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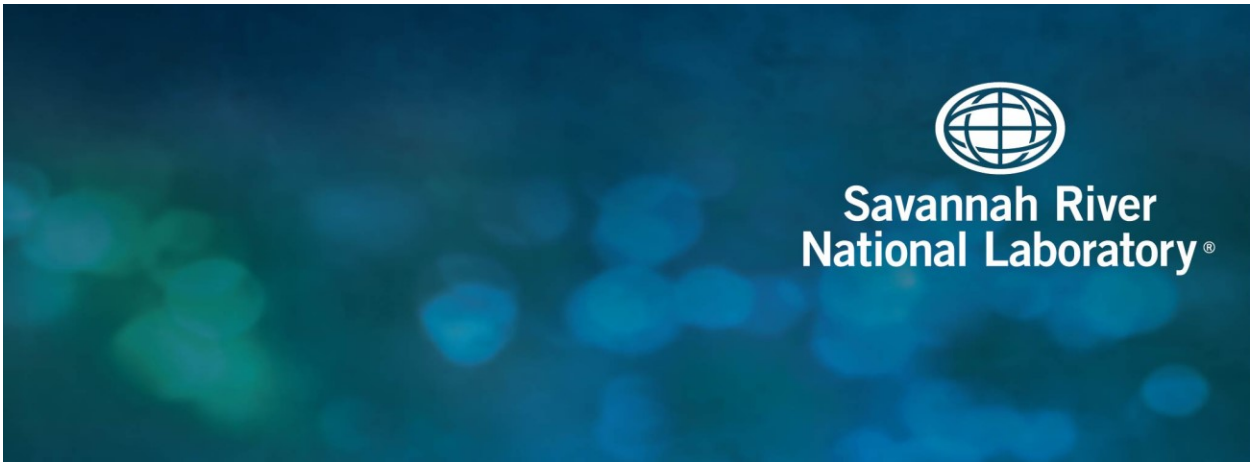

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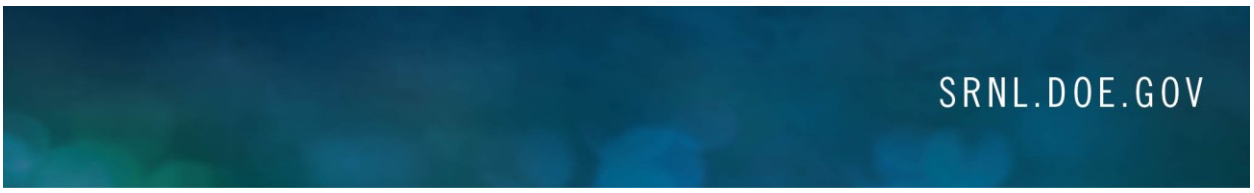
Product Consistency Test Results for the LAW Phase 5 Glasses

M. C. Hsieh

October 2021

SRNL-STI-2021-00446, Revision 0



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REVIEWS AND APPROVALS

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APPROVAL:

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EXECUTIVE SUMMARY

This report provides the results of the Vapor Hydration Test solutions and the Product Consistency Test leachates from the Low-Activity Waste Phase 5 glasses, a series of simulated nuclear waste glasses fabricated at the Pacific Northwest National Laboratory. The series included quenched and canister-centerline cooled versions of the glasses. These data will be used in the development of enhanced property/composition models for waste glass vitrification at Hanford.

Several of the blanks had detectable amounts of sodium and/or silicon. The measured concentrations (mg/L) of boron, sodium, and silicon for the low-activity test reference material glass included with the Product Consistency Tests were much lower than the expected low-activity test reference material test results. A review of the Product Consistency Test data indicated that there was generally little difference between the normalized values based on targeted or measured glass composition. Heat treatment had various impacts on the normalized concentration values. Most of the glasses had NC_B, NC_{Na}, and NC_{Si} values that were greater than the Hanford Tank Waste Treatment and Immobilization Plant low-activity waste constraint of 4 g/L. The release rates for boron, sodium, and silicon were highly correlated for the study glasses.

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LIST OF ABBREVIATIONS

ASTM	American Society for Testing and Materials
BDL	below detection limit
CCC	canister centerline cooled
DF	dilution factor
DOE	Department of Energy
IC	ion chromatography
ICP-OES	inductively coupled plasma – optical emission spectroscopy
ID	identifier
LAW	low-activity waste
LP5	Low-Activity Waste Phase 5
LRM	low-activity test reference material
NC_i	normalized concentration of element "*i*"
ORP	Office of River Protection
PCT	Product Consistency Test
PNNL	Pacific Northwest National Laboratory
Q	quenched
%RSD	percent relative standard deviation
SRNL	Savannah River National Laboratory
TTQAP	Task Technical and Quality Assurance Plan
VHT	Vapor Hydration Test
wt.%	weight percent
WTP	Hanford Tank Waste Treatment and Immobilization Plant

1.0 Introduction

The U.S. Department of Energy (DOE) is responsible for 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 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 successful 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[a]. Additional flexibility and expansion of the qualified glass forming region are the current focus.[1] SRNL support of this work is defined in the Task Technical and Quality Assurance Plan (TTQAP).[2]

This report provides the results of the Vapor Hydration Test (VHT) solutions and the Product Consistency Test (PCT) leachates from the Low-Activity Waste Phase 5 (LP5) glasses, a series of simulated nuclear waste glasses fabricated at the Pacific Northwest National Laboratory (PNNL). The series included quenched (Q) and canister-centerline cooled (CCC) versions of the glasses. The glasses were selected as part of a broader study of the influence of glass composition on chemical durability, sulfur retention, and other properties.[3] These data will be used in the development, validation, and implementation of enhanced property/composition models for nuclear waste glasses.[1]

2.0 Experimental Procedure

2.1 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in manual E7 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.[4] Laboratory data for this study were recorded in the SRNL Electronic Laboratory Notebook system, experiment L6390-00441-02. The leachates were provided by PNNL following a Task Plan.[1]

2.2 Glasses Selected for Study

The baseline (quenched) glass compositions in this study were selected and fabricated by PNNL. PNNL performed CCC heat treatments on a subsample of each of the glasses. ASTM C1285 PCT Method A[5] was performed on Q and CCC versions of each of the study glasses and ASTM C1663 VHT[6] was performed on Q and CCC versions of selected study glasses. The resulting PCT leachates and VHT solutions were sent to SRNL for chemical analysis. Identifiers for the VHT solutions are listed in Table 2-1. Identifiers for the PCT leachates are listed in Table 2-2.

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

Table 2-1. Identifiers for the VHT Solutions

PNNL Solution ID	Lab ID
LP5-01-Q-VHT	S-12396
LP5-02-Q-VHT	S-12397
LP5-03-Q-VHT	S-12398
LP5-04-Q-VHT	S-12399
LP5-05-Q-VHT	S-12400
LP5-07-Q-VHT	S-12401
LP5-08-Q-VHT	S-12402
LP5-09-Q-VHT	S-12403
LP5-10-Q-VHT	S-12404
LP5-11-Q-VHT	S-12405
LP5-12-1-Q-VHT	S-12406
LP5-13-Q-VHT	S-12407
LP5-14-Q-VHT	S-12408
LP5-15-Q-VHT	S-12409
LP5-16_Mod 1-Q-VHT	S-12410
LP5-17-Q-VHT	S-12411
LP5-18-Q-VHT	S-12412
LP5-19-Q-VHT	S-12413
LP5-20-Q-VHT	S-12414
LP5-21-Q-VHT	S-12415
LP5-22-Q-VHT	S-12416
LP5-23-Q-VHT	S-12417
LP5-24-Q-VHT	S-12418
LP5-25-Q-VHT	S-12419
LP5-01-CCC-VHT	S-12420
LP5-02-CCC-VHT	S-12421
LP5-03-CCC-VHT	S-12422
LP5-05-CCC-VHT	S-12423
LP5-06_Mod 1-CCC-VHT	S-12424
LP5-08-CCC-VHT	S-12425
LP5-09-CCC-VHT	S-12426
LP5-12-1-CCC-VHT	S-12427
LP5-15-CCC-VHT	S-12428

Table 2-2. Identifiers for the PCT Leachates

PNNL Solution ID	Lab ID	PNNL Solution ID	Lab ID
LP5-01-Q-PCT-B	S-12429	LP5-18-Q-PCT-C	S-12479
LP5-01-Q-PCT-C	S-12430	LP5-19-Q-PCT-A	S-12480
LP5-02-Q-PCT-A	S-12431	LP5-19-Q-PCT-B	S-12481
LP5-02-Q-PCT-B	S-12432	LP5-19-Q-PCT-C	S-12482
LP5-02-Q-PCT-C	S-12433	LP5-20-Q-PCT-A	S-12483
LP5-03-Q-PCT-A	S-12434	LP5-20-Q-PCT-B	S-12484
LP5-03-Q-PCT-B	S-12435	LP5-20-Q-PCT-C	S-12485
LP5-03-Q-PCT-C	S-12436	LP5-21-Q-PCT-A	S-12486
LP5-04-Q-PCT-A	S-12437	LP5-21-Q-PCT-B	S-12487
LP5-04-Q-PCT-B	S-12438	LP5-21-Q-PCT-C	S-12488
LP5-05-Q-PCT-A	S-12439	LP5-22-Q-PCT-A	S-12489
LP5-05-Q-PCT-B	S-12440	LP5-22-Q-PCT-B	S-12490
LP5-05-Q-PCT-C	S-12441	LP5-22-Q-PCT-C	S-12491
LP5-06-MOD1-Q-PCT-A	S-12442	LP5-23-Q-PCT-B	S-12492
LP5-06-MOD1-Q-PCT-B	S-12443	LP5-23-Q-PCT-C	S-12493
LP5-06-MOD1-Q-PCT-C	S-12444	LP5-24-Q-PCT-A	S-12494
LP5-07-Q-PCT-1-A	S-12445	LP5-24-Q-PCT-B	S-12495
LP5-07-Q-PCT-1-B	S-12446	LP5-24-Q-PCT-C	S-12496
LP5-07-Q-PCT-1-C	S-12447	LP5-25-Q-PCT-A	S-12497
LP5-08-Q-PCT-A	S-12448	LP5-25-Q-PCT-B	S-12498
LP5-08-Q-PCT-B	S-12449	LP5-25-Q-PCT-C	S-12499
LP5-08-Q-PCT-C	S-12450	LP5-01-CCC-PCT-A	S-12500
LP5-09-Q-PCT-A	S-12451	LP5-01-CCC-PCT-B	S-12501
LP5-09-Q-PCT-B	S-12452	LP5-01-CCC-PCT-C	S-12502
LP5-09-Q-PCT-C	S-12453	LP5-02-CCC-PCT-A	S-12503
LP5-10-Q-PCT-A	S-12454	LP5-02-CCC-PCT-B	S-12504
LP5-10-Q-PCT-B	S-12455	LP5-02-CCC-PCT-C	S-12505
LP5-10-Q-PCT-C	S-12456	LP5-03-CCC-PCT-A	S-12506
LP5-11-Q-PCT-A	S-12457	LP5-03-CCC-PCT-B	S-12507
LP5-11-Q-PCT-B	S-12458	LP5-03-CCC-PCT-C	S-12508
LP5-11-Q-PCT-C	S-12459	LP5-04-CCC-PCT-A	S-12509
LP5-12-1-Q-PCT-A	S-12460	LP5-04-CCC-PCT-B	S-12510
LP5-12-1-Q-PCT-B	S-12461	LP5-04-CCC-PCT-C	S-12511
LP5-12-1-Q-PCT-C	S-12462	LP5-05-CCC-PCT-A	S-12512
LP5-13-Q-PCT-A	S-12463	LP5-05-CCC-PCT-B	S-12513
LP5-13-Q-PCT-B	S-12464	LP5-05-CCC-PCT-C	S-12514
LP5-13-Q-PCT-C	S-12465	LP5-06-MOD1-CCC-PCT-A	S-12515
LP5-14-Q-PCT-A	S-12466	LP5-06-MOD1-CCC-PCT-B	S-12516
LP5-14-Q-PCT-B	S-12467	LP5-06-MOD1-CCC-PCT-C	S-12517
LP5-14-Q-PCT-C	S-12468	LP5-07-CCC-PCT-A	S-12518
LP5-15-Q-PCT-B	S-12469	LP5-07-CCC-PCT-B	S-12519
LP5-15-Q-PCT-C	S-12470	LP5-07-CCC-PCT-C	S-12520
LP5-16-MOD1-Q-PCT-A	S-12471	LP5-08-CCC-PCT-A	S-12521
LP5-16-MOD1-Q-PCT-B	S-12472	LP5-08-CCC-PCT-B	S-12522
LP5-16-MOD1-Q-PCT-C	S-12473	LP5-08-CCC-PCT-C	S-12523
LP5-17-Q-PCT-A	S-12474	LP5-09-CCC-PCT-A	S-12524
LP5-17-Q-PCT-B	S-12475	LP5-09-CCC-PCT-B	S-12525
LP5-17-Q-PCT-C	S-12476	LP5-09-CCC-PCT-C	S-12526
LP5-18-Q-PCT-A	S-12477	LP5-10-CCC-PCT-A	S-12527
LP5-18-Q-PCT-B	S-12478	LP5-10-CCC-PCT-B	S-12528

Table 2-2. Identifiers for the PCT Leachates (continued)

PNNL Solution ID	Lab ID	PNNL Solution ID	Lab ID
LP5-10-CCC-PCT-C	S-12529	LRM Standard-A 2/16/21	S-12575
LP5-11-CCC-PCT-A	S-12530	LRM Standard-B 2/16/21	S-12576
LP5-11-CCC-PCT-B	S-12531	LRM Standard-C 2/16/21	S-12577
LP5-11-CCC-PCT-C	S-12532	LRM Standard-A 2/26/21	S-12578
LP5-12-1-CCC-PCT-A	S-12533	LRM Standard-B 2/26/21	S-12579
LP5-12-1-CCC-PCT-B	S-12534	LRM Standard-C 2/26/21	S-12580
LP5-12-1-CCC-PCT-C	S-12535	LRM Standard-A 3/4/21	S-12581
LP5-13-CCC-PCT-A	S-12536	LRM Standard-B 3/4/21	S-12582
LP5-13-CCC-PCT-B	S-12537	LRM Standard-C 3/4/21	S-12583
LP5-13-CCC-PCT-C	S-12538	LRM Standard-A 3/12/21	S-12584
LP5-14-CCC-PCT-A	S-12539	LRM Standard-B 3/12/21	S-12585
LP5-14-CCC-PCT-B	S-12540	LRM Standard-C 3/12/21	S-12586
LP5-14-CCC-PCT-C	S-12541	LRM Standard-A 3/18/21	S-12587
LP5-15-CCC-PCT-A	S-12542	LRM Standard-B 3/18/21	S-12588
LP5-15-CCC-PCT-B	S-12543	LRM Standard-C 3/18/21	S-12589
LP5-15-CCC-PCT-C	S-12544	LRM Standard-A 3/26/21	S-12590
LP5-16-MOD1-CCC-PCT-A	S-12545	LRM Standard-B 3/26/21	S-12591
LP5-16-MOD1-CCC-PCT-B	S-12546	LRM Standard-C 3/26/21	S-12592
LP5-16-MOD1-CCC-PCT-C	S-12547	LRM Standard-A 4/1/21	S-12593
LP5-17-CCC-PCT-A	S-12548	LRM Standard-B 4/1/21	S-12594
LP5-17-CCC-PCT-B	S-12549	LRM Standard-C 4/1/21	S-12595
LP5-17-CCC-PCT-C	S-12550	LRM Standard-A 4/9/21	S-12596
LP5-18-CCC-PCT-A	S-12551	LRM Standard-B 4/9/21	S-12597
LP5-18-CCC-PCT-B	S-12552	LRM Standard-C 4/9/21	S-12598
LP5-18-CCC-PCT-C	S-12553	LRM Standard-A 4/19/21	S-12599
LP5-19-CCC-PCT-A	S-12554	LRM Standard-B 4/19/21	S-12600
LP5-19-CCC-PCT-B	S-12555	LRM Standard-C 4/19/21	S-12601
LP5-19-CCC-PCT-C	S-12556	DI Water BLK-A 2/16/21	S-12602
LP5-20-CCC-PCT-A	S-12557	DI Water BLK-B 2/16/21	S-12603
LP5-20-CCC-PCT-B	S-12558	DI Water BLK-A 2/26/21	S-12604
LP5-20-CCC-PCT-C	S-12559	DI Water BLK-B 2/26/21	S-12605
LP5-21-CCC-PCT-A	S-12560	DI Water BLK-A 3/4/21	S-12606
LP5-21-CCC-PCT-B	S-12561	DI Water BLK-B 3/4/21	S-12607
LP5-21-CCC-PCT-C	S-12562	DI Water BLK-A 3/12/21	S-12608
LP5-22-CCC-PCT-A	S-12563	DI Water BLK-B 3/12/21	S-12609
LP5-22-CCC-PCT-B	S-12564	DI Water BLK-A 3/18/21	S-12610
LP5-22-CCC-PCT-C	S-12565	DI Water BLK-B 3/18/21	S-12611
LP5-23-CCC-PCT-A	S-12566	DI Water BLK-A 3/26/21	S-12612
LP5-23-CCC-PCT-B	S-12567	DI Water BLK-B 3/26/21	S-12613
LP5-23-CCC-PCT-C	S-12568	DI Water BLK-A 4/1/21	S-12614
LP5-24-CCC-PCT-A	S-12569	DI Water BLK-B 4/1/21	S-12615
LP5-24-CCC-PCT-B	S-12570	DI Water BLK-A 4/9/21	S-12616
LP5-24-CCC-PCT-C	S-12571	DI Water BLK-B 4/9/21	S-12617
LP5-25-CCC-PCT-A	S-12572	DI Water BLK-A 4/19/21	S-12618
LP5-25-CCC-PCT-B	S-12573	DI Water BLK-B 4/19/21	S-12619
LP5-25-CCC-PCT-C	S-12574		

2.3 VHT Solution Analysis

The VHT solutions were analyzed by inductively coupled plasma – optical emission spectroscopy (ICP-OES)[7] and ion chromatography (IC)[8] under the auspices of an analytical study plan.[9] Samples of a multi-element standard solution[b] were also included in the analytical plan as a check of the accuracy of the instrument used for these measurements. The VHT solution measurements were not corrected for the dilutions performed at PNNL.

2.4 PCT Leachate Analysis

The PCT leachate samples were analyzed by ICP-OES[7] and IC[8] under the auspices of an analytical study plan.[9] Samples of a multi-element standard solution[b] were also included in the analytical plan as a check of the accuracy of the instrument used for these measurements. PNNL provided the dilution factor used in preparing the PCT leachates for analyses. The leachate measurements were adjusted using the provided dilution factor (DF) of 5 as described further below. Normalized release values were calculated for each glass based on the targeted and measured[10] glass compositions.

3.0 Results and Discussion

JMP® Version 14.3.0 (SAS Institute, Inc.)[11] was used to support these analyses.

3.1 Measured Compositions of the VHT Solutions

Table A-1 in Appendix A provides the elemental concentration measurements in mg/L for the VHT solutions and standard solutions as measured by ICP-OES in analytical sequence. Table A-2 in Appendix A provides the elemental concentration measurements in mg/L for the VHT solutions and standard solutions as measured by IC in analytical sequence. Values are shown as received from the analytical laboratory. These unprocessed data are provided so that the values are readily available should they be of interest for future reviews.

3.2 Measured Compositions of the PCT Leachates

Table B-1 in Appendix B provides the elemental concentration measurements in mg/L for the PCT leachates and standard solutions as measured by ICP-OES in analytical sequence. Table B-2 in Appendix B provides the elemental concentration measurements in mg/L for the PCT leachates and standard solutions as measured by IC in analytical sequence. Table B-3 and Table B-4 in Appendix B provide the results from rerun samples, which are discussed below, as measured by ICP-OES and IC, respectively. These values are shown as received from the analytical laboratory. These unprocessed data are provided so that the values are readily available should they be of interest for future reviews.

Table B-5 provides measurements for the PCT blanks and study glass leachates after using the provided dilution factor of 5 to correct for dilutions performed at PNNL. Note that the measured concentrations of the analytes in half of the blank samples were below detection limits (BDL) and denoted by a less than symbol (<). However, several blanks had measurable Na and/or Si concentrations. These samples were rerun, and the results were generally the same. For reference, the results of the reruns are listed in Table 3-2.

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

Table 3-1. PCT Blank Sample Rerun Results (mg/L)

PNNL Solution ID	Lab ID	Al	B	Li	Na	Si
DI Water BLK-A 2/16/21	S-12602	<5.00	<5.00	<5.00	<5.00	9.45
DI Water BLK-B 2/16/21	S-12603	<5.00	<5.00	<5.00	6.40	17.5
DI Water BLK-A 2/26/21	S-12604	<5.00	<5.00	<5.00	<5.00	19.8
DI Water BLK-B 2/26/21	S-12605	<5.00	<5.00	<5.00	<5.00	14.7
DI Water BLK-A 3/12/21	S-12608	<5.00	<5.00	<5.00	<5.00	9.75
DI Water BLK-B 3/18/21	S-12611	<5.00	<5.00	<5.00	<5.00	12.7
DI Water BLK-A 4/1/21	S-12614	<5.00	<5.00	<5.00	<5.00	10.1
DI Water BLK-A 4/19/21	S-12618	<5.00	<5.00	<5.00	<5.00	<5.00

Table B-6 in Appendix B provides measurements for the samples of the low-activity test reference material (LRM) reference glass included in the PCTs after using the provided dilution factor of 5 to correct for dilutions performed at PNNL. Note that the measured concentrations (mg/L) of B, Na, and Si were significantly lower than the LRM expected test results.[12] Values that fall outside the ranges of the expected test results are shaded in the table. Three of the LRM samples were rerun due to inconsistent B measurements. The rerun sample results were used for normalizing the PCT data. For reference, the results of the LRM reruns are listed in Table 3-2.

Table 3-2. PCT LRM Sample Rerun Results (mg/L)

PNNL Solution ID	Lab ID	Al	B	Li	Na	Si
LRM Standard-A 2/16/21	S-12575	6.60	8.50	<5.00	106	88.0
LRM Standard-A 3/4/21	S-12581	13.1	12.5	<5.00	101	73.5
LRM Standard-C 4/1/21	S-12595	14.1	21.8	<5.00	107	73.5

Following the guidance in ASTM C1285[5] the mean, standard deviation, and percent relative standard deviation (%RSD) were determined for each element present in the solution standard for each analytical block. As shown in Table B-7 in Appendix B, 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%), and the %RSD was less than 10% for each element. Thus, these analytical results are acceptable per the criteria in ASTM C1285[5], which indicates no significant issues with the analytical outcomes for the measurements of the PCT leachates.

Exhibit B-1 in Appendix B provides plots of the triplicate leachate concentrations by the glass ID. Both linear and logarithmic plots are provided for selected elements: Al, B, Li, Na, and Si. 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.

3.3 Normalization of PCT Data

The PCT leachate data were used to determine normalized concentrations for each element of interest using both the targeted and average measured compositions[10] of the glasses following the expression given in ASTM C1285.[5]

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

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}.[c]

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 for each of the study glasses. Note that the symbols in this second equation were kept consistent with those used in ASTM C1285,[5] 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 $g_{waste\ form}/L_{leachant}$, $\overline{\log_{10} c_i}$ 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 3.2), and $\log_{10} f_i$ is either the common logarithm of the targeted concentration of element "*i*" in the glass in units of weight percent (wt.%) or the common logarithm of the average measured concentration of element "*i*" in the glass in units of wt.% (reported previously[10]).

Table C-1 in Appendix C provides the normalized PCT responses for the Q and CCC for each of the study glasses as well as the responses for the LRM reference glass[12]. The results are grouped by compositional view. Note that an indicator (<) is provided as part of these plots to show results involving BDL values. The plots of Exhibit C-1 in Appendix C provide a graphical comparison between the PCT responses for the two versions of each study glass. Exhibit C-2 in Appendix C provides plots of the normalized PCT responses for the samples of LRM reference glass.

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

- Little difference is seen when evaluating the normalized values using the targeted or measured glass compositions.
- Heat treatment had various impacts on the NC_i values.
    - In most cases, heat-treatment had marginal impact on NC_i values.
    - The heat-treated versions of LP5-02, LP5-04, LP5-09, LP5-10, LP5-12-1, and LP5-16-MOD1 had significantly higher NC_i values than the quenched versions.
    - The heat-treated versions of LP5-01, LP5-14, and LP5-17 had lower NC_i values than the quenched versions.
- Most of the glasses exceeded the WTP NC_B, NC_{Na}, and NC_{Si} 4 g/L constraints.[d] The following did not exceed the constraints:
    - Both Q and CCC versions of LP5-06-MOD1, LP5-23, LP5-24, and LP5-25 had NC_B, NC_{Na}, and NC_{Si} values less than 4 g/L.
    - The Q versions of LP5-02, LP5-04, LP5-07, LP5-09, and LP5-12-1 had NC_B, NC_{Na}, and NC_{Si} values less than 4 g/L.

Exhibit C-3 provides the results of an evaluation of congruent leaching among the analytes for the study glasses. The release rates for B, Na, and Si were highly correlated in the study glasses.

[c] 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.

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

4.0 Summary

Several of the blanks had detectable amounts of Na and/or Si. The measured concentrations (mg/L) of B, Na, and Si for the LRM reference glass included with the PCTs were much lower than the expected LRM test results. A review of the PCT data indicated that there was generally little difference between the normalized values based on targeted or measured glass composition. Heat treatment had various impacts on the NC_i values. Most of the glasses had NC_B, NC_{Na}, and NC_{Si} values that were greater than the WTP low-activity waste constraint of 4 g/L. The release rates for B, Na, and Si were highly correlated for the study glasses.

5.0 References

1. C.E. Lonergan, "Low-activity Waste (LAW) Glass Testing Phase 5: Expansion of LAW Glass Composition Boundaries," Pacific Northwest National Laboratory, Richland, WA, EWG-TP-0135, Revision 1.0, 2021.

2. K.M. Fox, "Task Technical and Quality Assurance Plan for Hanford Waste Glass Development and Characterization," Savannah River National Laboratory, Aiken, SC, SRNL-RP-2013-00692, Revision 1, 2016.

3. D.K. Peeler, D.S. Kim, J.D. Vienna, M.J. Schweiger, and G.F. Piepel, "Office of River Protection Advanced Low-Activity Waste Glass Research and Development Plan," Pacific Northwest National Laboratory, Richland, WA, PNNL-24883, EWG-RPT-008, Revision 0, 2015.

4. "Technical Reviews," Savannah River Site, Aiken, SC, Manual E7, Procedure 2.60, Rev. 19, 2021.

5. ASTM, "Standard Test Methods for Determining Chemical Durability of Nuclear, Hazardous, and Mixed Waste Glasses and Multiphase Glass Ceramics: The Product Consistency Test (PCT)," ASTM International, West Conshohocken, PA, C1285 - 21, 2021.

6. ASTM, "Standard Test Method for Measuring Waste Glass or Glass Ceramic Durability by Vapor Hydration Test," ASTM International, West Conshohocken, PA, C1663 - 18, 2018.

7. "Calibration, Verification, and Operation of the Agilent 5110 ICP-OES Inductively Coupled Plasma-Optical Emission Spectrometer," Savannah River National Laboratory, Aiken, SC, Manual L33, Procedure 0242, Rev. 1, 2021.

8. "Anion Analysis Using the Dionex ICS 6000 Ion Chromatograph," Savannah River National Laboratory, Aiken, SC, Manual L33, Procedure 0244, Revision 1, 2020.

9. M.C. Hsieh, "An Analytical Plan for Measuring the VHT and PCT Solutions of the LAW Phase 5 Study Glasses," Savannah River National Laboratory Aiken, SC, SRNL-L3300-2021-00023, Revision 0, 2021.

10. M.C. Hsieh, "Composition Measurements of the LAW Phase 5 Glasses," Savannah River National Laboratory, Aiken, SC, SRNL-STI-2021-00409, Revision 0, 2021.

11. JMP(R) Version 14.3.0, SAS Institute Inc., Cary, NC, 2019.

12. W.L. Ebert and S.F. Wolf, “Round-Robin Testing of a Reference Glass for Low-Activity Waste Forms,” Argonne National Laboratory, Argonne, IL, ANL-99/22, Revision 0, 1999.

Appendix A. Tables Containing the Measurement Data for the LAW Phase 5 VHT Solutions

Table A-1. As Received VHT Solution Measurements (mg/L) Measured by ICP-OES

PNNL ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
VHT standard	1	1	std-VHT-11	4.09	18.9	<1.00	<1.00	4.04	10.1	9.20	<1.00	77.5	<1.00	<1.00	<1.00	<1.00	49.5	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-01-CCC-VHT	1	2	S-12420	<1.00	190	<1.00	137	1.01	171	<1.00	<1.00	796	<1.00	14.2	<1.00	8.51	84.3	1.80	<1.00	136	<1.00	<1.00
LP5-15-Q-VHT	1	3	S-12409	1.81	826	<1.00	<1.00	<1.00	786	<1.00	<1.00	3410	<1.00	15.3	<1.00	3.00	381	5.08	<1.00	545	<1.00	<1.00
LP5-16_Mod 1-Q-VHT	1	4	S-12410	<1.00	35.0	<1.00	<1.00	<1.00	4.26	<1.00	<1.00	236	<1.00	<1.00	<1.00	1.12	2.45	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-12-1-Q-VHT	1	5	S-12406	<1.00	250	<1.00	<1.00	<1.00	127	<1.00	<1.00	1150	<1.00	3.65	<1.00	3.72	96.9	7.16	<1.00	322	1.71	<1.00
LP5-05-Q-VHT	1	6	S-12400	1.04	625	<1.00	<1.00	1.43	304	<1.00	<1.00	3190	<1.00	7.18	<1.00	21.4	341	37.4	<1.00	806	4.65	<1.00
LP5-19-Q-VHT	1	7	S-12413	<1.00	514	<1.00	<1.00	<1.00	514	<1.00	<1.00	1950	<1.00	10.0	<1.00	17.5	173	8.99	<1.00	128	14.6	<1.00
VHT standard	1	8	std-VHT-12	4.29	18.3	<1.00	<1.00	4.10	10.3	9.49	<1.00	74.7	<1.00	<1.00	<1.00	<1.00	52.1	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-21-Q-VHT	1	9	S-12415	<1.00	425	<1.00	<1.00	<1.00	244	<1.00	<1.00	1080	<1.00	<1.00	<1.00	20.9	148	1.86	<1.00	213	2.38	<1.00
LP5-25-Q-VHT	1	10	S-12419	<1.00	3.16	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-08-CCC-VHT	1	11	S-12425	<1.00	56.0	<1.00	<1.00	<1.00	44.1	<1.00	<1.00	168	<1.00	2.29	<1.00	<1.00	34.9	1.32	<1.00	3.66	<1.00	<1.00
LP5-11-Q-VHT	1	12	S-12405	1.11	454	<1.00	<1.00	<1.00	43.8	<1.00	<1.00	2690	<1.00	4.01	<1.00	45.5	275	5.26	<1.00	758	8.77	<1.00
LP5-12-1-CCC-VHT	1	13	S-12427	<1.00	621	<1.00	<1.00	<1.00	347	<1.00	<1.00	1470	<1.00	1.00	<1.00	35.8	39.3	<1.00	<1.00	582	<1.00	<1.00
VHT standard	1	14	std-VHT-13	4.32	18.1	<1.00	<1.00	4.10	10.4	9.49	<1.00	75.3	<1.00	<1.00	<1.00	<1.00	52.3	<1.00	<1.00	<1.00	<1.00	<1.00
VHT standard	2	1	std-VHT-21	4.18	19.7	<1.00	<1.00	4.19	9.65	9.71	<1.00	79.7	<1.00	<1.00	<1.00	<1.00	51.4	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-02-Q-VHT	2	2	S-12397	1.08	309	<1.00	<1.00	<1.00	73.7	<1.00	<1.00	1960	<1.00	10.5	<1.00	28.8	156	5.84	<1.00	186	12.9	<1.00
LP5-03-Q-VHT	2	3	S-12398	<1.00	132	<1.00	104	<1.00	2.88	<1.00	<1.00	584	<1.00	<1.00	<1.00	17.0	16.6	<1.00	<1.00	146	<1.00	<1.00
LP5-17-Q-VHT	2	4	S-12411	<1.00	432	<1.00	<1.00	<1.00	301	<1.00	<1.00	1740	<1.00	<1.00	<1.00	24.7	130	2.54	<1.00	522	3.85	<1.00
LP5-06_Mod 1-CCC-VHT	2	5	S-12424	<1.00	257	<1.00	66.5	<1.00	196	<1.00	<1.00	941	<1.00	1.17	<1.00	8.63	58.3	1.55	<1.00	378	<1.00	<1.00
LP5-02-CCC-VHT	2	6	S-12421	1.90	640	<1.00	1.01	<1.00	242	<1.00	<1.00	2690	<1.00	2.63	<1.00	67.2	76.0	10.5	<1.00	490	3.61	<1.00
LP5-15-CCC-VHT	2	7	S-12428	3.71	639	<1.00	1.65	4.72	559	<1.00	<1.00	2500	<1.00	15.7	<1.00	6.06	433	3.31	<1.00	474	<1.00	1.01
VHT standard	2	8	std-VHT-22	4.29	19.9	<1.00	<1.00	4.36	10.0	9.97	<1.00	81.1	<1.00	<1.00	<1.00	<1.00	53.2	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-20-Q-VHT	2	9	S-12414	<1.00	205	<1.00	<1.00	<1.00	53.3	<1.00	<1.00	621	<1.00	1.34	<1.00	21.2	18.3	<1.00	<1.00	3.20	<1.00	<1.00
LP5-10-Q-VHT	2	10	S-12404	<1.00	266	<1.00	<1.00	<1.00	199	<1.00	<1.00	1660	<1.00	6.85	<1.00	19.7	75.2	5.31	<1.00	96.7	<1.00	<1.00
LP5-07-Q-VHT	2	11	S-12401	1.81	470	<1.00	88.2	7.88	127	<1.00	<1.00	1630	<1.00	10.4	<1.00	4.48	369	3.41	<1.00	82.8	<1.00	<1.00
LP5-14-Q-VHT	2	12	S-12408	<1.00	18.9	<1.00	<1.00	<1.00	11.2	<1.00	<1.00	66.4	<1.00	<1.00	<1.00	3.04	1.57	<1.00	<1.00	14.7	<1.00	<1.00
LP5-08-Q-VHT	2	13	S-12402	1.14	616	1.11	<1.00	<1.00	316	<1.00	<1.00	1690	<1.00	<1.00	<1.00	48.7	231	2.96	<1.00	308	3.69	<1.00
VHT standard	2	14	std-VHT-23	4.28	19.8	<1.00	<1.00	4.40	9.90	9.86	<1.00	80.0	<1.00	<1.00	<1.00	<1.00	54.4	<1.00	<1.00	<1.00	<1.00	<1.00
VHT standard	3	1	std-VHT-31	4.27	19.9	<1.00	<1.00	4.24	10.6	9.64	<1.00	85.6	<1.00	<1.00	<1.00	<1.00	51.1	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-09-CCC-VHT	3	2	S-12426	<1.00	247	<1.00	<1.00	<1.00	267	<1.00	<1.00	1260	<1.00	28.8	<1.00	22.7	169	5.51	<1.00	86.0	10.6	<1.00
LP5-09-Q-VHT	3	3	S-12403	<1.00	250	<1.00	<1.00	<1.00	195	<1.00	<1.00	1300	<1.00	8.70	<1.00	27.4	88.4	6.79	<1.00	70.1	4.01	<1.00
LP5-03-CCC-VHT	3	4	S-12422	<1.00	147	<1.00	41.0	<1.00	65.7	<1.00	<1.00	679	<1.00	3.84	<1.00	14.0	44.8	2.89	<1.00	198	<1.00	<1.00
LP5-04-Q-VHT	3	5	S-12399	<1.00	281	<1.00	<1.00	<1.00	219	<1.00	<1.00	1140	<1.00	2.24	<1.00	23.9	56.5	1.87	<1.00	5.66	4.46	<1.00
LP5-01-Q-VHT	3	6	S-12396	<1.00	86.3	<1.00	67.2	<1.00	71.3	<1.00	<1.00	367	<1.00	6.77	<1.00	17.7	24.5	1.15	<1.00	69.6	<1.00	<1.00
LP5-24-Q-VHT	3	7	S-12418	<1.00	21.8	<1.00	<1.00	<1.00	3.70	<1.00	<1.00	134	<1.00	<1.00	<1.00	1.47	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
VHT standard	3	8	std-VHT-32	4.12	20.3	<1.00	<1.00	4.20	11.0	9.21	<1.00	87.6	<1.00	<1.00	<1.00	<1.00	50.5	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-05-CCC-VHT	3	9	S-12423	<1.00	215	<1.00	66.7	<1.00	4.69	<1.00	<1.00	905	<1.00	2.00	<1.00	40.6	73.8	<1.00	<1.00	235	<1.00	<1.00
LP5-18-Q-VHT	3	10	S-12412	<1.00	390	<1.00	<1.00	<1.00	87.4	<1.00	<1.00	1350	<1.00	16.7	<1.00	38.5	146	<1.00	<1.00	205	2.92	<1.00
LP5-22-Q-VHT	3	11	S-12416	<1.00	<1.00	<1.00	1.32	<1.00	<1.00	<1.00	<1.00	3.34	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-23-Q-VHT	3	12	S-12417	<1.00	3.12	<1.00	3.92	<1.00	<1.00	<1.00	<1.00	17.3	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.13	<1.00	<1.00
LP5-13-Q-VHT	3	13	S-12407	5.43	804	1.25	4.20	3.79	479	<1.00	<1.00	2290	<1.00	36.2	1.42	66.5	704	4.89	1.81	644	24.6	2.70
VHT standard	3	14	std-VHT-33	4.33	20.0	<1.00	<1.00	4.30	10.7	9.72	<1.00	84.0	<1.00	<1.00	<1.00	<1.00	53.8	<1.00	<1.00	<1.00	<1.00	<1.00

Table A-2. As Received VHT Solution Measurements (mg/L) Measured by IC

PNNL ID	Block	Seq.	Lab ID	Cl^-	F^-
5ppm standard	1	1	5ppm ck std	4.90	5.02
LP5-19-Q-VHT	1	2	S-12413	104	13.4
LP5-01-CCC-VHT	1	3	S-12420	97.9	11.6
LP5-05-Q-VHT	1	4	S-12400	119	10.1
LP5-16_Mod 1-Q-VHT	1	5	S-12410	38.4	<1.00
LP5-12-1-CCC-VHT	1	6	S-12427	49.5	31.9
LP5-25-Q-VHT	1	7	S-12419	15.6	1.80
IC blank	1	8	blank-VHT-1a	<1.00	<1.00
5ppm standard	1	9	5ppm ck std	4.81	5.00
LP5-11-Q-VHT	1	10	S-12405	171	28.6
LP5-15-Q-VHT	1	11	S-12409	403	20.4
LP5-08-CCC-VHT	1	12	S-12425	40.8	3.73
LP5-12-1-Q-VHT	1	13	S-12406	47.3	22.7
LP5-21-Q-VHT	1	14	S-12415	90.2	9.81
5ppm standard	1	15	5ppm ck std	5.20	5.07
5ppm standard	2	1	5ppm ck std	4.58	4.63
LP5-02-CCC-VHT	2	2	S-12421	160	28.0
LP5-10-Q-VHT	2	3	S-12404	54.2	11.2
LP5-02-Q-VHT	2	4	S-12397	81.5	3.41
LP5-08-Q-VHT	2	5	S-12402	109	11.0
LP5-15-CCC-VHT	2	6	S-12428	199	15.9
LP5-07-Q-VHT	2	7	S-12401	46.3	8.79
IC blank	2	8	blank-VHT-2a	<1.00	<1.00
5ppm standard	2	9	5ppm ck std	5.01	4.95
LP5-20-Q-VHT	2	10	S-12414	57.6	9.50
LP5-03-Q-VHT	2	11	S-12398	59.1	6.94
LP5-06_Mod 1-CCC-VHT	2	12	S-12424	39.4	10.2
LP5-14-Q-VHT	2	13	S-12408	21.2	2.72
LP5-17-Q-VHT	2	14	S-12411	218	6.51
5ppm standard	2	15	5ppm ck std	5.13	4.97
5ppm standard	3	1	5ppm ck std	4.88	4.95
LP5-09-Q-VHT	3	2	S-12403	77.0	16.3
LP5-01-Q-VHT	3	3	S-12396	41.5	7.47
LP5-03-CCC-VHT	3	4	S-12422	32.7	3.17
LP5-09-CCC-VHT	3	5	S-12426	69.6	23.2
LP5-18-Q-VHT	3	6	S-12412	73.1	13.7
LP5-22-Q-VHT	3	7	S-12416	11.8	<1.00
IC blank	3	8	blank-VHT-3a	<1.00	<1.00
5ppm standard	3	9	5ppm ck std	4.94	4.96
LP5-24-Q-VHT	3	10	S-12418	21.3	3.22
LP5-05-CCC-VHT	3	11	S-12423	62.6	5.22
LP5-23-Q-VHT	3	12	S-12417	13.5	<1.00
LP5-13-Q-VHT	3	13	S-12407	90.5	21.7
LP5-04-Q-VHT	3	14	S-12399	45.5	6.69
5ppm standard	3	15	5ppm ck std	5.06	5.09

Appendix B. Tables and Exhibits Supporting the Analysis of the LAW Phase 5 PCT Leachates

Table B-1. As Received PCT Leachate Measurements (mg/L) Measured by ICP-OES

PNNL Solution ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
PCT standard	1	1	std-PCT-11	3.99	19.5	<1.00	<1.00	3.90	9.53	9.36	<1.00	78.9	<1.00	<1.00	<1.00	<1.00	50.7	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-08-CCC-PCT-A	1	2	S-12521	11.1	24.8	<1.00	<1.00	<1.00	7.41	<1.00	<1.00	157	<1.00	<1.00	<1.00	<1.00	26.8	4.15	<1.00	<1.00	1.15	<1.00
LRM Standard-A 4/19/21	1	3	S-12599	2.70	1.20	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.3	<1.00	<1.00	<1.00	<1.00	14.2	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-25-Q-PCT-A	1	4	S-12497	<1.00	3.77	<1.00	<1.00	<1.00	<1.00	1.26	<1.00	18.7	<1.00	<1.00	<1.00	<1.00	15.9	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 3/26/21	1	5	S-12612	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-19-CCC-PCT-A	1	6	S-12554	1.66	165	<1.00	3.18	<1.00	63.6	<1.00	<1.00	735	<1.00	1.16	<1.00	1.83	134	<1.00	<1.00	37.0	<1.00	<1.00
LP5-05-Q-PCT-A	1	7	S-12439	1.20	101	<1.00	1.36	<1.00	19.3	<1.00	<1.00	535	<1.00	<1.00	<1.00	<1.00	98.5	<1.00	<1.00	106	<1.00	<1.00
LRM Standard-A 3/26/21	1	8	S-12590	2.69	1.15	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.4	<1.00	<1.00	<1.00	<1.00	14.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-18-CCC-PCT-A	1	9	S-12551	<1.00	202	<1.00	5.89	<1.00	17.9	<1.00	<1.00	874	<1.00	11.4	<1.00	5.28	181	<1.00	<1.00	134	<1.00	<1.00
LP5-24-CCC-PCT-A	1	10	S-12569	2.55	4.11	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	31.9	<1.00	<1.00	<1.00	<1.00	11.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-04-Q-PCT-A	1	11	S-12437	1.62	<1.00	1.29	<1.00	<1.00	1.55	<1.00	<1.00	88.1	<1.00	<1.00	<1.00	<1.00	9.54	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-01-CCC-PCT-A	1	12	S-12500	1.49	630	<1.00	28.3	<1.00	190	<1.00	<1.00	2690	<1.00	19.4	<1.00	23.5	507	2.00	<1.00	327	<1.00	<1.00
LP5-07-CCC-PCT-A	1	13	S-12518	8.50	31.4	<1.00	<1.00	<1.00	1.62	<1.00	<1.00	140	<1.00	<1.00	<1.00	<1.00	28.7	<1.00	<1.00	2.21	<1.00	<1.00
LRM Standard-A 3/18/21	1	14	S-12587	2.68	1.23	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.0	<1.00	<1.00	<1.00	<1.00	14.5	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 3/4/21	1	15	S-12606	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-A 2/16/21	1	16	S-12575	1.28	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.6	<1.00	<1.00	<1.00	<1.00	17.1	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 3/18/21	1	17	S-12610	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	1	18	std-PCT-12	4.02	18.9	<1.00	<1.00	3.72	9.89	9.30	<1.00	77.2	<1.00	<1.00	<1.00	<1.00	49.8	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-03-Q-PCT-A	1	19	S-12434	<1.00	140	<1.00	10.1	<1.00	<1.00	<1.00	<1.00	644	<1.00	<1.00	<1.00	8.76	71.2	<1.00	<1.00	122	<1.00	<1.00
LP5-06-MOD1-Q-PCT-A	1	20	S-12442	5.76	7.66	<1.00	<1.00	<1.00	1.65	<1.00	<1.00	58.5	<1.00	<1.00	<1.00	<1.00	15.0	<1.00	<1.00	5.53	<1.00	<1.00
LP5-24-Q-PCT-A	1	21	S-12494	2.29	4.86	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	35.7	<1.00	<1.00	<1.00	<1.00	12.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-20-CCC-PCT-A	1	22	S-12557	<1.00	553	<1.00	9.21	<1.00	45.1	<1.00	<1.00	1660	<1.00	27.8	<1.00	26.5	318	<1.00	<1.00	13.9	<1.00	<1.00
DI Water BLK-A 2/16/21	1	23	S-12602	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	3.38	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-25-CCC-PCT-A	1	24	S-12572	<1.00	2.39	<1.00	<1.00	<1.00	<1.00	1.19	<1.00	16.0	<1.00	<1.00	<1.00	<1.00	14.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-14-Q-PCT-A	1	25	S-12466	<1.00	68.6	<1.00	3.27	<1.00	17.1	<1.00	<1.00	401	<1.00	6.43	<1.00	7.29	107	1.23	<1.00	70.8	<1.00	<1.00
LP5-12-1-CCC-PCT-A	1	26	S-12533	16.3	30.9	<1.00	1.46	<1.00	3.78	<1.00	<1.00	158	<1.00	<1.00	<1.00	<1.00	19.3	<1.00	<1.00	7.01	<1.00	<1.00
LP5-11-CCC-PCT-A	1	27	S-12530	1.04	143	<1.00	9.47	<1.00	2.86	<1.00	<1.00	888	<1.00	6.72	<1.00	14.7	177	<1.00	<1.00	205	<1.00	<1.00
LP5-19-Q-PCT-A	1	28	S-12480	1.67	164	<1.00	2.48	<1.00	59.3	<1.00	<1.00	708	<1.00	<1.00	<1.00	7.08	136	<1.00	<1.00	36.9	<1.00	<1.00
LP5-10-Q-PCT-A	1	29	S-12454	1.85	106	<1.00	2.75	<1.00	28.4	<1.00	<1.00	814	<1.00	3.70	<1.00	5.48	161	<1.00	<1.00	39.0	<1.00	<1.00
LP5-21-Q-PCT-A	1	30	S-12486	<1.00	188	<1.00	2.56	<1.00	36.0	<1.00	<1.00	594	<1.00	<1.00	<1.00	11.5	91.3	<1.00	<1.00	82.9	<1.00	<1.00
LP5-05-CCC-PCT-A	1	31	S-12512	1.22	109	<1.00	2.18	<1.00	19.3	<1.00	<1.00	558	<1.00	<1.00	<1.00	5.07	101	<1.00	<1.00	115	<1.00	<1.00
LRM Standard-A 3/4/21	1	32	S-12581	2.64	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.4	<1.00	<1.00	<1.00	<1.00	14.9	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-04-CCC-PCT-A	1	33	S-12509	20.8	40.2	<1.00	<1.00	<1.00	14.2	<1.00	<1.00	457	<1.00	4.37	<1.00	1.69	63.3	<1.00	<1.00	1.16	<1.00	<1.00
LP5-08-Q-PCT-A	1	34	S-12448	11.7	27.1	<1.00	<1.00	<1.00	7.80	<1.00	<1.00	166	<1.00	<1.00	<1.00	<1.00	28.8	3.97	<1.00	<1.00	<1.00	<1.00
PCT standard	1	35	std-PCT-13	4.01	18.1	<1.00	<1.00	3.67	9.66	9.17	<1.00	77.1	<1.00	<1.00	<1.00	<1.00	49.4	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	2	1	std-PCT-21	4.01	20.0	<1.00	<1.00	4.06	9.76	9.23	<1.00	81.4	<1.00	<1.00	<1.00	<1.00	53.1	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-02-CCC-PCT-A	2	2	S-12503	11.2	220	<1.00	7.20	<1.00	38.5	<1.00	<1.00	1440	<1.00	<1.00	<1.00	17.4	67.6	<1.00	<1.00	253	1.20	<1.00
LP5-06-MOD1-CCC-PCT-A	2	3	S-12515	3.72	10.9	<1.00	<1.00	<1.00	1.96	<1.00	<1.00	66.9	<1.00	<1.00	<1.00	1.52	17.9	<1.00	<1.00	12.1	<1.00	<1.00
LP5-23-CCC-PCT-A	2	4	S-12566	1.64	3.96	<1.00	<1.00	<1.00	1.02	<1.00	<1.00	99.4	<1.00	<1.00	<1.00	<1.00	39.4	<1.00	<1.00	3.41	<1.00	<1.00
LRM Standard-A 4/1/21	2	5	S-12593	2.72	2.43	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	20.8	<1.00	<1.00	<1.00	<1.00	16.7	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-17-Q-PCT-A	2	6	S-12474	<1.00	75.2	<1.00	1.49	<1.00	19.8	<1.00	<1.00	427	<1.00	1.56	<1.00	5.73	70.2	<1.00	<1.00	96.7	<1.00	<1.00
LP5-12-1-Q-PCT-A	2	7	S-12460	5.69	4.24	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	48.8	<1.00	<1.00	<1.00	1.06	17.3	<1.00	<1.00	3.24	<1.00	<1.00
LP5-11-Q-PCT-A	2	8	S-12457	1.10	140	<1.00	9.08	<1.00	3.50	<1.00	<1.00	965	<1.00	8.68	<1.00	30.3	175	<1.00	<1.00	213	<1.00	<1.00
LP5-14-CCC-PCT-A	2	9	S-12539	<1.00	39.7	<1.00	2.24	<1.00	10.9	<1.00	<1.00	270	<1.00	4.25	<1.00	6.26	80.2	1.43	<1.00	42.5	<1.00	<1.00
LRM Standard-A 4/9/21	2	10	S-12596	2.84	2.25	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	20.5	<1.00	<1.00	<1.00	<1.00	16.7	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-15-CCC-PCT-A	2	11	S-12542	7.90	24.9	<1.00	<1.00	<1.00	4.76	<1.00	<1.00	147	<1.00	<1.00	<1.00	<1.00	17.4	<1.00	<1.00	3.00	<1.00	<1.00
LP5-13-Q-PCT-A	2	12	S-12463	<1.00	718	<1.00	15.6	<1.00	135	<1.00	<1.00	2880	<1.00	35.6	<1.00	58.5	334	<1.00	<1.00	500	<1.00	<1.00
LP5-22-CCC-PCT-A	2	13	S-12563	<1.00	358	<1.00	1.93	<1.00	4.03	<1.00	<1.00	1420	<1.00	8.92	<1.00	16.1	491	<1.00	<1.00	37.2	<1.00	<1.00

Table B-1. As Received PCT Leachate Measurements (mg/L) Measured by ICP-OES (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
LP5-03-CCC-PCT-A	2	14	S-12506	<1.00	132	<1.00	10.2	<1.00	<1.00	<1.00	<1.00	684	<1.00	<1.00	<1.00	19.2	78.0	<1.00	<1.00	118	<1.00	<1.00
LP5-16-MOD1-CCC-PCT-A	2	15	S-12545	21.2	164	<1.00	8.71	<1.00	8.89	<1.00	<1.00	811	<1.00	<1.00	<1.00	18.9	37.5	1.93	<1.00	18.0	<1.00	<1.00
DI Water BLK-A 3/12/21	2	16	S-12608	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.25	<1.00	<1.00	<1.00	<1.00	3.34	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-A 2/26/21	2	17	S-12578	2.37	2.10	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	20.0	<1.00	<1.00	<1.00	<1.00	17.6	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	2	18	std-PCT-22	4.04	20.1	<1.00	<1.00	4.02	9.73	9.20	<1.00	79.6	<1.00	<1.00	<1.00	<1.00	53.1	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-20-Q-PCT-A	2	19	S-12483	<1.00	460	<1.00	6.89	<1.00	46.6	<1.00	<1.00	1650	<1.00	30.8	<1.00	55.5	318	<1.00	<1.00	14.9	<1.00	<1.00
LP5-16-MOD1-Q-PCT-A	2	20	S-12471	4.65	34.9	<1.00	1.50	<1.00	1.43	<1.00	<1.00	276	<1.00	<1.00	<1.00	4.16	41.1	<1.00	<1.00	6.50	<1.00	<1.00
LP5-17-CCC-PCT-A	2	21	S-12548	<1.00	64.2	<1.00	1.82	<1.00	17.9	<1.00	<1.00	369	<1.00	1.49	<1.00	5.25	66.0	<1.00	<1.00	86.0	<1.00	<1.00
LP5-22-Q-PCT-A	2	22	S-12489	<1.00	390	<1.00	1.12	<1.00	4.46	<1.00	<1.00	1470	<1.00	9.49	<1.00	17.4	522	<1.00	<1.00	40.0	<1.00	<1.00
LRM Standard-A 3/12/21	2	23	S-12584	2.53	1.89	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.0	<1.00	<1.00	<1.00	<1.00	17.3	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-09-Q-PCT-A	2	24	S-12451	8.95	8.54	<1.00	<1.00	<1.00	4.42	<1.00	<1.00	135	<1.00	<1.00	<1.00	1.75	34.5	1.34	<1.00	1.74	<1.00	<1.00
LP5-18-Q-PCT-A	2	25	S-12477	<1.00	198	<1.00	4.62	<1.00	19.2	<1.00	<1.00	959	<1.00	14.1	<1.00	26.4	190	<1.00	<1.00	145	<1.00	<1.00
LP5-02-Q-PCT-A	2	26	S-12431	1.67	7.88	<1.00	<1.00	<1.00	1.65	<1.00	<1.00	162	<1.00	<1.00	<1.00	1.95	27.8	<1.00	<1.00	6.48	<1.00	<1.00
LP5-13-CCC-PCT-A	2	27	S-12536	<1.00	682	<1.00	21.6	<1.00	114	<1.00	<1.00	2660	<1.00	34.0	<1.00	56.4	317	<1.00	<1.00	470	<1.00	<1.00
DI Water BLK-A 2/26/21	2	28	S-12604	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.48	<1.00	<1.00	<1.00	<1.00	5.91	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-07-Q-PCT-1-A	2	29	S-12445	9.88	26.6	<1.00	<1.00	<1.00	2.10	<1.00	<1.00	136	<1.00	<1.00	<1.00	<1.00	27.6	<1.00	<1.00	1.17	<1.00	<1.00
LP5-09-CCC-PCT-A	2	30	S-12524	4.33	310	<1.00	19.5	<1.00	89.4	<1.00	<1.00	1780	<1.00	16.1	<1.00	60.3	278	2.35	<1.00	89.5	2.18	<1.00
LP5-21-CCC-PCT-A	2	31	S-12560	<1.00	191	<1.00	5.62	<1.00	39.0	<1.00	<1.00	670	<1.00	<1.00	<1.00	20.4	111	<1.00	<1.00	89.6	<1.00	<1.00
LP5-10-CCC-PCT-A	2	32	S-12527	2.22	347	<1.00	11.5	<1.00	124	<1.00	<1.00	1980	<1.00	16.8	<1.00	34.3	460	2.51	<1.00	150	1.19	<1.00
LP5-19-Q-PCT-B	2	33	S-12481	1.68	161	<1.00	2.64	<1.00	63.7	<1.00	<1.00	749	<1.00	1.21	<1.00	12.8	157	<1.00	<1.00	38.3	<1.00	<1.00
PCT standard	2	34	std-PCT-23	4.06	20.3	<1.00	<1.00	4.05	10.4	9.36	<1.00	80.0	<1.00	<1.00	<1.00	<1.00	53.1	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	3	1	std-PCT-31	4.00	20.0	<1.00	<1.00	3.96	9.67	9.92	<1.00	82.1	<1.00	<1.00	<1.00	<1.00	49.4	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-B 4/1/21	3	2	S-12615	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-25-Q-PCT-B	3	3	S-12498	<1.00	4.89	<1.00	<1.00	<1.00	<1.00	1.32	<1.00	19.9	<1.00	<1.00	<1.00	<1.00	15.8	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-B 3/26/21	3	4	S-12591	2.65	2.38	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.8	<1.00	<1.00	<1.00	<1.00	14.0	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-B 4/9/21	3	5	S-12597	2.71	2.40	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.6	<1.00	<1.00	<1.00	<1.00	14.2	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-09-Q-PCT-B	3	6	S-12452	8.51	8.42	<1.00	<1.00	<1.00	4.34	<1.00	<1.00	135	<1.00	<1.00	<1.00	1.71	33.8	1.36	<1.00	1.66	<1.00	<1.00
LP5-17-CCC-PCT-B	3	7	S-12549	<1.00	66.7	<1.00	1.75	<1.00	16.7	<1.00	<1.00	350	<1.00	<1.00	<1.00	4.84	59.7	<1.00	<1.00	82.1	<1.00	<1.00
LP5-21-Q-PCT-B	3	8	S-12487	<1.00	171	<1.00	2.61	<1.00	35.5	<1.00	<1.00	579	<1.00	<1.00	<1.00	18.6	87.5	<1.00	<1.00	82.6	<1.00	<1.00
LRM Standard-B 4/1/21	3	9	S-12594	2.61	2.42	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.2	<1.00	<1.00	<1.00	<1.00	14.1	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-19-CCC-PCT-B	3	10	S-12555	1.67	159	<1.00	3.31	<1.00	63.7	<1.00	<1.00	702	<1.00	<1.00	<1.00	13.1	109	<1.00	<1.00	38.3	<1.00	<1.00
LP5-20-CCC-PCT-B	3	11	S-12558	<1.00	437	<1.00	9.42	<1.00	44.6	<1.00	<1.00	1470	<1.00	28.8	<1.00	51.3	260	<1.00	<1.00	14.0	<1.00	<1.00
LP5-12-1-Q-PCT-B	3	12	S-12461	4.54	4.08	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	45.3	<1.00	<1.00	<1.00	<1.00	17.7	<1.00	<1.00	2.63	<1.00	<1.00
LP5-23-CCC-PCT-B	3	13	S-12567	1.50	4.33	<1.00	<1.00	<1.00	1.07	<1.00	<1.00	101	<1.00	<1.00	<1.00	<1.00	35.8	<1.00	<1.00	3.37	<1.00	<1.00
LP5-11-CCC-PCT-B	3	14	S-12531	1.02	131	<1.00	10.0	<1.00	3.03	<1.00	<1.00	862	<1.00	6.79	<1.00	26.3	147	<1.00	<1.00	190	<1.00	<1.00
LP5-21-CCC-PCT-B	3	15	S-12561	<1.00	181	<1.00	5.59	<1.00	36.9	<1.00	<1.00	616	<1.00	<1.00	<1.00	20.2	94.1	<1.00	<1.00	89.7	<1.00	<1.00
LP5-08-Q-PCT-B	3	16	S-12449	12.1	27.7	<1.00	<1.00	<1.00	7.83	<1.00	<1.00	165	<1.00	<1.00	<1.00	<1.00	27.3	4.44	<1.00	<1.00	1.15	<1.00
LP5-03-CCC-PCT-B	3	17	S-12507	<1.00	125	<1.00	9.23	<1.00	<1.00	<1.00	<1.00	593	<1.00	<1.00	<1.00	17.2	65.8	<1.00	<1.00	106	<1.00	<1.00
PCT standard	3	18	std-PCT-32	3.89	19.6	<1.00	<1.00	3.80	9.08	9.54	<1.00	79.7	<1.00	<1.00	<1.00	<1.00	48.0	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-18-CCC-PCT-B	3	19	S-12552	<1.00	174	<1.00	5.99	<1.00	17.0	<1.00	<1.00	815	<1.00	11.6	<1.00	22.2	151	<1.00	<1.00	122	<1.00	<1.00
LP5-20-Q-PCT-B	3	20	S-12484	<1.00	451	<1.00	6.46	<1.00	42.0	<1.00	<1.00	1430	<1.00	29.2	<1.00	51.7	262	<1.00	<1.00	14.0	<1.00	<1.00
LRM Standard-B 2/16/21	3	21	S-12576	2.30	2.07	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.9	<1.00	<1.00	<1.00	<1.00	16.4	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-13-Q-PCT-B	3	22	S-12464	<1.00	670	<1.00	14.3	<1.00	126	<1.00	<1.00	2470	<1.00	32.0	<1.00	53.3	281	<1.00	<1.00	450	<1.00	<1.00
LP5-24-CCC-PCT-B	3	23	S-12570	2.33	5.29	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	32.7	<1.00	<1.00	<1.00	<1.00	11.0	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-11-Q-PCT-B	3	24	S-12458	<1.00	133	<1.00	8.58	<1.00	3.03	<1.00	<1.00	895	<1.00	7.46	<1.00	29.0	144	<1.00	<1.00	195	<1.00	<1.00
LP5-06-MOD1-CCC-PCT-B	3	25	S-12516	3.68	11.2	<1.00	<1.00	<1.00	1.62	<1.00	<1.00	70.1	<1.00	<1.00	<1.00	1.48	14.9	<1.00	<1.00	12.1	<1.00	<1.00
LP5-18-Q-PCT-B	3	26	S-12478	<1.00	195	<1.00	4.46	<1.00	18.0	<1.00	<1.00	920	<1.00	13.4	<1.00	25.5	156	<1.00	<1.00	138	<1.00	<1.00
LRM Standard-B 3/12/21	3	27	S-12585	2.55	2.42	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.9	<1.00	<1.00	<1.00	<1.00	14.2	<1.00	<1.00	<1.00	<1.00	<1.00

Table B-1. As Received PCT Leachate Measurements (mg/L) Measured by ICP-OES (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
LRM Standard-B 3/4/21	3	28	S-12582	2.64	2.41	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.2	<1.00	<1.00	<1.00	<1.00	13.9	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-03-Q-PCT-B	3	29	S-12435	<1.00	131	<1.00	10.4	<1.00	<1.00	<1.00	<1.00	633	<1.00	<1.00	<1.00	19.6	67.8	<1.00	<1.00	113	<1.00	<1.00
LRM Standard-B 2/26/21	3	30	S-12579	2.31	2.18	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.7	<1.00	<1.00	<1.00	<1.00	14.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-06-MOD1-Q-PCT-B	3	31	S-12443	5.37	8.97	<1.00	<1.00	<1.00	1.57	<1.00	<1.00	57.2	<1.00	<1.00	<1.00	<1.00	13.5	<1.00	<1.00	5.36	<1.00	<1.00
LP5-12-1-CCC-PCT-B	3	32	S-12534	15.1	27.8	<1.00	1.34	<1.00	3.25	<1.00	<1.00	150	<1.00	<1.00	<1.00	2.33	16.0	<1.00	<1.00	6.45	<1.00	<1.00
DI Water BLK-B 4/9/21	3	33	S-12617	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-08-CCC-PCT-B	3	34	S-12522	11.4	26.4	<1.00	<1.00	<1.00	6.88	<1.00	<1.00	165	<1.00	<1.00	<1.00	<1.00	26.6	4.32	<1.00	<1.00	1.28	<1.00
PCT standard	3	35	std-PCT-33	3.94	19.6	<1.00	<1.00	3.82	9.08	9.64	<1.00	78.8	<1.00	<1.00	<1.00	<1.00	48.3	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	4	1	std-PCT-41	4.10	19.9	<1.00	<1.00	4.09	9.71	9.41	<1.00	81.8	<1.00	<1.00	<1.00	<1.00	50.0	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-B 3/18/21	4	2	S-12611	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2.10	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-13-CCC-PCT-B	4	3	S-12537	<1.00	814	<1.00	21.5	<1.00	129	<1.00	<1.00	2680	<1.00	33.7	<1.00	56.5	311	<1.00	<1.00	516	<1.00	<1.00
DI Water BLK-B 3/26/21	4	4	S-12613	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-15-CCC-PCT-B	4	5	S-12543	7.74	26.1	<1.00	<1.00	<1.00	4.18	<1.00	<1.00	131	<1.00	<1.00	<1.00	<1.00	15.9	<1.00	<1.00	2.90	<1.00	<1.00
LP5-01-CCC-PCT-B	4	6	S-12501	1.55	538	<1.00	30.1	<1.00	153	<1.00	<1.00	2380	<1.00	21.6	<1.00	55.4	450	2.03	<1.00	304	<1.00	<1.00
LP5-24-Q-PCT-B	4	7	S-12495	2.65	6.72	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	38.3	<1.00	<1.00	<1.00	<1.00	13.5	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-04-Q-PCT-B	4	8	S-12438	1.36	2.13	1.16	<1.00	<1.00	1.85	<1.00	<1.00	97.1	<1.00	<1.00	<1.00	<1.00	11.4	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-10-Q-PCT-B	4	9	S-12455	1.89	104	<1.00	2.99	<1.00	28.2	<1.00	<1.00	817	<1.00	4.22	<1.00	10.1	136	<1.00	<1.00	41.5	<1.00	<1.00
LP5-07-CCC-PCT-B	4	10	S-12519	8.48	32.1	<1.00	<1.00	<1.00	1.48	<1.00	<1.00	142	<1.00	<1.00	<1.00	<1.00	25.7	<1.00	<1.00	2.25	<1.00	<1.00
LP5-22-Q-PCT-B	4	11	S-12490	<1.00	397	<1.00	1.11	<1.00	3.97	<1.00	<1.00	1330	<1.00	9.26	<1.00	17.1	474	<1.00	<1.00	38.6	<1.00	<1.00
LP5-25-CCC-PCT-B	4	12	S-12573	<1.00	4.55	<1.00	<1.00	<1.00	<1.00	1.20	<1.00	18.6	<1.00	<1.00	<1.00	<1.00	15.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-04-CCC-PCT-B	4	13	S-12510	20.7	39.6	<1.00	<1.00	<1.00	13.7	<1.00	<1.00	457	<1.00	5.09	<1.00	2.46	62.8	<1.00	<1.00	1.21	<1.00	<1.00
LP5-23-Q-PCT-B	4	14	S-12492	1.57	4.32	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	102	<1.00	<1.00	<1.00	<1.00	37.0	<1.00	<1.00	3.30	<1.00	<1.00
LRM Standard-B 3/18/21	4	15	S-12588	2.85	2.68	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	21.0	<1.00	<1.00	<1.00	<1.00	14.5	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-01-Q-PCT-B	4	16	S-12429	1.87	653	<1.00	27.3	<1.00	189	<1.00	<1.00	2880	<1.00	28.4	<1.00	90.9	551	2.41	<1.00	389	<1.00	<1.00
DI Water BLK-B 4/19/21	4	17	S-12619	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	4	18	std-PCT-42	4.05	20.1	<1.00	<1.00	4.01	9.42	9.29	<1.00	79.9	<1.00	<1.00	<1.00	<1.00	49.8	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-07-Q-PCT-1-B	4	19	S-12446	9.41	25.7	<1.00	<1.00	<1.00	1.76	<1.00	<1.00	128	<1.00	<1.00	<1.00	<1.00	24.1	<1.00	<1.00	1.14	<1.00	<1.00
LP5-16-MOD1-Q-PCT-B	4	20	S-12472	4.65	34.9	<1.00	1.50	<1.00	<1.00	<1.00	<1.00	256	<1.00	<1.00	<1.00	4.23	36.8	<1.00	<1.00	6.52	<1.00	<1.00
LP5-05-CCC-PCT-B	4	21	S-12513	1.28	106	<1.00	2.33	<1.00	18.3	<1.00	<1.00	564	<1.00	<1.00	<1.00	9.09	101	<1.00	<1.00	115	<1.00	<1.00
DI Water BLK-B 3/12/21	4	22	S-12609	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-22-CCC-PCT-B	4	23	S-12564	<1.00	384	<1.00	1.89	<1.00	3.46	<1.00	<1.00	1370	<1.00	9.05	<1.00	15.9	463	<1.00	<1.00	37.1	<1.00	<1.00
LP5-10-CCC-PCT-B	4	24	S-12528	2.24	360	<1.00	11.6	<1.00	112	<1.00	<1.00	1960	<1.00	17.6	<1.00	35.0	434	2.59	<1.00	150	1.23	<1.00
LP5-16-MOD1-CCC-PCT-B	4	25	S-12546	20.2	171	<1.00	8.43	<1.00	7.41	<1.00	<1.00	760	<1.00	<1.00	<1.00	18.5	33.3	1.90	<1.00	17.7	<1.00	<1.00
LRM Standard-B 4/19/21	4	26	S-12600	2.66	2.60	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.5	<1.00	<1.00	<1.00	<1.00	13.5	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-14-CCC-PCT-B	4	27	S-12540	<1.00	39.0	<1.00	2.16	<1.00	9.07	<1.00	<1.00	247	<1.00	4.25	<1.00	6.22	73.7	1.23	<1.00	41.5	<1.00	<1.00
LP5-02-Q-PCT-B	4	28	S-12432	1.62	8.27	<1.00	<1.00	<1.00	1.42	<1.00	<1.00	149	<1.00	<1.00	<1.00	1.87	23.4	<1.00	<1.00	6.36	<1.00	<1.00
LP5-14-Q-PCT-B	4	29	S-12467	<1.00	66.5	<1.00	3.46	<1.00	16.2	<1.00	<1.00	403	<1.00	7.66	<1.00	14.4	104	1.39	<1.00	74.4	<1.00	<1.00
LP5-15-Q-PCT-B	4	30	S-12469	8.88	32.4	<1.00	<1.00	<1.00	5.88	<1.00	<1.00	165	<1.00	<1.00	<1.00	<1.00	17.0	<1.00	<1.00	3.02	<1.00	<1.00
LP5-02-CCC-PCT-B	4	31	S-12504	11.3	236	<1.00	7.15	<1.00	33.7	<1.00	<1.00	1330	<1.00	<1.00	<1.00	18.3	62.0	<1.00	<1.00	260	1.27	<1.00
LP5-05-Q-PCT-B	4	32	S-12440	1.25	101	<1.00	1.48	<1.00	17.7	<1.00	<1.00	553	<1.00	<1.00	<1.00	8.89	98.2	<1.00	<1.00	112	<1.00	<1.00
LP5-09-CCC-PCT-B	4	33	S-12525	4.50	340	<1.00	20.4	<1.00	84.7	<1.00	<1.00	1790	<1.00	17.4	<1.00	64.1	260	2.32	<1.00	94.1	2.32	<1.00
LP5-17-Q-PCT-B	4	34	S-12475	<1.00	74.0	<1.00	1.46	<1.00	16.4	<1.00	<1.00	378	<1.00	1.56	<1.00	5.71	62.5	<1.00	<1.00	92.6	<1.00	<1.00
PCT standard	4	35	std-PCT-43	4.06	20.0	<1.00	<1.00	4.06	9.45	9.21	<1.00	80.8	<1.00	<1.00	<1.00	<1.00	49.6	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	5	1	std-PCT-51	4.03	19.9	<1.00	<1.00	4.04	10.2	9.27	<1.00	80.8	<1.00	<1.00	<1.00	<1.00	49.4	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-03-Q-PCT-C	5	2	S-12436	<1.00	137	<1.00	11.0	<1.00	<1.00	<1.00	<1.00	644	<1.00	<1.00	<1.00	20.5	70.9	<1.00	<1.00	119	<1.00	<1.00
LRM Standard-C 4/9/21	5	3	S-12598	2.65	2.53	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.7	<1.00	<1.00	<1.00	<1.00	13.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-20-Q-PCT-C	5	4	S-12485	<1.00	491	<1.00	6.91	<1.00	42.1	<1.00	<1.00	1620	<1.00	31.0	<1.00	54.6	282	<1.00	<1.00	14.9	<1.00	<1.00
LP5-16-MOD1-Q-PCT-C	5	5	S-12473	4.59	35.6	<1.00	1.53	<1.00	1.97	<1.00	<1.00	262	<1.00	<1.00	<1.00	4.09	38.7	<1.00	<1.00	6.65	<1.00	<1.00

Table B-1. As Received PCT Leachate Measurements (mg/L) Measured by ICP-OES (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
LP5-16-MOD1-CCC-PCT-C	5	6	S-12547	20.5	175	<1.00	8.87	<1.00	8.32	<1.00	<1.00	783	<1.00	<1.00	<1.00	18.6	34.4	2.04	<1.00	18.3	<1.00	<1.00
LP5-23-Q-PCT-C	5	7	S-12493	1.56	4.20	<1.00	<1.00	<1.00	1.41	<1.00	<1.00	101	<1.00	<1.00	<1.00	<1.00	35.8	<1.00	<1.00	3.12	<1.00	<1.00
LP5-02-CCC-PCT-C	5	8	S-12505	11.4	241	<1.00	7.41	<1.00	34.4	<1.00	<1.00	1360	<1.00	<1.00	<1.00	17.9	63.4	<1.00	<1.00	266	1.24	<1.00
LP5-14-Q-PCT-C	5	9	S-12468	<1.00	66.0	<1.00	3.40	<1.00	16.4	<1.00	<1.00	404	<1.00	7.13	<1.00	13.8	102	1.44	<1.00	72.6	<1.00	<1.00
LP5-22-Q-PCT-C	5	10	S-12491	<1.00	394	<1.00	1.11	<1.00	4.58	<1.00	<1.00	1360	<1.00	9.29	<1.00	16.3	460	<1.00	<1.00	38.4	<1.00	<1.00
LP5-19-CCC-PCT-C	5	11	S-12556	1.66	166	<1.00	3.32	<1.00	57.4	<1.00	<1.00	720	<1.00	1.30	<1.00	12.9	120	<1.00	<1.00	38.5	<1.00	<1.00
LRM Standard-C 2/26/21	5	12	S-12580	2.35	2.17	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.8	<1.00	<1.00	<1.00	<1.00	15.3	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-25-CCC-PCT-C	5	13	S-12574	<1.00	5.01	<1.00	<1.00	<1.00	1.56	1.14	<1.00	18.0	<1.00	<1.00	<1.00	<1.00	14.6	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-C 3/4/21	5	14	S-12583	2.03	2.22	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.5	<1.00	<1.00	<1.00	<1.00	14.5	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 4/9/21	5	15	S-12616	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-09-Q-PCT-C	5	16	S-12453	8.49	8.42	<1.00	<1.00	<1.00	4.33	<1.00	<1.00	125	<1.00	<1.00	<1.00	1.29	32.6	1.33	<1.00	1.67	<1.00	<1.00
DI Water BLK-B 3/4/21	5	17	S-12607	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	5	18	std-PCT-52	3.98	19.6	<1.00	<1.00	3.98	10.1	9.16	<1.00	78.2	<1.00	<1.00	<1.00	<1.00	48.9	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-15-CCC-PCT-C	5	19	S-12544	6.98	24.3	<1.00	<1.00	<1.00	4.40	<1.00	<1.00	130	<1.00	<1.00	<1.00	<1.00	14.1	<1.00	<1.00	2.67	<1.00	<1.00
LP5-23-CCC-PCT-C	5	20	S-12568	1.40	3.82	<1.00	<1.00	<1.00	1.57	<1.00	<1.00	89.0	<1.00	<1.00	<1.00	<1.00	30.9	<1.00	<1.00	2.93	<1.00	<1.00
LP5-10-Q-PCT-C	5	21	S-12456	1.77	101	<1.00	3.02	<1.00	26.5	<1.00	<1.00	762	<1.00	4.14	<1.00	9.33	125	1.01	<1.00	40.6	<1.00	<1.00
LP5-02-Q-PCT-C	5	22	S-12433	1.42	7.31	<1.00	<1.00	<1.00	1.77	<1.00	<1.00	136	<1.00	<1.00	<1.00	1.45	21.3	<1.00	<1.00	5.62	<1.00	<1.00
LP5-04-CCC-PCT-C	5	23	S-12511	18.7	36.7	<1.00	<1.00	<1.00	12.9	<1.00	<1.00	455	<1.00	4.47	<1.00	2.71	58.2	<1.00	<1.00	1.11	<1.00	<1.00
LP5-17-Q-PCT-C	5	24	S-12476	<1.00	72.9	<1.00	1.43	<1.00	16.3	<1.00	<1.00	390	<1.00	1.59	<1.00	5.52	61.1	<1.00	<1.00	90.0	<1.00	<1.00
LP5-19-Q-PCT-C	5	25	S-12482	1.77	188	<1.00	3.04	<1.00	61.9	<1.00	<1.00	810	<1.00	1.44	<1.00	14.4	124	<1.00	<1.00	43.2	<1.00	<1.00
LP5-11-CCC-PCT-C	5	26	S-12532	<1.00	137	<1.00	8.73	<1.00	3.12	<1.00	<1.00	875	<1.00	6.34	<1.00	22.8	154	<1.00	<1.00	193	<1.00	<1.00
LP5-17-CCC-PCT-C	5	27	S-12550	<1.00	56.2	<1.00	1.50	<1.00	13.1	<1.00	<1.00	350	<1.00	1.30	<1.00	3.95	50.8	<1.00	<1.00	69.7	<1.00	<1.00
LP5-01-CCC-PCT-C	5	28	S-12502	1.47	556	<1.00	29.4	<1.00	149	<1.00	<1.00	2460	<1.00	20.8	<1.00	74.4	443	2.19	<1.00	311	<1.00	<1.00
LRM Standard-C 4/19/21	5	29	S-12601	2.42	2.31	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	16.9	<1.00	<1.00	<1.00	<1.00	13.4	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-C 2/16/21	5	30	S-12577	2.22	2.02	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	18.6	<1.00	<1.00	<1.00	<1.00	14.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-06-MOD1-Q-PCT-C	5	31	S-12444	5.19	9.00	<1.00	<1.00	<1.00	2.05	<1.00	<1.00	55.0	<1.00	<1.00	<1.00	<1.00	13.5	<1.00	<1.00	5.34	<1.00	<1.00
LP5-21-CCC-PCT-C	5	32	S-12562	<1.00	196	<1.00	5.20	<1.00	31.2	<1.00	<1.00	649	<1.00	<1.00	<1.00	18.5	83.6	<1.00	<1.00	81.8	<1.00	<1.00
LP5-10-CCC-PCT-C	5	33	S-12529	2.19	369	<1.00	11.6	<1.00	105	<1.00	<1.00	1940	<1.00	16.8	<1.00	34.0	433	2.52	<1.00	150	1.18	<1.00
LRM Standard-C 4/1/21	5	34	S-12595	2.67	4.31	<1.00	<1.00	<1.00	1.46	<1.00	<1.00	20.4	<1.00	<1.00	<1.00	<1.00	14.8	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	5	35	std-PCT-53	3.96	19.5	<1.00	<1.00	3.96	10.0	9.07	<1.00	78.1	<1.00	<1.00	<1.00	<1.00	48.8	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	6	1	std-PCT-61	4.04	20.1	<1.00	<1.00	4.14	10.1	9.34	<1.00	80.9	<1.00	<1.00	<1.00	<1.00	50.4	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 4/1/21	6	2	S-12614	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2.07	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-05-CCC-PCT-C	6	3	S-12514	1.26	108	<1.00	2.42	<1.00	17.6	<1.00	<1.00	580	<1.00	<1.00	<1.00	9.51	103	<1.00	<1.00	117	<1.00	<1.00
LP5-05-Q-PCT-C	6	4	S-12441	1.14	97.1	<1.00	1.40	<1.00	15.9	<1.00	<1.00	482	<1.00	<1.00	<1.00	8.27	94.9	<1.00	<1.00	107	<1.00	<1.00
LP5-11-Q-PCT-C	6	5	S-12459	1.01	130	<1.00	8.19	<1.00	2.99	<1.00	<1.00	823	<1.00	7.71	<1.00	28.2	144	<1.00	<1.00	190	<1.00	<1.00
LP5-18-Q-PCT-C	6	6	S-12479	<1.00	191	<1.00	4.65	<1.00	16.3	<1.00	<1.00	869	<1.00	14.2	<1.00	27.3	159	<1.00	<1.00	135	<1.00	<1.00
LRM Standard-C 3/26/21	6	7	S-12592	2.58	2.57	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	20.0	<1.00	<1.00	<1.00	<1.00	14.4	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-06-MOD1-CCC-PCT-C	6	8	S-12517	3.58	10.9	<1.00	<1.00	<1.00	1.64	<1.00	<1.00	67.7	<1.00	<1.00	<1.00	1.70	15.6	<1.00	<1.00	12.1	<1.00	<1.00
LP5-01-Q-PCT-C	6	9	S-12430	1.70	582	<1.00	26.4	<1.00	153	<1.00	<1.00	2630	<1.00	27.2	<1.00	88.7	485	2.55	<1.00	342	<1.00	<1.00
LP5-12-1-CCC-PCT-C	6	10	S-12535	16.4	31.8	<1.00	1.63	<1.00	3.60	<1.00	<1.00	124	<1.00	<1.00	<1.00	2.87	20.5	<1.00	<1.00	7.59	<1.00	<1.00
LP5-25-Q-PCT-C	6	11	S-12499	<1.00	5.50	<1.00	<1.00	<1.00	1.67	1.13	<1.00	21.1	<1.00	<1.00	<1.00	<1.00	16.9	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-14-CCC-PCT-C	6	12	S-12541	<1.00	34.8	<1.00	1.97	<1.00	8.00	<1.00	<1.00	246	<1.00	3.80	<1.00	5.68	64.7	1.20	<1.00	37.4	<1.00	<1.00
LP5-08-Q-PCT-C	6	13	S-12450	12.3	27.5	<1.00	<1.00	<1.00	7.00	<1.00	<1.00	167	<1.00	<1.00	<1.00	1.01	28.2	4.56	<1.00	<1.00	1.30	<1.00
LP5-07-Q-PCT-1-C	6	14	S-12447	8.44	23.5	<1.00	<1.00	<1.00	1.72	<1.00	<1.00	121	<1.00	<1.00	<1.00	<1.00	23.6	<1.00	<1.00	1.01	<1.00	<1.00
LP5-12-1-Q-PCT-C	6	15	S-12462	6.42	4.87	<1.00	<1.00	<1.00	1.33	<1.00	<1.00	49.7	<1.00	<1.00	<1.00	1.25	14.8	<1.00	<1.00	3.59	<1.00	<1.00
DI Water BLK-B 2/16/21	6	16	S-12603	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.36	<1.00	<1.00	<1.00	<1.00	3.40	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-09-CCC-PCT-C	6	17	S-12526	4.57	344	<1.00	21.2	<1.00	80.9	<1.00	<1.00	1720	<1.00	17.6	<1.00	68.7	264	2.63	<1.00	96.7	2.36	<1.00
PCT standard	6	18	std-PCT-62	4.03	20.3	<1.00	<1.00	4.13	10.1	9.31	<1.00	80.5	<1.00	<1.00	<1.00	<1.00	50.5	<1.00	<1.00	<1.00	<1.00	<1.00

Table B-1. As Received PCT Leachate Measurements (mg/L) Measured by ICP-OES (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
LRM Standard-C 3/18/21	6	19	S-12589	2.81	2.75	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	20.5	<1.00	<1.00	<1.00	<1.00	14.8	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-21-Q-PCT-C	6	20	S-12488	<1.00	156	<1.00	2.43	<1.00	27.2	<1.00	<1.00	524	<1.00	<1.00	<1.00	17.9	81.2	<1.00	<1.00	73.1	<1.00	<1.00
LP5-08-CCC-PCT-C	6	21	S-12523	10.6	25.0	<1.00	<1.00	<1.00	5.75	<1.00	<1.00	151	<1.00	<1.00	<1.00	<1.00	26.3	4.10	<1.00	<1.00	1.25	<1.00
LP5-13-CCC-PCT-C	6	22	S-12538	<1.00	720	<1.00	22.3	<1.00	107	<1.00	<1.00	2570	<1.00	34.6	<1.00	62.7	293	<1.00	<1.00	481	<1.00	<1.00
LRM Standard-C 3/12/21	6	23	S-12586	2.36	2.29	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	19.1	<1.00	<1.00	<1.00	<1.00	16.0	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-03-CCC-PCT-C	6	24	S-12508	<1.00	134	<1.00	9.57	<1.00	<1.00	<1.00	<1.00	616	<1.00	<1.00	<1.00	19.5	66.9	<1.00	<1.00	113	<1.00	<1.00
LP5-24-Q-PCT-C	6	25	S-12496	2.20	6.48	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	38.1	<1.00	<1.00	<1.00	<1.00	13.1	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-24-CCC-PCT-C	6	26	S-12571	2.63	5.70	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	34.6	<1.00	<1.00	<1.00	<1.00	11.6	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-20-CCC-PCT-C	6	27	S-12559	<1.00	471	<1.00	10.1	<1.00	41.0	<1.00	<1.00	1500	<1.00	31.2	<1.00	60.1	285	<1.00	<1.00	15.0	<1.00	<1.00
LP5-07-CCC-PCT-C	6	28	S-12520	8.77	31.7	<1.00	<1.00	<1.00	2.01	<1.00	<1.00	128	<1.00	<1.00	<1.00	1.09	27.2	<1.00	<1.00	2.27	<1.00	<1.00
DI Water BLK-B 2/26/21	6	29	S-12605	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	3.01	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-13-Q-PCT-C	6	30	S-12465	<1.00	717	<1.00	15.4	<1.00	103	<1.00	<1.00	2540	<1.00	34.9	<1.00	63.6	297	<1.00	<1.00	480	<1.00	<1.00
LP5-18-CCC-PCT-C	6	31	S-12553	<1.00	183	<1.00	6.39	<1.00	15.6	<1.00	<1.00	834	<1.00	12.8	<1.00	26.6	167	<1.00	<1.00	130	<1.00	<1.00
DI Water BLK-A 4/19/21	6	32	S-12618	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.03	<1.00	<1.00	<1.00	<1.00	<1.00
LP5-15-Q-PCT-C	6	33	S-12470	7.84	31.2	<1.00	<1.00	<1.00	5.95	<1.00	<1.00	156	<1.00	<1.00	<1.00	<1.00	18.0	<1.00	<1.00	2.75	<1.00	<1.00
LP5-22-CCC-PCT-C	6	34	S-12565	<1.00	382	<1.00	1.98	<1.00	3.39	<1.00	<1.00	1250	<1.00	9.22	<1.00	18.1	459	<1.00	<1.00	38.3	<1.00	<1.00
PCT standard	6	35	std-PCT-63	4.05	20.5	<1.00	<1.00	4.10	10.1	9.38	<1.00	80.4	<1.00	<1.00	<1.00	<1.00	50.5	<1.00	<1.00	<1.00	<1.00	<1.00

Table B-2. As Received PCT Leachate Measurements (mg/L) Measured by IC

PNNL Solution ID	Block	Seq.	Lab ID	Cl^-	F^-
1ppm standard	1	1	1ppm standard	0.975	1.04
LP5-04-Q-PCT-A	1	2	S-12437	4.05	<1.00
LP5-14-Q-PCT-A	1	3	S-12466	22.8	7.77
LP5-06-MOD1-Q-PCT-A	1	4	S-12442	8.03	1.19
LP5-19-CCC-PCT-A	1	5	S-12554	19.3	6.25
DI Water BLK-A 3/18/21	1	6	S-12610	5.67	<1.00
LP5-12-1-CCC-PCT-A	1	7	S-12533	5.60	3.25
LP5-01-CCC-PCT-A	1	8	S-12500	107	36.5
LRM Standard-A 3/18/21	1	9	S-12587	6.46	2.18
LP5-07-CCC-PCT-A	1	10	S-12518	6.32	<1.00
LP5-25-Q-PCT-A	1	11	S-12497	3.26	<1.00
LP5-24-CCC-PCT-A	1	12	S-12569	6.72	<1.00
LP5-08-CCC-PCT-A	1	13	S-12521	8.21	1.28
DI Water BLK-A 2/16/21	1	14	S-12602	3.69	<1.00
LP5-25-CCC-PCT-A	1	15	S-12572	2.67	<1.00
LP5-05-Q-PCT-A	1	16	S-12439	14.9	3.77
LP5-10-Q-PCT-A	1	17	S-12454	14.6	4.81
IC Blank	1	18	blank-PCT-1a	<1.00	<1.00
1ppm standard	1	19	1ppm standard	0.923	0.921
LP5-20-CCC-PCT-A	1	20	S-12557	72.1	25.4
LP5-11-CCC-PCT-A	1	21	S-12530	34.6	15.4
LP5-08-Q-PCT-A	1	22	S-12448	9.75	1.80
LP5-21-Q-PCT-A	1	23	S-12486	28.7	8.99
LP5-18-CCC-PCT-A	1	24	S-12551	28.3	11.6
DI Water BLK-A 3/4/21	1	25	S-12606	4.91	<1.00
LP5-03-Q-PCT-A	1	26	S-12434	28.0	9.03
LRM Standard-A 4/19/21	1	27	S-12599	4.74	1.41
LP5-05-CCC-PCT-A	1	28	S-12512	13.2	3.79
LP5-19-Q-PCT-A	1	29	S-12480	17.4	5.74
LP5-24-Q-PCT-A	1	30	S-12494	7.85	1.02
LRM Standard-A 3/26/21	1	31	S-12590	3.20	1.16
DI Water BLK-A 3/26/21	1	32	S-12612	2.46	<1.00
LRM Standard-A 3/4/21	1	33	S-12581	2.36	1.13
LP5-04-CCC-PCT-A	1	34	S-12509	11.8	4.95
LRM Standard-A 2/16/21	1	35	S-12575	3.70	<1.00
1ppm standard	1	36	1ppm standard	1.04	1.00
1ppm standard	2	1	1ppm standard	0.994	1.00
LP5-03-CCC-PCT-A	2	2	S-12506	21.7	9.57
LRM Standard-A 3/12/21	2	3	S-12584	<1.00	1.01
LRM Standard-A 4/9/21	2	4	S-12596	<1.00	1.06
LP5-12-1-Q-PCT-A	2	5	S-12460	<1.00	<1.00
LP5-21-CCC-PCT-A	2	6	S-12560	21.7	9.03
LP5-02-Q-PCT-A	2	7	S-12431	2.13	<1.00
LP5-09-Q-PCT-A	2	8	S-12451	2.46	1.04
LP5-07-Q-PCT-1-A	2	9	S-12445	1.53	<1.00
LP5-22-CCC-PCT-A	2	10	S-12563	15.8	6.49

Table B-2. As Received PCT Leachate Measurements (mg/L) Measured by IC (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Cl^-	F^-
LP5-02-CCC-PCT-A	2	11	S-12503	30.1	23.7
LRM Standard-A 2/26/21	2	12	S-12578	<1.00	<1.00
LP5-13-CCC-PCT-A	2	13	S-12536	59.0	26.1
LP5-17-CCC-PCT-A	2	14	S-12548	17.0	2.69
LP5-17-Q-PCT-A	2	15	S-12474	26.6	2.92
LP5-15-CCC-PCT-A	2	16	S-12542	8.38	<1.00
LP5-18-Q-PCT-A	2	17	S-12477	28.3	12.9
IC Blank	2	18	blank-PCT-2a	<1.00	<1.00
1ppm standard	2	19	1ppm standard	0.979	0.984
LP5-09-CCC-PCT-A	2	20	S-12524	75.2	33.5
LP5-13-Q-PCT-A	2	21	S-12463	66.6	27.6
LP5-16-MOD1-Q-PCT-A	2	22	S-12471	6.80	2.51
LP5-22-Q-PCT-A	2	23	S-12489	17.9	6.94
LP5-06-MOD1-CCC-PCT- A	2	24	S-12515	1.04	<1.00
LP5-23-CCC-PCT-A	2	25	S-12566	<1.00	<1.00
LP5-14-CCC-PCT-A	2	26	S-12539	5.99	3.96
DI Water BLK-A 3/12/21	2	27	S-12608	<1.00	<1.00
LP5-19-Q-PCT-B	2	28	S-12481	12.8	5.63
LP5-16-MOD1-CCC-PCT- A	2	29	S-12545	18.3	10.3
LP5-20-Q-PCT-A	2	30	S-12483	67.8	25.5
LP5-11-Q-PCT-A	2	31	S-12457	32.4	14.8
LRM Standard-A 4/1/21	2	32	S-12593	<1.00	1.18
LP5-10-CCC-PCT-A	2	33	S-12527	28.5	15.1
DI Water BLK-A 2/26/21	2	34	S-12604	<1.00	<1.00
1ppm standard	2	35	1ppm standard	0.929	0.947
1ppm standard	3	1	1ppm standard	1.00	1.00
LRM Standard-B 3/12/21	3	2	S-12585	2.21	1.61
LRM Standard-B 4/1/21	3	3	S-12594	2.33	1.51
LP5-06-MOD1-Q-PCT-B	3	4	S-12443	4.40	<1.00
LP5-03-Q-PCT-B	3	5	S-12435	28.6	9.75
LP5-23-CCC-PCT-B	3	6	S-12567	5.21	<1.00
LRM Standard-B 2/26/21	3	7	S-12579	2.58	1.20
LP5-08-Q-PCT-B	3	8	S-12449	7.30	1.41
DI Water BLK-B 4/9/21	3	9	S-12617	2.72	<1.00
LP5-19-CCC-PCT-B	3	10	S-12555	17.6	6.35
LP5-20-CCC-PCT-B	3	11	S-12558	70.4	26.1
LRM Standard-B 3/4/21	3	12	S-12582	5.06	2.17
LP5-24-CCC-PCT-B	3	13	S-12570	5.56	<1.00
LP5-12-1-CCC-PCT-B	3	14	S-12534	4.36	3.28
LP5-11-Q-PCT-B	3	15	S-12458	38.6	15.4
LP5-12-1-Q-PCT-B	3	16	S-12461	4.61	<1.00
LP5-08-CCC-PCT-B	3	17	S-12522	6.74	1.31
IC Blank	3	18	blank-PCT-3a	<1.00	<1.00
1ppm standard	3	19	1ppm standard	1.01	0.962
LP5-09-Q-PCT-B	3	20	S-12452	5.87	1.11
LP5-11-CCC-PCT-B	3	21	S-12531	31.2	14.3

Table B-2. As Received PCT Leachate Measurements (mg/L) Measured by IC (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Cl^-	F^-
LP5-13-Q-PCT-B	3	22	S-12464	66.7	25.9
LRM Standard-B 2/16/21	3	23	S-12576	4.04	1.51
LP5-21-CCC-PCT-B	3	24	S-12561	26.9	9.48
LP5-20-Q-PCT-B	3	25	S-12484	72.4	27.1
LP5-21-Q-PCT-B	3	26	S-12487	28.6	9.83
LP5-18-CCC-PCT-B	3	27	S-12552	27.8	11.8
LP5-17-CCC-PCT-B	3	28	S-12549	21.8	2.87
LRM Standard-B 4/9/21	3	29	S-12597	3.59	1.17
LRM Standard-B 3/26/21	3	30	S-12591	2.03	1.18
LP5-03-CCC-PCT-B	3	31	S-12507	24.3	9.02
LP5-18-Q-PCT-B	3	32	S-12478	33.4	13.3
DI Water BLK-B 4/1/21	3	33	S-12615	3.46	<1.00
LP5-25-Q-PCT-B	3	34	S-12498	2.40	<1.00
LP5-06-MOD1-CCC-PCT- B	3	35	S-12516	3.25	<1.00
1ppm standard	3	36	1ppm standard	1.11	0.984
1ppm standard	4	1	1ppm standard	1.00	1.01
DI Water BLK-B 3/12/21	4	2	S-12609	<1.00	<1.00
LP5-01-CCC-PCT-B	4	3	S-12501	91.5	37.4
LP5-02-CCC-PCT-B	4	4	S-12504	30.84	24.8
LP5-07-Q-PCT-1-B	4	5	S-12446	1.51	<1.00
LP5-16-MOD1-CCC-PCT- B	4	6	S-12546	18.4	10.3
LP5-10-Q-PCT-B	4	7	S-12455	9.09	4.55
LP5-09-CCC-PCT-B	4	8	S-12525	76.1	35.1
LP5-16-MOD1-Q-PCT-B	4	9	S-12472	6.72	2.57
LP5-14-CCC-PCT-B	4	10	S-12540	5.97	4.04
LP5-23-Q-PCT-B	4	11	S-12492	<1.00	<1.00
LP5-01-Q-PCT-B	4	12	S-12429	113	42.7
LP5-14-Q-PCT-B	4	13	S-12467	16.0	7.70
LP5-25-CCC-PCT-B	4	14	S-12573	<1.00	<1.00
LP5-17-Q-PCT-B	4	15	S-12475	25.5	2.72
LP5-24-Q-PCT-B	4	16	S-12495	2.58	<1.00
LP5-07-CCC-PCT-B	4	17	S-12519	1.43	<1.00
IC Blank	4	18	blank-PCT-4a	<1.00	<1.00
1ppm standard	4	19	1ppm standard	0.997	0.989
LP5-05-Q-PCT-B	4	20	S-12440	9.24	3.66
LP5-04-Q-PCT-B	4	21	S-12438	<1.00	<1.00
LP5-22-Q-PCT-B	4	22	S-12490	17.2	6.67
DI Water BLK-B 3/26/21	4	23	S-12613	<1.00	<1.00
LRM Standard-B 3/18/21	4	24	S-12588	<1.00	<1.00
DI Water BLK-B 4/19/21	4	25	S-12619	<1.00	<1.00
LP5-05-CCC-PCT-B	4	26	S-12513	8.59	3.61
LRM Standard-B 4/19/21	4	27	S-12600	<1.00	<1.00
LP5-22-CCC-PCT-B	4	28	S-12564	15.1	6.23
LP5-13-CCC-PCT-B	4	29	S-12537	55.8	25.4
LP5-10-CCC-PCT-B	4	30	S-12528	30.1	16.2
LP5-02-Q-PCT-B	4	31	S-12432	1.90	<1.00

Table B-2. As Received PCT Leachate Measurements (mg/L) Measured by IC (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Cl^-	F^-
LP5-04-CCC-PCT-B	4	32	S-12510	7.32	5.42
LP5-15-CCC-PCT-B	4	33	S-12543	8.02	<1.00
DI Water BLK-B 3/18/21	4	34	S-12611	<1.00	<1.00
LP5-15-Q-PCT-B	4	35	S-12469	14.6	<1.00
1ppm standard	4	36	1ppm standard	0.993	0.993
1ppm standard	5	1	1ppm standard	1.01	1.03
LP5-23-Q-PCT-C	5	2	S-12493	2.67	<1.00
LP5-16-MOD1-Q-PCT-C	5	3	S-12473	10.1	2.46
LRM Standard-C 4/9/21	5	4	S-12598	2.48	1.18
LP5-02-CCC-PCT-C	5	5	S-12505	35.9	25.5
LP5-19-Q-PCT-C	5	6	S-12482	19.1	7.15
LP5-03-Q-PCT-C	5	7	S-12436	27.8	10.1
LP5-14-Q-PCT-C	5	8	S-12468	19.9	8.02
LP5-17-CCC-PCT-C	5	9	S-12550	20.5	2.81
LP5-10-CCC-PCT-C	5	10	S-12529	34.6	16.4
LRM Standard-C 4/19/21	5	11	S-12601	2.62	1.35
LP5-11-CCC-PCT-C	5	12	S-12532	30.1	14.5
LP5-16-MOD1-CCC-PCT- C	5	13	S-12547	23.0	10.6
LP5-15-CCC-PCT-C	5	14	S-12544	11.9	<1.00
DI Water BLK-A 4/9/21	5	15	S-12616	2.53	<1.00
LP5-04-CCC-PCT-C	5	16	S-12511	10.3	5.19
LP5-10-Q-PCT-C	5	17	S-12456	12.8	4.77
IC Blank	5	18	blank-PCT-5a	<1.00	<1.00
1ppm standard	5	19	1ppm standard	0.949	0.962
LP5-09-Q-PCT-C	5	20	S-12453	4.67	<1.00
LP5-06-MOD1-Q-PCT-C	5	21	S-12444	3.38	<1.00
LRM Standard-C 3/4/21	5	22	S-12583	1.61	<1.00
LP5-25-CCC-PCT-C	5	23	S-12574	1.42	<1.00
LP5-21-CCC-PCT-C	5	24	S-12562	25.1	9.66
LP5-19-CCC-PCT-C	5	25	S-12556	15.5	6.45
LRM Standard-C 2/16/21	5	26	S-12577	2.34	1.16
LRM Standard-C 4/1/21	5	27	S-12595	1.56	1.18
DI Water BLK-B 3/4/21	5	28	S-12607	1.28	<1.00
LP5-23-CCC-PCT-C	5	29	S-12568	2.01	<1.00
LRM Standard-C 2/26/21	5	30	S-12580	1.31	<1.00
LP5-01-CCC-PCT-C	5	31	S-12502	93.9	38.8
LP5-02-Q-PCT-C	5	32	S-12433	4.62	1.28
LP5-20-Q-PCT-C	5	33	S-12485	74.1	29.2
LP5-22-Q-PCT-C	5	34	S-12491	21.0	7.63
LP5-17-Q-PCT-C	5	35	S-12476	29.3	3.05
1ppm standard	5	36	1ppm standard	1.16	1.01
1ppm standard	6	1	1ppm standard	1.00	1.02
LP5-24-Q-PCT-C	6	2	S-12496	2.30	<1.00
LP5-24-CCC-PCT-C	6	3	S-12571	1.69	<1.00
LP5-18-CCC-PCT-C	6	4	S-12553	22.5	11.7
LP5-15-Q-PCT-C	6	5	S-12470	14.5	<1.00

Table B-2. As Received PCT Leachate Measurements (mg/L) Measured by IC (continued)

PNNL Solution ID	Block	Seq.	Lab ID	Cl^-	F^-
LP5-08-Q-PCT-C	6	6	S-12450	2.90	1.20
LP5-07-Q-PCT-1-C	6	7	S-12447	1.24	<1.00
LP5-06-MOD1-CCC-PCT- C	6	8	S-12517	<1.00	<1.00
DI Water BLK-B 2/26/21	6	9	S-12605	<1.00	<1.00
LRM Standard-C 3/26/21	6	10	S-12592	<1.00	<1.00
LRM Standard-C 3/18/21	6	11	S-12589	<1.00	<1.00
DI Water BLK-A 4/19/21	6	12	S-12618	<1.00	<1.00
LP5-18-Q-PCT-C	6	13	S-12479	28.8	13.2
LP5-05-Q-PCT-C	6	14	S-12441	8.96	3.57
LP5-13-Q-PCT-C	6	15	S-12465	61.9	26.5
LP5-12-1-Q-PCT-C	6	16	S-12462	<1.00	<1.00
LP5-01-Q-PCT-C	6	17	S-12430	109	41.5
IC Blank	6	18	blank-PCT-6a	<1.00	<1.00
1ppm standard	6	19	1ppm standard	1.03	1.01
LP5-25-Q-PCT-C	6	20	S-12499	<1.00	<1.00
LP5-22-CCC-PCT-C	6	21	S-12565	16.0	6.58
LP5-03-CCC-PCT-C	6	22	S-12508	20.7	9.09
LP5-20-CCC-PCT-C	6	23	S-12559	63.9	26.0
DI Water BLK-B 2/16/21	6	24	S-12603	<1.00	<1.00
LP5-14-CCC-PCT-C	6	25	S-12541	6.27	3.95
LP5-09-CCC-PCT-C	6	26	S-12526	78.5	36.1
LP5-12-1-CCC-PCT-C	6	27	S-12535	1.21	3.79
LP5-21-Q-PCT-C	6	28	S-12488	21.4	8.26
LP5-07-CCC-PCT-C	6	29	S-12520	1.49	<1.00
LP5-11-Q-PCT-C	6	30	S-12459	31.7	14.6
LP5-08-CCC-PCT-C	6	31	S-12523	2.97	1.37
LP5-13-CCC-PCT-C	6	32	S-12538	58.9	26.9
LRM Standard-C 3/12/21	6	33	S-12586	<1.00	1.02
LP5-05-CCC-PCT-C	6	34	S-12514	9.24	3.98
DI Water BLK-A 4/1/21	6	35	S-12614	<1.00	<1.00
1ppm standard	6	36	1ppm standard	1.05	1.05

Table B-3. As Received Sample Rerun Results (mg/L) Measured by ICP-OES

PNNL Solution ID	Seq.	Lab ID	Al	B	Ca	Cr	Fe	K	Li	Mg	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	Zr
Blank	1	Blank	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	2	std-PCT-1	3.90	19.5	<1.00	<1.00	4.01	10.1	9.15	<1.00	78.9	<1.00	<1.00	<1.00	<1.00	48.4	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-A 2/16/21	3	S-12575	1.32	1.70	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	21.2	<1.00	<1.00	<1.00	<1.00	17.6	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-A 3/4/21	4	S-12581	2.62	2.50	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	20.2	<1.00	<1.00	<1.00	<1.00	14.7	<1.00	<1.00	<1.00	<1.00	<1.00
LRM Standard-C 4/1/21	5	S-12595	2.82	4.36	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	21.4	<1.00	<1.00	<1.00	<1.00	14.7	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 2/16/21	6	S-12602	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.89	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 2/26/21	7	S-12604	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	3.96	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 3/12/21	8	S-12608	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.95	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-B 3/18/21	9	S-12611	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2.53	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-B 2/16/21	10	S-12603	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	1.28	<1.00	<1.00	<1.00	<1.00	3.50	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-B 2/26/21	11	S-12605	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2.93	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 4/1/21	12	S-12614	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	2.01	<1.00	<1.00	<1.00	<1.00	<1.00
DI Water BLK-A 4/19/21	13	S-12618	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
PCT standard	14	std-PCT-2	4.04	19.9	<1.00	<1.00	4.10	10.5	9.54	<1.00	79.9	<1.00	<1.00	<1.00	<1.00	49.7	<1.00	<1.00	<1.00	<1.00	<1.00

Table B-4. As Received Sample Rerun Results (mg/L) Measured by IC

PNNL Solution ID	Seq.	Lab ID	Cl^-	F^-
1ppm standard	1	1ppm standard	0.959	1.03
DI Water BLK-A 2/16/21	2	S-12602	<1.00	<1.00
DI Water BLK-A 3/18/21	3	S-12610	<1.00	<1.00
DI Water BLK-A 3/26/21	4	S-12612	<1.00	<1.00
DI Water BLK-A 3/4/21	5	S-12606	<1.00	<1.00
LRM Standard-A 2/16/21	6	S-12575	<1.00	1.06
LRM Standard-A 3/18/21	7	S-12587	<1.00	1.24
LRM Standard-A 3/26/21	8	S-12590	<1.00	1.17
LRM Standard-A 3/4/21	9	S-12581	<1.00	1.15
LRM Standard-A 4/19/21	10	S-12599	<1.00	1.19
DI Water BLK-B 4/1/21	11	S-12615	<1.00	<1.00
DI Water BLK-B 4/9/21	12	S-12617	<1.00	<1.00
LRM Standard-B 2/16/21	13	S-12576	<1.00	1.01
LRM Standard-B 2/26/21	14	S-12579	<1.00	1.12
Blank	15	BLANK	<1.00	<1.00
1ppm standard	16	1ppm standard	0.930	1.01
LRM Standard-B 3/12/21	17	S-12585	<1.00	1.06
LRM Standard-B 3/26/21	18	S-12591	<1.00	1.19
LRM Standard-B 3/4/21	19	S-12582	<1.00	1.18
LRM Standard-B 4/1/21	20	S-12594	<1.00	1.19
LRM Standard-B 4/9/21	21	S-12597	<1.00	1.21
DI Water BLK-A 4/9/21	22	S-12616	<1.00	<1.00
DI Water BLK-B 3/4/21	23	S-12607	<1.00	<1.00
LRM Standard-C 2/16/21	24	S-12577	<1.00	1.04
LRM Standard-C 2/26/21	25	S-12580	<1.00	1.04
LRM Standard-C 3/4/21	26	S-12583	<1.00	1.11
LRM Standard-C 4/1/21	27	S-12595	<1.00	1.22
LRM Standard-C 4/19/21	28	S-12601	<1.00	1.13
LRM Standard-C 4/9/21	29	S-12598	<1.00	1.17
1ppm standard	30	1ppm standard	0.952	1.05

Table B-5. Dilution-Corrected Values of Select Elements for the Study Glasses (mg/L)

PNNL Solution ID	Lab ID	Al	B	Li	Na	Si
LP5-01-Q-PCT-B	S-12429	9.35	3270	<5.00	14400	2760
LP5-01-Q-PCT-C	S-12430	8.50	2910	<5.00	13200	2430
LP5-02-Q-PCT-A	S-12431	8.35	39.4	<5.00	810	139
LP5-02-Q-PCT-B	S-12432	8.10	41.4	<5.00	745	117
LP5-02-Q-PCT-C	S-12433	7.10	36.6	<5.00	680	107
LP5-03-Q-PCT-A	S-12434	<5.00	700	<5.00	3220	356
LP5-03-Q-PCT-B	S-12435	<5.00	655	<5.00	3170	339
LP5-03-Q-PCT-C	S-12436	<5.00	685	<5.00	3220	355
LP5-04-Q-PCT-A	S-12437	8.10	<5.00	<5.00	441	47.7
LP5-04-Q-PCT-B	S-12438	6.80	10.7	<5.00	486	57.0
LP5-05-Q-PCT-A	S-12439	6.00	505	<5.00	2680	493
LP5-05-Q-PCT-B	S-12440	6.25	505	<5.00	2770	491
LP5-05-Q-PCT-C	S-12441	5.70	486	<5.00	2410	475
LP5-06-MOD1-Q-PCT-A	S-12442	28.8	38.3	<5.00	293	75.0
LP5-06-MOD1-Q-PCT-B	S-12443	26.9	44.9	<5.00	286	67.5
LP5-06-MOD1-Q-PCT-C	S-12444	26.0	45.0	<5.00	275	67.5
LP5-07-Q-PCT-1-A	S-12445	49.4	133	<5.00	680	138
LP5-07-Q-PCT-1-B	S-12446	47.1	129	<5.00	640	121
LP5-07-Q-PCT-1-C	S-12447	42.2	118	<5.00	605	118
LP5-08-Q-PCT-A	S-12448	58.5	136	<5.00	830	144
LP5-08-Q-PCT-B	S-12449	60.5	139	<5.00	825	137
LP5-08-Q-PCT-C	S-12450	61.5	138	<5.00	835	141
LP5-09-Q-PCT-A	S-12451	44.8	42.7	<5.00	675	173
LP5-09-Q-PCT-B	S-12452	42.6	42.1	<5.00	675	169
LP5-09-Q-PCT-C	S-12453	42.5	42.1	<5.00	625	163
LP5-10-Q-PCT-A	S-12454	9.25	530	<5.00	4070	805
LP5-10-Q-PCT-B	S-12455	9.45	520	<5.00	4090	680
LP5-10-Q-PCT-C	S-12456	8.85	505	<5.00	3810	625
LP5-11-Q-PCT-A	S-12457	5.50	700	<5.00	4830	875
LP5-11-Q-PCT-B	S-12458	<5.00	665	<5.00	4480	720
LP5-11-Q-PCT-C	S-12459	5.05	650	<5.00	4120	720
LP5-12-1-Q-PCT-A	S-12460	28.5	21.2	<5.00	244	86.5
LP5-12-1-Q-PCT-B	S-12461	22.7	20.4	<5.00	227	88.5
LP5-12-1-Q-PCT-C	S-12462	32.1	24.4	<5.00	249	74.0
LP5-13-Q-PCT-A	S-12463	<5.00	3590	<5.00	14400	1670
LP5-13-Q-PCT-B	S-12464	<5.00	3350	<5.00	12400	1410
LP5-13-Q-PCT-C	S-12465	<5.00	3590	<5.00	12700	1490
LP5-14-Q-PCT-A	S-12466	<5.00	343	<5.00	2010	535
LP5-14-Q-PCT-B	S-12467	<5.00	333	<5.00	2020	520
LP5-14-Q-PCT-C	S-12468	<5.00	330	<5.00	2020	510
LP5-15-Q-PCT-B	S-12469	44.4	162	<5.00	825	85.0
LP5-15-Q-PCT-C	S-12470	39.2	156	<5.00	780	90.0
LP5-16-MOD1-Q-PCT-A	S-12471	23.3	175	<5.00	1380	206
LP5-16-MOD1-Q-PCT-B	S-12472	23.3	175	<5.00	1280	184
LP5-16-MOD1-Q-PCT-C	S-12473	23.0	178	<5.00	1310	194
LP5-17-Q-PCT-A	S-12474	<5.00	376	<5.00	2140	351
LP5-17-Q-PCT-B	S-12475	<5.00	370	<5.00	1890	313
LP5-17-Q-PCT-C	S-12476	<5.00	365	<5.00	1950	306
LP5-18-Q-PCT-A	S-12477	<5.00	990	<5.00	4800	950

Table B-5. Dilution-Corrected Values of Select Elements for the Study Glasses (mg/L) (continued)

PNNL Solution ID	Lab ID	Al	B	Li	Na	Si
LP5-18-Q-PCT-B	S-12478	<5.00	975	<5.00	4600	780
LP5-18-Q-PCT-C	S-12479	<5.00	955	<5.00	4350	795
LP5-19-Q-PCT-A	S-12480	8.35	820	<5.00	3540	680
LP5-19-Q-PCT-B	S-12481	8.40	805	<5.00	3750	785
LP5-19-Q-PCT-C	S-12482	8.85	940	<5.00	4050	620
LP5-20-Q-PCT-A	S-12483	<5.00	2300	<5.00	8250	1590
LP5-20-Q-PCT-B	S-12484	<5.00	2260	<5.00	7150	1310
LP5-20-Q-PCT-C	S-12485	<5.00	2460	<5.00	8100	1410
LP5-21-Q-PCT-A	S-12486	<5.00	940	<5.00	2970	457
LP5-21-Q-PCT-B	S-12487	<5.00	855	<5.00	2900	438
LP5-21-Q-PCT-C	S-12488	<5.00	780	<5.00	2620	406
LP5-22-Q-PCT-A	S-12489	<5.00	1950	<5.00	7350	2610
LP5-22-Q-PCT-B	S-12490	<5.00	1990	<5.00	6650	2370
LP5-22-Q-PCT-C	S-12491	<5.00	1970	<5.00	6800	2300
LP5-23-Q-PCT-B	S-12492	7.85	21.6	<5.00	510	185
LP5-23-Q-PCT-C	S-12493	7.80	21.0	<5.00	505	179
LP5-24-Q-PCT-A	S-12494	11.5	24.3	<5.00	179	63.0
LP5-24-Q-PCT-B	S-12495	13.3	33.6	<5.00	192	67.5
LP5-24-Q-PCT-C	S-12496	11.0	32.4	<5.00	191	65.5
LP5-25-Q-PCT-A	S-12497	<5.00	18.9	6.30	93.5	79.5
LP5-25-Q-PCT-B	S-12498	<5.00	24.5	6.60	99.5	79.0
LP5-25-Q-PCT-C	S-12499	<5.00	27.5	5.65	106	84.5
LP5-01-CCC-PCT-A	S-12500	7.45	3150	<5.00	13500	2540
LP5-01-CCC-PCT-B	S-12501	7.75	2690	<5.00	11900	2250
LP5-01-CCC-PCT-C	S-12502	7.35	2780	<5.00	12300	2220
LP5-02-CCC-PCT-A	S-12503	56.0	1100	<5.00	7200	338
LP5-02-CCC-PCT-B	S-12504	56.5	1180	<5.00	6650	310
LP5-02-CCC-PCT-C	S-12505	57.0	1210	<5.00	6800	317
LP5-03-CCC-PCT-A	S-12506	<5.00	660	<5.00	3420	390
LP5-03-CCC-PCT-B	S-12507	<5.00	625	<5.00	2970	329
LP5-03-CCC-PCT-C	S-12508	<5.00	670	<5.00	3080	335
LP5-04-CCC-PCT-A	S-12509	104	201	<5.00	2290	317
LP5-04-CCC-PCT-B	S-12510	104	198	<5.00	2290	314
LP5-04-CCC-PCT-C	S-12511	93.5	184	<5.00	2280	291
LP5-05-CCC-PCT-A	S-12512	6.10	545	<5.00	2790	505
LP5-05-CCC-PCT-B	S-12513	6.40	530	<5.00	2820	505
LP5-05-CCC-PCT-C	S-12514	6.30	540	<5.00	2900	515
LP5-06-MOD1-CCC-PCT-A	S-12515	18.6	54.5	<5.00	335	89.5
LP5-06-MOD1-CCC-PCT-B	S-12516	18.4	56.0	<5.00	351	74.5
LP5-06-MOD1-CCC-PCT-C	S-12517	17.9	54.5	<5.00	339	78.0
LP5-07-CCC-PCT-A	S-12518	42.5	157	<5.00	700	144
LP5-07-CCC-PCT-B	S-12519	42.4	161	<5.00	710	129
LP5-07-CCC-PCT-C	S-12520	43.9	159	<5.00	640	136
LP5-08-CCC-PCT-A	S-12521	55.5	124	<5.00	785	134
LP5-08-CCC-PCT-B	S-12522	57.0	132	<5.00	825	133
LP5-08-CCC-PCT-C	S-12523	53.0	125	<5.00	755	132
LP5-09-CCC-PCT-A	S-12524	21.7	1550	<5.00	8900	1390
LP5-09-CCC-PCT-B	S-12525	22.5	1700	<5.00	8950	1300
LP5-09-CCC-PCT-C	S-12526	22.9	1720	<5.00	8600	1320

Table B-5. Dilution-Corrected Values of Select Elements for the Study Glasses (mg/L) (continued)

PNNL Solution ID	Lab ID	Al	B	Li	Na	Si
LP5-10-CCC-PCT-A	S-12527	11.1	1740	<5.00	9900	2300
LP5-10-CCC-PCT-B	S-12528	11.2	1800	<5.00	9800	2170
LP5-10-CCC-PCT-C	S-12529	11.0	1850	<5.00	9700	2170
LP5-11-CCC-PCT-A	S-12530	5.20	715	<5.00	4440	885
LP5-11-CCC-PCT-B	S-12531	5.10	655	<5.00	4310	735
LP5-11-CCC-PCT-C	S-12532	<5.00	685	<5.00	4380	770
LP5-12-1-CCC-PCT-A	S-12533	81.5	155	<5.00	790	96.5
LP5-12-1-CCC-PCT-B	S-12534	75.5	139	<5.00	750	80.0
LP5-12-1-CCC-PCT-C	S-12535	82.0	159	<5.00	620	103
LP5-13-CCC-PCT-A	S-12536	<5.00	3410	<5.00	13300	1590
LP5-13-CCC-PCT-B	S-12537	<5.00	4070	<5.00	13400	1560
LP5-13-CCC-PCT-C	S-12538	<5.00	3600	<5.00	12900	1470
LP5-14-CCC-PCT-A	S-12539	<5.00	199	<5.00	1350	401
LP5-14-CCC-PCT-B	S-12540	<5.00	195	<5.00	1240	369
LP5-14-CCC-PCT-C	S-12541	<5.00	174	<5.00	1230	324
LP5-15-CCC-PCT-A	S-12542	39.5	125	<5.00	735	87.0
LP5-15-CCC-PCT-B	S-12543	38.7	131	<5.00	655	79.5
LP5-15-CCC-PCT-C	S-12544	34.9	122	<5.00	650	70.5
LP5-16-MOD1-CCC-PCT-A	S-12545	106	820	<5.00	4060	188
LP5-16-MOD1-CCC-PCT-B	S-12546	101	855	<5.00	3800	167
LP5-16-MOD1-CCC-PCT-C	S-12547	103	875	<5.00	3920	172
LP5-17-CCC-PCT-A	S-12548	<5.00	321	<5.00	1850	330
LP5-17-CCC-PCT-B	S-12549	<5.00	334	<5.00	1750	299
LP5-17-CCC-PCT-C	S-12550	<5.00	281	<5.00	1750	254
LP5-18-CCC-PCT-A	S-12551	<5.00	1010	<5.00	4370	905
LP5-18-CCC-PCT-B	S-12552	<5.00	870	<5.00	4080	755
LP5-18-CCC-PCT-C	S-12553	<5.00	915	<5.00	4170	835
LP5-19-CCC-PCT-A	S-12554	8.30	825	<5.00	3680	670
LP5-19-CCC-PCT-B	S-12555	8.35	795	<5.00	3510	545
LP5-19-CCC-PCT-C	S-12556	8.30	830	<5.00	3600	600
LP5-20-CCC-PCT-A	S-12557	<5.00	2770	<5.00	8300	1590
LP5-20-CCC-PCT-B	S-12558	<5.00	2190	<5.00	7350	1300
LP5-20-CCC-PCT-C	S-12559	<5.00	2360	<5.00	7500	1430
LP5-21-CCC-PCT-A	S-12560	<5.00	955	<5.00	3350	555
LP5-21-CCC-PCT-B	S-12561	<5.00	905	<5.00	3080	471
LP5-21-CCC-PCT-C	S-12562	<5.00	980	<5.00	3250	418
LP5-22-CCC-PCT-A	S-12563	<5.00	1790	<5.00	7100	2460
LP5-22-CCC-PCT-B	S-12564	<5.00	1920	<5.00	6850	2320
LP5-22-CCC-PCT-C	S-12565	<5.00	1910	<5.00	6250	2300
LP5-23-CCC-PCT-A	S-12566	8.20	19.8	<5.00	497	197
LP5-23-CCC-PCT-B	S-12567	7.50	21.7	<5.00	505	179
LP5-23-CCC-PCT-C	S-12568	7.00	19.1	<5.00	445	155
LP5-24-CCC-PCT-A	S-12569	12.8	20.6	<5.00	160	58.0
LP5-24-CCC-PCT-B	S-12570	11.7	26.5	<5.00	164	55.0
LP5-24-CCC-PCT-C	S-12571	13.2	28.5	<5.00	173	58.0
LP5-25-CCC-PCT-A	S-12572	<5.00	12.0	5.95	80.0	73.0
LP5-25-CCC-PCT-B	S-12573	<5.00	22.8	6.00	93.0	78.0
LP5-25-CCC-PCT-C	S-12574	<5.00	25.1	5.70	90.0	73.0

Table B-5. Dilution-Corrected Values of Select Elements for the Study Glasses (mg/L) (continued)

PNNL Solution ID	Lab ID	Al	B	Li	Na	Si
DI Water BLK-A 2/16/21	S-12602	<5.00	<5.00	<5.00	<5.00	16.9
DI Water BLK-B 2/16/21	S-12603	<5.00	<5.00	<5.00	6.80	17.0
DI Water BLK-A 2/26/21	S-12604	<5.00	<5.00	<5.00	7.40	29.6
DI Water BLK-B 2/26/21	S-12605	<5.00	<5.00	<5.00	<5.00	15.1
DI Water BLK-A 3/4/21	S-12606	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-B 3/4/21	S-12607	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-A 3/12/21	S-12608	<5.00	<5.00	<5.00	6.25	16.7
DI Water BLK-B 3/12/21	S-12609	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-A 3/18/21	S-12610	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-B 3/18/21	S-12611	<5.00	<5.00	<5.00	<5.00	10.5
DI Water BLK-A 3/26/21	S-12612	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-B 3/26/21	S-12613	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-A 4/1/21	S-12614	<5.00	<5.00	<5.00	<5.00	10.4
DI Water BLK-B 4/1/21	S-12615	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-A 4/9/21	S-12616	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-B 4/9/21	S-12617	<5.00	<5.00	<5.00	<5.00	<5.00
DI Water BLK-A 4/19/21	S-12618	<5.00	<5.00	<5.00	<5.00	5.15
DI Water BLK-B 4/19/21	S-12619	<5.00	<5.00	<5.00	<5.00	<5.00
Rerun DI Water BLK-A 2/16/21	S-12602	<5.00	<5.00	<5.00	<5.00	9.45
Rerun DI Water BLK-B 2/16/21	S-12603	<5.00	<5.00	<5.00	6.40	17.5
Rerun DI Water BLK-A 2/26/21	S-12604	<5.00	<5.00	<5.00	<5.00	19.8
Rerun DI Water BLK-B 2/26/21	S-12605	<5.00	<5.00	<5.00	<5.00	14.7
Rerun DI Water BLK-A 3/12/21	S-12608	<5.00	<5.00	<5.00	<5.00	9.75
Rerun DI Water BLK-B 3/18/21	S-12611	<5.00	<5.00	<5.00	<5.00	12.7
Rerun DI Water BLK-A 4/1/21	S-12614	<5.00	<5.00	<5.00	<5.00	10.1
Rerun DI Water BLK-A 4/19/21	S-12618	<5.00	<5.00	<5.00	<5.00	<5.00

Table B-6. Dilution-Corrected LRM Leachate Measurements (mg/L)

PNNL Solution ID	Lab ID	Al	B	Na	Si
LRM Standard-A 2/16/21	S-12575	6.40	<5.00	93.0	85.5
LRM Standard-B 2/16/21	S-12576	11.5	10.4	99.5	82.0
LRM Standard-C 2/16/21	S-12577	11.1	10.1	93.0	73.0
LRM Standard-A 2/26/21	S-12578	11.9	10.5	100	88.0
LRM Standard-B 2/26/21	S-12579	11.6	10.9	98.5	73.0
LRM Standard-C 2/26/21	S-12580	11.8	10.9	94.0	76.5
LRM Standard-A 3/4/21	S-12581	13.2	<5.00	92.0	74.5
LRM Standard-B 3/4/21	S-12582	13.2	12.1	96.0	69.5
LRM Standard-C 3/4/21	S-12583	10.2	11.1	92.5	72.5
LRM Standard-A 3/12/21	S-12584	12.7	9.45	95.0	86.5
LRM Standard-B 3/12/21	S-12585	12.8	12.1	94.5	71.0
LRM Standard-C 3/12/21	S-12586	11.8	11.5	95.5	80.0
LRM Standard-A 3/18/21	S-12587	13.4	6.15	95.0	72.5
LRM Standard-B 3/18/21	S-12588	14.3	13.4	105	72.5
LRM Standard-C 3/18/21	S-12589	14.1	13.8	103	74.0
LRM Standard-A 3/26/21	S-12590	13.5	5.75	92.0	73.0
LRM Standard-B 3/26/21	S-12591	13.3	11.9	99.0	70.0
LRM Standard-C 3/26/21	S-12592	12.9	12.9	100	72.0
LRM Standard-A 4/1/21	S-12593	13.6	12.2	104	83.5
LRM Standard-B 4/1/21	S-12594	13.1	12.1	96.0	70.5
LRM Standard-C 4/1/21	S-12595	13.4	21.6	102	74.0
LRM Standard-A 4/9/21	S-12596	14.2	11.3	103	83.5
LRM Standard-B 4/9/21	S-12597	13.6	12.0	98.0	71.0
LRM Standard-C 4/9/21	S-12598	13.3	12.7	98.5	68.0
LRM Standard-A 4/19/21	S-12599	13.5	6.00	91.5	71.0
LRM Standard-B 4/19/21	S-12600	13.3	13.0	97.5	67.5
LRM Standard-C 4/19/21	S-12601	12.1	11.6	84.5	67.0
Rerun LRM Standard-A 2/16/21	S-12575	6.60	8.50	106	88.0
Rerun LRM Standard-A 3/4/21	S-12581	13.1	12.5	101	73.5
Rerun LRM Standard-C 4/1/21	S-12595	14.1	21.8	107	73.5

Ranges of Expected Test Results for LRM[e]
Aluminum: 7.3 – 21.6 mg/L
Boron: 19.5 – 33.9 mg/L
Sodium: 147 – 173 mg/L
Silicon: 69.3 – 94.7 mg/L

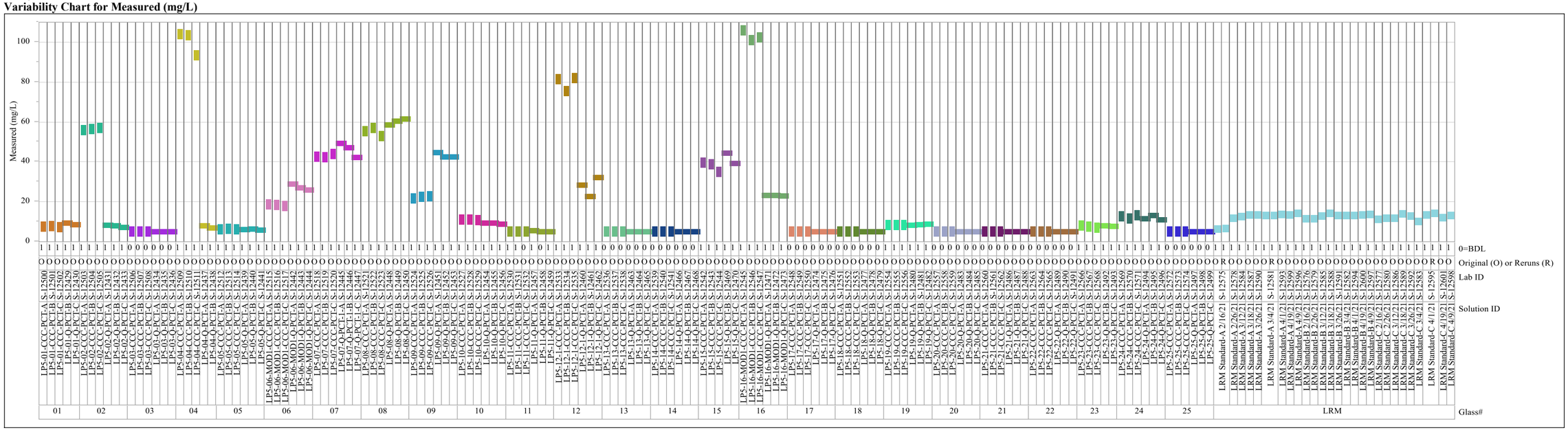
[e] W.L. Ebert and S.F. Wolf, "Round-Robin Testing of a Reference Glass for Low-Activity Waste Forms," Argonne National Laboratory, Argonne, IL, ANL-99/22, Revision 0, 1999

Table B-7. Results from Samples of the Multi-Element Solution Standard Included with the PCT Leachates

Analytical Block	1	2	3	4	5	6	Rerun	Reference Values (mg/L)
Mean (Al (mg/L))	4.01	4.04	3.94	4.07	3.99	4.04	3.97	4.00
Mean (B (mg/L))	18.8	20.1	19.7	20.0	19.7	20.3	19.7	20.0
Mean (Fe (mg/L))	3.76	4.04	3.86	4.05	3.99	4.12	4.06	4.00
Mean (K (mg/L))	9.69	9.96	9.28	9.53	10.1	10.1	10.3	10.0
Mean (Li (mg/L))	9.28	9.26	9.70	9.30	9.17	9.34	9.35	10.0
Mean (Na (mg/L))	77.7	80.3	80.2	80.8	79.0	80.6	79.4	81.0
Mean (Si (mg/L))	50.0	53.1	48.6	49.8	49.0	50.5	49.1	50.0
% relative bias, Al	0.2%	0.9%	-1.4%	1.8%	-0.3%	1.0%	-0.8%	<10% per ASTM C1285
% relative bias, B	-5.8%	0.7%	-1.3%	0.0%	-1.7%	1.5%	-1.5%	
% relative bias, Fe	-5.9%	1.1%	-3.5%	1.3%	-0.2%	3.1%	1.4%	
% relative bias, K	-3.1%	-0.4%	-7.2%	-4.7%	1.0%	1.0%	3.0%	
% relative bias, Li	-7.2%	-7.4%	-3.0%	-7.0%	-8.3%	-6.6%	-6.6%	
% relative bias, Na	-4.0%	-0.8%	-1.0%	-0.2%	-2.4%	-0.5%	-2.0%	
% relative bias, Si	-0.1%	6.2%	-2.9%	-0.4%	-1.9%	0.9%	-1.9%	
Standard Deviation (Al (mg/L))	0.02	0.03	0.06	0.03	0.04	0.01	0.10	
Standard Deviation (B (mg/L))	0.70	0.15	0.23	0.10	0.21	0.20	0.28	
Standard Deviation (Fe (mg/L))	0.12	0.02	0.09	0.04	0.04	0.02	0.06	
Standard Deviation (K (mg/L))	0.18	0.38	0.34	0.16	0.10	0.00	0.28	
Standard Deviation (Li (mg/L))	0.10	0.09	0.20	0.10	0.10	0.04	0.28	
Standard Deviation (Na (mg/L))	1.01	0.95	1.71	0.95	1.53	0.26	0.71	
Standard Deviation (Si (mg/L))	0.67	0.00	0.74	0.20	0.32	0.06	0.92	
%RSD (Al (mg/L))	0.4%	0.6%	1.4%	0.7%	0.9%	0.2%	2.5%	<10% per ASTM C1285
%RSD (B (mg/L))	3.7%	0.8%	1.2%	0.5%	1.1%	1.0%	1.4%	
%RSD (Fe (mg/L))	3.2%	0.5%	2.3%	1.0%	1.0%	0.5%	1.6%	
%RSD (K (mg/L))	1.9%	3.8%	3.7%	1.7%	1.0%	0.0%	2.7%	
%RSD (Li (mg/L))	1.0%	0.9%	2.0%	1.1%	1.1%	0.4%	3.0%	
%RSD (Na (mg/L))	1.3%	1.2%	2.1%	1.2%	1.9%	0.3%	0.9%	
%RSD (Si (mg/L))	1.3%	0.0%	1.5%	0.4%	0.7%	0.1%	1.9%	

Exhibit B-1. PCT Measurements by Glass ID

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



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

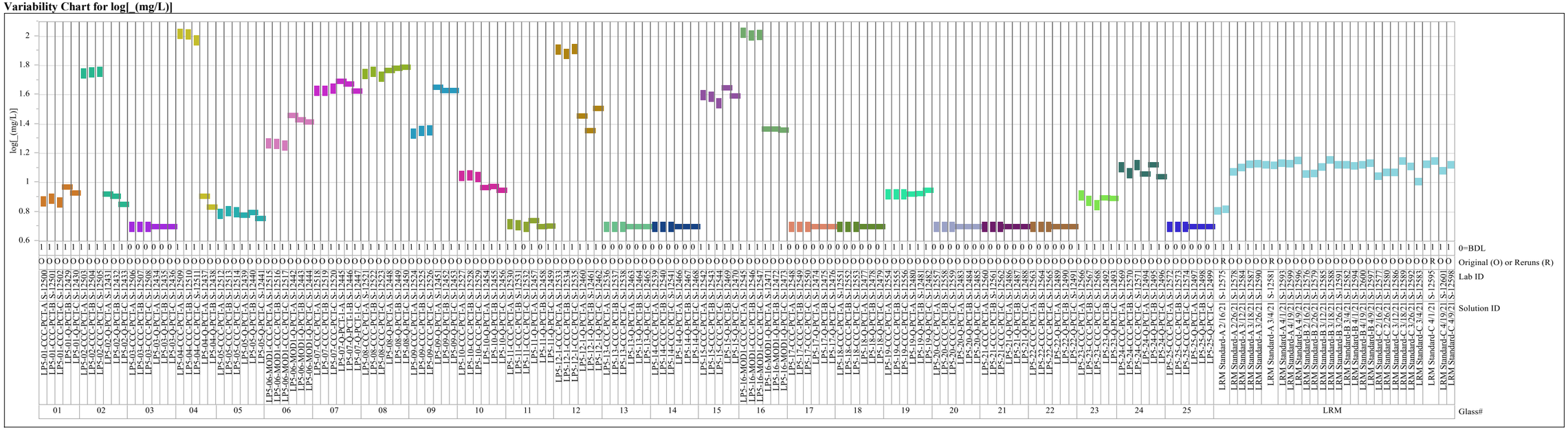
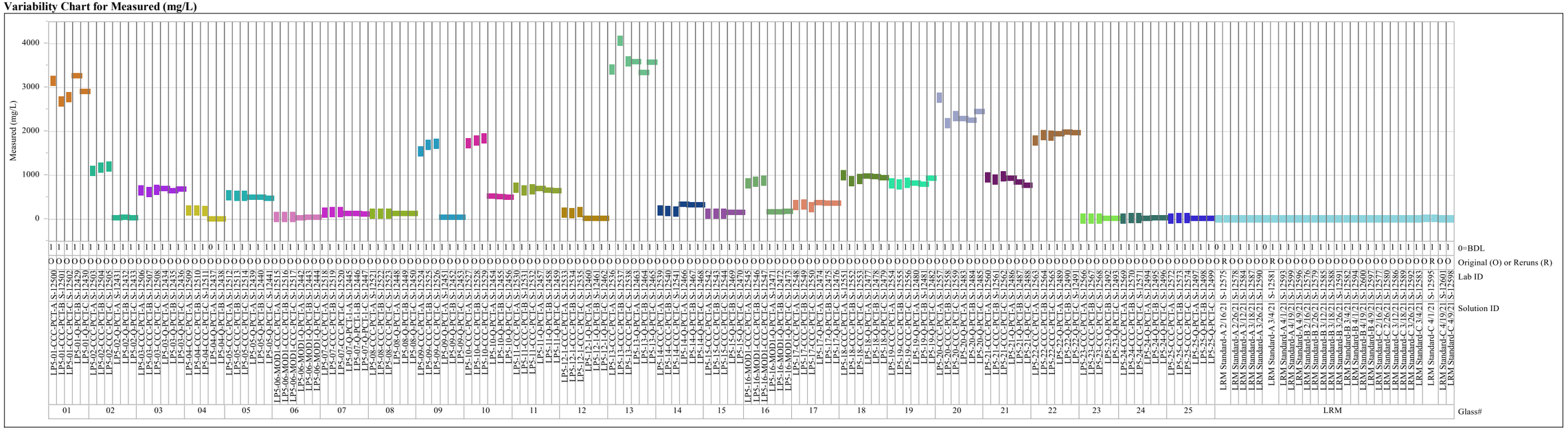


Exhibit B-1. PCT Measurements by Glass ID (continued)

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



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

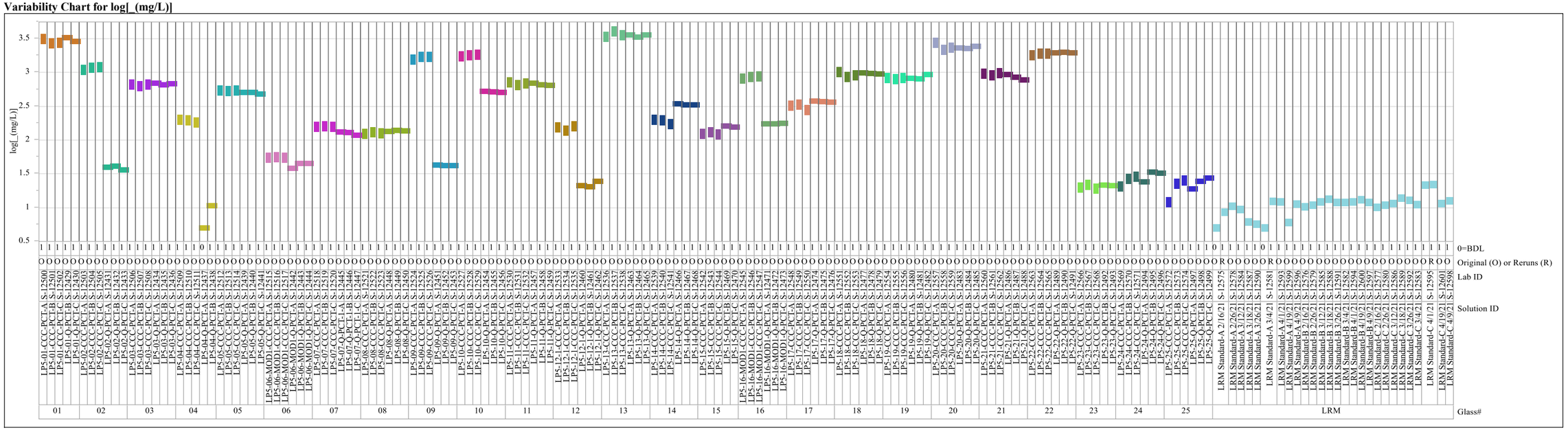
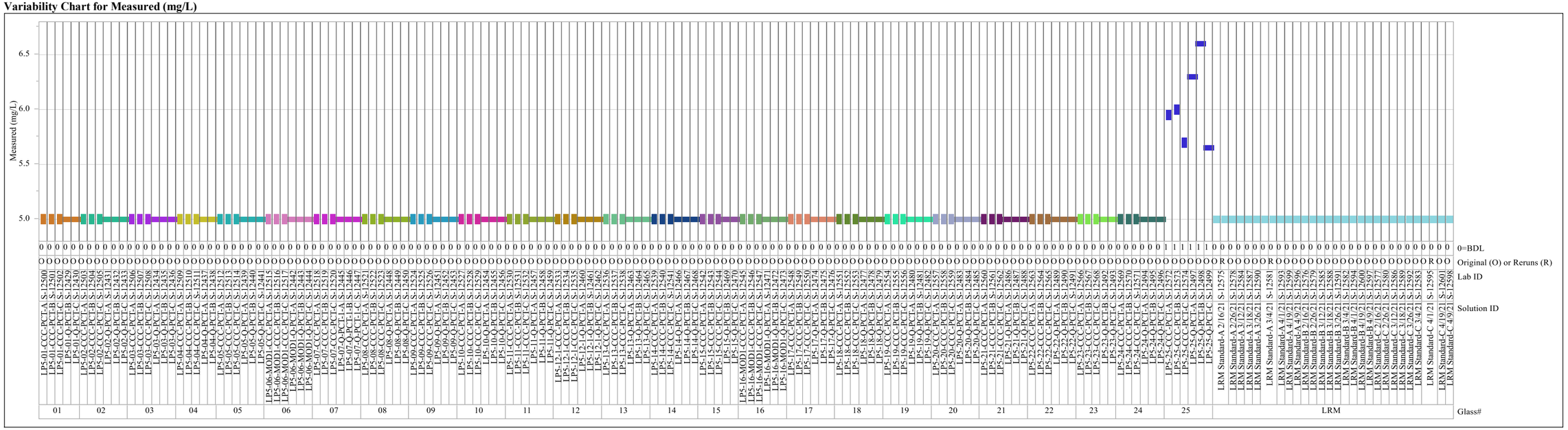


Exhibit B-1. PCT Measurements by Glass ID (continued)

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



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

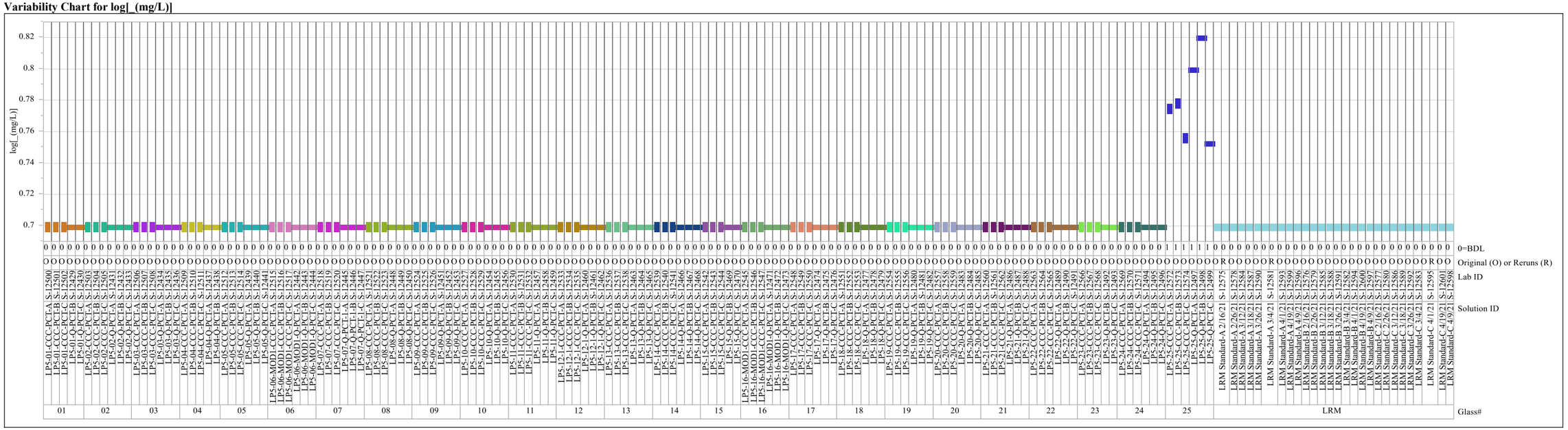
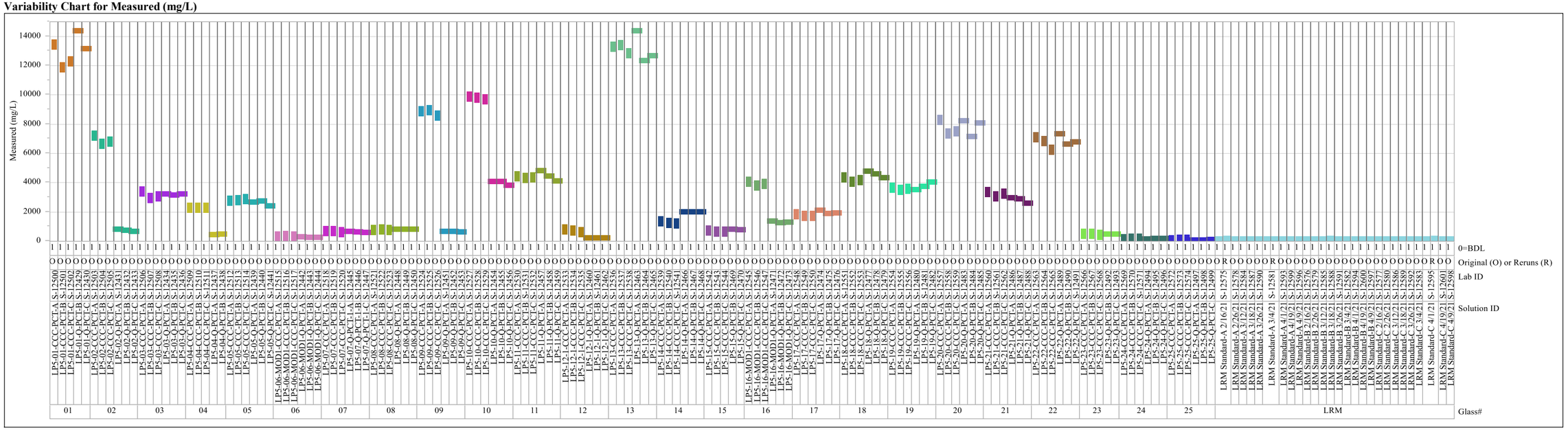


Exhibit B-1. PCT Measurements by Glass ID (continued)

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



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

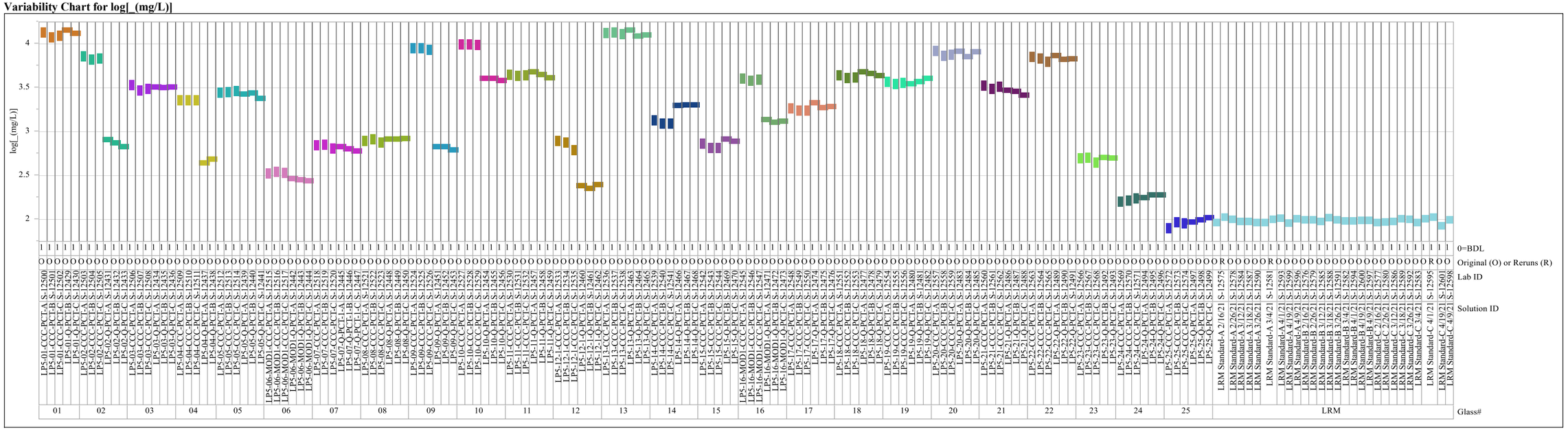
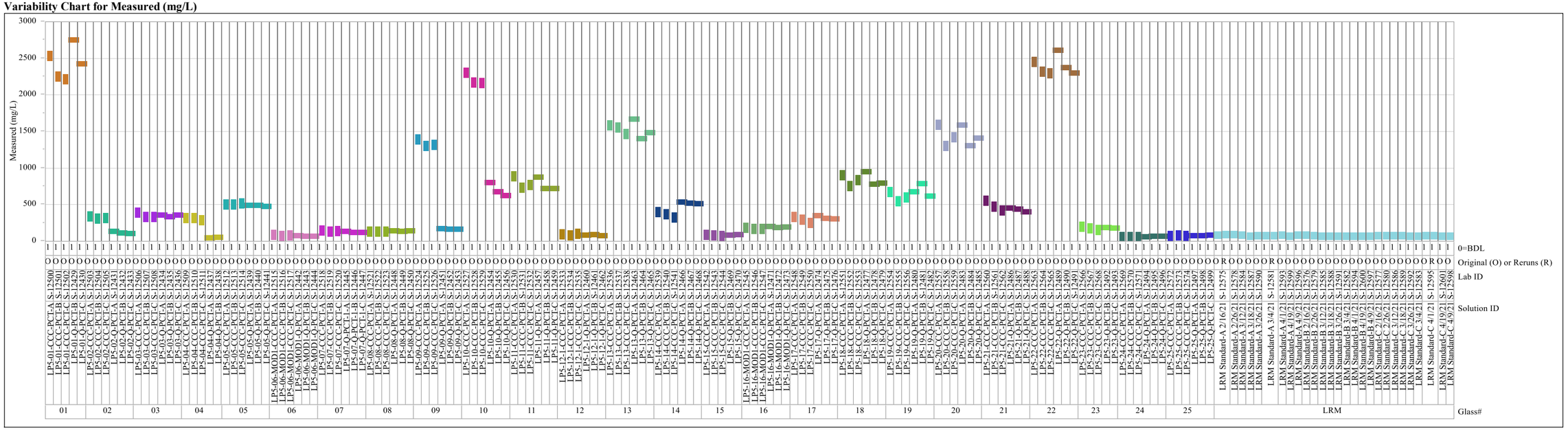
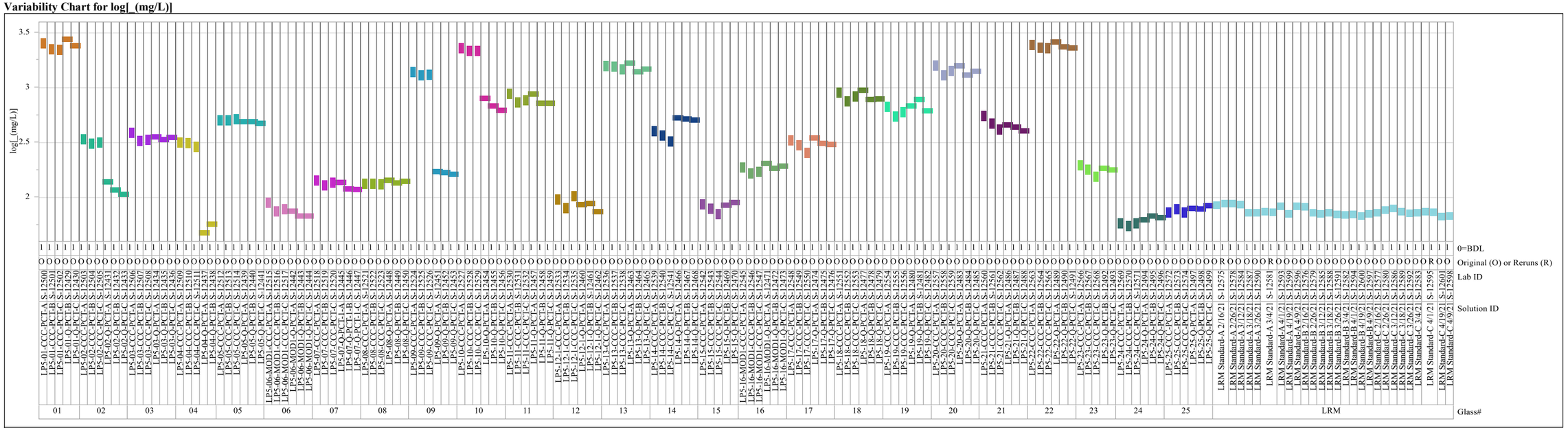


Exhibit B-1. PCT Measurements by Glass ID (continued)

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



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



Appendix C. Normalized PCT Results

Table C-1. Normalized PCT Results for Selected Elements

Glass ID	Comp. View	NC_{Al} (g/L)	NC_{B} (g/L)	NC_{Li} (g/L)	NC_{Na} (g/L)	NC_{Si} (g/L)
LP5-01-Q	Target	0.450	91.7	NA	70.5	16.5
LP5-01-Q	Measured	0.442	87.8	<5.01	72.7	16.0
LP5-01-CCC	Target	0.380	85.3	NA	64.2	14.8
LP5-01-CCC	Measured	0.373	81.7	<5.01	66.3	14.4
LP5-02-Q	Target	0.417	1.87	NA	3.87	0.743
LP5-02-Q	Measured	0.429	1.86	<5.01	4.01	0.732
LP5-02-CCC	Target	3.01	55.7	NA	35.8	1.99
LP5-02-CCC	Measured	3.09	55.3	<5.01	37.1	1.96
LP5-03-Q	Target	<0.194	21.1	NA	17.7	2.20
LP5-03-Q	Measured	<0.198	21.0	<5.01	17.5	2.19
LP5-03-CCC	Target	<0.194	20.3	NA	17.4	2.20
LP5-03-CCC	Measured	<0.198	20.2	<5.01	17.2	2.20
LP5-04-Q	Target	0.292	<0.234	NA	2.49	0.325
LP5-04-Q	Measured	0.302	<0.228	<5.01	2.53	0.314
LP5-04-CCC	Target	3.94	6.22	NA	12.3	1.91
LP5-04-CCC	Measured	4.07	6.07	<5.01	12.5	1.85
LP5-05-Q	Target	0.276	17.9	NA	14.8	3.02
LP5-05-Q	Measured	0.282	17.9	<5.01	15.2	3.00
LP5-05-CCC	Target	0.289	19.3	NA	16.1	3.16
LP5-05-CCC	Measured	0.295	19.3	<5.01	16.6	3.14
LP5-06-MOD1-Q	Target	0.432	1.72	NA	1.74	0.445
LP5-06-MOD1-Q	Measured	0.435	1.64	<4.29	1.73	0.422
LP5-06-MOD1-CCC	Target	0.291	2.22	NA	2.09	0.512
LP5-06-MOD1-CCC	Measured	0.293	2.12	<4.29	2.07	0.486
LP5-07-Q	Target	0.599	3.90	NA	3.26	0.703
LP5-07-Q	Measured	0.627	3.91	<5.01	3.44	0.694
LP5-07-CCC	Target	0.558	4.90	NA	3.47	0.763
LP5-07-CCC	Measured	0.583	4.91	<5.01	3.67	0.753
LP5-08-Q	Target	0.848	4.66	NA	4.16	0.871
LP5-08-Q	Measured	0.842	4.49	<5.01	4.13	0.844
LP5-08-CCC	Target	0.777	4.31	NA	3.95	0.824
LP5-08-CCC	Measured	0.772	4.15	<5.01	3.92	0.798
LP5-09-Q	Target	0.870	2.01	NA	3.35	1.05
LP5-09-Q	Measured	0.897	2.01	<5.01	3.44	1.03
LP5-09-CCC	Target	0.449	78.8	NA	44.8	8.33
LP5-09-CCC	Measured	0.463	78.5	<5.01	46.1	8.17
LP5-10-Q	Target	0.375	27.1	NA	20.0	4.14
LP5-10-Q	Measured	0.374	26.5	<5.01	20.4	4.11
LP5-10-CCC	Target	0.452	93.9	NA	49.1	13.1
LP5-10-CCC	Measured	0.451	91.8	<5.01	50.0	13.0
LP5-11-Q	Target	<0.178	30.3	NA	22.7	4.53
LP5-11-Q	Measured	<0.181	30.3	<5.01	23.3	4.47
LP5-11-CCC	Target	<0.175	30.9	NA	22.3	4.68
LP5-11-CCC	Measured	<0.178	30.9	<5.01	22.9	4.62
LP5-12-1-Q	Target	0.382	1.17	NA	1.41	0.521
LP5-12-1-Q	Measured	0.387	1.20	<5.01	1.40	0.504
LP5-12-1-CCC	Target	1.11	8.03	NA	4.22	0.582
LP5-12-1-CCC	Measured	1.12	8.25	<5.01	4.18	0.564

Table C-1. Normalized PCT Results for Selected Elements (continued)

Glass ID	Comp. View	NC_{Al} (g/L)	NC_{B} (g/L)	NC_{Li} (g/L)	NC_{Na} (g/L)	NC_{Si} (g/L)
LP5-13-Q	Target	<0.210	87.6	NA	66.7	9.51
LP5-13-Q	Measured	<0.208	86.2	<5.01	68.0	9.48
LP5-13-CCC	Target	<0.210	92.0	NA	67.0	9.62
LP5-13-CCC	Measured	<0.208	90.5	<5.01	68.3	9.60
LP5-14-Q	Target	<0.209	16.2	NA	11.5	2.89
LP5-14-Q	Measured	<0.212	16.3	<5.01	11.6	2.87
LP5-14-CCC	Target	<0.209	9.10	NA	7.23	2.01
LP5-14-CCC	Measured	<0.212	9.19	<5.01	7.32	2.00
LP5-15-Q	Target	0.593	5.65	NA	4.16	0.555
LP5-15-Q	Measured	0.611	5.39	<5.01	4.29	0.523
LP5-15-CCC	Target	0.535	4.46	NA	3.52	0.500
LP5-15-CCC	Measured	0.551	4.26	<5.01	3.63	0.470
LP5-16-MOD1-Q	Target	0.552	7.83	NA	7.08	1.24
LP5-16-MOD1-Q	Measured	0.541	7.61	<5.01	7.40	1.20
LP5-16-MOD1-CCC	Target	2.46	37.9	NA	21.0	1.12
LP5-16-MOD1-CCC	Measured	2.41	36.8	<5.01	21.9	1.08
LP5-17-Q	Target	<0.265	15.4	NA	12.2	2.04
LP5-17-Q	Measured	<0.266	15.4	<5.01	12.8	1.97
LP5-17-CCC	Target	<0.265	12.9	NA	10.9	1.85
LP5-17-CCC	Measured	<0.266	12.9	<5.01	11.5	1.79
LP5-18-Q	Target	<0.164	33.3	NA	25.2	4.59
LP5-18-Q	Measured	<0.165	32.7	<5.01	25.8	4.54
LP5-18-CCC	Target	<0.164	31.8	NA	23.1	4.54
LP5-18-CCC	Measured	<0.165	31.3	<5.01	23.7	4.49
LP5-19-Q	Target	0.423	26.3	NA	22.8	4.28
LP5-19-Q	Measured	0.430	26.2	<5.01	22.9	4.20
LP5-19-CCC	Target	0.412	25.2	NA	21.7	3.73
LP5-19-CCC	Measured	0.419	25.0	<5.01	21.8	3.66
LP5-20-Q	Target	<0.243	55.7	NA	41.3	7.90
LP5-20-Q	Measured	<0.233	52.9	<5.01	42.3	7.70
LP5-20-CCC	Target	<0.243	57.8	NA	40.7	7.90
LP5-20-CCC	Measured	<0.233	54.9	<5.01	41.7	7.71
LP5-21-Q	Target	<0.161	20.9	NA	17.2	2.65
LP5-21-Q	Measured	<0.160	20.3	<5.01	17.5	2.60
LP5-21-CCC	Target	<0.161	23.1	NA	19.7	2.92
LP5-21-CCC	Measured	<0.160	22.4	<5.01	19.9	2.87
LP5-22-Q	Target	<0.255	50.3	NA	37.8	10.8
LP5-22-Q	Measured	<0.258	49.9	<5.01	38.1	10.6
LP5-22-CCC	Target	<0.255	47.8	NA	36.7	10.5
LP5-22-CCC	Measured	<0.258	47.5	<5.01	37.0	10.3
LP5-23-Q	Target	0.385	1.08	NA	2.87	0.794
LP5-23-Q	Measured	0.399	1.07	<5.01	2.84	0.793
LP5-23-CCC	Target	0.372	1.02	NA	2.73	0.768
LP5-23-CCC	Measured	0.385	1.01	<5.01	2.69	0.767
LP5-24-Q	Target	0.224	1.01	NA	1.09	0.360
LP5-24-Q	Measured	0.231	1.01	<5.01	1.12	0.356
LP5-24-CCC	Target	0.236	0.845	NA	0.968	0.314
LP5-24-CCC	Measured	0.243	0.842	<5.01	0.994	0.310

Table C-1. Normalized PCT Results for Selected Elements (continued)

Glass ID	Comp. View	NC_{Al} (g/L)	NC_{B} (g/L)	NC_{Li} (g/L)	NC_{Na} (g/L)	NC_{Si} (g/L)
LP5-25-Q	Target	<0.156	0.747	0.530	0.930	0.372
LP5-25-Q	Measured	<0.155	0.722	0.645	0.930	0.362
LP5-25-CCC	Target	<0.156	0.607	0.506	0.819	0.343
LP5-25-CCC	Measured	<0.155	0.587	0.615	0.819	0.334
LRM Standard 2/16/21	Reference	0.188	0.394	<9.79	0.669	0.319
LRM Standard 2/26/21	Reference	0.233	0.441	<9.79	0.656	0.311
LRM Standard 3/4/21	Reference	0.240	0.487	<9.79	0.649	0.283
LRM Standard 3/12/21	Reference	0.246	0.449	<9.79	0.639	0.311
LRM Standard 3/18/21	Reference	0.276	0.428	<9.79	0.678	0.288
LRM Standard 3/26/21	Reference	0.262	0.393	<9.79	0.652	0.283
LRM Standard 4/1/21	Reference	0.270	0.605	<9.79	0.688	0.299
LRM Standard 4/9/21	Reference	0.271	0.490	<9.79	0.671	0.292
LRM Standard 4/19/21	Reference	0.257	0.396	<9.79	0.612	0.270

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

Variability Chart for NC_{Al} (g/L)

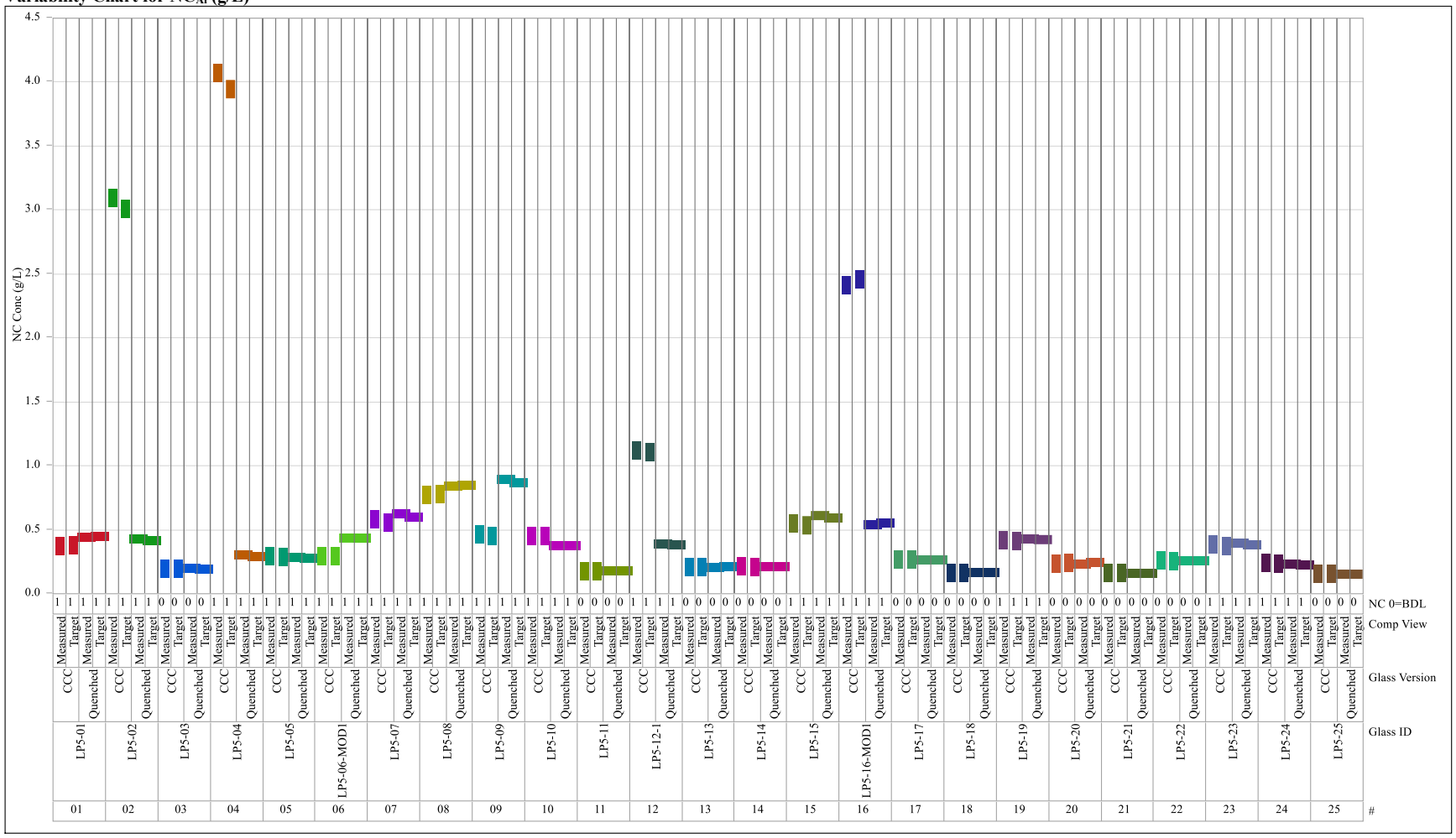


Exhibit C-1. Normalized PCT Results by Glass Version by Compositional View for Each Glass (continued)

Variability Chart for NC_B (g/L)

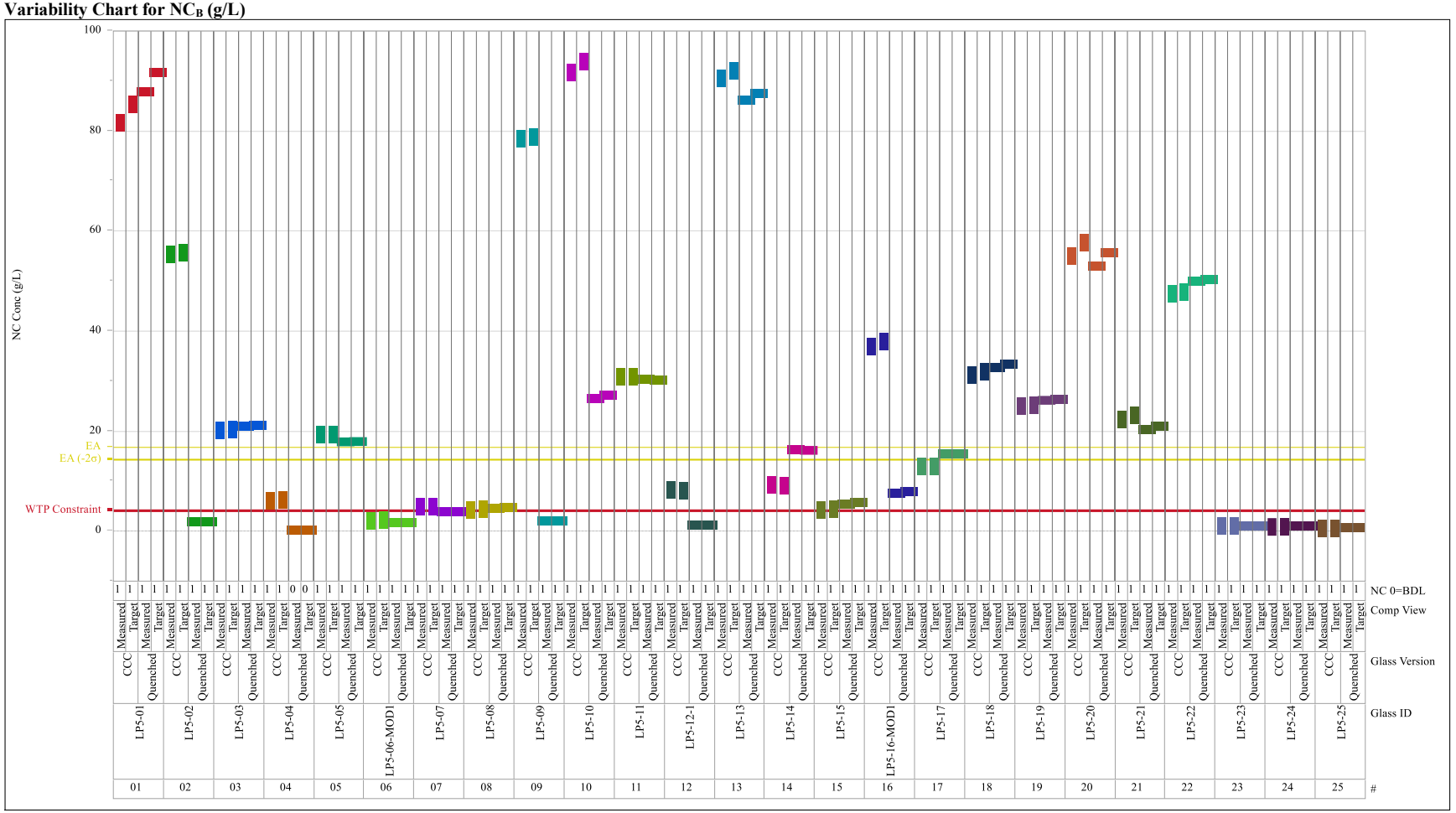


Exhibit C-1. Normalized PCT Results by Glass Version by Compositional View for Each Glass (continued)

Variability Chart for NC_{Li} (g/L)

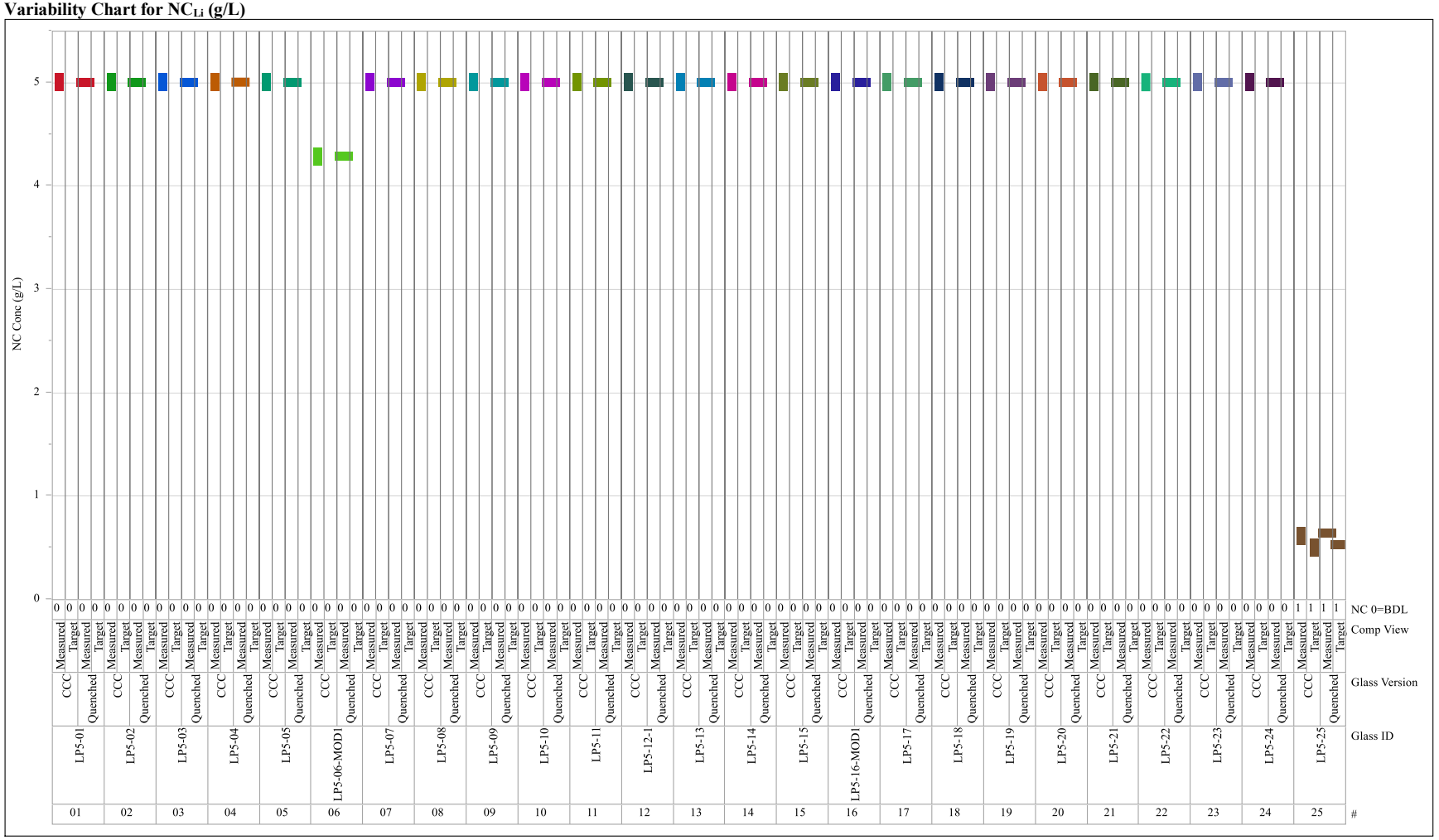


Exhibit C-1. Normalized PCT Results by Glass Version by Compositional View for Each Glass (continued)

Variability Chart for NC_{Na} (g/L)

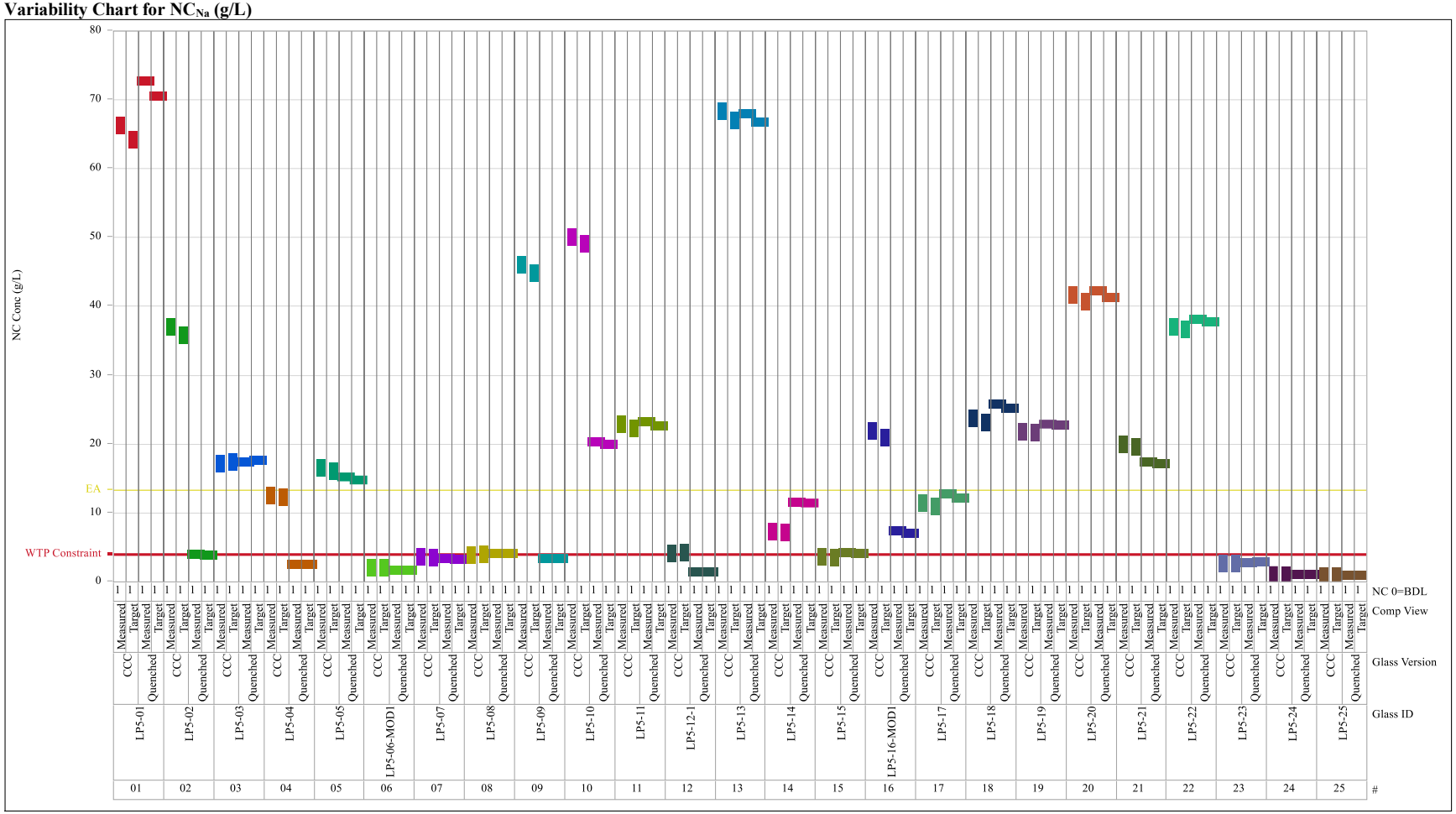


Exhibit C-1. Normalized PCT Results by Glass Version by Compositional View for Each Glass (continued)

Variability Chart for NC_{Si} (g/L)

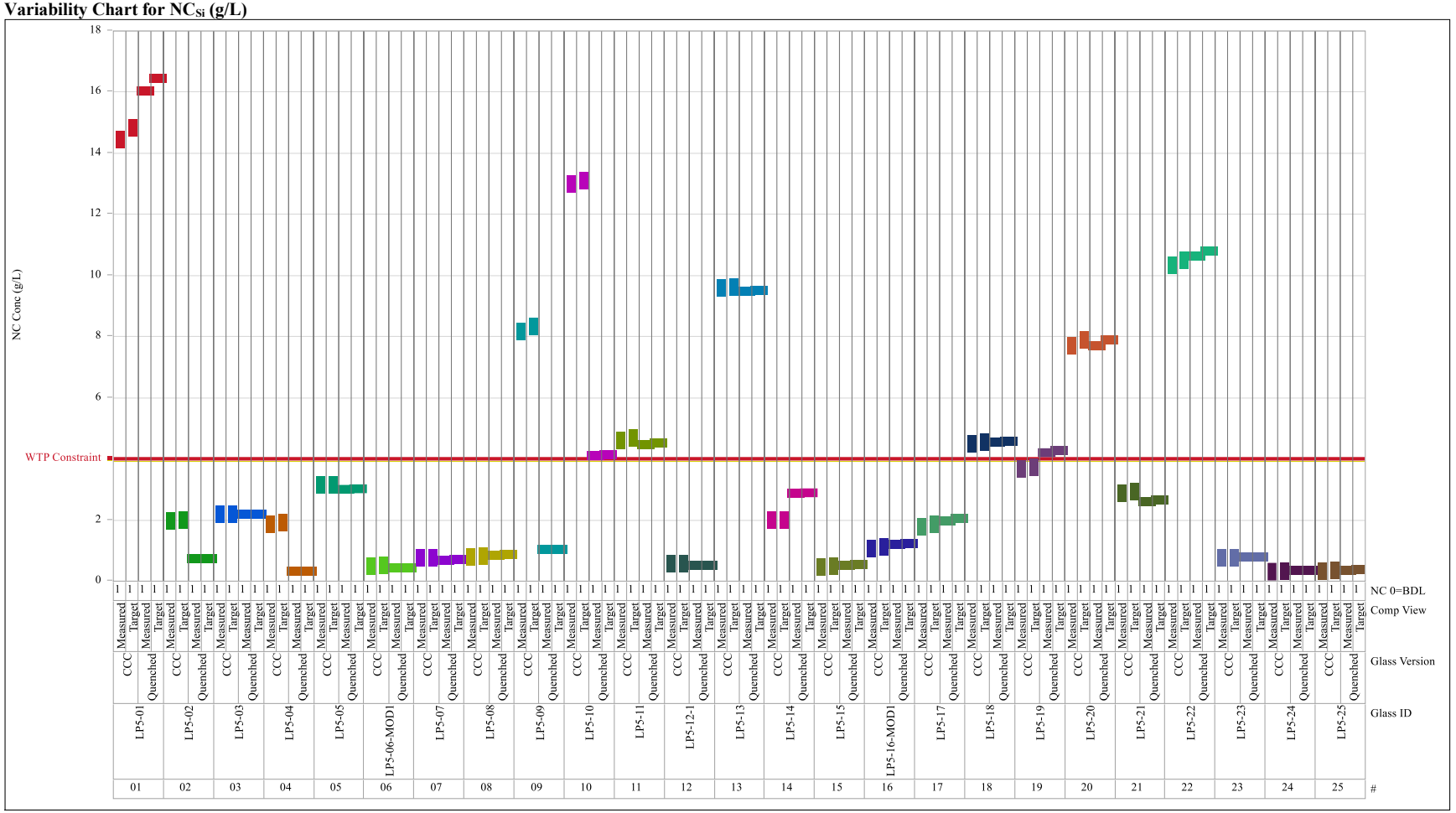
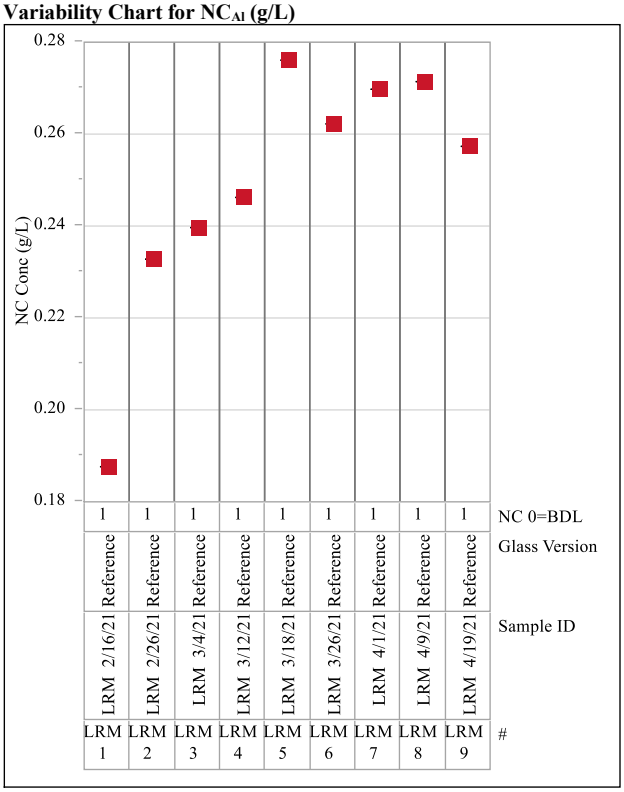


Exhibit C-2. Normalized PCT Results by Sample ID for the LRM Samples

Variability Chart for NC_{Al} (g/L)



Variability Chart for NC_{B} (g/L)

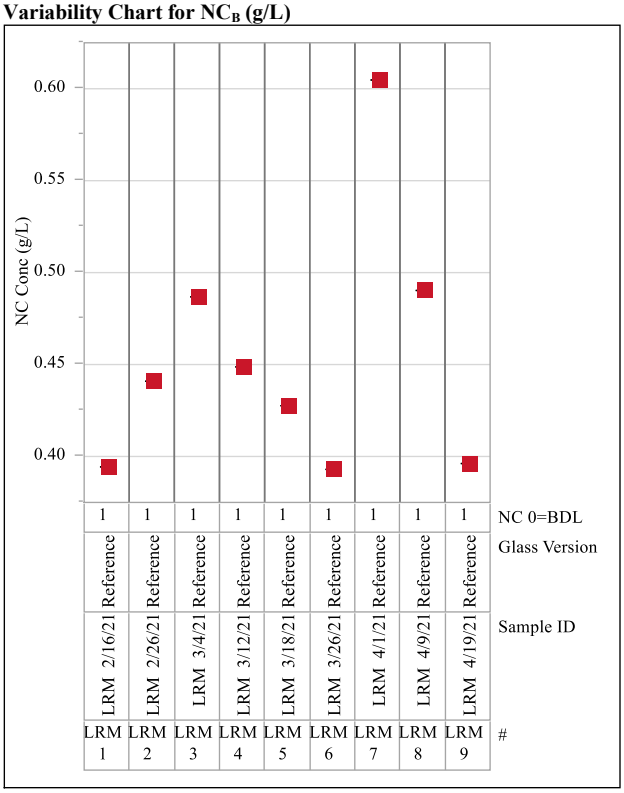
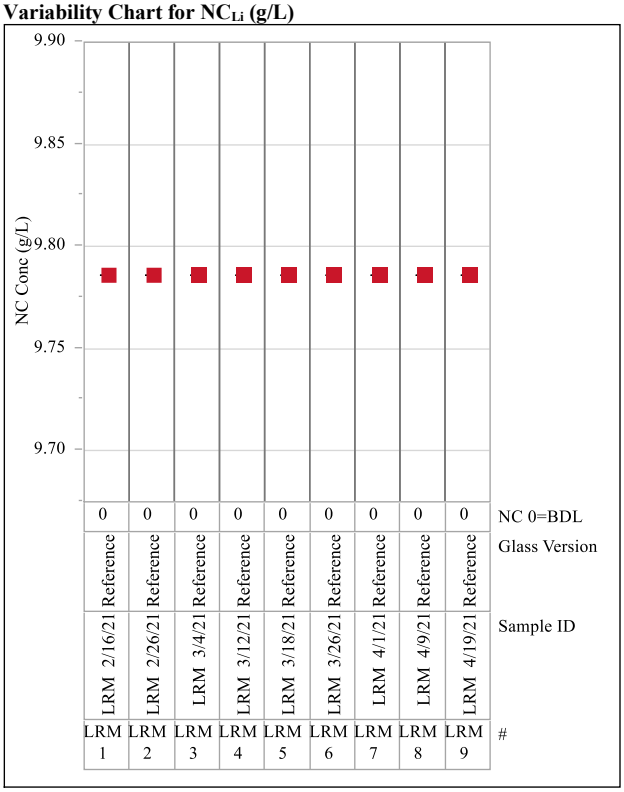


Exhibit C-2. Normalized PCT Results by Sample ID for the LRM Samples (continued)

Variability Chart for NC_{Li} (g/L)



Variability Chart for NC_{Na} (g/L)

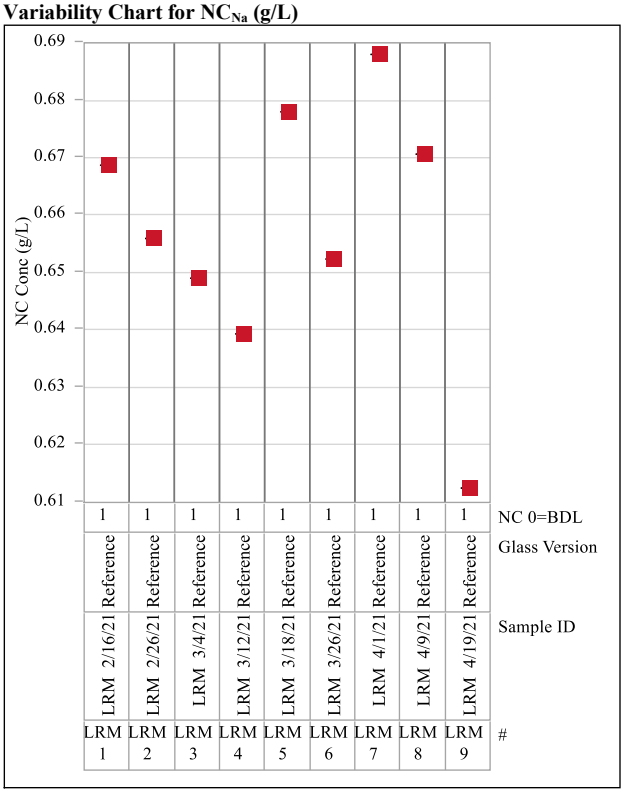


Exhibit C-2. Normalized PCT Results by Sample ID for the LRM Samples (continued)

Variability Chart for NC_{Si} (g/L)

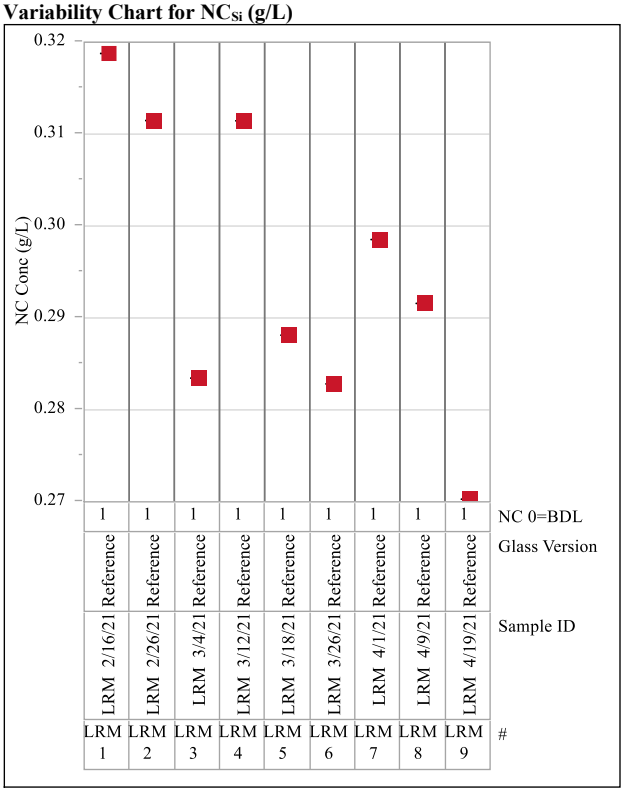


Exhibit C-3. Congruent Leaching Analysis for the Normalized PCT Results

Multivariate Correlations

Glass Version=CCC

	log NC[Al (g/L)]	log NC[B (g/L)]	log NC[Na (g/L)]	log NC[Si (g/L)]
log NC[Al (g/L)]	1.0000	0.0535	0.0588	-0.1881
log NC[B (g/L)]	0.0535	1.0000	0.9765	0.8901
log NC[Na (g/L)]	0.0588	0.9765	1.0000	0.9299
log NC[Si (g/L)]	-0.1881	0.8901	0.9299	1.0000

The correlations are estimated by Row-wise method.

Scatterplot Matrix

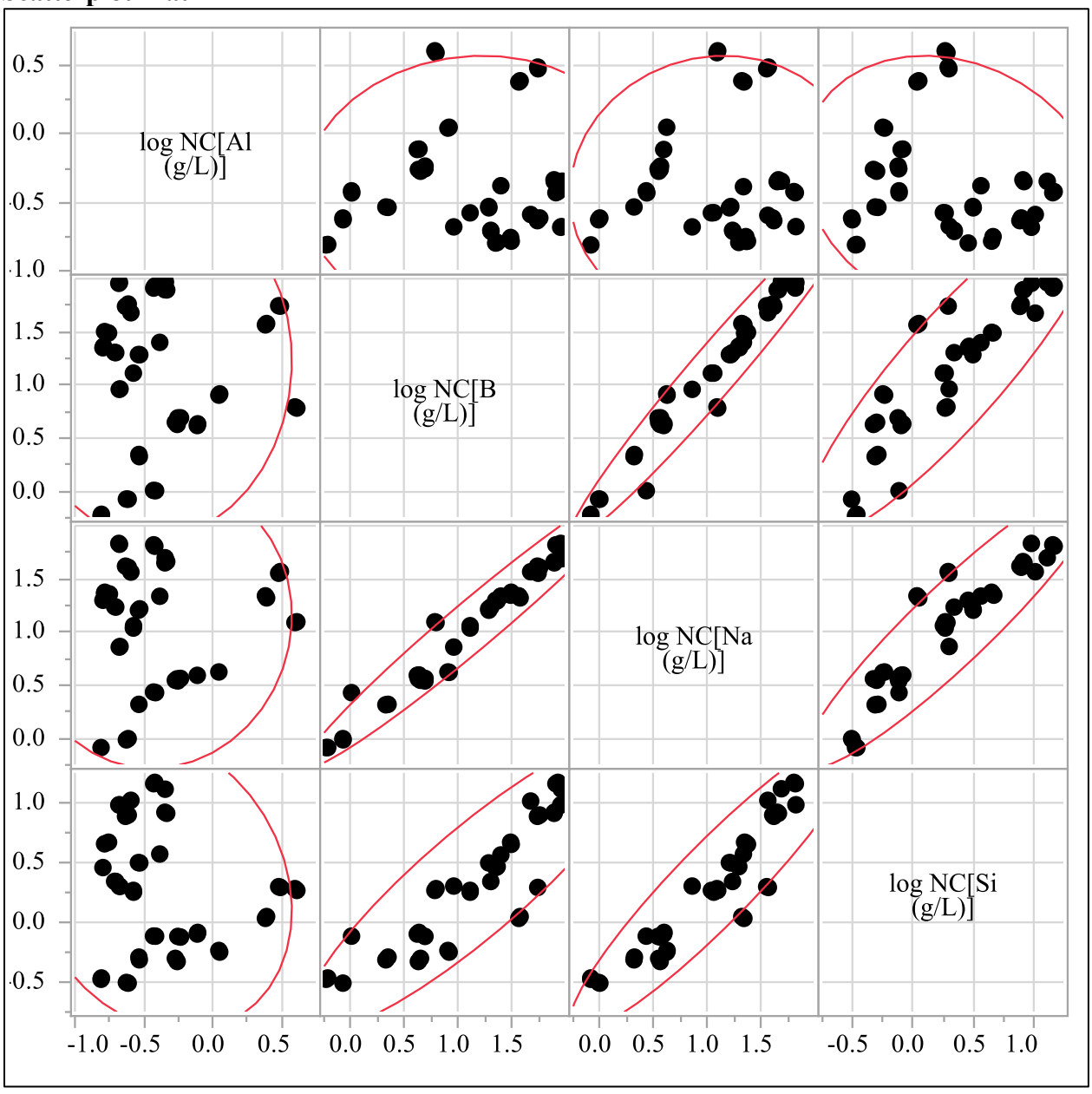


Exhibit C-3. Congruent Leaching Analysis for the Normalized PCT Results (continued)

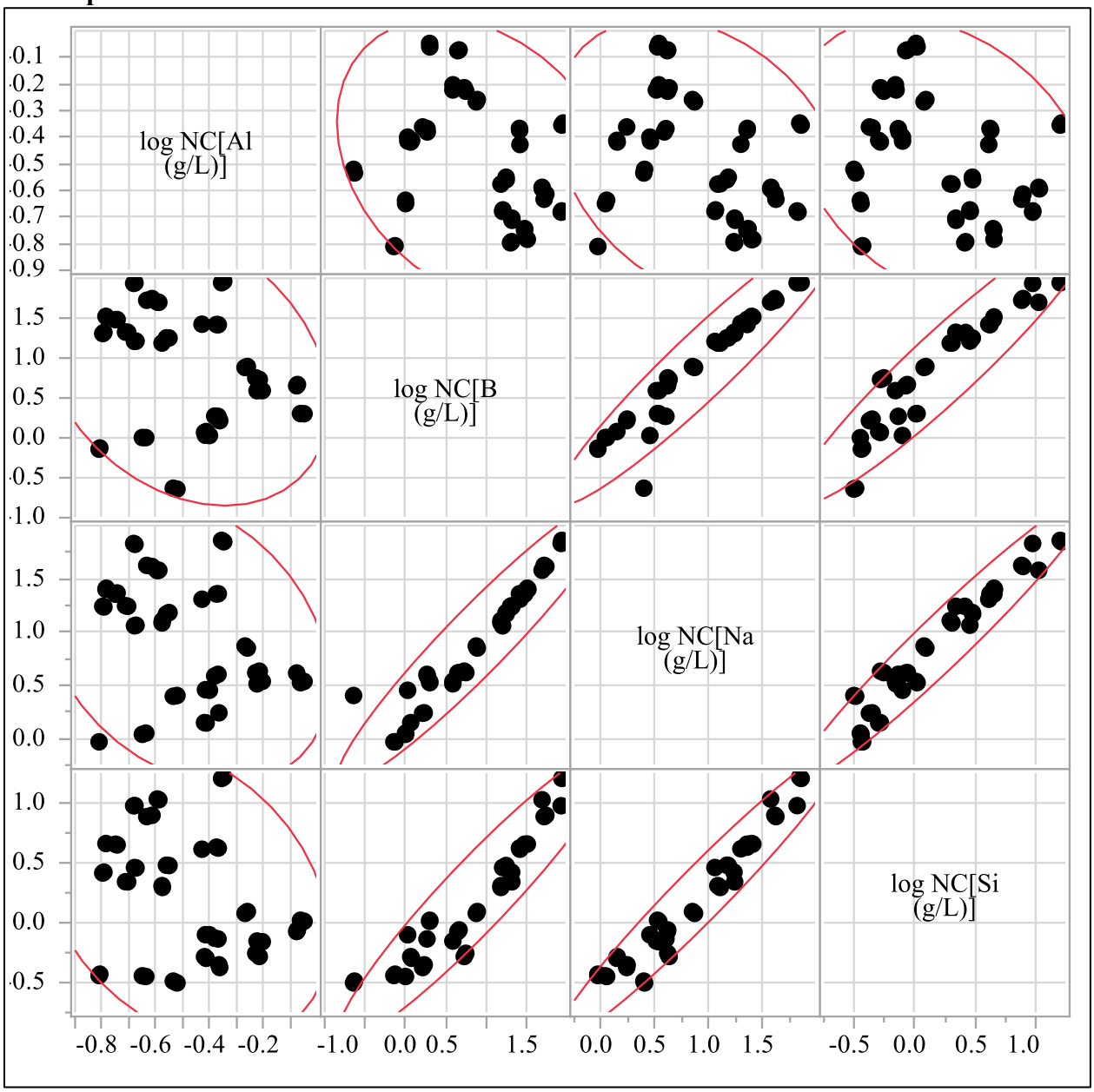
Multivariate Correlations

Glass Version=Quenched

	log NC[Al (g/L)]	log NC[B (g/L)]	log NC[Na (g/L)]	log NC[Si (g/L)]
log NC[Al (g/L)]	1.0000	-0.2766	-0.2922	-0.3004
log NC[B (g/L)]	-0.2766	1.0000	0.9510	0.9461
log NC[Na (g/L)]	-0.2922	0.9510	1.0000	0.9699
log NC[Si (g/L)]	-0.3004	0.9461	0.9699	1.0000

The correlations are estimated by Row-wise method.

Scatterplot Matrix



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