TRI-STATE

March 2, 2021

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
2020 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 the Annual Reclamation Report and the Annual Hydrology Report for the calendar year 2020.

If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 326-3560 at your convenience.

Sincerely,

DocuSigned by:
Daniel Casiraro
B70D69F114324DE...

Daniel J. Casiraro
Senior Manager
Environmental Services

DJC:TT:der

Enclosure

cc: Chris Gilbreath (via email)
Tom Fry (via email)

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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
Water Year January 1, 2020 to December 31, 2020

Annual Reclamation Report
Report Year 2020

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 monitoring sites is presented in Exhibit 1A and 1C of this report.

(ii) Water quality data obtained from the monitoring sites is presented in Exhibit 1A through 1D 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 Division each quarter.

(iii) A written interpretation of the data was requested by the Division in a letter to Colowyo dated September 30, 2013. Colowyo has been providing a written interpretation of the data annually, beginning with the submittal of the 2013 annual hydrology report; therefore, compliance has been met for this Rule as requested by the Division.

All analytical results from surface and ground water monitoring have been tabulated and are kept on file at the Colowyo mine site. Historical data is presented in past annual hydrology reports. The monitoring timeframe for this annual hydrology report (water year) is from January 1, 2020 through December 31, 2020.

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. Please see Map 10A in the permit for monitoring locations. Monitoring of each location occurs on a quarterly basis

SURFACE WATER

Colowyo currently samples each surface water monitoring location for a variety of quality parameters. Of all the parameters that are analyzed for, several key indicator parameters are identified an analyzed in more depth within this report. These are lab pH, lab conductivity, TDS, sulfate, calcium, iron, magnesium, sodium and flow rate. Summary of the indicator parameters for each surface water monitoring location is provided in a table formats. Surface water monitoring sites within each corresponding drainage have been compiled together and analyzed together as up gradient and down gradient conditions where applicable.

Sampling results acquired during the water year from each surface water monitoring location are presented in Exhibit 1A. Exhibit 1B presents a graphical statistical analysis

of the up and down gradient surface monitoring locations (where applicable) for each drainage potentially impacted by Colowyo's mining operations. These drainages include Good Spring Creek, Taylor Creek, Jubb Creek, Little Collom Gulch, and Collom Gulch.

Good Spring Creek

Five surface water-monitoring locations have been established along Good Spring Creek. 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 2020.

Lower Good Spring Creek (LGSC) is a downstream site, located below active mining conditions along State Highway 13. Monitoring has occurred from 1982 to 2020.

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 fourth quarter of 2007 to 2020.

The final two monitoring locations, EFGSC and UWFGSC, are flow measurements only. The flows from these two location are applied to create the actual flow for UWFGSC.

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.	1504.6	295.9	2842	3600	758	03/06/98	05/27/93
TDS	1130.7	230.9	1250	1610	360	7/8/2002	05/08/02
Sulfate	496.4	139.4	760	930	170	7/8/2002	05/20/97
Calcium	125.6	18.8	165.6	169	3.4	08/02/02	06/01/93
Iron	.76	1.5	8.53	8.54	0.01	05/17/99	02/11/02
Magnesium	122.4	29.2	226.9	228	1.1	08/02/02	04/27/98
Sodium	47.5	15.5	121.1	138	16.9	11/10/08	04/27/98
Flow rate	2.93	3.26	19.94	20	0.06	04/27/98	07/30/13

NUGSC Water Year Review

There were not any minimum or maximum values from sampling in 2020 at NUGSC. All sampling results for 2020 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. Data for the water year for NUGSC is provided in Exhibit 1A.

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.	1721.6	327.4	3139	3300	161	08/21/18	06/23/92
TDS	1370.7	345.6	3420	4050	630	11/08/00	05/23/95
Sulfate	650.4	159.4	815	1050	235	08/21/18	05/20/97
Calcium	140.4	24.2	198	208	10	12/28/89	3/13/84
Iron	0.64	0.89	8.81	8.84	0.03	08/13/08	04/08/15
Magnesium	144.3	29.2	225.3	226	0.7	12/04/89	05/20/97
Sodium	84.4	43.0	323.3	343	19.7	08/21/18	04/17/00
Flow rate	4.03	5.11	46.94	47	0.06	04/27/98	12/06/99

LGSC Water Year Review

No results from 2020 sampling were minimum or maximum values for any parameters listed above during the monitoring period. All sampling results for 2020 tracked similar to historical analysis. For the indicator parameters most are staying very stable. Laboratory conductivity, TDS, and sodium are trending upward, while sulfate is showing a minor trend downward over time. Data for the water year for LGSC is provided in Exhibit 1A.

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.	958.1	219.7	1027	1330	303	03/19/14	04/15/08
TDS	694.2	149.9	600	910	310	3/19/14	5/15/19
Sulfate	217.3	75.5	273	341	68	7/30/13	5/15/19
Calcium	96.5	15.8	66	121	55	11/10/11	5/15/19
Iron	1.46	2.11	9.81	9.86	0.05	04/27/16	10/31/12
Magnesium	75.9	19.7	73	103	30	11/18/13	5/15/19
Sodium	9.3	2.7	15	19	4	2/23/10	5/15/19
Flow rate	1.17	1.88	8.92	8.94	0.02	5/15/19	10/31/12

UWFGSC Water Year Review

No results from 2020 sampling were minimum or maximum values for any parameters listed above during the monitoring period. All sampling results for 2020 tracked similar to historical analysis. For the indicator parameters most are staying very stable with no trends apparent. Laboratory pH and electrical conductivity are slightly trending upward, while sodium is showing a minor trend downward over time. Flows at this location are also trending upward. Data for the water year for UWFGSC is provided in Exhibit 1A.

Good Spring Creek Impact Assessment

As shown on the graphs in Exhibit 1B for the indicator parameters, when comparing the up gradient and down gradient locations, LGSC tends to be historically higher for some the indicator parameters including calcium, laboratory conductivity, magnesium, sodium, sulfate and TDS. This makes sense given the fact that as discussed in Volume 1, Section 2.04.7, TDS concentrations showed an incremental increase (pre-mine) of 40 mg/l to 50 mg/l per mile of flow for Wilson and Good Spring Creeks.

Overall, the indicator parameters up gradient versus down gradient of mining are typically stable including calcium, iron, magnesium, and sulfate. Sodium, electrical conductivity and TDS at LGSC are trending upward over time compared to the up gradient locations, while pH at all up gradient and down gradient locations is increasing. pH at the down gradient location LGSC is lower overall than NUGSC and UWFGSC.

TDS concentrations were predicted to increase in surface water during the post-mining period [Volume 1 Section 2.04.7 and Volume 12 Section 2.05.6(3)(b)(iii)] with sulfate being the dominate increasing ion. This impact would be due to infiltration through mine spoil material. Water flowing through the backfill spoil areas is expected to exhibit a temporary increase in TDS owing to rapid dissolution of relatively soluble minerals such as gypsum and calcite. Moreover, the increase in TDS and major ions is predicated to be followed by a gradual decrease over time. Data from the down gradient location LGSC is showing increases in TDS as predicted. Please refer to Exhibit 1B for graphs presenting the long-term trends for LGSC in comparison to the up gradient monitoring locations NUGSC and UWFGSC. The trends in the data presented including an increase in TDS due to mining are as predicated to occur within the Good Spring Creek watershed.

Base flows in Good Spring Creek were also anticipated to be decreased by approximately 7% for approximately 45 years due to mining [Volume 12 Section 2.05.6(3)(b)(iii)]. Data from the down gradient location LGSC is trending downward, while the up gradient locations are remaining stable or slightly increasing (Exhibit 1B). However, the Colowyo Mine area has experienced drought conditions for many years and decreased flows in Good Spring Creek cannot fully be contributed to mining activities from Colowyo specifically, as overall precipitation over the long term in the area of Colowyo has been

trending down. That being said, this predicted impact in decreased flows from mining activities has been minimized overall.

Taylor Creek

One surface water-monitoring location, Lower Taylor Creek (LTC) has been established along Taylor Creek and is a downstream site, located below active mining conditions near Moffat County Road 17. Monitoring has occurred from 1983 to 2020. Colowyo's mining area extends into the headwaters of Taylor Creek; therefore, no upstream monitoring location can be established for comparison of data to the down gradient LTC location.

LTC:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.17	0.30	1.7	8.7	7	09/13/16	02/22/89
Lab Cond.	1798.9	646.4	3550	3750	200	11/30/17	02/28/90
TDS	1461.8	622.6	2776	2920	144	11/10/11	02/28/90
Sulfate	688.2	351.1	1591	1610	19	11/10/11	02/28/90
Calcium	95.8	25.5	133.2	159	25.8	11/10/11	02/05/01
Iron	3.6	15.6	131.99	132	0.01	02/28/90	09/13/95
Magnesium	125.0	41.5	230	238	8	10/12/88	02/28/90
Sodium	194.1	163.1	694	700	6	11/12/19	02/28/90
Flow rate	0.36	0.79	6.3	6.3	0	04/29/86	12/13/02

LTC Water Year Review

Sampling results for the 2020 water year track within all previous acquired results and no minimum or maximum values were noted. For the indicator parameters, some are increasing including lab conductivity, TDS, sulfate, and sodium. Data for the water year for LTC is provided in Exhibit 1A.

Taylor Creek Impact Assessment

TDS concentrations were predicted to increase in surface water during the post-mining period [Volume 1 Section 2.04.7 and Volume 12 Section 2.05.6(3)(b)(iii)] with sulfate being the dominate increasing ion. This impact would be due to infiltration through mine spoil material. Water flowing through the backfill spoil areas is expected to exhibit a temporary increase in TDS owing to rapid dissolution of relatively soluble minerals such as gypsum and calcite. Moreover, the increase in TDS and major ions is predicated to be followed by a gradual decrease over time. A significant acreage of reclamation has

occurred in the Taylor Creek watershed, and data from LTC is showing increases in TDS as predicted. Please refer to Exhibit 1B for graphs presenting the long-term trends for LTC. The trends in the data presented, including and increase in TDS, confirm predictions from mining activities occurring within the Taylor Creek watershed.

Base flows in Taylor Creek were also anticipated to be decreased by approximately 2% [Volume 12 Section 2.05.6(3)(b)(iii)] from mining activities in the South Taylor Pit. Data form the LTC is trending downward (Exhibit 1B). The notable part of this downward trend is an extended period of minimal to zero flows recorded in at LTC. Prior to mining activities Taylor Creek was an ephemeral drainage at best, and Colowyo uses water from Taylor Creek as part of a water right held by Colowyo on Taylor Creek above LTC. In approximately 2011, flows from Taylor Creek increased and have been more consistent than the previous years of minimal or no flow. If the years of low to zero flow were removed, the base flows in Taylor Creek would be consistent or increasing. Given this, the predicted impact of decreased flows has not occurred overall as flows in Taylor Creek have increased or have been more consistent since approximately 2011.

Jubb Creek

Two surface water-monitoring locations have been established along Jubb Creek. Confluence of Jubb Creek (CJC) represents the aggregate water quality in the Jubb Creek basin, downstream of mining impacted areas. Monitoring has occurred from the first quarter of 2011 to 2020.

West Fork of Jubb Creek (WFJC) represents conditions in the Jubb Creek watershed adjacent to the mining disturbance. Monitoring has occurred from the first quarter of 2011 to 2020.

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.	1993.8	258.3	1460	2380	920	11/26/16	03/22/11
TDS	1543	194.0	1150	1820	670	08/01/12	03/22/11
Sulfate	636.2	114.9	680	859	179	11/21/16	03/22/11
Calcium	140.8	15.8	77	178	101	08/01/12	3/6/19
Iron	.78	1.51	8.88	8.93	0.05	9/4/19	08/18/11
Magnesium	156.6	21.9	130	199	69	11/21/16	03/22/11
Sodium	136.0	22.9	140	167	27	08/01/12	03/22/11
Flow rate	0.09	0.13	0.79	0.8	0.01	9/4/19	08/20/18

CJC Water Year Review

No minimum or maximum value were recorded in 2020 for CJC. For the indicator parameters most are stable over time at CJC with the exception of iron, which is increasing. Data for the water year for CJC is provided in Exhibit 1A.

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.	1230.7	133.5	858	1740	882	03/22/11	05/04/11
TDS	901.8	115.0	680	1450	770	03/22/11	05/04/11
Sulfate	326.5	65.8	415	651	236	03/22/11	11/08/11
Calcium	119.2	8.2	39	135	96	11/05/14	09/18/17
Iron	0.36	0.60	3.52	3.57	0.05	05/04/11	08/18/11
Magnesium	99.4	11.0	64	143	79	03/22/11	05/04/11
Sodium	18.7	21.2	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

WFJC Water Year Review

No maximum or minimum values were recorded in 2020. For the indicator parameters, all have been stable overtime at WFJC. Data for the water year for WFJC is provided in Exhibit 1A.

Jubb Creek Impact Assessment

A complete data set from March of 2011 to December of 2020 is presented on the graphs in Exhibit 1B, which provides WFJC and CJC indicator parameters together on one graph. While reviewing this data, it needs to be noted that the Jubb Creek Haul Road disturbance commenced in 2017, and mining in the Collom Pit commenced in 2018; therefore, data acquired prior to 2017 represents the background condition prior to mining occurring.

Data results as shown for the indicator parameters establishes the down gradient location CJC tends to be higher overall than WFJC, with the exception of pH. Iron is trending upward at the CJC. All the remaining indicator parameters tend to track along with baseline conditions of Jubb Creek for both CJC and WFJC.

Potential mining impacts to Jubb Creek as described in Colowyo's permit were not anticipated to be statistically significant [Volume 15 Section 2.05.6(3)(b)(i & ii)]. To date, the data acquired and presented in this reports indicates all the indicator parameter

are tracking similar to pre-mine conditions with the exception of iron at CJC. This suggests that iron may be potentially affecting Jubb Creek. The remaining indicator parameters track similar to pre-mining conditions, which indicates that surface water impacts from the Jubb Creek Haul Road and Collom mining operations are being minimized on Jubb Creek.

Collom Gulch

Two surface water-monitoring locations have been established along Collom Gulch. Upper Collom Gulch (UCG) represents the water quality conditions in Collom Gulch upstream of the Collom mining area. Monitoring has occurred from the first quarter of 2011 through 2020.

Lower Collom Gulch (LCG) represents the conditions in Collom Gulch downstream of mining impacts. Monitoring has occurred from the first quarter of 2011 through 2020.

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.	681.6	160.9	726	1140	141	03/18/11	5/13/19
TDS	464.7	122.9	550	820	270	03/22/11	5/13/19
Sulfate	108.7	66.8	272	273	1	03/22/11	11/08/11
Calcium	73.3	16.3	70	118	48	03/22/11	5/13/19
Iron	1.6	2.16	8.95	9.0	0.05	04/26/16	08/18/11
Magnesium	44.7	15.3	74	97	23	03/22/11	05/19/14
Sodium	11.7	2.99	12	18	6	07/31/13	5/13/19
Flow rate	0.25	0.44	1.57	1.57	0	04/26/16	03/13/13

UCG Water Year Review

No maximum or minimum values were recorded in 2020. For the indicator parameters all demonstrate a consistent stability over time Data acquired in 2020 tracked within previously analysis acquired from this UCG. Data for the water year for UCG is provided in Exhibit 1A.

LCG:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.44	0.11	0.6	8.7	8.1	08/20/18	03/14/12
Lab Cond.	1000.2	182.3	1139	1830	691	5/13/19	05/04/11
TDS	686.2	163.5	1100	1540	440	5/13/19	05/24/17
Sulfate	205.4	84.5	558	658	100	5/13/19	05/24/17
Calcium	99.9	12.0	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	67.4	17.6	119	159	40	5/13/19	05/24/17
Sodium	29.0	18.2	119	133	14	5/13/19	03/22/11
Flow rate	.28	.43	1.57	1.57	0.03	05/04/11	10/20/15

LCG Water Year Review

No maximum or minimum values were recorded in 2020. The indicator parameters at LCG have been stable over time. Data acquired in 2020 from LCG tracked within previously analysis acquired from this location. Data for the water year for NUGSC is provided in Exhibit 1A.

Collom Gulch Impact Assessment

A complete data set from March of 2011 to December of 2020 is presented on the graphs in Exhibit 1B, which provides UCG and LCG indicator parameters together on one graph. While reviewing this data, it should be noted that mining in the Collom Pit commenced in 2018; therefore, data acquired prior to 2018 represents the background condition prior to mining occurring.

Data results as shown from the indicator parameters express that the down gradient location LCG and up gradient UCG trend very similar over time for all the indicator parameters. Iron is trending upward at the up gradient location UCG, while the down gradient LCG tends to remains constant. All the remaining indicator parameters tend to track along with baseline conditions of Collom Gulch.

Potential mining impacts to Collom Gulch as described Colowyo's permit were not anticipated to be statistically significant [Volume 15 Section 2.05.6(3)(b)(i & ii)]. To date, the data acquired and presented in this reports indicates all the indicator parameter are tracking similar to pre-mine conditions with influences from seasonal fluctuations. This signifies that impacts from the Collom mining operations have not occurred as predicated to date.

Little Collom Gulch

One surface water monitoring location, LLCG, has been established along Little Collom Gulch and represents the conditions in Little Collom Gulch downstream of mining disturbances. The Collom mining area extends nearly to the headwaters of Little Collom Gulch; therefore, no upstream monitoring location can be established for comparison of data to the down gradient LLCG monitoring location.

Little Collom Gulch Water Year Review

No flow has been observed at LLCG either during baseline data collection or during the ongoing monitoring that began in first quarter of 2011. Since no data has been collected from this site due to nonexistent flows, an evaluation, tabular and graphically analysis have not been completed for this monitoring location.

Little Collom Gulch Impact Assessment

Potential mining impacts to Little Collom Gulch as described Colowyo's permit were not anticipated to be statistically significant [Volume 15 Section 2.05.6(3)(b)(i & ii)]. Since no surface water flows have been present in Little Collom Gulch, an assessment of any potential impacts to Little Collom Gulch cannot be evaluated.

GROUNDWATER

Colowyo currently samples each ground water well for a variety of quality parameters. Of all the parameters that are analyzed for, several key indicator parameters are identified an analyzed in more depth within this report. These are lab pH, lab conductivity, TDS, sulfate, calcium, iron, magnesium, sodium, and water elevation. Summary of the indicator parameters for each ground water well is provided in a table formats. Ground water wells within each corresponding drainage have been compiled together and analyzed together as up gradient and down gradient conditions where applicable.

Sampling results acquired during the water year from each ground water well are presented in Exhibit 1C. Exhibit 1D presents a graphical statistical analysis of the up and down gradient well (where applicable) for each drainage potentially impacted by Colowyo's mining operations. These drainages include Good Spring Creek, Taylor Creek, Jubb Creek, Little Collom Gulch, and Collom Gulch.

One well is located near the Gossard Loadout facility, which evaluates water quality adjacent to the Gossard Loadout facility.

The Trout Creek well is a deep well that monitors potential impacts to the Trout Creek Sandstone, which is the only regional aquifer in the vicinity of the Colowyo Mine.

Good Spring Creek

Four ground water wells have been established along Good Spring Creek. 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 through 2020.

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 2020.

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 2020.

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 2020.

A-6:

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.	1110.6	72.7	512	1440	928	05/01/85	04/27/98
TDS	695.6	78.3	750	930	180	07/17/01	03/13/93
Sulfate	138.5	48.4	334.2	430	95.8	07/17/01	05/15/00
Calcium	61.6	15.8	121.1	169	47.9	11/18/97	11/13/00
Iron	0.23	0.37	1.81	1.82	0.01	09/26/98	11/18/97
Magnesium	53.2	14.8	128.0	169	41	11/18/97	03/21/11
Sodium	124.6	17.8	133.1	151.0	17.9	9/14/20	04/27/98
Elevation	6897.87	2.76	14.53	6902.53	6888	05/01/85	07/31/00

A-6 Water Year Review

One maximum value for sodium occurred in 2020. All of the other indicator parameters for the water year tracks within similar results as previous data acquired. The indicator parameters specify pH is slightly increasing while all the other indicator parameters are stable or decreasing at this location. Data for the water year for monitoring location A-6 is provided in Exhibit 1C.

A-7:

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.	1509.6	166.3	1100	2260	1160	06/18/08	05/05/10
TDS	1131.4	214.2	1160	2100	940	06/18/08	9/9/17
Sulfate	417.5	125.8	794	1110	316	06/18/08	11/12/19
Calcium	123.8	18.3	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	118.8	25.4	151	244	93	06/18/08	11/30/17
Sodium	48.4	7.2	43	77	34	06/18/08	05/20/14
Elevation	6888.9	3.51	20.1	6904.9	2884.8	11/12/19	9/14/20

A-7 Water Year Review

A minimum value for water elevation was recorded during 2020. The indicator parameters specify pH is slightly increasing while all the other indicator parameters are stable or decreasing at this location. Data for the water year for monitoring location A-7 is provided in Exhibit 1C.

A-8:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.2	0.20	0.8	8.4	7.6	05/21/13	11/10/08
Lab Cond.	1261.7	351.8	1443	2330	887	03/12/13	05/5/10
TDS	958.9	350.8	1420	2040	620	03/12/13	03/13/12
Sulfate	353.7	207.7	804	977	173	03/12/13	08/03/10
Calcium	121.6	31.1	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	104.2	36.4	142	214	72	03/12/13	03/13/12
Sodium	17.4	5.8	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

A-8 Water Year Review

No results from 2020 sampling were minimum or maximum values for any parameters listed above during the water year. All sampling results from 2020 tracked within historical analyses. For the indicator parameters most are showing a slight increase over time or are stable, while iron is indicating it is decreasing. Data for the water year for monitoring location A-8 is provided in Exhibit 1C.

NGSW:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	7.85	0.31	1.7	8.5	6.8	08/19/91	10/03/00
Lab Cond.	2083.2	298.3	1550	2700	1150	10/17/91	04/27/98
TDS	1695.3	259.7	1410	2190	780	04/27/16	04/27/98
Sulfate	792.3	157.6	1192	1340	148	03/17/09	05/05/10
Calcium	172.7	27.5	169.3	262	92.7	03/13/07	10/08/98
Iron	0.08	0.14	1.18	1.19	0.01	6/4/20	10/01/01
Magnesium	172.3	28.2	194	270	76	03/13/07	04/27/98
Sodium	102.2	27.5	151.3	183	31.7	03/14/18	04/27/98
Elevation	6535.0	1.79	10	6540.65	6530.65	03/13/93	05/19/99

NGSW Water Year Review

One sampling result for iron was a maximum value in 2020. Historically, this maximum value appears to be an outlier in a robust data set for NGSW (please refer to Exhibit 1D). All other monitoring results acquired during the water year tracked within previous results. For the indicator parameters, TDS, sulfate, sodium, pH, EC, calcium and magnesium are trending upward. Water year data for monitoring location NGSW is provided in Exhibit 1C.

Good Spring Creek Impact Assessment

For the indicator parameters, please see Exhibit 1D, when comparing the up gradient and down gradient locations, for all the indicator parameters, NGSW is trending higher than the up gradient wells with the exception of iron which is stable at NGSW.

Ground water impacts are not anticipated to be affected by mining, primarily because there is not a continuous, regional ground water system within the stratigraphic section that was or is mined [Volume 1 Sections 2.04.7, 4.05.11 and Volume 12 Sections 2.04.7(1), 2.05.6(3)(b)(iii)]. TDS and other indicator parameters that are trending higher at NGSW versus the up gradient well locations can be attributed to the conditions described for Good Spring Creek in the *Good Spring Creek Impact Assessment* for Surface Water provided previously in this hydrology report.

Taylor Creek

One ground water well, MT-95-02, has been established along Taylor Creek and represents the down gradient condition below mining activities. Monitoring started in the first quarter of 2008 and has continued through 2020. An up gradient well location is not

established for Taylor Creek as mining occurs in the headwaters of the Taylor Creek watershed.

MT-95-02:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	7.98	0.22	1.0	8.4	7.40	5/15/19	11/10/08
Lab Cond.	2769.6	257.1	1280	3350	2070	6/4/20	05/05/10
TDS	2242.3	151.0	730	2660	1930	9/14/20	12/10/20
Sulfate	914.51	85.74	412	1170	758	3/9/20	05/14/12
Calcium	205.6	17.4	112	233	121	9/14/20	11/10/11
Iron	0.05	0.00	0.01	0.06	0.05	11/10/08	11/02/09
Magnesium	199.2	13.5	80	227	147	6/4/20	11/10/11
Sodium	184.3	39.5	189	283	94	11/12/19	08/13/08
Elevation	6435.25	0.6	3.4	6437.87	6434.49	05/03/11	3/5/19

MT-95-02 Water Year Review

Maximum values for lab conductivity, TDS, sulfate, calcium and magnesium were recorded during 2020. Conversely, a minimum value for TDS was also recorded during 2020. Water year data for monitoring location MT-95-02 is provided in Exhibit 1C.

Taylor Creek Impact Assessment

A complete data set for MT-95-02 from 2008 to December of 2020 is presented on the graphs in Exhibit 1D. For the indicator parameters, laboratory conductivity, pH, sodium, sulfate and TDS are showing an increase over time, while calcium, iron, and magnesium are indicating downward trends or remaining constant. TDS values were already high (above 2,000 mg/l) when monitoring commenced at this location in 2008.

Ground water impacts are not anticipated to be affected by mining, primarily because there is not a continuous, regional ground water system within the stratigraphic section that was or is mined [Volume 1 Sections 2.04.7, 4.05.11 and Volume 12 Sections 2.04.7(1), 2.05.6(3)(b)(iii)]. TDS and other indicator parameters that are trending higher at MT-95-02 can be attributed to the conditions described for Taylor Creek in the *Taylor Creek Impact Assessment* for Surface Water provided previously in this hydrology report.

Gossard Loadout

One ground water well has been established along the Gossard Loadout facility. The 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 2020.

Gossard:

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.	2004.2	264.2	1310	2670	1360	11/22/16	03/29/85
TDS	1493.0	267.6	1238	2200	962	09/13/16	03/13/93
Sulfate	582.9	178.8	1025	1030	5	11/22/16	05/20/14
Calcium	115.3	24.9	190	202	12	11/10/11	11/30/93
Iron	0.76	2.98	28.99	29	0.01	10/08/98	10/21/02
Magnesium	138.4	26.7	202	217	15	10/08/98	11/30/93
Sodium	168.9	25.6	221	240	19	10/08/98	11/30/93
Elevation	6330.0	2.8	14	6339.09	6325.09	10/03/00	03/28/91

Gossard Water Year Review

No results from 2020 sampling were minimum or maximum values for any parameters listed above during the monitoring period. All sampling results tracked within previous analysis. Water year data for the Gossard well is provided in Exhibit 1C.

Gossard Impact Assessment

A complete data set for the Gossard well from 1983 to December of 2020 is presented on the graphs in Exhibit 1D. For the indicator parameters, laboratory conductivity, calcium, sodium, magnesium, sulfate and TDS are showing an increase over time, iron is trending down and pH remains relatively constant. The water level in the Gossard well is also trending upward overtime.

Ground water impacts are not anticipated to be affected by mining, primarily because there is not a continuous, regional ground water system within the stratigraphic section that was or is mined [Volume 1 Sections 2.04.7, 4.05.11 and Volume 12 Sections 2.04.7(1), 2.05.6(3)(b)(iii)]. TDS and other indicator parameters that are trending higher at the Gossard may be attributed to the conditions described for Taylor Creek in the *Taylor Creek Impact Assessment* for Surface Water provided previously in this hydrology report.

However, it is also possible that the alluvial aquifer along Wilson Creek is increasing in water since the mass wasting event that occurred in the spring of 1984 along the entire length Wilson Creek above and below mining including the Gossard Loadout facility. This increase in alluvial aquifer water level in Wilson Creek is shown in the Gossard well

water elevation (Exhibit 1D). As discussed in Volume 1, Section 2.04.7, TDS concentrations showed an incremental increase (pre-mine) of 40 mg/l to 50 mg/l per mile of flow for Wilson and Good Spring Creeks. Since Wilson Creek is not impacted by mining activities the trending upward values for TDS and the major ions may be attributed to this natural phenomenon rather than impacts from mining.

Little Collom Gulch

One ground water well, MLC-04-01, has been established along 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 2020.

MLC-04-01:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.13	0.21	1.2	8.40	7.20	03/13/13	03/22/11
Lab Cond.	1110.3	409.0	1309.0	1610	301	03/18/14	5/13/19
TDS	777.0	296.8	900	1100	200	07/31/13	5/13/19
Sulfate	251.2	123.9	502	505	3	05/15/12	03/22/11
Calcium	111.6	40.5	130	161	31	05/19/14	5/13/19
Iron	0.05	0.04	0.25	0.25	0.0006	03/14/12	9/14/2020
Magnesium	64.9	25.8	86	95	9	05/19/14	03/22/11
Sodium	40.4	17.9	73	78	5	11/27/18	03/22/11
Elevation*	44.8	4.99	27.41	50.16	22.75	11/28/18	03/13/18

*Water elevation is static water level depth from the top of casing.

MLC-04-01 Water Year Review

One minimum value for iron occurred in 2020 that was a non-detect in the analysis. All of the other indicator parameters from sampling results in 2020 track within previous analytical results. Water year data for monitoring location MLC-04-01 is provided in Exhibit 1C.

Little Collom Gulch Impact Assessment

A complete data set from March of 2011 to December of 2020 is presented on the graphs in Exhibit 1D. While reviewing this data, it needs to be noted that the mining in the Collom Pit commenced in 2018; therefore, data acquired prior to 2017 represents the background condition prior to mining occurring.

Data results as shown for the indicator parameters (Exhibit 1D) establishes that MLC-04-01 historically trends down for all the indicator parameters with the exception of pH that is slight trending upward.

Impacts to ground water in Little Collom Gulch valley fill deposits were not anticipated to occur as described in Colowyo's permit [Volume 15 Section 2.05.6(3)(b)(i & ii)]. To date, the data acquired and presented in this report (Exhibit 1C and Exhibit 1D) indicates all the indicator parameter are tracking similar to pre-mine conditions. This demonstrates that ground water impacts to the Little Collom Gulch valley fill deposits have not occurred to date as predicted.

Collom Gulch

Two ground water wells have been established along Collom Gulch. 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 2020.

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 2020.

MC-04-01:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.15	0.16	0.80	8.40	7.60	11/27/18	11/05/14
Lab Cond.	900.7	152.1	889	1270	381	6/4/20	9/14/20
TDS	622.3	149.0	990	1240	250	6/4/20	9/14/20
Sulfate	178.7	59.2	253	308	55	05/19/14	9/14/20
Calcium	89.6	16.2	95	133	38	6/4/20	9/14/20
Iron	0.06	0.02	0.13	0.18	0.05	03/14/12	03/22/11
Magnesium	58.3	12.2	62	80	18	05/23/13	9/14/20
Sodium	17.1	5.09	36	46	10	6/4/20	9/14/20
Elevation*	25.0	4.5	31.29	48.82	17.53	03/13/18	5/13/19

*Water elevation is static water level depth from the top of casing.

MC-04-01 Water Year Review

Several maximum values for laboratory conductivity, TDS, calcium and sodium were required in 2020. Conversely, minimum value for several of these same constituents were also recorded. Minimum values for laboratory conductivity, TDS, sulfate, calcium, magnesium, and sodium were also recorded in 2020. The indicator parameters for MC-

04-01 indicate that calcium, electrical conductivity, iron, magnesium sulfate, and TDS are trending down, sodium is stable, and pH is slight increasing over time. Water year data for monitoring location MC-04-01 is provided in Exhibit 1C.

MC-04-02:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.15	0.16	0.80	8.40	7.60	11/27/18	11/05/14
Lab Cond.	1291.4	147.3	844	1490	646	08/27/14	08/20/18
TDS	869.5	111.5	630	1010	380	11/01/12	08/20/18
Sulfate	255.1	46.5	221	321	100	11/01/12	12/10/20
Calcium	123.9	17.0	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	77.4	11.0	42	92	50	08/27/14	11/27/18
Sodium	60.7	22.9	114	127	13	03/13/13	11/27/18
Elevation*	11.2	0.90	4.52	14.13	9.61	01/12/15	05/24/17

*Water elevation is static water level depth from the top of casing.

MC-04-02 Water Year Review

One minimum value for sulfate occurred in 2020 at MC-04-02. All other sampling results tracking within previous values acquired, including data acquired prior to mining commencing in 2018. The indicator parameters for MC-04-02 indicate that calcium, electrical conductivity, iron, magnesium sulfate, and TDS are trending down, sodium is stable, and pH is slight increasing over time. Water year data for monitoring location MC-04-02 is provided in Exhibit 1C.

Collom Gulch Impact Assessment

A complete data set from March of 2011 to December of 2020 is presented on the graphs in Exhibit 1D. The graphs provided include MC-04-01 and MC-04-02 indicator parameters together on one graph for comparisons of both monitoring locations. While reviewing this data, it needs to be noted that the mining in the Collom Pit commenced in 2018; therefore, data acquired prior to 2017 represents the background condition prior to mining occurring.

Data results as shown for the indicator parameters (Exhibit 1D) establishes that MC-04-02 historically tracks higher for most of the indicator parameters, while both monitoring locations trend similar in regards to iron and pH. Overall, all the indicator parameters from both monitoring locations tend to track consistently over time showing consistent or decreasing values over time with the exception of pH, which is showing a minor increase.

Impacts to ground water in the Collom Gulch valley fill deposits were not anticipated to occur as described in Colowyo's permit [Volume 15 Section 2.05.6(3)(b)(i & ii)]. To date, the data acquired and presented in this report (Exhibit 1C and Exhibit 1D) indicates all the indicator parameter are tracking similar to pre-mine conditions with most values are overall decreasing. This demonstrates that ground water impacts to the Collom Gulch valley fill deposits have not occurred to date as predicated.

Jubb Creek

Two ground water wells have been established along Jubb Creek. 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 2020.

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 down gradient of the Collom Pit. Monitoring started in the first quarter of 2011 and has continued through 2020.

MJ-95-01:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.02	0.19	1.00	8.30	7.30	11/27/18	11/05/14
Lab Cond.	1290.3	79.1	350	1420	1070	08/27/14	05/04/11
TDS	853.3	51.6	220	940	720	08/18/11	09/18/17
Sulfate	246.5	15.6	63	277	214	08/18/11	05/23/13
Calcium	120.7	4.3	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	93.2	4.1	14	101	87	05/19/14	03/14/12
Sodium	29.3	1.99	11	34	23	9/14/20	05/24/17
Elevation*	13.97	3.25	16.96	24.29	7.33	11/08/11	04/30/18

*Water elevation is static water level depth from the top of casing.

MJ-95-01 Water Year Review

One maximum value for sodium was recorded during 2020. Indicator parameters for MJ-95-01 are trending along the same path as pre-mining conditions with all indicator parameters trending in a stable manner with the exception of pH, which is slightly increasing. Water year data for monitoring location MJ-95-01 is provided in Exhibit 1C.

MJ-95-03:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	8.17	0.13	0.70	8.40	7.70	11/27/18	11/05/14
Lab Cond.	2253.3	141.5	700	2460	1760	08/20/18	05/04/11
TDS	1797.5	81.4	320	1920	1600	08/18/11	05/24/17
Sulfate	797.4	49.2	205	891	686	05/04/11	11/08/11
Calcium	146.1	7.2	26	161	135	9/14/20	11/19/13
Iron	0.06	0.03	0.17	0.22	0.05	03/14/12	03/22/11
Magnesium	192.2	9.9	39	217	178	03/22/11	11/29/17
Sodium	139.4	12.4	55	166	111	03/22/11	12/10/20
Elevation*	20.2	0.85	5.81	21.57	15.76	09/13/16	11/08/11

*Water elevation is static water level depth from the top of casing.

MJ-95-03 Water Year Review

One maximum value for calcium and one minimum value for sodium minimum were recorded in 2020. Indicator parameters for MJ-95-03 are trending along the same path as pre-mining conditions with all indicator parameters trending in a stable manner with the exception of pH, which is slightly increasing. Water year data for monitoring location MJ-95-03 is provided in Exhibit 1C.

Jubb Creek Impact Assessment

A complete data set from March of 2011 to December of 2020 is presented on the graphs in Exhibit 1D. The graphs provided include MJ-95-01 and MJ-95-03 indicator parameters together on one graph for comparisons of both monitoring locations. While reviewing this data, it needs to be noted that the Jubb Creek Haul Road disturbance commenced in 2017, and mining in the Collom Pit commenced in 2018; therefore, data acquired prior to 2017 represents the background condition prior to mining occurring.

Data results as shown for the indicator parameters (Exhibit 1D), establishes that MJ-95-03 historically tracks higher for all indicator parameters, while both monitoring locations trend similar in regards to iron. Overall, all the indicator parameters from both monitoring locations tend to track consistently over time, which pH showing a minor increase.

Potential mining impacts to Jubb Creek as described in Colowyo's permit were not anticipated to be statistically significant [Volume 15 Section 2.05.6(3)(b)(i & ii)]. To date, the data acquired and presented in this reports indicates all the indicator parameter are tracking similar to pre-mine conditions, which indicates that ground water impacts within the Jubb Creek watershed are being minimized.

Trout Creek Sandstone Aquifer

One deep ground water well has been established into the Trout Creek Sandstone and is located on the northeastern edge of the Collom Pit. This well represents the regional aquifer condition of the Trout Creek Sandstone aquifer. Monitoring started in the first quarter of 2017 and has continued through 2020.

Trout Creek Well:

Parameter	Mean	Std dev	Range	Max.	Min.	Max at	Min at
Lab pH	9.24	0.28	0.90	9.50	8.6	08/20/18	3/6/19
Lab Cond.	1109.4	48.1	210	1220	1010	03/15/17	3/6/19
TDS	698.1	34.3	140	800	660	03/15/17	3/9/20
Sulfate	239.1	24.7	96	309	213	03/15/17	9/4/19
Calcium	6.6	3.6	12	16	4	03/15/17	12/10/20
Iron	0.07	0.04	0.17	0.22	0.05	03/13/18	11/29/17
Magnesium	23.1	5.0	21	38	17	03/15/17	12/10/20
Sodium	208.9	16.9	58	238	180	9/14/20	11/29/17
Elevation*	589.4	1.21	3.32	591.02	587.7	09/18/17	12/10/20

*Water elevation is static water level depth from the top of casing.

Trout Creek Well Water Year Review

Several minimum values occurred in 2020 for TDS, calcium, magnesium, and water elevation (depth). One maximum occurred for sodium. All other indicator parameters tracked within previous analytical results. Water year data for the Trout Creek well is provided in Exhibit 1C.

Trout Creek Well Impact Assessment

A complete data set from the first quarter of 2017 to December of 2020 is presented on the graphs in Exhibit 1D. Impacts to Trout Creek Sandstone aquifer were not anticipated to occur as described in Colowyo's permit [Volume 15 Section 2.05.6(3)(b)(i & ii)]. To date, the data acquired and presented in this report indicates all the indicator parameter are tracking similar to pre-mine conditions (in this case only data from 2017), which demonstrates that ground water impacts to the Trout Creek Sandstone aquifer have not occurred to date as predicated.

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 three springs that originate from non-mined areas in the highwall and percolate through the regraded spoil and emerge on the reclaimed surface. One spring is located just south of the East Taylor Pond in reclamation parcel WP014. 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 1A

Surface Water Monitoring Data
Water Year January 1, 2020 to December 31, 2020

Colowyo Mine
Site - CJC
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	4.9	17.40	11.7	1.8
Flow Rate, cfs	0.2	0.04	0.01	0.01
Field Conductivity, umhos/com	2070	2030	2070	2220
Lab Conductivity, umhos/com	1780	2070	1930	2020
Field pH	8.06	8.12	7.99	7.96
Lab pH	8.3	8.4	8.4	8.5
Bicarbonate as HCO3, D	595	660	457	666
TDS, mg/l	1440	1580	1580	1620
TSS, mg/l	6	60	6	32
NH3 as N, mg/l	0.1	0.0073	0.0289	0.0289
NO2 as N, mg/l	0.1	0.00592	0.00592	0.026
NO3 as N, mg/l	0.1	0.00784	0.00784	0.006
Phosphorus, T, mg/l	0.05	0.13	0.00354	0.13
Ca, D, mg/l	126	144	152	147
Mg, D, mg/l	148	160	166	156
Na, D, mg/l	124	139	158	138
Sulfate, D, mg/l	644	677	614	672
As, TR, mg/l	<0.003	0.232	0.232	0.232
Se, TR, mg/l	<0.005	0.266	0.006	8
Fe, T, mg/l	0.25	2.91	0.56	1.59
Zn, TR, mg/l	<0.05	<0.05	0.00225	0.00225
Pb, TR, mg/l	<0.2	0.0627	0.0627	0.0627
Mn, TR, mg/l	<0.03	0.19	0.04	0.14
Hg, TR, mg/l	<0.001	0.06	0.016	<0.001

Colowyo Mine
Site - LCG
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	10.3	10.3	10.1	Dry
Flow Rate, cfs	0.25	0.88	0.02	
Field Conductivity, umhos/com	990	990	990	
Lab Conductivity, umhos/com	890	890	915	
Field pH	8.17	8.17	8.08	
Lab pH	8.4	8.4	8.4	
Bicarbonate as HCO3, D	446	449	382	
TDS, mg/l	620	446	650	
TSS, mg/l	79	79	5	
NH3 as N, mg/l	0.1	0.0073	0.0289	
NO2 as N, mg/l	0.1	0.00592	0.00592	
NO3 as N, mg/l	0.4	0.4	0.1	
Phosphorus, T, mg/l	0.16	<0.1	0.00354	
Ca, D, mg/l	97	97	101	
Mg, D, mg/l	59	59	65	
Na, D, mg/l	23	23	28	
Sulfate, D, mg/l	188	188	180	
As, TR, mg/l	<0.003	<0.003	0.232	
Se, TR, mg/l	<0.005	<0.005	<0.005	
Fe, T, mg/l	2.55	0.59	0.06	
Zn, TR, mg/l	<0.05	<0.05	0.00225	
Pb, TR, mg/l	<0.2	<0.2	0.0627	
Mn, TR, mg/l	0.29	0.29	0.788	
Hg, TR, mg/l	<0.001	<0.001	0.016	

Colowyo Mine
Site - LGSC
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	2.6	15.2	10.2	3.2
Flow Rate, cfs	0.56	5.53	0.19	2.65
Field Conductivity, umhos/com	2030	1900	2600	2520
Lab Conductivity, umhos/com	1800	1840	2490	2400
Field pH	7.91	8.14	7.97	7.91
Lab pH	8.3	8.3	8.4	8.5
Bicarbonate as HCO3, D	565	575	651	730
TDS, mg/l	1480	1410	2060	1990
TSS, mg/l	14	18	5	5
NH3 as N, mg/l	0.1	0.0073	0.0289	0.0289
NO2 as N, mg/l	0.2	0.2	0.00592	0.026
NO3 as N, mg/l	1.1	0.7	0.3	0.6
Phosphorus, T, mg/l	0.05	0.07	0.05	0.06
Ca, D, mg/l	138	144	167	178
Mg, D, mg/l	141	144	170	172
Na, D, mg/l	133	98	293	222
Sulfate, D, mg/l	699	632	893	842
As, TR, mg/l	<0.003	<0.003	0.232	0.232
Se, TR, mg/l	0.008	0.005	0.266	0.266
Fe, T, mg/l	0.39	0.7	0.35	0.4
Zn, TR, mg/l	<0.05	<0.05	<0.05	<0.05
Pb, TR, mg/l	<0.2	0.0627	0.0627	0.0627
Mn, TR, mg/l	0.14	0.19	0.15	0.25
Hg, TR, mg/l	<0.001	<0.001	0.016	<0.001

Colowyo Mine
Site - LLCG
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	Dry	Dry	Dry	Dry
Flow Rate, cfs				
Field Conductivity, umhos/com				
Lab Conductivity, umhos/com				
Field pH				
Lab pH				
Bicarbonate as HCO3, D				
TDS, mg/l				
TSS, mg/l				
NH3 as N, mg/l				
NO2 as N, mg/l				
NO3 as N, mg/l				
Phosphorus, T, mg/l				
Ca, D, mg/l				
Mg, D, mg/l				
Na, D, mg/l				
Sulfate, D, mg/l				
As, TR, mg/l				
Se, TR, mg/l				
Fe, T, mg/l				
Zn, TR, mg/l				
Pb, TR, mg/l				
Mn, TR, mg/l				
Hg, TR, mg/l				

Colowyo Mine
Site - LTC
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	1.8	13.7	Dry	Dry
Flow Rate, cfs	0.62	0.2		
Field Conductivity, umhos/com	2080	3090		
Lab Conductivity, umhos/com	1800	3110		
Field pH	8.42	8.43		
Lab pH	8.4	8.3		
Bicarbonate as HCO3, D	567	567		
TDS, mg/l	2400	2400		
TSS, mg/l	18	18		
NH3 as N, mg/l	0.1	0.0073		
NO2 as N, mg/l	0.2	0.2		
NO3 as N, mg/l	1.8	1.8		
Phosphorus, T, mg/l	0.14	0.0122		
Ca, D, mg/l	81	104		
Mg, D, mg/l	71	182		
Na, D, mg/l	285	418		
Sulfate, D, mg/l	628	1220		
As, TR, mg/l	<0.003	0.232		
Se, TR, mg/l	<0.005	0.266		
Fe, T, mg/l	2.29	0.37		
Zn, TR, mg/l	<0.05	<0.05		
Pb, TR, mg/l	<0.2	0.0627		
Mn, TR, mg/l	0.09	0.09		
Hg, TR, mg/l	<0.001	0.06		

Colowyo Mine
Site - NUGSC
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	4	13.7	8.5	1.26
Flow Rate, cfs	0.56	0.2	0.11	1.26
Field Conductivity, umhos/com	1560	3090	1750	6.5
Lab Conductivity, umhos/com	1380	3110	1710	1630
Field pH	8.04	8.4	8.02	8.5
Lab pH	8.3	8.3	8.4	1580
Bicarbonate as HCO3, D	455	567	485	1180
TDS, mg/l	1080	930	1380	1180
TSS, mg/l	35	18	11	1.7
NH3 as N, mg/l	<0.1	<0.1	0.0289	0.026
NO2 as N, mg/l	0.1	0.1	0.1	0.0289
NO3 as N, mg/l	2.5	0.1	4.6	0.0035
Phosphorus, T, mg/l	0.06	<0.05	0.00354	0.0035
Ca, D, mg/l	122	104	138	125
Mg, D, mg/l	117	182	154	119
Na, D, mg/l	49	40	67	77
Sulfate, D, mg/l	447	369	620	482
As, TR, mg/l	0.232	0.232	0.232	0.232
Se, TR, mg/l	0.014	<0.005	0.015	0.009
Fe, T, mg/l	0.58	0.37	0.24	0.11
Zn, TR, mg/l	<0.05	<0.05	0.00225	0.0023
Pb, TR, mg/l	<0.2	<0.2	0.0627	0.0627
Mn, TR, mg/l	0.03	<0.03	30	40
Hg, TR, mg/l	<0.001	<0.001	0.016	0.0801

Colowyo Mine
Site - UCG
Water Year 1/1/202020 - 12/31/2020

	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	Dry	11.4	Dry	Dry
Flow Rate, cfs		0.14		
Field Conductivity, umhos/com		590		
Lab Conductivity, umhos/com		577		
Field pH		8.3		
Lab pH		8.6		
Bicarbonate as HCO3, D		269		
TDS, mg/l		380		
TSS, mg/l		251		
NH3 as N, mg/l		0.0073		
NO2 as N, mg/l		0.2		
NO3 as N, mg/l		0.7		
Phosphorus, T, mg/l		0.26		
Ca, D, mg/l		66		
Mg, D, mg/l		34		
Na, D, mg/l		8		
Sulfate, D, mg/l		72		
As, TR, mg/l		<0.003		
Se, TR, mg/l		<0.005		
Fe, T, mg/l		3.89		
Zn, TR, mg/l		<0.05		
Pb, TR, mg/l		0.0627		
Mn, TR, mg/l		0.16		
Hg, TR, mg/l		<0.001		

Colowyo Mine
Site - UWFGSC
Water Year 1/1/2020 - 12/31/2020

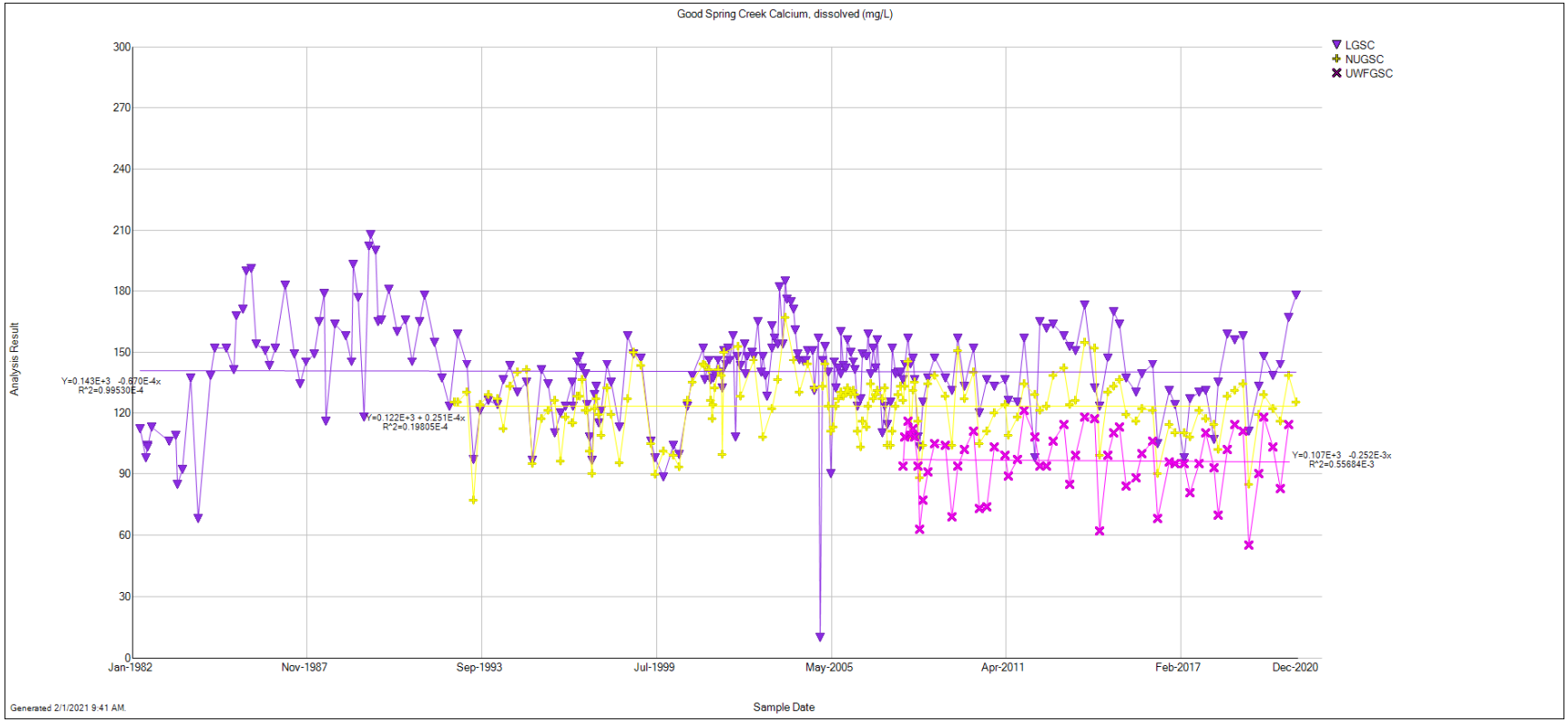
	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Flow Rate, cfs	0.81	0.69	0.07	Dry
Field pH	8.43	8.35	7.96	
Field Temp, °C	2	15.1	7.9	
Field Conductivity, umhos/com	1090	750	1200	
Lab pH	8.5	8.4	8.4	
Lab Conductivity, umhos/com	972	745	1110	
TDS, mg/l	720	500	850	
TSS, mg/l	156	197	14	
NO3 as N, mg/l	2.7	1.7	3.2	
NO2 as N, mg/l	0.1	0.00592	0.00592	
NH3 as N, mg/l	0.1	0.0073	0.0289	
Phosphorus, T, mg/l	0.22	0.28	0.06	
Bicarbonate as HCO3, D	402	311	334	
Sulfate, D, mg/l	239	141	311	
As, TR, mg/l	<0.003	0.232	0.232	
Ca, D, mg/l	103	83	114	
Fe, T, mg/l	2.89	3.45	0.19	
Pb, TR, mg/l	<0.2	0.0627	0.0627	
Mg, D, mg/l	79	53	98	
Mn, TR, mg/l	130	160	0.788	
Hg, TR, mg/l	<0.001	0.06	0.016	
Se, TR, mg/l	0.008	0.266	0.008	
Na, D, mg/l	9	6	12	
Zn, TR, mg/l	<0.05	<0.05	0.00225	

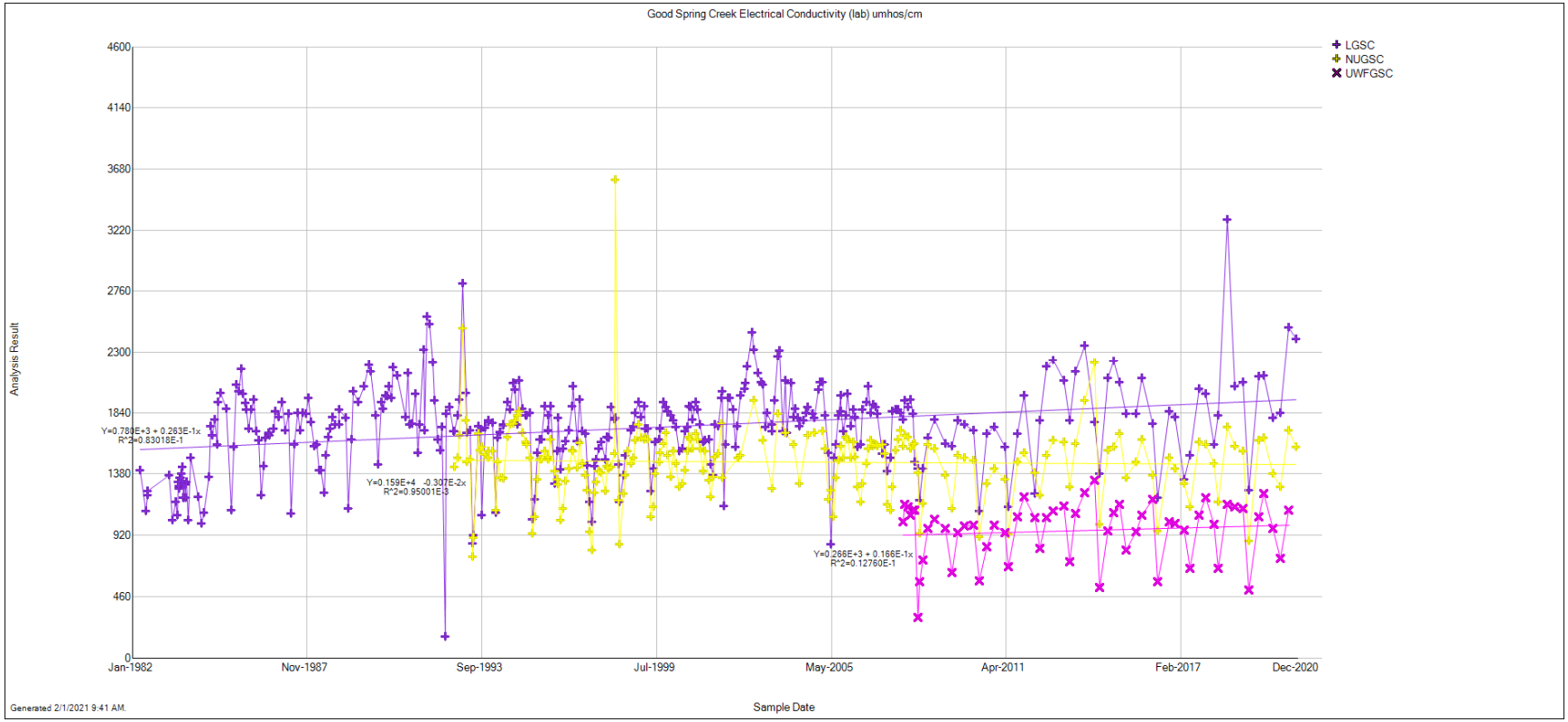
Colowyo Mine
Site - WFJC
Water Year 1/1/2020 - 12/31/2020

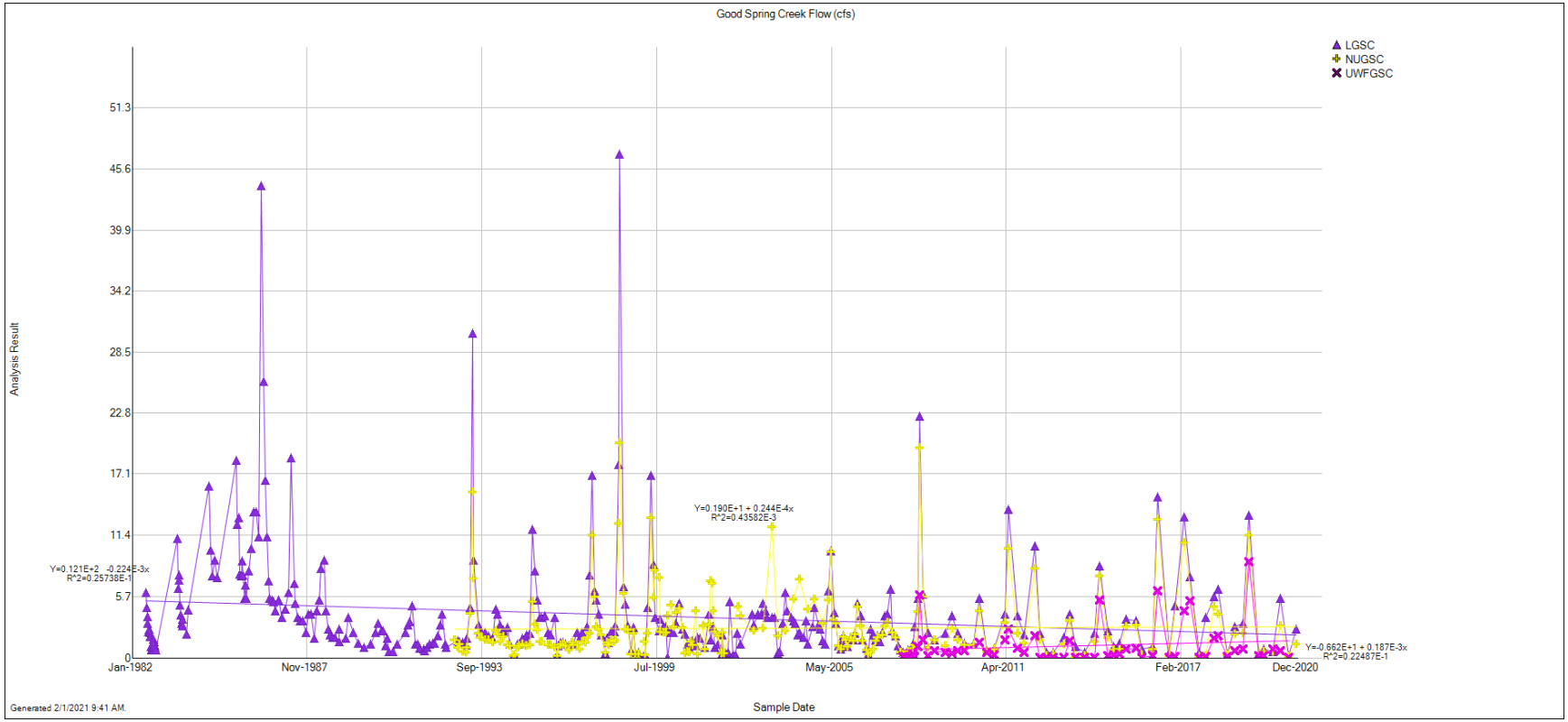
	Sample Date			
	3/9/2020	6/4/2020	9/14/2020	12/10/2020
Field Temp, °C	Dry	16.8	Dry	Dry
Flow Rate, cfs		0.01		
Field Conductivity, umhos/com		1180		
Lab Conductivity, umhos/com		1190		
Field pH		8.03		
Lab pH		8.4		
Bicarbonate as HCO3, D		420		
TDS, mg/l		870		
TSS, mg/l		21		
NH3 as N, mg/l		0.0073		
NO2 as N, mg/l		0.006		
NO3 as N, mg/l		0.008		
Phosphorus, T, mg/l		0.0122		
Ca, D, mg/l		115		
Mg, D, mg/l		95		
Na, D, mg/l		14		
Sulfate, D, mg/l		330		
As, TR, mg/l		<0.003		
Se, TR, mg/l		10		
Fe, T, mg/l		0.29		
Zn, TR, mg/l		<0.05		
Pb, TR, mg/l		0.0627		
Mn, TR, mg/l		1.58		
Hg, TR, mg/l		0.06		

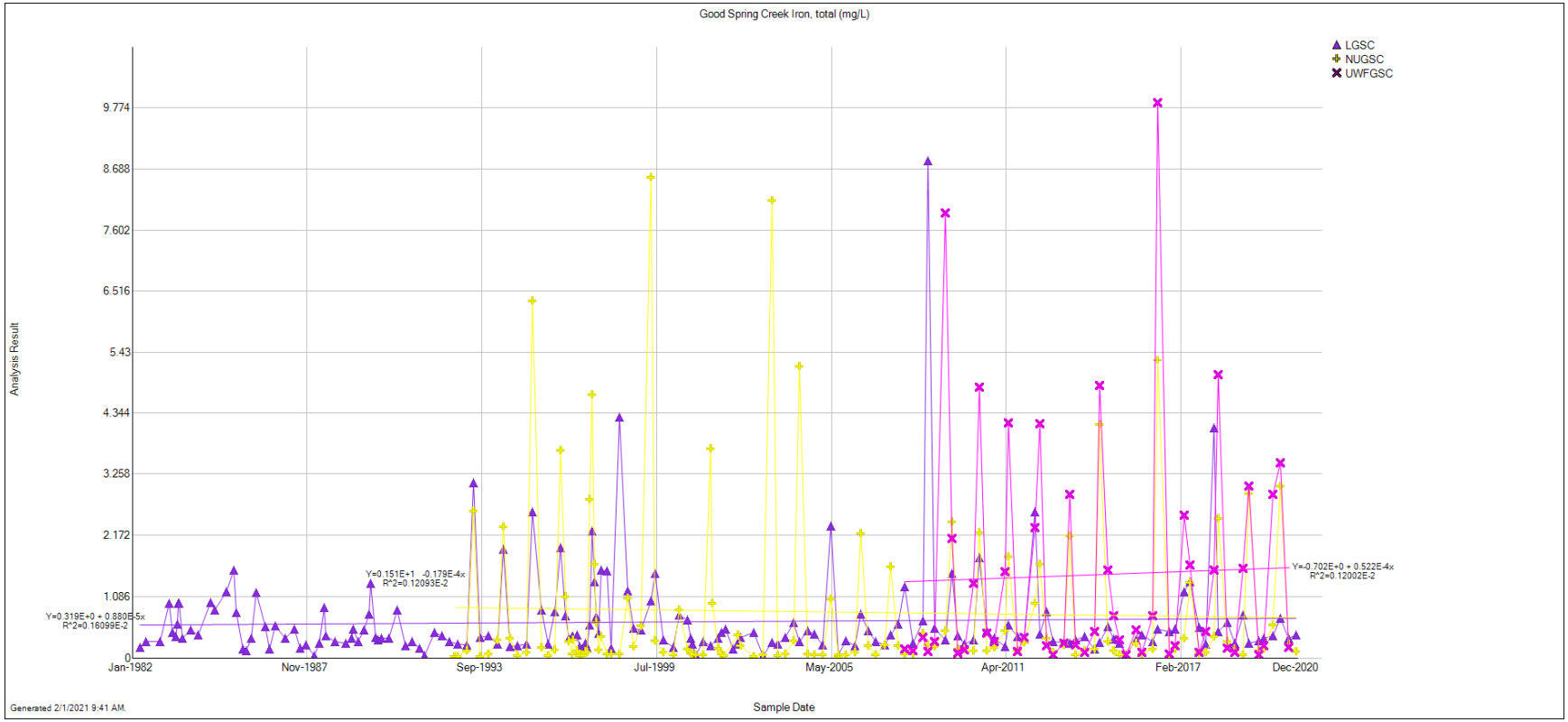
Exhibit 1B

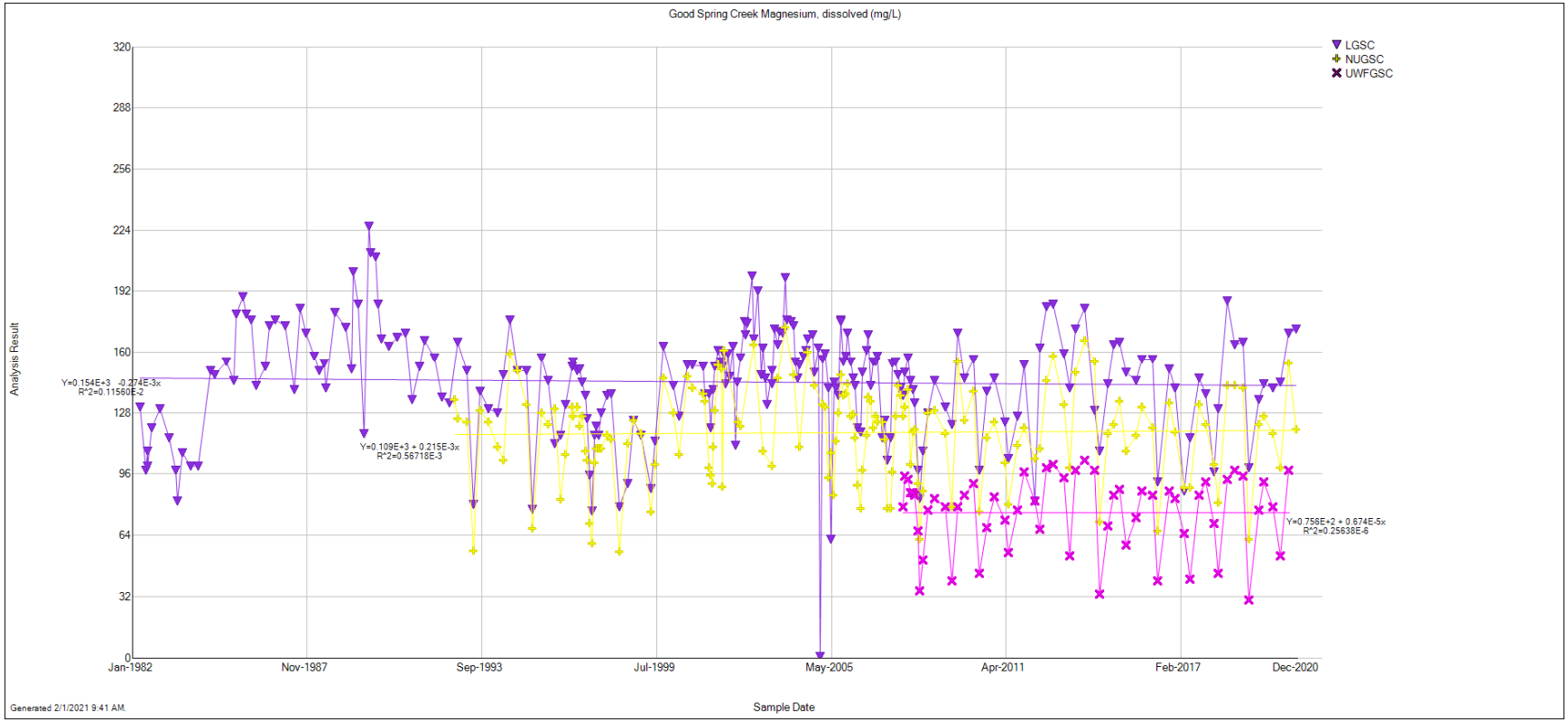
Surface Water Monitoring Graphs

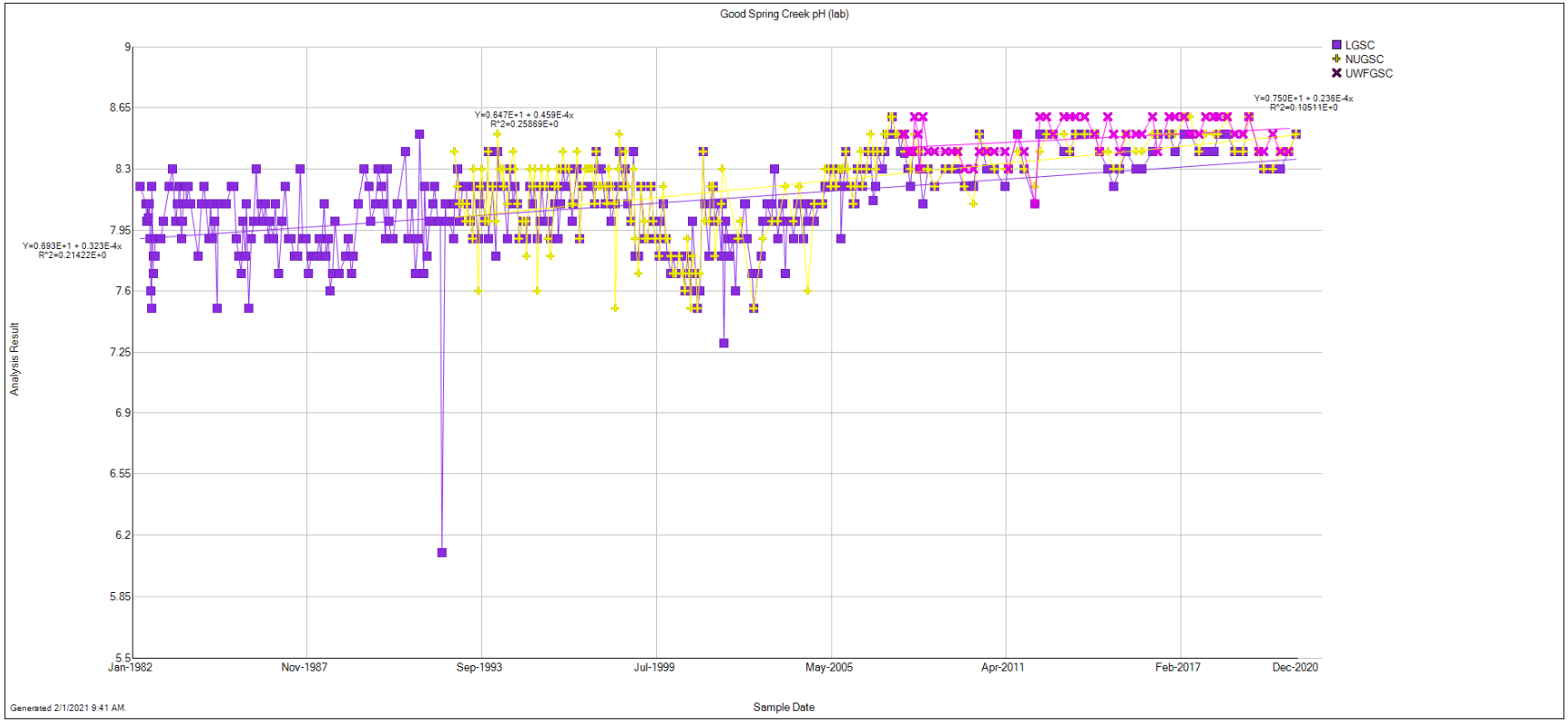

Good Spring Creek Calcium, dissolved (mg/L)
LGSC
NUGSC
UWFGSC
Analysis Result
300
270
240
210
180
150
120
90
60
30
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.143E+3 -0.670E-4x
R^2=0.99530E-4
Y=0.122E+3 + 0.251E-4x
R^2=0.19805E-4
Y=0.107E+3 -0.252E-3x
R^2=0.55684E-3
Generated 2/1/2021 9:41 AM.
Sample Date

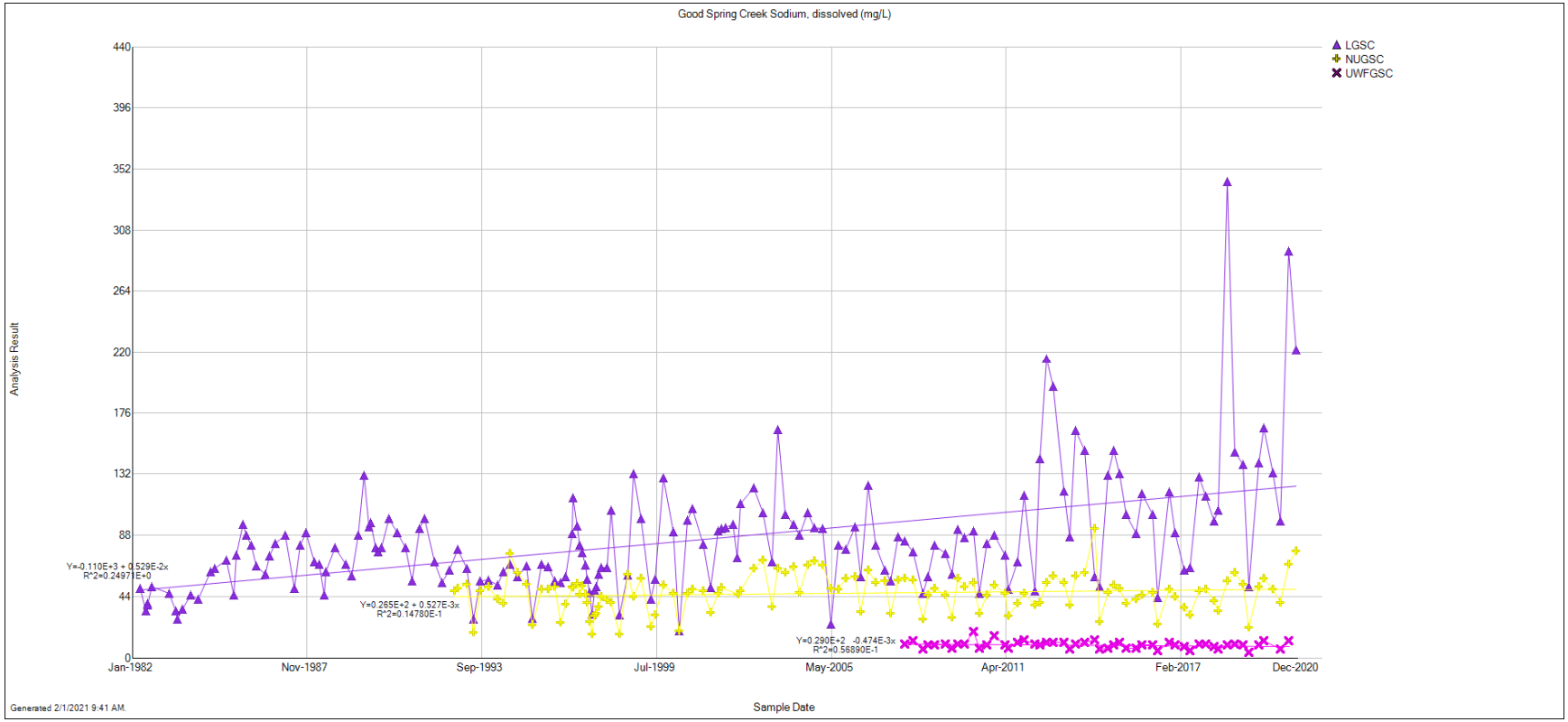

Good Spring Creek Electrical Conductivity (lab) umhos/cm
LGSC
NUGSC
UWFGSC
Analysis Result
4600
4140
3680
3220
2760
2300
1840
1380
920
460
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.780E+3 + 0.263E-1x
R^2=0.83018E-1
Y=0.159E+4 -0.307E-2x
R^2=0.95001E-3
Y=0.266E+3 + 0.166E-1x
R^2=0.12760E-1
Generated 2/1/2021 9:41 AM.
Sample Date

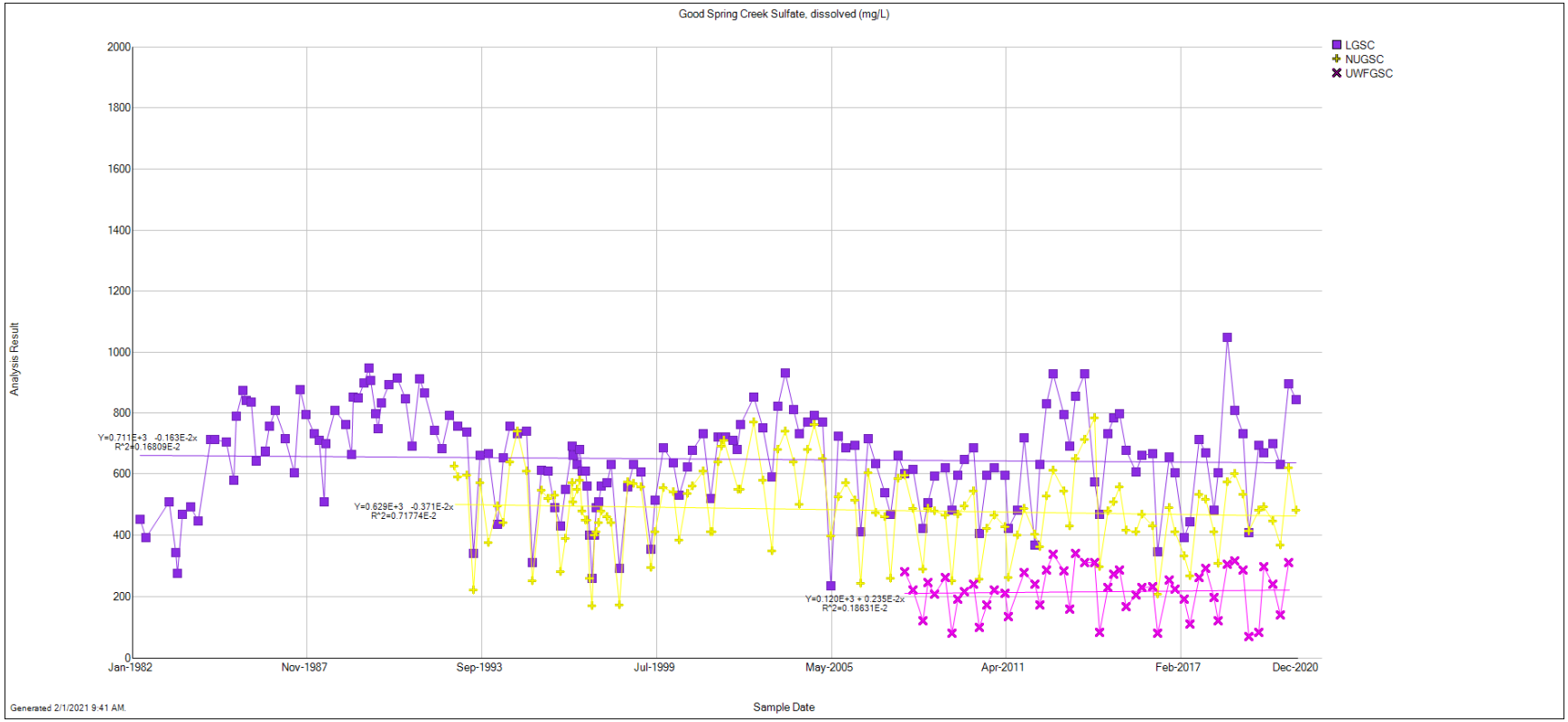

Good Spring Creek Flow (cfs)
LGSC
NUGSC
UWFGSC
Analysis Result
51.3
45.6
39.9
34.2
28.5
22.8
17.1
11.4
5.7
0
Y=0.121E+2 -0.224E-3x
R^2=0.25738E-1
Y=0.190E+1 + 0.244E-4x
R^2=0.43582E-3
Y=-0.662E+1 + 0.187E-3x
R^2=0.22487E-1
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/1/2021 9:41 AM.
Sample Date

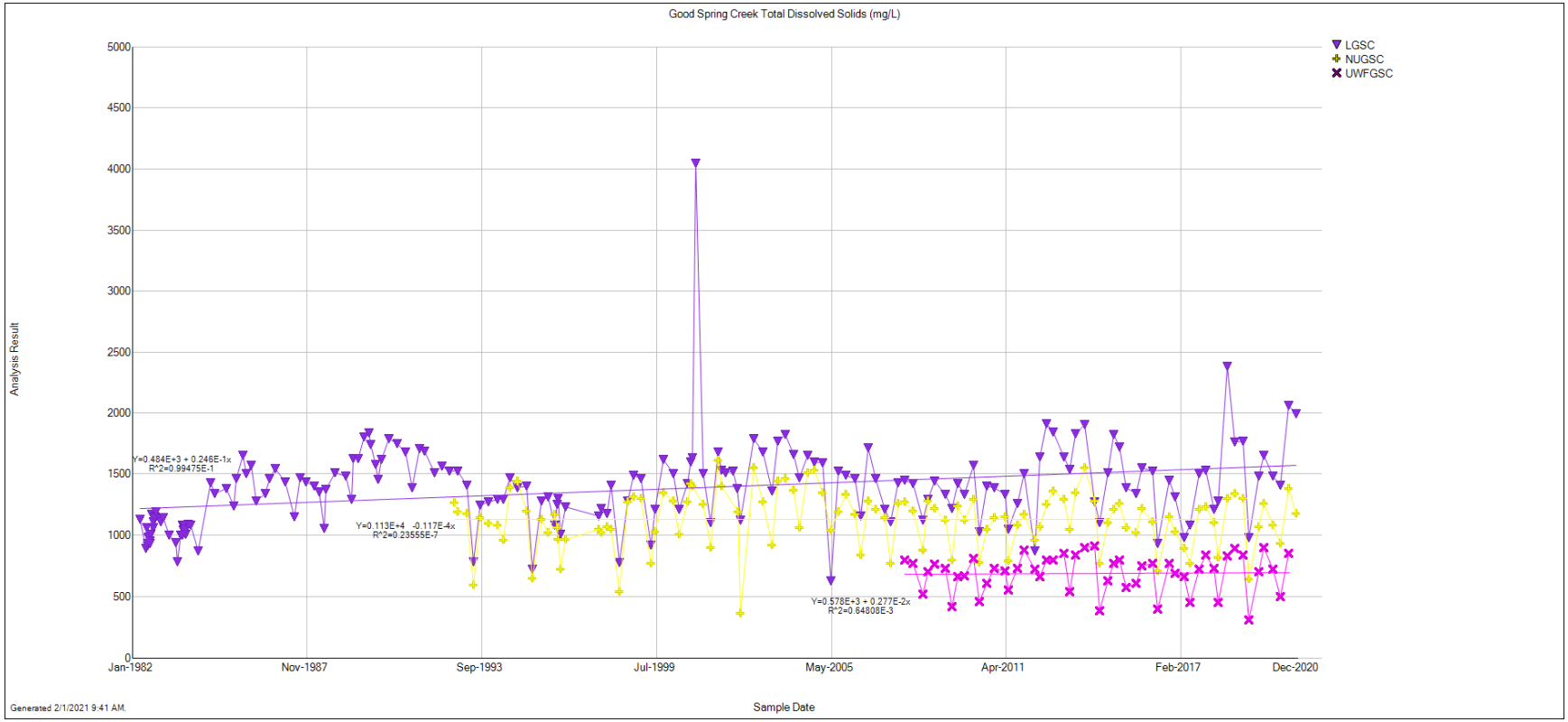

Good Spring Creek Iron, total (mg/L)
LGSC
NUGSC
UWFGSC
Analysis Result
9.774
8.688
7.602
6.516
5.43
4.344
3.258
2.172
1.086
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.319E+0 + 0.880E-5x
R^2=0.16099E-2
Y=0.151E+1 -0.179E-4x
R^2=0.12093E-2
Y=-0.702E+0 + 0.522E-4x
R^2=0.12002E-2
Generated 2/1/2021 9:41 AM.
Sample Date

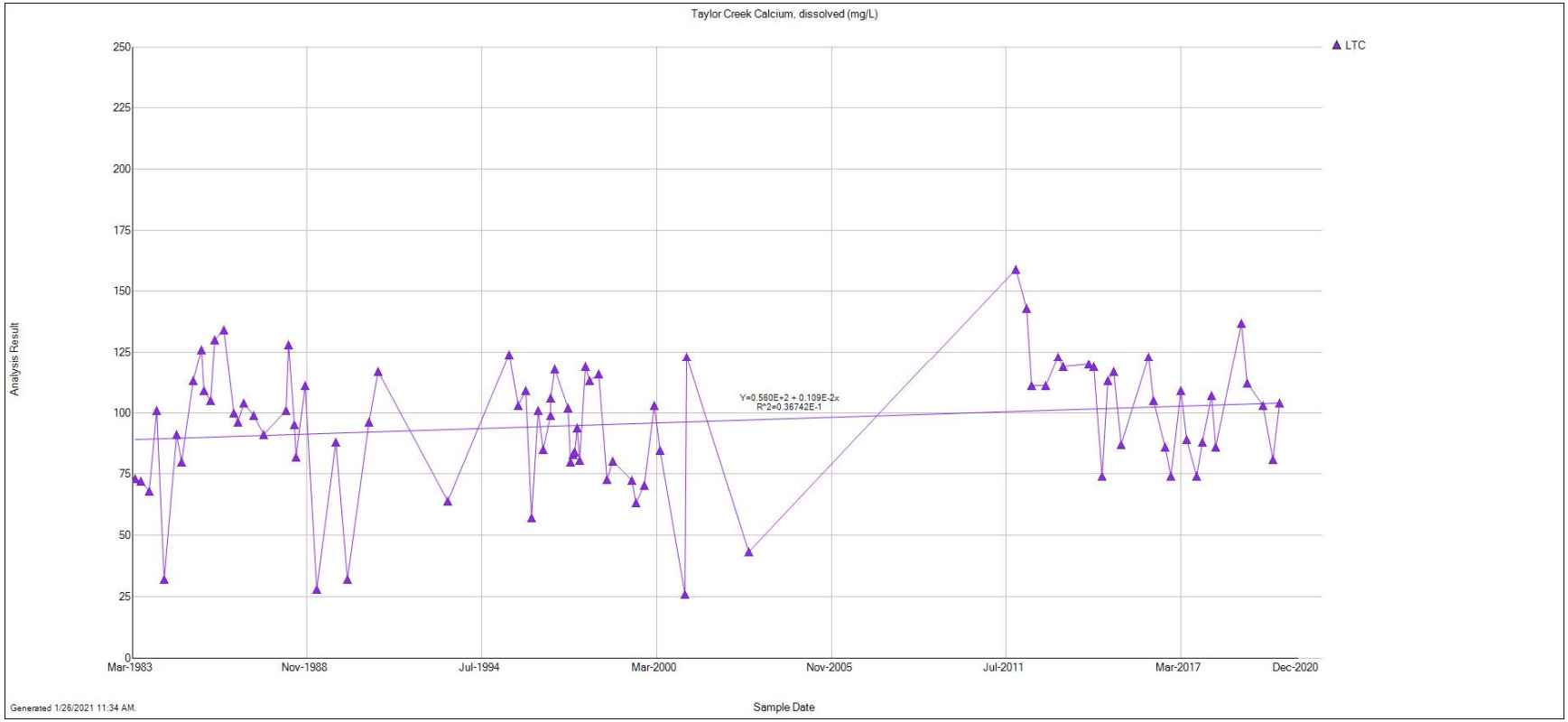

Good Spring Creek Magnesium, dissolved (mg/L)
LGSC
NUGSC
UWFGSC
Analysis Result
320
288
256
224
192
160
128
96
64
32
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.154E+3 -0.274E-3x
R^2=0.11560E-2
Y=0.109E+3 + 0.215E-3x
R^2=0.56718E-3
Y=0.758E+2 + 0.674E-5x
R^2=0.25638E-6
Generated 2/1/2021 9:41 AM.
Sample Date

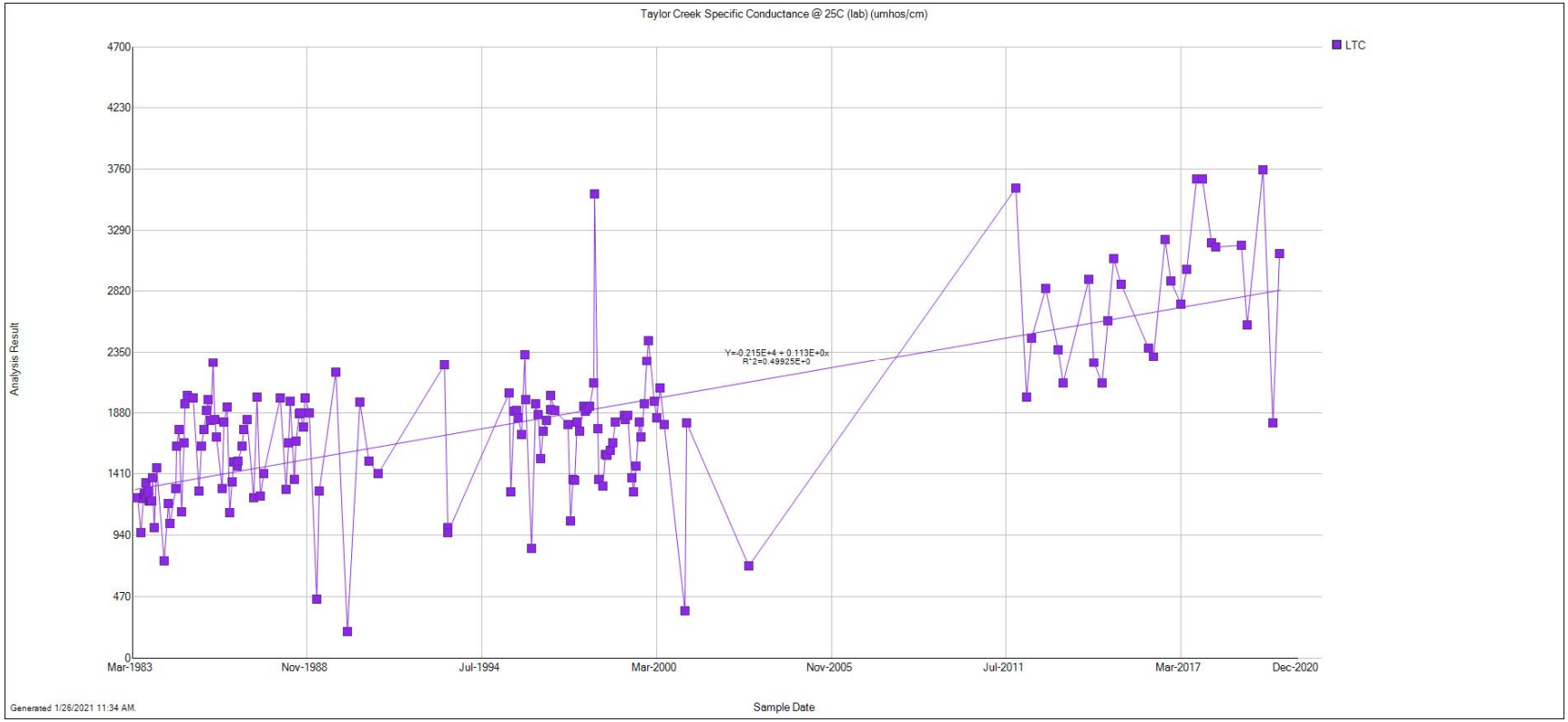

Good Spring Creek pH (lab)
LGSC
NUGSC
UWFGSC
Y=0.693E+1 + 0.323E-4x
R^2=0.21422E+0
Y=0.647E+1 + 0.459E-4x
R^2=0.25869E+0
Y=0.750E+1 + 0.236E-4x
R^2=0.10511E+0
Analysis Result
9
8.65
8.3
7.95
7.6
7.25
6.9
6.55
6.2
5.85
5.5
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/1/2021 9:41 AM.
Sample Date

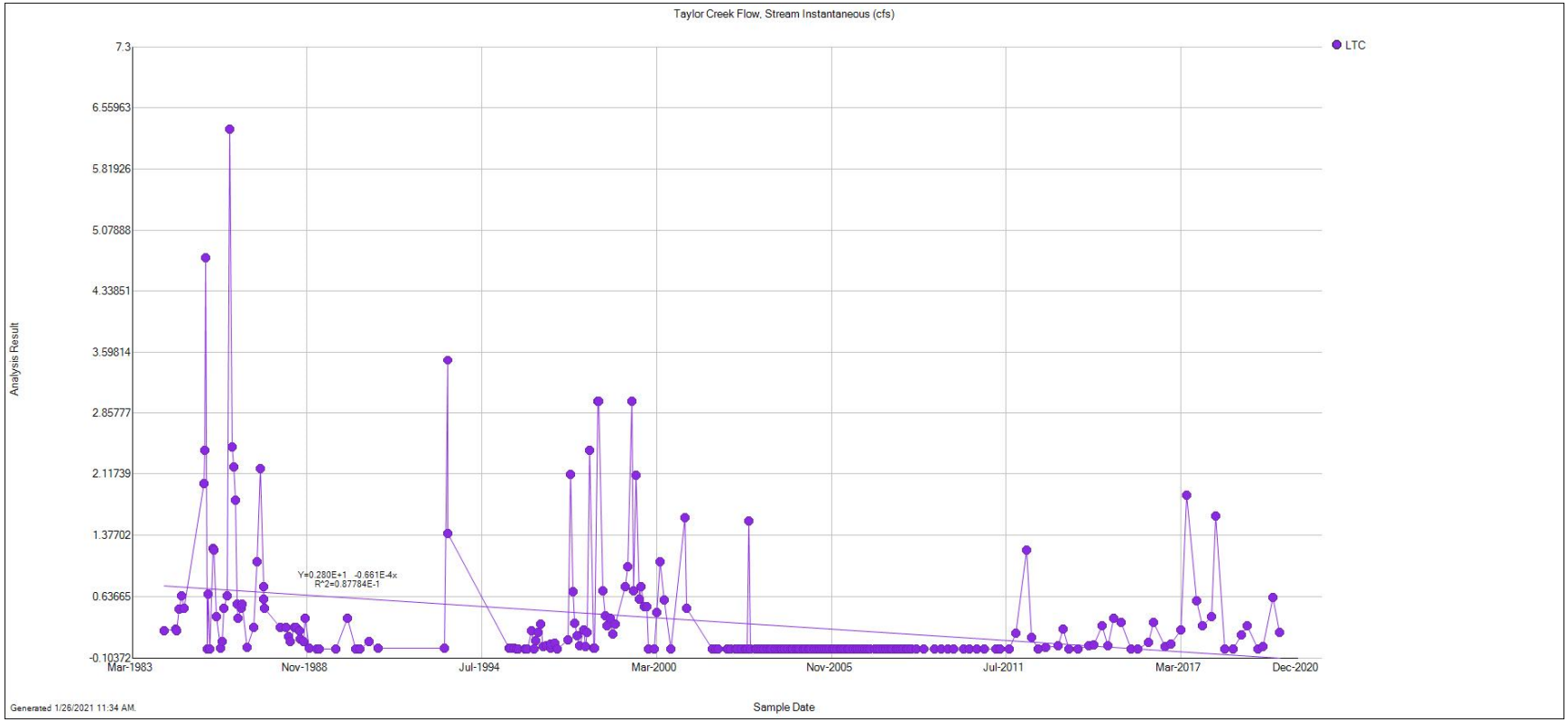

Good Spring Creek Sodium, dissolved (mg/L)
LGSC
NUGSC
UWFGSC
Analysis Result
440
396
352
308
264
220
176
132
88
44
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=-0.110E+3 + 0.529E-2x
R^2=0.24971E+0
Y=0.265E+2 + 0.527E-3x
R^2=0.14780E-1
Y=0.290E+2 -0.474E-3x
R^2=0.56890E-1
Generated 2/1/2021 9:41 AM.
Sample Date

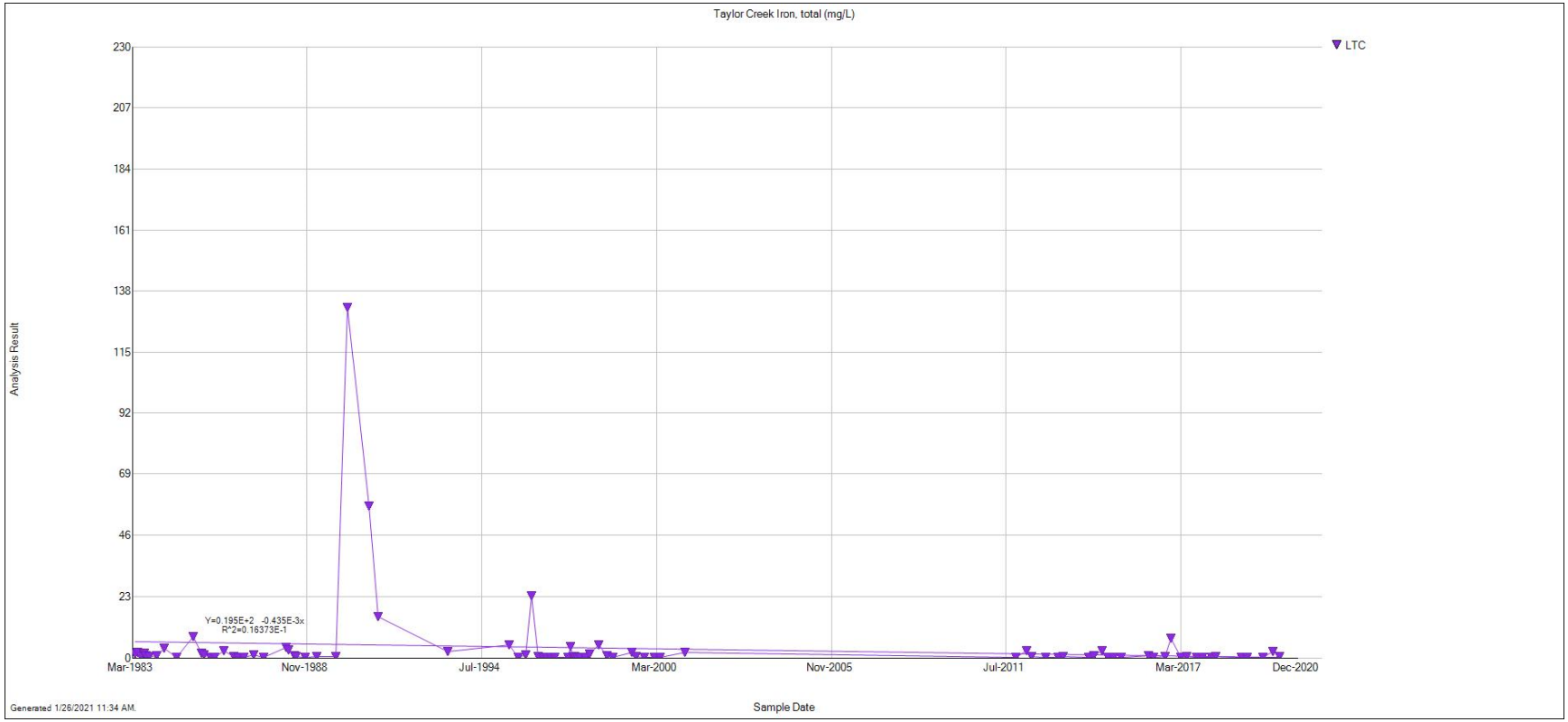

Good Spring Creek Sulfate, dissolved (mg/L)
LGSC
NUGSC
UWFGSC
Analysis Result
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Y=0.711E+3 -0.163E-2x
R^2=0.16809E-2
Y=0.629E+3 -0.371E-2x
R^2=0.71774E-2
Y=0.120E+3 + 0.235E-2x
R^2=0.18631E-2
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/1/2021 9:41 AM.
Sample Date

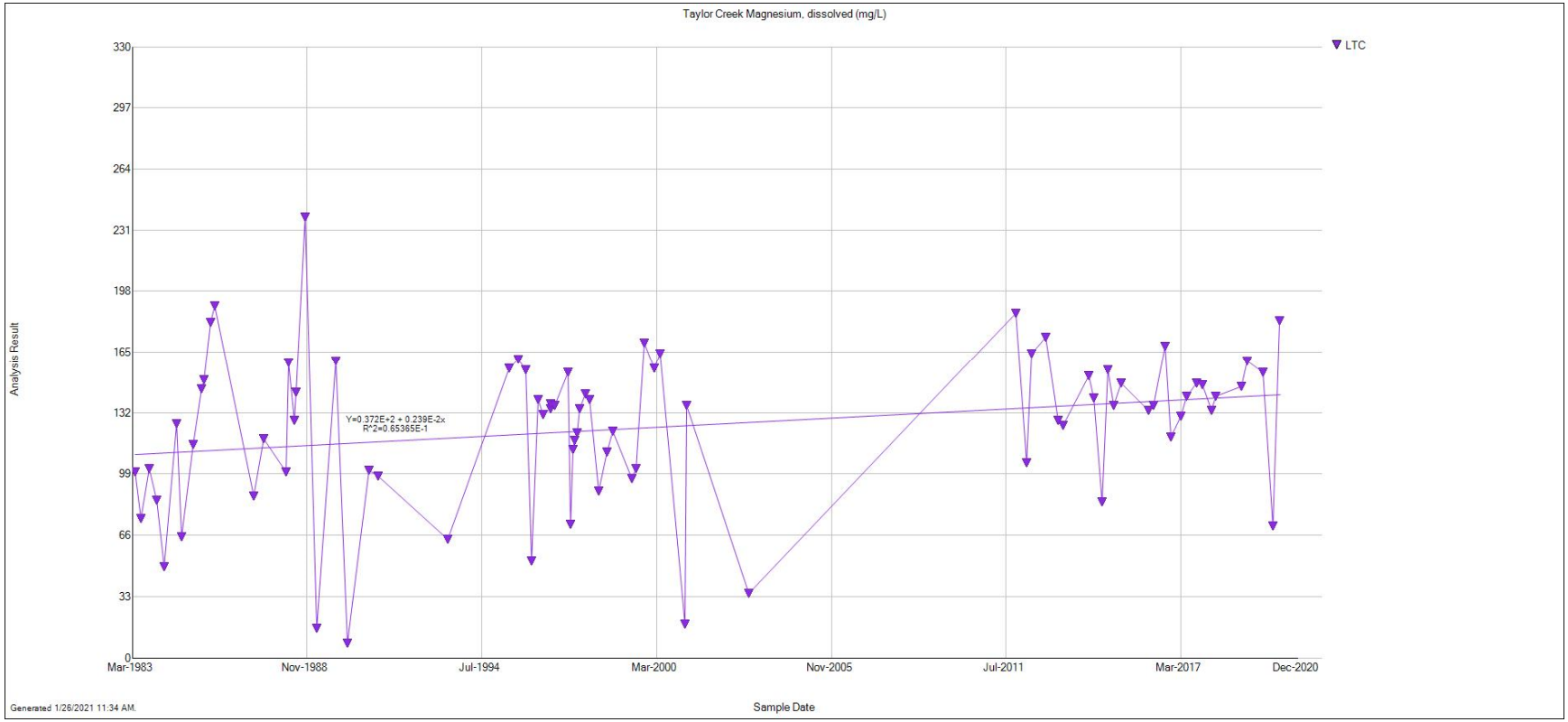

Good Spring Creek Total Dissolved Solids (mg/L)
LGSC
NUGSC
UWFGSC
Analysis Result
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Y=0.484E+3 + 0.246E-1x
R^2=0.99475E-1
Y=0.113E+4 -0.117E-4x
R^2=0.23555E-7
Y=0.578E+3 + 0.277E-2x
R^2=0.84808E-3
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/1/2021 9:41 AM.
Sample Date

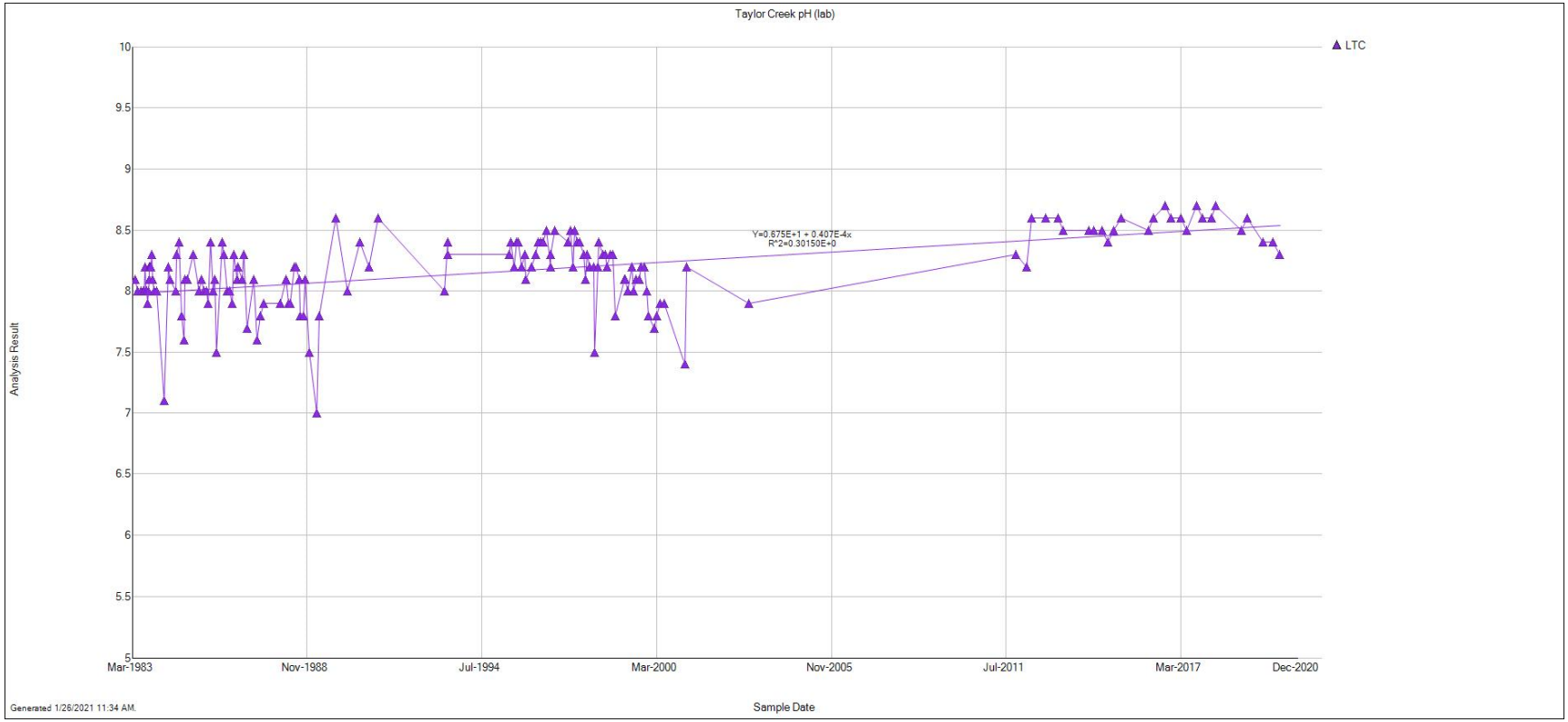

Taylor Creek Calcium, dissolved (mg/L)
LTC
Y=0.560E+2 + 0.109E-2x
R^2=0.36742E-1
Analysis Result
250
225
200
175
150
125
100
75
50
25
0
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

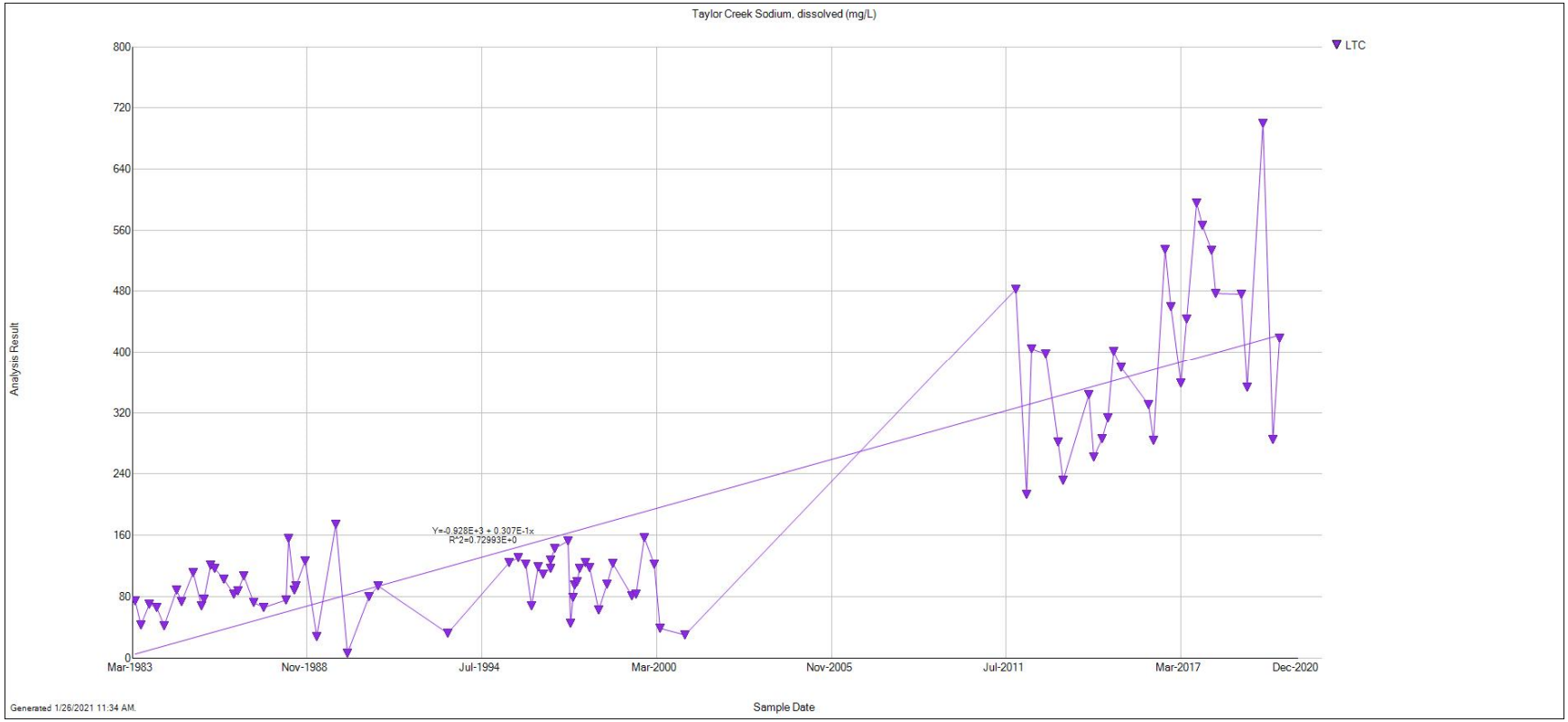

Taylor Creek Specific Conductance @ 25C (lab) (umhos/cm)
LTC
Y=-0.215E+4 + 0.113E+0x
R^2=0.49925E+0
Analysis Result
4700
4230
3760
3290
2820
2350
1880
1410
940
470
0
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

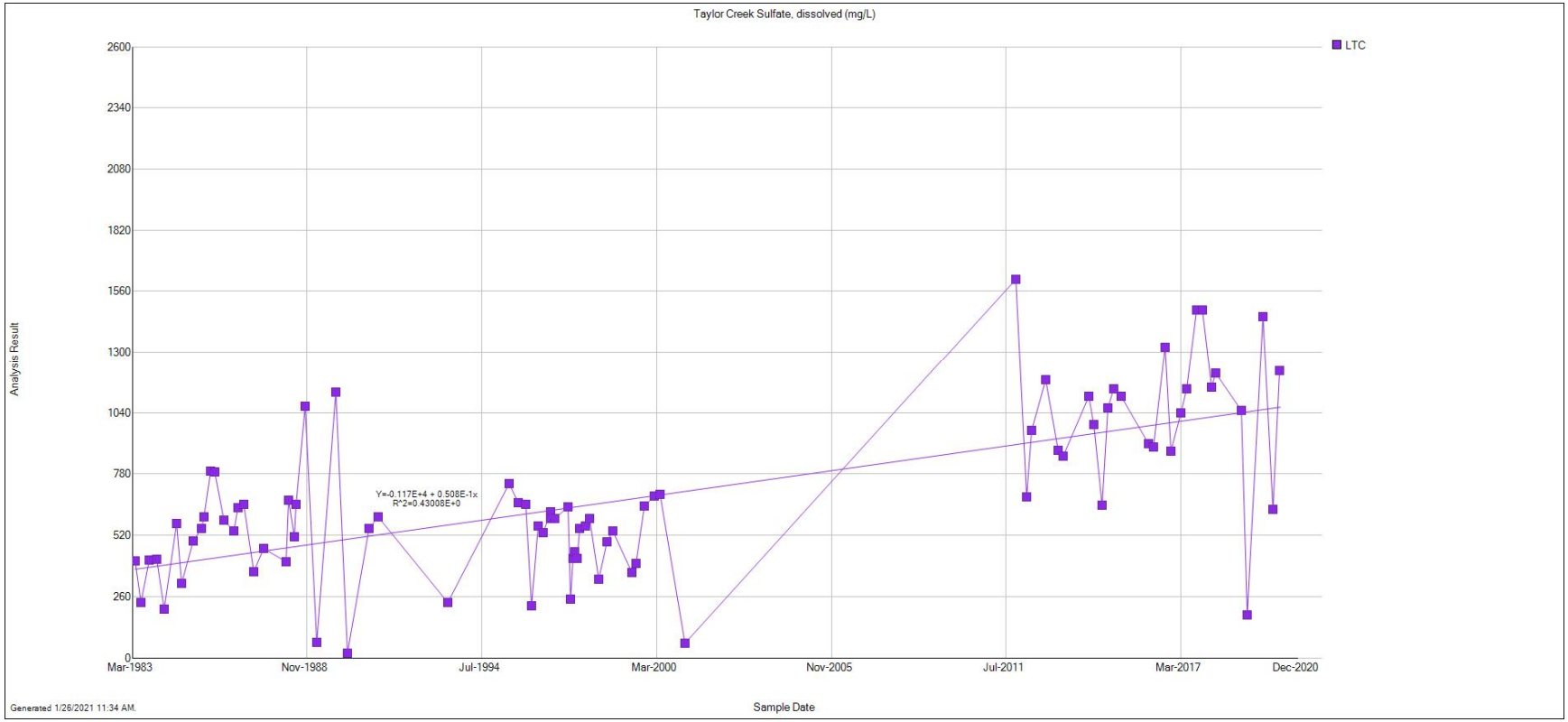

Taylor Creek Flow, Stream Instantaneous (cfs)
LTC
7.3
6.55963
5.81926
5.07888
4.33851
3.59814
2.85777
2.11739
1.37702
0.63665
-0.10372
Analysis Result
Y=0.280E+1 -0.661E-4x
R^2=0.87784E-1
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Sample Date
Generated 1/26/2021 11:34 AM.

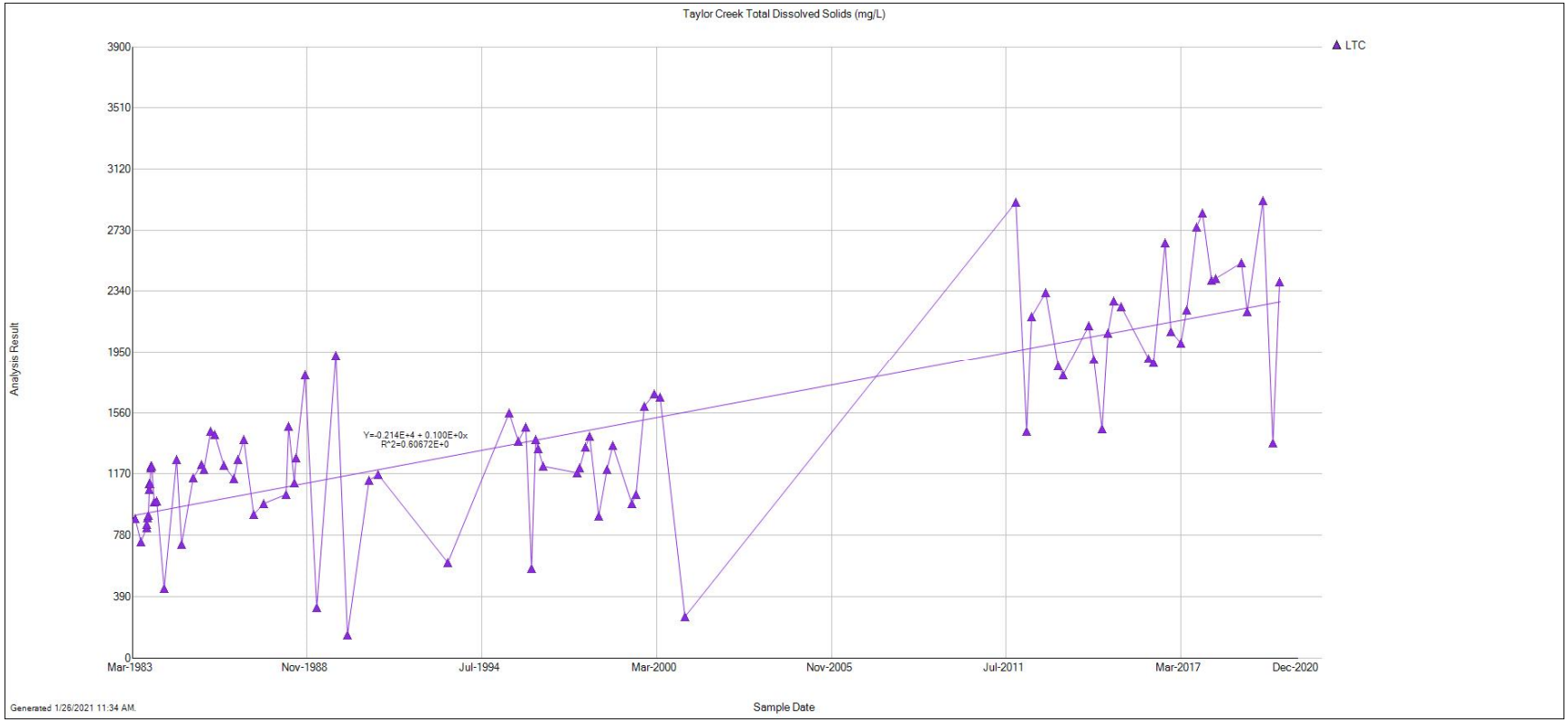

Taylor Creek Iron, total (mg/L)
LTC
230
207
184
161
138
115
92
69
46
23
0
Analysis Result
Y=0.195E+2 -0.435E-3x
R^2=0.16373E-1
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

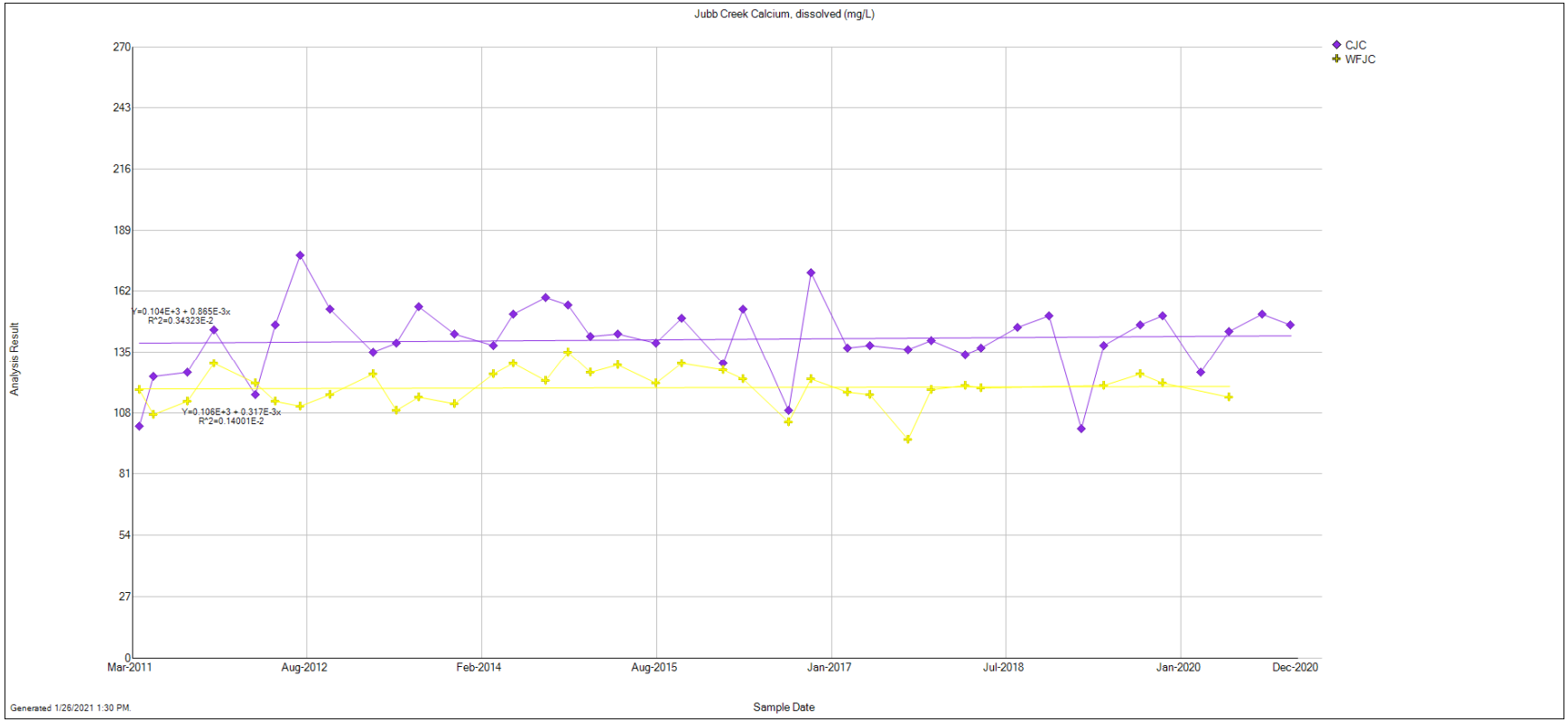

Taylor Creek Magnesium, dissolved (mg/L)
LTC
Analysis Result
330
297
264
231
198
165
132
99
66
33
0
Y=0.372E+2 + 0.239E-2x
R^2=0.65365E-1
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

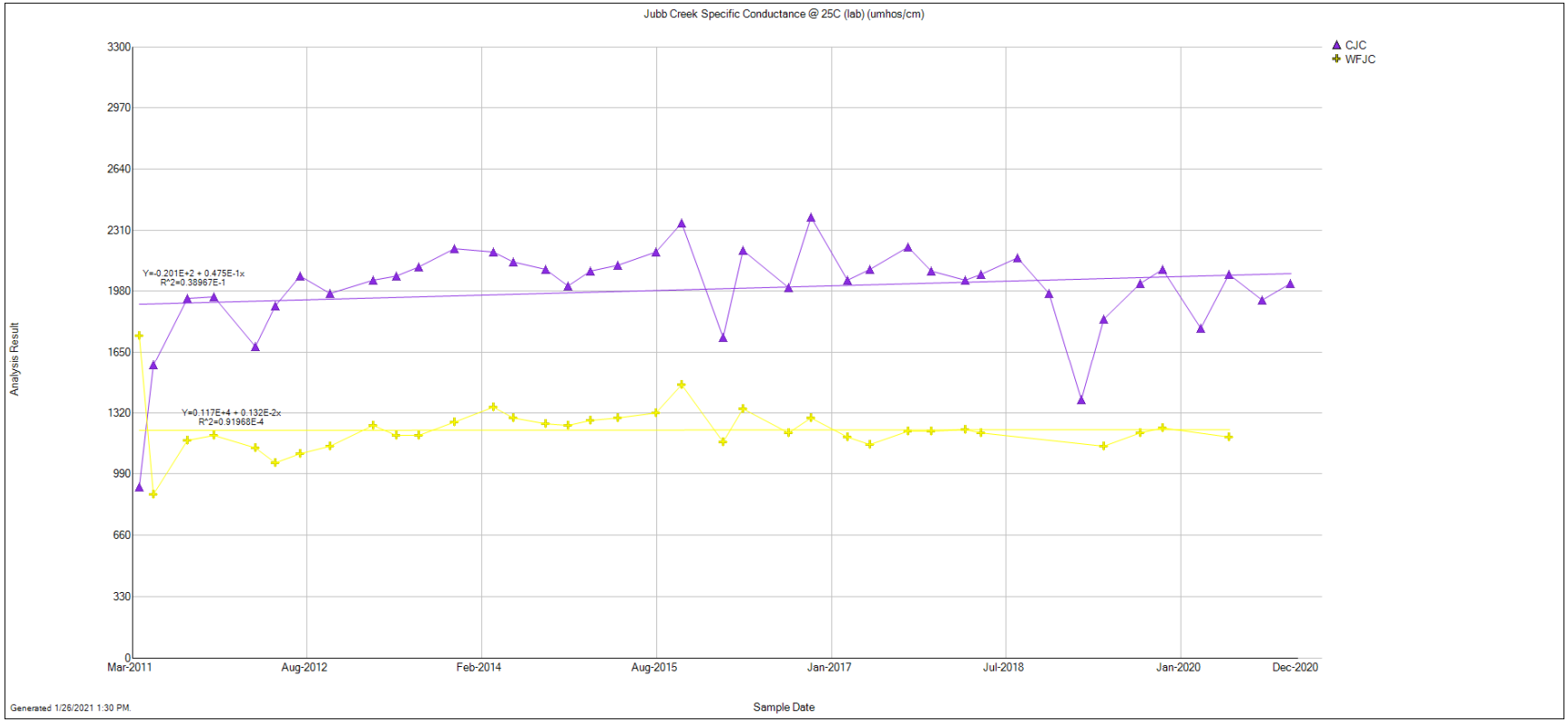

Taylor Creek pH (lab)
LTC
Y=0.675E+1 + 0.407E-4x
R^2=0.30150E+0
Analysis Result
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

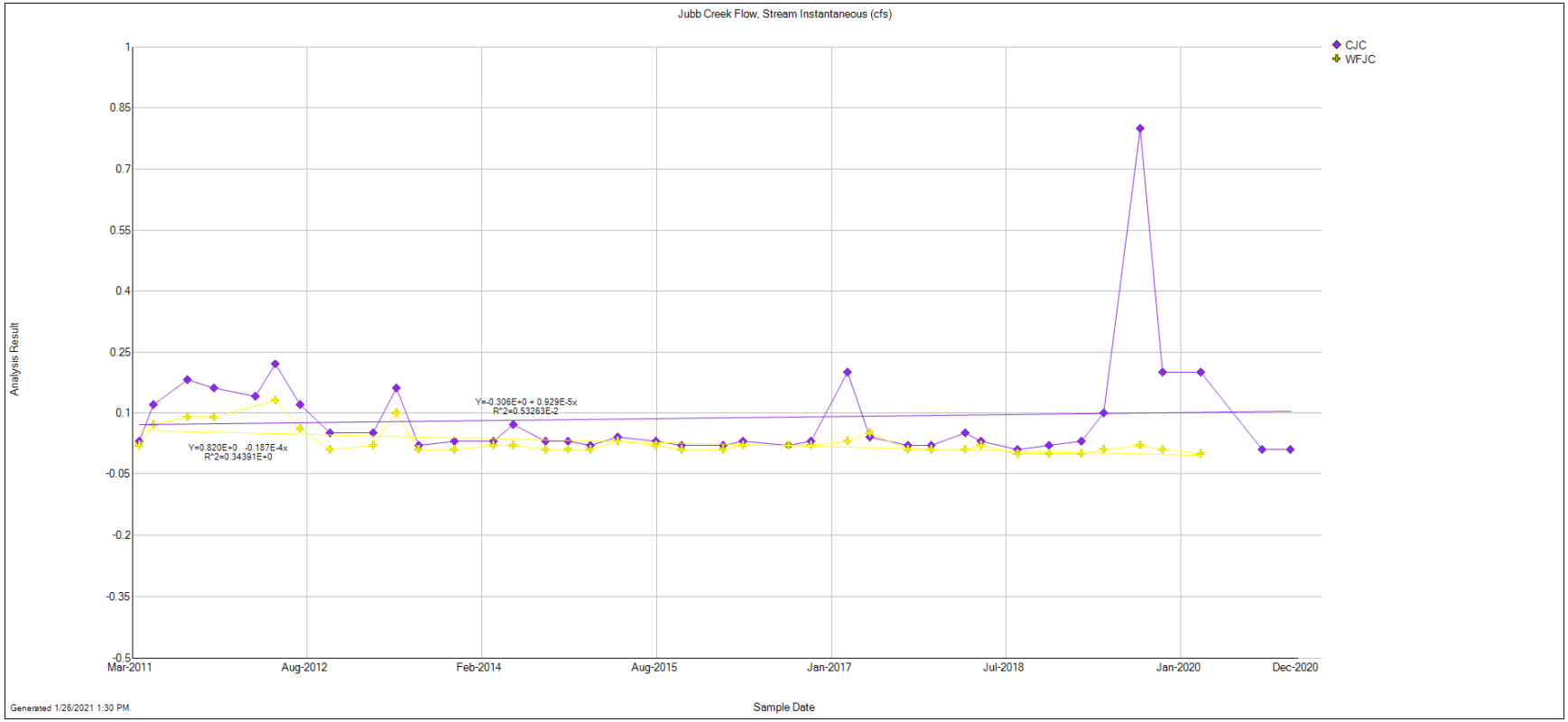

Taylor Creek Sodium, dissolved (mg/L)
LTC
Analysis Result
800
720
640
560
480
400
320
240
160
80
0
Y=-0.928E+3 + 0.307E-1x
R^2=0.72993E+0
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

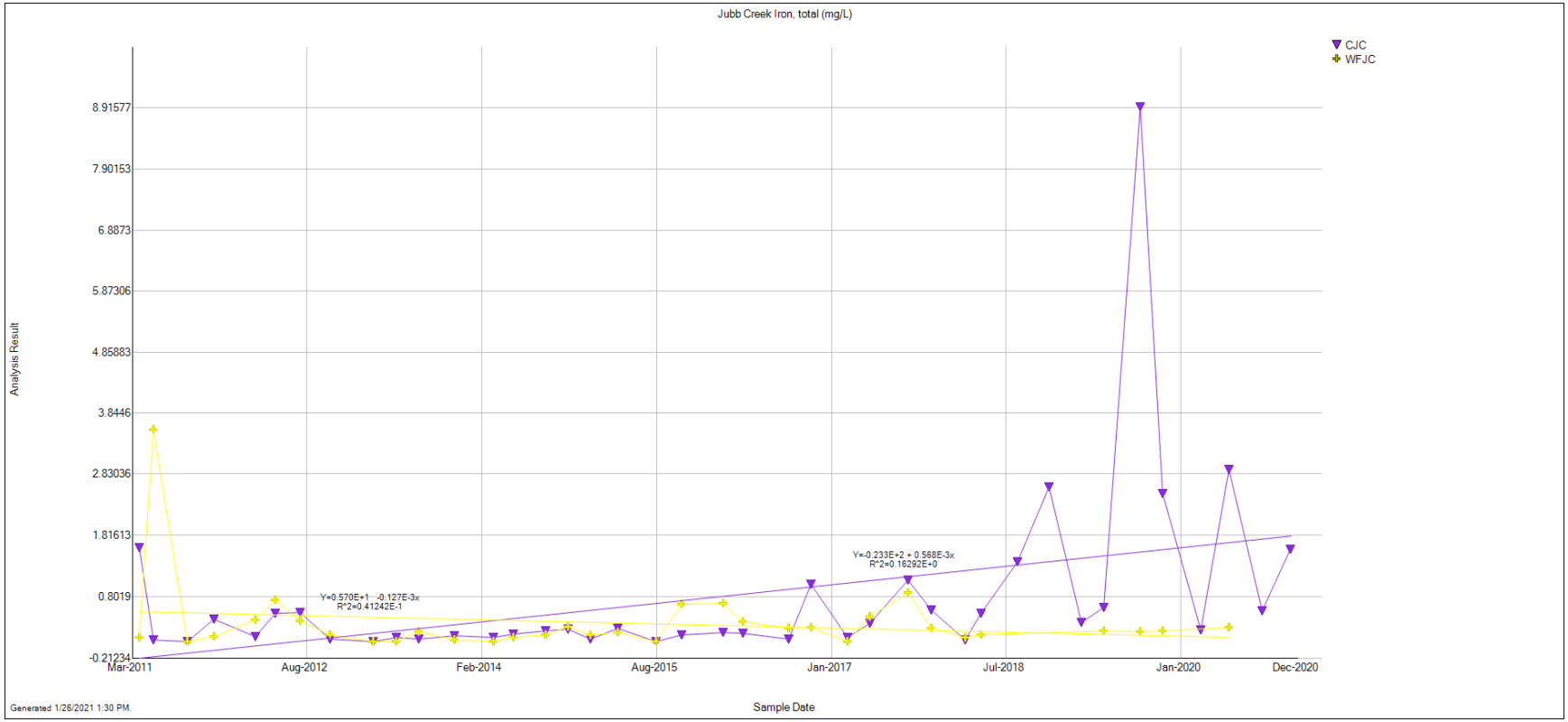

Taylor Creek Sulfate, dissolved (mg/L)
LTC
Analysis Result
2600
2340
2080
1820
1560
1300
1040
780
520
260
0
Y=-0.117E+4 + 0.508E-1x
R^2=0.43008E+0
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

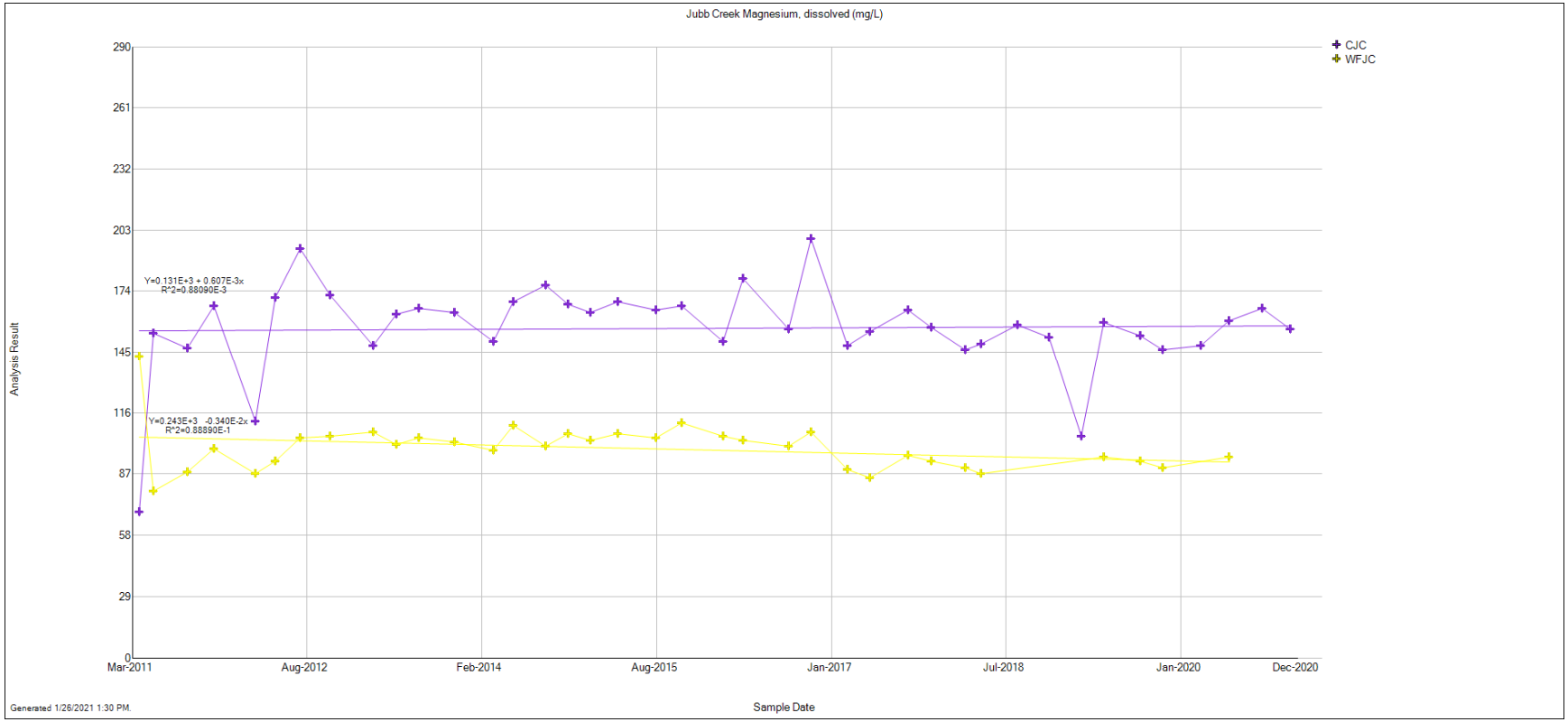

Taylor Creek Total Dissolved Solids (mg/L)
LTC
Analysis Result
3900
3510
3120
2730
2340
1950
1560
1170
780
390
0
Y=-0.214E+4 + 0.100E+0x
R^2=0.60672E+0
Mar-1983
Nov-1988
Jul-1994
Mar-2000
Nov-2005
Jul-2011
Mar-2017
Dec-2020
Generated 1/26/2021 11:34 AM.
Sample Date

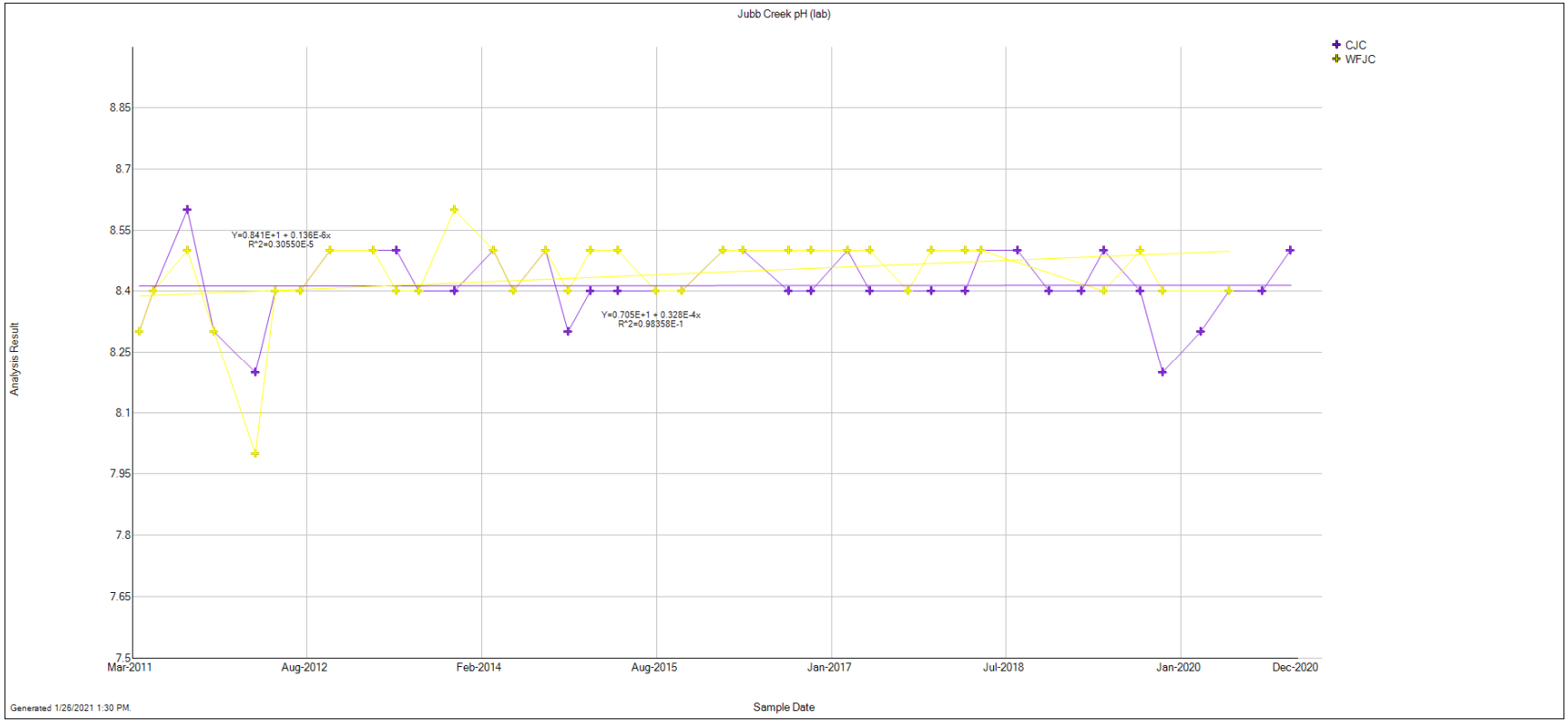

Jubb Creek Calcium, dissolved (mg/L)
CJC
WFJC
Y=0.104E+3 + 0.865E-3x
R^2=0.34323E-2
Y=0.106E+3 + 9.317E-3x
R^2=0.14001E-2
Analysis Result
270
243
216
189
162
135
108
81
54
27
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 1/26/2021 1:30 PM.

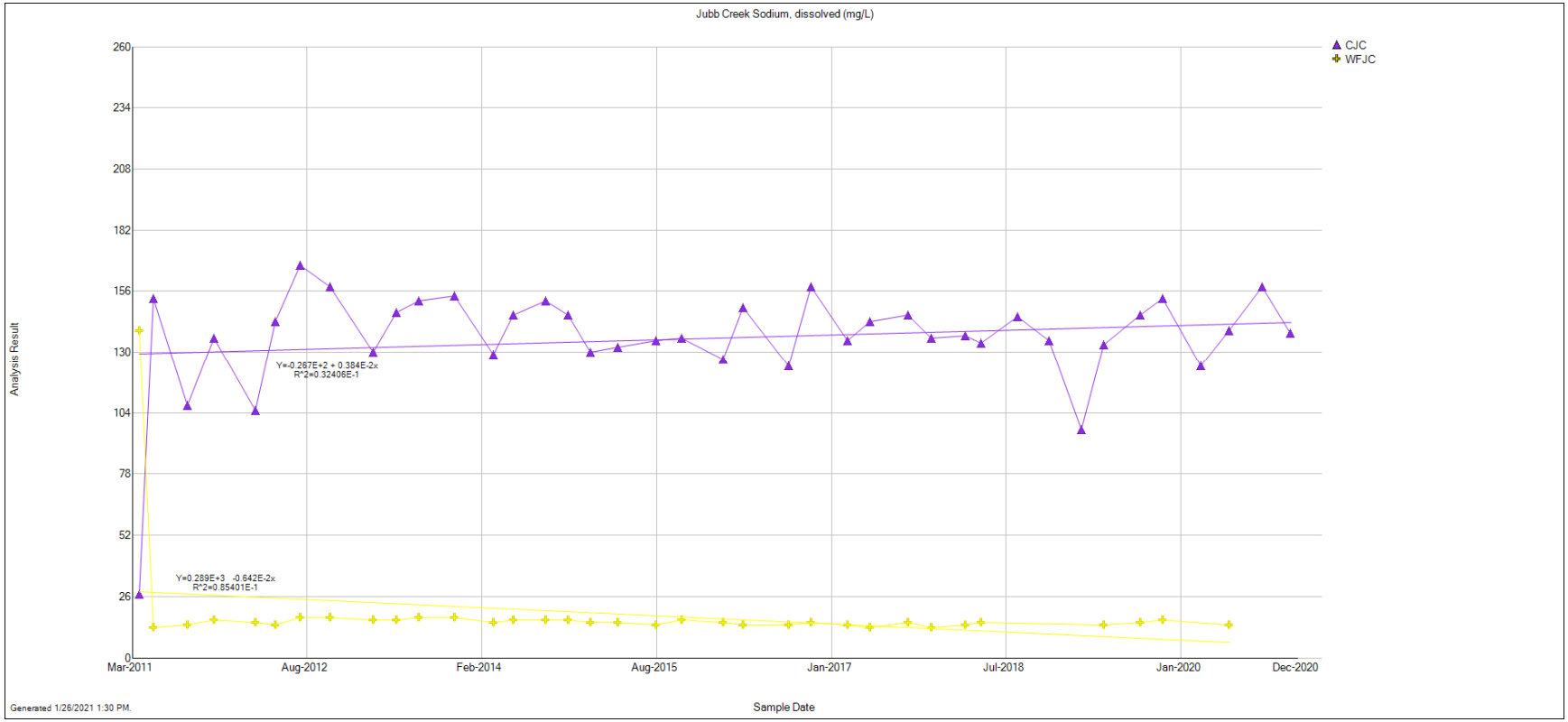

Jubb Creek Specific Conductance @ 25C (lab) (umhos/cm)
CJC
WFJC
Y=-0.201E+2 + 0.475E-1x
R^2=0.38987E-1
Y=0.117E+4 + 0.132E-2x
R^2=0.91988E-4
3300
2970
2640
2310
1980
1650
1320
990
660
330
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 1/26/2021 1:30 PM.

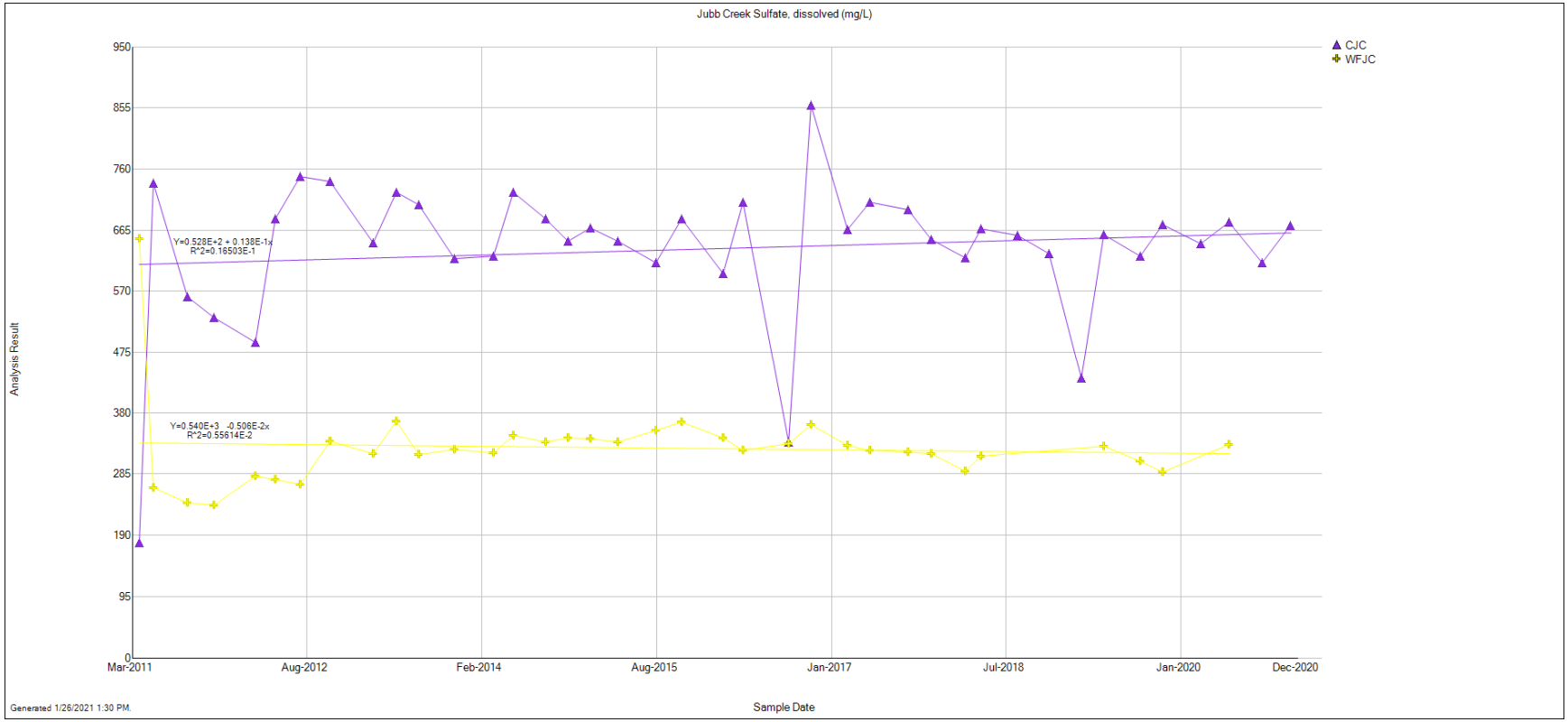

Jubb Creek Flow, Stream Instantaneous (cfs)
CJC
WFJC
Y=-0.306E+0 + 0.929E-5x
R^2=0.53263E-2
Y=0.820E+0 -0.187E-4x
R^2=0.34391E+0
Analysis Result
1
0.85
0.7
0.55
0.4
0.25
0.1
-0.05
-0.2
-0.35
-0.5
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 1/26/2021 1:30 PM.

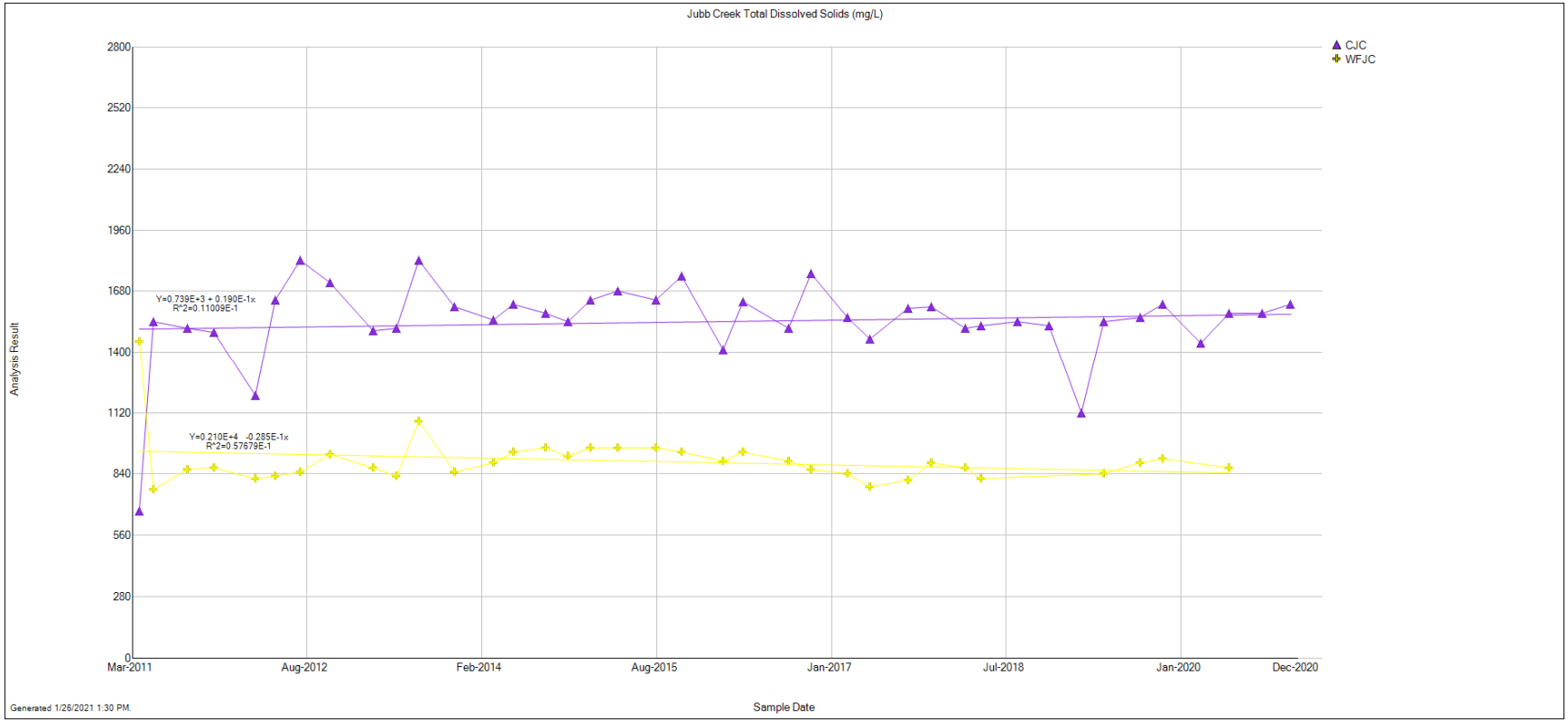

Jubb Creek Iron, total (mg/L)
CJC
WFJC
Analysis Result
8.91577
7.90153
6.8873
5.87306
4.85883
3.8446
2.83036
1.81613
0.8019
-0.21234
Y=0.570E+1 -0.127E-3x
R^2=0.41242E-1
Y=-0.233E+2 + 0.568E-3x
R^2=0.16292E+0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 1:30 PM.
Sample Date

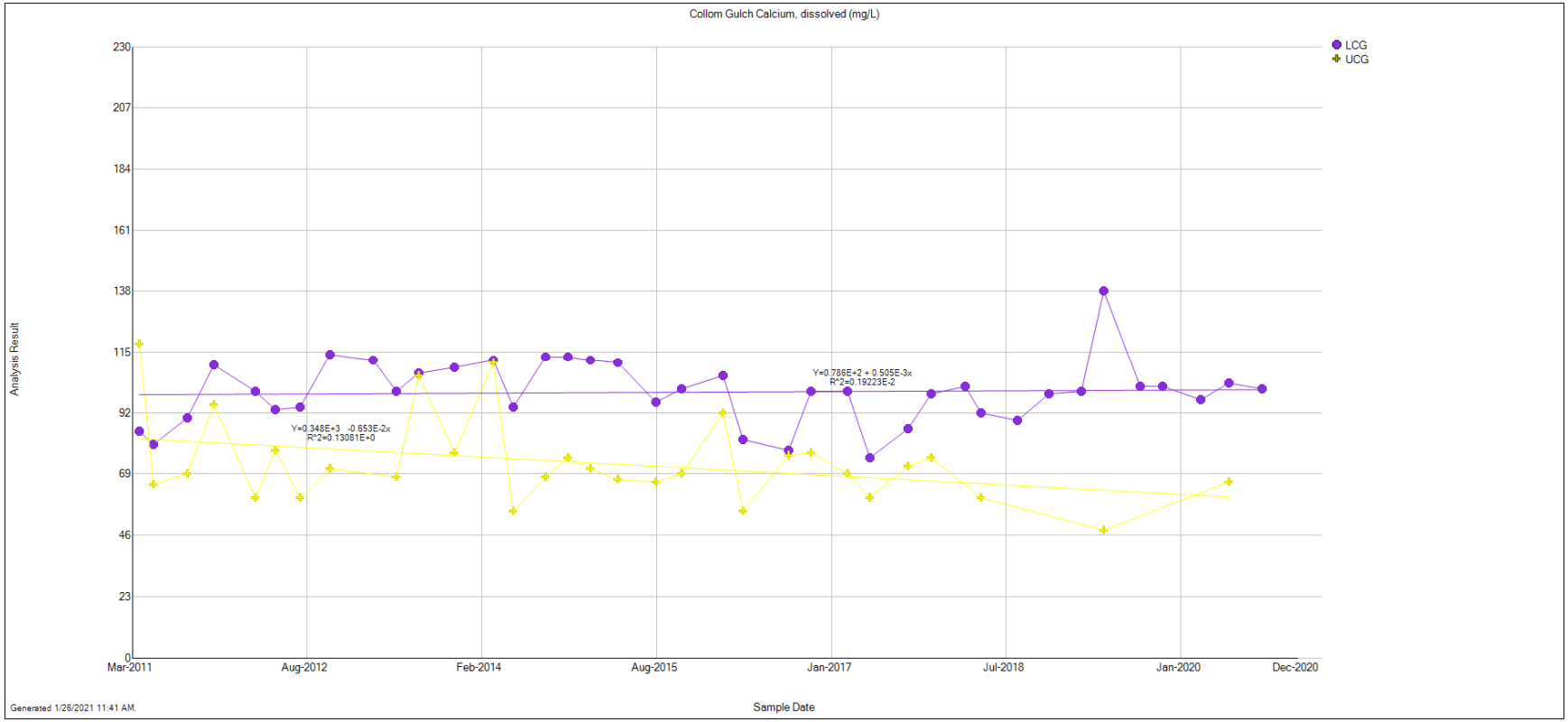

Jubb Creek Magnesium, dissolved (mg/L)
CJC
WFJC
Y=0.131E+3 + 0.607E-3x
R^2=0.88090E-3
Y=0.243E+3 -0.340E-2x
R^2=0.88890E-1
290
261
232
203
174
145
116
87
58
29
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 1/26/2021 1:30 PM.

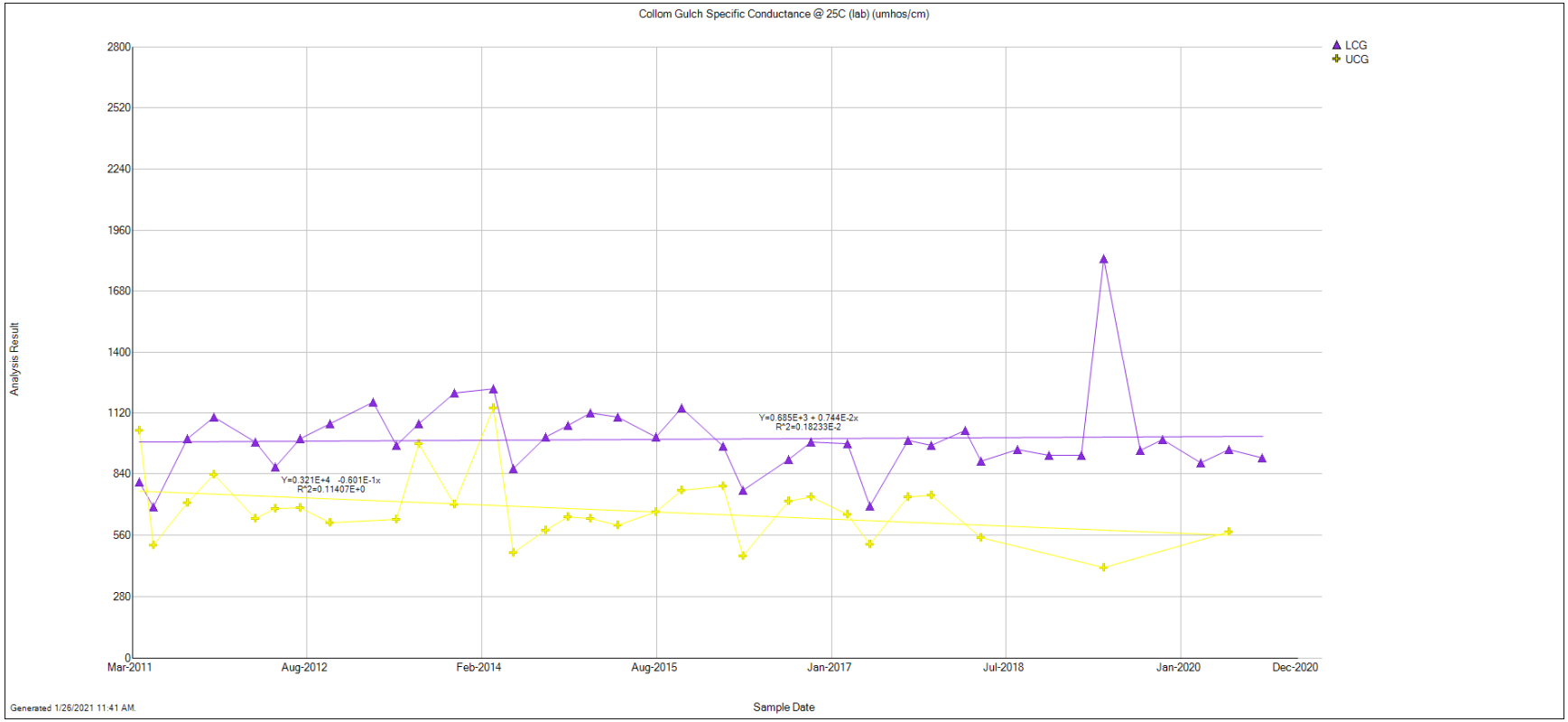

Jubb Creek pH (lab)
CJC
WFJC
Y=0.841E+1 + 0.136E-6x
R^2=0.30550E-5
Y=0.705E+1 + 0.328E-4x
R^2=0.98358E-1
Analysis Result
8.85
8.7
8.55
8.4
8.25
8.1
7.95
7.8
7.65
7.5
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 1:30 PM.
Sample Date

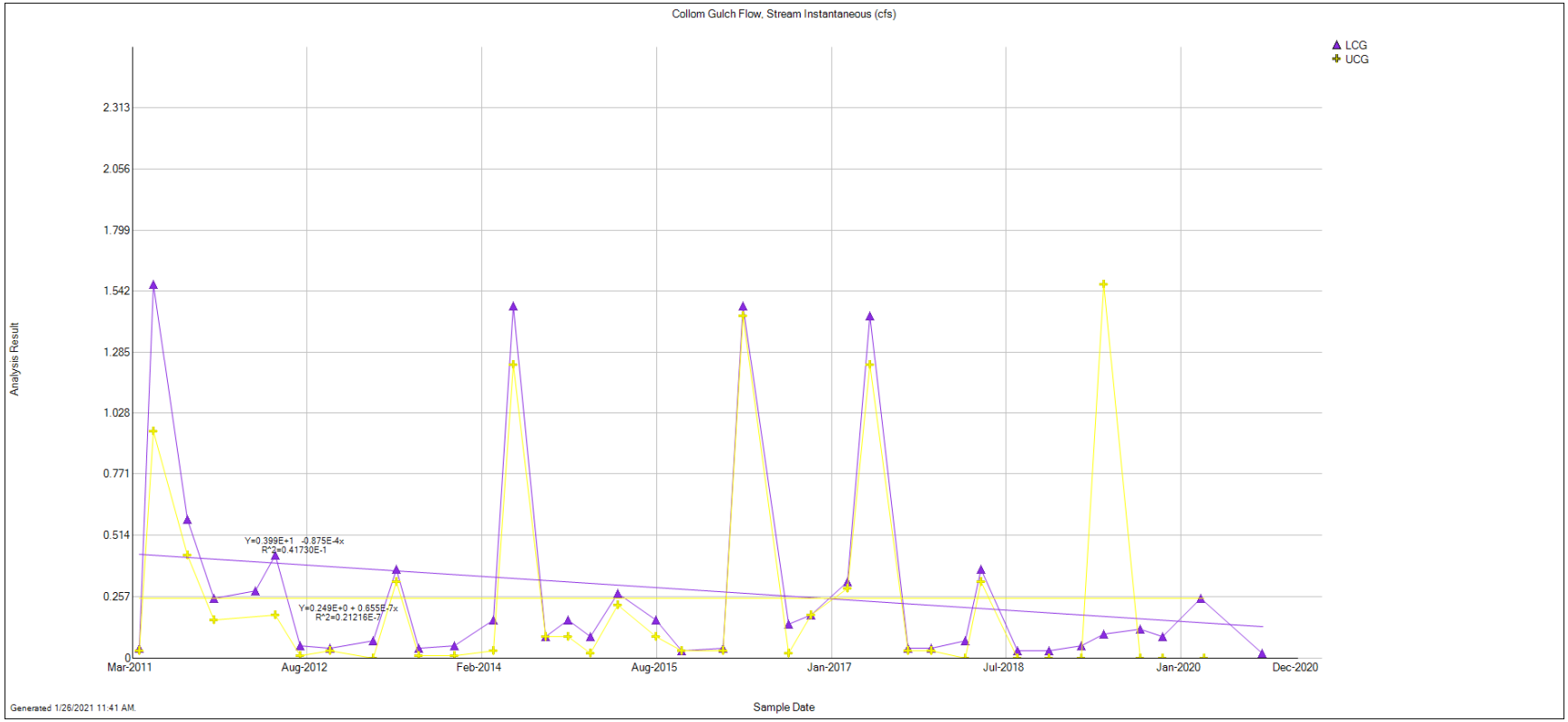

Jubb Creek Sodium, dissolved (mg/L)
CJC
WFJC
Analysis Result
260
234
208
182
156
130
104
78
52
26
0
Y=-0.267E+2 + 0.384E-2x
R^2=0.32406E-1
Y=0.289E+3 -0.642E-2x
R^2=0.85401E-1
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 1:30 PM.
Sample Date

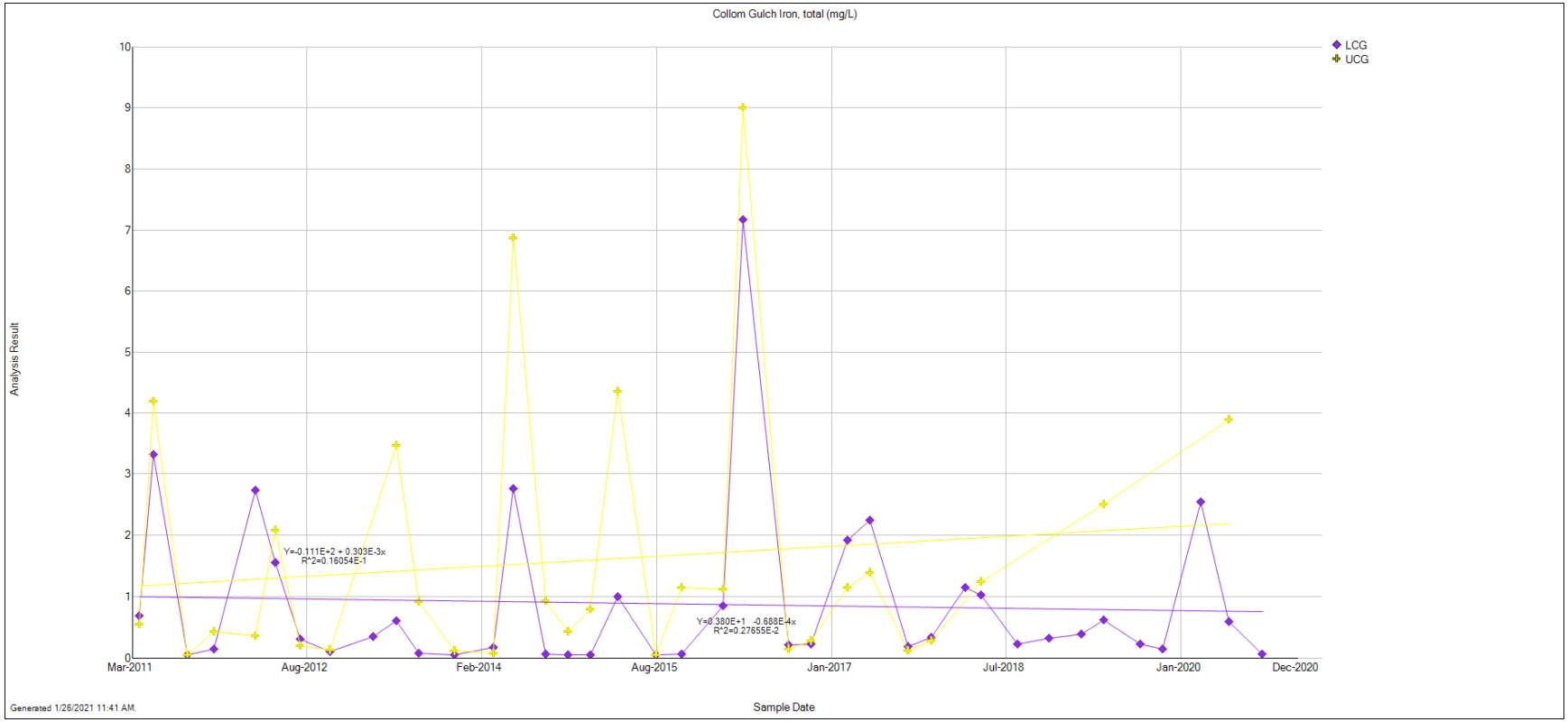

Jubb Creek Sulfate, dissolved (mg/L)
CJC
WFJC
Y=0.528E+2 + 0.138E-1x
R^2=0.16503E-1
Y=0.540E+3 -0.506E-2x
R^2=0.55614E-2
950
855
760
665
570
475
380
285
190
95
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 1/26/2021 1:30 PM.

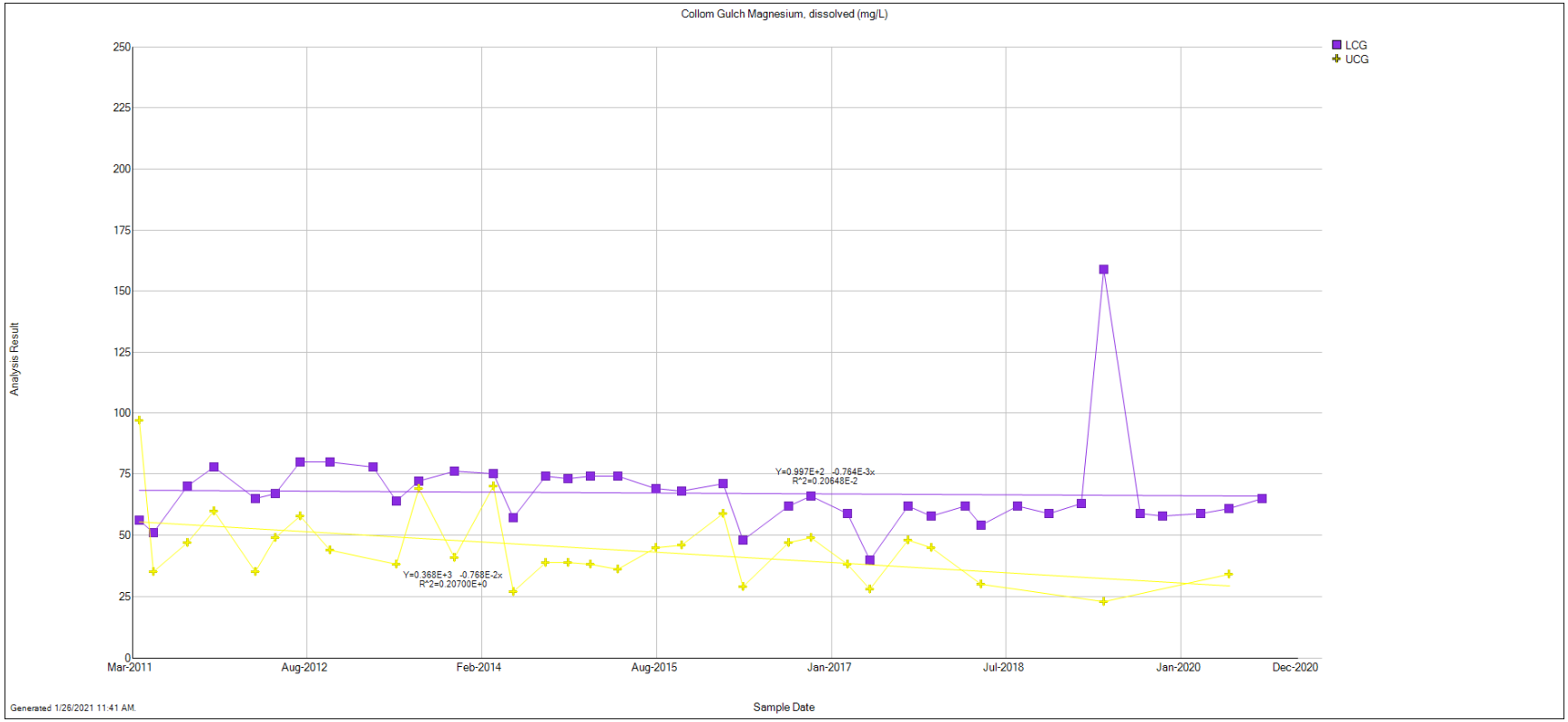

Jubb Creek Total Dissolved Solids (mg/L)
CJC
WFJC
Y=0.739E+3 + 0.190E-1x
R^2=0.11009E-1
Y=0.210E+4 -0.285E-1x
R^2=0.57679E-1
2800
2520
2240
1960
1680
1400
1120
840
560
280
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 1/26/2021 1:30 PM.

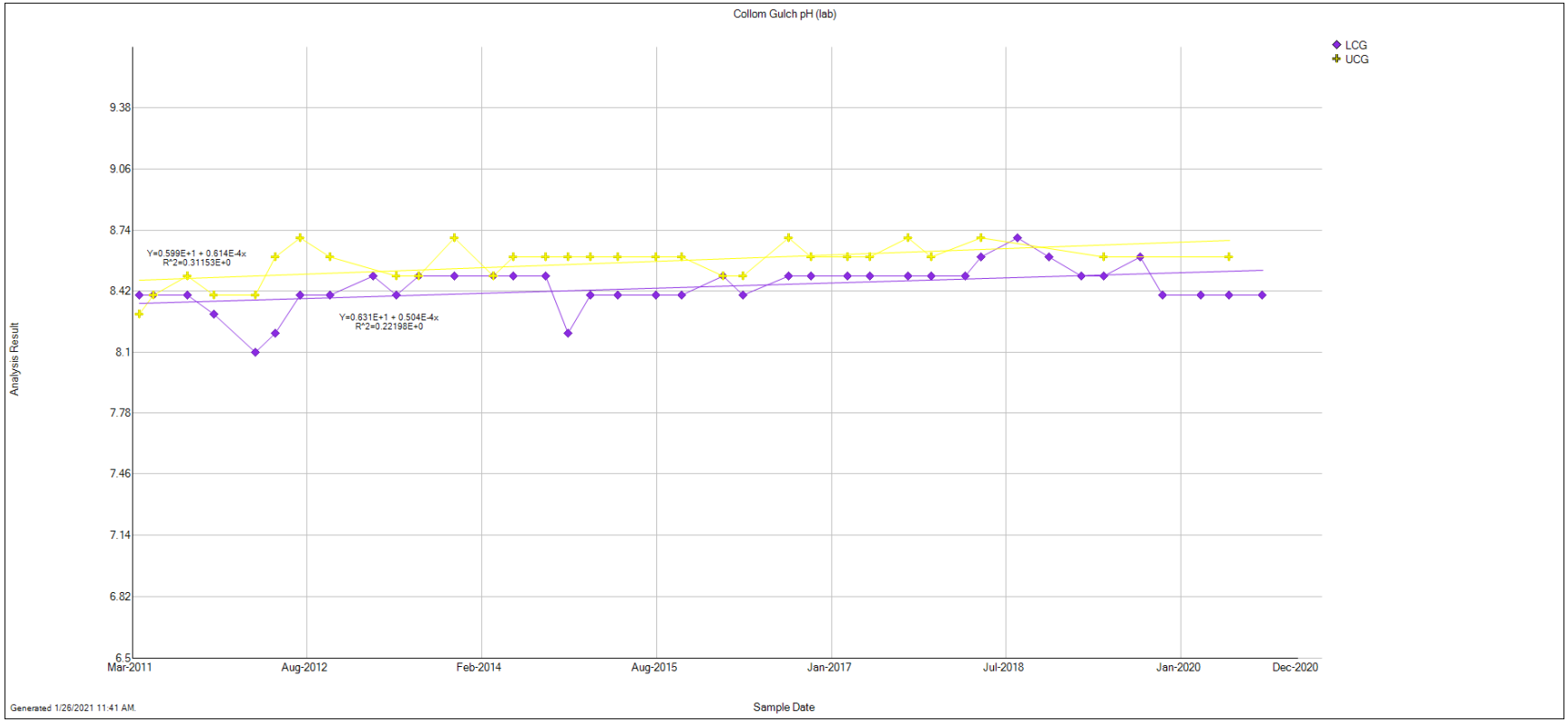

Collom Gulch Calcium, dissolved (mg/L)
LCG
UCG
Analysis Result
230
207
184
161
138
115
92
69
46
23
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Y=0.348E+3 -0.653E-2x
R^2=0.13081E+0
Y=0.786E+2 + 0.505E-3x
R^2=0.19223E-2
Generated 1/26/2021 11:41 AM.
Sample Date

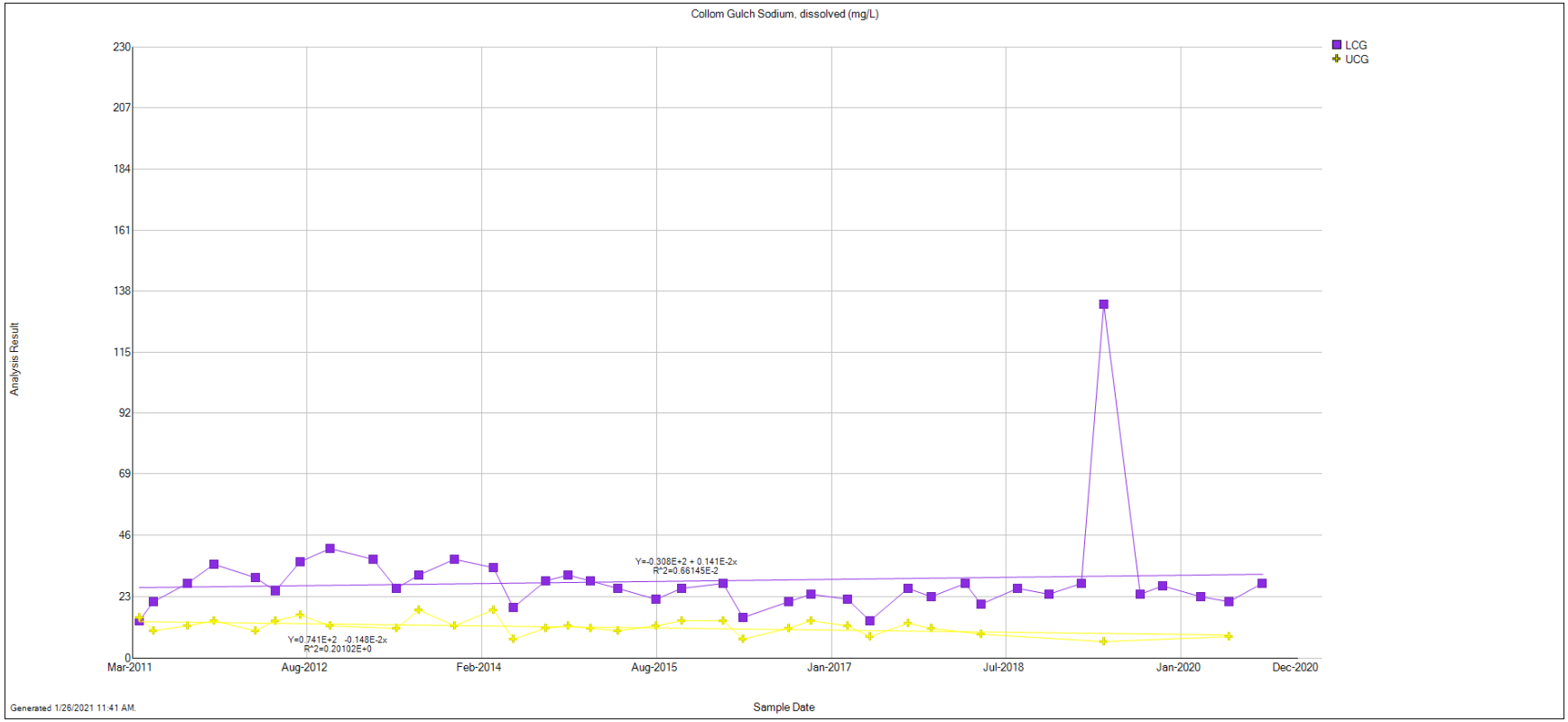

Collom Gulch Specific Conductance @ 25C (lab) (umhos/cm)
LCG
UCG
Y=0.685E+3 + 0.744E-2x
R^2=0.18233E-2
Y=0.321E+4 -0.601E-1x
R^2=0.11407E+0
Analysis Result
2800
2520
2240
1960
1680
1400
1120
840
560
280
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 11:41 AM.
Sample Date

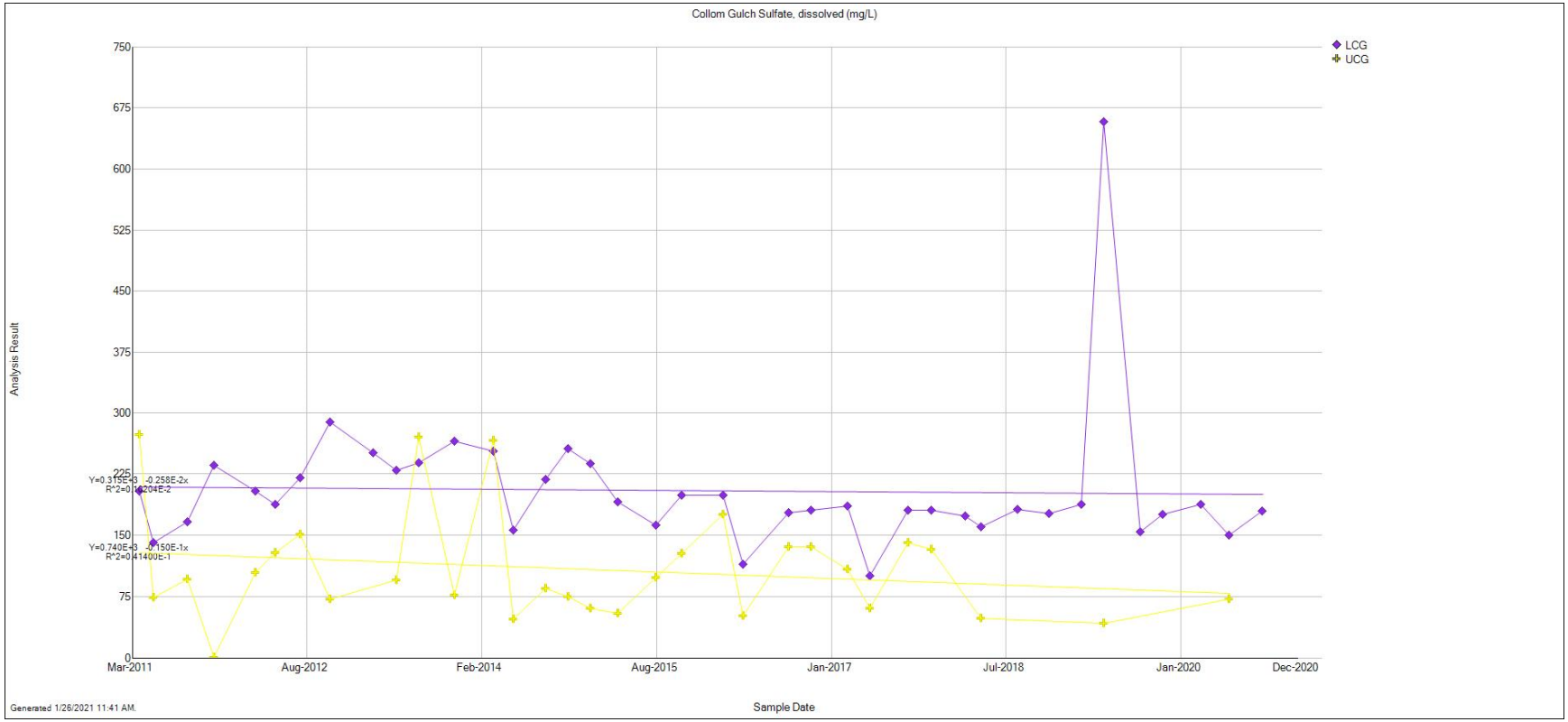

Collom Gulch Flow, Stream Instantaneous (cfs)
LCG
UCG
Analysis Result
2.313
2.056
1.799
1.542
1.285
1.028
0.771
0.514
0.257
0
Y=0.399E+1 -0.875E-4x
R^2=0.41730E-1
Y=0.249E+0 + 0.655E-7x
R^2=0.21216E-7
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 11:41 AM.
Sample Date


Collom Gulch Iron, total (mg/L)
LCG
UCG
Analysis Result
10
9
8
7
6
5
4
3
2
1
0
Y=-0.111E+2 + 0.303E-3x
R^2=0.16054E-1
Y=0.380E+1 -0.688E-4x
R^2=0.27655E-2
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 11:41 AM.
Sample Date


Collom Gulch Magnesium, dissolved (mg/L)
LCG
UCG
Analysis Result
250
225
200
175
150
125
100
75
50
25
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Y=0.997E+2...-0.764E-3x
R^2=0.20648E-2
Y=0.368E+3...-0.768E-2x
R^2=0.20700E+0
Generated 1/26/2021 11:41 AM.
Sample Date


Collom Gulch pH (lab)
LCG
UCG
Y=0.599E+1 + 0.614E-4x
R^2=0.31153E+0
Y=0.631E+1 + 0.504E-4x
R^2=0.22198E+0
9.38
9.06
8.74
8.42
8.1
7.78
7.46
7.14
6.82
6.5
Analysis Result
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 1/26/2021 11:41 AM.


Collom Gulch Sodium, dissolved (mg/L)
LCG
UCG
Analysis Result
230
207
184
161
138
115
92
69
46
23
0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Y=-0.308E+2 + 0.141E-2x
R^2=0.66145E-2
Y=0.741E+2 -0.148E-2x
R^2=0.20102E+0
Generated 1/26/2021 11:41 AM.
Sample Date


Collom Gulch Sulfate, dissolved (mg/L)
LCG
UCG
Analysis Result
750
675
600
525
450
375
300
225
150
75
0
Y=0.313E+3 -0.258E-2x
R^2=0.1204E-2
Y=0.740E+3 -0.150E-1x
R^2=0.41400E-1
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 11:41 AM.
Sample Date

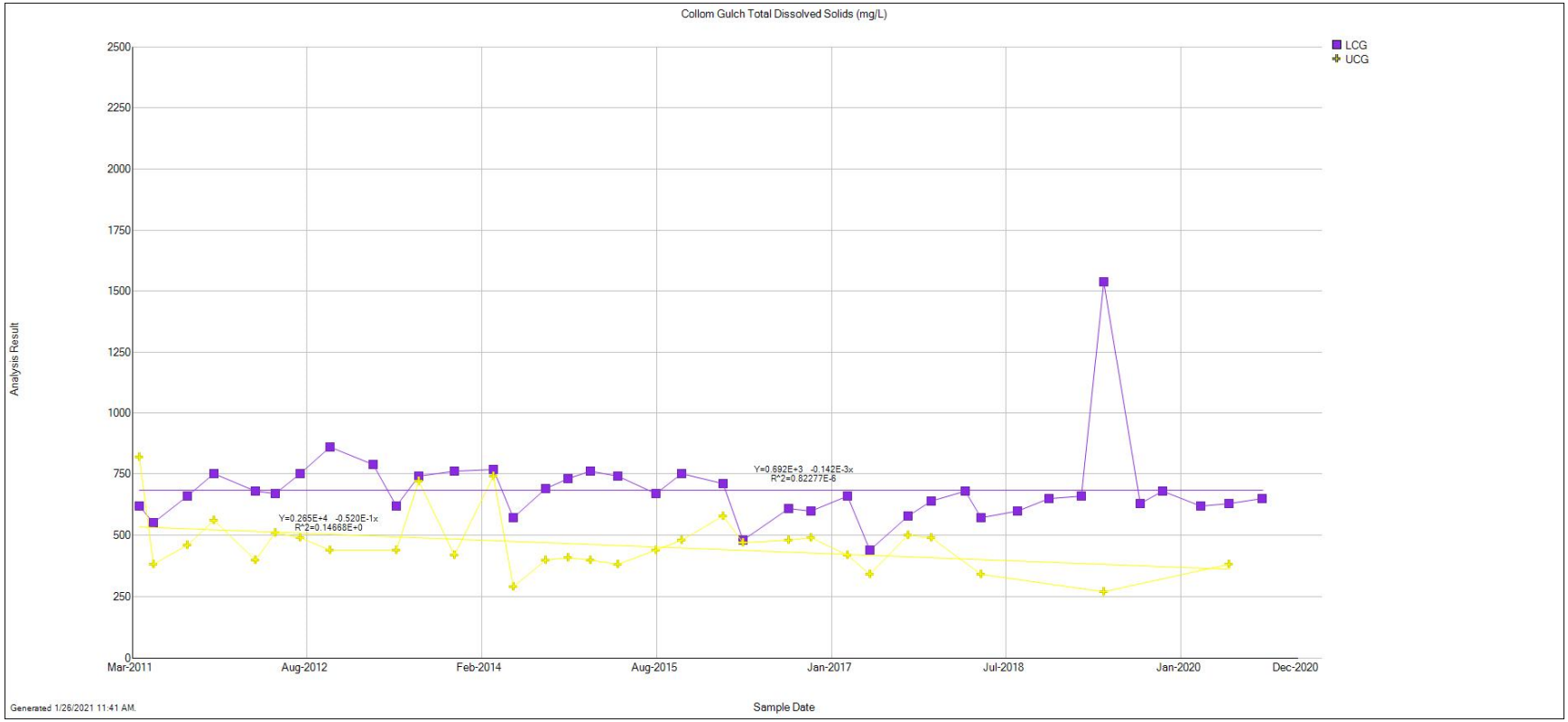

Collom Gulch Total Dissolved Solids (mg/L)
LCG
UCG
Analysis Result
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
Y=0.692E+3 -0.142E-3x
R^2=0.82277E-6
Y=0.265E+4 -0.520E-1x
R^2=0.14668E+0
Mar-2011
Aug-2012
Feb-2014
Aug-2015
Jan-2017
Jul-2018
Jan-2020
Dec-2020
Generated 1/26/2021 11:41 AM.
Sample Date

Exhibit 1C

Ground Water Monitoring Data
Water Year January 1, 2020 to December 31, 2020

Colowyo Mine
Well A-6
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	8.4	10.7	9.3	9.3
Field Conductivity, umhos/com	1200	1200	1140	1130
Lab Conductivity, umhos/com	1080	1160	1080	1090
Field pH	7.46	7.5	7.5	8.4
Lab pH	8	8.1	8.1	8.4
Bicarbonate as HCO3, D, mg/l	627	655	582	623
TDS, mg/l	690	710	710	690
Ammonia NH3, TD, mg/l	1.5	1.6	1.5	0.6
NO3 as N, mg/l	0.1	0.00784	0.00784	0.7
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	56	58	59	54
Mg, D, mg/l	49	49	47	47
Na, D, mg/l	135	134	151	132
Sulfate, D, mg/l	147	136	138	138
As, TD, mg/l	0.003	0.000299	0.000299	0.000121
Fe, TD, mg/l	0.05	0.00265	0.00265	0.00265
Pb, TD, mg/l	0.2	0.00003	0.00003	0.00006
Mn, TD, mg/l	0.04	0.04	0.04	0.000214
Zn, TD, mg/l	0.05	0.00307	0.00307	0.00307
Se, TD, mg/l	0.005	0.00028	0.00028	0.00029
Hg, TD, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL, ft MSL	6900.55	6897.65	6894.54	6895.89

Colowyo Mine
Well A-7
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	8.1	9.8	7.8	8.1
Field Conductivity, umhos/com	1520	1560	1440	1660
Lab Conductivity, umhos/com	1400	1530	1390	1630
Field pH	7.54	7.44	7.49	7.53
Lab pH	8	7.8	8.1	8.3
Bicarbonate as HCO3, D, mg/l	541	562	491	497
TDS, mg/l	1050	1070	1040	1300
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	1.6	1.9	1	4.7
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	118	125	122	144
Mg, D, mg/l	110	112	103	127
Na, D, mg/l	54	56	61	54
Sulfate, D, mg/l	379	347	356	579
As, D, mg/l	0.003	0.000299	0.000299	0.00012
Fe, D, mg/l	0.05	0.00265	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00003
Mn, D, mg/l	0.03	0.000214	0.000214	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.007	0.006	0.00028	0.014
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL, ft MSL	6889.16	6889.3	6884.81	6887.85

Colowyo Mine
Well A-8
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	Dry	10.7	9.7	Dry
Field Conductivity, umhos/com		1300	1260	
Lab Conductivity, umhos/com		1260	1200	
Field pH		7.58	7.5	
Lab pH		8.2	8	
Bicarbonate as HCO3, D, mg/l		473	435	
TDS, mg/l		890	900	
Ammonia NH3, TD, mg/l		0.0073	4.7	
NO3 as N, mg/l		4.7	0.00784	
Ortho PO4 as P, mg/l		0.00608	0.6	
Ca, D, mg/l		112	115	
Mg, D, mg/l		100	101	
Na, D, mg/l		14	17	
Sulfate, D, mg/l		314	312	
As, D, mg/l		0.000299	0.000299	
Fe, D, mg/l		0.00265	0.00265	
Pb, D, mg/l		0.00003	0.00003	
Mn, D, mg/l		0.000214	0.38	
Zn, D, mg/l		0.00307	0.00307	
Se, D, mg/l		0.008	0.00028	
Hg, D, mg/l		0.00006	0.00006	
Elevation SWL, ft MSL		7101.21	7100.26	

Colowyo Mine
Well Gossard
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	11.3	14.4	12.6	11.1
Field Conductivity, umhos/com	2520	2520	2450	2370
Lab Conductivity, umhos/com	2210	2480	2300	2250
Field pH	7.57	7.67	7.52	7.75
Lab pH	8.1	8.2	8.1	8.4
Bicarbonate as HCO3, D, mg/l	594	599	586	558
TDS, mg/l	1920	1900	1960	1900
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.5	0.5	0.6	0.5
Ortho PO4 as P, mg/l		0.00608	0.00608	0.018
Ca, D, mg/l	148	153	155	142
Mg, D, mg/l	171	178	176	163
Na, D, mg/l	195	204	207	191
Sulfate, D, mg/l	915	894	886	903
As, D, mg/l	0.003	0.000299	0.000299	0.000121
Fe, D, mg/l	0.05	0.00265	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.03	0.000214	0.000214	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.006	0.006	0.006
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL, ft MSL	6332.38	6332.27	6331.27	6331.21

Colowyo Mine
Well MC-04-01
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	8.9	9.1	9.8	9.1
Field Conductivity, umhos/com	790	950	830	820
Lab Conductivity, umhos/com	775	1270	381	774
Field pH	7.65	7.71	7.7	7.51
Lab pH	8.2	8.3	8.3	8.2
Bicarbonate as HCO3, D, mg/l	367	477	132	381
TDS, mg/l	470	1240	250	510
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.5	0.5	0.3	2
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	70	133	38	83
Mg, D, mg/l	47	76	18	48
Na, D, mg/l	14	46	10	14
Sulfate, D, mg/l	124	291	55	113
As, D, mg/l	0.003	0.000299	0.000299	0.005
Fe, D, mg/l	0.05	0.12	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.03	0.000214	0.000214	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.005	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL (from TOC), ft MSL	23.2	24.2	27.5	26

Colowyo Mine
Well MC-04-02
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	8.6	11.6	10.5	10.3
Field Conductivity, umhos/com	1290	1360	1300	1150
Lab Conductivity, umhos/com	1150	1290	1230	1130
Field pH	7.4	7.42	7.55	7.73
Lab pH	8.2	8.1	8.3	8.4
Bicarbonate as HCO3, D, mg/l	562	592	462	527
TDS, mg/l	760	860	890	750
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.1	0.00784	0.00784	0.006
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	95	127	137	86
Mg, D, mg/l	60	77	83	54
Na, D, mg/l	96	49	37	83
Sulfate, D, mg/l	215	241	244	100
As, D, mg/l	0.003	0.000362	0.000299	0.000121
Fe, D, mg/l	0.05	0.00749	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.03	0.42	0.48	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.00132	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL (from TOC), ft MSL	10.5	10.5	10.5	12.7

Colowyo Mine
Well MJ-95-01
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	7.1	10.9	10.5	9.4
Field Conductivity, umhos/com	1400	1390	1370	1340
Lab Conductivity, umhos/com	1240	1340	1250	1240
Field pH	7.39	7.31	7.39	7.52
Lab pH	8	7.9	8.1	8.3
Bicarbonate as HCO3, D, mg/l	657	634	629	640
TDS, mg/l	850	870	880	860
Ammonia NH3, TD, mg/l	2.1	1.9	1.8	1.8
NO3 as N, mg/l	0.1	0.2	0.00784	0.006
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	122	128	128	119
Mg, D, mg/l	96	95	96	92
Na, D, mg/l	28	30	34	28
Sulfate, D, mg/l	254	244	233	247
As, D, mg/l	0.003	0.000362	0.000299	0.000121
Fe, D, mg/l	0.05	0.00749	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.04	0.04	0.04	0.04
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.00132	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL (from TOC), ft MSL	9.62	13.5	16.51	16.86

Colowyo Mine
Well MJ-95-03
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	10.1	12.7	11.9	10.7
Field Conductivity, umhos/com	2460	2500	2400	2290
Lab Conductivity, umhos/com	2150	2410	2260	2200
Field pH	7.7	7.48	7.48	7.56
Lab pH	8.2	8.1	8.3	8.4
Bicarbonate as HCO3, D, mg/l	662	706	541	652
TDS, mg/l	1820	1840	1910	1890
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.7	0.6	0.4	0.2
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	152	155	161	154
Mg, D, mg/l	202	200	198	193
Na, D, mg/l	146	140	155	111
Sulfate, D, mg/l	879	853	851	874
As, D, mg/l	0.003	0.000664	0.000299	0.000121
Fe, D, mg/l	0.05	0.00749	0.00265	0.00265
Pb, D, mg/l	0.2	0.00006	0.00003	0.00006
Mn, D, mg/l	0.03	0.000463	0.000214	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.00242	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL (from TOC), ft MSL	19.68	19.68	20.74	20.32

Colowyo Mine
Well MLC-04-01
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	11.3	11.8	11.1	10.1
Field Conductivity, umhos/com	490	1320	420	540
Lab Conductivity, umhos/com	447	847	763	438
Field pH	7.32	7.45	7.72	7.81
Lab pH	8.1	8.3	8.3	8.3
Bicarbonate as HCO3, D, mg/l	192	346	306	187
TDS, mg/l	280	570	530	270
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.4	1.6	1.5	0.4
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	43	86	80	50
Mg, D, mg/l	23	54	49	21
Na, D, mg/l	13	18	18	14
Sulfate, D, mg/l	70	176	127	68
As, D, mg/l	0.003	0.000362	0.000299	0.000121
Fe, D, mg/l	0.05	0.00749	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.03	0.000463	0.000214	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.00132	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL (from TOC), ft MSL	49.1	48.7	48.9	48.7

Colowyo Mine
Well MT-95-02
Water Year 1/1/2020 - 12/31/2020

	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	10.6	12.4	11.2	10.2
Field Conductivity, umhos/com	3280	3280	3210	2380
Lab Conductivity, umhos/com	2940	3350	3100	2280
Field pH	7.22	7.18	7.51	7.44
Lab pH	8	8	8.2	8.3
Bicarbonate as HCO3, D, mg/l	781	805	699	703
TDS, mg/l	2600	2640	2660	1930
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.6	0.5	0.5	0.2
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	215	230	233	181
Mg, D, mg/l	212	227	219	182
Na, D, mg/l	253	277	296	152
Sulfate, D, mg/l	1170	1150	996	887
As, D, mg/l	0.003	0.000299	0.000299	0.000121
Fe, D, mg/l	0.05	0.00265	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.03	0.000214	0.000214	0.17
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.00028	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL, ft MSL	6435.62	6435.46	6435.28	6435.75

Colowyo Mine
Well NGSW
Water Year 1/1/2020 - 12/31/2020

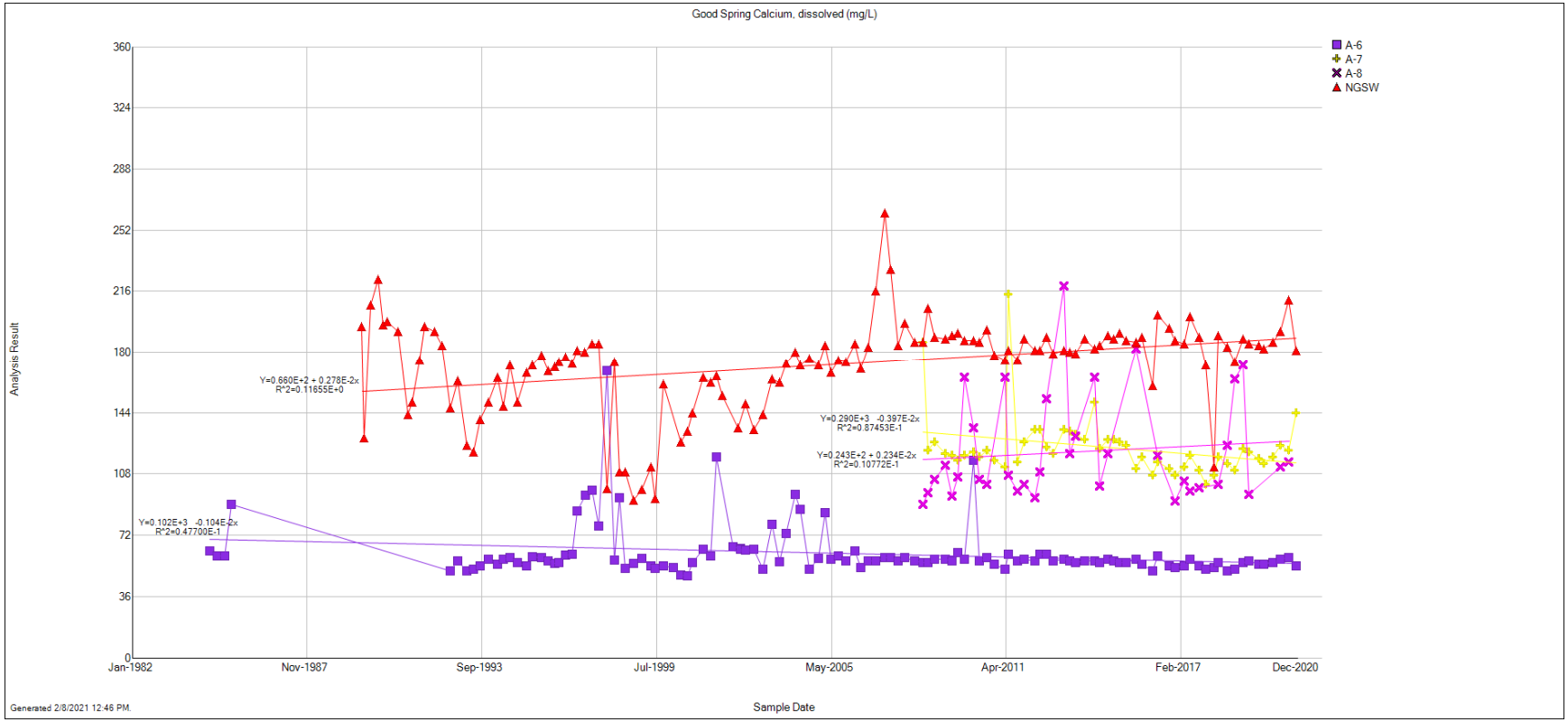
	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	8.4	11	9.4	10.2
Field Conductivity, umhos/com	2650	2580	2460	2380
Lab Conductivity, umhos/com	2260	2540	2360	2280
Field pH	7.5	7.58	7.5	7.44
Lab pH	8	7.8	8.3	8.3
Bicarbonate as HCO3, D, mg/l	749	796	690	703
TDS, mg/l	1960	2060	2000	1930
Ammonia NH3, TD, mg/l	0.5	0.0073	0.0289	0.0289
NO3 as N, mg/l	0.3	0.00784	0.00784	0.2
Ortho PO4 as P, mg/l	0.1	0.00608	0.1	0.018
Ca, D, mg/l	186	192	211	181
Mg, D, mg/l	184	187	202	182
Na, D, mg/l	177	164	166	152
Sulfate, D, mg/l	913	927	895	887
As, D, mg/l	0.003	0.000299	0.000299	0.00012
Fe, D, mg/l	0.05	1.19	0.00265	0.00265
Pb, D, mg/l	0.2	0.00003	0.20000	0.00006
Mn, D, mg/l	0.07	0.75	1	0.17
Zn, D, mg/l	0.05	0.003	0.003	0.003
Se, D, mg/l	0.005	0.00028	0.005	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL, ft MSL	6536.06	6536.17	6531.84	6532.73

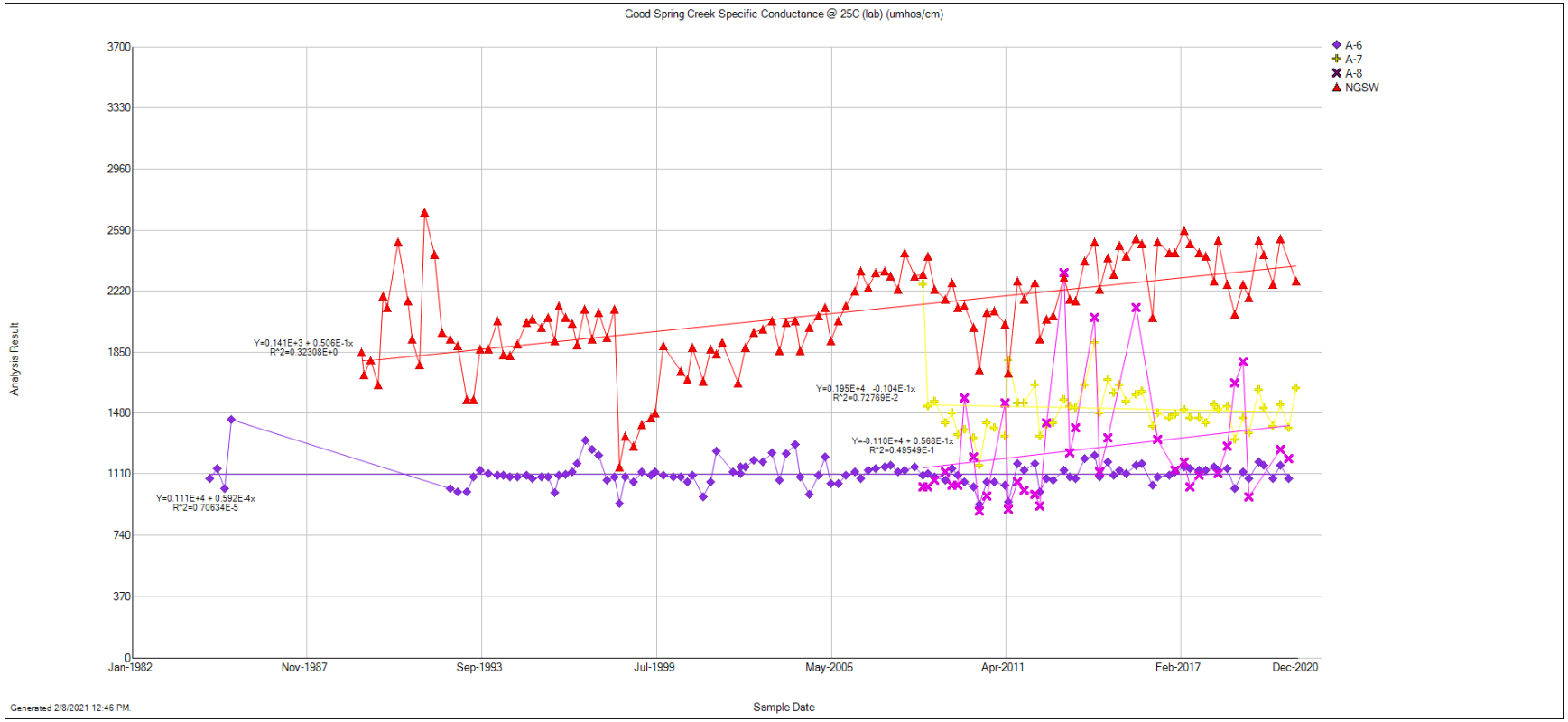
Colowyo Mine
Well Trout Creek
Water Year 1/1/2020 - 12/31/2020

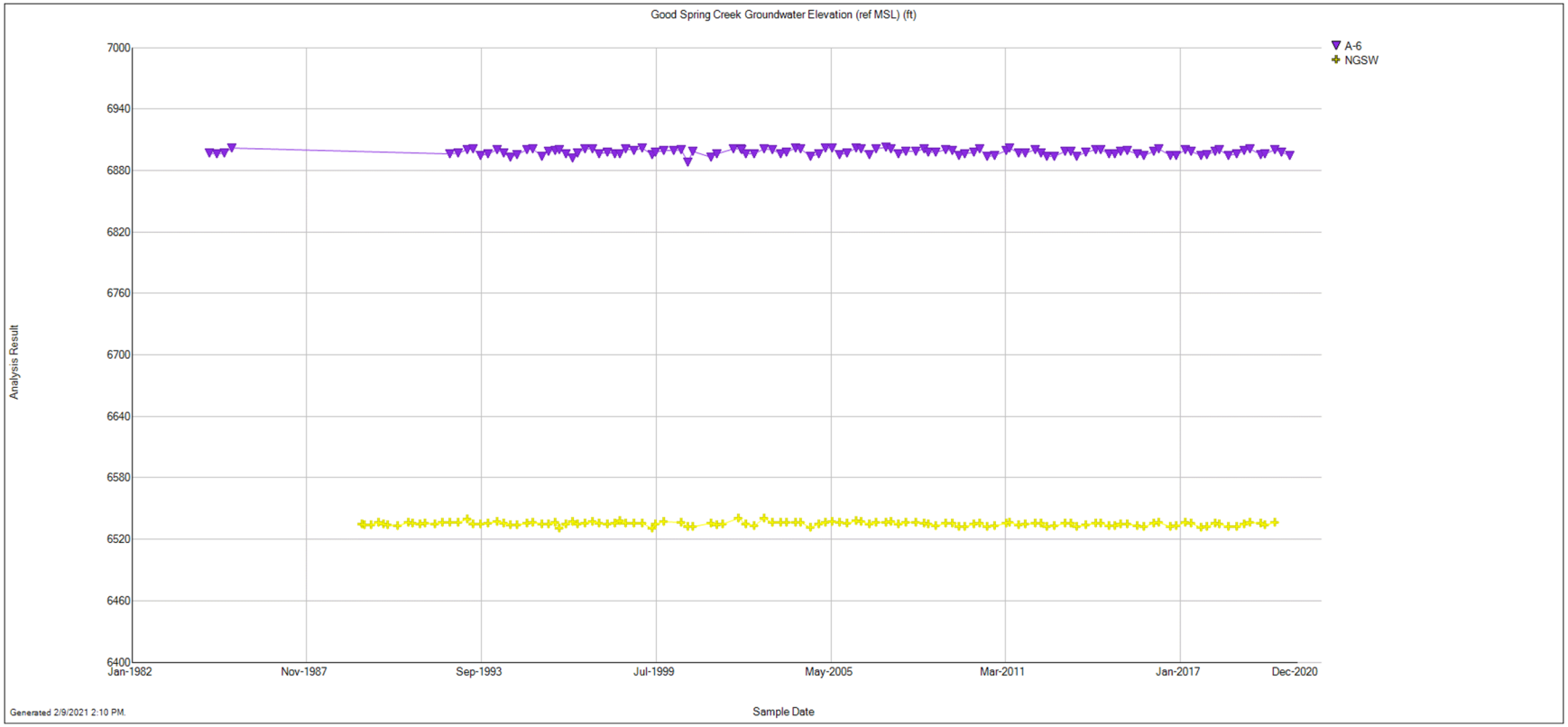
	Sample Date			
	03/09/20	06/04/20	09/14/20	12/10/20
Feld Temperature, °C	9.5	15.2	14.8	10.1
Field Conductivity, umhos/com	1160	1160	1120	1110
Lab Conductivity, umhos/com	1060	1130	1070	1100
Field pH	9.5	9.41	9.31	9.32
Lab pH	9.4	9.3	9.3	9.4
Bicarbonate as HCO3, D, mg/l	254	267	260	263
TDS, mg/l	660	680	690	690
Ammonia NH3, TD, mg/l	2	2.1	2	2
NO3 as N, mg/l	0.1	0.00784	0.00784	0.006
Ortho PO4 as P, mg/l	0.1	0.00608	0.00608	0.018
Ca, D, mg/l	5	5	4	4
Mg, D, mg/l	20	19	17	17
Na, D, mg/l	220	215	238	215
Sulfate, D, mg/l	233	230	221	260
As, D, mg/l	0.003	0.000362	0.000299	0.000121
Fe, D, mg/l	0.06	0.06	0.05	0.06
Pb, D, mg/l	0.2	0.00003	0.00003	0.00006
Mn, D, mg/l	0.03	0.000463	0.000214	0.000214
Zn, D, mg/l	0.05	0.00307	0.00307	0.00307
Se, D, mg/l	0.005	0.00132	0.00028	0.000299
Hg, D, mg/l	0.001	0.00006	0.00006	0.00006
Elevation SWL (from TOC), ft MSL	588.6	588.2	587.9	587.7

Exhibit 1D

Ground Water Monitoring Graphs


Good Spring Calcium, dissolved (mg/L)
A-6
A-7
A-8
NGSW
Analysis Result
360
324
288
252
216
180
144
108
72
36
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.660E+2 + 0.278E-2x
R^2=0.11655E+0
Y=0.290E+3 -0.397E-2x
R^2=0.87453E-1
Y=0.243E+2 + 0.234E-2x
R^2=0.10772E-1
Y=0.102E+3 -0.104E-2x
R^2=0.47700E-1
Generated 2/8/2021 12:46 PM.
Sample Date


Good Spring Creek Specific Conductance @ 25C (lab) (umhos/cm)
Analysis Result
3700
3330
2960
2590
2220
1850
1480
1110
740
370
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
A-6
A-7
A-8
NGSW
Y=0.141E+3 + 0.506E-1x
R^2=0.32308E+0
Y=0.195E+4 -0.104E-1x
R^2=0.72769E-2
Y=-0.110E+4 + 0.568E-1x
R^2=0.49549E-1
Y=0.111E+4 + 0.592E-4x
R^2=0.70634E-5
Generated 2/8/2021 12:46 PM.


Good Spring Creek Groundwater Elevation (ref MSL) (ft)
A-6
NGSW
Analysis Result
7000
6940
6880
6820
6760
6700
6640
6580
6520
6460
6400
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Mar-2011
Jan-2017
Dec-2020
Sample Date
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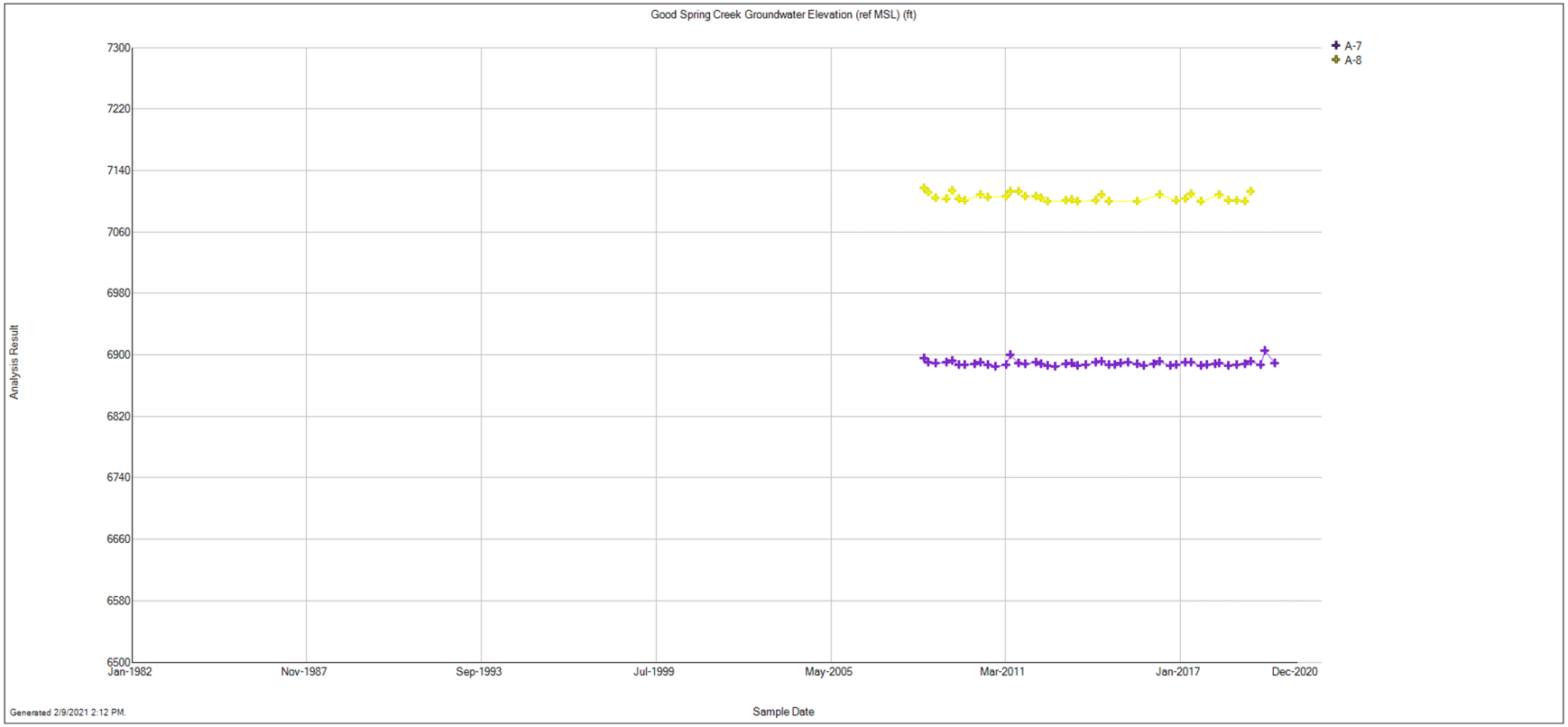
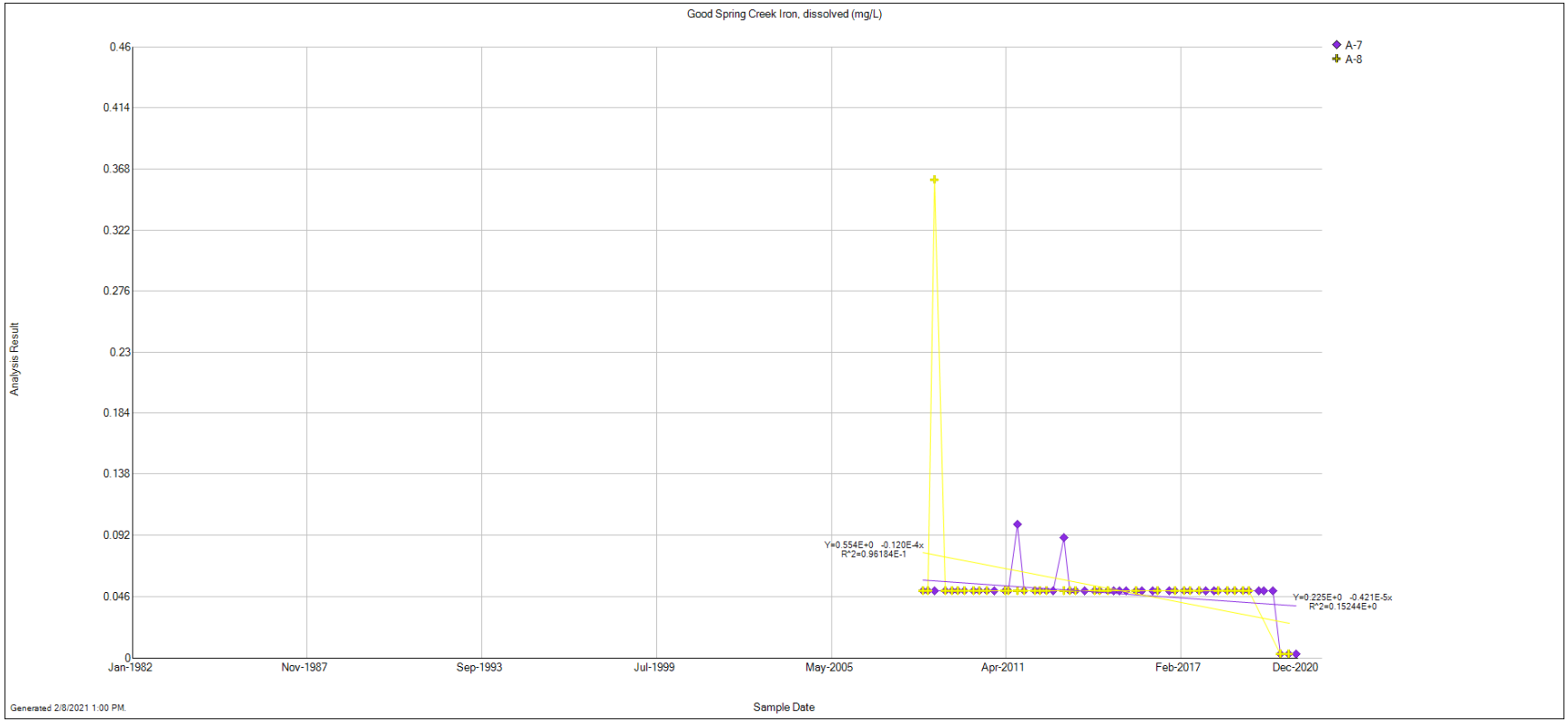
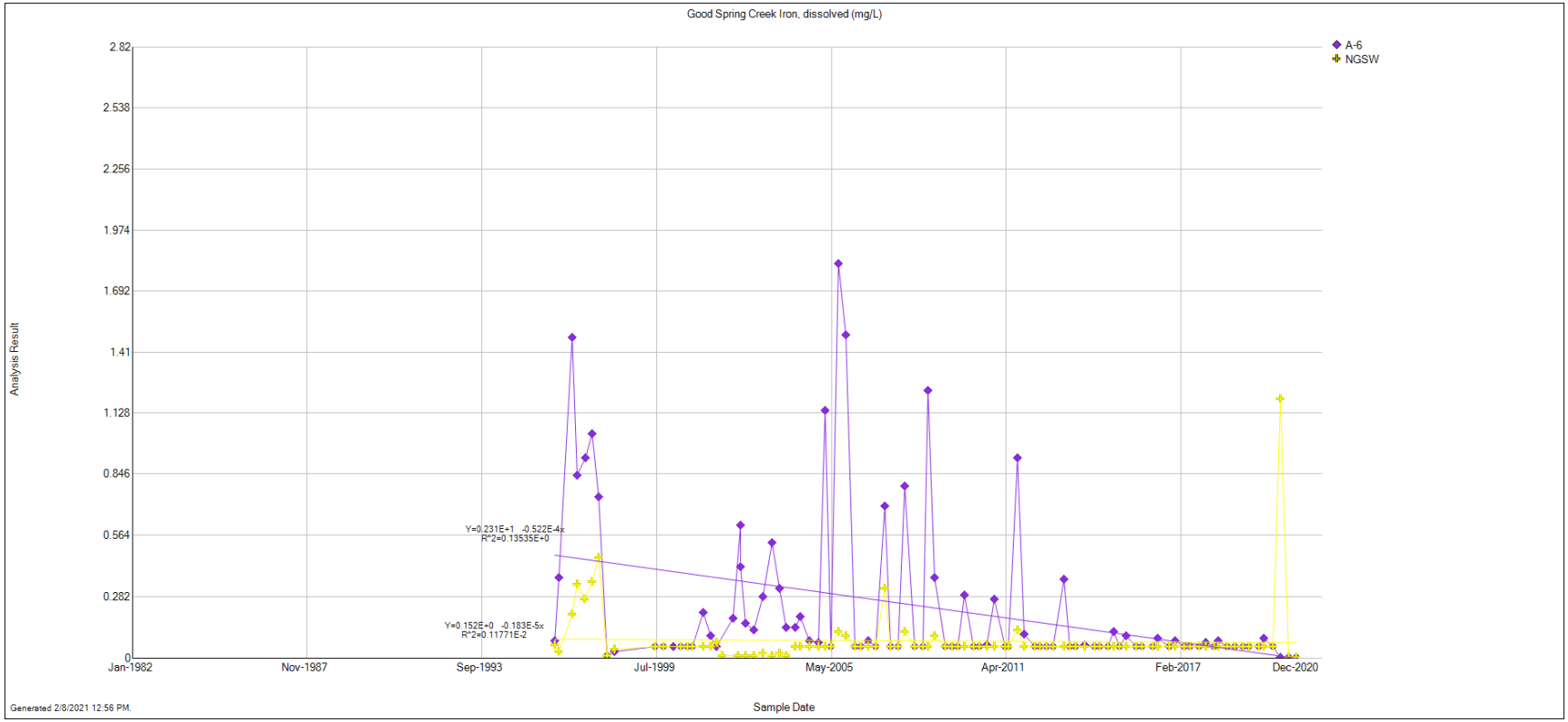
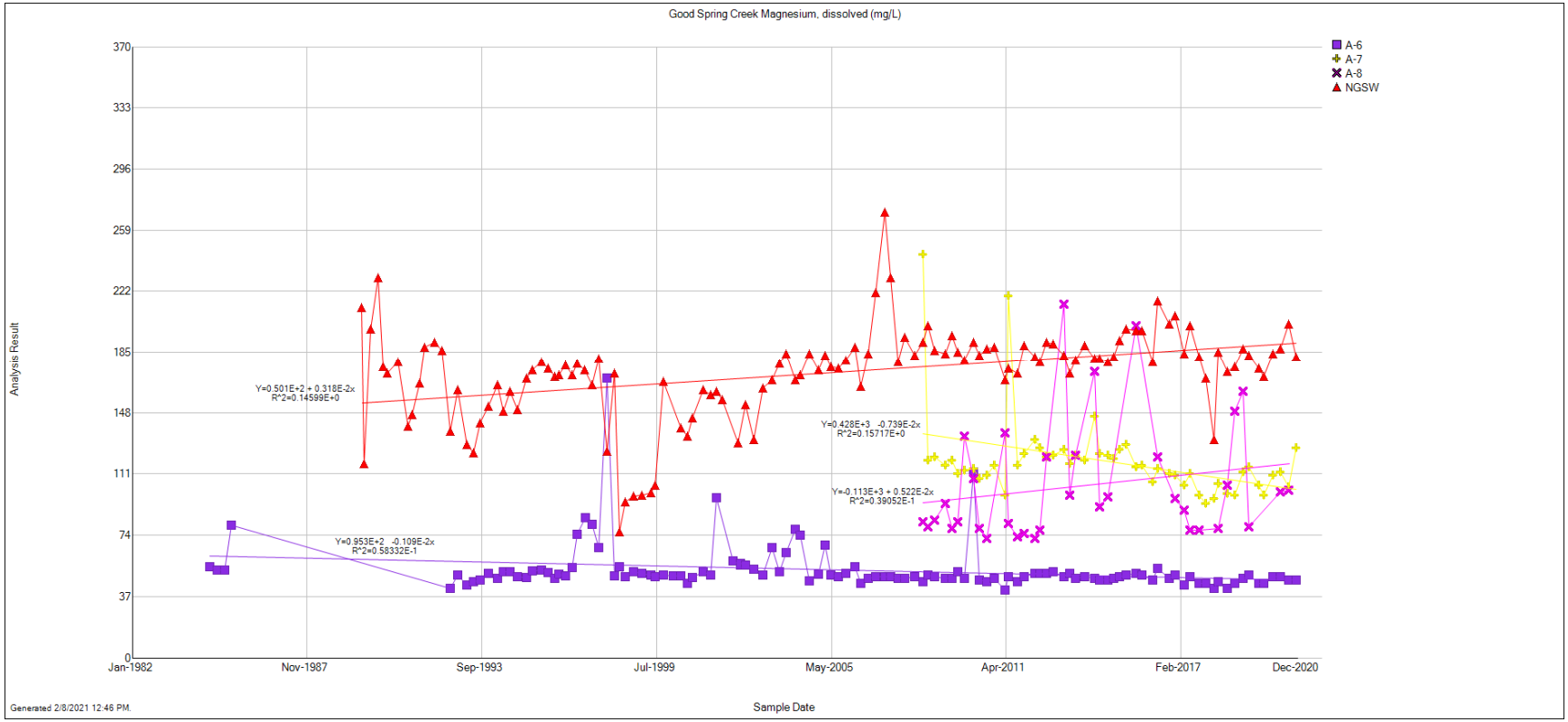
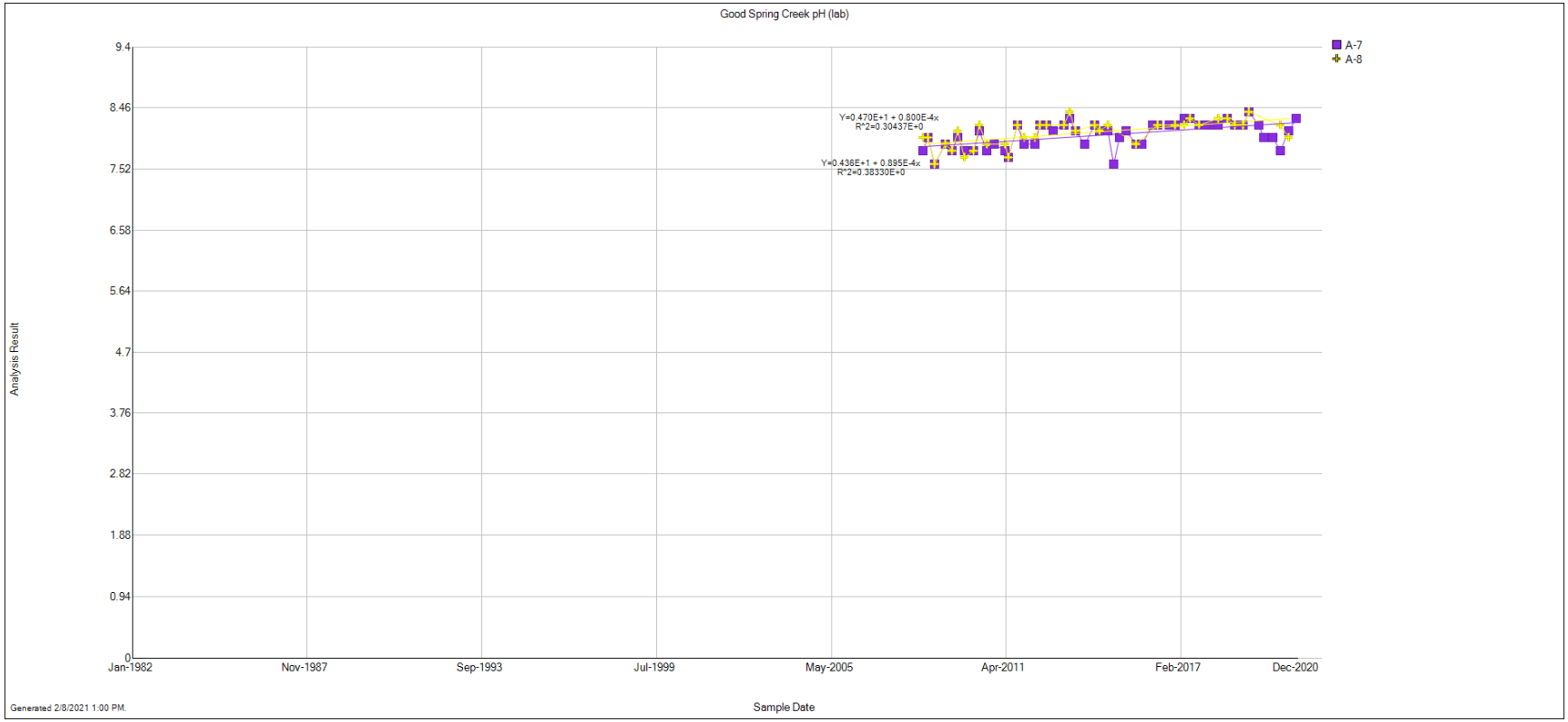
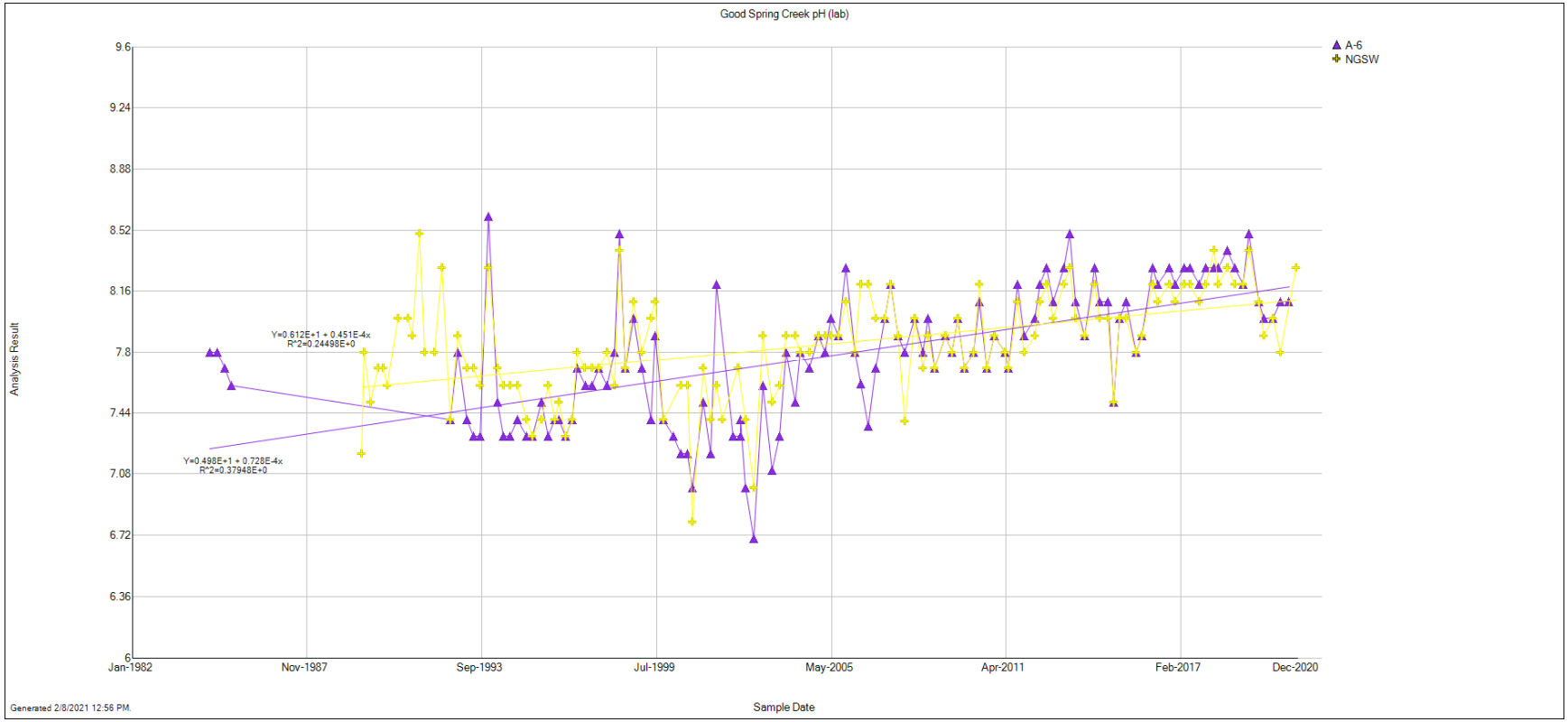

Good Spring Creek Groundwater Elevation (ref MSL) (ft)
A-7
A-8
7300
7220
7140
7060
6980
6900
6820
6740
6660
6580
6500
Analysis Result
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Mar-2011
Jan-2017
Dec-2020
Sample Date
Generated 2/9/2021 2:12 PM.

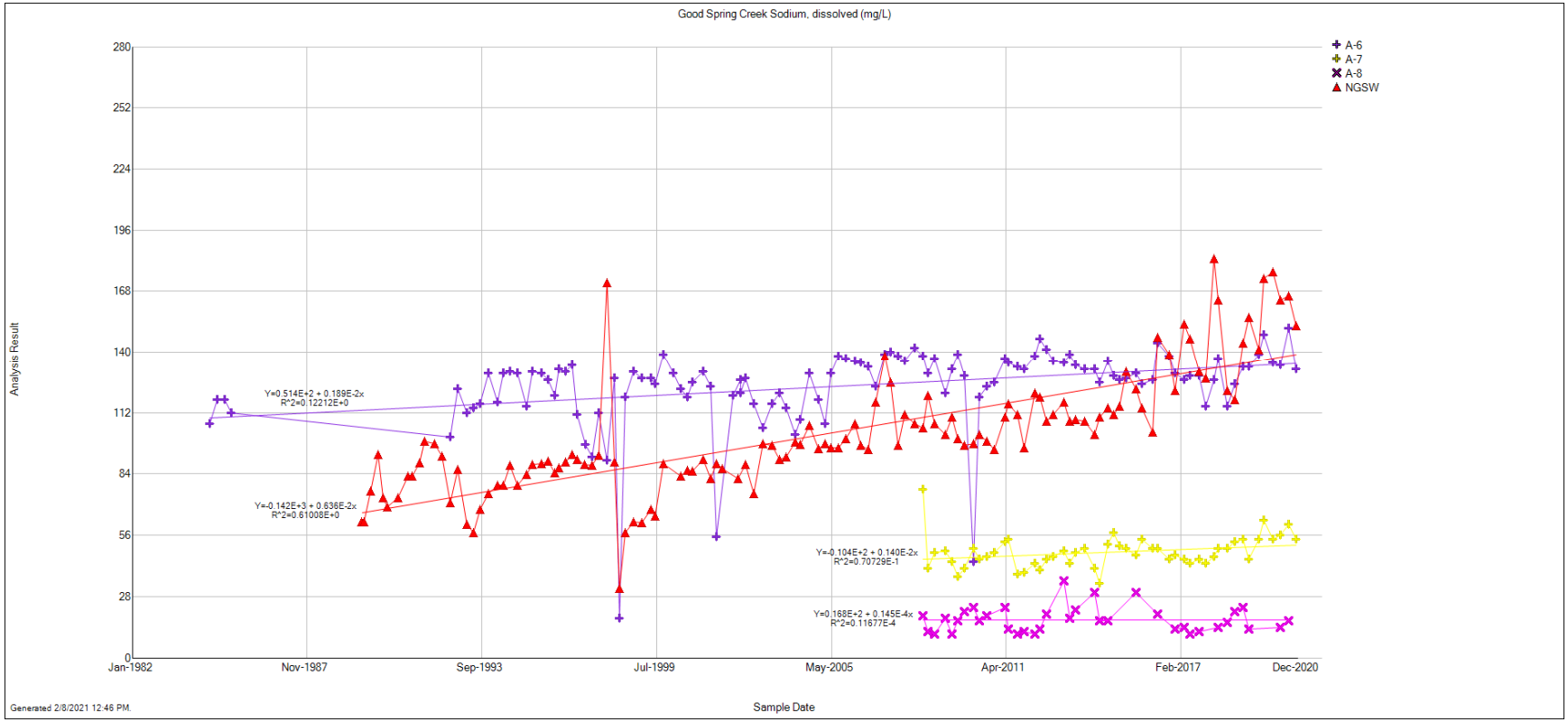

Good Spring Creek Iron, dissolved (mg/L)
A-7
A-8
0.46
0.414
0.368
0.322
0.276
0.23
0.184
0.138
0.092
0.046
0
Analysis Result
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Y=0.554E+0 -0.120E-4x
R^2=0.96184E-1
Y=0.225E+0 -0.421E-5x
R^2=0.15244E+0
Generated 2/8/2021 1:00 PM.

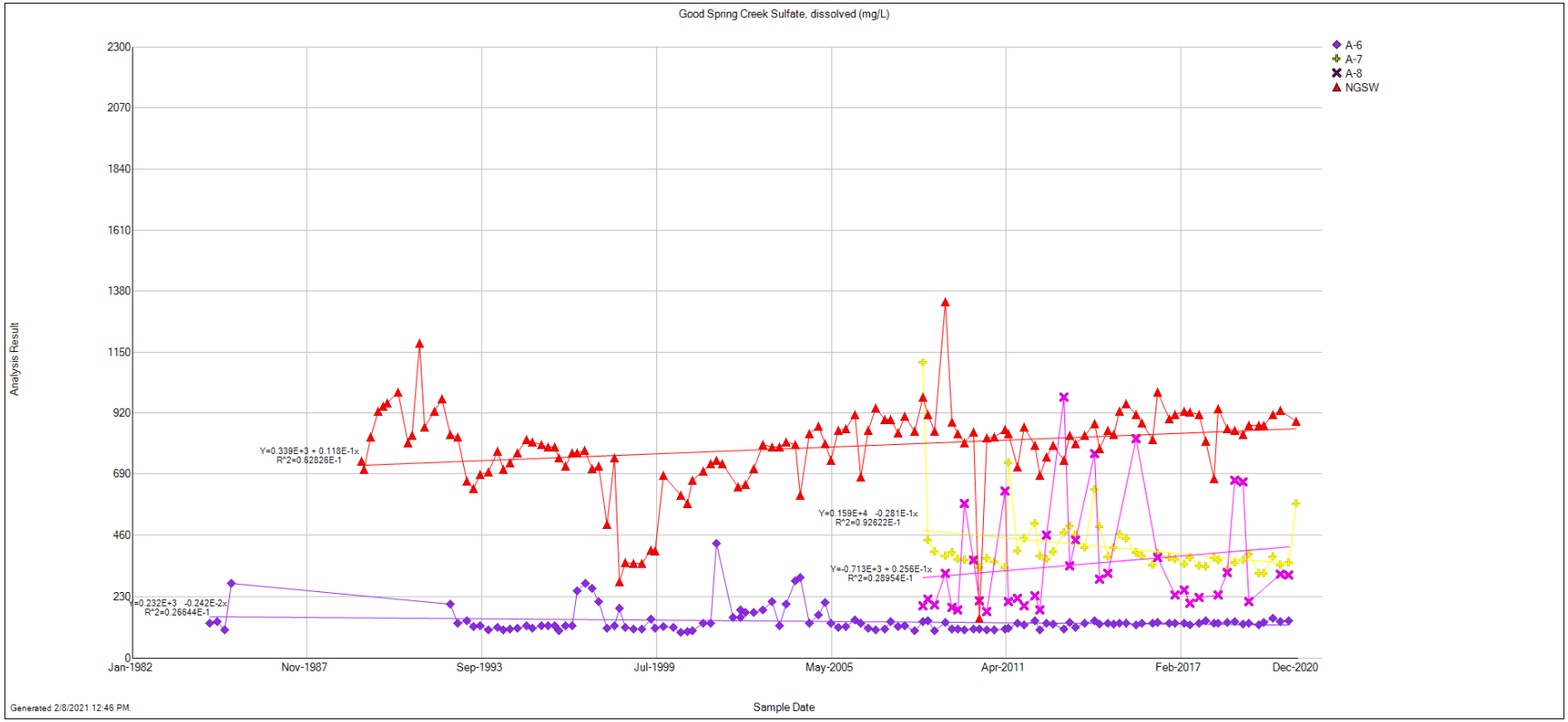

Good Spring Creek Iron, dissolved (mg/L)
A-6
NGSW
Analysis Result
2.82
2.538
2.256
1.974
1.692
1.41
1.128
0.846
0.564
0.282
0
Y=0.231E+1 -0.522E-4x
R^2=0.13535E+0
Y=0.152E+0 -0.183E-5x
R^2=0.11771E-2
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 12:56 PM.

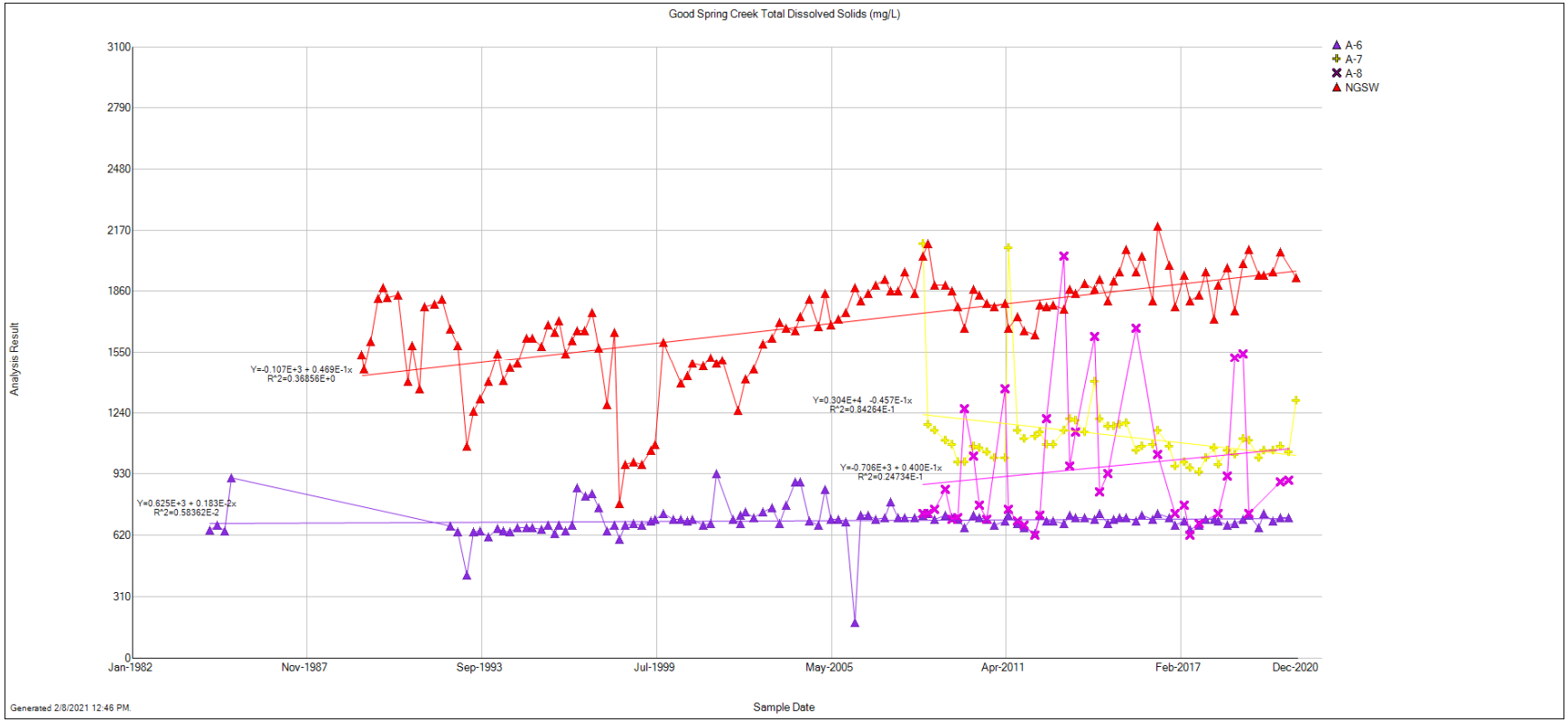

Good Spring Creek Magnesium, dissolved (mg/L)
A-6
A-7
A-8
NGSW
Analysis Result
370
333
296
259
222
185
148
111
74
37
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.501E+2 + 0.318E-2x
R^2=0.14599E+0
Y=0.428E+3 + -0.739E-2x
R^2=0.15717E+0
Y=-0.113E+3 + 0.522E-2x
R^2=0.39052E-1
Y=0.953E+2 + -0.109E-2x
R^2=0.58332E-1
Generated 2/8/2021 12:46 PM.
Sample Date


Good Spring Creek pH (lab)
A-7
A-8
Y=0.470E+1 + 0.800E-4x
R^2=0.30437E+0
Y=0.436E+1 + 0.895E-4x
R^2=0.38330E+0
9.4
8.46
7.52
6.58
5.64
4.7
3.76
2.82
1.88
0.94
0
Analysis Result
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 1:00 PM.


Good Spring Creek pH (lab)
A-6
NGSW
Y=0.612E+1 + 0.451E-4x
R^2=0.24498E+0
Y=0.498E+1 + 0.728E-4x
R^2=0.37948E+0
Analysis Result
9.6
9.24
8.88
8.52
8.16
7.8
7.44
7.08
6.72
6.36
6
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 12:56 PM.


Good Spring Creek Sodium, dissolved (mg/L)
A-6
A-7
A-8
NGSW
Y=0.514E+2 + 0.189E-2x
R^2=0.12212E+0
Y=-0.142E+3 + 0.636E-2x
R^2=0.61008E+0
Y=0.104E+2 + 0.140E-2x
R^2=0.70729E-1
Y=0.168E+2 + 0.145E-4x
R^2=0.11677E-4
Analysis Result
Sample Date
Generated 2/8/2021 12:46 PM.


Good Spring Creek Sulfate, dissolved (mg/L)
Analysis Result
Sample Date
Generated 2/8/2021 12:46 PM.
A-6
A-7
A-8
NGSW
2300
2070
1840
1610
1380
1150
920
690
460
230
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Y=0.339E+3 + 0.118E-1x
R^2=0.82826E-1
Y=0.159E+4 -0.281E-1x
R^2=0.92622E-1
Y=-0.713E+3 + 0.256E-1x
R^2=0.28954E-1
=0.232E+3 -0.242E-2x
R^2=0.26644E-1


Good Spring Creek Total Dissolved Solids (mg/L)
A-6
A-7
A-8
NGSW
Y=-0.107E+3 + 0.469E-1x
R^2=0.36856E+0
Y=0.304E+4 -0.457E-1x
R^2=0.84264E-1
Y=-0.706E+3 + 0.400E-1x
R^2=0.24734E-1
Y=0.625E+3 + 0.183E-2x
R^2=0.58362E-2
Analysis Result
3100
2790
2480
2170
1860
1550
1240
930
620
310
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
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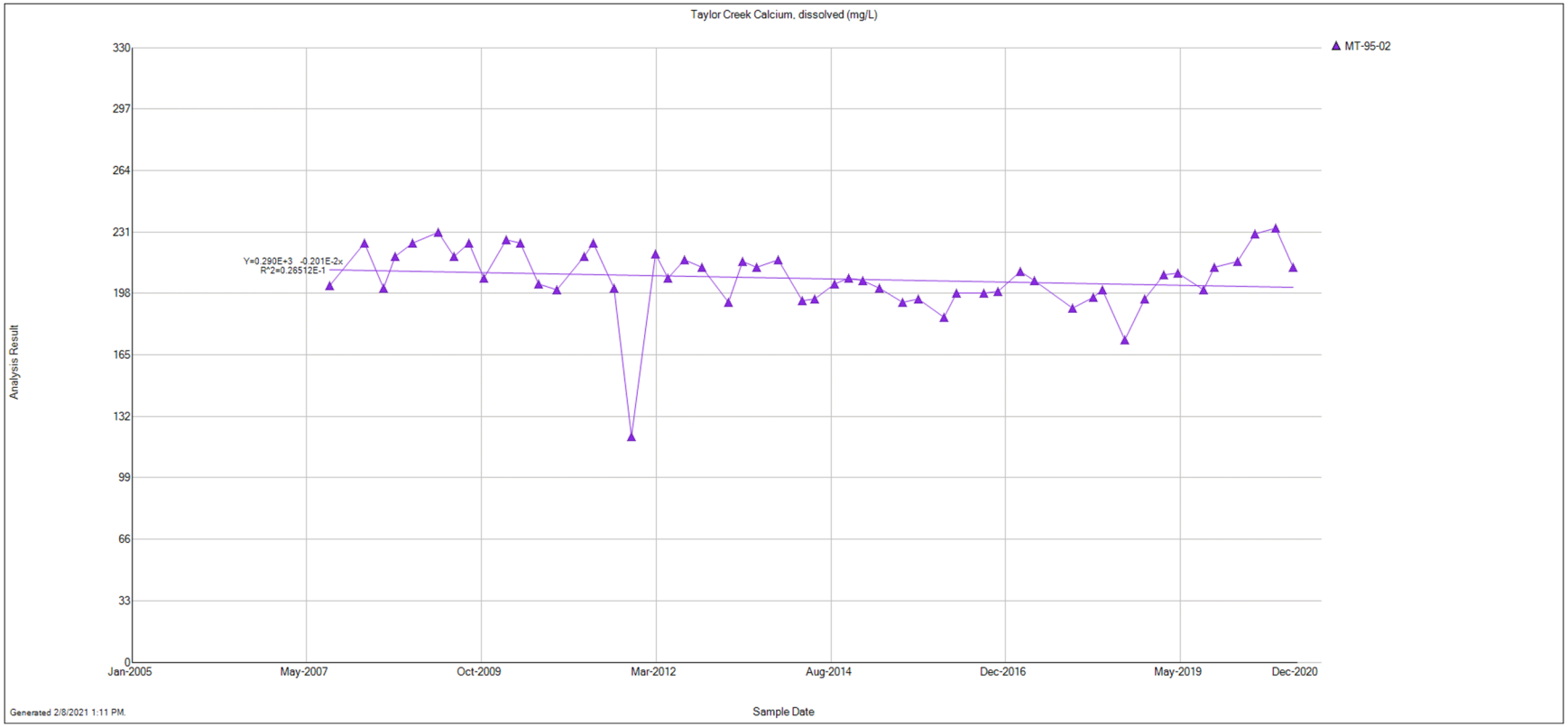
Taylor Creek Calcium, dissolved (mg/L)
MT-95-02
Y=0.290E+3 -0.201E-2x
R^2=0.26512E-1
330
297
264
231
198
165
132
99
66
33
0
Analysis Result
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Sample Date
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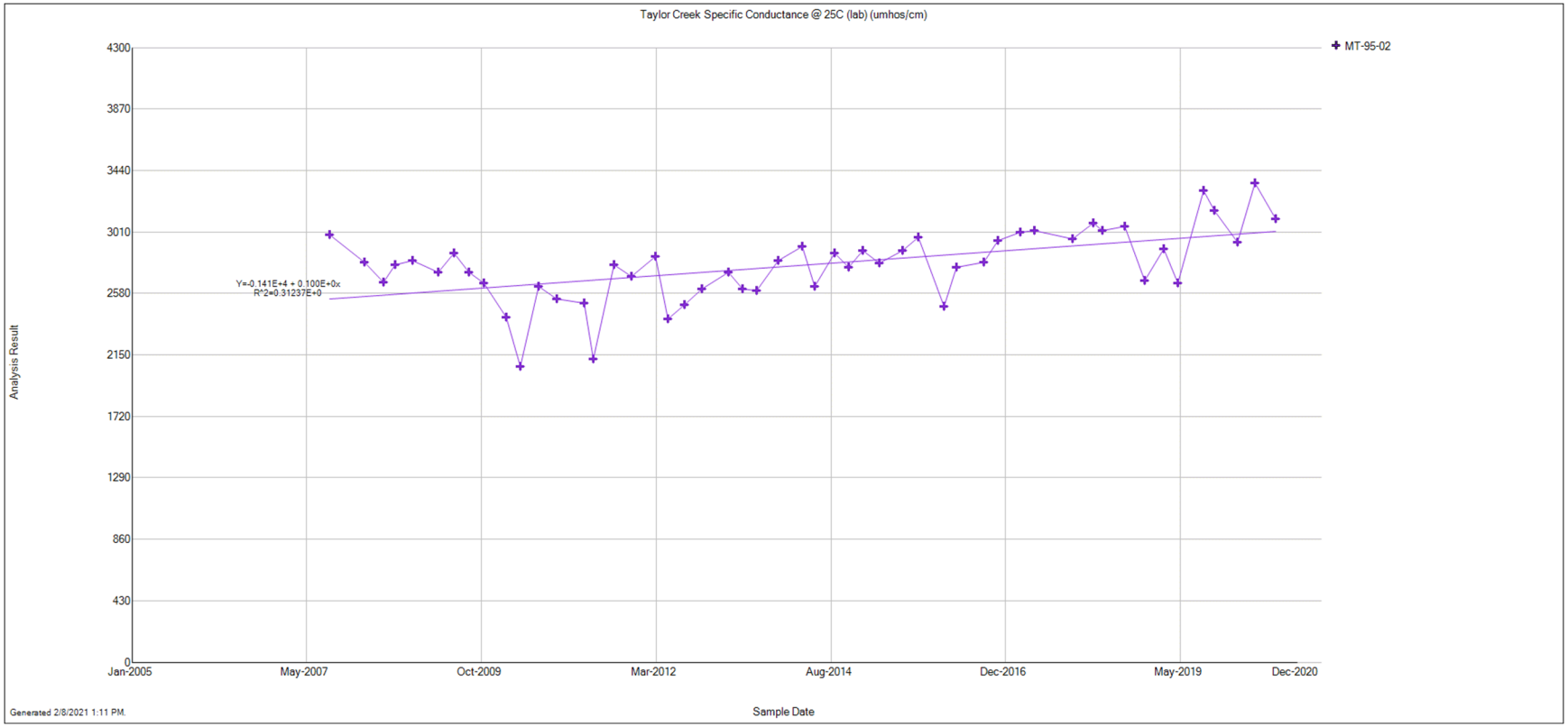
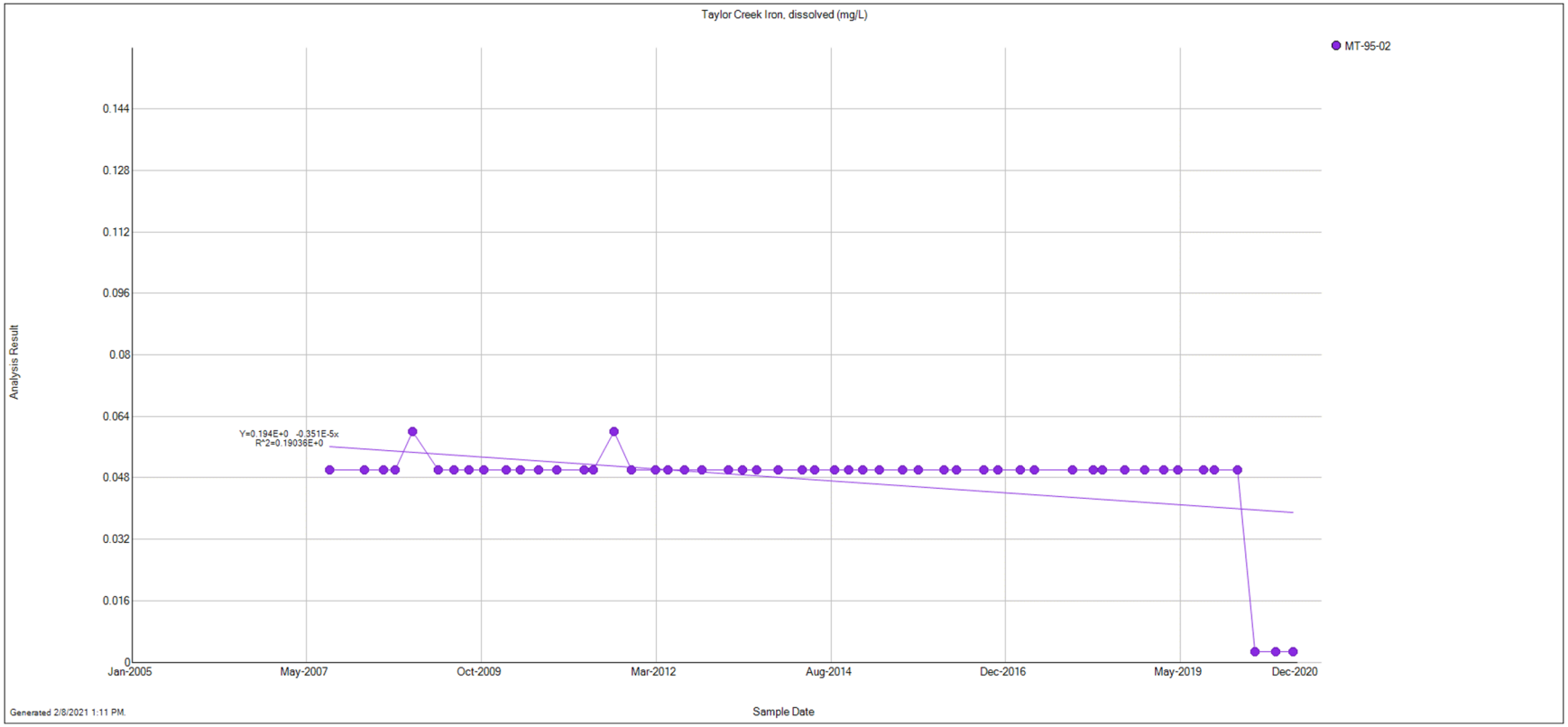
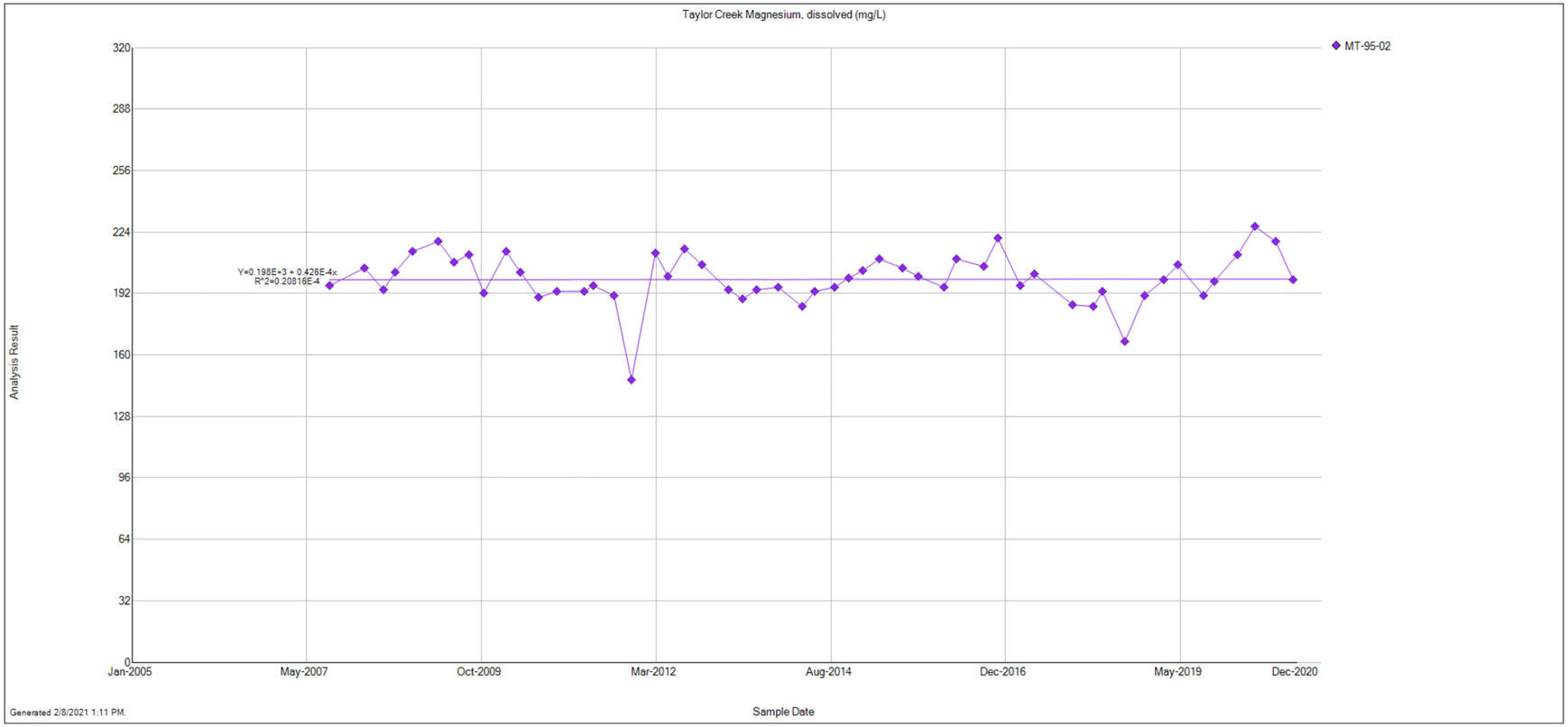
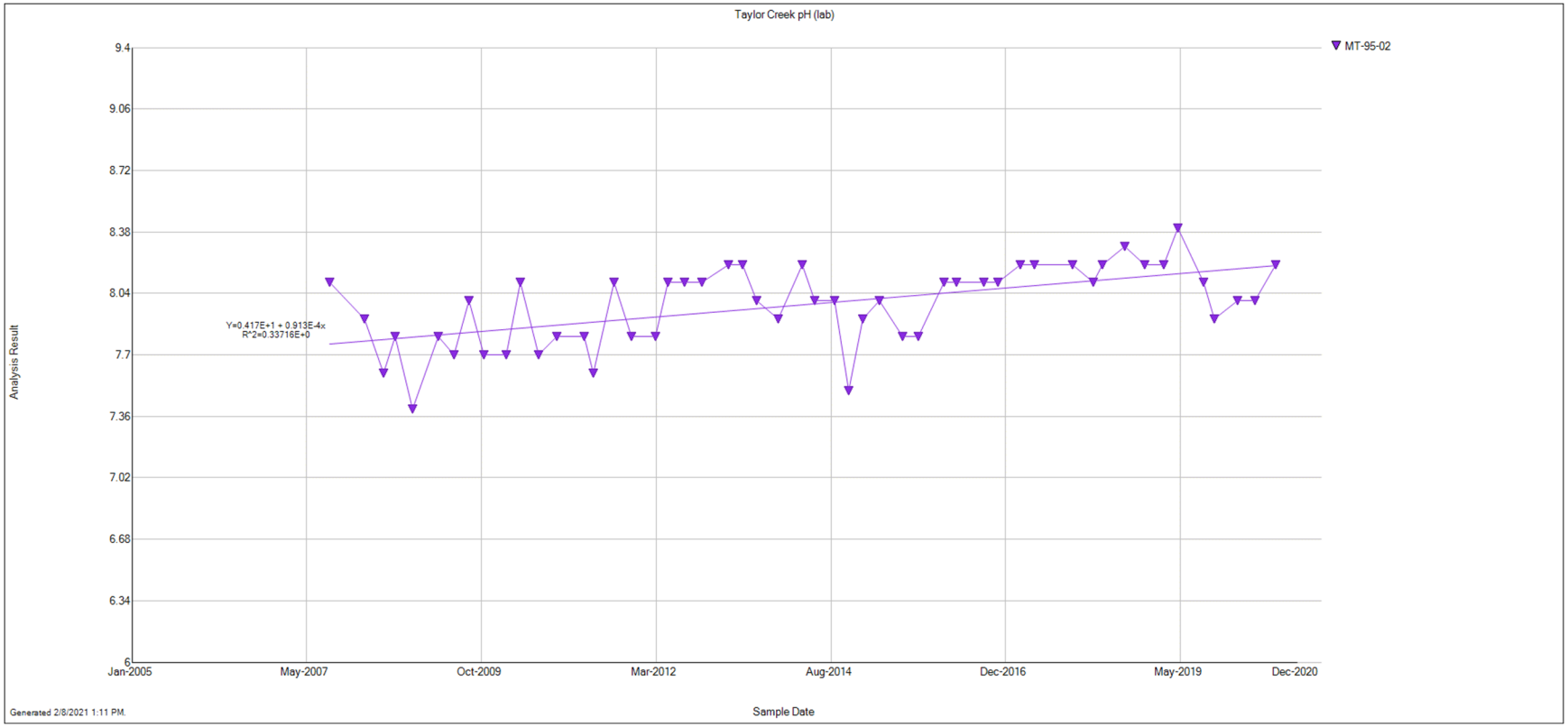
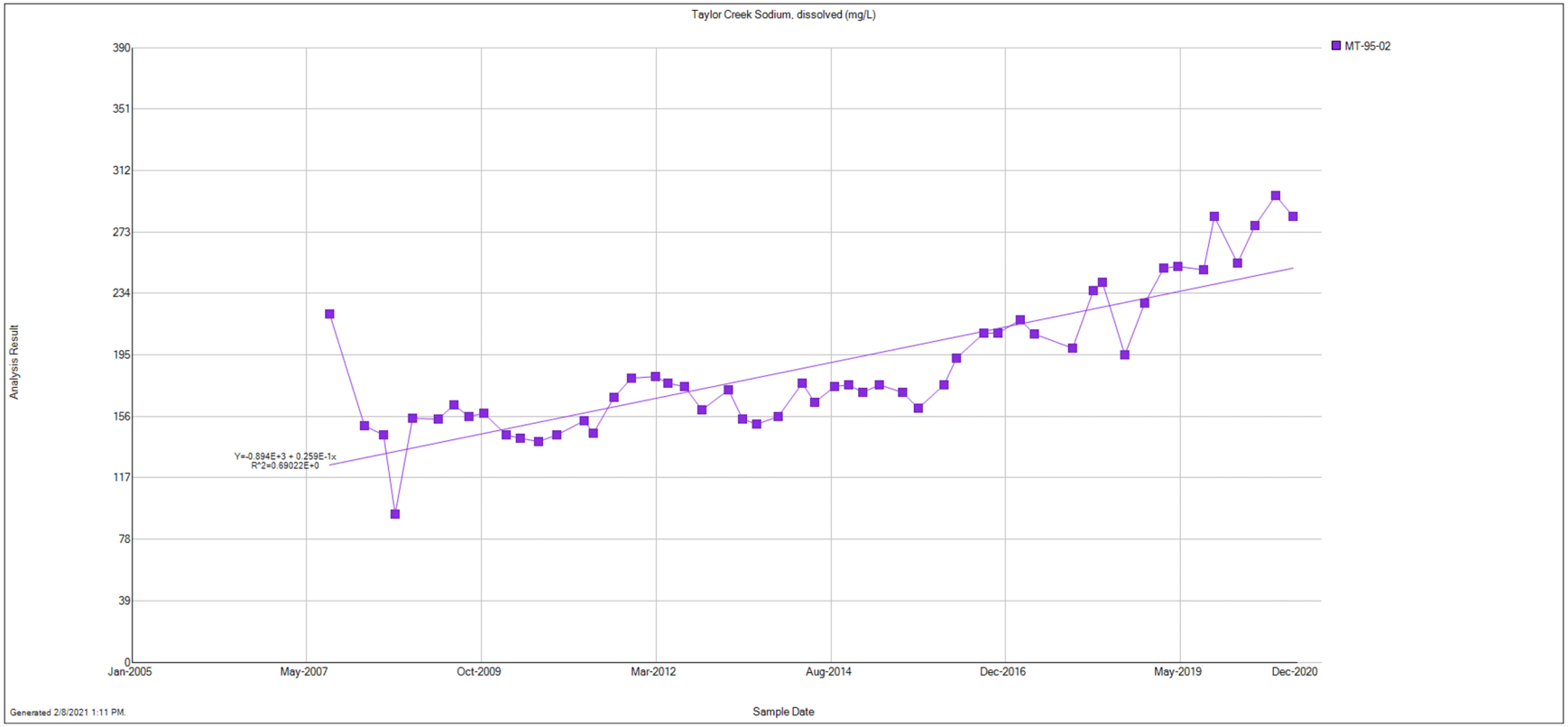
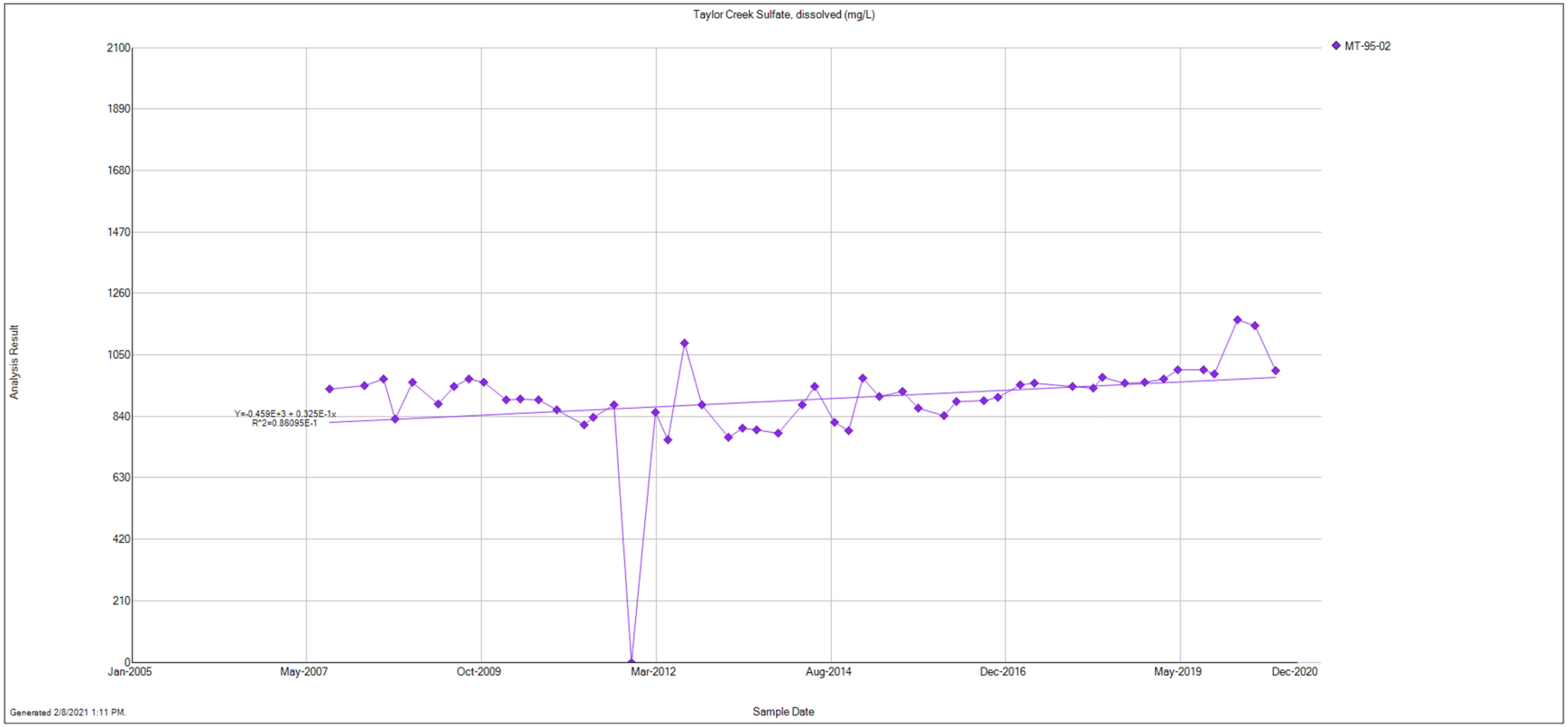

Taylor Creek Specific Conductance @ 25C (lab) (umhos/cm)
MT-95-02
Y=-0.141E+4 + 0.100E+0x
R^2=0.31237E+0
4300
3870
3440
3010
2580
2150
1720
1290
860
430
0
Analysis Result
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Sample Date
Generated 2/8/2021 1:11 PM.

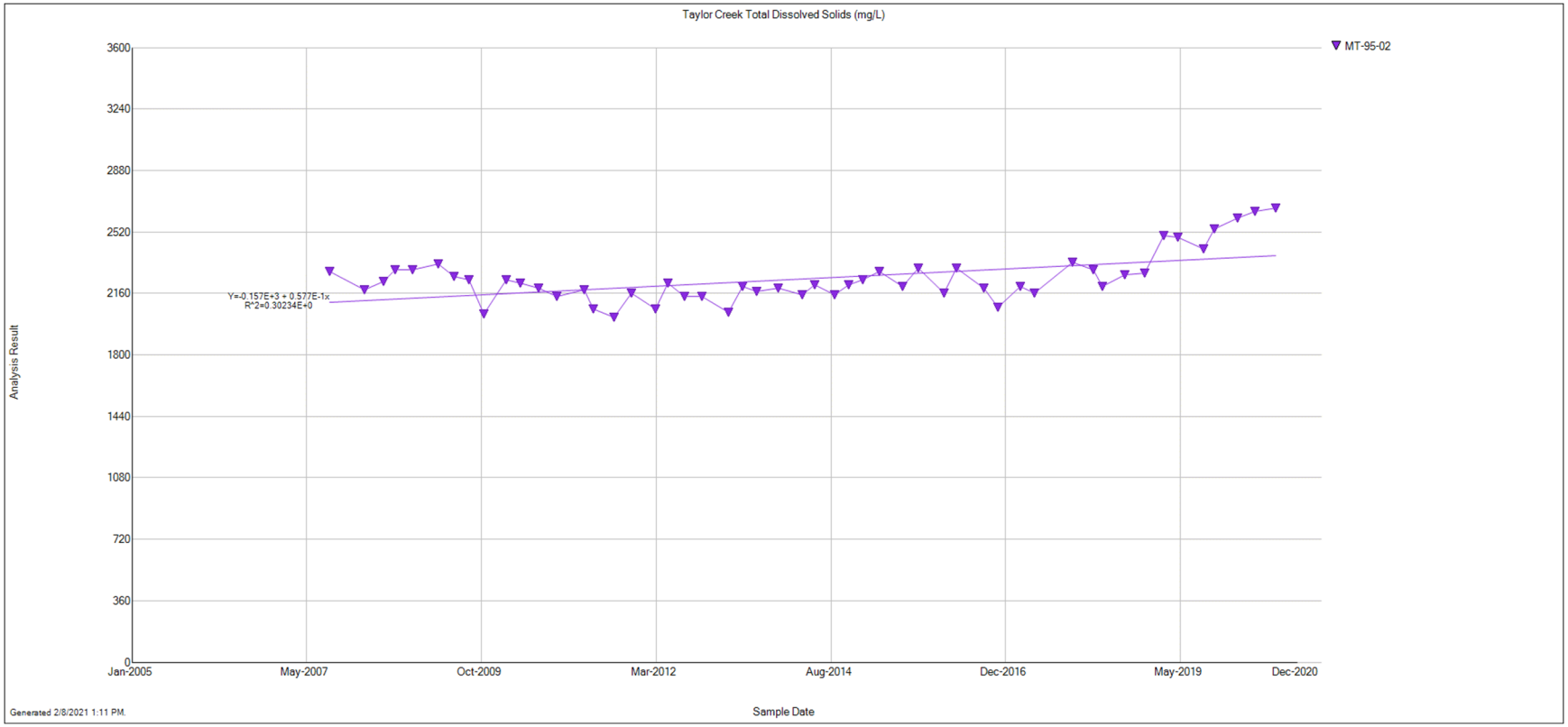

Taylor Creek Iron, dissolved (mg/L)
MT-95-02
Analysis Result
0.144
0.128
0.112
0.096
0.08
0.064
0.048
0.032
0.016
0
Y=0.194E+0 -0.351E-5x
R^2=0.19036E+0
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Sample Date
Generated 2/8/2021 1:11 PM.

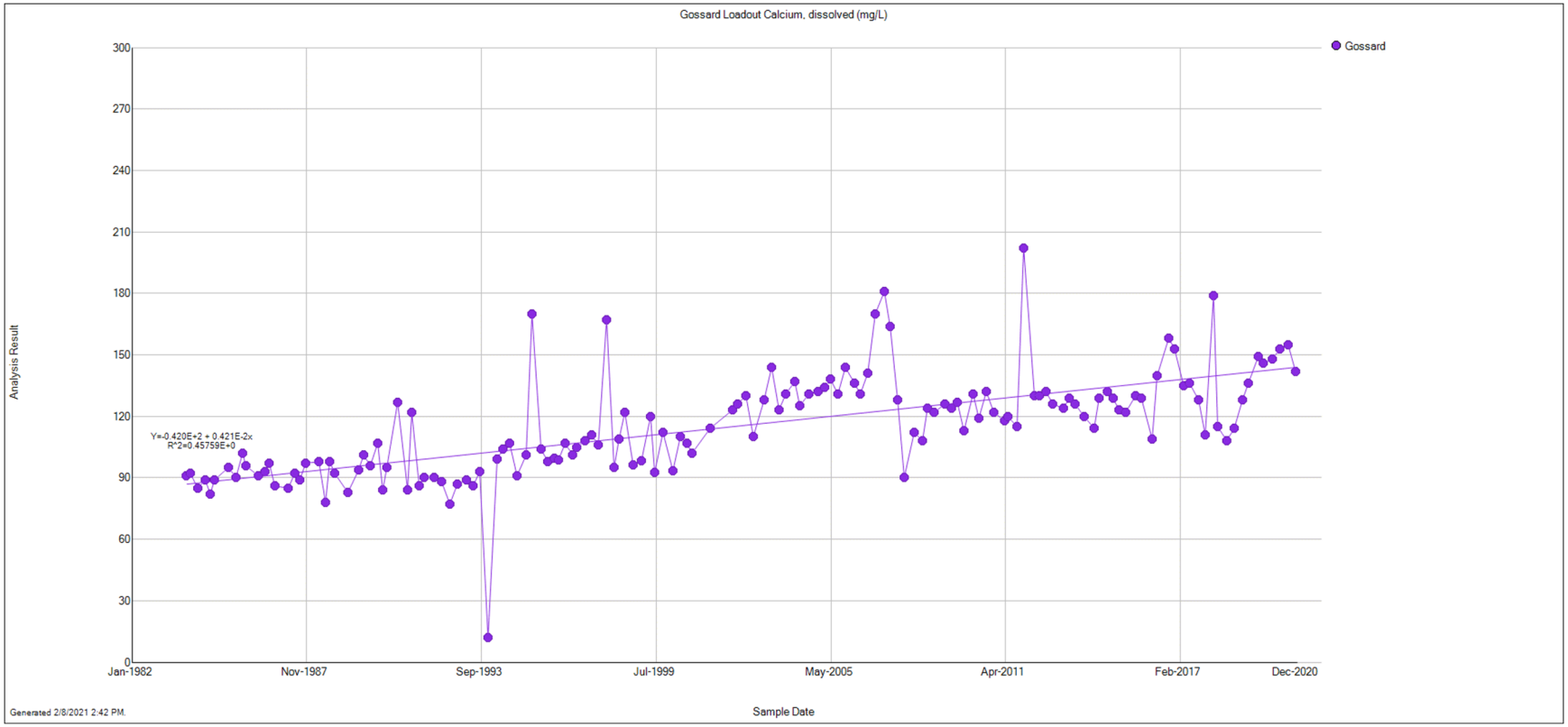

Taylor Creek Magnesium, dissolved (mg/L)
MT-95-02
Y=0.198E+3 + 0.426E-4x
R^2=0.20816E-4
320
288
256
224
192
160
128
96
64
32
0
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 1:11 PM.

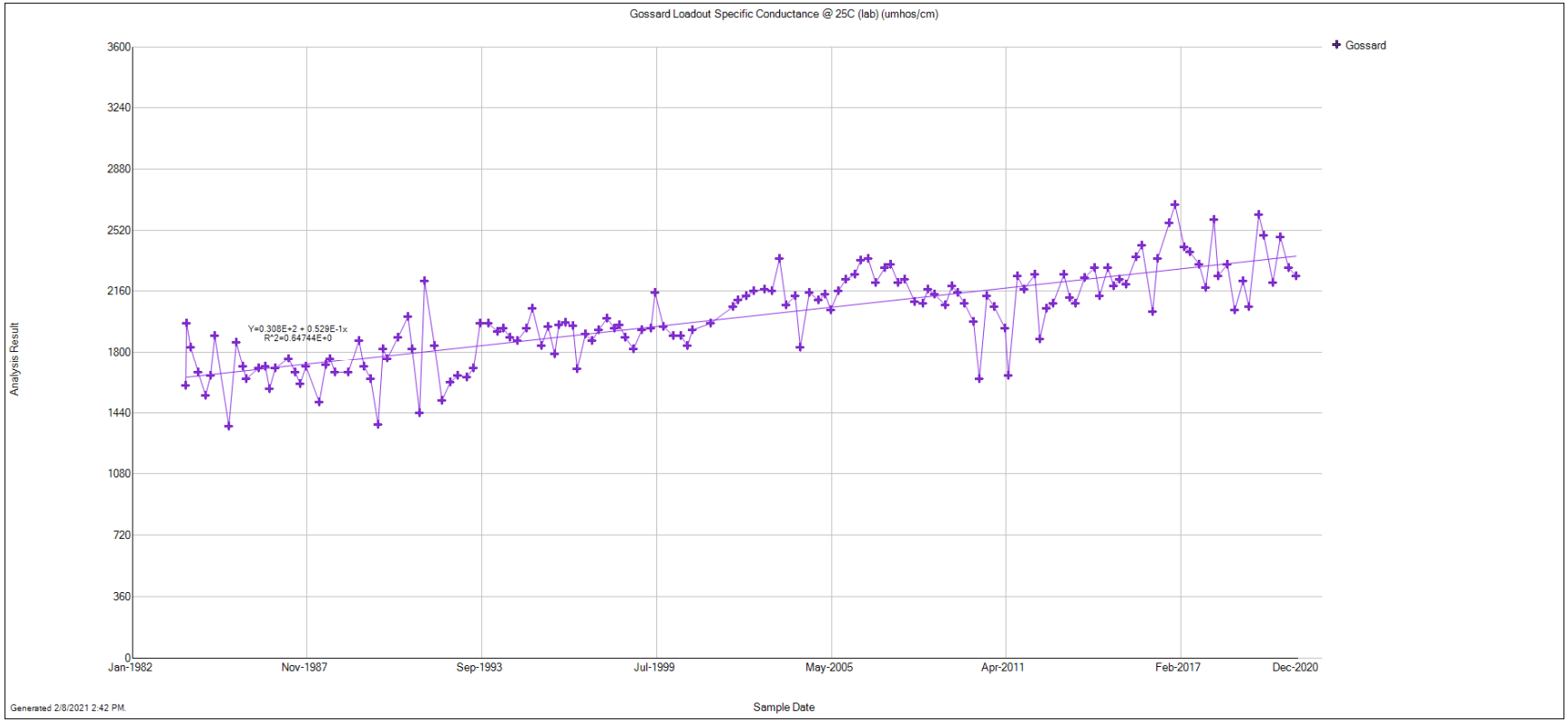

Taylor Creek pH (lab)
MT-95-02
Y=0.417E+1 + 0.913E-4x
R^2=0.33716E+0
Analysis Result
9.4
9.06
8.72
8.38
8.04
7.7
7.36
7.02
6.68
6.34
6
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Sample Date
Generated 2/8/2021 1:11 PM.

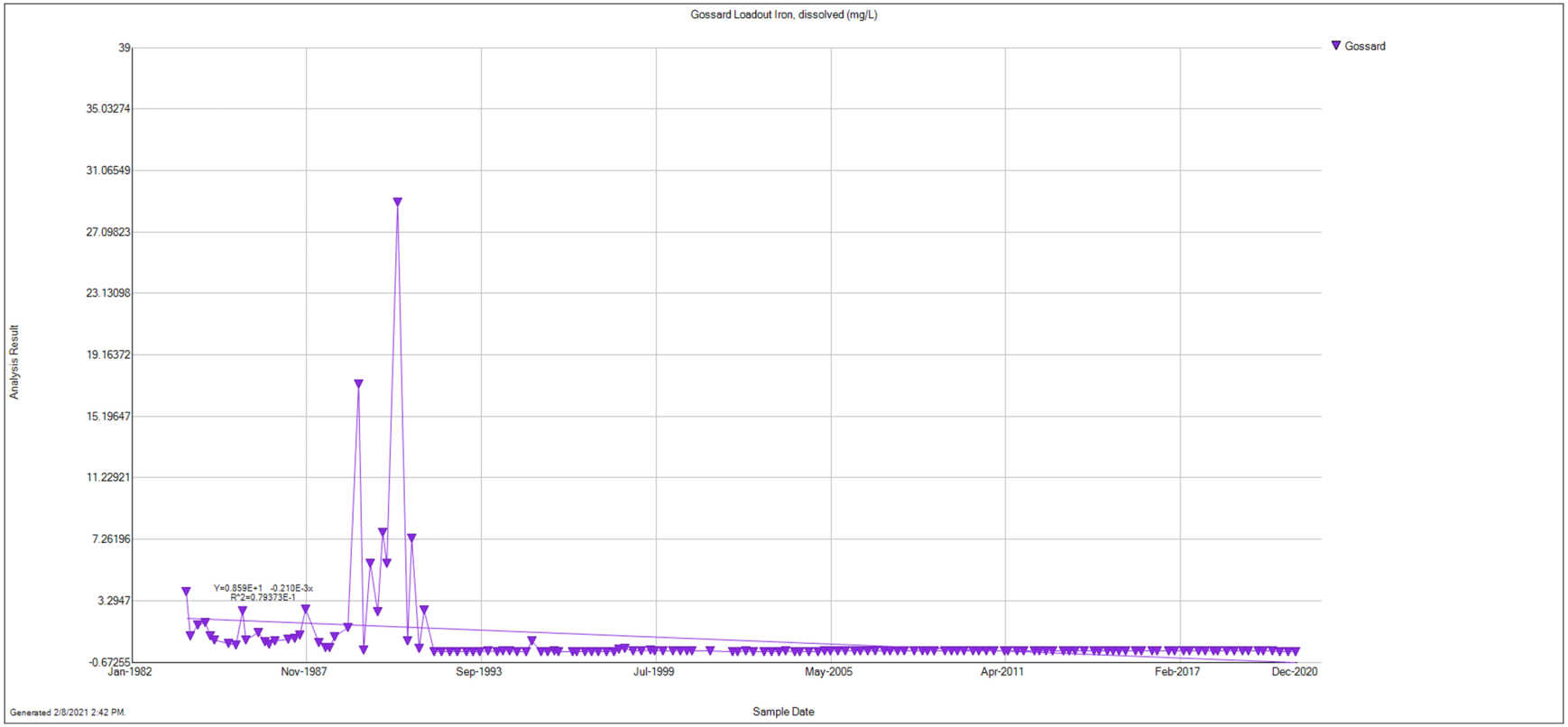

Taylor Creek Sodium, dissolved (mg/L)
MT-95-02
Analysis Result
390
351
312
273
234
195
156
117
78
39
0
Y=-0.894E+3 + 0.259E-1x
R^2=0.69022E+0
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Generated 2/8/2021 1:11 PM.
Sample Date

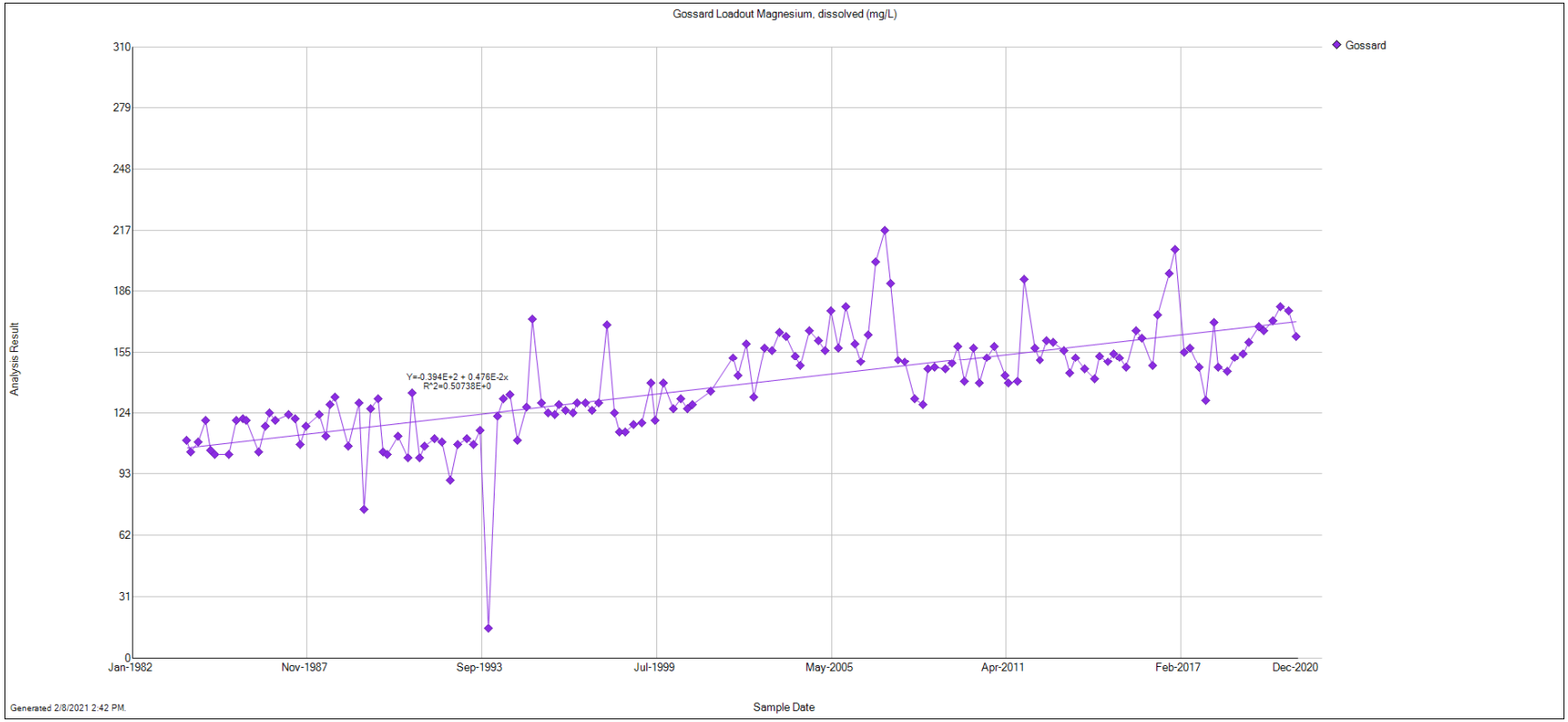

Taylor Creek Sulfate, dissolved (mg/L)
MT-95-02
Analysis Result
2100
1890
1680
1470
1260
1050
840
630
420
210
0
Y=-0.459E+3 + 0.325E-1x
R^2=0.86095E-1
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Sample Date
Generated 2/8/2021 1:11 PM.

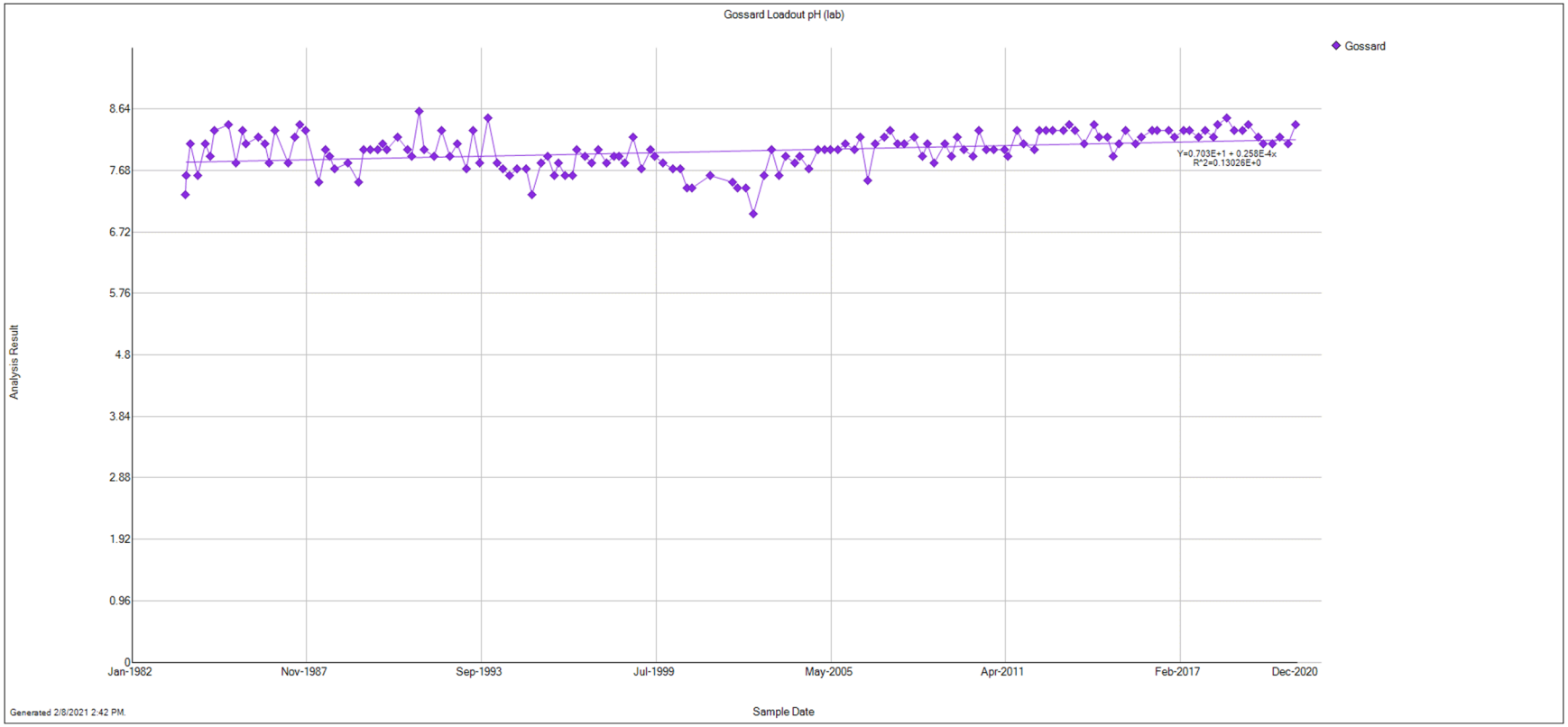

Taylor Creek Total Dissolved Solids (mg/L)
MT-95-02
Y=-0.157E+3 + 0.577E-1x
R^2=0.30234E+0
Analysis Result
3600
3240
2880
2520
2160
1800
1440
1080
720
360
0
Jan-2005
May-2007
Oct-2009
Mar-2012
Aug-2014
Dec-2016
May-2019
Dec-2020
Sample Date
Generated 2/8/2021 1:11 PM.

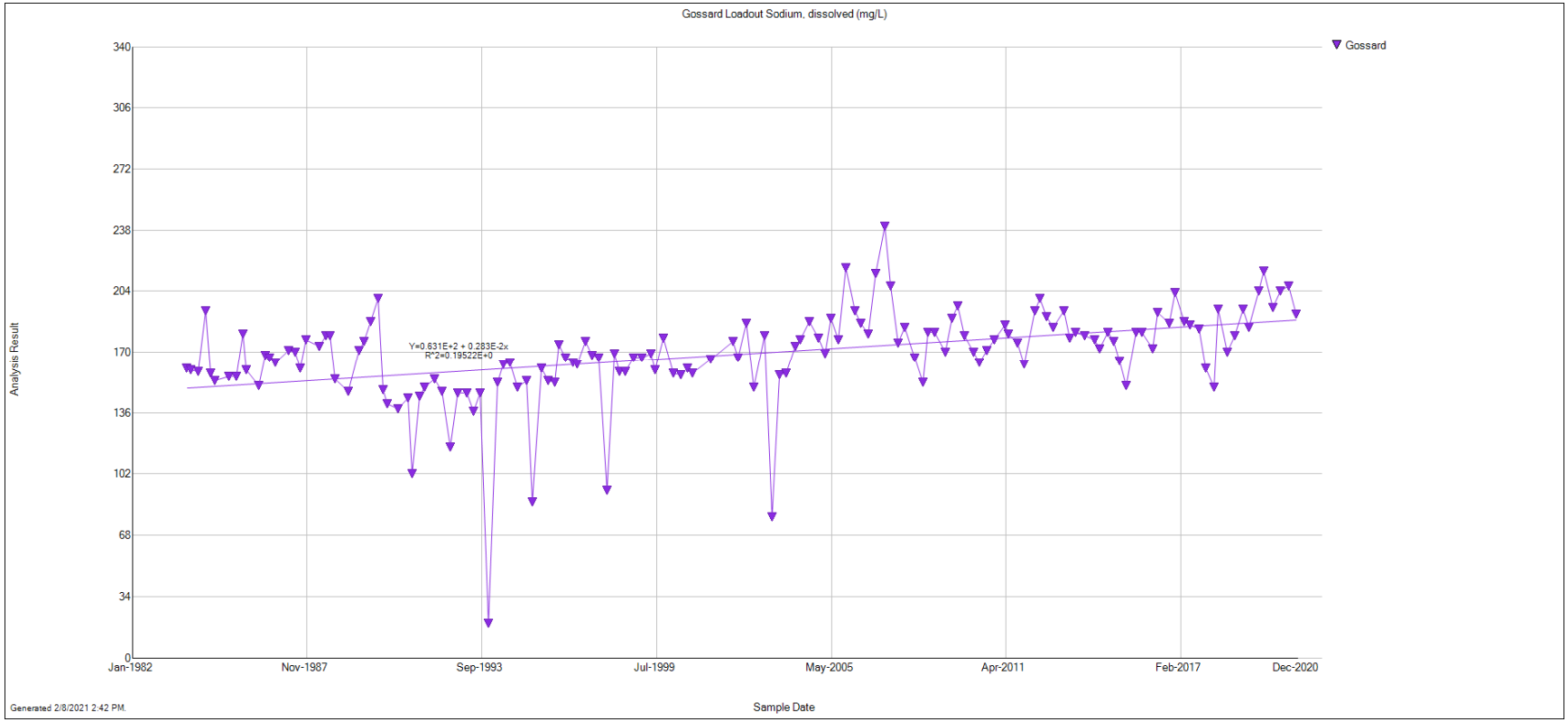

Gossard Loadout Calcium, dissolved (mg/L)
Gossard
Analysis Result
300
270
240
210
180
150
120
90
60
30
0
Y=-0.420E+2 + 0.421E-2x
R^2=0.45759E+0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 2:42 PM.

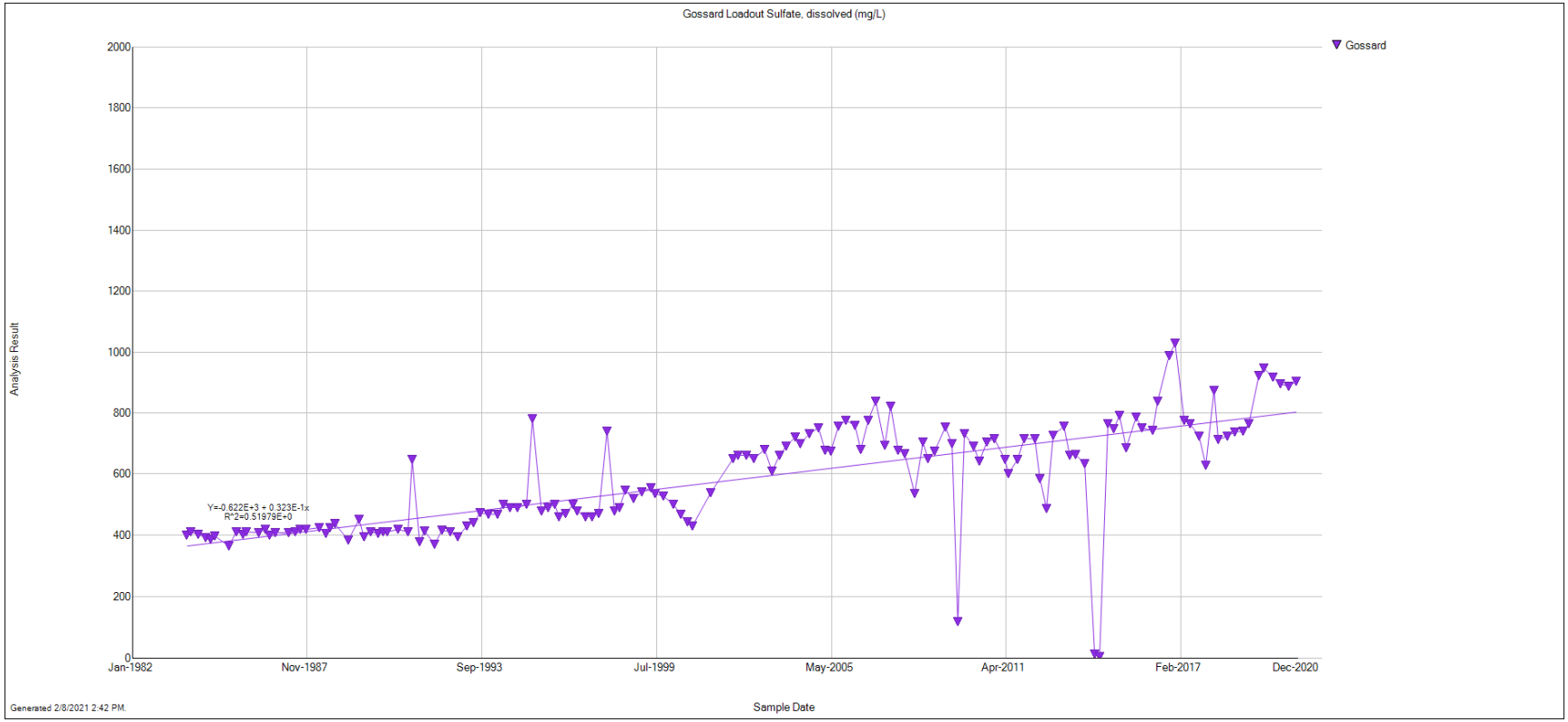

Gossard Loadout Specific Conductance @ 25C (lab) (umhos/cm)
Gossard
Y=0.308E+2 + 0.529E-1x
R^2=0.64744E+0
Analysis Result
3600
3240
2880
2520
2160
1800
1440
1080
720
360
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 2:42 PM.

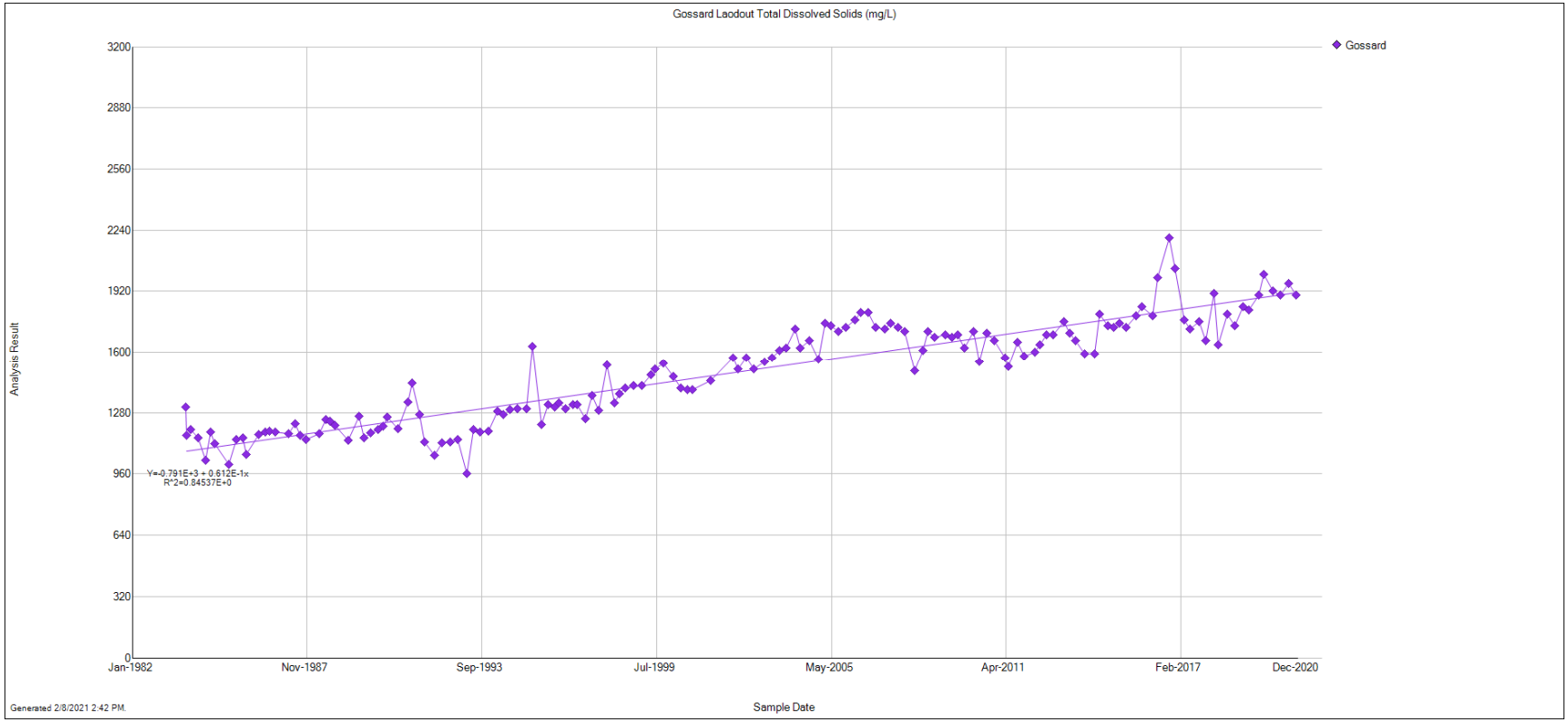

Gossard Loadout Iron, dissolved (mg/L)
Gossard
39
35.03274
31.06549
27.09823
23.13098
19.16372
15.19647
11.22921
7.26196
3.2947
-0.67255
Analysis Result
Y=0.859E+1 -0.210E-3x
R^2=0.79373E-1
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 2:42 PM.

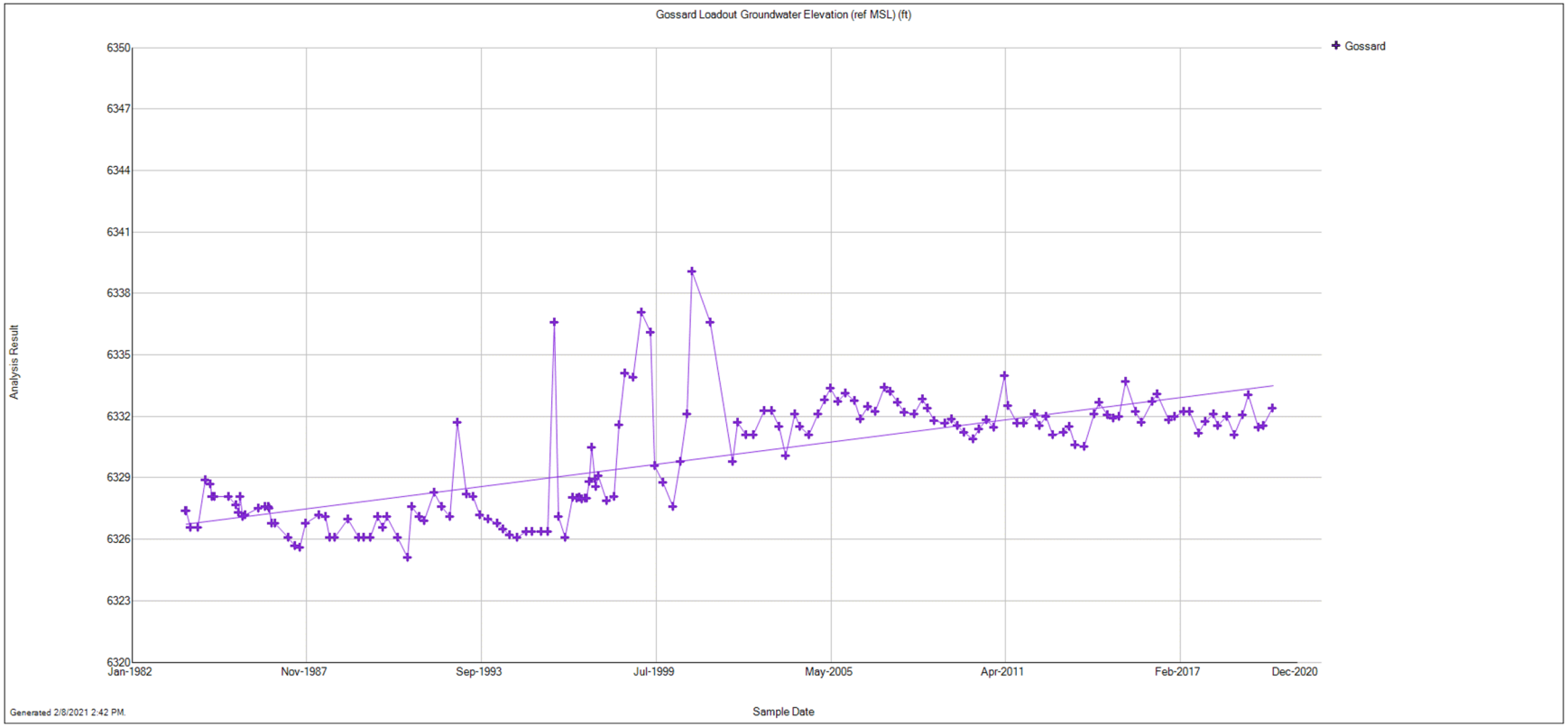

Gossard Loadout Magnesium, dissolved (mg/L)
Gossard
Y=-0.394E+2 + 0.476E-2x
R^2=0.50738E+0
Analysis Result
310
279
248
217
186
155
124
93
62
31
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 2:42 PM.

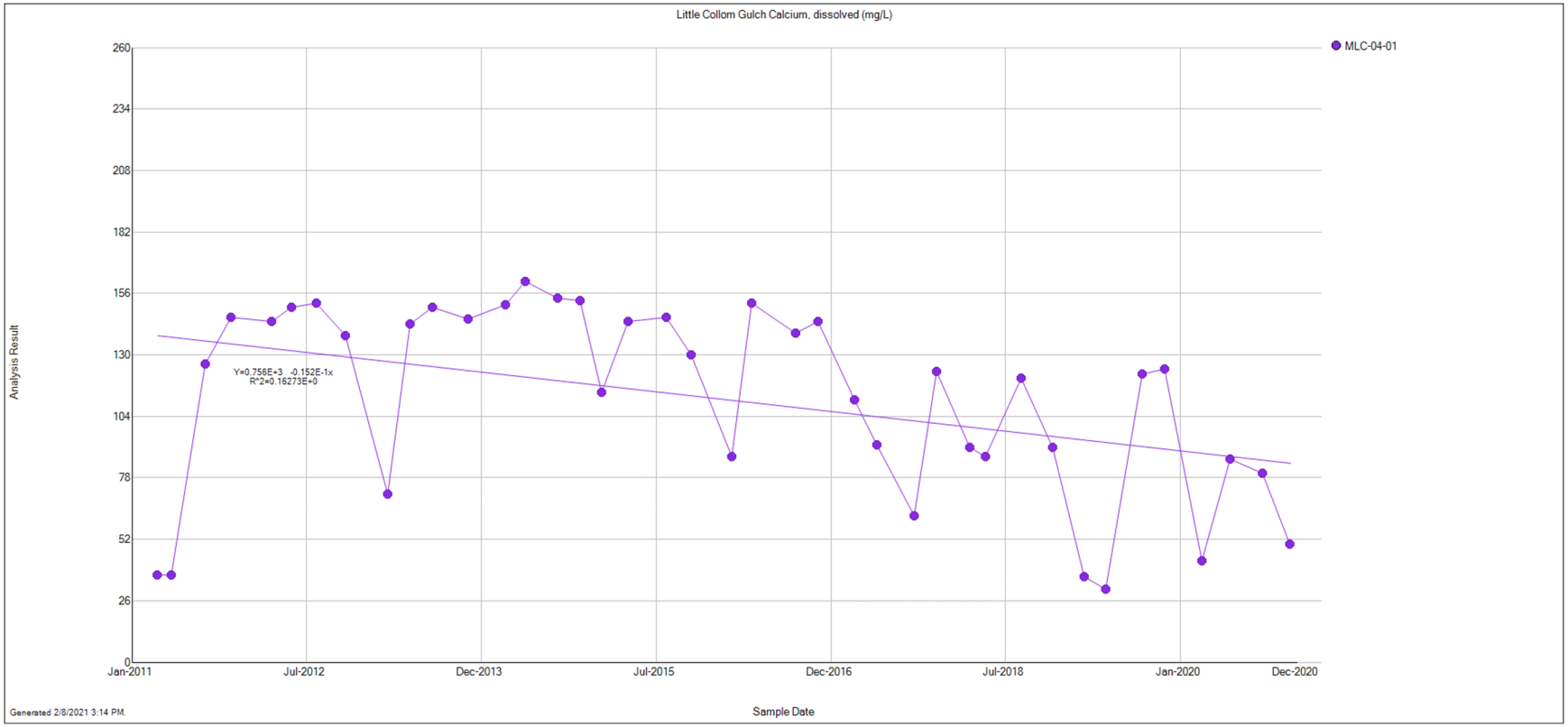

Gossard Loadout pH (lab)
Gossard
Y=0.703E+1 + 0.258E-4x
R^2=0.13026E+0
8.64
7.68
6.72
5.76
4.8
3.84
2.88
1.92
0.96
0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 2:42 PM.

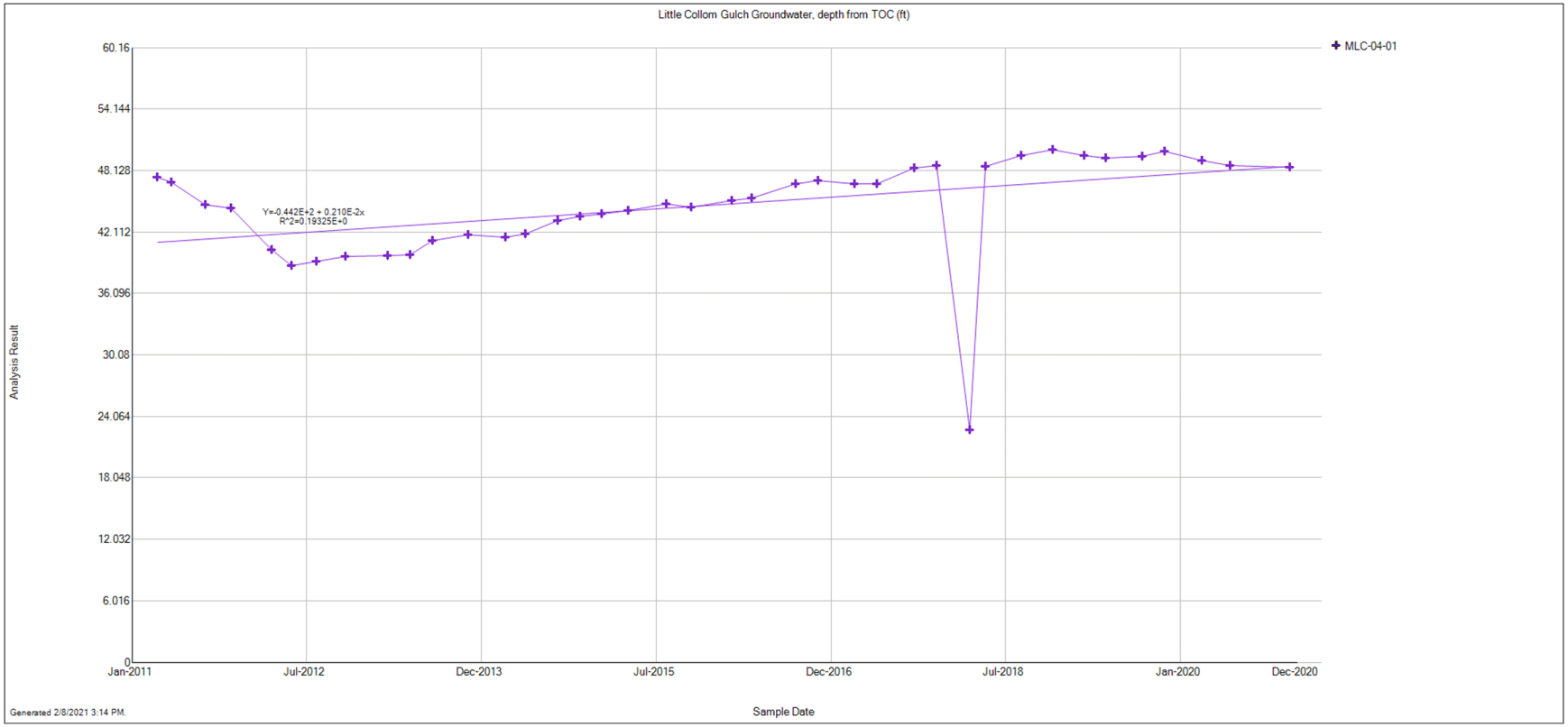

Gossard Loadout Sodium, dissolved (mg/L)
Gossard
Analysis Result
340
306
272
238
204
170
136
102
68
34
0
Y=0.631E+2 + 0.283E-2x
R^2=0.19522E+0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/8/2021 2:42 PM.
Sample Date

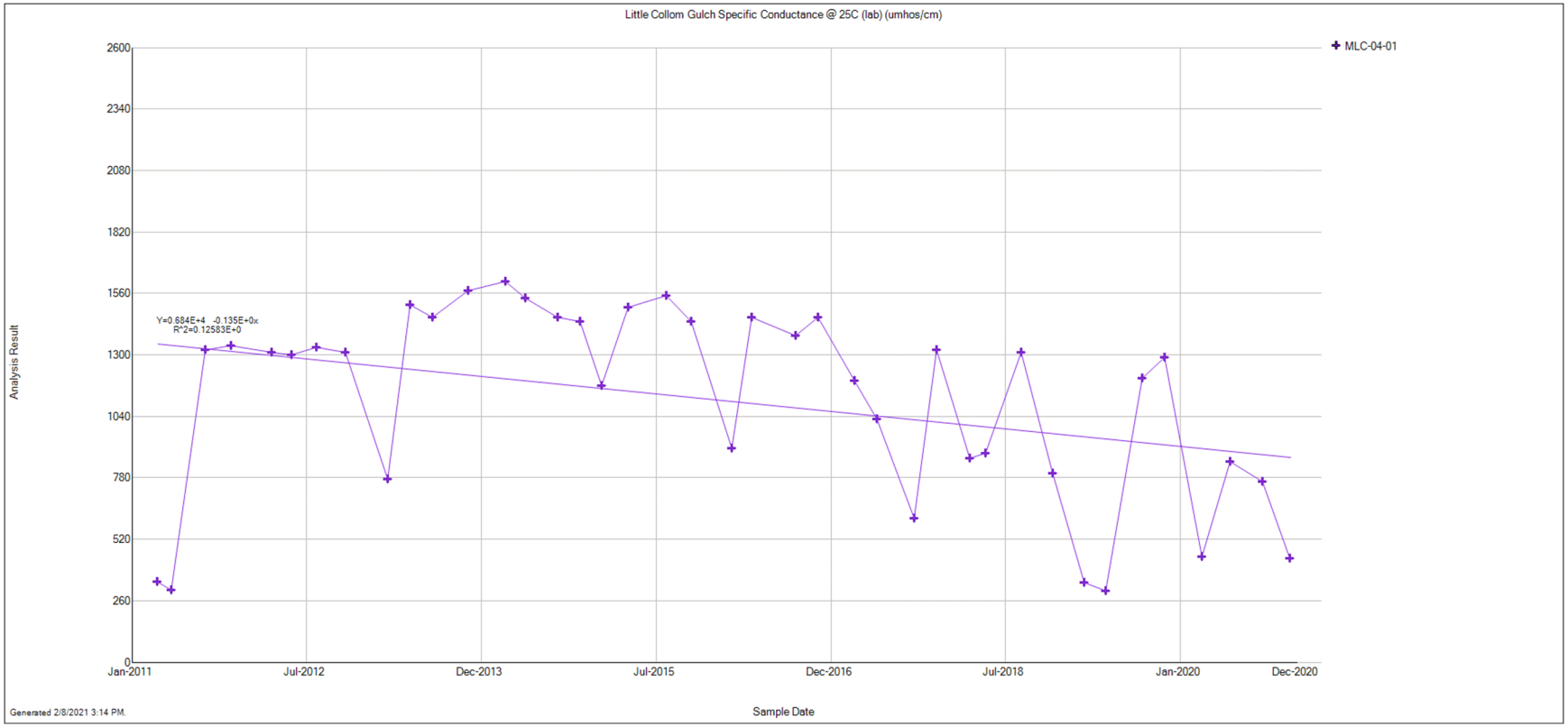

Gossard Loadout Sulfate, dissolved (mg/L)
Gossard
Analysis Result
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Y=-0.622E+3 + 0.323E-1x
R^2=0.51979E+0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/8/2021 2:42 PM.
Sample Date

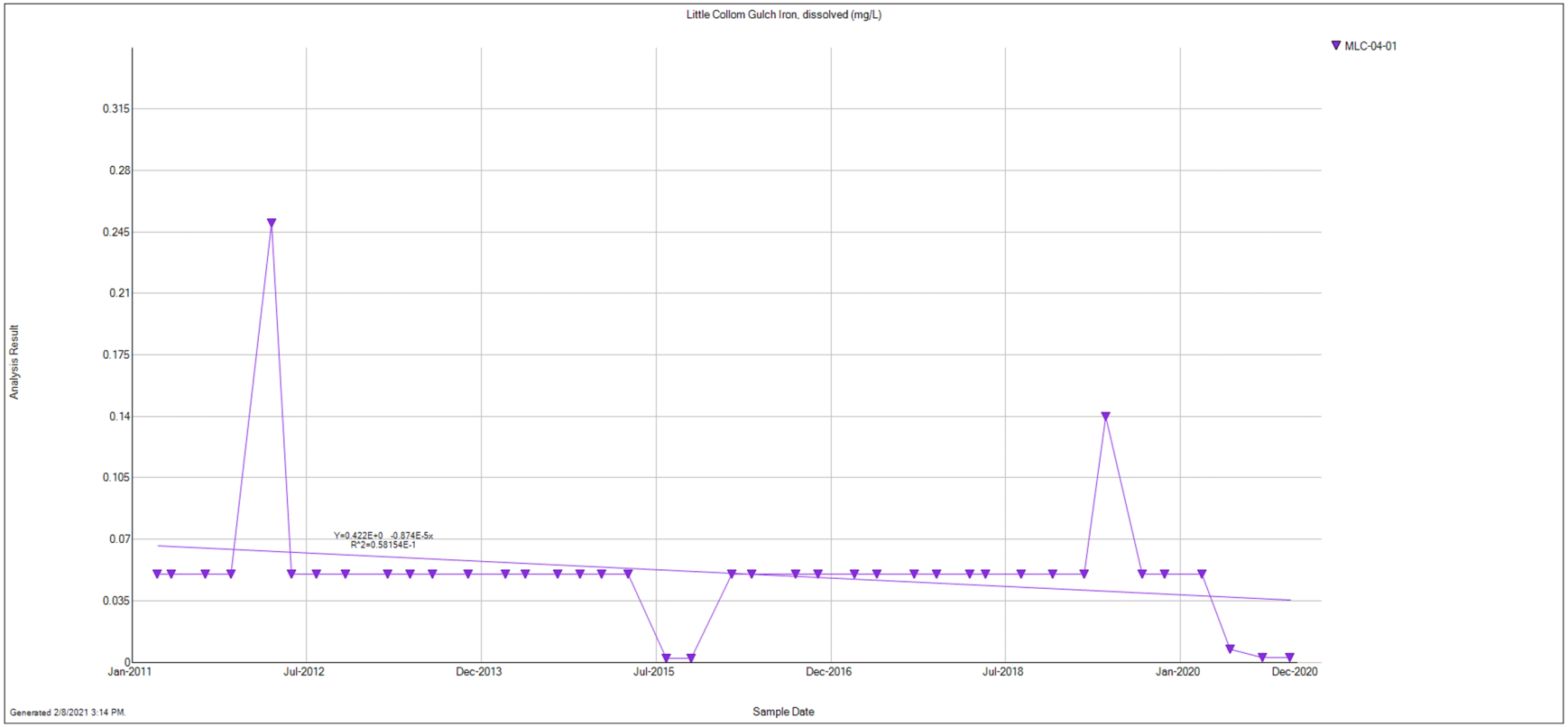

Gossard Laodout Total Dissolved Solids (mg/L)
Gossard
Analysis Result
3200
2880
2560
2240
1920
1600
1280
960
640
320
0
Y=-0.791E+3 + 0.612E-1x
R^2=0.84537E+0
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Generated 2/8/2021 2:42 PM.
Sample Date

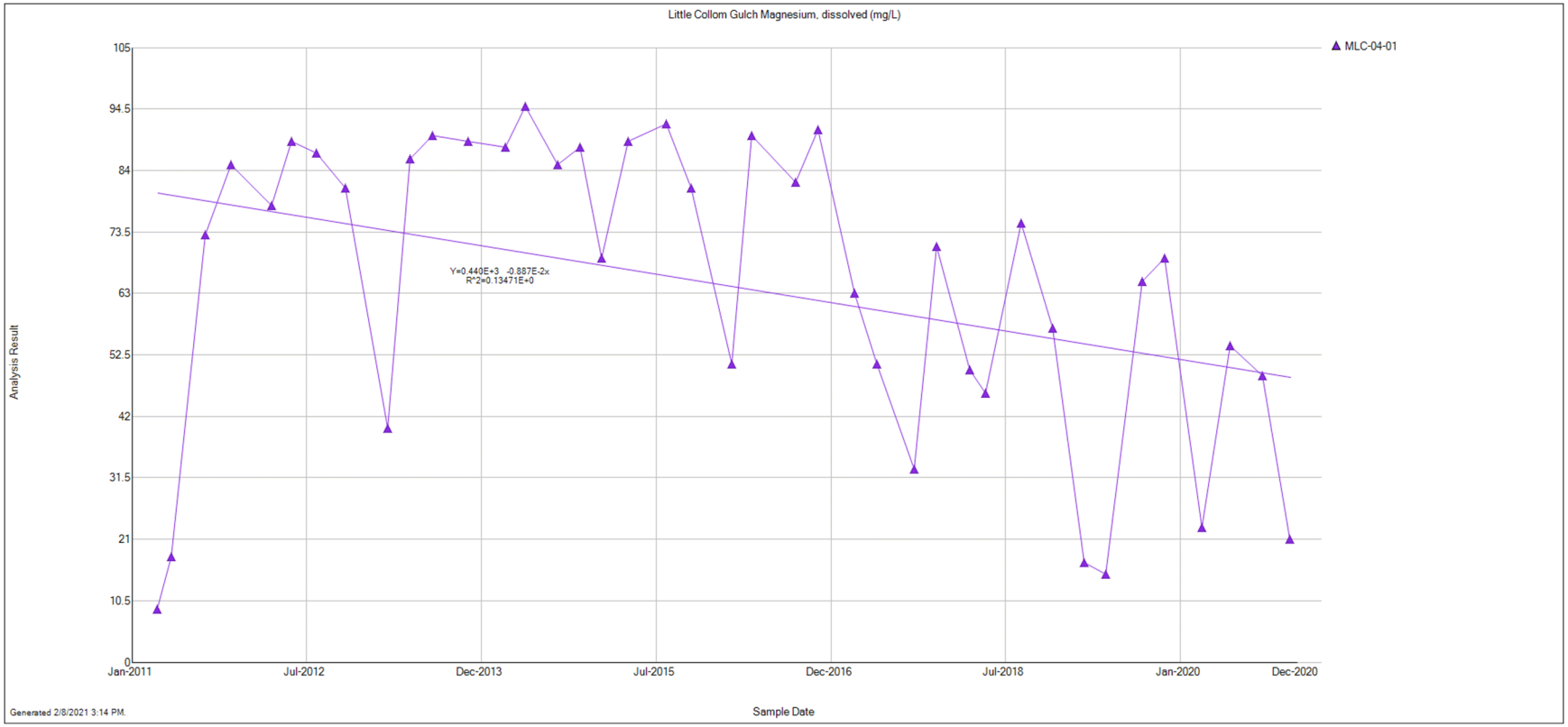

Gossard Loadout Groundwater Elevation (ref MSL) (ft)
Gossard
Analysis Result
6350
6347
6344
6341
6338
6335
6332
6329
6326
6323
6320
Jan-1982
Nov-1987
Sep-1993
Jul-1999
May-2005
Apr-2011
Feb-2017
Dec-2020
Sample Date
Generated 2/8/2021 2:42 PM.

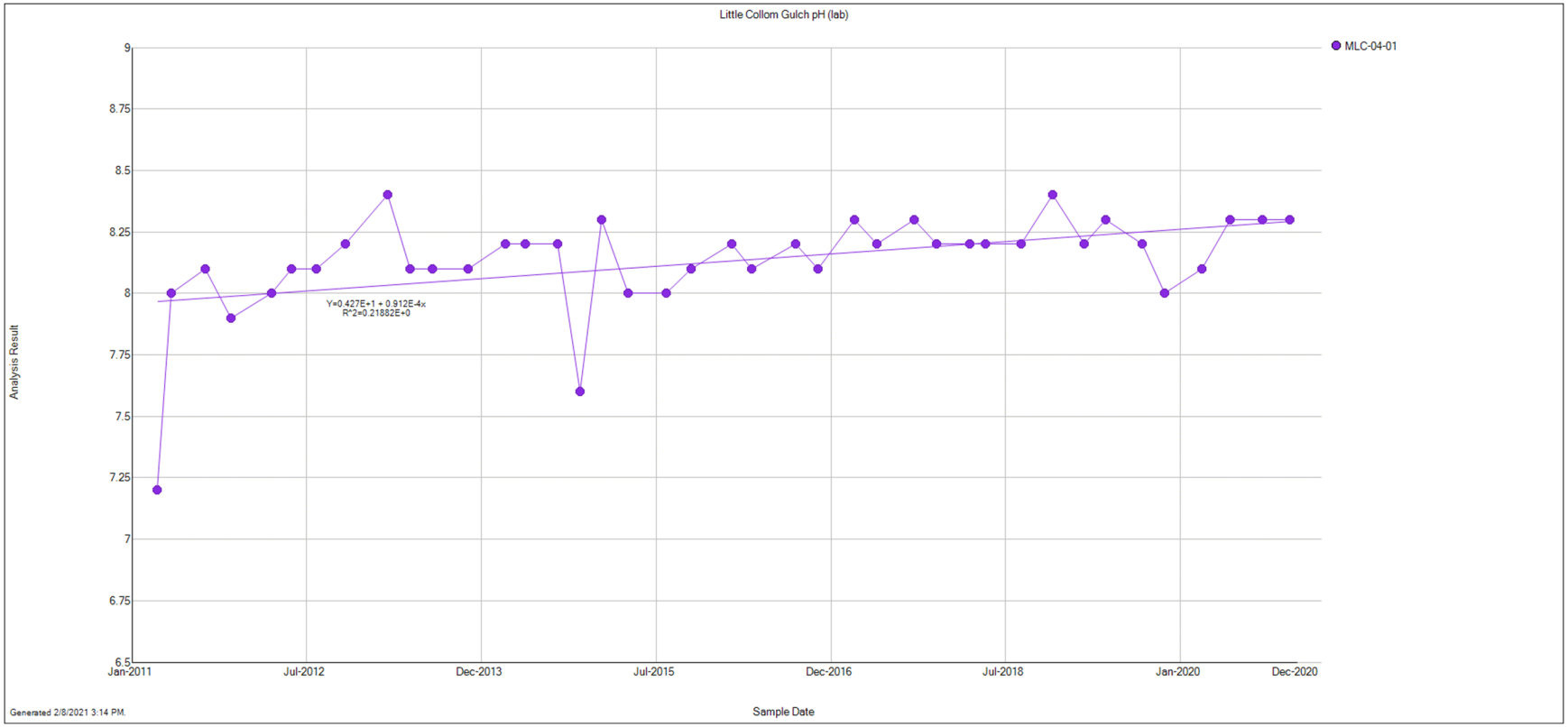

Little Collom Gulch Calcium, dissolved (mg/L)
MLC-04-01
Analysis Result
260
234
208
182
156
130
104
78
52
26
0
Y=0.756E+3 -0.152E-1x
R^2=0.16273E+0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:14 PM.
Sample Date

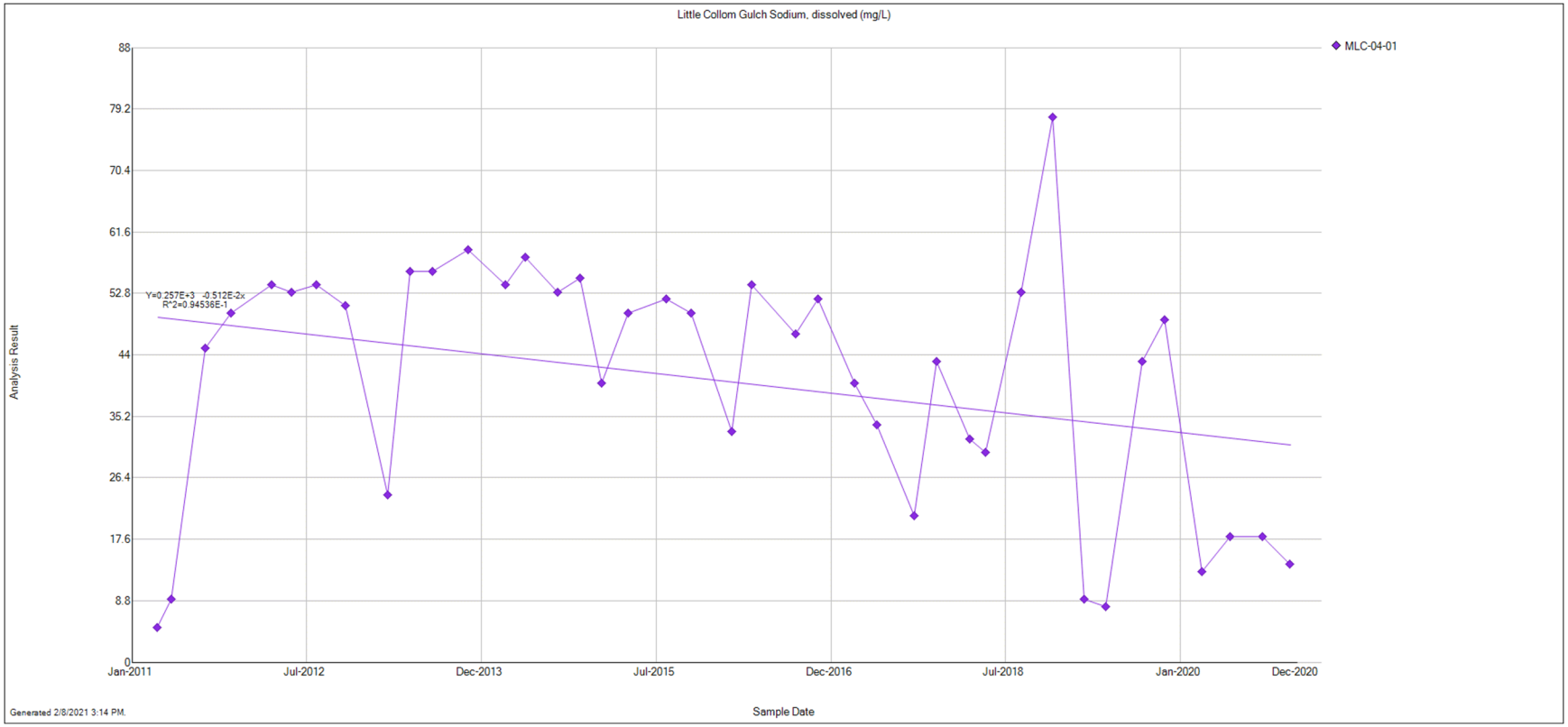

Little Collom Gulch Groundwater, depth from TOC (ft)
MLC-04-01
Y=-0.442E+2 + 0.210E-2x
R^2=0.19325E+0
60.16
54.144
48.128
42.112
36.096
30.08
24.064
18.048
12.032
6.016
0
Analysis Result
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:14 PM.

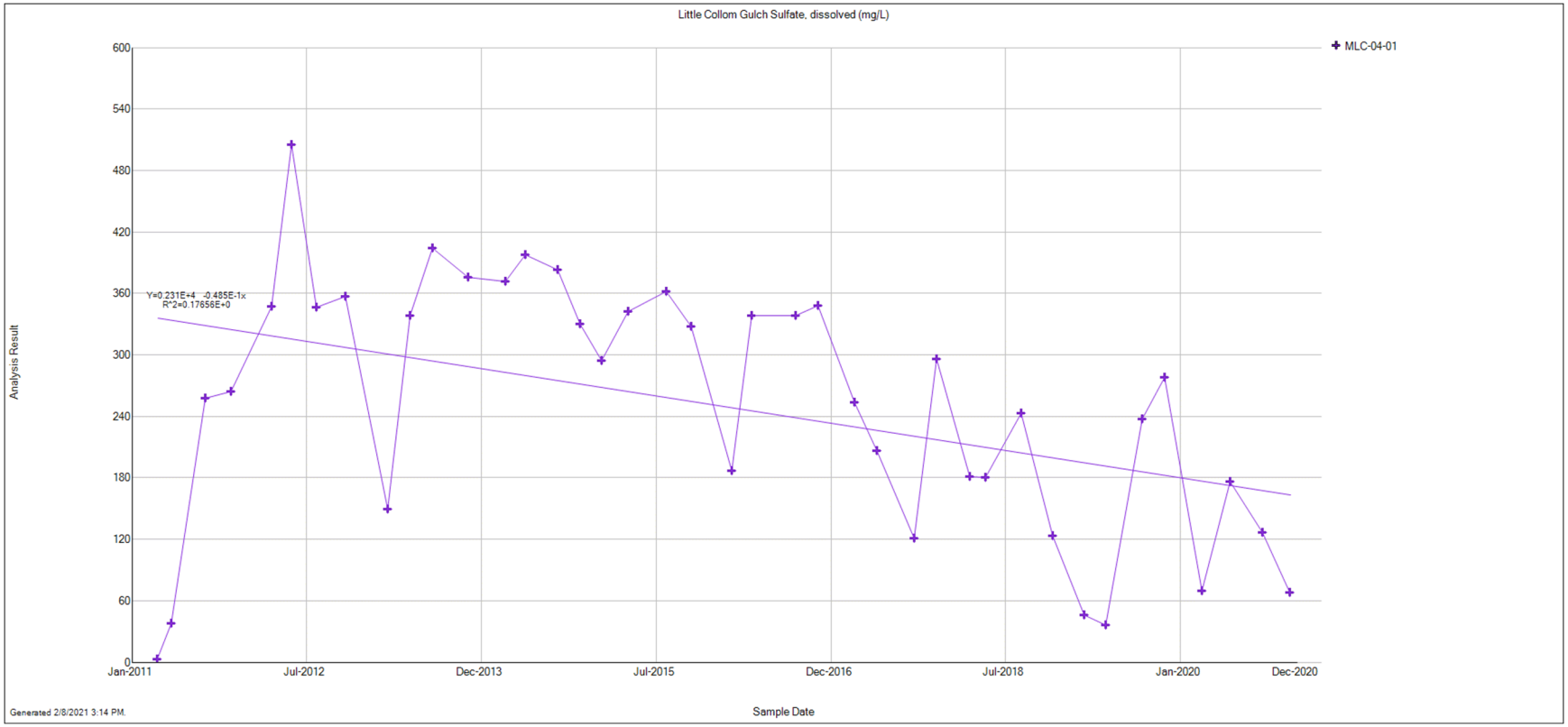

Little Collom Gulch Specific Conductance @ 25C (lab) (umhos/cm)
MLC-04-01
Y=0.684E+4 -0.135E+0x
R^2=0.12583E+0
Analysis Result
2600
2340
2080
1820
1560
1300
1040
780
520
260
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:14 PM.

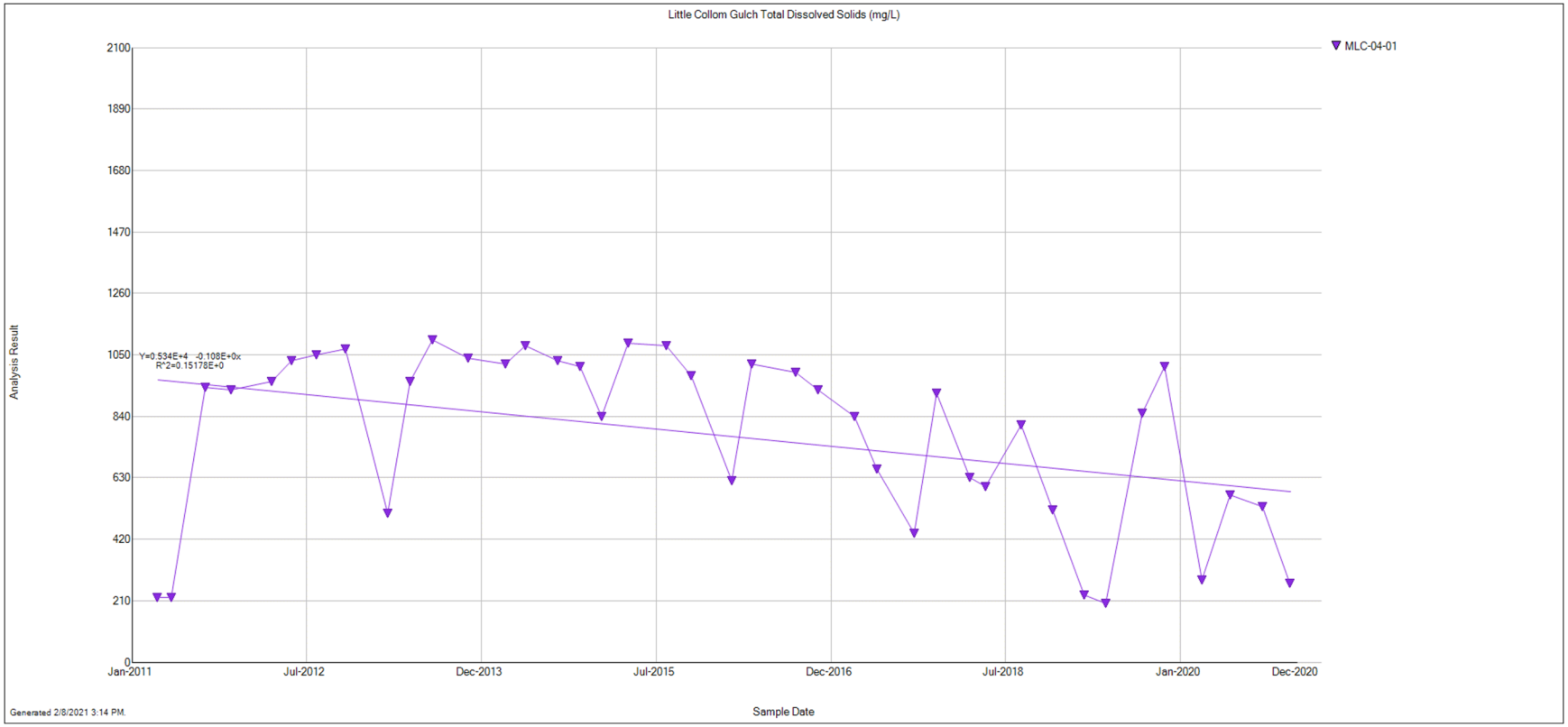

Little Collom Gulch Iron, dissolved (mg/L)
MLC-04-01
Analysis Result
0.315
0.28
0.245
0.21
0.175
0.14
0.105
0.07
0.035
0
Y=0.422E+0 -0.874E-5x
R^2=0.58154E-1
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:14 PM.
Sample Date

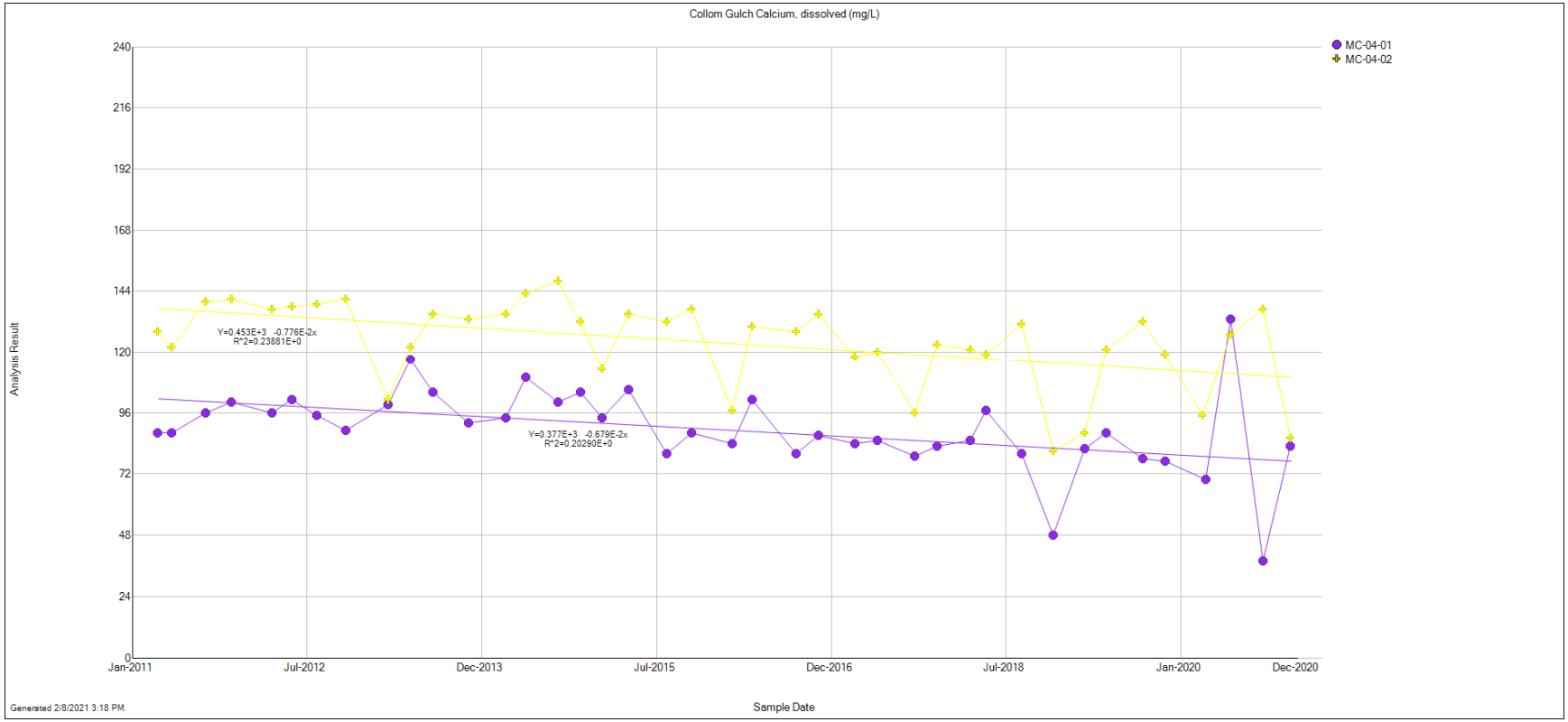

Little Collom Gulch Magnesium, dissolved (mg/L)
MLC-04-01
Analysis Result
105
94.5
84
73.5
63
52.5
42
31.5
21
10.5
0
Y=0.440E+3 -0.887E-2x
R^2=0.13471E+0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:14 PM.
Sample Date

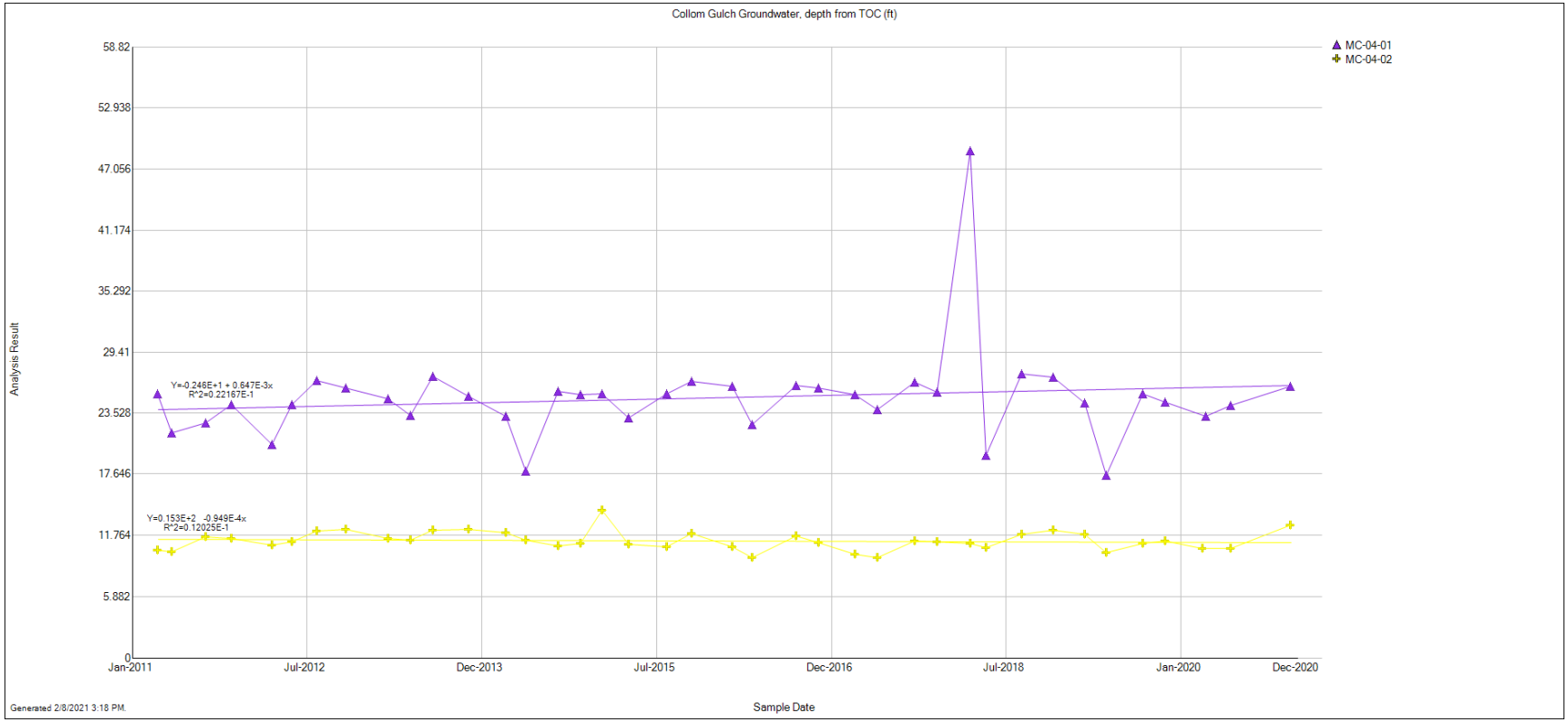

Little Collom Gulch pH (lab)
MLC-04-01
Y=0.427E+1 + 0.912E-4x
R^2=0.21882E+0
Analysis Result
9
8.75
8.5
8.25
8
7.75
7.5
7.25
7
6.75
6.5
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:14 PM.
Sample Date

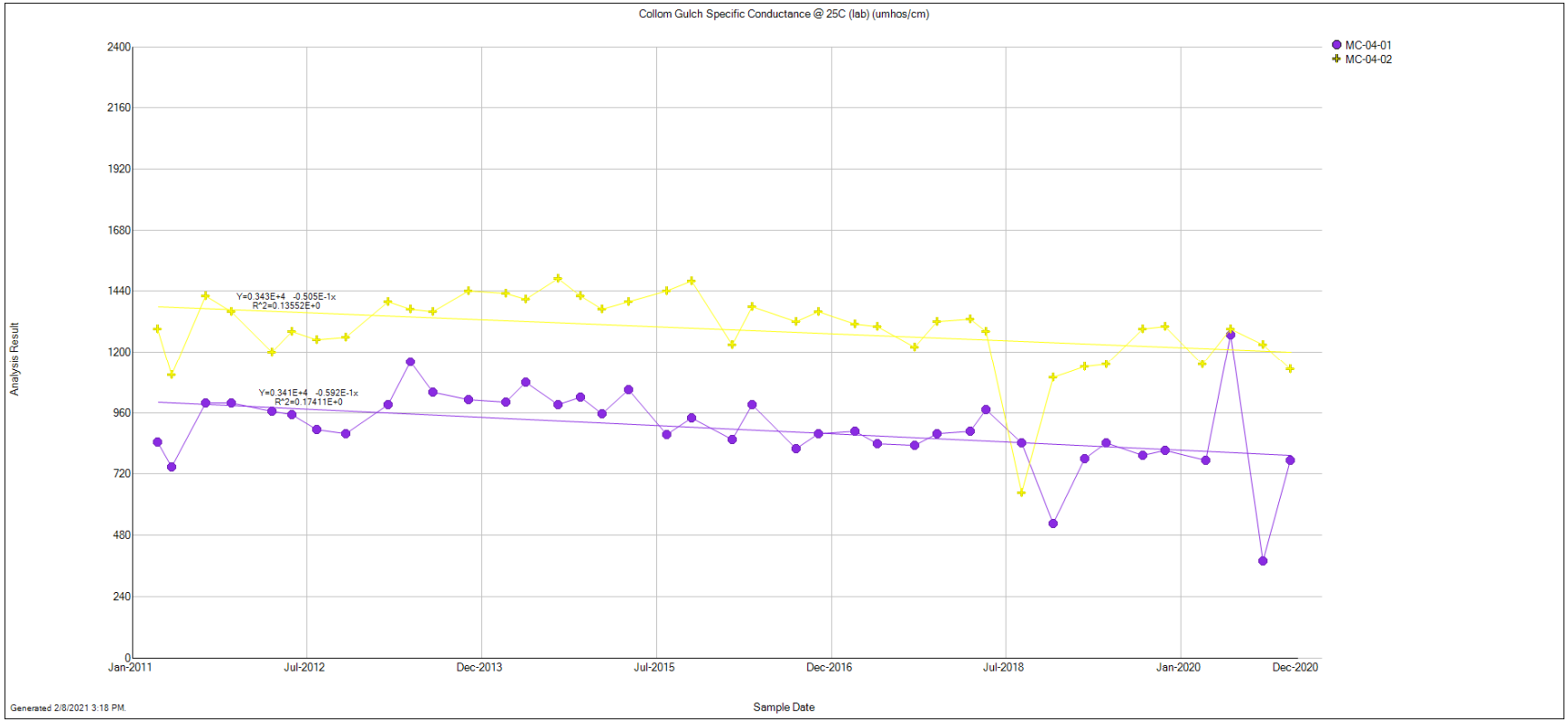

Little Collom Gulch Sodium, dissolved (mg/L)
MLC-04-01
Y=0.257E+3 -0.512E-2x
R^2=0.94536E-1
Analysis Result
88
79.2
70.4
61.6
52.8
44
35.2
26.4
17.6
8.8
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:14 PM.

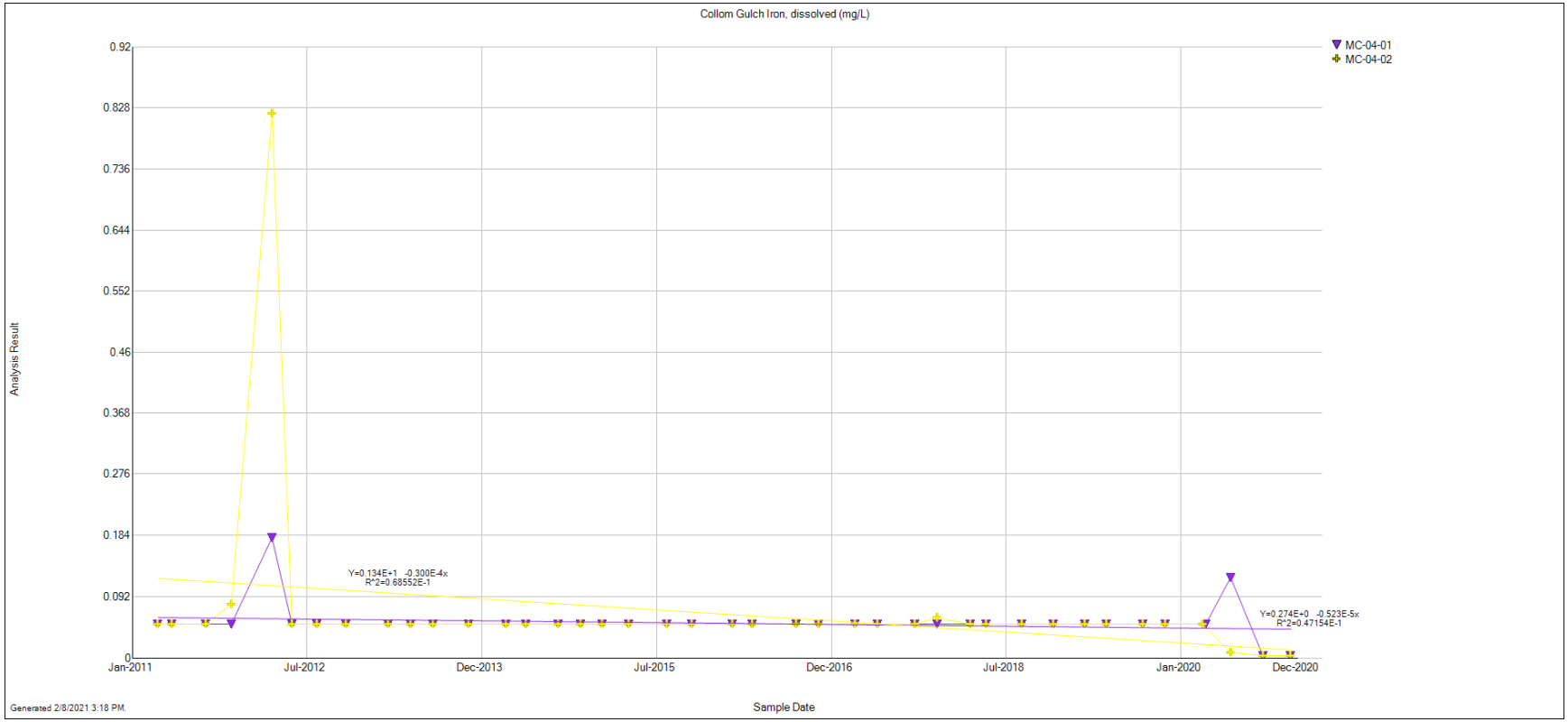

Little Collom Gulch Sulfate, dissolved (mg/L)
MLC-04-01
Y=0.231E+4 -0.485E-1x
R^2=0.17656E+0
Analysis Result
600
540
480
420
360
300
240
180
120
60
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:14 PM.
Sample Date

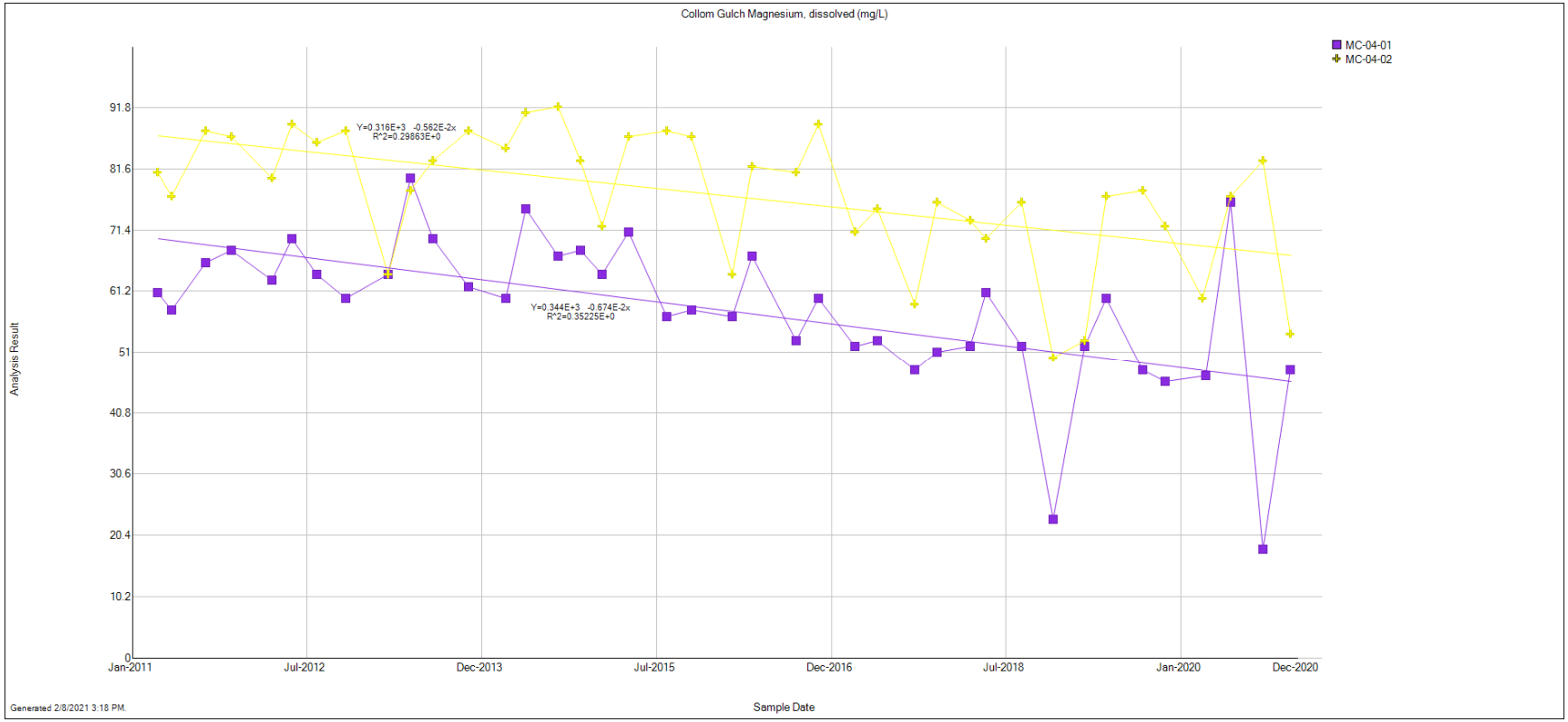

Little Collom Gulch Total Dissolved Solids (mg/L)
MLC-04-01
Y=0.534E+4 -0.108E+0x
R^2=0.15178E+0
2100
1890
1680
1470
1260
1050
840
630
420
210
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:14 PM.

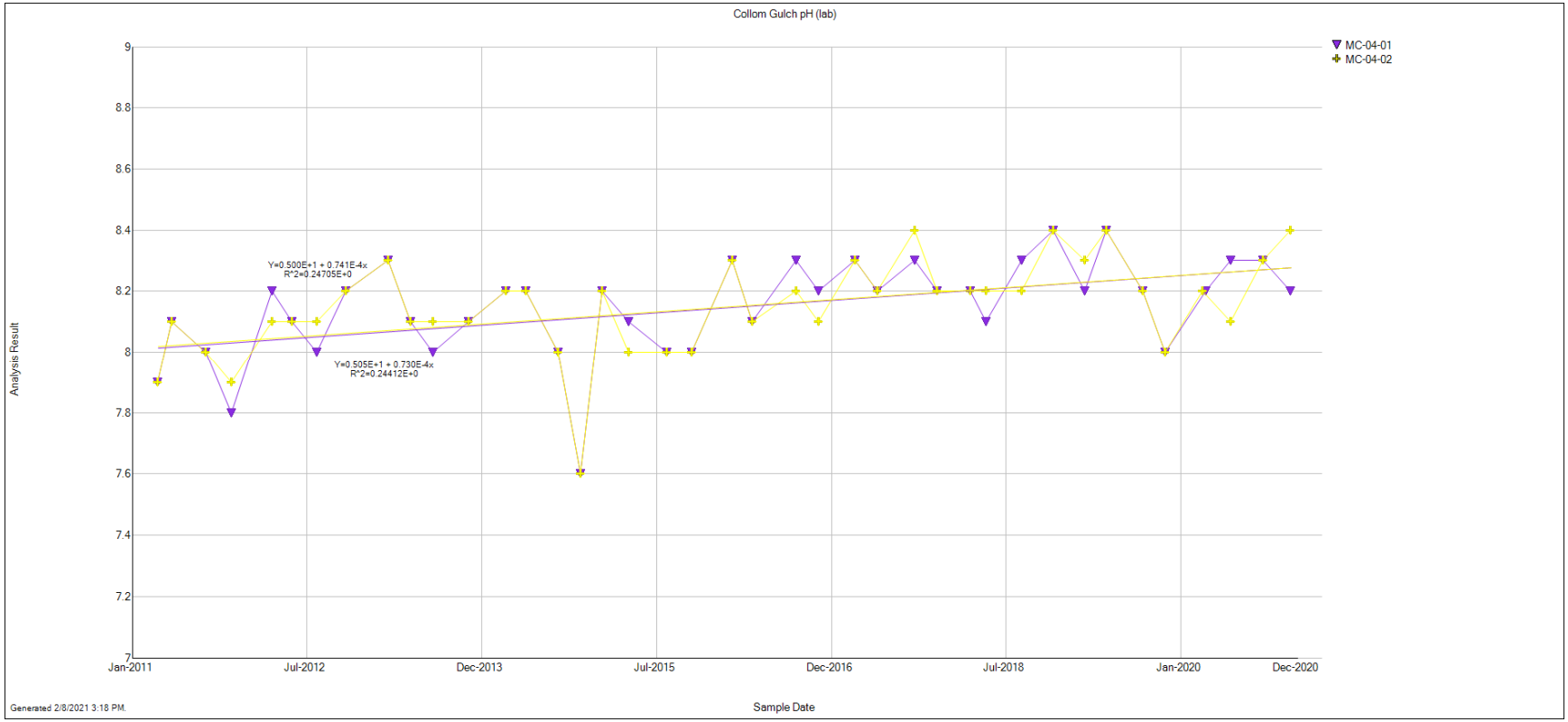

Collom Gulch Calcium, dissolved (mg/L)
MC-04-01
MC-04-02
Y=0.453E+3 -0.776E-2x
R^2=0.23881E+0
Y=0.377E+3 -0.679E-2x
R^2=0.20290E+0
Analysis Result
240
216
192
168
144
120
96
72
48
24
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:18 PM.
Sample Date

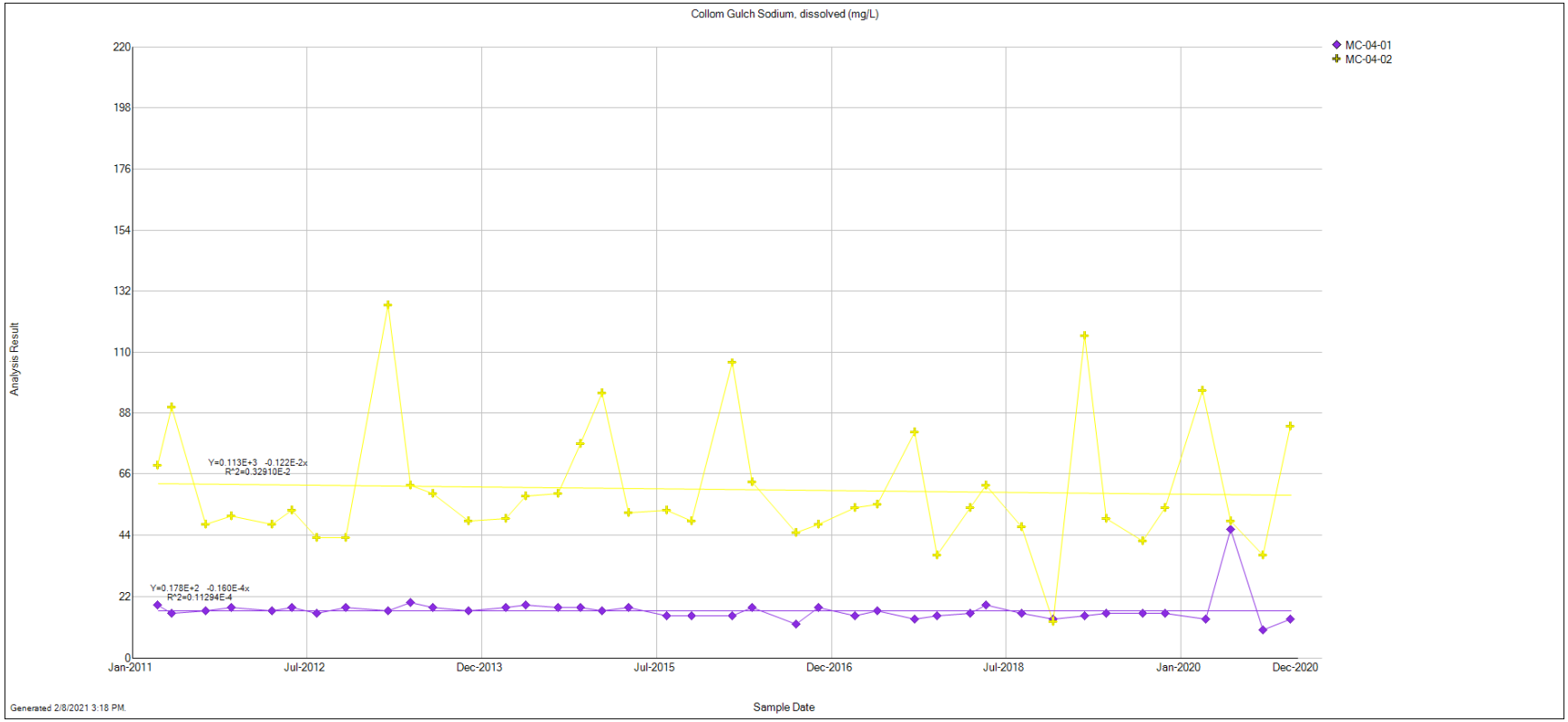

Collom Gulch Groundwater, depth from TOC (ft)
MC-04-01
MC-04-02
Y=-0.246E+1 + 0.647E-3x
R^2=0.22167E-1
Y=0.153E+2 -0.949E-4x
R^2=0.12025E-1
58.82
52.938
47.056
41.174
35.292
29.41
23.528
17.646
11.764
5.882
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:18 PM.

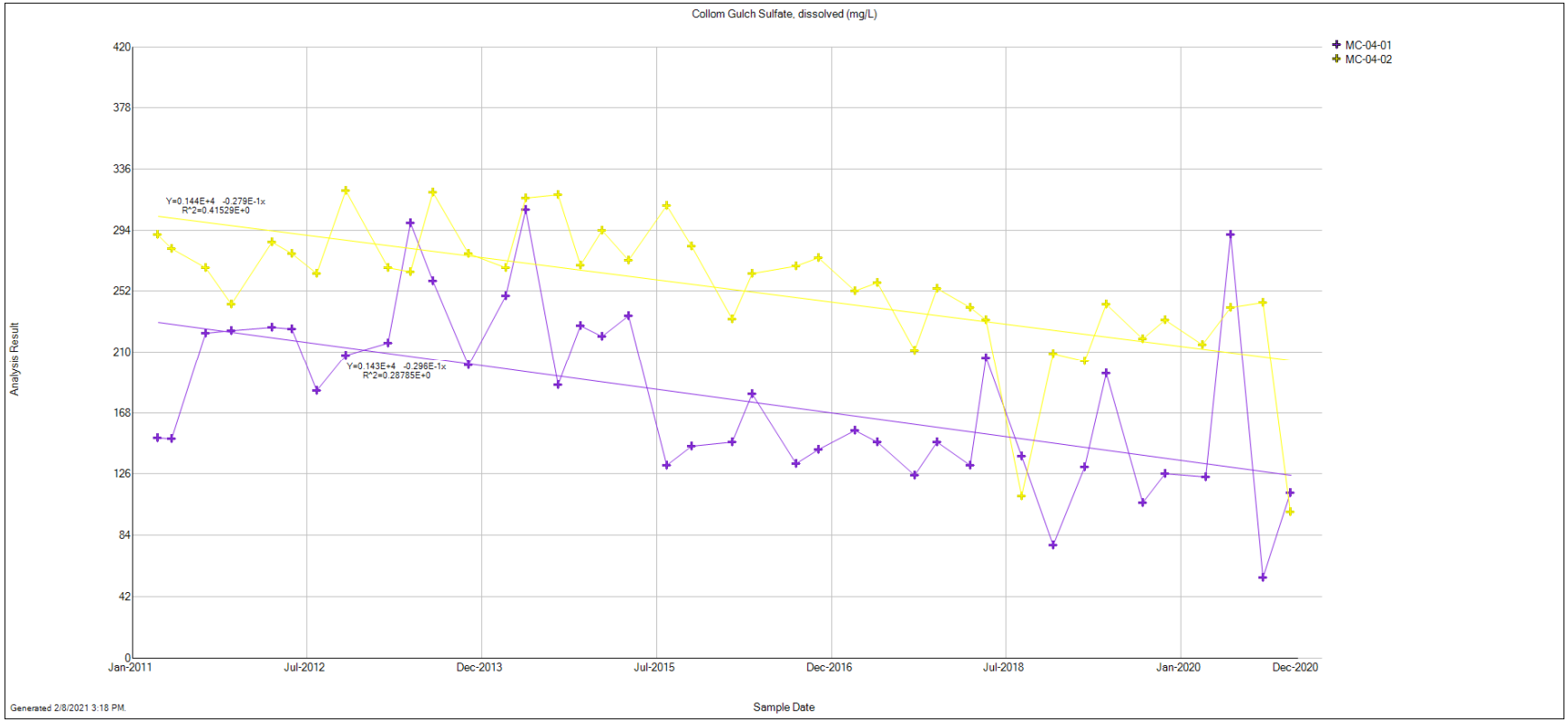

Collom Gulch Specific Conductance @ 25C (lab) (umhos/cm)
MC-04-01
MC-04-02
Y=0.343E+4 -0.505E-1x
R^2=0.13552E+0
Y=0.341E+4 -0.592E-1x
R^2=0.17411E+0
2400
2160
1920
1680
1440
1200
960
720
480
240
0
Analysis Result
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:18 PM.

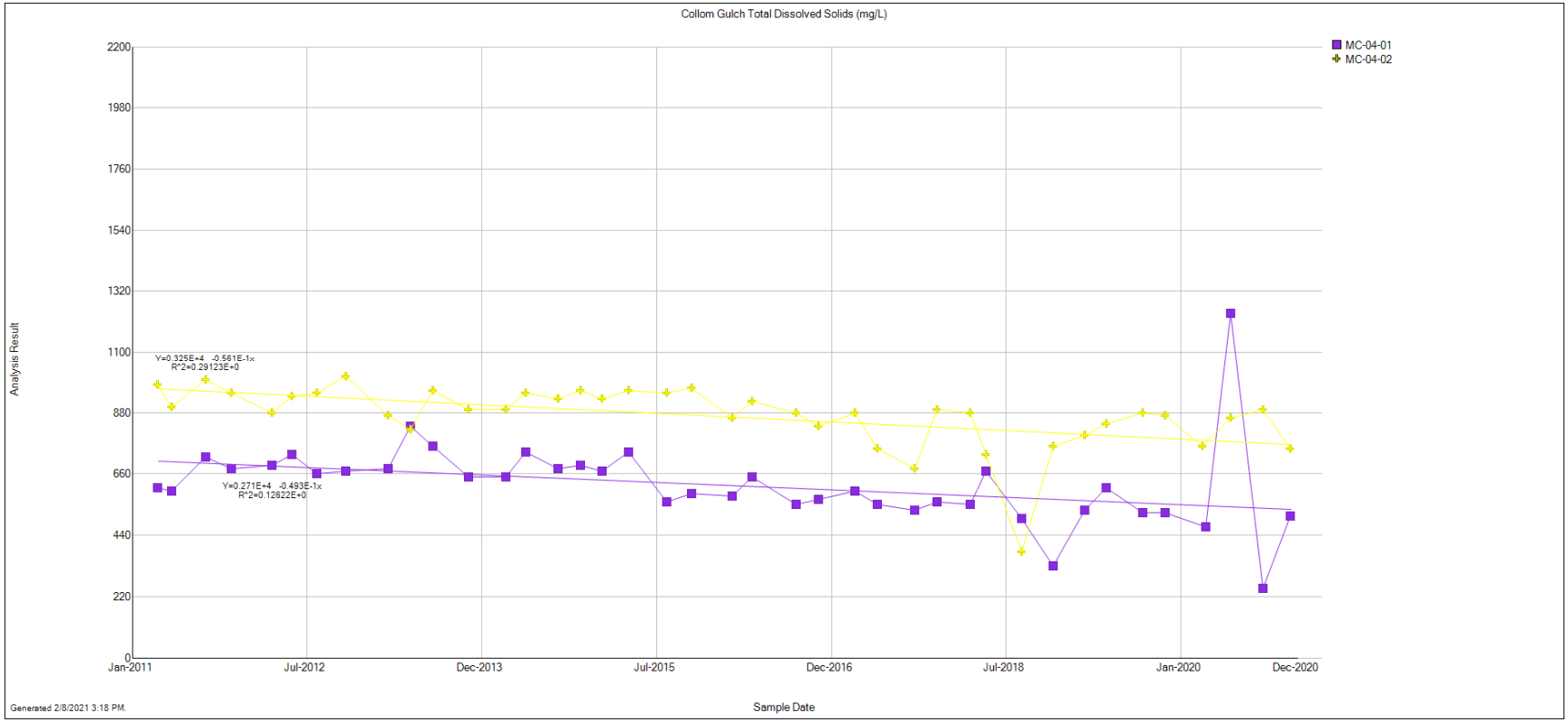

Collom Gulch Iron, dissolved (mg/L)
MC-04-01
MC-04-02
Analysis Result
0.92
0.828
0.736
0.644
0.552
0.46
0.368
0.276
0.184
0.092
0
Y=0.134E+1 -0.300E-4x
R^2=0.68552E-1
Y=0.274E+0 -0.523E-5x
R^2=0.47154E-1
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:18 PM.
Sample Date

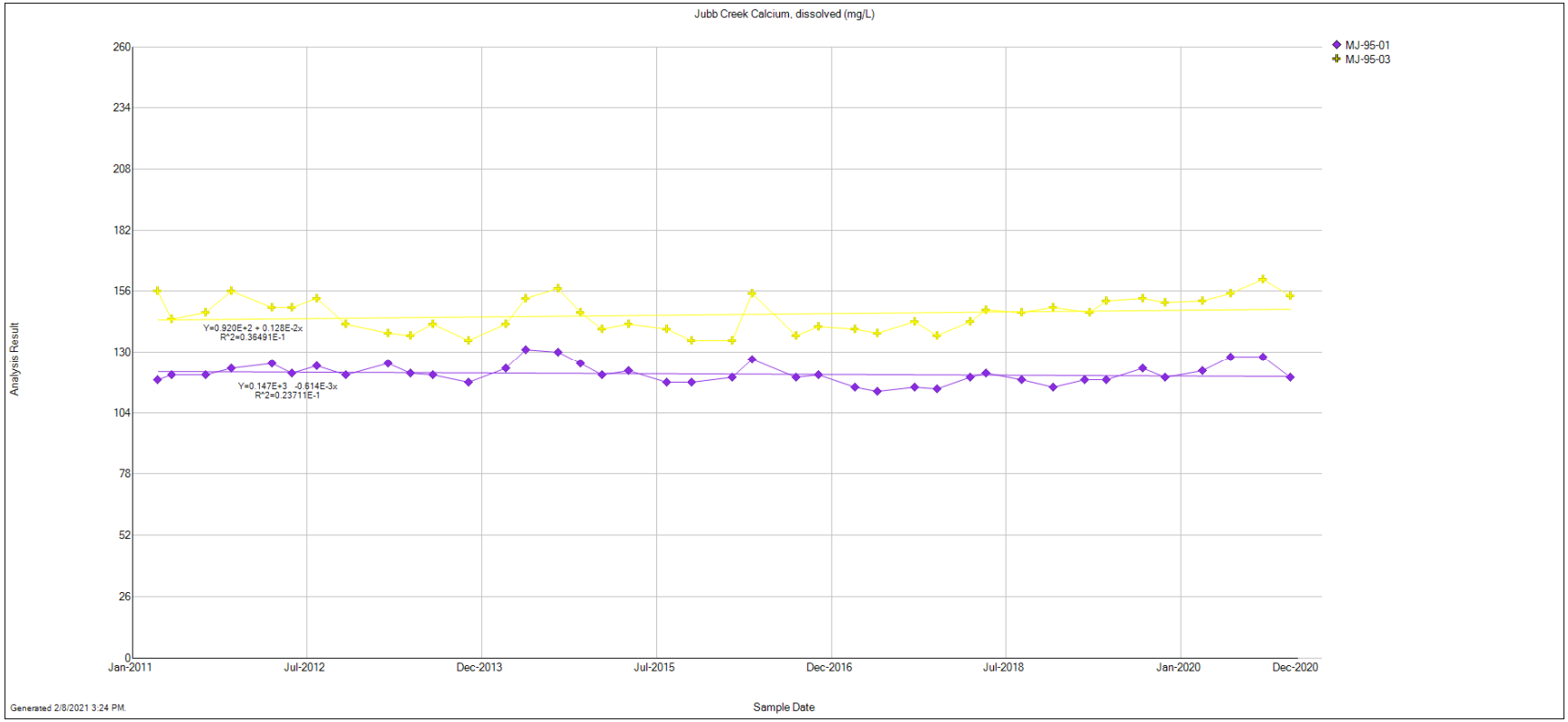

Collom Gulch Magnesium, dissolved (mg/L)
MC-04-01
MC-04-02
Y=0.316E+3 -0.562E-2x
R^2=0.29863E+0
Y=0.344E+3 -0.674E-2x
R^2=0.35225E+0
Analysis Result
91.8
81.6
71.4
61.2
51
40.8
30.6
20.4
10.2
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:18 PM.

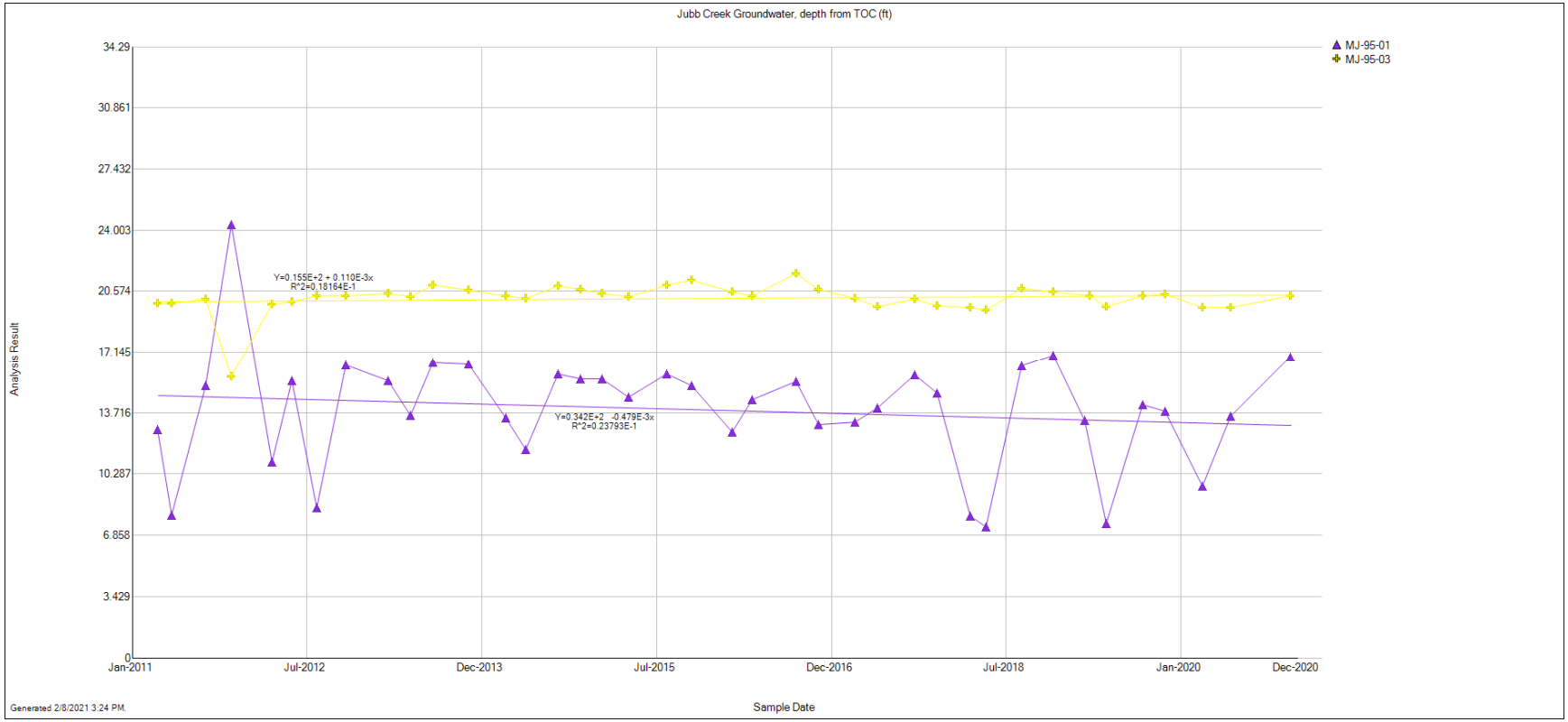

Collom Gulch pH (lab)
MC-04-01
MC-04-02
Y=0.500E+1 + 0.741E-4x
R^2=0.24705E+0
Y=0.505E+1 + 0.730E-4x
R^2=0.24412E+0
Analysis Result
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:18 PM.
Sample Date

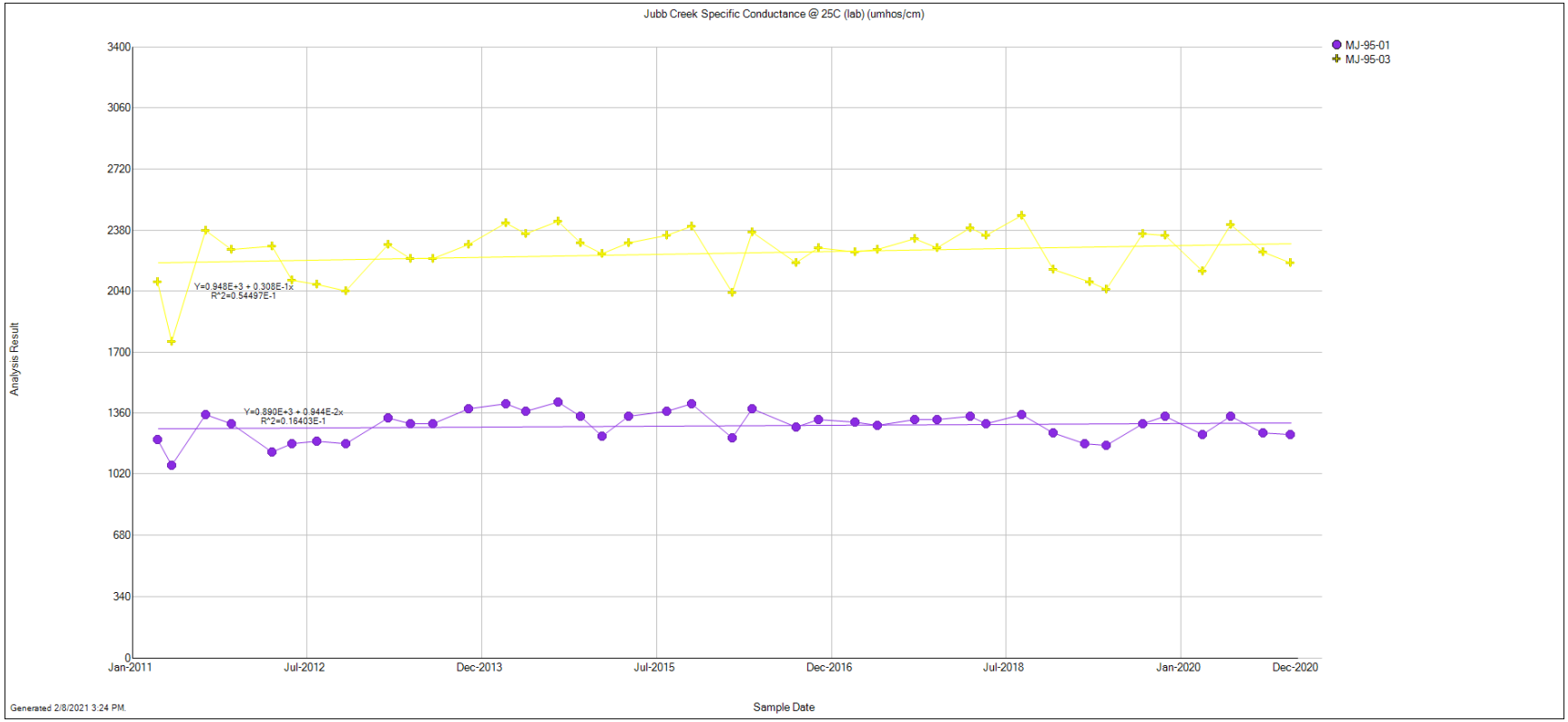

Collom Gulch Sodium, dissolved (mg/L)
MC-04-01
MC-04-02
Analysis Result
220
198
176
154
132
110
88
66
44
22
0
Y=0.113E+3 -0.122E-2x
R^2=0.32910E-2
Y=0.178E+2 -0.160E-4x
R^2=0.11294E-4
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:18 PM.
Sample Date

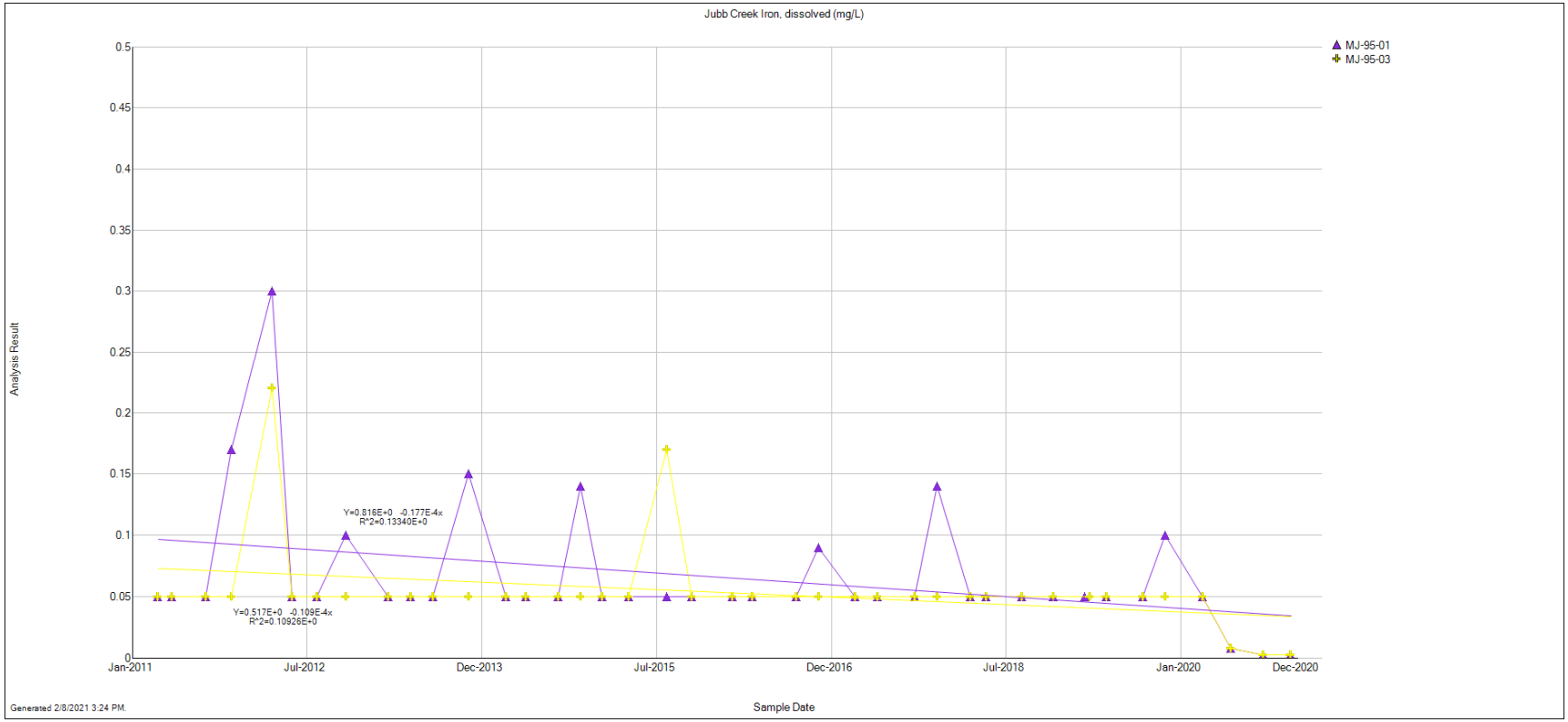

Collom Gulch Sulfate, dissolved (mg/L)
MC-04-01
MC-04-02
Y=0.144E+4 -0.279E-1x
R^2=0.41529E+0
Y=0.143E+4 -0.296E-1x
R^2=0.28785E+0
Analysis Result
420
378
336
294
252
210
168
126
84
42
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:18 PM.
Sample Date

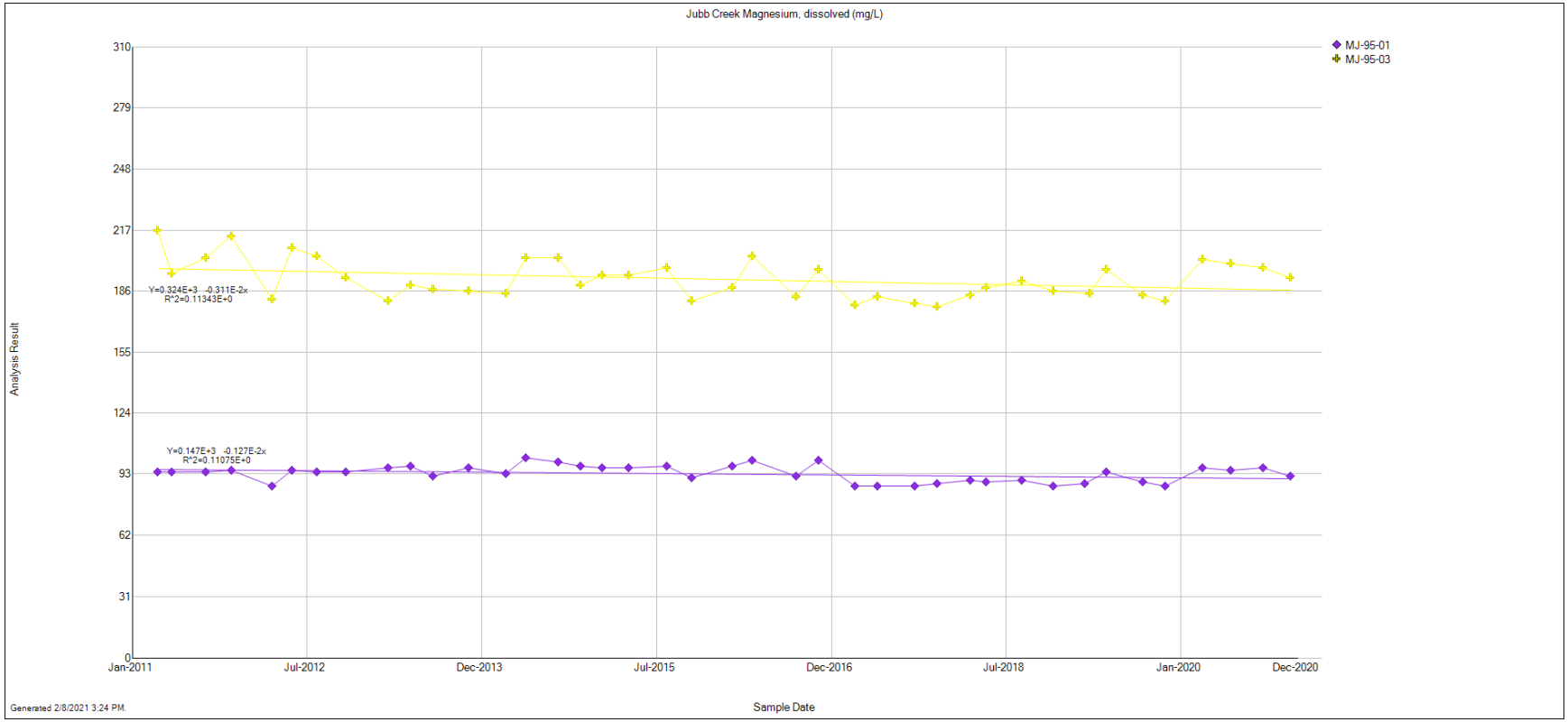

Collom Gulch Total Dissolved Solids (mg/L)
MC-04-01
MC-04-02
Y=0.325E+4 -0.561E-1x
R^2=0.29123E+0
Y=0.271E+4 -0.493E-1x
R^2=0.12622E+0
2200
1980
1760
1540
1320
1100
880
660
440
220
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:18 PM.

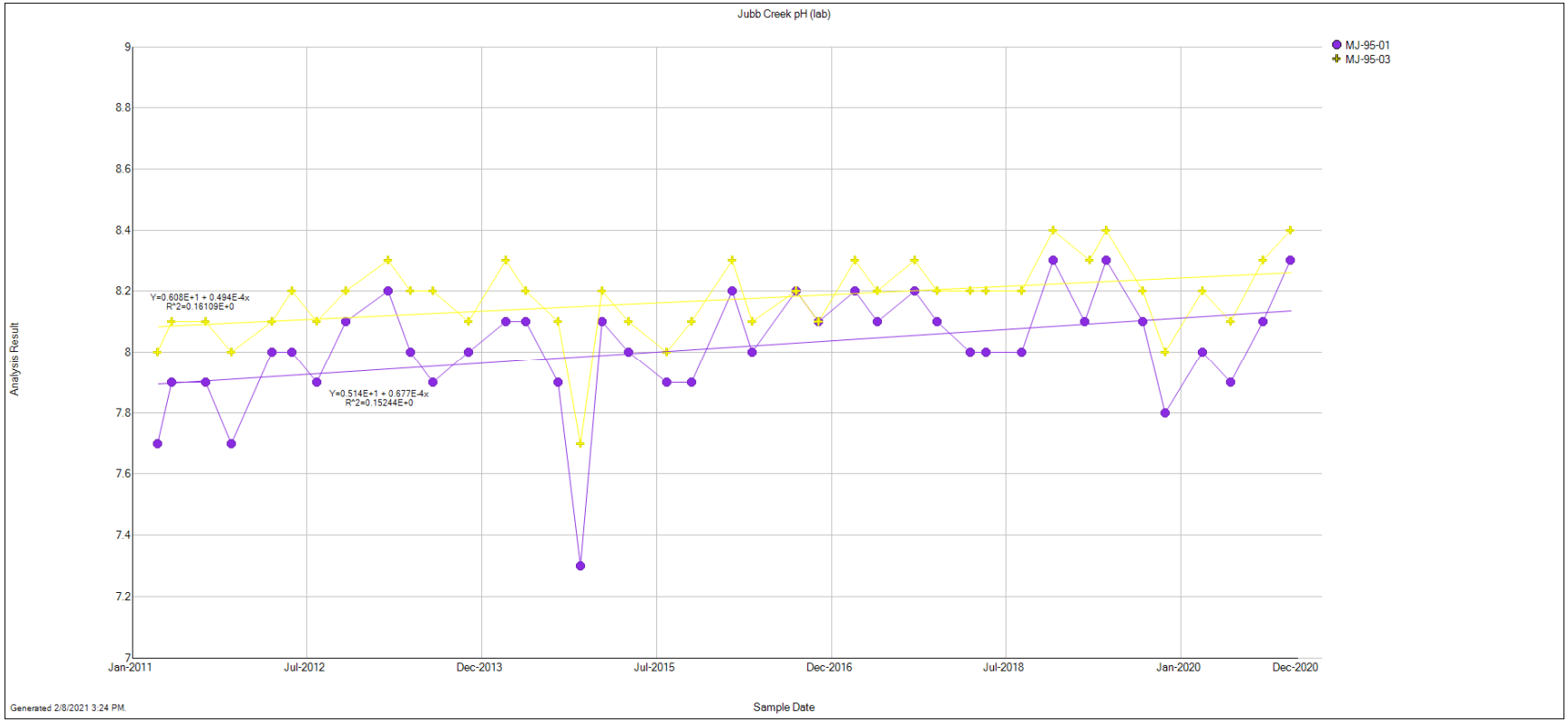

Jubb Creek Calcium, dissolved (mg/L)
MJ-95-01
MJ-95-03
Y=0.920E+2 + 0.128E-2x
R^2=0.36491E-1
Y=0.147E+3 -0.814E-3x
R^2=0.23711E-1
Analysis Result
260
234
208
182
156
130
104
78
52
26
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:24 PM.
Sample Date

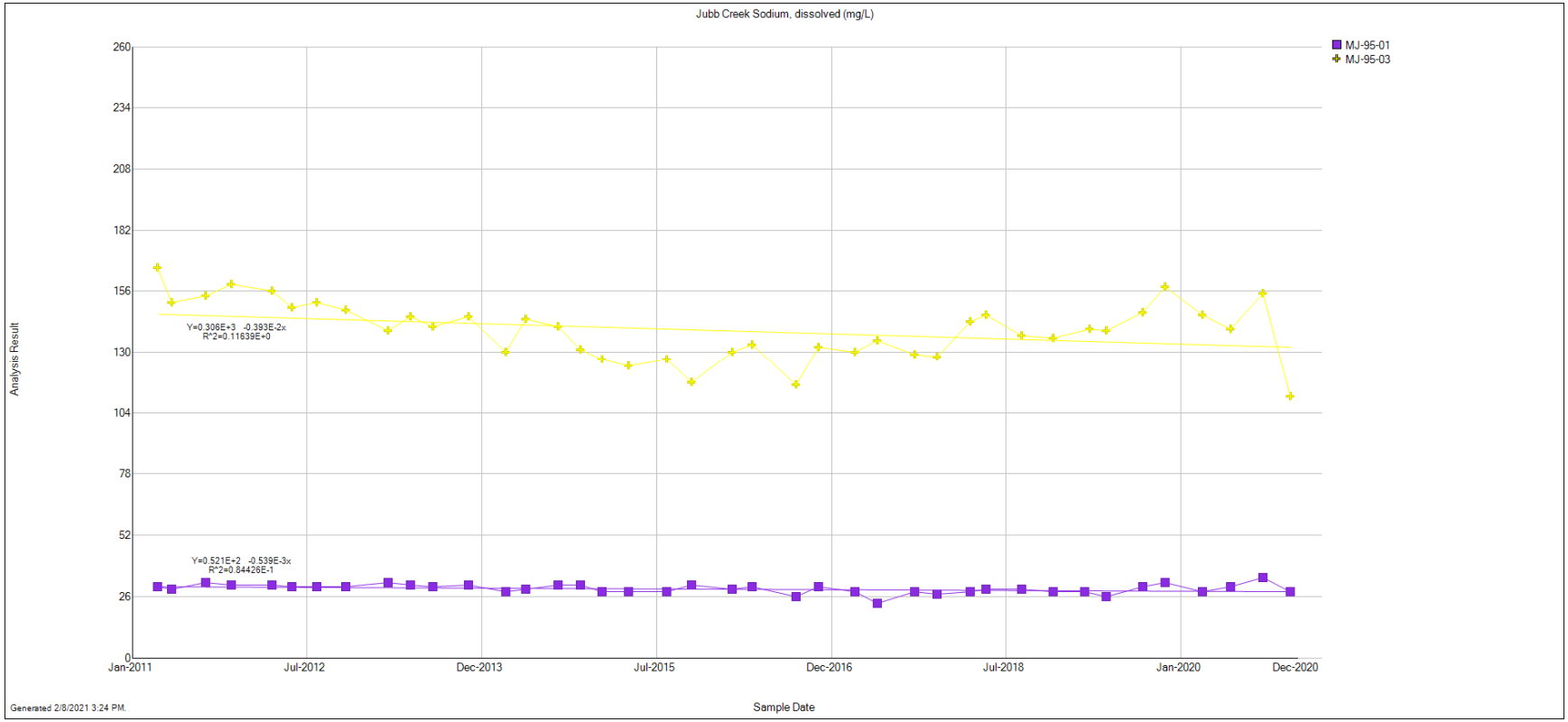

Jubb Creek Groundwater, depth from TOC (ft)
MJ-95-01
MJ-95-03
Y=0.155E+2 + 0.110E-3x
R^2=0.18164E-1
Y=0.342E+2 -0.479E-3x
R^2=0.23793E-1
34.29
30.861
27.432
24.003
20.574
17.145
13.716
10.287
6.858
3.429
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:24 PM.

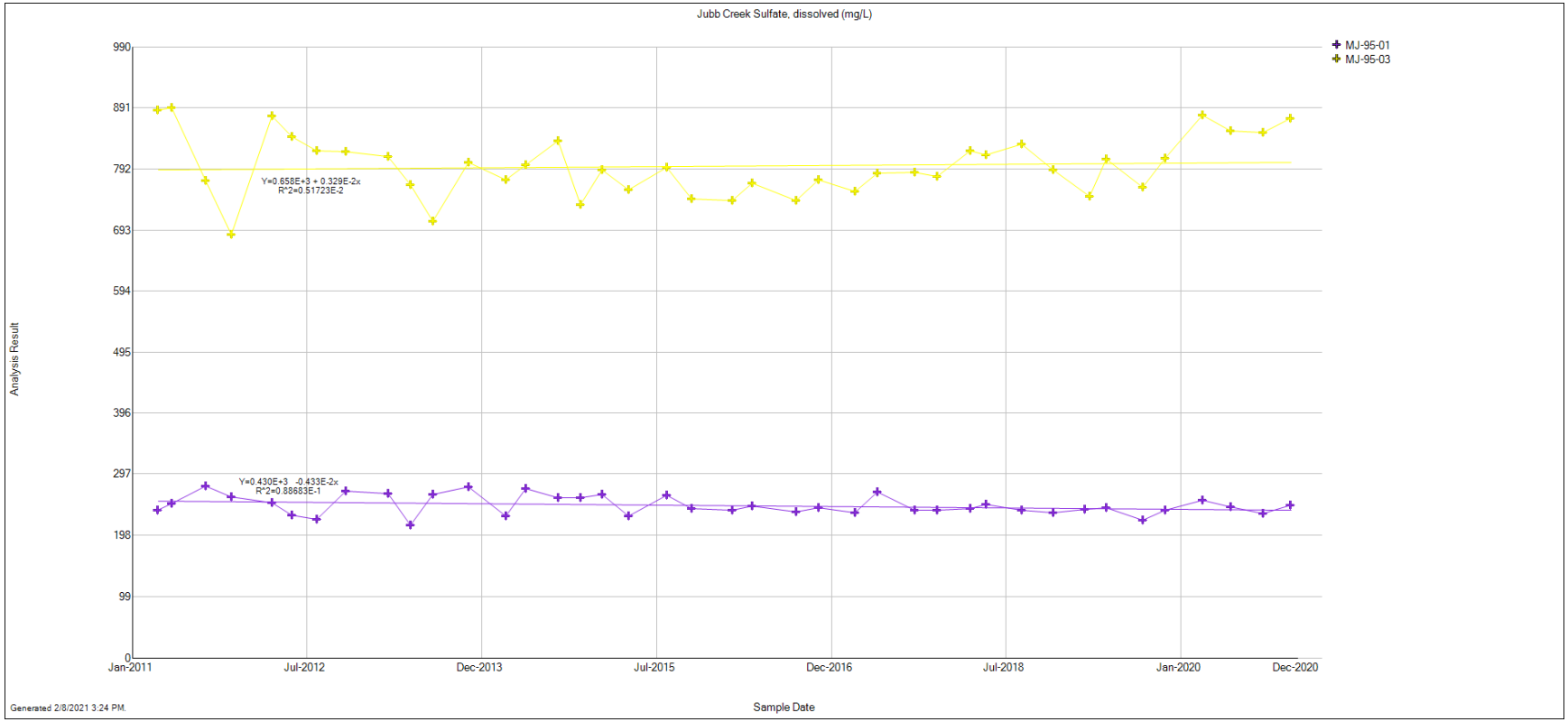

Jubb Creek Specific Conductance @ 25C (lab) (umhos/cm)
MJ-95-01
MJ-95-03
Y=0.948E+3 + 0.308E-1x
R^2=0.54497E-1
Y=0.890E+3 + 0.944E-2x
R^2=0.16403E-1
Analysis Result
3400
3060
2720
2380
2040
1700
1360
1020
680
340
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:24 PM.
Sample Date

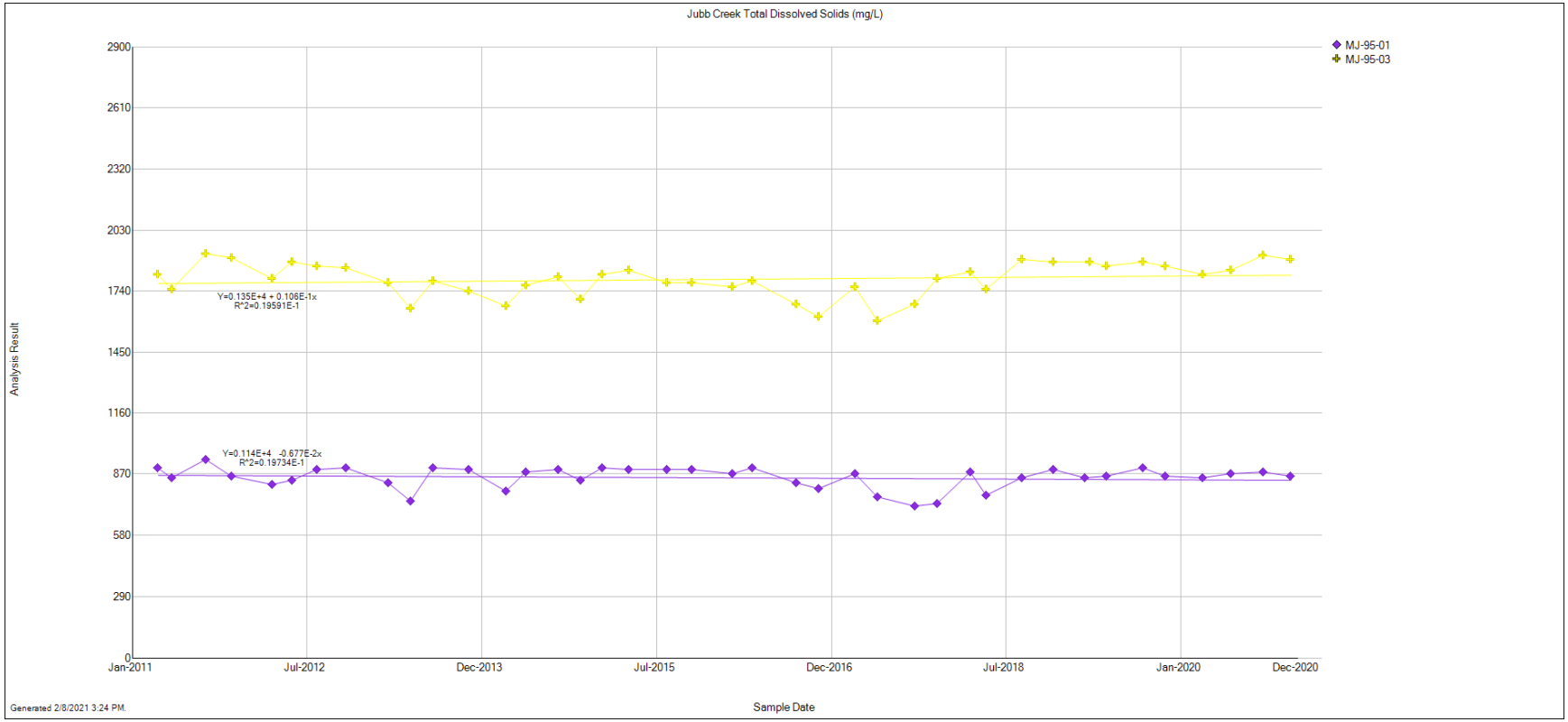

Jubb Creek Iron, dissolved (mg/L)
MJ-95-01
MJ-95-03
Analysis Result
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Y=0.816E+0 -0.177E-4x
R^2=0.13340E+0
Y=0.517E+0 -0.109E-4x
R^2=0.10926E+0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:24 PM.
Sample Date

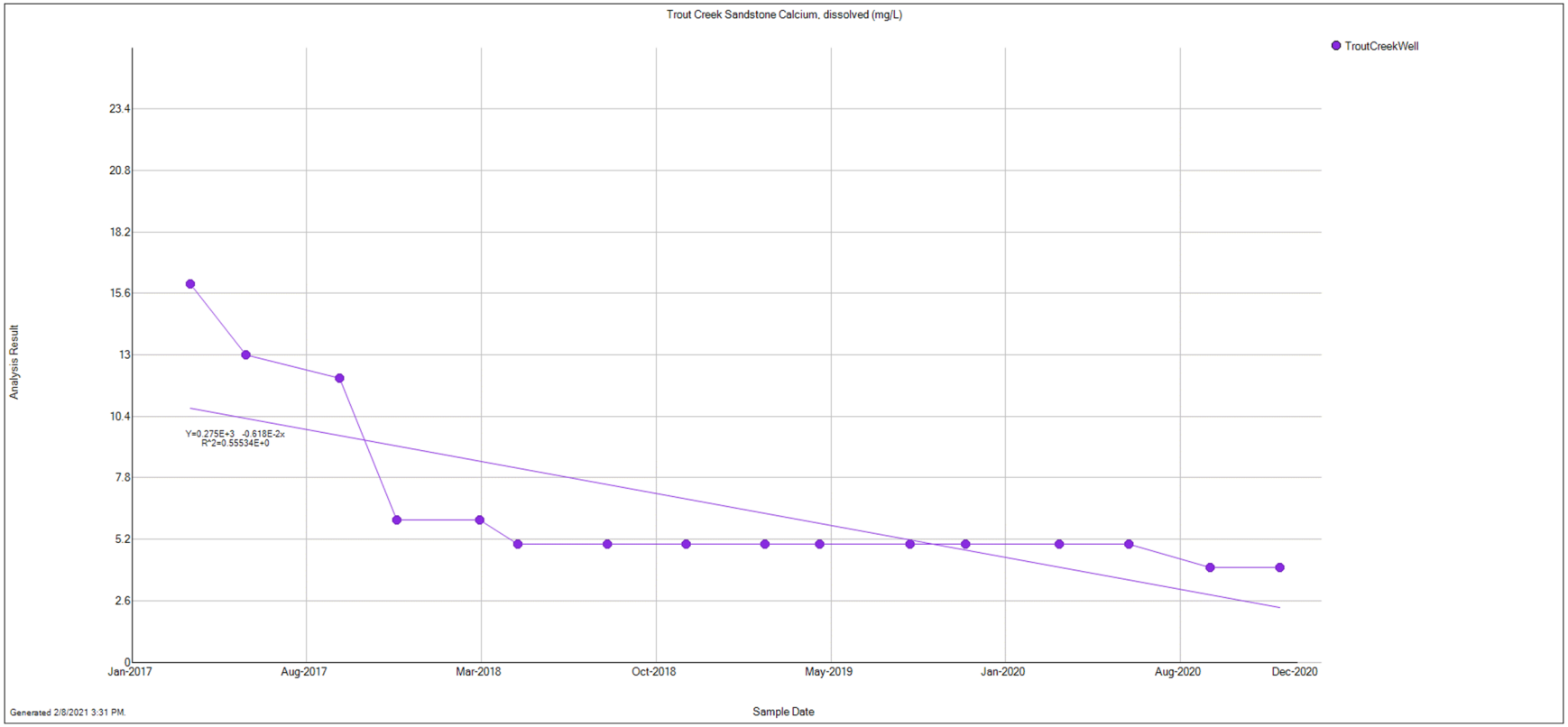

Jubb Creek Magnesium, dissolved (mg/L)
MJ-95-01
MJ-95-03
Y=0.324E+3 -0.311E-2x
R^2=0.11343E+0
Y=0.147E+3 -0.127E-2x
R^2=0.11075E+0
Analysis Result
310
279
248
217
186
155
124
93
62
31
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:24 PM.

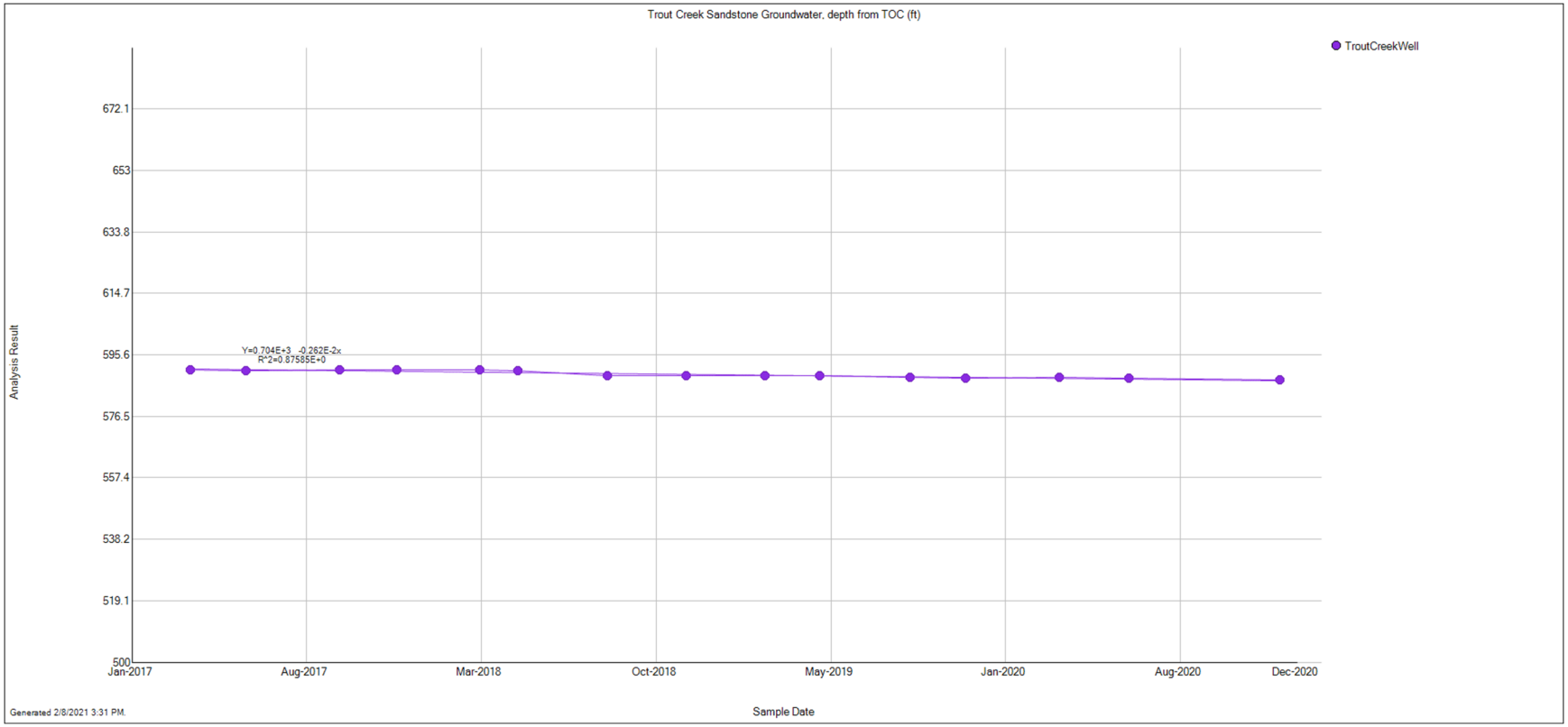

Jubb Creek pH (lab)
MJ-95-01
MJ-95-03
Y=0.608E+1 + 0.494E-4x
R^2=0.16109E+0
Y=0.514E+1 + 0.677E-4x
R^2=0.15244E+0
Analysis Result
9
8.8
8.6
8.4
8.2
8
7.8
7.6
7.4
7.2
7
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Generated 2/8/2021 3:24 PM.
Sample Date

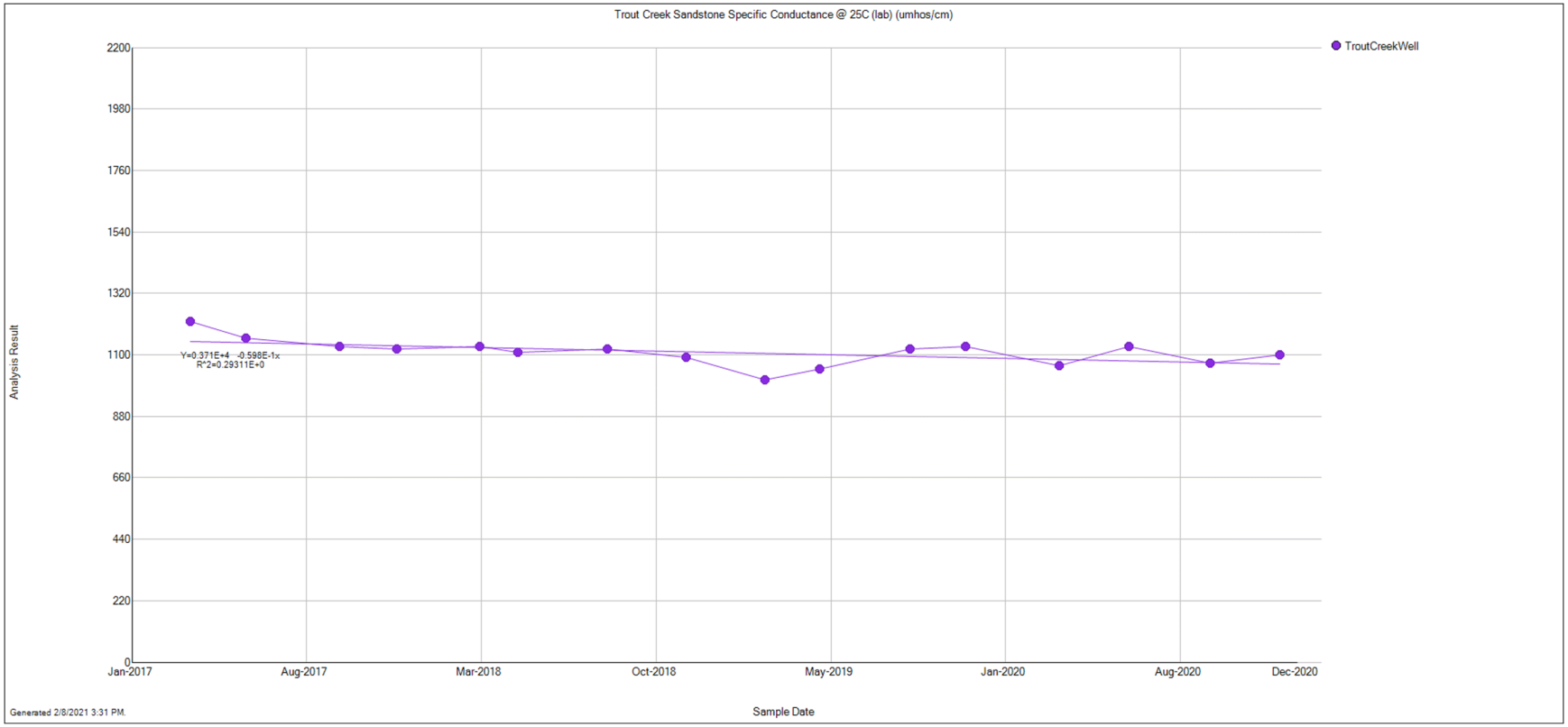

Jubb Creek Sodium, dissolved (mg/L)
MJ-95-01
MJ-95-03
Y=0.306E+3 -0.393E-2x
R^2=0.11639E+0
Y=0.521E+2 -0.539E-3x
R^2=0.84426E-1
260
234
208
182
156
130
104
78
52
26
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:24 PM.

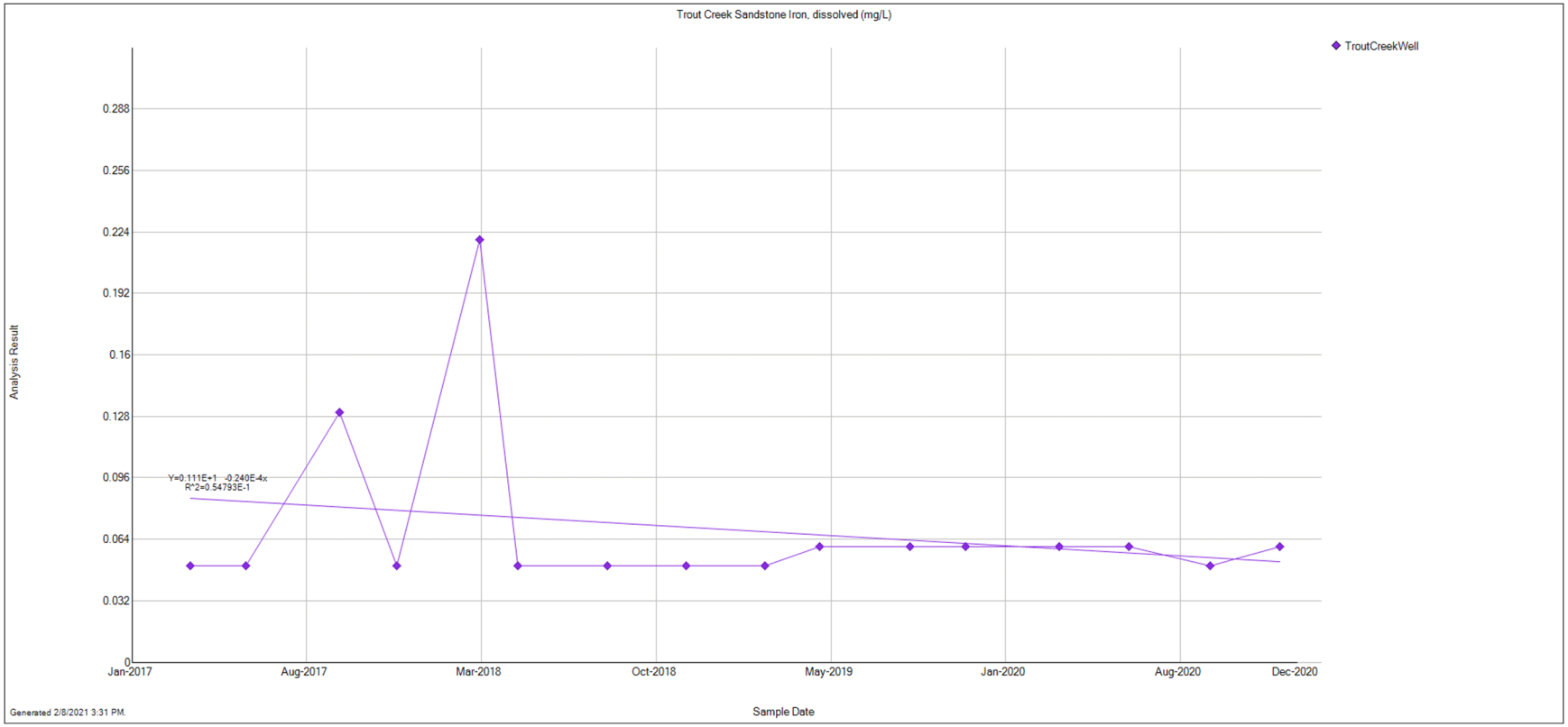

Jubb Creek Sulfate, dissolved (mg/L)
MJ-95-01
MJ-95-03
Y=0.658E+3 + 0.329E-2x
R^2=0.51723E-2
Y=0.430E+3 -0.433E-2x
R^2=0.88683E-1
990
891
792
693
594
495
396
297
198
99
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:24 PM.

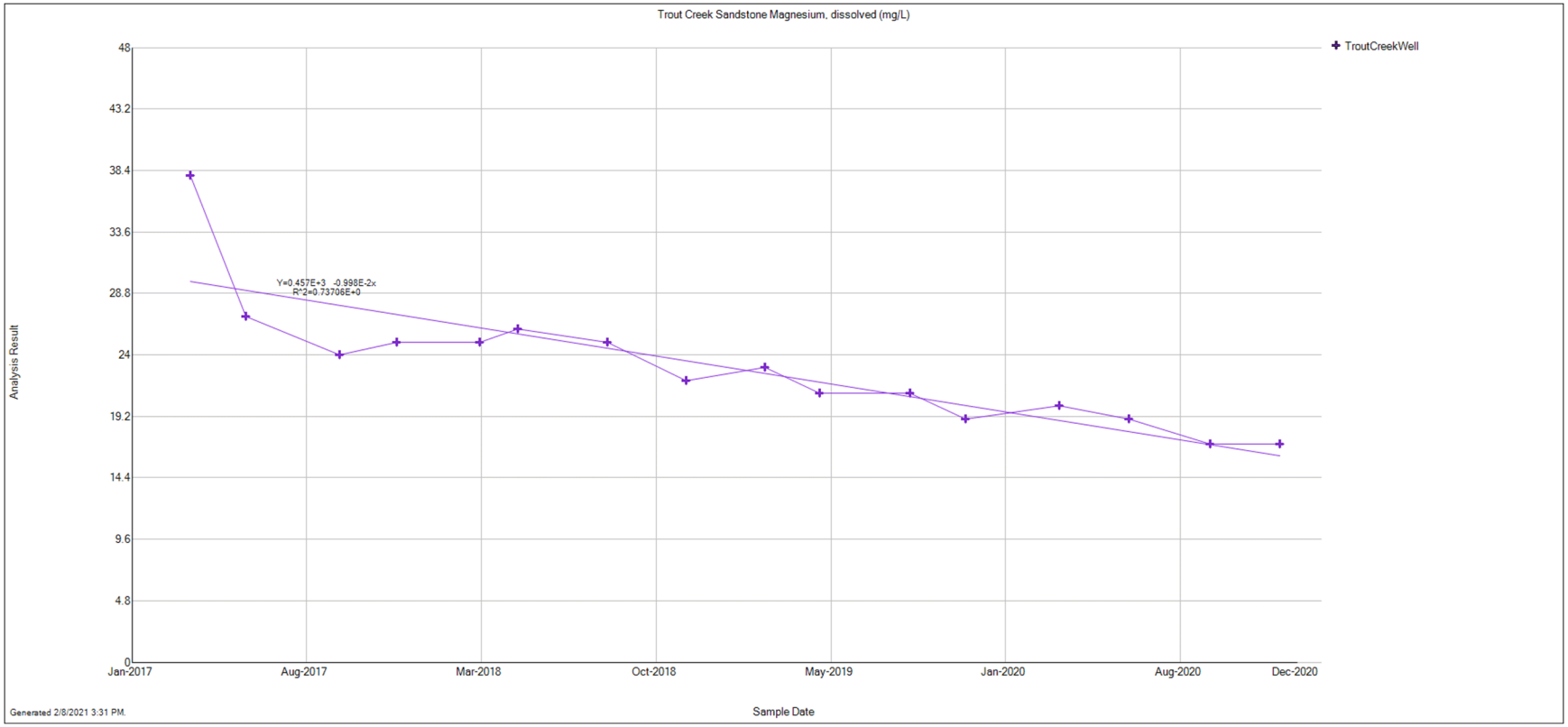

Jubb Creek Total Dissolved Solids (mg/L)
MJ-95-01
MJ-95-03
Y=0.135E+4 + 0.106E-1x
R^2=0.19591E-1
Y=0.114E+4 -0.677E-2x
R^2=0.19734E-1
2900
2610
2320
2030
1740
1450
1160
870
580
290
0
Jan-2011
Jul-2012
Dec-2013
Jul-2015
Dec-2016
Jul-2018
Jan-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:24 PM.

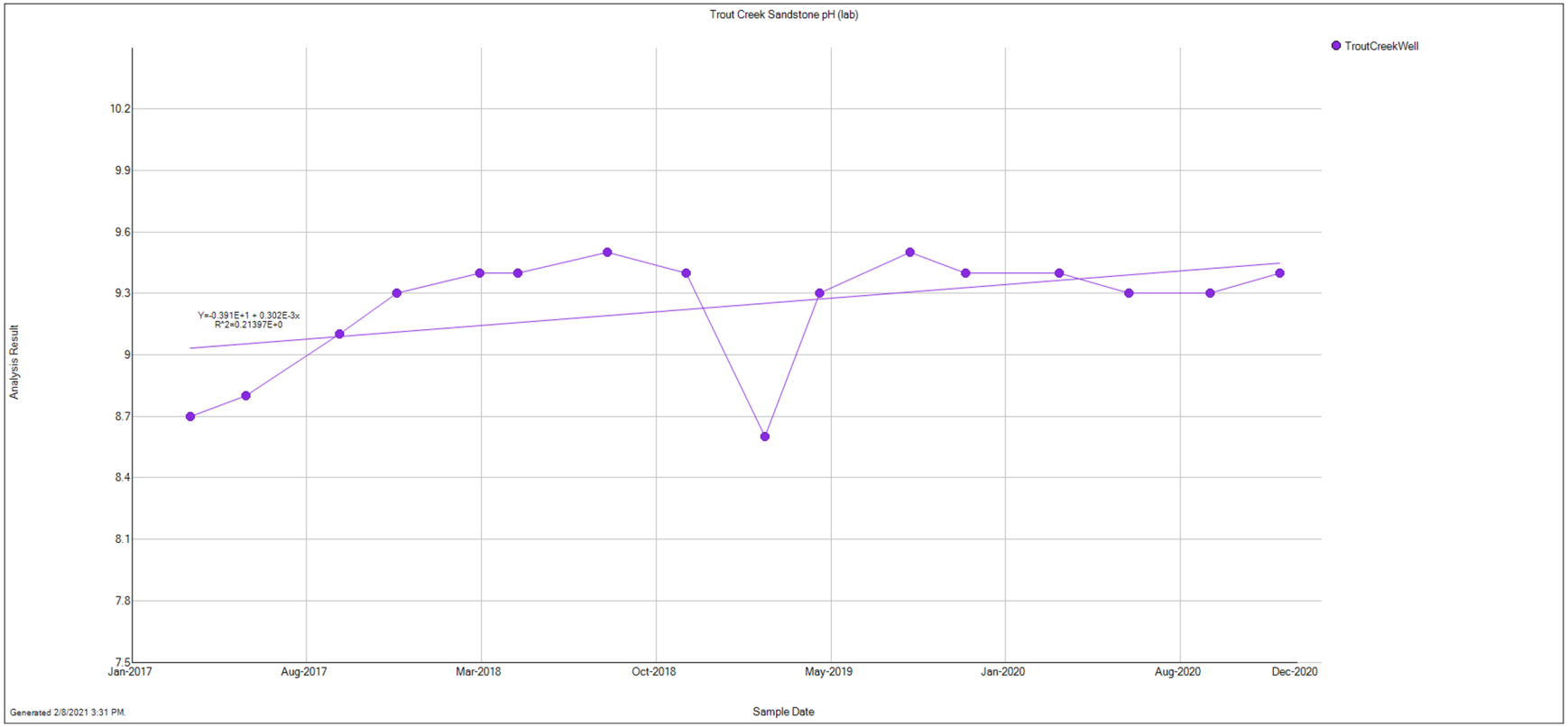

Trout Creek Sandstone Calcium, dissolved (mg/L)
TroutCreekWell
Analysis Result
23.4
20.8
18.2
15.6
13
10.4
7.8
5.2
2.6
0
Y=0.275E+3 -0.618E-2x
R^2=0.55534E+0
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:31 PM.

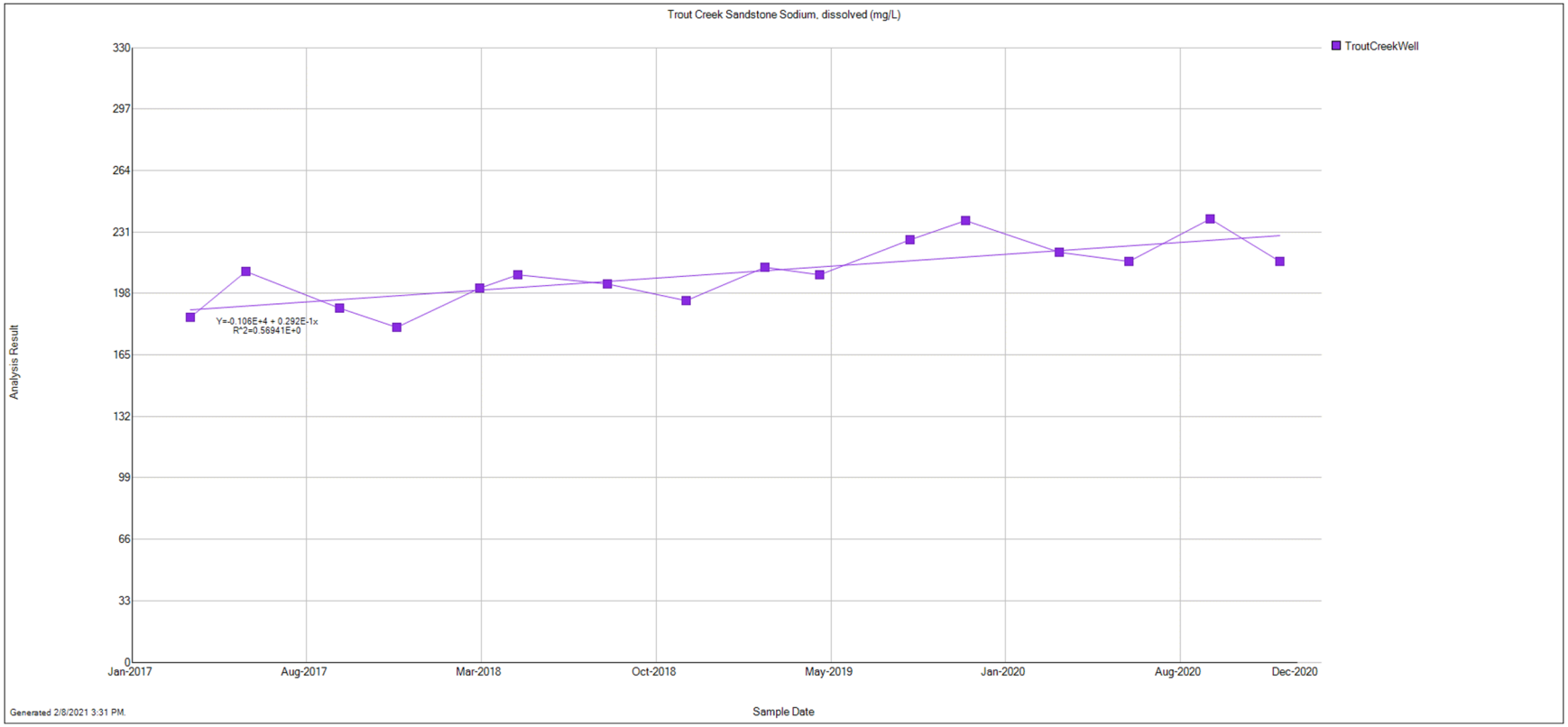

Trout Creek Sandstone Groundwater, depth from TOC (ft)
TroutCreekWell
Y=0.704E+3 -0.262E-2x
R^2=0.87585E+0
672.1
653
633.8
614.7
595.6
576.5
557.4
538.2
519.1
500
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Analysis Result
Sample Date
Generated 2/8/2021 3:31 PM.

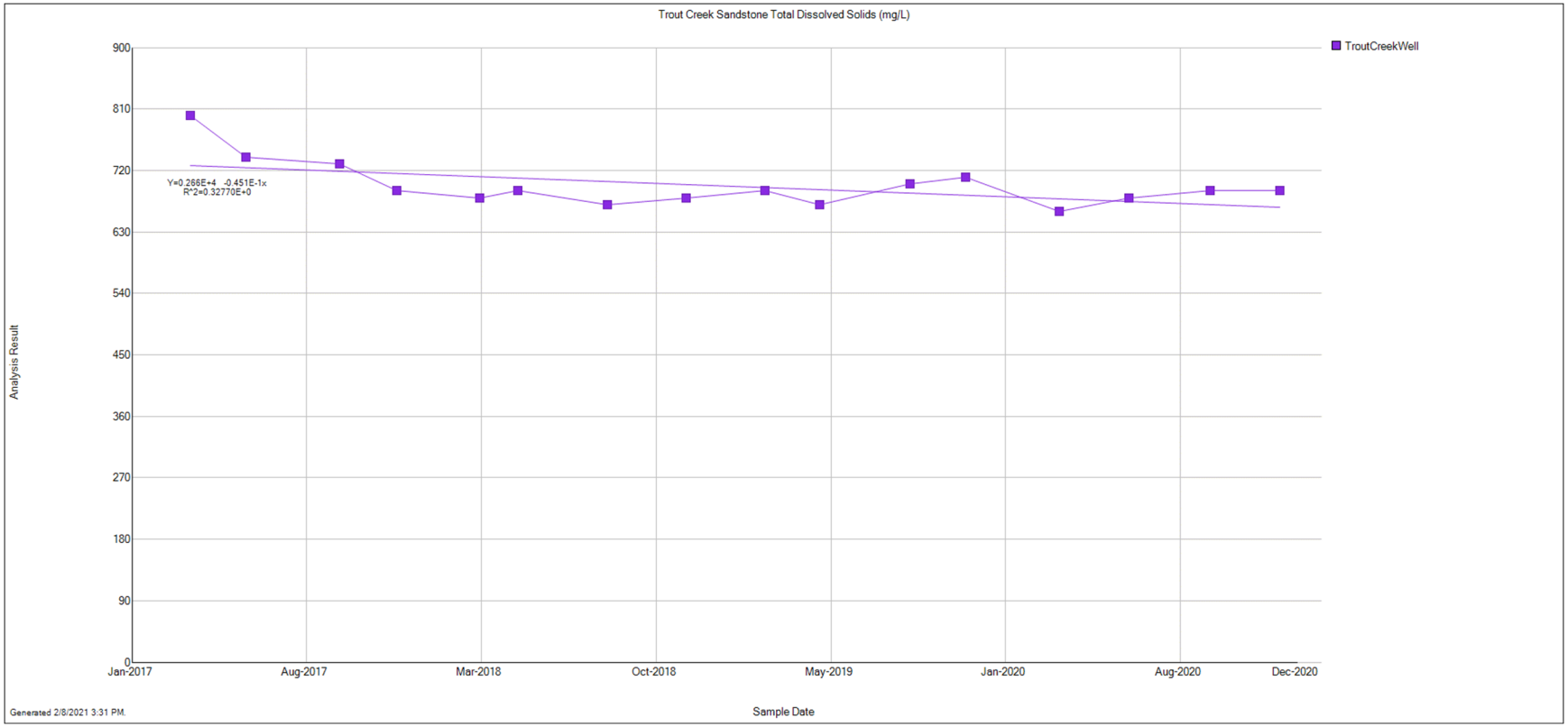

Trout Creek Sandstone Specific Conductance @ 25C (lab) (umhos/cm)
TroutCreekWell
Analysis Result
2200
1980
1760
1540
1320
1100
880
660
440
220
0
Y=0.371E+4 -0.598E-1x
R^2=0.29311E+0
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:31 PM.


Trout Creek Sandstone Iron, dissolved (mg/L)
TroutCreekWell
Analysis Result
0.288
0.256
0.224
0.192
0.16
0.128
0.096
0.064
0.032
0
Y=0.111E+1 -0.240E-4x
R^2=0.54793E-1
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:31 PM.


Trout Creek Sandstone Magnesium, dissolved (mg/L)
TroutCreekWell
Y=0.457E+3 -0.998E-2x
R^2=0.73706E+0
Analysis Result
48
43.2
38.4
33.6
28.8
24
19.2
14.4
9.6
4.8
0
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:31 PM.


Trout Creek Sandstone pH (lab)
TroutCreekWell
Y=-0.391E+1 + 0.302E-3x
R^2=0.21397E+0
Analysis Result
10.2
9.9
9.6
9.3
9
8.7
8.4
8.1
7.8
7.5
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:31 PM.


Trout Creek Sandstone Sodium, dissolved (mg/L)
TroutCreekWell
330
297
264
231
198
165
132
99
66
33
0
Analysis Result
Y=-0.106E+4 + 0.292E-1x
R^2=0.56941E+0
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
Generated 2/8/2021 3:31 PM.


Trout Creek Sandstone Total Dissolved Solids (mg/L)
TroutCreekWell
Y=0.266E+4 -0.451E-1x
R^2=0.32770E+0
900
810
720
630
540
450
360
270
180
90
0
Analysis Result
Jan-2017
Aug-2017
Mar-2018
Oct-2018
May-2019
Jan-2020
Aug-2020
Dec-2020
Sample Date
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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

In 2020, two technical revisions were approved which reduced Colowyo's permit boundary by removing Phase III released areas and other non-disturbed areas from the permit boundary. These areas are no longer under regulatory jurisdiction, and have been returned back to the appropriate surface landowner. Figure 2-1 reflects 873.4 acres being reduced for disturbance, backfilled and graded, topsoiled, and bond released acres reported due to this reduction in the permitted area at Colowyo.

DISTURBED ACRES

During 2020, 91.6 acres of additional disturbance occurred onsite. Please see Exhibit 2 for the locations of areas disturbed during 2002.

At the end of 2020, the total disturbance was 5,261.5 acres. Of this, 1,079.0 acres are in long-term facilities, and the active mining area comprised of 1,662.9 acres.

BACKFILLAND GRADED ACRES

During 2020, 0.0 acres were backfilled and graded. To date, 2,274.5 acres have been backfilled and graded. Please see Exhibit 2 for the locations of all areas that have been backfilled and graded to date.

TOPSOIL REPLACEMENT & SEEDING ACRES

During 2020, 0.0 acres were topsoiled, and 0.0 acres were permanently seeded. Please see Exhibit 2 for the all locations that have been topsoiled and seeded to date at Colowyo, and Figure 2-2 for more detailed description of each reclamation area at Colowyo.

Colowyo performed an augmented seeding in reclamation units EP059 (30.9 acres), EP062 (7.0 acres), WP030 (12.1 acres), and WP031 (10.0 acres) in 2020.

The species seeded on Colowyo's reclamation areas follow the approved seed mixtures located in Volume 1, 12, and 15.

Figure 2-1 Annual Reclamation Report Form, provides a detailed description of the acreages presented above.

Figure 2-1 –Annual Reclamation Report Form

Colorado Division of Reclamation, Mining and Safety

Annual Reclamation Report for Calendar Year – 2020

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]	1,609.8	53.1	0.0	=	1,662.9

Land Category	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
Acres Disturbed[2]	6,043.3	91.6	873.4	=	5,261.5
Acres Backfilled and Graded	3,147.9	0.0	873.4	=	2,274.5
Acres Topsoiled	2,972.7	0.0	873.4	=	2,099.3

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	1,097.8	77.5	0.0	=	1,175.3
Permanent Facilities (permitted)	8.9	0.0	5.2	=	3.7
Totals	1,106.7			=	1,179.0

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	1,164.5	0.0	185.5	=	979.0
10 Years and Greater	88.5	174.5	0.0	=	263.1
Totals	1,253.0			=	1,242.1

Bond Release	Last Year's Cumulative Total (from last year's ARR)	This Calendar Year			Cumulative Total
		Acres Added (+)	Acres Subtracted (-)		
Phase I Released	2,881.3	44.6	873.4	=	1,973.9
Phase II Released	2,317.9	238.2	873.4	=	1,682.7
Phase III Released	1,595.9	0.0	873.4	=	722.5

[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										
EP010	1988	1.7	32	Apr-98	Aug-01	Aug-12	1.7	1.7	1.7	Phase III Released - Unit was orginally 46 acres 1.7 remain inside permit boundary.
EP011	1989	7.8	31	Apr-98	Aug-01	Aug-12	7.8	7.8	7.8	Phase III Released - Unit was orginally 50 acres 7.8 remain inside permit boundary.
EP012	1990	5.9	30	Apr-98	Aug-01	Aug-12	5.9	5.9	5.9	Phase III Released - Unit was orginally 8.2 acres 5.9 remain inside permit boundary.
EP014	1991	11.5	29	Apr-98	Aug-01	Aug-12	11.5	11.5	11.5	Phase III Released - Unit was orginally 24.3 acres 11.5 remain inside permit boundary.
EP015	1991	7.9	29	Apr-98	Aug-01	Aug-12	7.9	7.9	7.9	Phase III Released - Unit was orginally 43.7 acres 7.9 remain inside permit boundary.
EP020	1993	3.8	27	Apr-98	Aug-01	Aug-12	3.8	3.8	3.8	Phase III Released - Unit was orginally 27.0 acres 3.8 remain inside permit boundary.
EP025	1994	23.6	26	Apr-98	Aug-01	Aug-12	23.6	23.6	23.6	Phase III Released - Unit was orginally 54.0 acres 23.6 remain inside permit boundary.
EP026	1995	15.6	25	Apr-98	Aug-01	Aug-12	15.6	15.6	15.6	Phase III Released - Unit was orginally 20.0 acres 15.6 remain inside permit boundary.
EP030	1997	3.9	23	Jun-11	Jun-11	Aug-12	3.9	3.9	3.9	Phase III Released - Unit was orginally 17.0 acres 3.9 remain inside permit boundary.
EP032	1998	13.9	22	Jun-11	Jun-11	Aug-12	13.9	13.9	13.9	Phase III Released - Unit was orginally 17.0 acres 3.9 remain inside permit boundary.
EP034	1999	6.9	21	Jun-11	Jun-11	Aug-12	6.9	6.9	6.9	Phase III Released
EP038	2001	3.2	19	Jun-11	Jun-11	Feb-17	3.2	3.2	3.2	Phase III Released - Unit was orginally 4.08 acres 3.2 remain inside permit boundary.
EP039	2003	4.1	17	Jun-11	Jun-11	Feb-17	4.1	4.1	4.1	Phase III Released
EP040	2003	10.3	17	Jun-11	Jun-11	Feb-17	10.3	10.3	10.3	Phase III Released
EP041	2003	29.3	17	Jun-11	Jun-11	Nov-18	29.3	29.3	29.3	Phase III Released - Unit was orginally 35.7 acres 29.3 remain inside permit boundary.
EP042	2002	9.6	18	Jun-11	Jun-11	Feb-17	9.6	9.6	9.6	Phase III Released - Unit was orginally 21.03 acres 9.6 remain inside permit boundary.
EP043	2002	10.2	18	Jun-11	Jun-11	Feb-17	10.2	10.2	10.2	Phase III Released - Unit was orginally 13.89 acres 10.2 remain inside permit boundary.
EP044	2003	6.0	17	Jun-11	Jun-11	Feb-17	6.0	6.0	6.0	Phase III Released - Unit was orginally 24.64 acres 6.0 remain inside permit boundary.
EP045	2003	6.1	17	Apr-12	Nov-18	Nov-18	6.1	6.1	6.1	Phase III Released - Unit was orginally 7.2 acres 6.1 remain inside permit boundary.
EP046	2005	96.7	15	Apr-12	Nov-18	Nov-18	96.7	96.7	96.7	Phase III Released
EP047	2005	0.0	15	Apr-12	Nov-18	Nov-18	0.0	1.9	1.9	Phase III Released
EP047	2006	1.9	14	Apr-12	Nov-18	Nov-18	1.9	0.0	0.0	Phase III Released
EP049	2006	0.8	14	Apr-12	Nov-18	Nov-18	0.8	0.8	0.8	Phase III Released - Unit was orginally 4.0 acres 0.8 remain inside permit boundary.
EP050	2006	0.0	14	Apr-12	Nov-18	Nov-18	0.0	18.0	18.0	Phase III Released - Unit was orginally 85.6 acres 77.5 remain inside permit boundary.
EP050	2007	77.5	13	Apr-12	Nov-18	Nov-18	77.5	59.5	59.5	Phase III Released - Unit was orginally 85.6 acres 77.5 remain inside permit boundary.
EP051	2009	32.0	11	Apr-12	Nov-18		32.0	32.0	32.0	8.0 ac Redisturbed in 2010 Reseeded in 2010
EP052	2010	37.0	10	Apr-12	Nov-18		37.0	37.0	37.0	37.0 Acres Seeded in 2011
EP053	2010	17.4	10	Apr-12	Nov-18		17.4	17.4	17.4	17.4 Acres Seeded 2011
EP054	2010	17.4	10	Apr-12	Nov-18		17.4	17.4	17.4	
EP055	2010	8.8	10	Apr-12	Nov-18		8.8	8.8	8.8	Old R3 stockpile
EP056	2011	34.8	9	Apr-12			34.8	34.8	34.8	34.8 acres seeded as grassland
EP057	2012	70.7	8	Aug-13	Nov-18		62.7	62.7	70.7	1.6 ac regrade only, 62.7 topsoiled seeded
EP058	2014	33.4	6	Jan-16	Oct-19		33.4	33.4	33.4	33.8 acres seeded as grassland
EP059	2016	48.9	4	Jan-18	Oct-20		30.9	30.9	48.9	30.9 acres seeded as grassland. Reseeded 30.9 acres in the fall of 2020.
EP060	2017	5.5	3	Aug-18	Oct-20		5.5	5.5	0.0	Redisturbance Topsoil Pile and Road No Backfill Sagebrush Steppe. 0.9 acres.
EP061	2018	14.5	2	Sep-19			14.5	14.5	0.0	All Regrade occurred with EP057 and EP059. Sagebrush Steppe 14.5 acres.
EP062	2019	7.0	1				7.0	7.0	7.0	Topsoil pile footprint reclaimed. 7.0 acres Sagebrush Steppe. Reseeded 7.0 acres in fall of 2020.
Grand Totals		**327.4**					**301.4**	**301.4**	**307.4**	Remove Phase III acreage from Grand Totals.
West Pit										
WP001	1995	6.2	25	Apr-98	Aug-01	Aug-12	6.2	6.2	6.2	Phase III Released
WP002	1995	32.7	25	Apr-98	Aug-01	Aug-12	32.7	32.7	32.7	Phase III Released
WP003	1995	7.0	25	Jun-11	Jun-11	Nov-18	7.0	7.0	7.0	Phase III Released
WP004	1996	8.9	24	Jun-11	Jun-11	Nov-18	8.9	8.9	8.9	Phase III Released
WP005	1997	6.1	23	Jun-11	Jun-11	Aug-12	6.1	6.1	6.1	Phase III Released
WP006	1998	2.0	22	Jun-11	Jun-11	Aug-12	2.0	2.0	2.0	Phase III Released
WP007	1999	7.9	21	Jun-11	Jun-11	Aug-12	7.9	7.9	7.9	Phase III Released
WP008	2000	10.1	20	Jun-11	Jun-11	Feb-17	10.1	10.1	10.1	Phase III Released
WP009	2001	0.5	19	Jun-11	Jun-11	Feb-17	0.5	0.5	0.5	Phase III Released
WP010	2001	5.2	19	Jun-11			5.2	5.2	5.2	Not released under SL-04 for Phase II
WP011	2001	1.7	19	Jun-11	Jun-11	Feb-17	1.7	1.7	1.7	Phase III Released
WP012	2002	0.0	18	Apr-12	Nov-18	Nov-18	0.0	4.0	4.0	Phase III Released
WP013	2006	4.0	14	Apr-12	Nov-18	Nov-18	3.9	0.0	0.0	Phase III Released
WP014	2009	47.3	11	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	10	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	9	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	7	Apr-12	Nov-18		12.6	12.6	12.6	12.6 ac Grassland - Regraded in 2011/Seeded in 2013
WP018	2013	31.2	7	Aug-13	Nov-18		31.2	31.2	31.2	24.1 ac Grassland/7.1 Sagebrush Steppe
WP019	2013	35.9	7	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	7	Jan-16	Nov-18		95.8	95.8	95.8	9.2 acres Grassland/86.6 Sagebrush Steppe
WP021	2015	75.4	5	Sep-16	Oct-20		64.4	74.9	75.4	2.1 acres regrade only - 74.9 acres Grassland/15.2 acres moved to unit WP023. 10.5 acres (seeded only) moved to WP032. 10.5 acres not Phase II released due to Musk Thistle.
WP022	2016	0.5	4	Aug-18	Oct-20		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	4	Jan-18	Oct-20		105.4	105.4	107.1	103.9 acres seeded as grassland.
WP024	2017	98.2	3	Aug-18	Oct-20		17.3	17.3	98.2	17.3 acres seeded as Sagebrush Steppe
WP025	2017	23.3	3	Apr-12	Oct-20		23.3	23.3	0.0	Originally part of WP015 Topsoiled 23.3 acres seeded as Sagebrush Steppe.
WP026	2018	54.2	2	Aug-18			54.2	54.2	1.8	52.4 acres regraded in 2017.
WP027	2018	17.8	2	Aug-18			17.8	17.8	0.0	17.8 acres regrade occurred in 2017.
WP028	2018	17.9	2	Sep-19			17.9	17.9	15.3	2.6 acres regraded in 2017.
WP029	2018	38.2	2	Sep-19			38.2	38.2	32.6	5.6 acres regraded in 2017.
WP030	2019	12.1	1				12.1	12.1	12.1	12.1 Acres Sagebrush Steppe - Reclaimed Topsoil pile footprint. Reseeded 12.1 acres in the fall of 2020.
WP031	2019	45.8	1	Jul-20			45.8	45.8	66.6	13.3 acres Sagebrush Steppe - 32.5 acres Grassland - Reseeded 10 Acres in the fall of 2020.
WP032	2015	10.5	5	Sep-16			10.5	0.0	0.0	This was orginally part of WP021 - removed during Phase II due to noxious weeds. Topsoil and backfilled acres are still part of WP021.
Grand Totals		**956.9**					**841.3**	**851.3**	**904.6**	Remove Phase III acreage from Grand Totals.

Figure 2-2 – Colowyo Reclamation Table Continued

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	
Section 16 Pit										
16002	1993	6.2	27	Jun-11	Jan-18	Jan-18	6.2	6.2	6.2	Phase III Released
16003	1993	25.9	27	Apr-98	Aug-01	Jan-18	25.9	25.9	25.9	Phase III Released
16005	1994	3.9	26	Jun-11	Jan-18	Jan-18	3.9	3.9	3.9	Phase III Released
16006	1994	50.5	26	Apr-98	Aug-01	Jan-18	50.5	50.5	50.5	Phase III Released
16008	1995	41.2	25	Apr-98	Aug-01	Jan-18	41.2	41.2	41.2	Phase III Released
16009	1996	1.3	24	Jun-11	Jan-18	Jan-18	1.3	1.3	1.3	Phase III Released
16010	1996	10.0	24	Jun-11	Jun-11	Jan-18	10.0	10.0	10.0	Phase III Released
16011	1997	6.2	23	Jun-11	Jan-18	Jan-18	6.2	6.2	6.2	Phase III Released
16012	1997	2.0	23	Jun-11	Jan-18	Jan-18	2.0	2.0	2.0	Phase III Released
16013	1997	3.2	23	Jun-11	Jan-18	Jan-18	3.2	3.2	3.2	Phase III Released
16014	1998	7.4	22	Jun-11	Jun-11	Jan-18	7.4	7.4	7.4	Phase III Released
16015	1998	2.0	22	Jun-11	Jan-18	Jan-18	2.0	2.0	2.0	Phase III Released
16016	1999	22.7	21	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	9	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	8	Aug-13	Oct-19		6.3	6.3	6.3	6.3 Grassland acres seeded in 2012
ST003	2013	1.2	7	Jan-16	Oct-19		1.2	1.2	1.2	1.2 acres Grassland
ST004	2014	12.2	6	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	4	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	4	Aug-18	Oct-20		3.4	3.4	3.4	Lower Admin Building - 3.4 acres Sagebrush Steppe
GF03	2017	17.7	3				17.7	17.7	17.7	This was the raw water pipeline. Seeded sagebrush steppe.
GF04	2017	10.4	3				10.4	10.4	10.4	
Grand Total		**31.5**					**31.5**	**31.5**	**31.5**	
Collom										
C01	2016	0.3	4	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	4	Aug-18			0.2	0.0	0.0	This was brushing only. Seeded sagebrush steppe.
C03	2016	0.1	4				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.
C05	2016	0.1	4	Aug-18			0.1	0.0	0.0	This was brushing only. Seeded sagebrush steppe.
Grand Total		**0.7**					**0.7**	**0.0**	**0.0**	

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

Overburden sampling did not occur in 2020 as there not any backfilled and graded areas that were to final grade.

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.

Exhibit 4

Interim Vegetation Report

Colowyo Mine

Permit No. C-1981-019

2020 Revegetation Monitoring Report

March, 2021

CEDAR CREEK ASSOCIATES, INC.

Table of Contents

In-Text Maps, Tables, and Charts

Colowyo Mine

Permit Number: C-1981-019

2020 Revegetation Monitoring Report

Revegetation Units:				Reference Areas:
EP059	WP017	WP023	ST003	CO01	Mountain Shrub
EP061	WP018	WP026		CO02	Sagebrush
	WP019	WP027	GF01	CO03	
	WP020	WP028		CO05	
	WP022	WP029			

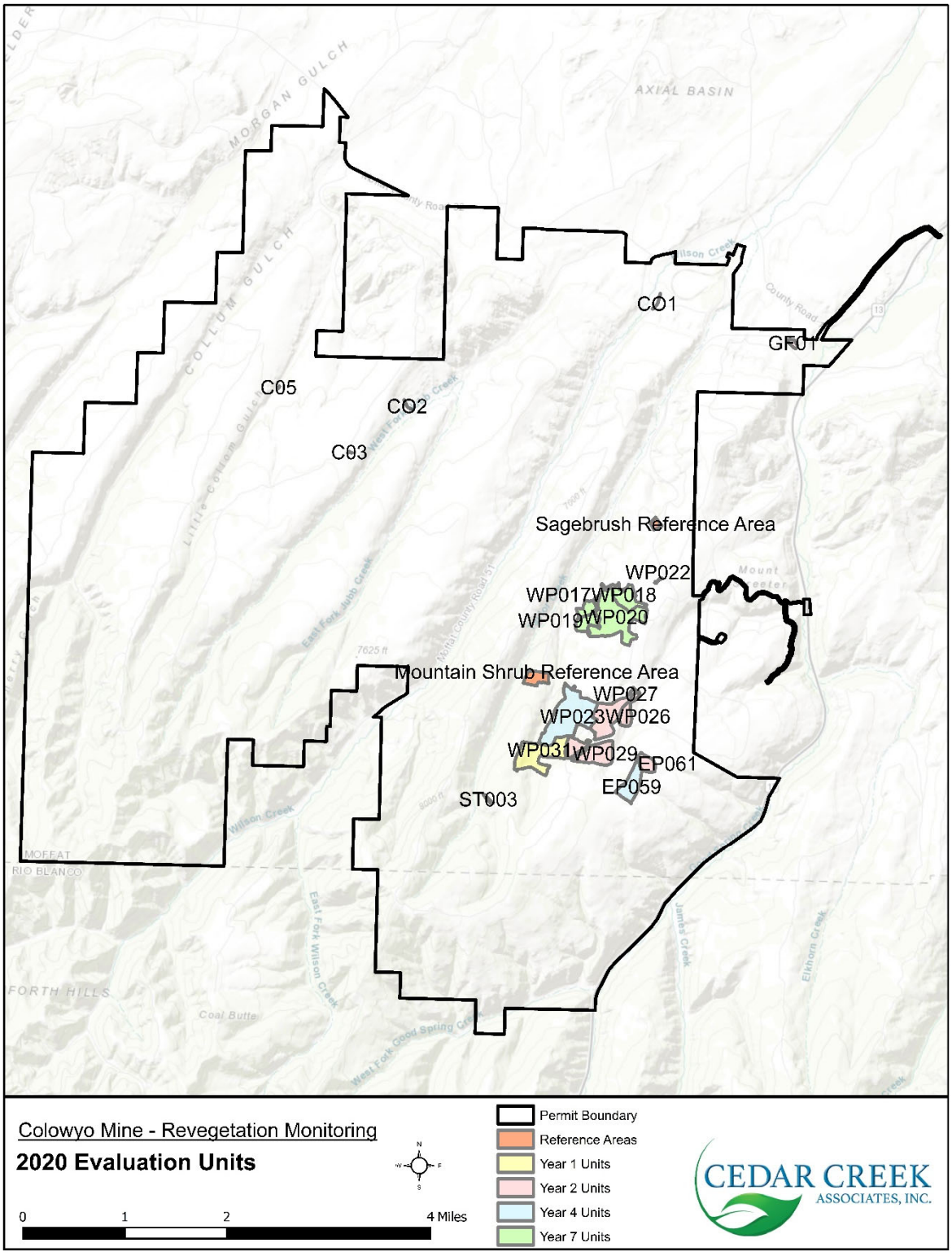
1.0 INTRODUCTION

Cedar Creek Associates, Inc. (Cedar Creek) was contracted in 2020 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 2020 consisted of four units in the vicinity of the Collom Pit, two units within the East Pit, one unit at the Gossard facilities, eleven units within the West Pit, and one South Taylor Pit unit. One of these units (WP031) was new in 2020. Units evaluated in 2020 range in size from less than one acre to 105 acres. At the time of sampling, revegetation within evaluated units had experienced between 1 and 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 2020 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 10th through August 13th, 2020. Field efforts in 2020 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 (Collom Pit, East Pit,

Gossard Facilities, West Pit, And South Taylor Pit) and then by revegetation unit. Each unit and resulting data/mapping are 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 2020 are presented in the Colowyo permit (Volume 1, 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.


AXIAL BASIN
MORGAN GULCH
COLLUM GULCH
C01
GR01
C05
C02
C03
Sagebrush Reference Area
WP022
WP017
WP018
WP019
WP020
Mountain Shrub Reference Area
WP027
WP023
WP026
WP031
WP029
EP061
EP059
ST003
Wilson Creek
East Fork Wilson Creek
James Creek
Eikhorn Creek
MOFFAT
RIO BLANCO
FORTH HILLS
Coal Butte
Colowyo Mine - Revegetation Monitoring
2020 Evaluation Units
0
1
2
4 Miles
Permit Boundary
Reference Areas
Year 1 Units
Year 2 Units
Year 4 Units
Year 7 Units
CEDAR CREEK
ASSOCIATES, INC.

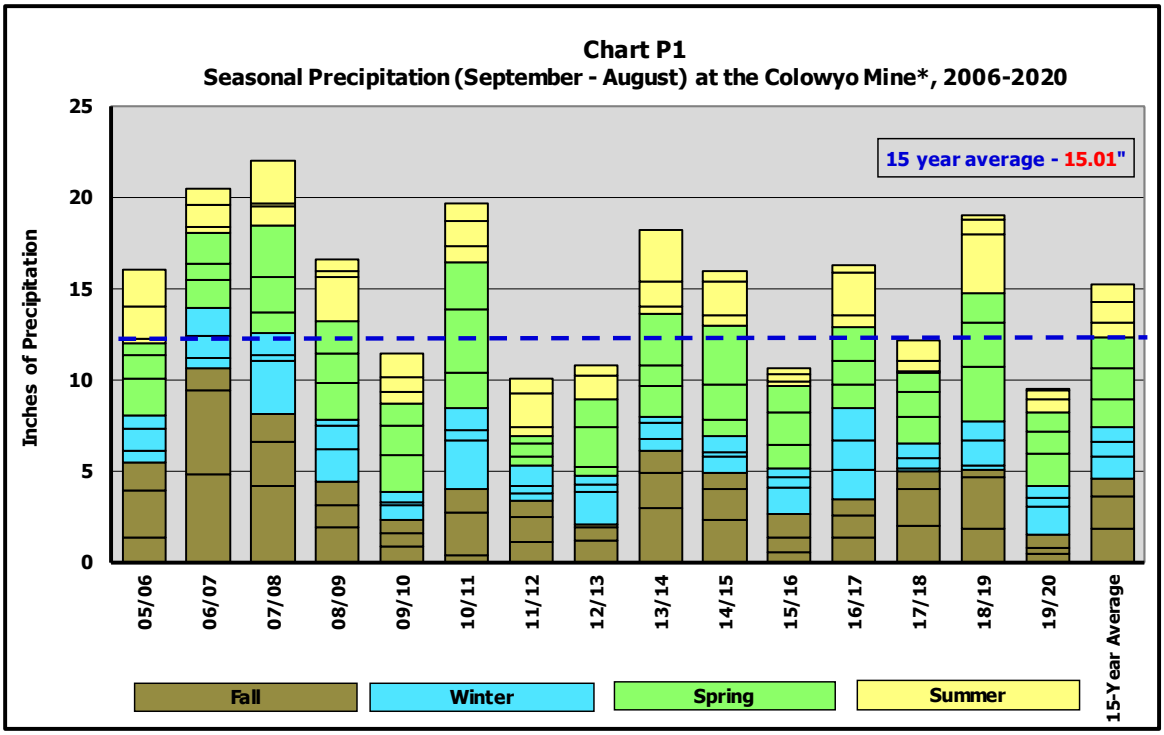
1.1 Climate Data

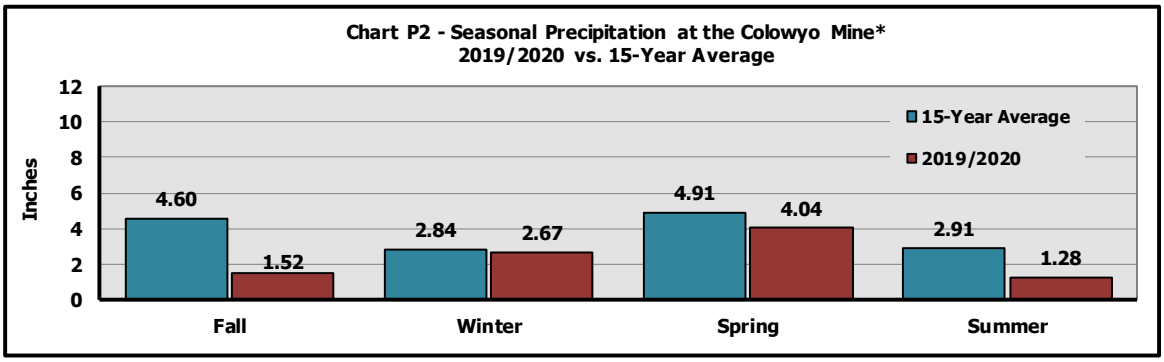
Precipitation data presented on Table P and Charts P1 and P2 is the average of two weather stations at the Colowyo Mine (SCN16 and SCN34 from 2009 to present). Table P presents precipitation accumulated annually at the Colowyo Mine over the past 15 years. Charts P1 and P2 display historical precipitation data organized by growing season. Precipitation in the project area for the 2019/2020 growing season (September 2019 through August 2020) was determined to be 62% of average when compared to the 15-year average (9.50 in. vs. 15.26 in.).

Perusal of Chart P2 indicates that 2019 fall precipitation was well-below average with 1.52 inches, 33% of the 15-year average. Winter of 2019 saw approximately average levels with 2.67 inches, 94% of average. Spring of 2020 received slightly below average precipitation with 4.04 inches (82% of average) while summer of 2020 received well-below average levels with 1.28 inches (44% of average). Since growing season precipitation were well-below average, collected data are reflective of below average vegetative vigor and production.

Table P - Annual Precipitation at the Colowyo Mine*, 2006-2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2006	1.19	0.71	2.01	1.33	0.64	0.25	1.77	2.02	4.83	4.62	1.15	0.63	**21.15**
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**
2020	0.49	0.70	1.77	1.25	1.03	0.73	0.48	0.08	1.04	0.59	0.92	1.19	**10.24**
2006-2020 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**





* An average of data collected by Colowyo Weather Stations SCN15 and WSTPT prior to 2009, and then from stations SCN16 and SCN34 due to the relocation of WSTPT.

2.0 REVEGETATION SUCCESS STANDARDS

Colowyo has made the commitment to establish reclaimed plant communities that meet the designated post mining land use of rangeland, with the subcomponents of grazing land and wildlife habitat [Volume 1, Section 2.05.5]. Areas designated as grazing land for the post mining land use will aim to establish vegetation communities comprised of species primarily selected for palatability and production, with incidental wildlife habitat, implemented on those lands with slopes greater than 10%. Areas designated for wildlife habitat as the post mining land use will aim to establish a sagebrush steppe vegetation community, and will be limited to those lands with slopes less than 10%.

Three reference areas selected to represent the three major vegetative communities are utilized to evaluate revegetation success at Colowyo; the Mountain Shrub reference area, Sagebrush reference area, and Collom Aspen reference area. The comparison between the reclamation area and the reference area occurs as follows:

East and West Pit (Including Gossard Facilities) Reclamation Areas - Reclaimed areas shall be compared to weighted parameters from the Mountain Shrub reference area (55% weight) and the Sagebrush reference area (45% weight) in accordance with Rule 4.15.7(4)(b).

South Taylor Pit Reclamation Areas - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (52% weight), the Sagebrush reference area (25% weight), and the Collom Aspen reference area (23% weight) in accordance with Rule 4.15.7(4)(b).

Collom Reclamation Areas - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (39% weight), the Sagebrush reference area (47% weight), and the Grassland reference area (14% weight) in accordance with Rule 4.15.7(4)(b).

Reference areas are utilized to test revegetation success for the metrics of herbaceous cover and herbaceous production, while woody plant density and diversity metrics are compared against technical standards. In addition, South Taylor reclamation areas require the establishment of aspens and tall shrubs. The success criteria for each revegetation metric are described below:

Herbaceous Cover - For revegetation targeting (and achieving) the rangeland land use subcomponents of grazing land and wildlife habitat, herbaceous cover of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous cover as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means, as described in Rule 4.15.8 (3) (a).

Herbaceous Production - For revegetation targeting the rangeland land use subcomponents of grazing land and wildlife habitat, herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous production, as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means, as described in Rule 4.15.8 (4).

Woody Plant Density - Where shrubs establish to form wildlife habitat, they will be segregated into low and high-density areas, each with a separate woody plant density success criterion. On high-density areas (areas of shrub concentration), the standard shall be 375 live woody plants per acre. At least one-half of these totals shall be sagebrush species. In low-density areas, the standard shall be 200 plants per acre. Furthermore, Colowyo will establish wildlife habitat areas, comprised of both low and high-density areas, on approximately 20% of the acres in each bond release evaluation, with at least 50% of those acres representing high-density areas. The grazing land acres will not be subject to woody plant density standards.

Tall Shrubs and Aspens - For the South Taylor reclamation areas, as part of the revegetation success criteria for those areas, Colowyo will establish 18.5 acres of aspens and 12.0 acres of tall shrubs. This will be accomplished through large singular plots or various small plots that add up the acres noted previously. For the Collom reclamation areas, Colowyo will incorporate approximately 750 small size exclosures into Collom reclamation areas on 150 acres at a density of approximately five exclosures per acre to meet their expectations for establishing tall shrub species.

Diversity - The revegetation objective for diversity will be to establish 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, with the following caveat; 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 dominant species will contribute to the appropriate structure and stability of the post-mining vegetative community.

* 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 2020, five evaluated units have existed for seven years and were assessed with ground cover, diversity, woody plant density, and production. Fourteen evaluated units have existed for either two or four growing seasons; these units were assessed with ground cover, diversity, and woody plant density. Summaries of the results from the seven, four, and two year old units are presented in the in-text compendia, with additional summaries and raw data presented in Appendix A. One unit was evaluated for Year 1 emergence success and is also summarized below. Reference Area results are summarized in Appendix A, Charts 4 through 5 and Tables 4 through 7, along with additional raw data.

Considering the 2020 evaluation effort as a whole, observed revegetation at Colowyo is generally in fair 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 and 2020 has likely delayed the progress of some younger units, which should be closely monitored moving forward. As revegetated communities continue to mature, the majority of units evaluated in 2020 should readily meet both land-use goals and bond release success criteria.

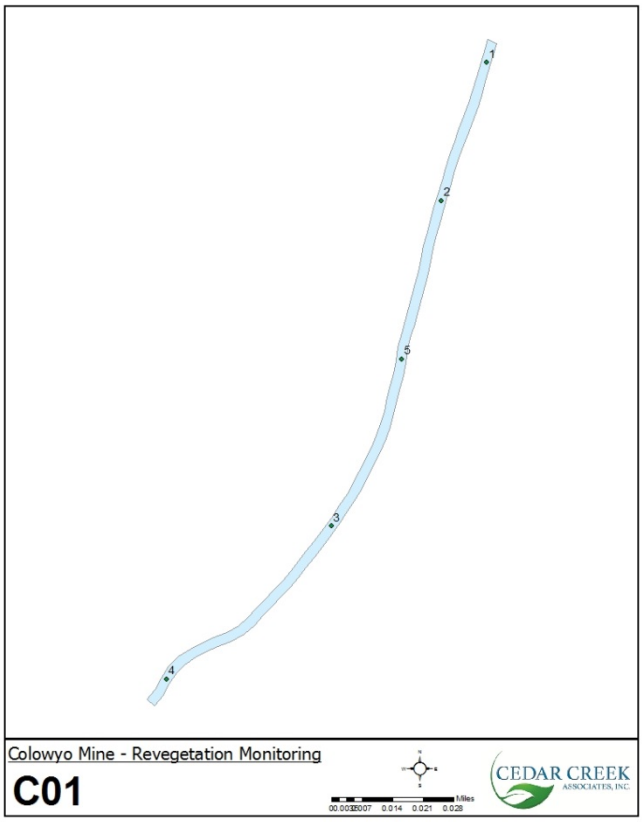
The following sections (Sections 3.1 to 3.6) provide a brief narrative of the results from each individual unit evaluated by Cedar Creek. Also included for each unit is a map indicating the 2020 sample points and a one-page summary (compendium) of all pertinent data collected from the unit in 2020 and previous years, if applicable.

3.1 Collom Expansion Area

3.1.1 C01 – Year 4 Unit

C01 is comprised of approximately 0.30 acres of generally flat revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 1). A representative photo for 2020 is presented below.

Ground cover was determined from 5 transects. Desirable perennial plants have established modestly on C01 with 16.0% average perennial cover in Year 4. Cheatgrass (*Bromus tectorum* and *Bromus japonicus*) exhibits 11.0% average cover in Year 4. Noxious weeds exhibit 0.0% average cover in Year 4. Annual forbs exhibit typical cover in Year 4 with 3.0% average cover. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 7 species observed on this unit in 2020. Woody plant density was determined from 5 belt transects and indicated 2,485 stems per acre in 2020, consisting primarily of rubber rabbitbrush (*Chrysothamnus nauseosus*) at 2,137 stems per acre, and with 348 stems per acre from big sagebrush (*Artemisia tridentata*).



Unit C01 exhibits fair perennial cover for four-year-old revegetation. It is recommended that this unit be evaluated in 2023 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 1 2020

C01

Location: **Collom**
Acres: **0.3**
First Growing Season: **2017**
Targeted Post-Mining Community: **Grazingland**

Ground Cover Results

Number of Ground Cover Transects = 5

	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	0.6	1.6		1.3	5.3		1	2	
Perennial Forbs	0.2	5.2		0.4	17.3		1	1	
Sub-shrubs	-	-		-	-		-	0	
Shrubs & Trees	2.6	9.2		5.8	30.7		1	2	
Annual Grass	-	-		-	-		1	0	
Annual / Biennial Forbs	5.2	3.0		11.6	10.0		1	1	
Noxious Weeds - Cheatgrass	34.8	11.0		77.3	36.7		1	0	
Noxious Weeds - Other	1.6	-		3.6	-		1	1	
Litter	11.4	48.0							
Rock	-	-							
Bareground	43.6	22.0							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**7**	**7**	
Total Plant Cover	**45.0**	**30.0**							
Total Perennial Cover	**3.4**	**16.0**		**7.6**	**53.3**				
Allowable Perennial Herbaceous Cover	**0.8**	**6.8**		**1.8**	**22.7**				

Woody Plant Density Results

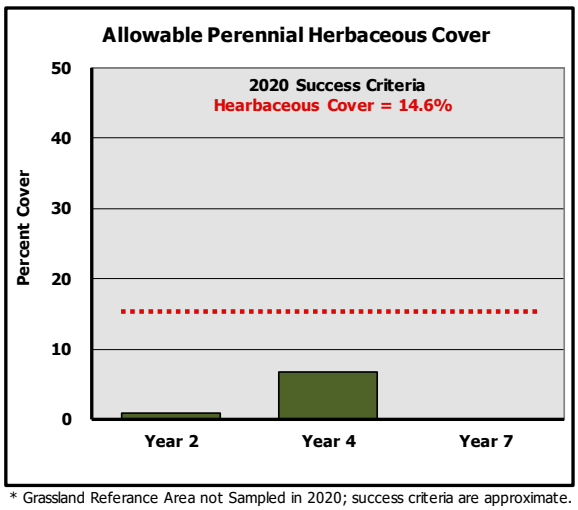
Number of Woody Plant Density belts = 5

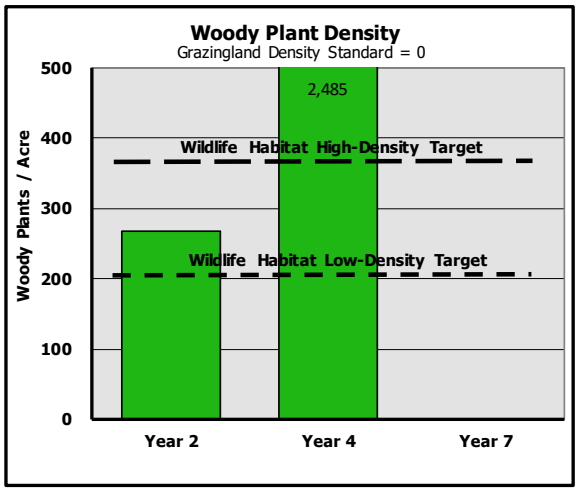
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush		348.0	
Chrysothamnus nauseosus	Rubber Rabbitbrush	267.1	2,136.7	
Total		**267.1**	**2484.8**	
Sagebrush Contribution (%)		0%	14%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		20%	100%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		60%	100%	

Production Results

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

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



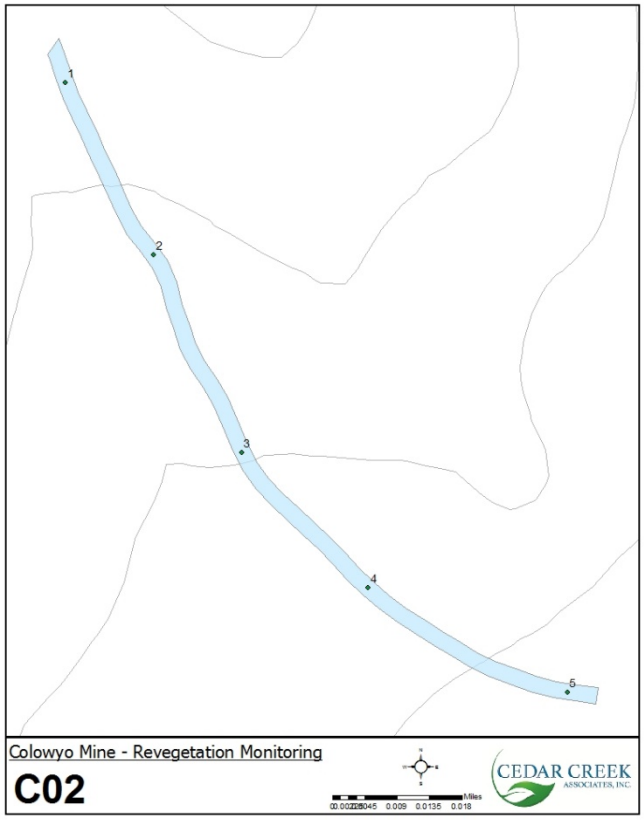


* Grassland Referance Area not Sampled in 2020; success criteria are approximate.

3.1.2 C02 – Year 4 Unit

C02 is comprised of approximately 0.1 acres of gently sloping north-facing revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 2). A representative photo for 2020 is presented below.

Ground cover was determined from 5 transects. Desirable perennial plants have established well on C02 with 45.4% average perennial cover in Year 4. Annual forbs and cheatgrass exhibit minor cover in Year 4 with 0.2% and 0.6% average cover, respectively. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 14 species observed on this unit in 2020. Woody plant density was determined from 5 belt transects and indicated 32.4 stems per acre in 2020, consisting of rubber rabbitbrush and plains pricklypear (*Opuntia polycantha*).



Unit C02 exhibits excellent perennial cover for four-year-old revegetation. It is recommended that this unit be evaluated in 2023 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 2 2020

C02

Location: **Collom**
Acres: **0.1**
First Growing Season: **2017**
Targeted Post-Mining Community: **Grazingland**

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	-	30.0		-	64.9		-	5	
Perennial Forbs	-	13.6		-	29.4		-	5	
Sub-shrubs	-	1.8		-	3.9		-	1	
Shrubs & Trees	-	-		-	-		-	0	
Annual Grass	-	-		-	-		-	0	
Annual / Biennial Forbs	-	0.2		-	0.4		-	1	
Noxious Weeds - Cheatgrass	-	0.6		-	1.3		-	0	
Noxious Weeds - Other	-	-		-	-		-	2	
Litter	-	42.8							
Rock	-	0.2							
Bareground	-	10.8							
Total	**-**	**100.0**		**-**	**100.0**		**-**	**14**	
Total Plant Cover	**-**	**46.2**							
Total Perennial Cover	**-**	**45.4**		**-**	**98.3**				
Allowable Perennial Herbaceous Cover	**-**	**43.6**		**-**	**94.4**				

Woody Plant Density Results

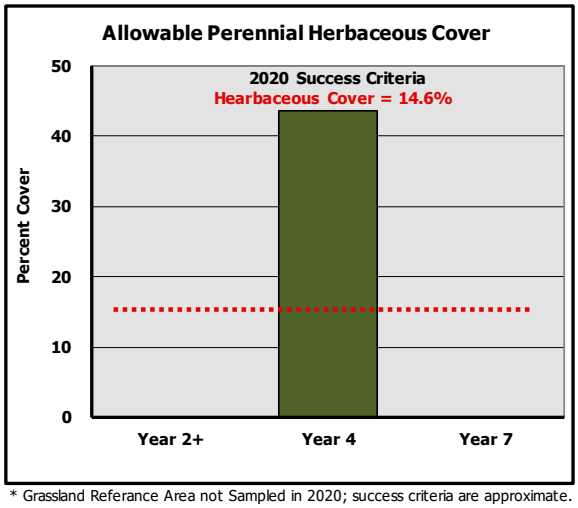
Number of Woody Plant Density Belts = 15

		Stems per Acre		
		Year 2+	Year 4	Year 7
Chrysothamnus nauseosus	Rubber Rabbitbrush		24.3	
Opuntia polyacantha	Plains Pricklypear		8.1	
Total		**0.0**	**32.4**	
Sagebrush Contribution (%)		0%	0%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	0%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%	0%	

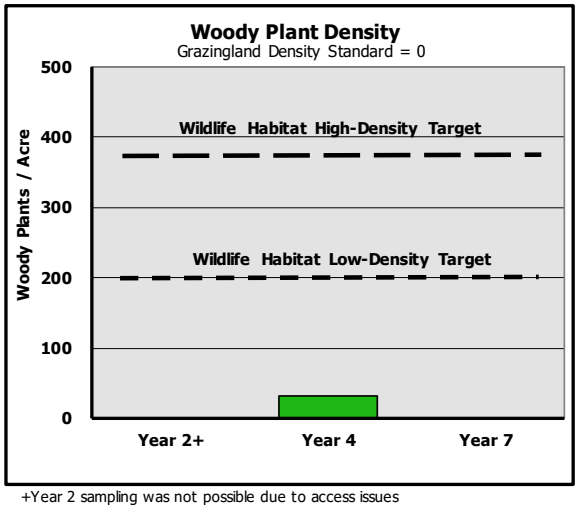
Production Results

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

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



* Grassland Referance Area not Sampled in 2020; success criteria are approximate.



+Year 2 sampling was not possible due to access issues

3.1.3 C03 – Year 4 Unit

C03 is comprised of approximately 0.3 acres of gently sloping north-facing revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 3). A representative photo from 2018 (year-2 sampling) is presented below.

Ground cover was determined from 5 transects. Desirable perennial plants have established well on C03 with 39.6% average perennial cover in Year 4. Annual forbs and cheatgrass exhibit minor cover in Year 4 with 4.2% and 0.0% average cover, respectively. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 6 species observed on this unit in 2020. Woody plant density was determined from 5 belt transects and indicated 97.1 stems per acre in 2020, consisting entirely of big sagebrush.

Unit C03 exhibits excellent perennial cover for four-year-old revegetation. It is recommended that this unit be evaluated in 2023 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.

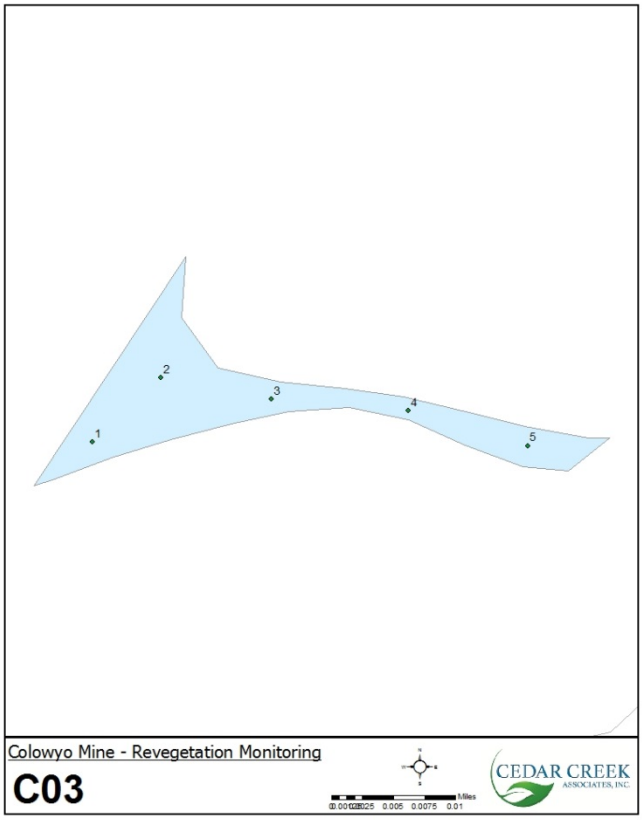



Photo From 2018

Compendium 3 2020

C03

Location: **Collom**
Acres: **0.3**
First Growing Season: **2017**
Targeted Post-Mining Community: **Grazingland**

Ground Cover Results

Number of Ground Cover Transects = 5

	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	38.6	39.2		87.3	89.1		3	2	
Perennial Forbs	-	-		-	-		-	0	
Sub-shrubs	0.6	0.4		1.4	0.9		1	1	
Shrubs & Trees	-	-		-	-		-	0	
Annual Grass	-	-		-	-		1	0	
Annual / Biennial Forbs	2.4	4.2		5.4	9.5		2	2	
Noxious Weeds - Cheatgrass	2.6	-		5.9	-		1	0	
Noxious Weeds - Other	-	0.2		-	0.5		-	1	
Litter	33.2	55.4							
Rock	-	-							
Bareground	22.6	0.6							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**8**	**6**	
Total Plant Cover	**44.2**	**44.0**							
Total Perennial Cover	**39.2**	**39.6**		**88.7**	**90.0**				
Allowable Perennial Herbaceous Cover	**38.6**	**39.2**		**87.3**	**89.1**				

Woody Plant Density Results

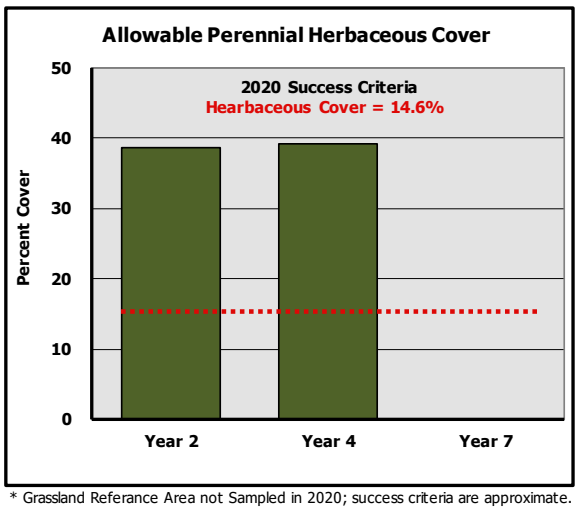
Number of Woody Plant Density belts = 5

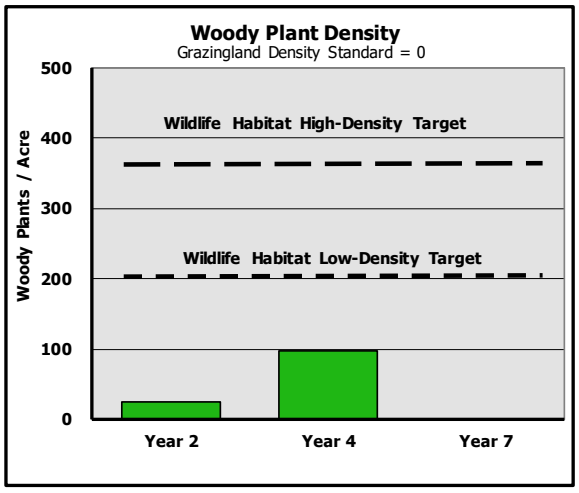
	Stems per Acre		
	Year 2	Year 4	Year 7
Artemisia tridentata Big Sagebrush	24.3	97.1	
Total	**24.3**	**97.1**	
Sagebrush Contribution (%)	100%	100%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)	0%	0%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)	0%	20%	

Production Results

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

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





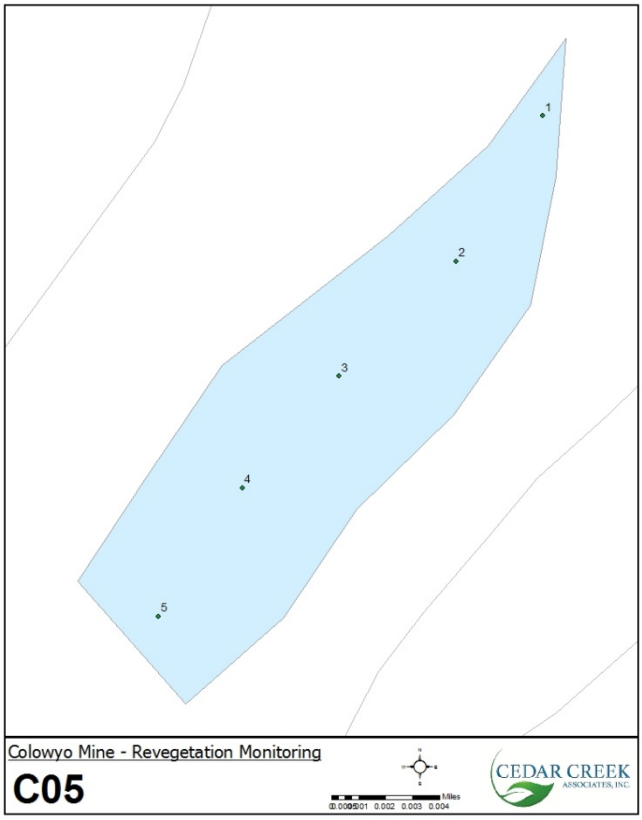
* Grassland Referance Area not Sampled in 2020; success criteria are approximate.

3.1.4 C05 – Year 4 Unit

C05 is comprised of approximately 0.1 acres of moderately sloping southeast-facing revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 5). A representative photo for 2020 is presented below.

Ground cover was determined from 5 transects. Desirable perennial plants have decreased on C05 with 13.8% average perennial cover in Year 4. Cheatgrass exhibits 25.2% average cover in Year 4. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 9 species observed on this unit in 2020. Woody plant density was determined from 5 belt transects and indicated 56.7 stems per acre in 2020, consisting primarily of four-wing saltbush (*Atriplex canescens*) with minor contributions from big sagebrush and rubber rabbitbrush.

Unit C05 exhibits good perennial cover for four-year-old revegetation. It is recommended that this unit be evaluated in 2023 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.



Compendium 5 2020

C05

Location: **Collom**
Acres: **0.1**
First Growing Season: **2017**
Targeted Post-Mining Community: **Grazingland**

Ground Cover Results

Number of Ground Cover Transects = 5

	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	27.2	11.6		47.4	25.2		2	4	
Perennial Forbs	-	2.0		-	4.3		-	1	
Sub-shrubs	-	-		-	-		-	0	
Shrubs & Trees	-	0.2		-	0.4		-	1	
Annual Grass	-	-		-	-		1	0	
Annual / Biennial Forbs	-	7.0		-	15.2		-	2	
Noxious Weeds - Cheatgrass	30.2	25.2		52.6	54.8		1	0	
Noxious Weeds - Other	-	-		-	-		-	1	
Litter	42.6	50.4							
Rock	-	1.4							
Bareground	-	2.2							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**4**	**9**	
Total Plant Cover	**57.4**	**46.0**							
Total Perennial Cover	**27.2**	**13.8**		**47.4**	**30.0**				
Allowable Perennial Herbaceous Cover	**27.2**	**13.6**		**47.4**	**29.6**				

Woody Plant Density Results

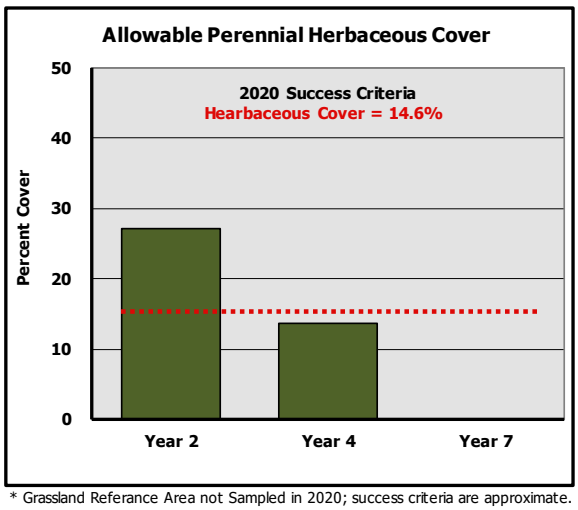
Number of Woody Plant Density belts = 5

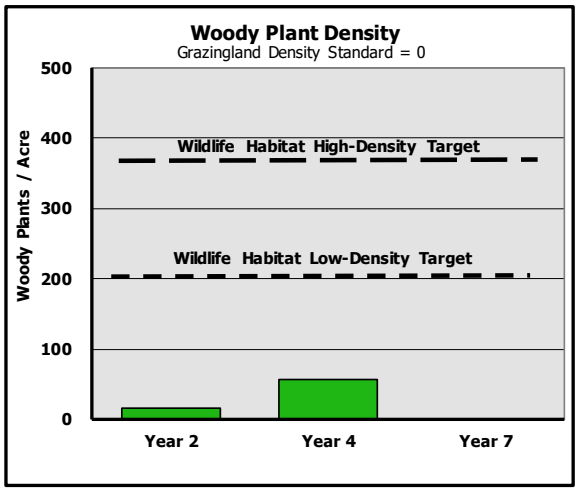
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush		8.1	
Atriplex canescens	Four-wing Saltbush		40.5	
Chrysothamnus nauseosus	Rubber Rabbitbrush	16.2	8.1	
Total		**16.2**	**56.7**	
Sagebrush Contribution (%)		0%	14%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	0%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%	20%	

Production Results

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

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





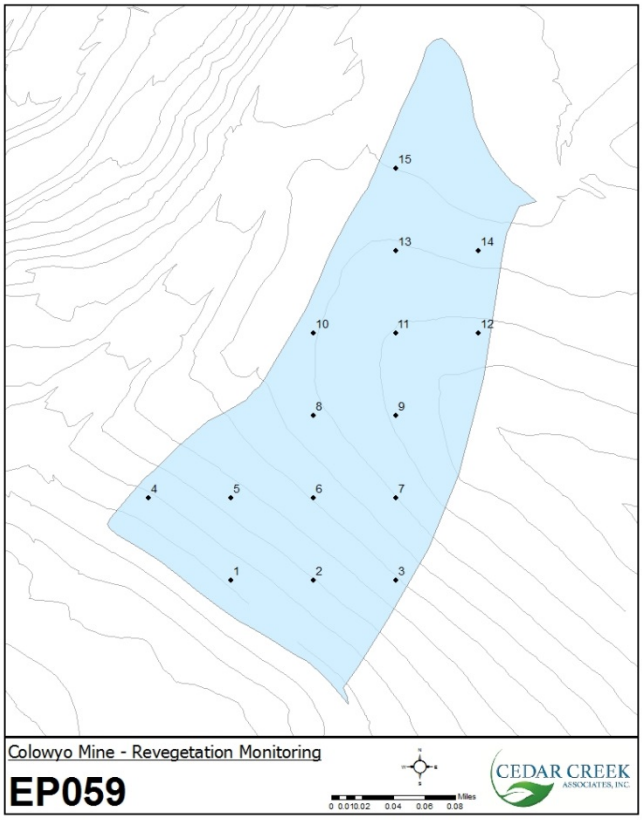
* Grassland Referance Area not Sampled in 2020; success criteria are approximate.

3.2 East Pit

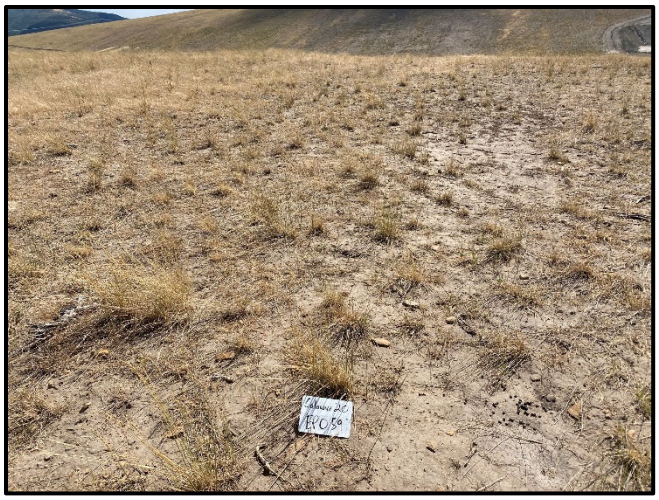
3.2.1 EP059 – Year 4 Unit

EP059 is comprised of approximately 30.90 acres of moderately sloping southeast-facing revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 6). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants increased slightly in 2020 with 6.9% average perennial cover in Year 4. Annual forbs initially exhibited elevated cover in Year 2, but have decreased substantially in 2020 with 2.5% average cover. Noxious weeds exhibit elevated cover in Year 4 with 1.0% average cover. Cheatgrass exhibits 2.5% average cover in Year 4. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 13 species observed on this unit in 2020. Woody plant density was determined from 15 belt transects and indicated 5.4 stems per acre in 2020 conisting of big sagebrush.



Unit EP059 has exhibited poor perennial cover for four-year-old revegetation. This unit was inter-seeded in the fall of 2020 to aid in perennial development. It is recommended that this unit be evaluated in 2023 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.



Compendium 5 2020

EP059

Location: **East Pit**
Acres: **30.9**
First Growing Season: **2017**
Targeted Post-Mining Community: **Grazingland**

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	5.1	6.9		20.2	53.6		2	6	
Perennial Forbs	0.2	-		0.8	-		2	0	
Sub-shrubs	-	-		-	-		-	0	
Shrubs & Trees	-	-		-	-		-	0	
Annual Grass	-	-		-	-		1	0	
Annual / Biennial Forbs	15.8	2.5		63.0	19.3		5	3	
Noxious Weeds - Cheatgrass	3.1	2.5		12.5	19.3		1	0	
Noxious Weeds - Other	0.9	1.0		3.5	7.8		2	4	
Litter	15.8	24.9							
Rock	0.1	2.4							
Bareground	59.0	59.9							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**13**	**13**	
Total Plant Cover	**25.1**	**12.8**							
Total Perennial Cover	**5.3**	**6.9**		**21.0**	**53.6**				
Allowable Perennial Herbaceous Cover	**5.3**	**6.9**		**21.0**	**53.6**				

Woody Plant Density Results

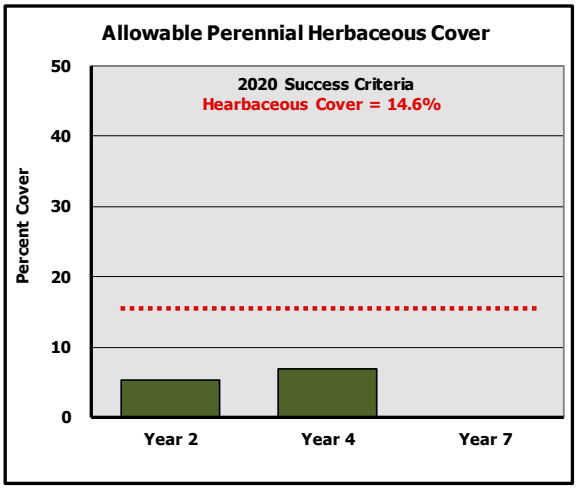
Number of Woody Plant Density Belts = 15

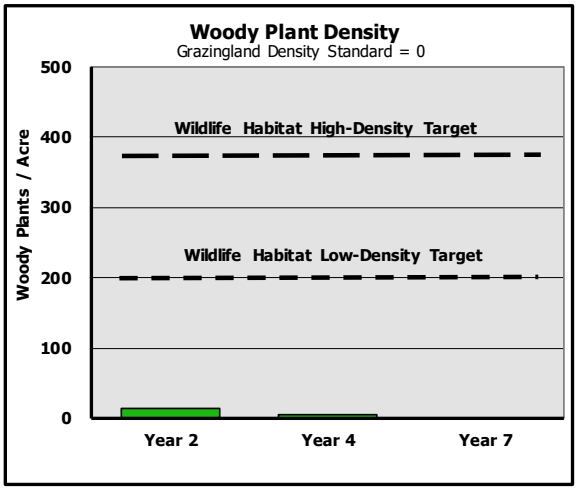
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia cana	Silver Sage	10.8		
Artemisia tridentata	Big Sagebrush	2.7	5.4	
Total		**13.5**	**5.4**	
Sagebrush Contribution (%)		20%	100%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	0%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%	0%	

Production Results

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

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

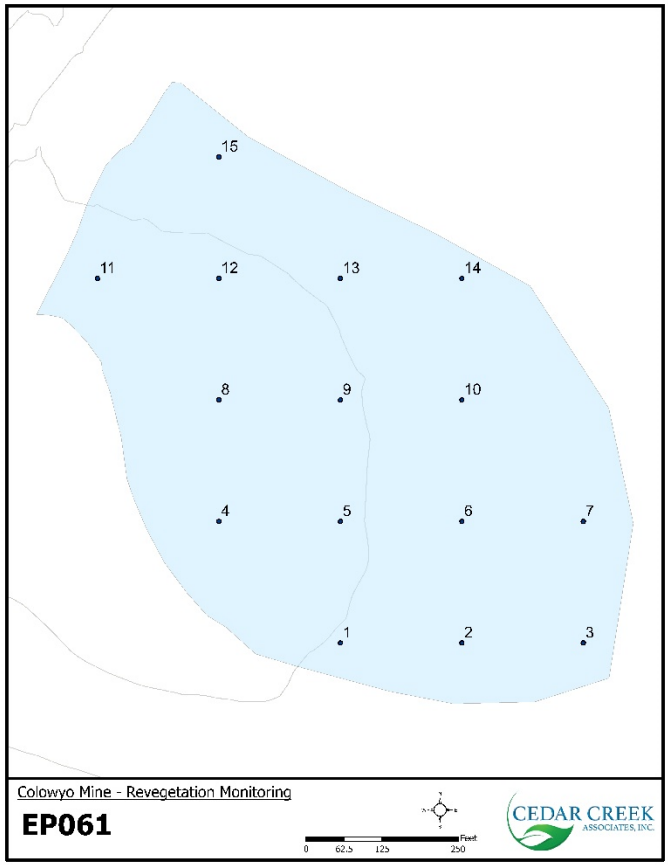




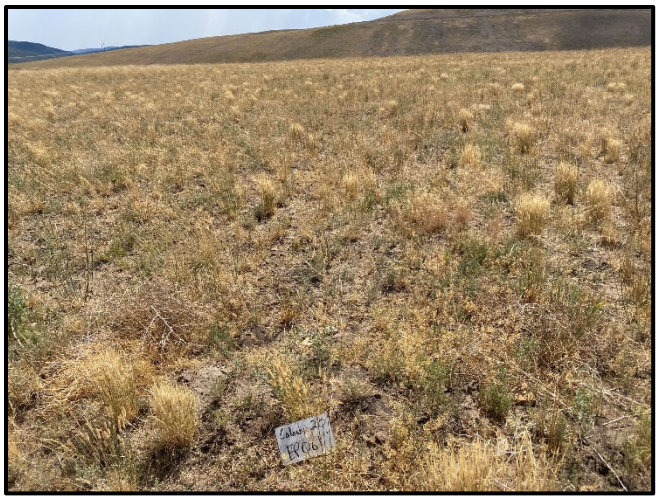
3.2.2 EP061 – Year 2 Unit

EP061 is comprised of approximately 14.5 acres of moderately sloping southeast-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its second growing season in 2020 (Compendium 7). A representative photo for 2020 is presented below.

Ground cover was determined from 5 transects. Desirable perennial plants have established well on EP061 with 12.0% average perennial cover in Year 2. Annual forbs exhibit elevated cover in Year 2 with 15.5% average cover. Cheatgrass exhibits 2.1% average cover in Year 2. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 22 species observed on this unit in 2020. Woody plant density was determined from 5 belt transects and indicated 3,413 stems per acre in 2020 consisting almost entirely of big sagebrush.



Unit EP061 exhibits good perennial cover for two-year-old revegetation. It is recommended that this unit be evaluated in 2022 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.



Compendium 6 2020

EP061

Location: **East Pit**
Acres: **14.5**
First Growing Season: **2018**
Targeted Post-Mining Community: **Wildlife Habitat**

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	10.1			34.0			10		
Perennial Forbs	0.1			0.5			2		
Sub-shrubs	-			-			-		
Shrubs & Trees	1.8			6.1			1		
Annual Grass	-			-			-		
Annual / Biennial Forbs	15.5			52.5			8		
Noxious Weeds - Cheatgrass	2.1			7.0			-		
Noxious Weeds - Other	-			-			1		
Litter	18.5								
Rock	0.9								
Bareground	50.9								
Total	**100.0**			**100.0**			**22**		
Total Plant Cover	**29.6**								
Total Perennial Cover	**12.0**			**40.5**					
Allowable Perennial Herbaceous Cover	**10.2**			**34.5**					

Woody Plant Density Results

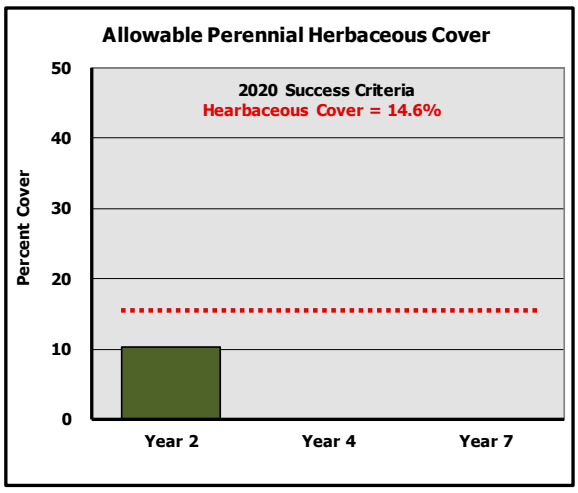
Number of Woody Plant Density Belts = 15

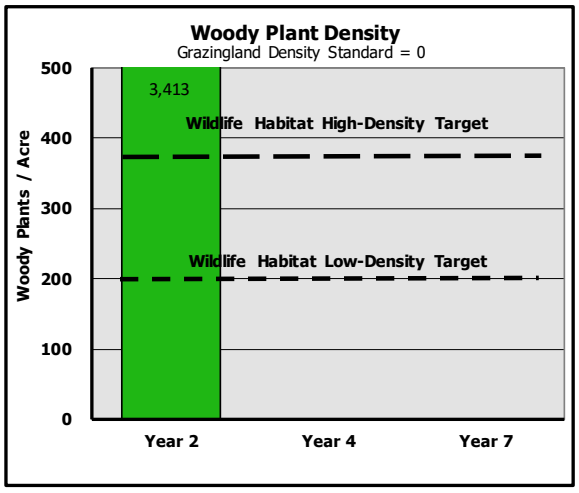
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	3,402.1		
Artemisia cana	Silver Sage	5.4		
Chrysothamnus nauseosus	Rubber Rabbitbrush	2.7		
Purshia tridentata	Antelope Bitterbrush	2.7		
Total		**3,412.8**		
Sagebrush Contribution (%)		100%		
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		100%		
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		100%		

Production Results

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

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





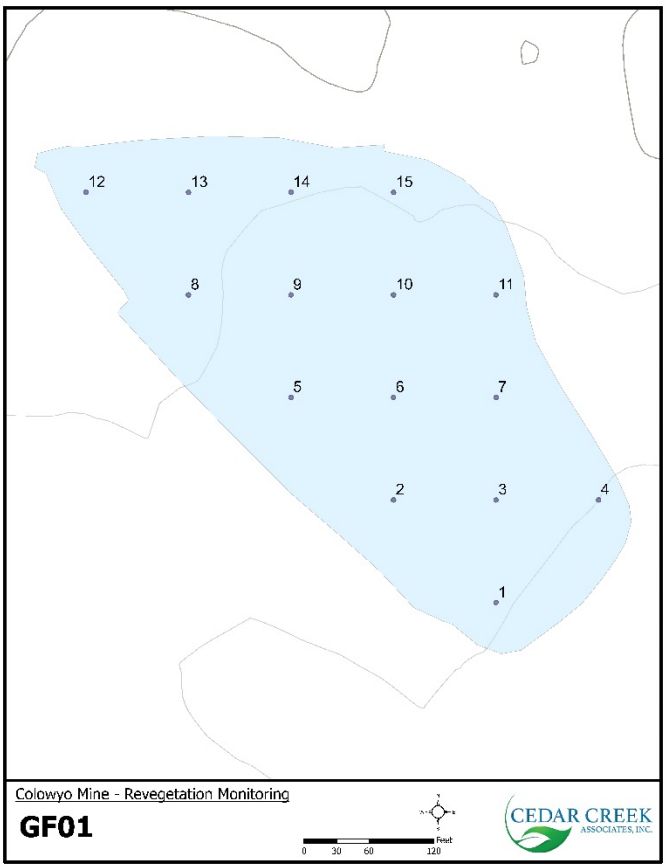
3.3 Gossard Facilities

3.3.1 GF01 – Year 4 Unit

GF01 is comprised of approximately 3.4 acres of generally flat revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 8). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established well on GF01 with 23.9% average perennial cover in Year 4. Average annual forb cover decreased to 2.1% in Year 4. Cheatgrass also decreased in Year 4, exhibiting 9.5% average cover. Cheatgrass and annual forbs tends to decrease on Colowyo's reclamation as perennial plant communities develop. There were 27 species observed on this unit in 2020. Woody plant density was determined from 15 belt transects and indicated 4,093 stems per acre in 2020, with 82% contribution from sagebrush.

Unit GF01 exhibits excellent perennial cover for four-year-old revegetation. It is recommended that this unit be evaluated in 2023 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.



Compendium 7 2020

GF01

Location: **Gossard Facilities** Targeted Post-Mining Community: **Wildlife Habitat**
Acres: **3.4**
First Growing Season: **2017**

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	7.7	16.1		15.8	45.6		6	12	
Perennial Forbs	0.5	2.5		1.0	7.2		4	3	
Sub-shrubs	-	-		-	-		-	-	
Shrubs & Trees	0.8	5.2		1.7	14.7		3	3	
Annual Grass	-	-		-	-		1	-	
Annual / Biennial Forbs	4.7	2.1		9.7	5.8		5	7	
Noxious Weeds - Cheatgrass	34.9	9.5		71.9	26.7		1	-	
Noxious Weeds - Other	-	-		-	-		-	2	
Litter	30.7	42.1							
Rock	0.3	0.3							
Bareground	20.4	22.2							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**20**	**27**	
Total Plant Cover	**48.6**	**35.4**							
Total Perennial Cover	**8.9**	**23.9**		**18.4**	**67.4**				
Allowable Perennial Herbaceous Cover	**8.1**	**18.7**		**16.7**	**52.7**				

Woody Plant Density Results

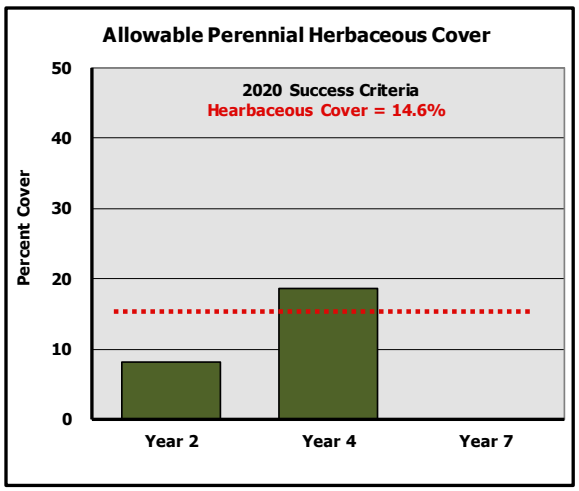
Number of Woody Plant Density Belts = 15

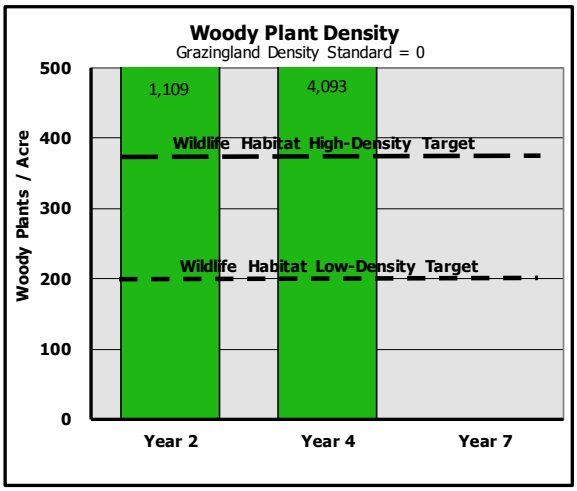
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia cana	Silver Sage	16.2		
Artemisia tridentata	Big Sagebrush	1,022.5	3,340.0	
Atriplex canescens	Four-wing Saltbush	21.6	8.1	
Chrysothamnus nauseosus	Rubber Rabbitbrush	48.6	701.5	
Chrysothamnus viscidiflorus	Yellow Rabbitbrush		43.2	
Total		**1,108.9**	**4092.7**	
Sagebrush Contribution (%)		92%	82%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		87%	100%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		100%	100%	

Production Results

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

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





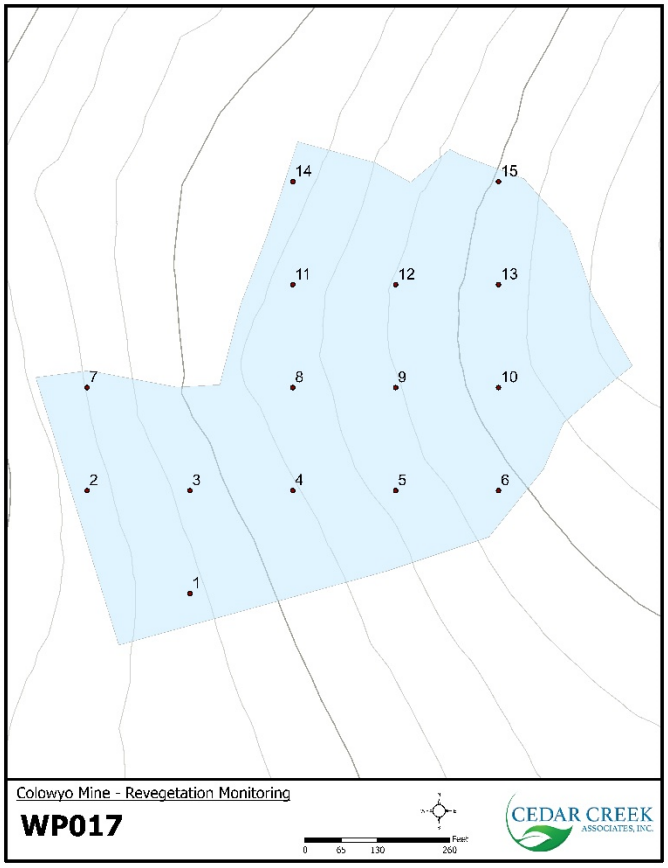
3.4 West Pit

3.4.1 WP017 – Year 7 Unit

WP017 is comprised of approximately 12.6 acres of north-facing moderately sloping revegetation. This unit was seeded in 2013, and therefore, was undergoing its seventh growing season in 2020 (Compendium 9). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have decreased from 44.9% average perennial cover in Year 4 to 10.8% in Year 7. Cheatgrass exhibits 13.2% average cover. A total of 15 species were observed in Year 4. Woody plant density was determined from 15 belt transects and indicated 35.1 stems per acre in 2020, consisting entirely of four-wing saltbush. Perennial herbaceous production was 664.1 pounds per acre, significantly above the success criteria of 286.7 pounds per acre.

Unit WP017 exhibits poor perennial cover for seven-year-old revegetation, likely due to recent drought conditions. This unit will likely rebound following the return of average precipitation. It is recommended that this unit be evaluated in 2022 for Year-9 bond release sampling.



Compendium 8 2020

WP017

Location: **West Pit**
Acres: **12.6**
First Growing Season: **2013**
Targeted Post-Mining Community: **Wildlife Habitat**

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	25.1	27.3	10.5	46.4	51.8	39.5	12	9	5
Perennial Forbs	0.6	0.2	0.2	1.1	0.4	0.8	2	4	1
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	-	0.2	0.1	-	0.4	0.5	-	1	1
Annual Grass	11.0	13.8	-	20.3	26.2	-	1	1	-
Annual / Biennial Forbs	16.1	4.1	2.4	29.7	7.7	9.1	7	10	5
Noxious Weeds - Cheatgrass	-	6.9	13.2	-	13.1	49.9	-	1	-
Noxious Weeds - Other	1.3	0.2	0.1	2.5	0.4	0.3	2	2	3
Litter	18.9	19.5	65.7						
Rock	2.2	2.6	0.7						
Bareground	24.8	25.2	7.2						
Total	**100.0**	**100.0**	**100**	**100.0**	**100.0**	**100**	**24**	**28**	**15**
Total Plant Cover	**54.1**	**52.7**	**26.5**						
Total Perennial Cover	**25.7**	**27.7**	**10.8**	**47.5**	**52.6**	**40.8**			
Allowable Perennial Herbaceous Cover	**25.7**	**27.5**	**10.7**	**47.5**	**52.2**	**40.3**			

Woody Plant Density Results

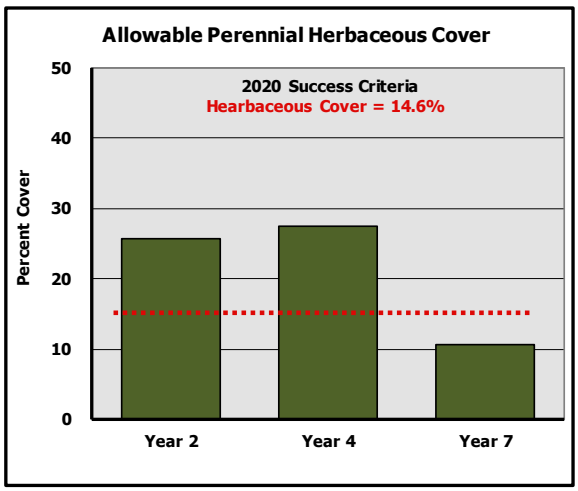
Number of Woody Plant Density belts = 15

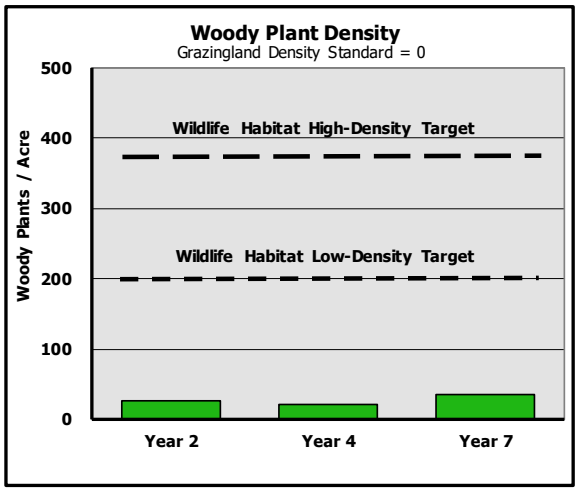
		Stems per Acre		
		Year 2	Year 4	Year 7
Atriplex canescens	Four-wing Saltbush	27.0	21.6	35.1
Total		**27.0**	**21.6**	**35.1**
Sagebrush Contribution (%)		0%	0%	0%
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	0%	0%
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		7%	7%	7%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		661
Perennial Forbs		4
Sub-shrubs		0
Annual Grasses		111.5
Annual / Biennial Forbs		12
Noxious Weeds	Cheatgrass	121.1
	Other	0.0
Total Production		**908.9**
Total Perennial Production		664.1
Allowable Perennial Herb. Production		**664.1**

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

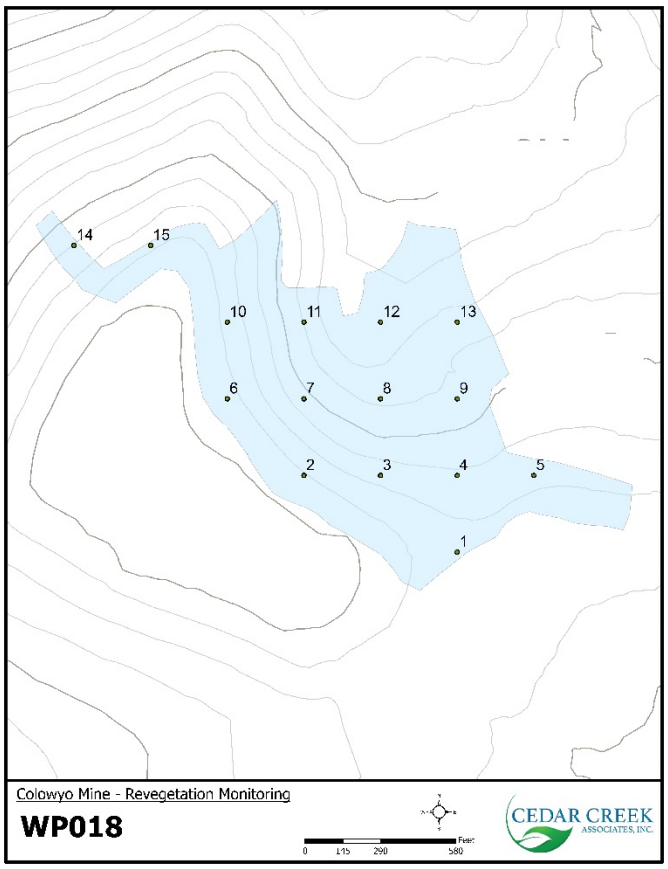




3.4.2 WP018 – Year 7 Unit

WP018 is comprised of approximately 31.2 acres of southeast-facing moderately sloping revegetation. This unit was seeded in 2013, and therefore, was undergoing its seventh growing season in 2020 (Compendium 10). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have decreased from 43.6% in Year 4, to 23.0% in Year 7 due to recent drought conditions. Annual forbs exhibit 1.7% average cover in Year 7. Cheatgrass exhibits minor cover with 1.9% average cover. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. A total of 22 species were observed in Year 7. Woody plant density was determined from 15 belt transects and indicated 24.3 stems per acre in 2019, consisting entirely of big sagebrush. Perennial herbaceous production was 627.8 pounds per acre, significantly above the success criteria of 286.7 pounds per acre.



Unit WP018 exhibits good perennial cover for seven-year-old revegetation considering recent precipitation, and is expected to rebound once average climatic conditions return. It is recommended that this unit be evaluated in 2022 for Year-9 bond release sampling.

Compendium 9 2020

WP018

Location: **West Pit**
Acres: **31.2**
First Growing Season: **2013**
Targeted Post-Mining Community: **Wildlife Habitat**

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	29.1	42.2	20.1	72.8	76.2	73.8	14	12	9
Perennial Forbs	1.5	1.3	2.7	3.7	2.4	9.8	5	3	5
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	-	0.1	0.3	-	0.1	1.0	-	2	1
Annual Grass	2.1	4.3	-	5.3	7.7	-	1	1	-
Annual / Biennial Forbs	6.1	2.3	1.7	15.4	4.2	6.1	9	10	4
Noxious Weeds - Cheatgrass	0.1	4.6	1.9	0.2	8.3	7.1	1	1	-
Noxious Weeds - Other	1.1	0.6	0.6	2.7	1.1	2.2	1	3	3
Litter	16.1	22.7	41.3						
Rock	0.9	0.9	1.9						
Bareground	43.1	20.9	29.7						
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.00**	**31**	**32**	**22**
Total Plant Cover	**39.9**	**55.4**	**27.2**						
Total Perennial Cover	**30.5**	**43.6**	**23.0**	**76.5**	**78.7**	**84.6**			
Allowable Perennial Herbaceous Cover	**30.5**	**43.5**	**22.7**	**76.5**	**78.6**	**83.6**			

Woody Plant Density Results

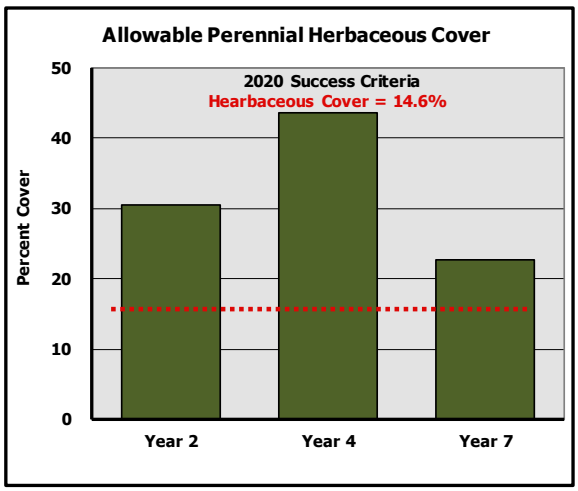
Number of Woody Plant Density belts = 15

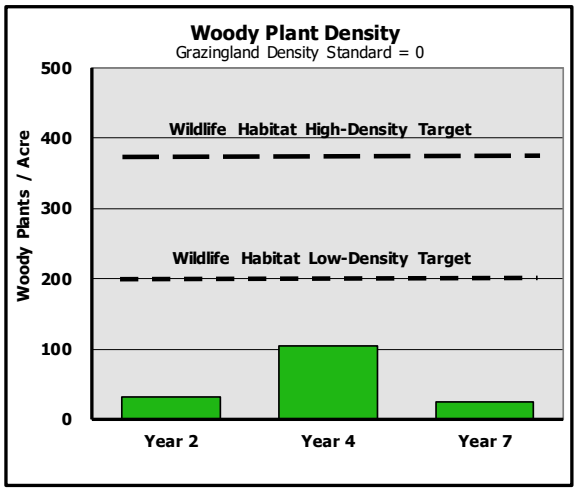
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	16.2	102.5	24.3
Atriplex canescens	Four-wing Saltbush	16.2	2.7	
Total		**32.4**	**105.2**	**24.3**
Sagebrush Contribution (%)		50%	97%	100%
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	1333%	0%
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%	1333%	0%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		585
Perennial Forbs		42
Sub-shrubs		0
Annual Grasses		9.3
Annual / Biennial Forbs		12
Noxious Weeds	Cheatgrass	0.0
	Other	0.0
Total Production		**648.8**
Total Perennial Production		627.8
Allowable Perennial Herb. Production		**627.8**

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

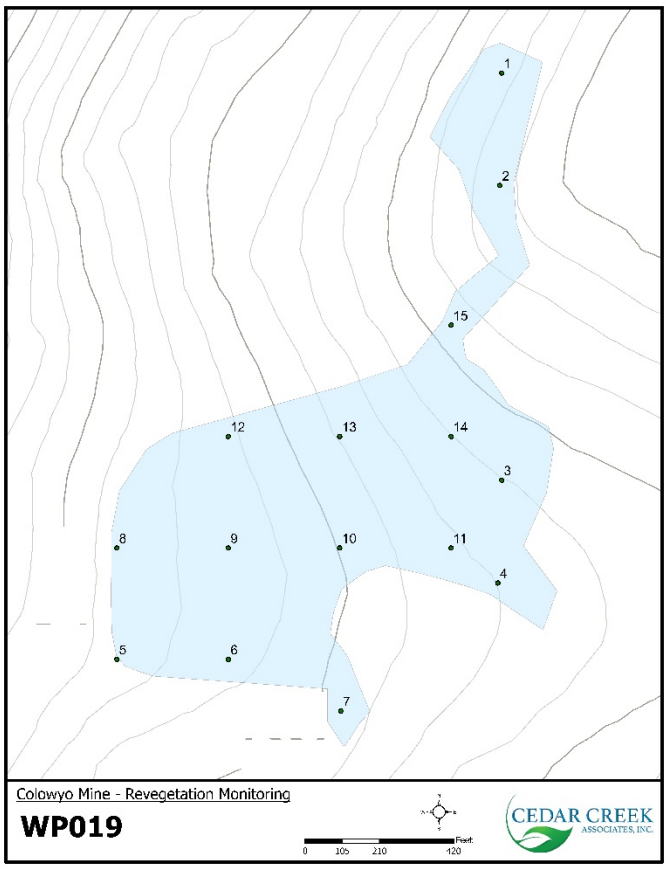




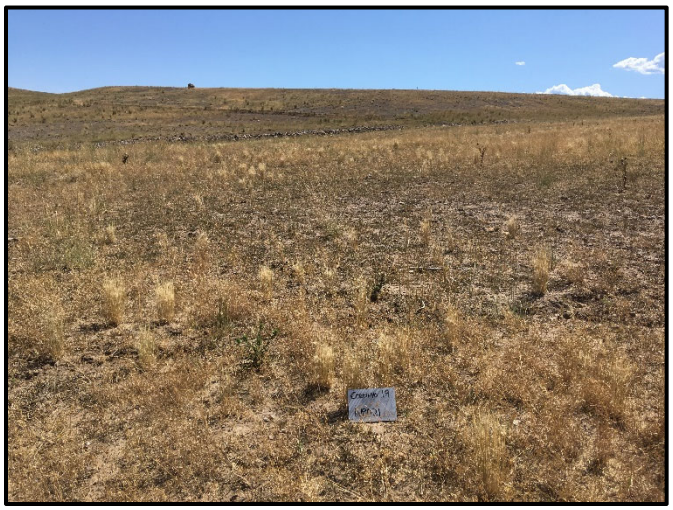
3.4.3 WP019 – Year 7 Unit

WP019 is comprised of approximately 22.1 acres of north-facing moderately sloping revegetation. This unit was seeded in 2013, and therefore, was undergoing its seventh growing season in 2020 (Compendium 11). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have decreased on WP019 from 34.3% in Year 4, to 18.0% in Year 7 due to recent climatic conditions. Annual forbs exhibit 5.1% average cover for Year 7. Cheatgrass exhibits modest cover with 6.9% average cover. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. A total of 20 species were observed in Year 7. Woody plant density was determined from 15 belt transects and indicated 132.2 stems per acre in 2020, with 55% comprising big sagebrush. Perennial herbaceous production was 331.0 pounds per acre, slightly below the success criteria of 286.7 pounds per acre.



Unit WP019 exhibits fair perennial cover for seven-year-old revegetation, yet is expected to rebound following the return of average precipitation. It is recommended that this unit be evaluated in 2022 for Year-9 bond release sampling.



Compendium 10 2020

WP019

Location: **West Pit**
Acres: **22.1**
First Growing Season: **2013**
Targeted Post-Mining Community: **Wildlife Habitat**

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	22.5	32.9	16.9	58.9	66.3	55.7	11	11	7
Perennial Forbs	0.9	0.3	0.9	2.4	0.7	2.9	3	5	2
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	-	1.0	0.2	-	2.0	0.7	-	2	2
Annual Grass	1.1	7.2	-	2.8	14.5	-	1	1	-
Annual / Biennial Forbs	13.2	2.0	5.1	34.6	4.0	16.7	9	7	6
Noxious Weeds - Cheatgrass	0.3	5.9	6.9	0.7	11.9	22.6	1	1	-
Noxious Weeds - Other	0.2	0.3	0.5	0.5	0.5	1.5	1	1	3
Litter	8.1	18.8	37.0						
Rock	3.5	2.9	4.3						
Bareground	50.2	28.7	28.3						
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**26**	**28**	**20**
Total Plant Cover	**38.1**	**49.7**	**30.4**						
Total Perennial Cover	**23.4**	**34.3**	**18.0**	**61.4**	**69.0**	**59.2**			
Allowable Perennial Herbaceous Cover	**23.4**	**33.3**	**17.8**	**61.4**	**67.0**	**58.6**			

Woody Plant Density Results

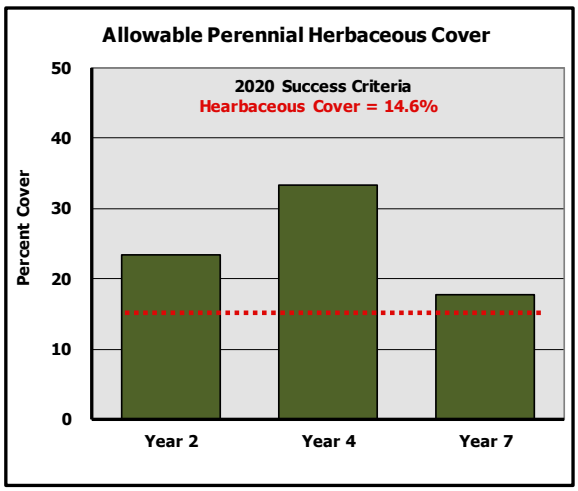
Number of Woody Plant Density belts = 15

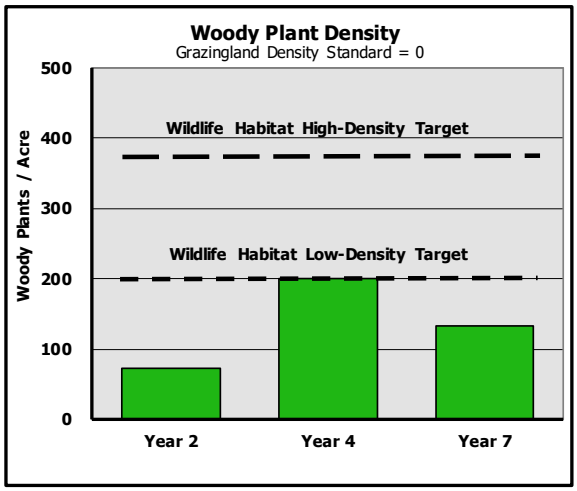
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	5.4	37.8	72.8
Atriplex canescens	Four-wing Saltbush	67.4	161.9	59.4
Total		**72.8**	**199.6**	**132.2**
Sagebrush Contribution (%)		7%	19%	55%
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	13%	0%
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		13%	40%	33%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		314
Perennial Forbs		17
Sub-shrubs		0
Annual Grasses		9.3
Annual / Biennial Forbs		16
Noxious Weeds	Cheatgrass	1.4
	Other	13.9
Total Production		**372.0**
Total Perennial Production		331.0
Allowable Perennial Herb. Production		**331.0**

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



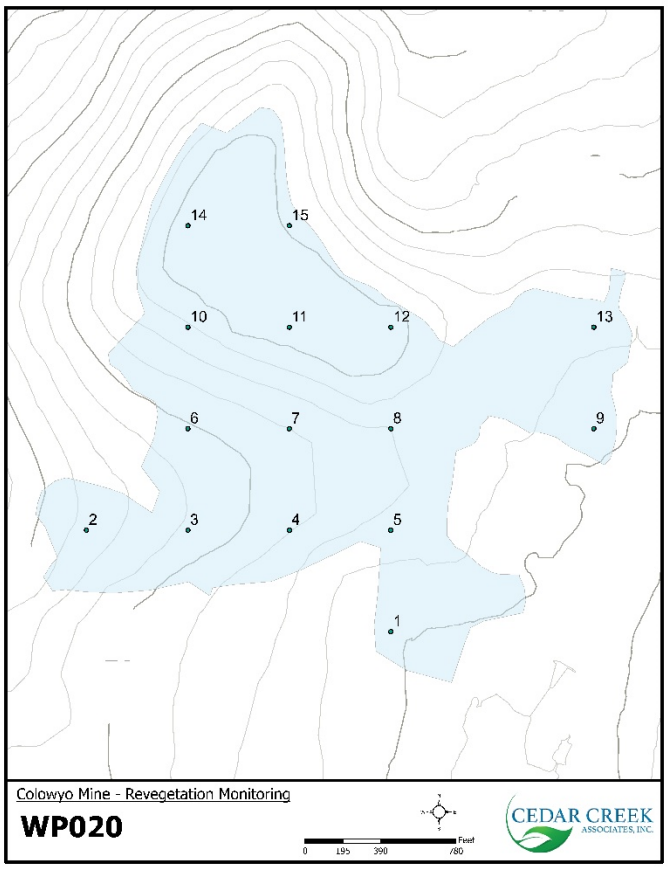


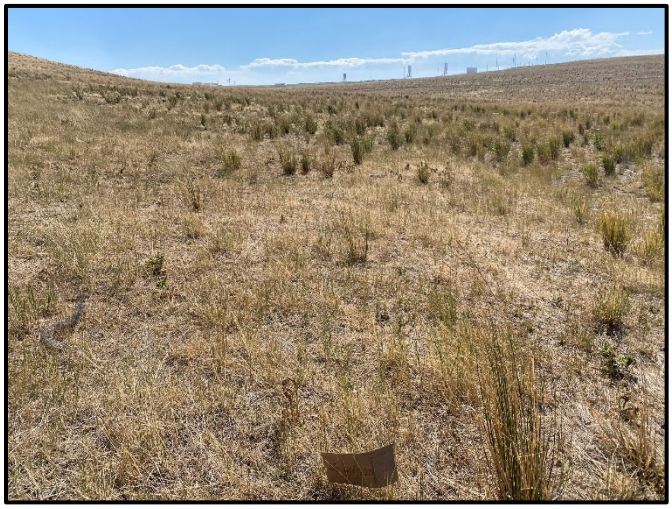
3.4.4 WP020 – Year 7 Unit

WP020 is comprised of approximately 95.8 acres of northeast-facing moderately sloping revegetation. This unit was seeded in 2013, and therefore, was undergoing its seventh growing season in 2020 (Compendium 12). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants remained constant in Year 7 with 18.3% average perennial cover. Annual forbs exhibit 2.4% average cover in Year 7. Cheatgrass exhibits minor cover with 3.8% 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 7. Woody plant density was determined from 15 belt transects and indicated 62.1 stems per acre in 2020, consisting entirely of big sagebrush. Perennial herbaceous production was 428.2 pounds per acre, considerably above the success criteria of 286.7 pounds per acre.

Unit WP020 exhibits fair perennial cover for seven-year-old revegetation, yet is expected to rebound following the return of average precipitation. It is recommended that this unit be evaluated in 2022 for Year-9 bond release sampling.





Compendium 11 2020

WP020

Location: **West Pit**
Acres: **95.8**
First Growing Season: **2013**
Targeted Post-Mining Community: **Wildlife Habitat**

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	17.7	18.4	17.7	47.6	48.3	70.6	14	15	11
Perennial Forbs	0.1	0.1	0.5	0.4	0.3	2.1	2	4	2
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	-	-	0.1	-	-	0.3	-	2	1
Annual Grass	1.3	6.3	-	3.4	16.6	-	1	1	-
Annual / Biennial Forbs	18.0	3.4	2.4	48.3	8.9	9.5	9	10	6
Noxious Weeds - Cheatgrass	0.1	9.4	3.8	0.2	24.7	15.1	1	1	-
Noxious Weeds - Other	0.1	0.4	0.6	0.2	1.1	2.4	1	3	3
Litter	11.1	18.6	35.1						
Rock	2.1	3.5	2.3						
Bareground	49.5	39.8	37.5						
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100**	**28**	**36**	**23**
Total Plant Cover	**37.3**	**38.1**	**25.1**						
Total Perennial Cover	**17.9**	**18.5**	**18.3**	**47.9**	**48.7**	**72.9**			
Allowable Perennial Herbaceous Cover	**17.9**	**18.5**	**18.3**	**47.9**	**48.7**	**72.7**			

Woody Plant Density Results

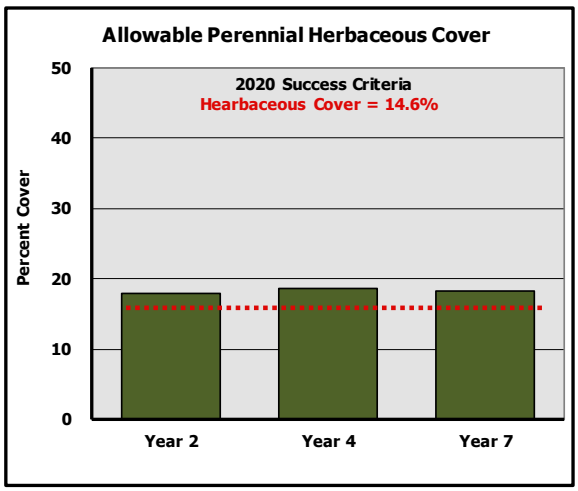
Number of Woody Plant Density belts = 15

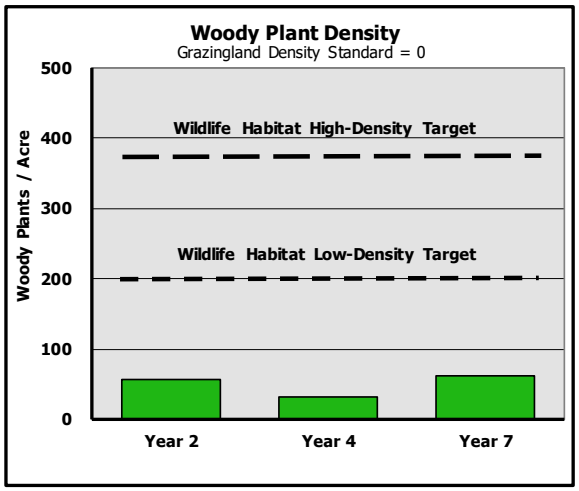
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia cana	Silver Sage	2.7		
Artemisia tridentata	Big Sagebrush	2.7	13.5	62.1
Atriplex canescens	Four-wing Saltbush	29.7	18.9	
Chrysothamnus nauseosus	Rubber Rabbitbrush	2.7		
Purshia tridentata	Antelope Bitterbrush	18.9		
Total		**56.7**	**32.4**	**62.1**
Sagebrush Contribution (%)		10%	42%	100%
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	0%	7%
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		667%	0%	13%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		428
Perennial Forbs		0
Sub-shrubs		0
Annual Grasses		81.9
Annual / Biennial Forbs		53
Noxious Weeds	Cheatgrass	25.7
	Other	5.0
Total Production		**593.9**
Total Perennial Production		428.2
Allowable Perennial Herb. Production		**428.2**

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

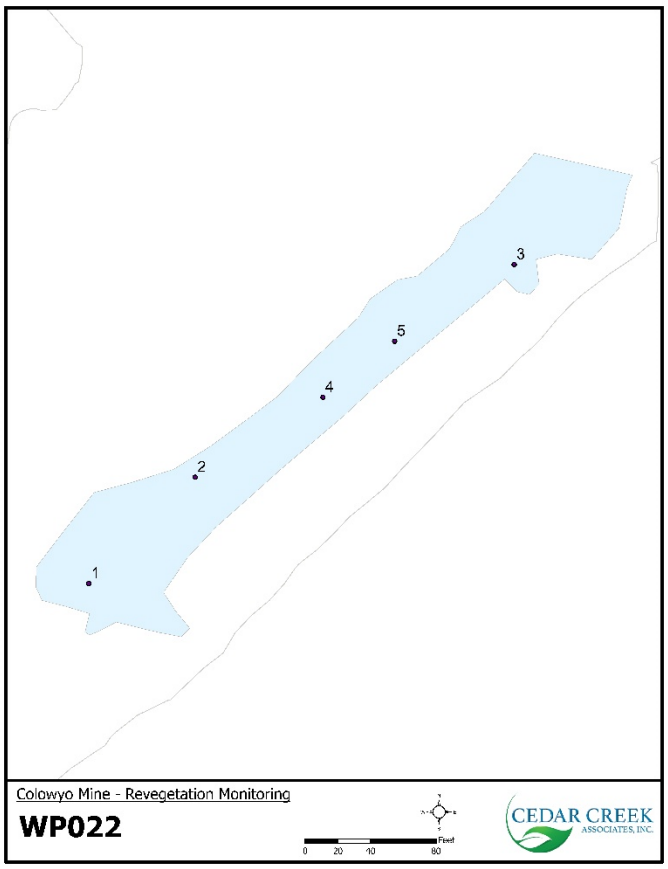




3.4.5 WP022 – Year 4 Unit

WP022 is comprised of approximately 0.5 acres of northeast-facing moderately sloping revegetation. This unit was seeded in 2016, and therefore, was undergoing its fourth growing season in 2020 (Compendium 13). A representative photo for 2020 is presented below.

Ground cover was determined from 5 transects. Desirable perennial plants have decreased from 23.1% average perennial cover in Year 2, to 18.2% in Year 4, due to recent unfavorable precipitation. Annual forbs exhibit 5.0% average cover for Year 4. Cheatgrass exhibits elevated cover with 15.6% average cover. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. A total of 20 species were observed in Year 4. Woody plant density was determined from 15 belt transects and indicated 1,594.5 stems per acre in 2020, with 47% contribution from big sagebrush.



Unit WP022 exhibits good perennial cover for four-year-old revegetation, and is expected to increase once average precipitation returns. This unit may require cheatgrass intervention if drought conditions persist. It is recommended that this unit be evaluated in 2023 for ground cover, production, and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 12 2020

WP022

Location: **West Pit**
Acres: **0.5**
First Growing Season: **2016**
Targeted Post-Mining Community: **Wildlife Habitat**

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	14.6		42.6	37.4		11	6	
Perennial Forbs	0.3	2.0		0.6	5.1		4	4	
Sub-shrubs	-	0.2		-	0.5		-	1	
Shrubs & Trees	-	1.4		-	3.6		-	2	
Annual Grass	0.9	-		1.7	-		1	-	
Annual / Biennial Forbs	12.4	5.0		23.3	12.8		5	5	
Noxious Weeds - Cheatgrass	2.5	15.6		4.6	40.0		1	-	
Noxious Weeds - Other	14.5	0.2		27.1	0.5		4	2	
Litter	16.1	58.2							
Rock	4.1	-							
Bareground	26.4	2.8							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**26**	**20**	
Total Plant Cover	**53.3**	**39.0**							
Total Perennial Cover	**23.1**	**18.2**		**43.2**	**46.7**				
Allowable Perennial Herbaceous Cover	**23.1**	**16.6**		**43.2**	**42.6**				

Woody Plant Density Results

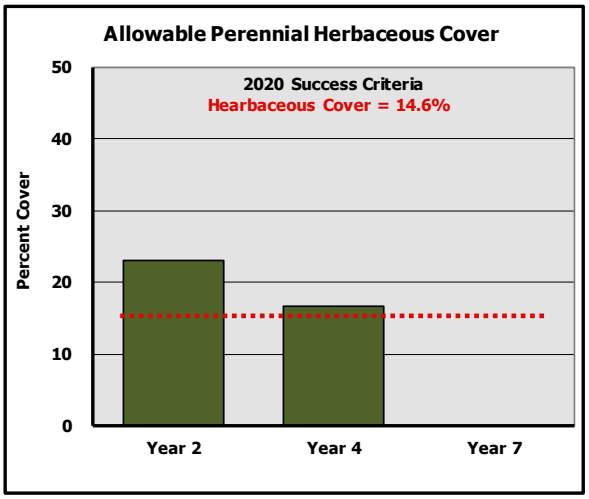
Number of Woody Plant Density belts = 15

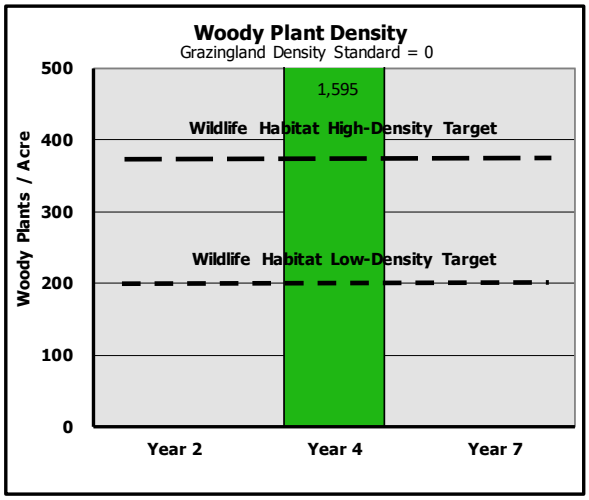
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush		744.6	
Atriplex canescens	Four-wing Saltbush		129.5	
Gutierrezia sarothrae	Broom Snakeweed		712.2	
Symphoricarpos rotundifolius	Roundleaf Snowberry		8.1	
Total		**0.0**	**1594.5**	
Sagebrush Contribution (%)		0%	47%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	100%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%	100%	

Production Results

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

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

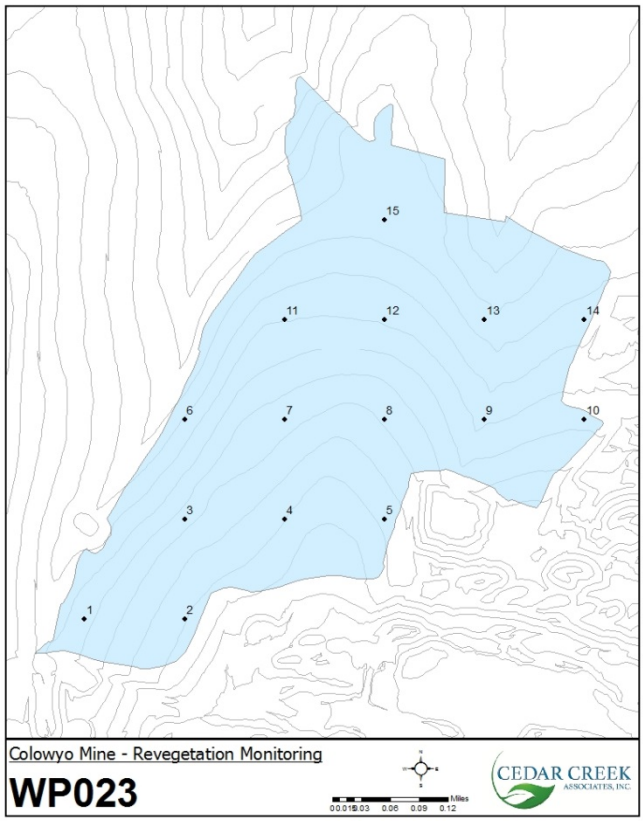




3.4.6 WP023 – Year 4 Unit

WP023 is comprised of approximately 105.4 acres of north-facing moderately sloping revegetation. This unit was seeded in 2016 and therefore, was undergoing its fourth growing season in 2020 (Compendium 14). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established well on WP023 with 22.5% average perennial cover in Year 4. Annual grasses exhibit 5.4% average cover. Cheatgrass remains constant with 18.9% average cover. Annual grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 17 species observed on this unit in 2020. Woody plant density on WP023 was determined from 15 belt transects and measured 94.4 stems per acre, consisting entirely of big sagebrush.



Unit WP023 exhibits good perennial cover for a four-year-old revegetation, especially considering recent precipitation patterns. It is recommended that this unit be evaluated in 2023 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 13 2020

WP023

Location: **West Pit**
Acres: **105.4**
First Growing Season: **2016**
Targeted Post-Mining Community: **Wildlife Habitat**

Ground Cover Results

Number of Ground Cover Transects = 5

	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	10.8	22.1		24.8	47.3		5	7	
Perennial Forbs	0.1	0.1		0.2	0.3		1	2	
Sub-shrubs	-	-		-	-		-	-	
Shrubs & Trees	-	0.2		-	0.4		-	1	
Annual Grass	-	-		-	-		1	-	
Annual / Biennial Forbs	14.5	5.4		33.2	11.5		5	5	
Noxious Weeds - Cheatgrass	18.2	18.9		41.8	40.5		1	-	
Noxious Weeds - Other	-	-		-	-		-	2	
Litter	24.7	35.7							
Rock	0.9	0.9							
Bareground	30.9	16.7							
Total	**100.0**	**100.0**		**100.0**	**100.0**		**13**	**17**	
Total Plant Cover	**43.5**	**46.8**							
Total Perennial Cover	**10.9**	**22.5**		**25.0**	**48.0**				
Allowable Perennial Herbaceous Cover	**10.9**	**22.3**		**25.0**	**47.6**				

Woody Plant Density Results

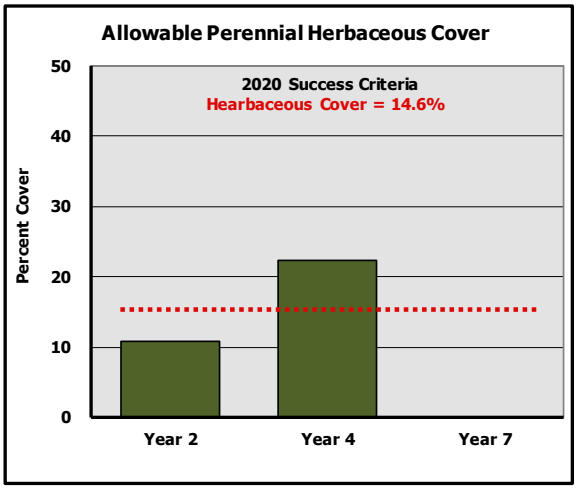
Number of Woody Plant Density belts = 15

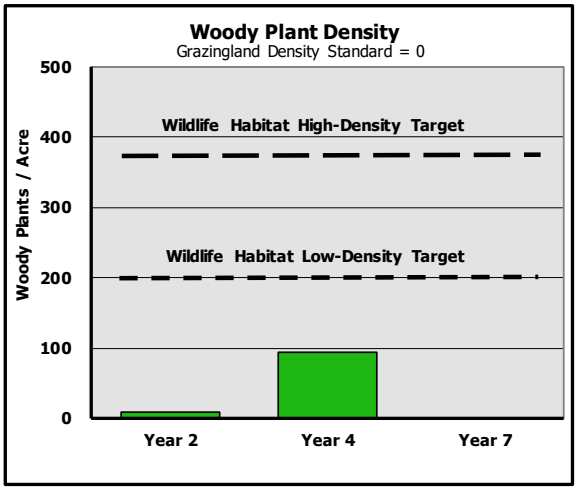
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia cana	Silver Sage	5.4		
Artemisia tridentata	Big Sagebrush	2.7	94.4	
Total		**8.1**	**94.4**	
Sagebrush Contribution (%)		33%	100%	
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%	0%	
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%	27%	

Production Results

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

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

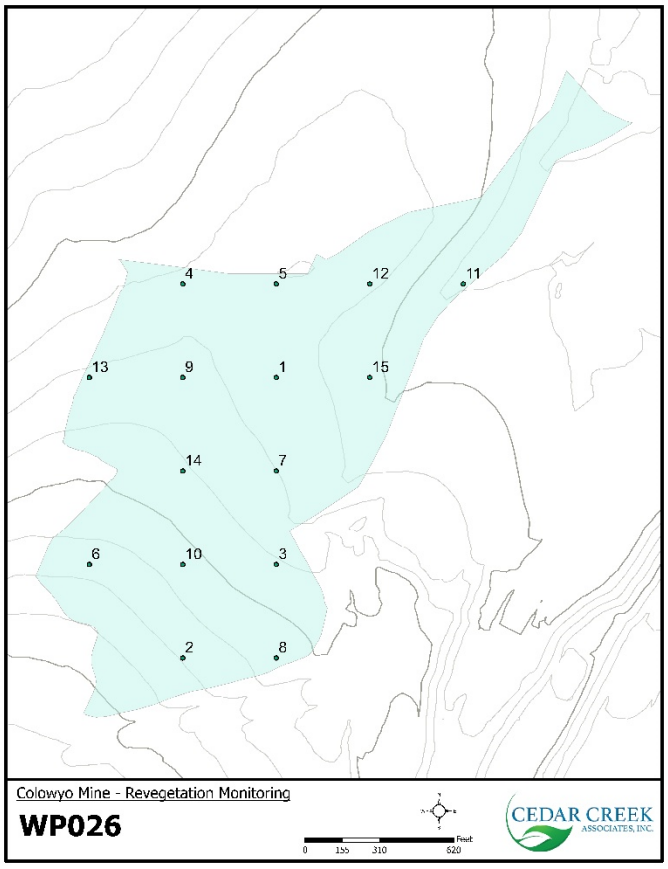




3.4.7 WP026 – Year 2 Unit

WP026 is comprised of approximately 54.2 acres of gently sloping north-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its second growing season in 2020 (Compendium 15). A representative photo for 2020 is not available.

Ground cover was determined from 15 transects. Desirable perennial plants have established fairly well on WP026 with 10.0% average perennial cover in Year 2. Annual forbs exhibit 9.6% average cover in Year 2. Cheatgrass exhibits 5.0% average cover in Year 2. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 16 species observed on this unit in 2020. Woody plant density was determined from 15 belt transects and indicated 161.9 stems per acre in 2020 consisting entirely of big sagebrush.



Unit WP026 exhibits good perennial cover for two-year-old revegetation. It is recommended that this unit be evaluated in 2022 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 14 2020

WP026

Location: **West Pit**
Acres: **54.2**
First Growing Season: **2018**
Targeted Post-Mining Community: **Wildlife Habitat**

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	9.9			40.4			7		
Perennial Forbs	-			-			-		
Sub-shrubs	-			-			-		
Shrubs & Trees	0.1			0.3			1		
Annual Grass	-			-			-		
Annual / Biennial Forbs	9.6			39.0			7		
Noxious Weeds - Cheatgrass	5.0			20.3			-		
Noxious Weeds - Other	-			-			1		
Litter	31.7								
Rock	0.3								
Bareground	43.4								
Total	**100.0**			**100.0**			**16**		
Total Plant Cover	**24.6**								
Total Perennial Cover	**10.0**			**40.7**					
Allowable Perennial Herbaceous Cover	**10.6**			**40.4**					

Woody Plant Density Results

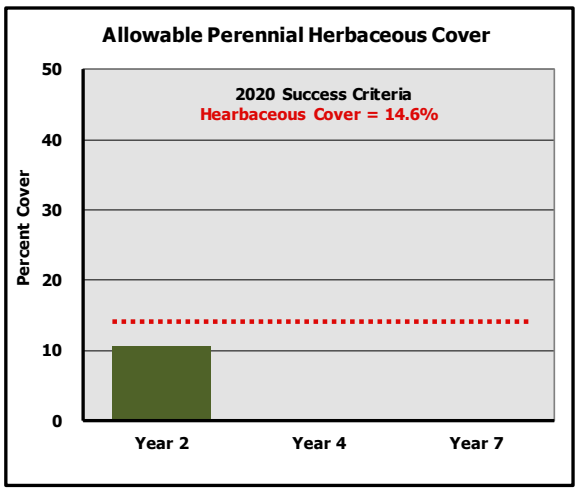
Number of Woody Plant Density belts = 15

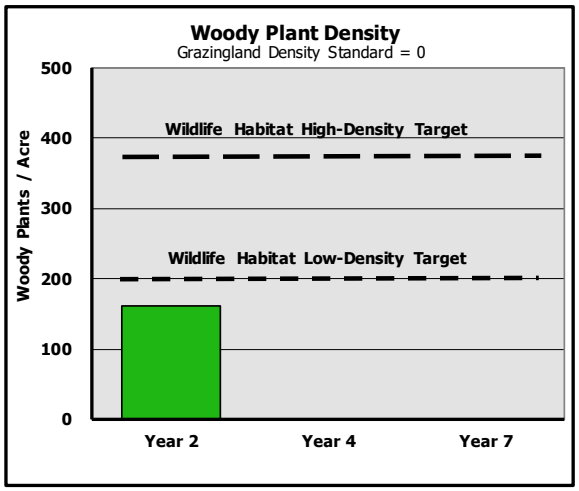
	Stems per Acre		
	Year 2	Year 4	Year 7
Artemisia tridentata Big Sagebrush	161.9		
Total	161.9		
Sagebrush Contribution (%)	100.0		
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)	13%		
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)	33%		

Production Results

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

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

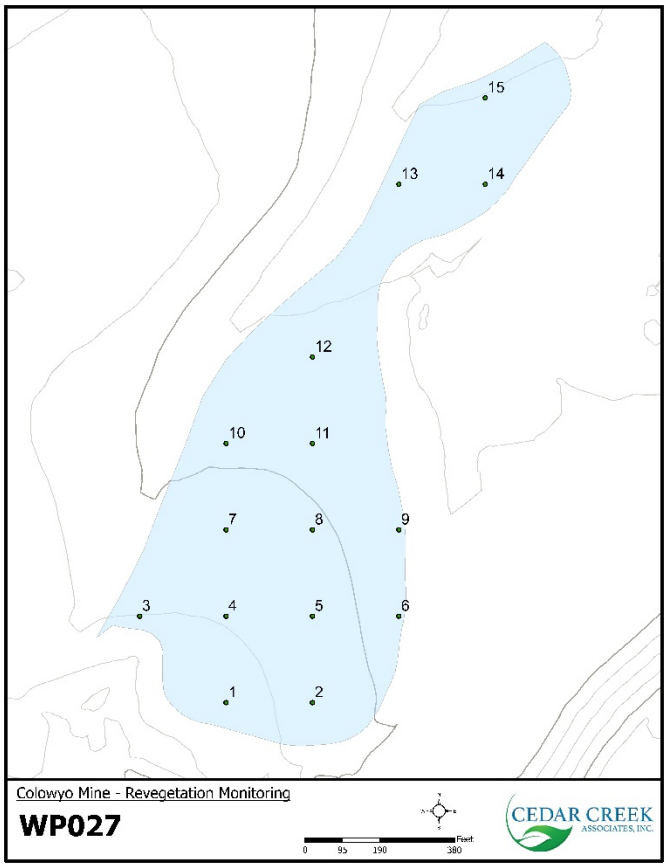




3.4.8 WP027 – Year 2 Unit

WP027 is comprised of approximately 17.8 acres of gently sloping north-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its second growing season in 2020 (Compendium 16). A representative photo for 2020 is not available.

Ground cover was determined from 15 transects. Desirable perennial plants have established modestly on WP027 with 6.5% average perennial cover in Year 2. Annual forbs exhibit elevated cover in Year 2 with 16.5% average cover. Cheatgrass exhibits 2.1% average cover in Year 2. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 16 species observed on this unit in 2020. Woody plant density was determined from 15 belt transects and indicated 291.4 stems per acre in 2020, 99% of which are big sagebrush.



Unit WP027 exhibits fair perennial cover for two-year-old revegetation, although is expected to progress following the return of favorable precipitation. It is recommended that this unit be evaluated in 2022 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 15 2020

WP027

Location: **West Pit**
Acres: **17.8**
First Growing Season: **2018**
Targeted Post-Mining Community: **Wildlife Habitat**

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	6.4			25.5			7		
Perennial Forbs	-			-			-		
Sub-shrubs	-			-			-		
Shrubs & Trees	0.1			0.3			1		
Annual Grass	-			-			-		
Annual / Biennial Forbs	16.5			66.0			7		
Noxious Weeds - Cheatgrass	2.1			8.2			-		
Noxious Weeds - Other	-			-			1		
Litter	35.3								
Rock	1.2								
Bareground	38.4								
Total	**100.0**			**100.0**			**16**		
Total Plant Cover	**25.1**								
Total Perennial Cover	**6.5**			**25.8**					
Allowable Perennial Herbaceous Cover	**6.4**			**25.5**					

Woody Plant Density Results

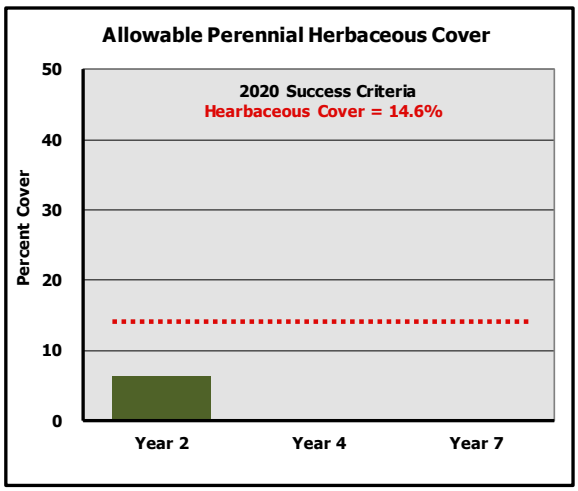
Number of Woody Plant Density belts = 15

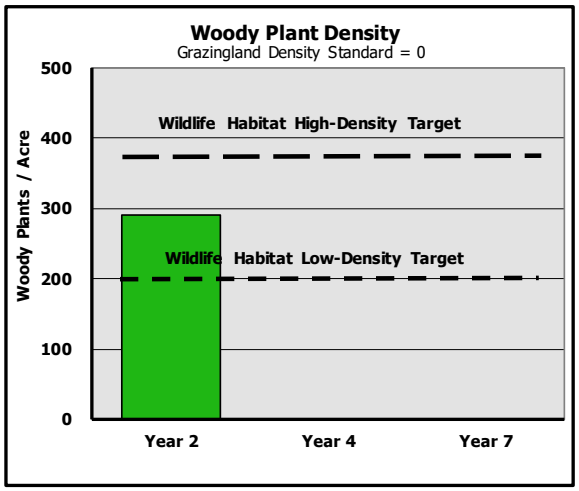
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	288.7		
Atriplex Canescens	Four-wing Saltbush	2.7		
Total		291.4		
Sagebrush Contribution (%)		99%		
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		27%		
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		67%		

Production Results

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

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

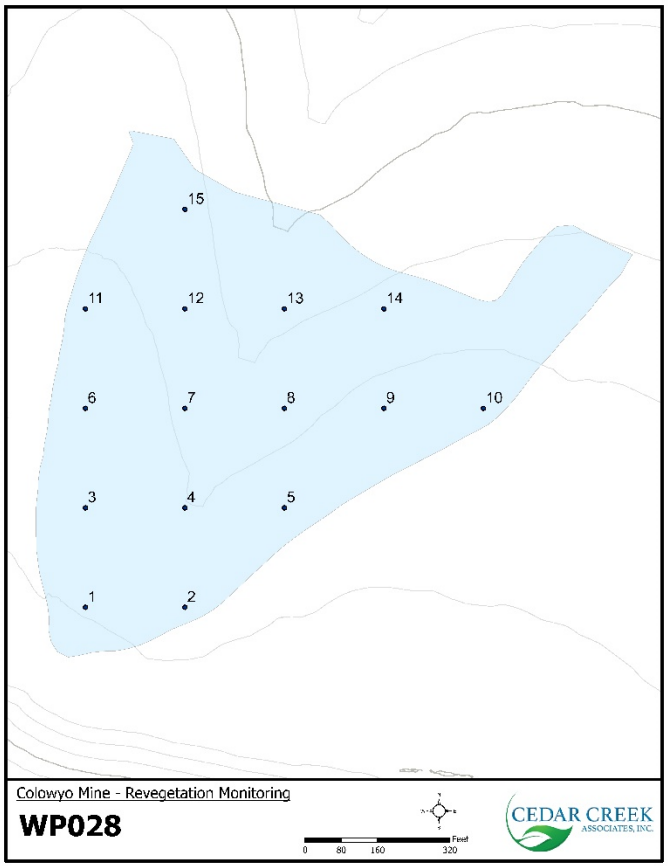




3.4.9 WP028 – Year 2 Unit

WP028 is comprised of approximately 17.9 acres of gently sloping north-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its second growing season in 2020 (Compendium 17). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established fairly well on WP028 with 14.1% average perennial cover in Year 2. Annual forbs exhibit elevated cover in Year 2 with 17.9% average cover. Cheatgrass exhibits 3.3% average cover in Year 2. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 16 species observed on this unit in 2020. Woody plant density was determined from 15 belt transects and indicated 45.9 stems per acre in 2020 with sagebrush contributing 65%.



Unit WP028 exhibits good perennial cover for two-year-old revegetation. It is recommended that this unit be evaluated in 2022 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 16 2020

WP028

Location: **West Pit**
Acres: **17.9**
First Growing Season: **2018**
Targeted Post-Mining Community: **Wildlife Habitat**

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	14.1			39.8	39.8		7		
Perennial Forbs	-			-	-		-		
Sub-shrubs	-			-	-		-		
Shrubs & Trees	-			-	-		-		
Annual Grass	-			-	-		-		
Annual / Biennial Forbs	17.9			50.8	50.8		7		
Noxious Weeds - Cheatgrass	3.3			9.4	9.4		-		
Noxious Weeds - Other	-			-	-		2		
Litter	31.3								
Rock	1.9								
Bareground	31.5								
Total	**100.0**			**100.0**			**16**		
Total Plant Cover	**35.3**								
Total Perennial Cover	**14.1**			**39.8**					
Allowable Perennial Herbaceous Cover	**14.1**			**39.8**					

Woody Plant Density Results

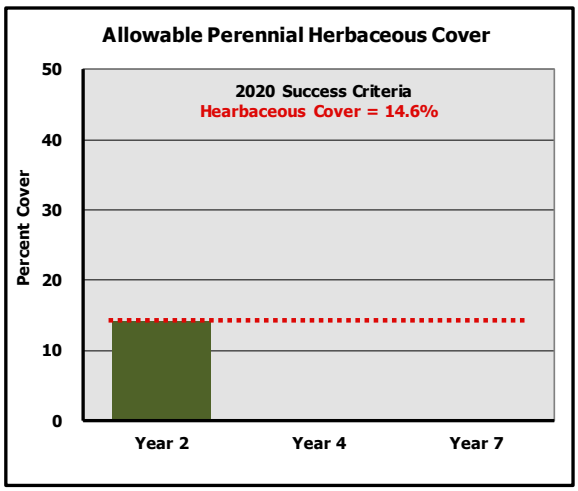
Number of Woody Plant Density belts = 15

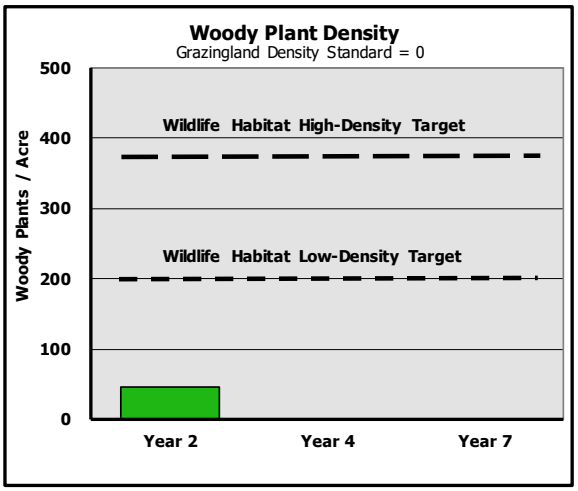
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata	Big Sagebrush	29.7		
Atriplex Canescens	Four-wing Saltbush	16.2		
Total		45.9		
Sagebrush Contribution (%)		65%		
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%		
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		13%		

Production Results

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

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

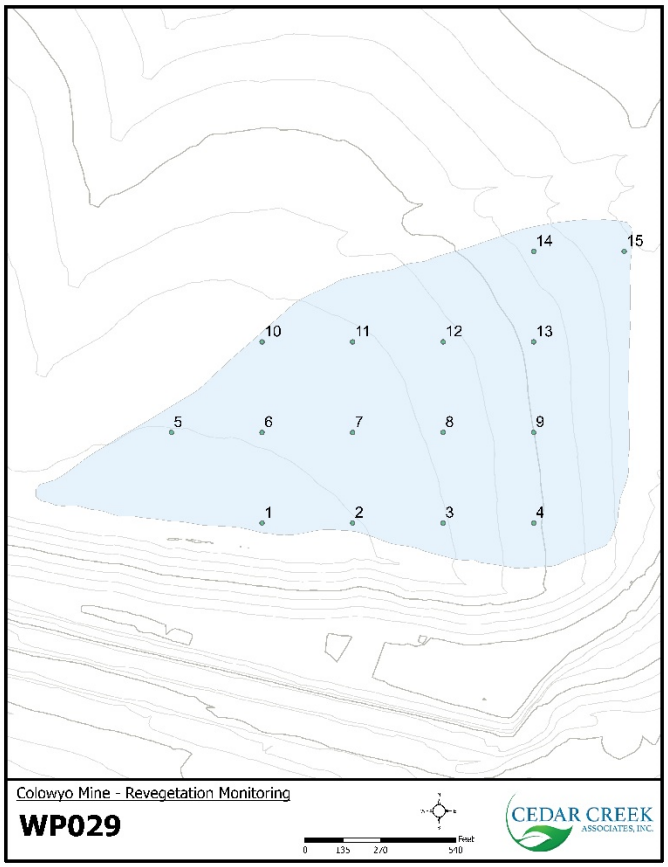




3.4.10 WP029 – Year 2 Unit

WP029 is comprised of approximately 38.3 acres of gently sloping north-facing revegetation. This unit was seeded in 2018 and therefore, was undergoing its second growing season in 2020 (Compendium 18). A representative photo for 2020 is presented below.

Ground cover was determined from 15 transects. Desirable perennial plants have established modestly on WP029 with 8.0% average perennial cover in Year 2. Annual forbs exhibit elevated cover in Year 2 with 13.0% average cover. Cheatgrass exhibits 4.7% average cover in Year 2. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. There were 14 species observed on this unit in 2020. Woody plant density was determined from 15 belt transects and indicated 64.7 stems per acre in 2020, with 29% contribution from big sagebrush.



Unit WP029 exhibits fair perennial cover for two-year-old revegetation. It is recommended that this unit be evaluated in 2022 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Compendium 17 2020

WP029

Location: **West Pit**
Acres: **38.3**
First Growing Season: **2018**
Targeted Post-Mining Community: **Grazingland**

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	8.0			31.2			5		
Perennial Forbs	-			-			-		
Sub-shrubs	-			-			-		
Shrubs & Trees	-			-			-		
Annual Grass	-			-			-		
Annual / Biennial Forbs	13.0			50.6			7		
Noxious Weeds - Cheatgrass	4.7			18.2			-		
Noxious Weeds - Other	-			-			2		
Litter	28.5								
Rock	0.5								
Bareground	45.4								
Total	**100.0**			**100.0**			**14**		
Total Plant Cover	**25.7**								
Total Perennial Cover	**8.0**			**31.2**					
Allowable Perennial Herbaceous Cover	**8.0**			**31.2**					

Woody Plant Density Results

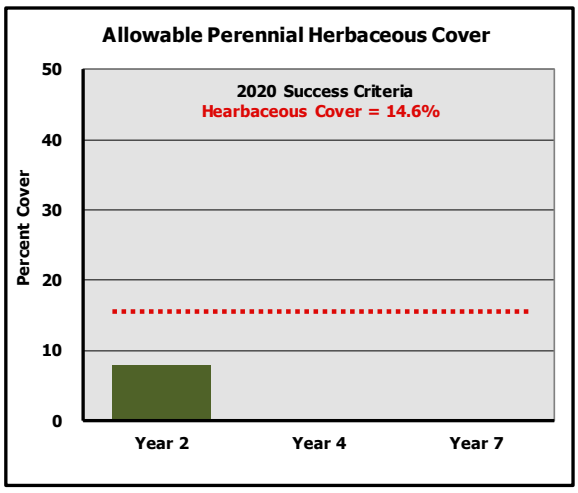
Number of Woody Plant Density belts = 15

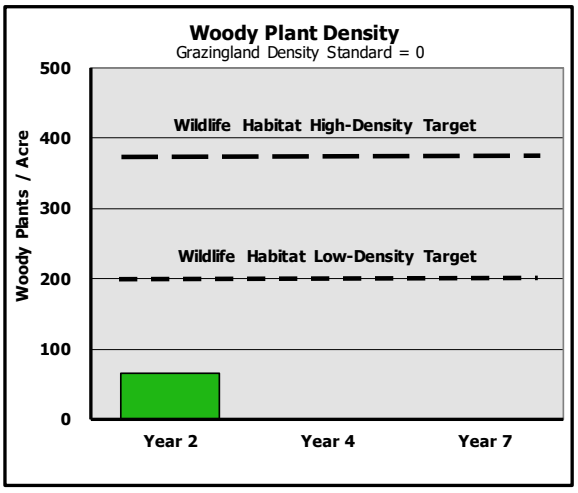
		Stems per Acre		
		Year 2	Year 4	Year 7
Artemisia tridentata vaseyana	Big Sagebrush	18.9		
Atriplex Canescens	Four-wing Saltbush	45.9		
Total		64.7		
Sagebrush Contribution (%)		29%		
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%		
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		20%		

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 Wildlife Habitat) will be delineated after Year 7 evaluation, in preparation for bond release evaluation.





3.4.11 WP031 – Year 1 Unit

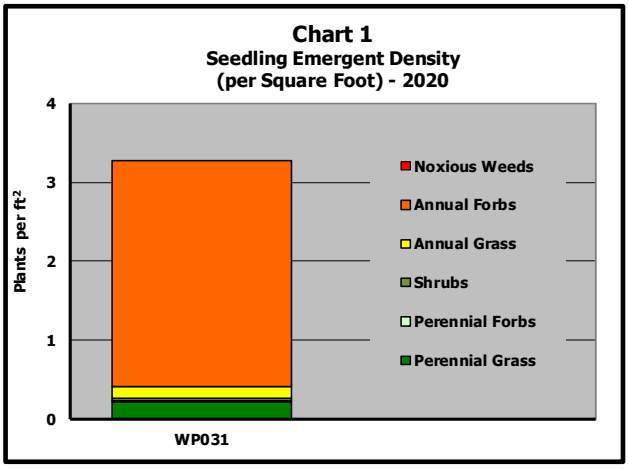
WP031 is comprised of approximately 66.6 acres of gently sloping northeast-facing revegetation. This unit was seeded in 2019 and therefore, was undergoing its second growing season in 2020.

An average of 3.28 plants per square foot was observed with perennials comprising 0.26 plants per square foot. Perennial seedling emergence in WP026/27 consisted of perennial grasses, forbs, and shrubs with 0.22, 0.02, and 0.02 plants per square foot, respectively (Table 1 and Chart 1).

Based on the germination results exhibited by this unit, seeding success can be considered poor. This unit was inter-seeded in the fall of 2020 to aid in perennial establishment. It is recommended that this unit be evaluated in 2021 for ground cover and woody plant density in accordance with Colowyo's monitoring schedule.

Table 1 Colowyo - Emergent Density - 2020

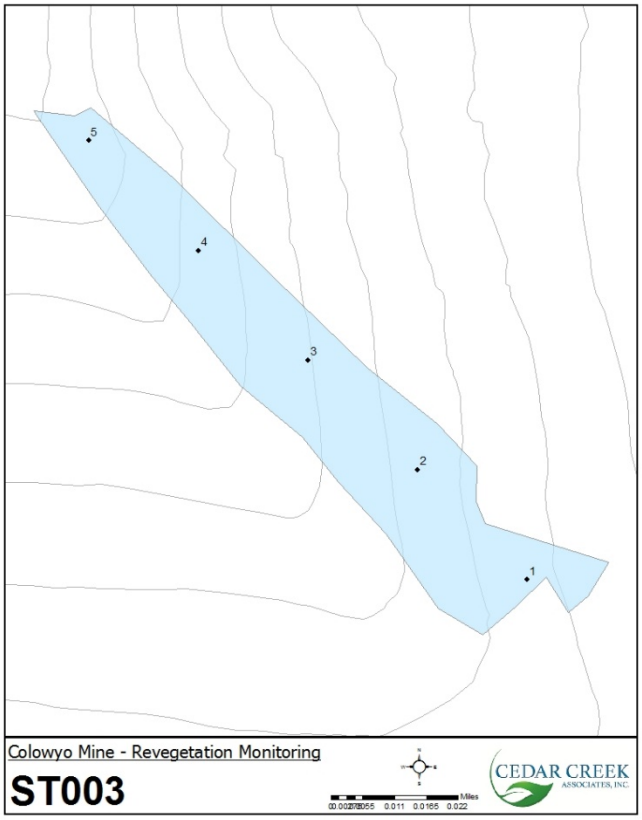
Seedling Emergent Density		
	Unit -->	WP031
	Reclamation Target -->	Grass / Sage
	Year of Seeding -->	2019
	No. of Quadrats -->	50
Annual	Grass	0.16
	Forb	2.86
	Subtotal	**3.02**
Perennial	Grass	0.22
	Forb	0.02
	Noxious Weed	-
	Subtotal	**0.24**
Shrubs	*Artemisia tridentata*	-
	Atriplex Canescens	0.02
	Subtotal	**0.02**
Total Density		3.28
Perennial Density		**0.26**



3.5 South Taylor

3.5.1 ST003 – Year 7 Unit

ST003 is comprised of approximately 1.2 acres of north-facing moderately sloping revegetation. This unit was seeded in 2013, and therefore, was undergoing its seventh growing season in 2020 (Compendium 19). A representative photo for 2020 is not available.



Ground cover was determined from 15 transects. Desirable perennial plants have decreased substantially in Year 7 to 4.4%, likely due to recent drought conditions. Annual forbs and noxious weeds each continued to decrease in year 7 with 1.0% and 9.6% average cover, respectively. Annual forbs and grasses tend to decrease on Colowyo's reclamation as perennial plant communities develop. Cheatgrass has increased to 15.8% average cover in Year 7. A total of 14 species were observed in Year 7. Woody plant density was determined from 15 belt transects. Woody plant density on ST003 indicated 202.3 stems per acre in Year 7, with no contribution from sagebrush. Perennial herbaceous production was 15.3 pounds per acre, significantly below the success criteria of 286.7 pounds per acre. Noxious weeds and cheatgrass comprise the majority of production.

Unit ST003 exhibits poor perennial cover for seven-year-old revegetation, yet is expected to rebound following the return of favorable precipitation conditions. Noxious weeds have improved substantially but the unit requires ongoing treatment to continue control of thistle populations. It is recommended that this unit be evaluated for Year 9 bond release sampling in 2022.

Compendium 18 2020

ST003

Location: **South Taylor**
Acres: **1.2**
First Growing Season: **2013**
Targeted Post-Mining Community: **Grazingland**

Ground Cover Results

Number of Ground Cover Transects = 5

	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	11.8	18.6	3.8	32.2	30.5	12.3	4	7	4
Perennial Forbs	0.4	1.0	0.2	1.1	2.0	0.6	2	4	1
Sub-shrubs	-	-	-	-	-	-	-	-	-
Shrubs & Trees	-	-	0.4	-	-	1.3	-	1	1
Annual Grass	1.0	1.8	-	2.7	3.0	-	1	1	-
Annual / Biennial Forbs	12.6	6.2	1.0	34.4	57.4	3.2	5	2	4
Noxious Weeds - Cheatgrass	-	0.8	15.8	-	1.3	51.3	-	1	-
Noxious Weeds - Other	10.8	32.6	9.6	29.5	5.9	31.2	4	4	4
Litter	10.4	20.4	42.4						
Rock	13.2	5.0	6.4						
Bareground	39.8	13.6	20.4						
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**16**	**20**	**14**
Total Plant Cover	**36.6**	**61.0**	**30.8**						
Total Perennial Cover	**12.2**	**19.6**	**4.4**	**33.3**	**32.5**	**14.3**			
Allowable Perennial Herbaceous Cover	**12.2**	**19.6**	**4.0**	**33.3**	**32.5**	**13.0**			

Woody Plant Density Results

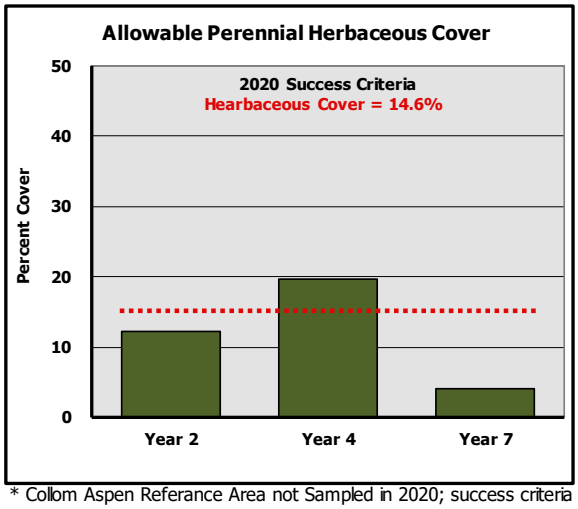
Number of Woody Plant Density belts = 5

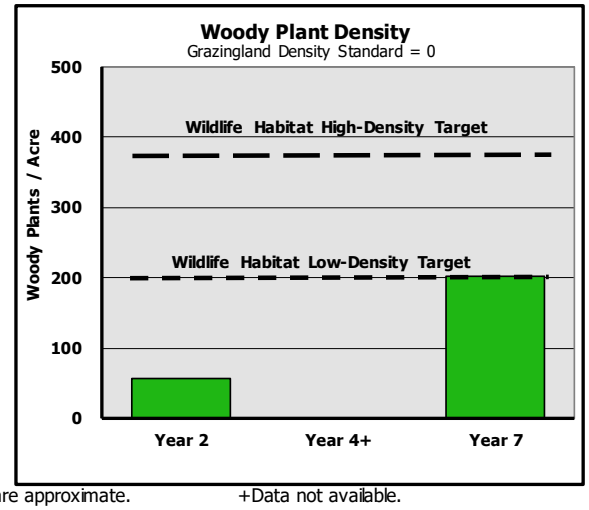
		Stems per Acre		
		Year 2	Year 4+	Year 7
Amelanchier alnifolia	Saskatoon Serviceberry			72.8
Symphoricarpos rotundifolius	Roundleaf Snowberry	56.7		129.5
Total		**56.7**		**202.3**
Sagebrush Contribution (%)		0%		0%
Percent of Transects Exceeding High-Density Standard (375 Stems per acre)		0%		40%
Percent of Transects Exceeding Low-Density Standard (Between 200 and 375 Stems per acre)		0%		40%

Production Results

		lbs per Acre
		Year 7
Perennial Grasses		15
Perennial Forbs		0
Sub-shrubs		0
Annual Grasses		233.0
Annual / Biennial Forbs		33
Noxious Weeds	Cheatgrass	0.7
	Other	306.8
Total Production		**589.3**
Total Perennial Production		15.3
Allowable Perennial Herb. Production		**15.3**

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



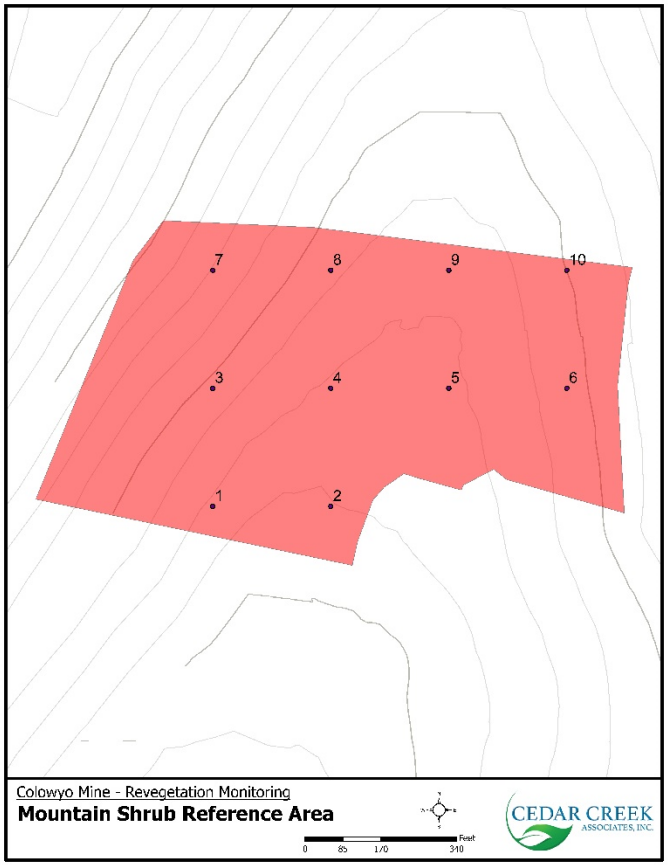


* Collom Aspen Referance Area not Sampled in 2020; success criteria are approximate. +Data not available.

3.6 Reference Areas

3.6.1 Mountain Shrub Reference Area

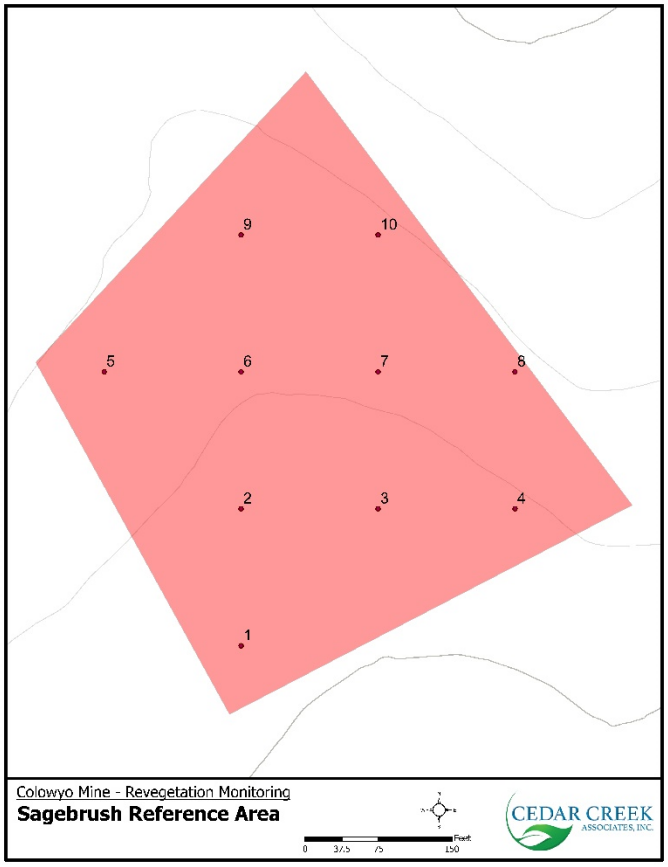
The Mountain Shrub Reference Area is comprised of approximately 18 acres of gently to moderately sloping vegetation with a predominately northwestern aspect (mesic) and eastern aspect (xeric). Rationale for the larger reference area with two dominant aspects is to provide a better representation of the distribution of Mountain Shrub communities located on and around Colowyo. 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.

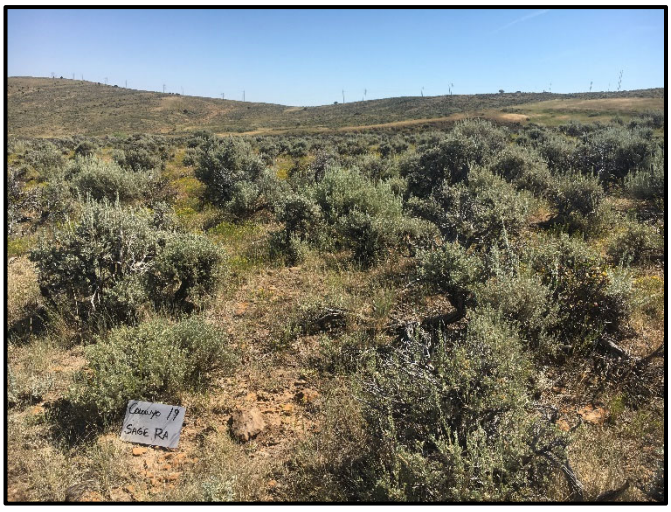


Ground cover in the Mountain Shrub Reference Area (Appendix A - Chart 3 and 4; and Table 3 and 4) consisted of 40.4% live vegetation, 0.8% rock, 52.6% litter, and bare soil exposure of 6.0%. Perennial cover across the unit averaged 38.5% with annual and biennial cover averaging 0.8%, with noxious cheatgrass cover averaging 1.1%. Current annual production across the area averaged 355.2 pounds per acre in 2020 with perennial grasses the dominant category, followed by perennial forbs and annual grasses. Total perennial production was 318.6 pounds per acre (Appendix A - Table 6 and Chart 6).

3.6.2 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 from 2019 is presented below.





Ground cover in the Sagebrush Reference Area consisted of 41.5% live vegetation, 2.3% rock, 45.7% litter, and bare soil exposure of 10.5% (Appendix A - Chart 3 and 4; and Table 3 and 4). Perennial cover across the unit averaged 35.3%, with annual and biennial cover of 1.7%, noxious cheatgrass cover of 4.5%, and no other noxious weed cover. Current annual herbaceous production across the area averaged 354.9 pounds per acre in 2020 with perennial grasses the dominant category, followed by sub-shrubs and cheatgrass and annual forbs. Total perennial production was 286.4 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 2020 can generally be considered in fair to 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 unfavorable 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 and 2020, 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.

The West Pit seven-year-old units (WP 017, 018, 019, and 020) have developed enough desirable perennial cover and are either passing or near passing the bond release standards. In previous years, these units have performed well above the desirable cover standards, but drought conditions in 2020 have resulted in decreased ground cover. These units should rebound once favorable precipitation returns. The South Taylor revegetation unit ST003 exhibits elevated noxious weed populations and may not meet bond release criteria in 2022 unless favorable precipitation returns, and noxious weed populations are effectively managed. Several four-year-old units have been impacted by recent drought conditions, yet are performing well and should be considered on track to meet bond release success in Years 9 and 10. These units should be reevaluated in 2023 for Year 7 monitoring. Two two-year old units are also performing well and should be reevaluated in 2022 for year 4 monitoring.

Appendix A

Charts, Tables, and Raw Data

Chart 3a
Average Ground Cover by Lifeform - 2020

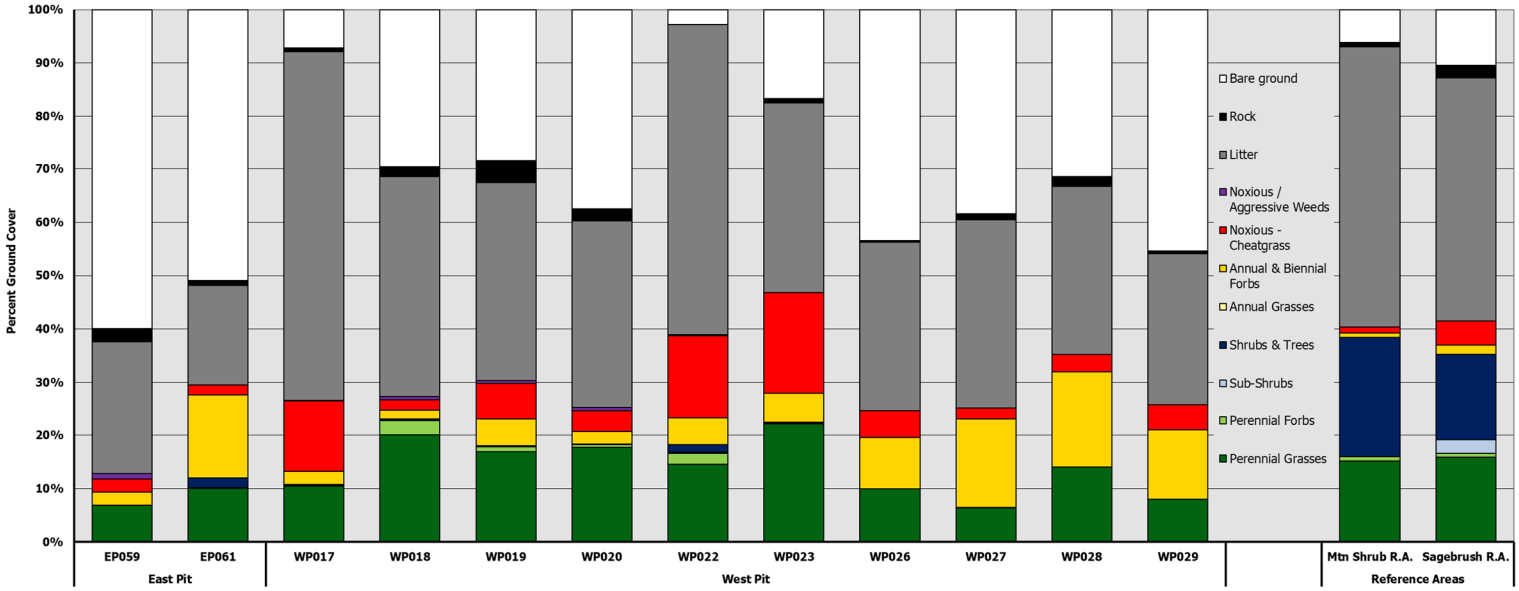
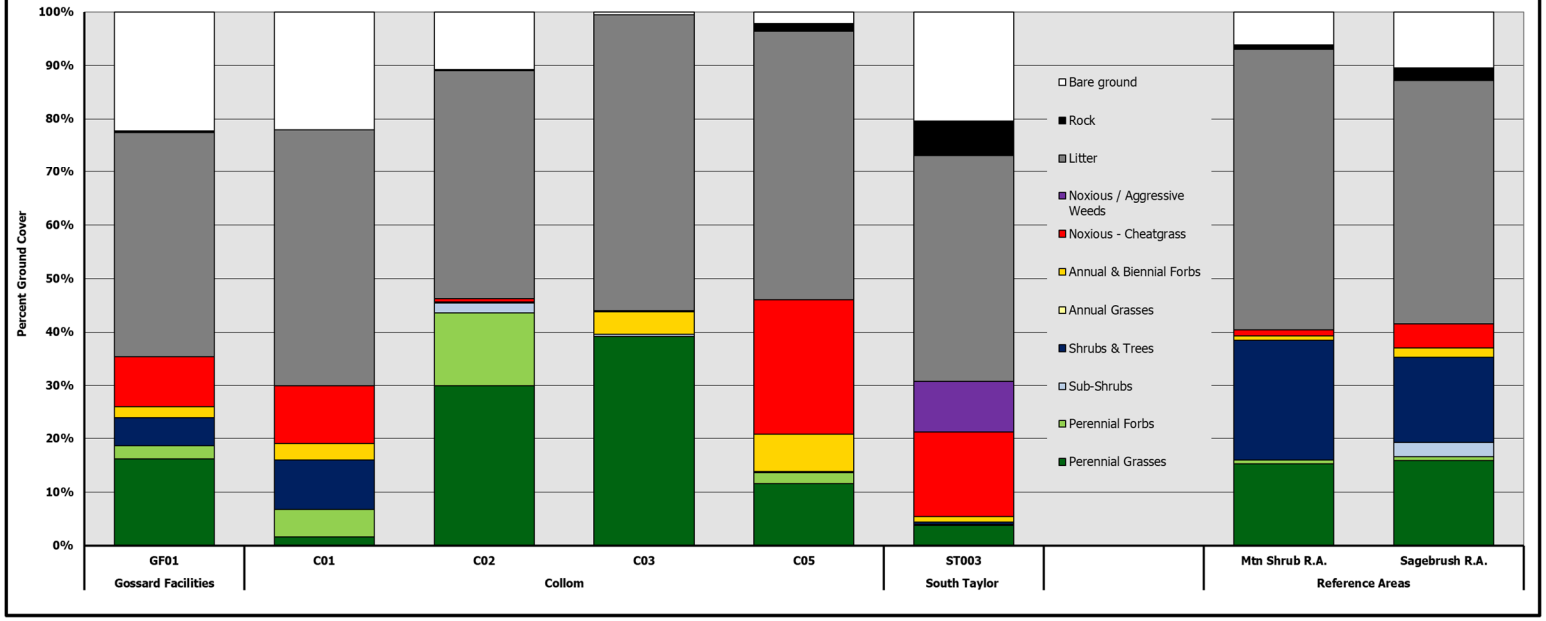


Chart 3b
Average Ground Cover by Lifeform - 2020



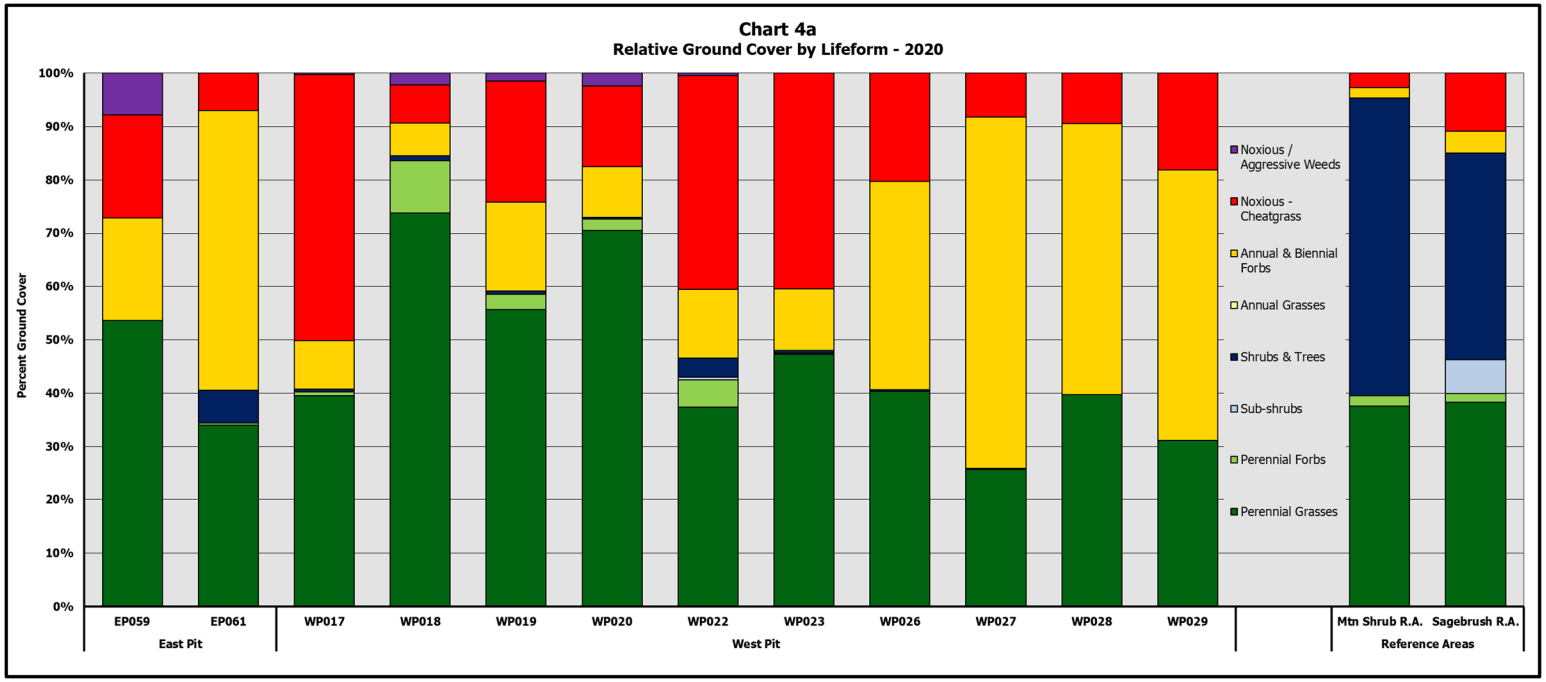


Chart 4a
Relative Ground Cover by Lifeform - 2020
Percent Ground Cover
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
EP059
EP061
WP017
WP018
WP019
WP020
WP022
WP023
WP026
WP027
WP028
WP029
Mtn Shrub R.A.
Sagebrush R.A.
East Pit
West Pit
Reference Areas
Noxious / Aggressive Weeds
Noxious - Cheatgrass
Annual & Biennial Forbs
Annual Grasses
Shrubs & Trees
Sub-shrubs
Perennial Forbs
Perennial Grasses

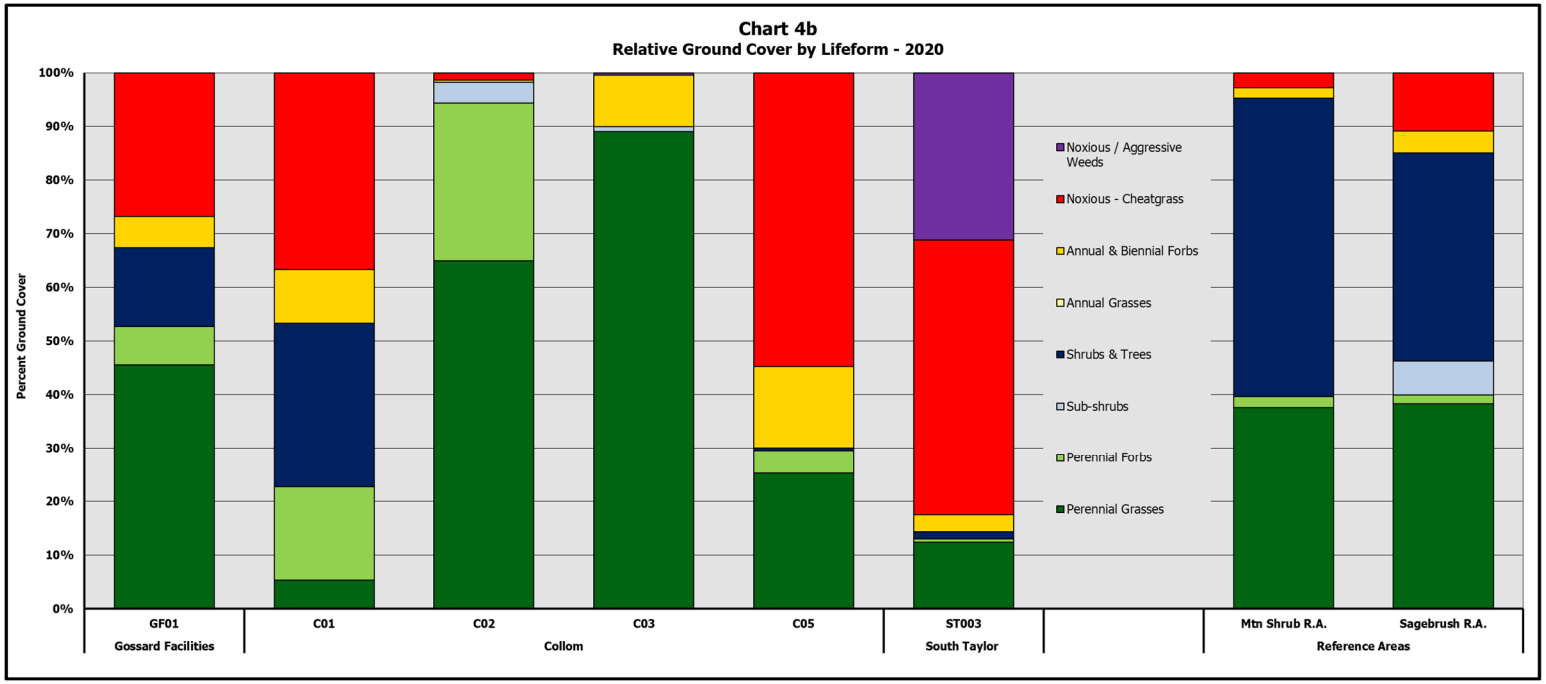


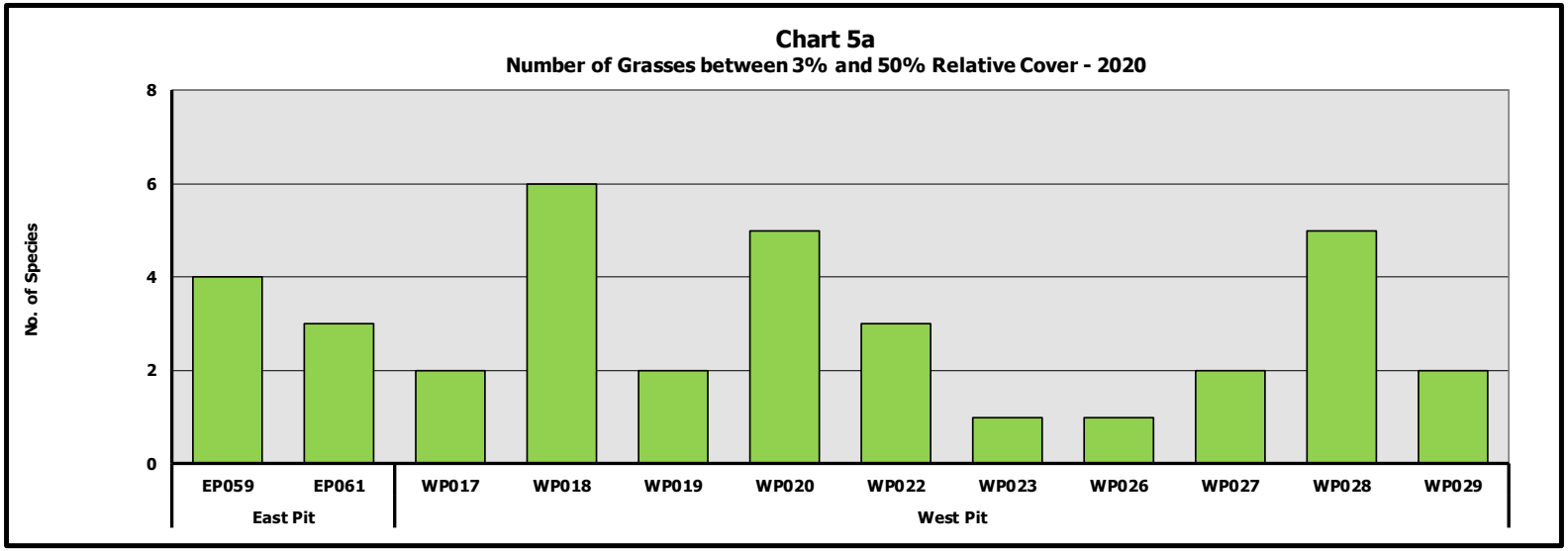
Chart 4b
Relative Ground Cover by Lifeform - 2020
Percent Ground Cover
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
GF01
C01
C02
C03
C05
ST003
Mtn Shrub R.A.
Sagebrush R.A.
Gossard Facilities
Collom
South Taylor
Reference Areas
Noxious / Aggressive Weeds
Noxious - Cheatgrass
Annual & Biennial Forbs
Annual Grasses
Shrubs & Trees
Sub-shrubs
Perennial Forbs
Perennial Grasses

Table 3a Colowyo - Vegetation Cover - 2020

Diversity Summary

(Number of Grasses with Between 3% - 50% Relative Cover, and Total Relative Forb Cover)

	East Pit		West Pit									
Unit ——>	EP059	EP061	WP017	WP018	WP019	WP020	WP022	WP023	WP026	WP027	WP028	WP029
Growing Seasons——>	4	2	7	7	7	7	4	4	2	2	2	2
Number of Perennial Grasses =	4	3	2	6	2	5	3	1	1	2	5	2
Forbs (% Relative Cover) =	19.3	52.9	9.8	15.9	19.5	11.7	17.9	11.8	39.0	66.0	50.8	50.6



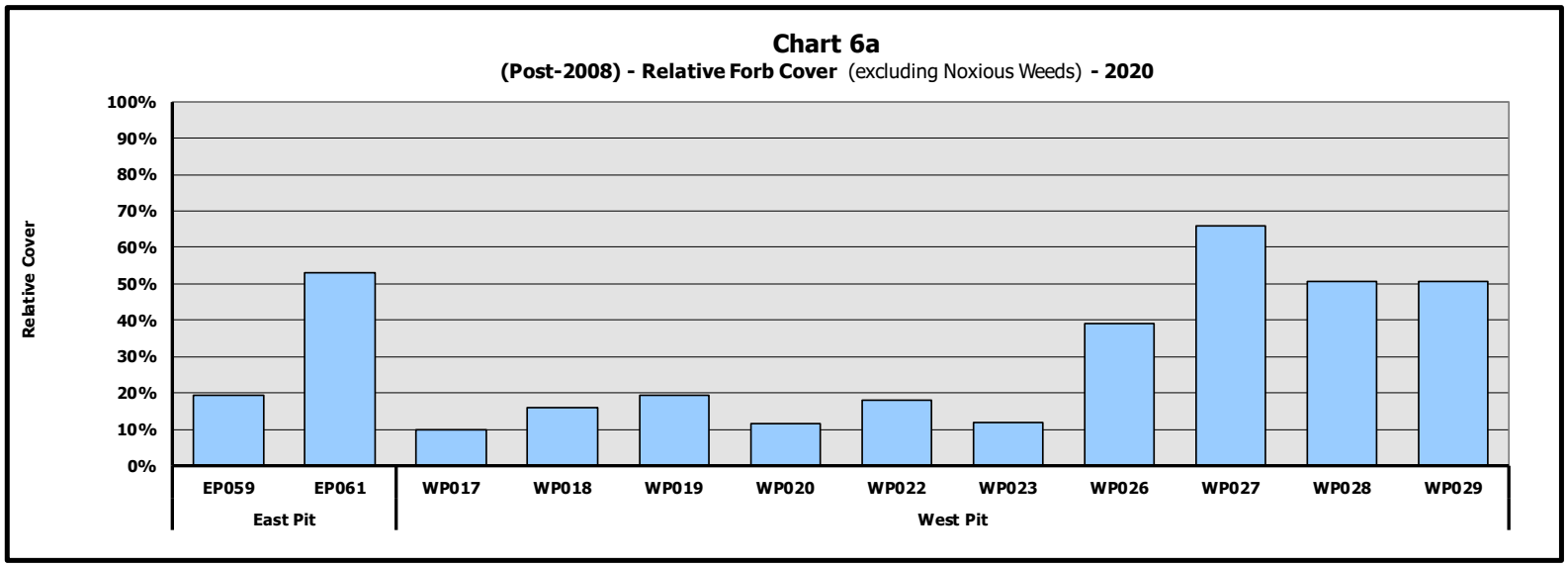
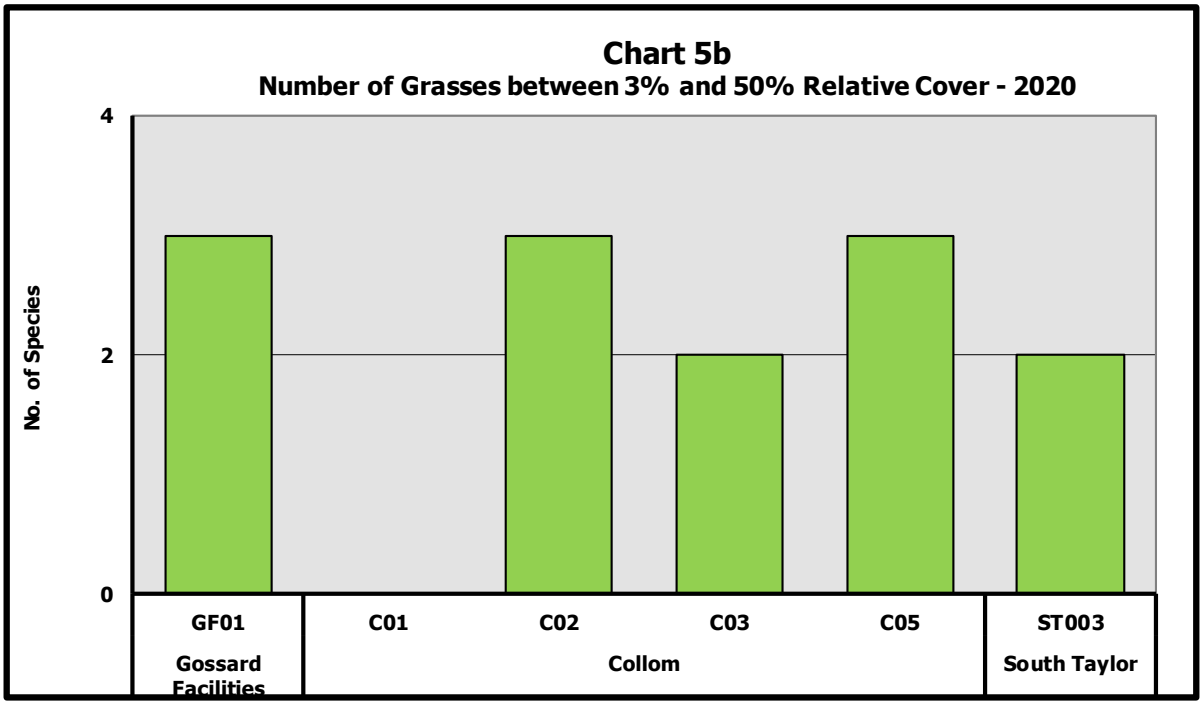


Table 3b Colowyo - Vegetation Cover - 2020

Diversity Summary

(Number of Grasses with Between 3% - 50% Relative Cover, and Total Relative Forb Cover)

	Gossard Facilities	Collom				South Taylor
Unit ——>	GF01	C01	C02	C03	C05	ST003
Growing Seasons——>	4	4	4	4	4	7
Number of Perennial Grasses =	3	0	3	2	3	2
Forbs (% Relative Cover) =	13.0	27.3	29.9	9.5	19.6	3.9



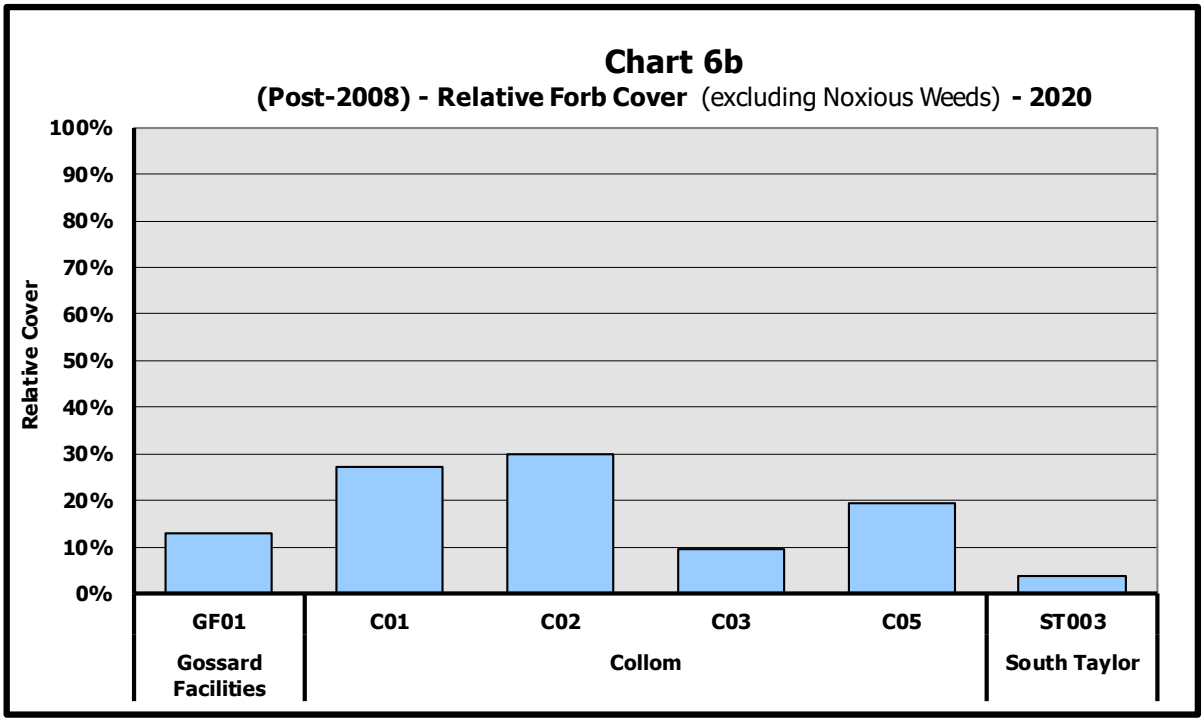


Table 4 Colowyo - Vegetation Cover - 2020

Average Ground Cover Summary

East Pit, West Pit, and Gossard Facilities

Percent Ground Cover Based on Point-Intercept Sampling

Area ——>	EP059	EP061	WP017	WP018	WP019	WP020	WP022	WP023	WP026	WP027	WP028	WP029	GF01	Mtn Shrub R.A.	Sagebrush R.A.	Weighted Reference Values
Weight ——>	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	55%	45%	
Total Plant Cover	**12.80**	**29.60**	**26.47**	**27.20**	**30.40**	**25.13**	**39.00**	**46.80**	**24.60**	**25.07**	**35.33**	**25.67**	**35.40**	**40.40**	**41.50**	**40.90**
Rock	2.40	0.93	0.67	1.87	4.27	2.27	-	0.87	0.33	1.20	1.87	0.47	0.33	0.80	2.30	1.48
Litter	24.87	18.53	65.67	41.27	37.00	35.07	58.20	35.67	31.67	35.33	31.33	28.47	42.07	52.60	45.70	49.50
Bare ground	59.93	50.93	7.20	29.67	28.33	37.53	2.80	16.67	43.40	38.40	31.47	45.40	22.20	6.20	10.50	8.14
Total Perennial Cover (Non-noxious)	**6.87**	**12.00**	**10.80**	**23.00**	**18.00**	**18.33**	**18.20**	**22.47**	**10.00**	**6.47**	**14.07**	**8.00**	**23.87**	**38.50**	**35.30**	**37.06**
Total Annual Cover (Non-noxious)	2.47	15.53	2.40	1.67	5.07	2.40	5.00	5.40	9.60	16.53	17.93	13.00	2.07	0.80	1.70	1.21
Summary by Lifeform:																
Perennial Grasses	**6.87**	**10.07**	**10.47**	**20.07**	**16.93**	**17.73**	**14.60**	**22.13**	**9.93**	**6.40**	**14.07**	**8.00**	**16.13**	**15.20**	**15.90**	**15.52**
Annual Grasses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noxious - Cheatgrass	2.47	2.07	13.20	1.93	6.87	3.80	15.60	18.93	5.00	2.07	3.33	4.67	9.47	1.10	4.50	2.63
Perennial Forbs	**-**	**0.13**	**0.20**	**2.67**	**0.87**	**0.53**	**2.00**	**0.13**	**-**	**-**	**-**	**-**	**2.53**	**0.80**	**0.70**	**0.76**
Annual & Biennial Forbs	2.47	15.53	2.40	1.67	5.07	2.40	5.00	5.40	9.60	16.53	17.93	13.00	2.07	0.80	1.70	1.21
Noxious / Aggressive Weeds	1.00	-	0.07	0.60	0.47	0.60	0.20	-	-	-	-	-	-	-	-	-
Sub-Shrubs	**-**	**-**	**-**	**-**	**-**	**-**	**0.20**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.60**	**1.17**
Shrubs & Trees	**-**	**1.80**	**0.13**	**0.27**	**0.20**	**0.07**	**1.40**	**0.20**	**0.07**	**0.07**	**-**	**-**	**5.20**	**22.50**	**16.10**	**19.62**
Sample Adequacy Calculations																
Mean=	12.80	29.60	26.47	27.20	30.40	25.13	39.00	46.80	24.60	25.07	35.33	25.67	35.40	40.40	41.50	
Variance=	56.03	68.69	34.41	138.60	101.54	74.41	33.50	194.17	22.26	60.07	160.81	92.10	137.54	138.49	84.50	
n=	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
n_{min}=	61.87	14.18	8.89	33.89	19.88	21.31	3.98	16.04	6.65	17.29	23	25.29	19.86	15.35	8.88	

Table 4 Colowyo - Vegetation Cover - 2020

Average Ground Cover Summary

South Taylor Pit

Percent Ground Cover Based on Point-Intercept Sampling

Area ——>	ST003	Mtn Shrub R.A.	Sagebrush R.A.	Aspen R.A.*	Weighted Reference Values+
Weight ——>	100%	52%	25%	23%	
Total Plant Cover	**30.80**	**40.40**	**41.50**	N/A	**40.95**
Rock	6.40	0.80	2.30	N/A	1.55
Litter	42.40	52.60	45.70	N/A	49.15
Bare ground	20.40	6.20	10.50	N/A	8.35
Total Perennial Cover	**4.40**	**38.50**	**35.30**	N/A	**36.90**
Total Annual Cover (Non-noxious)	1.00	0.80	1.70	N/A	**1.25**
Summary by Lifeform:					
Perennial Grasses	**3.80**	**15.20**	**15.90**	N/A	**15.55**
Annual Grasses	-	-	-	N/A	-
Noxious - Cheatgrass	15.80	1.10	4.50	N/A	2.80
Perennial Forbs	**0.20**	**0.80**	**0.70**	N/A	**0.75**
Annual & Biennial Forbs	1.00	0.80	1.70	N/A	1.25
Noxious / Aggressive Weeds	9.60	-	-		-
Sub-Shrubs	**-**	**-**	**2.60**	N/A	**1.30**
Shrubs & Trees	**0.40**	**22.50**	**16.10**	N/A	**19.30**
Sample Adequacy Calculations					
Mean=	30.80	40.40	41.50	N/A	
Variance=	174.70	138.49	84.50	N/A	
n=	15	15	15	N/A	
n_{min}=	33.32	15.35	8.88	N/A	

*Not sampled in 2020

+Approximation based on average calcualtion of MSRA and SBRA only.

Table 4 Colowyo - Vegetation Cover - 2020

Average Ground Cover Summary

South Taylor Pit

Percent Ground Cover Based on Point-Intercept Sampling

Area ——>	CO01	CO02	CO03	CO05	Mtn Shrub R.A.	Sagebrush R.A.	Grassland R.A.*	Weighted Reference Values+
Weight ——>	100%	100%	100%	100%	39%	47%	14%	
Total Plant Cover	**30.00**	**46.20**	**44.00**	**46.00**	**40.40**	**41.50**	N/A	**40.95**
Rock	-	0.20	-	1.40	0.80	2.30	N/A	1.55
Litter	48.00	42.80	55.40	50.40	52.60	45.70	N/A	49.15
Bare ground	22.00	10.80	0.60	2.20	6.20	10.50	N/A	8.35
Total Perennial Cover	**16.00**	**45.40**	**39.60**	**13.80**	**38.50**	**35.30**	N/A	**36.90**
Total Annual Cover (Non-noxious)	3.00	0.20	4.20	7.00	0.80	1.70	N/A	1.25
Summary by Lifeform:								
Perennial Grasses	**1.60**	**30.00**	**39.20**	**11.60**	**15.20**	**15.90**	N/A	**15.55**
Annual Grasses	-	-	-	-	-	-	N/A	-
Noxious - Cheatgrass	11.00	0.60	-	25.20	1.10	4.50	N/A	2.80
Perennial Forbs	**5.20**	**13.60**	**-**	**2.00**	**0.80**	**0.70**	N/A	**0.75**
Annual & Biennial Forbs	3.00	0.20	4.20	7.00	0.80	1.70	N/A	1.25
Noxious / Aggressive Weeds	-	-	0.20	-	-	-		
Sub-Shrubs	**-**	**1.80**	**0.40**	**-**	**-**	**2.60**	N/A	**1.30**
Shrubs & Trees	**9.20**	**-**	**-**	**0.20**	**22.50**	**16.10**	N/A	**19.30**
Sample Adequacy Calculations								
Mean=	30.00	46.20	44.00	46.00	40.40	41.50	N/A	
Variance=	39.50	193.70	75.50	48.50	138.49	84.50	N/A	
n=	5	5	5	5	15	15	N/A	
n_{min}=	7.94	16.42	7.06	4.15	15.35	8.88	N/A	

*Not sampled in 2020

+Approximation based on average calcualtion of MSRA and SBRA only.

Table 5 Colowyo - Vegetation Cover - 2020

Relative Ground Cover Summary (Post-2008)
East Pit, West Pit, and Gossard Facilities

Area ——>	EP059	EP061	WP017	WP018	WP019	WP020	WP022	WP023	WP026	WP027	WP028	WP029	GF01	Mtn Shrub R.A.	Sagebrush R.A.
Weight ——>	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	55%	45%
Summary by Lifeform:															
Perennial Grasses	53.65	**34.01**	**39.55**	**73.77**	**55.70**	**70.56**	**37.44**	**47.29**	**40.38**	**25.53**	**39.81**	**31.17**	**45.57**	**37.62**	**38.31**
Annual Grasses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noxious - Cheatgrass	19.27	6.98	49.87	7.11	22.59	15.12	40.00	40.46	20.33	8.24	9.43	18.18	26.74	2.72	10.84
Perennial Forbs	**-**	**0.45**	**0.76**	**9.80**	**2.85**	**2.12**	**5.13**	**0.28**	**-**	**-**	**-**	**-**	**7.16**	**1.98**	**1.69**
Annual & Biennial Forbs	19.27	52.48	9.07	6.13	16.67	9.55	12.82	11.54	39.02	65.96	50.75	50.65	5.84	1.98	4.10
Noxious / Aggressive Weeds	7.81	-	0.25	2.21	1.54	2.39	0.51	-	-	-	-	-	-	-	-
Sub-Shrubs	**-**	**-**	**-**	**-**	**-**	**-**	**0.51**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.27**
Shrubs & Trees	**-**	**6.08**	**0.50**	**0.98**	**0.66**	**0.27**	**3.59**	**0.43**	**0.27**	**0.27**	**-**	**-**	**14.69**	**55.69**	**38.80**
Diversity (Number of Perennial Grasses with between 3% - 50% Relative Cover)															
(Forb Relative Cover with between 1% - 50%):															
Number of Perennial Grasses =	**4**	**3**	**2**	**6**	**2**	**5**	**3**	**1**	**1**	**2**	**5**	**2**	**3**	**5**	**6**
Forb Relative Cover =	**19.27**	**52.93**	**9.82**	**15.93**	**19.52**	**11.67**	**17.95**	**11.82**	**39.02**	**65.96**	**50.75**	**50.65**	**12.99**	**3.96**	**5.78**

Table 5 Colowyo - Vegetation Cover - 2020

Relative Ground Cover Summary
South Taylor Pit

Area ——>	ST003	Mtn Shrub R.A.	Sagebrush R.A.	Aspen R.A.*
Weight ——>	100%	52%	25%	23%
Summary by Lifeform:				
Perennial Grasses	**12.34**	**37.62**	**38.31**	N/A
Annual Grasses	-	-	-	N/A
Noxious - Cheatgrass	51.30	2.72	10.84	N/A
Perennial Forbs	**0.65**	**1.98**	**1.69**	N/A
Annual & Biennial Forbs	3.25	1.98	4.10	N/A
Noxious / Aggressive Weeds	31.17	-	-	N/A
Sub-Shrubs	**-**	**-**	**6.27**	N/A
Shrubs & Trees	**1.30**	**55.69**	**38.80**	N/A
Diversity (Number of Perennial Grasses with between 3% - 50% Relative Cover)				
(Forb Relative Cover with between 1% - 50%):				
Number of Perennial Grasses =	**2**	**5**	**6**	N/A
Forb Relative Cover =	**3.90**	**3.96**	**5.78**	**N/A**

*Not sampled in 2020.

Table 5 Colowyo - Vegetation Cover - 2020

Relative Ground Cover Summary

South Taylor Pit

Area ——>	CO01	CO02	CO03	CO05	Mtn Shrub R.A.	Sagebrush R.A.	Grassland R.A.*
Weight ——>	100%	100%	100%	100%	39%	47%	14%
Summary by Lifeform:							
Perennial Grasses	**5.33**	**64.94**	**89.09**	**25.22**	**37.62**	**38.31**	N/A
Annual Grasses	-	-	-	-	-	-	N/A
Noxious - Cheatgrass	36.67	1.30	-	54.78	2.72	10.84	N/A
Perennial Forbs	**17.33**	**29.44**	**-**	**4.35**	**1.98**	**1.69**	N/A
Annual & Biennial Forbs	10.00	0.43	9.55	15.22	1.98	4.10	N/A
Noxious / Aggressive Weeds	-	-	0.45	-	-	-	N/A
Sub-Shrubs	**-**	**3.90**	**0.91**	**-**	**-**	**6.27**	N/A
Shrubs & Trees	**30.67**	**-**	**-**	**0.43**	**55.69**	**38.80**	N/A
Diversity (Number of Perennial Grasses with between 3% - 50% Relative Cover)							
(Forb Relative Cover with between 1% - 50%):							
Number of Perennial Grasses =	**0**	**3**	**2**	**3**	**5**	**6**	N/A
Forb Relative Cover =	**27.33**	**29.87**	**9.55**	**19.57**	**3.96**	**5.78**	N/A

*Not sampled in 2020.

Table 6 Colowyo - Woody Plant Density - 2020

East Pit and West Pit Reclamation Units

Woody Plants per Acre

			East Pit		West Pit									
		Unit -->	**EP059**	**EP061**	**WP017**	**WP018**	**WP019**	**WP020**	**WP022**	**WP023**	**WP026**	**WP027**	**WP028**	**WP029**
		Growing Seasons -->	4	2	7	7	7	7	4	4	2	2	2	2
N	P	*Artemisia tridentata*	Big Sagebrush	5.4	3,402.1	-	24.3	72.8	62.1	744.6	94.4	161.9	288.7	29.7	18.9
N	P	*Atriplex canescens*	Four-wing Saltbush	-	5.4	35.1	-	59.4	-	129.5	-	-	2.7	16.2	45.9
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	-	2.7	-	-	-	-	-	-	-	-	-	-
N	P	*Gutierrezia sarothrae*	Broom Snakeweed	-	-	-	-	-	-	712.2	-	-	-	-	-
N	P	*Purshia tridentata*	Antelope Bitterbrush	-	2.7	-	-	-	-	-	-	-	-	-	-
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry	-	-	-	-	-	-	8.1	-	-	-	-	-
		Total Per Acre		**5.4**	**3,412.8**	**35.1**	**24.3**	**132.2**	**62.1**	**1,594.5**	**94.4**	**161.9**	**291.4**	**45.9**	**64.7**

Chart 7a

Woody Plant Density by Species and Area - East Pit and West Pit - 2020

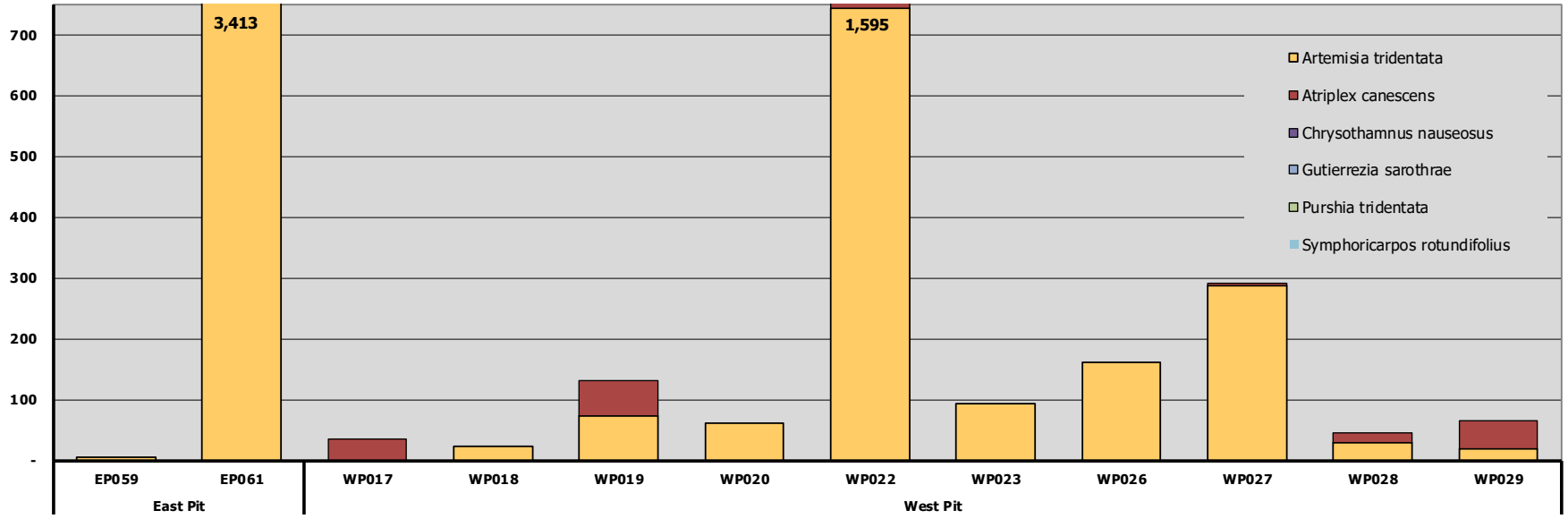


Table 6 Colowyo - Woody Plant Density - 2020

Collom, Gossard Facilities, and South Taylor Pit Reclamation Units

Woody Plants per Acre

			Collom					Gossard Facilities	South Taylor
		Unit -->	C01	C02	C03	C04	C05	GF01	ST003
		Growing Seasons -->	4	4	4	4	4	4	7
N	P	*Amelanchier alnifolia* Saskatoon Serviceberry	-	-	-	-	-	-	72.8
N	P	*Artemisia tridentata* Big Sagebrush	348.0	-	97.1	1,958.7	8.1	3,340.0	-
N	P	*Atriplex canescens* Four-wing Saltbush	-	-	-	-	40.5	8.1	-
N	P	*Chrysothamnus nauseosus* Rubber Rabbitbrush	2,136.7	24.3	-	-	8.1	701.5	-
N	P	*Chrysothamnus viscidiflorus* Yellow Rabbitbrush	-	-	-	8.1	-	43.2	-
N	P	*Opuntia polyacantha* Plains Pricklypear	-	8.1	-	-	-	-	-
N	P	*Symphoricarpos rotundifolius* Roundleaf Snowberry	-	-	-	113.3	-	-	129.5
		Total Per Acre	**2,484.8**	**32.4**	**97.1**	**2,080.1**	**56.7**	**4,092.7**	**202.3**

Chart 7b

Woody Plant Density by Species and Area - Collom, Gossard Facilities, and South Taylor - 2020

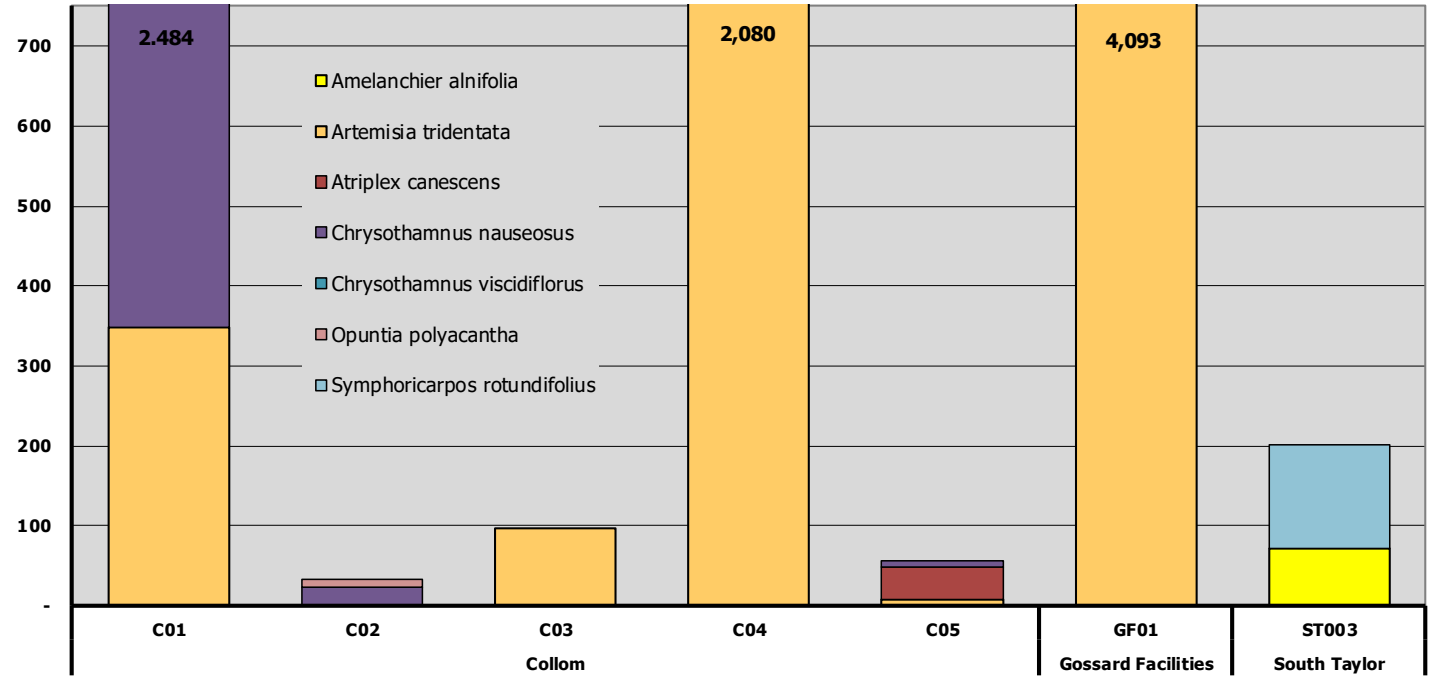
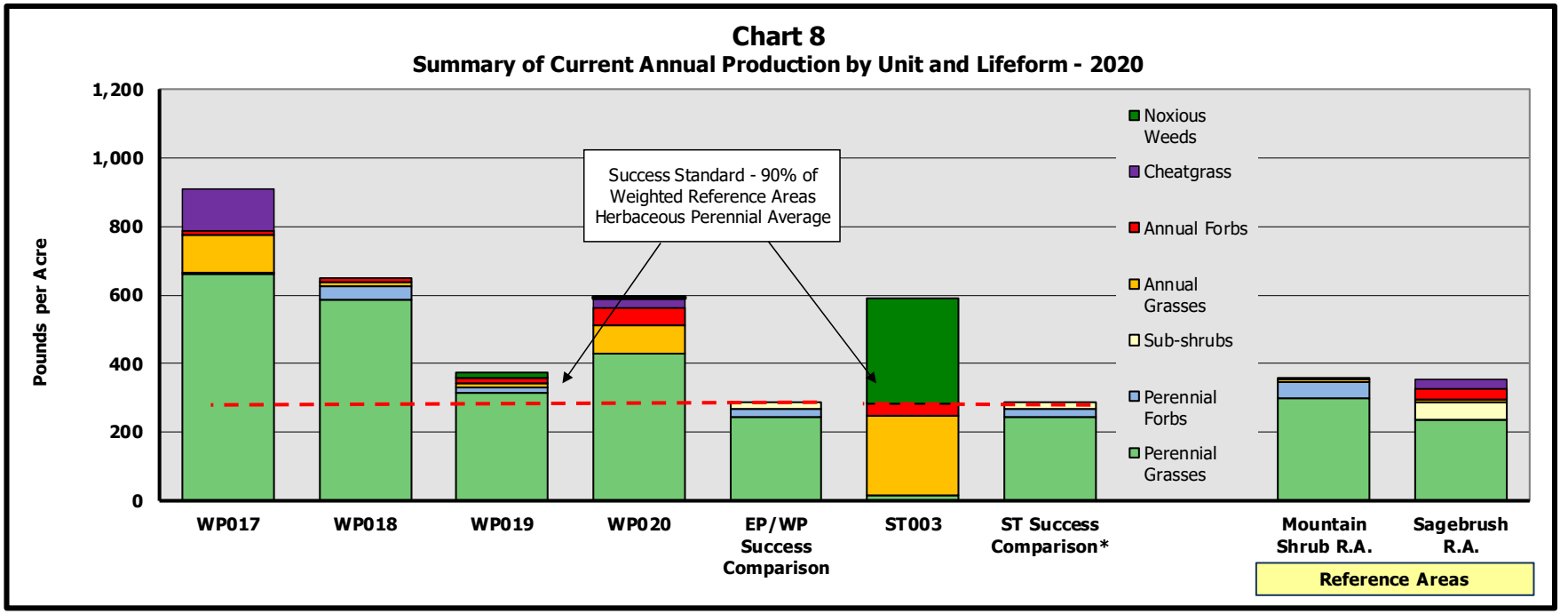


Table 7 Colowyo - Vegetation Production - 2020

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	WP017	100%	660.5	3.6	-	111.5	12.1	121.1	-	**908.9**	**664.1**
	WP018	100%	585.4	42.4	-	9.3	11.8	-	-	**648.8**	**627.8**
	WP019	100%	313.9	17.1	-	9.3	16.4	1.4	13.9	**372.0**	**331.0**
	WP020	100%	428.2	-	-	81.9	53.1	25.7	5.0	**593.9**	**428.2**
	ST003	100%	15.3	-	-	233.0	33.5	0.7	306.8	**589.3**	**15.3**
Reference Areas	Mountain Shrub	55% / 52%	299.3	45.6	-	10.0	0.7	-	-	**355.6**	**344.9**
	Sagebrush	45% / 25%	235.9	1.1	49.5	8.2	29.9	30.3	-	**354.9**	**286.4**
	Aspen	0% / 23%	- Not Sampled in 2020 -								
Weighted Averages	East Pit Comparison	55%/45%/0%	**270.7**	**25.6**	**22.3**	**9.2**	**13.9**	**13.6**	**-**	**355.2**	**318.6**
	South Taylor Comparison*	52%/25%/23%	**270.7**	**25.6**	**22.3**	**9.2**	**13.9**	**13.6**	**-**	**355.2**	**318.6**



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

Table 8 Colowyo - Vegetation Cover - 2020

EP059

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	14	4	10	1	3	4	7	4	1	2	2		6	1	3	**4.13**	**32.29**	**93**
I	P	*Agropyron intermedium*	Intermediate Wheatgrass				2		4										**0.40**	**3.13**	**13**
N	P	*Agropyron smithii*	Western Wheatgrass											10	1	2	8		**1.40**	**10.94**	**27**
X	A	*Bromus japonicus*	Japanese Brome	1	3		4								10	6		3	**1.80**	**14.06**	**40**
X	A	*Bromus tectorum*	Cheatgrass											6			3	1	**0.67**	**5.21**	**20**
N	P	*Elymus cinereus*	Basin Wildrye		2											1	3		**0.40**	**3.13**	**20**
N	P	*Elymus elymoides*	Squirreltail					4										1	**0.33**	**2.60**	**13**
N	P	*Nassela viridula*	Green Needlegrass			1		1	1										**0.20**	**1.56**	**20**
Forbs																					
X	P	*Cirsium arvense*	Canada Thistle			1	3												**0.27**	**2.08**	**13**
X	P	*Cirsium vulgare*	Bull Thistle		3					7	1								**0.73**	**5.73**	**20**
I	B	*Lactuca serriola*	Prickly Lettuce			1			2		2			9	2	1	2		**1.27**	**9.90**	**47**
I	A	*Pocilla biloba*	Twolobed Speedwell				2							5	4	2	2	2	**1.13**	**8.85**	**40**
I	A	*Polygonum aviculare*	Prostrate Knotweed			1													**0.07**	**0.52**	**7**
Sub-Shrubs																					
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																					
			none																**0.00**	**0.00**	**0**
																				Mean	
			Total Plant Cover	**15**	**12**	**14**	**12**	**8**	**11**	**14**	**7**	**1**	**2**	**32**	**17**	**18**	**19**	**10**		**12.80**	
			Rock	0	0	3	4	2	8	0	5	1	2	4	3	1	2	1		**2.40**	
			Litter	19	46	17	24	3	11	14	6	6	1	39	50	47	37	53		**24.87**	
			Bare ground	66	42	66	60	87	70	72	82	92	95	25	30	34	42	36		**59.93**	
			Total Perennial Cover	**14**	**6**	**11**	**3**	**8**	**9**	**7**	**4**	**1**	**2**	**12**	**1**	**9**	**12**	**4**		**6.87**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 4** **Forb Relative Cover = 19.27**
Sample Adequacy Calculations	**Plant Cover Mean = 12.80** **t= 1.35** **n = 15** **Variance = 56.03** **n_{min} = 61.87**

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

Table 9 Colowyo - Vegetation Cover - 2020

EP061

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				1		2			4	3		1				**0.73**	**2.48**	**33**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	1	4		10	10	7	3	5	3	2	4	4	3	8	1	**4.33**	**14.64**	**93**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass		1														**0.07**	**0.23**	**7**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass				2		3				1						**0.40**	**1.35**	**20**
X	A	*Bromus japonicus*	Japanese Brome	3					6		2	12	6		1		1		**2.07**	**6.98**	**47**
N	P	*Bromus marginatus*	Mountain Brome		3														**0.20**	**0.68**	**7**
N	P	*Elymus elymoides*	Squirreltail								4			6	6			4	**1.33**	**4.50**	**27**
N	P	*Nassela viridula*	Green Needlegrass				5		1	1									**0.47**	**1.58**	**20**
N	P	*Poa ampla*	Big Bluegrass		3				2			2			1		2		**0.67**	**2.25**	**33**
I	P	*Poa bulbosa*	Bulbous Bluegrass										1						**0.07**	**0.23**	**7**
N	P	*Sitanion hystrix*	Bottlebrush Squirreltail			8	5	1	1	9			3						**1.80**	**6.08**	**40**
Forbs																					
N	P	*Achillea millefolium*	Common Yarrow										1						**0.07**	**0.23**	**7**
N	A	*Alyssum alyssoides*	Pale Madwort								1	2				2			**0.33**	**1.13**	**20**
I	A	*Chenopodium album*	Lambsquarter	3				2	1				1			2			**0.60**	**2.03**	**33**
N	A	*Descurainia pinnata*	Pinnate Tansymustard	1															**0.07**	**0.23**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce	1	1				3					2				2	**0.60**	**2.03**	**33**
N	P	*Linum lewisii*	Lewis Flax				1												**0.07**	**0.23**	**7**
I	A	*Pocilla biloba*	Twolobed Speedwell	1	1		1				2	2		18	5	1	2	2	**2.33**	**7.88**	**67**
I	A	*Polygonum aviculare*	Prostrate Knotweed			1				3	1	2			5			4	**1.07**	**3.60**	**40**
I	A	*Salsola tragus*	Russian Thistle	27	8	11	2	13	12	16	3	7	4		4	3	14	4	**8.53**	**28.83**	**93**
I	A	*Thlaspi arvense*	Field Pennycress	7	3		1	4			1					6	8		**2.00**	**6.76**	**47**
Sub-Shrubs																					
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																					
N	P	*Artemisia tridentata*	Big Sagebrush		5	2	3	3		1	2	6		2		1	2		**1.80**	**6.08**	**67**
																			Mean		
			Total Plant Cover	**44**	**29**	**22**	**31**	**33**	**38**	**33**	**21**	**40**	**22**	**32**	**27**	**18**	**37**	**17**	**29.60**		
			Rock	1	0	0	0	0	0	0	0	1	2	2	1	4	0	3	**0.93**		
			Litter	19	8	7	14	16	14	7	31	30	13	29	16	30	30	14	**18.53**		
			Bare ground	36	63	71	55	51	48	60	48	29	63	37	56	48	33	66	**50.93**		
			Total Perennial Cover	**1**	**16**	**10**	**27**	**14**	**16**	**14**	**11**	**15**	**11**	**12**	**12**	**4**	**12**	**5**	**12.00**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 52.93**
Sample Adequacy Calculations	**Plant Cover Mean = 29.60** **t= 1.35** **n = 15** **Variance = 68.69** **n_{min} = 14.18**

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

Table 10 Colowyo - Vegetation Cover - 2020

WP017

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							4									**0.27**	**1.01**	**7**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	5			7	5	13	2	13	2	12	24	10	16	7	13	**8.60**	**32.49**	**87**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass												2				**0.13**	**0.50**	**7**
X	A	*Bromus japonicus*	Japanese Brome	14	3	17	24	24	13	8	19	21	8	11	2	6	4	4	**11.87**	**44.84**	**100**
X	A	*Bromus tectorum*	Cheatgrass		20														**1.33**	**5.04**	**7**
N	P	*Elymus cinereus*	Basin Wildrye			3			3	1					2	1			**0.67**	**2.52**	**33**
N	P	*Nassela viridula*	Green Needlegrass										1		6		4	1	**0.80**	**3.02**	**27**
Forbs																						
N	A	*Alyssum alyssoides*	Pale Madwort				1			3									**0.27**	**1.01**	**13**
I	P	*Astragalus cicer*	Cicer Milkvetch												3				**0.20**	**0.76**	**7**
X	P	*Cirsium vulgare*	Bull Thistle												1				**0.07**	**0.25**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce	1	2	1	3			2	1				2			2	**0.93**	**3.53**	**53**
I	A	*Pocilla biloba*	Twolobed Speedwell		1														**0.07**	**0.25**	**7**
I	A	*Sisymbrium altissimum*	Tumble Mustard		2	2	1	1		5	1								**0.80**	**3.02**	**40**
I	B	*Tragopogon dubius*	False Salsify		1			1								1	1	1	**0.33**	**1.26**	**33**
Sub-Shrubs																						
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																						
N	P	*Atriplex canescens*	Four-wing Saltbush										2						**0.13**	**0.50**	**7**
																			Mean		
			Total Plant Cover	**20**	**29**	**23**	**36**	**31**	**29**	**25**	**34**	**23**	**23**	**35**	**28**	**24**	**16**	**21**	**26.47**		
			Rock	0	1	2	1	0	2	0	1	2	0	0	0	0	0	1	**0.67**		
			Litter	69	66	71	55	66	57	68	64	60	65	59	62	74	76	73	**65.67**		
			Bare ground	11	4	4	8	3	12	7	1	15	12	6	10	2	8	5	**7.20**		
			Total Perennial Cover	**5**	**0**	**3**	**7**	**5**	**16**	**7**	**13**	**2**	**15**	**24**	**23**	**17**	**11**	**14**	**10.80**		

Diversity

No. of Perennial Grasses (3% - 50% Rel. Cover) = 2

Forb Relative Cover = 9.82

Sample Adequacy Calculations

Plant Cover Mean = 26.47 **t= 1.35** **n = 15**

Variance = 34.41 **n_{min} = 8.89**

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

Table 11 Colowyo - Vegetation Cover - 2020

WP018

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	4				1	1			6		2		1			**1.00**	**3.68**	**40**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	2	9	18			8	14	8		9	24	3	1	28	23	**9.80**	**36.03**	**80**
N	P	*Agropyron smithii*	Western Wheatgrass	1		3	1	1		3	4			1	6	2	5		**1.80**	**6.62**	**67**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass		1			14										1	**1.07**	**3.92**	**20**
X	A	*Bromus japonicus*	Japanese Brome		1	8			1	4	1			3	1	5	1	2	**1.80**	**6.62**	**67**
X	A	*Bromus tectorum*	Cheatgrass												1	1			**0.13**	**0.49**	**13**
N	P	*Elymus cinereus*	Basin Wildrye	5			6	14		10	6				15	8		1	**4.33**	**15.93**	**53**
N	P	*Elymus elymoides*	Squirreltail	1					1										**0.13**	**0.49**	**13**
N	P	*Nassela viridula*	Green Needlegrass	2				1				1			1		1	2	**0.53**	**1.96**	**40**
N	P	*Poa ampla*	Big Bluegrass				9	6								4			**1.27**	**4.66**	**20**
N	P	*Poa secunda*	Sandberg Bluegrass	2															**0.13**	**0.49**	**7**
Forbs																					
N	P	*Achillea millefolium*	Common Yarrow												2				**0.13**	**0.49**	**7**
N	A	*Alyssum alyssoides*	Pale Madwort						1										**0.07**	**0.25**	**7**
I	P	*Astragalus cicer*	Cicer Milkvetch				3			13									**1.07**	**3.92**	**13**
N	P	*Astragalus miser*	Weedy Milkvetch				3												**0.20**	**0.74**	**7**
N	P	*Astragalus tenellus*	Looseflower Milkvetch							2	2	1		6					**0.73**	**2.70**	**27**
X	P	*Cirsium vulgare*	Bull Thistle								4				2	3			**0.60**	**2.21**	**20**
I	B	*Lactuca serriola*	Prickly Lettuce		1											1			**0.13**	**0.49**	**13**
I	A	*Pocilla biloba*	Twolobed Speedwell	2		1	1	1			2	4			2	1			**0.93**	**3.43**	**53**
I	P	*Sanguisorba minor*	Small Burnet				1	7											**0.53**	**1.96**	**13**
I	B	*Tragopogon dubius*	False Salsify	2						1		3		1		1			**0.53**	**1.96**	**33**
Sub-Shrubs																					
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																					
N	P	*Artemisia tridentata*	Big Sagebrush				1								3				**0.27**	**0.98**	**13**
																			Mean		
			Total Plant Cover	**21**	**12**	**30**	**25**	**45**	**12**	**47**	**27**	**15**	**9**	**37**	**36**	**28**	**35**	**29**	**27.20**		
			Rock	0	4	3	3	0	8	1	2	0	1	0	1	0	1	4	**1.87**		
			Litter	35	49	44	17	25	28	40	45	41	49	58	51	40	51	46	**41.27**		
			Bare ground	44	35	23	55	30	52	12	26	44	41	5	12	32	13	21	**29.67**		
			Total Perennial Cover	**17**	**10**	**21**	**24**	**44**	**10**	**42**	**20**	**8**	**9**	**33**	**30**	**16**	**34**	**27**	**23.00**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 6** **Forb Relative Cover = 15.93**
Sample Adequacy Calculations	**Plant Cover Mean = 27.20** **t= 1.35** **n = 15** **Variance = 138.60** **n_{min} = 33.89**

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

Table 12 Colowyo - Vegetation Cover - 2020

WP019

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	2													**0.27**	**0.88**	**13**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	15	1	5	24	22	6	14	12	19	10	12	10	14	16	20	**13.33**	**43.86**	**100**
N	P	*Agropyron smithii*	Western Wheatgrass				2				2								**0.27**	**0.88**	**13**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass	3		7	5		5						6				**1.73**	**5.70**	**33**
X	A	*Bromus japonicus*	Japanese Brome				2		3	11	13	6	11	1	21	31	1	3	**6.87**	**22.59**	**73**
N	P	*Bromus marginatus*	Mountain Brome						2										**0.13**	**0.44**	**7**
N	P	*Elymus cinereus*	Basin Wildrye							2	4		1		1	1			**0.60**	**1.97**	**33**
N	P	*Poa secunda*	Sandberg Bluegrass	4			2	2		1									**0.60**	**1.97**	**27**
Forbs																						
N	P	*Achillea millefolium*	Common Yarrow	2															**0.13**	**0.44**	**7**
N	A	*Alyssum alyssoides*	Pale Madwort					1									2	2	**0.33**	**1.10**	**20**
I	P	*Astragalus cicer*	Cicer Milkvetch							2				6	1		2		**0.73**	**2.41**	**27**
X	P	*Cirsium arvense*	Canada Thistle								5								**0.33**	**1.10**	**7**
X	P	*Cirsium vulgare*	Bull Thistle								1				1				**0.13**	**0.44**	**13**
N	A	*Epilobium brachycarpum*	Tall Annual Willowherb							3									**0.20**	**0.66**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce					1	3	1					3	2			**0.67**	**2.19**	**33**
N	B	*Machaeranthera canescens*	Hoary Aster		6			2	2		3	1							**0.93**	**3.07**	**33**
I	A	*Pocilla biloba*	Twolobed Speedwell			3	1	1	11			1	5	5					**1.80**	**5.92**	**47**
I	B	*Tragopogon dubius*	False Salsify	5	1	1				4	1	1	2	2					**1.13**	**3.73**	**53**
Sub-Shrubs																						
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																						
N	P	*Artemisia tridentata*	Big Sagebrush									2							**0.13**	**0.44**	**7**
N	P	*Atriplex canescens*	Four-wing Saltbush													1			**0.07**	**0.22**	**7**
																			Mean		
			Total Plant Cover	**29**	**10**	**18**	**36**	**29**	**32**	**38**	**41**	**30**	**29**	**26**	**43**	**49**	**21**	**25**	**30.40**		
			Rock	8	18	9	7	12	1	2	2	1	2	0	2	0	0	0	**4.27**		
			Litter	26	10	11	23	28	36	45	46	38	43	34	47	49	48	71	**37.00**		
			Bare ground	37	62	62	34	31	31	15	11	31	26	40	8	2	31	4	**28.33**		
			Total Perennial Cover	**24**	**3**	**14**	**33**	**24**	**13**	**19**	**18**	**21**	**11**	**18**	**18**	**16**	**18**	**20**	**18.00**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 19.52**
Sample Adequacy Calculations	**Plant Cover Mean = 30.40** **t= 1.35** **n = 15** **Variance = 101.54** **n_{min} = 19.88**

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

Table 13 Colowyo - Vegetation Cover - 2020

WP020

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		1	5			1		5		1		1	3	10	**1.93**	**7.69**	**60**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	20	23		5	4	13	12	8	12	15			2	1		**7.67**	**30.50**	**73**
N	P	*Agropyron riparium*	Streambank Wheatgrass		2		1		5										**0.53**	**2.12**	**20**
N	P	*Agropyron smithii*	Western Wheatgrass		3				8										**0.73**	**2.92**	**13**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass				2	2							1	2			**0.47**	**1.86**	**27**
X	A	*Bromus japonicus*	Japanese Brome	1		1				3	13	2	12	9			9		**3.33**	**13.26**	**53**
X	A	*Bromus tectorum*	Cheatgrass												7				**0.47**	**1.86**	**7**
N	P	*Elymus cinereus*	Basin Wildrye	4	9		2		1	8	2				4	4	1		**2.33**	**9.28**	**60**
N	P	*Elymus elymoides*	Squirreltail	2											2				**0.27**	**1.06**	**13**
N	P	*Nassela viridula*	Green Needlegrass				3								2		3		**0.53**	**2.12**	**20**
N	P	*Poa ampla*	Big Bluegrass	7			7	6								5			**1.67**	**6.63**	**27**
N	P	*Poa secunda*	Sandberg Bluegrass							1								6	**0.47**	**1.86**	**13**
N	P	*Sitanion hystrix*	Bottlebrush Squirreltail			15								1				1	**1.13**	**4.51**	**20**
Forbs																							
N	A	*Alyssum alyssoides*	Pale Madwort								2	1							**0.20**	**0.80**	**13**
I	P	*Astragalus cicer*	Cicer Milkvetch	4				2											**0.40**	**1.59**	**13**
X	P	*Cirsium vulgare*	Bull Thistle							9									**0.60**	**2.39**	**7**
N	A	*Epilobium brachycarpum*	Tall Annual Willowherb			1													**0.07**	**0.27**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce			1	2							2					**0.33**	**1.33**	**20**
I	A	*Pocilla biloba*	Twolobed Speedwell		2	3	2	1		2	1					1			**0.80**	**3.18**	**47**
I	A	*Ranunculus testiculata*	Curveseed Butterwort									5							**0.33**	**1.33**	**7**
I	P	*Sanguisorba minor*	Small Burnet								1					1			**0.13**	**0.53**	**13**
I	B	*Tragopogon dubius*	False Salsify	1				2	1					2	1		2	1	**0.67**	**2.65**	**47**
Sub-Shrubs																							
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																							
N	P	*Artemisia tridentata*	Big Sagebrush	1															**0.07**	**0.27**	**7**
																			Mean		
			Total Plant Cover	**42**	**39**	**22**	**29**	**17**	**28**	**36**	**27**	**25**	**27**	**15**	**17**	**16**	**19**	**18**	**25.13**		
			Rock	3	1	7	3	5	0	2	5	0	0	0	0	5	1	2	**2.27**		
			Litter	20	42	20	14	29	45	33	47	42	49	58	45	17	40	25	**35.07**		
			Bare ground	35	18	51	54	49	27	29	21	33	24	27	38	62	40	55	**37.53**		
			Total Perennial Cover	**40**	**37**	**16**	**25**	**14**	**27**	**22**	**11**	**17**	**15**	**2**	**9**	**15**	**8**	**17**	**18.33**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 5** **Forb Relative Cover = 11.67**
Sample Adequacy Calculations	**Plant Cover Mean = 25.13** **t= 1.35** **n = 15** **Variance = 74.41** **n_{min} = 21.31**

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

Table 14 Colowyo - Vegetation Cover - 2020

WP022

Percent Ground Cover Based on Point-Intercept Sampling

				Transect No.——>	1	2	4	3	5	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes												
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass		24		18			**8.40**	**21.54**	**13**
I	P	*Agropyron intermedium*	Intermediate Wheatgrass			12				**2.40**	**6.15**	**7**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass		2					**0.40**	**1.03**	**7**
I	P	*Bromus inermis*	Smooth Brome						4	**0.80**	**2.05**	**7**
X	A	*Bromus japonicus*	Japanese Brome		7	18	6	32	15	**15.60**	**40.00**	**33**
N	P	*Elymus cinereus*	Basin Wildrye		1	2			2	**1.00**	**2.56**	**20**
N	P	*Nassela viridula*	Green Needlegrass			2	1	1	4	**1.60**	**4.10**	**27**
Forbs												
N	P	*Achillea millefolium*	Common Yarrow		2					**0.40**	**1.03**	**7**
N	A	*Alyssum desertorum*	Desert Alyssum					1	1	**0.40**	**1.03**	**13**
I	P	*Astragalus cicer*	Cicer Milkvetch				4			**0.80**	**2.05**	**7**
N	P	*Astragalus purshii*	Woollypod Milkvetch			1				**0.20**	**0.51**	**7**
X	P	*Cirsium arvense*	Canada Thistle			1				**0.20**	**0.51**	**7**
N	A	*Descurainia pinnata*	Pinnate Tansymustard			2				**0.40**	**1.03**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce		1	2	1	11	4	**3.80**	**9.74**	**33**
I	P	*Lepidium perfoliatum*	Clasping Pepperweed						3	**0.60**	**1.54**	**7**
I	A	*Pocilla biloba*	Twolobed Speedwell		1					**0.20**	**0.51**	**7**
I	A	*Thlaspi arvense*	Field Pennycress			1				**0.20**	**0.51**	**7**
Sub-Shrubs												
N	P	*Gutierrezia sarothrae*	Snakeweed				1			**0.20**	**0.51**	**7**
Shrubs & Trees												
N	P	*Artemisia tridentata*	Big Sagebrush			3			3	**1.20**	**3.08**	**13**
N	P	*Atriplex canescens*	Four-wing Saltbush		1					**0.20**	**0.51**	**7**
											Mean	
				Total Plant Cover	**39**	**44**	**31**	**45**	**36**		**39.00**	
				Rock	0	0	0	0	0		**0.00**	
				Litter	54	56	64	54	63		**58.20**	
				Bare ground	7	0	5	1	1		**2.80**	
				Total Perennial Cover	**30**	**20**	**24**	**1**	**16**		**18.20**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 17.95**
Sample Adequacy Calculations	**Plant Cover Mean = 39.00 n = 5 t= 1.53** **Variance = 33.50 n_{min} = 5.18**

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

Table 15 Colowyo - Vegetation Cover - 2020

WP023

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	30	26	25	8	17	11	5	26	36	19	7	32	28	17	14	**20.07**	**42.88**	**100**
N	P	*Agropyron riparium*	Streambank Wheatgrass										3						**0.20**	**0.43**	**7**
N	P	*Agropyron smithii*	Western Wheatgrass														4		**0.27**	**0.57**	**7**
X	A	*Bromus japonicus*	Japanese Brome			2	7		7	9		21	1		2	12	3	5	**4.60**	**9.83**	**67**
N	P	*Bromus marginatus*	Mountain Brome			2							6				1		**0.60**	**1.28**	**20**
X	A	*Bromus tectorum*	Cheatgrass	18	23	1	41	2	32	19		18	4	22		20	5	10	**14.33**	**30.63**	**87**
N	P	*Elymus cinereus*	Basin Wildrye	1					1								1		**0.20**	**0.43**	**20**
N	P	*Nassela viridula*	Green Needlegrass			1				1				1					**0.20**	**0.43**	**20**
N	P	*Sitanion hystrix*	Bottlebrush Squirreltail			1			2	2								4	**0.60**	**1.28**	**27**
Forbs																						
N	A	*Epilobium brachycarpum*	Tall Annual Willowherb			1													**0.07**	**0.14**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce				1												**0.07**	**0.14**	**7**
N	P	*Linum lewisii*	Lewis Flax										1						**0.07**	**0.14**	**7**
N	P	*Penstemon strictus*	Rocky Mtn. Penstemon											1					**0.07**	**0.14**	**7**
I	A	*Pocilla biloba*	Twolobed Speedwell	9		8		9	6	8	4	1	1	7	11	6	1	4	**5.00**	**10.68**	**87**
I	A	*Salsola tragus*	Russian Thistle											2					**0.13**	**0.28**	**7**
I	A	*Sisymbrium altissimum*	Tumble Mustard		2														**0.13**	**0.28**	**7**
Sub-Shrubs																						
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																						
N	P	*Artemisia tridentata*	Big Sagebrush														3		**0.20**	**0.43**	**7**
																				Mean	
			Total Plant Cover	**58**	**51**	**41**	**57**	**28**	**59**	**44**	**30**	**76**	**35**	**40**	**45**	**66**	**35**	**37**		**46.80**	
			Rock	0	2	1	0	2	1	1	1	0	0	1	0	0	2	2		**0.87**	
			Litter	35	42	19	40	31	37	52	27	23	54	32	40	26	48	29		**35.67**	
			Bare ground	7	5	39	3	39	3	3	42	1	11	27	15	8	15	32		**16.67**	
			Total Perennial Cover	**31**	**26**	**29**	**8**	**17**	**14**	**8**	**26**	**36**	**29**	**9**	**32**	**28**	**26**	**18**		**22.47**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 1** **Forb Relative Cover = 11.82**
Sample Adequacy Calculations	**Plant Cover Mean = 46.80** **t= 1.35** **n = 15** **Variance = 194.17** **n_{min} = 16.04**

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

Table 16 Colowyo - Vegetation Cover - 2020

WP026

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				2		**0.27**	**1.08**	**13**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	4	21	10	3	5	3	4	17	3	2	11	24	12	8	2	**8.60**	**34.96**	**100**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass															2	**0.13**	**0.54**	**7**
X	A	*Bromus japonicus*	Japanese Brome	2			4	1	5	2	6	18	16	7		2	6	6	**5.00**	**20.33**	**80**
N	P	*Elymus cinereus*	Basin Wildrye			1													**0.07**	**0.27**	**7**
N	P	*Elymus elymoides*	Squirreltail			1				1		1						1	**0.27**	**1.08**	**27**
N	P	*Nassela viridula*	Green Needlegrass			4			1			1							**0.40**	**1.63**	**20**
N	P	*Poa ampla*	Big Bluegrass			1				2									**0.20**	**0.81**	**13**
Forbs																					
N	A	*Alyssum alyssoides*	Pale Madwort		2				1				2				1		**0.40**	**1.63**	**27**
I	A	*Chenopodium album*	Lambsquarter				1									1			**0.13**	**0.54**	**13**
N	A	*Descurainia pinnata*	Pinnate Tansymustard										3		2	3			**0.53**	**2.17**	**20**
I	A	*Pocilla biloba*	Twolobed Speedwell	6			1	1	1							3	4	6	**1.47**	**5.96**	**47**
I	A	*Polygonum aviculare*	Prostrate Knotweed				3		3			4				2		6	**1.20**	**4.88**	**33**
I	A	*Salsola tragus*	Russian Thistle	9		2	2	3	7	3	1	1	3	4		1			**2.40**	**9.76**	**73**
I	A	*Thlaspi arvense*	Field Pennycress	2	8	4		12	3	8	6	2	2		2	2		1	**3.47**	**14.09**	**80**
Sub-Shrubs																					
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																					
N	P	*Artemisia tridentata*	Big Sagebrush													1			**0.07**	**0.27**	**7**
																			Mean		
			Total Plant Cover	**23**	**31**	**23**	**14**	**22**	**24**	**20**	**30**	**30**	**30**	**22**	**28**	**27**	**21**	**24**	**24.60**		
			Rock	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	**0.33**		
			Litter	10	29	21	24	43	27	33	33	32	11	52	42	35	52	31	**31.67**		
			Bare ground	65	40	56	62	35	49	47	37	38	59	26	30	38	27	42	**43.40**		
			Total Perennial Cover	**4**	**21**	**17**	**3**	**5**	**4**	**7**	**17**	**5**	**4**	**11**	**24**	**13**	**10**	**5**	**10.00**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 1** **Forb Relative Cover = 39.02**
Sample Adequacy Calculations	**Plant Cover Mean = 24.60** **t= 1.35** **n = 15** **Variance = 22.26** **n_{min} = 6.65**

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

Table 17 Colowyo - Vegetation Cover - 2020

WP027

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		1			2						1					**0.27**	**1.06**	**20**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass		8	13	6		3		6	1	12			6	5	5	**4.33**	**17.29**	**67**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass						13										**0.87**	**3.46**	**7**
X	A	*Bromus japonicus*	Japanese Brome			11	4			1	9					1	5		**2.07**	**8.24**	**40**
N	P	*Elymus elymoides*	Squirreltail												2				**0.13**	**0.53**	**7**
N	P	*Poa ampla*	Big Bluegrass	6					2		1								**0.60**	**2.39**	**20**
I	P	*Poa pratensis*	Kentucky Bluegrass													2			**0.13**	**0.53**	**7**
N	P	*Sitanion hystrix*	Bottlebrush Squirreltail													1			**0.07**	**0.27**	**7**
Forbs																						
N	A	*Alyssum alyssoides*	Pale Madwort				4			10		2		6					**1.47**	**5.85**	**27**
I	A	*Chenopodium album*	Lambsquarter				2				1					1			**0.27**	**1.06**	**20**
I	B	*Lactuca serriola*	Prickly Lettuce				1			1			1	1					**0.27**	**1.06**	**27**
I	A	*Pocilla biloba*	Twolobed Speedwell				4					13		2	26		9	12	**4.40**	**17.55**	**40**
I	A	*Polygonum aviculare*	Prostrate Knotweed		1	1	4	2	5	1	6			2	1				**1.53**	**6.12**	**60**
I	A	*Salsola tragus*	Russian Thistle	7			3	3	6	2	3	3	5		7	9		2	**3.33**	**13.30**	**73**
I	A	*Thlaspi arvense*	Field Pennycress	15	9	7		3	4	7		3	3	6	3		17	2	**5.27**	**21.01**	**80**
Sub-Shrubs																						
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																						
N	P	*Artemisia tridentata*	Big Sagebrush				1												**0.07**	**0.27**	**7**
																			Mean		
			Total Plant Cover	**28**	**19**	**32**	**29**	**10**	**33**	**22**	**26**	**22**	**21**	**18**	**39**	**20**	**36**	**21**	**25.07**		
			Rock	0	3	3	0	4	3	0	1	1	1	0	2	0	0	0	**1.20**		
			Litter	43	44	22	36	50	26	40	18	28	32	29	27	37	53	45	**35.33**		
			Bare ground	29	34	43	35	36	38	38	55	49	46	53	32	43	11	34	**38.40**		
			Total Perennial Cover	**6**	**9**	**13**	**7**	**2**	**18**	**0**	**7**	**1**	**12**	**1**	**2**	**9**	**5**	**5**	**6.47**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 65.96**
Sample Adequacy Calculations	**Plant Cover Mean = 25.07** **t= 1.35** **n = 15** **Variance = 60.07** **n_{min} = 17.29**

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

Table 18 Colowyo - Vegetation Cover - 2020

WP028

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	4	5	6	7	7	8	9	10	11	12	15	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																						
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	5	12	9	6	6		6		20		11	15	1	13	16	**8.00**	**22.64**	**80**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass										16						**1.07**	**3.02**	**7**
N	P	*Agropyron trachycaulum*	Slender Wheatgrass									2					3	3	**0.53**	**1.51**	**20**
X	A	*Bromus japonicus*	Japanese Brome	4	1	2	1		1	13	1	1	3	3	5	6			**2.73**	**7.74**	**80**
N	P	*Bromus marginatus*	Mountain Brome									12					7	8	**1.80**	**5.09**	**20**
X	A	*Bromus tectorum*	Cheatgrass					3				2					4		**0.60**	**1.70**	**20**
N	P	*Elymus elymoides*	Squirreltail		1	1	10		3		2					1			**1.20**	**3.40**	**40**
I	P	*Phleum pratense*	Timothy										2						**0.13**	**0.38**	**7**
N	P	*Sitanion hystrix*	Bottlebrush Squirreltail					3				9			2		4	2	**1.33**	**3.77**	**33**
Forbs																						
I	A	*Chenopodium album*	Lambsquarter											1		1		1	**0.20**	**0.57**	**20**
N	A	*Descurainia pinnata*	Pinnate Tansymustard		1									1					**0.13**	**0.38**	**13**
I	A	*Pocilla biloba*	Twolobed Speedwell	13	2	7	15	29	4	19	12	18	9	17	17	4	13	20	**13.27**	**37.55**	**100**
I	A	*Polygonum aviculare*	Prostrate Knotweed			8	1		17				3			4			**2.20**	**6.23**	**33**
I	A	*Salsola tragus*	Russian Thistle	1		1		1	1	4	2					7		2	**1.27**	**3.58**	**53**
I	A	*Sisymbrium altissimum*	Tumble Mustard															2	**0.13**	**0.38**	**7**
I	A	*Thlaspi arvense*	Field Pennycress	3	1	1			3					1		2			**0.73**	**2.08**	**40**
Sub-Shrubs																						
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																						
			none																**0.00**	**0.00**	**0**
																				Mean	
			Total Plant Cover	**26**	**18**	**29**	**33**	**42**	**29**	**42**	**17**	**64**	**33**	**34**	**39**	**26**	**44**	**54**		**35.33**	
			Rock	1	0	1	2	3	5	0	3	1	0	6	0	3	2	1		**1.87**	
			Litter	44	29	42	30	27	19	44	12	21	27	39	43	43	23	27		**31.33**	
			Bare ground	29	53	28	35	28	47	14	68	14	40	21	18	28	31	18		**31.47**	
			Total Perennial Cover	**5**	**13**	**10**	**16**	**9**	**3**	**6**	**2**	**43**	**18**	**11**	**17**	**2**	**27**	**29**		**14.07**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 5** **Forb Relative Cover = 50.75**
Sample Adequacy Calculations	**Plant Cover Mean = 35.33** **t= 1.35** **n = 15** **Variance = 160.81** **n_{min} = 23.30**

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

Table 19 Colowyo - Vegetation Cover - 2020

WP029

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															3	**0.20**	**0.78**	**7**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	3	5	8	8	2	1	12	7	12		6	9	13	5	5	**6.40**	**24.94**	**93**
N	P	*Agropyron smithii*	Western Wheatgrass	2	2			2	1		2			3		2			**0.93**	**3.64**	**47**
X	A	*Bromus japonicus*	Japanese Brome															2	**0.13**	**0.52**	**7**
X	A	*Bromus tectorum*	Cheatgrass	2	2	14	26		8	1	2	1		2	1			9	**4.53**	**17.66**	**73**
N	P	*Elymus elymoides*	Squirreltail	1		1		1	1			1				1			**0.40**	**1.56**	**40**
N	P	*Poa secunda*	Sandberg Bluegrass												1				**0.07**	**0.26**	**7**
Forbs																					
I	A	*Chenopodium album*	Lambsquarter	1				2	1				1						**0.33**	**1.30**	**27**
N	A	*Descurainia pinnata*	Pinnate Tansymustard					3	1						1				**0.33**	**1.30**	**20**
I	A	*Pocilla biloba*	Twolobed Speedwell	8	5	5	11	6	16	4	10	11	1	11	11		4	1	**6.93**	**27.01**	**93**
I	A	*Polygonum aviculare*	Prostrate Knotweed	2					2	1	1		4	1		3			**0.93**	**3.64**	**47**
I	A	*Salsola tragus*	Russian Thistle	3	6				3	2	1			4	1	1			**1.40**	**5.45**	**53**
I	A	*Sisymbrium altissimum*	Tumble Mustard			1			1	1		1					1	2	**0.47**	**1.82**	**40**
I	A	*Thlaspi arvense*	Field Pennycress	3	3		5	6	3	2		2					8	7	**2.60**	**10.13**	**60**
Sub-Shrubs																					
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																					
			none																**0.00**	**0.00**	**0**
																				Mean	
			Total Plant Cover	**25**	**23**	**29**	**50**	**22**	**38**	**23**	**23**	**28**	**6**	**27**	**24**	**20**	**18**	**29**		**25.67**	
			Rock	2	0	0	0	2	1	0	0	0	2	0	0	0	0	0		**0.47**	
			Litter	22	26	42	28	28	32	22	37	22	18	25	22	19	39	45		**28.47**	
			Bare ground	51	51	29	22	48	29	55	40	50	74	48	54	61	43	26		**45.40**	
			Total Perennial Cover	**6**	**7**	**9**	**8**	**5**	**3**	**12**	**9**	**13**	**0**	**9**	**10**	**16**	**5**	**8**		**8.00**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 50.65**
Sample Adequacy Calculations	**Plant Cover Mean = 25.67** **t= 1.35** **n = 15** **Variance = 92.10** **n_{min} = 25.29**

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

Table 20 Colowyo - Vegetation Cover - 2020

GF01

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		14			6	1		3		2	5	2		3		**2.40**	**6.78**	**53**
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	12	8	14	10	6	18	1	1	5	16	11	1	9	5	1	**7.87**	**22.22**	**100**
N	P	*Agropyron riparium*	Streambank Wheatgrass			2	2		3	1			4						**0.80**	**2.26**	**33**
N	P	*Agropyron smithii*	Western Wheatgrass						3						1	2	2	4	**0.80**	**2.26**	**33**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass													1		2	**0.20**	**0.56**	**13**
X	A	*Bromus japonicus*	Japanese Brome	19		2	4												**1.67**	**4.71**	**20**
X	A	*Bromus tectorum*	Cheatgrass		20			5	10	32			1	21	3	10	15		**7.80**	**22.03**	**60**
N	P	*Elymus cinereus*	Basin Wildrye					1	6										**0.47**	**1.32**	**13**
N	P	*Elymus glaucus*	Blue Wildrye												2				**0.13**	**0.38**	**7**
N	P	*Nassela viridula*	Green Needlegrass											1					**0.07**	**0.19**	**7**
N	P	*Poa ampla*	Big Bluegrass												1			4	**0.33**	**0.94**	**13**
I	P	*Poa bulbosa*	Bulbous Bluegrass			2		2	3	1		1	4	4	6	6	3	2	**2.27**	**6.40**	**73**
I	P	*Poa compressa*	Canada Bluegrass									4							**0.27**	**0.75**	**7**
N	P	*Poa secunda*	Sandberg Bluegrass								8								**0.53**	**1.51**	**7**
Forbs																					
N	P	*Achillea millefolium*	Common Yarrow		5		4	2		1		7	9	1		6			**2.33**	**6.59**	**53**
N	A	*Alyssum alyssoides*	Pale Madwort															1	**0.07**	**0.19**	**7**
I	P	*Astragalus cicer*	Cicer Milkvetch										1						**0.07**	**0.19**	**7**
N	B	*Grindelia squarrosa*	Curlycup Gumweed			4							2						**0.40**	**1.13**	**13**
I	B	*Lactuca serriola*	Prickly Lettuce											1					**0.07**	**0.19**	**7**
N	P	*Linum lewisii*	Lewis Flax					2											**0.13**	**0.38**	**7**
I	B	*Melilotus officinalis*	Sweetclover	8		3				1			1	1				2	**1.07**	**3.01**	**40**
I	A	*Pocilla biloba*	Twolobed Speedwell				1												**0.07**	**0.19**	**7**
I	A	*Ranunculus testiculata*	Curveseed Butterwort				3												**0.20**	**0.56**	**7**
I	B	*Tragopogon dubius*	False Salsify					1								1		1	**0.20**	**0.56**	**20**
Sub-Shrubs																					
			none																**0.00**	**0.00**	**0**
Shrubs & Trees																					
N	P	*Artemisia tridentata*	Big Sagebrush		2	3	7	22		1	4	11	1	5					**3.73**	**10.55**	**60**
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush			3	1	5	2		3	5	2						**1.40**	**3.95**	**47**
N	P	*Chrysothamnus viscidiflorus*	Low Rabbitbrush													1			**0.07**	**0.19**	**7**
																			Mean		
			Total Plant Cover	**39**	**49**	**33**	**32**	**52**	**46**	**38**	**19**	**33**	**43**	**50**	**16**	**36**	**28**	**17**	**35.40**		
			Rock	1	0	0	1	0	0	0	0	0	0	1	0	0	0	2	**0.33**		
			Litter	54	0	31	40	45	49	19	43	54	47	49	58	47	51	44	**42.07**		
			Bare ground	6	51	36	27	3	5	43	38	13	10	0	26	17	21	37	**22.20**		
			Total Perennial Cover	**12**	**29**	**24**	**24**	**46**	**36**	**5**	**19**	**33**	**39**	**27**	**13**	**25**	**13**	**13**	**23.87**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 12.99**
Sample Adequacy Calculations	**Plant Cover Mean = 35.40** **t= 1.35** **n = 15** **Variance = 137.54** **n_{min} = 19.86**

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

Table 21 Colowyo - Vegetation Cover - 2020

ST003

Percent Ground Cover Based on Point-Intercept Sampling

				Transect No.——>	1	2	3	4	5	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes												
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass		3		3	1	1	**1.60**	**5.19**	**27**
I	P	*Bromus inermis*	Smooth Brome						1	**0.20**	**0.65**	**7**
X	A	*Bromus japonicus*	Japanese Brome		13	38	21	5	2	**15.80**	**51.30**	**33**
N	P	*Bromus marginatus*	Mountain Brome			2				**0.40**	**1.30**	**7**
N	P	*Poa secunda*	Sandberg Bluegrass		2	4	2			**1.60**	**5.19**	**20**
Forbs												
N	P	*Agastache urticifolia*	Nettleleaf Giant Hyssop					1		**0.20**	**0.65**	**7**
X	P	*Cirsium arvense*	Canada Thistle		2	1	3			**1.20**	**3.90**	**20**
X	P	*Cirsium vulgare*	Bull Thistle		11	5	3	8	10	**7.40**	**24.03**	**33**
X	A	*Cynoglossum officinale*	Houndstongue				2	1	2	**1.00**	**3.25**	**20**
N	B	*Grindelia squarrosa*	Curlycup Gumweed					1		**0.20**	**0.65**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce				1			**0.20**	**0.65**	**7**
N	B	*Machaeranthera canescens*	Hoary Aster						1	**0.20**	**0.65**	**7**
I	B	*Tragopogon dubius*	False Salsify				1		1	**0.40**	**1.30**	**13**
Sub-Shrubs												
			none							**0.00**	**0.00**	**0**
Shrubs & Trees												
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry					1	1	**0.40**	**1.30**	**13**
										Mean		
				Total Plant Cover	**31**	**50**	**36**	**18**	**19**	**30.80**		
				Rock	8	4	1	4	15	**6.40**		
				Litter	45	42	53	42	30	**42.40**		
				Bare ground	16	4	10	36	36	**20.40**		
				Total Perennial Cover	**5**	**6**	**5**	**3**	**3**	**4.40**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 3.90**
Sample Adequacy Calculations	**Plant Cover Mean = 30.80** **n = 15** **t= 1.35** **Variance = 174.70** **n_{min} = 33.32**

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

Table 22 Colowyo - Vegetation Cover - 2020

C01

Percent Ground Cover Based on Point-Intercept Sampling

				Transect No.——>	1	2	3	4	5	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes												
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass			4			**0.80**	**2.67**	**7**
I	P	*Bromus inermis*	Smooth Brome			4			**0.80**	**2.67**	**7**
X	A	*Bromus tectorum*	Cheatgrass	13	13	5	14	10	**11.00**	**36.67**	**33**
Forbs												
N	P	*Cirsium undulatum*	Wavyleaf Thistle		10	3	1	12	**5.20**	**17.33**	**27**
I	B	*Lactuca serriola*	Prickly Lettuce	6	3	2		4	**3.00**	**10.00**	**27**
Sub-Shrubs												
			none						**0.00**	**0.00**	**0**
Shrubs & Trees												
N	P	*Artemisia tridentata*	Big Sagebrush			6			**1.20**	**4.00**	**7**
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	9		2	26	3	**8.00**	**26.67**	**27**
										Mean		
			Total Plant Cover	**28**	**26**	**26**	**41**	**29**		**30.00**	
			Rock	0	0	0	0	0		**0.00**	
			Litter	46	57	44	47	46		**48.00**	
			Bare ground	26	17	30	12	25		**22.00**	
			Total Perennial Cover	**9**	**10**	**19**	**27**	**15**		**16.00**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 0** **Forb Relative Cover = 27.33**
Sample Adequacy Calculations	**Plant Cover Mean = 30.00** **n = 5** **t= 1.53** **Variance = 39.50** **n_{min} = 10.32**

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

Table 23 Colowyo - Vegetation Cover - 2020

C02

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	5	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes											
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	3	13	3	4	15	**7.60**	**16.45**	**33**
N	P	*Agropyron smithii*	Western Wheatgrass		15	42			**11.40**	**24.68**	**13**
X	A	*Bromus japonicus*	Japanese Brome			1			**0.20**	**0.43**	**7**
X	A	*Bromus tectorum*	Cheatgrass					2	**0.40**	**0.87**	**7**
N	P	*Hesperostipa comata*	Needla and Thread	2					**0.40**	**0.87**	**7**
N	P	*Nassela viridula*	Green Needlegrass	1					**0.20**	**0.43**	**7**
N	P	*Poa secunda*	Sandberg Bluegrass	4	18	6	14	10	**10.40**	**22.51**	**33**
Forbs											
N	P	*Artemisia ludoviciana*	Prairie Sagewort	38	9				**9.40**	**20.35**	**13**
N	P	*Astragalus miser*	Weedy Milkvetch				2		**0.40**	**0.87**	**7**
N	P	*Heterotheca villosa*	Hairy False Goldenaster	5					**1.00**	**2.16**	**7**
N	P	*Lithospermum ruderale*	western stoneseed				9		**1.80**	**3.90**	**7**
N	B	*Machaeranthera canescens*	Hoary Aster				1		**0.20**	**0.43**	**7**
N	P	*Sphaeralcea coccinea*	Scarlet Globemallow	1				4	**1.00**	**2.16**	**13**
Sub-Shrubs											
N	P	*Gutierrezia sarothrae*	Snakeweed	2		6	1		**1.80**	**3.90**	**20**
Shrubs & Trees											
			none						**0.00**	**0.00**	**0**
										Mean	
			Total Plant Cover	**56**	**55**	**58**	**31**	**31**		**46.20**	
			Rock	0	0	0	1	0		**0.20**	
			Litter	34	32	36	62	50		**42.80**	
			Bare ground	10	13	6	6	19		**10.80**	
			Total Perennial Cover	**56**	**55**	**57**	**30**	**29**		**45.40**	

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 29.87**
Sample Adequacy Calculations	**Plant Cover Mean = 46.20** **n = 5** **t= 1.53** **Variance = 193.70** **n_{min} = 21.33**

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

Table 24 Colowyo - Vegetation Cover - 2020

C03

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	5	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes											
N	P	*Agropyron smithii*	Western Wheatgrass	17	9	22	31	24	**20.60**	**46.82**	**33**
I	P	*Poa bulbosa*	Bulbous Bluegrass	15	27	21	20	10	**18.60**	**42.27**	**33**
Forbs											
X	P	*Cirsium arvense*	Canada Thistle		1				**0.20**	**0.45**	**7**
N	B	*Grindelia squarrosa*	Curlycup Gumweed	7		1	8	4	**4.00**	**9.09**	**27**
I	B	*Tragopogon dubius*	False Salsify					1	**0.20**	**0.45**	**7**
Sub-Shrubs											
N	P	*Gutierrezia sarothrae*	Snakeweed	1	1				**0.40**	**0.91**	**13**
Shrubs & Trees											
			none						**0.00**	**0.00**	**0**
									Mean		
			Total Plant Cover	**40**	**38**	**44**	**59**	**39**	**44.00**		
			Rock	0	0	0	0	0	**0.00**		
			Litter	59	62	56	41	59	**55.40**		
			Bare ground	1	0	0	0	2	**0.60**		
			Total Perennial Cover	**33**	**37**	**43**	**51**	**34**	**39.60**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 2** **Forb Relative Cover = 9.55**
Sample Adequacy Calculations	**Plant Cover Mean = 44.00** **n = 5** **t= 1.53** **Variance = 75.50** **n_{min} = 9.17**

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

Table 25 Colowyo - Vegetation Cover - 2020

C05

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	5	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes											
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass			1	1	21	**4.60**	**10.00**	**20**
N	P	*Agropyron smithii*	Western Wheatgrass	4	4	7			**3.00**	**6.52**	**20**
X	A	*Bromus tectorum*	Cheatgrass	42	24	29	14	17	**25.20**	**54.78**	**33**
N	P	*Elymus cinereus*	Basin Wildrye				5		**1.00**	**2.17**	**7**
I	P	*Poa bulbosa*	Bulbous Bluegrass	4	10	1			**3.00**	**6.52**	**20**
Forbs											
N	P	*Achillea millefolium*	Common Yarrow		1		5	4	**2.00**	**4.35**	**20**
N	A	*Alyssum alyssoides*	Pale Madwort	4	3	11	12	4	**6.80**	**14.78**	**33**
I	B	*Tragopogon dubius*	False Salsify			1			**0.20**	**0.43**	**7**
Sub-Shrubs											
			none						**0.00**	**0.00**	**0**
Shrubs & Trees											
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	1					**0.20**	**0.43**	**7**
									Mean		
			Total Plant Cover	**55**	**42**	**50**	**37**	**46**	**46.00**		
			Rock	0	0	2	0	5	**1.40**		
			Litter	45	58	42	61	46	**50.40**		
			Bare ground	0	0	6	2	3	**2.20**		
			Total Perennial Cover	**9**	**15**	**9**	**11**	**25**	**13.80**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 3** **Forb Relative Cover = 19.57**
Sample Adequacy Calculations	**Plant Cover Mean = 46.00** **n = 5** **t= 1.53** **Variance = 48.50** **n_{min} = 5.39**

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

Table 26 Colowyo - Vegetation Cover - 2020

Mountain Shrub Reference Area

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.——>	1	2	3	4	5	6	7	8	9	10	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																
N	P	*Agropyron smithii*	Western Wheatgrass	3				9				19	4	**3.50**	**8.66**	**27**
I	P	*Bromus inermis*	Smooth Brome									2		**0.20**	**0.50**	**7**
X	A	*Bromus japonicus*	Japanese Brome					7	3				1	**1.10**	**2.72**	**20**
N	P	*Bromus marginatus*	Mountain Brome	6	9	5				3				**2.30**	**5.69**	**27**
N	P	*Carex geyeri*	Geyer's Sedge	3	8	6	17		2	4	4			**4.40**	**10.89**	**47**
N	P	*Hesperostipa comata*	Needla and Thread		4									**0.40**	**0.99**	**7**
N	P	*Nassela viridula*	Green Needlegrass						11		9		3	**2.30**	**5.69**	**20**
I	P	*Poa pratensis*	Kentucky Bluegrass	2			1							**0.30**	**0.74**	**13**
N	P	*Poa secunda*	Sandberg Bluegrass					4						**0.40**	**0.99**	**7**
N	P	*Stipa nelsonii*	Nelson Needlegrass	2	6	3	2			1				**1.40**	**3.47**	**33**
Forbs																
N	P	*Achillea millefolium*	Common Yarrow								1			**0.10**	**0.25**	**7**
N	P	*Galium boreale*	Northern Bedstraw			4								**0.40**	**0.99**	**7**
I	B	*Lactuca serriola*	Prickly Lettuce						5					**0.50**	**1.24**	**7**
I	A	*Pocilla biloba*	Twolobed Speedwell			1								**0.10**	**0.25**	**7**
N	P	*Senecio serra*	Tall Ragwort	1		1								**0.20**	**0.50**	**13**
N	P	*Stenotus armerioides*	Thrifty Goldenweed					1						**0.10**	**0.25**	**7**
I	A	*Thlaspi arvense*	Field Pennycress						2					**0.20**	**0.50**	**7**
Sub-Shrubs																
			none											**0.00**	**0.00**	**0**
Shrubs & Trees																
N	P	*Amelanchier alnifolia*	Saskatoon Serviceberry	6		2	5							**1.30**	**3.22**	**20**
N	P	*Artemisia tridentata*	Big Sagebrush	7				10			16	18		**5.10**	**12.62**	**27**
N	P	*Quercus gambellii*	Gambel Oak	12	11	21	12		3	30		9	7	**10.50**	**25.99**	**53**
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry			1	10	5		11	27		2	**5.60**	**13.86**	**40**
														Mean		
			Total Plant Cover	**42**	**38**	**44**	**47**	**36**	**26**	**49**	**57**	**48**	**17**	**40.40**		
			Rock	0	0	0	0	3	0	2	1	2	0	**0.80**		
			Litter	57	60	55	50	52	49	49	40	43	71	**52.60**		
			Bare ground	1	2	1	3	9	25	0	2	7	12	**6.20**		
			Total Perennial Cover	**42**	**38**	**43**	**47**	**29**	**16**	**49**	**57**	**48**	**16**	**38.50**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 5** **Forb Relative Cover = 3.96**
Sample Adequacy Calculations	**Plant Cover Mean = 40.40** **t= 1.35** **n = 15** **Variance = 138.49** **n_{min} = 15.35**

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

Table 27 Colowyo - Vegetation Cover - 2020

Sagebrush Reference Area

Percent Ground Cover Based on Point-Intercept Sampling

			Transect No.—–>	1	2	3	4	5	6	7	8	9	10	Average Cover	Relative Cover	Freq.
Grasses and Grass-likes																
N	P	*Agropyron dasystachyum*	Thickspike Wheatgrass	4	13	2		5	1	3	1			**2.90**	**6.99**	**47**
N	P	*Agropyron smithii*	Western Wheatgrass					3	6	2	8	6		**2.50**	**6.02**	**33**
N	P	*Agropyron spicatum*	Bluebunch Wheatgrass			23	3							**2.60**	**6.27**	**13**
I	P	*Bromus inermis*	Smooth Brome				12				12	1		**2.50**	**6.02**	**20**
X	A	*Bromus japonicus*	Japanese Brome	4	3	4	18	1			2		3	**3.50**	**8.43**	**47**
X	A	*Bromus tectorum*	Cheatgrass							10				**1.00**	**2.41**	**7**
I	P	*Festuca ovina/saximontana*	Hard Fescue					1				1		**0.20**	**0.48**	**13**
N	P	*Koeleria macrantha*	Prairie Junegrass					6	6	1			2	**1.50**	**3.61**	**27**
N	P	*Poa secunda*	Sandberg Bluegrass	12	11	4	3	1	1			4	1	**3.70**	**8.92**	**53**
Forbs																
N	P	*Achillea millefolium*	Common Yarrow									1	1	**0.20**	**0.48**	**13**
N	A	*Alyssum desertorum*	Desert Alyssum										1	**0.10**	**0.24**	**7**
N	B	*Grindelia squarrosa*	Curlycup Gumweed				12							**1.20**	**2.89**	**7**
N	P	*Sphaeralcea coccinea*	Scarlet Globemallow							2				**0.20**	**0.48**	**7**
N	P	*Stenotus armerioides*	Thrifty Goldenweed					1	1			1		**0.30**	**0.72**	**20**
I	A	*Thlaspi arvense*	Field Pennycress				1							**0.10**	**0.24**	**7**
I	B	*Tragopogon dubius*	False Salsify								2			**0.20**	**0.48**	**7**
	A		Unknown Forb	1										**0.10**	**0.24**	**7**
Sub-Shrubs																
N	P	*Gutierrezia sarothrae*	Snakeweed	11	9			1	3			2		**2.60**	**6.27**	**33**
Shrubs & Trees																
N	P	*Amelanchier alnifolia*	Saskatoon Serviceberry		1			4	2		1	7	5	**2.00**	**4.82**	**40**
N	P	*Artemisia tridentata*	Big Sagebrush	4	6	10	3	13	19	13	8	3	17	**9.60**	**23.13**	**67**
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush								4		2	**0.60**	**1.45**	**13**
N	P	*Chrysothamnus viscidiflorus*	Low Rabbitbrush								4			**0.40**	**0.96**	**7**
N	P	*Opuntia polyacantha*	Plains Pricklypear								2			**0.20**	**0.48**	**7**
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry		2	1		1	1		6		22	**3.30**	**7.95**	**40**
														Mean		
			Total Plant Cover	**36**	**45**	**44**	**52**	**37**	**40**	**31**	**50**	**26**	**54**	**41.50**		
			Rock	1	0	6	0	2	5	3	0	3	3	**2.30**		
			Litter	40	49	36	40	52	49	65	46	40	40	**45.70**		
			Bare ground	23	6	14	8	9	6	1	4	31	3	**10.50**		
			Total Perennial Cover	**31**	**42**	**40**	**21**	**36**	**40**	**21**	**46**	**26**	**50**	**35.30**		

Diversity	**No. of Perennial Grasses (3% - 50% Rel. Cover) = 6** **Forb Relative Cover = 5.78**
Sample Adequacy Calculations	**Plant Cover Mean = 41.50** **t= 1.35** **n = 15** **Variance = 84.50** **n_{min} = 8.88**

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

Table 28 Colowyo - Woody Plant Density - 2020

EP059 - 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**
		Total	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**5.4**

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

Table 29 Colowyo - Woody Plant Density - 2020

EP061 - 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	101	148	33	58	15	61	38	27	223	92	113	182	40	104	26	**1261**	**3402.1**
N P	*Atriplex canescens*	Four-wing Saltbush	1		1													**2**	**5.4**
N P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush			1													**1**	**2.7**
N P	*Purshia tridentata*	Antelope Bitterbrush		1														**1**	**2.7**
		Total	**102**	**149**	**35**	**58**	**15**	**61**	**38**	**27**	**223**	**92**	**113**	**182**	**40**	**104**	**26**	**1265**	**3412.8**

Sample Adequacy Calculations				
Mean = 84.33	**t= 1.35**	**n = 15**		
Variance = 3843.52	**n_{min} = 97.77**			

Table 30 Colowyo - Woody Plant Density - 2020

WP017 - 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	*Atriplex canescens*	Four-wing Saltbush					1			2	5	1	1	1	2			**13**	**35.1**
		Total	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**2**	**5**	**1**	**1**	**1**	**2**	**0**	**0**	**13**	**35.1**

Sample Adequacy Calculations				
Mean = 0.87	**t= 1.35**	**n = 15**		
Variance = 1.84	**n_{min} = 442.72**			

Table 31 Colowyo - Woody Plant Density - 2020

WP018 - 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			1	2			4				**9**	**24.3**
		Total	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**2**	**0**	**0**	**4**	**0**	**0**	**0**	**9**	**24.3**

Sample Adequacy Calculations				
Mean = 0.60	**t= 1.35**	**n = 15**		
Variance = 1.26	**n_{min} = 631.75**			

Table 32 Colowyo - Woody Plant Density - 2020

WP019 - 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			3	4	4	1	3	6		2		2			**27**	**72.8**
N	P	*Atriplex canescens* Four-wing Saltbush						2		1			5	6	6	2		**22**	**59.4**
		Total	**2**	**0**	**0**	**3**	**4**	**6**	**1**	**4**	**6**	**0**	**7**	**6**	**8**	**2**	**0**	**49**	**132.2**

Sample Adequacy Calculations			
Mean = 3.27	**t= 1.35**	**n = 15**	
Variance = 7.92	**n_{min} = 134.33**		

Table 33 Colowyo - Woody Plant Density - 2020

WP020 - 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	6		2	1		12									**23**	**62.1**
		Total	**2**	**6**	**0**	**2**	**1**	**0**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**23**	**62.1**

Sample Adequacy Calculations			
Mean = 1.53	**t= 1.35**	**n = 15**	
Variance = 10.98	**n_{min} = 844.95**		

Table 34 Colowyo - Woody Plant Density - 2020

WP022 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.——>	1	2	4	3	5	Count	Per Acre
Shrubs & Trees									
N P	*Artemisia tridentata*	Big Sagebrush	13	17	5	33	24	**92**	**744.6**
N P	*Atriplex canescens*	Four-wing Saltbush	4	5	1	3	3	**16**	**129.5**
N P	*Gutierrezia sarothrae*	Broom Snakeweed		16	26	46		**88**	**712.2**
N P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry			1			**1**	**8.1**
		Total	**17**	**38**	**33**	**82**	**27**	**197**	**1594.5**

Sample Adequacy Calculations

Mean = 39.40 **t= 1.53**
Variance = 628.30 **n = 5**
n_{min} = 95.14

Table 35 Colowyo - Woody Plant Density - 2020

WP023 - 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		2			5	2		5	3	3	7		5	2	**35**	**94.4**
		Total	**1**	**0**	**2**	**0**	**0**	**5**	**2**	**0**	**5**	**3**	**3**	**7**	**0**	**5**	**2**	**35**	**94.4**

Sample Adequacy Calculations

Mean = 2.33 **t= 1.35** **n = 15**
Variance = 5.24 **n_{min} = 174.05**

Table 36 Colowyo - Woody Plant Density - 2020

WP026 - 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			8	1			2	5	1	20		9	13		**60**	**161.9**
		Total	**1**	**0**	**0**	**8**	**1**	**0**	**0**	**2**	**5**	**1**	**20**	**0**	**9**	**13**	**0**	**60**	**161.9**

Sample Adequacy Calculations			
Mean = 4.00	**t= 1.35**	**n = 15**	
Variance = 36.14	**n_{min} = 408.66**		

Table 37 Colowyo - Woody Plant Density - 2020

WP027 - 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	17	11	11	19	6	8	2	8	7		8	6	1	3		**107**	**288.7**
		Total	**17**	**11**	**11**	**19**	**6**	**8**	**2**	**8**	**7**	**0**	**8**	**7**	**1**	**3**	**0**	**108**	**291.4**

Sample Adequacy Calculations			
Mean = 7.20	**t= 1.35**	**n = 15**	
Variance = 32.46	**n_{min} = 113.27**		

Table 38 Colowyo - Woody Plant Density - 2020

WP028 - 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					7		1		2	1						**11**	**29.7**
N	P	*Atriplex canescens* Four-wing Saltbush			1	1	1				3							**6**	**16.2**
		Total	**0**	**0**	**1**	**1**	**8**	**0**	**1**	**0**	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**17**	**45.9**

Sample Adequacy Calculations			
Mean = 1.13	**t= 1.35**	**n = 15**	
Variance = 5.27	**n_{min} = 741.80**		

Table 39 Colowyo - Woody Plant Density - 2020

WP029 - 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			4				1			1					**7**	**18.9**
N	P	*Atriplex canescens* Four-wing Saltbush	4	4		1	6	1	1									**17**	**45.9**
		Total	**5**	**4**	**0**	**5**	**6**	**1**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**24**	**64.7**

Sample Adequacy Calculations			
Mean = 1.60	**t= 1.35**	**n = 15**	
Variance = 4.83	**n_{min} = 341.23**		

Table 40 Colowyo - Woody Plant Density - 2020

GF01 - 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	46	151	95	68	105	56	64	120	82	48	154	89	24	33	103	**1238**	**3340.0**
N P	*Atriplex canescens*	Four-wing Saltbush					3											**3**	**8.1**
N P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	18	3	19	12	62	25	15	31	29	28	18					**260**	**701.5**
N P	*Chrysothamnus viscidiflorus*	Yellow Rabbitbrush														5	11	**16**	**43.2**
		Total	**64**	**154**	**114**	**80**	**170**	**81**	**79**	**151**	**111**	**76**	**172**	**89**	**24**	**38**	**114**	**1517**	**4092.7**

Sample Adequacy Calculations

Mean = 101.13 **t= 1.35** **n = 15**

Variance = 2064.98 **n_{min} = 36.53**

Table 41 Colowyo - Woody Plant Density - 2020

C01 - Raw Data

Sampling by 2m x 50m Belt Transects

		Transect No.—>	1	2	3	4	5	Count	Per Acre
Shrubs & Trees									
N P	*Artemisia tridentata*	Big Sagebrush	12	3	19	7	2	**43**	**348.0**
N P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	27	17	44	85	91	**264**	**2136.7**
		Total	**39**	**20**	**63**	**92**	**93**	**307**	**2484.8**

Sample Adequacy Calculations

Mean = 61.40 **t= 1.53**

Variance = 1038.30 **n = 5**

n_{min} = 64.74

Table 42 Colowyo - Woody Plant Density - 2020

C02 - Raw Data

Sampling by 2m x 50m Belt Transects

			Transect No.—>	1	2	3	4	5	Count	Per Acre
Shrubs & Trees										
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	3					**3**	**24.3**
N	P	*Opuntia polyacantha*	Plains Pricklypear	1					**1**	**8.1**
			Total	**4**	**0**	**0**	**0**	**0**	**4**	**32.4**

Sample Adequacy Calculations

Mean = 0.80 **t= 1.53**
Variance = 3.20 **n = 5**
n_{min} = 1175.36

Table 43 Colowyo - Woody Plant Density - 2020

C03 - Raw Data

Sampling by 2m x 50m Belt Transects

			Transect No.—>	1	2	3	4	5	Count	Per Acre
Shrubs & Trees										
N	P	*Artemisia tridentata*	Big Sagebrush	3	2	6		1	**12**	**97.1**
			Total	**3**	**2**	**6**	**0**	**1**	**12**	**97.1**

Sample Adequacy Calculations

Mean = 2.40 **t= 1.53**
Variance = 5.30 **n = 5**
n_{min} = 216.30

Table 44 Colowyo - Woody Plant Density - 2020

C05 - Raw Data

Sampling by 2m x 50m Belt Transects

			Transect No.——>	1	2	3	4	5	Count	Per Acre
Shrubs & Trees										
N	P	*Artemisia tridentata*	Big Sagebrush			1			**1**	**8.1**
N	P	*Atriplex canescens*	Four-wing Saltbush				5		**5**	**40.5**
N	P	*Chrysothamnus nauseosus*	Rubber Rabbitbrush	1					**1**	**8.1**
			Total	**1**	**0**	**1**	**5**	**0**	**7**	**56.7**

Sample Adequacy Calculations

Mean = 1.40 **t= 1.53**
Variance = 4.30 **n = 5**
n_{min} = 515.72

Table 45 Colowyo - Woody Plant Density - 2020

ST003 - Raw Data

Sampling by 2m x 50m Belt Transects

			Transect No.——>	1	2	3	4	5	Count	Per Acre
Shrubs & Trees										
N	P	*Amelanchier alnifolia*	Saskatoon Serviceberry				7	2	**9**	**72.8**
N	P	*Symphoricarpos rotundifolius*	Roundleaf Snowberry			1	7	8	**16**	**129.5**
			Total	**0**	**0**	**1**	**14**	**10**	**25**	**202.3**

Sample Adequacy Calculations

Mean = 5.00 **t= 1.53**
Variance = 43.00 **n = 5**
n_{min} = 404.32

Table 46 Colowyo - Vegetation Production - 2020

WP017

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	27.2			5.3	1.7			**34.2**	**609.2**
2	53.0	1.0		0.8	1.1			**55.9**	**995.8**
3	71.9							**71.9**	**1,280.8**
4						34.0		**34.0**	**605.7**
5	33.3			25.2	0.6			**59.1**	**1,052.8**
Average	**37.1**	**0.2**	**0.0**	**6.3**	**0.7**	**6.8**	**0.0**	**51.0**	**908.9**

Sampling Adequacy:	**n= 5**	**t = 1.533**	**var. = 274.417**
		Mean = 51.02	**n_{min} = 24.782**

Table 47 Colowyo - Vegetation Production - 2020

WP018

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	33.9	0.4		0.1	0.3			**34.7**	**618.1**
2	33.7			0.2	0.6			**34.5**	**614.6**
3	23.2	11.0			0.9			**35.1**	**625.3**
4	19.1			2.3	0.8			**22.2**	**395.5**
5	54.4	0.5			0.7			**55.6**	**990.5**
Average	**32.9**	**2.4**	**0.0**	**0.5**	**0.7**	**0.0**	**0.0**	**36.4**	**648.8**

Sampling Adequacy:			
	n= 5	**t = 1.533**	**var. = 144.617**
		Mean = 36.42	**n_{min} = 25.630**

Table 48 Colowyo - Vegetation Production - 2020

WP019

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	34.7			1.4	1.1	0.4		**37.6**	**669.8**
2	6.9			0.9	2.5		0.7	**11.0**	**196.0**
3	17.6	4.8		0.3				**22.7**	**404.4**
4	12.6				0.1			**12.7**	**226.2**
5	16.3				0.9		3.2	**20.4**	**363.4**
Average	**17.6**	**1.0**	**0.0**	**0.5**	**0.9**	**0.1**	**0.8**	**20.9**	**372.0**

Sampling Adequacy:			
	n= 5	**t = 1.533**	**var. = 111.907**
		Mean = 20.88	**n_{min} = 60.339**

Table 49 Colowyo - Vegetation Production - 2020

WP020

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	35.8				0.8		1.4	**38.0**	**676.9**
2				10.7	0.9	7.2		**18.8**	**334.9**
3				11.6	10.2			**21.8**	**388.3**
4	26.9			0.7	3.0			**30.6**	**545.1**
5	57.5							**57.5**	**1,024.3**
Average	**24.0**	**0.0**	**0.0**	**4.6**	**3.0**	**1.4**	**0.3**	**33.3**	**593.9**

Sampling Adequacy:			
	n= 5	**t = 1.533**	**var. = 239.378**
		Mean = 33.34	**n_{min} = 50.624**

Table 50 Colowyo - Vegetation Production - 2020

ST003

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				11.8	0.1	0.2	48.6	**60.7**	**1,081.3**
2	1.1			11.1	0.3		22.2	**34.7**	**618.1**
3				36.2	4.4		6.9	**47.5**	**846.2**
4	0.3			6.0	0.4		5.4	**12.1**	**215.5**
5	2.9			0.3	4.2		3.0	**10.4**	**185.3**
Average	**0.9**	**0.0**	**0.0**	**13.1**	**1.9**	**0.0**	**17.2**	**33.1**	**589.3**

Sampling Adequacy:	**n= 5**	**t = 1.533**	**var. = 481.992**
		Mean = 33.08	**n_{min} = 103.540**

Table 51 Colowyo - Vegetation Production - 2020

Mountain Shrub Reference Area

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	21.8	0.2						**22.0**	**391.9**
2	5.6	6.3		2.0	0.2			**14.1**	**251.2**
3	33.4	0.1						**33.5**	**596.8**
4	14.6	1.9						**16.5**	**293.9**
5	8.6	4.3		0.8				**13.7**	**244.1**
Average	**16.8**	**2.6**	**0.0**	**0.6**	**0.0**	**0.0**	**0.0**	**20.0**	**355.6**

Sampling Adequacy:	**t = 1.533**	**var. = 68.248**	
	n= 5	**Mean = 19.96**	**n_{min} = 40.269**

Table 52 Colowyo - Vegetation Production - 2020

Sagebrush Reference Area

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	7.1		11.0	1.2	0.3	0.4		**20.0**	**356.3**
2	26.1			0.5	0.4			**27.0**	**481.0**
3	17.5		2.9	0.4	4.9			**25.7**	**457.8**
4	0.3				2.5	8.1		**10.9**	**194.2**
5	15.2	0.3		0.2	0.3			**16.0**	**285.0**
Average	**13.2**	**0.1**	**2.8**	**0.5**	**1.7**	**1.7**	**0.0**	**19.9**	**354.9**

Sampling Adequacy:	**n= 5**	**t = 1.533**	**var. = 45.067**
		Mean = 19.92	**n_{min} = 26.698**

Table 53 Colowyo - Emergent Density - 2020

WP031

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									1		
	Forb		2	1	3	3	3	2	3	1	4	3	2	1	2	2	1	1	2	3	2		3	5	4	3	4
Perennial	Grass									1														1			
	Forb																										
	Noxious Weed																										
Shrub	*Artemisia tridentata*																										
	Atriplex canescens										1																
Total			**2**	**1**	**3**	**3**	**3**	**2**	**3**	**2**	**5**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**2**	**0**	**3**	**6**	**5**	**3**	**4**

		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						1				1															2	1	**0.16**
	Forb		2	2		3		2	4	3	2	1	3	8	5	3	7	3	3	1	1	2	5	4	3	7	9	**2.86**
Perennial	Grass				1						1					1			1		2					3		**0.22**
	Forb																					1						**0.02**
	Noxious Weed																											**0.00**
Shrub	*Artemisia tridentata*																											**0.00**
	Atriplex canescens																											**0.02**
Total			**2**	**2**	**1**	**3**	**1**	**2**	**4**	**3**	**4**	**1**	**3**	**8**	**5**	**4**	**7**	**3**	**4**	**1**	**3**	**3**	**5**	**4**	**3**	**12**	**10**	**3.28**

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 2020, Colowyo removed topsoil and placed it in stockpile for advancement of the Collom Pit, continued development of the temporary spoil pile, and roads and pads to support and in pit exploratory drilling program. Figure 5-1 provides the topsoil pile location for all topsoil that was removed.

In 2020, no topsoil replacement occurred on any reclamation areas.

No areas were requested to be exempt for topsoil removal in 2020.

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 2020 for the entire Colowyo mine site.

Figure 5-1 – Topsoil Movements During Report Period

Topsoil Removal

Task	Activity	Topsoil Placement Area
1	Removed Topsoil for advancement of the Collom Pit	Pile 36A
2	Removed Topsoil for advancement of the Collom out of pit stockpile	Pile 26A
3	Topsoil was windrowed for drill pad roads and drill pad construction	Various Windrows

Topsoil Replacement

Task	Activity	Topsoil Pile Mined
-	Topsoil Replacement Did Not Occur in 2020	

Areas Exempt from Topsoil Stripping Due to Conditions

Task	Activity	Acres Exempt
-	-	-

Figure 5-2 - Topsoil Stockpile for Report Year

Stockpile Number	Change in 2020 (cubic yards)	End of Year, 2020 (cubic yards)
9A		416
9B		26,612
15A		1,130,663
15E		3,201
15F		8,119
15G		24,656
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	72,735	658,929
26B		0
27A		12,316
Windrow 1		3,410
Windrow 2		298
Windrow 3		3,892
Windrow 4		2,189
Windrow 6		120
Windrow 8		1,490
Windrow 9		9,781
Windrow 12		9,960
28A		1,059
29A		29,042
30A		31,806
30B		21,631
36A	66,417	66,417
Collom Drill Pad Windrows	16,131	16,131
Total	155,283	5,333,144

Figure 5-3 –Topsoil Balance

Topsoil Balance As of December 2020

1	Disturbed Lands (See Figure 2-1)	4,539.0	acres*
2	Lands with Redistributed Topsoil (See Figure 2-1)	1,376.8	acres*
3	Lands Yet to be Retopsoiled (Line 1 Minus 2)	3,162.2	acres
4	Lands Yet to be Retopsoiled	137,745,000.0	sq. feet
5	Volume of Topsoil in Stockpiles (From Figure 5-2)	5,333,144.1	cu. yards*
6	Line 5 times 27	143,995,000.0	cu. ft
7	Average Replacement Depth Available (Line 6 divided by Line 4)	1.0	feet
8	Average Replacement Depth Available	12.5	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.

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 these ditch construction certifications be included in the annual reclamation report.

GENERAL DISCUSSION

During 2020, no post mine channels were constructed.

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 weed management 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 through EP053, and Units EP056 through EP061
West Pit – Units WP010 and Units WP014 through WP029
South Taylor Pit – Units ST001-ST004
Gossard Loadout/Facilities Area – Units GF01-GF04

Please see Exhibit 2 for the reclamation units noted above.