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MEMORANDUM

TO: Joanne Chamberlain

FROM: Patrick Tara (INTERA), Silong Lu (Dynamic Solutions), Renee Murch (INTERA)

DATE: October 26, 2018

RE: MEETING MINUTES- PEER REVIEW OF WEKIVA BASINS SURFACE WATER MODELS

The kickoff meeting was held at the District's Maitland office on October 23, 2018. Attendees are as noted on the District's sign-in sheet. Attendees were also present via a call-in number also noted on sign-in sheet.

Introductions and Meeting Objectives

Joanne Chamberlain welcomed everyone. The objective of today's meeting is to get the peer reviewer's initial comments and hear from stakeholders. Following this, the peer reviewers will submit their draft reports. Everyone went around the room and introduced themselves. Call-in attendees introduced themselves.

Peer Reviewer's Initial Comments

Patrick Tara from INTERA went through his presentation. The presentation is available for download on the District's website at https://www.sjrwmd.com/minimumflowsandlevels/wekiva-basin.

HEC-RAS and HSPF are defensible, well-used models. The model used best available data. Springflow handled as an external time series. Statistical models were used to develop continuous time series. More details should be added to the report for "Step 3" springs. Good spatial coverage of observed data in HSPF. No errors were generated by HSPF. HSPF calibration shows flow hydrographs (daily and monthly), scatter plots, flow duration curves, and statistics.

More detail on how STCOR was used should be added to the documentation. Model datum should be explicitly stated in the documentation. No model instabilities were exhibited in the model.

Initial conditions can impact the simulated results for a short period of time. Retention storage capacity (RETSC) was set fairly low for an impervious land segment. A value of 0.1-inches may be slightly low but model performance is good. A water budget check for Black Water Creek was performed. Wetland ET was very high, which is realistic. The overall water balance is realistic.

HEC-RAS model was reviewed. Good density of cross sections, good density of ground shots. Flow distribution sometimes cause cross-overs of profile flows. The District responded that tailwater conditions from St. Johns River may be the cause of this. Manning's n values were reviewed. The vertical variation of Manning's n is reasonable given the presence of vegetation. The changes in friction are reasonable given the presence of vegetation along various portions of the channel. The model replicates observed stages well.

In general, the models, the use of statistical models for gap-filling of springs, and the application of PEST are appropriate. The water balance appears reasonable, the calibration is adequate for MFL development. Small improvements include the correction of initial conditions, the documentation of the water balance, and expansion of documentation of the items noted in the presentation.

INTERA requested the PEST control file.

Dr. Lu from Dynamic Solutions went through his presentation. The presentation is available for download on the District's website at https://www.sjrwmd.com/minimumflowsandlevels/wekiva-basin.

HSPF is a widely accepted model. The needed data includes topography data, land use, soils, rainfall and potential evapotranspiration, springs and point source discharges and observed flow data for model calibration. There is a discrepancy in the number of springs noted in the UCI and the report. Overall, Dr. Lu agrees with the modeling approach. The flow data is adequate for calibration.

HEC-RAS model is widely accepted. The data needed for model development includes stream/river cross section data, hydraulic structure data, boundary condition data, channel roughness data, and observed stage data for model calibration. Methodologies to fill data gaps were reasonable and followed standard engineering practices.

For HSPF, review of model input and output found that input files appear to be fine. Key hydrologic parameters are reasonable but not summarized in the report. No model instability was observed. Water budget was not provided in the report.

For HEC-RAS, the full-extent of the geo-referenced cross-sections should be shown in the model and the report. Unbounded cross sections exist on reaches of the Wekiva and Little Wekiva. These cross sections should be extended to fully contain the highest flows. The width of the cross sections within the St. Johns River floodplain at the downstream end will influence the stage in the lower river. The width in the model should be as near as possible to the width of the active conveyance. The Manning's n values are reasonable and defensible. Vertical variation of Manning's n is physically based on stage. In Figure 30a of report, evaluate data from 2008 to present to develop the relationship because it is more physically based. This may be helpful unless there is a reason to use the methodology that was used. If both methods (the current and the proposed by Dr. Lu), it might be helpful to include the discussion of both in the report.

In summary, the HSPF models are reasonable and defensible. Suggestions for improvements include providing soil data, summarizing and discussing key hydrological parameters, providing water budget

and discussion, providing justification of why point sources were not included, and providing a consistent number of spring discharges between the model and the report.

The HEC-RAS models are reasonable and defensible. Suggestions for improvements include stating assumptions, discussion of the DEM in model development, and providing full-extent geo-referenced cross sections.

Chung asked a question for clarification on Dr. Lu's recommendation to state assumptions. Dr. Lu responded that assumptions for development of river centerline and distance between cross sections should be stated in the documentation.

Stakeholder Comments

Joanne Chamberlain asked for questions/comments from stakeholders.

OUC's comments are available for download on the District's website at https://www.sjrwmd.com/minimumflowsandlevels/wekiva-basin.

Dr. Lu stated that he briefly reviewed OUC's comments and that he is concerned about the big picture: model conceptualization, calibration, etc. Questions regarding impacts of Floridan Aquifer withdrawals are beyond the scope of what we are doing here.

Patrick Tara also commented that the relative impact of an error should also be considered. For example, if a springflow is estimated with a high percent error, that error may be insignificant to the overall model if the spring is very small in flow magnitude. Patrick Tara also noted in response to OUC's comments that some data should be reserved for verification that calibration is the best place to use data when data is limited. It is better to have a longer calibration period rather than calibration and verification periods.

Fatih Gordu asked if the reviewers needed additional information to complete the review. Patrick Tara asked for the PEST control file. Fatih Gordu agreed to provide it.

Yi Zhang, the author of the OUC comments, spoke about the OUC comments: the simulation period can be longer. Fatih Gordu responded that there are additional inputs besides rainfall and ET that are needed. There is also calibration data that is limited. A calibration period should be selected that has good, reliable data. In the next step of the MFL application, we will look into extending the model for MFL applications (not for calibration). The District usually does this for MFL applications. He asked about model validation during a different period to ensure that calibrated parameters are working and simulating properly. Fatih Gordu responded that Patrick Tara already addressed this question and that there are 2 schools of thought on this: to use all data for calibration or to use some data for calibration and some for verification. The District is going to look into extending the model to simulate a longer period. The stakeholder asked if SW GW interaction was considered in the HSPF model. Fatih Gordu responded that HSPF simulates baseflow and that springflow was a boundary condition. The stakeholder asked if deep GW interaction was considered. Fatih Gordu responded that during calibration, springflow already considered impact from GW withdrawals. Fatih Gordu responded that the District will be responding to his comment in writing.

A stakeholder commented that they agree with a few of OUC's comments. From the big picture, a verification simulation should be done. The verification has usefulness of eliminating the gray areas of the calibration "working out." The verification should focus on both the HSPF and the HEC-RAS models. They have a lot of overlapping comments with peer reviewers- PEST control files, residual files, control of parameterization between the 3 models, philosophy. Were the parameters set consistently between sub-basins? We don't want to end up with big differences between parameters. More discussion is needed. Patrick Tara responded that the SUP files are identical and that he did look for that during the review. Fatih Gordu added that he can add that discussion to the report. The calibrated parameters should be added to the report. The other significant area of comment is the springflows. They would also like to see the spreadsheets that were used for the springflow calculations because they are key boundary conditions. He mentioned the case of Silver Springs that the river condition impacts springflows. How does the increased channel roughness work its way into flow at the spring? This could lead to springflow suppression. More discussion should be added on the relationship between spring flows and stage. The HEC-RAS calibration period was set to attempt to be a constant roughness. Fatih Gordu responded that this will be considered during the next phase. He would also like to see more water budget information as highly discretized as possible to look at consistency across sub-basins. The stakeholder will provide written comments to the website and they will be posted to the website when received.

A stakeholder stated that the performance is overall satisfactory. Is there any possibility of improving the overall calibration? The District responded that they used consistent parameterization over all watersheds and that they believe it is overall the best approach. Fatih Gordu brought up the issue of data quality and not over-fitting the model. If the model is overfit, the model will be less reliable. The stakeholder asked about point source discharge. Fatih Gordu responded that the District is looking into it. Minor point source discharges were not included but this will be added to the documentation. The stakeholder commented that seasonal point source discharges should be considered, not just annual averages.

Next Steps

Joanne Chamberlain recapped the process so far. It began with a kickoff meeting and site visit. The peer reviewers will develop a meeting summary today after this concludes. Joanne Chamberlain would like draft technical memorandums by November 14th. Everything will be reviewed again when the District receives the Technical Memorandums from the peer reviewers. The peer reviewers may incorporate other stakeholder comments from today's meeting as they feel is appropriate. The District will respond to all comments, but it will be after the final Technical Memorandums are submitted by the peer reviewers. The District and stakeholders will have an approximate review time of 3 weeks. Another teleconference will be scheduled in mid to late December. A final technical memorandum will be due by peer reviewers shortly thereafter.

Meeting Summary

After the meeting, the peer reviewers developed a meeting summary.

Action Items

The District will provide the PEST control file for review and the spreadsheets used for springflow statistical models. All items will be posted to the District's MFL website when they are available.

Stakeholder Comments

Joanne Chamberlain opened the floor for additional stakeholder comments. No comments.

Meeting Adjourned

The meeting was adjourned by Joanne Chamberlain at 11:55 a.m.