memo

Project Name |	Weather Station Monitoring Program	**Date** |	2/04/2025
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Mike Majeski, Conservation Biologist		
Regarding |	2024 Weather Summary		

Background

The BCWD Weather Station Monitoring Program was initiated in the spring of 2011 and has been in operation since 2012. 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, dew point, solar radiation, wind speed, gust speed, and wind direction. The weather station is programmed to collect data from spring through fall each season and is removed during the winter months. 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 other projects including the Settlers Glen iron-enhanced sand filter, THPP, and the Biological Monitoring Program. The weather station data is also routinely shared with the Washington Conservation District (WCD).

The objective of this memorandum is to summarize temperature and precipitation data recorded in 2024 and how the data relates to temperatures recorded in Brown's Creek, particularity in the Brown's Creek gorge where coolwater and coldwater dependent species occur including rainbow darter, brown trout, and several macroinvertebrate species that have specific thermal and dissolved oxygen requirements to survive (e.g., stoneflies).

2024 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 April 5, 2024 and was removed on November 6, 2024. During this timeframe, a total of 33.36" of precipitation was recorded, including eight rain events exceeding one inch (Figure 1). Above average monthly precipitation occurred in April (+1.08", total of 3.95"), May (+2.65", total of 6.23"), June (+3.63", total of 8.39"), and August (+2.58", total of 4.92"). Dry periods occurred in July, September, and October and resulted in below average precipitation totals for those months: July (-1.05", total of 3.64"), September (-2.44", total of 1.14"), and October (-0.71", total of 1.89"). Notable dry periods over the course of the monitoring season included: Aug. 30-Sept. 18 (0.27" in 20 days) and Sept. 22-Oct. 23 (0.00" in 32 days).

Air temperatures recorded at the weather station fluctuated above and below the average high and low temperatures throughout the monitoring season, and there were 4 days when the maximum air temperature exceeded 90°F (Table 1 and Figure 2). For the second consecutive year, water temperatures recorded in Brown's Creek at the WOMP station never exceeded a maximum water temperature of 70°F

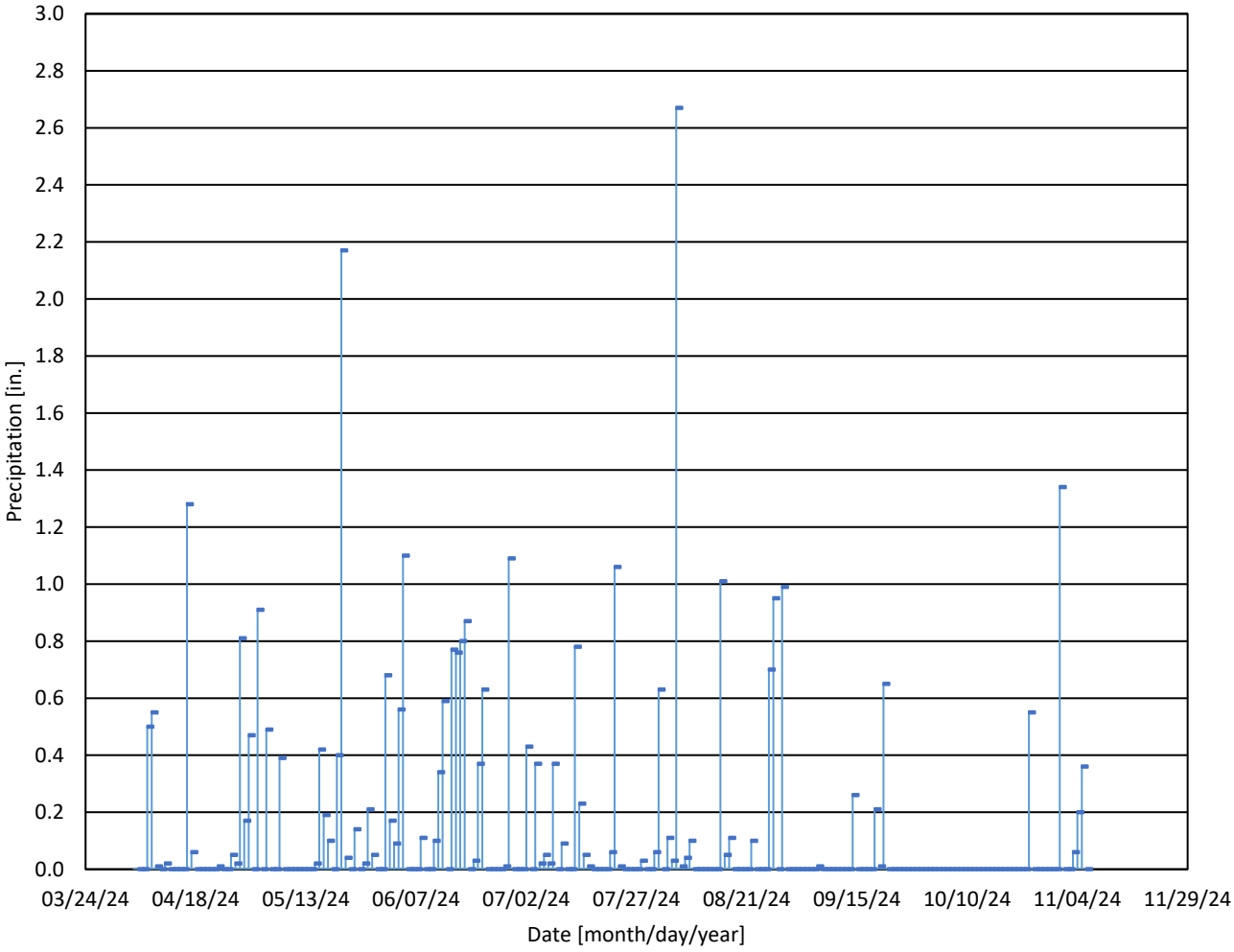

Figure 1. Daily precipitation recorded by the BCWD weather station (April 5 - November 6, 2024).

at any point during the year. This is notable since several aquatic species in Brown's Creek require cool water temperatures to survive. For example, brown trout can become physiologically stressed when water temperatures exceed 65°F, and young trout may stop feeding when water temperatures exceed 71°F (personal comm. MNDNR Fisheries).

There are multiple factors that influence instream temperatures that require detailed analysis beyond the scope of this project; however, the data summarized in Table 1 suggest that a combination of warm air temperatures with concurrent precipitation events appear to have a greater effect on instream temperatures than warm air temperatures alone. For example, since 2012, 2021 had the greatest number of days above 90°F and the warmest nights (nights when the low air temperature was above the average low), yet there was only one day when water temperatures exceeded 70°F at the WOMP station that year. 2021 was also the second driest year (from May 1-Sept.1) since the weather station was installed in 2012. Conversely, the years that had greater precipitation totals during warm weather periods had the greater

Table 1. Air and water temperature trends for Brown's Creek during warm weather months (May 1-September 1, 2012-2024)

Year	# days with max. air temp above 90° F	# nights with low air temp above average low [°F]	Average low air temp. above average low [°F]	# days when WOMP water temp. exceeded 70°F	Total precip. May 1-Sept 1 [in.]	Total precip. [in.] on days when WOMP water temp. exceeded 70°F
2012	20	43	5.10	21	17.26	5.28
2013	12	34	4.74	11	17.31	2.12
2014	0	25	4.64	7	21.28	0.10
2015	2	25	3.37	4	21.14	1.55
2016	12	38	3.79	10	20.80	4.96
2017	9	16	3.27	0	17.12	N/A
2018	18	45	4.58	8	15.84	3.10
2019	5	15	2.02	1	22.93	0.83
2020	15	42	4.20	8	21.68	3.14
2021	34	33	7.03	1	12.14	0
2022	16	30	4.69	1	13.30	0
2023	24	34	4.03	0	9.26	N/A
2024	4	29	3.51	0	25.76	N/A

number of days when the WOMP water temperature exceeded 70°F. Since the weather station was installed, 2023 had the second most days above 90°F but was also the driest year (from May 1-Sept.1), and WOMP water temperatures never exceeded 70°F at any point during the monitoring season.

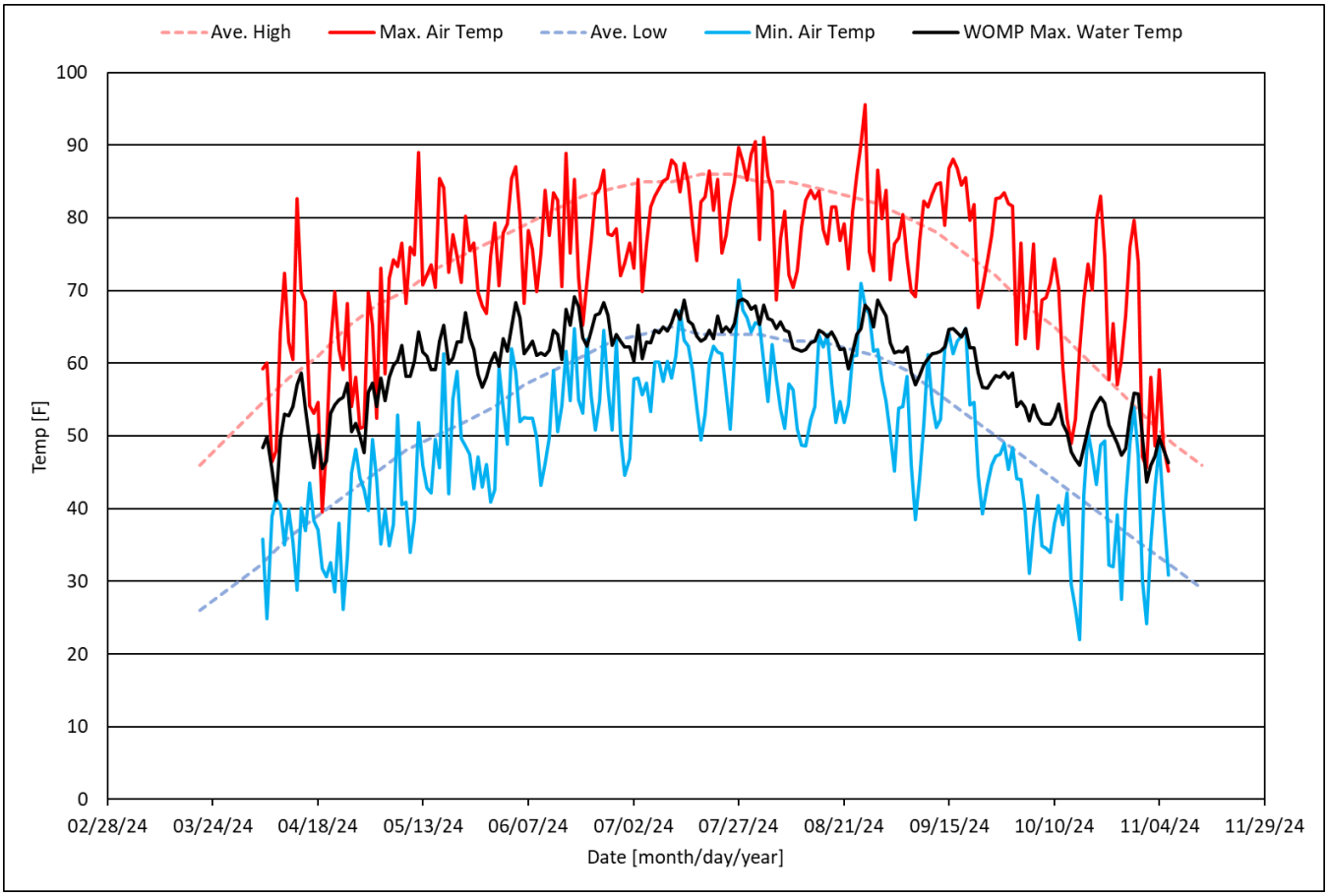

Figure 2. Daily maximum and minimum temperatures recorded by the BCWD weather station and WOMP daily maximum water temperatures recorded by the WCD/ Met Council. Average air temperature data source:

https://weather.com/weather/monthly/l/45.067273,-92.854033

Weather Station Maintenance

Prior to equipment installation, the precipitation gauge was calibrated to a simulated one-inch rain event according to the manufacturer's specifications. During the monitoring season, the weather station was visited periodically to download data and check for sensor fouling. All weather sensors were inspected in the fall of 2024 and no upgrades or replacements are needed at this time.

2025 Scope of Services

The following outlines the costs associated with equipment preparation, precipitation gauge calibration, data collection, and reporting for the 2025 monitoring season (March to November). All data collected will be forwarded to the Washington Conservation District and other entities as requested.

Task	Hours	Estimated Cost
Precipitation Calibration & Installation of Weather Station	5	$780
Monthly Download of Data (~6 months)	7	$1092
End of Season Equipment Removal	3	$468
Data QA/QC & Report, Data Storage, & Distribution to the WCD	8	$1,248
Expenses	N/A	$388*
TOTALS	**23**	**$3,976**

* Includes the cost for sensor replacement if needed (temp/ humidity or pyranometer sensor)

Requested Action

1. Approve this scope of services from account number 957-0000 to operate the BCWD weather station in 2025.