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

October 7, 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's return flow monitoring at the facility located on W. Oakwood Rd in Franklin, WI for the period **July through September 2024.** Daily volumes measured by the USGS were generally within 1% of those measured by the Clean Water Plant (CWP) maintained by the City of Waukesha. Additional detail is provided herein 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: JULY - SEPTEMBER 2024

USGS measured daily volumes were approximately 4% higher than those measured by CWP from July 1 – July 8, 2024. This discrepancy is likely due to stage values that fell outside the range of levels used for calibration on September 12, 2023. Observed discharge on July 1 – 8, 2024 was approximately 17.8 cfs throughout most of the day which corresponded to a stage value of 4.8 feet, approximately 0.20 feet greater than the maximum calibrated stage of approximately 4.6 feet (figure 1). Any stage value greater than 4.6 feet would have a higher degree of uncertainty due to extrapolation of the regression curve beyond the highest calibrated value. Stage values returned to within the calibrated range on July 9th resulting in USGS daily volumes to return to within 1% of CWP daily volumes and remained consistent through the end of the reporting period (figure 2).

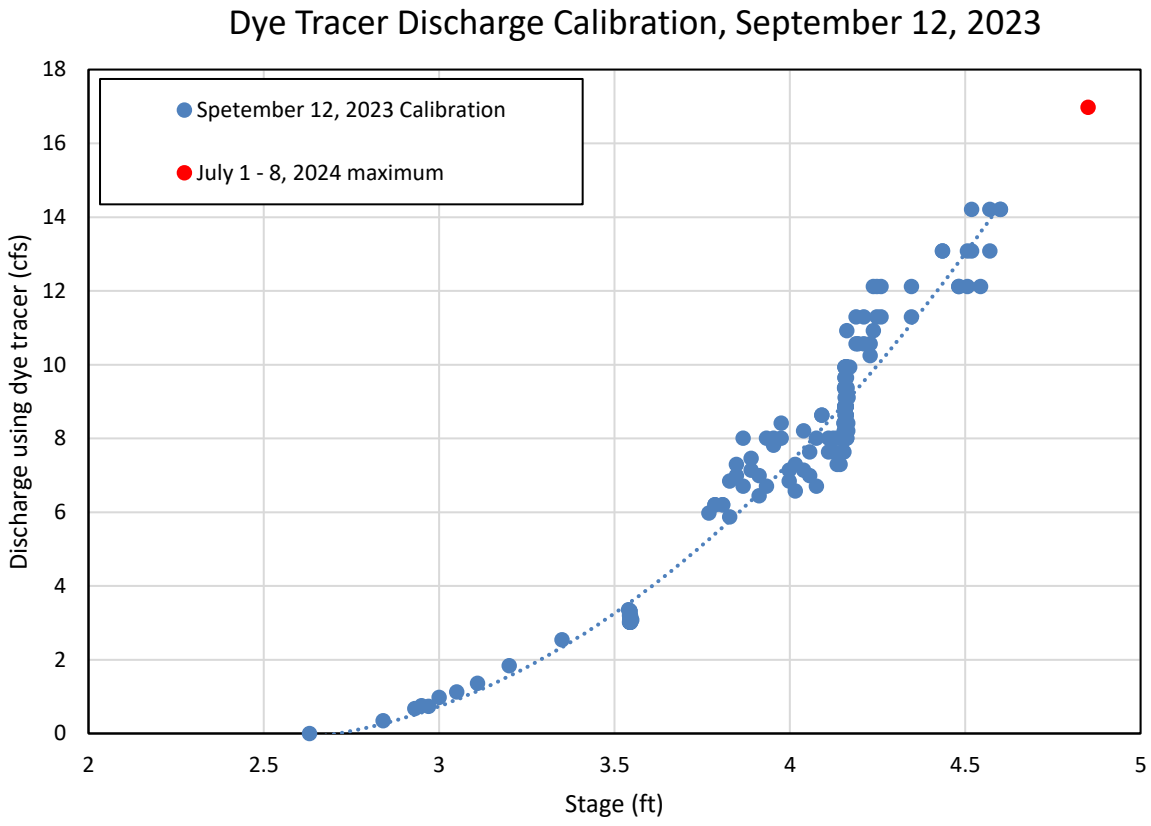

Figure 1. Range of stage values tested during the September 12, 2023 calibration. The maximum stage values measured during the July 1 – 8, 2024 return flow period fell outside this range creating greater uncertainty in discharge value.

There was little variation in daily volume among and between each month with median values ranging from approximately 709,000 to 715,000 cubic feet and coefficients of variation less than or equal to 0.01 (table 1). Monthly sums were similarly consistent with July having slightly more volume than August and September. The return flow discharge from July 1 – 8 was the largest measured discharge since the CWP went online in October 2023. September, having one less day than July or August, 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 2 and table 1 is considered acceptable and within the accuracy of the meter used to measure discharge at +/- 2 percent.

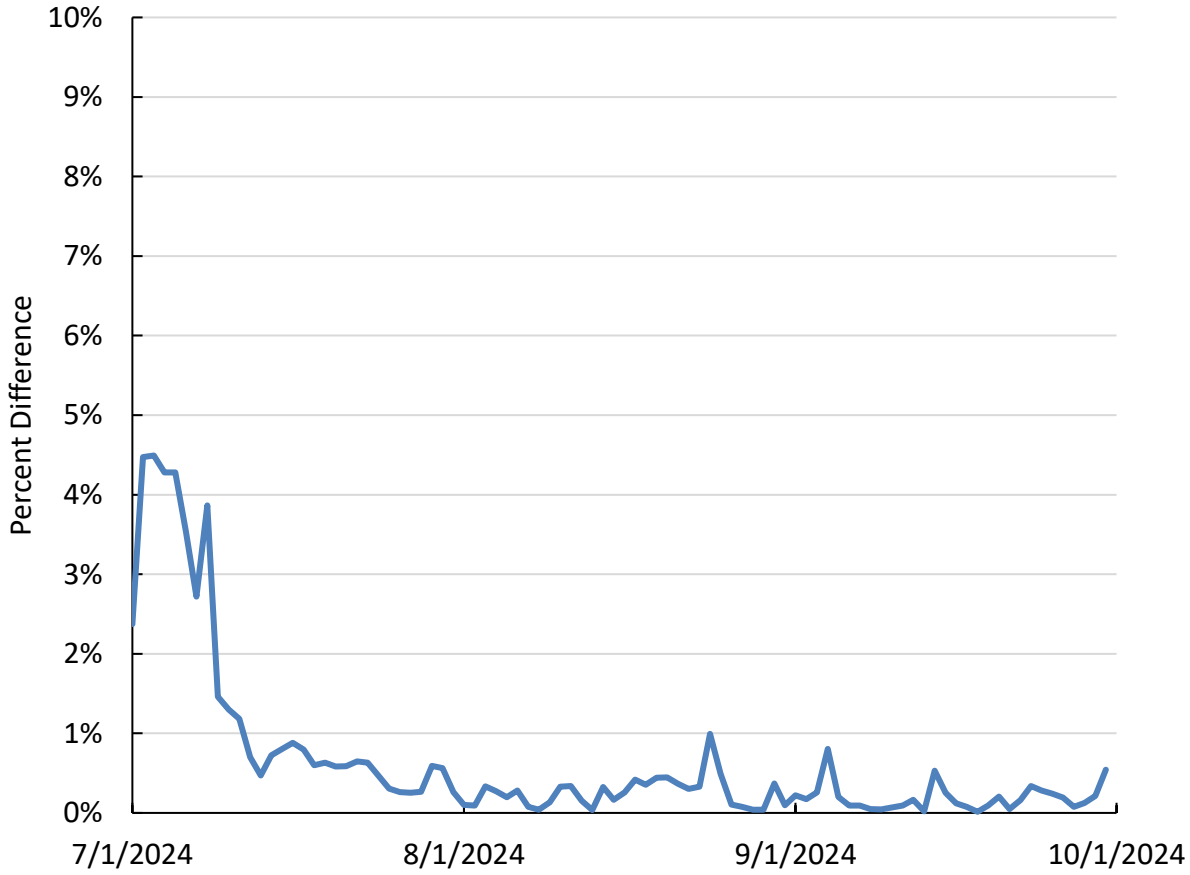

Figure 2. Percent difference between the USGS and CWP daily volume in July through September 2024. A positive value indicates USGS flow measurement is greater than the CWP's measurement.

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

Statistic	JULY		AUGUST		SEPTEMBER	
	USGS	CWP	USGS	CWP	USGS	CWP
Days	31	31	31	31	30	30
Minimum	711,317	709,435	702,918	708,473	707,461	705,863
Maximum	883,413	878,460	712,794	710,999	713,662	711,654
Median	715,370	709,903	708,739	709,889	710,061	709,869
Mean	725,854	715,372	708,963	709,914	709,937	709,682
Standard deviation	31,094	30,269	2,211	465	1,379	1,010
Variation coefficient	0.043	0.042	0.003	0.001	0.002	0.001
Sum	22,501,483	22,176,529	22,007,336	21,977,845	21,298,120	21,290,466
Sum, % difference	1.4%		0.1%		<0.1%	