SUMMARY OF DATA FOR ONSITE AND LABORATORY ANALYSES OF PRECIPITATION RUNOFF FROM CARBONATE-ROCK SURFACES, NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM, JUNE 1984 TO SEPTEMBER 1986

By Randolph B. See and Michael M. Reddy

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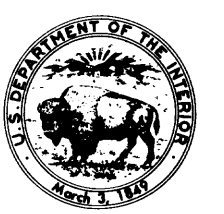

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DEPARTMENT OF THE INTERIOR

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CONVERSION FACTORS

The International System of Units (SI) (metric) units used in this report may be converted to inch-pound units by using the following conversion factors:

Multiply SI (metric) units	*By*	*To obtain inch-pound units*
liter (L)	1.057	quart
milliliters (mL)	0.03382	ounce, fluid
millimeter (mm)	0.03937	inch
Calcium, milliequivalent per liter (meq/L)	20.0401	part per million Ca^{2+}
Chloride, milliequivalent per liter (meq/L)	35.4484	part per million Cl^{-}
Potassium, milliequivalent per liter (meq/L)	39.0930	part per million K^{+}
Magnesium, milliequivalent per liter (meq/L)	12.1521	part per million Mg^{2+}
Sodium, milliequivalent per liter (meq/L)	22.9885	part per million Na^{+}
Ammonium, milliequivalent per liter (meq/L)	18.0375	part per million NH_4^{+}
Nitrate, milliequivalent per liter (meq/L)	61.9963	part per million NO_3^{-}
Sulfate, milliequivalent per liter (meq/L)	48.0307	part per million SO_4^{2-}

The following term and abbreviation also is used in this report:

microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C).

SUMMARY OF DATA FOR ONSITE AND LABORATORY ANALYSES OF PRECIPITATION RUNOFF FROM CARBONATE-ROCK SURFACES, NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM, JUNE 1984 TO SEPTEMBER 1986

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ABSTRACT

This report presents a summary of data collected from June 1984 to September 1986 as part of an experimental research program conducted in conjunction with the National Acid Precipitation Assessment Program that is designed to quantify the interaction of acid precipitation with a carbonate-rock surface. Precipitation-runoff samples were collected from polypropolene receptacles (blank samples), glass plates, and flat surfaces of two types of carbonate rocks--Salem limestone (from Indiana) and Shelburne marble (from Vermont). The summary is based on onsite and laboratory measurements for 1,078 samples that are available in a computer-data file. The data file consists of precipitation samples collected at four sites, which are representative of 247 storms, distilled-water reference samples, and standard-water reference samples.

INTRODUCTION

The National Acid Precipitation Assessment Program, Task Group G--Effects on Materials and Cultural resources--was organized, in part, as a 10-year program to measure and document acid-precipitation effects on two types of stone: Salem limestone (from Indiana) and Shelburne marble (from Vermont). Four field-research locations were established in the eastern United States at Newcomb, New York; Chester, New Jersey; Washington, D.C.; and Research Triangle Park, North Carolina. Precipitation-runoff samples from polypropolene receptacles, glass plates, and stone surfaces were analyzed. Details of the onsite and laboratory procedures are given elsewhere (Reddy and others, 1985; Reddy and Werner, 1985; Sherwood, 1984). Sample preparation, analytical procedures, and laboratory quality-control protocols applied in the U.S. Geological Survey laboratory are described by Fishman and Friedman (1985).

This work has been conducted as part of the National Acid Precipitation Assessment Program and was funded in part by the National Park Service. Results and conclusions presented in this publication do not necessarily reflect the views of the National Acid Precipitation Assessment Program or the National Park Service.

DATA FILE

Precipitation-runoff analysis data are available for samples collected and analyzed from June 1984 to September 1986. Five types of samples were collected from 247 storms during this period. To evaluate onsite-sampling variability, replicate samples were collected from adjacent stones of the same type. Duplicate samples were submitted to the laboratory to identify variability caused by sample processing and handling. Additional distilled-water reference samples and standard-water reference samples (SRWS) were submitted to the laboratory with the onsite samples. The reference samples were processed exactly as the onsite samples. During the indicated period, 1,078 samples were processed; results are available in the data file described in this report.

The data set consists of 25 variables. Variable names and codes established for source of samples and sample types are described in table 1. Variable names and codes established for sample collection and precipitation type are listed in table 2. Variable names for parameters measured onsite and in the laboratory are identified in table 3.

All data were entered twice to eliminate keypunching errors. The two files were compared and discrepancies were rectified. An additional check on the quality of the data was provided by an examination of summary statistics for the data, sorted by sample type. Samples with exceptionally large or small values were examined to determine if the values were true or erroneous. The summary statistics for each sample type are given in tables 4 through 11.

Table 1.--*Variable names and codes established for source of samples and sample types*

Variable name	Code	Definition
Source of samples	DC	Washington, D.C.
	LB	Reference samples from U.S. Geological Survey laboratory, Denver, Colorado.
	NJ	Chester, New Jersey.
	NC	Research Triangle Park, North Carolina.
	NY	Newcomb, New York.
Sample type	B	Blank (empty receptacle) rack.
	G	Glass.
	L	Limestone.
	M	Marble.
	D	Distilled-water reference sample.
	M-82	M-82 standard-reference water sample.
	P	Recording precipitation monitor.

Table 2.--*Variable names and codes established for sample collection and precipitation type*

Variable name	Code	Definition
Year	Two-digit code	Year of collection.
Event	Two-digit code	Sample-collection sequence.
Side	L	Sample collected from the left stone.
	R	Sample collected from the right stone.
Duplicate	1	Original sample.
	2	Split of original sample.
Julian day on	1-365	Date sample collector installed.
Julian day off	1-365	Date sample collector removed.
Flag	Y	Collector bottle overflowed.
	N	Collector bottle did not overflow.
	F	Known problems with sample collection.
Precipitation type	RN	Rain.
	SN	Snow.
	SL	Sleet.
	SR	Snow and rain mixed.

Table 3.--*Variable names established for onsite- and laboratory-measured parameters*

Variable Name	Units
Volume (onsite)	Sample volume (milliliters).
Precipitation (onsite)	Depth (millimeters).
pH (onsite)	Standard units.
pH (laboratory)	Standard units.
Specific conductance (onsite)	Microsiemens per centimeter.
Specific conductance (laboratory)	Microsiemens per centimeter.
Alkalinity (laboratory)	Milliequivalents per liter.
Calcium ion (laboratory)	Milliequivalents per liter.
Magnesium ion (laboratory)	Milliequivalents per liter.
Sodium ion (laboratory)	Milliequivalents per liter.
Potassium ion (laboratory)	Milliequivalents per liter.
Chloride ion (laboratory)	Milliequivalents per liter.
Sulfate ion (laboratory)	Milliequivalents per liter.
Nitrate ion (laboratory)	Milliequivalents per liter.
Ammonium ion (laboratory)	Milliequivalents per liter.

Table 4.--*Summary statistics for blank samples*

[mL, milliliters; mm, millimeters; µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; --, indicates results were less than detection limits for the selected analytical procedures; missing, data unavailable; less than detection, number of samples having results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Minimum	Maximum	Missing	Less than detection	Detected
Volume (mL)	1339.	1257.	11.	4240.	5	0	205
Precipitation (mm)	16.0	17.0	0.4	127.0	42	0	168
pH (onsite, standard units)	4.61	0.78	3.39	7.14	82	0	128
Hydrogen ion (onsite, µeq/L)	60.14	73.40	0.07	407.38	82	0	128
pH (laboratory, standard units)	4.90	0.98	3.13	7.70	41	0	169
Hydrogen ion (laboratory, µeq/L)	44.94	69.37	0.02	741.31	41	0	169
Specific conductance (onsite, µS/cm)	39.3	36.7	1.8	244.1	81	0	129
Specific conductance (laboratory, µS/cm)	35.4	29.6	3.3	270.0	38	1	171
Alkalinity (meq/L)	0.028	0.063	0	0.520	23	0	187
Calcium ion (meq/L)	0.079	0.177	0.002	1.951	35	1	174
Magnesium ion (meq/L)	0.013	0.024	0.001	0.253	37	4	169
Sodium ion (meq/L)	0.028	0.049	--	0.327	37	17	156
Potassium ion (meq/L)	0.004	0.004	--	0.026	112	1	97
Chloride ion (meq/L)	0.022	0.046	--	0.352	104	4	102
Sulfate ion (meq/L)	0.098	0.105	0.005	1.155	41	0	169
Nitrate ion (meq/L)	0.050	0.061	0.004	0.656	39	1	170
Ammonium ion (meq/L)	0.018	0.014	0.001	0.044	198	0	12

Table 5.--*Summary statistics for glass samples*

[mL, milliliters; mm, millimeters; µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; --, indicates results were less than detection limits for the selected analytical procedures; missing, data unavailable; less than detection, number of samples having results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Minimum	Maximum	Missing	Less than detection	Detected
Volume (mL)	2924.	1892.	46.	10140.	9	0	117
Precipitation (mm)	19.0	17.0	1.3	108.0	25	0	101
pH (onsite, standard units)	4.31	0.48	3.46	5.66	29	0	97
Hydrogen ion (onsite, µeq/L)	75.019	60.879	2.188	346.74	29	0	97
pH (laboratory, standard units)	4.35	0.49	3.70	6.54	46	0	80
Hydrogen ion (laboratory, µeq/L)	64.569	45.396	0.2858	199.53	46	0	80
Specific conductance (onsite, µS/cm)	34.7	21.4	3.50	102.	28	0	98
Specific conductance (laboratory, µS/cm)	38.3	23.3	3.20	110.	44	0	82
Alkalinity (meq/L)	0.006	0.020	0.000	0.10	43	0	83
Calcium ion (meq/L)	0.023	0.039	0.003	0.20	64	0	62
Magnesium ion (meq/L)	0.007	0.016	0.000	0.09	64	0	62
Sodium ion (meq/L)	0.019	0.039	--	0.24	64	2	60
Potassium ion (meq/L)	0.008	0.008	0.001	0.03	110	0	16
Chloride ion (meq/L)	0.021	0.050	0.001	0.29	40	12	74
Sulfate ion (meq/L)	0.085	0.065	0.008	0.34	40	0	86
Nitrate ion (meq/L)	0.048	0.043	0.001	0.25	40	0	86
Ammonium ion (meq/L)	0.023	0.016	0.006	0.04	115	0	11

Table 6.--*Summary statistics for limestone samples*

[mL, milliliters; mm, millimeters; µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; --, indicates results were less than detection limits for the selected analytical procedures; missing, data unavailable; less than detection, number of samples having results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Minimum	Maximum	Missing	Less than detection	Detected
Volume (mL)	1706.	1772.	0.	9999.	12	0	282
Precipitation (mm)	16.9	17.4	0.3	127.0	66	0	228
pH (onsite, standard units)	7.45	0.62	5.37	9.15	116	0	178
Hydrogen ion (onsite, µeq/L)	0.138	0.469	0.001	0.055	116	0	178
pH (laboratory, standard units)	7.05	0.56	4.33	8.12	87	0	207
Hydrogen ion (laboratory, µeq/L)	0.402	3.272	0.0076	47.098	87	0	207
Specific conductance (onsite, µS/cm)	73.4	34.2	12.4	204.0	115	0	179
Specific conductance (laboratory, µS/cm)	85.9	52.8	12.5	506.0	87	0	207
Alkalinity (meq/L)	0.593	0.307	0.134	2.600	95	0	199
Calcium ion (meq/L)	0.759	0.465	--	4.169	101	1	192
Magnesium ion (meq/L)	0.039	0.051	0.004	0.418	104	0	190
Sodium ion (meq/L)	0.044	0.061	0.001	0.507	104	4	186
Potassium ior (meq/L)	0.010	0.021	0.001	0.191	209	0	85
Chloride ion (meq/L)	0.036	0.064	0.002	0.559	154	3	137
Sulfate ion (meq/L)	0.193	0.256	0.006	3.063	98	1	195
Nitrate ion (meq/L)	0.067	0.076	0.005	0.633	98	2	194
Ammonium ion (meq/L)	0.005	0.004	0.001	0.010	283	0	11

Table 7.--*Summary statistics for marble samples*

[mL, milliliters; mm, millimeters; µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; --, indicates results were less than detection limits for the selected analytical procedures; missing, data unavailable; less than detection, number of samples having results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Minimum	Maximum	Missing	Less than detection	Detected
Volume (mL)	2100.	1630.	26.	7560.	10	0	272
Precipitation (mm)	16.7	17.7	0.3	127.0	62	0	220
pH (onsite, standard units)	7.24	0.54	5.49	8.97	97	0	185
Hydrogen ion (onsite, µeq/L)	0.158	0.384	0.001	3.236	97	0	185
pH (laboratory, standard units)	7.04	0.49	5.32	8.0	67	1	214
Hydrogen ion (laboratory, µeq/L)	0.196	0.470	0.0100	4.819	67	1	214
Specific conductance (onsite, µS/cm)	67.8	41.5	24.1	295.0	92	0	190
Specific conductance (laboratory, µS/cm)	71.2	45.8	27.3	341.0	66	0	216
Alkalinity (meq/L)	0.481	0.224	0.012	1.480	73	0	209
Calcium ion (meq/L)	0.633	0.403	0.235	3.145	81	1	200
Magnesium ion (meq/L)	0.026	0.026	0.002	0.190	83	0	199
Sodium ion (meq/L)	0.028	0.047	--	0.437	87	12	183
Potassium ion (meq/L)	0.015	0.094	0.001	0.921	183	2	97
Chloride ion (meq/L)	0.023	0.034	0.002	0.215	143	6	133
Sulfate ion (meq/L)	0.155	0.172	0.014	1.708	67	1	214
Nitrate ion (meq/L)	0.060	0.058	0.002	0.557	67	4	211
Ammonium ion (meq/L)	0.007	0.005	0.000	0.016	270	0	12

Table 8. --*Summary statistics for distilled-water reference samples*

[µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; --, indicates results were less than detection limits for the selected analytical procedure; -, indicates analytical results are not available; missing, data unavailable; less than detection, number of samples having results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Mini-mum	Maxi-mum	Missing	Less than detec-tion	Detec-ted
pH (onsite, standard units)	6.02	0.51	5.58	6.76	21	0	6
Hydrogen ion (onsite, µeq/L)	1.471	1.097	0.174	2.630	21	0	6
pH (laboratory, standard units)	6.79	1.21	4.54	8.40	8	0	19
Hydrogen ion (laboratory, µeq/L)	2.418	6.425	0.004	28.249	8	0	19
Specific conductance (onsite, µS/cm)	4.8	6.9	0.9	17.0	22	0	5
Specific conductance (laboratory, µS/cm)	2.4	1.4	0.9	5.0	6	0	21
Alkalinity (meq/L)	0.049	0.035	0.000	0.110	11	0	16
Calcium ion (meq/L)	0.006	0.007	0.000	0.020	8	9	10
Magnesium ion (meq/L)	0.002	0.002	0.000	0.005	5	14	8
Sodium ion (meq/L)	0.014	0.011	0.002	0.034	5	13	9
Potassium ion (meq/L)	0.003	0.004	--	0.010	16	3	8
Chloride ion (meq/L)	0.005	0.001	0.004	0.007	12	10	5
Sulfate ion (meq/L)	0.007	0.004	0.001	0.011	3	18	6
Nitrate ion (meq/L)	0.005	0.004	0.002	0.008	3	22	2
Ammonium ion (meq/L)	-	-	-	-	27	0	0

Table 9.--*Summary statistics for M-82 standard-reference water samples (SRWS)*

[µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; -, indicates analytical results are not available; missing, data unavailable; less than detection, number of samples having results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Mini-mum	Maxi-mum	Missing	Less than detec-tion	Detec-ted
pH (onsite, standard units)	7.53	0.19	7.21	7.69	15	0	6
Hydrogen ion (onsite, µeq/L)	0.032	0.016	0.020	0.062	15	0	6
pH (laboratory, standard units)	7.40	0.51	6.28	8.00	9	0	12
Hydrogen ion (laboratory, µeq/L)	0.086	0.145	0.010	0.525	9	0	12
Specific conductance (onsite, µS/cm)	131.3	5.3	127.6	140.0	16	0	5
Specific conductance (laboratory, µS/cm)	139.4	5.1	133.5	148.0	6	0	15
Alkalinity (meq/L)	0.658	0.057	0.596	0.740	8	0	13
Calcium ion (meq/L)	0.727	0.020	0.699	0.765	8	0	13
Magnesium ion (meq/L)	0.289	0.009	0.278	0.313	5	0	16
Sodium ion (meq/L)	0.282	0.012	0.265	0.301	5	0	16
Potassium ion (meq/L)	0.052	0.003	0.049	0.056	15	0	6
Chloride ion (meq/L)	0.070	0.015	0.025	0.083	10	0	11
Sulfate ion (meq/L)	0.585	0.027	0.549	0.668	5	0	16
Nitrate ion (meq/L)	0.016	0.033	0.000	0.075	5	11	5
Ammonium ion (meq/L)	-	-	-	-	21	0	0

Table 10.--*Expected analytical results for standard-reference water sample (SRWS) M-82*

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter]

Constituent	Mean	Standard deviation	Total number of analyses
pH (standard units)	6.9	0.39	42
Specific conductance (µS/cm)	138.3	8.6	43
Alkalinity (meq/L as carbonate)	0.6614	0.0420	37
Calcium ion (meq/L)	0.6891	0.0349	43
Magnesium ion (meq/L)	0.2954	0.0189	44
Sodium ion (meq/L)	0.2749	0.0135	41
Chloride ion (meq/L)	0.0739	0.0133	42
Sulfate ion (meq/L)	0.5836	0.0373	39

Table 11.--*Summary statistics for samples collected with the recording precipitation monitor*

[mL, milliliters; mm, millimeters; µeq/L, microequivalents per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; milliequivalents per liter; -, indicates analytical results are not available; missing, data unavailable; less than detection, results that were less than detection limits for the selected analytical procedures; detected, number of samples having results that were greater than detection limits]

Parameter	Mean	Standard deviation	Minimum	Maximum	Missing	Less than detection	Detected
Volume (mL)	983.	958.	0.	4000.	1	0	110
Precipitation (mm)	19.7	18.5	0.5	127.0	20	0	91
pH (onsite, standard units)	4.56	0.80	3.31	6.87	40	0	71
Hydrogen ion (onsite, µeq/L)	60.015	68.749	0.135	489.779	40	0	71
pH (laboratory, standard units)	5.06	0.92	3.47	7.20	34	0	77
Hydrogen ion (laboratory, µeq/L)	33.346	49.112	0.063	340.408	34	0	77
Specific conductance (onsite, µS/cm)	602.	1003.	11.	6000.	39	0	72
Specific conductance (laboratory, uS/cm)	425.	954.	2.	6960.	32	0	79
Alkalinity (meq/L)	0.025	0.065	0.000	0.400	34	0	77
Calcium ion (meq/L)	0.040	0.175	0.001	1.50	35	0	76
Magnesium ion (meq/L)	0.006	0.010	0.001	0.074	35	3	73
Sodium ion (meq/L)	0.055	0.126	0.001	0.795	35	11	65
Potassium ion (meq/L)	1.578	3.410	0.010	18.	75	0	36
Chloride ion (meq/L)	0.243	0.107	0.062	0.480	91	2	18
Sulfate ion (meq/L)	0.051	0.035	0.004	0.173	50	1	60
Nitrate ion (meq/L)	0.062	0.135	0.005	0.657	51	6	54
Ammonium ion (meq/L)	-	-	-	-	111	0	0

Samples with analytical results that were less than the detection limits of the selected methods were recorded in the data set as double dashes (--). The detection limits of quantification are listed in table 12.

Table 12.--*Detection levels for laboratory analyses*

[meq/L, milliequivalents per liter]

Parameter	Units	Detection limit	Method of analysis
Calcium	(meq/L as Ca)	0.0004	Inductively coupled plasma.
Magnesium	(meq/L as Mg)	0.0002	Inductively coupled plasma.
Sodium	(meq/L as Na)	0.0034	Inductively coupled plasma.
Potassium	(meq/L as K)	0.0001	Atomic absorption.
Chloride	(meq/L as Cl)	0.0007	Ion chromatography.
Sulfate	(meq/L as SO_4)	0.002	Ion chromatography.
Nitrate	(meq/L as NO_3)	0.0026	Ion chromatography.
Ammonia	(meq/L as N)	0.00003	Automated colorimetric analysis.

A sample part of the data set is reproduced in table 13. Copies of the entire data set are available, at cost, from:

U.S. Geological Survey
National Water Data Exchange Program
Mail Stop 421, National Center
Reston, Virginia 22092

Table 13.--*Sample data set*

[Ca, calcium ion; Mg, magnesium ion; Na, sodium ion; K, potassium ion; Cl, chloride ion; SO_4, sulfate ion; NO_3, nitrate ion; NH_4, ammonium ion; mL, milliliters; mm, millimeters; µS/cm, microsiemens per centimeter at 25 degrees Celsius; meq/L, milliequivalents per liter; -, indicates results are unavailable; --, indicates results were less than detection limits for selected analytical procedures; source of sample: DC, Washington, D.C.; LB, laboratory; NC, North Carolina; NJ, New Jersey; NY, New York; sample type: L, limestone; M, marble; D, distilled water; B, blank; G, glass]

Source of sample	Sample type	Year (19 omitted)	Event	Side	Duplicate	Julian day		Overflow	Volume (mL)	Precipitation (mm)	pH (standard units)		Specific conductance (µS/cm)	
						On	Off				Onsite	Laboratory	Onsite	Laboratory
DC	L	84	4	R	1	290	299	N	830.	-	7.520	7.422	88.00	92.50
DC	M	85	11	L	1	138	142	N	3,800.	-	6.460	6.789	57.00	120.70
LB	D	84	-	-	1	-	-	-	-	-	-	8.100	-	1.00
NC	B	84	16	L	1	208	212	N	3,943.	54.610	4.490	4.583	18.50	15.75
NC	L	85	25	L	1	276	277	Y	3,000.	20.828	6.710	7.558	54.00	60.90
NC	L	85	25	L	2	276	277	Y	3,000.	20.828	-	7.575	-	60.60
NC	M	84	3	L	1	173	177	N	85.	0.762	7.900	7.900	188.60	173.00
NJ	B	85	7	L	1	102	113	N	330.	11.430	-	3.880	-	113.00
NJ	G	86	1	R	1	123	127	N	1,400.	10.160	3.680	4.120	76.00	72.40
NJ	L	84	10	L	1	219	226	N	2,300.	20.320	-	6.804	-	87.40
NJ	M	86	1	L	1	123	127	N	1,600.	10.160	7.110	6.460	77.00	83.20
NJ	P	84	19	-	1	298	303	N	890.	7.620	-	4.138	-	55.30
NY	B	84	14	L	1	228	233	N	140.	1.270	-	5.805	-	24.50
NY	G	85	9	L	1	280	284	N	805.	1.778	3.680	-	59.00	53.20
NY	L	86	5	R	1	160	162	N	3,705.	27.940	7.340	6.430	51.00	47.80
NY	M	84	10	L	1	215	222	N	600.	1.778	7.550	7.290	120.30	122.50

Table 13.--*Sample data set*--Continued

Source of sample	Sample type	Year (19 omitted)	Event	Side	Duplicate	Alkalinity (meq/L)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Cl (meq/L)	SO_4 (meq/L)	NO_3 (meq/L)	NH_4 (meq/L)
DC	L	84	4	R	1	0.720	0.89800	0.02800	0.01900	0.00600	-	0.22900	0.04400	-
DC	M	85	11	L	1	1.380	0.57934	0.01513	0.43718	-	0.11645	0.10014	0.02226	-
LB	D	84	-	-	1	-	--	--	--	0.00100	-	0.01000	--	-
NC	B	84	17	L	1	0.000	-	-	-	-	-	-	-	-
NC	L	85	25	L	1	0.446	0.55090	0.02957	0.00575	-	0.01606	0.12198	0.06931	-
NC	L	85	25	L	2	0.408	0.52894	0.02853	0.00433	-	0.01551	0.12200	0.06897	-
NC	M	84	3	L	1	-	-	-	-	-	-	-	-	-
NJ	B	85	7	L	1	0.000	0.15334	0.06028	0.07969	-	0.09473	0.29877	0.16911	-
NJ	G	86	1	R	1	0.000	0.11766	0.02945	0.02647	0.012870	0.01721	0.24911	0.11863	-
NJ	L	84	10	L	1	0.720	0.84800	0.01600	0.01300	-	-	0.16448	0.04356	-
NJ	M	86	1	L	1	0.372	0.58383	0.01459	0.02758	0.007230	0.01726	0.24572	0.10845	-
NJ	P	84	19	-	1	0.000	0.00400	0.00300	0.00050	0.151000	-	0.06500	0.03713	-
NY	B	84	14	L	1	-	0.04000	0.00800	--	0.008000	-	0.10202	0.03427	-
NY	G	85	9	L	1	0.000	0.03039	0.00515	0.01116	0.004732	0.00920	0.12053	0.07348	0.04100
NY	L	86	5	R	1	0.348	0.44251	0.01611	0.00472	-	0.00817	0.08964	0.03733	-
NY	M	84	10	L	1	0.920	1.10129	0.06200	0.01300	0.009000	-	0.20820	0.06069	-

SUMMARY

A total of 1,078 samples from 247 storms have been analyzed under a protocol designed to minimize errors from handling procedures, laboratory analyses, and data-entry operations. Duplicate samples and standard-reference samples are included in this sample set. Further additions will be made to the data file as sample collection continues, and laboratory analyses are completed.

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