GCC Energy

"Safety as a Value"

Telephone: 970.385.4528
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GCC Energy, LLC
6473 County Road 120
Hesperus, CO 81326

January 7, 2015

State of Colorado
Division of Reclamation, Mining & Safety
691 CR 233, Suite A-2
Durango, CO 81301

Attn: Marcia Talvitie, Reclamation Specialist

Re: Permit #C-1981-035, King II Mine
Annual Hydrologic Report 2014

Dear Ms. Talvitie,

Please find enclosed the Annual Hydrologic Report for the King I and King II Mines. Included is a report by CDS Laboratories analyzing all available data.

The laboratory method used for determination of Calcium, Iron, Magnesium, Manganese, and Sodium is EPA200.7. Deb Zufelt at Green Analytical states: "EPA200.7 can be either dissolved, potentially dissolved or Total Recoverable Your metals are filtered, so the results are reported as dissolved."

At this time, GCC Energy requests that the #1 Upgradient Monitoring Well and the #3 Hay Gulch Ditch no longer be sampled until 2 years prior to final reclamation of the King II mine site. These points were sampled only to gather baseline data prior to construction of the King II site and no longer provide any useful information. There is no language in the permit text requiring that these sites be sampled.

This report will now be based on a "water year" defined as October 1 through September 30 and will now be submitted before December 31 of the same year. A minor revision will be submitted modifying the permit text to clarify these dates.

Please contact Tom Bird at 970.385.4528 x 6503 with questions or comments.

Sincerely,

Tom Bird

Manager of Coal Services
GCC Energy, LLC

GCC Energy, LLC
Monitoring Well Analysis - Field Data
King I Project

Wiltze Well

	12/14/04	3/16/05	6/6/05	8/5/05	12/2/05	3/27/06	6/28/06	8/30/06	12/6/06	3/12/07	6/30/07	9/2/07	12/6/07	3/31/08	6/30/08	8/19/08
Time	2:37pm	9:35am	10:35am	10:35am	1:10pm	10:35am	2:12pm	2:10pm	1:48pm	12:55pm	8:00am	12:45pm	9:35am	12.00pm	2:15pm	10:15am
Temp (deg. C)	9.8	8.6	10.7	10.1	10.1	6.5	11.4	12.1	9.7	10.9	12.2	15.8	10.3	9.6	12.5	11.9
pH	7.02	7.11	7.13	7.23	7.1	7.25	7.51	7.55	7.48	7.57	7.6	7.68	7.59	7.8	7.76	7.58
EC	2390	2190	2200	2270	2250	2260	1811	1865	1899	1738	1791	1894	1899	2170	1956	1971
Depth to Water (inches)	78	9	50	106	103	4	90	117	103	104	119	64	125	3	110	108
TDS	1190	1100	1090	1140	1070	1130	903	940	944	871	896	953	952	1080	985	990

	10/9/08	3/5/09	5/21/08	9/8/09	3/31/10	6/28/10	9/30/10	11/3/10	3/18/11	6/28/11	9/30/11	11/29/2011	3/27/2012	6/27/2012	9/28/2012	12/11/2012
Time	3:00pm	10:00am	9:45am	3:03pm	3:18pm	2:30pm	4:30pm	12:05pm	10:05am	9:50am	9:30am	12:30pm	1:20pm	2:30pm	8:30am	2:15pm
Temp (deg. C)	11.8	9	10.9	13.6	8.5	12.3	16.5	11.9	8.2	16	13.7	7.6	9.7	20.9	14.8	8.8
pH	7.62	8.02	7.75	8.11	7.84	7.95	8.23	8.01	8.1	8.25	8.05	8.39	7.92	8.1	8.06	7.74
EC	2010	2420	2070	2150	2460	2090	2330	2370	2450	2240	2130	1999	1999	1999	2060	2058
Depth to Water (inches)	115	35	29	47	0	30	26	29	7	31	43	23	20	29	55	56
TDS	1010	1200	1030	1060	1230	1050	1170	1190	1220	1120	1090	1160	1180	1196	1030	1031

	3/13/2013	6/5/2013	9/25/2013	12/19/2013	3/28/2014	6/23/2014	9/26/2014
Time	9:33am	1:50pm	2:40pm	9:50am	11:15am	10:51am	9:30am
Temp (deg. C)	10.6	16.8	15.9	7	10.4	12.8	11.8
pH	7.58	7.95	8.15	7.92	7.87	7.87	8.11
EC	2290	2440	2171	2190	2050	1886	1747
Depth to Water (inches)	30	43	40	43	40	33.5	48
TDS	1030	2220	2350	1090	1020	944	875

Haugen Well

							38882			
Time	4:40pm	4:15pm	5:05pm	4:30pm	5:15pm	5:25pm	8:20pm	5:45pm	5:00pm	4:45pm
Temp (deg. C)	9.6	12.7	14.7	18.1	13.8	20.3	18.1	18.4	15.2	12.8
pH	7.91	8.08	8.13	8.09	8.32	8.2	8.21	8.11	8.43	9.1
EC	1766	1540	424	355	1702	1734	1874	1744	1788	1828
Depth to Water	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TDS	860	766	783	1780	1686	860	714	1040	1035	875

GCC Energy, LLC
2014 Annual Hydrology Report
Wiltze Well Analysis

DATE	BICARBONATE, AS CaCO3(mg/L)	CALCIUM (mg/L)	DEPTH TO WATER, in.	CONDUCTIVITY FIELD DATA (mS/cm)	IRON (mg/l)	Mg (mg/L)	Mn (mg/L)	SODIUM (mg/L)	pH	SULPHATE (mg/L)	T.D.S. (mg/L)	TEMP (NC)
2/12/82		294		1504	0.361	159			7.3	1160	2130	4
5/10/82		250			0.1	160	2.1		7.1	940	1985	8
8/2/82		272			0.4	176	0.4		7.1	850	2145	17
12/20/82		242		1375	0.25	165	1.24		6.7	940	1785	9.5
4/20/83		134		1400	0.35	153	1.5		6.95	950	1910	8
6/20/83		245		1408	0.1	176	1.7		7.2		2300	9
11/28/83				1525	0.1	171	0.61		6.98	1050	2160	12
3/12/84		281		1300	0.007	174	2.02		7.16	900	1955	7.5
7/16/84		255		1780		118	1.38		7.36	1000	2045	18
10/15/84		229		1600	0.13	203	2.5		7.18	1010	2005	11
1/21/85		204	0	1700	0.031	147	1.646			790	1855	10
4/3/85		170	12	1700	0.017	143	1.47		6.95	790	1770	7.5
6/17/85		217	13	1400	<0.2	158	1.72		6.97	860	1890	13.5
9/9/85		227	15	1400	<0.2	156	0.045		7.5	990	1780	12.5
12/16/85		223	0	1275	<0.2	179	1.25		6.99	810	1810	8
3/10/86		208	0	1118	<0.2	161	1.39		7.2	930	1630	8
7/28/86		229	2	1200	<0.2	147	1.6		7.09	660	1680	10
9/2/86		254	0	1330	<0.2	160	1.55		7.27	860	1840	9
12/1/86		261	2	1350	<0.2	165	1.93		6.99		1840	8.5
3/23/87		272	16	1400	<0.2	180	1.5		7.06	1180	2160	7
6/8/87		288	0	1500	<0.2	191	1.8		6.89	1200	2200	9.5
8/31/87		362	9	1700	<0.5	204	1.8		7.08	1420	2540	10.5
11/9/87		338	0	1650	<0.5	196	2.2		6.94	1160	2320	10.5
2/1/88		286	22	1450	<0.5	176	1.7		7.09	1100	2185	8.5
5/2/88		286	0	1450	<0.5	185	1.65		7.1	966	1980	7.5
11/7/88		231	21	1450	<0.2	178	0.3		7.25	1100	1980	9.5
2/13/89		237	28	1280	<0.5	154	1.2		7.04	1000	1760	7
5/1/89		268	0	1250	<0.2	168	1.14		6.88	1025	1995	7.5

8/7/89		218	6	1350	<0.5	143	0.2		7.09	840	1500	12.5
10/6/89		223	24	1250	<0.5	141	0.4		7.28	775	1610	8
2/12/90		189	24	1800	<0.5	144	0.2		7.04	755	1620	6.2
5/21/90	485	219		1350	<0.2	149		48.4	7.09		1680	8.5
8/6/90	400	212	26	1150	<0.5	141		41.7	7.14	680	1460	10
11/5/90	600	250	24	1400	<0.5	139		46	6.96	880	1700	9.5
2/21/91	460	221	24	1150	<0.2	149		46.1	7.14	760	1520	12
7/2/91	474	196	0	1670	<0.5	126		43.2	7.03	580	1360	10
1/21/92	460	214		1150	<0.5	134		45.6	7.48	630	1490	8
3/30/92	470	216	0	1350	<0.3	141		45.8	7.13	610	1500	10
7/16/92	455	237	0	1380	<0.2	147		47.3	6.96	740	1780	8.5
12/18/92	470	242	18	1450	<0.2	176		60.3	7.1	720	1670	0
3/8/93	435	201	18	2320	<0.2	140		58.3	8.05	640	1470	10
6/14/93	418	269	0	1500	<0.5	167	1.1	93.5	7.19	860	1970	9
9/30/93	500	294	4	1650	<0.3	182	0.4	84.5	7.24	940	1960	11.5
12/6/93	485	284	0	1650	<0.2	182	0.4	81.1	7.18	1000	2040	6.5
3/7/94	510	238	0	1500	<0.5	155	1.1	72.4	7.05	940	1940	8.5
6/13/94	485	254	13	1600	<0.5	161	0.3	77	7.79	820	1870	9.5
9/19/94	490	247	32	1580	<0.2	164	0.2	73.9	7.22	840	1830	11
12/5/94	485	267	12	1650	<0.2	171	0.3	78.9	7.18	820	1880	10
3/13/95	445	267	0	1480	<0.2	170	0.9	83.8	6.92	740	1880	8
6/12/95	416	239	6	1450	<0.2	164	0.5	94.8	7.43	800	1860	9.5
9/11/95	435	215	9	1450	<0.2	138	0.2	78.3	7.47	730	1590	10.5
12/26/95	450	205	14	1220	<0.2	140	0.2	72	7.19	660	1580	7.5
3/18/96	398	226	0	1380	<0.2	147	0.3	75.2	7.07	790	1540	7.5
6/24/96	475	217	39	1480	<0.2	150	0.3	78	7.9	620	1750	11
10/21/96	475	212	42	2000	<0.4	139	0.3	70.2	7.53	680	1600	10
12/26/96	455	205	16	1380	<0.2	133	0.3	74.3	7.53	610	1630	8
3/30/97	445	185	6	1320	<0.2	126	1	87	7.94	660	1620	9.5
7/1/97	450	206	7	1550	<0.2	139	0.6	86.6	7.24	720	1670	18
12/10/97	450	224	37	1100	<0.2	140	0.7	101	7.21	760	1690	7.9

3/9/98	430	204	18	1350	<0.2	135	0.9	90.1	7.07	680	1650	28.2
6/4/98	465	183	12	1693	0.8	125	0.9	72.5	7.14	620	1490	10
9/25/98	470	230	84	1709	<0.2	150	0.9	87	7.38	680	1580	11.3
12/3/98	455	250	39	1909	<0.2	170	0.33	120	7.42	860	1760	10.2
3/2/99	450	210	15	1788	<.05	140	0.51	94	7.41	720	1600	9.5
6/30/99	440	210	28	1700	<.05	150	0.3	99	7.23	720	1760	12.5
9/27/99	394	220	0	2040	<.05	150	0.41	100	7.73	660	1680	11.8
1/5/00	396	220	12	2100	0.02	150	0.38	96	7.13	700	1780	6.8
4/4/00	400	240	0	2190	<.05	150	0.91	130	7	620	1570	7
6/20/00	396	230	36	1582	<.05	150	0.56	100	7.09	720	1670	9.8
12/19/00	420	210	23	1680	0.05	140	0.3	120	7.11	780	1860	7.5
3/31/01	396	200	0	1650	0.18	120	0.57	130	7.05	720	1690	7.5
6/22/01	405	214			<.05	140	0.54	137	7.25	690	1740	
9/14/01	425	210	36	1480	<.1	130	0.44	120	7.88	640	1670	10
12/7/01	286	230	20	1650	<1	140	0.8	150	7.16	753	1920	6
3/20/02	415	220	60	1750	0.83	140	1.5	170	7.18	760	2030	7
6/28/02	420	228	69	1980	<.2	149	1	202	7.18	840	2080	10
9/24/02	420	239	94	1920	0.3	150	0.67	209	7.32	860	2110	8.5
12/30/03	460	265	30	1300	<.2	165	0.44	262	7.13	1240	2440	9
3/26/03	455	246		1280	<.2	152	0.32	260	7.16	1260	2420	4
6/24/03	470	210	102	1300	<.05	139	0.692	255	7.3	1050	2200	12
10/10/03	450	183	50	910	<.05	117	1.26	241	7.25	860	1910	12
12/23/04	435	168		850	<.05	114	0.545	268	7.35	1160	2030	9
3/25/04	430	185	2.5	1020	<.05	112	0.1	255	7.22	800	1950	10
6/24/04	420	167	84	1320	<.05	103	0.781	230	7.26	800	1730	13
9/12/04	440	176	120	1200	<.05	106	1.28	237	7.11	760	1750	13
12/14/04	430	177	78	2390	<.05	111	0.821	233	7.29	820	1660	9.8
3/16/05	396	171	9	2190	<.05	91.8	0.244	212	7.62	700	1610	8.6
6/6/05	380	188	50	2200	<.05	104	0.163	176	7.41	740	1640	10.7
8/5/05	420	181	106	2270	<.05	118	1.35	173	7.48	740	1680	10.1
12/2/05	425	177	103	2250	<.05	108	1.26	173	7.06	800	1700	10.1

3/27/06	445	172	4	2260	<.05	103	0.24795	177	7.68	900	1730	6.5
6/28/06	425	142	90	1811	<.05	94.1	1	118	7.72	560	1220	11.4
8/30/06	396	161	117	1865	<.05	101	0.899	129	7.76	540	1170	12.1
12/6/06	455	147	103	1899	<.05	92.4	0.541	125	7.44	595	1210	9.7
3/12/07	445	140	104	1738	<.05	87.7	0.996	96.8	7.29	440	1150	10.9
6/30/07	400	160	119	1791	<.05	95.3	0.972	98.9	7.21	440	1230	12.2
9/2/07	430	170	64	1894	0.06	109	1.06	108	7.26	520	1370	15.8
12/6/07	350	156	125	1899	<.05	95.5	0.353	97.5	7.47	580	1330	10.3
3/31/08	480	175	3	2170	<.05	103	0.413	168	6.98	710	1520	9.6
6/30/08	390	171	110	1956	<.05	111	1.24	113	7.4	560	1450	12.5
8/19/08	415	170	108	1971	<.05	110	1.23	108	7.28	630	1470	11.9
10/9/08	480	178	115	2010	<.05	116	1.17	99.7	7.31	620	1480	11.8
3/5/09	445	223	35	2420	<.05	137	0.156	177	7.3	820	1930	9
5/21/09	450	190	29	2070	<.05	118	1.06	108	7.44	560	1520	10.9
9/8/09	520	215	47	2150	<.05	137	1.35	123	7.49	700	1690	13.6
11/26/09	460	204	42	2230	<.05	131	0.941	118	7.37	690	1600	10.4
3/31/10	382	231	0	2460	<.05	139	0.684	160	7.45	760	1960	8.5
6/28/10	392	203	30	2090	<.05	131	0.492	91.8	7.34	680	1810	12.3
9/30/10	425	233	26	2330	<.05	151	0.07	119	7.23	860	1830	16.5
11/3/10	465	237	29	2370	<.05	153	0.174	105	7.44	820	1780	11.9
3/18/11	440	247	7	2450	<.05	155	0.042	133	7.31	820	1900	8.2
6/28/11	470	235	31	2240	<.05	154	0.332	118	7.31	820	1740	16
9/30/11	480	234	43	2130	<.05	155	0.975	106	7.18	740	1640	13.7
11/29/11	520	226	23	1999	<.05	149	0.008	110	7.46	800	1730	7.6
3/27/12	475	234	20	1999	<.05	151	0.057	131	7.26	900	1900	9.7
6/27/12	450	197	29	1999	<.05	129	0.094	90.9	7.26	760	1550	20.9
9/28/12	445	205	55	2060	<.05	140	0.119	93	7.64	660	1650	14.8
12/11/12	460	209	56	2058	<.05	145	0.07	96.8	7.86	730	1520	8.8
3/13/13	425	212	30	2290	<.05	147	0.075	116	7.52	740	1770	10.6
6/5/13	530	218	43	2440	<.05	139	0.056	97.5	7.92	710	1570	16.8
9/25/13	485	225	40	2171	<.05	149	0.135	103	8.15	680	1760	15.9

12/19/13	520	224	43	2190	<.05	145	0.215	101	7.39	740	1590	7
3/28/14	430	203	40	2050	<.05	135	0.802	83.2	7.39	620	1530	10.4
6/23/14	422	208	33	1886	<.05	130	1.13	90.4	7.59	680	1520	12.8
9/26/14	430	179	48	1747	<.05	119	1.66	57.8	7.36	660	1370	11.8

GCC Energy, LLC
Monitoring Well Analysis - Field Data
King II Project

Well #1 (Upgradient)

	1/3/05	1/26/05	2/28/05	3/17/05	4/27/05	5/24/05	6/6/05	7/31/05	8/5/05	9/6/05	10/5/05	12/2/05	3/27/06	6/28/06	8/30/06	12/6/006	3/12/07	6/30/07	9/2/07	12/6/07
Time	2:20pm	2:30pm	9:35am	2:45pm	12:01pm	2:25pm	11:03am	9:45am	11:15am	9:05am	3:42pm	1:28pm	11:25am	2:26pm	2:30pm	12:50pm	1:17pm	8:40am	1:10pm	9:50am
Temp (deg. C)	7.6	7.1	6.4	8	8.9	10.4	12.6	14.4	14.7	14.4	14.2	9.9	8.6	14.5	16	10.8	8.9	13	15.1	10.9
pH	9.41	9.58	9.08	9.45	9.41	9.52	9.67	9.52	9.66	9.55	9.47	9.46	9.72	9.85	9.8	9.85	9.94	9.99	9.95	10.02
EC	1157	1146	1156	1159	1137	1122	1103	1134	1124	1115	1110	1125	1135	1085	1078	1069	1108	1072	1044	1068
Depth to Water (inches)	41	36	32	30	26	30	34	44	49	50	52	49	46	56	62	58	66	68	78	75
TDS	574	579	575	576	568	560	556	550	562	560	555	566	571	546	542	528	558	538	527	534

Well #2 (Downgradient)

Time	2:47pm	2:05pm	9:55am	3:07pm	12:15pm	2:40pm	11:20am	10:05am	11:40am	9:22am	3:20pm	1:47pm	11:47am	2:40pm	2:52pm	1:15pm	1:25pm	8:55am	1:21pm	10:05am
Temp (deg. C)	4.7	4	3.9	5.3	10.5	12.1	16.4	16.1	16.5	15.4	14.1	9.8	7.2	13.9	17.5	10.2	9	15.9	18.4	10.5
pH	7.05	7.24	7.19	7.55	8.08	7.83	7.66	7.55	7.66	7.7	7.78	7.69	7.45	7.83	7.99	8	7.96	8.02	8.11	8.12
EC	1051	1057	1032	1061	1011	922	827	740	752	766	788	992	1051	987	998	970	9.5	917	916	930
Depth to Water (inches)	26	8	5	2	3	7	11	72	79	77	76	83	88	101	84	82	97	97	114	116
TDS	527	525	519	536	507	508	413	380	371	384	394	497	524	495	497	485	476	459	460	465

Hay Gulch Ditch (North of CR 120)

Time	3:15pm	2:15pm	10:10am	3:22pm	12:40pm	2:53pm	11:42am	10:23am	11:50am	9:40am	3:05pm	2:10pm	11:59am	2:58pm	3:10pm	1:28pm	1:42pm	9:10am	1:33pm	10:18am
Temp (deg. C)	1.7	3	1.1	8	10.7	11.8	12.4	15.3	14.9	14.8	17	2.9	6.3	20.3	23	3.2	12.5	23	19.3	3
pH	7.91	7.52	8.03	8.01	8.43	8.4	8.35	8.55	8.62	8.22	8.71	8.42	7.91	8.85	9.06	8.42	9.09	9.51	8.04	8.13
EC	348	373	470	369	544	473	331	370	382	383	816	840	495	768	373	843	6	282	233	349
TDS	174	187	236	183	272	236	169	185	191	185	410	415	251	386	186	420	301	142	116	173

Well #1 (Upgradient)	3/31/08	6/30/08	8/19/08	10/9/08	3/5/09	5/21/09	9/8/09	3/31/10	6/28/10	9/30/10	11/3/10	3/18/11	6/28/11	9/30/11	11/29/11	3/27/12	6/27/12	9/28/12	12/11/12	3/13/13
Time	12:18pm	2:30pm	10:32am	3:20pm	10:18am	9:55am	3:20pm	3:36pm	2:45pm	4:15pm	2:18pm	10:18am	10.05:am	10:11am	1:00pm	1:45pm	2:45pm	8:49am	2:59pm	9:58am
Temp (deg. C)	9.7	12.1	13.4	14.2	8.6	10.4	14.2	8.3	11.3	14.7	15.7	9.3	11.1	14.9	12.6	14	18.8	13.7	9	9.2
pH	10.21	10.13	10.12	10.14	10.07	10.2	10.23	10.04	10.31	10.05	10.19	10.28	10.13	10.07	10.14	10.21	10.14	9.51	8.97	10.04
EC	1052	1033	1019	1013	1022	1018	999	1033	1009	984	996	1035	1017	981	999	1050	1039	1009	1016	1053
Depth to Water (inches)	61	69	72	80	70	69	81	62	71	81	80	70	70	84	86	86	89	84	102	90
TDS	530	518	512	507	510	511	501	516	506	493	500	517	510	492	517	517	521	503	415	529

Well #2 (Downgradient)																				
Time	12:32pm	2:50pm	10:49am	3:35pm	10:26am	10:18am	3:28pm	3:45pm	3:00pm	3:47pm	12:29pm	10:30am	10:30am	10:46am	1:30pm	3:00pm	2:54pm	9:12am	3:25pm	10:29am
Temp (deg. C)	8.1	17.9	20.4	15.7	7.8	12.6	17.6	6.9	17.3	15.6	14	8.1	18.5	15.8	11.7	14.6	15.7	14.1	9.6	10.2
pH	8.04	8.29	8.39	8.35	8.24	8.39	8.49	8.45	8.49	8.49	8.65	8.77	8.69	8.78	9.07	8.79	8.52	8.22	8.26	8.69
EC	931	901	905	920	948	923	633	997	653	700	754	921	587	590	770	735	733	771	970	847
Depth to Water (inches)	96	22	89	71	80	40	67	19	12	58	55	60	41	71	62	72	92	83	112	100
TDS	467	451	454	461	474	461	317	498	327	349	378	462	294	296	388	370	368	382	360	419

Hay Gulch Ditch (North of CR 120)																				
							9/16/09													
Time	12:55pm	3:05pm	11:02am	3:47pm	10:41am	10:29am	1:48pm	4:05pm	4:00pm	3:35pm	12:45pm	10:43am	10:45am	10:32am	1:15pm	2:10pm	3:15pm	Dry	3:15pm	10:06am
Temp (deg. C)	12.4	19.3	14.9	14.1	3.9	12.9	15.9	8.6	19.2	17.8	8.7	7.4	14.2	12.2	4.7	16.9	17.8		1	4.9
pH	9.09	8.66	8.78	8.65	8.98	8.12	8.65	8.1	8.57	8.83	8.83	8.69	9.19	9.11	9.26	9.28	9.65		8.98	8.93
EC	384	248	306	302	815	163	280	495	332	277	337	501	196	307	367	389	503		757	856
TDS	191	124	152	151	407	81.5	140	248	167	138	168	250	98	154	179	198	251		250	430
						Low Flow			Low Flow											

Well #1 (Upgradient)	6/5/13	9/25/13	12/19/13	3/28/14	6/23/14	9/26/14
Time	2:10pm	3:03pm	10:20am	11:53am	10:13am	9:52am
Temp (deg. C)	12.8	18.1	8.4	11.1	14.4	13.9
pH	9.96	9.93	9.66	9.71	9.63	9.57
EC	1010	958	1029	1004	988	962
Depth to Water (inches)	79	79	80	77	89	95
TDS	501	482	513	503	497	481

Well #2 (Downgradient)						
Time	2:30pm	4:07pm	10:50am	12:26pm	11:45am	10:11am
Temp (deg. C)	12.4	16.6	7.1	5.6	20.1	15.8
pH	8.52	8.66	8.17	8.2	8.65	8.68
EC	805	812	1054	874	853	826
Depth to Water (inches)	65	54	69	64	68	42
TDS	405	407	513	435	429	416

Hay Gulch Ditch (North of CR 120)						
Time	2:15pm	3:13pm	10:32am	12:07pm	11:26am	10:00am
Temp (deg. C)	18	15.3	3.1	8	18.1	15.2
pH	9.18	9.31	8.91	9.05	9.21	9.48
EC	663	326	865	426	272	282
TDS	332	161	432	213	137	141

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King II Mine

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DATE	CALCIUM (mg/L)	IRON (mg/l)	Mg (mg/L)	Mn (mg/L)	SODIUM (mg/L)	Hardness, as CaCO3	Alkalinity, as CaCO3(mg/L)	Bicarbonate, as CaCO3(mg/L)	Carbonate, as CaCO3(mg/L)	Hydroxide, as CaCO3(mg/L)	pH	Sulphate (mg/L)	T.D.S. (mg/L)	Temperatue (NC)	Depth to Water (in.)	Conductivity: Field Data (mS/cm)
1/3/05	3.6	<.05	6.8	<.005	322	37	690	390	300	<10	9.51	<10	585	7.6	41	1157
3/17/05	2.9	0.23	5.5	0.005	253	30	620	520	100	<10	9.51	<10	620	8	30	1157
6/6/05	3.1	0.08	6	0.006	248	32	600	520	80	<10	9.45	<10	635	12.6	34	1103
8/5/05	2.9	0.28	7.8	0.01	234	39	590	410	180	<10	9.41	<10	600	14.7	49	1124
12/2/05	2.9	0.05	7.6	0.005	232	39	590	410	180	<10	9.13	<10	640	9.9	49	1125
3/27/06	2.9	0.23	7.5	0.00297	245	38	610	610		<10	9.58	<10	590	8.6	46	1135
6/28/06	3	0.07	7.9	0.008	240	40	570	450	120	<10	9.42	<10	540	14.5	56	1085
8/30/06	3	<.05	7.5	0.005	245	38	620	580	40	<10	9.31	<10	465	16	62	1078
12/6/06	2.4	0.27	7.2	0.007	235	36	610	450	160	<10	9.26	<10	620	10.8	58	1069
3/12/07	3.1	0.09	9.2	<.005	232	46	620	460	160	<10	9.43	<10	520	8.9	66	1108
6/30/07	3.3	0.11	11.4	0.008	224	55	545	425	120	<10	9.35	<10	560	13	68	1072
9/2/07	3.5	<.05	11.7	0.007	224	57	590	490	100	<10	9.26	<10	550	15.1	78	1044
12/6/07	3.2	0.067	10.6	0.007	206	52	540	320	220	<10	9.31	<10	575	10.9	75	1068
3/31/08	3.7	0.08	17.4	<.005	210	81	590	370	220	<10	9.38	<10	495	9.7	61	1052
6/30/08	4.8	0.07	23.6	0.007	206	109	550	465	85	<10	9.39	15	560	12.1	69	1033
8/19/08	4.6	0.06	24.8	0.006	196	114	540	400	140	<10	9.31	18	500	13.4	72	1019
10/9/08	4.9	0.08	27.9	0.008	196	127	530	430	100	<10	9.29	13	535	14.2	80	1013
3/5/09	5.6	0.13	32.4	0.007	196	147	580	440	<10	<10	9.27	17	570	8.6	70	1022
5/21/09	6.4	<.05	36.3	<.005	172	165	525	315	210	<10	9.27	31	530	10.4	69	1018
9/8/09	6.4	0.06	42.9	0.011	177	193	530	450	80	<10	9.14	35	585	14.2	81	999
11/26/09	5.8	<.05	40.8	0.01	166	182	515	415	100	<10	9.1	33	485	12.1	77	951
3/31/10	7.8	0.15	52.4	0.011	146	235	490	420	70	<10	9.03	53	560	8.3	62	1033
6/28/10	7	0.16	51.5	0.009	136	230	475	405	70	<10	8.94	54	585	11.3	71	1009
9/30/10	6.7	<.05	52	0.013	141	231	485	455	30	<10	8.77	49	540	14.7	81	984
11/3/10	7.8	0.25	59.6	0.028	135	265	500	480	20	<10	8.67	39	540	15.7	80	996
3/18/11	8.2	0.2	60.7	0.014	136	270	530	470	60	<10	9.07	37	565	9.3	70	1035
6/28/11	7.58	0.625	63.4	0.017	141	280	515	465	50	<10	8.61	44	555	11.1	70	1017
9/30/11	8.51	0.06	60.3	0.013	135	269	470	470	30	<10	8.9	45	505	14.9	84	981
11/29/11	8.63	0	65.7	0.019	138	292	580	580	40	0	9.03	27	460	12.6	86	999
3/27/12	7.18	0	59.7	0.018	123	264	485	485	80	0	8.98	10	565	14	86	1050
6/27/12	6.59	0.061	57.6	0.021	120	253	540	540	60	0	8.89	0	505	18.8	89	1039
9/28/12	7.59	0.109	58.3	0.021	122	259	525	525	<10	<10	8.8	<10	445	13.7	84	1009
12/11/12	7.89	<.05	63.6	0.016	126	282	480	480	70	<10	8.97	<10	415	9	102	1016
3/13/13	6.83	0.061	62.5	0.02	123	275	525	525	<10	<10	8.98	<10	590	9.2	90	1053
6/5/13	6.99	<.05	61.9	0.028	124	272	570	570	20	<10	8.89	<10	485	12.8	79	1010
9/25/13	7.37	<.05	61.6	0.02	122	272	570	570	60	<10	8.82	<10	1800	18.1	79	958
12/19/13	8.56	<.05	69	0.029	133	306	590	590	<10	<10	8.93	<10	455	8.4	80	1029
3/28/14	8.02	<.05	62.4	0.032	122	277	532	408	124	<10	8.83	<10	510	11.1	77	1004
6/23/14	7.77	<.05	63.3	0.035	120	280	545	435	110	<10	8.79	<10	555	14.4	89	988
9/26/14	6.41	<.05	60.6	0.045	118	265	530	440	90	<10	8.68	<10	550	13.9	95	962

Analysis Data

#1 Upgradient Monitor Well

GCC Energy, LLC
2014 Annual Hydrology Report
King II Mine

October 20, 2014

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1/3/05	97.3	<.05	99.3	0.377	31.9	652	405	405	<10	<10	7.81	190	505	4.7	26	1051
3/17/05	81.4	<.05	77.5	0.372	25.4	522	376	376	<10	<10	7.7	195	625	5.3	2	1061
6/6/05	66.2	<.05	60	0.257	23.6	412	324	324	<10	<10	7.69	126	495	16.4	11	827
8/5/05	55.9	<.05	53.1	0.192	19.4	358	286	286	<10	<10	7.81	108	410	16.5	79	752
12/2/05	76.4	<.05	73.2	0.189	23.4	492	362	362	<10	<10	7.52	176	610	9.8	83	992
3/27/06	78.5	<.05	75.7	0.04415	26.7	508	400	400	<10	<10	7.81	205	605	7.2	88	1051
6/28/06	72.6	<.05	73.5	0.212	25.2	484	362	358	<10	<10	7.8	185	540	13.9	101	987
8/30/06	75.9	<.05	75.9	0.123	25.7	502	388	372	16	<10	7.93	175	435	17.5	84	998
12/6/06	67.6	0.18	61.1	0.212	23.7	420	420	420	<10	<10	7.75	161	515	10.2	82	970
3/12/07	65.1	<.05	66.6	0.027	22.6	437	430	430	<10	<10	7.64	115	435	9	97	950
6/30/07	66.4	<.05	66.5	0.047	22.5	440	410	400	10	<10	7.66	115	495	15.9	97	917
9/2/07	70.3	<.05	69.3	0.933	23.8	461	420	410	10	<10	7.74	128	485	18.4	114	916
12/6/07	63.2	<.05	64.4	0.061	21.7	423	385	325	60	<10	7.88	130	485	10.5	116	930
3/31/08	63.2	<.05	69.5	0.032	21.9	444	410	410	<10	<10	7.68	134	440	8.1	96	931
6/30/08	63	<.05	70.2	0.014	24	446	400	400	<10	<10	7.91	138	515	17.9	22	901
8/19/08	66.2	<.05	72.4	<.005	24.4	463	400	400	<10	<10	7.79	128	460	20.4	89	905
10/9/08	69.4	<.05	74.9	0.117	23.8	482	430	410	20	<10	7.8	138	520	15.7	99	920
3/5/09	69.2	<.05	75.3	0.013	26.1	483	405	405	<10	<10	7.78	132	550	7.8	80	948
5/21/09	63.3	<.05	68.3	0.005	23	439	385	385	<10	<10	7.77	126	485	12.6	40	923
9/8/09	47.8	<.05	47.9	0.009	14.9	317	278	278	<10	<10	7.81	69	345	17.6	67	633
11/26/09	58.2	<.05	54.2	0.006	17.3	369	320	292	28	<10	8.4	102	355	11.5	72	388
3/31/10	75.8	<.05	74.5	0.0015	24.1	496	174	138	36	<10	7.9	150	565	6.9	19	495
6/28/10	49.8	<.05	44.1	0.01	14.6	306	266	292	<10	<10	7.79	83	400	17.3	12	653
9/30/10	56.5	<.05	51.4	<.005	13.6	353	288	284	<10	<10	7.58	102	400	15.6	58	700
11/3/10	65.6	<.05	57.7	0.015	14.6	401	320	320	<10	<10	7.9	104	405	14	55	754
3/18/11	76.7	<.05	67.4	0.017	22.8	469	378	378	<10	<10	7.75	108	500	8.1	60	921
6/28/11	50.8	<.05	43.1	0.013	13.5	304	265	265	<10	<10	7.81	76	310	18.5	41	587
9/30/11	49	<.05	41.9	0.012	12.8	295	226	226	<10	<10	7.79	76	305	15.8	71	590
11/29/11	68.4	<.05	57.4	0.005	15.8	407	312	312	<10	<10	8.01	100	335	11.7	62	770
3/27/12	58.4	<.05	51	0.078	19	356	310	310	<10	<10	7.95	88	495	14.6	72	735
6/27/12	56.7	<.05	49.7	0.005	19.2	346	320	320	0	0	7.84	84	210	15.7	92	733
9/28/12	60.1	<.05	52.6	0.396	19.1	367	328	328	<10	<10	8.05	92	320	14.1	83	771
12/11/12	69	<.05	63.4	0.014	21.8	434	358	358	<10	<10	8.19	100	360	9.6	112	970
3/13/13	64.4	<.05	62.8	0.007	21.5	419	348	348	<10	<10	8.07	100	565	10.2	100	847
6/5/13	68.5	<.05	62.8	<.005	20.3	430	334	334	<10	<10	8.23	104	420	12.4	65	805
9/25/13	65.2	<.05	62.3	<.005	19.8	419	336	336	<10	<10	8.34	88	455	16.6	54	812
12/19/13	92.3	<.05	86.3	0.005	24.9	586	396	396	<10	<10	7.87	172	495	7.1	69	1054
3/28/14	68.2	<.05	68.8	<.005	21.5	454	366	366	<10	<10	7.9	116	450	5.6	64	874
6/23/14	68.6	<.05	67.5	0.308	21.5	449	344	344	<10	<10	7.93	112	545	20.1	68	853
9/26/14	61.3	<.05	63.4	0.125	20.5	414	320	320	<10	<10	7.9	112	635	15.8	42	826

Analysis Data

#2 Downgradient Monitor Well

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1/3/05	48.4	0.05	15.6	<.005	6.1	185	103	103	<10	<10	7.93	57	45	1.7	N/A	348
3/17/05	42.4	0.06	13.1	0.008	5.5	160	102	100	<10	<10	8.16	67	220	8	N/A	369
6/6/05	36.3	0.07	14.4	0.005	6.3	150	98	96	<10	<10	8.32	62	205	12.4	N/A	331
8/5/05	39.7	0.08	15.8	<.005	7	164	123	121	<10	<10	8.04	62	185	14.9	N/A	382
12/2/05	78	0.05	44.5	0.008	21.3	378	252	240	12	<10	8.06	162	490	2.9	N/A	840
3/27/06	48.7	0.05	21.5	0.00666	9.4	210	139	133	<10	<10	8.32	96	280	6.3	N/A	495
6/28/06	76.6	<.05	40.8	0.009	17.7	359	218	202	16	<10	8.45	185	420	20.3	N/A	768
8/30/06	41.8	<.05	15.1	0.005	6	167	101	97	<10	<10	8.58	77	195	23	N/A	373
12/6/06	73.6	0.06	38.4	0.086	16.1	342	220	220	<10	<10	8.12	189	435	3.2	N/A	843
3/12/07	53.9	<.05	29.7	0.006	11.5	257	180	158	22	<10	8.64	130	270	12.5	N/A	600
6/30/07	33.3	0.24	10.5	0.009	4.1	126	89	87	<10	<10	8.92	44	140	23	N/A	282
9/2/07	28.2	0.1	7.1	0.007	2.3	100	82	80	<10	<10	7.75	30	95	19.3	N/A	233
12/6/07	33.8	0.053	10.8	<.005	4.1	128	84	84	<10	<10	7.97	57	140	3	N/A	349
3/31/08	38.8	0.06	15	0.007	4.9	159	107	91	16	<10	8.58	72	140	12.4	N/A	384
6/30/08	26.1	0.15	9.2	0.009	3.6	103	89	89	<10	<10	8.27	25	125	19.3	N/A	248
8/19/08	33.6	<.05	11.4	<.005	4.4	131	103	101	<10	<10	8.06	44	145	14.9	N/A	306
10/9/08	35.1	0.08	10.9	<.005	4.2	133	102	98	<10	<10	8.19	42	120	14.1	N/A	302
3/5/09	79	<.05	48	<.005	18.7	395	252	236	16	<10	8.34	164	460	3.9	N/A	815
5/21/09	20.4	<.05	5.3	<.005	2.1	73	54	54	<10	<10	7.87	22	95	12.9	N/A	163
9/16/09	34.4	<.05	9.5	<.005	3.7	125	93	91	<10	<10	8.01	40	155	15.9	N/A	280
3/31/10	49.9	<.05	20.7	<.005	8.5	210	130	124	<10	<10	8.24	88	270	8.6	N/A	495
6/28/10	40.1	<.05	10.7	0.006	4.6	144	120	120	<10	<10	8.03	43	215	19.2	N/A	332
9/30/10	35	<.05	8.4	<.005	3.5	122	92	90	<10	<10	7.95	36	170	17.8	N/A	277
11/3/10	39.9	0.2	11.5	0.008	4.4	147	101	99	<10	<10	8.19	49	170	8.7	N/A	337
3/18/11	54	<.05	22.7	<.005	9.3	228	143	141	<10	<10	8.25	86	245	7.4	N/A	501
6/28/11	29.3	0.072	9.32	0.005	17.2	112	120	120	<10	<10	8	27	140	14.2	N/A	196
9/30/11	38.4	<.05	11.2	<.005	4.85	142	105	105	<10	<10	8.12	42	115	12.2	N/A	307
11/29/11	41	ND	14.8	ND	5.58	163	108	108	ND	ND	8.25	56	120	4.7	N/A	367
3/27/12	41.4	ND	15.6	ND	5.94	168	111	111	ND	ND	8.29	68	230	16.9	N/A	389
6/27/12	43.5	0	25.5	0.008	8.85	214	149	149	0	0	8.47	70	225	17.8	N/A	503
12/11/12	72.9	<.05	26.9	0.005	11.8	293	200	200	<10	<10	8.41	108	250	1	N/A	757
3/13/13	90.6	<.05	41.4	0.008	16	397	266	266	<10	<10	8.34	142	545	4.9	N/A	856
6/5/13	32.1	<.05	9	0.006	4.03	117	85	85	<10	<10	8.25	39	20	18	N/A	663
9/25/13	37	<.05	11.2	0.008	4.21	139	101	101	<10	<10	8.18	40	165	15.3	N/A	326
12/19/13	102	<.05	46.3	0.019	19.6	445	304	300	<10	<10	8.28	134	420	3.1	N/A	865
3/28/14	46.6	<.05	16.9	0.008	6.74	186	138	138	<10	<10	8.24	65	250	8	N/A	426
6/23/14	36.2	<.05	9.47	<.005	3.82	129	88	88	<10	<10	8.23	31	200	18.1	N/A	272
9/26/14	31.4	<.05	7.55	<.005	3.17	109	77	77	<10	<10	8.22	40	195	15.2	N/A	282

Analysis Data

#3 Hay Gulch Ditch

December 22, 2014

CDS
Environmental Services

Environmental Chemistry
Site Sampling & Testing
Site Assessments
Strategic Planning
Soil & Geochemistry
Safety Assessments
Contract Research
Wetland Remediation
Reclamation Services

P.O. Box 4124
Durango, CO 81302
1·800·553·6266

cdsenviro@frontier.net

Tom Bird
Manager of Coal Services
GCC Energy, LLC
6473 County Road 120
Hesperus, CO 81326

Sent via email to tbird@gcc.com

RE: Review of Annual Hydrology Report

Dear Mr. Bird,

As per your request, Dr. Joe Bowden of our office reviewed the water sampling data from both the King I and the King II mines monitoring wells/sites. This review is to address any trends and/or areas of concern, which are evident from an analysis/interpretation of the presented data.

The data submitted to the State of Colorado, Division of Reclamation, Mining and Safety was reviewed to determine any trends. In most cases, the trends are represented by analytical values with high degrees of variability from quarter to quarter and year to year. The paradox found in this data is that most of the trends are flat and in many cases exhibiting large standard deviations. Nevertheless, it is our professional opinion that many of the trends are real and are discussed below.

As to the question are these trends a result of the mining activities at either King I or King II, it is again our professional opinion that these trends are not a result of mining activities at either King I or King II mines. The single constant observation over the monitoring cycles is a very high degree of analytical variability which tends to follow the dry/wet cycles of precipitation observed in Southwest Colorado. Some of these cycles are profound in their degree of variability. For example, the water levels measured in the King II Down-gradient monitoring well varied from near artesian [2 inches below top of well] to a depth of more than 110 inches below top of well.

The southwest setting of these mines are at the interface of two regional environs, the northern edge of the high desert/piñon-juniper ecosystems, and southern edge of the low alpine/Gambel Oak-Ponderosa Pine zone. This interface is noted for unpredictable precipitation events, driven by decade long regional warming and cooling cycles. For example, the annual rainfall for three nearby towns, demonstrate this unpredictable nature. Durango, CO has a ten-year average rainfall of around 21 inches, Cortez, CO comes in at around 12 inches, while Farmington, NM is only about 9 inches.

The current weather cycle is in a warming phase. With this trend increased evaporation rates coupled with reduced precipitation can produce upward trends in the concentration of selected analytes due to a simple reduction in supplies of water.

CDS subjected the analytical data to trend analysis using formulas within Excel®. Each data set was analyzed for best fit using linear, polynomial and exponential methods. In all but three cases the linear trend analysis provided the best fit. Because many of the reported parameters vary considerably from quarter to quarter, trend analysis will provide a mathematical trend which may or may not be statically significant. For example, in the King II Up-gradient monitoring well, the sampled Manganese levels exhibit a high degree of variability. Even with this variability there is a significant ten year upward trend in Manganese concentration from about 0.005 mg/L to about 0.035 mg/L. However, other parameters also demonstrate linear trends, but because of high variability the trend may not be statically significant. That being said, in some cases it is our professional opinion that a particular trend may be real over longer periods of time, such as 10+ years.

Precipitation history and tree ring analysis indicates the area around both King I and King II mines is plagued by cycles of wet and dry that run for a few years up to decades. Even with the cycles much of the precipitation comes in the form of short lived downpours which can deposit ¼ or more of the annual average rainfall in a single event. This makes the interpretation of quarterly water analysis difficult at best.

Since all sampling wells derive their water from the Hay Gulch alluvial floor they may share a similar wet-dry cycle. In addition, the Hay Gulch Ditch, which derives its water from the La Plata River, will reflect its flow and chemistry variations. The Hay Gulch valley floor receives water from all slopes draining into its alluvium. Its chemistry will reflect the surface leaching of the exposed shale, mudstone, and sandstone outcroppings along the valley walls. Each of these two sources of water are different. The La Plata River drainage comes from alpine zones where minerals are slowly derived from hard rock formations, while the runoff into the valley floor comes from contained shale, mudstone and sandstone formations which tend to leach minerals quickly. So it is safe to assume the King I & II monitoring sites derives there water from more than a single source. This "mixing" of water sources can and does produce a complex family of water types, which are seen in these monitoring sites.

Section Summary: Conditions supporting the sampling sites for both King I and King II Mines are such that great variations in water chemistry can be expected. Trend analysis of reported quarterly sampling yields linear or polynomial plots which in some cases are significant.

Summary of analytical data:

CDS will summarize below the analytical data from each sampling site and provide limited interpretation of the data provided by GCC monitoring. A summary and conclusions are seen at the end of this section.

- King I Mine – Haugen Well – Only sampled between 8/1/2000 and 12/1/2006. There is significant trend upward in water temperature. Data on water depth is not available to correlate with ground temperature. A downward trend in TDS and field EC suggests an influx of low TDS warmer water into this well.

- King I – Wiltze Well – Sampled since 2/1/1982. This well demonstrates a significant fall in the water table servicing this well, suggesting reduced annual rainfall in the Hay Gulch drainage. This is mirrored by an increase in Field EC, however the TDS, total Sulfate and Manganese levels are trending downward, suggesting a change in the ionic profile of the water entering the Wiltze monitoring well. Other major anions, cations and pH trends all remain unchanged. CDS is unable to provide an interpretation of this collection of trends, other than the introduction of a water source with lower levels of Manganese and sulfate.

- King II Up-gradient well – Sampled since 1/1/2005. The most evident trend is the lowering of the water table over the nearly ten year sampling period. The average depth to water dropped about twenty-five inches. This trend is also found in the King I – Wiltze Well, which is located about one mile to the east in the floor of Hay Gulch. The chemistry of this well has varied considerably during its almost ten years of sampling. For example, the levels of Magnesium and Manganese have increased about ten-fold, while the TDS remained almost level. Slight reductions are seen in Iron [from about 0.15 mg/L in 2005 down to non-detect in 2013-2014] and Sodium [from about 322 mg/L to about 118 mg/L, a 50% reduction] in a bit less than ten years. The reduction of surface water from rain and irrigation will allow other deeper sources of water, with higher levels of cations [hardness], to produce selected increased levels while the overall TDS is reduced.

- King II Down-gradient well – Samples since 1/1/2005. The single most striking observation seen in this monitoring well is the extreme variability of water depth. In four dry periods [2006 through 2008] the water level dropped to 100 inches or lower. These dry years were offset by three very wet years when the water level was very near the surface [2005 at 2 inches; 2008 at 22 inches and 2010 at 12 in inches]. When compared to the up-gradient well, where the trend of water level is downward and significant, this down-gradient well water level has a near level trend, even with its high degree of variability. Even with the down-gradient well's high degree of water depth variability all major anions and cations were almost unchanged. [the slight decrease shown may not be statistically valid]. A single outlier is the reduction in Manganese which has a valid downward trend from around 0.2 mg/L to almost non-detectable [0.005 mg/L to ND].

- King II Hay Gulch Ditch – Sampled since 1/1/2005. As seen in other monitoring wells all tested parameters exhibit high degrees of variability from quarter to quarter and from year to year. When trend analysis is performed, the trends are essentially flat, for all monitored anions and cations, across the nearly ten year monitoring period. The notable exception is sulfate which demonstrated a significant reduction from about 90 mg/L to below 60 mg/L, suggesting a reduction in leached sulfate from the sulfate laden soils [derived from shales and mudstones] that line the Hay Gulch alluvium. The variability of Hay Gulch Ditch measured parameters strongly resembles the dry years seen in the monitoring wells, suggesting the ditch also receives rain leachate in addition to the water it receives from the La Plata River.

Summary and conclusions:

The environ encompassing the King I and King II Mines is a microcosm of complexity. The waters which enter this environ come from several sources. In addition the chemical signatures of these sources vary over time. Low TDS water from the La Plata River, via the Hay Gulch Ditch can mix with regional rainwater and existing shallow aquafers to produce mixed and ever changing water sources. The data used in this monitoring report is a series of "snapshots" taken quarterly. The analysis of these snapshots gives a different assortment of data points each quarter that can and do bounce all over the spectrum. A significant example is the depth to water in the King II Down-gradient Well which in one quarter was almost artesian at 2 inches and in a different quarter dropped to 100+ inches below grade. Another example is the level of Manganese in the King I Wiltze Well. This parameter varies from non-detect up to 2.5 mg/L while showing a significant downward trend over the near ten-year monitoring period.

The single notable finding of the trend analysis is that most parameters remain somewhat constant [linear] over long monitoring cycles, while others trend upward and still others trend downward. Examples of the former are found in the King II Up-gradient well where Calcium, Magnesium, and Manganese trend upward significantly. Examples of the latter is the downward trend in Iron in the King II Up-gradient Well and Manganese in the King II Down-gradient Well.

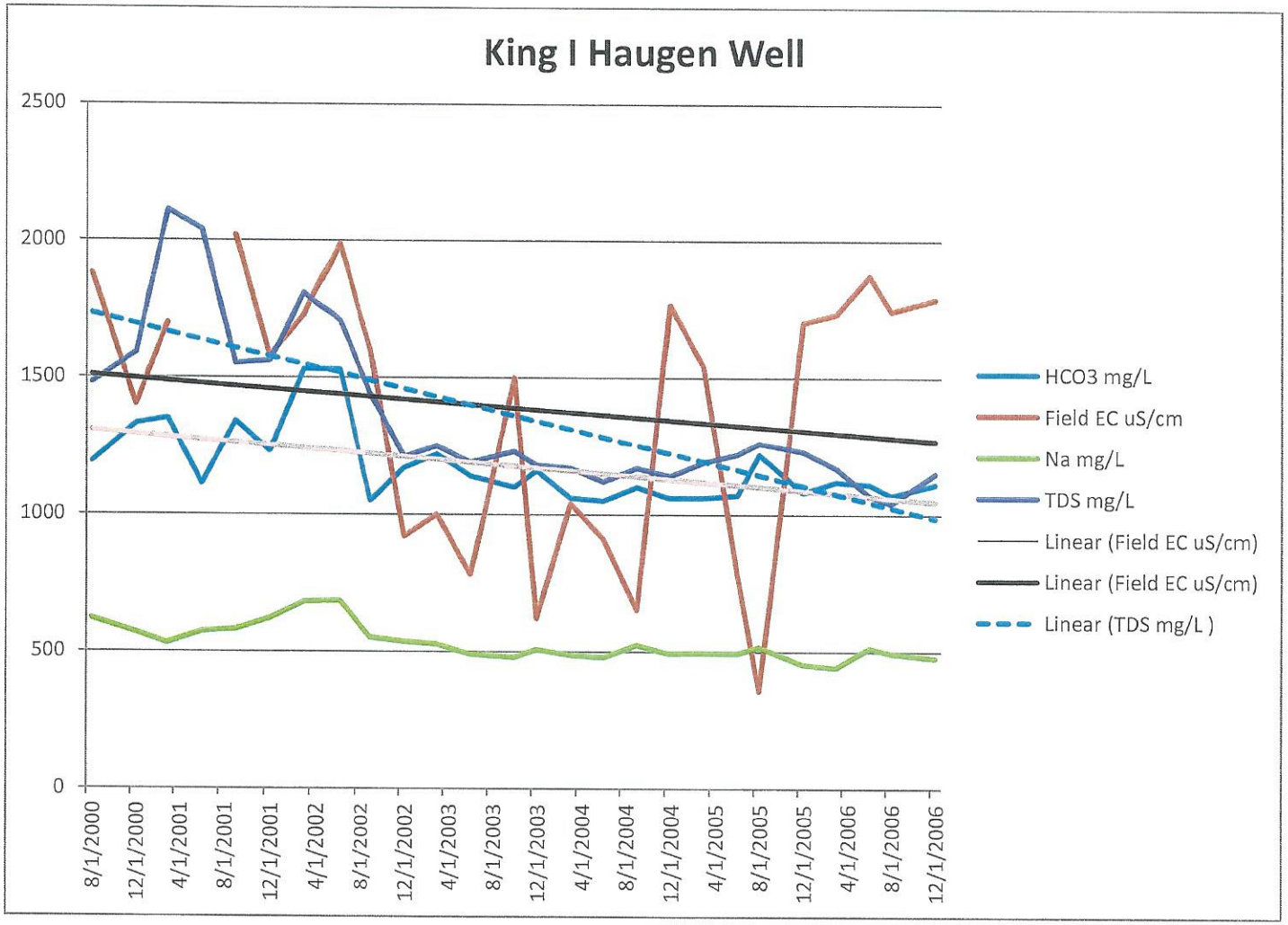
Even though most trends are linear and mostly flat, individual quarterly readings run the gambit from tight clusters around the linear trend to widely varying values along a trend line. This high degree of variability is in keeping with natural occurrences within this environ [Hay Gulch] and not as a result of mining activities

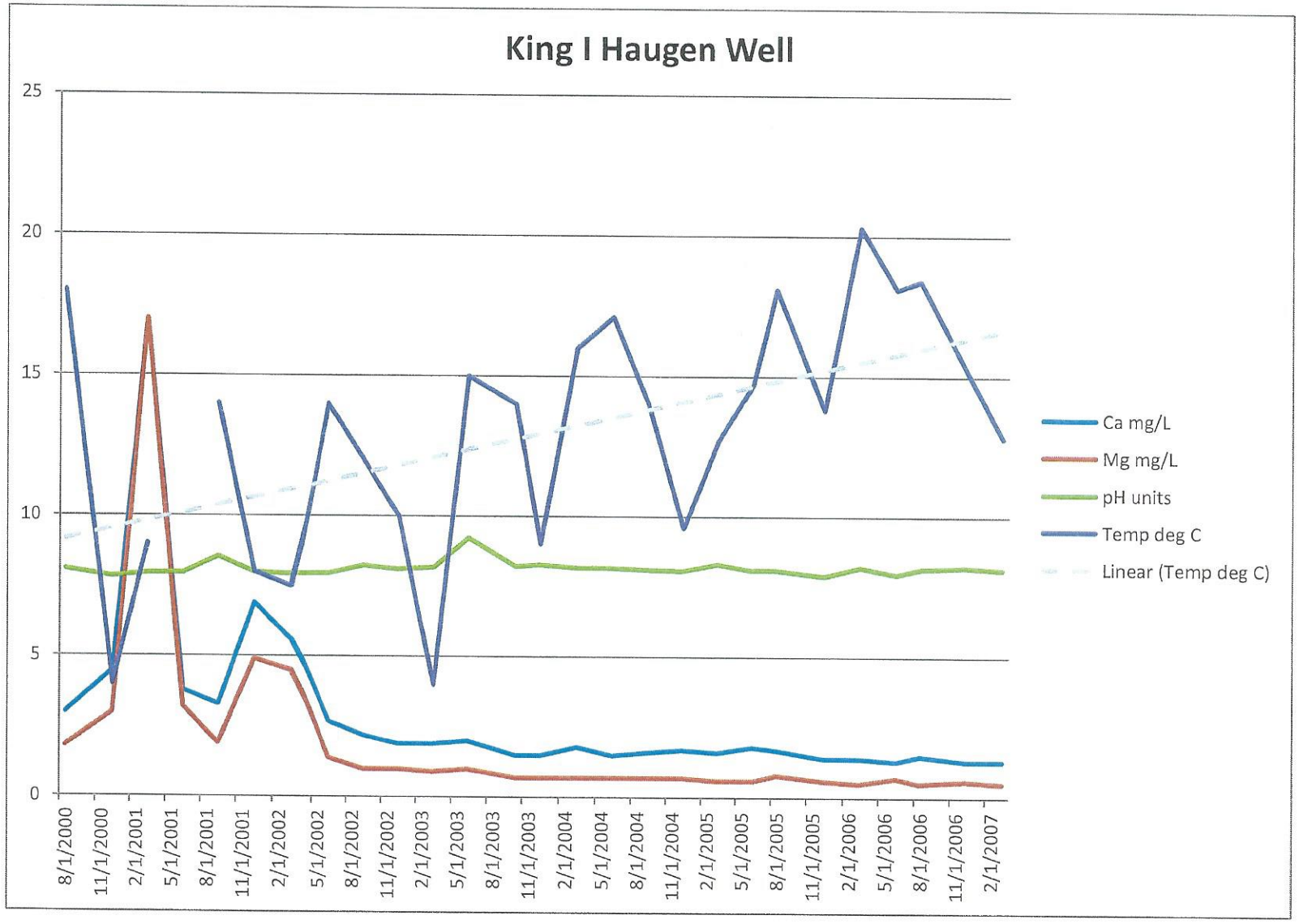
In conclusion: CDS performed trend analysis on all of the data submitted by GCC to the State of Colorado, Division of Reclamation, Mining and Safety and referenced in their letter dated April 21, 2014. The complex nature of the interaction of various water sources within the Hay Gulch environ precludes straightforward interpretations of the presented data. Simple models using precipitation are invalid due to the interaction with highly soluble soils along the Hay Gulch valley and an irrigation ditch carrying low TDS water. Variations in measured parameters are most closely related to what appears to be a long term warming cycle, not related to global warming, where more effects of reduced water supplies and found more often than precipitation driven changes.

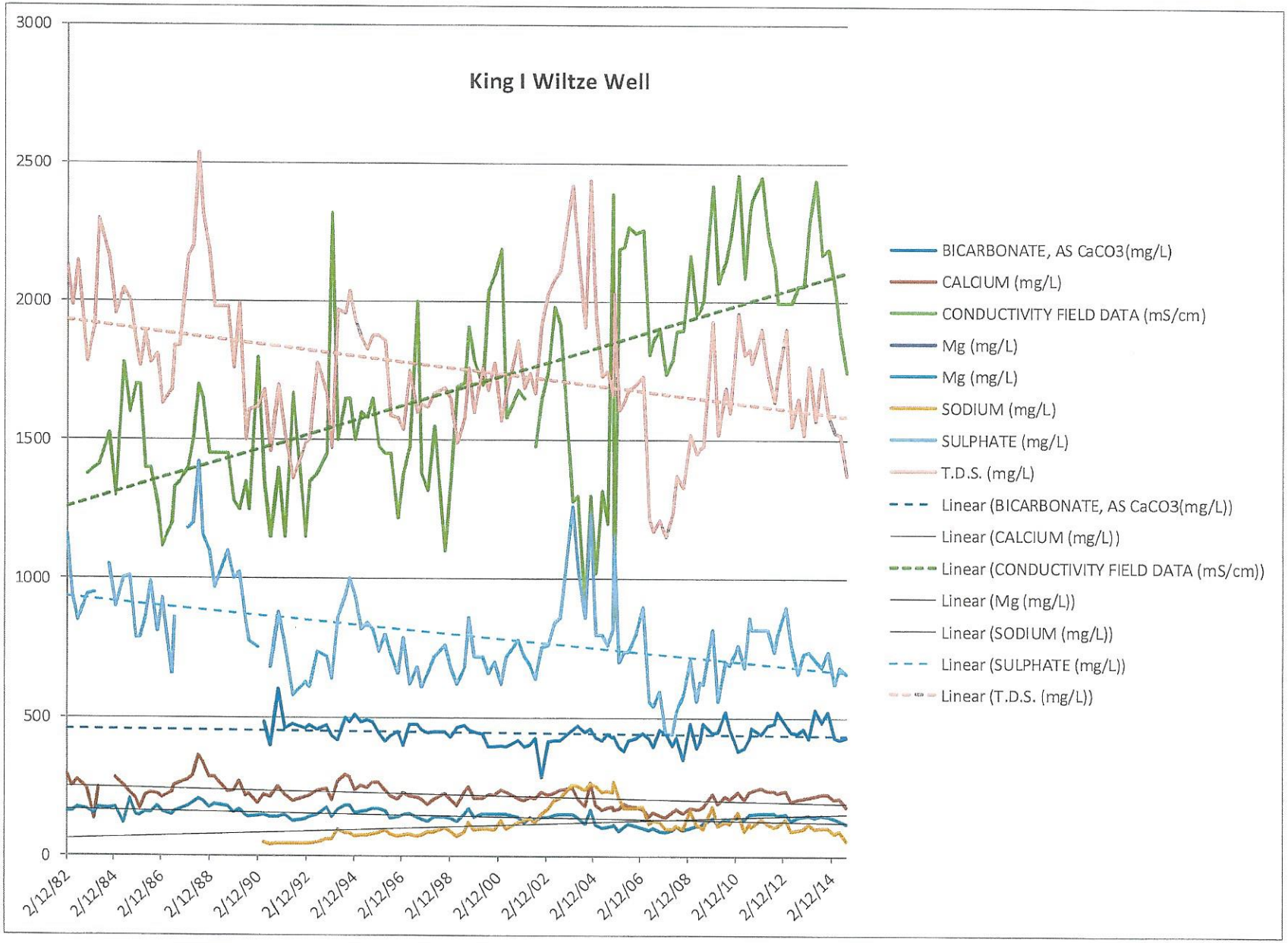
If you have any questions please call. An invoice for our services will follow.

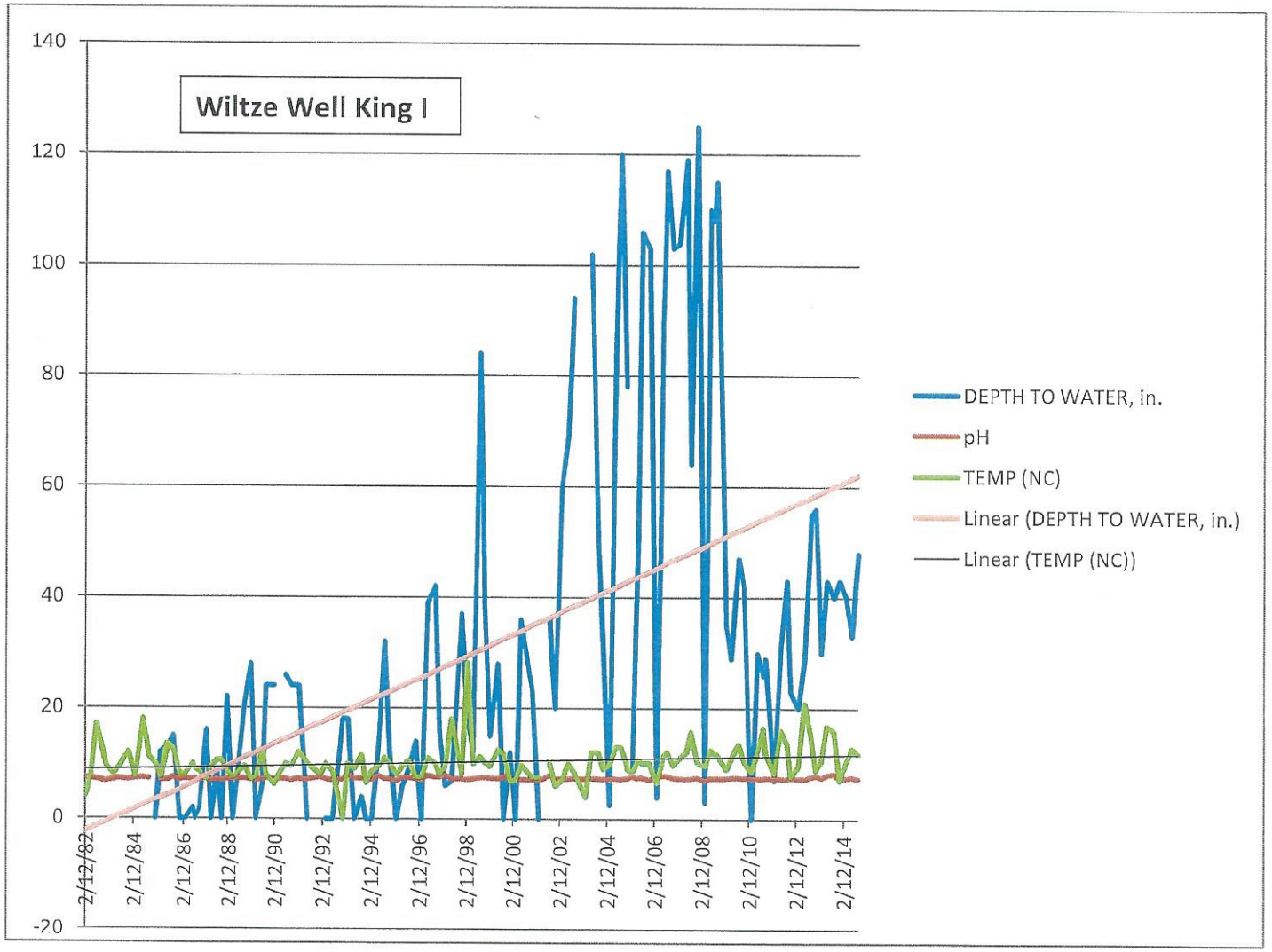
Joe Bowden Ph.D.
Senior Scientist and Partner

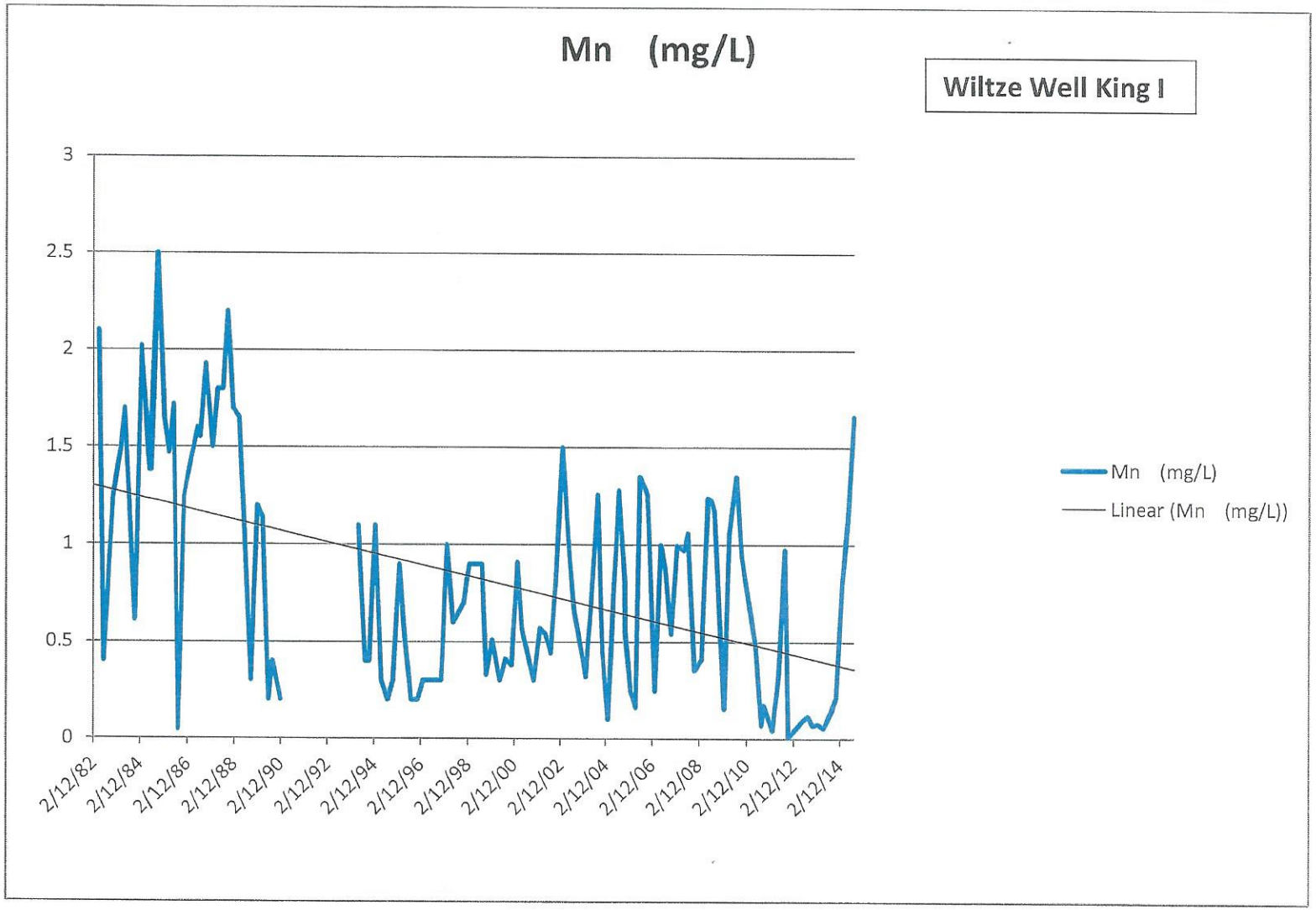
An appendix of all 14 trend plots are attached below.

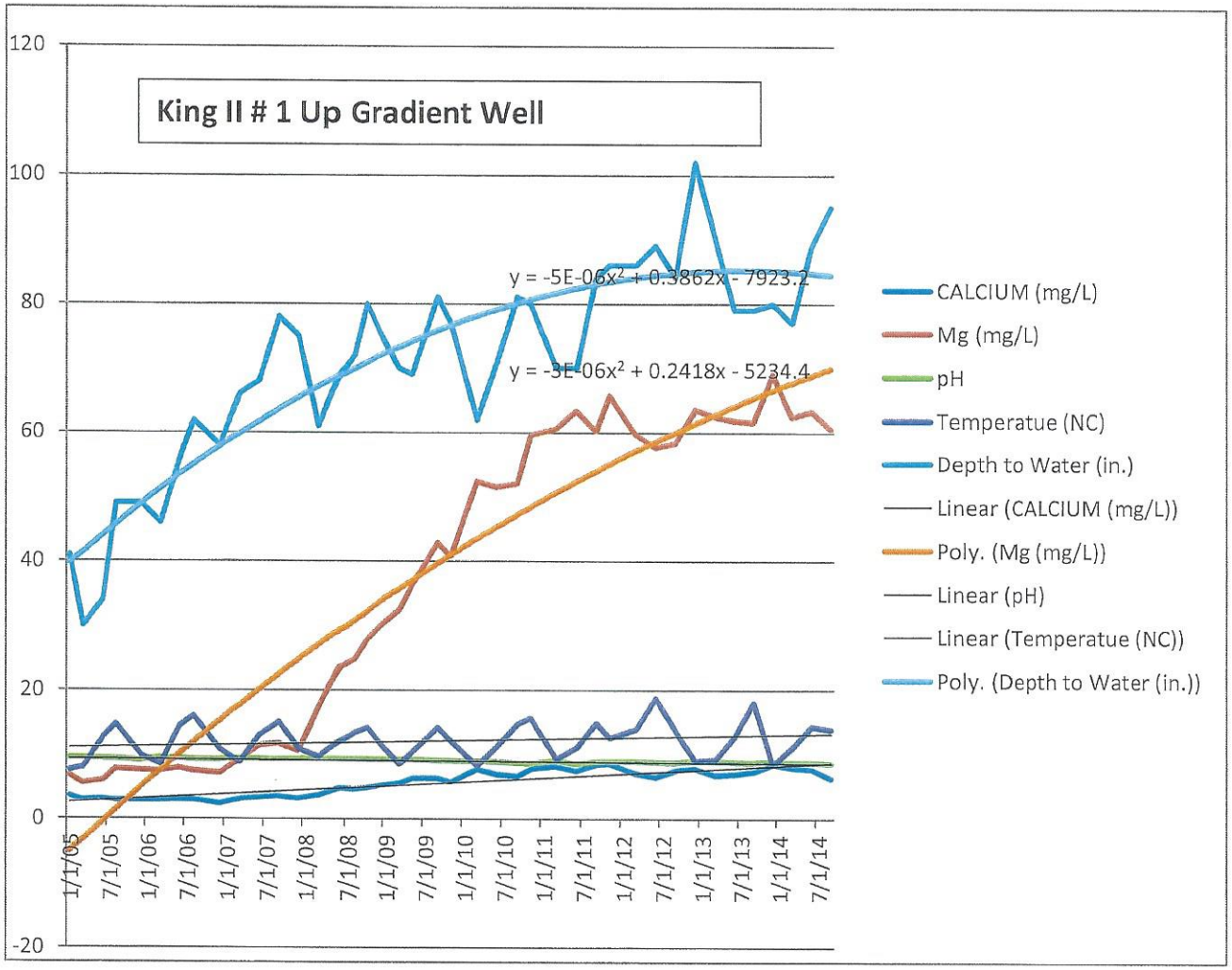

King I Haugen Well
2500
2000
1500
1000
500
0
8/1/2000
12/1/2000
4/1/2001
8/1/2001
12/1/2001
4/1/2002
8/1/2002
12/1/2002
4/1/2003
8/1/2003
12/1/2003
4/1/2004
8/1/2004
12/1/2004
4/1/2005
8/1/2005
12/1/2005
4/1/2006
8/1/2006
12/1/2006
HCO3 mg/L
Field EC uS/cm
Na mg/L
TDS mg/L
Linear (Field EC uS/cm)
Linear (Field EC uS/cm)
Linear (TDS mg/L)

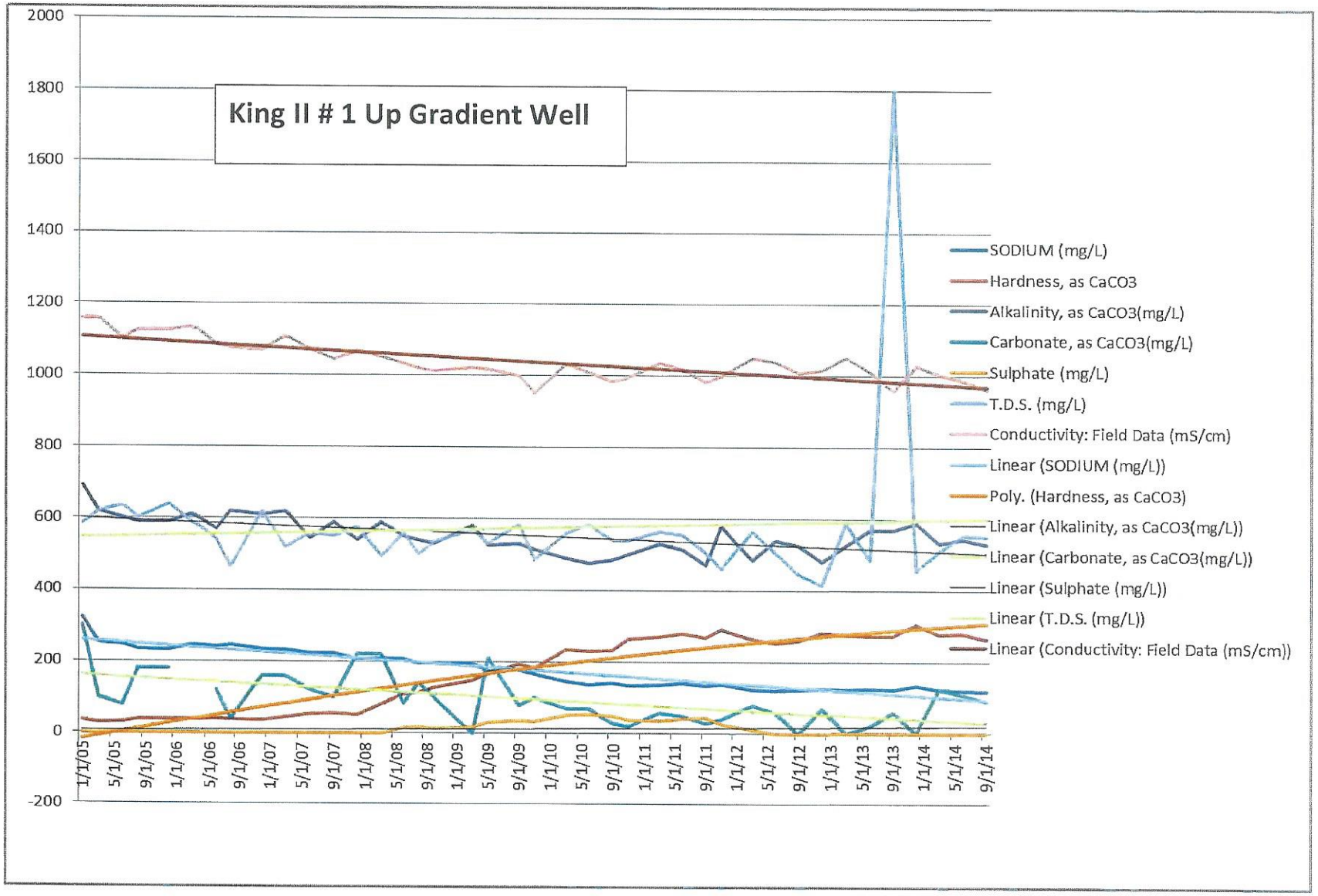

King I Haugen Well
25
20
15
10
5
0
8/1/2000
11/1/2000
2/1/2001
5/1/2001
8/1/2001
11/1/2001
2/1/2002
5/1/2002
8/1/2002
11/1/2002
2/1/2003
5/1/2003
8/1/2003
11/1/2003
2/1/2004
5/1/2004
8/1/2004
11/1/2004
2/1/2005
5/1/2005
8/1/2005
11/1/2005
2/1/2006
5/1/2006
8/1/2006
11/1/2006
2/1/2007
Ca mg/L
Mg mg/L
pH units
Temp deg C
Linear (Temp deg C)

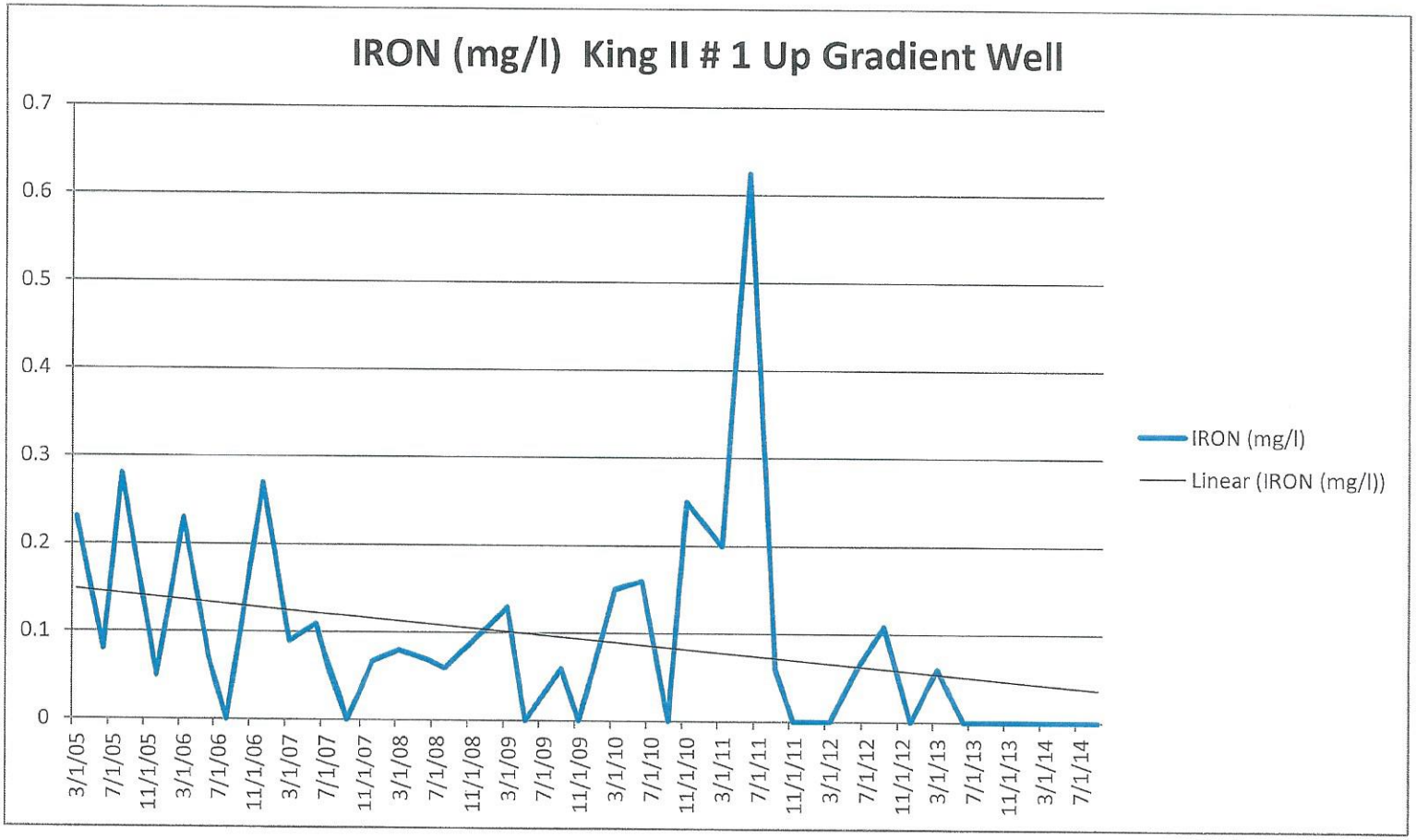

King I Wiltze Well
3000
2500
2000
1500
1000
500
0
2/12/82
2/12/84
2/12/86
2/12/88
2/12/90
2/12/92
2/12/94
2/12/96
2/12/98
2/12/00
2/12/02
2/12/04
2/12/06
2/12/08
2/12/10
2/12/12
2/12/14
BICARBONATE, AS CaCO3(mg/L)
CALCIUM (mg/L)
CONDUCTIVITY FIELD DATA (mS/cm)
Mg (mg/L)
Mg (mg/L)
SODIUM (mg/L)
SULPHATE (mg/L)
T.D.S. (mg/L)
Linear (BICARBONATE, AS CaCO3(mg/L))
Linear (CALCIUM (mg/L))
Linear (CONDUCTIVITY FIELD DATA (mS/cm))
Linear (Mg (mg/L))
Linear (SODIUM (mg/L))
Linear (SULPHATE (mg/L))
Linear (T.D.S. (mg/L))

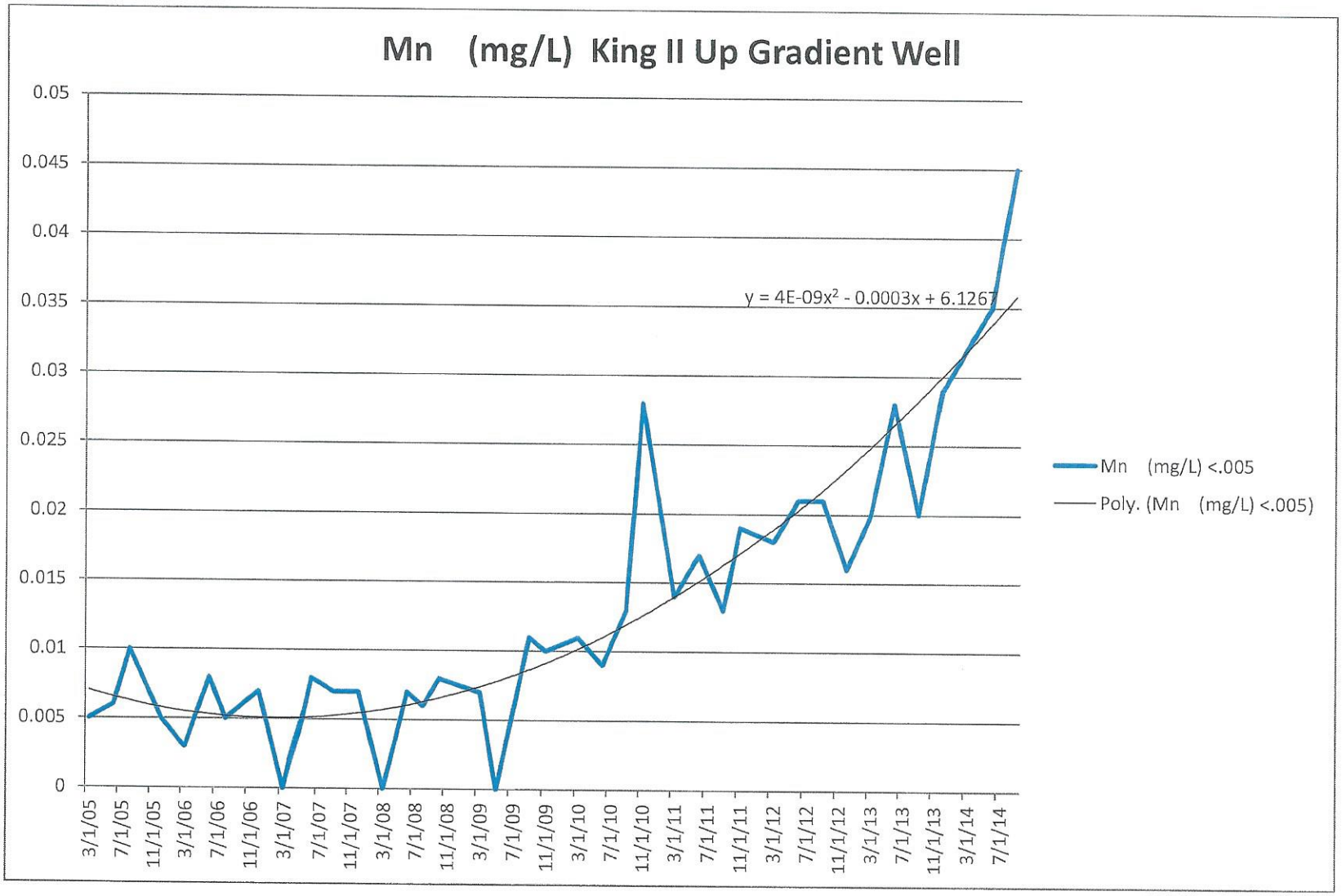

Wiltze Well King I
140
120
100
80
60
40
20
0
-20
2/12/82
2/12/84
2/12/86
2/12/88
2/12/90
2/12/92
2/12/94
2/12/96
2/12/98
2/12/00
2/12/02
2/12/04
2/12/06
2/12/08
2/12/10
2/12/12
2/12/14
DEPTH TO WATER, in.
pH
TEMP (NC)
Linear (DEPTH TO WATER, in.)
Linear (TEMP (NC))

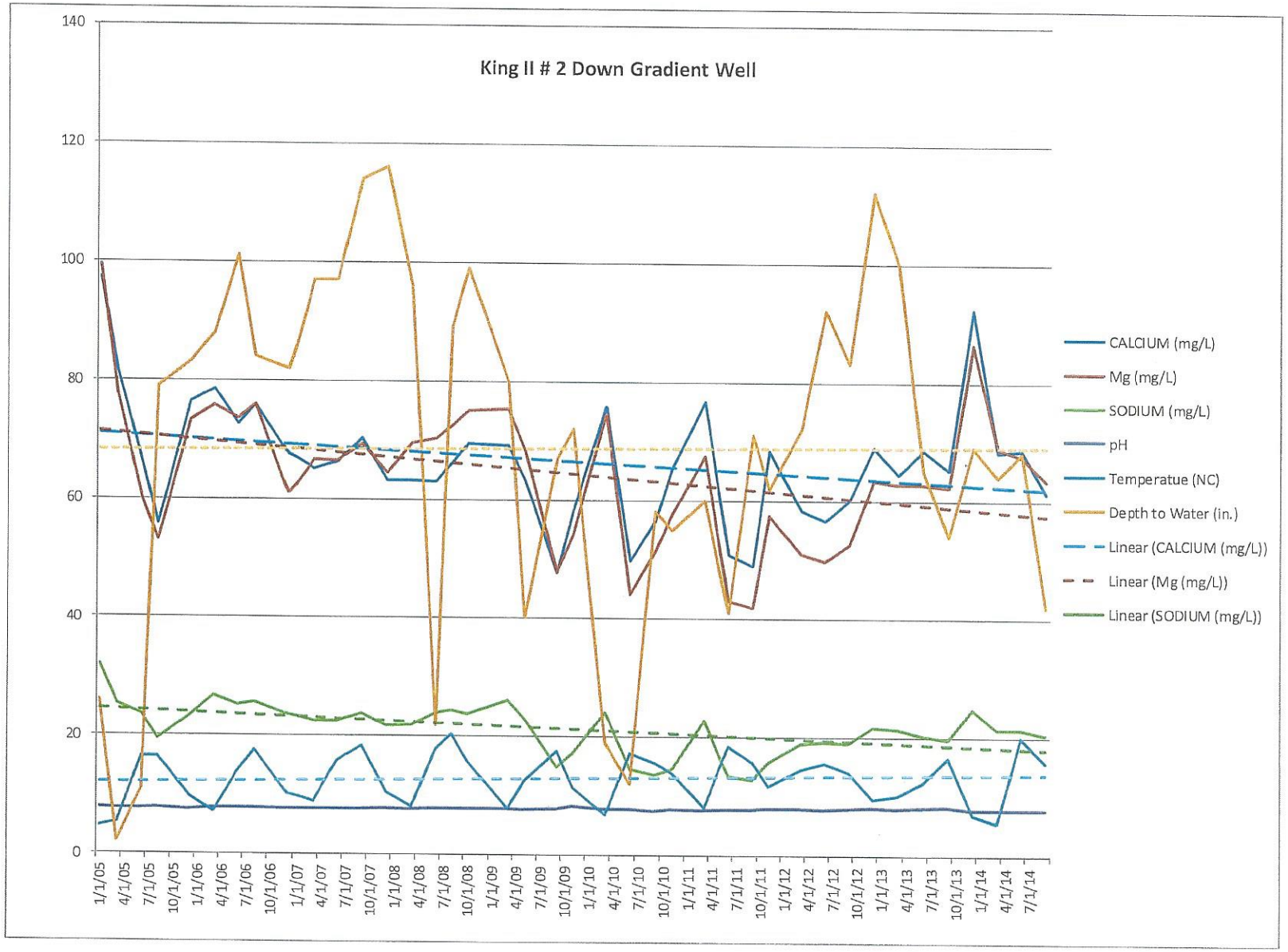

Mn (mg/L)
Wiltze Well King I
3
2.5
2
1.5
1
0.5
0
2/12/82
2/12/84
2/12/86
2/12/88
2/12/90
2/12/92
2/12/94
2/12/96
2/12/98
2/12/00
2/12/02
2/12/04
2/12/06
2/12/08
2/12/10
2/12/12
2/12/14
Mn (mg/L)
Linear (Mn (mg/L))

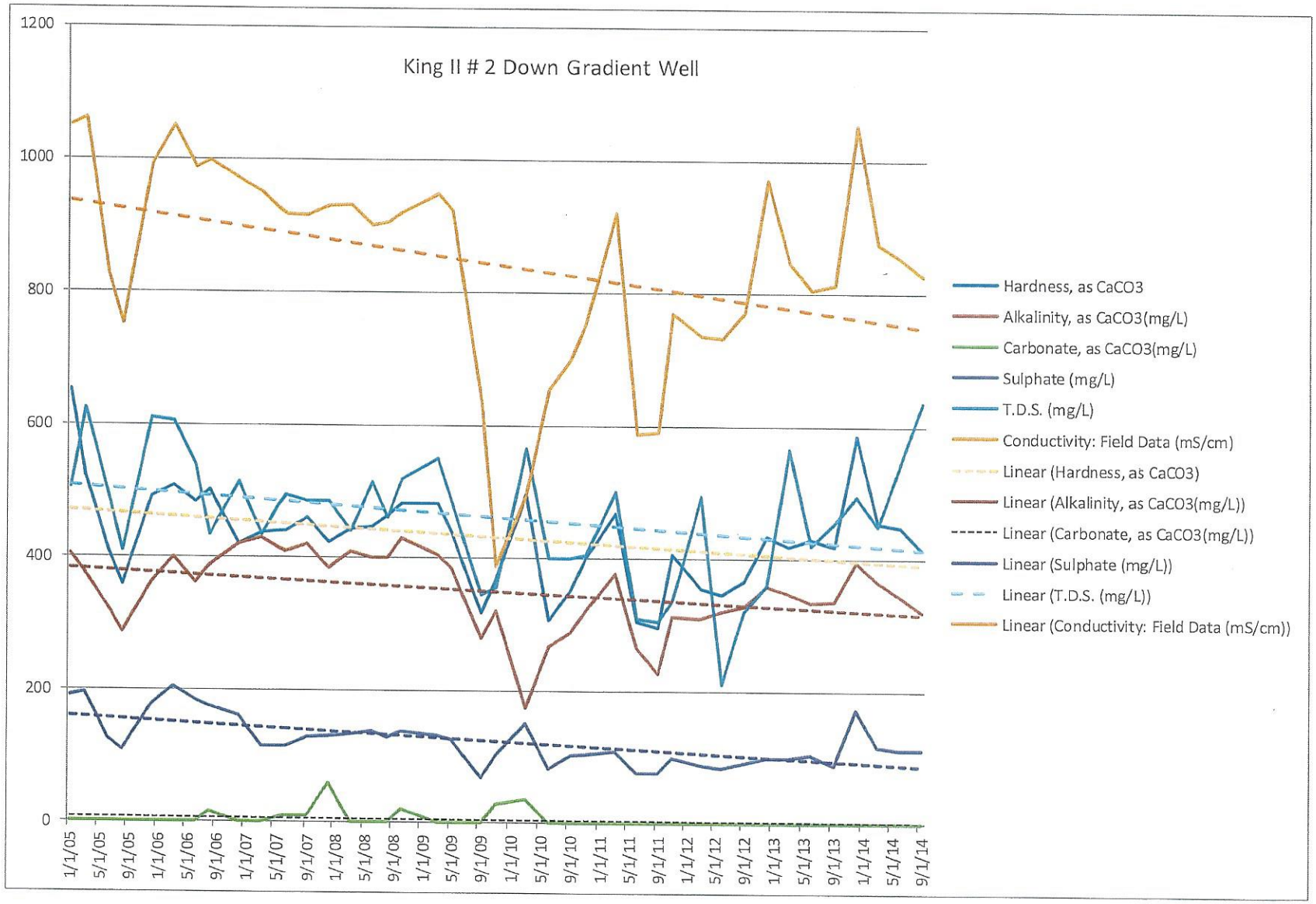

King II # 1 Up Gradient Well
120
100
80
60
40
20
0
-20
y = -5E-06x² + 0.3862x - 7923.2
y = -3E-06x² + 0.2418x - 5234.4
1/1/05
7/1/05
1/1/06
7/1/06
1/1/07
7/1/07
1/1/08
7/1/08
1/1/09
7/1/09
1/1/10
7/1/10
1/1/11
7/1/11
1/1/12
7/1/12
1/1/13
7/1/13
1/1/14
7/1/14
CALCIUM (mg/L)
Mg (mg/L)
pH
Temperatue (NC)
Depth to Water (in.)
Linear (CALCIUM (mg/L))
Poly. (Mg (mg/L))
Linear (pH)
Linear (Temperatue (NC))
Poly. (Depth to Water (in.))

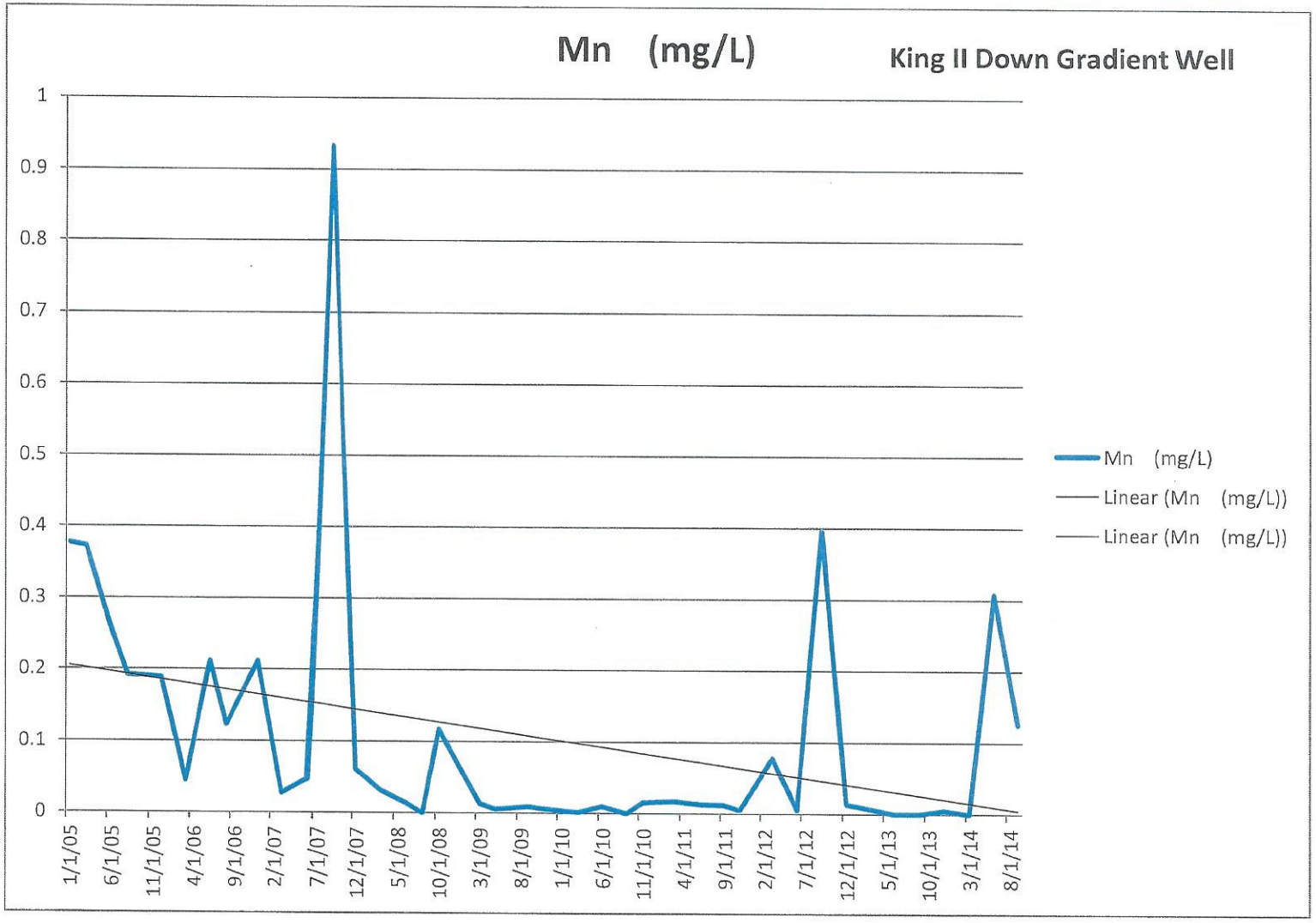

King II # 1 Up Gradient Well
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200
1/1/05
5/1/05
9/1/05
1/1/06
5/1/06
9/1/06
1/1/07
5/1/07
9/1/07
1/1/08
5/1/08
9/1/08
1/1/09
5/1/09
9/1/09
1/1/10
5/1/10
9/1/10
1/1/11
5/1/11
9/1/11
1/1/12
5/1/12
9/1/12
1/1/13
5/1/13
9/1/13
1/1/14
5/1/14
9/1/14
SODIUM (mg/L)
Hardness, as CaCO3
Alkalinity, as CaCO3(mg/L)
Carbonate, as CaCO3(mg/L)
Sulphate (mg/L)
T.D.S. (mg/L)
Conductivity: Field Data (mS/cm)
Linear (SODIUM (mg/L))
Poly. (Hardness, as CaCO3)
Linear (Alkalinity, as CaCO3(mg/L))
Linear (Carbonate, as CaCO3(mg/L))
Linear (Sulphate (mg/L))
Linear (T.D.S. (mg/L))
Linear (Conductivity: Field Data (mS/cm))

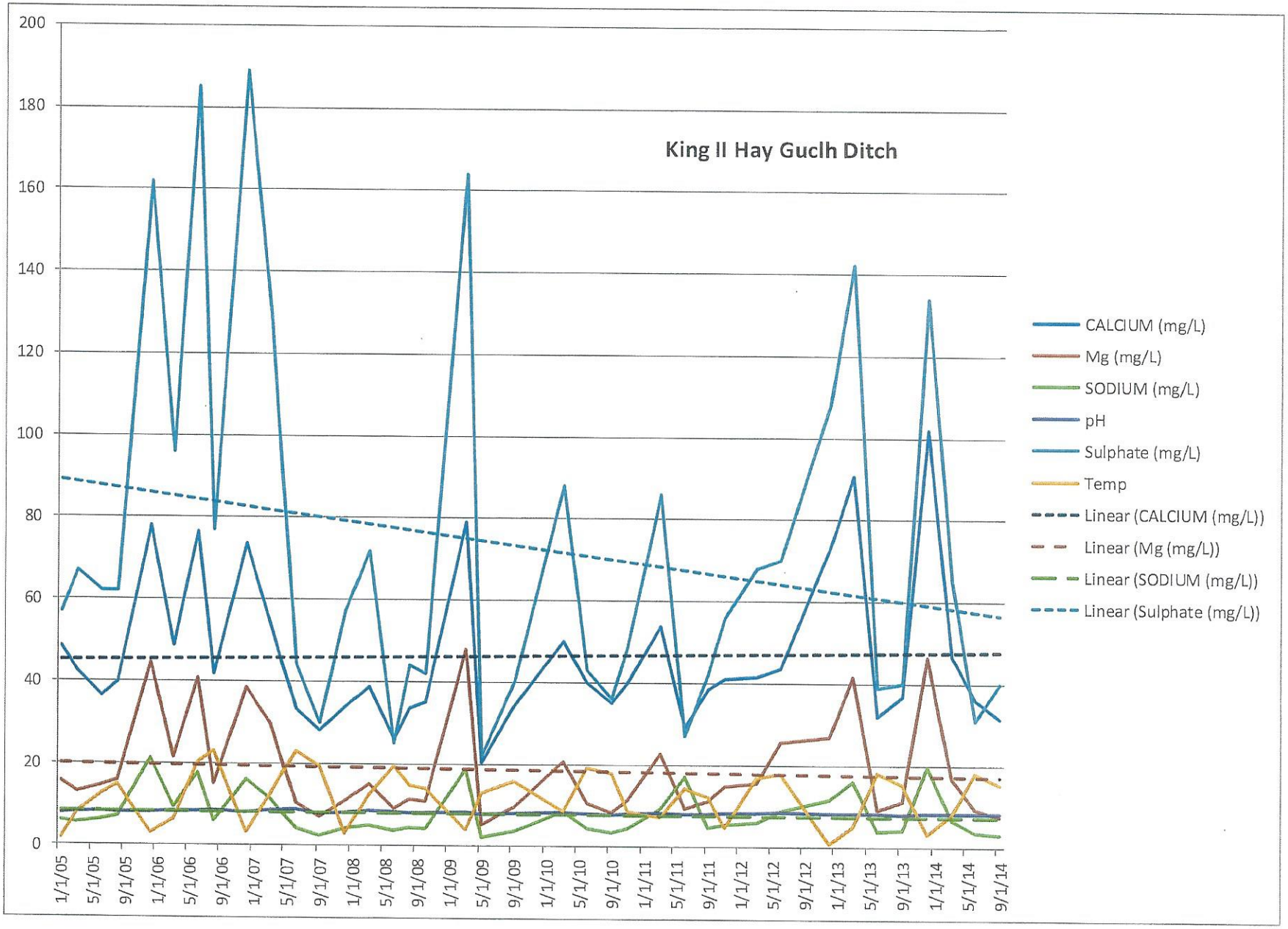

IRON (mg/l) King II # 1 Up Gradient Well
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
3/1/05
7/1/05
11/1/05
3/1/06
7/1/06
11/1/06
3/1/07
7/1/07
11/1/07
3/1/08
7/1/08
11/1/08
3/1/09
7/1/09
11/1/09
3/1/10
7/1/10
11/1/10
3/1/11
7/1/11
11/1/11
3/1/12
7/1/12
11/1/12
3/1/13
7/1/13
11/1/13
3/1/14
7/1/14
IRON (mg/l)
Linear (IRON (mg/l))

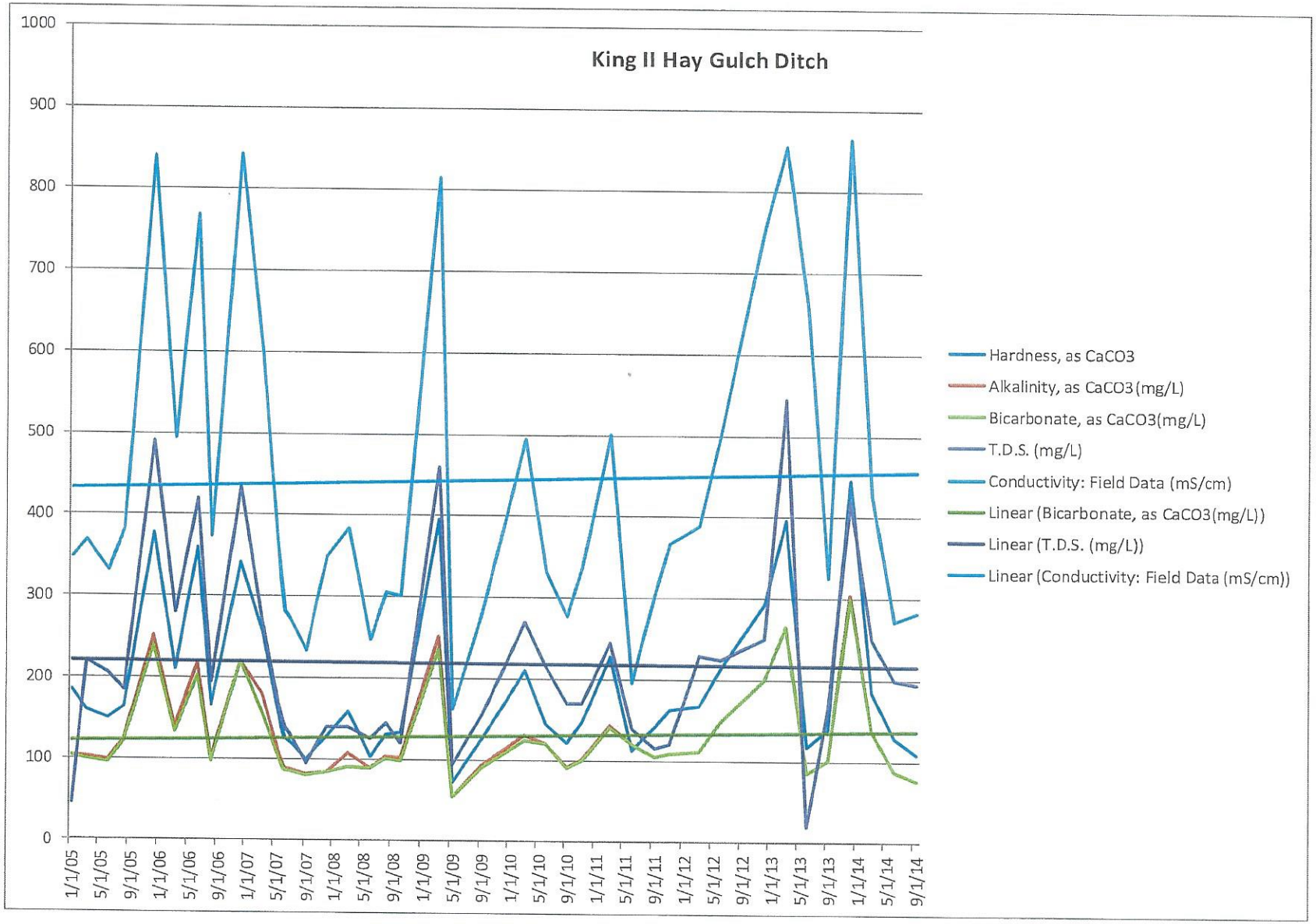

Mn (mg/L) King II Up Gradient Well
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
y = 4E-09x² - 0.0003x + 6.1267
3/1/05
7/1/05
11/1/05
3/1/06
7/1/06
11/1/06
3/1/07
7/1/07
11/1/07
3/1/08
7/1/08
11/1/08
3/1/09
7/1/09
11/1/09
3/1/10
7/1/10
11/1/10
3/1/11
7/1/11
11/1/11
3/1/12
7/1/12
11/1/12
3/1/13
7/1/13
11/1/13
3/1/14
7/1/14
Mn (mg/L) <.005
Poly. (Mn (mg/L) <.005)


King II # 2 Down Gradient Well
140
120
100
80
60
40
20
0
1/1/05
4/1/05
7/1/05
10/1/05
1/1/06
4/1/06
7/1/06
10/1/06
1/1/07
4/1/07
7/1/07
10/1/07
1/1/08
4/1/08
7/1/08
10/1/08
1/1/09
4/1/09
7/1/09
10/1/09
1/1/10
4/1/10
7/1/10
10/1/10
1/1/11
4/1/11
7/1/11
10/1/11
1/1/12
4/1/12
7/1/12
10/1/12
1/1/13
4/1/13
7/1/13
10/1/13
1/1/14
4/1/14
7/1/14
CALCIUM (mg/L)
Mg (mg/L)
SODIUM (mg/L)
pH
Temperatue (NC)
Depth to Water (in.)
Linear (CALCIUM (mg/L))
Linear (Mg (mg/L))
Linear (SODIUM (mg/L))


King II # 2 Down Gradient Well
1200
1000
800
600
400
200
0
1/1/05
5/1/05
9/1/05
1/1/06
5/1/06
9/1/06
1/1/07
5/1/07
9/1/07
1/1/08
5/1/08
9/1/08
1/1/09
5/1/09
9/1/09
1/1/10
5/1/10
9/1/10
1/1/11
5/1/11
9/1/11
1/1/12
5/1/12
9/1/12
1/1/13
5/1/13
9/1/13
1/1/14
5/1/14
9/1/14
Hardness, as CaCO3
Alkalinity, as CaCO3(mg/L)
Carbonate, as CaCO3(mg/L)
Sulphate (mg/L)
T.D.S. (mg/L)
Conductivity: Field Data (mS/cm)
Linear (Hardness, as CaCO3)
Linear (Alkalinity, as CaCO3(mg/L))
Linear (Carbonate, as CaCO3(mg/L))
Linear (Sulphate (mg/L))
Linear (T.D.S. (mg/L))
Linear (Conductivity: Field Data (mS/cm))


Mn (mg/L)
King II Down Gradient Well
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/05
6/1/05
11/1/05
4/1/06
9/1/06
2/1/07
7/1/07
12/1/07
5/1/08
10/1/08
3/1/09
8/1/09
1/1/10
6/1/10
11/1/10
4/1/11
9/1/11
2/1/12
7/1/12
12/1/12
5/1/13
10/1/13
3/1/14
8/1/14
Mn (mg/L)
Linear (Mn (mg/L))
Linear (Mn (mg/L))


King II Hay Guclh Ditch
200
180
160
140
120
100
80
60
40
20
0
1/1/05
5/1/05
9/1/05
1/1/06
5/1/06
9/1/06
1/1/07
5/1/07
9/1/07
1/1/08
5/1/08
9/1/08
1/1/09
5/1/09
9/1/09
1/1/10
5/1/10
9/1/10
1/1/11
5/1/11
9/1/11
1/1/12
5/1/12
9/1/12
1/1/13
5/1/13
9/1/13
1/1/14
5/1/14
9/1/14
CALCIUM (mg/L)
Mg (mg/L)
SODIUM (mg/L)
pH
Sulphate (mg/L)
Temp
Linear (CALCIUM (mg/L))
Linear (Mg (mg/L))
Linear (SODIUM (mg/L))
Linear (Sulphate (mg/L))


King II Hay Gulch Ditch
1000
900
800
700
600
500
400
300
200
100
0
1/1/05
5/1/05
9/1/05
1/1/06
5/1/06
9/1/06
1/1/07
5/1/07
9/1/07
1/1/08
5/1/08
9/1/08
1/1/09
5/1/09
9/1/09
1/1/10
5/1/10
9/1/10
1/1/11
5/1/11
9/1/11
1/1/12
5/1/12
9/1/12
1/1/13
5/1/13
9/1/13
1/1/14
5/1/14
9/1/14
Hardness, as CaCO3
Alkalinity, as CaCO3(mg/L)
Bicarbonate, as CaCO3(mg/L)
T.D.S. (mg/L)
Conductivity: Field Data (mS/cm)
Linear (Bicarbonate, as CaCO3(mg/L))
Linear (T.D.S. (mg/L))
Linear (Conductivity: Field Data (mS/cm))