TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

February 6, 2020

Mr. Zach Trujillo
Environmental Protection Specialist
Colorado Division of Reclamation, Mining & Safety
Department of Natural Resources
1313 Sherman Street, Room 215
Denver, CO 80203

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
2019 Annual Hydrology & Reclamation Report

Dear Mr. Trujillo,

Tri-State Generation and Transmission Association, Inc. (Tri-State), is the parent company to Axial Basin Coal Company, which is the general partner to Colowyo Coal Company L.P (Colowyo). The Colowyo Mine operates under the Colorado Division of Reclamation, Mining, and Safety Permit No. C-1981-019.

Rule 2.04.13(1) states, by February 15, or other such date as agreed on, each permittee shall file an annual reclamation report covering the previous calendar years for all areas under bond, and Rule 4.05.13(4)(c) states, a hydrologic report shall be submitted to the Division annually with the date of the submittal determined in consultation with the permittee. Colowyo by permit is required to submit both reports annually by March 15. Therefore, enclosed please find two (2) copies of the Annual Reclamation Report and the Annual Hydrology Report for the calendar year 2019.

If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 824-1232 at your convenience.

Sincerely,

Daniel J. Casiraro
Senior Manager
Environmental Services

DJC:TT:der

Enclosure

cc: Chris Gilbreath (via email)
Tom Fry (via email)
Angela Aalbers (via email)
File: C.F 17.14
G474-11.3(21)f - G474-11.3(21)g

COLOWYO COAL COMPANY L.P.

Permit No. C-1981-019

Annual Hydrology & Reclamation Report

Report Year 2019

LIST OF EXHIBITS

SECTION 1 – SURFACE AND GROUND WATER DATA

RULE REQUIREMENT

Rule 4.05.13(4)(c) Monitoring Report Requirements

(i) Water quantity data for the four surface monitoring sites is presented in Exhibit 1A and 1B of this report.

(ii) Water quality data obtained from the nine surface and eleven ground water sites is presented in Exhibit 1A and 1B of this report. Discharge monitoring reports are submitted to the Colorado Department of Public Health and Environment on a quarterly basis. A copy is forwarded to the CDRMS and is included in this report by reference.

(iii) A written interpretation of the data is included.

All analytical results from surface and ground water monitoring have been tabulated and are kept on file at Colowyo Coal Company L.P. Historical data is presented in past annual hydrology reports, and is available at the mine site. The monitoring timeframe for this annual hydrology report is from January 1, 2019 through December 31, 2019. A description of the surface and ground water monitoring plan is located in Colowyo's Permit No. C-1981-008, Volume 15, Section 4.05.13.

SURFACE WATER

Surface water monitoring sites are comprised of four upstream (or adjacent) and five downstream sites and are briefly described below (Please see Maps 10A in the permit for monitoring locations). Monitoring of each location occurs on a quarterly basis.

- New Upper Good Springs Creek (NUGSC) is a downstream site, located south of the mine along State Highway 13. Monitoring has occurred from 1992 to 2019.

- Lower Good Spring Creek (LGSC) is a downstream site, located below active mining conditions along State Highway 13. Monitoring has occurred from 1982 to 2019.

- Lower Taylor Creek (LTC) is a downstream site, located below active mining conditions along Moffat County Road 17. Monitoring has occurred from 1983 to 2019.

- Upper West Fork Good Spring Creek (UWFGSC) is an upstream site, located southwest of the mine along State Highway 13. Monitoring has occurred from the 4th quarter of 2007 to 2019.

- Upper Collom Gulch (UCG) represents the water quality conditions in Collom Gulch upstream of the Collom Lite mining area. Monitoring has occurred from the 1st quarter of 2011 to 2019.

- Confluence of Jubb Creek (CJC) represents the aggregate water quality in the Jubb Creek basin, downstream of potential mining impact areas. Monitoring has occurred from the 1st quarter of 2011 to 2019.

- Lower Collom Gulch (LCG) represents the conditions in Collom Gulch downstream of mining impacts. Monitoring has occurred from the 1st quarter of 2011 to 2019.

- West Fork of Jubb Creek (WFJC) represents conditions in the Jubb Creek watershed adjacent to the mining disturbance. Monitoring has occurred from the 1st quarter of 2011 to 2019.

- Little Lower Collom Gulch (LLCG) represents the conditions in Little Collom Gulch downstream of mining disturbances. Because Little Collom Gulch is ephemeral, and the mining area extends nearly to the headwaters, no upstream monitoring location can be established. As no flow has been observed at this location either during baseline data collection or during the observation period that began 1st quarter of 2011 through 2019, a parameter spreadsheet has not been generated for this location.

Colowyo currently samples each surface water site for a variety of quality parameters. Of all the parameters that are analyzed for, several key indicator parameters are identified an analyzed for this report. These are lab pH, lab conductivity, TDS, sulfate, calcium, iron, magnesium, sodium and flow rate. Statistical analysis is completed and illustrates historical trends for each parameter. See graphs for the trend lines in Exhibit 1A.

Summary of the indicator parameters for each surface water site is provided in the following tables.

NUGSC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.18	0.25	1.1	8.6	7.5	04/27/98	10/24/02
Lab Cond.	1496.8	278.7	2842	3600	758	03/06/98	05/27/93
TDS	1130.3	233.0	1250	1610	360	08/06/01	05/08/02
Sulfate	496.9	140.6	760	930	170	07/08/02	05/20/97
Calcium	125.7	18.9	165.6	169	3.4	08/02/02	06/01/93
Iron	0.77	1.52	8.53	8.54	0.01	05/17/99	02/11/02
Magnesium	121.9	29.1	226.9	228	1.1	08/02/02	04/27/98
Sodium	47.2	15.43	121.1	138	16.9	11/10/08	04/27/98
Flow rate	2.98	3.27	19.94	20	0.06	04/27/98	07/30/13

Evaluation Data For NUGSC

No results from 2019 sampling were minimum or maximum values for any parameters listed above during the monitoring period. All sampling results for 2019 tracked similar to historical analysis. For the indicator parameters most are staying very stable with no trends apparent. Laboratory pH is slightly trending upward and sulfate is showing a minor trend downward over time.

LGSC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.08	0.26	2.5	8.6	6.1	08/19/91	05/14/91
Lab Cond.	1716.9	324.5	3139	3300	161	08/21/18	06/23/92
TDS	1362.91	342.86	3420	4050	630	11/08/00	05/23/95
Sulfate	647.65	159.47	815	1050	235	08/21/18	05/20/97
Calcium	140.1	24.2	198	208	10	12/28/89	3/13/84
Iron	0.65	0.90	8.81	8.84	0.03	08/13/08	04/08/15
Magnesium	144.07	29.36	225.3	226	0.7	12/04/89	05/20/97
Sodium	81.96	38.77	323.3	343	19.7	08/21/18	04/17/00
Flow rate	4.05	5.13	46.94	47	0.06	04/27/98	12/06/99

Evaluation of 2019 data for LGSC

No results from 2019 sampling were minimum or maximum values for any parameters listed above during the monitoring period. All sampling results for 2019 tracked similar to historical analysis. For the indicator parameters most are staying very stable with no trends apparent. Laboratory conductivity, TDS, and sodium are slightly trending upward, while sulfate is showing a minor trend downward over time.

UWFGSC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.48	0.11	0.5	8.6	8.1	06/18/08	11/2/09
Lab Cond.	957.87	221.78	1027	1330	303	03/19/14	04/15/08
TDS	693.7	151.5	600	910	310	3/19/14	5/15/19
Sulfate	216.9	76.2	273	341	68	7/30/13	5/15/19
Calcium	96.4	15.96	66	121	55	11/10/11	5/15/19
Iron	1.43	2.12	9.81	9.86	0.05	04/27/16	10/31/12
Magnesium	75.9	19.8	73	103	30	11/18/13	5/15/19
Sodium	9.31	2.7	15	19	4	2/23/10	5/15/19
Flow rate	1.17	1.90	8.92	8.94	0.02	5/15/19	10/31/12

Evaluation of 2019 data for UWFGSC
Several results from the 2019 sampling were minimum values including TDS, sulfate, calcium, magnesium and sodium. All sampling results for 2019 tracked similar to historical analysis. For the indicator parameters most are staying very stable with no trends apparent. Laboratory pH and Laboratory conductivity are slightly trending upward, while sodium is showing a minor trend downward over time. Springs flows at this location are also trending upward.

LTC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.16	0.30	1.7	8.7	7	09/13/16	02/22/89
Lab Cond.	1790.51	641.98	3550	3750	200	11/30/17	02/28/90
TDS	1454.76	621.44	2776	2920	144	11/10/11	02/28/90
Sulfate	682.33	350.33	1591	1610	19	11/10/11	02/28/90
Calcium	95.95	25.77	133.2	159	25.8	11/10/11	02/05/01
Iron	3.70	15.75	131.99	132	0.01	02/28/90	09/13/95
Magnesium	124.96	41.52	230	238	8	10/12/88	02/28/90
Sodium	190.15	162.9	694	700	6	11/12/19	02/28/90
Flow rate	0.36	0.80	6.3	6.3	0	04/29/86	12/13/02

Evaluation of 2019 data for LTC
One result from the 2019 sampling was a maximum value and that was for sodium. All sampling results for 2019 tracked similar to historical analysis. For the indicator parameters some are increasing (lab conductivity, TDS, sulfate, and sodium) while the overall seasonal flows are decreasing.

UCG:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.57	0.10	0.4	8.7	8.3	08/01/12	03/22/11
Lab Cond.	685.21	162.52	726	1140	141	03/18/11	5/13/19
TDS	467.59	123.97	550	820	270	03/22/11	5/13/19
Sulfate	109.93	67.64	272	273	1	03/22/11	11/08/11
Calcium	73.55	16.55	70	118	48	03/22/11	5/13/19
Iron	1.53	2.16	8.95	9.0	0.05	04/26/16	08/18/11
Magnesium	45.14	15.4	74	97	23	03/22/11	05/19/14
Sodium	11.86	0.96	12	18	6	07/31/13	5/13/19
Flow rate	0.26	0.45	1.57	1.57	0	04/26/16	03/13/13

Evaluation of 2019 data for UCG

Several results from 2019 sampling were minimums including lab conductivity, TDS, calcium, and sodium. Mining commenced in the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable long-term analysis of the data acquired to date. Data reflects natural conditions with seasonal fluctuations.

CJC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.42	0.08	0.4	8.6	8.2	08/18/11	03/14/12
Lab Cond.	1998.6	269.6	1460	2380	920	11/26/16	03/22/11
TDS	1541.7	203.5	1150	1820	670	08/01/12	03/22/11
Sulfate	634.4	120.9	680	859	179	11/21/16	03/22/11
Calcium	140.6	16.4	77	178	101	08/01/12	3/6/19
Iron	0.72	1.54	8.88	8.93	0.05	9/4/19	08/18/11
Magnesium	156.5	23.1	130	199	69	11/21/16	03/22/11
Sodium	135.6	23.8	140	167	27	08/01/12	03/22/11
Flow rate	0.09	0.14	0.79	0.8	0.01	9/4/19	08/20/18

Evaluation of 2019 data for CJC

A maximum value for iron was recorded in 2019, and a minimum value for calcium. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date. Data reflects natural conditions with seasonal fluctuations.

LCG:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.45	0.12	0.6	8.7	8.1	08/20/18	03/14/12
Lab Cond.	1007.0	188.17	1139	1830	691	5/13/19	05/04/11
TDS	690.56	169.57	1100	1540	440	5/13/19	05/24/17
Sulfate	208.1	87.4	558	658	100	5/13/19	05/24/17
Calcium	99.9	12.5	63	138	75	5/13/19	05/24/17
Iron	0.9	1.4	7.12	7.17	0.05	04/26/16	08/18/11
Magnesium	67.9	18.22	119	159	40	5/13/19	05/24/17
Sodium	29.4	18.9	119	133	14	5/13/19	03/22/11
Flow rate	0.30	0.45	1.54	1.57	0.03	05/04/11	10/20/15

Evaluation of 2019 data for LGC
Several maximum values were recorded in 2019 for laboratory conductivity, TDS, sulfate, calcium, and magnesium. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date. Data reflects natural conditions with seasonal fluctuations.

WFJC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.44	0.10	0.6	8.6	8	11/19/13	03/14/12
Lab Cond.	1231.9	135.33	858	1740	882	03/22/11	05/04/11
TDS	902.7	116.7	680	1450	770	03/22/11	05/04/11
Sulfate	326.4	66.8	415	651	236	03/22/11	11/08/11
Calcium	119.03	8.3	39	135	96	11/05/14	09/18/17
Iron	0.37	0.61	3.52	3.57	0.05	05/04/11	08/18/11
Magnesium	99.5	11.2	64	143	79	03/22/11	05/04/11
Sodium	18.8	21.6	126	139	13	03/22/11	11/29/17
Flow rate	0.03	0.03	0.13	0.13	0.00	05/15/11	08/20/18

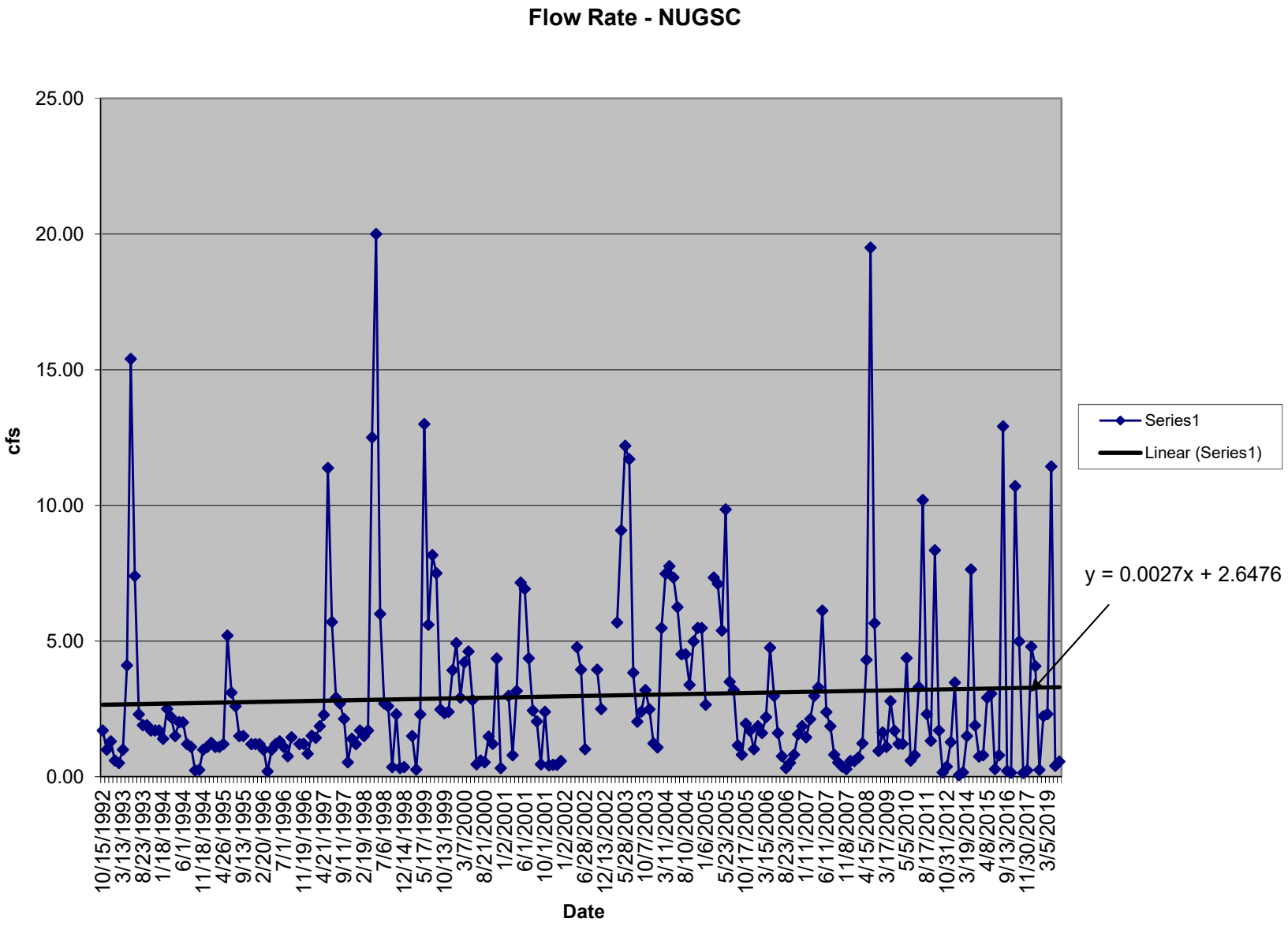
Evaluation of 2019 data for WFJC
No maximum or minimum values were recorded in 2019. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date. Data reflects natural conditions with seasonal fluctuations.

Exhibit 1A

Colowyo Mine
Site - NUGSC
Water Year 1/1/2019 - 12/31/19

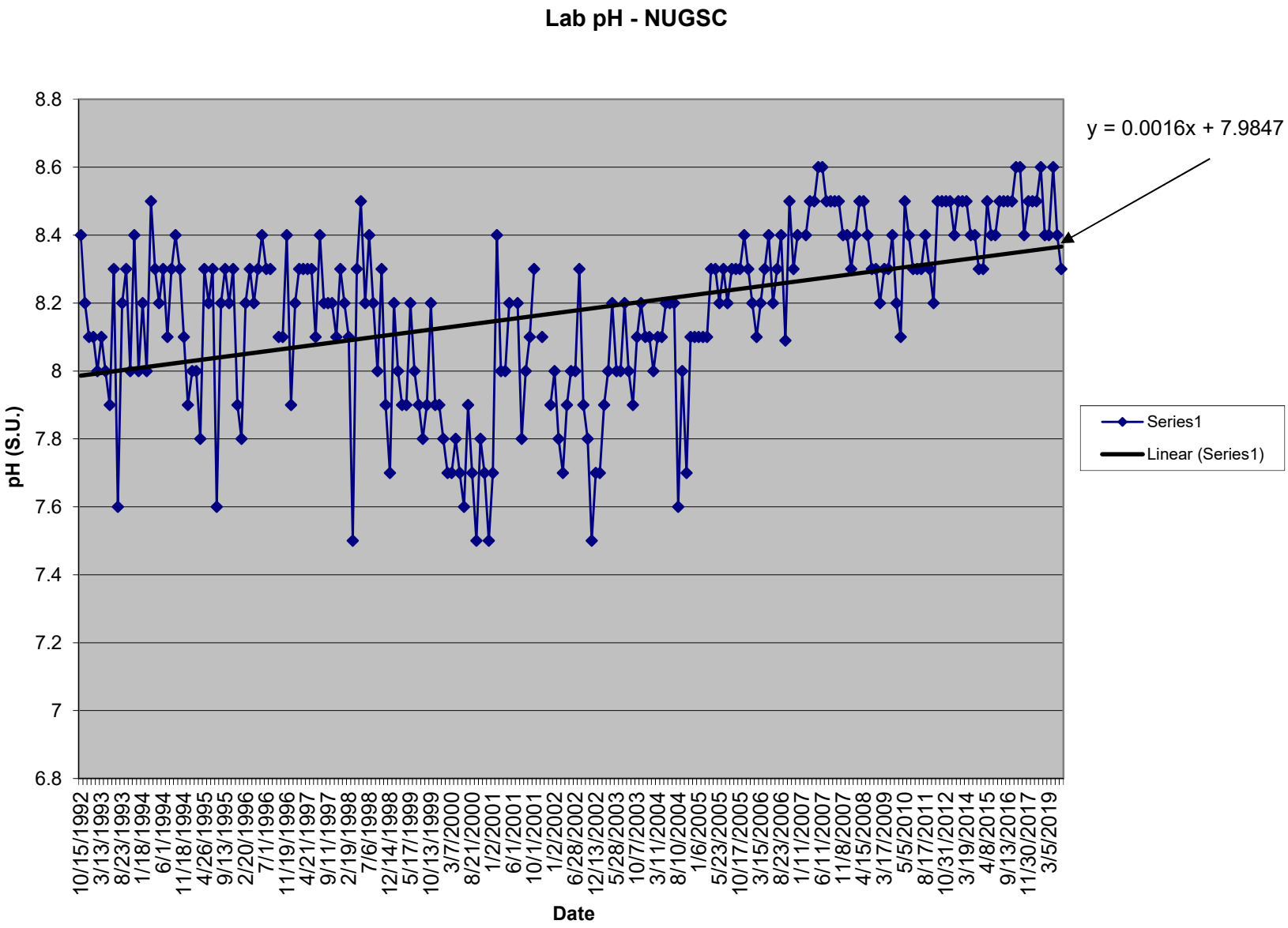
	Sample Date			
	3/5/2019	5/15/2019	9/9/2019	11/12/2019
Flow Rate, cfs	2.31	11.43	0.4	0.56
Field pH	7.83	7.89	8.19	8.04
Field Temp, °C	5.5	12	10.8	6.8
Field Conductivity, umhos/com	1620	910	1620	1780
Lab pH	8.4	8.6	8.4	8.3
Lab Conductivity, umhos/com	1550	879	1630	1650
TDS, mg/l	1300	640	1070	1260
TSS, mg/l	5	185	5	7
NO3 as N, mg/l	4.3	1.9	3.8	6.5
NO2 as N, mg/l	0.1	0.1	0.1	0.1
NO3+NO2 as N, mg/l	4.3	2	3.8	6.5
NH3 as N, mg/l	0.1	0.1	0.1	0.1
Phosphorus, T, mg/l	0.05	0.19	0.05	0.05
Bicarbonate as HCO3, D	480	308	474	521
Sulfate, D, mg/l	534	413	481	493
As, TD, mg/l	0.003	0.003	0.003	0.003
Ca, D, mg/l	134	85	119	129
Fe, TD, mg/l	0.05	2.91	0.12	0.16
Pb, TD, mg/l	0.2	0.2	0.2	0.2
Mg, D, mg/l	141	62	122	126
Mn, TD, mg/l	0.03	0.12	0.03	0.03
Hg, TD, mg/l	0.001	0.001	0.001	0.001
Se, TD, mg/l	0.017	0.005	0.012	0.014
Na, D, mg/l	53	22	51	57
Zn, TD, mg/l	0.05	0.05	0.05	0.05

Exhibit 1A



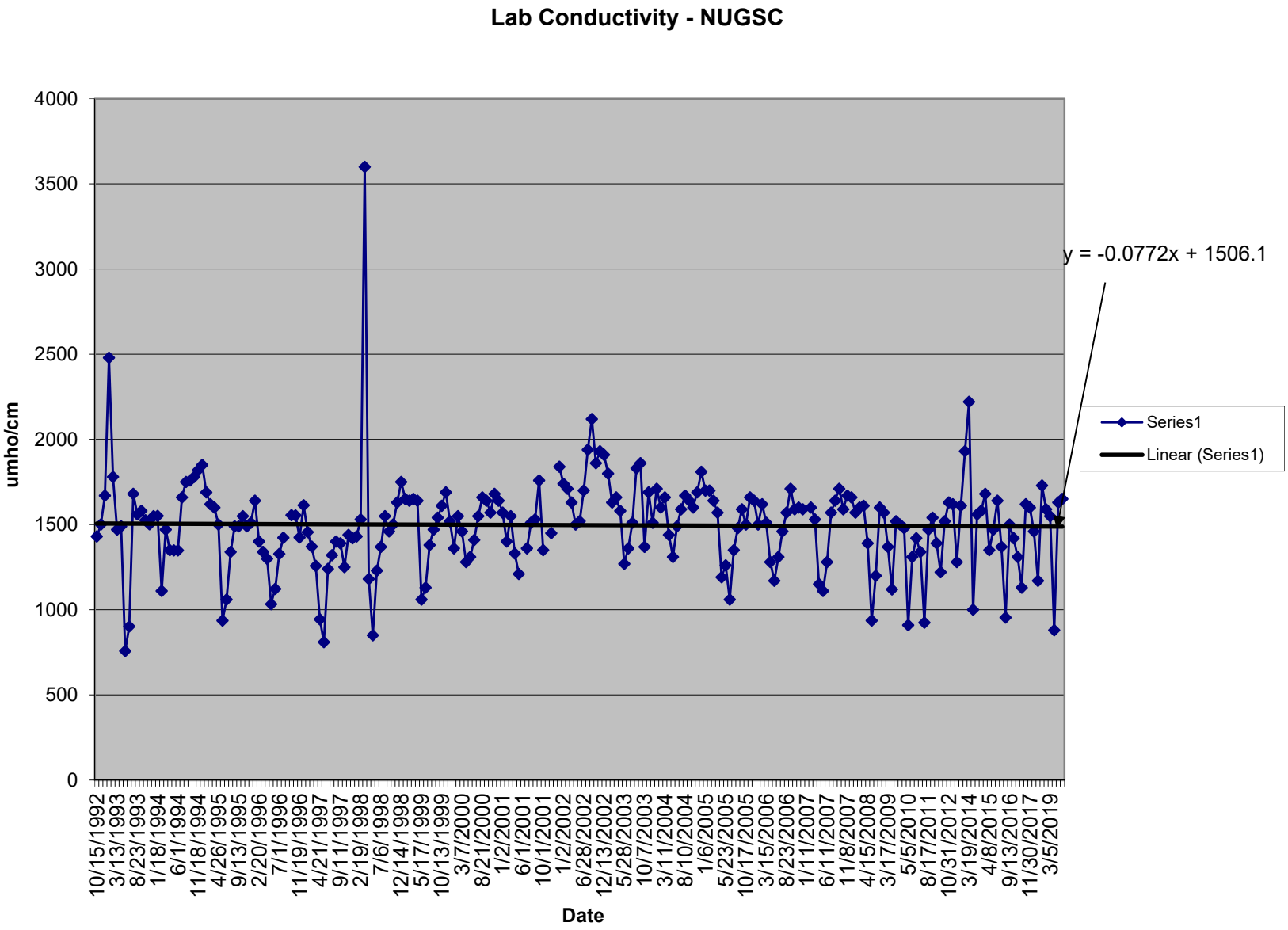
NUGSC

Exhibit 1A

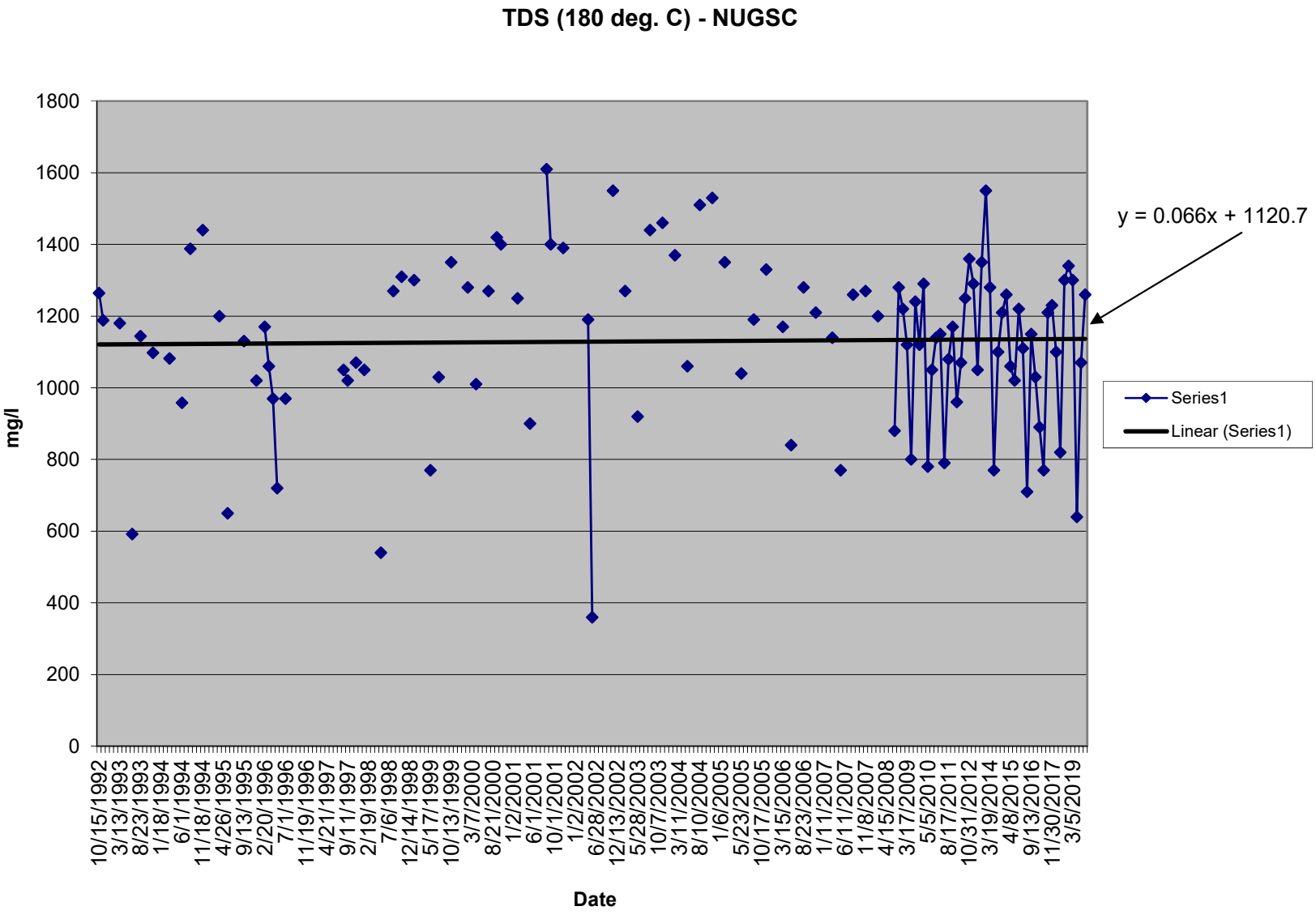


NUGSC

Exhibit 1A



NUGSC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mg/l
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1600
1400
1200
1000
800
600
400
200
0
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Series1
Linear (Series1)
10/15/1992
3/13/1993
8/23/1993
1/18/1994
6/1/1994
11/18/1994
4/26/1995
9/13/1995
2/20/1996
7/1/1996
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3/17/2009
5/5/2010
8/17/2011
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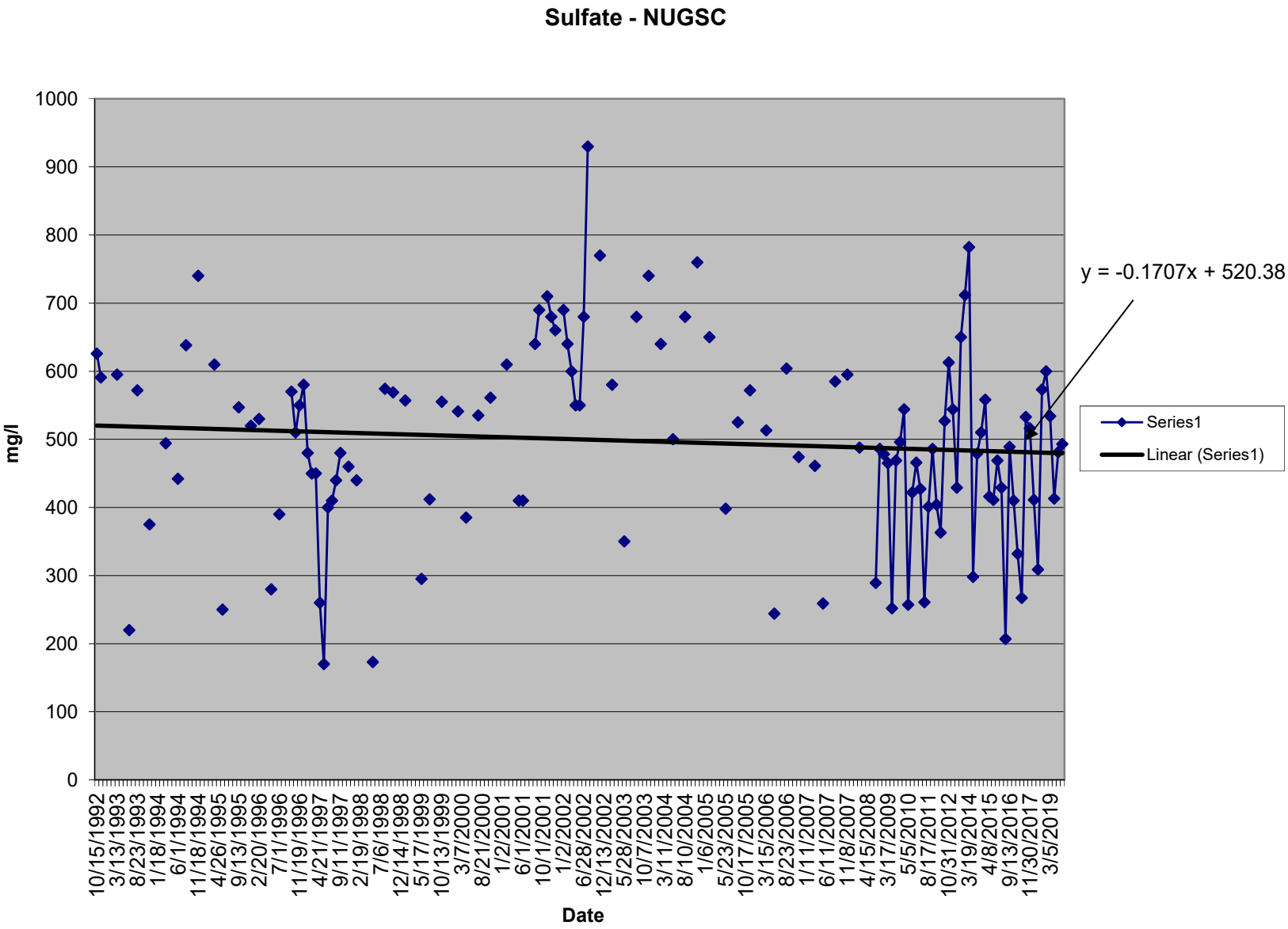
4/8/2015
9/13/2016
11/30/2017
3/5/2019
Date

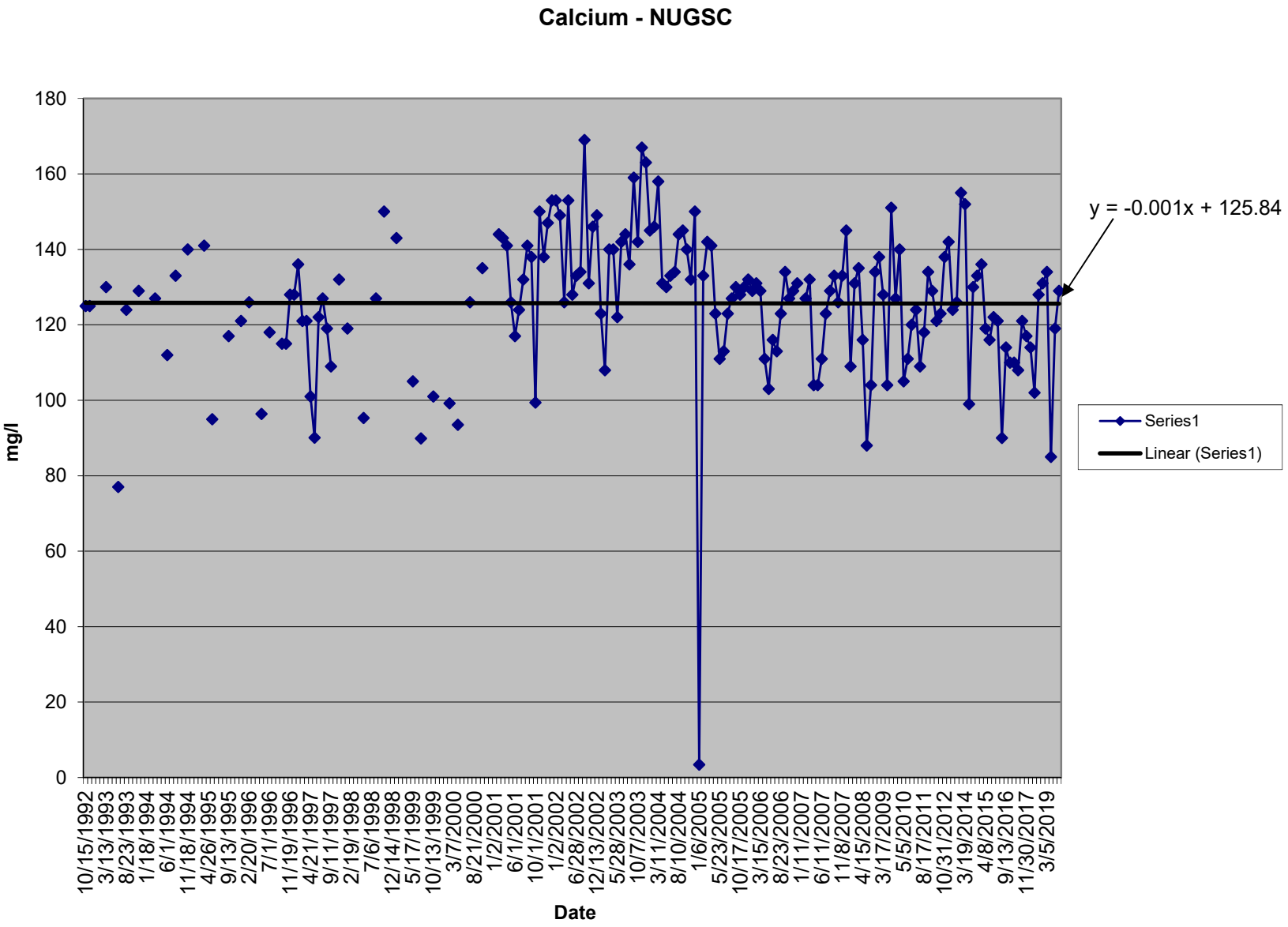
NUGSC

Exhibit 1A



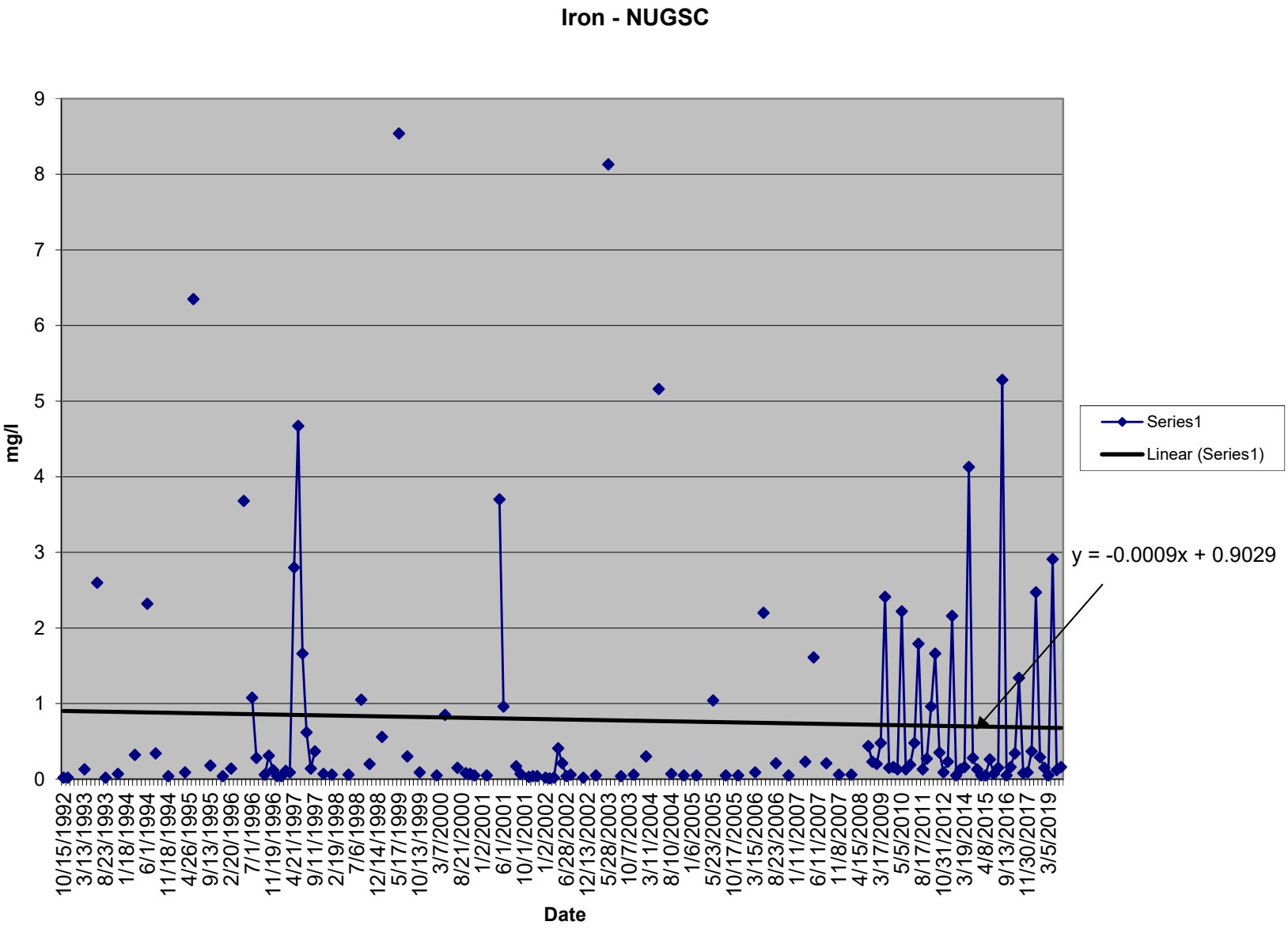
NUGSC

Exhibit 1A



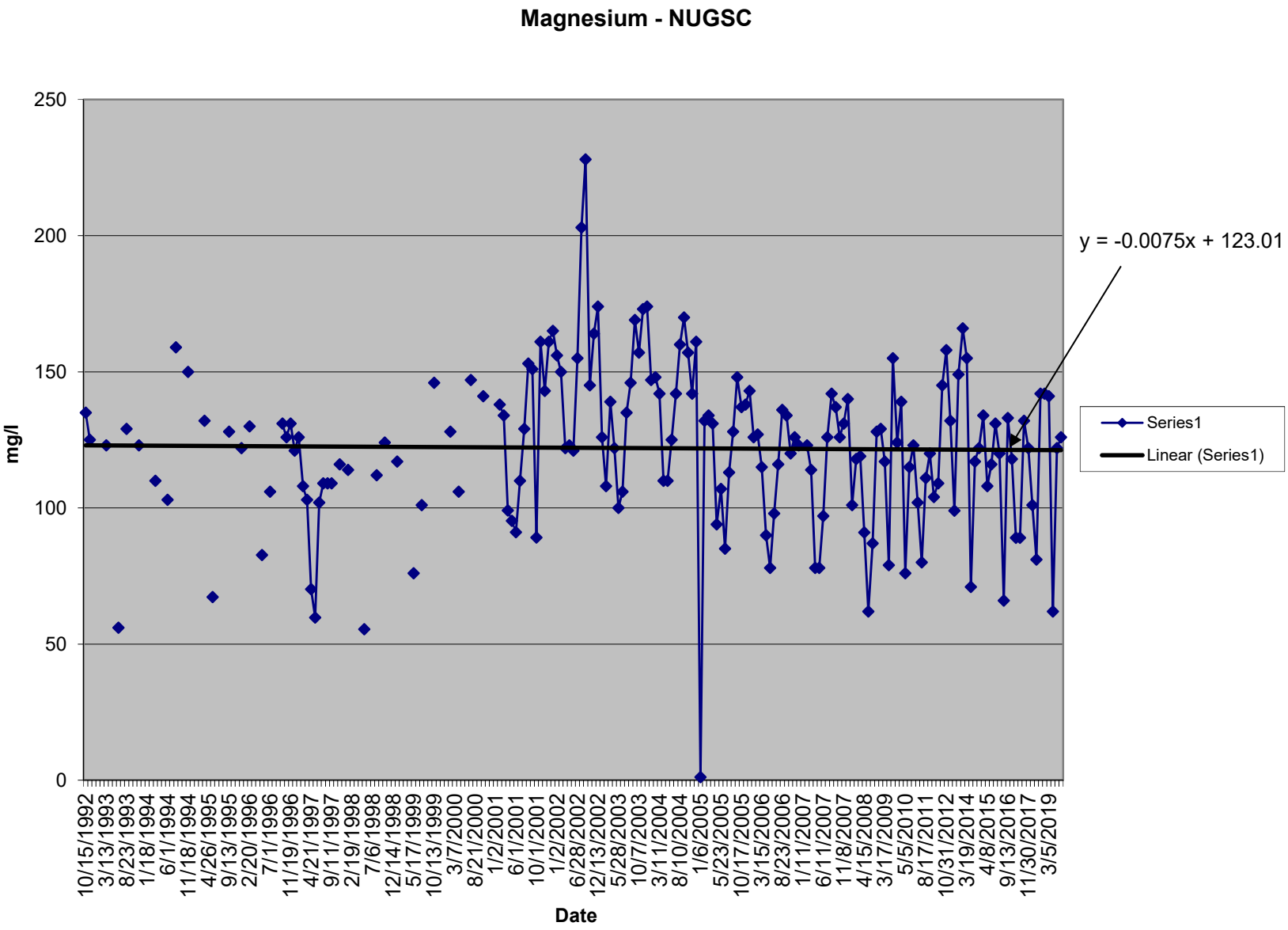
NUGSC

Exhibit 1A



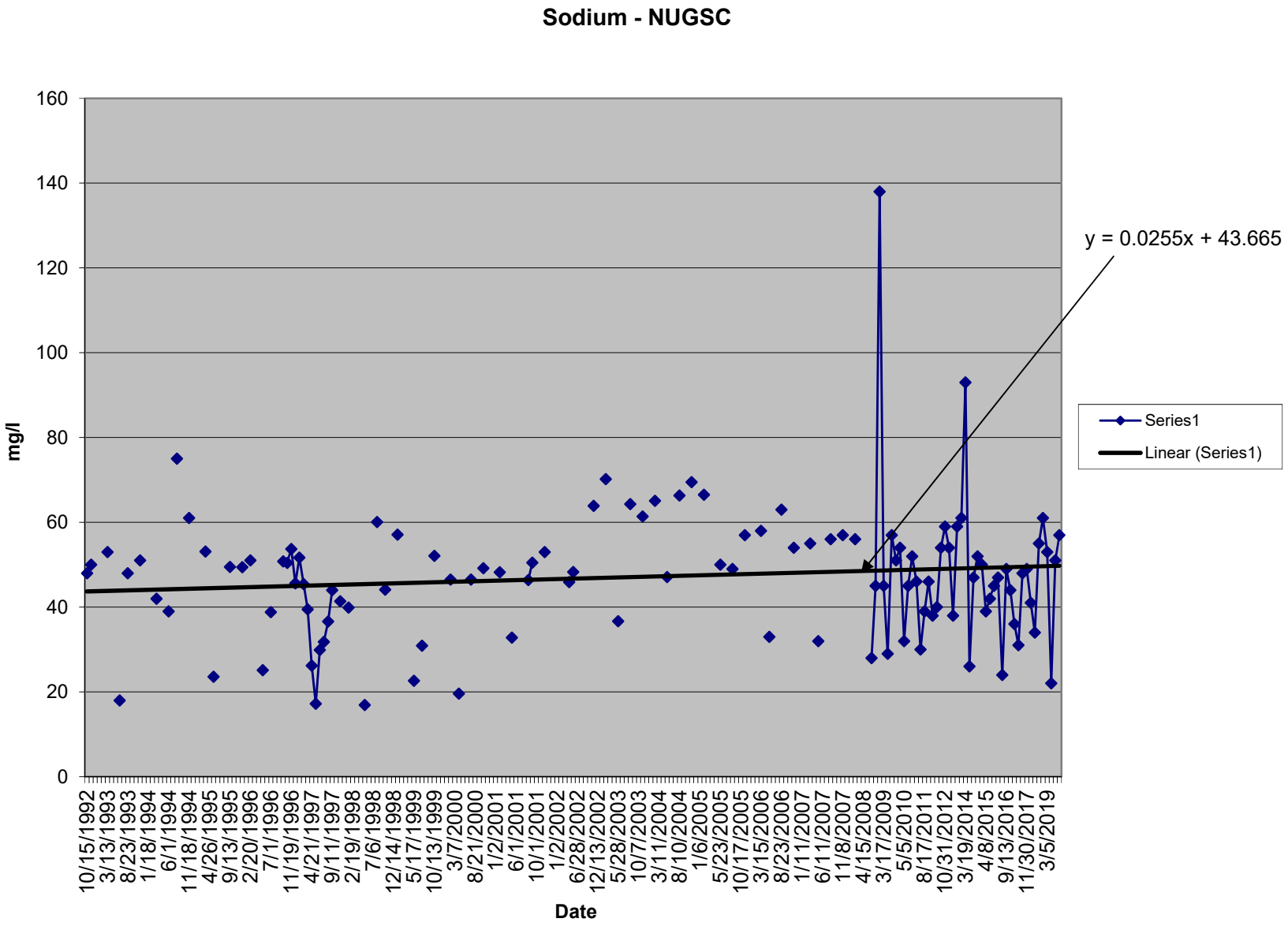
NUGSC

Exhibit 1A



NUGSC

Exhibit 1A



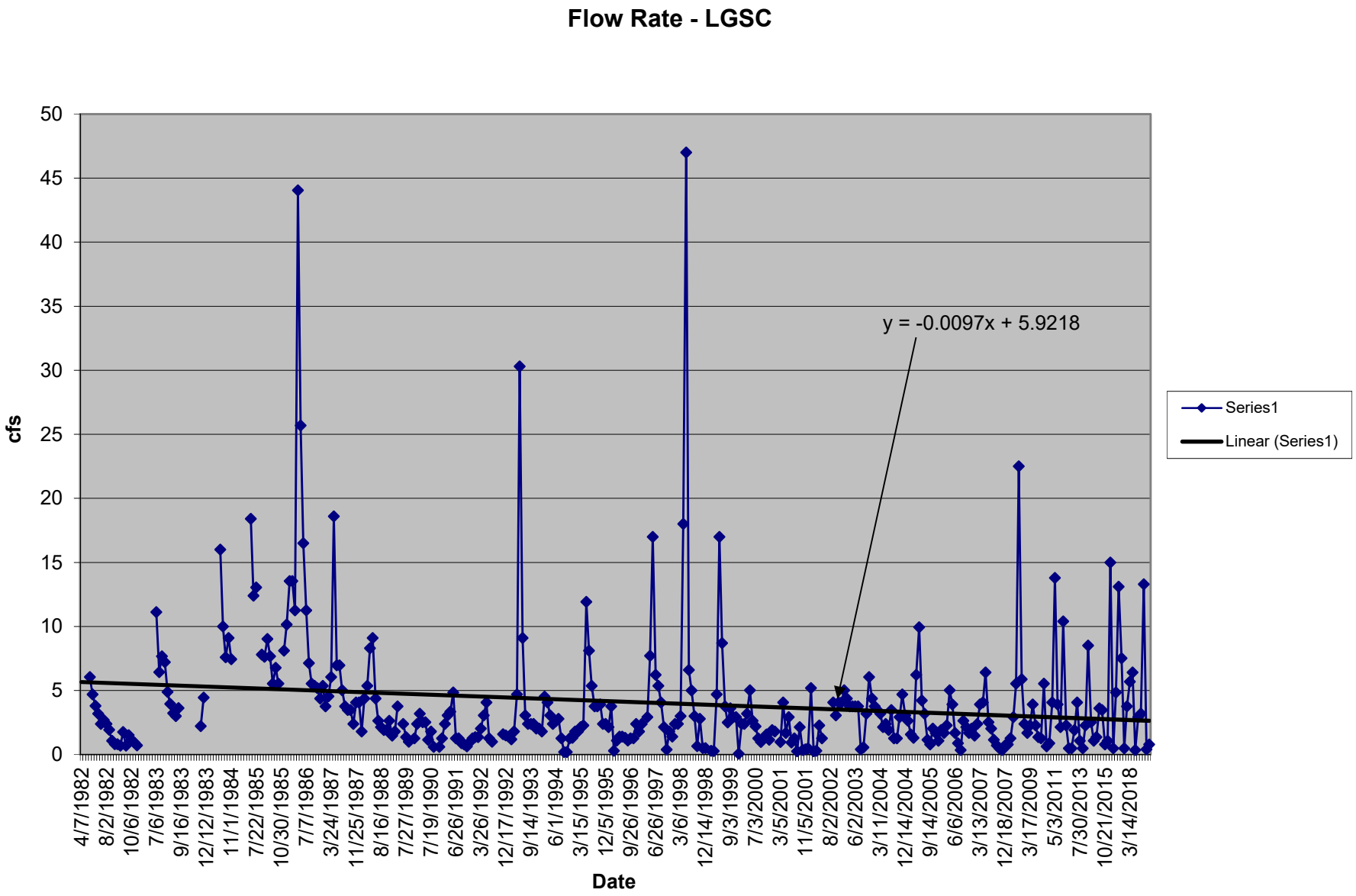
NUGSC

Exhibit 1A

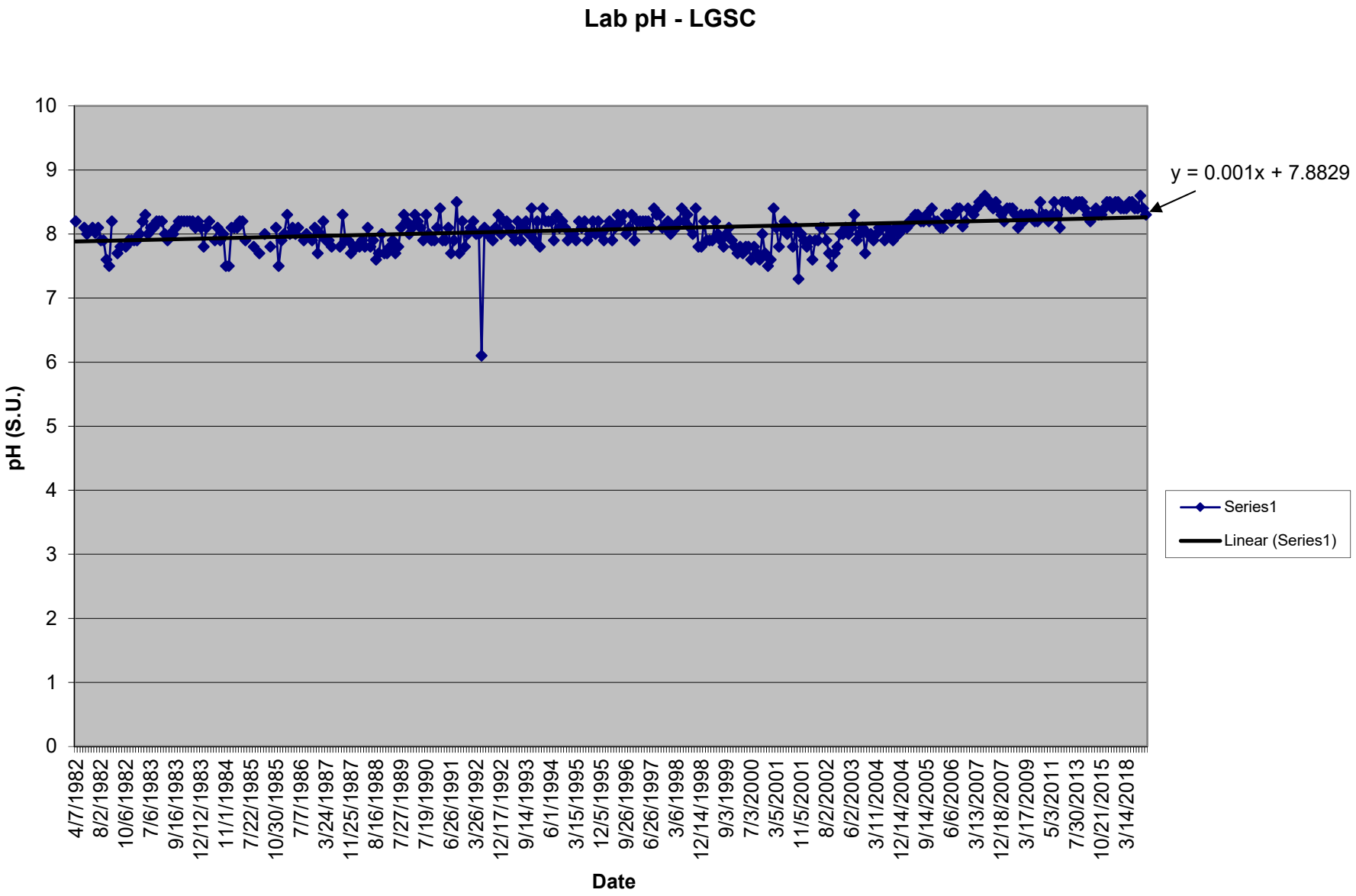
Colowyo Mine
Site - LGSC
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Flow Rate, cfs	3.2	13.3	0.42	0.8
Field pH	7.95	8.01	8.14	8.02
Field Temp, °C	3.2	12	10.9	6.1
Field Conductivity, umhos/com	2070	1300	2100	2280
Lab pH	8.4	8.6	8.4	8.3
Lab Conductivity, umhos/com	2070	1260	2110	2120
TDS, mg/l	1770	980	1480	1650
TSS, mg/l	15	11	5	5
NO3 as N, mg/l	0.1	0.9	1.1	1.6
NO2 as N, mg/l	0.1	0.1	0.1	0.1
NO3+NO2 as N, mg/l	0.1	0.9	1.1	1.6
NH3 as N, mg/l	0.1	0.1	0.1	0.1
Phosphorus, T, mg/l	0.07	0.05	0.05	0.05
Bicarbonate as HCO3, D	620	422	609	667
Sulfate, D, mg/l	730	408	694	669
As, TD, mg/l	0.003	0.003	0.003	0.003
Ca, D, mg/l	158	111	133	148
Fe, TD, mg/l	0.76	0.26	0.3	0.35
Pb, TD, mg/l	0.2	0.2	0.2	0.2
Mg, D, mg/l	165	99	135	143
Mn, TD, mg/l	0.17	0.04	0.17	0.22
Hg, TD, mg/l	0.001	0.001	0.001	0.001
Se, TD, mg/l	0.008	0.005	0.005	0.005
Na, D, mg/l	139	51	140	165
Zn, TD, mg/l	0.05	0.05	0.05	0.05

Exhibit 1A



LGSC


Lab pH - LGSC
y = 0.001x + 7.8829
pH (S.U.)
Date
Series1
Linear (Series1)
10
9
8
7
6
5
4
3
2
1
0
4/7/1982
8/2/1982
10/6/1982
7/6/1983
9/16/1983
12/12/1983
11/1/1984
7/22/1985
10/30/1985
7/7/1986
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8/16/1988
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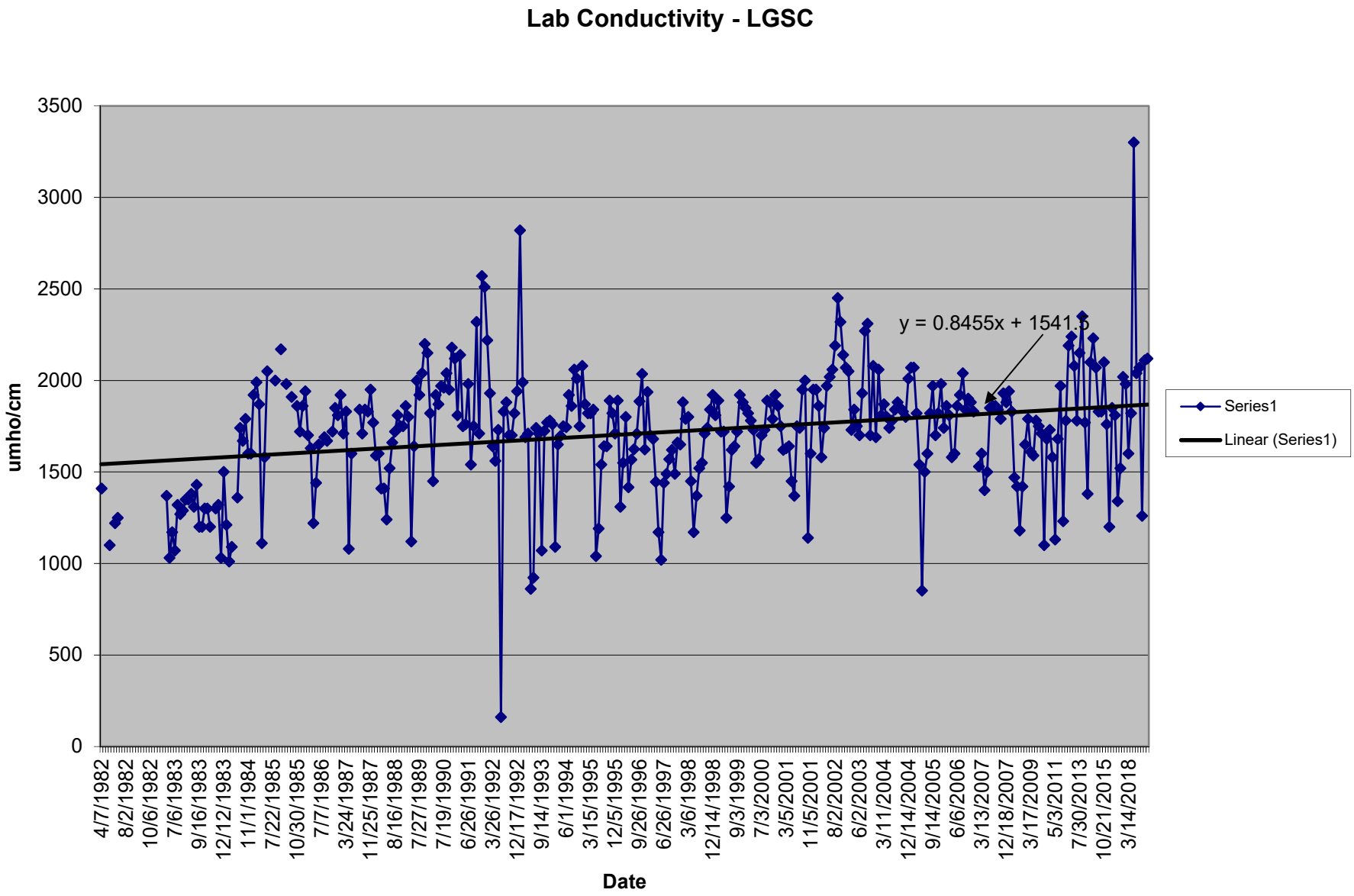
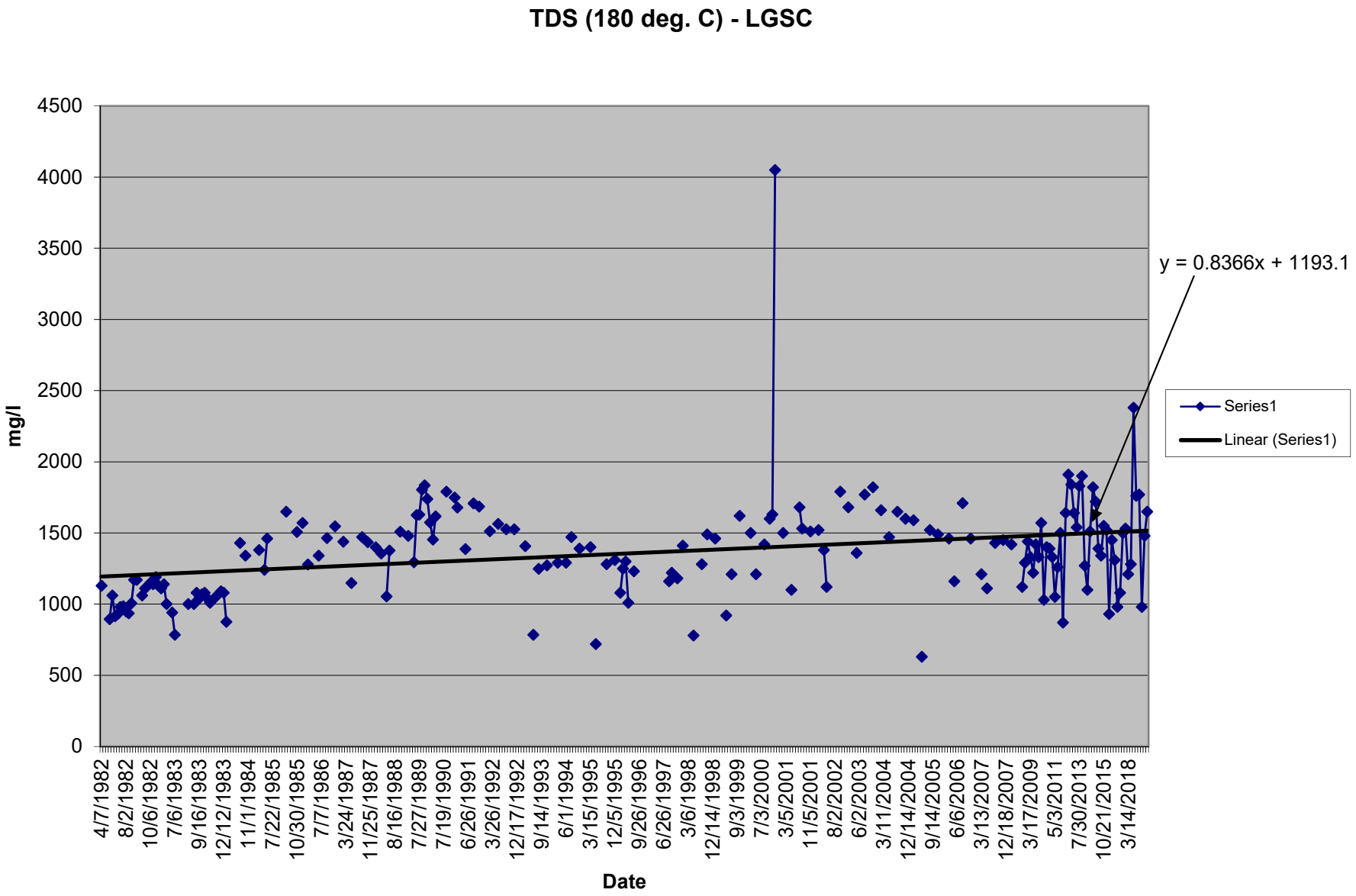
3/13/2007
12/18/2007
3/17/2009
5/3/2011
7/30/2013
10/21/2015
3/14/2018

LGSC

Exhibit 1A

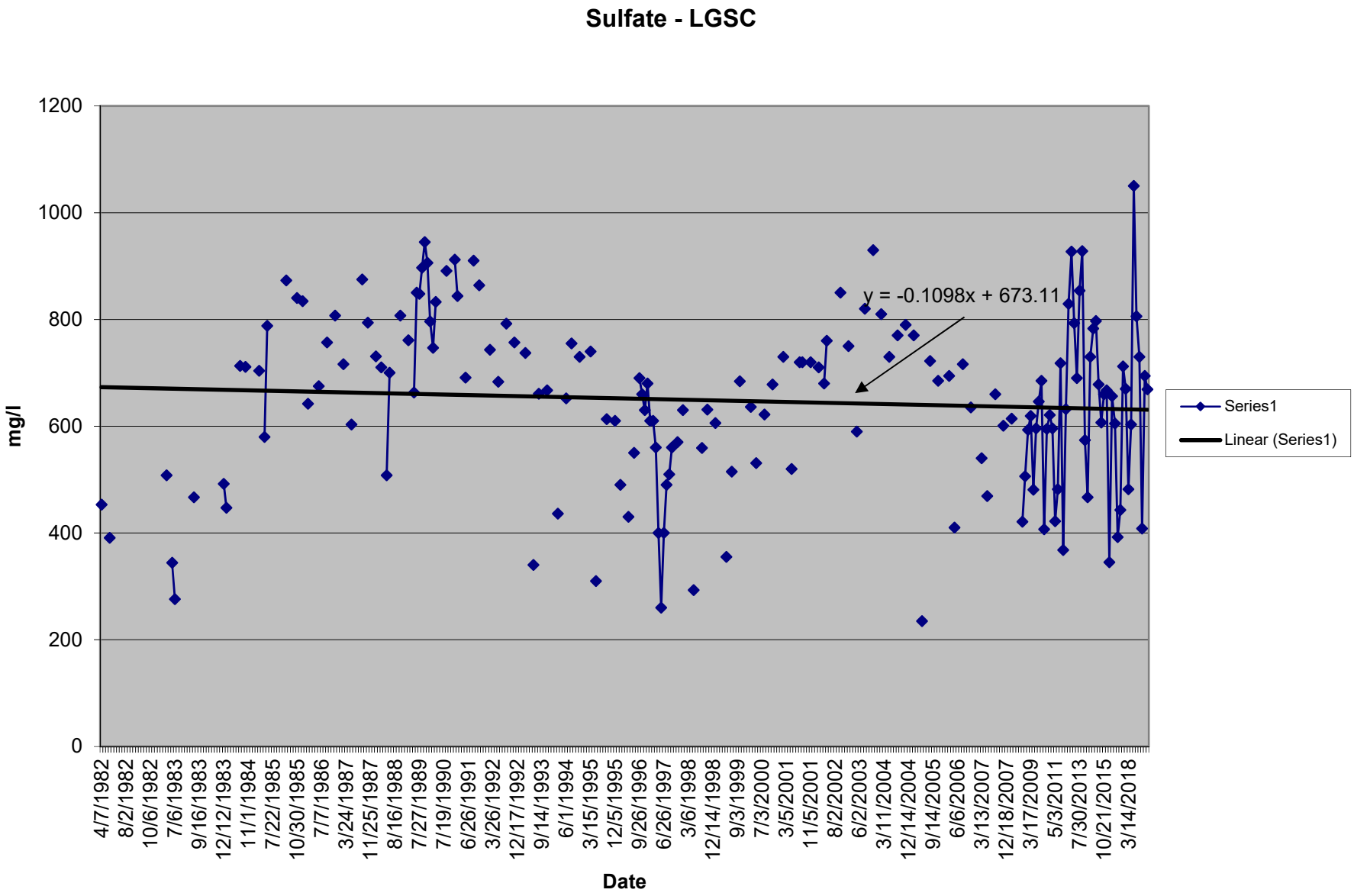


LGSC


TDS (180 deg. C) - LGSC
mg/l
4500
4000
3500
3000
2500
2000
1500
1000
500
0
y = 0.8366x + 1193.1
Series1
Linear (Series1)
4/7/1982
8/2/1982
10/6/1982
7/6/1983
9/16/1983
12/12/1983
11/1/1984
7/22/1985
10/30/1985
7/7/1986
3/24/1987
11/25/1987
8/16/1988
7/27/1989
7/19/1990
6/26/1991
3/26/1992
12/17/1992
9/14/1993
6/1/1994
3/15/1995
12/5/1995
9/26/1996
6/26/1997
3/6/1998
12/14/1998
9/3/1999
7/3/2000
3/5/2001
11/5/2001
8/2/2002
6/2/2003
3/11/2004
12/14/2004
9/14/2005
6/6/2006
3/13/2007
12/18/2007
3/17/2009
5/3/2011
7/30/2013
10/21/2015
3/14/2018
Date

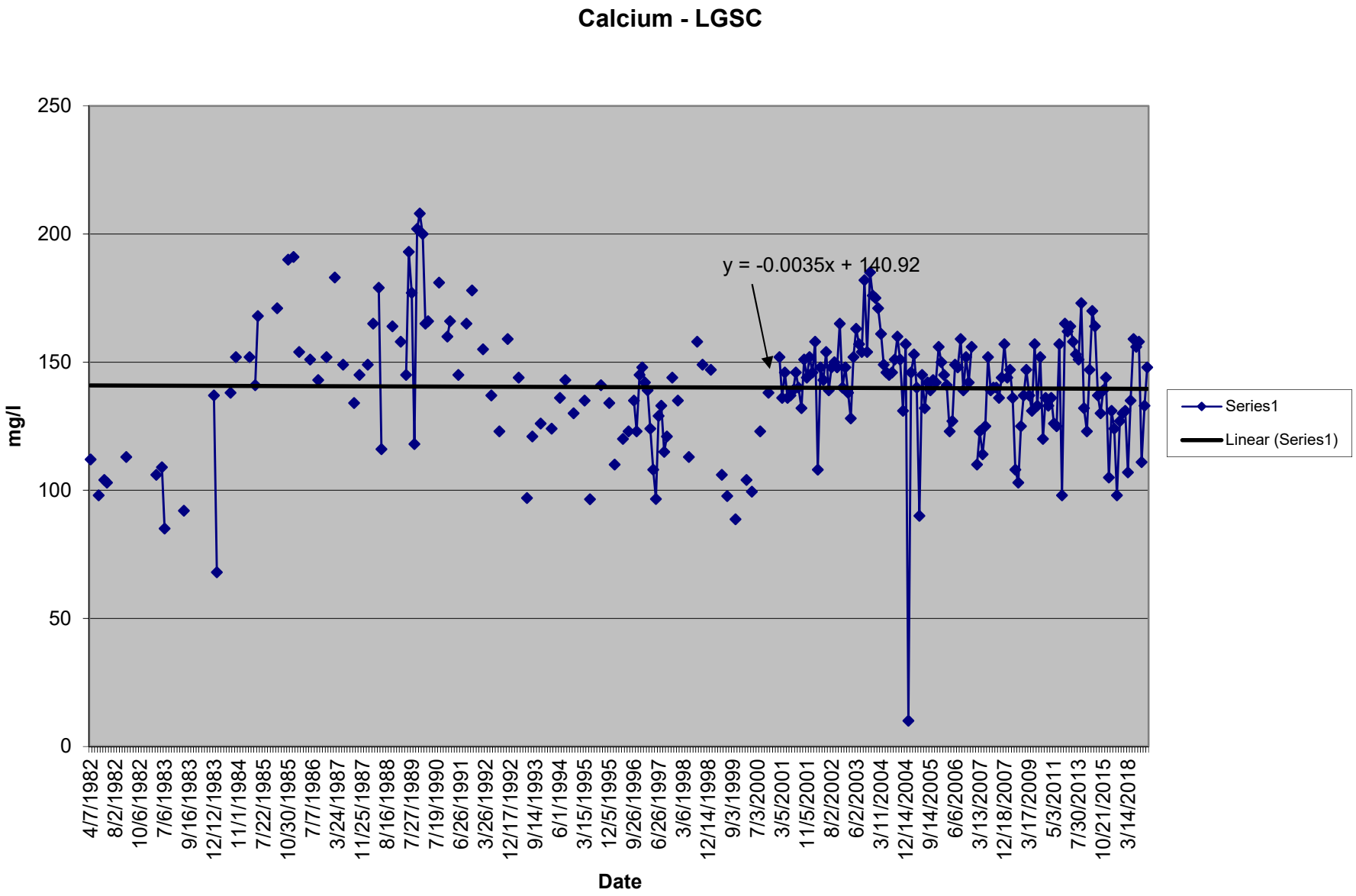
LGSC

Exhibit 1A



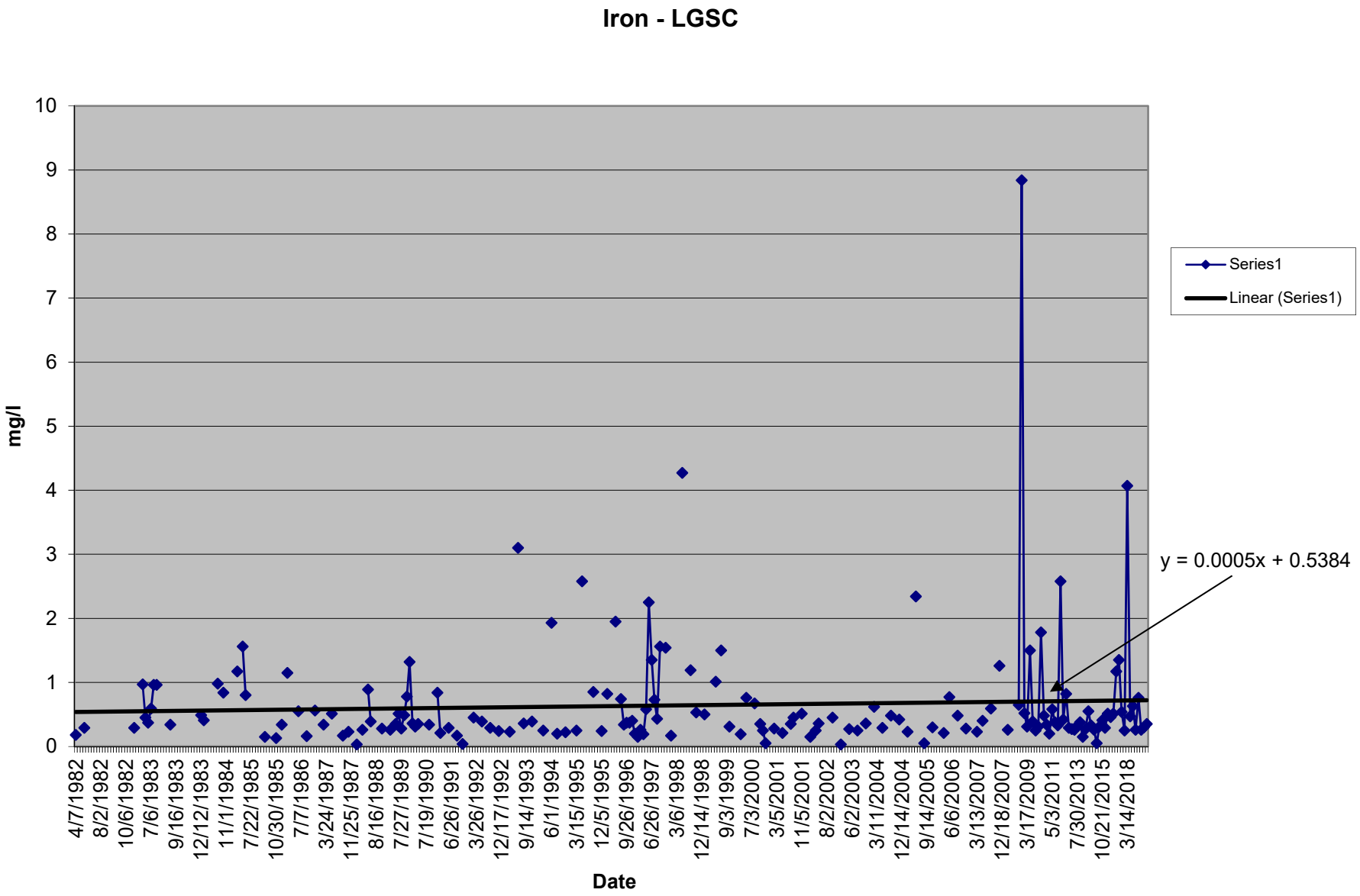
LGSC

Exhibit 1A



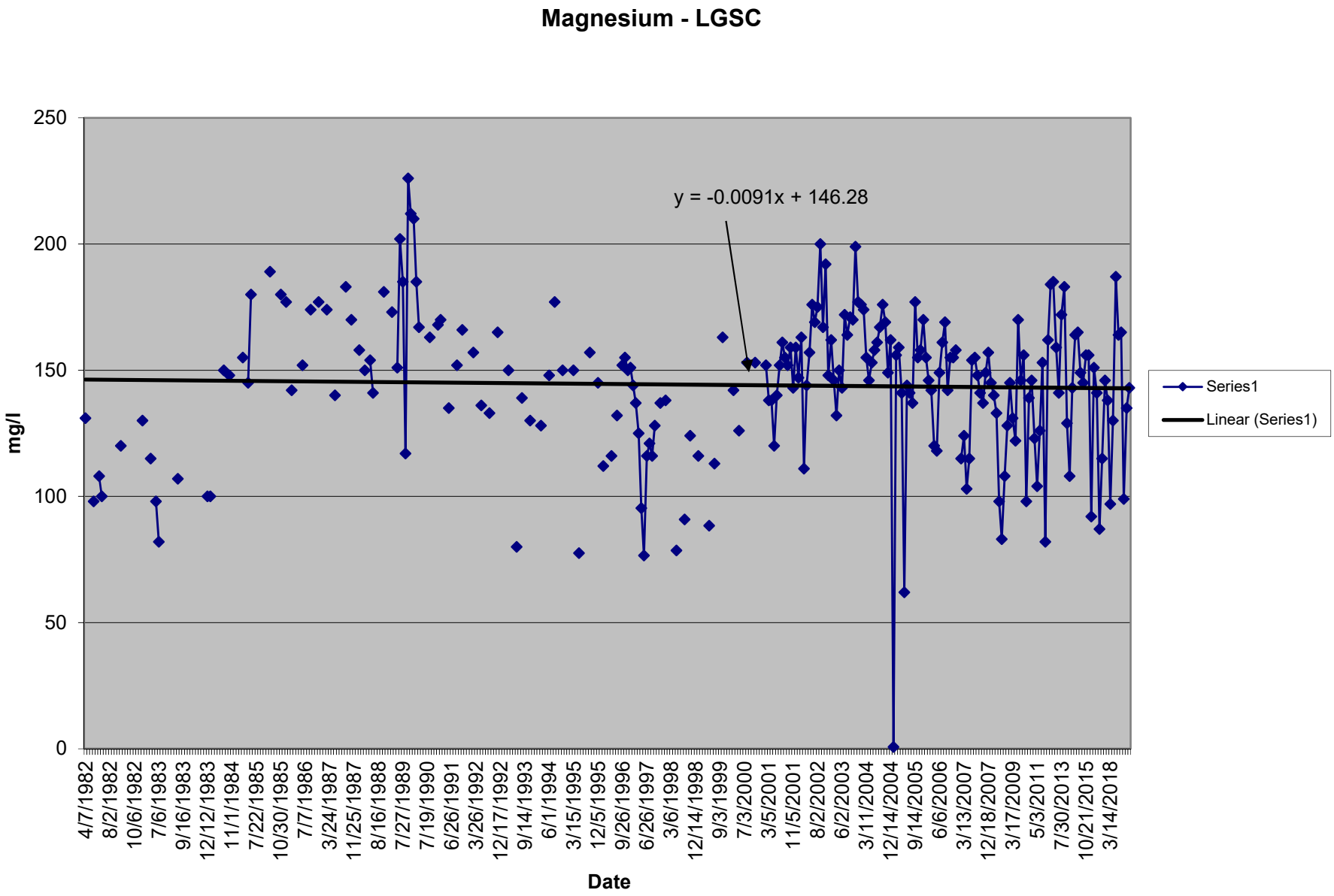
LGSC

Exhibit 1A



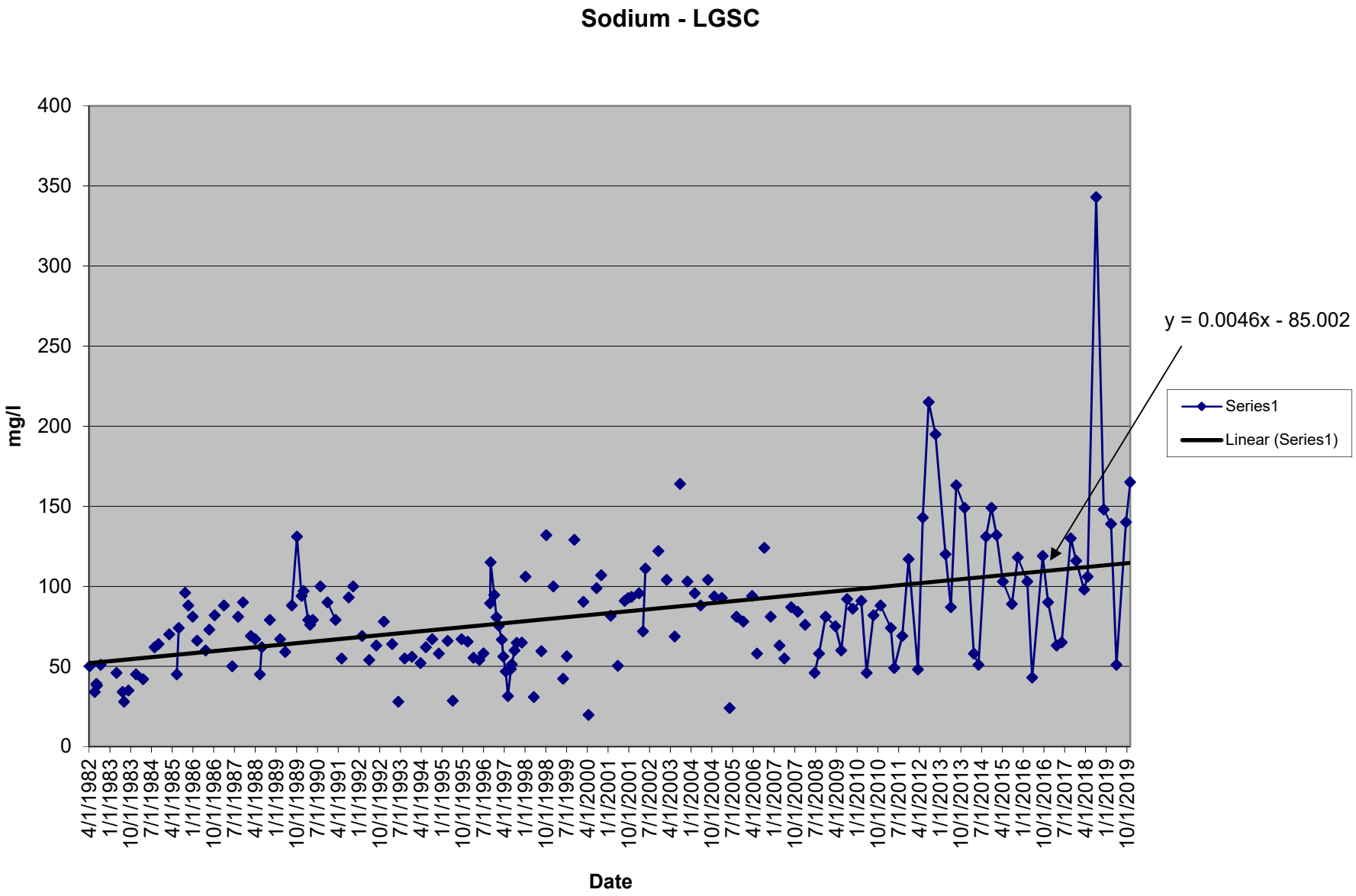
LGSC

Exhibit 1A



LGSC

Exhibit 1A

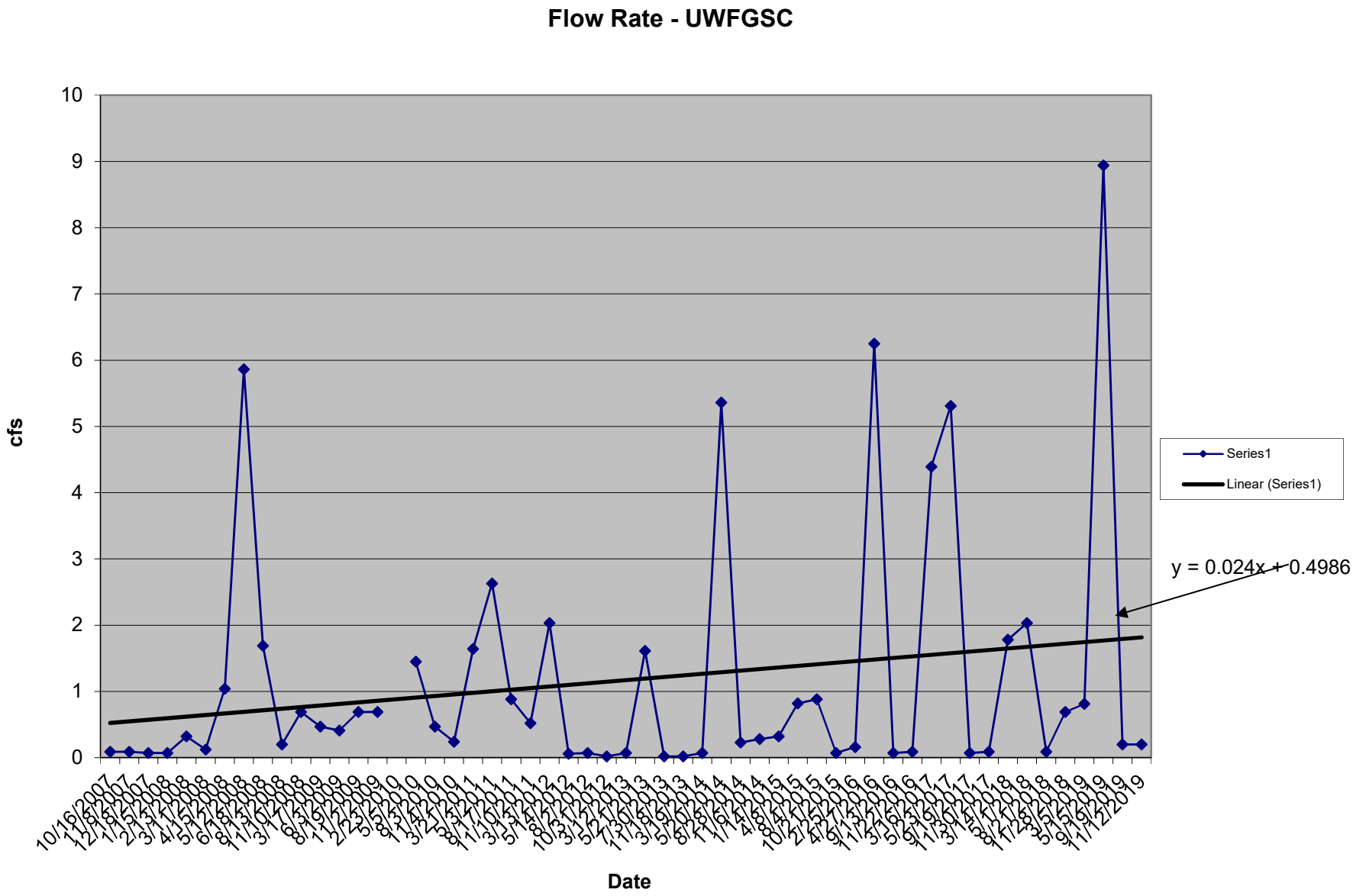


LGSC

Exhibit 1B

Colowyo Mine
Site - UWFGSC
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Flow Rate, cfs	0.81	8.94	0.2	0.2
Field pH	7.74	7.91	8.54	8.23
Field Temp, °C	3.7	10.1	8.6	6
Field Conductivity, umhos/com	1150	530	1110	1330
Lab pH	8.5	8.6	8.4	8.4
Lab Conductivity, umhos/com	1120	507	1060	1230
TDS, mg/l	840	310	700	900
TSS, mg/l	69	180	5	11
NO3 as N, mg/l	1.9	2.2	2.6	3.3
NO2 as N, mg/l	0.1	0.1	0.1	0.1
NO3+NO2 as N, mg/l	1.9	2.2	2.6	3.3
NH3 as N, mg/l	0.1	0.1	0.1	0.1
Phosphorus, T, mg/l	0.14	0.19	0.05	0.05
Bicarbonate as HCO3, D	441	224	378	473
Sulfate, D, mg/l	285	68	82	296
As, TD, mg/l	0.003	0.003	0.003	0.003
Ca, D, mg/l	111	55	90	118
Fe, TD, mg/l	1.58	3.04	0.05	0.22
Pb, TD, mg/l	0.2	0.2	0.2	0.2
Mg, D, mg/l	95	30	77	92
Mn, TD, mg/l	0.09	0.14	0.03	0.03
Hg, TD, mg/l	0.001	0.001	0.001	0.001
Se, TD, mg/l	0.009	0.005	0.008	0.008
Na, D, mg/l	9	4	9	12
Zn, TD, mg/l	0.05	0.05	0.05	0.05


Flow Rate - UWFGSC
cfs
Date
Series1
Linear (Series1)
y = 0.024x + 0.4986

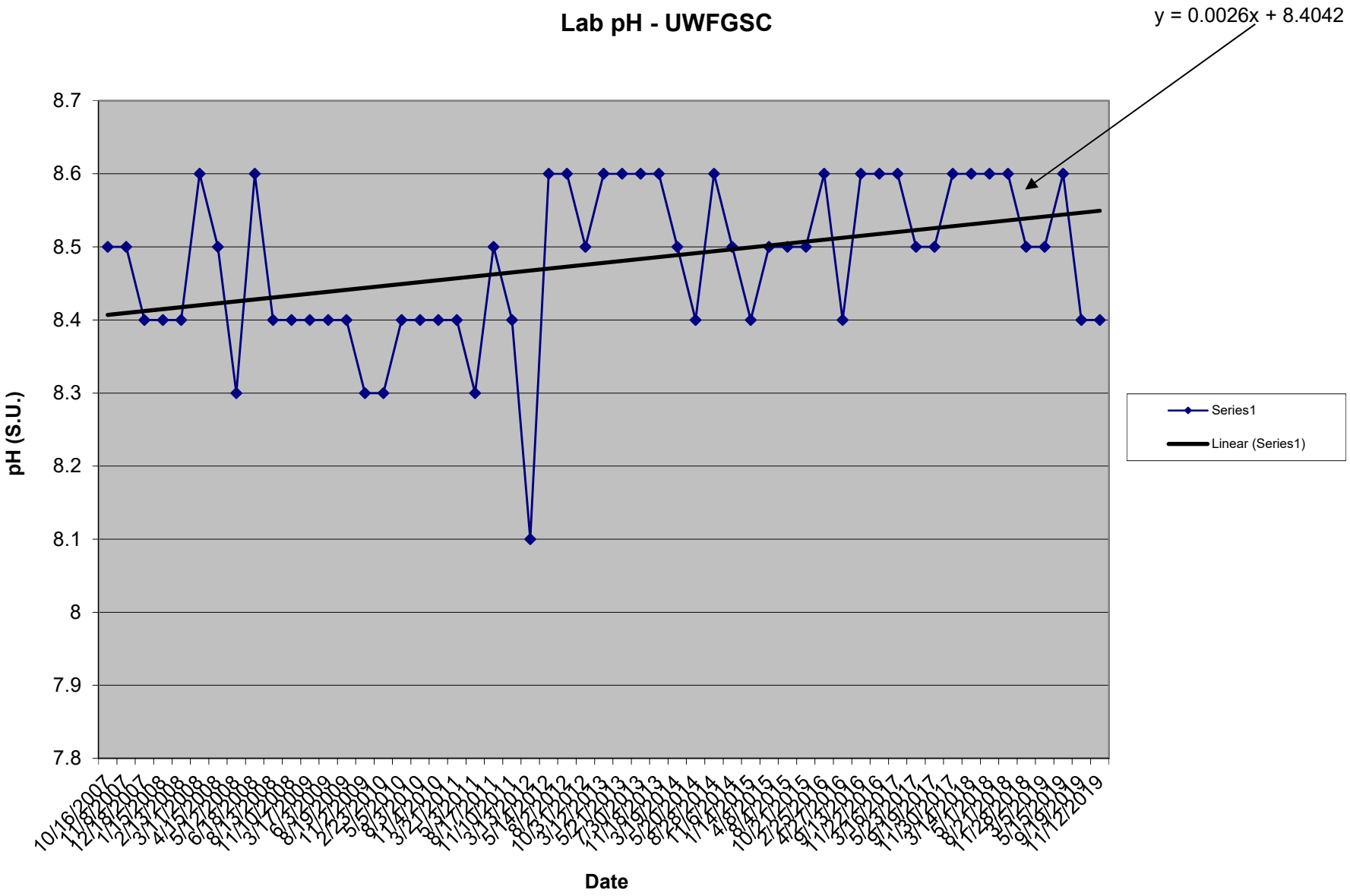
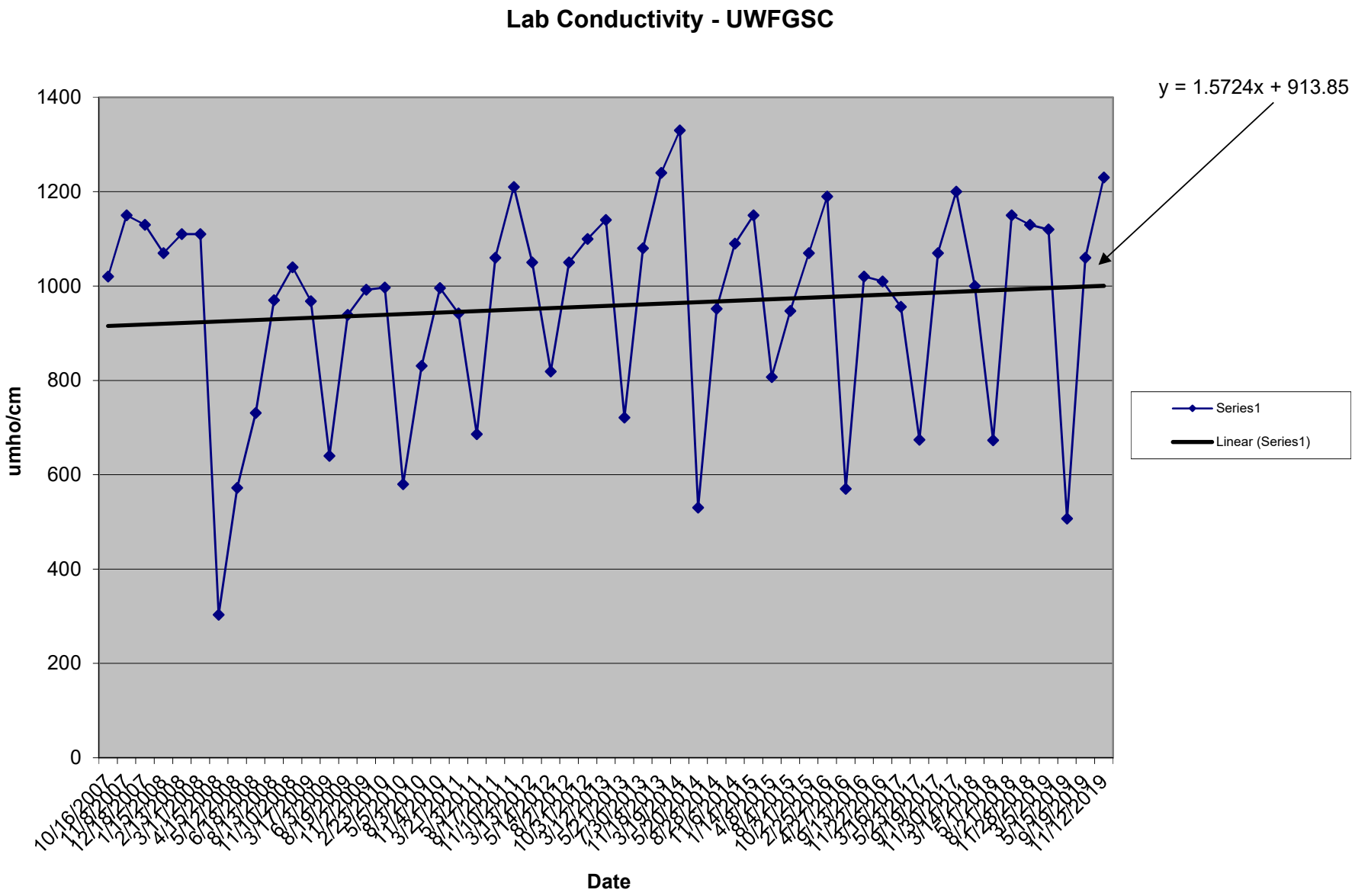
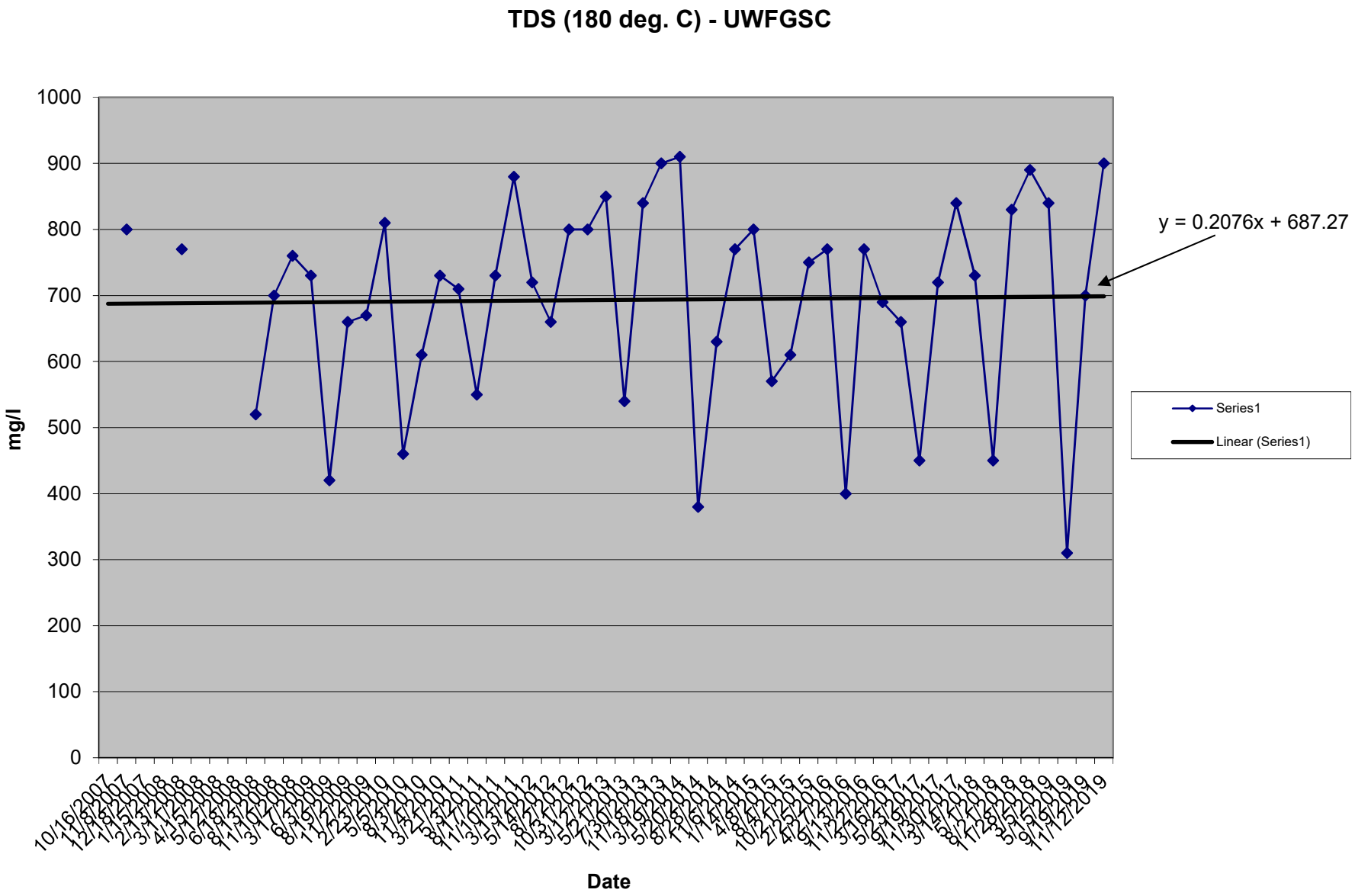

Lab pH - UWFGSC
y = 0.0026x + 8.4042
pH (S.U.)
8.7
8.6
8.5
8.4
8.3
8.2
8.1
8
7.9
7.8
Series1
Linear (Series1)
Date

Exhibit 1A



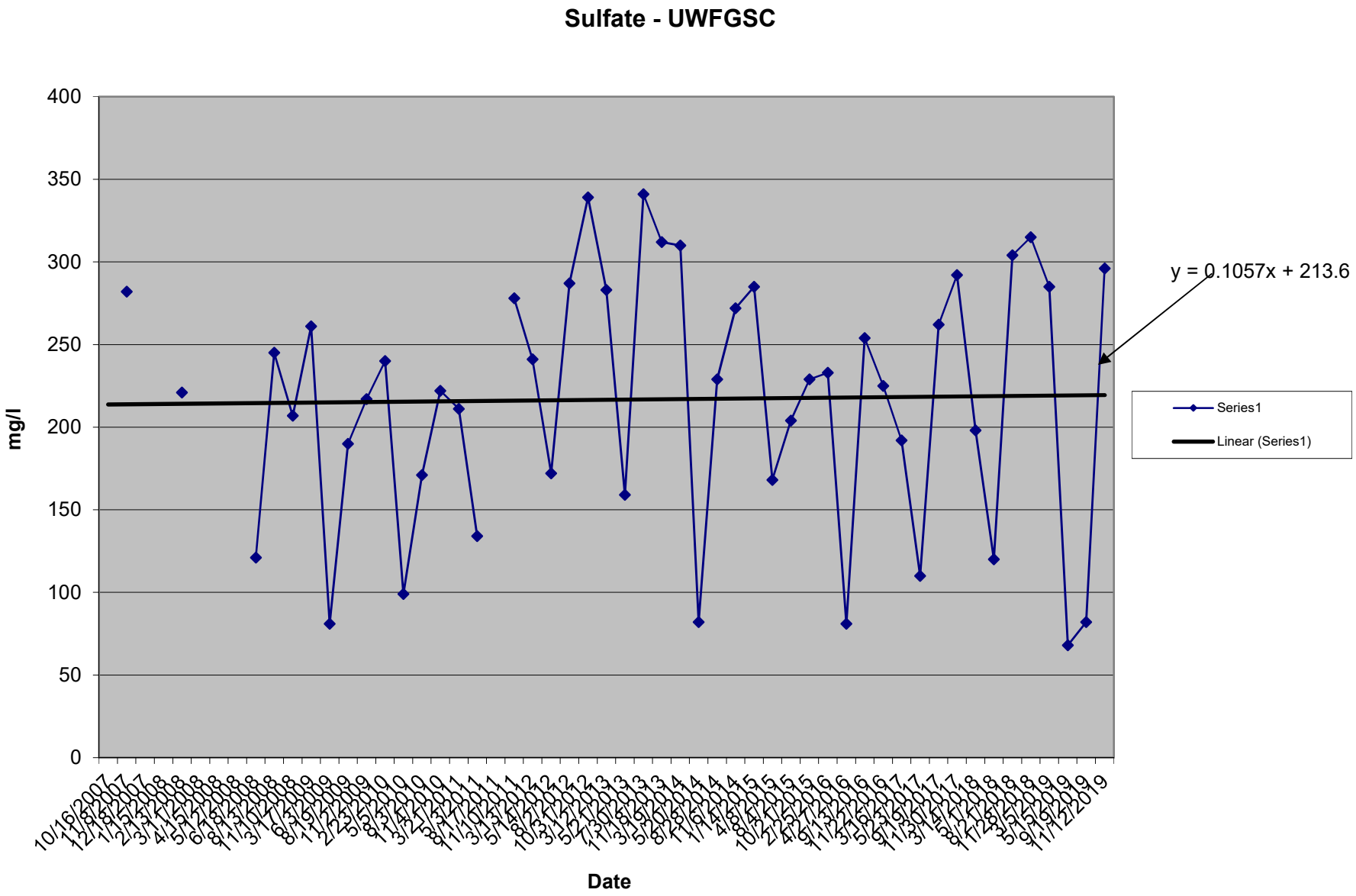
UWFGSC

Exhibit 1A



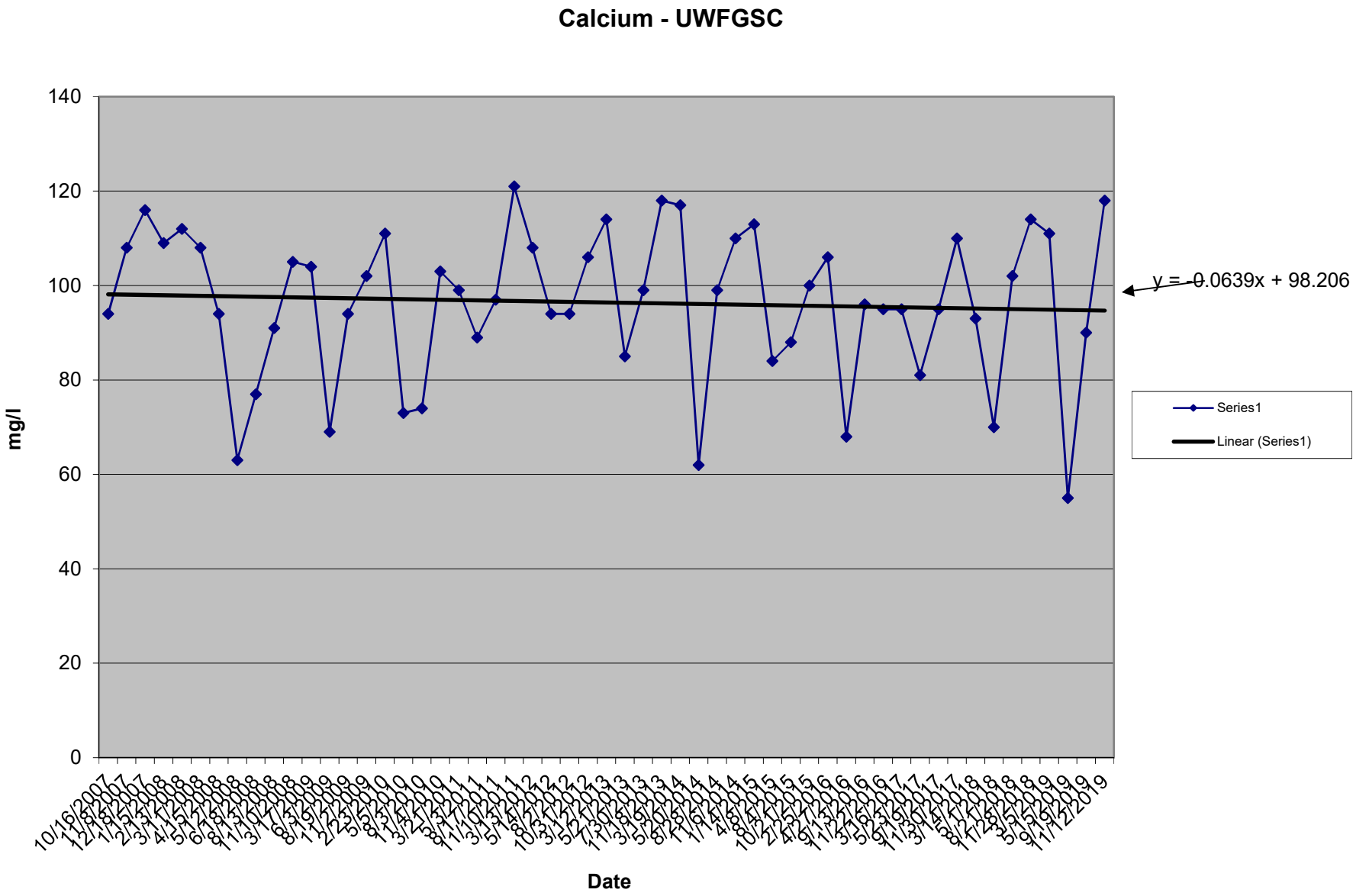
UWFGSC

Exhibit 1A



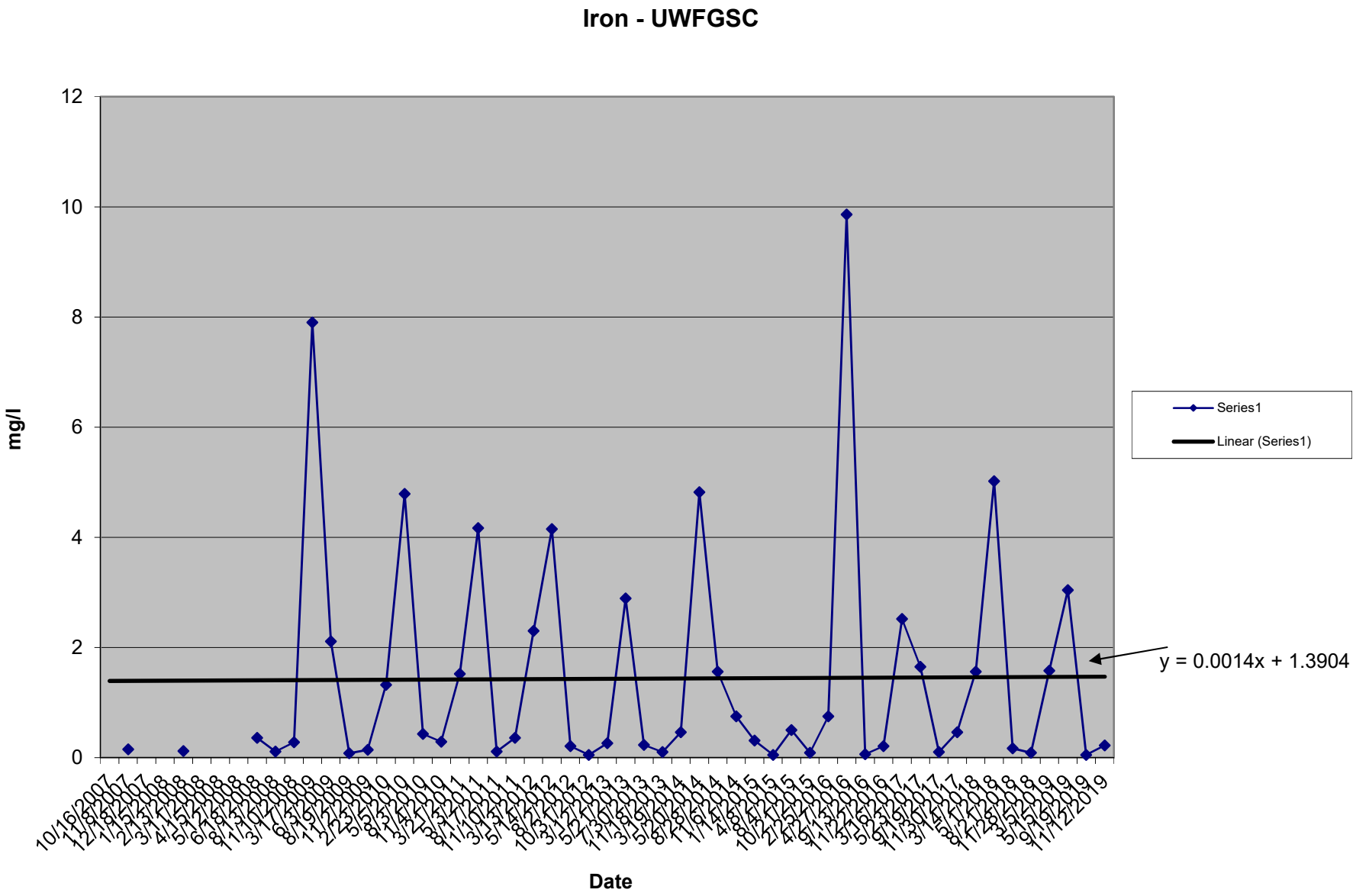
UWFGSC

Exhibit 1A



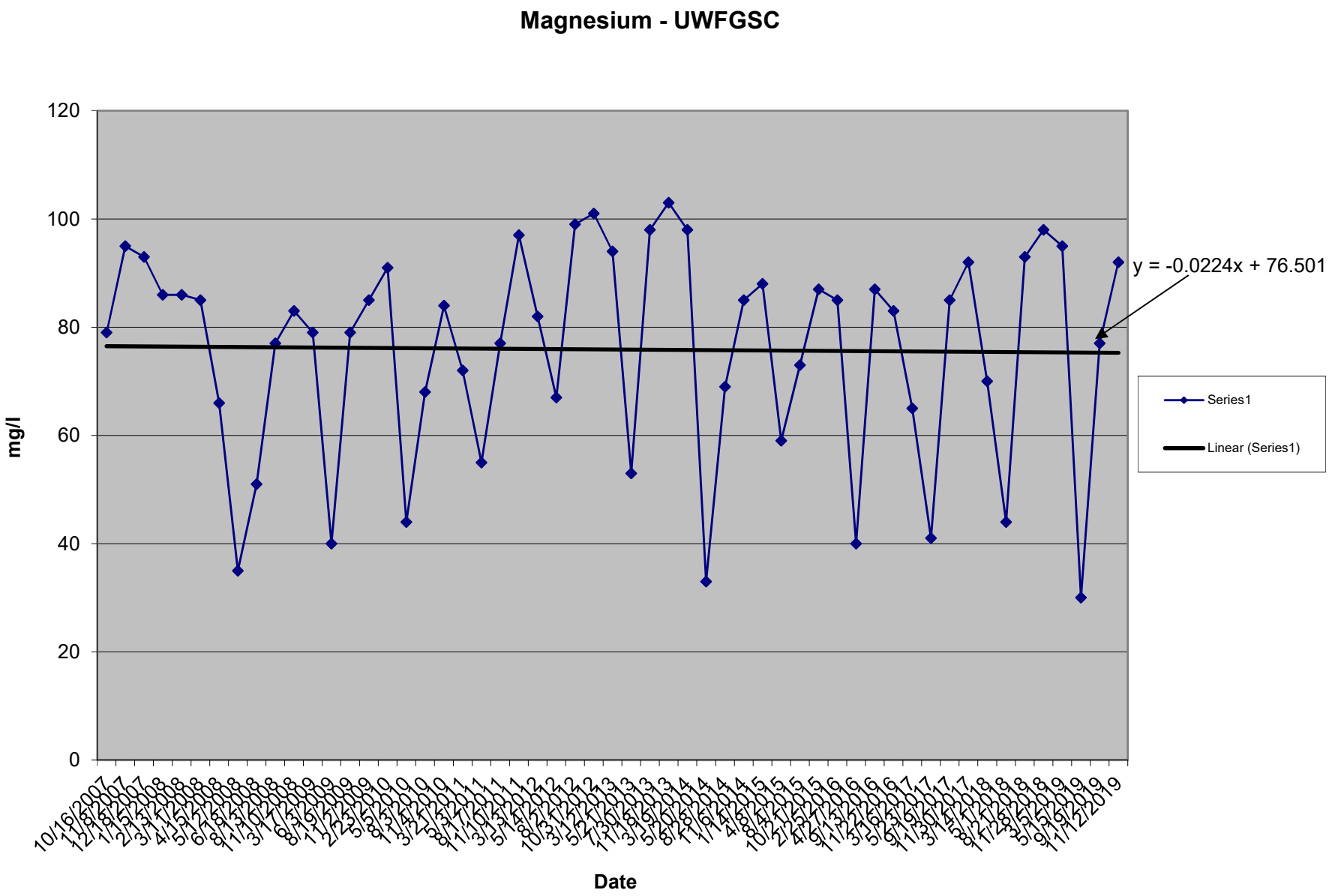
UWFGSC

Exhibit 1A



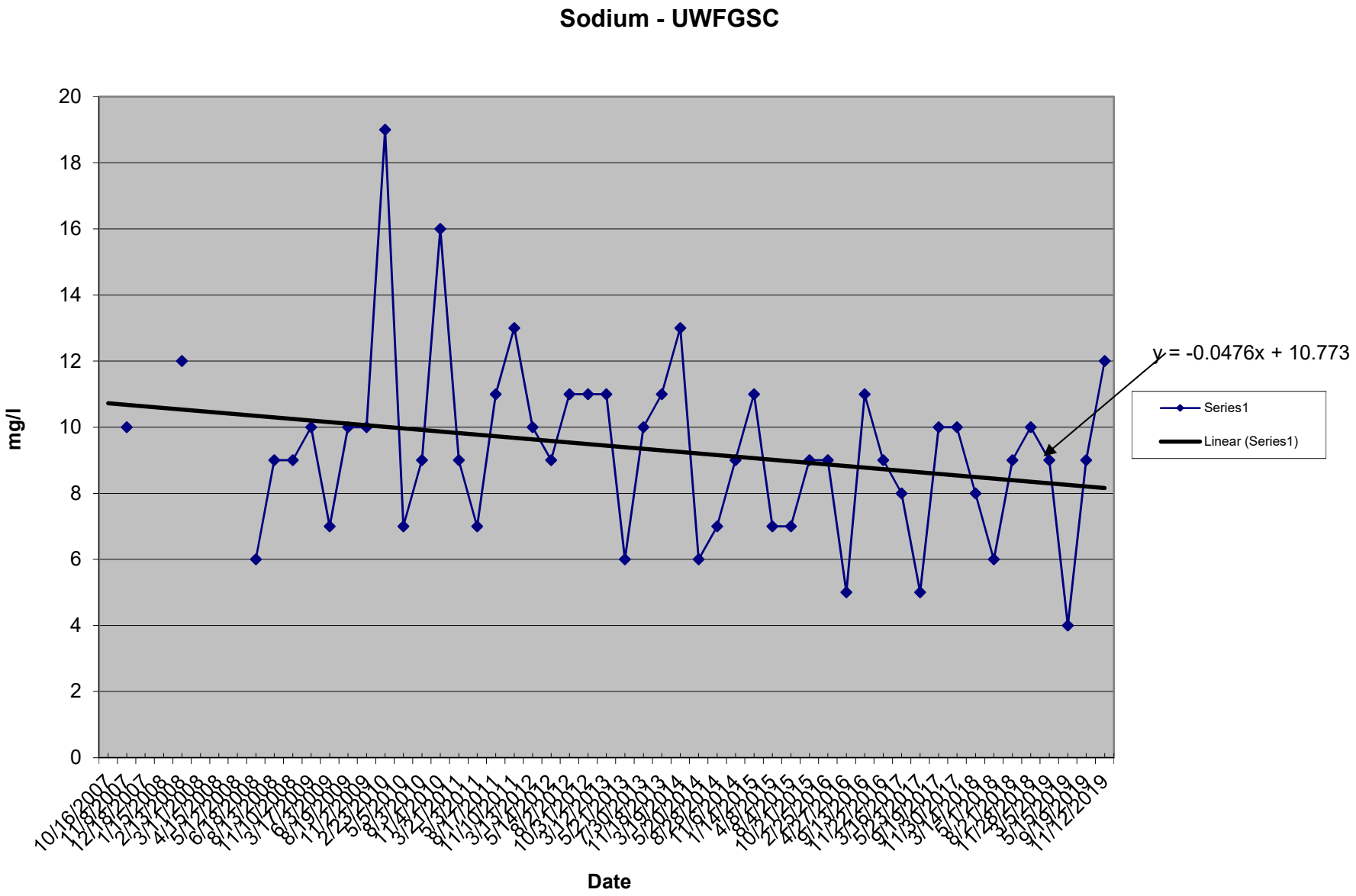
UWFGSC

Exhibit 1A



UWFGSC

Exhibit 1A

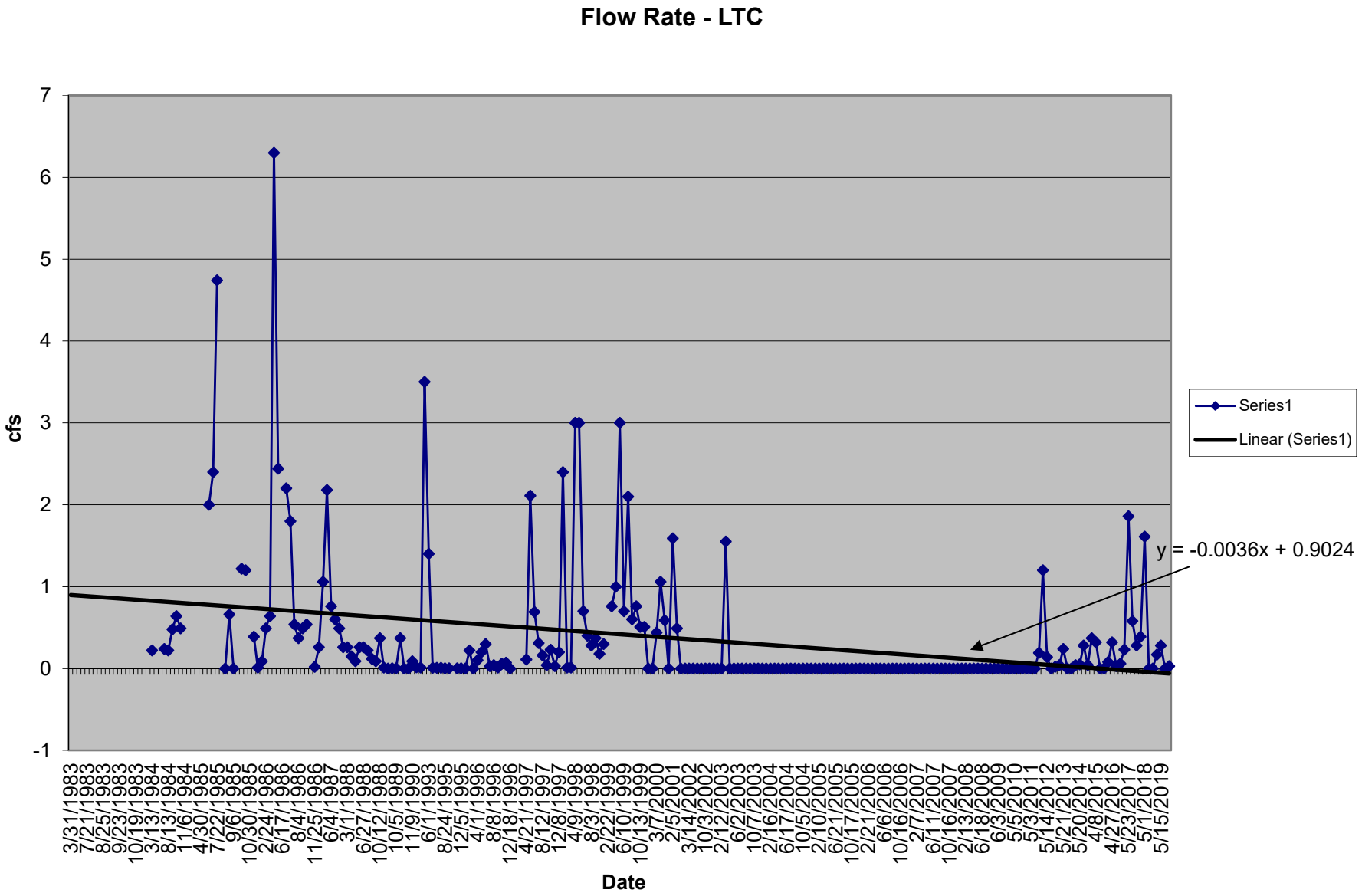


UWFGSC

Exhibit 1A

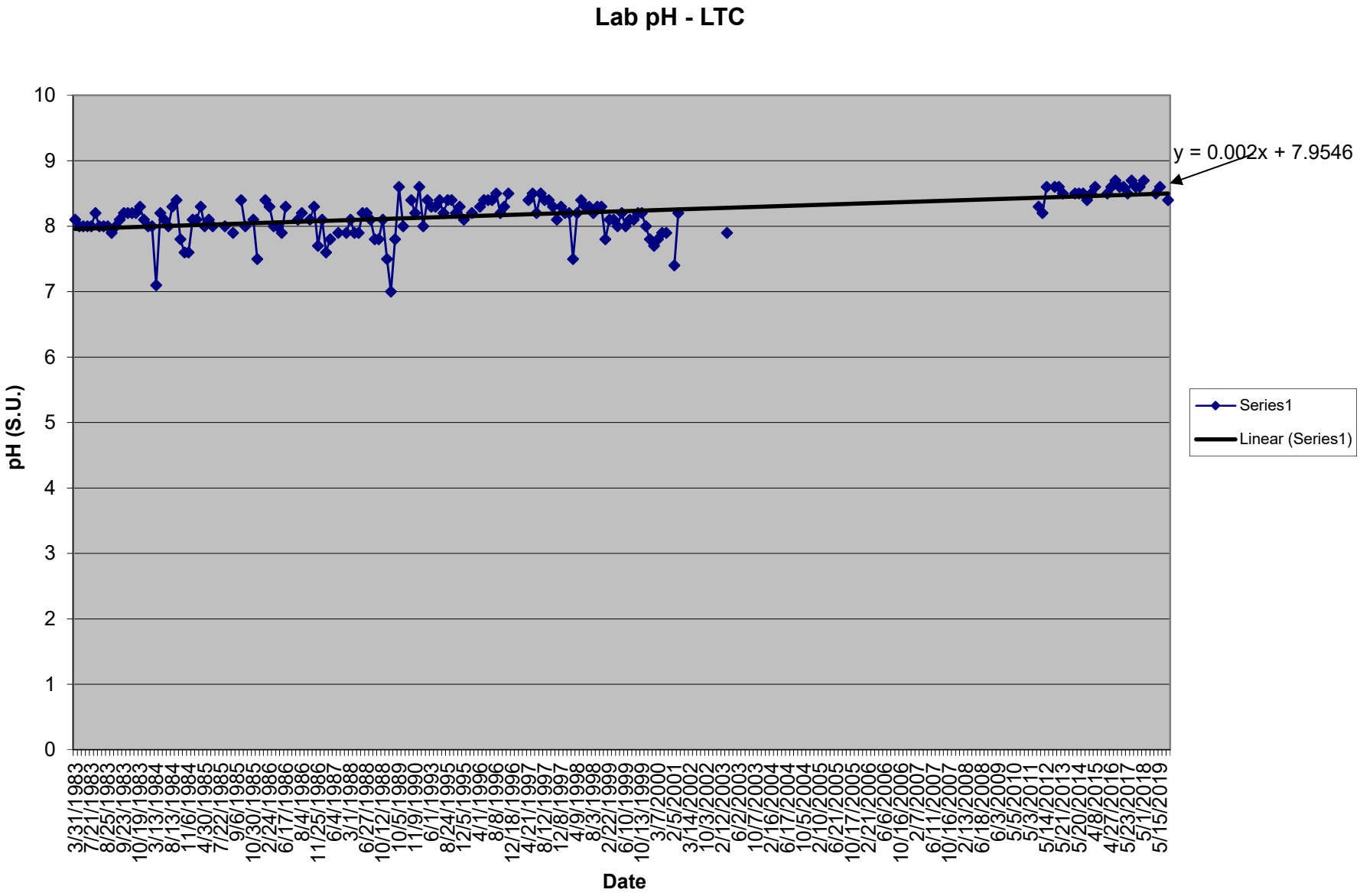
Colowyo Mine
Site - LTC
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Flow Rate, cfs	0.17	0.28	Dry	0.03
Field pH	7.69	7.74		8.26
Field Temp, °C	2.3	11.4		4.1
Field Conductivity, umhos/com	3160	2590		4040
Lab pH	8.5	8.6		8.4
Lab Conductivity, umhos/com	3170	2560		3750
TDS, mg/l	2520	2210		2920
TSS, mg/l	5	8		5
NO3+NO2 as N, mg/l	0.5	0.2		0.6
NH3 as N, mg/l	0.1	0.1		0.1
Phosphorus, T, mg/l	668	472		814
Bicarbonate as HCO3, D	1050	183		1450
Sulfate, D, mg/l	0.07	0.05		0.05
As, TD, mg/l	0.003	0.003		0.003
Ca, D, mg/l	137	112		103
Fe, TD, mg/l	0.12	0.22		0.19
Pb, TD, mg/l	0.2	0.2		0.2
Mg, D, mg/l	146	160		154
Mn, TD, mg/l	0.03	0.06		0.03
Hg, TD, mg/l	0.001	0.001		0.001
Se, TD, mg/l	0.005	0.005		0.005
Na, D, mg/l	476	353		700
Zn, TD, mg/l	0.05	0.05		0.05


Flow Rate - LTC
cfs
Date
Series1
Linear (Series1)
y = -0.0036x + 0.9024

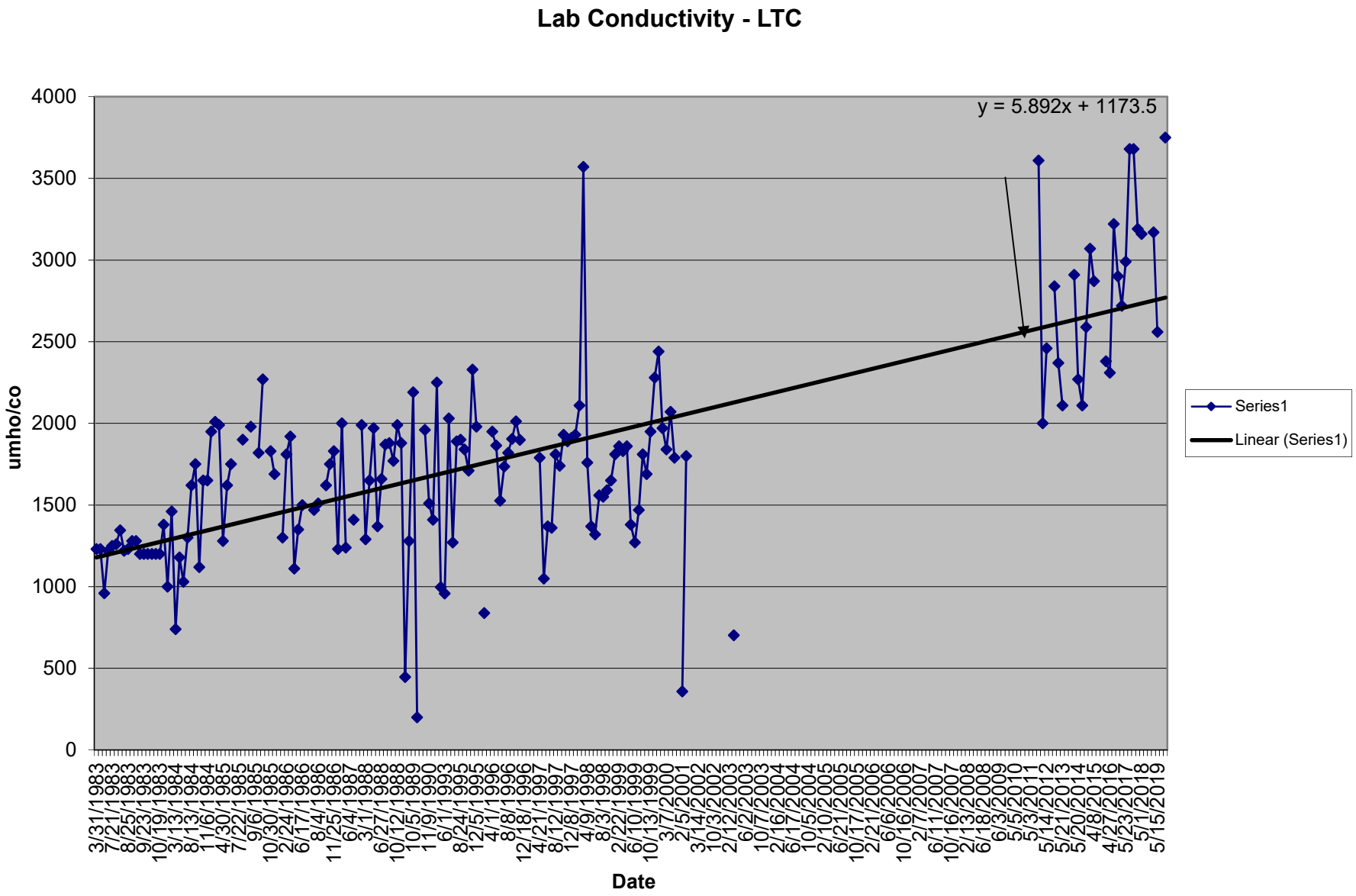
LTC

Exhibit 1A



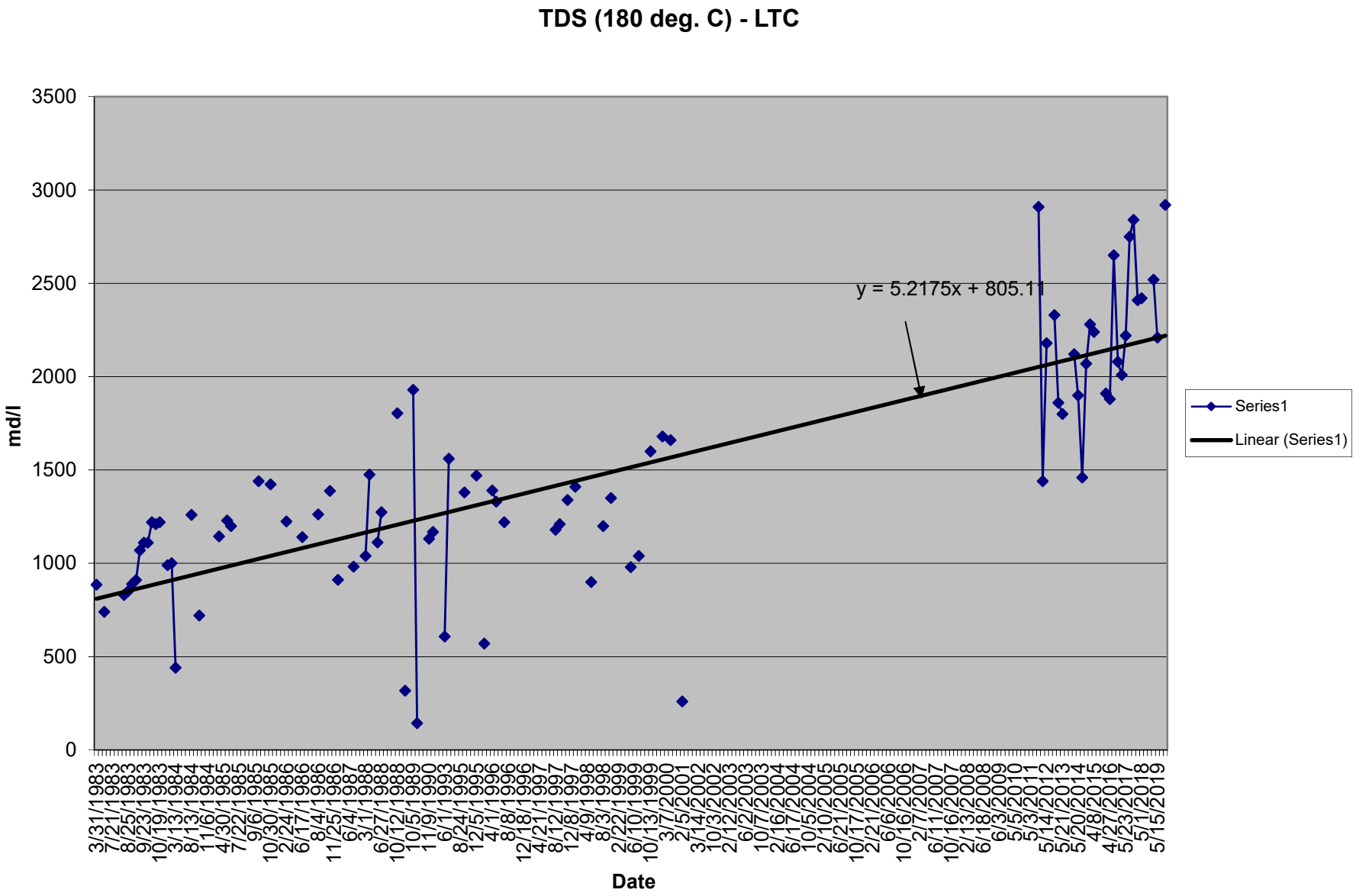
LTC

Exhibit 1A



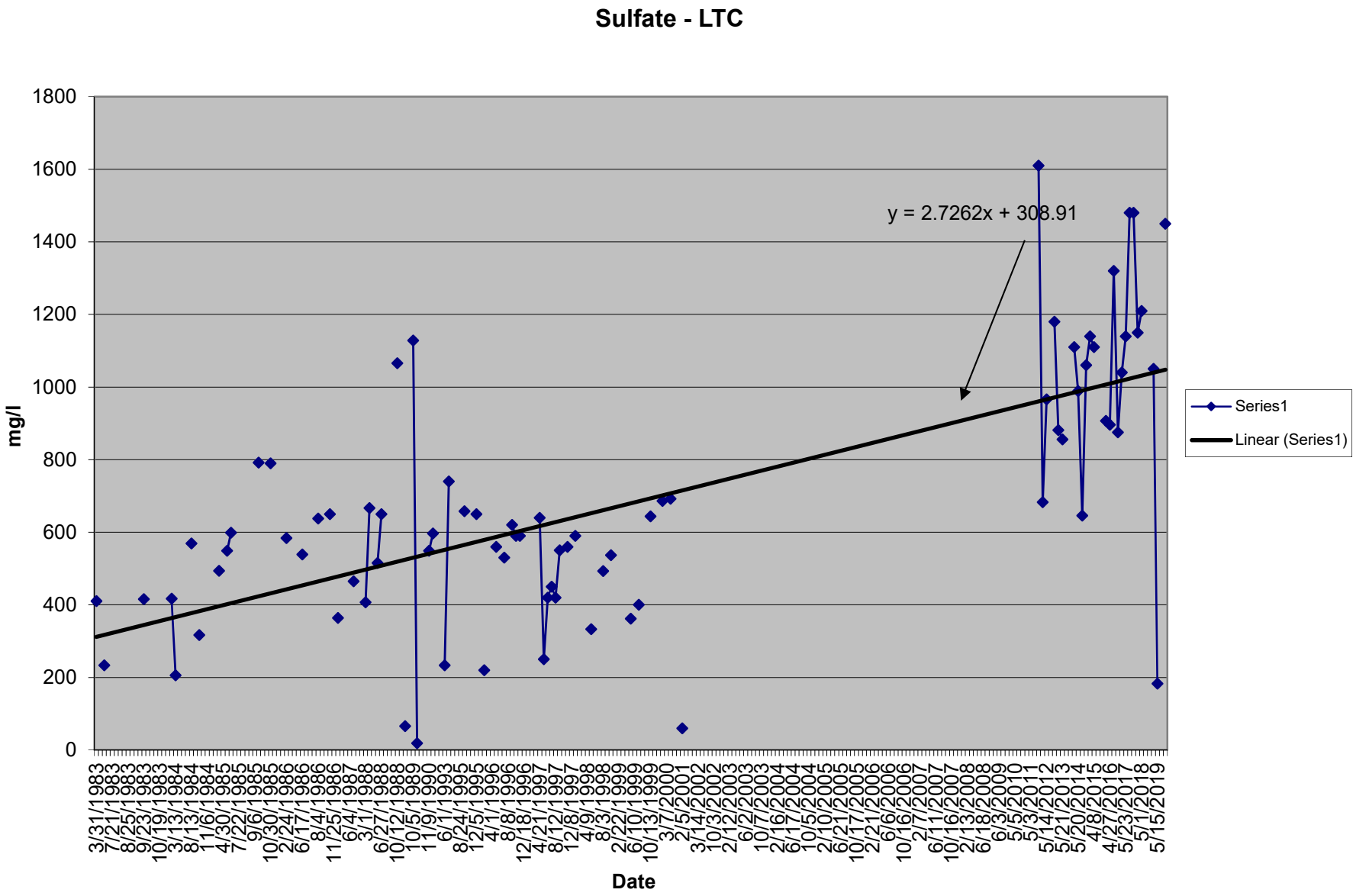
LTC

Exhibit 1A



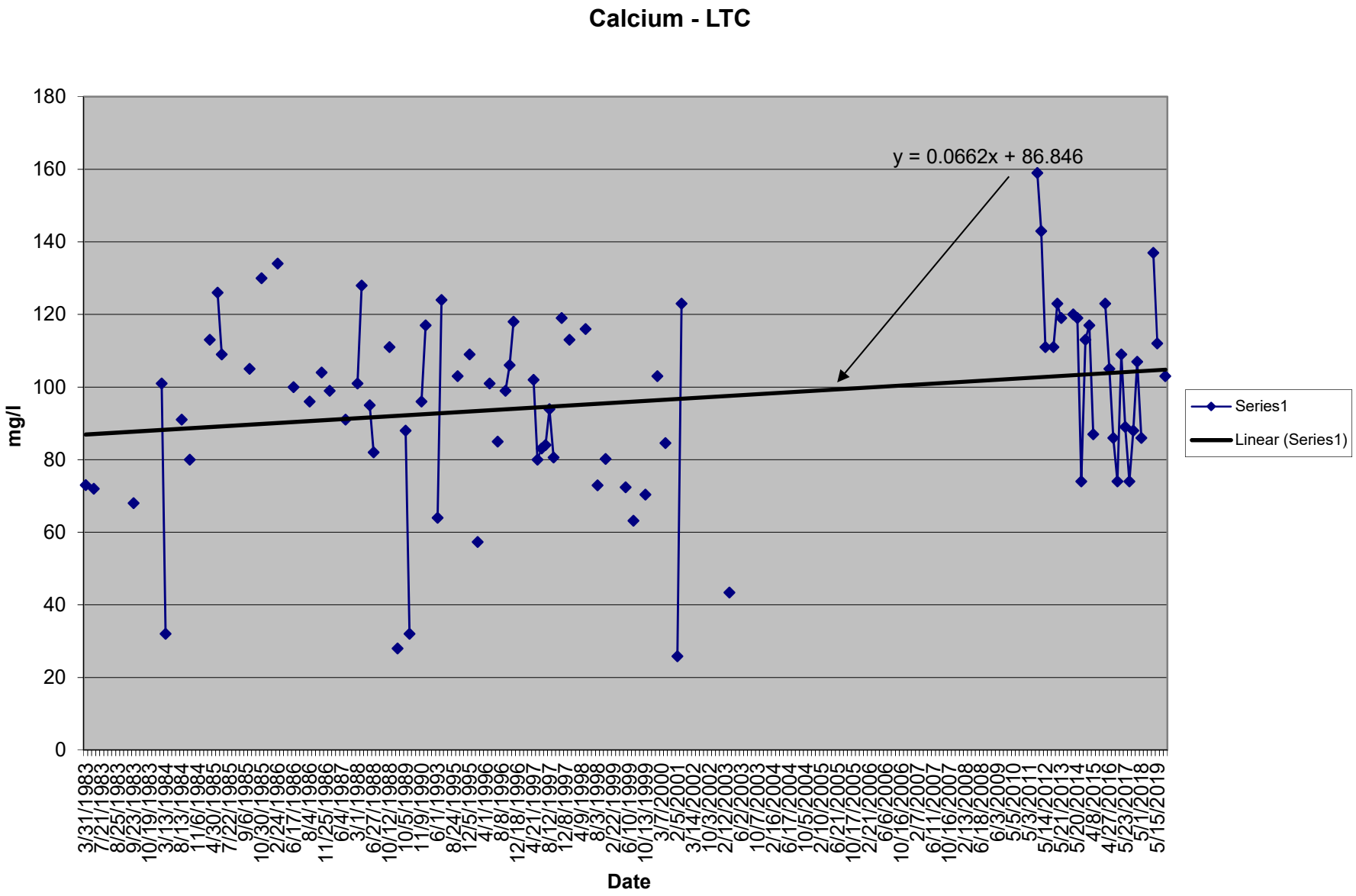
LTC

Exhibit 1A



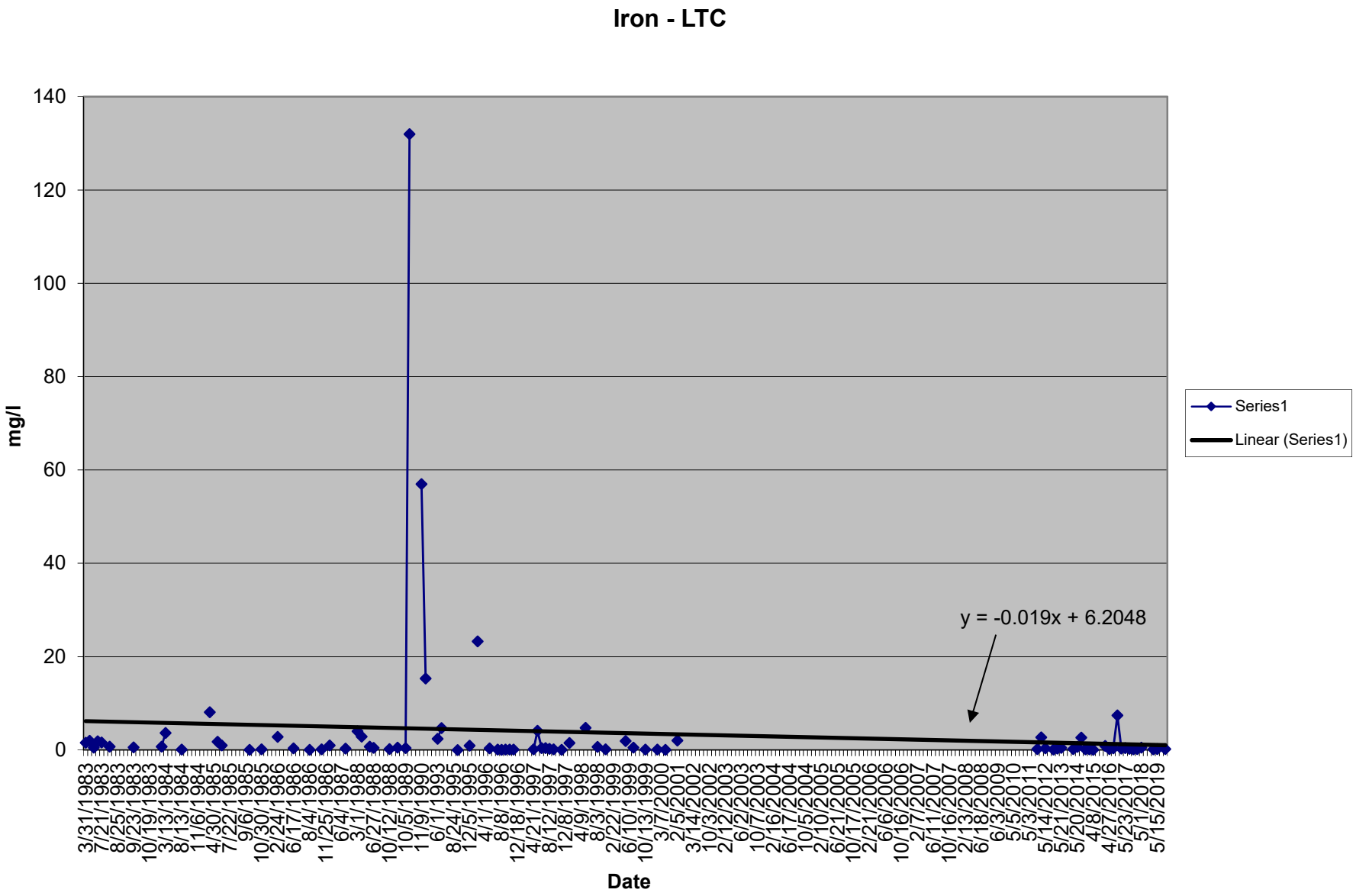
LTC

Exhibit 1A

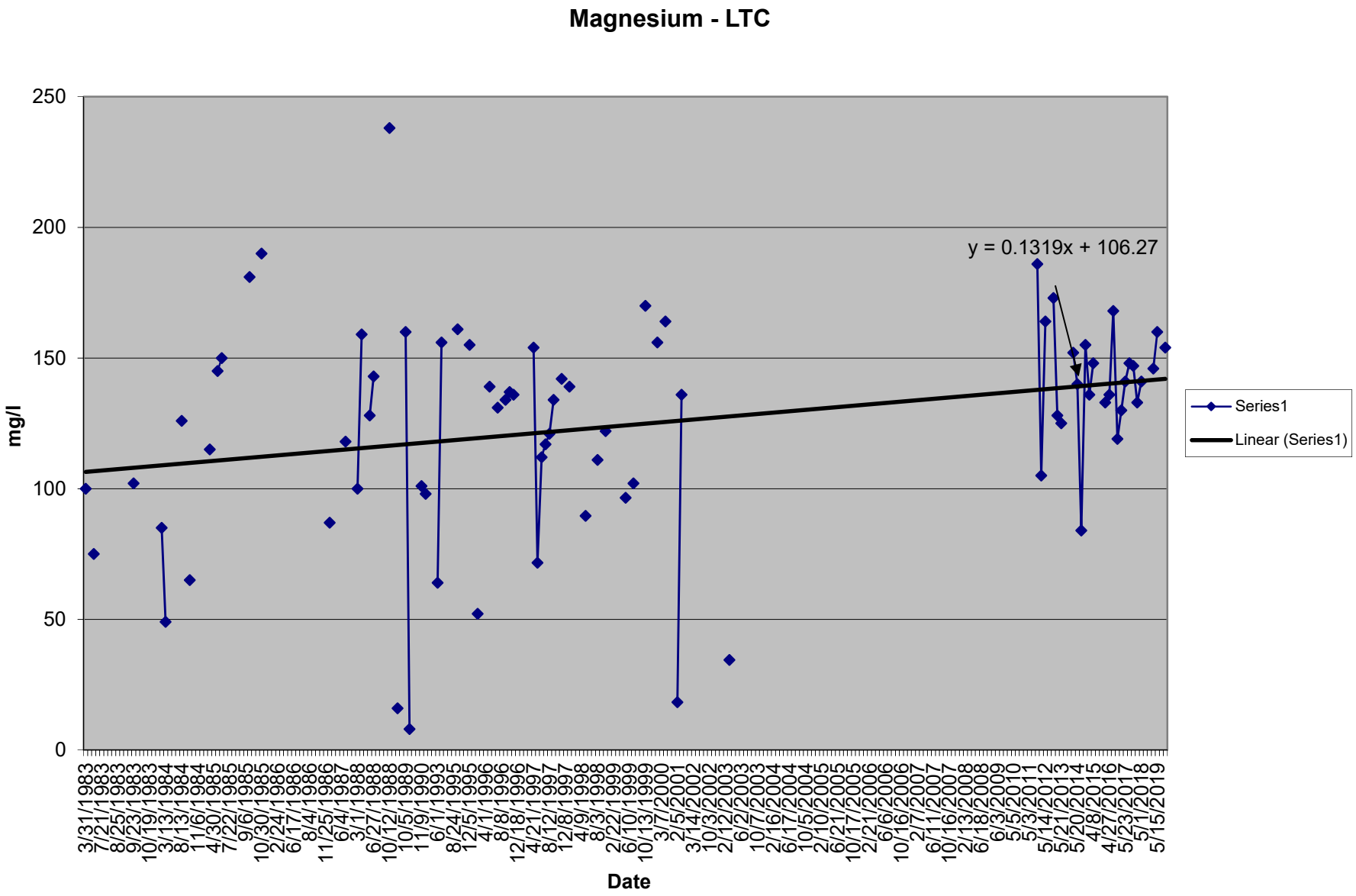


LTC

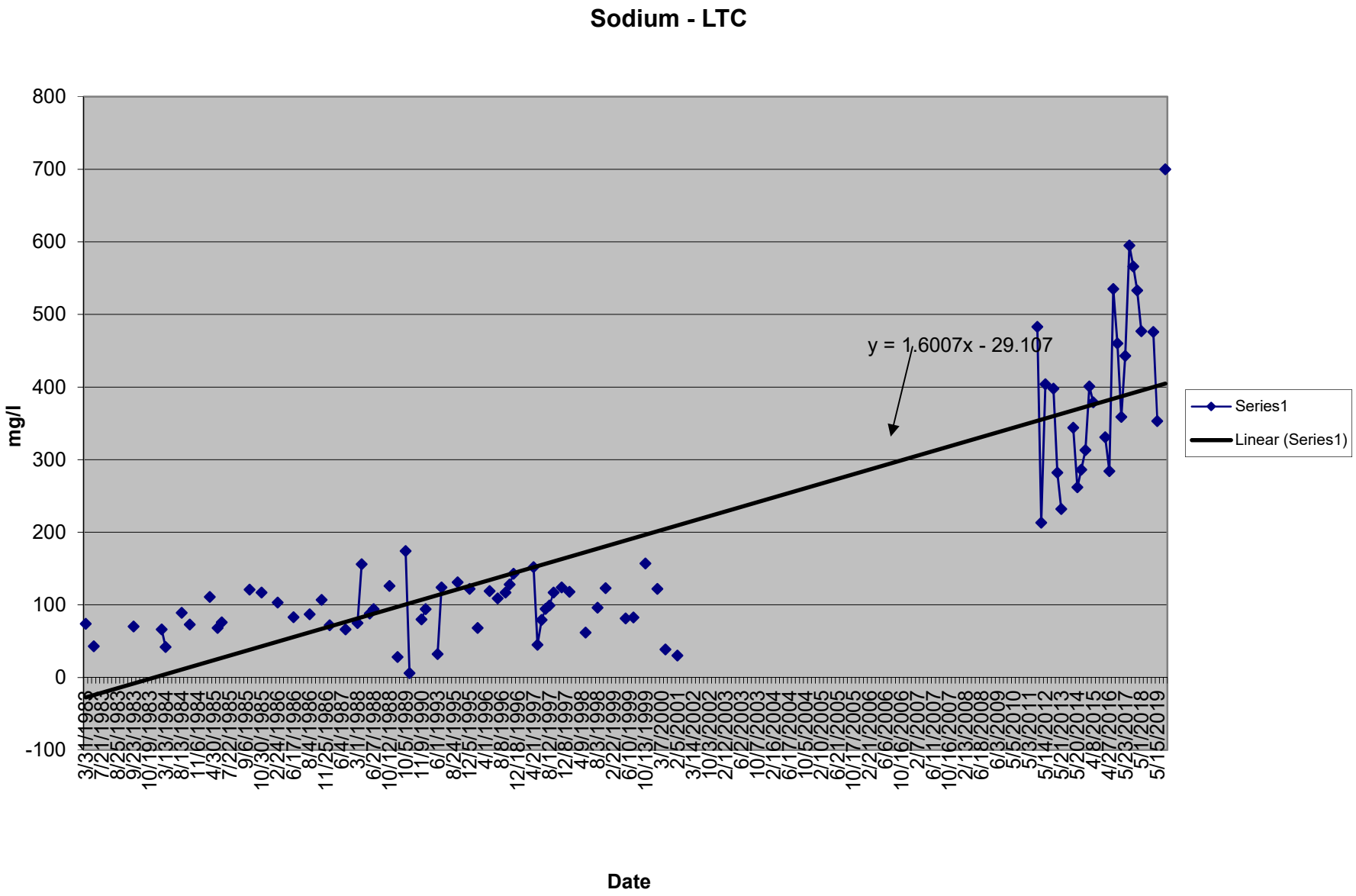
Exhibit 1A



LTC


Magnesium - LTC
y = 0.1319x + 106.27
mg/l
Date
Series1
Linear (Series1)

LTC


Sodium - LTC
800
700
600
500
400
300
200
100
0
-100
mg/l
y = 1.6007x - 29.107
Series1
Linear (Series1)
Date

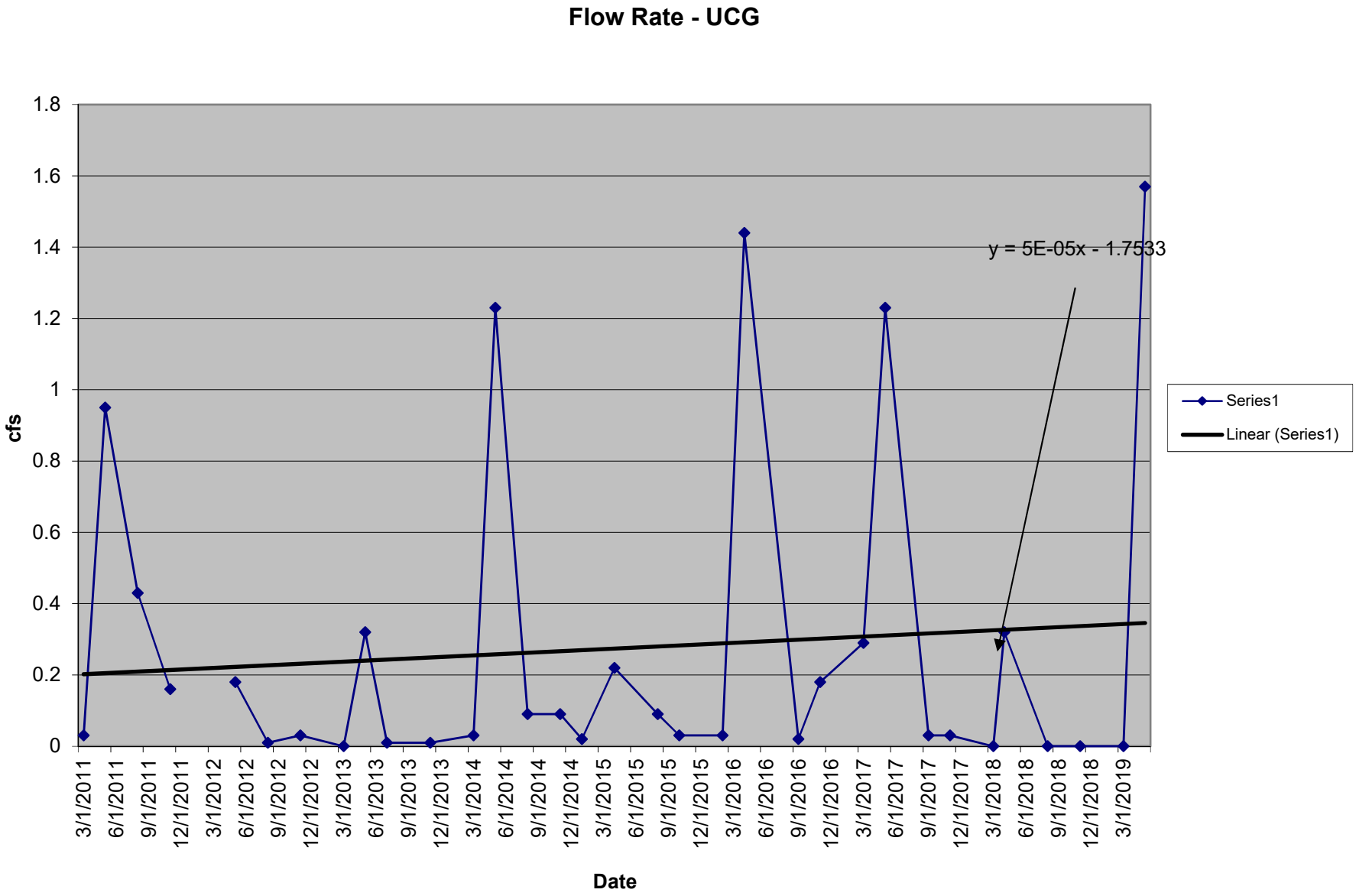
LTC

Exhibit 1B

Colowyo Mine
Site - UCG
Water Year 1/1/2019 - 12/31/19

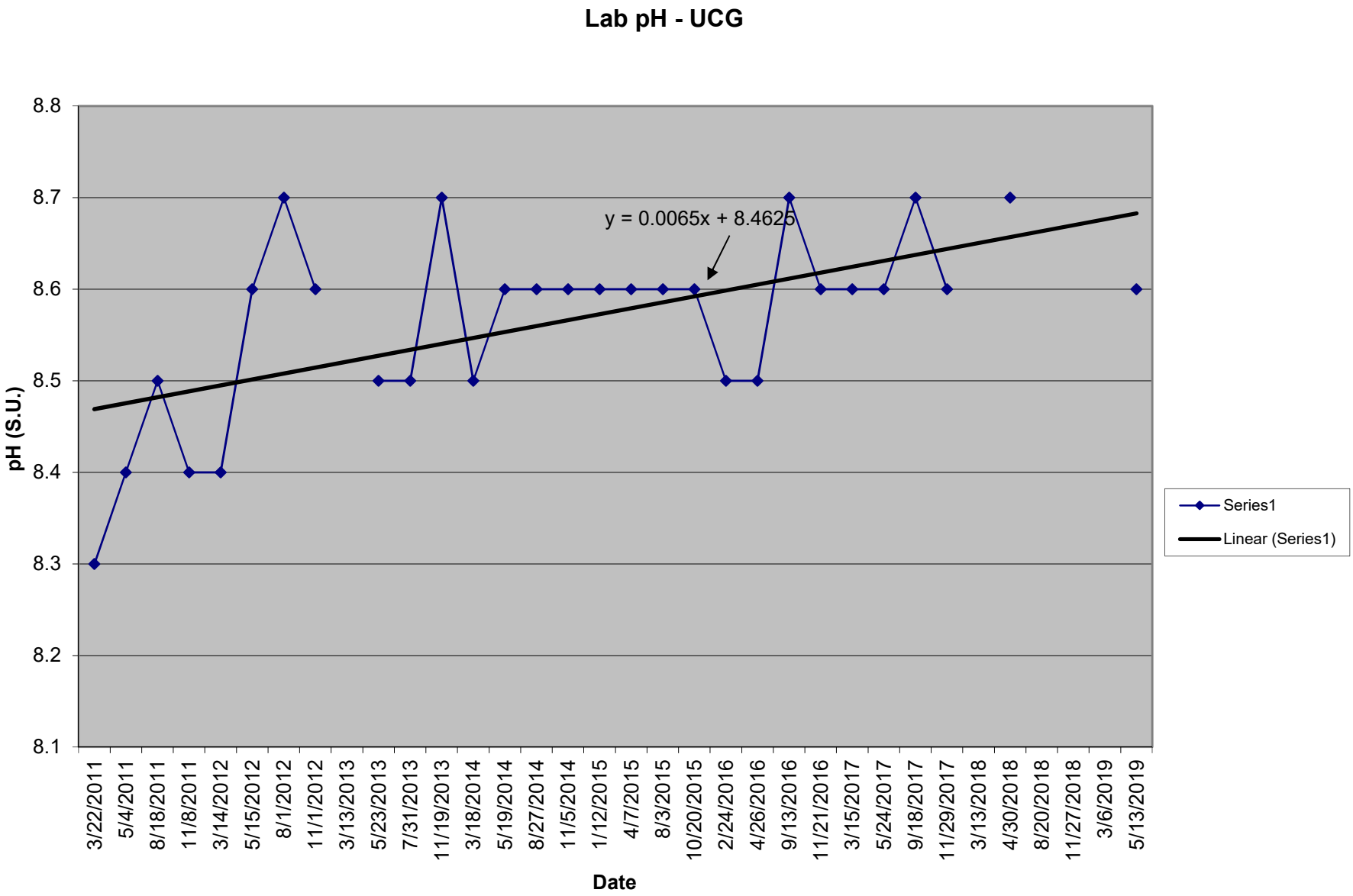
	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Flow Rate, cfs	Dry	1.57	Dry	Dry
Field pH		7.45		
Field Temp, °C		13.1		
Field Conductivity, umhos/com		440		
Lab pH		8.6		
Lab Conductivity, umhos/com		414		
TDS, mg/l		270		
TSS, mg/l		127		
NO3 as N, mg/l		2		
NO2 as N, mg/l		0.1		
NO3+NO2 as N, mg/l		2		
NH3 as N, mg/l		0.1		
Phosphorus, T, mg/l		0.15		
Bicarbonate as HCO3, D		202		
Sulfate, D, mg/l		42		
As, TD, mg/l		0.003		
Ca, D, mg/l		48		
Fe, TD, mg/l		2.51		
Pb, TD, mg/l		0.2		
Mg, D, mg/l		23		
Mn, TD, mg/l		0.08		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Na, D, mg/l		6		
Zn, TD, mg/l		0.05		

Exhibit 1A



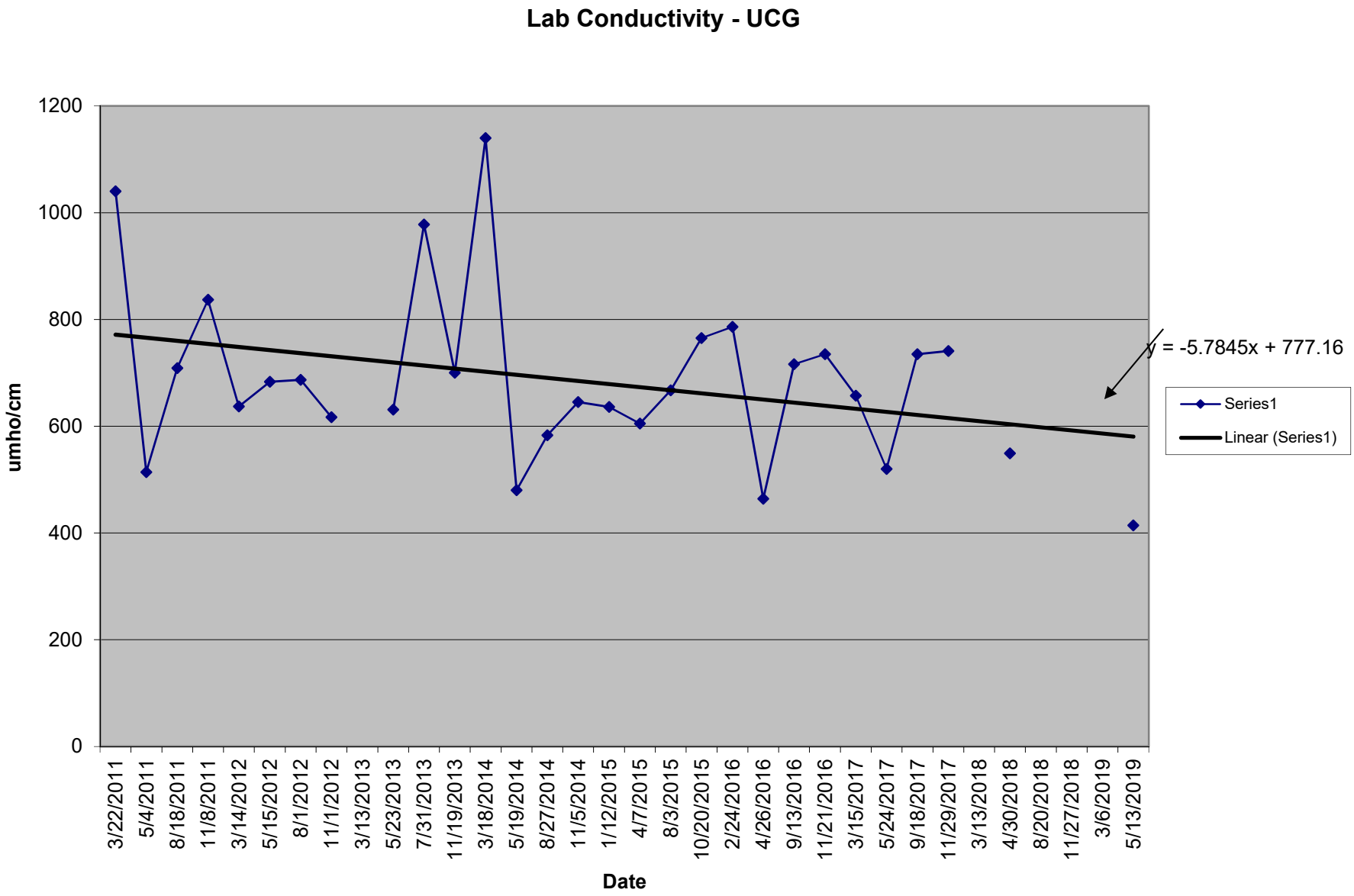
UCG

Exhibit 1A



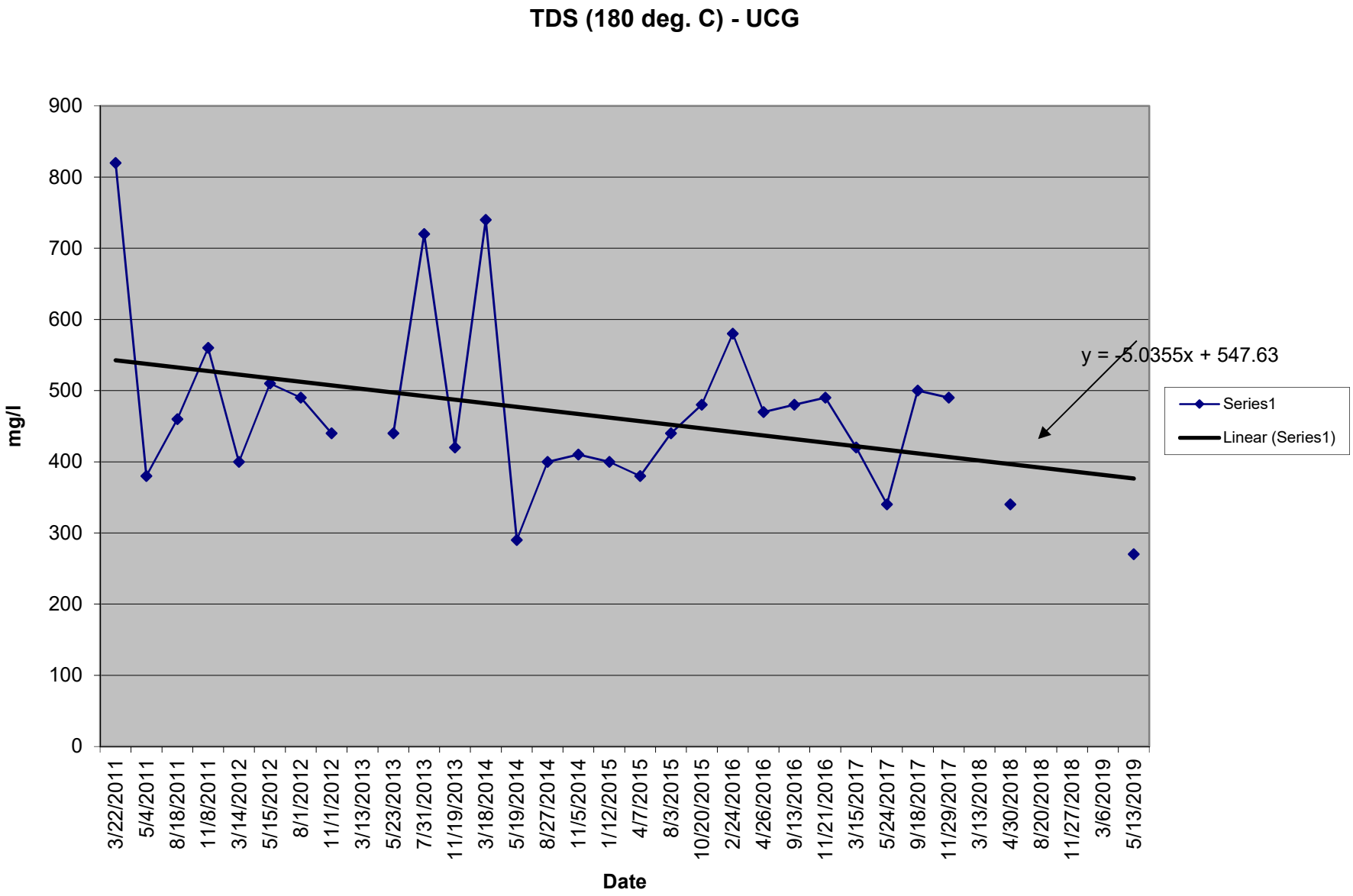
UCG

Exhibit 1A



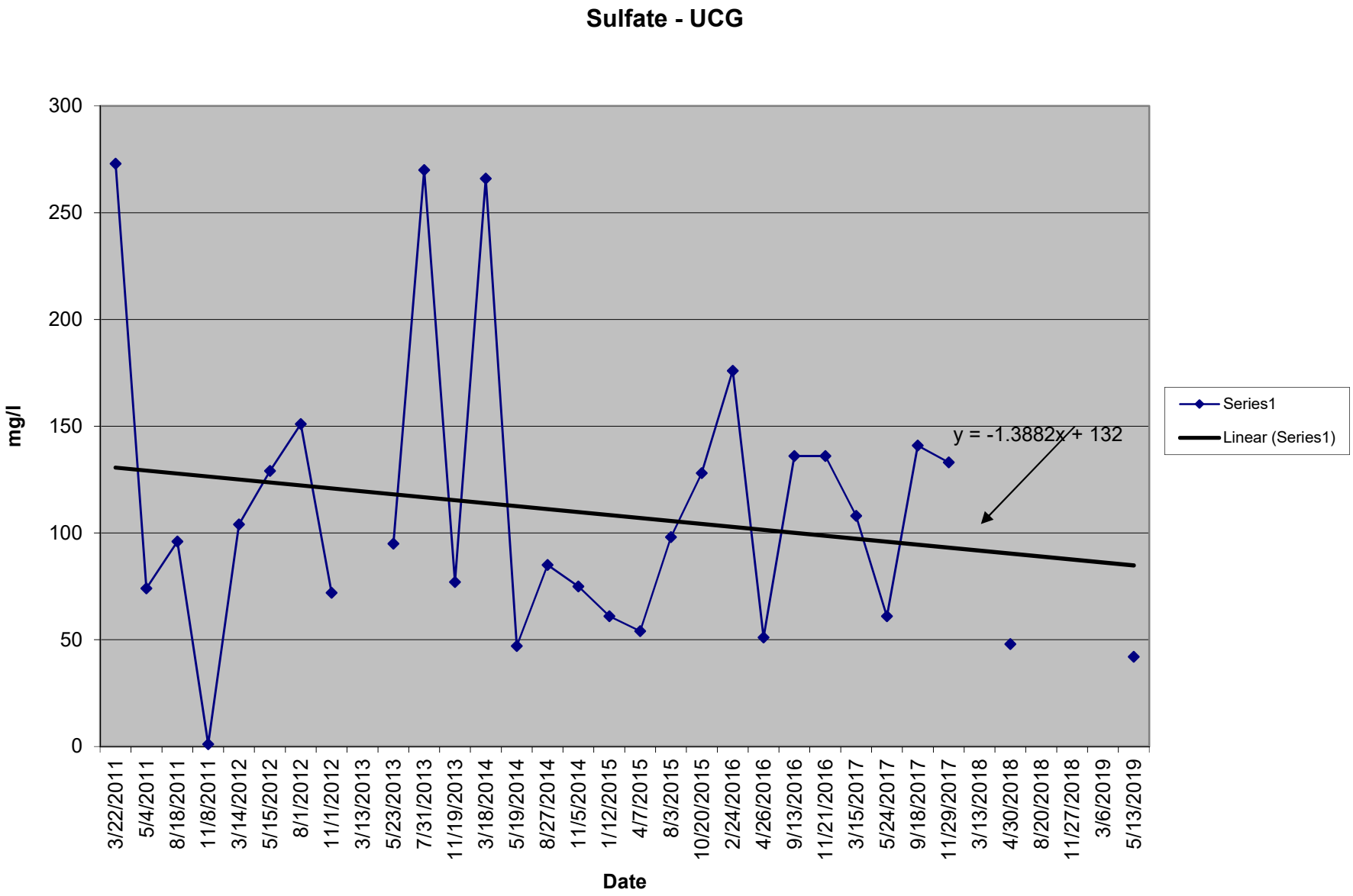
UCG

Exhibit 1A



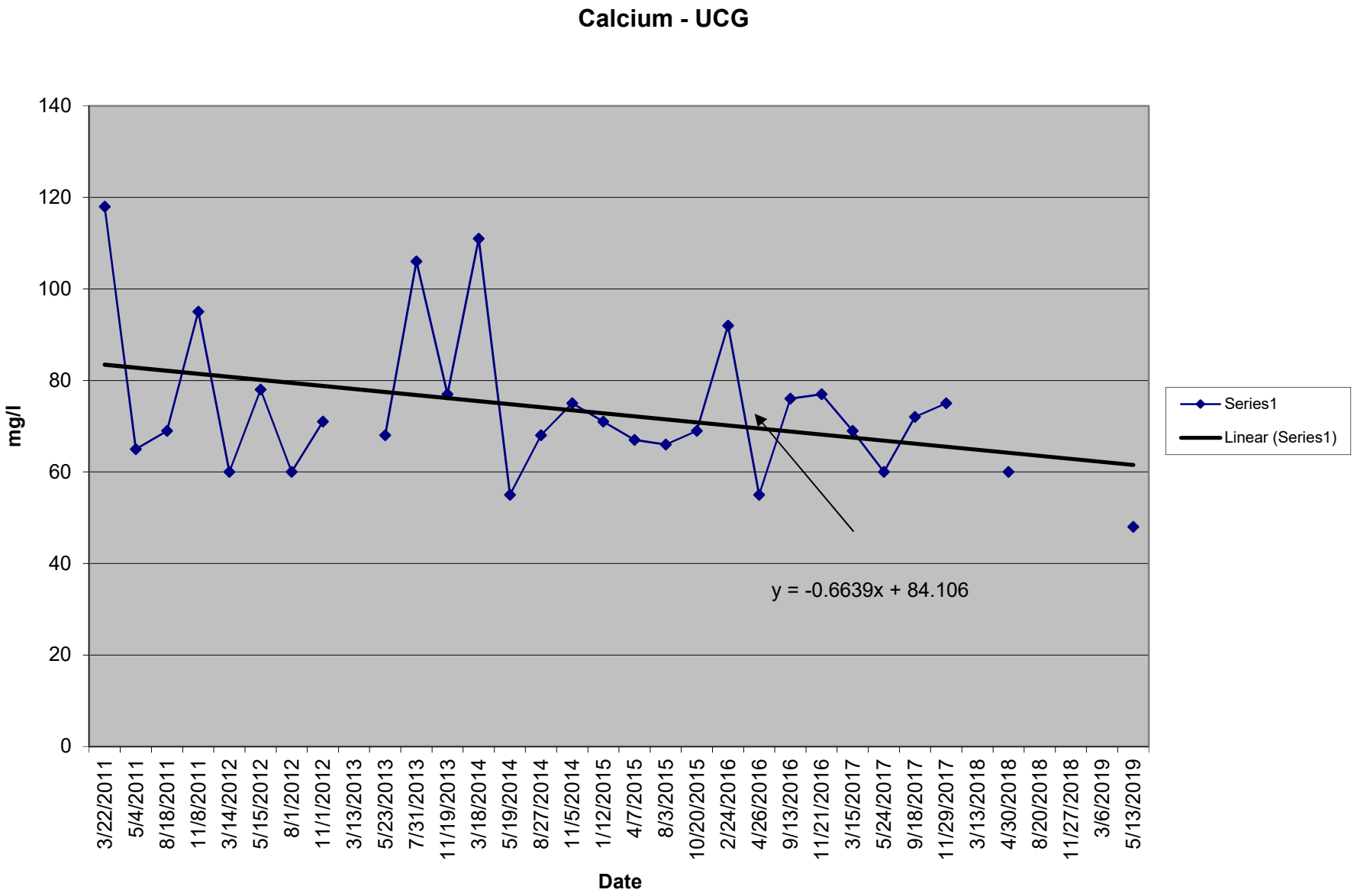
UCG

Exhibit 1A



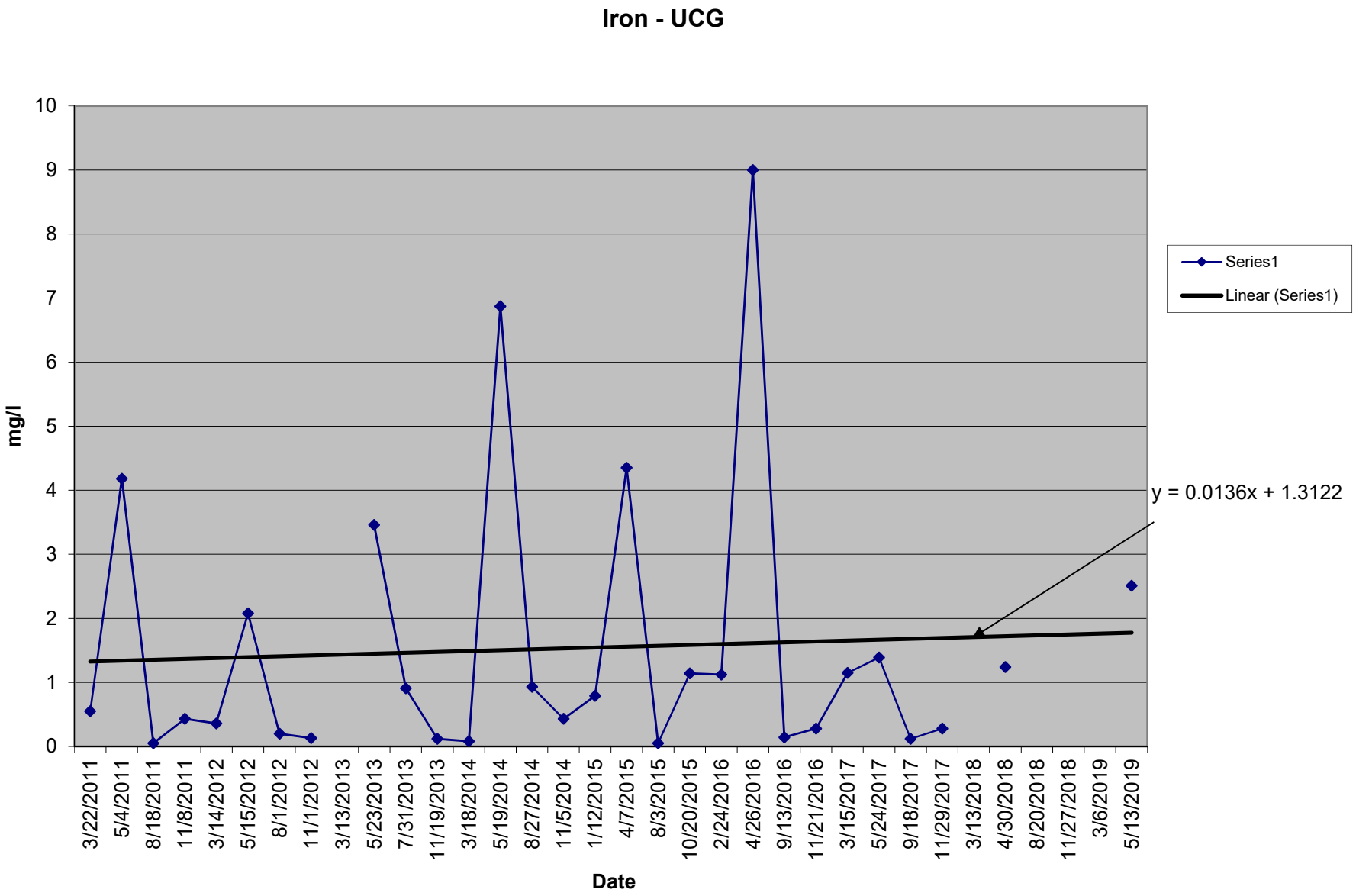
UCG

Exhibit 1A



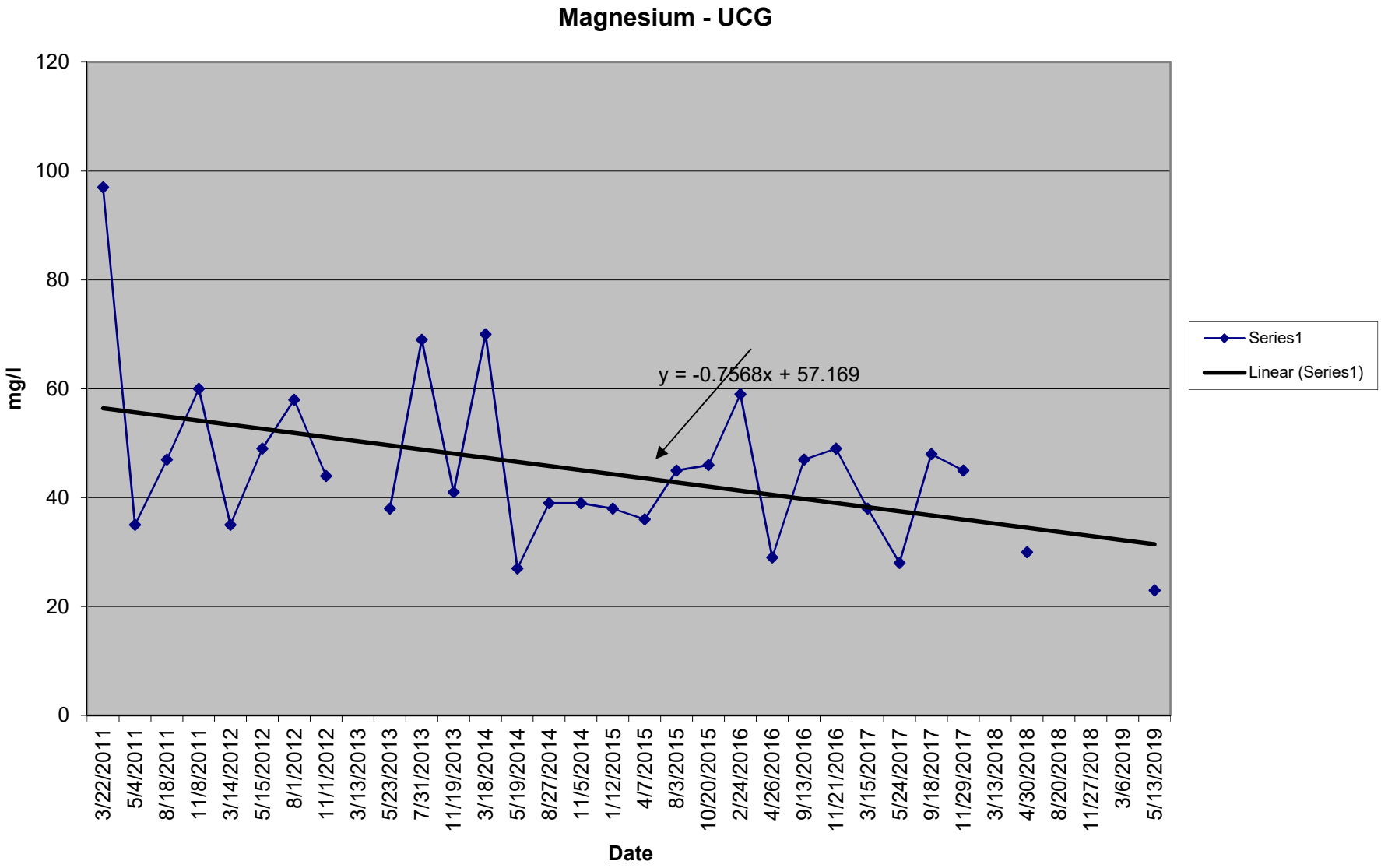
UCG

Exhibit 1A



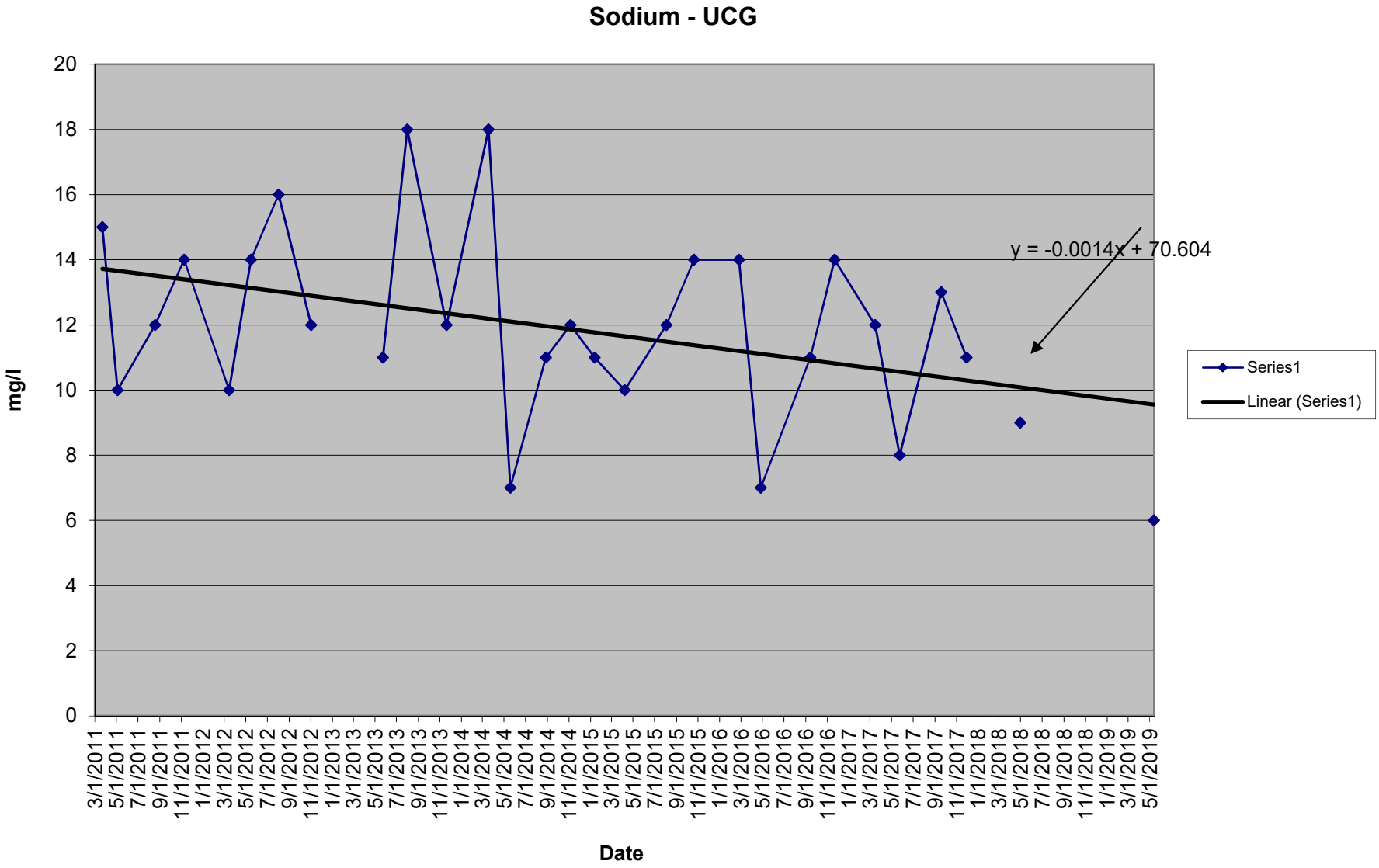
UCG

Exhibit 1A



UCG

Exhibit 1A



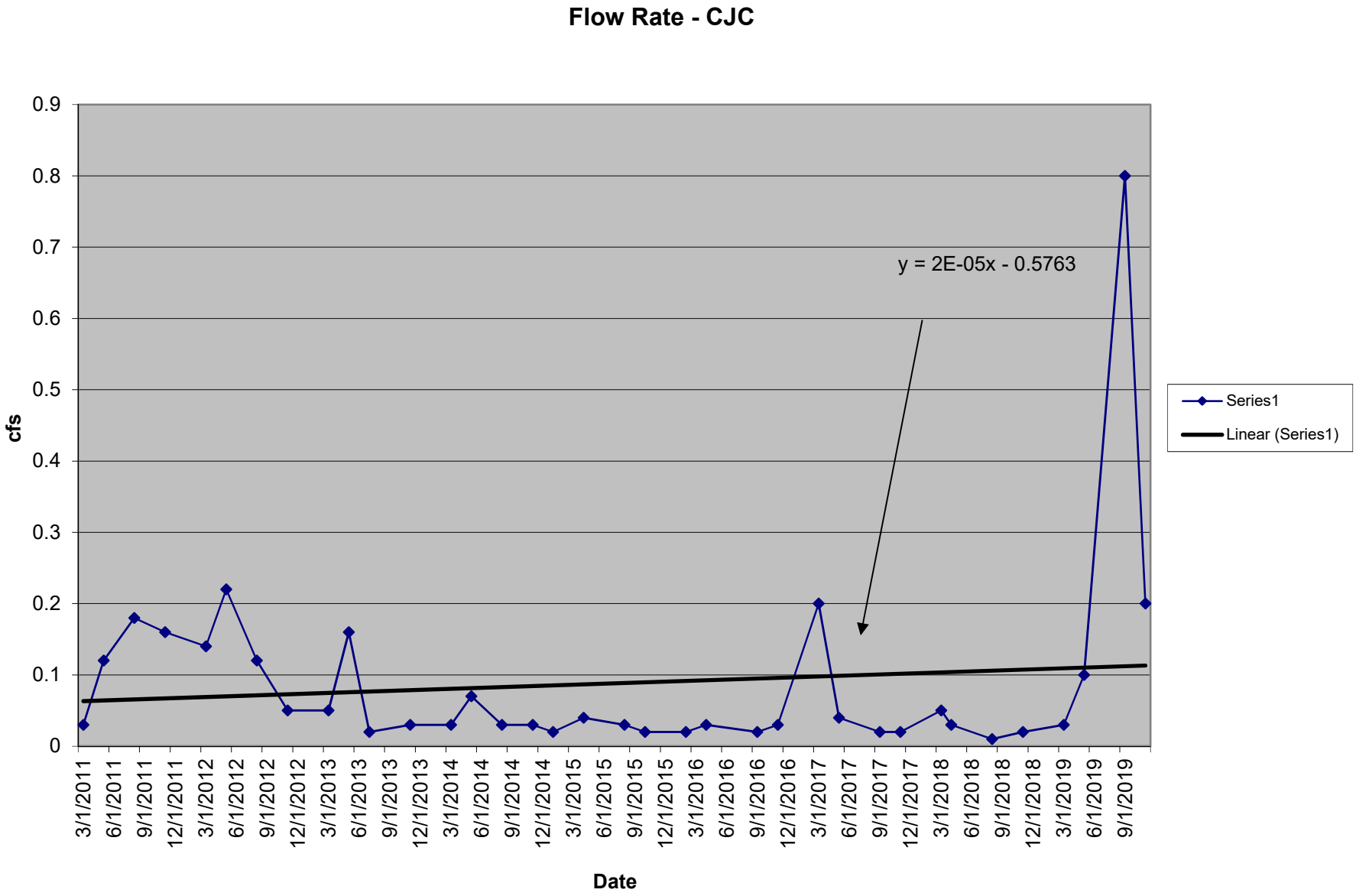
UCG

Exhibit 1A

Colowyo Mine
Site - CJC
Water Year 1/1/2019 - 12/31/19

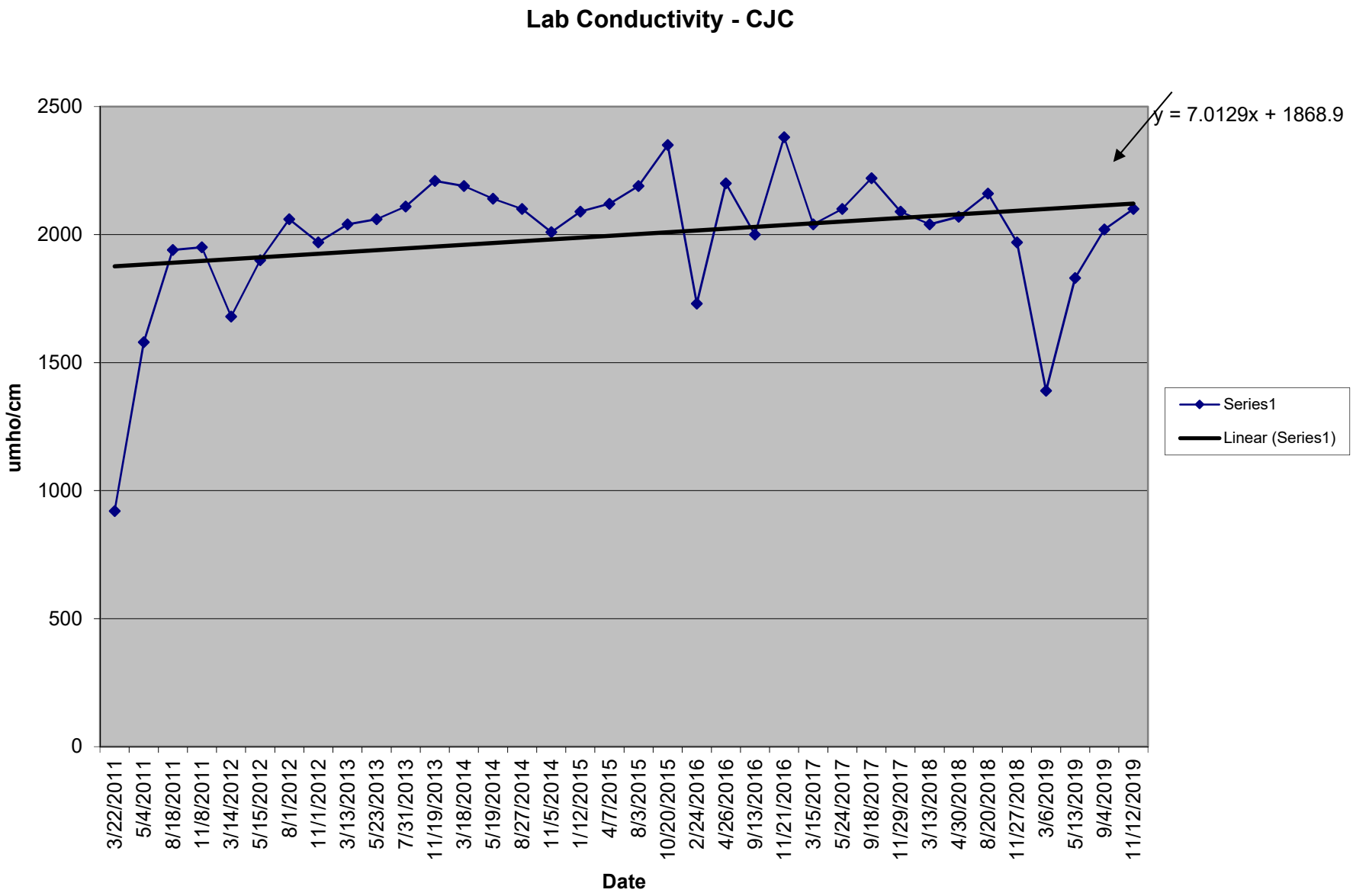
	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Flow Rate, cfs	0.03	0.10	0.8	0.2
Field pH	7.85	7.69	8.27	7.96
Field Temp, °C	4.7	8.9	9.9	2.8
Field Conductivity, umhos/com	1530	1920	2150	2270
Lab pH	8.4	8.5	8.4	8.2
Lab Conductivity, umhos/com	1390	1830	2020	2100
TDS, mg/l	1120	1540	1560	1620
TSS, mg/l	8	14	94	68
NO3 as N, mg/l	0.1	0.1	0.1	0.1
NO2 as N, mg/l	0.1	0.1	0.1	0.1
NO3+NO2 as N, mg/l	0.1	0.1	0.1	0.1
NH3 as N, mg/l	0.1	0.1	0.1	0.1
Phosphorus, T, mg/l	0.06	0.05	0.25	0.11
Bicarbonate as HCO3, D	485	600	654	729
Sulfate, D, mg/l	434	658	624	673
As, TD, mg/l	0.003	0.003	0.003	0.003
Ca, D, mg/l	101	138	147	151
Fe, TD, mg/l	0.37	0.62	8.93	2.51
Pb, TD, mg/l	0.2	0.2	0.2	0.2
Mg, D, mg/l	105	159	153	146
Mn, TD, mg/l	0.10	0.10	0.46	0.14
Hg, TD, mg/l	0.001	0.001	0.001	0.001
Se, TD, mg/l	0.005	0.005	0.005	0.007
Na, D, mg/l	97	133	146	153
Zn, TD, mg/l	0.05	0.05	0.05	0.05

Exhibit 1A



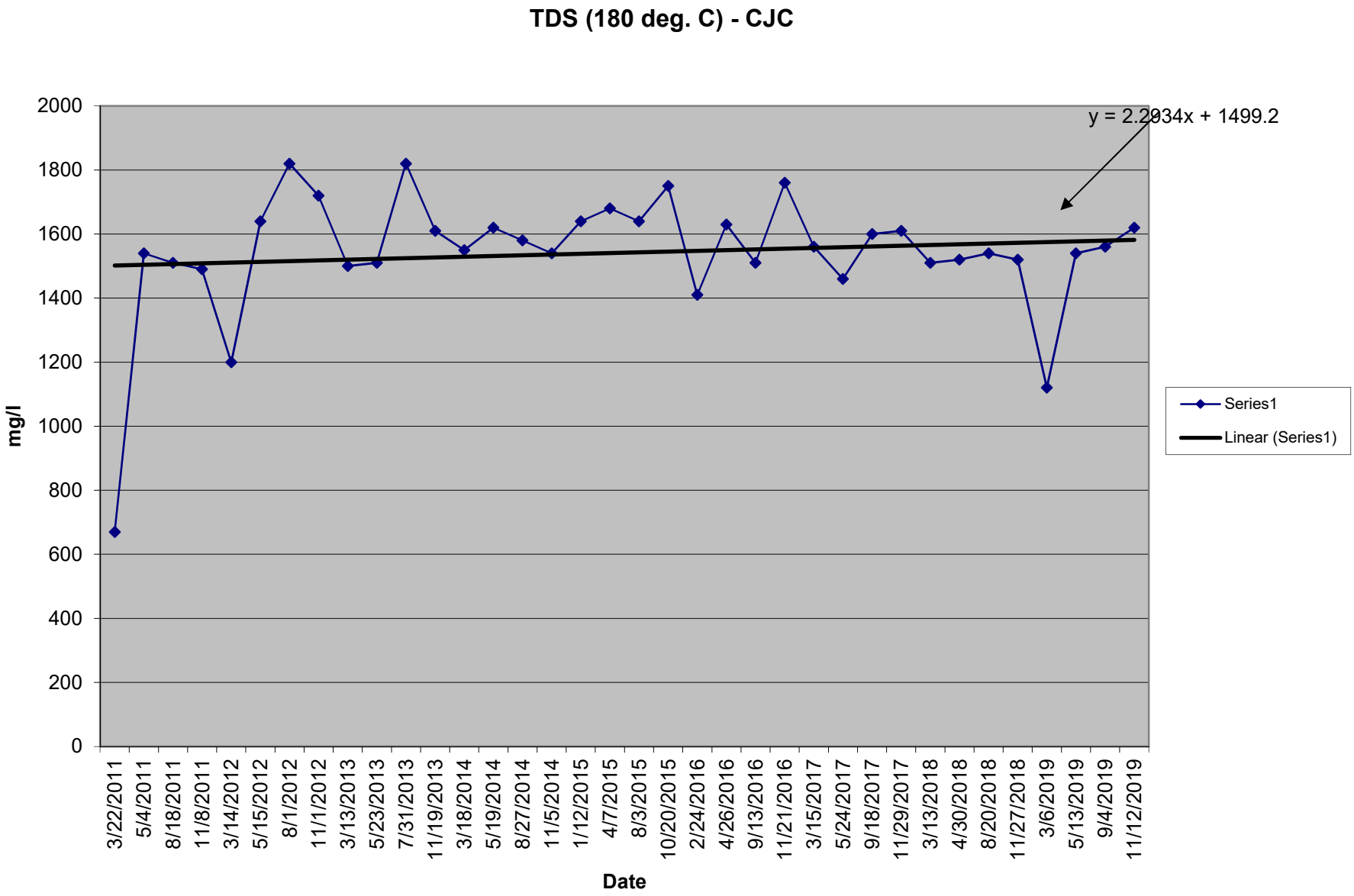
CJC

Exhibit 1A



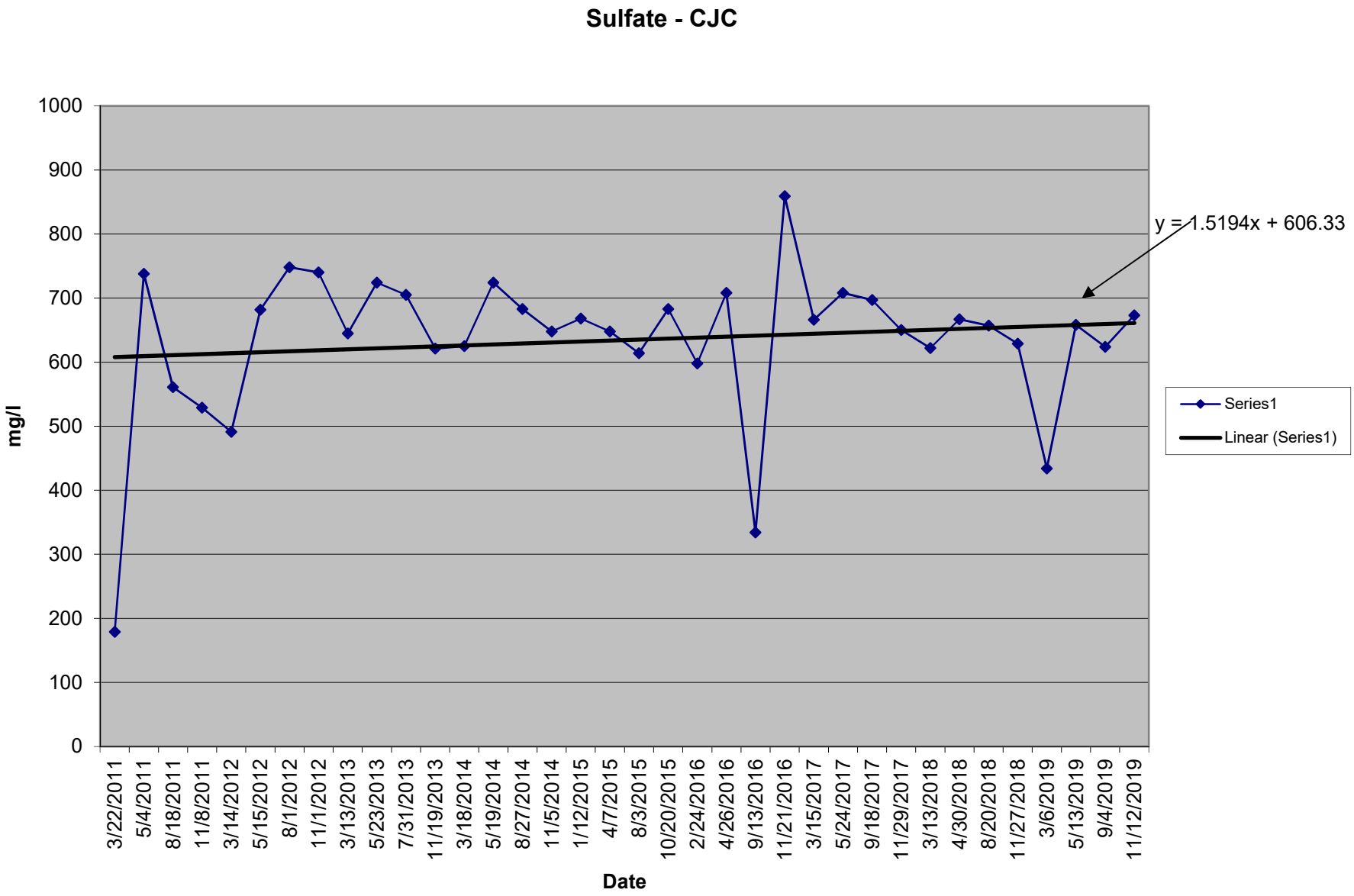
CJC

Exhibit 1A



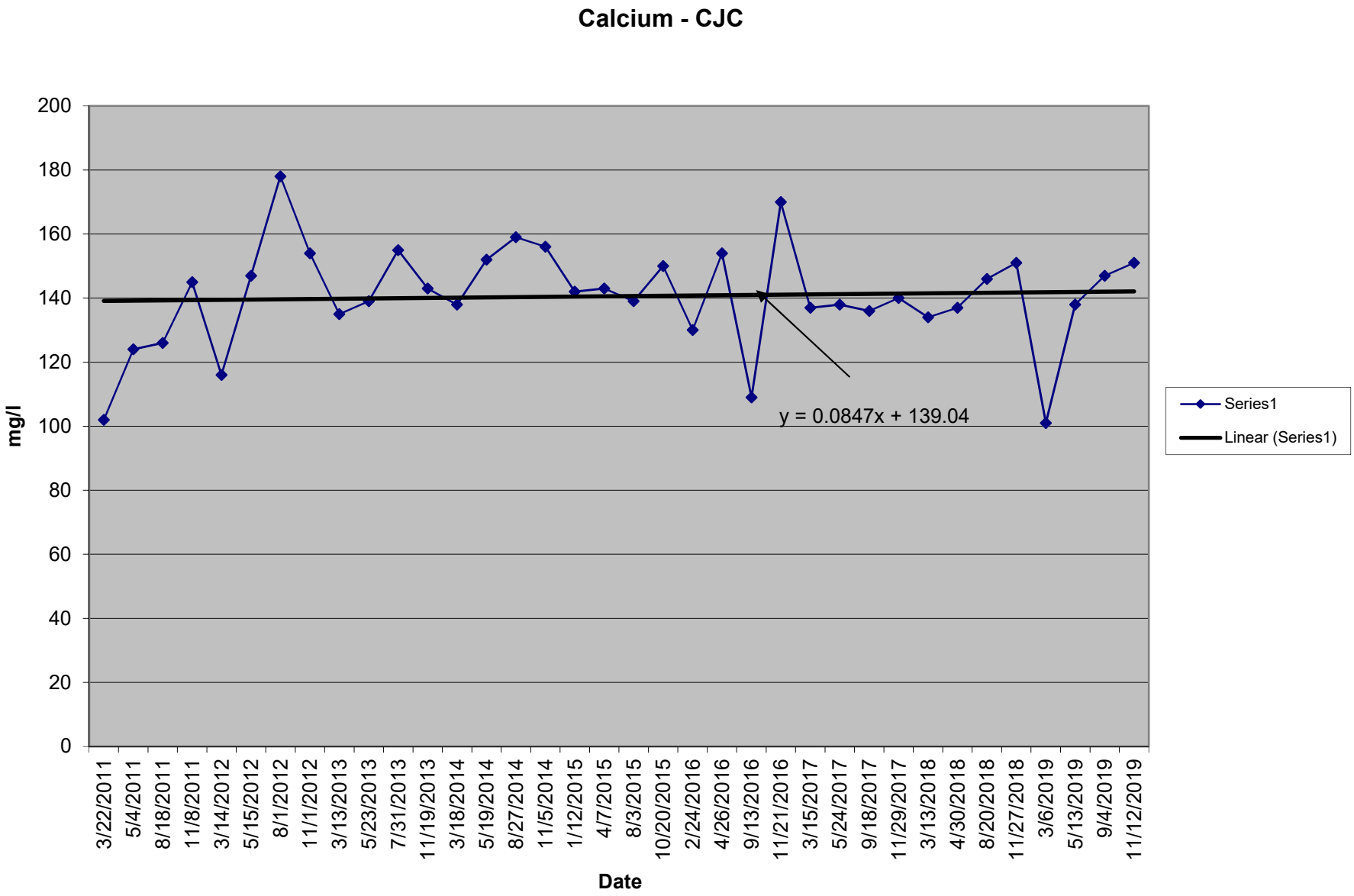
CJC

Exhibit 1A



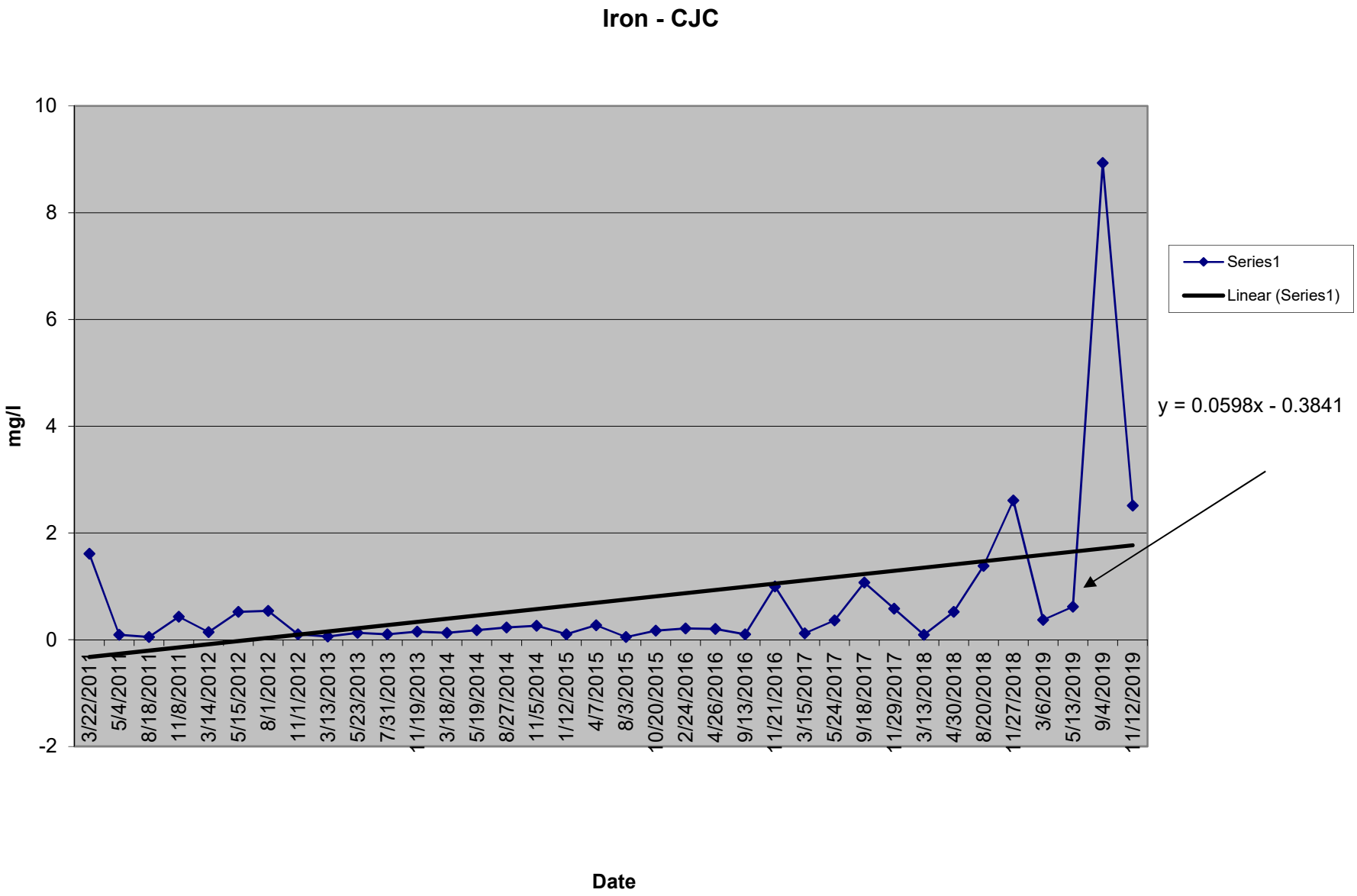
CJC

Exhibit 1A

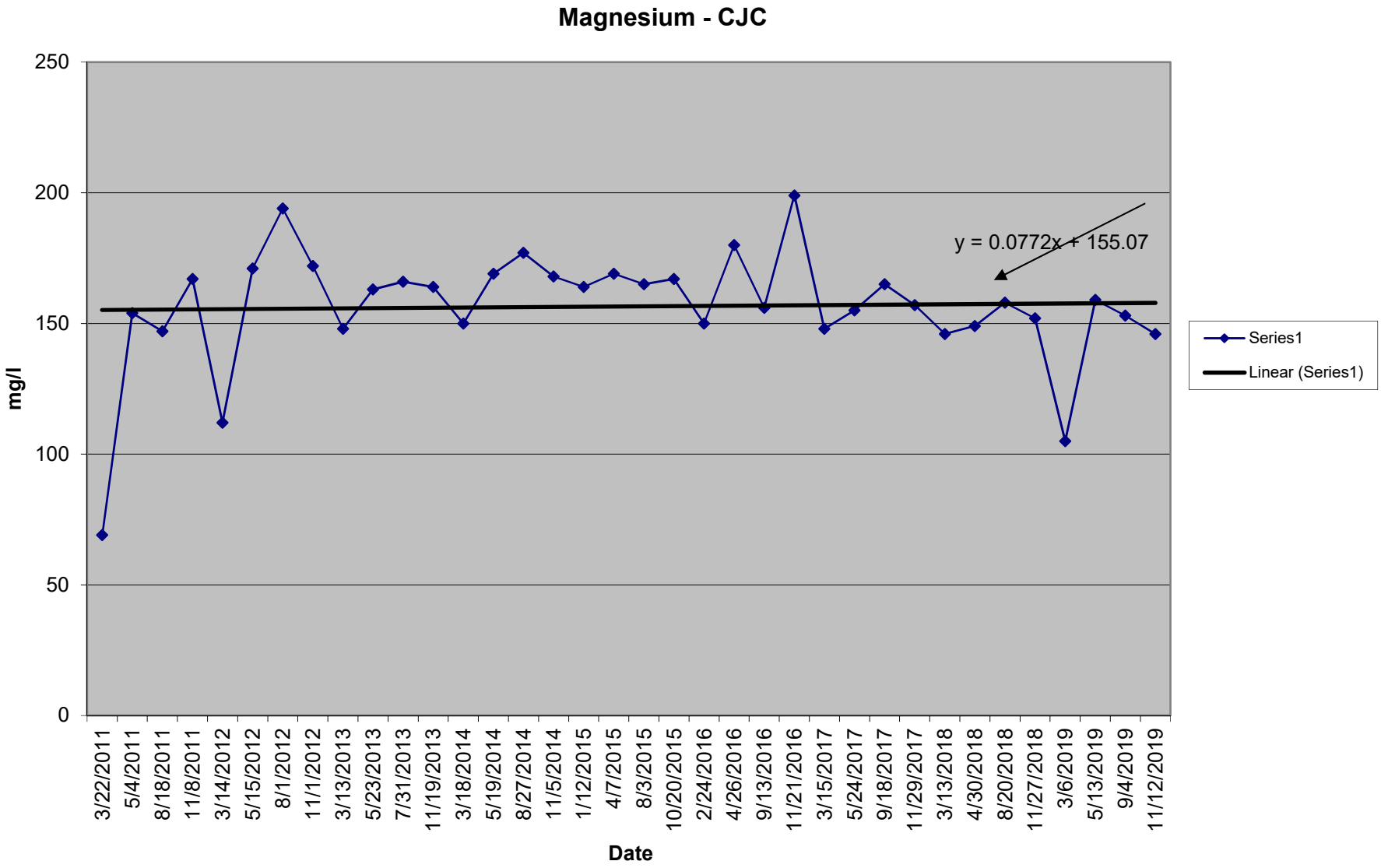


CJC

Exhibit 1A

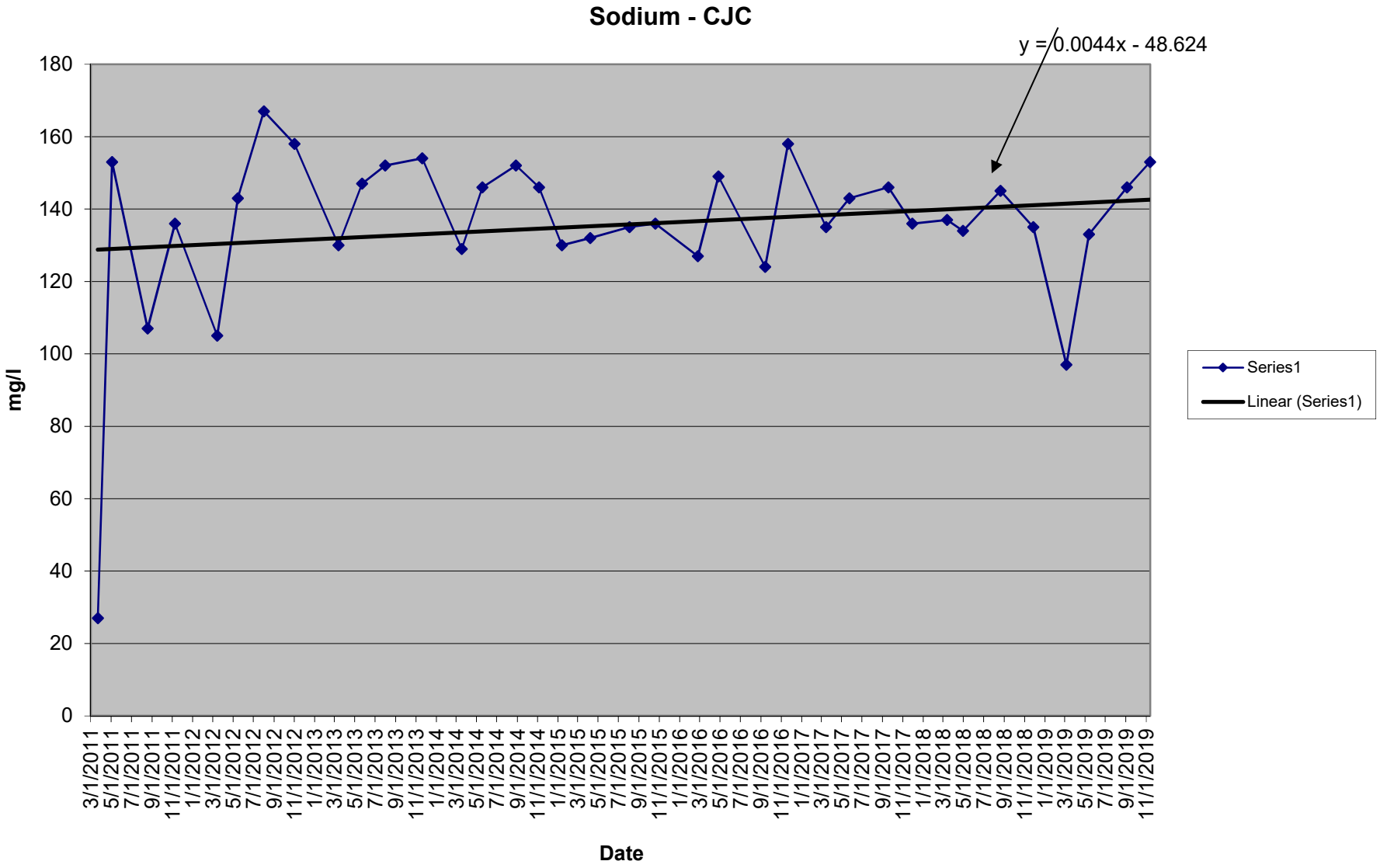


CJC


Magnesium - CJC
250
200
150
100
50
0
mg/l
y = 0.0772x + 155.07
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

CJC

Exhibit 1A



CJC

Exhibit 1A

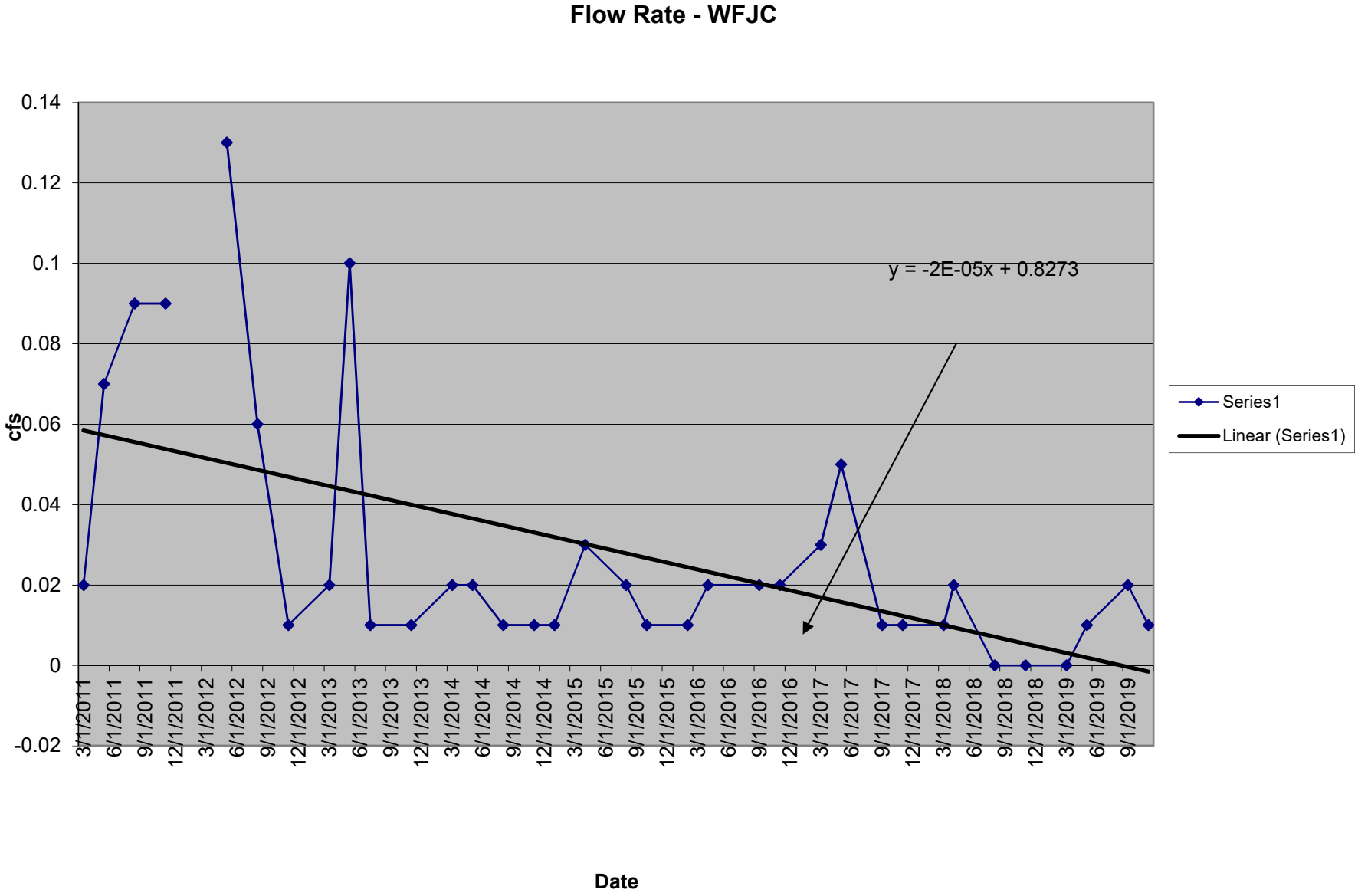
Colowyo Mine
Site - LCG
Water Year 1/1/2019 - 12/31/19

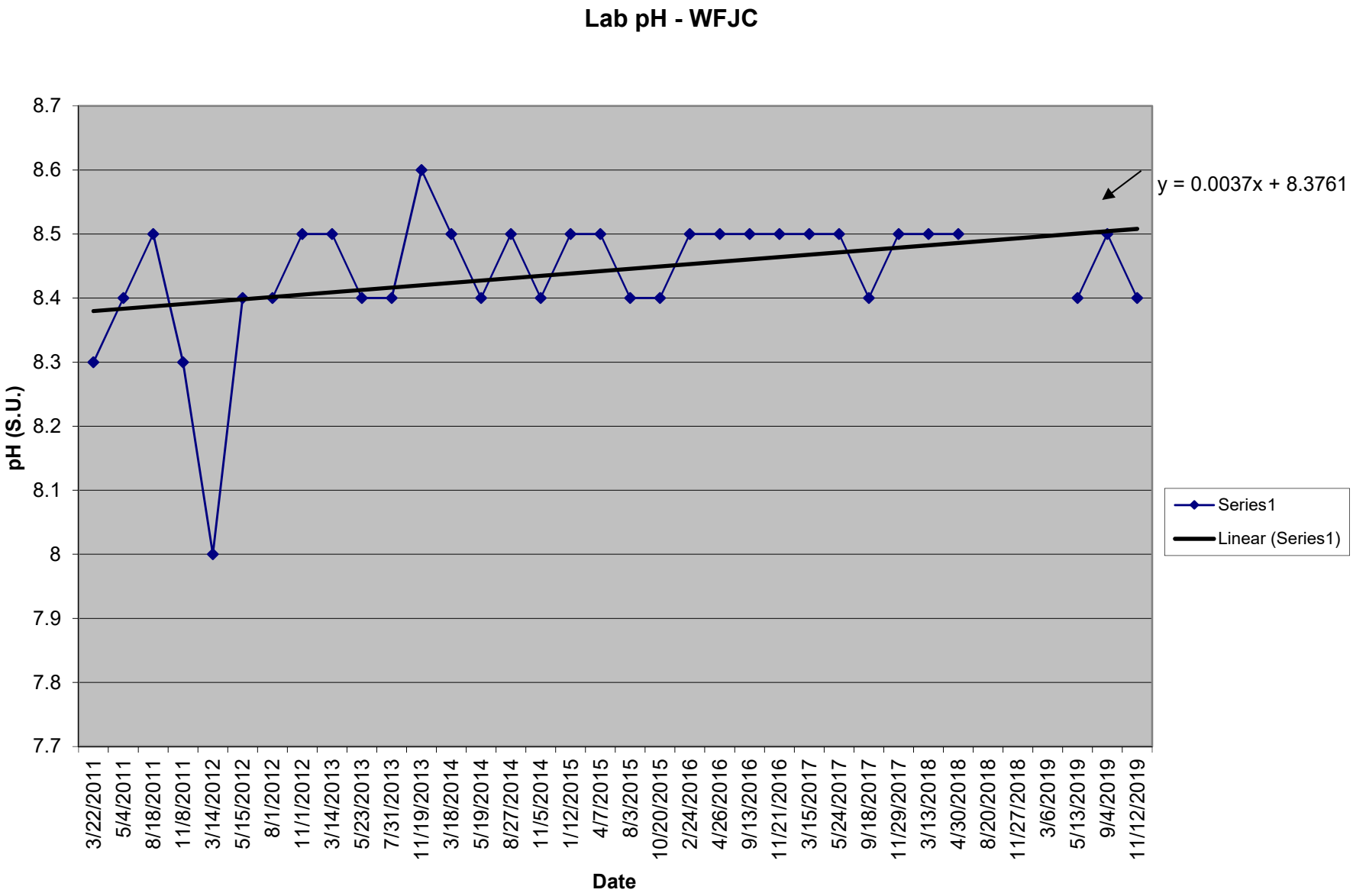
	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Flow Rate, cfs	0.05	0.1	0.12	0.09
Field pH	7.93	7.69	8.43	8.35
Field Temp, °C	4.2	8.9	12.5	3.1
Field Conductivity, umhos/com	1030	1920	1010	1050
Lab pH	8.5	8.5	8.6	8.4
Lab Conductivity, umhos/com	924	1830	948	999
TDS, mg/l	660	1540	630	680
TSS, mg/l	18	14	5	5
NO3 as N, mg/l	0.5	0.1	0.4	0.5
NO2 as N, mg/l	0.1	0.1	0.1	0.1
NO3+NO2 as N, mg/l	0.5	0.1	0.4	0.5
NH3 as N, mg/l	0.1	0.1	0.1	0.1
Phosphorus, T, mg/l	0.05	0.05	0.05	0.05
Bicarbonate as HCO3, D	430	600	487	501
Sulfate, D, mg/l	188	658	154	176
As, TD, mg/l	0.003	0.003	0.003	0.003
Ca, D, mg/l	100	138	102	102
Fe, TD, mg/l	0.38	0.62	0.23	0.14
Pb, TD, mg/l	0.2	0.2	0.2	0.2
Mg, D, mg/l	63	159	59	58
Mn, TD, mg/l	0.16	0.1	0.16	0.25
Hg, TD, mg/l	0.001	0.001	0.001	0.001
Se, TD, mg/l	0.005	0.005	0.005	0.005
Na, D, mg/l	28	133	24	27
Zn, TD, mg/l	0.05	0.05	0.05	0.05

Exhibit 1A

Colowyo Mine
Site - WFJC
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Flow Rate, cfs	Dry	0.01	0.02	0.01
Field pH		7.67	8.4	8.36
Field Temp, °C		10.9	11.2	1.4
Field Conductivity, umhos/com		1180	1280	1410
Lab pH		8.4	8.5	8.4
Lab Conductivity, umhos/com		1140	1210	1240
TDS, mg/l		840	890	910
TSS, mg/l		10	10	10
NO3 as N, mg/l		0.2	0.1	0.1
NO2 as N, mg/l		0.1	0.1	0.1
NO3+NO2 as N, mg/l		0.2	0.1	0.1
NH3 as N, mg/l		0.1	0.1	0.1
Phosphorus, T, mg/l		0.05	0.05	0.05
Bicarbonate as HCO3, D		426	442	493
Sulfate, D, mg/l		328	305	288
As, TD, mg/l		0.003	0.003	0.003
Ca, D, mg/l		120	125	121
Fe, TD, mg/l		0.24	0.22	0.23
Pb, TD, mg/l		0.2	0.2	0.2
Mg, D, mg/l		95	93	90
Mn, TD, mg/l		0.03	0.03	0.03
Hg, TD, mg/l		0.001	0.001	0.001
Se, TD, mg/l		0.009	0.006	0.007
Na, D, mg/l		14	15	16
Zn, TD, mg/l		0.05	0.05	0.05


Flow Rate - WFJC
y = -2E-05x + 0.8273
cfs
Date
Series1
Linear (Series1)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
3/1/2011
6/1/2011
9/1/2011
12/1/2011
3/1/2012
6/1/2012
9/1/2012
12/1/2012
3/1/2013
6/1/2013
9/1/2013
12/1/2013
3/1/2014
6/1/2014
9/1/2014
12/1/2014
3/1/2015
6/1/2015
9/1/2015
12/1/2015
3/1/2016
6/1/2016
9/1/2016
12/1/2016
3/1/2017
6/1/2017
9/1/2017
12/1/2017
3/1/2018
6/1/2018
9/1/2018
12/1/2018
3/1/2019
6/1/2019
9/1/2019


Lab pH - WFJC
8.7
8.6
8.5
8.4
8.3
8.2
8.1
8
7.9
7.8
7.7
pH (S.U.)
y = 0.0037x + 8.3761
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/14/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

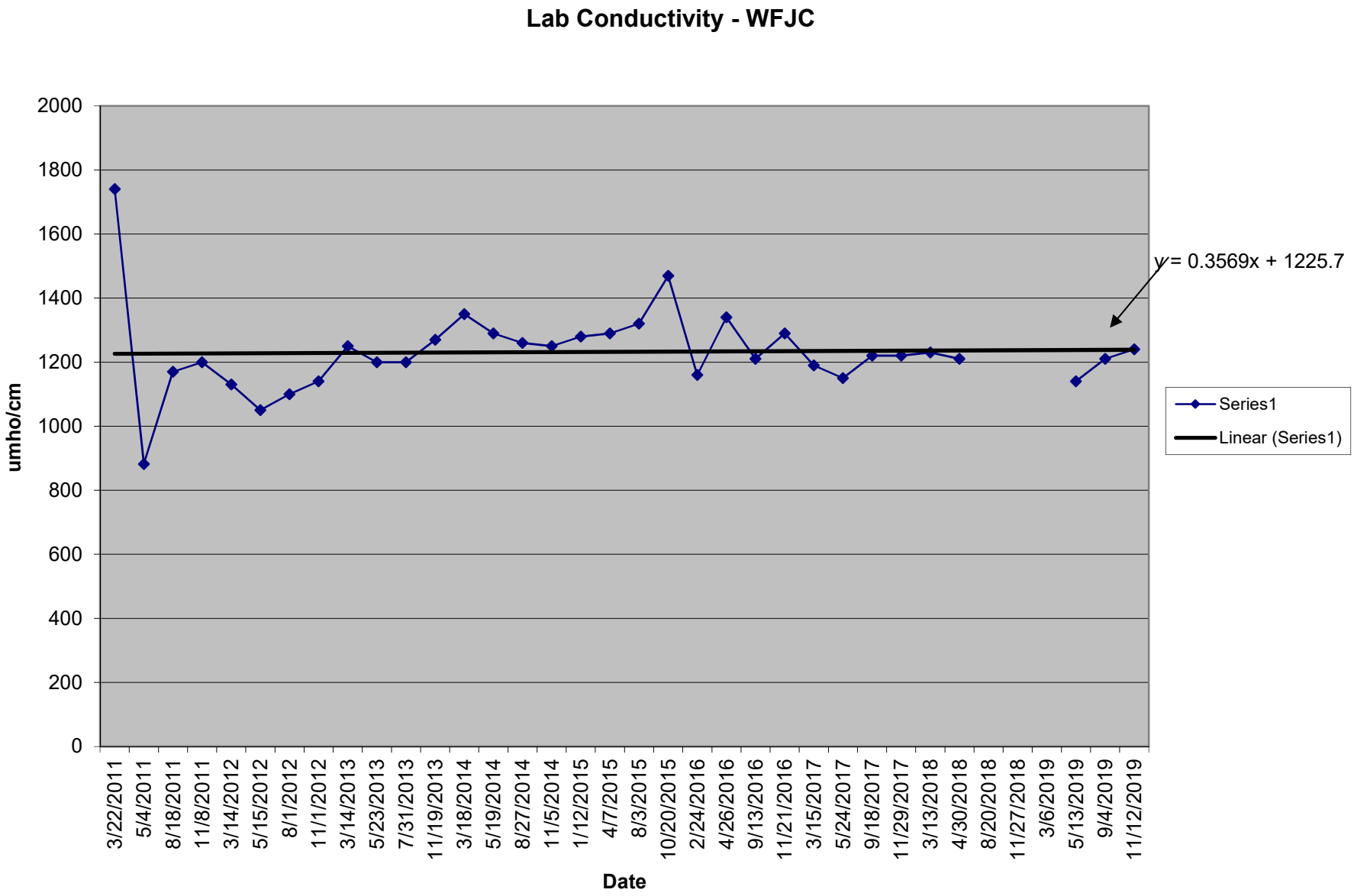
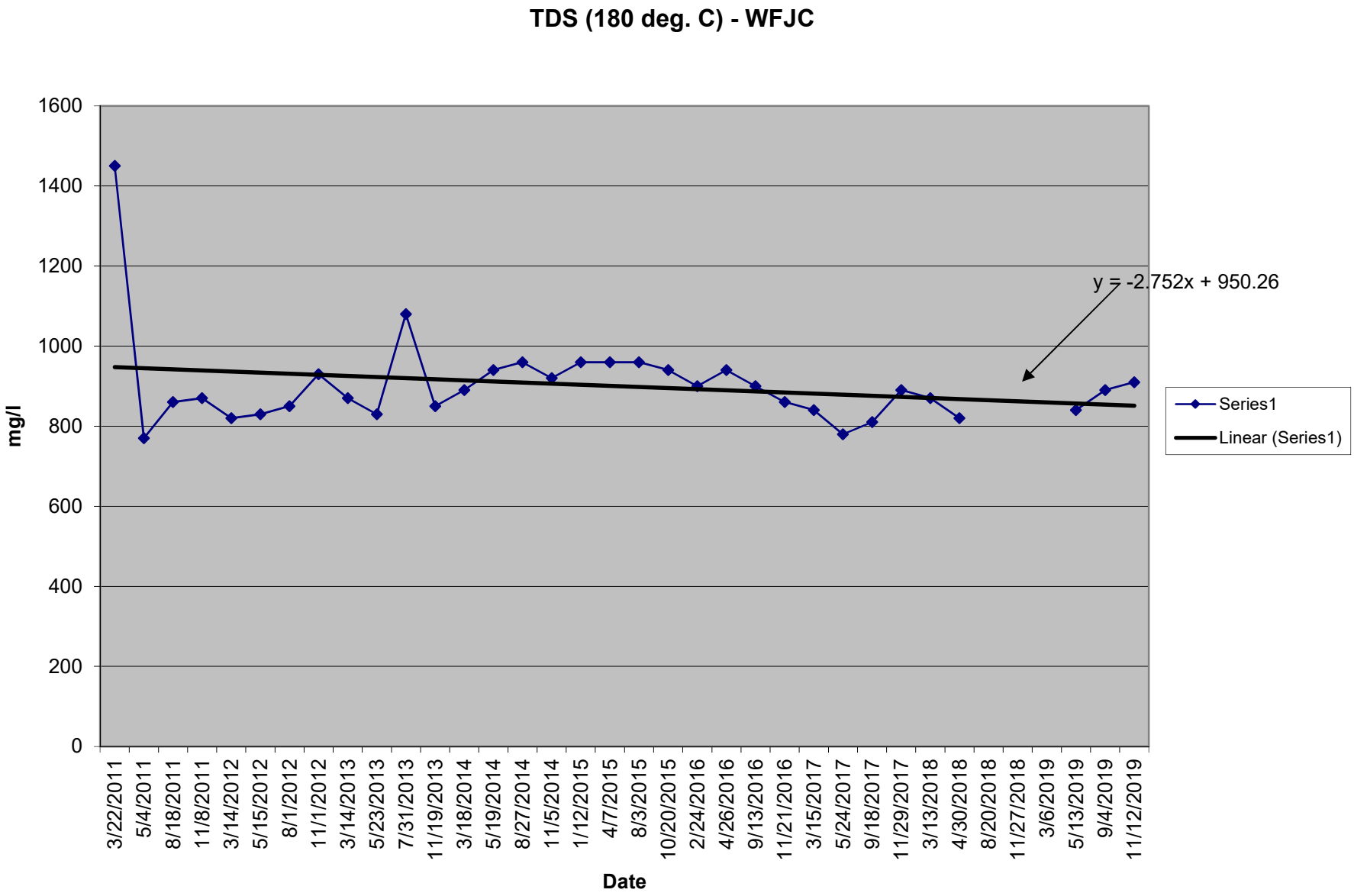
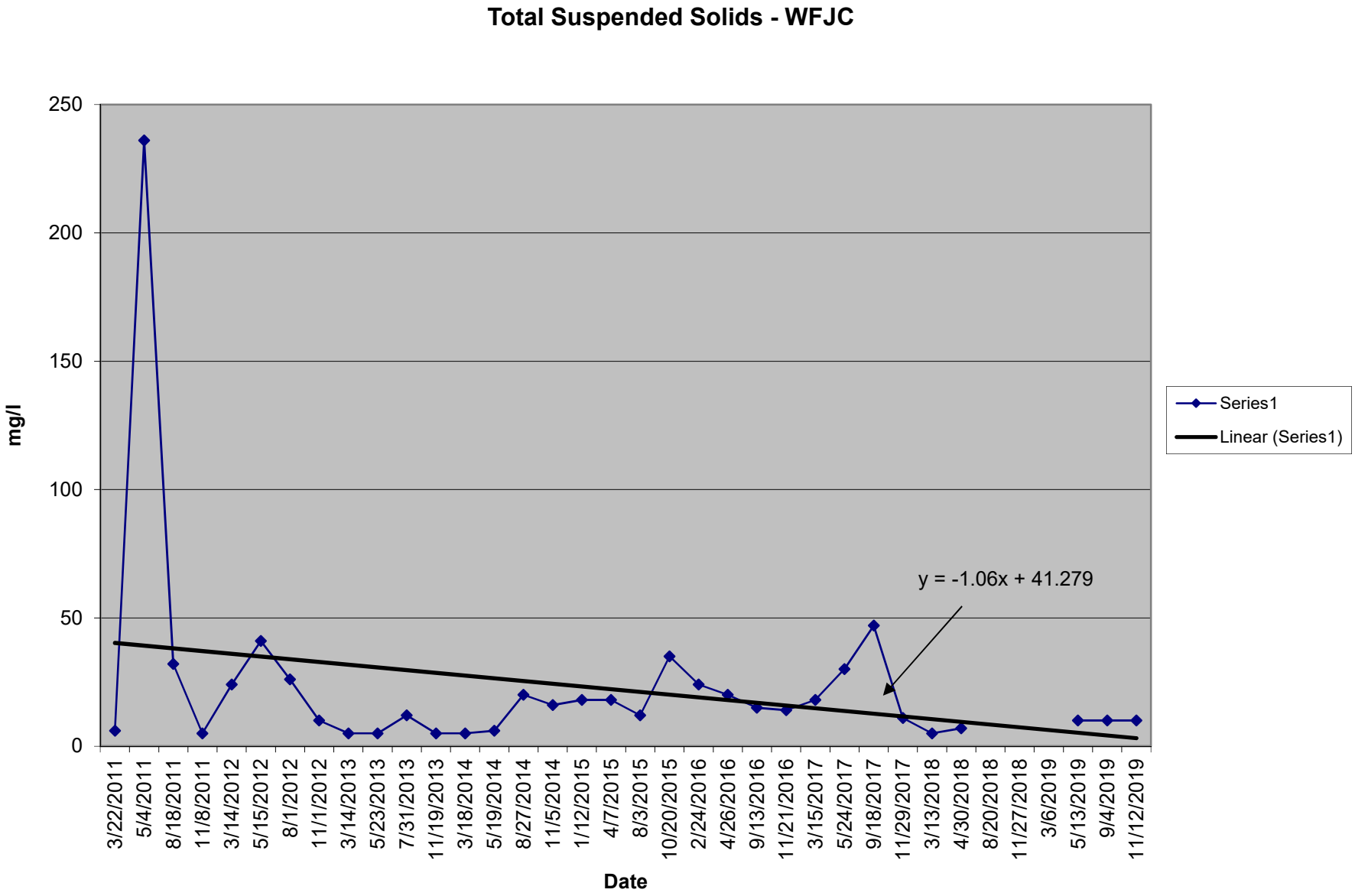

Lab Conductivity - WFJC
umho/cm
2000
1800
1600
1400
1200
1000
800
600
400
200
0
y = 0.3569x + 1225.7
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/14/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

Exhibit 1A



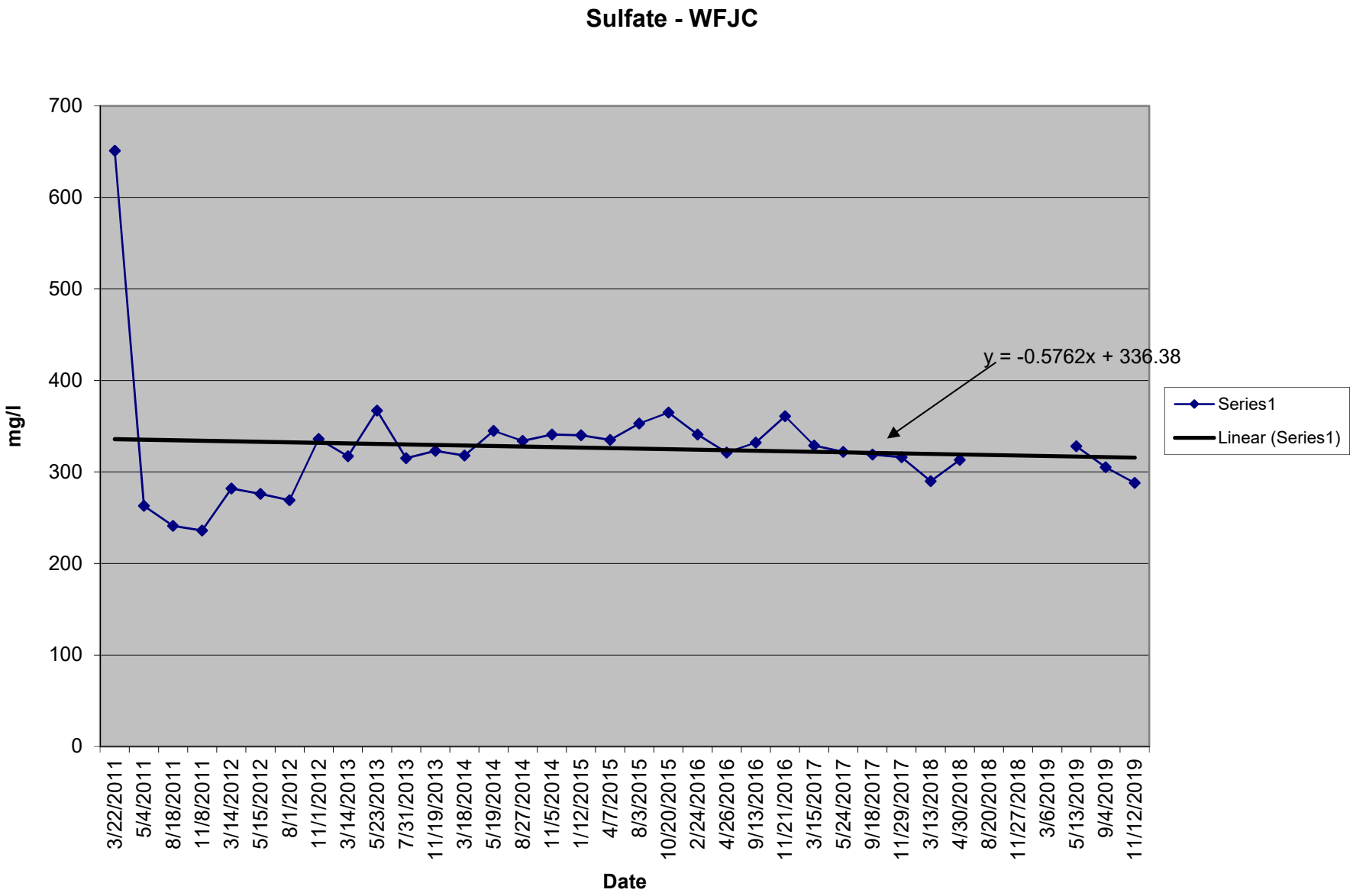
WFJC

Exhibit 1A



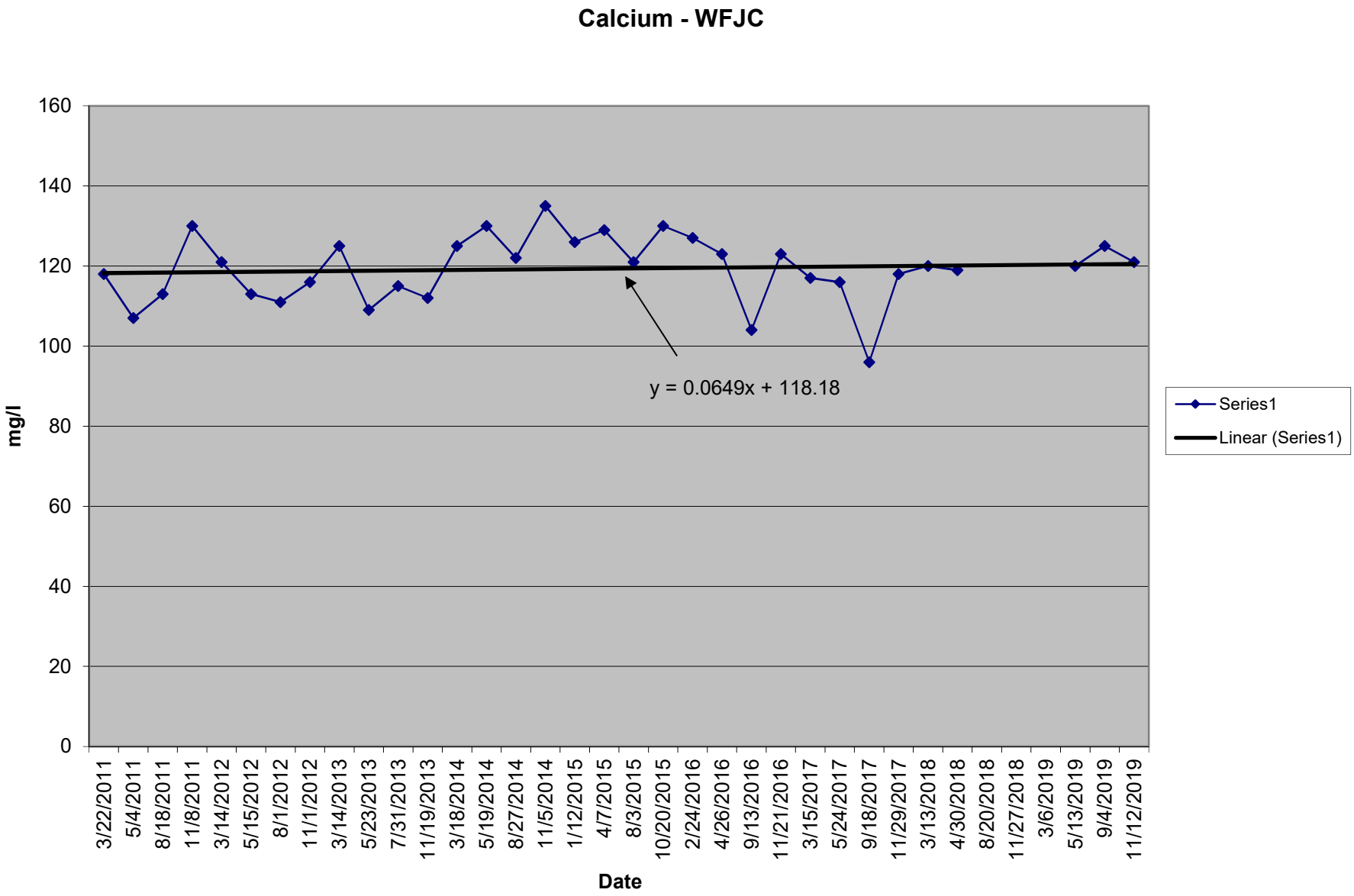
WFJC

Exhibit 1A



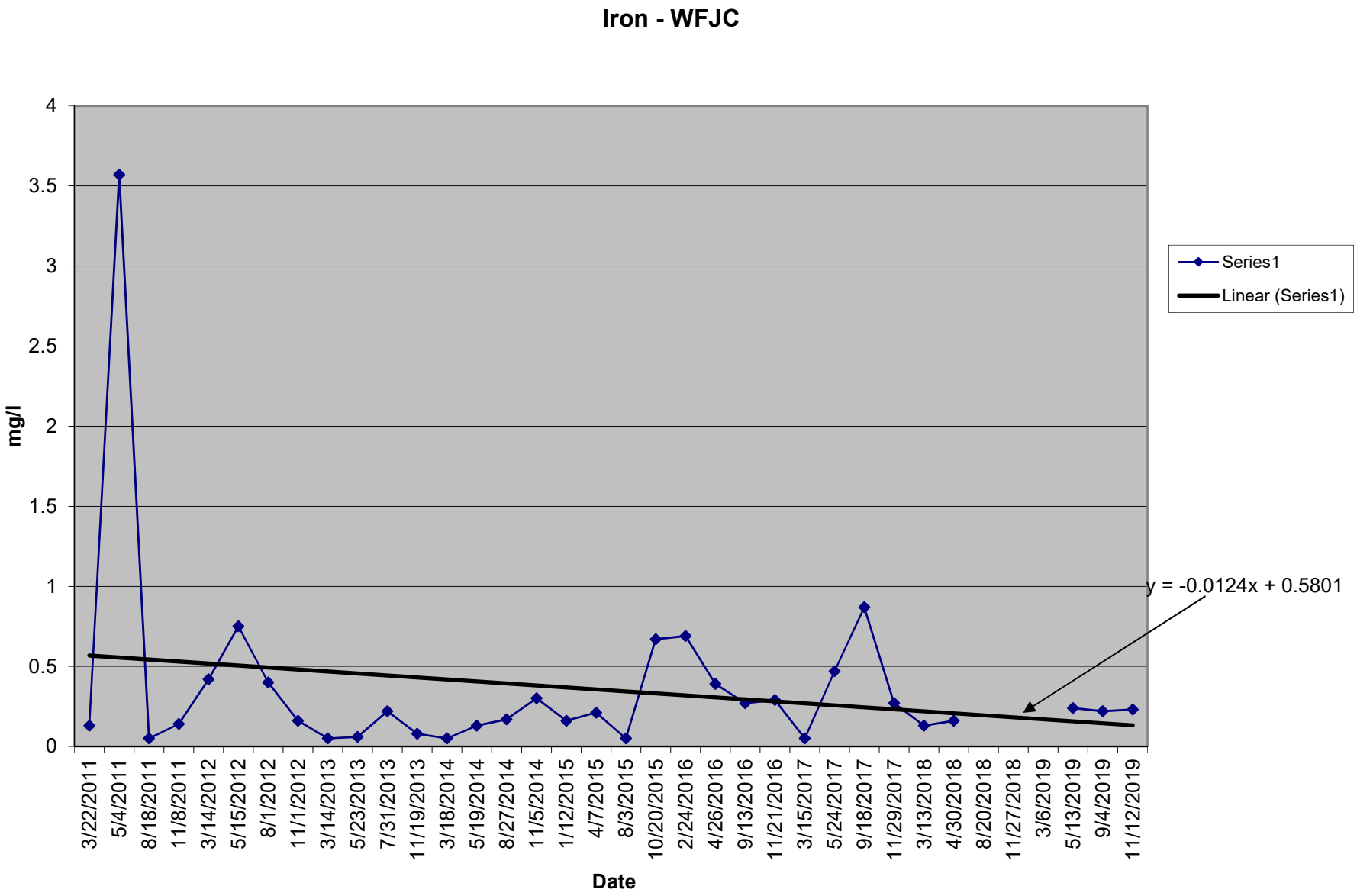
WFJC

Exhibit 1A

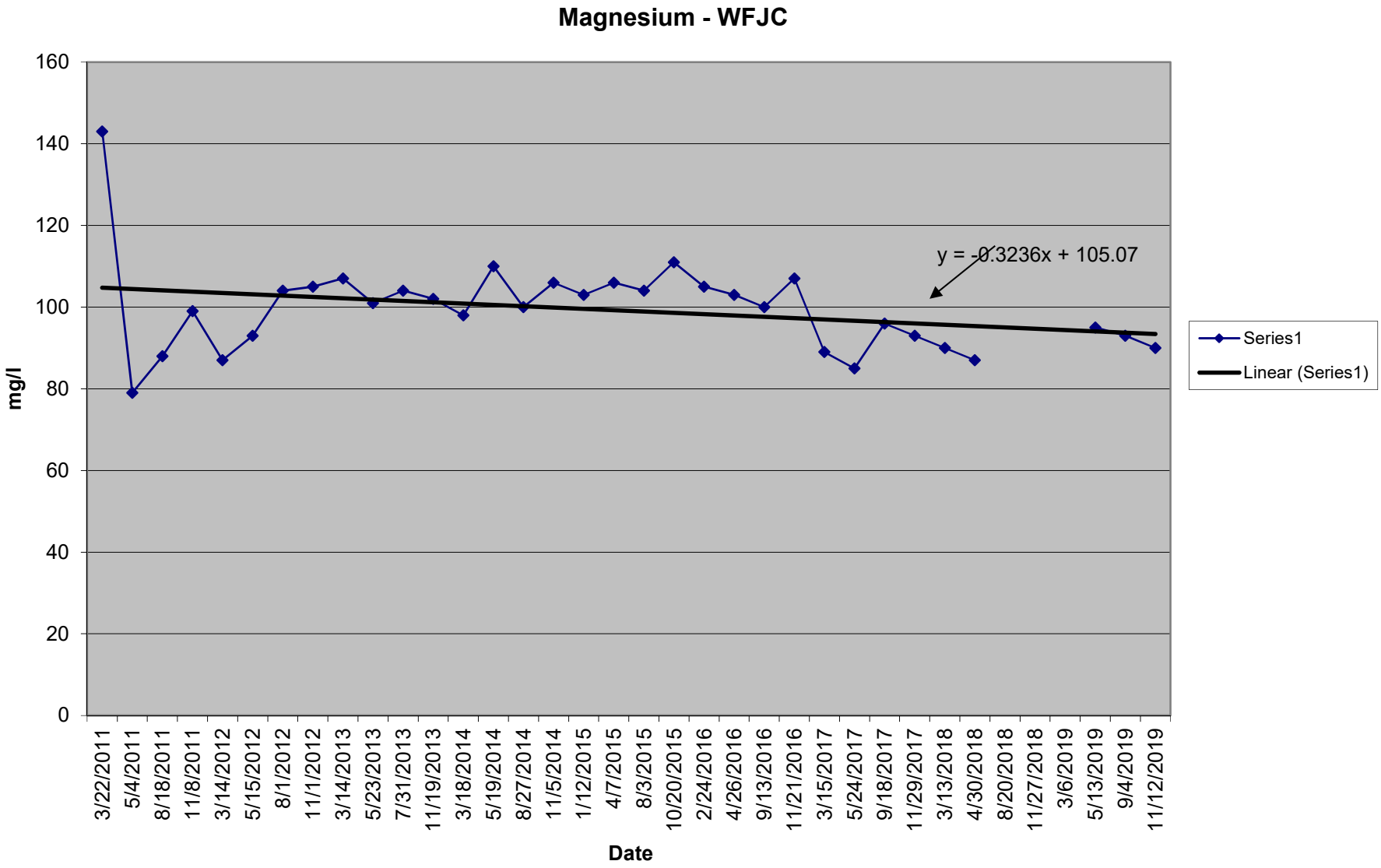


WFJC

Exhibit 1A



WFJC


Magnesium - WFJC
160
140
120
100
80
60
40
20
0
mg/l
y = -0.3236x + 105.07
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/14/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
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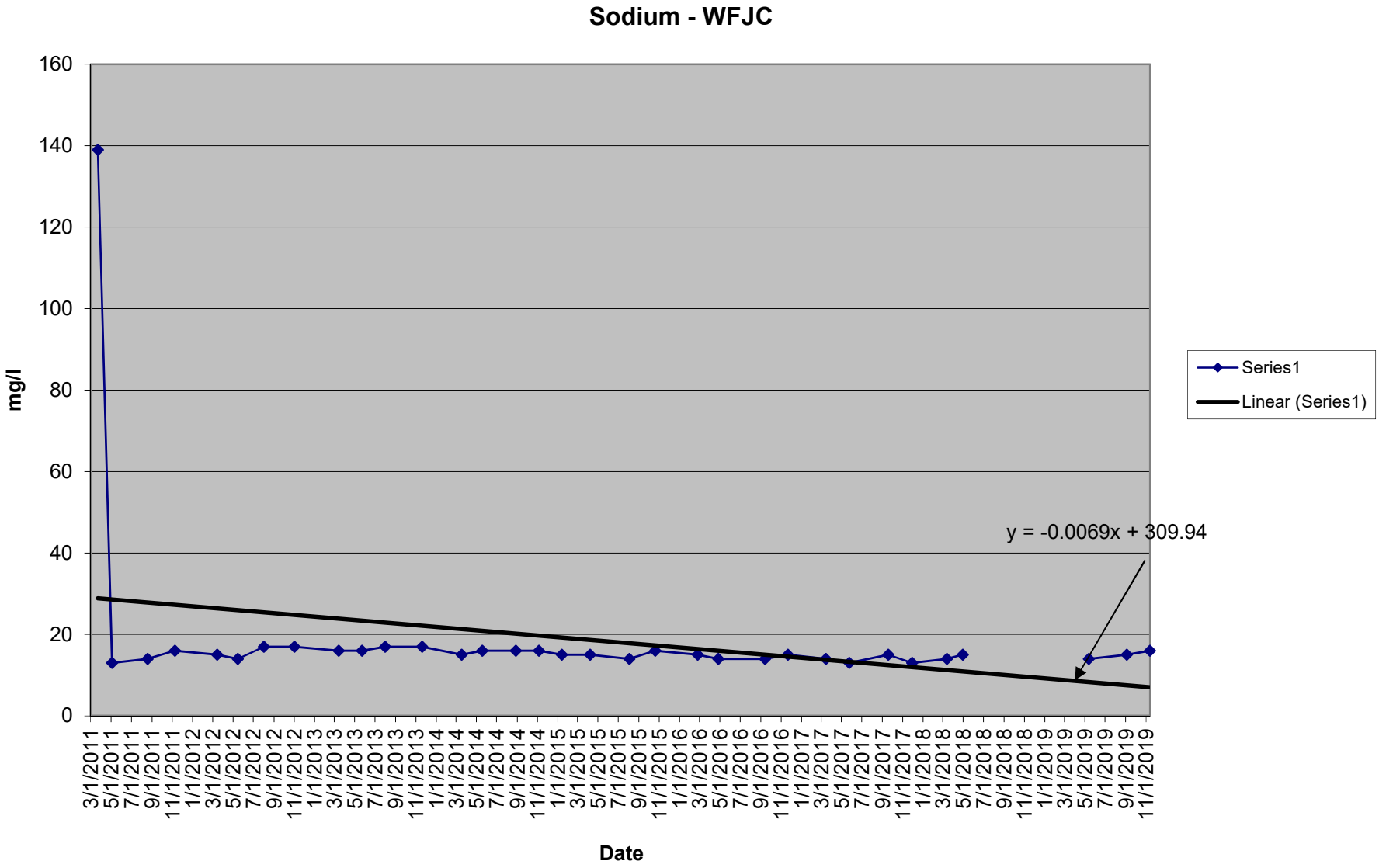
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date


Sodium - WFJC
160
140
120
100
80
60
40
20
0
mg/l
y = -0.0069x + 309.94
Series1
Linear (Series1)
3/1/2011
5/1/2011
7/1/2011
9/1/2011
11/1/2011
1/1/2012
3/1/2012
5/1/2012
7/1/2012
9/1/2012
11/1/2012
1/1/2013
3/1/2013
5/1/2013
7/1/2013
9/1/2013
11/1/2013
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3/1/2014
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7/1/2014
9/1/2014
11/1/2014
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9/1/2015
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3/1/2018
5/1/2018
7/1/2018
9/1/2018
11/1/2018
1/1/2019
3/1/2019
5/1/2019
7/1/2019
9/1/2019
11/1/2019
Date

WFJC

GROUNDWATER

Ground water monitoring sites are comprised of five up gradient (or adjacent) and six down gradient shallow alluvial wells and one deep aquifer well drilled into the Trout Creek Sandstone. Field parameters are acquired each quarter and sampling of each well occurs annually in the second quarter of the year. A brief summary for each well is described below (Please see Maps 10A in the permit for monitoring locations).

- A-6 Well (A-6) is located south of the mine along State Highway 13, and this site represents up gradient, undisturbed or background conditions. Monitoring has occurred from 1984 to 2019.

- A-7 Well (A-7) is located south of the mine along State Highway 13 and represents a potential down gradient condition below the South Taylor Pit operations. Monitoring started in the second quarter of 2008 and has continued through 2019.

- A-8 Well (A-8) is located south of the mine, west of State Highway 13, and represents the condition up-gradient of the South Taylor mining activities. Monitoring started in the second quarter of 2008 and has continued through 2019.

- North Good Springs Well (NGSW) is located along State Highway 13 and this site represents the down gradient condition below mining activities. Monitoring has occurred from 1989 to 2019.

- Gossard Well is located within the rail loop facility and represents the condition of groundwater associated with the Gossard Loadout Facility. Monitoring has occurred from 1983 to 2019.

- MT-95-02 Well is located in Taylor Creek and represents the down gradient condition below mining activities. Monitoring started in the first quarter of 2008 and has continued through 2019.

- MLC-04-01 is located in Little Collom Gulch. This site represents the down gradient condition below the Collom Pit. Monitoring started in the first quarter of 2011 and has continued through 2019.

- MC-04-01 is located in Collom Gulch, and this site represents the condition adjacent to the Collom Pit. Monitoring started in the first quarter of 2011 and has continued through 2019.

- MC-04-02 is located in Collom Gulch, and this site represents the down gradient condition below the Collom Pit. Monitoring started in the first quarter of 2011 and has continued through 2019.

- MJ-95-01 is located in the West Fork Jubb Creek, and this site represents the down gradient condition below the Collom Pit. Monitoring started in the first quarter of 2011 and has continued through 2019.

- MJ-95-03 is located in the Jubb Creek just downstream of the confluence of the West and East Forks of Jubb Creek, and this site represents the condition downgradient of the Collom Pit. Monitoring started in the first quarter of 2011 and has continued through 2019.

- The Trout Creek Well is located on the northeastern edge of the Collom Pit, this site represents the regional aquifer condition of the Trout Creek Sandstone. Monitoring started in the first quarter of 2017 and has continued through 2019.

Colowyo currently samples each groundwater site for a variety of quality parameters. Of all the parameters that are analyzed for, several key indicator parameters are identified. These are lab pH, lab conductivity, TDS, sulfate, calcium, iron, magnesium, sodium and elevation. Statistical analysis is completed and illustrates historical trends for each parameter in Exhibit 1B.

Summary of the indicator parameters for each ground water site is provided in the following tables.

A-6 Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	7.8	0.39	1.9	8.6	6.7	11/30/93	11/21/02
Lab Cond.	1110.9	73.7	512	1440	928	05/01/85	04/27/98
TDS	695.6	79.63	750	930	180	07/17/01	03/13/93
Sulfate	138.49	49.24	334.2	430	95.8	07/17/01	05/15/00
Calcium	61.74	16.01	121.1	169	47.9	11/18/97	11/13/00
Iron	0.24	.037	1.81	1.82	0.01	09/26/98	11/18/97
Magnesium	53.4	15.1	128.0	169	41	11/18/97	03/21/11
Sodium	124.1	17.9	130.1	148.0	17.9	11/12/19	04/27/98
Elevation	6897.89	2.77	14.53	6902.53	6888	05/01/85	07/31/00

Evaluation of 2019 data for A-6 Well
One maximum value for sodium occurred in 2019. The indicator parameters specify pH is slightly increasing while all the other indicator parameters are stable or decreasing at this location.

A-7 Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.05	0.20	0.8	8.4	7.6	5/15/19	11/10/08
Lab Cond.	1511.5	170.7	1100	2260	1160	06/18/08	05/05/10
TDS	1132.8	221.0	1160	2100	940	06/18/08	9/9/17
Sulfate	417.7	128.1	794	1110	316	06/18/08	11/12/19
Calcium	123.6	18.81	112	214	102	05/03/11	11/30/17
Iron	0.05	0.01	0.05	0.1	0.05	08/17/11	06/18/08
Magnesium	119.2	26.3	151	244	93	06/18/08	11/30/17
Sodium	47.7	7.1	43	77	34	06/18/08	05/20/14
Elevation	6888.9	3.61	19.84	6904.9	6885.06	11/12/19	10/31/12

Evaluation of 2019 data for A-7 Well

A minimum value for sulfate was recorded during 2019, and maximum vales for laboratory pH and static water level elevation occurred. The indicator parameters specify pH is slightly increasing while all the other indicator parameters are stable or decreasing at this location.

A-8 Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.08	0.20	0.8	8.4	7.6	05/21/13	11/10/08
Lab Cond.	1263.6	362.2	1443	2330	887	03/12/13	05/5/10
TDS	962.7	360.9	1420	2040	620	03/12/13	03/13/12
Sulfate	356.1	213.7	804	977	173	03/12/13	08/03/10
Calcium	122.0	31.9	129	219	90	03/12/13	06/18/08
Iron	0.06	0.05	0.31	0.36	0.05	11/10/08	06/18/08
Magnesium	104.4	37.5	142	214	72	03/12/13	03/13/12
Sodium	17.6	6.0	24	35	11	03/12/13	03/13/12
Elevation	7105.2	4.96	16.74	7116.93	7100.19	06/18/08	09/19/17

Evaluation of 2019 data for A-8 Well

No results from 2019 sampling were minimum or maximum values for any parameters listed above during the water year. For the indicator parameters most are showing a slight increase over time or are stable, while iron is indicating it is decreasing.

NGSW:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	7.84	0.31	1.7	8.5	6.8	08/19/91	10/03/00
Lab Cond.	2074.1	298.2	1550	2700	1150	10/17/91	04/27/98
TDS	1685.7	258.3	1410	2190	780	04/27/16	04/27/98
Sulfate	788.6	158.8	1192	1340	148	03/17/09	05/05/10
Calcium	172.1	27.7	169.3	262	92.7	03/13/07	10/08/98
Iron	0.07	0.07	0.45	0.46	0.01	08/14/97	10/01/01
Magnesium	171.7	28.4	194	270	76	03/13/07	04/27/98
Sodium	100.2	25.4	151.3	183	31.7	03/14/18	04/27/98
Elevation	6535.02	1.77	10	6540.65	6530.65	03/13/93	05/19/99

Evaluation of 2019 data for NGSW
No results from 2019 sampling were minimum or maximum values for any parameters listed above during the water year. For the indicator parameters most are showing a slight increase over time, while iron is indicating it is decreasing.

Gossard Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	7.99	0.29	1.6	8.6	7	10/08/98	10/21/02
Lab Cond.	1995.8	262.3	1310	2670	1360	11/22/16	03/29/85
TDS	1481.2	264.5	1238	2200	962	09/13/16	03/13/93
Sulfate	574.1	173.1	1025	1030	5	11/22/16	05/20/14
Calcium	114.3	24.5	190	202	12	11/10/11	11/30/93
Iron	0.78	3.02	28.99	29	0.01	10/08/98	10/21/02
Magnesium	137.5	26.4	202	217	15	10/08/98	11/30/93
Sodium	168.0	25.4	221	240	19	10/08/98	11/30/93
Elevation	6329.96	2.8	14	6339.09	6325.09	10/03/00	03/28/91

Evaluation of 2019 data for the Gossard Well
No results from 2019 sampling were minimum or maximum values for any parameters listed above during the monitoring period. For the indicator parameters, all are showing a slight increase over time, while iron is indicating it is decreasing.

MT-95-02 Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	7.97	0.22	1.0	8.4	7.40	5/15/19	11/10/08
Lab Cond.	2757.29	237.4	1230	3300	2070	9/19/19	05/05/10
TDS	2244.4	111.98	520	2540	2020	11/12/19	08/17/11
Sulfate	902.9	71.2	332	1090	758	08/02/12	05/14/12
Calcium	204.8	17.4	110	231	121	03/17/09	11/10/11
Iron	0.05	0.00	0.01	0.06	0.05	11/10/08	11/02/09
Magnesium	198.29	12.7	74	221	147	11/22/16	11/10/11
Sodium	180.3	36.94	189	283	94	11/12/19	08/13/08
Elevation	6435.23	0.61	3.38	6437.87	6434.49	05/03/11	3/5/19

Evaluation of 2019 data for MT-95-02 Well
Maximum values for Lab pH, Lab Conductivity, TDS and Sodium were recorded during 2019. For the indicator parameters, laboratory conductivity, sulfate and TDS are showing a slight increase over time, while calcium, iron, and magnesium are is indicating downward trends.

MLC-04-01:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.12	0.21	1.2	8.40	7.20	03/13/13	03/22/11
Lab Cond.	1164.31	390.5	1309.0	1610	301	03/18/14	5/13/19
TDS	817.5	281.2	900	1100	200	07/31/13	5/13/19
Sulfate	266.8	119.8	502	505	3	05/15/12	03/22/11
Calcium	116.8	38.8	130	161	31	05/19/14	5/13/19
Iron	0.06	0.04	0.25	0.25	0.002	03/14/12	08/03/15
Magnesium	67.7	24.98	86	95	9	05/19/14	03/22/11
Sodium	43.17	16.66	73	78	5	11/27/18	03/22/11
Elevation	44.36	5.08	27.41	50.16	22.75	11/28/18	03/13/18

Evaluation of 2019 data for MLC-04-01 Well
Several minimum values occurred in 2019 for laboratory conductivity, TDS, and calcium. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date.

MC-04-01:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.13	0.16	0.80	8.40	7.60	11/27/18	11/05/14
Lab Cond.	911.9	114.6	634	1160	526	05/23/13	11/27/18
TDS	622.8	94.0	500	830	330	05/23/13	11/27/18
Sulfate	182.4	53.7	231	308	77	05/19/14	11/27/18
Calcium	90.5	12.1	69	117	48	05/23/13	11/27/18
Iron	0.05	0.02	0.13	0.18	0.05	03/14/12	03/22/11
Magnesium	59.5	10.1	57	80	23	05/23/13	11/27/18
Sodium	16.7	1.7	8	20	12	05/23/13	09/13/16
Elevation	24.98	4.74	31.29	48.82	17.53	03/13/18	5/13/19

Evaluation of 2019 data for MC-04-01 Well
A minimum value for water elevation occurred in 2019. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date.

MC-04-02:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.14	0.16	0.80	8.40	7.60	11/27/18	11/05/14
Lab Cond.	1301.6	150.5	844	1490	646	08/27/14	08/20/18
TDS	875.6	114.3	630	1010	380	11/01/12	08/20/18
Sulfate	261.2	40.3	210	321	111	11/01/12	08/20/18
Calcium	125.3	15.8	67	148	81	08/27/14	11/27/18
Iron	0.07	0.13	0.77	0.82	0.05	03/14/12	03/22/11
Magnesium	78.3	10.5	42	92	50	08/27/14	11/27/18
Sodium	60.1	22.7	114	127	13	03/13/13	11/27/18
Elevation	11.24	0.90	4.52	14.13	9.61	01/12/15	05/24/17

Evaluation of 2019 data for MC-04-02 Well
No minimum or maximum values were recorded during 2019. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date.

MJ-95-01:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.01	0.19	1.00	8.30	7.30	11/27/18	11/05/14
Lab Cond.	1292.8	81.9	350	1420	1070	08/27/14	05/04/11
TDS	851.9	54.2	220	940	720	08/18/11	09/18/17
Sulfate	246.8	16.3	63	277	214	08/18/11	05/23/13
Calcium	120.33	4.13	18	131	113	05/19/14	05/24/17
Iron	0.07	0.05	0.25	0.30	0.05	03/14/12	03/22/11
Magnesium	93.06	4.3	14	101	87	05/19/14	03/14/12
Sodium	29.22	1.91	9	32	23	08/18/11	05/24/17
Elevation	13.95	3.28	16.96	24.29	7.33	11/08/11	04/30/18

Evaluation of 2019 data for MJ-95-01 Well
No minimum or maximum values were recorded during 2019. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date.

MJ-95-03:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.16	0.13	0.70	8.40	7.70	11/27/18	11/05/14
Lab Cond.	2253.1	145.7	700	2460	1760	08/20/18	05/04/11
TDS	1790.0	81.6	320	1920	1600	08/18/11	05/24/17
Sulfate	789.9	45.9	205	891	686	05/04/11	11/08/11
Calcium	145.0	6.7	22	157	135	08/27/14	11/19/13
Iron	0.06	0.03	0.17	0.22	0.05	03/14/12	03/22/11
Magnesium	191.5	10.2	39	217	178	03/22/11	11/29/17
Sodium	139.6	11.8	50	166	116	03/22/11	09/13/16
Elevation	20.20	0.88	5.81	21.57	15.76	09/13/16	11/08/11

Evaluation of 2019 data for MJ-95-03 Well
No minimum or maximum values were recorded during 2019. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date.

Trout Creek Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	9.20	0.32	0.90	9.50	8.6	08/20/18	3/6/19
Lab Cond.	1115.83	51.95	210	1220	1010	03/15/17	3/6/19
TDS	704.2	37.3	130	800	670	03/15/17	11/27/18
Sulfate	240.1	27.4	96	309	213	03/15/17	9/4/19
Calcium	7.33	3.94	11	16	5	03/15/17	11/27/18
Iron	0.07	0.05	0.17	0.22	0.05	03/13/18	11/29/17
Magnesium	24.7	4.8	19	38	19	03/15/17	11/12/19
Sodium	204.6	16.5	57	237	180	11/12/19	11/29/17
Elevation	589.9	1.04	2.59	591.02	588.43	09/18/17	11/12/19

Evaluation of 2019 data for Trout Creek Well

Several minimum values occurred in 2019 for laboratory pH, laboratory conductivity, sulfate, and magnesium. One maximum occurred for sodium. Mining commenced on the Collom Pit in the fall of 2018; therefore, not enough data has been acquired to provide any reasonable analysis of the data acquired to date.

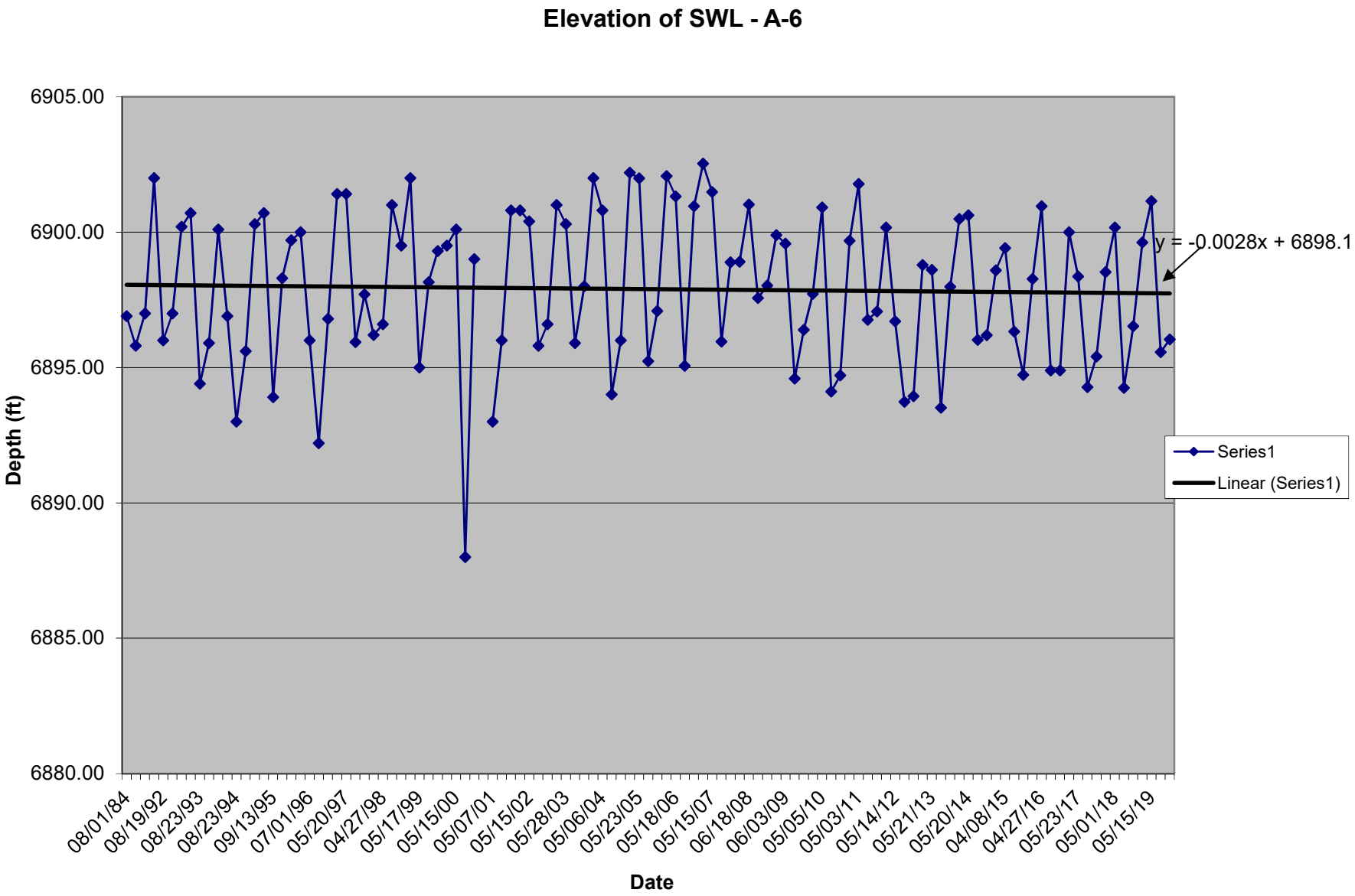
SPOIL SPRING DEVELOPMENT

Several active native springs have been identified on the reclaimed surface at the Colowyo Mine. These springs are the result of groundwater movement from groundwater complexes that were present pre-mining, whose waters pass through regraded overburden subsurface from the highwall (non-mined areas), and emerge at a location down gradient in the reclaimed surface. Colowyo has detected four springs that originate from non-mined areas in the highwall and percolate through the regraded spoil and emerge on the reclaimed surface. Two springs are located just south of the East Taylor Pond in reclamation parcel WP014. Each of these springs are located where the final highwall was regraded to the approved post mining topography (PMT). Two additional springs have been located in the East Pit reclamation parcel EP057, south of the Final East Pit Ditch where the final highwall was regraded to PMT.

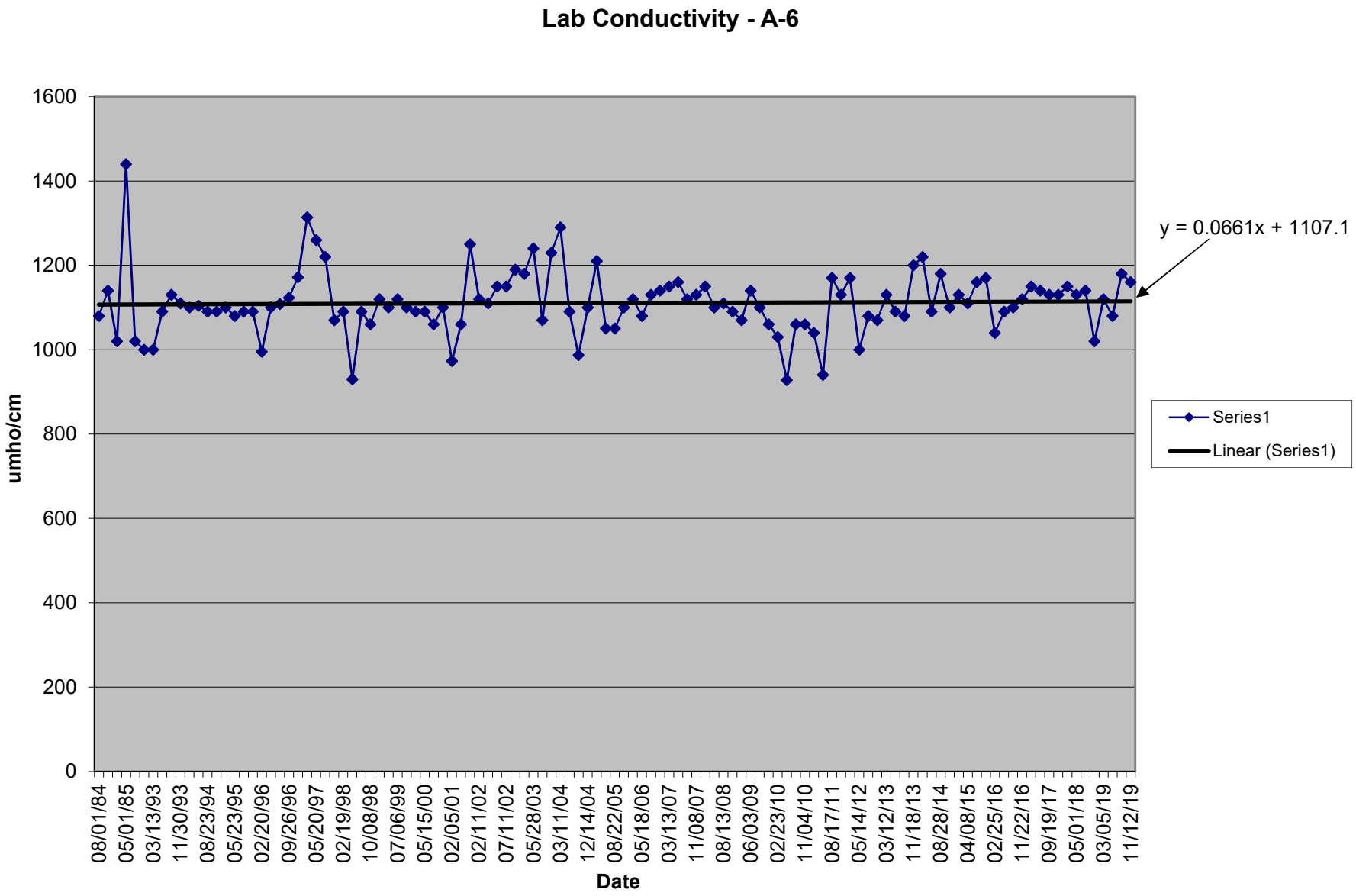
Exhibit 1B

Colowyo Mine
Well A-6
Water Year 1/1/2019 - 12/31/19

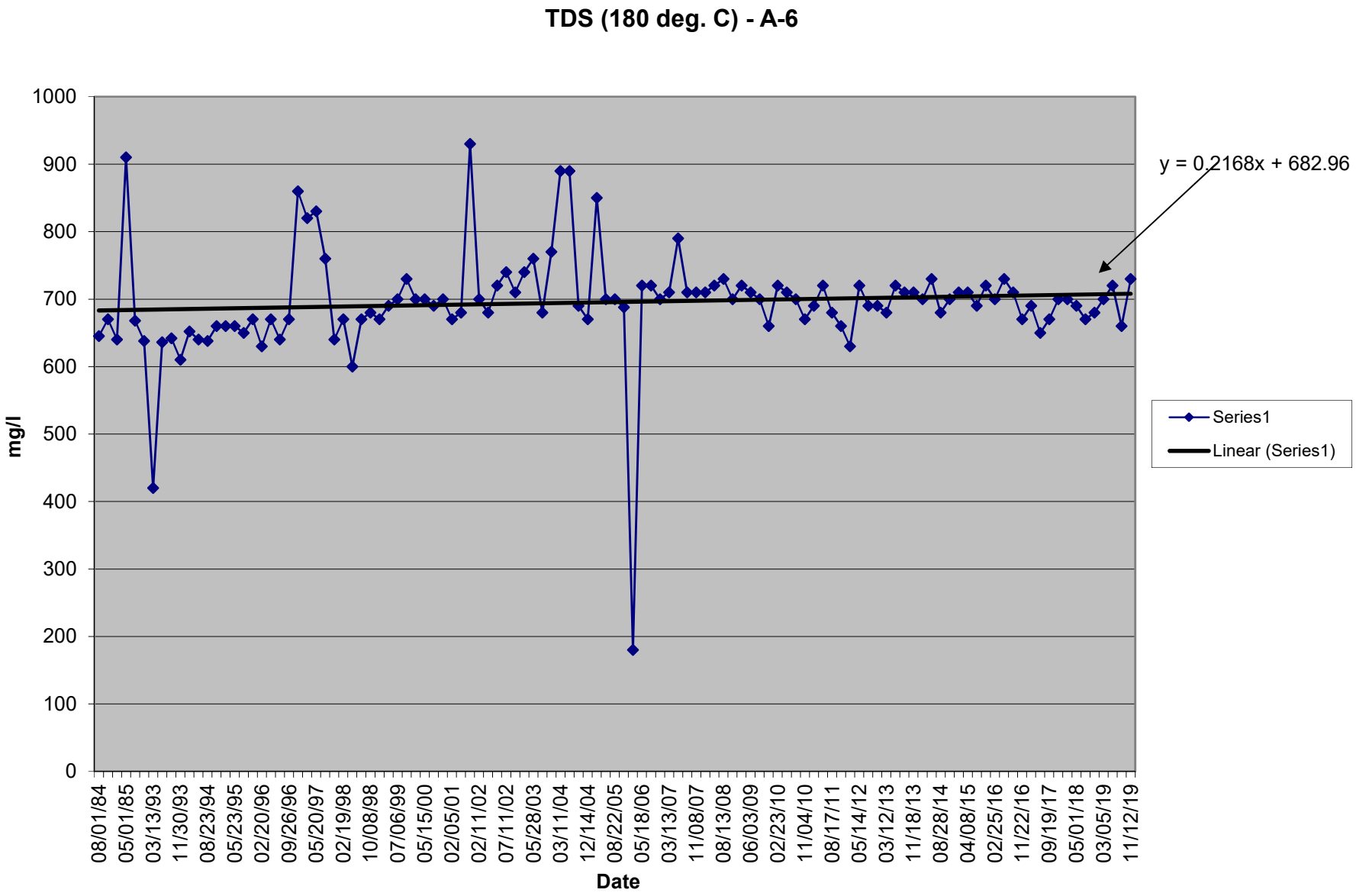
	Sample Date			
	03/05/19	05/15/19	09/19/19	11/12/19
Elevation SWL, ft MSL	6899.62	6901.15	6895.57	6896.04
Field pH	7.82	7.54	7.31	7.14
Feld Temperature, °C	8	9.9	8.9	9.2
Field Conductivity, umhos/com		1110		
Lab pH		8.5		
Lab Conductivity, umhos/com		1080		
TDS, mg/l		720		
Bicarbonate as HCO3, D, mg/l		587		
Ca, D, mg/l		57		
Mg, D, mg/l		50		
Ammonia NH3, TD, mg/l		1.7		
NO3 as N, mg/l		0.1		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		133		
Sulfate, D, mg/l		130		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.05		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		


Elevation of SWL - A-6
6905.00
6900.00
6895.00
6890.00
6885.00
6880.00
Depth (ft)
y = -0.0028x + 6898.1
Series1
Linear (Series1)
08/01/84
08/19/92
08/23/93
08/23/94
09/13/95
07/01/96
05/20/97
04/27/98
05/17/99
05/15/00
05/07/01
05/15/02
05/28/03
05/06/04
05/23/05
05/18/06
05/15/07
06/18/08
06/03/09
05/05/10
05/03/11
05/14/12
05/21/13
05/20/14
04/08/15
04/27/16
05/23/17
05/01/18
05/15/19
Date

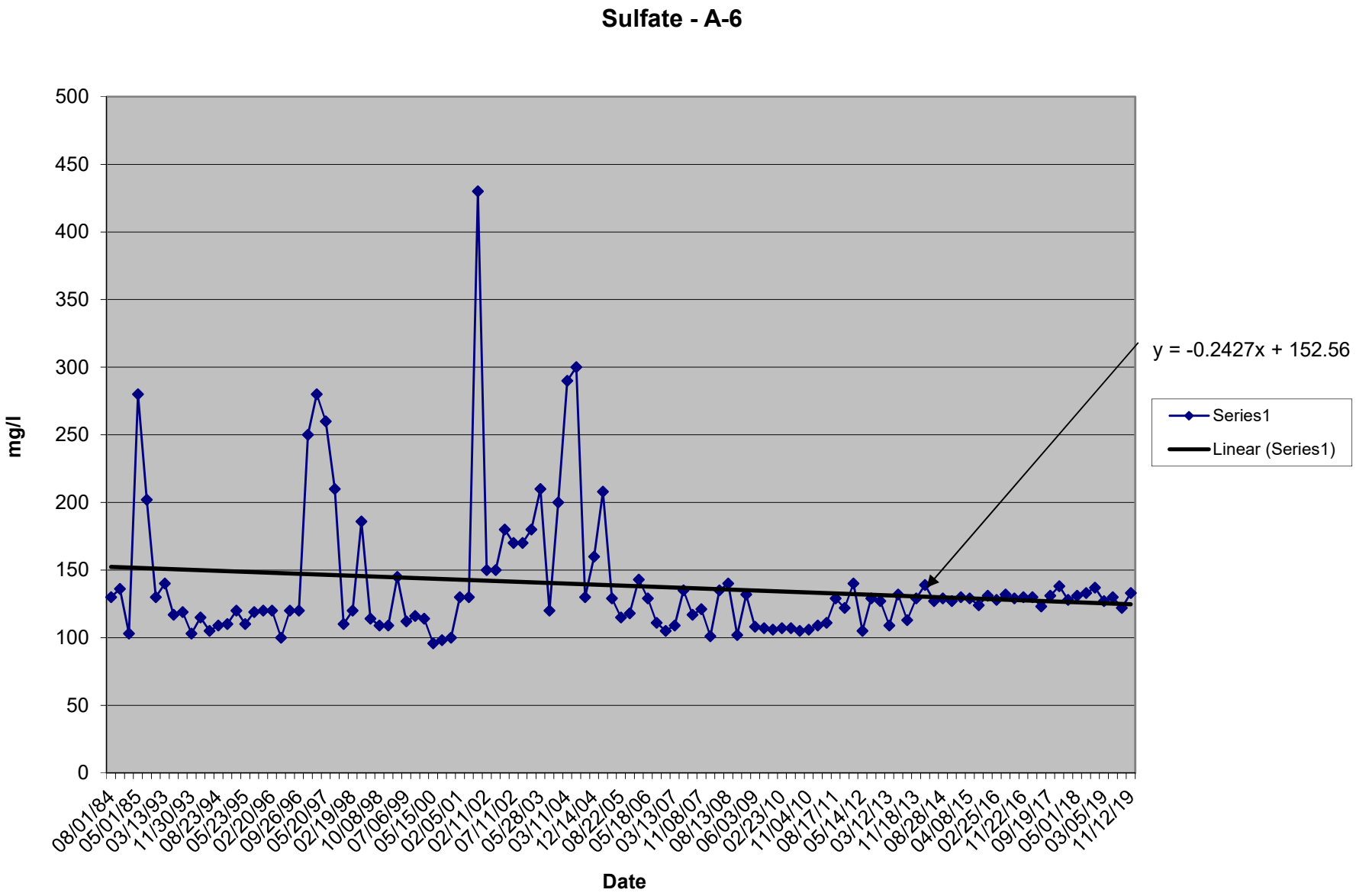
A-6 Well


Lab Conductivity - A-6
umho/cm
1600
1400
1200
1000
800
600
400
200
0
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19
Date
y = 0.0661x + 1107.1
Series1
Linear (Series1)

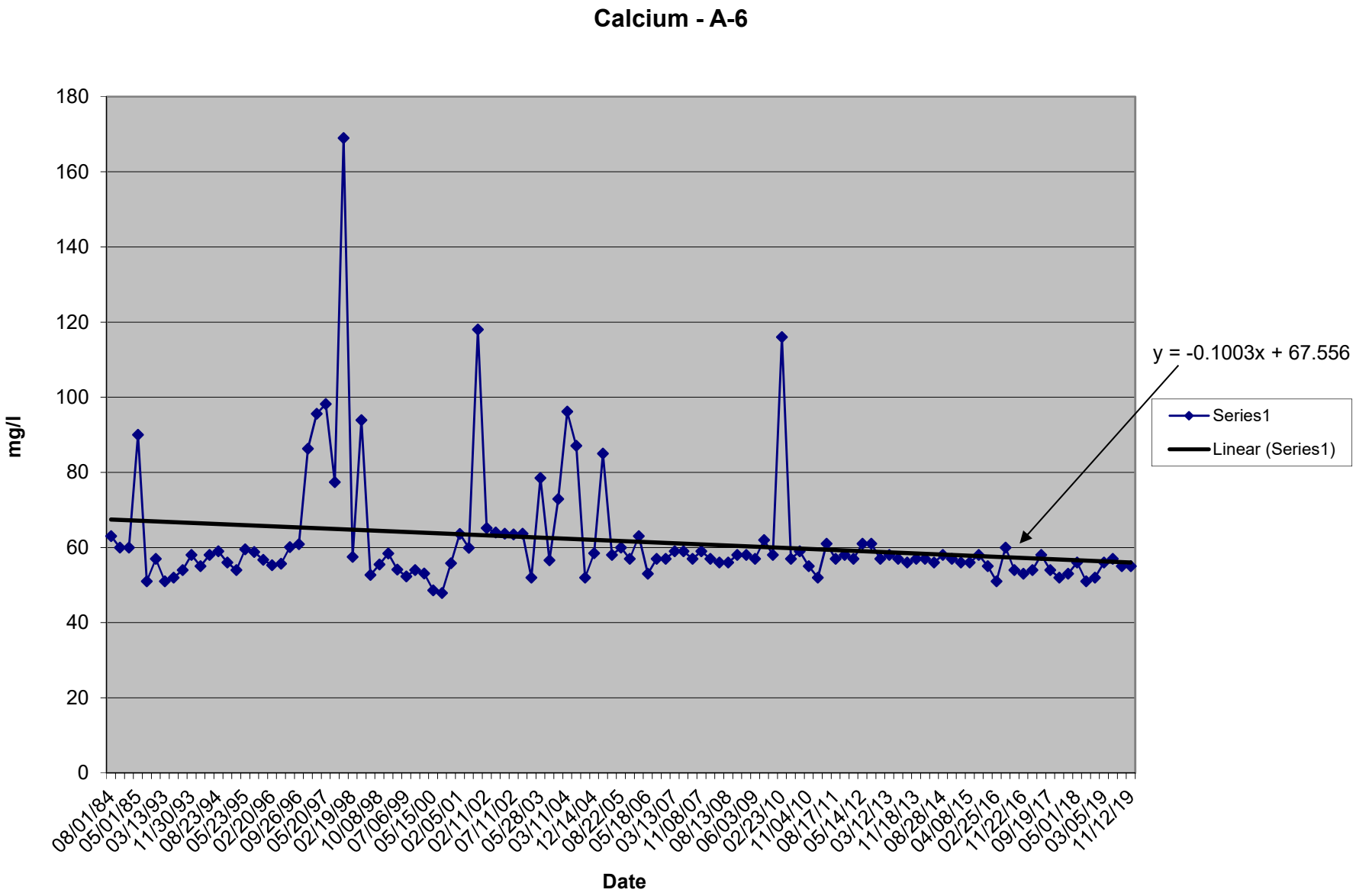
A-6 Well


TDS (180 deg. C) - A-6
y = 0.2168x + 682.96
mg/l
Date
Series1
Linear (Series1)
1000
900
800
700
600
500
400
300
200
100
0
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19

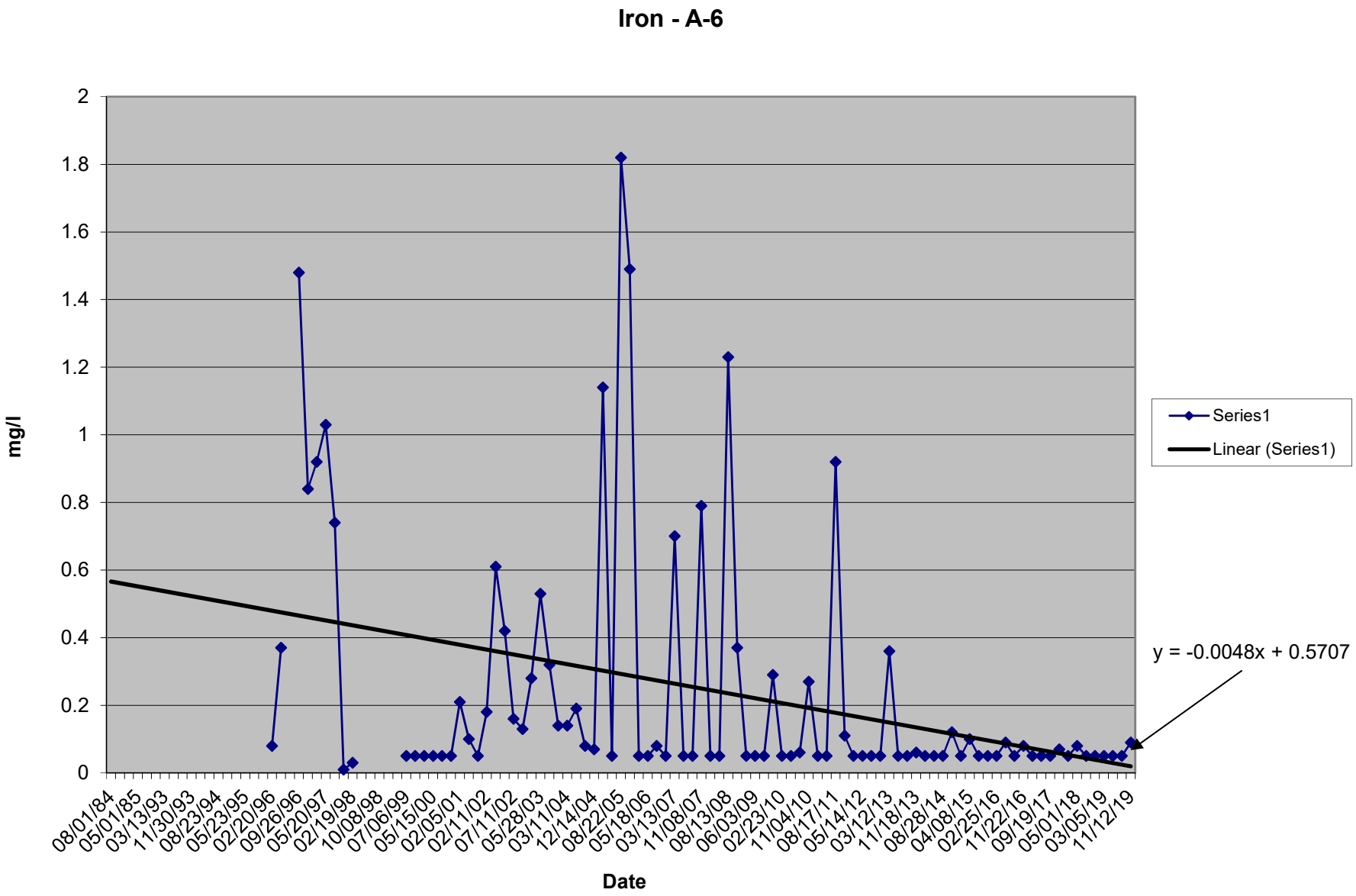
A-6 Well


Sulfate - A-6
mg/l
500
450
400
350
300
250
200
150
100
50
0
y = -0.2427x + 152.56
Series1
Linear (Series1)
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19
Date

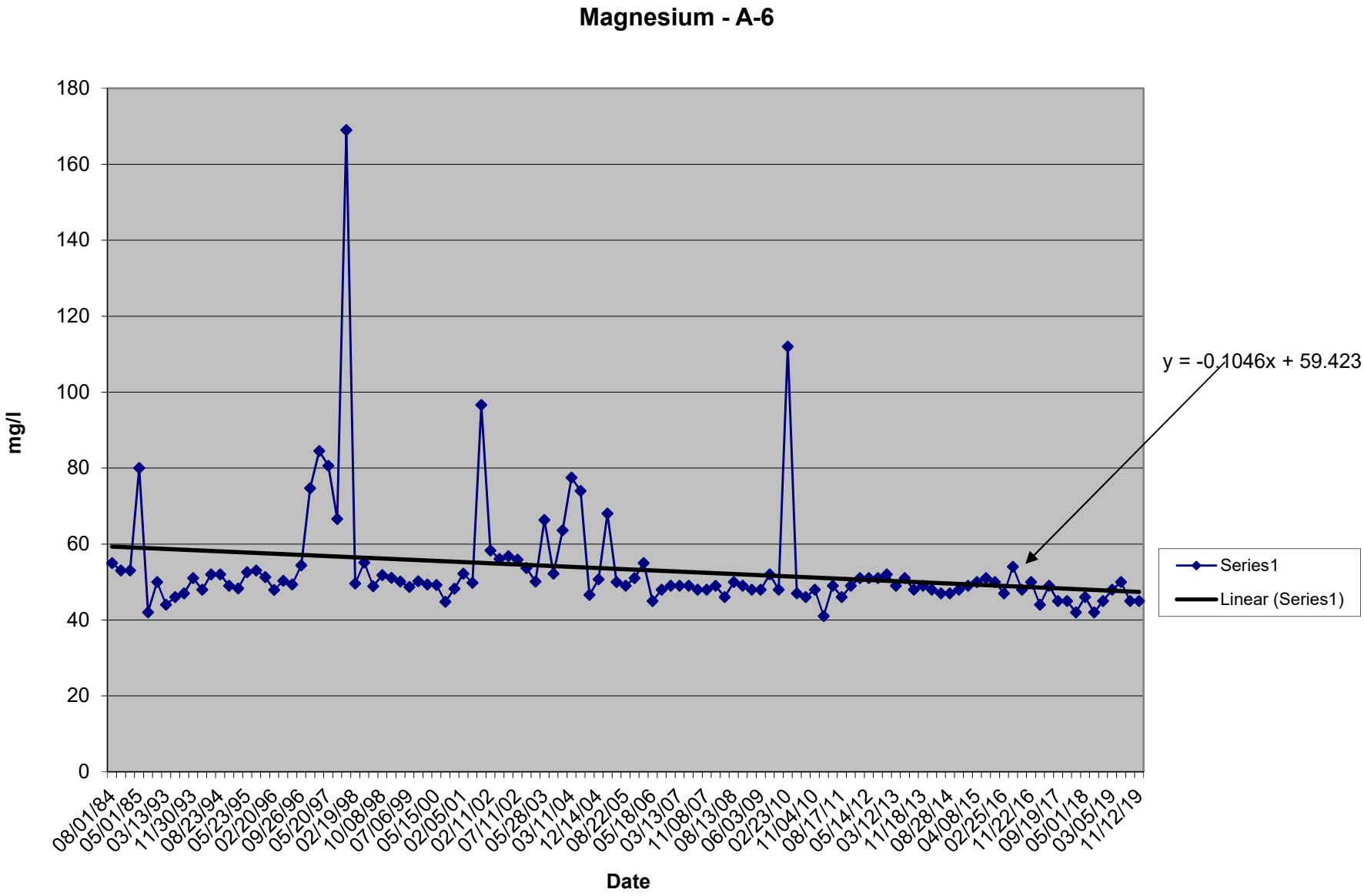
A-6 Well


Calcium - A-6
mg/l
Date
y = -0.1003x + 67.556
Series1
Linear (Series1)
180
160
140
120
100
80
60
40
20
0
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19

A-6 Well


Iron - A-6
mg/l
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Series1
Linear (Series1)
y = -0.0048x + 0.5707
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19
Date

A-6 Well


Magnesium - A-6
mg/l
180
160
140
120
100
80
60
40
20
0
y = -0.1046x + 59.423
Series1
Linear (Series1)
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19
Date

A-6 Well

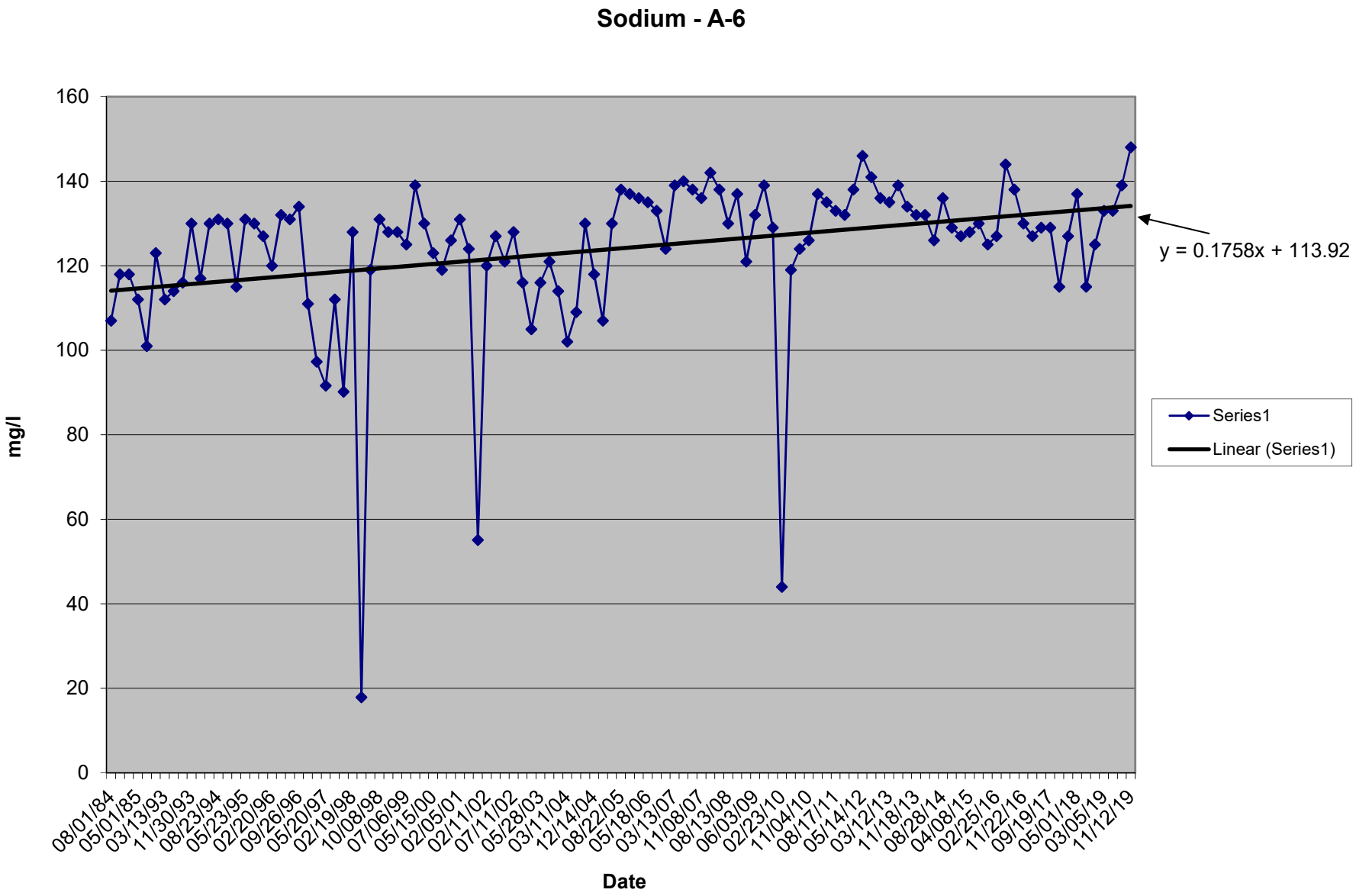
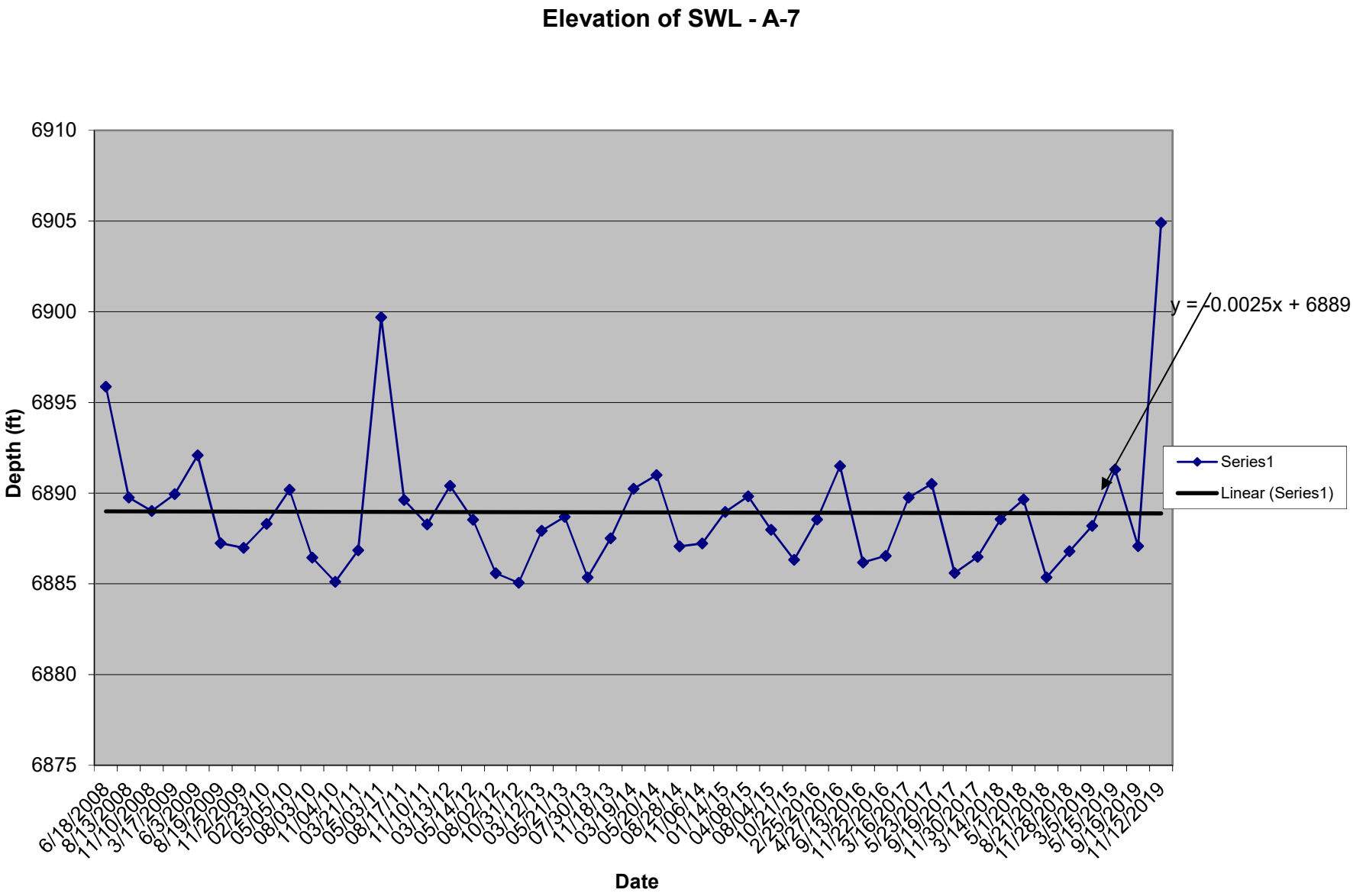

Sodium - A-6
160
140
120
100
80
60
40
20
0
mg/l
y = 0.1758x + 113.92
Series1
Linear (Series1)
08/01/84
05/01/85
03/13/93
11/30/93
08/23/94
05/23/95
02/20/96
09/26/96
05/20/97
02/19/98
10/08/98
07/06/99
05/15/00
02/05/01
02/11/02
07/11/02
05/28/03
03/11/04
12/14/04
08/22/05
05/18/06
03/13/07
11/08/07
08/13/08
06/03/09
02/23/10
11/04/10
08/17/11
05/14/12
03/12/13
11/18/13
08/28/14
04/08/15
02/25/16
11/22/16
09/19/17
05/01/18
03/05/19
11/12/19
Date

Exhibit 1B

Colowyo Mine
Well A-7
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Elevation SWL, ft MSL	6888.19	6891.30	6887.08	6904.9
Field pH	7.60	7.58	7.39	7.22
Feld Temperature, °C	8.9	9.0	8.4	8.7
Field Conductivity, umhos/com	1480	1400	1600	1550
Lab pH		8.4		
Lab Conductivity, umhos/com		1360		
TDS, mg/l		1100		
Bicarbonate as HCO3, D, mg/l		478		
Ca, D, mg/l		121		
Mg, D, mg/l		115		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		3.9		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		45		
Sulfate, D, mg/l		387		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.012		
Zn, TD, mg/l		0.05		


Elevation of SWL - A-7
Depth (ft)
6910
6905
6900
6895
6890
6885
6880
6875
y = -0.0025x + 6889
Series1
Linear (Series1)
Date
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
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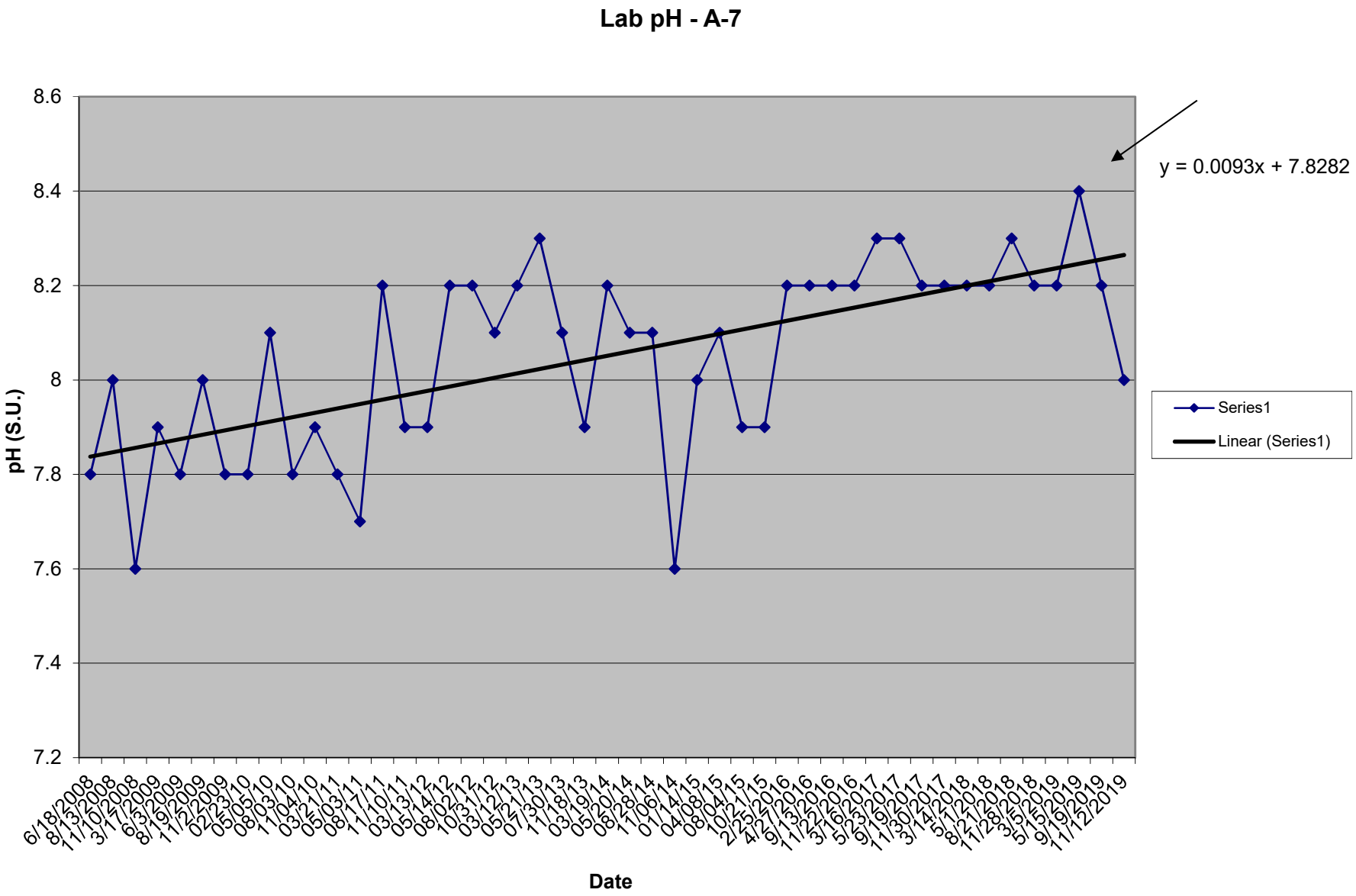
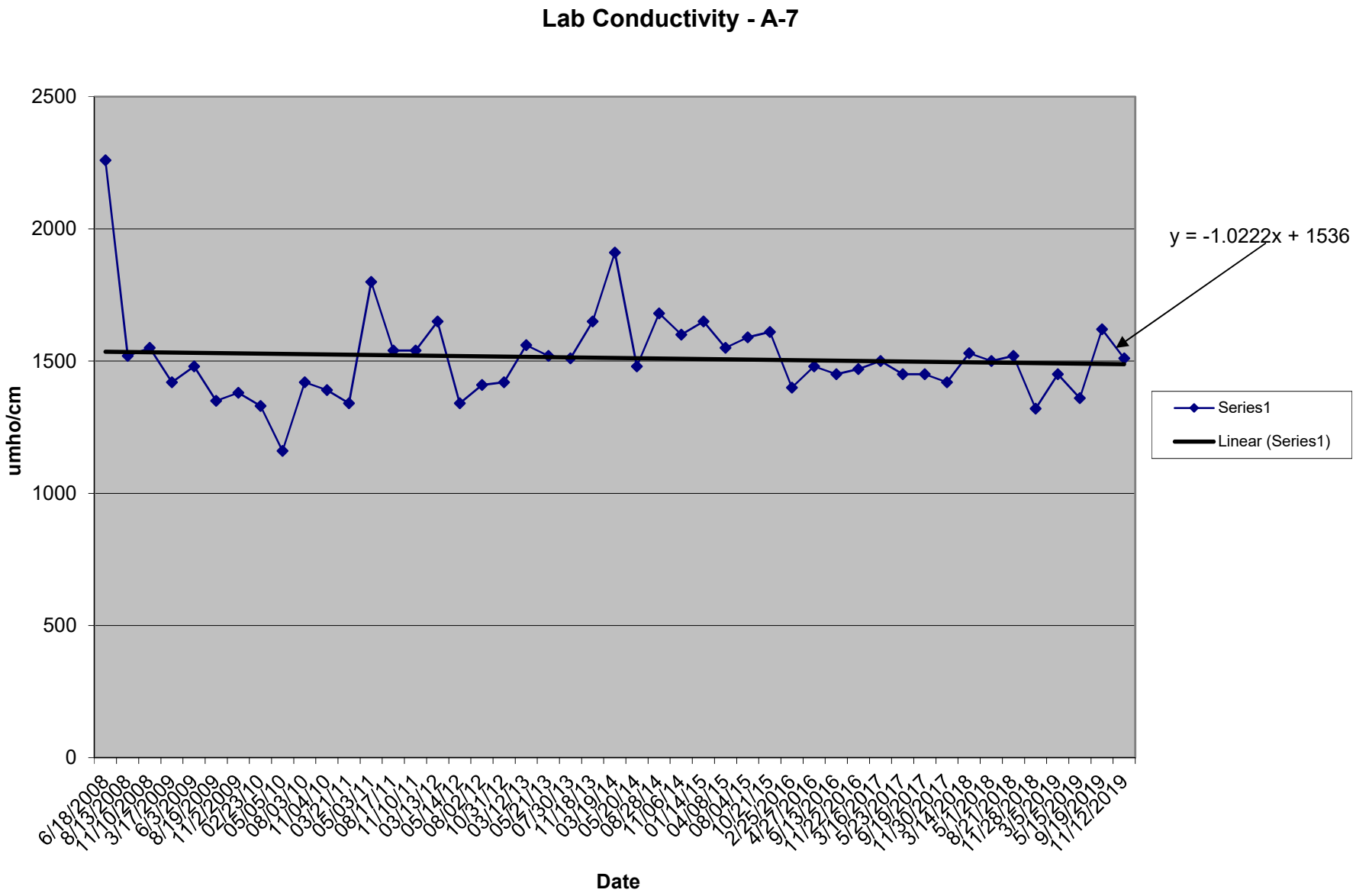
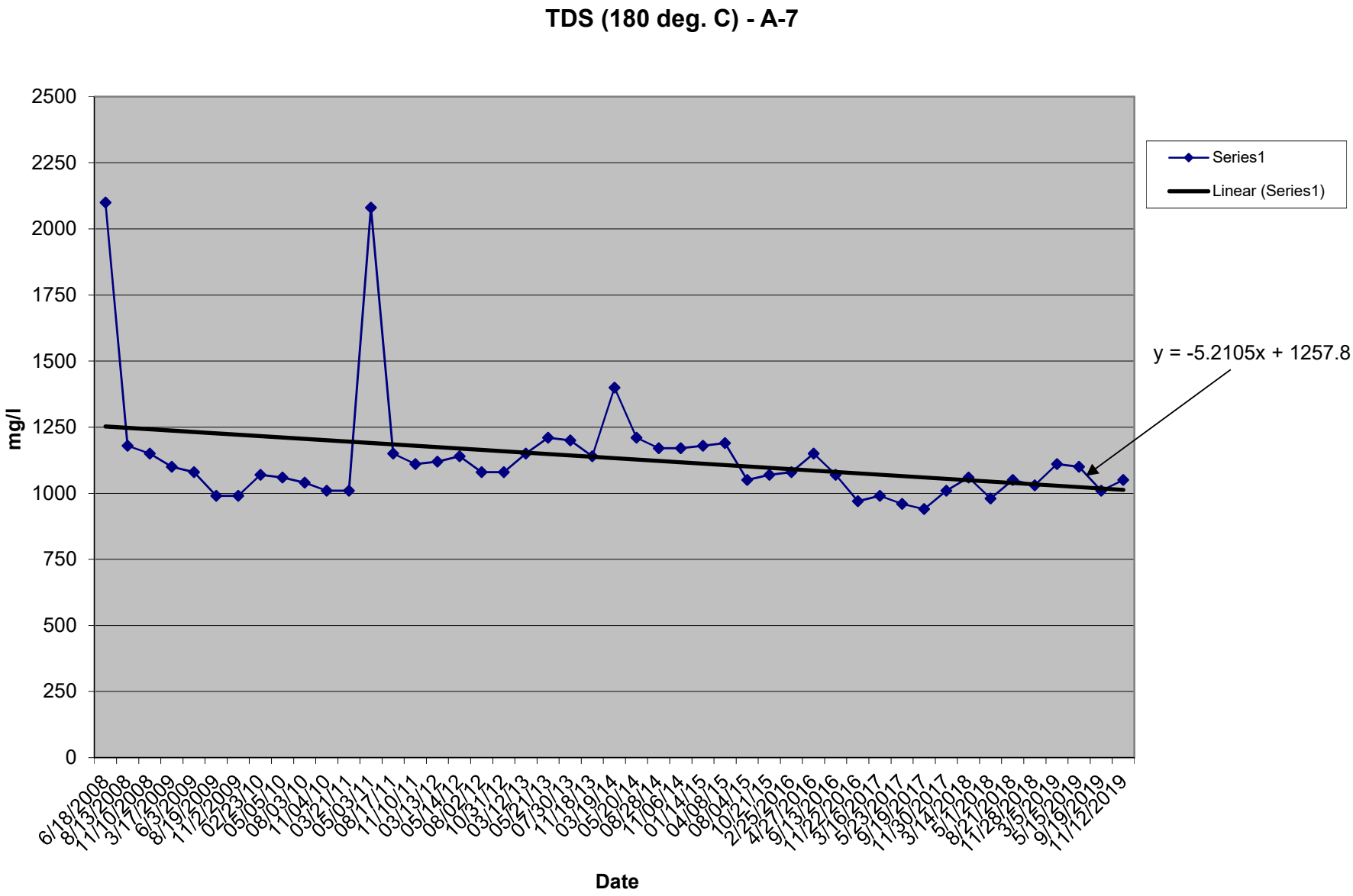
9/19/2019
11/12/2019


Lab pH - A-7
y = 0.0093x + 7.8282
pH (S.U.)
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
Series1
Linear (Series1)
Date
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
9/19/2019
11/12/2019

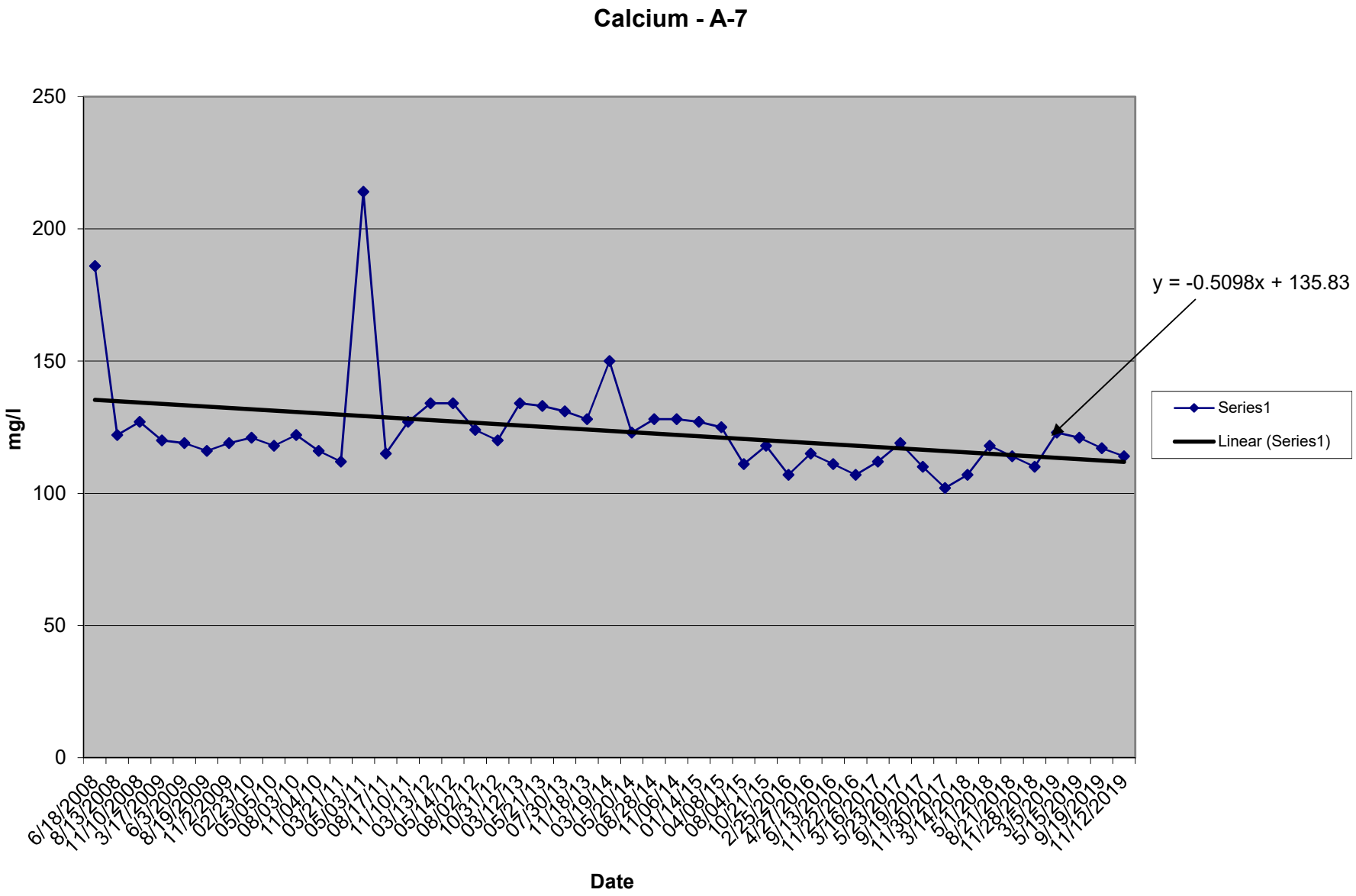
A-7 Well


Lab Conductivity - A-7
2500
2000
1500
1000
500
0
umho/cm
y = -1.0222x + 1536
Series1
Linear (Series1)
Date

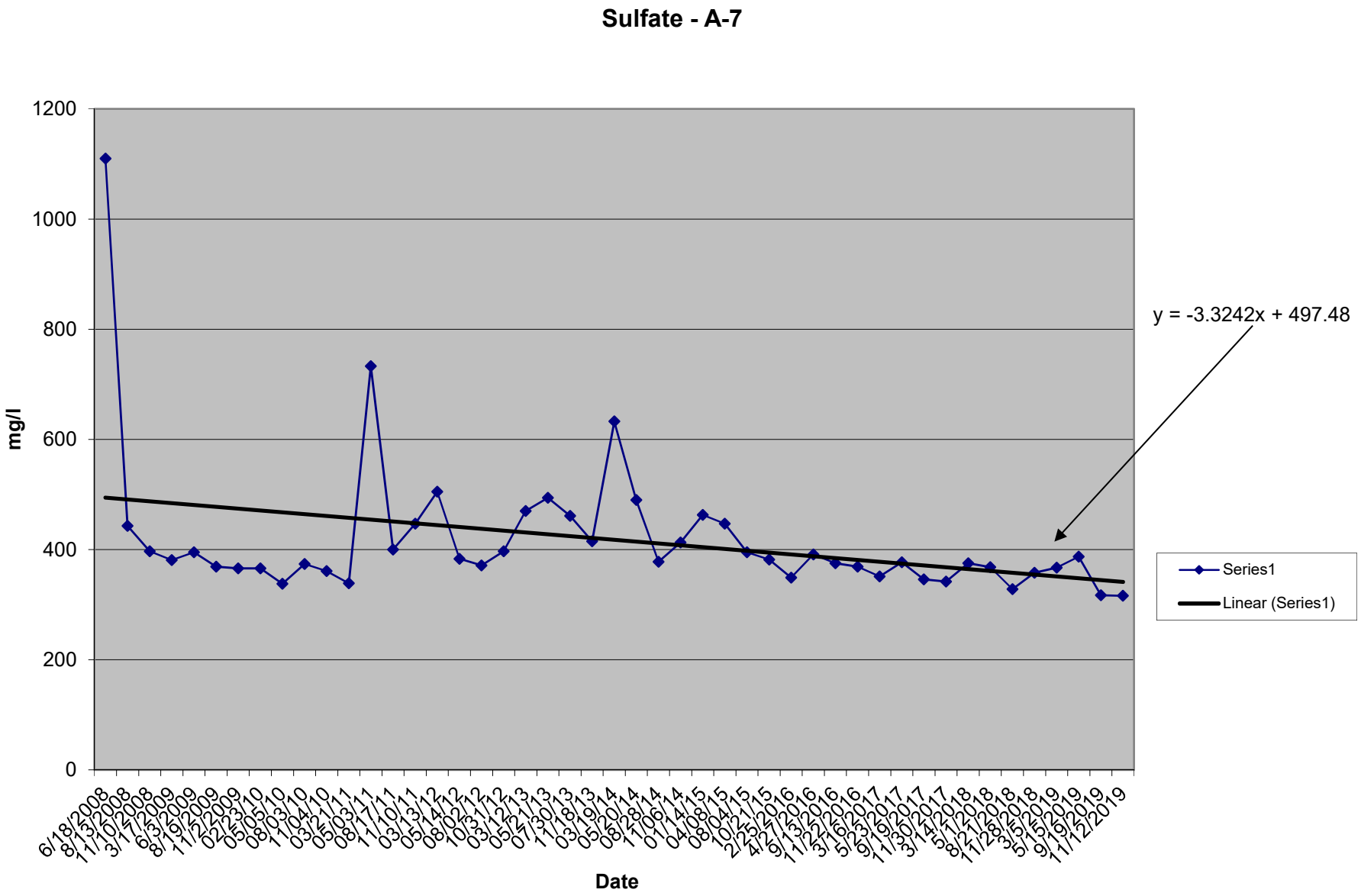
A-7 Well


TDS (180 deg. C) - A-7
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
mg/l
Series1
Linear (Series1)
y = -5.2105x + 1257.8
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/5/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
9/19/2019
11/12/2019
Date

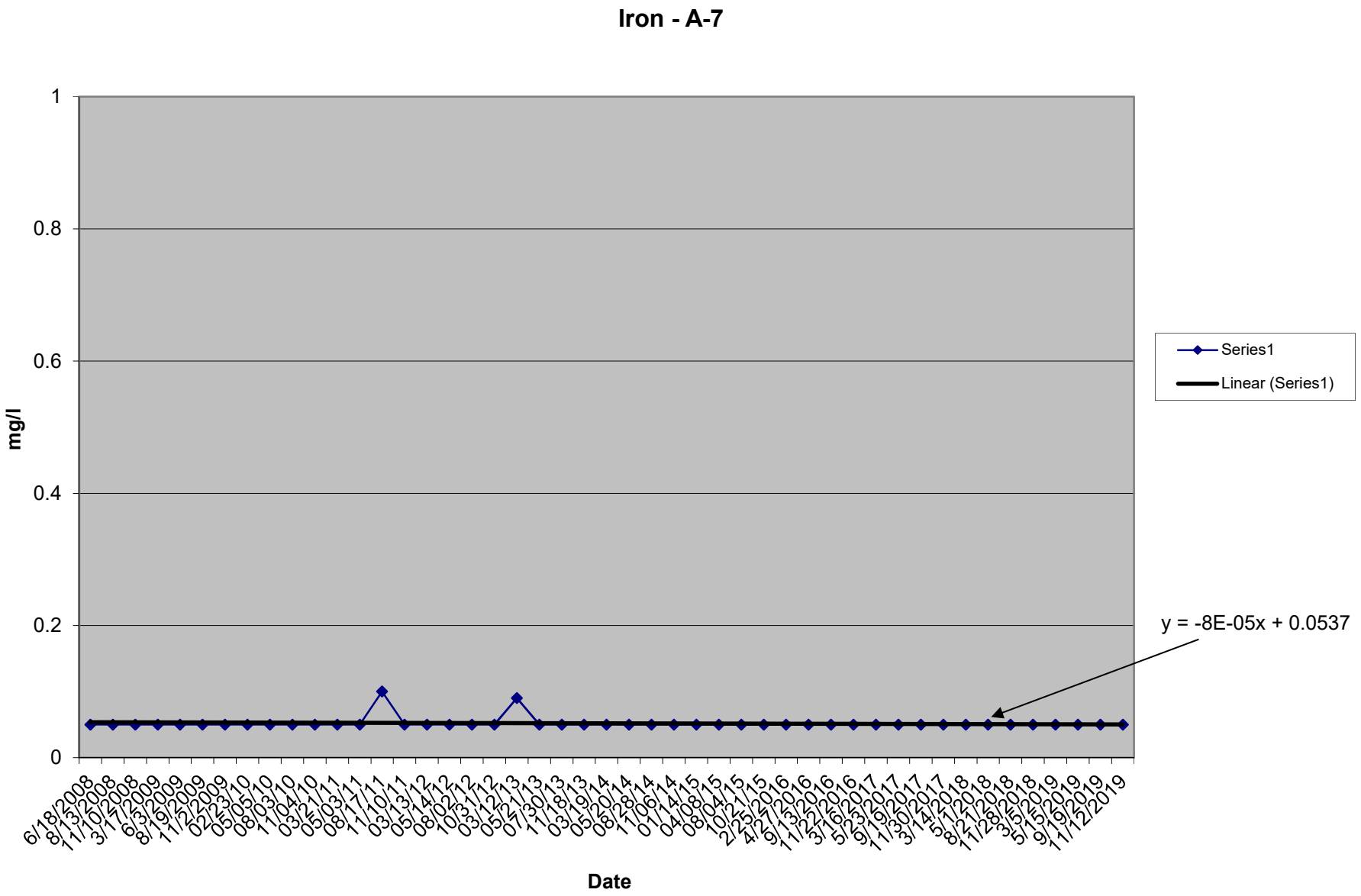
A-7 Well


Calcium - A-7
250
200
150
100
50
0
mg/l
y = -0.5098x + 135.83
Series1
Linear (Series1)
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
9/19/2019
11/12/2019
Date

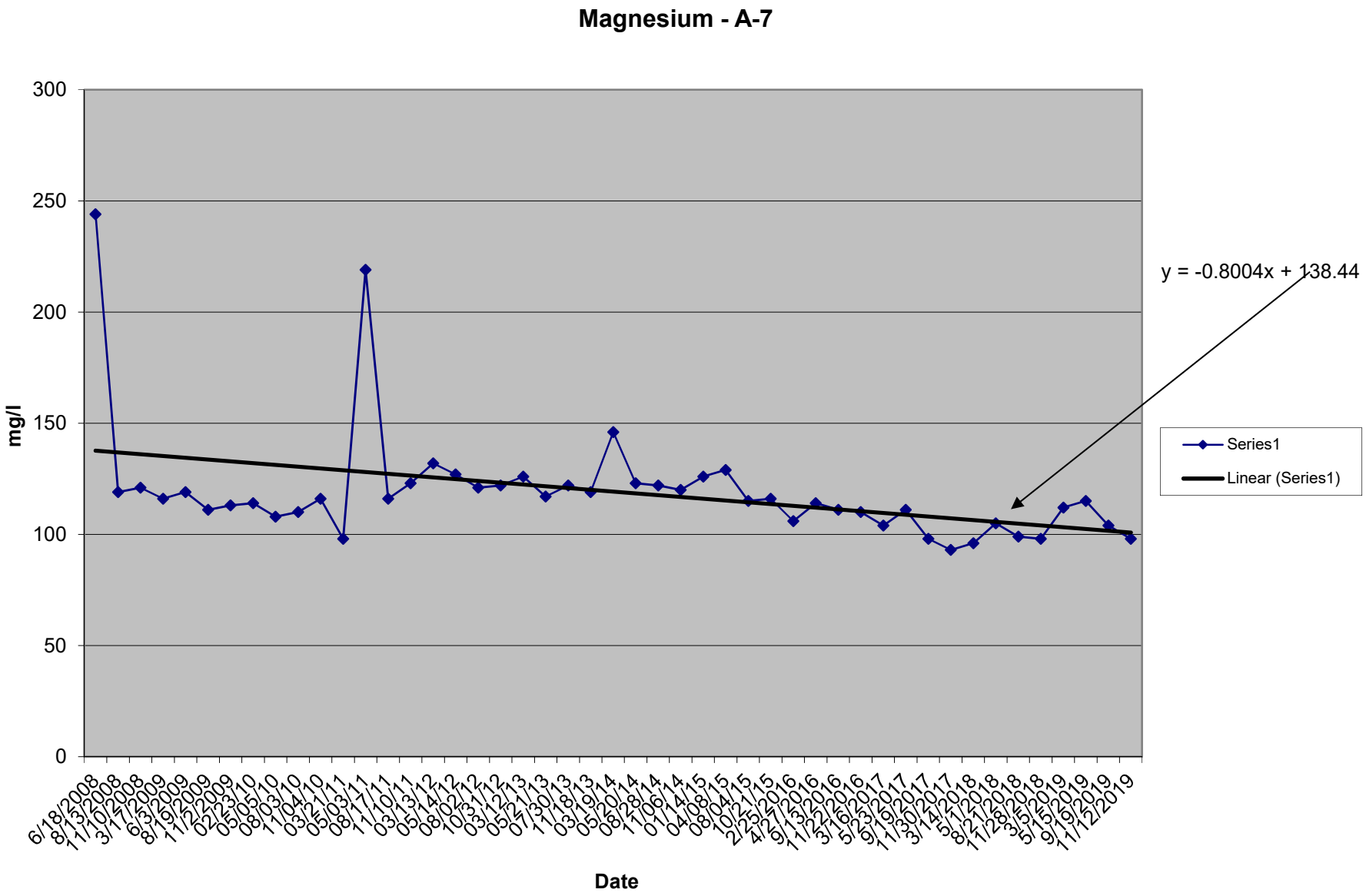
A-7 Well


Sulfate - A-7
1200
1000
800
600
400
200
0
mg/l
y = -3.3242x + 497.48
Series1
Linear (Series1)
Date
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
9/19/2019
11/15/2019

A-7 Well

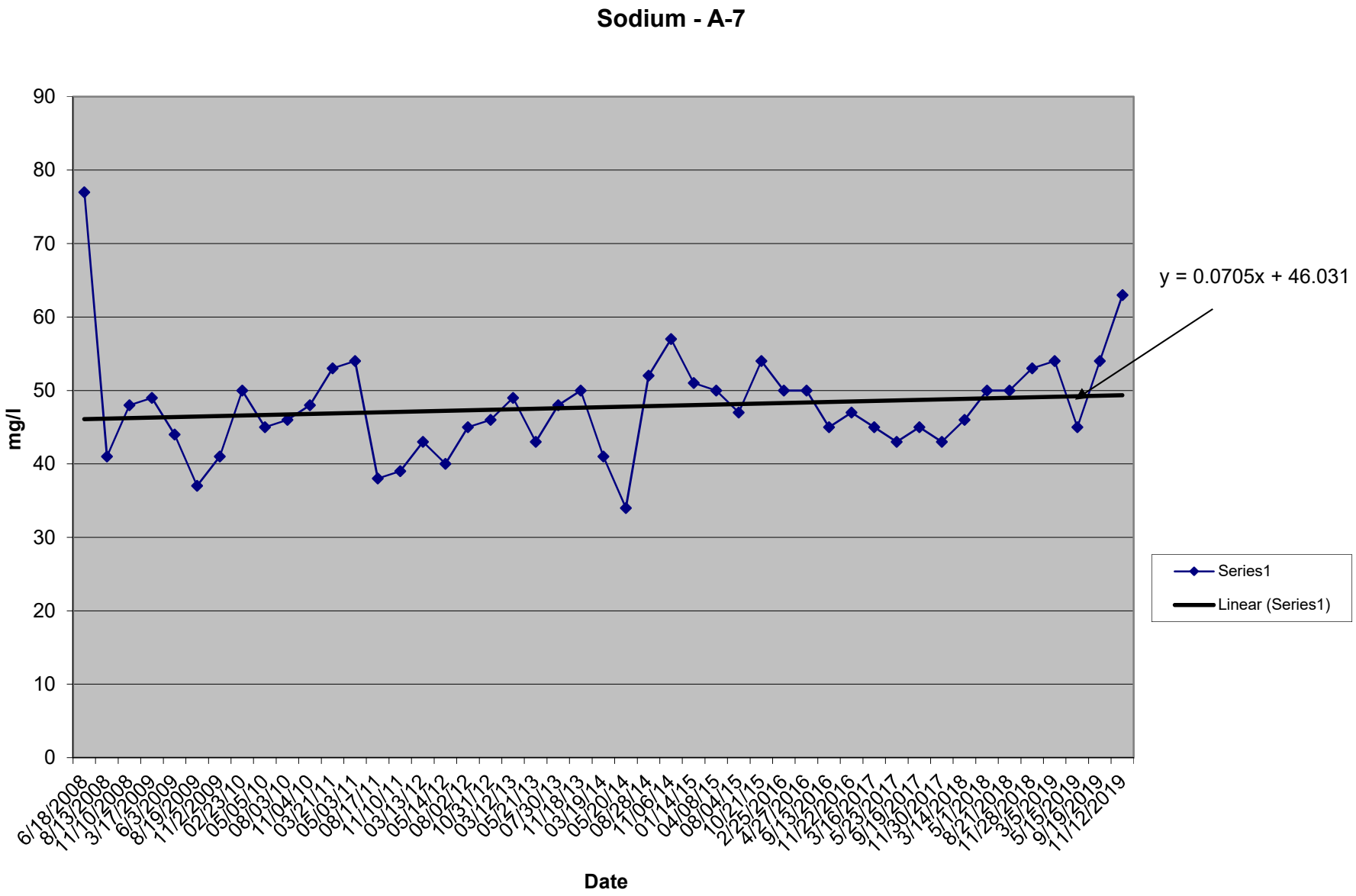

Iron - A-7
1
0.8
0.6
0.4
0.2
0
mg/l
Series1
Linear (Series1)
y = -8E-05x + 0.0537
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
9/19/2019
11/12/2019
Date

A-7 Well


Magnesium - A-7
300
250
200
150
100
50
0
mg/l
y = -0.8004x + 138.44
Series1
Linear (Series1)
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
02/23/10
05/05/10
08/03/10
11/04/10
03/21/11
05/03/11
08/17/11
11/10/11
03/13/12
05/14/12
08/02/12
10/31/12
03/12/13
05/21/13
07/30/13
11/18/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
9/19/2019
11/12/2019
Date

A-7 Well

Exhibit 1B

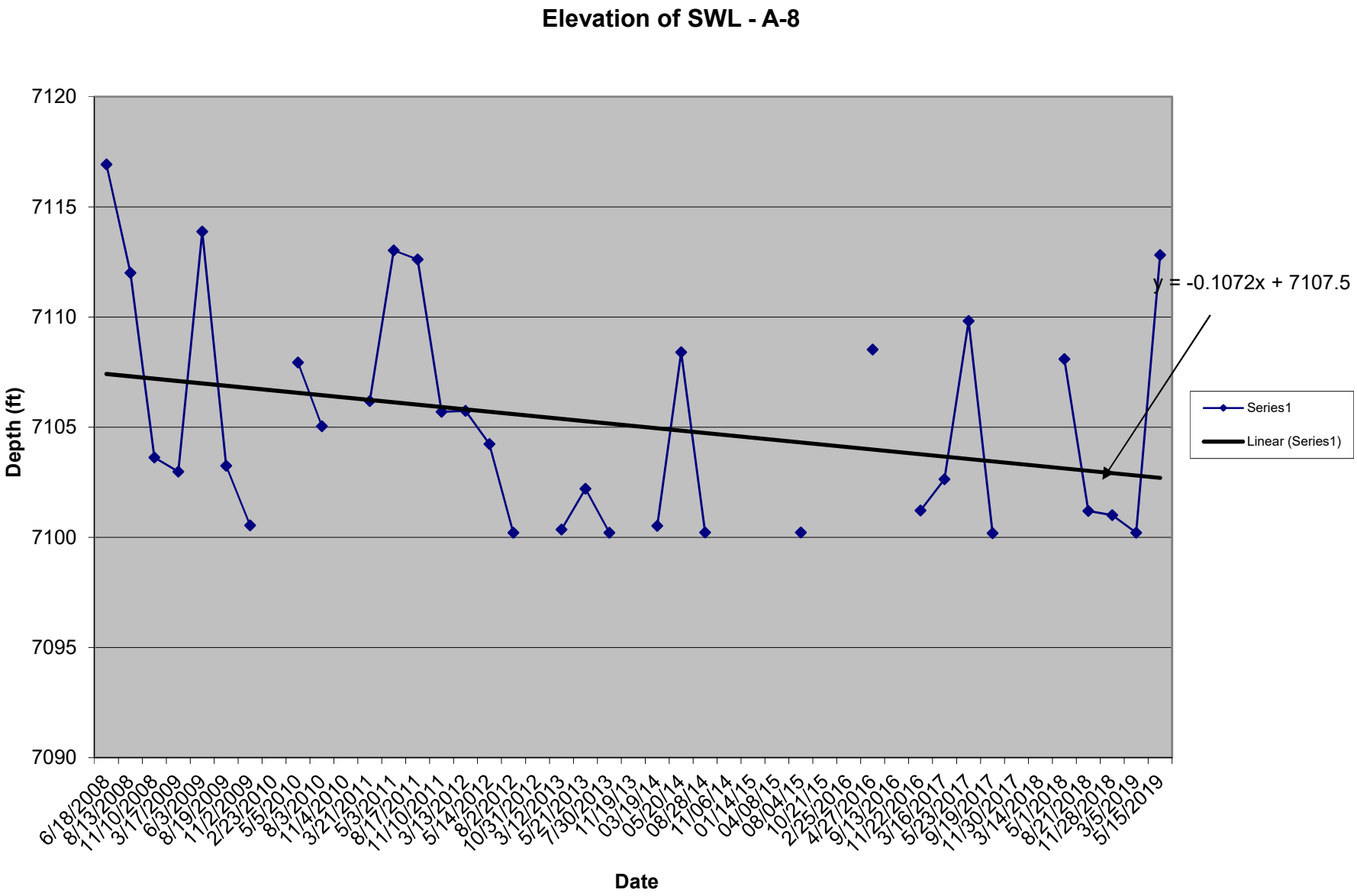


A-7 Well

Exhibit 1B

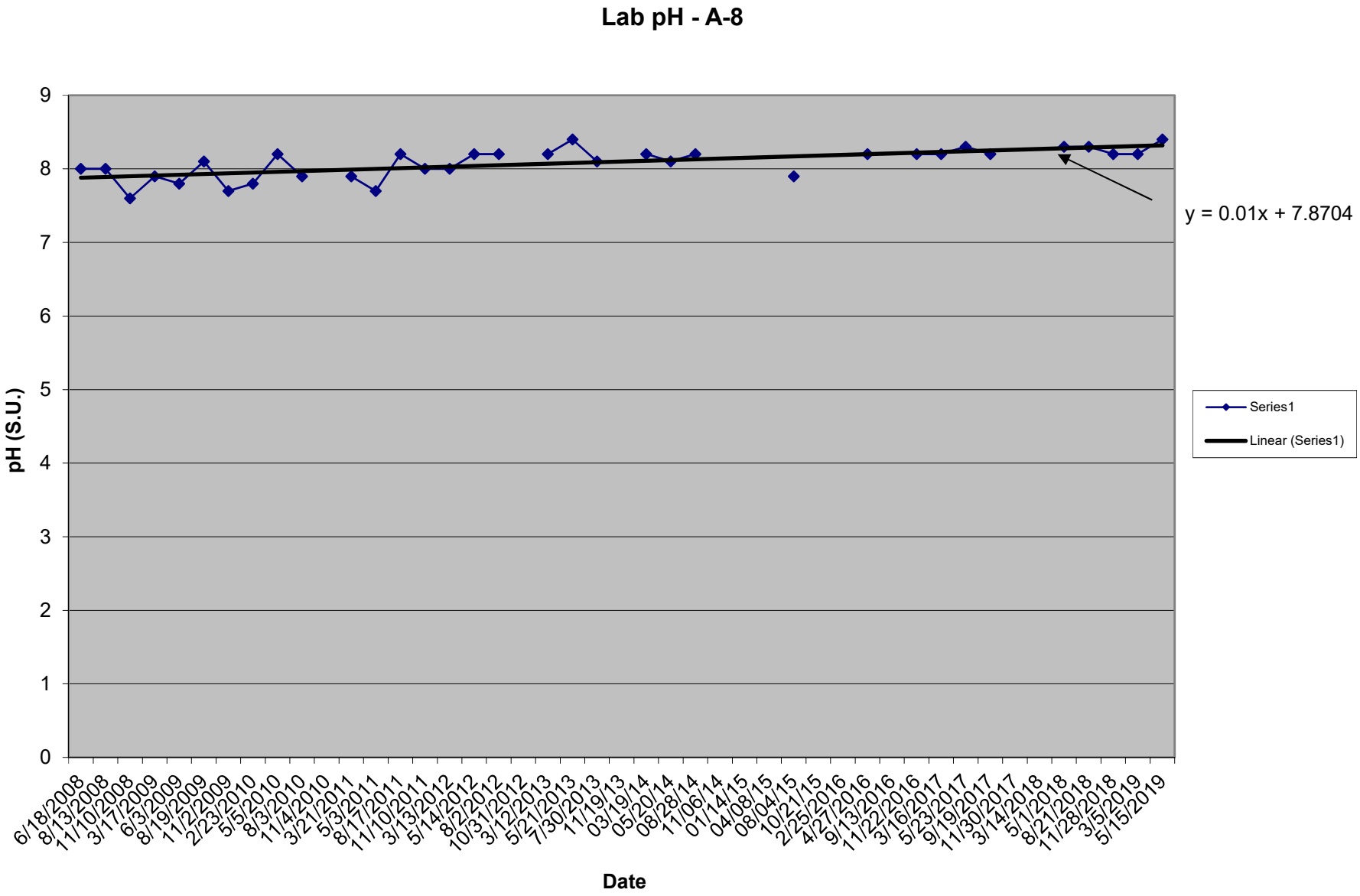
Colowyo Mine
Well A-8
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Elevation SWL, ft MSL	26.29	13.69	Dry	Dry
Field pH	7100.21	7112.81		
Feld Temperature, °C	7.29	7.36		
Field Conductivity, umhos/com	10.7	8.9		
Lab pH		1010		
Lab Conductivity, umhos/com		8.4		
TDS, mg/l		969		
Bicarbonate as HCO3, D, mg/l		414		
Ca, D, mg/l		96		
Mg, D, mg/l		79		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		2.4		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		13		
Sulfate, D, mg/l		210		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		

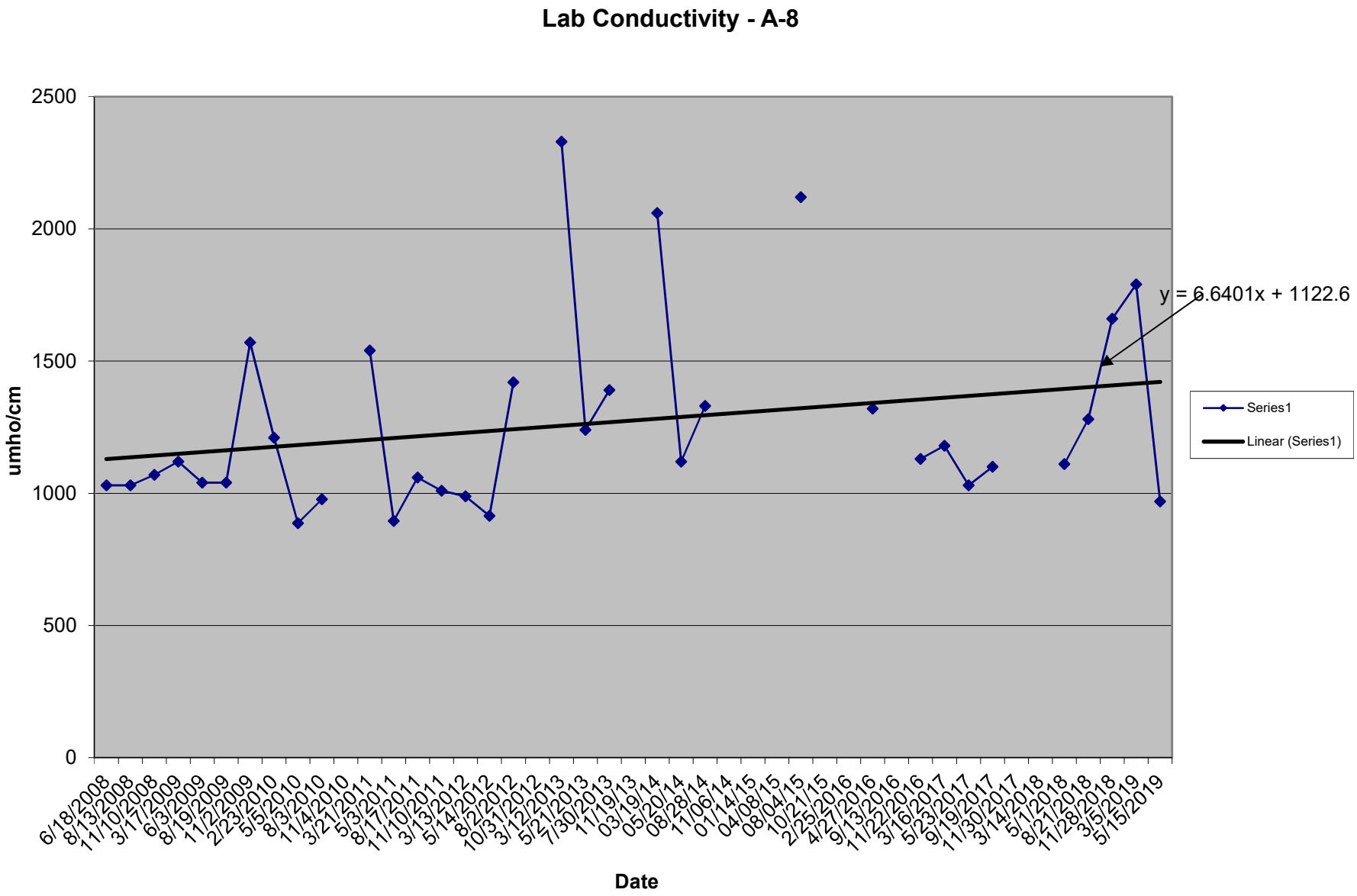

Elevation of SWL - A-8
Depth (ft)
7120
7115
7110
7105
7100
7095
7090
y = -0.1072x + 7107.5
Series1
Linear (Series1)
Date
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
8/2/2012
10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019

A-8 Well

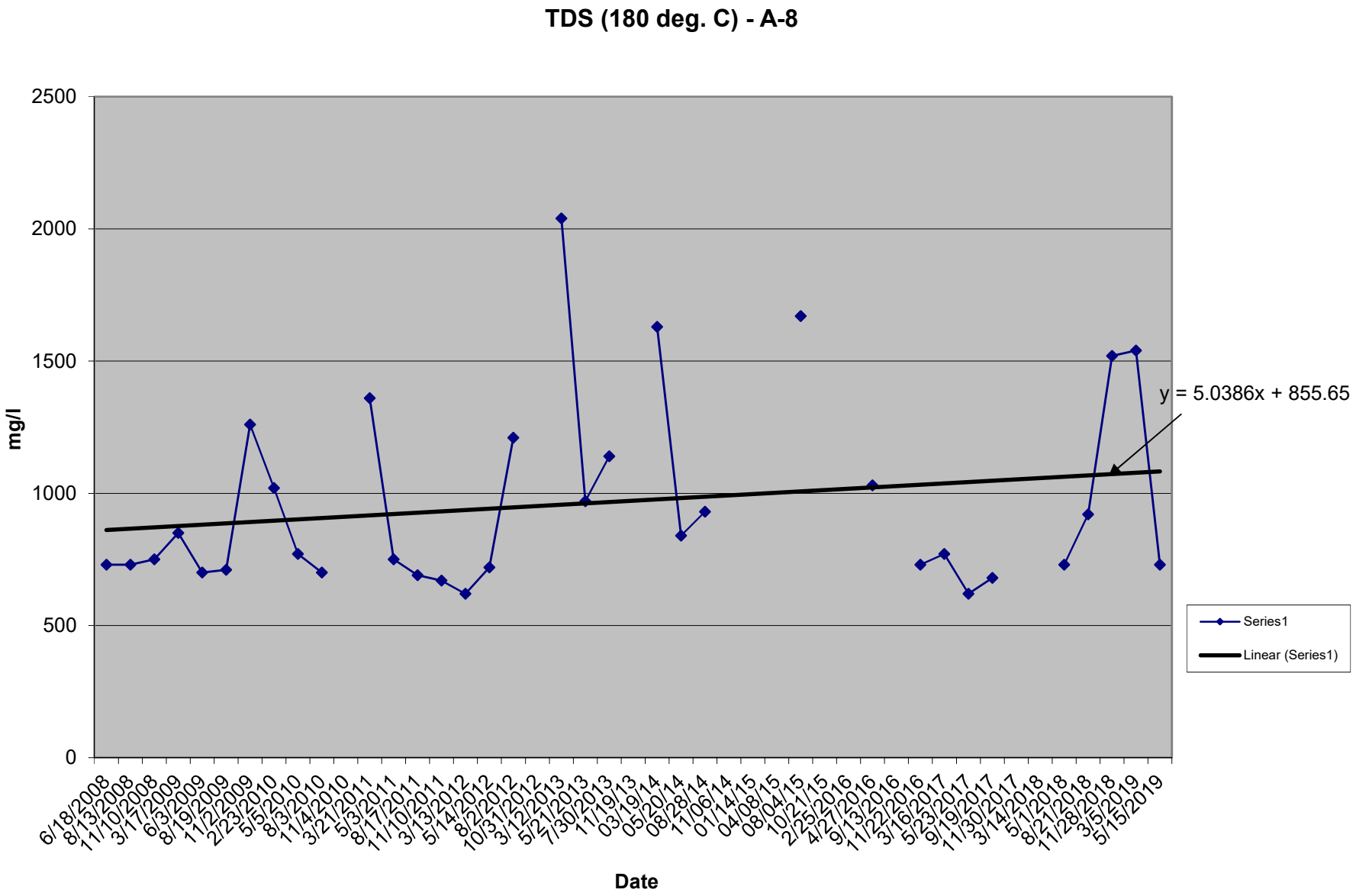
Exhibit 1B



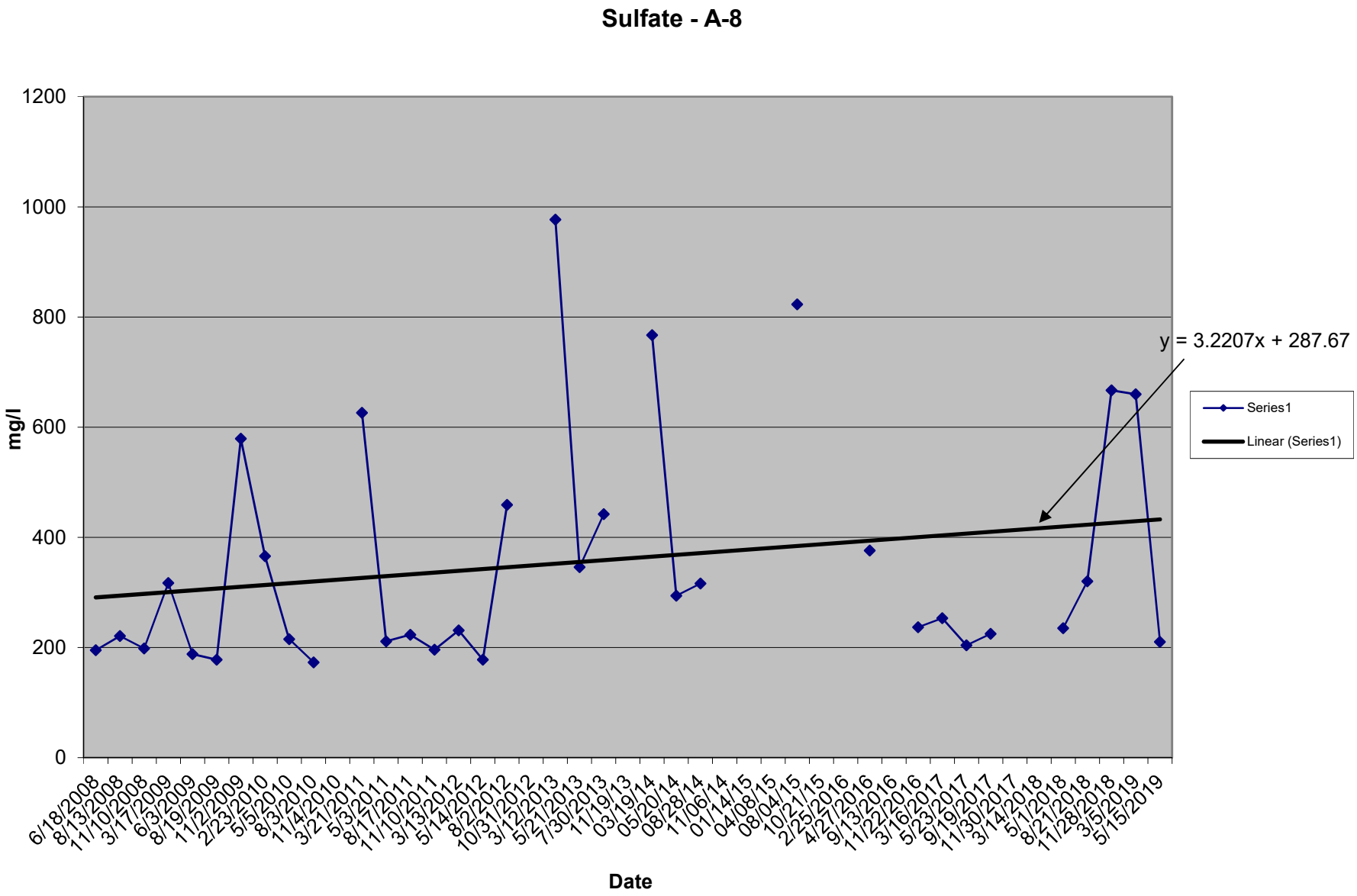
A-8 Well


Lab Conductivity - A-8
umho/cm
2500
2000
1500
1000
500
0
y = 6.6401x + 1122.6
Series1
Linear (Series1)
Date
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
8/2/2012
10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019

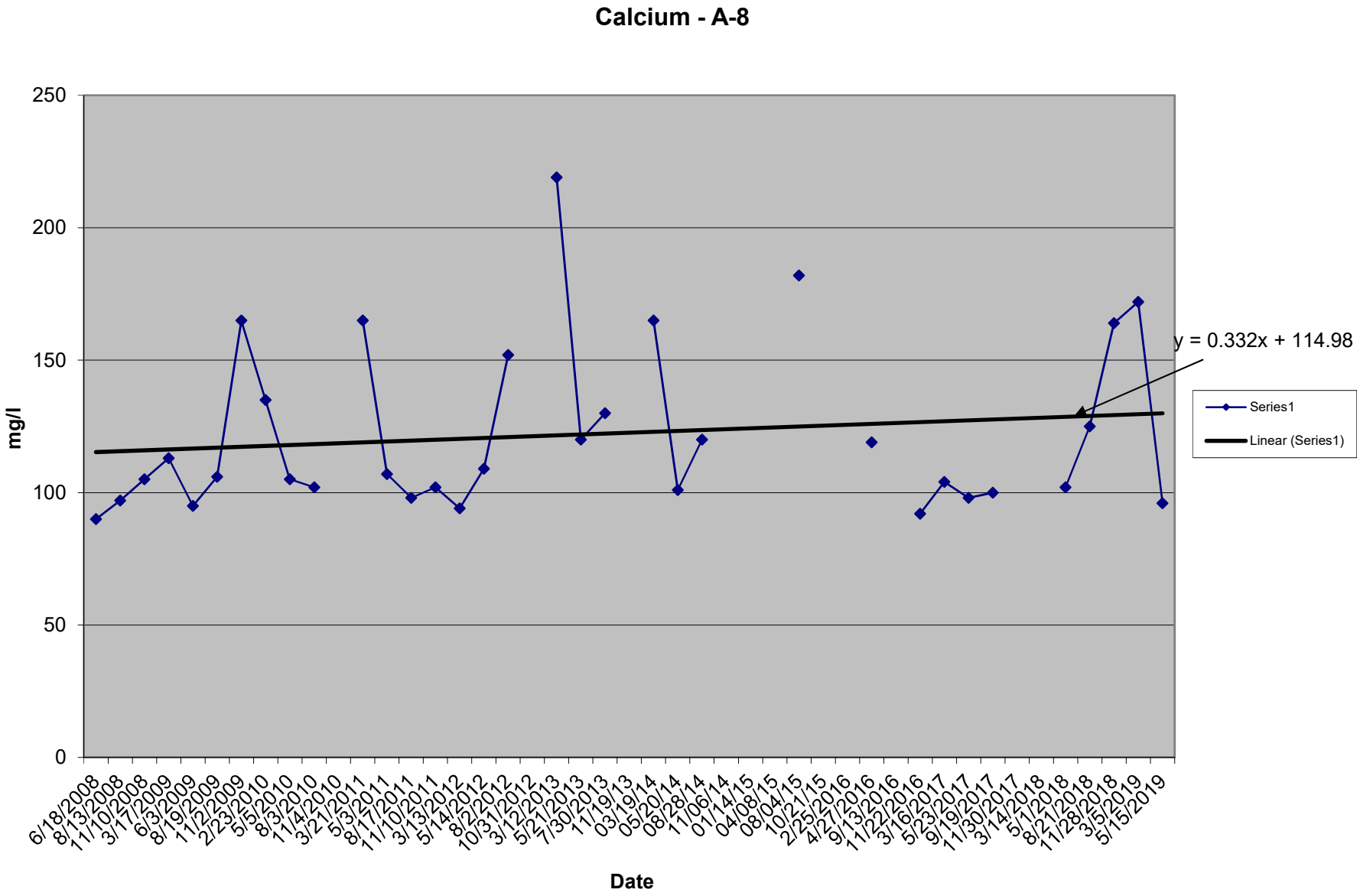
A-8 Well


TDS (180 deg. C) - A-8
mg/l
2500
2000
1500
1000
500
0
y = 5.0386x + 855.65
Series1
Linear (Series1)
Date
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
8/2/2012
10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019

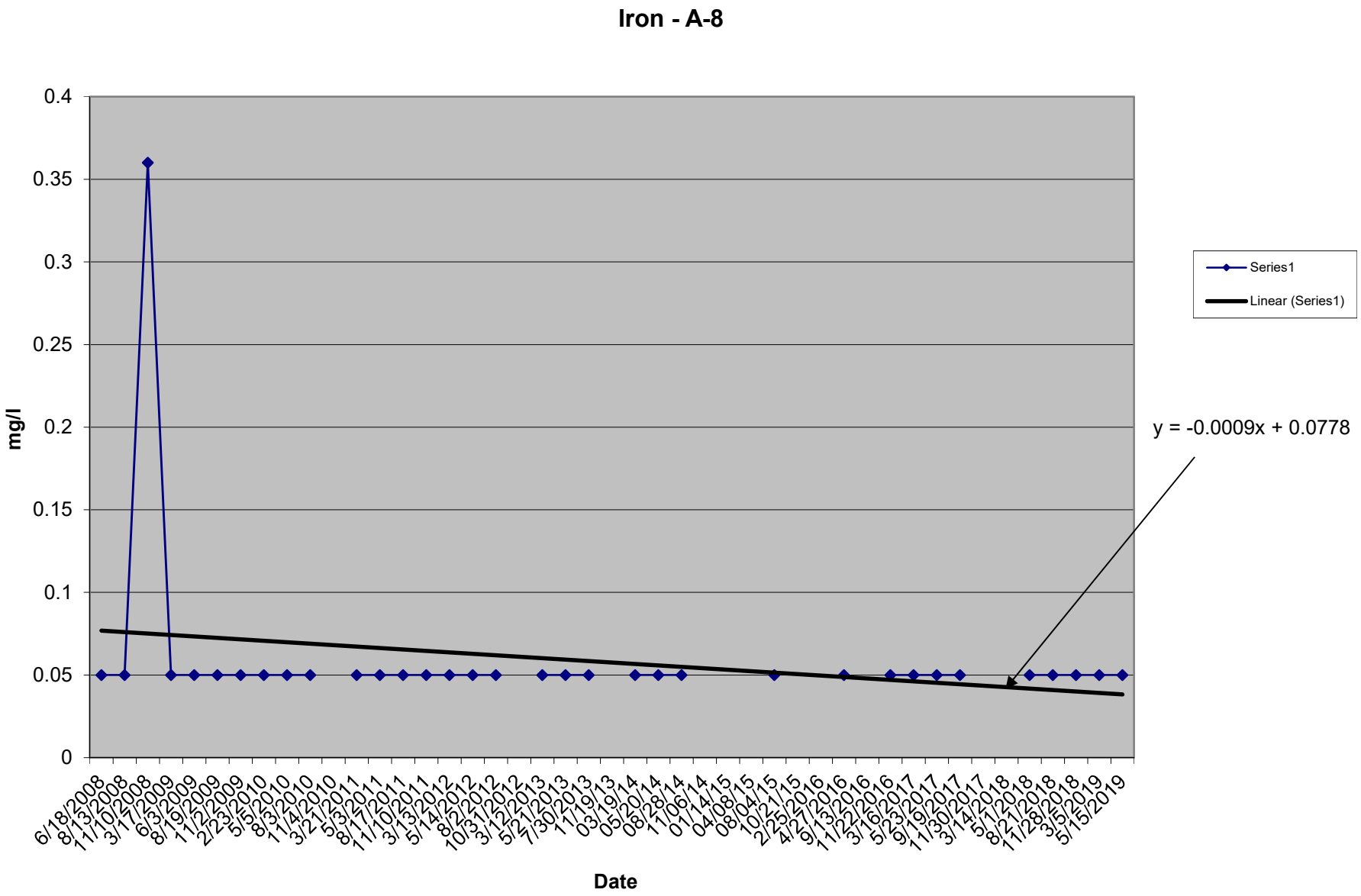
A-8 Well


Sulfate - A-8
1200
1000
800
600
400
200
0
mg/l
y = 3.2207x + 287.67
Series1
Linear (Series1)
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
8/2/2012
10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
Date

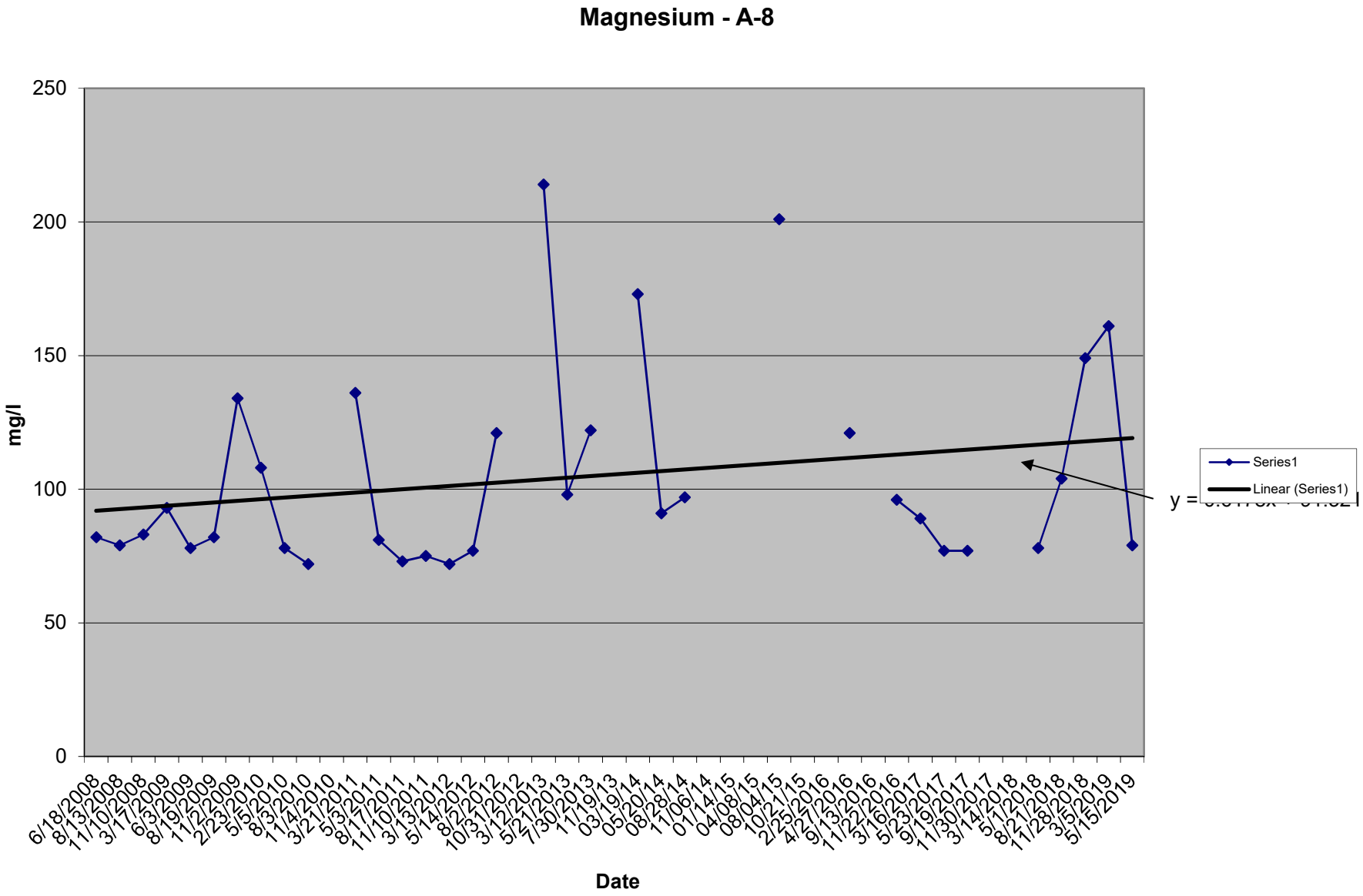
A-8 Well


Calcium - A-8
250
200
150
100
50
0
mg/l
y = 0.332x + 114.98
Series1
Linear (Series1)
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
8/2/2012
10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
Date

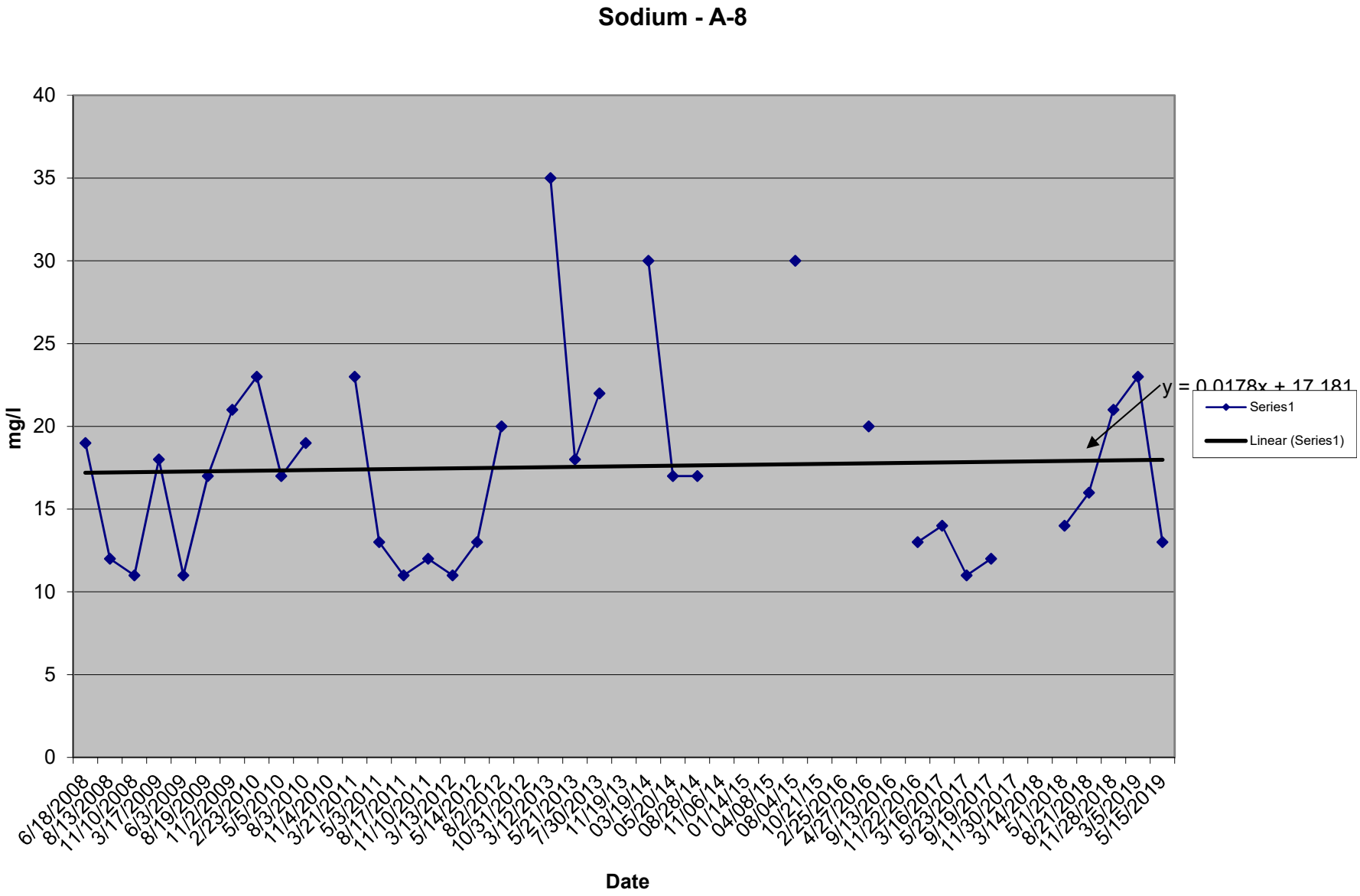
A-8 Well


Iron - A-8
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
mg/l
Series1
Linear (Series1)
y = -0.0009x + 0.0778
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
8/2/2012
10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019
Date

A-8 Well


Magnesium - A-8
250
200
150
100
50
0
mg/l
Date
Series1
Linear (Series1)
y =

A-8 Well


Sodium - A-8
mg/l
Date
y = 0.0178x + 17.181
Series1
Linear (Series1)
0
5
10
15
20
25
30
35
40
6/18/2008
8/13/2008
11/10/2008
3/17/2009
6/3/2009
8/19/2009
11/2/2009
2/23/2010
5/5/2010
8/3/2010
11/4/2010
3/21/2011
5/3/2011
8/17/2011
11/10/2011
3/13/2012
5/14/2012
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10/31/2012
3/12/2013
5/21/2013
7/30/2013
11/19/13
03/19/14
05/20/14
08/28/14
11/06/14
01/14/15
04/08/15
08/04/15
10/21/15
2/25/2016
4/27/2016
9/13/2016
11/22/2016
3/16/2017
5/23/2017
9/19/2017
11/30/2017
3/14/2018
5/1/2018
8/21/2018
11/28/2018
3/5/2019
5/15/2019

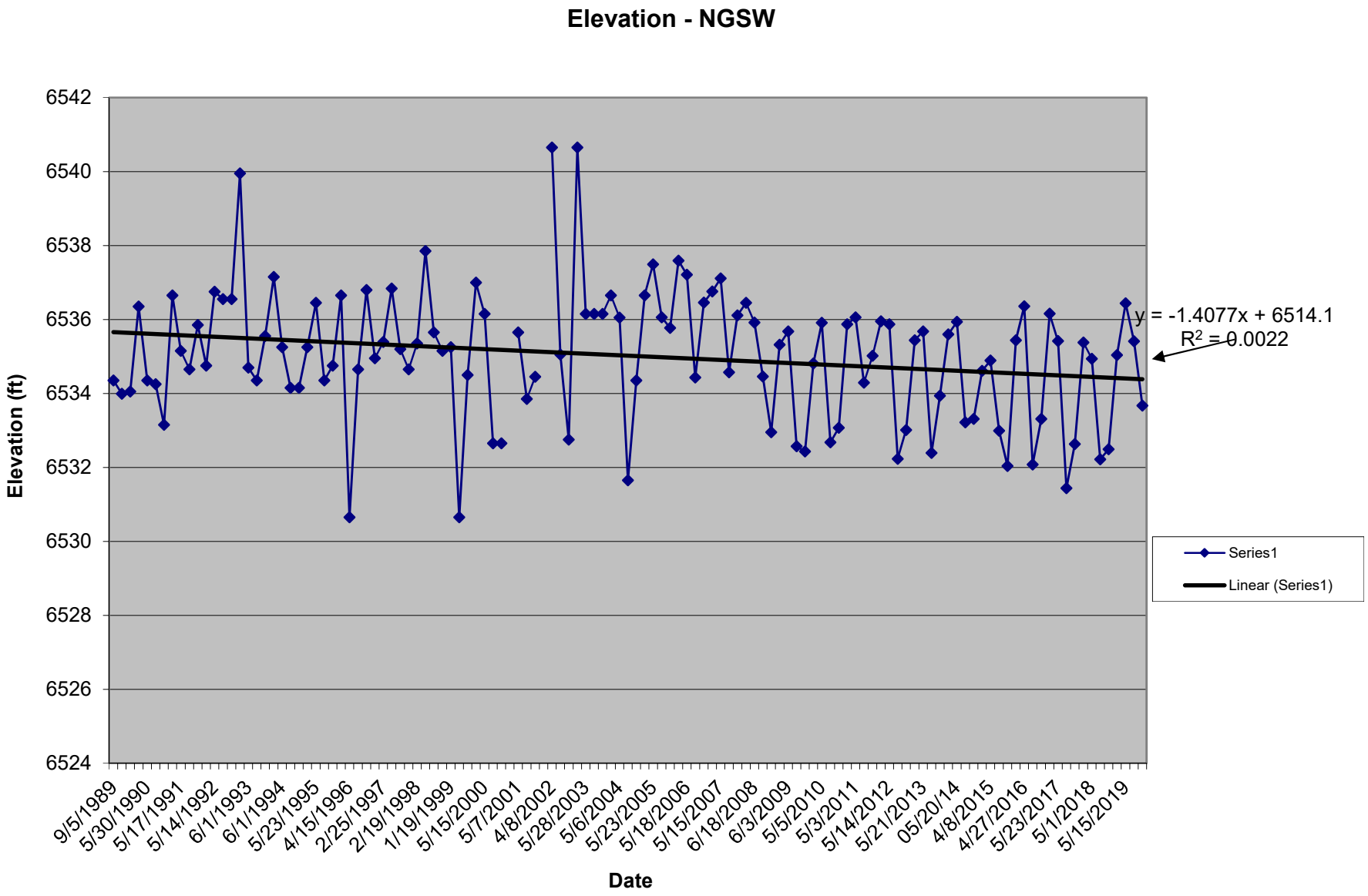
A-8 Well

Exhibit 1B

Colowyo Mine
Well NGSW
Water Year 1/1/2019 - 12/31/19

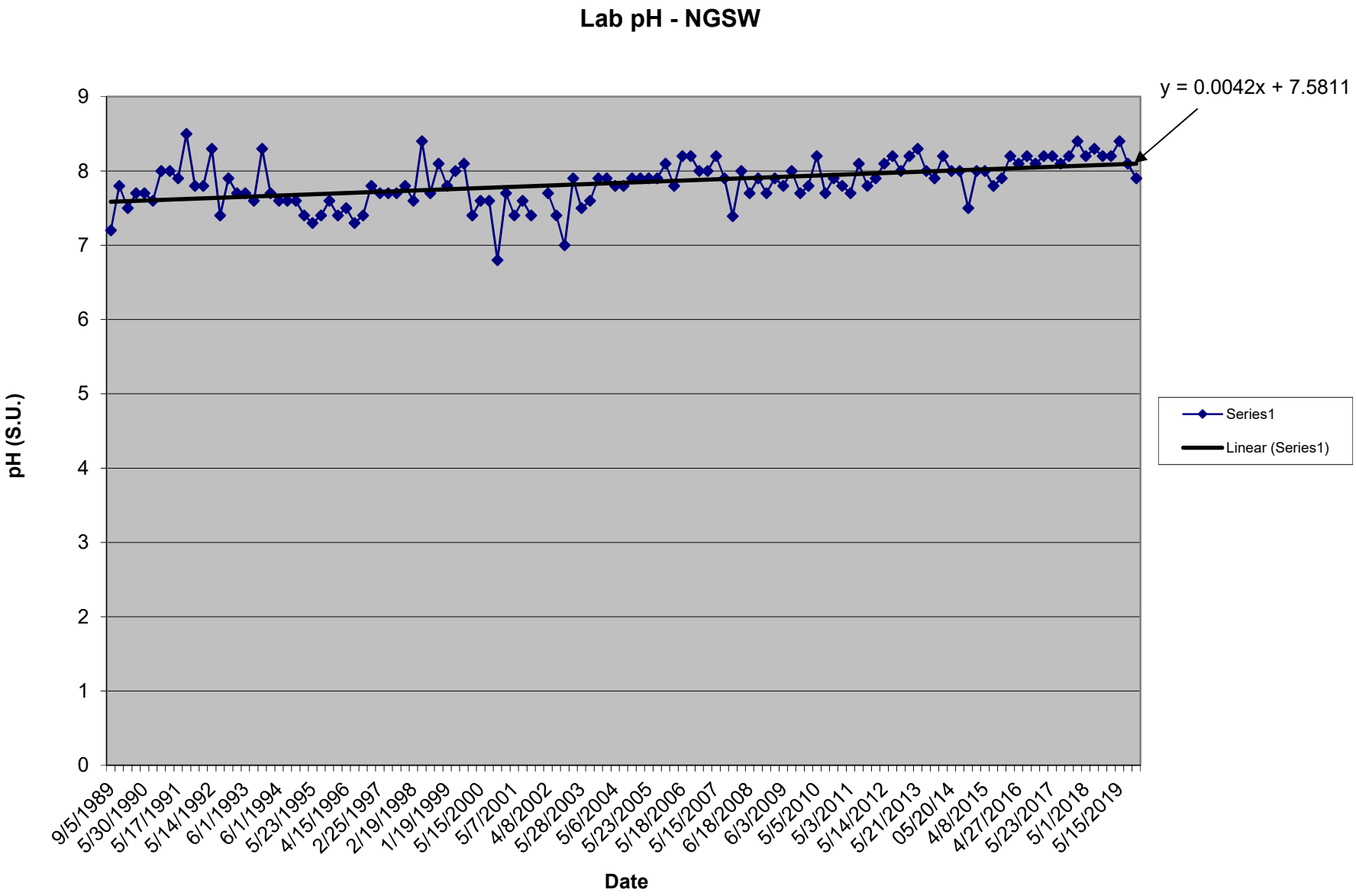
	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Elevation SWL, ft MSL	6535.04	6536.44	6535.41	6533.67
Field pH	7.76	7.68	7.24	7.14
Feld Temperature, °C	6.9	9.8	9.1	9.8
Field Conductivity, umhos/com	2260	2590	2550	2540
Lab pH		8.4		
Lab Conductivity, umhos/com		2180		
TDS, mg/l		2070		
Bicarbonate as HCO3, D, mg/l		703		
Ca, D, mg/l		185		
Mg, D, mg/l		183		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		0.1		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		156		
Sulfate, D, mg/l		873		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.98		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		

Exhibit 1B

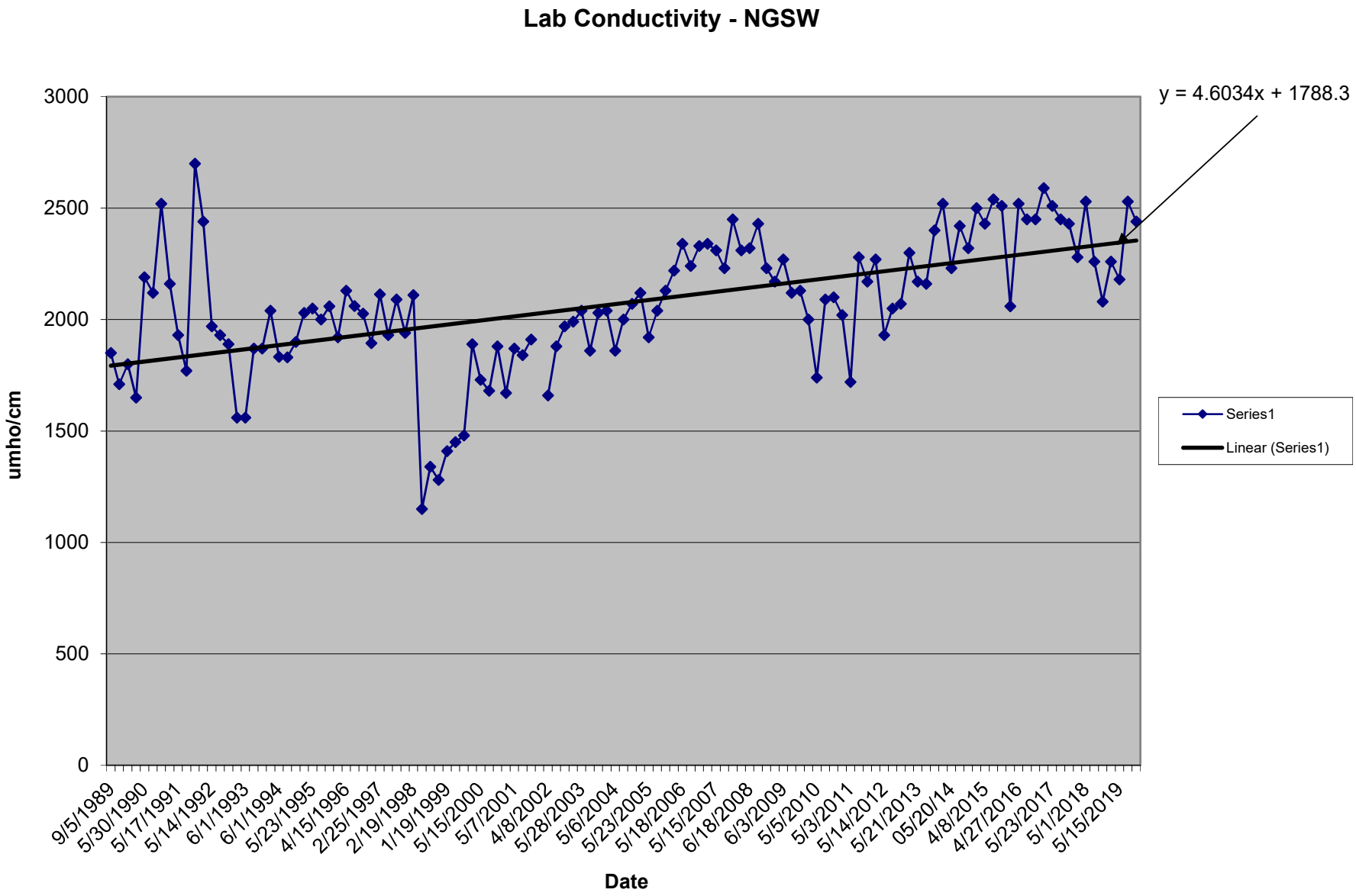


NGSW

Exhibit 1B

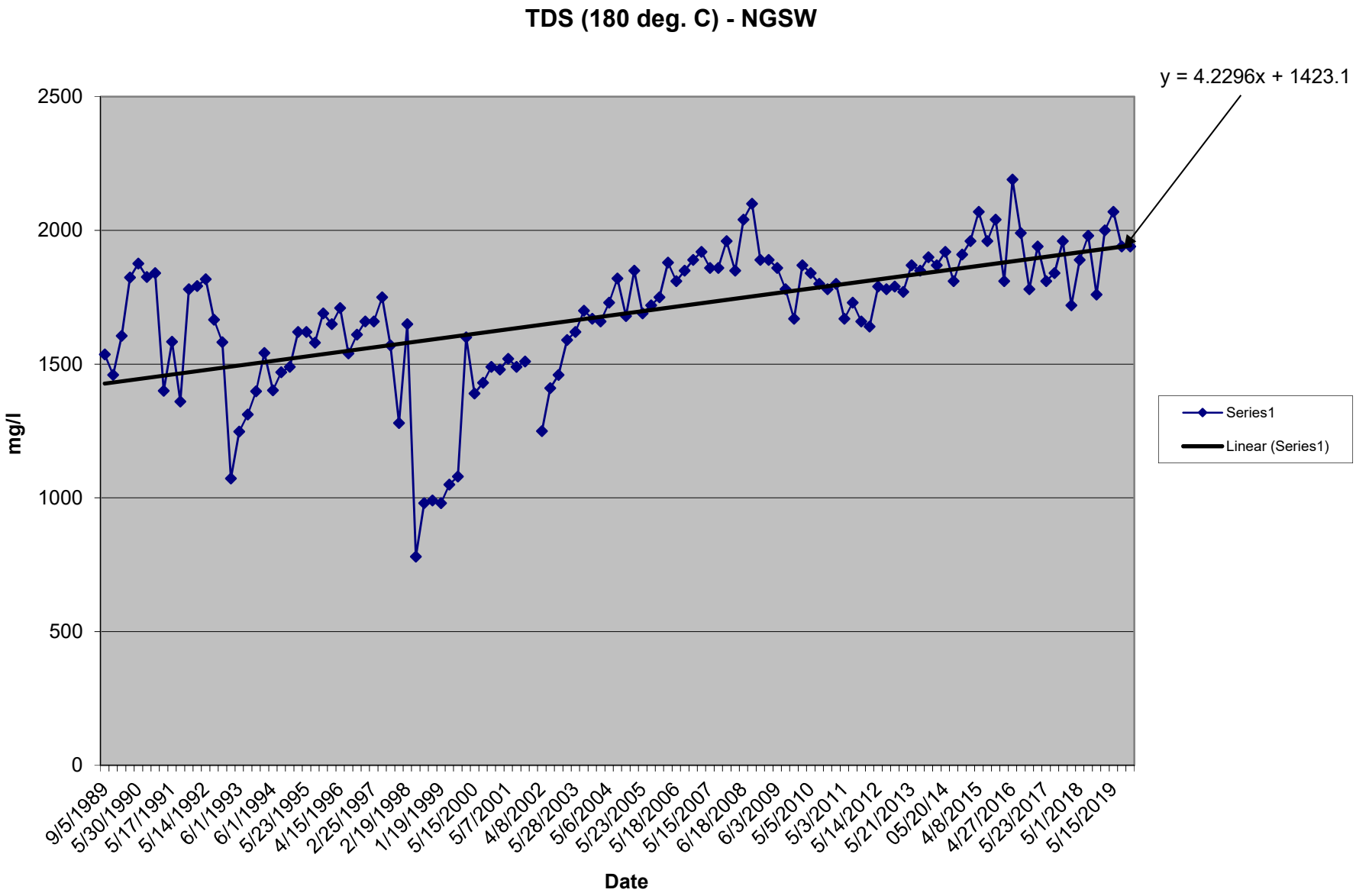


NGSW


Lab Conductivity - NGSW
y = 4.6034x + 1788.3
umho/cm
3000
2500
2000
1500
1000
500
0
Series1
Linear (Series1)
9/5/1989
5/30/1990
5/17/1991
5/14/1992
6/1/1993
6/1/1994
5/23/1995
4/15/1996
2/25/1997
2/19/1998
1/19/1999
5/15/2000
5/7/2001
4/8/2002
5/28/2003
5/6/2004
5/23/2005
5/18/2006
5/15/2007
6/18/2008
6/3/2009
5/5/2010
5/3/2011
5/14/2012
5/21/2013
05/20/14
4/8/2015
4/27/2016
5/23/2017
5/1/2018
5/15/2019
Date

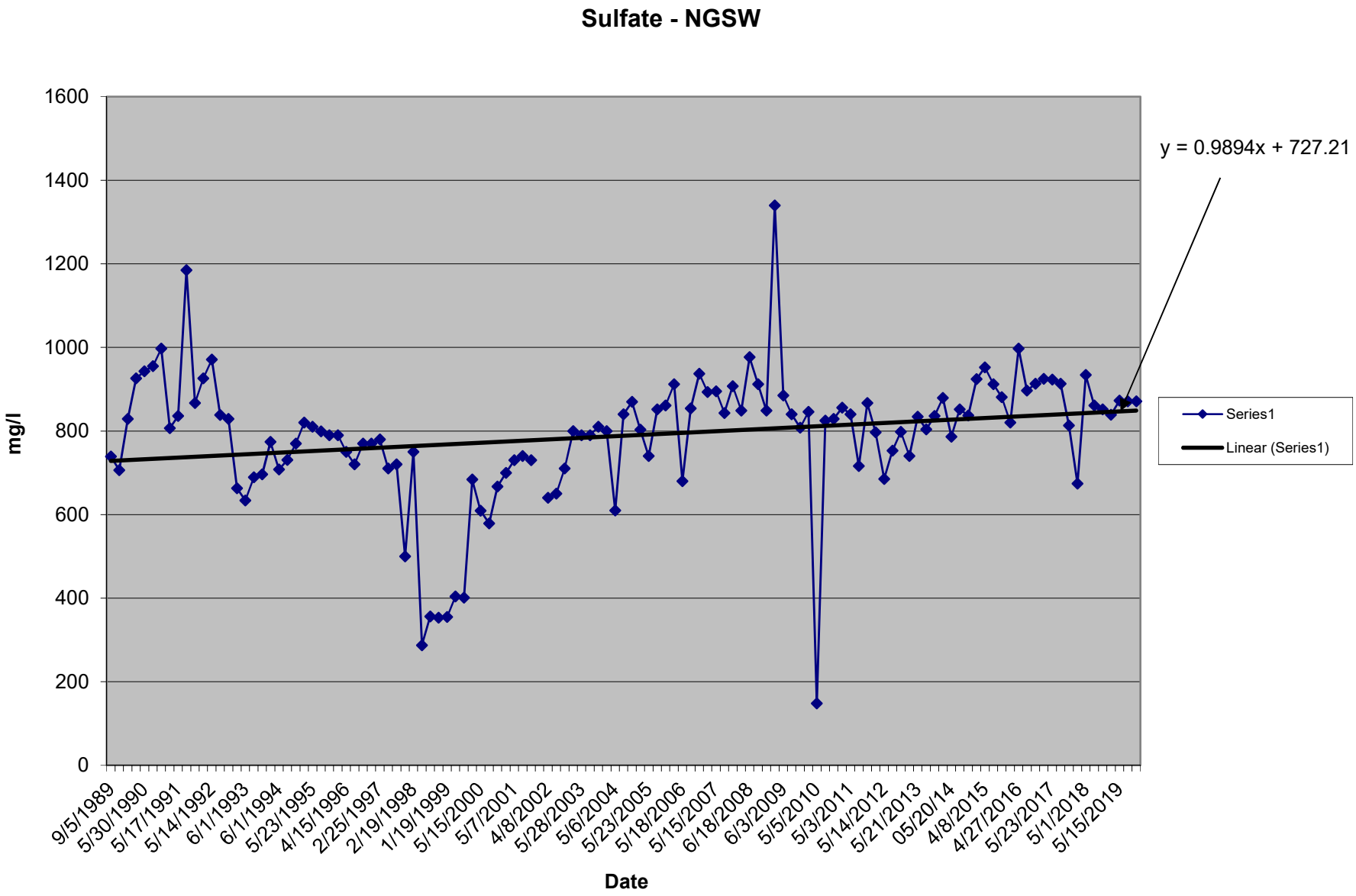
NGSW

Exhibit 1B



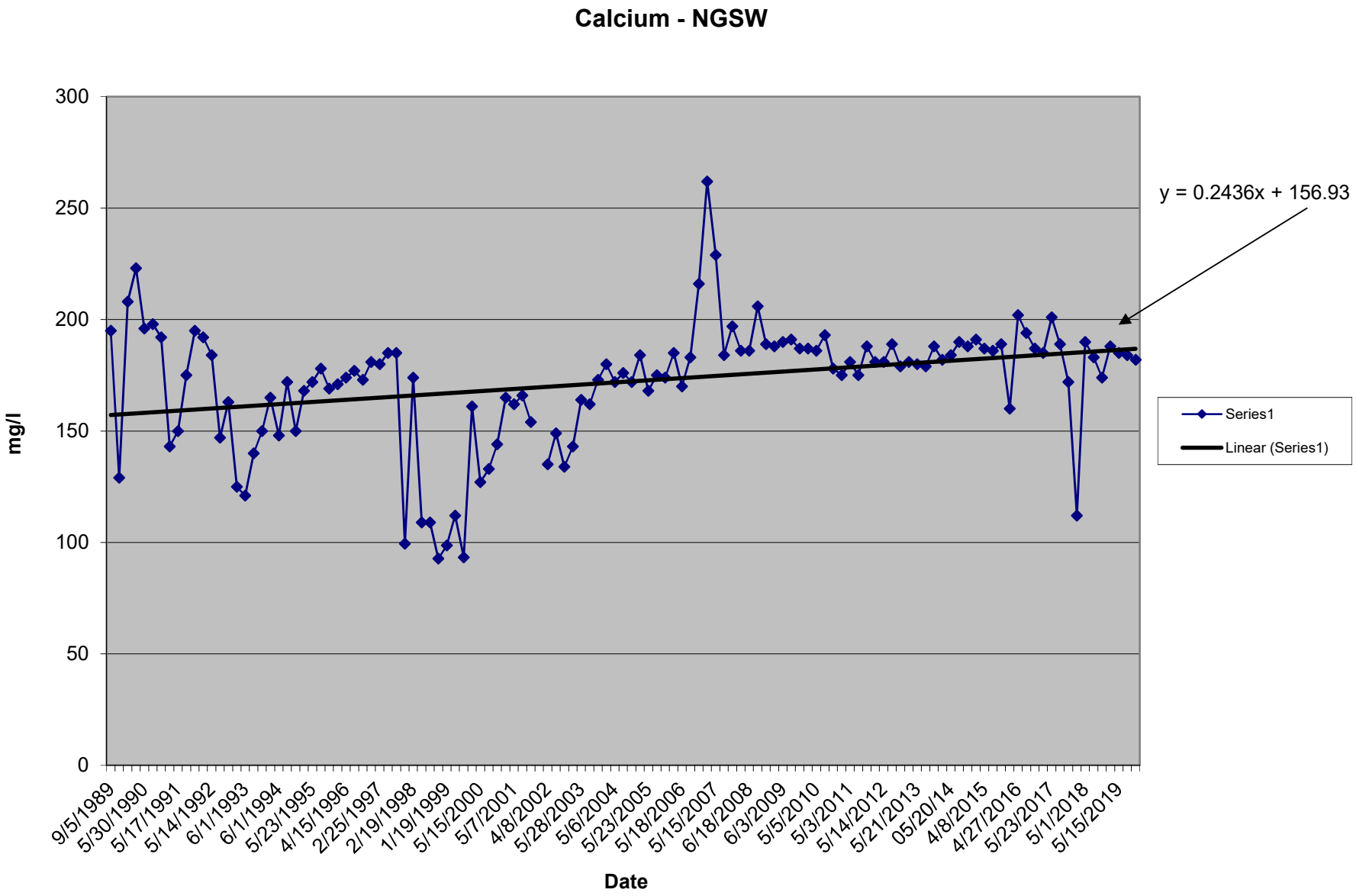
NGSW

Exhibit 1B

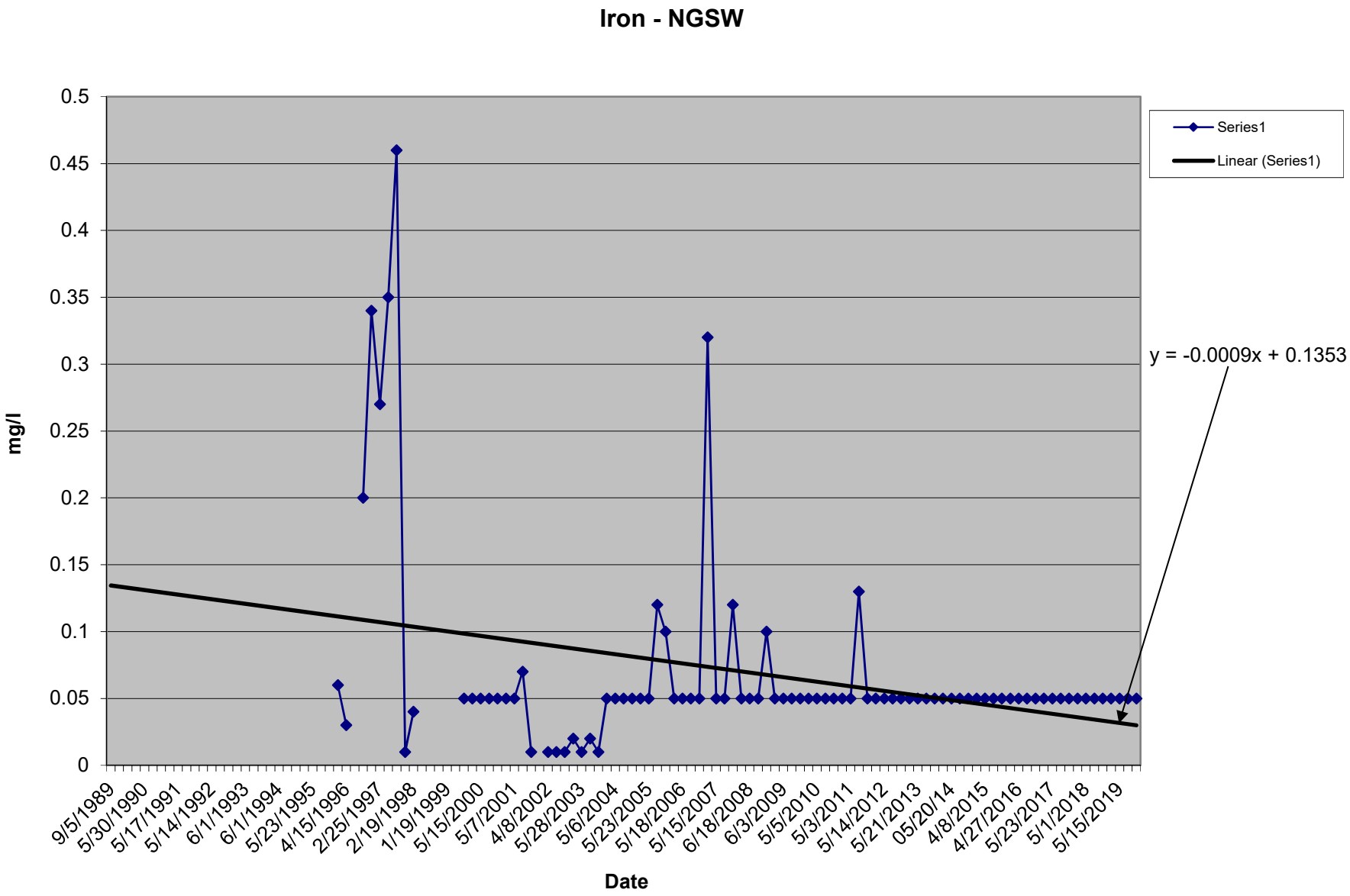


NGSW

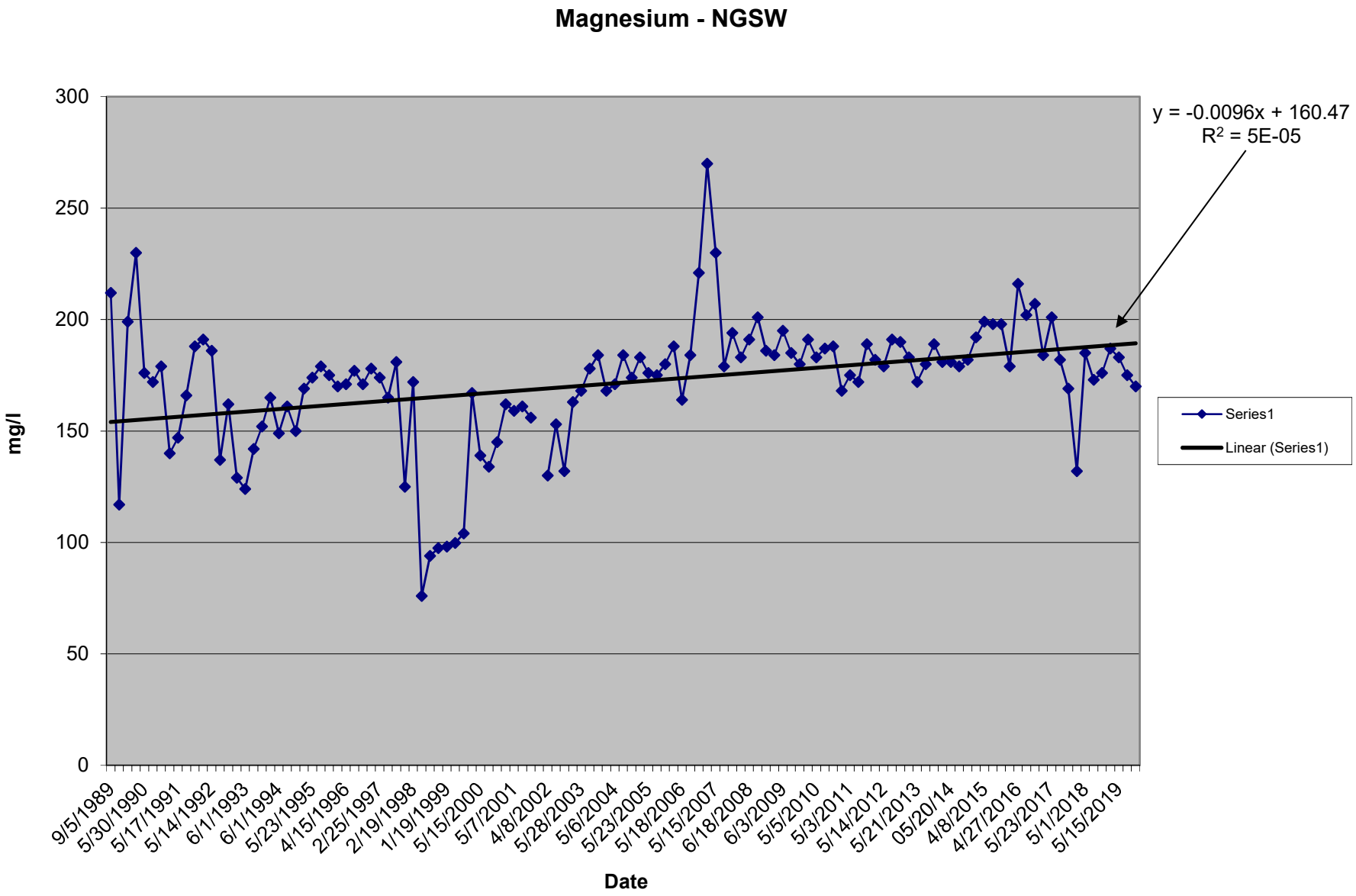
Exhibit 1B



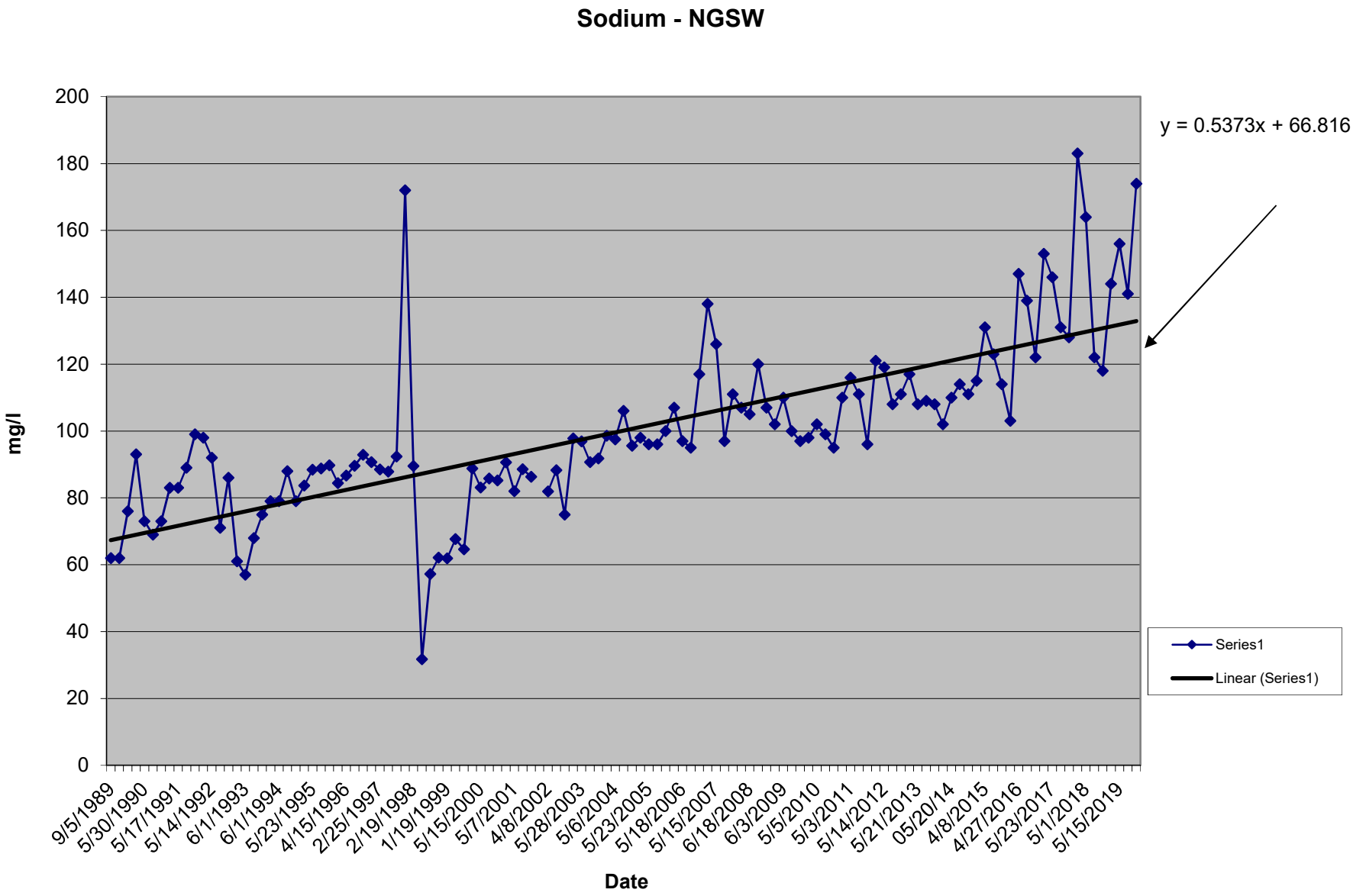
NGSW


Iron - NGSW
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
mg/l
Series1
Linear (Series1)
y = -0.0009x + 0.1353
9/5/1989
5/30/1990
5/17/1991
5/14/1992
6/1/1993
6/1/1994
5/23/1995
4/15/1996
2/25/1997
2/19/1998
1/19/1999
5/15/2000
5/7/2001
4/8/2002
5/28/2003
5/6/2004
5/23/2005
5/18/2006
5/15/2007
6/18/2008
6/3/2009
5/5/2010
5/3/2011
5/14/2012
5/21/2013
05/20/14
4/8/2015
4/27/2016
5/23/2017
5/1/2018
5/15/2019
Date

NGSW


Magnesium - NGSW
y = -0.0096x + 160.47
R2 = 5E-05
mg/l
Date
Series1
Linear (Series1)
300
250
200
150
100
50
0
9/5/1989
5/30/1990
5/17/1991
5/14/1992
6/1/1993
6/1/1994
5/23/1995
4/15/1996
2/25/1997
2/19/1998
1/19/1999
5/15/2000
5/7/2001
4/8/2002
5/28/2003
5/6/2004
5/23/2005
5/18/2006
5/15/2007
6/18/2008
6/3/2009
5/5/2010
5/3/2011
5/14/2012
5/21/2013
05/20/14
4/8/2015
4/27/2016
5/23/2017
5/1/2018
5/15/2019

NGSW


Sodium - NGSW
y = 0.5373x + 66.816
mg/l
Date
Series1
Linear (Series1)
0
20
40
60
80
100
120
140
160
180
200
9/5/1989
5/30/1990
5/17/1991
5/14/1992
6/1/1993
6/1/1994
5/23/1995
4/15/1996
2/25/1997
2/19/1998
1/19/1999
5/15/2000
5/7/2001
4/8/2002
5/28/2003
5/6/2004
5/23/2005
5/18/2006
5/15/2007
6/18/2008
6/3/2009
5/5/2010
5/3/2011
5/14/2012
5/21/2013
05/20/14
4/8/2015
4/27/2016
5/23/2017
5/1/2018
5/15/2019

NGSW

Exhibit 1B

Colowyo Mine
Gossard Well
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Elevation SWL, ft MSL	6332.05	6333.06	6331.47	6331.56
Field pH	7.85	7.87	7.58	7.61
Feld Temperature, °C	11.9	11.8	13.1	11.8
Field Conductivity, umhos/com	2150	2090	2620	2580
Lab pH		8.4		
Lab Conductivity, umhos/com		2070		
TDS, mg/l		1820		
Bicarbonate as HCO3, D, mg/l		547		
Ca, D, mg/l		136		
Mg, D, mg/l		160		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		0.1		
Ortho PO4 as P, mg/l		0.05		
Na, D, mg/l		184		
Sulfate, D, mg/l		763		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		

Exhibit 1B

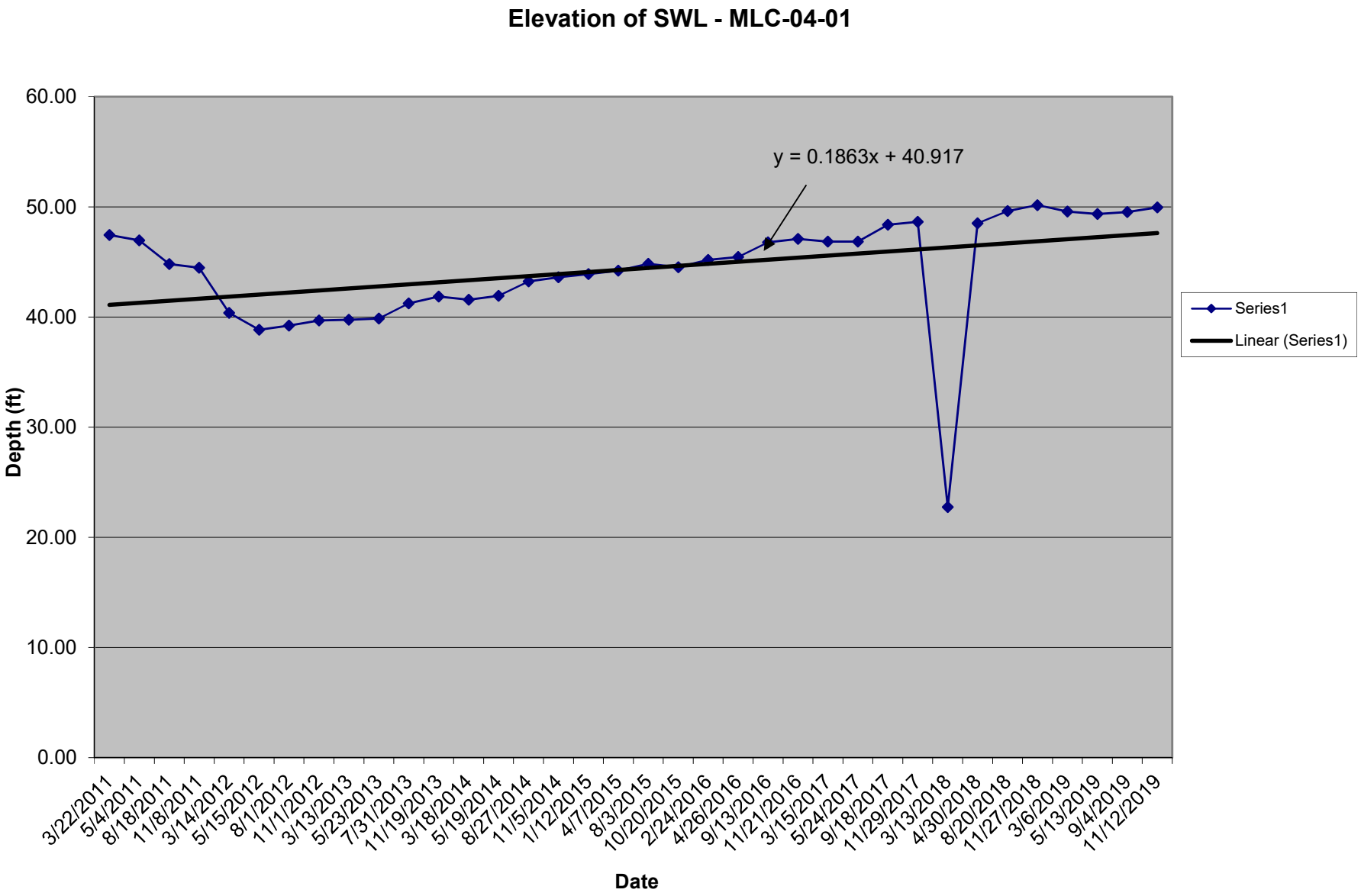
Colowyo Mine
Well MT-95-02
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/5/2019	5/15/2019	9/19/2019	11/12/2019
Elevation SWL, ft MSL	6434.49	6435.60	6435.21	6435.4
Field pH	7.57	7.61		7.08
Feld Temperature, °C	12.1	11.8	11.4	11.0
Field Conductivity, umhos/com	2750	2620	3230	3290
Lab pH		8.4		
Lab Conductivity, umhos/com		2650		
TDS, mg/l		2490		
Bicarbonate as HCO3, D, mg/l		719		
Ca, D, mg/l		209		
Mg, D, mg/l		207		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		0.5		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		251		
Sulfate, D, mg/l		1000		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		

Exhibit 1B

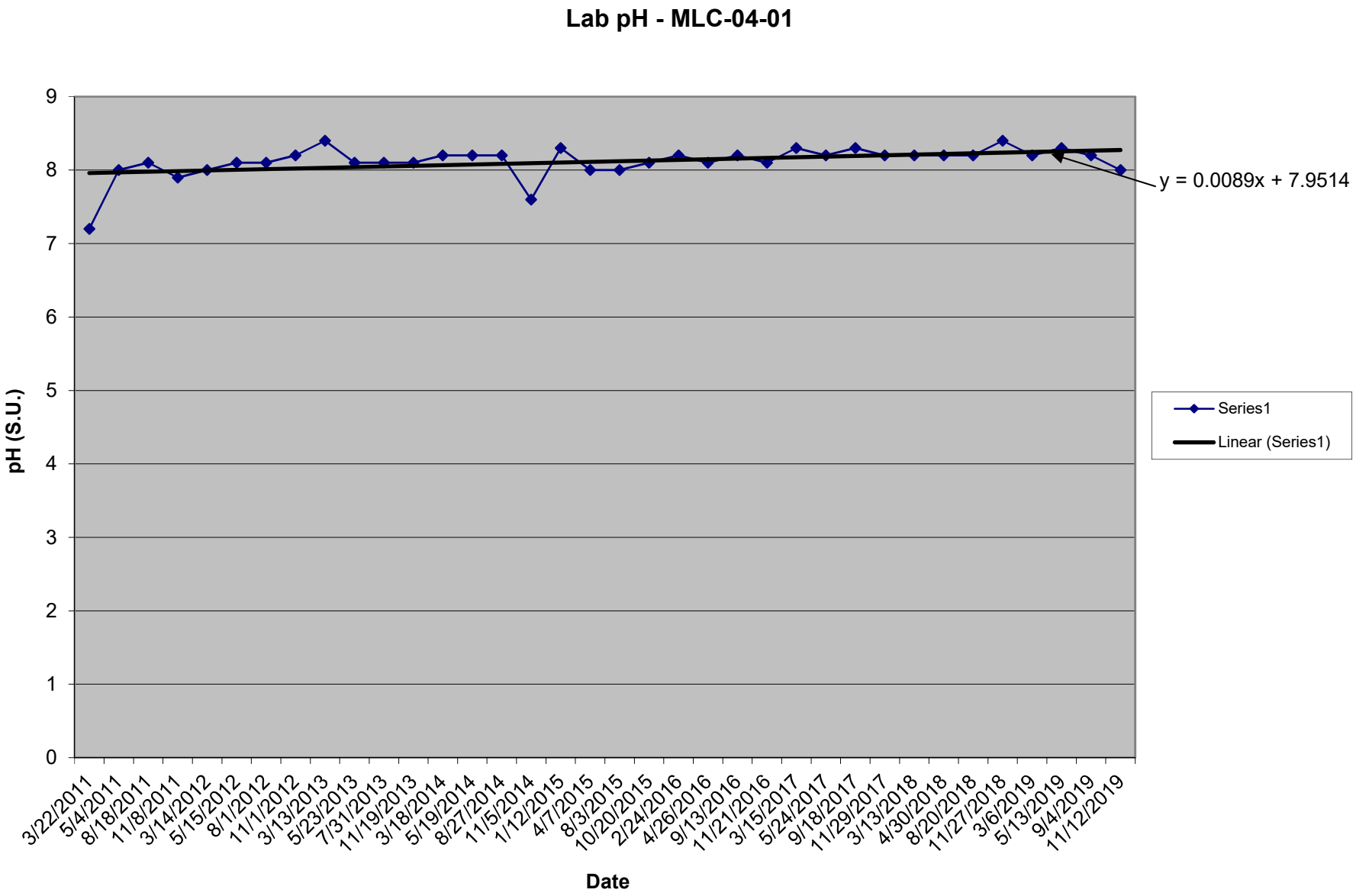
Colowyo Mine
Well MLC-04-01
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Elevation SWL, ft MSL	49.58	49.36	49.54	49.96
Field pH	8.34	7.98	7.40	7.29
Feld Temperature, °C	10.3	11.1	13.8	10.5
Field Conductivity, umhos/com	410	330	1290	1320
Lab pH		8.3		
Lab Conductivity, umhos/com		301		
TDS, mg/l		200		
Bicarbonate as HCO3, D, mg/l		145		
Ca, D, mg/l		31		
Mg, D, mg/l		15		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		0.2		
Ortho PO4 as P, mg/l		0.5		
Na, D, mg/l		8		
Sulfate, D, mg/l		36		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.14		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		

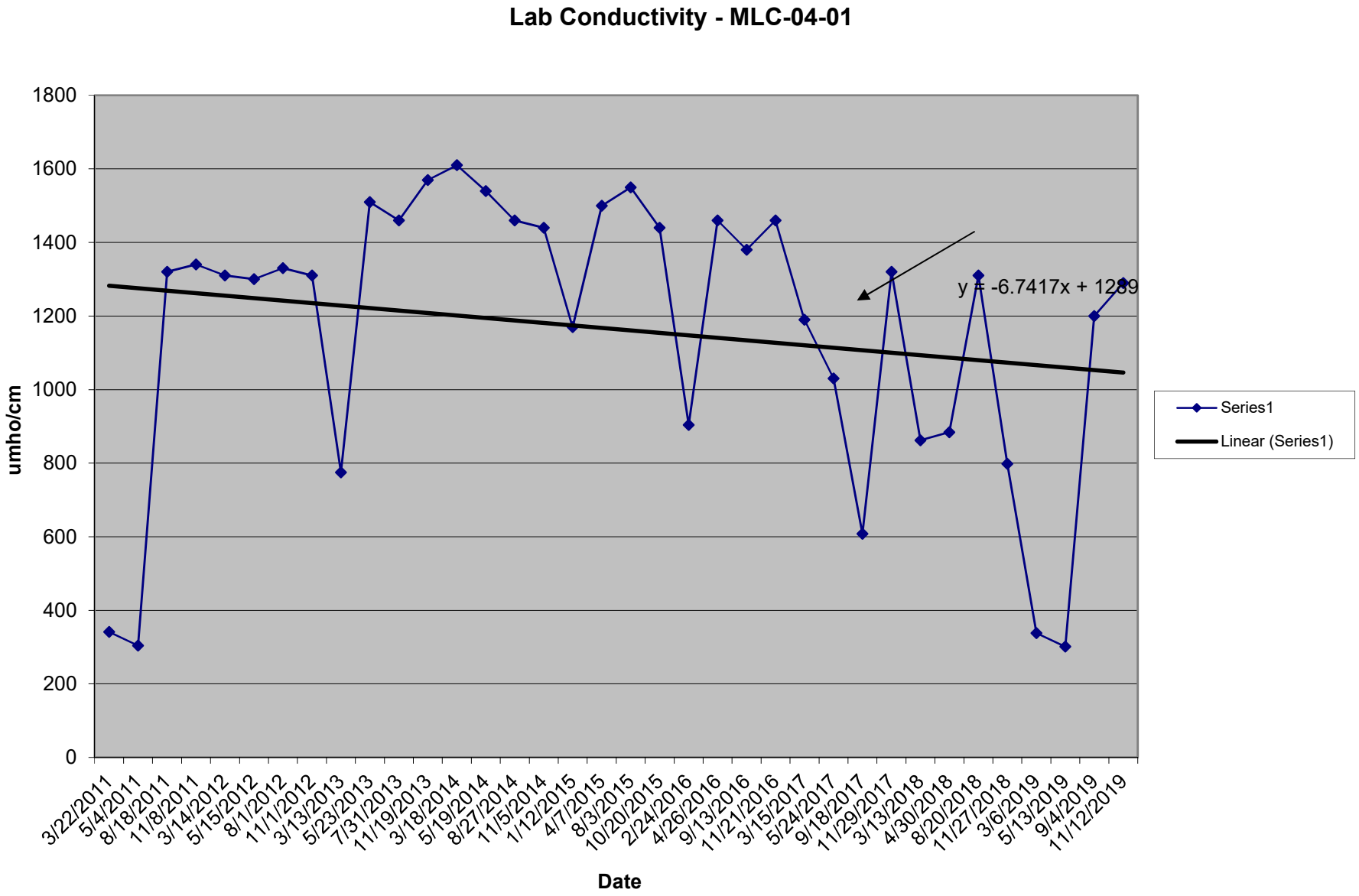


MLC-04-01 Well

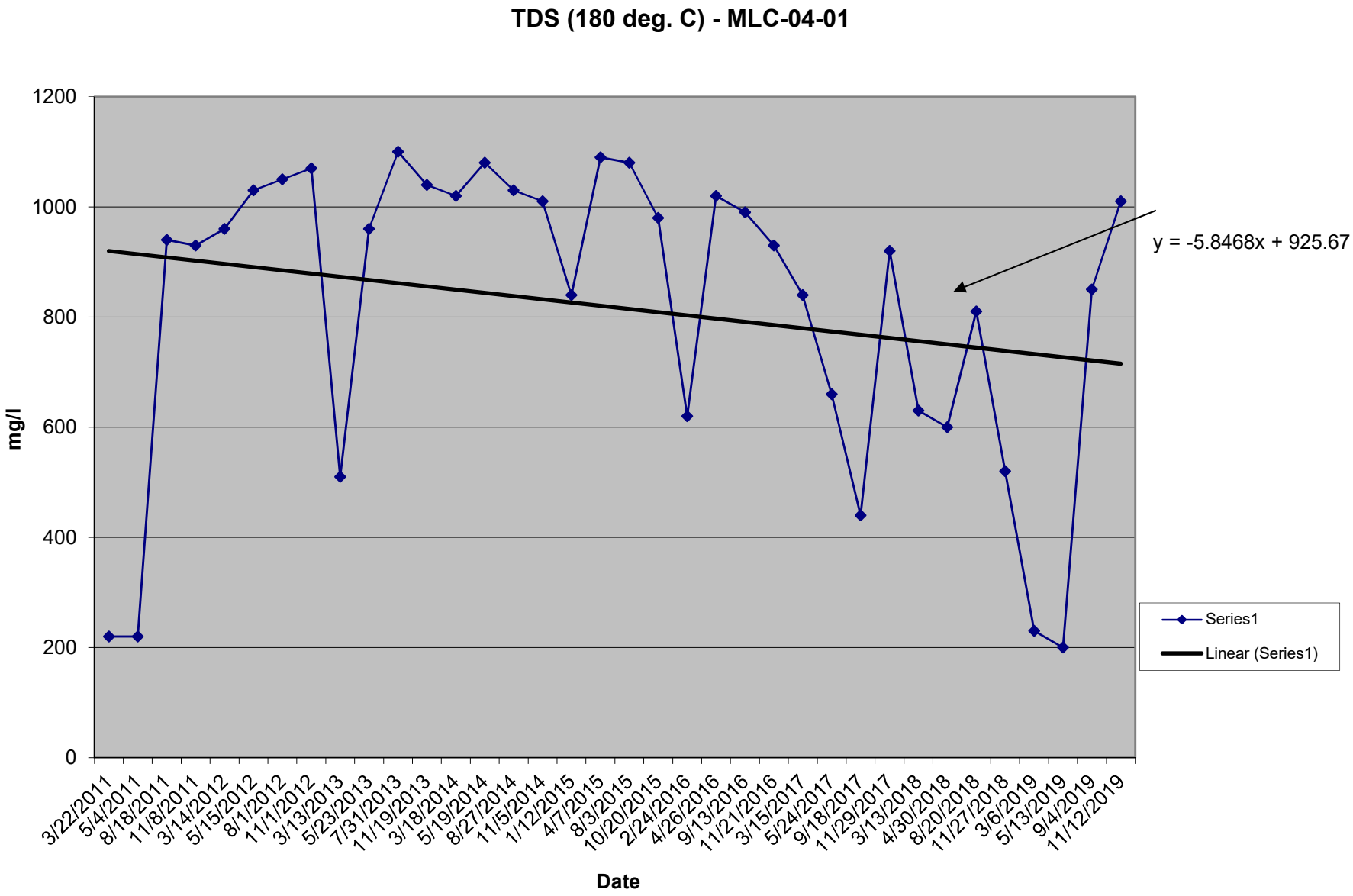
Exhibit 1B



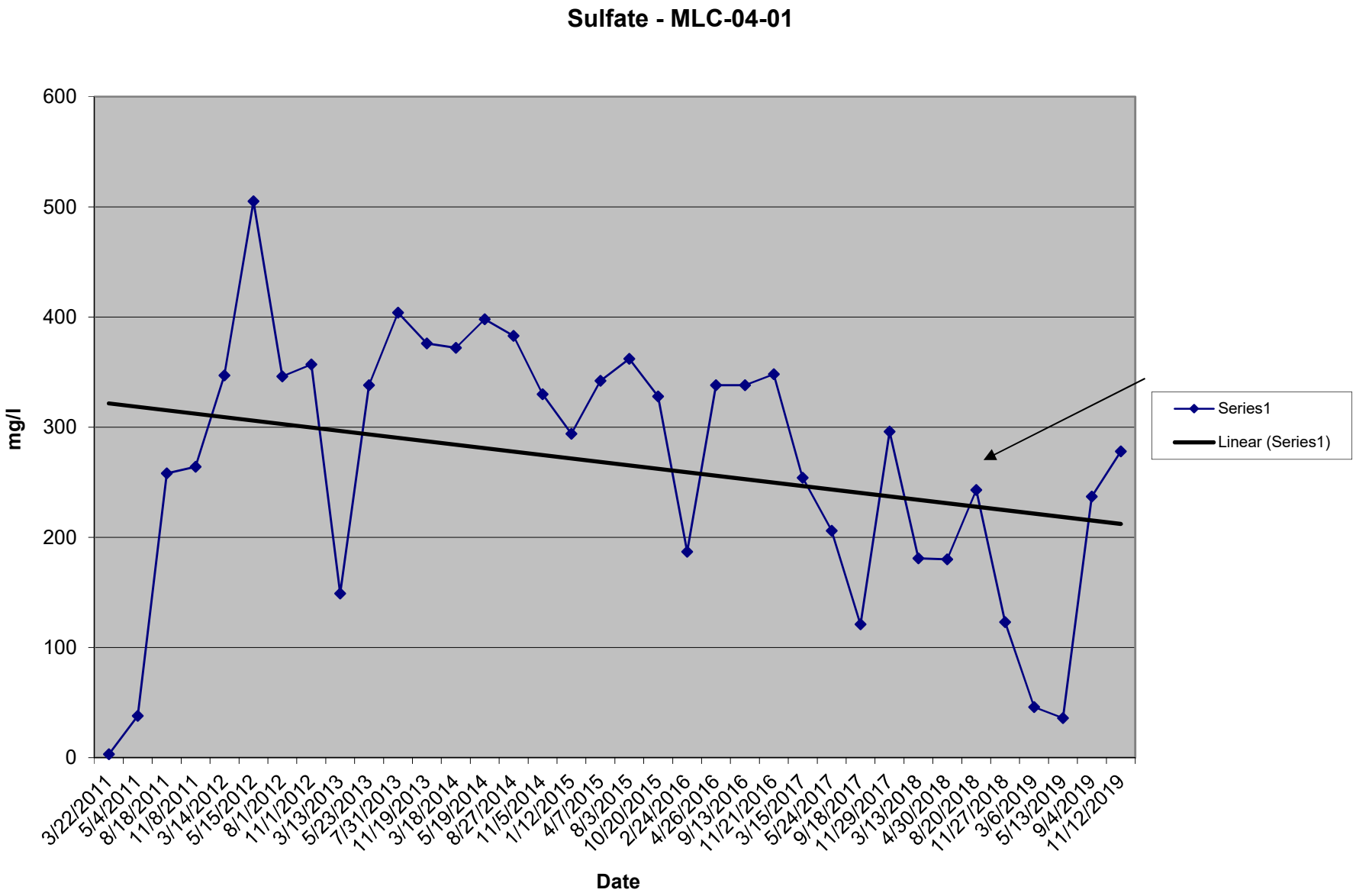
MLC-04-01 Well



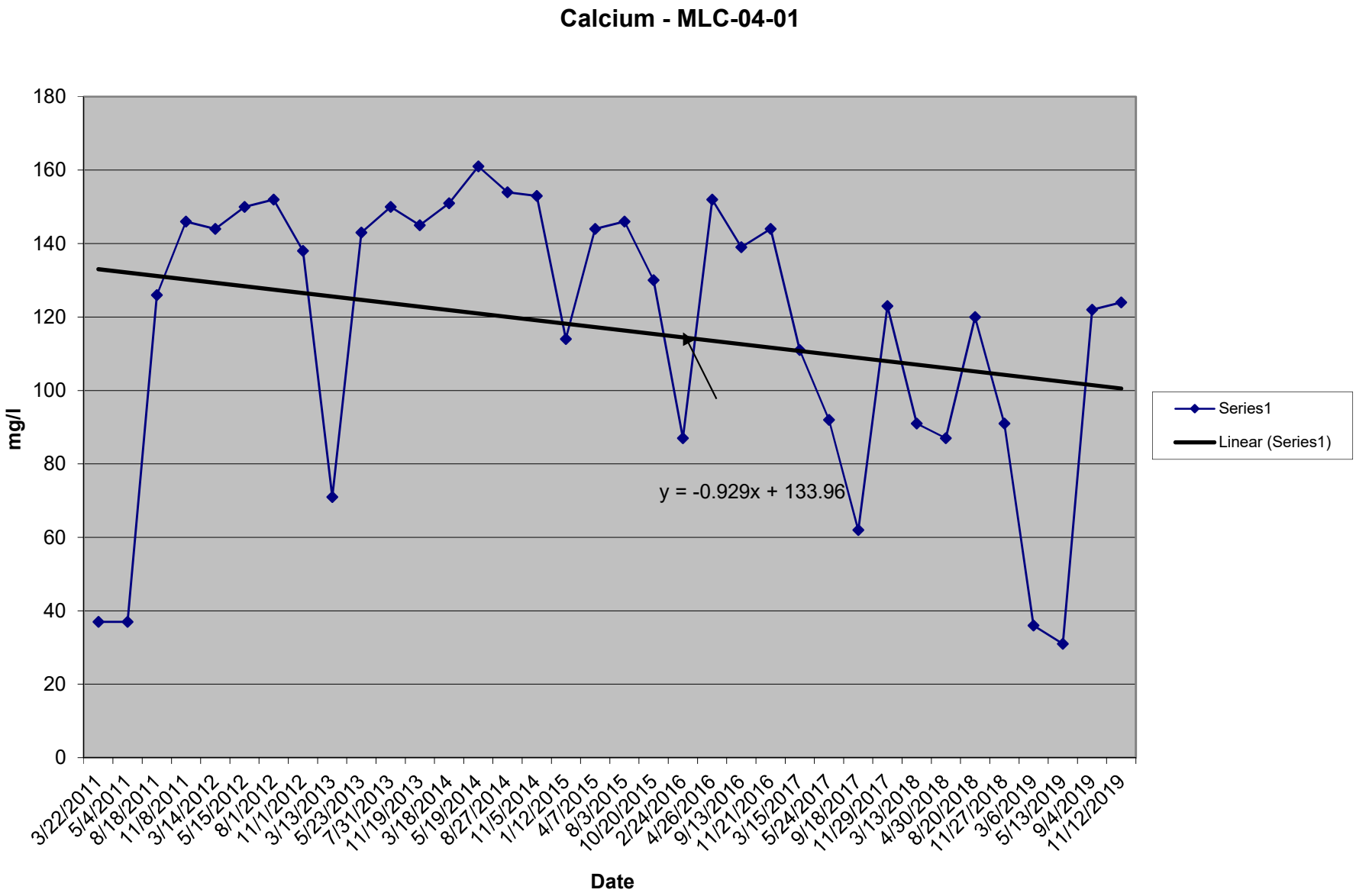
MLC-04-01 Well



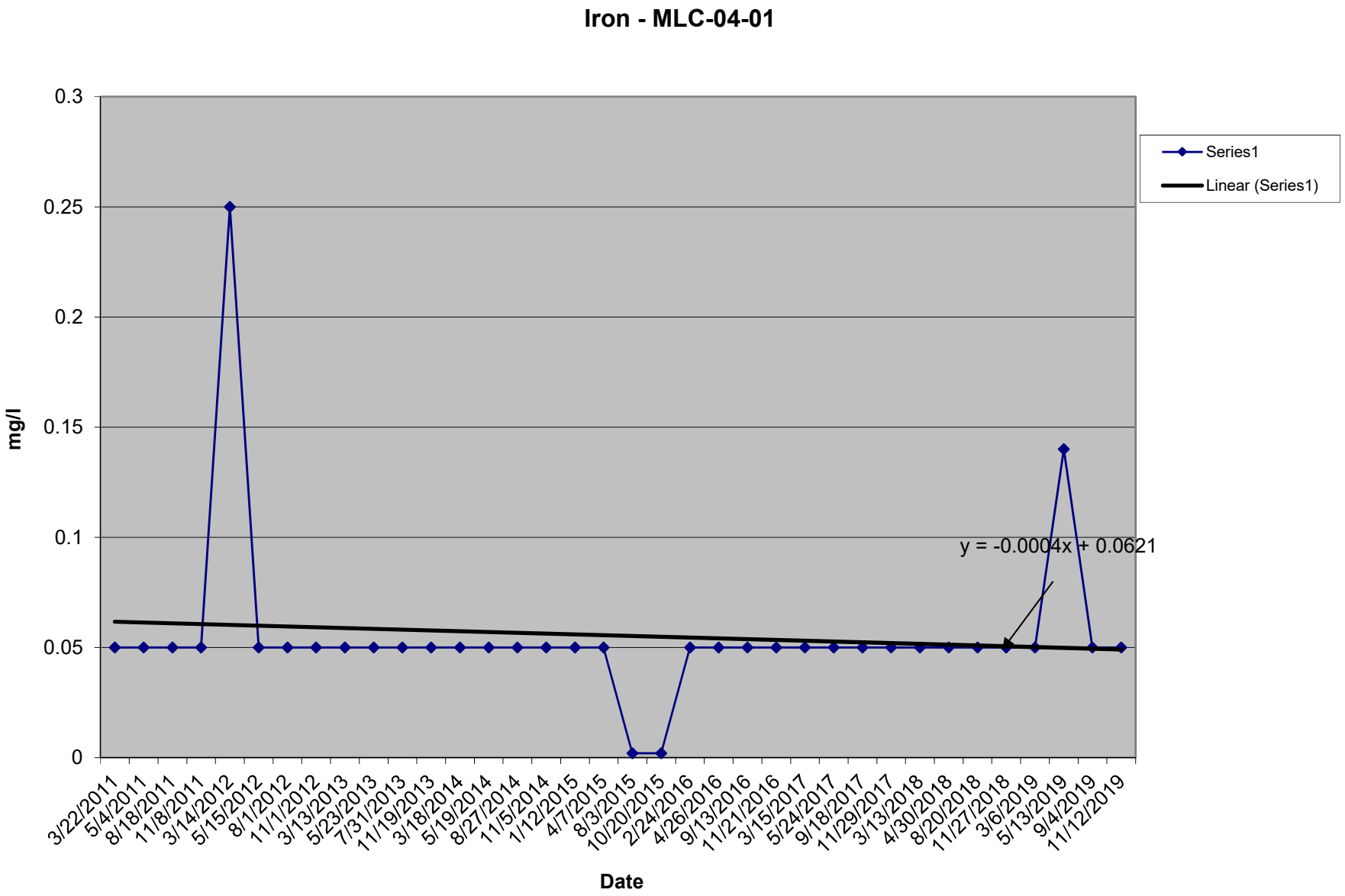
MLC-04-01 Well



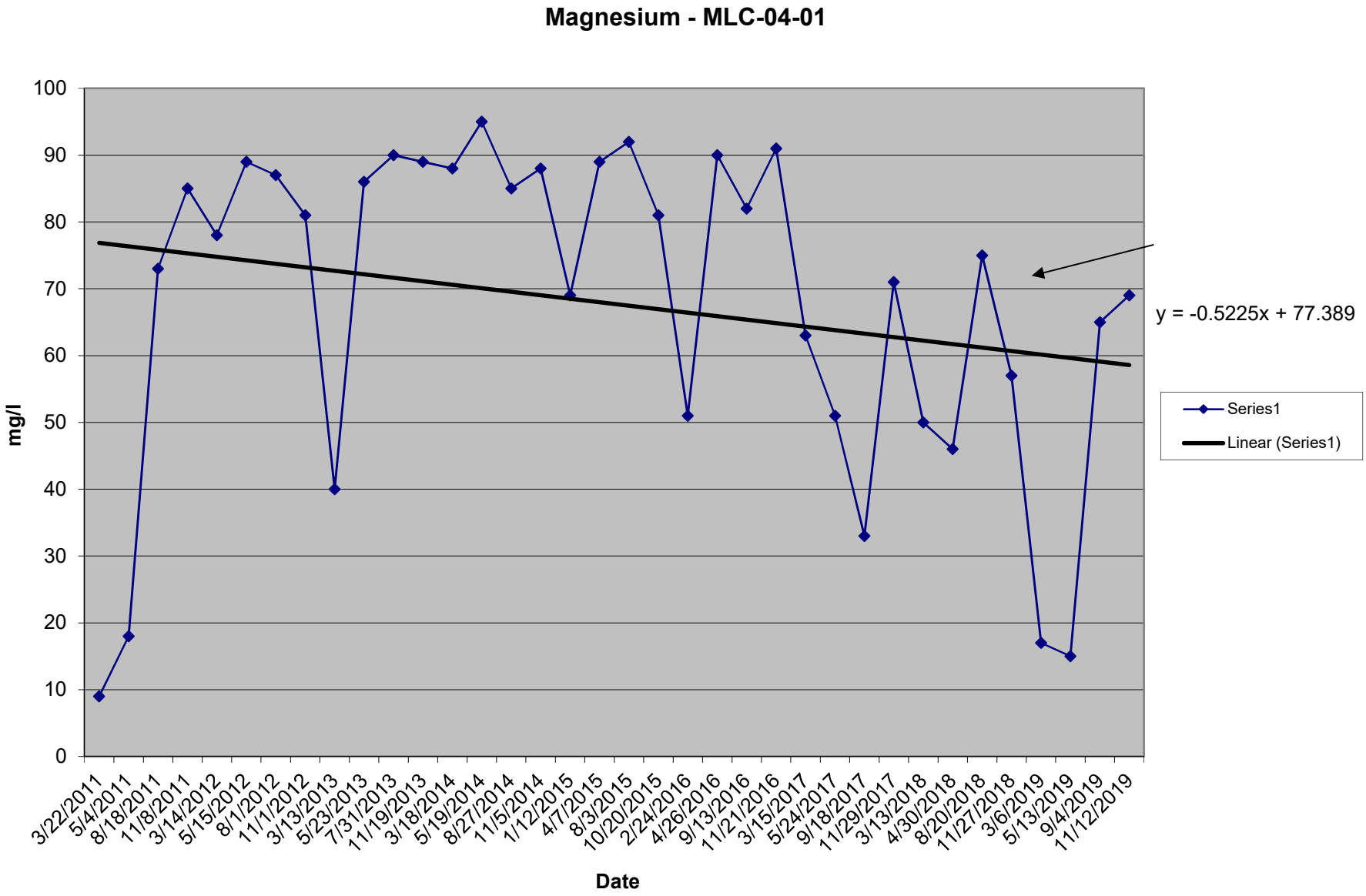
MLC-04-01 Well



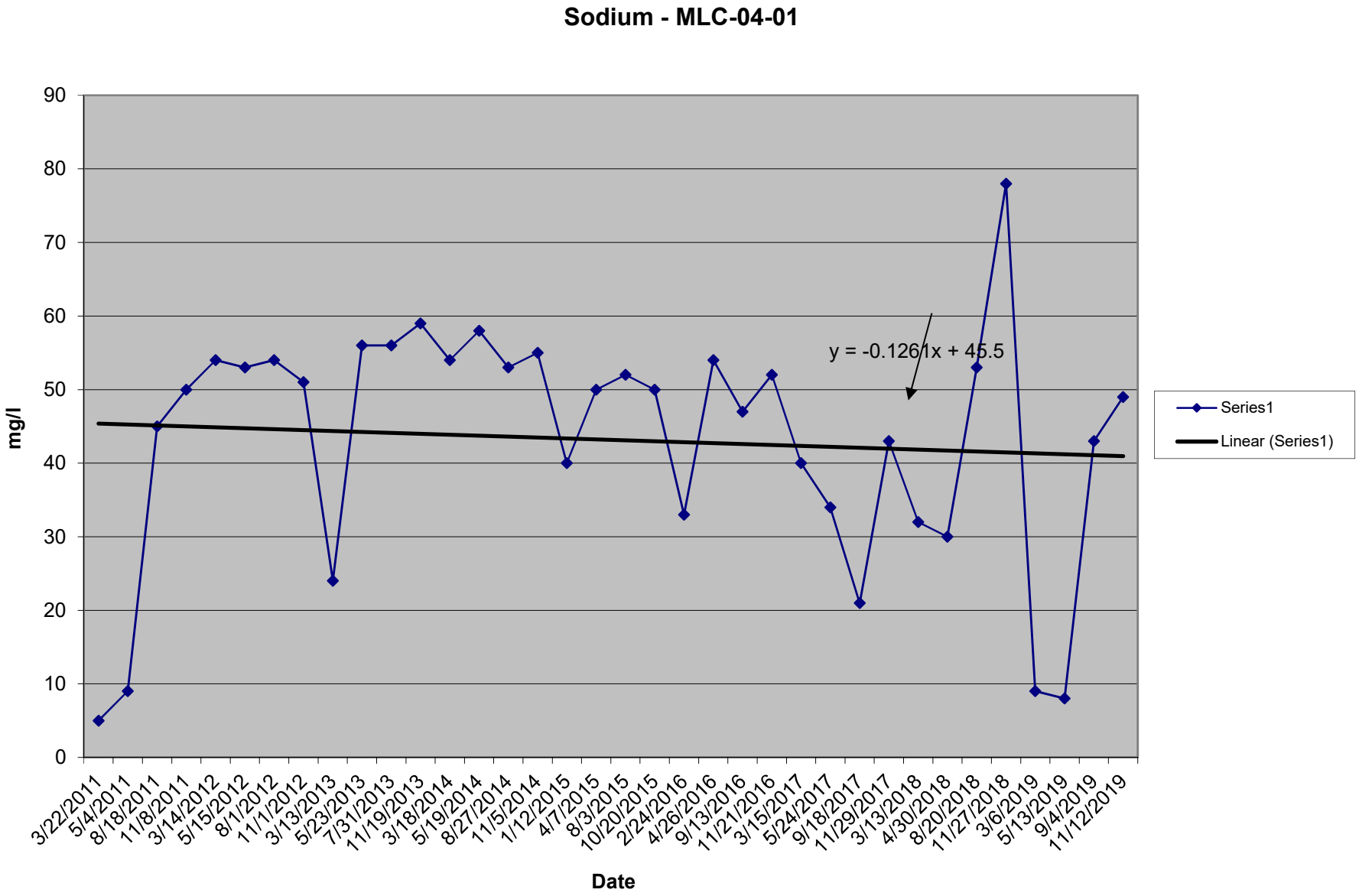
MLC-04-01 Well



MLC-04-01 Well



MLC-04-01 Well

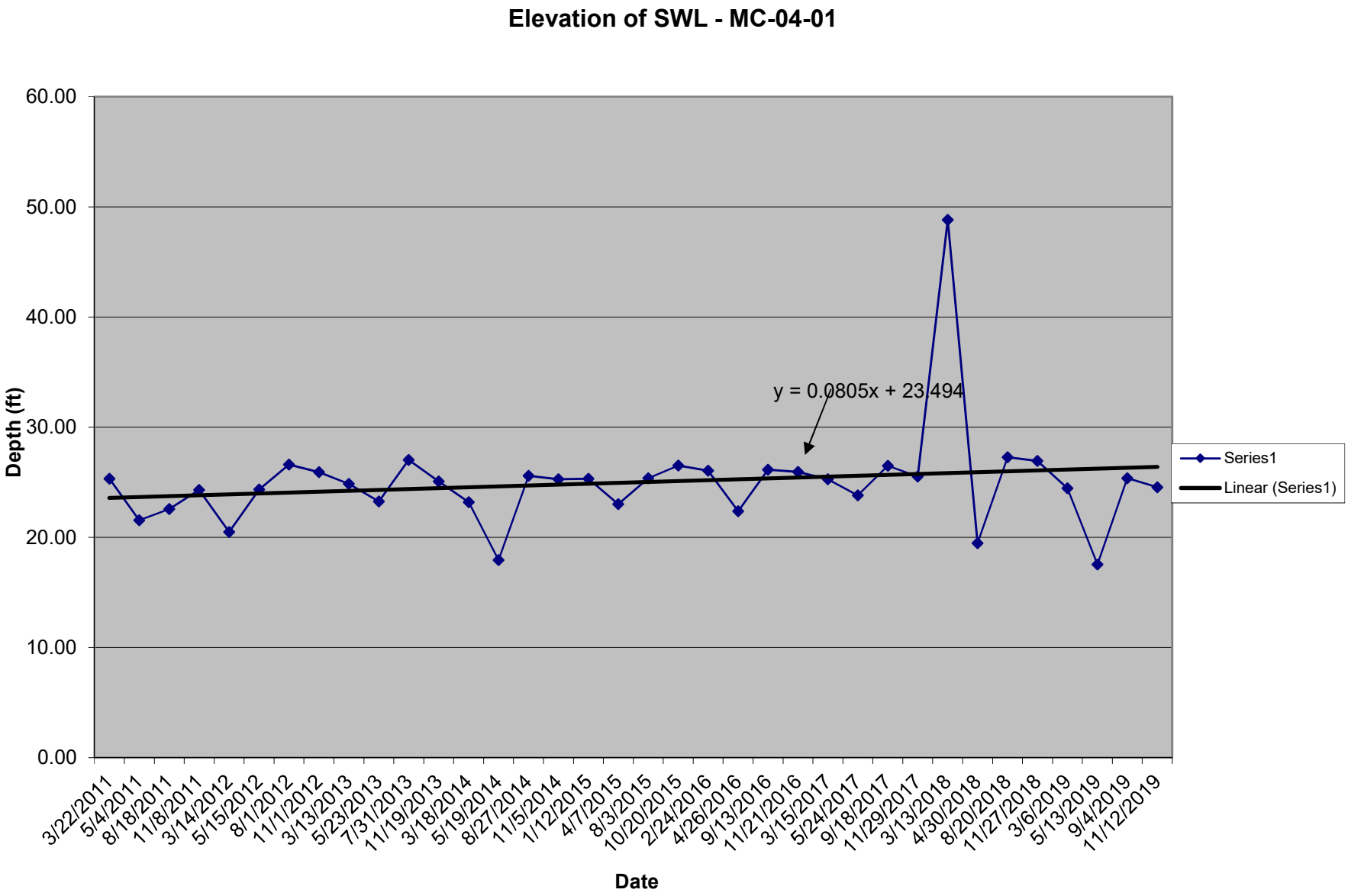


MLC-04-01 Well

Exhibit 1B

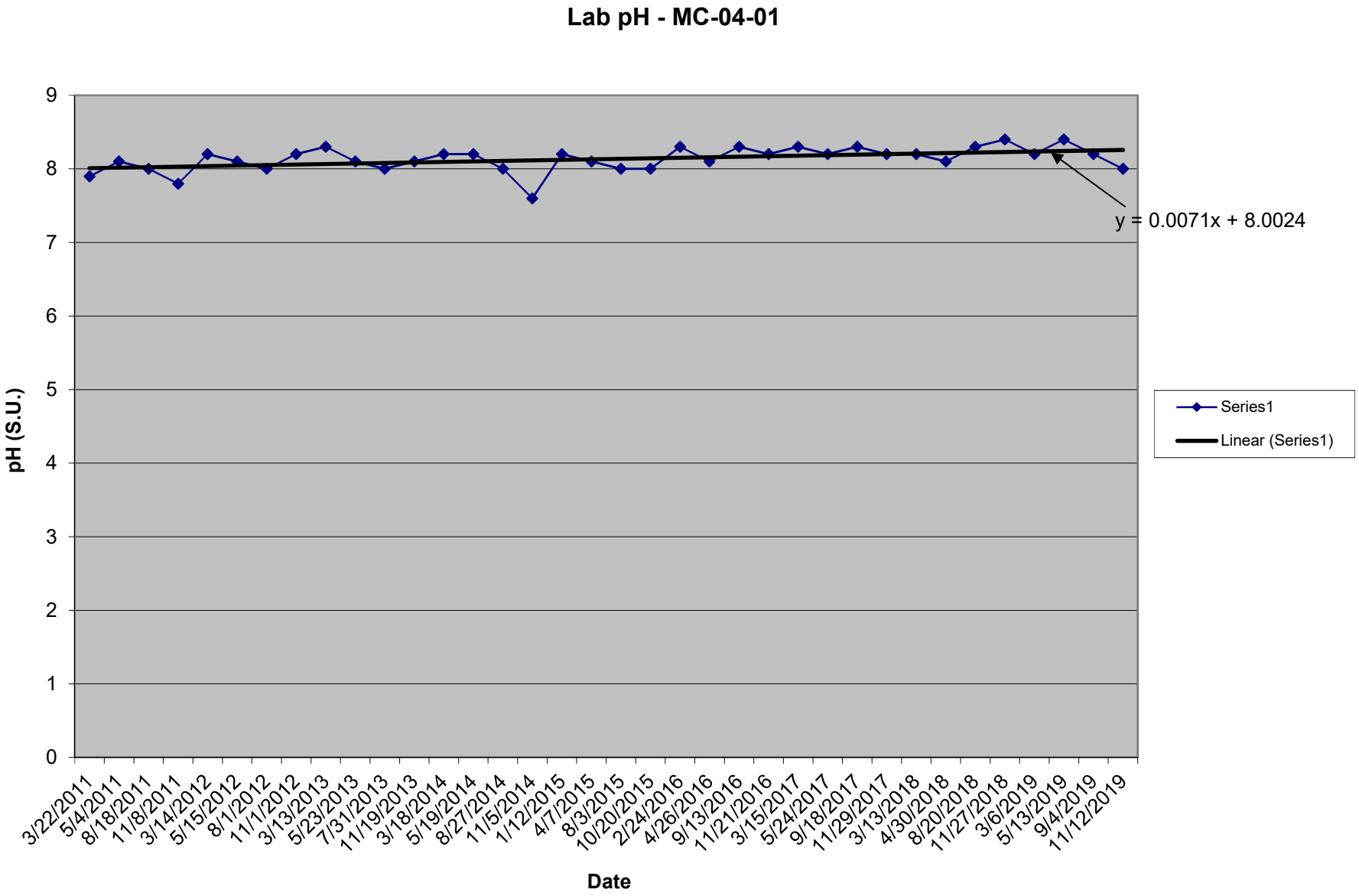
Colowyo Mine
Well MC-04-01
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Elevation SWL, ft MSL	24.46	17.53	25.37	24.55
Field pH	7.42	7.29	7.23	7.36
Feld Temperature, °C	6.3	9.0	9.2	7.8
Field Conductivity, umhos/com	840	880	850	830
Lab pH		8.4		
Lab Conductivity, umhos/com		843		
TDS, mg/l		610		
Bicarbonate as HCO3, D, mg/l		340		
Ca, D, mg/l		88		
Mg, D, mg/l		60		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		1.8		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		16		
Sulfate, D, mg/l		195		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.006		
Zn, TD, mg/l		0.05		

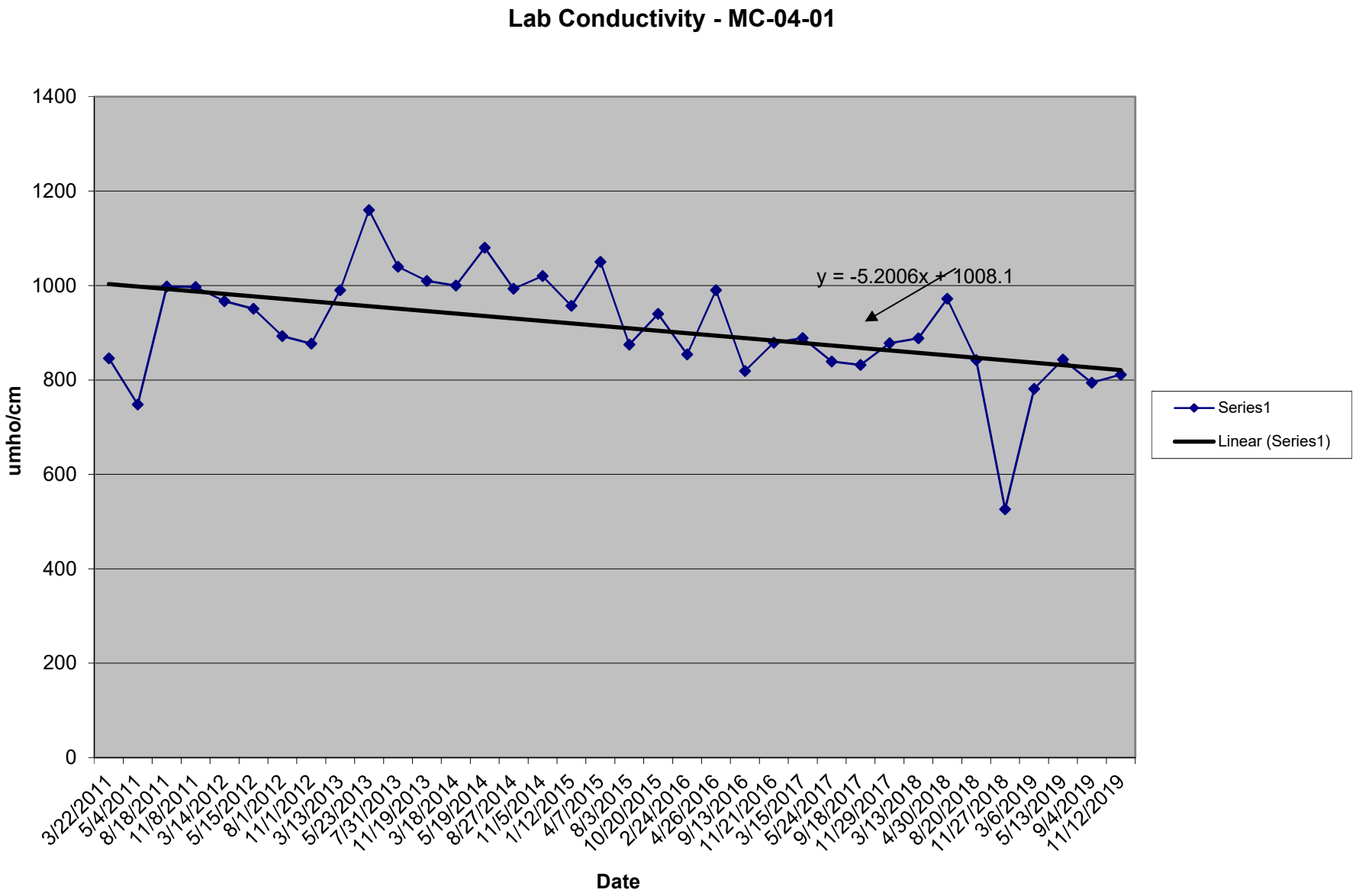

Elevation of SWL - MC-04-01
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Depth (ft)
y = 0.0805x + 23.494
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-01 Well

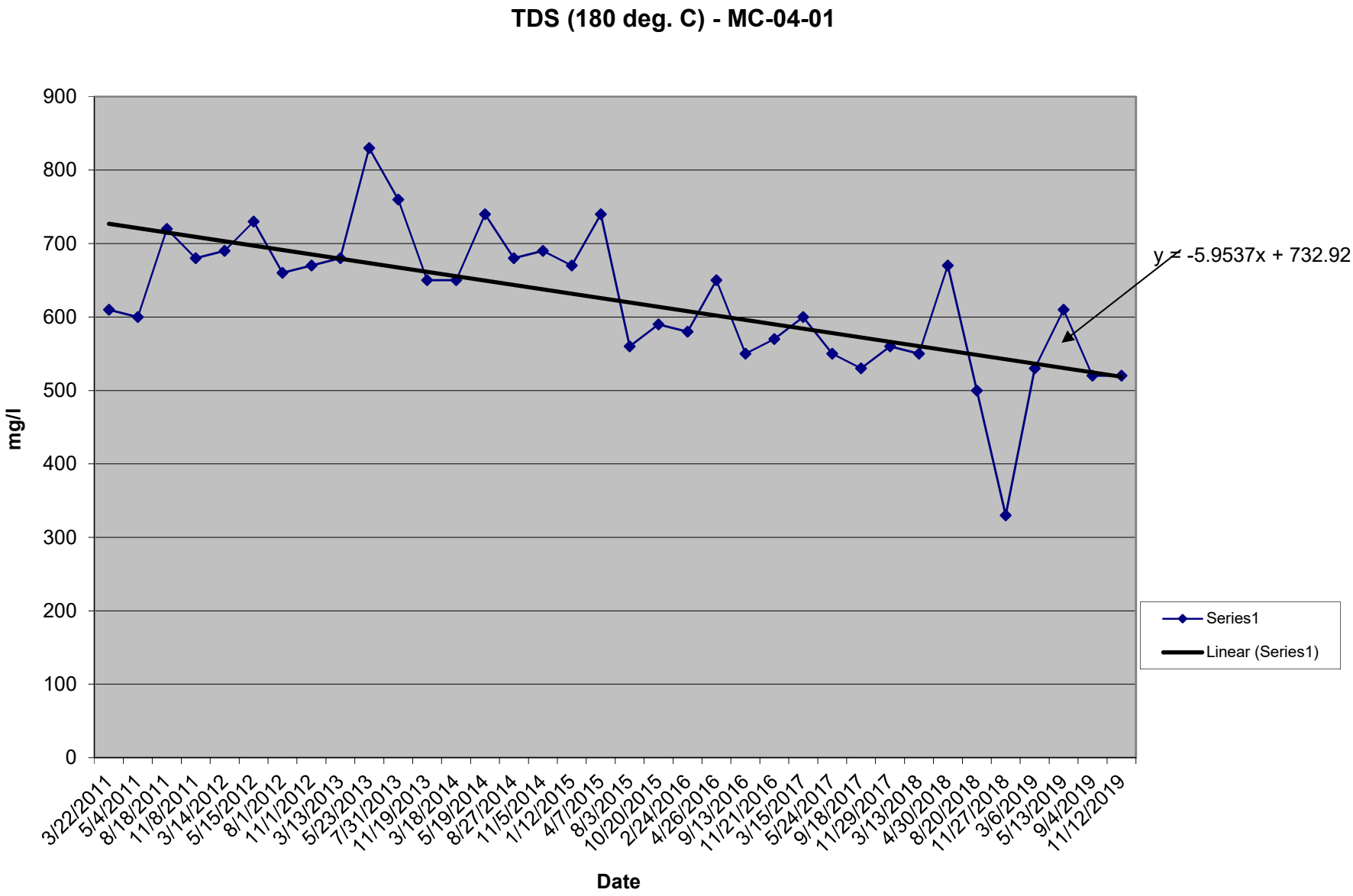
Exhibit 1B



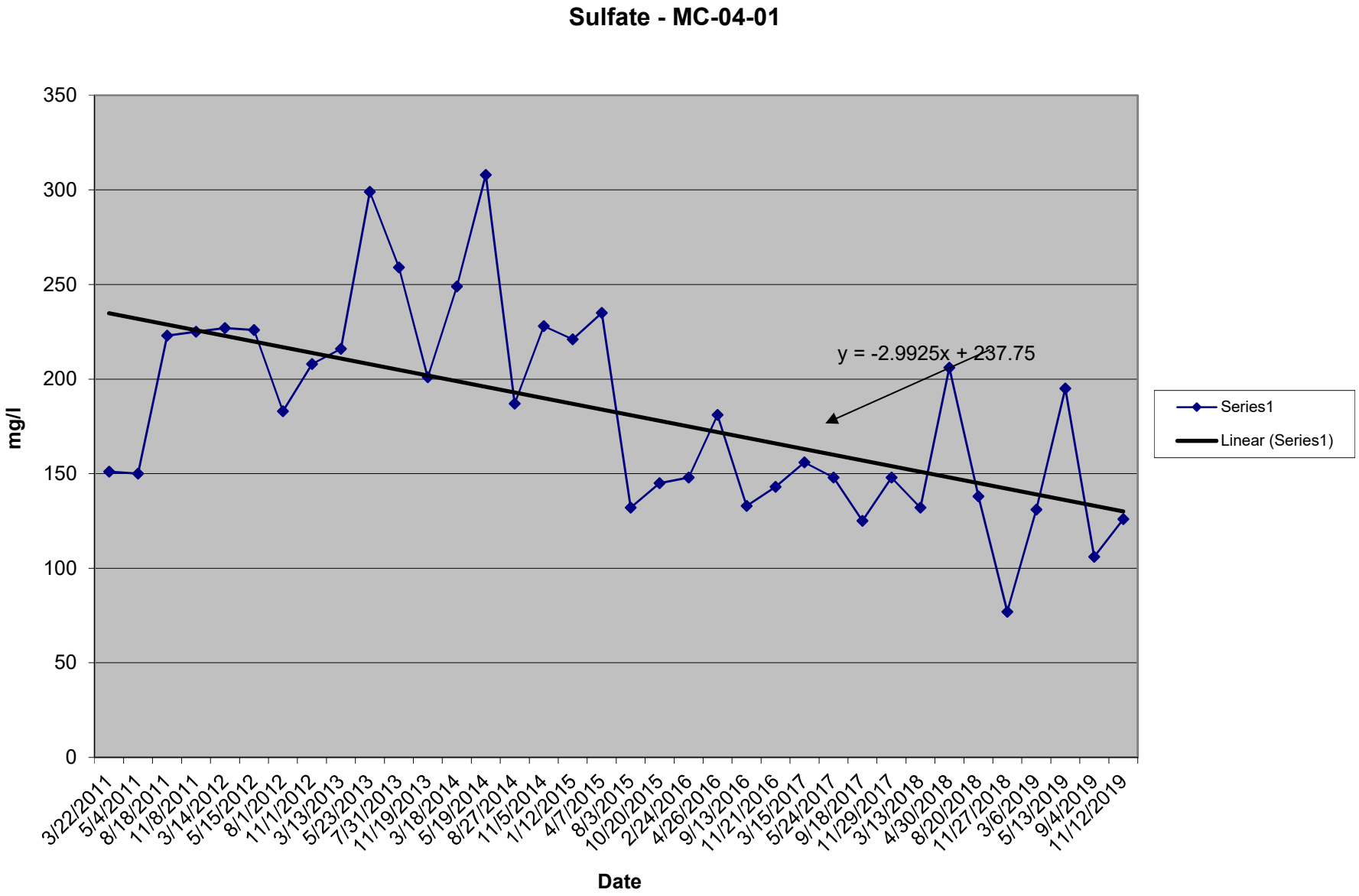
MC-04-01 Well


Lab Conductivity - MC-04-01
y = -5.2006x + 1008.1
umho/cm
Date
Series1
Linear (Series1)
0
200
400
600
800
1000
1200
1400
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019

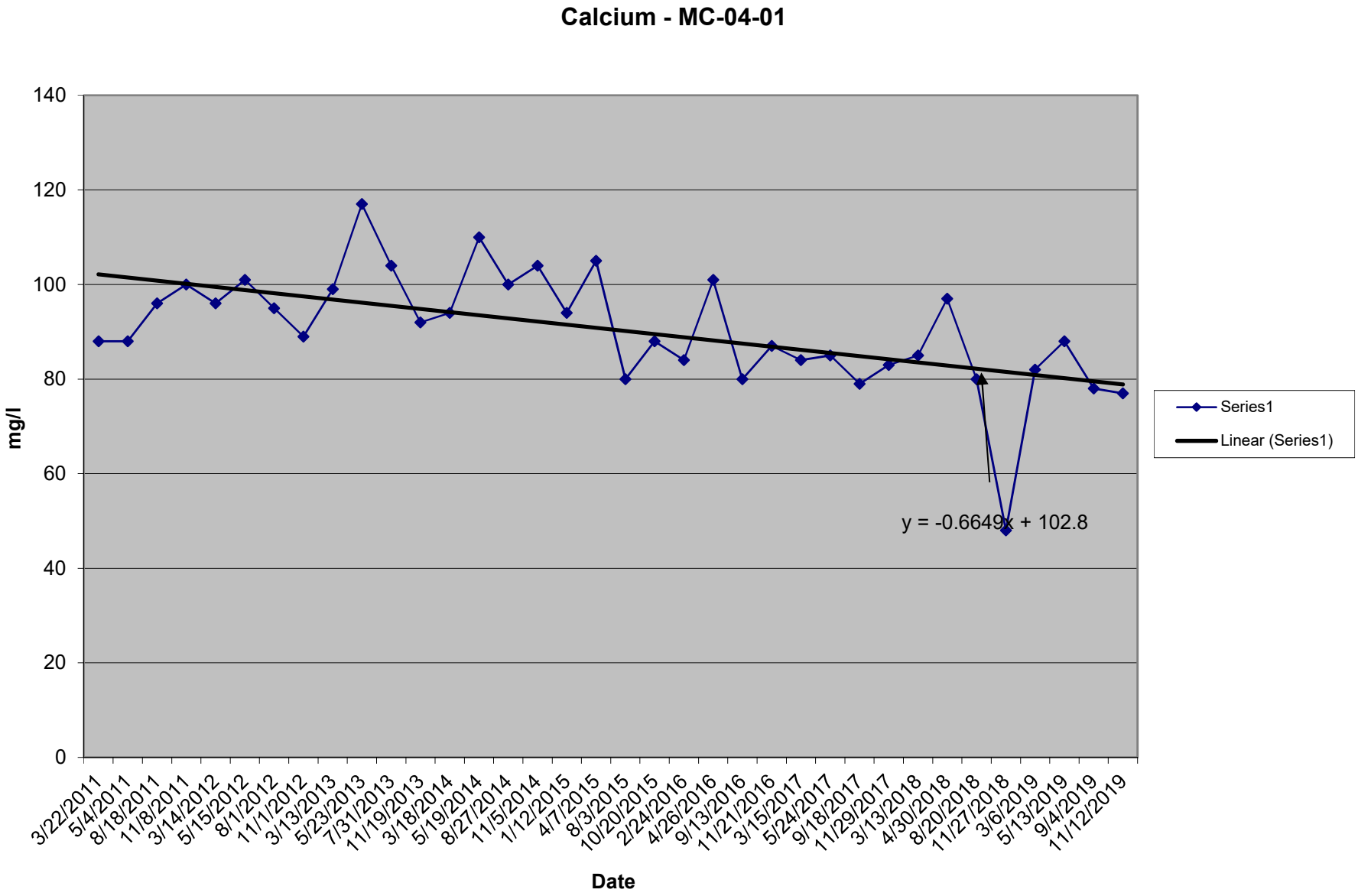
MC-04-01 Well


TDS (180 deg. C) - MC-04-01
mg/l
900
800
700
600
500
400
300
200
100
0
y = -5.9537x + 732.92
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

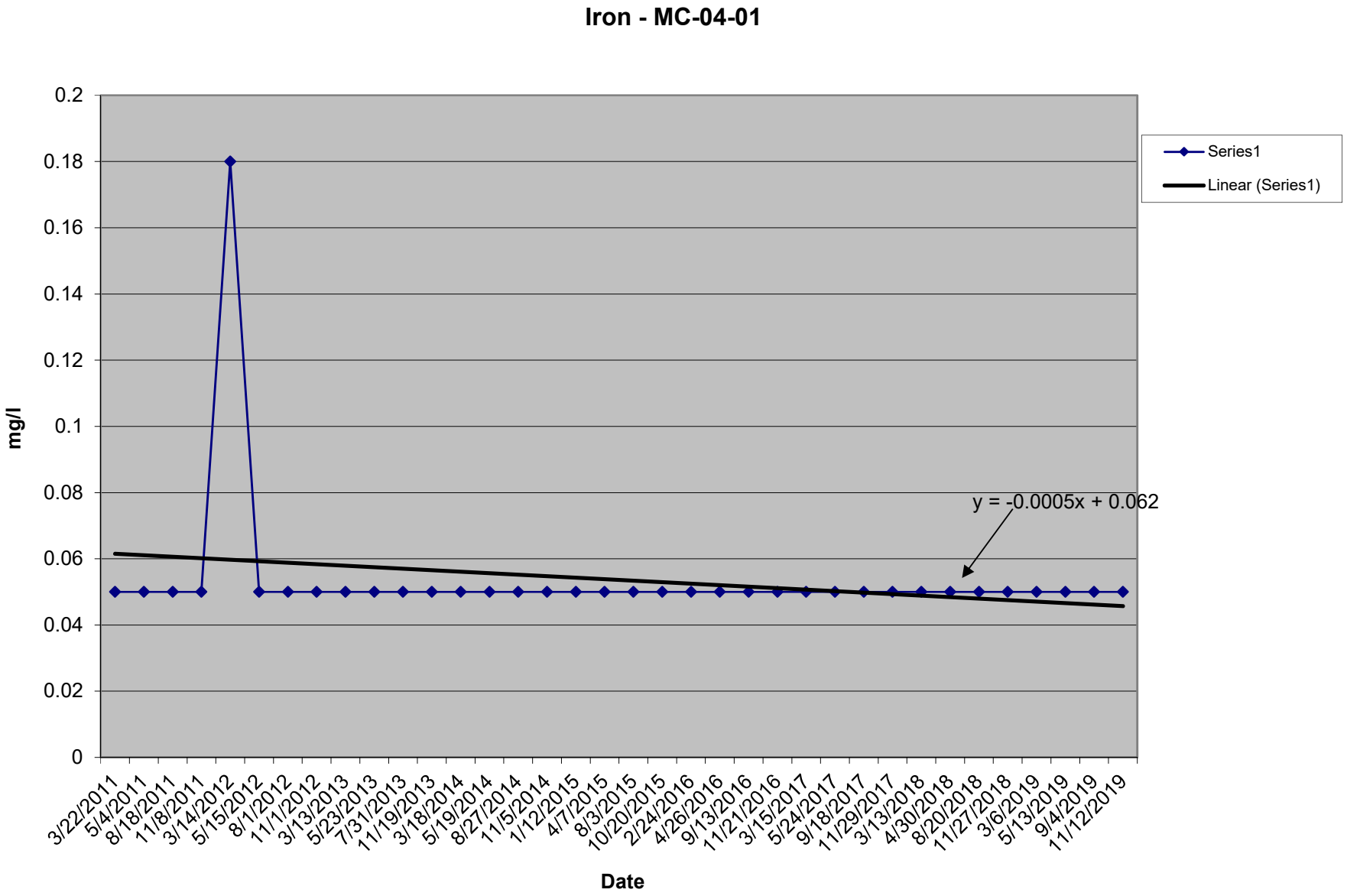
MC-04-01 Well


Sulfate - MC-04-01
mg/l
350
300
250
200
150
100
50
0
y = -2.9925x + 237.75
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-01 Well

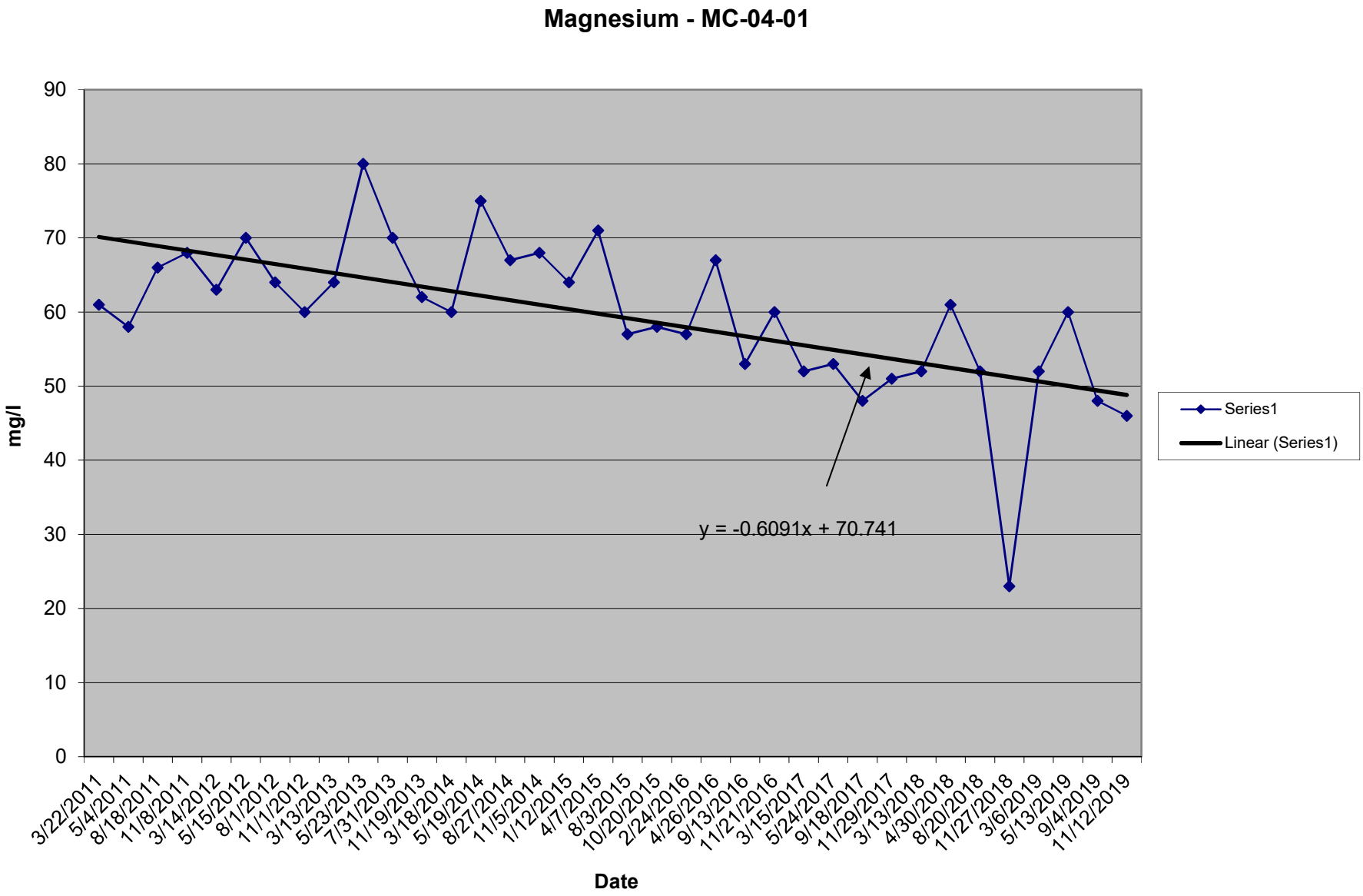

Calcium - MC-04-01
mg/l
140
120
100
80
60
40
20
0
y = -0.6649x + 102.8
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-01 Well

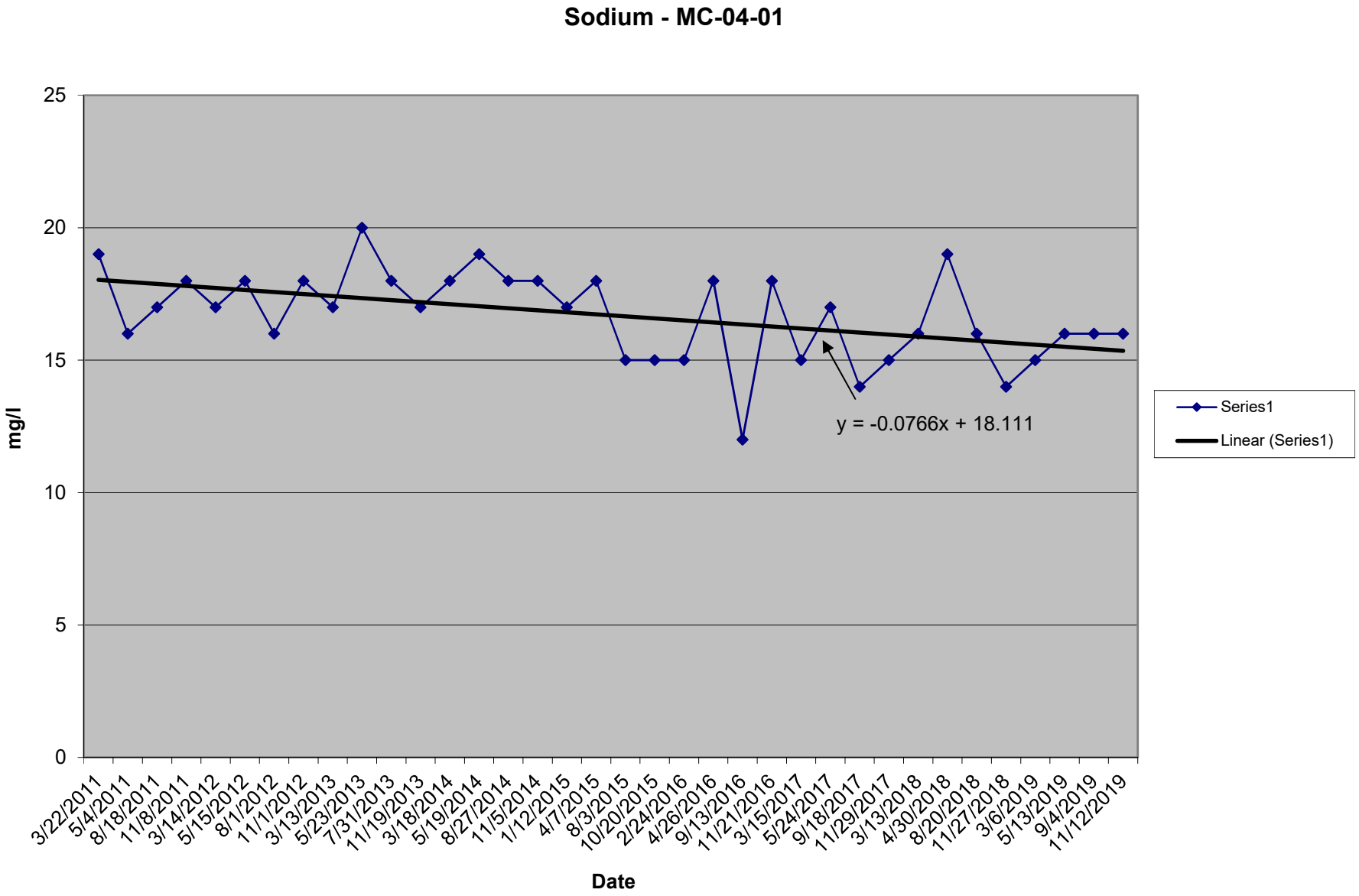

Iron - MC-04-01
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
mg/l
y = -0.0005x + 0.062
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-01 Well

Exhibit 1B



MC-04-01 Well

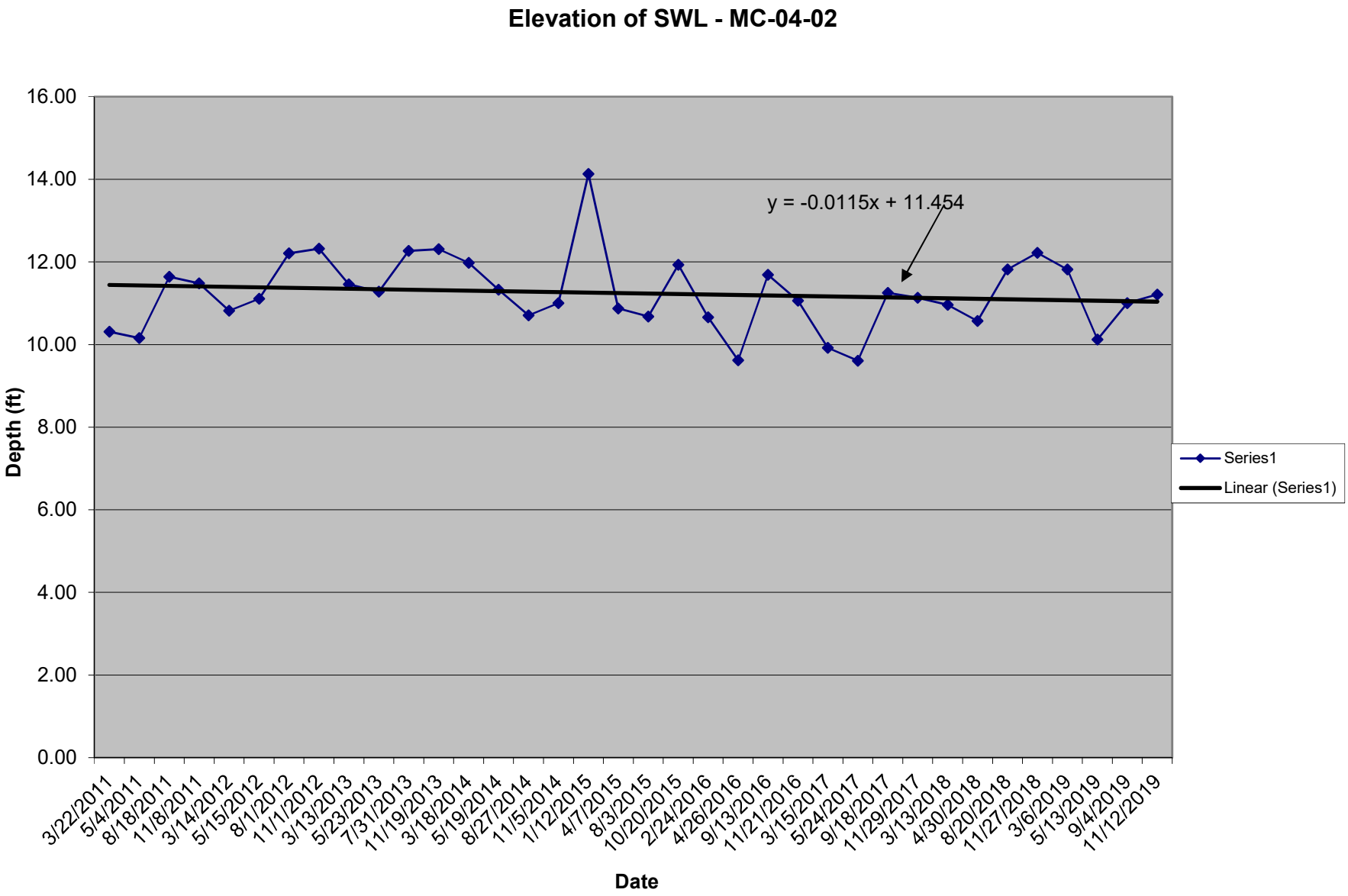

Sodium - MC-04-01
mg/l
25
20
15
10
5
0
y = -0.0766x + 18.111
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-01 Well

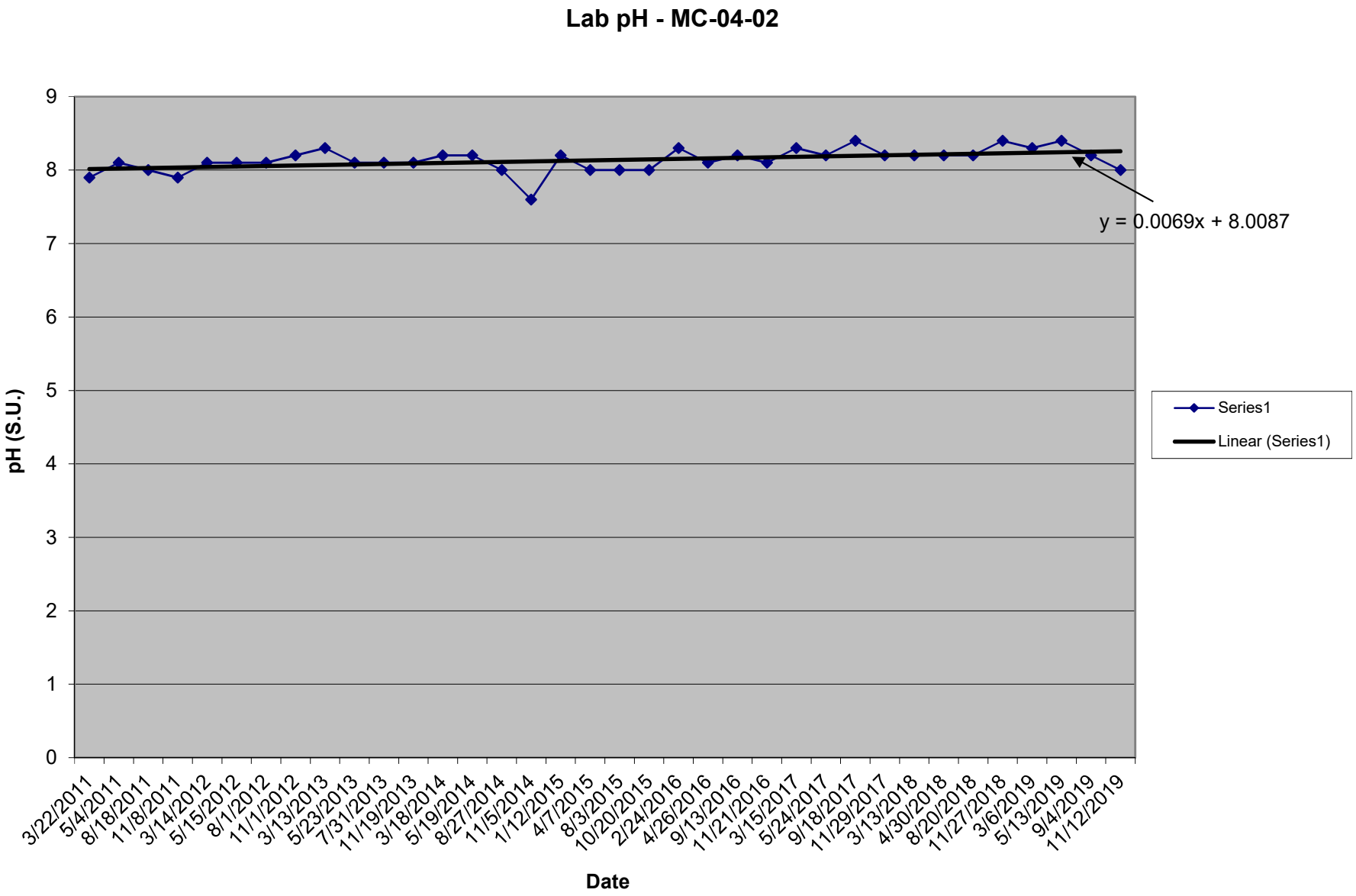
Exhibit 1B

Colowyo Mine
Well MC-04-02
Water Year 1/1/2019 - 12/31/19

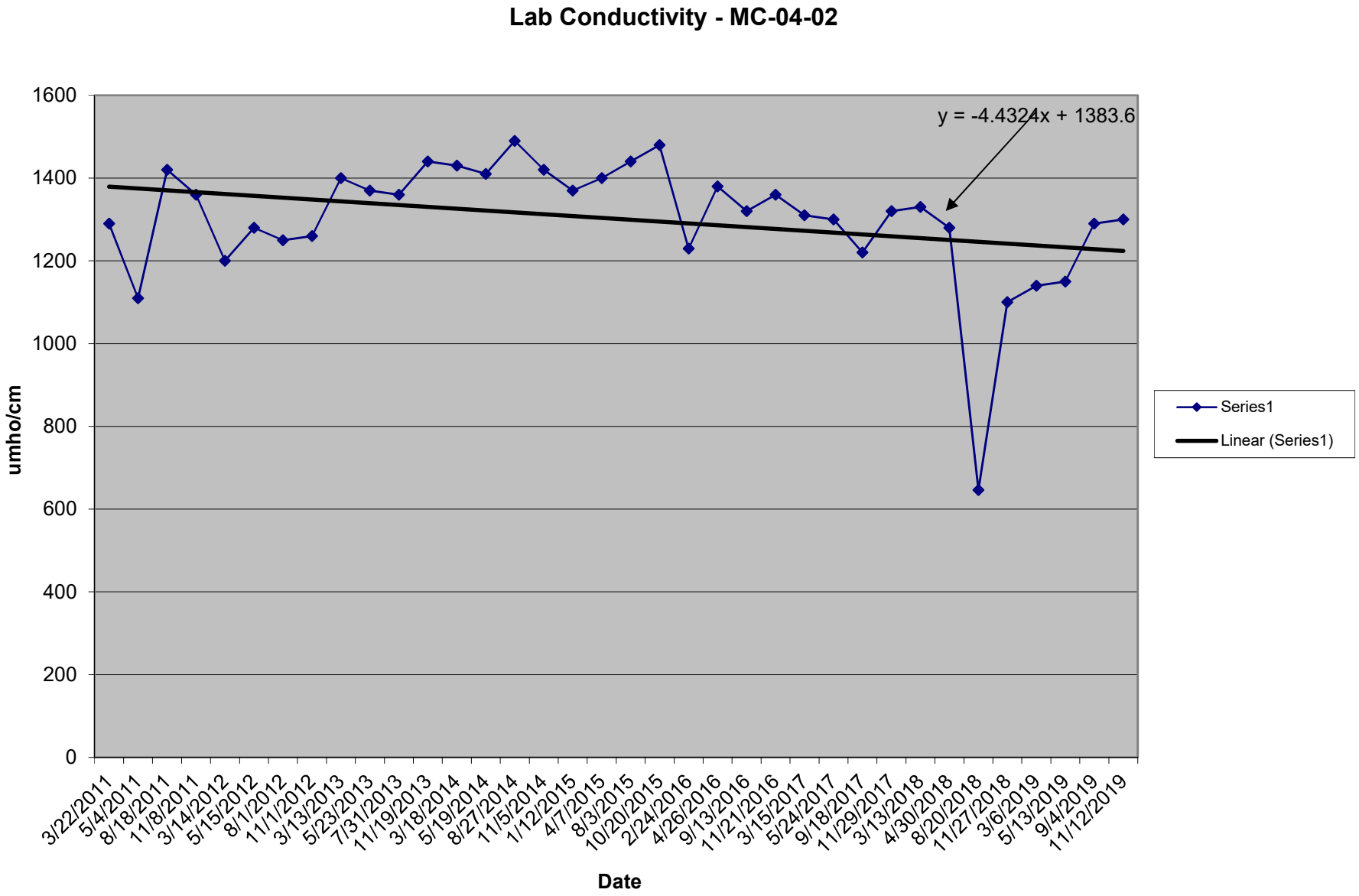
	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Elevation SWL, ft MSL	11.82	10.12	11.00	11.21
Field pH	7.92	7.61	7.38	7.3
Feld Temperature, °C	8.7	10.3	11.6	10.1
Field Conductivity, umhos/com	1210	1230	1410	1340
Lab pH		8.4		
Lab Conductivity, umhos/com		1150		
TDS, mg/l		840		
Bicarbonate as HCO3, D, mg/l		558		
Ca, D, mg/l		121		
Mg, D, mg/l		77		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		0.1		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		50		
Sulfate, D, mg/l		243		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.28		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		


Elevation of SWL - MC-04-02
y = -0.0115x + 11.454
Depth (ft)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date
Series1
Linear (Series1)

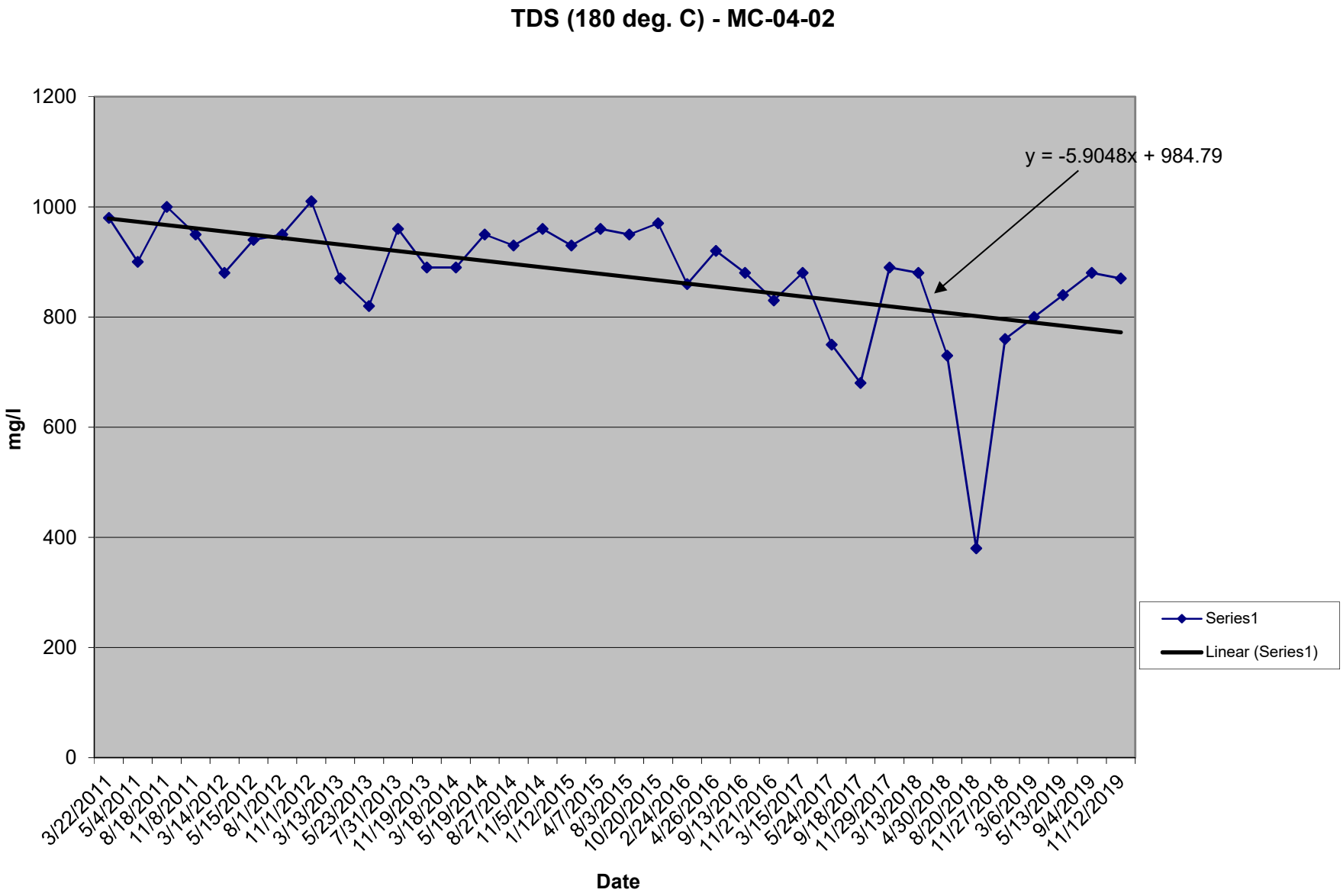
MC-04-02 Well


Lab pH - MC-04-02
pH (S.U.)
Date
y = 0.0069x + 8.0087
Series1
Linear (Series1)
0
1
2
3
4
5
6
7
8
9
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019

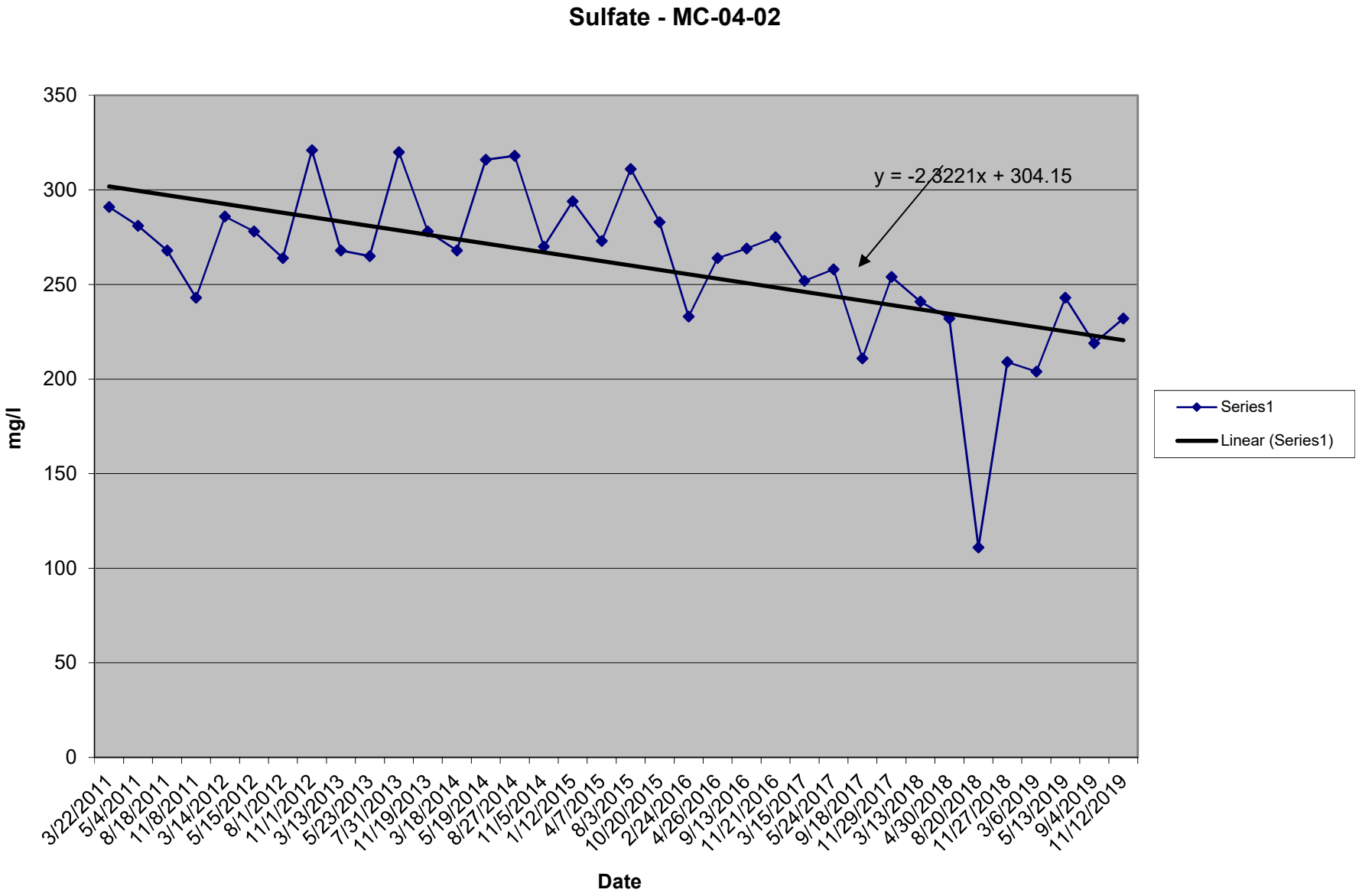
MC-04-02 Well


Lab Conductivity - MC-04-02
y = -4.4324x + 1383.6
umho/cm
1600
1400
1200
1000
800
600
400
200
0
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date
Series1
Linear (Series1)

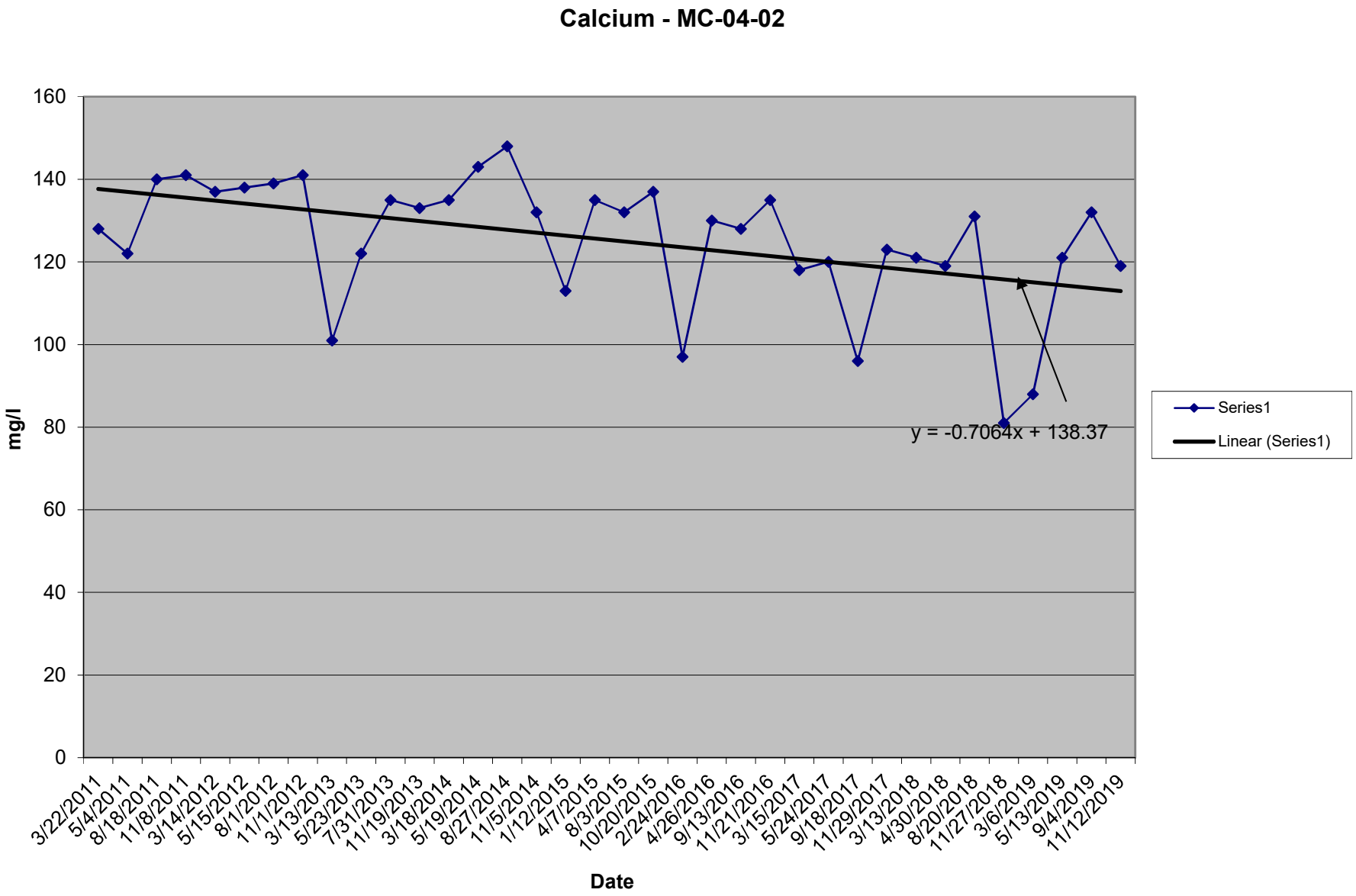
MC-04-02 Well


TDS (180 deg. C) - MC-04-02
y = -5.9048x + 984.79
mg/l
1200
1000
800
600
400
200
0
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date
Series1
Linear (Series1)

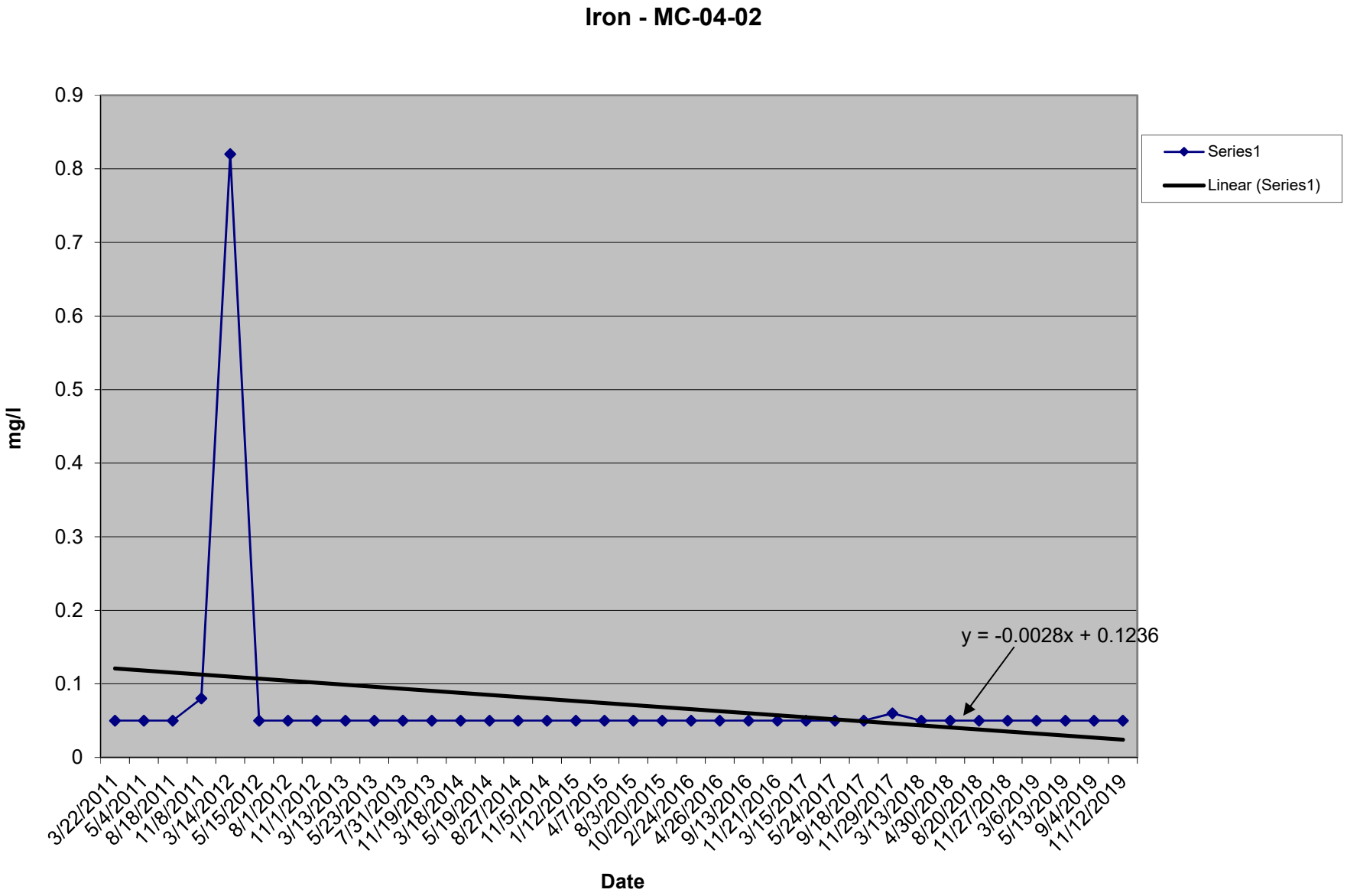
MC-04-02 Well


Sulfate - MC-04-02
y = -2.3221x + 304.15
mg/l
Date
Series1
Linear (Series1)
350
300
250
200
150
100
50
0
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019

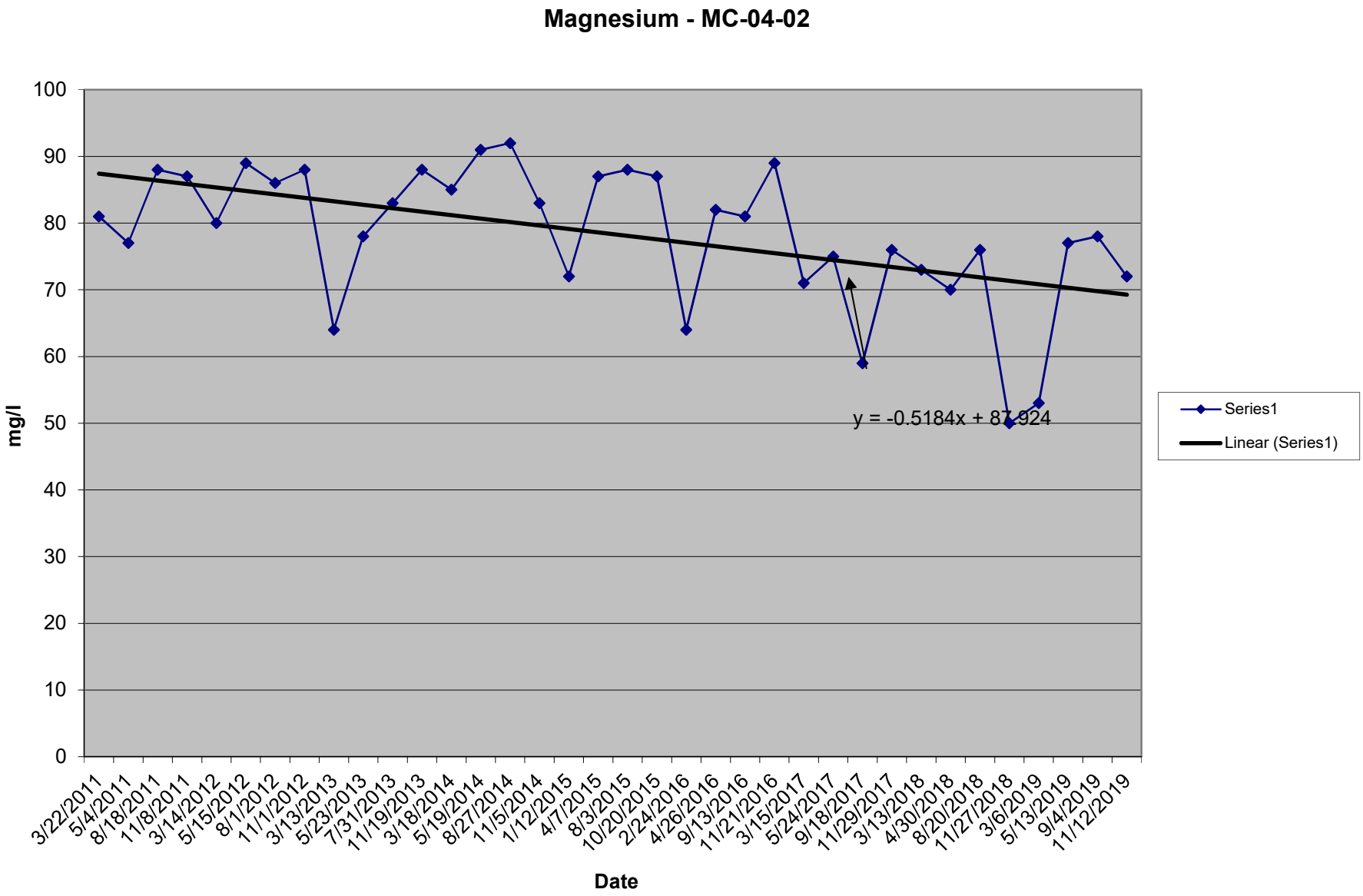
MC-04-02 Well


Calcium - MC-04-02
160
140
120
100
80
60
40
20
0
mg/l
y = -0.7064x + 138.37
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

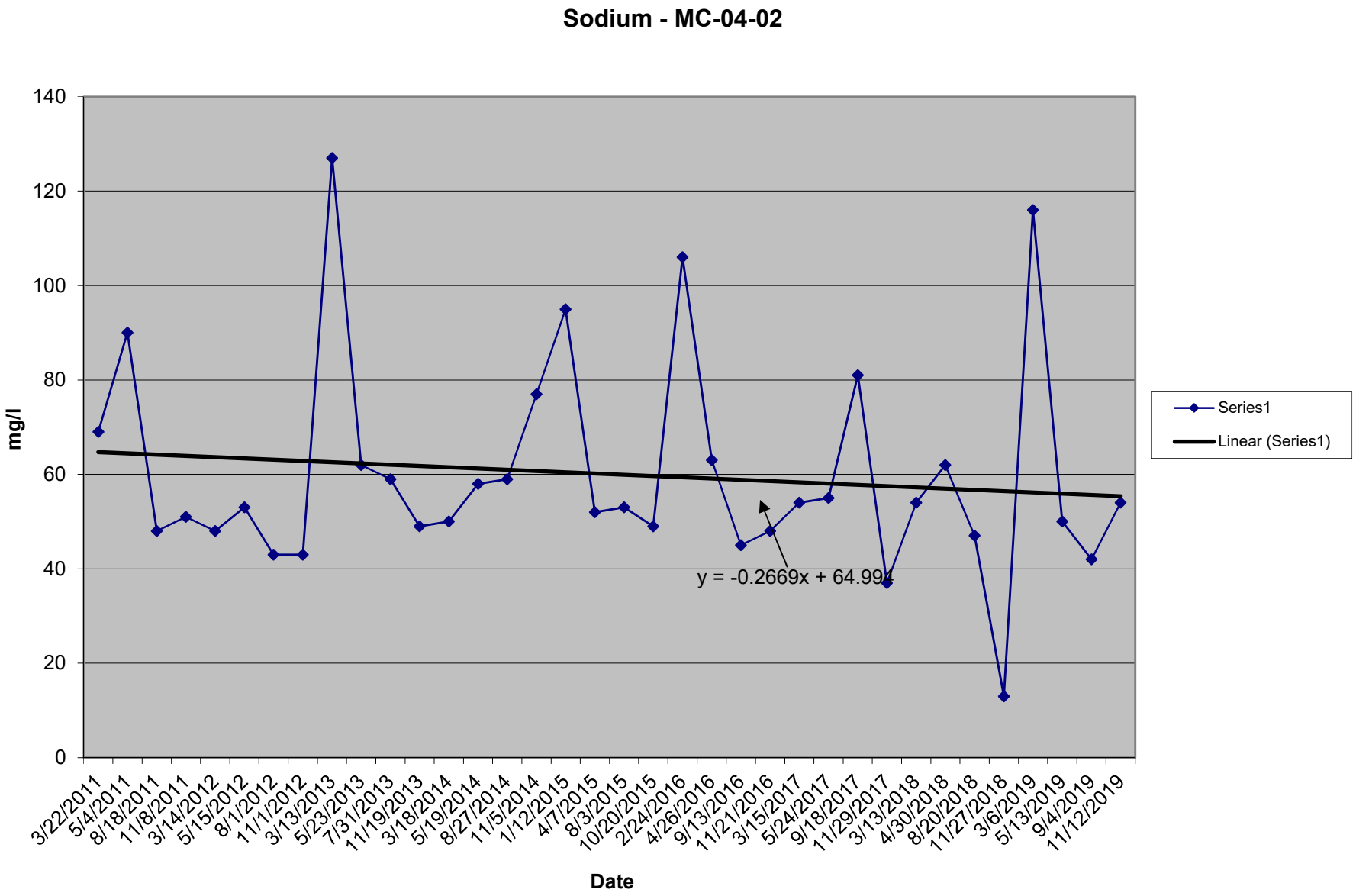
MC-04-02 Well


Iron - MC-04-02
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
mg/l
Series1
Linear (Series1)
y = -0.0028x + 0.1236
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-02 Well


Magnesium - MC-04-02
mg/l
100
90
80
70
60
50
40
30
20
10
0
y = -0.5184x + 87.924
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-02 Well

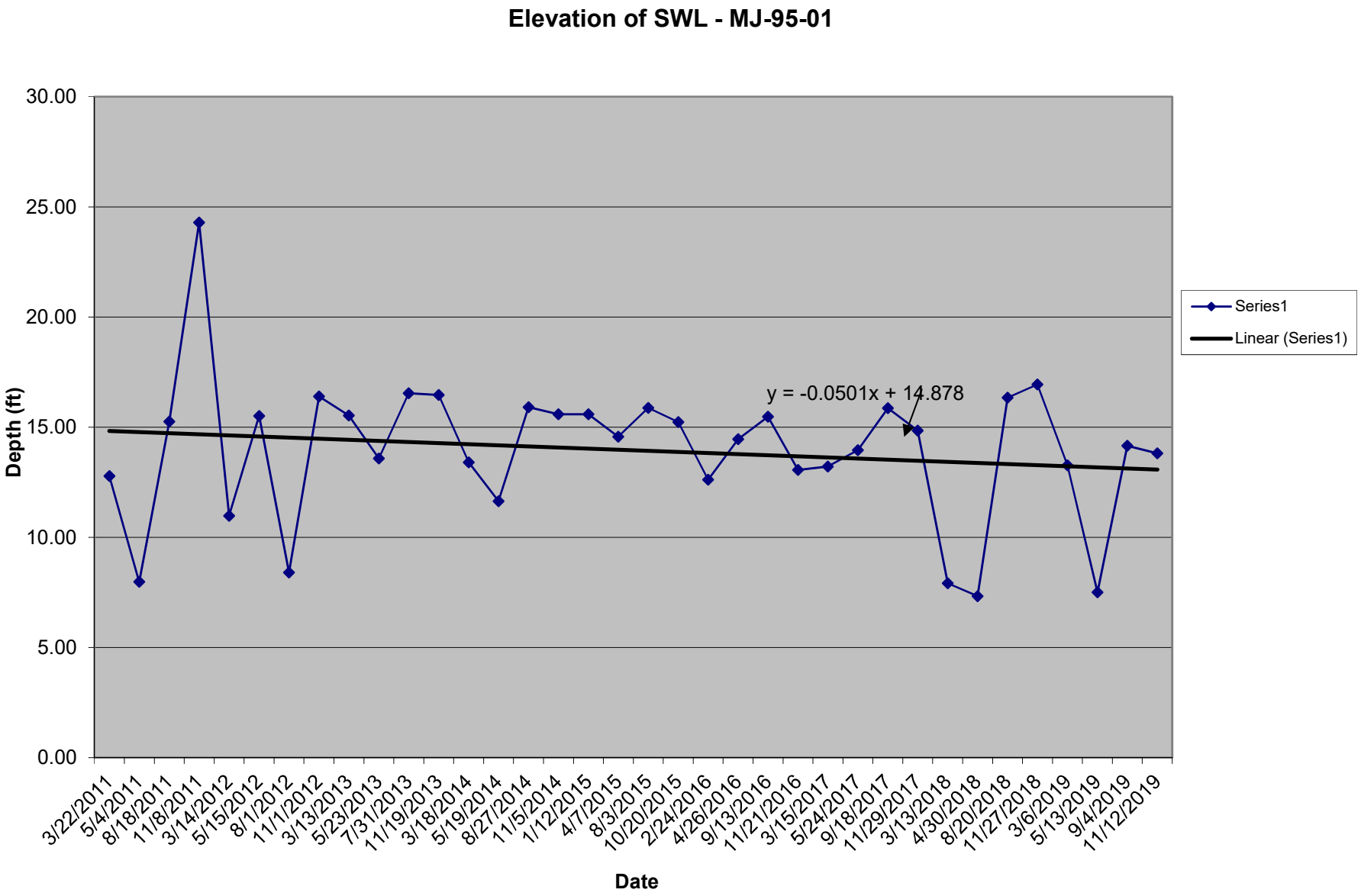

Sodium - MC-04-02
mg/l
140
120
100
80
60
40
20
0
y = -0.2669x + 64.994
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-02 Well

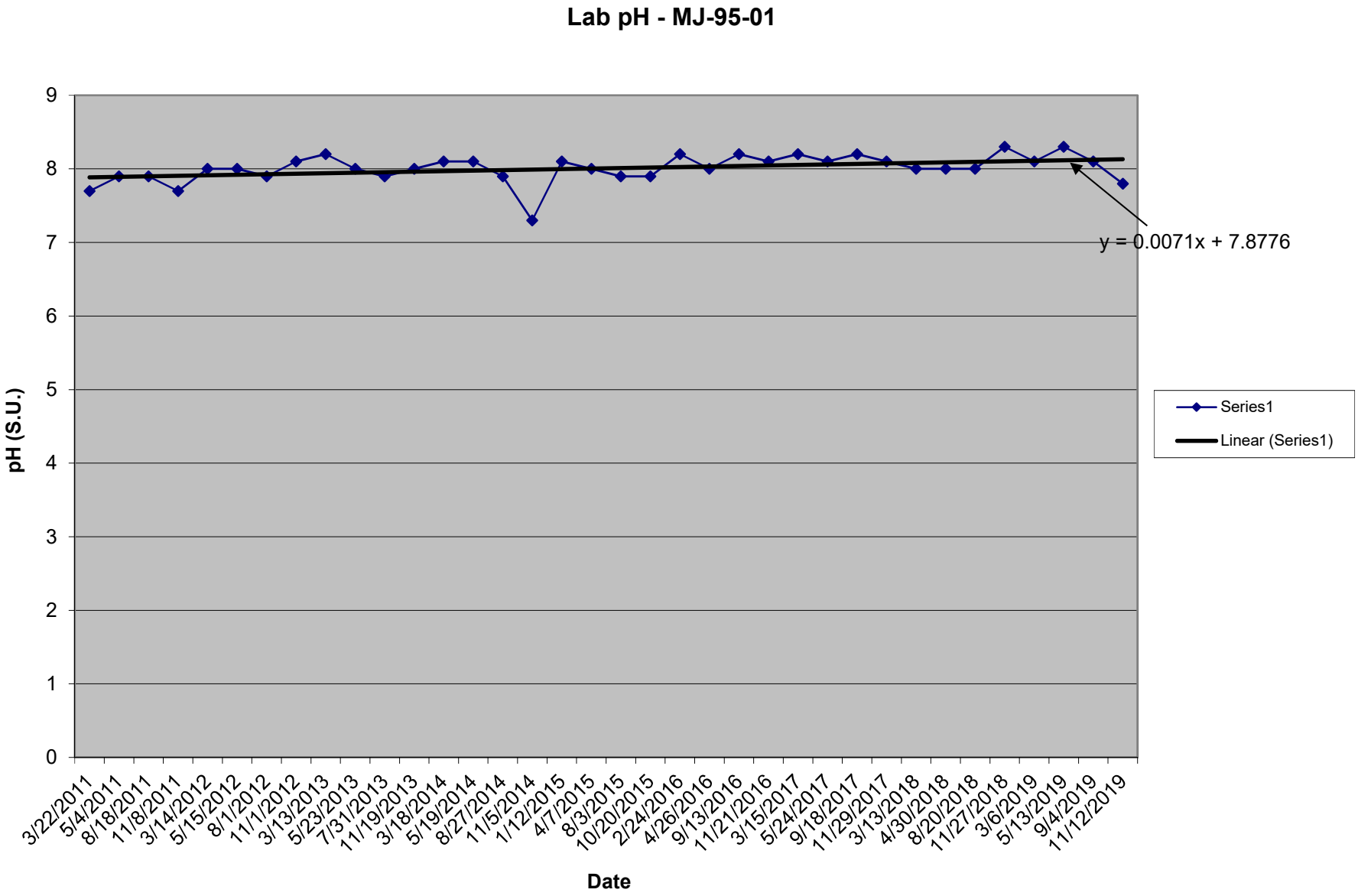
Exhibit 1B

Colowyo Mine
Well MJ-95-01
Water Year 1/1/2019 - 12/31/19

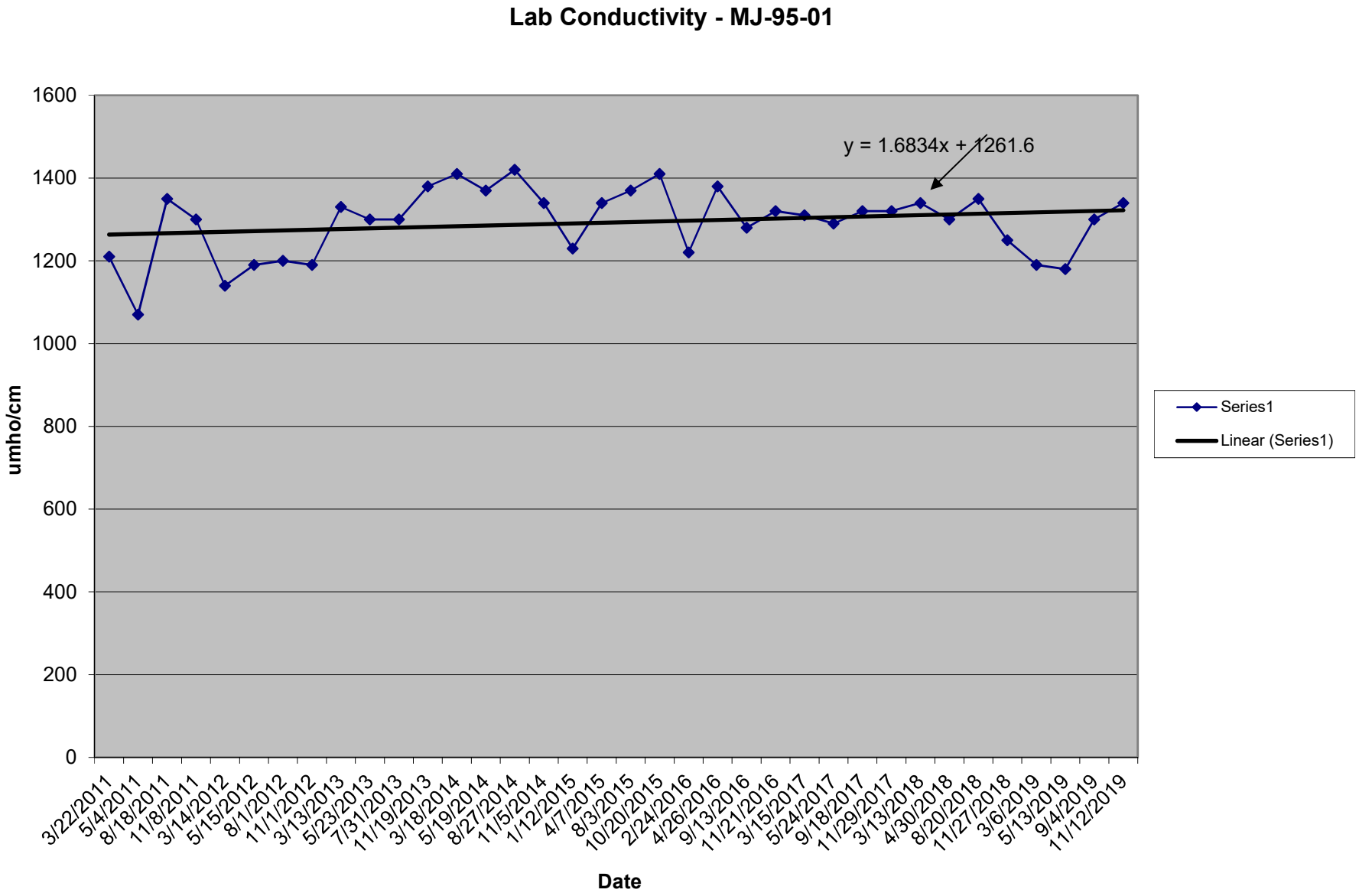
	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Elevation SWL, ft MSL	13.27	7.51	14.16	13.81
Field pH	7.42	7.29	7.11	7.04
Feld Temperature, °C	8	8.9	9.5	7.8
Field Conductivity, umhos/com	1290	1260	1440	1380
Lab pH		8.3		
Lab Conductivity, umhos/com		1180		
TDS, mg/l		860		
Bicarbonate as HCO3, D, mg/l		611		
Ca, D, mg/l		118		
Mg, D, mg/l		94		
Ammonia NH3, TD, mg/l		1.9		
NO3 as N, mg/l		0.1		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		26		
Sulfate, D, mg/l		243		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.04		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		


Elevation of SWL - MJ-95-01
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Depth (ft)
y = -0.0501x + 14.878
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MJ-95-01 Well

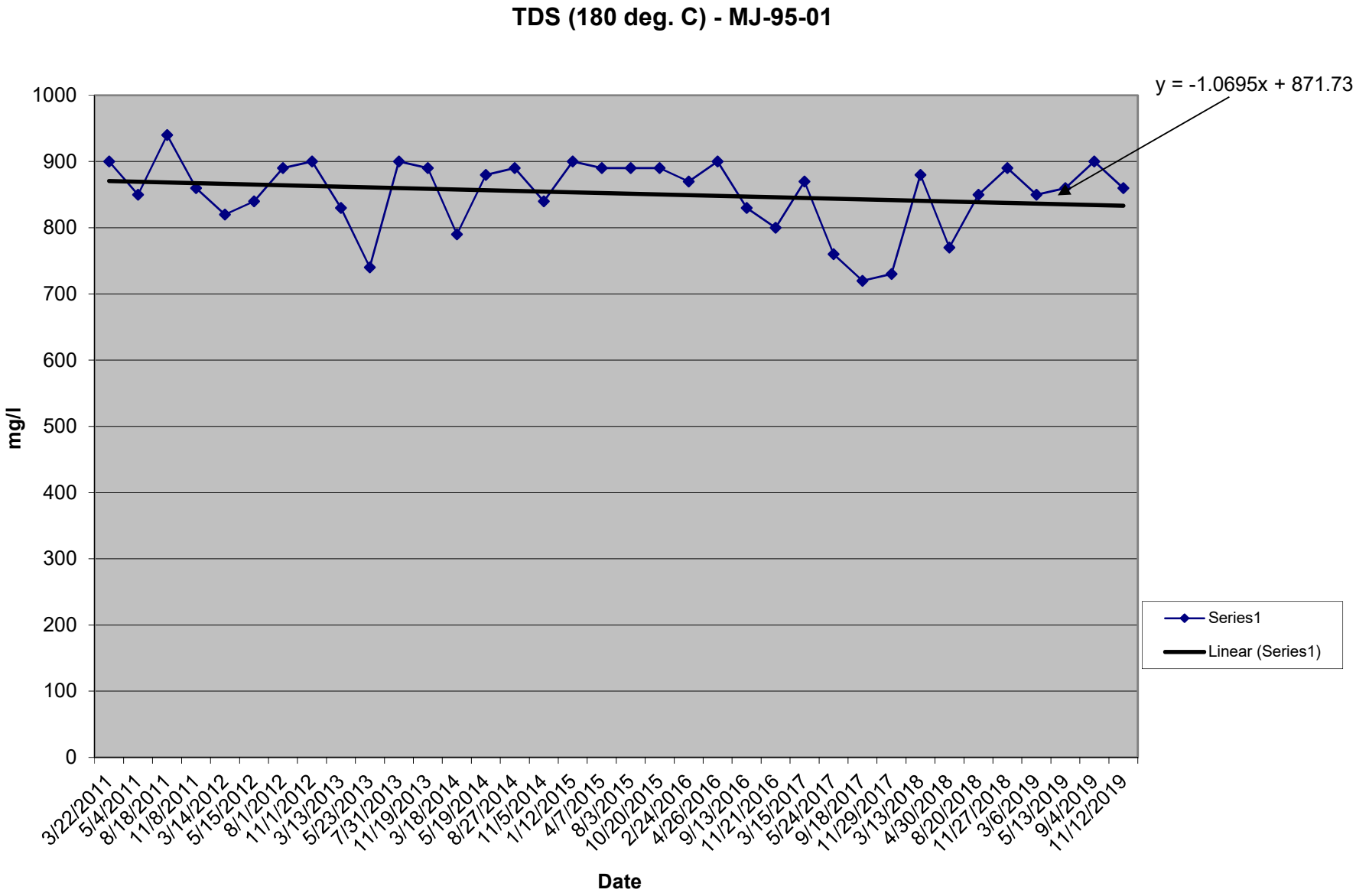

Lab pH - MJ-95-01
pH (S.U.)
Date
y = 0.0071x + 7.8776
Series1
Linear (Series1)
0
1
2
3
4
5
6
7
8
9
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019

MJ-95-01 Well

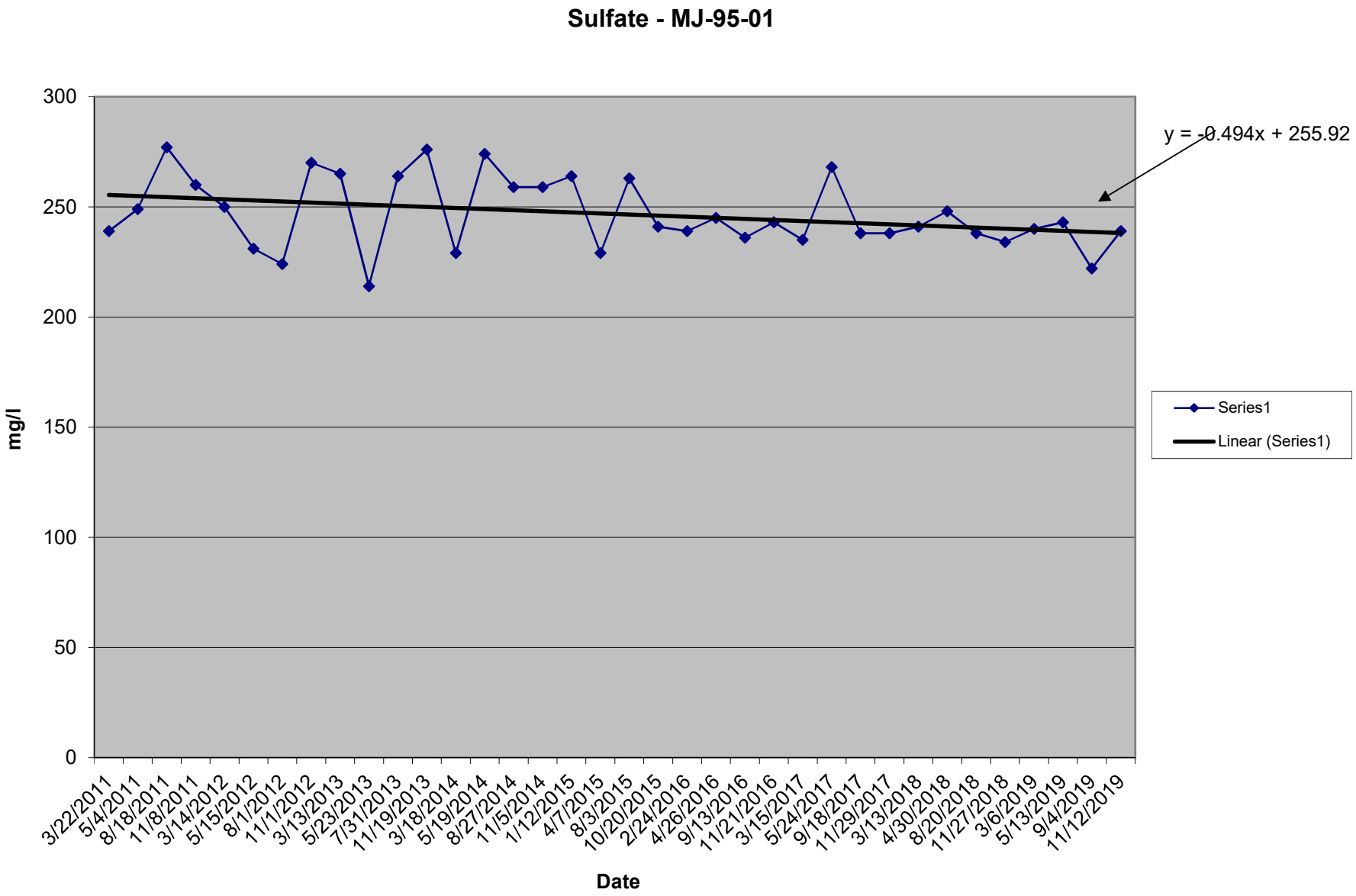

Lab Conductivity - MJ-95-01
y = 1.6834x + 1261.6
umho/cm
1600
1400
1200
1000
800
600
400
200
0
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date
Series1
Linear (Series1)

MJ-95-01 Well

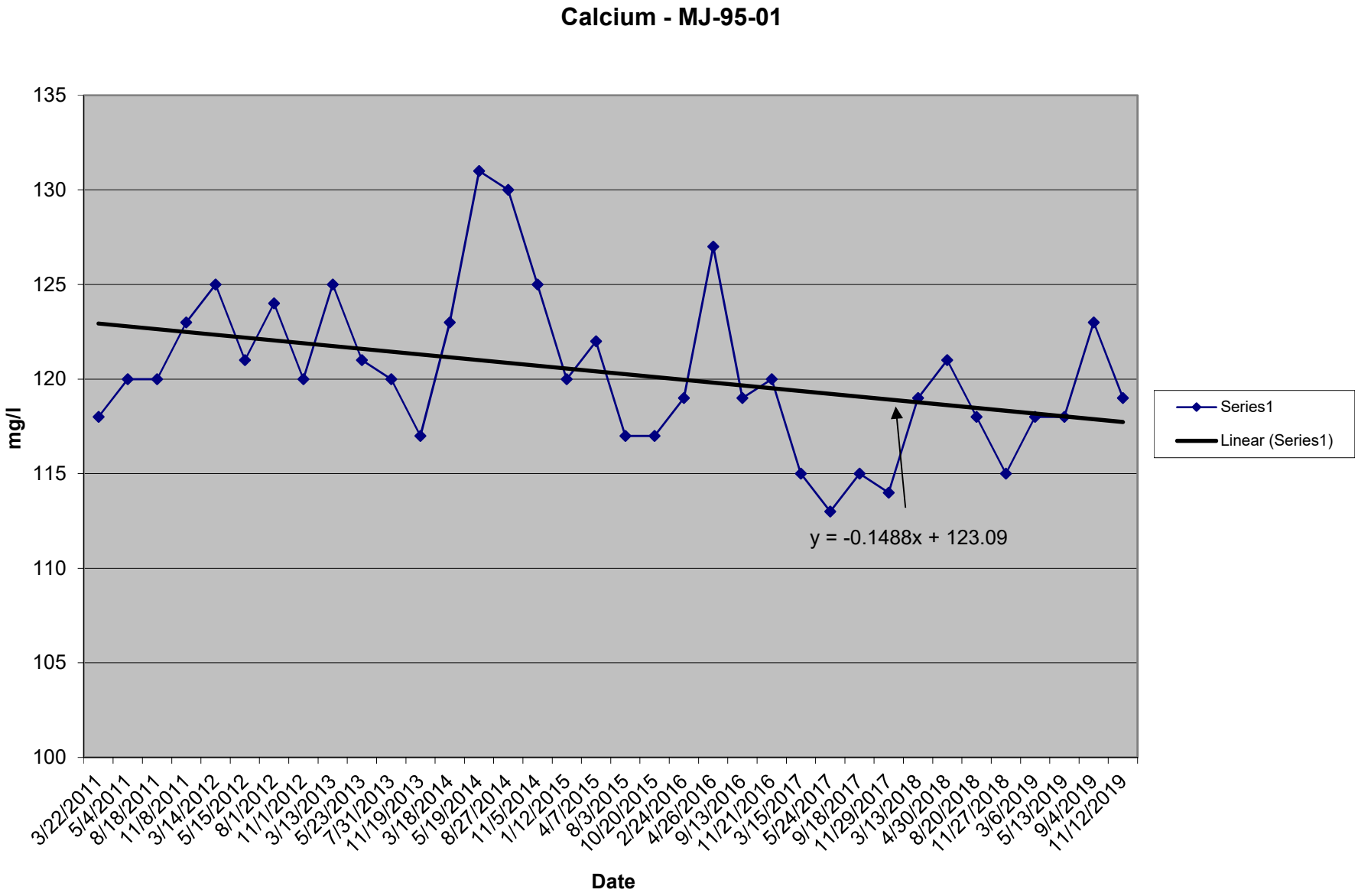
Exhibit 1B



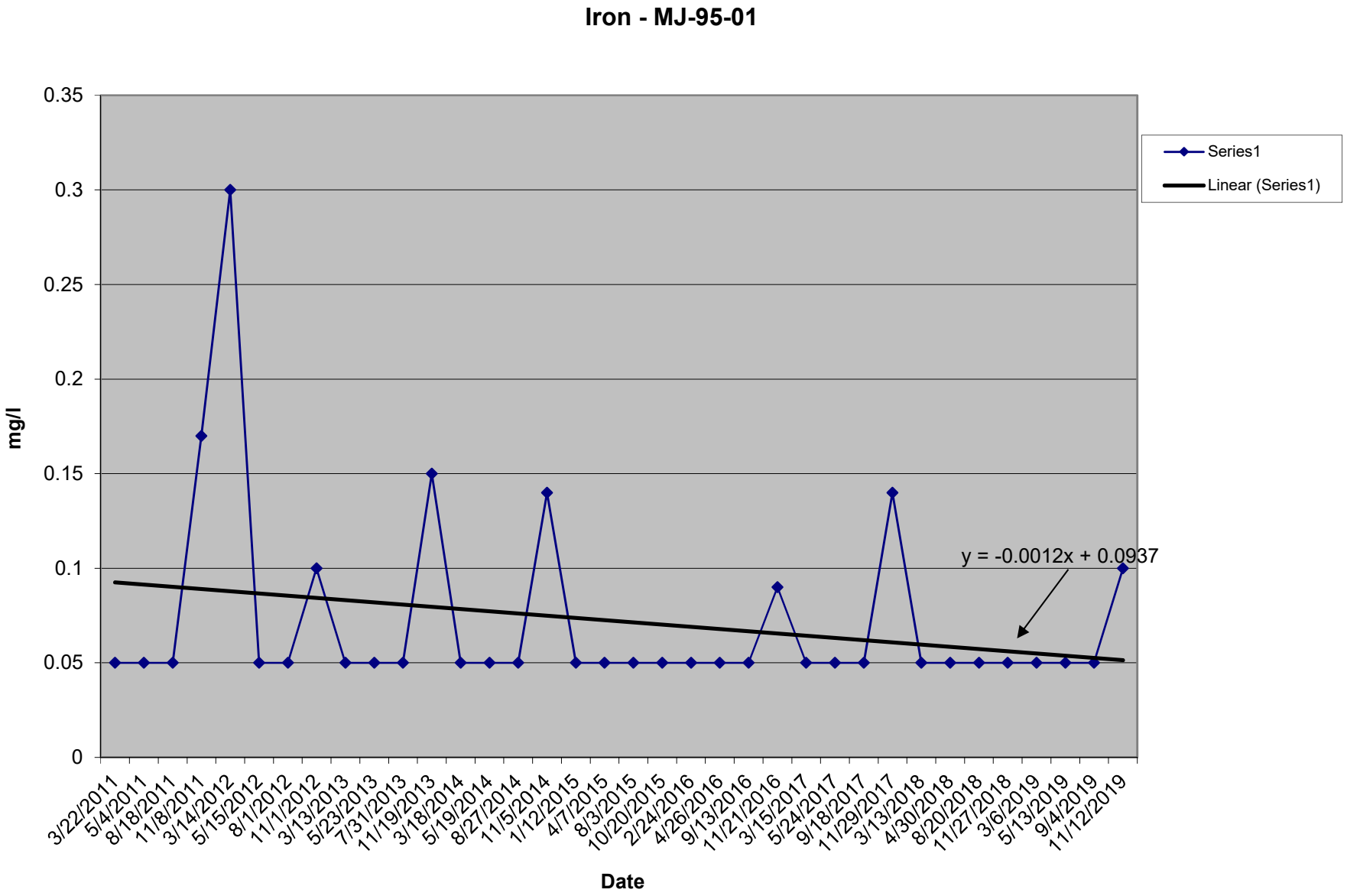
MJ-95-01 Well


Sulfate - MJ-95-01
y = -0.494x + 255.92
mg/l
300
250
200
150
100
50
0
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MJ-95-01 Well

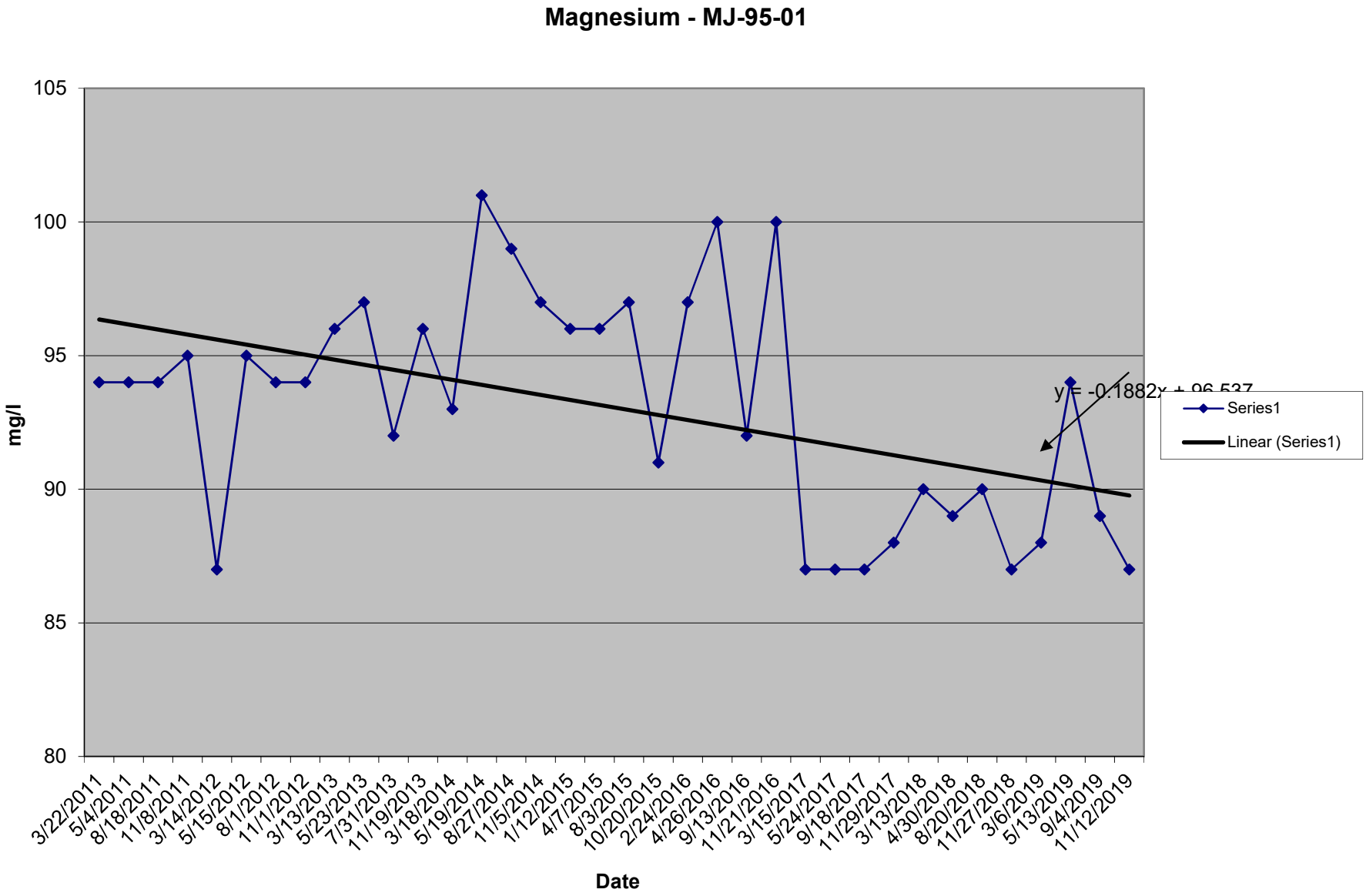

Calcium - MJ-95-01
mg/l
135
130
125
120
115
110
105
100
y = -0.1488x + 123.09
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MJ-95-01 Well

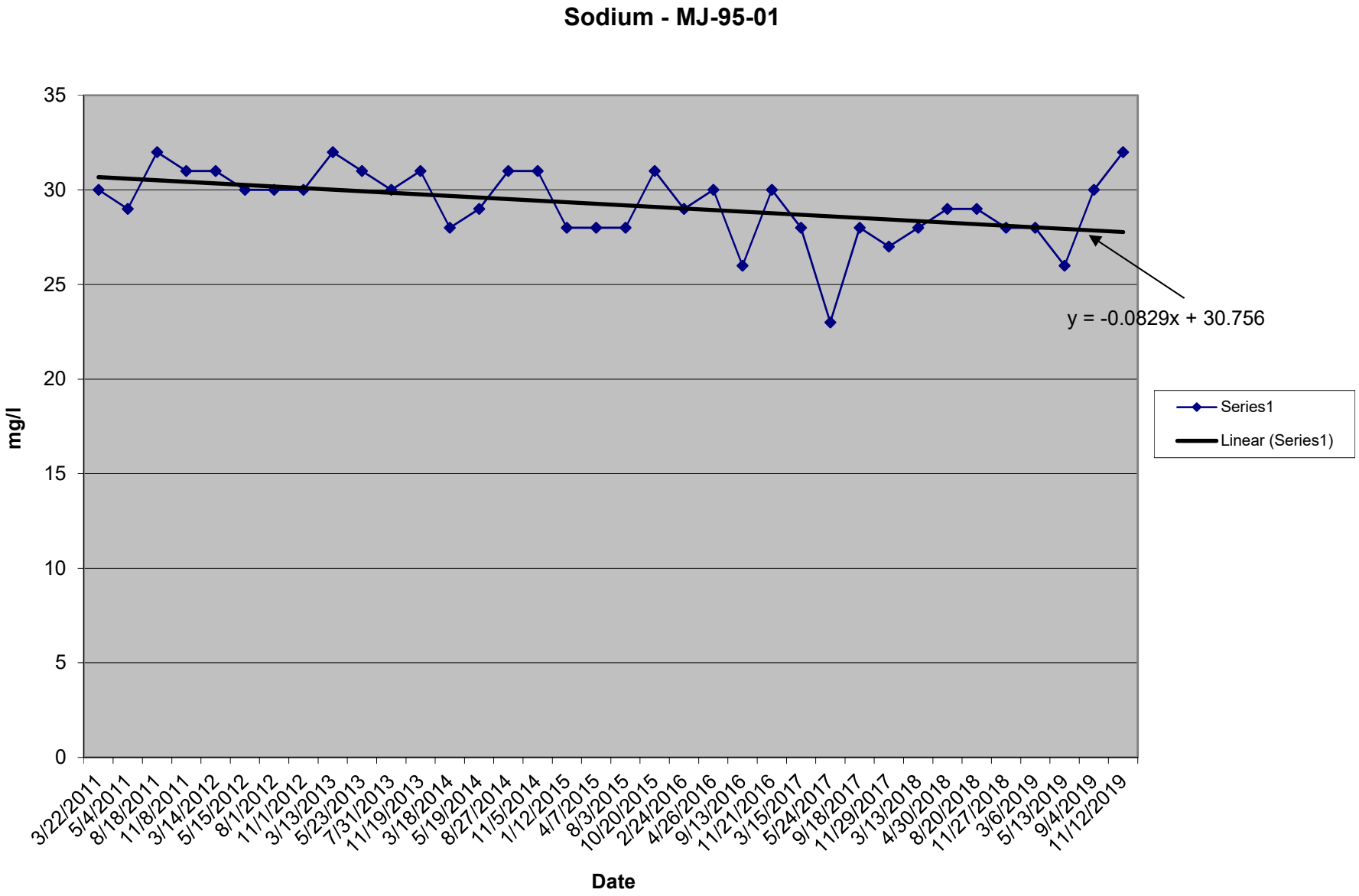

Iron - MJ-95-01
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
mg/l
Series1
Linear (Series1)
y = -0.0012x + 0.0937
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MJ-95-01 Well

Exhibit 1B



MJ-95-01 Well

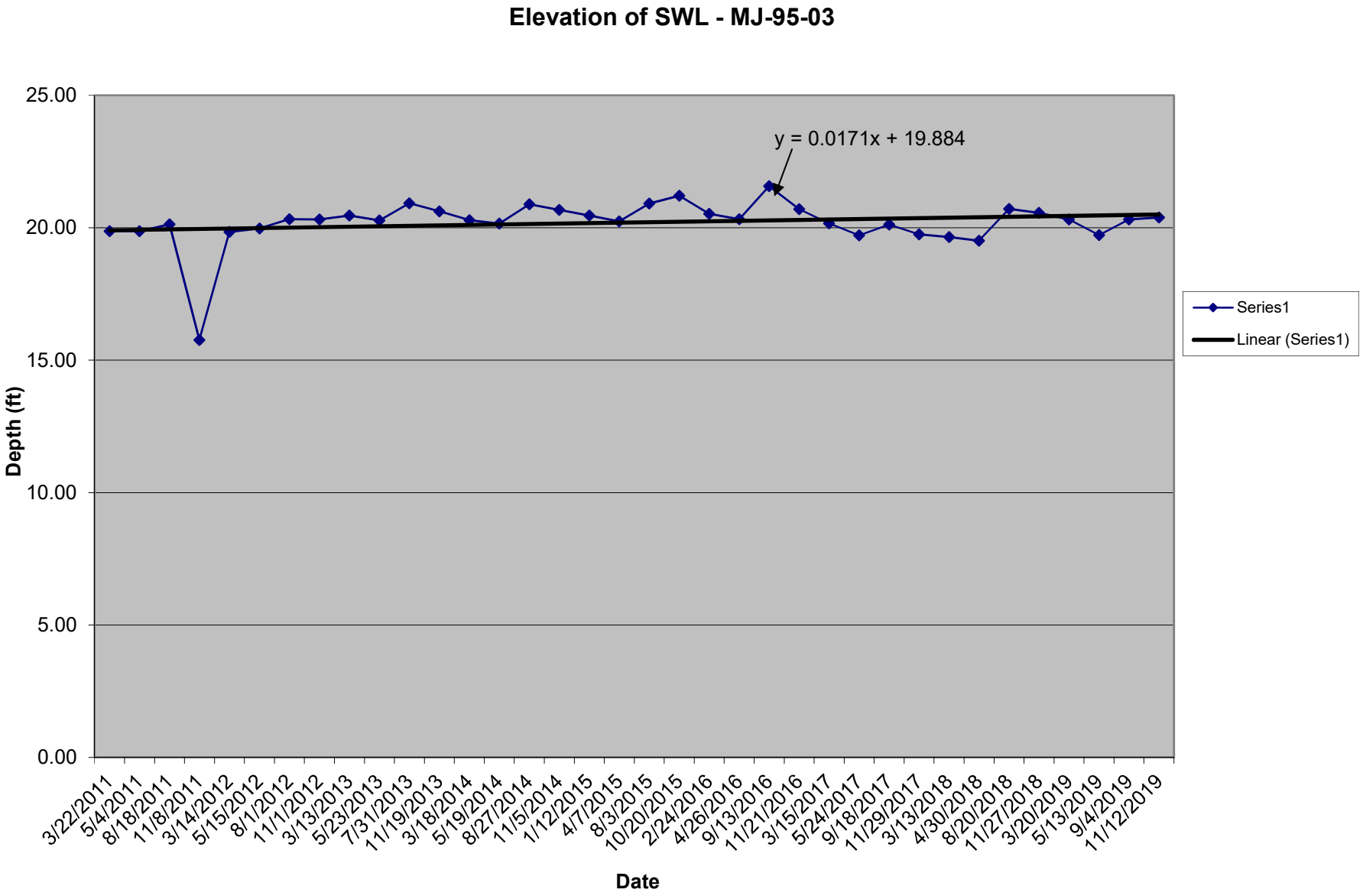

Sodium - MJ-95-01
35
30
25
20
15
10
5
0
mg/l
y = -0.0829x + 30.756
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MJ-95-01 Well

Exhibit 1B

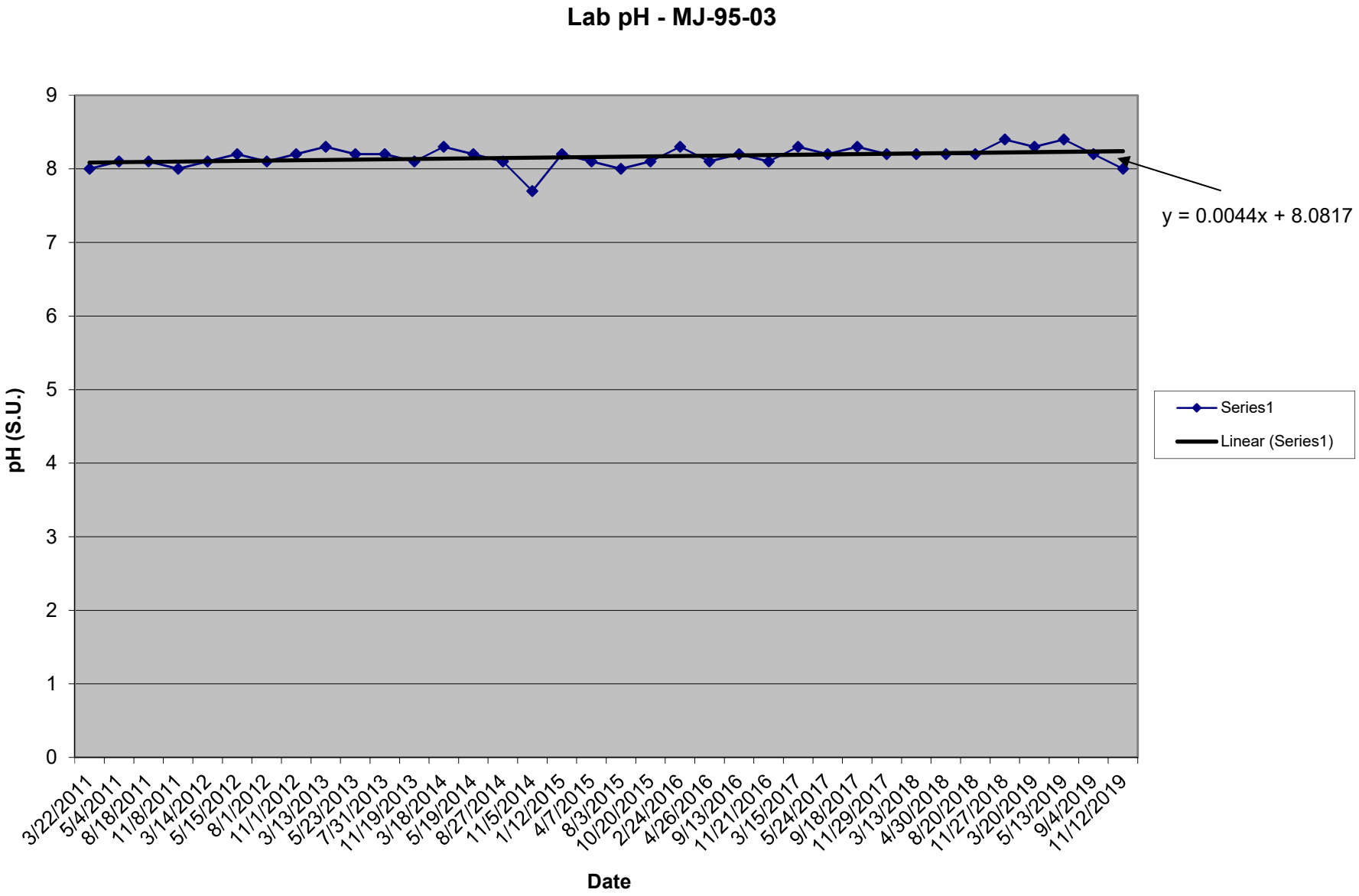
Colowyo Mine
Well MJ-95-03
Water Year 1/1/2019 - 12/31/19

	Sample Date			
	3/20/2019	5/13/2019	9/4/2019	11/12/2019
Elevation SWL, ft MSL	20.31	19.72	20.31	20.39
Field pH	7.26	7.34	7.45	7.48
Feld Temperature, °C	8.4	9.3	10.6	10.2
Field Conductivity, umhos/com	2160	2130	2520	2450
Lab pH		8.4		
Lab Conductivity, umhos/com		2050		
TDS, mg/l		1860		
Bicarbonate as HCO3, D, mg/l		718		
Ca, D, mg/l		152		
Mg, D, mg/l		197		
Ammonia NH3, TD, mg/l		0.5		
NO3 as N, mg/l		0.5		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		139		
Sulfate, D, mg/l		808		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.05		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.006		
Zn, TD, mg/l		0.05		

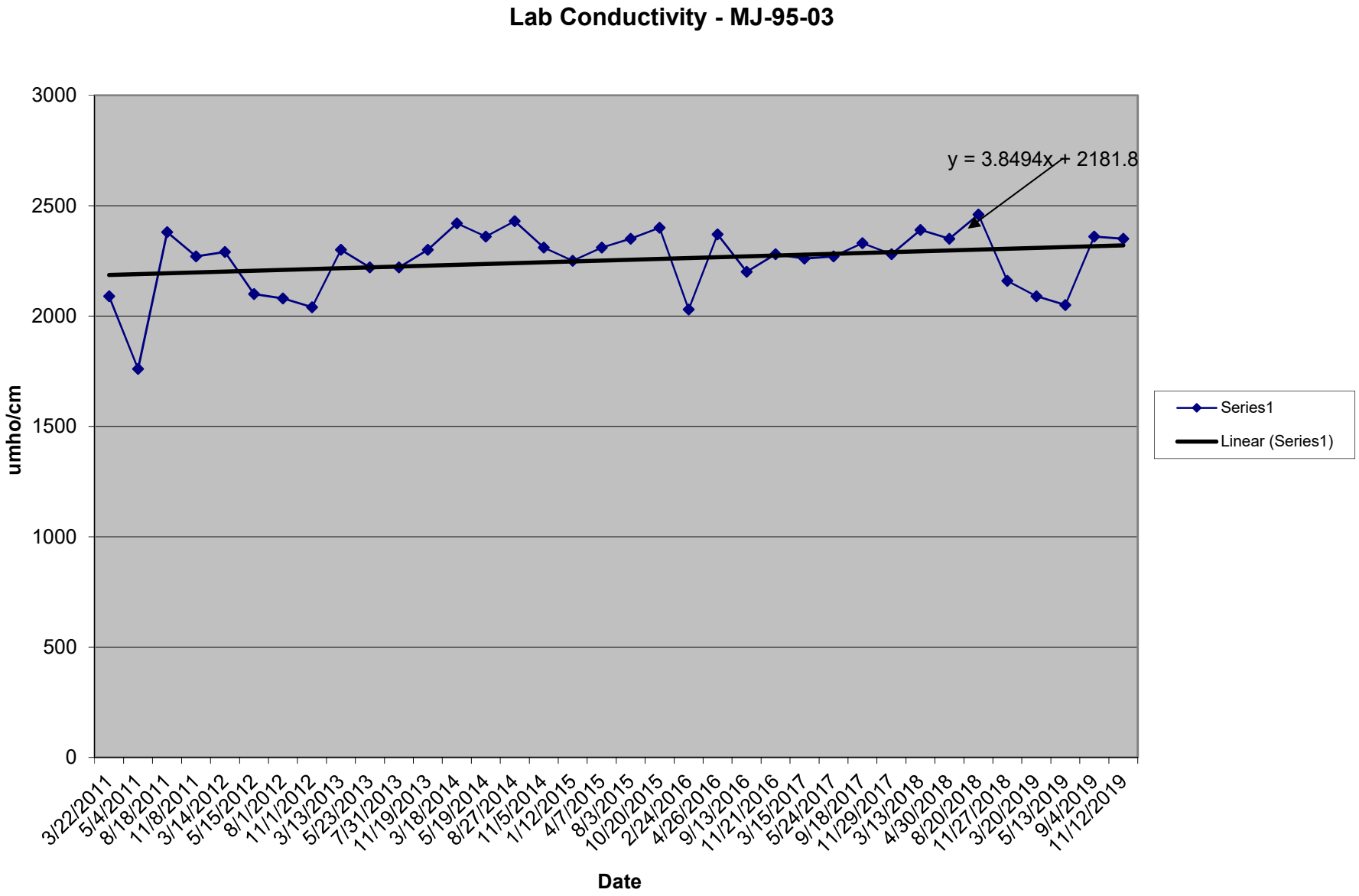

Elevation of SWL - MJ-95-03
y = 0.0171x + 19.884
25.00
20.00
15.00
10.00
5.00
0.00
Depth (ft)
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/20/2019
5/13/2019
9/4/2019
11/12/2019
Date

MJ-95-03 Well

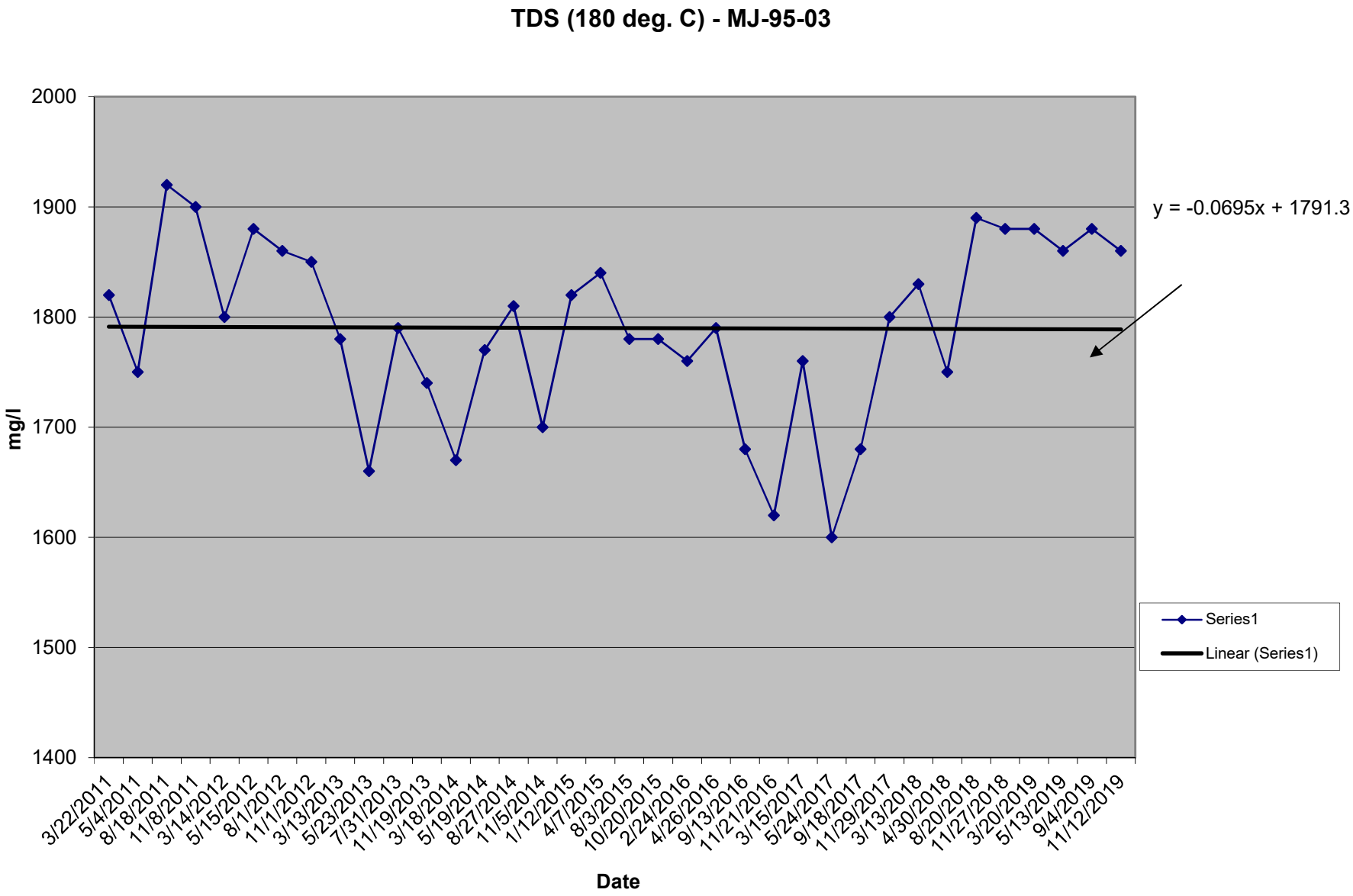
Exhibit 1B



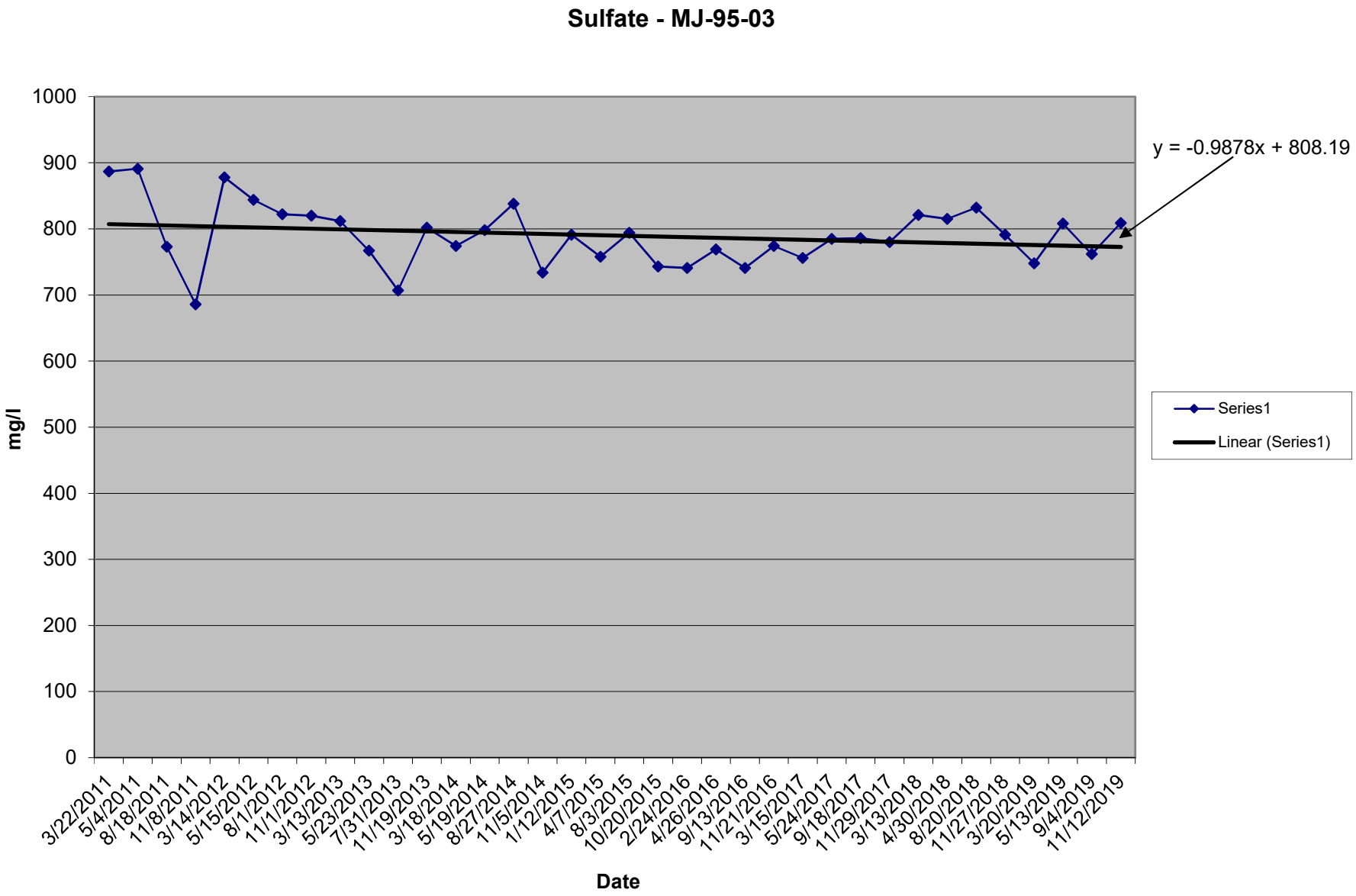
MJ-95-03 Well


Lab Conductivity - MJ-95-03
y = 3.8494x + 2181.8
umho/cm
3000
2500
2000
1500
1000
500
0
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/20/2019
5/13/2019
9/4/2019
11/12/2019
Date

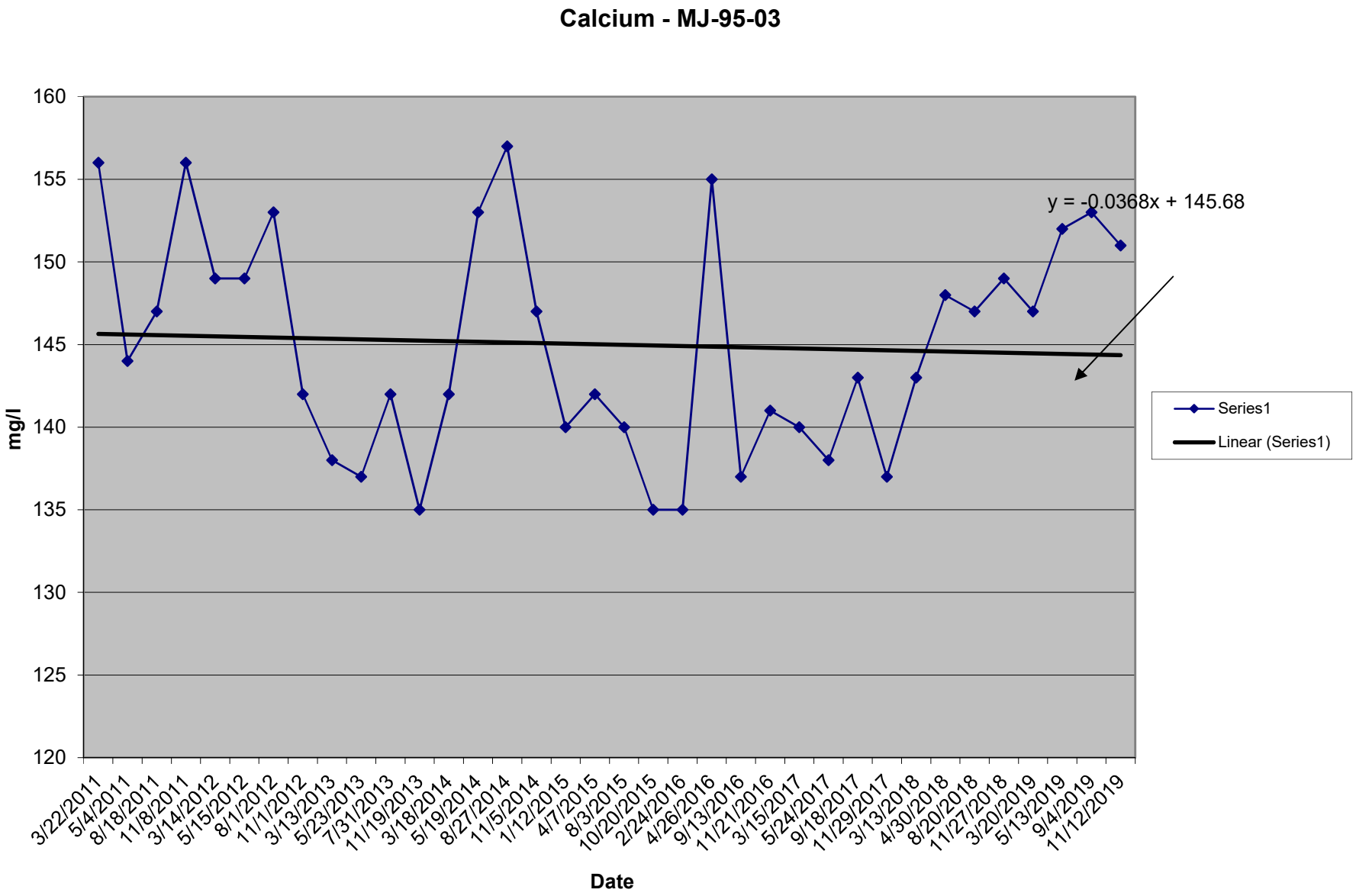
MJ-95-03 Well


TDS (180 deg. C) - MJ-95-03
2000
1900
1800
1700
1600
1500
1400
mg/l
y = -0.0695x + 1791.3
Series1
Linear (Series1)
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/20/2019
5/13/2019
9/4/2019
11/12/2019
Date

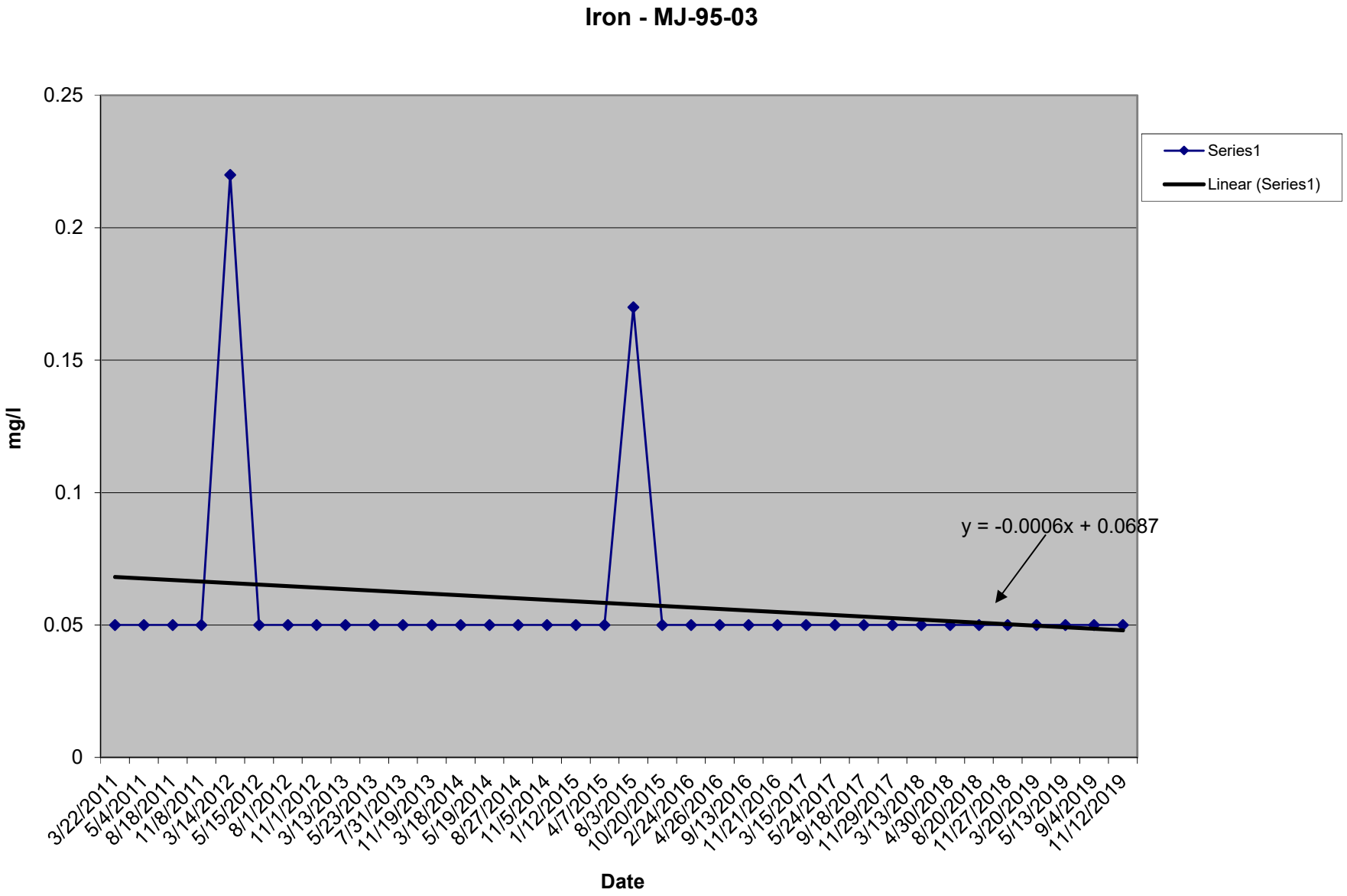
MJ-95-03 Well


Sulfate - MJ-95-03
y = -0.9878x + 808.19
mg/l
Date
Series1
Linear (Series1)
1000
900
800
700
600
500
400
300
200
100
0
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/20/2019
5/13/2019
9/4/2019
11/12/2019

MJ-95-03 Well

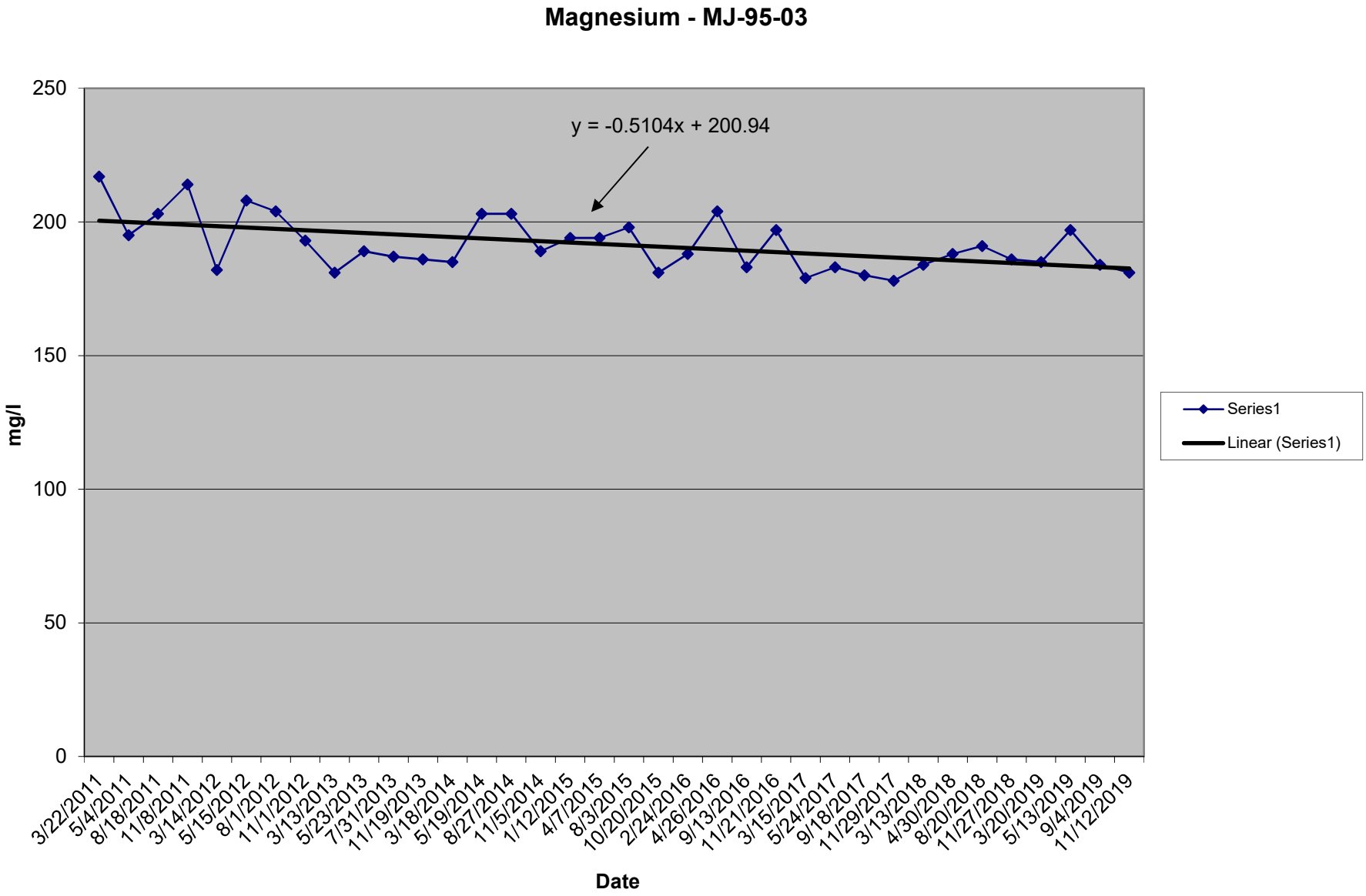

Calcium - MJ-95-03
y = -0.0368x + 145.68
mg/l
Date
Series1
Linear (Series1)
160
155
150
145
140
135
130
125
120
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/20/2019
5/13/2019
9/4/2019
11/12/2019

MJ-95-03 Well


Iron - MJ-95-03
0.25
0.2
0.15
0.1
0.05
0
mg/l
Series1
Linear (Series1)
y = -0.0006x + 0.0687
3/22/2011
5/4/2011
8/18/2011
11/8/2011
3/14/2012
5/15/2012
8/1/2012
11/1/2012
3/13/2013
5/23/2013
7/31/2013
11/19/2013
3/18/2014
5/19/2014
8/27/2014
11/5/2014
1/12/2015
4/7/2015
8/3/2015
10/20/2015
2/24/2016
4/26/2016
9/13/2016
11/21/2016
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/20/2019
5/13/2019
9/4/2019
11/12/2019
Date

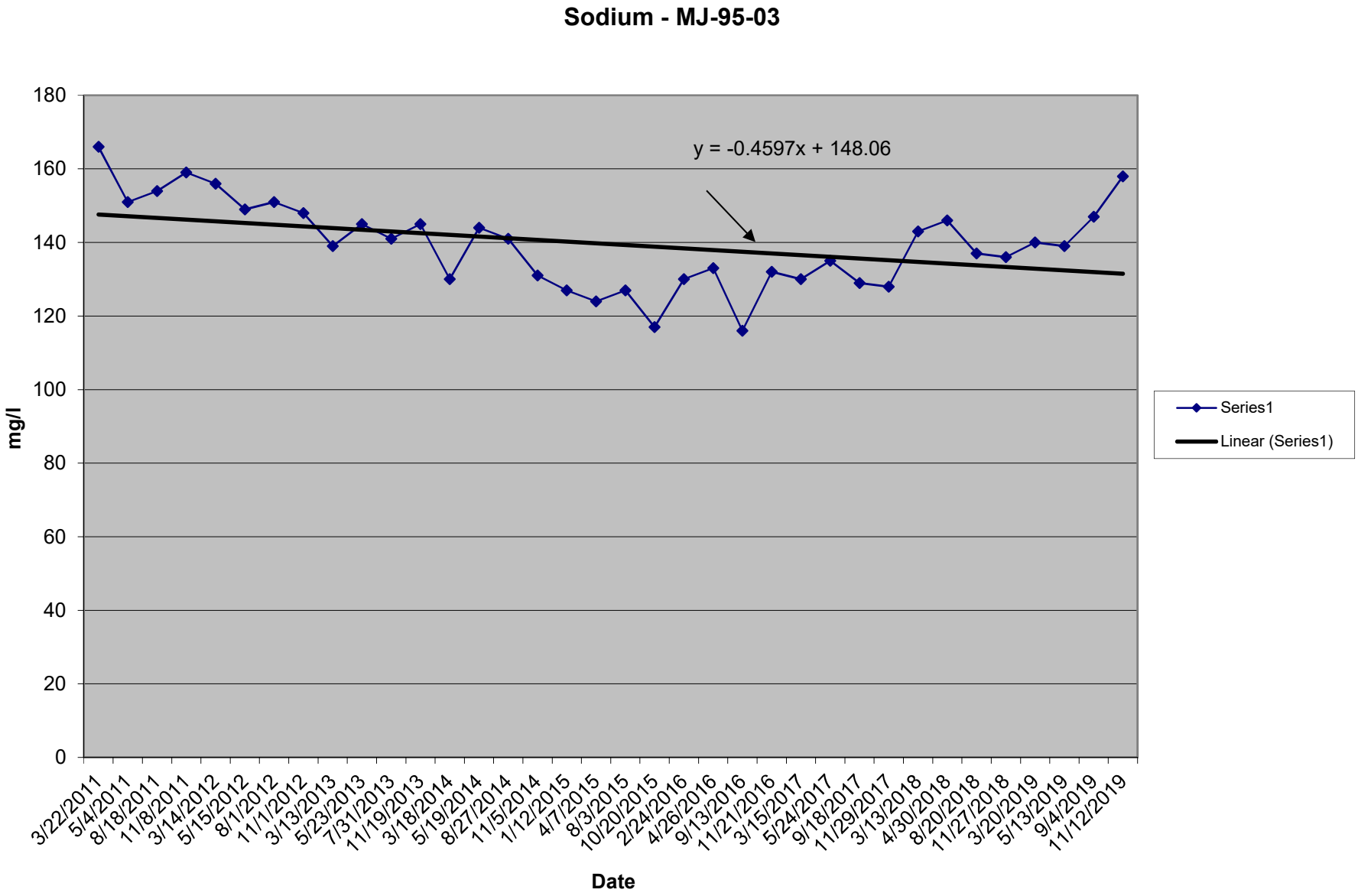
MJ-95-03 Well

Exhibit 1B



MJ-95-03 Well

Exhibit 1B

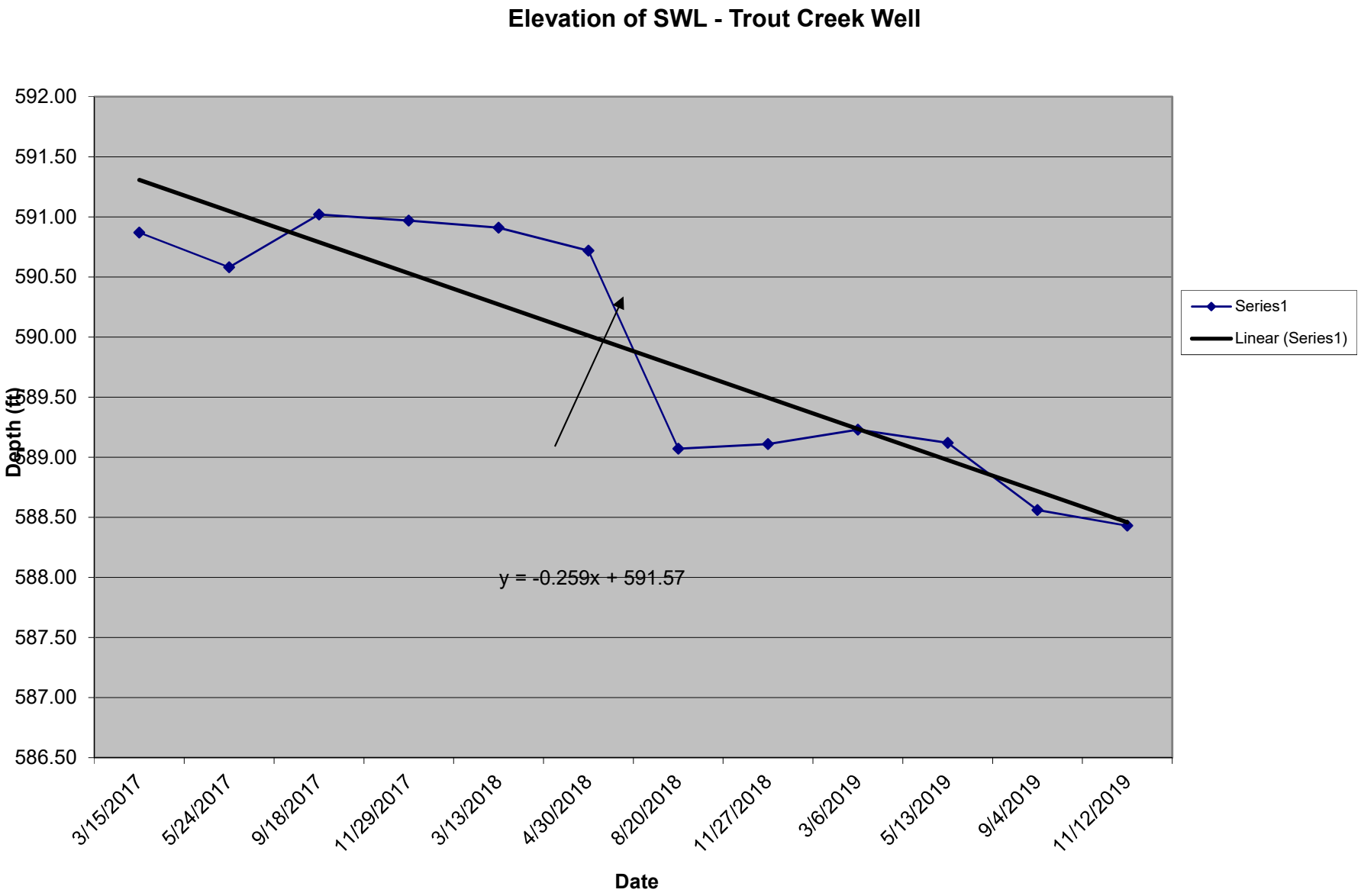


MJ-95-03 Well

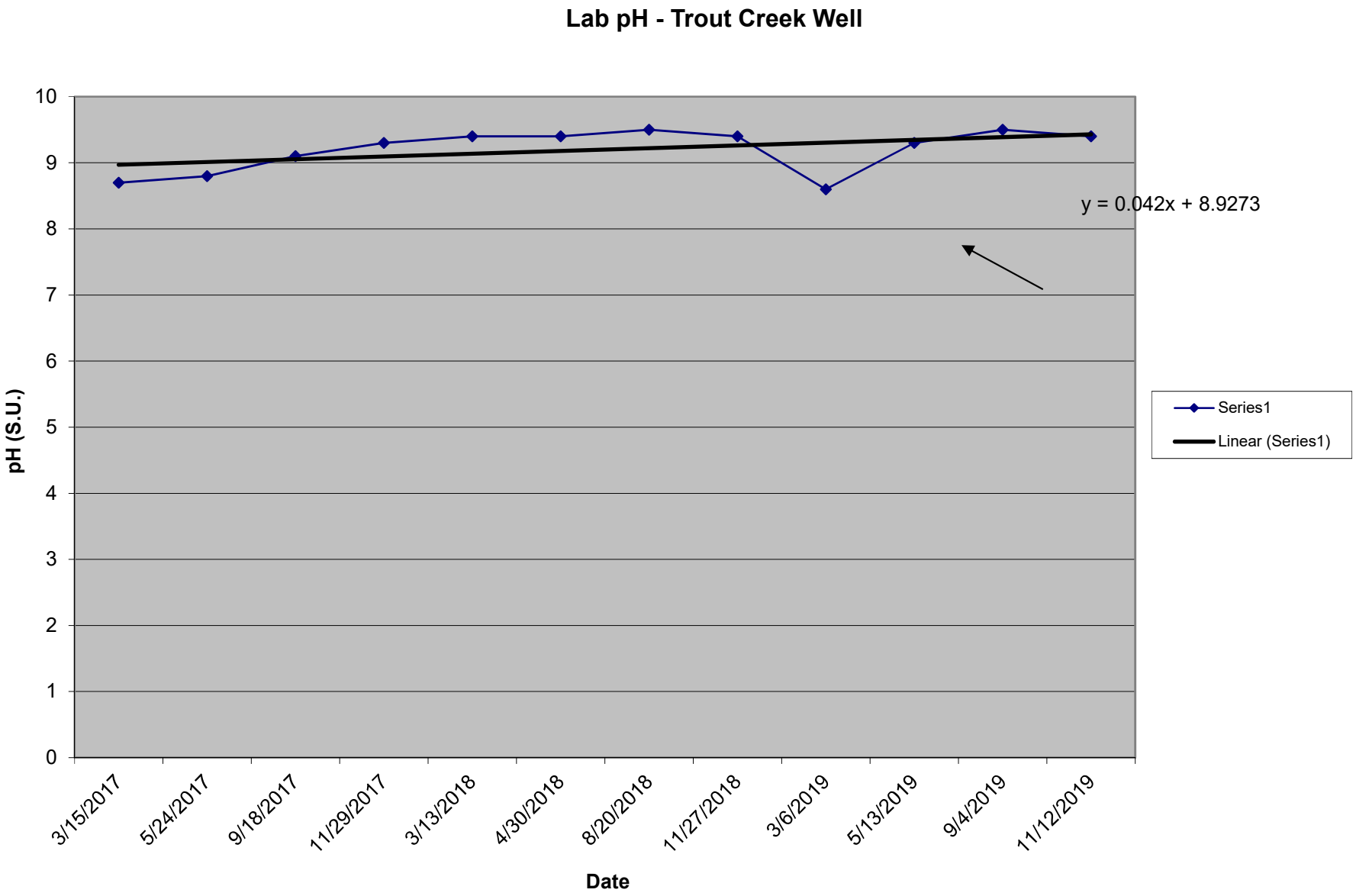
Exhibit 1B

Colowyo Mine
Trout Creek Well
Water Year 1/1/2019 - 12/31/19

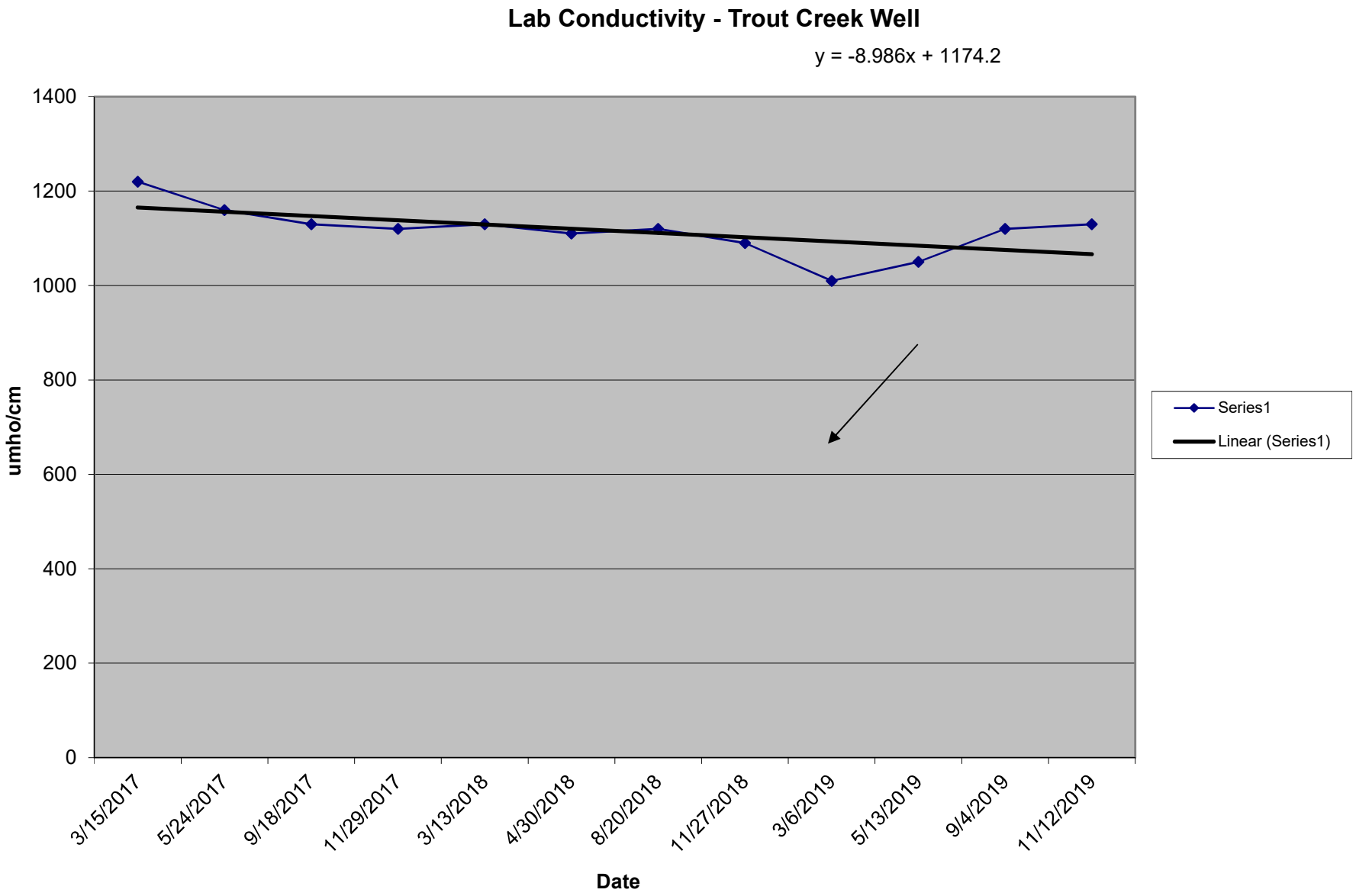
	Sample Date			
	3/6/2019	5/13/2019	9/4/2019	11/12/2019
Elevation SWL, ft MSL	589.23	589.12	588.56	588.43
Field pH	9.12	9.06	9.57	9.58
Feld Temperature, °C	8.9	9.8	12.4	8.2
Field Conductivity, umhos/com	1130	1080	1200	1180
Lab pH		9.3		
Lab Conductivity, umhos/com		1050		
TDS, mg/l		670		
Bicarbonate as HCO3, D, mg/l		258		
Ca, D, mg/l		5		
Mg, D, mg/l		21		
Ammonia NH3, TD, mg/l		2.3		
NO3 as N, mg/l		0.1		
Ortho PO4 as P, mg/l		0.1		
Na, D, mg/l		208		
Sulfate, D, mg/l		219		
As, TD, mg/l		0.003		
Fe, TD, mg/l		0.06		
Pb, TD, mg/l		0.2		
Mn, TD, mg/l		0.03		
Hg, TD, mg/l		0.001		
Se, TD, mg/l		0.005		
Zn, TD, mg/l		0.05		


Elevation of SWL - Trout Creek Well
592.00
591.50
591.00
590.50
590.00
589.50
589.00
588.50
588.00
587.50
587.00
586.50
Depth (ft)
y = -0.259x + 591.57
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

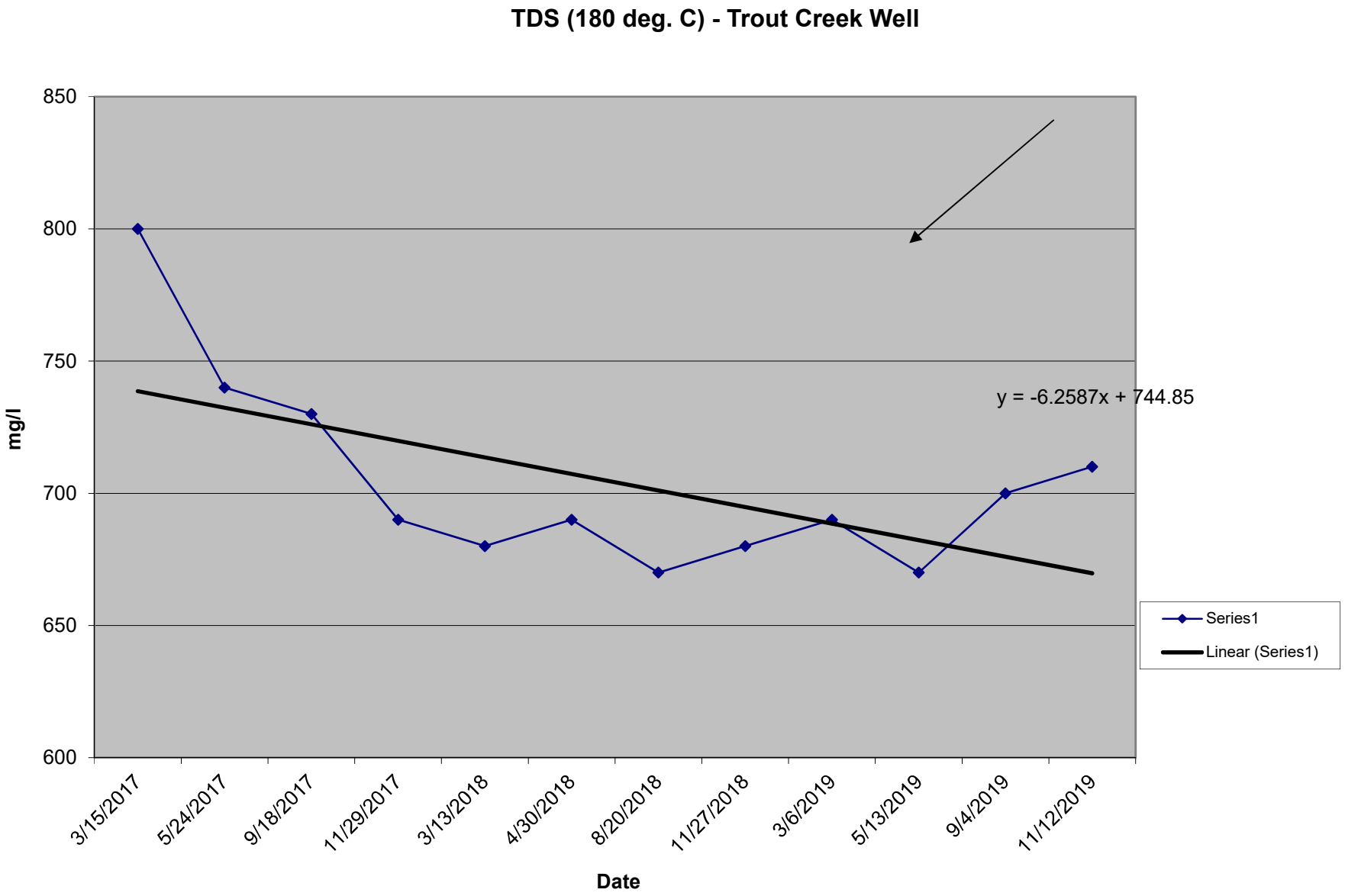
MC-04-02 Well


Lab pH - Trout Creek Well
10
9
8
7
6
5
4
3
2
1
0
pH (S.U.)
y = 0.042x + 8.9273
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

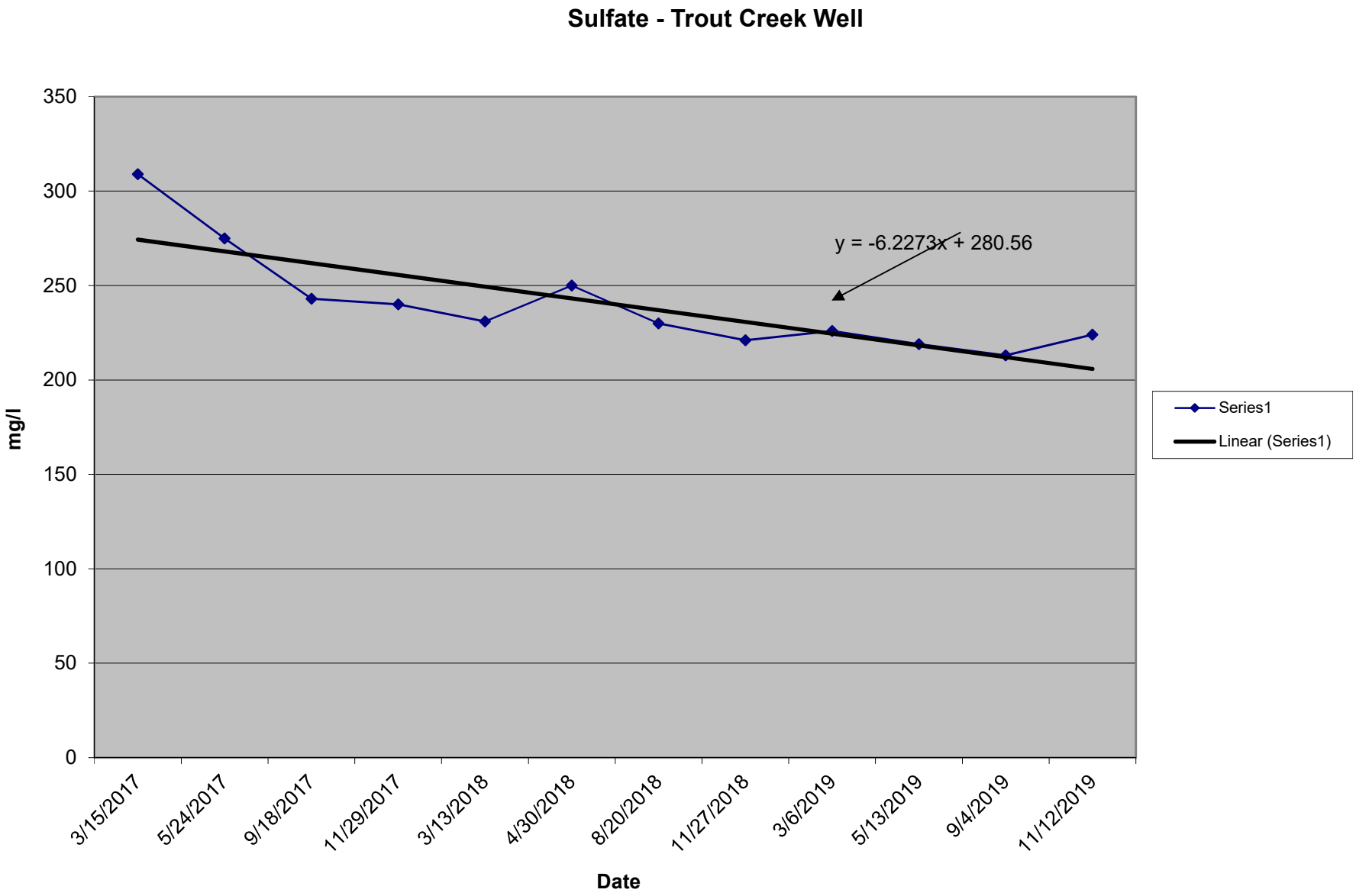
MC-04-02 Well


Lab Conductivity - Trout Creek Well
y = -8.986x + 1174.2
1400
1200
1000
800
600
400
200
0
umho/cm
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date
Series1
Linear (Series1)

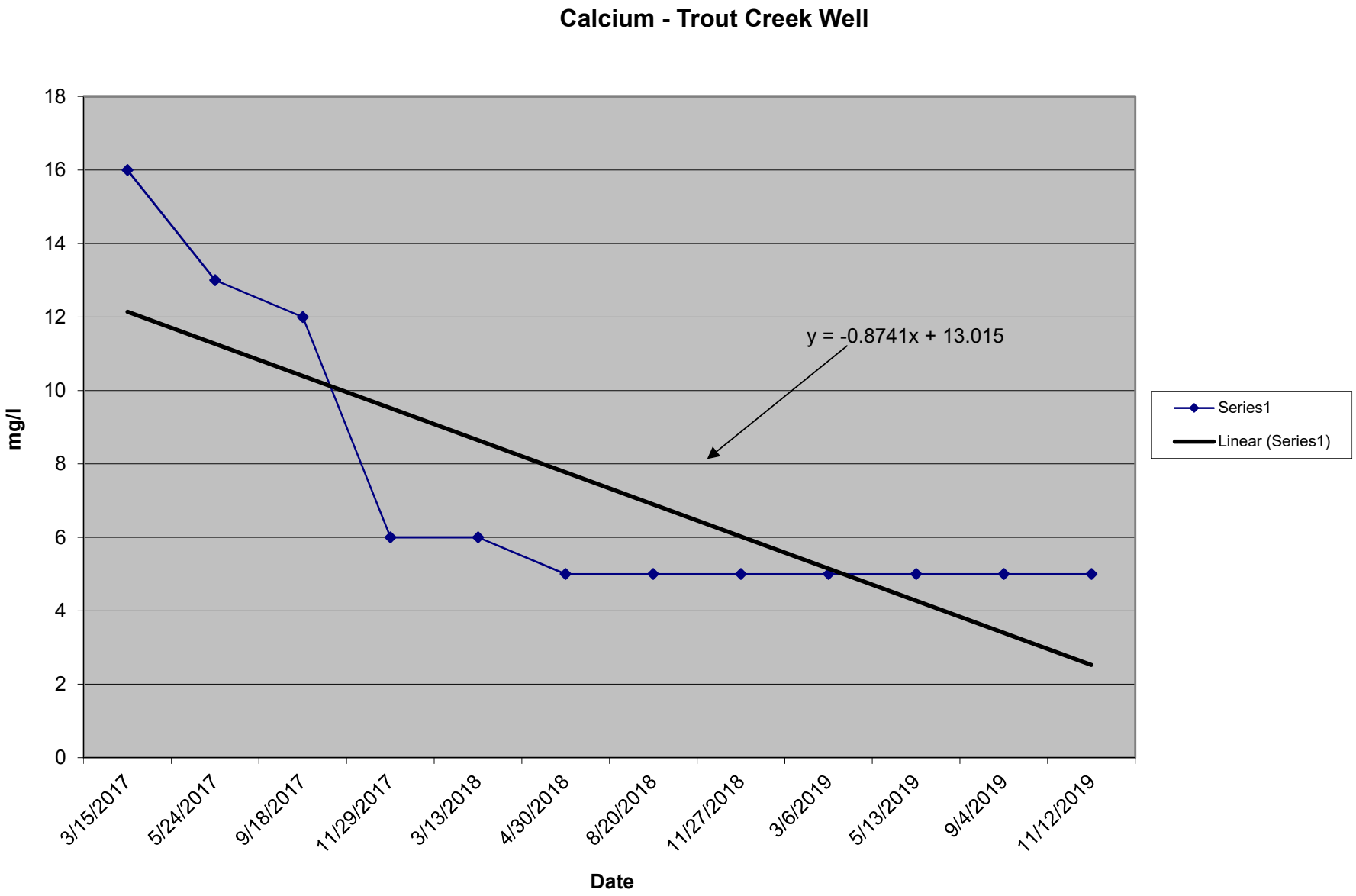
MC-04-02 Well


TDS (180 deg. C) - Trout Creek Well
850
800
750
700
650
600
mg/l
y = -6.2587x + 744.85
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

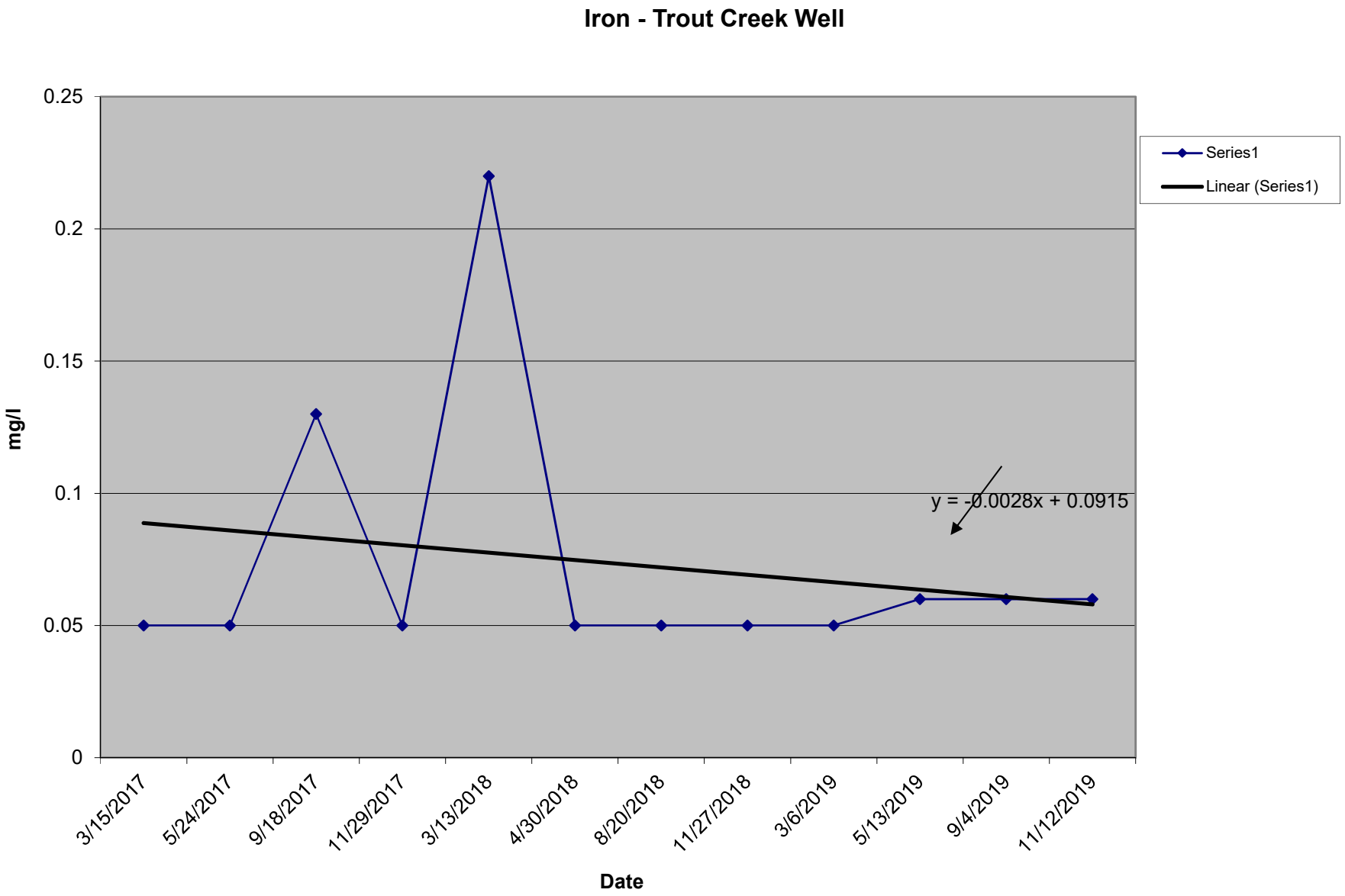
MC-04-02 Well


Sulfate - Trout Creek Well
350
300
250
200
150
100
50
0
mg/l
y = -6.2273x + 280.56
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

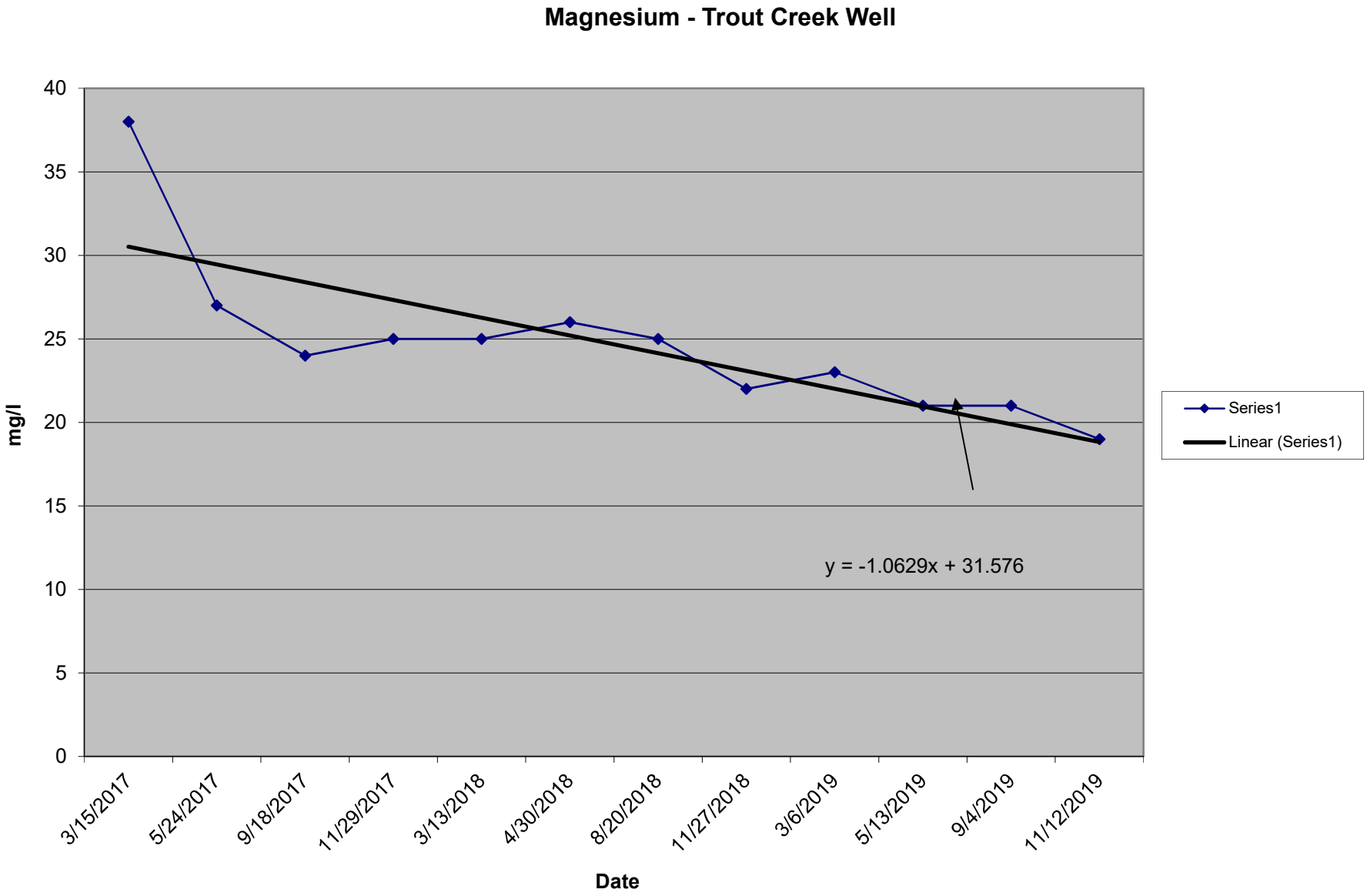
MC-04-02 Well


Calcium - Trout Creek Well
mg/l
18
16
14
12
10
8
6
4
2
0
y = -0.8741x + 13.015
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

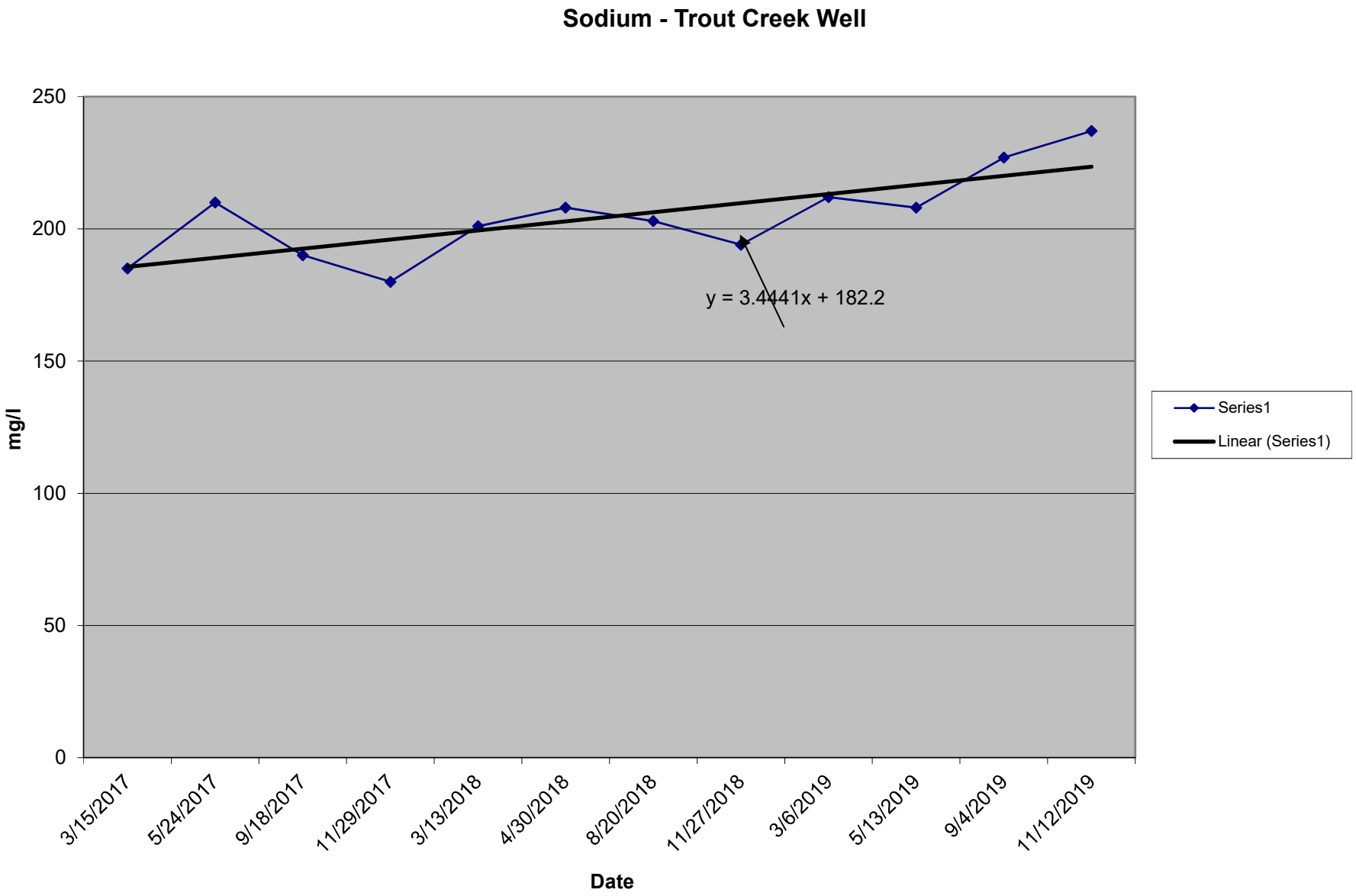
MC-04-02 Well


Iron - Trout Creek Well
0.25
0.2
0.15
0.1
0.05
0
mg/l
y = -0.0028x + 0.0915
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-02 Well


Magnesium - Trout Creek Well
mg/l
40
35
30
25
20
15
10
5
0
y = -1.0629x + 31.576
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-02 Well


Sodium - Trout Creek Well
250
200
150
100
50
0
mg/l
y = 3.4441x + 182.2
Series1
Linear (Series1)
3/15/2017
5/24/2017
9/18/2017
11/29/2017
3/13/2018
4/30/2018
8/20/2018
11/27/2018
3/6/2019
5/13/2019
9/4/2019
11/12/2019
Date

MC-04-02 Well

SECTION 2 – CDRMS ARR FORM AND SUPPORT DOCUMENTS

RULE REQUIREMENT

Rule 2.04.13(1) (a-f)

2.04.13(1) by April 1, or other such date as agreed on, each permittee shall file an annual reclamation report covering the previous calendar year for all areas under bond. The report shall include, but not be limited to, text, discussion and maps which address:

- the name and address of the permittee and permit number
- location and number of acres disturbed during that year
- location and number of acres backfilled and graded during that year
- location and number of acres topsoiled during that year
- the species, location and number of acres of vegetation planted during that year, including any augmented seeding or cultural practices
- location, number of acres and date of planting for all previously re-vegetated areas

PERMITTEE

Colowyo Coal Company L.P.
5731 State Highway 13
Meeker, CO 81647

DISTURBED ACRES

During 2019, 95.5 acres of additional disturbance occurred onsite.

At the end of 2019, the total disturbance was 6,043.3 acres. Of this, 1,106.7 acres are in long-term facilities, and the active mining area comprised of 1,6019.8 acres.

Please see Map 1 for the locations of these areas, and Figure 2-1 for a more detail description of the disturbance acres for the report year.

BACKFILLAND GRADED ACRES

During 2019, 84.7 acres were backfilled and graded. To date, 3,147.9 acres have been backfilled and graded. Please see Map 1 for the locations of all areas that have been backfilled and graded to date.

TOPSOIL REPLACEMENT & SEEDING ACRES

During 2019, 64.9 acres were topsoiled, and 64.9 acres were permanently seeded. Please see Map 1 for the locations that were topsoiled and seeded, and Figure 2-2 for more detailed description of the reclamation acres at Colowyo. Colowyo did not conduct any augmented seeding in 2019.

The species of plants seeded on Colowyo's reclamation areas follow the approved seed mixtures located in Volume 1, 12, and 15. Figure 2-3 provides the species that were planted in 2019.

Figure 2-1 – Completed Annual Reclamation Report Form

Colorado Division of Reclamation, Mining and Safety

Annual Reclamation Report for Calendar Year – 2019

Colowyo Mine	C-1981-019	Colowyo Coal Company L.P.
Mine Name	Permit Number	Permittee

5731 State Highway 13 Meeker, CO 81641
Address

This report, required by Rule 2.04.13, is due by February 15 of each year, or other date, as agreed upon by the Division. It should include text, discussion, and maps, at a minimum, in addition to any other reclamation monitoring data as required by the approved permit. The location of the acreage reported under each land status category and year of seeding (if applicable) should be clearly identified on a map included with the report.

Land Category	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
Acreage in Active Mining Areas[1]	1,684.1	10.4	84.7	=	1,609.8

Land Category	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
Acres Disturbed[2]	5,947.8	95.5	0	=	6,043.3
Acres Backfilled and Graded	3,063.2	84.7	0	=	3,147.9
Acres Topsoiled	2,907.8	64.9	0	=	2,972.7

Acreage in Long-term Facilities[3]	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
Non-Permanent Facilities	1,012.2	85.6	0	=	1,097.8
Permanent Facilities (permitted)	0	8.9	0	=	8.9
Totals	1,012.2			=	1,106.7

Acres Seeded (permanent)	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
9 Years and Less	1,192.8	0	28.3	=	1,164.5
10 Years and Greater	234.9	0	146.4	=	88.5
Totals	1,427.7			=	1,253.0

Bond Release	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
Phase I Released	2,734.1	77.2	0	=	2,811.3
Phase II Released	2,225.2	92.2	0	=	2,317.9
Phase III Released	1,587.0	8.9	0	=	1,595.9

[1]Includes pits, topsoil stripped areas in advance of pits, and spoil not backfilled and graded
[2]Surface Mine Acres Disturbed = B&G + Long-Term Facilities + Active Mining Areas; Underground Mine Acres Disturbed = B&G + Long-Term Facilities; Separately-permitted Loadouts = B&G + Long-Term Facilities
[3]Includes haul, access and light-use roads, temporary dams and impoundments; permanent dams and impoundments; diversion and collector ditches, water and air monitoring sites; topsoil stockpiles; overburden stockpiles; repair, storage and construction areas; office area, repair shops, and parking; coal stockpiles, loading, and processing areas; railroads; coal conveyors; refuse piles and coal mine waste impoundments; head-of-hollow fills; valley fills; ventilation shafts and entryways; and non-coal waste disposal area (garbage dumps and coal combustion by-products disposal areas).

Figure 2-2 – Colowyo Reclamation Table

Colowyo Reclamation Table

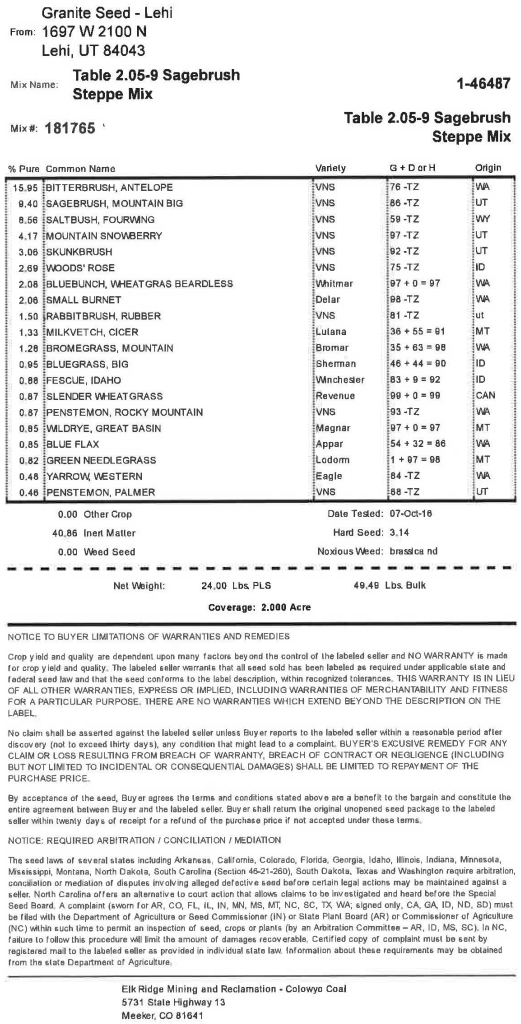
Area	Reclamation Period		Status							Notes:
	Year	Acreage	Revegetated Years	Bond Release Phase 1	Bond Release Phase 2	Bond Release Phase 3	Reclaimed (Seeded)	Topsoiled	Backfilled & Graded	
East Pit										
EP001	1978	11.0	41	Sep-87	Sep-87	Aug-12	11.0	11.0	11.0	Phase III Released
EP002	1979	7.5	40	Sep-87	Sep-87	Aug-12	7.5	7.5	7.5	Phase III Released
EP003	1980	4.9	39	Sep-87	Sep-87	Aug-12	4.9	4.9	4.9	Phase III Released
EP004	1982	19.8	37	Sep-87	Sep-87	Aug-12	19.8	19.8	19.8	Phase III Released
EP005	1983	20.2	36	Sep-87	Sep-87	Aug-12	20.2	20.2	20.2	Phase III Released
EP006	1984	21.6	35	Sep-87	Sep-87	Aug-12	21.6	21.6	21.6	Phase III Released
EP007	1985	89.0	34	Sep-87	Sep-87	Aug-12	89.0	89.0	89.0	Phase III Released
EP008	1986	50.0	33	Sep-87	Aug-01	Aug-12	50.0	50.0	50.0	Phase III Released
EP009	1987	50.0	32	Apr-98	Aug-01	Aug-12	50.0	50.0	50.0	Phase III Released
EP010	1988	46.0	31	Apr-98	Aug-01	Aug-12	46.0	46.0	46.0	Phase III Released
EP011	1989	50.0	30	Apr-98	Aug-01	Aug-12	50.0	50.0	50.0	Phase III Released
EP012	1990	8.2	29	Apr-98	Aug-01	Aug-12	8.2	8.2	8.2	Phase III Released
EP013	1990	30.0	29	Apr-98	Aug-01	Aug-12	30.0	30.0	30.0	Phase III Released
EP014	1991	24.3	28	Apr-98	Aug-01	Aug-12	24.3	24.3	24.3	Phase III Released
EP015	1991	43.7	28	Apr-98	Aug-01	Aug-12	43.7	43.7	43.7	Phase III Released
EP016	1991	58.4	28	Apr-98	Aug-01	Aug-12	58.4	58.4	58.4	Phase III Released
EP017	1992	26.5	27	Apr-98	Aug-01	Aug-12	26.5	26.5	26.5	Phase III Released
EP018	1992	20.0	27	Apr-98	Aug-01	Aug-12	20.0	20.0	20.0	Phase III Released
EP019	1992	5.8	27	Apr-98	Aug-01	Aug-12	5.8	5.8	5.8	Phase III Released
EP020	1993	27.0	26	Apr-98	Aug-01	Aug-12	27.0	27.0	27.0	Phase III Released
EP021	1993	27.0	26	Apr-98	Aug-01	Aug-12	27.0	27.0	27.0	Phase III Released
EP022	1994	6.0	25	Apr-98	Aug-01	Aug-12	6.0	6.0	6.0	Phase III Released
EP023	1994	8.0	25	Apr-98	Aug-01	Aug-12	8.0	8.0	8.0	Phase III Released
EP024	1994	22.0	25	Apr-98	Aug-01	Aug-12	22.0	22.0	22.0	Phase III Released
EP025	1994	54.0	25	Apr-98	Aug-01	Aug-12	54.0	54.0	54.0	Phase III Released
EP026	1995	20.0	24	Apr-98	Aug-01	Aug-12	20.0	20.0	20.0	Phase III Released
EP027	1995	13.0	24	Apr-98	Aug-01	Aug-12	13.0	13.0	13.0	Phase III Released
EP028	1996	17.0	23	Jun-11	Jun-11	Aug-12	17.0	17.0	17.0	Phase III Released
EP029	1996	16.0	23	Jun-11	Jun-11	Aug-12	16.0	16.0	16.0	Phase III Released
EP030	1997	17.0	22	Jun-11	Jun-11	Aug-12	17.0	17.0	17.0	Phase III Released
EP031	1997	48.0	22	Jun-11	Jun-11	Aug-12	48.0	48.0	48.0	Phase III Released
EP032	1998	21.0	21	Jun-11	Jun-11	Aug-12	21.0	21.0	21.0	Phase III Released
EP033	1998	12.0	21	Jun-11	Jun-11	Aug-12	12.0	12.0	12.0	Phase III Released
EP034	1999	6.9	20	Jun-11	Jun-11	Aug-12	6.9	6.9	6.9	Phase III Released
EP035	1999	30.6	20	Jun-11	Jun-11	Aug-12	30.6	30.6	30.6	Phase III Released
EP036	2000	67.8	19	Jun-11	Jun-11	Feb-17	67.8	67.8	67.8	Phase III Released
EP037	2002	21.7	17	Jun-11	Jun-11	Feb-17	21.7	21.7	21.7	Phase III Released
EP038	2001	4.1	18	Jun-11	Jun-11	Feb-17	4.1	4.1	4.1	Phase III Released
EP039	2003	4.1	16	Jun-11	Jun-11	Feb-17	4.1	4.1	4.1	Phase III Released
EP040	2003	10.3	16	Jun-11	Jun-11	Feb-17	10.3	10.3	10.3	Phase III Released
EP041	2003	6.3	16	Jun-11	Jun-11	Nov-18	6.3	6.3	6.3	Phase III Released
EP042	2002	20.5	17	Jun-11	Jun-11	Feb-17	20.5	20.5	20.5	Phase III Released
EP043	2002	13.7	17	Jun-11	Jun-11	Feb-17	13.7	13.7	13.7	Phase III Released
EP044	2003	24.6	16	Jun-11	Jun-11	Feb-17	24.6	24.6	24.6	Phase III Released
EP045	2003	0.0	16	Apr-12	Nov-18	Nov-18	0.0	7.2	7.2	Phase III Released
EP046	2005	96.7	14	Apr-12	Nov-18	Nov-18	96.7	96.7	96.7	Phase III Released
EP047	2005	0.0	14	Apr-12	Nov-18	Nov-18	0.0	1.9	1.9	Phase III Released
EP048	2005	0.0	14	Apr-12	Nov-18	Nov-18	0.0	3.0	3.0	Phase III Released
EP049	2005	0.0	14	Apr-12	Nov-18	Nov-18	0.0	4.0	4.0	Phase III Released
EP045	2006	7.2	13	Apr-12	Nov-18	Nov-18	7.2	0.0	0.0	Phase III Released
EP047	2006	1.9	13	Apr-12	Nov-18	Nov-18	1.9	0.0	0.0	Phase III Released
EP048	2006	3.0	13	Apr-12	Nov-18	Nov-18	3.0	0.0	0.0	Phase III Released
EP049	2006	4.0	13	Apr-12	Nov-18	Nov-18	4.0	0.0	0.0	Phase III Released
EP050	2006	0.0	13	Apr-12	Nov-18	Nov-18	0.0	26.1	26.1	Phase III Released
EP050	2007	85.6	12	Apr-12	Nov-18	Nov-18	85.6	59.5	59.5	Phase III Released
EP051	2009	32.0	10	Apr-12	Nov-18		32.0	32.0	32.0	8.0 ac Redisturbed in 2010 Reseeded in 2010.
EP052	2010	37.0	9	Apr-12	Nov-18		37.0	37.0	37.0	37.0 Acres Seeded in 2011
EP053	2010	17.4	9	Apr-12	Nov-18		17.4	17.4	17.4	17.4 Acres Seeded 2011
EP054	2010	17.4	9	Apr-12	Nov-18		17.4	17.4	17.4	
EP055	2010	8.8	9	Apr-12	Nov-18		8.8	8.8	8.8	Old R3 stockpile
EP056	2011	34.8	8	Apr-12			34.8	34.8	34.8	34.8 acres seeded as grassland
EP057	2012	70.7	7	Aug-13	Nov-18		62.7	62.7	70.7	1.6 ac regrade only, 62.7 topsoiled seeded
EP058	2014	33.4	5	Jan-16	Oct-19		33.4	33.4	33.4	33.8 acres seeded as grassland.
EP059	2016	48.9	3	Jan-18			30.9	30.9	48.9	30.9 acres seeded as grassland
EP060	2017	5.5	2	Aug-18			5.5	5.5	0.0	Redisturbance Topsoil Pile and Road No Backfill Sagebrush Steppe. 0.9 acres.
EP061	2018	14.5	1	Sep-19			14.5	14.5	0.0	All Regrade occurred with EP057 and EP059. Sagebrush Steppe 14.5 acres.
EP062	2019	7.0	0				7.0	7.0	7.0	Topsoil pile footprint reclaimed. 7.0 acres Sagebrush Steppe.
Grand Totals		**327.4**					**301.4**	**301.4**	**307.4**	Remove Phase III acreage from Grand Totals.
West Pit										
WP001	1995	6.2	24	Apr-98	Aug-01	Aug-12	6.2	6.2	6.2	Fully Phase III Released
WP002	1995	32.7	24	Apr-98	Aug-01	Aug-12	32.7	32.7	32.7	Fully Phase III Released
WP003	1995	7.0	24	Jun-11	Jun-11	Nov-18	7.0	7.0	7.0	Fully Phase III Released
WP004	1996	8.9	23	Jun-11	Jun-11	Nov-18	8.9	8.9	8.9	Fully Phase III Released
WP005	1997	6.1	22	Jun-11	Jun-11	Aug-12	6.1	6.1	6.1	Fully Phase III Released
WP006	1998	2.0	21	Jun-11	Jun-11	Aug-12	2.0	2.0	2.0	Fully Phase III Released
WP007	1999	7.9	20	Jun-11	Jun-11	Aug-12	7.9	7.9	7.9	Fully Phase III Released
WP008	2000	10.1	19	Jun-11	Jun-11	Feb-17	10.1	10.1	10.1	Fully Phase III Released
WP009	2001	0.5	18	Jun-11	Jun-11	Feb-17	0.5	0.5	0.5	Fully Phase III Released
WP010	2001	5.2	18	Jun-11			5.2	5.2	5.2	Not released under SL-04 for Phase II
WP011	2001	1.7	18	Jun-11	Jun-11	Feb-17	1.7	1.7	1.7	Fully Phase III Released
WP012	2002	0.0	17	Apr-12	Nov-18	Nov-18	0.0	4.0	4.0	Fully Phase III Released
WP013	2006	4.0	13	Apr-12	Nov-18	Nov-18	3.9	0.0	0.0	Fully Phase III Released
WP014	2009	47.3	10	Apr-12	Nov-18		51.3	51.3	51.3	6 Acres Redisturbed in 2010 Reseeded in 2010. Moved 4.4 acres to WP019.
WP015	2010	94.0	9	Apr-12	Nov-18		94.0	94.0	127.2	69.7 acres re-seeded in 2013/1.6 acres moved to WP023/23.3 acres moved to WP025 in 2017. Moved 9.9 acres to WP015.
WP016	2011	146.1	8	Apr-12	Nov-18		132.2	132.2	146.1	34.1 Acres Seeded in 2012/17.7 acres regraded 2011/3.7 acres moved to WP023
WP017	2013	12.6	6	Apr-12	Nov-18		12.6	12.6	12.6	12.6 ac Grassland - Regraded in 2011/Seeded in 2013
WP018	2013	31.2	6	Aug-13	Nov-18		31.2	31.2	31.2	24.1 ac Grassland/7.1 Sagebrush Steppe
WP019	2013	35.9	6	Jan-16	Nov-18		22.1	22.1	22.1	1.5 ac Sagebrush Steppe/20.6 acres Grassland - Added 4.0 acres from WP014 and 9.9 acres from WP015. WP014 acreage was seeded in 2009 and WP015 acreage was seeded in 2010.
WP020	2013	95.8	6	Jan-16	Nov-18		95.8	95.8	95.8	9.2 acres Grassland/86.6 Sagebrush Steppe
WP021	2015	75.4	4	Sep-16			74.9	74.9	75.4	2.1 acres regrade only - 74.9 acres Grassland/15.2 acres moved to unit WP023
WP022	2016	0.5	3	Aug-18			0.5	0.0	0.0	This was surface disturbance only or an access road. No topsoil stripping or regrade occurred. Planted with Sagebrush Steppe.
WP023	2016	105.4	3	Jan-18			105.4	105.4	107.1	103.9 acres seeded as grassland.
WP024	2017	98.2	2	Aug-18			17.3	17.3	98.2	17.3 acres seeded as Sagebrush Steppe
WP025	2017	23.3	2	Apr-12			23.3	23.3	0.0	Originally part of WP015 Topsoiled 23.3 acres seeded as Sagebrush Steppe.
WP026	2018	54.2	1	Aug-18			54.2	54.2	1.8	52.4 acres regraded in 2017.
WP027	2018	17.8	1	Aug-18			17.8	17.8	0.0	17.8 acres regrade occurred in 2017.
WP028	2018	17.9	1	Sep-19			17.9	17.9	15.3	2.6 acres regraded in 2017.
WP029	2018	38.2	1	Sep-19			38.2	38.2	32.6	5.6 acres regraded in 2017.
WP030	2019	12.1	0				12.1	12.1	12.1	12.1 Acres Sagebrush Steppe - Reclaimed Topsoil pile footprint.
WP031	2019	46.8	0				45.8	45.8	66.6	13.3 acres Sagebrush Steppe - 32.5 acres Grassland
Grand Totals		**956.9**					**851.8**	**851.3**	**904.6**	Remove Phase III acreage from Grand Totals.
Section 16 Pit										
16002	1993	6.2	26	Jun-11	Jan-18	Jan-18	6.2	6.2	6.2	Phase III Released
16003	1993	25.9	26	Apr-98	Aug-01	Jan-18	25.9	25.9	25.9	Phase III Released
16005	1994	3.9	25	Jun-11	Jan-18	Jan-18	3.9	3.9	3.9	Phase III Released

Figure 2-2 – Colowyo Reclamation Table Continued

Colowyo Reclamation Table

Area	Reclamation Period		Status							
	Year	Acreage	Revegetated Years	Bond Release Phase 1	Bond Release Phase 2	Bond Release Phase 3	Reclaimed (Seeded)	Topsoiled	Backfilled & Graded	Notes:
16006	1994	50.5	25	Apr-98	Aug-01	Jan-18	50.5	50.5	50.5	Phase III Released
16008	1995	41.2	24	Apr-98	Aug-01	Jan-18	41.2	41.2	41.2	Phase III Released
16009	1996	1.3	23	Jun-11	Jan-18	Jan-18	1.3	1.3	1.3	Phase III Released
16010	1996	10.0	23	Jun-11	Jun-11	Jan-18	10.0	10.0	10.0	Phase III Released
16011	1997	6.2	22	Jun-11	Jan-18	Jan-18	6.2	6.2	6.2	Phase III Released
16012	1997	2.0	22	Jun-11	Jan-18	Jan-18	2.0	2.0	2.0	Phase III Released
16013	1997	3.2	22	Jun-11	Jan-18	Jan-18	3.2	3.2	3.2	Phase III Released
16014	1998	7.4	21	Jun-11	Jun-11	Jan-18	7.4	7.4	7.4	Phase III Released
16015	1998	2.0	21	Jun-11	Jan-18	Jan-18	2.0	2.0	2.0	Phase III Released
16016	1999	22.7	20	Jun-11	Jan-18	Jan-18	22.7	22.7	22.7	Phase III Released
Grand Totals		**182.5**					**182.5**	**182.5**	**182.5**	
South Taylor Pit										
ST001	2011	46.1	8	Jan-16			46.1	46.1	46.1	Only 44.8 acres Phase I released in 2016-19.1 ac Sagebrush Steep/3.3 acres study area/23.7 ac Grassland
ST002	2012	6.3	7	Aug-13	Oct-19		6.3	6.3	6.3	6.3 Grassland acres seeded in 2012
ST003	2013	1.2	6	Jan-16	Oct-19		1.2	1.2	1.2	1.2 acres Grassland
ST004	2014	12.2	5	Jan-16			12.2	12.2	12.2	Only 4.5 acres Phase I released in 2016 - 12.2 acres Grassland
ST005	2016	1.4	3	Aug-18			1.4	0.0	0.0	Wildland Fire Area no backfill and grading occurred or topsoil stripping
Grand Totals		**67.2**					**67.2**	**65.8**	**65.8**	
Gossard Loadout/Facilities Areas										
GF01	2016	3.4	3	Aug-18			3.4	3.4	3.4	Lower Admin Building - 3.4 acres Sagebrush Steppe
GF02	2016	0.2	3				0.2	0.0	0.0	This was surface disturbance only. Seeded sagebrush steppe.
GF03	2017	17.7	2				17.7	17.7	17.7	This was the raw water pipeline. Seeded sagebrush steppe.
GF04	2017	10.4	2				10.4	10.4	10.4	
Grand Total		**31.7**					**31.7**	**31.5**	**31.5**	
Collom										
C01	2016	0.3	3	Aug-18			0.3	0.0	0.0	This was brushing only. Seeded sagebrush steppe. Previous total was 0.4 acres. 0.1 acres redisturbed in 2017.
C02	2016	0.2	3	Aug-18			0.2	0.0	0.0	This was brushing only. Seeded sagebrush steppe.
C03	2016	0.1	3				0.1	0.0	0.0	This was brushing only. Seeded sagebrush steppe. Previous total was 0.3 acres. 0.2 acres redisturbed in 2017.
C04	2016	0.2	3				0.2	0.0	0.0	This was brushing only. Seeded sagebrush steppe.
C05	2016	0.1	3	Aug-18			0.1	0.0	0.0	This was brushing only. Seeded sagebrush steppe.
Grand Total		**0.9**					**0.9**	**0.0**	**0.0**	

Figure 2-3 - Copies of Seed Tags



Granite Seed - Lehi
From: 1697 W 2100 N
Lehi, UT 84043

Mix Name: **Table 2.05-9 Sagebrush Steppe Mix** **1-46487**

Mix #: **181765** **Table 2.05-9 Sagebrush Steppe Mix**

% Pure	Common Name	Variety	G + D or H	Origin
15.95	BITTERBRUSH, ANTELOPE	VNS	76 -TZ	WA
9.40	SAGEBRUSH, MOUNTAIN BIG	VNS	86 -TZ	UT
8.56	SALTBUSH, FOURWING	VNS	59 -TZ	WY
4.17	MOUNTAIN SNOWBERRY	VNS	97 -TZ	UT
3.06	SKUNKBRUSH	VNS	92 -TZ	UT
2.69	WOODS' ROSE	VNS	75 -TZ	ID
2.08	BLUEBUNCH, WHEATGRAS BEARDLESS	Whitmar	97 + 0 = 97	WA
2.06	SMALL BURNET	Delar	98 -TZ	WA
1.50	RABBITBRUSH, RUBBER	VNS	81 -TZ	ut
1.33	MILKVETCH, CICER	Lutana	36 + 55 = 91	MT
1.28	BROMEGRASS, MOUNTAIN	Bromar	35 + 63 = 98	WA
0.95	BLUEGRASS, BIG	Sherman	46 + 44 = 90	ID
0.88	FESCUE, IDAHO	Winchester	83 + 9 = 92	ID
0.87	SLENDER WHEATGRASS	Revenue	99 + 0 = 99	CAN
0.87	PENSTEMON, ROCKY MOUNTAIN	VNS	93 -TZ	WA
0.85	WILDRYE, GREAT BASIN	Magnar	97 + 0 = 97	MT
0.85	BLUE FLAX	Appar	54 + 32 = 86	WA
0.82	GREEN NEEDLEGRASS	Lodorm	1 + 97 = 98	MT
0.48	YARROW, WESTERN	Eagle	84 -TZ	WA
0.46	PENSTEMON, PALMER	VNS	88 -TZ	UT

0.00 Other Crop — Date Tested: 07-Oct-16
40.86 Inert Matter — Hard Seed: 3.14
0.00 Weed Seed — Noxious Weed: brassica nd

Net Weight: 24.00 Lbs. PLS 49.49 Lbs. Bulk

Coverage: 2.000 Acre

NOTICE TO BUYER LIMITATIONS OF WARRANTIES AND REMEDIES

Crop yield and quality are dependent upon many factors beyond the control of the labeled seller and NO WARRANTY is made for crop yield and quality. The labeled seller warrants that all seed sold has been labeled as required under applicable state and federal seed law and that the seed conforms to the label description, within recognized tolerances. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE LABEL.

No claim shall be asserted against the labeled seller unless Buyer reports to the labeled seller within a reasonable period after discovery (not to exceed thirty days), any condition that might lead to a complaint. BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM OR LOSS RESULTING FROM BREACH OF WARRANTY, BREACH OF CONTRACT OR NEGLIGENCE (INCLUDING BUT NOT LIMITED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES) SHALL BE LIMITED TO REPAYMENT OF THE PURCHASE PRICE.

By acceptance of the seed, Buyer agrees the terms and conditions stated above are a benefit to the bargain and constitute the entire agreement between Buyer and the labeled seller. Buyer shall return the original unopened seed package to the labeled seller within twenty days of receipt for a refund of the purchase price if not accepted under these terms.

NOTICE: REQUIRED ARBITRATION / CONCILIATION / MEDIATION

The seed laws of several states including Arkansas, California, Colorado, Florida, Georgia, Idaho, Illinois, Indiana, Minnesota, Mississippi, Montana, North Dakota, South Carolina (Section 46-21-260), South Dakota, Texas and Washington require arbitration, conciliation or mediation of disputes involving alleged defective seed before certain legal actions may be maintained against a seller. North Carolina offers an alternative to court action that allows claims to be investigated and heard before the Special Seed Board. A complaint (sworn for AR, CO, FL, IL, IN, MN, MS, MT, NC, SC, TX WA; signed only, CA, GA, ID, ND, SD) must be filed with the Department of Agriculture or Seed Commissioner (IN) or State Plant Board (AR) or Commissioner of Agriculture (NC) within such time to permit an inspection of seed, crops or plants (by an Arbitration Committee – AR, ID, MS, SC). In NC, failure to follow this procedure will limit the amount of damages recoverable. Certified copy of complaint must be sent by registered mail to the labeled seller as provided in individual state law. Information about these requirements may be obtained from the state Department of Agriculture.

Elk Ridge Mining and Reclamation - Colowyo Coal
5731 State Highway 13
Meeker, CO 81641

Figure 2-3 - Copies of Seed Tags - Continued

Granite Seed - Lehi
From: 1697 W 2100 N
Lehi, UT 84043

Mix Name: **Table 2.05-7 Grassland** **1-46485**

Mix #: **181763** **Table 2.05-7 Grassland**

% Pure	Common Name	Variety	G + D or H	Origin
22.69	SALTBUSH, FOURWING	Natrona	59 -TZ	WY
11.70	BLUEBUNCH, WHEATGRAS BEARDLESS	Whitmar	97 + 0 = 97	WA
8.83	WESTERN WHEATGRASS	Rosana	96 -TZ	WA
7.31	THICKSPIKE WHEATGRASS	Critana	97 + 0 = 97	MT
5.97	BROMEGRASS, MOUNTAIN	Bromar	35 + 63 = 98	WA
4.58	SLENDER WHEATGRASS	Revenue	99 + 0 = 99	CAN
4.34	GREEN NEEDLEGRASS	Lodorm	1 + 97 = 98	MT
3.30	SAGEBRUSH, MOUNTAIN BIG	VNS	86 -TZ	UT
2.99	WILDRYE, GREAT BASIN	Magnar	97 + 0 = 97	MT
2.95	FESCUE, IDAHO	Winchester	97 + 0 = 97	OR
2.86	SKUNKBRUSH	VNS	92 -TZ	UT
1.87	MILKVETCH, CICER	Lutana	36 + 55 = 91	MT
1.52	PENSTEMON, ROCKY MOUNTAIN	VNS	93 -TZ	WA
1.49	BLUE FLAX	Appar	54 + 32 = 86	WA
1.49	MOUNTAIN SNOWBERRY	VNS	95 -TZ	UT
0.68	YARROW, WESTERN	Eagle	84 -TZ	WA

0.01 Other Crop
14.60 Inert Matter
0.01 Weed Seed

Date Tested: 03-Nov-16
Hard Seed: 9.52
Noxious Weed: brassica nd

Net Weight: 24.00 Lbs. PLS 35.28 Lbs. Bulk

Coverage: 2.000 Acre

NOTICE TO BUYER LIMITATIONS OF WARRANTIES AND REMEDIES

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No claim shall be asserted against the labeled seller unless Buyer reports to the labeled seller within a reasonable period after discovery (not to exceed thirty days), any condition that might lead to a complaint. BUYER'S EXCLUSIVE REMEDY FOR ANY CLAIM OR LOSS RESULTING FROM BREACH OF WARRANTY, BREACH OF CONTRACT OR NEGLIGENCE (INCLUDING BUT NOT LIMITED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES) SHALL BE LIMITED TO REPAYMENT OF THE PURCHASE PRICE.

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Elk Ridge Mining and Reclamation - Colowyo Coal
5731 State Highway 13
Meeker, CO 81641

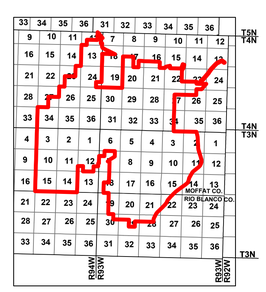
LEGEND

- PERMIT BOUNDARY
- DISTURBANCE BOUNDARY
- POST-MINE CHANNELS CONSTRUCTED TO DATE
- SHRUB ESTABLISHMENT AREA
- VALLEY FILL MONITOR WELL
- ROADS
- RECLAMATION AREAS
- REGRADE AREAS
- 2019 DISTURBANCE AREAS
- STOCK POND OR SEDIMENT POND

N W E S

0 2000' 4000'

CONTOUR INTERVAL 25 FT.
PREMINE TOPO



ANNUAL REPORT MAP
Colowyo Mine

Colowyo Coal Company
3731 State Highway 13
Meeker, Colorado 81641

SCALE: 1" = 1500'
DATE: 1/13/2020
DWG. BY: Tony
APPROVED BY:

DWG NO.
EXHIBIT 2

No.	REVISION	DATE	BY	CHK
4	Revised Reclaim Areas, Ditch Construction, Updated Topo	2/16/16	Tony	Kurt
5	Revised Reclaim Areas, Ditch Construction, Updated Topo	2/16/17	Tony	AA
6	Revised Reclaim Areas, Ditch Construction, Updated Topo	2/9/18	Tony	AA
7	Revised Reclaim Areas, Ditch Construction, Updated Topo, Consolidated to one map	1/11/19	Tony	AA

SECTION 3 – REGRADED OVERBURDEN SAMPLING

RULE REQUIREMENT

Rule 2.04.13(2) the Permittee may provide additional monitoring information as required by the approved permit.

Specific overburden sample suspect levels can be referenced in Volume 1 Section 2.05.3.

GENERAL DISCUSSION

Colowyo sampled eight locations of regraded overburden during 2019. During 2019, no sample results exceeded parameter thresholds. Please see Figure 3-1 for analytical results for all samples taken in 2019.

Figure 3-1 – Regraded Overburden Analytical Results

GRID #	DATE	EC (mmhos/cm)	pH	SAR
AA-19	30-Sep-19	2.64	6.70	1.21
BB-19	30-Sep-19	2.43	7.00	0.63
CC-19	30-Sep-19	1.97	6.10	0.97
DD-19	14-Oct-19	0.88	7.9	1.82
DD-20	14-Oct-19	1.60	7.5	1.14
CC-20	29-Oct-19	1.48	7.1	1.44
EE-20	11-Nov-19	0.37	7.5	0.44
BB-21	12-Nov-19	1.57	7.5	1.04

SECTION 4 – INTERIM REVEGETATION MONITORING REPORT

RULE REQUIREMENT

Rule 2.04.13(2) the Permittee may provide additional monitoring information as required by the approved permit.

GENERAL DISCUSSION

The Interim Revegetation Monitoring Report can be found in Exhibit 4.

Colowyo Mine

Permit No. C-1981-019

2019 Revegetation Monitoring Report

February, 2020

CEDAR CREEK ASSOCIATES, INC.

Table of Contents

In-Text Maps, Tables, and Charts

Colowyo Mine

Permit Number: C-1981-019

2019 Revegetation Monitoring Report

Revegetation Units:			Reference Areas:
EP057	WP021	ST002	Mountain Shrub
EP060	WP024		Sagebrush
	WP025		

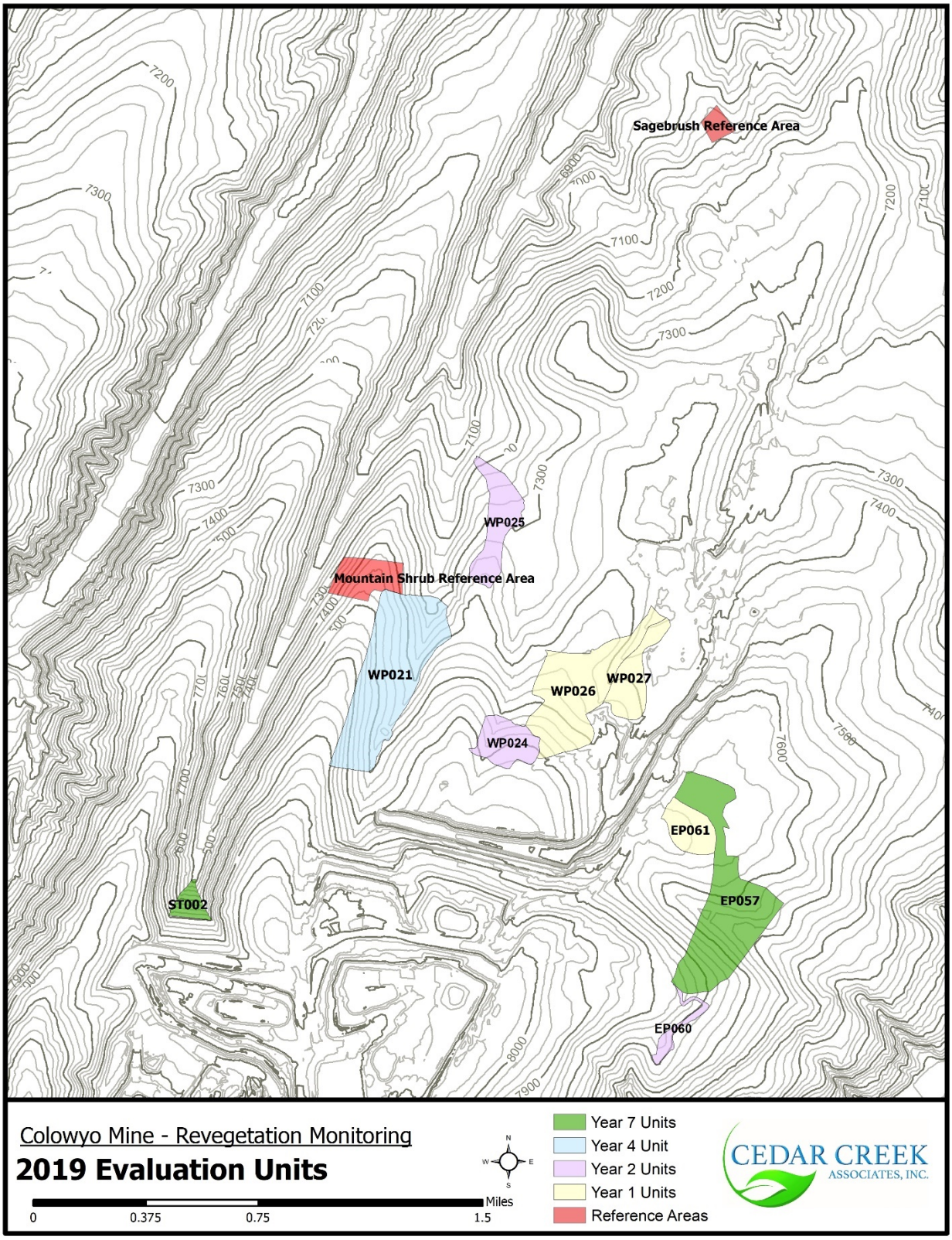
1.0 INTRODUCTION

Cedar Creek Associates, Inc. (Cedar Creek) was contracted in 2019 by Colowyo Coal Company (Colowyo) to implement a revegetation monitoring program within selected revegetated units at the Colowyo Mine. Monitoring was performed in the interest of ascertaining progress toward revegetation success in general accordance with Rule 3.03, Release of Performance Bonds. The revegetated areas evaluated in 2019 consisted of two units within the East Pit, three units within the West Pit, and one South Taylor Pit unit. Three of these units (EP060, WP024, WP025) were new units in 2018. Units evaluated in 2019 range in size from 5.5 acres to 98.2 acres. At the time of sampling, revegetation within evaluated units had experienced between 2 to 7 growing seasons following completion of seeding. In addition, two reference areas (Mountain Shrub – 1980 and Sagebrush – 1981) were sampled to provide cover and production comparison values to facilitate an evaluation of progress toward success for the reclaimed units. The location of each unit and associated reference areas evaluated in 2019 are indicated on Map 1, and the sample points within each area are provided on "in-text" maps for each unit in Section 3.0.

Field sampling for the directly measurable variables of ground cover, woody plant density, current annual production (seventh growing season units only) and seedling density (first growing season units only) was systematically conducted within the designated units from August 19th through August 23rd, 2019. Field efforts in 2019 were conducted under the direct supervision of Cedar Creek's Senior Reclamation Ecologist and Soil Specialist, Mr. Jesse H. Dillon.

The remainder of this document is divided into logical sections. Section 2.0 describes the revegetation performance standards. Section 3.0 provides results separated first by mine area (East Pit, West Pit, And

South Taylor Pit) and then by revegetation unit. Each unit and resulting data/mapping is presented separately, along with a brief discussion of pertinent observations and/or recommendations. Section 4.0 presents conclusions and recommendations. Descriptions of vegetation sampling methodologies utilized in 2019 are presented in the Colowyo permit (Volume 1, section 4.15.11; and permit Volume 15, section 4.15.11). Raw data tables and are presented in Appendix A. In this manner, only the most salient information is provided in the main body of this document. Acreages presented in this document were determined by Colowyo's technical services department.


Sagebrush Reference Area
WP025
Mountain Shrub Reference Area
WP021
WP026
WP027
WP024
EP061
EP057
EP060
ST002
Colowyo Mine - Revegetation Monitoring
2019 Evaluation Units
Miles
0
0.375
0.75
1.5
Year 7 Units
Year 4 Unit
Year 2 Units
Year 1 Units
Reference Areas
CEDAR CREEK
ASSOCIATES, INC.

1.1 Climate Data

Precipitation data presented on Table P and Charts P1 and P2 is the average of two weather stations at the Colowyo Mine (SCN16 and SCN34 from 2009 to present). Table P presents precipitation accumulated annually at the Colowyo Mine over the past 13 years. Charts P1 and P2 display historical precipitation data organized by growing season. Precipitation in the project area for the 2018/2019 growing season (September 2018 through August 2019) was determined to be 122% of average when compared to the 13-year average (19.01 in. vs. 15.64 in.).

Perusal of Chart P2 indicates that 2018 fall precipitation was slightly above average with 5.06 inches, 106% of the 13-year average. Winter of 2018 saw below average levels with 2.66 inches, 92% of average. Spring of 2019 received above average precipitation with 7.00 inches (139% of average) while summer of 2019 received well-above average levels with 4.3 inches (146% of average). Since growing season precipitation were well-above average, collected data are reflective of above average vegetative vigor and production.

Table P - Annual Precipitation at the Colowyo Mine*, 2006-2019													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
2007	1.21	1.50	1.54	0.92	1.67	0.30	1.27	0.84	4.18	2.38	1.60	2.84	**20.22**
2008	0.35	1.24	1.14	1.94	2.79	1.08	0.17	2.32	1.94	1.16	1.28	1.81	**17.19**
2009	1.32	0.31	1.99	1.67	1.79	2.42	0.33	0.59	0.85	0.71	0.78	0.81	**13.54**
2010	0.16	0.51	2.05	1.64	1.20	0.64	0.78	1.35	0.34	2.34	1.30	2.73	**15.01**
2011	0.55	1.18	1.96	3.45	2.59	0.93	1.38	0.96	1.09	1.38	0.90	0.38	**16.74**
2012	0.40	1.17	0.46	0.73	0.42	0.48	1.85	0.79	1.15	0.73	0.22	1.77	**10.13**
2013	0.43	0.45	0.45	2.25	1.54	0.00	1.26	0.60	2.93	1.96	1.24	0.60	**13.69**
2014	0.91	0.36	1.66	1.14	2.81	0.46	1.30	2.86	2.31	1.68	0.91	0.86	**17.26**
2015	0.27	0.93	0.88	1.91	3.24	0.59	1.87	0.57	0.52	0.79	1.29	1.51	**14.34**
2016	0.56	0.50	1.23	1.81	1.48	0.22	0.44	0.33	1.32	1.24	0.85	1.63	**11.58**
2017	1.63	1.80	1.31	1.31	1.79	0.69	2.34	0.38	1.95	2.03	1.02	0.14	**16.36**
2018	0.60	0.75	1.46	1.45	1.04	0.07	0.53	1.16	1.81	2.84	0.42	0.28	**12.36**
2019	1.37	1.02	2.98	2.47	1.55	3.30	0.78	0.22	0.44	0.30	0.78	1.49	**16.68**
2007-2019 Avg.	**0.75**	**0.90**	**1.47**	**1.74**	**1.84**	**0.86**	**1.10**	**1.00**	**1.60**	**1.50**	**0.97**	**1.29**	**15.01**

Chart P1
Seasonal Precipitation (September - August) at the Colowyo Mine*, 2007-2019

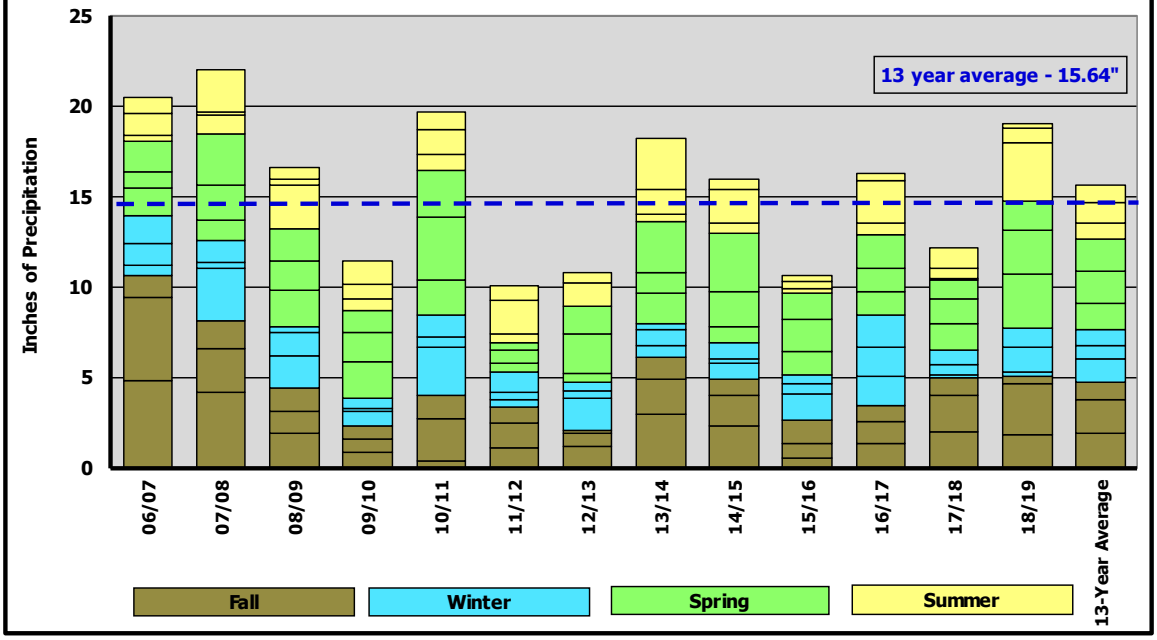
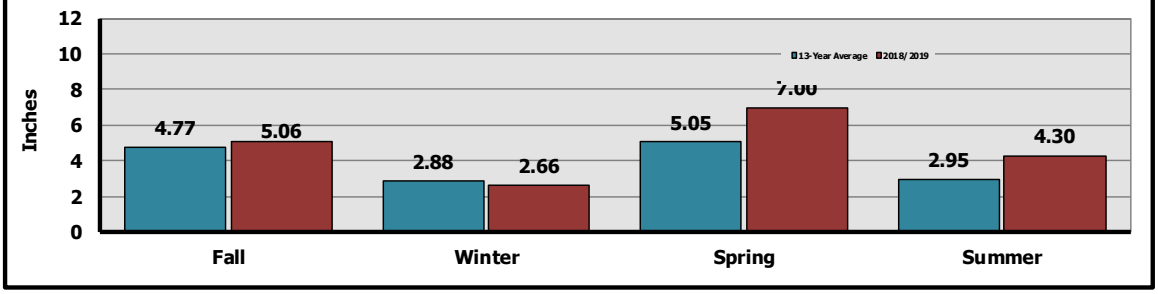


Chart P2 - Seasonal Precipitation at the Colowyo Mine*
2018/2019 vs. 13-Year Average



* An average of data collected by Colowyo Weather Stations SCN16 and WSTPT prior to 2009, and then from stations SCN16 and SCN34 due to the relocation of WSTPT.

2.0 REVEGETATION SUCCESS STANDARDS

In accordance with Colowyo's permit section 4.15 Revegetation Requirements, revegetation success will be assessed against standards for each post-mining vegetation type separately. Measured performance standards differ for each post-mining type, as such, a summary of permit requirements is presented below [full explanation is detailed in permit Volume 1, Section 4.15.8]. East Pit and West Pit Grazingland revegetation blocks are compared against the Mountain Shrub Reference Area (55% weight) and Sagebrush Reference Area (45% weight) [permit Volume 1, Section 4.15.7]. South Taylor Grazingland revegetation blocks are compared against Mountain Shrub Reference Area (52% weight), Sagebrush Reference Area (25% weight), and Aspen Woodland Reference Area (23% weight) [permit Volume 1, Section 4.15.7]. All lands that evolve into a Sagebrush Steppe community, regardless of mining area, are compared against just the Sagebrush Reference Area [permit Volume 1, Section 4.15.7].

Colowyo has made the commitment to establish sagebrush steppe (comprised of both core and ecotonal areas) on approximately 350 acres of the reclamation areas [Volume 15, Section 4.15.8] within the Collom permit expansion area, where Sagebrush Steppe "core areas" must comprise no less than one-half the minimum total shrub land acreage [Volume 15, Section 4.15.8]. Colowyo has also made the commitment to establish sagebrush steppe (comprised of both core and ecotonal areas) on approximately 450 acres of the reclamation areas [Volume 1, Section 4.15.8] within the East Pit, Gossard and Facilities areas, South Taylor Pit, and West Pit.

Grazingland:

1. Ground Cover - Revegetation will be deemed adequate if herbaceous vegetation cover of the reclaimed area exhibits at least 90% of the herbaceous vegetative cover of the appropriate reference area(s) comparison. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8]
2. Herbaceous Production - Revegetation will be deemed adequate if herbaceous vegetation production of the reclaimed area exhibits at least 90% of the herbaceous vegetative production of the appropriate reference area(s) comparison. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8]
3. Diversity – Test "a", and either test "b", "c", or test "d" shall be met to demonstrate success. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8]
   a) At least three native* cool season perennial grasses with between 3% and 50% relative cover (composition) and
   b) At least one perennial forb or shrub with between 2% and 50% relative cover (composition) or
   c) A total of all forbs or all shrubs combined with between 4% and 50% relative cover (composition) or

d) If five or more native* cool season perennial grass taxa contribute between 3% and 50% composition the requirement for perennial forbs and shrubs shall be limited to 1% or more relative cover combined.

Sagebrush Steppe:

1. Ground Cover - Revegetation will be deemed adequate if herbaceous vegetation cover of the reclaimed area exhibits at least 70% of the herbaceous vegetative cover of the appropriate reference area(s) comparison. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8]
2. Herbaceous Production - Revegetation will be deemed adequate if herbaceous vegetation production of the reclamation exhibits at least 70% of the herbaceous vegetative production of the appropriate reference area(s) comparison. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8]
3. Woody Plant Density - On core areas (comprising no less than half the total Sagebrush Steppe acreage), the standard shall be 375 live plants per acre or 200 live plants per acre with documentation of a positive recruitment rate, and at least one-half of these totals shall be sagebrush species. On ecotonal areas, the standard shall be 200 live plants per acre or 100 live plants per acre with documentation of a positive recruitment rate. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8]
4. Diversity – At least four native† perennial species, each more than 3% composition, minimum of two of which are grasses and a minimum of one which is a forb. [permit Volume 1, Section 4.15.8; and permit Volume 15, Section 4.15.8].
   If no single forb species exceeds 3% composition, the forb requirement can be met if:
   a) at least two native* perennial forbs combined comprise at least 2% composition, or;
   b) at least four native* perennial forbs combined comprise at least 1 % composition.

* The limitation to native status will not apply to introduced (and CDRMS approved taxa) specifically planted for an approved use such as Orchard grass or Cicer milkvetch.

† The limitation to native status will not apply to introduced (and CDRMS approved taxa) specifically planted for an approved use such as Orchard grass or Cicer milkvetch.

3.0 RESULTS

In 2019, two evaluated units have existed for seven years and were assessed with ground cover, diversity, woody plant density, and production sampling protocols. Four evaluated units have existed for either two or four growing seasons; these units were assessed with ground cover, diversity, and woody plant density sampling protocols. Summaries of the results from the seven, four, and two year old units are presented in in-text compendia, with additional summaries and raw data presented in Appendix A. Reference Area results are summarized in Appendix A, Charts 4 through 5 and Tables 4 through 7, along with additional raw data.

Considering the 2019 evaluation effort as a whole, observed revegetation at Colowyo is generally in good condition and on a path to demonstrate success. As seems to be normal for Colowyo revegetation, a few younger units exhibit elevated levels of early seral taxa (annual weedy species). However, based on past history it is unlikely these units will need remediation (herbicide treatment), except in rare occasions, given that precipitation patterns in the area tend to favor seeded perennials over time. The unfavorable precipitation in 2018 has likely delayed the progress of younger units, which should be closely monitored moving forward. As revegetated communities continue to mature, the majority of units evaluated in 2019 should readily meet both land-use goals and bond release success criteria.

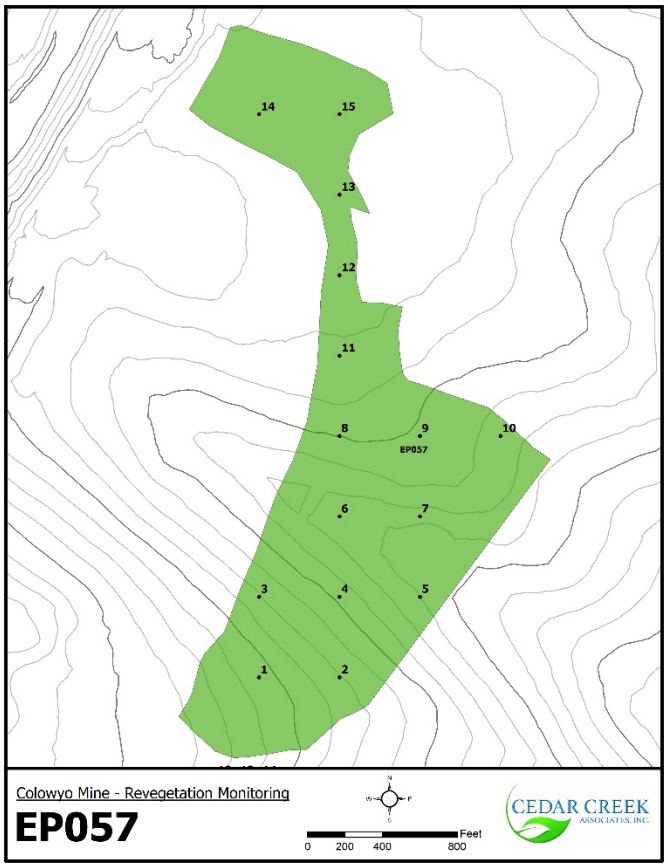
The following sections (Sections 3.1 to 3.4) provide a brief narrative of the results from each individual unit evaluated by Cedar Creek. Also included for each unit is a map indicating the 2019 sample points and a one-page summary (compendium) of all pertinent data collected from the unit in 2019 and previous years, if applicable.

3.1 East Pit

3.1.1 EP057 – Year 7 Unit

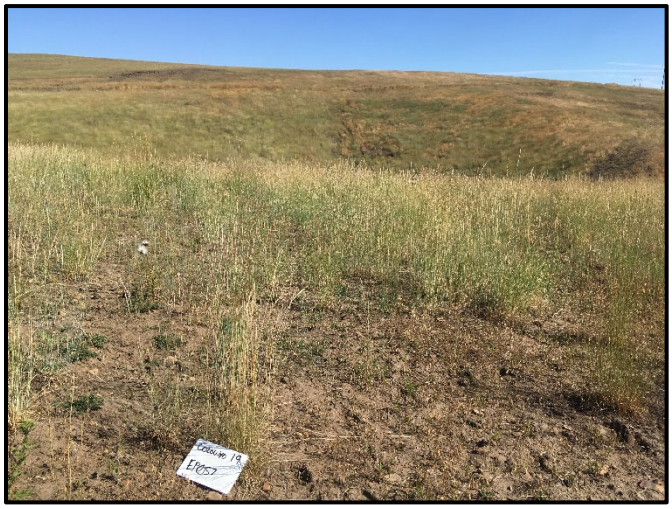
EP057 is comprised of approximately 70.7 acres of east-southeast facing revegetation. This unit was seeded in 2012 and therefore, was undergoing its seventh growing season in 2019 (Compendium 1). A representative photo for 2019 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established well on EP057 with 26.7% average perennial cover in Year 7. Cheatgrass (*Bromus tectorum*) exhibits 3.9% average cover in Year 7. Noxious weeds exhibit 0.1% average cover in Year 7. Annual forbs exhibit minor cover in Year 7 with 4.4% average cover. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 28 species observed on this unit in 2019. Woody plant density was determined from 15 belt transects and indicated 45.9 stems per acre in 2019, consistinting of big sagebrush (Artemisia tridentata) and four-wing saltbush (Atriplex canescens)



Perennial herbaceous production was 1,099.1 pounds per acre, more than tripling the grazingland success criteria of 301.4 pounds per acre.

Unit EP057 exhibits good perennial cover for seven-year-old revegetation. It is recommended that this unit be evaluated for Phase III bond release at the end of the liability period.



Compendium 1 2019

EP057

Location: **East Pit**
Acres: **70.7**
First Growing Season: **2013**

Targeted Post-Mining Community: **Grazingland Sagebrush Steppe**

Ground Cover Results

Number of Ground Cover Transects = 15

	Average Ground Cover (%)			Relative Ground Cover (%)			Species Observed (#)		
	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7
Perennial Grasses	7.6	18.7	13.9	18.7	45.2	31.2	9	12	12
Perennial Forbs	0.3	1.1	12.5	0.7	2.6	27.9	1	2	4
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	-	0.1	0.3	-	0.3	0.6	-	1	1
Annual Grass	3.9	12.0	9.7	9.7	29.0	21.6	1	1	1
Annual / Biennial Forbs	27.3	9.2	4.4	67.1	22.3	9.9	11	8	7
Noxious Weeds - Cheatgrass	1.5	-	3.9	3.6	-	8.7	1	-	1
Noxious Weeds - Other	0.1	0.3	0.1	0.3	0.6	0.2	1	1	2
Litter	13.6	22.5	30.6						
Rock	1.7	2.9	1.7						
Bareground	44.0	33.2	23.1						
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**24**	**25**	**28**
Total Plant Cover	**40.7**	**41.3**	**44.7**						
Total Perennial Cover	**7.9**	**19.9**	**26.7**	**19.3**	**48.1**	**59.7**			
Allowable Perennial Herbaceous Cover	**7.9**	**19.7**	**26.4**	**19.3**	**47.7**	**59.1**			

Woody Plant Density Results

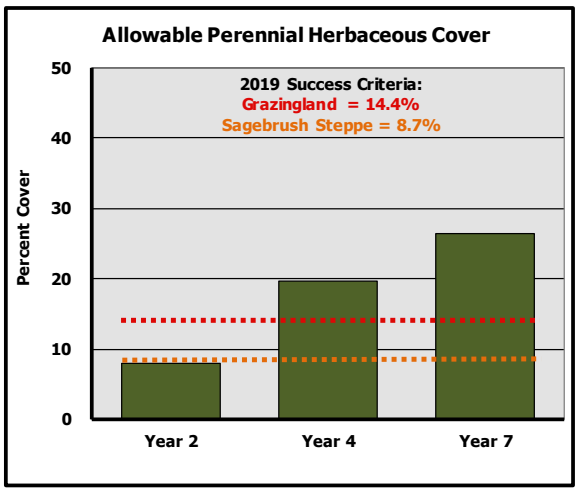
Number of Woody Plant Density Belts = 15

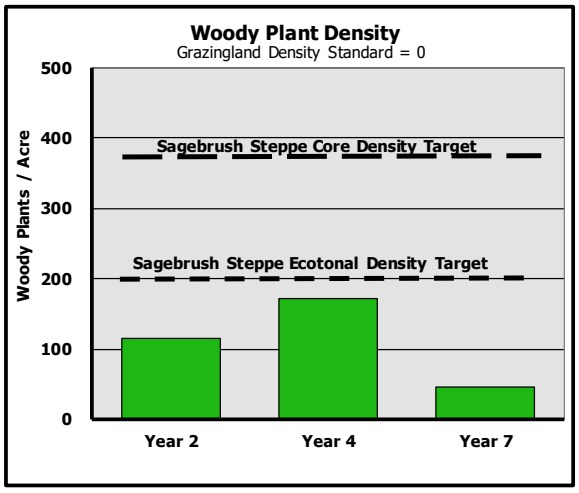
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	113.3	172.7	43
Atriplex canescens	Four-wing Saltbush	2.7	-	3
Total		**116.0**	**172.7**	**45.9**
Sagebrush Contribution (%)		98%	100%	94%
Percent of Transects Exceeding Core Standard (375 Stems per acre)		7%	13%	7%
Percent of Transects Exceeding Ecotonal Standard (Between 200 and 375 Stems per acre)		27%	27%	7%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		1,099.1
Perennial Forbs		-
Sub-shrubs		-
Annual Grasses		6.8
Annual / Biennial Forbs		78.4
Noxious Weeds	Cheatgrass	2.1
	Other	-
Total Production		**1,186.4**
Total Perennial Production		1,099.1
Allowable Perennial Herb. Production		**1,099.1**

* Evolving post-mining vegetation communites (Grazingland or Sagebrush Steppe) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.

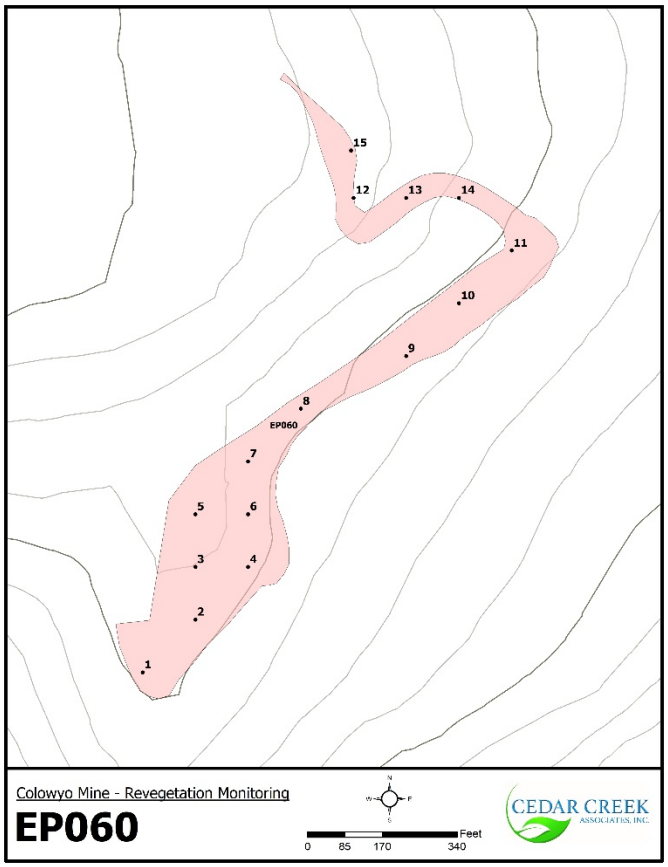




3.1.2 EP060 – Year 2 Unit

EP060 is comprised of approximately 5.5 acres of gently sloping north-facing revegetation. This unit was seeded in 2017 and therefore, was undergoing its second growing season in 2019 (Compendium 2). A representative photo for 2019 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established modestly on EP060 with 6.2% average perennial cover in Year 2. Annual forbs have established well with 46.5% average cover. Cheatgrass exhibit minor cover in Year 2 with 0.5% average cover. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 17 species observed on this unit in 2019. Woody plant density was determined from 15 belt transects and indicated 32.4 stems per acre in 2019, consisting of big sagebrush and four-wing saltbush.



Unit EP060 exhibits low perennial cover for two-year-old revegetation. It is recommended that this unit be evaluated in 2021 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 2 2019

EP060

Location:	**East Pit**	Targeted Post-Mining	**Grazingland**
Acres:	**5.5**	Community:	**Sagebrush Steppe**
First Growing Season:	**2018**		

Ground Cover Results

Number of Ground Cover Transects = 15

	Average Ground Cover (%)			Relative Ground Cover (%)			Species Observed (#)		
	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7
Perennial Grasses	6.0			11.0			5		
Perennial Forbs	0.2			0.4			2		
Sub-shrubs	-			-			-		
Shrubs & Trees	-			-			-		
Annual Grass	1.1			2.0			2		
Annual / Biennial Forbs	46.5			85.3			5		
Noxious Weeds - Cheatgrass	0.5			1			1		
Noxious Weeds - Other	0.2			0.4			2		
Litter	14.7								
Rock	2.4								
Bareground	28.4								
Total	**100.0**			**100.0**			**17**	**0**	
Total Plant Cover	**54.5**								
Total Perennial Cover	**6.2**			**11.4**					
Allowable Perennial Herbaceous Cover	**6.2**			**11.4**					

Woody Plant Density Results

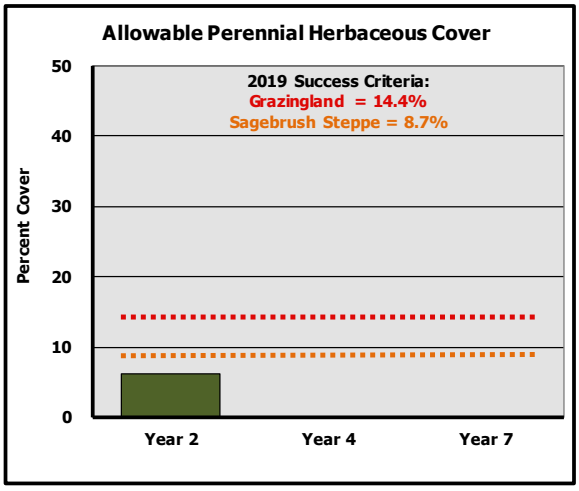
Number of Woody Plant Density belts = 15

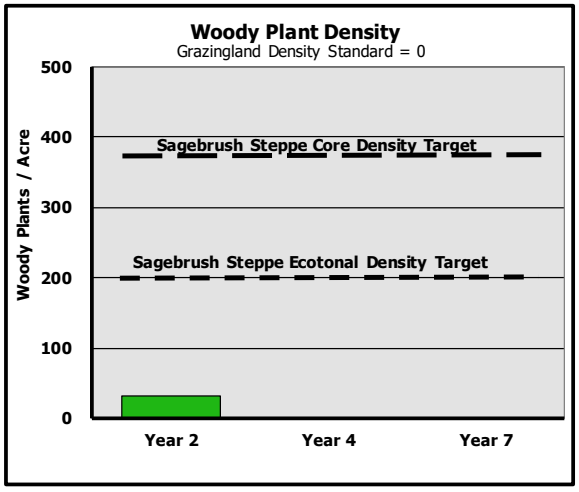
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	29.7		
Atriplex canescens	Four-wing Saltbush	2.7		
Total		**32.4**		
Sagebrush Contribution (%)		91.7		
Percent of Transects Exceeding Core Standard (375 Stems per acre)		0%		
Percent of Transects Exceeding Ecotonal Standard (Between 200 and 375 Stems per acre)		7%		

Production Results

	lbs per Acre
	Year 7
Perennial Grasses	
Perennial Forbs	
Sub-shrubs	
Annual Grasses	
Annual / Biennial Forbs	
Noxious Weeds	
Total Production	
Total Perennial Production	
Allowable Perennial Herb. Production	

* Evolving post-mining vegetation communites (Grazingland or Sagebrush Steppe) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.





3.1.3 EP061 – Year 1 Unit

EP061 is comprised of approximately 5.5 acres of gently sloping east-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its first growing season in 2018.

An average of 2.52 plants per square foot was observed with perennials comprising 1.72 plants per square foot. Perennial seedling emergence in EP061 consisted of perennial grasses, shrubs, and forbs with 1.16, 0.36, and 0.20 plants per square foot, respectively (Table 1 and Chart 1).

Based on the germination results exhibited by this unit, seeding success can be considered good with encouraging shrubs establishment. It is recommended that this unit be evaluated in 2020 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

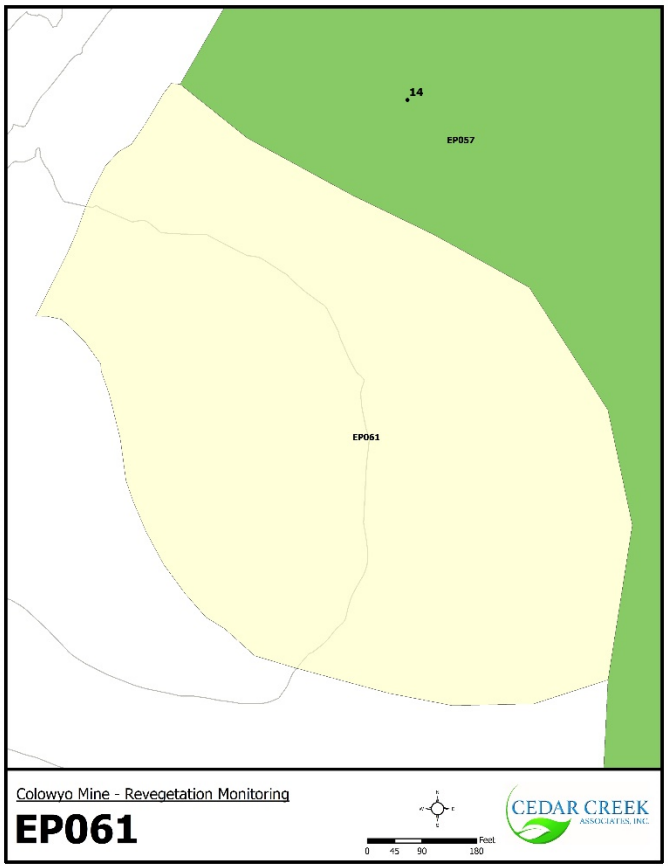
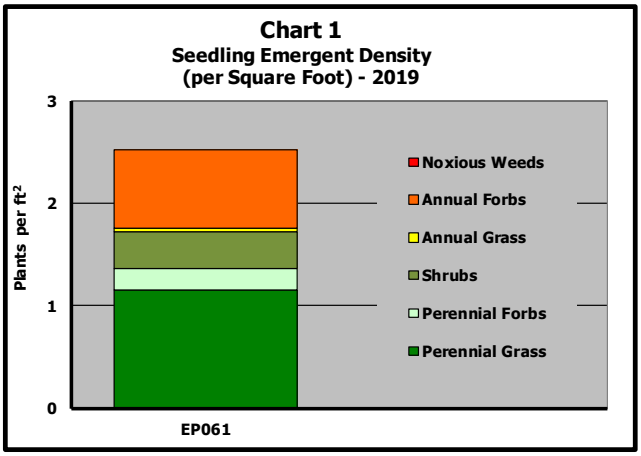


Table 1 Colowyo - Emergent Density - 2019

Seedling Emergent Density		
	Unit -->	**EP061**
	Reclamation Target -->	**Grassland**
	Year of Seeding -->	**2018**
	No. of Quadrats -->	50
Annual	Grass	0.04
	Forb	0.76
	Subtotal	**0.80**
Perennial	Grass	1.16
	Forb	0.20
	Noxious Weed	-
	Subtotal	**1.36**
Shrubs	*Artemisia tridentata*	0.36
	Subtotal	**0.36**
Total Density		2.52
Perennial Density		**1.72**



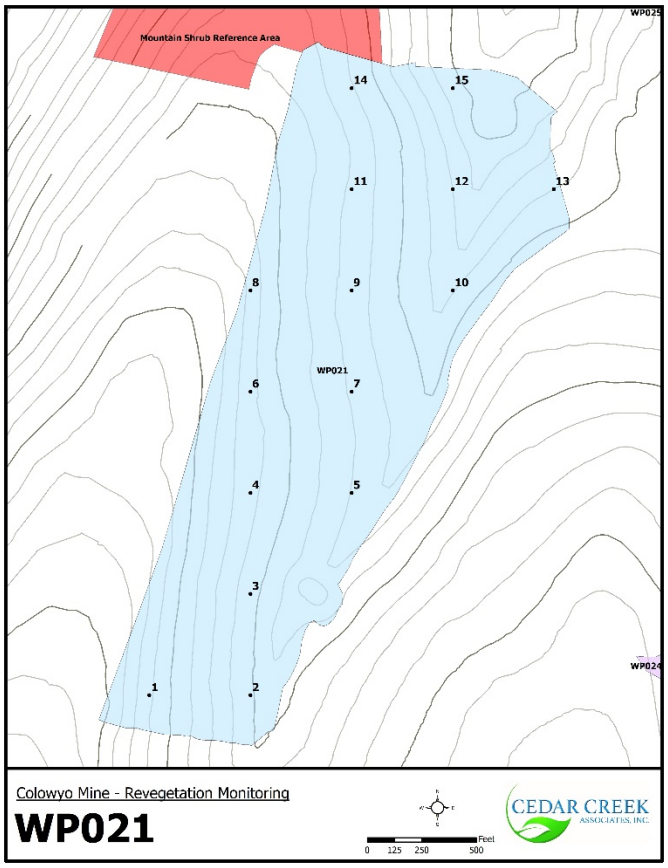
3.2 West Pit

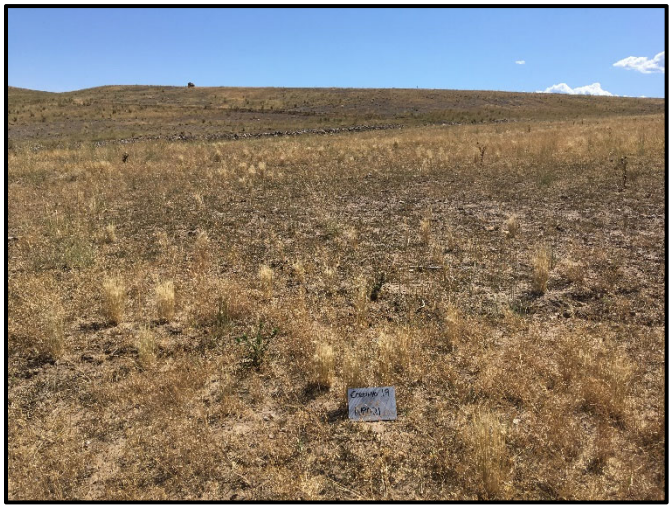
3.2.1 WP021 – Year 4 Unit

WP021 is comprised of approximately 75.4 acres of northeast-facing moderately sloping revegetation. This unit was seeded in 2015, and therefore, was undergoing its fourth growing season in 2019 (Compendium 3). A representative photo for 2019 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have continued to develop on WP021 as demonstrated by average perennial cover, which has increased from 23.1% in Year 2, to 44.9% in Year 4. Annual grasses exhibit 6.5% average cover for Year 4. Cheatgrass exhibits minor cover with 0.1% average cover. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. A total of 23 species were observed in Year 4. Woody plant density was determined from 15 belt transects and indicated 45.9 stems per acre in 2019, consisting entirely of big sagebrush.

Unit WP021 exhibits excellent perennial cover for four-year-old revegetation. It is recommended that this unit be evaluated in 2022 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.





Compendium 3 2019

WP021

Location: **West Pit**
Acres: **75.4**
First Growing Season: **2016**
Targeted Post-Mining Community: **Grazingland Sagebrush Steppe**

Ground Cover Results

Number of Ground Cover Transects = 15

	Average Ground Cover (%)			Relative Ground Cover (%)			Species Observed (#)		
	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7
Perennial Grasses	22.7	44.5		42.6	68.8		11	11	
Perennial Forbs	0.3	0.1		0.6	0.1		4	1	
Sub-shrubs	-	-		-	-		-	-	
Shrubs & Trees	-	0.3		-	0.5		-	1	
Annual Grass	0.9	6.5		1.7	10.1		1	2	
Annual / Biennial Forbs	12.4	11.4		23.3	17.6		5	4	
Noxious Weeds - Cheatgrass	2.5	0.1		4.6	0.1		1	1	
Noxious Weeds - Other	14.5	1.8		27.1	2.8		4	3	
Litter	16.1	18.3							
Rock	4.1	1.1							
Bareground	26.4	15.9							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**26**	**23**	
Total Plant Cover	**53.3**	**64.7**							
Total Perennial Cover	**23.1**	**44.9**		**43.2**	**69.4**				
Allowable Perennial Herbaceous Cover	**23.1**	**44.6**		**43.2**	**68.9**				

Woody Plant Density Results

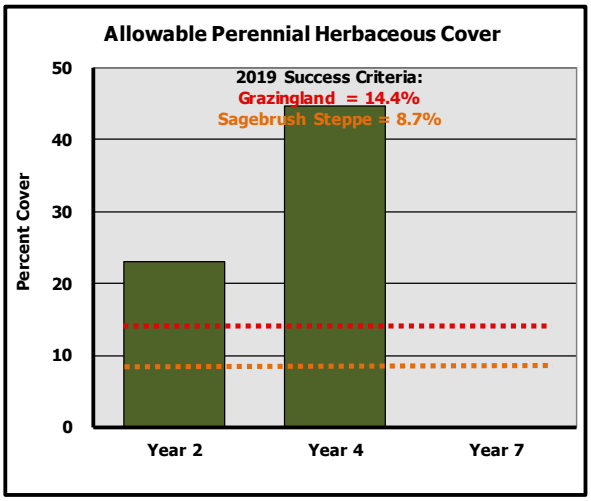
Number of Woody Plant Density belts = 15

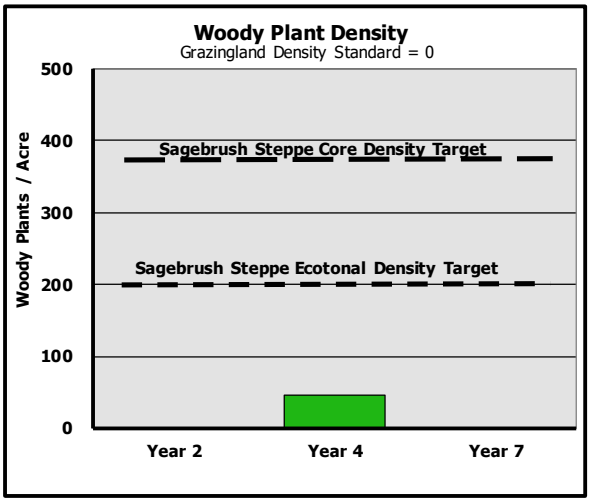
	Stems per Acre		
	Year 2	Year 4	Year 7
Artemisia tridentata Big Sagebrush	0.0	45.9	
Total	**0.0**	**45.9**	
Sagebrush Contribution (%)	0%	100%	
Percent of Transects Exceeding Core Standard (375 Stems per acre)	0%	0.0	
Percent of Transects Exceeding Ecotonal Standard (Between 200 and 375 Stems per acre)	0%	7%	

Production Results

	lbs per Acre
	Year 7
Perennial Grasses	
Perennial Forbs	
Sub-shrubs	
Annual Grasses	
Annual / Biennial Forbs	
Noxious Weeds	
Total Production	
Total Perennial Production	
Allowable Perennial Herb. Production	

* Evolving post-mining vegetation communites (Grazingland or Sagebrush Steppe) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.

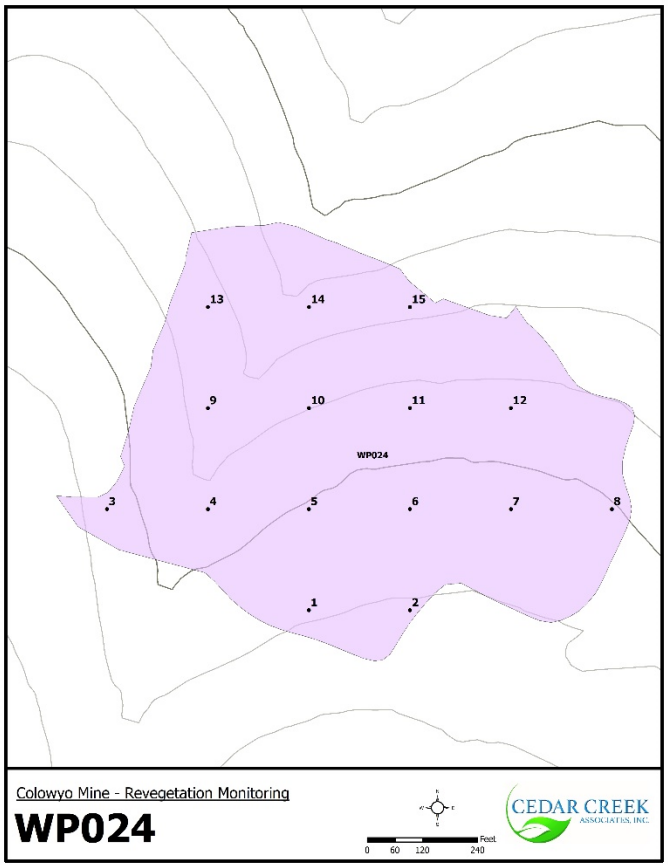




3.2.2 WP024 – Year 2 Unit

WP024 is comprised of approximately 17.3 acres of north-facing moderately sloping revegetation. This unit was seeded in 2017 and therefore, was undergoing its second growing season in 2019 (Compendium 4). A representative photo for 2019 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established modestly on WP024 2.1% average perennial cover in Year 2. Annual grasses exhibit 17.6% average cover. Annual forbs have established well with 24.9% average cover for Year 2. Cheatgrass and other noxious weeds are almost not present with 0.2% and 0.1% average growth, respectively. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 21 species observed on this unit in 2019. Woody plant density on WP024 was determined from 15 belt transects and indicates 10.8 stems per acre, respectively. Woody plants in Year 2 consisted of big sagebrush and four-wing saltbush.



Unit WP024 exhibits low perennial cover for a two-year-old revegetation. It is recommended that this unit be evaluated in 2021 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 4 2019

WP024

Location: **West Pit**
Acres: **17.3**
First Growing Season: **2018**

Targeted Post-Mining Community: **Grazingland Sagebrush Steppe**

Ground Cover Results

Number of Ground Cover Transects = 15

	Average Ground Cover (%)			Relative Ground Cover (%)			Species Observed (#)		
	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7
Perennial Grasses	1.6			3.6			7		
Perennial Forbs	0.5			1.0			3		
Sub-shrubs	-			-			-		
Shrubs & Trees	-			-			-		
Annual Grass	17.6			39.2			1		
Annual / Biennial Forbs	24.9			55.6			7		
Noxious Weeds - Cheatgrass	0.2			0.5			1		
Noxious Weeds - Other	0.1			0.2			2		
Litter	26.5								
Rock	1.7								
Bareground	26.9								
Total	**100.0**			**100.0**			**21**	**0**	
Total Plant Cover	**44.9**								
Total Perennial Cover	**2.1**			**4.6**					
Allowable Perennial Herbaceous Cover	**2.1**			**4.6**					

Woody Plant Density Results

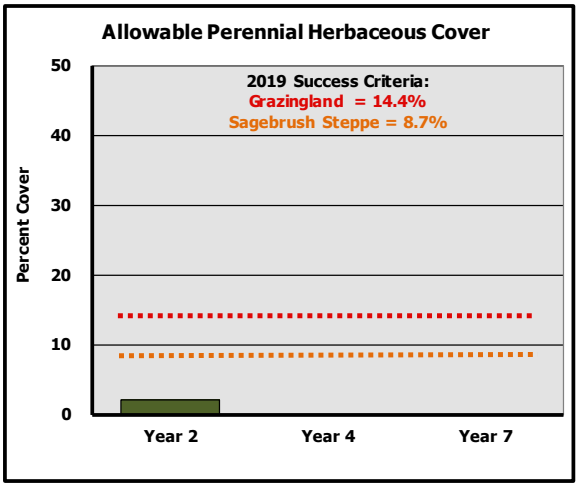
Number of Woody Plant Density belts = 15

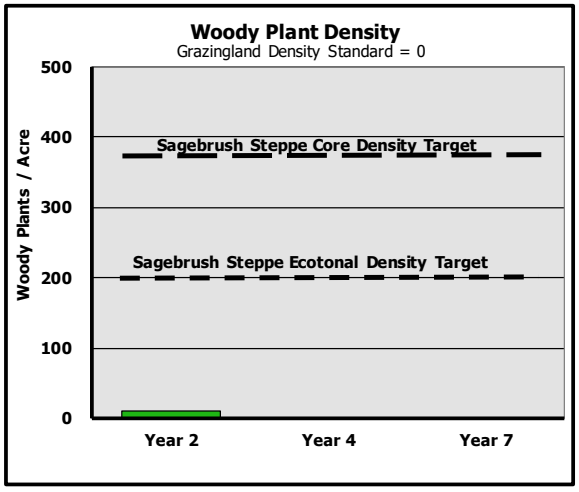
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	5.4		
Atriplex Canescens	Four-wing Saltbush	5.4		
Total		**10.8**		
Sagebrush Contribution (%)		50.0		
Percent of Transects Exceeding Core Standard (375 Stems per acre)		0%		
Percent of Transects Exceeding Ecotonal Standard (Between 200 and 375 Stems per acre)		0%		

Production Results

	lbs per Acre
	Year 7
Perennial Grasses	
Perennial Forbs	
Sub-shrubs	
Annual Grasses	
Annual / Biennial Forbs	
Noxious Weeds	
Total Production	
Total Perennial Production	
Allowable Perennial Herb. Production	

* Evolving post-mining vegetation communites (Grazingland or Sagebrush Steppe) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.

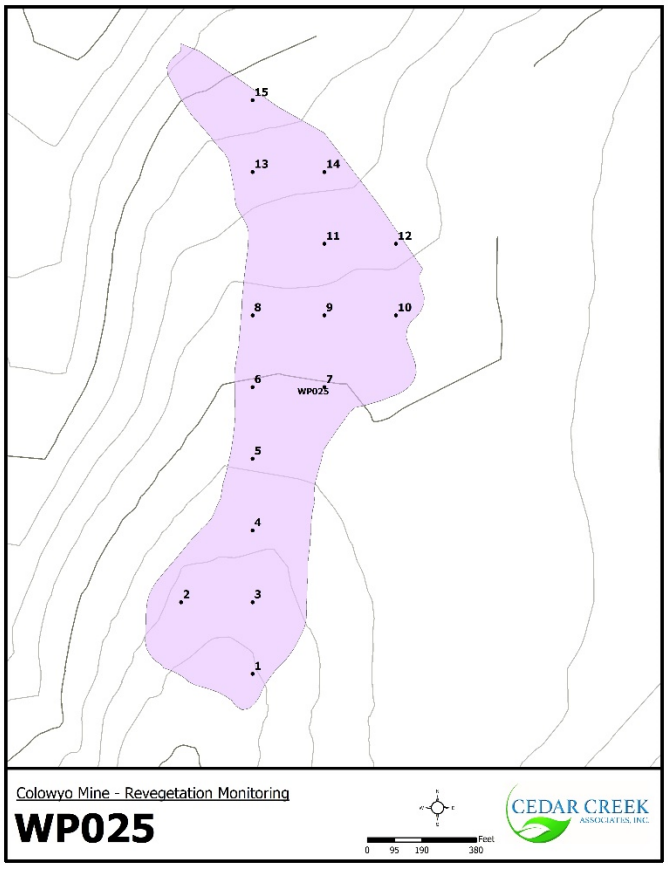




3.2.3 WP025 – Year 2 Unit

WP025 is comprised of approximately 23.3 acres of gently sloping north-facing revegetation. This unit was seeded in 2017 and therefore, was undergoing its second growing season in 2019 (Compendium 5). A representative photo for 2019 is not available.

Ground cover was determined from 15 transects. Desirable perennial plants have established fairly well on WP025 with 9.6% average perennial cover in Year 2. Annual forbs exhibit elevated cover in Year 2 with 26.3% average cover. Noxious weeds exhibit minimal cover in Year 2 with 0.1% average cover. Cheatgrass exhibits 3.7% average cover in Year 2. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 23 species observed on this unit in 2019. Woody plant density was determined from 15 belt transects and indicated 5.4 stems per acre in 2019.



Unit WP025 exhibits good perennial cover for two-year-old revegetation. It is recommended that this unit be evaluated in 2021 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 5 2019

WP025

Location: **West Pit**
Acres: **23.3**
First Growing Season: **2018**

Targeted Post-Mining Community: **Grazingland Sagebrush Steppe**

Ground Cover Results

Number of Ground Cover Transects = 15

	Average Ground Cover (%)			Relative Ground Cover (%)			Species Observed (#)		
	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7
Perennial Grasses	9.5			21.3			8		
Perennial Forbs	0.1			0.3			1		
Sub-shrubs	-			-			-		
Shrubs & Trees	-			-			-		
Annual Grass	4.7			10.6			2		
Annual / Biennial Forbs	26.3			59.2			9		
Noxious Weeds - Cheatgrass	3.7			8.4			1		
Noxious Weeds - Other	0.1			0.2			2		
Litter	23.8								
Rock	0.8								
Bareground	30.9								
Total	**100.0**			**100.0**			**23**	**0**	
Total Plant Cover	**44.5**								
Total Perennial Cover	**9.6**			**21.6**					
Allowable Perennial Herbaceous Cover	**9.6**			**21.6**					

Woody Plant Density Results

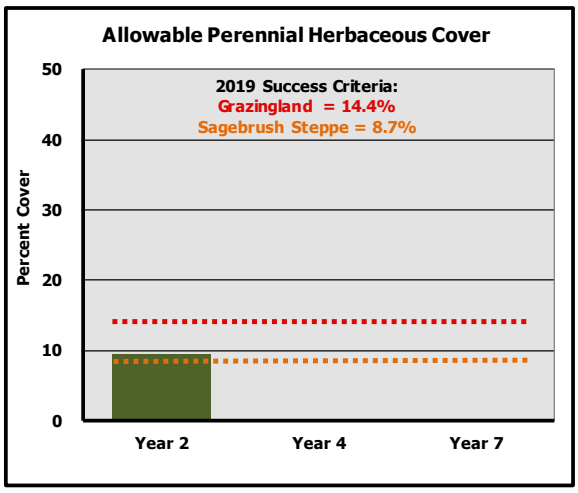
Number of Woody Plant Density belts = 15

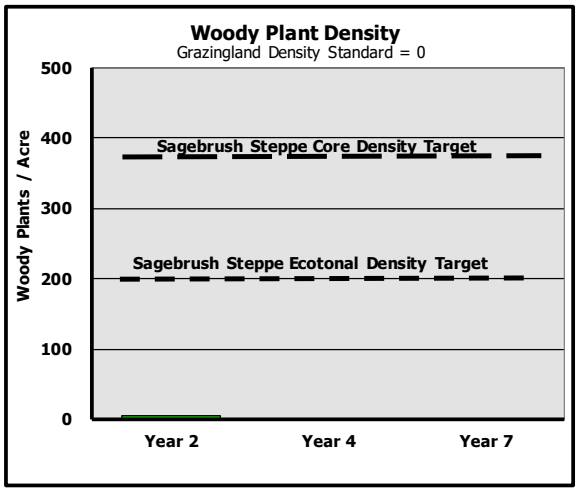
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata vaseyana	Big Sagebrush	2.7		
Atriplex Canescens	Four-wing Saltbush	2.7		
Total		5.4		
Sagebrush Contribution (%)		50.0		
Percent of Transects Exceeding Core Standard (375 Stems per acre)		0%		
Percent of Transects Exceeding Ecotonal Standard (Between 200 and 375 Stems per acre)		0%		

Production Results

	lbs per Acre
	Year 7
Perennial Grasses	
Perennial Forbs	
Sub-shrubs	
Annual Grasses	
Annual / Biennial Forbs	
Noxious Weeds	
Total Production	
Total Perennial Production	
Allowable Perennial Herb. Production	

* Evolving post-mining vegetation communites (Grazingland or Sagebrush Steppe) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.





3.2.4 WP026/27 – Year 1 Unit

WP026 and WP027 are comprised of approximately 54.2 and 17.8 acres of gently sloping northeast-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its first growing season in 2019.

An average of 5.96 plants per square foot was observed with perennials comprising 2.00 plants per square foot. Perennial seedling emergence in WP026/27 consisted of perennial grasses and shrubs with 1.94 and 0.06 plants per square foot, respectively (Table 2 and Chart 2).

Based on the germination results exhibited by this unit, seeding success can be considered good with encouraging shrubs establishment. It is recommended that this unit be evaluated in 2020 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

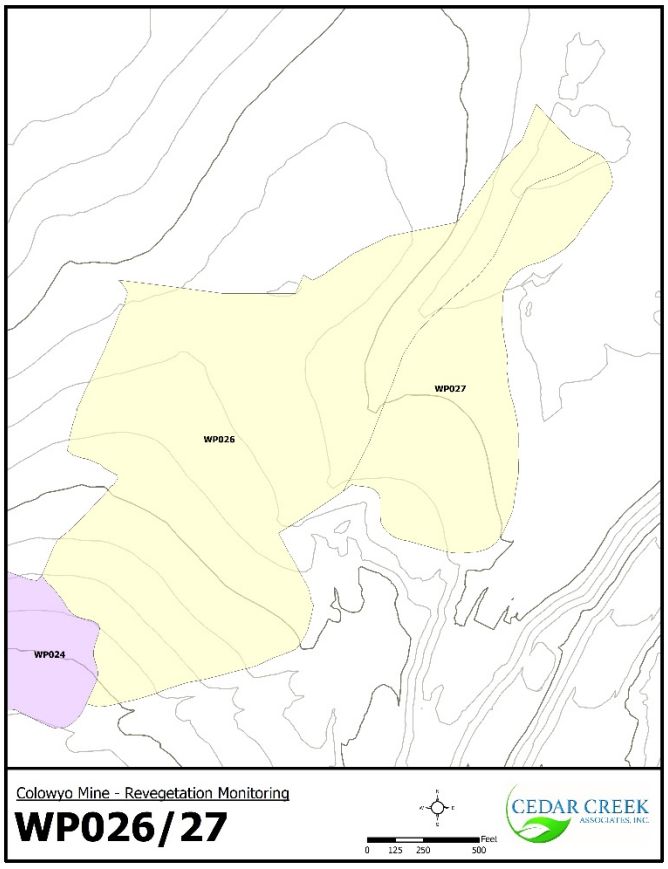
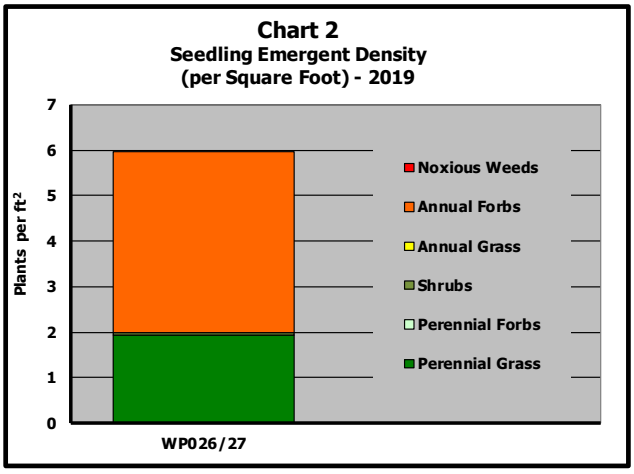


Table 2 Colowyo - Emergent Density - 2018

Seedling Emergent Density		
	Unit -->	WP026/27
	Reclamation Target -->	Grass / Sage
	Year of Seeding -->	2018
	No. of Quadrats -->	50
Annual	Grass	-
	Forb	3.96
	Subtotal	**3.96**
Perennial	Grass	1.94
	Forb	-
	Noxious Weed	-
	Subtotal	**1.94**
Shrubs	*Artemisia tridentata*	**0.02**
	Atriplex Canescens	0.04
	Subtotal	**0.06**
Total Density		5.96
Perennial Density		**2.00**



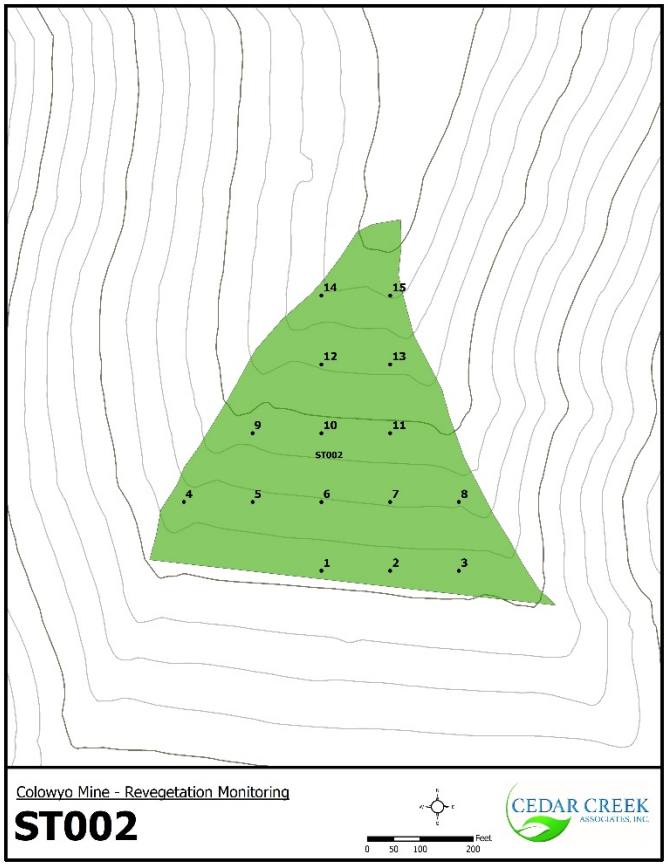
3.3 South Taylor

3.3.1 ST002 – Year 7 Unit

ST002 is comprised of approximately 6.3 acres of southeast-facing moderately sloping revegetation. This unit was seeded in 2012, and therefore, was undergoing its seventh growing season in 2019 (Compendium 6). A representative photo for 2019 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have continued to develop on ST002 as demonstrated by average perennial cover, which has increased from 16.3% in Year 2, to 30.5% in Year 4, to 35.7% in Year 7. Annual forbs and noxious weeds each continued to decrease in year 7 with 2.7% and 0.1% average cover, respectively. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. A total of 21 species were observed in Year 7. Woody plant density was determined from 15 belt transects. Woody plant density on ST002 indicated 4,667.4 stems per acre in Year 7, respectively. Perennial herbaceous production was 618.5 pounds per acre, significantly above the grazingland success criteria of 301.4 pounds per acre.

Unit ST002 exhibits good perennial cover for seven-year-old revegetation. It is recommended that this unit be evaluated for Phase III bond release at the end of the liability period.



Compendium 6 2019

ST002

Location: **South Taylor Pit**
Acres: **6.3**
First Growing Season: **2013**

Targeted Post-Mining Community: **Grazingland Sagebrush Steppe**

Ground Cover Results

Number of Ground Cover Transects = 15

	Average Ground Cover (%)			Relative Ground Cover (%)			Species Observed (#)		
	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7	Year 2	Year 4	Year 7
Perennial Grasses	13.1	22.6	11.4	28.4	57.6	26.0	8	10	7
Perennial Forbs	2.0	3.6	2.7	4.4	9.2	6.2	4	6	3
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	1.3	4.3	21.6	2.8	10.9	49.2	1	2	1
Annual Grass	-	-	0.1	-	-	0.2	-	-	1
Annual / Biennial Forbs	28.9	7.9	8.0	62.8	20.0	18.2	9	3	6
Noxious Weeds - Cheatgrass	-	-	-	-	-	-	-	-	1
Noxious Weeds - Other	0.7	0.9	0.1	1.6	2.4	0.3	3	1	2
Litter	12.7	34.6	33.9						
Rock	7.9	8.4	5.9						
Bareground	33.5	17.7	16.2						
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**25**	**22**	**21**
Total Plant Cover	**45.9**	**39.3**	**43.9**						
Total Perennial Cover	**16.3**	**30.5**	**35.7**	**35.6**	**77.6**	**81.3**			
Allowable Perennial Herbaceous Cover	**15.1**	**26.2**	**14.1**	**32.8**	**66.7**	**32.2**			

Woody Plant Density Results

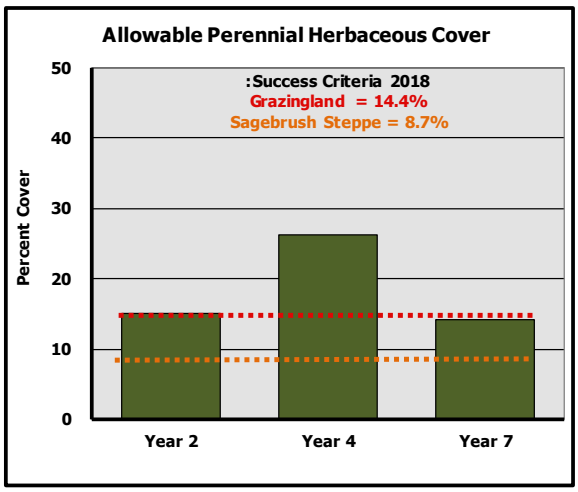
Number of Woody Plant Density Belts = 15

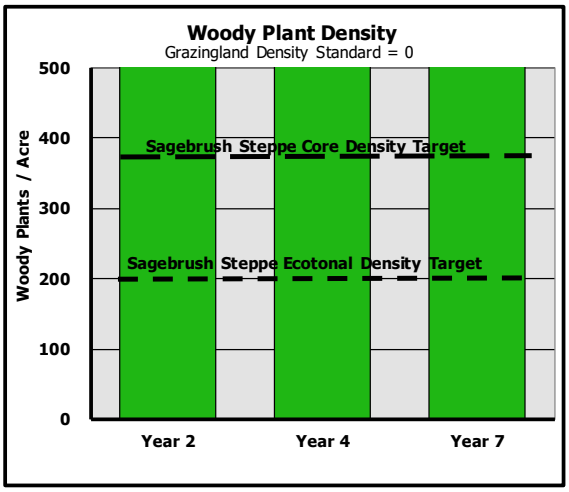
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	2,492.9	4,659.3	4,632.3
Symphoricarpos rotundifolius	Roundleaf Snowberry	-	5.4	35.1
Total		**2,492.9**	**4,664.7**	**4,667.4**
Sagebrush Contribution (%)		100%	100%	99%
Percent of Transects Exceeding Core Standard (375 Stems per acre)		100%	100%	100%
Percent of Transects Exceeding Ecotonal Standard (Between 200 and 375 Stems per acre)		100%	100%	0%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		535.5
Perennial Forbs		83.0
Sub-shrubs		-
Annual Grasses		-
Annual / Biennial Forbs		7.1
Noxious Weeds	Cheatgrass	-
	Other	-
Total Production		**625.6**
Total Perennial Production		618.5
Allowable Perennial Herb. Production		**618.5**

* Evolving post-mining vegetation communites (Grazingland or Sagebrush Steppe) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.

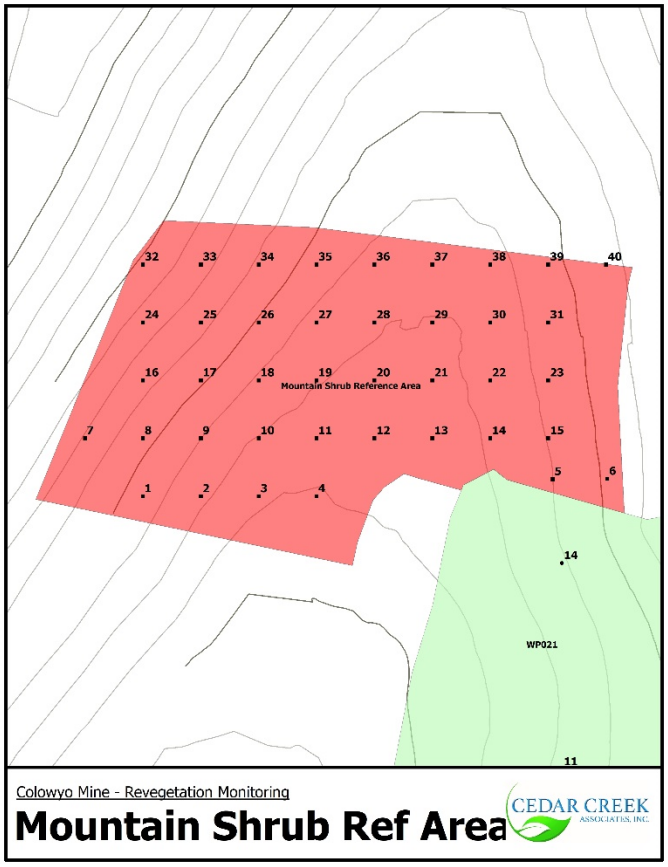




3.4 Reference Areas

3.4.1 Mountain Shrub Reference Area

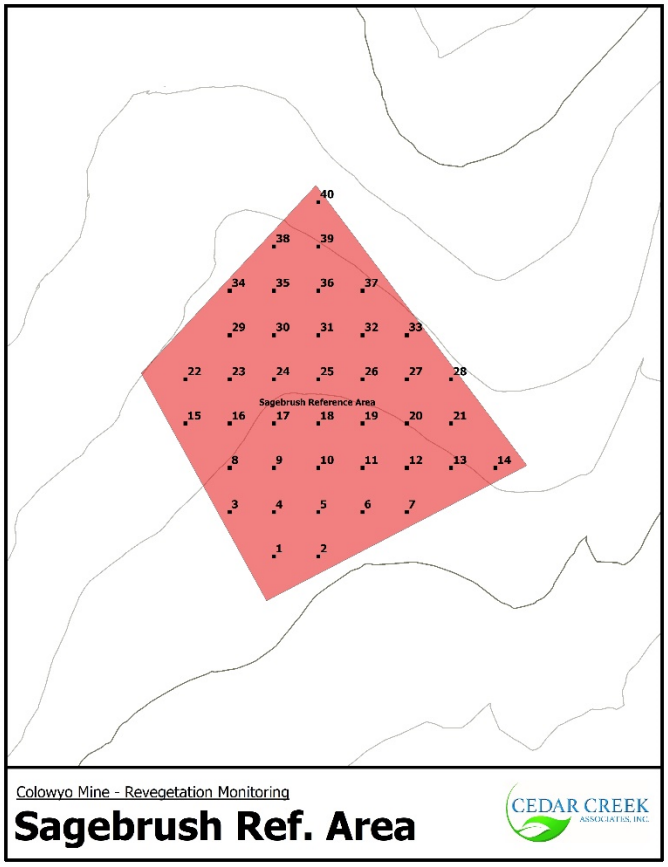
The Mountain Shrub Reference Area is comprised of approximately 18 acres of gently to moderately sloping vegetation with a predominately northwestern aspect (mesic) and eastern aspect (xeric). Rationale for the larger reference area with two dominant aspects is to provide a better representation of the distribution of Mountain Shrub communities located on and around Colowyo Coal Mine properties. The xeric exposure tends to exhibit more elevated herbaceous parameters, given a modest reduction in the overstory. This reference area is located on the undisturbed ridge immediately west of the West Pit Area (Map 1). A representative photo for 2019 is presented below.



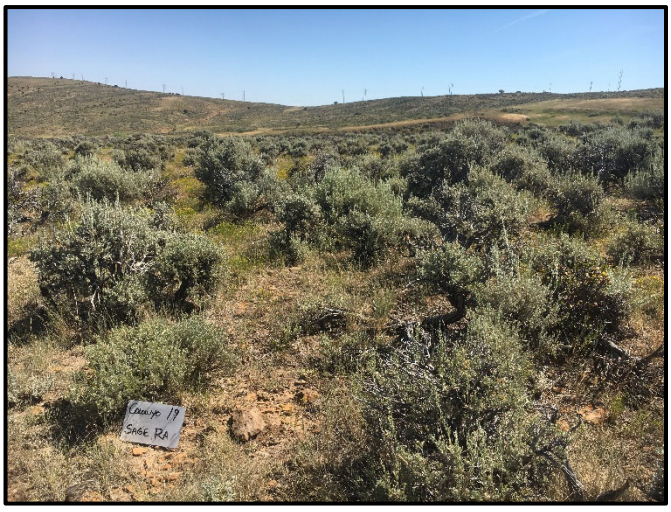
Ground cover in the Mountain Shrub Reference Area (Appendix A - Chart 3 and 4; and Table 3 and 4) consisted of 58.4% live vegetation, 0.4% rock, 39.1% litter, and bare soil exposure of 2.1%. Perennial cover across the unit averaged 50.3% with annual and biennial cover averaging 8.1%, with noxious weed cover averaging 0.0%. Current annual herbaceous production across the area averaged 319.7 pounds per acre in 2019 with perennial grasses the dominant category, followed by perennial forbs and annual forbs. Total perennial production was 284.0 pounds per acre (Appendix A - Table 6 and Chart 6).

3.4.2 Sagebrush Reference Area

The Sagebrush Reference Area is comprised of approximately 4.7 acres of gentle to moderately sloping topography that has a predominately northern aspect. This reference area is located on a gently sloping ridge north of the Administration / Facilities Area (Map 1). A representative photo for 2019 is presented below.



Ground cover in the Sagebrush Reference Area consisted of 53.5% live vegetation, 1.5% rock, 36.15% litter, and bare soil exposure of 8.9% (Appendix A - Chart 3 and 4; and Table 3 and 4). Perennial cover across the unit averaged 34.5%, with annual and biennial cover of 17.3%, cheatgrass cover of 1.87, and no other noxious weed cover. Current annual herbaceous production across the area averaged 475.7 pounds per acre in 2019 with perennial grasses the dominant category, followed by sub-shrubs and annual grasses. Total perennial production was 397.1 pounds per acre (Appendix A - Table 6 and Chart 6).



4.0 CONCLUSIONS and RECOMMENDATIONS

Overall, the revegetation at Colowyo evaluated by Cedar Creek in 2019 can generally be considered to be in relatively good condition and is typical of reclamation efforts at most western coal mines. As revegetation units age, they typically "thicken" with desirable (seeded) perennial species and exhibit increased diversity, cover, and production. Recent favorable precipitation conditions have occurred at Colowyo. Aside from the above-average precipitation in 2019, consecutive low-rainfall years occurred in 2012 and 2013 as well as 2018, which can result in stressed and/or poor revegetation conditions. Units planted during or just prior to the drought will take time to recover. Given the updated comparisons for vegetation parameters presented in the permit (Volume 1, Section 4.15.8; and Volume 15, Section 4.15.8), most areas at Colowyo appear to be progressing along expected pathways whereby success criteria should be achieved at or near the conclusion of the 10-year bond responsibility period.

Seven year old units, EP057 and ST002, have developed enough desirable perennial cover and can pass the bond release standards. The one unit in their fourth growing season, WP021, is performing well after good development from Year 2 to Year 4. Three Year 2 units (EP060, WP024, and WP025) exhibit diminished perennial cover, given the favorable precipitation in 2019. These units should be re-evaluated in Year 4 to determine if interventions are warranted. The majority of units are on a good trajectory for success in Years 9 and 10 and should be re-evaluated on the normal schedule to assess their continued development and further evaluate the new reclamation procedures.

Appendix A

Charts, Tables, and Raw Data

Chart 3
Average Ground Cover by Lifeform - 2019

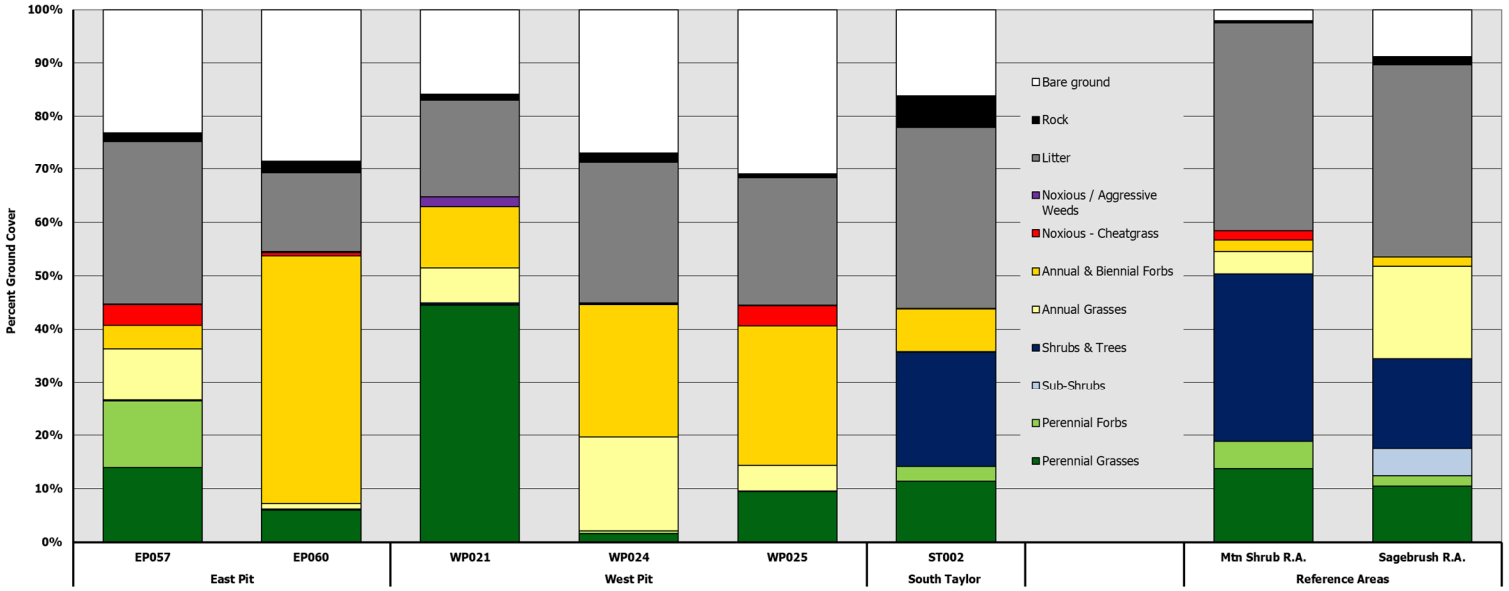


Chart 4
Relative Ground Cover by Lifeform - 2019

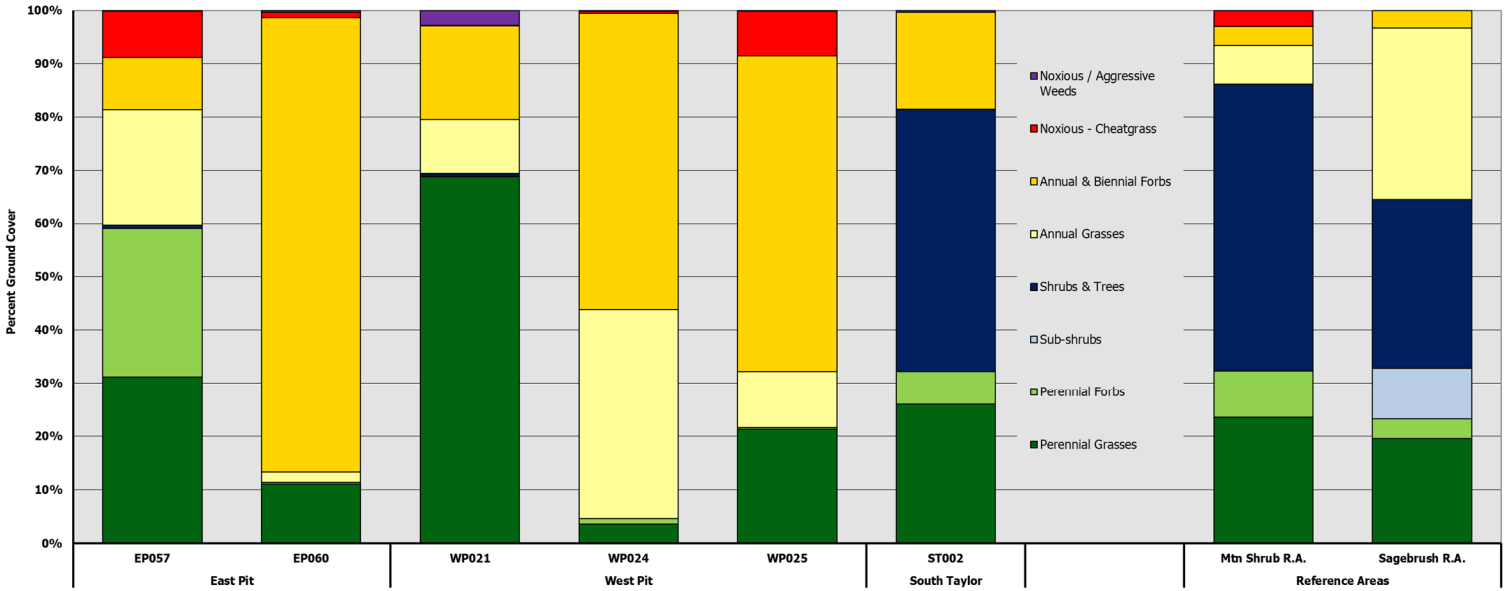


Table 3 Colowyo - Vegetation Cover - 2019

Average Ground Cover Summary

East Pit, West Pit, and South Taylor

Percent Ground Cover Based on Point-Intercept Sampling

Area ——>	EP057	EP060	WP021	WP024	WP025	ST002	Mtn Shrub R.A.	Sagebrush R.A.	Weighted Reference Values
Weight ——>	100%	100%	100%	100%	100%	100%	55%	45%	
Total Plant Cover	**44.67**	**54.47**	**64.73**	**44.87**	**44.47**	**43.93**	**58.40**	**53.50**	**56.20**
Rock	1.67	2.40	1.13	1.73	0.80	5.93	0.40	1.50	0.90
Litter	30.60	14.73	18.27	26.47	23.80	33.93	39.10	36.15	37.77
Bare ground	23.07	28.40	15.87	26.93	30.93	16.20	2.10	8.85	5.14
Total Perennial Cover (Non-noxious)	**26.67**	**6.20**	**44.93**	**2.07**	**9.60**	**35.73**	**50.30**	**34.50**	**43.19**
Total Annual Cover (Non-noxious)	14.07	47.53	17.93	42.53	31.07	8.07	6.35	19.00	12.04
Summary by Lifeform:									
Perennial Grasses	**13.93**	**6.00**	**44.53**	**1.60**	**9.47**	**11.40**	**13.75**	**10.45**	**12.27**
Annual Grasses	9.67	1.07	6.53	17.60	4.73	0.07	4.25	17.25	10.10
Noxious - Cheatgrass	3.87	0.53	0.07	0.20	3.73	-	1.75	-	0.96
Perennial Forbs	**12.47**	**0.20**	**0.07**	**0.47**	**0.13**	**2.73**	**5.10**	**1.95**	**3.68**
Annual & Biennial Forbs	4.40	46.47	11.40	24.93	26.33	8.00	2.10	1.75	1.94
Noxious / Aggressive Weeds	0.07	0.20	1.80	0.07	0.07	0.13	-	-	-
Sub-Shrubs	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**5.15**	**2.32**
Shrubs & Trees	**0.27**	**-**	**0.33**	**-**	**-**	**21.60**	**31.45**	**16.95**	**- 24.93**
Sample Adequacy Calculations									
Mean=	44.67	54.47	64.73	44.87	44.47	43.93	58.40	53.50	
Variance=	236.95	187.12	152.92	185.12	149.27	259.50	126.46	264.05	
n=	15	15	15	15	15	15	20	20	
n_{min}=	21.49	11.41	6.60	16.64	13.66	24.32	6.54	16.26	

Table 4 Colowyo - Vegetation Cover - 2019

Relative Ground Cover Summary (Post-2008)

East Pit, West Pit, and South Taylor

Area ——>	EP057	EP060	WP021	WP024	WP025	ST002	Mtn Shrub R.A.	Sagebrush R.A.
Weight ——>	100%	100%	100%	100%	100%	100%	55%	45%
Summary by Lifeform:								
Perennial Grasses	31.19	**11.02**	**68.80**	**3.57**	**21.29**	**25.95**	**23.54**	**19.53**
Annual Grasses	21.64	1.96	10.09	39.23	10.64	0.15	7.28	32.24
Noxious - Cheatgrass	8.66	0.98	0.10	0.45	8.40	-	3.00	-
Perennial Forbs	**27.91**	**0.37**	**0.10**	**1.04**	**0.30**	**6.22**	**8.73**	**3.64**
Annual & Biennial Forbs	9.85	85.31	17.61	55.57	59.22	18.21	3.60	3.27
Noxious / Aggressive Weeds	0.15	0.37	2.78	0.15	0.15	0.30	-	-
Sub-Shrubs	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**9.63**
Shrubs & Trees	**0.60**	**-**	**0.51**	**-**	**-**	**49.17**	**53.85**	**31.68**
Diversity (Number of Perennial Grasses with between 3% - 50% Relative Cover)								
(Forb Relative Cover with between 1% - 50%):								
Number of Perennial Grasses =	**3**	**1**	**3**	**0**	**2**	**4**	**2**	**2**
Forb Relative Cover =	**37.76**	**85.68**	**17.71**	**56.61**	**59.52**	**24.43**	**12.33**	**6.92**

Table 5 Colowyo - Woody Plant Density - 2019

East Pit, West Pit, and South Taylor Pit Reclamation Units

Woody Plants per Acre

			East Pit		West Pit			South Taylor
		Unit -->	**EP060**	**EP057**	**WP021**	**WP024**	**WP025**	**ST002**
		Growing Seasons -->	2	2	7	4	2	2
N	P	*Artemisia tridentata* Big Sagebrush	29.7	43.2	45.9	5.4	2.7	4,632.3
N	P	*Atriplex canescens* Four-wing Saltbush	2.7	2.7	-	5.4	2.7	-
N	P	*Symphoricarpos rotundifolius* Roundleaf Snowberry	-	-	-	-	-	35.1
		Total Per Acre	**32.4**	**45.9**	**45.9**	**10.8**	**5.4**	**4,667.4**

Chart 5

Woody Plant Density by Species and Area - East Pit, West Pit, South Taylor - 2019

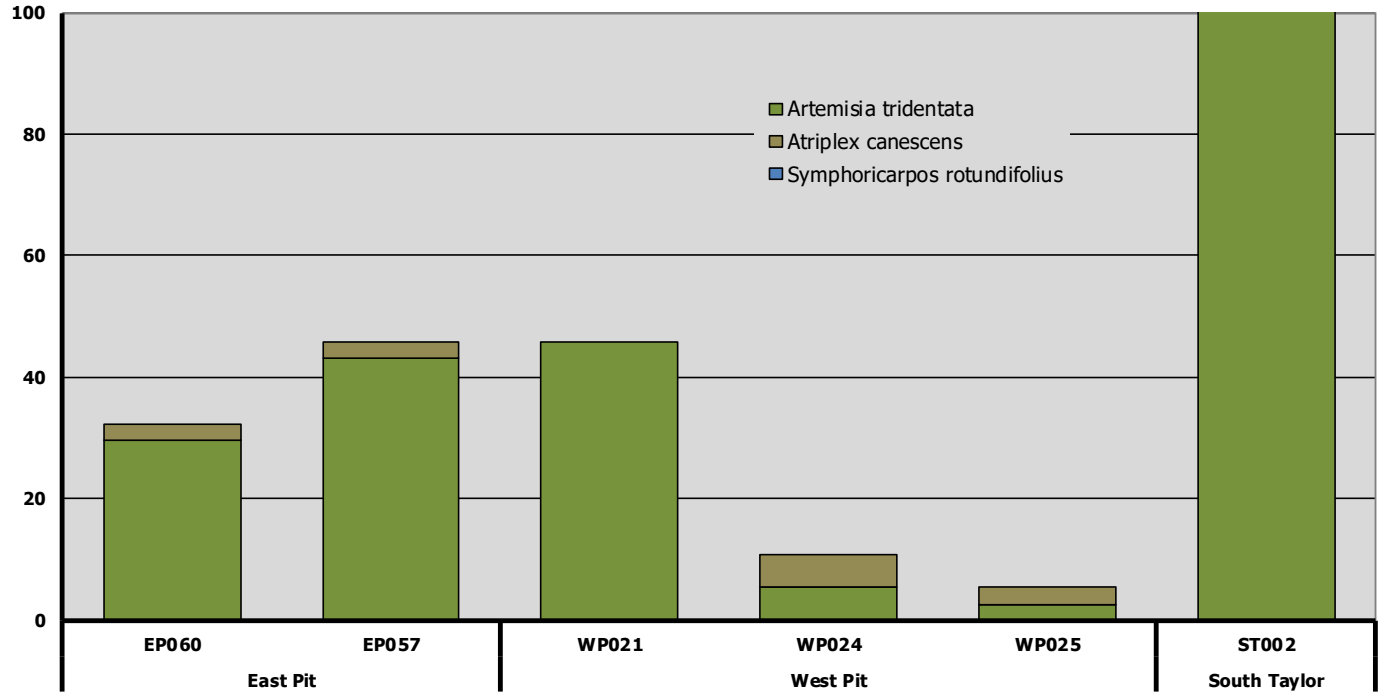
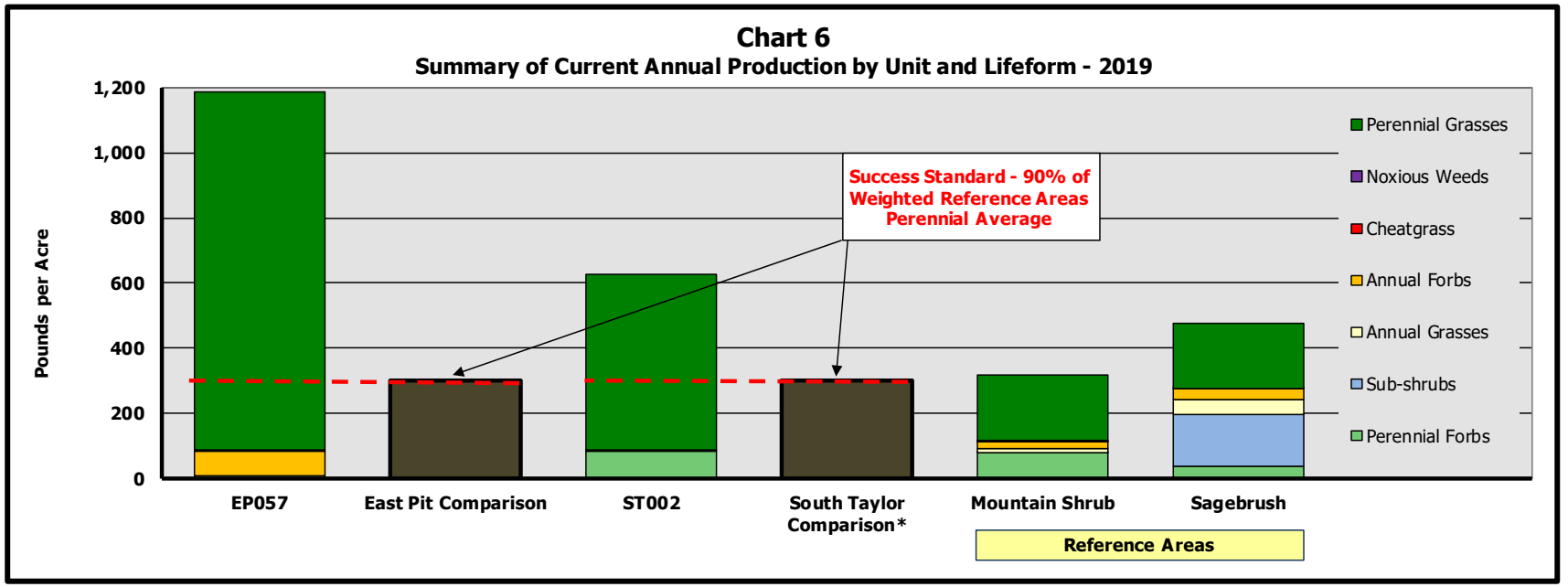


Table 6 Colowyo - Vegetation Production - 2019

Summary of Areas Sampled

Pounds (lbs) per Acre

	Area	Weight	*Perennial Grasses*	*Perennial Forbs*	*Sub-shrubs*	*Annual Grasses*	*Annual Forbs*	*Noxious Weeds*		TOTAL	
								Cheatgrass	*Other*	lbs / ac	Perennial lbs / ac
Reclamation Units	EP057	100%	1,099.1	-	-	6.8	78.4	2.1	-	**1186.4**	**1099.1**
	ST002	100%	535.5	83.0	-	-	7.1	-	-	**625.6**	**618.5**
Reference Areas	Mountain Shrub	55% / 52%	203.9	79.7	0.4	12.4	21.1	1.2	1.0	**319.7**	**284.0**
	Sagebrush	45% / 25%	200.5	36.1	160.5	45.0	33.5	0.1	-	**475.7**	**397.1**
	Aspen	0% / 23%	- Not Sampled in 2019 -								
Weighted Averages	East Pit Comparison	55%/45%/0%	**202.4**	**60.1**	**72.5**	**27.1**	**26.7**	**0.7**	**0.5**	**389.9**	**334.9**
	South Taylor Comparison*	52%/25%/23%	**202.4**	**60.1**	**72.5**	**27.1**	**26.7**	**0.7**	**0.5**	**389.9**	**334.9**



*Aspen Reference Area not sampled in 2019; The East Pit weighting was applied for the 2019 South Taylor reclamation unit comparison.

Table 6 Colowyo - Vegetation Cover - 2019

EP057

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																						
I	P	*Agropyron cristatum*	Crested Wheatgrass	21	5	6									2				**2.27**	**5.07**	**27**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass				10	6	15	20	16	5	21	2	2	2		1	**6.67**	**14.93**	**73**
N	P	*Agropyron smithii*	Western Wheatgrass		1	17						2							**1.33**	**2.99**	**20**
I	P	*Agropyron sp.*	Wheatgrass	8	10	4													**1.47**	**3.28**	**20**
N	P	*Bromus marginatus*	Mountain Brome		7														**0.47**	**1.04**	**7**
N	P	*Elymus cinereus*	Basin Wildrye				4						3						**0.47**	**1.04**	**13**
N	P	*Hordeum jubatum*	Foxtail Barley													1			**0.07**	**0.15**	**7**
N	P	*Koeleria macrantha*	Prairie Junegrass									1							**0.07**	**0.15**	**7**
N	P	*Nassela viridula*	Green Needlegrass						1										**0.07**	**0.15**	**7**
N	P	*Poa ampla*	Big Bluegrass													1			**0.07**	**0.15**	**7**
I	P	*Poa pratensis*	Kentucky Bluegrass			2							1						**0.20**	**0.45**	**13**
N	P	*Sitanion hystrix*	Bottlebrush Squirreltail															12	**0.80**	**1.79**	**7**
Forbs																					
N	P	*Phlox longifolia*	Longleaf Phlox				7	19	27	1	1		3	8	15	31		2	**7.60**	**17.01**	**67**
N	P	*Pseudostellaria jamesiana*	Tuber Starwort													4			**0.27**	**0.60**	**7**
N	P	*Senecio serra*	Tall Ragwort											3	10		5		**1.20**	**2.69**	**20**
N	P	*Thalictrum occidentale*	Western Meadow-Rue	3	7	3	1	1	1	1	3		1	4	8		14	4	**3.40**	**7.61**	**87**
Sub-Shrubs																					
			None																**0.00**	**0.00**	**0**
Shrubs & Trees																					
N	P	*Artemisia tridentata*	Big Sagebrush					1	3										**0.27**	**0.60**	**13**
																			Mean		
			Total Plant Cover	**35**	**36**	**32**	**31**	**35**	**61**	**54**	**66**	**16**	**39**	**63**	**63**	**60**	**33**	**46**	**44.67**		
			Rock	1	1	0	0	4	1	1	2	6	1	0	2	2	3	1	**1.67**		
			Litter	25	27	35	26	28	25	44	31	34	44	34	26	15	46	19	**30.60**		
			Bare ground	39	36	33	43	33	13	1	1	44	16	3	9	23	18	34	**23.07**		
			Total Perennial Cover	**32**	**30**	**32**	**22**	**27**	**47**	**22**	**20**	**8**	**29**	**17**	**37**	**39**	**19**	**19**	**26.67**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 37.76**
Sample Adequacy Calculations	**Plant Cover Mean = 44.67** **t= 1.35** **n = 15** **Variance = 236.95** **n_{min} = 21.49**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 7 Colowyo - Vegetation Cover - 2019

EP060

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																					
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	15	4	3	8	5	5	4	5	6	7	3	4	1		3	**4.87**	**8.94**	**93**
N	P	*Agropyron riparium*	Streambank Wheatgrass	1	1														**0.13**	**0.24**	**13**
N	P	*Agropyron smithii*	Western Wheatgrass	2	1		2				3	2							**0.67**	**1.22**	**33**
I	A	*Bromus arvensis*	Field Brome											1		10	1		**0.80**	**1.47**	**20**
I	P	*Bromus inermis*	Smooth Brome															1	**0.07**	**0.12**	**7**
I	A	*Bromus japonicus*	Japanese Brome			1	1	1	1										**0.27**	**0.49**	**27**
X	A	*Bromus tectorum*	Cheatgrass			3		1							3	1			**0.53**	**0.98**	**27**
N	P	*Elymus cinereus*	Basin Wildrye				2								1			1	**0.27**	**0.49**	**20**
Forbs																					
I	P	*Astragalus cicer*	Cicer Milkvetch									1							**0.07**	**0.12**	**7**
I	A	*Chenopodium album*	Lambsquarter				7	1	2	1	4	4	1	5	3	15	19		**4.13**	**7.59**	**73**
X	A	*Cynoglossum officinale*	Houndstongue									3							**0.20**	**0.37**	**7**
N	A	*Descurainia pinnata*	Pinnate Tansymustard	2										3					**0.33**	**0.61**	**13**
N	P	*Linum lewisii*	Lewis Flax	2															**0.13**	**0.24**	**7**
I	A	*Polygonum aviculare*	Prostrate Knotweed	8	4		3	10	22	50	25	16	7	5	20	7	32	5	**14.27**	**26.19**	**93**
I	A	*Salsola tragus*	Russian Thistle	5	67	30	43	1			2	2	24	22	3	8		3	**14.00**	**25.70**	**80**
I	A	*Thlaspi arvense*	Field Pennycress	10	3	23	5	22	10	2	1	14	35	29	13	13	2	24	**13.73**	**25.21**	**100**
Sub-Shrubs																					
			None																**0.00**	**0.00**	**0**
Shrubs & Trees																					
			None																**0.00**	**0.00**	**0**
																				Mean	
			Total Plant Cover	**45**	**80**	**60**	**71**	**41**	**40**	**57**	**40**	**48**	**74**	**68**	**47**	**55**	**54**	**37**	**54.47**		
			Rock	5	1	0	1	8	1	3	3	4	5	3	1	0	1	0	**2.40**		
			Litter	6	10	20	12	11	6	5	9	11	8	14	20	24	13	52	**14.73**		
			Bare ground	44	9	20	16	40	53	35	48	37	13	15	32	21	32	11	**28.40**		
			Total Perennial Cover	**20**	**6**	**3**	**12**	**5**	**5**	**4**	**8**	**9**	**7**	**3**	**5**	**1**	**0**	**5**	**6.20**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 1** **Forb Relative Cover = 85.68**
Sample Adequacy Calculations	**Plant Cover Mean = 54.47** **t= 1.35** **n = 15** **Variance = 187.12** **n_{min} = 11.41**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 8 Colowyo - Vegetation Cover - 2019

WP021

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																						
I	P	*Agropyron cristatum*	Crested Wheatgrass										2		3			1	**0.40**	**0.62**	**20**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	17	45	36			20		29	52	41	51	52	24	34	52	**30.20**	**46.65**	**80**
N	P	*Agropyron smithii*	Western Wheatgrass				12			17	2							1	**2.13**	**3.30**	**27**
I	P	*Agropyron sp.*	Wheatgrass				40	21		20									**5.40**	**8.34**	**20**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass		1	1							2	1	5		12	2	**1.60**	**2.47**	**47**
I	A	*Bromus arvensis*	Field Brome					16	5		13		2		1	1		2	**2.67**	**4.12**	**47**
I	A	*Bromus japonicus*	Japanese Brome			4	4	33						17					**3.87**	**5.97**	**27**
N	P	*Bromus marginatus*	Mountain Brome			2								1					**0.20**	**0.31**	**13**
X	A	*Bromus tectorum*	Cheatgrass	1															**0.07**	**0.10**	**7**
N	P	*Elymus cinereus*	Basin Wildrye		1	1	1				4	1					1		**0.60**	**0.93**	**40**
I	P	*Festuca ovina/saximontana*	Hard Fescue			2							1		6	5		1	**1.00**	**1.54**	**33**
N	P	*Hordeum jubatum*	Foxtail Barley												6			1	**0.47**	**0.72**	**13**
N	P	*Nassela viridula*	Green Needlegrass	3	6	1													**0.67**	**1.03**	**20**
I	P	*Poa pratensis*	Kentucky Bluegrass	2		8						1	2			1		14	**1.87**	**2.88**	**40**
Forbs																						
X	P	*Caradaria draba*	Lenspod Whitetop			1													**0.07**	**0.10**	**7**
X	P	*Carduus nutans*	Musk Thistle					14		9						3			**1.73**	**2.68**	**20**
N	P	*Linum lewisii*	Lewis Flax										1						**0.07**	**0.10**	**7**
I	A	*Pocilla biloba*	Twolobed Speedwell	55	12	22			17		14	3		5		16	12		**10.40**	**16.07**	**60**
I	A	*Polygonum aviculare*	Prostrate Knotweed							3									**0.20**	**0.31**	**7**
I	A	*Sisymbrium altissimum*	Tumble Mustard						3		4			1	2				**0.67**	**1.03**	**27**
I	A	*Thlaspi arvense*	Field Pennycress								1		1						**0.13**	**0.21**	**13**
Sub-Shrubs																						
			None																**0.00**	**0.00**	**0**
Shrubs & Trees																						
N	P	*Artemisia tridentata*	Big Sagebrush					1		3						1			**0.33**	**0.51**	**20**
																			Mean		
			Total Plant Cover	**78**	**65**	**78**	**57**	**85**	**45**	**52**	**67**	**57**	**52**	**76**	**75**	**51**	**59**	**74**	**64.73**		
			Rock	1	0	1	2	0	2	1	3	0	2	2	0	1	2	0	**1.13**		
			Litter	12	20	15	25	14	29	26	11	28	20	14	17	15	12	16	**18.27**		
			Bare ground	9	15	6	16	1	24	21	19	15	26	8	8	33	27	10	**15.87**		
			Total Perennial Cover	**22**	**53**	**51**	**53**	**22**	**20**	**40**	**35**	**54**	**49**	**53**	**72**	**31**	**47**	**72**	**44.93**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 17.71**
Sample Adequacy Calculations	**Plant Cover Mean = 64.73** **t= 1.35** **n = 15** **Variance = 152.92** **n_{min} = 6.60**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 9 Colowyo - Vegetation Cover - 2019

WP024

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																						
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass						1	1		2		2	1		2	2	**0.73**	**1.63**	**47**
N	P	*Agropyron smithii*	Western Wheatgrass					1									1		**0.13**	**0.30**	**13**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass	1													1		**0.13**	**0.30**	**13**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass												2				**0.13**	**0.30**	**7**
I	A	*Bromus japonicus*	Japanese Brome	9	63	9	26	8	56	53	2			4	4	10	5	15	**17.60**	**39.23**	**87**
X	A	*Bromus tectorum*	Cheatgrass	2			1												**0.20**	**0.45**	**13**
N	P	*Elymus cinereus*	Basin Wildrye													1		2	**0.20**	**0.45**	**13**
N	P	*Hordeum jubatum*	Foxtail Barley													1			**0.07**	**0.15**	**7**
N	P	*Nassela viridula*	Green Needlegrass													3			**0.20**	**0.45**	**7**
Forbs																						
N	A	*Alyssum alyssoides*	Pale Madwort	1		2									2				**0.33**	**0.74**	**20**
I	P	*Astragalus cicer*	Cicer Milkvetch															3	**0.20**	**0.45**	**7**
I	A	*Chenopodium album*	Lambsquarter	3			4	5			7	3	3	11	2	8	6	15	**4.47**	**9.96**	**73**
N	P	*Cirsium centaureae*	Fringed Thistle													1			**0.07**	**0.15**	**7**
X	P	*Cirsium vulgare*	Bull Thistle									1							**0.07**	**0.15**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce			1				1			2	1					**0.33**	**0.74**	**27**
N	P	*Linum lewisii*	Lewis Flax								3								**0.20**	**0.45**	**7**
I	A	*Pocilla biloba*	Twolobed Speedwell											2					**0.13**	**0.30**	**7**
I	A	*Polygonum aviculare*	Prostrate Knotweed	1		2								1					**0.27**	**0.59**	**20**
I	A	*Salsola tragus*	Russian Thistle	8		8	2	21	1		1	3	4	10	7	5	8	6	**5.60**	**12.48**	**87**
I	A	*Thlaspi arvense*	Field Pennycress	6	3	11	9	8	9	10	20	19	26	13	17	28	16	12	**13.80**	**30.76**	**100**
Sub-Shrubs																						
			None																**0.00**	**0.00**	**0**
Shrubs & Trees																						
			None																**0.00**	**0.00**	**0**
																				Mean	
			Total Plant Cover	**31**	**66**	**33**	**42**	**43**	**67**	**65**	**33**	**28**	**35**	**44**	**35**	**57**	**39**	**55**	**44.87**		
			Rock	3	0	1	0	2	0	0	2	2	1	1	6	1	5	2	**1.73**		
			Litter	42	24	30	16	25	25	14	16	41	43	19	27	30	25	20	**26.47**		
			Bare ground	24	10	36	42	30	8	21	49	29	21	36	32	12	31	23	**26.93**		
			Total Perennial Cover	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**3**	**2**	**0**	**2**	**3**	**6**	**4**	**7**	**2.07**		

Diversity

No. of Perennial Grasses (3% - 50% Rel. Cover) = 0

Forb Relative Cover = 56.61

Sample Adequacy Calculations

Plant Cover Mean = 44.87 **t= 1.35** **n = 15**

Variance = 185.12 **n_{min} = 16.64**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 10 Colowyo - Vegetation Cover - 2019

WP025

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																						
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	3	12	36	10	3	2	1	12	18	10	4		1	2	4	**7.87**	**17.69**	**93**
N	P	*Agropyron smithii*	Western Wheatgrass					1											**0.07**	**0.15**	**7**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass						3						2				**0.33**	**0.75**	**13**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass											4					**0.27**	**0.60**	**7**
I	A	*Bromus arvensis*	Field Brome					25	8		5		2						**2.67**	**6.00**	**27**
I	A	*Bromus japonicus*	Japanese Brome	1	1	5	9							2	4	3		6	**2.07**	**4.65**	**53**
X	A	*Bromus tectorum*	Cheatgrass		2	24	11				10		6					3	**3.73**	**8.40**	**40**
N	P	*Elymus cinereus*	Basin Wildrye	2		2				1	2								**0.47**	**1.05**	**27**
N	P	*Hordeum jubatum*	Foxtail Barley											2				2	**0.27**	**0.60**	**13**
I	P	*Poa bulbosa*	Bulbous Bluegrass													2	1		**0.20**	**0.45**	**13**
Forbs																						
N	P	*Achillea millefolium*	Common Yarrow					1				1	1						**0.13**	**0.30**	**13**
X	P	*Carduus nutans*	Musk Thistle					1											**0.07**	**0.15**	**7**
I	A	*Chenopodium album*	Lambsquarter	1	1		4	3	1	10	10		1	1	3		5	3	**2.87**	**6.45**	**80**
I	B	*Lactuca serriola*	Prickly Lettuce		1														**0.07**	**0.15**	**7**
N	A	*Microsteris gracilis*	Slender Phlox													1	1		**0.13**	**0.30**	**13**
I	A	*Pocilla biloba*	Twolobed Speedwell	7			6	4	4					10		4	7	15	**3.80**	**8.55**	**53**
I	A	*Polygonum aviculare*	Prostrate Knotweed		3		4	2	16	14	12	3	10	14	17	21	7	15	**9.20**	**20.69**	**87**
I	A	*Salsola tragus*	Russian Thistle	13					2	11		33			4		9		**4.80**	**10.79**	**40**
I	A	*Sisymbrium altissimum*	Tumble Mustard	1															**0.07**	**0.15**	**7**
I	A	*Thlaspi arvense*	Field Pennycress	3	12	1	16	7	2	4	11	1	12	2		1	6	1	**5.27**	**11.84**	**93**
I	A	*Unknown Forb*		1		1													**0.13**	**0.30**	**13**
Sub-Shrubs																						
			None																**0.00**	**0.00**	**0**
Shrubs & Trees																						
			None																**0.00**	**0.00**	**0**
																				Mean	
			Total Plant Cover	**32**	**32**	**69**	**60**	**46**	**38**	**41**	**62**	**56**	**42**	**39**	**30**	**33**	**38**	**49**	**44.47**		
			Rock	1	0	2	1	1	0	0	0	1	0	1	2	1	1	1	**0.80**		
			Litter	7	32	20	20	31	9	28	10	7	20	50	40	25	38	20	**23.80**		
			Bare ground	60	36	9	19	22	53	31	28	36	38	10	28	41	23	30	**30.93**		
			Total Perennial Cover	**5**	**12**	**38**	**10**	**4**	**5**	**2**	**14**	**19**	**11**	**10**	**2**	**3**	**3**	**6**	**9.60**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 1** **Forb Relative Cover = 59.52**
Sample Adequacy Calculations	**Plant Cover Mean = 44.47** **t= 1.35** **n = 15** **Variance = 149.27** **n_{min} = 13.66**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 12 Colowyo - Vegetation Cover - 2019

Sagebrush Reference Area

Percent Ground Cover Based on Point-Intercept Sampling

				Transect No.—→	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																											
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass					9	10														10		**1.45**	**2.71**	**15**
N	P	*Agropyron smithii*	Western Wheatgrass	6	1	1	5	3	2	1	2	5	5		2	8	24		2	5	2			**3.70**	**6.92**	**80**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass						3		4				9			1					1	**0.90**	**1.68**	**25**
I	P	*Bromus inermis*	Smooth Brome										11	25						6				**2.10**	**3.93**	**15**
I	A	*Bromus japonicus*	Japanese Brome	10	11	24	53	8	10	31	24	8	30	31	2	11	26	6		35		25		**17.25**	**32.24**	**85**
N	P	*Koeleria macrantha*	Prairie Junegrass	3	2	2		1				1			1	8		2	4		2		1	**1.35**	**2.52**	**55**
I	P	*Poa bulbosa*	Bulbous Bluegrass					1																**0.05**	**0.09**	**5**
N	P	*Poa secunda*	Sandberg Bluegrass		1	1		1		2		1	1		1	4		2			3			**0.85**	**1.59**	**50**
Forbs																											
N	A	*Alyssum alyssoides*	Pale Madwort			2	1	1		2	1	1	1			2	1	1	1				1	**0.75**	**1.40**	**60**
N	P	*Astragalus purshii*	Woollypod Milkvetch															1						**0.05**	**0.09**	**5**
N	P	*Cirsium centaureae*	Fringed Thistle														1							**0.05**	**0.09**	**5**
N	A	*Collomia linearis*	Slenderleaf Collomia																1	1		1		**0.15**	**0.28**	**15**
N	P	*Comandra umbellata*	Bastard Toadflax								1													**0.05**	**0.09**	**5**
N	A	*Cordylanthus ramosus*	Bushy Bird's Beak																2					**0.10**	**0.19**	**5**
N	A	*Epilobium brachycarpum*	Tall Annual Willowherb												1									**0.05**	**0.09**	**5**
N	A	*Erigeron bellidiastrum*	Western Daisy Fleabane															1	1					**0.10**	**0.19**	**10**
N	A	*Galium aparine*	Stickywilly																			2		**0.10**	**0.19**	**5**
N	P	*Helianthella uniflora*	Onelfower Helianthella											2			6			3				**0.55**	**1.03**	**15**
N	P	*Linum lewisii*	Lewis Flax															1						**0.05**	**0.09**	**5**
N	P	*Lupinus caudatus*	Tailcup Lupine							2				2			1							**0.25**	**0.47**	**15**
N	P	*Lygodesmia juncea*	Rush Skeletonplant	1		1			1															**0.15**	**0.28**	**15**
N	P	*Penstemon eriantherus*	Fuzzytongue Penstemon																		2			**0.10**	**0.19**	**5**
N	P	*Phlox hoodii*	Hood Phlox	1														1						**0.10**	**0.19**	**10**
N	P	*Phlox longifolia*	Longleaf Phlox															1				1	2	**0.20**	**0.37**	**15**
N	A	*Polygonum douglasii*	Douglas's Knotweed	1																				**0.05**	**0.09**	**5**
N	P	*Sphaeralcea coccinea*	Scarlet Globemallow													1								**0.05**	**0.09**	**5**
N	P	*Stenotus acaulis*	Stemless Moch Goldenweed									2						2	1		2			**0.35**	**0.65**	**20**
I	A	*Thlaspi arvense*	Field Pennycress														6			2		1		**0.45**	**0.84**	**15**
Sub-Shrubs																											
N	P	*Gutierrezia sarothrae*	Snakeweed	1	14	18	4	11	5	14		7			1			6	7		11		4	**5.15**	**9.63**	**65**
Shrubs & Trees																											
N	P	*Amelanchier alnifolia*	Saskatoon Serviceberry	2					3		4		3		1	2		10	2	2	2		3	**1.70**	**3.18**	**55**
N	P	*Artemisia tridentata*	Big Sagebrush	18	2	10	3		12	10	7	15	12	5	30	12	5	17	6			4	21	**9.45**	**17.66**	**85**
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush								14									7			8	**1.45**	**2.71**	**15**
N	P	*Chrysothamnus viscidiflorus*	Low Rabbitbrush														1			4		26		**1.55**	**2.90**	**15**
N	P	*Opuntia polyacantha*	Plains Pricklypear									1			1									**0.10**	**0.19**	**10**
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry	7		6	1		2	8	6			9	3	1		1		4		5	1	**2.70**	**5.05**	**65**
																									Mean		
				Total Plant Cover	**50**	**31**	**65**	**67**	**35**	**48**	**70**	**63**	**41**	**63**	**75**	**51**	**49**	**71**	**54**	**27**	**69**	**24**	**75**	**42**	**53.50**		
				Rock	2	0	0	0	0	7	0	0	7	0	0	2	0	0	7	1	0	3	0	1	**1.50**		
				Litter	30	40	31	32	59	40	30	35	48	37	25	42	40	29	30	46	31	32	23	43	**36.15**		
				Bare ground	18	29	4	1	6	5	0	2	4	0	0	5	11	0	9	26	0	41	2	14	**8.85**		
				Total Perennial Cover	**39**	**20**	**39**	**13**	**26**	**38**	**37**	**38**	**32**	**32**	**43**	**49**	**36**	**38**	**46**	**22**	**31**	**24**	**46**	**41**	**34.50**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 6.92**
Sample Adequacy Calculations	**Plant Cover Mean = 53.50** **t= 1.33** **n = 20** **Variance = 264.05** **n_{min} = 16.26**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 13 Colowyo - Vegetation Cover - 2019

Mountain Shrub Reference Area

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—>	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																										
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass					1	5	2							1	7						0.35	0.60	5
N	P	*Agropyron smithii*	Western Wheatgrass					1	5	2							1	2						0.55	0.94	25
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass													1			3	2	3		5	0.70	1.20	25
N	P	*Agropyron trachycaulum*	Slender Wheatgrass			3																		0.15	0.26	5
I	P	*Bromus inermis*	Smooth Brome																			3		0.15	0.26	5
I	A	*Bromus japonicus*	Japanese Brome	6		14		1	9	12				16		1		3			1		22	4.25	7.28	50
N	P	*Bromus marginatus*	Mountain Brome		3						2				2	1			1					0.45	0.77	25
X	A	*Bromus tectorum*	Cheatgrass	20	4						1			5				3		2				1.75	3.00	30
N	P	*Carex geyeri*	Geyer's Sedge		3		13	5			7	16	9	5	7	5	23		8	3	8	8		6.00	10.27	70
N	P	*Elymus glaucus*	Blue Wildrye								8				2									0.50	0.86	10
N	P	*Melica bulbosa*	Oniongrass					1				1												0.10	0.17	10
N	P	*Nassela viridula*	Green Needlegrass								8		2	1	9			3	10					1.65	2.83	30
I	P	*Poa pratensis*	Kentucky Bluegrass			6						4			6		9							1.25	2.14	20
N	P	*Stipa nelsonii*	Nelson Needlegrass				3	16				2	3			6	1		7					1.90	3.25	35
Forbs																										
N	P	*Achillea lanulosa*	Western Yarrow	2	1		1				2			2			1		2					0.55	0.94	35
N	P	*Allium textile*	Wild Onion			1				1						1				1			1	0.25	0.43	25
N	A	*Alyssum alyssoides*	Pale Madwort	4						1				1				1				1	2	0.50	0.86	30
N	P	*Arabis glabra*	Tower Rockcress			1																		0.05	0.09	5
N	P	*Artemisia ludoviciana*	Prairie Sagewort			1				1														0.10	0.17	10
N	P	*Aster ascendens*	Creeping Aster				3									4			4	1				0.60	1.03	20
N	P	*Cirsium centaureae*	Fringed Thistle			1																		0.05	0.09	5
N	A	*Collinsia parviflora*	Blue-eyed Mary													1								0.05	0.09	5
N	A	*Collomia linearis*	Slenderleaf Collomia	1			1				1					1	1							0.25	0.43	25
N	A	*Epilobium brachycarpum*	Tall Annual Willowherb			1																		0.05	0.09	5
N	A	*Galium aparine*	Stickywilly	4	2					1					1									0.40	0.68	20
N	P	*Galium boreale*	Northern Bedstraw								3													0.15	0.26	5
I	B	*Lactuca serriola*	Prickly Lettuce																1					0.05	0.09	5
N	P	*Lathyrus laetivirens*	Aspen Pea						2				1			1					1			0.25	0.43	20
N	P	*Linum lewisii*	Lewis Flax								1													0.05	0.09	5
N	P	*Lupinus caudatus*	Tailcup Lupine		2	2	3			1	1		4			1		6	2	1	3		3	1.45	2.48	60
N	A	*Microsteris gracilis*	Slender Phlox								1		1										1	0.15	0.26	15
N	P	*Phlox longifolia*	Longleaf Phlox																1					0.05	0.09	5
I	A	*Pocilla biloba*	Twolobed Speedwell		1			1															1	0.15	0.26	15
N	A	*Polygonum douglasii*	Douglas's Knotweed					1			1		1											0.15	0.26	15
N	P	*Pseudostellaria jamesiana*	Tuber Starwort	3	5	2	2				3	2				4	1		1					1.15	1.97	45
N	B	*Senecio integerrimus*	Lambstongue Ragwort					1																0.05	0.09	5
I	P	*Taraxacum officinale*	Dandelion						3	1											1			0.25	0.43	15
I	A	*Thlaspi arvense*	Field Pennycress							3								2						0.25	0.43	10
I	B	*Tragopogon dubius*	False Salsify																1					0.05	0.09	5
N	P	*Vicia americana*	American Vetch												1		1							0.10	0.17	10
N	P	*Viola sp.*	Violet																1					0.05	0.09	5
Sub-Shrubs																										
			None																					0.00	0.00	0
Shrubs & Trees																										
N	P	*Amelanchier alnifolia*	Saskatoon Serviceberry			19			3								3				1		3	1.45	2.48	25
N	P	*Artemisia tridentata*	Big Sagebrush		46	6		8	22	12			4	11			1	20		8	38	12	10	9.90	16.95	65
N	P	*Chrysothamnus viscidiflorus*	Low Rabbitbrush			6													4				8	0.90	1.54	15
N	P	*Mahonia repens*	Creeping Barberry													20								1.00	1.71	5
N	P	*Quercus gambellii*	Gambel Oak	7				16			29	7	17	26	13		8	3			4	41		8.55	14.64	55
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry	6	6	17	19		10	19			9	5	12	6	9	1	25	39	7		3	9.65	16.52	80
																								Mean		
			Total Plant Cover	**53**	**73**	**80**	**45**	**51**	**54**	**54**	**68**	**32**	**51**	**72**	**53**	**53**	**59**	**51**	**71**	**57**	**67**	**65**	**59**	58.40		
			Rock	0	0	0	0	0	0	0	0	1	3	0	0	2	0	0	0	0	0	0	2	0.40		
			Litter	46	20	20	53	38	45	46	32	67	46	26	45	44	41	48	27	42	33	35	28	39.10		
			Bare ground	1	7	0	2	11	1	0	0	0	0	2	2	1	0	1	2	1	0	0	11	2.10		
			Total Perennial Cover	**18**	**66**	**65**	**44**	**47**	**45**	**37**	**64**	**32**	**49**	**50**	**52**	**50**	**58**	**42**	**69**	**55**	**66**	**64**	**33**	50.30		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 12.33**
Sample Adequacy Calculations	**Plant Cover Mean = 58.40** **t= 1.33** **n = 20** **Variance = 126.46** **n_{min} = 6.54**

N=Native, I=Introduced, X-Noxious A=Annual, B=Biennial, P=Perennial

Table 14 Colowyo - Woody Plant Density - 2019

EP057 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Count	Per Acre
Shrubs & Trees																			
N P	*Artemisia tridentata*	Big Sagebrush				11	5				1							16	43.2
N P	*Atriplex canescens*	Four-wing Saltbush																1	2.7
		Total	**0**	**0**	**0**	**11**	**5**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**17**	**45.9**

Sample Adequacy Calculations			
Mean = 1.13	t= 1.35	n = 15	
Variance = 9.12	n_{min} = 1285.06		

Table 15 Colowyo - Woody Plant Density - 2019

EP060 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Count	Per Acre
Shrubs & Trees																			
N P	*Artemisia tridentata*	Big Sagebrush	2			7		2										11	29.7
N P	*Atriplex canescens*	Four-wing Saltbush	1															1	2.7
		Total	**3**	**0**	**0**	**7**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**32.4**

Sample Adequacy Calculations			
Mean = 0.80	t= 1.35	n = 15	
Variance = 3.74	n_{min} = 1058.00		

Table 16 Colowyo - Woody Plant Density - 2019

WP021 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Count	Per Acre
Shrubs & Trees																			
N P	*Artemisia tridentata*	Big Sagebrush		4				2				4			1	1	5	17	#DIV/0!
		Total	**0**	**4**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**4**	**0**	**0**	**1**	**1**	**5**	**17**	**#DIV/0!**

Sample Adequacy Calculations			
Mean = 1.13	t= 1.35	n = 15	
Variance = 3.12	n_{min} = 439.98		

Table 17 Colowyo - Woody Plant Density - 2019

WP024 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Count	Per Acre
Shrubs & Trees																			
N P	*Artemisia tridentata*	Big Sagebrush					1								1			2	5.4
N P	*Atriplex canescens*	Four-wing Saltbush			1					1								2	5.4
		Total	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**4**	**10.8**

Sample Adequacy Calculations			
Mean = 0.27	t= 1.35	n = 15	
Variance = 0.21	n_{min} = 533.04		

Table 18 Colowyo - Woody Plant Density - 2019

WP024 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Count	Per Acre
Shrubs & Trees																			
N P	*Artemisia tridentata*	Big Sagebrush														1		1	2.7
N P	*Atriplex canescens*	Four-wing Saltbush			1													1	2.7
		Total	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**5.4**

Sample Adequacy Calculations			
Mean = 0.13	t= 1.35	n = 15	
Variance = 0.12	n_{min} = 1259.91		

Table 19 Colowyo - Woody Plant Density - 2019

ST002 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.---->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Count	Per Acre
Shrubs & Trees																			
N P	*Artemisia tridentata*	Big Sagebrush	129	109	103	156	101	149	104	44	84	186	114	190	78	90	80	1717	4632.3
N P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry	1			1		3		2	1	1				2	2	13	35.1
		Total	**130**	**109**	**103**	**157**	**101**	**152**	**104**	**46**	**85**	**187**	**114**	**190**	**78**	**92**	**82**	**1730**	**4667.4**

Sample Adequacy Calculations			
Mean = 115.33	t= 1.35	n = 15	
Variance = 1665.10	n_{min} = 22.65		

Table 20 Colowyo - Vegetation Production - 2019

EP057 - Raw Data

Oven Dry Weight (grams per 1/2 square meter)

Sample No.	*Perennial Grasses*	*Perennial Forbs*	*Sub-shrubs*	*Annual Grasses*	*Annual / Biennial Forbs*	*Noxious Weeds*		TOTAL	
						Cheatgrass	*Other*	g/0.5m^2	lbs / ac
1	51.9			0.4	9.5	0.3		**62.1**	**1,106.2**
2	33.7			0.4	0.2			**34.3**	**611.0**
3	15.3			0.7	11.0	0.3		**27.3**	**486.3**
4	95.0				0.4			**95.4**	**1,699.5**
5	112.6			0.4	0.9			**113.9**	**2,029.0**
Average	**61.7**	**0.0**	**0.0**	**0.4**	**4.4**	**0.1**	**0.0**	**66.6**	**1186.4**

Sampling Adequacy:	**n= 5**	**t = 1.533**	**var. = 1418.690**
		Mean = 66.60	**n_{min} = 75.187**

Table 21 Colowyo - Vegetation Production - 2019

ST002 - Raw Data

Oven Dry Weight (grams per 1/2 square meter)

Sample No.	*Perennial Grasses*	*Perennial Forbs*	*Sub-shrubs*	*Annual Grasses*	*Annual / Biennial Forbs*	*Noxious Weeds*		TOTAL	
						Cheatgrass	*Other*	g/0.5m^2	lbs / ac
1	53.5	2.6			0.4			**56.5**	**1,006.5**
2	14.8	5.0			0.7			**20.5**	**365.2**
3	7.1	7.5			0.5			**15.1**	**269.0**
4	58.5				0.4			**58.9**	**1,049.2**
5	16.4	8.2						**24.6**	**438.2**
Average	**30.1**	**4.7**	**0.0**	**0.0**	**0.4**	**0.0**	**0.0**	**35.1**	**625.6**

Sampling Adequacy:	**n= 5**	**t = 1.533**	**var. = 436.952**
		Mean = 35.12	**n_{min} = 83.277**

Table 22 Colowyo - Vegetation Production - 2019

Mountain Shrub Reference Area - Raw Data

Oven Dry Weight (grams per 1/2 square meter)

Sample No.	*Perennial Grasses*	*Perennial Forbs*	*Sub-shrubs*	*Annual Grasses*	*Annual / Biennial Forbs*	*Noxious Weeds*		TOTAL	
						Cheatgrass	*Other*	g/0.5m^2	lbs / ac
1	11.6	5.2		2.3	0.3			**19.4**	**345.6**
2	5.1			0.3	2.1			**7.5**	**133.6**
3	9.5	7.0			1.2			**17.7**	**315.3**
4	6.9	3.0		0.7	8.4		0.2	**19.2**	**342.0**
5	9.4	7.1		2.0	0.5			**19.0**	**338.5**
6	2.1	15.2	1.0	1.5	2.5		2.0	**24.3**	**432.9**
7	21.6	4.8			2.9			**29.3**	**522.0**
8	8.5	15.2						**23.7**	**422.2**
9	10.2	14.2			0.3			**24.7**	**440.0**
10	16.1	0.2						**16.3**	**290.4**
11	3.8	1.8		0.2	0.4			**6.2**	**110.4**
12	6.0	4.0						**10.0**	**178.1**
13	28.4	1.4			0.3			**30.1**	**536.2**
14	7.6	5.1		2.0	3.0			**17.7**	**315.3**
15	5.6	1.1		2.5	1.5			**10.7**	**190.6**
16	9.0	7.1						**16.1**	**286.8**
17	31.6	2.6			0.3			**34.5**	**614.6**
18	9.7	1.3						**11.0**	**196.0**
19	17.4	6.0						**23.4**	**416.8**
20	7.8	0.8						**8.6**	**153.2**
21	13.9	0.7		0.2	0.4			**15.2**	**270.8**
22	5.7	0.4		2.0				**8.1**	**144.3**
23	5.1	1.8		4.8	2.2	0.2		**14.1**	**251.2**
24	7.8	1.5		1.6	1.0			**11.9**	**212.0**
25	9.8	17.7			1.2			**28.7**	**511.3**
26	4.5	4.3						**8.8**	**156.8**
27	14.3	1.8			5.0			**21.1**	**375.9**
28	37.8				0.2			**38.0**	**676.9**
29	8.7	1.4		0.1	0.5			**10.7**	**190.6**
30	7.2	0.2		0.5	2.5			**10.4**	**185.3**
31	9.5	1.7		0.5	1.5	0.1		**13.3**	**236.9**
32	10.1	9.8		0.7		1.5		**22.1**	**393.7**
33	16.4	7.3			0.2			**23.9**	**425.8**
34	6.5	1.6		1.0	2.0			**11.1**	**197.7**
35	15.7	4.1		0.4	0.9			**21.1**	**375.9**
36	13.0	0.8			1.5			**15.3**	**272.6**
37	19.8	0.6		1.0	1.5			**22.9**	**407.9**
38	6.2	3.5		0.5	1.0			**11.2**	**199.5**
39	5.0	5.2		1.0		1.0		**12.2**	**217.3**
40	12.9	11.5		2.0	2.0			**28.4**	**505.9**
Average	**11.4**	**4.5**	**0.0**	**0.7**	**1.2**	**0.1**	**0.1**	**17.9**	**319.7**

Sampling Adequacy:	**n= 40**	**t = 1.304**	**var. = 62.462**
		Mean = 17.95	**n_{min} = 32.955**

Table 23 Colowyo - Vegetation Production - 2019

Sagebrush Reference Area - Raw Data

Oven Dry Weight (grams per 1/2 square meter)

Sample No.	*Perennial Grasses*	*Perennial Forbs*	*Sub-shrubs*	*Annual Grasses*	*Annual / Biennial Forbs*	*Noxious Weeds*		TOTAL	
						Cheatgrass	*Other*	g/0.5m^2	lbs / ac
1	1.1		57.1	1.2	0.5			**59.9**	**1,067.1**
2	17.3	0.2		0.3	0.4			**18.2**	**324.2**
3	9.7	1.0	46.3	6.8	5.0			**68.8**	**1,225.6**
4	3.6		10.0	0.2	4.2			**18.0**	**320.7**
5	3.2		6.4	4.0	0.7			**14.3**	**254.7**
6	10.4	3.0		7.5	0.6			**21.5**	**383.0**
7	6.3	1.5	10.0	0.9	0.4			**19.1**	**340.2**
8	2.0		46.1	2.0	0.7			**50.8**	**905.0**
9	2.1		21.7	0.2	0.1			**24.1**	**429.3**
10	9.5	0.5	6.2	1.9	0.4			**18.5**	**329.6**
11	9.5	7.8		4.9	2.1			**24.3**	**432.9**
12	14.5	2.2		5.3	0.5	0.2		**22.7**	**404.4**
13	6.5			15.4	0.7			**22.6**	**402.6**
14	44.4				1.9			**46.3**	**824.8**
15	0.8	3.3	14.0		0.5			**18.6**	**331.3**
16	11.9			0.4	0.9			**13.2**	**235.1**
17	6.6	0.2	17.6	0.3	0.4			**25.1**	**447.1**
18	9.6	3.9	12.6	0.8				**26.9**	**479.2**
19	16.8	1.0		2.0	11.8			**31.6**	**562.9**
20	12.1	0.5		7.7	0.4			**20.7**	**368.7**
21	33.7			4.8	0.6			**39.1**	**696.5**
22	11.5		12.7		0.3			**24.5**	**436.4**
23	9.7	3.3	10.5					**23.5**	**418.6**
24	7.2	1.8	3.8					**12.8**	**228.0**
25	2.4	0.5	20.1		0.3			**23.3**	**415.1**
26	7.2	7.0	5.1	4.6	0.9			**24.8**	**441.8**
27	41.4	0.6		4.0	0.8			**46.8**	**833.7**
28	14.8	2.0		0.2	8.0			**25.0**	**445.4**
29	28.1		6.6		0.4			**35.1**	**625.3**
30	6.4	10.9	12.8	0.2	0.9			**31.2**	**555.8**
31	5.6	1.5			7.3			**14.4**	**256.5**
32	2.7	5.5		0.2	10.8			**19.2**	**342.0**
33	17.7	0.3		20.7				**38.7**	**689.4**
34	15.4	0.9	10.2	0.2	0.4			**27.1**	**482.8**
35	2.2	10.5			0.4			**13.1**	**233.4**
36	6.8	1.1	14.9					**22.8**	**406.2**
37	10.5	0.7		3.4	1.1			**15.7**	**279.7**
38	4.6	6.4	3.1					**14.1**	**251.2**
39	9.8		12.6		1.1			**23.5**	**418.6**
40	14.6	3.0		1.0	9.7			**28.3**	**504.1**
Average	**11.3**	**2.0**	**9.0**	**2.5**	**1.9**	**0.0**	**0.0**	**26.7**	**475.7**

Sampling Adequacy:	**n= 40**	**t = 1.304**	**var. = 163.295**
		Mean = 26.71	**n_{min} = 38.914**

Table 24 Colowyo - Emergent Density - 2019

EP061

One Square Foot Quadrats

		Sample Point -->	1					2					3					4					5				
		Quadrat -->	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Annual		Grass															1				1						
		Forb	1		1					6	5		1			4			2	1		1	1		1	1	
Perennial		Grass			11			11	1	3	3				1	1	2	2	1		3	2	1				
		Forb									2		1					2									
		Noxious Weed																									
Shrub		*Artemisia tridentata*															2	3	1		1			3	1		
Total			**1**	**0**	**12**	**0**	**0**	**11**	**1**	**9**	**10**	**0**	**2**	**0**	**1**	**5**	**5**	**7**	**4**	**1**	**5**	**3**	**2**	**3**	**2**	**1**	**0**

		Sample Point -->	6					7					8					9					10					Average Density (per ft^2)
		Quadrat -->	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Annual		Grass																										**0.04**
		Forb		1			1			1					1	5		1				2	1					**0.76**
Perennial		Grass					1			1	2				1	1	3		1		2	1			1	2		**1.16**
		Forb						1									3							1				**0.20**
		Noxious Weed																										**0.00**
Shrub		*Artemisia tridentata*														1	3			1		1		1				**0.36**
Total			**0**	**1**	**0**	**0**	**2**	**1**	**0**	**2**	**2**	**0**	**0**	**0**	**2**	**7**	**9**	**1**	**1**	**1**	**2**	**4**	**1**	**2**	**1**	**2**	**0**	**2.52**

Table 25 Colowyo - Emergent Density - 2019

WP026/27

One Square Foot Quadrats

		Sample Point -->	1					2					3					4					5				
		Quadrat -->	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Annual		Grass																									
		Forb	1	1	2	3			1	1	3	4	3	2	2	3	2	3	4	6	5	3	10	8	7	6	12
Perennial		Grass	4		3	3	5	1	2	1	4	2	4	1		7	4	8	3	1	5	1	1	1	4	2	2
		Forb																									
		Noxious Weed																									
Shrub		*Artemisia tridentata*	1																								
		Atriplex canescens											2														
Total			**6**	**1**	**5**	**6**	**5**	**1**	**3**	**2**	**7**	**6**	**9**	**3**	**2**	**10**	**6**	**11**	**7**	**7**	**10**	**4**	**11**	**9**	**11**	**8**	**14**

		Sample Point -->	6					7					8					9					10					Average Density (per ft^2)
		Quadrat -->	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Annual		Grass																										**0.00**
		Forb	13	11	6	5	12	6	8	5	3	4	1	1			3	5	7	2	5	3		1	1	3	1	**3.96**
Perennial		Grass	1		5				1	1	2		3	1		3			2	3					1	1	4	**1.94**
		Forb																										**0.00**
		Noxious Weed																										**0.00**
Shrub		*Artemisia tridentata*																										**0.02**
		Atriplex canescens																										**0.04**
Total			**14**	**11**	**11**	**5**	**12**	**6**	**9**	**6**	**5**	**4**	**4**	**2**	**0**	**3**	**3**	**5**	**9**	**5**	**5**	**3**	**0**	**1**	**2**	**4**	**5**	**5.96**

SECTION 5 – TOPSOIL

RULE REQUIREMENT

Rule 2.04.13(2) the Permittee may provide additional monitoring information as required by the approved permit.

GENERAL DISCUSSION

In 2019, Colowyo removed topsoil and placed it in stockpile for advancement of the Collom temporary spoil pile, installation of the Collom Pit power line, Clean Water Division 1 (CWD-1), and a small area for the Collom facilities. Figure 5-1 provides the topsoil pile location for all topsoil that was removed.

Also in 2019, Colowyo replaced topsoil on two reclamation units in the West Pit, and one reclamation unit in the East Pit. Please see Figure 5-1 for the topsoil pile and corresponding reclamation area topsoil was replaced.

No areas were requested to be exempt for topsoil removal in 2019.

Figure 5-2 provides each topsoil stockpile and the corresponding volume of material contained within each pile. Figure 5-3 provides the overall topsoil balance at the end of the year 2019 for the entire Colowyo mine site. Finally, Exhibit 5 provides the topsoil replacement depths for each reclamation unit that topsoil was replaced upon in 2019.

Please note that in 2018 and previous reporting years, it was noted that Windrow 5 contained 20,633 cubic yards. In 2019, Colowyo moved this entire windrow and only 5,607 cubic yards were available from that stockpile. It was determined that an incorrect survey and volumetric calculation occurred originally with this windrow.

Figure 5-1 – Topsoil Movements During Report Period

Topsoil Stripping

Task	Activity	Topsoil Placement Area
1	Removed Topsoil from Collom Temparory Spoil Pile Area	Pile 26A
2	Removed Topsoil for Collom Powerline and CWD-1	Windrows 9, 10, 11, and 12
3	Removed Topsoil from Collom Facilities Area	Pile 26A

Topsoil Replacement

Task	Activity	Topsoil Pile Mined
1	Replaced Topsoil on West Pit Reclamation area (WP030)	Pile 15B
2	Replaced Topsoil on West Pit Reclamation area (WP031)	Pile 9A, 15H, and Windrows 4 and 5
3	Replaced Topsoil on East Pit Reclamation Area (EP062)	Pile 15H

Areas Exempt from Topsoil Stripping Due to Conditions

Task	Activity	Acres Exempt
-	-	-

Figure 5-2 - Topsoil Stockpile for Report Year

Stockpile Number	Change in 2019 (cubic yards)	End of Year, 2019 (cubic yards)
9A		416
9B	26,612	26,612
15A		1,130,663
15B	(17,575)	0
15E		3,201
15F		8,119
15G		24,656
15H	(44,601)	0
15I		9,362
16A		77,392
16C		141,291
16D		923,289
16E		851,824
17A		1,686
17B		3,673
17C		1,396
17D		1,310
17E		735
18		458,707
17F		1,460
20A		24,968
21A		25,615
21B		42,433
21C		19,262
21D		53,537
22A		50,264
25A		533,961
26A	72,678	586,194
26B		0
27A		12,316
Windrow 1		3,410
Windrow 2		298
Windrow 3		3,892
Windrow 4	(8,361)	2,189
Windrow 5	(5,607)	0
Windrow 6		120
Windrow 8		1,490
Windrow 9	9,781	9,781
Windrow 12	9,960	9,960
28A		1,059
29A		29,042
30A		31,806
30B		21,631
Total	42,887	5,193,992

Figure 5-3 –Topsoil Balance

Topsoil Balance As of December, 2019

1	Disturbed Lands (See Figure 2-1)	4,447.4	acres*
2	Lands with Redistributed Topsoil (See Figure 2-1)	1,376.8	acres*
3	Lands Yet to be Retopsoiled (Line 1 Minus 2)	3,070.6	acres
4	Lands Yet to be Retopsoiled	133,755,000.0	sq. feet
5	Volume of Topsoil in Stockpiles (From Figure 5-2)	5,064,618.1	cu. yards*
6	Line 5 times 27	136,745,000.0	cu. ft
7	Average Replacement Depth Available (Line 6 divided by Line 4)	1.0	feet
8	Average Replacement Depth Available	12.3	inches

* All Phase III released acres have been removed.

Note: Values presented above represent an estimate of areas and volumes as of the date shown above. Stockpile inventories change frequently as mining plans vary.

WP030
2019
12.1ac

EP062
2019
7.0ac

3

Scale 1" = 50'

Scale 1" = 50'

70+00

75+00

80+00

85+00

WP031
2019
45.8 ac

WP031

Scale 1" = 100'

LEGEND

- RECLAIMED AREAS
- REGRADED AREAS
- TOPSOIL VERIFICATION LOCATION

NOTE: PLEASE SEE EXHIBIT 2A FOR LOCATION OF RECLAMATION AREAS SHOWN ABOVE.

N
W E
S

CONTOUR INTERVAL 25 FT.
FLIGHT DATE 12/18

TOPSOIL DEPTH VERIFICATION LOCATIONS

COLOWYO COAL COMPANY
"SAFETY - PEOPLE - PRODUCTION - ENVIRO"
5731 State Highway 13
Meeker, Colorado 81641

SCALE: As Shown
DATE: 3/6/13
DRWG. BY: TONY
APPROVED BY: K.B.

DRAWING NUMBER
EXHIBIT 5

No.	REVISION	DATE	BY	CHK
3	Revised with Current Topo & 2016 Sample Sites, Revised Exhibit #	3/6/17	Kurt	Kurt
4	Revised with Current Topo & 2017 Sample Sites	2/9/18	Tony	Tony
5	Revised with Current Topo & 2018 Sample Sites	2/18/19	Kurt	Kurt
6	Revised with Current Topo & 2019 Sample Sites	2/18/19	TF	Tony

SECTION 6 –DITCH CONSTRUCTION CERTIFICATIONS

RULE REQUIREMENT

Rule 2.04.13(2) the Permittee may provide additional monitoring information as required by the approved permit.

Please see Volume 1 Section 2.04.13 for the requirement that this topic be included in the annual reclamation report.

GENERAL DISCUSSION

During 2019, Colowyo constructed several portions of the Taylor Tributary Ditch. Please see Exhibit 6 for the construction certification.

EXHIBIT 6

POST MINING CHANNEL AS-BUILT CERTIFICATION

On November 11th, 2019, I inspected the following ditches:

- Taylor Tributary Ditch, Station 73+74 to 85+64

I inspected the channel width, length, alignment, channel slope and rip rap sizing for this channel. The channel design is described in Volume 2C, Exhibit 7-14C for the Taylor Tributary Ditch.

The following table is a summary of the design requirements for the listed channel segments, and the stationing this certification pertains.

Ditch Name	Inspection Date	Approximate Stationing	Permit Description	Average Slope (%)	Bottom Width (Feet)	Minimum Depth (Feet)	Side Slope (H:V)	RipRap D50 (Inches)
Taylor Tributary Ditch	11/11/2019	73+74 – 80+00	Exh. 7-14C	7.1	12	4	3	18
Taylor Tributary Ditch	11/11/2019	80+00 - 85+64	Exh. 7-14C	10.7	12	4	3	18

See Figure 7-1 for the design versus actual slope profile comparison.

The listed segments have been completed in accordance with the design requirements and dimensions. The channel widths and depths meet the minimum requirements specified in the above table. Rip rap size and placement is acceptable. Channel profiles are within specified slope percentages. The portion of ditch from station 73+74 - 80+00 is the upper most section of the section from station 40+00 – 80+00. Therefore, when tying into the upper section the slope gets steeper than design, however, the overall slope of the ditch matches the design criteria.

I am a Licensed Professional Engineer in the State of Colorado. The channel sections described above are in conformance to the applicable requirements of the approved permit documents within CDRMS Permit NO. C-1981-019.

Attachments: Photos 1-2, Figure 6-1

Photo 1 taken 11-11-19. Taylor Tributary Ditch looking south from the center of the inspected section.

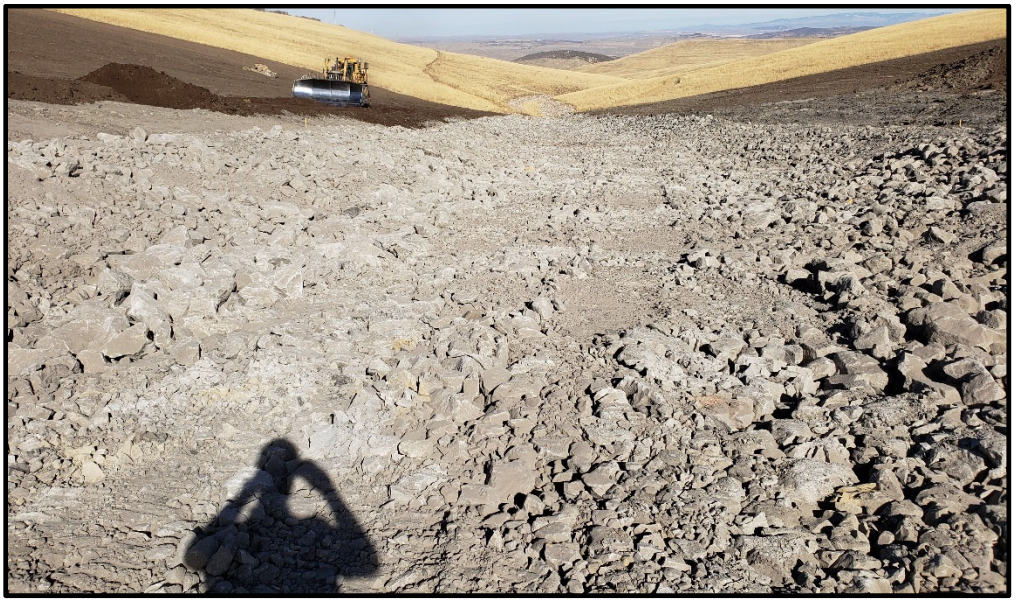
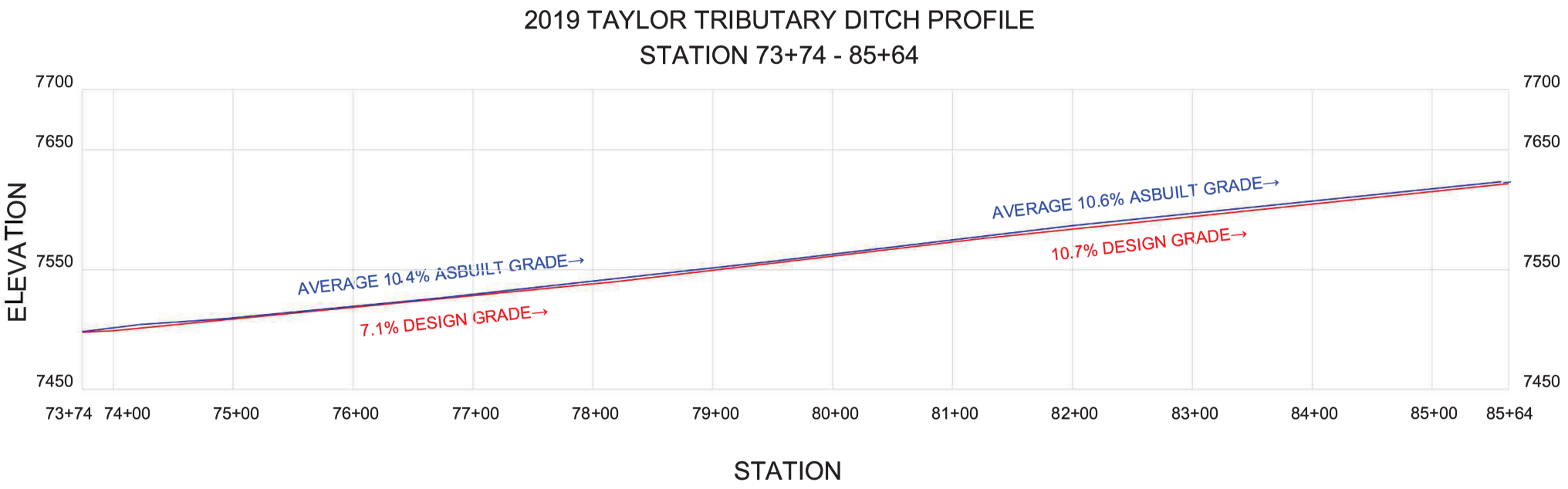


Photo 2 taken 11-11-19. Taylor Tributary Ditch looking north from the center of the inspected section.



Colowyo Coal Company
5731 State Highway 13

SCALE: NTS
DATE: 11-11-19
DRWG. BY: BWC
APPROVED BY:

DRWG NO.

Figure 6-1
2019 Reclamation Taylor Tributary Ditch Profile

Asbuilt Ditch Profile
Design Ditch Profile

SECTION 7 –WEED MANAGEMENT

RULE REQUIREMENT

Rule 2.04.13(2) the Permittee may provide additional monitoring information as required by the approved permit.

Please see Volume 1 Section 2.04.13 for the requirement that this topic be included in the annual reclamation report.

GENERAL DISCUSSION

Colowyo utilizes a combination of pickup mounted and UTV mounted boom/hand wand applicators to facilitate chemical control of noxious weeds within the entire permit boundary. Specifically targeted weed species include but are not limited to thistles, Houndstongue Mullein, knapweeds, whitetop, leafy spurge, etc. The below noted reclamation parcels were specifically treated and noted as they have not been Phase III released to date. However, Colowyo makes every attempt to spray all lands within the permit boundary where noxious weeks are present. It is not practical to map each location and many are too small of patch or individual plant and are random in nature to map out effectively.

East Pit – Units EP051-EP060
West Pit – Units WP010; WP014-WP025
South Taylor Pit – Units ST001-ST005
Gossard Loadout/Facilities Area – Units GF01-GF04
Collom – Units C01-C05

Please see Exhibit 2 for the reclamation units noted above.