memo

Project Name |	Weather Station Monitoring Program	**Date** |	1/19/2021
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Mike Majeski, Conservation Biologist		
Regarding |	2020 Weather Summary		

Background

The Weather Station Monitoring Program was initiated in the spring of 2011. Each season the weather station is installed on top of the vegetated berm at the Stillwater Public Works Facility and collects the following data: precipitation, air temperature, relative humidity, solar radiation, wind speed, gust speed, and wind direction. The weather station is programmed to collect data from spring through fall of each season. This information is being collected to support a variety of District programs such as hydrologic and hydraulic model upgrades and calibration (which require 15-minute precipitation data), thermal modeling efforts, and several projects including the Settlers Glen iron-enhanced sand filter, THPP, and the Brown's Creek Tributaries Restoration. The weather station data is also routinely shared with the Washington Conservation District (WCD).

For previous weather station memos, the BCWD weather station data was evaluated for quality assurance and quality control purposes by comparing data on a monthly basis to local weather stations reporting similar data parameters. However, inconsistencies in the availability of local weather station data, proximity of available weather stations, and differences between weather sensors made quality assurance efforts difficult to assess. Differences in local rainfall intensity and the relation of landscape obstructions such as buildings and trees to each weather station further complicated data assessments. It was also unknown if the local weather stations were routinely upgraded or calibrated. The BCWD weather station is routinely calibrated and upgraded with new sensors, and as such yields consistent, reliable data. Therefore, comparing data quality between the BCWD weather station and publicly operated weather stations was deemed no longer prudent. Rather, the focus of this memo is to summarize significant weather events recorded in 2020 and describe any maintenance or calibrations preformed on the BCWD weather station.

2020 Weather Summary

The BCWD weather station was installed at the Stillwater Public Works Facility (latitude: 45°03'49.86", longitude: 92°51'21.05") on March 18, 2020 and was removed on November 9, 2020. A total of 30.00 inches of precipitation was recorded over this timeframe, including eight rain events over 1" and three rain events over 2" (Figure 1). The largest rain event occurred on May 17 with 2.74". Above average monthly precipitation occurred in May (6.32") and June (7.80"), and near average precipitation occurred in July (4.58") and October (2.55"). Notable dry periods over the course of the monitoring season included: Mar 30-Apr 26 (0.39" in 28 days), Apr 29-May 15 (0.07" in 17 days), July 27-Aug 11 (0.25" in 16 days), and Oct 24-Nov 9 (0.03" in 17 days).

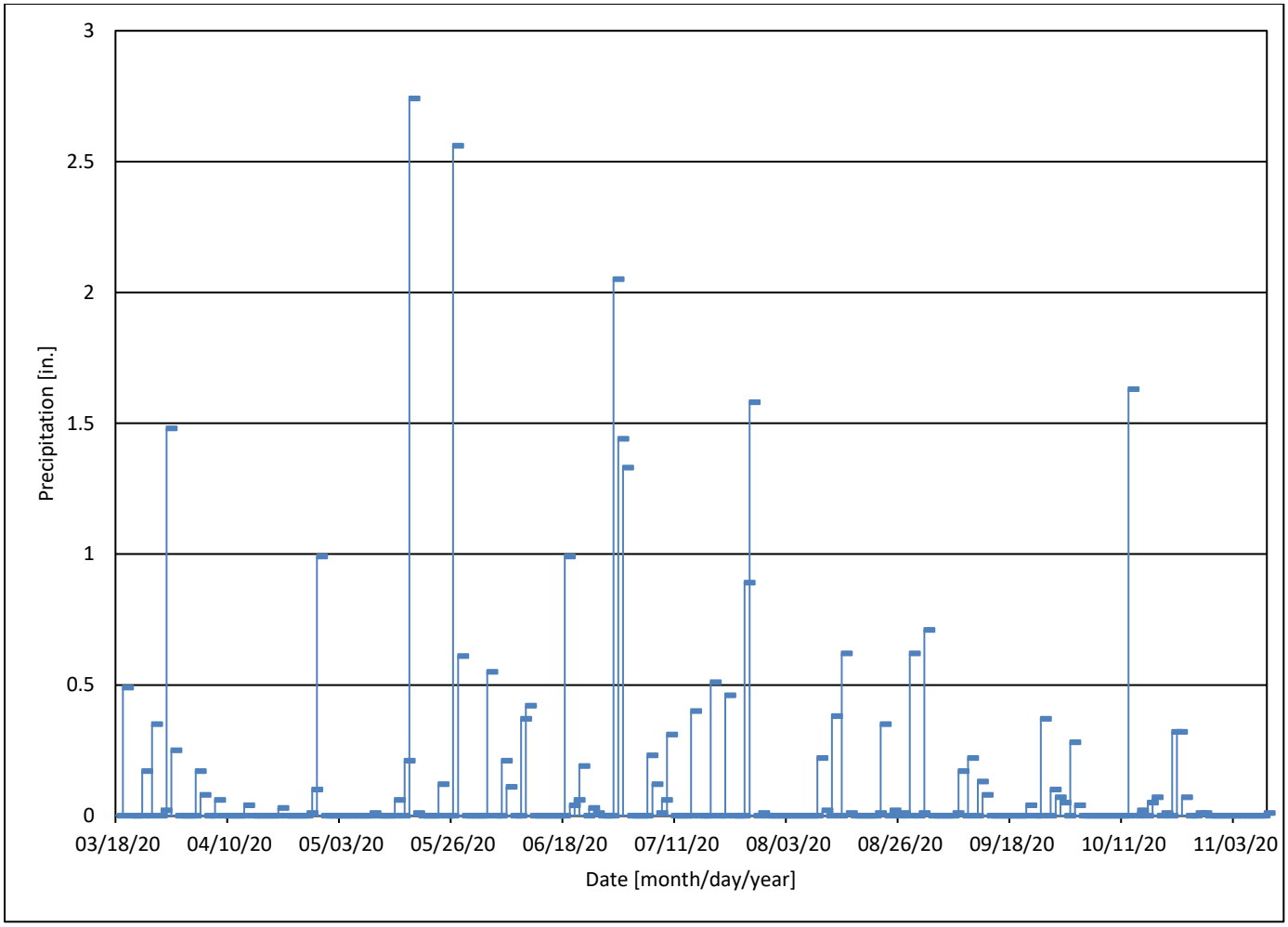

Figure 1. Daily precipitation recorded by the BCWD weather station (Mar 18-Nov 9)

Below average air temperatures occurred for prolonged periods in April, May, September, and October, with daily maximum and minimum temperatures well below average from Apr 11-Apr 20, May 9-May 13, Sept 8-Sept 12, and Oct 16-Nov 2 (Figure 2). A drastic warm up began on November 3, with both minimum and maximum air temperatures well above average through November 9. Water temperatures recorded in Brown's Creek at the WOMP station showed a significant increase in maximum daily water temperature starting in late June and peaking on July 2. This warm water period coincided with a warm weather pattern during the same timeframe, with four consecutive days of maximum air temperatures exceeding 90 degrees F. Overnight lows during this timeframe were also above average. This warm weather pattern resulted in elevated stream temperatures in Brown's Creek, with daily maximum water temperatures above 70 degrees F for six consecutive days from June 30-July 5.

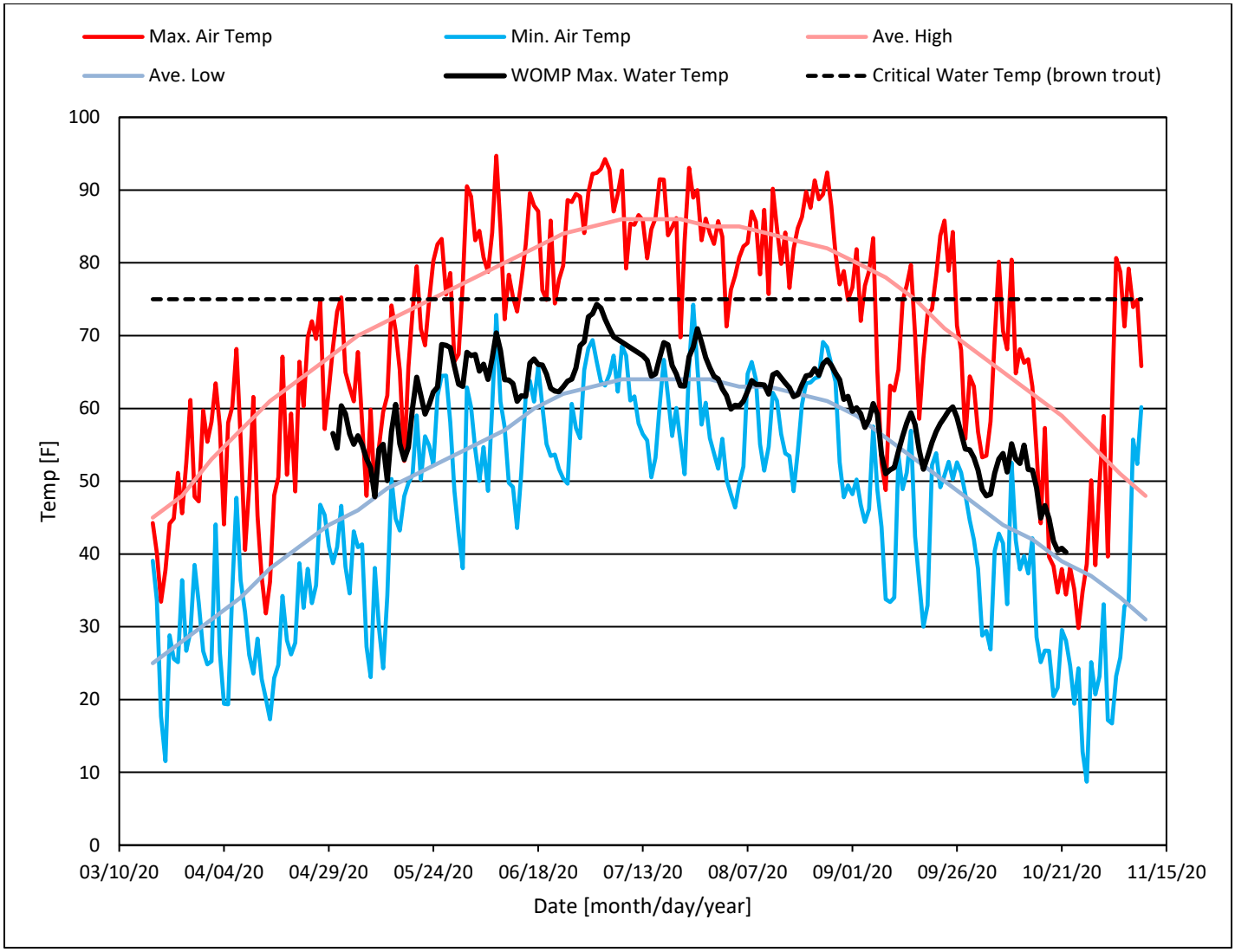

Figure 2. Daily maximum and minimum temperatures recorded by the BCWD weather station and WOMP daily maximum water temperature recorded by the WCD. Average air temperature data source: https://weather.com/weather/monthly/l/45.067273,-92.854033

Weather Station Maintenance

Prior to equipment installation, a new temperature and humidity sensor was installed, and the precipitation gauge was calibrated to a simulated one-inch rain event. The remaining weather sensors were inspected after the weather station was removed in the fall of 2020. The oldest sensor is the pyranometer (solar radiation sensor), but based on discussions with the manufacturer, the sensor should be accurate based on the clean, white color of the filter window. Should the filter window fade to a dull yellow color or darker, the sensor will need to be replaced.

2021 Scope of Services

The following scope identifies the costs associated with equipment preparation, precipitation gauge calibration, data collection, and reporting for the 2021 monitoring season (March to November).

This scope also includes the cost to replace the pyranometer sensor, if needed. All data collected in 2021 will be forwarded to the Washington Conservation District and other entities if requested.

Task	Hours	Estimated Cost
Precipitation Calibration & Installation of Weather Station	5	$745
Monthly Download of Data	7	$686
End of Season Equipment Removal	3	$447
Report, Data Storage, & Distribution to the WCD	6	$894
Expenses	N/A	$281*
TOTALS	**21**	**$3,053**

* includes the cost to replace the pyranometer sensor, if needed

Action Item

1. Approve this scope of services from account number 903-0001. This work will be completed by December 31, 2021.