Item 5G.
BCWMC 7-21-16

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Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Company
Subject: Item 5G –Receive Update on XP-SWMM Phase 2 Project
BCWMC July 21, 2016 Meeting Agenda
Date: July 13, 2016
Project: 23/27-0051 2015

5G Receive Update on XP-SWMM Phase 2 Project

Recommendations

- Information only

Status Update on Work for the XP-SWMM Model (Phase 2)

The following items summarize the status of the work completed to date on the development of the BCWMC XP-SWMM Phase 2 model. The 2015 scope focused on the development and calibration of the XP-SWMM models for the Medicine Lake and Plymouth Creek (including Parkers Lake) watersheds. This work was complete in January 2016.

The 2016 scope focuses on the development and calibration of the XP-SWMM models for portions of the watershed downstream of Medicine Lake, including: the North Branch of Bassett Creek, the Bassett Creek Main Stem from Medicine Lake to the confluence with the North Branch, and the Bassett Creek Main Stem downstream of the confluence with the North Branch (including the Sweeney branch). A portion ($93,000) of the 2016 work is being funded by a DNR Flood Reduction grant. The remainder of this memo summarizes the status of the work being completed in fiscal year 2016 (through January 2017), including a budget status table at the end of the memo.

As noted in item 3 below, we requested information from city staff to fill in data gaps for the model. City staff gathered and transmitted important data to us for use in the model's development. We acknowledge and thank city staff for the (sometimes significant) number of hours they spent on this task. Without this assistance from city staff, the BCWMC's project costs would have been higher.

1. **Subdivision of watersheds: *Task nearly complete.*** We subdivided the North Branch of Bassett Creek and Bassett Creek Main Stem subwatersheds based on the existing BCWMC P8 model subwatersheds. We made minor revisions to subwatershed divides in a few locations within the XP-SWMM model to better address the needs of hydrologic and hydraulic modeling and to reflect any new data obtained during this process (e.g. storm sewer information, as-built drawings, topography). For the portion of the watershed within the City of Minneapolis, we are coordinating with the City of Minneapolis' North Minneapolis XP-SWMM modeling project that is also underway. We will be utilizing the subwatershed information developed for the North Minneapolis modeling project and recently reviewed

and approved by City of Minneapolis staff. The resolution of the North Minneapolis modeling is much more refined (e.g. watersheds to individual catch basins and catch basin clusters), so we will be merging subwatershed as appropriate based on storm sewer information and expected surface storage in the streets. Based on the new XP-SWMM watershed divides, there are 122 subwatersheds in the North Branch Bassett Creek model area and 364 subwatersheds in the Bassett Creek Main Stem model area (including Wirth and Sweeney Lake, from the outlet of Medicine Lake to the City of Minneapolis boundary). The final number of watersheds for Bassett Creek Main Stem model area will increase after the merging with the North Minneapolis watersheds.

2. **Developing revised watershed hydrology inputs: *Task nearly complete.*** We used the revised United States Department of Agriculture's (USDA) Soil Survey Geographic Database (SSURGO) soils data to develop infiltration parameters based on the assigned hydrologic soil groups. For unclassified soil types, we will assume C soils, which is the predominant hydrologic soil classifications in the Bassett Creek watershed. Most of these unclassified soil types are present in largely impervious areas, where little rainfall infiltrates and the runoff is driven by impervious land cover. Average subwatershed slopes were developed based on the Minnesota Department of Natural Resources (MnDNR) 2011 LiDAR dataset. The initial subwatershed widths (an input parameter used for XP-SWMM) were developed based on the subwatershed areas and the longest flowpaths through the subwatershed. We developed the subwatershed imperviousness, which is based on the 2011 University of Minnesota Twin Cities metro area imperviousness data set and 2010 Metropolitan Council land use information. Watershed inputs were developed for the majority of the watershed, with the exception of the subwatersheds within the City of Minneapolis. As mentioned above, we are in the process of merging subwatersheds developed and approved for the North Minneapolis modeling and once complete, we will develop the watershed hydrology inputs.
3. **Modeling of storm sewer & outlet structures: *Task nearly complete.*** We used storm sewer information obtained during BCWMC P8 model revisions, focusing on the data from the Cities of Golden Valley, New Hope, Crystal, Robbinsdale, St Louis Park, and Minneapolis in 2016. This storm sewer data will be included in the Phase 2 XP-SWMM model, and primarily includes storm sewer that convey flows between each of the modeled ponds. Based on the original storm sewer data from the cities (in GIS format), we developed a list of "data gaps" where data required for modeling was not available. If possible, we utilized BCWMC plan review information (as available) or made reasonable assumptions for missing storm sewer data based on available surrounding data. However, if this was not possible, we developed data requests specific to each city requesting they provide (or help provide) the additional required storm sewer or pond outlet data (e.g. record drawings, storm sewer data). The Cities of Golden Valley, New Hope, Crystal, Robbinsdale, and St Louis Park

provided information in response to our requests (as available) and we have complete storm sewer and conveyance data for these portions of the watershed. Again, for the portion of the watershed within the City of Minneapolis, we will be utilizing the pipe network and conveyance information developed for the North Minneapolis modeling project. This information has been reviewed by City of Minneapolis staff and they are in the process of responding to comments; however, the draft of the North Minneapolis XP-SWMM model should be complete in August 2016.

4. **Integrating detailed storage within the watershed: *Task nearly complete.*** Based on the final subwatershed divides, we developed the storage curves using the MnDNR 2011 LiDAR data for the portions of the watershed between the outlet of Medicine Lake and the City of Minneapolis. Once we complete the merging of the subwatersheds within the City of Minneapolis, we will develop the storage curves for those subwatersheds as well. For storage along the Bassett Creek channel, we will use the cross section information used in the current (Phase 1) XP-SWMM model; the Phase 1 cross-section information was developed using the 2011 MnDNR LiDAR data and the previous BCWMC HEC-2 model data.

5. **Ensuring consistent vertical datums: *Task complete.*** The majority of the Phase 1 XP-SWMM model was developed in NAVD88; however, portions of the model were in NGVD29. The BCWMC Phase 2 XP-SWMM model is being developed in NAVD88. The areas in NGVD29 in the Phase 1 model were converted to NAVD88, so the vertical datums will be consistent throughout the model. This included conversion of existing models for the DeCola Ponds, Wirth Lake, and Sweeney Lake watersheds from NGVD29 to NAVD88. We contacted the Cities of Golden Valley, Crystal, Robbinsdale, and New Hope to verify the vertical datum of the available information from the Cities. Additionally, the information being developed for the City of Minneapolis North Minneapolis model is in NGVD29 and will be converted to NAVD88 before it is imported into the BCWMC Phase 2 model.

6. **Incorporating Atlas 14 precipitation data: *Task underway.*** We are running the XP-SWMM models using the Atlas 14 precipitation depths and the "MN MSE3" storm distribution (replacement of "Type 2" storm distribution, developed by the Natural Resource Conservation Service (NRCS) and approved in early 2015) for the 100-year storm event. Through this process, we will capture any "lost water" associated with this event and ensure all water is routed appropriately in the model. Once the model is fully calibrated, we will rerun the model using the Atlas 14 100-year storm event to develop peak flood elevations and inundation mapping for the portion of the watershed downstream of Medicine Lake.

7. **Flow monitoring & model calibration: *Task underway.*** For the 2016 modeling effort, we will be calibrating the model at three locations within the watershed downstream of Medicine Lake. In 2015, we installed a flow monitoring station on the North Branch of

Bassett Creek at Douglas Drive and collected data from late-June 2015 to November 2015. This data will be used to calibrate the North Branch Bassett Creek model. We have also obtained elevation data at the Wisconsin Avenue control structure from the automated SCADA system from the City of Golden Valley. This data is available from September 2014 through May 2016 and will be used to calibrate the Bassett Creek Main Stem model from the outlet of Medicine Lake to the Wisconsin Avenue control structure. Finally, we have obtained the 2015 Watershed Outlet Monitoring Program (WOMP) flow data for the monitoring station upstream of the entrance to the tunnel. This data will be used to calibrate the portion of the model downstream of the Wisconsin Avenue control structure and the confluence with the North Branch.

Additionally, we have selected two calibration events (one smaller event and one larger event) and a validation event from 2015. We are processing the NEXRAD data and local precipitation gage data from these events to develop the spatially-varying precipitation inputs for the XP-SWMM model for calibration.

8. **Develop a modeling methodology report:** ***Task underway.*** Work completed includes documentation of modeling assumptions and general methodology. A full report will be developed upon completion of the XP-SWMM model calibration.

Budget Update on Work for the XP-SWMM Model (Phase 2) – Work completed through July 1, 2016)

Task	Original Budget Amount	BCWMC Funds Spent To-Date	DNR Flood Reduction Grant Spent To-Date	Budget Remaining
2015 Tasks				
Plymouth Creek & Medicine Lake Direct Modeling, and North Branch Flow Monitoring	$103,000.00	$102,975.24	$0	$24.76
2016 Tasks				
North Branch & Main Stem Modeling, and Report on Modeling Methodology	$158,000.00	$ 53,583.50	$13,838.00	$90,578.50
Project Total	**$261,000.00**	**$156,558.74**	**$13,838.00[1]**	**$90,578.50[2]**

1 – Total DNR Flood Reduction Grant Awarded = $93,000

2 – Does not include $24.76 remaining from 2015, which was not carried over into 2016.