Appendix A – 2000 Demonstration Plant Data

Table A.1 – Water Quality Analysis - Feed

DWR Bryte Laboratory Analysis Results for Buena Vista Project

Note: all results are in mg/L unless otherwise stated

Feed Stream		1/6/2000	8/8/2000	8/15/2000	8/24/2000	8/31/2000	9/8/2000
Dissolved Bicarbonate	as ion		370	206	373	346	366
Dissolved Carbonate	as ion		1	1	2	1	<1
Dissolved Chloride		3990	2610				2380
EC	µS/cm @ 25 C	13700	10200	4880	9890	9650	9880
Dissolved Barium		0.183	0.13				0.116
Dissolved Boron		5.8	5.24				4.89
Dissolved Calcium		1090	696	329	663	702	725
Dissolved Fluoride		0.8					
Dissolved Iron							
Dissolved Magnesium		180	121	49	108	113	130
Dissolved Nitrate	as N	7	53				
Dissolved Nitrite	as N		0.03				
DOC	as C		4.5				
Dissolved Phosphate	as P						
Dissolved Potassium		9.8					
Dissolved Selenium		0.033	0.04				0.04
Dissolved Silica		46	54				29
Dissolved Sodium		1960	1530	705	1460	1410	1550
Dissolved Strontium		8.03	6.99				6.62
Dissolved Sulfate		1540	1420				1390
Hardness	as CaCO3	3484	2237	1023	2101	2219	2346
Hydroxide	as CaCO3		<1	<1	<1	<1	<1
pH	pH units	7.8	7.27	7.45	7.61	7.18	7.3
Total Alkalinity	as CaCO3	425	371	207	374	346	366
TDS		9430	7010	3160	6750	6730	6840
UV254	absorb./cm	0.171	0.149				0.117
Total Barium							
Total Calcium							
Total Iron							
Total Magnesium							
TOC as C	as C	3.9					3.7
Total Potassium							
Total Selenium							
Total Silica							
Total Sodium							
Total Strontium							
TSS		6	4				2
Turbidity	NTU	1.7	1.4	45.4	10.3, 11	4.8	<1

Table A.2 – Water Quality Analysis - Filtrate

DWR Bryte Laboratory Analysis Results for Buena Vista Project

Note: all results are in mg/L unless otherwise stated

Filtrate Stream		1/6/2000	8/8/2000	8/15/2000	8/24/2000	8/31/2000	9/8/2000
Dissolved Bicarbonate	as ion		370	203	372	345	366
Dissolved Carbonate	as ion		1	1	1	1	1
Dissolved Chloride			2610				2490
EC	µS/cm @ 25 C		10200	4650	9900	9650	9880
Dissolved Barium			0.13				0.108
Dissolved Boron			5.4				4.4
Dissolved Calcium			685	330	679	698	726
Dissolved Fluoride							
Dissolved Iron							
Dissolved Magnesium			124	50	110	113	97.3
Dissolved Nitrate	as N		52				
Dissolved Nitrite	as N		0.03				
DOC	as C		6.7				
Dissolved Phosphate	as P						
Dissolved Potassium							
Dissolved Selenium			0.039				
Dissolved Silica			53				41.9
Dissolved Sodium			1620	717		1420	1540
Dissolved Strontium			6.94				6.84
Dissolved Sulfate			1430				1400
Hardness	as CaCO3		2221	1030	2149	2209	2220
Hydroxide	as CaCO3		<1	<1	<1	<1	<1
pH	pH units		7.28	7.46	7.55	7.19	7.2
Total Alkalinity	as CaCO3		371	204	373	346	367
TDS			7000	3140			
UV254	absorb./cm		0.141				0.116
Total Barium							
Total Calcium							
Total Iron							
Total Magnesium							
TOC as C	as C						3.6
Total Potassium							
Total Selenium							
Total Silica							
Total Sodium							
Total Strontium							
TSS							1
Turbidity	NTU			<1	<1	<1	<1

Table A.3 – Water Quality Analysis - Permeate

DWR Bryte Laboratory Analysis Results for Buena Vista Project

Note: all results are in mg/L unless otherwise stated

Permeate Stream		1/6/2000	8/8/2000	8/15/2000	8/24/2000	8/31/2000	9/8/2000
Dissolved Bicarbonate	as ion				18	10	10
Dissolved Carbonate	as ion				<1	<1	<1
Dissolved Chloride							93
EC	µS/cm @ 25 C				679	389	387
Dissolved Barium							<0.05
Dissolved Boron							5.2
Dissolved Calcium					6	6	8
Dissolved Fluoride							
Dissolved Iron							
Dissolved Magnesium					<1	2	<1
Dissolved Nitrate	as N						
Dissolved Nitrite	as N						
DOC	as C						
Dissolved Phosphate	as P						
Dissolved Potassium							
Dissolved Selenium							0.002
Dissolved Silica							0.4
Dissolved Sodium					125	68	80
Dissolved Strontium							0.055
Dissolved Sulfate							12
Hardness	as CaCO3				18	23	21
Hydroxide	as CaCO3				<1	<1	<1
pH	pH units				6.3	6.04	6.2
Total Alkalinity	as CaCO3				18	10	10
TDS					343	199	194
UV254	absorb./cm						0.002
Total Barium							
Total Calcium							
Total Iron							
Total Magnesium							
TOC as C	as C						0.2
Total Potassium							
Total Selenium							
Total Silica							
Total Sodium							
Total Strontium							
TSS							
Turbidity	NTU				<1	<1	<1

Table A.4 – Water Quality Analysis - Concentrate

DWR Bryte Laboratory Analysis Results for Buena Vista Project

Note: all results are in mg/L unless otherwise stated

Concentrate Stream		1/6/2000	8/8/2000	8/15/2000	8/24/2000	8/31/2000	9/8/2000
Dissolved Bicarbonate	as ion						
Dissolved Carbonate	as ion						
Dissolved Chloride							6040
EC	µS/cm @ 25 C				17700		18000
Dissolved Barium							0.207
Dissolved Boron							8.7
Dissolved Calcium							
Dissolved Fluoride							
Dissolved Iron							
Dissolved Magnesium							
Dissolved Nitrate	as N						
Dissolved Nitrite	as N						
DOC	as C						
Dissolved Phosphate	as P						
Dissolved Potassium							
Dissolved Selenium							0.078
Dissolved Silica							9.6
Dissolved Sodium							
Dissolved Strontium							12.9
Dissolved Sulfate							2720
Hardness	as CaCO3						
Hydroxide	as CaCO3						
pH	pH units						7.2
Total Alkalinity	as CaCO3						
TDS					13100		13400
UV254	absorb./cm						0.235
Total Barium							
Total Calcium							
Total Iron							
Total Magnesium							
TOC as C	as C						8.6
Total Potassium							
Total Selenium							
Total Silica							
Total Sodium							
Total Strontium							
TSS							
Turbidity	NTU				10.2		<1

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Table A.5 – Year 2000 Filter Performance Data

Date	Train	Operation	Op Time (min)	P_{in} (psi)	P_{IS} (psi)	P_{out} (psi)	SDI	EC (mS)	pH
6/27/2000	2	-	-	63	63	62.5	3.1	-	-
6/28/2000	2	-	-	62	62	60	2.9	6.75	-
6/29/2000	2	-	-	61	62	60	2.2	7.67	-
6/30/2000	2	-	-	-	-	-	-	7.28	7.35
7/3/2000	2	-	-	62	63	61	2.9	7.64	8.78
7/4/2000	2	-	-	68	55	52	1.8	7.75	8.29
7/5/2000	2	Backwash	20	73	38	34	1.8	7.26	8.35
7/5/2000	1	Online	-	62	62	62	2.7	-	-
7/6/2000	1	-	-	61	61	60	3	5.58	8.45
7/7/2000	1	-	-	62	58	58	3.9	4.98	8.57
7/10/2000	1	Backwash	20	66	42	42	NC	4.54	8.56
7/10/2000	2	Online	-	62	62	62	3.6	-	-
7/11/2000	2	Backwash	20	70	47	42	NC	-	-
7/11/2000	1	Online	-	60	60	60	3.4	-	-
7/12/2000	1	Backwash	20	66	30	30	3.4	-	-
7/12/2000	1	Online	-	60	60	60	-	-	-
7/13/2000	2	Online	-	60	60	60	-	-	-
7/14/2000	1	Online	-	60	60	60	-	-	-
7/17/2000	1	-	-	58	56	54	2.1	8.28	8.80
7/18/2000	1	-	-	58	54	54	2.9	8.00	8.58

Table A.5 – Year 2000 Filter Performance Data (cont.)

Date	Train	Operation	Op Time (min)	P_{in} (psi)	P_{IS} (psi)	P_{out} (psi)	SDI	EC (mS)	pH
7/18/2000	-	Took Sample/RO Online	-	-	-	-	-	-	-
7/19/2000	1	Backwash	20	58	50	50	1.8	6.39	8.51
7/19/2000	2	Online	-	56	52	52	-	-	-
7/20/2000	2	Backwash	20	50	46	30	1.7	8.04	5.51
7/20/2000	1	Online	-	58	58	58	-	-	-
7/24/2000	1	Backwash	20	58	48	46	1.7	6.77	8.50
7/24/2000	2	Online	-	58	58	56	-	-	-
7/25/2000	2	Took Sample	-	56	56	51	1.8	8.03	8.49
7/26/2000	2	Backwash	20	54	50	36	-	-	-
7/26/2000	1	Online	-	51	51	51	-	-	-
7/27/2000	1	-	-	52	50	48	2.5	7.98	8.36
7/28/2000	1	Backwash	20	51	41	40	5.1	6.04	8.48
7/28/2000	2	Online	-	-	-	-	-	-	-
7/31/2000	2	Backwash	20	50	50	18	4	6.80	8.46
7/31/2000	1	Online	-	-	-	-	-	-	-
8/1/2000	1	-	-	60	60	60	3.5	7.48	8.43
8/2/2000	1	Backwash	20	54	48	46	3.2	7.31	8.10
8/2/2000	2	Online		38	38	36	-	-	-
8/3/2000	2	Backwash	20	44	36	34	2.5	8.41	8.37
8/3/2000	1	Online		46	46	45	-	-	-

Table A.5 – Year 2000 Filter Performance Data (cont.)

Date	Train	Operation	Op Time (min)	P_{in} (psi)	P_{IS} (psi)	P_{out} (psi)	SDI	EC (mS)	pH
8/4/2000	1	-	-	42	40	38	2.3	8.40	8.69
8/7/2000	1	Backwash	20	44	28	26	-	8.43	9.38
8/8/2000	2	-	-	44	44	42	2.3	8.29	4.16
8/9/2000	2	-	-	44	42	40	2.2	8.30	9.00
8/10/2000	2	Backwash/Irrigation Began	20	46	38	32	2.3	8.37	9.00
8/14/2000	1	Backwash	20	46	43	42	3.1	8.30	8.86
8/15/2000	2			44	42	38	5.0	5.08	8.57
8/16/2000	2	Backwash	20	48	40	28	3.2	8.44	8.40
8/17/2000	1	Online		48	46	44	2.9	8.77	8.46
8/18/2000	1	-	-	48	44	42		8.65	7.51
8/22/2000	-	Load New Membranes	-	-	-	-	-	-	-
8/24/2000	1	Sampled	-	28	28	26	2.6	8.68	7.39
8/25/2000	2	Online	-	28	28	26		7.30	7.14
8/28/2000	2	-	-	26	26	24	2.1	6.84	-
8/29/2000	2	Backwash	20	26	24	20	2.2	6.31	-
8/30/2000	-	2nd Stage Membranes	-	-	-	-	-	-	-
8/31/2000	1	Sampled		26	24	22	2.1	4.29	-
9/6/2000	1	Backwash	20	-	-	-	-	-	-
9/6/2000	2	Online	-	26	26	22	-	0.93	-
9/7/2000	2	-	-	26	26	22	-	6.09	-

Table A.5 – Year 2000 Filter Performance Data (cont.)

Date	Train	Operation	Op Time (min)	P_{in} (psi)	P_{IS} (psi)	P_{out} (psi)	SDI	EC (mS)	pH
9/8/2000	2	-	-	26	26	24	-	3.48	-
9/11/2000	1	Online		26	26	24		6.73	
9/12/2000	1			26	26	24		5.13	
9/13/2000	1			26	26	24		5.57	

Table A.6 – RO Performance Data

Date	Conductivity (mS/s)					Pressure (psi)						Flow (gpm)	
	Overall	P1	P2	P3	P4	Permeate	Filter In	Filter Out	Feed	IS	Concentrate	Permeate	Concentrate
8/1/2000	1130	984	1426	1420	1810	3	67	63	206	160	154	10	10
8/2/2000	930	769	1357	1370	1842	3	75	70	215	160	155	10	10
8/3/2000	1354	1069	1874	1812	2390	3	41	37	145	105	95	9	12
8/4/2000	1533	1012	1806	1671	2240	3	38	34	205	165	145	11	10
8/7/2000	1705	1197	2080	1857	2500	3	44	39	225	185	170	12	9
8/8/2000	1743	1235	2130	1880	2530	3	42	38	225	160	165	8	10
8/9/2000	1766	1217	2080	1879	2500	3	40	36	235	185	160	10	10
8/10/2000	1679	1173	2020	1817	2420	3	34	30	225	180	165	10	10
8/14/2000	1651	-	-	-	-	3	-	-	226	176	166	10	10
8/15/2000	657	470	780	732	1009	3	39	37	200	150	145	9	12
8/16/2000	1460	1030	1670	1625	2120	3	30	30	215	170	155	10	9.5
8/17/2000	1768	1129	1774	1712	2330	3	45	45	225	180	165	10	9.8
8/18/2000	1485	1028	1552	1512	2130	-	-	-	-	-	-	-	-
8/22/2000	990	207	483	2060	2820	-	-	-	-	***New***	***Membranes***	-	-
8/24/2000	717	102	336	1933	2610	4	27	26	215	200	185	10	10
8/25/2000	682	95.6	321	1800	2460	4	25	25	215	195	185	10	10
8/28/2000	693	90	299	1009	2510	-	-	-	-	-	-	-	-
8/29/2000	623	90.4	291	1778	2460	4	24	23	215	195	185	10	10
8/30/2000						-	-	-	-	***New***	***Membranes***	-	-
8/31/2000	420	93.1	273	633	831	4	24	22	200	175	150	9.5	10.5
9/6/2000	430	275	410	781	1027	4	24	24	185	160	135	11	10
9/7/2000	394	100	303	765	1130	4	24	24	210	185	160	10	10
9/8/2000	350	76.9	178	570	763	4	25	24	205	175	160	10	10
9/11/2000	350	101	262	628	856	3	26	26	185	160	135	10	10
9/12/2000	436	95.3	295	689	973	4	62	60	220	195	170	10	10
9/13/2000	483	98.3	300	752	1150	4	61	61	220	195	170	10	10

Table A.7 – Filter Train 1 SDI Data

Date	Train	Operation	Op Time (min)	P_{in} (psi)	P_{IS} (psi)	P_{out} (psi)	SDI	EC (mS)	pH
7/5/2000	1	Online	-	62	62	62	2.7	-	-
7/6/2000	1	-	-	61	61	60	3	5.58	8.45
7/7/2000	1	-	-	62	58	58	3.9	4.98	8.57
7/11/2000	1	Online	-	60	60	60	3.4	-	-
7/12/2000	1	Backwash	20	66	30	30	3.4	-	-
7/17/2000	1	-	-	58	56	54	2.1	8.28	8.80
7/18/2000	1	-	-	58	54	54	2.9	8.00	8.58
7/19/2000	1	Backwash	20	58	50	50	1.8	6.39	8.51
7/24/2000	1	Backwash	20	58	48	46	1.7	6.77	8.50
7/27/2000	1	-	-	52	50	48	2.5	7.98	8.36
7/28/2000	1	Backwash	20	51	41	40	5.1	6.04	8.48
8/1/2000	1	-	-	60	60	60	3.5	7.48	8.43
8/2/2000	1	Backwash	20	54	48	46	3.2	7.31	8.10
8/4/2000	1	-	-	42	40	38	2.3	8.40	8.69
8/14/2000	1	Backwash	20	46	43	42	3.1	8.30	8.86
8/17/2000	1	Online		48	46	44	2.9	8.77	8.46
8/24/2000	1	Sampled	-	28	28	26	2.6	8.68	7.39
8/31/2000	1	Sampled		26	24	22	2.1	4.29	-
Average	2.9								
SD	0.80								

Table A.8 – Filter Train 2 SDI Data

Date	Train	Operation	Op Time (min)	P_{in} (psi)	P_{IS} (psi)	P_{out} (psi)	SDI	EC (mS)	pH
7/3/2000	2	-	-	62	63	61	2.9	7.64	8.78
7/4/2000	2	-	-	68	55	52	1.8	7.75	8.29
7/5/2000	2	Backwash	20	73	38	34	1.8	7.26	8.35
7/10/2000	2	Online	-	62	62	62	3.6	-	-
7/20/2000	2	Backwash	20	50	46	30	1.7	8.04	5.51
7/25/2000	2	Took Sample	-	56	56	51	1.8	8.03	8.49
7/31/2000	2	Backwash	20	50	50	18	4	6.80	8.46
8/3/2000	2	Backwash	20	44	36	34	2.5	8.41	8.37
8/8/2000	2	-	-	44	44	42	2.3	8.29	4.16
8/9/2000	2	-	-	44	42	40	2.2	8.30	9.00
8/10/2000	2	Backwash/Irrigation Began	20	46	38	32	2.3	8.37	9.00
8/15/2000	2			44	42	38	5.0	5.08	8.57
8/16/2000	2	Backwash	20	48	40	28	3.2	8.44	8.40
8/28/2000	2	-	-	26	26	24	2.1	6.84	-
8/29/2000	2	Backwash	20	26	24	20	2.2	6.31	-
Average	2.6								
SD	0.92								
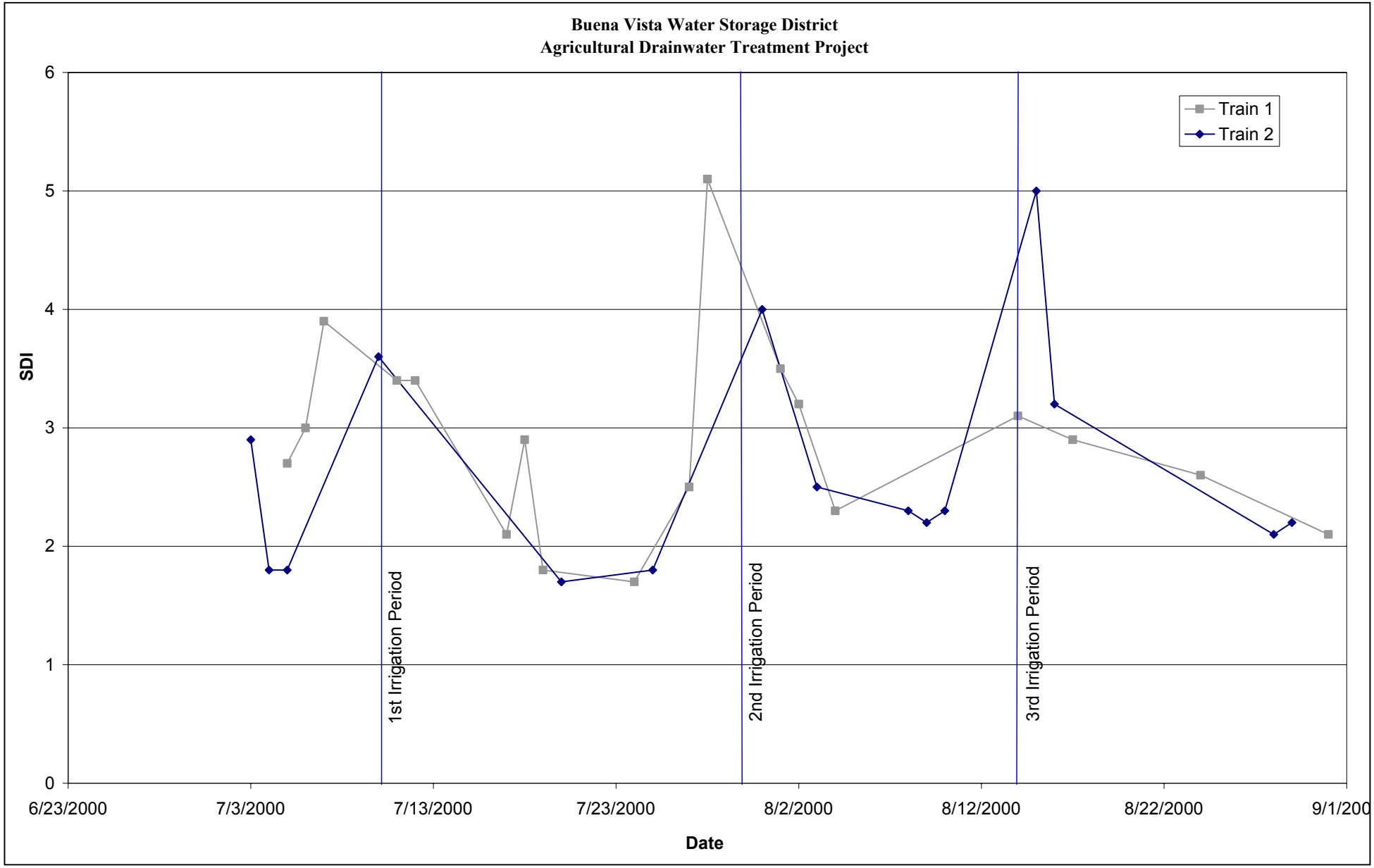
Figure A.9 – Filter Performance Data for Year 2000