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July 26, 1984

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High Level Waste Licensing Management Branch
Division of Waste Management
Mail Stop 965 SS
U. S. Nuclear Regulatory Commission
Washington, DC 20555

WM Record File

A311

WM Project

Docket No.

PDR

LPDR

Distribution:

EWick

(Return to WM, 523-39)

Dear Mr. Wick:

Comparison of SRL Glass Leaching Data to Recent MCC Long-Term Results

At your request, a comparison has been made of glass leaching data from SRL and recent information reported by PNL on SRL-131 glass.¹ All tests were carried out on "composite" borosilicate glass devised by SRL to simulate a composition that is an "intermediate" between the Stage 1 and Stage 2 waste form compositions to be produced at the Defense Waste Processing Facility.

In order to compare data from the two studies, SRL results on composite glass, given in reference 2, have been used. Data from this report are, however, not comprehensive, and are for tests lasting up to 28 days. Therefore, only short-term-test data from the MCC tests were used to serve as a basis for comparison. The test conditions common to both sets of data include the following:

Test temperature	90°C
Test solutions	Deionized water (DIW), MCC brine, MCC silicate water
Test times	7d, 28d
Glass surface area to solution volume ratio (SA/V)	0.1 cm ⁻¹
Elements leached	Si, B, Na, Cs, U.

1. "MCC-D2 One-Year Leach Test Data for SRL-131 Glass," Materials Characterization Center, May 1, 1984.
2. M. J. Plodinec and others, "An Assessment of Savannah River Borosilicate Glass in the Repository Environment," DP-1629, 1982.

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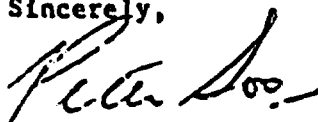
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Tables 1 and 2 summarize the SRL and MCC data, respectively. The reproducibility of the MCC data is excellent. This is to be expected since they were obtained under carefully controlled conditions for one series of tests. The SRL results were probably obtained over a period of time in separate experiments.

Table 3 shows a comparison of leaching results for Si, B, Na, Cs and U. Usually, there is good agreement between the two data bases for DIW and MCC silicate water. For brine, however, the leach rates obtained by SRL are much higher. Also, the U release rates are several times higher in the SRL studies for all three test solutions. Reasons for these discrepancies are not clear at this time.

In summary, the MCC and SRL leaching data for tests lasting up to 28 days are basically in agreement. Exceptions are found for the SRL brine leachant studies and for U releases in all solutions in which cases the MCC leach rates are much lower.

Sincerely,



Peter Soo, Associate Division Head
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PS:gfs

Enclosure

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Table 1. Summary of composite SRL glass leaching data from Report Number DP-1029.

Temp. (°C)	Test Time (d)	Solution	SA/V (cm ⁻¹)	Leachability (g/m ² -d)					DP-1629 Table Number
				Si	B	Na	Cs	U	
90	28	DIW	0.1	0.61	0.86	0.94			15
90	7	DIW	0.1	1.52					23
90	7	MCC Brine	0.1	0.34					23
90	7	MCC Silicate	0.1	0.75					23
90	28	DIW	?	0.55	0.79		1.39		24
90	28	MCC Brine	?	0.21	0.31		0.24		24
90	28	MCC Silicate	?	0.21	0.38		0.83		24
90	28	DIW	0.1	0.96			0.58	0.13	25
90	28	MCC Brine	0.1	0.32			0.35	<0.019	25
90	28	MCC Silicate	0.1	0.56			0.49	0.44	25

Table 2. Summary of composite SRL glass leaching data from MCC-D2 tests.

Temp. (°C)	Test Time (d)	Solution	SA/V (cm ⁻¹)	Leachability (g/m ² -d)					MCC-D2 Table Number
				Si	B	Na	Cs	U	
90	7	DIW	0.1	2.30	2.89	2.73	3.43	0.15	4.1
90	28	DIW	0.1	0.88	1.19	1.10	1.29	0.03	4.1
90	28	DIW	0.1	0.87	1.17	1.09	1.27	0.06	4.1
90	28	DIW	0.1	0.81	1.11	1.03	1.21	0.06	4.1
90	28	MCC Brine	0.1	0.05	0.03	=0	=0	0.003	4.7
90	28	MCC Brine	0.1	0.06	0.01	=0	=0	0.004	4.7
90	28	MCC Brine	0.1	0.05	0.03	=0	=0	0.002	4.7
90	28	MCC Silicate	0.1	0.44	0.70	0.84	0.75	0.17	4.4
90	28	MCC Silicate	0.1	0.44	0.70	0.88	0.74	0.19	4.4
90	28	MCC Silicate	0.1	0.45	0.74	0.87	0.77	0.15	4.4

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Table 3. Comparison of MCC-D2 and SRL leaching data for composite glass for 7- and 28-day tests.

Temp. (°C)	Test Time (d)	Solution	SA/V (cm ⁻¹)	Element	Leachability Range (g/m ² -d)	
					SRL	MCC-D2
90	7	DIW	0.1	Si	1.52	2.30
90	28	DIW	0.1	Si	0.55-0.96	0.81-0.88
90	28	DIW	0.1	B	0.79-0.86	1.11-1.19
90	28	DIW	0.1	Na	0.94	1.03-1.10
90	28	DIW	0.1	Ca	0.58-1.39	≈0
90	28	DIW	0.1	U	0.13	0.03-0.06
90	28	MCC Brine	0.1	Si	0.21-0.32	0.05-0.06
90	28	MCC Brine	0.1	B	0.31	0.01-0.03
90	28	MCC Brine	0.1	Ca	0.24-0.35	≈0
90	28	MCC Brine	0.1	U	<0.019	0.002-0.004
90	28	MCC Silicate	0.1	Si	0.21-0.56	0.44-0.45
90	28	MCC Silicate	0.1	B	0.38	0.70-0.74
90	28	MCC Silicate	0.1	Ca	0.49-0.83	0.74-0.77
90	28	MCC Silicate	0.1	U	0.44	0.15-0.19