South Carolina Surface Water Quantity Models
Monthly Summary

Invoice Date: February 1, 2016
For Services Between: January 3, 2016 and January 31, 2016
Invoice No.:   17

Summary of Work Completed During Invoice Period

Project Management and Related Tasks
- Continued internal project coordination and management tasks, including:
    - Weekly project team meetings
    - Monthly project meeting by teleconference

Data Collection
- Data collection in the Broad, Pee Dee, Catawba, Santee, and Salkehatchie River basins is substantially complete; however additional follow-up calls are being made as the data is analyzed and incorporated and used for unimpaired flow (UIF) development and model development. Data collection in the Saluda and Edisto is complete.

Data Analysis and Modeling

Saluda
- CDM Smith submitted responses to DNR comments (dated 1/14/16) which focused primarily on reservoir modeling. A conference call was held with DNR and DHEC staff to discuss the comments and responses.

Edisto
- Alternative headwater flows/UIFs for tributaries to the North and South Fork Edisto were evaluated in order to improve the model simulated peak flows, eliminate the seasonality observed at select gages, and improve the model's ability to more accurately reproduce low flows. A final set of headwater flows was selected and both daily and monthly calibration workbooks were submitted to DNR and DHEC for review.

Broad
- CDM Smith submitted draft UIFs for the Enoree, Tyger, and Pacolet Rivers to DNR. DNR comments were received on 1/28/16.
- CDM Smith continued working on development of UIFs on the Broad mainstem.

Pee Dee
- Work continued on the Pee Dee basin UIF Methodology Memorandum.
- Development of UIF workbooks continued.

Catawba
- o CDM Smith held a conference call with DNR and Ed Bruce of Duke Energy to discuss the possibility of extending the SWAM model into the North Carolina portion of the basin.
- o Work continued on the UIF Methodology Memorandum. Because an existing dataset is being used for mainstem UIFs, the methodology used to develop the entire UIF dataset will be slightly different than in other basins.

Santee
- o Santee Cooper was contacted to obtain operating rules associated with Lakes Marion and Moultrie.
- o The draft model framework was prepared and documented in a memorandum.

Savannah
- o Dr. Wei Zeng with Georgia EPD was contacted to obtain the current UIF dataset.
- o Stan Simpson with the Army Corps of Engineers was contacted to obtain and discuss reservoir operating rules in the upper Savannah basin.

Salkehatchie
- o No work was completed.

Stakeholder Involvement
- No work was completed.

Summary of Upcoming Work

Over the next month, the project team will:
- Submit the final Edisto UIF dataset and Results Memorandum.
- Update the draft Edisto Modeling Report, based on the final, calibrated model.
- Complete a draft of the Broad UIF dataset. Once the final Broad dataset is complete, the Saluda Basin UIF dataset will be completed to the confluence of the Wateree River.
- Continue development of the draft Pee Dee UIF dataset and submit (unextended) UIFs for DNR review.

Issues Impacting Scope, Schedule, or Project Cost

In late 2015, discussions were held between CDM Smith and DNR regarding how reservoir operating rules are incorporated in SWAM. DNR indicated the preference for additional flexibility in SWAM to allow the user to evaluate more complex alternative management rules. It was noted that when more complex rules (such as the Lake Murray Striped Basin release rules) were included in SWAM as "prescribed rules", user-initiated adjustments to test variations of the rule were not easily performed. CDM Smith prepared and submitted a summary of proposed model enhancements that will allow for increased flexibility with regard to reservoir operating rules. This additional work will result in a minor increase in scope and project cost.

Additional discussions were held between CDM Smith and DNR regarding how reservoir operating rules are incorporated in SWAM. DNR indicated the preference for additional flexibility in SWAM to allow the user to evaluate more complex alternative management rules. It was noted that when more complex rules (such as the Lake Murray Striped Basin release rules) were included in SWAM as "prescribed rules", user-initiated adjustments to test variations of the rule were not easily performed. CDM Smith prepared and submitted a summary of proposed model enhancements that will allow for increased flexibility with regard to reservoir operating rules. This additional work may result in a minor increase in scope and project cost.

Schedule adjustments were made to reflect the project progress and more accurately account for future deliverables. It is currently anticipated that due to delays in completion of the pilot model, the project schedule will need to be extended approximately six months, to the end of 2016. An updated schedule is attached.

During the project kickoff meeting, and based on DNR and DHEC review of the draft Modeling Plan, several potential out-of-scope model enhancements were identified. These include:

- A "Current Situation Analysis" for quasi-real time operational support. This functionality would provide a probabilistic analysis of current conditions at any future point in time and how conditions are likely to change within 6 or 12 months based on projected use and management patterns.

- The ability to use near-term hydrologic flow forecasts (for example, 60-day streamflow forecasts from NOAA) for month-to-month operational planning.

- Use of HEC DSSVue and DSS files for results display and analysis.

CDM Smith has presented a scope for implementing these enhancements to DNR and DHEC. The decision on whether to implement one or more of these enhancements will likely be made once the additional models are completed.

Schedule — 2016 (Gantt chart by Basin and Milestone)

Week columns: Jan (4, 11, 18, 25) · Feb (1, 8, 15, 22, 29) · Mar (7, 14, 21, 28) · Apr (4, 11, 18, 25) · May (2, 9, 16, 23, 30) · June (6, 13, 20, 27) · Jul (4, 11, 18, 25) · Aug (1, 8, 15, 22, 29) · Sep (5, 12, 19, 26) · Oct (3, 10, 17, 24, 31) · Nov (7, 14, 21, 28) · Dec (5, 12, 19, 26)

Broad

Milestone	Markers
Model Framework	—
1st Meeting	—
UIF Dataset	D (8-Feb), F (14-Mar)
Calibrated Model	D (21-Mar), F (9-May)
2nd Meeting & Training	2 (25-Apr), T (4-Jul)

Pee Dee

Milestone	Markers
Model Framework	—
1st Meeting	—
UIF Dataset	D (22-Feb), F (21-Mar)
Calibrated Model	D (11-Apr), F (9-May)
2nd Meeting & Training	2 (25-Apr), T (4-Jul)

Catawba-Wateree

Milestone	Markers
Model Framework	—
1st Meeting	—
UIF Dataset	D (11-Apr), F (16-May)
Calibrated Model	D (13-Jun), F (8-Aug)
2nd Meeting & Training	2 (11-Jul), T (10-Oct)

Santee

Milestone	Markers
Model Framework	D (25-Jan), F (15-Feb)
1st Meeting	1 (29-Feb)
UIF Dataset	D (13-Jun), F (11-Jul)
Calibrated Model	D (8-Aug), F (5-Sep)
2nd Meeting & Training	2 (29-Aug), T (10-Oct)

Savannah

Milestone	Markers
Model Framework	D (6-Jun), F (4-Jul)
1st Meeting	1 (25-Jul)
UIF Dataset	D (8-Aug), F (12-Sep)
Calibrated Model	D (24-Oct), F (5-Dec)
2nd Meeting & Training	2 (14-Nov), T (12-Dec)

Salkehatchie

Milestone	Markers
Model Framework	D (13-Jun), F (25-Jul)
1st Meeting	1 (25-Jul)
UIF Dataset	D (8-Aug), F (12-Sep)
Calibrated Model	D (24-Oct), F (21-Nov)
2nd Meeting & Training	2 (14-Nov), T (12-Dec)

Legend

1 = First Meeting
2 = 2nd Meeting
D = Draft Comlpetion Date
F = Final Completion Date
T = Training

2016 Proposed Stakeholder Meeting Schedule

Basin	1st Meeting Week of:	2nd Meeting Week of:
Saluda	*completed*	*completed*
Edisto	*completed*	*completed*
Broad	*completed*	25-Apr-16
Pee Dee	*completed*	25-Apr-16
Catawba-Water.	*completed*	11-Jul-16
Santee	29-Feb-16	29-Aug-16
Savannah	25-Jul-16	14-Nov-16
Salkehatchie	25-Jul-16	14-Nov-16