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December 2, 2013

Kassie Lang
Wisconsin DNR DG/5
PO Box 7921
Madison, WI 53707-7921.

Dear Ms. Lang,

On behalf of Milwaukee Riverkeeper, I am submitting comments and questions for your consideration pertaining to the return flow plans detailed in the City of Waukesha's revised application for a Great Lakes Diversion (Volume 4 of 5). We also signed on to comments from Clean Wisconsin addressing all aspects of Waukesha's proposed diversion, which were submitted on behalf of the Compact Implementation Coalition, of which we are a part.

**Data extrapolation concerns**

Overall, there are minimal additions of substantive information relating to return flow since the 2010 application, with most additions pertaining to projected impacts on the Root River, which is Waukesha's new preferred return flow route. While there is some new information pertaining to projected impacts on the Root River, there is also significant extrapolation of water quantity, water quality, and fisheries/habitat information from earlier analyses conducted for Underwood Creek--some appropriate and others less so. Of particular concern is absence of any Root River specific impact on habitat and fisheries conducted for this application. There is not even any desktop analysis of whether or not the fish species assemblage found in Underwood Creek and the Root River are similar and thus comparable. While the Root River and Underwood Creek share some characteristics due to their size and urban nature, there are considerable differences in watershed size, stream morphology, and land use. There is also no Root River specific analysis on sheer stress and erosion potential, except for extrapolation from an earlier Underwood Creek analysis, which seems unrealistic given that Underwood Creek is concrete channelized as opposed to the Root River, and given also that the gradients, numbers of meanders, soils, and size of these watersheds differ greatly. In addition, Waukesha's new proposed return flow management scheme is drastically different than the proposed Underwood Creek regime, which would essentially divert anything over a 2-year flow to the Fox River. The new preferred Alternative (Alternative 5) would divert up to the maximum 16.7 MGD back to the Root River, and send excess waters down the Fox River. Given this change, which would send water back to the Fox River on an increased basis, there is no updated analysis on projected impacts of this alternative on flows and habitat particularly for the Fox River (other than saying that levels would be reduced by the amount of the diversion).

Another example of an extrapolation that does not seem reasonable pertains to thermal impacts or namely that Waukesha could meet thermal regulations in NR102 and NR106 for a discharge to the Root

River by using a similar mixing zone analysis developed for the Fox River. Waukesha argues that since their return flow is not "hot", and since they were given an exemption from effluent thermal limits for their Fox River discharge based on a mixing zone study, that "thermal limits are not needed" for the Root discharge. Waukesha states that they would do additional analysis should the application be accepted, but it seems that they should have conducted a preliminary analysis for the Root River instead of referring to an analysis for the Fox River from Strand Associates (2011) that is not included in the application. They do state that in the absence of an acceptable mixing zone or attempts to use more site specific water quality information to get around meeting thermal standards, that Waukesha would have other "buildable" alternatives such as treatment wetlands and multiple outfall construction that could address thermal issues. Information on Waukesha's ability to meet thermal regulations should be a part of the EIS and technical review, as State implementing regulations state that any water diversion must meet state and federal laws. It seems impossible that WDNR would have enough information to make a determination at present of whether or not Waukesha's discharge could meet thermal regulations.

**Data analysis concerns**

There is also considerable confusion as to the data analyzed/time periods covered as one goes through Volume 4. While we understand this could be in part due to data availability or other issues that we are unaware of, it seems that data analysis in particular relating to years of data analyzed seem to vary considerably for unknown reasons. To the casual observer, it seems Waukesha is "cherry picking" to represent the best statistics. For example, Waukesha and its consultants only looked at two years of data to assess flow rates--2005 and 2008--which were a dry and wet year, respectively. We've commented several times over the last 3+ years that this analysis did not seem suitably robust enough for Underwood Creek, but this was approach was replicated for the Root River analysis. We also though this analysis did not adequately consider projected climate impacts or the concern that future flows can no longer be entirely predicted by looking solely at past flows.

It does appear that the hydraulic conditions information (Appendix K) is based on many years of data as incorporated into the SEWRPC Regional Water Quality model, but it's unclear what exact time period was used. For example, was data for the entire time range of the Regional Water Quality Management Plan used (1975-2001) or the updated data for the Root River Watershed Restoration Plan or some combination of both? Given that only two years of data were used to look at water level impacts, it was surprising that the consultants looked at daily average and 7-day rolling average flow rates over a 49 YEAR PERIOD at each Root River USGS stream gauge when trying to justify Waukesha's claim that they will be able to meet rigorous thermal standards for the Root River (using mixing zones and dissipation of heat downstream). Why was this data set not used when coming up with water level/flow information if it was available? The water withdrawal and return flow volumes for each management plan alternative (Exhibit 4) use actual daily water demand and WWTP flow from Waukesha between 2005 and 2012, which doesn't correspond to the return flow volumes. Similarly, data for the water quality model is based on data from October 2002 through August 2009 to represent a conservative scenario based on higher flow rates and maximum discharge (Appendix M), but did not include a year of epic flooding in 2010. The thermal analysis only looked at Root River effluent limits and effluent temperature data from December 2010 to March 2013 (Attachment A-5). Chloride concentrations were reviewed from March 2006 through May 2013 (Attachment A-4). It's hard to make data comparisons from one appendix to another, as it seems that the information is often apples and oranges.

**Water quality and erosion concerns**

Waukesha currently has a variance from meeting mercury levels as well as has a compliance schedule to meet chloride levels. While Attachment A-3 (WDNR memo on likely limits for Waukesha's discharge to return flow streams) notes that Waukesha will have to meet a new 1.3 ng/l limit for mercury, there is no information given on Waukesha's existing mercury effluent limits anywhere in Appendix A or Appendix M or anywhere else in Volume 4. Given that the return flow will discharge to Lake Michigan, which is a public water supply, this is of concern. There was some conversation about historical heavy metal contamination, but nothing other than cursory statements regarding mercury.

There is a separate appendix on chloride limits for return flow and Waukesha's compliance plan (Attachment A-4), which is very informative. The City's existing limit for discharge to the Fox River is 690 mg/L with a target value f 440 mg/L. The WDNR has intimated that the limit for a Root River discharge (or Underwood Creek discharge) would be 395 mg/L (Attachment A-3). Waukesha acknowledges that to meet this new limit, they will have to reduce chloride loading from residential and industrial/commercial customers by at least 60 percent (after looking at source reduction from the new water supply and other salt application reductions). This seems to be a very aggressive and perhaps unrealistic in the near term. Would WDNR allow for a compliance plan to meet chloride discharge limits into the Root River? Is there data on how much chloride was reduced when New Berlin and the west side of Menomonee Falls converted from well water to Lake Michigan water? It's hard to know whether these chloride reduction assumptions are valid or not. It's also possible that Waukesha treatment plant upgrades will address this issue, although it is unclear what those upgrades are meant to address as there is no documentation other than general references to their facility plan (Strand, 2011).

The water quality model developed for the Root River is also confusing (Appendix M). It seems that there was an analysis of water quality effects under an expected discharge condition (based on historical data) and a maximum potential discharge assuming the 16.7 MGD maximum daily water demand (which translates to around 18 cfs addition to base flow). Given that during low flows, this would constitute a 300% increase in flow, one would expect to see some major impacts on water quality at the point of discharge. Yet the data show that phosphorus would increase slightly below the return flow location and other parameters would largely be unaffected. The model also shows that largely under all scenarios and in all steam reaches, phosphorus levels are expected to remain the same or decrease. In addition, the model projects that for all months, Total Phosphorus levels will be exactly 0.075 mg/L (when other parameters vary month to month based on conditions)? Is this wishful thinking or a model limitation or why do the numbers for TP, Ortho-P, and Org N not differ on a monthly or seasonal basis? It's unclear.

The model also shows that Total Suspended Solids (TSS) will decrease essentially at all locations within the river system, which seems misleading given that sediment transport will likely occur given huge changes in baseflow volumes of the Root River. While water quality could be improved just downstream of the return flow point for some parameters such as TSS, it is likely that bank erosion and scour will also cause movement of sediment downstream, which could impair water quality and wildlife habitat (affecting areas where fish lay their eggs and macroinvertebrates live). Waukesha is proposing to discharge an average of 11.7 MGD (the daily average 10.1 MGD amount plus out of basin volumes), that is roughly an 18 cfs increase, with an 25.8 cfs increase projected for the daily maximum of 16.7 MGD. Given that at the return flow site, that the daily discharge exceeds 18 cfs about 50% of the time now, that means that the discharge rate will be nearly doubled for at least half the time. This increased velocity is likely to cause erosion, especially on outside banks (there are about 10 major switchbacks according to SEWRPC), in areas with steep gradient (largely negligible or under 10% of stream miles under 6% gradient according to SEWRPC), and in areas of sensitive soils. It seems that the EIS should

take a better look at changes to sheer stress, erosion, etc. as applied to existing Root River data (compiled by SEWRPC) and then equate that also to sediment transport (using existing MMSD models) and impacts on fish and aquatic life. The only sheer stress/erosion analysis conducted pertains to Underwood Creek.

**Fisheries and aquatic life concerns**

In Appendix C, Waukesha states that the average maximum velocity for northern pike is 1.5-1.7 fps (based on Underwood Creek effluent return evaluation from MMSD). It then goes on in later appendices to emphasize the benefits that base flow increases will have, particularly in spring, for salmonids returning to the Root River from Lake Michigan but does not refer again to impacts on native species. The return flow effects on hydraulic conditions of the Root River analysis (Appendix K) shows that at the return flow location, that average river velocities would largely fit into this range with return flow that are ideal for northern pike (used as a surrogate for other native species that aren't strong swimmers). However, velocities for return flow at the steelhead egg harvesting facility only meet this northern pike criteria during low flow and vastly exceed this criteria from the 2-year to 100-year flood scenarios yielding from 3.45 to 5.05 fps, respectively. This seems another attempt to"cherry pick" the data or "fish" to emphasize the potential benefits of return flow for salmonids, while negating or not fully considering the flow effects on northern pike and other native fish species (some of which to be fair would undoubtedly be positive). In addition, given the major collapse of Lake Michigan fisheries' forage base and decreasing fish weight due to lack of food, the future of salmon stocking to Wisconsin tributaries is very much in question. Thus, benefits to these introduced species should be weighed with benefits/costs to native fish species as well.

It would seem that increased velocities and likely sediment transport could also negatively impact macroinvertebrate species as well as mussels. There is little to no info on these organisms in the Root River or even an appendix with existing HBI and IBI data in Volume 4 (as reported by SEWRPC in multiple plans), and these species should be more fully considered as part of the EIS and technical review. On the flip side, increased flows could help water quality parameters such as oxygen, which could be helpful in upstream portions of the Root River that have problems meeting oxygen standards and that have led to a largely pollution tolerant fisheries assemblage and fairly low HBI indexes.

Even though volumes and depth would likely increase due to return flow, which could benefit salmonid populations, it seems a bit of an over-statement that this continuous return flow would be a drastic improvement to these fisheries. Chinook and Coho spawn during the fall, and are likely impacted by low flows. Brown Trout and Steelhead spawn in both spring and fall. In addition, most salmonids respond both in spring and fall to "pulses" of flow brought about by rain events, after which salmon and trout push upstream, and it's unclear whether continuously increased flows would have a major impact lacking further analysis. Since spring flows are generally high, it is likely that return flow will not be that significant in spring either in a positive or negative way; however, there is more interest in enhancing conditions for fall spawning fish when flows are reduced.

A group of UWM students working with Tim Ehlinger (Maraijko et. al, 2013) modeled impacts of flow levels from spring of 1998 to fall of 2012 on salmonid populations in the Root River. The greatest impacts on population, although not significant statistically, were for Chinook and Steelhead populations that did show some correlation with increased flows (or return flow) during the autumn months using a linear model. However, after normalizing the data to remove bias (using a natural log based model) , more conservative projections show that there were no significant population changes based on projected flow increases from Waukesha's return flow in autumn months (there was not robust data

available for the other two species). Students determined that an increase of around 15 cfs would not result in a major increase in salmonid populations. Using the flow/population graphs developed by the students, there seems to be no major increase in populations of Chinook or Steelhead for an 18 cfs increase in flow (using numbers from the revised application). The info supporting the benefits to the DNR rearing facility consist of a one page letter from Brad Eggold (Appendix L) and some cross sections of the Root River in low and high flow at the rearing facility that only show water level differences (Attachment B to Appendix K). The purported benefits from the return flow on the rearing facility need to be better documented.

Thank you for your consideration of these comments and questions.

Sincerely,

Cheryl Nenn
Riverkeeper