MEMORANDUM

To: Eric Osterdyk, Wenck Associates
Todd Shoemaker, Wenck Associates
Chris Meehan, Wenck Associates

From: Brian Beck, Minnehaha Creek Watershed District

Date: 1/7/2019

Re: City of Long Lake P8 Model Comment Responses

Purpose:

The purpose of this memo is to respond to comments made by Wenck Associates with respect to the City of Long Lake P8 model. Please see MCWD's responses (*italics*) to Wenck's comments (**bold and underlined**) outlined below.

Response to General Model Comments

Wenck Comment: Total watershed impervious percentages and pervious area curve number seem reasonable, but we do not have adequate data to verify.

MCWD Response:

We have supplied the spreadsheets used to calculate curve numbers and impervious fractions. In addition. The shapefiles used to derive the numbers for the spreadsheets have been attached.

Wenck Comment: Directly connected and indirectly connected fractions seem reasonable, but we do not have adequate data to verify. The directly connected fraction is different for each watershed. Since it is unlikely that these were measured for each individual watershed, justify directly connected impervious fraction.

MCWD Response:

We have attached the spreadsheets used to calculate curve numbers and impervious fractions. In addition. The shapefiles used to derive the numbers for the spreadsheets have been attached.

Wenck Comment: Permanent pool and flood pool volumes see reasonable, but we do not have adequate data to verify.

MCWD Response:

The only measured pond information MCWD staff could obtain was for MCWD ponds. We used the volumes from Wenck pond surveys for the ponds located in watersheds LLC-2 and LLC-4.

MCWD was required to make assumptions about the pond volumes due to a lack of information. MCWD had requested data on pond volumes, as-builts, and pond designs from the Cities. We have yet to receive that information from the Cities. In addition, we have requested pond design data from our permitting department. To date, we have yet to receive any information on pond volumes. Therefore, we estimated the permanent pool volumes by assuming an average depth of 3 feet, which was multiplied by the pond permanent pool area to arrive at the permanent pool volume. For flood pool, we assumed a 2 foot depth multiplied by the flood pool area.

We used LiDAR to characterize permanent pool and flood pool areas. MCWD has supplied the "watershed device" shapefile that resulted from the flood pool and permanent pool GIS exercise.

We will update volumes if we receive any information from the Cities or our permitting department.

Wenck Comment: Several shallow lakes or wetlands are modeled as "pond" devices. May need to adjust particle removal scale factor. Consider using BATHTUB.

MCWD Response:

All lakes have already been modeled in BATHTUB. P8 is being used to supply watershed loading and BATHTUB is being used to estimate in-lake TP concentrations.

Wenck Comment: Overall, predicted pollutant removals are very high (93.7% TSS and 55.5%TP). Modeling lakes as settling ponds in P8 may overestimate removal rates.

MCWD Response:

As mentioned before in meetings, lakes are being modeled outside P8. The lake volumes were included in P8 since it seems odd to leave them out of the watershed model.

With that being said, you have keyed in on why it is impossible to calibrate the watershed models for water quality parameters in P8 if there are upstream lakes in the watershed. There are no monitoring locations without upstream lakes, which means that the P8 models would not accurately model watershed concentrations.

MCWD has mentioned that BATHTUB lake models will be calibrated with lake sampling data. This will be the primary calibration step in the process. MCWD will continue to update models as data is collected in the future, but the current stream dataset is inappropriate to use for P8 calibration. Therefore, the focus of calibration will be on the lake models.

Wenck Comment: All pond devices are modeled with a 24-inch orifice outlet for simplicity. Consider modeling specific outlet types for each pond such as orifice, weir, and riser outlet types.

MCWD Response:

MCWD will be conducting a culvert/device outlet inventory in 2020. Until then, we made assumptions about outlets for devices.

Wenck Comment: Wenck recommends calibrating the P8 models to monitoring data. Calibration is important since the Long Lake watershed is mostly rural, low density residential land use and P8 is intended for urban areas. Calibrating the models will result in more accurate runoff concentrations and loading rates for the specific land uses in the study area.

The GIS data indicates seven monitoring stations within the study area. It does not appear that the P8 models has been calibrated since particle files and WQ components remain at the default values. Wenck understands calibration has been held off to collect additional monitoring data for 2019 before editing the models.

MCWD Response:

It is important to note that a GIS monitoring point might mean that there was one TP sample collected without flow data at some point in history. In addition, it is important to note that MCWD has never collected storm samples in the Long Lake Creek subwatershed. In addition MCWD only began collecting continuous flow data at the outlet of the Wolsfeld Lake and outlet of the Holy Name/Deerhill pond subwatersheds in 2018 and 2019. What does this mean:

1) *There is no actual stream water quality data to calibrate the model for TP and TSS since there are no storm samples available. It is well documented in literature that annual loads will be dramatically under estimated using only baseflow samples.*
2) *There is no flow data for the downtown Long Lake model, which means it cannot be calibrated for annual volume.*

MCWD is in the process of buying storm samplers and level loggers to deploy in the downtown City of Long Lake watershed, but that data won't be available until the end of 2020. Therefore, any calibrations would be randomly adjusting the model to literature values since there is no actual data to calibrate the models.

Response to City of Long Lake Specific Comments:

Wenck Comment: Subwatershed area in P8 does not match areas in GIS for LLC-10. It is possible that the discrepancy is due to accounting for pond area since the GIS area is higher than the P8 area. Subwatershed area in GIS is 174 acres, where the area in P8 is 162 acres.

MCWD Response:

MCWD used the 2016 Met Council's dataset for landuse, which also includes "open water". Any area labeled "open water" was removed since having open water in the P8 model will result in an overestimate in pollutant runoff. The data used to create watershed areas was included in a spreadsheet format.

Wenck Comment: Consider adding a pond device or combining subwatershed with downstream watershed containing a pond device for simplicity. Pipe devices receive no pollutant removal and are superfluous unless a time of concentration is added. Below is a list of watersheds currently modeled with a pipe device:

- **LLC-2**
- **LLC-10**
- **LLC-29**
- **LLC-30**
- **LLC-31**

MCWD Response:

Devices were added to LLC-2 and LLC-10. The LLC-2 volume was based on the most recent Wenck pond survey. The LLC-10 device volume was based on Dickey's Lake volume. It is important to note that MCWD staff will be using measured TP concentrations from Dickey's Lake and runoff volumes from P8 to calculate loading for the Long Lake BATHTUB model.

Wenck Comment: Clarify downstream routing for device LLC-3. GIS attributes show LLC-3 discharges to LLC-1. P8 indicates LLC-3 discharges to LLC-2. LiDAR appears to indicate that LLC-3 discharges to LLC-2.

MCWD Response: This was fixed in the P8 model.

Wenck Comment: Verifying loading rates results

MCWD Response: Not possible without storm sampling data and continuous flow data.