

# 2021 ANNUAL HYDROLOGY REPORT

YOAST MINE

PERMIT C-94-082

April 2022



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## **1.0 INTRODUCTION**

This Annual Hydrology Report presents the hydrologic monitoring data collected during the 2021 water year (October 2020 - September 2021) at the Seneca Coal Company's (SCC) Yoast Mine (Yoast). The AHR fulfills the reporting requirements under the Colorado Division of Reclamation, Mining, and Safety (CDRMS) Permit No. C-1994-082.

### **1.1 BACKGROUND**

Yoast is a surface coal mine located in Routt County, approximately 25 miles west of Steamboat Springs, Colorado (Figure 1). The Yoast permit went into effect on August 8, 1995. Overburden removal began in 1996 in the Grassy Creek watershed and 2000 in the Sage Creek watershed. The last of the coal at Yoast was removed in February 2006. The mine has been reclaimed and vegetated for many years and SCC is actively pursuing bond release.

## 2.0 METEOROLOGICAL

Meteorological data for the 2021 water year is presented in Appendix A. The 2021 data was obtained from NOAA weather station USC00053867 located in Hayden, Colorado ([www.ncdc.noaa.gov/cdo-wb/](http://www.ncdc.noaa.gov/cdo-wb/)). A total of 12.44 inches of precipitation was measured in 2021, which is 5.68 inches less than the 1981-2021 average of 18.12 inches. February and March were slightly wetter than normal ( $\leq 0.24$  inches), but the remaining months were drier than normal. Potential snowpack runoff, as estimated by totaling November through March precipitation, was 6.49 inches, which was 1.04 inches below the 1981-2021 average of 7.53 inches.

### 3.0 GROUNDWATER

The Yoast groundwater monitoring program includes 10 monitoring wells. The following table includes the wells monitored, the water bearing unit they are screened in, the frequency of monitoring, and the required parameter list. The monitoring well locations are shown on Figure 1. Groundwater monitoring was completed by experienced personnel and samples were collected following the monitoring practices described in Tab 15 of Permit C-1994-082. All samples were analyzed by ACZ Laboratories.

Site	Unit	Monitoring Frequency		Parameter List
		Water Level	Water Quality	
YAAL14	Annand Draw Alluvium	A	A	GW Long
YGAL16	Grassy Creek Alluvium	A	A	GW Long
SGAL70	Grassy Creek Alluvium	A	A	GW Long
YSAL1	Sage Creek Alluvium	A	A	GW Long
YSAL3	Sage Creek Alluvium	A	A	GW Long
YOV30	Wadge Overburden	A	A	GW Long
YW30	Wadge Coal	A	A	GW Long
YWU30	Wadge Underburden	A	A	GW Long
YWC33	Wolf Creek Coal	A	A	GW Short
YWCU33	Wolf Creek Underburden	A	A	GW Short

**Note**

A: Annual

GW Long: Field conductivity, field pH, field temperature, fluoride, dissolved iron, dissolved manganese, nitrate, nitrite, dissolved selenium, sulfate, total dissolved solids

GW Short: Field conductivity, field pH, field temperature, dissolved iron, dissolved manganese, total dissolved solids

### 3.1 WATER LEVELS

The static water levels measured during the 2021 water year are included with the groundwater quality data in Appendix B. Water level hydrographs for each of the wells are also provided in Appendix C. The static water levels were measured at all wells except for YWC33, where the well casing was damaged, and a measurement

could not be made. The water levels measured at all wells this year except for YOV30 and SGAL70 were within their respective historic range. The static water level in Wadge Overburden Well YOV30 (134.64 ft bgs) was the lowest recorded since its installation. This water level was only about a foot lower than previous minimum measured in June of 2015. Despite this drop the water level in YOV30 has been fairly stable, ranging from 132.61 - 134.64 ft bgs, since 2015. A historically low water level was also observed in Grassy Creek Alluvium Well SGAL70 in September 2021. The depth to water at Grassy Creek alluvium well SGAL70 was 12.58 feet below top of casing, 0.89 feet lower than its prior minimum observed in 2017. There were no changes to the alluvial groundwater use in this reach. The drop in water level observed in 2021 at both YOV30 and SGAL70 is likely related to the ongoing drought conditions that have been experienced in this region. This area only received 12.44 inches of precipitation during the 2021 water year, approximately 5.68 inches less than the annual average observed during the last 40 years (1981-2021).

Water levels in most of the water bearing units at Yoast exhibit seasonal fluctuations. The water table in the shallow alluvial wells fluctuates in response to seasonal precipitation events, with the water table typically at its highest during the spring snowmelt seasons and then declining through late summer/early fall in response to the dry conditions. The water levels in the bedrock overburden and coal seams also fluctuate in response to recharge from seasonal precipitation but are partially influenced by interactions with groundwater in the reclaimed mine spoil. Due to the bedrock unit depths and lower hydraulic conductivity the water level fluctuations are typically muted relative to the fluctuations observed in the shallow alluvium.

### **3.2 GROUNDWATER QUALITY**

The Yoast Mine Groundwater Points of Compliance (GWPOC) were established in Technical Revision 39 (TR-39) (see Attachment 15-1 of Permit C-1994-082). The two GWPOC monitoring wells are YSAL3 which is screened within the Sage Creek Alluvium and SGAL70 which is screened within the Grassy Creek Alluvium (Figure 1). SGAL70 is located downgradient of both the Yoast Mine and the adjacent Sage Creek Mine. Bedrock GWPOC wells were deemed unnecessary in TR-39 due to the limited potential for the mine to negatively impact the quality of bedrock groundwater. The Wadge and

Wolf Creek Coal exhibit low hydraulic conductivity (Wadge Coal:  $2.45\text{E-}7$  to  $3.5\text{E-}7$  cm/sec; Wolf Creek Coal:  $4.55\text{E-}6$  cm/sec) which impedes the migration of mine-impacted groundwater through these units. Attenuation and dilution should further limit water quality impacts. Aquifers of regional significance include the Trout Creek Sandstone and the Twentymile Sandstone. The Twentymile Sandstone is located approximately 500 ft above the Wadge Coal seam and is not found within the Yoast permit boundary. Low permeability confining layers of the Williams Fork Formation isolate the Trout Creek Sandstone from the mine. The Trout Creek Sandstone lies approximately 300 to 400 feet below the Wadge Coal seam and approximately 60 to 100 feet below the Wolf Creek Coal Seam. The groundwater in the Trout Creek Sandstone is under confined conditions and exhibits an upward hydraulic head that further limits the potential for mine affected groundwater to infiltrate into this unit. See TR-39 located in the Appendix 15-1 of the Yoast Mine permit package for additional justification for the Groundwater Points of Compliance.

Tables B.1 and B.2 in Appendix B include the analytical results for samples collected from wells SGAL70 and YSAL3 in 2021 and provide a comparison to the Grassy Creek and Sage Creek Alluvial GWPOC water quality standards established in TR-39. Table B.3 includes the analytical results for the remaining monitoring wells however no comparison to water quality standards were made as these wells are not GWPOC. The groundwater quality at SGAL70 meets the TR-39 water quality standards for all parameters except for dissolved cadmium. This exceedance is not associated with a measurable value of cadmium as the lab detection limit exceeded the cadmium water quality standard. Water quality samples at commercial labs are often run in groups that include samples from unrelated locations and the detection limit for the batch of samples can be increased above the normal detection as a result of elevated concentrations in one or more samples within the batch or from unrelated instrument interference. The fact that cadmium has not historically been an issue at this well suggests that that the elevated detection limit is unlikely to be censoring a measured value above the water quality standard. There were no exceedances of the GWPOC standards at YSAL3 in 2021.

Predictions for the potential TDS increases at several of the Yoast monitoring wells were made in the Probable Hydrologic Consequences (PHC, Tab 17) section of Permit



C-1994-082. The following table outlines these predictions along with this year's observed value.

Well	Predicted TDS (mg/L)	This Years TDS (mg/L)
YAAL14	2036	3470*
YGAL16	1296	1870*
YSAL1	798	1850*
YSAL3	798	1130*
YOV30	3201	2800
YW30	2570	3200*
YWC33**	2721	-

**Note**

\*Indicates value above prediction

\*\* YWC33 well casing broken. Sample could not be collected.

In 2021, the TDS at five of the seven wells exceeded the predicted value. Although the predicted TDS values for the Grassy Creek (YAAL14, YGAL16) and Sage Creek (YSAL1, YSAL3) alluvial wells were exceeded its important to acknowledge that the 2021 values remain within the range of ambient, pre-mine, TDS measured in alluvial monitoring wells in these same drainages. Overburden removal in the Grassy Creek basin began in 1996. The pre-mine (1/1/1980 - 1/31/1994) TDS measured in Grassy Creek alluvial wells YGAL15, YGAL16, YGAL17 and YGAL18 ranged from 546 - 4030 mg/L (mean:1603 mg/L) (see Table 6 TR-39). The pre-mine (1/1/1980 - 12/31/1999) TDS measured in Sage Creek alluvial wells YSAL1, YSAL12, YSAL3, and YSAL8 ranged from 230 - 2140 mg/L (see Table 2 TR-39). This suggests that the slightly elevated TDS concentrations could be from non-mine related sources such as bedrock groundwater contributions from the underlying Lewis Shale or agriculture, which can concentrate dissolved salts, which weren't considered as part of the post mine predictions.

The TDS measured in 2021 at bedrock well YW30 also exceeded its predicted values. As described above the low hydraulic conductivity of the bedrock units will inhibit groundwater from migrating away from the mine. Groundwater from the Wadge Coal and its overburden have not historically been used in this area because groundwater yields from these units are insufficient for irrigation or domestic use.

Low permeable confining bedrock units separating the mine from usable aquifers will continue to isolate the mine water from these systems.

## 4.0 SURFACE WATER

The Yoast Mine lies within the headwaters of the Grassy Creek and Sage Creek watersheds. The southwest portion of the permit drains to the west towards Sage Creek, which ultimately flows to the north-northeast towards the Yampa River. A small area on the southeastern end of the permit drains southeast towards Grassy Creek, which flows to the northeast near the southern end of the permit area before bending to the north towards the Yampa River. The remainder of the permit area drains to the north-northeast towards Annand Draw, which drains north to Scotchmans Gulch, before eventually flowing to the east-northeast to Grassy Creek. The following table includes the Yoast surface water monitoring points, the watershed they are located in, the frequency of monitoring, and the required parameter list. See Figure 1 for the location of the surface water monitoring points. Surface water monitoring was completed by experienced personnel and samples were collected following the monitoring practices described in Tab 15 of Permit C-1994-082. All samples were analyzed by ACZ Laboratories.

Site	Type	Watershed	Monitoring Frequency		Parameter List
			Flow	Water Quality	
NPDES11	NPDES	Grassy Creek	M	M	NPDES
YSGF5	Surface Water	Grassy Creek	SA	SA	SW Long
NPDES10	NPDES	Grassy Creek	M	M	NPDES
YSG5	Surface Water	Grassy Creek	SA	SA	SW Long
YSSF3	Surface Water	Sage Creek	SA	SA	SW Short
NPDES14	NPDES	Sage Creek	M	M	NPDES
NPDES13	NPDES	Sage Creek	M	M	NPDES
NPDES12	NPDES	Sage Creek	M	M	NPDES
YSS2	Surface Water	Sage Creek	SA	SA	SW Long

**Note**

SA: Semiannual during spring snowmelt and summer baseflow

M: Monthly

SW Long: Field conductivity, field pH, field temperature, total recoverable iron, dissolved manganese, total mercury, ammonia, nitrate, nitrite, dissolved selenium, sulfate, sulfide, total dissolved solids, total suspended solids

SW Short: Field conductivity, field pH, field temperature, total recoverable iron, dissolved manganese, total suspended solids, total dissolved solids

NPDES: See NPDES permit CO-0000221

The Colorado Water Quality Control Commission (CWQCC) has established segment specific aquatic life water quality standards for Grassy Creek (Segment 13i and 13j) and Sage Creek (Segment 13e) of the Yampa River. The water quality standards for these segments are included in CWQCC Regulation 33. Therefore, the following surface water quality discussion has been organized by drainage basin. The 2021 Water Year surface water quality data is provided in Appendix D. Samples from this year's stream points are compared to both the Colorado Department of Public Health & Environment (CDPHE) surface water agricultural use standards (CDPHE, Reg. 31) and the appropriate segment specific aquatic life water quality standards. Samples from NPDES outfalls are compared to NPDES discharge limits as well as the segment specific aquatic life standards. Additional discussion of the water quality in each stream segment follows.

#### 4.1 GRASSY CREEK

Analytical results for the 2021 surface water monitoring conducted at upper Grassy Creek Segment 13i stream point YSGF5 and NPDES Outfall 011 are provided in Tables D.1 and D.2 of Appendix D. Analytical results for lower Grassy Creek stream point YSG5 and NPDES Outfall 010 are provided in Table D.3 and D.4. As described in CWQCC Regulation 33, a current conditions temporary modification of the chronic total recoverable iron and chronic dissolved selenium standard are in place for Yampa Segment 13i which includes Grassy Creek from its headwaters to immediately above the confluence with Scotchmans Gulch. WQCC intends to extend the total recoverable iron modification until Phase II bond release has been obtained for all mines within the watershed and post-mine iron conditions can be adequately characterized. A current conditions temporary modification of the chronic dissolved selenium standard is also in place for Yampa River Segment 13j however the chronic iron standard in this segment is 1 mg/L.

There were no exceedances of NPDES permit limits or instream water quality standards at Outfalls 010 or 011. Due to the dry conditions experienced in the region Outfall 011 did not discharge in 2021. Although the potentially dissolved selenium measured in February at Outfall 010 (100 µg/L) was above the acute aquatic life and

agriculture use standards, its important to acknowledge that the total recoverable selenium in this sample was less than 1 µg/L and well below both standards. The total recoverable selenium analysis includes a measurement of both the metals that are dissolved in the water and the metals that are present in the particulates in the water after its been treated with acid preservative. The potentially dissolved metals analysis measures the metals present in the filtrate of the water that was first treated with acid preservative and allowed to stand for several hours before being filtered through a membrane filter. The potentially dissolved selenium can not be greater than the total recoverable selenium as the potentially dissolved form is a subset of the selenium that is measured as a part of the total recoverable analysis. This indicates the elevated potentially dissolved selenium result was likely the result of an ICP-MS matrix interference which can result in overestimation of selenium concentrations (Smith and Compton, 2004), and not a real exceedance. There were no other exceedances of the selenium water quality standards at Outfall 012 in 2021.

Although not an exceedance due to the temporary modification for chronic total recoverable iron in Yampa Segment 13i, the 3.62 mg/L total recoverable iron measured in June at YSGF5 was elevated relative to the states table value standard of 1 mg/L. Although YSGF5 receives drainage from Outfall 011, the outfall did not contribute to the iron during this event as it did not discharge in 2021. Pre-mine monitoring conducted at YSGF5 between 1991 and 1993 indicates iron was routinely above (mean: 1.34 mg/L; range: 0.15 - 9.9 mg/L; n:19) the states table value standard. Total recoverable iron at Grassy Creek stream point YSGF5 is strongly correlated ( $r^2$ : 0.91) with suspended solids which become naturally elevated during rain and snow melt runoff events (Figure D.1). This indicates that the elevated iron in Grassy Creek is unrelated to the runoff from the reclaimed mine and is likely the result of natural erosional processes that are occurring within the unmined portions of the watershed.

The method detection limit for the sulfide analysis (MDL: 0.02 mg/L) conducted by SCC's lab exceeds the CDPHE Yampa Segment 13d water quality standard for un-ionized sulfide ( $H_2S$ ) of 0.002 mg/L. All of the sulfide samples analyzed were non-detect. This analytical method detects both dissolved sulfides and acid-soluble metallic sulfides that are present in suspended matter and provides a single cumulative concentration. Furthermore, dissolved sulfide includes both the ionized

(HS<sup>-</sup>) and un-ionized forms of hydrogen sulfide (H<sub>2</sub>S). The distribution of sulfide between the un-ionized hydrogen sulfide and ionized form is dependent on the temperature and pH. At low pH most of the dissolved sulfide exists as the toxic un-ionized hydrogen sulfide. In alkaline waters, like those present at Yoast, most of the dissolved sulfide is present as non-toxic ionized sulfide.

The method detection limit for mercury (0.02 µg/L) used by SCC's lab is above the 0.01 µg/L aquatic life standard. None of the samples collected during 2021 exceeded the lab's method detection limit. The CDPHE previously performed a reasonable potential analysis for Outfall 010 and determined that there was no reasonable potential for discharges from this outfall to exceed the mercury limit and the monitoring requirement was dropped from the NPDES permit. There is no reason to believe total mercury in Grassy Creek exceeds the aquatic life standard.

CWQCC Regulation 31 specifies that the manganese agricultural use standard of 0.2 mg/L standard is only applicable when irrigation water is applied to soils with pH lower than 6.0. The soils at Yoast Mine are alkaline and the 0.2 mg/L standard is therefore not applicable. Dissolved manganese at YSGF5 and YSG5 are significantly lower than the CDPHE Yampa Segment 13i acute and chronic manganese standards.

## 4.2 SAGE CREEK

Analytical results for the 2021 surface water monitoring conducted at Sage Creek stream points YSSF3 and YSS2 are provided in Table D.5 of Appendix D and the analytical results for Outfalls 012, 013, and 014 that report to Sage Creek are included in Table D.6 through D.8. There was an exceedance of the Segment 13e total recoverable iron standard at upstream monitoring point YSSF3 on 6/15/2021 and an exceedance at downstream point YSS2 on 9/9/2021.

The exceedance at YSS2 on 9/9/2021 occurred during the dry fall season during a low flow event (4.3 gpm). Outfalls 013 and Outfall 014 were not discharging and the 0.106 mg/L of total recoverable iron measured in the Outfall 012 discharge was well within the 1 mg/L aquatic life standard, indicating the iron at YSS2 was not associated with runoff from the reclaimed mine. The pH at YSS2 was slightly alkaline (8.5 s.u.),

suggesting any dissolved iron should have precipitated out of the water column, but the total suspended solids were elevated (181 mg/L). A statistical comparison of the total suspended solids and total recoverable iron concentrations at YSS2 indicate that they are strongly correlated ( $r^2$ : 0.90) (Figure D.2). This suggests that the iron measured at Sage Creek YSS2 was likely the reflective of the elevated suspended solids present from natural erosional processes within the unmined portions of the watershed. This is further supported by the elevated ambient total recoverable iron also seen at upstream point YSSF3 earlier in the year.

As discussed in Section 4.1, the lab used by SCC has a method detection limit for mercury and sulfide that are above the Segment 13e water quality standard. None of the samples collected from YSS2 in 2021 exceed the labs mercury or sulfide method detection limit. All other parameters sampled at Sage Creek stream points YSS2 and YSSF3 were within the applicable water quality standards.

There were no exceedances of the Yampa Segment 13e aquatic life standards or Agricultural Use standards at Outfalls 012, 013, and 014. Due to the dry conditions experienced in the region Outfalls 013 and 014 did not discharge in 2021.

In the Probable Hydrological Consequences Probable Hydrologic Consequences (PHC, Tab 17) section of Permit C-1994-082, predictions were made for the expected TDS increases to be observed at several stream points. The following table outlines these predictions along with 2021's average concentration.

Stream Point	Predicted TDS (mg/L)	Mean TDS (mg/L)*
NPDES10	3938	2982
YSGF5	1337	1067
NPDES12	4291	3278
WSSF3**	2118	1255

\* Duplicates removed from average calculation

\*\* WSSF3 is a Seneca II-W stream point located in Sage Creek, downstream of the Yoast outfalls. See the 2021 Annual Hydrology Report for Permit C-1982-057 for the full dataset.

The annual average TDS measured at each of the four monitoring locations was less than the predicted value.

## 5.0 SPRINGS

The Yoast monitoring program includes four spring sites. The following table includes the list of springs monitored, the frequency of monitoring, and the parameter list. See Figure 1 for the location of the spring points. Spring monitoring was completed by experienced personnel and samples were collected following the monitoring practices described in Tab 15 of Permit C-1994-082. All samples were analyzed by ACZ Laboratories.

Site	Type	Unit	Monitoring Frequency		Parameter List
			Discharge	Water Quality	
YSSPG1	Spring	Spoils	A	A	SW Long
YSSPG2	Spring	Spoils	A	A	SW Short
YSSPG3	Spring	Spoils	A	A	SW Short
YSSPG4	Spring	Spoils	A	A	SW Short

**Note**

A: Annual

SW Long: Field conductivity, field pH, field temperature, total recoverable iron, dissolved manganese, total mercury, ammonia, nitrate, nitrite, dissolved selenium, sulfate, sulfide, total dissolved solids, total suspended solids

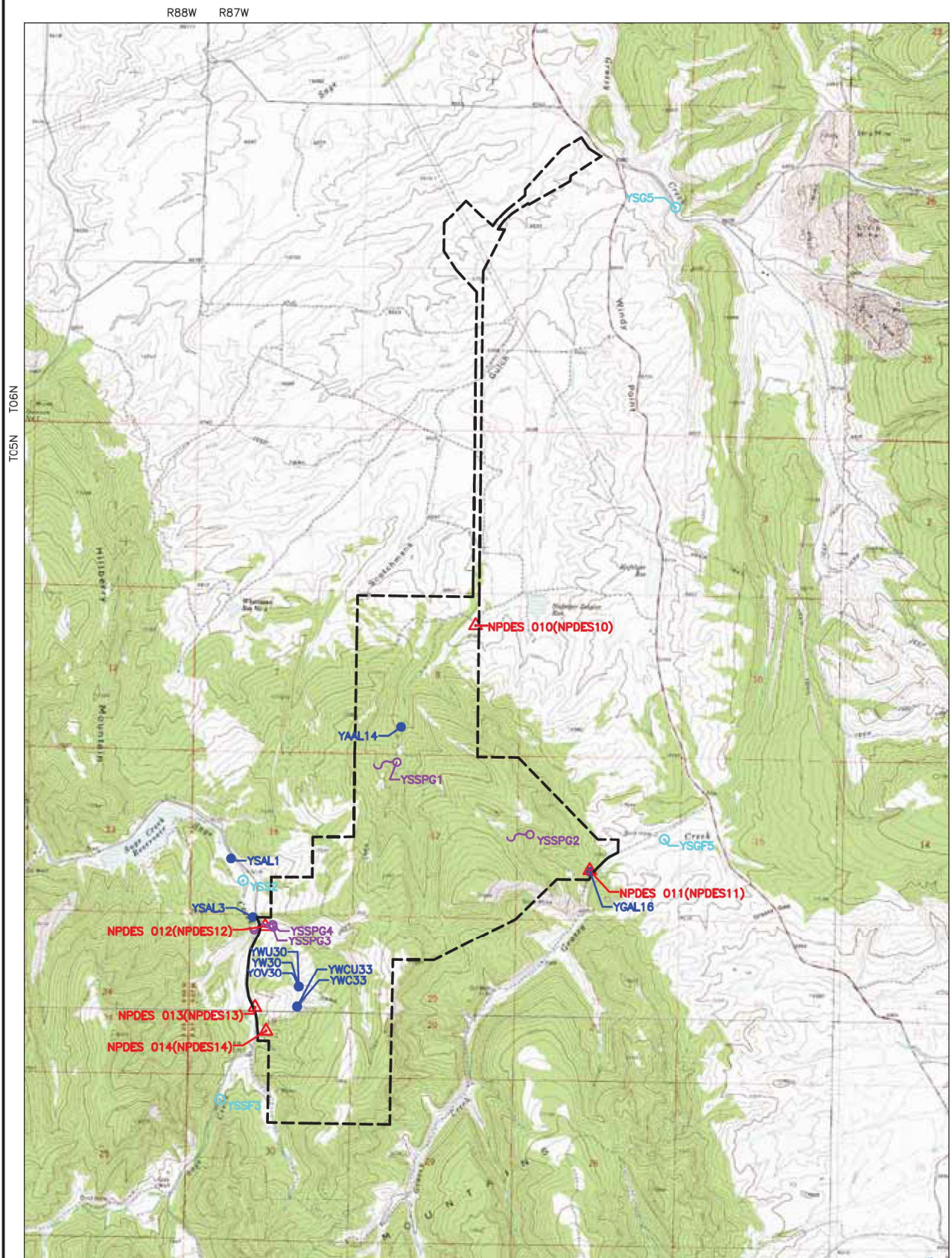
SW Short: Field conductivity, field pH, field temperature, total recoverable iron, dissolved manganese, total suspended solids, total dissolved solids

Table E.1 in Appendix E includes the analytical results for samples collected from the four spoil springs in 2021. The primary post-mine land use in this area is livestock grazing and wildlife habitat. Therefore, the water quality collected from the spoil springs is compared to the CWQCC Agricultural Use standards established in CDPHE Regulation 31. Due to the dry conditions experienced in the region none of the springs were flowing and samples could not be collected. Therefore, there were no exceedances of the Agricultural Use surface water quality standards at the springs in 2021.



## 6.0 SUMMARY

No significant hydrologic impacts, attributable to activities at Yoast, were noted during 2021. Groundwater levels in all monitoring wells except for YOV30 and SGAL70 were within their historic range. Historically low water levels were observed at YOV30 and SGAL70 in 2021. There were no known changes to water use in this area and the drop in their water levels were likely associated with the drought conditions. No measured water quality exceedances occurred at the GWPOC. Exceedances of the total recoverable iron chronic aquatic life standards occurred once at downstream stream monitoring point YSS2 and once at upstream monitoring point YSSF3, however synoptic monitoring during these events confirmed that iron was unrelated to discharge from Yoast's outfalls and is likely the result of natural erosional processes that are occurring within the unmined portions of the watershed.



GROUNDWATER  
 SURFACE WATER  
 NPDES  
 SPRING  
 PERMIT BOUNDARY

0 4000'  
SCALE

IMAGE SOURCE:  
 DIGITAL RASTER GRAPHIC COUNTY MOSAIC BY NRCS  
 OF ROUTT COUNTY, COLORADO FROM GEOSPATIAL  
 DATA GATEWAY ([HTTPS://GDG.SC.EGOV.USDA.GOV](https://gdg.sc.egov.usda.gov))  
 DOWNLOADED 10/16

DESIGNED BY:  
 JAH  
 DRAWN BY:  
 SDG  
 CHECKED BY:  
 TNS  
 DATE:  
 2019

FIGURE 1  
 MONITORING SITE LOCATIONS

YOAST MINE  
 PEABODY SAGE CREEK MINING, LLC  
 PEABODY ENERGY

WWCENGINEERING

APPENDIX A  
METEOROLOGICAL DATA

PERIOD OF RECORD PRECIPITATION SUMMARY													
Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
2021	0.87	0.74	1.46	1.03	1.59	1.67	0.5	1.02	0.15	0.86	1.09	1.46	12.44
2020	1.90	1.37	2.60	2.53	2.40	1.67	1.75	1.63	0.77	0.71	0.43	0.43	18.19
2019	2.14	1.81	1.62	2.45	1.46	2.89	1.66	1.88	3.57	0.38	0.44	1.53	21.83
2018	2.45	1.31	1.36	1.65	1.92	1.90	2.95	0.85	0.15	0.15	1.33	0.17	16.19
2017	1.29	0.91	2.06	2.70	1.47	0.84	2.06	1.85	0.13	1.68	0.46	1.74	17.19
2016	1.39	1.90	2.55	2.65	1.16	1.40	3.02	1.94	0.40	0.81	0.19	1.02	18.43
2015	1.60	2.10	1.84	0.55	1.02	1.30	1.60	4.36	0.61	2.36	1.53	0.90	19.77
2014	2.69	1.75	1.42	2.02	0.78	1.96	1.19	2.58	0.72	1.50	3.77	0.87	21.25
2013	0.86	0.46	3.21	1.02	0.73	1.29	3.58	1.67	0.06	0.46	1.48	2.76	17.58
2012	1.41	1.65	0.36	0.87	1.97	0.50	1.13	0.22	0.15	2.43	0.55	1.56	12.80
2011	2.18	1.91	2.98	1.59	2.09	2.52	4.50	3.56	0.85	1.82	0.65	1.14	25.79
2010	1.22	0.77	1.24	0.75	0.90	0.73	1.98	2.80	1.34	1.19	1.56	0.62	15.10
2009	0.53	1.16	1.38	2.80	0.60	1.32	1.40	1.89	2.08	0.51	1.04	0.48	15.19
2008	1.41	0.13	3.36	2.51	1.70	1.64	0.94	1.68	0.37	0.57	0.75	0.91	15.97
2007	2.64	0.76	0.86	1.04	1.34	1.46	0.62	0.87	0.33	0.52	1.12	2.72	14.28
2006	2.27	2.04	2.01	1.78	0.58	1.06	0.95	0.93	0.24	1.48	2.71	2.75	18.80
2005	1.34	1.68	0.50	1.49	0.84	0.99	1.97	1.41	3.36	0.57	1.57	1.30	17.02
2004	0.44	2.90	1.58	0.74	1.64	0.40	1.57	1.26	0.86	1.00	1.44	2.76	16.59
2003	1.88	1.09	1.28	0.74	1.95	0.99	2.57	1.15	1.33	0.47	0.62	1.83	15.90
2002	1.14	1.17	0.54	0.88	0.92	1.06	1.39	0.40	0.37	0.78	1.26	1.94	11.85
2001	0.67	1.60	1.16	0.96	1.41	1.07	1.28	1.15	0.85	1.11	2.06	1.66	14.98
2000	0.43	0.61	1.66	1.66	1.68	1.46	1.84	1.94	0.54	0.75	2.38	2.00	16.95
1999	1.85	0.81	1.13	2.13	0.99	0.57	3.21	2.00	1.39	2.10	1.85	0.78	18.81
1998	2.37	1.08	0.95	1.34	1.93	1.77	1.77	0.62	2.51	1.50	0.48	1.50	17.82
1997	1.79	2.39	1.69	2.88	0.97	0.48	3.19	2.75	1.60	1.05	3.57	5.48	27.84
1996	1.32	2.20	1.26	3.60	2.19	0.99	1.34	2.10	1.00	1.33	0.35	1.37	19.05
1995	0.95	2.09	0.68	1.47	0.97	0.82	3.36	4.48	1.54	1.23	0.73	2.69	21.01
1994	3.02	1.61	1.16	0.69	1.13	0.56	1.85	1.07	0.43	0.24	0.98	0.72	13.46
1993	1.46	1.48	1.33	2.28	1.66	1.53	2.55	1.14	1.29	0.65	1.37	1.39	18.13
1992	1.18	2.79	0.85	0.88	1.16	1.20	1.66	3.08	1.15	4.38	0.95	0.98	20.26
1991	3.20	1.71	1.18	1.75	0.86	2.42	1.09	0.96	1.74	1.59	2.00	1.32	19.82
1990	0.77	1.38	2.08	0.65	1.64	1.54	1.36	1.12	1.38	1.14	0.51	1.22	14.79
1989	0.13	2.79	1.13	1.02	2.50	1.38	0.45	1.39	0.53	1.82	1.33	1.52	15.99
1988	1.27	1.22	2.32	2.80	0.70	1.31	0.83	1.85	1.93	0.60	1.03	2.31	18.17
1987	2.65	1.00	0.56	1.28	1.35	1.50	1.60	1.92	0.64	1.78	1.35	0.46	16.09
1986	3.51	4.19	1.34	0.79	3.01	1.59	2.70	0.99	1.00	1.65	1.96	2.12	24.85
1985	2.61	1.68	1.80	2.40	1.01	2.40	3.77	1.40	0.68	1.28	0.64	1.17	20.84
1984	2.16	2.82	5.03	0.59	0.43	2.31	2.68	1.33	2.36	1.84	2.61	1.31	25.47
1983	1.64	1.52	1.03	1.10	1.66	2.17	2.28	1.57	2.76	1.88	1.08	0.79	19.48
1982	3.76	0.78	2.51	1.71	0.62	2.64	1.92	0.97	0.46	1.60	1.19	2.64	20.80
1981	1.09	0.33	0.43	0.53	0.45	2.50	0.69	3.97	1.65	2.24	1.12	1.33	16.33
AVG	1.69	1.55	1.60	1.57	1.35	1.46	1.92	1.75	1.10	1.27	1.31	1.55	18.12

**Note**

Data from October 1980 to February 1982, and 2011 Water Year and later, from U.S. Department of Commerce - NOAA - Hayden Station. All other data from Seneca II Mine Meteorological Station with Belfort Weighing Bucket Rain Gage. Site relocated to USGS site on August 31, 1991. Precipitation recorded in inches.

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological  
Observations**  
**These data are quality controlled and may not  
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Generated on 02/17/2022

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	10	01	68	26	61	0.00		0.0		0.0								
2020	10	02	63	29	61	0.00		0.0		0.0								
2020	10	03	66	25	64	0.00		0.0		0.0								
2020	10	04	77	33	71	0.00		0.0		0.0								
2020	10	05	78	28	70	0.00		0.0		0.0								
2020	10	06	77	31	69	0.00		0.0		0.0								
2020	10	07	80	33	70	0.00		0.0		0.0								
2020	10	08	79	32	69	0.00		0.0		0.0								
2020	10	09	78	33	72	0.00		0.0		0.0								
2020	10	10	79	39	68	0.00		0.0		0.0								
2020	10	11	68	31	45	0.22		1.0		0.0								
2020	10	12	63	24	56	0.00		0.0		0.0								
2020	10	13	71	28	63	0.00		0.0		0.0								
2020	10	14	65	35	55	0.00		0.0		0.0								
2020	10	15	55	28	44	0.00		0.0		0.0								
2020	10	16	61	19	57	0.00		0.0		0.0								
2020	10	17	64	33	61	0.00		0.0		0.0								
2020	10	18	66	39	62	0.00		0.0		0.0								
2020	10	19	63	33	57	0.00		0.0		0.0								
2020	10	20	63	33	56	0.00		0.0		0.0								
2020	10	21	72	30	67	0.00		0.0		0.0								
2020	10	22	67	41	41	0.00		0.0		0.0								
2020	10	23	41	9	36	0.00		0.0		0.0								
2020	10	24	50	19	48	0.00		0.0		0.0								
2020	10	25	48	11	11	0.54		7.0		7.0								
2020	10	26	15	2	7	0.11		2.0		8.0								
2020	10	27	28	-10	19	0.00		0.0		7.0								
2020	10	28	34	6	31	0.00		0.0		6.0								
2020	10	29	50	17	45	0.00		0.0		4.0								
2020	10	30	57	25	50	0.00		0.0		1.0								
2020	10	31	57	23	49	0.00		0.0		0.0								
Summary			61	25		0.87		10.0										

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"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation  
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Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

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National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	11	01	64	25	47	0.00		0.0		0.0								
2020	11	02	66	27	49	0.00		0.0		0.0								
2020	11	03	68	28	52	0.00		0.0		0.0								
2020	11	04	66	30	52	0.00		0.0		0.0								
2020	11	05	68	28	50	0.00		0.0		0.0								
2020	11	06	58	30	51	0.00		0.0		0.0								
2020	11	07	65	30	57	0.00		0.0		0.0								
2020	11	08	57	27	31	0.12		0.5		0.0								
2020	11	09	39	23	26	0.09		1.5		1.0								
2020	11	10	32	18	25	0.15		3.0		2.0								
2020	11	11	38	20	30	0.00		0.0		1.0								
2020	11	12	34	17	23	0.10		2.5		2.0								
2020	11	13	48	9	38	0.00		0.0		0.0								
2020	11	14	42	23	24	0.22		2.0		1.0								
2020	11	15	34	12	33	0.00		0.0		1.0								
2020	11	16	56	27	42	0.00		0.0		0.0								
2020	11	17	59	26	46	0.00		0.0		0.0								
2020	11	18	63	29	55	0.00		0.0		0.0								
2020	11	19	55	37	37	0.00		0.0		0.0								
2020	11	20	45	25	34	0.00		0.0		0.0								
2020	11	21	45	20	32	0.00		0.0		0.0								
2020	11	22	45	12	35	0.00		0.0		0.0								
2020	11	23	48	25	37	0.04		0.0		0.0								
2020	11	24	38	27	29	0.00		0.0		0.0								
2020	11	25	43	17	34	0.00		0.0		0.0								
2020	11	26	35	16	22	0.02		T		0.0								
2020	11	27	36	6	21	0.00		0.0		0.0								
2020	11	28	34	8	22	0.00		0.0		0.0								
2020	11	29	42	8	26	0.00		0.0		0.0								
2020	11	30	46	10	30	0.00		0.0		0.0								
Summary			49	21		0.74		9.5										

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National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	12	01	30	16	24	0.05		0.5		1.0								
2020	12	02	28	7	13	0.00		0.0		1.0								
2020	12	03	33	-1	18	0.00		0.0		1.0								
2020	12	04	41	7	26	0.00		0.0		T								
2020	12	05	41	5	27	0.00		0.0		0.0								
2020	12	06	50	10	30	0.00		0.0		0.0								
2020	12	07	45	9	26	0.00		0.0		0.0								
2020	12	08	51	9	29	0.00		0.0		0.0								
2020	12	09	54	13	33	0.00		0.0		0.0								
2020	12	10	39	16	29	0.00		0.0		0.0								
2020	12	11	32	18	22	0.07		1.0		1.0								
2020	12	12	27	16	19	0.07		1.0		2.0								
2020	12	13	25	-7	13	0.00		0.0		2.0								
2020	12	14	25	8	20	0.19		3.0		4.0								
2020	12	15	24	12	13	T		0.5		4.0								
2020	12	16	25	8	22	0.14		4.0		6.0								
2020	12	17	27	6	25	0.00		0.0		6.0								
2020	12	18	29	22	23	0.13		1.5		6.0								
2020	12	19	29	10	23	0.00		0.0		5.0								
2020	12	20	31	6	28	T		T		4.0								
2020	12	21	44	27	30	0.00		0.0		2.0								
2020	12	22	36	1	15	0.10		1.0		2.0								
2020	12	23	19	1	12	0.04		0.5		2.0								
2020	12	24	26	-6	15	0.00		0.0		2.0								
2020	12	25	35	2	25	0.00		0.0		2.0								
2020	12	26	34	6	31	0.00		0.0		2.0								
2020	12	27	33	22	25	0.01		T		2.0								
2020	12	28	26	8	20	0.07		1.5		3.0								
2020	12	29	23	6	6	0.59		7.0		10.0								
2020	12	30	19	-9	9	0.00		0.0		9.0								
2020	12	31	27	7	20	0.00		0.0		9.0								
Summary			33	8		1.46		21.5										

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Station: **HAYDEN, CO US USC00053867**

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National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	01	01	23	2	10	0.00		0.0		9.0								
2021	01	02	22	-5	17	0.00		0.0		8.0								
2021	01	03	25	0	23	0.05		0.5		8.0								
2021	01	04	33	13	22	0.00		0.0		7.0								
2021	01	05	31	18	27	0.38		6.0		13.0								
2021	01	06	27	1	16	0.00		0.0		12.0								
2021	01	07	27	4	18	0.00		0.0		12.0								
2021	01	08	29	2	13	0.00		0.0		10.0								
2021	01	09	20	-1	14	0.00		0.0		9.0								
2021	01	10	22	10	10	T		T		9.0								
2021	01	11	24	-8	6	0.00		0.0		9.0								
2021	01	12	24	0	12	0.00		0.0		9.0								
2021	01	13	32	10	24	0.00		0.0		9.0								
2021	01	14	29	14	20	0.00		0.0		9.0								
2021	01	15	25	-1	21	0.00		0.0		9.0								
2021	01	16	35	15	23	0.01		0.5		9.0								
2021	01	17	36	15	31	0.00		0.0		9.0								
2021	01	18	35	18	18	0.00		0.0		9.0								
2021	01	19	25	-6	13	0.00		0.0		9.0								
2021	01	20	34	3	18	0.00		0.0		9.0								
2021	01	21	37	9	26	0.00		0.0		9.0								
2021	01	22	38	24	32	T		T		9.0								
2021	01	23	37	26	26	0.16		2.0		11.0								
2021	01	24	33	12	21	0.00		0.0		11.0								
2021	01	25	28	11	19	0.13		2.0		12.0								
2021	01	26	20	1	15	0.02		0.5		12.0								
2021	01	27	25	-1	20	0.00		0.0		12.0								
2021	01	28	37	19	25	0.00		0.0		11.0								
2021	01	29	48	17	41	0.00		0.0		10.0								
2021	01	30	41	26	26	0.28		3.0		13.0								
2021	01	31	28	7	19	T		T		13.0								
Summary			30	8		1.03		14.5										

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Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	02	01	33	6	25	0.00		0.0		12.0								
2021	02	02	42	14	35	0.00		0.0		11.0								
2021	02	03	45	25	26	0.10		1.5		13.0								
2021	02	04	28	9	24	0.02		0.5		11.0								
2021	02	05	27	17	27	0.35		6.0		16.0								
2021	02	06	33	20	32	0.00		0.0		14.0								
2021	02	07	41	22	33	0.00		0.0		12.0								
2021	02	08	41	19	33	0.00		0.0		12.0								
2021	02	09	35	14	29	0.04		1.0		13.0								
2021	02	10	41	27	34	0.07		0.5		13.0								
2021	02	11	40	18	36	T		T		12.0								
2021	02	12	37	29	33	0.19		2.0		12.0								
2021	02	13	35	22	22	0.19		2.0		14.0								
2021	02	14	22	-8	-6	0.19		2.5		16.0								
2021	02	15	21	-7	18	0.04		0.5		15.0								
2021	02	16	34	14	23	0.20		3.0		17.0								
2021	02	17	28	14	20	0.04		1.0		17.0								
2021	02	18	22	-5	16	0.00		0.0		16.0								
2021	02	19	28	0	24	0.00		0.0		16.0								
2021	02	20	31	12	26	T		T		16.0								
2021	02	21	30	14	27	0.00		0.0		16.0								
2021	02	22	37	17	27	0.00		0.0		16.0								
2021	02	23	42	7	32	0.00		0.0		15.0								
2021	02	24	36	3	25	0.00		0.0		15.0								
2021	02	25	27	6	18	0.00		0.0		15.0								
2021	02	26	32	5	25	0.00		0.0		14.0								
2021	02	27	26	14	15	0.16		2.0		16.0								
2021	02	28	22	-6	12	0.00		0.0		16.0								
Summary			33	12		1.59		22.5										

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Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	03	01	31	0	23	0.00		0.0		15.0								
2021	03	02	39	9	30	0.00		0.0		15.0								
2021	03	03	43	12	36	0.00		0.0		14.0								
2021	03	04	36	22	34	0.07		1.0		14.0								
2021	03	05	42	20	37	0.00		0.0		13.0								
2021	03	06	50	25	40	0.00		0.0		13.0								
2021	03	07	56	26	44	0.00		0.0		11.0								
2021	03	08	49	27	44	0.00		0.0		10.0								
2021	03	09	57	27	44	0.00		0.0		8.0								
2021	03	10	44	23	23	0.38		3.0		10.0								
2021	03	11	40	20	27	0.12		1.0		10.0								
2021	03	12	42	22	36	0.05		1.0		9.0								
2021	03	13	40	17	30	0.11		1.0		9.0								
2021	03	14	40	27	34	0.06		0.5		8.0								
2021	03	15	43	22	40	0.14		2.5		9.0								
2021	03	16	40	22	35	0.10		1.0		9.0								
2021	03	17	42	27	42	0.00		0.0		9.0								
2021	03	18	44	22	42	0.00		0.0		8.0								
2021	03	19	53	22	50	0.00		0.0		3.0								
2021	03	20	60	32	54	0.00		0.0		0.0								
2021	03	21	54	26	38	0.12		1.5		0.0								
2021	03	22	45	22	42	0.00		0.0		0.0								
2021	03	23	43	36	39	T		T		0.0								
2021	03	24	45	16	42	0.00		0.0		0.0								
2021	03	25	42	18	32	T		T		0.0								
2021	03	26	44	28	36	0.45		2.5		2.0								
2021	03	27	43	36	40	0.07		0.5		1.0								
2021	03	28	53	22	51	0.00		0.0		0.0								
2021	03	29	58	36	36	0.00		0.0		0.0								
2021	03	30	40	32	38	0.00		0.0		0.0								
2021	03	31	48	20	46	0.00		0.0		0.0								
Summary			45	23		1.67		15.5										

Empty, or blank, cells indicate that a data observation was not reported.

\*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological  
Observations**  
These data are quality controlled and may not  
be identical to the original observations.

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Generated on 02/17/2022

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	04	01	60		58	0.00		0.0		0.0								
2021	04	02	68	24	64	0.00		0.0		0.0								
2021	04	03	72	28	70	0.00		0.0		0.0								
2021	04	04	70	34	68	0.00		0.0		0.0								
2021	04	05	73	32	68	0.00		0.0		0.0								
2021	04	06	68	32	40	0.01		T		0.0								
2021	04	07	54	33	52	0.05		0.5		0.0								
2021	04	08	63	21	61	0.00		0.0		0.0								
2021	04	09	61	32	46	0.00		0.0		0.0								
2021	04	10	61	22	56	0.00		0.0		0.0								
2021	04	11	56	20	50	0.00		0.0		0.0								
2021	04	12	50	25	44	0.00		0.0		0.0								
2021	04	13	60	22	54	0.00		0.0		0.0								
2021	04	14	54	30	46	0.23		2.0		0.0								
2021	04	15	50	30	38	0.07		T		0.0								
2021	04	16	42	22	40	0.04		0.5		0.0								
2021	04	17	51	16	46	0.00		0.0		0.0								
2021	04	18	59	30	56	0.00		0.0		0.0								
2021	04	19	58	24	38	0.00		0.0		0.0								
2021	04	20	45	8	45	0.00		0.0		0.0								
2021	04	21	45	16	42	T		T		0.0								
2021	04	22	56	28	55	T		T		0.0								
2021	04	23	58	36	54	0.00		0.0		0.0								
2021	04	24	64	28	61	0.00		0.0		0.0								
2021	04	25	72	39	70	0.00		0.0		0.0								
2021	04	26	70	36	57	0.00		0.0		0.0								
2021	04	27	58	32	43	0.06		0.0		0.0								
2021	04	28	62	32	60	0.04		0.0		0.0								
2021	04	29	72	28	70	0.00		0.0		0.0								
2021	04	30	80	39	78	0.00		0.0		0.0								
Summary			60	28		0.50		3.0										

Empty, or blank, cells indicate that a data observation was not reported.

\*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological  
Observations**  
**These data are quality controlled and may not  
be identical to the original observations.**  
Generated on 02/17/2022

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	05	01	78	38	72	0.00		0.0		0.0								
2021	05	02	74	32	50	0.02		0.0		0.0								
2021	05	03	50	39	40	0.40		0.0		0.0								
2021	05	04	54	32	46	0.03		0.0		0.0								
2021	05	05	64	34	64	0.03		0.0		0.0								
2021	05	06	76	27	76	0.00		0.0		0.0								
2021	05	07	80	40	76	0.00		0.0		0.0								
2021	05	08	76	41	60	T		0.0		0.0								
2021	05	09	60	24	54	0.00		0.0		0.0								
2021	05	10	56	32	48	0.02		0.0		0.0								
2021	05	11	48	32	40	0.44		2.5		0.0								
2021	05	12	66	22	62	0.00		0.0		0.0								
2021	05	13	76	30	72	0.00		0.0		0.0								
2021	05	14	79	34	64	0.00		0.0		0.0								
2021	05	15	77	39	70	0.02		0.0		0.0								
2021	05	16	76	34	66	0.00		0.0		0.0								
2021	05	17	72	40	58	0.00		0.0		0.0								
2021	05	18	76	34	74	0.00		0.0		0.0								
2021	05	19	80	34	78	0.00		0.0		0.0								
2021	05	20	80	42	76	0.00		0.0		0.0								
2021	05	21	76	46	68	0.00		0.0		0.0								
2021	05	22	82	39	56	T		0.0		0.0								
2021	05	23	64	38	60	0.05		0.0		0.0								
2021	05	24	66	29	66	0.00		0.0		0.0								
2021	05	25	74	26	70	0.00		0.0		0.0								
2021	05	26	79	40	70	0.00		0.0		0.0								
2021	05	27	78	30	75	T		0.0		0.0								
2021	05	28	82	32	78	0.00		0.0		0.0								
2021	05	29	80	36	68	T		0.0		0.0								
2021	05	30	80	46	54	0.01		0.0		0.0								
2021	05	31	74	34	66	0.00		0.0		0.0								
Summary			72	35		1.02		2.5										

Empty, or blank, cells indicate that a data observation was not reported.

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"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

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U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological  
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Generated on 02/17/2022

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	06	01	77	38	76	0.00		0.0		0.0								
2021	06	02	80	42	80	0.00		0.0		0.0								
2021	06	03	89	46	83	0.00		0.0		0.0								
2021	06	04	93	42	91	0.00		0.0		0.0								
2021	06	05	92	46	62	0.00		0.0		0.0								
2021	06	06	87	52	77	0.00		0.0		0.0								
2021	06	07	88	54	84	0.00		0.0		0.0								
2021	06	08	84	46	75	0.00		0.0		0.0								
2021	06	09	82	39	80	0.00		0.0		0.0								
2021	06	10	80	46	74	0.00		0.0		0.0								
2021	06	11	74	31	71	0.00		0.0		0.0								
2021	06	12	80	37	79	0.00		0.0		0.0								
2021	06	13	85	46	84	0.00		0.0		0.0								
2021	06	14	92	46	91	0.00		0.0		0.0								
2021	06	15	91	46	91	0.00		0.0		0.0								
2021	06	16	92	56	92	0.00		0.0		0.0								
2021	06	17	92	55	91	0.00		0.0		0.0								
2021	06	18	91	54	86	0.00		0.0		0.0								
2021	06	19	87	64	80	0.01		0.0		0.0								
2021	06	20	86	44	83	0.00		0.0		0.0								
2021	06	21	84	45	84	0.00		0.0		0.0								
2021	06	22	90	44	88	0.00		0.0		0.0								
2021	06	23	88	52	78	0.00		0.0		0.0								
2021	06	24	81	52	60	0.03		0.0		0.0								
2021	06	25	72	52	64	0.03		0.0		0.0								
2021	06	26	74	44	66	0.05		0.0		0.0								
2021	06	27	76	42	75	0.00		0.0		0.0								
2021	06	28	80	43	78	0.00		0.0		0.0								
2021	06	29	78	50	77	0.00		0.0		0.0								
2021	06	30	78	49	73	0.03		0.0		0.0								
Summary			84	47		0.15		0.0										

Empty, or blank, cells indicate that a data observation was not reported.  
\*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown  
"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation  
"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.  
"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.  
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U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
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Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological Observations**  
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Generated on 02/17/2022

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	07	01	82	52	82	0.17		0.0		0.0								
2021	07	02	88	54	80	0.00		0.0		0.0								
2021	07	03	93	52	85	T		0.0		0.0								
2021	07	04	92	52	81	0.00		0.0		0.0								
2021	07	05	92	52	82	0.00		0.0		0.0								
2021	07	06	92	51	86	0.03		0.0		0.0								
2021	07	07	92	56	91	0.00		0.0		0.0								
2021	07	08	96	57	88	0.00		0.0		0.0								
2021	07	09	97	62	92	0.00		0.0		0.0								
2021	07	10	92	44	89	0.00		0.0		0.0								
2021	07	11	90	52	86	0.00		0.0		0.0								
2021	07	12	97	54	94	0.00		0.0		0.0								
2021	07	13	94	62	72	0.00		0.0		0.0								
2021	07	14	84	54	68	0.00		0.0		0.0								
2021	07	15	91	52	82	0.00		0.0		0.0								
2021	07	16	90	52	84	0.00		0.0		0.0								
2021	07	17	92	52	89	0.00		0.0		0.0								
2021	07	18	97	54	96	0.00		0.0		0.0								
2021	07	19	96	62	94	0.00		0.0		0.0								
2021	07	20	94	54	82	0.01		0.0		0.0								
2021	07	21	94	62	88	0.00		0.0		0.0								
2021	07	22	92	62	84	0.00		0.0		0.0								
2021	07	23	88	62	86	0.00		0.0		0.0								
2021	07	24	87	54	83	0.00		0.0		0.0								
2021	07	25	96	62	68	0.23		0.0		0.0								
2021	07	26	94	52	90	0.06		0.0		0.0								
2021	07	27	94	54	93	0.00		0.0		0.0								
2021	07	28	97	54	90	0.00		0.0		0.0								
2021	07	29	90	62	82	0.20		0.0		0.0								
2021	07	30	86	64	78	0.16		0.0		0.0								
2021	07	31	86	54	74	0.00		0.0		0.0								
Summary			92	56		0.86		0.0										

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"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation  
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National Oceanic & Atmospheric Administration  
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Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological  
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National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	08	01	83	58	72	0.02		0.0		0.0								
2021	08	02	78	54	78	0.00		0.0		0.0								
2021	08	03	80	57	70	0.30		0.0		0.0								
2021	08	04	84	51	80	0.07		0.0		0.0								
2021	08	05	87	52	87	0.00		0.0		0.0								
2021	08	06	87	54	81	0.02		0.0		0.0								
2021	08	07	81	45	76	0.00		0.0		0.0								
2021	08	08	88	44	87	0.00		0.0		0.0								
2021	08	09	87	50	84	0.00		0.0		0.0								
2021	08	10	87	47	84	0.00		0.0		0.0								
2021	08	11	86	46	86	0.00		0.0		0.0								
2021	08	12	93	52	90	0.00		0.0		0.0								
2021	08	13	90	54	87	0.00		0.0		0.0								
2021	08	14	90	52	88	0.00		0.0		0.0								
2021	08	15	88	54	80	0.00		0.0		0.0								
2021	08	16	88	54	86	0.02		0.0		0.0								
2021	08	17	87	53	82	0.00		0.0		0.0								
2021	08	18	89	56	76	0.00		0.0		0.0								
2021	08	19	76	56	60	0.45		0.0		0.0								
2021	08	20	76	44	76	0.00		0.0		0.0								
2021	08	21	80	46	77	0.00		0.0		0.0								
2021	08	22	82	46	80	0.00		0.0		0.0								
2021	08	23	84	44	84	0.00		0.0		0.0								
2021	08	24	85	46	83	0.00		0.0		0.0								
2021	08	25	83	46	82	0.00		0.0		0.0								
2021	08	26	82	54	66	0.10		0.0		0.0								
2021	08	27	83	44	83	0.11		0.0		0.0								
2021	08	28	84	44	84	0.00		0.0		0.0								
2021	08	29	86	45	83	0.00		0.0		0.0								
2021	08	30	86	42	85	0.00		0.0		0.0								
2021	08	31	85	45	80	0.00		0.0		0.0								
Summary			85	50		1.09		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

\*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration  
National Environmental Satellite, Data, and Information Service  
Current Location: Elev: 6467 ft. Lat: 40.4926° N Lon: -107.2548° W  
Station: **HAYDEN, CO US USC00053867**

**Record of Climatological  
Observations**  
These data are quality controlled and may not  
be identical to the original observations.  
Generated on 02/17/2022

National Centers for Environmental Information  
151 Patton Avenue  
Asheville, North Carolina 28801

Observation Time Temperature: 1800 Observation Time Precipitation: 1800

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Obs.	24 Hour Amounts Ending at Observation Time				At Obs. Time	24 Hour Wind Movement (mi)	Amount of Evap. (in)	4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)			Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2021	09	01	80	50	60	0.31		0.0		0.0								
2021	09	02	78	54	74	0.15		0.0		0.0								
2021	09	03	80	46	72	0.00		0.0		0.0								
2021	09	04	78	44	76	0.00		0.0		0.0								
2021	09	05	80	35	76	0.00		0.0		0.0								
2021	09	06	84	40	84	0.00		0.0		0.0								
2021	09	07	88	42	80	0.00		0.0		0.0								
2021	09	08	88	44	86	0.00		0.0		0.0								
2021	09	09	88	44	86	0.00		0.0		0.0								
2021	09	10	89	45	87	0.00		0.0		0.0								
2021	09	11	87	50	65	0.03		0.0		0.0								
2021	09	12	80	44	77	0.00		0.0		0.0								
2021	09	13	82	50	74	0.00		0.0		0.0								
2021	09	14	80	37	74	0.03		0.0		0.0								
2021	09	15	80	42	77	0.00		0.0		0.0								
2021	09	16	82	44	79	0.00		0.0		0.0								
2021	09	17	79	42	78	0.00		0.0		0.0								
2021	09	18	83	44	75	0.00		0.0		0.0								
2021	09	19	77	44	72	0.02		0.0		0.0								
2021	09	20	72	36	52	0.38		0.0		0.0								
2021	09	21	63	28	56	0.00		0.0		0.0								
2021	09	22	74	31	70	0.00		0.0		0.0								
2021	09	23	75	36	73	0.00		0.0		0.0								
2021	09	24	74	36	64	0.00		0.0		0.0								
2021	09	25	78	37	74	0.00		0.0		0.0								
2021	09	26	82	37	73	0.00		0.0		0.0								
2021	09	27	83	36	76	0.00		0.0		0.0								
2021	09	28	82	40	54	0.15		0.0		0.0								
2021	09	29	54	44	48	0.37		0.0		0.0								
2021	09	30	58	44	57	0.02		0.0		0.0								
Summary			79	42		1.46		0.0										

Empty, or blank, cells indicate that a data observation was not reported.  
\*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown  
"s" This data value failed one of NCDC's quality control tests. "At Obs." = Temperature at time of observation  
"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.  
"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.  
Data value inconsistency may be present due to rounding calculations during the conversion process from SI metric units to standard imperial units.



APPENDIX B  
GROUNDWATER QULITY DATA

**Table B.1.** Groundwater analytical results for Point of Compliance (POC) well YSAL3 during water year 2021.

Location	Date	Static Water Level FT BTOC	SPC, Field N UMHOS/CM	pH, Field N S.U.	Temp., Field N DEG-C	Fluoride N MG/L	Iron D MG/L	Manganese D MG/L	Nitrate N. N MG/L	Nitrite N. N MG/L	Selenium D UG/L	Sulfates N MG/L	TDS, Lab N MG/L
YSAL3	5/14/2021	5.11	1620	7.57	7.1	0.28	0.493	0.177	0.09	< 0.01	< 2	557	1130
<b>Sage Creek TR39 GWPOC Standards*</b>			-	6.5 - 8.5	-	2	4.91	0.76	10	1	20	1200	2675

**Notes**

\* See Yoast Mine Technical Revision 39 (TR-39) for GWPOC standards

**Bold** Exceeds groundwater quality standard

**Table B.2.** Groundwater analytical results for Point of Compliance (POC) well SGAL70 during water year 2021.

Well	Date	Depth to Water ft btoc	pH, Field N S.U.	Temp., Field N DEG-C	SPC, Field N UMHOS/CM	Aluminum D MG/L	Arsenic D UG/L	Boron D UG/L	Cadmium D UG/L	Chloride N MG/L	Chromium D UG/L	Copper D UG/L	Fluoride N MG/L
SGAL70	5/13/2021	10.33	7.28	8.8	3270	< 0.1	< 0.4	96	<b>&lt; 16</b>	30.7	< 40	< 20	0.22
SGAL70	9/25/2021	12.58	7.25	10.4	3050	< 0.1	< 0.4	137	<b>&lt; 16</b>	29	< 40	< 20	0.34
<b>Grassy Creek TR39 GWPOC Standard*</b>			6.5 - 8.5	-	-	<b>5</b>	<b>50</b>	<b>750</b>	<b>5</b>	<b>250</b>	<b>100</b>	<b>200</b>	<b>2</b>

Well	Date	Iron D MG/L	Lead D UG/L	Manganese D MG/L	Mercury D UG/L	Nickel D UG/L	Nitrate N. N MG/L	Nitrite N. N MG/L	Selenium D UG/L	Sulfates N MG/L	Sulfide N MG/L	TDS, Lab N MG/L	Zinc D MG/L
SGAL70	5/13/2021	< 0.12	< 60	0.082	< 0.2	< 16	< 0.02	< 0.01	< 2	1980	< 0.02	3300	< 0.04
SGAL70	9/25/2021	< 0.12	< 60	0.354	< 0.2	< 16	< 0.02	< 0.01	< 2	1940	< 0.02	3160	2.97
<b>TR-39 GWPOC Standards*</b>		<b>14.1</b>	<b>70</b>	<b>2.44</b>	<b>2</b>	<b>100</b>	<b>10</b>	<b>1</b>	<b>20</b>	<b>2517</b>	<b>-</b>	<b>5038</b>	<b>5</b>

Well	Date	Alk. as CaCO <sub>3</sub> , @ pH 4.5 N MG/L	Calcium D MG/L	SPC, Lab N UMS/CM	Hardness N MG/L	Magnesium D MG/L	Potassium D MG/L	Sodium D MG/L	SAR N NONE	Cation / Anion Balance N %
SGAL70	5/13/2021	353	376	3390	1940	242	5.56	181	1.8	-3.1
SGAL70	9/25/2021	374	394	3530	2020	251	6.04	190	1.9	0
<b>TR-39 GWPOC Standards*</b>		<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

**Notes**

\* See Yoast Mine Technical Revision 39 (TR-39) for GWPOC standards

**Bold** Analyte exceeds the TR-39 GWPOC Standard

**Table B.3.** Groundwater analytical results for Non-Point of Compliance wells during water year 2021.

Location	Date	Static Water Level FT BTOC	SPC, Field N UMHOS/CM	pH, Field N S.U.	Temp., Field N DEG-C	Fluoride N MG/L	Iron D MG/L	Manganese D MG/L	Nitrate N. N MG/L	Nitrite N. N MG/L	Selenium D UG/L	Sulfates N MG/L	TDS, Lab N MG/L
YAAL14	5/13/2021	8.71	3080	7.09	9.3	0.19	< 0.06	1.14	0.13	< 0.01	< 2	1830	3470
YGAL16	5/13/2021	11.67	2020	7.02	9.8	< 0.15	0.073	0.045	< 0.02	< 0.01	< 2	1080	1870
YSAL1	5/14/2021	4.97	2080	7.54	7.9	0.2	0.091	< 0.01	0.21	< 0.01	< 2	1030	1850
YOV30	5/14/2021	134.64	2690	7.81	9.8	1.22	< 0.06	0.034	< 0.02	< 0.01	< 2	935	2800
YW30	5/14/2021	193.6	3560	7.41	9.4	0.5	0.429	0.171	1.39	< 0.01	< 2	1430	3200
YWU30	5/14/2021	213.53	1590	7.1	10.1	< 0.15	0.06	0.021	0.12	< 0.01	< 2	433	1240
YWC33*	5/14/2021												
YWCU33	5/14/2021	249.17	1390	8.64	10.9		< 0.06	< 0.01					890

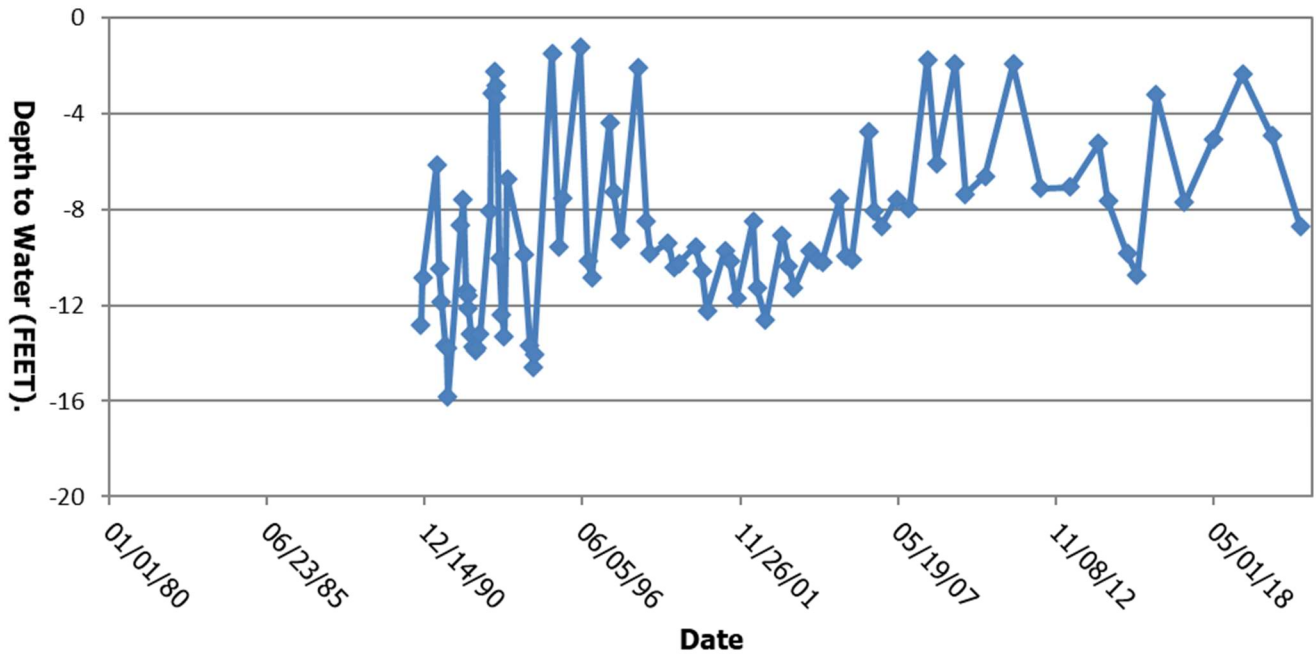
**Notes**

\*YWC33 well casing broken. Water level could not be measured and a sample could not be collected.

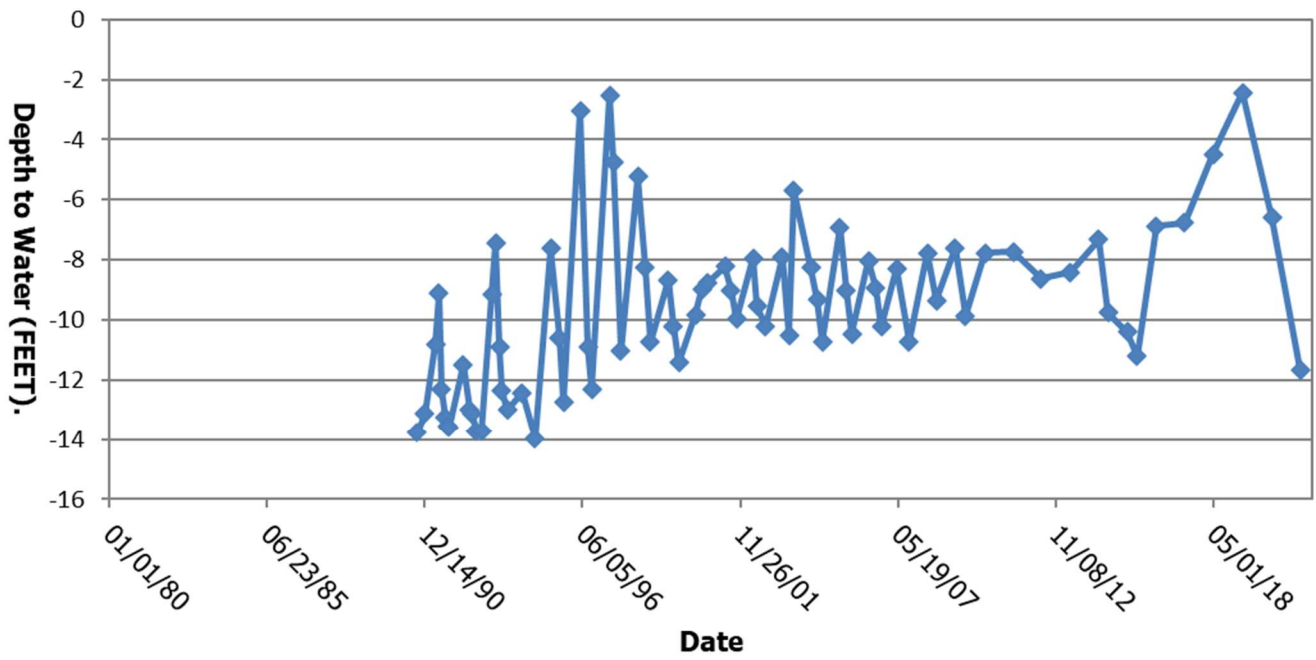
APPENDIX C

GROUNDWATER HYDROGRAPHS

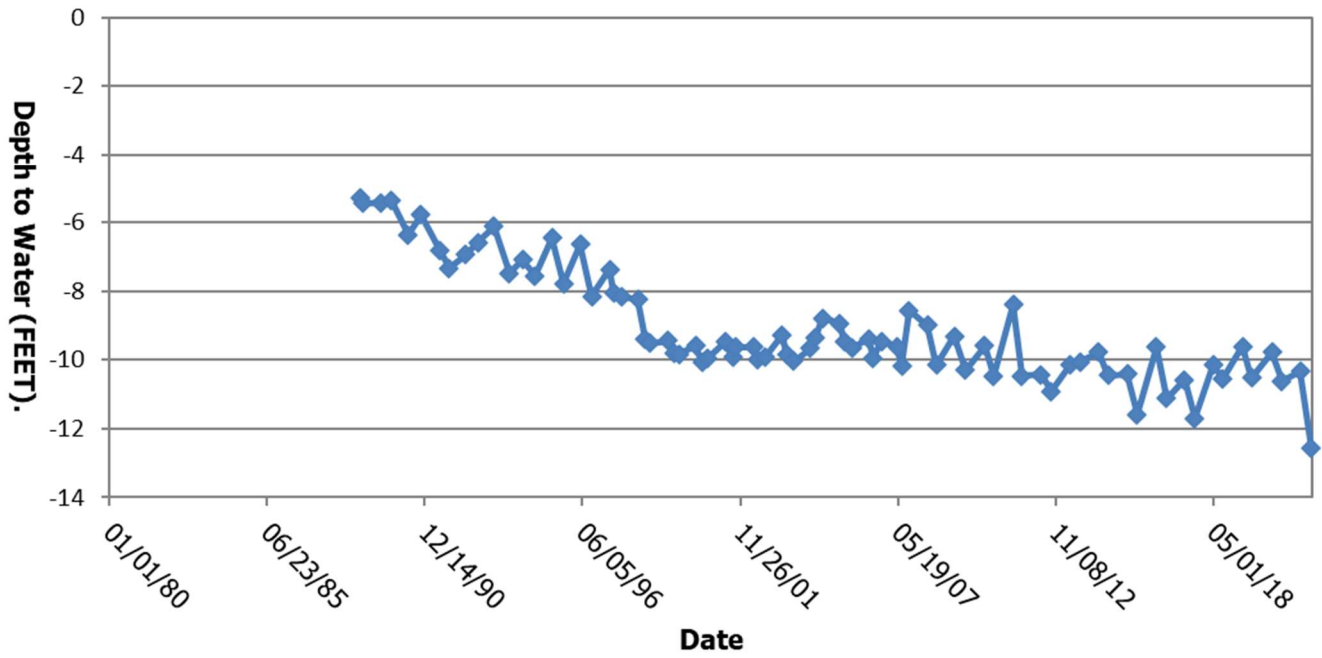
### YAAL14



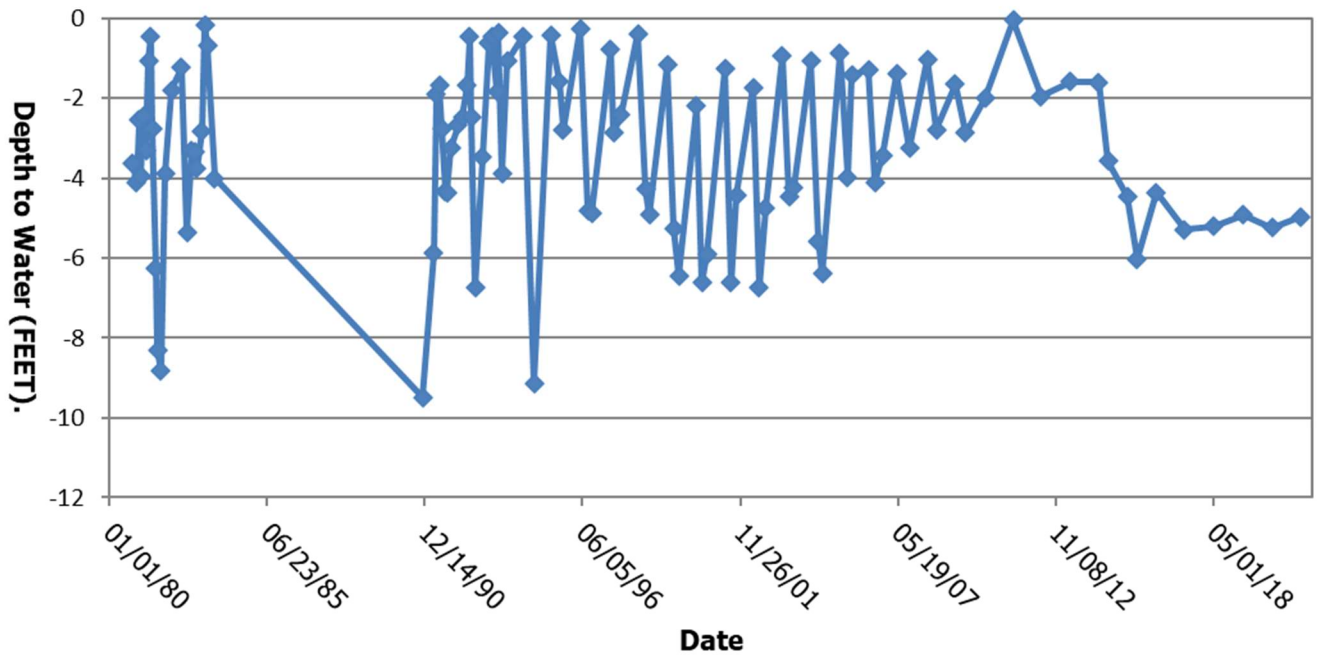
### YGAL16



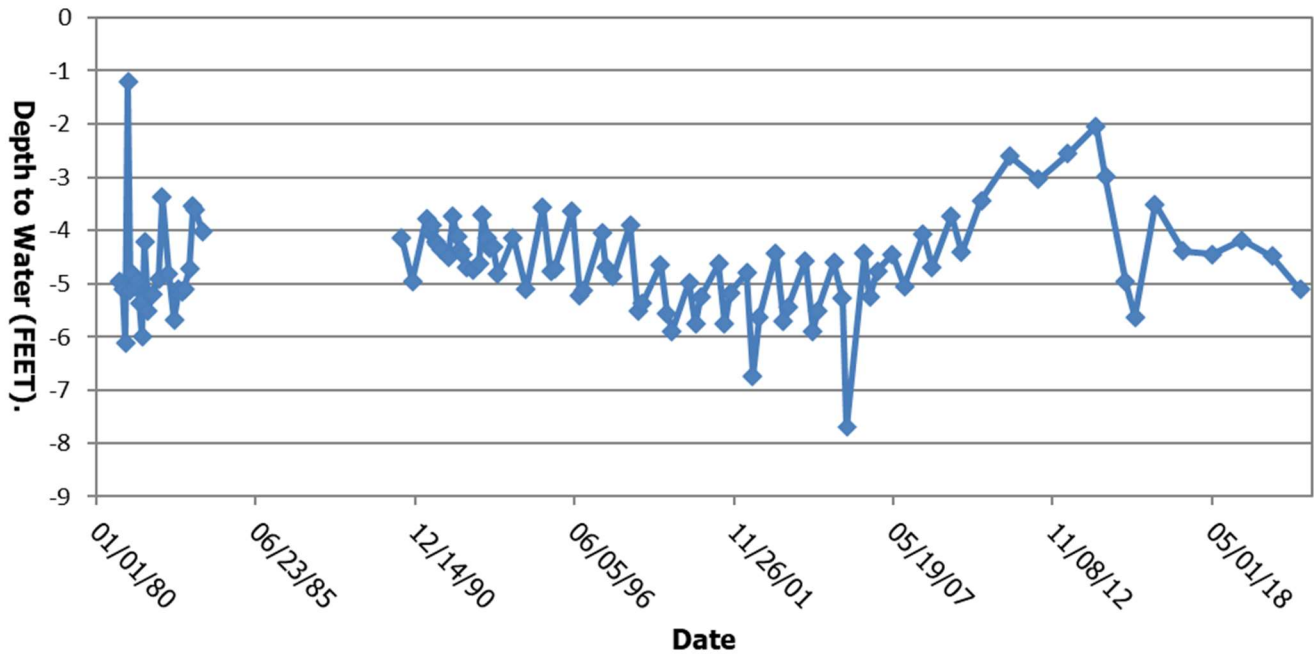
### SGAL70



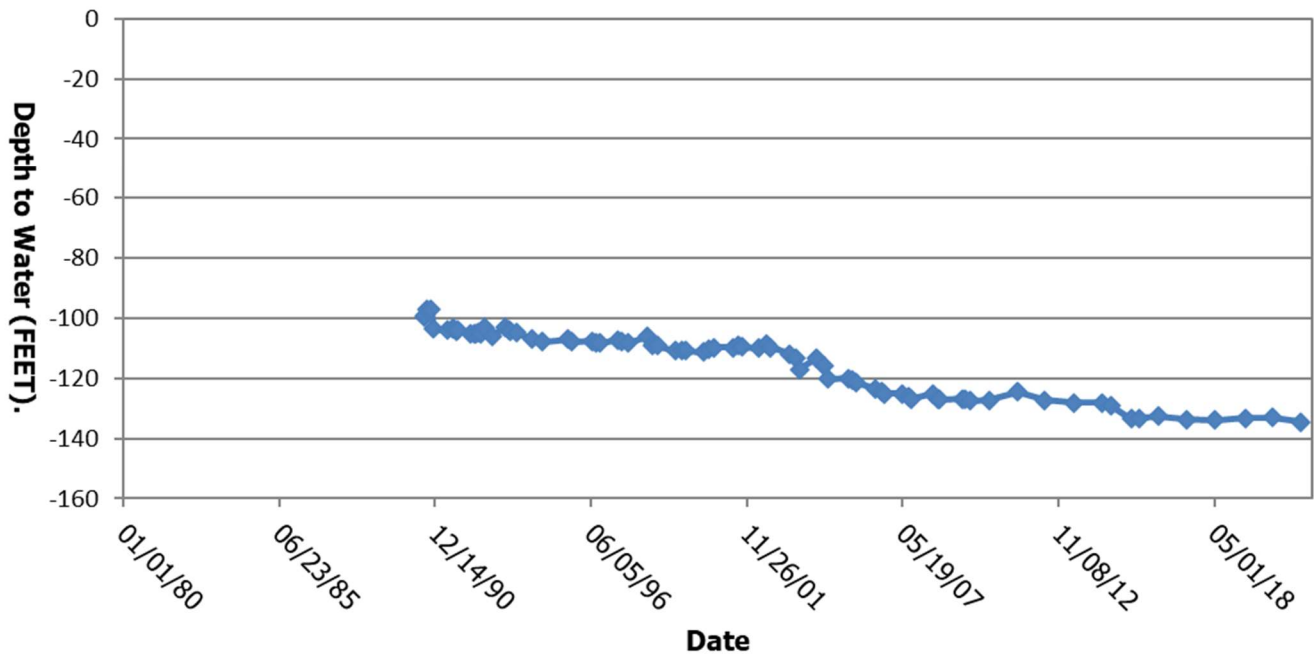
### YSAL1



### YSAL3

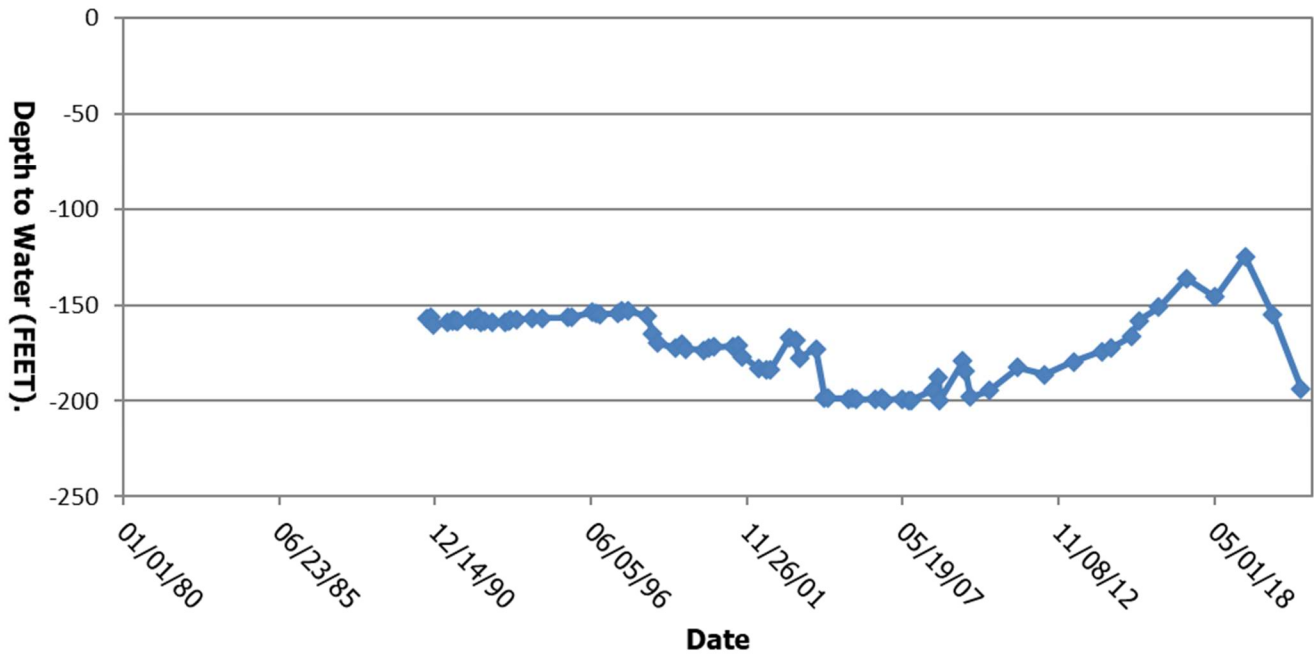


### YOV30

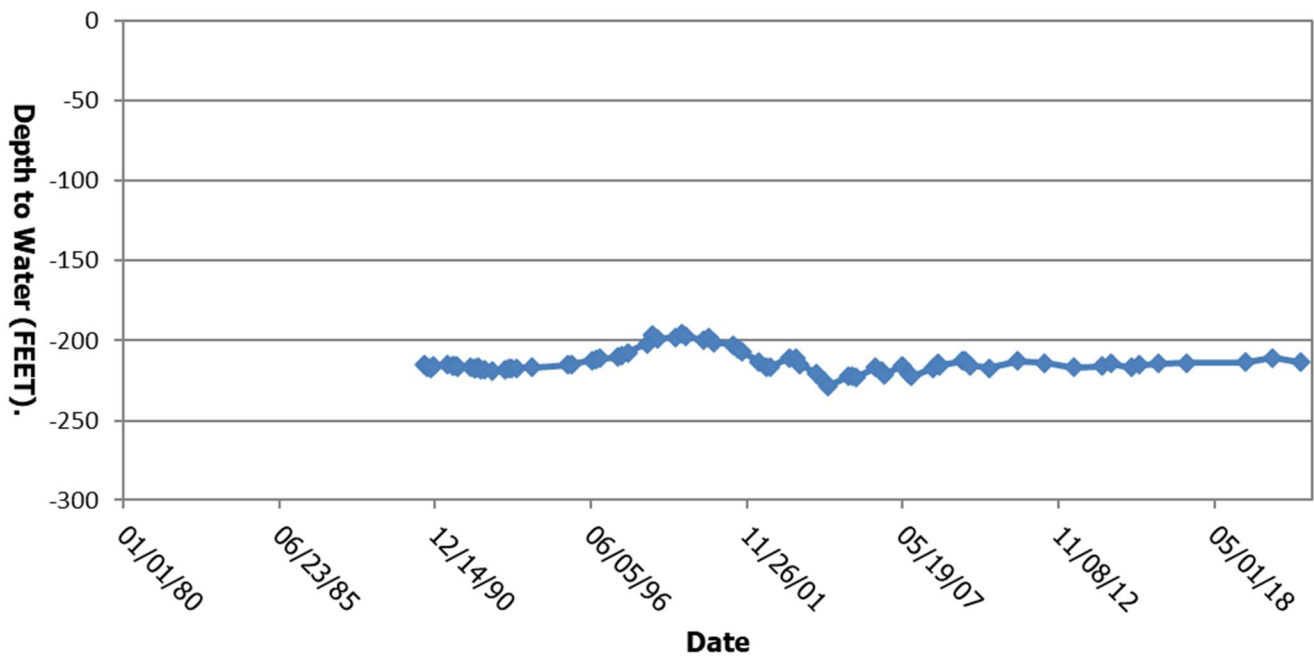




### YW30



### YWU30





APPENDIX D

SURFACE WATER QUALITY DATA

**Table D.1** Upper Grassy Creek Yampa Segment 13i stream point analytical data for water year 2021.

Location	Date	Flow N GPM	SPC, Field N UMHOS/CM	pH, Field N S.U.	Temp., Field N C	Iron D MG/L	Iron PD MG/L	Iron TR MG/L	Manganese D MG/L	Mercury T UG/L	Ammonia N. N MG/L	Nitrate N. N MG/L	Nitrite N. N MG/L	Selenium D UG/L
YSGF5	4/21/2021	727	1315	8.5	5.3			0.406	0.209	< 0.2	< 0.05	< 0.02	< 0.01	0.81
YSGF5	4/21/2021	727	1315	8.5	5.3	< 0.06	0.241	0.434						
YSGF5	6/15/2021	17.6	1527	7.32	13.5			3.69	0.272	< 0.2	< 0.05	< 0.02	< 0.01	0.26
YSGF5	7/20/2021	0												
YSGF5	9/9/2021	0												
Yampa Segment 13i Standards - Acute		-	-	6.5 - 9.0	-	-	-	-	4.738	0.01***	Varies	100	0.05	18.4
Yampa Segment 13i Standards - Chronic		-	-	-	-	-	-	TM*	2.618	-	Varies	-	-	TM*
Agricultural Use Standards		-	-	-	-	-	-	-	0.2**	-	-	100	10	20

Location	Date	Selenium PD UG/L	Selenium TR UG/L	Sulfates N MG/L	Sulfide N MG/L	TDS, Lab N MG/L	TSS N MG/L
YSGF5	4/21/2021	0.72	0.67	529	< 0.02	1020	11
YSGF5	4/21/2021					1030	8
YSGF5	6/15/2021	0.26	0.43	667	< 0.02	1150	141
YSGF5	7/20/2021						
YSGF5	9/9/2021						
Yampa Segment 13i Standards - Acute		-	-	-	0.002****	-	-
Yampa Segment 13i Standards - Chronic		-	-	-	-	-	-
Agricultural Use Standards		-	-	-	-	-	-

**Notes**

The ammonia standard varies based on stream classification, pH, and temperature. See Regulation 33 Table Value Standard calculation formula. Each samples water quality was compared to calculated standard.

\* A current conditions temporary modification is in place for the Segment 13i chronic iron and selenium standard.

\*\* The manganese agricultural use standard is only applicable for areas with acidic soils. This areas soils are alkaline.

\*\*\* The mercury standard is an order of magnitude less than the labs 0.2 mg/L analytical detection limit.

\*\*\*\* The sulfide standard is an order of magnitude less than the labs 0.02 mg/L sulfide analytical detection limit.

**Bold** Analyte exceeds the Yampa Segment 13i or Agricultural Use Standards

**Table D.2.** Upper Grassy Creek Segment 13i NPDES Outfall 011 analytical data for water year 2021.

Location	Date	Flow N GPM	pH, Field N S.U.	Oil & Grease Y / N	Iron TR MG/L	TDS, Lab N MG/L	Cadmium PD UG/L	Chromium PD UG/L	Copper PD UG/L	Lead PD UG/L	Mercury T UG/L	Nickel PD UG/L
NPDES11	10/22/2020	0										
NPDES11	11/3/2020	0										
NPDES11	12/2/2020	0										
NPDES11	1/12/2021	0										
NPDES11	2/9/2021	0										
NPDES11	3/23/2021	0										
NPDES11	4/21/2021	0										
NPDES11	5/17/2021	0										
NPDES11	6/14/2021	0										
NPDES11	7/20/2021	0										
NPDES11	8/4/2021	0										
NPDES11	9/9/2021	0										
NPDES Limit	Daily Max		6.5 - 9.0	10	Report	Report	Report	Report	Report	Report	Report	Report
	Monthly Avg.		NA	NA	1	Report	Report	Report	Report	Report	Report	Report
Yampa Segment 13i Standards - Acute			6.5 - 9.0	-	-	-	9.2	1773	50	281	0.01	1513
Yampa Segment 13i Standards - Chronic			-	-	TM**	-	1.2	231	29	11	-	168
Agricultural Use Standards			-	-	-	-	10	100	200	100	-	200

Location	Date	Selenium PD UG/L	Selenium* TR UG/L	Silver PD UG/L	Zinc PD MG/L
NPDES11	10/22/2020				
NPDES11	11/3/2020				
NPDES11	12/2/2020				
NPDES11	1/12/2021				
NPDES11	2/9/2021				
NPDES11	3/23/2021				
NPDES11	4/21/2021				
NPDES11	5/17/2021				
NPDES11	6/14/2021				
NPDES11	7/20/2021				
NPDES11	8/4/2021				
NPDES11	9/9/2021				
NPDES Limit	Daily Max	Report	-	Report	Report
	Monthly Avg.	Report	-	Report	Report
Segment 13i Standards - Acute		18.4	-	22	0.565
Segment 13i Standards - Chronic		TM**	-	3.5	0.428
Agricultural Use Standards		-	20	-	2

**Note**

\*NPDES11 does not have a Total Recoverable Selenium NPDES monitoring requirement.

\*\* A current conditions temporary modification is in place for the Segment 13i chronic Iron and selenium standard.

**Bold** Analyte exceeds the NPDES limit, Segment 13i aquatic life standard, or Agricultural Use standard

**Table D.3** Lower Grassy Creek Yampa Segment 13j stream point analytical data for water year 2021.

Location	Date	Flow N GPM	SPC, Field N UMHOS/CM	pH, Field N S.U.	Temp., Field N C	Iron D MG/L	Iron PD MG/L	Iron TR MG/L	Manganese D MG/L	Mercury T UG/L	Ammonia N. N MG/L	Nitrate N. N MG/L	Nitrite N. N MG/L	Selenium D UG/L
YSG5	4/21/2021	1237	2990	8.37	5.2			0.421	0.507	< 0.2	< 0.05	0.11	< 0.01	2.15
YSG5	4/21/2021	1237	2990	8.37	5.2									2.22
YSG5	6/15/2021	7.3	3618	7.9	17.6			0.897	1.69	< 0.2	0.091	0.03	< 0.01	0.59
YSG5	7/20/2021	0												
YSG5	9/9/2021	0												
Yampa Segment 13j Standards - Acute		-	-	6.5 - 9.0	-	-	-	-	4.738	0.01***	Varies	100	0.05	18.4
Yampa Segment 13j Standards - Chronic		-	-	-	-	-	-	1	2.618	-	Varies	-	-	TM*
Agricultural Use Standards		-	-	-	-	-	-	-	0.2**	-	-	100	10	20

Location	Date	Selenium PD UG/L	Selenium TR UG/L	Sulfates N MG/L	Sulfide N MG/L	TDS, Lab N MG/L	TSS N MG/L
YSG5	4/21/2021		1.99	1910	< 0.02	3020	5
YSG5	4/21/2021		1.97	1840		3010	
YSG5	6/15/2021		0.58	1990	< 0.03	3310	28
YSG5	7/20/2021						
YSG5	9/9/2021						
Yampa Segment 13j Standards - Acute		-	-	-	0.002****	-	-
Yampa Segment 13j Standards - Chronic		-	-	-	-	-	-
Agricultural Use Standards		-	-	-	-	-	-

**Notes**

The ammonia standard varies based on stream classification, pH, and temperature. See Regulation 33 Table Value Standard calculation formula. Each samples water quality was compared to calculated standard.

\* A current conditions temporary modification is in place for the Segment 13j chronic selenium standard.

\*\* The manganese agricultural use standard is only applicable for areas with acidic soils. This areas soils are alkaline.

\*\*\* The mercury standard is an order of magnitude less than the labs 0.2 mg/L analytical detection limit.

\*\*\*\* The sulfide standard is an order of magnitude less than the labs 0.02 mg/L sulfide analytical detection limit.

**Bold** Analyte exceeds the Yampa Segment 13j or Agricultural Use Standards



**Table D.4.** Lower Grassy Creek Segment 13j NPDES Outfall 010 analytical data for water year 2021.

Location	Date	Flow N GPM	pH, Field N S.U.	Oil & Grease Y / N	Iron TR MG/L	TDS, Lab N MG/L	Copper PD UG/L	Selenium* D UG/L	Selenium PD UG/L	Selenium* TR UG/L
NPDES10	10/22/2020	1.1	8.07	N	0.147	3340	< 1.6		< 0.2	0.28
NPDES10	11/2/2020	1.3	8.68	N	0.137	3290	< 0.8		0.37	0.44
NPDES10	12/1/2020	2.1	8.69	N	< 0.12	3490	< 1.6		0.36	0.47
NPDES10	1/11/2021	1.3	7.59	N	0.206	3190	< 1.6		2.9	1.91
NPDES10	2/8/2021	1.2	7.5	N	< 0.12	3100	< 8		100	0.66
NPDES10	3/22/2021	2.4	7.91	N	0.172	1960	1.96		0.96	0.9
NPDES10	4/21/2021	17.4	8.07	N	0.415	2810	< 1.6	0.76	0.83	0.7
NPDES10	4/21/2021	17.4	8.07	N		2780				0.66
NPDES10	5/17/2021	14.7	8.11	N	0.12	2880	< 0.8		0.62	0.64
NPDES10	6/14/2021	0								
NPDES10	7/20/2021	0								
NPDES10	8/3/2021	0								
NPDES10	9/9/2021	0								
NPDES Limit	Daily Max		6.5 - 9.0	10	Report	Report	Report	-	Report	-
	Monthly Avg.		NA	NA	1	Report	Report	-	Report	-
Yampa Segment 13j Standards - Acute			6.5 - 9.0	-	-	-	50	18.4	-	-
Yampa Segment 13j Standards - Chronic			-	-	1	-	29	TM**	-	-
Agricultural Use Standards			-	-	-	-	200	-	-	20

**Note**

\*NPDES10 does not have a Dissolved or Total Recoverable Selenium NPDES monitoring requirement.

\*\* A current conditions temporary modification is in place for the Segment 13j chronic selenium standard.

**Bold** Analyte exceeds the NPDES limit, Segment 13j aquatic life standard, or Agricultural Use standard

**Table D.5.** Sage Creek Segment 13e stream point analytical data for water year 2021.

Location	Date	Flow N GPM	SPC, Field N UMHOS/CM	pH, Field N S.U.	Temp., Field N C	Iron D MG/L	Iron PD MG/L	Iron TR MG/L	Manganese D MG/L	Mercury T UG/L	Ammonia N. N MG/L	Nitrate N. N MG/L	Nitrite N. N MG/L	Selenium D UG/L
YSSF3	4/22/2021	867	698	8.48	1.6			0.085	0.0305					0.77
YSSF3	6/15/2021	9.6	921	8.07	9.4			<b>2.1</b>	0.0651					0.14
YSS2	4/22/2021	1843	1735	8.55	1.8			0.222	0.198	< 0.2	< 0.05	< 0.02	< 0.01	0.7
YSS2	6/15/2021	7.7	2788	7.82	11			0.734	0.194	< 0.2	< 0.05	0.05	< 0.01	0.32
YSS2	9/9/2021	4.3	3511	8.5	14.8			<b>4.12</b>	0.0746					0.28
Yampa Segment 13e Standards - Acute		-	-	6.5 - 9.0	-	-	-	-	4.738	0.01**	Varies	100	0.05	18.4
Yampa Segment 13e Standards - Chronic		-	-	-	-	-	-	1.25	2.618	-	Varies	-	-	TM***
Agricultural Use Standards		-	-	-	-	-	-	-	0.2*	-	-	100	10	20

Location	Date	Selenium PD UG/L	Selenium TR UG/L	Sulfates N MG/L	Sulfide N MG/L	TDS, Lab N MG/L	TSS N MG/L
YSSF3	4/22/2021	0.74	0.67			398	< 5
YSSF3	6/15/2021	0.17	0.24			510	75
YSS2	4/22/2021	0.71	0.6	804	< 0.02	1450	< 5
YSS2	6/15/2021	0.33	0.46	1480	< 0.02	2450	22
YSS2	9/9/2021	0.32	0.49			3120	181
Yampa Segment 13e Standards - Acute		-	-	-	0.002****	-	-
Yampa Segment 13e Standards - Chronic		-	-	-	-	-	-
Agricultural Use Standards		-	-	-	-	-	-

**Notes**

The ammonia standard varies based on stream classification, pH, and temperature. See Regulation 33 Table Value Standard calculation formula. Each samples water quality was compared to calculated standard.

\* The manganese agricultural use standard is only applicable for areas with acidic soils. This areas soils are alkaline.

\*\* The mercury standard is an order of magnitude less than the labs 0.2 mg/L analytical detection limit.

\*\*\* A current conditions temporary modification is in place for the Segment 13e chronic selenium standard.

\*\*\*\* The sulfide standard is an order of magnitude less than the labs 0.02 mg/L sulfide analytical detection limit.

**Bold** Analyte exceeds the Yampa Segment 13e or Agricultural Use Standards



**Table D.6.** Sage Creek Segment 13e NPDES Outfall 014 analytical data for water year 2021.

Location	Date	Flow N GPM	pH, Field N S.U.	Oil & Grease Y / N	TDS N MG/L	Selenium* D UG/L	Selenium* TR UG/L
NPDES14	10/22/2020	0					
NPDES14	11/2/2020	0					
NPDES14	12/1/2020	0					
NPDES14	1/11/2021	0					
NPDES14	2/8/2021	0					
NPDES14	3/22/2021	0					
NPDES14	4/22/2021	0					
NPDES14	5/17/2021	0					
NPDES14	6/14/2021	0					
NPDES14	7/21/2021	0					
NPDES14	8/3/2021	0					
NPDES14	9/9/2021	0					
NPDES Limit	Daily Max		6.5 - 9.0	10	Report	-	-
	Monthly Avg.		NA	NA	Report	-	-
Yampa Segment 13e Standards - Acute			6.5 - 9.0	-	-	18.4	-
Yampa Segment 13e Standards - Chronic			-	-	-	TM**	-
Agricultural Use Standards			-	-	-	-	20

**Note**

\*NPDES14 does not have a Dissolved or Total Recoverable Selenium NPDES monitoring requirement.

\*\* A current conditions temporary modification is in place for the Segment 13e chronic selenium standard.

**Bold** Analyte exceeds the NPDES limit or Agricultural Use standard

**Table D.7.** Sage Creek Segment 13e NPDES Outfall 013 analytical data for water year 2021.

Location	Date	Flow N GPM	pH, Field N S.U.	Oil & Grease Y / N	TDS, Lab N MG/L	Arsenic TR UG/L	Cadmium PD UG/L	Chromium PD UG/L	Copper PD UG/L	Iron TR MG/L	Lead PD UG/L	Manganese PD MG/L	Mercury T UG/L	Nickel PD UG/L
NPDES13	10/22/2020	0												
NPDES13	11/2/2020	0												
NPDES13	12/1/2020	0												
NPDES13	1/11/2021	0												
NPDES13	2/8/2021	0												
NPDES13	3/22/2021	0												
NPDES13	4/22/2021	0												
NPDES13	5/17/2021	0												
NPDES13	6/14/2021	0												
NPDES13	7/21/2021	0												
NPDES13	8/3/2021	0												
NPDES13	9/9/2021	0												
NPDES Limit	Daily Max		6.5 - 9.0	10	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
	Monthly Avg.		NA	NA	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Yampa Segment 13e Standards - Acute			6.5 - 9.0	-	-	340	9.2	1773	50	1.25	281	4.738	0.01	1513
Yampa Segment 13e Standards - Chronic			-	-	-	100	1.2	231	29	-	11	2.618	-	168
Agricultural Use Standards			-	-	-	100	10	100	200	-	100	0.2***	-	200

Location	Date	Selenium D UG/L	Selenium PD UG/L	Selenium TR UG/L	Zinc PD MG/L	TSS* N MG/L
NPDES13	10/22/2020	0				
NPDES13	11/2/2020	0				
NPDES13	12/1/2020	0				
NPDES13	1/11/2021	0				
NPDES13	2/8/2021	0				
NPDES13	3/22/2021	0				
NPDES13	4/22/2021	0				
NPDES13	5/17/2021	0				
NPDES13	6/14/2021	0				
NPDES13	7/21/2021	0				
NPDES13	8/3/2021	0				
NPDES13	9/9/2021	0				
NPDES Limit	Daily Max	-	Report	-	Report	-
	Monthly Avg.	-	Report	-	Report	-
Segment 13e Standards - Acute		18.4	-	-	0.565	-
Segment 13e Standards - Chronic		TM**	-	-	0.428	-
Agricultural Use Standards		-	-	20****	2	-

**Note**

\*TSS is not an NPDES monitoring requirement at this outfall

\*\* A current conditions temporary modification is in place for the Segment 13e chronic selenium standard.

\*\*\* The agricultural use manganese standard is only applicable to areas with acidic soils. These are not present at Yeast Mine.

\*\*\*\* The agricultural use standard is applied to total recoverable selenium

**Bold** Analyte exceeds the NPDES limit, Segment 13e aquatic life standard, or Agricultural Use standard

**Table D.8.** Sage Creek Segment 13e NPDES Outfall 012 analytical data for water year 2021.

Location	Date	Flow N GPM	pH, Field N S.U.	Oil & Grease Y / N	Iron TR MG/L	TDS N MG/L	Manganese PD MG/L	Selenium* D UG/L	Selenium PD UG/L	Selenium* TR UG/L
NPDES12	10/22/2020	76.3	8.09	N	0.172	3350	0.053		0.24	0.35
NPDES12	11/2/2020	64.7	8.39	N	< 0.12	3020			0.29	0.36
NPDES12	12/1/2020	57.6	8.29	N	< 0.12	3520			0.35	0.28
NPDES12	1/11/2021	57.4	8.06	N	0.176	3240	0.203		0.29	0.24
NPDES12	2/8/2021	56.8	7.94	N	< 0.12	3040			0.12	0.28
NPDES12	3/22/2021	54.6	8.17	N	0.163	3180			0.81	0.52
NPDES12	4/22/2021	73.8	8.33	N	0.235	3150	0.055	0.68	0.73	0.63
NPDES12	4/22/2021	73.8	8.33	N		3150				0.62
NPDES12	5/17/2021	71.8	8.17	N	0.178	3280			0.53	0.55
NPDES12	6/14/2021	57.7	7.87	N	0.37	3700			0.35	0.59
NPDES12	7/21/2021	36.6	7.97	N	< 0.12	3370	0.155	0.79	< 0.1	0.43
NPDES12	7/21/2021	36.6	7.97	N		3390				0.43
NPDES12	8/3/2021	37.3	8.13	N	0.112	3410			0.4	0.52
NPDES12	9/9/2021	43.6	8.1	N	0.106	3090			0.32	0.37
NPDES Limit	Daily Max		6.5 - 9.0	10	Report	Report	Report	-	18	-
	Monthly Avg.		NA	NA	1	Report	Report	-	4.6	-
Yampa Segment 13e Standards - Acute			6.5 - 9.0	-	1	-	4.738	18.4	-	-
Yampa Segment 13e Standards - Chronic			-	-	-	-	2.618	TM**	-	-
Agricultural Use Standards			-	-	-	-	0.2***	-	-	20

**Note**

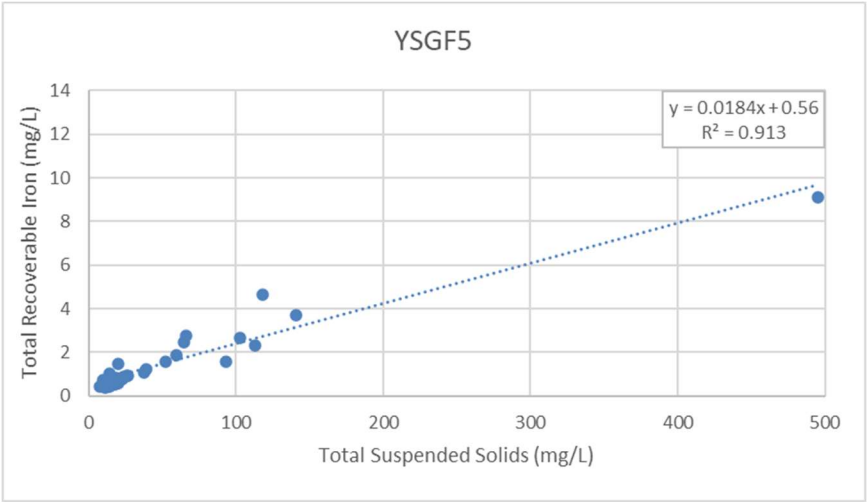
\*NPDES12 does not have a Dissolved or Total Recoverable Selenium NPDES monitoring requirement.

\*\* A current conditions temporary modification is in place for the Segment 13e chronic selenium standard.

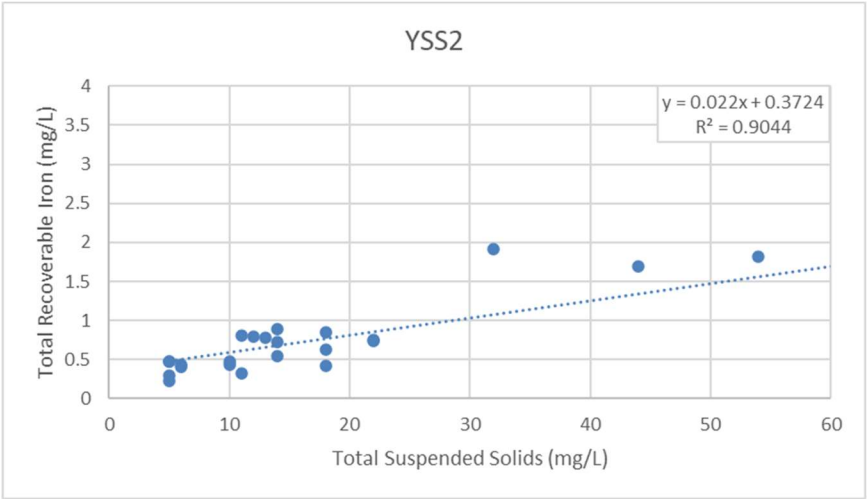
\*\*\* The manganese agricultural use standard is only applicable to areas with acidic soils. These are not present at Yoast Mine.

**Bold** Analyte exceeds the NPDES limit, Segment 13e aquatic life standard, or Agricultural Use standard

**Figure D.1.** Suspended solids vs total recoverable iron at Grassy Creek stream points YSGF5 collected between January 1, 2014 and September 30, 2021.



**Figure D.2.** Suspended solids vs total recoverable iron at Sage Creek stream points YSS2 collected between January 1, 2014 and September 30, 2021.



APPENDIX E

SPRING WATER QUALITY DATA

**Table E.1.** Analytical data for springs sampled during the 2021 water year.

Location	Date	Flow N GPM	SPC, Field N UMHOS/CM	pH, Field N S.U.	Temp., Field N C	Iron TR MG/L	Manganese D MG/L	Mercury T UG/L	Ammonia N. N MG/L	Nitrate N. N MG/L	Nitrite N. N MG/L
YSSPG1	6/15/2021	0									
YSSPG2	6/15/2021	0									
YSSPG3	6/16/2021	0									
YSSPG4	6/16/2021	0									
Agricultural Use Standards		-	-	-	-	-	0.2*	-	-	100	10

Location	Date	Selenium D UG/L	Selenium PD UG/L	Selenium TR UG/L	Sulfates N MG/L	Sulfide N MG/L	TDS, Lab N MG/L	TSS N MG/L
YSSPG1	6/2/2020							
YSSPG2	6/2/2020							
YSSPG3	6/3/2020							
YSSPG4	6/3/2020							
Agricultural Use Standards		20	-	-	-	-	-	-

**Notes**

\* The manganese agricultural use standard is only applicable for areas with acidic soils. This areas soils are alkaline.

**Bold** Analyte exceeds the Agricultural Use Standards