Surface Water Availability Assessment in South Carolina
Legislative Quarterly Report, August 2016

Background

South Carolina currently has limited scientific information about the future demands on and availability of our water supply. As a result, the General Assembly allocated $1.5M to complement South Carolina's new surface water permitting program administered by SC Department of Health and Environmental Control (DHEC), and to gather the information necessary to update the State Water Plan developed by SC Department of Natural Resources (DNR). The two agencies are in the process of gathering data on South Carolina's eight basins: Broad, Catawba, Edisto, Pee Dee, Salkehatchie, Saluda, Santee, and Savannah.

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Scientific Process for Measurement and Legislative Reporting

The availability assessment will develop a computer-generated model of each of the eight basins to evaluate existing water availability. These analyses will be used to inform the resource agencies and stakeholders if there are areas of the State where there is a "gap" or concern about the amount of water needed to meet our increasing demands over the next 50 years.

The funds appropriated above to the DNR for the State River Basin Study Project must be used for water data collection to provide scientific information on water resources in the state's eight major river basins. The DNR shall, in cooperation with DHEC, submit to the Senate Finance Committee, the House Ways and Means Committee, the Senate Agriculture and Natural Resources Committee, and the House Agriculture, Natural Resources and Environmental Affairs Committee, a report on the project's timeline, findings, and expenditure of funds on a quarterly basis. Additionally, this information will be posted electronically on DNR and DHEC websites.

Summary of Activities During the Past Quarter

CDM Smith's *Simplified Water Allocation Model* (SWAM) will be used for the project. During the past quarter, the model framework for the Savannah River basin was developed and submitted for review. The UIF (unimpaired flow) dataset for the Savannah was requested of and received by the Georgia Environmental Protection Division. In the Catawba River basin, information regarding lake levels and releases were made available by Duke Energy and HDR Engineering Inc. for incorporation into the model. A draft UIF dataset for the Catawba was developed and submitted to DNR and DHEC for review. Development of the Catawba calibration model was initiated during the past quarter and development of the UIF dataset for the Santee River basin commenced. In the Salkehatchie River basin, a model framework, UIF dataset, and calibration model were all completed. Calibration models for the Broad River and Pee Dee basins were updated based on DNR comments.

To date, model frameworks have been completed for all eight basins; UIF datasets have been completed for the Saluda, Edisto, Pee Dee, Broad, Catawba, and Salkehatchie River basins; draft calibration models have been completed for the Saluda, Edisto, Pee Dee, Broad, and Salkehatchie River basins; draft model reports have been completed for the Saluda, Edisto, Pee Dee, Broad and Salkehatchie River basins; and the draft baseline model for the Saluda River basin has been completed.

Stakeholder meetings are facilitated by Clemson University and are attended by CDM Smith, DNR, DHEC, and basin stakeholders. A combined first and second stakeholder meeting for the Salkehatchie River basin was held on August 9th at the Colleton County Memorial Library in

Walterboro. The first of two planned stakeholder meetings for the Savannah River basin was held on August 10th at the North Augusta Municipal Center.

Progress reports are being provided by CDM Smith at monthly conference calls and at in-person meetings with DNR, DHEC, and the project TAC. Written monthly progress reports and meeting notes are being posted on the DNR webpage. In addition to the monthly progress reports, CDM Smith is required to prepare quarterly progress reports, the seventh of which is provided below. Financial statements can be found at the end of this report. Additional information on the project can be found at the following websites:

http://dnr.sc.gov/water/waterplan/surfacewater.html

http://www.scwatermodels.com/

South Carolina Surface Water Quantity Models
Quarterly Progress Report No. 8

May 16, 2016 to August 15, 2016

Introduction

The South Carolina Departments of Natural Resources (DNR) and Health and Environmental Control (DHEC) have contracted with CDM Smith to develop surface water quantity models in the eight major river basins in South Carolina. Per the requirements of the contract, CDM Smith will prepare and submit Quarterly Progress Reports summarizing work completed on each basin model. This eight Quarterly Progress Report covers the three-month period from May 16, 2016 to August 15, 2016.

The Quarterly Progress Report provides a bulleted summary of activities and accomplishments; identifies upcoming work and deliverables; highlights issues that have the potential to impact scope, schedule or costs; and provides the current project schedule. Activities and accomplishments are presented for the following categories: (1) project planning and management; (2) data collection; (3) data analysis and modeling; and (4) stakeholder involvement.

Activities and Accomplishments

Project Planning and Management

- Monthly Progress meetings attended by CDM Smith, DNR/DHEC, and the Technical Advisory Committee (TAC) were held on June 6th, July 5th, and August 1st.
- Project submittals to date include:
    - Draft and Final Modeling Plan
    - Draft and Final Unimpaired Flow (UIF) Methodology and Results Technical Memoranda for the Saluda, Edisto, and Broad basins
    - Combined Draft UIF Methodology and Results Technical Memorandum for the Salkehatchie, Catawba-Wateree and Pee Dee basins
    - UIF Methodology Technical Memorandum for the Santee basin
    - Draft and Final Modeling Framework for the Saluda, Edisto, Broad, Catawba-Wateree, Pee Dee, Salkehatchie, Savannah and Santee basins
    - Draft and Final Technical Memoranda and model summarizing historical agriculture irrigation withdrawal estimates for all basins
    - Draft UIF Datasets for the Saluda, Edisto, Broad, Catawba-Wateree, Salkehatchie and Pee Dee basins
    - Draft Modeling Reports for the Saluda, Edisto, Broad, Salkehatchie and Pee Dee basins
    - An updated version of the SWAM User's Manual (v3.0)
    - Various additional memoranda summarizing modeling methodology.

Data Collection

- CDM Smith has substantially finished contacting registered and permitted water users in all basins to confirm reported withdrawal amounts, sources, and discharge amounts; collect pre-reporting withdrawal amounts (or estimates); and confirm other operational parameters. As work progresses in each basin, certain users are contacted again to clarify data, and seek additional data where necessary.
- Savannah basin UIFs were received from the Georgia EPD. Raw data used to develop UIFs were also received.
- CDMS Smith worked with Duke Energy to HDR Engineering Inc. to receive and clarify information associated with lake levels and releases in the Catawba-Wateree basin.

Data Analysis and Modeling

Saluda (Pilot Basin Model)

- Section 7 of the Model Report was enhanced and submitted to DNR and DHEC for review.
- Remaining work includes finalizing the Model Report, once DNR has completed their review, and finalizing the baseline model.

Edisto

- No additional work was completed. Remaining work includes enhancing Section 7 of the Model
- Report, based on DNR comments and finalizing the baseline model.

Broad

- The UIF dataset was updated and resubmitted to DNR and DHEC.
- The calibration model was updated based on several rounds of DNR comments and resubmitted.
- The Draft Model Report was updated based on DNR comments.
- Remaining work includes finalizing the baseline model.

Pee Dee

- The Final UIF dataset was submitted to DNR and DHEC.
- The calibration model was updated based on DNR comments and resubmitted.
- The Model Report was updated based on DNR comments and resubmitted.
- Remaining work includes finalizing the baseline model.

Catawba-Wateree

- The Draft UIFs were submitted to DNR and DHEC for review. Based on DNR comments, revisions were made to the UIFs, and they were resubmitted.
- Development of the calibration model was initiated.
- Remaining work includes finalizing the calibration and baseline models and developing the Model Report.

Santee

- Development of Draft UIFs was initiated.
- Remaining work includes finalizing UIFs, finalizing the calibration and baseline models, and developing the Model Report.

Savannah

- CDM Smith worked with Georgia EPD to collect raw data used to develop the existing UIFs.
- The model framework was developed and submitted.
- Remaining work includes developing the UIFs, finalizing the calibration and baseline models and developing the Model Report.

Salkehatchie

- The model framework was submitted.
- The Draft and Final UIFs were submitted.
- The calibration model was completed.
- The Model Report was completed. Based on DNR comments, Section 7 of the Model Report will be enhanced to discuss uncertainty in the basin due to lack of gage data.
- Remaining work includes finalizing the Model Report and baseline model.

Stakeholder Involvement

- The first of two planned Stakeholder Meetings in the Savannah basin was held on August 10th at the North Augusta Municipal Center.
- A combined first and second Stakeholder Meeting in the Salkehatchie basin was held on August 9th at the Colleton County Memorial Library in Walterboro.
- The project TAC was included on monthly progress calls and given the opportunity to review and comment on various deliverables and interim work products.

Summary of Upcoming Work

Over the next quarter, the project team will:

- Complete development of the draft Savannah and Santee UIF datasets.
- Finalize development of the Catawba-Wateree and Santee calibration models.
- Complete draft SWAM calibration models for the Catawba-Wateree and Santee basins.
- Hold the second Stakeholder Meetings in the Catawba-Wateree and Santee basins.

Issues Impacting Scope, Schedule, or Project Cost

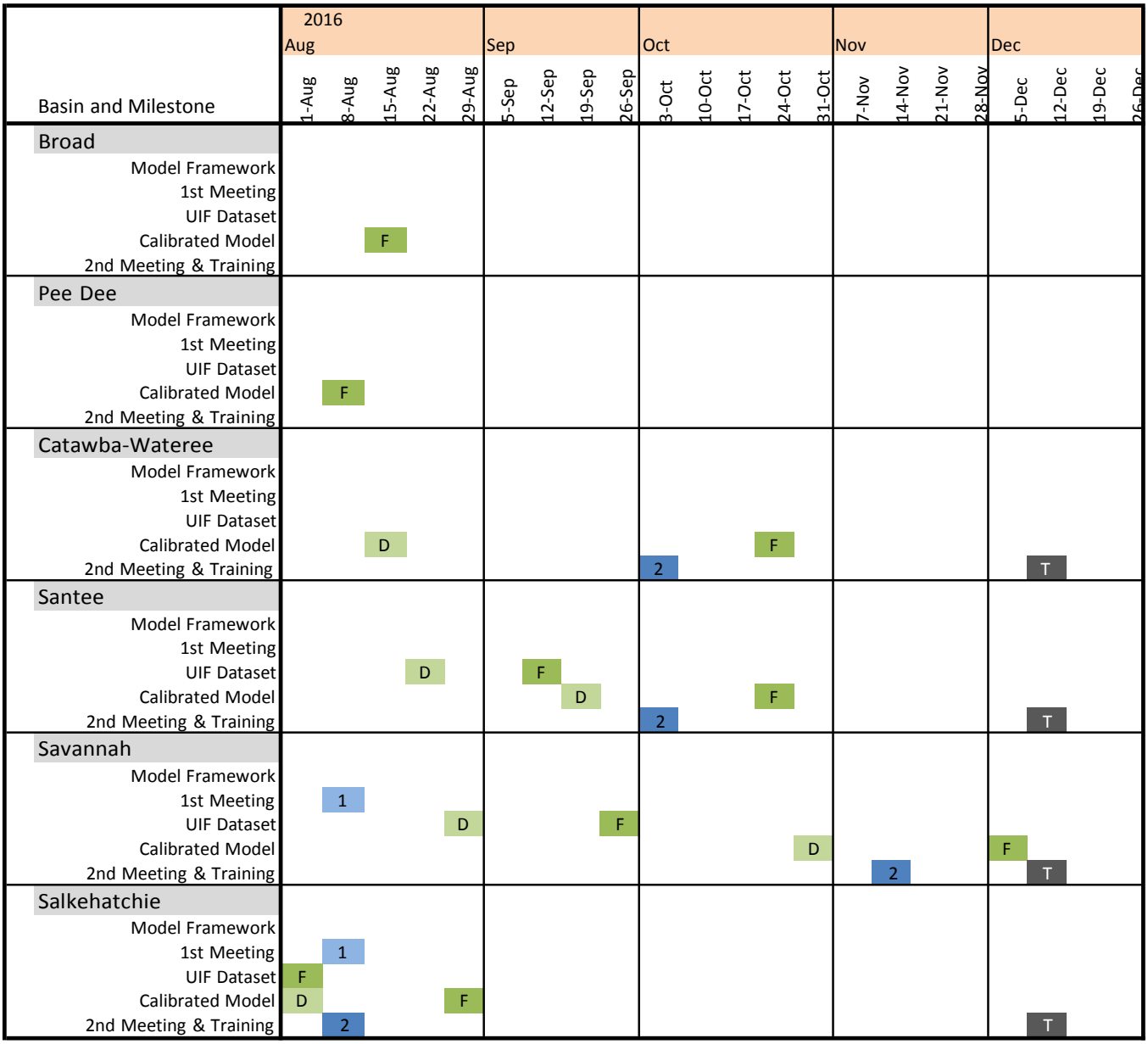
Schedule adjustments have been made to reflect the project progress and more accurately account for future deliverables. Additional time has been spent (1) collecting water use and hydrologic information to support the UIFs and models; (2) performing model enhancements to provide increased user flexibility when modeling reservoirs and their operating rules; and (3) to allow for adequate review time of draft UIF datasets and models. In response, DNR has approved a time-only change order extending the project by five and one-half 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 for 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 additional models are completed.

South Carolina Surface Water Quantity Assessment Schedule Updated August 1, 2016



2016 Proposed Stakeholder Meeting Schedule

Basin	1st Meeting Week of:	2nd Meeting Week of:
Saluda	completed	completed
Edisto	completed	completed
Broad	completed	completed
Pee Dee	completed	completed
Catawba-Water.	completed	3-Oct-16
Santee	completed	3-Oct-16
Savannah	completed	14-Nov-16
Salkehatchie	completed	completed

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

CDM Smith Invoice Number 21

Invoice Date: June 3, 2016
For Services Between: May 1, 2016 and May 27, 2016

River Basin	Original Contract Amount	Amended Contract Amount[2]	This Invoice	Total Invoiced	Amount Remaining	Percent Complete
Saluda	$155,926	$167,989	$0	$167,989	$0	100%
Edisto[1]	$226,034	$232,597	$0	$232,597	$0	100%
Broad	$132,960	$170,023	$650	$167,378	$2,645	98%
Pee Dee	$189,865	$196,428	$3,200	$195,165	$1,263	99%
Catawba	$141,639	$175,802	$25,100	$133,957	$41,845	76%
Santee	$128,775	$135,338	$1,500	$85,430	$49,908	63%
Savannah	$154,637	$172,200	$0	$28,950	$143,250	17%
Salkehatchie	$128,775	$135,334	$24,320	$64,540	$70,794	48%
Total	**$1,258,611**	**$1,385,711**	**$54,770**	**$1,076,006**	**$309,705**	**78%**

[1] Project startup-activities including the kickoff meeting, modeling plan, model enhancement and other activities were included under the Edisto Basin budget. The Edisto was originally identified as the pilot basin for modeling.

[2] The amended contract amount includes an additional (1) $30,500 for the Broad River Basin unimpaired flow development; (2) $16,600 for the Catawba Basin unimpaired flow development; (3) $52,500 for additional meetings, divided equally between all eight basins ($6,562.50 each); and (4) $27,500 for SWAM code enhancements related to reservoir operations primarily in the Saluda, Catawba, and Savannah basins.

CDM Smith Invoice Number 22

Invoice Date: July 1, 2016
For Services Between: May 28, 2016 and June 25, 2016

River Basin	Original Contract Amount	Amended Contract Amount[2]	This Invoice	Total Invoiced	Amount Remaining	Percent Complete
Saluda	$155,926	$167,989	$0	$167,549	$0	100%
Edisto[1]	$226,034	$232,597	$0	$232,597	$0	100%
Broad	$132,960	$170,023	$1,240	$168,618	$1,405	99%
Pee Dee	$189,865	$196,428	$0	$195,165	$1,263	99%
Catawba	$141,639	$175,802	$8,800	$142,757	$33,045	81%
Santee	$128,775	$135,338	$7,700	$93,130	$42,208	69%
Savannah	$154,637	$172,200	$26,450	$55,400	$116,800	32%
Salkehatchie	$128,775	$135,334	$27,650	$92,190	$43,144	68%
Total	**$1,258,611**	**$1,385,711**	**$71,840**	**$1,147,846**	**$237,865**	**83%**

[1] Project startup-activities including the kickoff meeting, modeling plan, model enhancement and other activities were included under the Edisto Basin budget. The Edisto was originally identified as the pilot basin for modeling.

[2] The amended contract amount includes an additional (1) $30,500 for the Broad River Basin unimpaired flow development; (2) $16,600 for the Catawba Basin unimpaired flow development; (3) $52,500 for additional meetings, divided equally between all eight basins ($6,562.50 each); and (4) $27,500 for SWAM code enhancements related to reservoir operations primarily in the Saluda, Catawba, and Savannah basins.

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CDM Smith Invoice Number 23

Invoice Date: July 29, 2016

For Services Between: June 26, 2016 and July 29, 2016

River Basin	Original Contract Amount	Amended Contract Amount[2]	This Invoice	Total Invoiced	Amount Remaining	Percent Complete
Saluda	$155,926	$167,989	$0	$167,989	$0	100%
Edisto[1]	$226,034	$232,597	$0	$232,597	$0	100%
Broad	$132,960	$170,023	$1,100	$169,718	$305	99.8%
Pee Dee	$189,865	$196,428	$600	$195,765	$663	99.7%
Catawba	$141,639	$175,802	$14,350	$157,107	$18,695	89%
Santee	$128,775	$135,338	$3,800	$96,930	$38,408	72%
Savannah	$154,637	$172,200	$8,650	$64,050	$108,150	37%
Salkehatchie	$128,775	$135,334	$22,450	$114,640	$20,694	85%
Total	**$1,258,611**	**$1,385,711**	**$50,950**	**$1,198,796**	**$186,915**	**87%**

[1] Project startup-activities including the kickoff meeting, modeling plan, model enhancement and other activities were included under the Edisto Basin budget. The Edisto was originally identified as the pilot basin for modeling.

[2] The amended contract amount includes an additional (1) $30,500 for the Broad River Basin unimpaired flow development; (2) $16,600 for the Catawba Basin unimpaired flow development; (3) $52,500 for additional meetings, divided equally between all eight basins ($6,562.50 each); and (4) $27,500 for SWAM code enhancements related to reservoir operations primarily in the Saluda, Catawba, and Savannah basins.