

Engineering Committee Report

Republican River Compact Administration

August 22, 2019

Colby, KS

EXECUTIVE SUMMARY

The Engineering Committee (EC) met four times since the August 21, 2018, Republican River Compact Administration (RRCA) Annual Meeting. Over the past year, the EC completed these assignments: 1) hold quarterly meetings; 2) exchange information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, including all required data and documentation; 3) finalize 2018 accounting; 4) continue work on documenting historical changes to the RRCA Accounting Procedures; 5) provide updates on the progress of new and ongoing management strategies for maintaining compact compliance; 6) continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC; 7) continue work and provide updates on improving accounting tools developed by the Engineering Committee; 8) work on improving the the Lovewell Ops worksheet; 9) Continue work to summarize and document the status of Table 4A in the RRCA accounting procedures and recommend how said document should be memorialized, and 10) Prepare the 2018 RRCA annual meeting (KS) report.

Ongoing assignments include: 1) hold quarterly meetings; 2) continue work on documenting historical changes to the RRCA Accounting Procedures; 3) provide updates on the progress of new and ongoing management strategies for maintaining compact compliance; 4) work on maintaining and enhancing the RRCA public website; and 5) continue work and provide future updates on improving accounting tools developed by the Engineering Committee

The EC recommends discussion by the RRCA on the exchange of data and documentation and the modeling runs completed by Principia Mathematica for 2018, discussion on the proposed 2018 accounting, and the recommended EC assignments for the following year.

Details of the various EC tasks are described further in the remainder of this report, including:

Attachment 1: Minutes of the quarterly meetings of the EC

Attachment 2: Accounting Inputs and Accounting Tables from the RRCA Accounting for 2018 recommended by the EC for approval by the RRCA

Attachment 3: Description of Lovewell net evaporation and Courtland Canal outflow charged to Republican River

Attachment 4: Status of Table 4A

COMMITTEE ASSIGNMENTS AND RELATED WORK ACTIVITIES

1. Meet quarterly to review the tasks assigned to the committee.
 - a. The EC met November 19, 2018; March 1, 2019; May 16, 2019; and July 23, 2019. See Attachment 1 for the approved notes of these meetings.
 - b. The EC met August 21, 2019 to finalize the annual EC report for the 2019 RRCA annual meeting.
 - c. The EC recommends that this task continue.
2. Exchange by April 15, 2019, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2018, the states will exchange any updates to these data.
 - a. Nebraska posted its data on April 12, 2019 and provided an update on May 23, 2019.
 - b. Kansas posted its preliminary data on April 15, 2019, and made several updates to the data, declaring it final on July 11, 2019.
 - c. Colorado reported that its accounting data were posted April 2, 2019. Colorado provided its Crop Irrigation Requirement analysis on August 21, 2019.
3. Finalize the 2018 accounting and recommend it for approval by the RRCA.
 - a. Colorado, Kansas, and Nebraska accounting data for 2018 is final and the EC hereby recommends its approval by the RRCA.
 - b. The applicable summary accounting tables are presented in Attachment 2.
4. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
 - a. A draft of this document has been developed by Kansas and is currently being reviewed by Colorado and Nebraska.
 - b. The EC recommends that this task continue.
5. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
 - a. Nebraska provided updates on the N-CORPE and Rock Creek augmentation projects, and on the status of the proposed Platte-Republican Diversion Project.
 - b. Colorado provided updates on the operations of the Colorado Compact Compliance Pipeline project.
 - c. The EC recommends that this task continue.
6. Continue efforts to develop and publish an administrative website that would be an informational page for the public.

- a. State staff have maintained and updated the website which is accessible to the public.
 - b. The EC recommends this task as a recurring assignment to maintain the website and provide regular updates to the EC.
7. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
 - a. The EC continues to use the website accounting tool and the accounting spreadsheet to compare results. The comparisons continue to be favorable.
 - b. The EC recommends that this task continue.
8. Work on improving the understanding of/operation of the inputs to the accounting from the Lovewell Ops worksheet.
 - a. Kansas has proposed to return to a simplified version of Lovewell calculations for evaporation charged to the Republican River, and to Republican River water diversions to the district below Lovewell. The method was previously used in 1995-2002 accounting.
 - b. Kansas' proposal was provided to the EC for its review on August 3, 2018.
 - c. At its November 19, 2018 meeting, the EC unanimously approved the methodology laid out in Kansas' proposal, which was used in preparing the 2018 accounting, and which shall be used henceforth.
 - d. The newly adopted methodology is included in this report as Attachment 3.
 - e. The EC reports that his task is completed.
9. Summarize and document the status of Table 4A in the RRCA accounting procedures and recommend how said document should be memorialized.
 - a. Kansas provided the EC with a proposal to document the status Table 4A on February 15, 2018.
 - b. At the March 1, 2019 EC meeting Kansas and Colorado reported that they were comfortable with the simple statement on the status of Table 4A that Kansas provided to the EC on February 15, 2018. Nebraska did not believe the statement adequately described the disputed issues, but has agreed that the simple statement fulfills the intent of the assignment to document the status of Table 4A. All States agreed that the simple statement be included with the final EC report to memorialize the document and complete this assignment (Attachment 4).
10. Prepare the 2018 RRCA annual meeting report for approval by the RRCA at the 2019 annual meeting
 - a. The report has been finalized and approved by the EC and is hereby recommended for approval by the RRCA.

ITEMS FOR RRCA DISCUSSION & ACTION

1. Data exchange and modeling results for 2018. The EC recommends the proposed 2018 accounting presented in Attachment 5 and in the spreadsheet titled “RRCA Accounting 2018 Final.xlsx” for approval by the RRCA. Upon approval of the accounting, the above-mentioned spreadsheet file will be placed on the public website.
2. Modeling and data tasks to be assigned to Principia Mathematica for 2019. The EC recommends that Principia Mathematica continue to perform periodic model and accounting updates at the same level of service as in 2018.
3. During 2018-2019, the EC maintained and updated the RRCA website. The website’s purpose is to provide public information, including history of the compact and the RRCA, links to compact-related data and reports, state information, etc. The EC requests any additional comments and direction from the commissioners on the content that the RRCA wants published to the website
4. Discussion of the recommended EC assignments and other potential assignments for the next year and agreement on a final set of assignments. The EC presents the following list of recommended assignments to report on at the 2020 annual meeting of the RRCA.

RECOMMENDED ASSIGNMENTS FOR THE COMING YEAR

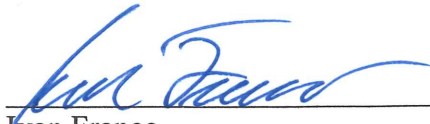
The Engineering Committee recommends that the Republican River Compact Administration assign the following tasks:

1. Meet quarterly to review the tasks assigned to the committee.
2. Exchange by April 15, 2020, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2020, the states will exchange any updates to these data.
3. Finalize the 2019 accounting and recommend it for approval by the RRCA.
4. Review the Flood Flow provisions of the RRCA Accounting Procedures, especially as they are applied to the allocations in Tables 5C and 5D, to evaluate whether the accounting methods are in conformance with the intent of the FSS and if they are not, develop a recommendation for how to modify the Accounting Procedures to bring them into conformance so that 2019 accounting results can be approved at the 2020 Annual Meeting.
5. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
6. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
7. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.

8. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
9. Prepare the 2019 RRCA annual meeting (KS) report.

The Engineering Committee Report and the exchanged data will be posted on the web at

SUBMITTED TO THE RRCA BY



Ivan Franco
Engineering Committee Member for Colorado



Carol J. Myers Flaute
Engineering Committee Member for Nebraska



Chris Beightel
Chair, Engineering Committee Member for Kansas

Meeting Notes for the
**QUARTERLY MEETING of the
ENGINEERING COMMITTEE of the
REPUBLICAN RIVER COMPACT ADMINISTRATION**
19 November 2018, 2:00 PM CST
Meeting was held telephonically

Attendees:

Chris Beightel, Kansas
Chelsea Erickson, Kansas
Ginger Pugh, Kansas
Sam Perkins, Kansas
Carol Myers Flaute, Nebraska
Catherine Jensen, Nebraska
Jennifer Schellpeper, Nebraska
Brian Harmon, Nebraska
Ivan Franco, Colorado
Willem Schreüder, Principia Mathematica

Agenda Items and Notes:

1. Introductions
2. Review/Modify Agenda
 - a. No modifications were suggested.
3. Review and Update Progress on Engineering Committee Task List
 - a. Meet quarterly to review the tasks assigned to the committee.
 - i. The committee met November 19, 2018.
 - ii. The committee upcoming meetings May 16, and July 25.
 - b. Exchange by April 15, 2019, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2019, the states will exchange any updates to these data.
 - i. No updates yet.
 - c. Finalize the 2018 accounting and recommend it for approval by the RRCA.
 - i. No updates yet.
 - d. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
 - i. Document is in draft form yet. Kansas will circulate the draft before the February EC meeting.

- e. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
 - i. This is a placeholder for discussing any new projects.
 - ii. Kansas
 - 1. Chris Beightel reported that Kansas hosted a meeting October 2nd to discuss Bonny Reservoir and the settlement funds from Colorado. There were 150 public responses to the questionnaire provided.
 - iii. Nebraska
 - 1. Carol Flaute reported that Nebraska held a forecast meeting on November 14th and 2019 will be a Compact Call Year.
 - 2. The Republican River Basin-Wide Plan was reviewed with the public during meetings on November 13th and 14th. Now there are 60 days to adopt the plan either with or without modifications. Highlights include that the plan is 140 pages and there is a 2 page executive summary.
 - 3. Willem Schreüder asked if 2019 will be a Water Short Year and Carol Flaute responded that it depends because the numbers are very close to the 119,000 AF trigger.
 - iv. Colorado – Ivan Franco reported no updates at this time.
- f. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
www.republicanriver.org
 - i. No update yet. Chelsea Erickson reported that technical difficulties have prevented uploading new documents.
- g. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
 - i. Schreüder reported that 2018 diversion data is available and will update the files.
 - ii. Kansas and Nebraska reported no additional updates.
- h. Work on improving the Lovewell Ops worksheet.
 - i. Beightel reported that Kansas had made a proposal and that Nebraska and Colorado staff were reviewing that proposal.
 - ii. Schreüder added that he was looking to Nebraska to review the proposal due to the use of Nebraska datasets that he did not have access to.
 - iii. Flaute reported that Kari Burgert and other staff had looked over the proposal and approved.
 - iv. Beightel then concluded that the Engineering Committee agreed and accepted the proposal and will recommend that it be adopted into the Accounting Procedures. No objections were reported.
- i. Continue work to summarize and document the status of Table 4A in the RRCA accounting procedures and recommend how said document should be memorialized.

- i. Document historical perspective to describe those blanks in the accounting. Use the Accounting Procedure tracking document to memorialize the issue.
 1. Flaute questioned if the EC was waiting on responses from lawyers. Beightel said he would check and report back.
 - j. Prepare the 2018 RRCA annual meeting (KS) report.
 - i. 55th & 56th annual reports circulated by Erickson on October 12, 2018 via email. Those versions included a Table of Contents and signed approval pages.
 - ii. Status of transcript for 2018 annual meeting
 1. Erickson is checking the transcript edits and will distribute the final document.
 2. Franco and Flaute reported that they approve the final transcript pending Erickson's review.
 - iii. Status of 57th annual report (KS)
 1. Kansas staff is preparing the report and will circulate when finished.
 - k. A Special Meeting of the RRCA was held on November 6, 2018.
 - i. The EC will prepare a resolution for the outcome of that meeting.
 - ii. The EC will then modify the Accounting Procedures and Reporting Requirements and the RRCA Rules & Regulations for approval at the 2019 RRCA annual meeting.
 - iii. The November 6th, 2018, meeting will also be part of the 2019 annual report prepared by Kansas.
 - iv. Kansas is preparing the necessary documents for the special meeting report and will circulate when finished.
 4. Summary of Meeting Actions/Assignments
 - a. Nebraska will provide the executive summary of the Republican River Basin-wide Plan.
 - b. Erickson will update the RRCA website with recent documents.
www.republicanriver.org.
 - c. The EC has approved the KS proposal on Lovewell Ops method, so Kansas will draft a resolution to incorporate into the Accounting Procedures.
 - d. Beightel and Franco will reach out to their respective attorneys to see what progress can be made on the Table 4a documentation.
 - e. Erickson will finalize review of the draft 2018 August annual meeting transcript.
 - f. Kansas will prepare the updated Accounting Procedures and Rules & Regulations, as well as a resolution of the RRCA to adopt them pursuant to the November 6, 2018 special meeting.
 5. Future Meetings
 - a. May 16, July 25. 2 pm central, same call information.
 6. Adjournment

Meeting Notes for the
**QUARTERLY MEETING of the
ENGINEERING COMMITTEE of the
REPUBLICAN RIVER COMPACT ADMINISTRATION**
1 March 2019, 10:00 AM CST
Meeting was held telephonically

Attendees:

Chris Beightel, Kansas
Chelsea Erickson, Kansas
Ginger Pugh, Kansas
Sam Perkins, Kansas
Carol Myers Flaute, Nebraska
Catherine Jensen, Nebraska
Kari Burgert, Nebraska
Ivan Franco, Colorado
Willem Schreüder, Principia Mathematica

Agenda Items and Notes:

1. Introductions
2. Review/Modify Agenda
 - a. No modifications were suggested.
3. Review and Update Progress on Engineering Committee Task List
 - a. Meet quarterly to review the tasks assigned to the committee.
 - i. The committee's upcoming meetings are May 16 and July 25.
 - b. Exchange by April 15, 2019, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2019, the states will exchange any updates to these data.
 - i. Beightel gave an update on the Kansas online water use report system. March 1 is the deadline for water users to file their reports. Kansas has had a no-fee online system available for a couple years, but this year the state imposed a \$20 per water right fee on paper filing. Last year about 27% of the reports were filed online. This year, online reporting is nearing 90% of reports submitted. The online system will increase efficiency with meeting the April 15 data exchange.
 - ii. Schreüder asked if Nebraska could complete the surface water input spreadsheet with the April 15 data exchange. Burgert responded that Nebraska plans to provide the Nebraska inputs to the SWInputs spreadsheet with the data exchange from now on.

- iii. Schreüder mentioned that Colorado data comes from the HydroBase system, which keeps track of diversions across the states. The system was updated February 28, but it will be a couple weeks before final data is available for use.
 - 1. Beightel asked for a description of HydroBase and how long Colorado has been using it. Schreüder responded it has been in place for a while but has taken time to incorporate the meter readings which were required only five years ago or so. He further explained that individuals report meter readings to the Division office and then the office enters the data into HydroBase.
 - 2. Beightel inquired when the meter readings are due to the Division offices. Schreüder relayed that water users have about 45 days to provide their readings after irrigation season.
- c. Finalize the 2018 accounting and recommend it for approval by the RRCA.
 - i. No updates yet.
- d. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
 - i. The document is still in draft form. Kansas will circulate the draft after the March 1 EC meeting. Beightel mentioned that future edits to the document would include the November 6 special meeting changes and the revised Lovewell Ops methodology.
- e. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
 - i. Kansas
 - 1. Beightel reported that Kansas is working on identify a stakeholder group to address the best use of the South Fork Republican River settlement funds. Kansas staff reviewed responses from the South Fork users survey. Generally, there are strongly held preferences for both increasing streamflow into Kansas and storing water in Bonny Reservoir, which are mutually exclusive. There was a recent news article about the Colorado South Fork Coalition and KS staff will be tracking that group's recommendations to see if there is an opportunity for the states to work together for a common goal.
 - 2. Beightel also reported on the February 28 meeting of the Lower Republican River Access District Steering Committee. Participants included KBID, USBR, KS Water Office and KS Division of Water Resources. The goal was to identify and address challenges for when water might be available to the proposed access district. There was discussion of how Warren Act water could be used. The state is looking at when and where to utilize available water to relieve water users subject to Minimum Desirable Streamflow restrictions downstream of KBID.

3. Beightel mentioned that the 3 States group will meet next Thursday in Denver. Colorado's new Agriculture Commissioner and the new Kansas Secretary of Ag Mike Beam will be there and plan to review the 2016 long-term agreement provisions.
 - ii. Nebraska –Flaute reported that the Republican River Basin-Wide Plan went into effect March 1 and that she provided Beightel and Franco with copies of the document and summary. Flaute also mentioned that the Platte River Diversion Project permit application is still being reviewed by the department at this time. The applicant has filed legal briefs responding to legal challenges to the project and now the state is reviewing the legal briefs. Beightel asked what the next steps are for the project. Flaute responded that after reviewing the legal briefs, the department will decide how to move forward on the procedural questions raised by the legal arguments.
 - iii. Colorado – Schreüder reported that to minimize the negative effects of a cycle of over-delivery and under-delivery year over year, Colorado plans to over-deliver through the CCP by about 2,000 AF for 2019. The unknown element is how much flow to expect from the Arikaree and South Fork, as the streams have started to flow early but keep freezing with the wintery weather. The goal is to run the CCP through the end of March, review predictions for summer conditions, and then possibly shut the pipeline off in April. So far, the project has delivered about 4,000 AF. Beightel asked if Colorado is reconsidering the over-delivery amount and Schreüder clarified that the state is trying to determine how much of the delivery will be pipeline versus natural flow.
- f. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
www.republicanriver.org
- i. Erickson reported that documents from the annual meeting and special meeting have been added to the website.
 - ii. Erickson asked for a meeting of the website committee to review the website prior to promoting the upcoming annual meeting.
 - iii. Flaute mentioned that Nebraska will appoint a website representative soon to replace Brian Harmon who has moved on.
- g. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
- i. Beightel reported that at the last EC meeting the accounting method for Lovewell Ops worksheet was approved by the EC. Beightel committed to providing drafts of the updated Accounting Procedures, RRCA Rules, and a resolution to the other states by May 2 for review.
- h. Work on improving the Lovewell Ops worksheet.
- i. Beightel noted that the issue was already discussed as part of #7.

- i. Continue work to summarize and document the status of Table 4A in the RRCA accounting procedures and recommend how said document should be memorialized.
 - i. Document historical perspective to describe those blanks in the accounting. Use the Accounting Procedure tracking document to memorialize the issue.
 1. Beightel reported that he had talked with Kansas' attorney who in turn has discussed the issue with Colorado's attorney. The status is that Kansas and Colorado are comfortable with the simple statement on the status of Table 4A that Beightel provided to the EC on February 15, 2018. Beightel mentioned that the issue could be further discussed by the commissioners, but that for now, the EC has taken it as far as it can. Flaute will share the status of the issue with Nebraska's Commissioner.
 - j. Prepare the 2018 RRCA annual meeting (KS) report.
 - i. Status of transcript for 2018 annual meeting
 1. Erickson distributed the final transcript for the annual meeting via email on February 18.
 - ii. Status of 57th annual report (KS)
 1. Kansas staff is preparing the report and will circulate a draft to the other states by mid-March for review by early May.
 - k. Document the November 6, 2018 RRCA special meeting.
 - i. KS staff will draft a resolution, and updates to the Accounting Procedures and Reporting Requirements, and the Rules & Regulations for approval at the 2019 RRCA annual meeting.
 - ii. The November 6, 2018 meeting will be part of the 2019 annual report prepared by Kansas.
 1. There was no court reporter for the special meeting. The commissioners directed the EC to make an audio recording of the meeting and then prepare a summary of it to include in the annual report.
 2. Kansas is preparing a summary of the meeting and will also share the audio recording of the meeting with the EC, as requested by Flaute.
4. Summary of Meeting Actions/Assignments
 - a. Kansas will send the draft Accounting Procedure tracking document to the other states.
 - b. The website committee will meet and review the site after Nebraska appoints a new member.
 - c. Kansas will prepare drafts of the updated Accounting Procedures and Rules & Regulations, as well as a resolution of the RRCA to adopt the new documents pursuant to the November 6, 2018 special meeting and the updated Lovewell Ops methodology.
 - d. Kansas staff will prepare draft reports for the 2018 annual meeting and November 6 special meeting for review by the other states.
5. Future Meetings
 - a. May 16 at 2 pm central, same call information.
 - b. July 25 at 2 pm central, same call information.
6. Adjournment 10:38

Meeting Minutes for the
**QUARTERLY MEETING of the
ENGINEERING COMMITTEE of the
REPUBLICAN RIVER COMPACT ADMINISTRATION**
16 May 2019, 2:00 PM CST
Meeting was held telephonically

Attendees:

Chris Beightel, Kansas
Chelsea Erickson, Kansas
Ginger Pugh, Kansas
Sam Perkins, Kansas
Carol Myers Flaute, Nebraska
Sarah Nevison, Nebraska
Kari Burgert, Nebraska
Ivan Franco, Colorado
Willem Schreüder, Principia Mathematica

Agenda Items and Notes:

1. Introductions
2. Approve Minutes
 - a. Engineering Committee Chair Chris Beightel asked for approval of the March 1, 2019 EC minutes. Members Carol Myers Flaute and Ivan Franco affirmed approval of the minutes for the March 1st EC meeting.
3. Review/Modify Agenda
 - a. The agenda was modified by Kansas to add approval of the March 1, 2019 minutes. No other modifications were presented.
4. Review and Update Progress on Engineering Committee Task List
 - a. Meet quarterly to review the tasks assigned to the committee.
 - i. The committee's final quarterly meeting will be held July 23, 2019.
 - b. Exchange by April 15, 2019, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2019, the states will exchange any updates to these data.
 - i. Beightel reported that the Kansas data was about 90% accurate and complete with a few corrections needed in the coming weeks.
 - ii. Schreüder reported that the Colorado data was posted and close to final. Flaute requested that Colorado provide notice in the future when their data are posted. Schreüder confirmed they can do that. Beightel inquired if the Colorado meter data was posted and Schreüder reported that the data is on the website.

- iii. Burgert reported that a couple of corrections to the Nebraska data will be finalized in the coming week.
 - iv. Flaute asked if there was any portion of the Kansas data that is ready to review. Sam Perkins responded that the surface water data is final, but the groundwater data is still being updated.
 - v. Schreüder asked Burgert if the spreadsheet she had sent had been corrected. Burgert confirmed that the formulas have been corrected.
- c. Finalize the 2018 accounting and recommend it for approval by the RRCA.
- i. Beightel noted that this task appears to be on track.
- d. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
- i. Beightel noted that Chelsea Erickson sent a version to the EC for review and once that document is agreed to by the states, it will be attached to the Accounting Procedures and updated with AP changes in the future.
 - ii. Flaute asked about the depth of the review and the intent of the tracking document. The language is not clear if this document would be the official record or just be a description of the official record. Flaute suggested adding a caveat that if a question arises that the annual reports would be the official record still.
 - iii. Beightel agreed with the concerns Flaute expressed and suggested the word “record” was too strong. Beightel would discuss the intent of the tracking document with David Barfield.
 - iv. Franco concurred with Flaute that the tracking document should not supersede the annual report.
- e. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
- i. Kansas and Nebraska had no updates at this time.
 - ii. Schreüder reported that some of the Colorado compliance pipeline equipment was ruined in recent storms and the amount pumped was just short of 6,000 acre-feet. The plan is to pump again in November, but the target amount is yet to be determined.
- f. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
www.republicanriver.org
- i. Erickson reported that the website committee met, but no changes were suggested or made. The annual meeting information will be added once final plans are in place.
- g. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.

- i. There were no state updates at this time.
 - ii. Schreüder mentioned that he used the same tool as last time to check the spreadsheet and it did find mistakes, so the tool works great.
 - h. Work on improving the Lovewell Ops worksheet.
 - i. Beightel noted that this task is done. Beightel had suggested via email to the Committee that the reference does not need to be added to the Accounting Procedures document, but that the procedure will be memorialized in this year's Engineering Committee report as an attachment.
 - ii. Franco and Flaute agreed with the plan, but Franco said he would review the issue with Mike Sullivan and Kevin Rein.
 - i. Continue work to summarize and document the status of Table 4A in the RRCA accounting procedures and recommend how said document should be memorialized.
 - i. Beightel reported that there was no change in the status of this task.
 - ii. Colorado and Nebraska concurred.
 - j. Prepare the 2018 RRCA annual meeting (KS) report.
 - i. Status of 57th annual report (KS)
 - 1. Erickson reported that the annual report was circulated to Nebraska and Colorado. The states will be reviewing the documents over the coming weeks and provide edits to Erickson.
 - k. A Special Meeting of the RRCA was held on November 6, 2018.
 - i. KS will prepare the meeting report and circulate to the other states.
 - ii. Beightel made the voice recording available to the states for their records.
 - iii. Flaute agreed with Beightel's email suggestion that this special meeting result did not need to be put into the Accounting Procedures or Rules and Regulations.
 - iv. Franco is waiting for an official response from Commissioner Rein on the issue.
- 5. Summary of Meeting Actions/Assignments
 - a. Kansas will provide the Lovewell Ops document as an attachment to the forthcoming Engineering Committee report. Franco will get an official response from Colorado on the issue.
 - b. Kansas will provide a summary of the November special meeting for the states to review.
 - c. Kansas will be providing accounting corrections to the 2018 data and Nebraska will also provide updates soon.
 - d. The states will be reviewing the Accounting Procedure tracking document.
 - e. Nebraska and Colorado will be reviewing the 2018 annual report as provided by Kansas.
- 6. Future Meetings
 - a. July 23, 2019, 2 pm central, same call information.
- 7. Adjournment 2:28 PM central

Meeting Minutes for the
**QUARTERLY MEETING of the
ENGINEERING COMMITTEE of the
REPUBLICAN RIVER COMPACT ADMINISTRATION**
23 July 2019, 2:00 PM CST
Meeting was held telephonically

Attendees:

Chris Beightel, Kansas
Chelsea Erickson, Kansas
Ginger Pugh, Kansas
Carol Myers Flaute, Nebraska
Sarah Nevison, Nebraska
Kari Burgert, Nebraska
Ivan Franco, Colorado
Willem Schreüder, Principia Mathematica

Agenda Items and Notes:

1. Introductions
2. Approve Minutes
 - a. Engineering Committee Chair Chris Beightel asked for approval of the May 16, 2019 EC minutes. Members Carol Myers Flaute and Ivan Franco affirmed approval of the minutes for the May 16th EC meeting.
3. Review/Modify Agenda
 - a. No modifications were presented.
4. Review and Update Progress on Engineering Committee Task List
 - a. Meet quarterly to review the tasks assigned to the committee.
 - b. Exchange by April 15, 2019, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2019, the states will exchange any updates to these data.
 - i. Beightel reported that Kansas data exchange is complete.
 - ii. Burgert reported the Nebraska data exchange is complete.
 - iii. Schreüder reported that all the Colorado data is final, but the CIR data is still being processed and should be available within a few days.
 - iv. Schreüder noted that a model update was posted and asked if the Nebraska proposed accounting spreadsheet was finalized. Burgert reported that Nebraska is still reviewing the last Kansas data submission over the coming days and then will finalize the Nebraska spreadsheet.
 - c. Finalize the 2018 accounting and recommend it for approval by the RRCA.
 - i. Beightel noted that this task is on track as noted in task #2.

- ii. There was discussion about the process of finalizing the accounting spreadsheet. Schreüder clarified that he takes the Nebraska spreadsheet and checks what all three states submitted and then runs the model. There were past issues with minor differences in acre-feet between the states' spreadsheets, so for the past three years this has been the procedure used.
- d. Continue work on creating a document memorializing when RRCA Accounting Procedures have changed over the years and incorporate it into the Accounting Procedures.
 - i. Beightel noted that a draft document was circulated to the states for review. Beightel confirmed that the accounting procedure change document is only an explanatory document and would not supersede the RRCA transcripts or resolutions.
 - ii. Myers Flaute noted that the Nebraska review is underway but asked for the addition of a table or summary of each change with a brief description to help understand the timeline of changes. Franco agreed with that suggestion and noted that Colorado's review is still in progress as well.
- e. Provide updates on the progress of new and ongoing management strategies for maintaining compact compliance.
 - i. Kansas and Nebraska had no updates at this time.
 - ii. Schreüder reported no change in Colorado's pipeline pumping plans from previous reports. The South Fork Republican has a total of 2500 acre-feet and the Arikaree is still running at this time.
- f. Continue development and maintenance of the RRCA administrative website that serves as an informational page for the public and provide regular updates to the EC.
www.republicanriver.org
 - i. Erickson reported that the website committee was solicited for comments, but no changes were suggested. The annual meeting information was added to the website main page.
- g. Continue work and provide future updates on improving accounting tools developed by the Engineering Committee.
 - i. No further updates at this time.
- h. Work on improving the Lovewell Ops worksheet.
 - i. No further updates at this time.
- i. Continue work to summarize and document the status of Table 4A in the RRCA accounting procedures and recommend how said document should be memorialized.
 - i. No further updates at this time.
- j. Prepare the 2018 RRCA annual meeting (KS) report.
 - i. Status of 57th annual report (KS)

1. Erickson reported that the annual report was circulated to Nebraska and Colorado. The states are reviewing the documents and will provide edits to Erickson.
- k. A Special Meeting of the RRCA was held on November 6, 2018.
 - i. Erickson noted that a summary has been prepared but needs further review before circulating to the states for comments.
5. Summary of Meeting Actions/Assignments
 - a. Nebraska will finalize the accounting spreadsheet after review of Kansas data. Schreüder will do a final review of the accounting spreadsheet for the annual Engineering Committee report.
 - b. Kansas will create a summary table of the accounting procedure changes to aid in the understanding of the accounting tracking document. Nebraska and Colorado continue their review of the current document.
 - c. Nebraska and Colorado will be reviewing the 2018 annual report as provided by Kansas.
 - d. Kansas will provide a summary of the November special meeting for the states to review.
 - e. Kansas will circulate a draft of the annual Engineering Committee report for the other states to review.
6. Future Meetings
 - a. RRCA working session Wednesday August 21st in Colby at the Pioneer Memorial Library.
 - b. RRCA annual meeting Thursday August 22nd at the same location.
7. Adjournment 2:24 p.m. central

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ACCOUNTING INPUTS

Calendar Year		2018
Groundwater Data		
North Fork Subbasin	GW CBCU Colorado	17,365
	GW CBCU Kansas	0
	GW CBCU Nebraska	1,205
Arikaree Subbasin	GW CBCU Colorado	2,639
	GW CBCU Kansas	178
	GW CBCU Nebraska	112
Buffalo Subbasin	GW CBCU Colorado	521
	GW CBCU Kansas	0
	GW CBCU Nebraska	3,601
Rock Subbasin	GW CBCU Colorado	123
	GW CBCU Kansas	0
	GW CBCU Nebraska	5,200
South Fork Subbasin	GW CBCU Colorado	14,602
	GW CBCU Kansas	6,630
	GW CBCU Nebraska	974
Frenchman Subbasin	GW CBCU Colorado	1,175
	GW CBCU Kansas	0
	GW CBCU Nebraska	82,359
Driftwood Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	0
	GW CBCU Nebraska	867
Red Willow Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	0
	GW CBCU Nebraska	9,645
Medicine Creek Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	0
	GW CBCU Nebraska	21,374
Beaver Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	6,564
	GW CBCU Nebraska	4,284
Sappa Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	2,960
	GW CBCU Nebraska	2,144
Prairie Dog Subbasin	GW CBCU Colorado	0
	GW CBCU Kansas	9,886
	GW CBCU Nebraska	0
Mainstem Subbasin	GW CBCU Colorado	(1,978)
	GW CBCU Kansas Above Guide Rock	964
	GW CBCU Kansas Below Guide Rock	47
	GW CBCU Nebraska Above Guide Rock	88,133
	GW CBCU Nebraska Below Guide Rock	2,440
Import Water Data		
North Fork Subbasin	Imported Water Nebraska	0
Arikaree Subbasin	Imported Water Nebraska	0
Buffalo Subbasin	Imported Water Nebraska	0
Rock Subbasin	Imported Water Nebraska	0
South Fork Subbasin	Imported Water Nebraska	0
Frenchman Subbasin	Imported Water Nebraska	10
Driftwood Subbasin	Imported Water Nebraska	0
Red Willow Subbasin	Imported Water Nebraska	65
Medicine Creek Subbasin	Imported Water Nebraska	11,274
Beaver Subbasin	Imported Water Nebraska	0
Sappa Subbasin	Imported Water Nebraska	58
Prairie Dog Subbasin	Imported Water Nebraska	0
Mainstem Subbasin	Imported Water Nebraska Above Guide Rock	14,529
	Imported Water Nebraska Below Guide Rock	(17)
	Total	25,919

Calendar Year		2018
SW Pumping Data		
North Fork Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	463
	SW Diversions - Irrigation - Small Pumps - Colorado	16
	SW Diversions - M&I - Colorado	0
Arikaree Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Buffalo Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	241
	SW Diversions - Irrigation - Small Pumps - Nebraska	4
	SW Diversions - M&I - Nebraska	0
Rock Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
South Fork Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Frenchman Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Driftwood Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	0
	SW Diversions - M&I - Nebraska	0
Red Willow Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	0
	SW Diversions - Irrigation - Small Pumps - Nebraska	6
	SW Diversions - M&I - Nebraska	0
Medicine Creek Subbasin	SW Diversions - Irrigation - Non-Federal Canals - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Small Pumps - Nebraska - Above Gage	11
	SW Diversions - M&I - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	11
	SW Diversions - M&I - Nebraska - Below Gage	0

Calendar Year		2018
SW Pumping Data		
Beaver Subbasin	SW Diversions - Irrigation -Non-Federal Canals- Colorado	0
	SW Diversions - Irrigation - Small Pumps - Colorado	0
	SW Diversions - M&I - Colorado	0
	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	3
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Small Pumps - Nebraska - Above Gage	0
	SW Diversions - M&I - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	0
	SW Diversions - M&I - Nebraska - Below Gage	0
Sappa Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	0
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Small Pumps - Nebraska - Above Gage	0
	SW Diversions - M&I - Nebraska - Above Gage	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	0
	SW Diversions - M&I - Nebraska - Below Gage	0
Prairie Dog Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	436
	SW Diversions - M&I - Kansas	307
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska -Below Gage	0
	SW Diversions - Irrigation - Small Pumps -Nebraska - Below Gage	110
	SW Diversions - M&I - Nebraska - Below Gage	0
Mainstem Subbasin	SW Diversions - Irrigation - Non-Federal Canals- Kansas	0
	SW Diversions - Irrigation - Small Pumps - Kansas	690
	SW Diversions - M&I - Kansas	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska	2,677
	SW Diversions - Irrigation - Small Pumps - Nebraska	1,489
	SW Diversions - M&I - Nebraska	0
	SW Diversions - Irrigation - Non-Federal Canals - Nebraska Below Guide Rock	0
	SW Diversions - Irrigation - Small Pumps - Nebraska Below Guide Rock	1,177
	SW Diversions - M&I - Nebraska - Below Guide Rock	0

Non-Federal SW Consumptive Use

% Non-Federal Canal Diversion Consumed	60%
% Small Surface Water Pumps Consumed	75%
% Municipal And Industrial SW Consumed	50%

Calendar Year		2018
Non-Federal Reservoir Evaporation Data		
North Fork Subbasin	Non-Federal Reservoir Evaporation - Colorado	38
Arikaree Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Kansas	12
	Non-Federal Reservoir Evaporation - Nebraska	0
Buffalo Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Nebraska	8
Rock Subbasin	Non-Federal Reservoir Evaporation - Nebraska	87
South Fork Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Kansas	106
	Non-Federal Reservoir Evaporation - Nebraska	0
Frenchman Subbasin	Non-Federal Reservoir Evaporation - Nebraska	53
Driftwood Subbasin	Non-Federal Reservoir Evaporation - Kansas	8
	Non-Federal Reservoir Evaporation - Nebraska	0
Red Willow Subbasin	Non-Federal Reservoir Evaporation - Nebraska	137
Medicine Creek Subbasin	Non-Federal Reservoir Evaporation - Nebraska - Above Gage	162
	Non-Federal Reservoir Evaporation - Nebraska - Below Gage	2
Beaver Subbasin	Non-Federal Reservoir Evaporation - Colorado	0
	Non-Federal Reservoir Evaporation - Kansas	197
	Non-Federal Reservoir Evaporation - Nebraska - Above Gage	71
	Non-Federal Reservoir Evaporation - Nebraska - Below Gage	0
Sappa Subbasin	Non-Federal Reservoir Evaporation - Kansas	211
	Non-Federal Reservoir Evaporation - Nebraska - Above Gage	27
	Non-Federal Reservoir Evaporation - Nebraska - Below Gage	1
Prairie Dog Subbasin	Non-Federal Reservoir Evaporation - Kansas	141
	Non-Federal Reservoir Evaporation - Nebraska	7
Mainstem Subbasin	Non-Federal Reservoir Evaporation - Kansas	50
	Non-Federal Reservoir Evaporation - Nebraska - Above Guide Rock Gage - Whole Basin Value:	632
	Non-Federal Reservoir Evaporation - Nebraska - Below Guide Rock Gage - Whole Basin Value:	(9)

Stream Gage Data

North Fork Subbasin	North Fork Republican River At Colorado-Nebraska State Line	32,580
Arikaree Subbasin	Arikaree River At Haigler	821
Buffalo Subbasin	Buffalo Creek Near Haigler	1,858
Rock Subbasin	Rock Creek At Parks	4,095
South Fork Subbasin	South Fork Republican River Near Benkelman	1,970
Frenchman Subbasin	Frenchman Creek At Culbertson	25,906
Driftwood Subbasin	Driftwood Creek Near McCook	3,911
Red Willow Subbasin	Red Willow Creek Near Red Willow	3,932
Medicine Creek Subbasin	Medicine Creek Below Harry Strunk	25,135
Beaver Subbasin	Beaver Creek Near Beaver City	1,023
Sappa Subbasin	Sappa Creek Near Stamford	12,574
Prairie Dog Subbasin	Prairie Dog Creek Near Woodruff	4,205
Mainstem Subbasin	Republican River At Guide Rock	63,585
	Republican River Near Hardy	110,861

Hardy Gage Data

USGS Gage 06853500 Republican River Near Hardy, NE

Mainstem Subbasin	January	4,619
	February	5,521
	March	7,386
	April	3,658
	May	2,309
	June	7,601
	July	3,805
	August	5,065
	September	23,848
	October	17,603
	November	9,231
	December	20,216
	ANNUAL	110,862

ACCOUNTING TABLES

2018 Basin	Virgin Water Supply	Computed Water Supply	Allocations				Computed Beneficial Consumptive Use		
			Colorado	Kansas	Nebraska	Unallocated	Colorado	Kansas	Nebraska
North Fork	41,570	41,570	9,310	0	10,230	22,030	17,690	0	3,410
Arikaree	3,760	3,760	2,950	190	630	(10)	2,640	190	110
Buffalo	6,140	6,140	0	0	2,030	4,110	520	0	3,760
Rock	9,510	9,510	0	0	3,800	5,710	120	0	5,290
South Fork	24,640	24,640	10,940	9,910	340	3,450	14,960	6,740	970
Frenchman	114,230	113,460	0	0	60,810	52,650	1,180	0	85,380
Driftwood	2,540	2,540	0	180	420	1,940	0	10	870
Red Willow	19,050	15,060	0	0	2,890	12,170	0	0	9,930
Medicine	42,910	37,770	0	0	3,440	34,330	0	0	21,560
Beaver	12,140	12,140	2,430	4,710	4,930	70	0	6,760	4,360
Sappa	16,830	16,830	0	6,920	6,920	2,990	0	3,170	2,170
Prairie Dog	19,310	16,120	0	7,370	1,230	7,520	0	11,910	90
Main Stem	187,690	147,550	0	75,400	72,150	0	(1,980)	22,670	128,180
Total All Basins	500,320	447,090	25,630	104,680	169,820	146,960	35,130	51,450	266,080
Main Stem Including Unallocated		294,510	0	150,500	144,010				
Total	500,320	447,090	25,630	179,780	241,680	0	35,130	51,450	266,080

Table 2: Original Compact Virgin Water Supply and Allocations

Basin	Virgin Water Supply	Colorado Allocation	% of Basin Supply	Kansas Allocation	% of Basin Supply	Nebraska Allocation	% of Basin Supply	Unallocated	% of Basin Supply
North Fork	44,700	10,000	22.4%			11,000	24.6%	23,700	53.0%
Arikaree	19,610	15,400	78.5%	1,000	5.1%	3,300	16.8%	(90)	-0.4%
Buffalo	7,890					2,600	33.0%	5,290	67.0%
Rock	11,000					4,400	40.0%	6,600	60.0%
South Fork	57,200	25,400	44.4%	23,000	40.2%	800	1.4%	8,000	14.0%
Frenchman	98,500					52,800	53.6%	45,700	46.4%
Driftwood	7,300			500	6.9%	1,200	16.4%	5,600	76.7%
Red Willow	21,900					4,200	19.2%	17,700	80.8%
Medicine	50,800					4,600	9.1%	46,200	90.9%
Beaver	16,500	3,300	20.0%	6,400	38.8%	6,700	40.6%	100	0.6%
Sappa	21,400			8,800	41.1%	8,800	41.1%	3,800	17.8%
Prairie Dog	27,600			12,600	45.7%	2,100	7.6%	12,900	46.7%
Tributaries Sub-Total	384,000							175,500	
Main Stem	94,500								
Main Stem + Unallocated	270,000			138,000	51.1%	132,000	48.9%		
Total	478,900	54,100		190,300		234,500			

Table 3A: Table to Be Used to Calculate Colorado's Five-Year Running Average Allocation and Computed

	Col. 1	Col. 2	Col. 3	Col. 4
				Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and CORWS Credit Col 1 – (Col 2- Col 3)
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit and CORWS	
2014	21,900	32,100	7,448	(2,752)
2015	24,760	33,780	10,760	1,740
2016	25,190	33,930	10,130	1,390
2017	22,960	31,810	11,330	2,480
2018	25,630	35,130	13,578	4,078
Avg 2014-2018	24,090	33,350	10,650	1,390

Table 3B: Table to Be Used to Calculate Kansas's Five-Year Running Average Allocation and Computed

	Col. 1	Col. 2	Col. 3	Col. 4
				Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Col 1 – (Col 2- Col 3)
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit	
2014	102,760	60,060	NA	42,700
2015	163,420	50,890	NA	112,530
2016	156,760	51,320	NA	105,440
2017	177,230	62,040	NA	115,190
2018	179,780	51,450	NA	128,330
Avg 2014-2018	155,990	55,150	NA	100,840

Table 3C: Table to Be Used to Calculate Nebraska's Five-Year Running Average Allocation and Computed

	Col. 1	Col. 2	Col. 3	Col. 4
				Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and NERWS Credit Col 1 – (Col 2- Col 3)
Year	Allocation	Computed Beneficial Consumptive	Imported Water Supply Credit and NERWS	
2014	168,970	206,010	75,136	38,096
2015	223,860	243,530	36,171	16,501
2016	217,880	256,120	61,816	23,576
2017	238,540	242,140	39,439	35,839
2018	241,680	266,080	25,943	1,543
Avg 2014-2018	218,190	242,780	47,700	23,110

Table 4A: Colorado Compliance with the Sub-basin Non-impairment Requirement

Table 4A is left unpopulated pursuant to the August 24, 2016 “RESOLUTION BY THE REPUBLICAN RIVER COMPACT ADMINISTRATION APPROVING OPERATION AND ACCOUNTING FOR THE COLORADO COMPACT COMPLIANCE PIPELINE AND COLORADO’S COMPLIANCE EFFORTS IN THE SOUTH FORK REPUBLICAN RIVER BASIN”, paragraph E.

2018

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
Sub-basin	Colorado Sub-basin Allocation (Five-year Running Average)	Unallocated Supply (Five-year Running Average)	Credits from Imported Water Supply and CORWS Credit (Five-year Running Average)	Total Available Supply (Five-year Running Average)	Colorado Computed Beneficial Consumptive Use (Five-year Running Average)	Difference Between Available Supply and Computed Beneficial Consumptive Use (Five-year Running Average)
North Fork						
Arikaree						
South Fork						
Beaver						

Table 4B: Kansas's Sub-Basin Non-impairment Compliance**2018**

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7
Sub-basin	Kansas Sub-basin Allocation (Five-year Running Average)	Unallocated Supply (Five-year Running Average)	Unused Allocation from Colorado (Five Year Running Average)	Credits from Imported Water Supply (Five-year Running Average)	Total Available Supply Col 1 + Col 2 + Col 3 + Col 4 (Five-year Running Average)	Kansas Computed Beneficial Consumptive Use (Five-year Running Average)	Difference Between Available Supply and Computed Beneficial Consumptive Use Col 5 - Col 6 (Five-year Running Average)
Arikaree	152	(10)	122	N/A	264	198	66
South Fork	9,684	3,370	0	N/A	13,054	6,278	6,776
Driftwood	92	1,008	0	N/A	1,100	10	1,090
Beaver	4,146	62	2,138	N/A	6,346	5,962	384
Sappa	3,600	1,556	0	N/A	5,156	1,434	3,722
Prairie Dog	4,852	4,956	0	N/A	9,808	8,212	1,596

Table 5A: Colorado's Compliance During Water-Short Year Administration

	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
Year	Is the year Water Short Pursuant to III.J?* (Yes or No)	Statewide Allocation	Beaver Creek Reduction Pursuant to Table 5F	Allocation - Beaver Creek Reduction (Col. 2 - Col.3)	Computed Beneficial Consumptive (excluding the Beaver Creek Sub-basin)	Imported Water Supply Credit - IWS Beaver Creek + CORWS Credit	Difference between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit and CORWS Credit (Col. 4 - Col. 5 + Col. 6)
2014	Yes	21,900	1,228	20,672	32,100	7,448	(3,980)
2015	Yes	24,760	1,406	23,354	33,780	10,760	334
2016	Yes	25,190	1,650	23,540	33,930	10,130	(260)
2017	No	22,960	0	22,960	31,810	11,330	2,480
2018	Yes	25,630	1,852	23,778	35,130	13,578	2,226
Avg 2014-2018	Yes	24,090	1,230	22,860	33,350	10,650	160

Table 5F: Colorado's Beaver Creek Reduction During Water-Short Years

Water Short Year (WSY) Pursuant to III.J	Beaver Creek Allocation	Reduction = Average of last five WSY Beaver Creek Allocations
	Col. 1	Col. 2
2002	770	N/A
2003	260	N/A
2004	360	N/A
2005	910	N/A
2006	1,420	N/A
2007	2,320	744
2013	1,130	1,054
2014	1,250	1,228
2015	2,130	1,406
2016	2,430	1,650
2018	2,430	1852

Table 5B: Kansas's Compliance During Water-Short Year Administration
Kansas

Year	Allocation				Computed Beneficial Consumptive Use	Imported Water Supply Credit	Difference Between Allocation and the Computed Beneficial Consumptive Use offset by Imported Water Supply Credit
Column	1	2	3	4	5	6	7
	Sum Sub-basins	Kansas' Share of Unallocated Supply	Kansas' Share of the Unused Colorado Allocation	Total Col 1 + Col 2 + Col 3			Col 4 - (Col 5 - Col 6)
2017	24,490	6,004	1,380	31,874	24,830	N/A	7,044
2018	29,280	8,156	1,400	38,836	28,780	N/A	10,056
Avg 2017-2018	26,885	7,080	1,390	35,355	26,805	N/A	8,550

Table 5C: Nebraska's Compliance During Water-Short Year Administration

Year	Allocation				Computed Beneficial Consumptive Use			Imported Water Supply Credit and NERWS Credit	Difference Between Allocation and Computed Beneficial Consumptive Use offset by Imported Water Supply Credit Above Guide Rock and NERWS Credit
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
	State-Wide Allocation	Allocation Below Guide Rock	Allocation Above Guide Rock	Nebraska's Share of Unused Colorado Allocation	State-Wide CBCU	CBCU Below Guide Rock	CBCU Above Guide Rock	Credits Above Guide Rock	Col 3 + Col 4 - (Col 7 - Col 8)
2017	238,540	11,539	227,001	1,320	242,140	3,585	238,555	39,466	29,232
2018	241,680	19,786	221,894	1,340	266,080	3,314	262,766	25,943	(13,590)
Avg 2017-2018	240,110	15,660	224,450	1,330	254,110	3,450	250,660	32,700	7,820

Table 5D: Nebraska's Compliance Under a Alternative Water-Short Year Administration Plan

Year	Allocation				Computed Beneficial Consumptive Use			Supply Credit and	and Computed Beneficial
Column	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9
	State-Wide Allocation	Allocation Below Guide Rock	Allocation Above Guide Rock	Share of Unused Colorado Allocation	State-Wide CBCU	CBCU Below Guide Rock	CBCU Above Guide Rock	Credits Above Guide Rock	Col 3 + Col 4 - (Col 7 - Col 8)
2016	217,880	12,878	205,002	1,193	256,120	2,758	253,362	61,841	14,675
2017	238,540	11,539	227,001	1,320	242,140	3,585	238,555	39,466	29,232
2018	241,680	19,786	221,894	1,340	266,080	3,314	262,766	25,943	(13,590)
Avg 2016-2018	232,700	14,730	217,970	1,280	254,780	3,220	251,560	42,420	10,110

Table 5E: Nebraska's Tributary Compliance During Water-Short Year Administration

Year	Allocation			Computed Beneficial Consumptive Use	Water Supply Credit and AWS	Allocation - (CBCU - IWS- AWS)
	Sub-Basin Total	Share of Unallocated Supply	Total			
2016	89,960	71,096	161,056	136,720	52,742	77,078
2017	92,370	70,186	162,556	132,440	30,481	60,597
2018	97,670	71,863	169,533	137,900	11,446	43,079
Avg 2016-2018	95,020	71,025	166,045	135,170	20,964	51,838

ATTACHMENTS

Attachment 1: Sub-basin Flood Flow Thresholds

Sub-basin	Sub-basin Flood Flow Threshold Acre-feet per Year ³
Arikaree River	16,400
North Fork of Republican River	33,900
Buffalo Creek	9,800
Rock Creek	9,800
South Fork of Republican River	30,400
Frenchman Creek	51,900
Driftwood Creek	9,400
Red Willow Creek	15,100
Medicine Creek	55,100
Beaver Creek	13,900
Sappa Creek	26,900
Prairie Dog	15,700

³ Flows considered to be Flood Flows are flows in excess of the 94% flow based on a flood frequency analysis for the years 1971-2000. The Gaged Flows are measured after depletions by Beneficial Consumptive Use and change in reservoir storage.

Attachment 6: Computing Water Supplies and Consumptive Use Above Guide Rock

Year	Total Mainstem CWS	Hardy Gage	Superior Courtland Diversion Dam	Courtland Canal Diversions	Superior Canal Diversion	Courtland Canal Returns	Superior Canal Returns	Total Bostwick Returns Below Guide Rock	NE CBCU Below Guide Rock	KS CBCU Below Guide Rock	Total CBCU Below Guide Rock	Gain Guide Rock to Hardy	VWS Guide Rock to Hardy	Mainstem VWS Above Guide Rock	NE MS Allocation Above Guide Rock	KS MS Allocation Above Guide Rock	Nebraska Guide Rock to Hardy Allocation	Kansas Guide Rock to Hardy Allocation
2018	147,550	110,861	63,585	62,438	8,121	5,315	5,377	10,692	3,314	565	3,878	36,584	40,463	107,087	52,366	54,722	19,786	20,676

COURTLAND CANAL					
	2014	2015	2016	2017	2018
Return Flow From Courtland Canal To Republican River Above Lovewell From Kansas	813	764	563	789	608
Return Flow From Courtland Canal To Republican River Above Hardy From Nebraska	4,465	5,027	5,055	7,785	4,706
Courtland Canal Diversions At Headgate	59,654	57,452	44,129	62,438	46,704
Courtland Canal At Kansas-Nebraska State Line	54,209	50,960	37,548	52,599	40,559
NE Courtland Canal CBCU (includes transportation loss)	0	361	416	345	405
Superior Canal CBCU	0	2,157	2,049	2,616	2,744

NEBRASKA					
	2014	2015	2016	2017	2018
SW Diversions - Irrigation - Small Pumps - Nebraska Below Guide Rock	476	786	655	1,261	1,177
SW Diversions - M&I - Nebraska - Below Guide Rock	0	0	0	0	0
SW Non-Federal Reservoir Evaporation - Below Guide Rock	67	14	34	93	(9)
SW Return - Irrigation	119	197	164	315	294
SW Return - M&I	0	0	0	0	0
GW CBCU Nebraska Below Guide Rock	1,911	2,337	2,233	2,546	2,440

KANSAS					
	2014	2015	2016	2017	2018
SW CBCU - Irrigation - Small Pumps	484	554	535	727	518
SW CBCU - M&I	0	0	0	0	0
GW CBCU Kansas Below Guide Rock	31	28	43	53	47

Attachment 7: Calculations of Return Flows from Bureau of Reclamation Canals

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12
Canal	Canal Diversion	Spill to Waste-Way	Net Diversion	Field Deliveries	Canal Loss	Average Field Loss Factor	Field Loss	Total Loss from District	Percent Field and Canal Loss That Returns to the Stream	Total return to Stream from Canal and Field Loss	Return as Percent of Canal Diversion
Name Canal	Headgate Diversion	Sum of measured spills to river	Col 2 - Col 3	Sum of Deliveries to the field	Col 4 - Col 5	1 -Weighted Average Efficiency of Application System for the District*	Col 5 x Col 7	Col 6 + Col 8	Estimated Percent Loss*	Col 9 x Col 10 + Col 3	Col 11/Col 2
Σ Irrigation Season											
Σ Non- Irrigation Season											
Culbertson	7,426	194	7,232	319	6,913	30%	96	7,009	82%	5,941	80%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Culbertson Extension	0	0	0	0	0	30%	0	0	82%	0	100%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Meeker - Driftwood	14,295	617	13,678	4,264	9,414	30%	1,279	10,693	82%	9,385	65.7%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Red Willow	0	0	0	0	0	30%	0	0	82%	0	100.0%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Bartley	9,172	2,477	6,695	1,733	4,962	30%	520	5,482	82%	6,972	76.0%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Cambridge	21,005	2,307	18,698	7,235	11,463	30%	2,171	13,634	82%	13,486	64.2%
	0	0	0	0	0	30%	0	0	92%	0	100.0%
Naponee	660	88	572	212	360	35%	74	434	82%	444	67.3%
	0	0	0	0	0	35%	0	0	92%	0	100.0%
Franklin	15,780	2,064	13,716	4,614	9,102	35%	1,615	10,717	82%	10,852	68.8%
	0	0	0	0	0	35%	0	0	92%	0	100.0%
Franklin Pump	813	5	808	406	402	35%	142	544	82%	451	55.5%
	0	0	0	0	0	35%	0	0	92%	0	100.0%
Almena	0	0	0	0	0	30%	0	0	82%	0	100.0%
Superior	8,121	269	7,852	2,352	5,500	31%	729	6,229	82%	5,377	66.2%
	0	0	0	0	0	31%	0	0	92%	0	100.0%
Nebraska Courtland	539	0	539	497	42	23%	114	156	82%	128	23.8%
Courtland Canal Above Lovewell (KS)	17,007	1,026	15,981	7,928	8,053	23%	1,823	9,876	82%	9,125	53.7%
Courtland Canal Below Lovewell	30,608	2,648	27,960	16,558	11,402	23%	3,808	15,210	82%	15,120	49.4%

Attachment 8

CCV and RCCV Tracking ^a												
	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
Year	Start of Year RCCV	RCCV Adjustment	CCV	CCV Inflow Into HCL	RCCV Inflow Into HCL	Total CCV and RCCV Inflow Into HCL	Total CCV and RCCV Available for Release	CCV Released from HCL as Flow	CCV Released from HCL as Evaporation	CCV Retained in HCL (at End of Year)	CWSA	End of Year RCCV
	=Col 12 of previous year	b	c			= Col. 4 + Col. 5	=Col. 6 + Col. 10 of previous year			= Col. 7 – (Col. 8 + Col. 9)	=Col. 10 – Col. 10 of previous year	= Col. 1 – Col. 2 + Col. 3 - Col. 6 ^d
2007	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	8332	0	8332	8332	0	0	8332	8332	0
2016	0	0	41,935	24752	0	24752	33084	5084	4321	23679	15347	9,300
2017	9300	0	20,000	20,000	0	20000	43679	20000	2241	21438	-2241	9,300
2018	9300	0	0	0	0	0	21438	0	1339	20099	-1339	9,300

APV and RWS					RCCV Calc
Colorado		Nebraska			
Aug. Pumping Volume (APV)	Resolution Water Supply Credit (CORWS)	Aug. Pumping Volume (APV) Rock Creek That Passed Sub-basin Gage in the Current Year	Aug. Pumping Volume (APV) N-CORPE That Passed Sub-basin Gage in the Current Year	Resolution Water Supply Credit (NERWS)	Extra CCV Efforts Above CCV (Use with RCCV Calc)
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	15,766	0	15,766	0
7,448	7,448	19,397	42,758	62,155	0
10,760	10,760	1,098	25,932	18,698	8332
10,130	10,130	499	22,803	41,935	449
11,330	11,330	4,563	11,106	20,000	0
13,578	13,578	0	0	0	0

a. Calculations for RCCV, CWSA, & RWS don't start until Oct. 1, 2015

b. See Provision 10 of the RRCA Resolution signed August 24, 2016, titled "Resolution Approving Long-Term Agreement Related to the Operation of Harlan County Lake for Compact Call Years" for the terms of assigning RCCV Adjustment. The RCCV Adjustment for each year is equal to 20% of the unadjusted portion of the RCCV, if it is a non-Compact Call Year, plus any remaining volumetric reductions from the previous four years.

c. In years when the contributions from Nebraska's water management activities, consistent with the 2016 CCY HCL Operations Resolution, are greater than CCV and the NERWS is equal to the greater contribution volume, CCV in Column 3 should also be set equal to the contribution.

d. The formula for calculation of RCCV is based on calendar year operations and will vary when operations occur in a different calendar year than NERWS Credit is applied.

Flood Flow Calculations Based on Accounting Procedures III.B.1 and Attachment 1.

Hardy Gage Monthly Data (acre-feet)					
	2014	2015	2016	2017	2018
January	1,704	1,390	5,429	11,315	4,619
February	4,733	2,093	6,532	6,369	5,521
March	4,560	2,027	6,415	6,420	7,386
April	1,638	2,364	6,625	6,933	3,658
May	2,138	34,054	13,501	33,286	2,309
June	5,818	36,781	5,901	11,956	7,601
July	5,726	7,906	4,844	24,712	3,805
August	6,893	7,712	6,153	5,874	5,065
September	4,491	2,180	9,868	3,532	23,848
October	4,717	1,690	5,278	8,752	17,603
November	4,167	1,944	5,286	2,399	9,231
December	3,779	4,790	4,685	5,575	20,216
ANNUAL	50,364	104,931	80,515	127,122	110,862
Over 400K	0	0	0	0	0

Sub-basin Flows Above Attachment 1 Flood Flow Thresholds					
	2014	2015	2016	2017	2018
North Fork	0	0	0	0	0
Arikaree	0	0	0	0	0
Buffalo	0	0	0	0	0
Rock	0	0	0	0	0
South Fork	0	0	0	0	0
Frenchman	0	0	0	0	0
Driftwood	0	0	0	0	0
Red Willow	0	0	0	0	0
Medicine Creek	0	0	0	0	0
Beaver	0	0	0	0	0
Sappa	0	0	0	0	0
Prairie Dog	0	0	0	0	0
Sub-basin Sum	0	0	0	0	0

5-month Consecutive Period Flows (acre-feet)					
	2014	2015	2016	2017	2018
Jan-May	14,773	41,928	38,501	64,322	23,494
Feb-Jun	18,887	77,319	38,973	64,964	26,475
Mar-Jul	19,880	83,132	37,285	83,307	24,760
Apr-Aug	22,213	88,817	37,023	82,760	22,438
May-Sep	25,066	88,633	40,266	79,359	42,628
Jun-Oct	27,645	56,269	32,043	54,825	57,922
Jul-Nov	25,994	21,432	31,428	45,268	59,552
Aug-Dec	24,047	18,316	31,269	26,132	75,962

5-month Consecutive Period Test					
	2014	2015	2016	2017	2018
Jan-May	0	0	0	0	0
Feb-Jun	0	0	0	0	0
Mar-Jul	0	0	0	0	0
Apr-Aug	0	0	0	0	0
May-Sep	0	0	0	0	0
Jun-Oct	0	0	0	0	0
Jul-Nov	0	0	0	0	0
Aug-Dec	0	0	0	0	0
TOTAL	0	0	0	0	0

2-month Consecutive Period Flows (acre-feet)					
	2014	2015	2016	2017	2018
Jan-Feb	6,437	3,483	11,960	17,683	10,140
Feb-Mar	9,293	4,120	12,946	12,789	12,907
Mar-Apr	6,198	4,391	13,039	13,353	11,045
Apr-May	3,776	36,418	20,126	40,219	5,967
May-Jun	7,956	70,835	19,402	45,242	9,910
Jun-Jul	11,544	44,687	10,744	36,668	11,406
Jul-Aug	12,619	15,618	10,996	30,586	8,870
Aug-Sep	11,384	9,892	16,020	9,406	28,912
Sep-Oct	9,208	3,870	15,146	12,283	41,451
Oct-Nov	8,884	3,634	10,564	11,151	26,834
Nov-Dec	7,946	6,734	9,971	7,974	29,447

2-month Consecutive Period Test					
	2014	2015	2016	2017	2018
Jan-Feb	0	0	0	0	0
Feb-Mar	0	0	0	0	0
Mar-Apr	0	0	0	0	0
Apr-May	0	0	0	0	0
May-Jun	0	0	0	0	0
Jun-Jul	0	0	0	0	0
Jul-Aug	0	0	0	0	0
Aug-Sep	0	0	0	0	0
Sep-Oct	0	0	0	0	0
Oct-Nov	0	0	0	0	0
Nov-Dec	0	0	0	0	0
TOTAL	0	0	0	0	0

Final Sub-basin Flood Flows					
	2014	2015	2016	2017	2018
North Fork Flood Flow	0	0	0	0	0
Arikaree Flood Flow	0	0	0	0	0
Buffalo Flood Flow	0	0	0	0	0
Rock Flood Flow	0	0	0	0	0
Southfork Flood Flow	0	0	0	0	0
Frenchman Flood Flow	0	0	0	0	0
Driftwood Flood Flow	0	0	0	0	0
Red Willow Flood Flow	0	0	0	0	0
Medicine Creek Flood Flow	0	0	0	0	0
Beaver Flood Flow	0	0	0	0	0
Sappa Flood Flow	0	0	0	0	0
Prairie Dog Flood Flow	0	0	0	0	0
Mainstem Flood Flow	0	0	0	0	0

Combined Test					
	2014	2015	2016	2017	2018
FINAL TOTAL	0	0	0	0	0

Description of Lovewell net evaporation and Courtland Canal outflow charged to Republican River
David Barfield, Chris Beightel and Sam Perkins June 19, 2018 (revised August 3, 2018)

Summary

This note is in response to Willem's request for us to clarify how we calculate CBCU charges to the Republican River for Lovewell reservoir evaporation and diversions to Courtland Canal below Lovewell. These CBCU charges have been calculated annually in sheet Computations of Excel files Lovewell_Ops_YYYY.xls for years YYYY = 2003 to 2017 according to a procedure that maintains storage accounts for both Republican R (RR) and White Rock C (WRC) inflows with monthly time steps. For years 1995-2002, a simpler procedure was used to calculate these charges retrospectively with annual time steps in file Lovewell1995-02.xls. Based on a review of these procedures, we propose to use the simpler form of CBCU calculations with annual time steps as implemented in the file Lovewell1995-2017.xlsx.

CBCU charges to Kansas associated with Lovewell Reservoir evaporation of Republican R water and diversions to Courtland Canal below Lovewell are identified in RRCA Accounting Procedures under Part B.15, "Specific Formulas" for the North Fork and the Main Stem. The FSS Appendix C specifies that net evaporation be split according to inflows from Republican R via Courtland Canal and White Rock Creek.

Some of the data sources for the updated version differ from the original 1995-2002 calculations. For the update, WRC inflow is given by flow at the USGS Burr Oak gage instead of BOR calculated WRC inflow; and total Lovewell outflow is based on BOR instead off the USGS gage below Lovewell, which terminated operation in September 2002.

Entries to the Kansas Input sheet (file KS_input_sheet_2017.xlsx) include the following three items:

RR inflow from Courtland Canal to Lovewell (cell J19):	line 269
Net reservoir evaporation assigned to RR (EvapRR, cell O19):	line 228
RR water diverted to lower Bostwick district (cell S19):	line 270

Only the second and third of these appear in the RRCA SWInput.xls for RRCA accounting; as explained by Willem in an email (7/10/2018), "Only deliveries FROM Lovewell are used in the accounting."

Data sources and calculations

RR Inflow from Courtland Canal is given by sheet 'C-LOV' of BOR file BOST-MISC3MWD.xlsx.

White Rock Creek (WRC) inflow to Lovewell is assumed to be the flow at Burr Oak, USGS gage 06853800.

Lovewell discharge to lower KS Bostwick District [BOR: from sheet 'C-BELOW', file KS-BOST3MWD.xlsx (Courtland Canal, Mile 38.0).

Lovewell reservoir Net evaporation (= evaporation – direct precipitation) is calculated in sheet Net_Evap, file Lovewell.xls.

[A question for EC: why is precipitation subtracted? Since direct precipitation on the reservoir is included in the forebay elevation measurement, is precipitation counted twice?]

The fraction of net evaporation charged to RR is given by the RR inflow fraction, $RR / (RR + WRC)$.

RR diversions to the Bostwick district below Lovewell are given by the minimum of (a) RR inflow to Lovewell minus RR evaporation charge, and (b) Lovewell discharge to the lower district. This is based on the assumption that all spills to WRC are from WRC water, consistent with original calculations for 1995-2002 (file Lovewell1995-02.xls).

The above data and calculations are in sheet RR_CBCU, columns a through k of Excel file Lovewell1995-2017.xlsx; values for the previous versions are in columns P:W. The following descriptions for columns a through k are repeated in sheet Doc of the Excel file.

- a) Calendar year
- b) Lovewell Net evaporation (NetEvap), [EC]: calculated in sheet Net_Evap of file Lovewell.xlsx, given by Lovewell evaporation – direct precipitation as prescribed by RRCA EC for federal reservoirs.
- c) RR Inflow from Courtland Canal [BOR: sheet ‘C-LOV’, file BOST-MISC3MWD.xlsx; entered in KS accounting input sheet, line 269 but not used in compliance accounting as noted above]
- d) WRC Inflow [USGS]: mean annual flow at Burr Oak USGS gage 06853800 and converted to acre-feet.
- e) Lovewell discharge to lower KS Bostwick District [BOR: from sheet ‘C-BELOW’, file KS-BOST3MWD.xlsx (Courtland Canal, Mile 38.0).
- f) Lovewell outflow, af [BOR: file Lov-outfl.xlsx; copy: sheet LVKS_Out_AF Lovewell1995-2017.xlsx]
- g) $fRR = RR / (RR + c * WRC)$ [RR: col. C, WRC: col. D, $c = A2/A1 = 1.52$, ratio of basin drainage areas for USGS White Rock C gages at Lovewell and Burr Oak]
- h) RR Evap charge, $EvapRR = fRR * NetEvap$ (cols. G and B); **compliance accounting input line 228.**
- i) Diversion to Lower District = $\text{Min}(RR - EvapRR, \text{Outflow to lower district})$ [cols. C, H, E]; **compliance accounting input line 270.**
- j) WRC diversion to Lower District = [col. E] – [col. I]
- k) WRC spill: Lovewell total discharge – Lovewell discharge to Lower District = [col. F] – [col. E].

Comparison of results with previous calculation of RR evap charge and diversion to lower district

Fig. 1 plots annual calculation of the RR evaporation charge with previously calculated results for 1995-2017 that include an annual calculation for 1995-2002 and monthly accounting of stored RR and WRC water for 2003-2017. The comparison shows that the proposed annual calculation of the RR evaporation charge closely approximates the previous calculation with annual time steps for 1995-2002, but differs significantly from monthly calculations based on RR and WRC storage accounts in files Lovewell_Ops_YYYY.xls for years YYYY = 2003 to 2017. RR evap charge averaged over 2000-2016 is 1575 ac-ft as revised, compared with 908 ac-ft for original calculations.

Fig. 2 plots annual calculation of RR diversion to the Lower District (column I of RR_CBCU), and compares these with previously calculated values from Lovewell_Ops_YYYY.xls. Discrepancies for 1995-2002 are significant and likely due to the change in data sources for WRC inflow and Lovewell total outflow. Discrepancies in most subsequent years are small, and average RR diversions over 2000-2016 are nearly the same: 26.4 KAF for revised calculations and 26.6 KAF for original calculations.

Fig. 3 superimposes annual plots of RR and WRC inflows to Lovewell, RR evaporation charge, Lovewell discharge to the Lower District and RR diversion to the Lower District.

The following table summarizes inflow to Lovewell from Courtland Canal (RR) and White Rock Creek (WRC); evaporation charged to RR (EvapRR); and diversions to the Lower District below Lovewell from RR and WRC, averaged over years 2000-2016.

Average inflows from RR and WRC to Lovewell, RR CBCU charge for net evaporation and diversions to lower district from RR and WRC; averages over years 2000-2016. [range a55:f58 of sheet RR_CBCU]

units	Inflow to Lovewell		EvapRR	Diversions to Courtland below Lovewell	
	RR	WRC		RR	WRC
vol. afy	28,499	13,311	1,587	26,360	10,960
ratios	68.16%	31.84%		70.63%	29.37%

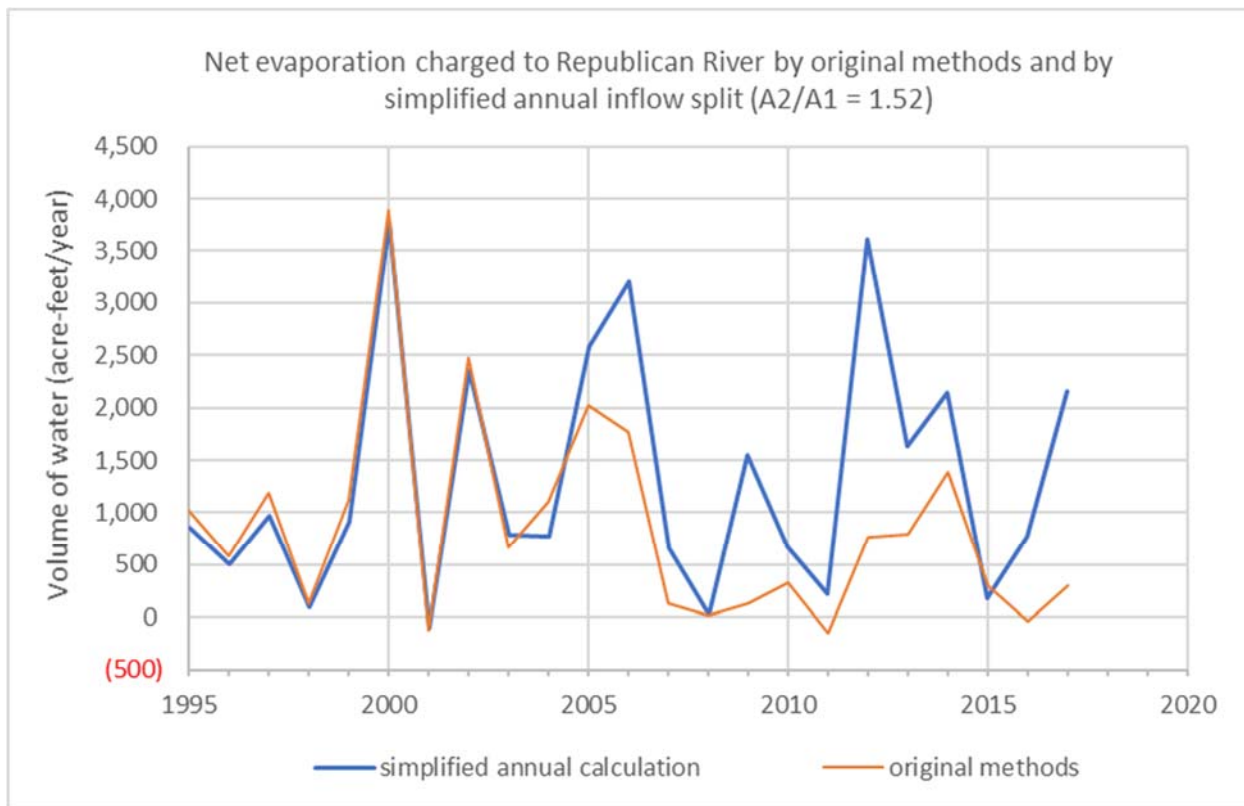


Fig. 1. Lovewell net evaporation charged to Republican River 1995-2017. Comparison of simplified annual calculation based on RR fraction of inflow vs. previous method of tracking RR and WRC storage accounts. [sheet RR_CBCU at P42 in Lovewell1995-2017.xlsx]

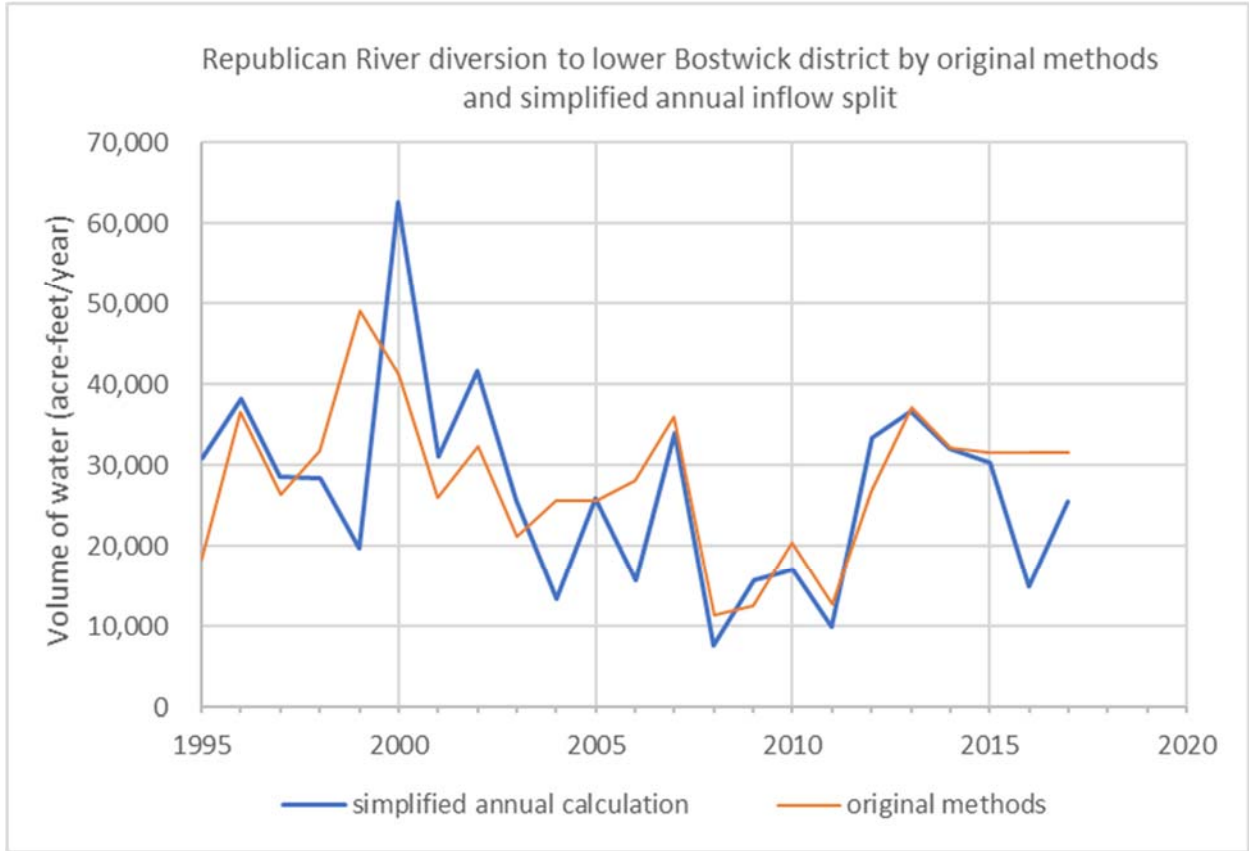


Fig. 2. Republican River diversion to lower Bostwick district 1995-2017. Comparison of simplified annual calculation based on RR fraction of inflow vs. previous method of tracking RR and WRC storage accounts. [sheet RR_CBCU at P68 in Lovewell1995-2017.xlsx]

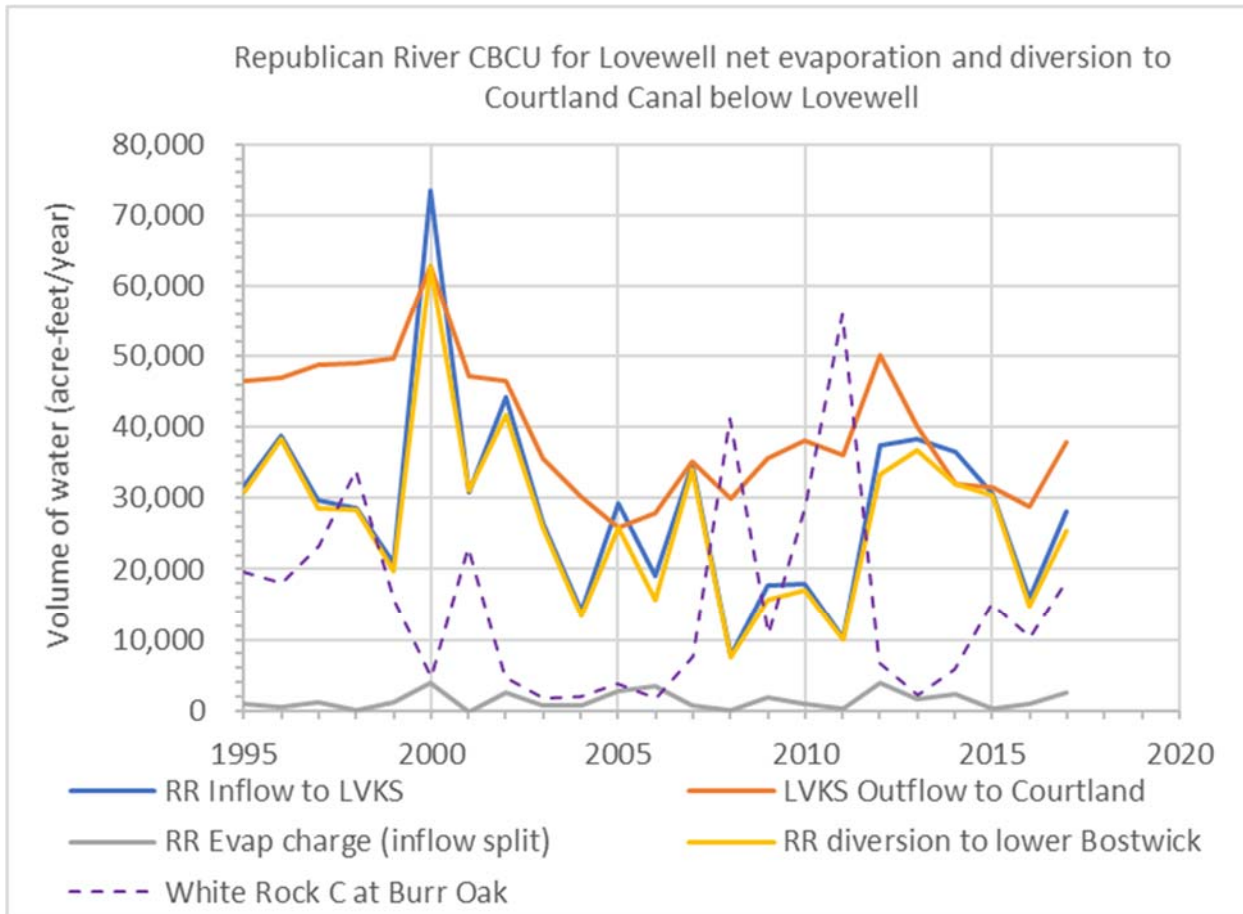


Fig. 3. RR diversion to Courtland bl Lovewell (yellow), RR evap charge (gray), RR inflow (blue), WRC inflow (dashed) and Lovewell discharge to Lower District (orange). [sheet RR_CBCU at I42 in Lovewell1995-2017.xlsx]

Notes on the status of Table 4A

At the August 24, 2016 RRCA annual meeting in Burlington, Colorado, the RRCA adopted a resolution concerning the Colorado Compliance Pipeline and Colorado's compliance efforts in the South Fork Republican river basin "CCP/SF Resolution". Attachment 10. Section E of the CCP/SF Resolution explicitly preserves each state's legal positions concerning the use of Unallocated Supply of the South Fork.

As part of a negotiated agreement to approve the 2007-2015 Accountings and to normalize the Administration's approval of the 2016 Accounting and subsequent years' accountings, citing Section E of the CCP/SF Resolution, Table 4A "Colorado Compliance with the Sub-basin Non-impairment Requirement" is left blank and effectively removed, both as a test of compliance and as a required accounting metric, from the accountings beginning with 2007 and for so long as the CCP/SF Resolution remains in effect.

Explanatory language is included on pages 2 and 24 of the RRCA Engineering Committee Report, which includes the 2007-2015 accountings presented to, and subsequently approved by the Administration at the May 25, 2017 Special Meeting; and above Table 4A in the approved 2016 Accounting.