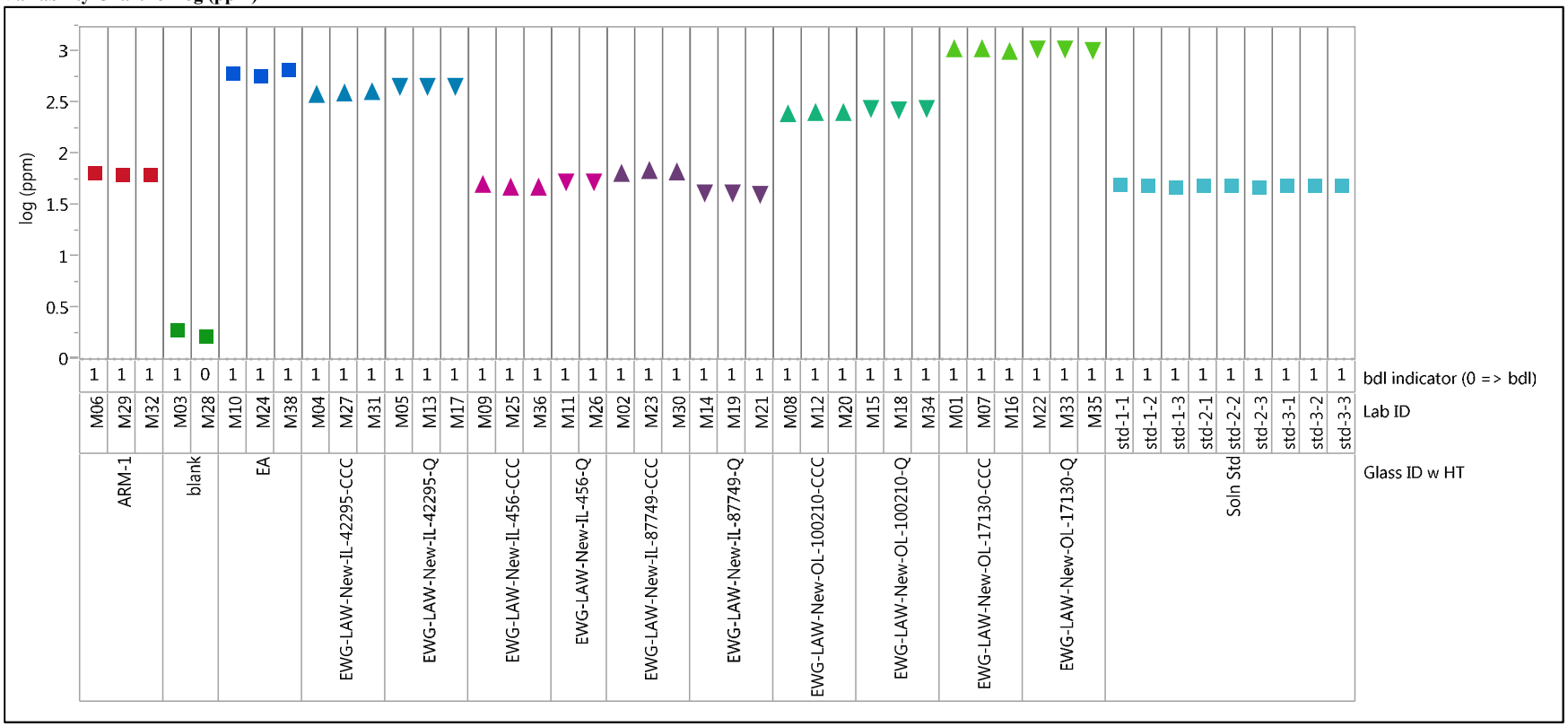


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Oct, Analyte=B
Variability Chart for log (ppm)

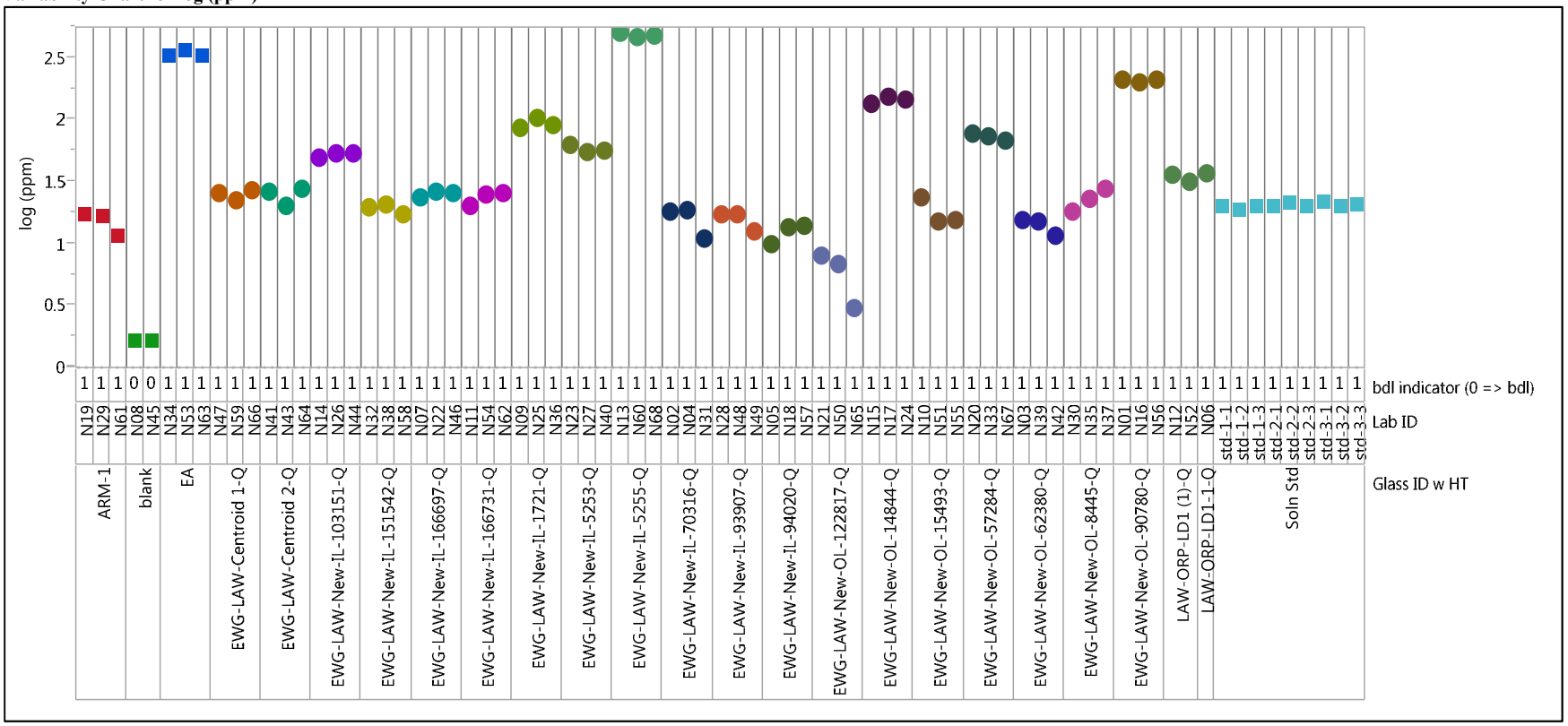


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Oct, Analyte=Li
Variability Chart for log (ppm)

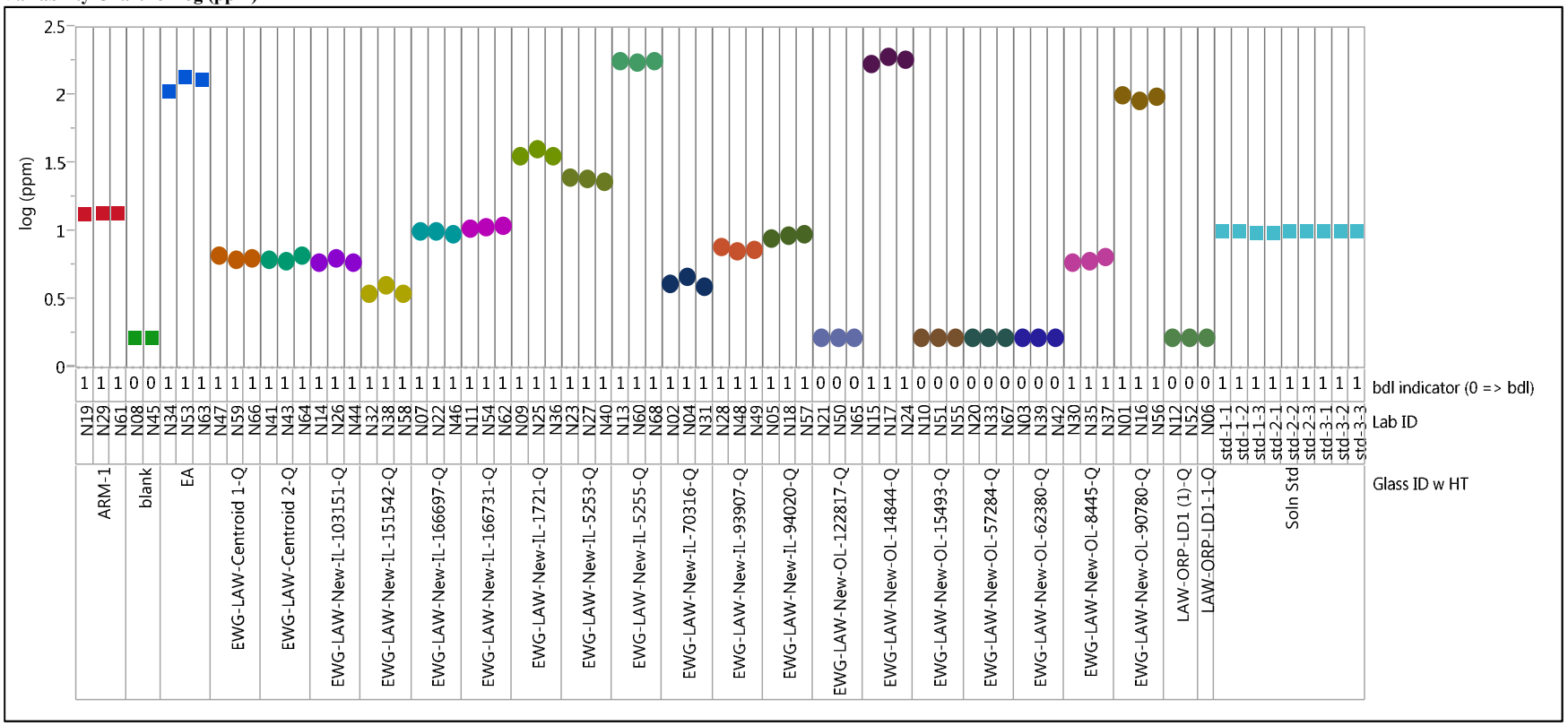


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Oct, Analyte=Na
Variability Chart for log (ppm)

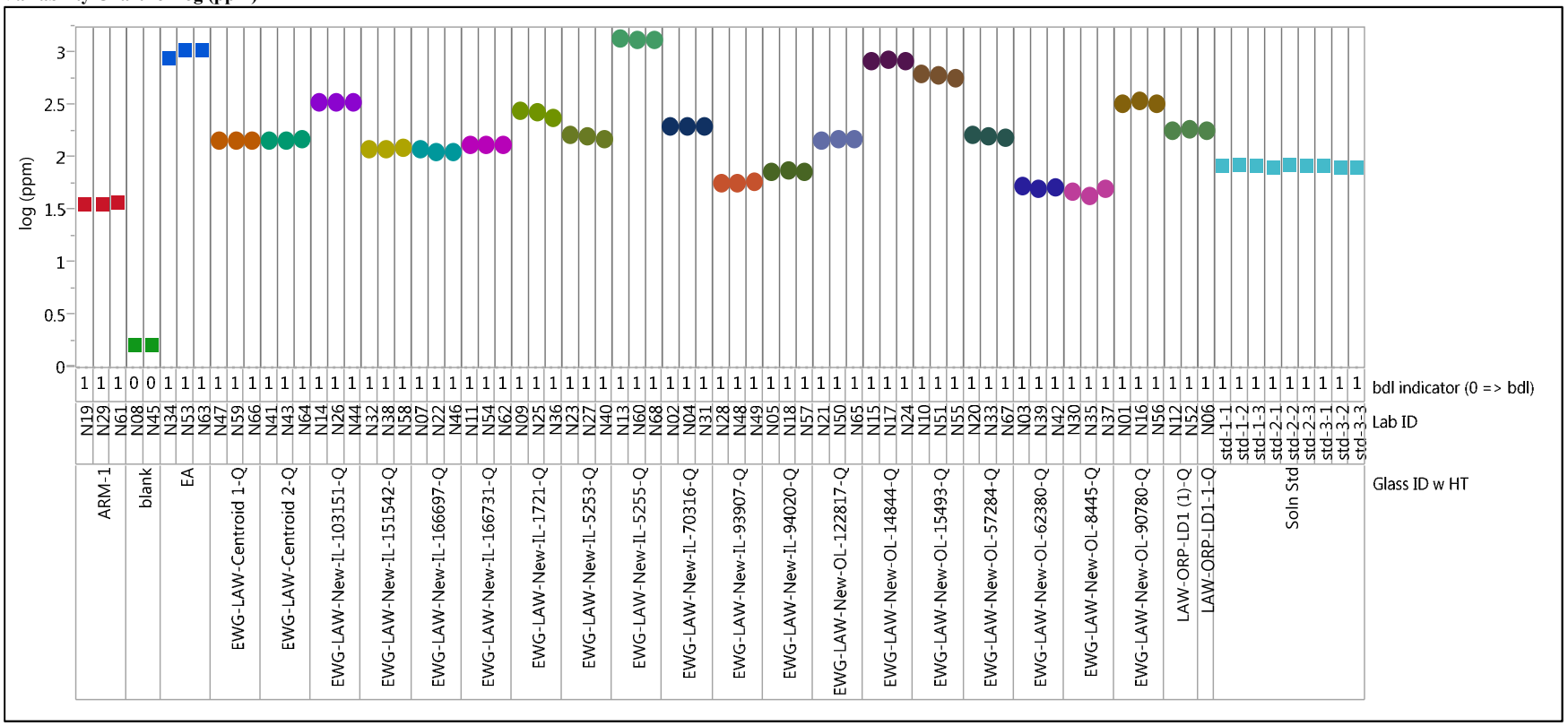


Exhibit B-2. PCT Measurements for Each Set of LAW Study Glasses (continued)

Set=Oct, Analyte=Si
Variability Chart for log (ppm)

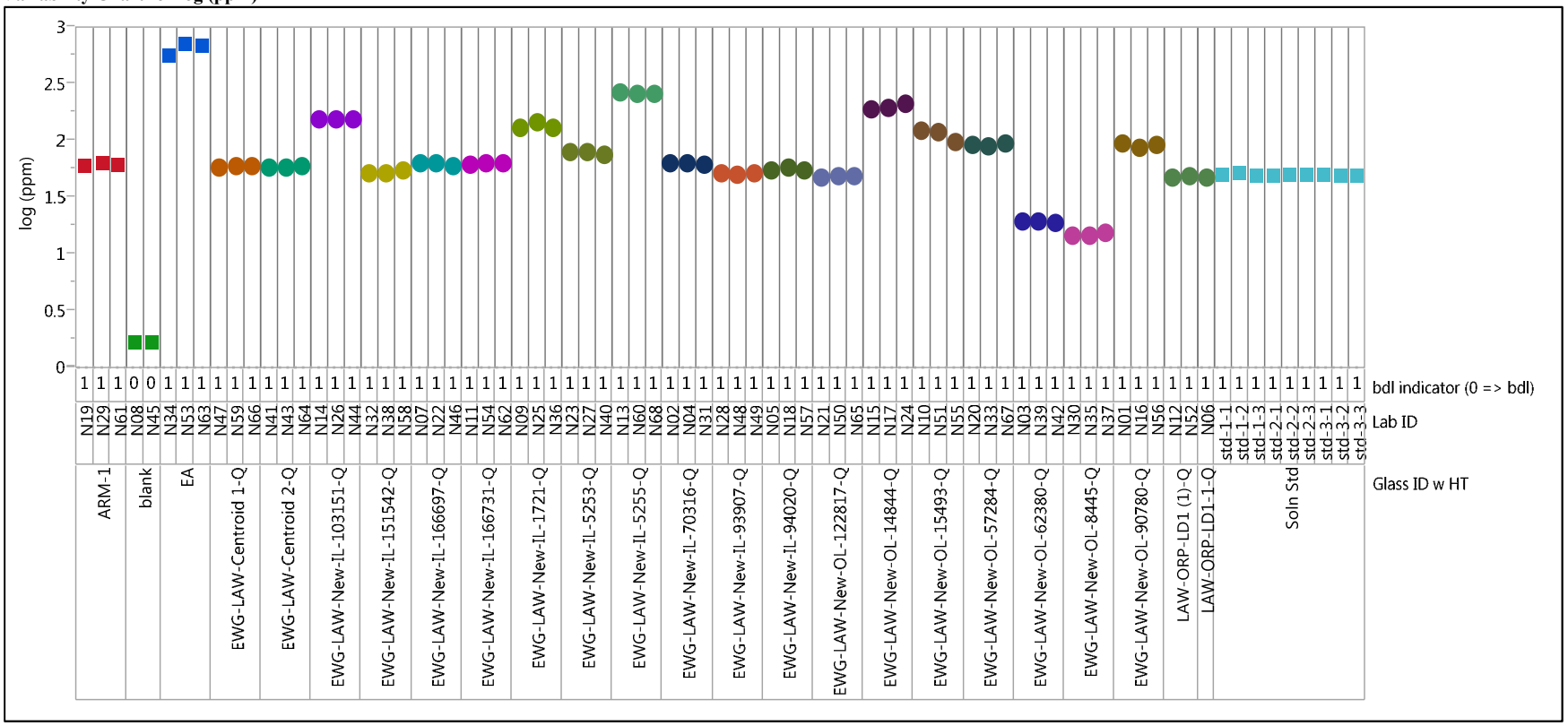


Exhibit B-3. Normalized PCT Results by Heat Treatment by Compositional View for Each Glass

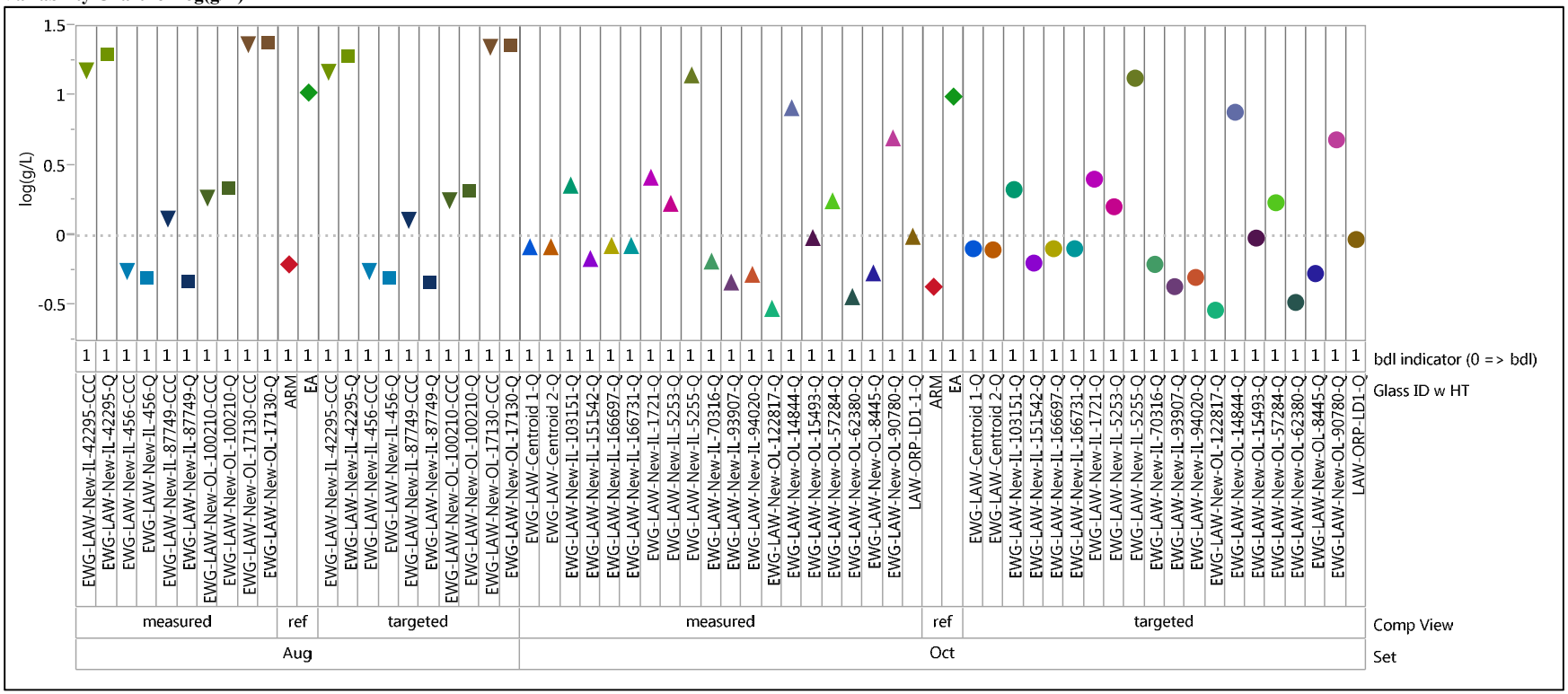


Exhibit B-3. Normalized PCT Results by Heat Treatment by Compositional View for Each Glass (continued)

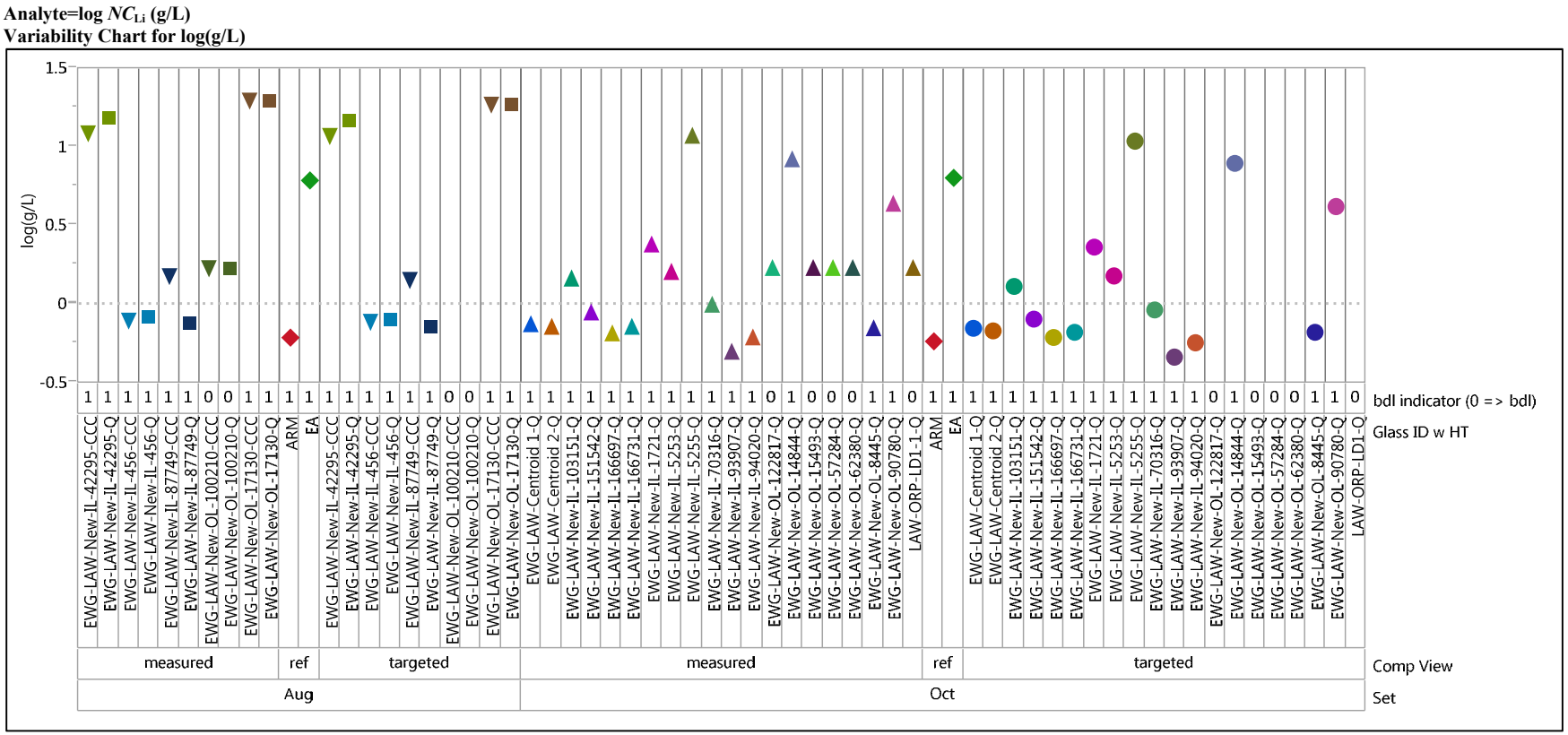


Exhibit B-3. Normalized PCT Results by Heat Treatment by Compositional View for Each Glass (continued)

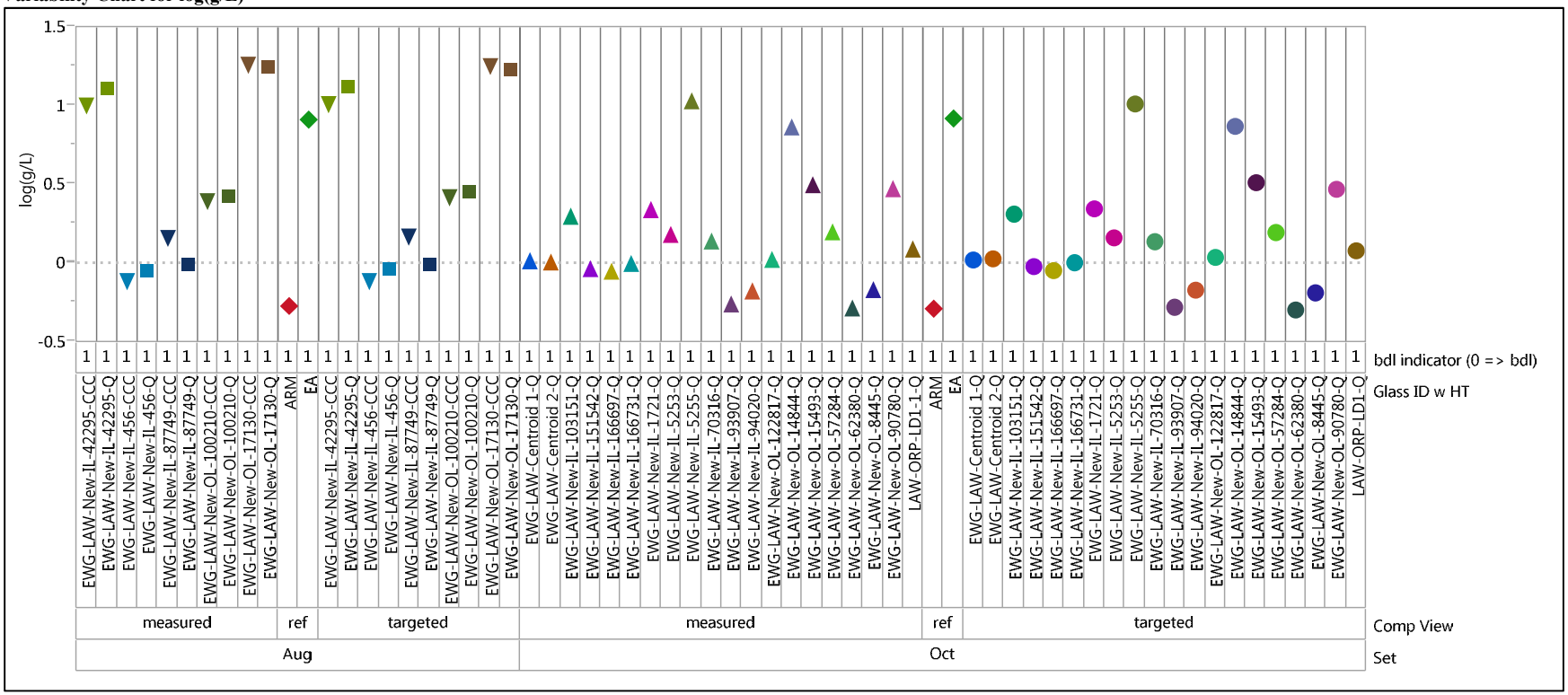
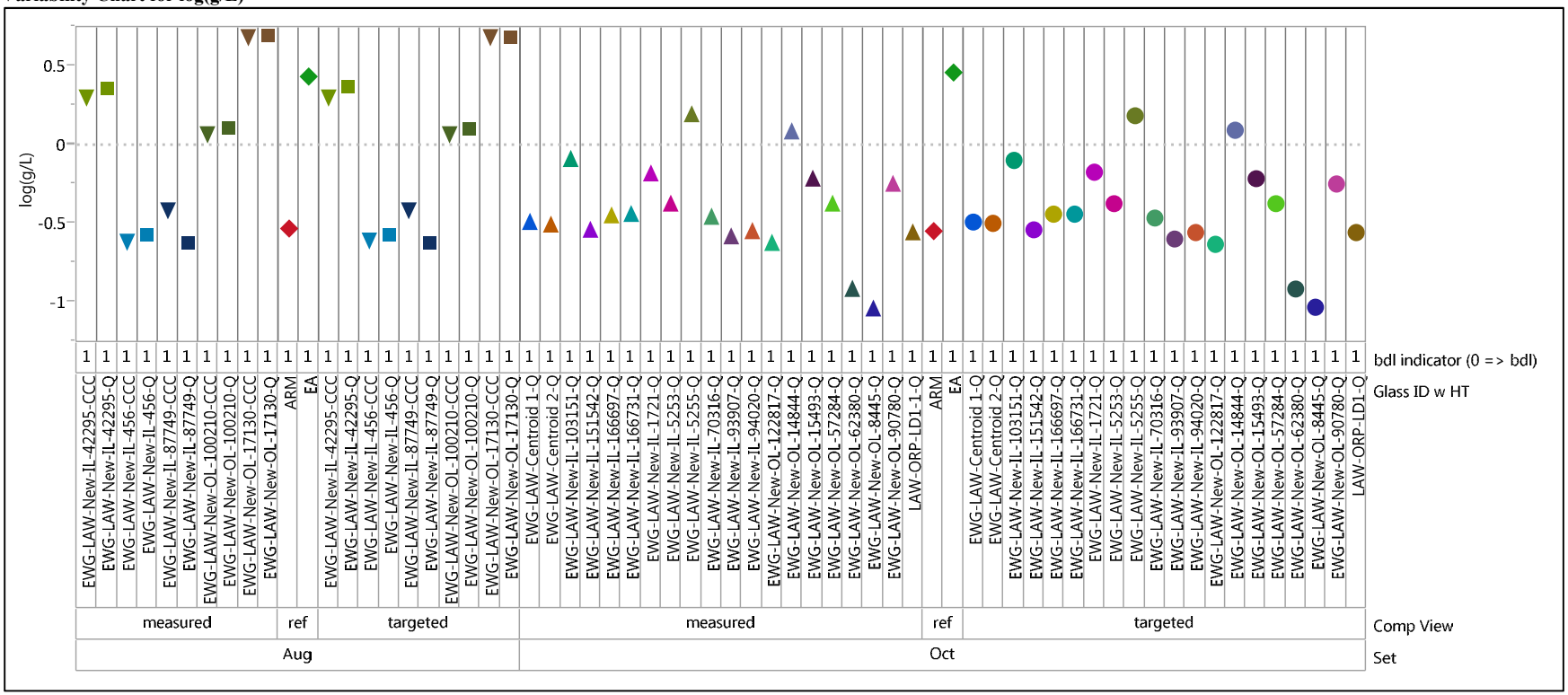


Exhibit B-3. Normalized PCT Results by Heat Treatment by Compositional View for Each Glass (continued)



Distribution:

J. W. Amoroso, 999-W
T. B. Brown, 773-A
J. H. Christian, 999-W
C. L. Crawford, 773-42A
J. V. Crum, PNNL
W. A. Drown, 773-41
T. B. Edwards, 999-W
S. D. Fink, 773-A
K. M. Fox, 999-W
C. C. Herman, 773-A
E. N. Hoffman, 999-W
C. M. Jantzen, 773-A
F. C. Johnson, 999-W
D. S. Kim, PNNL
A. A. Kruger, DOE-ORP
J. C. Marra, 999-2W
S. L. Marra, 773-A
J. Matyáš, PNNL
D. H. McGuire, 999-W
D. K. Peeler, PNNL
F. M. Pennebaker, 773-42A
R. L. Russell, PNNL
M. J. Schweiger, PNNL
J. D. Vienna, PNNL
W. R. Wilmarth, 773-A
Records Administration (EDWS)