Appendix A

Review of CLFLWD XP-SWMM Model

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TECHNICAL MEMORANDUM

TO: Comfort Lake Forest Lake Watershed District
Randy Anhorn, Administrator
Board of Managers

FROM: John R. Thene, P.E., Project Manager
Pamela Massaro, P.E., Project Engineer

DATE: December 21, 2006

SUBJECT: Comfort Lake Forest Lake Watershed District
Water Quality Modeling and Design Services
Task 4 – Review of XP-SWMM Model

Review of Scope

Task 4 Review of XP-SWMM Model for FIS Map Submittal

Wenck will review the existing CLFLWSD XP-SWMM model against FEMA standards for floodplain analysis and against other accepted practices. Following review, Wenck will prepare a technical memorandum to the Managers summarizing the review and identifying any necessary work required before submittal to FEMA and preparation of new Flood Insurance Study maps. (Any such revisions for the purpose of floodplain mapping could be completed by Wenck at additional cost, if requested.)

Review Results

The model, in its current state;

- Generally meets professional standards of care for prediction of flood elevations, although some deficiencies have been identified, and require correction and/or explanation (see below.)
- Does not meet the higher FEMA standards of care for model-building and documentation, and is not ready to submit to FEMA without additional work.
- Will meet our needs to complete our study, but
    - SRF is addressing some issues, directly related to their report and model. These must be completed before we can initiate our modeling study.
    - Wenck is required to make some revisions, addressing remaining issues, as we initiate our modeling study.

Resolution of Model Issues with SRF

Wenck completed the detailed model review and identified potential technical issues. Then, Wenck, along with Administrator Randy Anhorn, met with SRF on Wednesday, December 13, 2006 to discuss and resolve issues. The meeting was not in our proposal or budget, but was required because the report lacked discussion of SRF's modeling building methodology. The meeting was productive and insight was gained on methodologies used by SRF. SRF will submit the following revisions to the Hydraulic Capacity and Model Calibration report (May 2005):

- Reprint Figures 8A – 9E with datum note correction
- Respond to comments regarding discrepancies between surveyed structures (report Table 1) and modeling files (SRF plans to set delivery schedule in early January.)
    - Provide footnote for Arch Pipe dimension reported in Table 1.
    - If necessary, submit revised models & output files.
- Respond to comments regarding model water losses (flooding at modeled nodes) and storage definitions at 8 lakes. Specifically addressing question about effect on flooding values reported in the report's Tables 3, 4, 5, 6 and Figures 5 & 6.

SRF will transmit model supporting data to CLFLWSD:

- Model building GIS coverages (ArcMAP) including the following, but not limited to:
    - Subwatershed boundaries
    - Soils
    - Landuse for existing conditions modeled
    - Landuse for ultimate conditions modeled
- Planimetrics (Microstation)

SRF stated (and Wenck agreed,) that their model's under prediction of rainfall volume on lakes had an insignificant effect on flood event summary values reported, and will not be fixed. However, Wenck will have to change the modeling methodology because it has a significant impact on the low flow modeling effort.

Following SRF's correction of these issues, the model will meet general professional standards of care to predict flood elevations, but still need refinements and additional documentation for submittal to FEMA (detailed in Attachment A.)

Wenck is required to resolve several issues so the model is ready for use in our study. Some items were not anticipated in our proposal, but best efforts will be made to rectify issues without impact on budget and schedule:

- Change modeling approach to incorporate public data sources of evaporation (in proposal)
- Incorporate public data sources of groundwater for 'low flow' calibration (in proposal)
- Change modeling approach for Little Comfort Lake
- Enhance existing dry-weather flow modeling approach
- Incorporate public data sources of rainfall for 'low flow' calibration (in proposal)
- Change modeling approach for rain falling on lakes
- Change modeling approach for modeling water losses

Attachment A includes a discussion of the requirements for FEMA submittal of the model, revised elevations and mapping through the Letter of Map Revision process.

Watershed districts were established to deal with land use regulation and flood control (among other things.) Preparing floodplain maps for the Watershed District is a state granted power, however the watershed should give careful consideration before proceeding because there are reasons why a watershed could opt to forgo the formal process of updating the FEMA FIS work.

A watershed could decide to formally update the FEMA FIS, if the floodplain maps are wrong, because they:

- Are based on incorrect or outdated information;
- Don't account for new developments;
- Don't reflect changing landuse in the watershed;
- Don't reflect stormsewer systems built.

A watershed could decide to NOT formally update the FEMA FIS, and complete a flooding study. The updated study results could be used to establish watershed rules and operational plans for structures to provide the additional flood protection above the FEMA FIS elevations. Cities could also consider adoption of elevations from the model in ordinance. This approach may be favorable because the local water resources are managed with the new information without spending the watershed's budget on the formal submission of a FIS update to FEMA.

One potential "speed bump" to the FIS update process is getting approval from all communities and individual's affected by a change in the floodplain. City engineers and city councils (whose prior approval of flood elevation changes is critical for timely processing by FEMA) could resist a change in the existing flood plains for various reasons:

- Dealing with permits for buildings removed from the regulatory floodplain, due to lowering of floodplain elevation
- Loss of flood insurance protection for property owners removed from the regulatory floodplain
- Dealing with permits for buildings added to the regulatory floodplain, due to raising of floodplain elevation
- Changes in federal dollars granted for solving flooding problems due to changes in floodplain elevation
- Modify established building permitting system for modified floodplain.

Attachment A
Considerations for FEMA Submittal and FEMA Map Revisions

A considerable amount of effort is required to complete the Letters of Map Revision (LOMR) process with FEMA. First, one must prepare to submit a LOMR application booklet to FEMA (listed below,) which can cost up to several $100,000. Then FEMA begins review process, which can take 9 to 12 months (answering questions and responding to comments) which can cost up to several $10,000.

Completion of the LOMR application forms requires the following tasks be completed or nearing completion prior to submittal:

- Evaluate benefit of pro-actively addressing modeling methodology of ineffective flow cross-section & related expansion and contraction coefficients. (aid XP-SWMM to better mimic the modeling methodology of the "FEMA preferred model," HEC-RAS.)
- Run model & summarize results for additional events (10-, 50-, & 500-year flood events.)
- Prepare Duplicate Effective Model results to prove tie-in to published model boundary floodplain elevations (effective 1979, 1982, & 1993.)
- Complete/Submit MT-2 Application Form 1 (Overview & Concurrence Form)
    - Detailed review/documentation of effective flood zones impacted by proposed revised floodplain zones.
- Complete MT-2 Application Form 2 (Riverine Hydrology & Hydraulics Form)
    - Signatures/Seals obtained from communities that evidence approval/review process:
        - State: MN DNR - Waters (Suzanne Jiwani)
        - Counties: Chisago & Washington
        - Townships: Franconia, Wyoming, New Scandia
        - Cities: Forest Lake
        - Individual legal notices stating that property owners, who were adversely impacted by any increases in /and or shifting of the 1% annual chance floodplain, were notified.
    - Prepare detailed summary tables of model results from 10-, 50-, 100- & 500-year flood events.
    - Prepare certified topographic mapping of flood events.
- Complete MT-2 Application Form 3 (Riverine Structures Form)
    - Comprehensive inventory submission of structures (culverts, bridges, weirs) modeled, including record drawings & survey data.