United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Upper Midwest Water Science Center

Minnesota Office
2280 Woodale Drive
Mounds View, MN 55112
763.783.3100

Wisconsin Office
1 Gifford Pinchot Dr
Madison, WI 53726
608.828.9901

Michigan Office
5840 Enterprise Drive
Lansing, MI 48911
517.887.8903

April 11, 2024

Brent Brown
Jacobs Engineering
1610 N. 2nd Street
Suite 201
Milwaukee, WI 53212

RE: Summary comparison between City of Waukesha Clean Water Plant and USGS return flow Monitoring

Dear Brent,

I am pleased to provide a summary of the City of Waukesha return flow monitoring at the facility located on W. Oakwood Rd in Franklin, WI for the period January through March 2024. Daily volumes measured by the USGS are generally within 1% of those measured by the Clean Water Plant maintained by the city of Waukesha. Although USGS volumes are consistently greater than CWP, they are within normal levels of instrumentation and measurement error and can therefore be considered equivalent estimates. Additional detail is provided below for your review. Please do not hesitate to contact me should you have any questions.

Sincerely,

William R Selbig

William Selbig
Research Hydrologist
USGS – Upper Midwest Water Science Center

Waukesha Clean Water Plant Flow Monitoring: JANUARY – MARCH, 2024

Daily volumes measured by the USGS were slightly greater but generally within 1 percent of those measured by the Waukesha Clean Water Plant mag meter (CWP) (figure 1). Differences were greater than 4 percent over a 6-day period in early January (January 3rd – 8th) due to a small leak in the primary bubble line causing erroneous water levels resulting in unreliable USGS computed discharge and volume. Due to the location of the bubble orifice, determination of a correction factor for values measured on January 3rd – 8th was not considered practical because this would have required CWP pumps to be turned off and the facility drained of standing water to gain access. Instead, the secondary area-velocity meter was used to estimate discharge over this time period. The bubble line was repaired on January 9th and percent differences between USGS and CWP daily volumes quickly returned to within 1 percent difference.

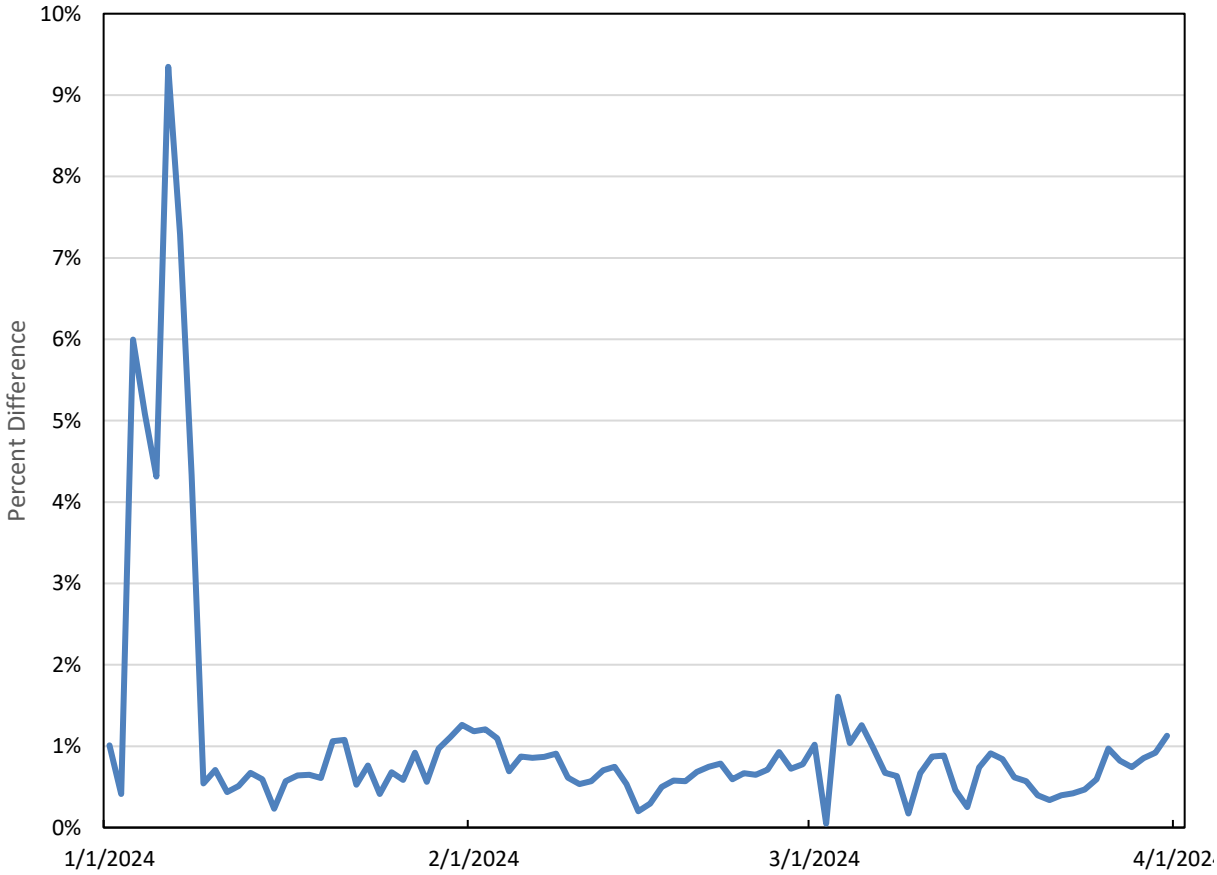

Figure 1. Percent difference between the USGS and CWP daily volume in January through March 2024. A positive value indicates USGS discharge is greater than CWP.

There was little variation in daily volume among and between each month with median values ranging from 710,000 to 715,000 cubic feet and coefficients of variation less than or equal to 0.05 (table 1). Monthly sums were similarly consistent with March having slightly more volume than January and February. February, having two less days than January or March, had the lowest monthly volume. Like daily volumes, differences between monthly sums were generally within 1 percent (table 1). The range of percent differences presented in figure 1 and table 1 is considered

acceptable and generally within the accuracy of the meter used to measure discharge at +/- 2 percent.

Table 1. Summary statistics for daily return flow volumes measured by USGS and CWP, January – March 2024. All values rounded to the nearest 1,000 cubic feet unless otherwise noted.

Statistic	JANUARY		FEBRUARY		MARCH	
	USGS	CWP	USGS	CWP	USGS	CWP
Days	31[a]	31	29	29	31	31
Minimum	568,000	599,000	711,000	710,000	709,000	708,000
Maximum	779,000	713,000	719,000	710,000	721,000	713,000
Median	715,000	710,000	715,000	710,000	715,000	710,000
Mean	712,000	703,000	715,000	710,000	715,000	710,000
Standard deviation	38,000	27,000	2,000	28	2,000	1,000
Variation coefficient	0.05	0.04	<0.01	<0.01	<0.01	<0.01
Sum	22,074,000	21,781,000	20,736,000	20,588,000	22,162,000	22,006,000
Sum, % difference	1.3%		0.7%		0.7%	

a – small leak in USGS bubble line affected about 6 days of USGS data