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Product Consistency Test Results for the LAW Phase 4 Glasses

M. C. Hsieh

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EXECUTIVE SUMMARY

In this report, the Savannah River National Laboratory provides chemical analysis of Product Consistency Test (PCT) leachates from a series of simulated nuclear waste glasses fabricated at the Pacific Northwest National Laboratory (PNNL). The series included quenched and canister-centerline cooled (CCC) versions of the glasses. The resulting data will be used in the development of enhanced property/composition models for waste vitrification at Hanford.

For some of the glass leachates, minor scatter among the triplicate values of some analytes were observed. For other leachates, there were more significant differences among the triplicate values. A review of the PCT data noted that there was little difference between the normalized values based on targeted or measured glass composition. Several of the study glasses have normalized concentration of element "*i*" (NC_i) values that are greater than the Hanford Tank Waste Treatment and Immobilization Plant immobilized low-activity waste constraint of 4 g/L for boron (B), sodium (Na), and silicon (Si). The results of these glasses will help ensure the ability of advanced glass performance models to appropriately predict acceptable compositions. For the study glasses with NC_i values exceeding 4 g/L, the CCC heat treatment samples had generally lower NC_i values than quenched samples. The samples of the Environmental Assessment (EA) reference glass included with each PCT set had generally consistent NC_i values. The release rates for boron (B), potassium (K), lithium (Li), sodium (Na), and silicon (Si) were highly correlated for the study glasses.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

BDL	Below Detection Limit
CCC	Canister Centerline Cooled
DOE	U.S. Department of Energy
EA	Environmental Assessment
ICP-OES	Inductively Coupled Plasma – Optical Emission Spectroscopy
LAW	Low-Activity Waste
NC_i	Normalized Concentration of element "*i*"
ORP	Office of River Protection
PCT	Product Consistency Test
PNNL	Pacific Northwest National Laboratory
%RSD	Percent Relative Standard Deviation
SRNL	Savannah River National Laboratory
TTQAP	Task Technical and Quality Assurance Plan
wt.%	Weight Percent
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.0 Introduction

The U.S. Department of Energy (DOE) is building the Tank Waste Treatment and Immobilization Plant (WTP) at the Hanford Site in Washington state to remediate 55 million gallons of radioactive waste that is temporarily stored in 177 underground tanks. The Office of River Protection (ORP) has requested that the Savannah River National Laboratory (SRNL) contribute in areas of recognized capabilities and expertise for glass waste form development to support startup of the WTP.

Successful efforts have allowed for demonstration of greatly enhanced treatment efficiencies of those projected from the minimum requirements set forth in the WTP Contract. Additional flexibility and expansion of the qualified glass forming region are the current focus. SRNL support of this work is defined in the Task Technical and Quality Assurance Plan (TTQAP).[1]

In this report, the Savannah River National Laboratory provides chemical analysis of Product Consistency Test (PCT) leachates from a series of simulated nuclear waste glasses fabricated at the Pacific Northwest National Laboratory (PNNL). The glasses were selected as part of a broader study of the influence of glass composition on chemical durability, sulfur retention, and other properties.[2] The glasses were designated the Low-Activity Waste (LAW) Phase 4 study glasses. The resulting data will be used in the development of enhanced property/composition models for nuclear waste glasses.

2.0 Experimental Procedure

2.1 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. Laboratory data for this study were recorded in the SRNL Electronic Laboratory Notebook system, experiment L6390-00413-07. The glasses provided by PNNL were fabricated following a Task Plan.[3]

2.2 Glasses Selected for Study

The baseline (quenched) glass compositions in this study were selected and fabricated by PNNL. PNNL performed canister centerline cooled (CCC) heat treatments on a subsample of each of the glasses. The ASTM Product Consistency Test (PCT) Method A[4] was performed on quenched and CCC versions of each of the study glasses, and the resulting leachates were sent to SRNL for chemical analysis. The leachates were received and subsequently analyzed in several groups. Identifiers for Set 1 leachates are listed in Table 2-1 and Set 2 leachates are listed in Table 2-2.

In the sections that follow, the methods used for measuring the chemical compositions of the PCT leachates are described, the concentrations of the leachate constituents are normalized to the targeted and measured glass compositions, and reviews of the resulting data are provided. Detailed data from these analyses are included in the appendices.

Table 2-1. Identifiers for the Set 1 PCT Leachates

PNNL Solution ID	PNNL Solution ID	PNNL Solution ID
LP4-01-Q-PCT-A	LP4-17-Q-PCT-A	LP4-24-Q-PCT-A
LP4-01-Q-PCT-B	LP4-17-Q-PCT-B	LP4-24-Q-PCT-B
LP4-01-Q-PCT-C	LP4-17-Q-PCT-C	LP4-24-Q-PCT-C
LP4-02-Q-PCT-A	LP4-18-Q-PCT-A	DWPF-EA-PCT-3-A
LP4-02-Q-PCT-B	LP4-18-Q-PCT-B	DWPF-EA-PCT-3-B
LP4-02-Q-PCT-C	LP4-18-Q-PCT-C	DWPF-EA-PCT-3-C
LP4-03-Q-PCT-A	LP4-20-Q-PCT-A	Blank-3-1
LP4-03-Q-PCT-B	LP4-20-Q-PCT-B	Blank-3-2
LP4-03-Q-PCT-C	LP4-20-Q-PCT-C	LP4-04-1-Q-PCT-A
LP4-05-Q-PCT-A	LP4-02-CCC-PCT-A	LP4-04-1-Q-PCT-B
LP4-05-Q-PCT-B	LP4-02-CCC-PCT-B	LP4-04-1-Q-PCT-C
LP4-05-Q-PCT-C	LP4-02-CCC-PCT-C	LP4-06-2-Q-PCT-A
LP4-10-Q-PCT-A	LP4-11-CCC-PCT-A	LP4-06-2-Q-PCT-B
LP4-10-Q-PCT-B	LP4-11-CCC-PCT-B	LP4-06-2-Q-PCT-C
LP4-10-Q-PCT-C	LP4-11-CCC-PCT-C	LP4-07-1-Q-PCT-A
LP4-11-Q-PCT-A	DWPF-EA-PCT-2-A	LP4-07-1-Q-PCT-B
LP4-11-Q-PCT-B	DWPF-EA-PCT-2-B	LP4-07-1-Q-PCT-C
LP4-11-Q-PCT-C	DWPF-EA-PCT-2-C	LP4-23-1-Q-PCT-A
LP4-14-Q-PCT-A	Blank-2-1	LP4-23-1-Q-PCT-B
LP4-14-Q-PCT-B	Blank-2-2	LP4-23-1-Q-PCT-C
LP4-14-Q-PCT-C	LP4-03-CCC-PCT-A	LP4-25-1-Q-PCT-A
LP4-01-CCC-PCT-A	LP4-03-CCC-PCT-B	LP4-25-1-Q-PCT-B
LP4-01-CCC-PCT-B	LP4-03-CCC-PCT-C	LP4-25-1-Q-PCT-C
LP4-01-CCC-PCT-C	LP4-12-CCC-PCT-A	LP4-19-Q-PCT-A
LP4-10-CCC-PCT-A	LP4-12-CCC-PCT-B	LP4-19-Q-PCT-B
LP4-10-CCC-PCT-B	LP4-12-CCC-PCT-C	LP4-19-Q-PCT-C
LP4-10-CCC-PCT-C	LP4-09-CCC-PCT-A	LP4-05-CCC-PCT-A
DWPF-EA-PCT-1-A	LP4-09-CCC-PCT-B	LP4-05-CCC-PCT-B
DWPF-EA-PCT-1-B	LP4-09-CCC-PCT-C	LP4-05-CCC-PCT-C
DWPF-EA-PCT-1-C	LP4-15-CCC-PCT-A	LP4-08-1-CCC-PCT-A
Blank-1-1	LP4-15-CCC-PCT-B	LP4-08-1-CCC-PCT-B
Blank-1-2	LP4-15-CCC-PCT-C	LP4-08-1-CCC-PCT-C
LP4-09-Q-PCT-A	LP4-20-CCC-PCT-A	LP4-07-1-CCC-PCT-A
LP4-09-Q-PCT-B	LP4-20-CCC-PCT-B	LP4-07-1-CCC-PCT-B
LP4-09-Q-PCT-C	LP4-20-CCC-PCT-C	LP4-07-1-CCC-PCT-C
LP4-12-Q-PCT-A	LP4-22-Q-PCT-A	LP4-16-CCC-PCT-A
LP4-12-Q-PCT-B	LP4-22-Q-PCT-B	LP4-16-CCC-PCT-B
LP4-12-Q-PCT-C	LP4-22-Q-PCT-C	LP4-16-CCC-PCT-C
LP4-15-Q-PCT-A	LP4-13-Q-PCT-A	DWPF-EA-PCT-4-A
LP4-15-Q-PCT-B	LP4-13-Q-PCT-B	DWPF-EA-PCT-4-B
LP4-15-Q-PCT-C	LP4-13-Q-PCT-C	DWPF-EA-PCT-4-C
LP4-16-Q-PCT-A	LP4-21-Q-PCT-A	Blank-4-1
LP4-16-Q-PCT-B	LP4-21-Q-PCT-B	Blank-4-2
LP4-16-Q-PCT-C	LP4-21-Q-PCT-C	

Table 2-2. Identifiers for the Set 2 PCT Leachates

PNNL Solution ID		PNNL Solution ID
LP4-06-2-CCC-PCT-A		LP4-25-1-CCC-PCT-A
LP4-06-2-CCC-PCT-B		LP4-25-1-CCC-PCT-B
LP4-06-2-CCC-PCT-C		LP4-25-1-CCC-PCT-C
LP4-14-CCC-PCT-A		DWPF-EA-PCT-5-A
LP4-14-CCC-PCT-B		DWPF-EA-PCT-5-B
LP4-14-CCC-PCT-C		DWPF-EA-PCT-5-C
LP4-17-CCC-PCT-A		Blank-5-1
LP4-17-CCC-PCT-B		Blank-5-2
LP4-17-CCC-PCT-C		LP4-02-Q-PCT-A
LP4-18-CCC-PCT-A		LP4-02-Q-PCT-B
LP4-18-CCC-PCT-B		LP4-02-Q-PCT-C
LP4-18-CCC-PCT-C		LP4-08-1-Q-PCT-A
LP4-19-CCC-PCT-A		LP4-08-1-Q-PCT-B
LP4-19-CCC-PCT-B		LP4-08-1-Q-PCT-C
LP4-19-CCC-PCT-C		LP4-04-1-CCC-PCT-A
LP4-21-CCC-PCT-A		LP4-04-1-CCC-PCT-B
LP4-21-CCC-PCT-B		LP4-04-1-CCC-PCT-C
LP4-21-CCC-PCT-C		LP4-08-1-CCC-PCT-A
LP4-22-CCC-PCT-A		LP4-08-1-CCC-PCT-B
LP4-22-CCC-PCT-B		LP4-08-1-CCC-PCT-C
LP4-22-CCC-PCT-C		LP4-13-CCC-PCT-A
LP4-23-1-CCC-PCT-A		LP4-13-CCC-PCT-B
LP4-23-1-CCC-PCT-B		LP4-13-CCC-PCT-C
LP4-23-1-CCC-PCT-C		DWPF-EA-PCT-6-A
LP4-24-CCC-PCT-A		DWPF-EA-PCT-6-B
LP4-24-CCC-PCT-B		DWPF-EA-PCT-6-C
LP4-24-CCC-PCT-C		Blank-6-1
		Blank-6-2

2.3 PCT Leachate Analysis

The PCT leachate samples were analyzed by Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES)[5] under the auspices of two analytical study plans.[6,7] Samples of a multi-element standard solution[a] were also included in the analytical plan as a check on the accuracy of the ICP-OES instrument used for these measurements. PNNL provided the dilution factors used in preparing the PCT leachates for analyses. The leachates received at SRNL were diluted by a factor of 5. The dilution factors were used in adjusting the leachate measurements as described further below. Normalized release values were calculated for each glass based on the targeted and measured[8] compositions.

3.0 Results and Discussion

Data for the Set 1 PCT leachates are shown in Appendix A, and data for the Set 2 PCT leachates are shown in Appendix B. These data are generally reviewed and discussed as one large set in the sections that follow. The normalized PCT results are presented in Appendix C. JMP Version 14.3.0 (SAS Institute, Inc.)[9] was used to support these analyses.

3.1 Measured Compositions of PCT Leachates

Table A-1 in Appendix A and Table B-1 in Appendix B provide the elemental leachate concentration measurements for the PCT leachates and standard solutions. Values are shown both as received from the analytical laboratory and after correction for the dilutions performed at PNNL. Note that the measured

[a] ICP multi-element custom solution, product number SM-744-013, High Purity Standards, Charleston, SC.

concentrations of the analytes in most of the blank samples were generally below detection limits, with three blanks in Table A-1 in Appendix A having measurable Na concentrations of about 2 mg/L, one of which also having a measurable Si concentration a little over the detection limit of 1 mg/L.

Table A-2 in Appendix A and Table B-2 in Appendix B provide a review of the measurements of the solution standard samples that were included in the analytical blocks for the PCT leachate 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,[4] 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 A-2 and Table B-2 satisfy these criteria, and thus, the results for the solution standard suggest no significant issues with the analytical outcomes for the measurements of the PCT leachates.

Exhibit A-1 in Appendix A and Exhibit B-1 in Appendix B provide plots of the leachate concentrations (mg/L) in analytical sequence by analytical block. Both linear and logarithmic plots are provided for each analyte. 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 a review of these plots.

Exhibit A-2 in Appendix A and Exhibit B-2 in Appendix B provide plots of the triplicate leachate concentrations by the glass ID. Both linear and logarithmic plots are provided for each analyte. Plotting the data in this format allows for the assessment of the repeatability of the measurements for each glass. For some of the glasses, minor scatter among the triplicate values of some analytes is observed. For two glasses, there are more significant differences among the triplicate values. Note for example:

- The measurements in Set 1 for DWPF-EA-PCT-3-A (S-11354) are about 5x higher and LP4-04-1-Q-PCT-A (S-11359) are about 2x higher. These are thought to be the result of differences in dilutions.

After discussion with PNNL, it was decided that these samples would be excluded from normalization calculations.

3.2 Normalization of PCT Data

The PCT leachate data were used to determine normalized concentrations for each element of interest using both the targeted and measured (quenched) compositions of the glasses following the expression given in ASTM C1285:

$$NC_i = \frac{c_i\left(sample\right)}{f_i}$$

where NC_i is the normalized concentration in units of $g_{waste\ form}/L_{leachant}$, $c_i(sample)$ is the concentration of element "*i*" in the leachate in units of g_i/L (corrected for the dilutions performed at PNNL), and f_i is the mass fraction of element "*i*" in the unleached glass in units of g_i/g_{glass}.[b]

An equation was developed to allow for calculation of the NC_i values using the units of measurement provided with the analytical results for this study, and to accommodate the triplicate leachate measurements

[b] 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.

for each of the study glasses. Note that the symbols in this second equation were kept consistent with those used in ASTM C1285,[4] but the units of measurement differ. The common logarithm of the normalized concentration for each element "*i*" (NC_i) for each of the study glasses was determined using the equation:

$$\log_{10}\left(NC_i\right) = \overline{\log_{10} c_i} - \left[1 + \log_{10} f_i\right]$$

where NC_i remains in units of $g_{\text{waste form}}/L_{\text{leachant}}$, $\overline{\log_{10} c_i}$ is the average of the common logarithms of the measured concentrations of element "*i*" in the triplicate leachates in units of mg/L (corrected for the dilutions performed at PNNL as discussed in Section 2.3), and $\log_{10} f_i$ is either the common logarithm of the targeted concentration of element "*i*" in the glass in units of wt.%, or the common logarithm of the average measured concentration of element "*i*" in the glass in units of wt.% (reported earlier[8]).

Exhibit C-1 in Appendix C provides plots of the normalized PCT responses for the quenched (Q) and CCC for each of the study glasses as well as the responses for the Environmental Assessment (EA) reference glass[10] (labeled "DWPF EA-PCT" in the PNNL experiments). The results are grouped by compositional view. Note that an indicator is provided as part of these plots to show results involving below detection limit (BDL) values. The plots of Exhibit C-1 provide a graphical comparison between the PCT responses for the two heat treatments of each study glass.

A review of the PCT data resulted in the following observations:

- Measured concentrations for Zr in the leachates are all below detection levels.
- Little difference is seen when evaluating the normalized values using the targeted or measured glass composition.
- Several of the study glasses, both quenched and CCC, have NC_i values that are greater than the WTP immobilized LAW constraint[c] of 4 g/L for B and Na. One of these study glasses, LP4-10, also has NC_i values that are greater than 4 g/L for Si. For most of these glasses, the CCC versions of the glasses have lower NC_i values than the quenched version of the glasses.
    - Three of the quenched glasses, LP4-13-Q, LP4-14-Q, and LP4-17-Q, have NC_i values approximately two times greater than the NC_i values of heat-treated versions.
    - LP4-09-CCC, LP4-09-Q, LP4-10-CCC, LP4-10-Q, LP4-13-CCC, LP4-13-Q, and LP4-17-Q have NC_B, NC_{Li}, and NC_{Na} values higher than the EA benchmark NC_B value of 16.695 g/L, NC_{Li} value of 9.565 g/L, and NC_{Na} value of 13.346 g/L.
    - LP4-10-CCC and LP4-10-Q also have NC_{Si} values higher than the EA benchmark NC_{Si} value of 3.922 g/L.[10]
- For most of the study glasses, heat treatment had only a marginal impact on the NC_i values.
- The samples of the EA reference glass (labeled "DWPF-EA-PCT" in the study) included with each PCT set have generally consistent NC_i values.
    - Glass DWPF-EA-PCT-6 has NC_i values that are about 33 percent lower than the other five EA samples. This could be due to an error in the initial dilution of the samples.
- As discussed earlier, two samples, DWPF-EA-PCT-3-A (S-11354) and LP4-04-1-Q-PCT-A (S-11359) were noted to have significantly different values from the other samples within the same triplicate. After discussion with PNNL, it was decided to exclude these samples from normalization calculations due to potential initial dilution errors.

Exhibit C-2 provides the results of an evaluation of congruent leaching among the analytes for the study glasses and EA reference glass. For the EA reference glass, the release rates for B, Li, Na, and Si are highly correlated. The release rates for B, K, Li, Na, and Si are highly correlated for the study glasses. For the

[c] Contract DE-AC27-01RV14136, as amended, U.S. Department of Energy, Richland, WA (2000).

other analytes, aluminum (Al) and chromium (Cr), less correlation is seen among the release rates for the study glasses.

4.0 Summary

In this report, SRNL provides chemical analysis of PCT leachates from a series of simulated nuclear waste glasses fabricated at PNNL. The series included quenched and CCC versions of the glasses. The resulting data will be used in the development of enhanced property/composition models for waste vitrification at Hanford.

For some of the glass leachates, minor scatter among the triplicate values of some analytes was observed. For other leachates, there were more significant differences among the triplicate values. A review of the PCT data noted that there was little difference between the normalized values based on targeted or measured glass composition. Several of the study glasses have NC_i values that are greater than the Hanford Tank Waste Treatment and Immobilization Plant immobilized low-activity waste constraint of 4 g/L for B, Na, and Si. For the study glasses with NC_i values exceeding 4 g/L, the CCC heat-treated samples had generally lower NC_i values than quenched samples. The samples of the Environmental Assessment reference glass included with each PCT set had generally consistent NC_i values. The release rates for B, K, Li, Na, and Si were highly correlated for the study glasses.

5.0 References

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Appendix A. Tables and Exhibits Supporting Analysis of the Set 1 PCT Leachates

Table A-1. Set 1 PCT Leachate Measurements in Analytical Sequence

PNNL Solution ID	Lab ID	Block	Seq	Al (ar)	B (ar)	Cr (ar)	K (ar)	Li (ar)	Na (ar)	Si (ar)	Zr (ar)	Dil. Fac.	Al (mg/L)*	B (mg/L)*	Cr (mg/L)*	K (mg/L)*	Li (mg/L)*	Na (mg/L)*	Si (mg/L)*	Zr (mg/L)*
Standard	std-11	1	1	3.70	18.0	<1.00	9.77	9.61	80.6	47.8	<1.00	1	3.70	18.0	1.00	9.77	9.61	80.6	47.8	1.00
LP4-05-CCC-PCT-B	S-11378	1	2	2.21	5.91	<1.00	<1.00	<1.00	37.3	9.94	<1.00	5	11.1	29.6	5.00	5.00	5.00	187	49.7	5.00
DWPF-EA-PCT-3-C	S-11356	1	3	<1.00	115	<1.00	<1.00	33.5	328	167	<1.00	5	5.00	575	5.00	5.00	168	1640	835	5.00
LP4-20-CCC-PCT-C	S-11341	1	4	<1.00	73.0	2.25	19.4	7.23	181	17.8	<1.00	5	5.00	365	11.3	97.0	36.2	905	89.0	5.00
LP4-10-CCC-PCT-A	S-11287	1	5	<1.00	127	15.8	85.9	64.9	412	168	<1.00	5	5.00	635	79.0	430	325	2060	840	5.00
LP4-14-Q-PCT-C	S-11283	1	6	<1.00	85.6	4.80	37.2	27.0	169	34.9	<1.00	5	5.00	428	24.0	186	135	845	175	5.00
LP4-02-Q-PCT-B	S-11267	1	7	2.85	<1.00	<1.00	1.14	2.03	6.01	8.70	<1.00	5	14.3	5.00	5.00	5.70	10.2	30.1	43.5	5.00
LP4-11-Q-PCT-B	S-11279	1	8	2.17	6.38	<1.00	2.39	1.14	19.1	10.2	<1.00	5	10.9	31.9	5.00	12.0	5.70	95.5	51.0	5.00
LP4-16-Q-PCT-A	S-11304	1	9	<1.00	51.6	<1.00	3.82	24.3	90.0	39.9	<1.00	5	5.00	258	5.00	19.1	122	450	200	5.00
LP4-12-Q-PCT-C	S-11300	1	10	<1.00	63.6	1.64	30.9	15.6	125	34.8	<1.00	5	5.00	318	8.20	155	78.0	625	174	5.00
LP4-07-1-Q-PCT-B	S-11366	1	11	1.72	2.32	<1.00	1.61	1.66	24.8	8.06	<1.00	5	8.60	11.6	5.00	8.05	8.30	124	40.3	5.00
LP4-10-Q-PCT-A	S-11275	1	12	<1.00	158	20.7	105	79.0	503	198	<1.00	5	5.00	790	104	525	395	2515	990	5.00
LP4-09-Q-PCT-B	S-11296	1	13	<1.00	244	1.03	79.9	60.2	501	45.6	<1.00	5	5.00	1220	5.15	400	301	2505	228	5.00
LP4-03-Q-PCT-C	S-11271	1	14	2.10	8.90	<1.00	4.27	4.62	17.0	7.74	<1.00	5	10.5	44.5	5.00	21.4	23.1	85.0	38.7	5.00
LP4-23-1-Q-PCT-C	S-11370	1	15	3.06	4.27	<1.00	6.66	4.28	43.2	25.5	<1.00	5	15.3	21.4	5.00	33.3	21.4	216	128	5.00
LP4-24-Q-PCT-C	S-11353	1	16	4.12	7.08	<1.00	4.62	3.05	29.2	10.5	<1.00	5	20.6	35.4	5.00	23.1	15.3	146	52.5	5.00
LP4-08-1-CCC-PCT-C	S-11382	1	17	4.70	<1.00	<1.00	4.15	2.33	26.4	16.4	<1.00	5	23.5	5.00	5.00	20.8	11.7	132	82.0	5.00
LP4-15-CCC-PCT-B	S-11337	1	18	2.97	5.26	<1.00	<1.00	<1.00	44.3	14.0	<1.00	5	14.9	26.3	5.00	5.00	5.00	222	70.0	5.00
Standard	std-12	1	19	3.72	19.7	<1.00	9.58	9.59	81.5	49.0	<1.00	1	3.72	19.7	1.00	9.58	9.59	81.5	49.0	1.00
LP4-06-2-Q-PCT-A	S-11362	1	20	3.39	3.09	<1.00	2.76	1.31	13.3	9.36	<1.00	5	17.0	15.5	5.00	13.8	6.55	66.5	46.8	5.00
LP4-18-Q-PCT-C	S-11312	1	21	<1.00	6.51	<1.00	<1.00	3.47	50.9	29.0	<1.00	5	5.00	32.6	5.00	5.00	17.4	255	145	5.00
LP4-19-Q-PCT-A	S-11374	1	22	3.43	1.52	<1.00	2.13	<1.00	25.1	9.33	<1.00	5	17.2	7.60	5.00	10.7	5.00	126	46.7	5.00
LP4-09-CCC-PCT-A	S-11333	1	23	<1.00	206	1.03	96.4	52.4	421	42.7	<1.00	5	5.00	1030	5.15	482	262	2105	214	5.00
LP4-01-Q-PCT-A	S-11263	1	24	2.94	56.9	<1.00	<1.00	<1.00	191	21.4	<1.00	5	14.7	285	5.00	5.00	5.00	955	107	5.00
LP4-17-Q-PCT-B	S-11308	1	25	<1.00	169	11.0	50.9	64.0	365	63.0	<1.00	5	5.00	845	55.0	255	320	1825	315	5.00
Blank-1-1	S-11293	1	26	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
DWPF-EA-PCT-1-A	S-11290	1	27	<1.00	86.4	<1.00	<1.00	25.6	232	126	<1.00	5	5.00	432	5.00	5.00	128	1160	630	5.00
LP4-21-Q-PCT-B	S-11349	1	28	<1.00	8.15	<1.00	<1.00	2.72	15.4	14.9	<1.00	5	5.00	40.8	5.00	5.00	13.6	77.0	74.5	5.00
Blank-4-2	S-11393	1	29	<1.00	<1.00	<1.00	<1.00	<1.00	1.48	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	7.40	5.00	5.00
LP4-02-CCC-PCT-A	S-11316	1	30	3.35	<1.00	<1.00	1.03	3.05	6.71	9.93	<1.00	5	16.8	5.00	5.00	5.15	15.3	33.6	49.7	5.00
LP4-11-CCC-PCT-B	S-11320	1	31	1.84	<1.00	<1.00	1.48	<1.00	8.34	8.21	<1.00	5	9.20	5.00	5.00	7.40	5.00	41.7	41.1	5.00
LP4-03-CCC-PCT-C	S-11329	1	32	2.50	15.7	<1.00	5.60	7.20	25.4	8.40	<1.00	5	12.5	78.5	5.00	28.0	36.0	127	42.0	5.00
LP4-16-CCC-PCT-A	S-11386	1	33	<1.00	29.9	<1.00	2.45	15.1	55.0	31.0	<1.00	5	5.00	150	5.00	12.3	75.5	275	155	5.00
DWPF-EA-PCT-2-B	S-11323	1	34	<1.00	112	<1.00	<1.00	33.5	331	165	<1.00	5	5.00	560	5.00	5.00	168	1655	825	5.00
LP4-13-Q-PCT-A	S-11345	1	35	<1.00	194	3.04	78.0	49.0	633	106	<1.00	5	5.00	970	15.2	390	245	3165	530	5.00
Standard	std-13	1	36	3.77	19.4	<1.00	9.42	9.63	81.7	47.9	<1.00	1	3.77	19.4	1.00	9.42	9.63	81.7	47.9	1.00
Standard	std-21	2	1	3.77	19.6	<1.00	9.12	10.0	80.2	48.1	<1.00	1	3.77	19.6	1.00	9.12	10.0	80.2	48.1	1.00
LP4-02-Q-PCT-C	S-11268	2	2	1130	320	15.5	354	343	1100	1900	142	5	5650	1600	77.5	1770	1715	5500	9500	710
LP4-01-Q-PCT-B	S-11264	2	3	3.68	47.5	<1.00	<1.00	<1.00	184	27.6	<1.00	5	18.4	238	5.00	5.00	5.00	920	138	5.00
LP4-05-CCC-PCT-C	S-11379	2	4	2.25	7.28	<1.00	<1.00	<1.00	36.2	10.4	<1.00	5	11.3	36.4	5.00	5.00	5.00	181	52.0	5.00
LP4-05-Q-PCT-A	S-11272	2	5	3.08	8.94	<1.00	<1.00	<1.00	43.7	12.7	<1.00	5	15.4	44.7	5.00	5.00	5.00	219	63.5	5.00
LP4-02-CCC-PCT-B	S-11317	2	6	3.45	1.60	<1.00	1.27	3.16	6.85	9.81	<1.00	5	17.3	8.00	5.00	6.35	15.8	34.3	49.1	5.00
LP4-22-Q-PCT-A	S-11342	2	7	1.60	57.4	<1.00	<1.00	4.77	127	9.83	<1.00	5	8.00	287	5.00	5.00	23.9	635	49.2	5.00
LP4-01-CCC-PCT-A	S-11284	2	8	2.54	51.1	<1.00	<1.00	<1.00	196	20.0	<1.00	5	12.7	256	5.00	5.00	5.00	980	100	5.00
Blank-2-1	S-11325	2	9	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-10-CCC-PCT-B	S-11288	2	10	<1.00	107	14.2	92.7	60.2	393	164	<1.00	5	5.00	535	71.0	464	301	1965	820	5.00
LP4-20-Q-PCT-A	S-11313	2	11	<1.00	73.5	1.93	18.5	7.81	186	17.9	<1.00	5	5.00	368	9.65	92.5	39.1	930	89.5	5.00
LP4-07-1-CCC-PCT-A	S-11383	2	12	1.49	3.20	<1.00	1.17	1.23	23.4	7.46	<1.00	5	7.45	16.0	5.00	5.85	6.15	117	37.3	5.00
Blank-3-2	S-11358	2	13	<1.00	<1.00	<1.00	<1.00	<1.00	1.90	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	9.50	5.00	5.00
LP4-16-Q-PCT-B	S-11305	2	14	<1.00	47.3	<1.00	4.13	25.0	86.3	38.1	<1.00	5	5.00	237	5.00	20.7	125	432	191	5.00

ar = as received measurements prior to correction for dilution factor (Dil. Fac)

* = dilution corrected values

Table A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

PNNL Solution ID	Lab ID	Block	Seq	Al (ar)	B (ar)	Cr (ar)	K (ar)	Li (ar)	Na (ar)	Si (ar)	Zr (ar)	Dil. Fac.	Al (mg/L)*	B (mg/L)*	Cr (mg/L)*	K (mg/L)*	Li (mg/L)*	Na (mg/L)*	Si (mg/L)*	Zr (mg/L)*
LP4-09-CCC-PCT-B	S-11334	2	15	<1.00	204	1.10	86.7	52.5	427	38.3	<1.00	5	5.00	1020.0	5.50	434	263	2135	192	5.00
DWPF-EA-PCT-2-C	S-11324	2	16	<1.00	108	<1.00	<1.00	35.0	328	163	<1.00	5	5.00	540	5.00	5.00	175	1640	815	5.00
LP4-16-CCC-PCT-B	S-11387	2	17	<1.00	28.1	<1.00	2.40	15.4	53.2	29.2	<1.00	5	5.00	141	5.00	12.0	77.0	266	146	5.00
LP4-04-1-Q-PCT-A	S-11359	2	18	15.2	23.0	<1.00	27.3	31.6	103	50.6	<1.00	5	76.0	115	5.00	137	158	515	253	5.00
Standard	std-22	2	19	3.68	18.6	<1.00	9.09	9.83	79.1	45.8	<1.00	1	3.68	18.6	1.00	9.09	9.83	79.1	45.8	1.00
LP4-11-Q-PCT-C	S-11280	2	20	2.04	6.73	<1.00	2.45	1.09	17.6	9.00	<1.00	5	10.2	33.7	5.00	12.3	5.45	88.0	45.0	5.00
DWPF-EA-PCT-1-B	S-11291	2	21	<1.00	103	<1.00	<1.00	33.0	307	151	<1.00	5	5.00	515	5.00	5.00	165	1535	755	5.00
LP4-25-1-Q-PCT-A	S-11371	2	22	1.81	6.77	<1.00	3.62	6.10	23.2	16.1	<1.00	5	9.05	33.9	5.00	18.1	30.5	116	80.5	5.00
DWPF-EA-PCT-4-A	S-11389	2	23	<1.00	103	<1.00	<1.00	33.8	309	155	<1.00	5	5.00	515	5.00	5.00	169	1545	775	5.00
LP4-11-CCC-PCT-C	S-11321	2	24	1.84	2.65	<1.00	1.61	<1.00	9.22	8.14	<1.00	5	9.20	13.3	5.00	8.05	5.00	46.1	40.7	5.00
LP4-07-1-Q-PCT-C	S-11367	2	25	1.44	3.05	<1.00	1.19	1.14	21.8	6.64	<1.00	5	7.20	15.3	5.00	5.95	5.70	109	33.2	5.00
LP4-12-CCC-PCT-A	S-11330	2	26	<1.00	51.3	1.62	26.2	14.7	107	31.6	<1.00	5	5.00	257	8.10	131	73.5	535	158	5.00
LP4-13-Q-PCT-B	S-11346	2	27	<1.00	193	2.93	73.0	51.0	630	103	<1.00	5	5.00	965	14.7	365	255	3150	515	5.00
LP4-15-Q-PCT-A	S-11301	2	28	2.96	5.48	<1.00	<1.00	<1.00	40.9	12.2	<1.00	5	14.8	27.4	5.00	5.00	5.00	205	61.0	5.00
LP4-17-Q-PCT-C	S-11309	2	29	<1.00	168	9.27	42.8	60.7	372	53.0	<1.00	5	5.00	840	46.4	214	304	1860	265	5.00
LP4-10-Q-PCT-B	S-11276	2	30	<1.00	153	19.5	102	80.2	490	194	<1.00	5	5.00	765	97.5	510	401	2450	970	5.00
LP4-21-Q-PCT-C	S-11350	2	31	<1.00	8.15	<1.00	1.08	2.73	14.6	14.7	<1.00	5	5.00	40.8	5.00	5.40	13.65	73.00	73.50	5.00
LP4-15-CCC-PCT-C	S-11338	2	32	2.97	5.72	<1.00	<1.00	<1.00	42.4	13.2	<1.00	5	14.9	28.6	5.00	5.00	5.00	212	66.0	5.00
LP4-19-Q-PCT-B	S-11375	2	33	3.37	2.75	<1.00	2.07	<1.00	23.7	8.57	<1.00	5	16.9	13.8	5.00	10.4	5.00	119	42.9	5.00
LP4-09-Q-PCT-C	S-11297	2	34	<1.00	241	1.10	107	63.9	506	42.4	<1.00	5	5.00	1205	5.50	535	320	2530	212	5.00
LP4-06-2-Q-PCT-B	S-11363	2	35	3.43	4.25	<1.00	3.03	1.38	13.7	9.26	<1.00	5	17.2	21.3	5.00	15.2	6.90	68.5	46.3	5.00
Standard	std-23	2	36	3.67	18.0	<1.00	9.05	9.77	79.7	45.4	<1.00	1	3.67	18.0	1.00	9.05	9.77	79.7	45.4	1.00
Standard	std-31	3	1	3.88	19.8	<1.00	9.22	10.4	80.9	48.7	<1.00	1	3.88	19.8	1.00	9.22	10.4	80.9	48.7	1.00
LP4-10-Q-PCT-C	S-11277	3	2	<1.00	154	21.3	103	85.6	493	198	<1.00	5	5.00	770	107	515	428	2465	990	5.00
LP4-13-Q-PCT-C	S-11347	3	3	<1.00	188	2.87	68.7	50.2	614	108	<1.00	5	5.00	940	14.4	344	251	3070	540	5.00
LP4-04-1-Q-PCT-B	S-11360	3	4	3.95	3.30	<1.00	5.62	6.26	18.4	11.7	<1.00	5	19.8	16.5	5.00	28.1	31.3	92.0	58.5	5.00
LP4-15-Q-PCT-B	S-11302	3	5	3.17	6.08	<1.00	<1.00	<1.00	42.6	13.2	<1.00	5	15.9	30.4	5.00	5.00	5.00	213	66.0	5.00
LP4-03-CCC-PCT-A	S-11327	3	6	2.70	17.5	<1.00	5.50	8.50	27.2	9.15	<1.00	5	13.5	87.5	5.00	27.5	42.5	136	45.8	5.00
LP4-06-2-Q-PCT-C	S-11364	3	7	3.68	4.79	<1.00	3.15	1.47	14.3	9.66	<1.00	5	18.4	24.0	5.00	15.8	7.35	71.5	48.3	5.00
LP4-16-CCC-PCT-C	S-11388	3	8	<1.00	29.9	<1.00	2.57	16.7	55.5	31.3	<1.00	5	5.00	150	5.00	12.9	83.5	278	157	5.00
Blank-1-2	S-11294	3	9	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-19-Q-PCT-C	S-11376	3	10	3.49	2.96	<1.00	2.02	<1.00	23.9	8.77	<1.00	5	17.5	14.8	5.00	10.1	5.00	120	43.9	5.00
LP4-24-Q-PCT-A	S-11351	3	11	4.46	8.77	<1.00	4.59	3.65	31.7	10.8	<1.00	5	22.3	43.9	5.00	23.0	18.3	159	54.0	5.00
DWPF-EA-PCT-4-B	S-11390	3	12	<1.00	107	<1.00	<1.00	35.1	304	153	<1.00	5	5.00	535	5.00	5.00	176	1520	765	5.00
LP4-20-CCC-PCT-A	S-11339	3	13	<1.00	71.0	2.37	19.2	8.11	178	17.0	<1.00	5	5.00	355	11.9	96.0	40.6	890	85.0	5.00
LP4-12-Q-PCT-A	S-11298	3	14	<1.00	63.5	1.96	31.8	17.9	131	35.7	<1.00	5	5.00	318	9.80	159	89.5	655	179	5.00
LP4-02-CCC-PCT-C	S-11318	3	15	3.47	1.80	<1.00	1.26	3.30	7.19	9.98	<1.00	5	17.4	9.00	5.00	6.30	16.5	36.0	49.9	5.00
DWPF-EA-PCT-1-C	S-11292	3	16	<1.00	106	<1.00	<1.00	34.5	291	148	<1.00	5	5.00	530	5.00	5.00	173	1455	740	5.00
LP4-14-Q-PCT-A	S-11281	3	17	<1.00	78.5	4.85	34.0	28.0	166	31.3	<1.00	5	5.00	393	24.3	170	140	830	157	5.00
LP4-03-Q-PCT-A	S-11269	3	18	2.26	11.1	<1.00	4.20	5.61	19.2	8.06	<1.00	5	11.3	55.5	5.00	21.0	28.1	96.0	40.3	5.00
Standard	std-32	3	19	3.85	19.2	<1.00	9.25	10.3	81.0	47.2	<1.00	1	3.85	19.2	1.00	9.25	10.3	81.0	47.2	1.00
LP4-22-Q-PCT-B	S-11343	3	20	1.87	62.7	<1.00	<1.00	5.50	140	11.2	<1.00	5	9.35	314	5.00	5.00	27.5	700	56.0	5.00
LP4-07-1-CCC-PCT-B	S-11384	3	21	1.60	3.36	<1.00	1.04	1.28	24.6	7.53	<1.00	5	8.00	16.8	5.00	5.20	6.40	123	37.7	5.00
LP4-23-1-Q-PCT-A	S-11368	3	22	1.77	5.36	<1.00	5.77	4.16	42.2	21.5	<1.00	5	8.85	26.8	5.00	28.9	20.8	211	108	5.00
LP4-16-Q-PCT-C	S-11306	3	23	<1.00	46.4	<1.00	3.68	24.9	83.7	37.5	<1.00	5	5.00	232	5.00	18.4	125	419	188	5.00
LP4-01-CCC-PCT-B	S-11285	3	24	2.64	53.3	<1.00	<1.00	<1.00	198	20.6	<1.00	5	13.2	267	5.00	5.00	5.00	990	103	5.00
LP4-01-Q-PCT-C	S-11265	3	25	2.80	43.5	<1.00	<1.00	<1.00	180	17.4	<1.00	5	14.0	218	5.00	5.00	5.00	900	87.0	5.00
LP4-08-1-CCC-PCT-A	S-11380	3	26	4.94	2.42	<1.00	3.83	2.55	26.2	16.2	<1.00	5	24.7	12.1	5.00	19.2	12.8	131	81.0	5.00
LP4-05-Q-PCT-B	S-11273	3	27	2.38	8.64	<1.00	<1.00	<1.00	44.3	10.8	<1.00	5	11.9	43.2	5.00	5.00	5.00	222	54.0	5.00
LP4-25-1-Q-PCT-B	S-11372	3	28	1.75	7.50	<1.00	3.82	6.52	24.4	16.6	<1.00	5	8.75	37.5	5.00	19.1	32.6	122	83.0	5.00

ar = as received measurements prior to correction for dilution factor (Dil. Fac)

* = dilution corrected values

Table A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

PNNL Solution ID	Lab ID	Block	Seq	Al (ar)	B (ar)	Cr (ar)	K (ar)	Li (ar)	Na (ar)	Si (ar)	Zr (ar)	Dil. Fac.	Al (mg/L)*	B (mg/L)*	Cr (mg/L)*	K (mg/L)*	Li (mg/L)*	Na (mg/L)*	Si (mg/L)*	Zr (mg/L)*
LP4-10-CCC-PCT-C	S-11289	3	29	<1.00	138	18.1	91.2	76.7	439	185	<1.00	5	5.00	690	90.5	456	384	2195	925	5.00
LP4-09-CCC-PCT-C	S-11335	3	30	<1.00	209	1.15	91.5	56.6	424	40.8	<1.00	5	5.00	1045	5.75	458	283	2120	204	5.00
LP4-18-Q-PCT-A	S-11310	3	31	<1.00	8.13	<1.00	<1.00	4.12	56.0	30.5	<1.00	5	5.00	40.7	5.00	5.00	20.6	280	153	5.00
DWPF-EA-PCT-3-A	S-11354	3	32	<1.00	242	<1.00	<1.00	70.3	675	298	<1.00	5	5.00	1210	5.00	5.00	352	3375	1490	5.00
LP4-20-Q-PCT-B	S-11314	3	33	<1.00	74.4	2.00	19.3	8.33	165	18.1	<1.00	5	5.00	372	10.0	96.5	41.7	825	90.5	5.00
Blank-4-1	S-11392	3	34	<1.00	<1.00	<1.00	<1.00	<1.00	2.20	1.07	<1.00	5	5.00	5.00	5.00	5.00	5.00	11.0	5.35	5.00
LP4-12-CCC-PCT-B	S-11331	3	35	<1.00	52.6	1.65	26.3	15.4	109	32.9	<1.00	5	5.00	263	8.25	132	77.0	545	165	5.00
Standard	std-33	3	36	3.82	19.0	<1.00	9.25	10.3	80.9	47.4	<1.00	1	3.82	19.0	1.00	9.25	10.3	80.9	47.4	1.00
Standard	std-41	4	1	3.95	20.5	<1.00	9.28	10.6	82.2	49.5	<1.00	1	3.95	20.5	1.00	9.28	10.6	82.2	49.5	1.00
DWPF-EA-PCT-2-A	S-11322	4	2	<1.00	84.8	<1.00	<1.00	27.8	237	123	<1.00	5	5.00	424	5.00	5.00	139	1185	615	5.00
LP4-05-Q-PCT-C	S-11274	4	3	2.43	9.09	<1.00	<1.00	<1.00	44.0	11.2	<1.00	5	12.2	45.5	5.00	5.00	5.00	220	56.0	5.00
LP4-22-Q-PCT-C	S-11344	4	4	1.79	62.5	<1.00	<1.00	5.36	140	10.8	<1.00	5	8.95	313	5.00	5.00	26.8	700	54.0	5.00
LP4-08-1-CCC-PCT-B	S-11381	4	5	5.05	2.55	<1.00	3.83	2.55	26.1	16.5	<1.00	5	25.3	12.8	5.00	19.2	12.8	131	82.5	5.00
DWPF-EA-PCT-3-B	S-11355	4	6	<1.00	115	<1.00	<1.00	37.6	329	166	<1.00	5	5.00	575	5.00	5.00	188	1645	830	5.00
LP4-03-Q-PCT-B	S-11270	4	7	2.16	10.5	<1.00	3.89	5.15	17.7	7.70	<1.00	5	10.8	52.5	5.00	19.5	25.8	88.5	38.5	5.00
LP4-02-Q-PCT-A	S-11266	4	8	3.41	1.82	<1.00	1.20	2.36	6.71	9.71	<1.00	5	17.1	9.10	5.00	6.00	11.8	33.6	48.6	5.00
LP4-20-CCC-PCT-B	S-11340	4	9	<1.00	71.7	2.54	19.1	7.86	173	17.5	<1.00	5	5.00	359	12.7	95.5	39.3	865	87.5	5.00
LP4-03-CCC-PCT-B	S-11328	4	10	2.69	16.8	<1.00	5.75	8.17	27.2	8.87	<1.00	5	13.5	84.0	5.00	28.8	40.9	136	44.4	5.00
Blank-2-2	S-11326	4	11	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-04-1-Q-PCT-C	S-11361	4	12	4.31	3.33	<1.00	6.15	6.48	19.5	12.5	<1.00	5	21.6	16.7	5.00	30.8	32.4	97.5	62.5	5.00
LP4-12-CCC-PCT-C	S-11332	4	13	<1.00	63.1	1.96	30.8	17.6	130	34.9	<1.00	5	5.00	316	9.80	154	88.0	650	175	5.00
LP4-15-Q-PCT-C	S-11303	4	14	3.20	6.01	<1.00	<1.00	<1.00	43.2	13.3	<1.00	5	16.0	30.1	5.00	5.00	5.00	216	66.5	5.00
DWPF-EA-PCT-4-C	S-11391	4	15	<1.00	105	<1.00	<1.00	34.6	301	154	<1.00	5	5.00	525	5.00	5.00	173	1505	770	5.00
LP4-05-CCC-PCT-A	S-11377	4	16	2.32	7.63	<1.00	<1.00	<1.00	38.6	10.3	<1.00	5	11.6	38.2	5.00	5.00	5.00	193	51.5	5.00
LP4-17-Q-PCT-A	S-11307	4	17	<1.00	173	11.0	50.8	70.0	379	62.4	<1.00	5	5.00	865	55.0	254	350	1895	312	5.00
Standard	std-42	4	18	3.89	19.6	<1.00	9.32	10.3	81.4	47.8	<1.00	1	3.89	19.6	1.00	9.32	10.3	81.4	47.8	1.00
LP4-15-CCC-PCT-A	S-11336	4	19	3.11	6.39	<1.00	<1.00	<1.00	43.8	13.6	<1.00	5	15.6	32.0	5.00	5.00	5.00	219	68.0	5.00
LP4-24-Q-PCT-B	S-11352	4	20	4.38	8.31	<1.00	4.56	3.36	30.1	10.6	<1.00	5	21.9	41.6	5.00	22.8	16.8	151	53.0	5.00
LP4-01-CCC-PCT-C	S-11286	4	21	2.63	52.9	<1.00	<1.00	<1.00	193	20.4	<1.00	5	13.2	265	5.00	5.00	5.00	965	102	5.00
Blank-3-1	S-11357	4	22	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-07-1-CCC-PCT-C	S-11385	4	23	1.58	3.65	<1.00	1.02	1.34	25.3	7.21	<1.00	5	7.90	18.3	5.00	5.10	6.70	127	36.1	5.00
LP4-18-Q-PCT-B	S-11311	4	24	<1.00	8.26	<1.00	<1.00	4.08	56.0	30.7	<1.00	5	5.00	41.3	5.00	5.00	20.4	280	154	5.00
LP4-11-Q-PCT-A	S-11278	4	25	2.27	7.39	<1.00	2.45	1.19	19.2	10.1	<1.00	5	11.4	37.0	5.00	12.3	5.95	96.0	50.5	5.00
LP4-07-1-Q-PCT-A	S-11365	4	26	1.64	3.23	<1.00	1.39	1.56	21.7	6.96	<1.00	5	8.20	16.2	5.00	6.95	7.80	109	34.8	5.00
LP4-23-1-Q-PCT-B	S-11369	4	27	1.83	5.21	<1.00	5.26	4.13	42.2	21.4	<1.00	5	9.15	26.1	5.00	26.3	20.7	211	107	5.00
LP4-14-Q-PCT-B	S-11282	4	28	<1.00	81.3	4.98	35.6	28.8	162	33.9	<1.00	5	5.00	407	24.9	178	144	810	170	5.00
LP4-11-CCC-PCT-A	S-11319	4	29	1.95	2.80	<1.00	1.55	<1.00	9.45	8.51	<1.00	5	9.75	14.0	5.00	7.75	5.00	47.3	42.6	5.00
LP4-21-Q-PCT-A	S-11348	4	30	<1.00	8.75	<1.00	<1.00	2.91	15.5	14.9	<1.00	5	5.00	43.8	5.00	5.00	14.6	77.5	74.5	5.00
LP4-09-Q-PCT-A	S-11295	4	31	<1.00	240	1.07	107	63.8	493	43.0	<1.00	5	5.00	1200	5.35	535	319	2465	215	5.00
LP4-12-Q-PCT-B	S-11299	4	32	<1.00	62.2	1.89	29.7	17.0	127	34.3	<1.00	5	5.00	311	9.45	149	85.0	635	172	5.00
LP4-25-1-Q-PCT-C	S-11373	4	33	1.71	7.51	<1.00	3.92	6.67	24.4	17.0	<1.00	5	8.55	37.6	5.00	19.6	33.4	122	85.0	5.00
LP4-20-Q-PCT-C	S-11315	4	34	<1.00	78.0	2.07	19.8	8.53	184	18.9	<1.00	5	5.00	390	10.4	99.0	42.7	920	94.5	5.00
Standard	std-43	4	35	3.92	19.6	<1.00	9.30	10.5	81.6	48.0	<1.00	1	3.92	19.6	1.00	9.30	10.5	81.6	48.0	1.00

ar = as received measurements prior to correction for dilution factor (Dil. Fac)

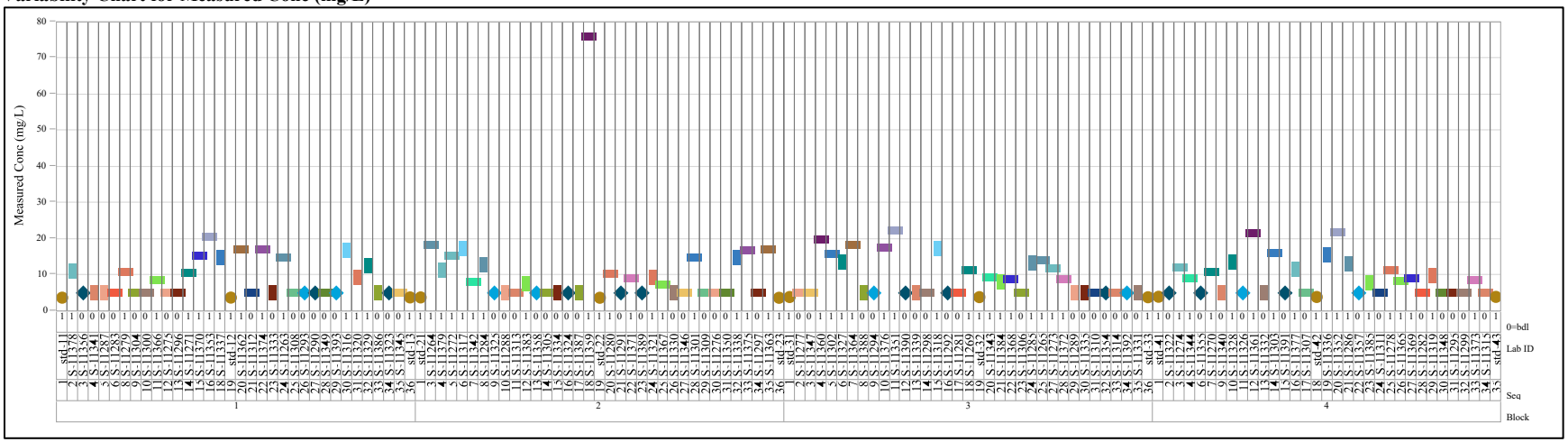
* = dilution corrected values

Table A-2. Results from Samples of the Multi-Element Solution Standard Included with the Set 1 PCT Leachates

Analytical Block	1-1	1-2	1-3	1-4	Reference Values (mg/L)
Mean (Al (mg/L))	3.73	3.71	3.85	3.92	4
Mean (B (mg/L))	19.03	18.73	19.33	19.90	20
Mean (K (mg/L))	9.59	9.09	9.24	9.30	10
Mean (Li (mg/L))	9.61	9.87	10.33	10.47	10
Mean (Na (mg/L))	81.27	79.67	80.93	81.73	81
Mean (Si (mg/L))	48.23	46.43	47.77	48.43	50
% relative bias, Al	-6.8%	-7.3%	-3.8%	-2.0%	<10% per ASTM C1285
% relative bias, B	-4.8%	-6.3%	-3.3%	-0.5%	
% relative bias, K	-4.1%	-9.1%	-7.6%	-7.0%	
% relative bias, Li	-3.9%	-1.3%	3.3%	4.7%	
% relative bias, Na	0.3%	-1.6%	-0.1%	0.9%	
% relative bias, Si	-3.5%	-7.1%	-4.5%	-3.1%	
Std Dev (Al (mg/L))	0.036	0.055	0.030	0.030	
Std Dev (B (mg/L))	0.907	0.808	0.416	0.520	
Std Dev (K (mg/L))	0.175	0.035	0.017	0.020	
Std Dev (Li (mg/L))	0.020	0.119	0.058	0.153	
Std Dev (Na (mg/L))	0.586	0.551	0.058	0.416	
Std Dev (Si (mg/L))	0.666	1.457	0.814	0.929	
%RSD (Al (mg/L))	1.0%	1.5%	0.8%	0.8%	<10% per ASTM C1285
%RSD (B (mg/L))	4.8%	4.3%	2.2%	2.6%	
%RSD (K (mg/L))	1.8%	0.4%	0.2%	0.2%	
%RSD (Li (mg/L))	0.2%	1.2%	0.6%	1.5%	
%RSD (Na (mg/L))	0.7%	0.7%	0.1%	0.5%	
%RSD (Si (mg/L))	1.4%	3.1%	1.7%	1.9%	

Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence

Analyte=Al
Variability Chart for Measured Conc (mg/L)



Analyte=Al
Variability Chart for log [Conc (mg/L)]

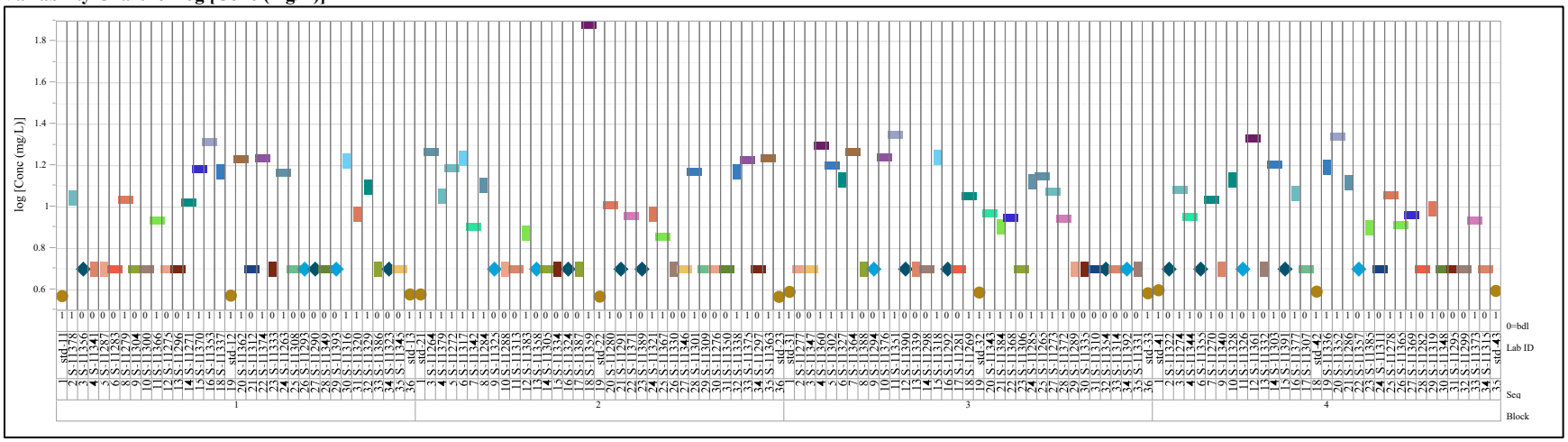
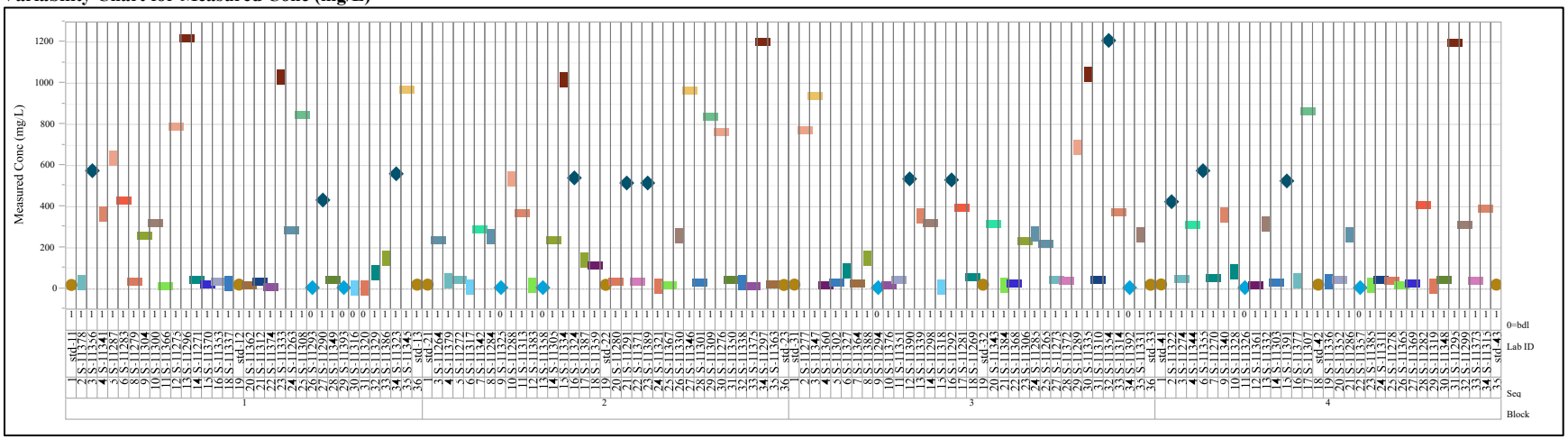


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=B
Variability Chart for Measured Conc (mg/L)



Analyte=B
Variability Chart for log [Conc (mg/L)]

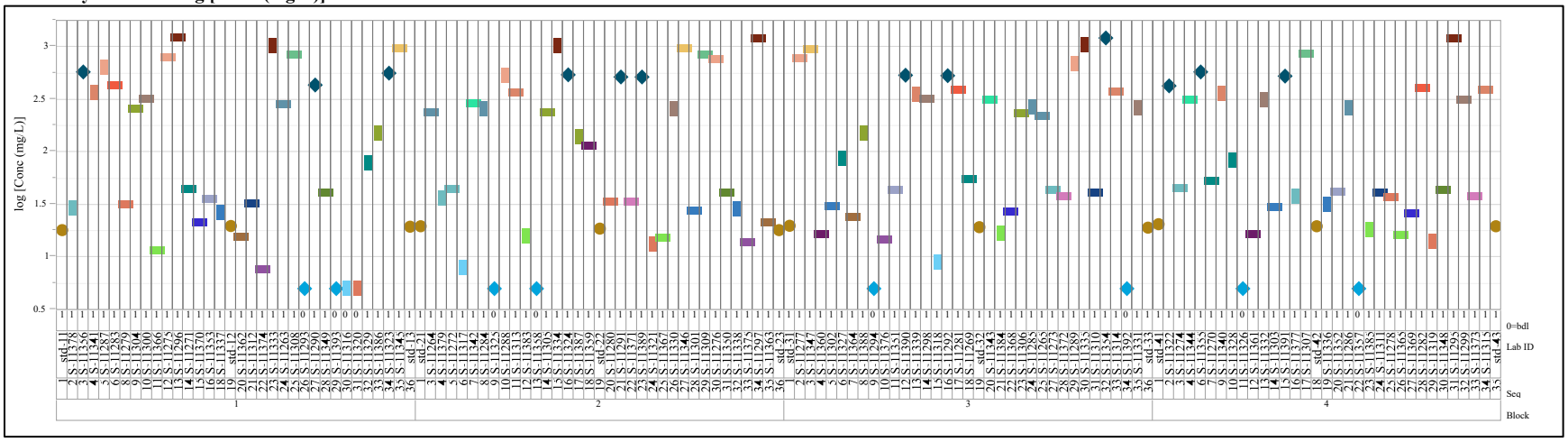
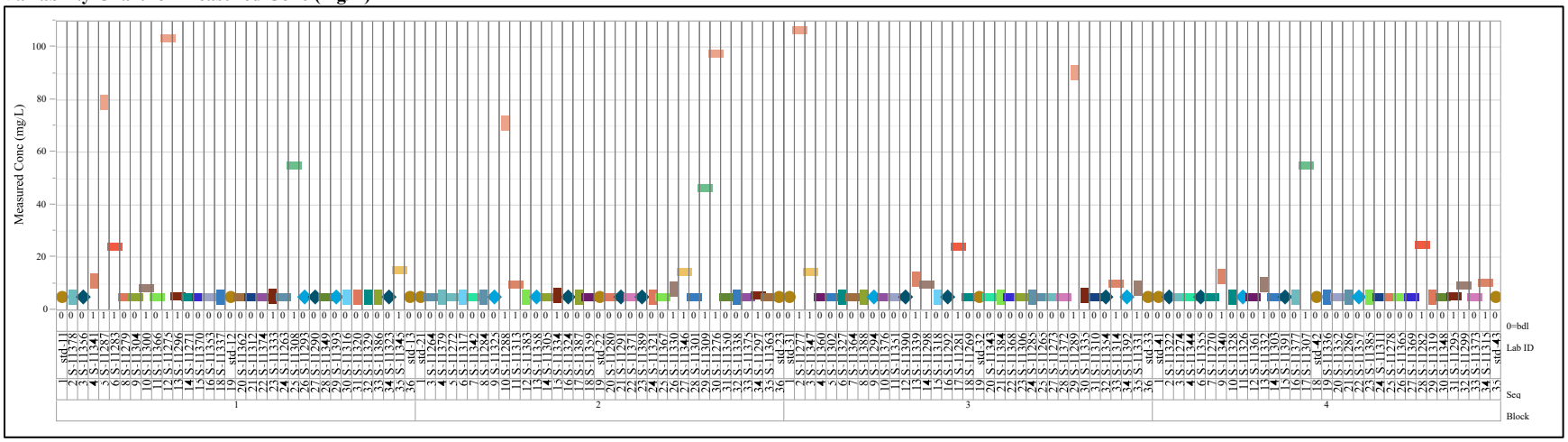


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Cr
Variability Chart for Measured Conc (mg/L)



Analyte=Cr
Variability Chart for log [Conc (mg/L)]

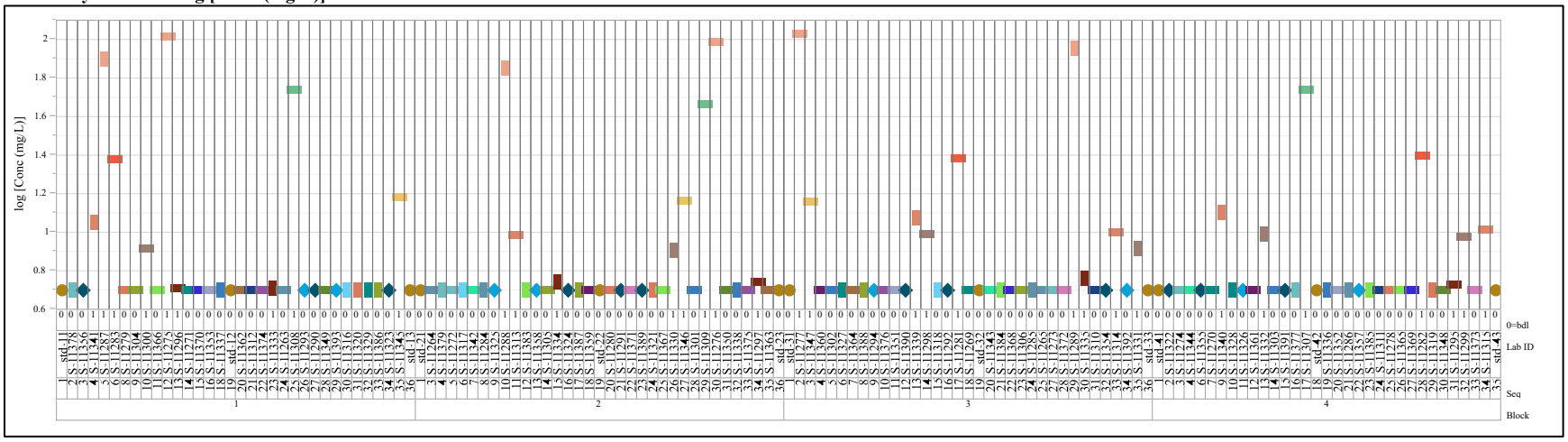
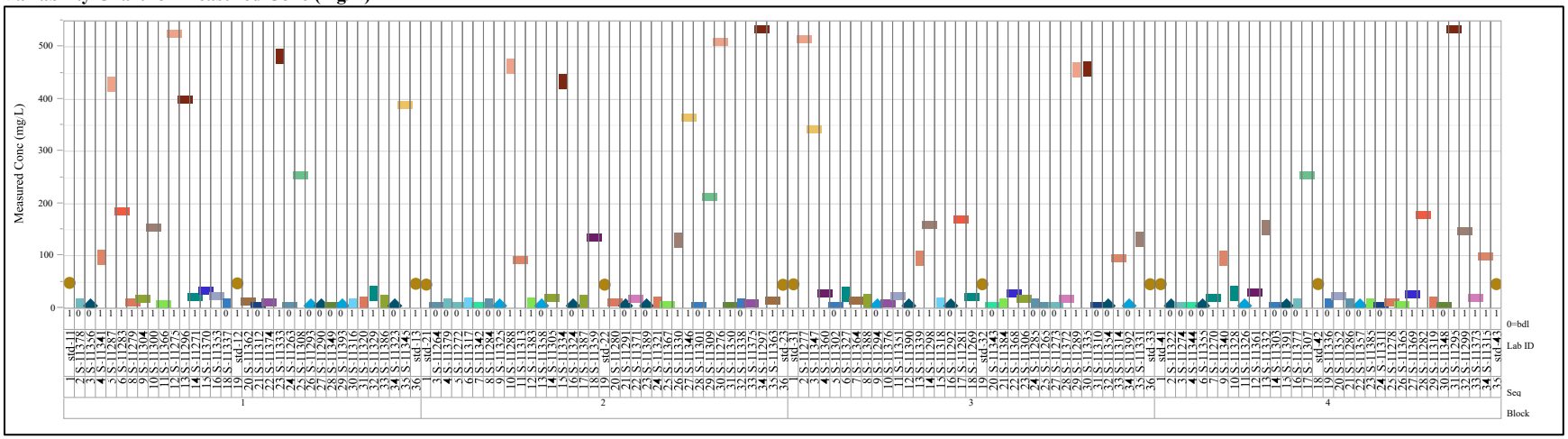


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=K
Variability Chart for Measured Conc (mg/L)



Analyte=K
Variability Chart for log [Conc (mg/L)]

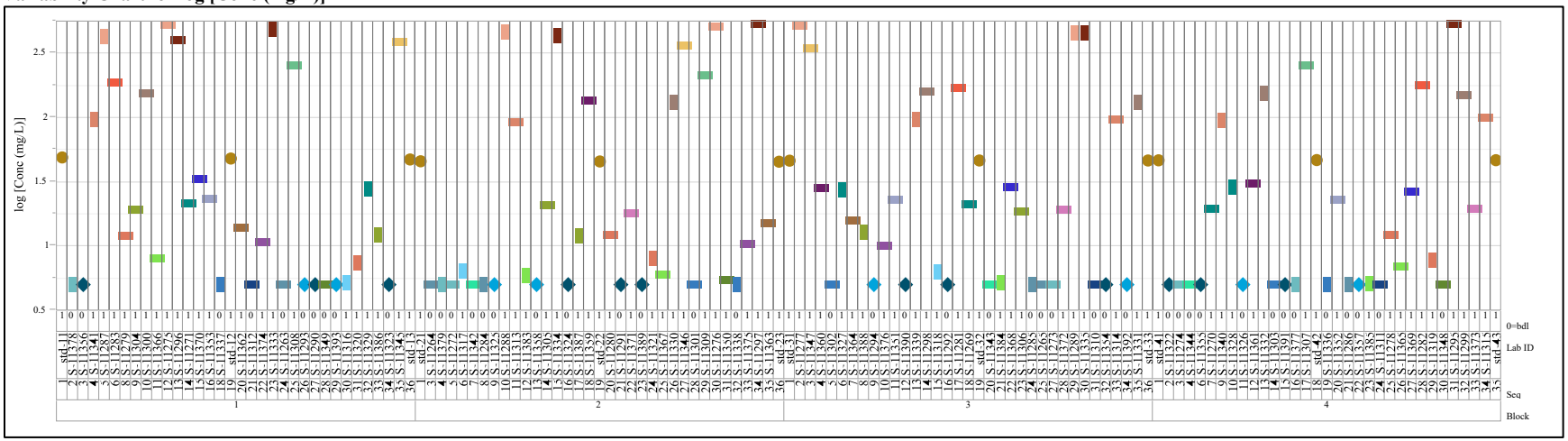
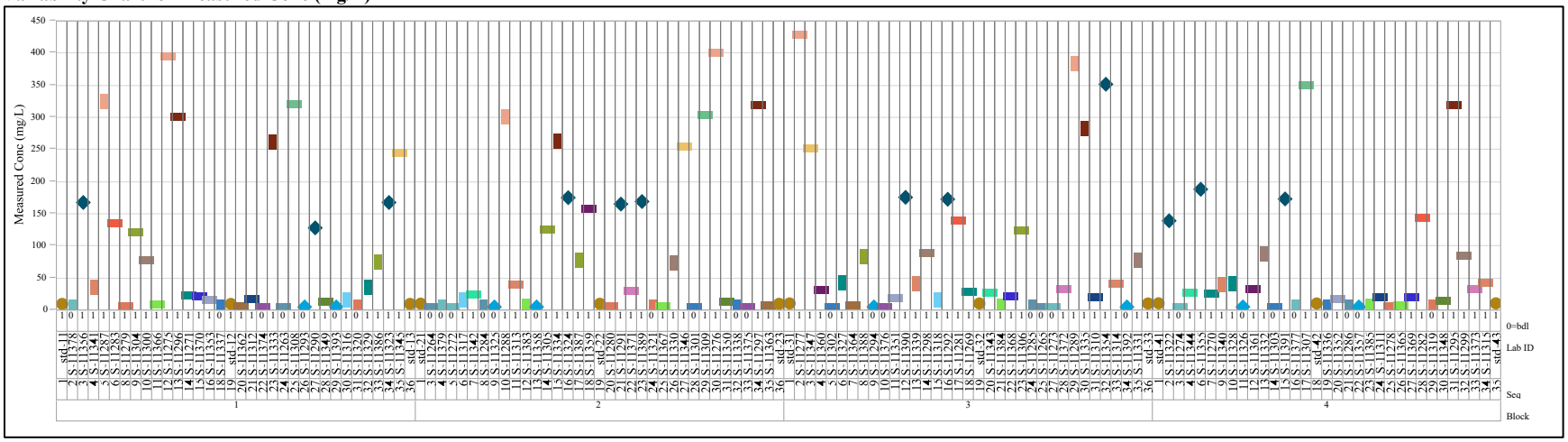


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Li
Variability Chart for Measured Conc (mg/L)



Analyte=Li
Variability Chart for log [Conc (mg/L)]

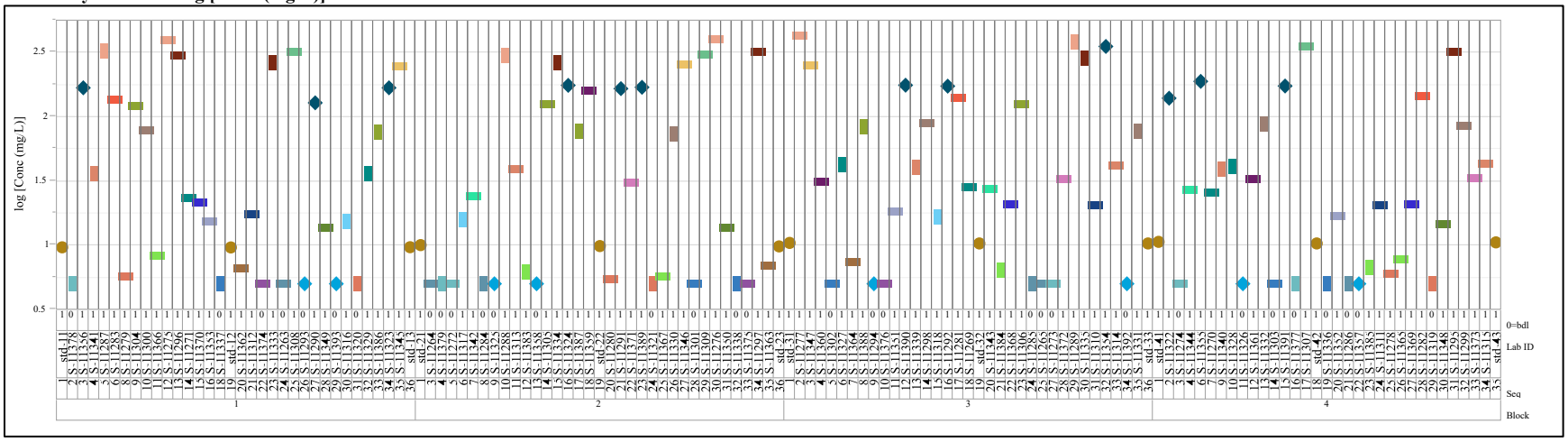
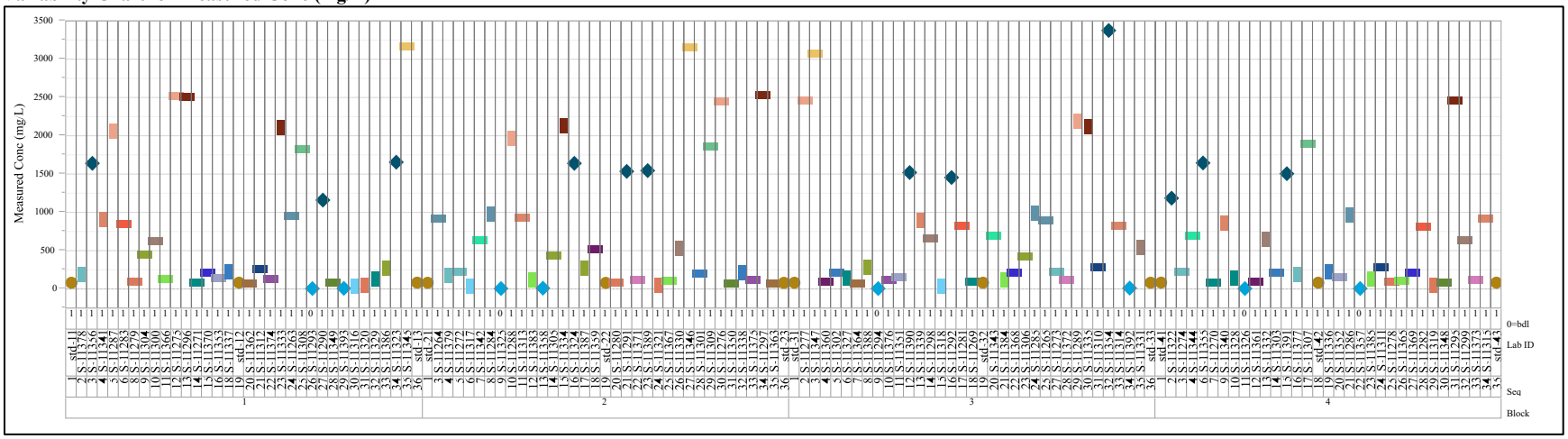


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Na
Variability Chart for Measured Conc (mg/L)



Analyte=Na
Variability Chart for log [Conc (mg/L)]

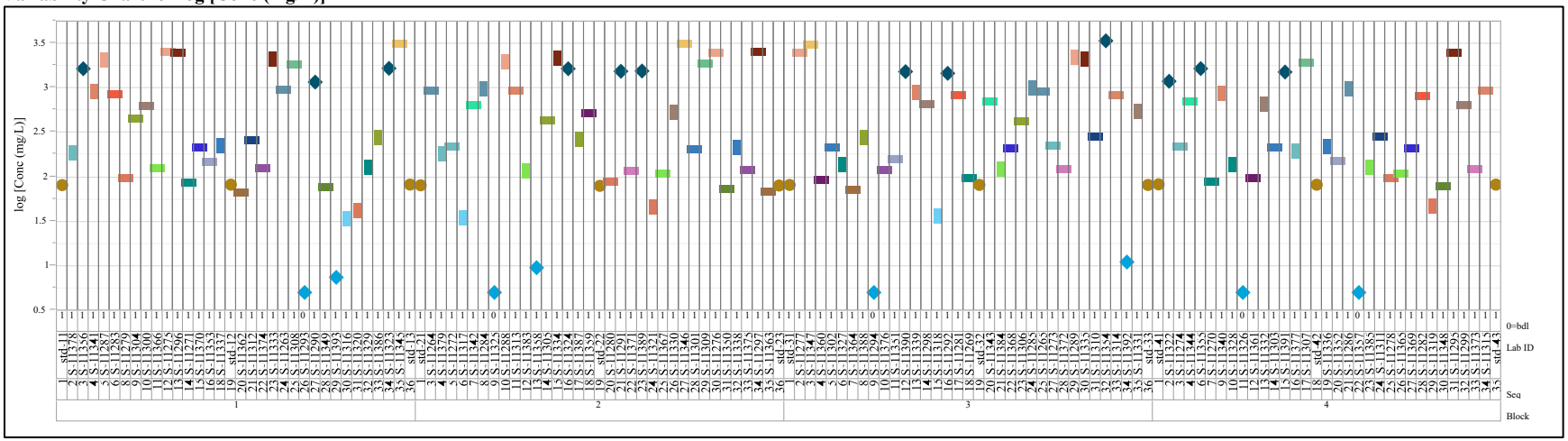
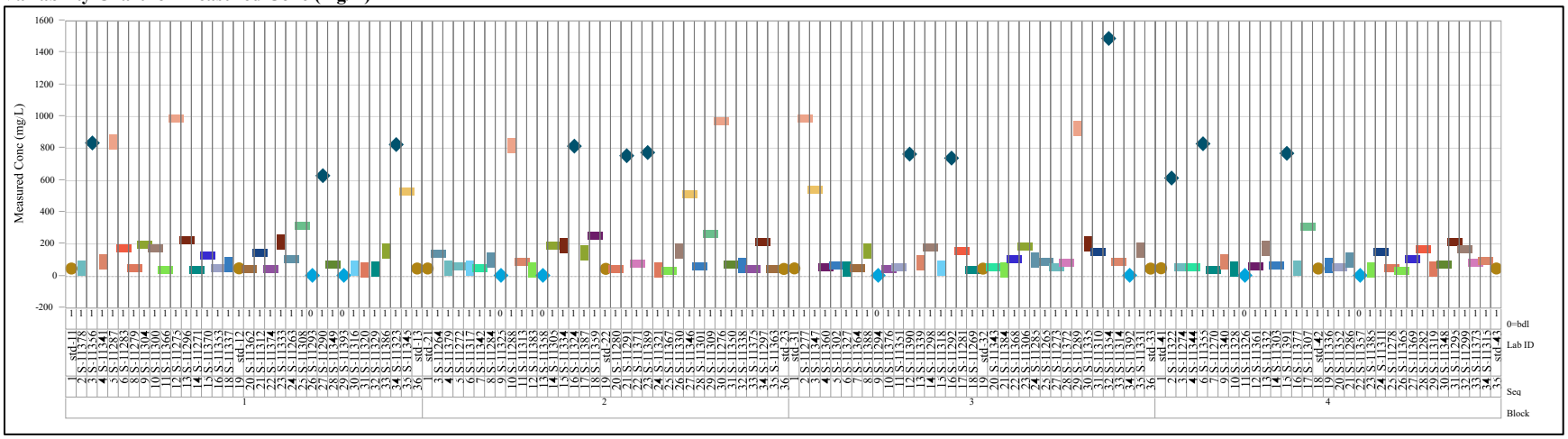


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Si
Variability Chart for Measured Conc (mg/L)



Analyte=Si
Variability Chart for log [Conc (mg/L)]

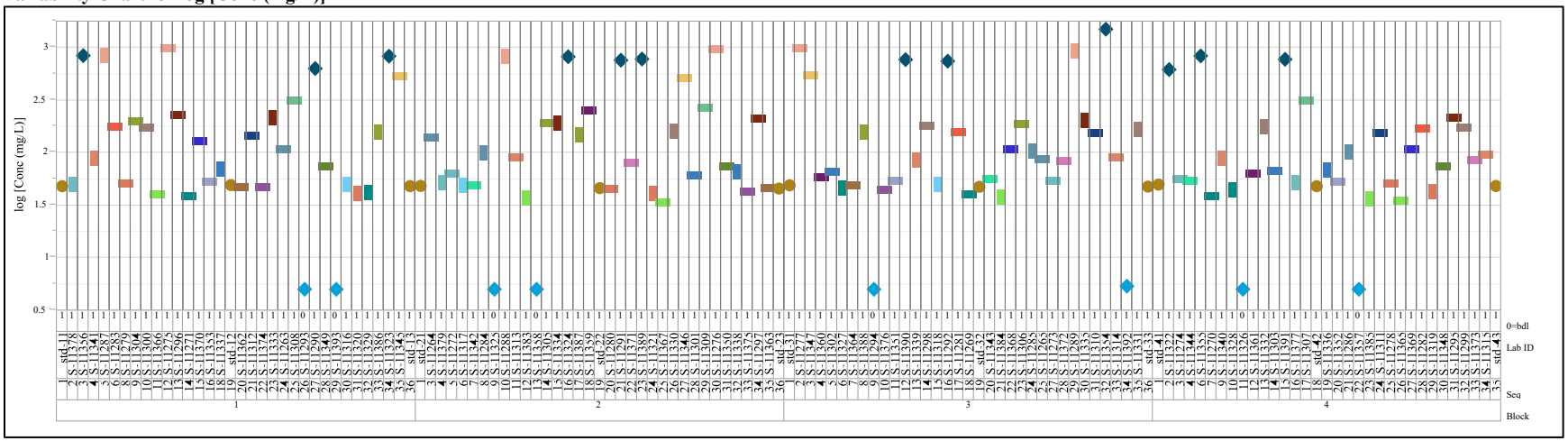
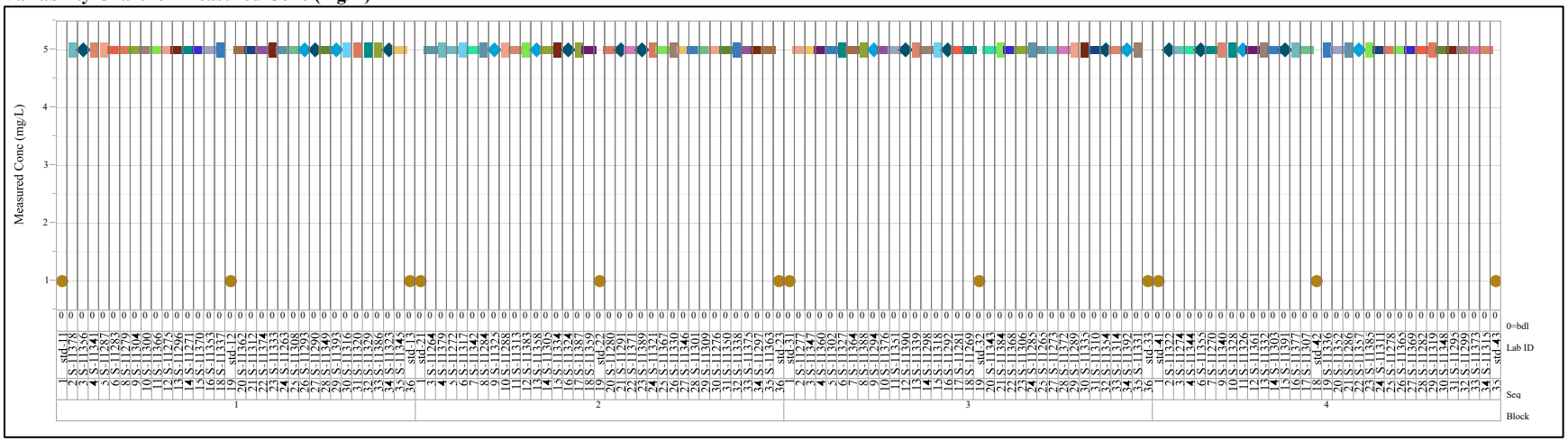


Exhibit A-1. Set 1 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Zr
Variability Chart for Measured Conc (mg/L)



Analyte=Zr
Variability Chart for log [Conc (mg/L)]

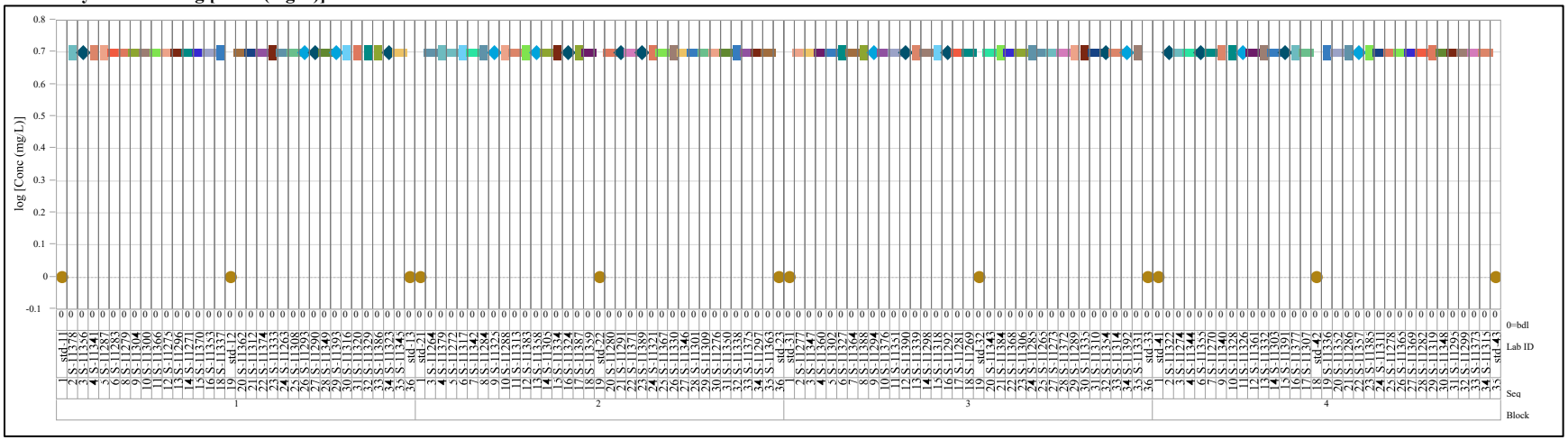
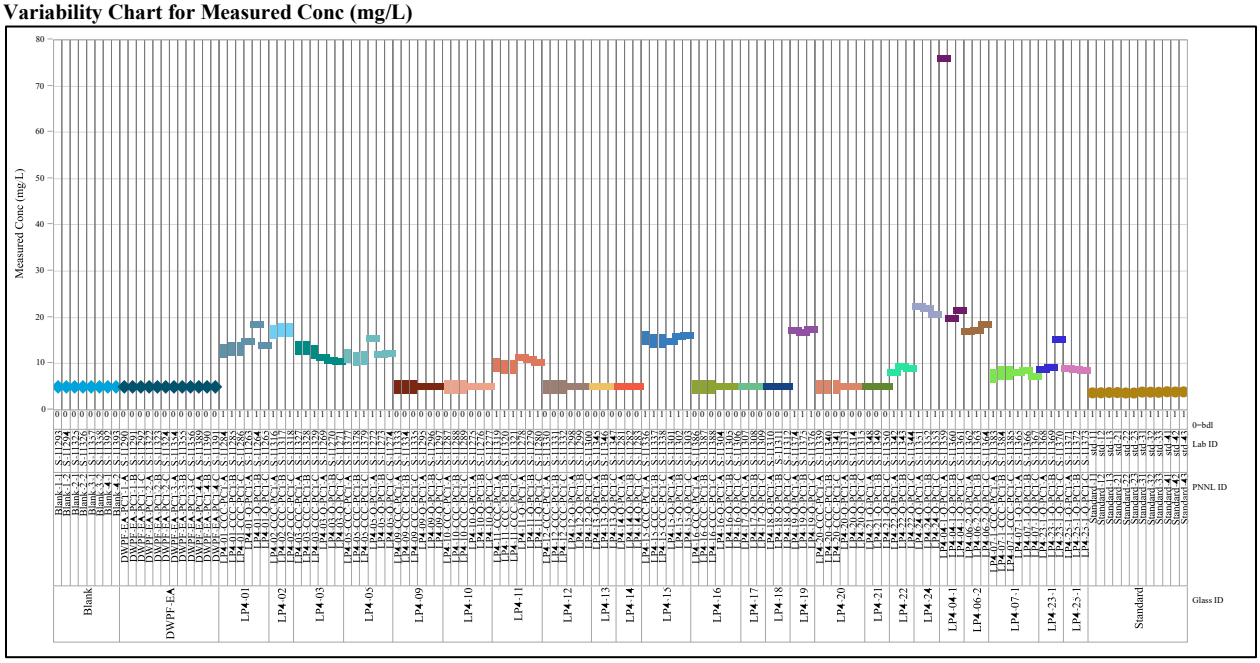


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID

Analyte=Al
Variability Chart for Measured Conc (mg/L)



Analyte=Al
Variability Chart for log [Conc (mg/L)]

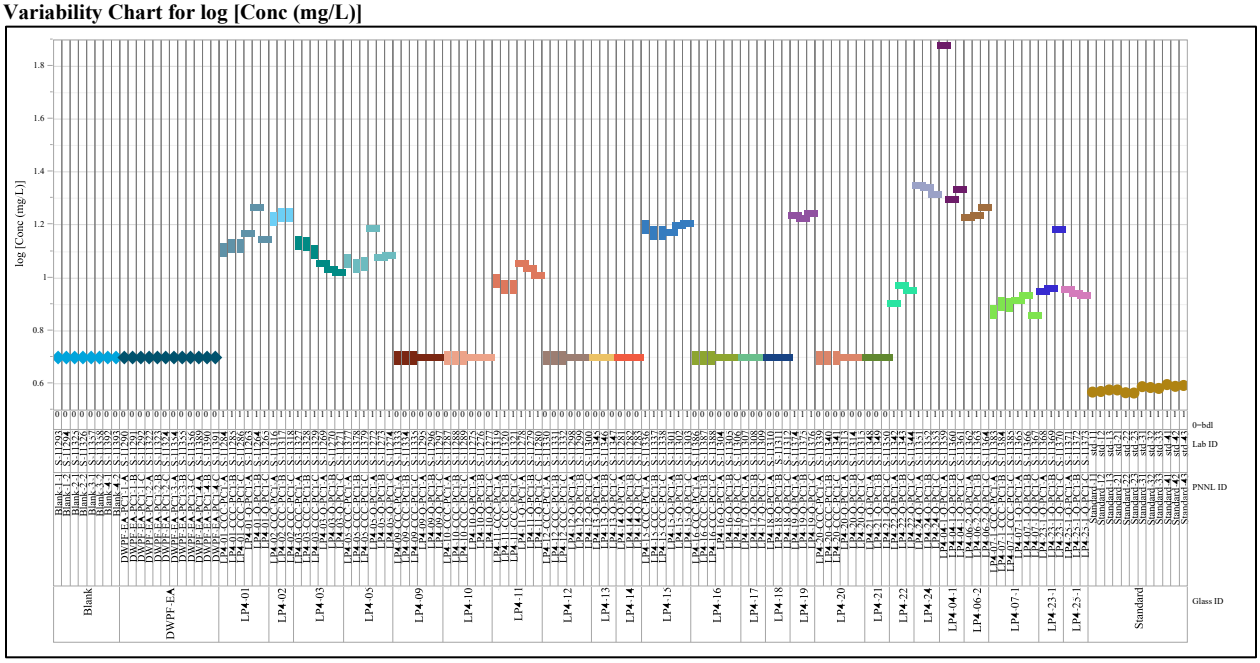
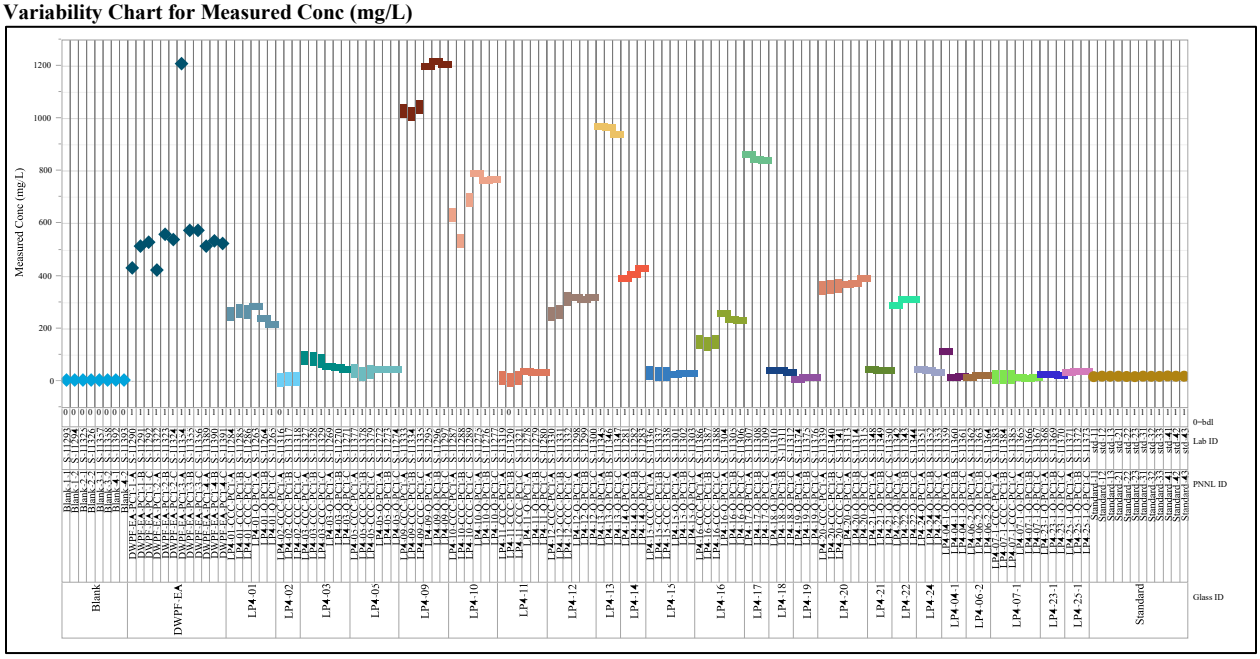


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=B
Variability Chart for Measured Conc (mg/L)



Analyte=B
Variability Chart for log [Conc (mg/L)]

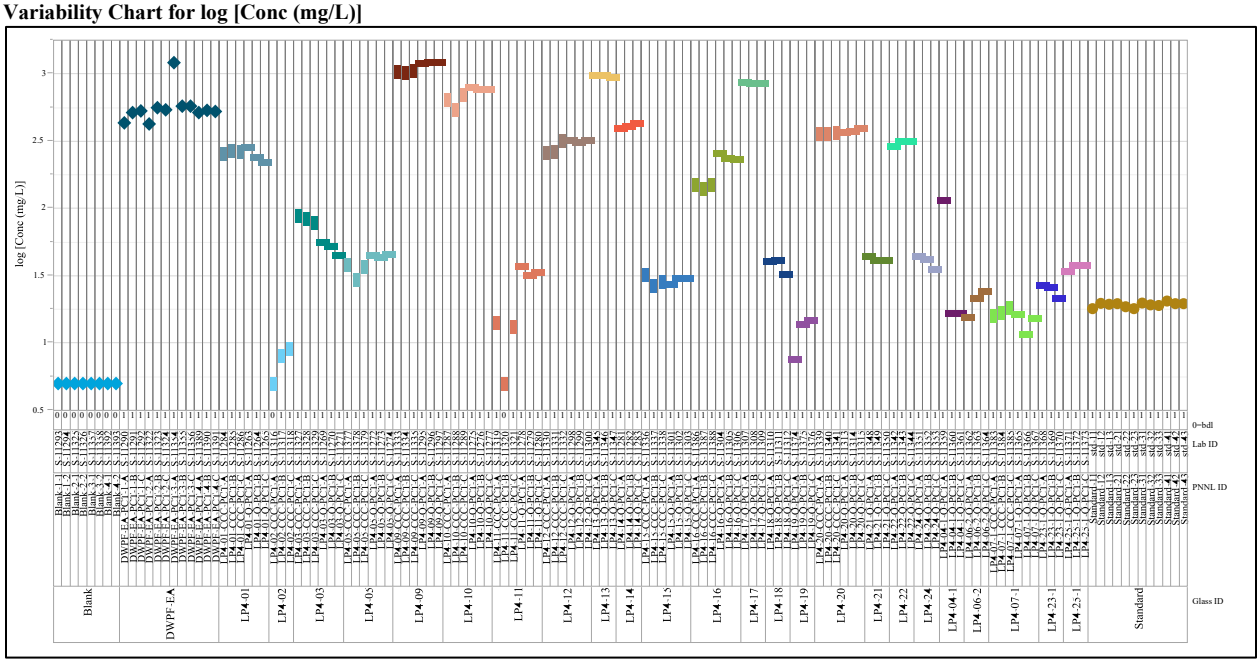
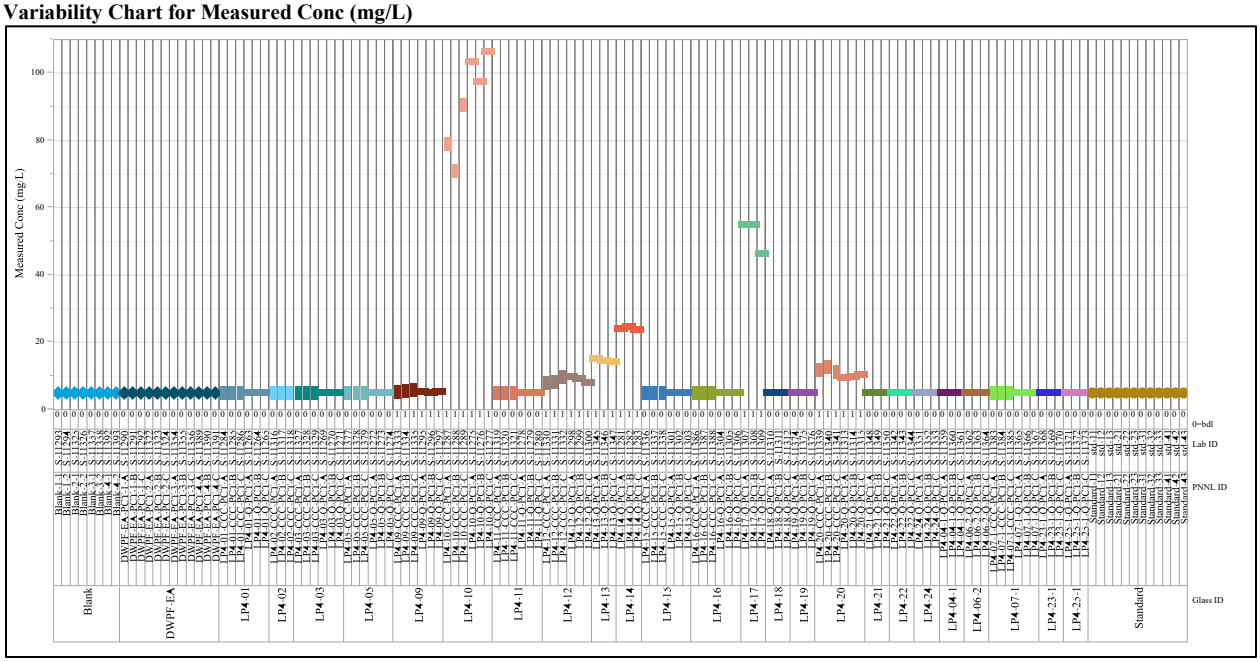


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=Cr
Variability Chart for Measured Conc (mg/L)



Analyte=Cr
Variability Chart for log [Conc (mg/L)]

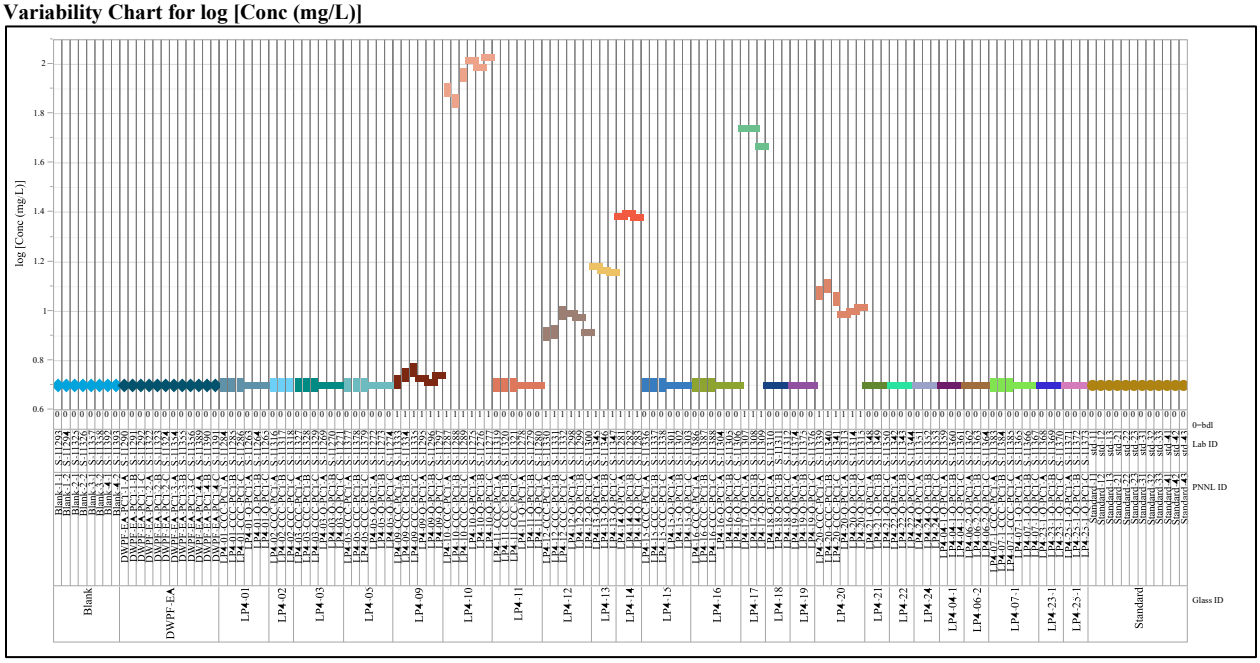
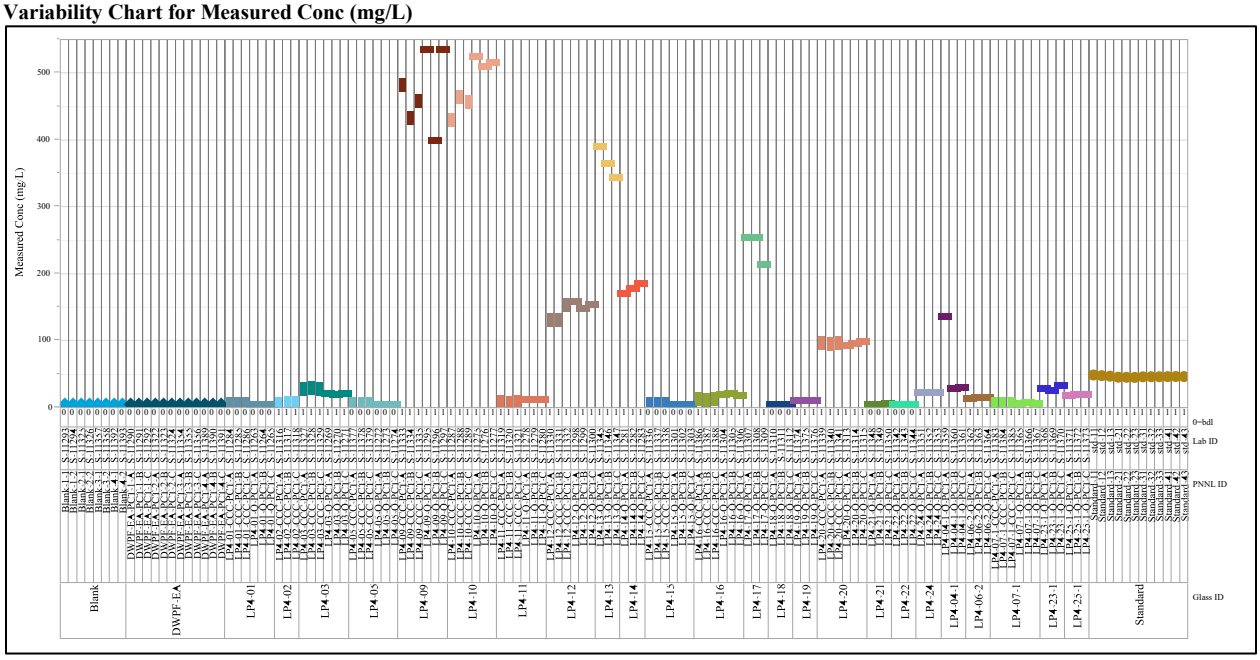


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=K
Variability Chart for Measured Conc (mg/L)



Analyte=K
Variability Chart for log [Conc (mg/L)]

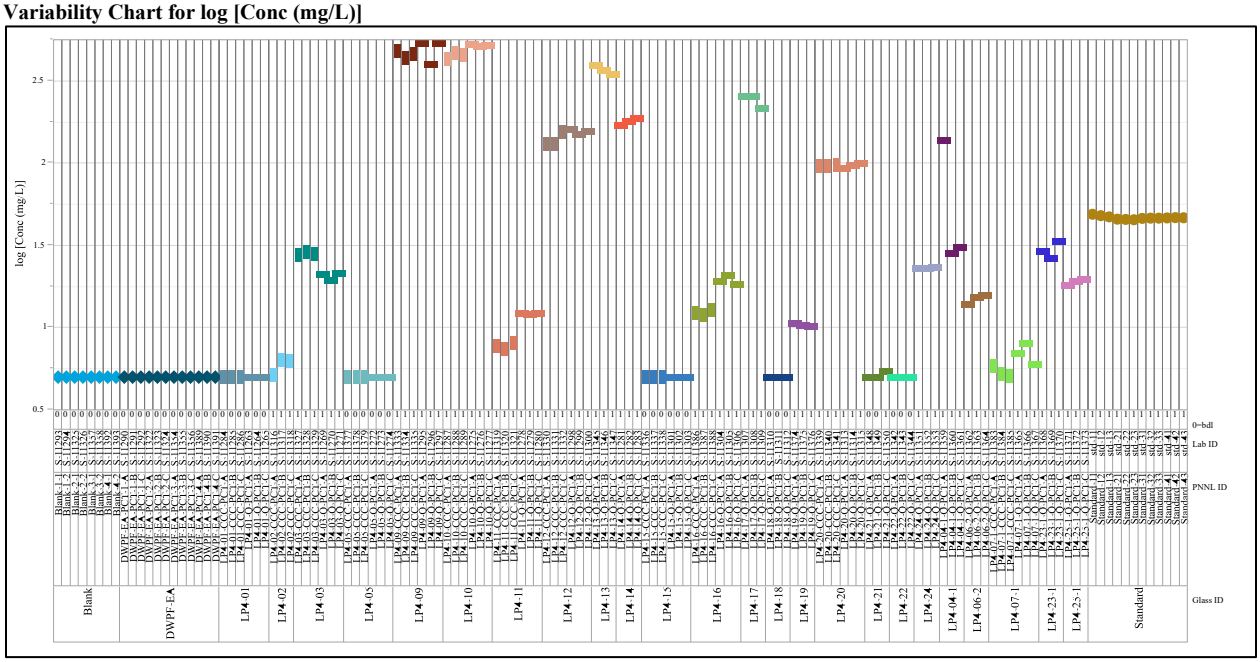
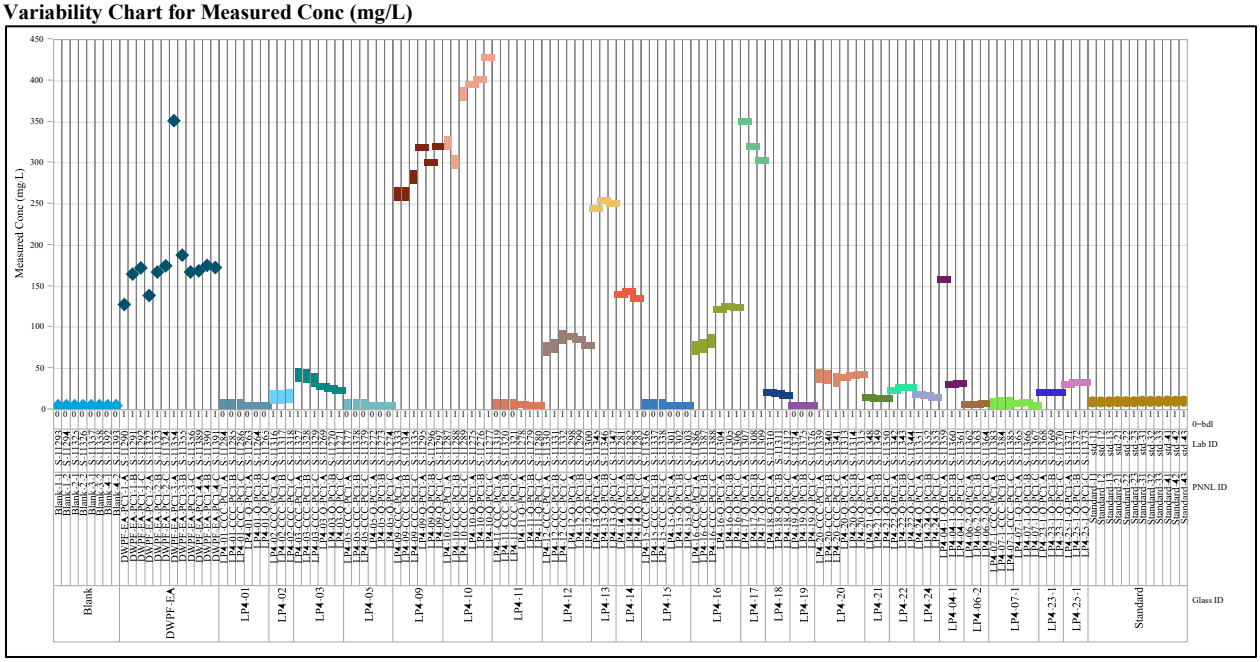


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=Li
Variability Chart for Measured Conc (mg/L)



Analyte=Li
Variability Chart for log [Conc (mg/L)]

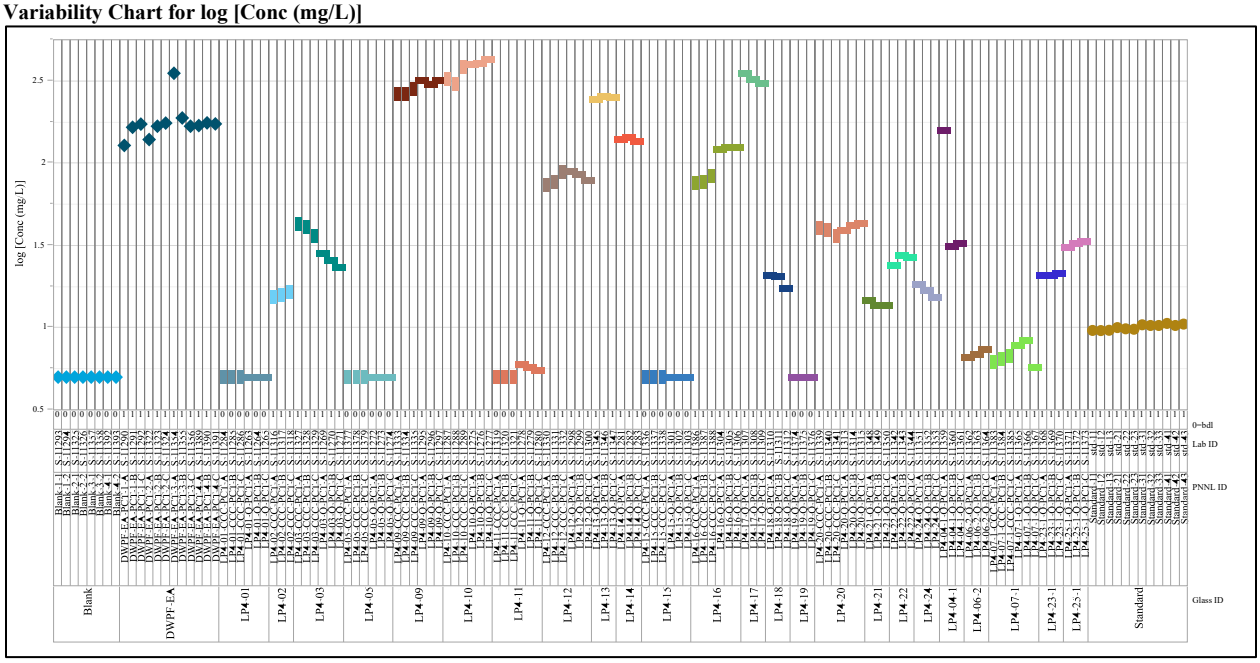
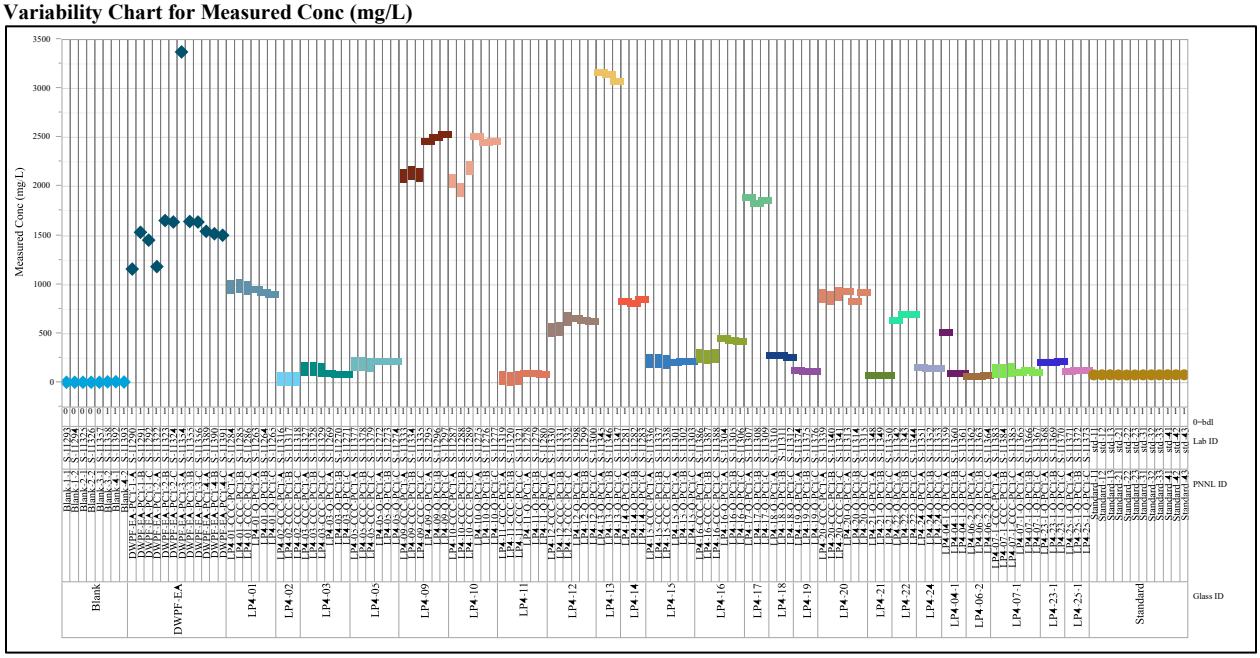


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=Na
Variability Chart for Measured Conc (mg/L)



Analyte=Na
Variability Chart for log [Conc (mg/L)]

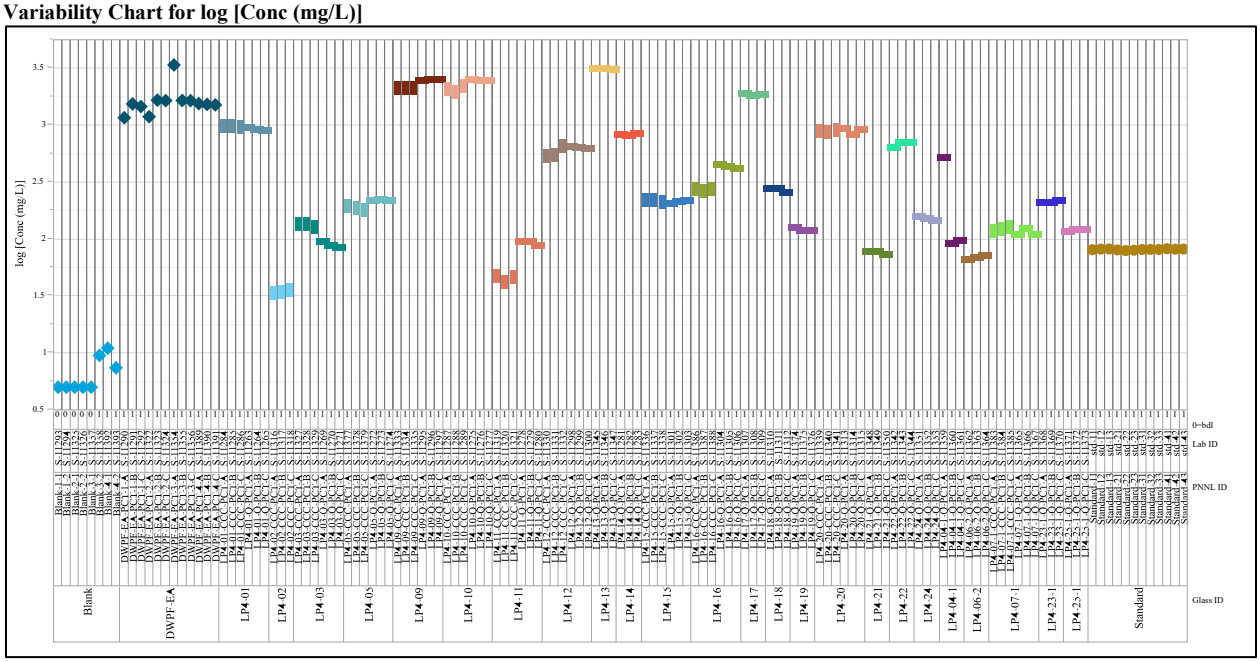
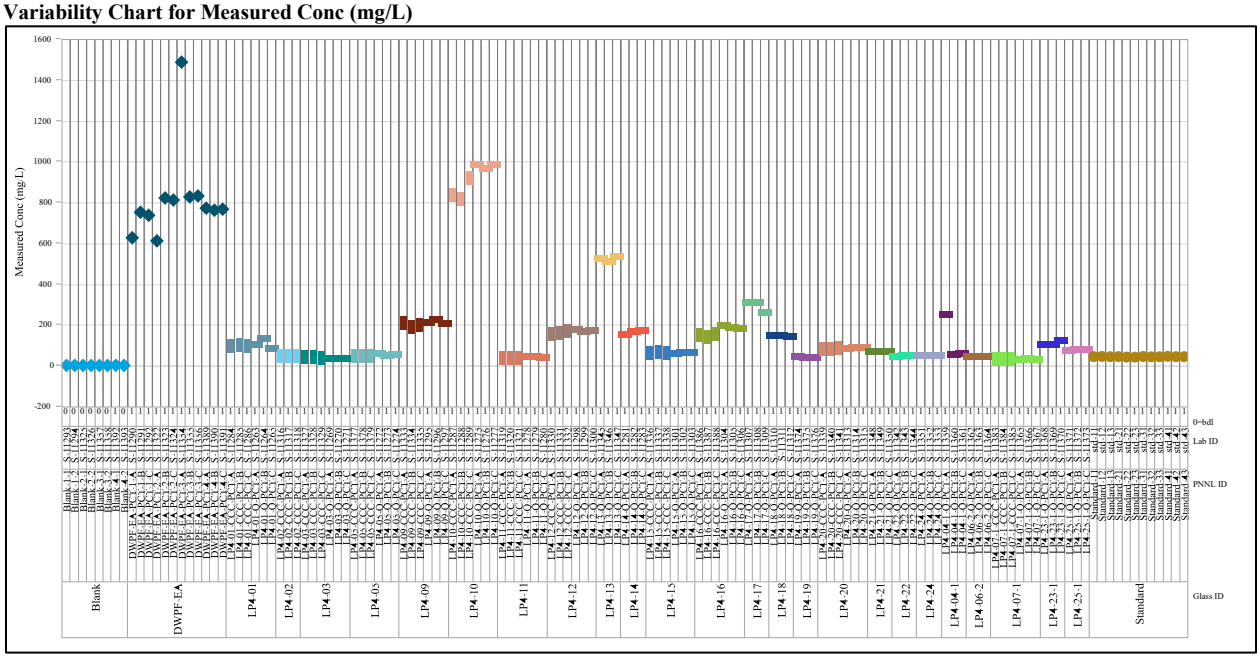


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=Si
Variability Chart for Measured Conc (mg/L)



Analyte=Si
Variability Chart for log [Conc (mg/L)]

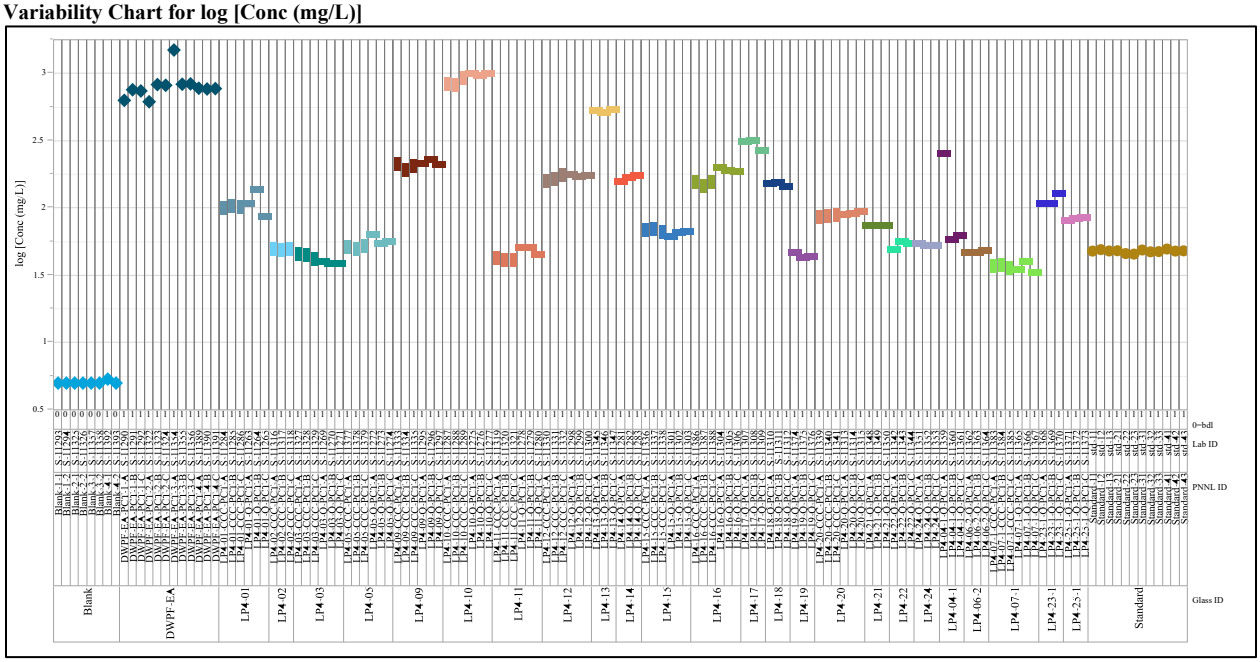
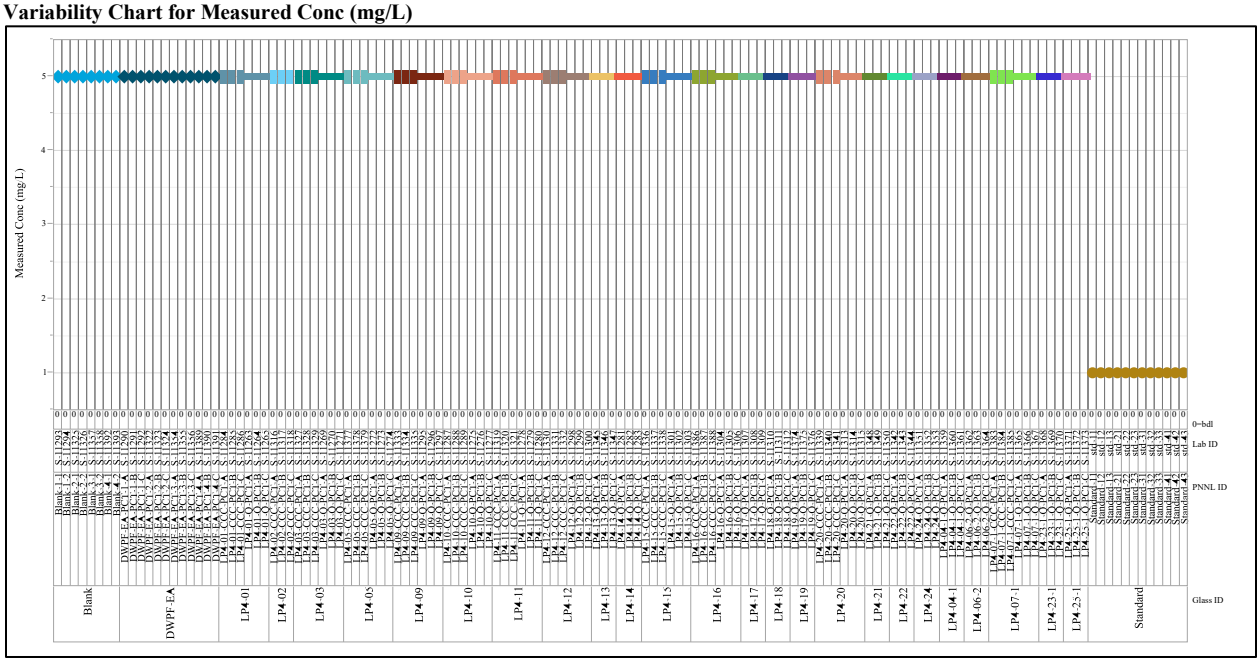
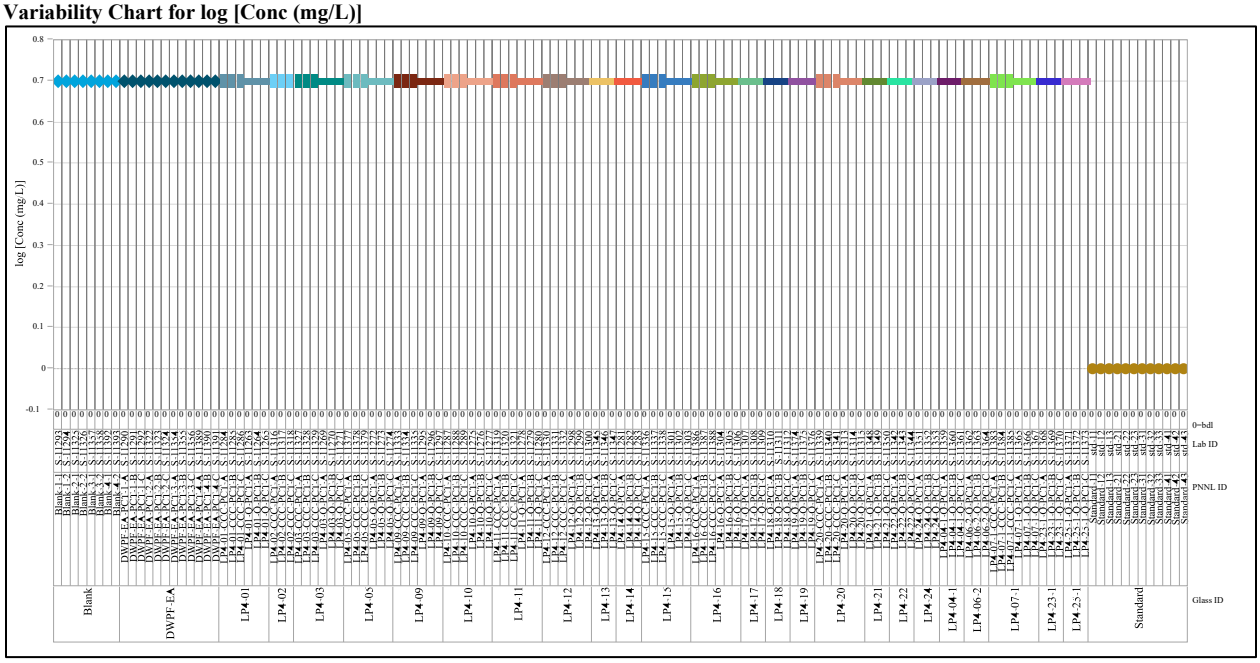


Exhibit A-2. Set 1 PCT Leachate Measurements by Glass ID (continued)

Analyte=Zr
Variability Chart for Measured Conc (mg/L)



Analyte=Zr
Variability Chart for log [Conc (mg/L)]



Appendix B. Tables and Exhibits Supporting Analysis of the Set 2 PCT Leachates

Table B-1. Set 2 PCT Leachate Measurements in Analytical Sequence

PNNL Solution ID	Lab ID	Block	Seq	Al (ar)	B (ar)	Cr (ar)	K (ar)	Li (ar)	Na (ar)	Si (ar)	Zr (ar)	Dil. Fac.	Al (mg/L)*	B (mg/L)*	Cr (mg/L)*	K (mg/L)*	Li (mg/L)*	Na (mg/L)*	Si (mg/L)*	Zr (mg/L)*
Standard	std-11	1	1	3.92	19.8	<1.00	9.09	11.0	83.2	49.1	<1.00	1	3.92	19.8	5.00	45.5	11.0	83.2	49.1	1.00
LP4-02-Q-PCT-B	S-11472	1	2	3.35	1.53	<1.00	<1.00	2.47	6.49	9.69	<1.00	5	16.8	7.65	5.00	5.00	12.4	32.5	48.5	5.00
DWPF-EA-PCT-5-B	S-11467	1	3	<1.00	105	<1.00	<1.00	36.3	305	159	<1.00	5	5.00	525	5.00	5.00	182	1525	795	5.00
LP4-13-CCC-PCT-B	S-11484	1	4	<1.00	107	1.54	39.8	33.9	357	81.6	<1.00	5	5.00	535	7.70	199	170	1785	408	5.00
Blank-5-2	S-11470	1	5	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-23-1-CCC-PCT-B	S-11458	1	6	1.48	5.16	<1.00	5.20	4.70	42.4	21.7	<1.00	5	7.40	25.8	5.00	26.0	23.5	212	109	5.00
LP4-22-CCC-PCT-B	S-11455	1	7	2.11	31.7	<1.00	<1.00	3.28	74.6	10.6	<1.00	5	10.6	159	5.00	5.00	16.4	373	53.0	5.00
LP4-08-1-CCC-PCT-B	S-11481	1	8	4.15	1.60	<1.00	3.01	2.23	19.6	13.2	<1.00	5	20.8	8.00	5.00	15.1	11.2	98.0	66.0	5.00
LP4-17-CCC-PCT-B	S-11443	1	9	<1.00	73.6	4.11	20.5	31.3	157	49.9	<1.00	5	5.00	368	20.6	103	157	785	250	5.00
LP4-08-1-Q-PCT-B	S-11475	1	10	4.48	1.93	<1.00	3.35	2.24	23.2	14.7	<1.00	5	22.4	9.65	5.00	16.8	11.2	116	73.5	5.00
Standard	std-12	1	11	3.72	18.6	<1.00	10.3	10.9	80.0	47.1	<1.00	1	3.72	18.6	5.00	51.5	10.9	80.0	47.1	1.00
LP4-25-1-CCC-PCT-B	S-11464	1	12	<1.00	5.45	<1.00	2.38	5.21	19.7	13.3	<1.00	5	5.00	27.3	5.00	11.9	26.1	98.5	66.5	5.00
LP4-18-CCC-PCT-B	S-11446	1	13	<1.00	5.80	<1.00	<1.00	3.36	45.4	24.4	<1.00	5	5.00	29.0	5.00	5.00	16.8	227	122	5.00
LP4-19-CCC-PCT-B	S-11449	1	14	3.41	5.62	<1.00	2.81	<1.00	36.0	9.44	<1.00	5	17.1	28.1	5.00	14.1	5.00	180	47.2	5.00
LP4-04-1-CCC-PCT-B	S-11478	1	15	2.99	8.48	<1.00	8.86	13.4	30.1	18.5	<1.00	5	15.0	42.4	5.00	44.3	67.0	151	92.5	5.00
LP4-06-2-CCC-PCT-B	S-11437	1	16	3.07	3.77	<1.00	1.93	<1.00	11.8	8.37	<1.00	5	15.4	18.9	5.00	9.65	5.00	59	41.9	5.00
LP4-14-CCC-PCT-B	S-11440	1	17	<1.00	33.1	1.90	13.0	12.8	69.9	22.4	<1.00	5	5.00	166	9.50	65.0	64.0	350	112	5.00
LP4-24-CCC-PCT-B	S-11461	1	18	3.22	16.2	<1.00	5.91	6.84	49.2	13.3	<1.00	5	16.1	81.0	5.00	29.6	34.2	246	66.5	5.00
LP4-21-CCC-PCT-B	S-11452	1	19	<1.00	8.71	<1.00	<1.00	3.03	15.3	14.6	<1.00	5	5.00	43.6	5.00	5.00	15.2	76.5	73.0	5.00
DWPF-EA-PCT-6-B	S-11487	1	20	<1.00	64.0	<1.00	<1.00	23.5	186	111	<1.00	5	5.00	320	5.00	5.00	118	930	555	5.00
Standard	std-13	1	21	3.72	18.1	<1.00	9.97	10.7	82.1	47.1	<1.00	1	3.72	18.1	5.00	49.9	10.7	82.1	47.1	1.00
Standard	std-21	2	1	3.76	20.1	<1.00	9.00	10.6	78.4	50.1	<1.00	1	3.76	20.1	5.00	45.0	10.6	78.4	50.1	1.00
LP4-08-1-CCC-PCT-A	S-11480	2	2	4.30	2.01	<1.00	3.71	2.35	19.7	13.9	<1.00	5	21.5	10.1	5.00	18.6	11.8	98.5	69.5	5.00
Blank-5-1	S-11469	2	3	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-14-CCC-PCT-A	S-11439	2	4	<1.00	34.4	1.99	16.5	13.9	70.5	23.8	<1.00	5	5.00	172	9.95	82.5	69.5	353	119	5.00
LP4-13-CCC-PCT-A	S-11483	2	5	<1.00	109	1.52	43.2	34.7	347	84.4	<1.00	5	5.00	545	7.60	216	174	1735	422	5.00
LP4-25-1-CCC-PCT-A	S-11463	2	6	<1.00	5.45	<1.00	2.89	5.26	18.2	13.1	<1.00	5	5.00	27.3	5.00	14.5	26.3	91.0	65.5	5.00
LP4-23-1-CCC-PCT-A	S-11457	2	7	1.49	5.68	<1.00	5.81	4.81	41.7	22.2	<1.00	5	7.45	28.4	5.00	29.1	24.1	209	111	5.00
LP4-04-1-CCC-PCT-A	S-11477	2	8	3.08	8.95	<1.00	10.6	14.0	29.0	18.7	<1.00	5	15.4	44.8	5.00	53.0	70.0	145	93.5	5.00
LP4-22-CCC-PCT-A	S-11454	2	9	2.14	33.5	<1.00	<1.00	3.39	74.1	10.9	<1.00	5	10.7	168	5.00	5.00	17.0	371	54.5	5.00
LP4-18-CCC-PCT-A	S-11445	2	10	<1.00	6.26	<1.00	<1.00	3.48	43.7	25.3	<1.00	5	5.00	31.3	5.00	5.00	17.4	219	127	5.00
Standard	std-22	2	11	3.89	19.6	<1.00	9.39	10.9	80.8	48.4	<1.00	1	3.89	19.6	5.00	47.0	10.9	80.8	48.4	1.00
LP4-08-1-Q-PCT-A	S-11474	2	12	4.64	2.30	<1.00	4.01	2.36	23.0	15.3	<1.00	5	23.2	11.5	5.00	20.1	11.8	115	76.5	5.00
LP4-21-CCC-PCT-A	S-11451	2	13	<1.00	9.36	<1.00	<1.00	3.30	15.2	15.4	<1.00	5	5.00	46.8	5.00	5.00	16.5	76.0	77.0	5.00
LP4-02-Q-PCT-A	S-11471	2	14	3.45	1.90	<1.00	1.33	2.66	6.91	10.2	<1.00	5	17.3	9.50	5.00	6.65	13.3	34.6	51.0	5.00
DWPF-EA-PCT-6-A	S-11486	2	15	<1.00	61.8	<1.00	<1.00	23.4	183	109	<1.00	5	5.00	309	5.00	5.00	117	915	545	5.00
LP4-17-CCC-PCT-A	S-11442	2	16	<1.00	74.4	4.25	22.7	32.3	159	50.6	<1.00	5	5.00	372	21.3	114	162	795	253	5.00
LP4-24-CCC-PCT-A	S-11460	2	17	3.21	16.3	<1.00	6.99	7.06	46.9	13.3	<1.00	5	16.1	81.5	5.00	35.0	35.3	235	66.5	5.00
DWPF-EA-PCT-5-A	S-11466	2	18	<1.00	106	<1.00	<1.00	36.6	300	159	<1.00	5	5.00	530	5.00	5.00	183	1500	795	5.00
LP4-19-CCC-PCT-A	S-11448	2	19	3.45	6.09	<1.00	3.47	<1.00	35.0	9.65	<1.00	5	17.3	30.5	5.00	17.4	5.00	175	48.3	5.00
LP4-06-2-CCC-PCT-A	S-11436	2	20	3.07	4.30	<1.00	2.48	<1.00	11.8	8.36	<1.00	5	15.4	21.5	5.00	12.4	5.00	59.0	41.8	5.00
Blank-6-2	S-11490	2	21	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Standard	std-23	2	22	3.80	19.5	<1.00	9.07	10.7	79.9	47.9	<1.00	1	3.80	19.5	5.00	45.4	10.7	79.9	47.9	1.00
Standard	std-31	3	1	3.91	19.8	<1.00	9.62	10.7	81.5	48.9	<1.00	1	3.91	19.8	5.00	48.1	10.7	81.5	48.9	1.00
LP4-13-CCC-PCT-C	S-11485	3	2	<1.00	111	1.58	44.7	34.1	352	85.0	<1.00	5	5.00	555	7.90	224	171	1760	425	5.00
LP4-23-1-CCC-PCT-C	S-11459	3	3	1.50	5.62	<1.00	5.88	4.63	41.2	22.7	<1.00	5	7.50	28.1	5.00	29.4	23.2	206	114	5.00
LP4-21-CCC-PCT-C	S-11453	3	4	<1.00	9.38	<1.00	<1.00	3.20	15.0	15.4	<1.00	5	5.00	46.9	5.00	5.00	16.0	75.0	77.0	5.00
LP4-25-1-CCC-PCT-C	S-11465	3	5	<1.00	5.45	<1.00	2.93	5.04	17.9	13.0	<1.00	5	5.00	27.3	5.00	14.7	25.2	89.5	65.0	5.00
LP4-02-Q-PCT-C	S-11473	3	6	3.28	1.88	<1.00	1.26	2.51	6.66	9.77	<1.00	5	16.4	9.40	5.00	6.30	12.6	33.3	48.9	5.00
DWPF-EA-PCT-6-C	S-11488	3	7	<1.00	65.3	<1.00	<1.00	24.3	189	112	<1.00	5	5.00	327	5.00	5.00	122	945	560	5.00

ar = as received measurements prior to correction for dilution factor (Dil. Fac)

* = dilution corrected values

Table B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

PNNL Solution ID	Lab ID	Block	Seq	Al (ar)	B (ar)	Cr (ar)	K (ar)	Li (ar)	Na (ar)	Si (ar)	Zr (ar)	Dil. Fac.	Al (mg/L)*	B (mg/L)*	Cr (mg/L)*	K (mg/L)*	Li (mg/L)*	Na (mg/L)*	Si (mg/L)*	Zr (mg/L)*
LP4-08-1-CCC-PCT-C	S-11482	3	8	4.31	2.02	<1.00	3.60	2.28	19.7	14.3	<1.00	5	21.6	10.1	5.00	18.0	11.4	98.5	71.5	5.00
LP4-06-2-CCC-PCT-C	S-11438	3	9	3.08	4.07	<1.00	2.40	<1.00	11.2	8.39	<1.00	5	15.4	20.4	5.00	12.0	5.00	56.0	42.0	5.00
LP4-08-1-Q-PCT-C	S-11476	3	10	4.52	2.22	<1.00	3.92	2.20	22.5	15.1	<1.00	5	22.6	11.1	5.00	19.6	11.0	113	75.5	5.00
Standard	std-32	3	11	3.84	19.4	<1.00	9.37	10.4	80.3	48.6	<1.00	1	3.84	19.4	5.00	46.9	10.4	80.3	48.6	1.00
LP4-18-CCC-PCT-C	S-11447	3	12	<1.00	6.03	<1.00	<1.00	3.30	43.2	24.5	<1.00	5	5.00	30.2	5.00	5.00	16.5	216	123	5.00
Blank-6-1	S-11489	3	13	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
LP4-19-CCC-PCT-C	S-11450	3	14	3.39	6.26	<1.00	3.44	<1.00	35.9	9.84	<1.00	5	17.0	31.3	5.00	17.2	5.00	180	49.2	5.00
LP4-04-1-CCC-PCT-C	S-11479	3	15	3.10	9.04	<1.00	10.8	13.8	29.4	19.2	<1.00	5	15.5	45.2	5.00	54.0	69.0	147	96.0	5.00
LP4-22-CCC-PCT-C	S-11456	3	16	2.17	33.6	<1.00	<1.00	3.32	74.8	11.1	<1.00	5	10.9	168	5.00	5.00	16.6	374	55.5	5.00
LP4-24-CCC-PCT-C	S-11462	3	17	3.27	17.4	<1.00	7.53	7.29	50.2	13.8	<1.00	5	16.4	87.0	5.00	37.7	36.5	251	69.0	5.00
LP4-14-CCC-PCT-C	S-11441	3	18	<1.00	36.1	2.20	24.8	15.0	70.5	23.5	<1.00	5	5.00	181	11.0	124	75.0	353	118	5.00
DWPF-EA-PCT-5-C	S-11468	3	19	<1.00	105	<1.00	<1.00	38.4	304	162	<1.00	5	5.00	525	5.00	5.00	192	1520	810	5.00
LP4-17-CCC-PCT-C	S-11444	3	20	<1.00	69.8	4.23	32.5	33.0	154	50.9	<1.00	5	5.00	349	21.2	163	165	770	255	5.00
Standard	std-33	3	21	3.77	20.0	<1.00	9.39	10.4	78.8	50.3	<1.00	1	3.77	20.0	5.00	47.0	10.4	78.8	50.3	1.00

ar = as received measurements prior to correction for dilution factor (Dil. Fac)

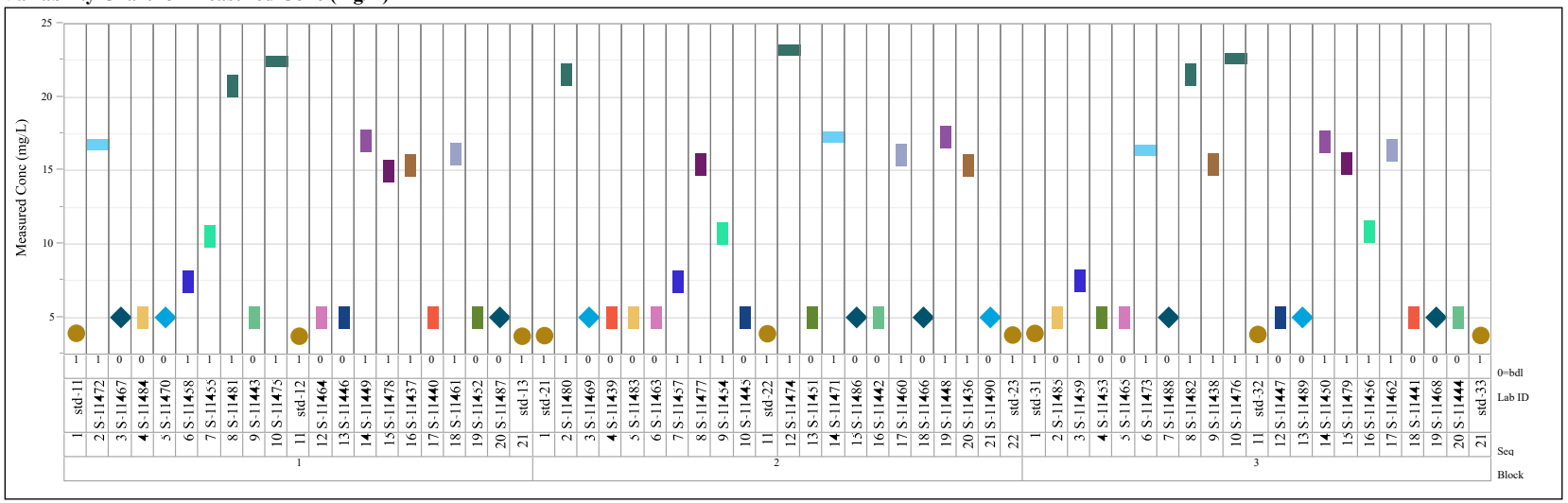
* = dilution corrected values

Table B-2. Results from Samples of the Multi-Element Solution Standard Included with the Set 2 PCT Leachates

Analytical Block	2-1	2-2	2-3	Reference Values (mg/L)
Mean (Al (mg/L))	3.79	3.82	3.84	4
Mean (B (mg/L))	18.83	19.73	19.73	20
Mean (K (mg/L))	9.79	9.15	9.46	10
Mean (Li (mg/L))	10.87	10.73	10.50	10
Mean (Na (mg/L))	81.77	79.70	80.20	81
Mean (Si (mg/L))	47.77	48.80	49.27	50
% relative bias, Al	-5.3%	-4.6%	-4.0%	<10% per ASTM C1285
% relative bias, B	-5.8%	-1.3%	-1.3%	
% relative bias, K	-2.1%	-8.5%	-5.4%	
% relative bias, Li	8.7%	7.3%	5.0%	
% relative bias, Na	0.9%	-1.6%	-1.0%	
% relative bias, Si	-4.5%	-2.4%	-1.5%	
Std Dev (Al (mg/L))	0.115	0.067	0.070	
Std Dev (B (mg/L))	0.874	0.321	0.306	
Std Dev (K (mg/L))	0.625	0.208	0.139	
Std Dev (Li (mg/L))	0.153	0.153	0.173	
Std Dev (Na (mg/L))	1.626	1.212	1.353	
Std Dev (Si (mg/L))	1.155	1.153	0.907	
%RSD (Al (mg/L))	3.0%	1.7%	1.8%	<10% per ASTM C1285
%RSD (B (mg/L))	4.6%	1.6%	1.5%	
%RSD (K (mg/L))	6.4%	2.3%	1.5%	
%RSD (Li (mg/L))	1.4%	1.4%	1.6%	
%RSD (Na (mg/L))	2.0%	1.5%	1.7%	
%RSD (Si (mg/L))	2.4%	2.4%	1.8%	

Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence

Analyte=Al
Variability Chart for Measured Conc (mg/L)



Analyte=Al
Variability Chart for log [Conc (mg/L)]

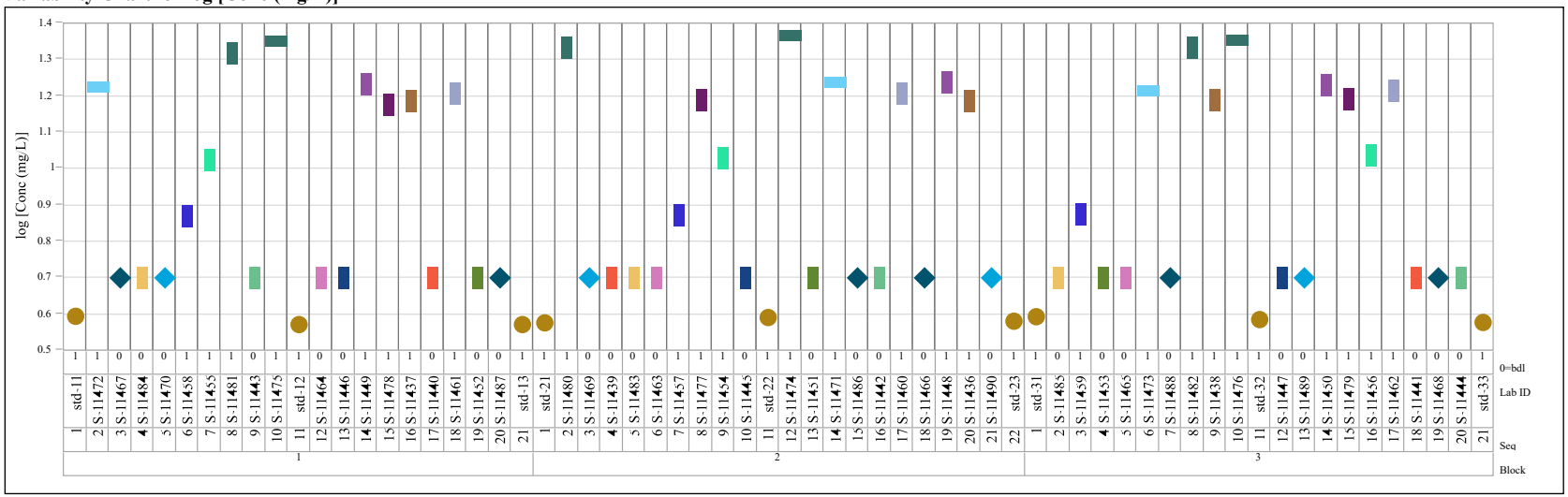
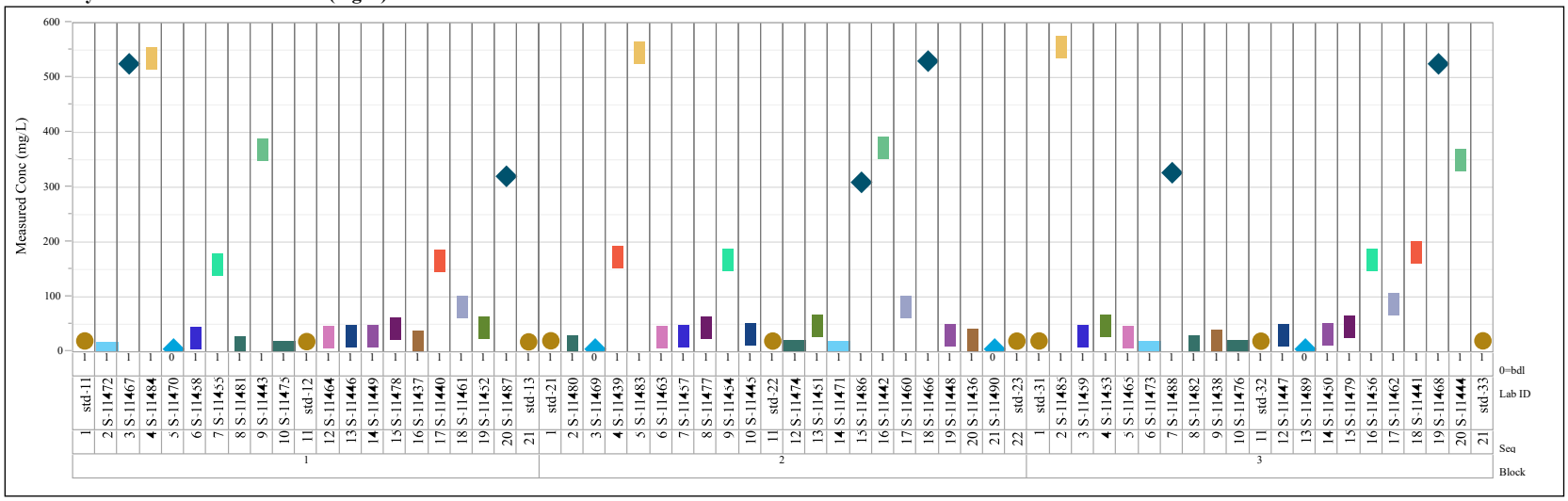


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=B
Variability Chart for Measured Conc (mg/L)



Analyte=B
Variability Chart for log [Conc (mg/L)]

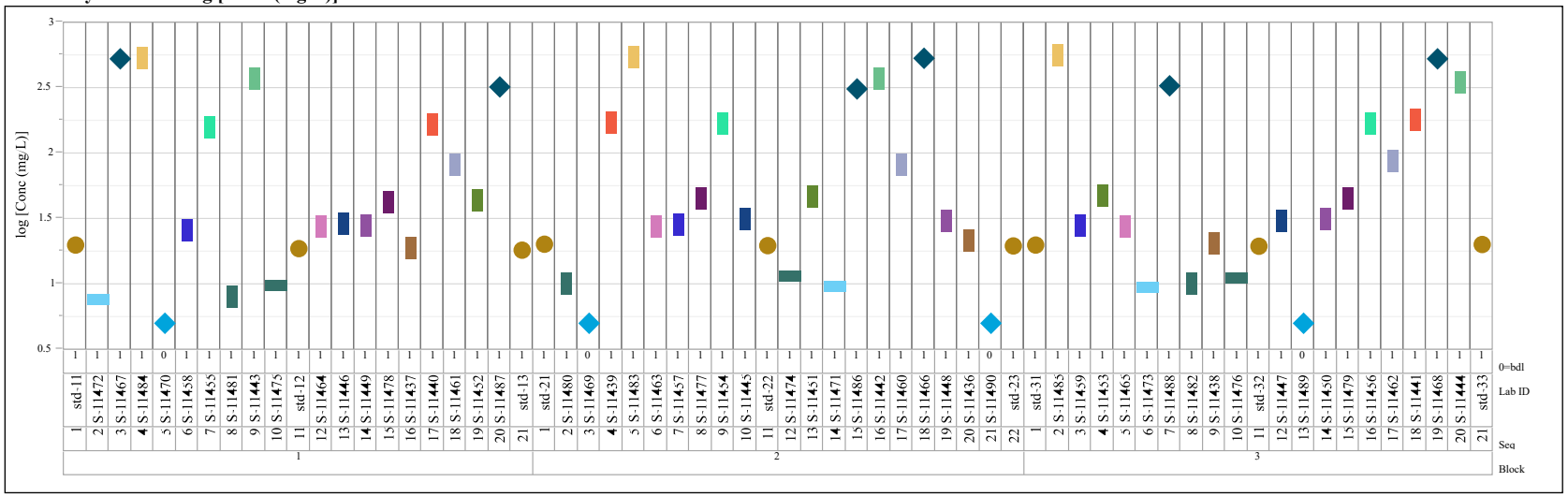
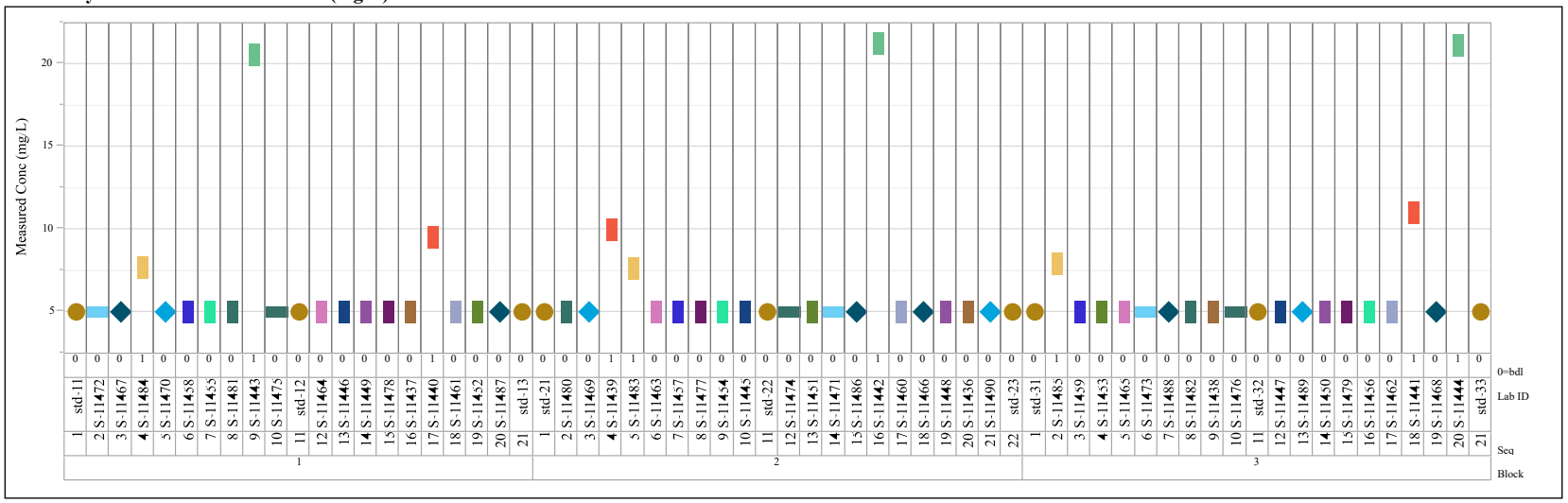


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Cr
Variability Chart for Measured Conc (mg/L)



Analyte=Cr
Variability Chart for log [Conc (mg/L)]

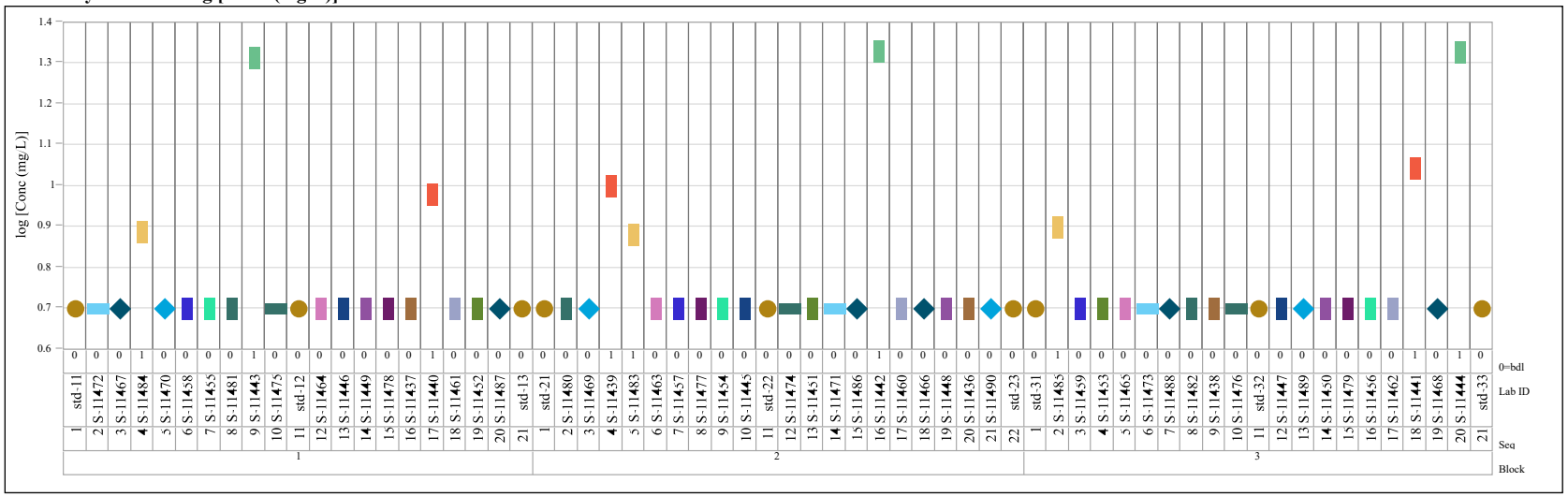
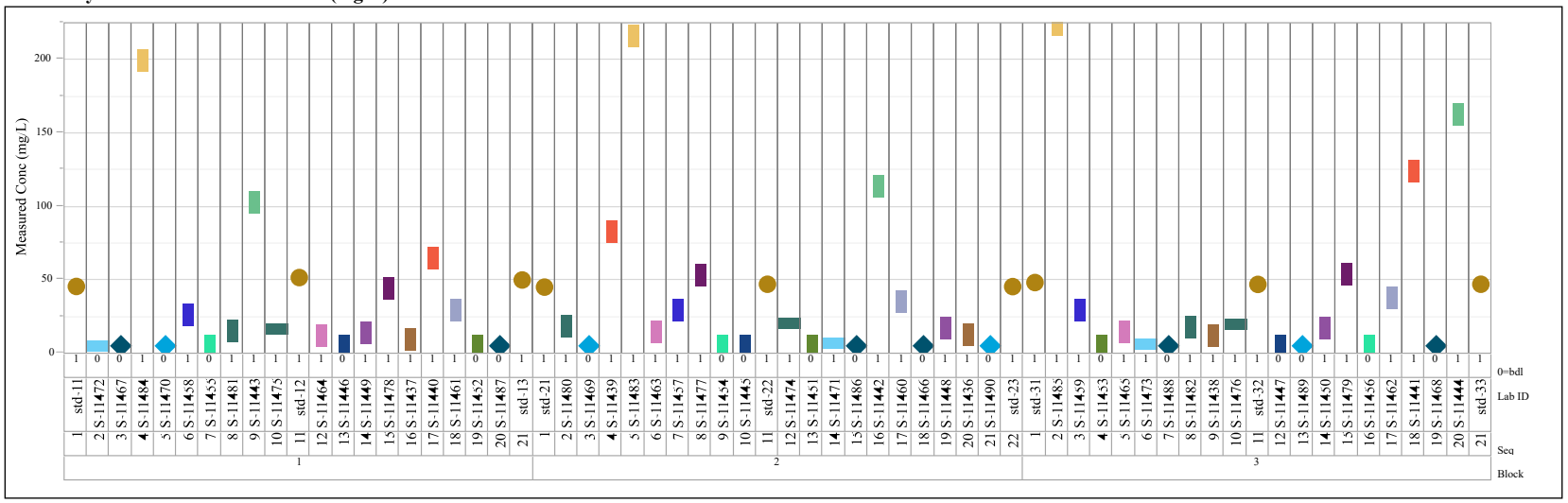


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=K
Variability Chart for Measured Conc (mg/L)



Analyte=K
Variability Chart for log [Conc (mg/L)]

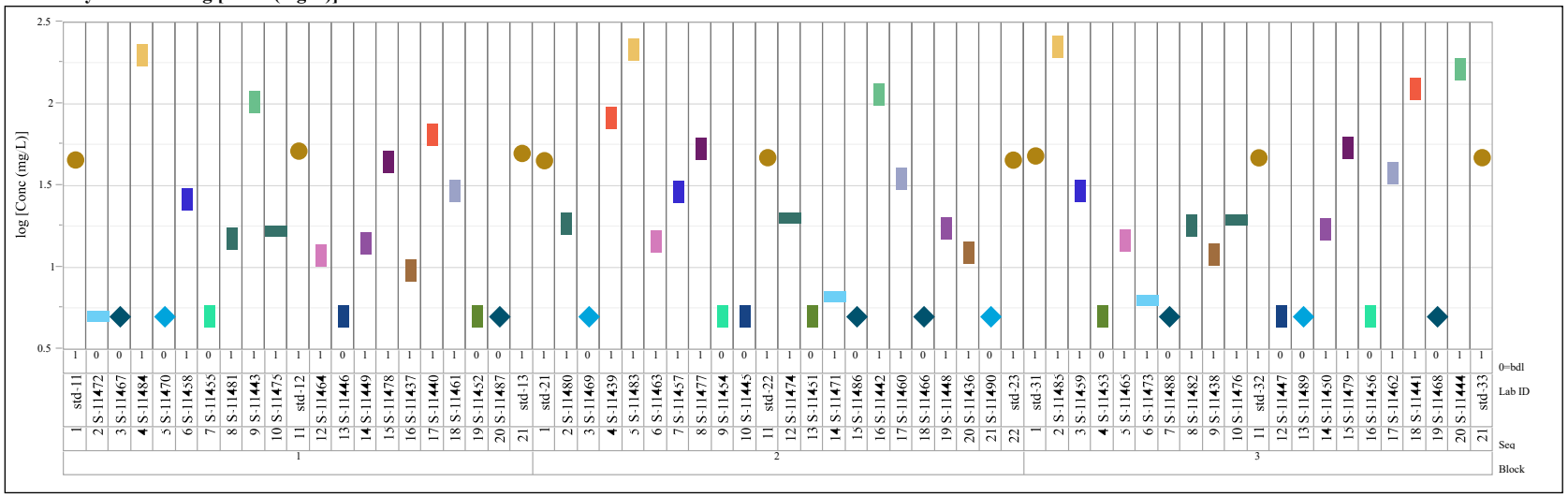
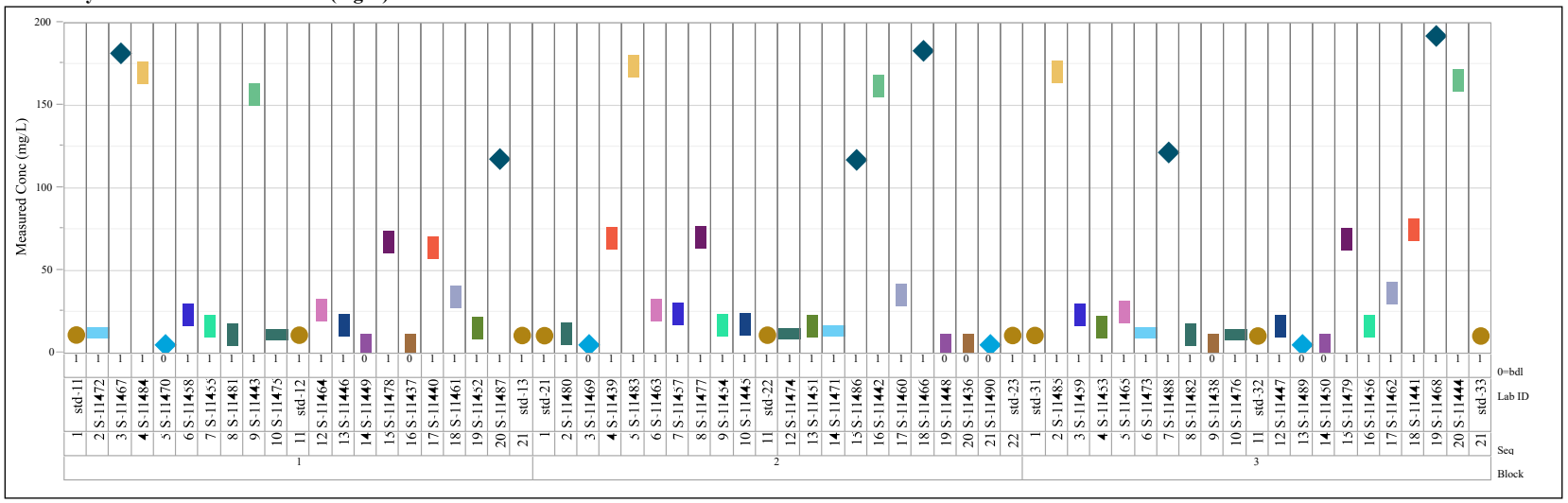


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Li
Variability Chart for Measured Conc (mg/L)



Analyte=Li
Variability Chart for log [Conc (mg/L)]

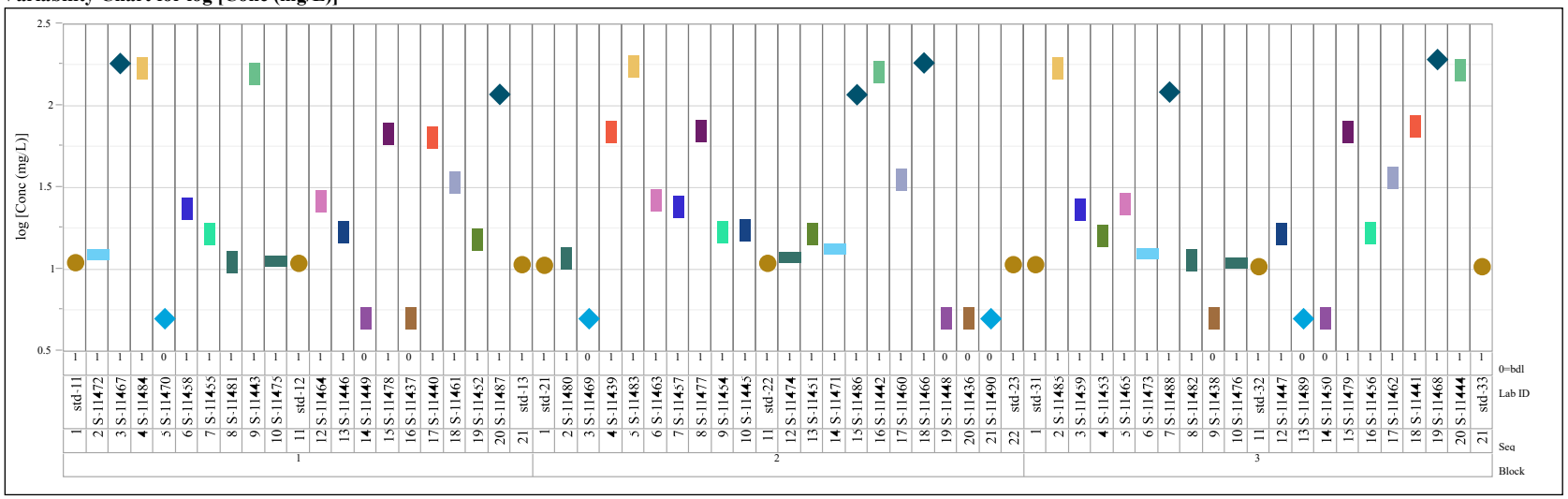
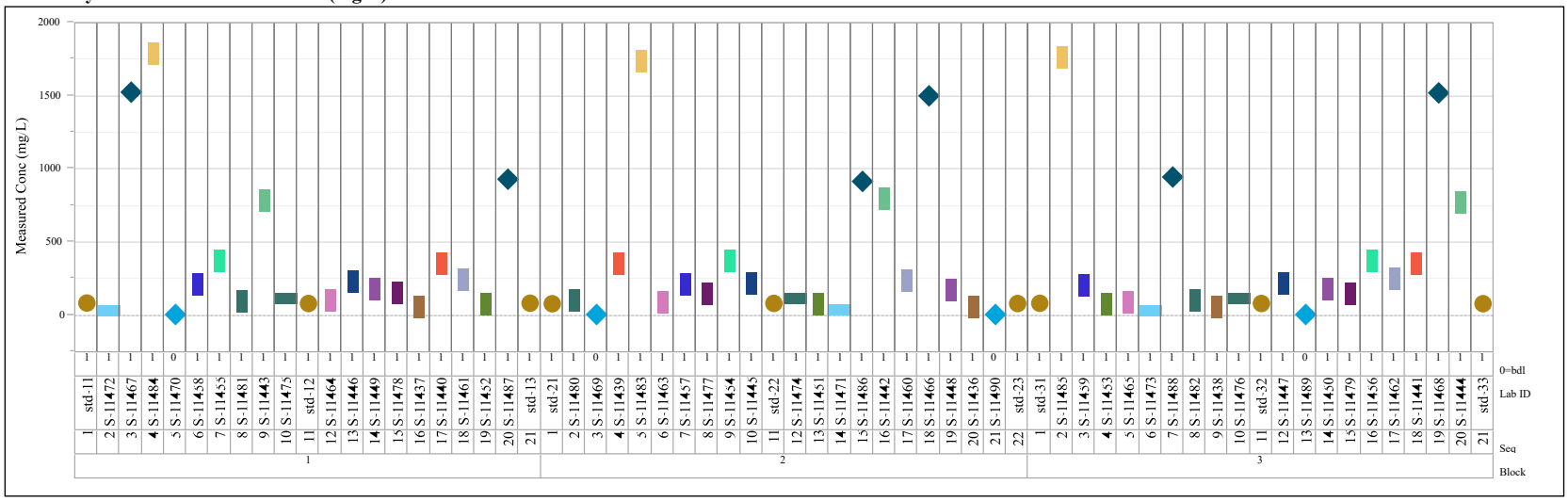


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Na
Variability Chart for Measured Conc (mg/L)



Analyte=Na
Variability Chart for log [Conc (mg/L)]

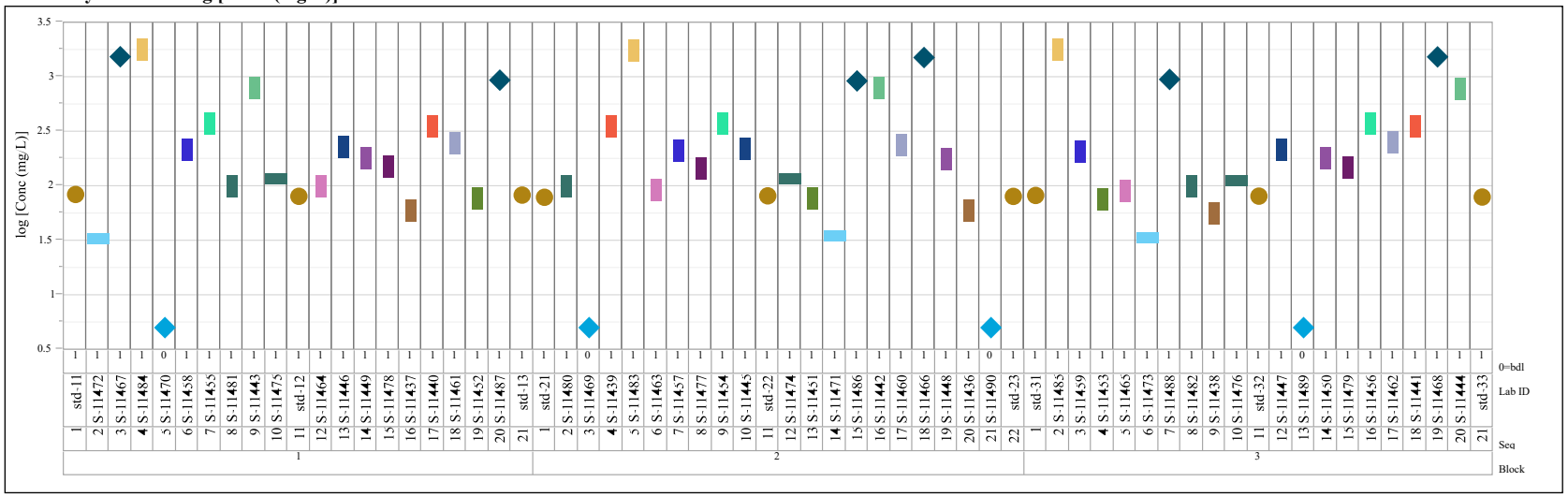
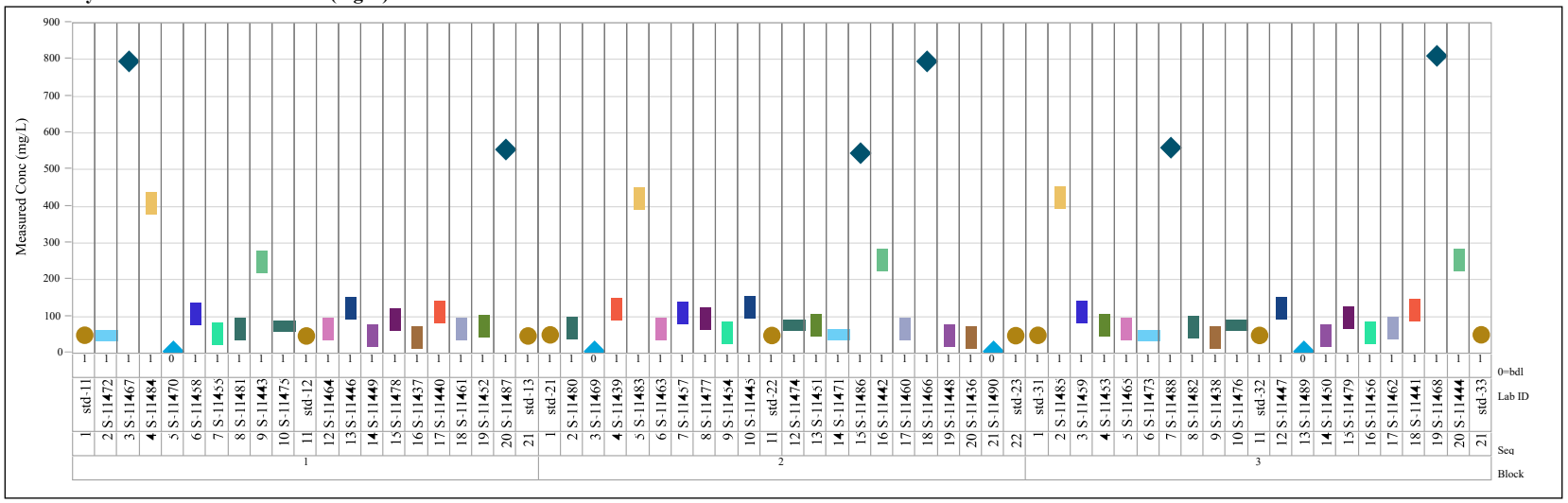


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Si
Variability Chart for Measured Conc (mg/L)



Analyte=Si
Variability Chart for log [Conc (mg/L)]

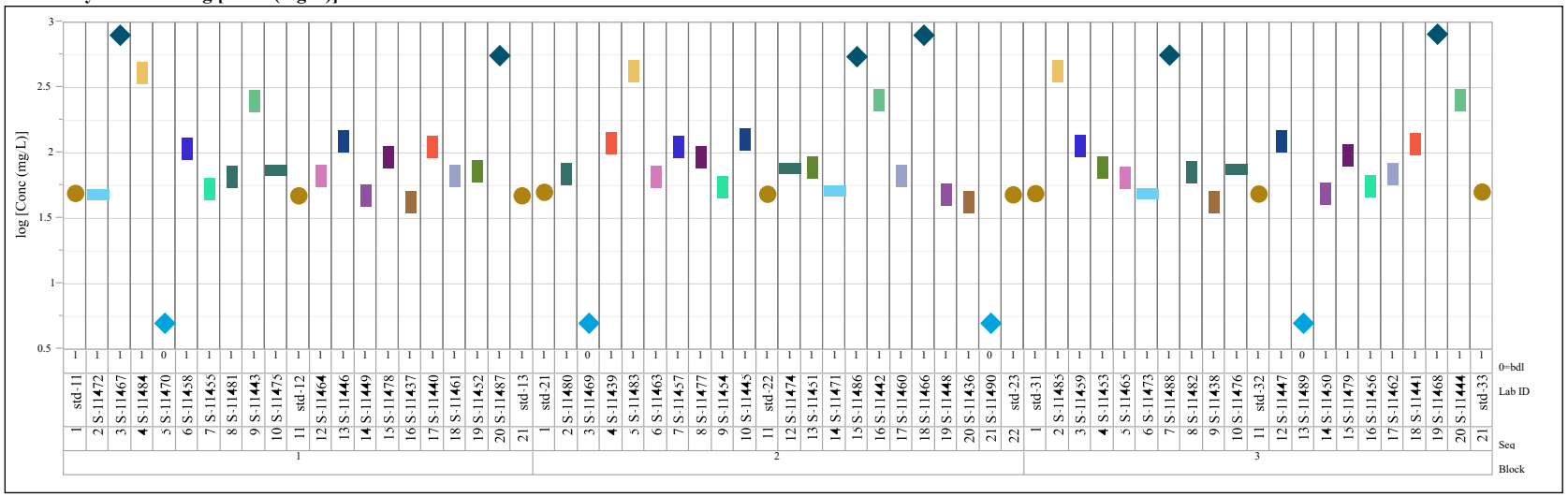
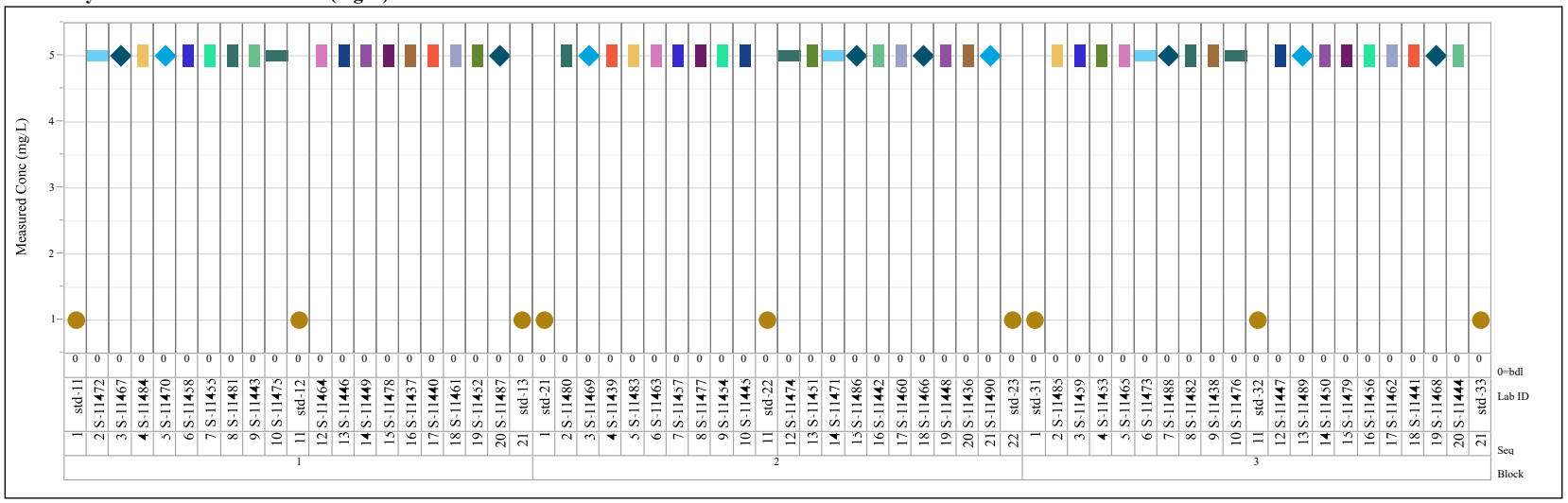


Exhibit B-1. Set 2 PCT Leachate Measurements in Analytical Sequence (continued)

Analyte=Zr
Variability Chart for Measured Conc (mg/L)



Analyte=Zr
Variability Chart for log [Conc (mg/L)]

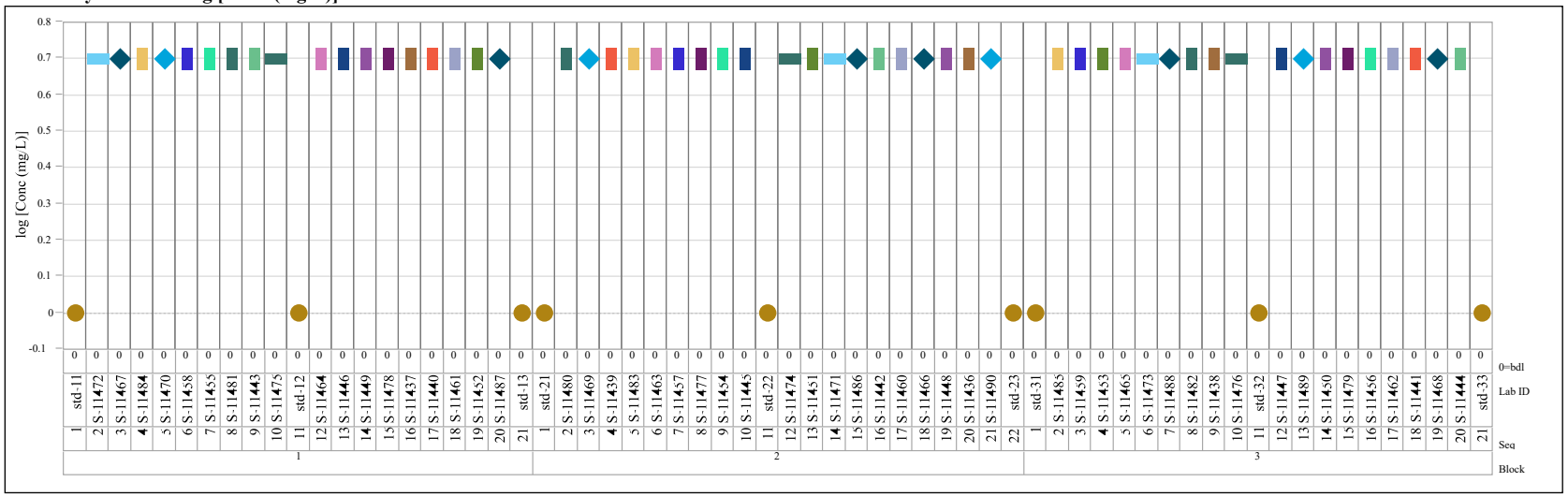
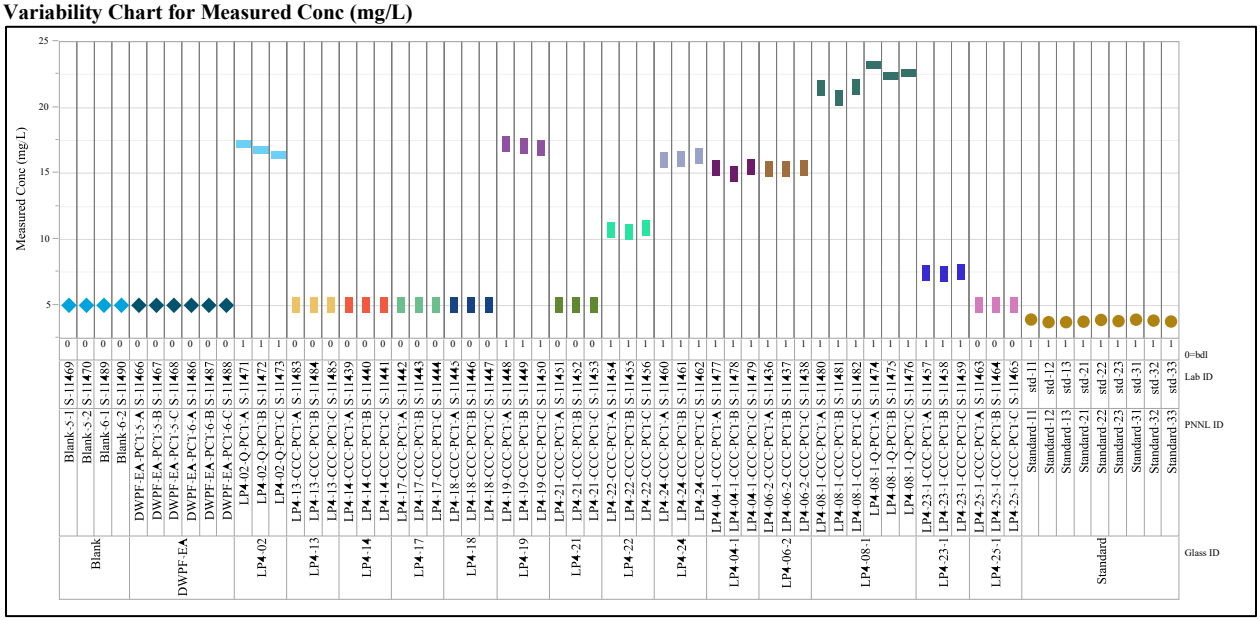


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID

Analyte=Al
Variability Chart for Measured Conc (mg/L)



Analyte=Al
Variability Chart for log [Conc (mg/L)]

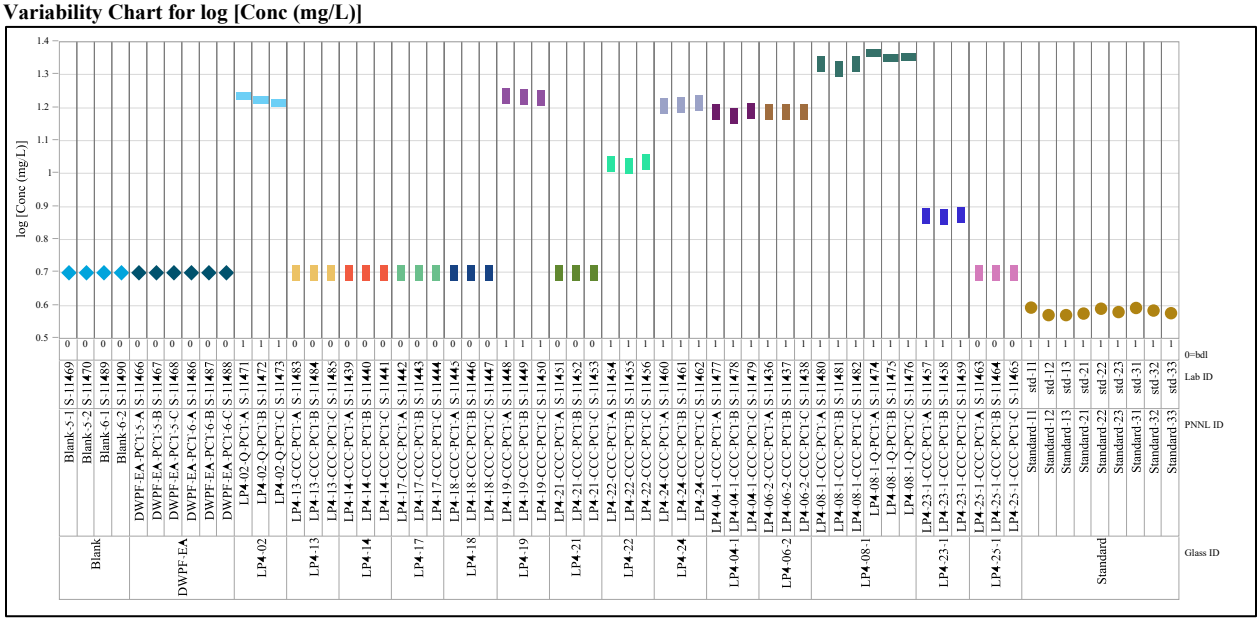
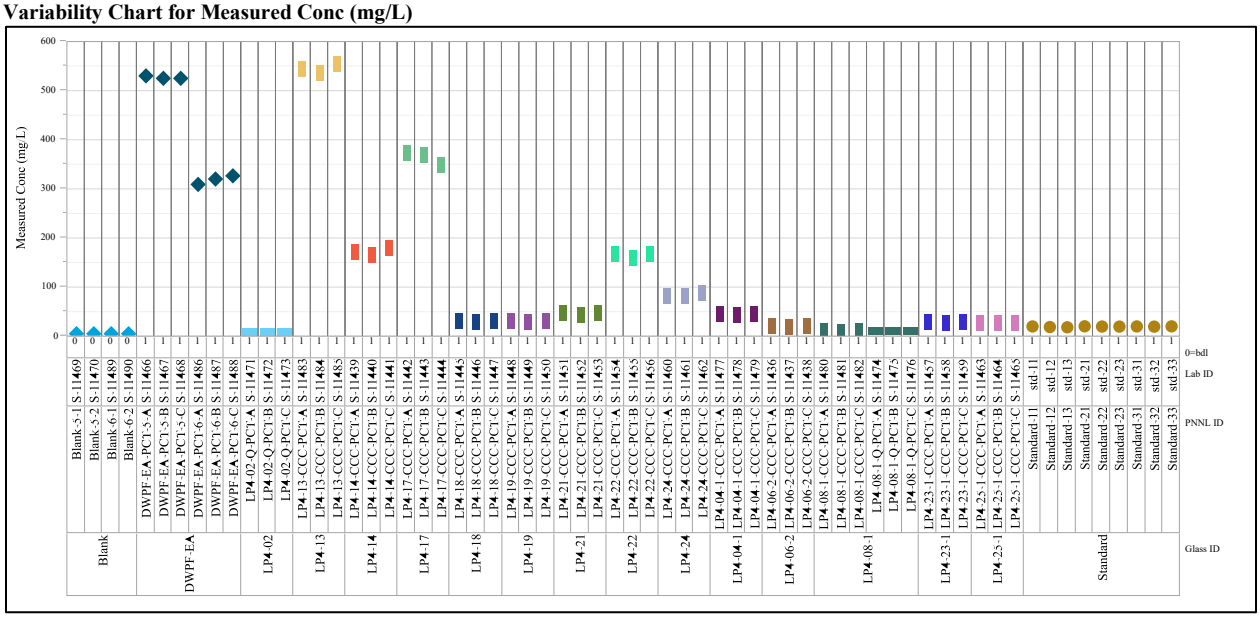


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=B
Variability Chart for Measured Conc (mg/L)



Analyte=B
Variability Chart for log [Conc (mg/L)]

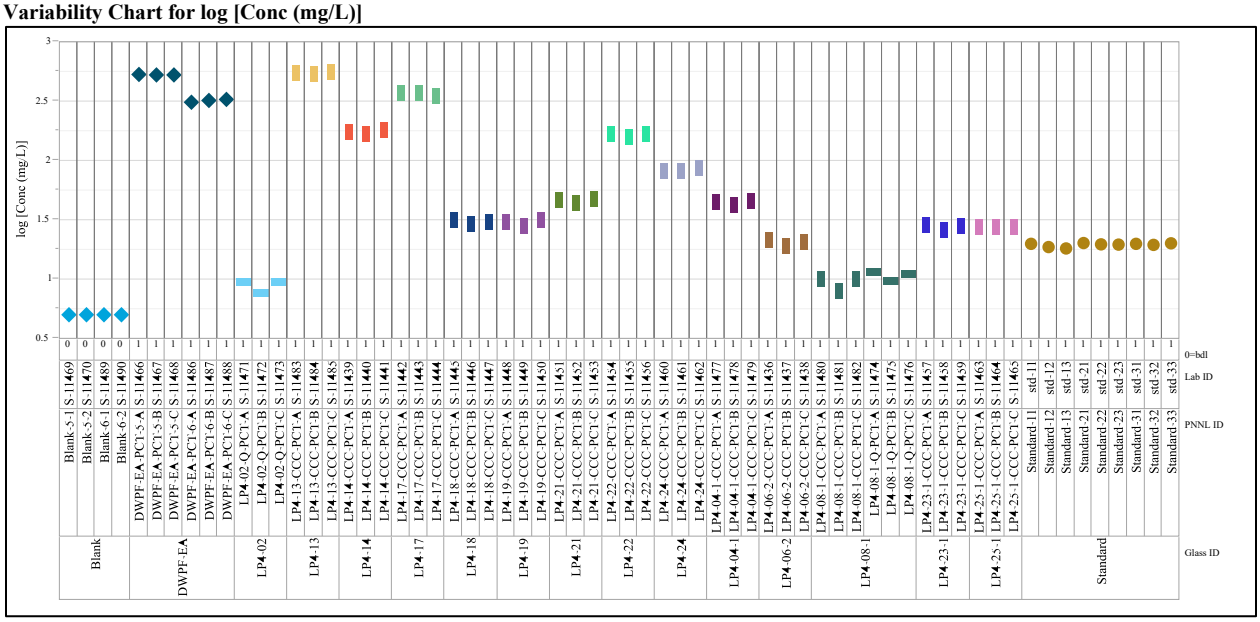
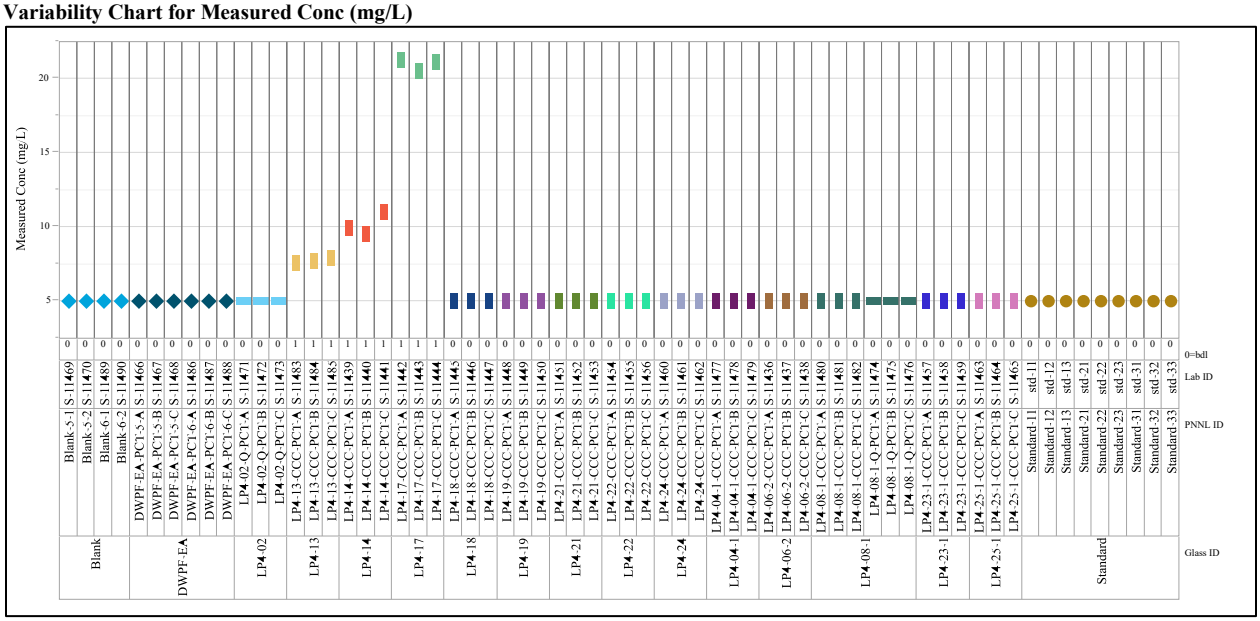


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=Cr
Variability Chart for Measured Conc (mg/L)



Analyte=Cr
Variability Chart for log [Conc (mg/L)]

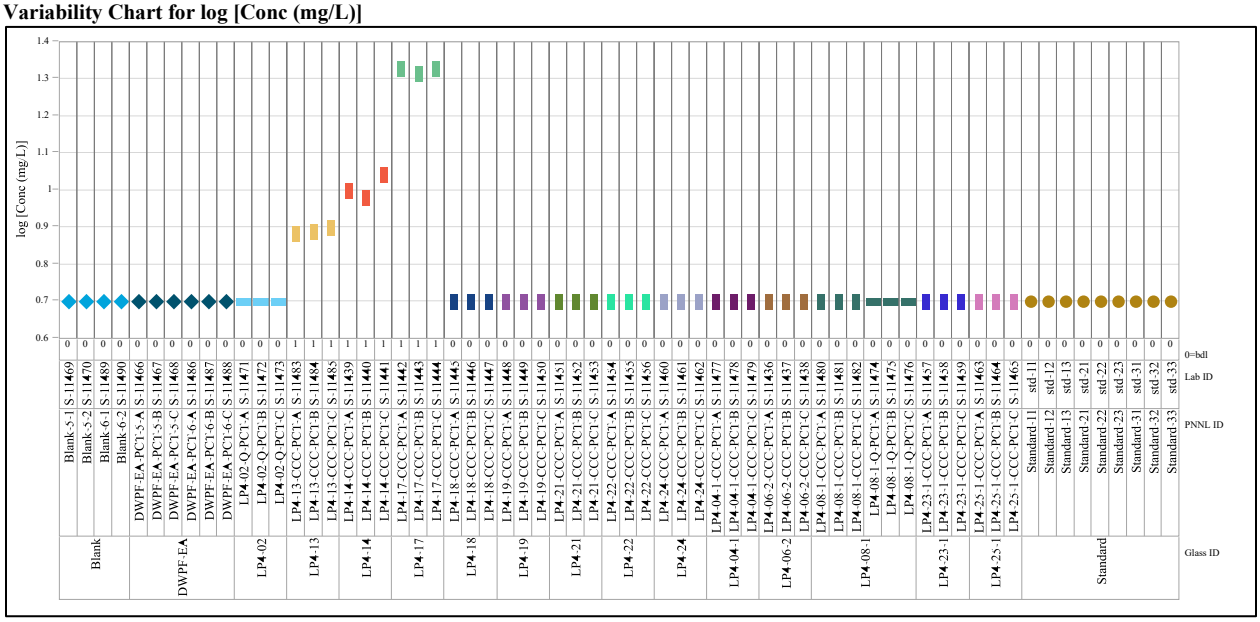
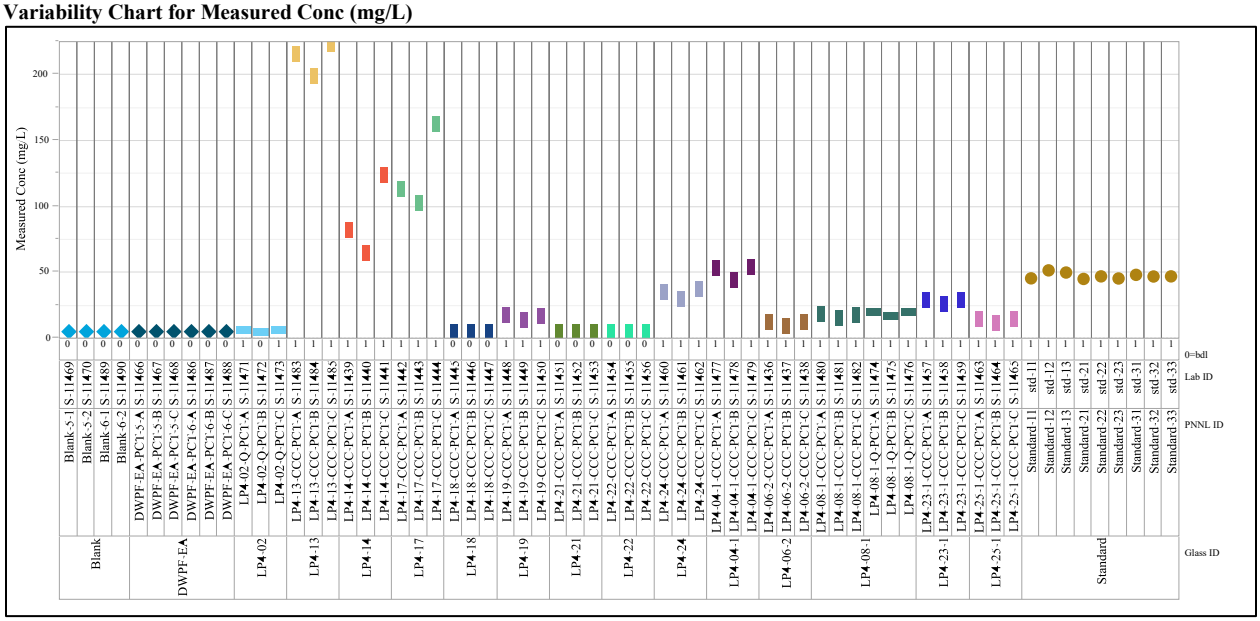


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=K
Variability Chart for Measured Conc (mg/L)



Analyte=K
Variability Chart for log [Conc (mg/L)]

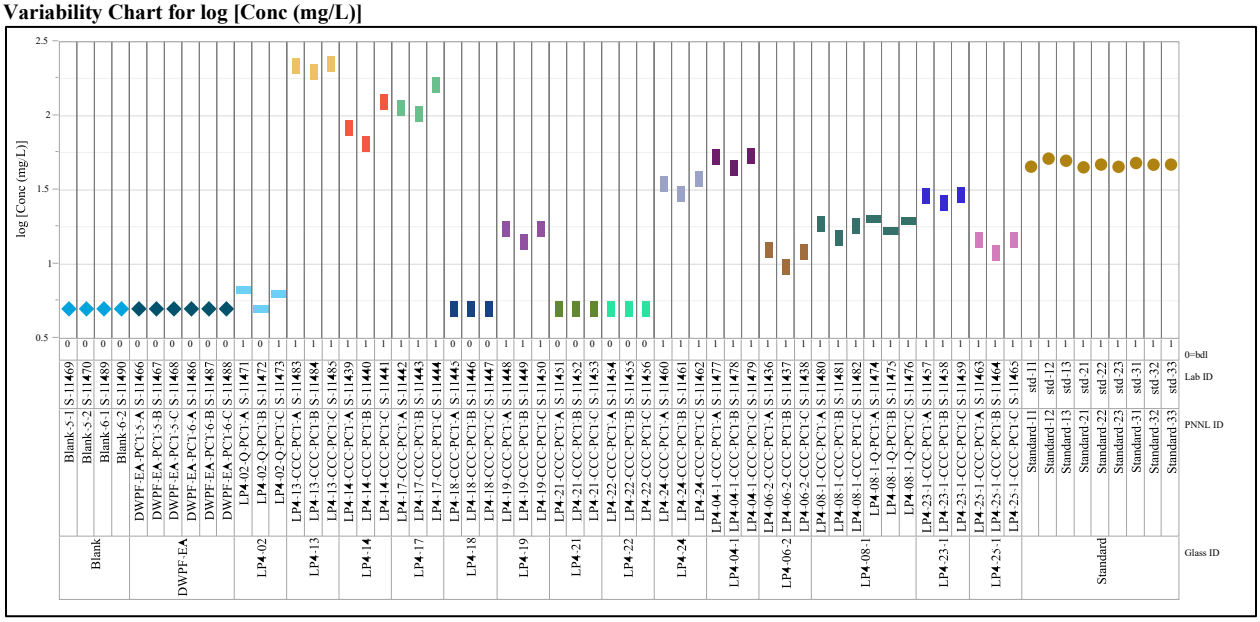
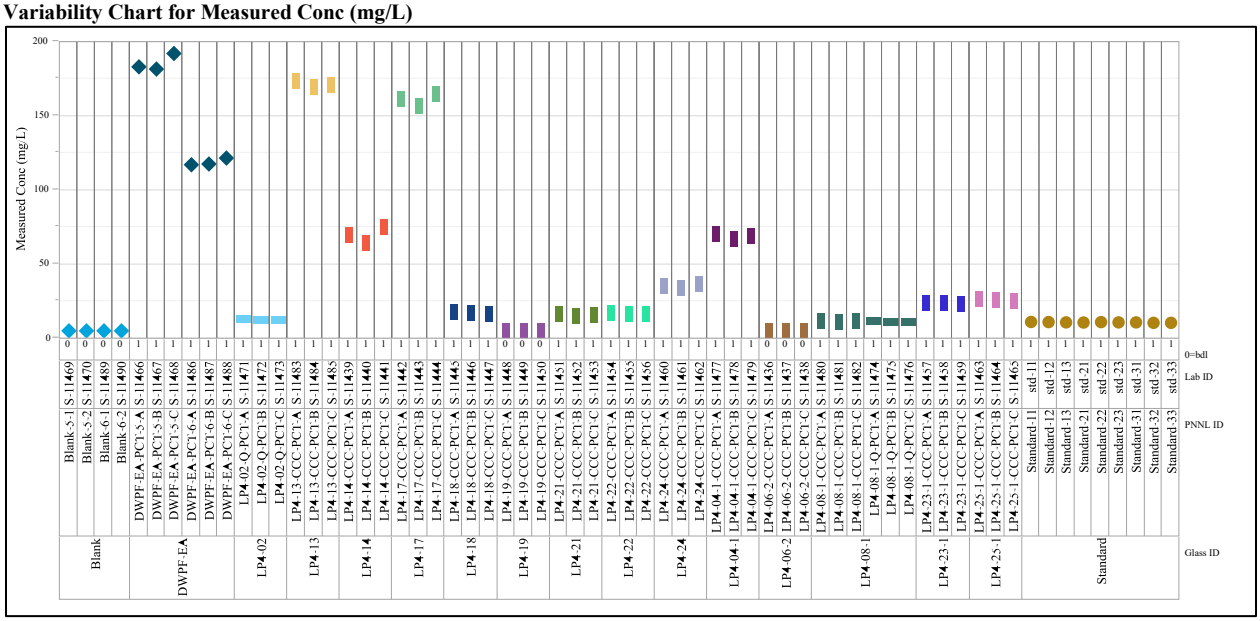


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=Li
Variability Chart for Measured Conc (mg/L)



Analyte=Li
Variability Chart for log [Conc (mg/L)]

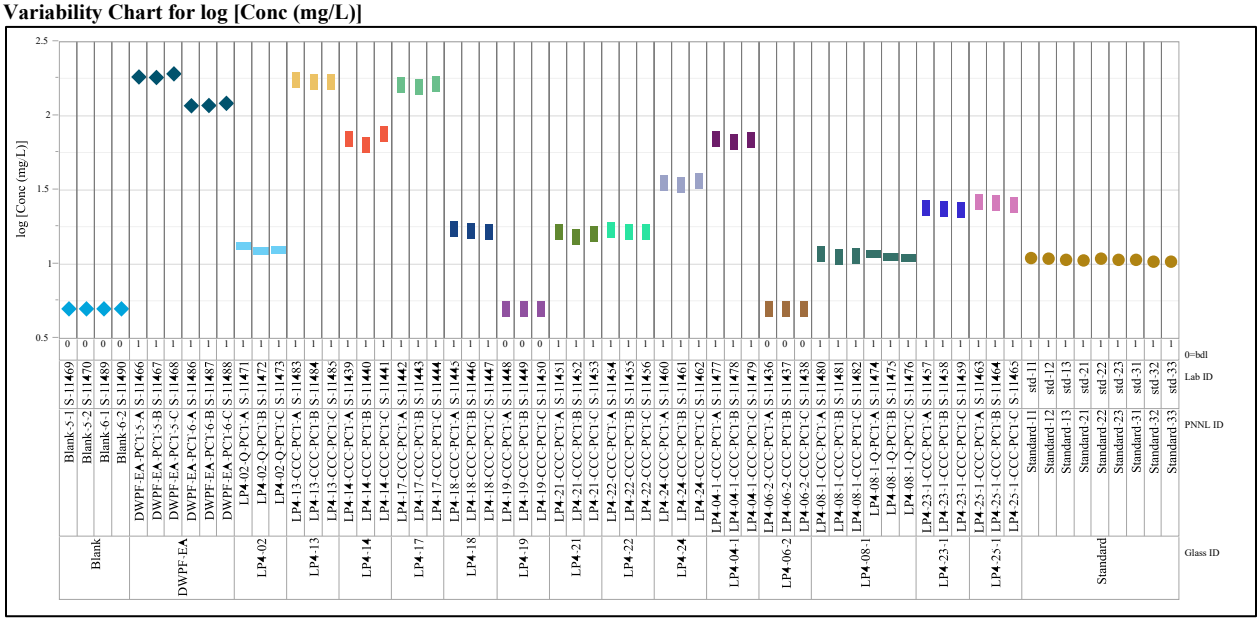
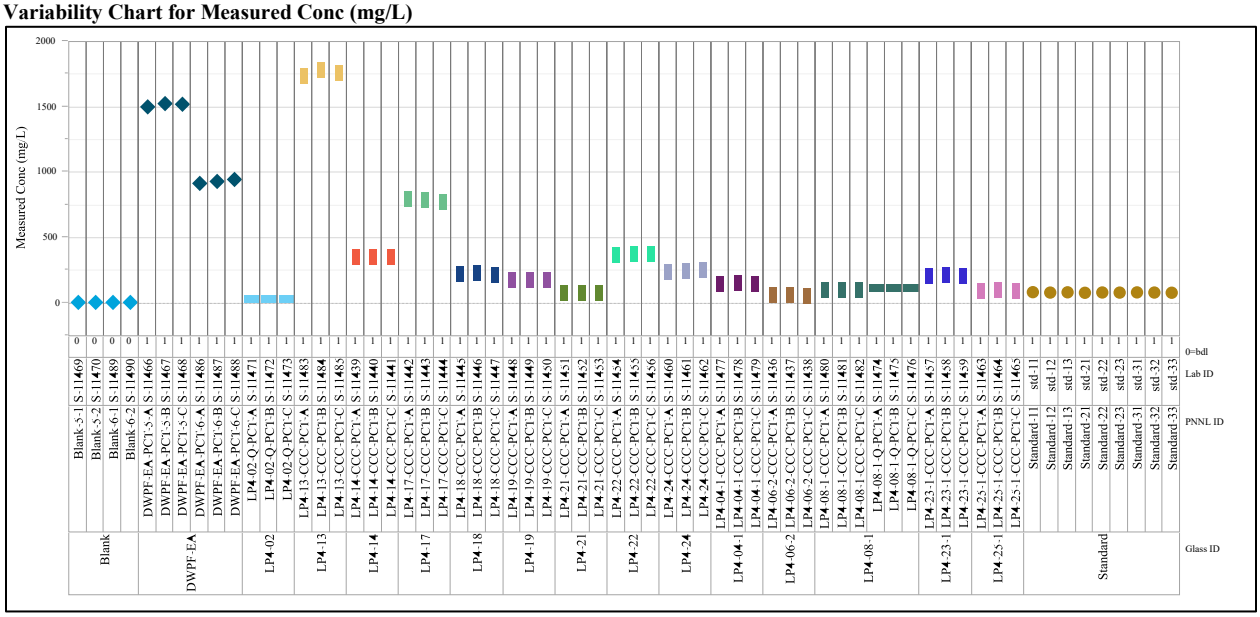


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=Na
Variability Chart for Measured Conc (mg/L)



Analyte=Na
Variability Chart for log [Conc (mg/L)]

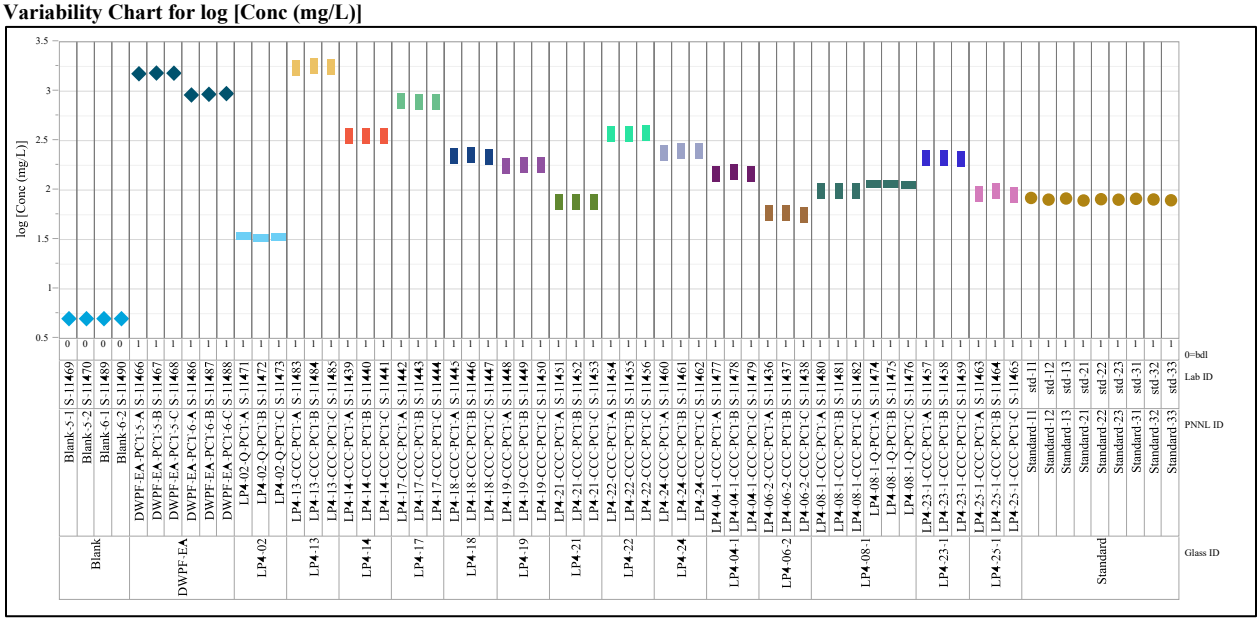
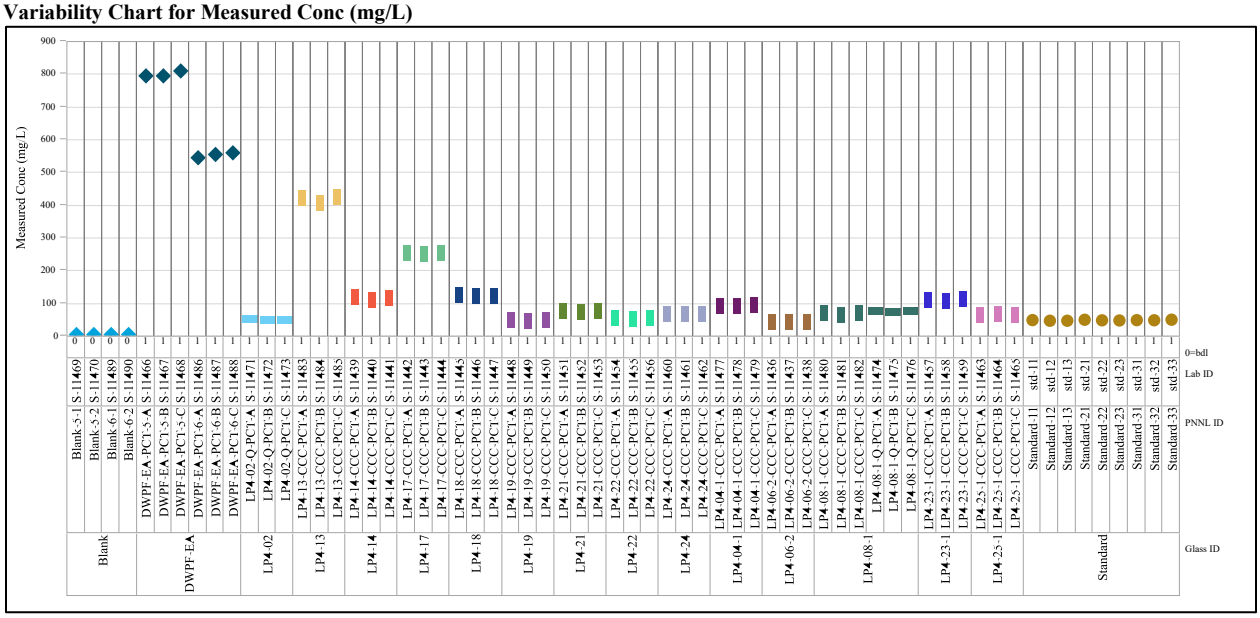


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=Si
Variability Chart for Measured Conc (mg/L)



Analyte=Si
Variability Chart for log [Conc (mg/L)]

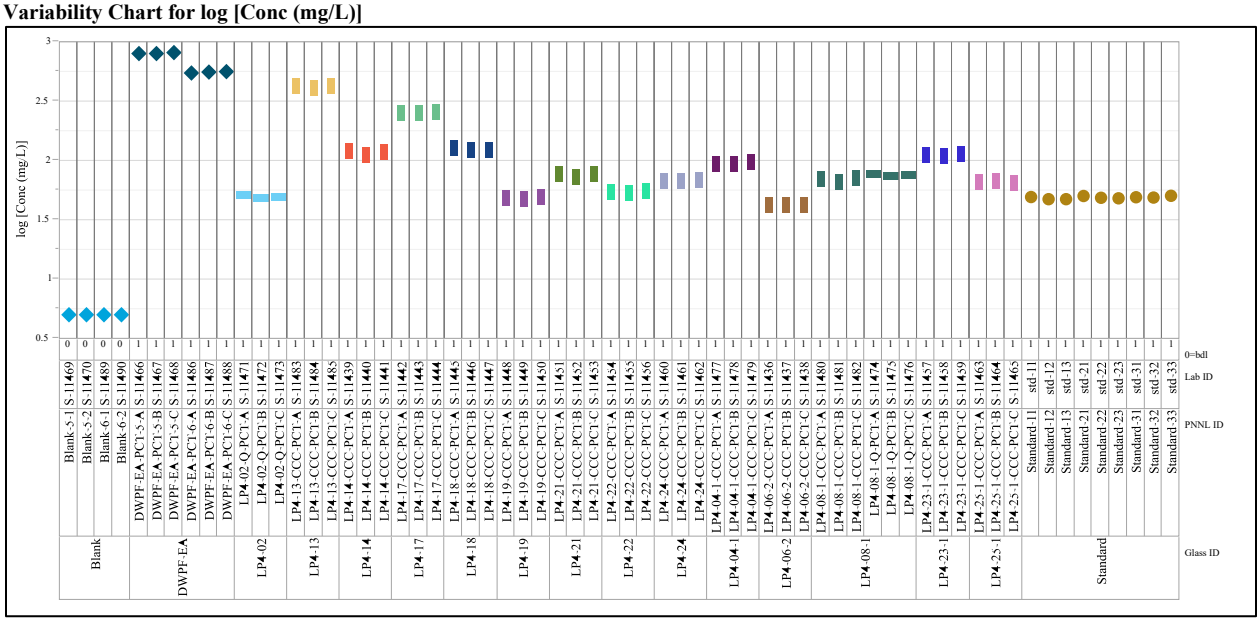
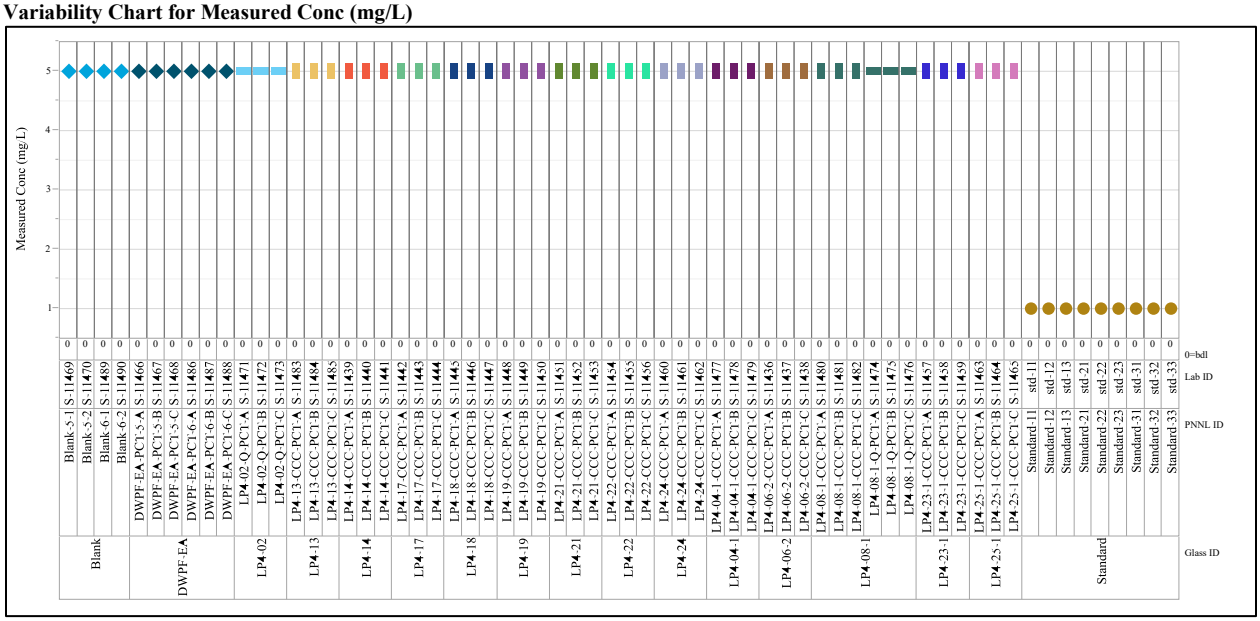
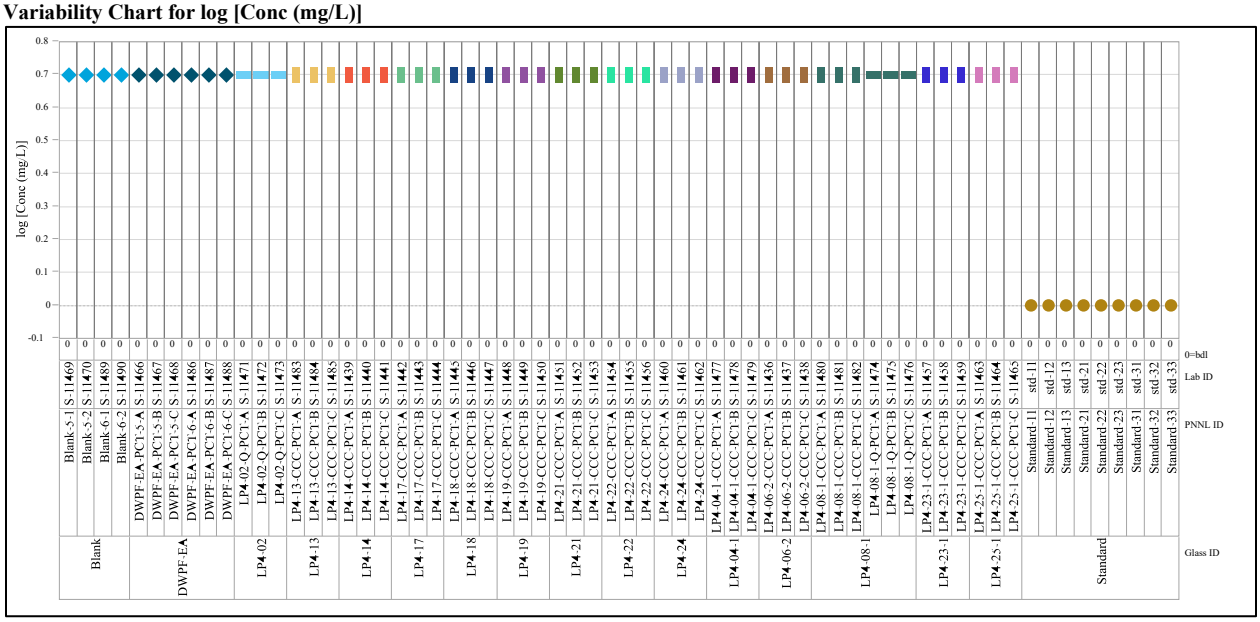


Exhibit B-2. Set 2 PCT Leachate Measurements by Glass ID (continued)

Analyte=Zr
Variability Chart for Measured Conc (mg/L)



Analyte=Zr
Variability Chart for log [Conc (mg/L)]



Appendix C. Normalized PCT Results

Table C-1. Normalized PCT Results

Glass ID	Comp. View	NC_{Al} (g/L)		NC_{B} (g/L)		NC_{Cr} (g/L)		NC_{K} (g/L)		NC_{Li} (g/L)		NC_{Na} (g/L)		NC_{Si} (g/L)		NC_{Zr} (g/L)	
DWPF-EA-PCT-1	Reference	<	0.255		13.998	<		<	15.058		7.776		11.014		3.100	<	1.468
DWPF-EA-PCT-2	Reference	<	0.255		14.394	<		<	15.058		8.072		11.837		3.271	<	1.468
DWPF-EA-PCT-3	Reference	<	0.255		16.414	<		<	15.058		8.968		13.171		3.655	<	1.468
DWPF-EA-PCT-4	Reference	<	0.255		14.984	<		<	15.058		8.717		12.215		3.380	<	1.468
DWPF-EA-PCT-5	Reference	<	0.255		15.034	<		<	15.058		9.372		12.149		3.512	<	1.468
DWPF-EA-PCT-6	Reference	<	0.255		9.089	<		<	15.058		5.996		7.457		2.429	<	1.468
LP4-01-CCC	Targeted		0.402		6.024	<	2.357	<		<			4.978		0.611	<	0.143
LP4-01-CCC	Measured		0.393		5.880	<	2.420	<	5.019	<	5.007		5.036		0.629	<	0.125
LP4-01-Q	Targeted		0.482		5.630	<	2.357	<		<			4.706		0.654	<	0.143
LP4-01-Q	Measured		0.471		5.495	<	2.420	<	5.019	<	5.007		4.760		0.673	<	0.125
LP4-02-CCC	Targeted		0.235	<	0.317	<	4.299		0.209		0.732		0.455		0.245	<	0.308
LP4-02-CCC	Measured		0.250	<	0.326	<	4.539		0.211		0.734		0.456		0.250	<	0.276
LP4-02-Q	Targeted		0.231		0.393	<	4.299	<	0.210		0.588		0.440		0.244	<	0.308
LP4-02-Q	Measured		0.246		0.404	<	4.539	<	0.212		0.590		0.441		0.249	<	0.276
LP4-03-CCC	Targeted		0.252		1.927	<	1.329		0.703		1.916		1.661		0.254	<	0.184
LP4-03-CCC	Measured		0.258		1.965	<	1.366		0.707		1.922		1.656		0.253	<	0.164
LP4-03-Q	Targeted		0.208		1.172	<	1.329		0.515		1.233		1.121		0.226	<	0.184
LP4-03-Q	Measured		0.213		1.194	<	1.366		0.518		1.237		1.118		0.225	<	0.164
LP4-04-1-CCC	Targeted		0.218		2.276	<	36.540		1.112		2.927		1.853		0.528	<	0.204
LP4-04-1-CCC	Measured		0.231		2.534	<	5.005		1.172		2.887		1.803		0.536	<	0.224
LP4-04-1-Q	Targeted		0.294		0.855	<	36.540		0.651		1.358		1.190		0.340	<	0.204
LP4-04-1-Q	Measured		0.312		0.953	<	5.005		0.686		1.339		1.158		0.345	<	0.224
LP4-05-CCC	Targeted		0.208		0.914	<	1.462	<	3.764	<			1.189		0.292	<	0.313
LP4-05-CCC	Measured		0.206		0.890	<	1.488	<	3.422	<	5.007		1.207		0.285	<	0.337
LP4-05-Q	Targeted		0.241		1.178	<	1.462	<	3.764	<			1.400		0.329	<	0.313
LP4-05-Q	Measured		0.238		1.147	<	1.488	<	3.422	<	5.007		1.422		0.322	<	0.337
LP4-06-2-CCC	Targeted		0.225		0.562	<	12.180		0.267	<	0.815		0.614		0.239	<	0.341
LP4-06-2-CCC	Measured		0.232		0.603	<	5.005		0.280	<	0.782		0.579		0.243	<	0.370

Table C-1. Normalized PCT Results (continued)

Glass ID	Comp. View	NC_{Al} (g/L)		NC_{B} (g/L)		NC_{Cr} (g/L)		NC_{K} (g/L)		NC_{Li} (g/L)		NC_{Na} (g/L)		NC_{Si} (g/L)		NC_{Zr} (g/L)	
LP4-06-2-Q	Targeted		0.256		0.553	<	12.180		0.352		1.130		0.729		0.270	<	0.341
LP4-06-2-Q	Measured		0.264		0.594	<	5.005		0.370		1.084		0.687		0.274	<	0.370
LP4-07-1-CCC	Targeted		0.156		0.748	<	5.622		0.558		1.096		1.137		0.229	<	0.175
LP4-07-1-CCC	Measured		0.163		0.779	<	5.005		0.546		1.083		1.120		0.230	<	0.193
LP4-07-1-Q	Targeted		0.160		0.625	<	5.622		0.720		1.226		1.058		0.222	<	0.175
LP4-07-1-Q	Measured		0.167		0.650	<	5.005		0.704		1.211		1.042		0.223	<	0.193
LP4-08-1-CCC	Targeted		0.370		0.492	<	1.661		0.384		0.781		0.854		0.371	<	0.338
LP4-08-1-CCC	Measured		0.382		0.569	<	1.822		0.404		0.774		0.823		0.383	<	0.364
LP4-08-1-Q	Targeted		0.395		0.566	<	1.661		0.420		0.774		0.994		0.404	<	0.338
LP4-08-1-Q	Measured		0.409		0.654	<	1.822		0.442		0.767		0.958		0.417	<	0.364
LP4-09-CCC	Targeted	<	0.212		25.630		15.964		9.546		16.499		19.102		1.185	<	0.155
LP4-09-CCC	Measured	<	0.207		25.471	<	5.467		9.551		17.328		19.013		1.193	<	0.174
LP4-09-Q	Targeted	<	0.212		30.020		15.585		10.134		19.201		22.525		1.275	<	0.155
LP4-09-Q	Measured	<	0.207		29.834	<	5.337		10.139		20.166		22.421		1.284	<	0.174
LP4-10-CCC	Targeted	<	0.232		23.805		20.102		9.286		16.334		20.043		4.104	<	0.179
LP4-10-CCC	Measured	<	0.225		23.445		20.783		9.344		16.283		20.558		3.956	<	0.161
LP4-10-Q	Targeted	<	0.232		29.918		25.813		10.675		19.906		23.965		4.690	<	0.179
LP4-10-Q	Measured	<	0.225		29.466		26.687		10.741		19.843		24.581		4.521	<	0.161
LP4-11-CCC	Targeted		0.193	<	0.246	<	1.589		0.215	<	0.748		0.419		0.204	<	0.277
LP4-11-CCC	Measured		0.189	<	0.237	<	1.620		0.218	<	0.808		0.422		0.197	<	0.299
LP4-11-Q	Targeted		0.222		0.861	<	1.589		0.338		0.852		0.867		0.240	<	0.277
LP4-11-Q	Measured		0.217		0.830	<	1.620		0.343		0.921		0.874		0.232	<	0.299
LP4-12-CCC	Targeted	<	0.242		8.613		4.882		2.999		7.937		6.745		0.761	<	0.167
LP4-12-CCC	Measured	<	0.226		8.230		4.939		3.074		8.095		6.623		0.730	<	0.173
LP4-12-Q	Targeted	<	0.242		9.805		5.129		3.335		8.415		7.494		0.803	<	0.167
LP4-12-Q	Measured	<	0.226		9.368		5.189		3.419		8.582		7.359		0.770	<	0.173
LP4-13-CCC	Targeted	<	0.243		16.445		10.274		8.027		14.227		13.426		2.502	<	0.164
LP4-13-CCC	Measured	<	0.254		17.881	<	7.741		8.153		14.205		13.332		2.602	<	0.160

Table C-1. Normalized PCT Results (continued)

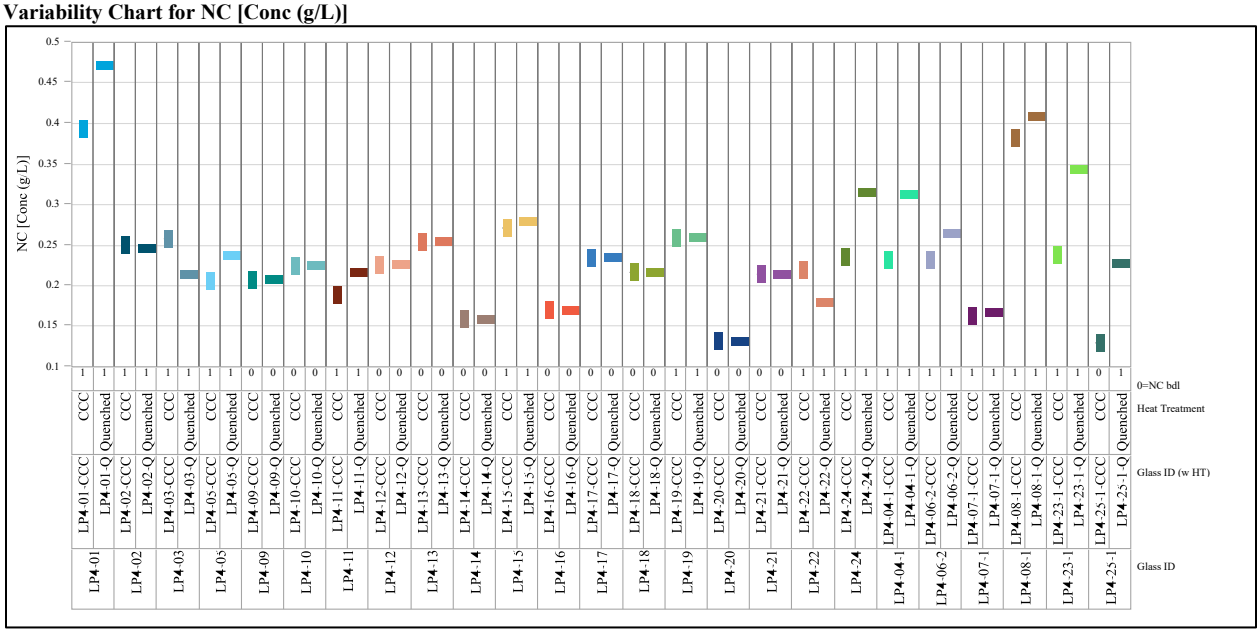
Glass ID	Comp. View	NC_{Al} (g/L)		NC_{B} (g/L)		NC_{Cr} (g/L)		NC_{K} (g/L)		NC_{Li} (g/L)		NC_{Na} (g/L)		NC_{Si} (g/L)		NC_{Zr} (g/L)	
LP4-13-Q	Targeted	<	0.243		28.917		19.571		13.809		20.806		23.863		3.160	<	0.164
LP4-13-Q	Measured	<	0.254		31.442	<	14.745		14.024		20.774		23.697		3.286	<	0.160
LP4-14-CCC	Targeted	<	0.158		4.162		2.598		3.030		4.666		4.135		0.686	<	0.220
LP4-14-CCC	Measured	<	0.158		4.171		2.649		3.095		4.800		4.128		0.672	<	0.240
LP4-14-Q	Targeted	<	0.158		9.858		6.252		6.175		9.393		9.742		0.985	<	0.220
LP4-14-Q	Measured	<	0.158		9.879		6.375		6.308		9.662		9.727		0.965	<	0.240
LP4-15-CCC	Targeted		0.282		0.967	<	1.589	<	0.596	<			1.260		0.371	<	0.235
LP4-15-CCC	Measured		0.271		0.930	<	1.596	<	0.577	<	5.007		1.310		0.347	<	0.252
LP4-15-Q	Targeted		0.290		0.980	<	1.589	<	0.596	<			1.223		0.351	<	0.235
LP4-15-Q	Measured		0.279		0.943	<	1.596	<	0.577	<	5.007		1.272		0.329	<	0.252
LP4-16-CCC	Targeted	<	0.171		3.962	<	9.135		0.719		3.600		2.761		0.725	<	0.294
LP4-16-CCC	Measured	<	0.170		3.979	<	5.005		0.703		3.651		2.753		0.718	<	0.323
LP4-16-Q	Targeted	<	0.171		6.545	<	9.135		1.127		5.664		4.383		0.915	<	0.294
LP4-16-Q	Measured	<	0.170		6.574	<	5.005		1.102		5.745		4.372		0.907	<	0.323
LP4-17-CCC	Targeted	<	0.254		10.709		5.287		5.101		11.071		9.521		1.293	<	0.168
LP4-17-CCC	Measured	<	0.234		10.157		5.352		5.058		11.684		9.566		1.228	<	0.186
LP4-17-Q	Targeted	<	0.254		25.084		13.092		9.903		22.281		22.606		1.519	<	0.168
LP4-17-Q	Measured	<	0.234		23.791		13.252		9.819		23.513		22.714		1.442	<	0.186
LP4-18-CCC	Targeted	<	0.227		1.516	<	3.654	<	7.529		1.988		1.928		0.596	<	0.341
LP4-18-CCC	Measured	<	0.216		1.444	<	3.710	<	5.019		2.094		1.955		0.567	<	0.360
LP4-18-Q	Targeted	<	0.227		1.909	<	3.654	<	7.529		2.281		2.373		0.725	<	0.341
LP4-18-Q	Measured	<	0.216		1.818	<	3.710	<	5.019		2.403		2.406		0.689	<	0.360
LP4-19-CCC	Targeted		0.258		1.302	<	1.218		0.573	<	2.243		1.205		0.282	<	0.146
LP4-19-CCC	Measured		0.259		1.315	<	1.809		0.597	<	2.162		1.284		0.274	<	0.159
LP4-19-Q	Targeted		0.259		0.503	<	1.218		0.368	<	2.243		0.819		0.260	<	0.146
LP4-19-Q	Measured		0.260		0.508	<	1.809		0.384	<	2.162		0.873		0.253	<	0.159
LP4-20-CCC	Targeted	<	0.138		8.555		3.003		2.970		7.491		6.635		0.531	<	0.375
LP4-20-CCC	Measured	<	0.132		8.037		3.062		2.975		8.332		6.767		0.498	<	0.398

Table C-1. Normalized PCT Results (continued)

Glass ID	Comp. View	NC_{Al} (g/L)		NC_{B} (g/L)		NC_{Cr} (g/L)		NC_{K} (g/L)		NC_{Li} (g/L)		NC_{Na} (g/L)		NC_{Si} (g/L)		NC_{Zr} (g/L)	
LP4-20-Q	Targeted	<	0.138		8.957		2.519		2.964		7.969		6.664		0.558	<	0.375
LP4-20-Q	Measured	<	0.132		8.415		2.568		2.969		8.864		6.797		0.523	<	0.398
LP4-21-CCC	Targeted	<	0.220		1.098	<	2.030	<	0.410		1.294		0.996		0.342	<	0.169
LP4-21-CCC	Measured	<	0.214		1.078	<	2.235	<	0.393		1.363		0.990		0.341	<	0.185
LP4-21-Q	Targeted	<	0.220		1.002	<	2.030	<	0.420		1.136		0.996		0.335	<	0.169
LP4-21-Q	Measured	<	0.214		0.984	<	2.235	<	0.403		1.195		0.990		0.334	<	0.185
LP4-22-CCC	Targeted		0.213		4.134	<	73.080	<	1.506		3.414		2.448		0.287	<	0.217
LP4-22-CCC	Measured		0.219		4.309	<	5.005	<	1.394		3.369		2.637		0.292	<	0.242
LP4-22-Q	Targeted		0.175		7.637	<	73.080	<	1.506		5.331		4.454		0.280	<	0.217
LP4-22-Q	Measured		0.179		7.960	<	5.005	<	1.394		5.261		4.797		0.284	<	0.242
LP4-23-1-CCC	Targeted		0.232		1.366	<	6.644		0.822		1.697		1.699		0.570	<	0.292
LP4-23-1-CCC	Measured		0.238		1.544	<	5.005		0.859		1.662		1.677		0.586	<	0.328
LP4-23-1-Q	Targeted		0.334		1.227	<	6.644		0.858		1.508		1.730		0.584	<	0.292
LP4-23-1-Q	Measured		0.343		1.387	<	5.005		0.897		1.478		1.708		0.600	<	0.328
LP4-24-CCC	Targeted		0.230		2.788	<	2.923		0.876		2.621		2.047		0.412	<	0.215
LP4-24-CCC	Measured		0.236		2.859	<	2.995		0.879		2.540		1.954		0.414	<	0.238
LP4-24-Q	Targeted		0.308		1.345	<	2.923		0.593		1.241		1.273		0.326	<	0.215
LP4-24-Q	Measured		0.315		1.379	<	2.995		0.596		1.203		1.215		0.327	<	0.238
LP4-25-1-CCC	Targeted	<	0.127		1.000	<	5.220		0.626		1.319		1.167		0.356	<	0.260
LP4-25-1-CCC	Measured	<	0.130		1.032	<	5.005		0.652		1.270		1.144		0.354	<	0.290
LP4-25-1-Q	Targeted		0.224		1.331	<	5.220		0.870		1.639		1.507		0.449	<	0.260
LP4-25-1-Q	Measured		0.228		1.373	<	5.005		0.907		1.579		1.477		0.446	<	0.290

Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass

Analyte=Al, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=Al, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

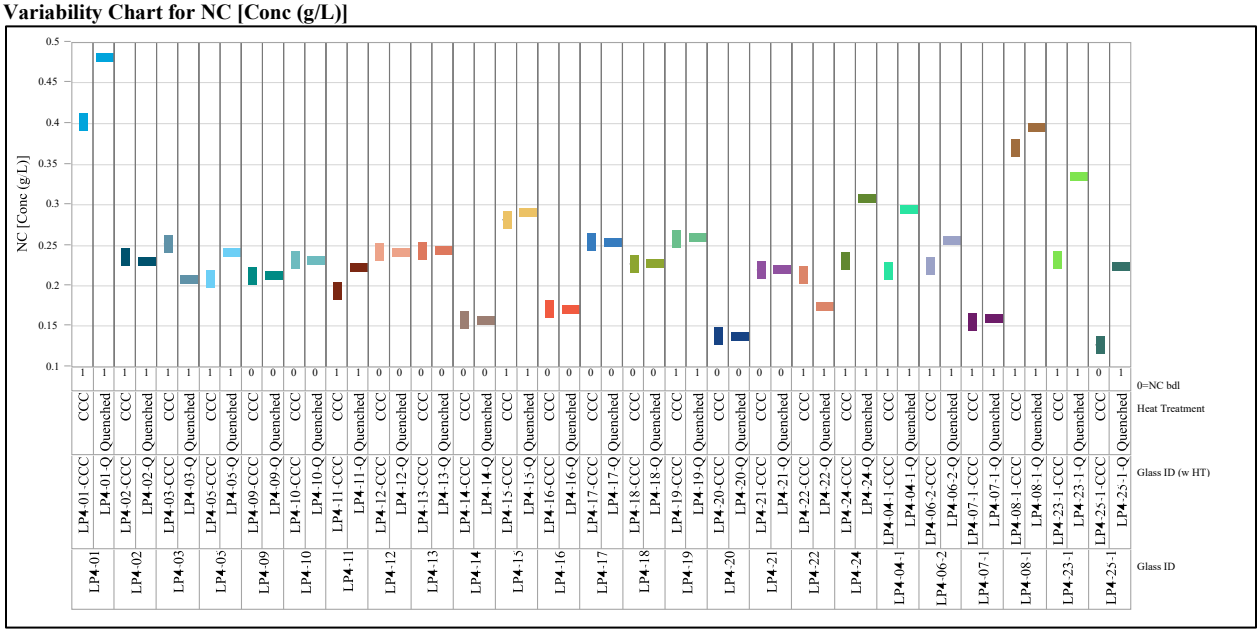
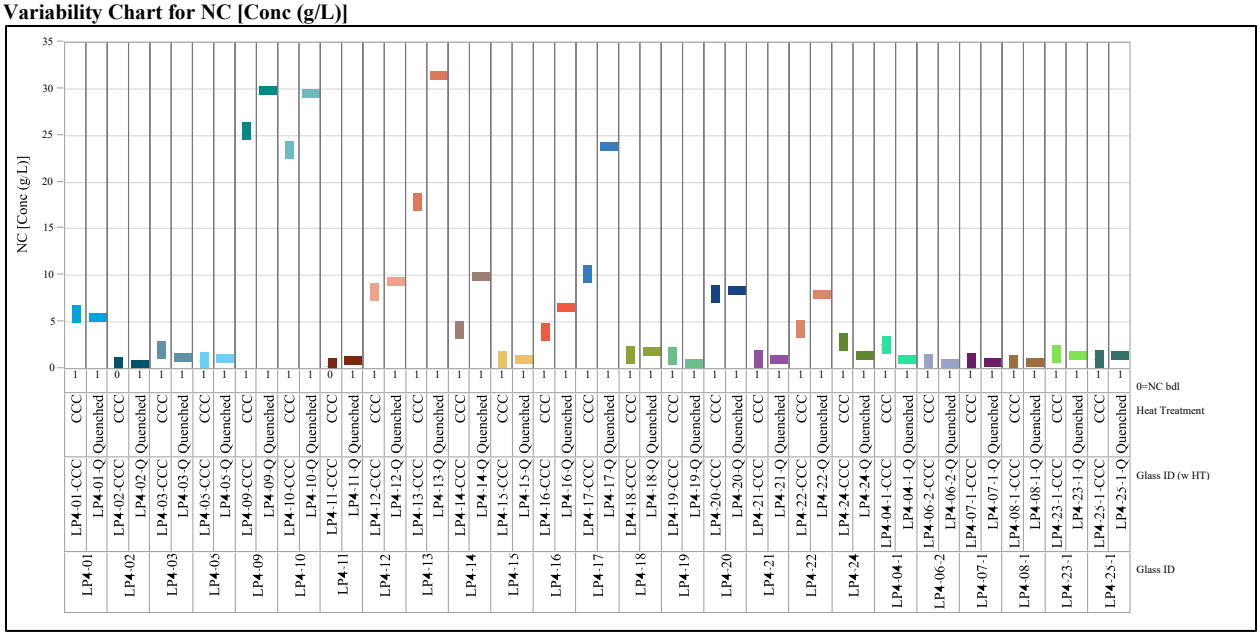


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=B, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=B, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

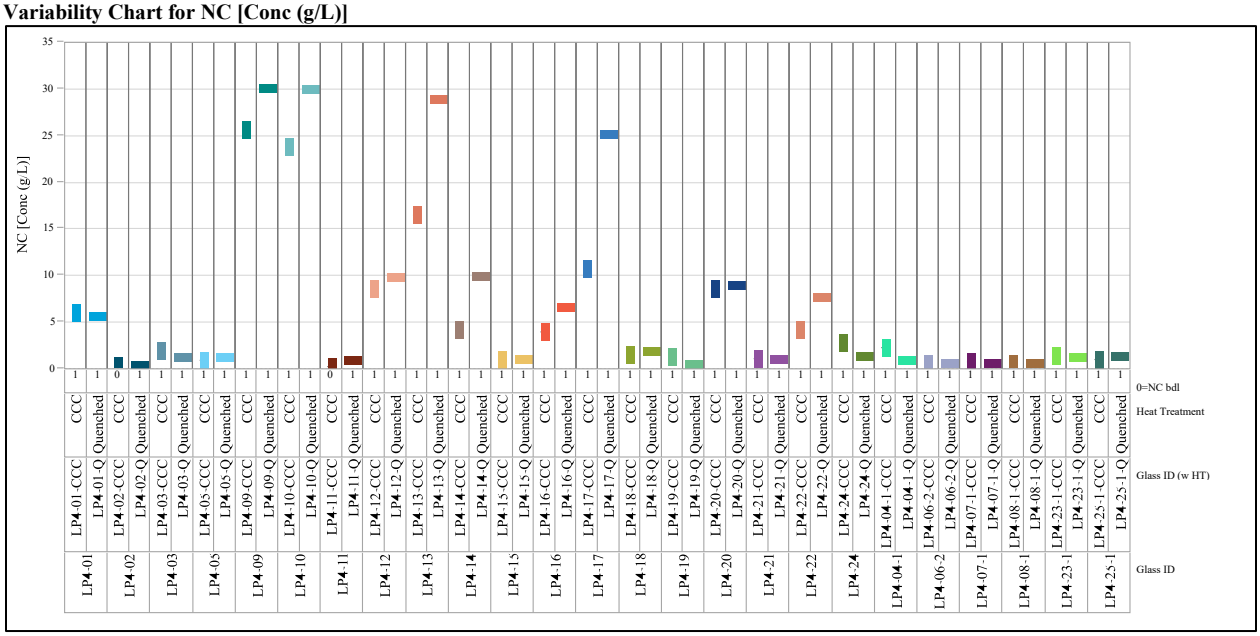
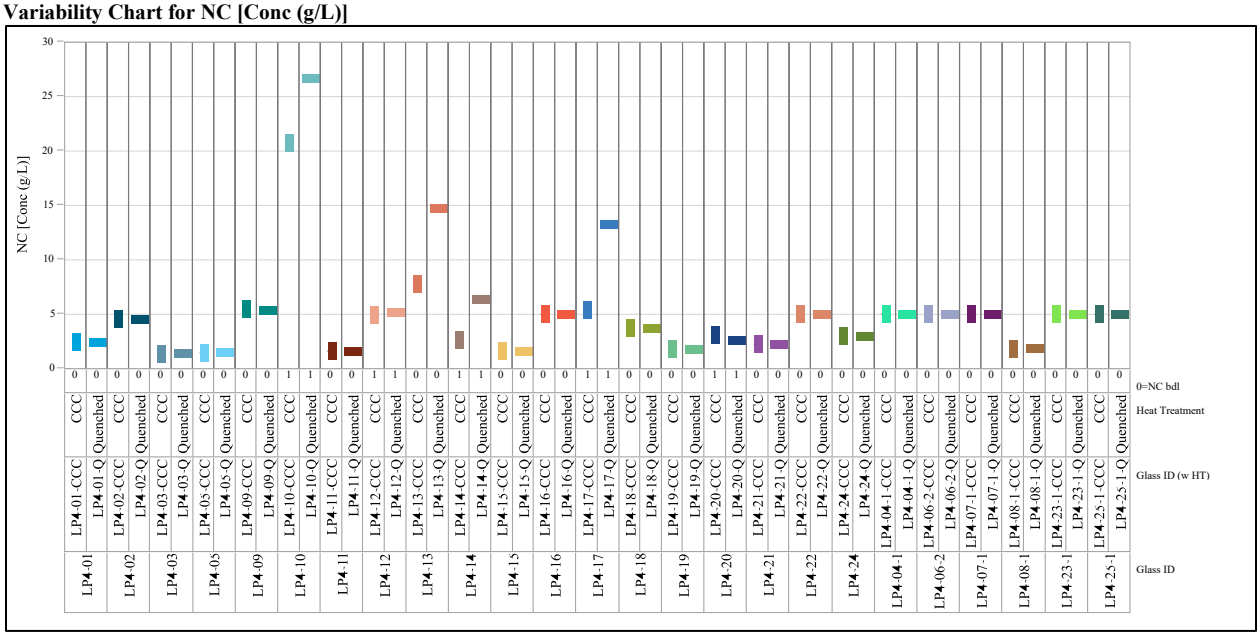


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Cr, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=Cr, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

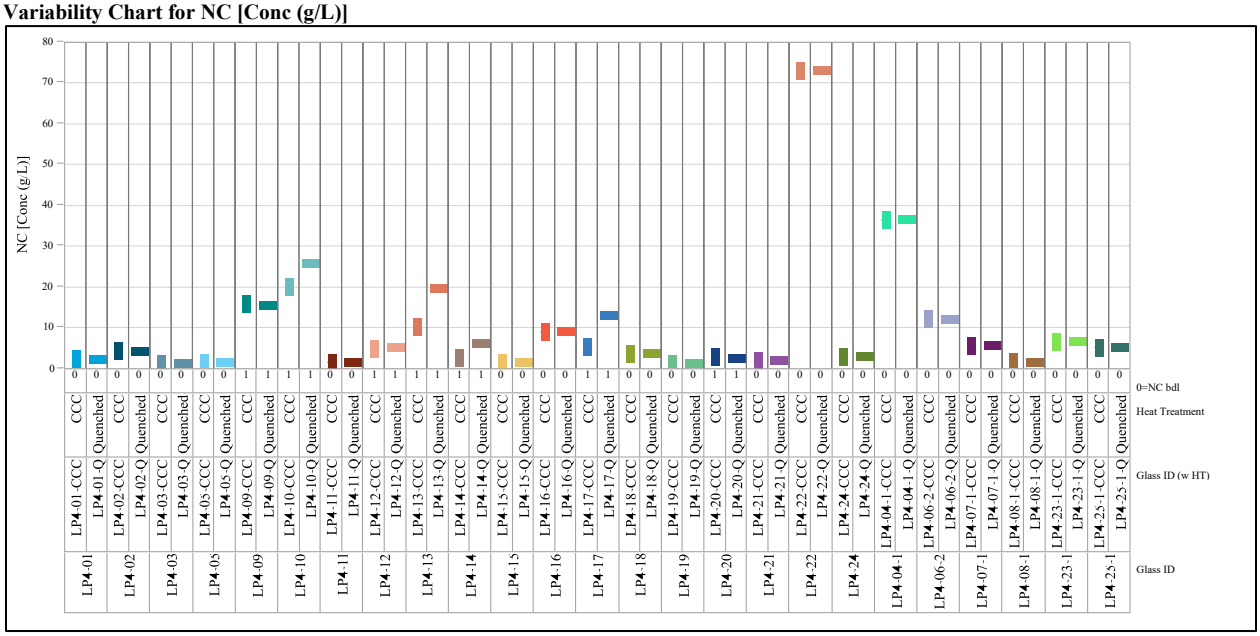
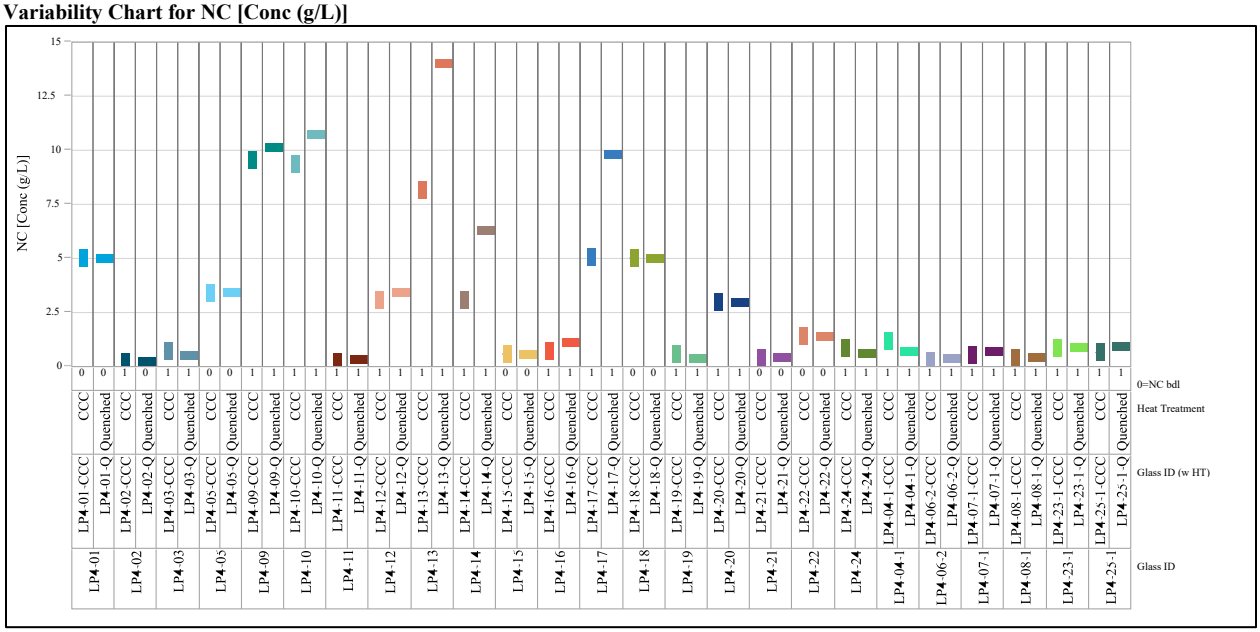


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=K, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=K, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

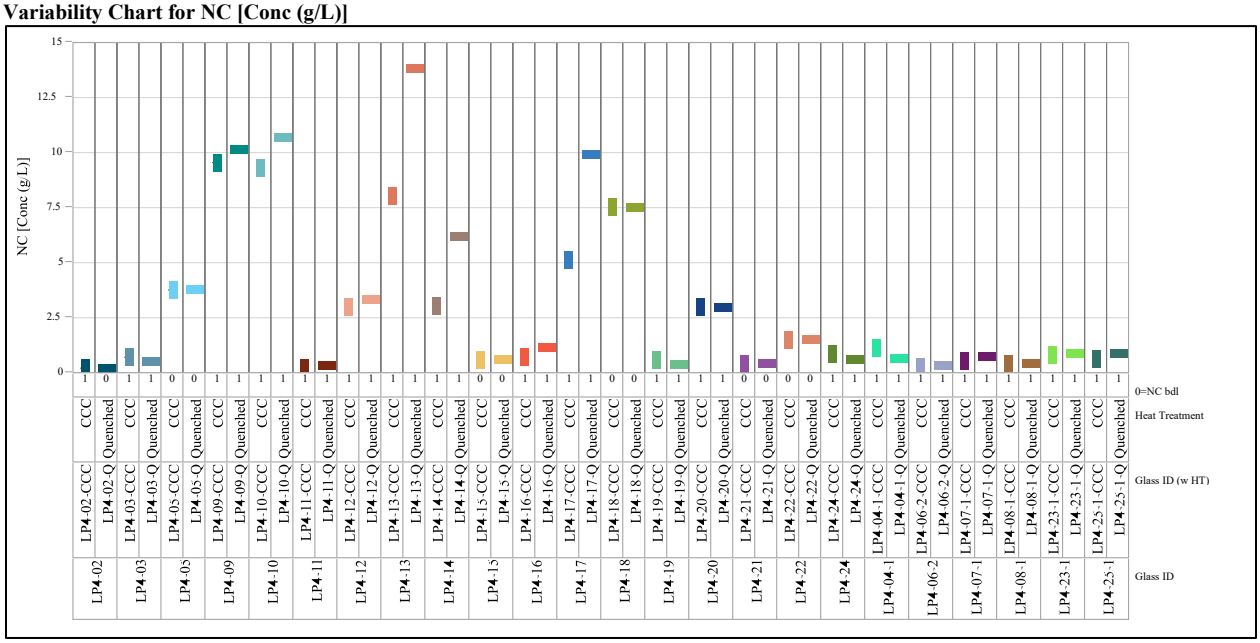
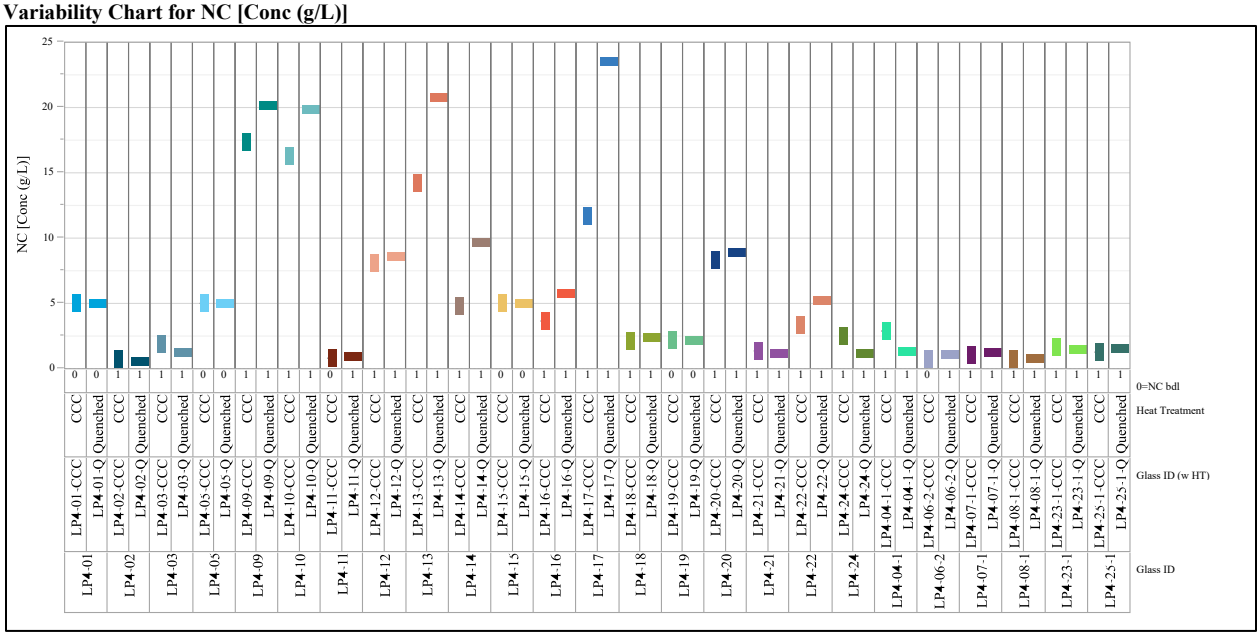


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Li, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=Li, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

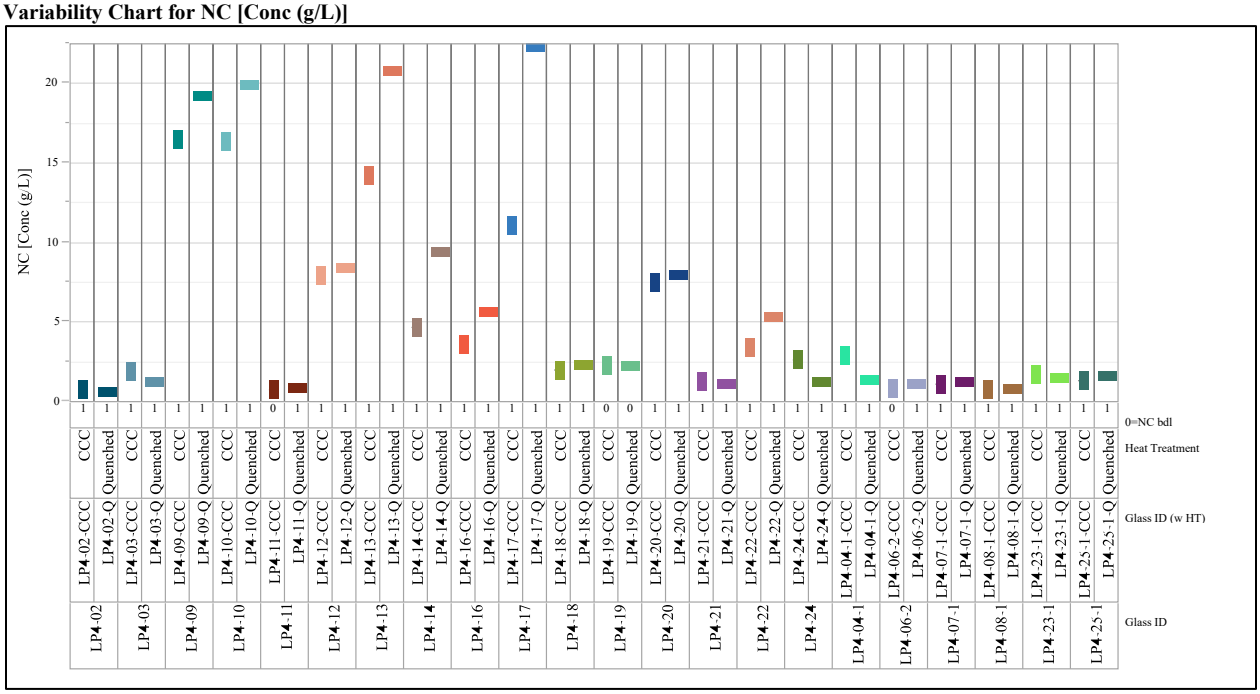
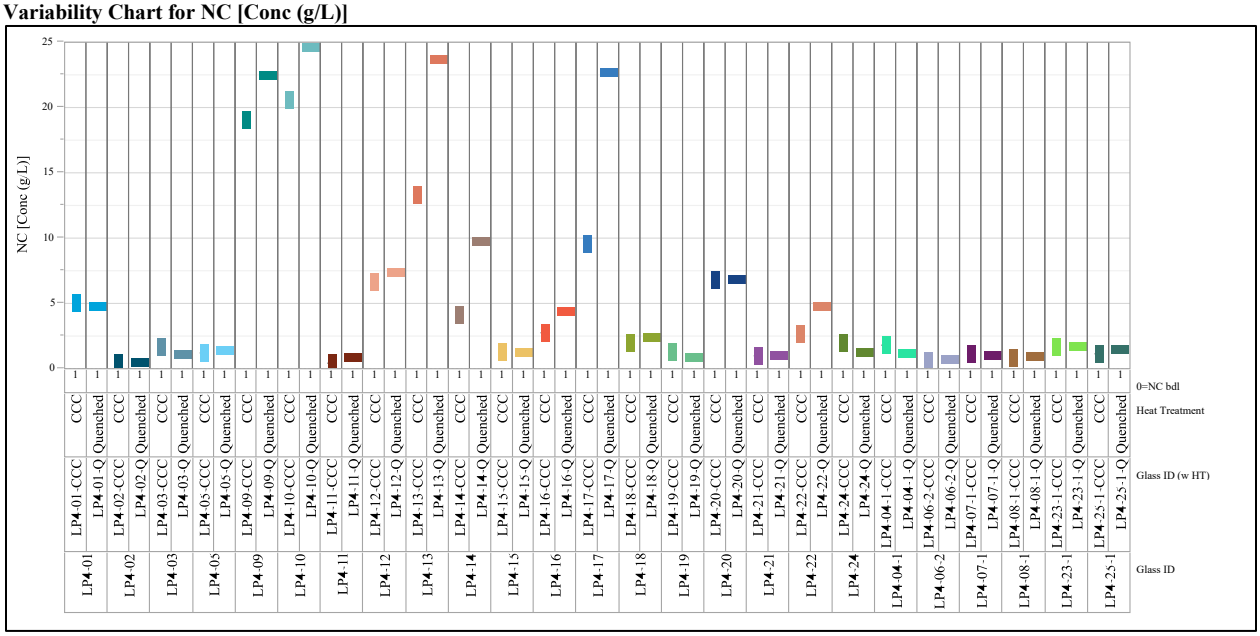


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Na, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=Na, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

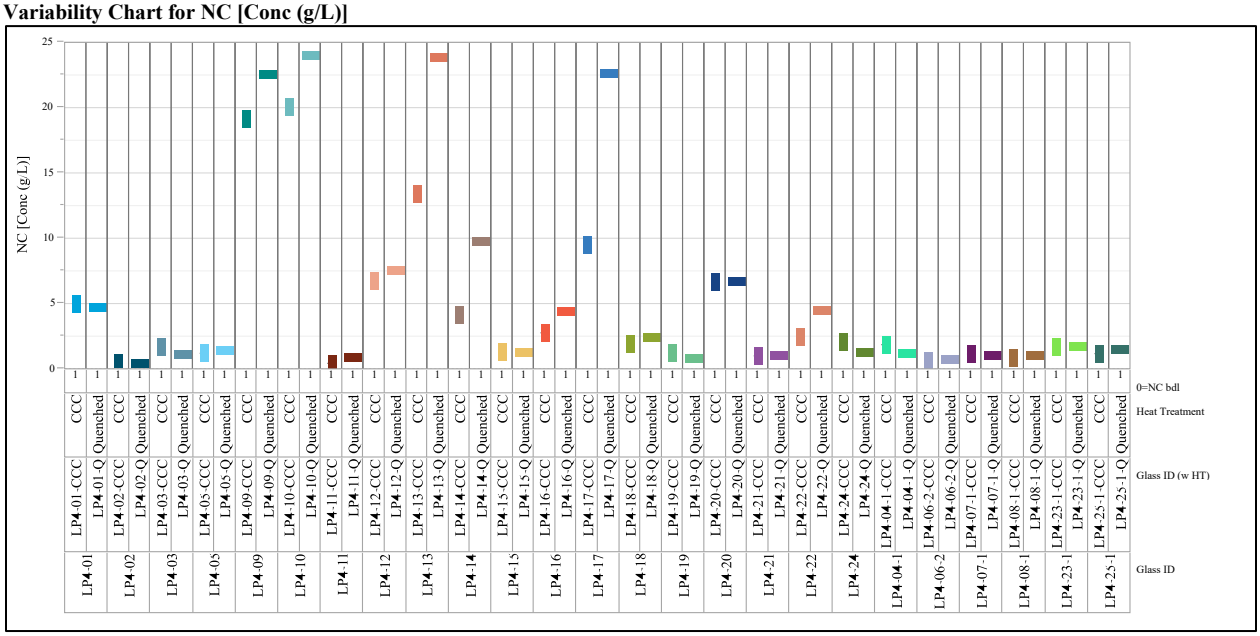
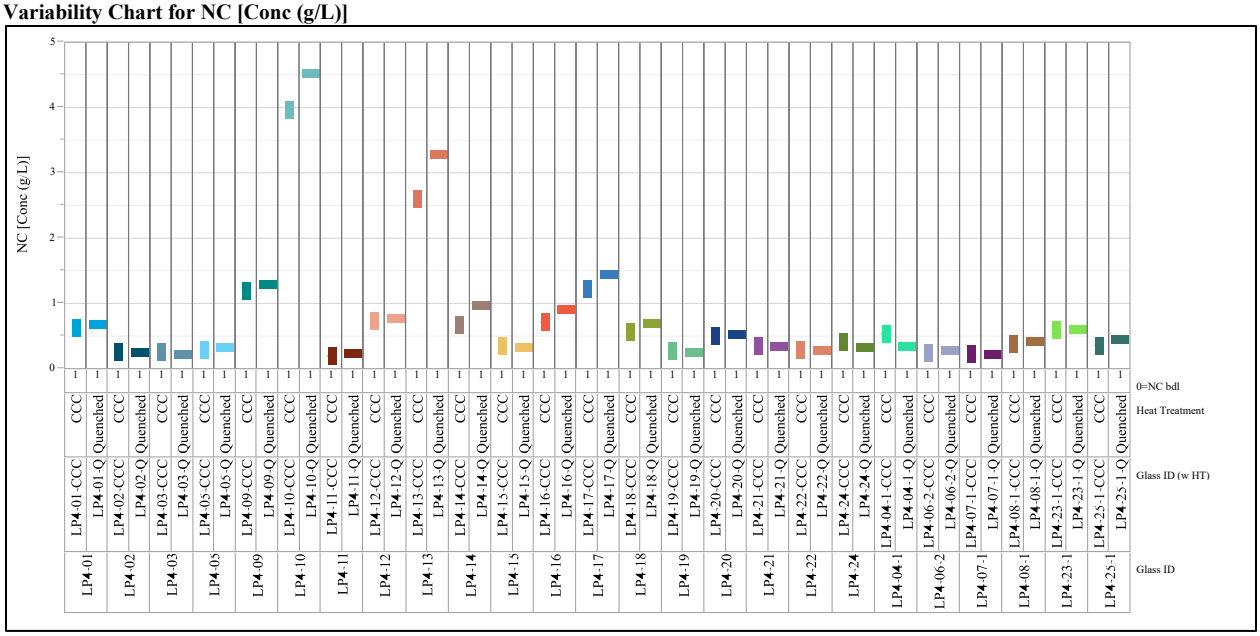


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Si, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=Si, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

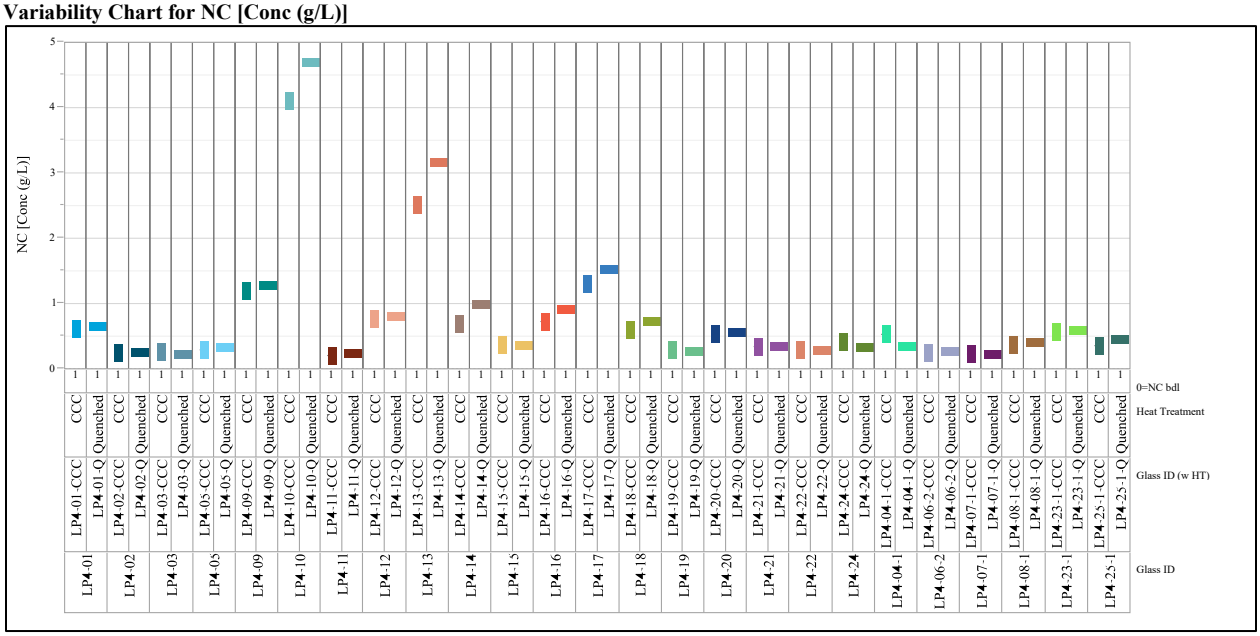
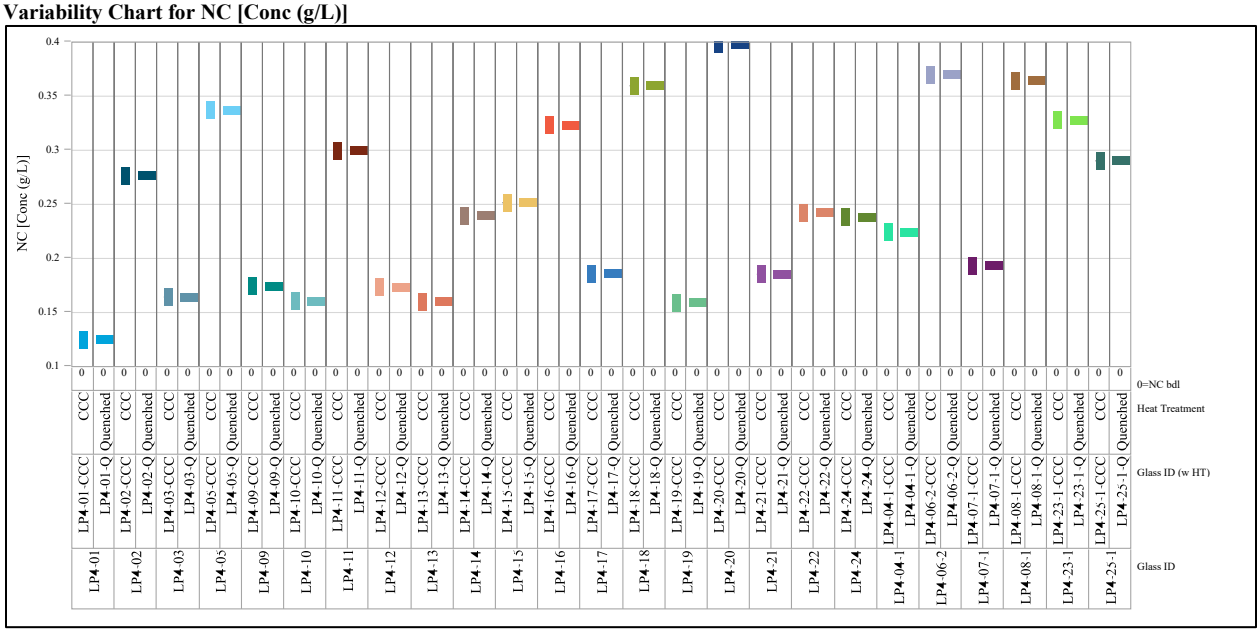


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Zr, Comp View=Measured
Variability Chart for NC [Conc (g/L)]



Analyte=Zr, Comp View=Targeted
Variability Chart for NC [Conc (g/L)]

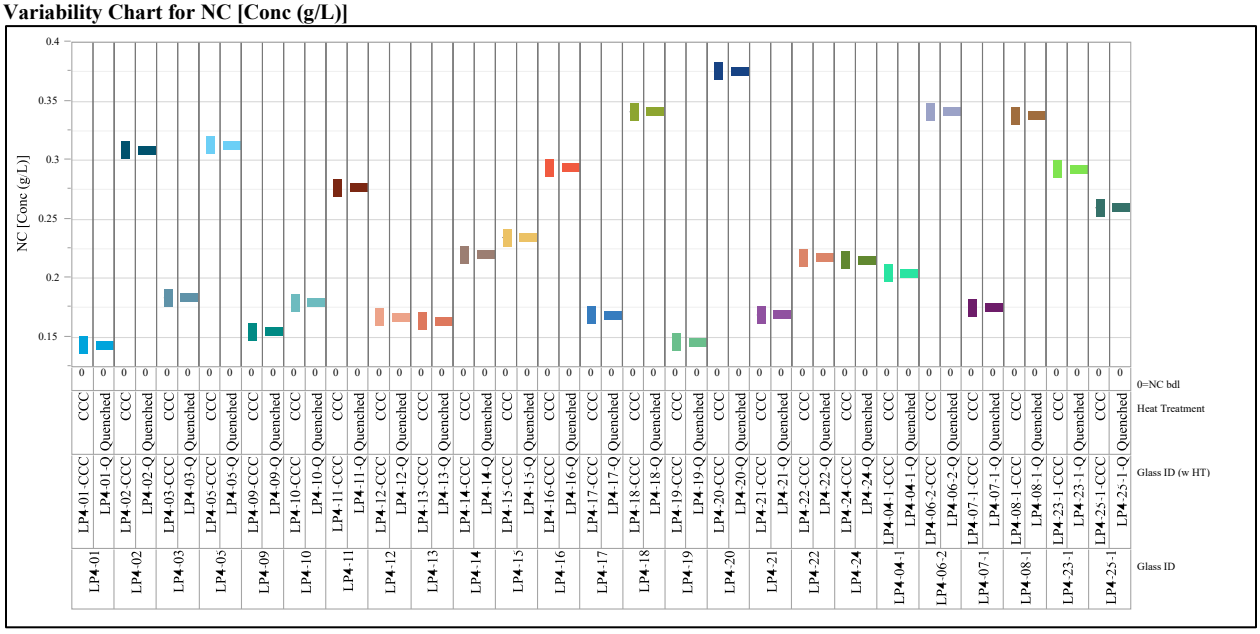
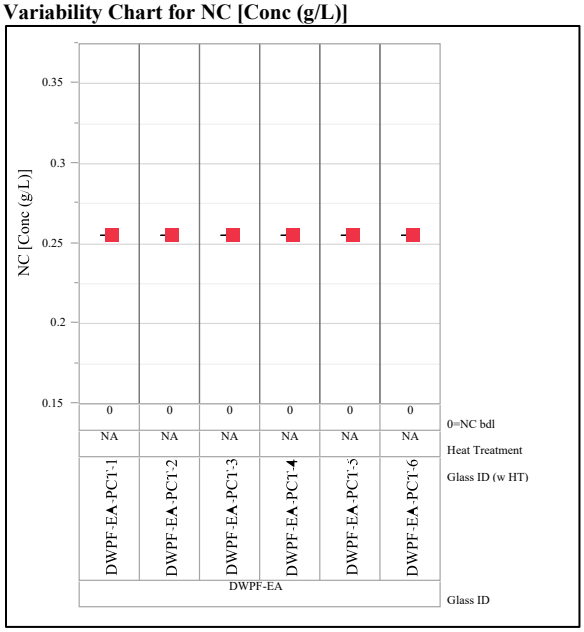


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Al, Comp View=Reference
Variability Chart for NC [Conc (g/L)]



Analyte=B, Comp View=Reference
Variability Chart for NC [Conc (g/L)]

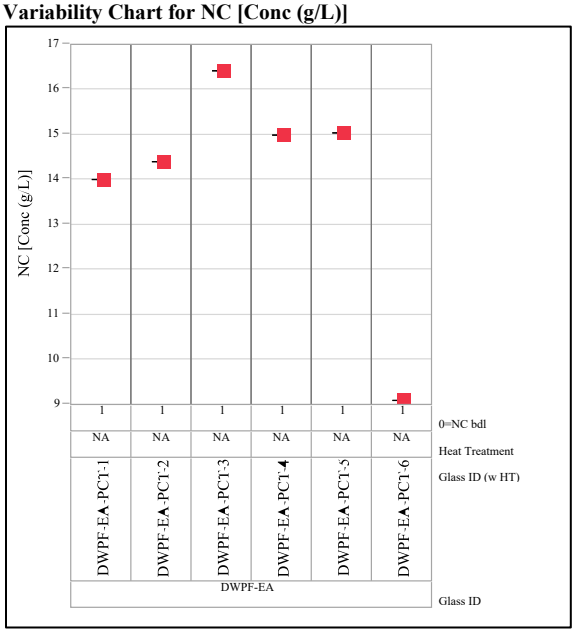
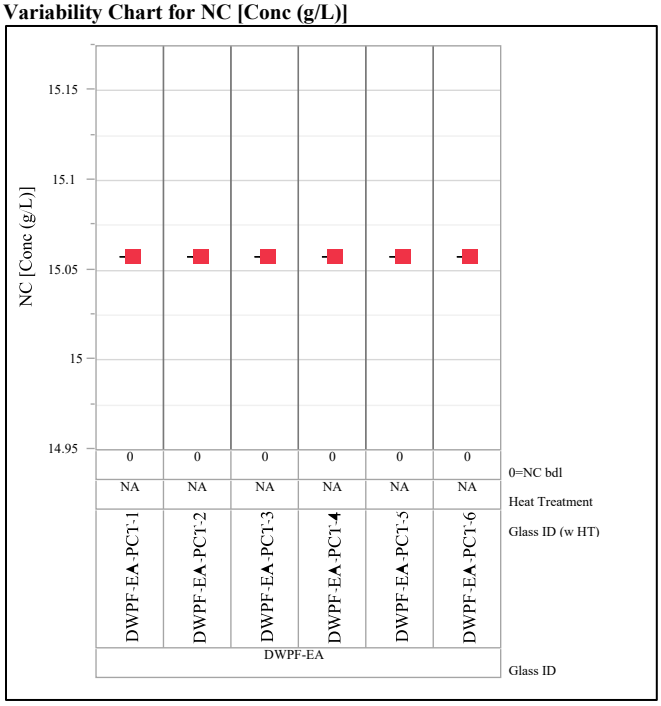


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=K, Comp View=Reference
Variability Chart for NC [Conc (g/L)]



Analyte=Li, Comp View=Reference
Variability Chart for NC [Conc (g/L)]

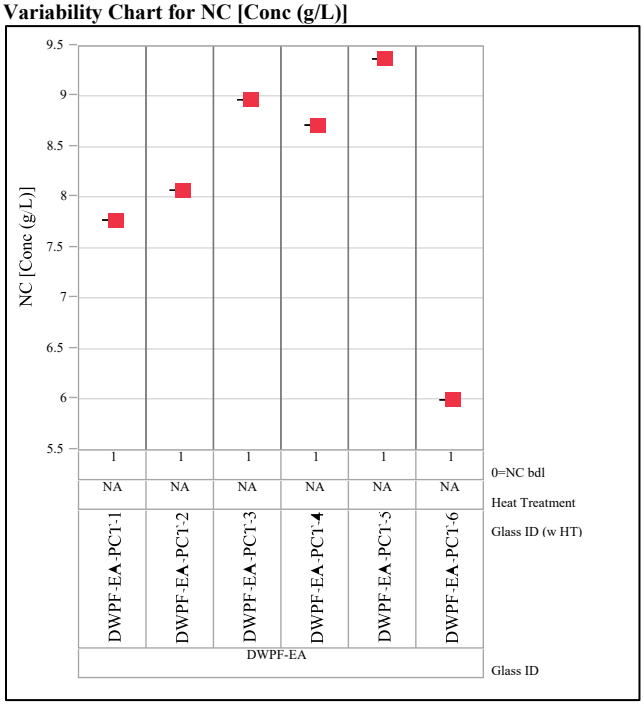
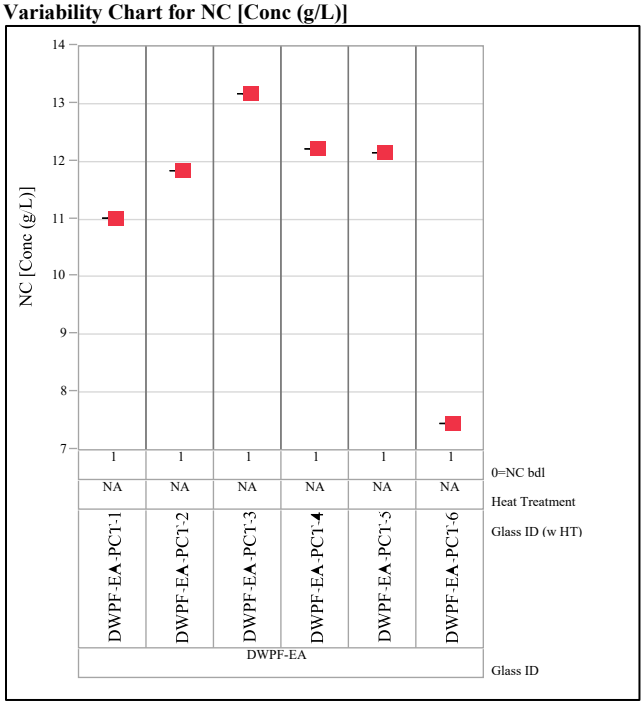


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Na, Comp View=Reference
Variability Chart for NC [Conc (g/L)]



Analyte=Si, Comp View=Reference
Variability Chart for NC [Conc (g/L)]

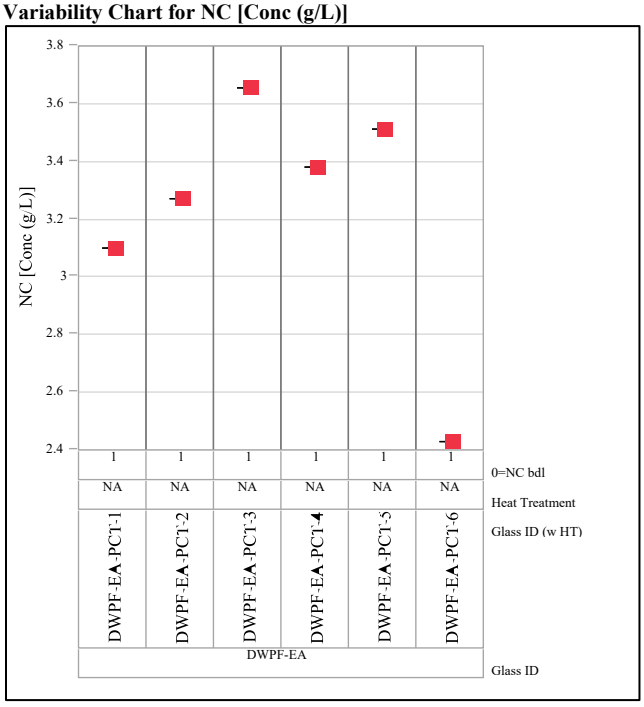


Exhibit C-1. Normalized PCT Results by Compositional View by Heat Treatment for Each Glass (continued)

Analyte=Zr, Comp View=Reference
Variability Chart for NC [Conc (g/L)]

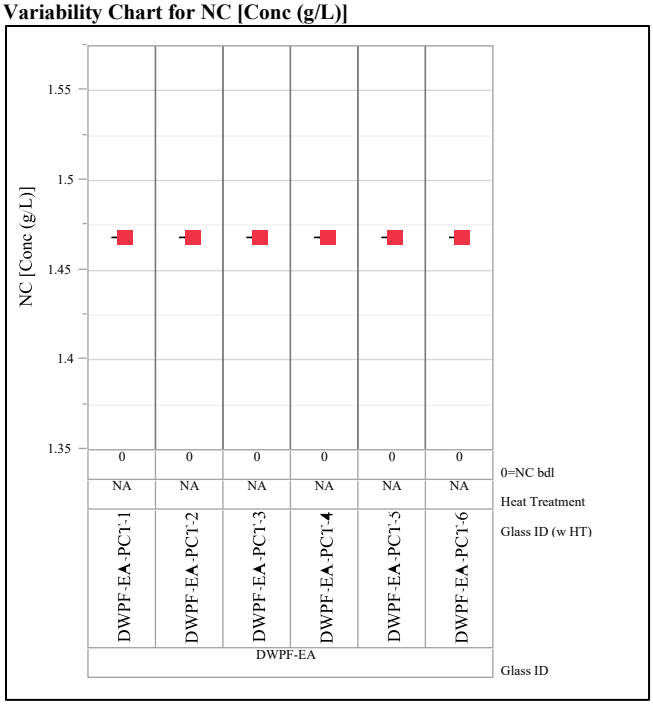


Exhibit C-2. Congruent Leaching Analysis for the Normalized PCT Results

Multivariate Correlations

Measured-CCC

	log NC[Al(g/L)]	log NC[B(g/L)]	log NC[Cr(g/L)]	log NC[K(g/L)]	log NC[Li(g/L)]	log NC[Na(g/L)]	log NC[Si(g/L)]	log NC[Zr(g/L)]
log NC[Al(g/L)]	1.0000	-0.0404	-0.2012	-0.0059	-0.0463	-0.0423	0.0629	-0.3387
log NC[B(g/L)]	-0.0404	1.0000	0.5571	0.8580	0.9132	0.9838	0.8473	-0.5034
log NC[Cr(g/L)]	-0.2012	0.5571	1.0000	0.4197	0.3938	0.5523	0.6948	-0.1693
log NC [K(g/L)]	-0.0059	0.8580	0.4197	1.0000	0.8859	0.9011	0.7932	-0.3751
log NC[Li(g/L)]	-0.0463	0.9132	0.3938	0.8859	1.0000	0.9358	0.7984	-0.4403
log NC[Na(g/L)]	-0.0423	0.9838	0.5523	0.9011	0.9358	1.0000	0.8816	-0.4900
log NC[Si(g/L)]	0.0629	0.8473	0.6948	0.7932	0.7984	0.8816	1.0000	-0.3888
log NC[Zr(g/L)]	-0.3387	-0.5034	-0.1693	-0.3751	-0.4403	-0.4900	-0.3888	1.0000

The correlations are estimated by Row-wise method.

Scatterplot Matrix

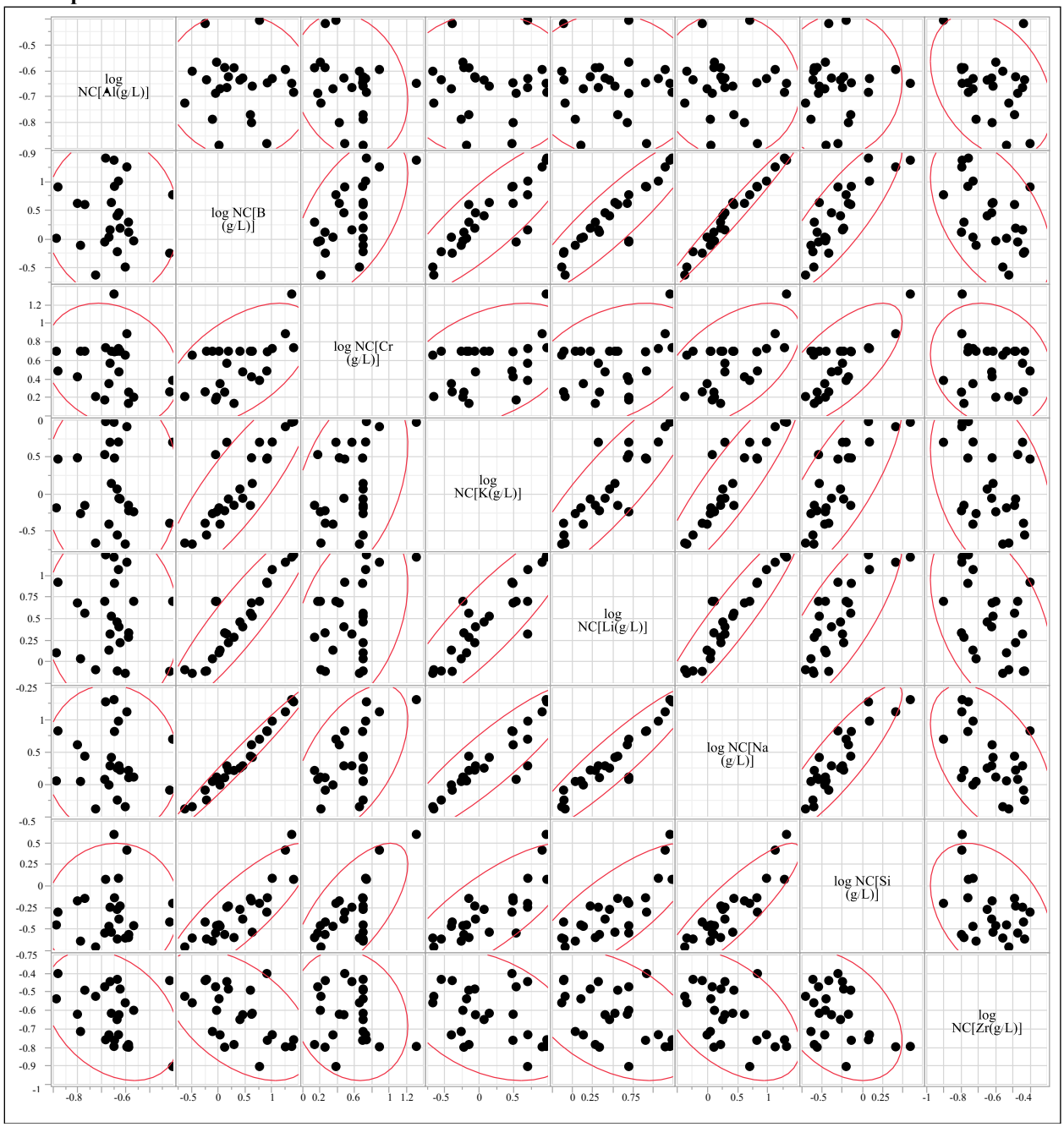


Exhibit C-2. Congruent Leaching Analysis for the Normalized PCT Results (continued)

Multivariate Correlations

Measured-Quenched

	log NC[Al(g/L)]	log NC[B(g/L)]	log NC[Cr(g/L)]	log NC[K(g/L)]	log NC[Li(g/L)]	log NC[Na(g/L)]	log NC[Si(g/L)]	log NC[Zr(g/L)]
log NC[Al(g/L)]	1.0000	-0.2884	-0.1691	-0.1749	-0.2960	-0.2645	-0.0530	-0.1608
log NC[B (g/L)]	-0.2884	1.0000	0.6651	0.8888	0.9261	0.9895	0.8589	-0.3751
log NC[Cr (g/L)]	-0.1691	0.6651	1.0000	0.5887	0.5582	0.6810	0.7778	-0.2520
log NC[K(g/L)]	-0.1749	0.8888	0.5887	1.0000	0.8973	0.9225	0.8437	-0.3215
log NC[Li(g/L)]	-0.2960	0.9261	0.5582	0.8973	1.0000	0.9453	0.8051	-0.3638
log NC[Na (g/L)]	-0.2645	0.9895	0.6810	0.9225	0.9453	1.0000	0.8867	-0.3863
log NC[Si (g/L)]	-0.0530	0.8589	0.7778	0.8437	0.8051	0.8867	1.0000	-0.3182
log NC[Zr(g/L)]	-0.1608	-0.3751	-0.2520	-0.3215	-0.3638	-0.3863	-0.3182	1.0000

The correlations are estimated by Row-wise method.

Scatterplot Matrix

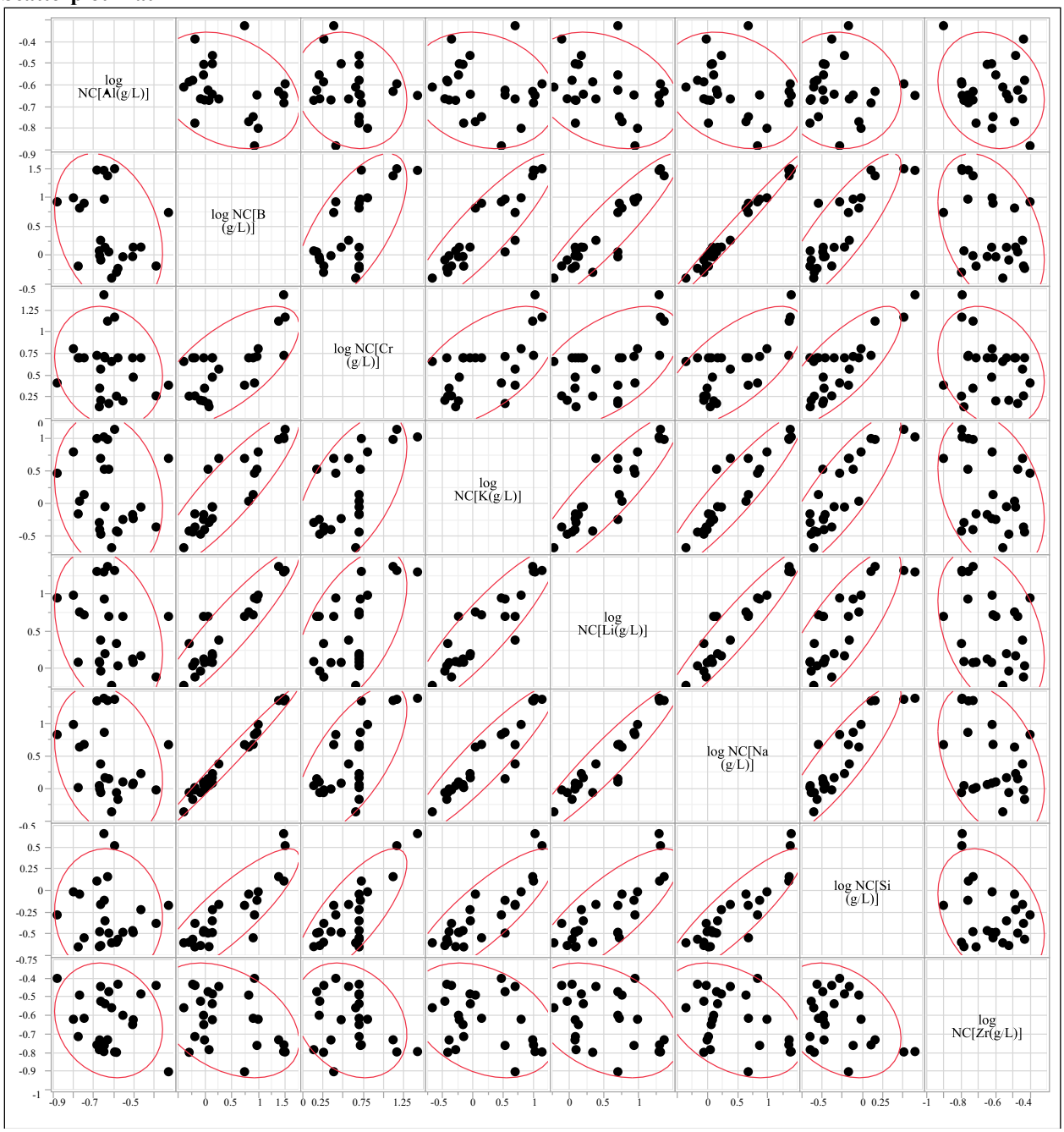


Exhibit C-2. Congruent Leaching Analysis for the Normalized PCT Results (continued)

Multivariate Correlations

Targeted-CCC

	log NC[Al(g/L)]	log NC[B(g/L)]	log NC[Cr(g/L)]	log NC[K(g/L)]	log NC[Li(g/L)]	log NC[Na(g/L)]	log NC[Si(g/L)]	log NC[Zr(g/L)]
log NC[Al(g/L)]	1.0000	0.0068	-0.1871	0.0046	0.0163	0.0216	0.0975	-0.2752
log NC[B (g/L)]	0.0068	1.0000	0.4292	0.8367	0.9865	0.9853	0.8444	-0.5052
log NC[Cr (g/L)]	-0.1871	0.4292	1.0000	0.2858	0.3910	0.3807	0.3848	-0.0954
log NC[K(g/L)]	0.0046	0.8367	0.2858	1.0000	0.8468	0.8743	0.7861	-0.3007
log NC[Li(g/L)]	0.0163	0.9865	0.3910	0.8468	1.0000	0.9839	0.8619	-0.5172
log NC[Na (g/L)]	0.0216	0.9853	0.3807	0.8743	0.9839	1.0000	0.8887	-0.4802
log NC[Si (g/L)]	0.0975	0.8444	0.3848	0.7861	0.8619	0.8887	1.0000	-0.3521
log NC[Zr(g/L)]	-0.2752	-0.5052	-0.0954	-0.3007	-0.5172	-0.4802	-0.3521	1.0000

There are 3 missing values. The correlations are estimated by REML method.

Scatterplot Matrix

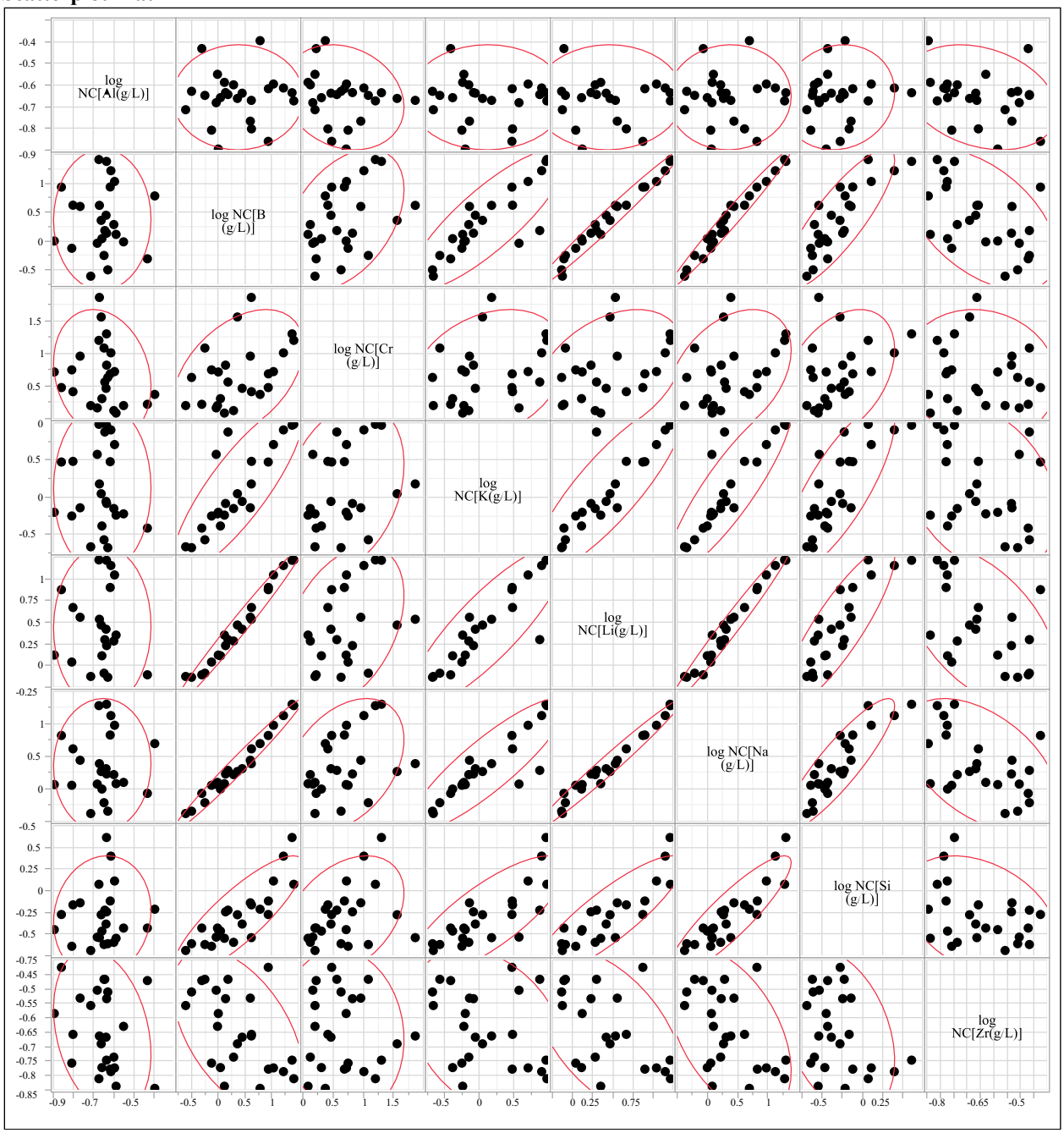


Exhibit C-2. Congruent Leaching Analysis for the Normalized PCT Results (continued)

Multivariate Correlations

Targeted-Quenched

	log NC[Al(g/L)]	log NC[B(g/L)]	log NC[Cr(g/L)]	log NC[K(g/L)]	log NC[Li(g/L)]	log NC[Na(g/L)]	log NC[Si(g/L)]	log NC[Zr(g/L)]
log NC[Al(g/L)]	1.0000	-0.2419	-0.2007	-0.2251	-0.2647	-0.1994	-0.0200	-0.1350
log NC[B (g/L)]	-0.2419	1.0000	0.5240	0.8682	0.9692	0.9882	0.8566	-0.3745
log NC[Cr (g/L)]	-0.2007	0.5240	1.0000	0.4169	0.5258	0.5191	0.4571	-0.1679
log NC[K(g/L)]	-0.2251	0.8682	0.4169	1.0000	0.8618	0.9024	0.8373	-0.2317
log NC[Li(g/L)]	-0.2647	0.9692	0.5258	0.8618	1.0000	0.9778	0.8552	-0.4276
log NC[Na (g/L)]	-0.1994	0.9882	0.5191	0.9024	0.9778	1.0000	0.8937	-0.3884
log NC[Si (g/L)]	-0.0200	0.8566	0.4571	0.8373	0.8552	0.8937	1.0000	-0.2802
log NC[Zr(g/L)]	-0.1350	-0.3745	-0.1679	-0.2317	-0.4276	-0.3884	-0.2802	1.0000

There are 3 missing values. The correlations are estimated by REML method.

Scatterplot Matrix

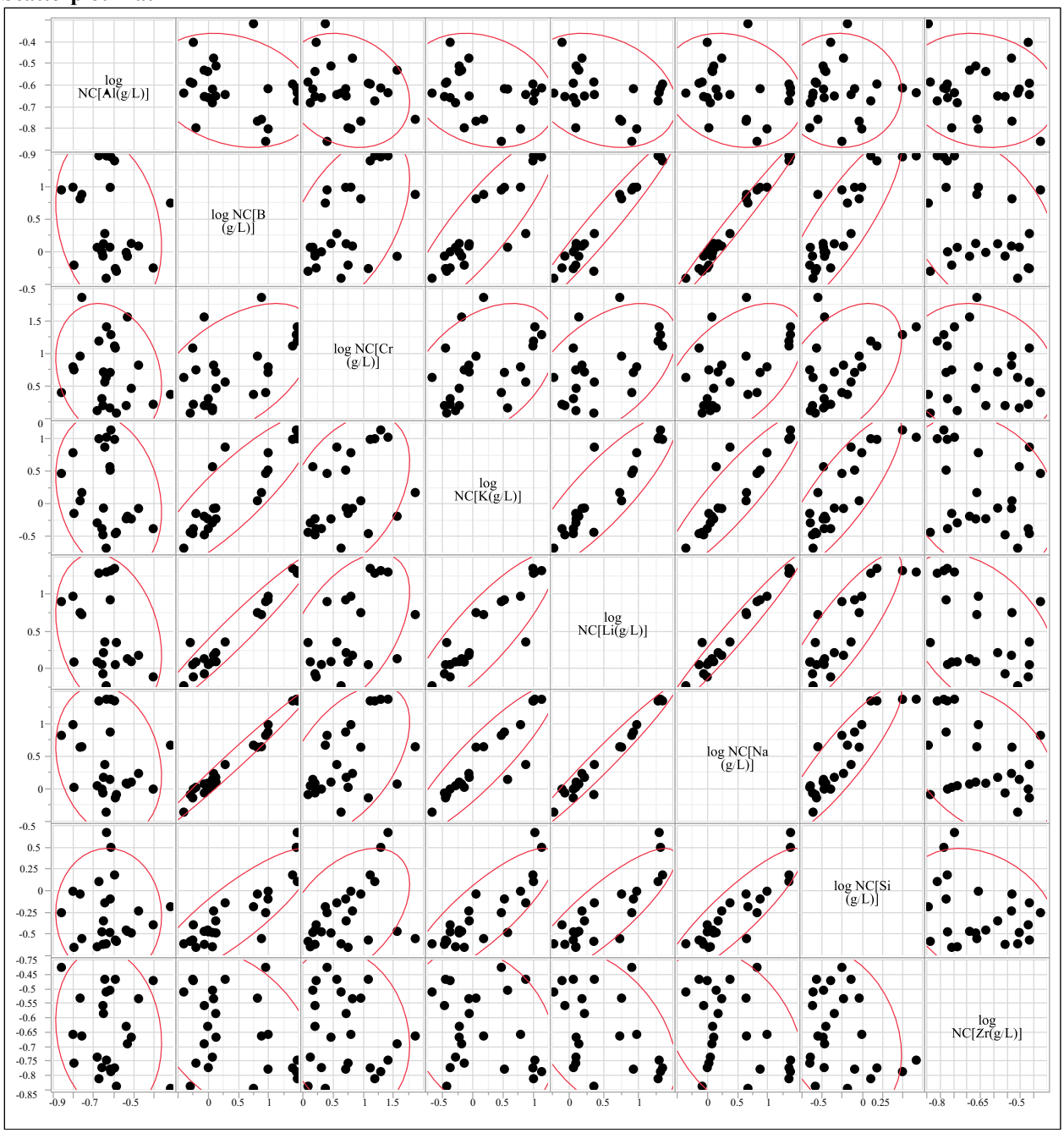


Exhibit C-2. Congruent Leaching Analysis for the Normalized PCT Results (continued)

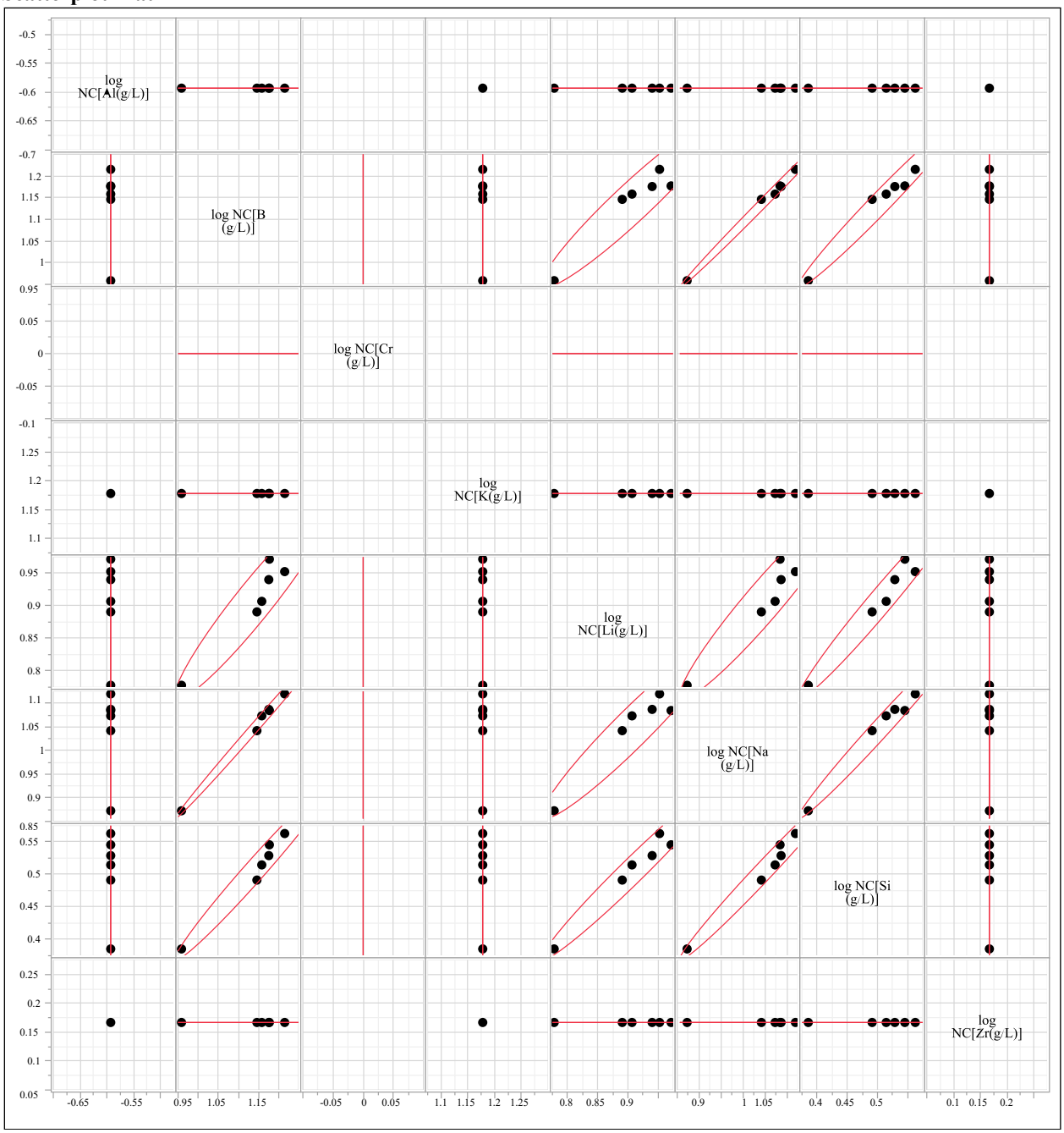
Multivariate Correlations

Reference-NA

	log NC[Al(g/L)]	log NC[B(g/L)]	log NC[Cr(g/L)]	log NC[K(g/L)]	log NC[Li(g/L)]	log NC[Na(g/L)]	log NC[Si(g/L)]	log NC[Zr(g/L)]
log NC[Al(g/L)]	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
log NC[B (g/L)]	0.0000	1.0000	0.0000	0.0000	0.9543	0.9972	0.9846	0.0000
log NC[Cr (g/L)]	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000
log NC[K(g/L)]	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
log NC[Li(g/L)]	0.0000	0.9543	0.0000	0.0000	1.0000	0.9585	0.9815	0.0000
log NC[Na (g/L)]	0.0000	0.9972	0.0000	0.0000	0.9585	1.0000	0.9887	0.0000
log NC[Si (g/L)]	0.0000	0.9846	0.0000	0.0000	0.9815	0.9887	1.0000	0.0000
log NC[Zr(g/L)]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

There are 6 missing values. The correlations are estimated by Pairwise method.

Scatterplot Matrix



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